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WCR
Basker South-1
(W839)

SHELL-AUSTRALIA E. & P. OIL AND GAS

W839

SDA 582

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

GIPPSLAND TEAM/
PETROLEUM ENGINEERING

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SHELL DEVELOPMENT (AUSTRALIA) PTY LTD

GV:03

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ATTACHMENT (added by DNRE)

FINAL WELL REPORT (PE903478)

TABLES

1. SUMMARY

Basker South-1, the fifth well to be drilled in Permit VIC/P19, was spudded on 23rd November 1983 by the semi-submersible rig Nymphea, and abandoned on 30th December 1983 after reaching a total depth of 3420m without finding significant hydrocarbons.

Basker South-1 was drilled to prove additional reserves to the small volume found in Basker-1. Production test results from Basker-1 indicated that the oil accumulation was partly stratigraphically trapped. FEATEX studies showed that the amplitude of the black loop associated with the main oil zone in Basker-1 varied over the Basker fault block and it was thought that the variations in amplitude may be due to variations in sandstone thickness. Basker South-1 was drilled 1.5km SSW of Basker-1 (Fig. 1) where the FEATEX studies suggested the reservoir section was likely to be well developed. This location was within the structural closure but below the oil/water contact in Basker-1.

The main objective, the lower coastal plain sequence between the Lower and intra-Campanian markers was found to contain thin channel sands of fair reservoir quality. Those between 3200 - 3294m contained slight hydrocarbon saturations (up to 25%). The lack of hydrocarbons is thought to be due to a lack of stratigraphic trapping at this location.

Modelling studies and analysis of the synthetic seismogram for Basker South-1 indicate that the Basker-1 "oil sand black loop" appears to arise from interference of reflections from impedance contrasts between siltstones with different carbon contents. It appears seismic characteristics cannot be used to predict reservoir development in this coastal plain environment, where individual sandstone beds are generally less than 4m thick, and the largest impedance contrasts are between the high and low carbonaceous shales and siltstones.

2. INTRODUCTION

Basker South-1 was the fifth well to be drilled by Shell in offshore exploration permit VIC/P19, in partnership with News (20%), TNT (20%), Crusader (15%) and Mincorp (5%).

Production test results and FIT measurements in Basker-1 suggested that the oil accumulation encountered by that well was much smaller than required for an independent commercial development. Basker South-1 was therefore aimed at proving additional reserves in a possible stratigraphic trap below the oil/water contact in Basker-1. The well was located 1.5 km SSW of Basker-1 where both seismic characteristics and their relationship to faulting suggested that isolated fluvial sand bodies were likely to be well developed.

3. WELL HISTORY

3.1 Summary of Well Data

Well Classification	:	Expendable exploration well
Location Co-ordinates (Final)	:	38° 19' 11.40" S 148°41' 21.56" E
Contractor	:	Foramer/Nymphea
Derrick Floor Elevation	:	25m above MSL
Water Depth	:	239m
BOP Stack	:	10,000 psi, 18-3/4" Cameron
Start of Operations	:	1900 hours, 21/11/83
Spudded	:	1030 hours, 23/11/83
Abandoned	:	1900 hours, 30/12/83
End of Operations	:	1300 hours, 06/01/84
Objective	:	Upper Cretaceous sandstones in the Latrobe Group
Total Depth	:	3420m
Formation at TD	:	Latrobe Group
Results	:	Dry Hole, P & A
Casing Record	:	30" at 311m 20" at 700m 9-5/8" at 2249m

Logs	:	DLL/MSFL/GR/CAL/SP		2249- 699m
		LDL/GR/CAL		2251- 699m
		LSS/GR		2248- 699m
		DLL/MSFL/CAL/GR/SP		3415-2245m
		LDL/CNL/GR		3418-2245m
		HDT		3418-2245m
		BHC/GR		3417-2245m
		CBL/VDL		2245- 400m
		CST	Interval	2250- 699m
			"	3420-2250m
		RFT	Segregated sample	3231m
			15 pressure measurements	
		WST	24 levels	

3.2 <u>Site Survey</u>

The Basker South location was covered by the Basker site survey (Ref 1), so a separate survey was not carried out. An additional side-scan coverage of the area was obtained from the post-drill site clearance survey of Basker-1. This covered an area of 1500m radius around the abandoned well to investigate whether any debris had been left on the seabed.

Previous use of side-scan had given disappointing results because the tow cable length was too short to allow the fish to be towed at a sufficient depth to give good resolution of seabed features. Therefore, for this survey, a 1000m cable with a remote controlled high speed winch was contracted. Some problems were encountered with cross-talk between channels and although these were not adequately remedied the records obtained showed a considerable improvement over those of previous surveys. Areas of slumping were clearly visible, so this method provides a useful means of identifying zones where drilling may be dangerous.

The work was carried out between 2nd and 15th October, 1983 using the supply vessel Herdentor. Details are given in Reference 2.

3.3 Rig Navigation and Positioning

3.3.1 General

Positioning was provided by Geometra Survey Services (previously B.T.W.) using a Syledis B radio positioning system interfaced to a Hewlett Packard 9825 computer. Software was provided by the contractor using their "Geonav" package and computations were checked throughout the operation using a Hewlett-Packard 85 computer and software supplied by SIPM The Hague. Details are given in Reference 3.

3.3.2 Operations

Previous calibrations of positioning equipment for operations in the VIC/P19 permit area had been carried out over the Seaspray calibration range. As this was remote from the area of operations a new baseline was selected at Lakes Entrance, where storage facilities and workshop for the equipment were also found. From previous experience, stations were placed at Mt Taylor, Stringers Knob, Cape Conran and Point Hicks.

The rig was positioned directly from the derrick antenna without the use of buoys to pre-mark the position. A long run-in along a line to the position of anchor no.6 was made. The chain had at this stage been let out so that the anchor was a few metres above the seabed. It was then dropped as the position for anchor no.6 was passed, and the chain played out as the rig continued directly along its course to the rig location. A fault did occur, however, with the direction of the rig along the run-in line on the first attempt. A power failure resulted in the loss of navigation for a period and as a result, when the rig passed over the position for anchor no.6, the direction of movement was unsuitable to lay out the chain. Total rig time lost due to these problems was around 6 hours.

3.3.3 Gyro Reference Marker Directions

For the purpose of gyro surveys made on the Nymphea, the direction of a line from the drill floor to a reference marker must be accurately determined.

From the position of this well, 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:-

Basker South-1 (drill floor) to reference marker = 270°23'.

3.3.4 Anchor Handling

The thrusters on board the rig make anchor handling a simple and safe operation. The anchor handling proceeded smoothly and in good time once the weather was suitable. The method of using anchor chasers, rather than buoys was extremely successful. Although extra time was involved in chasing the wires back to the rig, this was easily compensated for by not having to deal with buoys on deck. No slipping of anchors or problems with the anchor configuration were encountered.

3.3.5 Rig Orientation

Taking into account prevailing wind directions, a rig heading of 270° was decided upon. This also provided reasonable positions for the anchors on the seabed. The pattern used was that of a regular octagon, with 45° between the anchors in each pair (Fig. 2).

3.4 Drilling History

Following the end of operations at Bignose-1 at 1900 hours on 21/11/83, the Nymphea was towed 8km to the Basker South-1 location.

After completing the running of the anchors and pretensioning to 180-200 tons, the temporary guide base was run and set at 264m bdf. The 36" BHA was made up and Basker South-1 spudded at 1030 hours on 23/11/83. The 36" hole was drilled to 316m in 4 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 seabed.

The shoe track and pocket were cleaned with a 26" bit and then a 12-1/4" pilot hole was drilled to 706m in 23 hours. The 26" BHA was made up and the hole opened up to 26" using seawater and viscous pills. Thirty five joints of 20" casing were run and landed with the shoe at 700m. The casing was cemented with returns to the seabed observed by the divers.

The BOP stack and riser were run, landed and tested in 24 hours. After making up the 17-1/2" drilling assembly and tagging cement at 686m, the shoe track and pocket were drilled out with seawater. The hole was displaced to mud, and a leak off test performed, giving an equivalent maximum mud gradient of 1.52 sg. A 12-1/4" turbodrill assembly was made up and the interval to 2254m drilled in 6 days. The main problem during this section was the tendency of the turbodrill assembly to build angle (see Table 5).

Three logging runs were made at 2254m as well as a 51 shot sidewall sample run.

DLL/MSFL/GR/SP/CAL	2249- 699m
LDL/GR	2251- 699m
LSS/GR	2248- 699m

A checktrip was made and the hole circulated clean. 166 joints of 9-5/8" 47 ln/ft N-80 casing were run and landed with the shoe at 2249m. The casing was cemented and pressure tested to 3400 psi.

After a BOP stack test, the casing running tool was retrieved, and the 9-5/8" wearbushing set. The BHA for the 8-1/2" hole was made up, and run in the hole to the top of cement at 2224m. The collar, shoe track and pocket to 2254m were drilled out, and new formation drilled to 2261m with slow progress due to sidewall sample junk on bottom. An Eastman gyro multishot survey was then run on Schlumberger cable from 2225m to 300m.

The 8-1/2" hole was drilled slowly to 2288m whilst working the junk basket and then a leak off test carried out (max. equivalent mud gradient EMG = 1.82 sg).

A roundtrip was made and a shocksub, 6 point reamer, and two stabilisers added to the bottom hole assembly. The 8-1/2" hole was drilled to 2590m in 2 bit runs. A non-magnetic drill collar was added to the BHA. Drilling continued trouble free to 3341m using 4 bit runs and 9 days. Eastman single shot surveys were run every 150m and deviation decreased from 7-3/4° at 2588m to 3° at 3341m. Whilst pulling out of the hole at 3341m for a bit change, the driller hit the crown block with the travelling block. Twenty six hours were spent making repairs. The roundtrip was then completed and the 8-1/2" hole drilled to a total depth of 3420m.

Schlumberger was rigged up and the following logging runs were made:

Run 1	DLL/MSFL/CAL/GR/SP	3414 - 2246m
2	LDL/CNL/CAL/GR	3417 - 2246m
3	BHC/GR	3417 - 2246m
4	CBL/VDL	2246 - 400m
5	HDT	3418 - 2246m
6	WST - Velocity Survey	24 levels

After run 6, a checktrip was carried out and the mud conditioned. An RFT run was made with 17 pressure measurements and a segregated sample at 3231m taken. The sample recovered mud filtrate.

The decision to abandon the well was made and the following cement plugs set:

Plug 1	3300 - 3100m	
2	3075 - 2875m	
3	2067 - 2279m	
4	365 - 305m	

Plug 3 was tagged and tested with 11 tons. The BOP stack and riser were retrieved and the ICI explosive canister was run and the casing shot 5m below the seabed. Three further runs with the explosives were required to free the wellhead. The PGB and TGB and wellhead were retrieved and set back on the spider beams. The divers made a seabed survey (all clear). Four days were spent on an annual inspection and after waiting on weather for 24 hours the anchors were pulled and the rig released to Manta-1 at 1300 hours on 6/1/84.

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 Testing	:	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 12-P-15 7 x 12
BOP's	:	Cameron 18-3/4" 10,000 psi
Well Head 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).

12-1/4" Hole Section

The 12-1/4" 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 12 lb/bbl. Celpol was used to keep the yield point in the range 10-16 lb/100 sq. ft. A continuous addition of seawater was required to maintain the mud weight less than 1.11 sg (2-5 m^3/hr seawater).

This hole section was drilled with a turbine. No hole problems were experienced and the mud properties were easily maintained.

8-1/2" Hole Section

Mud weight was run at 1.11-1.12 sg, MBC 8-13 lb/bbl, yield point 12-17 lb/100 sq. ft, and API water loss less than 6cc/30min. Water loss and rheology were controlled by additions of Dextrid and CMC.

Table 1: Bit Record Summary - Basker South-1

Bit No.	Bit Size (in)	Bit Type	Jet Size 1	Jet Size 2	Jet Size 3	Depth Out (m)	Metres	Hours	WOB (mt)	RPM	Flow (1/min)	Press (psi)	Mud Wt	Mud Visc. (secs)	Dull Code T	Dull Code B	Dull Code G	Remarks
1	36					316	52	2.75	2/5									
2	12-1/4	SDGH	20	20	20	706	390	16.0	2/5	100	340	2000	1.03	27	1	1	0	Good for reruns
3	26.0	DSJ	20	20	20	706	390	30.5	5	75	422	2300	1.03	27	2	2	0	Good for reruns
4	17-1/2	DSJ	16	16	16	709	3	3.5	5	75		2200	1.03	27	2	2	0	Drilled 686-705 cement
5	12-1/4	LX 27HS	+9-1/2" Turbo		A2	2254	1545	108.5	3.10	55	3200	3700	1.10	43	40% worn			Neyrforturbe
6	8-1/2	SDGH	20	20	20													Rerun. Checktrip
7	8-1/2	SVH	16	16	16	2261	7	5.25	0.5	50	1500	970	1.10	42	8	4	1.8	Drilled cement, 3-1/2 hours
8	8-1/2	FDGH	14	14	14	2288	27	5.5	1/5	60	1600	1400	1.10	45	2	2	IG	Lost 1 tooth
9	8-1/2	FDGH	10	10	11	2372	84	8.5	1/8	70/80	1450	2400	1.10	44	3	2	1/8	1 lost tooth, 7.1 rot hrs on bottom
10	8-1/2	FDGH	10	10	11	2409	37	8.75	3/12	60/80	1450	2400	1.10	44	3	2	1/8	8 rot hours on bottom
11	8-1/2	F2	10	10	11	2590	181	20.5	15/16	60	1450	2500	1.11	46	2	3	1/8	17.4 rot hours on bottom
12	8-1/2	F2	10	10	11	2828	238	37.75	15/17	60/70	1450	2600	1.11	45	5	5	1/8	34 hours on bottom
13	8-1/2	F3	10	10	11	2999	171	41.75	15	60/70	1450	2600	1.12	51	4	6	I	39.3 hours. No.2 cone loose
14	8-1/2	V537	10	10	11	3188	189	49.5	15	65	1450	2600	1.12	45	3	5	I	On bottom 45.3 hours
15	8-1/2	F3	10	10	11	3341	153	40.5	15	65	1450	2600	1.13	48	2	2	I	On bottom 37.5 hours
16	8-1/2	F3	10	10	11	3420	79	26.75	15	60/70	1450	2600	1.13	47	2	2	I	On bottom 23.1 hours

Table 2: Casing Summary - Basker South-1

Date Run	Size (ins)	Grade	Weight (lb/ft)	Coupling	Shoe Depth (mbdf)	Remarks
23/11/83	30	B	310	Vetco ATD Squnch	311	4 joints
27/11/83	20	X52	133	Vetco LS	700	35 joints. 18-3/4" 10,000 psi SG=5 Wellhead System
7/12/83	9-5/8"	N80	47	BTC	2249	166 joints

Table 3: Cement Summary - Basker South-1

Date	Job Description	Hole Size /Depth	Casing Shoe	Cement Used (mT)	Slurry Wt (sg)	Mixwater/Additives	Remarks
24/11/83	30" casing	36"/316	311	Class G 14.4 13.5	1.56 1.92	Drillwater plus 2% BWOW $CaCl_2$ 2.5% BWOW Gel 13.8m³ Sea water 6.0m³	Returns to seabed observed by diving bell Design Figures: Lead: 1.29 m³ slurry/mt cement 0.96 m³ mixwater/mt cement Tail: 0.76 m³ slurry/mt cement 0.44 m³ water/mt cement
27/11/83	20" casing	26"/706	700	Class G 81 26	1.48 1.90	Drill water plus 2% BWOC $CaCl_2$ 3% BWOW Gel 87m³ Sea water 12 m³	Return observed to seabed Design Figures: Lead: 1.46 m³ slurry/mt cement 0.13 m³ mixwater.mt cement Tail: 0.76 m³ slurry/mt cement 0.44 m³ water/mt cement
7/12/83	9-5/8" casing	12-1/4"/2254	2249	Class G 48 4.3	1.50 1.90	Drill water plus 3% BWOW Gel 54 m³ Drill water 0.2% BWOC, HR-7 1.9 m³	TOC 550m 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
27/12/83	Abandonment Plug 1	8-1/2"		Class G 9.6	1.90	Drill water	Plug 1: 3300-3100m
27/12/83	Plug 2	8-1/2"		9.5	1.90	Drill water	Plug 2: 3075-2875
28/12/83	Plug 3	8-1/2" hole/ 9-5/8" casing		11	1.90	Drill water	Plug 3: 2279-2067m
	Plug 4	9-5/8" casing		3	1.90	Sea water	Plug 4: 365-305m

Table 4: Mud Record - Basker South-1

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														
872	1.06	46	12	11	4	22	8.2	200	18000	TR	97	3	9.4	15
1672	1.09	41	11	10	3	13	9.7	200	18000	TR	95	5	9.0	10
2110	1.10	42	10	10	4	24	11.4	300	19000	TR	94	6	9.0	10
2365	1.11	45	15	16	3	16	5.8	200	19000	TR	94	6	9.7	10
2583	1.11	45	15	14	2	12	6.1	200	19000	TR	94	6	9.4	10
2818	1.11	46	15	14	2	16	4.8	200	21000	TR	94	6	9.8	8
2977	1.11	50	16	17	3	15	4.7	200	21000	TR	94	6	9.0	8
3076	1.11	47	13	13	5	17	5.6	200	21000	TR	94	6	9.1	10
3226	1.12	45	13	11	2	14	4.5	200	20000	TR	93	7	10.1	10
3340	1.13	47	15	15	4	12	4.1	180	19500	TR	93	7	10.1	10
3420	1.13	47	16	14	4	15	4.4	170	19000	TR	92	8	9.9	10

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", and 9-5/8" casing shoes. The following results were obtained:

Depth (m)	Surface Pressure (psi)	Mud (sg)	EMG (sg)	Formation
709	500	1.03	1.52	Gippsland Limestone
2288	2320	1.10	1.81	Latrobe Group

3.6.6 Lost Circulation

None

3.6.7 Perforations

None

3.6.8 Fishing

None

3.6.9 Side Tracking

None

3.6.10 Deviation

See Table 5 - Deviation Record

See Figure 3 - Well Path (Plan View)

3.6.11 Abandonment

See Figure 4 - Well Status

Table 5: Deviation Record - Basker South-1

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

Depth AH (m)	Inclination (degree)	Remarks
316	0.5	Totco
500	0.5	Totco
706	0.75	Totco
956	2.0	Totco
1130	1.5	Totco
1378	2.0	Totco
1615	2.5	Totco
1832	3.0	Totco
2032	4.5	Totco
2239	7.5	Totco
2260	7.0	Totco
2513	7.75	Totco
2588	7.75	Totco
2673	6.75	Eastman
2818	5.75	Eastman
2987	5.0	Eastman
3176	3.5	Eastman
3341	3.0	Eastman
3420	2.5	Eastman

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; continuous monitoring and chromatographic analysis of gas. These values were recorded at one metre for 8-1/2" and 5 metre intervals (in top 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 package of interactive programs to assist in drilling control, drilling optimisation, pressure evaluation and formation evaluation were available from the Gemdas unit. Examples of these programs include hydraulics analysis, D exponent analysis, kick analysis, fracture gradient analysis. A summary of this data can be found in Reference 4.

3.7.2 Cuttings

Ditch cuttings were collected every 10m below 20" casing (700m) 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).

Descriptions are given in Reference 5.

3.7.3 Sidewall Samples

A total of 102 shots were fired with a total recovery of 88 samples. For descriptions of samples see Reference 5.

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 (in)	Interval (m)	Type
4.12.83	12¼	2249 - 699	DLL/MSFL/GR/CAL/SP
		2251 - 699	LDL/GR/CAL
		2248 - 699	LSS/GR
		2251 - 699	CST 45/51
24/12/83	8½	3415 - 2245	DLL/MSFL/GR/CAL/SP
		3418 - 2245	LDL/CNL/GR
		3418 - 2245	HDT
		3417 - 2245	BHCS/GR
		2245 - 400	CBL/VDL
		3418 - 2245	CST 43/51
		3231	RFT segregated sample
		3420 - 0	WST 24 levels

3.8.2 Evaluation

3.8.2.1 General

Petrophysical evaluation indicated the logged section of Basker South-1 to be mainly water bearing. Marginal hydrocarbon saturations (up to 40%) were calculated below 2925m in 1-2 metre thick sandstone layers with low porosity. An RFT attempted at 3231m recovered only a negligible amount of gas and contaminated formation water with mud filtrate.

No major problems were posed in log interpretation.

For further details on pore pressure analysis of Basker South-1, see Reference 4.

3.8.2.2 Formation Water Resistivity (Rw)

Formation water resistivity values were derived from Resistivity/Porosity crossplots which tie in with the measured values in nearby wells.

3.8.2.3 Method of Evaluation

For a detailed discussion of the evaluation method see Appendix 7.1.

3.8.2.4 Petrophysical Parameters Used in Evaluation

Refer to Table 6.

3.8.2.5 Evaluation Results

No net hydrocarbons above the porosity and hydrocarbon saturations cut off (13% and 50% respectively) were calculated from the logs.

Refer to Enclosure 1 for the depth plot of the petrophysical evaluation.

3.8.3 Repeat Formation Test Results

See Table 7 for results of formation pressures measured and Figure 5 for a plot of RFT pressures vs depth.

The following segregated sample was taken.

Depth: 3231m

Type: Segregated

Recovery: Dirty water both chambers

pH = 7

NaCl = 31700 ppm

No oil/gas indications

Table 6: Petrophysical Parameters used in Evaluation

Parameter		Interval			
		2210-2560m	2560-2723m	2723-2975m	2975-3410m
GR minimum	(API units)	27	27	27	27
GR maximum	(API units)	150	150	150	150
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)	0.092	0.092	0.085	0.08
Rmc	(ohm.m)	0.148	0.148	0.13	0.122
Rsh	(ohm.m)	0.10	20	40	40
Rw	(ohm.m)	0.10	0.112	0.12	0.150
m		2.098	2.098	2.098	2.098
A		0.584	0.584	0.584	0.584
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
h = Hydrocarbon Density

Table 7: Summary of RFT Pressure Tests - Basker South-1

Depth (m)	Formation Pressure (psia)
2340	3337
2536	3614
2651.5	3781
2804.2	3999
2907.7	4155
2932	4194
2971	4255
3034	4350
3111.5	4467
3151.5	4524
3177.6	4568
3215.5	4615
3231	4645
3258.8	4686
3267.7	4733
3382.2	4854

3.9 Geopressure Engineering

Pore pressure gradient was normal (0.44 psi/ft) with no evidence of any overpressure down to 3420m. For further details on pore pressure analysis of Basker South-1, see Reference 4.

3.10 Well Cost, Time Allocation

See Figure	6	:	Drilling Time Graph
See Table	8	:	Chemical Consumption Cost
See Table	9	:	Time Allocation
See Table	10	:	Well Cost

Table 8: Chemical Consumption Cost - Basker South-1

Interval: Surface - 700m
Casing Size: 30" and 20"

Product	Quantity
Gel	16 mt
Caustic	10 dm
CMC HV/EHC	19 sx

Cost: $ 5,518
Cost/Metre: $ 12.66

Interval: 700-2254m
Casing Size: 9-5/8"

Product	Quantity
Gel	17 mt
Barite	7 mt
Caustic	50 dm
Lime	11 sx
CMCHV/EHV	43 sx
CMC LV	75 sx
Q Broxin	32 sx
Celpol	59 sx
Magcolube	1 dm
Torq trim	22 dm

Cost: $ 31,106
Cost/Metre: $ 20.01

Interval: 2254 - 3420m
Casing Size: 8-1/2"

Product	Quantity
Gel (sacks)	9 sx
Barite	42 mt
Caustic	78 dm
Lime	175 sx
Sodium Bicarbonate	10 sx
CMC HV/EHV	71 sx
CMC LV	112 sx
Q Broxin	47 sx
Dextrid	290 sx
Celpol	28 sx
Serflo W300	3 dm
Condet	1 dm

Cost: $ 43,481
Cost/Metre: $ 37.29

Total Mud Chemical Cost: $ 80,105
Cost/Metre Drilled : $ 25.38/metre

Table 8: Chemical Consumption Cost - Basker South-1 (cont'd)

Cement Chemicals

Product	Quantity	
Cement	239 mt	
HR-7	1 sx	
HR-12	1 sx	
NF-1	3 dm	
$CaCl_2$	997 sx	
Gel	73 sx	
Total Cost Cementing Materials:		$ 66,439
TOTAL COST CHEMICALS/CEMENT :		$ 146,544

Table 9: Time Allocation Basker South-1

		Hours	%
I	Preparation	-	-
II	Mobilisation, Moving, etc.		
	Moving	29	
	Rigging Up/Down	52.5	
	Total Mobilisation	81.5	8.0
III	Making Hole		
	Drilling	405.75	
	Adding Pipe	13.25	
	Surveys	19.50	
	Checking	2.75	
	Roundtrip - bit change	90.00	
	- deviation operation	0.25	
	Circulation	11.50	
	Reaming/Washing	4.25	
	Fishing	8.00	
	Rig Service	5.00	
	Repairs	28.50	
	Miscellaneous	7.50	
	Total Making Hole	596.25	59.1
IV	Securing Hole		
	Drilling Cement	5.75	
	Roundtrip - Cement Drilling	12.75	
	- before casing	11.25	
	Circulation	2.25	
	Reaming/Washing	4.75	
	Fishing	2.00	
	Rig Service	0.25	
	Casing/Liner run & cement	42.75	
	Flanging Up (BOP)	37.25	
	Standing cement	2.00	
	Total Securing Hole	121.00	12.0

Table 9: Time Allocation Basker South-1 (cont'd)

V	Formation Evaluation		
	Checktrip	1.5	
	Roundtrip - logging	5.5	
	- formation test	9.5	
	Circulation	4.5	
	Formation Strength Test	2.5	
	Rig Service	0.25	
	Logging - Open Hole	44.0	
	Testing Formation	10.0	
	Circulating - Geology Info	9.0	
	Total Formation Evaluation	86.75	8.6
VI	Completion/Suspension	Nil	
VII	Plug-Back/Abandonment		
	Wait Time	23.5	
	Abandonment	100.5	
	Total Plug-Back/Abandonment	124.0	12.3
	TOTAL WELL	1009.5	100

Table 10: Well Cost Basker South-1

Cost	Type	$ Million
0	Preparation/Mobilisation	0.08
1	Drilling - Installation	3.82
2	Mud	0.095
3	Bits	0.123
4	Casing & Cement	0.472
5	Evaluation	0.578
6	Production Testing	0.090
7	Abandonment	0.017
8	Transportation	1.346
9	Recoveries/Recharges	0.092
	TOTAL	6.70

Note: Rig contract day rates x total days = 3.185 Million
Open hole logging cost = 0.505 Million

4. GEOLOGY

4.1 Regional Setting

Permit VIC/P19 lies at the north-eastern margin of the Gippsland Rift (Fig. 1), 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	264	239
Pliocene - Miocene		Gippsland Limestone	264-823 823-2067	239-798 798-2042
Mid Miocene - Late Eocene	D2 - K	Lakes Entrance Formation	2067-2210	2042-2185
Early Eocene - ?Late Paleocene	A.hyperacanthum lower M.diversus	Flounder Formation	2210-2278	2185-2253
LATROBE GROUP				
Paleocene	lower L.balmei		2278-2534	2253-2509
Maastrichtian	T.longus	Latrobe Coarse Clastics	2534-2975	2509-2950
Campanian	T. lilliei		2975-3420	2950-3395
		TD	3420	3395

4.3 Well Stratigraphy

The stratigraphic sequence in Basker South-1 is detailed 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 264 - 2067m

264-2067m — Marl (90%) light grey to greenish grey, soft, very fossiliferous (forams, echinoderms) with traces of carbonaceous detritus, glauconite and pyrite, grading in places to grey, firm, fine-grained, fossiliferous calcarenite (10%).

Palaeontological data indicate the marls and calcarenites were deposited on the continental slope, in many cases as canyon fill.

4.3.2 Lakes Entrance Formation 2067 - 2210m

2067-2100m — Marl (50%) light grey to greenish grey, soft, traces of forams, pyrite and glauconite interbedded with claystone (50%) greyish brown, calcareous, traces of carbonaceous material and fossils becoming less calcareous with depth.

2100-2210m — Claystone, light grey to greenish grey, slightly calcareous, fossiliferous, with traces of pyrite, glauconite and carbonaceous detritus.

These sediments were deposited as part of a transgressive sequence on a mid-shelf platform. Rapid deepening of the area occurred during the Late Eocene and Oligocene with the upper part of the formation consisting of continental shelf sediments.

4.3.3 Latrobe Group 2210 - 3420m (TD)

Flounder Formation 2210 - 2278m

2210-2245m — Sandstone, light grey, unconsolidated, poorly sorted, glauconitic and pyritic.

2245-2278m — Siltstone dark grey, soft, argillaceous, slightly calcareous, with fine sand and common glauconite.

Latrobe Coarse Clastics 2278 - 3420 (TD)

2278-2334m — Light grey unconsolidated and coarse-grained barrier sandstone grading downwards into sandy, pyritic, siltstone.

2334-2370m — Unconsolidated, fine to coarse-grained, pyritic and glauconitic sandstone.

2370-2485m — Interbedded pyritic, glauconitic and sandy siltstone and claystone with the amount of sand increasing downwards, deposited as shallow marine and barrier sediments.

Where is sandstone? (2468-2482M) look at the log data.

2485-2534m — Interbedded argillaceous, glauconitic siltstone, glauconitic, greenish claystone and minor sandstone. The base of this unit corresponds to the Lower Paleocene shale marker, a widespread, near base Tertiary, marine transgressive unit.

2534-3658m — Interbedded back barrier and lagoonal siltstone, claystone, sandstone and minor coal. The sandstone is fine to medium-grained and in beds less than 3m thick. ?

On the top of this interval you'll find a sandstone of 8m thick!

2658-2724m Beach/barrier sandstone, medium-grained, well sorted, fining downwards to argillaceous siltstone and pyritic claystone. The base of this unit is the Maastrichtian Marker, a well defined marker on both logs and seismic and representing the first widespread and well documented marine incursion into the eastern part of the basin.

2724-2975m Back barrier/lagoonal siltstones, sandstones, claystones and minor coals. The sandstones are fine to medium-grained with dolomite and silica cement and bed thickness less than 12m.

2975-3294m Lower coastal plain siltstones, sandstones, claystones and coals. The percentage of coal is higher than in the above sequence and the sandstones, although lithologically similar are thinner. The maximum thickness of sandstone beds in this interval is 4m and most have fining upwards trends indicative of fluvial point bar deposits. Sandstone comprises about 20% of this interval.

3294-3363m Grey siltstone and fine-grained, silica and dolomite cemented sandstone increasing in the lower 15m. Dinoflagellates indicating a marginal marine/brackish environment have been recovered from part of this interval. This is the first evidence from VIC/P19 that there was a marine incursion into the basin in Campanian times.

3363-3380m Volcanics, grey tuffaceous and amygdaloidal, similar to those seen in Basker-1.

3380-3920m(TD) Interbedded siltstone and fine to medium-grained lithic well cemented sandstone.

4.4 Geophysics

4.4.1 Seismic Interpretation

Seismic data through Basker-1 shows that a black loop broadly overlies a package containing several hydrocarbon-bearing fluvial sandstones. FEATEX studies showed this loop varied in amplitude over the Basker fault block and it was thought that although unlikely that variations in amplitude would reflect variations in the thickness of individual sandstone beds (as they were too thin to be resolved by the seismic) they may indicate overall thickness changes of the oil-bearing section. Basker South-1 was drilled 1.5km to the SSW of Basker-1, within the same structural closure but below the oil water contact (Fig. 7), at a location where it was thought that amplitude changes and their relationship to faulting indicated this package was well developed (Reference 6).

Basker South-1 did not find the section equivalent to the oil zone in Basker-1 to have better reservoir development. The synthetic seismogram indicates the black loop is caused by interference of reflectors generated by the many, closely spaced, large impedance contrasts between the soft, carbonaceous shales/coals and the dense, low carbonaceous shales and siltstones and is not influenced by sandstone development.

4.4.2 Synthetic Seismogram

The basic impedance log was computed from the well sonic and density logs, which required very little editing except for extrapolation to the seafloor. This was then converted to time using the well velocity survey data and sampled at 4msec. This was filtered (5/10/40/60 HZ) and displayed in VAR wiggle with the corresponding zero phase reflection synthetic seismograms with normal and reversed polarity. The zero phase seismic data for the seven traces around the well location at zero phase, show the best correlation with the reversed polarity synthetic (Encl. 4).

4.4.3 Seismic Markers

The main geological and seismic markers are listed below with their times and depths below derrick floor. The time-depth relationship is shown in figure 8.

		TWT (secs)	Depth, m, bdf
Base Gippsland Limestone	:	1.57	2067
Top Flounder Formation	:	1.665	2210
Base Flounder Formation	:	1.70	2278
Mid Paleocene Marker	:	1.755	2365
Lower Paleocene Marker	:	1.84	2534
Maastrichtian Marker	:	1.95	2724
Intra Campanian Marker	:	2.075	2975
Lower Campanian Marker	:	2.275	3294
Top Volcanics	:	2.319	3363

4.5 Hydrocarbon Indications and Interpretation

The top of significant ditch gas occurred at about 2915m bdf, below which background total gas was generally around 0.1 to 0.2% with peaks up to 1 to 2% opposite coal beds. The gas, which has an approximate average composition of 90% C1, 7% C2, 3% C3 and traces of C4, is interpreted as an early generation product; the associated coals show only a weak cut fluorescence compared with the more mature coals in Volador-1 and Bignose-1. A few of the associated fluvial sandstones in the gas-bearing section contain traces of spotted fluorescence and a weak cut fluorescence. Whilst none of these are regarded as substantial shows, they do indicate that either some early generated liquids have been expelled from adjacent coals, or that some oil has migrated up-dip through these sands from the kitchen area to the south. If the shows were due to early generation more of the sandstones would be expected to have some shows so the latter explanation is favoured. The same was true at Basker-1, where it has been demonstrated geochemically by comparison of oil and extract chromatograms that there was substantial migration the vertical component being about 1300 metres (Reference 7).

4.6 Reservoir Potential

The sandstones in the upper part of the Latrobe Group down to the Lower Paleocene Marker are barrier sands deposited in a coastal environment. The sandstones are quartzose, unconsolidated, well sorted and coarse-grained with porosity values up to 26%. All the sands in this section are water-bearing.

The sandstones in the sequence below the intra-Campanian marker are less well sorted and thinner bedded. Associated sediments indicate the sandstones were deposited in a fairly low energy coastal plain environment. Most show fining upwards trends and contain carbonaceous debris, and are probably fluvial, point bar deposits. Porosity values range from 13 to 25%.

4.7 Source Rocks

As in other VIC/P19 well penetrations of the Campanian lower coastal plain sequence, the carbonaceous siltstones, shales and coals are very organic-rich (TOC's up to 73%) with very good potential hydrocarbon yields (up to more than 400 mg/g). However, the Rock-Eval T_{max} temperatures are below 435°C and the Production Indices are less than 0.05, which suggests that the samples are thermally immature for oil generation (the deepest sample is 100m above the base of the main source rock sequence at 3294m bdf).

Vitrinite reflectance data range from VR = 0.41% at 2554m to 0.67% at 3085m and extrapolation of a regression line through the results suggests that the source rock sequence below 3225m may be just entering the oil-generative window at VR about 0.7%.

4.8 Well Correlation

The main sequence of interest, the lower coastal plain sequence between the intra and Lower Campanian markers (319m gross) could be broadly correlated between Basker South-1 and Basker-1 (Encl. 5), but this was not true of individual sandstone beds. For example, the oil sands between 3090 and 3097m in Basker-1 are similar, on the basis of nearby shales and coals, to two thin sands between 3160 and 3167m in Basker South-1. However, there is no evidence that the sands actually correlate, and in view of the boundary constraints imposed by the production test data on those in Basker, it seems unlikely. This apparent lack of correlation between wells 1.5 km apart emphasizes the rapid lateral variation of facies typical of the coastal plain environment.

4.9 Conclusions and Contributions to Geological Knowledge

1. Basker South-1 tested the Basker fault block south of the oil accumulation encountered in Basker-1. The well was disappointing in that it showed a lack of hydrocarbons, probably due to lack of stratigraphic trapping in this position and emphasized the unpredictability of sand distribution in the Campanian coastal plain section.

2. The thin channel sands in the objective sequence had fair reservoir quality (up to 26% porosity), and these between 3200m and 3294m contained some slight hydrocarbon saturations (up to 15-20%). The sandstone with the most promising combination of porosity and hydrocarbon saturation at 3231m was sampled with the RFT tool, which recovered 21 litre of filtrate and 0.9 cu ft of gas in the lower chamber and 9.5 litres of filtrate and 0.7 cu ft of gas in the upper chamber.

3. The results of Basker South-1 suggest that amplitude variations in the Basker "oil sand black loop" bear no predictable relationship to reservoir development, and in Basker South-1 instead arise from impedance contrasts between siltstones of different carbon contents.

4. The main sequence of interest, the lower coastal plain sequence between the intra and Lower Campanian markers, could be broadly correlated between Basker-1 and Basker South-1. However, this was not true of individual sandstone beds, as is typical of sediments deposited in this type of environment.

5. Dinoflagellates recovered from the siltstone sequence overlying the volcanics at 3330m (Campanian) indicate a marginal marine depositional environment. This is the first evidence from VIC/P19 that there was a marine incursion into the Basin in Campanian times.

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APPENDIX 7.1

Petrophysical Evaluation

APPENDIX 7.1

7.1.1 Method Used

Due to the absence of core data the Simandoux rather than the Waxman-Smit method was used.

