W817

PHILLIPS
PETROLEUM
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PHILLIPS AUSTRALIAN OIL COMPANY

PERTH, WESTERN AUSTRALIA

OIL and GAS DIVISION

WELL COMPLETION REPORT

ATHENE NO. 1

PERMIT VIC/P18

VICTORIA

W817

15 NOV 1983

by

PHILLIPS AUSTRALIAN OIL COMPANY
Perth, Australia
November, 1983

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SUMMARY

Drilling

The Athene No. 1 well was drilled with the semi-submersible drilling unit, Diamond M "Epoch" in a water depth of 264 metres (867 feet). The well was drilled to a total depth of 3385 metres (11,105 feet); plugged and abandoned in 45 days (excluding strike).

The Diamond M "Epoch" arrived on location at 0200 hours on May 20, 1983. The anchors were run and the well was spudded at 1430 hours on May 22nd. A 36 inch hole was drilled to 334 metres (1,095 feet). The 30 inch conductor was run and cemented with the casing shoe at 330 metres (1,081 feet). The 26 inch hole was spudded and drilled to 543 metres (1,780 feet). The 20 inch conductor with the 16-3/4 inch wellhead was run and cemented with the casing shoe at 530 metres (1,739 feet).

The 16-3/4 inch blowout preventer stack was run with the 18-5/8 inch riser. The blow-out preventor was latched up to the well head and successfully tested to Phillips Australian Oil Company's specifications. A 14-3/4 inch bottom hole assembly was made up and run in the hole. The 14-3/4 inch bit was used to push aside 3 leaves of a 5 inch drill pipe centralizer that were left in the hole after becoming separated from the cement stinger equipment while cementing the 20 inch conductor. After drilling to 532 metres (1,745 feet) the AWU members on the rig voted to go on strike. The bit was pulled into the 20 inch casing shoe and the drill pipe was hung off in the wellhead. At 1730 hours on May 26, 1983, drilling operations were suspended and remained suspended for 14 days while the AWU members were on strike.

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*All depths quoted are below rotary kelly bushing which was 23 metres (75 feet) above mean sea level.

On June 11, 1983 the strike was terminated and the workers returned to the rig. The BOP's were tested and a 17-1/2 inch bottom hole assembly was run in the hole. A 17-1/2 inch hole was drilled to 547 metres (1,795 feet). The bit was pulled back into the 20 inch casing shoe and a formation leak off test was performed. The test indicated that formation leak-off occurred at an equivalent mud weight of 10.9 ppg. The 17-1/2 inch hole was drilled to 1209 metres (3,967 feet). Electric logs were run. The 13-3/8 inch casing was run and cemented with the casing shoe at 1193 metres (3,914 feet).

The BOP stack was pulled to replace a leaking ball joint on the lower marine riser package. The ball joint was replaced and the BOP's were stump tested. The upper Hydril tested okay. The lower Hydril would not test. Since there was no replacement Hydril packing element on board the rig to repair the Hydril, the BOP's were re-run back to the wellhead to avoid delay. (Safety standards dictate that only one Hydril is required to drill a well). After the BOP's were relatched to the wellhead, the test plug was run in the hole. While running in the hole the test plug hung up in the lower marine riser package. The first indications were that the plug was hanging up in the lower Hydril. The lower marine riser package was pulled and the lower Hydril was repaired. The package was re-run to the BOP package. The test plug was run in the hole and it continued to hang up in the lower marine riser package. The lower marine riser package was pulled again. The problem was found to be in the ball joint that had just been replaced. The ball joint was changed out again and the lower riser package was re-run and latched to the BOP package. The BOP's were successfully tested to PAOC's specifications.

The 12-1/4 inch bottom hole assembly was made up and run in the hole. The float shoe, cement, float collar and 5 metres (16 feet) of new hole were drilled to 1214 metres (3,983 feet). The bit was pulled back into the 13-3/8 inch casing shoe and a formation leak off test was performed. The test indicated that formation leak off occurred at an equivalent mud weight of 14.5 ppg. A 12-1/4 inch hole was drilled on to 1490 metres (4,888 feet) with a conventional bottom hole assembly. At this point, a turbo drilling bottom hole assembly was run in the hole and drilled to 2257 metres (7,405 feet), thus eliminating the drillcollar failures experienced in the Hermes No. 1 well while drilling the same section of the Gippsland limestone. A conventional 12-1/4 inch bottom hole assembly was run back in the hole and drilled on to 2760 metres (9,054 feet.) Electric logs were run and selective side wall cores were taken. Next, the 9-5/8 inch casing was run and cemented with the casing shoe at 2750 metres (9,024 ft.).

The BOP's were tested to PAOC's specifications. The 8-1/2 inch bottom hole assembly was made up and run in the hole. An 8-1/2 inch hole was drilled to 2762 metres (9,062 ft.). The bit was pulled back into the 9-5/8 inch casing shoe and a formation leak off test was performed. There was no leak off. The test indicated that the formation can withstand an equivalent mud weight of 14.5 ppg. An 8-1/2 inch hole was drilled on to 3385 metres (11,105 feet) (total depth) which occurred on July 7, 1983. Electric logs were run, selective side wall cores were taken and a velocity survey was run. Preparations were made to plug the well.

An EZSV squeeze packer was set at 2720 metres (8,925 feet). Drill pipe with a stinger was run in the hole and stung into the packer. Twenty four barrels of class "G" neat cement mixed at 15.8 ppg were squeezed below the packer. Ten barrels of cement were then placed on top of the packer. The plug was successfully tested to 1000 psi for 15 minutes. The 9-5/8 inch casing was cut at 361 metres (1,185 feet) and retrieved. Open end drill pipe was run in the hole to set the surface cement plug. The surface plug, 168 sacks Class "G" cement mixed at 15.8 ppg, was placed from 412 metres to 317 metres (1,040-1,353 feet).

The BOP stack and riser were pulled and recovered. An explosive charge was run in the hole and detonated at 291 metres (954 feet). The 16-3/4 inch wellhead with a 20 inch casing stub, 13-3/8 inch casing and 30 inch casing with the permanent guide base were recovered. After several attempts, the floating guide base was recovered using the four tensioner air hoists and a set of slings attached to drill pipe.

The anchors were partially pulled and the AWU workers voted to go out on strike. The main anchors were re-run and the rig was secured. Operations were suspended starting at 0700 hours 15th July, 1983.

Operations remained suspended for 50 days until 1600 hours 2nd September, 1983. The rig workers returned to work and the anchors were pulled. The Diamond M 'Epoch" departed the Athene No. 1 location at 2400 hours 4th September, 1983.

Geological

INTERPRETATIVE

Athene No. 1 was the fourth exploration well drilled in Permit Vic/P18. The well was located 3.3 kilometres to the northeast of Selene No. 1 and 9.4 kilometres to the southwest of Hapuku No. 1. The well was positioned to evaluate the hydrocarbon potential of Top Latrobe and intra-Latrobe objectives. Closure was mapped at the Top Latrobe Group, Top Cretaceous and Within Cretaceous horizons. Intra-Cretaceous stratigraphic pinchout of sands was also anticipated.

Sediments penetrated by Athene No. 1 range from Recent to Late Cretaceous (Campanian) in age. Cuttings samples were not caught prior to drilling out of the 20-inch casing shoe at 543 metres. From 543 metres to 2264.5 metres interbedded calcarenite, marl, siltstone and claystone of the Middle-to-Late Miocene Gippsland Limestone were penetrated. The Gippsland Limestone rests conformably on the Early-to-Middle Miocene claystone and siltstone of the Lakes Entrance Formation.

A major unconformity of some twelve million years duration separates Early Miocene sediments from Early Oligocene sediments, within the Lakes Entrance Formation at 2713 metres. The Early Oligocene Lakes Entrance Formation is composed of siltstone, claystone and sandstone and conformably overlies similar lithologies of the Late Eocene Colquhoun Formation at 2755 metres. Lithologically, this 5-metre interval is differentiated from the Lakes Entrance Formation by an increase in sand and glauconite content. At 2760 metres a three- million year hiatus separates the Colquhoun Formation from the Middle Eocene glauconitic siltstone, claystone and sandstone of the Gurnard Formation. The Gurnard Formation is in turn separated by a five-to-ten million year hiatus from the underlying sandstone, minor siltstone and claystone sequence of the Early Eocene Flounder Formation at 2784 metres. The Flounder, Gurnard and Colquhoun Formations are collectively known as the "condensed sequence" and were deposited in an estuarine environment.

At 2860 metres the Flounder Formation unconformably overlies the Maastrichtian aged Latrobe Coarse Clastics. Paleocene-age sediments were not penetrated in Athene No. 1. The Latrobe Coarse Clastics extend from 2860 metres to 3220.5 metres. Very fine-to-very coarse grained sandstones with minor siltstone, silty sandstone and claystone, deposited in a near shore/shallow marine environment, were penetrated from 2860 metres to 3138 metres. Medium-to-very coarse grained sands characterize the beach barrier environment between 3138 metres and 3220.5 metres.

A Maastrichtian-aged back barrier-lagoonal environment between 3220.5 metres and 3298 metres is comprised of tidal-inlet channel and flood-tidal delta sediments. Sandstone with minor dolomitic sandstone, siltstone and silty sandstone characterizes the tidal-inlet channel between 3220.5 metres and 3272.5 metres. The underlying flood-tidal delta between 3272.5 metres and 3298 metres is dominantly composed of medium-to-very coarse grained sandstone.

Interbedded claystone and medium-to-coarse grained sandstone with minor coal and siltstone constitute the Campanian section between 3298 metres and total depth. The well reached total depth within this back barrier/coal swamp-marsh environment at 3384.6 metres.

No significant hydrocarbon shows occurred in Athene No. 1. Fluorescence and cut were recorded in three sidewall cores from within the condensed sequence of the Colquhoun, Gurnard and Flounder Formations. All three shows occur within very fine-to-fine grained glauconitic sandstones that exhibit poor visual porosity. White-to-golden yellow cut and faint white residual cut were observed in the dolomitized sandstone within the interval 3285 metres to 3298.5 metres. These very poor shows are interpreted as being due to residual hydrocarbons.

Post-drilling analysis reveals a disparity between the seismically-predicted formation tops and the actual tops. Post-Campanian structural downwarping contemporaneous with deposition resulted in significantly thicker sections of Maastrichtian and Eocene sediments than were expected. Because of the greater-than-predicted throw on the southwest-bounding fault and the resultant miscorrelation of intra-Latrobe reflectors across the fault, the well failed to penetrate the Cretaceous braided stream sand objective which had been identified in the Selene No. 1 well.

Good quality source rocks lying within the peak oil generation window were not penetrated in Athene No. 1. Vitrinite reflectance data indicate an early stage thermal maturity for Late Cretaceous sediments penetrated at total depth. Ample reservoirs are provided by the near shore/shallow marine and beach barrier sands of the Maastrichtian Latrobe Coarse Clastics section.

The absence of a substantial hydrocarbon accumulation at Athene No. 1 is attributed to the absence of structural closure at the top of the Latrobe Coarse Clastics, the lack of adequate sealing units within the Latrobe Coarse Clastics and the leanness and relative immaturity of the source rocks.

INTRODUCTION

Athene No. 1 was the fourth well to be drilled in offshore Exploration Permit Vic/P18 in the Bass Strait off the southeastern coast of Victoria, Australia. This permit is held by a group consisting of Phillips Australian Oil Company (Operator), Mount Isa Mines Limited, and Lend Lease Petroleum Limited.

Athene No. 1 was located at Latitude 38 degrees 35 minutes 52.145 seconds south and Longitude 148 degrees 27 minutes 20.164 seconds east (Figure 1). Drilling was performed from the semi-submersible drilling unit Diamond M "Epoch" in 264 metres (867 feet) of water.

FIGURE 1 to follow

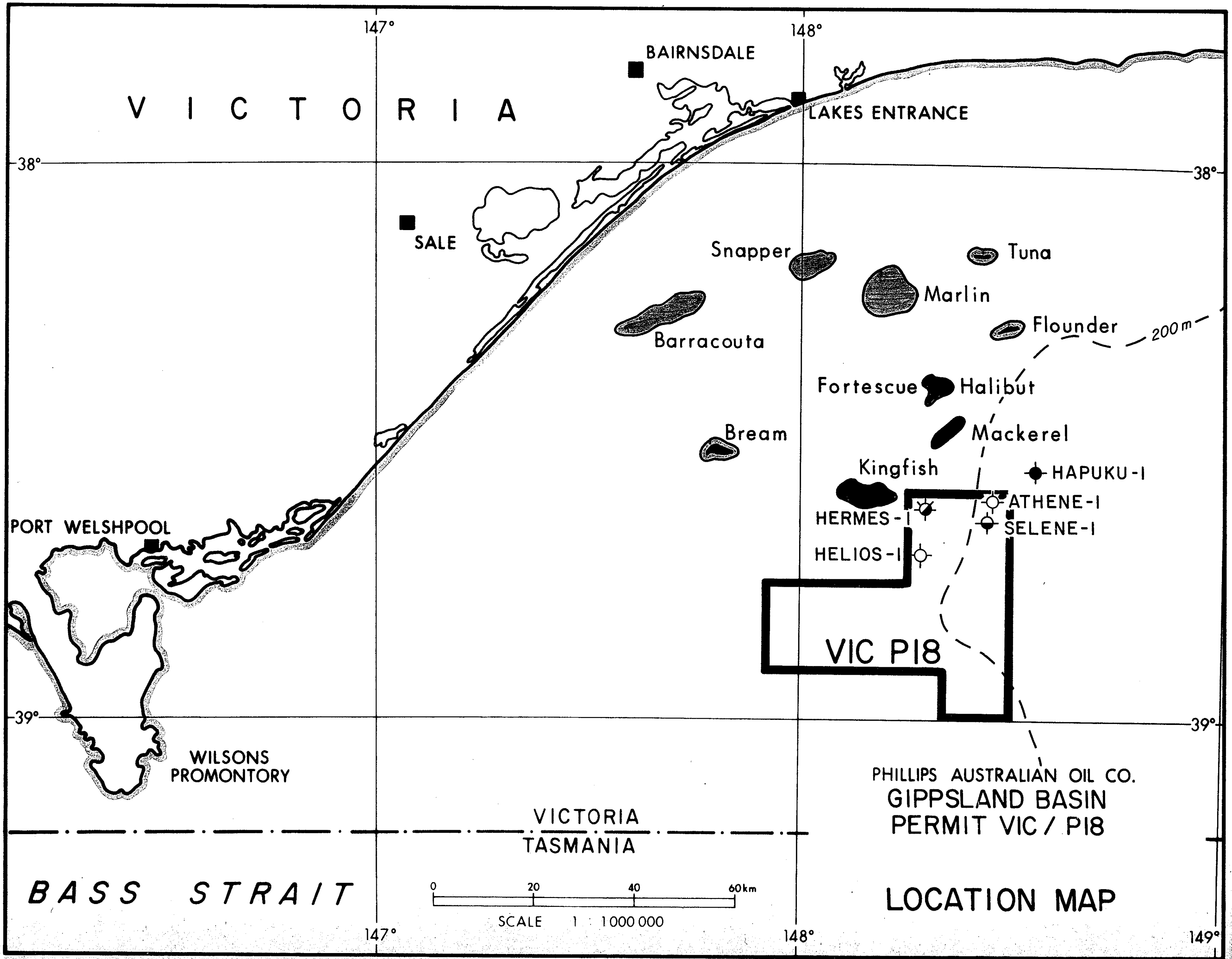
PE905121

This is an enclosure indicator page.
The enclosure PE905121 is enclosed within the container PE902547 at this location in this document.

The enclosure PE905121 has the following characteristics:

ITEM_BARCODE = PE905121
CONTAINER_BARCODE = PE902547
NAME = Permit Vic/P18 Location Map
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = GENERAL
SUBTYPE = PROSPECT_MAP
DESCRIPTION = Athene-1 Gippsland Basin Permit Vic/P18 Location Map. Figure 1 of WCR.
REMARKS =
DATE_CREATED = 15/11/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)



PHILLIPS AUSTRALIAN OIL CO.
GIPPSLAND BASIN
PERMIT VIC / P18

LOCATION MAP

FIGURE 1

A-5405-10

WELL HISTORY

The following provides details on the operational parameters of Athene No. 1.

General Data

Well Name : Athene No. 1

Name and Address of Operator : Phillips Australian Oil Company
23rd floor, City Centre Tower
44 St. George's Terrace
PERTH. W.A. 6000.
(G.P.O. Box 2066W
PERTH. W.A. 6001.)

Co-venturer Parties' Names and Addresses : Lend Lease Petroleum Limited
Australia Square Tower,
Level 38,
SYDNEY, N.S.W. 2000

Mount Isa Mines Limited
15th floor, 160 Ann Street
BRISBANE, QLD. 4000.

Exploration Permit : VIC/P18

District : Gippsland Basin, Victoria

Location : Lat. 38 degrees 35 min 52.145 sec South
Long. 148 degrees 27 min 20.164 sec East

Elevations : Water depth 264 metres (867 feet)
R/T to seabed 287 metres (942 feet)

Total Depth : 3384.6 metres (11,105 feet) RKB

Status : Plugged and Abandoned

DRILLING DATA

Name and Address of Drilling Contractor	:	Diamond "M" Marine Company 2121 Sage Road, Suite 200 P.O. Box 22738 Houston, Texas 770727 U.S.A.
Drilling Vessel	:	Diamond M "Epoch" Semi-Submersible Drilling Unit Length : 88.4m (290 feet) Beam : 61.0m (200 feet) Lower Hull Beam : 10.7m (35 feet) Lower Hull Depth : 7.6m (25 feet) Lightship Displacement : 7754 long tons
Operating Depth	:	9,144 metres in 366 metres of water (30,000 feet in 1,200 feet of water)
Position System	:	Honeywell RS-505 acoustic position and riser angle indicator
Heave Compensator	:	Vetco 400-20D with 400,000 lbs capacity - 6.1m (20') stroke
Riser Tensioning	:	6ea - Western Gear 80,000 lbs - 15.2m (50') stroke.
Guide Line Tensioning	:	4 ea - Western Gear 16,000 lbs - 12.2m (40') stroke
Slip Joint	:	Vetco X-52 with MR-4B connectors - 12.2m (40') stroke
Riser	:	Vetco X-52 18-5/8" x 5/8" wall MR-4B connectors
Diverter	:	Regan Model KFDH-3
B.O.P.	:	16-3/4" - 10,000 lbs working pressure - H2S trimmed/Vetco ball joint with MR-4B connector/C.I.W. riser connector/Two Hydril annular preventers/Two-double "U" Cameron ram preventors

B.O.P. Control System : Koomey with acoustic back-up

Choke Manifold : 10,000 lbs working pressure - H2S trimmed with Cameron type F gate valves/Two adjustable chokes and one remote operated Swaco Super Choke.

Pumps : Two Oilwell 1700 PT triplex pumps with pulsation dampeners. Each driven by two GE-752 DC motors. Mud Pumps to be charged by two 6 x 8 centrifugal pumps.

Drawworks : Oilwell E-3000 driven by two GE 752 DC motors, with Baylor 7838 electric brake and Crown-O-Matic.

Power : Two EMD 16E-9 diesel engines, 3070 Hp. Each driving EMD 2000 KW AC generators. One EMD 16E-8 diesel engine, 2200 Hp, driving EMD 1500 KW AC generator.

Storage :

Sack storage		3,500	sacks
Bulk tanks		10,000	cu. ft.
Mud tanks		1,594	BBLS
Fuel		6,400	BBLS
Drillwater		15,842	BBLS
Potable water		755	BBLS
Mud volume active		660	BBLS
Mud volume reserve		681	BBLS
Helifuel	3 ea	5,000	litres

TIME ANALYSIS

Significant Times and Dates

	Hours	Date
Departed Hermes No. 1 location	1930	19th May, 1983
Arrived at Athene No. 1 Location	0200	20th May, 1983
Spud	1430	22nd May, 1983
Strike No. 1 started	1630	26th May, 1983
Strike No. 1 ended	1430	10th June, 1983
TD	0130	7th July, 1983
Strike No. 2 started	0700	15th July, 1983
Strike No. 2 ended	1600	2nd September, 1983
Depart Location	2400	4th September, 1983

Time Breakdown from transfer from Hermes No. 1, till departure from location

	Hours	%
Drilling	278.0	10.7
Reaming/Hole Opening	8.5	0.3
Cond. mud and circ.	43.0	1.7
Trips and making up BHA	194.5	7.5
Dev Survey	2.0	0.1
BOP Preparation	35.5	1.4
BOP Run/Retrieve	68.5	2.6
BOP Testing	28.5	1.1
Surface Equip. Test	5.0	0.2
Logging	31.0	1.2
Cementing	15.0	0.6
DST/Leak off test	3.0	0.1
Repairs mechanical	20.0	0.8
Delays/strike	1557.0	60.0
Weather delays	97.0	3.7
Move and positioning	7.0	0.3
Casing	36.5	1.4
Velocity survey	14.5	0.6
Anchoring	128.0	4.8
Other	24.0	0.9
	2596.5	100.00

WELL COMPLETION RECORDS

Included as Tables 1-5 are details concerning the drilling of Athene No. 1. Enclosure No. 1 is the Operational Summary for Athene No. 1. A summary of daily operations is given in Appendix No. 2.

DRILLING FLUIDS

The hole was spudded using sea water, periodically flushing with high viscosity pills. A sea water/gel/polymer mud was used from 543 metres (1,780 feet) to T.D. Dextrid, Drispac and Drispac Superlow were added to maintain the programmed API water loss. Mud properties, materials and cost are given in Tables 6-8

ABANDONMENT STATUS

Figure 2 shows the abandonment status for the Athene No. 1 well.

ATHENE No 1 - ABANDONMENT STATUS

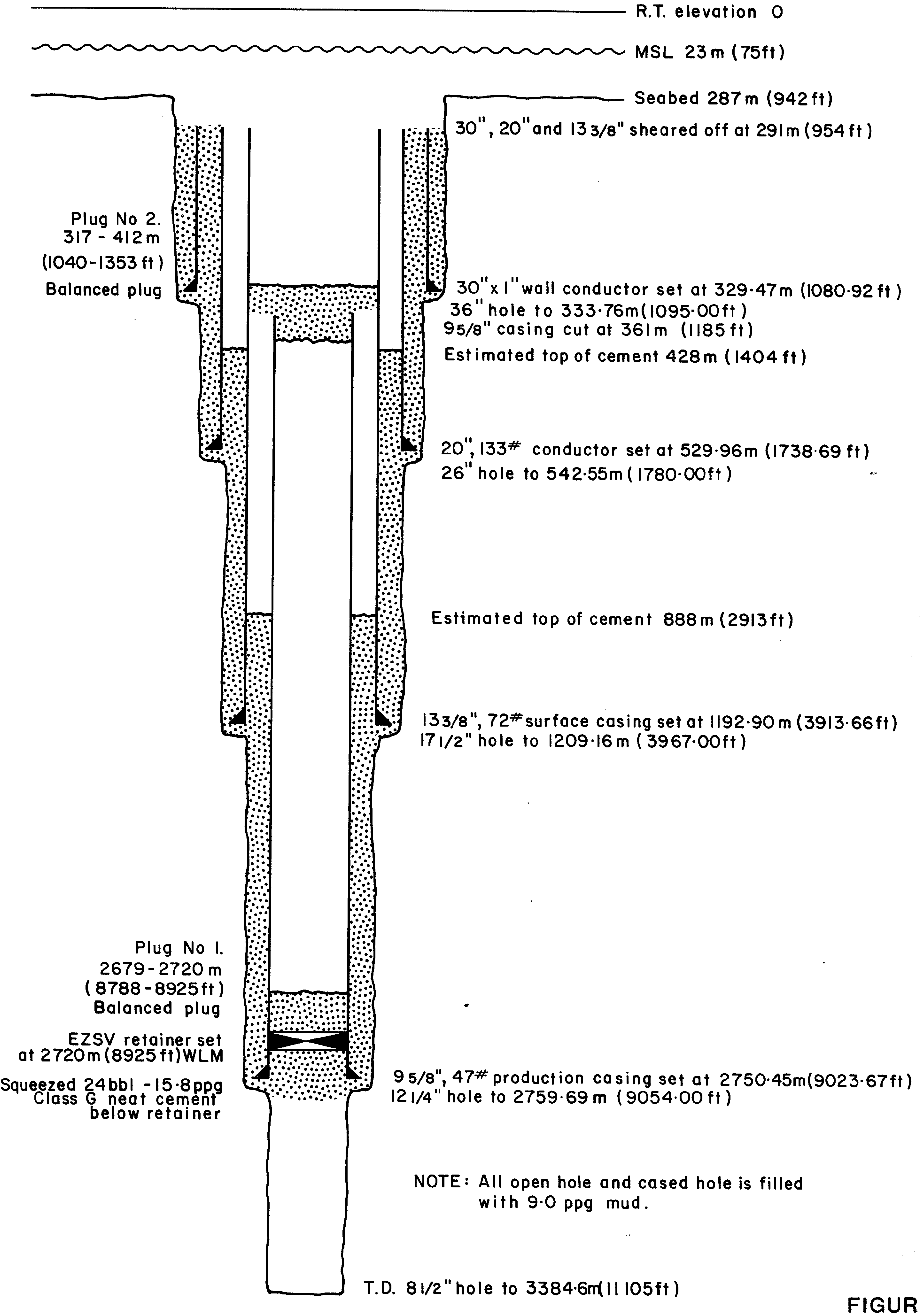


FIGURE 2

A-5968

TABLE 1

ATHENE NO. 1

TOTCO SURVEY SUMMARY

Depth m (ft) RKB	Vertical Deviation - Degrees
316 (1,037)	1.0
334 (1,095)	0.75
427 (1,401)	0.00
543 (1,780)	0.75
964 (3,162)	0.50
1143 (3,750)	0.75
1209 (3,967)	0.75
1476 (4,842)	1.00
1841 (6,039)	0.75
2210 (7,249)	0.75
2257 (7,406)	0.50
2544 (8,345)	0.50
2760 (9,054)	0.50
3385 (11,105)	4.00

TABLE 2
ATHENE NO. 1 CASING AND CEMENT

Permit VIC/P18

Elevations
RKB to MSL 23m (75 ft)
RKB to seabed 287m (942 ft)

Casing						Cement				
Date	Size	Weight	Grade & Coupling	Amount Run	Depth Set (RKB)	Cuft Slurry	Class/Type	Slurry Weight	TOC	Additives
23.5.83	30"	1" wall	Vetco Squnch	45.03m (148 ft)	329.47m (1081 ft)	1725	Class G/Neat mixed with seawater	15.8 PPG	seabed	1% CaCL
24.5.83	20"	133 lb/ft	X-56 Cameron JV Type LW	246.19m (808 ft)	529.96m (1739 ft)	Lead 2522	Class G/Neat mixed with drillwater	12.8 PPG	seabed	2.5% gel-water 0.5% CFR-2
						Tail 575	Class G/Neat mixed with seawater	15.8 PPG		
16.6.83	13-$\frac{3}{8}$"	72 lb/ft	N-80 Buttress	907.60m (2978 ft)	1192.90m (3914 ft)	Lead 2328	Class G/Neat mixed with drillwater	12.8 PPG	428.0m (1404 ft)	2.5% gel-water & 0.5% CFR-2
						Tail 575	Class G/Neat mixed with drillwater	15.8 PPG		0.1% HR-6L
2.7.83	9-5/8"	47 lb/ft	S-95/L-80 Buttress	2466.58m (8089 ft)	2750.45m (9024 ft)	Lead 1440	Class G/Neat mixed with drillwater	12.0 PPG	888.0m (2913 ft)	3.7% gel - water,0.5% CFR-2
						Tail 575	Class G/Neat mixed with drillwater	15.8 PPG		0.5% CFR-2 0.8% Halad 22A 0.1% HR-6L

TABLE 3

ATHENE NO. 1

Leak Off Test

	BBls Pumped	Leak off Pressure (PSI)	BBls Bled Back	Mud Wt (PPG)	EMW (PPG)
20" Shoe	10.00	200	1.00	8.7	10.9
13-3/8" Shoe	3.00	1100	1.00	9.2	14.5
9-5/8" Shoe	5.25	2600 (No leak-off)	5.25	9.0	14.5

COMPANY Phillips Australian Oil Company
CONTRACTOR D[redacted]nd [redacted]arin[redacted]omp[redacted]
COUNTY Offshore
STATE V[redacted]ria, Australia
[redacted]
LEASE Vic/P18
WELL NO. Athene No 1
SEC.
TOWNSHIP
RANGE
BLOCK
FIELD

TOOL PUSHER
DAY DRILLER
EVENING DRILLER
MORNING DRILLER

DRILL PIPE 5" Grade E & S
TOOL JOINT MAKE SIZE 4½ TYPE IF
DRILL COLLAR NO 20 O.D. 7-3/4 I D 2-13/16 LENGTH 30'
DRILL COLLAR NO 30 O.D 6½" I D 2-13/16 LENGTH 30'

DRAW WORKS
POWER Electric H P
PUMP NO. 1 MAKE Oilwell MODEL A1700 PT STROKE 12"
PUMP NO 2 MAKE Oilwell MODEL A1700 PT STROKE 12"

UNDER SURF
INT DATE 1430 hours 22 May, 1983
T.D. DATE 0130 hours 7 July, 1983

BIT NO.	BIT SIZE	BIT MFGR.	BIT TYPE	SERIAL NO. OF BIT	JET SIZE			DEPTH OUT	FTGE	HOURS RUN	ACC. HOURS	FT/HR	WEIGHT 1000 LBS.	ROTARY R.P.M	VERT. DEV.	PUMP PRESS	PUMPS			MUD		DULL CODE			REMARKS FORMATION, CIRC. FLUID, ETC.	DATE
					1	2	3										No.	Liner	SPM	Wt	Vis	T	B	G		
1	26"	HTC	OSC 3AJ	VJ878	22	22	22	942 1095	153	2.5	2.5	61.2	3/5	120	3/4	2500	½	6.5	240	8.6	200+	Mint			ok for re-run	23/5/83
1	36"	Servco	Hole Opener	-	22	22	22	1095	153	2.5	-	61.2	3/5	120	3/4	2500	½	6.5	240	8.6	200+				used on Hermes	23/5/83
1RR	26"	HTC	OSC 3AJ	VJ878	22	22	22	1780	635	9.5	12.0	66.8	10/15	120	3/4	2900	½	6.5	240	8.6	200+	Mint			ok for re-run	24/5/83
2	14 3/4"	Smith	SDT	SBF814	24	24	24	1795	15	0.5	12.5	30.0	5/10	75	—	900	½	6.5	292	8.6	42				used to drill shoe - push junk/broken teeth-locked cone	27/5/83
3	14 3/4"	Smith	SDT	SBF792	24	24	24	3162	1367	23.5	36.0	58.0	30/35	110	½	2400	½	6.5	200	9.5	35	2	2	I	U.R. 2-5 Tripped to changeUR	12/6/83
3RR	14 3/4"	Smith	SDT	SBF792	24	24	24	3749	587	20.5	56.5	28.6	30/35	110	3/4	2400	½	6.5	210	9.5	35/40	4	2	I	U.R. 1, 2 - Tripped to change bit	13/6/83
4	14 3/4"	Smith	SDT	SBF812	24	24	24	3967	218	8.0	64.5	27.3	30/35	110/120	-	2400	½	6.5	210	9.5	40	3	2	I	U.R. 2-4	15/6/83
5	12¼	Smith	SDT	XAG159	14	14	14	4889	922	23.5	88.0	39.2	40/45	120	1	2800	½	6.5	280	9.3	38	4	3	1/8	5 teeth missing	22/6/83
6	12¼	Diamax	ADS II	210-23	-	-	-	7406	2517	71.5	159.5	35.2	25/30	40/700	½	3550	½	6.0	185	9.2	44	40% used		I		26/6/83
7	12¼	Smith	SDS	CH4957	14	14	14	8345	939	28.5	188.0	33.0	45/50	100	½	3200	½	6.0	155	10.0	47	3	5	I		28/6/83
8	12¼	Smith	SDT	CN0229	15	15	15	9054	709	24.5	212.5	28.9	45/50	100	½	3250	½	6.0	160	10.0	47	2	2	I		30/6/83
8RR	12¼	Smith	SDT	CN0229	Op	e	n	9054	0	-	-	-	20/25	100	½	2200	½	6.0	161	11.0	49	2	2	I	Wiper trip	1/7/83
9	8½	Reed	H551	915752	10	10	10	9062	8	1.0	213.5	8.0	80	100	½	2600	½	6.0	104	9.0	40	1	1	I	Would not drill Drilled cemt.plugs	3/7/83
10	8½	Smith	F2	CC7530	11	11	11	11105	2043	51.5	265.5	39.7	30/40	60/50	4	2800	½	6.0	101	9.0	41	7	4	¼		7/7/83

Compliments of SMITH SMITH TOOL

SMITH REPRESENTATIVE ____________ PHONE ____________

P.O. BOX C19511 • IRVINE, CALIF. 92713-9511
DIVISION OF SMITH INTERNATIONAL, INC.

TABLE 5

ATHENE NO. 1

SQUEEZE RECORD

Date	Size of Casing	Retainer		Cement				
		Type	Set	Slurry Cu ft	Class/Type	Slurry Weight	Additives	Company
9.7.83	9-5/8", 47 lb, S-95/L-80 Buttress	EZ-SV	2720.4m (8925 ft)	187	Class G/Neat	15.8 PPG	0.1% HR-6L	Halliburton

TABLE 6

ATHENE NO. 1

MUD PROPERTIES

Depth		Hole Size	Temp	Weight	Chloride	Viscosity	Water Loss	PV	YP	PH
(ft.)	(m)	(inches)	(°C)	(ppg)	(PPM)	(sec)	(API)			
1,099	335	36	-	8.6	-	200+	-	-	-	-
1,765	538	26	-	8.6	-	200+	-	-	-	-
1,778	542	26	-	8.7	-	200+	-	-	-	-
2,310	704	17-1/2	-	9.2	12,500	33	-	6	4	10.0
3,225	983	17-1/2	29.0	9.5	12,000	35	20.0	7	6	10.0
3,750	1143	17-1/2	34.3	9.4+	14,500	39	12.8	8	14	10.0
3,966	1209	17-1/2	34.3	9.5	17,000	40	10.4	9	13	10.0
3,966	1209	17-1/2	34.0	9.5	17,000	39	10.6	9	11	9.5
4,229	1289	12-1/4	30.4	9.2	17,500	38	10.9	9	9	10.5
4,698	1432	12-1/4	30.2	9.3	18,000	38	10.8	8	9	10.0
5,167	1575	12-1/4	30.3	9.3+	18,000	38	9.2	10	9	9.5
6,109	1862	12-1/4	34.3	9.4	18,000	40	7.7	12	11	10.5
7,303	2226	12-1/4	32.0	9.3	17,000	42	6.0	18	10	10.5
7,447	2270	12-1/4	28.0	9.3	17,000	45	5.5	18	11	10.5
7,999	2438	12-1/4	31.0	10.0	16,000	51	5.2	17	24	10.5
8,340	2542	12-1/4	47.0	10.0	16,500	47	5.2	16	18	10.5
8,957	2730	12-1/4	42.0	10.0	16,500	47	5.1	16	18	10.0
9,052	2759	12-1/4	50.0	11.0	16,500	50	5.2	22	23	10.5
9,052	2759	12-1/4	45.0	11.0	16,500	49	5.0	22	22	10.5
9,052	2759	8-1/2	-	9.0	18,500	40	6.0	13	12	10.0
9,340	2847	8-1/2	24.0	9.0	20,000	40	4.8	12	9	10.0
10,466	3190	8-1/2	32.0	9.0	18,000	40	5.0	15	15	10.5
11,053	3396	8-1/2	32.0	9.0	17,500	41	5.8	12	13	10.5
11,105	3385	8-1/2	-	9.0	17,500	41	5.8	12	13	10.5
11,105	3385	8-1/2	-	9.0	20,000	40	5.8	12	12	10.5

TABLE 7

ATHENE NO. 1

MUD MATERIALS

Type	Unit	Quantity
Al. Stearate	25 kg	8
Aquagel (bulk)	100 lbs	1,632
Caustic Soda	70 kg	149
Dextrid	50 lbs	20
Desco	25 lbs	232
Drispac	50 lbs	186
Drispac Superlo	50 lbs	180
PAC-R	50 lbs	6
Soda Ash	40 kg	98
Sodium Bicarb.	40 lbs	6
Soltex	50 lbs	547
Baroid (bulk)	100 lbs	4,948
Mud chemicals	BBL	712
Fresh water	BBL	4,750
Sea water	BBL	10,890
Total mud made	BBL	16,352

TABLE 8

ATHENE NO. 1

MUD COST

Interval	Hole Size		Cost A$
Seabed to 334m (seabed to 1,095 ft.)	36"		4,269.10
334m to 543m (1,095 ft to 1,780 ft)	26"		4,005.33
543m to 1209m (1,780 ft to 3,967 ft.)	17-1/2"		21,532.78
1209m to 2760m (3,967 ft. to 9,054 ft.)	12-1/4"		116,501.70
2760m to 3385m (9,054 ft to 11,105 ft.)	8-1/2"		21,778.41
		TOTAL:	$168,087.32

Figure 3. to follow

PE905122

This is an enclosure indicator page.
The enclosure PE905122 is enclosed within the container PE902547 at this location in this document.

The enclosure PE905122 has the following characteristics:

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CONTAINER_BARCODE = PE902547
NAME = Stratigraphic Section Gippsland Basin
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = WELL
SUBTYPE = STRAT_COLUMN
DESCRIPTION = Athene-1 Stratigraphic Section Gippsland Basin with Seismic Mapping Horizons. Figure 3 of WCR.
REMARKS =
DATE_CREATED = 15/11/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

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STRATIGRAPHIC SECTION
GIPPSLAND BASIN

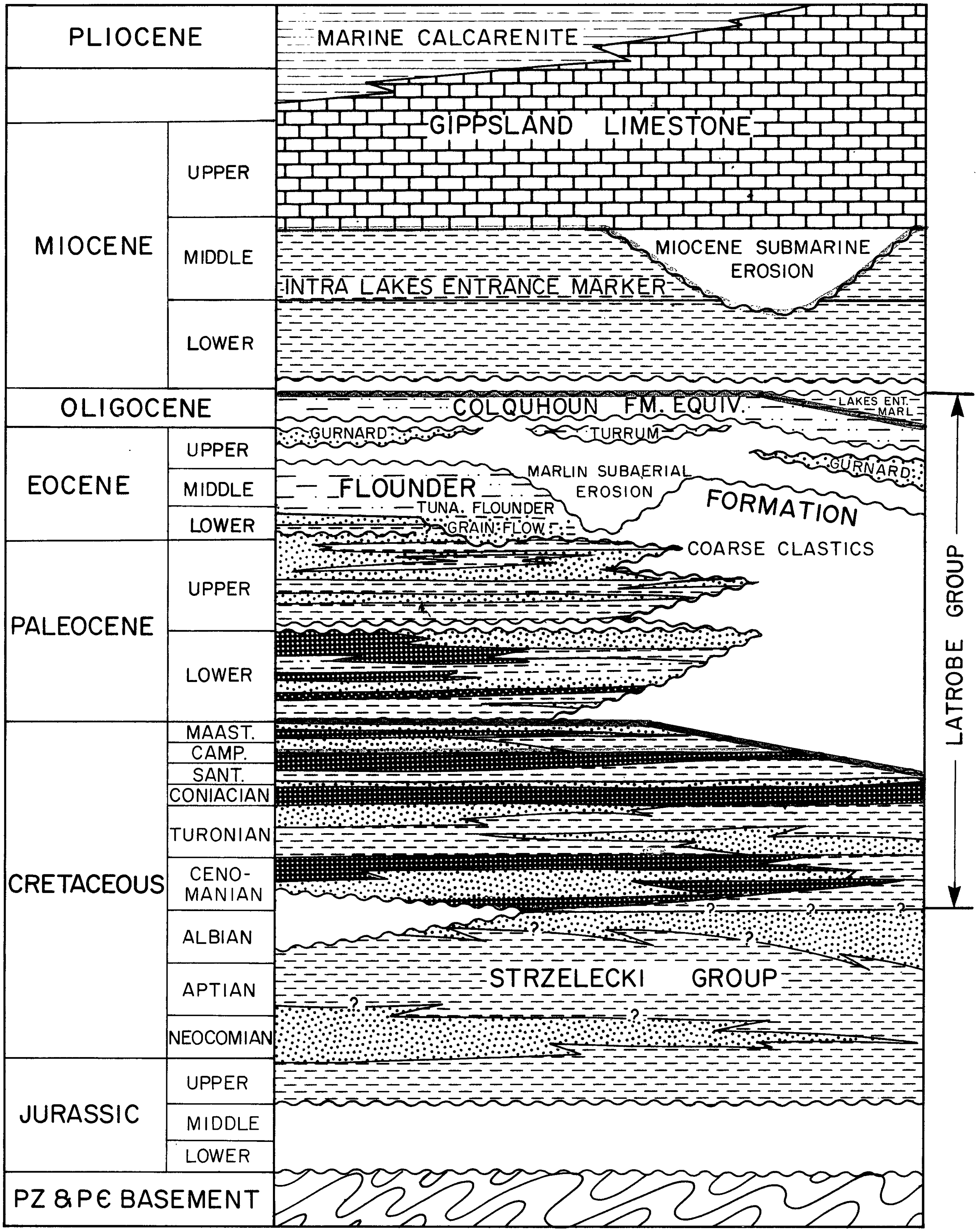

FIGURE 3

INTERPRETATIVE

GEOLOGY

SUMMARY OF PREVIOUS INVESTIGATIONS

Offshore exploration began in the 1950's when the Bureau of Mineral Resources conducted regional gravity and aeromagnetic surveys over limited onshore and offshore areas. The main exploration effort began in 1960 when Broken Hill Proprietary Limited (BHP) through its subsidiary, Hematite Petroleum Limited, applied for an exploration permit over the major portion of the offshore Gippsland Basin. This was Permit Vic/P1.

Results of regional aeromagnetic and reconnaissance seismic surveys were so encouraging that by May 1964 Esso Australia Limited and Hematite Petroleum Limited had concluded an agreement for the joint exploration of the offshore Gippsland Basin.

On June 5, 1965, Barracouta No. 1, the first offshore Gippsland Basin well was abandoned as a gas discovery. To date more than 100 exploration and step-out wells have been drilled in the offshore Gippsland Basin. Twelve oil and gas fields have been declared commercial by Esso-BHP since 1965 with recoverable reserves of approximately 3.6 billion barrels and 8 trillion cubic feet of gas.

Two wells were drilled by Esso/BHP during 1972/73 within the area now occupied by Permit Vic/P18. These were Pike No. 1 and Moray No. 1, which were both plugged and abandoned as dry holes. A number of seismic surveys were also conducted by Esso/BHP within the area, mainly over the period 1968 to 1974.

Following the second mandatory relinquishment of a portion of Permit Vic/P1, Phillips Australian Oil Company and co-venturers were granted Exploration Permit Vic/P18 on September 2, 1981. A 2,303 kilometre seismic survey was recorded in November/December, 1981 with processing completed by early April, 1982.

Drilling in Permit Vic/P18 commenced on October 28, 1982 with the spudding of Helios No. 1, drilled to a total depth of 3500 metres and plugged and abandoned as a dry hole on December 22, 1982. Helios No. 1 was a test of a Top Latrobe anomaly. The well encountered minor hydrocarbon shows at the top of the Latrobe Group in estuarine silts and silty sands of unusually thick Colquhoun/Flounder Formations.

Selene No. 1, the second well drilled in Permit Vic/P18, was spudded on December 27, 1982. Selene No. 1 was drilled to a total depth of 3539 metres and was plugged and abandoned as a dry hole with minor hydrocarbon shows on February 13, 1983. The primary objective in the well was an intra-Latrobe structural-stratigraphic anomaly which proved to be a thinly-interbedded sand/shale/siltstone interval.

February 14, 1983 was the spud date for Hermes No. 1, the third well drilled in Permit Vic/P18. Hermes No. 1 was drilled to a total depth of 4565 metres and was plugged and abandoned on May 16, 1983 with only minor hydrocarbon shows. The well was designed to test three intra-Latrobe target horizons. Small quantities of gas were recovered from two drillstem tests and gas and gas condensate were recovered from two wireline tests.

INTERPRETATIVE

REGIONAL GEOLOGY

The development of the Gippsland Basin can be attributed to two separate phases of continental rifting and separation, firstly, that of the Lord Howe Rise and New Zealand land mass from eastern Australia in Late Jurassic - Late Cretaceous time and secondly, that of Antarctica from southern Australia in Late Cretaceous - Early Eocene time. Both phases are part of the fragmentation of Eastern Gondwanaland.

The Gippsland Basin developed as a consequence of a divergent wrench shear associated with early rifting, as did the en-echelon Bass, Torquay and Otway Basins. These wrench shear zones developed in narrow linear rift basins linking the main extensional rift around the southern and eastern margins of the Australian continental plate. The first major unconformity in the Gippsland Basin occurs at the base Upper Jurassic and is related to the onset of rifting between southeastern Australia and the Lord Howe Rise microcontinent. The Tasman Sea breakup unconformity is the second major unconformity in the Gippsland Basin and can be correlated with the top of the Strzelecki Group sediments (Figure 3).

With continued divergent wrench motion between southeastern Australia and Tasmania during Late Cretaceous to Eocene time, second-order left-lateral wrench motion along northwest-southeast trending extensional faults or tension gashes became the loci for wrench-induced anticlines. With continued opening of the Tasman Sea most of the extensional faults were downthrown to the northeast (Figure 4).

Figure 4. to follow

PE905123

This is an enclosure indicator page.
The enclosure PE905123 is enclosed within the container PE902547 at this location in this document.

The enclosure PE905123 has the following characteristics:

ITEM_BARCODE = PE905123
CONTAINER_BARCODE = PE902547
NAME = Structural Trends and Location Map
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = GENERAL
SUBTYPE = GEOL_MAP
DESCRIPTION = Athene-1 Structural Trends and Location Map. Figure 4 of WCR.
REMARKS =
DATE_CREATED = 15/11/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

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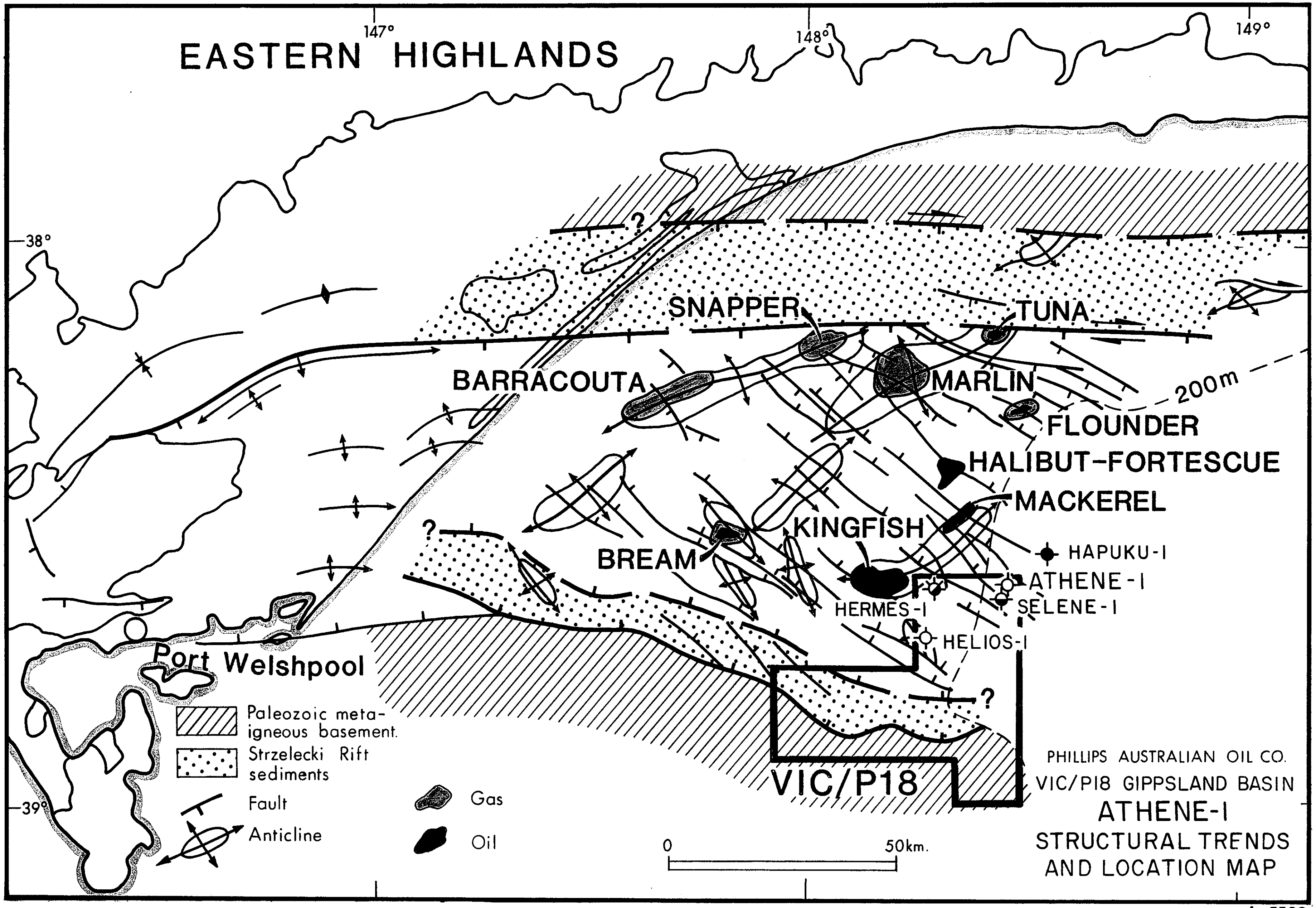
FIGURE 4



PHILLIPS AUSTRALIAN OIL CO.
VIC/P18 GIPPSLAND BASIN
ATHENE-1
STRUCTURAL TRENDS
AND LOCATION MAP

A-5588

INTERPRETATIVE

During this period, fluvio-paralic clastics and coals of the Latrobe Group were deposited in the Gippsland Basin. An unconformity at the top of the Late Cretaceous may be related to the onset of rifting in the Southern Ocean. An unconformity at the top of the Latrobe Coarse Clastic sequence is related to the breakup of Antarctica from Australia in latest Early Eocene time.

During Mid-Eocene time there was a change from divergent to convergent wrench motion along the Gippsland-Otway trend. The mechanisms of this change are not fully understood since the relative over-riding motion between Australia and Antarctica appears to be extensional. Divergent wrench motion between Tasmania and Australia at this time may, however, have been related to incipient movement along fracture zones in the Tasman Sea.

The consequences of the change from divergent to convergent wrench motion were expressed along the northern rift shoulder of the basin. A series of compressional wrench-induced anticlines developed on the northern rift shoulder at a new orientation to the pre-existing wrench anticlinal fabric. This new system developed in an east-northeast-west-southwest direction and largely grew where listric basin-bounding faults in the northern rift shoulder were able to move in a horizontal fashion. That is, they were reactivated to become wrench faults. Convergent wrenching has continued right up to the present day.

INTERPRETATIVE

STRATIGRAPHY

The stratigraphic section penetrated in Athene No. 1 extends from Recent to Late Cretaceous (Campanian) in age. Anticipated-versus-actual stratigraphic sections are shown in Figure 5. Formation names, lithology and ages are shown in Figure 6.

Formation tops and ages are based upon lithological, micropaleontological and palynological studies of sidewall cores and drill cuttings, in conjunction with wireline log characteristics and correlation with the nearby Selene No. 1 and Hapuku No. 1 wells (Figures 7 and 8). Sampling commenced at 543 metres. All depths were recorded from the Rotary Kelly Bushing 23 metres above mean sea level. Ages from Mid-to-Late Tertiary are based on micropaleontological data (Appendix 5), whereas those for the Early Tertiary and Late Cretaceous are based on palynological (spore-pollen and dinoflagellate) data (Appendix 6).

The stratigraphy of Athene No. 1 generally reflects an overall transgression interrupted by episodic regressive pulses. The lowermost sandstone/claystone/siltstone/minor coal interval in Athene No. 1 represents back barrier/coal swamp-marsh environments. These intra-Latrobe sediments are overlain by an 82.5-metre thick sequence of stacked beach barrier sandstone deposits of the basal Latrobe Coarse Clastics. The beach barrier deposits are in turn overlain by sandstone with minor claystone and siltstone of the nearshore/shallow marine environment. Estuarine sandstone, siltstone and claystone of the Colquhoun, Gurnard and Flounder Formations comprise the sedimentary section between the Top Latrobe Group at 2755 metres and the Top Latrobe Coarse Clastics at 2860 metres. The transgressive theme continued with the deposition of marine claystone, siltstone and basal sandstone of the Lakes Entrance Formation. The marine calcarenite, marl, siltstone and claystone of the Gippsland Limestone Formation overlies the Lakes Entrance Formation.

Figures 5, 6, 7 & 8 to follow

PE905124

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The enclosure PE905124 has the following characteristics:

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CONTAINER_BARCODE = PE902547
NAME = Anticipated vs Actual Stratigraphy
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = WELL
SUBTYPE = STRAT_COLUMN
DESCRIPTION = Athene-1 Anticipated Stratigraphy verses Actual Stratigraphy. Figure 5 of WCR.
REMARKS =
DATE_CREATED = 15/11/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

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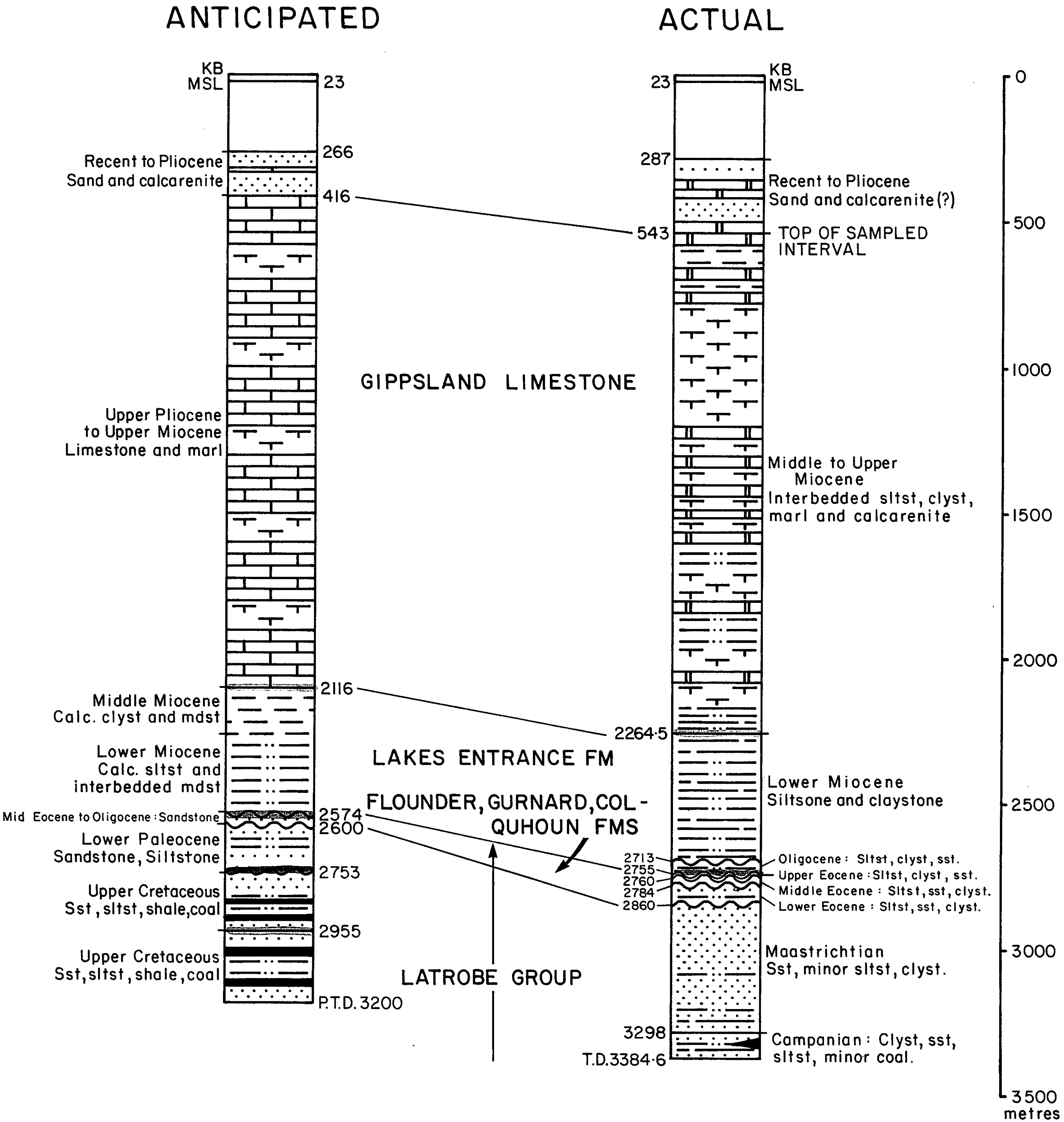
INTERPRETATIVE

ATHENE - I STRATIGRAPHY



ALL DEPTHS ARE IN METRES BELOW K.B.

A-6025

FIGURE 5

27

PE905125

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The enclosure PE905125 is enclosed within the container PE902547 at this location in this document.

The enclosure PE905125 has the following characteristics:

ITEM_BARCODE = PE905125
CONTAINER_BARCODE = PE902547
NAME = Athene-1 Stratigraphic Table
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = WELL
SUBTYPE = STRAT_COLUMN
DESCRIPTION = Athene-1 Stratigraphic Table. Figure 6 of WCR.
REMARKS =
DATE_CREATED = 15/11/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

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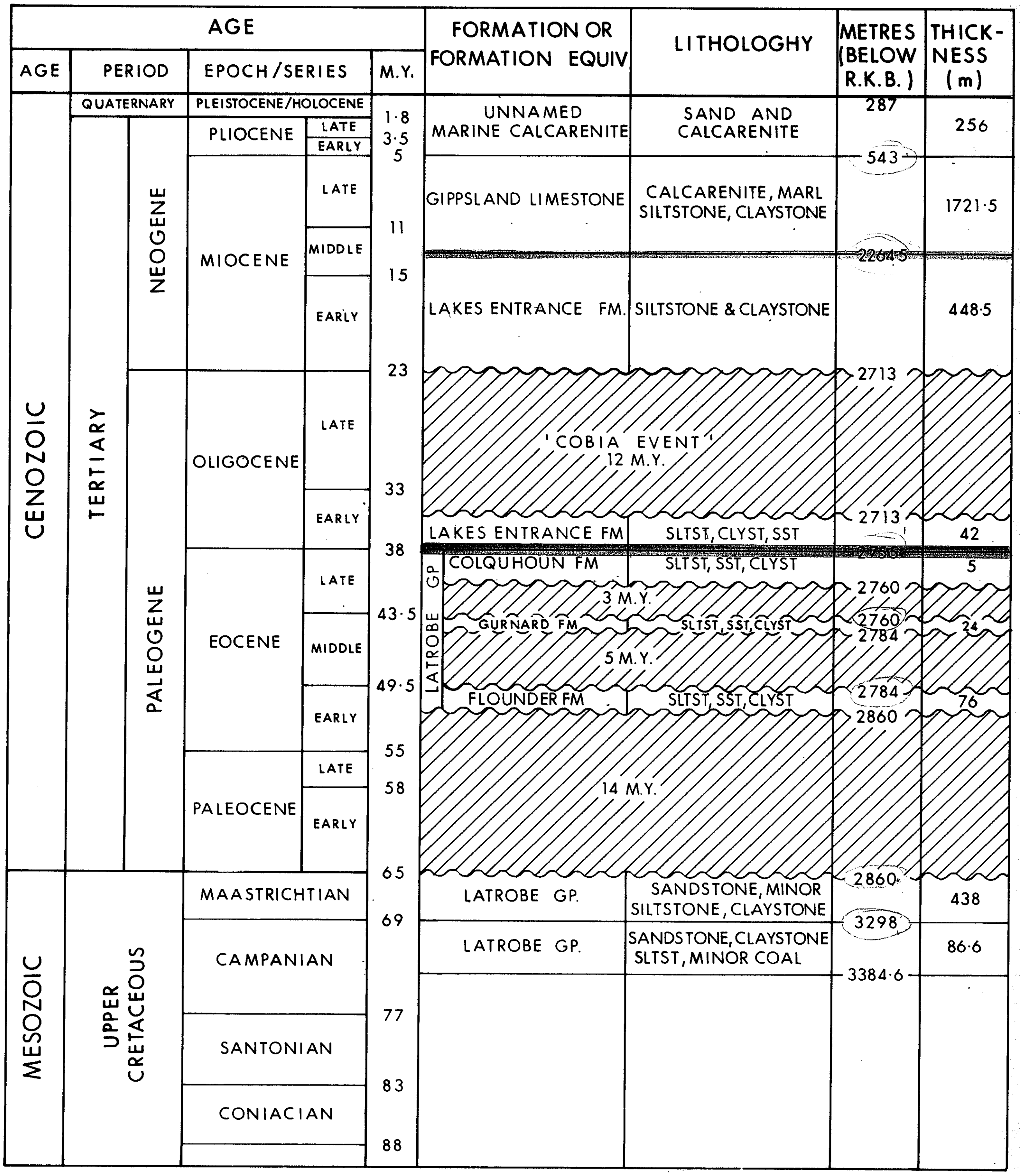
INTERPRETATIVE

STRATIGRAPHIC TABLE: ATHENE-1



AGE	PERIOD		EPOCH/SERIES		M.Y.	FORMATION OR FORMATION EQUIV	LITHOLOGHY	METRES (BELOW R.K.B.)	THICK-NESS (m)
CENOZOIC	QUATERNARY		PLEISTOCENE/HOLOCENE		1·8	UNNAMED MARINE CALCARENITE	SAND AND CALCARENITE	287	256
	TERTIARY	NEOGENE	PLIOCENE	LATE	3·5				
				EARLY	5				
			MIOCENE	LATE	11	GIPPSLAND LIMESTONE	CALCARENITE, MARL SILTSTONE, CLAYSTONE	543	1721·5
				MIDDLE	15				
				EARLY	23	LAKES ENTRANCE FM.	SILTSTONE & CLAYSTONE	2264·5	448·5
		PALEOGENE	OLIGOCENE	LATE	33	'COBIA EVENT' 12 M.Y.		2713	
				EARLY	38	LAKES ENTRANCE FM	SLTST, CLYST, SST	2713	42
			EOCENE	LATE		LATROBE GP. COLQUHOUN FM	SLTST, SST, CLYST	2755	5
						3 M.Y.		2760	
				MIDDLE	43·5	LATROBE GP. GURNARD FM	SLTST, SST, CLYST	2760	24
						5 M.Y.		2784	
				EARLY	49·5	LATROBE GP. FLOUNDER FM	SLTST, SST, CLYST	2784	76
			PALEOCENE	LATE	55	14 M.Y.		2860	
				EARLY	58				
MESOZOIC	UPPER CRETACEOUS		MAASTRICHTIAN		65	LATROBE GP.	SANDSTONE, MINOR SILTSTONE, CLAYSTONE	2860	438
			CAMPANIAN		69	LATROBE GP.	SANDSTONE, CLAYSTONE SLTST, MINOR COAL	3298	86·6
								3384·6	
			SANTONIAN		77				
			CONIACIAN		83				
					88				

A-6023

FIGURE 6

27

PE905126

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The enclosure PE905126 has the following characteristics:

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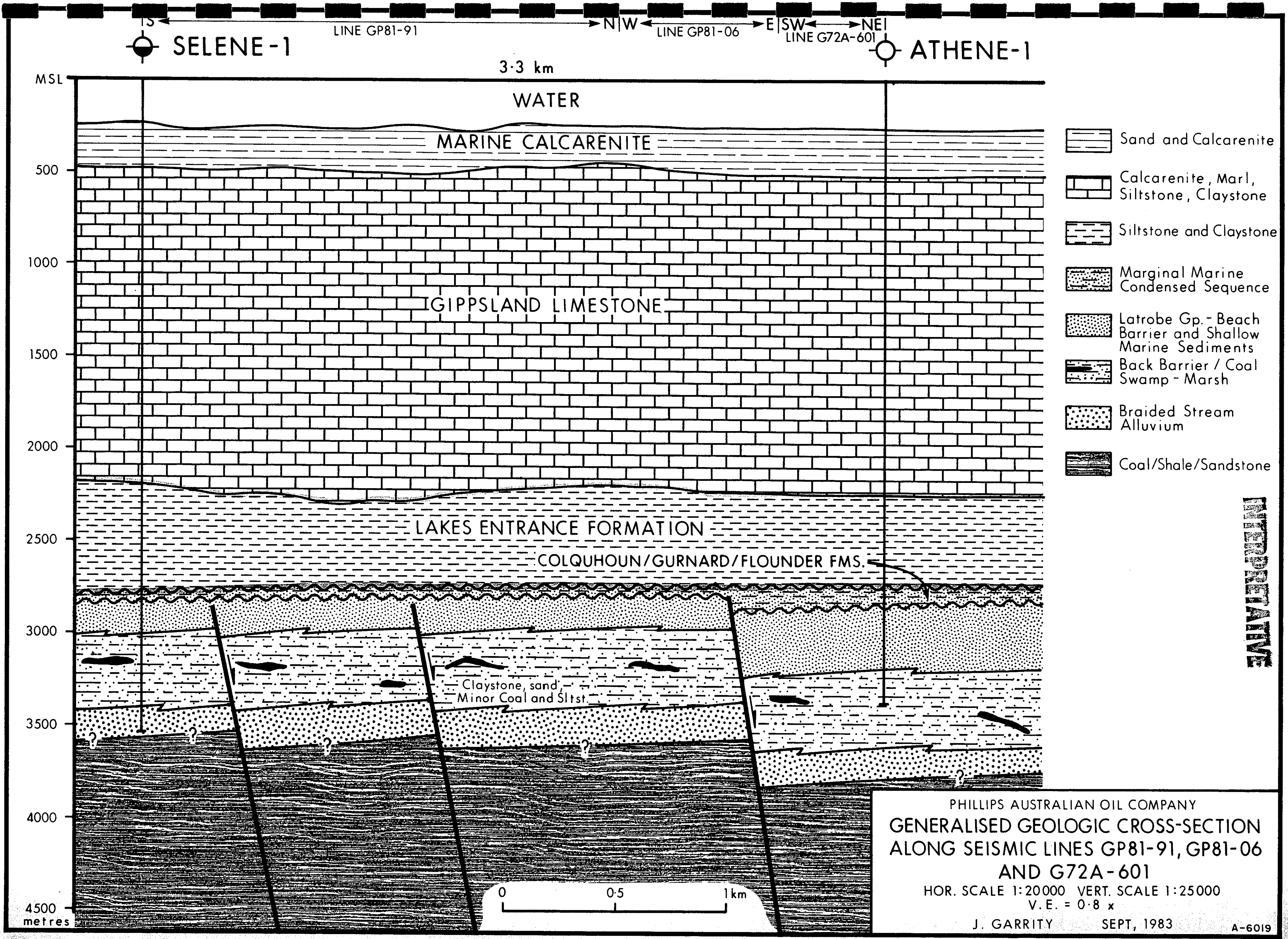
CONTAINER_BARCODE = PE902547
NAME = Generalised Geologic Cross-Section
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = SECTION
DESCRIPTION = Generalised Geologic Cross-Section along Seismic lines GP81-91, GP81-06 and G72A-601. Figure 7 of WCR.
REMARKS =
DATE_CREATED = 30/09/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)

FIGURE 7



INTERPRETATIVE

PHILLIPS AUSTRALIAN OIL COMPANY

GENERALISED GEOLOGIC CROSS-SECTION ALONG SEISMIC LINES GP81-91, GP81-06 AND G72A-601

HOR. SCALE 1:20000 VERT. SCALE 1:25000
V.E. = 0·8 x

J. GARRITY SEPT, 1983

A-6019

PE905127

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The enclosure PE905127 is enclosed within the container PE902547 at this location in this document.

The enclosure PE905127 has the following characteristics:
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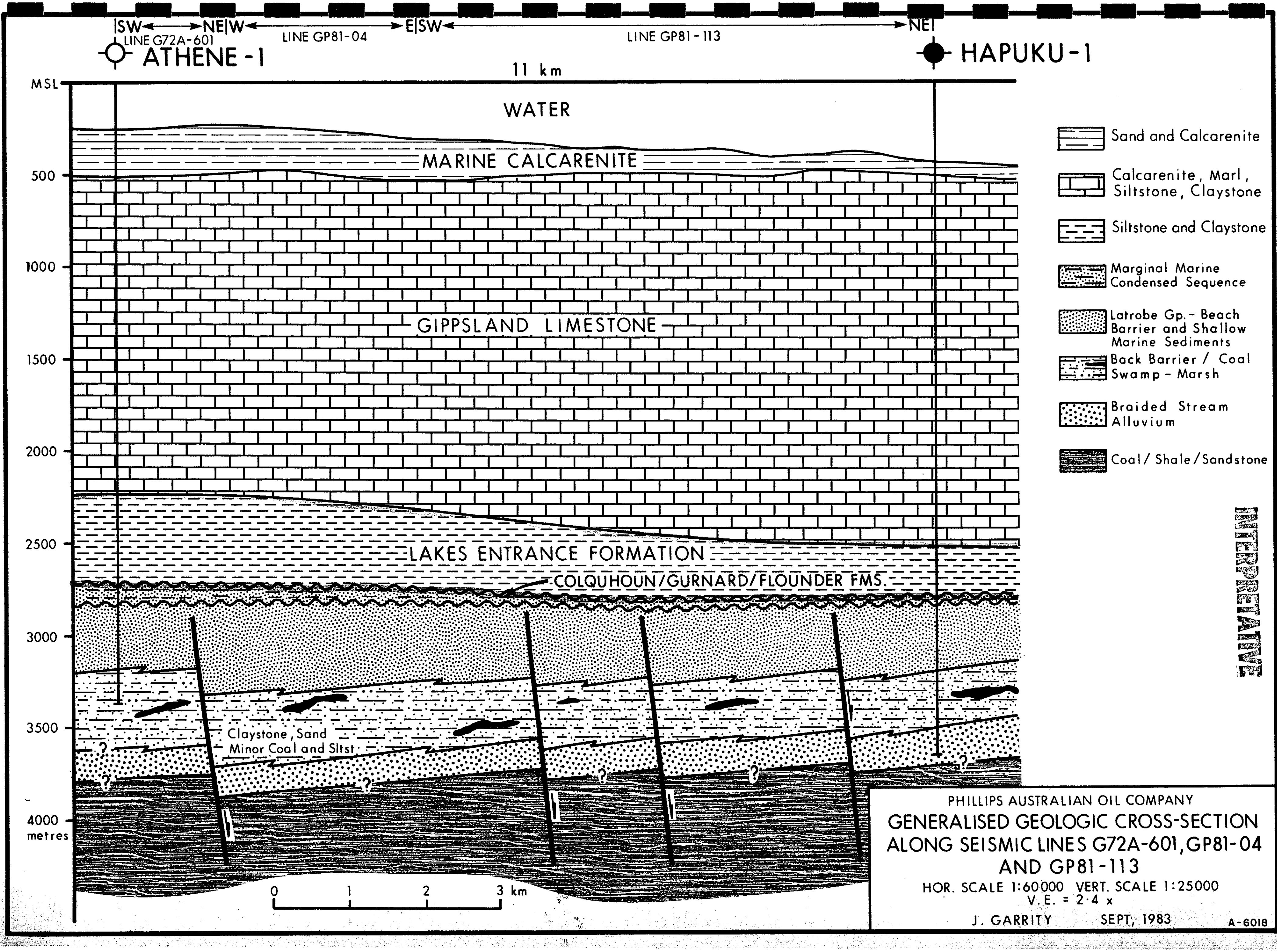
CONTAINER_BARCODE = PE902547
NAME = Generalised Geologic Cross-Section
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = SECTION
DESCRIPTION = Generalised Geologic Cross-Section along Seismic lines G72A-601, GP81-04 and GP81-113. Figure 8 of WCR.
REMARKS =
DATE_CREATED = 30/09/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)



PHILLIPS AUSTRALIAN OIL COMPANY

GENERALISED GEOLOGIC CROSS-SECTION ALONG SEISMIC LINES G72A-601, GP81-04 AND GP81-113

HOR. SCALE 1:60000 VERT. SCALE 1:25000
V. E. = 2·4 x

J. GARRITY SEPT, 1983 A-6018

FIGURE 8

INTERPRETATIVE

A major hiatus possibly representing the 'Southern Ocean Rift Onset' exists between Late Maastrichtian and Early Eocene strata. This 'rift onset' is the final rifting phase between Australia and Antarctica preceding continental breakup and sea floor spreading. The rifting may have created a drop in sea level causing non-deposition and/or erosion in the Athene No. 1 area. Significant hiatii also exist between the Early Eocene and the late Mid Eocene, and the late Mid Eocene and the Late Eocene (Figure 6). The unconformities were caused by tectonic fluctuations resulting in marine transgressions and regressions all related to the continued separation of Australia and Antarctica. One final major hiatus exists between the Earliest Oligocene and the Early Miocene. This unconformity, referred to as the "Cobia Event" (Taylor, 1983), is related to the final opening of a deep seaway between Australia and Antarctica which created a major eustatic sea level low.

Brief descriptions of the stratigraphic units penetrated in the well are presented below. Detailed lithologic descriptions of cuttings and sidewall cores are given in Appendices 3 and 4 respectively, and also on the Geologist's Litholog (Enclosure 3) and Geoservices Mud Log (Enclosure 2). A detailed summary of stratigraphic interpretations for Athene No. 1 is presented on the Well Composite Log (Enclosure 4).

Tertiary

Middle-to-Late Miocene : Gippsland Limestone
543m - 2264.5m (1721.5m)

The top of the Gippsland Limestone is arbitrarily placed at 543 metres, the top of the sampled interval.

The Gippsland Limestone consists of interbedded calcarenite, marl, siltstone and claystone comprising six gross lithologic units. The interval from 543 metres to 597 metres consists of calcarenite, white to light grey, hard to moderately soft, medium-to-coarse grained, crystalline, with a sucrosic texture, occasional fossil fragments and platy calcite. From 597 metres to 1222 metres the section is dominantly marl, with minor calcarenite interbeds between 597 metres and 806 metres. The marl is light grey, soft, very plastic, sticky, ductile, calcareous, homogeneous, with trace platy calcite, oolites and calcispheres. Calcarenite and minor interbedded marl dominate the interval between 1222 metres and 1765 metres. The occurrence of marl increases with depth while the calcarenite is light-to-dark grey to brown, hard to soft, moderately well sorted, argillaceous, with minor fine-to-coarse grained quartz grains in the matrix. In the interval 1765 metres to 2186 metres the dominant lithology is marl, light-to-dark grey to white, soft, plastic, sticky, calcareous, argillaceous with minor-to-abundant very fine grained quartz and silt in the matrix. Minor calcarenite and siltstone interbeds occur throughout the interval with siltstone content increasing with depth. The final lithologic unit in the interval 2186 metres to 2264.5 metres is composed of interbedded claystone, siltstone and calcareous siltstone.

The carbonate depositional environment was probably continental shelf edge with water depths ranging between 180 metres and 350 metres.

The base of the Gippsland Limestone (2264.5 metres) is readily picked on electric logs as a marked increase in sonic travel time and decrease in resistivity.

INTERPRETATIVE

Early Oligocene to Middle Miocene : Lakes Entrance Formation 2264.5m - 2755m (490.5m)

This fine grained clastic unit can be split into two general lithologic divisions. The upper unit from 2264.5 metres to 2713 metres consists of interbedded claystone and siltstone. From 2713 metres to 2755 metres the lower unit consists of interbedded siltstone, claystone and sandstone. The sandstone is very fine grained, poorly sorted, calcareous cemented, argillaceous, silty and has an increasing glauconite content with depth. Glauconite is also present within the claystones and siltstones of the lower unit but is missing in similar lithologies above 2713 metres.

The sediments above 2713 metres in the uppermost section of the Lakes Entrance Formation, were deposited on the continental shelf edge or slope in water depths ranging between 350 metres and 700 metres. Deposition of the lower section of the Lakes Entrance Formation from 2713 metres to 2755 metres occurred in the higher-energy shallow-marine continental shelf environment, as is evidenced by the occurrence of sandstone and glauconite in the interval.

A major hiatus known as the "Cobia Event" occurs at 2713 metres and represents an erosional break between the Early Oligocene and the Early Miocene. This hiatus represents a marine regression of some 12 million years duration.

The "Cobia Event" can be distinguished downsection on electric logs as a slight increase in sonic travel time and a decrease in resistivity, as well as by a distinct lithologic change with the first appearance of sandstone and glauconite.

Paleontological evidence suggests that the lower unit of the Lakes Entrance Formation, from 2713 metres to 2755 metres was deposited in the deepwater continental rise environment. This conclusion is based solely on the benthonic foraminiferal assemblage found in the sidewall cores. The foraminiferal assemblage indicates a catastrophic subsidence of some 800 metres at 2755 metres when the environment shifted from estuarine Colquhoun Formation from 2755 metres to 2760 metres to continental rise Lakes Entrance Formation. The same foraminiferal assemblage does not indicate the existence of a biostratigraphic unconformity between these two environmental units. Lithologically, the Lakes Entrance interval from 2713 metres to 2755 metres appears to be consistent with deposition in the shallow marine continental shelf environment. Selene No. 1, 3.3 kilometres to the southwest, penetrated a glauconitic, medium grey, silty claystone which had been deposited in a high-energy shelfal environment between 100 metres and 200 metres water depths during Early Oligocene time. The occurrence of glauconitic sandstone and siltstone in the time equivalent Athene No. 1 section is suggestive of a higher-energy shelfal depositional environment than in Selene No. 1. For these reasons the paleontologically-based interpretation of continental rise sedimentation in the lowermost Lakes Entrance Formation is doubted.

Late Eocene : Latrobe Group - Colquhoun Formation
2755m - 2760m (5m)

The Colquhoun Formation consists of interbedded siltstone, claystone, and sandstone. Three sandstone types are recognized; a silty very fine to medium grained sandstone, a very fine-to-fine grained glauconitic sandstone and a medium-to-very coarse grained sandstone. Lithologically it is differentiated from the overlying Lakes Entrance Formation by the increase in sand and glauconite content. On electric logs the Lakes Entrance Formation/Colquhoun Formation boundary is characterized by a slight decrease in sonic travel time and a slight increase in resistivity upon penetrating the latter formation.

Biostratigraphically it is impossible to prove the presence of a hiatus between the Colquhoun (Zone K) and the Lakes Entrance Formations (Zone J2). Paleontological studies indicate deposition of the Colquhoun Formation within the tidal zone of an estuary that is subject to a significant marine influence.

Middle Eocene : Latrobe Group - Gurnard Formation
2760m - 2784m (24m)

INTERPRETATIVE

The Gurnard Formation consists of an interbedded sequence of siltstone, claystone and sandstone and based on cuttings descriptions appears lithologically identical to the Colquhoun Formation. Cement contamination after drilling out of the 9-5/8 inch casing hampered cuttings descriptions and interpretations in the interval 2760 metres to 2800 metres. Sidewall cores indicate that the Gurnard Formation sandstones have red-yellow iron-stained quartz grains indicative of subaerial exposure. The glauconite content within the Gurnard Formation is significantly greater than that in the Colquhoun Formation.

A three million year hiatus separates the Gurnard Formation from the overlying Colquhoun Formation. Gurnard Formation sedimentation took place within the tidal zone of an estuary and the presence of wind blown quartz sand and lateritized glauconitic clay suggests proximity to a beach barrier system. On electric logs the Gurnard Formation is distinguished from the overlying Colquhoun Formation by a decrease in sonic travel time and an increase in resistivity.

Early Eocene : Latrobe Group - Flounder Formation

2784m - 2860m (76m)

The Flounder Formation is comprised of medium-to-coarse grained, glauconitic sandstone with minor interbedded siltstone, silty sandstone and claystone. The sandstone exhibits moderate sorting, angular to subrounded and moderate-to-high sphericity quartz grains as well as being pyritic. Siltstone and claystone content decreases with depth.

The Flounder Formation is barren of planktonic foraminifera. However, based on a few arenaceous benthonic foraminifera and palynological evidence, the environment of deposition is interpreted as being in a low salinity part of an estuary.

A hiatus of between five and ten million years separates the Flounder Formation from the overlying Gurnard Formation. Resistivity within the Flounder Formation decreases with depth while the density is consistently high when compared to formations above and below it.

Cretaceous

Maastrichtian : Latrobe Group - Latrobe Coarse Clastics

2860m - 3220.5m (360.5m)

The Maastrichtian Latrobe Coarse Clastic section is dominantly very fine-to-very coarse grained sandstone with minor interbeds of claystone and siltstone. Environments of deposition range from shallow/nearshore marine to beach barrier.

From 2860 metres to 3100.5 metres the lithology is glauconitic and pyritic, very fine-to-very coarse grained sandstone with minor siltstone, silty sandstone and claystone deposited in a near shore/shallow marine environment. These very fine-to-very coarse grained sandstones are characteristic of the unit. The quartz grains are clear to translucent with minor opaque and yellow grains, unconsolidated, moderate-to-well sorted, angular to rounded, with low-to-high sphericity, and exhibit fair-to-excellent visual porosity. Glauconite and pyrite are common to abundant.

The only potential sealing unit within the Maastrichtian was intersected between 3100.5 metres and 3114 metres. This interval consists of interbedded claystone, siltstone, silty sandstone and medium-to-very coarse grained sandstone. The claystone is glauconitic and carbonaceous while the siltstone within the interval is carbonaceous, micaceous, pyritic, and exhibits poor visual porosity. The medium-to-very coarse grained sandstone contains unconsolidated, well sorted, angular to rounded, clear-to-translucent and minor opaque-and-yellow quartz grains. The sandstone has excellent visual porosity. The very fine-to-fine grained silty sandstone is glauconitic, micaceous, carbonaceous, pyritic and exhibits poor visual porosity.

The electric log signature of this near shore/shallow marine unit is distinctive. The gamma ray reading is very high (greater than 120 API units), while the resistivity increases dramatically when compared to that of lithologies above and below the 13.5 metre zone. The neutron-density curves cross over (density to right, neutron to left) indicating a nonporous fine-grained lithology.

In the interval 3114 metres to 3138 metres, a medium-to-very coarse grained sandstone with minor interbeds of siltstone and silty sandstone was penetrated. The sandstone is composed of clear-to-translucent quartz grains, well sorted, angular to rounded with moderate sphericity and excellent visual porosity. The occurrence of glauconite and the dominance of sandstone support a high-energy near-shore marine environment of deposition for this sequence. In terms of electric log character the resistivity and gamma ray logs both show dramatic decreases at the top of this section. The sonic travel time increases and the neutron-density curves cross over (neutron to the right, density to the left).

From 3138 metres to 3220.5 metres the dominant lithology is medium-to-very coarse grained sandstone. The quartz grains are generally clear, well sorted, angular to rounded, with moderate sphericity and exhibit excellent visual porosity. Only trace amounts of siltstone and silty sandstone occur within this 82.5-metre interval. The interval also lacks the glauconite and pyrite of the preceding intervals. Deposition within the beach barrier system is postulated for this interval. The clean, porous nature of these beach barrier sands is reflected on the neutron-density log by cross over that gives a wide sandstone separation (neutron to the right, density to the left).

The resistivity within these water wet sands is significantly lower than in the overlying near shore marine sandstones, siltstones and claystones, as are the gamma ray values which indicate an almost continuous 82.5 metres of clean sandstone. Dipmeter analysis (Appendix 9) does not indicate the presence of any high angle cross-bedding diagnostic of dunal facies.

Maastrichtian : Latrobe Group - Back Barrier/Lagoonal Sediments
3220.5m - 3298m (77.5m)

A tidal-inlet channel environment is postulated for the medium-to-very coarse grained sandstone deposited in the interval 3220.5 metres to 3272.5 metres. The quartz grains are clear to translucent, moderate-to-well sorted, angular to rounded, with moderate-to-low sphericity and excellent visual porosity. Minor interbeds of dolomitic sandstone, siltstone, silty sandstone and claystone were recorded within this unit. Tidal inlets are more or less permanent passages between barrier islands that allow tidal exchange between the open sea and lagoons, bays and tidal marshes behind the islands. The occurrence of glauconite, pyrite and carbonaceous material is therefore consistent with the postulated environment of deposition. Electric log signatures between this unit and the overlying beach barrier sands are distinct. The gamma ray API units increase dramatically as does the resistivity upon entering the tidal-inlet deposits. The sonic travel time increases and the neutron-density curves cross over (density to the right, neutron to the left) at 3220.5 metres.

Medium-to-very coarse grained sandstone dominates the interval between 3272.5 metres and 3298 metres in Athene No. 1. Only trace amounts of dolomitic sandstone, siltstone and silty sandstone were logged within this 25.5 metre unit. The percentage of dolomitic sandstone appears to have been underestimated as the electric logs indicate a very hard, low porosity interbedded zone between 3282.5 metres and 3298 metres. The resistivity values increase, the sonic travel time decreases and the density increases and is interpreted to indicate dolomite-cemented, very fine-to-medium grained sandstone.

The gamma ray log signature suggests the existence of three stacked, coarsening-upward sand bodies between 3272.5 metres and 3298 metres. Sedimentologically, the unit closely resembles a flood tidal delta within the beach barrier system. Flood tidal deltas are formed on the lagoon side of the tidal inlet channel and are affected by the tidal range and the amount of wave energy.

Campanian : Latrobe Group - Back Barrier/Coal Swamp-Marsh Sediments

3298m - 3384.6m (86.6m)

The lithology of this interval is interbedded claystone and medium-to-coarse grained sandstone with minor interbedded coal, siltstone, and dolomitic sandstone. The claystone is light grey to brown, slightly calcareous, with very fine grained quartz abundant in part, and carbonaceous. The medium-to-coarse grained sandstone has clear to translucent quartz grains, that are moderate-to-well sorted, angular to rounded, exhibit low-to-moderate sphericity and excellent visual porosity.

The coal is black, hard, blocky or fissile with conchoidal fracture. The siltstone is dark grey to brown to black, moderate-to-poorly sorted, dolomitic, with very fine-to-medium grained quartz abundant in the matrix, argillaceous, pyritic, carbonaceous and with poor visual porosity. The very fine-to-medium grained dolomitic sandstone is moderate-to-poorly sorted, has angular to subangular, low sphericity quartz grains, dolomite cemented, silty, argillaceous, with poor-to-fair visual porosity.

The Maastrichtian/Campanian boundary is placed at 3298 metres based on palynology and electric log character. The sidewall core at 3258.5 metres contains Proteacidites angulatus, one of the few species that makes its first appearance at the base of the Tricolpites longus zone (Maastrichtian). A Campanian Tricolporites lilliei age is designated for the sidewall core at 3302.5 metres based on an assemblage of palynomorphs that first appear in the Tricolporites lilliei zone, and on the lack of any species that are known to occur at the base of the overlying Tricolpites longus zone. Palynologically the Maastrichtian/Campanian boundary lies somewhere between 3258.5 metres and 3302.5 metres. Lithological and electric log data indicate a major change at 3298 metres in Athene No. 1. The environment of deposition changes from flood tidal delta to back barrier/coal swamp-marsh environment at 3298 metres. Both the sonic travel time and gamma ray readings increase dramatically at 3298 metres while the resistivity of the formation decreases when compared to the overlying dolomitic sandstones. Based on this evidence the Top Campanian is placed at 3298 metres.

These rocks were deposited in the back barrier/coal swamp-marsh environment. The occurrence of claystone, siltstone and coal is consistent with the depositional environment. Medium-to-coarse grained sandstones were probably deposited as small point bars in creeks and streams that emptied into back barrier swamps, marshes and lagoons.

Figure 9. to follow

PE905128

This is an enclosure indicator page.
The enclosure PE905128 is enclosed within the container PE902547 at this location in this document.

The enclosure PE905128 has the following characteristics:

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CONTAINER_BARCODE = PE902547
NAME = Stratigraphic Comparison Table
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = WELL
SUBTYPE = STRAT_COLUMN
DESCRIPTION = Stratigraphic Comparison between Athene-1, Selene-1 and Hapuku-1. Figure 9 of WCR.
REMARKS =
DATE_CREATED = 15/11/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

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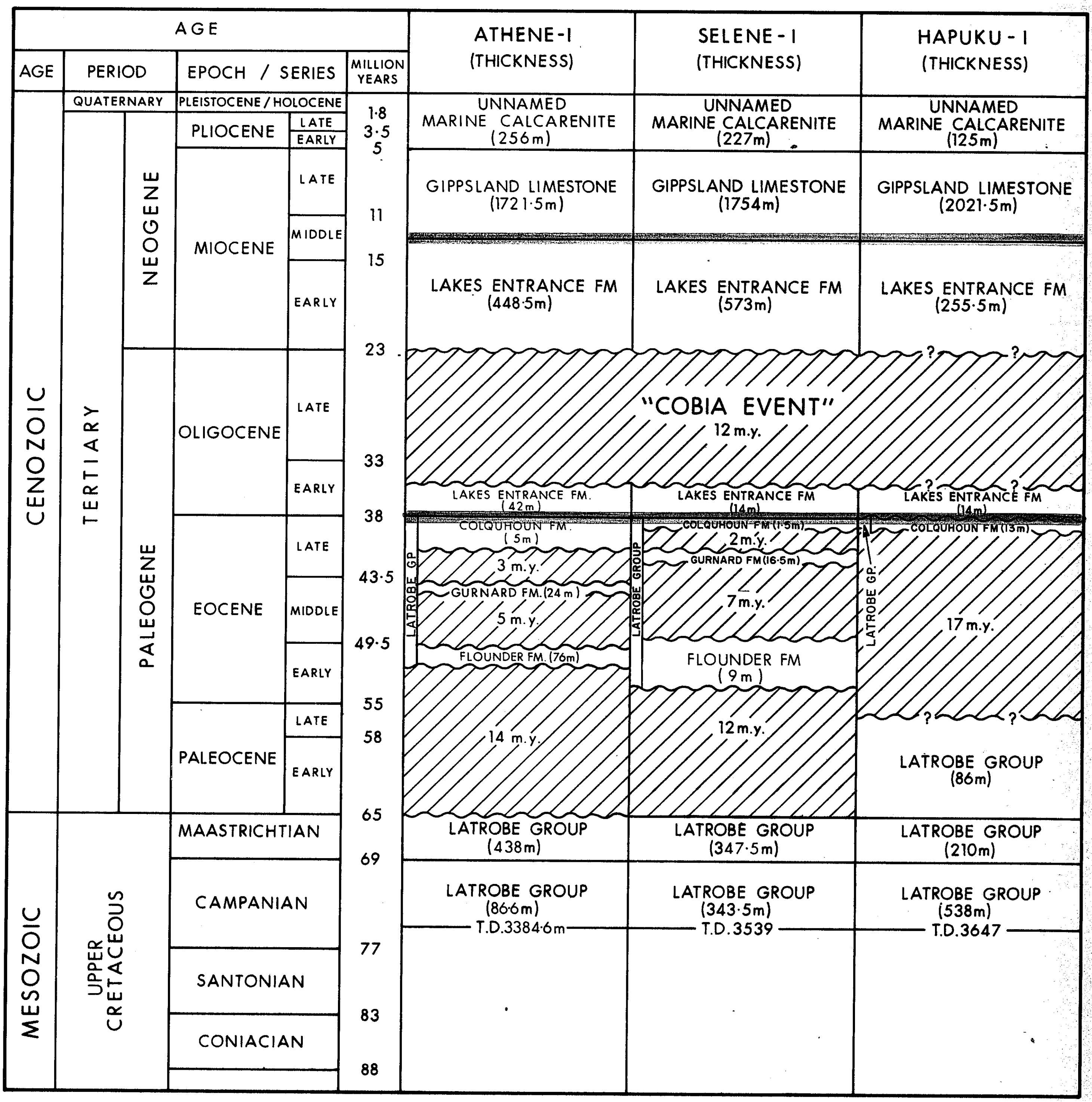
INTERPRETATIVE

STRATIGRAPHIC COMPARISON: ATHENE-1, SELENE-1, HAPUKU-1



A-6024

FIGURE 9

INTERPRETATIVE

WELL CORRELATION

A comparison of the stratigraphy of Athene No. 1 with that of Selene No. 1 and Hapuku No. 1 is illustrated in Figure 9 and Table 9. Selene No. 1, located 3.3 kilometres to the southwest, is the closest well within Permit Vic/P18 to the Athene No. 1 location. Hapuku No. 1 is located 9.4 kilometres to the northeast in open acreage.

Most of the units penetrated in Athene No. 1 occur in the other two wells, however, a number of stratigraphic differences are evident. The following comparisons can be made:

a. The Gippsland Limestone and the overlying Marine Calcarenite are of approximately equal thicknesses at Athene No. 1 (1977.5 metres), Selene No. 1 (1981 metres) and Hapuku No. 1 (2146.5 metres). The subsidence due to the regional tilting associated with Australian continental breakup from Antarctica must have been similar at all three well locations.

b. The Lakes Entrance Formation above the 'Cobia Event' is significantly thicker in Athene No. 1 (448.5 metres) and Selene No. 1 (573 metres) than in Hapuku No. 1 (255.5 metres). This again is considered to be related to regional tilting associated with the Australian and Antarctica continental breakup, resulting in relatively greater uplift in the Hapuku No. 1 area than in the Athene No. 1/Selene No. 1 area to the southwest. The majority of the tilting occurred before or during deposition of the latest Lakes Entrance Formation during Middle Miocene time.

c. The twelve million-year Early-to-Late Oligocene hiatus known as the 'Cobia Event' occurs in all three wells.

d. Basal Lakes Entrance Formation sediments below the 'Cobia Event' grade conformably into the Colquhoun Formation at Athene No. 1 and Selene No. 1. An unconformity based solely on micro-paleontological data exists between the Lakes Entrance and Colquhoun Formations at Hapuku No. 1. The interval thickness to the base Colquhoun unconformity is 47 metres in Athene No. 1 and 15.5 metres in Selene No. 1. The sediments at both locations are Late Eocene to Early Oligocene intertidal/estuarine silt-stones, claystones and sandstones. These sediments probably represent the final infilling of a northwest-southeast trending trough created earlier in Eocene time by major uplift in the northeast of the permit area.

e. The Colquhoun Formation is 13 metres thick at Hapuku No. 1 and appears to thin in a southwesterly direction to 5 metres at Athene No. 1 and 1.5 metres at Selene No. 1. An unconformity exists at the base of the Colquhoun Formation in all three wells. The hiatus lasts three million years in Athene No. 1 and two million years in Selene No. 1 and overlies the Gurnard Formation in these two wells.

f. The Gurnard Formation was penetrated in Athene No. 1 and Selene No. 1 but is missing in Hapuku No. 1. This estuarine Middle Eocene deposit is thicker at Athene No. 1 (24 metres) than in Selene No. 1 (16.5 metres) because of localized downfaulting in the Athene No. 1 area. In both wells the Gurnard Formation rests unconformably on the Flounder Formation. Non-deposition and/or erosion as a result of structural movement in the Eocene could explain the absence of both the Gurnard and Flounder Formations at Hapuku No. 1.

g. The Flounder Formation is significantly thicker in Athene No. 1 (76 metres) than in Selene No. 1 (9 metres), only 3.3 kilometres to the southwest. Middle Eocene structural movement in the northeast of the permit area has previously been discussed, but localized downfaulting of the Athene No. 1 fault block within this regime probably accounts for the greater thickness of Flounder Formation at Athene No. 1.

h. A major unconformity occurs beneath the Flounder Formation in Athene No. 1 and Selene No. 1. This unconformity marks the beginning of the southern ocean breakup caused by the separation of Australia from Antarctica.

i. Paleocene sediments were absent at Athene No. 1 and Selene No. 1, while Hapuku No. 1 penetrated 86 metres. A Paleocene age was tentatively assigned to the sediments below the Top Latrobe Clastics unconformity at Selene No. 1. However, subsequent to the drilling of Athene No. 1, the Selene No. 1 Latrobe Clastics were redesignated as being of Maastrichtian age. A channel was incised into the Latrobe Group sediments as a result of earliest Eocene uplift in the northeastern portion of the basin. In the Athene No. 1 and Selene No. 1 areas the erosion was probably more regional in nature and not confined to a distinct channel. The Paleocene section at both Athene No. 1 and Selene No. 1 was completely eroded while the equivalent section at the structurally higher Hapuku No. 1 was preserved. Palynology confirms that the Lygistepollenites balmei and the uppermost Tricolpites longus spore-pollen zones which are characteristically Paleocene are missing in Athene No. 1.

j. Athene No. 1 and Selene No. 1 have excellent reservoir sands beneath the Top Latrobe Clastics unconformity. However, sands beneath the Top Latrobe Clastics unconformity in Hapuku No. 1 have suffered post-depositional dolomitization.

INTERPRETATIVE

TABLE 9 : CORRELATION WITH SELENE NO. 1 AND HAPUKU NO. 1

FORMATION/ STRATIGRAPHIC HORIZON	SELENE NO. 1 SUBSEA DEPTH TO FORMATION TOP	ATHENE NO. 1 SUBSEA DEPTH TO FORMATION TOP	HAPUKU NO. 1 SUBSEA DEPTH TO FORMATION TOP
MARINE CALCARENITE	230m	264m	375.5m
GIPPSLAND LIMESTONE	457m	520m	500.5m
UPPER LAKES ENTRANCE FORMATION	2211m	2241.5m	2521.5m
INTRA LAKES ENTRANCE FORMATION	2240m	2444m	2632m
COLQUHOUN FORMATION	2798m	2732m	2791.5m
GURNARD FORMATION	2799.5m	2737m	No Data
FLOUNDER FORMATION	2816m	2761m	No Data
TOP LATROBE CLASTICS	TOP LATROBE CLASTICS/TOP CRETACEOUS 2825m	TOP LATROBE CLASTICS/TOP CRETACEOUS 2837m	2804.5m
TOP CRETACEOUS	2825m	2837m	2890.5m
TOP CAMPANIAN	3172m	3275m	3100.5m
TOTAL DEPTH	3516m	3362m	3638.5m

k. The Maastrichtian Latrobe section at Athene No. 1 (438 metres) is significantly thicker than time equivalent sections at either Selene No. 1 (320.5 metres) or Hapuku No. 1 (210 metres). Contemporaneous downfaulting and deposition within the Athene No. 1 area throughout the Maastrichtian could explain the localized extra section.

l. All three wells intersected beach barrier sands of Maastrichtian age.

m. Selene No. 1 and Hapuku No. 1 both terminated in Campanian braided-stream sediments while Athene No. 1 terminated in Campanian back barrier/coal swamp-marsh sediments.

INTERPRETATIVE

SEISMIC MARKER IDENTIFICATION

A well velocity survey was conducted at Athene No. 1 upon completion of drilling (Addendum 3). The synthetic seismogram is illustrated in Addendum 4. The resultant well velocity log was used to relate the main seismic mapping horizons to stratigraphy as shown in Table 10. Both the blue and orange seismic marker horizons were related to distinct lithology and E-log changes.

Table 10

Seismic Horizon Times and Depths: Pre-Drill and Post-Drill Comparison

SEISMIC HORIZONS

PRE-DRILL ESTIMATES

	BASE GIPPSLAND LIMESTONE (BLUE HORIZON)	TOP LATROBE GROUP (ORANGE HORIZON)	TOP CRETACEOUS (BROWN HORIZON)	WITHIN UPPER CRETACEOUS (GREEN HORIZON)
Two-way Time (Secs.)	1.633	1.976	2.081	2.177
Depth (m) (RKB)	2119m	2553m	2760m	2937m
POST-DRILL				
True depth (m) (RKB) for above Two-way Time	2261m	2766m	2945m	3122m
Actual Two-way Time (Secs.) to Horizon	1.642	1.962	(1)	Not reached (2)
Actual Depth (m) (RKB) to Horizon	2264.5m	2755m	(1)	Not reached (2)

(1) The brown seismic horizon could not be picked on lithology change, E-log character or drilling parameters. Consequently, time and depth to this horizon has not been determined.

(2) The correlation of the horizon at 2.177 seconds two-way time with the "green" regional mapping horizon was found to be in error. This was caused by a miscorrelation of reflections across the southwest bounding fault. The green seismic horizon is found to originate from within the Upper Cretaceous coal beds as found in Helios No. 1, Selene No. 1 and Hermes No. 1. The top of this coal sequence was encountered at total depth and hence the green horizon lies below the 3384.6m RKB total depth of the well.

INTERPRETATIVE

STRUCTURE

The Athene No. 1 well was located on a seismically-defined rotated fault block. Small closure on an easterly-plunging structural nose extending from the Kingfish Anticline was mapped at Top Latrobe Group level. Dip-and-fault closures were also mapped at Top Cretaceous and Within Cretaceous levels. Because of rapid thinning between the Within Cretaceous and Top Cretaceous horizons, stratigraphic pinchout of sands was also anticipated. The Athene structure was interpreted as being the highest of a series of northwest-southeast trending rotated fault blocks downthrown to the northeast. The fault blocks are located in the northeastern corner of the permit, with the Athene prospect being bounded by two northwest-southeast trending faults which were interpreted to cut the Latrobe Group section at least as high as Top Cretaceous level.

Three horizons corresponding to the orange (Top Latrobe), brown (Top Cretaceous) and green (Within Cretraceous) seismic markers were mapped with closure. Two-way time seismic maps were converted to depth using layered smoothed interval velocities. Time-to-depth conversion was essential because of rapid lateral changes in velocities within the Gippsland Limestone and variations in water depth.

Athene No. 1 was located at shot point 1809 on seismic line G72A-601. Figures 10 and 11 illustrate the pre-drilling seismic interpretation of the mapped horizons. The change in interpretation of critical horizons after drilling is illustrated in Figures 10A and 11A. Pre-drilling time and depth maps for the three targeted horizons are illustrated in Figures 12 through 17.

FIGURES. 10, 10A, 11, 11A, 12, 13, 14, 15, 16 & 17 to follow.

PE905129

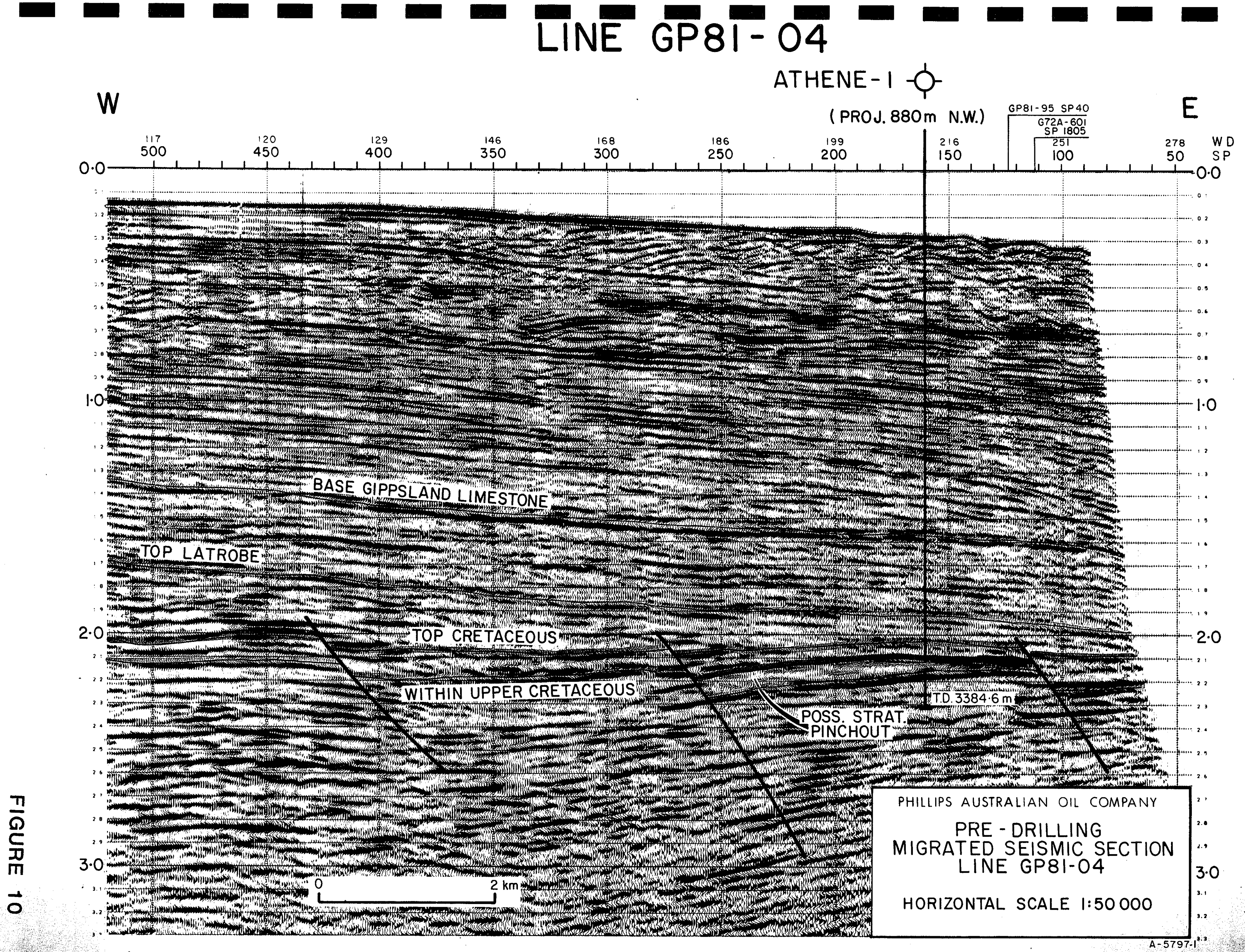
This is an enclosure indicator page.
The enclosure PE905129 is enclosed within the container PE902547 at this location in this document.

The enclosure PE905129 has the following characteristics:

ITEM_BARCODE = PE905129
CONTAINER_BARCODE = PE902547
NAME = Athene-1 Line GP81-04 (Migrated)
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = SECTION
DESCRIPTION = Athene-1 Pre-Drilling Migrated Seismic Section Line GP81-04 (East-West). Figure 10 of WCR.
REMARKS =
DATE_CREATED = 15/11/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)

LINE GP81-04



PHILLIPS AUSTRALIAN OIL COMPANY

PRE-DRILLING
MIGRATED SEISMIC SECTION
LINE GP81-04

HORIZONTAL SCALE 1:50 000

INTERPRETATIVE

FIGURE 10

PE905130

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The enclosure PE905130 has the following characteristics:

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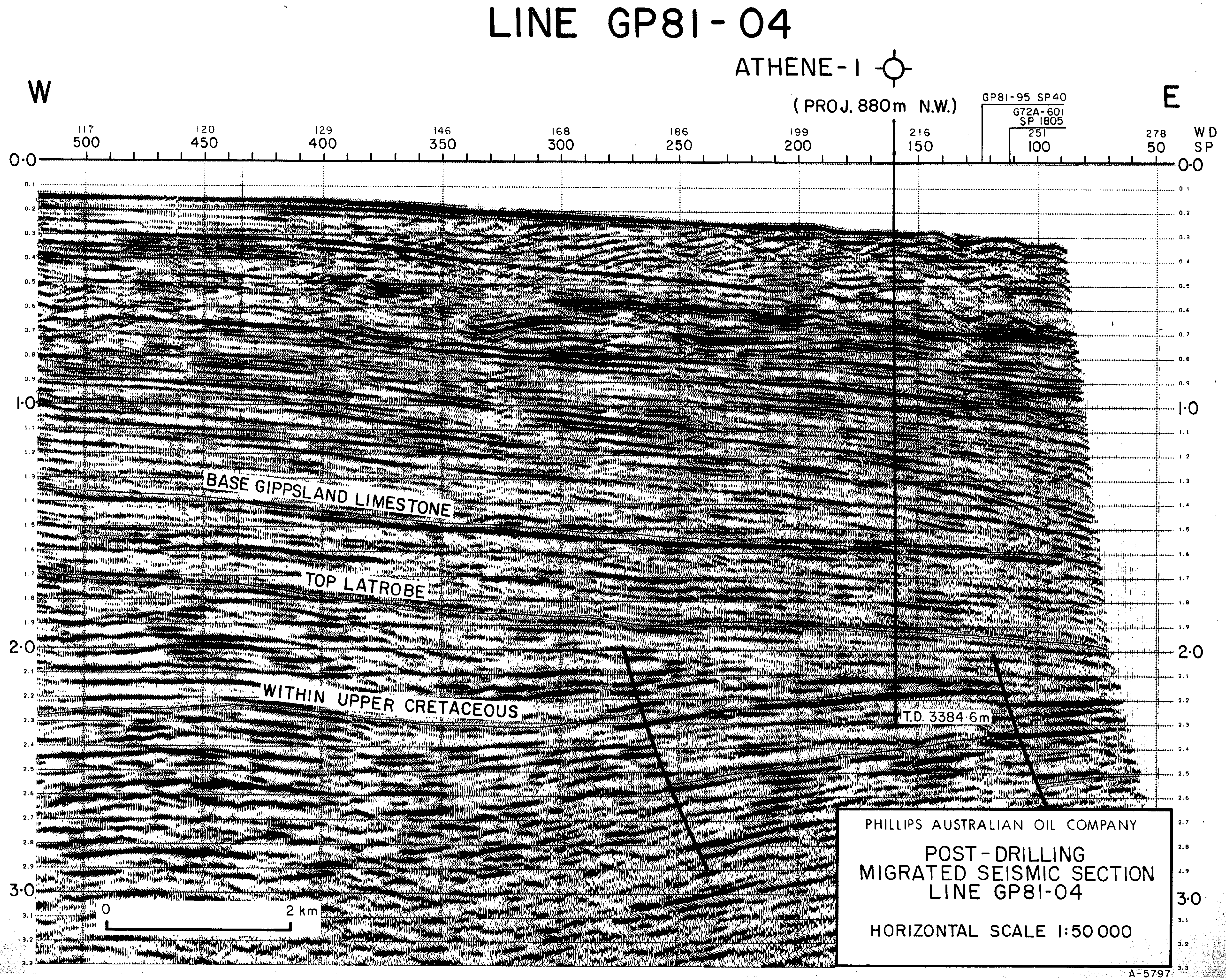
CONTAINER_BARCODE = PE902547
NAME = Athene-1 Line GP81-04 (Migrated)
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = SECTION
DESCRIPTION = Athene-1 Post-Drilling Migrated Seismic Section Line GP81-04 (East-West). Figure 10A of WCR.
REMARKS =
DATE_CREATED = 15/11/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)



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POST-DRILLING
MIGRATED SEISMIC SECTION
LINE GP81-04

HORIZONTAL SCALE 1:50 000

FIGURE 10A

INTERPRETATIVE

PE905131

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The enclosure PE905131 has the following characteristics:
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BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = SECTION
DESCRIPTION = Athene-1 Pre-Drilling Migrated Seismic Section Line G72A-601 (NE-SW). Figure 11 of WCR.
REMARKS =
DATE_CREATED = 15/11/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

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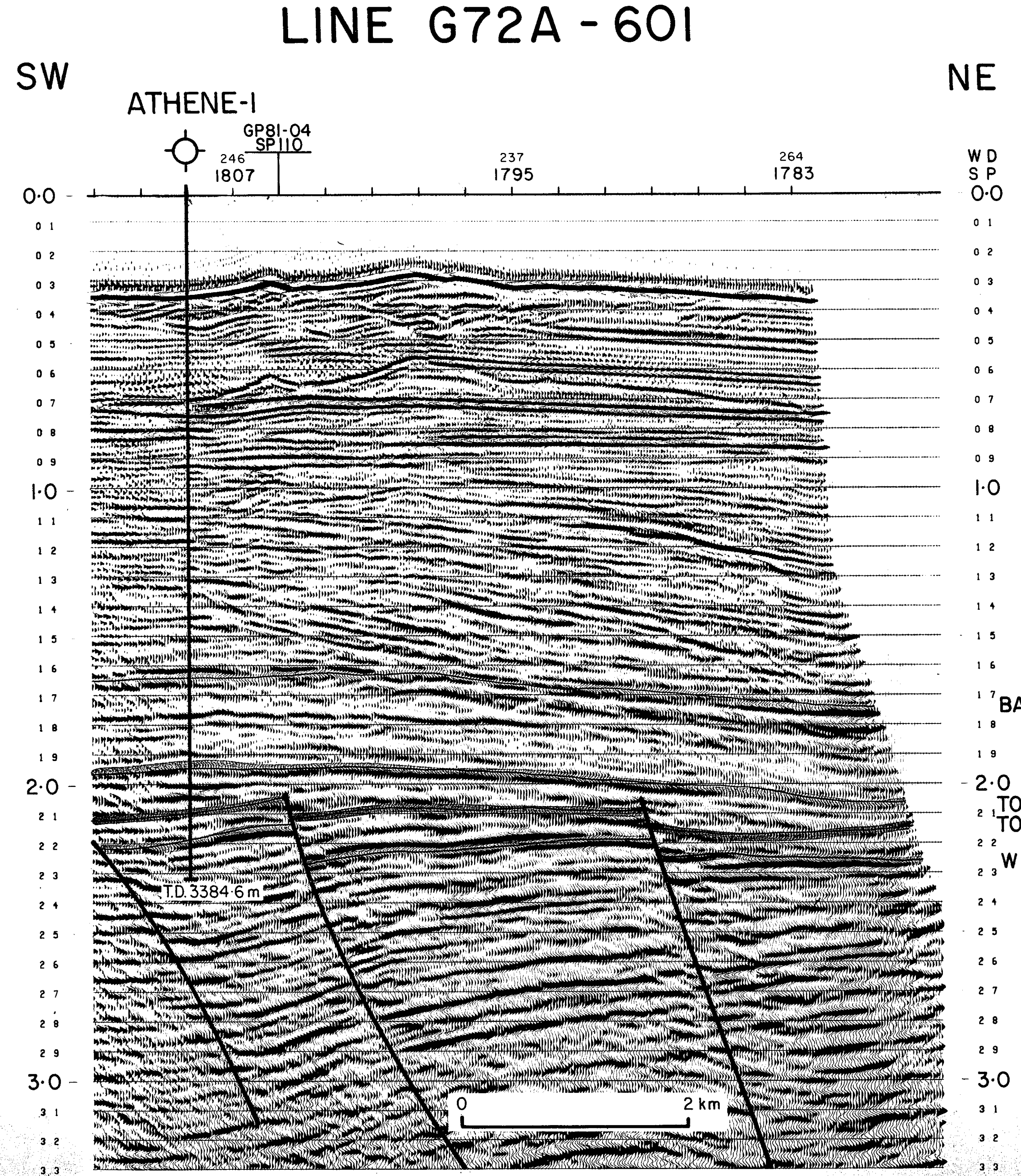
FIGURE 11



PHILLIPS AUSTRALIAN OIL COMPANY

PRE - DRILLING
MIGRATED SEISMIC SECTION
LINE G72A-601

HORIZONTAL SCALE 1:50000

INTERPRETATIVE

A-5798-1

PE905132

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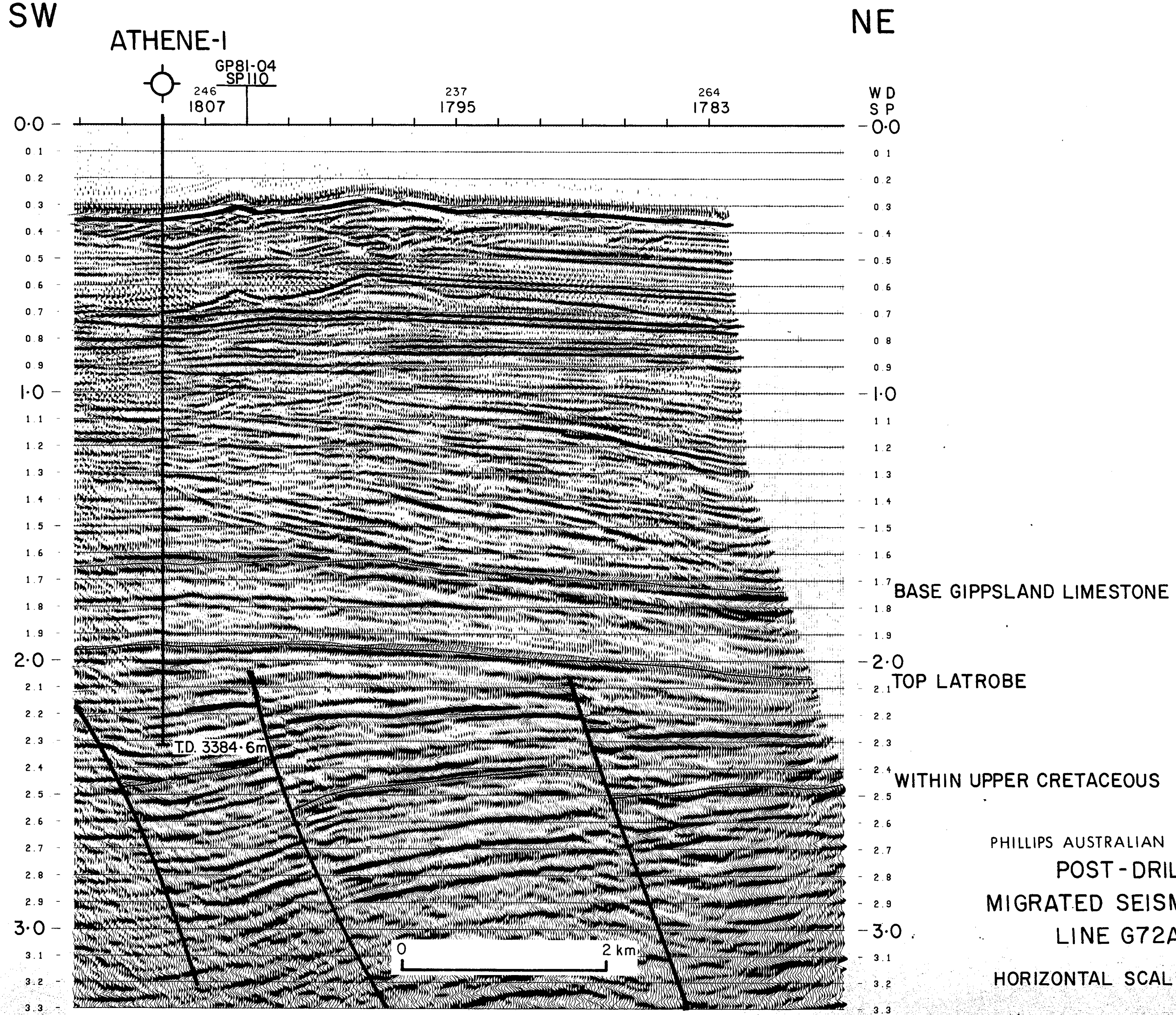
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = SECTION
DESCRIPTION = Athene-1 Post-Drilling Migrated Seismic Section Line G72A-601 (NE-SW). Figure 11A of WCR.
REMARKS =
DATE_CREATED = 15/11/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)

LINE G72A - 601



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POST-DRILLING

MIGRATED SEISMIC SECTION

LINE G72A-601

HORIZONTAL SCALE 1:50000

FIGURE 11A

INTERPRETATIVE

A-5798

PE905133

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document.

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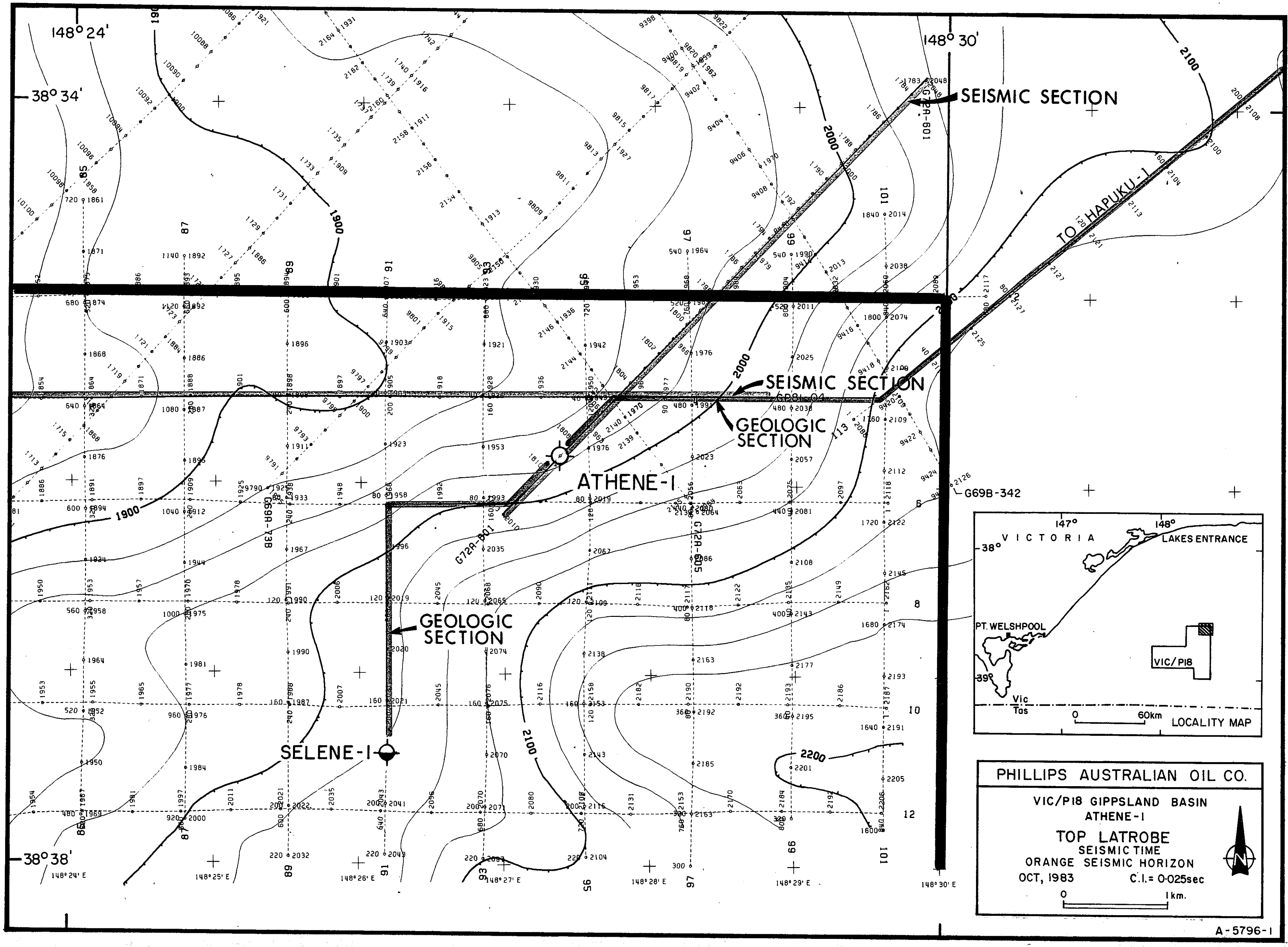
CONTAINER_BARCODE = PE902547
NAME = Top Latrobe Seismic Time Map
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = HRZN_CONTR_MAP
DESCRIPTION = Athene-1 Top Latrobe Seismic Time Map, Orange Seismic Horizon (C.I.=0.025 sec). Figure 12 of WCR
REMARKS = No orange seismic horizon coloured in.
DATE_CREATED = 31/10/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)



PHILLIPS AUSTRALIAN OIL CO.

VIC/P18 GIPPSLAND BASIN
ATHENE-1

TOP LATROBE
SEISMIC TIME
ORANGE SEISMIC HORIZON
OCT, 1983 C.I.= 0·025sec
0 1km.

A-5796-1

FIGURE 12

INTERPRETATIVE

PE905134

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CONTAINER_BARCODE = PE902547
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BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = HRZN_CONTR_MAP
DESCRIPTION = Athene-1 Top Latrobe Seismic Depth Map, Orange Seismic Horizon (C.I.=25 m). Figure 13 of WCR
REMARKS =
DATE_CREATED = 31/10/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)

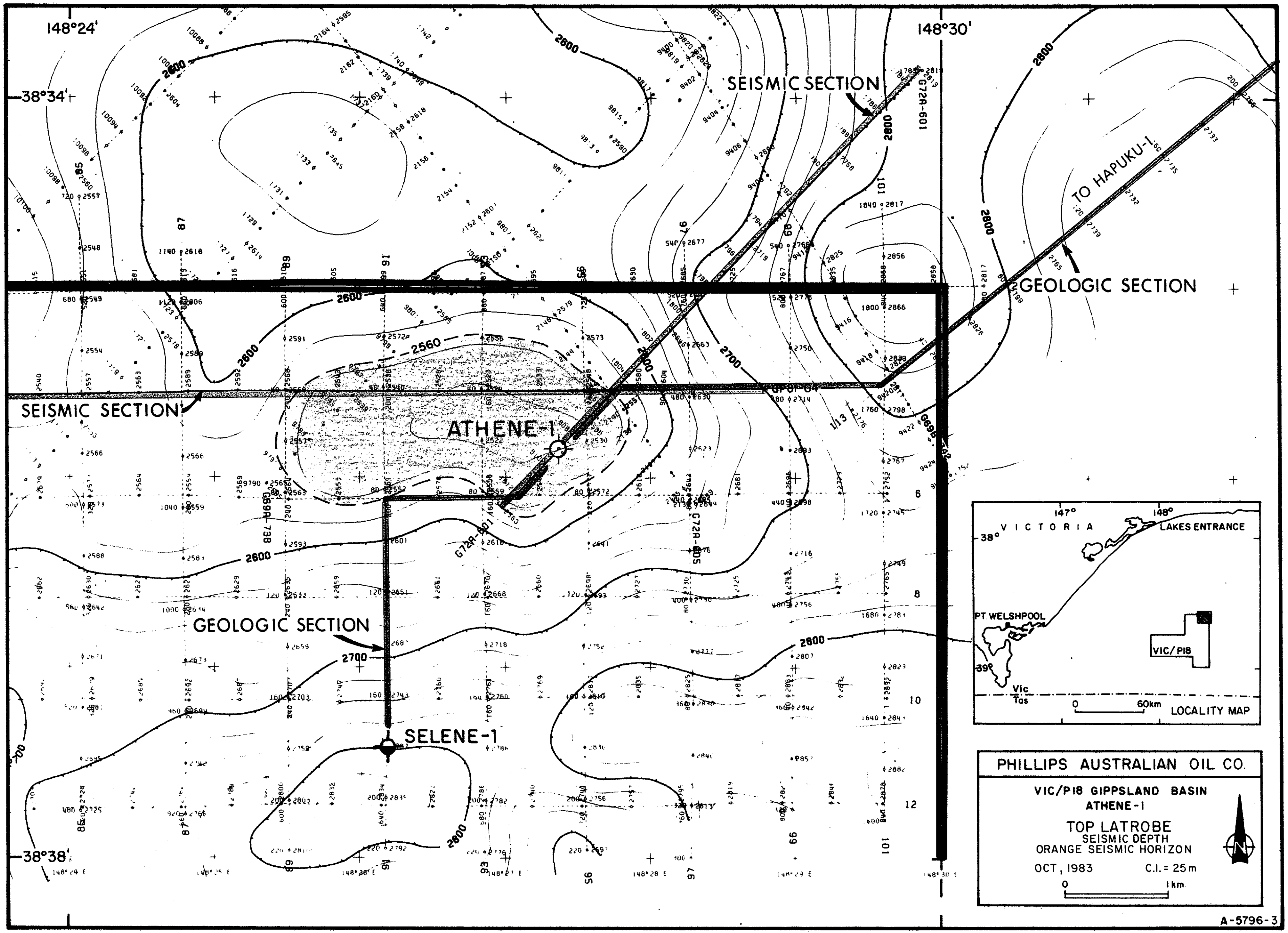

FIGURE 13

INTERPRETATIVE

PE905135

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The enclosure PE905135 has the following characteristics:

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CONTAINER_BARCODE = PE902547
NAME = Top Cretaceous Seismic Time Map
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = HRZN_CONTR_MAP
DESCRIPTION = Athene-1 Top Cretaceous Seismic Time Map, Brown Seismic Horizon (C.I.=0.025 sec). Figure 14 of WCR.
REMARKS =
DATE_CREATED = 31/10/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)

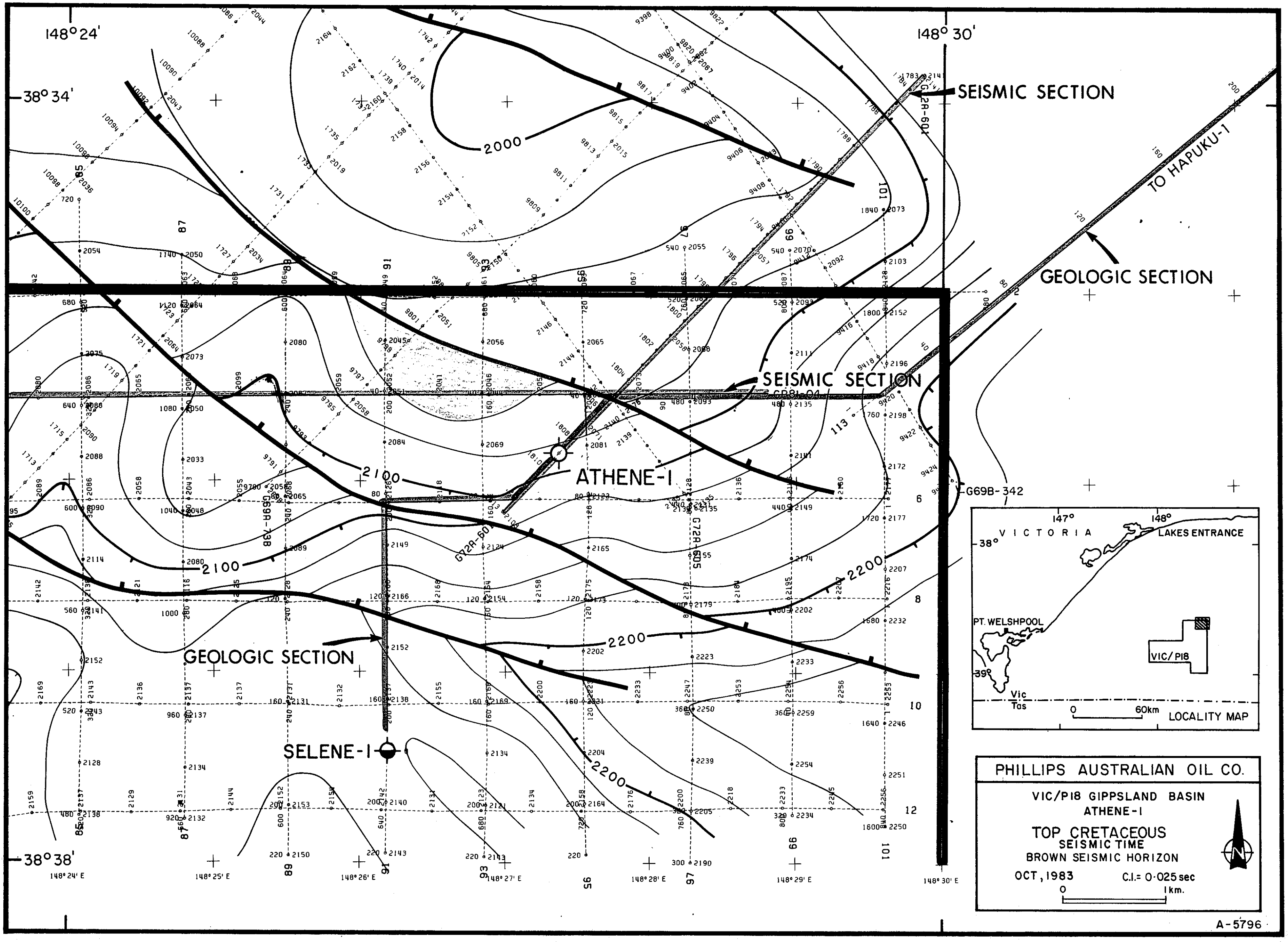
148° 24'
148° 30'
38° 34'
38° 38'
SEISMIC SECTION
G72A-604
TO HAPUKU-1
GEOLOGIC SECTION
SEISMIC SECTION
G81-04
ATHENE-I
G69B-342
G69A-738
G72A-605
G72A-601
GEOLOGIC SECTION
SELENE-I
2000
2100
2100
2200
2200
2200
148° 24' E
148° 25' E
148° 26' E
148° 27' E
148° 28' E
148° 29' E
148° 30' E
147°
148°
38°
39°
VICTORIA
LAKES ENTRANCE
PT. WELSHPOOL
VIC/P18
Vic
Tas
0
60km
LOCALITY MAP
PHILLIPS AUSTRALIAN OIL CO.
VIC/P18 GIPPSLAND BASIN
ATHENE-I
TOP CRETACEOUS
SEISMIC TIME
BROWN SEISMIC HORIZON
OCT, 1983
C.I.= 0·025 sec
0
1km.
N
A-5796

FIGURE 14

PE905136

This is an enclosure indicator page.
The enclosure PE905136 is enclosed within the container PE902547 at this location in this document.

The enclosure PE905136 has the following characteristics:

ITEM_BARCODE = PE905136
CONTAINER_BARCODE = PE902547
NAME = Top Cretaceous Seismic Depth Map
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = HRZN_CONTR_MAP
DESCRIPTION = Athene-1 Top Cretaceous Seismic Depth Map, Brown Seismic Horizon (C.I.=25 m). Figure 15 of WCR.
REMARKS =
DATE_CREATED = 31/10/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)

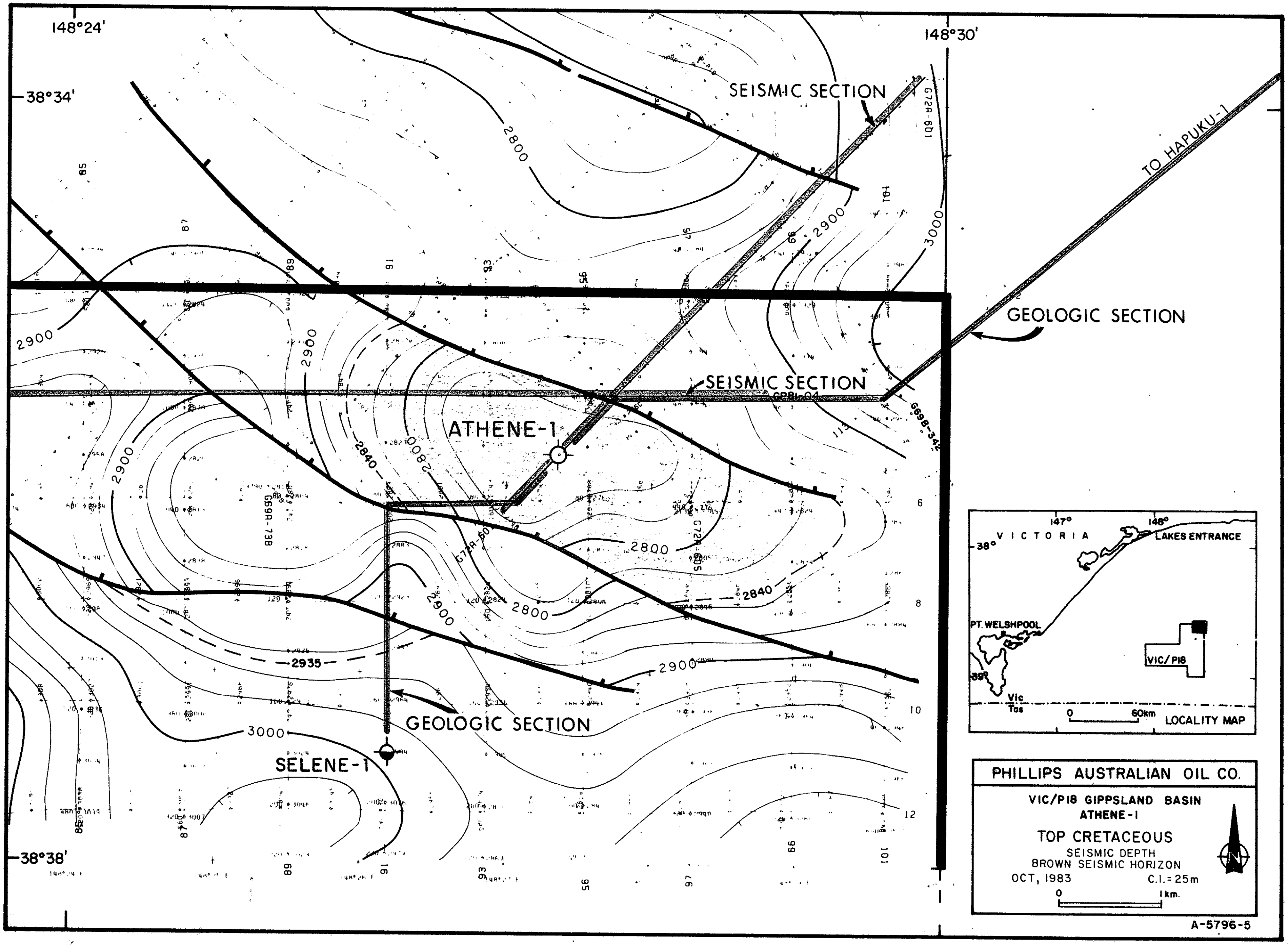

FIGURE 15

INTERPRETATIVE

PE905137

This is an enclosure indicator page.
The enclosure PE905137 is enclosed within the container PE902547 at this location in this document.

The enclosure PE905137 has the following characteristics:

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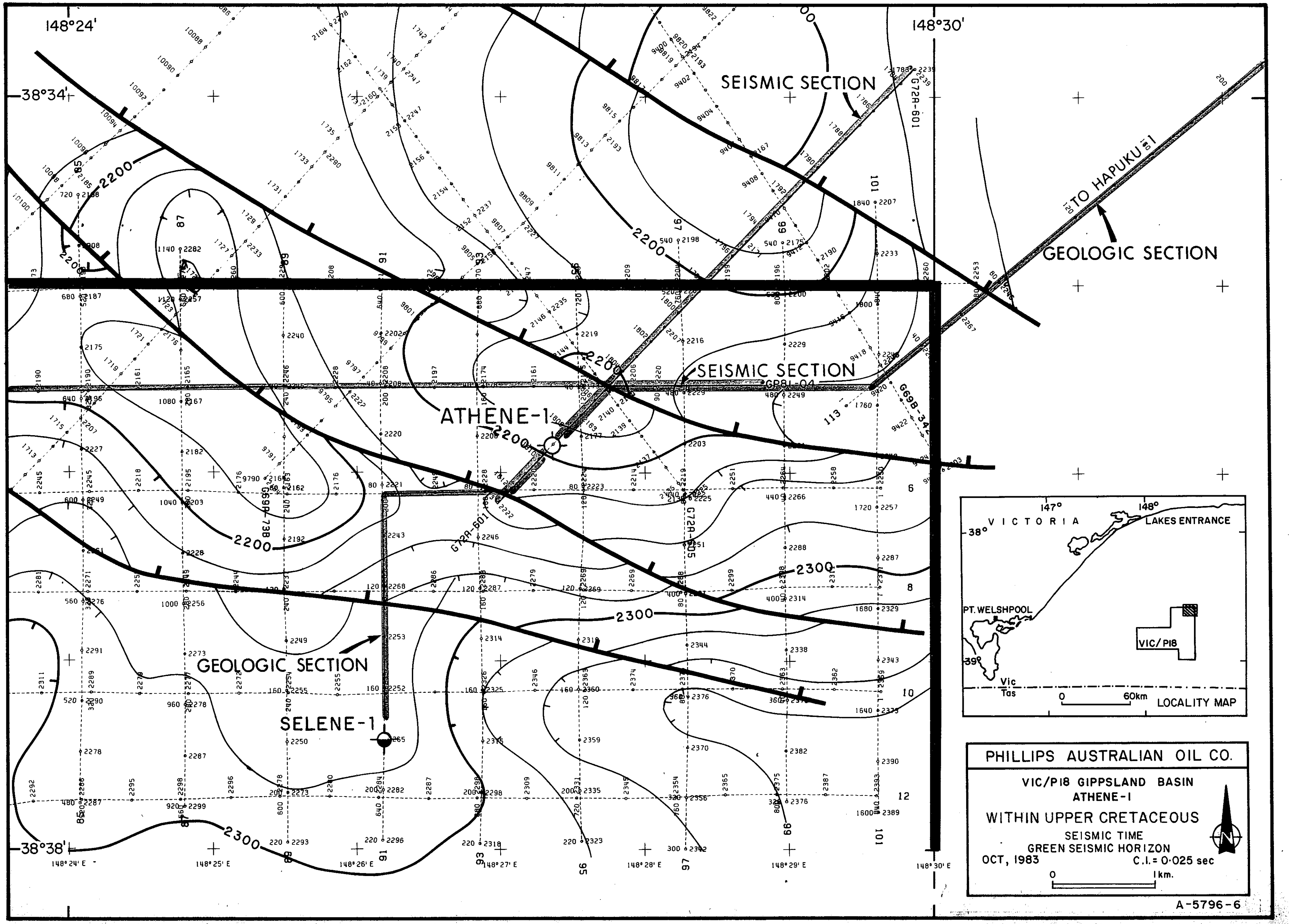
CONTAINER_BARCODE = PE902547
NAME = Within Upper Cretaceous Seismic Time Map
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = HRZN_CONTR_MAP
DESCRIPTION = Athene-1 Within Upper Cretaceous Seismic Time Map, Green Seismic Horizon (C.I.=0.025 sec). Figure 16 of WCR.
REMARKS =
DATE_CREATED = 31/10/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)

INTERPRETATIVE



PHILLIPS AUSTRALIAN OIL CO.

VIC/P18 GIPPSLAND BASIN
ATHENE-1

WITHIN UPPER CRETACEOUS

SEISMIC TIME
GREEN SEISMIC HORIZON

OCT, 1983
C.I.= 0·025 sec

A-5796-6

FIGURE 16

PE905138

This is an enclosure indicator page.
The enclosure PE905138 is enclosed within the container PE902547 at this location in this document.

The enclosure PE905138 has the following characteristics:

ITEM_BARCODE = PE905138
CONTAINER_BARCODE = PE902547
NAME = Within Upper Cretaceous Seismic Depth Map
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = HRZN_CONTR_MAP
DESCRIPTION = Athene-1 Within Upper Cretaceous Seismic Depth Map, Green Seismic Horizon (C.I.=25 m). Figure 17 of WCR.
REMARKS =
DATE_CREATED = 31/10/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)

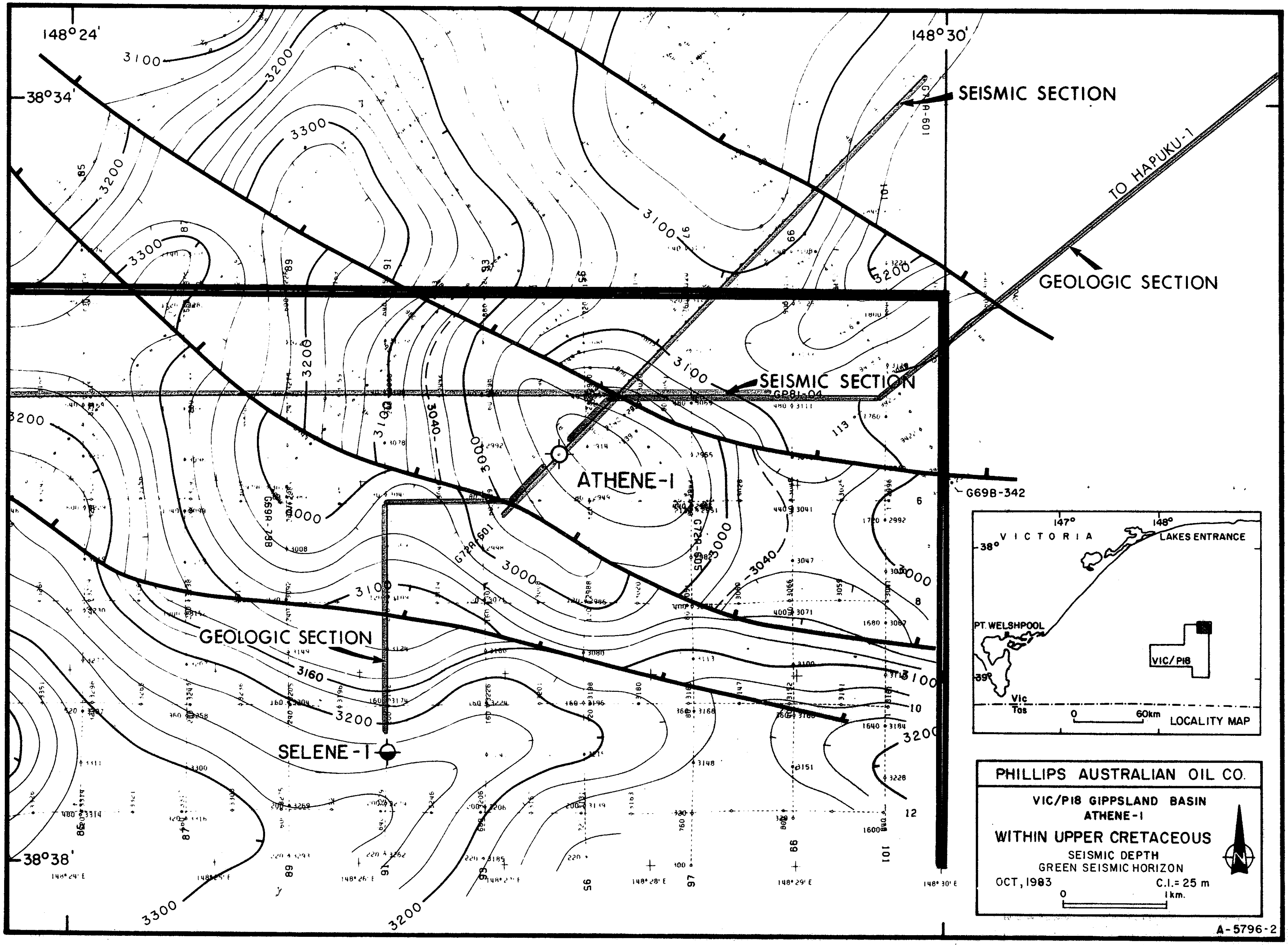


FIGURE 17

INTERPRETATIVE

There is a significant difference between the predicted and actual formation tops and depths to seismic horizons. The Top Latrobe Group (seismic orange horizon) was penetrated at 2755 metres, 202 metres deeper than the predicted depth of 2553 metres. Two-way time is 1.902 seconds. A revised post-drilling Top Latrobe Group (orange seismic horizon) depth map (Figure 18) of the Athene area demonstrates that 18 metres closure is developed at this level.

After drilling Athene No. 1 it was determined that the brown seismic horizon at this location shows no character on the velocity log and nothing distinguishable in terms of lithology, or electric log signature. Potential "lower delta plain" sealing units identified on the color impedance profiles were non-existent. Consequently, post-drill remapping of the brown horizon was not attempted and the position of this horizon is not displayed in Figures 10A and 11A. The intra-Latrobe horizon mapped as the brown seismic marker (two-way time 2.081 seconds) had a predicted depth of 2760 metres. The actual computed depth from the time-depth plot is 2945 metres, 185 metres low to the predicted depth.

The green seismic horizon (two-way time 2.177 seconds) had a predicted depth of 2937 metres. The actual depth corresponding to the two-way time seismic pick is 3132 metres, which is 195 metres low to the predicted depth. However, based on correlation with the Selene No. 1 well, it is apparent that the green horizon was incorrectly correlated across the fault blocks in the Athene area, and lies much deeper than originally picked (Figures 10A and 11A). Depth to the correct position of the green marker is estimated to be 3570 metres, on the basis of correlation to the Selene No. 1 well. Remapping of the green horizon (Figure 19) demonstrates that no closure exists in the Athene area.

FIGURES 18 & 19 to follow

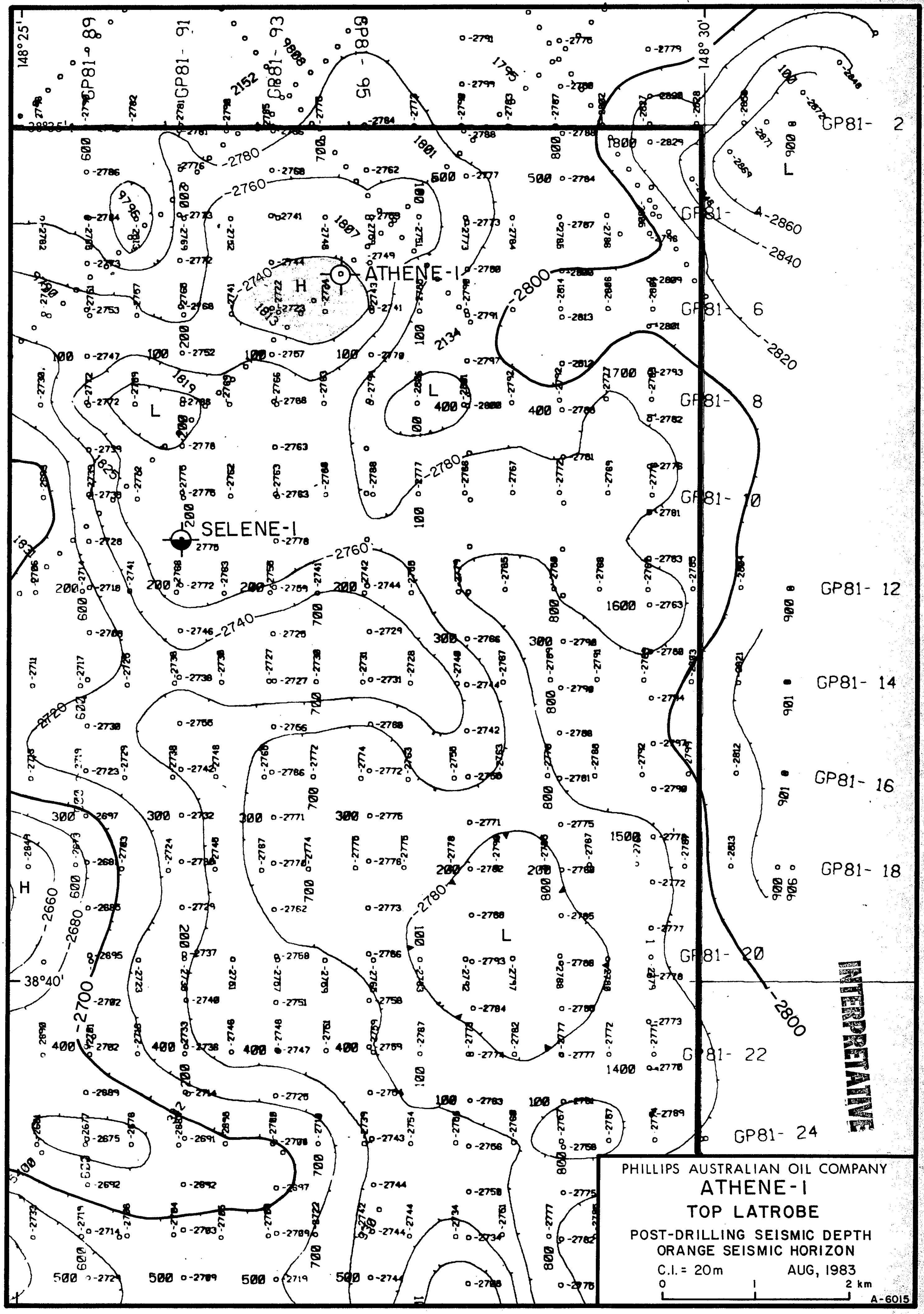
PE905139

This is an enclosure indicator page.
The enclosure PE905139 is enclosed within the container PE902547 at this location in this document.

The enclosure PE905139 has the following characteristics:

ITEM_BARCODE = PE905139
CONTAINER_BARCODE = PE902547
NAME = Top Latrobe Post-Drilling Seismic Depth
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = HRZN_CONTR_MAP
DESCRIPTION = Athene-1 Top Latrobe Post-Drilling Seismic Depth Map, Orange Seismic Horizon (C.I.=20 m). Figure 18 of WCR.
REMARKS =
DATE_CREATED = 31/08/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)



PHILLIPS AUSTRALIAN OIL COMPANY

ATHENE-1

TOP LATROBE

POST-DRILLING SEISMIC DEPTH
ORANGE SEISMIC HORIZON

C.I. = 20m AUG, 1983

FIGURE 18

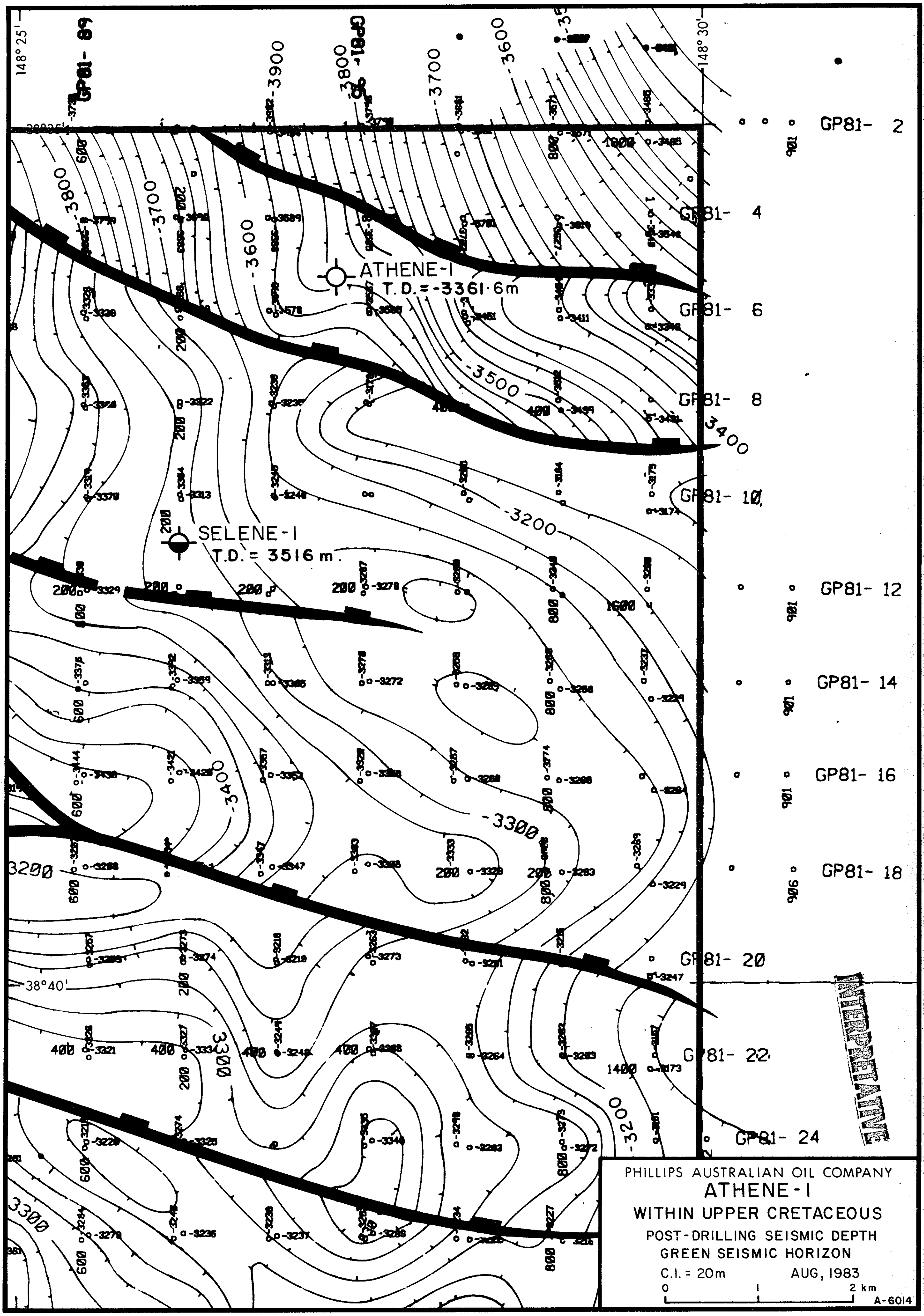
PE905140

This is an enclosure indicator page.
The enclosure PE905140 is enclosed within the container PE902547 at this location in this document.

The enclosure PE905140 has the following characteristics:

ITEM_BARCODE = PE905140
CONTAINER_BARCODE = PE902547
NAME = Within Upper Cretaceous Post-Drilling Depth
BASIN = GIPPSLAND
PERMIT = VIC/P18
TYPE = SEISMIC
SUBTYPE = HRZN_CONTR_MAP
DESCRIPTION = Athene-1 Within Upper Cretaceous Post-Drilling Seismic Depth Map, Green Seismic Horizon (C.I.=20 m). Figure 19 of WCR.
REMARKS =
DATE_CREATED = 31/08/1983
DATE_RECEIVED = 15/11/1983
W_NO = W817
WELL_NAME = Athene-1
CONTRACTOR =
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)



PHILLIPS AUSTRALIAN OIL COMPANY
ATHENE-1
WITHIN UPPER CRETACEOUS
POST-DRILLING SEISMIC DEPTH
GREEN SEISMIC HORIZON
C.I. = 20m AUG, 1983

FIGURE 19

INTERPRETATIVE

RELEVANCE TO THE OCCURRENCE OF HYDROCARBONS

Hydrocarbon Indicators

Hydrocarbon indicators were monitored throughout the drilling of Athene No. 1. Cuttings samples were examined under black-light for primary fluorescence and tested under solvent for cut fluorescence. A continuous record of gas-in-mud readings was maintained by Geoservices Inc. Total gas determinations and chromatographic analysis was conducted using a flame ionization detector with a gas chromatograph as backup.

No significant hydrocarbon shows occurred in Athene No. 1. Fluorescence and cut were recorded in three sidewall cores within the condensed sequence of the Colquhoun, Gurnard and Flounder Formations. All three shows occur within very fine-to-fine grained glauconitic sandstones that exhibit poor visual porosity. The neutron-density curves indicate a relative porosity increase at 2778.5 metres and 2773.5 metres, with respect to the rest of the tight condensed sequence. Very poor sporadic oil shows were logged during the drilling of the condensed sequence between 2784 metres and 2840 metres. No fluorescence was observed but in some samples up to 5% of the sandstone grains gave a streaming white cut leaving a very faint white residue. These shows are interpreted as being due to residual hydrocarbons.

The only other shows were observed in dolomitized sandstone within the interval 3285 metres to 3298.5 metres. In these shows there was no hydrocarbon fluorescence but 5% of the grains gave a moderately fast white-to-golden yellow cut, leaving a faint white ring. These very poor shows were also interpreted as being due to residual hydrocarbons.

Shows observed from sidewall cores are described as follows:

DEPTH (RKB)	DESCRIPTIONS
2773.5 metres	Bright golden-yellow fluorescence on 50% of grains. In patches, covering 15% of the core. Slow milky-yellow cut leaving extremely faint yellow ring. Trace C_1 only, over the interval 2770 metres to 2775 metres.
2778.5 metres	Moderate-to-golden yellow fluorescence on 40% of grains. In patches covering 10% of the core. Slow milky-yellow cut leaving faint pale yellow ring. Trace C_1 only, over the interval 2775 metres to 2780 metres.
2788.5 metres	Moderately-bright golden-yellow fluorescence on 50% of grains. In patches covering 15% of the core. Slow milky-yellow cut leaving very pale yellow ring. 0.16% C_1 and 0.026% C_2 over the interval 2785 metres to 2790 metres.

INTERPRETATIVE

Reservoir Rock Characteristics

Potential reservoir intervals in Athene No. 1 are contained within the Maastrichtian Latrobe Coarse Clastics. A log analysis is presented in Appendix 8 and a Computer Log Analysis Plot is presented in Enclosure 5. Reservoir rocks in Athene No. 1 are divided into six zones for comment.

The uppermost zone extends from the intra-Lakes Entrance Formation 'Cobia Event' at 2713 metres to the top of the Latrobe Coarse Clastics at 2860 metres, and includes the basal Lakes Entrance, Colquhoun, Gurnard and Flounder Formations. Sandstones deposited within this marginal marine environment range in thickness from 7 metres to less than 1 metre, however log-derived effective porosity only consistently exceeds 10% below 2810 metres. The condensed sequence below 2810 metres is comprised of clay-choked unconsolidated medium-to-coarse grained sandstone and interbedded siltstone, silty sandstone and claystone of the Flounder Formation. Log-derived porosities in the overlying Gurnard, Colquhoun and Lakes Entrance Formations do not consistently exceed 10% and sidewall cores indicate poor visual porosity within these intervals. A sidewall core shot at 2838.5 metres recovered fine-to-very coarse grained glauconitic sandstone with poor visual porosity. Log-derived porosities average 12%, and it is considered that the effects of clay and glauconite artifically upgrade the porosity determinations. A similar section was drillstem tested in the Helios No. 1 well and permeability was found to be extremely low. The interval should therefore be considered as a sealing unit rather than a reservoir unit. Sands within this zone were 100% water saturated.

The second zone extends from 2860 metres to 3138 metres and includes the shallow marine/nearshore marine environment of deposition in the Athene No. 1 well. Very fine-to-very coarse grained unconsolidated sandstone with traces of siltstone, silty sandstone and claystone characterize the lithology of this potential reservoir section. Individual sands range in thickness from less than 1 metre to 45 metres and have good-to-excellent visual porosity. Log-derived porosities are excellent, averaging 22%. Water saturations below 100% were calculated in the interval 3125 metres to 3130 metres, where four individual sands each less than 1 metre thick have calculated water saturations ranging from 87% to 94%. This interval was not associated with any hydrocarbon show during drilling.

Medium-to-very coarse grained sandstone with trace siltstone and silty sandstone dominate the interval between 3138 metres and 3220.5 metres. Being well sorted and clean, these beach barrier sands have the best reservoir characteristics in Athene No. 1. Log-derived porosities average 20% for the entire 82.5 metres of the unit. No sidewall cores were shot in this interval. Calculated water saturations are all 100%.

The fourth interval extends from 3220.5 metres to 3272.5 metres and comprises back barrier/lagoonal sandstone with minor interbedded very fine-to-fine grained dolomitic sandstone, siltstone, silty sandstone and trace claystone. The sandstone is medium-to-very coarse grained, moderate-to-well sorted and has excellent visual porosity. Sands range in thickness from 7 metres to less than 1 metre. Log-derived porosities range from 10% to 22% with the average being 18%. The presence of dolomite-cemented sandstone indicates the existence of reservoir diagenesis. Lithologies affected by dolomitization have their effective porosities reduced to zero. Sidewall cores shot in this interval indicate poor visual porosity for the very fine-to-fine grained sandstones. At 3262.25 metres, 3267.5 metres and 3273.25 metres a water saturation of between 95% and 99% was calculated. Each zone however was less than 0.3 metres thick and was not associated with any hydrocarbon indications. The remaining section is 100% water saturated.

A flood tidal delta environment within the back barrier/lagoonal system is postulated for the interval 3272.5 metres to 3298 metres. The interval is comprised of medium-to-very coarse grained sandstone with excellent visual porosity and trace very fine-to-medium grained dolomitic sandstone, siltstone and silty sandstone. The 25.5 metre sandstone interval is dolomitized in part, but still has reservoir-quality rocks ranging in thickness from 2 metres to 10 metres. Log-derived porosities within these sands average 20%.

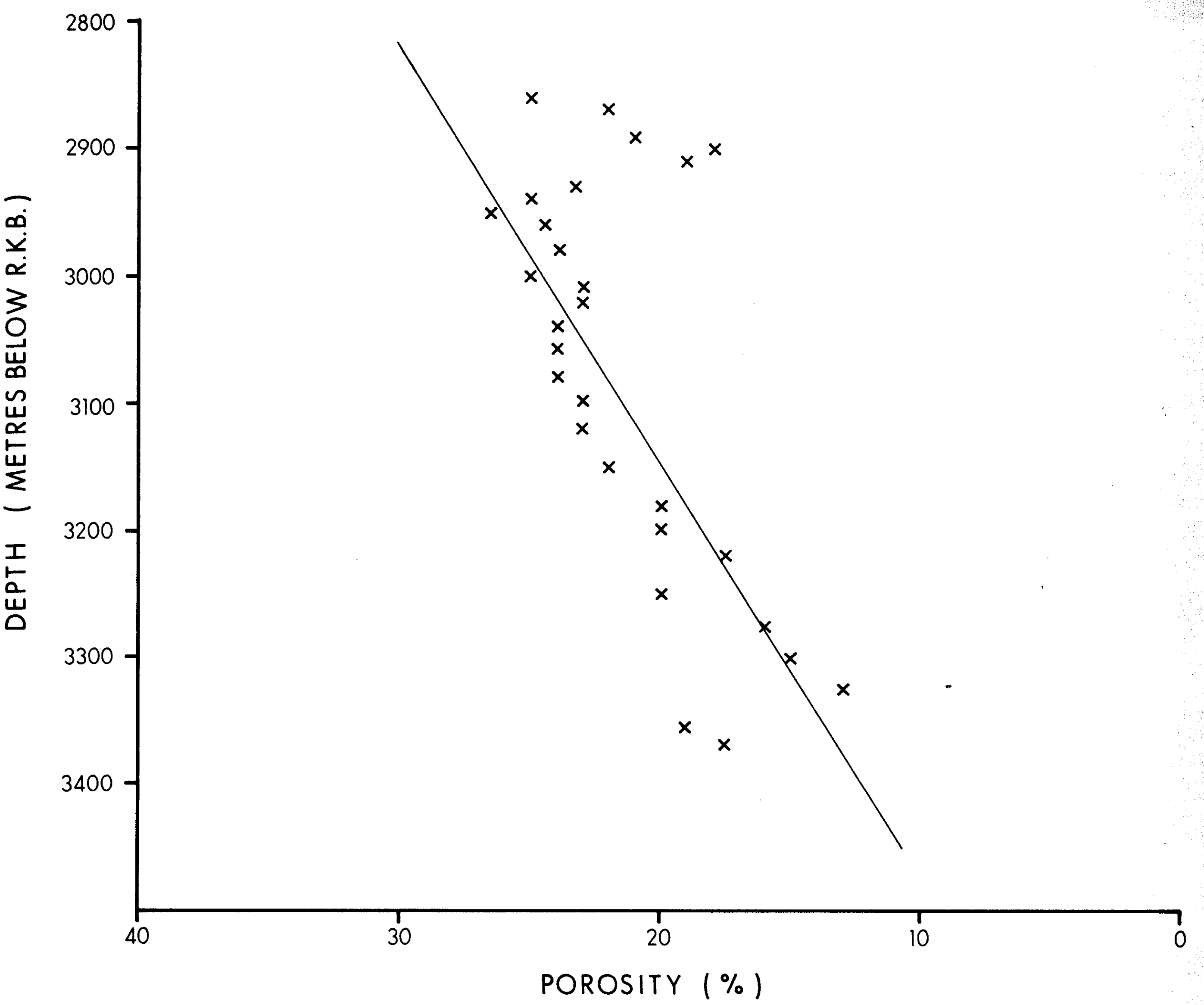
Between 3293 metres and 3296 metres the water saturation averages 85%, with a porosity of 20%. As mentioned in the previous section on hydrocarbon indications, sporadic, very poor residual oil shows were recorded within the interval 3285 metres to 3298.5 metres. All other reservoir quality sands are 100% water saturated. No sidewall cores were shot in this interval.

The lowermost zone of interest lies between 3298 metres and 3384.6 metres in the back barrier/coal swamp-marsh environment. A sequence of interbedded claystone and medium-to-coarse grained sandstones with minor coal, siltstone and dolomitic sandstone dominates this interval. The sandstones vary in thickness from less than 1 metre to 10 metres and have average log-derived porosities of 10%. The maximum log-derived porosity is 18%. All sands are 100% water saturated and side-wall cores indicate poor visual porosity for the dolomitic sandstones. This basal section is considered to be the least prospective of the sediments penetrated below the top of the Latrobe Coarse Clastics in terms of reservoir characteristics.

Figure 20 shows a general linear trend of decreasing porosity with depth throughout the Maastrichtian and Campanian Latrobe Group sediments. Clean uncemented sandstones were selected for this plot to show the effect of compaction.

INTERPRETATIVE

SANDSTONE POROSITY Vs. DEPTH
ATHENE - I



A-6020

FIGURE 20

Source Rock Potential

The hydrocarbon source rock potential of the sedimentary section encountered in Athene No. 1 was evaluated using palynological and vitrinite reflectance data, and borehole temperature measurements.

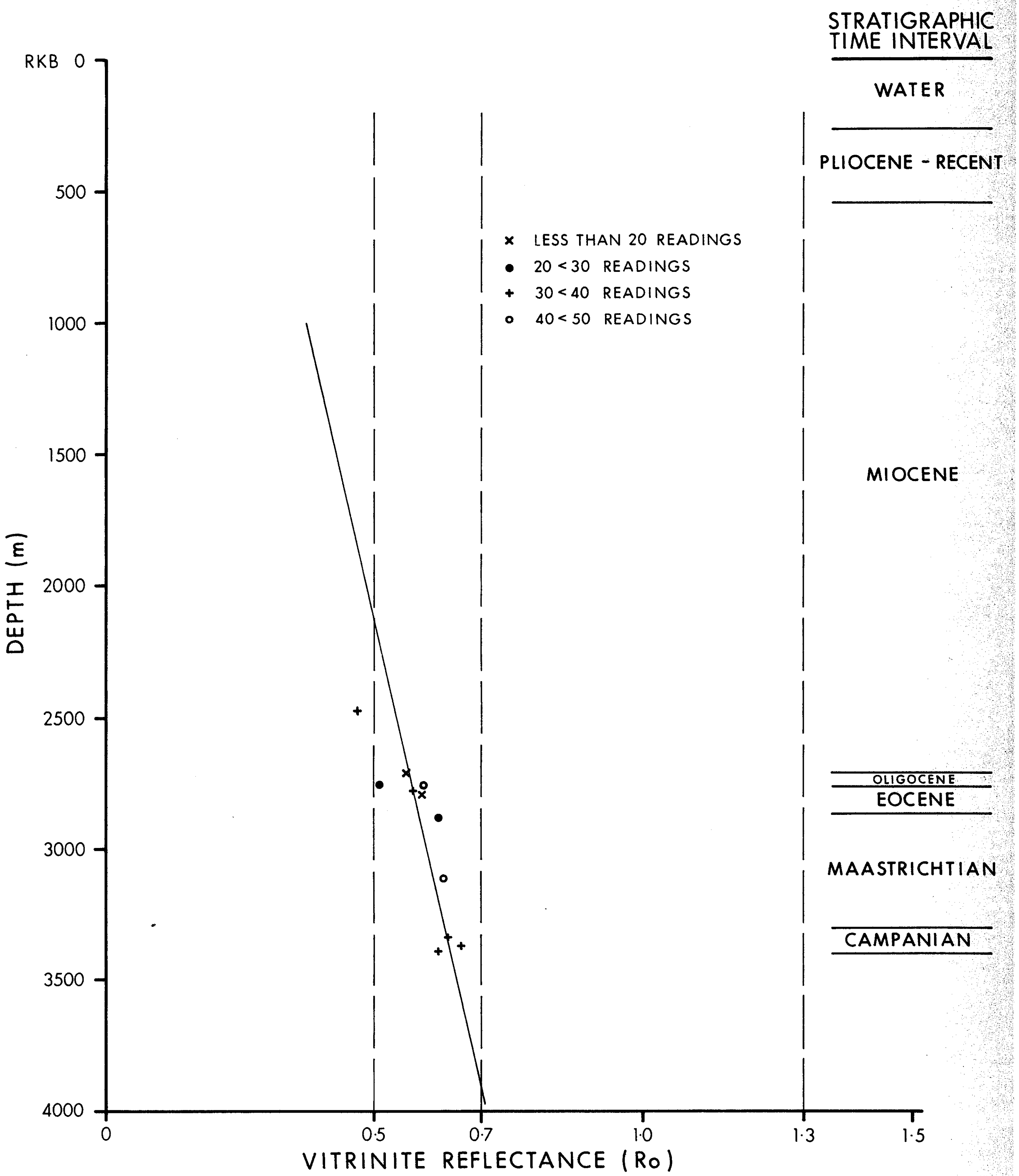
Total organic carbon determinations, pyrolysis, vitrinite reflectance, kerogen and spore coloration studies were carried out on twelve sidewall cores by the Exploration Projects Section of Phillips Petroleum Company (Appendix 7). Of the twelve samples analysed four were from within the 105 metre thick Eocene condensed section and five more samples from within the Maastrichtian to Campanian Latrobe Group section. The remaining three samples were located between the base Gippsland Limestone and the 'Cobia Event' so as to aid in the delineation of the vitrinite reflectance versus depth curve (Figure 21).

Four samples from the Colquhoun, Gurnard and Flounder Formations exhibited poor (less than 0.5%) to moderate (0.5% - 1.0%) levels of total organic carbon content at Athene No. 1. Although the percentage of oil prone kerogen within the three Gurnard and one Flounder Formation samples was 80% or greater, the combination of low S_2 peak, low hydrogen index and poor-to-moderate total organic carbon values indicates that no significant source rock potential exists within this interval.

A sidewall core shot was shot at 2879.5 metres in the Maastrichtian near shore/shallow marine Latrobe Coarse Clastics sediments. As would be expected in this dominantly sandy interval, the source rock potential of this core is negligible. A poor total organic carbon value, low S_2 peak, low hydrogen index value and an oil prone kerogen content of 20% is the basis for this conclusion. It can be concluded that the source rock potential of the entire sandy interval is very poor.

INTERPRETATIVE

VITRINITE REFLECTANCE Vs. DEPTH
ATHENE - I



A-6021

FIGURE 21

The interbedded claystone, sandstone and siltstone between 3100.5 metres and 3114 metres was tested for source rock potential with a sample taken from 3113.5 metres. The siltstone had good (greater than 1%) total organic carbon values but a low hydrogen index and less than 30% oil prone kerogen. Consequently this interval is rated as having no significant source rock potential.

Samples from 3328 metres and 3363.5 metres were the only ones that could be considered potential source rocks. Both have a rich organic carbon content (greater than 1.4%) and a dominance of oil prone kerogen (greater than 60%). These two samples are from within the Campanian back barrier/coal swamp-marsh environment, which elsewhere in the basin is considered to contain good quality source rocks. However, the data obtained from these samples is regarded as being somewhat questionable because of marginal S_2 peak and hydrogen index values, along with the strong possibility that Soltex mud additive contamination is present. Soltex mud additive tends to high grade the oil potential of any sample.

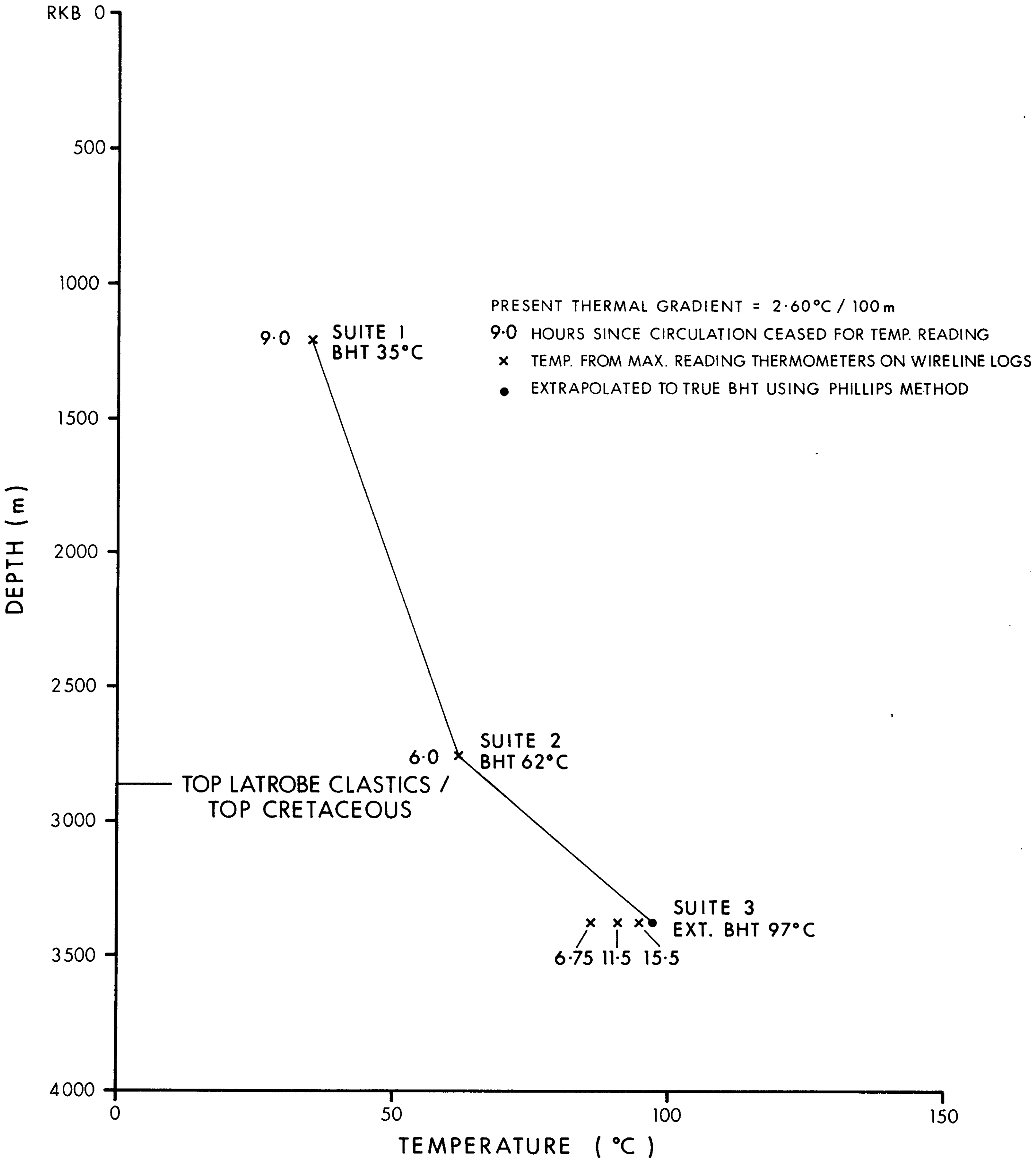
The deepest sample at 3382.5 metres has no significant source rock potential because of its very low organic carbon content of less than 0.16%.

The maximum Ro value of 0.66% is reached at 3363.5 metres and is indicative of an early stage of thermal maturity. Consequently, no significant source rock potential is indicated in any of these samples at their present level of thermal maturity. The onset of the peak zone of liquid hydrocarbon generation (Ro = 0.7% to 1.0%) is reached at approximately 3880 metres by extrapolation from total depth (Figure 21).

The present day geothermal gradient at Athene No. 1 is 2.60°C/100 metres as calculated from the bottom hole temperature at total depth extrapolated to static equilibrium (Figure 22) and assuming a sea floor temperature of 15.5°C.

INTERPRETATIVE

TEMPERATURE Vs DEPTH
ATHENE-1



A-6022

FIGURE 22

INTERPRETATIVE

Summary of Hydrocarbon Significance

1. The lack of significant accumulations of hydrocarbons in Athene No. 1 can be attributed to the following parameters:

   a. Although closure is present at Top Latrobe Group level, it is comprised entirely of non-reservoir section. No closure is developed at the actual top of Latrobe Coarse Clastics level. The three remaining Late Cretaceous intra-Latrobe Group targets all encountered good quality reservoir section. In all cases however, adequate sealing units were absent. The primary intra-Latrobe objective at the "green" mapping horizon level was not reached in the well because of miscorrelation across the southwest bounding fault. This resulted in the horizon being mapped incorrectly.

   b. The only sealing unit within the top 360.5 metres of the reservoir quality Maastrichtian Latrobe Coarse Clastics was intersected between 3100.5 metres and 3114 metres. Lack of hydrocarbon accumulation at this level can be attributed to absence of structural closure and/or immaturity and leanness of adjacent source rocks.

   c. The back barrier/lagoonal/coal swamp-marsh environment sediments between 3220.5 metres and total depth contained a number of reservoir quality sands, each of which was encased in a siltstone or claystone and therefore presumably sealed. Log-derived porosities in this interval range from 10% to 22%. The most likely reason for the lack of hydrocarbons in these sands is the leanness and immaturity of the adjacent source rock section and/or lack of structural closure.

2. Sandstone reservoirs with porosities greater than 20% were evident throughout most of the Maastrichtian Latrobe Group penetrated in Athene No. 1. Exceptionally good reservoirs were found between 2860 metres and 3138 metres, where log-derived porosities averaged 22% and sand thicknesses ranged up to 45 metres. Some 82.5 metres of well sorted, porous beach barrier sand represented the best potential reservoir section in Athene No. 1 in the interval 3138 metres to 3220.5 metres. Permeabilities although not measured are also estimated to be moderate-to-good in the sandstones between 2860 metres and 3220.5 metres.

3. Good quality source rocks lying within the peak oil generation window were not penetrated in Athene No. 1. Vitrinite reflectance data indicate only early stage thermal maturity for Late Cretaceous sediments penetrated at total depth. Based on the well results and on previous evidence, the organically-rich Latrobe Coal Measure sequence must occur at deeper burial depths where a high enough thermal maturity for oil generation may exist.

CONTRIBUTIONS TO GEOLOGICAL KNOWLEDGE

1. The 'Cobia Event' unconformity which occurs at 2713 metres represents the final opening of the deep sea-way between Australia and Antarctica.

2. Early Oligocene sediments occur in Athene No. 1 as the Basal Lakes Entrance Formation, between the overlying 'Cobia Event' unconformity and the underlying Colquhoun Formation.

3. The Late Eocene Colquhoun Formation at Athene No. 1 is conformable with the overlying Early Oligocene sediments. The Colquhoun Formation represents deposition within the tidal zone of an estuary that is subject to a significant marine influence.

4. The late Mid-Eocene Gurnard Formation is separated from the overlying Colquhoun Formation and the underlying Early Eocene Flounder Formation by unconformities. These unconformities reflect the unstable nature of the region during these times, created by the continuing separation of Australia from Antarctica. Gurnard Formation sedimentation took place within the tidal zone of an estuary in close proximity to a beach barrier system.

5. The Early Eocene Flounder Formation is barren of planktonic foraminifera. However, based on a few arenaceous benthonic foraminifera and palynological evidence, the environment of deposition is interpreted to lie in a low salinity part of an estuary. A hiatus of fourteen million years separates the Flounder Formation from the underlying Upper Cretaceous Latrobe Coarse Clastics.

6. Paleocene sediments are absent in Athene No. 1 and Selene No. 1. The Hapuku structure remained a paleo-high throughout the earliest Eocene erosional period.

7. Maastrichtian Latrobe Group sediments are 438 metres thick in Athene No. 1. This sand-dominated interval has excellent reservoir potential. Environments of deposition range from shallow/nearshore marine at the top, to beach barrier-to-back barrier/lagoonal at the base.

8. Athene No. 1 has an anomalously thick condensed sequence (105 metres) and Maastrichtian Latrobe Group section (438 metres) when compared to nearby wells. Structural downwarping contemporaneous with deposition during Maastrichtian and Eocene times may account for the anomalous thicknesses.

9. Back barrier/coal swamp-marsh environments dominated the Campanian section penetrated between 3298 metres and total depth.

REFERENCES

ESSO-BHP:

Hapuku No. 1 Basic Data.

PHILLIPS AUSTRALIAN OIL COMPANY:

Helios No. 1 Well Completion Report.

Selene No. 1 Well Completion Report.

Hermes No. 1 Well Completion Report.

TAYLOR, D., 1983:

The Gippsland Basin Enigma - Top Latrobe. For: Phillips Australian Oil Company

APPENDIX NO. 1

GOVERNMENT APPROVALS

DEPARTMENT OF MINERALS AND ENERGY
PRINCES GATE EAST 151 FLINDERS STREET MELBOURNE, VIC. 3000
TELEPHONE (03) 653 9200 TELEX: MINERG AA 36595

Our Ref.
Your Ref.
Contact
Ext.

6th April 1983

Phillips Australian Oil Company
23rd floor, City Centre Tower
44 St.George's Terrace
PERTH 6000

Dear Sir,

ATHENE 1 - Drilling Application

With reference to and in accordance with your application dated 29 March, 1983, I am to advise that Designated Authority consent under the provisions of Clause 3 of the Directions as to Drilling Operations has been given to the drilling of Athene-1 new field wildcat well, subject to the following conditions -

1. A preliminary abandonment programme shall be submitted to the Designated Authority at least one week prior to submission of the detailed (post final logs) abandonment programme.

2 Where cuttings are recovered, dried samples submitted to the Designated Authority shall each be of a minimum 100 grams in weight.

Yours faithfully,

Ian Fraser
ACTING DIRECTOR
OIL & GAS DIVISION

APPENDIX NO. 2

DAILY DRILLING SUMMARY

Daily Drilling Summary

(Covers previous 24 hour period to 0800 hours on report date)

Date	Total Depth (RKB) Metres (Feet)	Work Performed
20 May, 1983		Rig under tow to Athene No. 1 location at 1930 hours EST. Dropped first anchor on new location at 0200 hrs EST. Workboats ran primary anchors 2 and 6.
21 May, 1983		Workboats ran primary anchors 1, 3, 4, 5, 7 and 8. Workboats set piggyback anchors 2, 3, 4 and 6.
22 May, 1983		Workboats set piggyback anchors 1, 5, 6 and 7. Tested all anchors to 350,000 pounds tension. Set floating guide base on bottom. Final coordinates: Latitude: 38-35-52.1445 south Longitude: 148-27-20.1642 east
23 May, 1983	334m (1095 ft.)	Tagged seabed at 287 metres (942 ft.) RKB. Drilled 36 inch hole to 334 metres (1095 ft) RKB. Ran and cemented 30 ich casing at 330 metres (1081 ft.) RKB.
24 May, 1983	543m (1,780 ft.)	Drilled 26 inch hole to 543 metres (1780 ft.)
25 May, 1983	543m (1780 ft.)	Ran and cemented 20 inch casing at 530 metres (1739 ft.) RKB.
26 May, 1983	543m (1780 ft.)	Assembled and ran BOP/marine riser. Tested to specifications. Okay.

Date	Total Depth (RKB) Metres (Feet)	Work Performed
27 May, 1983	543m (1780 ft.)	Ran in hole with 14-3/4 inch bottom hole assembly to 518 metres. Pushed centralizer junk to side of casing and drilled out cement, casing float collar and casing shoe to 532 metres (1745 ft.). AWU members voted to go on strike. Pulled bit into casing shoe and hung off in wellhead. Secured rig. Drilling operations suspended as of 1730 hours.
28 May, 1983 - 10 June, 1983	543m (1780 ft.)	Drilling operations suspended. AWU workers on strike.
11 June, 1983	543m (1780 ft.)	AWU workers returned to rig. Pulled out of hole with hang off tool. Ran in hole and drilled cement from 532 to 543 metres (1745 - 1781 ft.) and formation from 543 to 547 metres (1781 to 1794 ft.). Pulled out of hole with bit. Ran in hole with test plug and tested BOP's to PAOC's specifications. (Six hours were lost due to waiting on weather).
12 June, 1983	853m (1913 ft.)	Made up 17-1/2 inch bottom hole assembly and ran in hole. Drilled and underreamed from 518 metres to 853 metres (1699-1913 ft.).
13 June, 1983	1067m (3501 ft.)	Drilled and underreamed from 853 metres to 1,067 metres (1913-3501 ft.). Tripped to change underreamer arms at 964 metres (3163 ft.).
14 June, 1983	1207m (3960 ft.)	Drilled and underreamed from 1067 metres to 1,207 metres (3501-3960 ft.). Tripped for bit change at 1143 metres (3750 ft.).

Date	Total Depth (RKB) Metres (Feet)	Work Performed
15 June, 1983	1209m (3967 ft.)	Drilled and underreamed from 1207 metres to 1209 metres (3960-3967 ft.). Circulated and conditioned mud. Pulled out of hole to 20 inch shoe at 530 metres (1739 ft.). Waited on weather to offload logging equipment and 13-3/8 inch casing from workboat.
16 June, 1983	1209m (3967 ft.)	The weather abated and the logging tools and 13-3/8 inch casing were offloaded from the workboat. Circulated and pulled out of hole. Rigged up and ran GR-DIL-SLS and caliper logs from 1209 metres to 530 metres (3967-1739 ft.). Rigged up and started running 13-3/8 inch casing.
17 June, 1983	1209m (3967 ft.)	Finished running and cementing 13-3/8 inch casing with the casing shoe at 1193 metres (3914 ft.). Rigged up and started pulling the BOP and riser to repair a leaking ball joint on the lower marine riser package.
18 June, 1983	1209m (3967 ft.)	Finished pulling BOP. Replaced leaking ball joint. Stump tested BOPs. The lower Hydril would not hold pressure. Since there was no replacement element on board the rig to repair the Hydril, the BOP's were re-run back to the wellhead to avoid delay.
19 June, 1983	1209m (3967 ft.)	Finished running BOP's. Ran in hole with BOP test plug but it would not pass through the lower marine riser package. Pulled lower marine riser package and repaired lower Hydril. Prepared to re-run same.

Date	Total Depth (RKB) Metres (Feet)	Work Performed
20 June, 1983	1209m (3967 ft.)	Re-ran lower marine riser package. Ran in hole with test plug. Plug still would not pass through the lower marine riser package. Pulled lower marine riser package. Set package in moon pool. Tried to run test plug through package. Plug stopped at ball joint. Replaced ball joint. Ran test plug through entire package. Okay. Rigged up to re-run package.
21 June, 1983	1209m (3967 ft.)	Re-ran lower marine riser package. Tested BOP's to PAOC's specifications. Ran in hole with 12-1/4 inch bottom hole assembly and drilled out float shoe, collar and cement to 1193 metres (3,914 ft.). Cleaned out rat-hole to 1209 metres (3967 ft.).
22 June, 1983	1476m (4842 ft.)	Drilled a 12-1/4 inch hole from 1209 metres to 1214 metres (3967-3983 ft.). Performed a formation leak-off test (equivalent mud weight of 14.5 ppg). Drilled from 1214 metres to 1476 metres (3983-4842 ft.).
23 June, 1983	1631m (5351 ft.)	Drilled from 1476 metres to 1490 metres (4842-4888 ft.). Pulled string to change over to turbo drilling bottom hole assembly. Hole surveyed 1 degree at 1490 metres (4888 ft.). Changed out mud pump liners to 6 inches. Ran in hole with turbo drilling assembly and drilled from 1490 metres to 1631 metres (4888-5351 ft.).
24 June, 1983	1925m (6316 ft.)	Drilled with turbo drill from 1631 metres to 1925 metres (5351-6316 ft.). Hole surveyed 0.75 degrees at 1841 metres (6040 ft.).

Date	Total Depth (RKB) Metres (Feet)	Work Performed
25 June, 1983	2117m (6945 ft.)	Drilled with turbo drill from 1925 metres to 2117 metres (6316 -6945 feet).
26 June, 1983	2248m (7375 ft.)	Drilled with turbo drill from 2117 metres to 2248 metres (6945 -7375 ft.). Hole surveyed 3/4 degrees at 2209 metres (7247 ft.)
27 June, 1983	2352m (7716 ft.)	Drilled with turbo drill from 2248 metres to 2257 metres (7375 -7405 ft.). Penetration rate decreased to 10 min/metre (20 ft/hr) due to entering clay formation. Pulled out of hole. Hole surveyed 1/2 degree at 2257 metres (7405 ft.). Laid down turbo-drill assembly and changed over to conventional-toothed bit bottom hole assembly. Drilled from 2257 metres to 2352 metres (7405-7716 ft.) with conventional bit.
28 June, 1983	2530m (8300 ft.)	Drilled from 2352 metres to 2530 metres (7716-8300 ft.).
29 June, 1983	2574m (8445 ft.)	Drilled from 2530 metres to 2544 metres (8300-8346 ft.). Made trip to change bit. Hole surveyed 1/2 degree at 2544 metres (8346 ft.). Tested BOP and other well control equipment. Drilled from 2544 metres to 2574 metres (8346-8445 ft.).
30 June, 1983	2760m (9035 ft.)	Drilled from 2574 metres to 2760 metres (8445-9055 ft.). Circulated and conditioned mud prior to running electric logs.

Date	Total Depth (RKB) Metres (Feet)	Work Performed
1 July, 1983	2760m (9055 ft.)	Pulled to 13-3/8 inch casing shoe and ran in hole to 2758 metres (9048 ft.) reaming tight spots. Heavy cavings of Siltstone. Circulated and conditioned mud. Built mud weight from 10 ppg to 11 ppg to stabilize hole. Deviation survey: 1/4° at 2760 metres (9055 ft.). Rigged up Schlumberger and logged with DIL/SLS/GR/CAL tools.
2 July, 1983	2760m (9055 ft.)	Logged with DIL/SLS/GR/CAL tools. Shot and recovered 21 sidewall cores. Made trip to condition hole and circulate mud prior to running casing.
3 July, 1983	2760m (9055 ft.)	Ran and cemented 9-5/8 inch casing. Casing shoe at 2750 metres (9024 ft.). Tested BOP's.
4 July, 1983	2762m (9062 ft.	Changed to 8-1/2 inch bottom hole assembly and drilled to 2762 metres (9062 ft.). Pressure dropped. Conducted leak-off test. Pulled out of hole looking for drill string washout.
5 July, 1983	2981m (9780 ft.)	Laid down leaking shock sub and ran in hole with new bit. Drilled from 2762 metres to 2981 metres (9062-9780 ft.).
6 July, 1983	3272m (10735 ft.)	Drilled from 2981 metres to 3272 metres (9780-10735 ft.)
7 July, 1983	3385m (11105 ft.)	Drilled an 8-1/2 inch hole from 3272 metres to 3385 metres (10735-11105 ft.). Weather deteriorated. Pulled bit into 9-5/8 inch casing shoe and hung off in well head. Six hours were lost waiting on weather.

Date	Total Depth (RKB) Metres (Feet)	Work Performed
8 July, 1983	3385m (11105 ft.)	Waited on weather for eight hours. Weather abated. Ran in hole and retrieved hang off tool. Ran in hole to 3385 metres (11105 ft.) and conditioned hole for logs. Pulled out of hole. Rigged up Schlumberger and ran DIL/SLS/GR logs from 3385 metres to 2750 metres (11105-9024 ft.).
9 July, 1983	3385m (11105 ft.)	Ran LDL/CNL/GR and HDT logs from 3385 metres to 2750 metres (11105-9024 ft.). Shot 30 sidewall cores. Recovered 26 samples and two empty shells. Two shells were left in the hole. Rigged up S.S.L. for velocity survey. Ran in hole with both tools. Both tools malfunctioned. Four hours were lost waiting on replacement tools.
10 July, 1983	2679m (8788 ft.)	Waited three hours for replacement tools. Ran in hole and conducted velocity survey. Ran in hole and set EZSV squeeze packer at 2720 metres (8925 ft.) with Schlumberger wireline. Ran in hole with stinger on drill pipe. Stung into EZSV packer and established an injection rate of 2 BPM at 2250 psi. Pulled out of EZSV packer. Mixed and pumped 168 sacks of class G cement at 15.8 ppg. Stung into packer and squeezed away 24 bbl of cement below packer. Pulled out and placed 10 bbl of cement on top of packer. Pulled out of hole laying down drill pipe.

Date	Total Depth (RKB) Metres (Feet)	Work Performed
11 July, 1983	317m (1040 ft.)	Retrieved 9-5/8 inch wear bushing and seal assembly. Ran in hole with casing cutter and cut 9-5/8 inch casing at 361 metres (1185 ft.). Ran in hole with 9-5/8 inch casing spear and retrieved 9-5/8 inch casing. Ran in hole with open end drill pipe to 412 metres (1353 ft.). Mixed and pumped 168 sacks of class G cement at 15.8 ppg. Top of plug at 317 metres (1040 ft.). Pulled out of hole. Started pulling BOP stack and riser.
12 July, 1983	P and A	Pulled riser and BOP stack. Made up ICI explosive charge and ran in hole. Detonated charge at 291 metres (954 ft.). Ran in hole with casing spear and retrieved 13-3/8 inch, 20 inch and 30 inch casing with permanent guide frame. Attempted to pull floating guide base. All four guide lines broke when floating guide base reached the surface. The guide base fell back to bottom. Located and attached recovery tools to guide base. Pulled guide base to 61 metres (200 ft.) below splash zone and waited on weather to pull to surface. M/V Handler recovered mooring buoy, pendant line, cement block and anchor.
13 July, 1983	P and A	Attempted to recover floating guide base. Attempts were unsuccessful. Boats recovered piggy back anchors No. 6 and 7 and pendant wires. Seventeen hours were lost waiting on weather to pull anchors.

Date	Total Depth (RKB) Metres (Feet)	Work Performed
14 July, 1983		Recovered floating guide base. Recovered piggyback anchors Nos. 5 and 8. Bolstered main anchors Nos. 5 and 8. Thirteen and one half hours were lost due to waiting on weather.
15 July, 1983		Waited five hours on weather. Lost piggyback anchor No. 1. Bolstered main anchor No. 1. AWU workers held meeting at 0000 hours. Workers voted to go on strike. Boats re-ran main anchors Nos. 1, 5 and 8. All main anchors out with piggybacks on Nos. 2, 3 and 4. Secured rig.

APPENDIX NO. 3

DETAILED CUTTINGS DESCRIPTIONS

APPENDIX NO. 3

DETAILED CUTTINGS DESCRIPTIONS

All depths quoted are below Rotary Kelly Bushing, which is 23 metres above mean sea level and 287 metres above the sea bed. Drill cuttings were collected at 10 metre intervals until 2690 metres, then every 5 metres to Total Depth. No samples were collected above 543 metres.

543 - 597m (54m) : Calcarenite: White to light grey, hard to moderately soft, medium to coarse grained, crystalline, sucrosic texture, calcareous, occasional fossil fragments and platy calcite.

597 - 806m (209m) : Marl: Light grey, very soft, very plastic, sticky, ductile, very calcareous, homogeneous, non fossiliferous with minor interbedded Calcarenite; white to light grey, hard to moderately soft, medium to coarse grained, crystalline, sucrosic texture, calcareous, trace quartz grains, occasional fossil fragments and platy calcite.

806 - 1222m (416m) : Marl: Light grey, very soft, very plastic, sticky, ductile, very calcareous, homogeneous, non fossiliferous, trace platy calcite, oolites and calcispheres.

1222 - 1570m (348m) : Calcarenite: Light to dark grey to brown, moderately hard to moderately soft, massive, moderately well sorted, calcareous, argillaceous and calcareous matrix, non fossiliferous with trace clear to yellow, well rounded, highly spherical, poorly sorted, very fine to coarse grained quartz, with interbedded Marl; light to dark grey, very soft, very plastic, sticky, very calcareous, homogeneous in part, non fossiliferous, highly argillaceous.

1570 - 1765m (195m) : Marl: Light to dark grey, very soft, very plastic, sticky, very calcareous, homogeneous, highly argillaceous in part, non fossiliferous, with interbedded Calcarenite; light to dark grey to brown, hard, massive, moderately well sorted, argillaceous and calcareous matrix, non fossiliferous.

1765 - 1945m (180m) : Marl: Light to dark grey, very soft, very plastic, sticky, very calcareous, homogeneous, highly argillaceous in part, non fossiliferous with minor interbedded Calcarenite; light to dark grey to brown, hard, massive, moderately well sorted, argillaceous and calcareous matrix, non fossiliferous, with minor interbedded Siltstone; black, hard to moderately hard, calcareous and argillaceous matrix, carbonaceous, subfissile.

1945 - 2186m (241m) : Marl: Light to dark grey to white, soft, decrease in plasticity and stickiness with depth, calcareous, abundant to minor very fine grained quartz and silt in the matrix, non fossiliferous, with interbedded Siltstone; black to dark grey, moderately hard to soft, moderate sorting, calcareous, argillaceous matrix, minor very fine grained quartz in the matrix, non fossiliferous, subfissile to fissile in part, with minor Calcarenite; light to dark grey to brown, hard, massive, moderately well sorted, argillaceous and calcareous matrix, non fossiliferous.

2186 - 2264.5m (78.5m) : Claystone: Light grey to white, soft, moderate sorting, calcareous, abundant to minor amounts of silt and very fine to fine grained quartz in matrix, glauconite common with depth, non fossiliferous, abundant oolites and calcispheres with interbedded Siltstone; black to dark grey, moderately hard to soft, moderate sorting, calcareous, argillaceous matrix, minor to abundant very fine to fine grained quartz in matrix, non fossiliferous, subfissile to fissile in part, with interbedded Calcareous Siltstone; black to dark grey, very hard, very well sorted, very calcareous, argillaceous, carbonaceous, non fossiliferous, contorted white lamellae, carbonaceous lamellae, subfissile in part, blocky nature.

2264.5 - 2353m (88.5m) : Claystone: Light grey to white, soft, moderate sorting, calcareous, abundant to minor silt and very fine to fine grained quartz in matrix, abundant to rare very fine to fine grained glauconite, increasing pyrite with depth, abundant oolites and calcispheres, with minor Siltstone; black to dark grey, moderate to good sorting, moderately hard to soft, calcareous, argillaceous, micaceous, abundant to minor very fine grained quartz in matrix, subfissile to fissile, poor visual porosity, with minor Calcareous Siltstone; black to dark grey, very hard, very well sorted, very calcareous, argillaceous, carbonaceous, contorted white lamellae, subfissile in part, blocky nature, poor visual porosity.

2353 - 2428m (75m) : Claystone: Light grey to white, soft, moderate sorting, calcareous, abundant to minor silt and very fine to fine grained quartz in matrix, pyritic, abundant fossil fragments and foraminifera, abundant oolites and calcispheres, with interbedded Siltstone; light to dark grey, hard to soft, moderate sorting, calcareous, slightly argillaceous, some very fine grained quartz in matrix, micaceous, pyritic, abundant fossil fragments and foraminifera, abundant oolites and calcispheres, rare sponge spicules, poor visual porosity.

2428 - 2532.5m (104.5m) : Claystone: Light grey to white, soft, moderate to poor sorting, calcareous, abundant silt and very fine grained quartz in matrix, abundant fossil fragments, oolites and calcispheres, granular pyrite abundant to rare, with minor Siltstone; light to dark grey to olive green, hard to firm, poor to well sorted, calcareous, argillaceous in part, slightly micaceous, pyritic, abundant fossil fragments, oolites and calcispheres, poor visual porosity.

2532.5m - 2578m (45.5m) : Siltstone: Light to dark grey to light to dark olive green, hard to soft, poor to moderate sorting, calcareous, argillaceous, abundant very fine to fine grained quartz in matrix, rare clear, angular, coarse grained quartz in matrix, pyritic, fossil fragments common, subfissile, poor visual porosity, with interbedded Claystone; white to light grey, soft, moderate to poor sorting, calcareous, abundant silt and very fine to fine grained quartz in the matrix, abundant granular pyrite.

2578 - 2679m (101m) : Claystone: White to light grey, soft, moderate to poor sorting, calcareous, abundant silt and very fine to fine grained quartz in matrix, abundant granular pyrite, with interbedded Siltstone; light to dark grey to light to dark olive green, hard to soft, poor to well sorted, calcareous, abundant very fine to fine grained quartz in the matrix, argillaceous, stringers of silt sized pyrite common, subfissile, poor visual porosity.

2679 - 2713m (34m) : Claystone: Light grey to white, soft, poor sorting, calcareous, abundant silt and very fine to fine grained quartz in matrix, abundant to rare granular pyrite, with minor interbedded Siltstone; light to dark grey to light to dark olive green, hard to soft, poor to moderate sorting, well sorted in part, calcareous, abundant very fine to fine grained quartz in the matrix, argillaceous, micaceous, stringers of very fine grained to silt sized pyrite common, subfissile in part, poor visual porosity.

2713 - 2755m (42m) : Siltstone: Light to dark grey to light to dark olive green, very hard to soft, poor to well sorted, calcareous, abundant to rare very fine to fine grained quartz in the matrix, argillaceous in part, micaceous, rare red mica flakes, disseminated silt sized to fine grained pyrite grains common, carbonaceous specks, very fine to fine grained glauconite common, subfissile, abundant fossil fragments and foraminifera, poor visual porosity, with interbedded Claystone; white to light grey, rare pink grains, soft, poor sorting, calcareous, abundant silt and very fine grained quartz in the matrix, glauconitic, pyrite-granular, carbonaceous, abundant fossil fragments and foraminifera, with interbedded Sandstone; light to dark grey to white to tan, moderately hard, very fine grained quartz, poorly sorted, calcareous cement, argillaceous matrix, very silty, carbonaceous in upper section, micaceous, pyritic in lower section, increasing glauconite with depth, abundant fossil fragments and foraminifera, poor visual porosity.

2755 - 2784m (29m) : Siltstone: Light to dark grey, hard to soft, moderately sorted, calcareous, abundant very fine grained quartz in matrix, moderate clay content, abundant fine to medium grained glauconite, pyritic, poor visual porosity, with interbedded Silty Sandstone; light brown to brown, hard, very fine to medium grained quartz, poor sorting, angular to subangular, low sphericity, calcareous cement, silty, glauconitic, pyritic, poor visual porosity, with interbedded Glauconitic Sandstone; dark grey to green, moderately hard to firm to soft, clear, translucent and yellow-red quartz grains, very fine to fine grained, poor to moderate sorting, low to moderate sphericity, calcareous cement, minor clay, silty, very glauconitic, micaceous, minor carbonaceous matter, poor visual porosity, with interbedded Claystone; light grey, soft, poor sorting, abundant silt and very fine grained quartz in the matrix, calcareous, glauconitic, pyritic, minor carbonaceous matter, with interbedded Sandstone; clear to translucent, unconsolidated, medium to very coarse grained quartz, poor to moderate sorting, subangular to rounded, low to high sphericity, glauconitic, pyritic, excellent visual porosity.

2784 - 2860m (76m) : Sandstone: Clear, translucent and minor opaque and yellow quartz grains, unconsolidated, medium to coarse grained, moderate sorting, angular to subrounded, moderate to high sphericity, glauconitic, pyritic, excellent visual porosity with minor interbedded Siltstone; light to dark grey, hard to soft, moderate to poor sorting, very sandy in part, very fine grained quartz in matrix, argillaceous in part, glauconitic, pyritic, poor visual porosity, with minor interbedded Silty Sandstone; light brown to brown, hard, very fine to medium grained, poor sorting, angular to subangular, low sphericity, calcareous cement, silty, glauconitic, pyritic, micaceous, occasional coarse to very coarse, rounded, highly spherical quartz grains becoming dominant towards base of the section, decrease in siltiness with depth, poor visual porosity, with minor interbedded Claystone; light grey, soft, poor sorting, calcareous, abundant silt and very fine grained quartz in the matrix, glauconitic, pyritic, trace carbonaceous material.

2860 - 2925.5m (65.5m) : Sandstone: Clear to translucent with minor opaque and yellow grains, unconsolidated, dominantly fine to coarse grained quartz, moderate to good sorting, angular to rounded, moderate to low sphericity, slightly silty, micaceous, glauconitic, trace carbonaceous material, excellent to fair visual porosity, with minor interbedded Siltstone; light to dark grey to brown, hard to soft, poor sorting, calcareous, very sandy in part, very fine grained quartz in matrix, argillaceous, micaceous, glauconitic, poor visual porosity, with trace interbedded Silty Sandstone; light brown to brown, hard, very fine to medium grained quartz, poor sorting, angular to subangular, low sphericity, calcareous cement, silty, glauconitic, pyritic, poor visual porosity, with trace interbedded Claystone; light grey, soft, poor sorting, calcareous, abundant silt and very fine grained quartz in the matrix, glauconitic, trace carbonaceous material.

2925.5 - 3100.5m (175m)	: Sandstone: Clear to translucent with minor opaque and yellow quartz grains, unconsolidated, very fine to coarse grained, but dominantly medium to coarse grained quartz, very well sorted and clean in part, moderate to good sorting elsewhere, angular to rounded, low to high sphericity, silty in part, trace carbonaceous matter, glauconitic, excellent to fair visual porosity, with trace interbedded Siltstone; light to dark grey to brown, hard to firm, poor sorting, calcareous, very sandy in part - very fine grained quartz in matrix, glauconitic, micaceous, carbonaceous, poor visual porosity, with trace interbedded Silty Sandstone; light brown to brown to grey, hard, very fine to medium grained quartz, poor sorting, angular to subangular, low sphericity, calcareous cement, very silty, glauconitic, pyritic, poor visual porosity.
3100.5 - 3114m (13.5m)	: Claystone: Light grey to white, soft, well sorted, slightly calcareous, minor very fine grained quartz and silt in the matrix, glauconitic, carbonaceous, with interbedded Sandstone; clear to translucent with minor opaque and yellow quartz grains, unconsolidated, medium to very coarse grained, well sorted, angular to rounded, moderate sphericity, excellent visual porosity, with interbedded Siltstone; light grey to light brown, hard to firm to soft, poor to moderate sorting, non calcareous, sandy in part - very fine grained quartz in the matrix, carbonaceous, micaceous, pyritic, subfissile in part, poor visual porosity, with interbedded Silty Sandstone; light to dark grey to brown, hard to firm, very fine to fine grained clear to translucent quartz, moderate to poor sorting, angular to subangular, low sphericity, non calcareous cement, very silty, minor clay in matrix, glauconitic, micaceous, carbonaceous, pyritic, poor visual porosity.

3114 - 3138m : Sandstone: Clear to translucent with minor opaque and yellow quartz grains, unconsolidated, medium to very coarse grained, well sorted, angular to rounded, moderate sphericity, excellent visual porosity, with minor interbedded Siltstone; light grey to light brown, hard to firm to soft, poor to moderate sorting, non calcareous, sandy in part - very fine grained quartz in the matrix, carbonaceous, micaceous, minor pyrite, minor glauconite, subfissile in part, poor visual porosity, with minor interbedded Silty Sandstone; light to dark grey to brown, hard to firm, very fine to fine grained clear to translucent quartz, moderate to poor sorting, angular to subangular, low sphericity, non calcareous cement, very silty, minor clay in matrix, minor glauconite, minor pyrite, micaceous, carbonaceous, poor visual porosity.
(24m)

3138 - 3220.5m: Sandstone: Clear with minor opaque and yellow grains, unconsolidated, medium to very coarse grained quartz, well sorted, angular to rounded, moderate sphericity, excellent visual porosity with trace interbedded Siltstone; light grey to light brown, hard to firm, moderate sorting, sandy in part - very fine grained quartz in matrix, carbonaceous, micaceous, poor visual porosity, with trace interbedded Silty Sandstone; light to dark grey to brown, hard to firm, very fine to fine grained quartz, poor sorting, angular to subangular, low sphericity, calcareous cement, very silty, trace pyrite, poor visual porosity.
(82.5m)

3220.5 - 3272.5m (52m) : Sandstone: Clear to translucent with minor opaque quartz grains, unconsolidated, medium to very coarse grained, moderate to well sorted, angular to rounded, moderate to low sphericity, excellent visual porosity, with minor interbedded Dolomitic Sandstone; clear to white to translucent quartz grains, hard, very fine to fine grained quartz, moderate to poor sorting, angular to subangular, moderate to low sphericity, dolomite cement, silty and argillaceous matrix, fine to very fine grained glauconite common, abundant silt sized pyrite, carbonaceous, poor visual porosity, with minor interbedded Siltstone; light grey to light brown, hard to firm, moderate to poor sorting, slightly calcareous, very fine grained quartz in the matrix, minor clay in the matrix, carbonaceous, micaceous, pyritic, trace glauconite, poor visual porosity, with minor interbedded Silty Sandstone; light to dark grey to brown, hard to firm, very fine to fine grained quartz, poor sorting, angular to subangular, low sphericity, calcareous cement, very silty, glauconitic, poor visual porosity, with minor interbedded Claystone; light grey to white, soft, well sorted, slightly calcareous, minor very fine grained quartz and silt in matrix, carbonaceous, glauconitic.

3272.5 - 3298m (25.5m) : Sandstone: Clear to translucent with minor opaque and yellow quartz grains, unconsolidated, medium to very coarse grained quartz, moderate to well sorted, angular to rounded, moderate to low sphericity, excellent visual porosity, with trace interbedded Dolomitic Sandstone; clear quartz, hard, very fine to medium grained quartz, moderate sorting, angular to subangular, low sphericity, dolomite cement, increasing cementation with depth, silty and argillaceous matrix, carbonaceous, glauconitic, poor visual porosity with trace interbedded Siltstone; light grey to light brown, hard to firm, moderate sorting, sandy in part - very fine grained quartz in the matrix, carbonaceous, micaceous, pyritic, poor visual porosity, with trace interbedded Silty Sandstone; light to dark grey to brown, hard to firm, very fine to fine grained quartz, poor sorting, angular to subangular, low sphericity, calcareous cement, very silty, glauconitic, poor visual porosity.

3298 - 3384.5m: Claystone: Light grey to brown, soft, moderate to well sorted, slightly calcareous, very fine grained quartz abundant in part, carbonaceous, with interbedded Sandstone; clear to translucent quartz grains, unconsolidated, medium to coarse grained, moderate to well sorted, angular to rounded, low to moderate sphericity, excellent visual porosity, with minor interbedded Coal; black, vitreous lustre, hard, blocky or fissile in part, conchoidal fracture in part, with minor interbedded Siltstone; dark grey to brown to black, hard to firm, moderate to poor sorting, dolomitic, very fine to medium grained quartz abundant in matrix in part, moderate to very high clay content, pyritic, carbonaceous streaks, slightly micaceous, subfissile in part, poor visual porosity, with minor interbedded Dolomitic Sandstone; clear to translucent quartz, hard, very fine to medium grained quartz, moderate to poor sorting, angular to subangular, low sphericity, dolomite cement, rare to abundant silt in the matrix, slightly argillaceous, rare glauconite, poor to fair visual porosity.

(86.6m)

APPENDIX NO. 4

SIDEWALL CORE DESCRIPTIONS

SIDEWALL CORE SUMMARY

Suite No.	Run No.	Attempted	Received	Depth
2	2	21	21	1192m - 2754m
3	4	30	26	2756m - 3382.5m

PHILLIPS AUSTRALIAN OIL COMPANY

SIDEWALL CORE DESCRIPTION

WELL ATHENE-1 INTERVAL 2756m - 3382.5m DATE 8/7/83 PAGE 1

SWC ATTEMPTED 30 RECEIVED 26 MISSFIRES 0 NO RECOVERY 4

RUN No. Suite 3, Run 4 GEOLOGIST J. Garrity

DEPTH in metres	LENGTH RECVD	DESCRIPTION	ODOR	STAIN	FLUORESCENCE Brightness Colour	CUT Type Colour
3382.5	1.25 cm	Sandstone with Carbonaceous Stringers: Sandstone: Light grey, clear to translucent quartz, friable, unconsolidated, very fine to fine grained, angular to subangular, good sorting, low to moderate sphericity, no reaction with 50% HCL, trace clay and silt in matrix, no fossils, abundant black carbonaceous specks, trace glauconite?, fair porosity. Carbonaceous Stringers: Brown, soft, clay to silt size grains, homogeneous, slightly calcareous, poor visual porosity.	-	-	-	-
3375	0.75 cm	Silty Sandstone: Dark grey, clear to translucent quartz, friable, very fine grained, subangular to subrounded, moderate sorting, low sphericity, dolomitic?, abundant silt and minor clay in matrix, no fossils, carbonaceous specks, micaceous, poor visual porosity.	-	-	-	-
3363.5	1 cm	Siltstone: Dark brown to black, firm to soft to hard, silt size grains, very poor sorting, abundant very fine to fine to medium grained, clear, angular to subangular quartz grains, moderate to low sphericity, occasional very coarse grained, well rounded, high sphericity quartz grains, dolomitic?, very carbonaceous, micaceous, moderately argillaceous, poor visual porosity.	-	-	-	-
3328	1.75 cm	Siltstone: Very dark grey to brown, hard to firm, silt size quartz, hard to firm, dolomitic?, moderately well sorted ,minor clay, very fine to fine grained quartz common in matrix, micaceous, very pyritic - siltsize, carbonaceous, no fossils, very poor visual porosity.	-	-	-	-

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SIDEWALL CORE DESCRIPTION

WELL ATHENE-1 INTERVAL 2756m - 3382.5m DATE 8/7/83 PAGE 2

SWC ATTEMPTED 30 RECEIVED 26 MISSFIRES 0 NO RECOVERY 4

RUN No. Suite 3, Run 4 GEOLOGIST J. Garrity

DEPTH in metres	LENGTH RECVD	DESCRIPTION	ODOR	STAIN	FLUORESCENCE Brightness Colour	CUT Type Colour
3315	0.5 cm	<u>Sandstone</u>: Light to dark grey, firm to soft, very fine grained, clear to translucent quartz, angular to subrounded, low sphericity, moderately well sorted, dolomitic, minor silt and clay matrix, no fossils, micaceous, pyritic, carbonaceous specks, poor visual porosity.	-	-	-	-
3302.5	0.5 cm	<u>Sandstone</u>: Light to dark grey, soft to firm, very fine to fine grained, clear to translucent quartz grains, angular to subangular, moderately well sorted, low sphericity, dolomitic, minor silt in matrix, no fossils, pyritic, carbonaceous, poor visual porosity.	-	-	-	-
3296	0	No recovery - Formation too hard ? dolomitic.	-	-	-	-
3291	0	No recovery - Formation too hard ? dolomitic.	-	-	-	-
3258.5	0.5 cm	<u>Siltstone</u>: Light grey to brown, firm to soft, silt size quartz grains, moderate to poor sorting, slightly calcareous, abundant very fine grained translucent quartz grains in matrix, very minor clay, pyritic, carbonaceous, trace glauconite, poor visual porosity.	-	-	-	-
3231	0.75 cm	<u>Sandstone</u>: Light to dark grey, soft to firm, very fine to fine grained translucent to clear quartz grains, angular to subangular, low sphericity, dolomitic, silty, micaceous, carbonaceous, abundant silt sized pyrite, glauconite - fine to very fine grained common, poor visual porosity.	-	-	-	-
3113.5	0.75 cm	<u>Siltstone</u>: Dark grey, hard to soft, silt size quartz grains, poor to fair sorting, dolomitic, abundant very fine grained quartz, abundant silt size pyrite, abundant mica in part, carbonaceous, occasional granular pyrite - very hard, subfissile in part, poor visual porosity.	-	-	-	-

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SIDEWALL CORE DESCRIPTION

WELL ATHENE-1 INTERVAL 2756m - 3382.5m DATE 8/7/83 PAGE 3

SWC ATTEMPTED 30 RECEIVED 26 MISSFIRES 0 NO RECOVERY 4

RUN No. Suite 3, Run 4 GEOLOGIST J. Garrity

DEPTH in metres	LENGTH RECVD	DESCRIPTION	ODOR	STAIN	FLUORESCENCE Brightness Colour	CUT Type Colour
3108	0.75 cm	Sandstone: Dark grey, soft to firm, very fine to fine grained quartz, translucent to clear, angular to subangular, low sphericity, poor sorting, dolomitic?, silty, micaceous, pyritic, no fossils, poor visual porosity.	-	-	-	-
3103.5	0.5 cm	Silty Sandstone: Dark grey to black, soft to firm, very fine grained, translucent to clear quartz, angular to subangular, moderate to poor sorting, low sphericity, silty, minor clay, micaceous, pyritic, carbonaceous, no fossils, poor visual porosity.	-	-	-	-
3084	0.5 cm	Sandstone: Clear to white, soft, unconsolidated, very fine to coarse grained, angular to subrounded, poorly sorted, low to high sphericity, very silty in part, no fossils, trace carbonaceous matter, poor visual porosity.	-	-	-	-
2940.5	1 cm	Sandstone: Clear to translucent to yellow quartz grains, unconsolidated, medium to coarse grained, subangular to rounded, moderate to well sorted, moderate to high sphericity, slightly silty, no fossils, trace glauconite, trace carbonaceous material, good visual porosity.	-	-	-	-
2904.5	1.25 cm	Sandstone: Light grey, unconsolidated, fine to very coarse grained quartz, dominantly medium to coarse grained, angular to subangular, some larger grains well rounded, poor sorting, micaceous, carbonaceous in part, trace glauconite, moderate visual porosity.	-	-	-	-
2879.5	2 cm	Sandstone: Light grey, clear to translucent quartz grains, unconsolidated, dominantly fine to medium grained, angular to subangular, occasional subrounded to rounded coarse grained quartz, moderately well sorted, low sphericity, slightly silty, no fossils, micaceous, carbonaceous in part, glauconitic, pyritic, moderate visual porosity.	-	-	-	-

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SIDEWALL CORE DESCRIPTION

WELL ATHENE-1 INTERVAL 2756m - 3382.5m DATE 8/7/83 PAGE 4
SWC ATTEMPTED 30 RECEIVED 26 MISSFIRES 0 NO RECOVERY 4
RUN No. Suite 3, Run 4 GEOLOGIST J. Garrity

DEPTH in metres	LENGTH RECVD	DESCRIPTION	ODOR	STAIN	FLUORESCENCE Brightness Colour	CUT Type Colour
2857.5	0	No Recovery.	-	-	-	-
2838.5	1.75 cm	<u>Glauconitic Sandstone</u>: Green, hard, fine to very coarse grained quartz and glauconite grains, dominantly medium to coarse grained, angular to subangular, poor sorting, low sphericity, dolomitic?, slightly silty, abundant weathered mica, no fossils, poor visual porosity, >30% glauconite.	-	-	-	-
2788.5	1.25 cm	<u>Glauconitic Sandstone</u>: Dark grey-green, hard, dominantly fine to very fine quartz and glauconite grains, angular to subangular, low sphericity, poor to moderate sorting, slightly calcareous cement, silty, no fossils, poor visual porosity, 20% glauconite.	-	-	Moderately Bright Golden Yellow on 50% of Grains in Patches Covering 15% of Core	Slow Milky Yellow Cut Leaving Very Pale Yellow Ring
2786.5	1 cm	<u>Glauconitic Sandstone</u>: Dark grey-green, hard, dominantly fine to very fine quartz and glauconite, angular to subangular, low sphericity, poor to moderate sorting, calcareous cement, occasional coarse to very coarse rounded, highly spherical quartz grains, slightly silty, no fossils, micaceous, slightly carbonaceous, poor visual porosity, 40% glauconite.	-	-	-	-
2780	2 cm	<u>Glauconitic Sandstone</u>: Dark grey-green, hard, very fine to fine grained, clear to translucent and yellow-red quartz grains, angular to subangular, moderate to poor sorting, low sphericity, dolomitic?, very silty, no fossils, micaceous, trace carbonaceous grains, poor visual porosity, 30% glauconite.	-	-	-	-

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SIDEWALL CORE DESCRIPTION

WELL ATHENE-1 INTERVAL 2756m - 3382.5m DATE 8/7/83 PAGE 5
SWC ATTEMPTED 30 RECEIVED 26 MISSFIRES 0 NO RECOVERY 4
RUN No. Suite 3, Run 4 GEOLOGIST J. Garrity

DEPTH in metres	LENGTH RECVD	DESCRIPTION	ODOR	STAIN	FLUORESCENCE Brightness Colour	CUT Type Colour
2778.5	2 cm	<u>Glauconitic Sandstone</u>: Dark grey-green, hard to firm, very fine to fine grained, clear to translucent, and yellow-red quartz grains, angular to subangular, poor sorting, low to moderate sphericity, calcareous cement, silty, no fossils, slightly micaceous, carbonaceous in part, poor visual porosity, 30% glauconite.	-	-	Moderate to golden yellow on 40% of grains in patches covering 10% of core	Cut as per 2788.5, leaving faint pale yellow ring
2777	0	No Recovery.	-	-	-	-
2775.5	1.5 cm	<u>Glauconitic Sandstone</u>: Dark grey-green, hard to firm, very fine to fine grained, clear to translucent and yellow-red quartz, angular to subangular, poor sorting, low to moderate sphericity, calcareous cement, silty, no fossils, micaceous, carbonaceous, poor visual porosity, 50% glauconite.	-	-	-	-
2773.5	2 cm	<u>Glauconitic Sandstone</u>: Dark grey, hard to firm, very fine grained to fine grained, yellow-red iron stained quartz grains, angular to subrounded, poor to moderate sorting, low to moderate sphericity, calcareous cement, silty, some clay, no fossils, micaceous in part, poor visual porosity, 20% glauconite.	-	-	Bright golden yellow on 50% of grains in patches covering 15% of core	Cut as per 2788.5 leaving extremely faint yellow ring
2770	1.75 cm	<u>Glauconitic Sandstone</u>: Dark grey, firm to soft, very fine to fine grained, yellow-light red quartz, angular to subrounded, poor sorting, low to moderate sphericity, calcareous cement, silty, fair clay content, no fossils, slightly micaceous, poor visual porosity, 20% glauconite.	-	-	-	-
2765	2 cm	<u>Sandy Siltstone</u>: Dark grey, firm, dominantly silt size quartz grains, moderate to well sorted, very calcareous, abundant very fine grained quartz in matrix, moderate clay content, no fossils, abundant fine to medium grains of glauconite, pyritic, poor visual porosity.	-	-	-	-

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SIDEWALL CORE DESCRIPTION

WELL ATHENE-1 INTERVAL 2756m - 3382.5m DATE 8/7/83 PAGE 6

SWC ATTEMPTED 30 RECEIVED 26 MISSFIRES 0 NO RECOVERY 4

RUN No. Suite 3, Run 4 GEOLOGIST J. Garrity

DEPTH in metres	LENGTH RECVD	DESCRIPTION	ODOR	STAIN	FLUORESCENCE Brightness Colour	CUT Type Colour
2760	1.75 cm	Siltstone: Dark grey, hard to firm, silt size quartz grains, well sorted, calcareous cement, abundant very fine grained glauconite grains in matrix, no fossils, micaceous, subfissile in part, poor visual porosity.	-	-	-	-
2756	1.75 cm	Siltstone: Dark grey, firm, silt size quartz grains, moderately well sorted, calcareous cement, abundant very fine grained glauconite grains in matrix, no fossils, very fine grained quartz abundant, micaceous, carbonaceous specks, moderate clay content in part, poor visual porosity.	-	-	-	-

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SIDEWALL CORE DESCRIPTION

WELL ATHENE-1 INTERVAL 1192m - 2754m DATE 1/7/83 PAGE 1

SWC ATTEMPTED 21 RECEIVED 21 MISSFIRES 0 NO RECOVERY 0

RUN No. Suite 2, Run 2 GEOLOGIST J. Garrity

DEPTH in metres	LENGTH RECVD	DESCRIPTION	ODOR	STAIN	FLUORESCENCE Brightness Colour	CUT Type Colour
2754	2.5cm	Laminated Siltstone and Sandstone Siltstone: Dark grey, very hard, silt size quartz grains, well sorted, calcareous, no fossils very fine grained quartz common, occasional very fine grained carbonaceous matter, micaceous, disseminated silt size pyrite rare, subfissile, very poor visual porosity. Sandstone: Dark to light grey, unconsolidated, dominantly very fine grained quartz grains, moderate sorting, unconsolidated, soft, calcareous silty matrix, no fossils, micaceous, no sedimentary structures, very poor visual porosity.	-	-	-	-
2752	2.5cm	Laminated Siltstone and Sandstone Siltstone: Dark grey-olive green, hard, silt sized quartz grains, well sorted, calcareous, no fossils, rare very fine grained quartz, carbonaceous, micaceous, disseminated silt size pyrite common, subfissile, poor visual porosity. Sandstone: Dark to light grey, unconsolidated, dominantly very fine grained quartz grains, moderate sorting, calcareous cement, silty, no fossils, micaceous, very fine grained disseminated pyrite common, abundant very fine grained glauconite, poor visual porosity.	-	-	-	-
2750	1.75	Sandstone: Dark to light grey, moderately hard, dominantly very fine grained quartz, moderate sorting, moderately hard, calcareous cement, very silty in part, no fossils, micaceous, abundant subangular to subrounded fine to very fine grained glauconite, fine grained carbonaceous grains common, poor visual porosity.	-	-	-	-

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SIDEWALL CORE DESCRIPTION

WELL ATHENE-1 INTERVAL 1192m - 2754m DATE 1/7/83 PAGE 2
SWC ATTEMPTED 21 RECEIVED 21 MISSFIRES 0 NO RECOVERY 0
RUN No. Suite 2, Run 2 GEOLOGIST J. Garrity

DEPTH in metres	LENGTH RECVD	DESCRIPTION	ODOR	STAIN	FLUORESCENCE Brightness Colour	CUT Type Colour
2748	2 cm	Laminated Siltstone and Sandstone Siltstone: Dark grey, moderately hard to soft, silt size quartz grains, well sorted, calcareous, no fossils, very fine grained quartz grains common, fine grained red mica rare, micaceous, very fine to fine grained glauconite common, subfissile, poor visual porosity. Sandstone: Dark grey, moderately hard to soft, dominantly very fine grained quartz, moderate sorting, silty, no fossils, micaceous, abundant fine to very fine grained glauconite, subangular to subrounded, poor visual porosity.	-	-	-	-
2746	1.5cm	Laminated Siltstone and Sandstone Siltstone: Dark grey, moderately hard to hard, silt size quartz grains, well sorted, calcareous, no fossils, very fine grained quartz grains common, micaceous, very fine to fine well rounded glauconite grains common, fine grained black well rounded carbonaceous grains common, subfissile. Sandstone: Light to dark grey, soft, dominantly very fine grained quartz grains, moderate to good sorting, minor silt content, calcareous cement, rare calcareous forams, micaceous, rare red mica, abundant fine to very fine grained glauconite, subrounded, poor visual porosity.	-	-	-	-
2744	2 cm	Silstone: Dark grey, hard, silt size quartz grains, well sorted, calcareous, no fossils, very fine grained quartz rare, micaceous, rare red mica grains, pyrite very fine to fine grained common, subfissile, poor visual porosity.	-	-	-	-
2737.5	1.25 cm	Sandstone: Light to dark grey, soft, very fine grained quartz, well sorted, very minor silt content, calcareous cement, micaceous, abundant subrounded very fine to fine grained glauconite, subrounded black fine grained carbonaceous grains common, poor visual porosity.	-	-	-	-

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SIDEWALL CORE DESCRIPTION

WELL ATHENE-1 INTERVAL 1192m - 2754m DATE 1/7/83 PAGE 3
SWC ATTEMPTED 21 RECEIVED 21 MISSFIRES 0 NO RECOVERY 0
RUN No. Suite 2, Run 2 GEOLOGIST J. Garrity

DEPTH in metres	LENGTH RECVD	DESCRIPTION	ODOR	STAIN	FLUORESCENCE Brightness Colour	CUT Type Colour
2733.5	1 cm	<u>Sandstone</u>: Light grey, soft to firm, very fine grained quartz, moderate sorting, minor silt and moderate clay content, calcareous cement, micaceous, subrounded very fine to fine grained glauconite common, common carbonaeous specks, occasional subrounded fine quartz grains, poor visual porosity.	-	-	-	-
2726.5	1.25 cm	<u>Siltstone</u>: Dark grey, hard, silt size quartz grains dominate, well sorted, calcareous, no fossils, very fine to fine grained subrounded glauconite common, micaceous, silt sized disseminated pyrite common, poor visual porosity.	-	-	-	-
2720	2 cm	<u>Siltstone</u>: Dark grey, very hard, silt size quartz, well sorted, calcareous, no fossils, occasional very fine grained quartz grains, micaceous, subfissile, fissile in part, poor visual porosity.	-	-	-	-
2711	1.75 cm	<u>Siltstone</u>: Light to dark grey, very hard, silt sized quartz, well sorted, calcareous, no fossils, micaceous, very rare very fine grained quartz, stringers of silt sized pyrite common, no sedimentary structures, poor visual porosity.				
2707.5	1 cm	<u>Laminated Siltstone and Claystone</u> <u>Siltstone</u>: Dark grey, hard, silt size quartz grains, well sorted, calcareous, no fossils, micaceous, stringers of very fine grained to silt sized pyrite commmon, subfissile in part, poor visual porosity. <u>Claystone</u>: Light grey, soft, consolidated, calcareous, no fossils, stringers of very fine to silt sized pyrite common, homogeneous.				
2692.5	1.25 cm	<u>Siltstone</u>: Dark grey, hard, silt size pyrite grains, well sorted, calcareous, no fossils, slightly micaceous, stringers of very fine to silt sized pyrite common, argillaceous in part, homogeneous, poor visual porosity.	-	-	-	-

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SIDEWALL CORE DESCRIPTION

WELL ATHENE-1 INTERVAL 1192m - 2754m DATE 1/7/83 PAGE 4

SWC ATTEMPTED 21 RECEIVED 21 MISSFIRES 0 NO RECOVERY 0

RUN No. Suite 2, Run 2 GEOLOGIST J. Garrity

DEPTH in metres	LENGTH RECVD	DESCRIPTION	ODOR	STAIN	FLUORESCENCE Brightness Colour	CUT Type Colour
2671	1 cm	Siltstone: Dark to light grey, hard to soft, silt size quartz grains dominate, moderate to well sorted, calcareous, no fossils, slightly micaceous, stringers of silt sized pyrite common, moderate to high light grey clay content in part, poor visual porosity.	-	-	-	-
2472.5	1.25 cm	Siltstone: Dark grey, hard to firm, silt size quartz grains, moderate to well sorted, calcareous, no fossils, slightly micaceous, minor light grey clay content, no sedimentary structure, homogeneous, poor visual porosity.	-	-	-	-
2264.5	0.75 cm	Laminated Siltstone and Claystone Siltstone: Dark grey, hard, silt size quartz grains, well sorted, calcareous, no fossils, micaceous, rare very fine grained quartz grains, homogeneous, subfissile in part, poor visual porosity. Claystone: Light grey, soft, consolidated, calcareous, no fossils, stringers of silt size pyrite common, abundant very fine grained quartz, homogeneous.	-	-	-	-
2240	0.75 cm	Siltstone: Dark grey, hard, silt size quartz grains, good sorting, calcareous, no fossils, slightly micaceous, rare subrounded very fine to fine quartz grains, very fine glauconite grains common, subfissile in part but generally homogeneous, poor visual porosity.	-	-	-	-
1985	1 cm	Calcarenite: Dark to light grey to white, very fine to fine grained, moderate to well sorted, very calcareous, no fossils, abundant very fine grained glauconite, carbonaceous specks, homogeneous, poor visual porosity.	-	-	-	-
1733.5	0.5 cm	Calcarenite: Dark to light grey to white, hard to firm, very fine grained to fine grained, well sorted, very calcareous, no fossils, carbonaceous specks, homogeneous, poor visual porosity.	-	-	-	-

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SIDEWALL CORE DESCRIPTION

WELL ATHENE-1 INTERVAL 1192m - 2754m DATE 1/7/83 PAGE 5
SWC ATTEMPTED 21 RECEIVED 21 MISSFIRES 0 NO RECOVERY 0
RUN No. Suite 2, Run 2 GEOLOGIST J. Garrity

DEPTH in metres	LENGTH RECVD	DESCRIPTION	ODOR	STAIN	FLUORESCENCE Brightness Colour	CUT Type Colour
1493	1 cm	Calcarenite/Calcareous Siltstone: Light grey, hard, very fine grained to silt size grains, well sorted, very calcareous, minor clay in matrix, no fossils, homogeneous, poor visual porosity.	-	-	-	-
1286.5	0.75 cm	Calcarenite: Light to dark grey, very hard to unbreakable, very fine grained, well sorted, very calcareous, no fossils, abundant very fine grained quartz, carbonaceous specks, homogeneous, poor visual porosity.	-	-	-	-

APPENDIX NO. 5

MICROPALEONTOLOGICAL REPORT

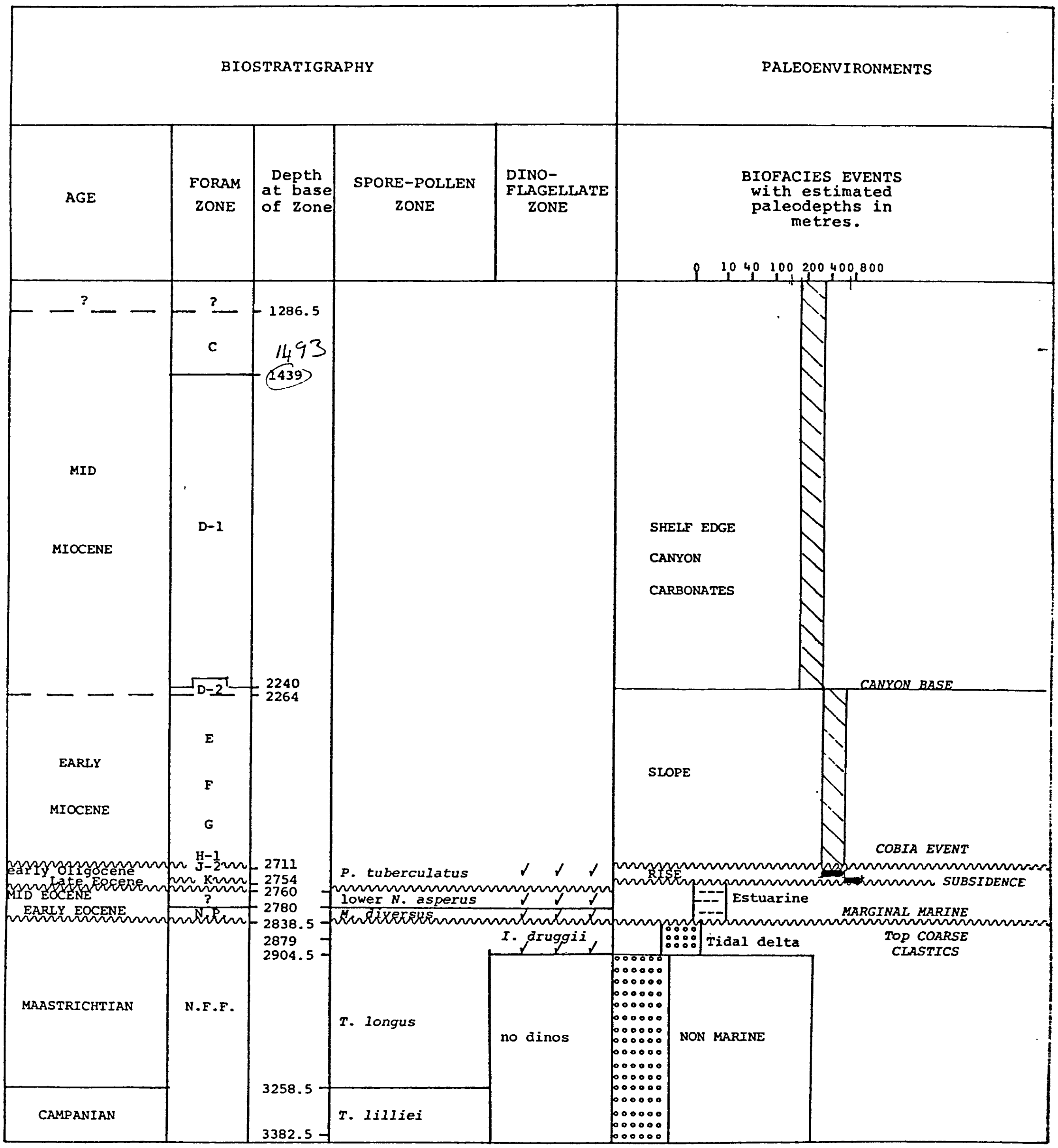
THE FORAMINIFERAL SEQUENCE
and
BIOSTRATIGRAPHIC and BIOFACIES SYNTHESIS
of
ATHENE # 1,
GIPPSLAND BASIN.

for: PHILLIPS AUSTRALIAN OIL COMPANY.

August 25, 1983.

David Taylor,
23 Ballast Point Road,
BIRCHGROVE, NSW, 2041,
AUSTRALIA.

(02)810 5643



BIOSTRATIGRAPHY					PALEOENVIRONMENTS
AGE	FORAM ZONE	Depth at base of Zone	SPORE-POLLEN ZONE	DINO-FLAGELLATE ZONE	BIOFACIES EVENTS with estimated paleodepths in metres.
?	?	1286.5			
MID MIOCENE	C	1493 1439			SHELF EDGE CANYON CARBONATES
	D-1	2240			CANYON BASE
	D-2	2264			
EARLY MIOCENE	E F G H-1				SLOPE COBIA EVENT
early Oligocene	J-2	2711	P. tuberculatus	✓ ✓ ✓	RISE
Late Eocene	K	2754			SUBSIDENCE
MID EOCENE	?	2760	lower N. asperus	✓ ✓ ✓	Estuarine
EARLY EOCENE	N.P.	2780	M. diversus	✓ ✓ ✓	MARGINAL MARINE
		2838.5			
MAASTRICHTIAN	N.F.F.	2879	T. longus	I. druggii ✓ ✓ ✓	Tidal delta Top COARSE CLASTICS
		2904.5		no dinos	NON MARINE
		3258.5			
CAMPANIAN		3382.5	T. lilliei		

TABLE 1: INTERPRETED BIOSTRATIGRAPHIC and FACIES SEQUENCE for ATHENE # 1.
(An integration of the stratigraphic palynology and foraminiferal sequence reports).

by: *David Taylor & Helene A Martin,*
August 24th, 1983.

<u>KEY</u>:

〰〰 = hiatus
✓ ✓ ✓ = dinoflagellates present but unable to nominate Zone.
N.P. = no planktonic foraminifera
N.F.F. = no foraminifera found

INTRODUCTION.

Forty seven sidewall cores and one rotary cutting sample were submitted for examination from ATHENE # 1 between 3382.5 and 1286.5 metres. The sidewall cores between 3382.5 to 2838.5m were barren of foraminifera, although the rotary cutting sample labelled 3110m contained Mid Eocene planktonics, which proved to be contaminants (see below). Sidewall cores at 2754 and 2752m could not be adequately cleaned before preparation and heavy contamination is reported (see Table 2); no doubt due to mud cake.

The following Tables accompany this report:-

TABLE 1:	INTERPRETED BIOSTRATIGRAPHIC and FACIES SEQUENCE: an integration of the palynology and this report: on Page 1.
TABLE 2:	Factual data: PLANKTONIC FORAMINIFERAL DISTRIBUTION: at back of text.
TABLE 3:	Factual data: BENTHONIC FORAMINIFERAL DISTRIBUTION and SEDIMENT GRAIN ANALYSIS: at back of text.
TABLE 4:	Factual data: RESIDUE LITHOLOGY of BARREN FORAMINIFERAL INTERVAL between 2835.5 and 3382.5m: at back of text.
TABLE 5:	Interpretative: FORAMINIFERAL BIOSTRATIGRAPHIC DATA with reliability of Zonal Picks: at back of text.

The ATHENE # 1 sequence is discussed briefly in ascending order (i.e. uphole). The palynology has been integrated with the foraminiferal results: see Table 1, and report by Helene A Martin.

LATE CRETACEOUS - 3382.5 to 2879m.

Age determined by palynology as this interval was found to be barren of foraminifera, although limonitic stained Mid Eocene planktonics were present in the rotary cutting sample from 3110m. As this assemblage was identical to that from the limonitic rich sidewall core at 2780m, it was apparent that the cuttings from 3110m were downhole contaminants. Moreover, Dr. Martin found Eocene microfloras in these cuttings, whilst the sidewall core above and below, were of Late Cretaceous age.

The top of the Late Cretaceous interval (at 2879.5m) is marked by the occurrence of the *Isabelidinium druggii* Dinoflagellate Zone, with an unnamed dinoflagellate assemblage immediately below it (at 2904.5m). However, neither sidewall cores contained foraminifera, although across the Tasman, in New Zealand, *I. druggii* is associated with late Maastrichtian planktonic foraminifera (Strong, 1977 and Wilson, 1977). One can only conclude that the late Maastrichtian marine transgression in the Tasman Sea region only marginally affected the Gippsland deltas, so that the salinity threshold did not approach the 35°/$_{\infty}$ required to substain planktonic foraminifera. Some species of modern dinoflagellates can withstand salinities far below that of normal seawater (= 35°/$_{\infty}$). For instance, Smayda (1983, p.80-81) cites a figure of <5°/$_{\infty}$ for occurrences of *Gonyaulax* sp. in the Gulf of Finland.

The occurrence of *I. druggii* is near the top of the *COARSE CLASTICS*. Despite the sample gap between the latest Cretaceous at 2879m and the Early Eocene at 2838.5m, a major hiatus is apparent at 2850m (on E-logs). The time span of this hiatus was in the order of 14 million years.

EARLY EOCENE 2838.5 to 2786.5m.

Age determined by palynology as this interval was barren of planktonic foraminifera. A few specimens of the arenaceous benthonic foraminifera *Haplophragmoides* confirm the assessment of marginal marine environments proposed by Dr. Martin on palynological grounds. In modern estuarine systems, ecologists apply the form *gradient* to such backwater, low salinity, areas that are embraced within the paleoecologist's term *marginal marine* (Smayda, 1983, fig. 4.1).

Both the age and biofacies of this unit indicate that it can be equated with the, lower *Member III*, of the *FLOUNDER FORMATION*. A hiatus occurred between the top of this Early Eocene unit and the overlying Mid Eocene *GURNARD FORMATION*. It is difficult to estimate the length of this hiatus which could have been as much as 10 million years but certainly no less than 5 m.y.

MID EOCENE - 2780 to 2765m.

In this oxidised "greensand" interval, planktonic foraminifera were sporadic and specific diversity very low, with *Globigerina angiporoides minima* being the only species listed which was restricted to the Mid

Eocene (Jenkins, 1974). The palynological evidence, presented by Dr. Martin, is far more convincing regarding a Mid Eocene age determination.

The Mid Eocene planktonic assemblages may be better developed in horizons not sampled by sidewall cores, as Mid Eocene, limonitic stained specimens were abundant as mud contaminants in ditch cuttings from the non-marine Late Cretaceous sequence (for example, at 3110m).

The common occurrence of the arenaceous benthonic, *Haplophragmoides,* together with the episodic occurrence of planktonics (refer Table 3) supports a paleoenvironmental designation of marginal marine. In the classification of modern estuarine systems, this Mid Eocene unit would be within the *tidal* zone (Smayda, 1983, fig. 4.1). The presence of wind blown quartz sand and laterised glauconitic clay suggests proximity to a sand dune barrier to the open sea, with occasional breaches in this barrier allowing influx of planktonic foraminifera. A modern local analogue is the Gippsland Lakes/Ninety Mile Beach System (Apthorpe, 1980).

This unit has the biofacies characteristics and is within the age range of the *GURNARD FORMATION.* The hiatus between it and the overlying Latest Eocene *COLQUHOUN FORMATION* was of some 3 million years in extent.

LATEST EOCENE - ZONE K - 2760 to 2756m.

The association of the Oligocene species *Globigerina brevis* with the Eocene species *G. linaperta* and *Globigerinatheka index* is evidence of a position right on the Eocene/Oligocene boundary (Jenkins, 1974), but by local convention, the interval is designated late Eocene. However, from the presence of the angiosperm pollen *Proteacidites tuberculatus,* palynologists designate this unit as no older than earliest Oligocene. This quibble can be dismissed as being semantic, as neither planktonic foraminiferal workers, nor palynologists would dispute a geochronological age approximating 37 m.y. What should be emphasised is that the latest Eocene, Zone K foraminiferal assemblages are distinct and thus distinguishable from the Early Oligocene Zone J-2 assemblages.

The benthonic foraminifera present were those of an open estuarine and/or littoral environment from documented distribution patterns on the Tasman Sea Margins; both ancient (Hayward & Buzas, 1979) and modern (Apthorpe, 1980). This unit was deposited within the *tidal* zone when compared with modern estuaries (Smayda, 1983, fig. 4.1), although the marine influence into this Late Eocene tidal estuary was greater than that into the tidal lagoon of the underlying Mid Eocene Gurnard Formation; compare foraminiferal frequency and diversity for both units on Table 3.

Age, biofacies and lithofacies of this unit combine for a designation of *COLQUHOUN FORMATION* for this unit.

The *EO/OLIGOCENE BASIN DEEP SUBSIDENCE EVENT* is demonstrated by the sharp contrast in depositional style between the shallow water, marginal marine Zone K sediment of 2756m and the deep water, continental rise carbonate, Zone J-2 sediment of 2754m. In fact, the difference in paleodepth could have been as great as 800 metres; suggesting dramatic subsidence on the Eo/Oligocene boundary. A similar paleoenvironmental discordance has been observed in other Gippsland Basin Deep wells. This subsidence coincides with volcanism and uplift of the East Gippsland Highlands (Wellman, 1974). The Gippsland Basin Deep subsidence may well have been a compensatory response to this uplift.

Biostratigraphically it is impossible to prove the presence of a hiatus between Zone K and Zone J-2, but by deduction there must have been one in Athene # 1 because of the extent of the discordance in sedimentary style across the boundary.

EARLY OLIGOCENE - ZONE J-2 - 2754 to 2720m.

This unit, grading upwards from quartz sandy marls to purer micrites, contained diverse planktonic assemblages with species present whose ranges are either restricted to (i.e. *Globorotalia gemma*) or do not range above Zone J-2 (i.e. *Globigerina brevis*). But the two basal sidewall cores at 2754 & 2752m, have mixed assemblages with obvious Early/Mid Miocene species also present (refer to Table 2). The other eight sidewall cores contained discrete assemblages with only species assignable to Zone J-2, and without the Miocene elements. The confusion regarding the biostratigraphic entity of the sidewall cores at 2754 and 2752m was due obviously to an inability to remove mud cake prior to processing, rather than to reworking of Early Oligocene assemblages into the Miocene sediments.

The dominance of deep oceanic, benthonic foraminifera (refer Table 3 and Hayward & Buzas, 1979) suggests a continental rise sedimentation site, with an estimated paleodepth of some 800m. Towards the top of the unit, species appear which indicate proximity to the base of the continental slope, coinciding with increased purity of the biogenic carbonates.

This unit is obviously a *deep water equivalent* of the *LAKES ENTRANCE MARL*.

THE *COBIA EVENT* at 2713m (E-logs).

The change in planktonic assemblages from the Early Oligocene, J-2 at 2720m to the Early Miocene H-1 at 2711m is indicative of the effects of this hiatus with a time span of some 12 million years. It is noted that there was no expression of gross environmental change on either side of the unconformity, with both lithofacies and biofacies being very similar. However, the Early Miocene micrites display a greater degree of carbonate diagenesis than the Early Oligocene ones below (refer Table 3).

EARLY to MID MIOCENE - Zones H-1, G, F, E & D-2 - 2711 to 2264.5m.

Zone H-1 assemblages are well represented at the base of the unit and the assemblage at the top is typical of Zone D-2. But, because of inadequate sampling, it can only be assumed that Zones G, F, E-2 and E-1 are present. This assumption is substantiated partly by the abundance of elements of these assemblages (without *Orbulina universa*) within the Early Oligocene assemblages (refer Table 2).

Sedimentation occurred on the continental slope with the presence of upper slope/shelf edge species being evidence of shelf edge progradation up sequence. The unit is designated *TASMAN SEA CARBONATES*.

MID MIOCENE *CANYON FILL* - Zones D-1 to C - 2240 to 1493 to ?1286.5m.

The base of turbo-carbonate, canyon fill sequence is at 2264m (E-logs), yet there is not recognisable biostratigraphic break between the rich D-2 assemblage at 2264.5m and the sparse D-1 assemblages at and above 2240m.

The rapid accumulation rate of the canyon fill unit can be appreciated from the scaled Table 1; in that more than 900m of canyon fill accumulated in less than 5 million years, whilst the underlying 1150m of the Athene sequence represents some 60 million years of geological time.

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SIDEWALL CORES Depth in metres	PLANKTONIC FORAMINIFERA																																			PLANKTONIC FORAMINIFERAL BIOSTRATIGRAPHY		
	MID EOCENE			LATE EOCENE to EARLY OLIGOCENE									EARLY to MID MIOCENE																								ZONE	Depth at Base	AGE
	G'ina senni	*G'ina linaperta*	*G'ina angiporoides minima*	*G'ina brevis*	*G'ina angiporoides* (SS)	*G'alia nana*	*G'theka index*	*G'ina euapertura*	*G'ina praebulloides*	*G'ina tripartita*	*G'alia munda*	*G'alia gemma*	*G'alia continuosa*	*G'ina woodi connecta*	*G'ina woodi woodi*	*G'ina bulloides*	*G'oides parawoodi*	*G'alia siakensis/mayeri*	*G'alia zealandica* (SS)	*G'quad dehiscens* (SS)	*G'quad advena*	*Cat. dissimilis*	*G'alia kugleri*	*G'alia bella*	*G'oides trilobus*	*Orb. universa*	*Praeorb. glomerosa*	*G'oides bisphericus*	*G'alia miozea miozea*	*G'alia miozea conoidea*	*G'alia praescitula*	*G'alia praemenardii*	*G'alia peripheronda*	*G'alia conica*	*G'ina ciperoensis*	*G'ina* & *G'alia* indet (<.2mm)			
1286.5→																°										°											C		MID MIOCENE
1493.0→															x	x		x								°										D		1493	
1733.5→	indet																																				D-1		
1985.0→															x	x		°							°	°				°				°					
2240.0→															x	x		x							°	°				°								2240	
2264.5→															x	x		x							x	x	°	°	x	x	x	x	°	x	x		D-2	2264.5	
2472.5→														x	x	x	°	°	°	°					?												G	2472	EARLY MIOCENE
2671.0→	indet																																				?	2671	
2692.5→													°	x	x	x	x			°		x															H-1		
2707.5→													x	x	x	x	x	x	x	x	°	x	°	°												D			
2711.0→													°	x	x	x	°	°	°	°	°	°														D		2711	
∿∿∿∿∿∿																																					∿∿∿∿		∿∿∿∿∿∿
2720.0→				x	x				x	x																										D	J-2		EARLY OLIGOCENE
2726.5→				x	x			x		x	°																									D			
2733.5→				x	x			x	x	x	°	°	°																							D			
2737.5→				x	x				x	°	°	x																								D			
2744.0→	indet																																						
2746.0→				x	x			x	x	x	?	?	?																							D			
2748.0→				?	x			x		?																										D			
2750.0→				x	x	x		x	x	x	x	x	x																							D			
2752.0→				°	x			x	x	°		?		ζ	ζ	ζ			ζ	ζ				ζ	ζ		ζ	ζ	ζ		ζ								
2754.0→				x	x			x		x				ζ	ζ	ζ			ζ	ζ	ζ	ζ		ζ	ζ			ζ	ζ		ζ					D		2754	
∿∿∿∿∿∿	?							?							?							?							?							?	∿∿∿∿		∿∿∿∿ ? ∿∿∿∿
2756.0→		°		°	x	°	?	x	x	°	°																										K		LATEST EOCENE
2760.0→				°	°	°																																2760	
∿∿∿∿∿∿	?							?							?							?							?							?	∿∿∿∿		∿∿∿∿ ? ∿∿∿∿
2765.0→		°	°																																		?		MID EOCENE
2770.0→	No planks																																						
2773.5→	°	°	°																																				
2775.5→	No planks																																						
2778.5→			°																																				
2780.0→	°	°	°																																			2780	
2786.5→	No planks																																						
2788.5→	No planks																																						

KEY:
° = <20 specimens
x = >20 specimens
D = Dominant >60% specimens
ζ = mud cake contaminants

N.F.F. = no foraminifera found
∿∿∿∿∿∿∿∿ = hiatus
∿∿∿∿ ? ∿∿∿∿ = probable hiatus

TABLE 2: PLANKTONIC FORAMINIFERAL DISTRIBUTION - ATHENE # 1.

David Taylor, August 23, 1983.

SIDEWALL CORES	ESTUAR-INE					CONTINENTAL RISE																	CONTINENTAL SLOPE											RESIDUE GRAIN LITHOLOGY													
																																		MAJOR COMPONENTS	MINOR COMPONENTS												
Depth in metres	*Haplophragmoides spp.*	*Bathysiphon angelseaensis*	*Nodosaria spp.*	*Ammodiscus parri*	*Cibicides perforatus*	*Ammobaculites calcarcus*	*Ammoglobigerina globigeriformis*	*Hyperammina subnodosum*	*Rhabdammina abyssorum*	*Vulvulina spp.*	*Melonis barleeanum*	*Oridorsalis tenera*	*Osangularia bengalensis*	*Stillostomella antillea*	*Karreriella bradyi*	*Discammina compressa*	*Lagena spp.*	*Martinotiella communis*	*Pleurostomella tenera*	*Alvelophragmium spp.*	*Cibicides karreriformis*	*Ammodiscus incertus*	*Siphonina australis*	*Cassidulina leavigata*	*Cibicides wuellerstorfi*	*Gyroidina spp.*	*Sphearoidina bulloides*	*Cibicides mediocris*	*Oridorsalis umbonifer*	*Cibicides molestus*	*Siphouvigerina proboscidea*	*Cibicides subhaidingeri*	*Euuvigerina pygmea*	Ψ: recrystallised biomicrite f: planktonic foraminifera m: biomicrite .÷: qtz sandy marls & calc siltst. G: pellet glauc .o: polymodal qtz sdst. ∇Δ: frosted & fractured qtz.	pyrite	mica	limonitic clay	glauconite	f-m ang qtz	c ang-subrd qtz	fish fragments	echinoid spines	ostracodes	brachiopods	sponge spicules	foram count	Plank foram %
1286.5₊	indet																																	ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ									r			?	?
1493.0₊																	°							x			°				°	°	x	ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ			C								r	200	60
1733.5₊	indet																																	ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ												?	?
1985.0₊																	°						°	°		°				°				ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ			r	r								?	?
2240.0₊																	x						°	°						°		°		ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ			C								r	?	?
2264.5₊																														°	x			ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ fff	C		C									2000	99
2472.5₊																°													°					ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ			C		C							200	95
2671.0₊	indet																																	ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ						r						?	?
2692.5₊								°	°					°													°	°						ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ			A			A						300	90
2707.5₊												°														°	°	°						ΨΨΨΨΨΨΨΨΨΨ ffffffff	r		A								r	3000	98
2711.0₊							°			°		°								°	°						°							ΨΨΨΨΨΨΨΨΨΨ ffffffff			C	r	A	r	r					2000	98
∿∿∿∿∿	∿∿∿∿∿					∿∿∿∿∿																	∿∿∿∿∿											∿∿∿∿∿	∿∿∿∿∿											∿∿∿∿∿	∿∿∿∿∿
2720.0₊								x	x	°	°	x								x		°			°	°								mmmmmmmmmmmm ffffffff				r				C				2000	90
2726.5₊									°	°		x	x							°			x	x										mmmmmmmmmmmm ffffffff	r		r	r	A			C				2000	95
2733.5₊						°			x																									mmmmmmmmmmmmmmmmmmmmmmmm	A		A	r	A							500	90
2737.5₊						°	°		x			°	x			x				°		°												mmmmmmmmmmmmmmmmmm fff				A	r			r				2000	90
2744.0₊	indet																																	.÷.÷.÷.÷.÷.÷.÷.÷.÷.												?	?
2746.0₊						°		°	x	°			°			x					°													÷.÷.÷.÷.÷.÷.÷.÷ fff	C		C	A				r	r			2000	95
2748.0₊						°	°	°		°						°		°		°														.÷.÷.÷.÷.÷.÷.÷.÷.÷.								r	C	r		500	90
2750.0₊										°			°	°	°	x	x	°	°															÷.÷.÷.÷.÷.÷.÷.÷ fff				A				r				2000	98
2752.0₊								°	x	°					°	°	°																	.÷.÷.÷.÷.÷.÷.÷.÷.÷.			A	A				r	r			?500	?90
2754.0₊						°	°	x	x	°	°	°	°	°																				÷.÷.÷.÷.÷.÷.÷.÷.÷.÷			A	A				r				?1000	?90
∿∿∿∿∿	∿∿ ? ∿∿					∿∿ ? ∿∿																	∿∿ ? ∿∿											∿∿ ? ∿∿	∿∿ ? ∿∿											∿∿ ?	∿?∿
2756.0₊	x		°	°	°																													.÷.÷.÷.÷.÷.÷.÷.÷ GG		C										200	90
2760.0₊	x	D	°	°	°																													.o.o.o.o.o.o.o.o.o GG	r											100	15
∿∿∿∿∿	∿∿ ? ∿∿					∿∿ ? ∿∿																	∿∿ ? ∿∿											∿∿ ? ∿∿	∿∿ ? ∿∿											∿∿ ?	∿?∿
2765.0₊	x	x																																∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇	A		A									100	20
2770.0₊	°																																	Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇ GG	C		A				r					10	nil
2773.5₊	°	x																																∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇	r			A								50	20
2775.5₊	°																																	Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ			C	A								10	nil
2778.5₊																																		∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇	r	r	r	C								10	100
2780.0₊	°																																	Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	C		A	A								20	50
2786.5₊	°																																	∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ GG		A										10	nil
2788.5₊	°																																	Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇ GG	r											10	nil

KEY: ° = <20 specimens ∿∿∿∿∿∿ = hiatus
x = >20 specimens ∿∿∿?∿∿∿? = probable hiatus
indet = indeterminate due to preservation

TABLE 3: BENTHONIC FORAMINIFERAL DISTRIBUTION and SEDIMENT GRAIN ANALYSIS - ATHENE # 1.

David Taylor, August 24, 1983.

TABLE 4.

RESIDUE LITHOLOGIES of BARREN FORAMINIFERAL INTERVAL between 2835.5 and 3382.5m in ATHENE # 1.

Prepared by: *David Taylor,*
August 22, 1983.

Depth in metres	SWC	Residue Lithology (grains >.075mm)
2838.5	#19	m-c, ang-subrd qtz with Abundant limonite, pellet glauc & rare pyrite.
2879.5	#17	f-m, ang frosted qtz with pyrite common.
2904.5	#16	f-c, ang frosted qtz with abundant limonitic clay, common mica & rare pyrite.
2940.0	#15	*ibid*
3084.0	#14	*ibid*
3103.0	#13	f ang qtz, clayey sdst, with mica & limonite common.
3108.0	#12	f ang qtz, clayey sdst with glauc common & mica rare.
3113.5	#11	*ibid*
3237.0	#10	f ang qtz, clayey sdst, with rare limonitic clay.
3258.0	# 9	*ibid*
3302.5	# 6	f ang qtz, clayey sdst.
3315.0	# 5	f ang qtz, clayey sdst, limonite & mica rare.
3328.0	# 4	f ang qtz, sandy siltst with pyrite common.
3363.5	# 3	f-m ang qtz, clayey sdst with pyrite & limonite common.
3375.0	# 2	*ibid*
3382.5	# 1	f ang qtz, clayey sdst with abundant limonitic clay & common pyrite, glauc & mica.

TABLE 5.

MICROPALEONTOLOGICAL DATA SHEET

BASIN: GIPPSLAND ELEVATION: KB: ______ GL: ______

WELL NAME: ATHENE # 1 TOTAL DEPTH: ______

AGE		FORAM. ZONULES	HIGHEST DATA					LOWEST DATA				
			Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
PLEIS-TOCENE		A_1										
		A_2										
PLIO-CENE		A_3										
		A_4										
MIOCENE	LATE	B_1										
		B_2										
		C	1493	2				1493	2			
	MIDDLE	D_1	1985	1				2240	2			
		D_2	2264.5	0				2264.5	0			
		E_1	¶									
		E_2	¶									
	EARLY	F	¶									
		G	2472.5	2				2472.5	2			
		H_1	2692.5	1				2711	1	2707.5	0	
OLIGOCENE	LATE	H_2										
		I_1										
		I_2										
	EARLY	J_1										
		J_2	2720	1				2754*	1	2750	0	
EOC-ENE		K	2756	1				2760	2			
		Pre-K	2765	2				2780	2			

COMMENTS Pre K interval between 2765 & 2780m contains sporadic low diversity assemblages of mid Eocene planktonic foraminifera.

* SWCs at 2754 & 2752m were part mud cake & could be adequately cleaned. They contained Zone F to E-1 species and contaminants.

¶ Zones not found, due to sample gap; probably present on observation above.

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: August 23, 1983.

DATA REVISED BY: ______ DATE: ______

APPENDIX NO. 6

PALYNOLOGICAL REPORT

THE STRATIGRAPHIC PALYNOLOGY
OF
ATHENE # 1,
GIPPSLAND BASIN.

for: PHILLIPS AUSTRALIAN OIL COMPANY.

August 22, 1983.

Helene A Martin,
School of Botany,
University of New South Wales,
Box 1, Post Office,
KENSINGTON, NSW, 2033,
AUSTRALIA.
(02)662 2954

ATHENE # 1

SUMMARY OF STRATIGRAPHIC PALYNOLOGY.

DEPTH (m)	SPORE POLLEN ZONE	DINOFLAGELLATE ZONE	AGE	PALEOENVIRONMENT
2756 - 2760	*P. tuberculatus*	?	Early Oligocene	marine to marginal marine
2765 - 2780	Lower *N. asperus*	?	Mid Eocene	
2786.5 - 2838.5	*M. diversus*	?	Early Eocene	
2879.5	*T. longus*	*I. druggii*	Maastrichtian	non marine to marginal marine
2904.5		?		
2904.5 - 3258.5				non marine
3302.5 - 3382.5	*T. lilliei*		Campanian	

A. SIDEWALL CORES.

SPORES and POLLEN

The spores and pollen identified are listed in Table 1 and the ranges of diagnostic species are shown on Figure 1. The species in Table 1 are grouped into three categories:-

1) Spores, mostly from ferns and their allies.
2) Gymnosperm pollen: pines e.g. hoop pine, Huon pine etc. These would have been mostly forest trees. Their relatives are found today in forests of Tasmania, New Zealand, New Caledonia and New Guinea. Only a few grow on the Australian Mainland and they are restricted to rainforests and the wetter climates.
3) Angiosperm pollen: flowering plants. These may have been trees or shrubs.

An assessment of the abundance of plant tissue debris is included in Table 1. Plant tissue debris is abundant in non marine swamps but less so in fresh water lakes. Plant tissue debris is not abundant in marine environments unless the location is close to a river outlet. However, other factors are involved with the abundance of plant tissue debris, e.g. preservation. Poor preservation may destroy or render unrecognisable much of the plant tissue debris.

The ranges of diagnostic species and zonation follows Stover & Partridge (1973, 1982) as ammended by Partridge (1976). Some modification has been made in the light of experience and they are explained in the text.

Experience has shown that subsequent publications on the same period extend the ranges of some diagnostic species. This is seen especially for the Early and Middle Cretaceous where three groups of authors have published on this time range. For this reason, if the ranges of some species fall slightly outside of those given in the references, then it is not considered serious. Sometimes there is conflicting evidence, and the method adopted then is to add up all the pros and cons before making a decision. Even with this approach, some assemblages remain problematical and it requires independant evidence to resolve these difficulties.

1. *T. lilliei* Zone, Campanian, 3302.5-3382.5m.

Triporopollenites sectilis and *Latrobosporites amplus* are found in the oldest sample. Both of these species first appear at the base of the *T. lilliei* Zone. Other species which first appear in the *T. lilliei* Zone are found in other samples, viz. *Latrobosporites ohaiensis, Lygistepollenites balmei* and *Nothofagidites endurus.* There are no species present which first appear in the overlying zone.

2. *T. longus* Zone, Maastrichtian, 2904.5-3258.5m.

The *T. longus* and *T. lilliei* Zones are generally similar with only a few species appearing at the base of the *T. longus* Zone. Of these few species, only *Proteacidites angulatus* is found regularly in these assemblages and it extends down to 3258.5m. One questionable specimen of *Dilwynites granulatus,* which also first appears at the base of the *T. longus* Zone, is found at 3113.5m.

Experience with Helios and Hermes has shown that the *T. longus* Zone extends above the *I. druggii* dinoflagellate Zone (discussed further below) and into the Paleocene. However, in Athene # 1, the *T. longus* Zone stops at the *I. druggii* Zone, hence is Maastrichtian here. Thus relative to Helios and Hermes the upper part of the *T. longus* Zone is absent in Athene.

3. *M. diversus* Zone, Early Eocene, 2786.5-2838.5m.

The lowermost assemblage here contains no pollen whatsoever, but the dinoflagellates (discussed further below) indicate an age compatible with the *M. diversus* Zone. In the other assemblages, *Ischyosporites gremius, Cupanieidites orthoteichus* and *Nothofagidites emarcidus* first appear at the base of the *M. diversus* Zone. *Australopollis obscurus* terminates its range at the top of the *L. balmei* Zone, but experience has shown that it is a frequent transgressor into the *M. diversus* Zone; contrary to published range charts. There are no species present which first appear in the overlying *P. asperopolus* Zone.

The *M. diversus* Zone has been divided into lower, middle and upper, but the diagnosis of this subdivision has not been published, hence is unknown. Consequently, it is not possible to place these assemblages into a subdivision of the *M. diversus* Zone.

4. Lower *N. asperus* Zone, Mid-late Eocene, 2765-2780m.

These assemblages all have abundant *Nothofagidites* species, and this is a feature of this zone. *Nothofagidites asperus, N. vansteenisii* and *N. falcata* first appear at the base of the Lower *N. asperus* Zone. There are no species present whose ranges terminate in the underlying *P. asperopolus* Zone.

Originally, the Lower and Upper *N. asperus* Zones were described (Stover & Partridge, 1973). Subsequently, the Middle *N. asperus* Zone has been named but not described, so its diagnostic features are unknown and it is not used here. However, the Lower *N. asperus* Zone in the original sense, and used here, probably includes both the subsequent lower and middle subdivisions.

5. *P. tuberculatus* Zone, Early Oligocene - Mid Miocene, 2756-2760m.

Cyatheacidites annulatus is present and it first appears at the base of the *P. tuberculatus* Zone. *Proteacidites tuberculatus* is also present but it first appears at the base of the Upper *N. asperus* Zone. There are no species present which first appear in the younger zone above.

DINOFLAGELLATES

The dinoflagellates identified are listed on Table 1 and the ranges of diagnostic species shown on Figure 2. Precise ranges are known for only the diagnostic species. Although ranges for the other species are not documented, the age of the type specimen is usually available, and is used as supporting evidence.

Dinoflagellate zones have been named in Partridge (1976) and Stover et al (1979) but they have not been described, so the diagnostic features of the zones are not known. One assumption of the diagnosis is that the species after which the zone is named is common therein. Another possible assumption is that the presence of the nominate species indicates the zone until the next nominate species of the zone above it appears. It should be noted that the ranges of these species usually extend beyond the zone. As with the spores and pollen, experience may show that the ranges require modification. Some modifications have been adopted in this report and they are explained on next page.

1. 2904.5m.

Here, there are two crumpled dinoflagellates which cannot be identified reliably, hence they are listed as unidentified species on Table 1. However, one of them has the type of spines seen on *Apectodinium homomorphum*. From evidence in Helios and Hermes, an informal "*Apectodinium* spp. Assemblage" has been recognised below the *I. druggii* Zone. Although the evidence in Athene is not conclusive, it suggests that the same pattern exists here.

2. *I. druggii* Zone, Late Maastrichtian-Early Paleocene, 2879.5m.

Only two specimens of *I. druggii* have been found here.

Originally, Partridge (1976) placed the *I. druggii* Zone completely within the Maastrichtian, the top of the zone being coeval with the top of the Cretaceous. Stover et al (1979) follow this scheme. However, in New Zealand, *I. druggii* occurs both below and above unconformable contact between late Maastrichtian and early-mid Paleocene in a single, well documented outcrop section (Strong, 1977, Wilson, 1978). Moreover, *I. druggii* occurs in the type Danian of Denmark (Wilson, 1978).

Figure 2 has been modified in the light of this evidence.

3. 2756-2786.5m.

Dinoflagellates occur throughout this interval. Unfortunately, none of the named zones can be recognised, even if both of the assumptions of diagnosis (discussed above) are adopted. Considered in conjunction with the spore pollen zones, however, the dinoflagellates are in good agreement.

a) *M. diversus* Zone, Early Eocene, 2786.5-2838.5m.
Glaphyrocysta retiintexta occurs here, within its range. Other dinoflagellates are compatible with this age, e.g. *Achomosphaera crassipellis, Leiosphaera scrobiculata*. Others are long ranging, e.g. *Spiniferites ramosus*.

b) Lower *N. asperus* Zone, Mid-late Eocene, 2765-2780m.
Systematophora placacantha and *Areosphaeridium capricornum* (although a poor specimen in this case) both occur within their ranges here. Others are compatible with a mid-late Eocene age, e.g. *Deflandrea leptodermata, Impagidinium dispertitum* and *Phthanoperidinium eocenicum*.

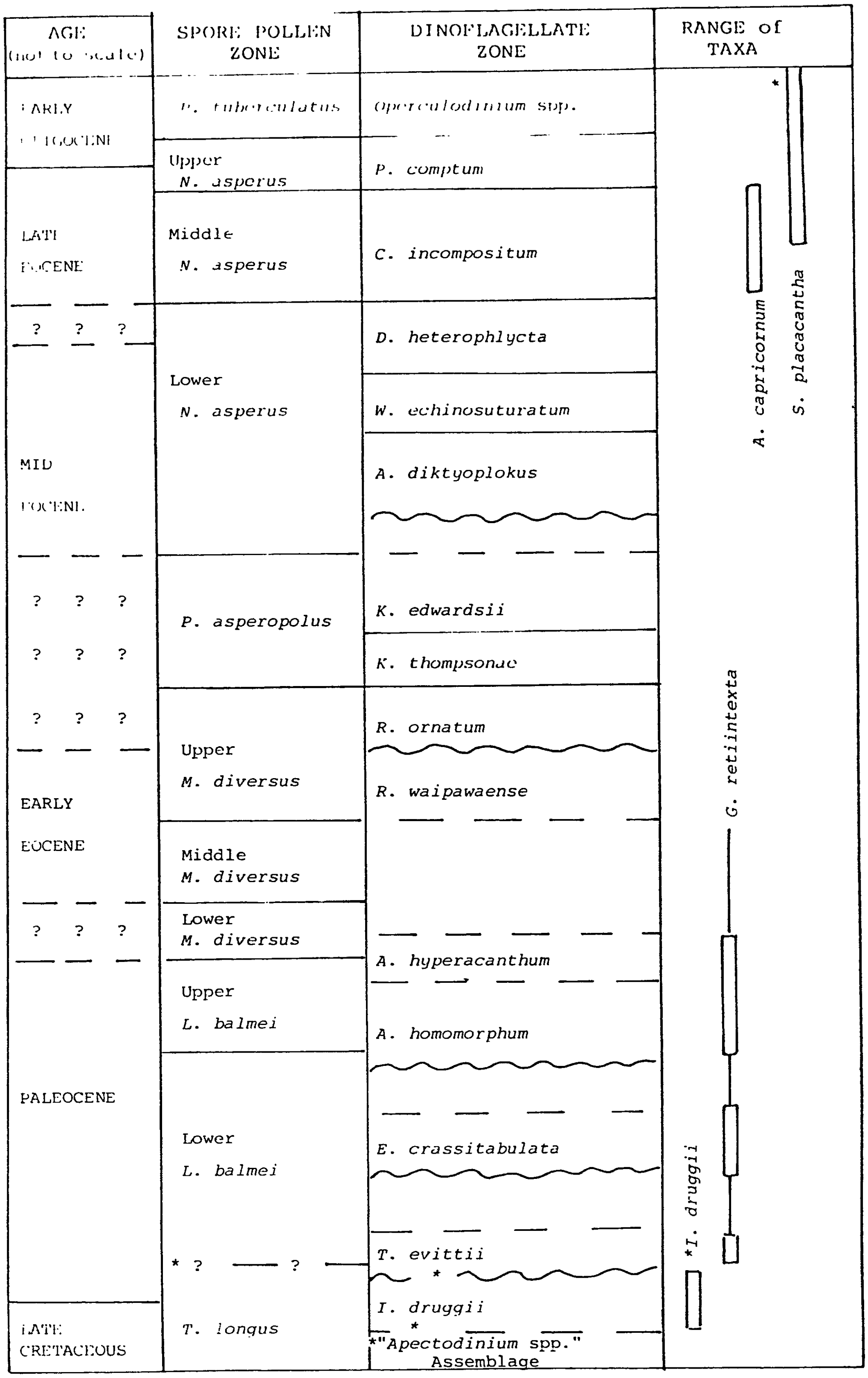

FIGURE 2: ATHENE # 1 DINOFLAGELLATE RANGE CHART BASED on STOVER et al (1979) & PARTRIDGE (1976), with modifications marked*. For further explanation, see text.

Helene A Martin, August 1983.

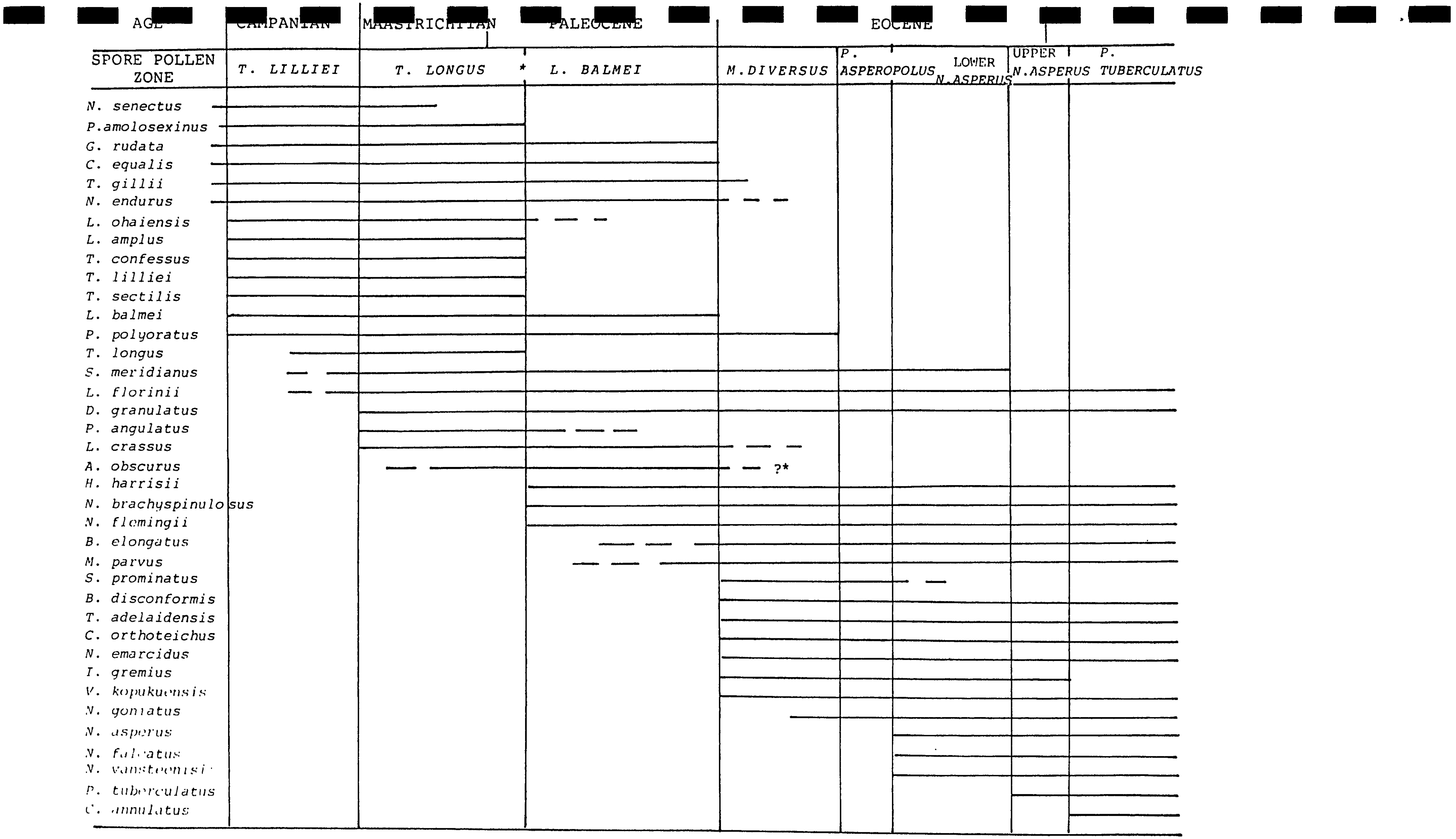

FIGURE 1: ATHENE # 1 SPORE POLLEN RANGE CHART.
Based on STOVER & PARTRIDGE (1973, 1982) and PARTRIDGE (1976), with modifications marked*. For further explanation, see text.

Helene A Martin, August 1983.

c) *P. tuberculatus* Zone, Early Oligocene-Mid Miocene, 2756-2760m.

Operculodinium centrocarpum is the most common dinoflagellate in 2760m, hence would agree with the *Operculodinium* spp. Zone named in Partridge (1976). However, *Operculodinium* sp. is the most common dinoflagellate in 2770m, in the Lower *N. asperus* Zone, so it is doubtful whether this feature is reliable for the diagnosis of an Early Oligocene zone. *O. centrocarpum* is also very abundant in the Early Miocene of the Murray Basin (Martin, unpubl.) and it is one of the most common dinoflagellates found in surface marine sediments today (Wall et al, 1979), which casts further doubt on the usefulness of an *Operculodinium* spp. Zone as diagnostic of the Early Oligocene.

PALEOECOLOGY.

Table 1 lists the abundance of spores, pollen, dinoflagellates and plant tissue debris. As discussed previously, plant tissue debris originates from land plants, hence is more abundant in non marine deposition. However, with poor preservation, it may be destroyed, so the lack of plant tissue debris is not necessarily indicative of marine conditions.

1. 2904.5-3084m.

There are no dinoflagellates here and plant tissue debris is fairly abundant in most assemblages, thus indicating non-marine conditions.

2. 2879.5-2904.5m.

A few dinoflagellates are found here. The abundance of plant tissue debris, spores and pollen is low. These assemblages are non marine to marginal marine.

3. 2756-2838.5m.

Dinoflagellates are consistently present, although the abundance fluctuates. The spore pollen content is low in most samples with an occasional good assemblage. Plant tissue debris is low to a trace occurrence in most samples. These assemblages are marine to marginal marine.

B. CUTTINGS.

Cutting samples labelled 3110m were examined but the results are spurious. This depth falls within the *T. longus* Zone, sidewall cored interval, but no species diagnostic of this zone were identified in the cuttings. This happens also with some sidewall cores within this zone. Only species which range through both the *T. longus* and *L. balmei* Zones, together with Eocene contaminants have been identified. These samples also contained dinoflagellates and foraminifera, whilst no marine indicators were found in the sidewall cores spanning this interval. Thus the cuttings were heavily contaminated and it is impossible to deduce the true age from the cuttings at 3110m.

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SIDEWALL CORES

Depth in metres	*Aequitriradites* sp. 1*	*Baculatisporites comaumensis* 1	*Ceratosporites equalis* 1	*Cicatricosisporites australiensis* 1	*Cyathea paleospora* 9	*Cyatheacidites annulatus* 3	*Cyathidites australis* 1	*C. minor* 1	*Gleicheniidites* cf *G. circinidites* 1	*Ischyosporites gremius* 3	*Laevigatosporites ovatus* 1	*Latrobosporites amplus* 3	*L. crassus* 3	*L. ohaiensis* 3	*Leptolepidites verrucatus* 1*	*Lycopodiumsporites* spp 1	*Polypodiidites* sp	*Stereisporites* cf *S. antiquasporites* 1	*Verrucosisporites kopukuensis* 3
2756.0					+	+		+											+
2760.0		+			+	+		+								+		+	
2765.0										+									
2770.0					+		+												
2773.5					+		+			+									
2775.5					+														
2778.5					+					+						+			
2780.0		+			+					+	+								
2786.5									+										
2788.5								+		+			+			+		+	
2838.5																			
2879.5											+								
2904.5			+									+				+		+	
3103.5		+						+				+				+	+		
3108.0		+					+	+				+				+		+	
3113.5												+						+	
3231.0		+									+	?			+				
3258.5	+	+		+			+	+			+					+			
3302.5				+														+	
3315.0		+					+												
3328.0		+					+							+		+		+	
3363.5		+	+									+				+		+	
3375.0		+					+	+				+				+		+	
3382.5			+				+	+			+	+							

GYMNOSPERM POLLEN

Depth in metres	*Araucariacites australis* 1	*Dacrycarpites australiensis* 10	*Ginkgocycadophytus nitidus* 1	*Lygistepollenites balmei* 3	*L. florinii* 3	*Microcachryidites antarctus* 1	*Phyllocladidites mawsonii* 3	*Podocarpidites* spp.	*Podosporites microsaccatus* 1
2756.0	+	+			+		+		
2760.0	+	+					+	+	
2765.0	+				+	+	+	+	
2770.0	+				+		+	+	
2773.5									
2775.5	+								
2778.5	+				+			+	
2780.0					+	+	+		
2786.5	+						+	+	
2788.5	+	+					+	+	
2838.5									
2879.5	+				+	+	+	+	
2904.5					+			+	+
3103.5			+	+	+	+	+	+	+
3108.0				+	+		+	+	
3113.5	+						+	+	+
3231.0				+			+	+	
3258.5					+		+		
3302.5	+						+	+	
3315.0	+	+					+	+	
3328.0	+							+	
3363.5	+			+			+	+	
3375.0	+					+	+	+	
3382.5	+						+	+	

ANGIOSPERM POLLEN

Depth in metres	*Australopollis obscurus* 3	*Banksieaeidites elongatus* 3	*Cupanieidites orthoteichus* 3	*Dilwynites granulatus* 3	*Gambierina rudata* 3	*Haloragacidites canacomyricoides* 4	*H. harrisii* 3	*Myrtaceidites parvus* 9	*Nothofagidites asperus* 3	*N. brachyspinulosus* 3	*N. deminutus* 3	*N. emarcidus* 3	*N. endurus* 3	*N. falcatus* 3	*N. flemingii* 3	*N. goniatus* 3	*N. senectus* 3	*N. vansteenisii* 3
2756.0							+	+				+		+		+		+
2760.0			+	+											+			
2765.0				+				+				+				+		+
2770.0				+			+	+				+						+
2773.5										+								
2775.5				+				+		+		+						
2778.5										+	+				+			
2780.0		+				+	+	+	+		+	+			+	+		+
2786.5				+								+						
2788.5	+		+	+				+				+	+		+			
2838.5																		
2879.5					+													
2904.5					+													
3103.5					+								+					
3108.0					+								+					
3113.5				?	+								+					
3231.0					+								+					
3258.5					+								+				+	
3302.5													+					
3315.0																		
3328.0					+								+					
3363.5					+								+					
3375.0													+					
3382.5																		

Depth in metres	*Periporopollenites polyoratus* 3	*Proteacidites amolosexinus* 3	*P. angulatus* 3	*P. ivanhoensis* 9	*P. scaboratus* 2	*P. tuberculatus* 3	*Proteacidites* spp.	*Simplicepollis meridianus* 3	*Spinizonocolpites prominatus* 3	*Tricolpites confessus* 3	*T. gillii* 3	*T. longus* 3	*T. waiparensis* 7	*Tricolporites adelaidensis* 4	*T. lilliei* 3	*Triorites minor* 2	*Triporopollenites sectilis* 3	Undescribed tricolpates/tricolporates
2756.0						+												
2760.0							+											+
2765.0							+											
2770.0							+							+				
2773.5																		+
2775.5																		+
2778.5									+									
2780.0																		+
2786.5																		
2788.5							+											+
2838.5																		
2879.5			?	+			+				+					+		+
2904.5		+	+	+	+		+											+
3103.5		+	+	+	+		+									+	+	
3108.0	+	+	?	+	+		+				+	?			+	+	+	+
3113.5		+	+				+				+						+	
3231.0				+	+						+		+		+		+	+
3258.5			+		+					+					+	+	+	+
3302.5																		+
3315.0					+													+
3328.0								?			?		+		+		+	
3363.5		+													+		+	+
3375.0				?							+						+	+
3382.5																	+	

DINOFLAGELLATES

Depth in metres	*Achomosphaera crassipellis* 6	*Areolinga* sp.	*Areosphaeridium capricornum* 6	*Cannosphaeropsis* cf *C. densiradiata* 5	*Cleistosphaeridium* sp.	*Cordosphaeridium inodes* 5	*Deflandrea* cf *C. leptodermata* 5	*Deflandrea* sp.	*Glaphyrocysta retiintexta* 6	*Glaphyrocysta* sp.	*Heterosphaeridium heteracanthum* 5	*Hystrichokolpoma* sp.	*Hystrichosphaeridium* cf *H. tubiferum* 5	*Hystrichosphaeridium* sp.	*Impagidinium dispertitum* 6	*Isabelidinium druggii* 5	*Leiosphaera scrobiculata* 8	*Lingulodinium machaerophorum* 5	*Operculodinium centrocarpum* 5	*Operculodinium* sp.	*Phthanoperidinium eocenicum* 5	*Spiniferites ramosus* 5	*Spiniferites* sp.	*Systematophora placacantha* 6	No. of unidentified dinoflagellates
2756.0					+			+		+				+	+				+			+		+	2
2760.0																		?	+			+		+	2
2765.0					+								+						+			+		?	
2770.0			?															?		+					
2773.5							+													+	?				
2775.5				+								+	+							+		+	+		4
2778.5																									2
2780.0													+		+							+			1
2786.5													+										+		4
2788.5	+				+	+		+	?		+			+			+		+			+			4
2838.5		?							+				+							+					2
2879.5																+									
2904.5																									2
3103.5																									
3108.0																									
3113.5																									
3231.0																									
3258.5																									
3302.5																									
3315.0																									
3328.0																									
3363.5																									
3375.0																									
3382.5																									

Depth in metres	Spore-pollen abundance	Dinoflagellate abundance	Plant tissue debris abundance	Preservation	SPORE/POLLEN ZONE	DINOFLAGELLATE ZONE	AGE
2756.0	o	o	z	o	*P. tuberculatus*	?	Early Oligocene
2760.0	+	+	z	+			
2765.0	o	+	o	+	Lower *N. asperus*	?	Mid Eocene
2770.0	z	z	z	+			
2773.5	z	z	z	+			
2775.5	+	z	z	+			
2778.5	+	z	z	+			
2780.0	ϕ	+	o	o			
2786.5	z	z	z	z	*M. diversus*	---- ?	Early Eocene
2788.5	+	+	+	+			
2838.5	z	o	z	+			
2879.5	+	z	+	+	*T. longus*	*I. druggii*	Maastrichtian
2904.5	z	z	z	+		?	
3103.5	ϕ		o	o			
3108.0	ϕ		o	o			
3113.5	+		o	+			
3231.0	o		+	ϕ			
3258.5	ϕ		o	o			
3302.5	z		+	+	*T. lilliei*		Campanian
3315.0	z		z	+			
3328.0	+		ϕ	+			
3363.5	ϕ		ϕ	o			
3375.0	+		o	+			
3382.5	+		o	+			

BARREN SAMPLES:
2940.5
3084.0

Reference to Species:
1. Dettmann, 1963
2 Dettmann & Playford, 1968
3 Stover & Partridge, 1973
4 Stover & Partridge, 1982
5 Lentin & Williams, 1977
6 Stover & Evitt, 1978
7 Couper, 1960
8 Deflandre & Cookson, 1955
9 Martin, 1973
10 Cookson & Pike, 1953

*Reworked Early Cretaceous
?Identification probable but specimens poorly preserved or broken

Key to assessment of abundance and preservation:
- ϕ good, above average
- o average
- \+ poor, below average
- z exceedingly poor, trace occurrence

TABLE 1: SPORES, POLLEN AND DINOFLAGELLATES IDENTIFIED IN ATHENE # 1.

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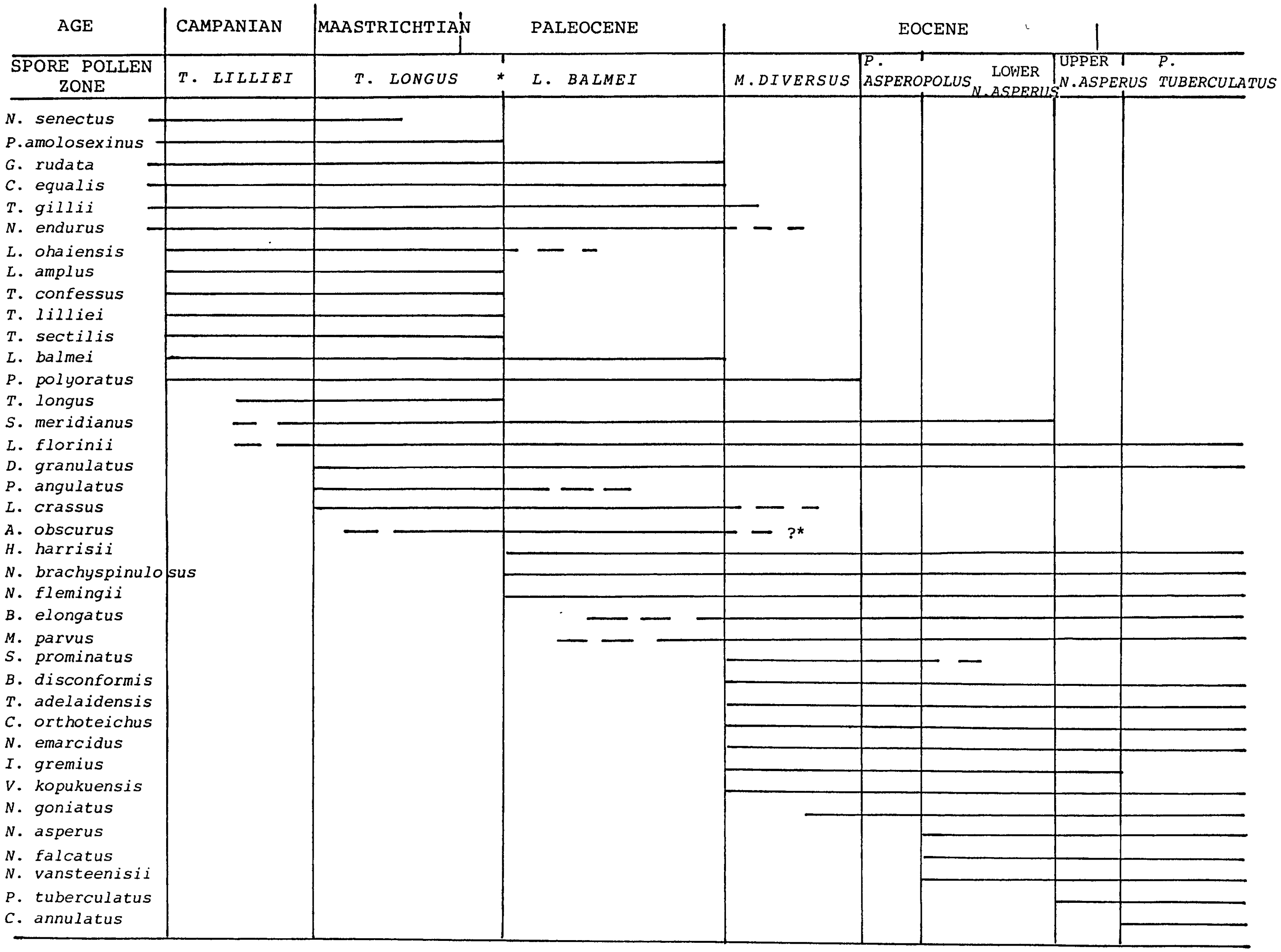

FIGURE 1: ATHENE # 1 SPORE POLLEN RANGE CHART.
Based on STOVER & PARTRIDGE (1973, 1982) and PARTRIDGE (1976), with modifications marked*. For further explanation, see text.

Helene A Martin, August 1983.

APPENDIX NO. 7

BASIC HYDROCARBON SOURCE ROCK POTENTIAL ANALYSIS OF ATHENE NO. 1 SIDEWALL CORE SAMPLES, GIPPSLAND BASIN, OFFSHORE AUSTRALIA

OK

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INTER-OFFICE CORRESPONDENCE / SUBJECT:
BARTLESVILLE, OKLAHOMA

August 12, 1983

Basic Hydrocarbon Source Rock
Potential Analysis of PPCo.
Athene No. 1 Sidewall Core
Samples, Gippsland Basin,
Offshore Australia
Project No. RA4059
EPS Report No. 1302L
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BVP-109-83

O. J. Koop (r) N. C. Tallis
Perth Office

Summary and Conclusions

Two of the 12 captioned samples submitted for analyses have an uncertain secondary source rock potential for liquid hydrocarbon generation at existing thermal maturity levels; the uncertainty concerning these samples is a result of the probable presence of Soltex mud additive contamination. These two samples are at 3328.0 meters and 3363.5 meters. As explained in the Selene-1X well report (EPS Rpt. No. 2464L of March 8, 1983), this contamination would falsely inflate the oil generation potential of the samples.

The other ten samples, ranging in depth from 2264.5 meters to 3382.5 meters, have no significant hydrocarbon source rock potential; this conclusion is based both on visual kerogen and pyrolysis results.

Peak range thermal maturity for oil generation was either not attained in this section or, at best, just marginally attained near T.D. Early stage thermal maturity, however, is indicated below 2765.0 meters and possibly as high as 2711.0 meters. Where these samples might be found in peak oil generation phase thermal maturity, the source rock potential would be essentially unchanged. If found in gas phase maturity, samples 3113.5, 3328.0 and 3363.5 meters have the potential for possibly generating significant dry gas.

The more pertinent results of this project were telexed to you July 27, 1983. Included in the present report are a source rock plot, a pyrolysis chart and computer printouts of kerogen and pyrolysis data.

Discussion

2264.5-3313.5m (9 spl's.)

No significant source rock potential is indicated for these samples. Although sample 3113.5m has a rich organic carbon content of 1.27 wt.%, and approximately 30% oil prone kerogen, a low hydrogen index value suggests that the organics probably were oxidized to some extent prior to or during burial, destroying the oil generating potential. Four other samples have a dominance of oil prone kerogen ranging from 70% to 85%, but a combination of low TOC, S2 peak and hydrogen index values preclude significant source rock potential. Although the upper two samples are immature, early stage maturity for oil generation is attained at 2765.0m, and possibly as high as 2711.0m.

3328.0-3363.5m (2 spl's.)

These samples have an uncertain secondary source rock potential for liquid hydrocarbon generation. Both have a rich organic carbon content and a dominance of oil prone kerogen. Vitrinite reflectance indicates that these samples are well into early phase maturity for oil generation, with the deeper one being possibly into peak range maturity. However, marginal S2 peak and hydrogen index values, along with the strong possibility that Soltex mud additive contamination is present, leave the data obtained from these samples somewhat questionable. As mentioned in the summary, this contamination problem was discussed in an earlier well report.

3382.5m (1 spl.)

This sample has no significant source rock potential because of its very low organic carbon content of < 0.16 wt.%.

Sample 2264.5m was indeterminate for vitrinite reflectance and several others were questionable (see kerogen data printout), because low levels of reliable indigenous vitrinite are present. A great deal of recycled, much higher reflecting vitrinite was present in most samples.

Dennis R Logan
Dennis R. Logan

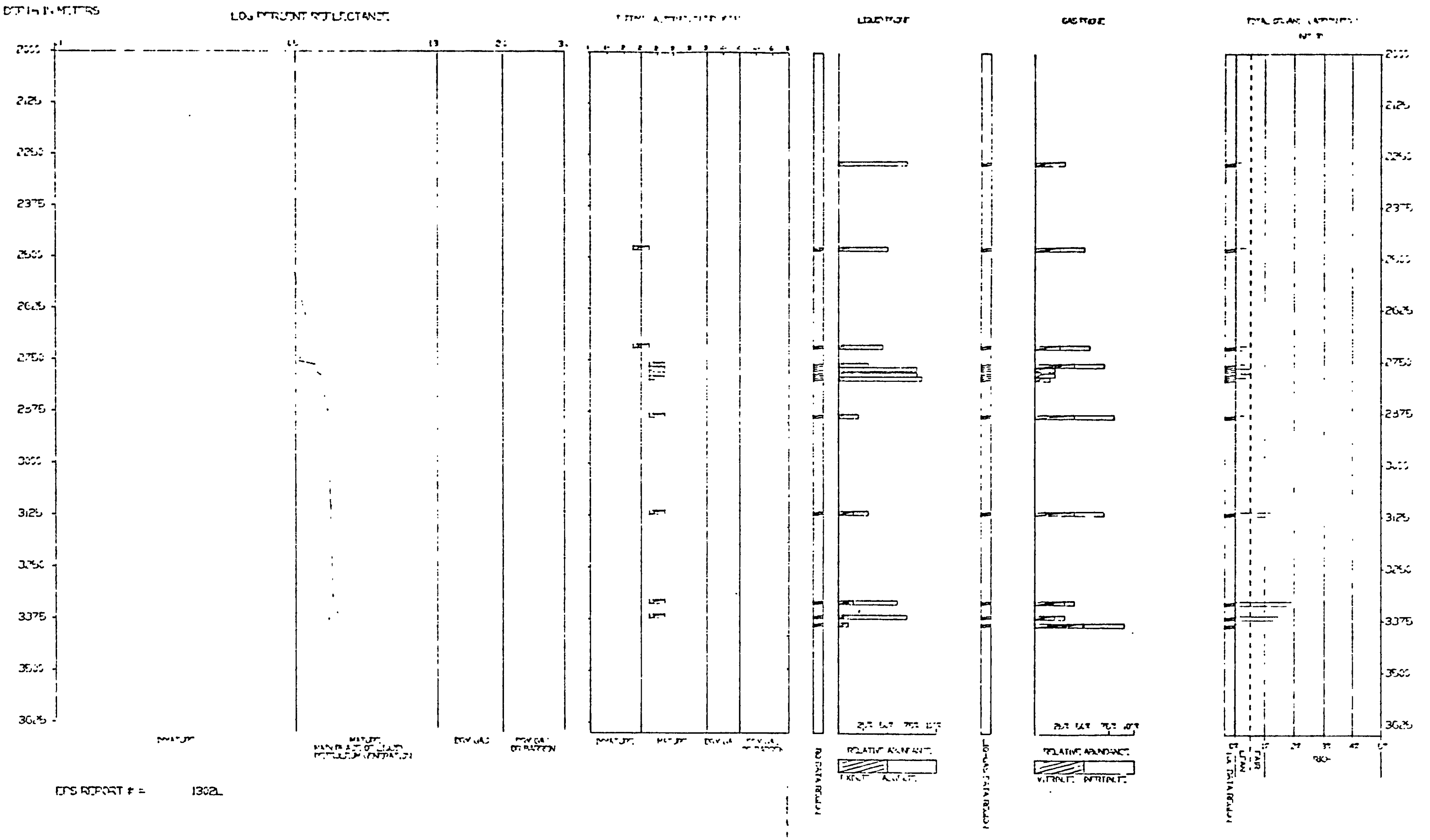
Approved: E A Stanley
E. A. Stanley

DRL/sjb

Attachments

cc: W. E. Ryker
K L. Lyons (r) B. W. Knuth
J. C. Smith (r) J. A. Standridge
H. A. Kuehnert (r) D. W. Dalrymple DWD (EAS)
M. E. Smith MES

THERMAL ALTERATION AND SOURCE ROCK POTENTIAL OF PPCO ATHENE NO 1 GIPPSLAND BASIN AUST



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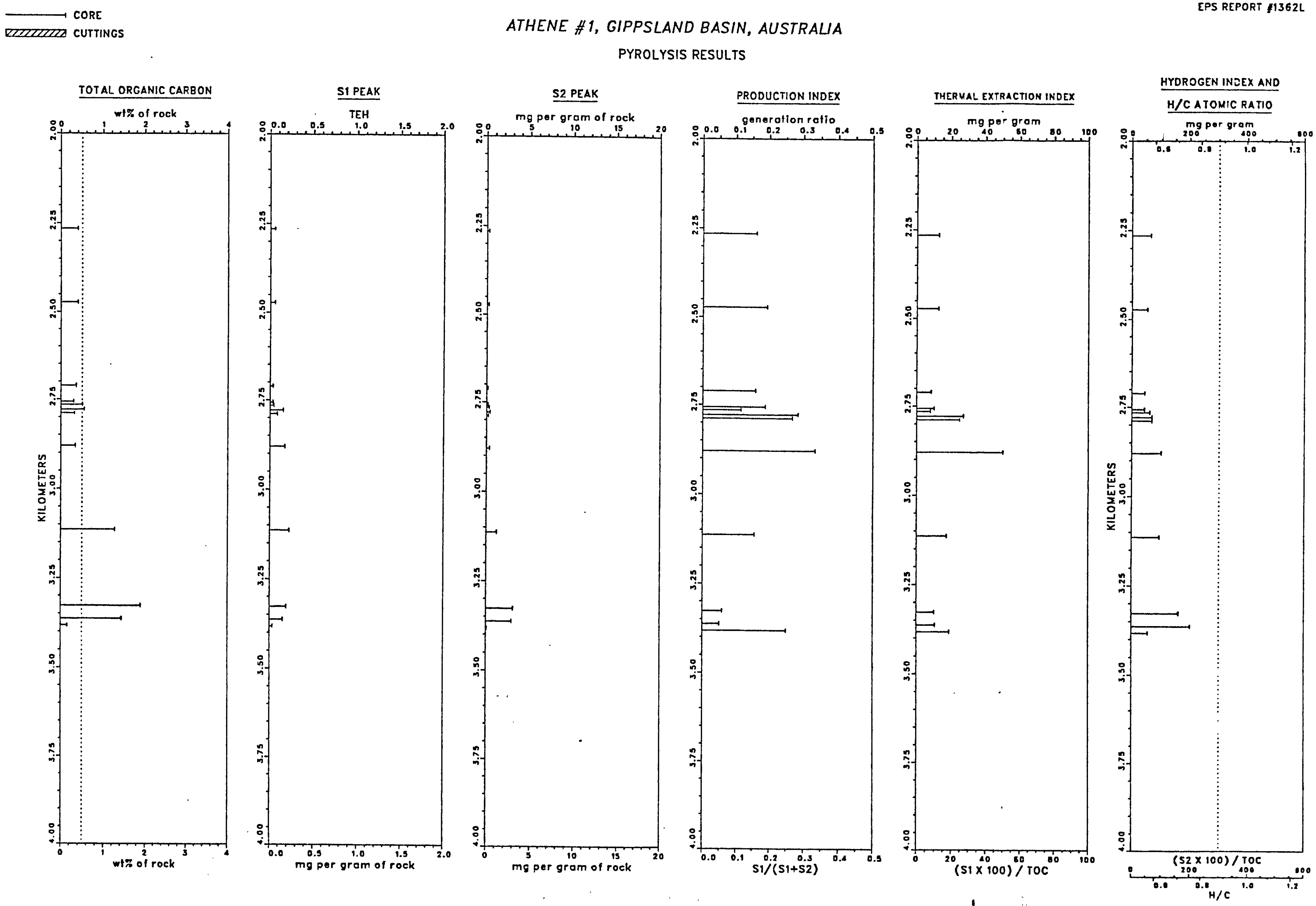
EPS REPORT #1362L

ATHENE #1, GIPPSLAND BASIN, AUSTRALIA

PYROLYSIS RESULTS



[illegible] LOGA)

PPCO ATHENE NO 1 GIPPSLAND BASIN AUST
EPS REPORT # 1302L

			NORMALIZED TO 100% BY VOLUME (LIQUID PRONE)		(GAS PRONE)								
										RANGE			
SAMPLE I.D.	TYPE	TAI	EXI-NITE	ALGI-NITE	VITRI-NITE	INERTI-NITE	RO MEAN	STND. DEV	MODE	LOW	HIGH	NO. OF VIT. READINGS	TOTAL ORGANIC CARBON (WT %)	EXT OR MA (F
2264.5METERS	SW		5.	65.	15.	15.							0.40	
2472.3METERS	SW	2	10.	40.	25.	25.	0.47	0.02	0.45	0.44	0.51	35	0.40	
2711.0METERS	SW	2	5.	40.	25.	30.	?0.56	0.07	0.61	0.44	0.66	17	0.36	
2755.0METERS	SW	2+	5.	25.	40.	30.	?0.51	0.08	0.50	0.39	0.67	21	0.30	
27[illegible].0METERS	SW	2+	5.	75.	10.	10.	0.59	0.04	0.53	0.52	0.66	45	0.51	
2778.5METERS	SW	2+	5.	75.	10.	10.	0.57	0.06	0.51	0.47	0.69	32	0.55	
2738.5METERS	SW	2+	5.	80.	10.	5.	?0.59	0.02	0.57	0.54	0.63	12	0.32	
[illegible]79.5METERS	SW	2+	5.	15.	40.	40.	0.62	0.03	0.54	0.57	0.67	26	0.34	
[illegible].5METERS	SW	2+	15.	15.	40.	30.	0.63	0.03	0.66	0.56	0.68	40	1.27	
3523.0METERS	SW	2+	15.	45.	30.	10.	0.64	0.04	0.53	0.59	0.71	36	1.90	
3555.5METERS	SW	2+	10.	60.	20.	10.	0.66	0.04	0.64	0.58	0.73	36	1.44	
3592.5METERS	SW		10.	0.	50.	40.	?0.62	0.04	0.57	0.56	0.69	30	0.16	

TERMINOLOGY USED FOR SOURCE ROCK PLOT

TAI = THERMAL ALTERATION INDEX (SPORE COLOR) (1-2 YELLOW) (2-3 BROWN) (3-4 DARK BROWN) (5 BLACK)
EXINITE = POLLEN AND SPORE EXINE + PLANT CUTICLES + RESINS + OTHER STRONGLY FLUORESCENT ORGANIC MATERIALS + AMORPHOUS HERBACEOUS (IF RECOGNIZABLE AS FROM TERRESTRIAL SOURCE - IF NOT IT IS RECORDED UNDER ALGINITE)
ALGINITE = (ALGAL DEBRIS - CYSTS AND BODIES) + AMORPHOUS SAPROPEL
VITRINITE = WOODY TISSUE (ALTERED T) HUMIC COMPOUNDS) + NONFLUORESCENT STRUCTURED TRANSLUCENT MATERIAL
INERTINITE = COALY MATERIAL INCLUDING FUSINITE, SEMIFUSINITE, PSEUDOVITRINITE, MACRINITE, & INERTODETRINITE
* RATIO = F / (1.25 * TOC)

EPS REPORT #1302L

PYROLYSIS RESULTS FOR SAMPLES FROM THE ATHENE #1, GIPPSLAND BASIN, AUSTRALIA

PAGE 1 OF 1

STRAT. INTERVAL	SPL TYP	SAMPLE DEPTH METERS	TOTAL ORGANIC CARBON WT.%	S1 MG.HC/ G.ROCK	S2 MG.HC/ G.ROCK	PRODUCTION INDEX S1/(S1+S2)	THERMAL EXTRACTION INDEX MG/G.	HYDROGEN INDEX MG/G.	HYDROGEN TO CARBON ATOMIC RATIO	GEOCHEM SAMPLE CODE
	SWC	2254.5	.40	.05	.26	.161	12.50	65.0	.582	EP83FCM
	SWC	2472.0	.40	.05	.21	.192	12.50	52.5	.566	EP83FCN
	SWC	2711.0	.36	.03	.16	.158	8.33	44.4	.556	EP83FCO
	SWC	2756.0	.30	.03	.13	.187	10.00	43.3	.555	EP83FCP
	SWC	2765.0	.51	.04	.31	.114	7.84	60.8	.577	EP83FCQ
	SWC	2772.0	.55	.15	.38	.283	27.27	69.1	.587	EP8 CR
	SWC	2782.5	.32	.08	.22	.267	25.00	68.7	.587	EP83FCS
	SWC	2379.5	.34	.17	.34	.333	50.00	100.0	.626	EP83FCT
	SWC	3113.5	1.27	.22	1.19	.156	17.32	93.7	.618	EP83FCU
	SWC	3323.0	1.90	.19	3.04	.059	10.00	160.0	.702	EP83FCV
	SWC	3565.5	1.44	.15	2.90	.049	10.42	201.4	.754	EP83FCW
	SWC	3382.5	< .16	.03	.09	.250	18.75	56.2	.571	EP83FCX

APPENDIX NO. 8

LOG ANALYSIS

LOG ANALYSIS

All wireline logs run in Athene No. 1 are listed in Table 1. A Phillips Computer Well Log Plot (CPI), a composite of log analysis over the interval 2753 metres to 3385 metres is provided in Enclosure 5. A constant Rw of 0.065 at 93°C was used in calculating water saturations. A cementation exponent (m) of 1.8 was used with a saturation exponent (n) of 2.

Several data sources were used for interpreting the lithology on the Composite Log including the mud log, geologists' lithologic log, daily drilling reports and sidewall core descriptions. On the other hand, only wireline log responses were used to interpret lithology of the computer well log plot. For this reason, the lithology portrayed on the Phillips Computer Well Log Plot may not everywhere mirror the interpreted lithology on the Composite Log (Enclosure 4).

Thin hydrocarbon-bearing zones are apparent on the Computer Well Log Plot between 3125 metres to 3130 metres, 3219 metres to 3272.5 metres and 3293 metres to 3296 metres respectively, with water saturations in the 85% to 99% range. These zones exhibit a false hydrocarbon content probably due to the presence of freshwater or the differences in lithology between these zones and the average sandstone zones which were used to determine the basic saturation parameters.

TABLE 1 : SUMMARY OF WIRELINE LOGGING

SUITE	RUN	LOG	INTERVAL (METRES)
1	1	DIL-SLS-GR-CAL	530m - 1208m
2	1	DIL-SLS-GR-CAL	1192m - 2753m
2	2	CST	1286.5m - 2754m 21 attempted - 21 recovered
3	1	DIL-SLS-GR	2751m - 3384m
3	2	LDL-CNL-GR	2751m - 3384m
3	3	HDT	2751m - 3380m
3	4	CST	2756m - 3382.5m 30 attempted - 26 recovered
3	5	VELOCITY SURVEY	31 shots

INTERPRETATIVE

APPENDIX NO. 9

DIPMETER INTERPRETATION

INTERPRETATIVE

APPENDIX NO. 9

DIPMETER ANALYSIS, ATHENE NO. 1

The dipmeter was run over the interval 2751 metres to 3380 metres in Athene No. 1. This interval includes 105 metres of the condensed sequences and all the Upper Cretaceous Latrobe Group sediments penetrated in the well. Dipmeter analysis of sandstones within the section aids in determining the main paleocurrent directions of each unit and their respective depositional environments. The study has concentrated on major Latrobe Group sand bodies of Maastrichtian age.

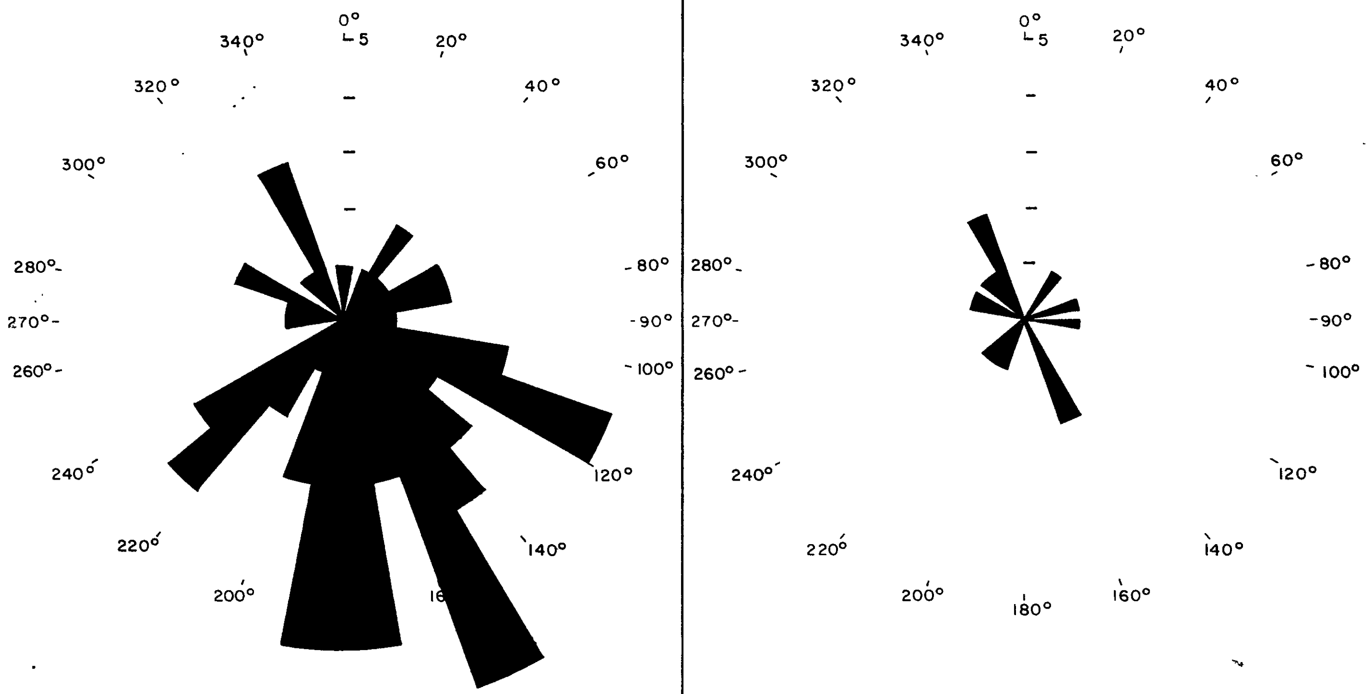
In order to study the sedimentary dips, a correlation interval of 1 metre, step distance of 0.5 metre and a search angle of 35 degrees was used. Polar plots were constructed to display depositional information which is unique to each unit studied. For each unit three plots have been made; one including all dip values, a plot of all dip values greater than or equal to 5 degrees, and a plot based on confidence of dipmeter data. The plot of all dip values was used to determine the general sedimentary dip direction, while the plot of dip values greater than or equal to 5 degrees determined any trend in larger dip values which may be particularly relevant in fluvio-deltaic environments. Polar plots based on confidence of dipmeter data were used to eliminate data of poor quality. Dip azimuths were grouped into 10-degree intervals for plotting purposes.

A Maastrichtian shallow marine sand body was penetrated between 2925 metres and 2966 metres in Athene No. 1. Dipmeter readings when all dips are plotted (Figure 1A), indicate a pattern with a south-southeast dip direction. When dips of 5 degrees or greater are plotted (Figure 1B), there is a bimodal distribution of dip directions, with both northwest and southeast trends apparent. Figure 1C indicates that 93% of all dips plotted have a confidence level of C or higher (A is best, D is eliminated), and supports south or southeasterly dip. Dips of A level quality represent 76% of the total data indicating that the data is of excellent quality. The dipmeter, electric log and lithological data suggest that the sand between 2925 metres and 2966 metres was deposited in the shallow marine environment, generally below wave base. This interpretation is supported by dipmeter data that indicates only 19% of all dips are greater than 5 degrees, suggesting deposition in a low energy environment in water depths greater than 15 metres. Water depth during deposition of the upper part of the sand decreased, which resulted in higher dip values. The bimodal sedimentary dips (Figure 1B) represent deposition closer to the paleoshoreline, which probably had a northeast-southwest orientation at this time.

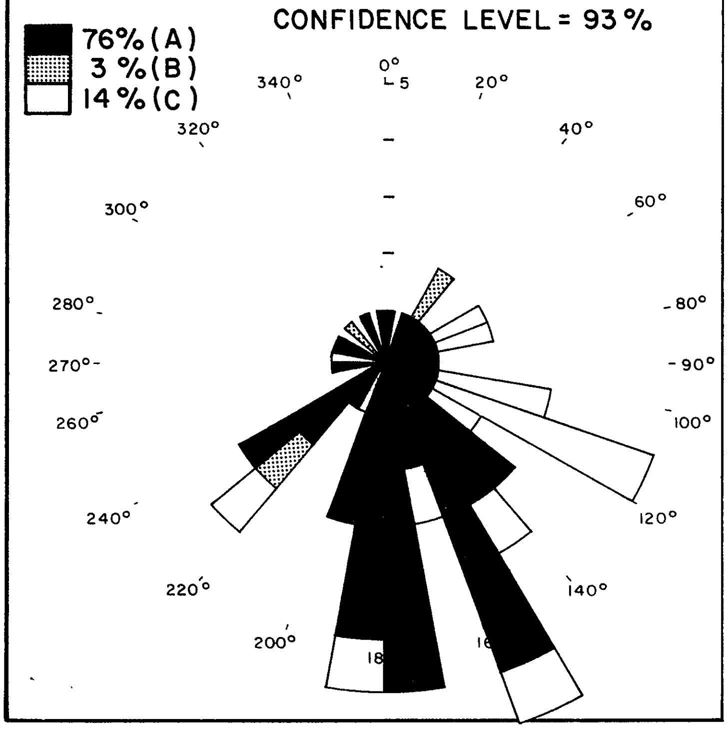
Major structuring in the Athene area is interpreted to consist of a series of northwest-southeast trending rotated fault blocks downthrowing to the northeast. Strike valley sedimentation in a southeasterly direction is a result of this structuring, with the paleoshoreline locally oriented in a northeast-southwest direction.

A. ALL DIP ANGLES
n = 75

B. DIP ANGLES ≥ 5°
n = 14



C. CONFIDENCE LEVELS FOR ALL DIP ANGLES
n = 70



PHILLIPS AUSTRALIAN OIL COMPANY

ATHENE-1
2925m to 2966m

POLAR PLOT OF PALEOCURRENTS MEASURED FROM DIPMETER DATA

LATROBE GROUP SHALLOW MARINE SANDS

B.E. SEE OCT, 1983

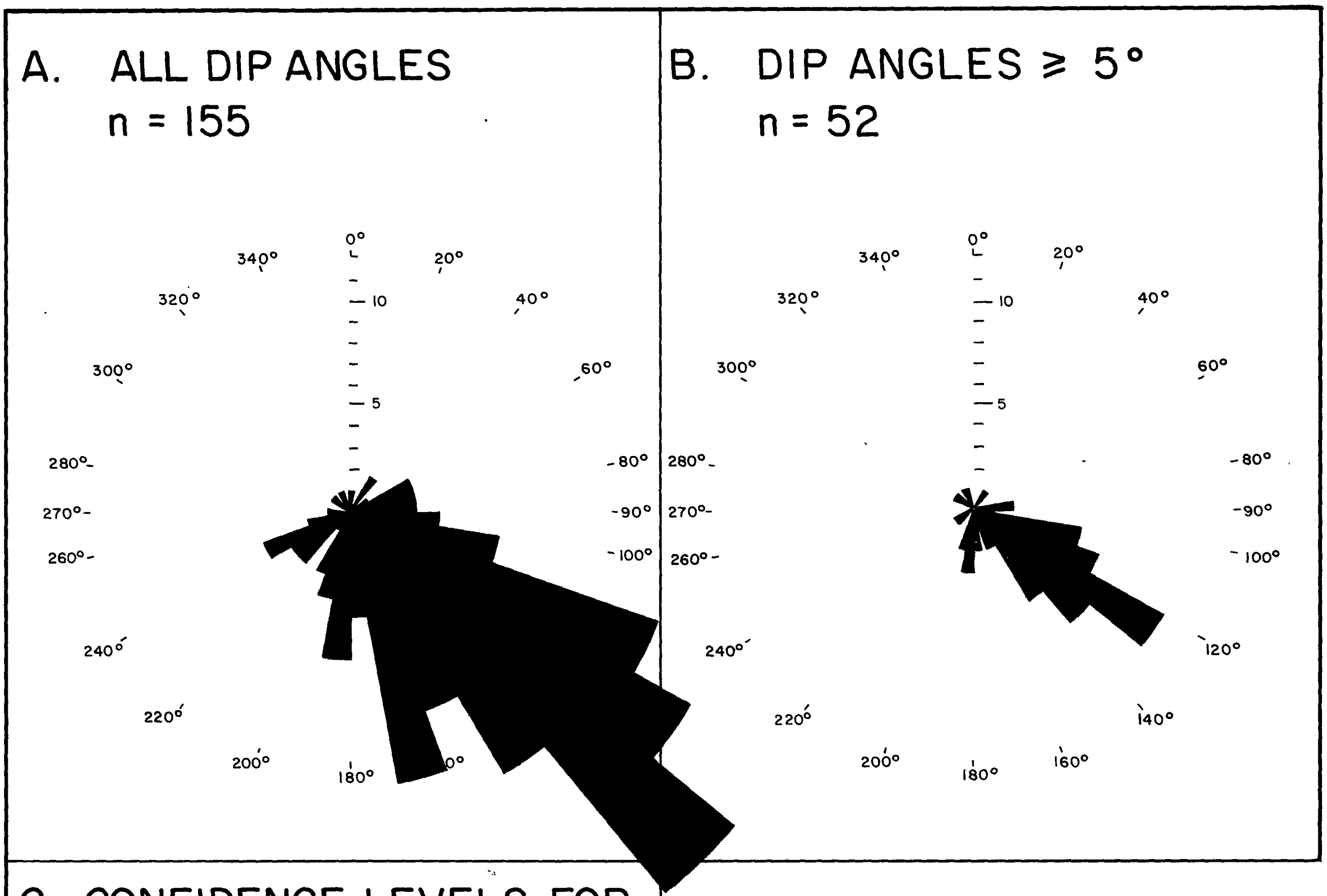
INTERPRETATIVE

A-5756-18

FIGURE 1

Athene No. 1 penetrated additional Maastrichtian sands between 2966 metres and 3046 metres. Dipmeter data through these sands indicate strong southeasterly dip, when all dips are plotted (Figure 2A). Dip magnitudes of 5 degrees or greater (Figure 2B) also indicate strong southeasterly dip. The confidence level plot (Figure 2C) indicates that 97% of all dips are C level or better (84% are A level) and confirms southeasterly dip. The depositional environment of this unit between 2966 metres and 3046 metres was near shore marine, somewhat closer to the paleoshoreline than the previously described shallow marine sands. Closer proximity to the paleoshoreline is indicated by an increased percentage (34%) of dips equal to or greater than 5°. The increased percentage of 5 degree or greater dips indicates higher depositional energy, probably due to wave energy in shallow water (15 metres or less). The paleoshoreline probably had a northeast to southwest orientation during the deposition of these sands. Primary sediment supply and progradation was from the northwest along the northwest-southeast trending strike valley.

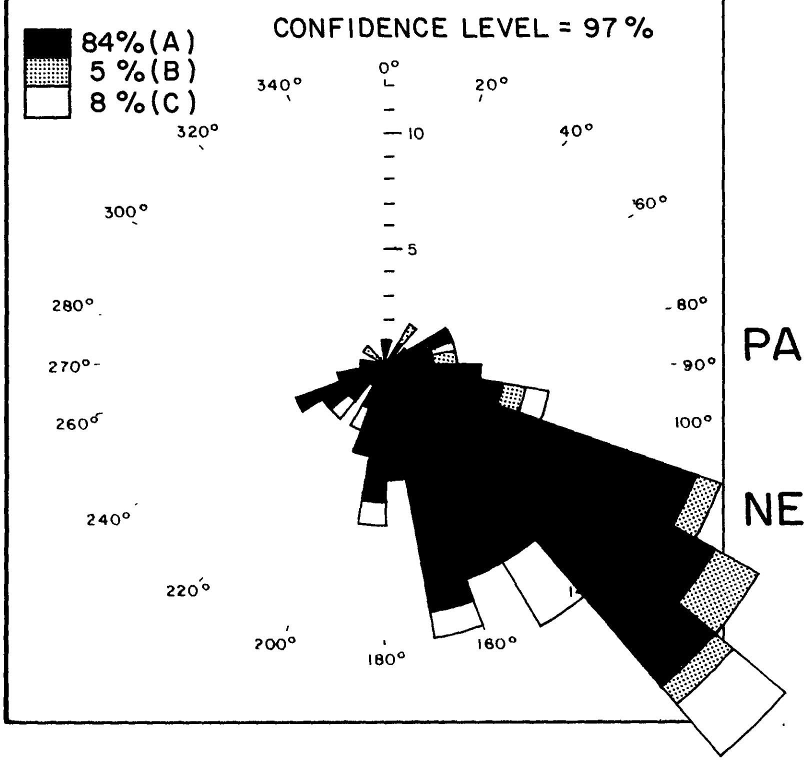
A 54.5 metre thick Maastrichtian sand was penetrated between 3046 metres and 3100.5 metres in Athene No. 1. Dipmeter readings, when all dips are plotted (Figure 3A) indicate southeasterly dip. For dips of 5 degrees or greater (Figure 3B), the sedimentary dip direction becomes more southerly, while the confidence plot (Figure 3C) displays a 78% confidence level which trends from southeast to south-southwest. The data quality is still considered to be very good, with A level dips representing 50% of the total. The sands penetrated between 3046 metres and 3100.5 metres represent near-shore marine sediments probably deposited in water depths less than 15 metres along a northeast-southwest trending paleoshoreline.



A. ALL DIP ANGLES
n = 155

B. DIP ANGLES ≥ 5°
n = 52

C. CONFIDENCE LEVELS FOR ALL DIP ANGLES
n = 150



PHILLIPS AUSTRALIAN OIL COMPANY

ATHENE-1
2966m to 3046m

POLAR PLOT OF PALEOCURRENTS MEASURED FROM DIPMETER DATA

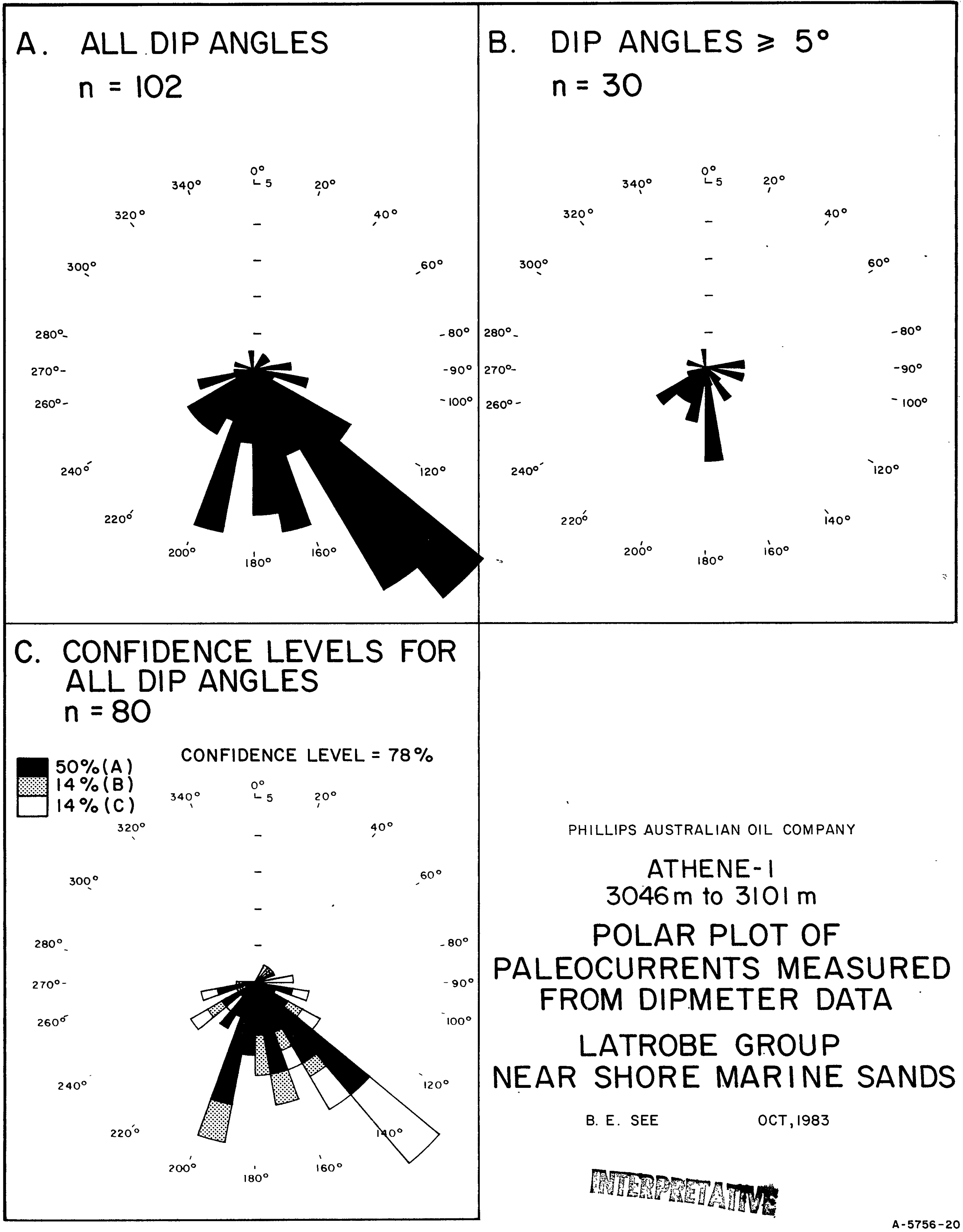
LATROBE GROUP
NEAR SHORE MARINE SANDS

B. E. SEE OCT, 1983

INTERPRETATIVE

A-5756-19

FIGURE 2



A. ALL DIP ANGLES
n = 102

B. DIP ANGLES ≥ 5°
n = 30

C. CONFIDENCE LEVELS FOR ALL DIP ANGLES
n = 80

■ 50%(A)
▨ 14%(B)
☐ 14%(C)

CONFIDENCE LEVEL = 78%

PHILLIPS AUSTRALIAN OIL COMPANY

ATHENE-1
3046m to 3101m

POLAR PLOT OF PALEOCURRENTS MEASURED FROM DIPMETER DATA

LATROBE GROUP NEAR SHORE MARINE SANDS

B. E. SEE OCT, 1983

INTERPRETATIVE

A-5756-20

FIGURE 3

A massive sand of Maastrichtian age was penetrated between 3114 metres and 3220.5 metres in Athene No. 1. The sand is representative of deposition within a near shore marine environment between 3114 metres and 3138 metres, and a beach barrier system between 3138 metres and 3220.5 metres. To obtain the maximum data the sand was divided into two units and each studied individually.

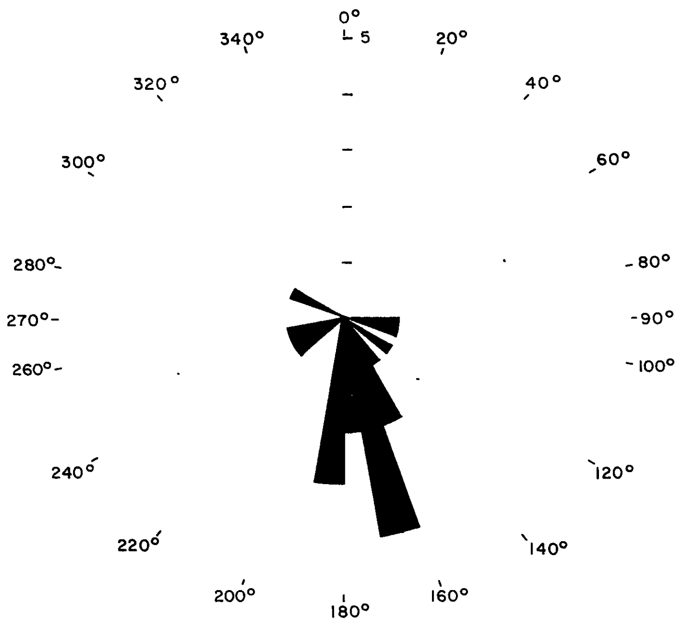
The uppermost unit of the massive sand body was penetrated between 3114 metres and 3124 metres. Figure 4A displays a south-southeasterly dip trend when all dip azimuths are plotted. When dips of 5 degrees or greater are plotted (Figure 4B), the sedimentary dip direction remains to the south-southeast. The dip confidence level plot (Figure 4C) indicates that 79% of the sedimentary dips are C level or better and that 47% of the dips are A level. The dipmeter data for this interval is of good quality and the confidence level plot supports a south-southeasterly sedimentary dip.

The beach barrier unit of the massive sand body was penetrated between 3170 metres and 3220.5 metres. A southwest to southeast dip trend is evident when all dips are plotted (Figure 5A), and for dips of 5 degrees or greater a bimodal trend emerges with the primary dip direction to the south-southwest. The dipmeter confidence level is excellent at 88% (Figure 5C) and supports a southwest to southeast sedimentary dip azimuth.

As postulated earlier, the southeasterly dip component is probably due to sedimentation along the northwest-southeast trending strike valley formed by earlier structural movements. The southwesterly dip component in the beach barrier unit is probably indicative of structural dip resultant from movement on the northwest to southeast trending rotated fault blocks.

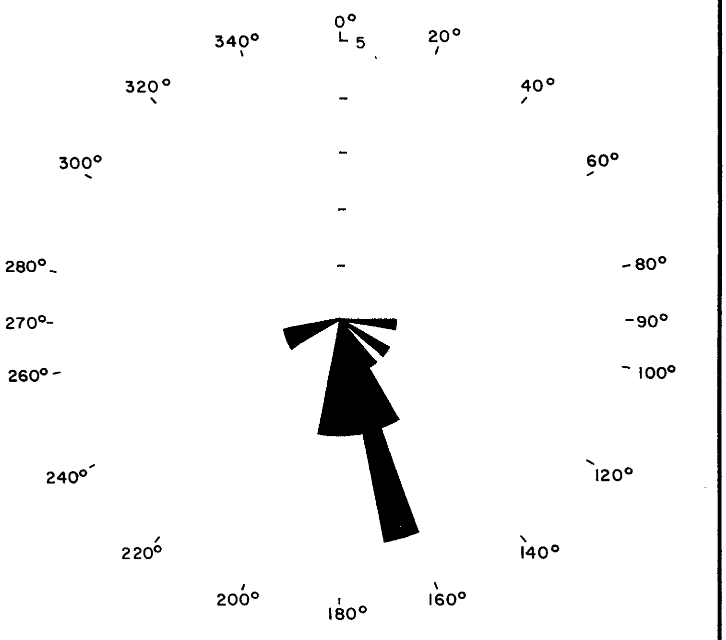
A. ALL DIP ANGLES

n = 19



B. DIP ANGLES ≥ 5°

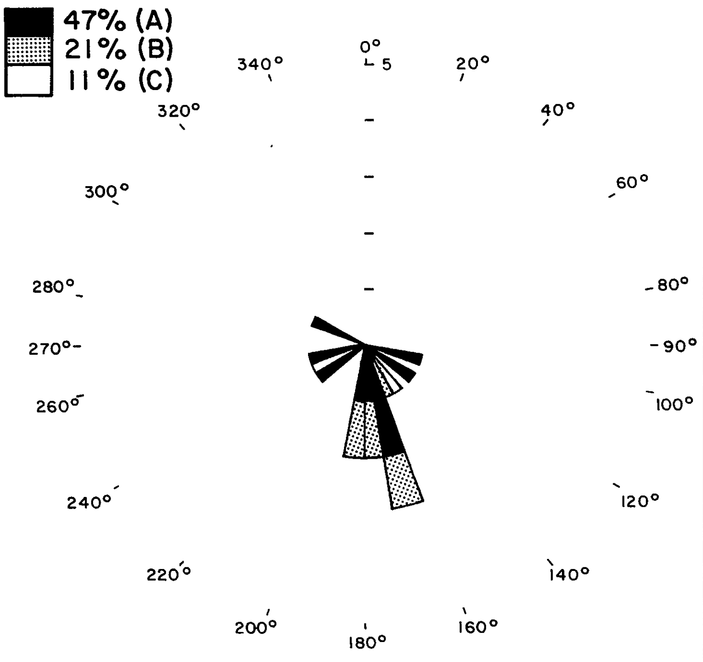
n = 15



C. CONFIDENCE LEVELS FOR ALL DIP ANGLES

n = 15

CONFIDENCE LEVEL = 79%



PHILLIPS AUSTRALIAN OIL COMPANY

ATHENE-1
3114m to 3124m

POLAR PLOT OF PALEOCURRENTS MEASURED FROM DIPMETER DATA

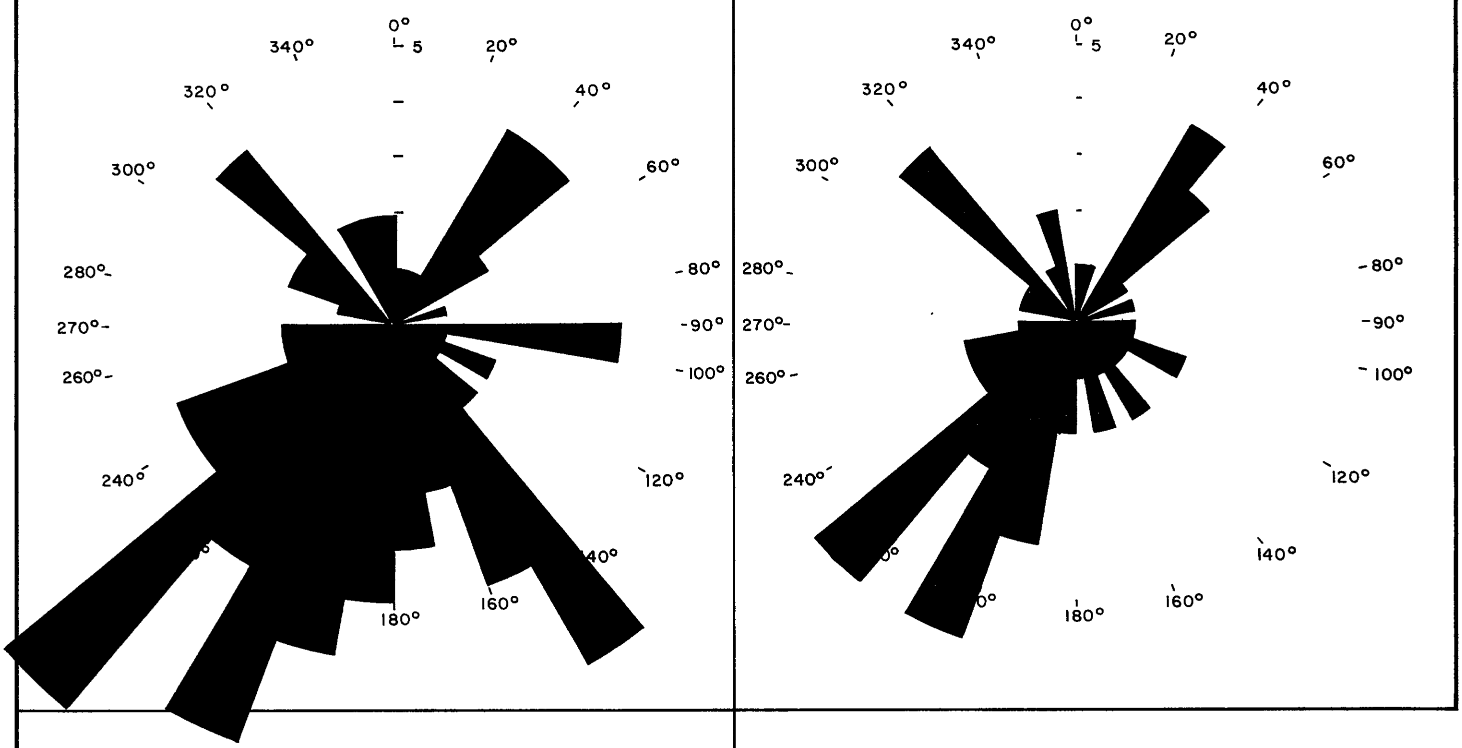
LATROBE GROUP NEAR SHORE MARINE SANDS

B.E. SEE OCT, 1983

INTERPRETATIVE

A-5756-21

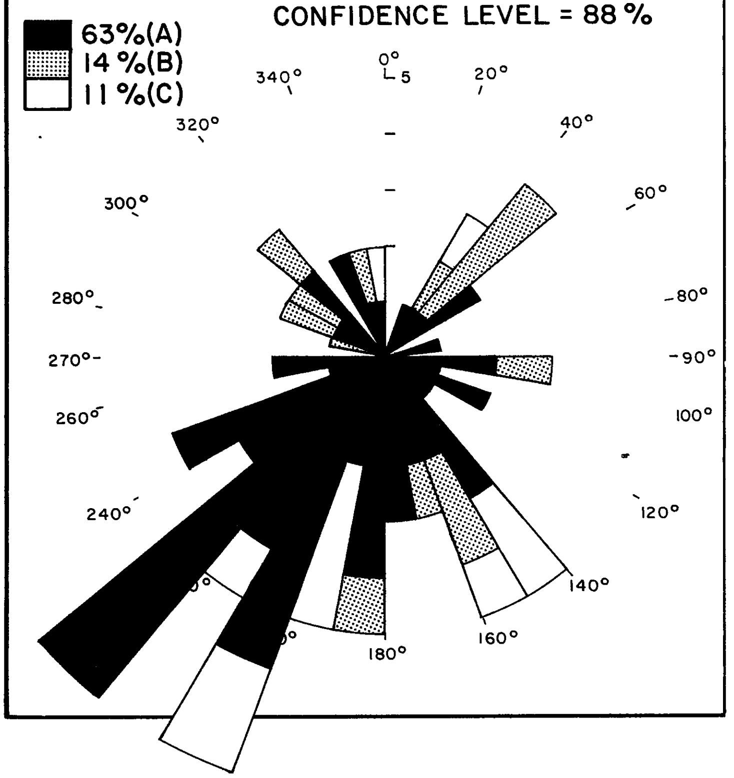
FIGURE 4



A. ALL DIP ANGLES
n = 103

B. DIP ANGLES ≥ 5°
n = 61

C. CONFIDENCE LEVELS FOR ALL DIP ANGLES
n = 91



PHILLIPS AUSTRALIAN OIL COMPANY

ATHENE-1
3170m to 3222m

POLAR PLOT OF PALEOCURRENTS MEASURED FROM DIPMETER DATA

LATROBE GROUP BEACH BARRIER SANDS

B. E. SEE OCT, 1983

INTERPRETATIVE

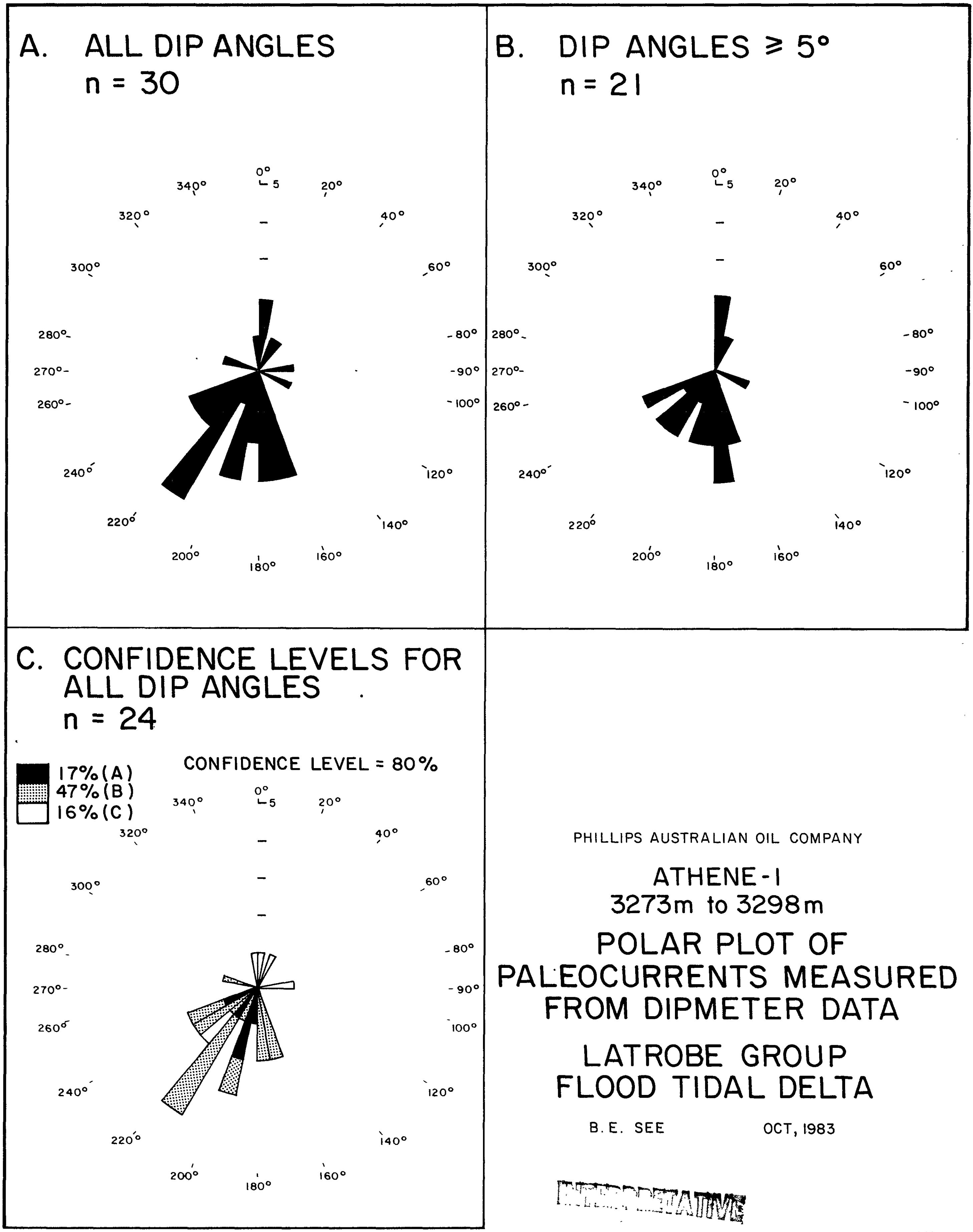
A-5756-22

FIGURE 5

The lowermost sand body studied using the dipmeter was intersected between 3272.5 metres and 3298 metres. Deposition of these sands occurred in the back barrier environment. When all dip azimuths are plotted (Figure 6A) a dip direction of south to southwest is displayed. Figure 6B illustrates a dip of south when dips of 5 degrees or greater are used. The dipmeter confidence level (Figure 6C) is of good quality at 80% and indicates south to southwesterly dip. Lithology, log character and dipmeter data suggest that the sand body intersected between 3272.5 metres and 3298 metres was deposited in the back barrier environment, probably as a flood tidal delta deposit. Flood tidal deltas form in the lagoon, landward of a tidal inlet. Again, the southwesterly dip component could be attributed to the structural dip.

Correlation of Dipmeter With Wireline Log Responses

Figure 7 illustrates a stacked beach barrier system from the Maastrichtian Latrobe Group. The beach barrier shows stacked cylinder shapes topped by a funnel shape on the gamma-ray log, excellent porosity on the neutron-density curves and low to moderately high dip magnitudes trending from southwest to southeast. The slightly serrated cylinder shapes on the gamma-ray indicate fairly uniform sands. The cylinder shapes also suggest a system that was prograding very slowly. The slightly serrated funnel-shaped gamma-ray indicates coarsening upward and is more representative of a prograding beach. Dip angles generally decrease with depth and indicate shoreface deposition although many of the dips are random indicating deposition in a moderately high energy environment.



A. ALL DIP ANGLES n = 30

B. DIP ANGLES ≥ 5° n = 21

C. CONFIDENCE LEVELS FOR ALL DIP ANGLES n = 24

PHILLIPS AUSTRALIAN OIL COMPANY

ATHENE-1
3273m to 3298m

POLAR PLOT OF PALEOCURRENTS MEASURED FROM DIPMETER DATA

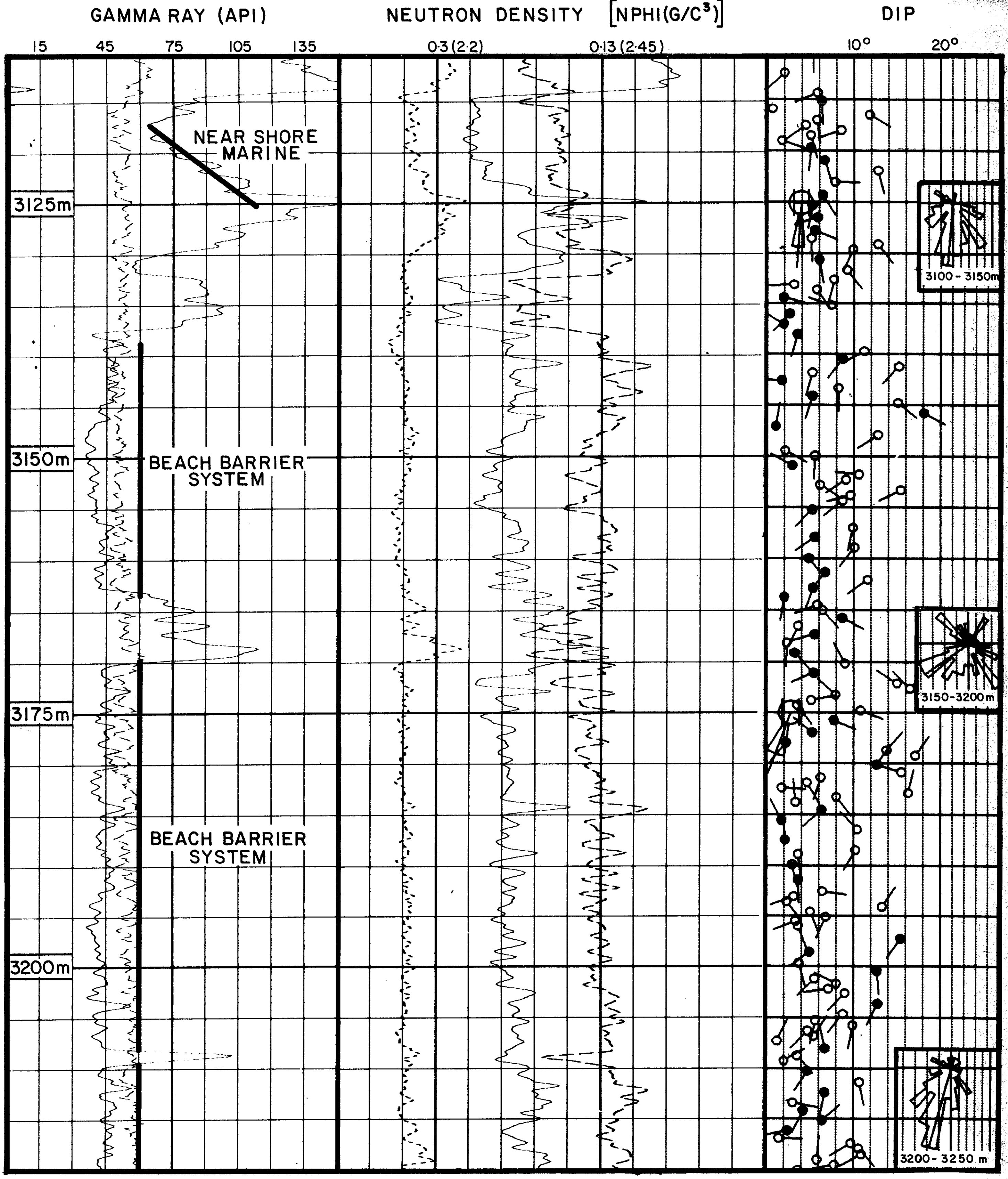
LATROBE GROUP FLOOD TIDAL DELTA

B. E. SEE OCT, 1983

INTERPRETATIVE

A-5756-23

FIGURE 6



LATROBE GP. DEPOSITION = 3114 - 3219 m NEAR SHORE MARINE DEPOSITION = 3114 - 3138 m
BEACH BARRIER SYSTEM = 3138 - 3219 m

ATHENE - 1

INTERPRETATIVE

DIPMETER, GAMMA RAY LOG SHAPE AND POROSITY RELATIONSHIPS

A-6017

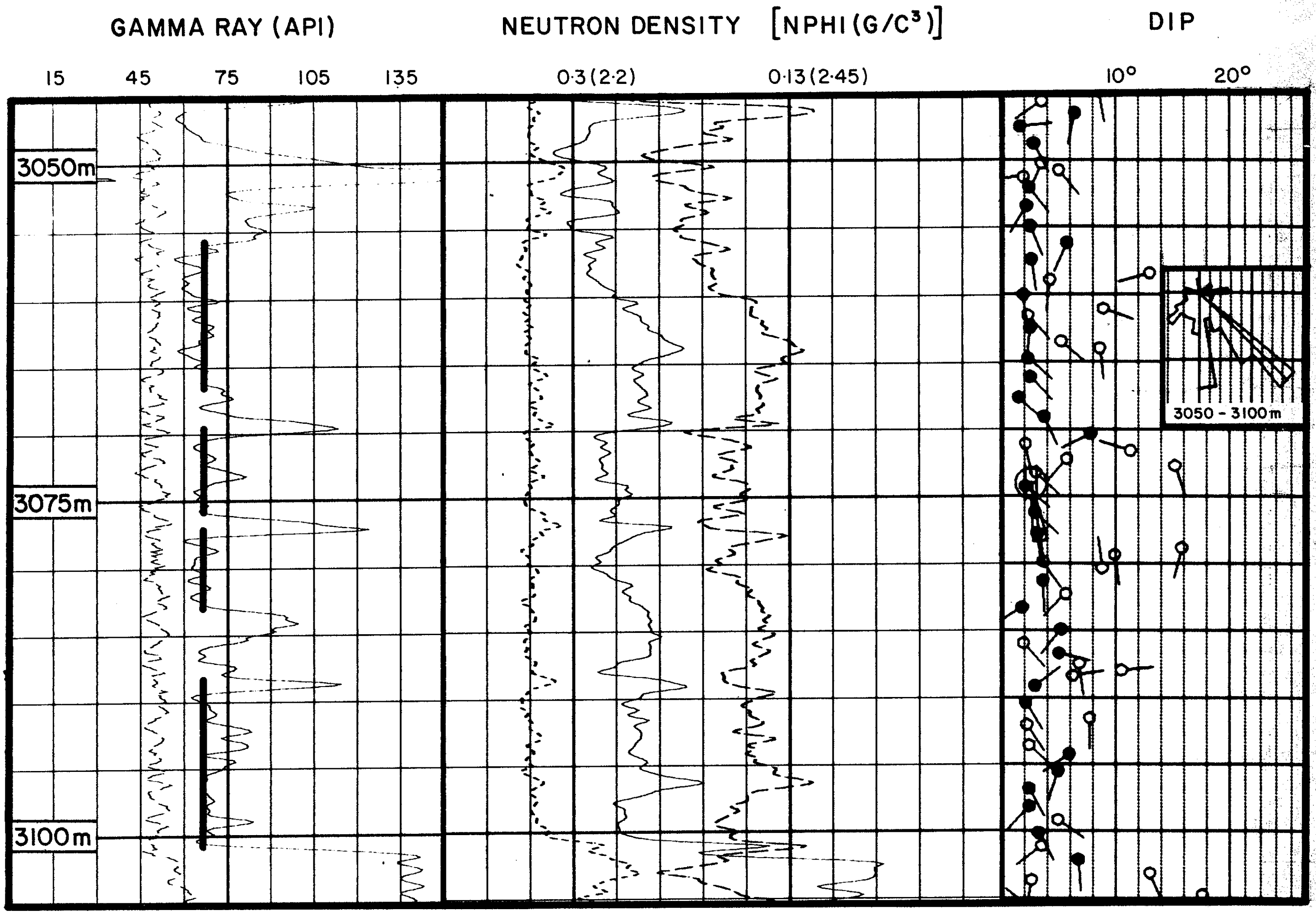
FIGURE 7

The upper portion of Figure 8 displays Maastrichtian Latrobe Group near-shore marine sands which were penetrated between 3046 and 3100.5 metres in Athene No. 1. The near shore marine sands are stratigraphically higher than the beach barrier system described in Figure 8. The sands show a stacked series of slightly serrated cylinder shapes on the gamma-ray log, excellent porosity on the neutron-density combination and generally low dip magnitudes trending generally southeast. The slightly serrated cylinder shapes on the gamma-ray along with fairly constant porosity on the neutron-density combination indicate uniform sands. The gamma-ray peaks are probably caused by glauconite. Dip magnitudes are generally low indicating deposition in deeper water with occasional higher dip magnitudes indicating influence by wave base. These sands were probably deposited on a shallow shelf area, in water 15 metres or less in depth and within 1 kilometre of the northeast-southwest trending paleoshore.

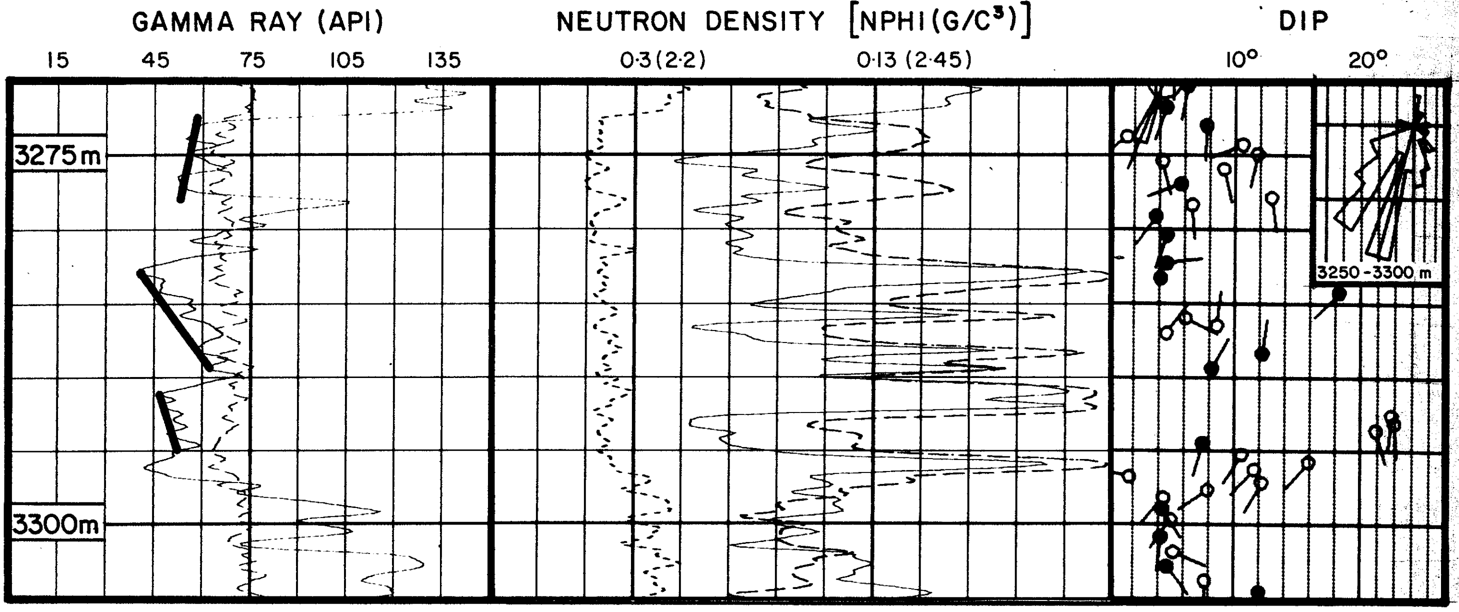
Figure 8 shows, in the lower portion, a Maastrichtian back barrier sand body penetrated between 3273 metres and 3298 metres in Athene No. 1. This sand body is stratigraphically lower than the beach barrier described in Figure 8. The sand displays a series of slightly serrated funnel and bell shapes on the gamma-ray log, good to poor porosity on the neutron-density combination and low to moderately high dip magnitudes trending generally southwest. The slightly serrated funnel and bell shapes on the gamma-ray indicate both coarsening upward and fining upward sediments. The inconsistent porosity on the neutron-density combination was caused by dolomitization as indicated by lithological data.

The low to moderately high dip magnitudes indicate deposition in shallow water in a relatively high energy environment. This sand body was deposited in the back barrier environment, probably as a flood tidal delta as described earlier.

LATROBE GROUP MAASTRICHTIAN NEAR SHORE MARINE SANDS
3046 - 3100·5m.



LATROBE GROUP MAASTRICHTIAN FLOOD TIDAL DELTA
3273 - 3298 m



INTERPRETATIVE

ATHENE - I

DIPMETER, GAMMA RAY LOG SHAPE AND
POROSITY RELATIONSHIPS

A-6016

FIGURE 8

INTERPRETATIVE

Dipmeter Summary and Environmental Interpretation

Dipmeter data, when used with wireline log, palynological and lithological information has proved useful in environmental interpretation in Athene No. 1. The environmental history is as follows:

1. During the Early Maastrichtian, the Athene area experienced back barrier depositional environments, which included lagoonal deposits, back barrier sands and washover features. The paleoshoreline was oriented in a northeast-southwest direction with progradation to the southeast. Structural dip was to the southwest.

2. Subsequent deposition in the Maastrichtian is represented by a beach barrier system prograding to the southeast, behind a northeast-southwest oriented paleoshoreline. Southwest structural dip still influenced sedimentation at this time.

3. Later in the Maastrichtian a marine transgression from the southeast dominated the Athene area. The entire depositional regime was influenced by the major northwest-southeast trending faults and resulted in strike valley sedimentation prevailing.

4. Near shore to shallow marine deposition within the strike valley sedimentary regime continued until the Upper Cretaceous/Early Eocene unconformity at the Top Latrobe Coarse Clastics level. The paleoshoreline remained oriented in a northeast-southwest position throughout this period.

PE902548

This is an enclosure indicator page.
The enclosure PE902548 is enclosed within the container PE902547 at this location in this document.

The enclosure PE902548 has the following characteristics:

ITEM_BARCODE = PE902548
CONTAINER_BARCODE = PE902547
NAME = Operational Summary
BASIN =
PERMIT = Vic/P18
TYPE = WELL
SUBTYPE = summary
DESCRIPTION = Operational Summary
REMARKS =
DATE_CREATED = 01/07/1983
DATE_RECEIVED = 15/11/1983
W_NO =
WELL_NAME = Athene-1
CONTRACTOR = Phillips Petroleum 66
CLIENT_OP_CO = Phillips Petroleum 66

(Inserted by DNRE - Vic Govt Mines Dept)

PE601270

This is an enclosure indicator page.
The enclosure PE601270 is enclosed within the container PE902547 at this location in this document.

The enclosure PE601270 has the following characteristics:
ITEM_BARCODE = PE601270
CONTAINER_BARCODE = PE902547
NAME = Mud Log (Geoservices Masterlog)
BASIN =
PERMIT = Vic/P18
TYPE = WELL
SUBTYPE = well log
DESCRIPTION = Mud Log (Geoservices Masterlog)
REMARKS =
DATE_CREATED = 07/07/1988
DATE_RECEIVED = 15/11/1983
W_NO =
WELL_NAME = Athene-1
CONTRACTOR = Phillips Petroleum 66
CLIENT_OP_CO = Phillips Petroleum 66

(Inserted by DNRE - Vic Govt Mines Dept)

PE601271

This is an enclosure indicator page.
The enclosure PE601271 is enclosed within the container PE902547 at this location in this document.

The enclosure PE601271 has the following characteristics:

ITEM_BARCODE = PE601271
CONTAINER_BARCODE = PE902547
NAME = Geologist's Litholog
BASIN =
PERMIT = Vic/P18
TYPE = WELL
SUBTYPE = well log
DESCRIPTION = Geologist's Litholog
REMARKS =
DATE_CREATED = 22/05/1983
DATE_RECEIVED = 15/11/1983
W_NO =
WELL_NAME = Athene-1
CONTRACTOR = Phillips Petroleum 66
CLIENT_OP_CO = Phillips Petroleum 66

(Inserted by DNRE - Vic Govt Mines Dept)

PE601272

This is an enclosure indicator page.
The enclosure PE601272 is enclosed within the container PE902547 at this location in this document.

The enclosure PE601272 has the following characteristics:

ITEM_BARCODE = PE601272
CONTAINER_BARCODE = PE902547
NAME = Composite Log
BASIN =
PERMIT = Vic/P18
TYPE = WELL
SUBTYPE = well log
DESCRIPTION = Composite Log
REMARKS =
DATE_CREATED = 08/07/1983
DATE_RECEIVED = 15/11/1983
W_NO =
WELL_NAME = Athene-1
CONTRACTOR = Phillips Petroleum 66
CLIENT_OP_CO = Phillips Petroleum 66

(Inserted by DNRE - Vic Govt Mines Dept)

PE601273

This is an enclosure indicator page.
The enclosure PE601273 is enclosed within the container PE902547 at this location in this document.

The enclosure PE601273 has the following characteristics:

ITEM_BARCODE = PE601273
CONTAINER_BARCODE = PE902547
NAME = Phillips Computer Log Analysis Plot
BASIN =
PERMIT = Vic/P18
TYPE = WELL
SUBTYPE = well log
DESCRIPTION = Phillips Computer Log Analysis Plot
REMARKS =
DATE_CREATED = 14/07/1983
DATE_RECEIVED = 15/11/1983
W_NO =
WELL_NAME = Athene-1
CONTRACTOR = Phillips Petroleum 66
CLIENT_OP_CO = Phillips Petroleum 66

(Inserted by DNRE - Vic Govt Mines Dept)

PE905425

This is an enclosure indicator page.
The enclosure PE905425 is enclosed within the container PE902547 at this location in this document.

The enclosure PE905425 has the following characteristics:

ITEM_BARCODE = PE905425
CONTAINER_BARCODE = PE902547
NAME = Athene 1 Time Depth Curve (encl. 6, WCR)
BASIN = GIPPSLAND
ON_OFF = OFFSHORE
PERMIT = VIC/P18
TYPE = WELL
SUBTYPE = VELOCITY
DESCRIPTION = Athene 1 Time Depth Curve (enclosure 6 of WCR)
REMARKS =
DATE_CREATED = 31/8/83
DATE_RECEIVED = 15/11/83
W_NO = W817
WELL_NAME = Athene 1
CONTRACTOR = Phillips Australia Oil Company
CLIENT_OP_CO = Phillips Australian Oil Company

(Inserted by DNRE - Vic Govt Mines Dept)

PE902549

This is an enclosure indicator page.
The enclosure PE902549 is enclosed within the
container PE902547 at this location in this
document.

The enclosure PE902549 has the following characteristics:
ITEM_BARCODE = PE902549
CONTAINER_BARCODE = PE902547
NAME = Observed Gippsland Basin Biostratigraphic Sequences of Planktonic Foraminiferal Assemblages
BASIN =
PERMIT = Vic/P18
TYPE = WELL
SUBTYPE = biostratigraphy
DESCRIPTION = Observed Gippsland Basin Biostratigraphic Sequences of Planktonic Foraminiferal Assemblages
REMARKS =
DATE_CREATED = 01/09/1981
DATE_RECEIVED = 15/11/1983
W_NO =
WELL_NAME = Athene-1
CONTRACTOR = Phillips Petroleum 66
CLIENT_OP_CO = Phillips Petroleum 66

(Inserted by DNRE - Vic Govt Mines Dept)