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BIGNOSE-1
(W832)

SHELL-AUSTRALIA E. & P. OIL AND GAS

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BIGNOSE-1
WELL COMPLETION REPORT
GIPPSLAND BASIN
OFFSHORE VICTORIA
(VIC/P19)

GIPPSLAND TEAM/
PETROLEUM ENGINEERING

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SHELL DEVELOPMENT (AUSTRALIA) PTY LTD

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1. SUMMARY

Bignose-1, the fourth well to be drilled in Permit VIC/P19, was spudded on 16th September 1983 by the semi-submersible rig Nymphea and plugged and abandoned on 20th November 1983 after reaching a total depth of 3995m.

The upper objective (Maastrichtian-Paleocene coastal sands) in Bignose-1 was dry, however 10m of net hydrocarbons were encountered in thin fluvial Campanian sandstones, which produced up to 1.45 mmscf/d gas on test. The gas had a high CO_2 content (38%) which is similar to the gas composition in Volador-1.

The results of Bignose-1, taken with those of Volador-1, show that the south-western sector of the permit can be regarded as a single hydrocarbon domain. Early-generated hydrocarbon and non-hydrocarbon gases and liquids remain in the mature Campanian section, with insufficient migration occurring to concentrate the hydrocarbon liquids into producible oil columns.

2. INTRODUCTION

The Bignose structure, situated approximately 12km east of the Flounder Oilfield, is an elongated closure broken by major faults. The upper objective was a dip/fault closure in Upper Maastrichtian-lowermost Paleocene coastal cycles topsealed by marine shales. The lower objective was a fault closure in thin fluvial sandstones of Campanian age similar to those with hydrocarbon shows in Volador-1. Following disappointing results in Volador, the potential of the similar Bignose structure was somewhat downgraded, except that it was considered that the presence of faults may enhance vertical migration. Bignose was the second of the two prime prospects identified at the permit application phase.

3. WELL HISTORY

3.1 Summary of Well Data

Well Classification	:	Expendable exploration well
Location Co-ordinates (final)	:	Lat. 38°21'21.42" S Long. 148°36'05.49" E
Contractor/Rig	:	Foramer/Nymphea
Derrick Floor Elevation	:	25m above MSL
Water Depth	:	354m below MSL
BOP Stack	:	10,000 psi, 18-3/4" Cameron
Start of Operations	:	23.00 hours, 10/9/83
Spudded	:	12.00 hours, 16/9/83
Abandoned	:	05.00 hours, 20/11/83
End of Operations	:	19.00 hours, 21/11/83
Objective	:	Fault trap in multiple, thin, fluvial, Latrobe Group sandstones of Campanian age.
Total Depth	:	3995m
Formation at TD	:	Latrobe Group
Results	:	Plugged and abandoned as a dry well. Flowed minor gas and oil in production test.
Casing Record	:	30" at 425m 20" at 674m 13-3/8" at 1200m 9 -5/8" at 2740m 7" at 3994m

Logs :

DIL/LSS/SP/GR	1201- 674m
LDL/GR/CAL	1201- 674m
DLL/MSFL/GR/CAL	2740-1200m
LDL/GR/CAL	2743-1200m
DLL/MSFL/SP/GR/CAL	3992-2739m
LDL/CNL/GR/CAL (2 runs)	3994-2740m
BHCS/GR	3993-2740m
CST Interval	2740/1200m
"	3990-2740m

		RFT	Sample depths
			3557.5
			3582.5 (tight)
			3618
			3910
			26 pressures
		SHDT	3994-2740m
		CBL/VDL/GR	1300- 400m
		CBL/VDL/GR/CCL	3960-2575
		WST	
Production Test	:	Interval	3554-3563m
		Recovery	460 bbl/d water 1.45 MMSCFD gas (40% inerts) 3/4" fixed choke

3.2 Site Survey

A site and sea-bottom survey were carried out jointly over the Bignose and Volador locations (Fig.1). Details of the survey are given in Reference 1.

3.3 Navigation and Positioning

3.3.1 General

Positioning was provided by Geometra Survey Services (previously known as BTW) using a Syledis B radio positioning system interfaced to a Hewlett Packard 9825 computer. Software was provided by the contractor using their "Hydropac" package. Computations were checked throughout the operation using a Hewlett-Packard 85 computer and software supplied by SIPM the Hague. A three month delay occurred between the time the equipment was mobilized and when the move to the Bignose-1 location (Fig.2) took place. This was due to a delay in abandoning Basker-1 caused by an extension in the testing programme and an industrial dispute.

3.3.2 Operations

Positioning equipment performed well during the move, however some problems were experienced with the anchor handling operations.

The Herdentor broke her work wire attempting to recover anchor No. 4 at Basker-1 and later, while running anchor No. 3 at the Bignose location, her winch became unusable and the work wire which was still attached to the anchor chaser had to be abandoned. The inexperience of her crew in anchor handling may have attributed to these failures.

Details of the operations are given in Reference 2.

3.3.3 Rig Orientation

Taking into account prevailing wind directions and experience at previous locations a rig heading of 270° was decided upon. The anchor pattern used was a regular octagon with 45° between the anchors in each pair (Fig.3).

3.3.4 Gyro Reference Marker Directions

To make gyro surveys on the Nymphea the direction of a line from the drill floor to a reference marker needed to be accurately determined.

From the Bignose-1 position, a number of Esso production platforms may be seen. These have been accurately surveyed by means of a laser traverse, and their co-ordinates are known to within a metre. Using these as accurate indicators, the direction of the line was determined using a sextant to measure the angle between the line and the bearing to the platform positions. The final direction was Bignose-1 (drill floor) to reference marker 271°25'.

This was determined from measurements to four platform positions giving a standard deviation of 3 minutes. This however refers to the direction at the time of measurement. As the Nymphea is a floating platform, subject to the influence of wind, current, anchor tensions and buoyancy, change of this bearing by up to 1 degree is possible.

3.4 Drilling History

Following the end of operations at Basker-1 at 2300 hours on 10/9/83, Nymphea was towed 9 km to the Bignose-1 location. The first anchor was dropped at 0615 hours on 11/9/83, but it was not until 0800 hours on 15/9/83 that anchor handling was completed. During this period 2½ days were lost waiting on weather and additional time was lost due to problems with the winches on the supply boat Herdentor.

After completing the running of the anchors, and pretensioning to 175-225 T, the temporary guide base was run and set at 379m BDF with a 5 degree angle. The 36" BHA was made up and Bignose-1 was spudded at 1200 hours on the 16/9/83. The 36" hole was drilled to 433m in 8½ hours and circulated to viscous mud. Four joints of 30" casing together with the permanent guide base were run and the casing cemented with returns to the sea bed.

The 26" BHA was made up and the shoe track and pocket cleaned. A 12¼" pilot hole was drilled to 682m in 15 hours, and then opened up to 26" using seawater and viscous pills. 24 joints of 20" casing together with a cement stinger were run, and the casing landed with the shoe at 674m. The casing was cemented with returns to the seabed observed by the divers. The running tool was released and retrieved.

The BOP stack and riser were run, landed and tested in 34 hours. After making up the 17½" drilling assembly and tagging cement at 665m, the shoe track and pocket were drilled out with seawater. The hole was displaced to seawater - lignosulphonate - bentonite mud, and a leak off test performed at 688m, giving an equivalent maximum mud gradient of 1.40sg. The 17½" hole to 1206m was drilled in 3 days with one bit change. This section was trouble free. Two logging runs were then made; DIL/LSS/GR/SP and LDL/GR/CAL.

A checktrip was made, the hole was circulated clean, and the wearbushing retrieved. 72 joints of 13-3/8" N80 casing were run in 8 hours with the shoe at 1200m. A Halliburton subsea release system was used for the cementation. On bumping the top plug, the casing was tested to 2,000 psi, and the seal assembley energized and tested to 5,000 psi. The BOP was tested and the casing running tool retrieved.

The 17½" bottom bole assembly was laid down, and a 12¼" slick assembly made up and run in the hole to the top plug at 1176m. The cement plugs and shoe track were drilled, and the pocket cleaned. Six metres of new formation were drilled to 1212m, and a Formation Intake Test carried out, giving a maximum equivalent mud gradient of 2.09sg (mud weight 1.11sg, max surface pressure 1700psi). Drilling continued until 1256m, when the bit was changed and 4 stabilizers added to the drill string. The 12¼" hole was drilled to 1375m and a trip made to pick up a turbodrill assembly.

The interval 1375-1670m was turbodrilled in 12 hours and then a checktrip carried out. Drilling continued till 1836m when a drop in pump pressure of 300 psi was noted, necessitating a round trip. No leaks were observed and the interval 1836-2642m turbodrilled in 3 days with a 7 stand checktrip carried out at 2212m. High torque was noted at 2642m, and the turbine was pulled out and laid down. A conventional 12¼" bit (F3) was run in and the interval 2642-2745m drilled in 12 hours.

The following logging runs were made:

Run 1	DLL/MSFL/GR/SP/CAL	2740-1200m
2	LDL/GR/CAL	2743-1200m
3	LSS/GR	2743-1200m

A 51 shot side wall sample run and a 30 shot side wall sample run were then made, with a total recovery of 77 (2 lost, 2 empty). After rigging down Schlumberger, a checktrip was made. Light reaming was necessary from 2690-2735m and 3m of new hole was drilled to 2748m whilst working the junk sub.

The 9-5/8" casing (199 joints 47 lb/ft N80) was run, and landed with the shoe at 2740m. The casing was cemented and pressure tested to 3500psi. After a BOP stack test, the casing running tool was retrieved, and the 9-5/8" wearbushing set. An Eastman gyro multishot survey was then run on Schlumberger cable from 2675m - seabed. This run was not accepted due to some of the readings being erratic and a return was carried out from 2575m to seabed.

The bottom hole assembly for the 8½" hole was made up and run in the hole to the top of cement at 2715m. The collar, shoe track and pocket to 2748m were drilled out, and new formation drilled to 2789m with high torque and slow progress. A Formation Intake Test was carried out, giving a maximum equivalent mud gradient of 1.61sg.

A round trip was made and shocksub, 6 point reamer, and 2 stabilizers added to the bottom hole assembly. 8½" hole was drilled to 2987m (average ROP 4m/hr) at which depth a roundtrip was made for a bit change. Drilling continued to 3336m in 2 bit runs (5 days), with a BOP test carried out during the round trip at 3241m. The deviation surveys at 3241 and 3336m showed inclinations of 6° and 7-3/4° respectively, indicating the bottom hole assembly to be building angle. The bottom stabilizer was moved down one drill collar to the top of the shock sub. Drilling continued to 3473m and a roundtrip made for a bit change. The Totco inclination measurements (6-3/4° at 3388m, 5° at 3473m) showed that deviation was decreasing. Nevertheless a non-magnetic drill collar was run on the bottom hole assembly and an Eastman magnetic multishot run. Two attempts were made to survey the 8½" hole section back to the casing shoe but both were misruns. Drilling continued to 3492m and two further attempts to survey the 8½" hole were made. The fourth run was successful.

The rest of the 8½" hole section to 3995m (total depth) was drilled in 8 days with 2 further bit runs. This section was relatively trouble free, and deviation was reduced to 2°.

Schlumberger was rigged up and the following logs were run:

Run 1	DLL/MSFL/GR/CAL	
2	LDL/CNL/GR/CAL	
3	BHCS;GR	
4	CBL/VDL	1300-425m (TOC 750m)
5	HDT	
6	WST	

The CNL results were not accepted due to erroneous measurements in the sandstones. After run 6, a checktrip was made to TD, and the mud conditioned. Four RFT runs were then made with some gas and traces of condensate recovered from sands at 3557.5m and 3618m. Another run was made with the LDL/CNL/CAL/GR and 2 sidewall sample runs made (fired 102, recovered 88, 14 empty).

The decision was made to production test the interval 3554-3563m. A 9-5/8" casing scraper was run and the interval 2550-2650m scraped. The casing was then pressure tested to 5,000 psi using a Halliburton 9-5/8" RTTS packer and a checktrip was carried out to 3995m.

119 joints of 7" N80 liner, together with a Brown Oil Tool liner hanger were run on 5" drill pipe. The hanger was set, and the liner cemented with the shoe at 3994m, and the top of the liner at 2588m. The liner from 3450-3600m was scraped and the well was displaced to brine (1.08sg). The scraper assembly was laid down, and a 9-5/8" RTTS packer run into the hole. The drill pipe was displaced to diesel, the packer set, and an inflow test with 505 psi drawdown carried out. An immediate strong flow was noted and on shutting in, 450 psi pressure remained on the string indicating communication of fluids through the liner lap. The RTTS packer was laid down, and a 7" mill run in to clean out the tie back sleeve bore. Subsequently a tie back packer was run to the top of the liner and set. Another inflow test was carried out and the tie back packer was shown to properly seal off the liner lap.

Schlumberger was rigged up and a gauge ring/junk basket run prior to setting an F-1 packer at 3519m. The tubing was run, tested and circulated to diesel and the interval 3554-3563m was perforated. Details of flow rates are given in section 3.9.

After a build up period (6 hours), the well was killed with brine and the production tubing and assemblies laid down. A model N bridge plug was set at 3518m and abandonment cement plugs set (Plug 1 3518-3318m, Plug 2 2618-2429m, Plug 3 480-420m). Plug 2 was tagged and tested with 10T.

The BOP stack and riser were retrieved. The ICI explosive cannister was run and the casing shot 5m below the seabed. A further run with the explosives was required to free the wellhead. The PGB was retrieved with the wellhead, and then a run made with the J tool to retrieve the TGB. The well was abandoned at 1630 hours on 20/11/83. The divers made a seabed survey (all clear) and then the anchors were pulled, and the rig released to Basker South-A at 1900 hours on 21/11/83.

3.5 List of Contractors, Service Companies and Main Equipment

The Nymphea was brought into Australian waters under a one year contract between Shell Development (Australia) Pty Ltd and Foramer S.A.

The following contractors and service companies had contracts with Shell Development for the duration of the one year drilling programme:

Drilling Contract	:	Foramer S.A.
Supply Vessels	:	Australian Offshore Services
		Vessels used - Herdentor
		- Lady Penelope
Helicopter Services	:	Commercial Aviation
	:	2 x Bell 212 Helicopters
Electric Logging	:	Schlumberger
Mud Logging	:	Exlog Gemdas Unit
Subsea Support Services	:	Solus Ocean Systems
		OMBV System
Surface Production	:	Flopetrol Schlumberger
Cementing Services	:	Halliburton Australia
Mud Service and Materials	:	Baroid Australia Pty Ltd

Main Equipment

Drilling Vessel Design	:	Enhanced Pacesetter Semisubmersible
Drilling Vessel Built	:	1982 Hitachi Zosen
Derrick	:	160 ft, 1,000,000 lbs
Drawworks	:	National 1625DE 16,000-25,000 ft rating
Mud Pumps	:	National 12P 150 7*12
BOP's	:	Cameron 18-3/4" 10,000 psi
Wellhead Equipment	:	Vetco SG-5
Anchors	:	8 x 20 Stevin type anchors
		8 x 3" chain 3 - breaking load 474 MT
Cementing Unit	:	Halliburton

Solids Control Equipment	:	- Harrisburg triple tandem shale shaker - Pioneer Sandmaster Desander T8-6 Capacity 800 GPM - Pioneer Siltmaster Desilter T16-4 800 GPM - Thule VMS 200 Mud Cleaner 16 cones - 1 Swaco degasser

3.6 Drilling Data

3.6.1 Bit Record

See Table 1: Bit Record

3.6.2 Casing Summary

See Table 2: Casing Summary

3.6.3 Cement Summary

See Table 3: Cement Summary

3.6.4 Mud Summary

See also Table 4: Mud Record

36" and 26" Hole Section

The 36" and 26" holes were drilled with seawater and viscous pills with minimum control of properties. Before running the 20" casing, the 26" hole was displaced to viscous mud (prehydrated bentonite).

17½" Hole Section

The 17½" hole was drilled with a seawater-bentonite-polymer system. A mud weight of 1.09-1.11 sg was used and the MBC was kept less than 19 lb/bbl. Celpol was used to keep the yield point in the range 10-13 lb/100 sq. ft. Large additions of seawater were required to maintain the mud weight less than 1.11 sg (5-10 m^3/hr seawater).

No hole problems were experienced during this hole section, and the mud properties were easy to maintain.

12¼" Hole Section

The 12¼" hole was drilled with similar mud to the 17½" hole. Mud weight was run at 1.10-1.12 sg, MBC 12-15 lb/bbl, yield point 10-15 lb/100 sq. ft. and API water loss less than 9cc. Water loss was controlled with Dextrid and CMC, and small additions of Celpol to control rheology. All solids removal equipment was kept operating at maximum capacity.

This hole section was drilled with turbine and was relatively trouble free. Small additions of mud lubricant Magcolube (5 litres/m^3) were used.

8½" Hole Section

The 8½" hole was drilled with similar mud to the 12¼" hole section. Mud weight was run at 1.12 sg, MBC 10-13 lb/bbl, yield point 12-17 lb/100 sq.ft, and API water loss less than 5cc/30min. Water loss and rheology were controlled by additions of Dextrid and CMC. In order to maintain HTHP water loss below 20cc/30min it was necessary to partly replace Dextrid with Durenex as bottom hole temperatures increased.

In general this section was trouble free. The high and fluctuating torque problem encountered whilst drilling Volador-1 was also evident, but was effectively controlled by using a roller reamer in the BHA.

3.6.5 Formation Intake Test

Formation intake tests were carried out after drilling out the 20", 13-3/8", 9-5/8" casing shoes. The following results were obtained:

Depth (m)	Surface Pressure (psi)	Mud (sg)	EMG (sg)	Formation
682	355	1.03	1.40	Marl
1212	1700	1.11	2.09	Marl
2789	2100	1.11	1.61	Sandstone

3.6.6 Lost Circulation

None

3.6.7 Perforations

Interval 3554-3563m (4 shots.foot)

This was carried out using a through tubing 2-1/8" Enerjet perforating gun.

Table 1: Bit Record Summary

Run No.	Bit No.	Bit Size	Bit Type	Jet Size 1	Jet Size 2	Jet Size 3	Depth Out (m)	Metres	Hours	WOB (mt)	RPM	Flow (l/min)	Press (psi)	Mud Wt	Mud Visc. (secs)	Dull Code T	Dull Code B	Dull Code G	Remarks
1	1RR	26	DSJ	20	20	20	433	55	7-3/4	0/2	30/40	2500	550			2	4	I	Seawater plus viscous pills
2	2RR	26	DSJ	20	20	20	433		4-1/2	2	45		1800			2	4	I	Drill cement
3	3	12-1/4	FDGH	16	16	16	682	249	12	3	100	3306	2500			1	1	I	Pilot Hole
4	4RR	26	DSJ	20	20	20	682	249	16	4	70	3800	2100			2	5	I	Opened Hole
5	5	17-1/2	DSJ	16	16	16	1049	367	41	8/9	80	3303	2100			2	4	I	Drill cement, Marl
6	6	17-1/2	DSJ	16	16	16	1206	157	21-1/4	9	90	3300	2200	1.05	44	2	3	I	Marl
7	7RR	12-1/4	FDGH	16	16	16	1256	50	5	8	90	3083	2675	1.09	38	1	1	I	Drilled Cement, shoe tr, Marl
8	8	12-1/4	SDS	16	16	16	1375	119	7-3/4	15	100	3083	2675	1.11	42	1	1	I	Marl
9	9	12-1/4	DIAMOND BOART				2642	1267	86-1/2	0/10	90	3234	4000	1.11	45				80% wear with 12-1/4" Neyrfor turbine
10	10	12-1/4	F3	16	16	16	2745	103	13	5/12	80	2400	2100	1.11	44	1	1	I	11 Hours rotary BT
11	11	12-1/4	SDS	16	16	16	2748	3	1/2	6/18	70	2300	2000	1.11	44	1	1	I	2-1/4 hours reaming Excl
12	12	8-1/2	SVH	16	16	16	2789	41	10-3/4	2/8	40/80	1500	1600	1.11	48	5	3	1/8	plugged nozzle
13	13	8-1/2	F3	10	10	11	2987	198	40-3/4	15/18	50/70	1450	2700	1.12	46	3	3	1/8	36 hours rot on bottom
14	14	8-1/2	F3	10	10	11	3241	254	55-3/4	12/15	50/70	1450	2750	1.12	47	3	7	1/8	50.5 hours rot on bottom
15	15	8-1/2	F3	10	10	11	3336	95	31	15/10	50/70	1450	2650	1.11	45	2	3	1/8	POOH to change BHA
16	16	8-1/2	F3	10	10	11	3473	137	47-1/4	15	50	1450	2530	1.12	43	5	3	1/8	43.9 hours on bottom
17	17	8-1/2	F3	10	10	11	3684	211	65-1/4	15	50	1450	2590	1.11	46	4	4	1/8	60.2 hours on bottom. Some broken inserts
18	18	8-1/2	F3	10	10	11	3832	148	54	15/18	50/60	1450	2590	1.12	49			I	50.7 hours on bottom
19	19	8-1/2	F3	10	10	11	3995	163	54-3/4	18	60	1450	2530	1.12	44	4	4	I	51.3 hours on bottom

Table 2: Casing Summary

Date Run	Size (ins)	Grade	Weight (lb/ft)	Coupling	Show Depth (mbdf)	Remarks
17/9/83	30	B	310	Vetco ATD Squnch	425	4 joints
20/9/83	20	X52	133	Vetco LS	674	24 joints. 18-3/4" 10,000 psi SG-5 wellhead system
28/9/83	13-3/8"	N80	72	BTC	1200	72 joints
9/10/83	9-5/8"	N80	47	BTC	2740	199 joints
7/11/83	7	N80	29	BTC	3994	119 joints Top of liner at 2588m

Table 3: Cement Summary

Date	Job Description	Hole Size /Depth	Casing Shoe	Cement Used (mT)	Slurry Wt (sg)	Mixwater Additives	Remarks
17/9/83	30" casing	36"/433	425	Class G 17 15.7	1.62 1.92	Seawater plus Econolite 24 litres/m³ 16m³ Seawater 6.8m³	Returns to seabed observed by diving bell Design Figures: Lead: 1.27 m³ slurry/mt cement 0.92 m³ mixwater/mt cement Tail: 0.76 m³ slurry/mt cement 0.44 m³ water/mt cement
20/9/83	20" casing	26"/682	674	Class G 56 26	1.60 1.90	Seawater plus Econolite 52m³ Seawater 11 m³	Return observed to seabed Design Figures: Lead: 1.27 m³ slurry/mt cement 0.92 m³ mixwater/mt cement Tail: 0.76 m³ slurry/mt cement 0.44 m³ water/mt cement
29/9/83	13-3/8" casing	17-1/2"/1206	1200	Class G 27 9.2	1.48 1.90	Drill water plus 3% BWOW Gel 31 m³ Seawater 4.1 m³	TOC 600m Design Figures: Lead: 1.46 m³ slurry/mt cement 1.13 m³ water/mt cement Tail: 0.76 m³ slurry/mt cement 0.44 m³ water/mt cement
9/10/83	9-5/8" casing	12-1/4"/2745	2740	Class G 42.3 5	1.5 1.9	Drill water plus 3% BWOW Gel, HR-7 0.5% BWOC 48 m³ Seawater plus 0.6% BWOC, HR-7 2 m³	TOC 1050m Design Figures: Lead: 1.46 m³ slurry/mt cement 1.13 m³ water/mt cement Tail: 0.76 m³ slurry/mt cement 0.44 m³ water/mt cement
7/11/83	7" liner	8-1/2"	3994	Class G 36	1.9	Drill water plus 0.75% BWOC, CFR-2 0.6% BWOC, Halad 22A 0.4% BWOC, HR-12 16 m³	Design Figures: 0.76 m³ slurry/mt cement 0.44 m³ water/mt cement
18/11/83	Abandonment Plug 1	8-1/2"		Class G 5	1.9	Drill water HR-12 0.3% BWOC CFR-2 0.75% BWOC	Plug 1: 3518-3318m
18/11/83	Plug 2	8-1/2"		9	1.9	Drill water	Plug 2: 2618-2418
18/11/83	Plug 3	7" liner		3	1.9	Seawater	Plug 3: 480-420m

Table 4: Mud Record

Depth (M.BDF)	Weight (SG)	Visc. (sec)	PV (cp)	YP	GELS 10 (sec)	GELS 10 (min)	Filtrate API (cc)	Filtrate (Ca ppm)	Analysis (Cl ppm)	Sand (%)	Retort Water (%)	Analysis Solids (%)	pH	MBC (LB/bbl)
36" and 26" hole drilled with seawater and viscous slugs														
720	1.05	44	9	25	7	20	-	80	11000	TR	97	3	9	12.5
1068	1.10	41	9	12	5	16	11.5	60	18500	TR	96	4	9.4	12.5
1212	1.10	38	9	10	3	14	11.0	80	19000	TR	96	4	9.6	11.0
1651	1.11	42	11	13	3	12	7.8	400	20000	TR	95	5	9.0	10.0
2183	1.11	41	11	12	2	12	8.6	420	19000	TR	94	6	9.2	10.0
2639	1.11	45	12	14	4	22	8.8	300	19000	TR	95	5	9.4	12.0
2825	1.12	48	17	15	3	14	3.8	160	19000	TR	95	5	9.9	10.0
3002	1.12	46	17	13	4	12	4.3	160	19500	TR	95	5	9.5	10.0
3305	1.12	48	17	16	4	12	4.4	120	20000	TR	95	5	9.8	10.5
3474	1.12	50	17	16	4	13	5.3	140	20000	TR	94.5	5.5	9.7	10.5
3634	1.12	48	18	17	4	14	4.8	120	20000	TR	94.5	5.5	9.8	10.0
3781	1.12	46	14	16	5	17	4.8	120	20000	TR	94	6	9.3	10.0
3994	1.12	44	14	14	4	14	4.3	100	20000	TR	93	7	9.0	10.0

3.6.8 Fishing

None

3.6.9 Side Tracking

None

3.6.10 Deviation

See Table 5 - Deviation Record

See Fig. 4 - Well Path (Plan View)

3.6.11 Abandonment

See Fig. 5 - Well Status

TABLE 5: Deviation Record

See Eastman survey Figure 4 of well path to the 9-5/8" casing shoe.

Depth AH (m)	Inclination	Remarks
392	1	Totco
433	0	Totco
445	1	Totco
682	0	Totco
764	0	Totco
792	0	Totco
811	0	Totco
944	0	Totco
1049	1/4	Totco
1206	1/4	Totco
1370	0	Totco
1670	1	Totco
1965	2	Totco
2212	3	Totco
2487	3-1/2	Totco
2642	3-1/2	Totco
2745	1-1/4	Totco
2987	2	Totco
3239	6	Totco
3331	7-3/4	Totco
3388	6-3/4	Totco
3473	5	Totco
3684	2	Totco
3830	1-1/2	Totco
3995	2-1/2	Totco

3.7 Formation Evaluation

3.7.1 Mudlogging Services

The mudlogging services on the Nymphea were provided by Exploration Logging Australia. The unit was crewed by two mudloggers and one 24 hour Gemdas computer operator.

Services included collection, washing, drying and packing of cuttings samples, routine examination of cuttings and checking for hydrocarbon indications. Continuous monitoring of drilling parameters (ROP, WOB, torque, pump rate), mud tank levels, and mud weight and continuous monitoring and chromatographic analysis of gas were also carried out. These values were recorded at 5 metre intervals in the top hole and at one metre intervals for the 8½" hole by an on-line computer which also produced real-time prints and plots (against driller's depth) of this data. Logged depths were calculated automatically by the computer. A summary of this data can be found in Reference 3.

3.7.2 Cuttings

Ditch cuttings were collected every 10m below 20" casing (551m) down to 9-5/8" casing depth and thereafter every 3m to total depth. The samples were bagged and distributed as follows:

(a) Four sets of washed and dried samples (in 100gm packets) were prepared; one set each was sent to the Bureau of Mineral Resources and the Victorian Department of Minerals and Energy, and two sets were sent to Corelab, Perth to be stored on behalf of Shell Development.

(b) An additional set of washed and dried samples was packed into miniature plastic samplex trays and sent to Shell Development in Perth for office use.

(c) Two sets of unwashed cuttings packed in half-kilogram bags were sent to Corelab, Perth (for Shell).

Detailed cutting descriptions are found in References 3 and 4.

3.7.3 Sidewall Samples

A total of 183 shots were fired with a total recovery of 165 samples. For descriptions of samples see Reference 4.

3.7.4 Velocity Survey

The velocity survey, carried out by Schlumberger was performed at 24 levels.

3.8 Petrophysics

3.8.1 Wireline Logs

The following wireline logs were run:

Date	Hole Size	Interval	Type
27/9/83	17½"	1201-674m	DIL/LSS/SP/GR
		1201-674m	LDL/GR/CAL
6/10/83	12¼"	2740-1200m	DLL/MSFL/GR/CAL
		2743-1200m	LDL/GR/CAL
		2743-1200m	LSS/GR
			CST 77/81
31/10/83	8½"	3992-2739m	DLL/MSFL/GR/SP/CAL
		3994-2740m	LDL/CNL/GR/CAL
		3993-2740m	BHCS/GR
		1300-400m	CBL/VDL/GR
		3994-2739m	SHDT
			WST
			RFTs (4 runs)
		3557.5m	
		3582.5	Samples
		3618m	
		3910m	
			26 pressure measurements
			CST 88/102
11/11/83	7" liner	3960-2575m	CBL/CCL/VDL/GR

3.8.2 Evaluation

3.8.2.1 General

Logged intervals down to approximately 3450m are all water bearing. Marginal hydrocarbon saturations (up to 40%) were calculated in rather shaly sands from 3450m to 3540m. This ties in with the increase in gas readings observed whilst drilling below 3460m. Log evaluation of the sands below 3540m indicated a few intervals with hydrocarbon saturations up to 62% although the type of hydrocarbons was unclear (refer 3.8.2.2). One RFT sample taken in this section (at 3557.5m) failed to provide a conclusive answer and a production test was performed over the interval 3554-3563m. This recovered gas and water with minor amounts of condensate (see section 3.9).

A total of 10.0m of net hydrocarbons (based on 13% porosity and 50% hydrocarbon saturation cut-offs) were derived from the log evaluation.

3.8.2.2 Problems Associated with Log Interpretation

The high CO_2 content of the gas (up to 21% weight/weight) causes it to have a higher density than normal hydrocarbon gas and hence mask the gas effect on the LDT/CNL crossover.

3.8.2.3 Formation Water Resistivity (Rw)

Formation water resistivity was determined from analyses carried out on formation water recovered from the production test (see Table 6 for details).

3.8.2.4 Method of Evaluation

Details of the calculation method are given in Appendix 7.1.

TABLE 6:

Recovered Formation Water and Mud Filtrate Properties

	Chlorides (ppm)	Equiv. NaCl (ppm)	Resistivity (ohmm Rw)	Equiv. NaCl (ppm)	Hardness (ppm)	pH
Production Test Water 3554 - 3563m						
a) Field measured	7200	11880*	0.45 @ 22°C	13500	100	7.5
b) Measured by Analab	6745	13495			50	8.6
RFT						
Water recovered by RFT from 3557.5m, 3610m was mud filtrate.						
Mud Filtrate	21000	34650	0.20 @ 17°C	39000	100-300	9.5

*7200 x 1.65

3.8.2.5 Petrophysical Parameters Used in Evaluation

See Table 7.

3.8.2.6 Evaluation Results

Final logging evaluation in Bignose-1 produced the following net figures (based on 13% and 50% cut-offs for porosity and hydrocarbon saturations respectively):

Interval	Net (m)	Avg Porosity (%)	Avg Hysat %
3554.1-3562.8	2.9	17.9	61.7
3580.8-3585.2	3.2	17.3	57.0
3613.8-3620.4	0.9	22.0	57.2
3770.5-3774.3	1.0	16.6	57.6
3784.4-3789	2	13.9	54.4
Total	10	17.2	58

(Refer to Enclosure 1 for the depth plot of Petrophysical Evaluation)

3.8.3 Repeat Formation Test Results

3.8.3.1 Samples Taken

The following samples were taken:

1) Depth : 3557.5m
   Type : Segregated
   Recovery : Chamber 1 (6 gal)
   13 Litre mud filtrate with trace condensate 49.3 SCF gas.
   : Chamber 2 (1 gal)

2) Depth : 3910m
   Type : Segregated
   Recovery : Chamber 1 (6 gal)
   23 litre mud filtrate, no gas
   : Chamber 2 (1 gal)
   3.6 litre mud filtrate, no gas

3) Depth : 3618m

Type : Segregated

Recovery : Chamber 1 (6 gal)

22.5 litre mud filtrate

0.3 SCF gas

: Chamber 2 (1 gal)

3.6 litre mud filtrate

For typical properties of mud filtrate see Table 7.

3.8.3.2 Analysis of RFT sample at 3557.5m

The upper chamber from the RFT test was sent to Flopetrol for analysis and the results are given below. Note the very high content of CO_2 in the reservoir fluid.

Sampling pressure	:	5000 psi
Transfer pressure	:	4700 psi
Condensate gas ratio	:	25 bbl/MMscf
API gravity condensate	:	47.7 degrees
Specific gravity (60/60°F)	:	0.7897

Molecular composition of reservoir fluids:

Component	Reservoir fluid mole percent
Nitrogen	1.98
Carbon Dioxide	32.39
Methane	53.16
Ethane	5.14
Propane	3.10
I-Butane	1.05
N-Butane	0.82
I-Pentane	0.41
N-Pentane	0.27
Hexanes	0.23
Heptanes +	1.45
Total	100.00

Molecular weight	:	30.508
Gravity (Air = 1)	:	1.053
Molecular weight of Heptanes +	:	175.9

3.8.3.3 Evaluation of RFT Pressures

(RFT pressures are listed in Table 8)

The general gradient determined from RFT pressures (see Fig. 6) is 1.016 sg, which is a normal brackish water gradient. Between 3480m and 3880m, however, all the sands are overpressured. The probable explanation of this is poor pressure communication within this interval and generation of hydrocarbons charging the sands. The overpressuring makes it impossible to determine the extent of any hydrocarbon columns in this interval.

Table 7: Petrophysical Parameters used in Evaluation

PARAMETERS		INTERVAL			
		2525-2740m	2740-3320m	3320-3450m	3450-3990m
GR minimum	(API units)	30	30	30	30
GR maximum	(API units)	140	140	140	140
mf	(g/cc)	1.0	1.0	1.0	1.0
ma	(g/cc)	2.66	2.66/2.72	2.66/2.72	2.66/2.72
Rmud	(ohm.m)	.107	.09	.08	.08
Rmc	(ohm.m)	.195	.135	.12	.12
Rsh	(ohm.m)	6	10	25	40
Rw	(ohm.m)	.08	.15	.15	.14
m		2.098	2.098	2.098	2.098
A		.584	.584	.584	.584
n		1.83	1.83	1.83	1.83
h	(g/cc)	1.0	1.0	1.0	1.0

GR = Gamma Ray Reading

mf = Mud Filtrate Density

mc = Matrix Density

R_{mud} = Mud Resistivity

R_{mc} = Mud Cake Resistivity

R_{sh} = Shale Resistivity

m = Cementation Factor

A = Constant

n = Saturation Exponent

R_w = Formation Water Resistivity

P_h = Hydrocarbon Density

TABLE 8: Summary of RFT Pressure Tests

Depth (m)	Final B.U.P. (psia)	Mud Pressure (psia)	Temp. (°F)	Time elapsed since last circulation (hours)	Remark
2800	3998	4519	185.6	7.0	
2910	4154	4691	187.7	7.2	
3058	4358	4919	194.0	7.3	
3142.5	4486	5061	197.5	7.5	
3305	4727	5315	204.6	7.7	
3437	4920	5524	208.6	7.8	
3483.5	4995	5598	222.1	30.5	
3527.5	5125	5667	212.4	8.0	
3534.4	5122	5679	215.8	8.2	
3555	5131	5711	217.9	8.3	
3557.5	5134	5715	222.6	17.0	Sample
3560.8	5137	5721	219.8	8.5	
3582.5	5207	5755	221.1	8.7	
3584.5	5205	5758	229.9	24.0	
3618	5250	5810	222.4	8.8	
3618	5257	5815	239.7	35.0	Sample
3638	5308	5840	230.8	31.0	
3646	5365	5852	230.8	31.2	
3666	5429	5885	236.3	31.4	
3679	5326	5907	237.6	31.6	
3710	5439	5954	240.0	31.8	
3747.5	5811	6017	226.6	9.0	
3747.5	5812	6016	242.3	32.0	
3788	5958	6081	250.3	26.4	
3873.5	5572	6208	256.0	25.8	
3885.8	5565	6229	233.4	9.3	
3899	5582	6244	256.4	25.5	
3910	5629	6266	253.8	25.0	
3918.5	5638	6282	243.9	9.5	

3.9 Production Testing

3.9.1 Operations Summary and Results (see also Fig. 7 for test results)

After setting the 7" liner and testing it, Schlumberger was rigged up. A CBL/VDL/GR/CCL log was run (3962-2575m, top of cement at 2755m) and a 7" gauge ring/junk basket run to 3700m, followed by an F-1 production packer set at 3519m. The production string was run, landed and pressure tested. The surface equipment was installed and tested to 5000 psi. The tubing was displaced to diesel, the SSD closed and the interval 3554-3563m perforated using a through-tubing 2-1/8" Enerjet perforating gun (4 shots/foot).

The pressure gradually built up to 620 psi after two hours, after an initial drawdown of 790 psi. The well was opened up at 1645 on 14/11 on 5/16" choke, the pressure fell within two minutes to zero and the well was choked back to 1/4" choke. The pressure started to increase and the choke was gradually increased to 1/2".

The production rates on 1/2" choke were:

Water Production	:	380 bbl/d
Gas Production	:	1.5 MMscf/d
FTHP	:	815 psi

At 0100 hours 15/11 the well was closed in to run pressure gauges. After taking the first gradient stop in the lubricator the Schlumberger operator pulled the cable and broke the weak point. In the second run the CRG gauge failed when on bottom and it had to be pulled. An additional Amerada (2 Ameradas) and the back-up CRG gauge were installed. The CRG gauge failed while running in and the test had to be performed with Ameradas only.

The well was opened up on a 3/8" choke. Methanol had to be injected initially to remove hydrates plugging the production string. The well stabilised on the following rates:

Water Production	:	330 bbl/d
Gas Production	:	1.26 MMscf/d
FTHP	:	710 psig

The bottom hole pressure fell from 4780 psig when opening up to 2290 psig just prior to beaning up to 3/4" choke. The well stabilised as follows on 3/4" choke:

Water Production	:	460 bbl/d
Gas Production	:	1.45 MMscf/d
FTHP	:	300 psig

The bottom hole pressure was approximately 1500 psig during this period, its fluctuations indicating that the well was delivering at maximum rate.

At 2100 hours 15/11 the well was closed in for buildup. The pressure built up from 1526 psig to 4360 psig after six hours. The gauges were pulled and the well killed by reverse circulating through the open SSD. The test string was pulled out of the F-1 packer and the remaining gas and water was reversed out. A bridge plug was set on top of the F-1 packer at 3518m.

3.9.2 Interpretation of Pressure Buildup After Main Flow

The buildup never reached semi log straight line so the interpretation was based on Gringarten afterflow analysis (see Fig. 8). The results are listed below:

$\frac{k}{u}$	(transmissibility)	=	56.6 md/cp
S	(skin factor)	=	14.5

The results are based on the following down hole production rates and parameters:

q_w	water	=	438 bbl/d
q_g	gas	=	673 bbl/d
C_t	(total compressibility)	=	6.25×10^{-5} psi^{-1}
r_w	(well bore radius)	=	0.354 ft
ϕ	(porosity)	=	0.16
h	(net producing interval)	=	6m = 19.5ft

The results indicate a low permeability and the formation to be damaged.

3.10 Well Cost, Time Allocation

See Fig. 9	:	Drilling Time Graph
See Table 9	:	Chemical Consumption Cost
See Table 10	:	Time Allocation
See Table 11	:	Well Cost

Table 9: Chemical Consumption Cost

Interval: Surface - 682m
Casing Size: 30" and 20"

Product	Quantity
Gel	19 mt
Caustic	6 dm
Lime 7sx	7 sx

Cost: $ 5,076
Cost/Metre: $ 16.75

Interval: 682 - 1206m
Casing Size: 13-3/8"

Product	Quantity
Gel	22 mt
Gel (sacks)	46 sx
Barite	7 mt
Caustic	50 dm
Soda ash	10 sx
Lime	9 sx
Q Broxin	40 sx
Celpol	20 sx

Cost: $ 13,449
Cost/Metre: $ 25.67

Interval: 1206 - 2745m
Casing Size: 9-5/8"

Product	Quantity
Gel (sacks)	50 sx
Barite	5 mt
Caustic	38 dm
Soda ash	60 sx
Lime	3 sx
CMCHV	6 sx
CMCLV	33 sx
Q Broxin	10 sx
Durenex	28 sx
Dextrid	107 sx
Celpol	122 sx
Condet	2 dm
Magcolube	15 dm

Cost: $ 42,730
Cost/Metre: $ 27.76

Table 9: Chemical Consumption Cost (Cont'd)

Interval 2745 - 3995m (includes final logging)

Product	Quantity
Gel	17 mt
Barite	29 mt
Barite	162 sx
Caustic	125 dm
Soda ash	12 sx
Lime	2 sx
$CaCl_2$	14 sx
Sodium Bicarbonate	30 sx
CMCHV	35 sx
CMCLV	107 sx
Q Broxin	27 sx
Durenex	162 sx
Dextrid	383 sx
Celpol	77 sx
Condet	1 dm
Surflo W300	2 dm

Cost: $ 61,961
Cost/Metre: $ 49.57

Total Mud Chemical Cost: $123,216
Cost/Metre Drilled: $ 34.08

Production Test Chemicals

Product	Quantity
Barochem C448	1 dm
Methanol	3 dm
Ethylene Glycol	1 dm
Salt	832 sx

Cost: $ 5,978

Cement Chemicals

Product	Quantity
Cement	389 mt
HR-7	15 sx
HR-12	16 sx
Halad 14L	1 dm
Halad 22A	19 sx
CFR-2	28 sx
NF-1	8 dm
Econolite	3200 litre

Total Cost Cementing Materials: $129,238

TOTAL COST CHEMICALS/CEMENT: $258,432

Table 10: Time Allocation

		Hours	%
I.	Preparation	-	-
II.	Mobilisation, Moving etc.		
	Moving	105.25	6.1
	Rigging Up/Down	27.75	1.6
	Total Mobilisation	133.0	7.7
III.	Making Hole		
	Drilling	566.0	32.9
	Surveys	24.75	1.4
	Checktrip	13.75	0.8
	Roundtrip - bit change	128.50	7.5
	Circulation	15.25	0.9
	Reaming/washing	9.50	0.6
	Stuckpipe	5.75	0.3
	Rig Service	3.50	0.2
	Wait time	1.0	0.1
	Miscellaneous	20.75	1.2
	Total Making Hole	788.87	45.9
IV.	Securing Hole		
	Drilling cement	14.5	0.8
	Adding Pipe	7.25	0.4
	Surveys	11.0	0.6
	Checktrip	2.5	0.1
	Reaming	2.5	0.1
	Roundtrip - cement drilling	13.75	0.8
	- before casing	10.25	0.6
	Circulation	8.25	0.5
	Rig service	4.25	0.2
	Miscellaneous	4.75	0.3
	Casing liner - run & cement	79.0	4.6
	Flanging up BOP	69.25	4.0
	Total Securing Hole	230.25	13.3

Table 10 : Time Allocation (Cont'd)

		Hours	%
V.	Formation Evaluation		
	Surveys	0.25	-
	Checktrip	0.75	-
	Roundtrip - logging	24.0	1.4
	Circulation	10.0	0.6
	Formation strength test	6.25	0.4
	Fishing	0.5	-
	Rig Service	0.25	-
	Logging - open hole	73.0	4.2
	Testing formation	32.75	1.9
	Circulation	9.25	0.5
	Total Formation Evaluation	157.0	9.1
VI.	Completion/Suspension		
	Checktrips	11.5	0.7
	Roundtrip - before casing	10.75	0.6
	- bit & scraper	30.75	1.8
	Circulation	31.75	1.8
	Inflow test	31.50	1.8
	Rig Service	1.0	0.1
	Wait time	1.5	0.1
	Miscellaneous	19.25	1.1
	Liner - run & cement	38.0	2.2
	Flanging up - installation wellhead	12.75	0.7
	Testing (& perforating)	24.25	1.4
	Running - tubing	42.75	2.5
	- production packer	6.0	0.3
	- wireline	34.75	2.0
	Pressure surveys	6.0	0.3
	Total Completion/Suspension	302.50	17.6
VII.	Plug Back/Abandonment		
	Abandonment	111.50	6.5
	Total Abandonment	111.50	6.5
	TOTAL WELL	1723.0	100.0

Table 11: Well Cost

Cost	Type	$ Million
0	Preparation/Mobilisation	0.139
1	Drilling - Installation	6.336
2	Mud	0.151
3	Bits	0.118
4	Casing & Cement	0.856
5	Evaluation	0.919
6	Production Testing	0.393
7	Abandonment	0.134
8	Transportation	2.621
9	Recoveries/Recharges	0.124
	TOTAL:	11.791

Note: Rig contract day rate X No. of days = $5.081 Million
Open hole logging cost = $0.723 "

4. GEOLOGY

4.1 Regional Setting

Permit VIC/P19 lies at the north-eastern margin of the Gippsland Rift (Fig. 2), a failed rift arm associated with the opening of the Tasman Sea.

The geological history of the rift is interpreted as follows:

- Early Cretaceous: deposition of continental Strzelecki Group sediments in a 'pre-' or 'infra-rift' basin.

- Cenomanian to Mid-Campanian: deposition of 'rift-phase' alluvial plain and fan facies and volcanogenic lower Latrobe Group sediments (cf. the Upper Cretaceous Golden Beach Fm 100km west).

- Mid-Campanian: culmination of volcanic activity immediately preceding the Tasman Sea break-up (c. 78 m.y. BP).

- Mid-Campanian to Mid/Late Maastrichtian: coastline transgressed north-westwards from the newly opening Tasman Sea (i.e. 'Tasman Drift' phase). Paludal, coastal plain facies were deposited landward of back-barrier and lagoonal sediments. The existing rift faults continued to grow slightly, but probably as a result only of compaction of the underlying rift phase sediments. This phase could be described as a 'failed-rift' stage.

- Late Maastrichtian: first major marine transgression into southern VIC/P19.

- Paleocene: transgressive/regressive cycle sedimentation with a net transgressive effect. Tasman Sea drift ceased in Late Paleocene.

- Early Eocene: Southern Ocean began to open ('Southern Drift'); submarine channelling of the eastern seaward margin of the Gippsland Basin.

- Early Eocene to Early Oligocene: limited subsidence and deposition during the 'early Southern Drift' phase.

- Mid-Oligocene to present: rapid subsidence recommenced during the 'late Southern Drift' phase; bioclastic marls and carbonates prograded across the area during the Miocene and Pliocene.

4.2 Stratigraphic Table

AGE	BIOZONE	FORMATION	DEPTH bdf (m)	DEPTH ss (m)
		Sea level	25	0
		Sea floor	379	354
Piocene - Mid Miocene	A4-C	GIPPSLAND LIMESTONE	379-2164	354-2139
Mid Miocene - E. Eocene	D1-J2	LAKES ENTRANCE FORMATION	2164-2523	2139-2498
E. Eocene - ?Paleocene	M. diversus	Flounder Fm	2523-2597	2498-2572
		LATROBE GROUP		
Paleocene	L. balmei		2597-2763	2572-2738
Maastrichtian	T. longus	Latrobe Coarse	2763-3390	2738-3365
Campanian	T. lilliei	Clastics	3390-3995	3365-3970
		TD	3995	3970

4.3 Well Stratigraphy

The stratigraphic sequence is summarized in section 4.2 and on Enclosures 2 and 3. Formation tops and ages are based on lithological, palaeontological, and palynological information from cuttings and sidewall samples, together with wireline log characteristics. All depths are below derrick floor.

4.3.1 Gippsland Limestone 379-2164m

379-674m No returns.

674-2164m Marl, light grey to medium grey, soft to firm, sticky, very fossiliferous (large and small forams, with minor echinoderms, ostracods and sponge spicules) with traces of glauconite and carbonaceous detritus, interbedded with light grey, very fine to fine-grained, argillaceous calcarenite, also fossiliferous with traces of glauconite and carbonaceous detritus.

4.3.2 Lakes Entrance Formation 2164-2523m

2164-2523m Claystone, light to medium grey, calcareous, fossiliferous (forams), pyritic in places, with traces of glauconite, grading in places to grey to brownish grey, argillaceous, calcarenite.

4.3.3 Latrobe Group 2523-3995m (TD)

2523-2597m Flounder Formation

Siltstone grey to grey brown, argillaceous, micaceous, with minor pyrite, glauconite and traces of very fine to fine-grained sand and carbonaceous detritus.

2597-3995m Latrobe Course Clastics

This part of the Latrobe Group can be divided into several major units.

2597-2720m Barrier face/neritic deposits consisting of clean, unconsolidated, medium to very coarse-grained subangular to rounded, moderately well sorted sandstone with thin beds of grey, micaceous siltstone between 2666m and 2615m. Blocky log character suggests that the sandstones are dumped, mass flow deposits.

2720-2763m Neritic siltstone, claystone and dark green, very glauconitic, pyritic, argillaceous sandstone. The base of this unit corresponds to the Lower Paleocene Shale seismic marker.

2976-2026m Back barrier/lower coastal plain sandstones, siltstones, carbonaceous claystones and minor coals. The fluvial sandstones in this sequence are generally medium-grained and less than 3m thick. The siltstones are grey to light brown, argillaceous, micaceous and grade into claystone.

2926-2989m Beach/neritic sandstones and siltstones. This coarsening upwards sequence grades from neritic siltstones and claystones at the base to coarse, quartzose beach sand at the top. The transgressive base of this unit corresponds to the Maastrichtian Marker.

2989-3065.5 Back barrier sandstones, medium to coarse-grained, and well sorted, interbedded with minor brown argillaceous siltstones.

3064.5-3318m Back barrier/lagoonal interbedded siltstone, sandstone and minor claystone. The sandstones are fine to coarse-grained, poorly sorted with common silica and dolomite cement. The siltstones are grey to brown, argillaceous, carbonaceous in part and grade into the claystone.

3318-3805m Lower coastal plain carbonaceous siltstone, claystone and coal (22%), sandstone (14%) and low-carbonaceous siltstone and claystone (64%). The carbonaceous siltstone and claystone are brown, soft to firm, micaceous, and very carbonaceous grading to dark brown hard brittle coal. The sandstone is very fine to coarse-grained with silica and dolomite cement. Most of the sandstones have fining upwards trends, indicative of fluvial point bar deposits. The low-carbonaceous siltstone and claystone are grey to brownish grey and micaceous.

3805-3995m(TD) Alluvial/coastal plain sandstones and siltstones with minor claystones. This section is sandier than that above with only minor claystones and coals. The sands are very fine to medium-grained becoming coarse-grained in the thicker sandstone beds (up to 17m). The sandstones are quartzo feldspathic and lithic with dolomite and silica cement.

4.4 Geophysics

4.4.1 Structure

Pre-drill depth maps derived from seismic data showed the Bignose prospect to be an elongated anticlinal closure broken by major NW-SE trending faults (Encl. 4). Due largely to the eastward increase in water depth closure was substantially reduced on time contour maps. Depth conversion, performed using AIMS derived velocities, showed an areal closure independant of faulting of 6.5 sq km at the upper objective basal Paleocene/Upper Maastrichtian sands. In the unlikely case of effective fault sealing at this objective the structure possessed a maximum areal closure of 14.5 sq km in three separate fault blocks. At the Lower Campanian marker a maximum fault closure of 12.5 sq km was mapped. Faults were assumed to be sealing because of the high shale percentage in this section.

Well velocity data for Bignose-1 (Fig. 10) indicates that major markers within the Latrobe Group were penetrated approximately 40m higher than prognosed. This discrepancy results from AIMS-derived velocities which are too fast by about 2%, an error which appears to be intrinsic to the method. Base of the Flounder channelling was encountered 50m deeper than originally interpreted. However, since closure is not present at this level, revision of the pick does not affect the trap configuration.

4.4.2 Seismic Markers

Depths below derrick floor to the main seismic markers are listed below:

	Time, secs	m, bdf
Base Gippsland Limestone	1.60	2164
Top Flounder Formation	1.87	2523
Base Flounder Formation	1.91	2597
Lower Paleocene Shale	2.00	2763
Maastrichtian Marker	2.13	2989
Intra Campanian Marker	2.31	3318
? Lower Campanian Marker	2.56	3805

4.5 Hydrocarbon Indications

Significant gas shows on the mudlog were recorded from 3458m downwards, with values up to 100 units. Peaks were associated with coal beds as well as the sandstones. Traces of blue/white fluorescence with a dull cut fluorescence were seen in sandstones below 3526m and from 3564m the coals gave a slow streaming cut fluorescence. This corresponds to the level of VR=0.7%, the onset of oil maturity. The type and quality of shows was similar to those seen in Volador-1, and probably indicates the hydrocarbons are not continuous phase oil or gas.

4.6 Reservoir Potential

Sandstones in the upper objective in Bignose-1 are clean, quartzose, medium to coarse-grained, barrier/back barrier sandstones with porosity values up to 25% and an average value of about 23%. All these sands are water-bearing.

Sandstones in the Campanian coastal plain sequence are quartz arenites with silica and dolomite cement. Porosities range from 13% to 22%. The thickest sand is 10m with the rest being less than 5m thick. The sands show fining upwards trends and are interpreted to be point bar deposits. The sand percentage between the intra and Lower Campanian markers in Bignose is 14%, which is intermediate between that in Volador-1 (9%) and Basker-1 (21%). A 17m thick possibly alluvial sandstone at 3906m has porosity values ranging from 3-17%.

4.7 Source Rocks

Geochemical analyses show that the late Campanian/early Maastrichtian source-rock sequence in Bignose-1 is very similar to the sections of similar age in Volador-1 and Basker-1 in terms of Pyrolysis yields. T_{MAX} ranges from 430 to 440°C, indicative of marginal to low oil maturity as at Volador-1. The total generative potentials (S1 + S2) of the very carbonaceous shales and coals, which have TOC's of greater than 20 and 40% respectively, are very high (around 100 to 200 Kg of petroleum per tonne of rock), as in Volador-1 and Basker-1. As in these wells, however, the production indices (PI), which are the ratios of the hydrocarbons which have been generated (S1) to the total potential (S1 + S2), are less than 10%.

One surprising feature of the Bignose results is that the hydrogen indices (S1 x 100/TOC) range up to values twice as high as in Volador-1 and Basker-1, indicating a greater potential for oil generation compared with gas than in those wells.

Maceral analysis shows the exinite/vitrinite ratio ranges from 0.1 to 0.6 with no systematic varition down the hole, with a mean of about 0.3, in line with samples from Volador-1 and Basker-1. The main macerals are sporinite, cutinite and liptodetrinite with lesser resinite. Weak oil cuts in the deeper samples emanate from exinite and in some cases from vitrinite, a feature which was also observed in samples from Basker-1 and Volador-1.

The logarithms of the mean maximum reflectances are plotted versus depth in metres below seafloor in Figure 11. The regression line for the Bignose-1 data (ln VR on depth) has a similar slope to the regression lines for data from other wells in the area.

4.8 Well Correlation

Well correlation between Bignose-1, the other shell VIC/P19 wells and Phillips well, Hernes-1 (Encl.5), VIC/P10, shows that markers in the upper part of the Latrobe Group can be correlated easily between the wells. The Lower Campanian marker in Basker-1, which corresponds to the top of the volcanics, is difficult to identify in Volador-1 and Bignose-1, but may correspond to the top of a slightly more sandy section with less carbonaceous shale.

4.9 Conclusions and Contributions to Geological Knowledge

1. The lithological sequence penetrated in Bignose-1 was close to that predicted from surrounding well control. The sequence below the intra-Campanian marker had more similarities with Volador-1 than Basker-1. The sand percentage in this section is higher than in Volador-1 (14% c.f. 9%), however it is not as coal rich.

2. The upper objective, like that in Volador-1, was devoid of hydrocarbon shows. The onset of oil shows at 3526m was close to the level of onset of significant maturity (0.7% VR) at 3560m. This implies that only very limited vertical migration of oil has occurred above the depth of onset of oil maturity.

3. RFT pressure measurements indicated a water gradient down to the top of hydrocarbon shows and then overpressures (local gradient up to 0.97 psi/foot) down to the base of the coal-rich sequence (c. 3805m), where the pressures were again normal.

4. The uppermost sandstone unit (3554-3563m) in the coastal plain sequence, which had given the most encouraging RFT sample (13 litres of filtrate, 49 cu ft of gas and traces of condensate) was production tested. The well finally produced a stabilised flow of 460 BBL/d water and 1.45 MMSCF/d gas with an FTHP of 300 psig on a 3/4" choke. On analysis the gas was found to contain 38% CO_2, and 3% N_2. The high CO_2 content is similar to the gas composition in Volador-1 (up to 36% CO_2).

5. The results of Bignose-1, taken with those of Volador-1, show that the south-western sector of the permit can be regarded as a single hydrocarbon domain. Considerable quantities of early-generated hydrocarbon and non-hydrocarbon gases and liquids remain in the mature Campanian section, but there has been insufficient migration to concentrate the hydrocarbon liquids into producible oil columns.

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APPENDIX 7.1

PETROPHYSICAL EVALUATION METHOD

7.1 Petrophysical Evaluation Method

7.1.1 Method Used

Due to the lack of core data the Simandoux method rather than the Waxman-Smits equation was used in the petrophysical evaluation.

1) $$Sw = \left[A.Rw\ Ø^{-m} \left(\frac{1}{R_t} - \frac{Vsh\ Sw}{R_{sh}} \right) \right]^{1/2}$$

2) $$Sh = 1 - Sw$$

where

S_w	=	water saturation in the virgin zone as fraction of pore volume.
S_h	=	hydrocarbon saturation in the virgin zone as fraction of pore volume.
A	=	constant from Archie's formula
R_w	=	formation water resistivity in ohm.m
Ø	=	porosity as fraction of bulk volume
m	=	cementation factor
R_t	=	true resistivity in ohm.m
V_{sh}	=	fraction of shale
R_{sh}	=	shale resistivity in ohm.m
n	=	saturation exponent

7.1.2 Calculation Procedure

The following steps were used in the petrophysical evaluation of Bignose-1:

- Correction for borehole effect of the Gamma Ray and Density logs.
- Calculation of shale content (Vsh) log by means of Gamma Ray log.
- Identification of coal layers and dolomitic sands based on the response of the density and neutron logs together with ditch cuttings/sidewall samples description.
- Differentiation of sands and shales based on a 50% cut-off of shale content (after elimination of coal and dolomitic sands).
- Correction for borehole effect of the Dual Laterolog Deep and shallow readings as well as the Microspherically Focused log.
- True resistivity (R_t) determination.
- Porosity calculation from density log over the water/hydrocarbon bearing zones in sand layers.
- Calculation of hydrocarbon saturations by means of Simandoux equation over the sand intervals.

APPENDIX 7.2

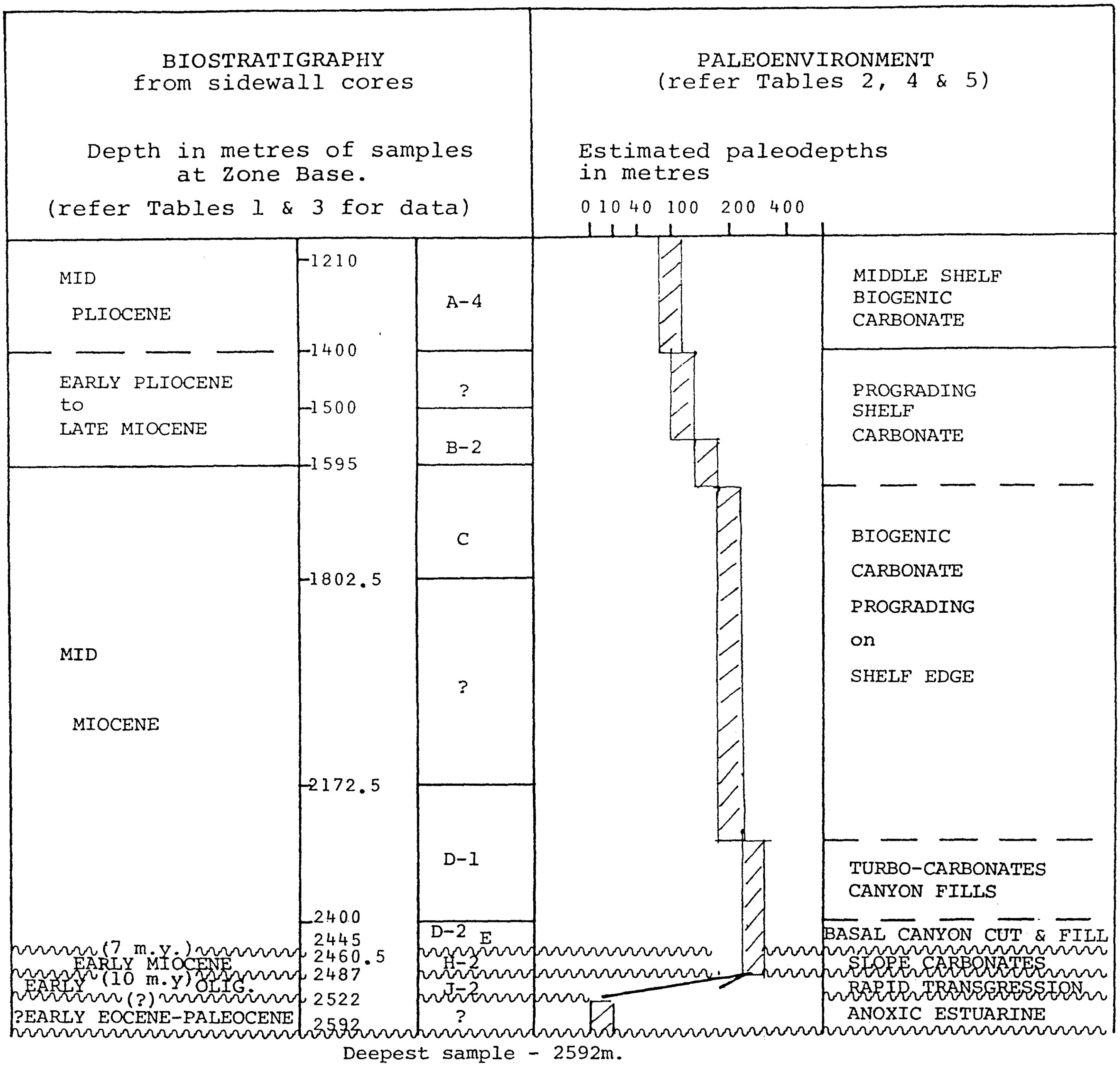
THE FORAMINIFERAL SEQUENCE IN BIGNOSE -1

THE FORAMINIFERAL SEQUENCE
in
BIGNOSE # 1,
GIPPSLAND BASIN.

for: SHELL DEVELOPMENT (AUSTRALIA) PTY. LTD.

November 17, 1983.

David Taylor,
23 Ballast Point Road, Birchgrove, 2041
AUSTRALIA. (02)810 5643.



~~~~(7 m.y.)~~~~ = hiatus with time span parentheses

To Scale 10cm = 100m

FIGURE 1: INTERPRETED FORAMINIFERAL SEQUENCE for BIGNOSE # 1.

David Taylor, November 15, 1983.
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INTRODUCTION.

Sixtyone sidewall cores were submitted from BIGNOSE # 1, between 1210m and 2592m. The carbonate section from 2522m to the highest sample at 1210m contained Oligo-Miocene to Pliocene planktonic foraminifera, although preservation quality varied with nine samples containing specifically indeterminate faunas, due to carbonate diagenesis. Sandy siltstone samples, between 2592m and 2525m, were biostratigraphically indeterminate because of absence of planktonic foraminifera, although the arenaceous species present have affinities with Paleocene to Early Eocene faunas in the Tasman Sea and New Zealand.

The following Figures and Tables constitute this report:-

FIGURE 1:	*INTERPRETED FORAMINIFERAL SEQUENCE* based on Figures 2 to 5.
TABLE 1:	*BIOSTRATIGRAPHIC DATA SUMMARY* with reliability of zonal picks.
TABLE 2:	*PRE-OLIGOCENE BENTHONIC FORAMINIFERA and SEDIMENT GRAIN ANALYSIS.*
TABLE 3:	*OLIGO-MIOCENE and PLIOCENE PLANKTONICFORAMINIFERAL DISTRIBUTION.*
TABLE 4:	*OLIGO-MIOCENE and PLIOCENE BENTHONIC FORAMINIFERAL DISTRIBUTION.*
TABLE 5:	*OLIGO-MIOCENE and PLIOCENE PALEOENVIRONMENTAL ANALYSIS* based on Tables 2, 3 & 4.

PRE-OLIGOCENE = ? LATE PALEOCENE to EARLY CRETACEOUS - 2592m to 2525m (E-logs - 2593m to 2524m).

These quartz, sandy siltstones contain numerically and specifically sparse arenaceous benthonic foraminiferal faunas (see Table 2). The overall assemblage interval includes two species, *Gaudyrina whangaia* and *Controtrochammina whangaia,* which Webb (1975) regards as being diagnostic of the Teurian Stage in New Zealand. The Teurian is regarded by Webb and other New Zealand workers as being Paleocene age, but may well extend into the Early Eocene, when represented purely by arenaceous foraminifera.

This is the first known occurrence of these "Teurian" arenaceous faunas in Gippsland or elsewhere along the southern Australian margin, although similar faunas are reported at DSDP Site 283 in the South Tasman Sea, (Webb, 1975) as well as on Campbell Island and the adjoining Campbell Plateau (Oliver et al, 1950 and Jenkins, 1975). These faunas are quite distinct from the early to mid Eocene faunas I have studied from the upper unit of the *Flounder Formation* in Flounder # 1, # 2 and # 4 wells. But the basal unit of the *Flounder Formation* is barren of foraminifera in all wells previously studied. Therefore, it could be assumed, on somewhat tenuous grounds, that this late Paleocene to early Eocene unit in BIGNOSE # 1 represents the lower part of the Flounder Formation.

The Bignose "Teurian" arenaceous faunas lack *Rhabdammina* spp. and *Rzehakina* spp., which were present in the Tasman Sea (D.S.D.P. Site 283) and led Webb (1975) to assume a deep water abyssal origin for the sediments. However, Webb (l.c.) suggests that the absence of *Rhabdammina* and *Rzehakina* from Teurian fauna in New Zealand, east coast outcrops indicates shallower water, more onshore environments. Therefore, the Bignose "Teurian" assemblages would be evidence of shallow water conditions. The Bignose sedimentation site was precluded from open oceanic circulation and restricted with regard to oxygenation; as apparent from the absence of planktonic calcareous benthonic foraminifera. The dominance of morphologically primitive arenaceous species (for example, *Haplophragmoides* spp.) implies low or fluctuating salinities of the water (Taylor, 1965). Also present were pyritized discs and spheres; obviously of biological origin and probably were diatoms. The paleo-biological evidence strongly points to an estuarine, environment which is supported by the occurrence of frosted and fractured quartz grains, which suggests aeolian transport and thus the presence of barrier sand dunes in the vicinity of the Bignose site in Late Paleocene and/or Early Eocene times.

<u>EARLY OLIGOCENE - ZONE J-2</u>; 2522m to 2492m (E-logs - 2523m to 2491m). Typical Zone J-2 planktonic assemblages were fairly well represented in this assemblage. The outstanding feature was the change in benthonic components. Benthonic fauans at 2522m and 2520m represented the shallower "Jan Jukian stage" assemblages of Crespin (1943), with shelf edge and upper

slope faunas being evident at and above 2515m (on criteria presented by Hayward & Buzas, 1979). This rapid trend of increasing water depth is one of a rapid transgression on a subsiding margin.

EARLY MIOCENE - ZONE H-1 and the "COBIA EVENT" HIATUS between 2487m and 2465m (E-log 2491m).

Well developed Zone H-1 faunas directly overly the Early Oligocene Zone J-2 assemblages, indicating a hiatus of some 10 million years effected this sequence. Despite the biostratigraphic dislocation, there was no paleoenvironmental disruption, as sediment on both sides of the hiatus contained upper slope benthonic faunas. This hiatus can be demonstrated in many of the sections drilled previously within the deeper parts of the offshore Gippsland Basin.

EARLY/MID MIOCENE to MID PLIOCENE - 2460m to 1210m.

The basal sample at 2460m has the *Praeorbulina* fauna, whilst that at 2455m has the initial appearance of *Orbulina* forms. Therefore, these two samples represent the Early/Mid Miocene transition and indicate an unconformable contact with the underlying earliest Miocene. This hiatus at 2463m (on E-log) had a time span of some 7 million years. The facies between 2460m and 2276m was that of typical Gippsland Miocene "turbo-carbonate", canyon fill; note for instance, size and shape sorting of faunas (refer Table 5). Therefore, the missing sediment was removed by an episode of canyon cutting at the termination of the Early Miocene.

Extreme diagenetic effects made biostratigraphic determination difficult; especially above 2200m. However, a continuous Mid Miocene to Mid Pliocene sequence is inferred, despite the inability to identify the Zone B-1 interval. The sequence above 2255m was a prograding one, shallowing from a shelf edge situation to a mid shelf one in the Pliocene.

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TABLE 1

MICROPALEONTOLOGICAL DATA SHEET

BASIN: GIPPSLAND — ELEVATION: KB: 25.3m GL: ______

WELL NAME: BIGNOSE # 1 — TOTAL DEPTH: -379.00m

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	1210	1				1400	0			
		B_1	*					*				
MIOCENE	LATE	B_2	1550	1				1595	1			
		C	1605	1				1802.5	0			
	MIDDLE	D_1	2200					2400	2	2385	0	
		D_2	2410	1				2445	0			
		E_1	2450	1				2455	0			
		E_2	2460.5	0				2460.5	0			
	EARLY	F										
		G										
		H_1	2472.5	0				2487	0			
OLIGOCENE	LATE	H_2										
		I_1										
		I_2										
	EARLY	J_1										
		J_2	2492	2	2500	1		2522	1			
EOCENE		K										
		Pre-K	2525					2592				

COMMENTS: Pre K benthonic arenaceous foraminifera was biostratigraphically indeterminant, but by comparison was probably of Paleocene to possibly early Eocene age (see report).

*Probably present but indeterminant due to carbonate diagnesis.

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: *David Taylor* — DATE: *November 16, 1983.*

DATA REVISED BY: ______ — DATE: ______

SIDEWALL CORES Depth in metres	ARENACEOUS FORAMINIFERA									RESIDUE GRAIN LITHOLOGY (>.075mm)										E-LOG CHARACTER CHANGE	AGE
										MINOR CONSTITUENTS									MAJOR CONSTITUENTS		
	Haplophragmoides suborbicularia	*H. cf. kirki*	*H. sp.?*	*Textularia cf. plummerae*	*Ammobaculites sp.*	*Bathysiphon cylindrica*	*Conotrochammina whangaia*	*Ammomarginulina stephensoni*	*Gaudyrina whangaia*	Total foram count	% planktonics	pyritized discs ? diatoms	pyritized spheres ? diatoms	pyrite	mica	carbonaceous matter	glauconite pellets	coarse rock fragments	P : pyrite ... : f quartz ∇Δ∇ : c-f frosted & fractured quartz		
2520.0→ 2522.0→	refer Tables 3, 4 & 5																				EARLY OLIGOCENE (ZONE J-2)
2525.0→	x	x			°				°	50	nil		r				C		.... PPPPP	2524	? EARLY EOCENE or LATE PALEOCENE ? (similar to fauna at DSDP Site 283 - Webb, 1975).
2544.5→	x	x				°				100	nil		A	C			C	A	∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇		
2559.0→	°				°		°	°		10	nil	A	A	A			C		....		
2568.0→				°	°	°				10	nil	r		C	C		C		Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ		
2585.0→	N.F.F.									-	-			A	A	A			....		
2590.0→			°							10	nil			A	A	A	r	A	∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇		
2592.0→	°	°	°							10	nil			C	C				Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	2593	

<u>KEY</u>:

° = <20 specimens
x = >20 specimens
N.F.F. = no foraminifera found

A = 1-5% of grains
C = >20 grains
r = <20 grains

TABLE 2: PRE-OLIGOCENE BENTHONIC FORAMINIFERA and SEDIMENT GRAIN ANALYSIS - BIGNOSE # 1.

David Taylor,
November 10, 1983.

SIDEWALL CORE Depth in metres	G'ina brevis	G'ina labiacrassata	G'ina angiporoides (S.S.)	G'ina praebulloides	G'ina euapertura	G'alia gemma	G'alia munda	G'alia obesa	G'ina tripartita	G'alia continuosa	G'alia spp. indet	G'alia nana	G'quad dehiscens (S.L.)	G'ina woodi woodi	G'ina woodi connecta	G'ina bulloides	G'alia zealandica incognita
1210.0																x	
1261.0																x	
1300.0																x	
1345.0																x	
1400.0																x	
1450.5																	
1500.0																x	
1550.0																x	
1595.0														x		x	
1605.0														x		x	
1645.0																x	
1695.0														x		x	
1750.0														x		x	
1802.5														x		x	
1855.0	indet																
1885.0	indet																
1898.5	indet																
1911.0	indet																
1950.0														x		x	
2050.0														°			
2100.0																	
2147.0														°		°	
2172.5	indet																
2200.0														°		°	
2225.0																	
2249.0														°			
2276.0														x		x	
2299.5	indet																
2320.0	indet																
2338.0														x		x	
2355.0														x		x	
2375.0														x		x	
2385.0														x		°	
2400.0																°	
2410.0														x		x	
2422.5														x		x	
2430.0														x		x	
2440.0														°			
2445.0														x		x	
2450.0																°	
2455.0														x		x	
2460.5														°		°	
2465.0	indet																
2472.5				x									°	x	x		°
2475.0	indet																
2479.0										°				°	°	°	°
2487.0													x	x	x	x	°
2492.0			°	°	°							°					
2500.0	°		°	°	°				°		°						
2508.0	°	x	x	x	x					x		x					
2510.0			x	x	°						x						
2515.0	x	x	x	x	x	x	°	°	x	°							
2520.0			°		°												
2522.0	x	x	x	x	x	°	°	°									

SIDEWALL CORE Depth in metres	G'oides parawoodi	Cat. dissimilis	G'alia bella	Praeorb. glomerosa	G'oides bisphericus	G'oides trilobus	G'oides trilobus (elongate)	G'quad dehiscens (S.S.)	G'quad advena	G'quad altispira	G'alia praescitula	G'alia miozea miozea	G'alia siakensis/mayeri	G'alia praemenardii	G'ina & G'alia indet (<.2mm)	Orb. suturalis	G'alia peripheronda	G'alia conica
1210.0																		
1261.0										°								
1300.0																		
1345.0																		
1400.0								°		°								
1450.5															x			
1500.0										°								
1550.0										°								
1595.0										°								
1605.0										°			x					
1645.0																		
1695.0													x		D			
1750.0										°								
1802.5										°			x					
1855.0																		
1885.0																		
1898.5																		
1911.0																		
1950.0								°										
2050.0															D			
2100.0															D			
2147.0																		
2172.5																		
2200.0											°							
2225.0															D			
2249.0											°				D			°
2276.0											°		x		D			x
2299.5																		
2320.0																		
2338.0								°					x					
2355.0													x					°
2375.0													°					°
2385.0						°					°	°	x					°
2400.0										°	°							
2410.0					x	x					°	x	x	°			x	
2422.5					°	x	°	°				°						
2430.0				°	°	x		°			°	x	x	°			°	°
2440.0										°								
2445.0					°	x				°	x	x				°		°
2450.0				°	°					°	°	°				x	°	
2455.0		x			°	x	x				x	x	x	x	x	°	°	x
2460.5			°	°	°	°	x	x	°	°	x	x	x	°	x			
2465.0																		
2472.5	x	x	°															
2475.0																		
2479.0	°		°															
2487.0	°	°																
2492.0																		
2500.0																		
2508.0																		
2510.0																		
2515.0																		
2520.0																		
2522.0																		

SIDEWALL CORE Depth in metres	Orb. universa	G'oides ruber	G'alia miozea conoidea	G'alia peripheroacuta	G'ina ciperoensis Gp.	G'alia miotumida	G'alia scitula	G'alia lenguaensis	G'alia acostaensis	G'ina decoraperta	G'ina falconensis	G'ina pachyderma	G'alia crassaformis	G'alia humerosa	G'alia conomiozea	G'alia puncticulata	G'ina nepenthes
1210.0									x	x	x	x		x	x	x	
1261.0	°								°	x	x	x	°	x		x	
1300.0	°						°		°	x	x	x		x		°	°
1345.0							°				x			°			
1400.0			°						°	x	x	x	x	°	x	x	
1450.5									°			°					
1500.0			°						°	x	x	x					
1550.0			°				°		x	x	°	x					
1595.0					x		°		°								
1605.0	°		°		x	°	°										
1645.0					x		°										
1695.0	x		x		x	°	°	°									
1750.0	D		°		x												
1802.5	x		x		x	°	°										
1855.0																	
1885.0																	
1898.5																	
1911.0																	
1950.0	x																
2050.0																	
2100.0																	
2147.0	°																
2172.5																	
2200.0	°		°														
2225.0																	
2249.0			°														
2276.0			x														
2299.5																	
2320.0																	
2338.0																	
2355.0	x		°	°													
2375.0			°														
2385.0	°		x	°													
2400.0	°		°														
2410.0	x		x														
2422.5	°		x														
2430.0	°		°														
2440.0																	
2445.0	°	°															
2450.0																	
2455.0																	
2460.5																	
2465.0																	
2472.5																	
2475.0																	
2479.0																	
2487.0																	
2492.0																	
2500.0																	
2508.0																	
2510.0																	
2515.0																	
2520.0																	
2522.0																	

2525.0 - 2592.0 - No planktonics, See Table

PLANKTONIC FORAMINIFERAL BIOSTRATIGRAPHY

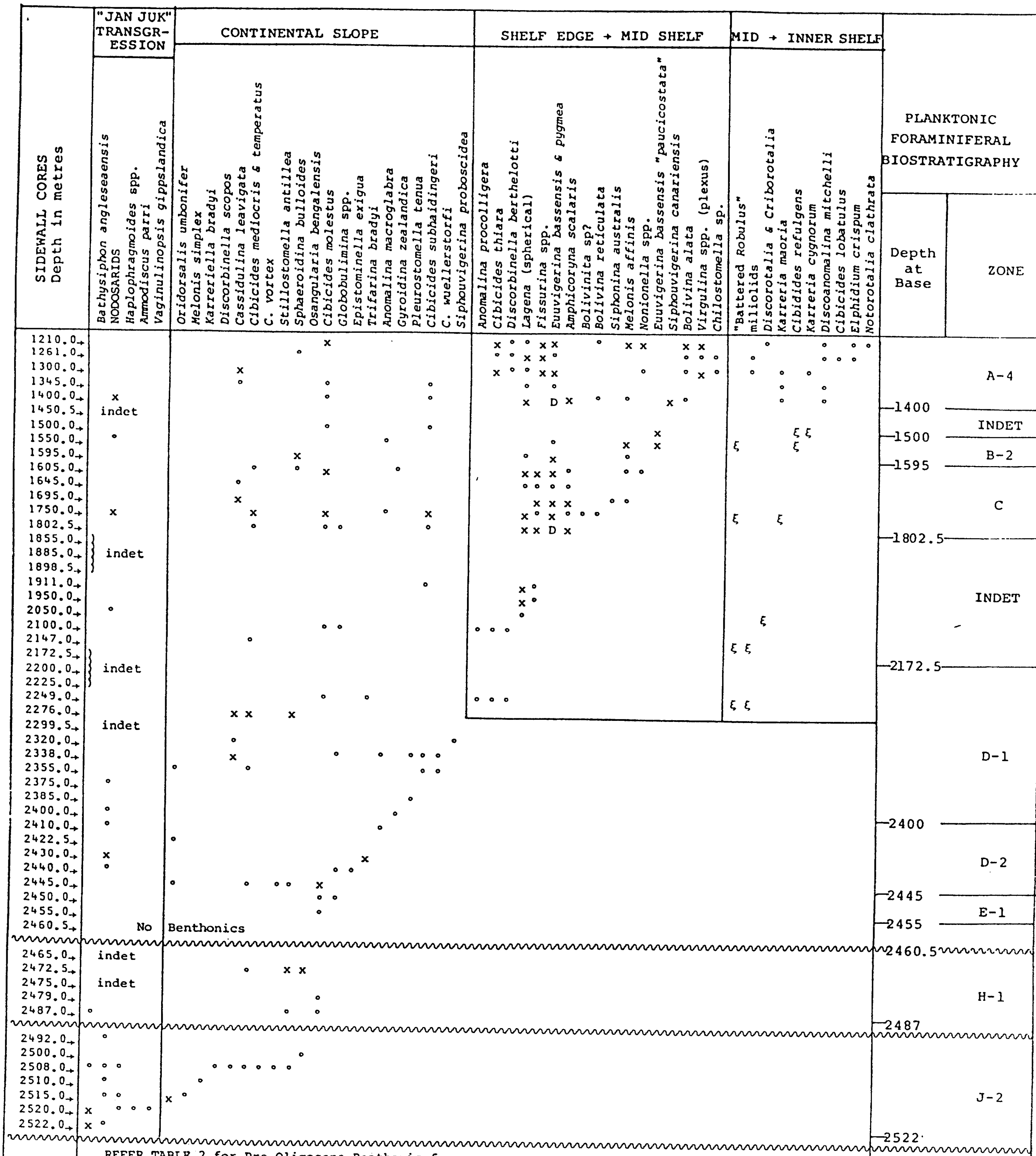
Depth to Base of Zone	ZONE
1400	A-4
1500	INDET
1595	B-2
1802.5	C
2172.5	INDET
2400	D-1
2445	D-2
2455	E-1
2460.5	E-2
2487	H-1
2522	J-2

KEY: ° = <20 specimens
x = >20 specimens
D = Dominant >60% of specimens

∿∿∿∿∿ = definite hiatus
indet = specifically indeterminate due to diagenesis.

TABLE 3: OLIGO-MIOCENE and PLIOCENE PLANKTONIC FORAMINIFERAL DISTRIBUTION - BIGNOSE # 1.

David Taylor, November 8, 1983.



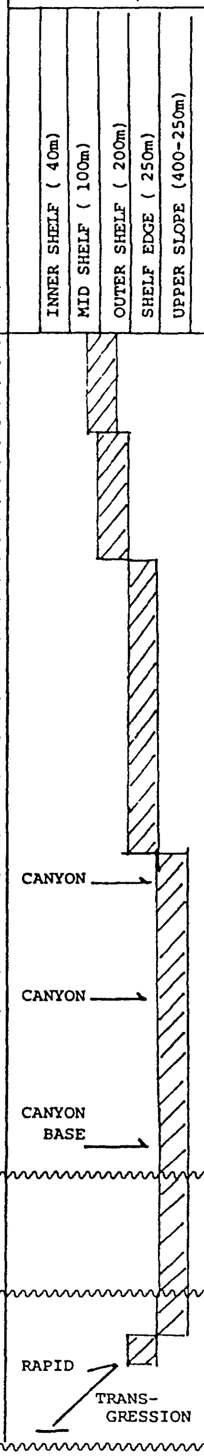
KEY: ° = <20 specimens
x = >20 specimens
D = Dominant >60% benthonic fauna
ξ = environmentally misplaced specimens
〰 = definite hiatus
indet = specifically indeterminate due to diagenesis.

TABLE 4 - OLIGO-MIOCENE and PLIOCENE BENTHONIC FORAMINIFERAL DISTRIBUITON - BIGNOSE # 1.

David Taylor, November 11, 1983.

SIDEWALL CORES Depth in metres	GROSS FORAMINIFERAL ASSEMBLAGE CHARACTERS: Total foram count	% planktonic forams	ASSEMBLAGE FEATURE	ENERGY REGIME	OXYGENATION	PRESERVATION	RESIDUE GRAINS – MINOR COMPONENTS: Glauconite pellets	Angular quartz	Pyrite	Limonitic pellets	Echinoid spines	Ostracods	Sponge spicules	Bryozoal fragments	MAJOR COMPONENTS (f : foraminifera; m : biomicrite; Ψ : recryst. biomicrite; ... : f angular qtz)
1210.0	2000	70				G					A				mmmmmmmm ffffff
1261.0	1000	80				G		A			A				ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1300.0	2000	80				M					C				mmmm fffffffff
1345.0	?	?				P					r				ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1400.0	2000	70				M	r				A	r			ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1450.5	?	?				MP									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1500.0	250	75	ξ	PRO		MP									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1550.0	250	75	ξ	PRO		MP									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1595.0	?	?				MP									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1605.0	750	75				MP						r			ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1645.0	200	90				MP									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1695.0	500	90				MP									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1750.0	1000	60	ξ S	PRO		M					A			A	ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1802.5	1000	60				M					C			C	ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1855.0	?	?				VP									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1885.0	?	?	ξ	PRO		VP								ξ	ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1898.5	?	?	ξ	PRO		VP								ξ	ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1911.0	?	?				VP									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
1950.0	?	?	S	HIGH		P							A		ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2050.0	?	?	ξ	PRO		VP		r					r	ξ	ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2100.0	?	?				VP					C				ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2147.0	?	?	ξ	PRO		VP									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2172.5	?	?				VP									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2200.0	?	?				VP									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2225.0	?	?	S	HIGH		VP	C								ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2249.0	?	?	ξ S	PRO		P		r							ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2276.0	2000	95	S	HIGH		G									fffffffffffffff
2299.5	?	?				VP							C		ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2320.0	?	?				VP									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2338.0	200	80	S	HIGH		M									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2355.0	250	98	S	HIGH		G			A						ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2375.0	100	95				M									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2385.0	250	95				M		r			r				Ψ fffffffffffff
2400.0	20	90	S	HIGH		M		r							ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2410.0	500	98	S	HIGH		G									Ψ fffffffffffff
2422.5	500	99				M/P									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2430.0	500	90				G						r			ΨΨ ffffffffffff
2440.0	?	?				P									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2445.0	300	80				G			A				r		ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2450.0	50	95				M			A						ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2455.0	500	99				EX		r							fffffffffffffff
2460.5	500	100				G			A				C		ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
∿∿∿															
2465.0	?	?				VP									ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2472.5	1000	95			P	M			A						ΨΨΨΨΨΨΨΨ ffffff
2475.0	?	?			P	VP			A						ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2479.0	100					P						r			ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2487.0	500	98			P	M			A	r					ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
∿∿∿															
2492.0	?	?				VP		r							ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2500.0	?	?				VP		r	r						ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2508.0	1000	95				M		r							ΨΨΨΨΨΨΨ fffffff
2510.0	?	?				P			r						ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2515.0	1000	95				M		r			r				ΨΨΨΨΨΨΨΨ ffffff
2520.0	?	?				P	r	A							ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ
2522.0	250	95				M/P	r								.... mmmmmmmm
∿∿∿															
	REFER TABLE 2 for Pre-Oligocene Benthonic Fauna.														

PALEO-ENVIRONMENTAL ASSESSMENT (refer also Table 4)



E-LOG CHARACTER CHANGE: 1650; 2255; 2463; 2491; 2523

PLANKTONIC FORAMINIFERAL BIOSTRATIGRAPHY

Depth to Base of Zone	ZONE
1400	A-4
1500	INDET
1595	B-2
1802.5	C
2172.5	INDET
2400	D-1
2445	D-2
2455	E-1
2460.5	E-2
2487	H-1
2522	J-2

KEY: ξ = environmentally misplaced specimens from shallower water situations, indicating - PRO = PROGRADATION

S=size or shape sorting, indicating HIGH ENERGY CURRENTS

A = abundant
C = common
r = rare
ξ = misplaced

TABLE 5: OLIGO-MIOCENE and PLIOCENE PALEOANALYSIS - BIGNOSE # 1.

David Taylor, November 15, 1983.

APPENDIX 7.3

PALYNOLOGICAL ANALYSIS OF BIGNOSE -1

APPENDIX

PALYNOLOGICAL ANALYSIS OF BIGNOSE-1
(GIPPSLAND BASIN, PERMIT VIC/P19)

by

Jan van Niel

1. SUMMARY

Depth (m)	Dinoflagellate Zones	Spore Pollen Zones	Age
2525-2592	A. HYPERACANTHUM	Lower M.DIVERSUS	Late PALEOCENE/ Early EOCENE
2611.5	(Paleocene palynomorphs reworked into Early Eocene)		
2667-2760	T.EVITTII	Lower L.BALMEI	Early PALEOCENE
2806m	I.DRUGGII	T.LONGUS	Late MAASTRICHTIAN
2816-3390	-	T.LONGUS	MAASTRICHTIAN
3470-3993 (TD @ 3996)	-	T.LILLIEI	CAMPANIAN

SPORE COLOUR/DEGREE OF ORGANIC MATURITY (DOM)/SOURCE ROCK QUALITY

Transmitted (white) light: from pale yellow (2525m) to yellow or light brown (3993m).
Incident UV light: from light yellow to yellow/orange
DOM: from immature at 2525m to early mature at TD
Source rock quality: 2525-2760m: poor; 2806-3993m: fair to very good, especially from about 3300-3550m.

EVIRONMENT OF DEPOSITION (Palynofacies)

2525-2592m: marine, probably shallow marine
2667-2760m: marine, near shore, near source of land-derived organic material
2806m: marginal marine
2816-3993m non-marine (swamp, lake, fluvial deposits)

2. INTRODUCTION AND METHODS

The interval examined palynologically ranged from 2525m down to 3993m (TD is at 3996m, bdf). A total of 47 sidewall cores were selected on the basis of lithology. Grey to black, fine-grained sediments (mudstones, shales) are generally richer in palynomorphs than sediments such as silts and sands deposited in higher-energy environments. Where mudstones or shale samples were not available, siltstone samples were prepared. The quality of the sidewall cores was poor to fair.

Samples were prepared in Perth by Exploration Consultants Ltd (ECL) using the "standard" technique for siliciclastic sediments, i.e. hydrochloric and hydrofluoric acid treatment followed by heavy-liquid separation to remove mineral matter; controlled oxidation with nitric acid to reduce unwanted organic constituents and thus concentrate the palynomorphs; and finally washing with sodium hydroxide to remove humic acids. The resulting acid-insoluble residue was mounted in Elvacite to produce permanent microscope preparations. A slide of the non-oxidised residue was used for palynomaceral studies.

All samples yielded an organic fraction and most were productive. Only a few samples were too poor to be of much value. Richness and diversity of the assemblages varied but was generally good in the Tertiary section, becoming gradually poorer in the Cretaceous. Preservation deteriorated as well, particularly in the deeper part.

The palynomorphs were recorded semi-quantitatively. To provide continuity with the work of Harris, 1983, the stratigraphic interpretation of assemblages follows the zonal characteristics given in his "Biostratigraphic Summary" (Harris, undated). The range charts in this "Summary" are largely based on published and unpublished work of Stover and Evans (1974), Stover and Partridge (1973), Partridge (1975), Partridge (1976) and HELBY et. al. (in press).

Reworked palynomorphs were found in several samples but mostly as single occurrences only. Most were Permo-Triassic and Jurassic in age. Early and mid Cretaceous spores were regularly found in the Upper Cretaceous. Perhaps they were reworked but, although found in younger sediments than their published ranges would suggest, they may in fact belong.

Contamination from the mud was present in some samples. Although all samples were carefully cleaned before preparation, a fractured or broken-up sidewall sample cannot always be fully trusted as some contamination with palynomorphs from the mud is unavoidable.

3. ANALYSIS OF ZONES

A. DINOFLAGELLATE ZONES

2525-2592m (7 SWS): A. HYPERACANTHUM Zone, late PALEOCENE/early EOCENE

Based on the presence of Ceratiopsis dartmooria, Apectodinium homomorphum, Muratodinium fimbriatum, Diphyes colligerum, Palaeocystodinium sp. and Kenleyia leptocerata (one specimen only). "Leiosphaeridia" trematophora was very common at 2544.5m. Most samples contained one or more species that could not be identified and may well be undescribed.

2611.5m (1 SWS) (Paleocene palynomorphs reworked into Eocene)

This sample contains a mixture of Paleocene and Eocene markers, especially noticeable from the pollen (see under 3B). Dinoflagellates were present but not common. Ceratiopsis dartmooria and Senegalinium dilwynensis occur together although their ranges normally do not overlap.

2667-2760m (12 SWS): T.EVITTII Zone, Early PALEOCENE

The nominate species is common at 2760m only but Palaeoperidinium pyrophorum occurs throughout the interval. Other dinoflagellate species present are: Ceratiopsis speciosa, Palaeocystodinium sp., Eisenackia crassitabulata, Vozzhennikovia/Spinidinium spp., Hystrichokolpoma sp., Paralecaniella indentata and a variety of chorate cysts.

2806m (1 SWS) I.DRUGGII Zone, late MAASTRICHTIAN

The nominate species was fairly common. No other dinoflagellates were found.

2816-3993m:

Single specimens of dinoflagellates occur in some samples but are either indeterminate or suspected contamination. One specimen of Isabelidinium cretaceum at 3910m is perhaps noteworthy. An unknown Dinogymnium at 3925m may belong as well, although the sample was contaminated.

B. SPORE-POLLEN ZONES

2525-2592m (7 SWS) lower M. DIVERSUS Zone, late PALEOCENE/early EOCENE

Most obvious is a variety of the larger Proteacidites such as:

P. grandis, P. incurvatus, P. kopiensis and P. adenanthoides. These markers have their base occurrence in this pollen zone. Verrucosisporites kopukuensis is present as well. Some of the other sporomorphs found are Nothofagidites spp., M. diversus, Intratriporopollenites notabilis and one specimen of Spinozonocolpites prominatus.

The top of the Lower M.DIVERSUS Zone is immediately below the base of markers indicating the Upper M.DIVERSUS Zone. Such markers have not been found. Evidence from dinoflagellates also indicate that at 2525m the assemblage is indeed not younger than the Lower M.DIVERSUS Zone.

2611.5m (1 SWS) (Paleocene palynomorphs reworked into Eocene)

This assemblage contains marker types that (according to published and unpublished data) are mutually exclusive. Proteacidites incurvatus, P. grandis, Verrucosisporites kopukuensis and Banksiaeidites arcuatus all have their base in the Lower M.DIVERSUS Zone. But markers such as Gambierina rudata, Australopollis obscurus and Proteacidites angulatus have tops in the underlying L.BALMEI Zone. The dinoflagellates provided some evidence for reworking as well (see 3A).

2667-2760m (12 SWS) Lower L.BALMEI Zone, PALEOCENE

Dinoflagellates support an Early Paleocene age but the pollen data are less precise. The combined presence of Proteacidites angulatus and the absence of T.LONGUS zonal markers indicate that the interval belongs to the lower L.BALMEI pollen zone.

2806-3390m (16 SWS) T.LONGUS Zone, MAASTRICHTIAN

Assemblages vary in richness and diversity but are generally poor in sporomorphs. The nominate species occurred in the highest samples together with "Grapnelispora evansii", Camarozonosporites amplus, Proteacidites "reticuloconcavus" and P. "clinei". Amongst other types present in the interval are Stereisporites (Tripunctispora) sp., S. regium, Proteacidites amolosexinus, P. angulatus, P. "otwayensis", P. "gemmatus", Tetracolporites verrucosus, Tricolpites lilliei and Triporopollenites sectilis.

The base of the zone proved to be difficult to locate, as is not unusual. The top of the underlying T.LILLIEI Zone is based on negative evidence, i.e. the absence of markers for the T.LONGUS Zone. The deeper samples are poor in pollen and the absence of zonal markers may therefore not be indicative. At 3390m P. angulatus is still present, together with a fragment of the morphologically highly characteristic "Grapnelispora evansii". However, another feature usually present at the T.LONGUS/T.LILLIEI boundary is not too clear: the ratio of Nothofagidites spp. to Gambierina spp. generally shows a high for the former in the T.LILLIEI Zone and a high for the latter in the T.LONGUS Zone. Applying this criteria indicates an area of uncertainty between 3197 and 3390m. The assemblage at 3137m clearly belongs to the T.LONGUS Zone whereas common Nothofagidites at 3470m suggests the T.LILLIEI Zone. The interval in between (because of poor assemblages) cannot be confidently placed in either one or the other. On balance, however, the boundary is best placed between 3390 and 3470m.

3470-3993m (10 SWS): T.LILLIEI Zone, CAMPANIAN

The deepest assemblage, at 3993m, still contains the nominate species, together with Nothofagidites endurus, Proteacidites scaboratus, Triporopollenites sectilis and Stereisporites regium, while Tricolpites sabulosus is present as well, all indicating that the well bottomed in the T.LILLIEI pollen Zone.

4. SPOROMORPH COLOUR, DEGREE OF ORGANIC METAMORPHISM (D.O.M.) AND SOURCE ROCK POTENTIAL

The colour of palynomorphs changes when subjected to the increasing or prolonged temperatures such as occur during burial. These changes in colour are irreversible and therefore indicate the maximum level of maturity reached. The different stages, yellow to golden-yellow through orange and brown to black can be correlated with changes in chemical composition as hydrocarbons are generated from the organic matter (see Fuchs, 1969; Standard Legend, 23.51.10). The sporomorph colour scale is more subjective than the more commonly used vitrinite reflectance scale. Ideally, a long-ranging sporomorph type should be selected as different types of sporomorph within the same sedimentary section show variations in colour. As observed in transmitted white light the change in colour from light yellow to golden-yellow or orange corresponds with the onset of oil generation, whereas the onset of gas generation is associated with a change in colour from orange to brown. Post-mature source rocks contain black sporomorphs and organic fragments only.

In incident ultraviolet light palynomorphs (and some palynomacerals) exhibit fluorescence colours that not only help in their identification but also increase and decrease according to rank. Fluorescence is maximal at the threshold of the "oil window", decreases with increasing rank and disappears at the end of the "oil window" (1-1.3% R_o, see Robert, 1981).

In Bignose-1 sporomorph-colour in transmitted light ranged from pale-yellow at 2525m to yellow and yellow-light brown at 3993m. Over the same interval fluorescence colours of sporomorphs ranged from golden yellow to yellowish-orange. Both estimates seem to indicate immature conditions at 2525m, changing into early mature for oil at 3993m.

Palynomaceral determination was carried out on a sieved, non-oxidised preparation. The sieving (with a 10 micrometer mesh sieve) was necessary to concentrate the large palynomacerals that otherwise would be diluted by fine, amorphous organic matter. This fine fraction is undoubtedly important for source rock characterisation but its nature and origin cannot be determined by ordinary means.

In Bignose-1 a rough estimate during preparation showed that between 2525 and 2760m total organic matter varied from less than 0.05 to 0.7 millilitre per 10 grammes of sediment, and between 2806-3993m from less than 0.05 to 8.0 millilitre per 10 grammes of sediment. The interval 2525-2592m is dominated by inertinite, with woody tissues and palynomorphs coming second; from 2667 down to 2760m inertinite is still common but so are woody tissues and liptinite; below 2806m liptinite dominates and inertinite, although still present is only occasionally dominant over liptinite.

Source Rock Qualities

The amount and composition of the organic matter would suggest that the best source rocks occur between about 3300-3550m, fair to good source rocks between 2806-3993m and poor source rocks between 2525-2760m. It should however be remembered that these conclusions are drawn from a limited set of samples, selected for palynology and including neither coals nor coarse grained sediments. Results were formulated after a visual examination and not by accurate measurement.

5. ENVIRONMENT OF DEPOSITION/PALYNOFACIES

The relationship between organic matter and grainsize of the sediments has been well-documented and is used to deduce depositional environment (palynofacies) from the type of palynomorphs and palynomacerals present.

The palynomorphs can be divided into marine organisms such as dinoflagellates and Tasmanites (both algae) and foraminiferal test linings; fresh and brackish water organisms such as Botryococcus and Acritarchs; and land derived pollen and spores (Sporomorphs).

Breakdown products of plants (woody fragments, epidermal tissues, cork cells, resin), algal and bacterial remains, animal tissue and many inderterminate organic fragments are collectively known as palynomacerals.

Although wind transport is an important aspect of the initial dispersal of sporomorphs, water transport then carries the sporomorphs and palynomacerals until they settle out of the water column. A continuous process of mechanical abrasion, biological degradation and wave and current action sorts and grades the particles during this transportation phase. Less buoyant, heavy or larger organic particles tend to characterise environments close to source while lighter, more buoyant and smaller particles are carried further afield. Very low sporomorph diversity indicates authochthonous environments (marsh, swamps); allochthonous environments are characterised by more diverse assemblages. Marine microplankton diversity increases in an offshore direction (Whitaker, 1979).

In Bignose-1 the interval 2525-2592m is clearly marine: dinoflagellates are present throughout although not abundantly so and not of diverse composition; the presence of sporomorphs and other land-derived organic matter suggests a shallow marine, near source environment. The interval 2667-22760m is very similar but is richer in sporomorphs and plant tissues which again suggests a marine, but near source/near shore environment. In the interval 2806-3993m only the highest sample (at 2806m) contains dinoflagellates. Only one species is present in low numbers. This probably reflects a very restricted, marginally marine environment. Below 2816m no marine indicators are present (excepting rare, single specimens that could easily be contaminants from the drilling mud). Leiospheres of the Nummus type are common at 3910m and at 3925m. Single to several specimens occur in many samples of the T.LONGUS and T.LILLIEI Zones and it is therefore more likely that it is a freshwater organism than a constituent of a marginal marine environment as Morgan (1975) suggests for Nummus monoculatus.

The absence of marine indicators and the abundance and variety of (sometimes very large) plant remains, together with the generally low diversity of the sporomorph assemblages suggests a low energy swamp environment or low to medium energy fluvial or lacustrine deposts over most of the interval examined (2816-3993m).

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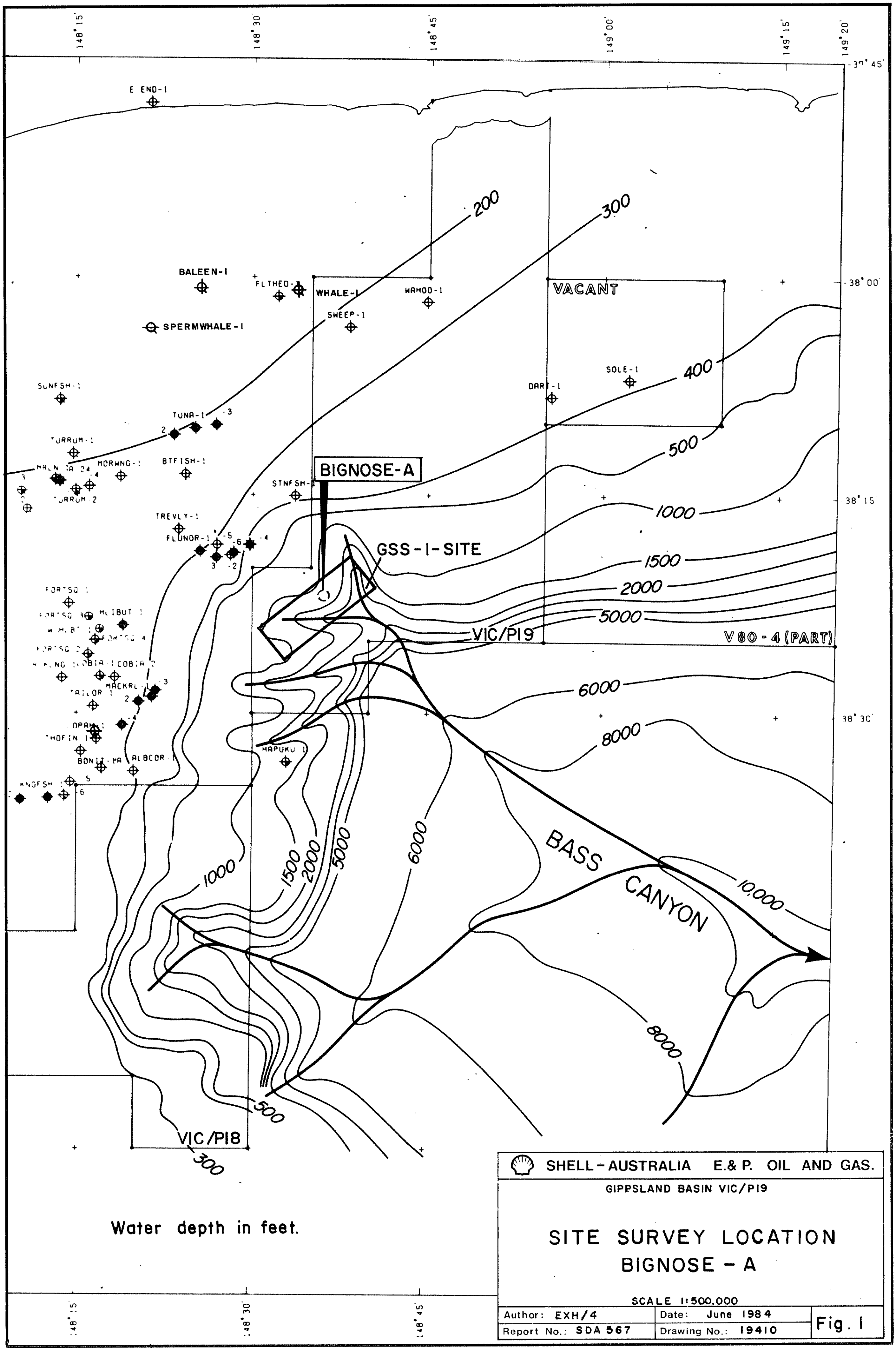


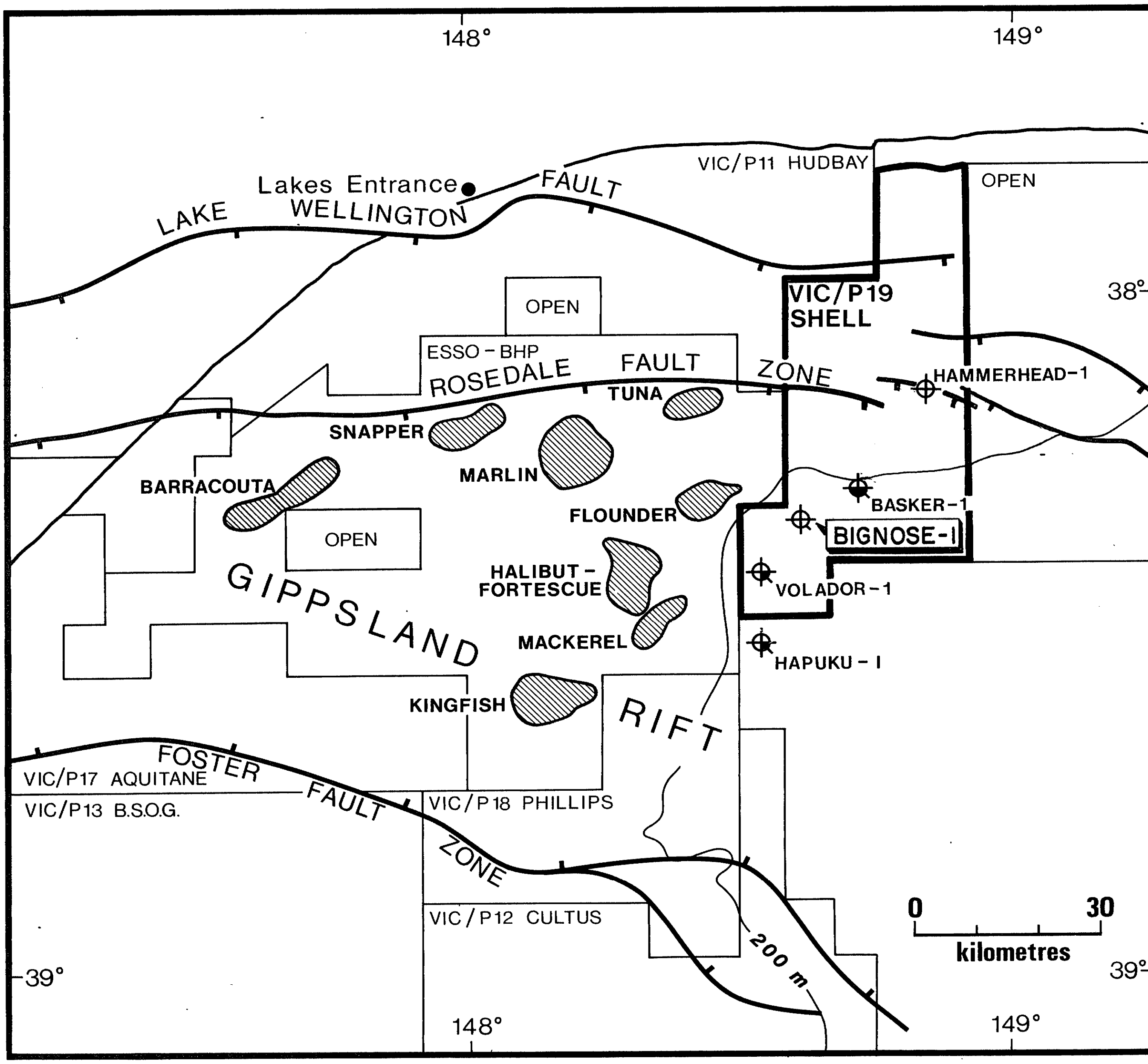
SHELL-AUSTRALIA E.& P. OIL AND GAS.

GIPPSLAND BASIN VIC/P19

SITE SURVEY LOCATION
BIGNOSE - A

SCALE 1:500,000

Author: EXH/4	Date: June 1984	Fig. 1
Report No.: SDA 567	Drawing No.: 19410	



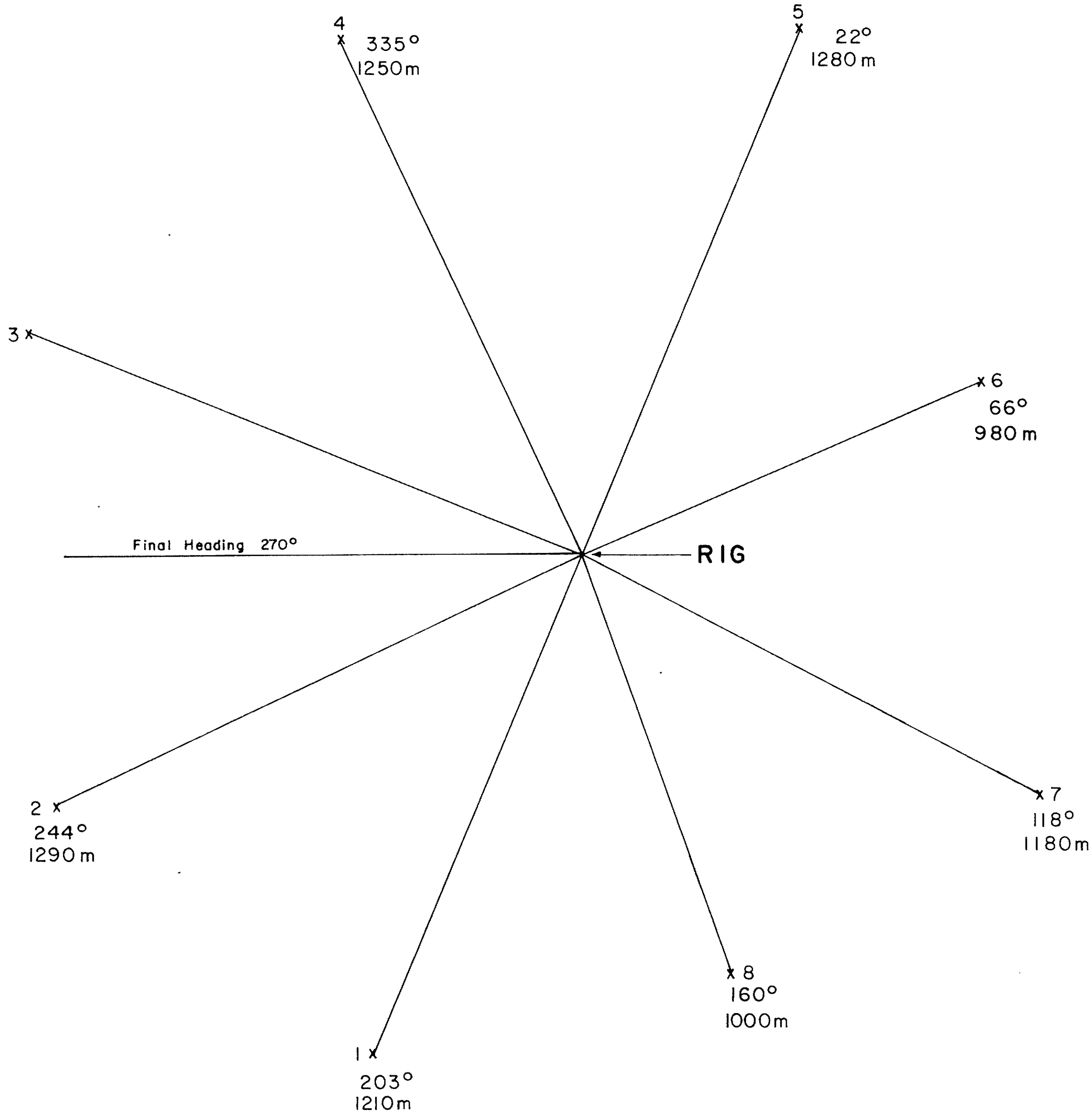
SHELL - AUSTRALIA E.& P. OIL AND GAS.

GIPPSLAND BASIN

BIGNOSE -I

LOCATION MAP

Author: EPE/I	Date: June 1984	Fig. 2
Report No.: SDA 567	Drawing No.: 19416	



Note: Distances shown are horizontal from centre of rig.

BIGNOSE - 1 FINAL CO-ORDINATES
LAT. 38° 21' 21·42" S
LONG. 148° 36' 05·49" E

SHELL - AUSTRALIA E.& P. OIL AND GAS.

GIPPSLAND BASIN

ANCHOR PATTERN OF NYMPHEA AT BIGNOSE - 1

Author: EPE/1	Date: June 1984	Fig. 3
Report No.: SDA 567	Drawing No.: 19411	

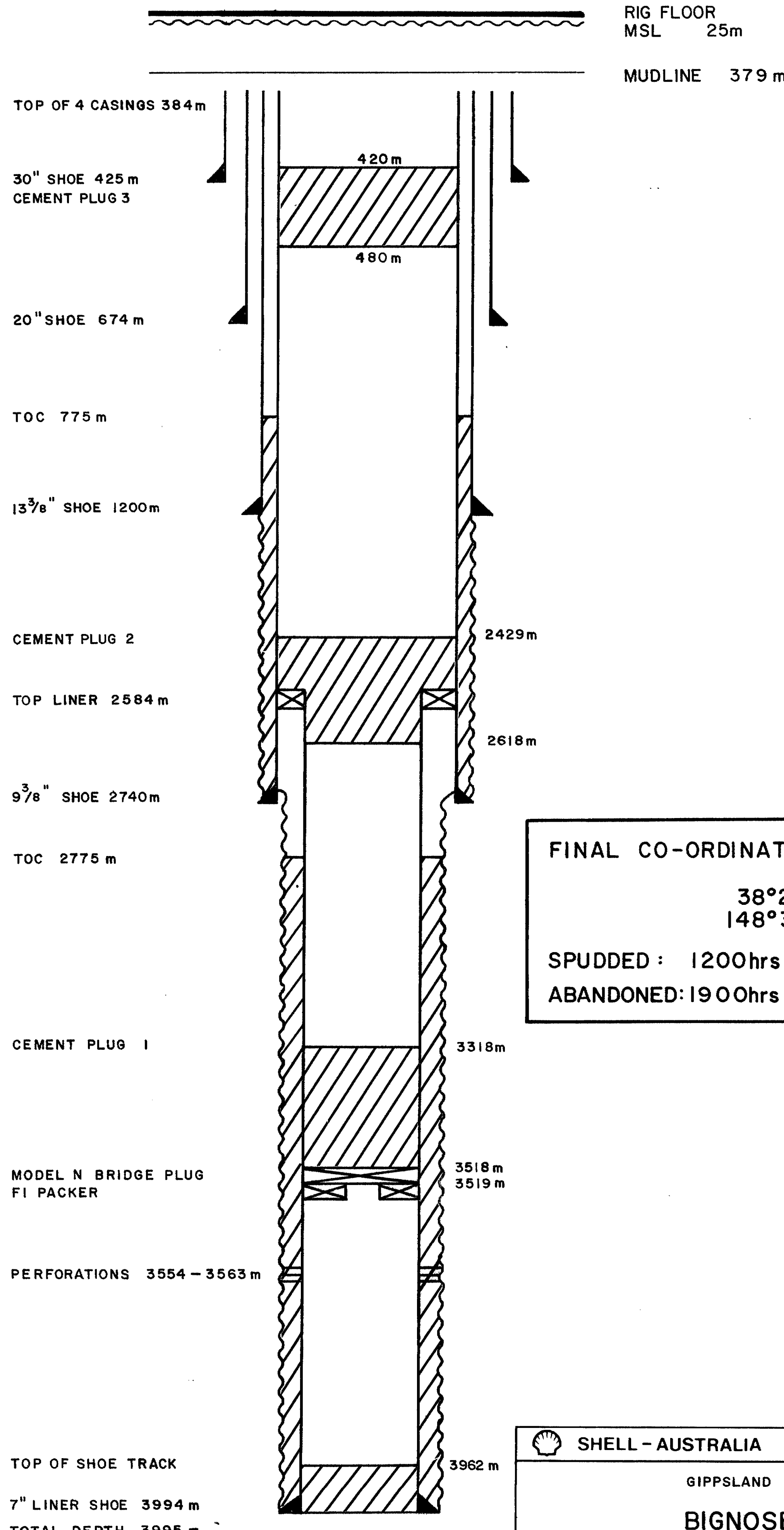
PE903457

This is an enclosure indicator page.
The enclosure PE903457 is enclosed within the container PE902523 at this location in this document.

The enclosure PE903457 has the following characteristics:

ITEM_BARCODE =	PE903457
CONTAINER_BARCODE =	PE902523
NAME =	Bignose 1 horizontal projection of well path
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Bignose 1 horizontal projection of well path
REMARKS =	
DATE_CREATED =	30/06/84
DATE_RECEIVED =	8/08/94
W_NO =	W832
WELL_NAME =	Bignose-1
CONTRACTOR =	Shell Development (Australia) Pty Ltd
CLIENT_OP_CO =	Shell Development (Australia) Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)



FINAL CO-ORDINATES:

38°21'21.42" S
148°36'05.49" E

SPUDDED: 1200hrs 16-9-83

ABANDONED: 1900hrs 21-11-83

SHELL - AUSTRALIA E.& P. OIL AND GAS.

GIPPSLAND BASIN

BIGNOSE – I

WELL STATUS

Author: EPE / I	Date: June 1984	Fig. 5
Report No.: SDA 567	Drawing No.: 19007	

PE903458

This is an enclosure indicator page.
The enclosure PE903458 is enclosed within the container PE902523 at this location in this document.

The enclosure PE903458 has the following characteristics:

ITEM_BARCODE =	PE903458
CONTAINER_BARCODE =	PE902523
NAME =	Bignose 1 rft pressure tests btn 2800-3918.5m
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Bignose 1 RFT pressure tests in the interval 2800-3918.5m
REMARKS =	
DATE_CREATED =	30/06/84
DATE_RECEIVED =	8/08/94
W_NO =	W832
WELL_NAME =	Bignose-1
CONTRACTOR =	Shell Development (Australia) Pty Ltd
CLIENT_OP_CO =	Shell Development (Australia) Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE903459

This is an enclosure indicator page.
The enclosure PE903459 is enclosed within the container PE902523 at this location in this document.

The enclosure PE903459 has the following characteristics:

ITEM_BARCODE = PE903459
CONTAINER_BARCODE = PE902523
NAME = Bignose 1 production test 3554-3563m
BASIN = GIPPSLAND
PERMIT = VIC/P19
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Bignose 1 prosuction test 3554-3563m
REMARKS =
DATE_CREATED = 30/06/84
DATE_RECEIVED = 8/08/94
W_NO = W832
WELL_NAME = Bignose-1
CONTRACTOR = Shell Development (Australia) Pty Ltd
CLIENT_OP_CO = Shell Development (Australia) Pty Ltd

PE903460

This is an enclosure indicator page.
The enclosure PE903460 is enclosed within the container PE902523 at this location in this document.

The enclosure PE903460 has the following characteristics:

ITEM_BARCODE =	PE903460
CONTAINER_BARCODE =	PE902523
NAME =	Bignose 1 pressure buildup after main flow
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Bignose 1 pressure buildup after main flow period
REMARKS =	
DATE_CREATED =	30/06/84
DATE_RECEIVED =	8/08/94
W_NO =	W832
WELL_NAME =	Bignose-1
CONTRACTOR =	Shell Development (Australia) Pty Ltd
CLIENT_OP_CO =	Shell Development (Australia) Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

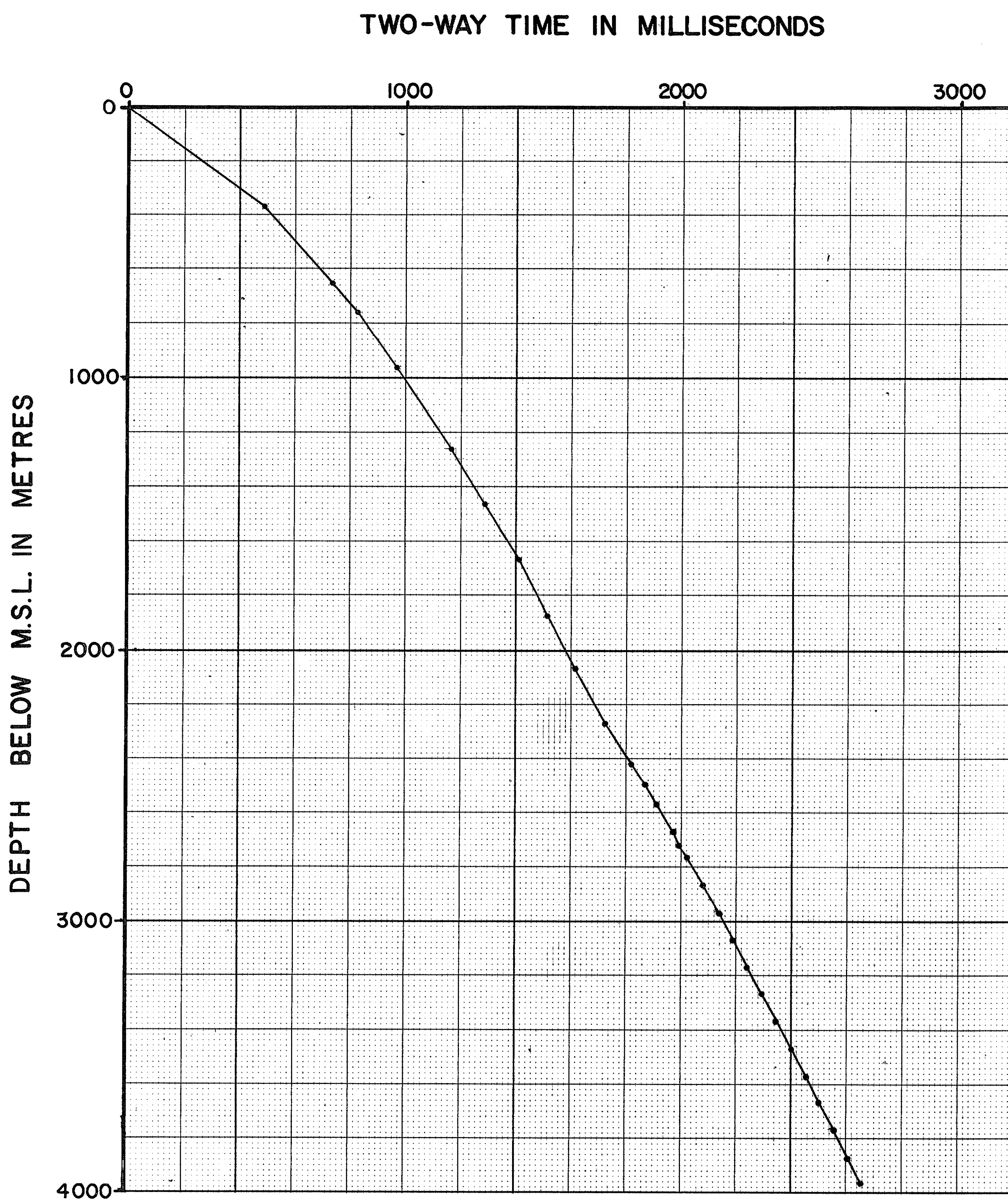
PE903461

This is an enclosure indicator page.
The enclosure PE903461 is enclosed within the container PE902523 at this location in this document.

The enclosure PE903461 has the following characteristics:

ITEM_BARCODE =	PE903461
CONTAINER_BARCODE =	PE902523
NAME =	Bignose 1 drilling time graph
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Bignose 1 drilling time graph
REMARKS =	
DATE_CREATED =	30/06/84
DATE_RECEIVED =	8/08/94
W_NO =	W832
WELL_NAME =	Bignose-1
CONTRACTOR =	Shell Development (Australia) Pty Ltd
CLIENT_OP_CO =	Shell Development (Australia) Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)



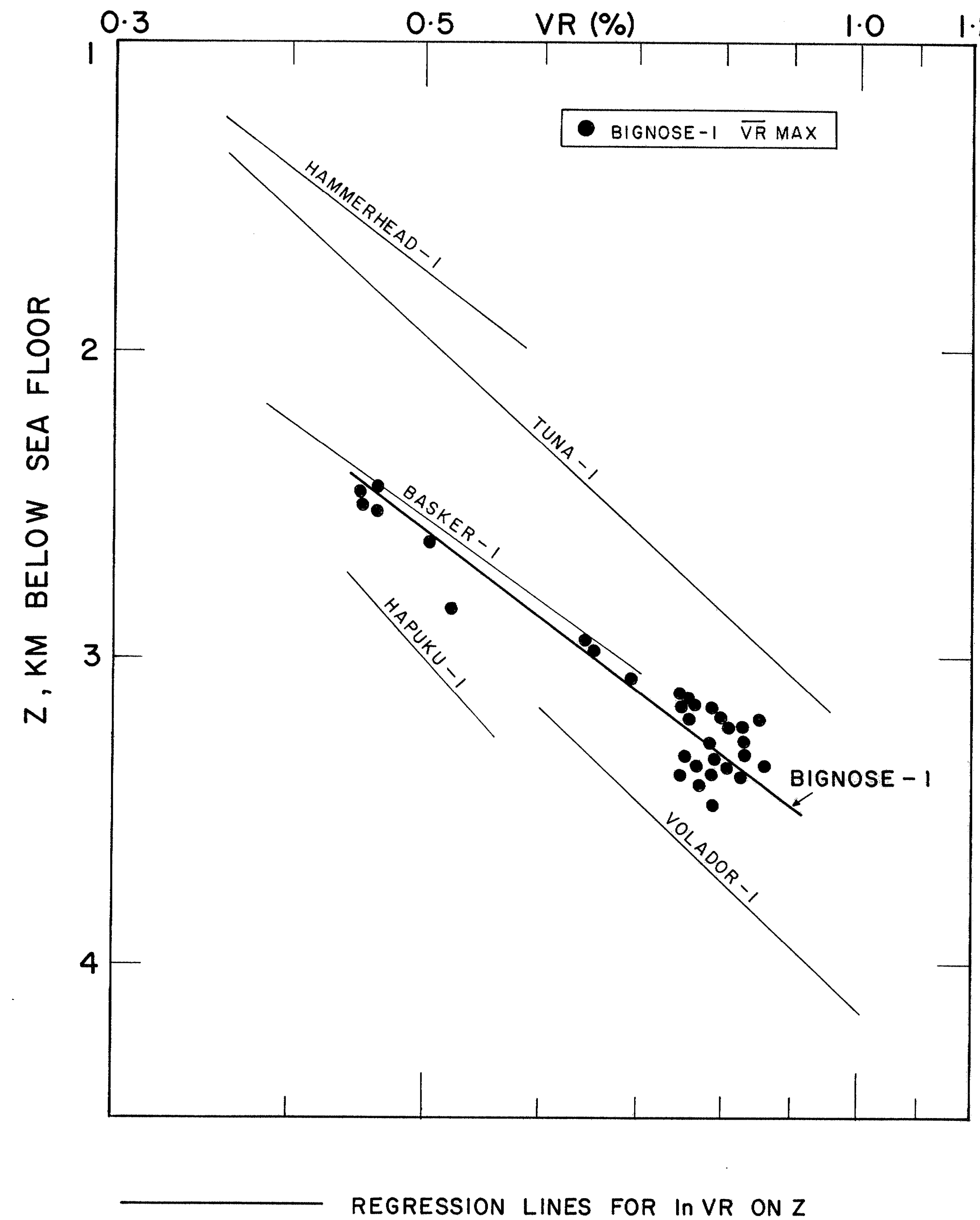
SHELL-AUSTRALIA E.& P. OIL AND GAS.

GIPPSLAND BASIN VIC/P19

BIGNOSE-1

WELL SHOOT DATA

Author: EXH/4	Date: June 1984	Fig. 10
Report No. SDA 567	Drawing No.: 19415	



SHELL-AUSTRALIA E.& P. OIL AND GAS.

GIPPSLAND BASIN

BIGNOSE-I VR DATA VERSUS DEPTH BELOW SEA FLOOR COMPARED WITH NEARBY WELLS

Author: EXH/4	Date: July 1984	Fig. II
Report No.: SDA 567	Drawing No.: 19618	

PE601249

This is an enclosure indicator page.
The enclosure PE601249 is enclosed within the container PE902523 at this location in this document.

The enclosure PE601249 has the following characteristics:

ITEM_BARCODE =	PE601249
CONTAINER_BARCODE =	PE902523
NAME =	Petrophysical Evaluation
BASIN =	GIPPSLAND
PERMIT =	Vic/P19
TYPE =	WELL
SUBTYPE =	well log
DESCRIPTION =	Petrophysical Evaluation
REMARKS =	
DATE_CREATED =	30/06/1984
DATE_RECEIVED =	08/08/1994
W_NO =	W832
WELL_NAME =	Bignose-1
CONTRACTOR =	Shell
CLIENT_OP_CO =	Shell

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PE902524

This is an enclosure indicator page.
The enclosure PE902524 is enclosed within the container PE902523 at this location in this document.

The enclosure PE902524 has the following characteristics:

ITEM_BARCODE =	PE902524
CONTAINER_BARCODE =	PE902523
NAME =	Well Summary Sheet
BASIN =	GIPPSLAND
PERMIT =	
TYPE =	WELL
SUBTYPE =	MONTAGE
DESCRIPTION =	Well Summary Sheet
REMARKS =	
DATE_CREATED =	30/06/1984
DATE_RECEIVED =	08/08/1994
W_NO =	W832
WELL_NAME =	Bignose-1
CONTRACTOR =	Shell
CLIENT_OP_CO =	Shell

PE601250

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The enclosure PE601250 is enclosed within the container PE902523 at this location in this document.

The enclosure PE601250 has the following characteristics:

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CONTAINER_BARCODE =	PE902523
NAME =	Well Completion Log
BASIN =	GIPPSLAND
PERMIT =	
TYPE =	WELL
SUBTYPE =	COMPOSITE_LOG
DESCRIPTION =	Well Completion Log
REMARKS =	
DATE_CREATED =	30/06/1984
DATE_RECEIVED =	08/08/1994
W_NO =	W832
WELL_NAME =	Bignose-1
CONTRACTOR =	Shell
CLIENT_OP_CO =	Shell

(Inserted by DNRE - Vic Govt Mines Dept)

PE902525

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The enclosure PE902525 is enclosed within the container PE902523 at this location in this document.

The enclosure PE902525 has the following characteristics:

ITEM_BARCODE =	PE902525
CONTAINER_BARCODE =	PE902523
NAME =	Time/Depth Contour Map Lower Paleocene Shale
BASIN =	GIPPSLAND
PERMIT =	Vic/P19
TYPE =	WELL
SUBTYPE =	map
DESCRIPTION =	Time/Depth Contour Map Lower Paleocene Shale
REMARKS =	
DATE_CREATED =	30/08/1984
DATE_RECEIVED =	08/08/1994
W_NO =	W832
WELL_NAME =	Bignose-1
CONTRACTOR =	Shell
CLIENT_OP_CO =	Shell

(Inserted by DNRE - Vic Govt Mines Dept)

PE902526

This is an enclosure indicator page.
The enclosure PE902526 is enclosed within the container PE902523 at this location in this document.

The enclosure PE902526 has the following characteristics:

ITEM_BARCODE =	PE902526
CONTAINER_BARCODE =	PE902523
NAME =	Well Correlation
BASIN =	GIPPSLAND
PERMIT =	Vic/P19
TYPE =	WELL
SUBTYPE =	well log
DESCRIPTION =	Well Correlation
REMARKS =	
DATE_CREATED =	30/07/1984
DATE_RECEIVED =	08/08/1994
W_NO =	W832
WELL_NAME =	Bignose-1
CONTRACTOR =	Shell
CLIENT_OP_CO =	Shell

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