1) $$Sw = A.Rw\ \phi^{-m} \left(\frac{1}{R_t} - \frac{Vsh\ Sw}{R_{sh}} \right)^{1/n}$$

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

ϕ = 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 <u>Deck Card Structure</u>

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

- Calculation of shale content (Vsh) log by means of Gamma Ray log.

- Identification of coal layers, dolomitic sands and volcanics 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, dolomitic sands and volcanics).

- Correction for borehole effect of the Dual Laterolog deep and shallow readings a well as the Microspherical focused log.

- True resistivity (R_t) determination.

- Porosity calculation from density log in sand layers.

- Calculation of hydrocarbon saturations by means of Simandoux equation over the sand intervals.

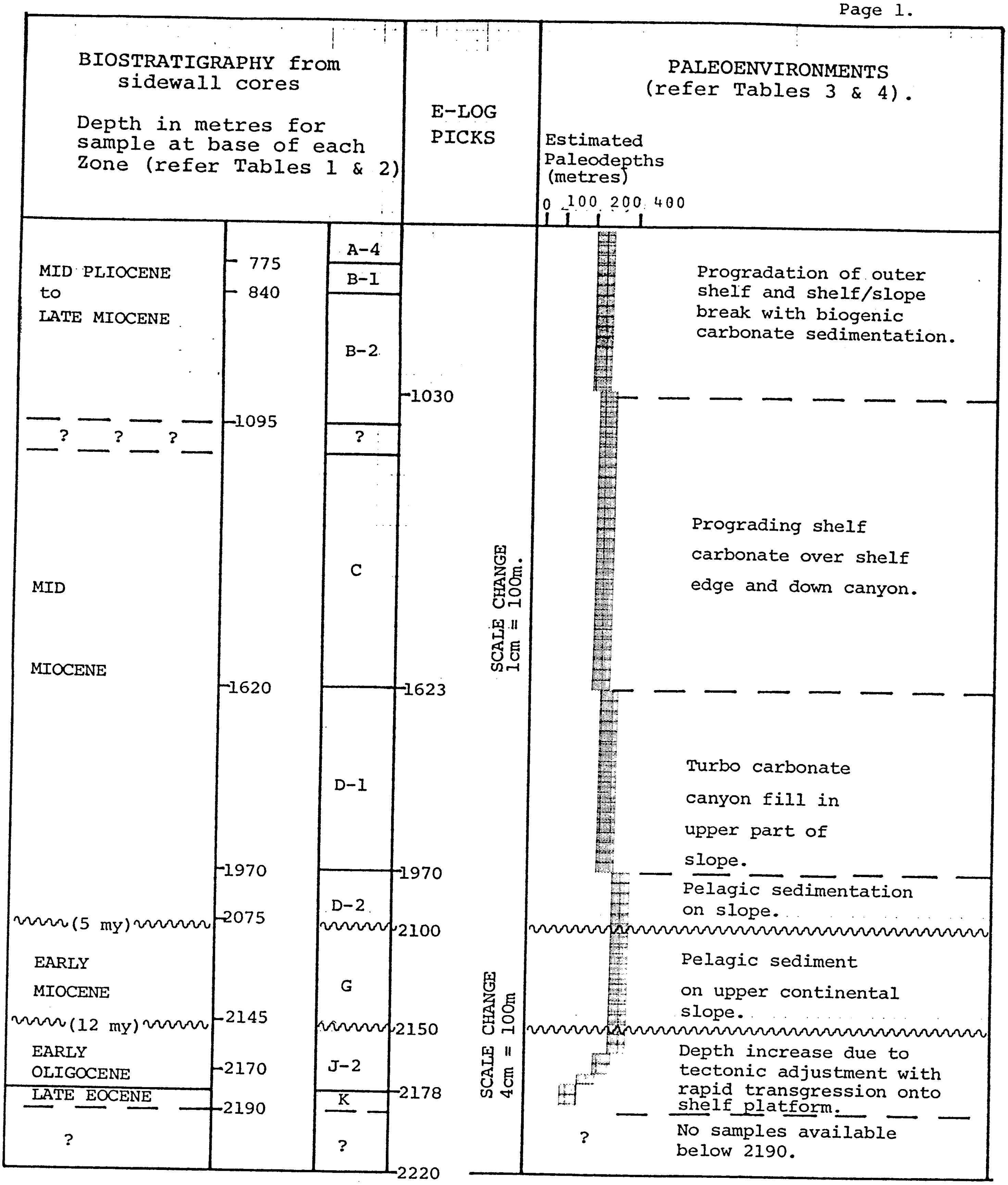
APPENDIX 7.2

THE FORAMINIFERAL SEQUENCE
in
BASKER SOUTH # 1,
GIPPSLAND BASIN

for: SHELL DEVELOPMENT (AUSTRALIA) PTY. LTD.

March 8, 1984.

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



(5 my) = hiatus with time span parentheses.
N.B. change in vertical scale at 2100m.

FIGURE 1: INTERPRETED FORAMINIFERAL SEQUENCE in BASKER SOUTH # 1.

David Taylor, March 7, 1984.

INTRODUCTION.

Forty three sidewall cores were submitted from BASKER SOUTH # 1, between 747 and 2190metres. All samples contained foraminifera in a sequence from Late Eocene to Mid Pliocene. However, as was common in the offshore Gippsland Basin, this sequence was twice interrupted; firstly by extending over most of the Oligocene into the Early Miocene, and later by a shorter hiatus at the top of the Early Miocene (refer Fig. 1 on previous page). Also in these Gippsland sequences, lateral facies changes over short distances make correlation difficult in a sedimentary regime dominated by submarine cutting and filling, and continental shelf edge progradation. This is exemplified by the comparison of the Basker # 1 with Basker South # 1 sequences which conclude this report.

Interpretations and conclusions drawn in this report are based on the same evidence cited in my reports for Basker # 1 (August 11, 1983) and Bignose # 1 (November 17, 1983).

The following Figures and Tables constitute this report:-

FIGURE 1	:	*INTERPRETED FORAMINIFERAL SEQUENCE* based on Tables 1 & 2.
TABLE 1	:	*BIOSTRATIGRAPHIC DATA SUMMARY* with reliability of zonal picks.
TABLE 2	:	*PLANKTONIC FORAMINIFERAL DISTRIBUTION.*
TABLE 3	:	*SELECTED BENTHONIC FORAMINIFERAL DISTRIBUTION.*
TABLE 4	:	*PALEOENVIRONMENTAL ANALYSIS* based on Table 3.

LATE EOCENE - ZONE K, 2190-2180m (?2220 to 2178 on E-logs).

The lower part of the Late Eocene interval was not represented by samples, so that its presence below 2190m can only be inferred from E-logs. This inference is supported by the fact that the benthonic assemblage at 2190m was indicative of a rapid sedimentary transgression on a mid shelf platform, suggesting that the initial, in-shore, phase of this transgression was represented in samples below 2190m.

The only real differences in the planktonic foraminiferal assemblages between Zone K and Zone J-2 in Basker South # 1, was the presence of *Globigerina linaperta* in Zone K (at 2190 & 2180m) and its absence in Zone J-2 (at 2170 & 2157.7m). This implies a biostratigraphic position very high in the Eocene for the samples at 2190 and 2180m; once again supporting the contention that the Eocene sample suite was incomplete.

EARLY OLIGOCENE - ZONE J-2, 2170 to 2157.7m (2178 to 2150m on E-logs) and the "COBIA EVENT" HIATUS at 2150m (E-logs).

The rapid deepening of the depositional site apparent during the Late Eocene, continued and in fact accelerated during the earliest Oligocene; with the sample at 2157.7m having been deposited on the continental slope. This may have been a response to tectonic adjustment, associated with Late Eocene volcanism and uplift of the East Gippsland Highlands (Wellman, 1974).

The sudden change in planktonic components between the Zone J-2 sample at 2157.7m and the Zone G at 2145m, is the evidence of a hiatus of some 12 million years; during most of the Oligocene as well as the lower part of the Early Miocene. The "*Cobia Event*" Hiatus was widespread over the Gippsland Basin Deep. Despite the real change in the planktonic assemblages above the depositional break, there was no such dramatic alteration in benthonic components (compare Tables 2 & 3). Therefore, depositional depth was much the same before and after the "*Cobia Event*" in Basker South # 1; with deposition continuing on the continental slope. This stability in paleoenvironments across the "*Cobia Event*" has been noted in many Gippsland sequences and would imply that the event was not caused by any tectonic adjustment; such as during the Eo/Oligocene transition (see above).

One apparent difference in the carbonate sediment above the hiatus is that it was subjected to a greater degree of diagenesis than that below (refer Table 4).

EARLY MIOCENE - ZONE G, 2145 to 2126m (2145 to 2057m - E-Logs) and EARLY MIOCENE HIATUS at 2075m (E-Logs).

This deep water, continental slope carbonate was heavily recrystallised, yet almost complete planktonic assemblages representing Zone G, were recognised. Unfortunately, the sidewall core jar # 13, labelled 2110m, was empty, so that the interval could not be examined completely, but Zones F and E are probably missing between the Zone G sample at 2126m and the Zone D-2 sample at 2075m.

MID MIOCENE - ZONE D-2, 2075 to 2005m (2075 to 1970m on E-Logs).

The lowest appearance of *Orbulina universa* was at 2075m. Other species present, particularly *Globorotalia miozea miozea* and *G. praescitula*, indicate a position low in the Mid Miocene. Paleoenvironmentally, this interval was very similar to the Early Miocene sediment below the hiatus. Therefore, the hiatus may have been due to slumping on an unstable continental slope. It is noted that the carbonates in this interval are not as heavily recrystallised as those of the Early Miocene below the hiatus.

MID MIOCENE - ZONE D-1, 1970 to 1655m (1970 to 1623 on E-Logs).

Planktonic specimens within this interval were in general, poorly preserved, yet what identification was possible, confirmed a Zone D-1 designation. The difficulty in identification was due in part to carbonate diagenesis, but also to the fact that a high proportion of the specimens were very small (<.2mm); indicating size sorting in a high energy depositional regime. Size and shape sorting is also apparent in the benthonic assemblages with dominance of small lens and shaped forms such as *Cassidulina leavigata*. This sedimentary unit is believed to have been deposited as fill in a submarine canyon on the upper continental slope.

MID MIOCENE - ZONE C, 1620 to 1130m.

Presence, as well as preservation of planktonic foraminifera, fluctuates within this interval. Misplaced, inner shelfal elements, occur, suggesting progradation of the shelf, accompanied by strong bottom currents, operating from the inner shelf to the shelf edge.

LATE MIOCENE to MID PLIOCENE - ZONES B-2, B-1 and A-4, 1095 to 747m.

This interval of prograding shelfal biogenic carbonates, contains abundant foraminiferal faunas, which exhibit size and shape sorting; for instance, note dominance of small size planktonics and the lens shaped benthonic *Cassidulina leavigata*. Together with the presence of misplaced inner shelf species, the size and shape sorted assemblages are evidence of high energy bottom currents associated with a seaward, prograding shelf.

COMPARISON WITH BASKER # 1.

Despite the proximity of Basker # 1 to Basker South # 1, there are differences in the sequences of sedimentary events during the Miocene. For instance -

BASKER # 1		BASKER SOUTH # 1
ZONE C		ZONE D-2
∿∿∿∿∿∿∿∿	*intra Miocene Hiatus*	∿∿∿∿∿∿∿∿
ZONE F		ZONE G

From these differences in timing of sediment preserved on either side of the *intra Miocene Hiatus*, it could be assumed that the slumping on the unstable slope occurred at differing times when the two sequences are compared. Greater accumulation rates during the Late Miocene in Basker # 1, when compared with Basker South # 1, is reflection of later slumping in the former sequence.

The benthonic foraminiferal assemblages listed for the Mid and Late Miocene in Basker # 1 and Basker South # 1, are almost identical in sequence of occurrence of nominated species. However, the correlation between the two sequences is offset in time, when the planktonic foraminiferal biostratigraphy is superimposed; with shelf edge progradation commencing in the Mid Miocene Basker South # 1, but was delayed to Late Miocene in Basker # 1.

Such paleoenvironmental situations, as an unstable upper slope and prograding shelf edge, inhibit correlations by means other than proven biostratigraphic ones, even over a short distance; as between Basker # 1 and Basker South # 1.

REFERENCE.

WELLMAN, P., 1974 - Potassium-Argon ages on the Cainozoic Volcanic Rocks of Eastern Victoria, Australia. *J. Geol. Soc. Aust.*, *21;* 359-376.

TABLE 1

MICROPALEONTOLOGICAL DATA SHEET

BASIN: GIPPSLAND ELEVATION: KB: 25.3m GL: -264m

WELL NAME: BASKER SOUTH # 1 TOTAL DEPTH:

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	747	1				775	0			
		B_1	815	1				840	1			
MIOCENE	LATE	B_2	890	1				1095	0			
		C	1165	1				1620	0			
	MIDDLE	D_1	1655	2	1725	1		1970	1			
		D_2	2005	0				2075*	0			
		E_1										
		E_2										
	EARLY	F										
		G	2126*	0				2145	0			
		H_1										
OLIGOCENE	LATE	H_2										
		I_1										
		I_2										
	EARLY	J_1										
		J_2	2157.7	0				2170	0			
EOCENE		K	2180	1				2190	0			
		Pre-K										

COMMENTS: No sample received below 2190m.

*Sidewall core jar # 13, labelled 2110m, was empty.

CONFIDENCE RATING:

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

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: March 7, 1984.

DATA REVISED BY: DATE:

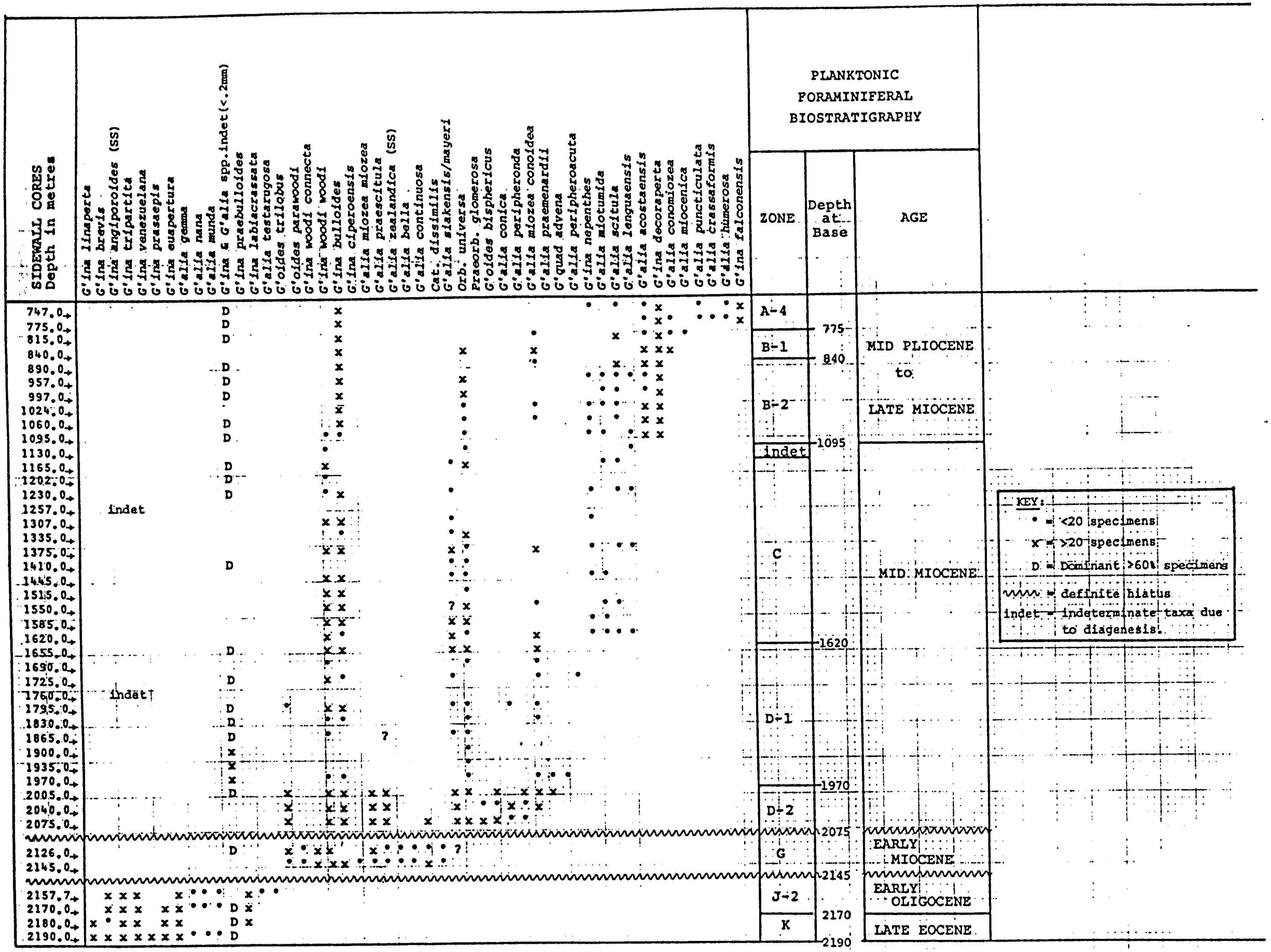


TABLE 2: PLANKTONIC FORAMINIFERAL DISTRIBUTION - BASKER SOUTH # 1.

David Taylor, March 2nd, 1984.

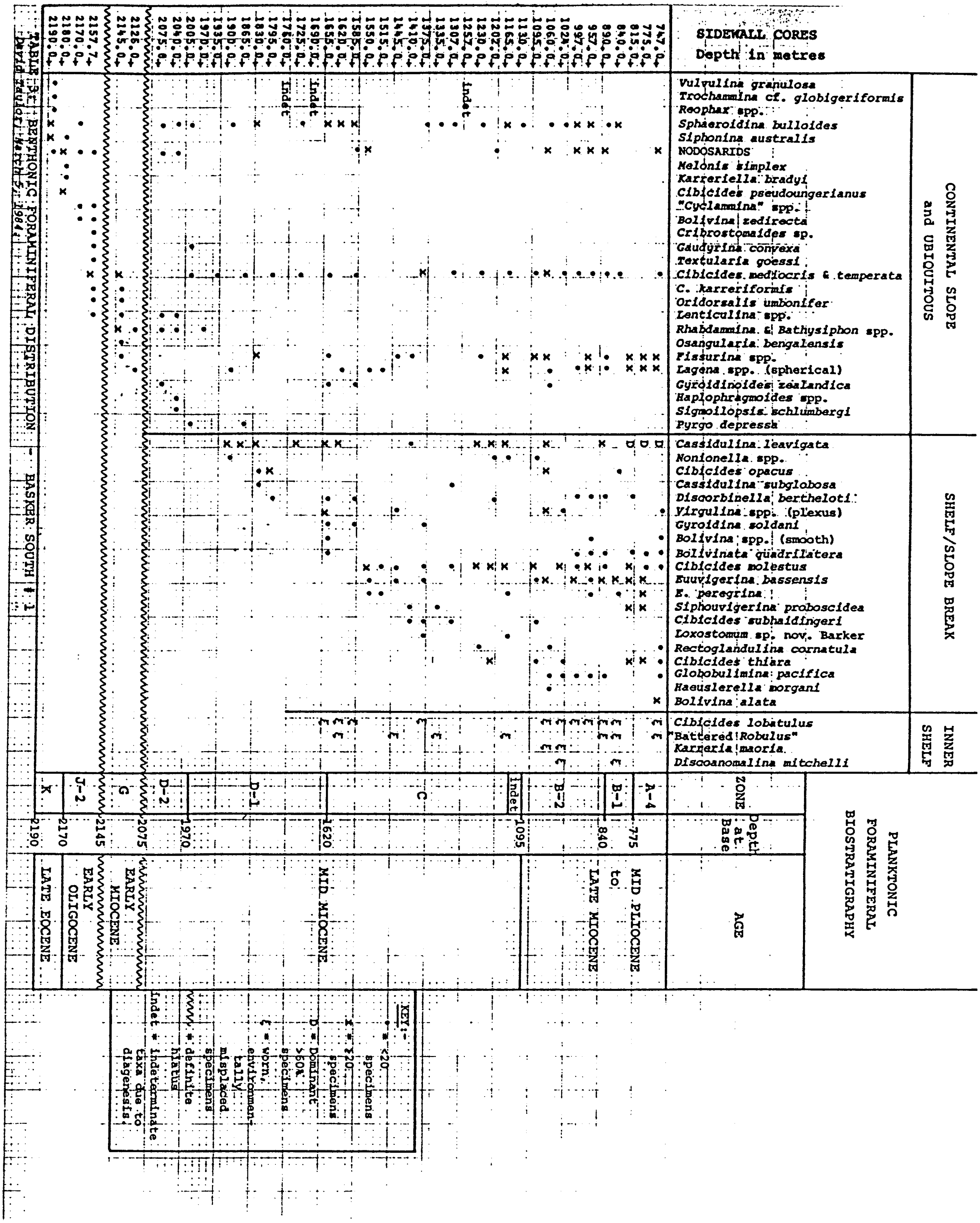


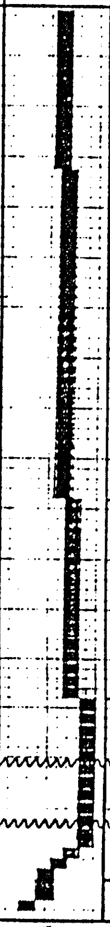
TABLE 3E: BENTHONIC FORAMINIFERAL DISTRIBUTION - BASKER SOUTH # 1
David Taylor, March 5, 1984
SIDEWALL CORES
Depth in metres
747.0
775.0
815.0
840.0
890.0
957.0
997.0
1024.0
1060.0
1095.0
1130.0
1165.0
1202.0
1230.0
1257.0
1307.0
1335.0
1375.0
1410.0
1445.0
1515.0
1550.0
1585.0
1620.0
1655.0
1690.0
1725.0
1760.0
1795.0
1830.0
1865.0
1900.0
1935.0
1970.0
2005.0
2040.0
2075.0
2126.0
2145.0
2157.7
2170.0
2180.0
2190.0
CONTINENTAL SLOPE and UBIQUITOUS
Vulvulina granulosa
Trochammina cf. globigeriformis
Reophax spp.
Sphaeroidina bulloides
Siphonina australis
NODOSARIDS
Melonis simplex
Karreriella bradyi
Cibicides pseudoungerianus
"Cyclammina" spp.
Bolivina zedirecta
Cribrostomoides sp.
Gaudyrina convexa
Textularia goessi
Cibicides mediocris & temperata
C. karreriformis
Oridorsalis umbonifer
Lenticulina spp.
Rhabdammina & Bathysiphon spp.
Osangularia bengalensis
Fissurina spp.
Lagena spp. (spherical)
Gyroidinoides zealandica
Haplophragmoides spp.
Sigmoilopsis schlumbergi
Pyrgo depressa
SHELF/SLOPE BREAK
Cassidulina leavigata
Nonionella spp.
Cibicides opacus
Cassidulina subglobosa
Discorbinella bertheloti
Virgulina spp. (plexus)
Gyroidina soldani
Bolivina spp. (smooth)
Bolivinata quadrilatera
Cibicides molestus
Euuvigerina bassensis
E. peregrina
Siphouvigerina proboscidea
Cibicides subhaidingeri
Loxostomum sp. nov. Barker
Rectoglandulina cornatula
Cibicides thiara
Globobulimina pacifica
Haeuslerella morgani
Bolivina alata
INNER SHELF
Cibicides lobatulus
"Battered Robulus"
Karreria maoria
Discoanomalina mitchelli
Indet
PLANKTONIC FORAMINIFERAL BIOSTRATIGRAPHY
ZONE
Depth at Base
AGE
A-4
775
B-1
840
MID PLIOCENE to LATE MIOCENE
B-2
1095
Indet
C
1620
MID MIOCENE
D-1
1970
D-2
2075
EARLY MIOCENE
G
2145
EARLY OLIGOCENE
J-2
2170
K
2190
LATE EOCENE
KEY:-
• = <20 specimens
x = ≥20 specimens
D = Dominant >60% specimens
{ = worn, environmentally misplaced specimens
/\/\/\ = definite hiatus
Indet = Indeterminate taxa due to diagenesis

SIDEWALL CORES Depth in metres	Total foram count	% planktonic forams	ASSEMBLAGE FEATURES	ENERGY REGIME	PRESERVATION	pyrite	glauconite	mica	c-m subrd-ang qtz	limonite	f. ang qtz	echinoid spines	ostracods	fish fragments	ovoid pellets	sponge spicules	bryozoal fragments	MAJOR COMPONENTS
747.0	2000	70	ξ S	HIGH								A						Φ
775.0	1000	70	S	HIGH	G													Φ
815.0	2000	50	S	HIGH	G													Φ
840.0	1000	70	ξ		G													Φ
890.0	2000	80	ξ S	HIGH	G							r					r	Φ
957.0	1500	80	ξ S	HIGH	M													Φ
997.0	1000	80	ξ		M													Φ
1024.0	?	?	ξ S	HIGH	P													Y
1060.0	2000	80	ξ S	HIGH	M								r				A	Y
1095.0	1000	80	ξ S	HIGH	M							r					A	Y
1130.0	?	?	ξ		P												A	Y
1165.0	1000	80	ξ S	HIGH	M	C											C	Y
1202.0	1000	80	ξ S	HIGH	M	C											C	Y
1230.0	?	?	S	HIGH	VP	C												Y
1257.0	?	?			VP	r												Y
1307.0	?	?	ξ		M				r								r	Y
1335.0	?	?	ξ		P	r			r									Y
1375.0	300	80			M	C												Y
1410.0	?	?			VP	C												Y
1445.0	300	80			P													Y
1515.0	?	?			VP	C												Y
1550.0	?	?	ξ		VP	C			r									Y
1585.0	300	90	ξ		M	A											r	Y
1620.0	500	50	ξ S	HIGH	M	A							r					Φ
1655.0	1000	80	ξ S	HIGH	M	C							r				r	Φ
1690.0	?	?			VP													Y
1725.0	?	?			VP													Y
1760.0	?	?	ξ		VP	r										r		Y
1795.0	500	95	ξ		VP												r	Y
1830.0	?	?	ξ S	HIGH	VP						r							Y
1865.0	?	?	ξ S	HIGH	VP						A							Y
1900.0	?	?	ξ S	HIGH	VP	r					A							Y
1935.0	?	?			VP													Y
1970.0	100	95			P	A												Y
2005.0	2000	99			M	C				A		A			A	C		Φ
2040.0	500	95			MP	r				r				r				Φ
2075.0	500	95			MP													Φ
2126.0	500	99			P													Y
2145.0	2000	95			MP	C			r			A						Y
2157.7	3000	96			EX	r	A						r					Φ
2170.0	3000	99			M	r	r	r				C						Φ
2180.0	500	90			P													Φ
2190.0	1000	95			M													Φ

GROSS FORAMINIFERAL ASSEMBLAGE CHARACTERS; RESIDUE GRAINS: MINOR COMPONENTS, MAJOR COMPONENTS

Φ = biomicrite
Y = recrys. micrite

PALEO-ENVIRONMENTAL ASSESSMENT



E-LOG CHARACTER CHANGE: 1030, 1623, 1970, 2100, 2150, 2178

PLANKTONIC FORAMINIFERAL BIOSTRATIGRAPHY

ZONE	Depth at Base	AGE
A-4	775	MID PLIOCENE to LATE MIOCENE
B-1	840	
B-2		
indet	1095	
C	1620	MID MIOCENE
D-1	1970	
D-2	2075	
G	2145	EARLY MIOCENE
J-2	2170	EARLY OLIGOCENE
K	2190	LATE EOCENE

KEY:
ξ = misplaced grains from shallow water
S = size & shape sorted

Preservation Code:
EX = excellent
G = good
M = moderate
P = poor
VP = very poor

Distribution Frequency:
A = Abundant; 1-5% grains
C = Common; >20 grains
r = rare; <20 grains

TABLE 4: PALEOENVIRONMENTAL ANALYSIS - BASKER SOUTH # 1 (refer also Benthonic Distribution, Table 3)
David Taylor, March 6, 1983

APPENDIX 7.3

I.D. 0519B/0050B

APPENDIX

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

by

Jan van Niel

1. SUMMARY

Depth (m)	Dinoflagellate Zones	Spore-Pollen Zones	Age
2240-2257	A. HYPERACANTHUM	Lower M.DIVERSUS	Late PALEOCENE Early EOCENE
2316-2467	Upper T.EVITTII/ E.CRASSITABULATA	Lower L.BALMEI	Early-Mid PALEOCENE
2498-2525	T.EVITTII	Lower L.BALMEI	Early PALEOCENE
2568	-	prob. T.LONGUS	MAASTRICHTIAN
2713-2940	-	T.LONGUS	MAASTRICHTIAN
2719	I.DRUGGII	-	MAASTRICHTIAN
2985	-	? T.LONGUS	?MAASTRICHTIAN
3138-3412	-	T.LILLIEI	CAMPANIAN

(3420m TD)

SPORE COLOUR/DEGREE OF ORGANIC MATURITY (D.O.M.)/SOURCE ROCK QUALITY

Transmitted (white) light: from pale yellow (2240m) to yellow (3412m)
Incident U.V. light: from light yellow to golden yellow or orange
D.O.M.: probably immature to T.D.
Source rock quality: 2240-2530m: poor; 2568-3412m: poor to good.

ENVIRONMENT OF DEPOSITION (Palynofacies)

2240-2525m: marine, near shore
2568-2716m, 2734-3316m and 3412m: non-marine (swamp, lake or fluvial deposits)
2719m and 3330-3344m: marginal marine

2. INTRODUCTION AND METHODS

The interval examined palynologically ranged from 2240m down to 3412m (TD is at 3420m, bdf). A total of 28 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. Sampling gaps are fairly large in the Cretaceous section.

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 almost all were productive, although one (at 2734m) proved to be barren of palynomorphs and several were too poor to be of much value. Preservation was excellent to reasonable in most samples. Diversity of assemblages varied but was generally good in the Tertiary to poor in the Cretaceous part of the examined section.

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) and Partridge (1976).

Reworked palynomorphs were regularly found, mostly as single occurrences only. Most were Permio-Triassic and Jurassic in age.

It is not clear how to classify the regular occurrences of early and mid Cretaceous spores. They could be reworked, but, although found in younger sediments than their published ranges would indicate 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

2240-2257m (3 SWS): A.HYPERACANTHUM Zone, Early EOCENE

Based on the presence of Ceratiopsis dartmooria, Hafniasphaera septata and a single specimen of Muratodinium fimbriatum. A fragmented Glaphyrocysta retiintexta was present as well. Assemblages were poor in specimens and diversity. Apart from the markers mentioned only Apectodinium homomorphum, Palaeocystodinium sp. and some chorate cysts were present.

2316-2467m (5 SWS): Upper T.EVITTII/E.CRASSITABULATA Zone, Early/Mid PALEOCENE

Based on the presence of Isabelidinium bakeri, Ceratiopsis speciosa, Glaphyrocysta retiintexta, Senegalinium dilwynensis and one fragmented Eisenackia crassitabulata. Palaeocystodinium sp. was fairly common and a few chorate cysts were present as well, but assemblages were poor both in species and in specimens.

2498-2525m (2 SWS): T.EVITTII Zone, Early PALEOCENE

Again, assemblages are not diverse. Apart from the nominate species the following markers were present: Palaeoperidinium pyrophorum (fragments only) and Ceratiopsis speciosa. Spiny cysts of the Spinidinium/Vozzhennikovia-type were quite common. Also present were Paralecaniella indentata, Palaeocystodinium sp., Glaphyrocysta retiintexta, chorate cysts and a few indet. Deflandrea sp.

2719m (1 SWS): I.DRUGGII Zone, Late MAASTRICHTIAN

Apart from the nominate species only a single specimen of Palaeocystodinium sp. was present.

3330-3344m (3 SWS): (dinoflagellate zone unknown) prob. CAMPANIAN

A number of specimens of an as yet unidentified Isabelidinium and several specimens of a Chatangiella sp. were present in these samples. A single specimen of Odontochitina cf. operculata may or may not belong as its preservation and colour is somewhat different from the other dinoflagellates.

The interval cannot be assigned to one of the established zones because of lack of markers.

B. SPORE POLLEN ZONES

2240-2257m (3 SWS): Lower M.DIVERSUS Zone, Late PALEOCENE/ Early EOCENE

The presence of Proteacidites grandis, P. incurvatus, Verrucosisporites kopukuensis and Intratriporopollenites notabilis indicate an age not older than Lower M.DIVERSUS. Top of the interval is characterised on negative evidence, i.e. the absence of markers for the overlying Upper M.DIVERSUS Zone. Such markers were not found. Evidence from dinoflagellates (see 3A) supports the interpretation.

2316-2525m (7 SWS): Lower L.BALMEI Zone, Early to Mid PALEOCENE

The combined presence of Australopollis obscurus, Baculatisporites mallatus, Polycolpites langstonii, Proteacidites angulatus and Tricolpites phillipsii indicate the lower L.BALMEI Zone. Also found, a.o.: Herkosporites elliotii, Gambierina rudata, Lygistepollenites balmei, Nothofagidites spp., Proteacidites spp., Stereisporites (Tripunctisporis) sp. and more.

2568 (1 SWS): probably T.LONGUS Zone, MAASTRICHTIAN

The presence of Camarozonosporites amplus, Proteacidites "reticuloconcavus", P. "otwayensis" and P. "clinei" in this sample has been taken to indicate the top of the T.LONGUS Zone as the nominate species itself is absent. Small Proteacidites spp. and Gambierina rudata were quite common, Nothofagidites spp. much less so.

(Sampling gap of 145m to next sample down).

2713-2940m (6 SWS): T.LONGUS Zone, MAASTRICHTIAN

The nominate species is present in the highest sample (at 2713m). Of the 4 sidewall cores available between 2713 and 2734m one (at 2734m) is barren of palynomorphs and one (at 2716m) too poor to be of any use. Next sample down is at 2877m, leaving a gap of about 160m. The assemblages at 2877m and 2940m are rich in specimens and although not diverse contain some typical T.LONGUS Zone markers. Present, a.o., were Tricolpites longus, Triporopollenites sectilis, Tricolpites lilliei, common Gambierina rudata and less common Nothofagidites spp., Proteacidites angulatus, P. "reticuloconcavus", P. "clinei", P. palisadus, P. "otwayensis", P. "scaboratus", Stereisporites regium, Quadraplanus brossus, "Grapnelispora evansii" (one fragmented specimen), and more.

2595m (1 SWS): ? T.LONGUS Zone, ? MAASTRICHTIAN
2568 m from SWC description table.

This sample is difficult to place with certainty in either the T.LILLIEI Zone or the T.LONGUS Zone although on balance the latter is the more likely. Proteacidites angulatus is present as doubtful specimens only; the ratio between Nothofagidites and Gambierina is about even and no other markers could be found. Pollen types present, such as Triporopollenites sectilis, Camarozonosporites amplus, Gephyrapollenites wahooensis, Stereisporites regium, Proteacidites "clinei" and P. "reticuloconcavus" can occur in either zone. Baculatisporites sp. is unusually common at 2985m.

3138-3412m (9 SWS): T.LILLIEI Zone, CAMPANIAN

The ratio of Nothofagidites/Gambierina is clearly in favour of the former at 3138m and this has been taken as the top of the T.LILLIEI Zone. Markers for the overlying T.LONGUS Zone are absent. Assemblages are poor and not diverse, consisting mainly of Nothofagidites spp., small Proteacidites spp., Triporopollenites sectilis, Tricolpites lilliei, Lygistepollenites balmei, Ceratospora sp., Gephyrapollenites wahooensis, Proteacidites amolosexinus, P. scaboratus, P. "reticuloconcavus", Tricolpites confessus, T. gillii and other sporomorphs, present in the overlying T.LONGUS Zone as well.

The presence of T.lilliei, T.sectilis, G.wahooensis and N.endurus indicate that the underlying N.SENECTUS Zone was not reached and that the well bottomed in the T.LILLIEI 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, 23.5.10). 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 Basker South-1 sporomorph-colour in transmitted light ranged from pale-yellow at 2240m to yellow at 3412m. Over the same interval fluorescence colours of sporomorphs ranged from light yellow to golden yellow or orange. Both estimates seem to indicate immature conditions over most if not all of the section studied.

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 Basker South-1 a rough estimate during preparation showed that between 2240m and 2530m total organic matter varied from 0.1 to 0.5 millilitre per 10 grams of sample, and from 2568m to 3412m from 0.1 to 2.0 millilitre per 10 grams of sample. It should be remembered that these estimates may not reflect the true picture, as they are based on an inadequately sampled section, using only the samples selected for palynology (e.g. disregarding coarser grained sediments and coals).

The interval 2240m to 2530m is rich in inertinite while plant tissues, pollen, spores and dinoflagellates are present in various amounts, but the very low figures for total amount of organic matter per 10 grams of sample classifies them as poor source rocks. The interval 2568m to 3412m (again, considering the palynological samples only) has better amounts of organic matter, mostly consisting of plant tissues (woody and epidermal) with palynomorphs a minor percentage only.

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 interterminate 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 wve 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 Basker South-1 the interval 2240-2525m is clearly marine because dinoflagellates, reasonably diverse, are present in all samples; a fairly rich and diverse pollen flora, together with plant tissues indicate an environment near a source of land-derived organic matter. Between 2568m and 3412m only two intervals contain marine indicators: at 2719m and at 3330-3344m. Both are dominated by one species of dinoflagellate only. This is generally interpreted as indicating a marginal marine environment. Leiospheres of the Nummus type were common at 3330m. Its environmental significance is not clear. Morgan

(1975) considered his Nummus monoculatus to be part of a marine assemblage. They are, however, present singly or as a few specimens in assemblages within the T.LONGUS and T.LILLIEI Zones, classified as non-marine. The other assemblages in the interval 2568-3412m lacked marine indicators. Furthermore, the variety and size range of the plant tissues suggests limited water transport such as can be expected in swamp, lake or some fluvial deposits.

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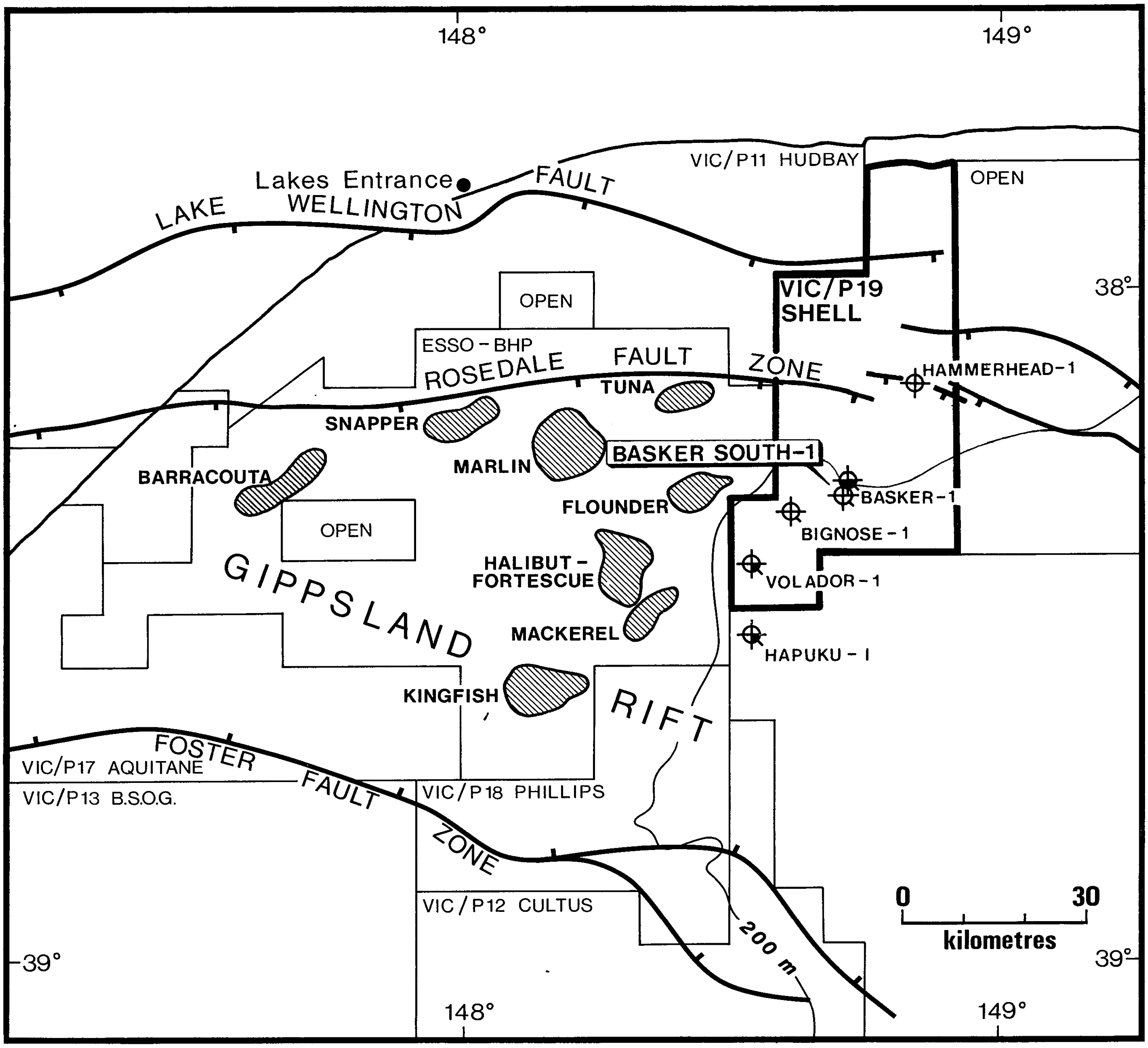
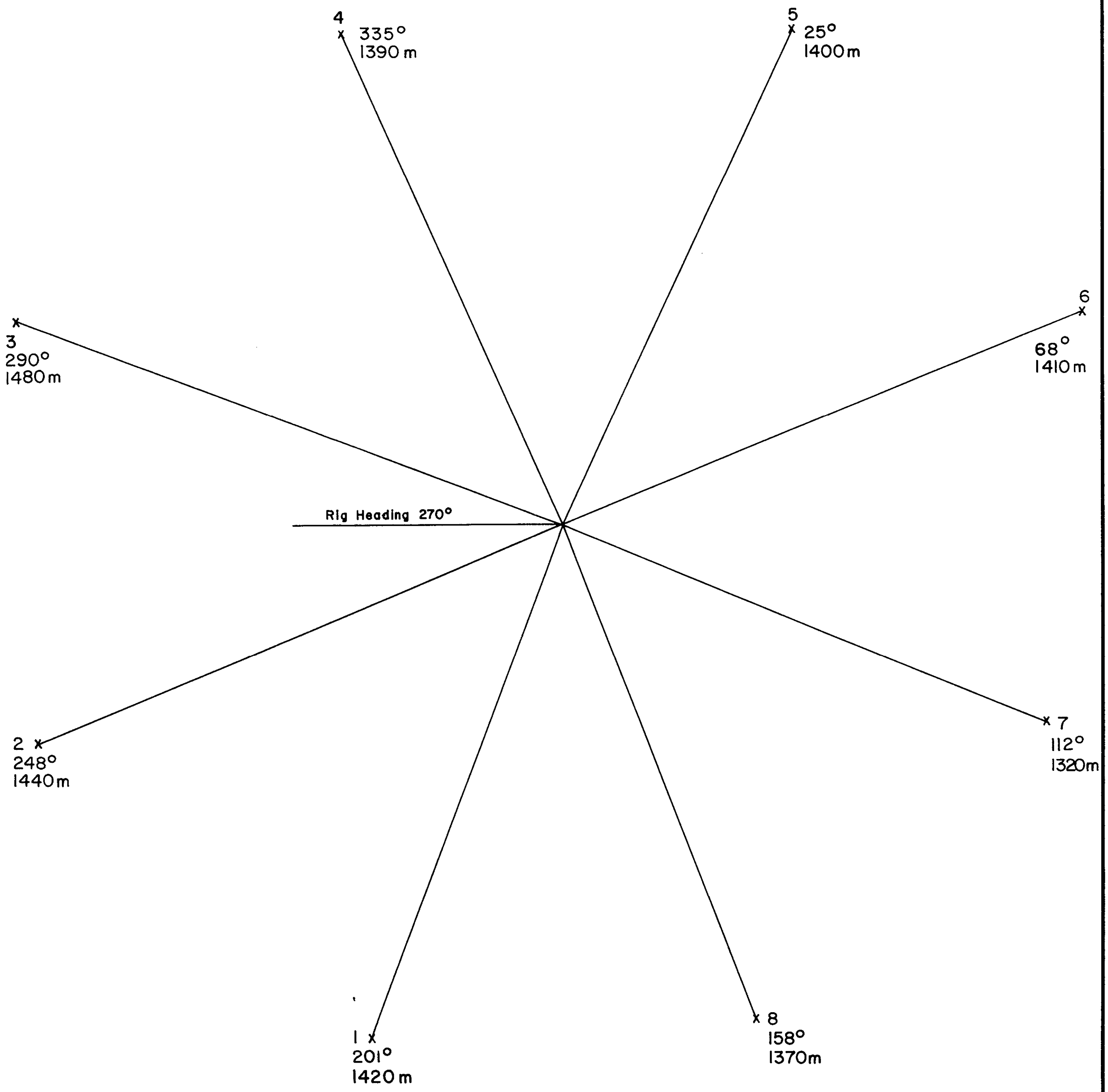


SHELL - AUSTRALIA E.& P. OIL AND GAS.		
GIPPSLAND BASIN BASKER SOUTH - 1 LOCATION MAP SCALE 1:1000 000		
Author: EPE/1	Date: September 1984	Fig. 1
Report No.: SDA 582	Drawing No.: 19715	



Note: Distances shown are horizontal from centre of rig.

Final Coordinates 38°19' 11·40" S
148°41' 21·56" E

SHELL-AUSTRALIA E.& P. OIL AND GAS.		
GIPPSLAND BASIN		
ANCHOR PATTERN AND HEADING OF NYMPHEA AT BASKER SOUTH-1		
Author: EPE/1	Date: June 1984	Fig.2
Report No.: SDA 582	Drawing No.: 19175	

PE903971

This is an enclosure indicator page.
The enclosure PE903971 is enclosed within the container PE902510 at this location in this document.

The enclosure PE903971 has the following characteristics:

ITEM_BARCODE = PE903971
CONTAINER_BARCODE = PE902510
NAME = RFT Pressure Data vs Depth Chart
BASIN = GIPPSLAND
PERMIT = VIC/P19
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Basker South 1 RFT Pressure Data Vs Depth chart (enclosure from WCR)
REMARKS =
DATE_CREATED = 30/09/84
DATE_RECEIVED = 24/09/84
W_NO = W839
WELL_NAME = Basker South-1
CONTRACTOR = Shell Australia Exploration and Production. Oil and Gas.
CLIENT_OP_CO = Shell Australia Exploration and Production. Oil and Gas.

(Inserted by DNRE - Vic Govt Mines Dept)

PE903972

This is an enclosure indicator page.
The enclosure PE903972 is enclosed within the container PE902510 at this location in this document.

The enclosure PE903972 has the following characteristics:

ITEM_BARCODE = PE903972
CONTAINER_BARCODE = PE902510
NAME = Drilling Time Graph
BASIN = GIPPSLAND
PERMIT = VIC/P19
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Basker South 1 Drilling Time Graph (enclosure from WCR)
REMARKS =
DATE_CREATED = 30/09/84
DATE_RECEIVED = 24/09/84
W_NO = W839
WELL_NAME = Basker South-1
CONTRACTOR = Shell Australia Exploration and Production. Oil and Gas.
CLIENT_OP_CO = Shell Australia Exploration and Production. Oil and Gas.

(Inserted by DNRE - Vic Govt Mines Dept)

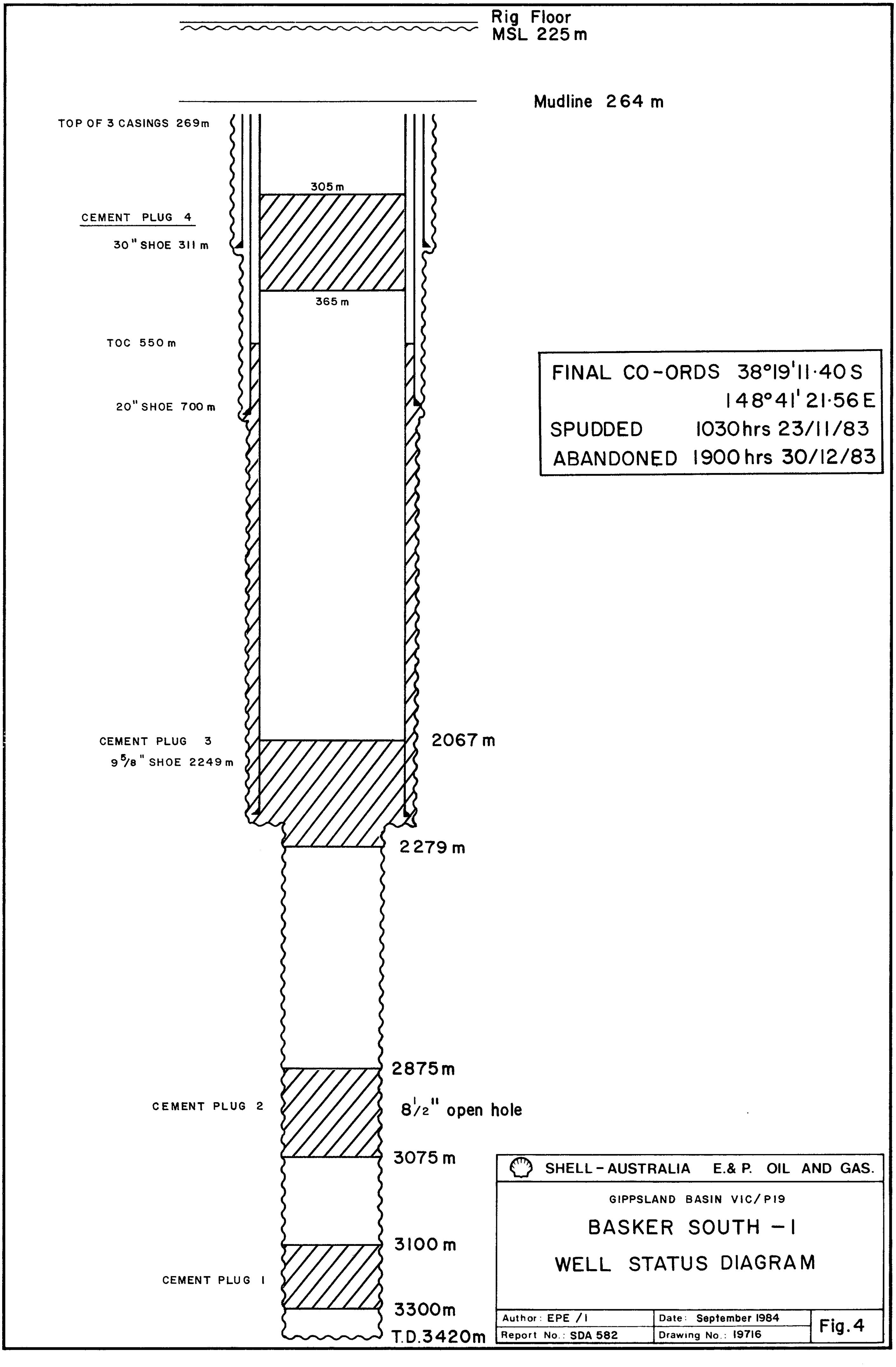
PE903970

This is an enclosure indicator page.
The enclosure PE903970 is enclosed within the container PE902510 at this location in this document.

The enclosure PE903970 has the following characteristics:

ITEM_BARCODE =	PE903970
CONTAINER_BARCODE =	PE902510
NAME =	Horizontal Projection of Well Path
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Basker South 1 Horizontal projection of well path (enclosure from WCR)
REMARKS =	
DATE_CREATED =	31/05/84
DATE_RECEIVED =	24/09/84
W_NO =	W839
WELL_NAME =	Basker South-1
CONTRACTOR =	Shell Australia Exploration and Production. Oil and Gas.
CLIENT_OP_CO =	Shell Australia Exploration and Production. Oil and Gas.

(Inserted by DNRE - Vic Govt Mines Dept)


Rig Floor
MSL 225 m
Mudline 264 m
TOP OF 3 CASINGS 269m
305 m
CEMENT PLUG 4
30" SHOE 311 m
365 m
TOC 550 m
20" SHOE 700 m
FINAL CO-ORDS 38°19'11·40S
148°41'21·56E
SPUDDED 1030hrs 23/11/83
ABANDONED 1900hrs 30/12/83
CEMENT PLUG 3
9 5/8" SHOE 2249 m
2067 m
2279 m
2875m
CEMENT PLUG 2
8 1/2" open hole
3075 m
3100 m
CEMENT PLUG 1
3300m
T.D.3420m
SHELL-AUSTRALIA E.& P. OIL AND GAS.
GIPPSLAND BASIN VIC/P19
BASKER SOUTH - I
WELL STATUS DIAGRAM
Author: EPE /1
Report No.: SDA 582
Date: September 1984
Drawing No.: 19716
Fig. 4

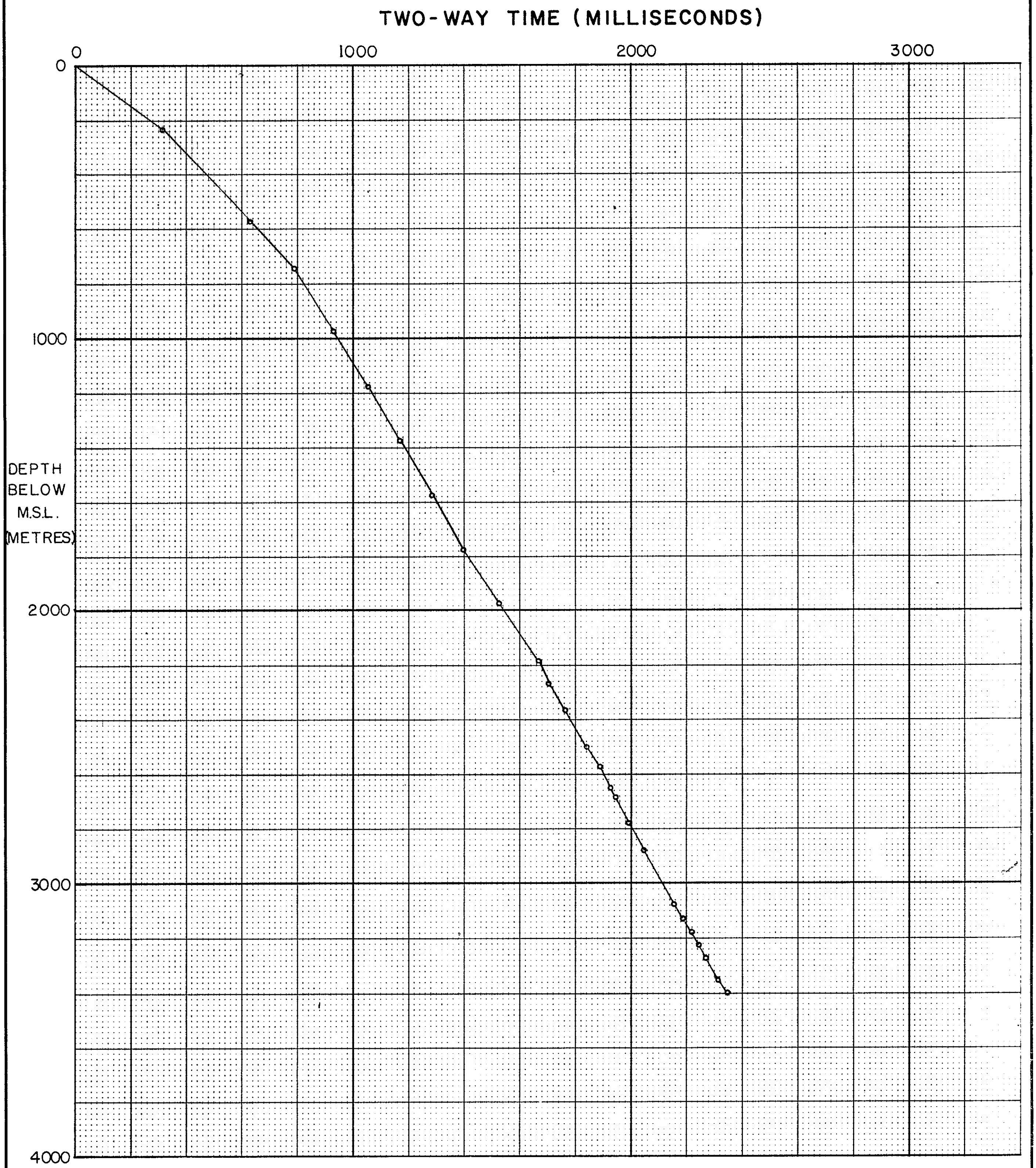
PE903973

This is an enclosure indicator page.
The enclosure PE903973 is enclosed within the container PE902510 at this location in this document.

The enclosure PE903973 has the following characteristics:

ITEM_BARCODE = PE903973
CONTAINER_BARCODE = PE902510
NAME = Time Contour Map
BASIN = GIPPSLAND
PERMIT = VIC/P19
TYPE = SEISMIC
SUBTYPE = HRZN_CONTR_MAP
DESCRIPTION = Basker South 1 Migrated Time Contour Map Lower Campanian Marker (enclosure from WCR)
REMARKS =
DATE_CREATED = 30/09/84
DATE_RECEIVED = 24/09/84
W_NO = W839
WELL_NAME = Basker South-1
CONTRACTOR = Shell Australia Exploration and Production. Oil and Gas.
CLIENT_OP_CO = Shell Australia Exploration and Production. Oil and Gas.

(Inserted by DNRE - Vic Govt Mines Dept)



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

GIPPSLAND BASIN

BASKER SOUTH-1
WELL SHOOT DATA

Author: EXH/4	Date: September 1984	Fig. 8
Report No.: SDA 582	Drawing No.: 19757	

BASE DRG. No. 17902

PE601243

This is an enclosure indicator page.
The enclosure PE601243 is enclosed within the container PE902510 at this location in this document.

The enclosure PE601243 has the following characteristics:

ITEM_BARCODE = PE601243
CONTAINER_BARCODE = PE902510
NAME = Petrophysical Evaluation
BASIN = GIPPSLAND
PERMIT = VIC/P19
TYPE = WELL
SUBTYPE = WELL_LOG
DESCRIPTION = Petrophysical Evaluation (enclosure from WCR) for Basker South-1
REMARKS =
DATE_CREATED = 30/06/84
DATE_RECEIVED = 24/09/84
W_NO = W839
WELL_NAME = Basker South-1
CONTRACTOR = SHELL AUSTRALIA E & P OIL AND GAS
CLIENT_OP_CO = SHELL AUSTRALIA E & P OIL AND GAS

PE902511

This is an enclosure indicator page.
The enclosure PE902511 is enclosed within the container PE902510 at this location in this document.

The enclosure PE902511 has the following characteristics:

ITEM_BARCODE = PE902511
CONTAINER_BARCODE = PE902510
NAME = Well Summary Sheet
BASIN = GIPPSLAND
PERMIT = VIC/P19
TYPE = WELL
SUBTYPE = MONTAGE
DESCRIPTION = Well Summary Sheet
REMARKS = has a seismic section, straigraphic column, a hrzn cntr map amd a written summary.
DATE_CREATED = 30/09/84
DATE_RECEIVED = 24/09/84
W_NO = W839
WELL_NAME = Basker South-1
CONTRACTOR = SHELL AUSTRALIA E & P OIL AND GAS
CLIENT_OP_CO = SHELL AUSTRALIA E & P OIL AND GAS

(Inserted by DNRE - Vic Govt Mines Dept)

PE601244

This is an enclosure indicator page.
The enclosure PE601244 is enclosed within the container PE902510 at this location in this document.

The enclosure PE601244 has the following characteristics:

ITEM_BARCODE = PE601244
CONTAINER_BARCODE = PE902510
NAME = Composite Well Log
BASIN = GIPPSLAND
PERMIT = VIC/P19
TYPE = WELL
SUBTYPE = COMPOSITE_LOG
DESCRIPTION = Composite Well Log (enclosure from WCR) for Basker South-1
REMARKS =
DATE_CREATED = 31/05/84
DATE_RECEIVED = 24/09/84
W_NO = W839
WELL_NAME = Basker South-1
CONTRACTOR = SHELL DEVELOPMENT AUSTRALIA PTY LTD
CLIENT_OP_CO = SHELL AUSTRALIA E & P OIL AND GAS

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PE902512

This is an enclosure indicator page.
The enclosure PE902512 is enclosed within the container PE902510 at this location in this document.

The enclosure PE902512 has the following characteristics:

ITEM_BARCODE = PE902512
CONTAINER_BARCODE = PE902510
NAME = Synthetic Seismgogram and Seismic Well Tie
BASIN = GIPPSLAND
PERMIT = VIC/P19
TYPE = WELL
SUBTYPE = SYNTH_SEISMOGRAM
DESCRIPTION = Synthetic Seismogram and Seismic Well Tie (enclosure from WCR) for Basker South-1
REMARKS =
DATE_CREATED = 28/02/84
DATE_RECEIVED = 24/09/84
W_NO = W839
WELL_NAME = Basker South-1
CONTRACTOR = SHELL AUSTRALIA E & P OIL AND GAS
CLIENT_OP_CO = SHELL AUSTRALIA E & P OIL AND GAS

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PE601245

This is an enclosure indicator page.
The enclosure PE601245 is enclosed within the container PE902510 at this location in this document.

The enclosure PE601245 has the following characteristics:

ITEM_BARCODE =	PE601245
CONTAINER_BARCODE =	PE902510
NAME =	Well Correlation
BASIN =	GIPPSLAND
PERMIT =	VIC/P19
TYPE =	WELL
SUBTYPE =	WELL_CORRELATION
DESCRIPTION =	Well Correlation (enclosure from WCR) for Basker South-1
REMARKS =	
DATE_CREATED =	30/09/84
DATE_RECEIVED =	24/09/84
W_NO =	W839
WELL_NAME =	Basker South-1
CONTRACTOR =	SHELL AUSTRALIA E & P OIL AND GAS
CLIENT_OP_CO =	SHELL AUSTRALIA E & P OIL AND GAS

(Inserted by DNRE - Vic Govt Mines Dept)