OFFSHORE 38

374001

AROO NO. 1

WELL COMPLETION REPORT

by

E.A. Hodgson

HEMATITE PETROLEUM PTY. LTD.

July 1974.

OR-0339

CONTENTS

374002

	Page No.
I. SUMMARY	1
(1) Drilling	1
(2) Geological	1
II. INTRODUCTION	3
III. WELL HISTORY	5
(1) General Data	5
(2) Drilling Data	6
(3) Location	10
(4) Formation Sampling	11
(5) Logging and Surveys	13
(6) Testing	14
IV. GEOLOGY	15
(1) Summary of Previous Work	15
(2) Summary of Regional Geology	16
(3) Stratigraphic Table	17
(4) Stratigraphy	19
(5) Structure	21
(6) Relevance to Occurrence of Petroleum	22
(7) Contribution to Geological Concepts	24
(8) Porosity and Permeability of Sediments Penetrated	26
V. REFERENCES	28
TEXT FIGURES	
(1) Locality Map	2
(2) Stratigraphic Chart	18
VI. ENCLOSURES (See Over)	
VII. APPENDICES	
(1) Petrological Reports	
(a) Petrology	
(b) Geochronology	

374003

(2) Palaeontological Reports

(a) Micropalaeontology
(b) Palynology
(c) Palaeobotany

(3) Description of Cores and Sidewall Cores
(4) Core Analysis Results
(5) Summary of Formation Interval Tests
VOL II (6) Well Velcoity Survey
(7) Lithological Description.

LIST OF ENCLOSURES

1a. Composite Well Log

1b. Composite Well Log

2. Wireline Logs and FIT Data

3. Computer Log Interpretation (not with report)

4. Well History Chart (not with report)

5. Baroid Master Log

6. Structure Contour Map on Red Horizon

7. Structure Contour Map on Orange Horizon

8. Structure Contour Map on Brown Horizon

9. Baroid Log

10a. Caliper Log - Run 1

10b. Caliper Log – Run 2

11a. Formation Tester – Run 1

11b. Formation Tester – Run 2

11c. Formation Tester – Run 3

12a. Continuous Dipmeter – Run 1

12b. Continuous Dipmeter – Run 2 - Correlation Interval – Hand – Arrow

12c. Continuous Dipmeter – Run 2 - Correlation Interval – 2 feet – Polar Plot

12d. Continuous Dipmeter – Run 2 - Correlation Interval – 2 feet – Polar F Plot

12e. Continuous Dipmeter – Run 2 - Correlation Interval – 2 feet – Arrow Plot

12f. Continuous Dipmeter – Run 2 - Correlation Interval – 12 feet – Arrow Plot

13a. ISF– Run 1 / Depth Scale - 2 inches

13b. ISF Sonic Log – Run 1 / Depth Scale - 5 inches

13c. ISF – Run 2 / Depth Scale - 2 inches

ENCLOSURES (cont.)

13d. ISF Sonic Log – Run 2 / Depth Scale – 5 inches

13e. ISF – Run 3 / Depth Scale – 2 inches

13f. ISF Sonic Log – Run 3 / Depth Scale – 5 inches

13g. ISF – Run 4 / Depth Scale – 2 inches

13h. ISF Sonic Log – Run 4 / Depth Scale – 5 inches

14a. Compensated Neutron Formation Density Log - Run 1 / Depth Scale -2 inches

14b. Compensated Neutron Formation Density Log - Run 1 / Depth Scale -5inches

14c. Compensated Neutron Formation Density Log - Run 2 – 26/3/1974 / Depth Scale -2 inches

14d. Compensated Neutron Formation Density Log - Run 2 – 26/3/1974 / Depth Scale –5 inches

14e. Compensated Neutron Formation Density Log - Run 2 – 7/4/1974 / Depth Scale –2 inches

14f. Compensated Neutron Formation Density Log - Run 2 – 7/4/1974 / Depth Scale –5 inches

14g. Compensated Neutron Formation Density Log - Run 3 / Depth Scale –2 inches

14h. Compensated Neutron Formation Density Log - Run 3 / Depth Scale –5 inches

15a. Compensated Formation Density Log - Run 1/ Depth Scale –2 inches

15b. Compensated Formation Density Log - Run 1 / Depth Scale –5 inches

16. Casing Collar Log and Perforating Record

17a. Computer Processed Interpretation – Coriband, Analysis of Complex Reservoirs

17b. Computer Processed Interpretation

17c. Computer Processed Interpretation (Special Processing on Client Request)

18a. Proximity Log-Microlog – Run 1 / Depth Scale – 2 inches

18b. Proximity Log-Microlog – Run 1 / Depth Scale – 5 inches

374006

I. SUMMARY

(1) Drilling

Aroo No. 1 was drilled with the "Glomar Conception" floating rig for the operator, Hematite Petroleum Pty. Ltd. The well was spudded on the 4th of March, 1974 at latitude 39° 47' 30.325" South, longitude 145° 26' 47.976" East in 250 feet of water. It was abandoned on the 23rd of April, 1974 after reaching a total depth of 12,112 feet below K.B. 20 inch casing was set at 704 feet, $13\frac{3}{8}$ inch casing at 2979 feet and $9\frac{5}{8}$ inch casing at 9635 feet. Cement plugs were placed over the intervals 9734 to 9200 feet, 2679 to 2397 feet and 590 to 354 feet. Total drilling time was 51 days.

(2) Geological

The well spudded in and drilled to 5950 feet K.B. through bioclastic calcirudite, fossiliferous marl and calcareous siltstone of the Oligocene to Miocene Torquay Group below which it penetrated the Eocene to Oligocene Demons Bluff Formation; a uniform, thinly bedded glauconitic, calcareous siltstone. The first sand in the well, at 6723 feet K.B., marks the top of the Eastern View Coal Measures (Paleocene to Eocene) which consist of interbedded sandstone, siltstone, shale and coal. At 10,327 feet the well encountered volcanics which together with minor interbedded sediments persisted to total depth at 12,112 feet K.B. The volcanics are interpreted as a succession of partially weathered basaltic flows of Paleocene or Pre-Paleocene age.

Indications of hydrocarbons were observed at several levels in Aroo-1, including the top of a sand within the volcanic sequence. Five formation interval tests were run. Three tests recovered very small amounts of gas. A fourth test was a mud run and FIT No. 5, though valid, achieved no recovery due to impermeability of the formation.

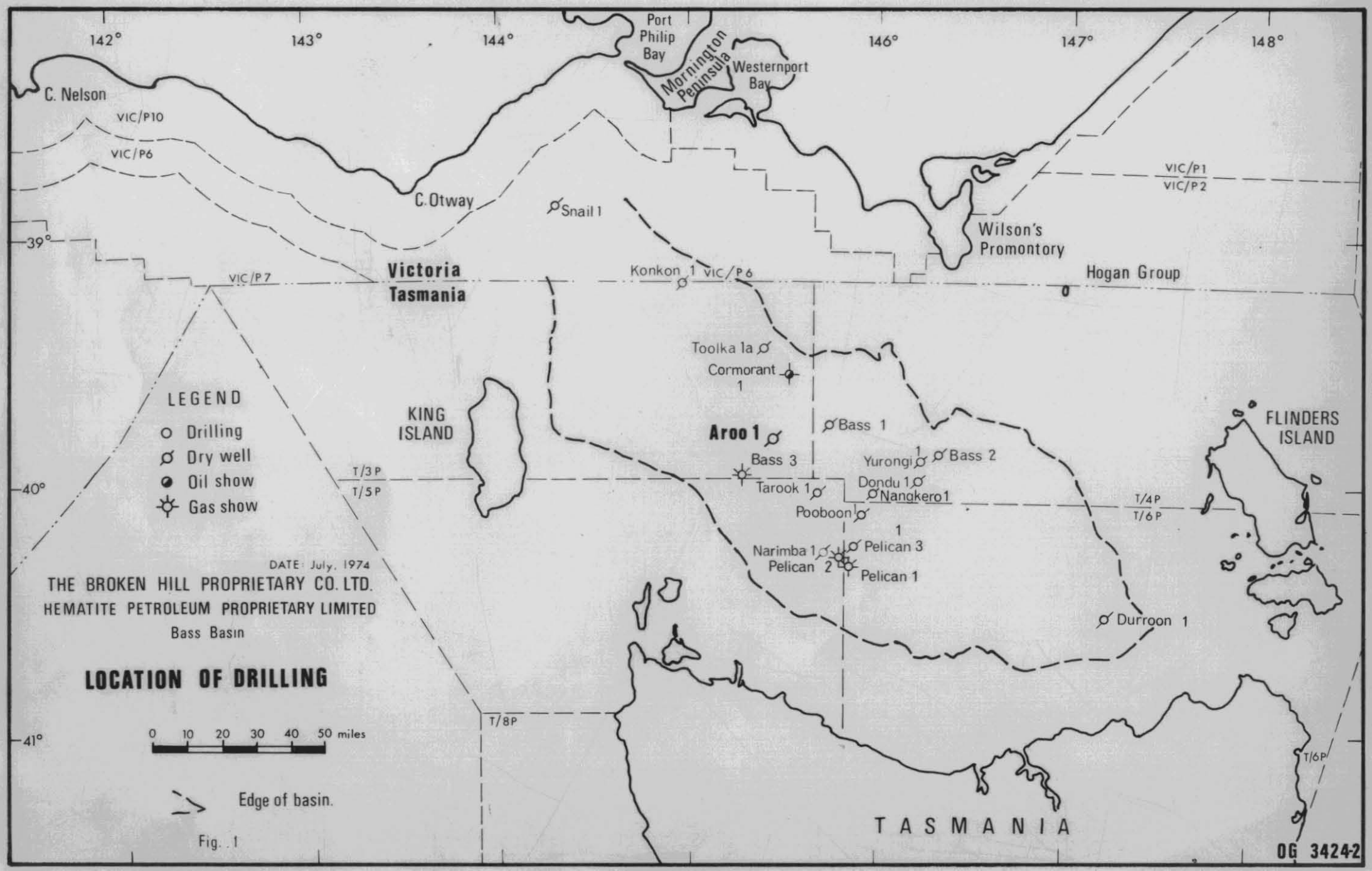

5 cm
142°
143°
144°
146°
147°
148°
39°
40°
41°
Port Philip Bay
Mornington Peninsula
Westernport Bay
C. Nelson
C. Otway
VIC/P10
VIC/P6
VIC/P1
VIC/P2
VIC/P7
VIC/P6
Victoria
Tasmania
Snail 1
Konkon 1
Wilson's Promontory
Hogan Group
Toolka 1a
Cormorant 1
KING ISLAND
Aroo 1
Bass 1
Bass 2
Bass 3
Yurongi 1
Dondu 1
Tarook 1
Nangkero 1
Pooboon 1
Narimba 1
Pelican 3
Pelican 2
Pelican 1
Durroon 1
FLINDERS ISLAND
T/3P
T/5P
T/4P
T/6P
T/8P
T/6P
LEGEND
Drilling
Dry well
Oil show
Gas show
DATE: July, 1974
THE BROKEN HILL PROPRIETARY CO. LTD.
HEMATITE PETROLEUM PROPRIETARY LIMITED
Bass Basin
LOCATION OF DRILLING
0 10 20 30 40 50 miles
Edge of basin.
TASMANIA
OG 3424-2

Fig. 1

II. INTRODUCTION

374008

Aroo No. 1, the sixteenth well in the Bass Basin, was drilled in T/3P (see Fig. 1) by the permit holder Hematite Petroleum Pty. Ltd. The costs of the operation were subsidised by the Commonwealth Government under the Petroleum Search Subsidy Act 1959-1969.

The well was located over a major basement ridge above which closure had been mapped at three levels interpreted to lie within the Eastern View Coal Measures. The lowest, and largest, of these mapped closures, that of the Blue horizon, believed to be an unconformity, was the primary target of the Aroo-1 well. The nature of the rocks below the horizon was unknown but amplitude character at this level was considered indicative of sandstone, possibly correlates of M. diversus and L. balmei zone sands which are hydrocarbon bearing elsewhere in the basin. However, Aroo-1 showed that the Blue horizon lies within a thick sequence of basaltic flows and minor interbedded sediments which occur between 10,327 and 12,112 feet (K.B.).

The Aroo-1 well was drilled outside of the highest mapped closure (Red horizon) but within the intermediate Brown horizon closure. The minor fluorescence and wet gas in the mud which were logged in the well between the Red and Brown horizons were not therefore expected. These indications were in M. diversus to N. asperus zone correlates of the Cormorant-1 gas and condensate bearing sands. The more important hydrocarbon indications were in sands of the lower L. balmei zone near the Brown horizon. Two cores cut in the best sand in the well showed fluorescence and fair to good porosity and low permeability, however a plug at 9530 feet had a permeability of 113 md. Formation interval tests of this and other sands containing hydrocarbon indications suggest very low permeabilities. Wet gas was logged in a sandstone within the volcanic sequence.

Apart from the volcanic sequence in the lower part of the well, the succession penetrated in Aroo-1 was as expected and the key horizons above the volcanics were close to their predicted positions. The well was spudded in and drilled through calcirudite, marl and siltstone of the Torquay Group underlain by siltstone of the Demons Bluff Formation. More than three and a half thousand feet of sandstone, siltstone, shale and coal of the Eastern View Coal Measures were penetrated in Aroo-1 above the volcanic sequence, which, in the absence of dating cannot either be included in or excluded from the formation. The volcanics are interpreted as a Paleocene or Pre-Paleocene succession of partially weathered basaltic flows and interbedded sandstone and siltstone. The well was plugged and abandoned in volcanics at 12,112 feet (K.B.).

374009

Drilling data in the report was contributed by B.J.W. Wood, geophysical data and interpretation by J.I. Denham and M. McNicol. Other authors are listed in the relevant appendices.

374010

III. WELL HISTORY

1. General Data

(i)	Well Name & Number	Aroo No.1
(ii)	Name & Address of Operator	Hematite Petroleum Pty. Ltd., 140 William Street, MELBOURNE, VIC. 3000
(iii)	Name & Address of Titleholder	Hematite Petroleum Pty. Ltd., 140 William Street, MELBOURNE, VIC. 3000
(iv)	Petroleum Title	T/3P
(v)	District	King 1:250,000
(vi)	Location Latitude : Longitude:	39° 47' 30.325" South 145° 26' 47.976" East
(vii)	Elevation Seafloor : Kelly Bushing:	250 feet below sea level 32 feet above sea level
(viii)	Total Depth	12,112 ft. below K.B.
(ix)	Date Drilling Commenced	4th March, 1974.
(x)	Date Total Depth Reached	19th April, 1974.
(xi)	Date Well Abandoned	22nd April, 1974.
(xii)	Date Rig Released	23rd April, 1974.
(xiii)	Drilling time in days to Total Depth	47 days
(xiv)	Status	Dry- plugged and abandoned
(xv)	Total Cost	Not available at date of submission.

374011

2. Drilling Data

(i)	Name & 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 (x 2) Caterpillar (x 8)
	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

(v) Cont'd.

Make	Type	Size	Series (API)
Shaffer	1 x Spherical annular BOP	16¾"	1500 5,000 psi MSP
Hydril	1 x annular (bag type) "	16¾"	1500 5,000 psi MSP
Shaffer	1 x Shear/Blend Ram BOP	16¾"	1500 5,000 psi MSP
Cameron	3 x Pipe Ram BOP	16¾" x 5"	1500 5,000 psi MSP

(vi) Hole Sizes & Depths:

26 inch hole	Seabed to 772 ft.
15 inch hole	772 ft. to 3034 ft.
12¼inch hole	3034 ft. to 9686 ft.
8½inch hole	9686 ft. to12112 ft.

(vii) Casing Details

Size	Weight	Grade	Length	Setting Depth K.B.
20"	94 $\frac{lbf}{ft}$	X52	431 ft.	704 ft.
13⅜"	68 $\frac{lbf}{ft}$	J55	2701 ft.	2979 ft.
9-5/8"	47 $\frac{lbf}{ft}$	N80	9360 ft.	9635 ft.

374013

	20 Inch	13⅜ Inch	9-5/8 Inch
Position of Float Collar	-	2939 ft.	9595 ft.
Position of Float Shoe	704 ft.	2979 ft.	9635 ft.
Position of Centralizers	1 centralizer at bottom and top of first joint. Position stop rings for 5' of centralizer movement between collar and stop ring. 1 centralizer at top of 2nd joint with stop ring positioning as above. 1 centralizer free to move on 4th, 6th and 8th joints.	1 centralizer at bottom and top of first joint. Position stop rings for 5' of centralizer movement. 1 centralizer free to move on 3rd, 5th, 7th, 9th, 11th, 13th, 15th and 17th joints.	1 centralizer at bottom and top of first joint. Position stop rings for 5' of centralizer movement. 1 centralizer free to move on 3rd, 5th and 7th joints. 1 centralizer free to move every 3rd joint from 8th joint to 8200'.
Quantity of Cement used	1000	1250	400
Grade of Cement	650 Sx of Aust "N" & 350 Sx of Aust "N" with 2% Cac/2	1250 Sx of Aust "N" with 1% Cac/2	400 Sx of Aust "N" with 0.9% 1+R-12
Top of Cement	Sea Floor	-	-

(viii) Drilling Fluid

Depth	Type	WT PPG	Visc. SEC	WL cc	FC in.	pH	Sand %
Sea Bed - 3034 ft.	Sea Water	8.8					
3034 - 12112	Ligno Sulphonate	10.1	44	6.4	2/32	10.7	Tr

Treatment: Mud pumped over shale shaker and through de-sander and de-silter. Thinning was accomplished by addition of water, lignosulphonate. pH controlled by addition of Caustic Soda.

Materials and Chemicals Consumed:

Gel	(SX)	1634
Benex	(SX)	75
Soda Ash	(SX)	72
Caustic	(Drum)	107
Condet	(Gal)	95
CC-16	(SX)	468
Barite	(SX)	7075
Q'Broxin	(SX)	425
Al.Stearate	(SX)	8
CMC	(SX)	50
Nitrate	(SX)	4

374015

(ix) Water Supply: Fresh Water transported by Workboat.

(x) Plugging back and Cementation Jobs:

Type: Abandonment Plug

	Plug No.1	Plug No.2	Plug No.3
Interval	9734 - 9200 ft.	2679 - 2397ft.	590 - 354'
Quantity of Cement	175 sacks	170 sacks	90 sacks
Details		Squeezed 14 bbls. in perforations between 2676 - 2679 ft.	

Perforation: at 2679 feet,
4 shots/foot at 90° phasing.

(xii) Fishing Operations: Nil.

(xiii) Side-tracked Hole: Nil.

3. Location

(i) Site Investigations Carried Out: Nil.

(ii) Anchoring Methods: The "Glomar Conception has an advanced chain and LWT Moorfast 30,000 lb. anchor mooring system. The drillship arrived on location on the night of 3 March, 1974 and dropped anchor No.7. Following this anchors 2, 5 and 10 were located and tested to 250 Kipps. After landing the base plate and commencing drilling, the remaining anchors (3,4,8 and 9) were run and anchors 3, 4 and 8 were tested to 250 Kipps. Anchors 1 and 6 are Boss anchors run on $2\frac{3}{4}$" steel cable. The anchor pattern used is a $40^{\circ}/80^{\circ}$ pattern. Total mooring time was 23 hours.

(iii) Transportation: Helicopters and Workboats from Barry Beach Marine Terminal near Port Welshpool, Vic.

374016

4. Formation Sampling

(i) Ditch Cuttings:

Below 772 feet, 5 sets of washed and dried samples every 30 feet interval; from 6160 feet every 20 feet interval; below 6920 feet every 10 feet interval.

All samples were bagged and caught from a standard 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 to the Tasmanina Mines Department and a set retained by Hematite Petroleum at:

15 Lorimer Street,
South Melbourne, Victoria.

(ii) Coring:

Core No.	Interval Cored (feet below K.B.)	Footage Cut	Recovery (feet)	Recovery (%)
1	9515-9545	30	30	100
2	9545-9570	25	25	100
3	11782-11812	30	30	100

Specific samples were waxed and sent to the Bureau of Mineral Resources for core analysis (see Appendix 4 for results). The remainder was slabbed into thirds; one-third sent to the B.M.R., one third to the Tasmanian Mines Department and one third retained by Hematite Petroleum. For full descriptions see Appendix 3.

(iii) Sidewall Sampling:

90 Sidewall Cores were shot by Schlumberger of which 85 were recovered. The material was retained by Hematite for palynological and micropalaeontological processing. For full description see Appendix 3.

374017

Depth (feet)	Recovered (inches)
11909	3/4
11853	3/4
11761	1/2
11700	3/4
11676	1/2
11630	1 1/2
11565	1
11525	1
11445	1/2
11410	no recovery
11363	1 1/2
11185	3/4
11133	1 1/4
10977	1 1/2
10897	3/4
10818	3/4
10715	no recovery
10605	1
10570	3/4
10435	1
10330	1/2
10294	1 1/4
10250	3/4
10194	1/2
10147	no recovery
10057	1/4
9990	1/2
9872	1/4
9828	no recovery
9748	1
9651	1
9621	1
9578	1
9494	1
9487	1 1/4
9451	1 1/4
9447	1 1/4
9350	1 1/4
9250	1
9180	3/4
9166	1
9120	7/8
9080	1
8990	1 3/4
8944	1
8910	1 1/8
8897	1 1/4
8878	1 1/4
8794	1
8748	1
8698	3/4
8615	3/4
8603	1 1/4
8553	3/4
8520	1 1/2
8459	1 1/4
8384	1 1/4
8290	1 1/4
8265	1 1/2
8189	1 1/2
8114	5/8
7990	5/8
7923	1 1/2
7868	3/4
7844	1
7723	3/4
7566	1
7431	1
7390	3/4
6944	1 1/2
6920	1 1/2
6840	1
6825	1 1/2
6730	1 1/4
6715	1/2
6555	1 1/4
6394	1 1/4
6246	1 1/4
6105	1 1/2
5956	2
5824	1 1/2
5700	2
5612	2
5466	2
5317	2
5244	2
5055	2
4904	no recovery
4794	2
4624	2

374018

5. Logging and Surveys

(i) Electric Logging:

Log	Interval (feet)	Scale (Inches to 100 feet)
GR/SP/ISF/S	3030-704	2(SP/ISF only) and 5
SP/ISF/S	9688-2988	2(SP/ISF only) and 5
GR/SP/ISF/S	11257-10950	2(SP/ISF only) and 5
SP/ISF	11973-9638	2 and 5
GR/CAL/FDC/CNL	9693-2988 10572-9638	2 and 5 2 and 5
GR/CAL/FDC	11982-10386	2 and 5
CAL	3034-704 11251-10700	5 5
HDT	9694-2988	Recorded 10":100' Interpreted logs 2 and 5 inch:100'
CAL/PML	9685-2988	2 and 5
CCL	2679-2676	5

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 772 feet to total depth.

(iii) Deviation Surveys: The location and results of Totco surveys are shown on the complete well log.

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

(v) Other Well Surveys: Velocity surveys were conducted prior to running 9 5/8 casing at 9635 feet and at total depth (12112 feet). See Appendix 6.

374019

6. Testing

(i) Formation Testing:

Details in Enclosure 2, summary in Appendix 5.

Test No.	Depth (feet)	Recovery Gas (c.f.)	Recovery Water (c.c.)	Final Shut in Pressure (psi)	Comment
2	9133	1.9	9000	3966	
1	9530	1.4	1900	4444	
3	10318	1.9	8600	4750	
4	10708	-	-	-	Impermeable Formation
5	10890	-	-	-	Mud Run

(ii) Production Testing: Nil.

374020

IV. GEOLOGY

(1) Summary of Previous Work

Line B-14 of the 1963 Flinders Island - Kingston Area Seismic Survey was shot over Aroo, but lack of deep data at that time gave no indication of the structure. The B71A Lines 44 and 51 provided the first data deep enough for the reversal at Aroo to be identified and it was further delineated in the B72A Marine Seismic Survey (Lines 87-91). On the basis of this survey, three fault controlled culminations were mapped at Aroo. In 1973 several lines of the Flinders Seismic Survey were shot over Aroo, these gave much better deep data than had hitherto been recorded and enabled mapping of structural closure at the Blue, Brown and Red horizons in the Aroo area. The Blue closure was considered the most attractive drilling target and Aroo-1 was located on the crest of that structure. The location also lies within the mapped closure of the Brown horizon but outside that of the Red horizon.

Seismic mapping of the Red horizon within the main coal sequence, is relatively easy between Cormorant and Aroo, but neither the Blue nor Brown horizons can be positively traced across faults downthrown to the south in the vicinity of Aroo. Accordingly, although there was reasonable certainty about the structural configuration of these horizons at Aroo, the lithology of the interval below the Brown horizon was conjectural. The Brown to Blue interval was interpreted as shale, at the base of which, amplitude character was believed to indicate sandstone, possibly correlates of very coarse sands in the L. balmei zone in Poonboon-1 and Dondu-1 and T. longus zone sands in Bass-3. The Blue horizon was thought to be an unconformity surface of unknown time value over an interbedded sand-shale sequence, whose seismic character is different on the north and south sides of Aroo. It is not known whether this reflects genuine lithological differences or is due to masking of lower reflections on the south side by the more widespread overlying coals in that area.

374021

(2) Summary of Regional Geology

Aroo-1 was drilled in the north western part of the Bass Basin on a structure which lies over a basement structural high of regional significance. This ridge runs north east to south west generally 2,000 to 10,000 feet below the top of the main coal sequence of the Eastern View Coal Measures. The deep basin proper lies to the south east of the ridge and there are a series of distinct, more isolated depressions in basement to the north west, on the other side, of the ridge. These depressions are elongated parallel to the ridge and are up to 9,000 feet deep. Data from the Flinders Seismic Survey suggests that the basement high may consist of Palaeozoic rocks and has been an important structural and topographic feature of the Bass Basin since the beginning of the Upper Cretaceous when the north western depocentres were established. These sub basins appear to be faulted on their southern margins and reflect structural growth of the ridge throughout the Upper Cretaceous. Subsequent growth, mainly in Paleocene and Eocene times, was relatively minor. However, preferential growth of the deep basin relative to the northern basinal area continued through the Tertiary. This growth may be demonstrated seismically and is reflected in the fact that the top of the Eastern View Coal Measures is about 2000 feet lower in Pelican-1 than in Cormorant-1. Aroo has no closure at this level. The highest mapped closure at Aroo being the Red horizon within the P. asperopolus or N. asperus zones (late Eocene) in this part of the basin. Closure at Aroo is also mapped at the Orange (M. diversus zone or younger) (Encl. 7) and Brown (L. balmei zone) horizons (Enc. 8).

In the Aroo area, the M. diversus zone is between 500 and 800 feet thick whereas it is more than two thousand feet thick to the north in Cormorant and to the south in Pelican where gas shows occurred in this interval in the Pelican-1 and-2 wells.

Basement of possible Palaeozoic age is thought to lie at approximately 17,000 feet at Aroo.

A major NW-SE fault to the east of the Aroo structure cuts through to the Red horizon. Thickening of the section on the downthrown (north east) side of the fault is interpreted to be of the order of 2000 feet of interbedded sediments. The orientation of the fault and several smaller ones in the Aroo area is parallel to the main basin-forming tensional faults which are believed to have developed during early stages of the Antarctic-Australia pull apart.

374022

(3) Stratigraphic Table:

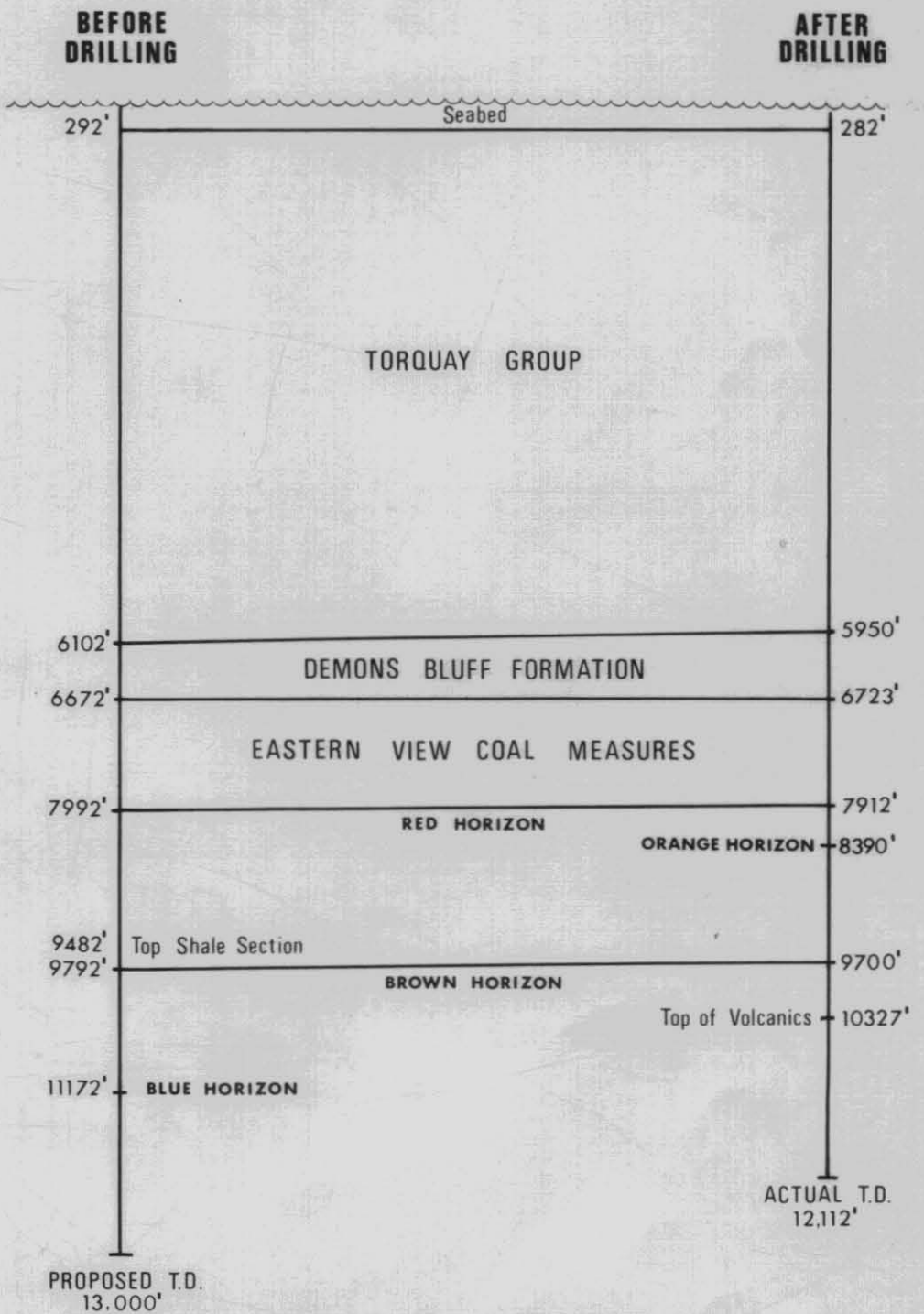
Age	Formation	Top of Formation		Thickness	Lithology
		K.B. (feet)	Subsea (feet)	(feet)	
Oligocene to Miocene	Torquay Group	282	250	5668	Bioclastic calcirudite, overlying fossiliferous marl, calcareous siltstone.
Eocene to Oligocene	Demons Bluff Formation	5950	5918	773	Glauconitic, calcareous siltstone.
Paleocene to Eocene	Eastern View Coal Measures	6723	6691	3604	Sandstone, siltstone, shale, mudstone, coal, dolomite.
Paleocene or Pre-Paleocene	Unnamed	10327	10295	1785+	Fresh and weathered volcanic rocks including amygdaloidal basalt; siltstone sandstone.

374023

DATE: July, 1974

THE BROKEN HILL PROPRIETARY CO. LTD.
OIL AND GAS DIVISION
(HEMATITE PETROLEUM PROPRIETARY LIMITED)
Bass Basin

5 cm



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

AROO NO. 1

STRATIGRAPHIC CHART

Fig. 2
OG 3536

(4) Stratigraphy

(a) General

The tops of the Demons Bluff Formation and Eastern View Coal Measures were intersected close to prediction being 152 feet higher and 51 feet lower respectively. However in the lower part of the coal measures an unpredicted sequence of interbedded volcanics and sediments was penetrated between 10,327 feet and total depth (12,112 feet).

(b) Stratigraphic Description

Oligocene to Miocene Torquay Group 282-5959 feet (K.B.) (Thickness 5668 feet)

The formation was not sampled above 772 feet (K.B.) nor was it logged above the 20 inch casing shoe at 704 feet (K.B.) but it is presumed to extend to the sea floor (282 feet (K.B.)).

No attempt has been made to subdivide the group as penetrated in this well into the formations recognised onshore but broad lithological variations are recognised. Above 2358 feet (K.B.) the dominant lithology is unconsolidated bioclastic calcirudite containing some complete, well preserved microfossils. A fossiliferous, glauconitic, calcarenite is interpreted to occur between 2358 and 2545 feet (K.B.) below which is a fossiliferous marl grading at about 4120 feet (K.B.) into clauconitic, calcareous siltstone and marl. The boundary with the underlying Demons Bluff Formation is gradational and lithologically very indistinct. An apparent increase in mica content below about 5600 feet continues into the underlying formation.

Log character correlation with nearby wells places the top of the Demons Bluff Formation at 5950 feet.

Eocene to Oligocene Demons Bluff Formation 5950-6723 feet (K.B.) (Thickness 773 feet)

The Formation is a micaceous glauconitic, calcareous, siltstone which, on the basis of log character and samples, has overall uniformity despite its thinly bedded nature.

The boundary with the underlying Eastern View Coal Measures is placed at the top of the first sand in the well at 6723 feet (K.B.).

374025

Paleocene to Eocene Eastern View Coal Measures
6723-10,327 feet (K.B.) (Thickness 3604 feet)

Several thick sandstone units above 8100 feet give this part of the formation a much more sandy aspect than the lower part. The sandstones are very fine to medium grained and contain minor dolomitic streaks. They are interbedded with siltstone, shale and coal beds. From 8100 to the top of the volcanics at 10,327, the formation is much more shaly and less sandy. The total thickness of coal in the well is less than 80 feet.

Paleocene or Pre-Paleocene volcanic succession
10,327-12,112 feet (T.D.) (K.B.) (Thickness 1785+ feet)

The volcanics in Aroo-1 are interpreted as a series of basaltic flows, some of which have weathered tops and which are interbedded with minor sandstone, siltstone and shale.

Lithological interpretation of the volcanics from the wireline logs is difficult and in addition attempts to obtain radiometric and palynological ages have been unsuccessful. Seismically, the volcanics appear conformable with the overlying coal measure succession but their areal extent cannot be mapped seismically and their relationships with the Eastern View Coal Measures remains conjectural.

An angular discordance and change of seismic character at around 11,000 feet, near the previously mapped position of the Blue horizon, is still recognised.

374026

(5) Structure

Prior to drilling, closure at Aroo was mapped at the Blue, Brown and Red horizons. The main target was the Blue horizon and the well was located on the interpreted Blue horizon crest which placed it within the Brown closure but outside a small closure mapped at the Red level.

The Blue horizon, mapped with some difficulty prior to drilling, occurred within what the well proved to be a thick volcanic succession and the pre-drilling geological interpretation below the Brown horizon in the Aroo area must therefore be revised. However the structural interpretation remains valid. Events within the volcanic succession can still be mapped at around 11,000 feet sub-sea in the vicinity of what was previously mapped as the Blue horizon closure.

The well confirmed closure at the Brown level which has now been remapped (Enc. 8) but which is not interpreted as being significantly different from its pre-drilling configuration.

The encouraging indications of hydrocarbons in the Red to Brown interval in Aroo-1 led to an attempt to map just below the Red horizon a marker designated as the Orange horizon in rocks of M. diversus or younger age (Enc. 7).

374027

(6) Relevance to Occurrence of Petroleum

(i) Hydrocarbon Occurrences

There were intermittent indications of hydrocarbons in Aroo-1 below 6944 feet, the main zone of interest being in the interval 9100-10,320 feet in sands of Paleocene (upper and lower L. balmei) age. Details of the hydrocarbons are contained in appendices and enclosures dealing with cores, sidewall cores, FIT's and log interpretation.

The first hydrocarbon indication in the well, apart from background gas, was pale yellow fluorescence and slow cut associated with a sandstone from 6935-6950 feet. Sands at 8286-8296 and 8874-8881 feet were associated with logged wet gas. A sidewall core in the lower sand, at 8878 feet, had dull bluish fluorescence and very slow cut. However a sidewall core at 8290 feet gave no indication of fluorescence, nor was fluorescence observed in the cuttings from these two sands.

A sandstone from 9174-9181 feet and several thin sands between 9400 and 10,320 showed dull fluorescence and gave slow cut in cuttings associated with wet gas on the mud log. The best hydrocarbon indication in the well was from the sandstone at 9512-9557 feet which was fluorescent throughout and produced varying degrees of cut in cores 1 and 2 (Appendices 4 and 5). FIT 1 at 9530 feet recovered 1.4 cubic feet of gas, and 1900 cc's of water, probably filtrate. Pressure data indicate that effective permeability of the sandstone is low.

A sandstone (11,848-11,920 feet) within the volcanic sequence, showed wet gas on the chromatograph, without associated fluorescence or cut. Log interpretation of the interval is not reliable due to the great enlargement of the hole.

(ii) Relevance to Occurrence of Petroleum

Aroo-1 confirmed the hydrocarbon potential of the Paleocene to middle Eocene (lower L. balmei to lower N. asperus zones) sediments in this part of the basin. The hydrocarbons in the upper part of this succession, i.e. in M. diversus to N. asperus correlates of the Cormorant-1 gas and condensate bearing sands, were not expected at Aroo because the highest closure mapped prior to drilling was the Brown horizon within the

374028

lower L. balmei zone strata. Post-drill remapping has delineated structural closure at Aroo just below the Red horizon at a seismic marker designated the Orange horizon (Enc. 7) in rocks of the M. diversus or younger zones.

The upper limit of the M. diversus zone is poorly defined in Aroo-1 but the whole zone is less than 800 feet thick and possibly only 500 feet thick. In addition, the net sand ratio for the M. diversus zone strata in the well is very low and only very minor hydrocarbon indications were encountered in it. This contrasts with the Pelican 1 and 2 wells which encountered gas and condensate shows in a very thick M. diversus zone sequence. The results of Aroo-1 suggest that significant hydrocarbon accumulations are unlikely at this stratigraphic level in the Aroo area.

Strata in the L. balmei zone, especially the lower L. balmei zone, gave the best hydrocarbon indications in the well and, despite generally poor permeability, this interval is most worthy of any further attempts to define possible new drilling targets in the area.

374029

(7) Contribution to Geological Concepts

Aroo-1 confirmed the existence of more than three and a half thousand feet of Eastern View Coal Measures in this part of the Bass Basin. It also drilled an unexpected sequence of volcanics and minor interbedded sediments at least 1785 feet thick. Log character and sidewall core samples indicate that the volcanics are a series of more than twelve successive basalt flows separated from each other by upper weathered (kaolinized) zones or by thin interbedded sediments or both. The volcanics are Paleocene or older. Attempts to date them more accurately by palynology and Potassium-Argon geochronology were unsuccessful (see Appendix 1).

The well encountered hydrocarbon indications in M. diversus to N. asperus zone correlates of the Cormorant-1 gas and condensate bearing strata and in strata of the lower L. balmei (Paleocene zone. However, only 500 to 800 feet of M. diversus (lower Eocene) zone strata were penetrated in Aroo-1, compared with several thousand feet elsewhere in the Basin. The apparently reduced thickness of the M. diversus zone may be due either to intermittent or reduced rate of deposition of these strata or to erosion. The latter being indicated by a weak seismically defined unconformity at about 8300 feet (K.B.) which may correspond with a possible break interpreted on the logs between 8300 and 8600 feet (K.B.). It is also likely that part of the M. diversus zone strata has been eliminated by movement on a small east dipping normal fualt which is recognised on HB73A Line 143 as passing through the Aroo-1 well. Additional evidence of the presence of a fault in the well comes from the dipmeter interpretation which shows easterly dip below 8750 feet in contrast to the regional dip at this level as deduced from seismic data which is clearly to the west. The east dip is believed to be due to drag folding. In the well the fault zone is probably between 8750 and 9100 feet, the drag folding first encountered in the well being on the upper (downthrown) side. A marked shale density change at about 8765 feet may indicate the approximate position of the fault, though it possibly lies even deeper.

The microfloras found in Aroo-1 were poorly preserved, especially in the lower part of the well where there is severe carbonization due to post depositional effects. Marine dinoflagellate cysts throughout the Eastern View Coal Measure section reflect intermittent marine phases into what is dominantly a non-marine succession.

374030

Reworked Permian and (?) lower Cretaceous palynomorphs indicate that the Eastern View Caol Measures at Aroo-1 are at least partly derived from rocks of this age. It was not possible to determine whether or not erosion of lower Tertiary strata had similarly contributed to the younger Tertiary sediments.

(8) Porosity and Permeability of Sediments Penetrated

Foot by foot porosity estimates for the interval from 8001 to 10,553 feet (K.B.) are listed in the computer processed interpretation (Enclosure 3). Appendices 3 and 4 contain visual porosity estimates and core analysis results (Cores 1 and 2) respectively.

The only potential reservoir rocks of interest in Aroo-1 are the sandstone bodies of the Eastern View Coal Measures. These fall into three broad groupings; those in the upper part of the formation (P. asperopolus to N. asperus palynological zones) above 8100 , those lying between 8100 and 10,327 feet (lower L. balmei to M. diversus zones) and those below 10,327 feet (undated) which are interbedded with volcanics.

Above 8100 feet, although GR/SP development is poor, the Eastern View Coal Measures contain 0.5 net sand. The individual bodies are thick and very fine to medium grained and their average (corrected) ϕ_D is within the range 0.15 to 0.17. In a few places maximum ϕ_D (uncorrected reaches 0.27. Minimum ϕ_D is 0 on dolomite streaks within sands near the top of the upper sand sequence.

Between 8100 feet and the top of the volcanics (10,327 feet K.B.) there is 550 feet of sandstone (0.25 net sand) with maximum ϕ_D (corrected) of 0.26 minimum ϕ_D 0.04 and weighted average ϕ_D (corrected) 0.15. The best sand in this interval is from 9514 to 9546 feet. It has an average ϕ_D (corrected) of 0.16 and maximum and minimum ϕ_D (corrected) of 0.20 and 0.08 respectively. Cores 1 and 2 were cut in this interval and core plugs from 9516 and 9530 feet showed porosities of 0.176 and 0.208 respectively. Corresponding permeabilities for the two samples were 0.89 md and 113 md. FIT No. 1 at 9530 feet recovered 1.4 cubic feet of gas and 1900 cc's of water. The pressure data and recoveries for this test were achieved only after a shape charge has been fired into the formation indicating the extremely low permeability of the formation at this point in the well. FIT 2 at 9133 feet in a 6 feet thick sand with average ϕ_D (corrected) of 0.10 (0.14 at 9133 feet) also indicated very tight formation.

Within the volcanic sequence from 10,327 to total depth (12,112 feet) are interbedded sediments including an interpreted thickness of 148 feet of sandstone. Only sidewall cores were obtained from these units and lithology determination in this section is difficult and log derived porosities even more unreliable due to lack of knowledge of the mineralogy, clay choking, borehole enlargement and other factors. Porosity of

374032

these sands is probably low and FIT No. 5, a valid test at 10,708 feet, failed to recover any formation fluids due to low permeability.

374033

REFERENCES

Esso Exploration and Production Australia Pty. Ltd.	1967	Esso Bass-3 Tasmania, Well Completion Report.
	1970	Cormorant No.1 Well Completion Report.
	1970	Pelican No.1 Well Completion Report.
	1970	Pelican No.2 Well Completion Report.
	1971	Bass B71A Marine Seismic Survey.
	1972	Bass B72A Marine Seismic Survey.
Haematite Explorations Pty. Ltd.	1963	Final Subsidy Report of the Flinders Island - Kingston Area Seismic Survey.
Hematite Petroleum Pty. Ltd.	1973	Final Subsidy Report of the Flinders Seismic Survey.
Robinson, V.A.	1974	Geologic History of the Bass Basin. Aust. Petrol. Expl. Assoc. Jour. 14.
Stover, L.E. and Evans, P.R.	1973	Upper Cretaceous - Eocene Spore-pollen zonation offshore Gippsland Basin, Australia. Geol. Soc. Aust. Spec. Publ. 4.
Stover, L.E. and Partridge, A.D.	1973	Tertiary and late Cretaceous spores and pollen from the Gippsland Basin, south-eastern Australia. Proc. Roy. Soc. Vict. 85 (2).

374034

APPENDIX NO. 1

Petrological Reports

(a) Petrological by C.E. Palethorpe

(b) Geochronology by AMDEL

THE BROKEN HILL PROPRIETARY CO. LTD.
EXPLORATION DEPARTMENT
Petrology Section

374035

Melbourne Research Laboratories
245-273 Wellington Road
Clayton, Victoria 3168
P.O. Box 274, Clayton
Telephone 560-7066

Appendix 1a

Memo to: B.R. Brown

Date 22.4.74
Our Ref: CEP-LJT
Your Ref:
File: M207
Date:

Subject: E1/15: Petrological examination of basalts from Aroo-1, Bass Basin.

Aroo-1 has intersected a basaltic unit, four specimens of which have been submitted for petrological examination.

Specimen MRL 4883 Aroo 1 11,788'.

This rock is a dark grey fine grained amygdaloidal basalt.

Plagioclase laths (≈ 0.5 mm long) marginally zoned from An 65 (labradorite) to An 40 (andesine) occupy 50% of the rock and occur subophitically intergrown with titanaugite (20%). Chlorite is an important constituent of the rock also and occurs in the following habits; intersertal to plagioclase and titanaugite with a colloform texture, 5-10%; as zoned colourless, violet, pink, green and yellow chlorite pseudomorphing euhedral stumpy prismatic crystals (100-150 mμ in diameter) outlined by goethite, 3%; as an alteration product of plagioclase, 3%; as an alteration product of occasional larger (500 mμ) euhedral prismatic conchoidally fractured crystals, 3%; and rimming amygdales, 3%. Calcite also occurs as an alteration product in association with chlorite and fills amygdales, 5-10%. Interstitial opaque minerals (3%) altered to goethite make up the remainder of the rock.

Discussion. The rock is an amygdaloidal basalt. The presence of titanaugite indicates the rock has alkaline affinities. The small crystals altered to chlorite appear to have been nepheline and the large ones were almost certainly olivine. If nepheline was originally present the rock could be termed a basanite or if not an alkali olivine basalt.

Specimen MRL 4884 Aroo 1 11,799'.

This specimen is a dark grey fine-grained basalt and in thin section is an identical rock type to MRL 4883 except it is not amygdaloidal. It is an alkali olivine basalt.

Specimen MRL 4885 Aroo 1 11,801'.

This rock is a pale grey slightly schistose altered basalt. In thin section it has an identical texture to MRL 4883 however the primary mineralogy has been completely destroyed. Calcite has replaced the plagioclase and titanaugite is represented by an irresolvable sub-opaque leucoxene-carbonate mixture. Intergranular and amygdaloidal calcite and chlorite are also present. Original olivines are now serpentine and carbonate. It was originally an alkali olivine basalt.

Specimen MRL 4886 Aroo 1 11,831'.

This is a medium grey altered basalt, containing large dark green chlorite-filled amygdales and calcite veins. In thin section the rock is strongly altered and has a similar texture and mineralogy to MRL 4885, with one important difference. Talc containing euhedral crystals of carbonate occupies about 20% of the rock and in some areas can be seen to be pseudomorphous after olivine.

The rock is more basic than the other three specimens and is an altered picrite basalt.

Discussion The specimens represent a partially altered basaltic flow derived from a magma undersaturated in silica. The presence of amygdales suggests it was a surface flow (rather than a sill) however there is evidence of crystal settling toward the base as signified by increased olivine pseudomorphs in MRL 4886.

C.E. Palethorpe
Research Geologist.

c.c. Chief Geologist, Research & Planning
Library.
Ms. I. Mellins

Appendix 1b.

374037

GEOCHRONOLOGY REPORT: AROO-1

Plagioclase was separated from Aroo-1, 11,799' for K-Ar dating. The potassium determination of 0.004% indicated that there would not be any detectable radiogenic argon present and that at this level of concentration, the experimental uncertainty in any date calculated would be of the order of ±100%.

Miss Mellins was advised by telephone on 4 June 1974 that there was no point in continuing with the argon determination on this sample and she authorised an attempt to separate and date plagioclase from the 11,788' sample. When the four thin sections were initially examined, the sample from this depth appeared to be suitable for mineral separation. However, the portion of the core that was sectioned could not have been representative of the rock as a whole for when the 11,788' sample was crushed, the major leucocratic mineral present was calcite. Plagioclase was present in only very minor amounts and could not be concentrated in sufficient quantity for analysis.

374038

APPENDIX NO. 2

Palaeontological Reports

(a) Micropalaeontology by David Taylor

(b) Palynology by W.K. Harris

(c) Palaeobotany by J.G.G. Douglas

Appendix 2a

374039

FORAMINIFERAL BIOSTRATIGRAPHY

AROO-1 WELL

BASS BASIN

by David Taylor.

Fourteen side wall cores and rotary cutting samples from 2000 feet to 6800 feet were examined for Foraminifera. No fauna was found in side wall core at 6246 feet and no new fauna was recognised below 6555 feet. A large fragment of Ammodiscus parri was submitted from a cutting sample between 9470 and 9500 feet. As A. parri is present in both the Demons Bluff Formation and the basal Jan Juk, this specimen was probably a down hole contaminant, especially as the species was recorded in the side wall core at 5824 feet (= early Oligocene). However large specimens of A. parri are common in the Dilwyn Formation of the Otway Basin (e.g. Wangoom-2, conventional core between 2500 and 2511), so that the possibility of early Eocene marginal marine conditions in Aroo-1 cannot be dismissed completely.

A distribution chart of planktonic foraminifera is submitted with this report together with an environmental analysis diagram. When the distribution chart and the environmental diagram are compared it is apparent why there are fluctuations in the degree of biostratigraphic control. There are only two small intervals, representing oceanic flooding or very high tides, within the tidal salt marsh environment between 6555 feet and 5700 feet. The interval at 6105 feet contains a Zone K fauna (= late Eocene) whilst that at 5700 feet contains a Zone J (= early Oligocene) fauna. More marine conditions exist above 5700 feet, but the deposition was on a very shallow shelf with poor oceanic circulation resulting in that no planktonic foraminifera were washed in and that arenaceous foraminifera were dominant due to poor oxygenation. Marine flooding at about 5000 feet introduced Zone I (late Oligocene) planktonics and oxygenation increased as is expressed by the absence of an arenaceous fauna.

In the early Miocene the environments reverts to one of a sheltered shallow continental shelf, without oceanic circulation reaching the depositional area and zonation is impossible due to absence of planktonic fauna between 5000 feet and 4300 feet. Above 4300 feet there is a gradual increase in the planktonic fauna culminating with a rich Zone E fauna (base of late Miocene). A rich planktonic fauna was characteristic of Zone E throughout the basin and marks the peak of the Miocene transgression.

Between 3100 feet and 2800 feet (Zone D) there is a decline in planktonic fauna which is absent completely above 2800, so that zonation is impossible. Richly bryozoal calcarenites are present above 2800 feet and this together with a dominance of miliolid and/or elphidid benthonic foraminifera indicates high energy conditions above the wave base.

374040

The Aroo biostratigraphic sequence is similar to Bass-1 and the environmental trend is identical. However deposition is in much shallower water than Bass-1 and apart from at the peak of the Miocene transgression, the site was protected from open oceanic currents. Possibly Aroo was structurally higher than Bass-1 during the Oligo-Miocene.

A R 0 0 - 1 - PLANKTONIC FORAMINIFERAL BIOSTRATIGRAPHY

. = 1 - 20 specimens

I = over 20 specimens

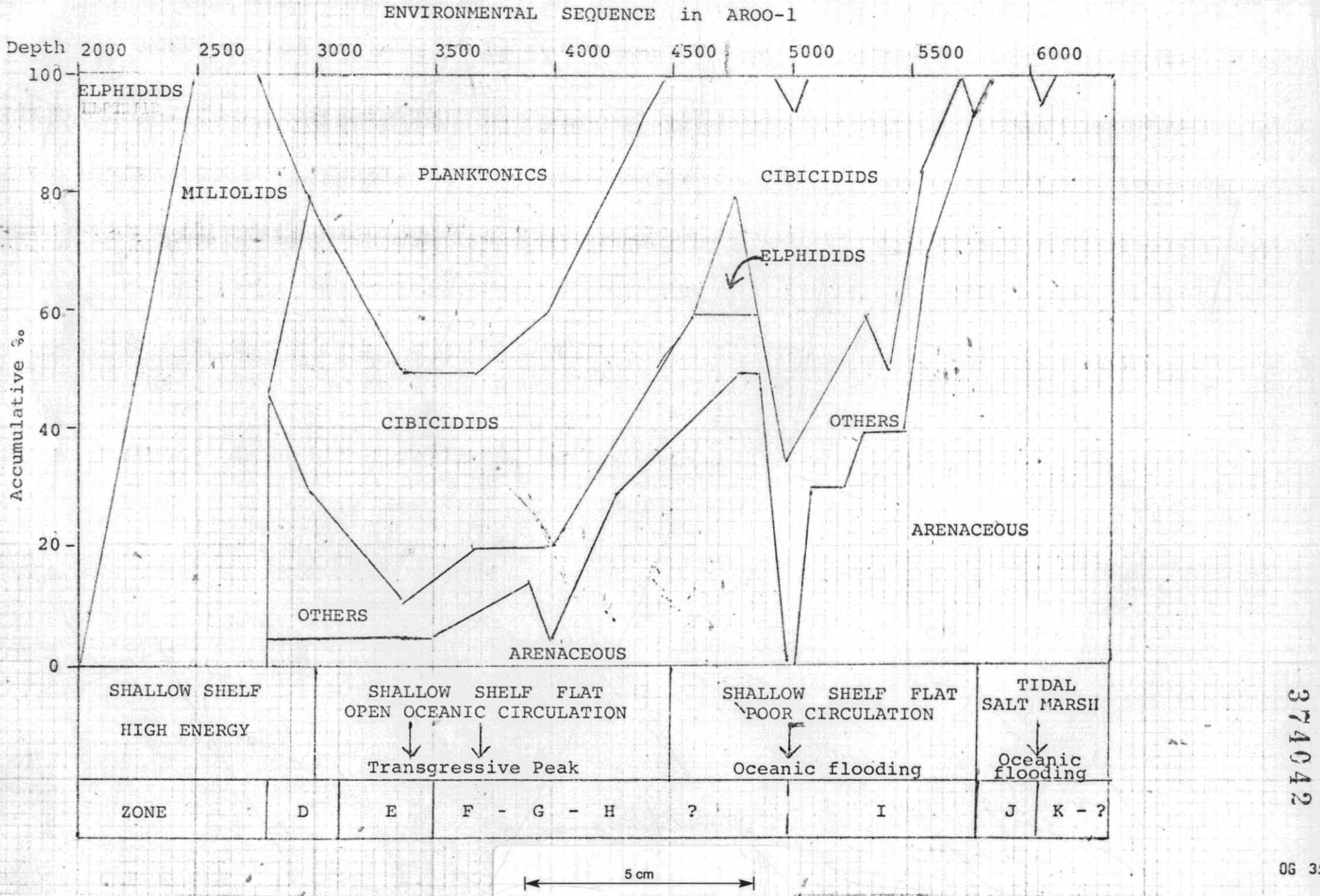
Depth	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500
Side wall core						T T	T T T	T T T T	T T T T	
PLANKTONICS										
1. Orbulina unversa	. .									
2. Globigerina apertura	.	I	I I	I	I	I	I I I I	I . .		
3. G. bulloides	.	I	I I	I	.			. :		
4. G. woodi woodi		I	I	I	I	.	.	. .	.	.
5. Globigerinoides bisphericus	.	.	I	.	.	.	.		.	
6. G. trilobus	.	.	I	.	.	.	.			
7. Globorotalia conica		.								
8. G. inflata			.							
9. G. miocenica			.	.						
10. Orbulina suturalis			.	.	.					
11. Globigerinoides glomerosus curvus				.	.					
12. Globoquadrina altispira				.		.				
13. Globigerina woodi connecta				.						
14. Globoquadrina dehiscens					.					
15. Globigerina euapertura							. . .	.	.	
16. G. praebulloides							. . .	.		
17. G. sp.?								.	.	.
18. Globoquadrina prsédehiscens								.		
19. Globigerina angioporoides								? .	...	
20. G. ampliapertura									.	
21. G. linaperta									.	.

Depth	2800	3100	3520	4990	5700	6105	
ZONE		D	E ?	F - G - H ?	I	J	K - ?

OG 355

5 cm

3740411


ENVIRONMENTAL SEQUENCE in AROO-1
Depth
2000
2500
3000
3500
4000
4500
5000
5500
6000
100
80
60
40
20
0
Accumulative %
ELPHIDIDS
MILIOLIDS
PLANKTONICS
CIBICIDIDS
ELPHIDIDS
CIBICIDIDS
OTHERS
ARENACEOUS
OTHERS
ARENACEOUS
SHALLOW SHELF
HIGH ENERGY
SHALLOW SHELF FLAT
OPEN OCEANIC CIRCULATION
Transgressive Peak
SHALLOW SHELF FLAT
POOR CIRCULATION
Oceanic flooding
TIDAL
SALT MARSH
Oceanic flooding
ZONE
D
E
F - G - H
?
I
J
K - ?
5 cm

3740 42

OG 35

Form R 193 3/71

BASIN BASS BY David Taylor

WELL NAME AROO-1 DATE 10-6-74 ELEV.

374043

Foram Zonules

		Highest Data	Quality	2 Way Time	Lowest Data	Quality	2 Way Time
MIOCENE	A						
	Alternate						
	B						
	Alternate						
	C						
	Alternate						
	D_1	2800	3				
	Alternate						
	D_2				2980	3	
	Alternate						
	E	3100*	3		3400	3	
	Alternate						
	F	3520	3				
	Alternate						
	G						
	Alternate						
	H_1						
	Alternate						
	H_2				4910	3	
	Alternate						
OLIGOCENE	I_1	4990	3				
	Alternate	5055	1				
	I_2				5680	3	
	Alternate				5612	1	
	J_1	5700	2				
	Alternate						
	J_2				5824	1	
	Alternate						
EOC.	K	6105	2		6105	2	
	Alternate						
	Pre K						

* Good incoming of E fauna.

COMMENTS:

Note: If highest or lowest data is a 3 or 4, then an alternate 0, 1, 2 highest or lowest data will be filled in if control is available.

If a sample cannot be interpreted to be one zonule, as apart from the other, no entry should be made.

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

Date Revised

By

OG 3554

Appendix 2b

374044

DEPARTMENT OF MINES
SOUTH AUSTRALIA

The Palynology of Hematite Aroo No. 1, Bass Basin, Tasmania

by

W.K. Harris
Palynologist
Biostratigraphy Division

Rept.Bk.No. 74/784
D.M. No.155/73
G.S. No. 5442
Biostrat. 5/74

6th June, 1974

374045

CONTENTS

	PAGE
Summary	1
Discussion	2
Conclusions	4
Reference	4
Appendix	

Distribution of palynomorphs.

374046

SUMMARY

Depths in feet	Zones	Age
6715 - 6730	*N. asperus*	Middle to Late Eocene
6825 - 7431	Lower *N. asperus*	Middle Eocene
7566 - 7923	Indeterminate	
8189	*Proteacidites asperopolus*	Early to Middle Eocene
8384	Indeterminate	
8520 - 8944	*M. diversus*	Early Eocene
8990 - 9080	Upper *L. balmei*	Late Paleocene
9120	Indeterminate	
9166 - 9528	?Lower *L. balmei*	Paleocene
9559 - 9872	Indeterminate	
9990 - 10,294	Lower *L. balmei*	Paleocene
11,133 - 11,565	Indeterminate	

The above palynological zone assignments are based on 33 side wall core and 2 conventional core samples from Hematite Aroo No. 1, Bass Basin, Tasmania (Permit T/3P, Latitude 39°47'30.62" south, Longitude 145°26'51.08" east). Total depth of the well was 12,112 feet.

Assemblages between 6715 and 7431 feet yielded very sparse assemblages with fair to good preservation. From 7566 to 10,294 feet the assemblages were very poorly preserved and often carbonised. This feature imposes severe restraints on the interpretation of assemblages with very few specimens identifiable to specific level. Thus finer subdivisions of these zones is not possible.

The low confidence of many of the samples is further disadvantaged by mud invasion of fractured sidewall cores.

Rare to sparse microplankton are present sporadically in all zones except that of *P. asperopolus*.

SAMPLE AND DEPTH IN FEET		ZONE	AGE	PRESERVATION	DIVERSITY	REMARKS	SAMPLE NO.
SWC 45	6 715	*M.asperum*	Middle to Late Eocene	Fair to good	Very low		S3020
SWC 44	6 730	*M.asperum*	Middle to Late Eocene	Fair to good	Very low	Very rare microplankton	S3019
SWC 43	6 825	Lower *M.asperum*	Middle Eocene	Poor to fair	Low	Sparse microplankton	S3018
SWC 41	6 920	Lower *M.asperum*	Middle Eocene	Poor to fair	Low	Very rare microplankton, reworked Permian spores.	S3017
SWC 38	7 431	?Lower *M.asperum*	Middle Eocene	Poor to fair	Low	Core fractured and mud invaded.	S3016
SWC 37	7 566	Indeterminate					S3015
SWC 33	7 923	Indeterminate					S3014
SWC 30	8 189	*Proteacidites asperopolus*	Early to Middle Eocene	Very poor	Very low	Core fractured and mud invaded	S3013
SWC 27	8 384	Indeterminate					S3012
SWC 25	8 520	*M. diversum*	Early Eocene	Very poor	Low	Moderate yield of microplankton.	S3011
SWC 22	8 615	*M. diversum*	Early Eocene	Very poor	Very low		S3010
SWC 20	8 748	Indeterminate				Essentially barren	S3009
SWC 19	8 794	Indeterminate		Very poor	Very low	?Non-marine dinoflagellates	S3008
SWC 17	8 897	Indeterminate					S3007
SWC 15	8 944	*M. diversum*	Early Eocene	Very poor	Very low		S3005
SWC 14	8 990	Upper *L. balmei*	Late Paleocene	Very poor	Low	Moderate yield of microplankton	S3004
SWC 13	9 080	Upper *L. balmei*	Late Paleocene	Very poor	Low	Rare microplankton, reworked Cretaceous and Permian spores.	S3003
SWC 12	9 120	Indeterminate				Essentially barren.	S3006
SWC 11	9 166	?Lower *L. balmei*	Paleocene	Very poor	Very low	Rare microplankton, reworked Permian spores.	S3002
SWC 9	9 250	?Lower *L. balmei*	Paleocene	Very poor	Very low	Core badly fractured and mud invaded, rare microplankton.	S3001
SWC 8	9 350	?Lower *L. balmei*	Paleocene	Very poor	Very low	Core badly fractured and mud invaded.	S3000
SWC 4	9 494	Indeterminate				Essentially barren	S2999
Core 1	9 528	?Lower *L. balmei*	Paleocene	Poor	Low	First appearance of *C. gigantia*	S2998
Core 2	9 559	Indeterminate		Very poor	Very low	Forms barely identifiable.	S2997
SWC 30	9 747	Indeterminate					S3031
SWC 28	9 872	Indeterminate				Virtually barren	S3030
SWC 27	9 990	Lower *L. balmei*	Paleocene	Very low	Very low	Very rare dinoflagellates, reworked Permian spores.	S3029
SWC 26	10 057	Indeterminate					S3028
SWC 24	10 194	Indeterminate					S3027
SWC 23	10 250	Indeterminate					S3026
SWC 22	10 294	?Lower *L. balmei*	Paleocene	Very poor	Very low	A very small assemblages and possibly contaminated.	S3025
SWC 13	11 133	Indeterminate					S3024
SWC 8	11 525	Indeterminate					S3022
SWC 7	11 909	Indeterminate					S3021
SWC 1	11 565	Indeterminate					S3023

Table I - Summary of palynological analyses, Hematite Aroo No. 1 Well, Bass Basin, Tasmania.

3740 47

374048

DISCUSSION

The biostratigraphic scheme of Stover & Partridge (1973) has been applied to the assemblages from this well. Table 1 summarises the palynological analyses.

N. asperus Zone - sidewall cores from 6715 to 7431 feet. The preservation of palynomorphs in this interval is generally fair, but the assemblages are not particularly diverse. Rare microplankton occur sporidically at 6730, 6825 and 6920 feet. Species recorded include *Spiniferites* spp., *Pterospermopsis* sp., *Cordosphaeridium* cf. *C. gracilis* and *Hystrichosphaeridium* cf. *tubiferum* and do not conflict with the assignment of the spore-pollen assemblages to the *N. asperus* Zone.

Based on the presence of *Intratriporopollenites notabilis* at 6825 feet the assemblage from this core is equated with the lower *N. asperus* Zone. Other significant species include *Proteacidites pachypolus, Tricolpites thomasii* and diverse and common *Nothofagidites* spp. Assemblages from 6920 and 7431 feet are assigned to this zone because of the predominance of *Nothofagidites* pollen over *Haloragacidites harrisii* rather than to the older *P. asperopolus* Zone.

Proteacidites asperopolus Zone - sidewall core at 8189 feet the assemblage although very poorly preserved and of very low diversity, is dominated by an abundance of *Haloragacidites harrisii*. Rare species include *Ephedripites* sp., *Proteacidites pachypolus, P. grandis* and *P. kopiensis*. The assemblage is assigned to this zone on very limited data, however the *H. harrisii* (*Nothofagidites* relationship is a useful regional guide, particularly in the lower sections of the zone.

Malvacipollis diversus Zone - sidewall cores at 8520 to 8944 feet. Further deterioration of preservation resulting in low diversity assemblages and four confident specific allocations, is most evident in this zone.

The lower boundary of this unit is determined by the first appearance of *Malvacipollis diversus*. It is associated with *Cyathidites gigantis* and *Proteacidites incurvatus*. Other species which make an apparent entry later include *Sapataceoidaepollenites rotundus* and *Periporopollenites demarctus*. Again the assemblages are so poorly preserved that no finer subdivisions are possible.

A low divernity but nevertheless characteristic suite of microplankton is present in the sidewall core at 8520 feet. The presence of *Diphyes colligerum*, *Wetzeliella homomorpha*, *?Deflandrea pachyceros*, *Operailodinium* sp. *Spiniferites* sp. and *Cordosphaeridium* sp. is strongly reminiscent of assemblage from this zone in the upper Dilwyn Formation of the Otway Basin.

Lygistepollenites balmei Zone — sidewall cores from 8990 to 10,294 feet.

The recognition of this zone is based on the consistent occurrence of *Gambierina edwardsii* and *G. rudata* and the presence of *L. balmei* in most samples. Other significant species include *Cyathidites gigantis Australopollis obscurus* and *Verrucosisporites kopukuensis*. The occurrence of *C.gigantis* and *V.kopukueusis* in the assemblage at 9080 feet would suggest that this is upper *L. balmei* but because of poor preservation and yields the boundary between upper and lower *L. balmei* cannot be resolved with any confidence. *Proteacidites incurvatus* occurs in the next sidewall core at 8990 feet. The first appearance of *C. gigantis* at 9528 feet is an alternative base to the upper *L. balmei* Zone.

Microplankton occur sporadically in most samples. At 8990 feet the assemblage of dinoflagellate cysts is characterised by *?Kenleyia fimbriata*, *Cyclonephelium* sp. and *Wetzeliella homomorpha*.

Reworked palynomorphs - Both Permian and Cretaceous spores and pollen are present throughout the section examined but it was not possible to determine the extent, if any, of any reworking of early Tertiary elements.

CONCLUSIONS

Despite poor yields many barren samples and generally very poor preservation the microfloral assemblages do show trends which can be compared with well documented sequences elsewhere in southern Australia. Thus although an initial low confidence value was placed on individual assemblages this was strengthened when the whole sequence was considered.

The generally poor preservation is most probably due to post-depositional effects. The high degree of carbonication attests to this and in the lower sections of the well it is undoubtedly related to the emplacement of the interbedded volcanics.

Marine influence is marked by the presence of sparse and sporadic assemblages of marine dinoflagellite cysts and is reflected as a poralic sequence involving marginal marine and non-marine environments.

Both Permian and probably early Cretaceous reworked palynomorphs are readily recognised in several samples.

W.K. HARRIS

Palynologist

Biostratigraphy Division

6th June, 1974

REFERENCE

Stover, L.E. & Partridge, A.D. 1973. Tertiary and Late Cretaceous spores and pollen from the Gippsland Basin, southeastern Australia. *Proc. R. Soc. Vict.* 85: 237 - 286.

APPENDIX

Distribution of Palynomorphs

(Note: only productive samples listed here)

374051

SPECIES	6715	6730	6825	6920	7431	8189	8520	8615	8794	8944	8990	9080	9120	9166	9250	9350	9528	9559	9990	10294
Nothofagidites emarcidus	X	X	X	X	X		X	X		X	X	X		X	X	X	X		X	
N. falcata	X	X		X																
Haloragacidites harrisii	X	X	X	X	X	X	X	X			X			X			X			
Cyathidites australis	X		X	X	X		X	X				X		X					X	X
Myrtaceidites parvus	X					X					X					X	X			
Microcachyridites antarcticus	X				X		X								X		X			X
Proteacidites pachypolus	X		X			X														
P. parvus	X	X				X		X				X	X	X					X	X
P. adenanthoides	X			X																
Lycopodium sporites sp.	X											X				X			X	
Triletes tuberculiformis	X		X	X								X								
Dictyophyllidites sp.		X	X		X					X				X			X			
Nothofagidites vansteenisii		X	X																	
Lygistepollenites florinii		X	X	X	X	X	X								X		X			
Proteacidites annularis		X	X	X						X	X									
Cupanieidites orthoteichus		X	X	X				X												
Podocarpidites sp.		X		X			X	X		X				X	X		X	X	X	X
Nothofagidites flemingii		X	X	X	X		X	X			X			X	X					
*Pterospermopsis sp.		X																		
Santalumidites cainozoicus			X																	
Intratriporopollenites notabilis			X																	
*Cordosphaeridium cf. gracilis			X																	
*Spiniferites ramosus			X	X			X				X									
*Hystrichosphaeridium cf. tubiferum			X																	
Verrucosisporites kopukuensis			X	X	X			X				X								
Proteacidites crassus			X		X									X						
Phyllocladidites mawsonii			X		X			X			X	X		X	X	X	X		X	X
Malvacipollis diversus			X	X	X	X	X	X		X										
Tricolporites spp.			X	X	X	X	X					X		X			X		X	
Gleicheniidites circinidites			X				X			X	X			X	X	X	X			
Tricolpites thomasii			X																	
Triorites magnificus			X																	
Simplicepollis meridianus				X				X									X			
Polypodiidites sp.				X	X		X			X		X		X	X		X			
Perinomonoletes sp.				X																
Sapotaceoidaepollenites rotundus				X				X												
Stereisporites antiquasporites				X						X	X	X			X					
Periporopollenites demarcatus				X	X			X							X					
Laevigatosporites major					X		X							X		X				
**Parasaccites sp. (Permian)				X								X		X						
**Platysaccus sp. (Permian)																				
Proteacidites kopiensis				X		X					X				X					
P. recavus				X																
P. leightonii					X	X		X	X	X	X	X								
Ericipites sp.						X											X			
Triporopollenites ambiguus						X														
Osmundacidites sp.							X				X	X								
*Diphyes colligerum							X													
*Operculodinium sp.							X	X												
*Wetzeliella homomorpha							X				X	X								
*?Gonyaulacysta sp.							X													
*?Cordosphaeridium sp.							X													
Dilwynites granulatus							X				X	X			X					
Clavifera triplex							X	X			X	X			X	X				
*?Deflandrea pachyceros								X	X						X					
Stereisporites (Tripunctisporis) sp.								X									X			
Cyathidites gigantis										X		X				X	X			
Proteacidites incurvatus										X	X									
*Kenleyia fimbriata																				
Lygistepollenites balmei											X			X		X	X			
Tricolpites gillii											X						X			
Ceratosporites equalis											X	X			X					
Gambierina rudata											X	X	X	X	X	X	X		X	X
*?Achomosphaera sp.											X									
*Spiniferites cingulatus											X									
Cyclonephelium sp.											X			X						
*Australopollis obscurus											X	X		X			X			
?Byssapollis emaciatus											X									
Cingutriletes clavus											X			X						
Krauselisporites papillatus											X									
Tricolpites phillipsii											X				X					
Gambierina edwardsii												X		X	X	X	X			X
Cyathidites splendens												X		X		X	X	X	X	
**Aequitriradites verrucosus (Cretaceous)												X								
Podosporites microsaccatus												X					X		X	
Camarozonosporites sp.												X						X		
Phyllocladidites verrucosus														X			X			
P. paleogenicus														X					X	
**Striate bisaccate (Permian)																			X	
**?Rouseisporites sp. (?Cretaceous)																				X

HEMATITE AR00-1

* Denotes microplankton species

** Reworked species

Appendix 2C

374052

Plant macrofossil from Aroo-1 Core No. 2,

9546 feet (K.B.)

Comments by

J.G.G. Douglas

Victorian Mines Department

The leaf fragment is part of a palmate or chordate dicotyledonous angiosperm, possibly comparable with the sub-basaltic floras of the Bogong High Plains in Victoria. A lower Tertiary age and warm, humid palaeoclimate are indicated.

APPENDIX NO. 3

Description of Cores and Sidewall Cores

5 cm

374054

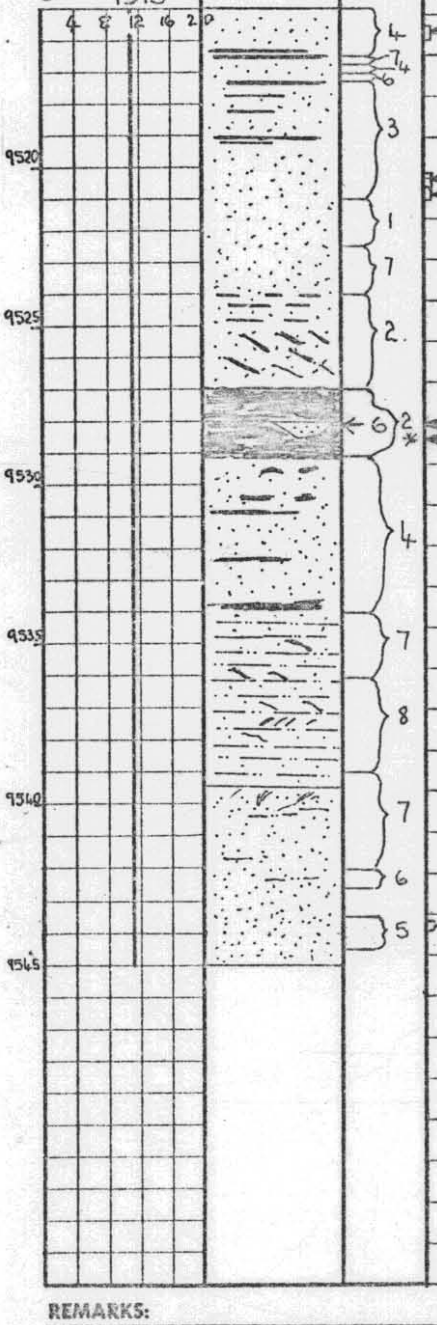
CORE DESCRIPTION

Core No. 1

WELL: AROO – 1

Interval Cored 9515 – 9545 ft., Cut 30 ft., Recovered 30 ft., (100 %) Fm. Eastern View C.M.

Bit Type C 20, Bit Size 8 15/32 in., Desc. by E. A. Hodgson Date 24 March 1974



SAMPLE	Interval (ft.)	Descriptive Lithology
A	9515' – 9518'	SANDSTONE, white, fine to medium, well sorted, sub angular to rounded; quartz overgrowths. 1–10 mm coaly beds 1–100 mm apart
	9518' – 9520'	SANDSTONE as above with less interbedded coal
D		
B	9520' – 9524'	SANDSTONE as above
	9524' – 9525' 3"	SANDSTONE as above with minor thin coal stringers.
	9525' 3" – 9527	SANDSTONE as above, thin coal stringers cross bedded at 10°
A	9527' – 9529' 4"	COAL and SHALE, chocolate, v. carbonaceous, hard. SANDSTONE in washout breccia at 9528' 6" has spotty fluorescence. Fractures in shale brilliant yellow-green fluorescence.
	9529' 4" – 9534'	SANDSTONE, white, carbonaceous, firm, moderately well cemented, medium grained with minor ½ – 2 mm coal beds
	9534' – 9539' 6"	SANDSTONE, white, fine, clean, thinly interbedded with light to dark grey SILTSTONE, tight, some festoon cross bedding, carbonaceous, slightly micaceous
	9539' 6" – 9545'	SANDSTONE fine to medium grading to very coarse (>1 mm) at top, with minor siltstone and shale. Sandstone is white, firm, hard, sub to well rounded quartz grains, mainly clear, some milky; slightly micaceous. Minor festoon cross bedding towards top
C		

KEY TO FLUORESCENCE and CUT

1. Bright yellow fluorescence, strong fast cut
2. Bright yellow-green fluorescence, fast cut
3. Yellow fluorescence, strong fast cut
4. Greenish – white fluorescence, good cut
5. Brilliant yellow-green fluorescence, good cut
6. Mottled yellow and golden fluorescence, good cut
7. Dull golden fluorescence, very slow weak cut
8. Dull red to golden fluorescence, no cut.

* fluorescence in fractures only

REMARKS:

Ⓐ – Sample for Palynology

SAMPLES FOR CORE ANALYSIS

A 9515' 6" – 9516'
B 9520' 8" – 9521'
C 9543' 8" – 9544'
} To BMR.

D 9520' 4" – 9520' 8" – To Baroid $\phi = 15\%$ $S_{oi} = 30.5\%$ $S_w = 44.593\%$ $S_g = 52.331$ $K = 3.281$ md

DG 3413

374055

5 cm

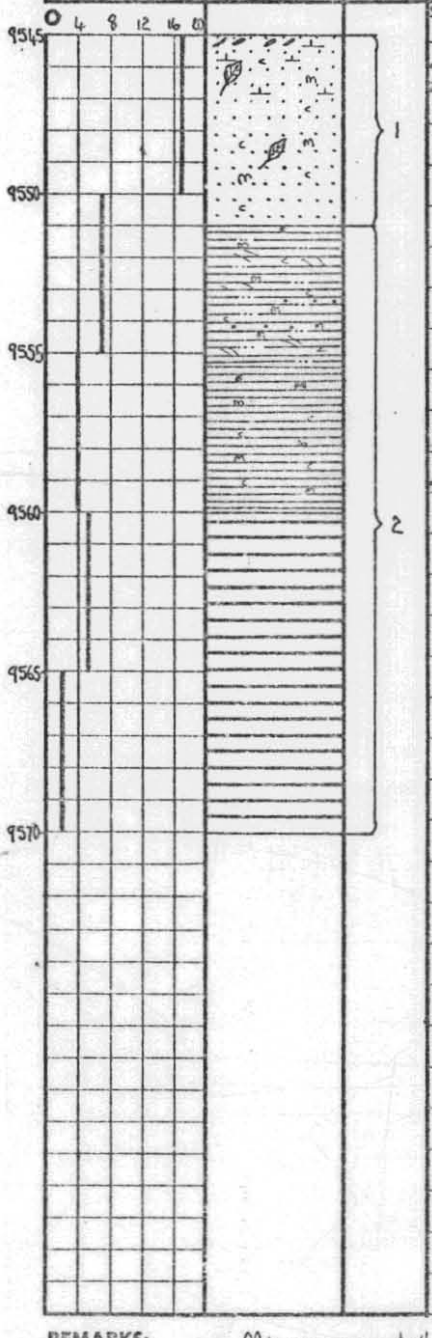
CORE DESCRIPTION

Core No. 2

WELL: AROO-1

Interval Cored 9545-9570 ft., Cut 25 ft., Recovered 25 ft., (100 %) Fm. Eastern View C.M.

Bit Type C 20, Bit Size 8 15/32 in., Desc. by E.A. Hodgson Date 25 March 1974



Interval (ft.)	Descriptive Lithology
SAMPLES	
9545'-9551'	SANDSTONE buff to light grey, firm, medium grained, slightly calcareous towards top. Quartz overgrowths but porosity visually estimated at 10-15%. Carbonaceous, micaceous (biotite and muscovite), especially on bedding planes where comminuted plant debris also occurs. Dull gold fluorescence, slow weak cut.
9551'-9555'6"	SHALE, light grey, silty, hard, thinly bedded with minor, low angle cross bedding. Slow weak cut. Thin, fine sandstone interbeds have dull gold fluorescence.
9555'6"-9560'	SHALE, medium grey colour. Very thinly bedded, hard. Slightly carbonaceous, slightly micaceous. Slow weak cut.
9560'-9570'	MUDSTONE, shaly, grey to chocolate brown colour. massive, hard, conchoidally fractured. Slow weak cut.

KEY TO FLUORESCENCE AND CUT

1. Dull gold fluorescence, slow weak cut
2. Minor, very dull golden fluorescence, slow weak cut throughout. Fluorescence confined to rare sandy interbeds.

REMARKS: Minor, very dull golden fluorescence throughout the shale - siltstone - mudstone part of core

Sample for Palynology

A Sample for Core Analysis by B.M.R. (9546' 8" - 9547')

Sample for Paleobotany

5 cm

OG-3473

374056

CORE DESCRIPTION

Core No. 3

WELL: AR00-1

Interval Cored 11782 - 11812 ft., Cut 30 ft., Recovered 30 ft., (100 %) Fm. —

Bit Type C 20, Bit Size 8 15/32 in., Desc. by D.R. NICHOLLS Date April 16, 1974

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.) Sample	Descriptive Lithology
0 4 8 12 16 20				
11,780'				
				11782' 0" to 11 804' 2"
85				VOLCANICS: probable basic extrusive; dark grey with local white and light green vesicle infillings; white fracture outlines; and green-black angular
			⊗	fragments (1-10mm: Xenoliths? phenocrysts); hard; finely crystalline with groundmass dominated by felspar
90				laths; abundant calcite, mainly as vesicle and fracture infillings. Strong yellow mineral
				fluorescence with calcite - no cut.
95				
				11,804' 2" to 11,811' 9"
800			⊗	VOLCANICS: light grey; with local white and light green vesicle infillings and white fracture outlines
				as above; very firm to hard; ground mass
05				variable between recognisably crystalline - weathered or hydrothermally altered and non crystalline
				claystone appearance. Yellow calcite
			⊗	fluorescence as above.
				11,811' 9" to 11,812' 0"
10			⊗	VOLCANICS: As for 11782' 0" to 11,804' 2"
15				

REMARKS:

⊗ Petrologic Analysis

E.A. Hodgson 27/3/1974

SIDEWALL CORE REPORT

Run 1 shot 60 recovered 59

Sample Submitted for ✓ Palynological Determination * Foraminiferal Determination

374057

NO.	DEPTH (feet)	RECOVERY (inches)	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS
1	9651	1"	Sandstone	-	trace golden	slow,	poor	-	Soft clay choked, medium and
						very weak			dirty fine sandstone
2	9621	1"	"	-	bright light	slow	poor	-	Soft, clay choked, medium
					yellow streak				slightly carbonaceous
3	9578	1"	Siltstone	-	-	-	very poor		Soft, grey carbonaceous siltstone
4	9494	1"	Sandstone	-	-	-	very poor	✓	Soft, dark grey, carbonaceous,
									clay choked
5	9487	1¼"	Sandstone	-	-	-	fair	-	Friable, slightly clay choked,
									medium, white
6	9451	1¼"	Sandstone	-	patchy bright	strong	fair	-	White, slightly friable, clay
					light yellow				choked, medium bedded
7	9447	1¼"	Sandstone	-	bright greenish	strong	fair	-	White-light grey, slightly
					white	blue white			friable, clay choked
8	9350	1¼"	Mudstone	-	-	-	-	✓	Dark brown, soft, carbonaceous
									fetid smell
9	9250	1"	Mudstone	-	-	-	-	✓	Dark brown-grey, soft,
									carbonaceous
10	9180	¾"	Sandstone	-	trace yellow	slow weak	poor	-	Clay choked, fine-medium,
									fluorescence adjacent to
									carbonaceous band

SIDEWALL CORE REPORT

Sample Submitted for ✓ Palynological Determination * Foraminiferal Determination

374058

NO.	DEPTH (feet)	RECOVERY (inches)	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS
11	9166	1"	Mudstone	-	-	-	-	✓	Dark brown, soft, carbonaceous, slightly sandy in parts
12	9120	7/8"	Mudstone	-	-	-	-	✓	Dark brown, soft, carbonaceous micaceous
13	9080	1"	Shaly Mudstone	-	-	-	-	✓	Slightly fissile, dark brown, carbonaceous, soft
14	8990	1¾"	Mudstone	-	-	-	-	✓	Dark brown, slightly silty, carbonaceous
15	8944	1"	Silty Mudstone	-	-	-	-	✓	Dark brown, slightly calcareou slightly micaceous, soft
16	8910	1⅛"	Fine sandstone & Mudstone	-	-	-	-		Dark brown mudstone, light gre fine, thinly interbedded sand- stone, soft
17	8897	1¼"	Coal	-	-	-	-	✓	Black, friable, sooty
18	8878	1¼"	Sandstone	-	dull bluish	very slow	poor	-	White, friable, clay choked, thin bedded
19	8794	1"	Sandy siltstone	-	-	-	very poor	✓ marine?	Dark grey(Greenish), soft, sandy, non-calcareous, slightl micaceous
20	8748	1"	Sandstone	-	-	-	poor	✓ marine?	Grey-green, friable, glauconiti medium

SIDEWALL CORE REPORT

Sample Submitted for ✓ Palynological Determination *Foraminiferal Determination

374059

NO.	DEPTH (feet)	RECOVERY (inches)	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS
21	8698	¾"	Mudstone	-	-	-	-	poor sample	Dark brown, soft, sticky
22	8615	¾"	Silty Mudstone	-	-	-	-	✓	Dark grey, thin bedded, soft
23	8603	1¼"	Sandstone	-	-	-	good	-	White, friable, fine-medium, non-calcareous
24	8553	¾"	Sandstone	-	-	-	fair	-	White, friable, fine, non-calcareous. Thin brown silt-stone interbeds
25	8520	1½"	Shaly Mudstone	-	-	-	-	✓	Dark brown, fissile-soft, slightly micaceous
26	8459	1¼"	Shaly Mudstone	-	-	-	-	poor sample	Dark brown, slightly fissile-soft
27	8384	1¼"	Coal	-	yellow on resin	NO	-	✓	Black, sooty, friable, trace orange, tarry resin
28	8290	1¼"	Sandstone	-	-	-	poor	-	White, friable, fine
29	8265	1½"	Mudstone	-	-	-	-	poor sample	Brown, soft, with fine sand lens (3 x 10 m)
30	8189	1½"	Mudstone	-	-	-	-	✓	Shaly, dark brown, fissile, very carbonaceous
31	8114	5/8"	Sandstone	-	-	-	poor	-	Pale grey, fine-medium, friable slightly clay choked, inter-bedded with thin mudstone

SIDEWALL CORE REPORT

Sample Submitted for ✓ Palynological Determination *Foraminiferal Determination

NO.	DEPTH (feet	RECOVERY (inches)	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS 374060
32	7990	5/8"	Sandstone	-	-	-	poor	-	Light grey, fine-medium, friable, slightly clay choked
33	7923	1½"	Coal	-	-	NO	-	✓	Black, hard, lustrous, brown bands
34	7868	¾"	Mudstone	-	-	-	-	-	Yellowish brown, slightly fissile, silty, pyritic
35	7844	1"	Sandstone	-	-	-	poor	-	White, friable, slightly clay choked, medium sandstone
36	7723	¾"	Siltstone	-	-	-	very poor	poor sample	Dark grey, friable, thinly bedded
37	7566	1"	Coal	-	-	NO	-	✓	Slightly friable, lustrous
38	7431	1"	Siltstone & Coal	-	-	NO	-	✓	Dark grey-brown siltstone with 3mm coal beds
39	7390	¾"	Sandstone	-	-	-	-	-	Light grey-Light brown, very fine, ½mm coaly mudstone beds
40	6944	1½"	Sandstone	-	trace pinpoint	-	fair	-	Light greenish grey, friable, medium well sorted
41	6920	1½"	Siltstone/ Midstone	-	-	-	very poor	✓	Very thinly interbedded, white siltstone and brown mudstone
42	6840	1"	Sandstone	-	-	-	poor	-	Light grey, fine grained with coarse subrounded milky quartz up to 5mm.

SIDEWALL CORE REPORT

Sample Submitted for ✓Palynological Determination *Foraminiferal Determination

NO.	DEPTH (feet)	RECOVERY (inches)	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS 374061
43	6825	1½"	Sandstone	-	-	-	poor	✓	Brown-greenish, micaceous, ?glauconitic, very fine
44	6730	1¼"	Sandstone	-	-	-	very poor	✓	Dark greenish grey, slightly carbonaceous, ?glauconitic
45	6715	½"	Siltstone	-	-	-	very poor	✓	Dark brown, soft, slightly micaceous
46	6555	1¼"	Siltstone	-	-	-	very poor	*	Chocolate brown, calcareous with minor sandstone
47	6394	1¼"	Siltstone	-	-	-	very poor	*	Chocolate brown, calcareous- firm
48	6246	1¼"	Siltstone	-	-	-	very poor	*	Chocolate brown calcareous - firm
49	6105	1½"	Siltstone	-	-	-	very poor	*	Chocolate brown calcareous - firm
50	5956	2"	Claystone	-	-	-	-	*	Chocolate brown, slightly micaceous, calcareous
51	5824	1½"	Claystone	-	-	-	-	*	Dark grey, firm, calcareous
52	5700	2"	Claystone	-	-	-	-	*	Dark brown, firm, very calcareous, glauconitic
53	5612	2"	Siltstone	-	-	-	-	*	Dark grey brown, firm, calcareous

SIDEWALL CORE REPORT

Sample Submitted for Palynological Determination *Foraminiferal Determination

NO.	DEPTH (Feet)	RECOVERY (inches)	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS
54	5466	2"	Marl	-	-	-	-	*	Dark grey-brown, soft, very calcareous
55	5317	2"	Siltstone	-	-	-	-	*	Dark grey, firm, calcareous, pyritic
56	5244	2"	Siltstone	-	-	-	-	*	Dark grey, firm, calcareous
57	5055	2"	Siltstone	-	-	-	-	*	Light grey, glauconitic, calcareous
58	4904	0"							
59	4794	2"	Marl	-	-	-	-	*	Grey, very calcareous
60	4624	2"	Siltstone	-	-	-	-	*	Light grey, very calcareous

374062

SIDEWALL CORE REPORT AR00-1

Run 2 shot 30 recovered 26

E.A. Hodgson. 18/4/74.

✓indicates Sample Submitted for Palynological Determination.

NO.	DEPTH	RECOVERY (inches)	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS
									374063
1	11909	¾	SANDSTONE	———	———	——	poor	poor ✓	clay choked, fine to medium, lithic, carbonaceous
2	11853	¾	SANDSTONE	———	———	——	poor	no	clay choked, fine to medium, lithic, carbonaceous, no gas in sample.
3	11761	½	SILTSTONE	———	———	——	tight	no	light green, very clayey
4	11700	¾	VOLCANIC	———	———	——	———	no	mottled green and brown, weathered, soft
5	11676	½	VOLCANIC	———	———	——	———	no	soft, light green, kaolinized
6	11630	1½	VOLCANIC	———	———	——	———	no	soft, mottled light green and brown weathered - kaolinized
7	11565	1	VOLCANIC	———	———	——	———	no	mottled brown-green, weathered with calcite veinlets
8	11525	1	CLAYSTONE	———	———	——	———	poor ✓	Chocolate brown, slightly silty
9	11445	½	SANDSTONE	———	———	——	tight	no	light green to brown, very clay choked, medium - coarse
10	11410	0	———						
11	11363	1½	SILTSTONE	———	———	——	———	✓	dark grey to chocolate brown, very clayey, moderately soft
12	11185	¾	VOLCANIC	———	———	——	———	——	hard, dark green, kaolinized, slightly weathered, calcareous
13	11133	1½	SILTSTONE	———	———	——	———	✓	dark grey, soft, clayey

SIDEWALL CORE REPORT AROO-1

NO.	DEPTH	RECOVERY (inches)	LITHOLOGY	HYDROCARBON ODOUR/STAIN	FLUORESCENCE	CUT	P/P	PALEO	REMARKS 374064
14	10977	1½	VOLCANIC	———	———	—	—	—	light green-grey, kaolinized
15	10897	¾	VOLCANIC	———	———	—	—	—	grey, kaolinized, soft
16	10818	¾	SILTSTONE	———	———	—	—	—	cream to white, clayey
17	10715	0	———						
18	10605	1	VOLCANIC	———	———	—	—	—	light grey-green, kaolinized, soft
19	10570	¾	VOLCANIC	———	———	—	—	—	soft, greenish grey, calcareous with calcite
									veinlets, kaolinized
20	10435	1	VOLCANIC	———	———	—	—	—	grey, mottled, kaolinized
21	10330	½	VOLCANIC	———	———	—	—	—	mottled green and brown, kaolinized
22	10294	1¼	SHALE	———	———	—	—	✓	chocolate brown, fissile
23	10250	¾	SILTSTONE	———	———	—	—	✓	light brown, soft, clayey
24	10194	½	SILTSTONE	———	———	—	—	✓small sample	light brown, soft, clayey
25	10147	¼	NO SAMPLE	———	———	—	—	—	three chips sandstone/ siltstone/dolerite volcanic
26	10057	¼	SILTSTONE	———	———	—	—	✓small	dark brown, hard, may be contamination - not
									representative
27	9990	½	SILTSTONE	———	———	—	—	✓small	brown, clayey, soft
28	9872	¼	SILTSTONE	———	———	—	—	✓small	brown, clayey, soft
29	9828	⅛	NO SAMPLE	———	———	—	—	—	two chips siltstone/dolerite
30	9748	1	SANDSTONE	———	———	—	very poor	✓	brown, mod well consolidated, clay choked

374065

APPENDIX NO. 4

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. ARDO NO. 1 DATE ANALYSIS COMPLETED JUNE 10 1974

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	Sample "cut" in tetrachlorethylene
	From	To			V	H	Dry Bulk	Apparent Grain	Water	Oil				
1	9516'	*	Sst; f.gr. carb.	17.6	0.89	2.0	2.20	2.67	44	2.4	N.D.	NIL	Dull Yellow	Trace
1	9521'	*	as above	18.6	2.3	0.76	2.17	2.66	65	0.84	N.D.	NIL	Pale Blue - Yellow	Fair
1	9524'		Sst; m.gr. carb. lam.	21.2	11	14	2.09	2.67	2.6	5.9	N.D.	NIL	as above	Trace
1	9530'		Sst; m.gr to c.gr.carb.	20.8	113	53	2.08	2.64	47	3.8	N.D.	NIL	Trace Dull Yellow	Trace
1	9544'	*	Sst; f.gr. to c.gr.carb	17.3	0.55	0.78	2.22	2.69	51	Tr	N.D.	NIL	Trace Dull Yellow	NIL
2	9546'	*	Sst; v.f.gr. to f.gr.carb	11.7	0.26	0.11	2.42	2.75	67	NIL	N.D.	NIL	Very Dull Yellow	NIL
2	9552'		as above	14.3	0.15	0.15	2.34	2.70	32	2.4	N.D.	NIL	NIL	NIL
2	9561'		Sh; black	1.1	<0.1	<0.1	2.59	2.62	N.D.	N.D.	N.D.	N.D.	NIL	NIL

Remarks: - * - Samples preserved in wax.

General File No. ~~XXXXX~~ 72/2914
Well File No. 74/203

37066

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. ARCO NO.1 DATE ANALYSIS COMPLETED JUNE 10 1974

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	Sample "cut" in tetrachlorethylene
	From	To			V	H	Dry Bulk	Apparent Grain	Water	Oil				
3	11,785		Basalt	8.1	<0.1	<0.1	2.64	2.84	N.D.	N.D.	N.D.	N.D.	NIL	NIL

Remarks: -

General File No. ~~XXXXX~~ 72/2914
Well File No. 74/208

3/4063

374068

APPENDIX NO. 5

Summary of Formation Interval Tests

FORMATION INTERVAL TESTS

AR00-1

Test No.	Depth (feet)	Recovery			Water Salinity (ppm)	Water Resistivity (ohm-m^2/m)	Hydrostatic Pressure (psi)	Sampling Pressure (psi)	Final Shut-in Pressure (psi)	Surface Pressure (psi)	Comment
		Gas (c.f.)	Oil (cc.)	Water (cc.)							
2	9,133	1.9	-	9,000	5,000	0.67 @ 75° F	4720 *2	962 *2 (after shape charge fired)	3966 *2	700 *3	Second run at this depth, no seal on first run
1	9,530	1.4	trace	1,900	6,300	0.54 @ 75° F	4917 *2	42 *2 (after shape charge fired) Flowline plugged	4444 *2	1,500 *3	All pressures relate to segregator
3	10,318	1.9	-	8,600	3,600	0.65 @ 77° F	5400 *3	1,250 *3	4750 *3	280 *3	-
5	10,708	-	-	-	-	-	6084	-	-	-	Impermeable formation
4	10,890	-	-	-	-	-	6248 *2	-	-	-	Mud run. No seal due to enlarged hole condition

*1 Amerada 10,300 gauge
*2 Amerada 11,800 gauge
*3 Schlumberger

374069

374070

APPENDIX NO. 6

Well Velocity Survey

by Austral United Geophysical Pty. Ltd.

374071

Bendix

WELL VELOCITY SURVEY

of

AROO No.1

for

HEMATITE PETROLEUM PTY. LTD.

by

AUSTRAL UNITED GEOPHYSICAL PTY. LTD.

Party 86

374072

Bendix

Table of Contents

1. Well Information
2. Operations
3. Computing
4. Results of Velocity Survey

Figures

1. Location Map
2. Amplifier Frequency Response Curves
3. Computation Diagram

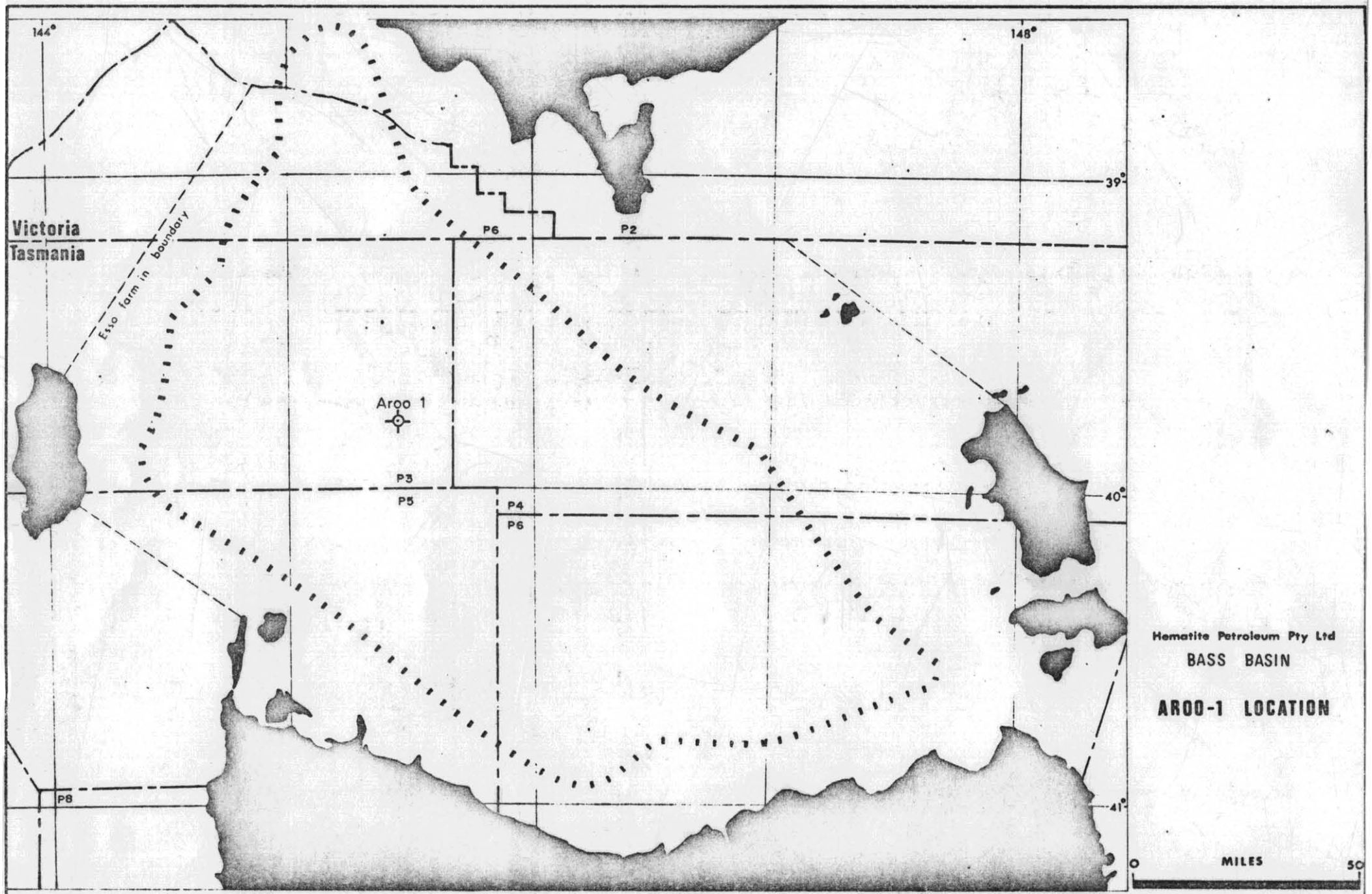
Reduced Records of Velocity Survey

Appendix

A Time-Depth Plot (Plate 1)

B Velocity Function Plot (Plate 2)

C Computation Sheet



3740C73

5 cm

FIGURE 1.

OG 3428

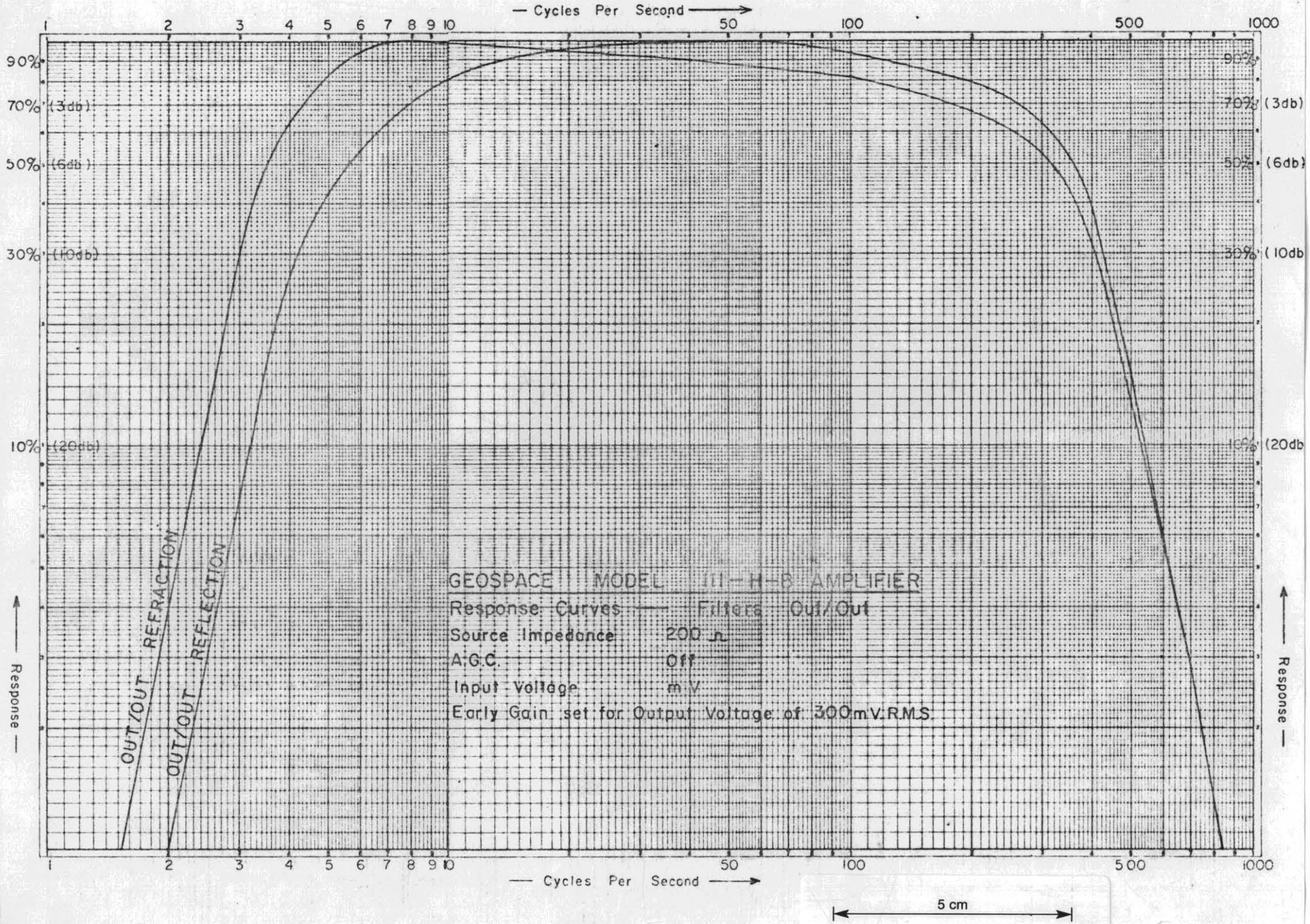
374074

Bendix

1. WELL INFORMATION

NAME OF WELL	Aroo No.1
DATES OF SURVEYS	27th March & 20th April, 1974
LOCATION	95 miles Southwest of Welshpool township, Victoria, in offshore permit Vic/P3.
CO-ORDINATES	Latitude 39° 47' 31" S. Longitude 145° 26' 51" E.
ELEVATION K.B.	+ 32.0 feet M.S.L.
ELEVATION G.L.	-250 feet M.S.L.
ELEVATION DATUM PLANE	0.0 feet M.S.L.
INTERVAL SURVEYED	2942 feet to 12100 feet below K.B.
SEISMOGRAPH PROFILE	Shotpoint 668. Line HB 73A/143
TOTAL DEPTH	12,112 below K.B.
CASING	20" @ 704 feet below K.B. 13 3/8" @ 2979 feet below K.B. 9 5/8" @ 9635 feet below K.B.
RIG	Glomar Conception

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 III-H-B AMPLIFIER
Response Curves — Filters Out/Out
Source Impedance 200 Ω
A.G.C. Off
Input Voltage mV
Early Gain set for Output Voltage of 300mV.R.M.S.
5 cm

Bendix

2. OPERATIONS

A. Recording Equipment

Well geophone	Geospace wall lock velocity geophone Model WLS-1000 (6 X 4.5 hertz detectors)
Cable	Schlumberger cable and reel
Reference and Time Break Hydrophones	Marsh Marine MP3
Camera	Electro Tech Model ER62
Amplifiers	Geospace Model III

B. 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)

C. Energy Source

Gas Gun	4.24 cubic feet capacity (Propane Oxygen mixture)
Ignition System	United Hi-voltage Detonator Panel
Gas Control System	United gas fill timer

Bendix

D. 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.5
Filters :	Hi-Cut 300 hertz Lo-Cut 5 hertz
Amplifier No. 3	Time-Break Hydrophone
Output :	Single output to trace No.4
Filters :	Hi-Cut 300 hertz Lo-Cut 5 hertz

Time break to trace No.6 (not amplified)

E. Operational Statisics

Surveyed Interval	2942 feet to 12100 feet below K.B.
Number of horizons surveyed	Twelve
Number of shots per horizon	One to Three
Gun Offset	85 to 100 feet
Gun Depth	45 feet
Gas fill time	20 secs. (approx. 2 cubic feet)

Bendix

E. Operational Statistics (Cont'd)

Intermediate Survey

Observer	W.J. Larsen
Shooter	G. Mathews

Final Survey

Observer	P. Bird
Shooter	R. Collins

F. Recording instruments were set up in an air conditioning room one deck below the bridge of the "Glomar Conception".

Recording of shots, energy source firing and geophone locking functions were conducted from this location.

A 4.24 cubic feet gas gun was lowered over the port side, 45 feet below sea level and offset to a maximum of 85 to 100 feet from the well.

The gas gun was charged with a propane/oxygen mixture and remotely fired from the recorder by spark ignition.

Dual time breaks were recorded on two MP3 hydrophones adjacent to the gas gun.

Horizontal offsets were computed from recorded times to a reference hydrophone in the moonpool of the ship.

Depth measurements for all levels were relative to kelly bushing, and were set using the Schlumberger depth indicator.

Bendix

Comments

Two velocity surveys were conducted on the Aroo well.

The first survey on March 27th to 9670 feet was prior to running intermediate 9 5/8" casing.

The final survey on April 20th was at a total depth of 12,112 feet K.B.

All shots were in open hole, with one exception at 2942 feet where because of hole oversize below the first casing string the geophone was locked inside the 13 3/8" casing.

Bendix

3. COMPUTING

A. Datum Plane

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

Velocity survey times were processed in Brisbane by the Scientific & Technical Computing Centre from data supplied by Austral United Geophysical.

B. Record Quality

Record quality at all levels is good and arrival times are considered reliable. Record times from groups of shots at the same level are in close agreement.

C. Sonic Calibration

A cumulative correction plot is shown on Plate 1.

Seismic and sonic times were tied at 2942 feet K.B. and using seismic times as reference values the cumulative errors of sonic times were plotted against depth.

Correction to the sonic log at 5650 feet is $-.039^5$ seconds, and at 9670 feet is -040^5 seconds.

The caliper log shows excessive washout between 2900 feet and 4200 feet K.B. and it is likely that the sonic log drift occurs across this section of hole.

Intermediate times taken from the sonic log between check shots at 2942 feet and 5650 feet are assumed to drift between 2942 feet and 4532 feet, but agree with seismic time between 4532 feet and 5650 feet.

Bendix

D. 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.

Bendix

4. RESULTS

A. Horizon arrival times

Average times were used to plot the time depth curve the arrival times to the principal horizons are as follows.

HORIZON	DEPTH BELOW DATUM (0 Feet M.S.L.)	ARRIVAL TIMES (One way Time)

Bendix

B. Velocity Function

The following velocity functions were computed for AROO No.1.

General function	Datum to Total Depth	V = 5730 + 0.74Z	
Detailed function	Datum to 3150'	V = 5744 + 1.23Z	
	3150' to 4000'	V = 6818'/sec.	constant velocity
	4000' to 5820'	V = 8438'/sec.	constant velocity
	5820' to 12068'	V = 5730 + 0.74Z	

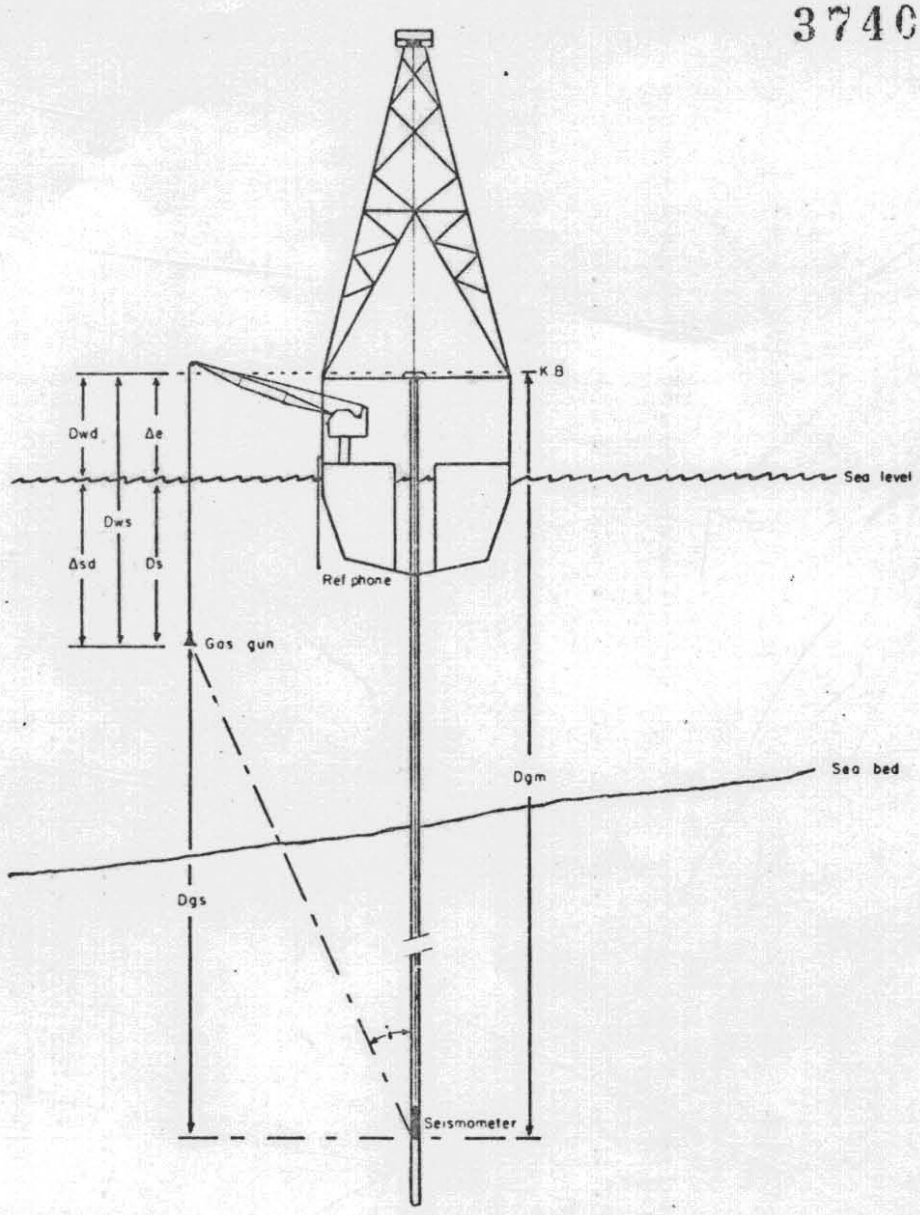
A Plot of the velocity functions computed for AROO No.1 is included in the appendix of this report for comparison purposes.

Respectfully submitted,

AUSTRAL UNITED GEOPHYSICAL PTY. LTD.
Party 86.

Supervisor.

374084



Dwd = Kelly – datum elevation
R = Record number
Ew = Elevation of sea level above M.S.L.
Dgm = Depth below kelly bushing
Tc = Time correction
Ds = Depth of shot (gas gun)
Δe = Kelly – sea level elevation
Dws = Ds + Δe
Δsd = Dws – Dwd
Dgs = Dgm – Dws
H = Gas gun offset from well
Tan-i = H / Dgs
T = Well seismometer time from time break
Tgs = T Cos-i
Q = Record quality
Tgd = Tgs + Δsd / Vd + Tc = (vertical travel time from datum to well seismometer)
Dgd = Dgm – Dwd (vertical distance datum to seismometer)
VI = Δ Dgd / