W 6585

SNAIL NO. 1

WELL COMPLETION REPORT

by

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I. Mellins.

HEMATITE PETROLEUM PTY. LTD.

March, 1973.

CONTENTS

I. SUMMARY

(1) Drilling

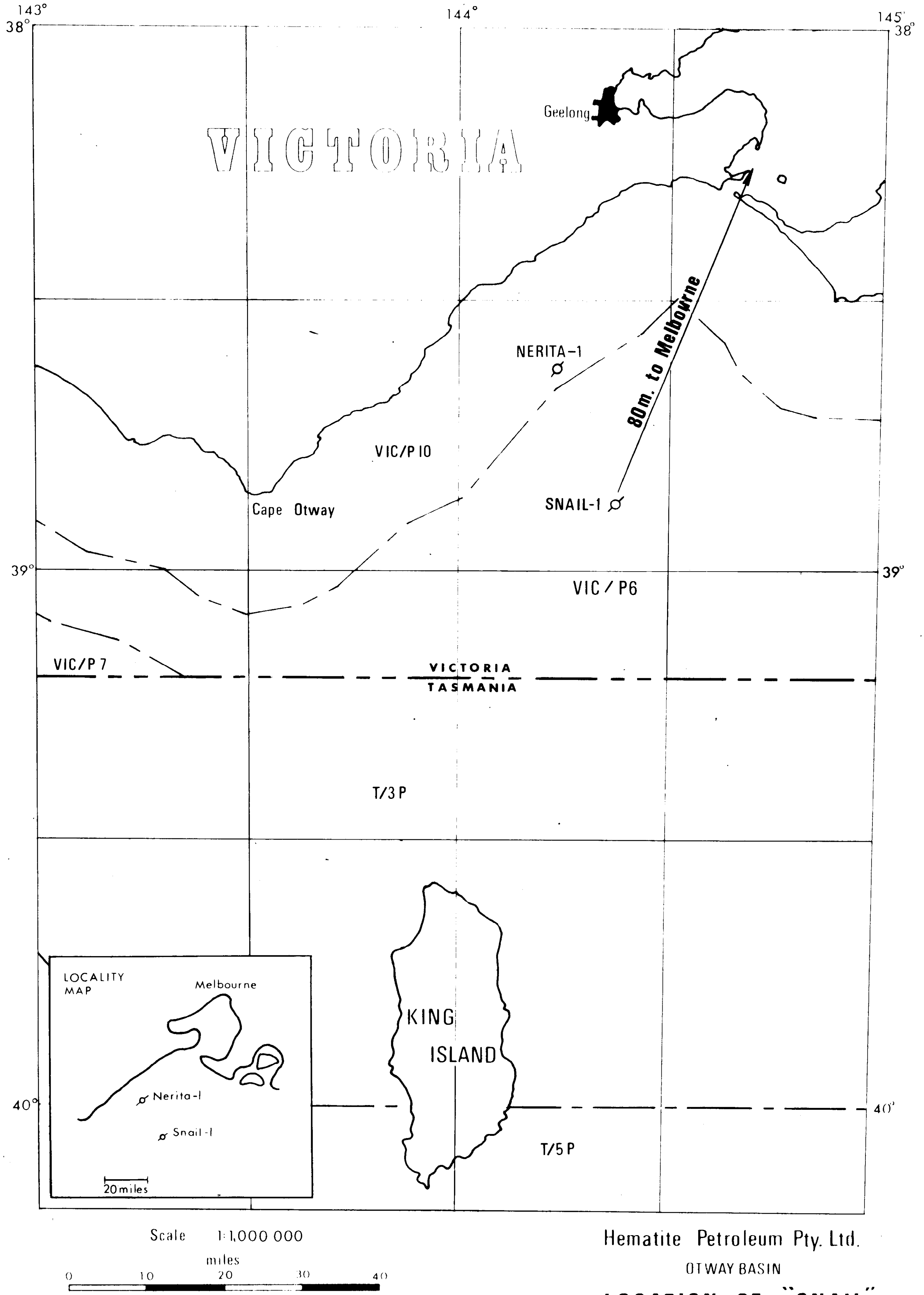
Snail No. 1 was drilled with the "Glomar Conception" floating rig for the operator, Hematite Petroleum Pty. Ltd. The well was spudded in 266 feet of water on the 26th November, 1972. It was abandoned on 8th December, 1972 after reaching a total depth of 4,051 feet below K.B. 20 inch casing was set at 706 feet and 13⅜ inch casing at 1,795 feet. Cement plugs were placed over the intervals 1915 feet - 1595 feet and 620 feet - 420 feet. Total drilling time was 11 days.

(2) Geological

Snail No. 1 spudded in and drilled through a sequence of mid-Miocene to uppermost Eocene marine carbonates, marls and clays of the Torquay Group to 2,126 feet below K.B. Underlying the Torquay Group to 2,572 feet were the Eocene silty claystones of the Demons Bluff Formation. The well penetrated Eocene-Paleocene equivalent of the Eastern View Coal Measures to 2,904 feet, which consisted of glauconitic sandstone, claystone, clayey sand, very minor shale and dolomite and rare traces of coal. The top of the lower Cretaceous Otway Group, corresponding to the seismic "C" Horizon, was encountered at 2,904 feet, about 130 feet higher than predicted. Paleocene to middle Eocene Eastern View Coal Measures rest unconformably on the Otway Group; the upper Cretaceous section is believed absent. The well was abandoned at 4,051 feet after drilling through 1,147 feet of Otway Group sediments.

No hydrocarbon shows were encountered and no drill stem tests were run.

Fig.1



OG 2988-1

Hematite Petroleum Pty. Ltd.

OTWAY BASIN

LOCATION OF "SNAIL"

II. INTRODUCTION

Snail No. 1 was the second well to be drilled in the offshore portion of the Torquay Embayment. It was drilled by Hematite Petroleum Pty. Ltd. in the company's Vic/P6 petroleum permit (see Fig.1). The costs of the operation were subsidised by the Commonwealth Government under the Petroleum Search Subsidy Act 1959-1969.

The well was drilled primarily to test the hydrocarbon potential of the Eastern View Coal Measures in the southern part of the Embayment. It was drilled on a broad, low relief structure with closure mapped at the top of the Eastern View Coal Measures. The secondary aim of the well was to investigate the nature of the expected Otway Group immediately below the Eastern View Coal Measures to obtain stratigraphic and reservoir information.

The sedimentary succession penetrated was basically as predicted. The well was spudded in and penetrated a thick Torquay Group sequence consisting of limestones and marls which were underlain by the silty claystones of the Demons Bluff Formation. Below the latter, a relatively thin Eastern View Coal Measures sequence was encountered and this consisted of glauconitic sandstone, claystone, clayey sand, very minor shale and dolomite and rare traces of coal. The well terminated in unprospective Otway Group sediments which unconformably underlie the Eastern View Coal Measures.

No hydrocarbons were encountered and the well was plugged and abandoned at a total depth of 4,051 feet below Kelly Bushing.

Drilling data in this report was contributed by W. J. Waterhouse and the geophysical data by J. I. Denham. Other authors are listed in the relevant appendices.

III. WELL HISTORY

1. General Data

(i)	Well name and number:	SNAIL No. 1
(ii)	Name and address of operator:	Hematite Petroleum Pty. Ltd. 140 William Street, Melbourne. Vic. 3000.
(iii)	Name and address of title holder:	Hematite Petroleum Pty. Ltd. 140 William Street, Melbourne. Vic. 3000.
(iv)	Petroleum title:	Vic/P6
(v)	District:	Queenscliff 1:250,000 series
(vi)	Location Latitude :	38° 53' 50" S
	Longitude:	144° 18' 02" E
(vii)	Elevation Seafloor:	266 feet below sea level
	Kelly Bushing (K.B.):	32 feet above sea level
(viii)	Total Depth :	4051 feet below Kelly Bushing
(ix)	Date drilling commenced:	26th November, 1972
(x)	Date total depth reached :	7th December, 1972
(xi)	Date well abandoned:	8th December, 1972
(xii)	Date rig released:	8th December, 1972
(xiii)	Drilling time in days to total depth:	11
(xiv)	Status:	Dry; plugged and abandoned
(xv)	Total Cost:	Not available at date of submission.

AMG Zone 55

(v) (Contd.)

Make	Type	Size	Series (API)
Shaffer	1 x Spherical annular BOP	$16\frac{3}{4}$ ins.	1500 5,000 psi MSP
Hydril	1 x annular (bag type) "	$16\frac{3}{4}$ ins.	1500 5,000 psi MSP
Shaffer	1 x Shear/Blend Ram BOP	$16\frac{3}{4}$ ins.	1500 5,000 psi MSP
Cameron	3 x Pipe Ram BOP	$16\frac{3}{4}$ ins. x 5 ins.	1500 5,000 psi MSP

(vi) Hole Sizes and Depths:

36 inch hole	Seabed (298 feet) to 338 feet below K.B.
26 inch hole	338 feet to 798 feet below K.B.
15 inch hole under-reamed to 18 inches	798 feet to 1833 feet below K.B.
$12\frac{1}{4}$ inch hole	1833 feet to 4051 feet below K.B.

(vii) Casing and Liner

Cementing Details:

Size	Weight	Grade	Range	Setting Depth
20 inch	91.5 lb/ft	X52-LP	3	215m 706 feet
$13\frac{3}{8}$ inch composite string	72 lb/ft	N-80	3	547m 1,795 feet
	54.5 lb/ft	J-55	3	
	72 lb/ft	C-75	3	

	20 inch	$13\frac{3}{8}$ inch
Position of Float Collar	-	1750 feet
Position of Float Shoe	706 feet	1795 feet
Number of Centralisers	3	10
Position of Centralisers	Above shoe and across first two couplings.	Two on first joint, then on every second joint.
Number of Scratchers	Nil	Nil
Quantity Cement Used	1150 sacks	700 sacks
Top of Cement	Seafloor (298 feet below K.B.)	1000 feet below K.B.
Method Used (plug, multi-stage etc.)	Displacement Plug	Displacement Plug

2. Drilling Data

(i)	Name and address of drilling contractor:	Global Marine (A/asia) Pty. Ltd. 380 Lonsdale Street, Melbourne, Vic. 3000.
(ii)	Drilling plant :	
	Make	National 1625
	Type	Diesel Electric
	Rated Capacity with drill pipe used	25,000 feet with 5 inch drill pipe
	Motors	
	Make	General Electric (x2) Caterpillar (x8)
	Type	Diesel Electric D 398 U12 Diesel
	B.H.P.	752 D1x2 8720 Intermittent 6800 Continuous
(iii)	Derrick :	
	Make	Built by Continental EMSCO, using a Global Marine design (142f)
	Type	Standard type with travelling block guide rails
	Rated Capacity	1,000,000 lb.
(iv)	Pumps :	
	Make	National
	Type	N 1300
	Size	1300 H.P. each
(v)	Blowout Preventer	
	Equipment :	Shaffer/Hydril/Cameron combination sub-sea stack connected to surface by Vetco marine riser system

(viii) Drilling Fluid :

Depth	Type	Wt.	P.V.	W.L.	F.C.	pH	Sand
0-1600ft	Seawater	8.55					
1600-1832ft	Fresh water bentonite	9.4					
1832-4051ft	Fresh water bentonite lignosulphonate	12.0	2.2	3.0	2/32 ins.	9.5	0.4%

Treatment: Mud pumped over shale shaker and through de-sander and de-silter. Thinning accomplished by addition of fresh water, lignosulphonate and lignin. pH maintained with caustic soda.

List of Types and Quantity of Mud Materials and Chemicals consumed:

Barytes	4,650	sacks
Bentonite	497	sacks
Caustic	20	drums
Lignosulphonate	148	sacks
Lignin	134	sacks

(ix) Water Supply : Fresh water ex Barry Beach transported by workboat.

(x) Perforating and Shooting Record: Nil

(xi) (a) Plugging Back Cementation Jobs:

Type: Abandonment plug	No. 1	No. 2
Length:	320 ft	200 ft
Number of sacks used:	255	150
Position:	1915 -1595 ft	620 -420 ft
Method used:	Displacement through drill pipe.	
Whether plug job was satisfactorily tested:	N/A	Yes

(b) Squeeze Cementation Jobs : Nil.

(xii) Fishing Operations : Nil.

(xiii) Side-tracked Hole : Nil.

3. Location

(i) Site Investigations Carried Out : Ocean Bed Survey by Geomechanics.

(ii) Anchoring Methods : 10 x 30,000 lb.anchors were laid by workboats in a $40^{\circ}/80^{\circ}$ pattern on an average radius of 1,800 feet.

(iii) Transportation :

1. Helicopters from Grovedale airport, near Geelong, Vic.
2. Workboats from Barry Beach, near Port Welshpool, Vic.

4. Formation Sampling

(i) Ditch Cuttings : From 800 feet, 4 sets of washed and dried samples every 30 feet interval; from 1910 feet, every 20 feet interval; from 2030 feet, every 10 feet interval. One set of unwashed bagged samples over the same intervals as the dried samples; one canned sample every 100 feet.
All samples were bagged and caught off a standard shale shaker by Baroid mudlogging personnel under the supervision of the Hematite well-site geologist.
A set of washed and dried samples was sent to the Bureau of Mineral Resources and the Victorian Mines Department and two sets retained by Hematite Petroleum at the following address:

15 Lorimer Street,
South Melbourne, Vic.

(ii) Coring :

Core No.	Interval Cored (feet below K.B.)	Footage Cut	Recovery (feet)	Recovery (%)
1	2598 -2615	17	Nil	0
2	2667 -2699	32	23	72
3	3152 -3179	27	25½	94

The core material was slabbed into thirds; one-third sent to BMR, one-third to the Victorian Mines Department and one-third retained by Hematite Petroleum. For full descriptions see Appendix 4.

(iii) Sidewall Sampling :

30 Sidewall cores were taken by Schlumberger; 29 were recovered. The material was retained by Hematite for palaeontological processing. For full descriptions see Appendix 4.

Depth (feet)	Recovered (inches)	Depth (feet)	Recovered (inches)
4031	1½	2901	1¼
4017	1½	2865	1½
3990	1½	2783	1¾
3994	1½	2749	1¼
3931	1¾	2718	1½
3909	1½	2707	1½
3840	1½	2678	½
3817	½	2664	1¼
3600	1¾	2626	1¾
3560	1½	2584	1
3536	½	2560	-
3449	1¾	2546	1¼
3107	1¼	2113	½
2930	1¾	1938	1¾
2907	1½	1897	1½

5. Logging and Surveys

(i) Electric Logging :

Log	Interval (feet)	Scale (Inches to 100 feet)
SP-ISF/S	1820- 707	2 inches & 5 inches
SP-ISF/S	4049-1794	2 inches & 5 inches
GR/CAL-FDC	1826- 707	2 inches & 5 inches
GR/CAL-FDC/CNL	4048-1794	2 inches & 5 inches
HDT	4041-1794	2 inches & 5 inches
CAL/PML	4040-1795	2 inches & 5 inches

Copies of all logs are in Enclosure 2.

(ii) Penetration Rate and Gas Logs : Penetration rates, gas chromatographic analysis and total gas measurements were recorded from 800 feet to T.D. "d" exponent value and drillability measurements were made from 800 feet to T.D. (See Enclosure 4).

(iii) Deviation Surveys : None run.

(iv) Temperature Surveys: None run. BHT recordings were taken on electrical logging runs.

(v) Other Well Surveys : A velocity survey was conducted at total depth. (See Appendix 5).

6. Testing

No formation or production tests were carried out.

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IV. GEOLOGY

(1) Summary of Previous Work

(a) Geological

Surface geological studies have been conducted in the onshore Torquay Embayment since the latter part of the last century and are continuing at present. These have been mainly conducted by the Geological Survey of Victoria and a number of individual contributors and exploration companies. Up to 1952, most geological mapping was restricted to the coastal outcrops; subsequently, geological reconnaissance work was done by the Geological Survey of Victoria, which has published the geological maps of the Queenscliff 1:250,000 sheet and the Anglesea 1-mile sheet areas.

(b) Geophysical

The Torquay Embayment was first defined in areal extent by a marine seismic survey conducted by Haematite Explorations Pty. Ltd. in 1962-63. This survey confirmed the aeromagnetic high separating the Torquay Embayment from the Bass Basin and provided the first clear indication of the offshore boundaries of the embayment. A further survey by Haematite in 1964-65 indicated several attractive structural features. A structural terrace, "Snail structure", in the south of the embayment was detailed by Esso Exploration and Production Aust. Pty. Ltd. in 1967-68. In 1967, Shell Development (Aust.) Pty. Ltd. mapped in detail two prominent structures in the adjoining permit, one of which was later tested by Nerita No. 1. Hematite Petroleum Pty. Ltd. conducted a seismic and magnetic survey in the Torquay Embayment in 1972 in order to locate possible structures in the deeper parts of the basin. Four small structural leads were located, only one of which showed closure. Attention was therefore focussed on "Snail", the only other large, untested structure in the embayment. Esso's 1967-68 seismic records over the "Snail structure" were partly reprocessed by Hematite (1972) and the structure was then re-mapped showing increased areal and vertical closure. It was tested by Snail No. 1 well.

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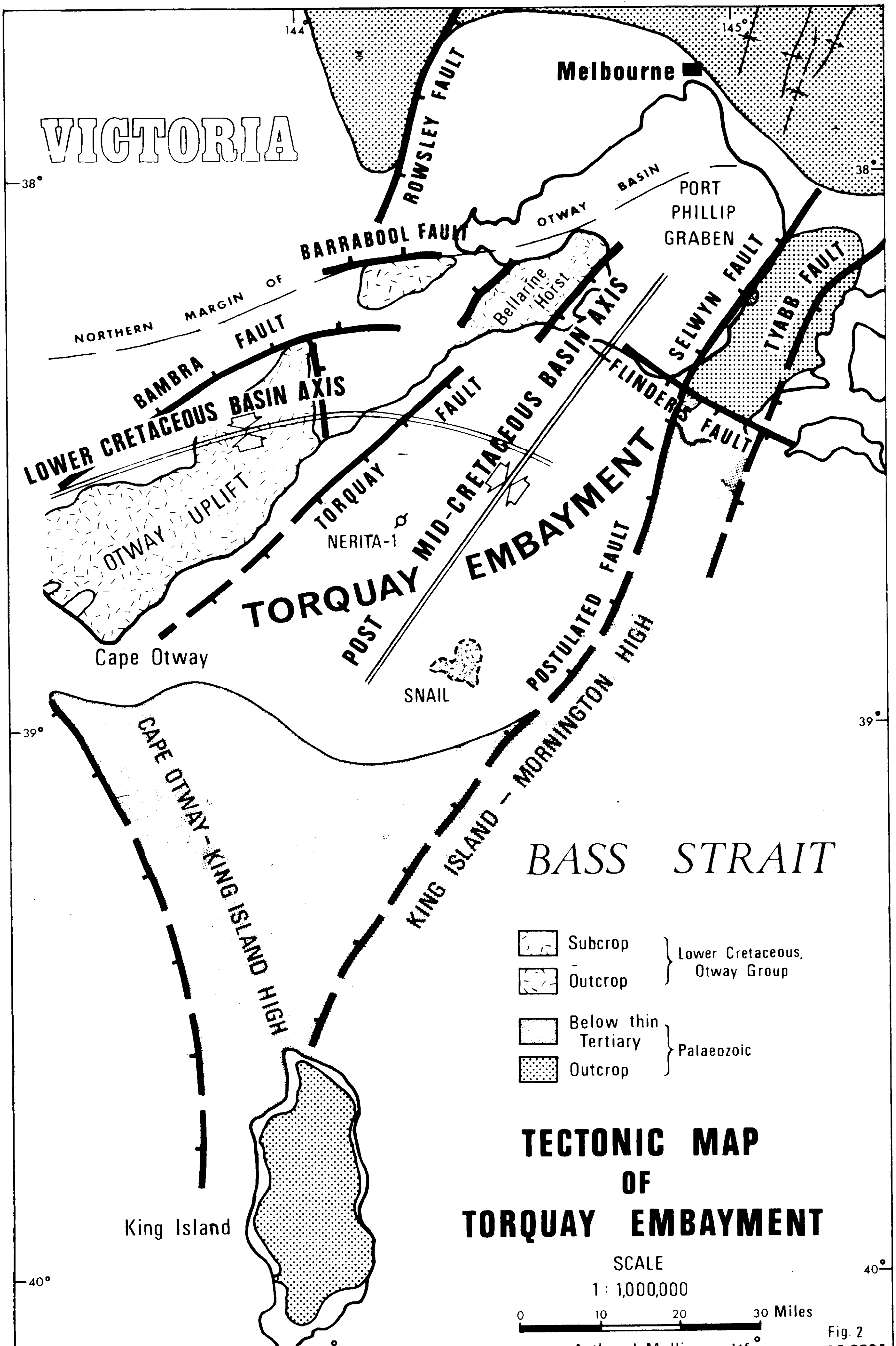
(c) Drilling

To date, drilling in the Torquay Embayment has been in search of either water, coal or oil. The discovery of brown coal near Anglesea in 1958 led to intensive drilling of the Eastern View Coal Measures by several companies and the Geological Survey of Victoria. Numerous water bores have been sunk in the Torquay-Anglesea area by the Geological Survey since 1964, when an investigation into the hydrogeology of the area was initiated for Alcoa of Australia Ltd. These wells ranged in depth from a few hundred feet to about 2,000 feet.

A small number of oil exploration wells have been drilled in the onshore part of the Torquay Embayment and only one, Nerita No. 1, offshore. The primary target was the Eastern View Coal Measures and the secondary, the Otway Group. None of these wells encountered significant hydrocarbons. Hydrogen gas was found in the Geelong Flow Oil Co. No. 1 well in a porous zone at the top of the Otway Group and gas (methane) cut water was found in sands in the Otway Group in Hindhaugh Creek No. 1.

Data from these wells has provided further knowledge of the onshore distribution and thickness of the recognised stratigraphic units of the area. The Otway Group was encountered in a number of wells below varying thicknesses of Tertiary sediments. Upper Cretaceous sediments were thought to be present in the deepest part of the basin near Anglesea; and in Anglesea No. 1, a possible upper Cretaceous section of the Eastern View Coal Measures was encountered. The drilling of the offshore well, Nerita No. 1, proved the existence of a considerable thickness of upper Cretaceous Eastern View Coal Measures section in addition to the Paleocene-Eocene section occurring onshore.



TECTONIC MAP OF TORQUAY EMBAYMENT

Author I. Mellins

Fig. 2

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(2) Regional Geology

During mid-Cretaceous times, marked tectonic activity in the eastern Otway Basin produced a number of horst and graben features controlled by predominantly NE-SW trending faults and folds. Upwarping and doming with related tensional block faulting along the Otway Ranges belt resulted in the parallel formation of two flanking depositional basins; the Port Campbell Embayment to the west, and Torquay Embayment to the east. The Torquay Embayment occupied a graben-like depression between the Otway Ranges Uplift and the Mornington-King Island High (see Fig. 2).

During upper Cretaceous and Paleocene times, a thick sequence of fluvio-deltaic and intercalated marine sediments comprising sands, gravels, shales, coals and minor dolomites was deposited unconformably on the eroded surface of Otway Group and/or Palaeozoic rocks.

These sediments, known as the Eastern View Coal Measures, form the basal lithological unit of the Torquay Embayment. They extend outwards from a depocentre located in Bass Strait, some 25 miles S.E. of Anglesea and spread westwards on to the flanks of the Otway Ranges and northwards into the Port Phillip Graben.

Evidence from marine seismic surveys suggests that the Eastern View Coal Measures thin out and probably drape across the basement highs comprising Palaeozoic sediments and igneous rocks, to the south and east of the main depocentre. The thickest section lies generally north west of "Snail": the maximum known thickness of the Eastern View Coal Measures in the Torquay Embayment is 2,653 feet at the Nerita well location. However, seismic interpretation indicates that they may reach over 3,000 feet in the deeper parts of the basin.

Local disconformities occur within the sequence and may be attributed to minor fluctuations in sea level.

The "Snail structure" itself lies on the edge of a basement uplift formed by the King Island-Mornington High (see Fig. 2) and has remained as an elevated area since its early formation during the Eastern View Coal Measures deposition. The structure was thus marginal to a depositional basin in which it was thought possible to generate hydrocarbons from carbonaceous land-derived organic material.

The drilling of Snail No. 1 has shown that the southern margin of the Torquay Embayment did not undergo continuous upper Cretaceous to Paleocene deposition as in the deeper parts of the basin, e.g. at the Nerita location, but received only later Paleocene and also Eocene sedimentation. These sediments draped

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unconformably over the Otway Group at the Snail location and are equivalents of the Eastern View Coal Measures. They consist of 332 feet of glauconitic sandstone, carbonate-cemented sandstone, clayey sand, claystone, minor shale and dolomite and rare traces of coal. The Eastern View Coal Measures are more marine in nature at the Snail location than further to the north.

Basinwide tectonic activity in the lower to middle Eocene was accompanied by a period of erosion and local ferruginisation. A late Eocene transgression led to the deposition of the marine deltaic Demons Bluff Formation. Shallow straits and platforms developed across the basement ridge separating the Bass Basin from the Torquay Embayment in the early Eocene and again at the end of upper Eocene, and allowed lateral continuity between the two depositional areas. Thus the upper sands and minor silts of the Eastern View Coal Measures and the transgressive silts, shales and clays of the Demons Bluff Formation were in their turn continuous across the barrier at these times.

Early in the Oligocene, a minor marine regression caused the shoreline to retreat near Point Addis. During this time the predominantly non-marine clays and sands, volcanic breccias and agglomerates of the Angahook Member of the Demons Bluff Formation were deposited conformably on the Anglesea Siltstone in the near-shore environment. Renewed tectonic movements and contemporaneous vulcanism (Older Volcanic Series) accompanied the regression.

Tensional en echelon faulting broke up the area into a mosaic of structural blocks. The main trend of major faults was NE-SW and a secondary trend at right angles - e.g. Bellarine Horst and its southern extension into the Torquay Embayment probably formed as a mid-basin ridge at this time.

Following the regression, a marine transgression moved diachronously across the Torquay Embayment from the south to the north. Normal marine conditions were fully established by Upper Oligocene times and continued during the Miocene with thick accumulations of limestones and marls of the Torquay Group (over 1,800 feet in Snail No. 1). Foraminiferal evidence indicates that the base of the Torquay Group is uppermost Eocene at the Snail location, lower Oligocene at the Nerita location and upper Oligocene at Anglesea.

Remnant vulcanicity may have continued into late Oligocene times in the present offshore area, as is suggested in an area SW of the Nerita location at an horizon above the base of the Torquay Group (Horizon "A").

Tectonic activity at the end of the Miocene culminated in the Kosciuskan Orogeny, causing further uplift of the Otway Ranges and Barrabool Hills and regression and shallowing of the sea. At this time, the structures in the deeper part of the basin were formed (e.g. Nerita). However, areas to the south along the King Island-Mornington High were not affected by the orogeny (e.g. Snail).

Continental deposition became increasingly dominant as gradual uplift of the coastal areas continued into the Pliocene and late Pleistocene and the sea assumed its present position. Gentle folding of the Tertiary sediments and extrusion of the Newer Volcanics probably began at this time.

A generalised stratigraphic succession in the Torquay Embayment is as follows :

Age	Formation
Recent	Undifferentiated sediments
Pleistocene-Pliocene	Newer Volcanic Series; undifferentiated sediments.
	Disconformity or angular unconformity
Mid-Miocene to Upper Eocene	Torquay Group (including Pt. Addis Limestone; Jan Juc Formation; Puebla Formation); Older Volcanics Series.
	Disconformity or angular unconformity
Mid-Oligocene to Mid-Eocene	Demons Bluff Formation (including Anglesea Siltstone Member; Angahook Member)
	Disconformity or unconformity
Lower Eocene to Upper Cretaceous	Eastern View Coal Measures (including 'Boonah Sandstone')
	Unconformity
Lower Cretaceous to Jurassic	Otway Group
Palaeozoic to Pre-Cambrian	Basement

(3) Stratigraphic Table :

Age	Formation	Top of Fm. K.B. (feet)	Top of Fm. Subsea (feet)	Thickness (feet)	Lithology
Miocene to Upper Eocene	Torquay Group	298	- 266	1828	
	Puebla Fm.	298	- 266	1194	Claystone, marl, bioclastics, siltstone.
	Jan Juc Fm.	1492	-1460	634	Claystone, marl, sandstone, sand, bioclastics, calcarenite, limestone, siltstone.
Eocene	Demons Bluff Formation	2126	-2094	446	Silty claystone.
Eocene to mid-Paleocene	Eastern View Coal Measures	2572	-2540	332	Glauconitic sandstone, claystone, clayey sand, very minor shale and dolomite; rare traces of coal.
Lower Cretaceous	Otway Group	2904	-2872	1147+	Sandstone, siltstone.
	T.D.	4051	-4019		

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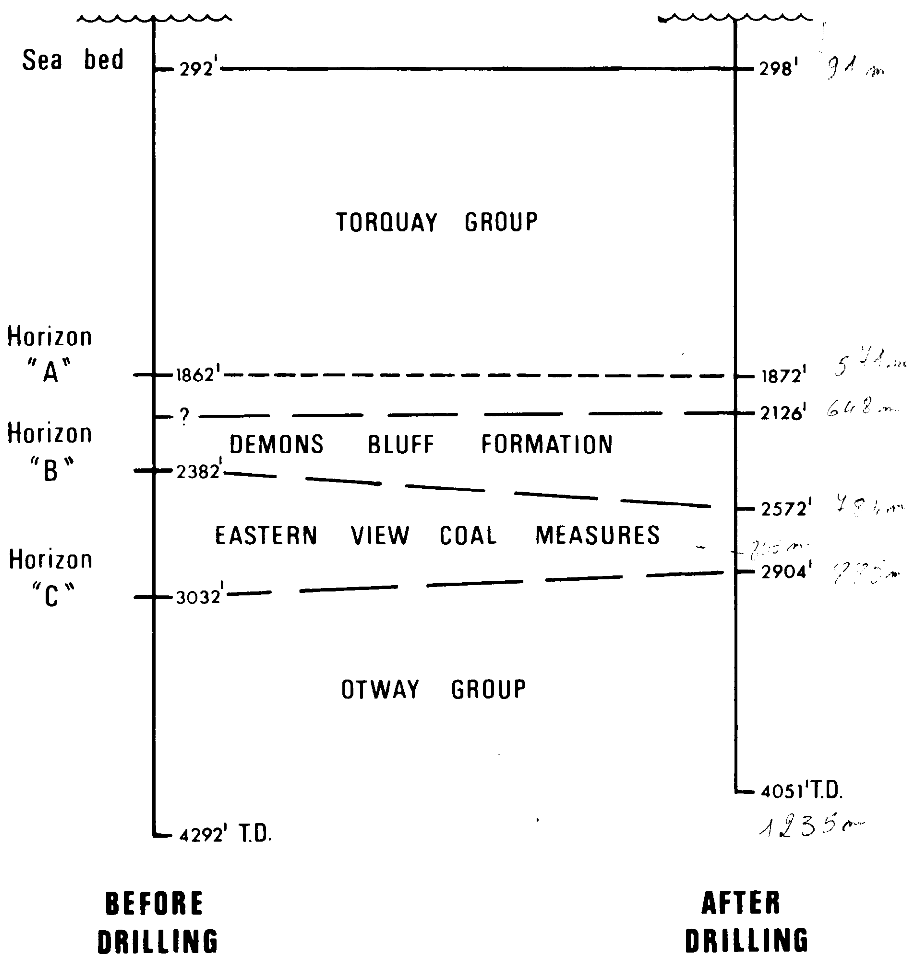

All depths are below K.B. (32 ft. above Sea level)

SNAIL NO. 1

STRATIGRAPHIC CHART

Fig.3
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(4) Stratigraphy

(a) General

The stratigraphic succession penetrated at Snail No. 1 was essentially as predicted on the basis of seismic mapping with well control from Nerita No. 1. Figure No. 4 shows a correlation of the two wells with the onshore section.

The primary target of Snail No. 1, the Eastern View Coal Measures, was expected to be about 650 feet thick in the well, but only 332 feet of the formation was penetrated. The top was predicted at 2382 feet (K.B.) but occurred lower, at 2572 feet (K.B.) and the top of the Otway Group, expected at 3032 feet (K.B.), was at 2904 feet (K.B.).

(b) Stratigraphic Description

Miocene Puebla Formation, 298-1492 feet (K.B.) (thickness 1194 feet)

The formation is largely claystone and marl containing bioclastics with minor siltstone, and sandstone.

It is presumed to extend to the sea floor, although it is not sampled above 800 feet (K.B.) nor wireline logged above the 20 inch casing shoe at 706 feet (K.B.). The contact with the underlying Jan Juc formation is placed at 1492 feet (K.B.) at the top of a highly fossiliferous limestone bed.

Upper Eocene to Oligocene Jan Juc Formation, 1492-2126 feet (K.B.) (thickness 634 feet)

Lithologically the formation is partly glauconitic claystone and marl with interbedded siltstone, calcarenite, sandstone, sand and fossiliferous limestone.

Two limestone beds are recognised. The lower one is very close to the depth at which Horizon "A" was predicted. This event can be seismically mapped over a large area but is too shallow in the Nerita area to be tied in to that well. Well correlation suggests that the upper limestone in Snail No. 1 correlates with the Point Addis Limestone as recognised in Nerita No. 1.

Eocene Demons Bluff Formation, 2126-2572 feet (K.B.) (thickness 446 feet)

In Snail No. 1 this formation is a monotonous, silty, glauconitic claystone sequence. It is to be compared lithologically with the Anglesea Siltstone Member of the onshore section rather than with the Angahook Member.

The lower contact of the formation is placed at the top of a sand bed at 2572 feet (K.B.).

Eocene-mid-Paleocene Eastern View Coal Measures, 2572-2904 feet (K.B.) (thickness 332 feet)

The Eastern View Coal Measures are distinctive in this well in that they contain only very minor coals and are represented by poorly consolidated, clay choked, glauconitic, marginal marine sandstone, with relatively minor beds of carbonaceous claystone, clayey sand and very minor shale and dolomite.

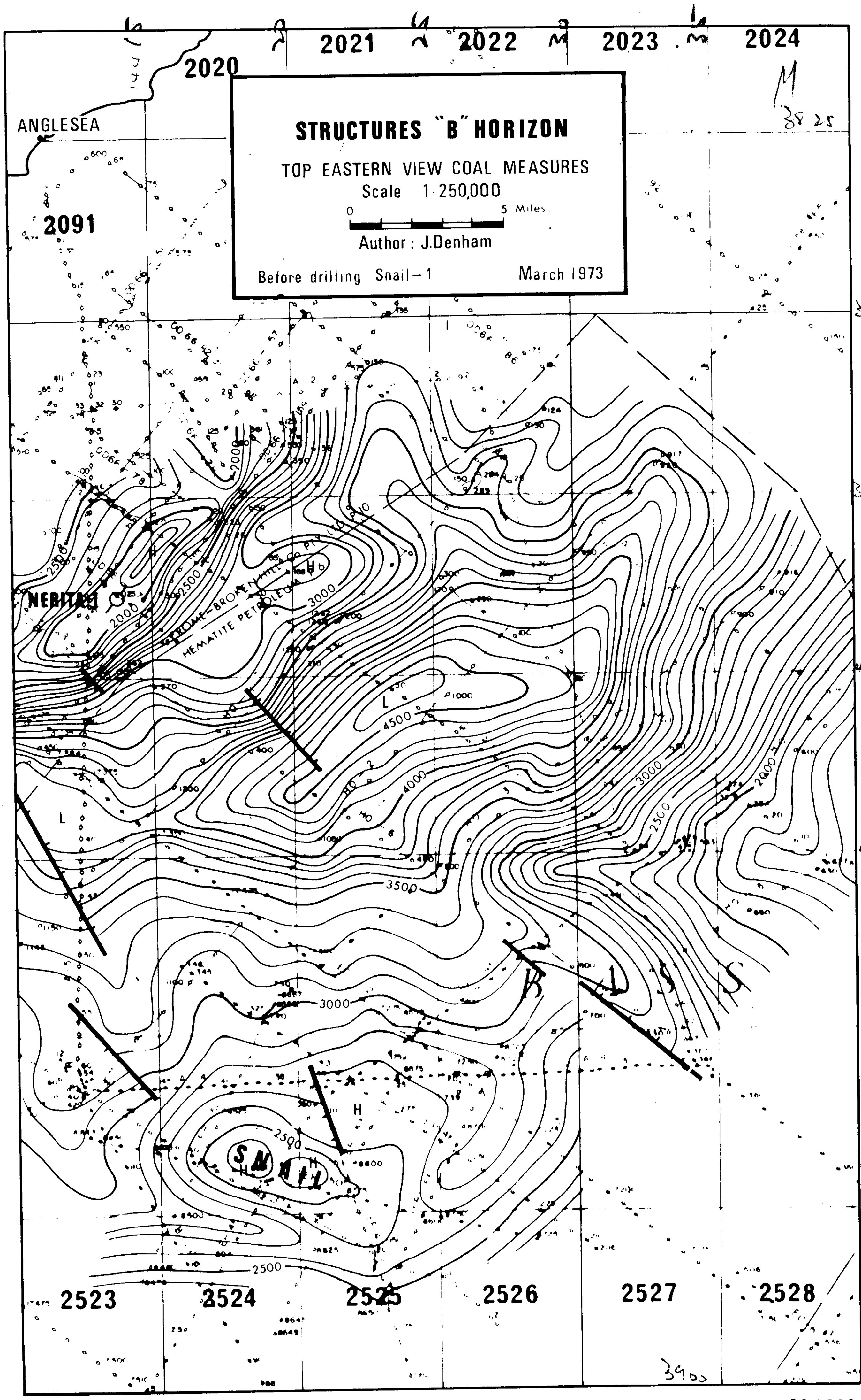
A sharp log break and lithological change at 2904 feet (K.B.) marks the top of the underlying Otway Group.

Lower Cretaceous Otway Group 2904-4051 feet (K.B.) thickness 1147+ feet

This formation consists of lithic, kaolinitic (?) zeolitic sandstone with a few thin beds of carbonaceous siltstone. Below 3720 feet the sandstone appears to be bimodal, having a fine to coarse quartz sand fraction and granule size lithic fraction.

(5) Structure

Snail No. 1 was drilled on a structural terrace feature believed to be related to basement uplift in the south of the Torquay Embayment. Hematite's mapping of the "Snail structure" showed closure at an horizon corresponding to the top of the Eastern View Coal Measures (Horizon "B"). Nerita No. 1 was used as the nearest control point to tie in the mapping of the seismic horizons. Prior to drilling, an areal closure of approximately 20 square miles and a vertical closure of 200 feet, with a maximum of 280 feet, were defined on the structure (see Fig. 5). The well confirmed the structure down to the top of the Demons Bluff Formation. However, Horizon "B" was encountered 190 feet lower at -2540 feet, and Horizon "C" (top of Otway Group) was encountered about 130 feet higher than predicted (see Fig. 3). Hence, a considerably reduced section of the Eastern View Coal Measures was actually drilled, but the overall configuration of the structure remained essentially unchanged. Re-mapping of the structure after drilling shows an areal closure of approximately 17½ square miles and a maximum vertical closure of 165 feet (see Fig. 6).



STRUCTURES "B" HORIZON
TOP EASTERN VIEW COAL MEASURES
Scale 1:250,000
0
5 Miles
Author: J.Denham
Before drilling Snail-1
March 1973
2020
2021
2022
2023
2024
ANGLESEA
2091
NERITA-1
HOME - BROKEN HILL OIL PTY. LTD.
HEMATITE PETROLEUM
SNAIL
2523
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Fig. 5

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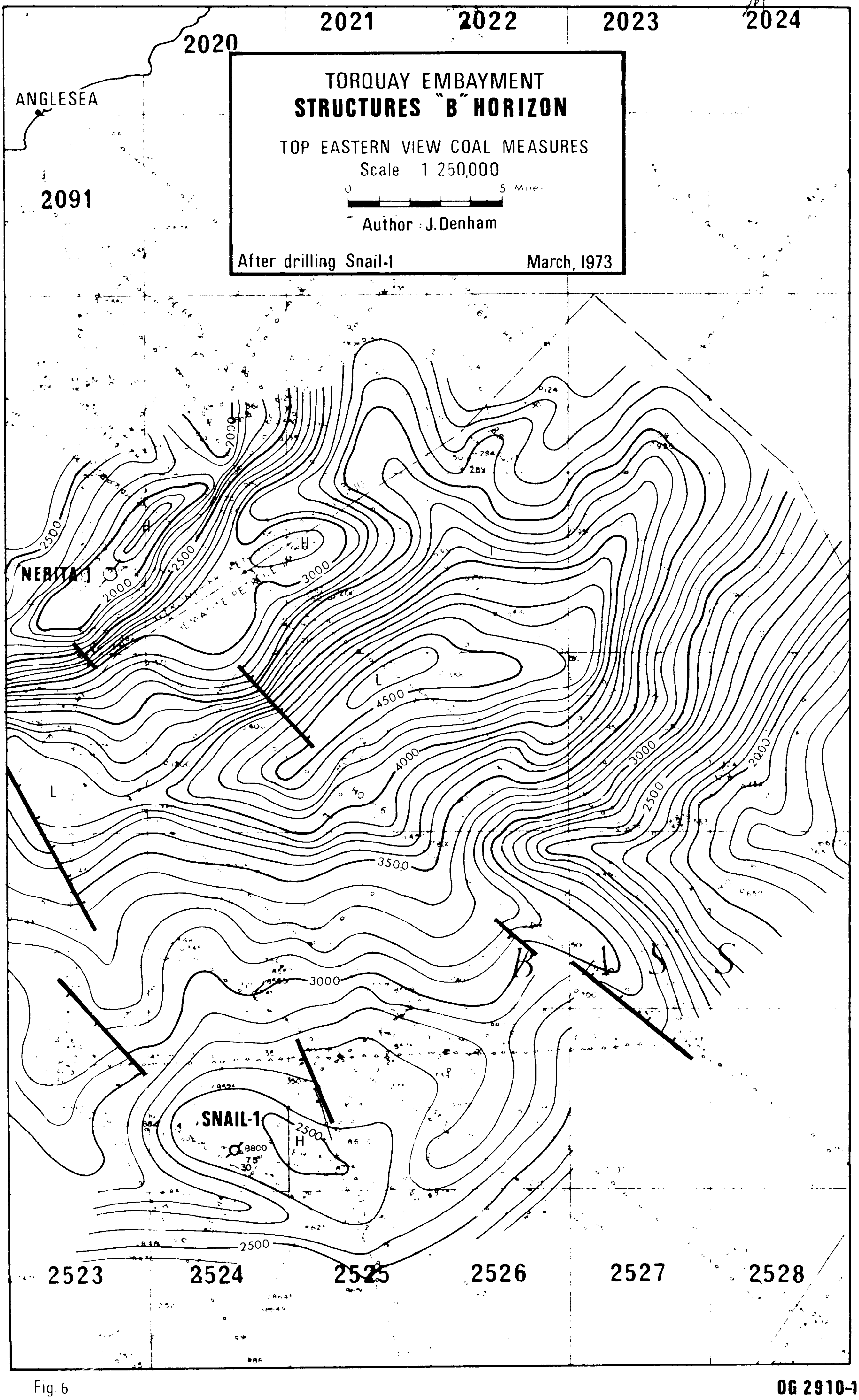

Fig. 6

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(6) Relevance to Occurrence of Petroleum

Re-mapping on the basis of the well velocity survey confirms the Snail structure and shows that Snail No. 1 was a valid crestal test of the structure. In the well there were no indications of hydrocarbons in any cuttings, cores or sidewall cores and only minor background gas was recorded in the mud. Log interpreted water saturations of Eastern View and Otway sands are in the range 90 to 100 per cent.

Prior to drilling, Snail was interpreted to be an early and persistent high on the south-eastern edge of the basin, favourably located for trapping hydrocarbons which had migrated to the south east from the deeper part of the basin. It was assumed that the deep basin contained source rocks overlain by sufficient overburden and subjected to suitable geothermal gradients for hydrocarbon generation. The absence of hydrocarbons in Nerita No. 1 was explained as due to the fact that Nerita's structural growth was after migration had occurred.

The drilling of Snail No. 1 confirms that the structure was well timed and well located for trapping hydrocarbons which might have migrated from the deep basin. Snail No. 1 proved that the structure is largely devoid of hydrocarbons and it is therefore unlikely that conditions suitable for generation of economically significant amounts of hydrocarbons ever occurred in the deep basin and they are even less likely to have occurred in the shallower parts.

(7) Contribution to Geological Concepts

The drilling of Snail No. 1 confirms that in this part of the Torquay Embayment the Eastern View Coal Measures are of middle Paleocene to middle Eocene age and lie directly on the lower Cretaceous Otway Group. No upper Cretaceous sediments were identified in the well.

The presence of recycled late Permian spores in the Otway Group at Snail No. 1 indicates that upper Permian rocks, possibly existent to the south, acted as a source for the early Cretaceous sediments.

In Snail No. 1, the Eastern View Coal Measures are lithologically distinctive, compared with the onshore and Nerita No. 1 sections, in that they lack coals and appear to reflect a more marine environment. This is demonstrated by the presence throughout the formation of dinoflagellate cysts and acritarchs. The Eastern View microfloras at Snail belong to two zones, the middle to upper Paleocene Gambierina edwardsii zone and the Proteacidites pachypolus zone of middle to upper Eocene age. Intermediate zones, representing the lower and middle Eocene, were not identified and are probably absent. A similar hiatus representing the same zones is recognised in the Bass Strait region.

The Jan Juc Formation of the Torquay Group in Snail No. 1 is similar in overall character and thickness to that recognised in Nerita No. 1. The base of the formation is of upper Eocene age, which is older than at Nerita and significantly older than in the onshore occurrences. This suggests that the marine transgression started in the southern part of the embayment in upper Eocene time and progressed northwards during the upper Eocene and Oligocene.

(8) Porosity and Permeability

Visual estimates of sidewall core porosity and permeability are included in Appendix No. 4, and Appendix No.6 contains the results of analyses of Cores Nos. 2 and 3. Most of Core No. 2, from the Eastern View Coal Measures, was typical of that formation in that it was largely unconsolidated sand and therefore unsuitable for core analysis. However, the top of the core was a thin, well-cemented, tight, dolomitic, pyritic sandstone which, though atypical of the formation, was suitable for core analysis. Its porosity was measured as 3.6 per cent.

The 80 foot sand between 2699 feet (K.B.) and 2779 feet (K.B.) has better SP/GR development than sands above and below it in the Eastern View Coal Measures in Snail No. 1. Its pososity is also higher, with a mean ϕ_D of 32% (range 18% to 36%) compared with the overall mean ϕ_D of 29% and the overall range of ϕ_D of from 14% to 36%. Corrected neutron (sandstone) porosities and sonic porosities are much higher, due to the unconsolidated nature of the sands and to the presence of dispersed clay in them.

Analyses of four samples from Core No. 3 (Otway Group) indicate average effective porosities in the range 34 to 36 per cent and permeabilities from 90 to 710 Millidarcies.

Density log porosities for the Otway Group mostly range from 15 to 35 per cent. The average for the interval from 2029 to 3470 feet is about 28 per cent, whereas from 3470 to 4048 feet it is no more than 25 per cent. For the same intervals, sonic and neutron log derived porosities are much higher, probably due to clay choking.

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" " "	1955	Stratigraphy of Tertiary Rocks between Torquay and Eastern View, Vic. <u>Proc. Roy. Soc. Vic. 67; 75-142.</u>
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APPENDIX NO.1

Petrological Report by Amdel

EXAMINATION OF TWO SANDSTONES FROM SNAIL - 1

Sample: Core 2, 2667 : TS 30115

Location:
Snail No. 1.

Rock Name:
Carbonate-cemented sandstone.

Hand Specimen:
A massive, compact sandstone. Large voids, several millimetres across are present.

Thin Section:
An optical estimate of the constituents gives the following:

	%
Quartz	65
Calcite	20
Dolomite/Siderite	7 - 10
Opaques	2 - 3
Tourmaline	trace
Mica	<1
Voids	5 (approximately)

This is a coarse, rather poorly sorted sandstone cemented by fine-grained calcite and a subordinate carbonate which is probably dolomite or siderite.

The detrital fragments range in size up to about 0.8 mm (coarse sand) with a continuous gradation to very fine sand; however, most grain are 0.2 - 0.3 mm in diameter. Equant, subround grains are predominant except where detrital features of the grains have been destroyed by marginal corrosion by carbonate.

Tourmaline, mica and opaque grains are up to about 0.1 mm in size and tend to be angular; in the case of the opaques, the grains are equant. Mica has a typical flakey habit and the few tourmaline grains comprise both equant and prismatic forms. Many detrital grains are fractured and have been penetrated by carbonate.

Calcite is the most abundant cement and it fills much of the intergranular space. The mineral is fine-grained and formsoriented aggregates which show a wavy extinction pattern; this is probably related to the growth of calcite away from adjacent quartz grains. A different carbonate (not stained by Alizarin Red-S) is subordinate to calcite and has a distinctly different finely-granular habit. This carbonate is probably dolomite or siderite.

The sandstone shows considerable chemical maturity but is not well-sorted; it may be a recycled sandstone. Cementation has been achieved by the growth of two carbonate minerals. Voids are up to about 1 mm across and are relatively abundant.

Sample: Core 3, 3152 ft. : TS 30116

Location:
Snail No. 1.

Rock Name:
Lithic sandstone.

Hand Specimen:
A massive, friable sandstone with a dark, grey-to-green colour.

Thin Section:
An optical estimate of the constituents gives the following:

	%
Lithic fragments	85
Quartz fragments	5
Feldspar fragments	2 - 3
Mica fragments	3
Chlorite	trace
Clay matrix	5 (approximately)
Authigenic minerals	<1
Opaques	1
Zircon	trace
Tourmaline	trace

Alteration of this rock is extensive and this, together with the fine-grained nature of the rock, means that details of mineralogy and texture are difficult to distinguish in parts.

Most of the rock consists of ill-defined fine-grained lithic fragments now composed largely of clays, quartz and mica. Many of these fragments have an elongate shape and are probably derived from shaley sediments. Grains within the size range 0.15 - 0.25 mm are most abundant.

Less important detrital material are turbid flakes of oxidised biotite which commonly show deformed shapes. Angular quartz and feldspar grains and small, equant grains of opaques, tourmaline and zircon are also present.

The deformation of the mica and the close packing of the equant grains indicates that there has been considerable compaction of this rock and matrix material is only of very limited abundance.

Apart from patches of somewhat indeterminate ?kaolinite, the matrix contains some rectangular crystals which are probably authigenic. The largest of these crystals is about 0.03 mm across and has optical properties consistent with albitic feldspar or (less likely) a zeolite, (?laumontite). Accessory green chlorite is also present.

This is a lithic arenite containing a notably low proportion of quartz and feldspar grains. The rock is derived from the rapid weathering of a largely sedimentary terrain.

APPENDIX NO. 2

Palaeontological Reports:

(a) Micropalaeontology by D. J. Taylor

(b) Palynology by W. K. Harris

FORAMINIFERAL BIOSTRATIGRAPHY

HEMATITE SNAIL-1 WELL

OTWAY BASIN

by David Taylor,
Department of Geology & Geophysics,
University of Sydney.

25th January, 1973.

Three side wall cores and three samples from conventional core-2 were submitted for examination with rotary cutting samples for the interval 800 to 4050 feet. No fauna was found in the side wall core at 2664 feet nor in the conventional core samples. Side wall cores at 1879 and 2113 feet contained non diagnostic fauna. The rotary cutting samples were severely contaminated due to cave ins and the mud. As far as could be ascertained the fauna found in cutting below 2590 were all mud contaminants, thus 2590 feet was regarded as the base of the foraminiferal sequence.

All depths quoted as those written on the samples with the Kelly Bushing as datum.

Three distribution sheets accompany this report. Entire content of the samples is shown on the sheets, regardless of whether it is contaminated.

BIOSTRATIGRAPHY

An attempt has been made to apply the biostratigraphic scheme used by Taylor in the Bass-1 Well completion report to the Snail sequence. This proved difficult due to rotary cutting contamination and the very shallow water origin of the sediment. The diversity of planktonic foraminiferal faunas decreases with decreasing water depth. Thus in shallow water deposits there is less chance of recognising biostratigraphic zones than in deep water ones.

The first cutting sample at 800 feet contained *Globigerinoides glomerosus glomerosus* which was restricted to Zone E (= base of middle Miocene). The S.D.A. report on Nerita-1 regards *G. glomerosus* as being indicative of Zone F, but this is contrary to my observation in all three Bass Strait Basins. Samples down to 980 feet contain members of the *G. glomerosus* complex as well as *Orbulina suturalis*. The base of Zone E is probably at 980 feet, but it is difficult to be certain as *O. suturalis* persists below this level.

No zone can be designated till 1700 feet where *Globigerina euapertura* is present indicating Zone I. This does not imply that Zones F, G and H are absent, but that they cannot be positively identified. Neither can Zone J be identified, but the top of Zone K is recognised by the appearance of *Globigerina linaperta* at 1910 feet. The presence of *G. pseudoampliapertura* at 2080 feet strongly suggests a zone below K. Thus the top of the Oligocene can be placed tentatively at 1700 feet and the top of the Eocene at 1910 feet. The Eocene age is also confirmed by the presence of the aragonitic benthonic form *Cerobertina kakohoica*.

ENVIRONMENT

The depositional environment of the Snail-1 sequence is a shallow water one throughout. The benthonic fauna to 1500 feet is dominated by *Cibicides spp* and miliolids, suggesting shallow continental shelf conditions. The addition of *Notorotalia spp* below 1500 feet indicates even shallower conditions at the base of the Miocene and in the Oligocene. The percentage and specific diversity of planktonic foraminifera also give evidence of the same trend, as they are higher at the top of the sequence and decrease rapidly downwards.

The environment of the Eocene is impossible to deduce because of heavy down hole contamination. However the presence of "pyrite tubes", typical of the Demons Bluff Formation, are indicators of anaerobic conditions whilst the occurrence of *Cerobertina kakohoica* probably implies cold water. Depositional depth of the Demons Bluff Formation cannot be determined but there is no evidence that it was anything but shallow water.

COMPARISON WITH OTHER SEQUENCES

Snail-1 was deposited in much shallower water than either Nerita-1 or Bass-1. The frequency of planktonic fauna suggests that there were more inhibitions to oceanic circulation over the Snail site than over the Nerita and Bass-1 sites.

The sea floor at Nerita was composed of Zone E (Zone F according to the Nerita report), whilst Zone E is approximately 400 feet below sea level at Snail. The presence of *Orbulina universa* as a contaminant, suggests that Zone D is within the unsampled (above 800 feet) part of the Snail sequence. It could be concluded that structural growth took place on the Nerita structure post Zone E: that is during the late Miocene or Plio-pleistocene. Maybe there was structural growth on Snail post Eocene and pre late Miocene, thus accounting for the shallow water nature of Snail when compared with Nerita and Bass-1.

KEY TO SYMBOLS ON THE THREE DISTRIBUTION SHEETS

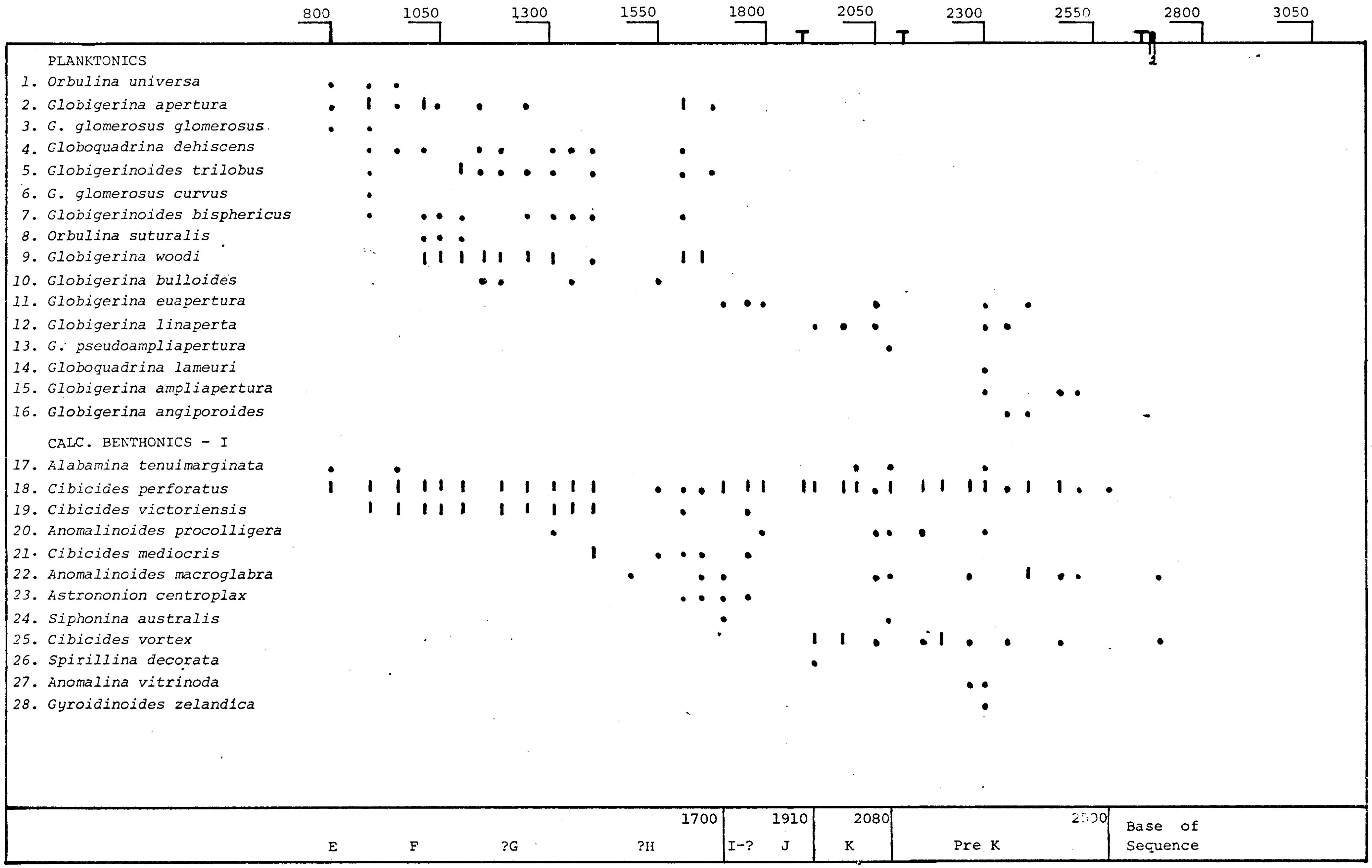
T = side wall cores at 1879, 2113 and 2664 feet

= conventional core 2 with samples at 2667, 2683 and 2689 feet.

Other samples plotted are rotary cuttings.

● = 1-20 specimens

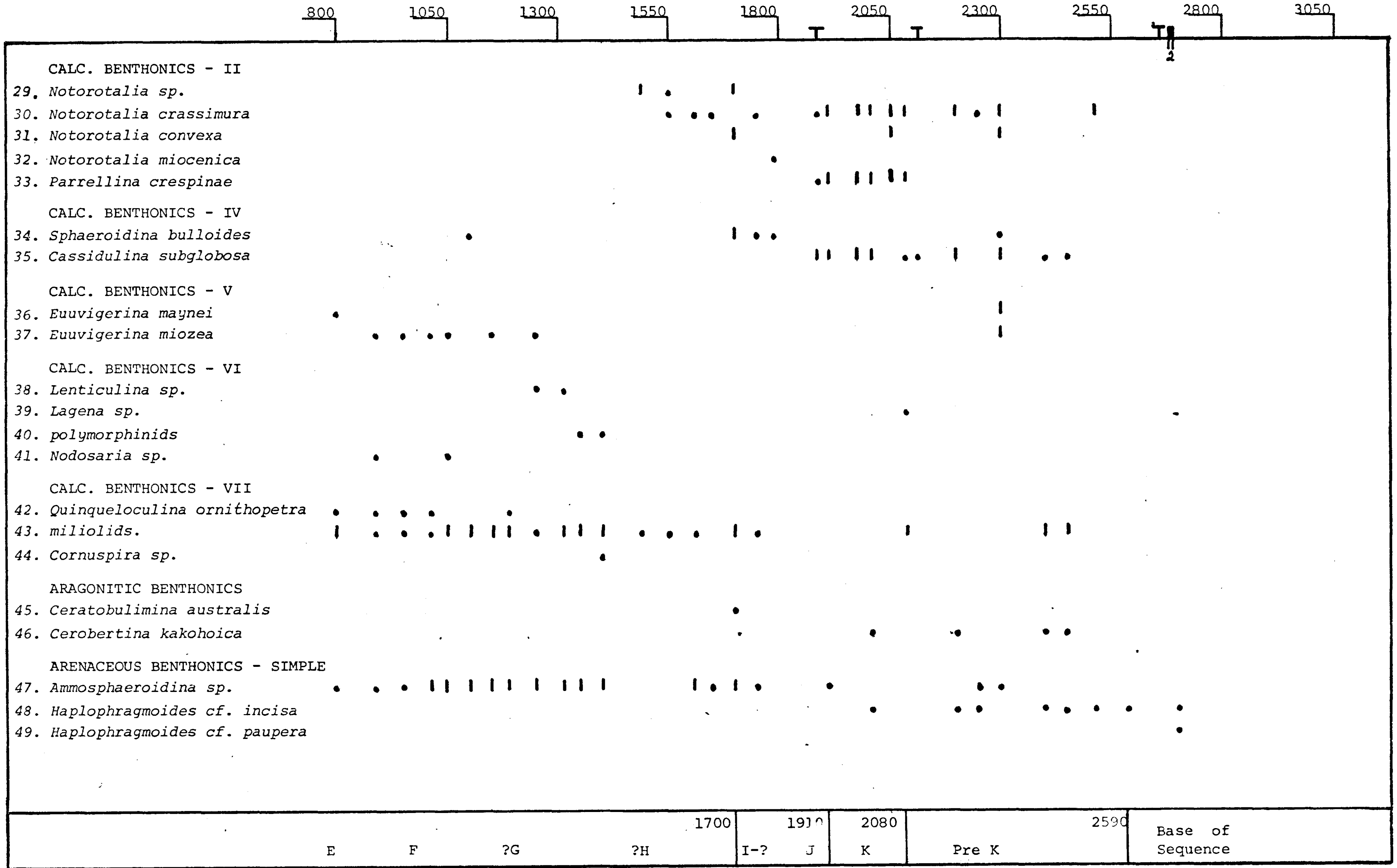
| = over 20 specimens


800
1050
1300
1550
1800
2050
2300
2550
2800
3050
PLANKTONICS
1. Orbulina universa
2. Globigerina apertura
3. G. glomerosus glomerosus
4. Globoquadrina dehiscens
5. Globigerinoides trilobus
6. G. glomerosus curvus
7. Globigerinoides bisphericus
8. Orbulina suturalis
9. Globigerina woodi
10. Globigerina bulloides
11. Globigerina euapertura
12. Globigerina linaperta
13. G. pseudoampliapertura
14. Globoquadrina lameuri
15. Globigerina ampliapertura
16. Globigerina angiporoides
CALC. BENTHONICS - I
17. Alabamina tenuimarginata
18. Cibicides perforatus
19. Cibicides victoriensis
20. Anomalinoides procolligera
21. Cibicides mediocris
22. Anomalinoides macroglabra
23. Astrononion centroplax
24. Siphonina australis
25. Cibicides vortex
26. Spirillina decorata
27. Anomalina vitrinoda
28. Gyroidinoides zelandica
1700
1910
2080
2500
E
F
?G
?H
I-?
J
K
Pre K
Base of Sequence

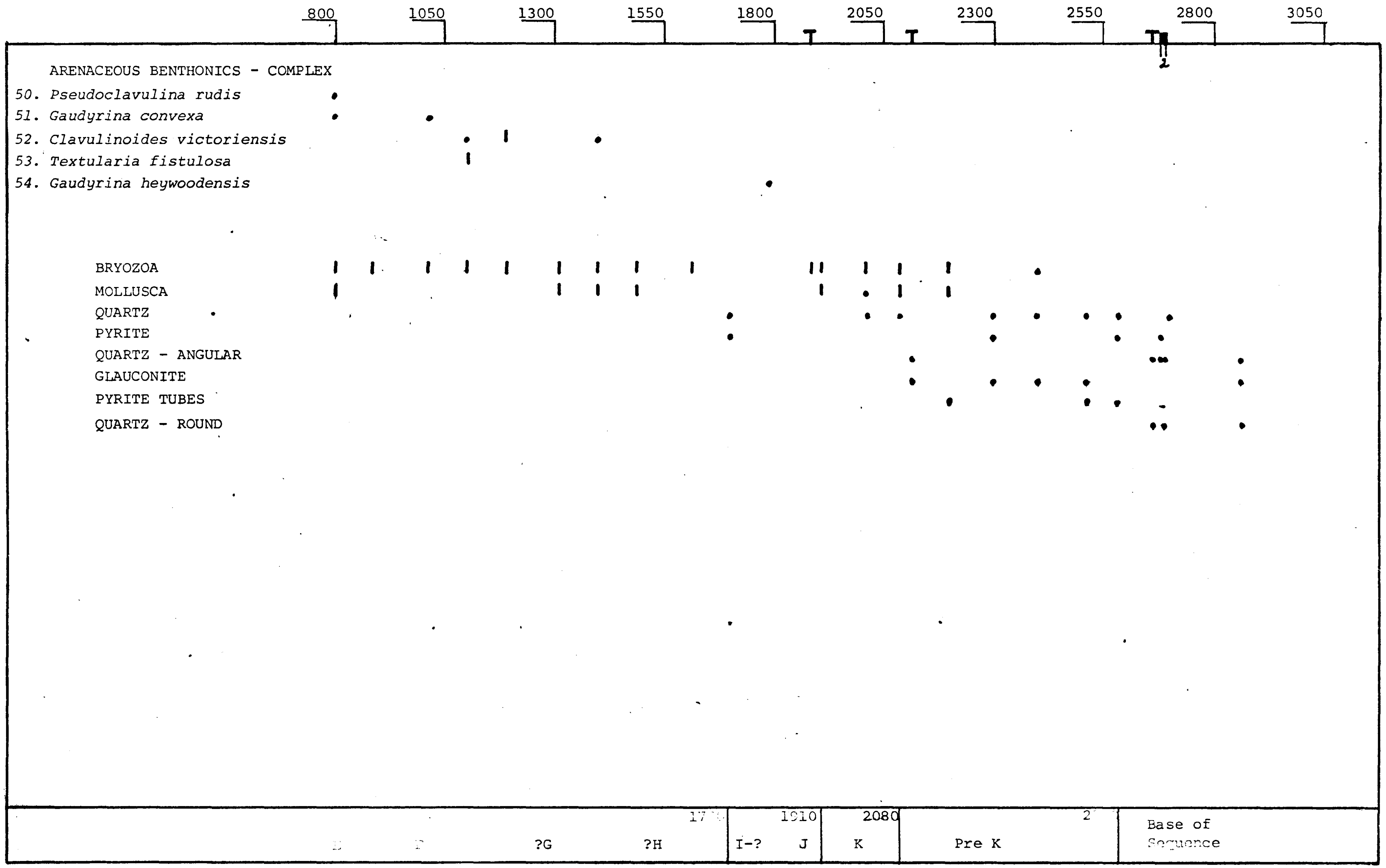
OG 3129

SNAIL - J

Sheet 2 or 3 sheets



OG 3130


800
1050
1300
1550
1800
2050
2300
2550
2800
3050
ARENACEOUS BENTHONICS - COMPLEX
50. Pseudoclavulina rudis
51. Gaudyrina convexa
52. Clavulinoides victoriensis
53. Textularia fistulosa
54. Gaudyrina heywoodensis
BRYOZOA
MOLLUSCA
QUARTZ
PYRITE
QUARTZ - ANGULAR
GLAUCONITE
PYRITE TUBES
QUARTZ - ROUND
1910
2080
?G
?H
I-?
J
K
Pre K
Base of Sequence

OG 3131

HEMATITE SNAIL NO. 1 - TORQUAY EMBAYMENT
OTWAY BASIN, VICTORIA
PALYNOLOGICAL EXAMINATION OF CORES & SIDE WALL CORES

by

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7th March, 1973

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PAGE

HEMATITE SNAIL NO. 1 - TORQUAY EMBAYMENT, OTWAY BASIN, VICTORIA
PALYNOLOGICAL EXAMINATION OF CORES & SIDE WALL CORES

ABSTRACT

Results of palynological examination of cores and sidewall cores from Hematite Snail No. 1 Well, Torquay Embayment, Victoria, indicate an Oligocene age at 1938 ft., a Middle Eocene age (Proteacidites pachypolus zone) between 2564 and 2783 ft., a Middle to Upper Paleocene (Gambierina edwardsii zone) for a sidewall core at 2865 ft. and an early Cretaceous age for sediments between 2907 and 4031 ft.

All Tertiary units carry marine dinoflagellate cysts indicating marine incursions, at times limited, within the sequence.

A remanié assemblage of late Permian forms is present in the highest Cretaceous sample. The source of these is unknown.

INTRODUCTION

Hematite Petroleum Pty. Ltd. drilled Snail No. 1 Well in the Torquay Embayment of the Otway Basin at Lat. 38°54'S and Long. 144°18'E to a total depth of 4 051 feet. This report details the palynology of two core and thirteen sidewall core samples. The distribution of species is plotted on plan No. 73-130 together with the S.P. and Resistivity logs. A sidewall core 21 at 2 707 ft. was not prepared. It is a sand and is extensively mud infiltrated.

A comparison of palynological biostratigraphic schemes for southern Australia is presented in Table 1.

CORRELATION AND AGE

Cretaceous

Assemblages from SWCs. 1 to 15 and from Core 3 were generally well preserved but very sparse. The best assemblage is from SWC 15 at 2 907 ft. and contains a typical lower Cretaceous microflora with C. australiensis and D. complex. There is nothing else in the assemblage to correlate with Dettmann and Playford's (1969) biostratigraphic scheme for the Cretaceous. The section of the well from 2 907 to 4 031 feet is therefore undifferentiated lower Cretaceous.

Tertiary

Assemblages of this age are diverse and generally well preserved. Those from SWC 17 (2 865 ft.) and SWC 29 (1 938 ft.) are better preserved than those from the middle of the section. Three distinct units are present and will be dealt with separately.

1. Middle-Upper Paleocene

SWC 17 at 2 865 ft. yielded a typical Paleocene assemblage with, in particular, Lygistepollenites balmei, Gambierina edwardsii and Australopollis obscurus. These species indicate a correlation with the Gambierina edwardsii zone of Middle to Upper Paleocene age (Harris, 1971). In terms of Stover and Evan's (1973) scheme, the assemblage would be correlated with their Lygistepollenites balmei zone (see Table 1).

On-shore sections of the Eastern View Coal Measures are to be correlated with this sample. The important difference lies in the presence of an assemblage of marine dinoflagellates in the off-shore sample. The on-shore sequence appears to be entirely non-marine and dominated by coaly facies.

2. Middle Eocene

SWC's 18-27 and Core 2 carry assemblages which are more or less similar and are assigned to the one biostratigraphic unit. The unit is characterised firstly by a diverse assemblage of Nothofagidites spp. including N. asperus in one sample. Present also are Proteacidites pachypolus and P. asperopolus , Tricolpites thomasii, and Triorites magnificus. Although N. asperus is rare and P. asperopolus is present but rare, this assemblage is a correlative of the Proteacidites pachypolus zone of Harris (1971). The absence of Proteacidites rectomarginis (= P. clintonensis Harris 1972) indicates that it is within the lower part of the zone. There are no indications of the older Proteacidites confragosus zone being present, such as the nominate species, low frequency of Nothofogidites spp., and high Haloragacidites harrisii count.

The age of this unit is Middle Eocene. In the Eucla Basin, it is present in the Pidinga Formation with a Middle Eocene foraminiferal fauna (Lindsay and Harris, 1973).

On-shore correlatives of this biostratigraphic unit in the

Otway Basin are not yet well documented. It does not appear to be present in the onshore Torquay Embayment where only the younger half of the P. pachypolus zone is present (see Harris 1971) and the outcrop section further to the west at Browns Creek is all certainly younger. Nevertheless it is more closely related to the Demons Bluff Formation than to the Eastern View Coal Measures. The Kongorong Sand in the Gambier Embayment is a probable correlative but this has not yet been studied in detail.

This assemblage is equivalent to the lower part of Stover and Evan's (1973) Nothofagidites asperus zone in the Gippsland Basin (see Table 1).

?Oligocene

The highest sidewall core, 29 at 1 938 ft. yielded an assemblage dominated by Nothofagidites spp. associated with Proteacidites rectomarginis, very rare Cyatheacidites annulatus and Tricolpites retequetrus. The microplankton component includes the freshwater green algal colony, Pediastrum sp. C. annulatus has not been found in outcrop sections older than the Janjukian. It is rare within the basal unit at the type section of the Jan Juc Formation but not present in the Browns Creek Clays further to the west. The latter unit possibly extends into the early Oligocene. On this limited evidence SWC 29 is probably of Oligocene age but no younger. The Cyatheacidites annulatus zone of Harris (1971) is a correlative and should now be extended down into the Oligocene with the finding of C. annulata in the type Janjukian. The Proteacidites tuberculatus zone of Stover and Partridge (1973) of Early Oligocene to Early Miocene age is a correlative.

ENVIRONMENTS

Cretaceous

No marine fossils were observed in sediments of this age. The large amount of detrital woody tissue, sands and few spores or pollen indicate rapid sedimentation in a non-marine environment.

Tertiary

All units described herein carry marine dinoflagellate cysts and acritarchs in varying amounts. In SWC 29 the microplankton dominate the assemblage and an offshore shelf environment is indicated.

Microplankton occur more sporadically in the Middle Eocene and the Paleocene units and do not reach more than 5% of the total sporomorph count.

A marginal marine facies with very limited marine influence is indicated.

A note on preservation

In contrast to the Oligocene and Paleocene assemblages, those from the Middle Eocene were generally less well preserved and were noticeably darker in colour - yellow to brown. This would indicate greater diagenetic changes in the unit compared with those above or below.

Colour changes such as these have been used elsewhere to indicate possible hydrocarbon generation. Colour changes to a darker yellow have been shown to be associated with liquid hydrocarbons and those of darker brown colours with gaseous hydrocarbons (Staplin, 1969).

PALEOCENE-EOCENE BOUNDARY

Table 1 shows the sequence of palynological zones for the early Tertiary in Southern Australia and despite which system (i.e. Harris, 1971; Stover and Evans, 1973; Stover and Partridge, 1973) is used two zones appear to be absent from this well. That is, the whole of the Lower Eocene and probably the early part of the Middle Eocene were either not deposited or were eroded prior to the deposition of the lower P. pachypolus zone. A similar feature has been noted by Harris (1971) from on-shore sections in the Torquay Embayment, but here more section is absent and deposition did not commence in the Eocene until late P. pachypolus zone. There is only about 80 ft. between SWC17 and SWC18 and it is very doubtful whether the "missing" interval is represented in this section. The geophysical logs do not show any major changes in this interval.

TABLE 1

Attempted comparison of early Tertiary palynological zonal schemes, southern Australia

Age		Harris, 1971	Stover & Partridge, 1973
	U	Triorites magnificus	
Eocene	M-U	Proteacidites pachypolus	Nothofagidites asperus
	M	Proteacidites confragosus	Proteacidites asperopolus
	L	Cupanieidites orthoteichus	Malvacipollis diversus
Paleocene	M-U	Gambierina edwardsii	Lygistepollenites balmei
	?L		Tricolpites longus

REWORKED FOSSILS

Throughout the Middle Eocene and Cretaceous sediments species such as Cicatricosisporites australiensis, C. hughesi and Contignisporites sp. appear occasionally with more rarely occurring Permian striate bisaccate pollen. The source of the Cretaceous species is easily explained by the presence of the underlying Cretaceous sediments.

However, at the top of the Cretaceous section in SWC15 at 2 907 ft. several Permian species are present (not included in the chart): Dulhuntyispora parvithola (Balme and Hennelly), Striatopodocarpidites phaleratus (Balme and Hennelly), Parasaccites gondwanensis (Balme and Hennelly) and Protohaploxypinus spp. In Western Australia D. parvithola occurs only in the Upper Permian Wagina Sandstone (Segroves, 1970). Within the Cooper Basin in South Australia the presence of this species indicates an Upper Stage 5 assemblage (Paten, 1969), which probably spans the boundary between the Lower and Upper Permian.

The source of this late Permian assemblages would not appear to be from onshore Victorian Permian units as these are all within Stage 2 (Early Permian) unless later units have been completely eroded. An alternative is an unknown source to the south or south west on the margin of the Embayment. The late Permian sediments in Tasmania are too distant to be considered as a probable source.

Permian remanié microfossils have been reported previously in both Cretaceous and Tertiary sediments of the Otway Basin (Cookson, 1955; Harris, 1965).

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APPENDIX

Data on Samples Studies

Sample No.	Depth in Feet (metres in parenthesis)	Core or Sidewall No.
S2635	1938 (590.70)	SWC29
S2631	2546 (776.02)	SWC27
S2632	2584 (787.60)	SWC25
S2633	2626 (800.40)	SWC24
S2634	2664 (811.99)	SWC23
S2651	2684 (818.08)	Core 2
S2636	2783 (848.26)	SWC18
S2637	2865 (873.25)	SWC17
S2638	2907 (886.05)	SWC15
S2644	3157 (962.25)	Core 3
S2639	3449 (1051.26)	SWC12
S2640	3600 (1097.28)	SWC9
S2641	3909 (1191.46)	SWC6
S2642	3931 (1198.17)	SWC5
S2643	4031 (1228.65)	SWC1

PE900275

This is an enclosure indicator page.
The enclosure PE900275 is enclosure within the container PE900273 at this location in this document.

The enclosure PE900275 has the following characteristics:

ITEM_BARCODE	=	PE900275
CONT AINER_BARCODE	=	PE900273
NAME	=	Snail 1 Figure 1 Species Distribution Chart (Appendix 2b)
BASIN	=	OTWAY
PERMIT	=	VIC/P6
TYPE	=	WELL
SUBTYPE	=	DIAGRAM
DESCRIPTION	=	Snail 1 Figure 1 Species Distribution Chart (Appendix 2b)
DATE_CREATED	=	2/03/1973
DATE_RECEIVED	=	
W_NO	=	W658
WELL_NAME	=	SNAIL-1
CONTRATOR	=	Dept Mines SA
CLIENT_OP_CO	=	Hematite Petroleum Pty Ltd

APPENDIX NO.3

Description of Cuttings Samples

Hematite SNAIL-1

DESCRIPTION OF CUTTINGS SAMPLES

Depth Interval (feet K.B.)	Percent	Lithology
800 - 830		Mainly cement. CLAYSTONE, light grey to buff, soft to firm, non-calcareous, grading to siltstone, sandy in part. Trace SANDSTONE, buff-light grey, well rounded quartz grains up to $1\frac{1}{2}$ mm, silty mudstone matrix. Trace BIOCLASTICS (gastropod, pelecypod, echinoid fragments, complete shells up to 3 mm), foraminifera.
830 - 860		As above.
860 - 890		As above.
890 - 920		As above. Trace SILTSTONE, dark grey to green.
920 - 950		As above
950 - 980		As above.
980 -1010	60	CLAYSTONE-MARL, light grey to buff, soft, slightly silty, slightly calcareous.
	20	SILTSTONE, grey to green, soft to hard.
	20	BIOCLASTICS, mainly echinoid spines. Note: Bioclastics in this and suceeding samples are probably *in situ* in CLAYSTONE-MARL.
1010-1040		As above.
1040-1070		As above.
1070-1100		As above.
1100-1130		Mainly cement contamination. SILTSTONE, grey to green, grading to fine sandstone. BIOCLASTICS, bryozoans, echinoids, corals etc. as above.
1130-1160	50	SILTSTONE, as above.
	40	CLAYSTONE-MARL, firm to hard, grey-green.
	10	BIOCLASTICS as above.
1160-1190		As above.
1190-1220		As above.
1220-1250		As above.
1250-1280		As above.

Depth Interval (feet K.B.)	Percent	Lithology
1280 - 1310		As above, mainly cement contamination.
1310 - 1340	60	SILTSTONE, as above.
	40	CLAYSTONE-MARL, grey-buff.
		Trace BIOCLASTICS
1340 - 1370	50	SILTSTONE, grey-green as above.
	40	CLAYSTONE-MARL, light grey to buff, grading to siltstone.
	10	CLAYSTONE.
		Trace BIOCLASTICS.
1370 - 1400	80	CLAYSTONE-MARL, grey-green, grading to siltstone, containing shell fragments.
	10	SILTSTONE, grey-green.
	10	BIOCLASTICS, as above.
1400 - 1430	80	CLAYSTONE-MARL, as above.
	10	SILTSTONE as above, grading to sandstone.
	10	BIOCLASTICS.
1430 - 1460	70	CLAYSTONE-MARL, as above.
	20	BIOCLASTICS.
	10	SILTSTONE, as above.
		Trace COAL, black, hard, woody.
		Trace LIMONITE.
		Trace CHERT, microcrystalline, yellow-orange, hard.
1460 - 1490	80	BIOCLASTICS, (mainly bryozoal) white, $\frac{1}{2}$ - 2 mm diameter, some echinoid spines up to 8 mm long, foraminifera etc. as above.
	20	CLAYSTONE-MARL, as above, light grey - buff, grading to siltstone.
1490 - 1520	70	BIOCLASTICS, (mainly bryozoal) as above.
	30	CLAYSTONE-MARL, as above.
		Trace COAL, as above.
1520 - 1550	60	CLAYSTONE-MARL, as above, light grey to buff, grading to siltstone.
	20	SILTSTONE, grey-green, grading to fine sandstone.
	20	BIOCLASTICS, including bryozoal debris.
		Trace SILTSTONE, grey-green to apple green, glauconitic.
		Trace SILTSTONE, brownish to buff .
		Trace COAL, as above.
1550 - 1580	50	CLAYSTONE-MARL, as above.
	40	SILTSTONE, grey-green, grading to fine sandstone, glauconitic in part.
	10	BIOCLASTICS, as above.
1580 - 1610	40	CLAYSTONE-MARL, as above, only slightly calcareous.
	30	SILTSTONE, as above, grey to apple green, grading to fine sandstone, containing

Depth Interval (feet K.B.)	Percent	Lithology
1580 - 1610 (Contd)		fine shell debris, slightly calcareous.
	30	BIOCLASTICS, as above.
1610 - 1640	50	CALCARENITE, white to cream, very calcareous, firm, sand size, angular, carbonate grains in carbonate cement; glauconitic, micaceous, contains some silt-size quartz, fossiliferous.
	30	CLAYSTONE-MARL, dark grey, grading to fine siltstone, slightly glauconitic in part, slightly calcareous.
	20	BIOCLASTICS, as above.
		Trace COQUINA.
		Trace CHERT, hard, cryptocrystalline, light yellow-brown.
1640 - 1670	40	CLAYSTONE-MARL, grey-green, glauconitic, grading to fine siltstone.
	30	SILTSTONE, grey green, glauconitic grading to fine sandstone.
	20	CALCARENITE, as above.
	10	BIOCLASTICS, as above.
1670 - 1700	60	CLAYSTONE-MARL, as above, calcareous.
	30	SILTSTONE, as above.
	10	CALCARENITE, as above.
		Trace BIOCLASTICS, as above.
1700 - 1730	50	CLAYSTONE-MARL, as above.
	40	SILTSTONE, medium grey-green, soft to firm, glauconitic, grading to fine sandstone.
	10	BIOCLASTICS, as above.
		Trace CALCARENITE, as above.
		Trace LIMONITE.
1730 - 1760		As above.
1760 - 1790		As above.
1790 - 1820		As above.
1820 - 1850	60	SILTSTONE, medium grey-green, soft to firm, glauconitic, grading to fine sandstone.
	30	SANDSTONE, light grey-greenish grey, fine to medium, firm, glauconitic, fossiliferous.
	10	BIOCLASTICS, as above.
	Trace	CHERT, ferruginous, brick red to milky white.
	Trace	SANDSTONE, calcareous, medium to coarse, cream-white.
	Trace	COAL, black, hard, woody.
	Trace	SILTSTONE, pyritic.

Depth Interval (feet K.B.)	Percent	Lithology
1850 - 1880	50	SILTSTONE, medium grey to green, soft to firm, glauconitic, grading to fine sandstone, as above.
	30	LIMESTONE, microcrystalline allochemical, poorly sorted, (?dolomitic), fossiliferous, slightly glauconitic (rounded sand size grains).
	10	SANDSTONE, as above.
	10	BIOCLASTICS, as above.
1880 - 1910	60	CLAYSTONE-MARL, grey-green, grading to fine siltstone, fossiliferous.
	40	LIMESTONE, microcrystalline allochemical, as above.
	Trace	SANDSTONE, as above.
	Trace	SILTSTONE, as above.
1910 - 1930	50	BIOCLASTICS, mainly 2-10 (average 5) mm, cream-pink, gastropod fragments and complete shells.
	40	SILTSTONE, grey-green grading to fine sandstone - fossiliferous.Bioclastics above probably from siltstone and claystone-marl.
	10	CLAYSTONE-MARL, as above.
	Trace	SAND, unconsolidated, medium, clear to milky, subrounded to angular.
	Trace	SANDSTONE, dark grey, medium to fine, pyritic.
	Trace	CHERT, ferruginous, brick red to milky white, as above.
1930 - 1950	70	CLAYSTONE-MARL, grey-green, with abundant bioclastics, silty, glauconitic, soft to firm.
	30	SILTSTONE, grey-green, glauconitic, bioclastic, grading to fine sand.
	Trace	SAND, unconsolidated, medium, as above.
	Trace	CHERT,as above.
1950 - 1970	80	CLAYSTONE-MARL, as above.
	20	SILTSTONE, as above.
	Trace	SAND, medium to coarse, well rounded to sub-angular, polished, clear and milky quartz.
1970 - 1990	60	CLAYSTONE-MARL, as above.
	20	SILTSTONE, grading to fine sandstone, dark green-grey, with bioclastics, siltsize and abundant sand size dark green dispersed glauconite, also glauconite infillings of gastopods, bryozoa etc.
	20	SAND, as above.
	Trace	CHERT, as above.
1990 - 2010	70	CLAYSTONE-MARL, as above.
	20	SILTSTONE, as above.
	10	SAND, as above.

Depth Interval (feet K.B.)	Percent	Lithology
2010 - 2030	60	SAND, as above.
	30	CLAYSTONE-MARL, as above.
	10	SILTSTONE, as above.
	Trace	SANDSTONE, brick red, medium to coarse, sub-angular to angular quartz "floating" in ferruginous, chert cement.
2030 - 2050	80	CLAYSTONE-MARL, as above.
	10	SAND, as above.
	10	SILTSTONE, as above.
	Trace	CALCARENITE: cream-white, hard, containing well rounded, $\frac{1}{4}$ - $\frac{1}{2}$ mm glauconite grains and rounded to angular carbonate grains, $\frac{1}{4}$ - 1 mm diameter.
	Trace	SANDSTONE, ferruginous, as above.
2050 - 2060	60	CLAYSTONE-MARL, as above.
	20	SAND, as above.
	20	SILTSTONE, grading to fine sandstone, buff - grey with abundant dark green, sand size, well rounded glauconite, bioclastics.
2060 - 2070	50	CLAYSTONE-MARL, bioclastic, as above.
	20	SILTSTONE, as above, grey-green.
	30	SILTSTONE, as above, buff-green, glauconitic, grading to sandstone, bioclastics.
2070 - 2080	40	CLAYSTONE-MARL, bioclastic.
	30	SILTSTONE, as above, grey-green.
	30	SILTSTONE, as above, buff-green.
	Trace	SANDSTONE, medium, tight, buff, carbonate cemented.
2080 - 2090		As above.
2090 - 2120	70	SAND, medium to granule size, unconsolidated, sub to well rounded, milky and clear quartz, clay matrix probably washed out.
	20	CLAYSTONE-MARL, as above.
	10	SILTSTONE, buff-green and light grey, glauconitic.
	Trace	COAL, black, brittle, woody.
	Trace	SANDSTONE, fine to medium, pyritic, glauconitic.
	Trace	SANDSTONE, medium, tight, buff, carbonate cemented.
2120 - 2130	50	SAND, medium sand to granule size, unconsolidated, sub to very well rounded.
	20	CLAYSTONE-MARL, as above.
	20	SILTSTONE, light grey-green, glauconitic, firm to soft.
	10	SILTSTONE, buff-grey, glauconitic, firm to hard.
	Trace	COAL, as above.
	Trace	SANDSTONE, pyritic, glauconitic.

Depth Interval (feet K.B.)	Percent	Lithology
2130 - 2140	50	CLAYSTONE-MARL, bioclastic, as above.
	30	SAND, as above.
	20	SILTSTONE, as above.
	Trace	COAL, as above.
	Trace	CHERT, ferruginous, sandy.
2140 - 2150	40	CLAYSTONE-MARL, as above, bioclastic.
	40	SAND, as above.
	20	SILTSTONE, light grey-green, glauconitic, bioclastic.
	Trace	COAL, as above.
	Trace	CHERT, as above.
2150 - 2160	50	SILTSTONE, as above.
	30	CLAYSTONE-MARL, as above.
	20	SAND, as above.
2160 - 2170		As above.
	Trace	COAL, as above.
2170 - 2180		As above.
	Trace	COAL, as above.
	Trace	CALCARENITE.
2180 - 2190	60	SILTSTONE, dark grey-green, bioclastic, grading to fine sand as above,glauconitic.
	30	CLAYSTONE-MARL, as above.
	10	SAND, as above.
	Trace	COAL, as above.
	Trace	CALCARENITE, as above.
2190 - 2200	60	SILTSTONE, as above.
	20	CLAYSTONE-MARL, as above.
	20	SAND, as above.
	Trace	COAL, as above.
	Trace	SANDSTONE, fine, pyritic, glauconitic.
2200 - 2210	70	SILTSTONE, as above.
	20	CLAYSTONE-MARL, as above.
	10	SAND, as above.
	Trace	COAL, as above.
	Trace	SANDSTONE, pyritic, glauconitic.
2210 - 2220	50	SILTSTONE, as above, fossiliferous, glauconitic.
	40	CLAYSTONE-MARL, as above, fossiliferous, silty.
	10	SAND, unconsolidated as above, probably washed out of clay matrix.
	Trace	COAL, as above.
	Trace	CALCARENITE, as above.
2220 - 2230		As above.
2230 - 2240	80	SILTSTONE, as above, grey-green-buff, glauconitic, bioclastic.
	20	CLAYSTONE-MARL, as above.
	Trace	SAND, as above.
	Trace	COAL, as above.
	Trace	SANDSTONE, pyritic.

Depth Interval (feet K.B.)	Percent	Lithology
2240 - 2250	60	CLAYSTONE-MARL, as above.
	30	SILTSTONE, as above.
	10	SAND, as above.
	Trace	COAL, as above.
2250 - 2260	60	CLAYSTONE-MARL, as above, grading to silt.
	20	SILTSTONE, as above.
	20	SAND, as above.
	Trace	SANDSTONE, brick red, hard, cherty.
2260 - 2270	80	CLAYSTONE-MARL, as above.
	20	SILTSTONE, as above.
	Trace	SAND, as above.
	Trace	SANDSTONE, pyritic, glauconitic.
2270 - 2280		As above.
	Trace	SANDSTONE, brick red, hard, cherty, ferruginous.
	Trace	COAL, as above.
		Note: Decreasing fossil content of the grey-green siltstone.
2280 - 2290	50	CLAYSTONE, dark brown-grey, silty, sand size glauconite, otherwise as above.
	30	CLAYSTONE-MARL, dark grey-green, glauconitic as above.
	20	SILTSTONE, as above.
	Trace	SAND.
	Trace	COAL.
	Trace	CHERT.
2290 - 2300	40	CLAYSTONE, chocolate brown as above.
	30	CLAYSTONE-MARL, dark grey-green, as above.
	30	SILTSTONE, as above.
	Trace	SAND.
	Trace	COAL.
2300 - 2310	30	CLAYSTONE, chocolate brown as above.
	30	CLAYSTONE-MARL, as above.
	30	SILTSTONE, as above.
	10	COAL.
	Trace	SAND, unconsolidated, medium to coarse.
2310 - 2320	60	CLAYSTONE-MARL, grey green, slightly silty, as above.
	30	CLAYSTONE, chocolate brown, as above.
	10	SILTSTONE, as above.
	Trace	COAL.
	Trace	SAND.
2320 - 2330	50	CLAYSTONE-MARL, light grey-green.
	30	SILTSTONE, as above.
	20	CLAYSTONE, chocolate brown, as above.
	Trace	COAL.
	Trace	SAND.

Depth Interval (feet K.B.)	Percent	Lithology
2330 - 2340	60	SILTSTONE, light green-grey, glauconitic, firm to soft, clayey.
	30	CLAYSTONE-MARL, light green-grey, glauconitic.
	10	SILTSTONE, chocolate brown, clayey.
	Trace	SAND.
2340 - 2350		As above.
2350 - 2360	70	CLAYSTONE-MARL, light grey-green, as above.
	20	SILTSTONE, light green-grey, as above.
	10	SILTSTONE, chocolate brown.
	Trace	COAL.
	Trace	SAND.
2360 - 2370	As above.	
2370 - 2380	As above.	
2380 - 2390	As above.	
2390 - 2400	50	CLAYSTONE-MARL, as above.
	30	SILTSTONE, chocolate brown, as above.
	10	SILTSTONE, light grey green as above.
	10	SAND, angular to sub angular, medium to coarse, milky and clear quartz, as above.
2400 - 2420	70	CLAYSTONE, chocolate brown, silty.
	20	SILTSTONE, dark grey-green, clayey, glauconitic, as above.
	10	SAND, as above.
2420 - 2430	80	CLAYSTONE, chocolate brown - dark grey, glauconitic, rounded glauconite grains up to medium sand size.
	20	SILTSTONE, grey-green, grading to fine sand size, firm, hard.
2430 - 2440	70	CLAYSTONE, chocolate brown - dark grey, as above.
	20	SILTSTONE as above.
	10	SAND, unconsolidated, medium to coarse, subangular to sub-rounded, milky and clear quartz.
2440 - 2450		As above.
2450 - 2460		As above.
2460 - 2480		As above.

Depth Interval (feet K.B.)	Percent	Lithology
2480 - 2490	60	SILTSTONE, chocolate, soft to firm, gummy, glauconitic.
	40	CLAYSTONE, chocolate brown to dark grey, as above.
	Trace	SAND, unconsolidated, medium to coarse, subangular to sub-rounded, milky and clear quartz.
	Trace	BIOCLASTICS.
2490 - 2500	70	CLAYSTONE, chocolate brown to dark grey, as above.
	30	SILTSTONE, chocolate brown to dark grey.
	Trace	SAND, as above.
	Trace	BIOCLASTICS.
	Trace	COAL.
	Trace	SANDSTONE, pyritic.
2500 - 2560	60	CLAYSTONE as above.
	40	SILTSTONE as above.
	Trace	SAND as above.
	Trace	COAL as above.
	Trace	BIOCLASTICS as above.
2560 - 2570		As above.
		(Drilling break at 2570 feet from 80 ft/hr to 300 ft/hr - circulated out).
2570 - 2580	40	SAND, unconsolidated, medium, well sorted, well to sub-rounded, clear and milky quartz, no shows.
	30	CLAYSTONE, chocolate brown, as above.
	30	SILTSTONE chocolate brown - dark grey, as above.
2580 - 2590	40	CLAYSTONE, as above.
	30	SILTSTONE, light grey - buff, hard to firm, glauconitic.
	20	SAND, unconsolidated, medium to coarse grained, well to sub-rounded.
	10	COAL, black, massive.
2590 - 2598		As above.
		(Cut CORE NO. 1, 2598 feet - 2614 feet cut 16 feet, recovered nil).
2614 - 2620	90	CLAYSTONE, as above.
	10	SILTSTONE, as above.
	Trace	SAND, as above.
	Trace	COAL.
	Trace	SANDSTONE, pyritic.

Depth Interval (feet K.B.)	Percent	Lithology
2620 - 2630	70	CLAYSTONE, as above.
	30	SILTSTONE, dark grey-chocolate brown, soft to firm.
	Trace	SILTSTONE, light grey-grey green, hard, firm, glauconitic.
	Trace	COAL.
	Trace	SHALE, carbonaceous.
	Trace	BIOCLASTICS.
	Trace	SAND, unconsolidated, medium to coarse.
2630 - 2640	80	CLAYSTONE, as above.
	20	SILTSTONE, as above.
	Trace	SAND as above.
	Trace	COAL, as above.
	Trace	SANDSTONE, pyritic.
	Trace	BIOCLASTICS, as above.
2640 - 2650	90	CLAYSTONE, as above.
	10	SAND, unconsolidated, medium to coarse, well to sub-rounded, clear to milky quartz, polished, frosted.
2650 - 2660	70	CLAYSTONE, as above.
	30	SAND, as above.
2660 - 2667	70	SAND, as above.
	30	CLAYSTONE, as above.
		(Cut CORE NO. 2, 2667-2699 feet, cut 32 feet, recovered 23 feet).
2699 - 2730	70	SILTSTONE, dark chocolate brown, firm, slightly fissile, grading to shale.
	20	SAND, unconsolidated, medium to coarse, well to sub-rounded, milky and clear quartz.
	10	SANDSTONE, medium, buff, pyritic, dolomitic, tight.
	Trace	SANDSTONE, medium to coarse, hard, pyritic.
2730 - 2760	60	SAND, unconsolidated, coarse sand to granule size (up to 4 mm) quartz, well to sub-rounded, milky, clear, frosted grains.
	20	SILTSTONE, dark chocolate brown, grading to shale, as above.
	20	SANDSTONE, medium, buff, dolomitic.
	Trace	SANDSTONE, pyritic.
2760 - 2790	70	SAND, as above.
	20	SANDSTONE, medium, buff, dolomitic.
	10	SILTSTONE, dark chocolate brown, grading to shale, as above.
2790 - 2840	50	SAND, unconsolidated, coarse sand to granule size, sub-rounded to angular, milky and clear quartz, also lithics inc. chert.

Depth Interval (feet K.B.)	Percent	Lithology
2790 - 2840 (Contd)	30	CLAYSTONE, chocolate brown, grading to siltstone.
	10	COAL, black, brittle, massive and woody.
	10	SANDSTONE, dolomitic, as above.
2840 - 2870	70	SAND, unconsolidated, medium sand to granule size, most very coarse, well to sub-rounded, mainly milky and clear quartz, some lithics.
	20	SANDSTONE, dolomitic, as above.
	10	CLAYSTONE, chocolate brown, grading to siltstone as above.
	Trace	COAL.
	Trace	LITHIC GRANULES, including chert.
2870 - 2880	90	SAND, as above.
	10	COAL, black, lustrous.
2880 - 2900		As above.
2900 - 2930	100	SANDSTONE, grey to green, fine to medium, lithic, clay choked, (?)kaolinitic, (?) zeolitic, soft, poorly cemented, clear and milky quartz, dark grey quartz. Lithics include green quartz rock, rare shale, light green siltstone.
	Trace	COAL.
	Trace	SAND, well rounded, granule size, milky, clear.
	Trace	MUSCOVITE.
2930 - 3020		As above.
3020 - 3050	100	SANDSTONE as above.
	Trace	SILTSTONE, light green, chloritic granules.
	Trace	COAL.
3050 - 3080		As above.
	Trace	MUSCOVITE.
	Trace	QUARTZ granules.
3080 - 3110		As above.
	Trace	COAL - woody.
	Trace	SILTSTONE, buff.
3110 - 3140		As above.
3140 - 3152		As above.
		(Cut CORE NO. 3, 3152 - 3179 feet, cut 27 feet, recovered 25½ feet).
3179 - 3250	90	SANDSTONE, fine to medium, lithic, medium to dark grey, clay choked, soft, unconsolidated, mainly grey lithics, grey and green sand sized quartz.
	10	COAL.

Depth Interval (feet K.B.)	Percent	Lithology
3250 - 3330	70	SANDSTONE, fine to medium, as above, with granules, i.e. bimodal.
	30	LITHIC GRANULES and small pebbles up to 5 mm, very well to sub-rounded, including tight calcareous, medium sandstone, quartz, massive black conchoidally fractured shale, grey siltstone, reddish brown siltstone.
	Trace	COAL.
	Trace	MUSCOVITE.
3330 - 3450	100	SANDSTONE, as above.
	Trace	COAL.
	Trace	GRANULES, lithic.
3450 - 3510	100	SANDSTONE, as above.
	Trace	COAL.
	Trace	GRANULES, quartz.
3510 - 3570	70	SANDSTONE, medium grey to green, fine to medium, as above.
	30	SANDSTONE, grey to green, medium to coarse, lithic, kaolinitic.
	Trace	GRANULES, lithic and quartz.
3570 - 3600	100	SANDSTONE, fine to medium, lithic as above.
	Trace	GRANULES, siltstone, jade green, hard.
3600 - 3640	100	SANDSTONE, medium to coarse, as above.
3640 - 3660		As above.
3660 - 3720	90	SANDSTONE, fine to medium.
	10	COAL, black, woody, - probably cavings.
3720 - 3740	90	SANDSTONE, medium to coarse.
	10	GRANULES, quartz and lithics, angular to sub-rounded, including jade green siltstone and grey shale.
3740 - 3750	100	SANDSTONE, as above.
	Trace	SHALE, dark grey, fissile.
		(Drilling Break at 3750 feet from 100 feet/hr to 370 feet/hr - circulated out).
3750 - 3760	50	SANDSTONE, dark grey to green, medium to coarse, lithic, very kaolinitic.
	50	GRANULES, lithic and quartz, sub-angular to sub-rounded, mostly sub-angular, including fine grained sandstone, siltstone, light grey shale, brick red siltstone. Very coarse fraction is apparently in medium to coarse sandstone matrix described as 50% of this sample.

Depth Interval (feet K.B.)	Percent	Lithology
3760 - 3780		As above.
	Trace	COAL.
3780 - 3840		As above.
	Trace	COAL.
3840 - 3860		SANDSTONE, bimodal, medium to coarse and very coarse granule fractions, as above.
	Trace	COAL.
3860 - 3870	100	SANDSTONE, medium to coarse, very kaolinitic, as above.
3870 - 3910	60	SANDSTONE, medium, kaolinitic, bimodal as above.
	40	SAND, lithics, very coarse granules as above.
3910 - 3930	80	SANDSTONE as above.
	20	SAND, very coarse granules, as above.
3930 - 3950	90	SANDSTONE, as above.
	10	SAND, as above.
3950 - 4000	80	SANDSTONE, medium to coarse, kaolinitic, dark grey to green lithics.
	20	SAND, coarse sand to granule size, angular to sub-rounded, mainly quartz.
4000 - 4020	90	SANDSTONE, medium to coarse, as above, sand size, dark grey-green lithics.
	10	SAND, coarse sand to granule size, angular to sub-rounded, clear, milky quartz, lithics include grey shale, green quartz rock.
4020 - 4051	80	SANDSTONE, medium to coarse, as above.
	20	SAND, coarse sand to granule size, angular to sub-rounded, milky to clear quartz, light grey siltstone, grey shale, green quarts rock, black, hard, well-rounded shale grains.
	Trace	MUSCOVITE.
	Trace	COAL.

Total Depth 4051 feet.

APPENDIX NO.4

Description of Cores and Sidewall Cores

HEMATITE PETROLEUM PTY. LTD. **CORE REPORT**

CORE NO. 1

INTERVAL 2598 TO 2614

RECOVERY NIL

% REC. NIL

WELL : SNAIL - 1

DATE : 5/12/72.

DESCRIBED BY : E. A. HODGSON

DEPTH	CORING RATE min/ft.	LITHOLOGY	SHOWS STAIN ODOUR FLUORESCENCE CUT	LITHOLOGY DESCRIPTION

HEMATITE PETROLEUM PTY. LTD.

CORE REPORT

CORE NO. 2
INTERVAL 2667 TO 2699 (32 feet)
RECOVERY 23 feet
% REC. 72%
WELL : SNAIL - 1
DATE : 5/12/72.
DESCRIBED BY : E. A. HODGSON

DEPTH	CORING RATE min/ft.	LITHOLOGY	SHOWS STAIN ODOUR FLUORESCENCE CUT	LITHOLOGY DESCRIPTION	
2667			NO SHOWS	SANDSTONE 2667-2669'	M-C, l gy-gn, well-sub r qtz, (20%) glauc, hard, tight, well cemented with qtz, calcite, ?dolomite, limonite cement, 20mm x 5mm burrows infilled with glauc and pyrite, some carbonate (calcite -?dolomite) filled burrows, no bedding apparent, rare indistinct dolomitic calcite veins up to 5 mm wide. Indistinct, v hard massive, irregular areas of d.br pyritic claystone.
2675½					
2677				SAND 2669-2673'	F-m, l gy-greenish gy, well-sub r, (5%) glauc, qtz, firm-unconsolidated, silty, may be crushed with fingers, micaceous, some well sorted fine sand size beds, rare d brown claystone beds, rare dolomitized zones up to 40 mm diameter.
				SAND 2673-2675½'	A-a with up to 10% glauc, inc granule size, apple green, rounded glauc. also with rounded, polished c sand and granule size qtz (milky and clear).
2687				SAND 2675½-2676'	F-vf, choc brown, micaceous, soft - partly consolidated, clayey, grading to silt. Tight.
				SAND 2676-2677'	M-c, l gy-greenish gy well sub r up to 10% c sand size and dispersed (10mm) glauc, v sl consol a.a. silty.
2691				SAND 2677-2689'	F-vf a.a. becoming sl more micaceous towards base.
				SAND 2689-2691'	M-c, l gy- well-sub r, v rare glauc, sl micaceous, silty.

KEY TO SAND SIZE
m - c
f - m
f
shale intraclasts

HEMATITE PETROLEUM PTY. LTD. **CORE REPORT**

CORE NO. 3 INTERVAL 3152 TO 3179 (27 feet)

RECOVERY $25\frac{1}{2}$ feet
% REC. 94%

WELL : SNAIL - 1
DATE : 5/12/72.
DESCRIBED BY : E. A. HODGSON

DEPTH	CORING RATE min/ft.	LITHOLOGY	SHOWS STAIN ODOUR FLUORESCENCE CUT	LITHOLOGY DESCRIPTION	
3152			NO SHOWS	SANDSTONE 3152-3153'	F-m (1/16-1/2 mm) firm, l gy-gn, whitish to l green (?)zeolite (?)kaolinite matrix, ang - sub ang qtz and sand size lithics, sl micaceous, sl carbonaceous, green qtz.
				3153-3155'	M otherwise a.a., sl slickensided, micaceous (Muscovite).
3162				3155-3162'	A-a, m-c. At 3156' thin indistinct, wavy carbonaceous bedding and 1 mm thick wavy jade green (?)zeolite vein. At 3157' bte, musc ? chlorite books (?authigenic) carbonaceous material on bedding planes. At 3158-3159' v chloritic, 1-2 mm books (?authigenic). At 3160' - about 50% d grey lithics.
3172				$3162-3177\frac{1}{2}$'	A.a. f-m, lithics and qtz sand size grains "floating" in l gn-gy (?)kaolinitic-zeolitic matrix. At 3163' - abndt muscovite, bte, chlorite. At 3167' - 2 mm coal stringer. 3168-69' - well sorted sandst with shale intraclasts on bedding planes. At 3170' - angular and sub r lithics (inc shale) up to 10 mm. At 3173' - A.a. angular qtz to 5 mm. At 3176' - indistinct bedding dipping at about 15°.
$3177\frac{1}{2}$			KEY TO SAND SIZE		
3179			• • m - c		
			· · · f - m		
			· · f		
			shale intraclasts		

HEMATITE SNAIL-1

SIDEWALL CORE REPORT

7/12/72. Run 1 Shot 30, recovered 29, accepted 28.

NO.	DEPTH	RECOVERY	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	SUITABLE FOR PALYNOLOGY	REMARKS
30	1879	1½	SANDSTONE	N.B. No odour, stain, fluorescence			Low	No	F-m, clay choked, sl glauc, V calc, white.
29	1938	1¾	SANDSTONE	or cut in any sample.			Moderate	Yes	Vf,-silty, glauc. V calc. fossiliferous, d. gy-gn.
28	2113	½	CLAYSTONE	-	-	-	-	No	Soft, silty, sandy, glauc, sl calc, M br-gy.
27	2546	1¼	CLAYSTONE	-	-	-	-	Yes	Soft, sl sandy, glauc, mottled br and gy-gn.
26	2560	0							NO RECOVERY
25	2584		SANDSTONE	-	-	-	Good	Yes	F-m, well sorted, clayey, d.br
24	2626	1¾	CLAYSTONE	-	-	-	-	Yes	D.br, v carb, grading to coal.
23	2664	1¼	COAL	-	-	-	-	Yes	D.brown-black, soft, waxy.
22	2678	½	SANDSTONE	-	-		tight	No	M-c, l gy-gn, glauc, clay choked, calc, ?dolomitic, well rounded qtz, firm.
21	2707	1½	SAND	-	-	-	Moderate	Yes	(M-c, well sorted sand fraction (l br, unconsol, clay choked, (glauc.
20	2718	1½	SAND	-	-	-	Moderate	Less than 21.	M-c, well sorted sand fraction l br, unconsol, clay choked, glauc
19	2749	1¼	SAND	-	-	-	Moderate	Less than 20	M-c, well sorted sand fraction, l br, unconsol, clay choked, glauc.
18	2783	1¾	CLAYSTONE	-	-	-	-	Yes	D br, carbonaceous, soft with 1-3 mm, irregular, m-c sand stringers.
17	2865	1½	SANDSTONE	-	-	-	Moderate	Yes	f, l gy, clay choked, sl consolidated, sl. carbonaceous.

HEMATITE SNAIL-1

SIDEWALL CORE REPORT

7/12/72. Run 1 Shot 30, recovered 29, accepted 28.

NO.	DEPTH	RECOVERY	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	Suitable for Palynology	REMARKS
16	2901	1¼	SAND	-	-	-	Poor	No	f, l gy, clay choked, sl carb.
15	2907	1½	SANDSTONE	-	-	-	Poor	Yes	thinly interbedded (1-3mm) l gy and d gy (contorted beds) f-vf, silty, unconsol.
14	2930	1¾	SANDSTONE	-	-	-	Poor	No	M, clay choked, gy, gn, calc. lithic, with clear and gn qtz, micaceous, soft.
13	3107	1¾	SANDSTONE	-	-	-	Poor	No	M, clay choked, lithic, with clear and gn qtz, micaceous, zeolitic, soft.
12	3449	1¾	SANDSTONE	-	-	-	Poor	? Yes	D gy - gn, clay choked, lithic, with clear gn qtz, d gy, red lithics, zeolitic - mod firm.
11	3536	½	SANDSTONE	-	-	-	tight	No	D gy-gn, calcareous, f, ~~dry~~ clay choked, zeolitic, lithic, clear, gn, gy qtz, well cemented (?)calcite, zeolite, qtz.
10	3560	1½	SANDSTONE	-	-	-	tight	?Yes	D gy-gr, clay choked, zeolitic well cemented, lithic with cl, gr qtz, mainly d gy lithics, firm.
9	3600	1¾	SILTSTONE	-	-	-	tight	Yes	D gy, carbonaceous, non calc. lithic, grading to f sandstone well cemented.
8	3817	½	SANDSTONE	-	-	-	tight	No	D gy-grn, non calc, lithic m-c qtz veins, biotite, zeolites.
7	3840	1½	SANDSTONE	-	-	-	tight	?Yes	M-c, d gy, lithic
6	3909	1½	SANDSTONE	-	-	-	tight	?Yes	M-c, d gy, lithic.
5	3931	1¾	SANDSTONE	-	-	-	tight	Yes	Gy-gn, M-c, lithic, clay choked sl carbonaceous, micaceous.

HEMATITE SNAIL-1

SIDEWALL CORE REPORT

7/12/72. Run 1 Shot 30, recovered 29, accepted 28.

NO.	DEPTH	RECOVERY	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	Suitable for Palynology	REMARKS
4	3944	1½	SANDSTONE	-	-	-	tight	No	M, d gy, lithic.
3	3990	½	SANDSTONE	-	-	-	tight	No	F-m, l gy-gn, clay choked.
2	4017	1½	SANDSTONE	-	-	-	tight	No	Gy-gn, f-m, lithic, clay choked.
1	4031	1½	SANDSTONE	-	-	-	tight	Yes	F-m, gy-gn, clay choked, lithic, sl carbonaceous.

APPENDIX NO.5

Well Velocity Survey

by Austral United Geophysical Pty. Ltd.

WELL VELOCITY SURVEY

of

SNAIL No. 1

FOR

HEMATITE PETROLEUM PTY. LTD.

by

AUSTRAL UNITED GEOPHYSICAL PTY. LTD.

Party 86

Bendix

Table of Contents

Figures

Appendix

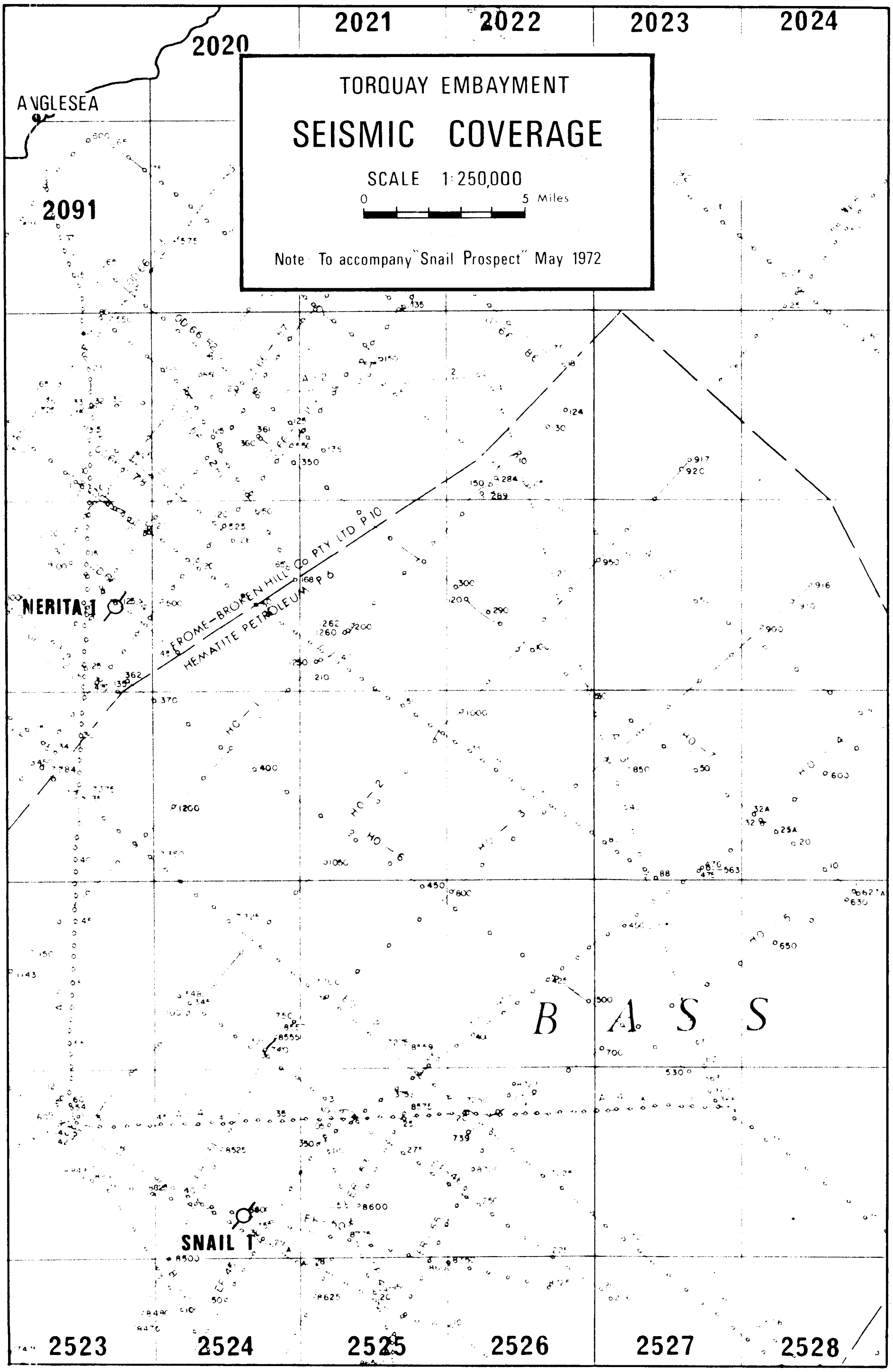

TORQUAY EMBAYMENT
SEISMIC COVERAGE
SCALE 1:250,000
0
5 Miles
Note To accompany "Snail Prospect" May 1972
2020
2021
2022
2023
2024
2091
ANGLESEA
NERITA 1
SNAIL 1
FROME-BROKEN HILL Co PTY LTD P 10
HEMATITE PETROLEUM P 6
BASS
2523
2524
2525
2526
2527
2528

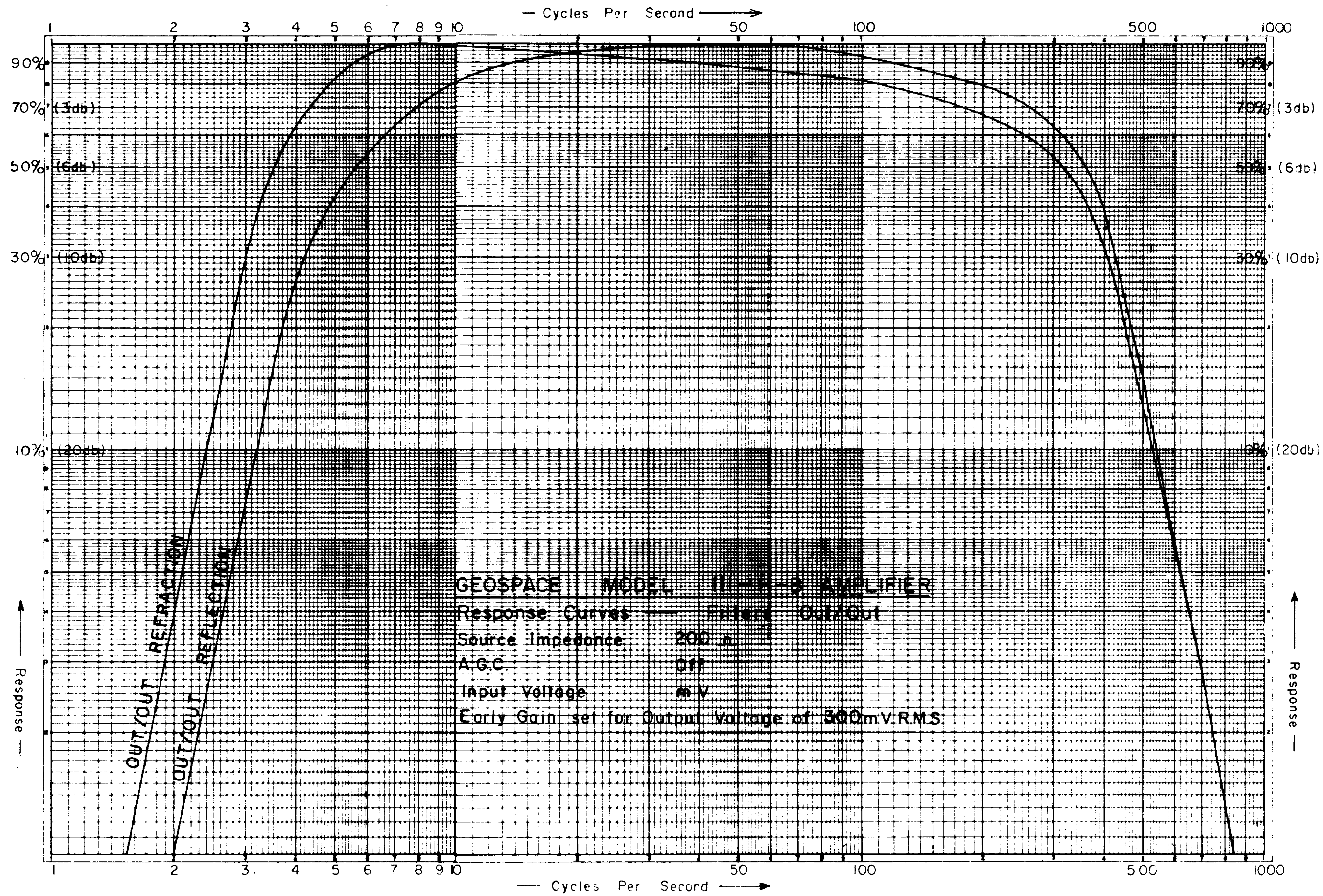
Fig - I

OG-2894

WELL INFORMATION

NAME OF WELL	Snail No.1
DATE OF SURVEY	7th December, 1972
LOCATION	35 miles south of Anglesea township, southern Victoria, in P.E.P. 6
CO-ORDINATES	Latitude 38° 53' 51.8" S. Longitude 144° 18' 02.3" E.
ELEVATION K.B.	+ 31.0 feet M.S.L.
ELEVATION G.L.	- 264 feet M.S.L.
ELEVATION DATUM PLANE	0.0 feet M.S.L.
INTERVAL SURVEYED	1877 feet to 4040 feet below K.B.
SEISMOGRAPH PROFILE	Shotpoint 8802. Line ER50.
TOTAL DEPTH	4040 feet below K.B.
CASING	1795 feet below K.B.
SHIP HEADING	234°

Fig. 2.



— Cycles Per Second →
1 2 3 4 5 6 7 8 9 10 50 100 500 1000
90%
70% (3db)
50% (6db)
30% (10db)
10% (20db)
Response
OUT/OUT REFRACTION
OUT/OUT REFLECTION
GEOSPACE MODEL
AMPLIFIER
Response Curves — Filters Out/Out
Source Impedance 200 Ω
A.G.C. Off
Input Voltage mV
Early Gain set for Output Voltage of 300 mV RMS

OPERATIONS

1. Recording Equipment

Well geophone	Geospace wall lock velocity geophone
Cable	Schlumberger cable and reel
Reference and Time Break Hydrophones	Marsh Marine MP3
Camera	Electro Tech Model ER62
Amplifiers	Geospace Model III

2. Amplifier Specifications

Geospace Model III

Frequency Response	:	Within 3db attenuation from 5 to 300 hertz
Input Signal Range	:	From 1 microvolt to 300 millivolts R.M.S.
Input Impedance	:	500 ohms
Noise	:	0.1 microvolts R.M.S. broad band from 10 to 300 hertz (200 ohms source impedance)

3. Energy Source

Gas Gun	2.78 cubic feet capacity (Propane Oxygen mixture)
Ignition System	United Hi-voltage Detonator Panel
Gas Control System	United gas fill timer

4. Recording Procedure

Amplifier No, 1	Downhole geophone
Output:	Divided output to traces No,1, No,2 and No,3
Filters:	Hi-Cut 300 hertz Lo-Cut 5 hertz
Amplifier No. 2	Moonpool Reference Hydrophone
Output:	Single output to trace No,4
Filters:	Hi-Cut 300 hertz Lo-Cut 5 hertz
Amplifier No. 3	Time-Break Hydrophone
Output:	Single output to trace No,5
Filters:	Hi-Cut 300 hertz Lo-Cut 5 hertz

Time break to trace No,6 (not amplified)

5. Operational Statistics

Surveyed Interval	1877 feet to 4040 feet below K,B,
Number of horizons surveyed	Seven
Number of shots per horizon	Two
Gun Offset	75 feet
Gun Depth	40 feet
Gas fill time	20 secs, (approx, 2 cubic feet)
Observer	W,J. Larsen
Shooter	L,D, Moore

6. Recording Operations

Recording instruments were set up in the air conditioning room of the *Glomar Conception*, and gas gun equipment on the main deck.

Interconnect cables between observer and shooter were used for communications, remote firing and hydrophone signals.

The gas gun was lowered 40 feet below sea level on the port side crane.

A 20 second gun fill of propane and oxygen fired by spark plug gave sufficient energy for good records at all levels.

Dual time breaks were recorded by MP3 hydrophones fastened 5 feet (.001 seconds) from the gun on control lines.

An additional hydrophone 10 feet below sea level in the moonpool, was used to record offset times.

Depth measurements for downhole geophone levels were made using the Schlumberger depth indicator.

COMPUTING

1. Datum Plane

Well geophone arrival times were corrected to sea level datum plane using a 5000 feet per second reduction velocity.

A time correction of +.001 seconds was applied to all shots to correct for the distance (5 feet) from gun to time break detector.

Record times were computed by the S.T.C.C. IBM computer in Brisbane from data supplied by Austral United Geophysical Pty. Ltd.

2. Record Quality

Record quality is good at all levels, and times from both shots at each level are identical.

3. Sonic Calibration

The cumulative correction plot shows sonic time .006 seconds shorter than seismic time at 4040 feet, from the tie point at 1846 feet.

Bendix

4. Horizon Arrival Times

Corrected arrival times to the principle horizons are as follows:

Horizon	Depth Below Datum (0' MSL)	Arrival Times (One Way Time)
HORIZON "A" MARKER	1,841	0.306 secs.
DEMON'S BLUFF FORMATION	2,069	0.338 secs.
EASTERN VIEW COAL MEASURES	2,541	0.406^{5} secs.
OTWAY GROUP	2,896	0.454 secs.

5. Function Computation

The velocity function was computed by the Nash Miller method, using the following expressions and information from the plot of vertical time against depth.

$$a = \frac{4.605}{t_1} \log 10 \left(\frac{Z_1 - Z_2}{Z_2}\right)$$

$$Vd = \frac{aZ_1}{e^{at_1} - 1}$$

Z_1 and t_1 are corresponding depth and one way time at a deeper point in the section, and Z_2 is the depth corresponding to one way time of $\frac{t_1}{2}$ secs.

This function was computed with respect to a sea level datum plane.

RESULTS

1. Velocity Function

The function V = 5,030 + 1.05Z was computed for the Snail No.1 well and is a close fit to the time depth curve from Datum to total depth.

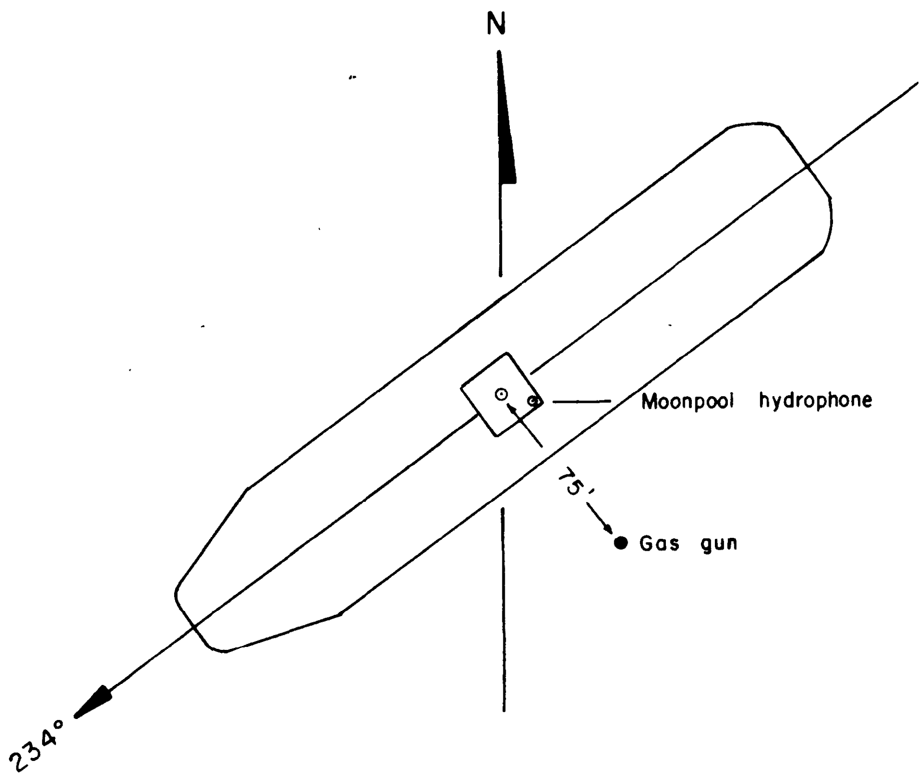
2. Function Plots

A plot of the above function is included in the appendix of this report for comparison purposes.

Respectfully submitted

Austral United Geophysical Pty. Ltd.
Party 86

Supervisor



GAS GUN LOCATION PLAT.

WELL VELOCITY SURVEY

HEMATITE PETROLEUM P/L

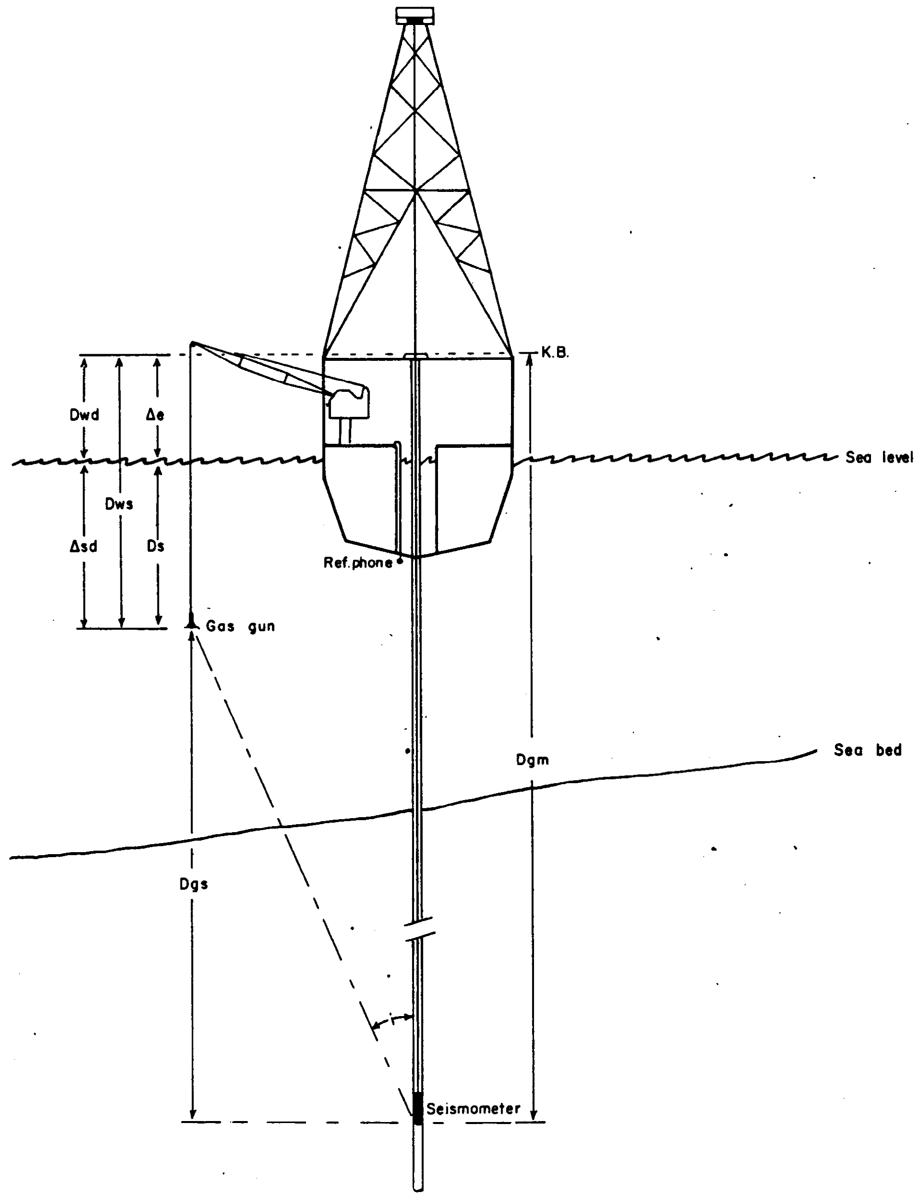
SNAIL Nº1.

by

AUSTRAL UNITED GEOPHYSICAL P/L

Party 86 7 December 1972

Fig. 3.



Dwd = Kelly – datum elevation
R = Record number
Ew = Elevation of sea water above M.S.L.
Dgm = Depth below kelly bushing
Tas = Time to "Moonpool" hydrophone
Tc = Time correction
Te = $\left(\frac{1}{V_w} - \frac{1}{V_o}\right)$ X distance shot to sea floor
Ds = Depth of shot / depth of gas gun
Δe = Kelly – sea level elevation = Dwd – Ew
Dws = Ds + Δe
Δsd = Dws – Dwd
Dgs = Dgm – Dws
H = Horizontal distance shotpoint to well
Tan-I = H/Dgs
T = Arrival time from time break to wellphone
Tgs = T Cos-I
Q = Record quality
Tgd = Tgs + Δsd / Vd + Tc or Te
(Vertical travel time from datum to well phone)
Dgd = Dgm – Dwd
(Vertical distance datum plane to wellphone)
VI = Interval velocity = Δ Dgd / Δ Tgd
VA = Average velocity = Dgd/Tgd
Vd = Datum reduction velocity

COMPUTATION DIAGRAM

WELL VELOCITY SURVEY

HEMATITE PETROLEUM Pty. Ltd.

SNAIL Nº1.

by

AUSTRAL UNITED GEOPHYSICAL P/L.

Party 86 7 December 1972.

Fig-4

PE900281

This is an enclosure indicator page.
The enclosure PE900281 is enclosed within the container PE900273 at this location in this document.

The enclosure PE900281 has the following characteristics:

ITEM_BARCODE = PE900281
CONTAINER_BARCODE = PE900273
NAME = Snail 1 Well Velocity Determination, Appendix 5A
BASIN = OTWAY
PERMIT = VIC/P6
TYPE = WELL
SUBTYPE = VELOCITY_CHART
DESCRIPTION = Snail 1 Well Velocity Determination, Appendix 5A
REMARKS =
DATE_CREATED = 7/12/72
DATE_RECEIVED = *
W_NO = W658
WELL_NAME = SNAIL-1
CONTRACTOR = Hematite Petroleum Pty Ltd
CLIENT_OP_CO = Hematite Petroleum Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE900274

This is an enclosure indicator page.
The enclosure PE900274 is enclosed within the container PE900273 at this location in this document.

The enclosure PE900274 has the following characteristics:

ITEM_BARCODE =	PE900274
CONTAINER_BARCODE =	PE900273
NAME =	Snail 1 Well Velocity Determination, Velocity Function, Appendix 5B
BASIN =	OTWAY
PERMIT =	VIC/P6
TYPE =	WELL
SUBTYPE =	VELOCITY_CHART
DESCRIPTION =	Snail 1 Well Velocity Determination, Velocity Function, Appendix 5B
REMARKS =	
DATE_CREATED =	7/12/72
DATE_RECEIVED =	*
W_NO =	W658
WELL_NAME =	SNAIL-1
CONTRACTOR =	Hematite Petroleum Pty Ltd
CLIENT_OP_CO =	Hematite Petroleum Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE904291

This is an enclosure indicator page.
The enclosure PE904291 is enclosed within the container PE900273 at this location in this document.

The enclosure PE904291 has the following characteristics:

ITEM_BARCODE = PE904291
CONTAINER_BARCODE = PE900273
NAME = Snail 1 Well Velocity Computation Sheet
BASIN = Otway
PERMIT = VIC/P10
TYPE = WELL
SUBTYPE = VELOCITY_RPT
DESCRIPTION = Snail 1 Well Velocity Computation Sheet, Appendix 5 Enclosure C
REMARKS = *
DATE_CREATED = 7/12/72
DATE_RECEIVED = *
W_NO = W658
WELL_NAME = Snail 1
CONTRACTOR = Hematite Petroleum Pty Ltd
CLIENT_OP_CO = Hematite Petroleum Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY LTD

WELL SNAIL Nº 1

Record No G 1

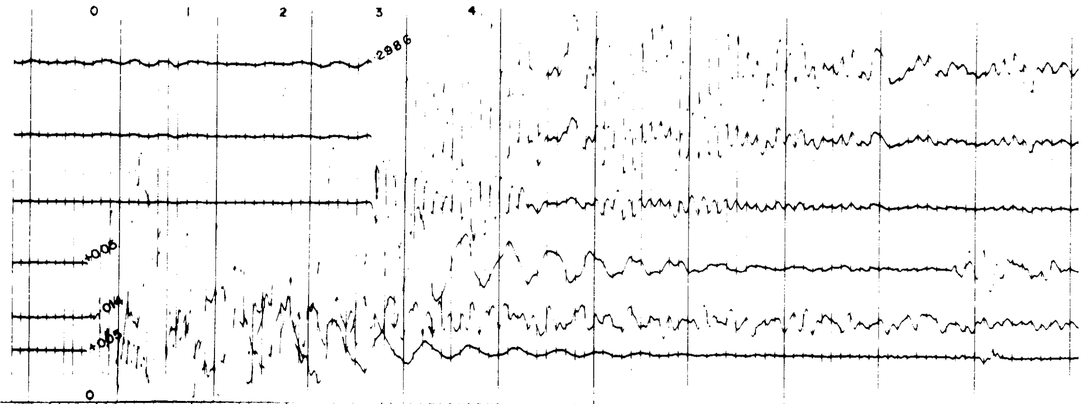
Shot Hole No
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 1877'

Below Datum 00ft (A.S.L.) 1846'

Charge Gas 20 sec Depth of Shot 40'



WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY. LTD.

WELL SNAIL Nº 1

Record No G 2

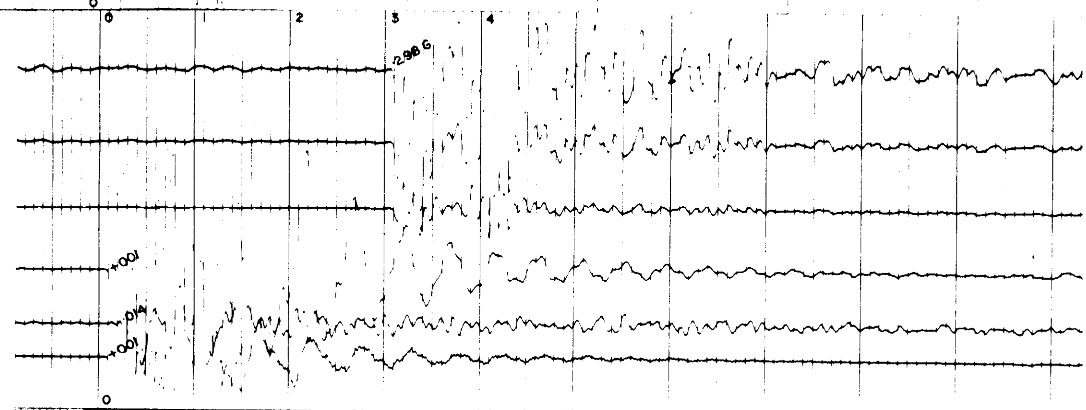
Shot Hole No
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 1877'

Below Datum 00ft (A.S.L.) 1846'

Charge Gas 20 sec Depth of Shot 40'



WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY. LTD.

WELL SNAIL Nº 1

Record No F 2

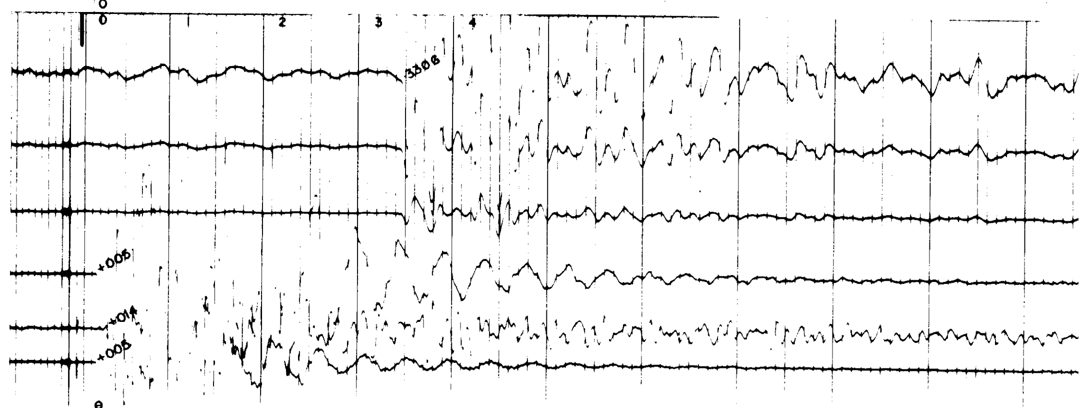
Shot Hole No
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 2105'

Below Datum 00ft (A.S.L.) 2074'

Charge Gas 20 sec Depth of Shot 40'



WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY LTD

WELL SNAIL Nº 1

Record No F 3

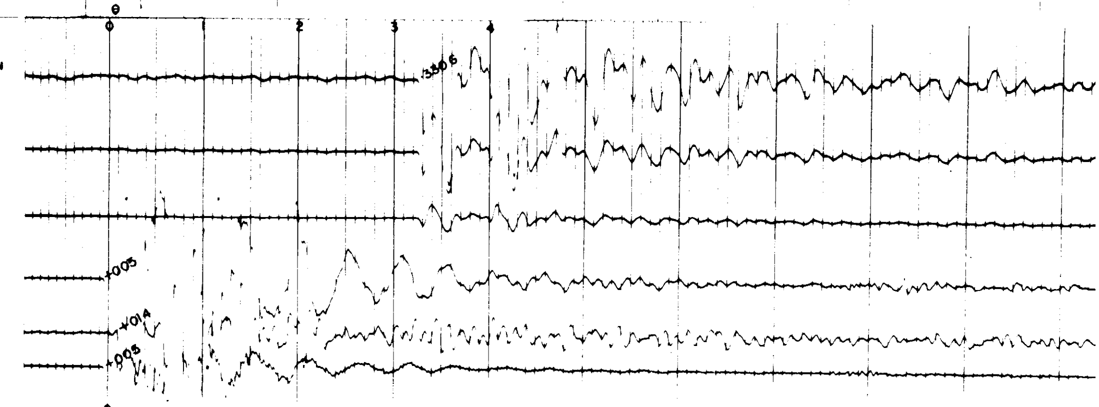
Shot Hole No
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 2105'

Below Datum 00ft (A.S.L.) 2074'

Charge Gas 20 sec Depth of Shot 40'



WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY LTD

WELL SNAIL Nº 1

Record No E 1

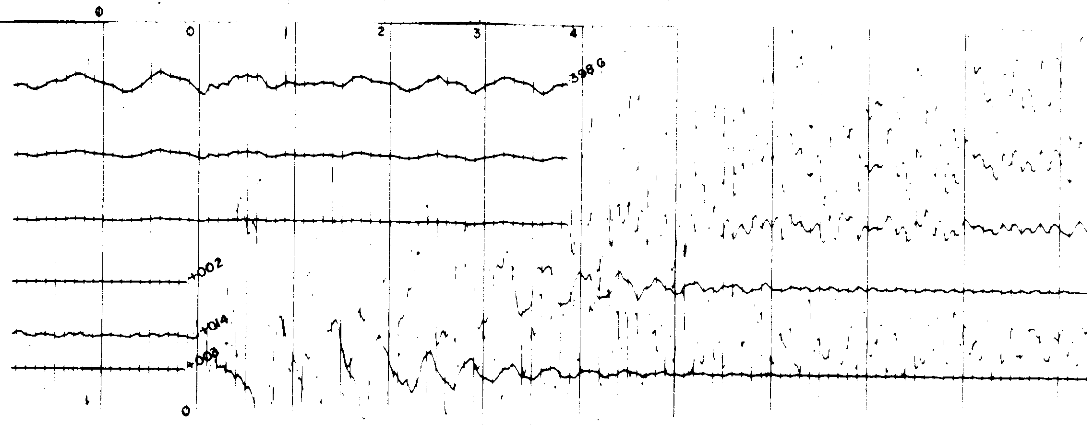
Shot Hole No
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 2574'

Below Datum 00ft (A.S.L.) 2543'

Charge Gas 20 sec Depth of Shot 40'



WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY. LTD.

WELL SNAIL Nº I

Record No. E 2

Shot Hole No.

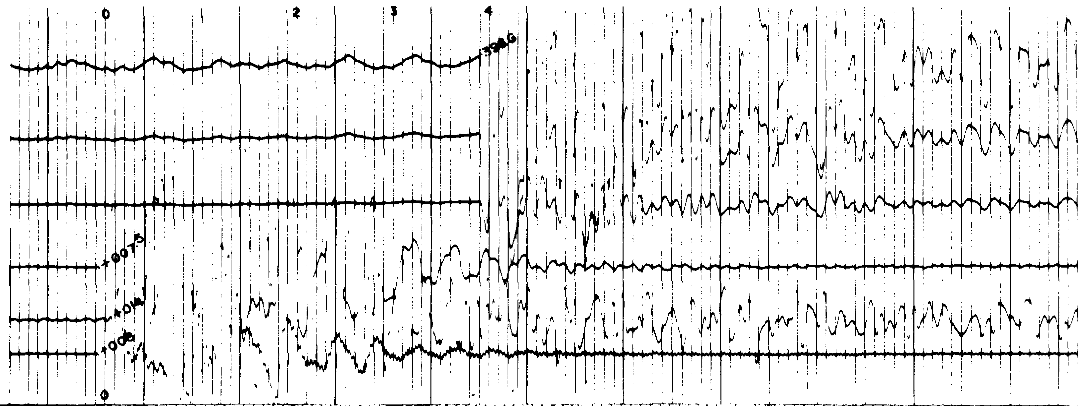
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 2574'

Below Datum 00ft (A.S.L.) 2543'

Charge Gas 20 sec Depth of Shot 40'



WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY. LTD.

WELL SNAIL Nº I

Record No. D 1

Shot Hole No.

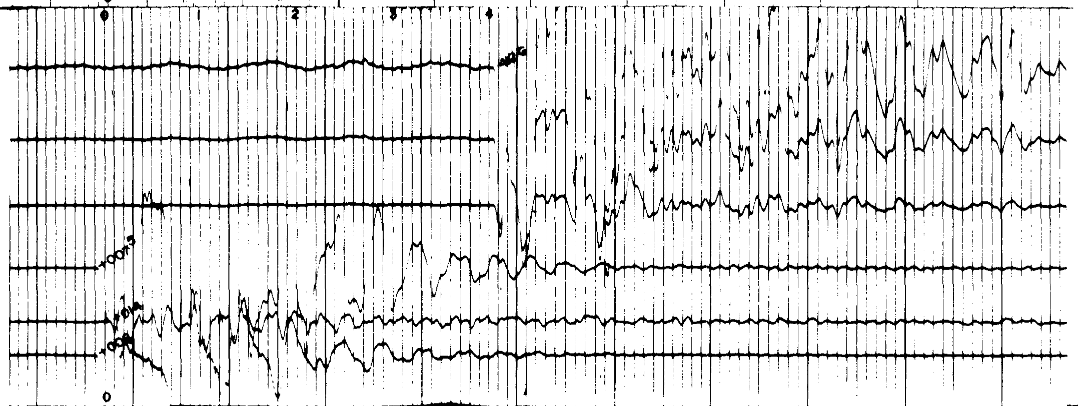
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 2675'

Below Datum 00ft (A.S.L.) 2644'

Charge Gas 20 sec Depth of Shot 40'.



WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY. LTD.

WELL SNAIL Nº I

Record No. D 2

Shot Hole No.

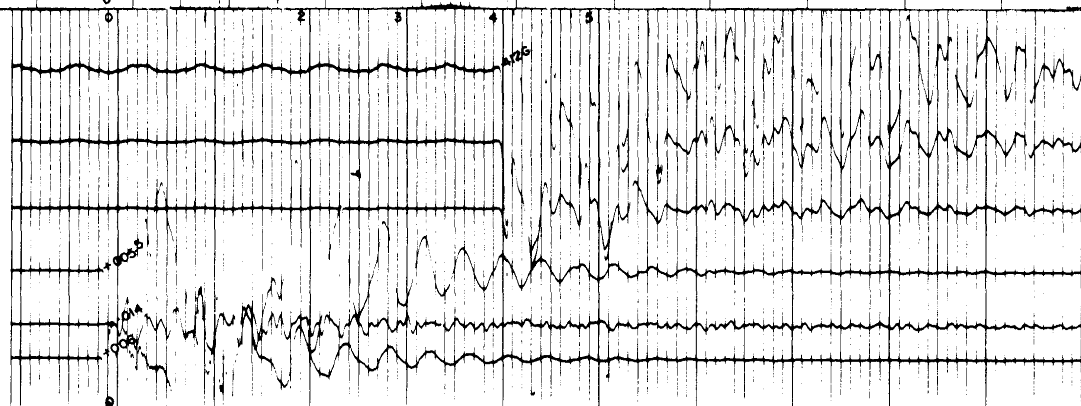
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 2675'

Below Datum 00ft (A.S.L.) 2644'

Charge Gas 20 sec Depth of Shot 40'.



WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY. LTD.

WELL SNAIL Nº I

Record No. C 1

Shot Hole No.

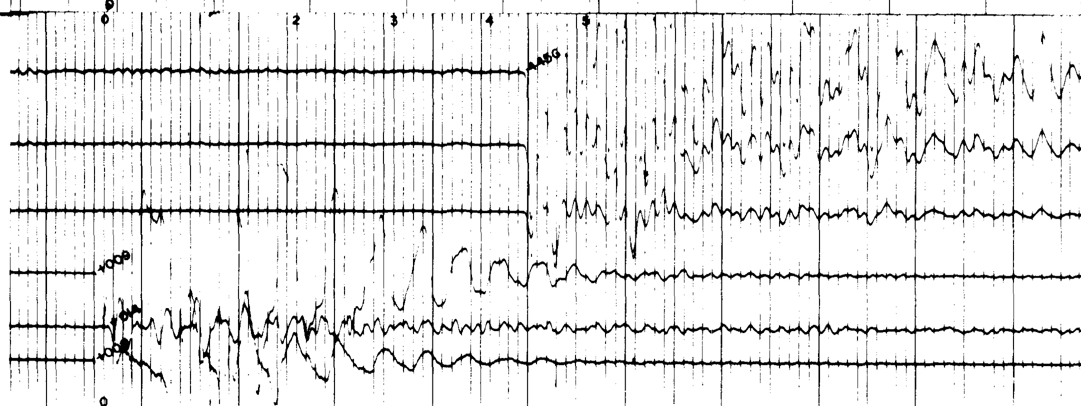
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 2927'

Below Datum 00ft (A.S.L.) 2896'

Charge Gas 20 sec Depth of Shot 40'



WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY. LTD.

WELL SNAIL Nº I

Record No. C 2

Shot Hole No.

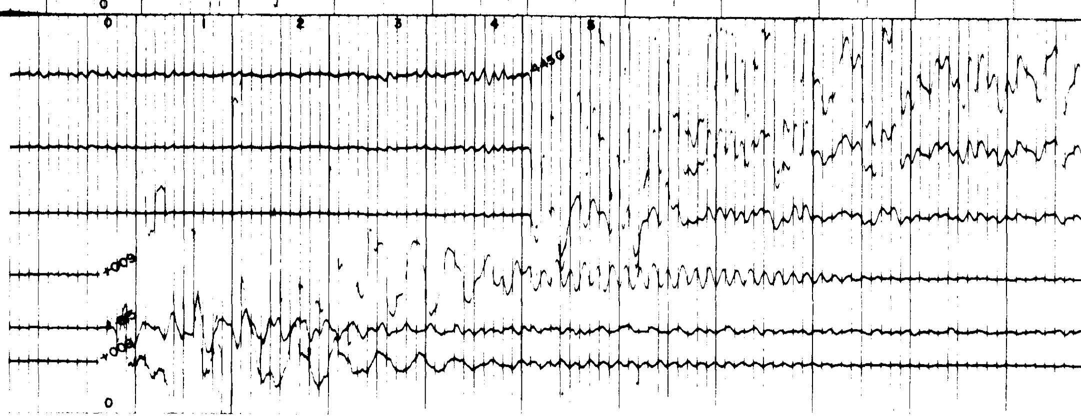
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 2927'

Below Datum 00ft (A.S.L.) 2896'

Charge Gas 20 sec Depth of Shot 40'



WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY. LTD.

WELL SNAIL Nº I

Record No B I

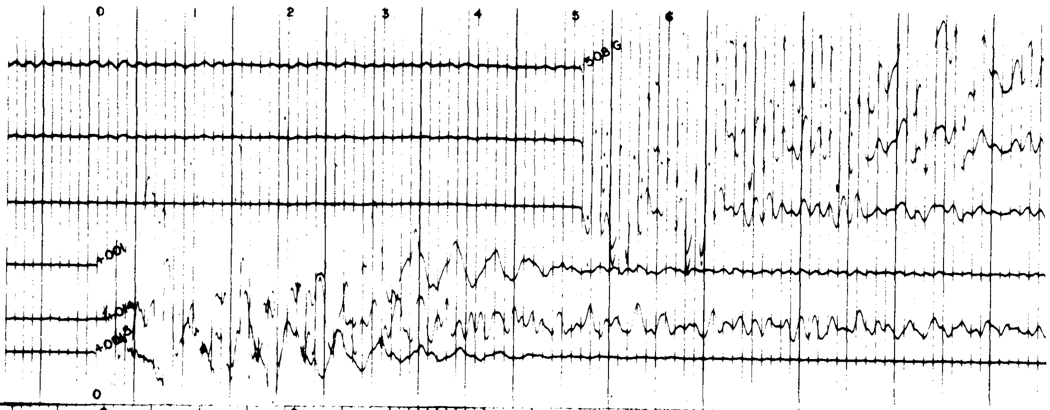
Shot Hole No
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 3470'

Below Datum 00ft (A.S.L.) 3439'

Charge Gas 20 sec Depth of Shot 40'



WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY. LTD.

WELL SNAIL Nº I

Record No B 2

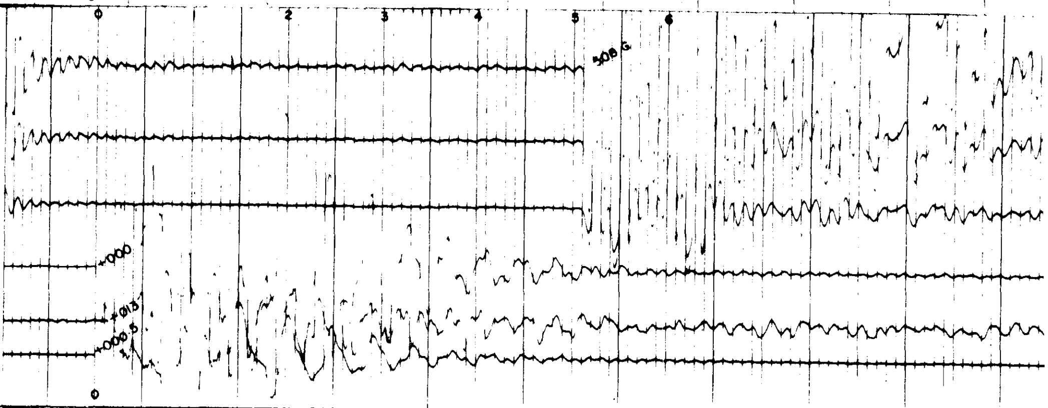
Shot Hole No
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 3470'

Below Datum 00ft (A.S.L.) 3439'

Charge Gas 20 sec Depth of Shot 40'



WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY. LTD

WELL SNAIL Nº I

Record No A 2

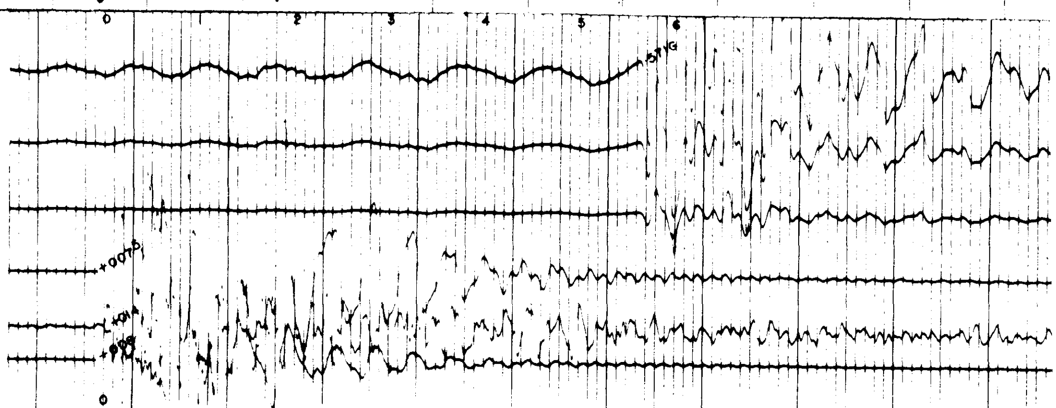
Shot Hole No
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 4040'

Below Datum 00ft (A.S.L.) 4009'

Charge Gas 20 sec Depth of Shot 40'



WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM PTY LTD

WELL SNAIL Nº I

Record No A 3

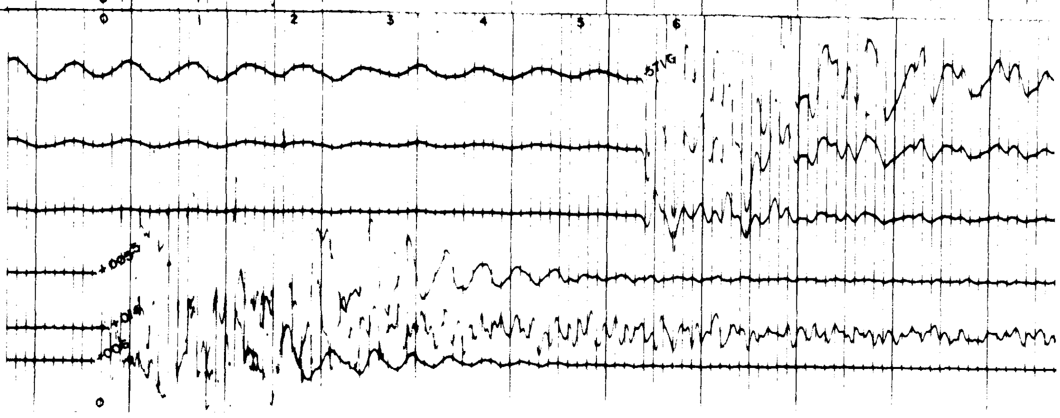
Shot Hole No
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 4040'

Below Datum 00ft (A.S.L.) 4009'

Charge Gas 20 sec Depth of Shot 40'



APPENDIX NO. 6

Core Analysis Results

by

Petroleum Technology Laboratory,
Bureau of Mineral Resources,
Geology and Geophysics, Canberra.

Petroleum Technology Laboratory, Bureau of Mineral Resources, Geology and Geophysics, Canberra

CORE ANALYSIS RESULTS

NOTE: (i) Unless otherwise stated, porosities and permeabilities were determined on two plugs (V&H) cut vertically and horizontally to the axis of the core. Ruska porosimeter and permeameter were used with air and dry nitrogen as the saturating and flowing media respectively. (ii) Oil and water saturations were determined using Soxhlet type apparatus. (iii) Acetone test precipitates are recorded as Neg., Trace, Fair, Strong or Very Strong.

WELL NAME AND NO. Snail No. 1

DATE ANALYSIS COMPLETED 15/3/73

Core No.	Sample Depth		Lithology	Average Effective Porosity two plugs (% Bulk Vol.)	Absolute Permeability (Millidarcy)		Average Density (gm/cc.)		Fluid Saturation (% pore space)		Core Water Salinity (p.p.m. NaCl)	Acetone Test	Fluorescence of freshly broken core	
	From	To			V	H	Dry Bulk	Apparent Grain	Water	Oil				
2	2667' 0"	2667' 8"	Lst; arg.	3.6	0.1	0.1	2.75	2.85	100	NIL	N.D.	NIL	Dull yellow	
3	3152' 0"	3153' 0"	Sst; m.gr. Lithic	34.6	298	655	1.77	2.73	33	NIL	N.D.	NIL	NIL	
3	3161' 0"	3162' 0"	as above	35.6	211	254	1.77	2.73	23	NIL	N.D.	NIL	NIL	
3	3164'		as above	35.8	710	653	1.75	2.73	81	NIL	N.D.	NIL	NIL	*
3	3170'		as above	34.3	90	110	1.79	2.73	94	NIL	N.D.	NIL	NIL	*

Remarks: - Samples wrapped in plastic and foil
CORE 1 - No recovery

General File No. 72/2914
Well File No. 72/3159

PE900282

This is an enclosure indicator page.
The enclosure PE900282 is enclosed within the container PE900273 at this location in this document.

The enclosure PE900282 has the following characteristics:

ITEM_BARCODE = PE900282
CONTAINER_BARCODE = PE900273
NAME = Snail 1 Composite Well Log, Enclosure 1
BASIN = OTWAY
PERMIT = VIC/P6
TYPE = WELL
SUBTYPE = COMPOSITE_LOG
DESCRIPTION = Snail 1 Composite Well Log, Enclosure 1
REMARKS =
DATE_CREATED = *
DATE_RECEIVED = *
W_NO = W658
WELL_NAME = SNAIL-1
CONTRACTOR = Hematite Petroleum Pty Ltd
CLIENT_OP_CO = Hematite Petroleum Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE900300

This is an enclosure indicator page.
The enclosure PE900300 is enclosed within the
container PE900273 at this location in this
document.

The enclosure PE900300 has the following characteristics:
ITEM_BARCODE = PE900300
CONTAINER_BARCODE = PE900273
NAME = Snail 1 Composite Well Log, Enclosure 1
BASIN =
OTWAY
PERMIT = VIC/P6
TYPE = WELL
SUBTYPE = COMPOSITE_LOG
DESCRIPTION = Snail 1 Composite Well Log, Enclosure 1
REMARKS =
DATE_CREATED = *
DATE_RECEIVED = *
W_NO = W658
WELL_NAME = SNAIL-1
CONTRACTOR = Hematite Petroleum Pty Ltd
CLIENT_OP_CO = Hematite Petroleum Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE600221

This is an enclosure indicator page.
The enclosure PE600221 is enclosed within the container PE900273 at this location in this document.

The enclosure PE600221 has the following characteristics:

ITEM_BARCODE = PE600221
CONTAINER_BARCODE = PE900273
NAME = Snail 1 Dipmeter log Interpretation
BASIN = OTWAY
PERMIT = VIC/P6
TYPE = WELL
SUBTYPE = WELL_LOG
DESCRIPTION = Snail 1 Dipmeter log Interpretation
REMARKS =
DATE_CREATED = 7/12/72
DATE_RECEIVED = *
W_NO = W658
WELL_NAME = SNAIL-1
CONTRACTOR = Data Analysis
CLIENT_OP_CO = Hematite Petroleum Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE600222

This is an enclosure indicator page.
The enclosure PE600222 is enclosed within the container PE900273 at this location in this document.

The enclosure PE600222 has the following characteristics:

```
     ITEM_BARCODE = PE600222
CONTAINER_BARCODE = PE900273
             NAME = Snail 1 Dipmeter log Interpretation
            BASIN = OTWAY
           PERMIT = VIC/P6
             TYPE = WELL
          SUBTYPE = WELL_LOG
      DESCRIPTION = Snail 1 Dipmeter log Interpretation
          REMARKS =
     DATE_CREATED = 7/12/72
    DATE_RECEIVED = *
             W_NO = W658
        WELL_NAME = SNAIL-1
       CONTRACTOR = Data Analysis
     CLIENT_OP_CO = Hematite Petroleum Pty Ltd
```

(Inserted by DNRE - Vic Govt Mines Dept)

PE600223

This is an enclosure indicator page.
The enclosure PE600223 is enclosed within the container PE900273 at this location in this document.

The enclosure PE600223 has the following characteristics:

```
     ITEM_BARCODE = PE600223
CONTAINER_BARCODE = PE900273
             NAME = Snail 1 Four-Arm High Resolution
                    Continuous Dipmeter
            BASIN = OTWAY
           PERMIT = VIC/P6
             TYPE = WELL
          SUBTYPE = WELL_LOG
      DESCRIPTION = Snail 1 Four-Arm High Resolution
                    Continuous Dipmeter
          REMARKS =
     DATE_CREATED = 7/12/72
    DATE_RECEIVED = *
             W_NO = W658
        WELL_NAME = SNAIL-1
       CONTRACTOR = Schlumberger
    CLIENT_OP_CO = Hematite Petroleum Pty Ltd
```

(Inserted by DNRE - Vic Govt Mines Dept)

PE600224

This is an enclosure indicator page.
The enclosure PE600224 is enclosed within the container PE900273 at this location in this document.

The enclosure PE600224 has the following characteristics:

ITEM_BARCODE =	PE600224
CONTAINER_BARCODE =	PE900273
NAME =	Snail 1 Compensated Fun Density/Compensated Neutron Porosity
BASIN =	OTWAY
PERMIT =	VIC/P6
TYPE =	WELL
SUBTYPE =	WELL_LOG
DESCRIPTION =	Snail 1 Compensated Fun Density/Compensated Neutron Porosity
REMARKS =	
DATE_CREATED =	6/12/72
DATE_RECEIVED =	*
W_NO =	W658
WELL_NAME =	SNAIL-1
CONTRACTOR =	Schlumberger
CLIENT_OP_CO =	Hematite Petroleum Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE600227

This is an enclosure indicator page.
The enclosure PE600227 is enclosed within the container PE900273 at this location in this document.

The enclosure PE600227 has the following characteristics:

ITEM_BARCODE = PE600227
CONTAINER_BARCODE = PE900273
NAME = Snail 1 ISF/Sonic
BASIN = OTWAY
PERMIT = VIC/P6
TYPE = WELL
SUBTYPE = WELL_LOG
DESCRIPTION = Snail 1 ISF/Sonic
REMARKS =
DATE_CREATED = 29/11/72
DATE_RECEIVED = *
W_NO = W658
WELL_NAME = SNAIL-1
CONTRACTOR = Schlumberger
CLIENT_OP_CO = Hematite Petroleum Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE600228

This is an enclosure indicator page.
The enclosure PE600228 is enclosed within the container PE900273 at this location in this document.

The enclosure PE600228 has the following characteristics:

ITEM_BARCODE =	PE600228
CONTAINER_BARCODE =	PE900273
NAME =	Snail 1 ISF/Sonic
BASIN =	OTWAY
PERMIT =	VIC/P6
TYPE =	WELL
SUBTYPE =	WELL_LOG
DESCRIPTION =	Snail 1 ISF/Sonic
REMARKS =	
DATE_CREATED =	6/12/72
DATE_RECEIVED =	*
W_NO =	W658
WELL_NAME =	SNAIL-1
CONTRACTOR =	Schlumberger
CLIENT_OP_CO =	Hematite Petroleum Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE600230

This is an enclosure indicator page.
The enclosure PE600230 is enclosed within the container PE900273 at this location in this document.

The enclosure PE600230 has the following characteristics:

ITEM_BARCODE =	PE600230
CONTAINER_BARCODE =	PE900273
NAME =	Snail 1 Proximity Log-Micrólog (with caliper)
BASIN =	OTWAY
PERMIT =	VIC/P6
TYPE =	WELL
SUBTYPE =	WELL_LOG
DESCRIPTION =	Snail 1 Proximity Log-Micrólog (with caliper)
REMARKS =	
DATE_CREATED =	7/12/72
DATE_RECEIVED =	*
W_NO =	W658
WELL_NAME =	SNAIL-1
CONTRACTOR =	Schlumberger
CLIENT_OP_CO =	Hematite Petroleum Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE900298

This is an enclosure indicator page.
The enclosure PE900298 is enclosed within the container PE900273 at this location in this document.

The enclosure PE900298 has the following characteristics:
ITEM_BARCODE = PE900298
CONTAINER_BARCODE = PE900273
NAME = Snail 1 Well history Chart, Enclosure 3
BASIN = OTWAY
PERMIT = VIC/P6
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Snail 1 Well history Chart, Enclosure 3
REMARKS =
DATE_CREATED = *
DATE_RECEIVED = *
W_NO = W658
WELL_NAME = SNAIL-1
CONTRACTOR = Hematite Petroleum Pty Ltd
CLIENT_OP_CO = Hematite Petroleum Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE900301

This is an enclosure indicator page.
The enclosure PE900301 is enclosed within the container PE900273 at this location in this document.

The enclosure PE900301 has the following characteristics:

ITEM_BARCODE = PE900301
CONTAINER_BARCODE = PE900273
NAME = Snail 1 Baroid ppm Log (Mud Log)
BASIN = OTWAY
PERMIT = VIC/P6
TYPE = WELL
SUBTYPE = MUD_LOG
DESCRIPTION = Snail 1 Baroid ppm Log (Mud Log)
REMARKS =
DATE_CREATED =
DATE_RECEIVED =
W_NO = W658
WELL_NAME = SNAIL-1
CONTRACTOR = Baroid Well Logging Services
CLIENT_OP_CO = Hematite Petroleum Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE900297

This is an enclosure indicator page.
The enclosure PE900297 is enclosed within the container PE900273 at this location in this document.

The enclosure PE900297 has the following characteristics:

ITEM_BARCODE = PE900297
CONTAINER_BARCODE = PE900273
NAME = Snail 1 Baroid Log (part of Mud Log)
BASIN = OTWAY
PERMIT = VIC/P6
TYPE = WELL
SUBTYPE = MUD_LOG
DESCRIPTION = Snail 1 Baroid Log (part of Mud Log)
REMARKS =
DATE_CREATED = *
DATE_RECEIVED = *
W_NO = W658
WELL_NAME = SNAIL-1
CONTRACTOR = Baroid Well Logging Services
CLIENT_OP_CO = Hematite Petroleum Pty Ltd

(Inserted by DNRE - Vic Govt Mines Dept)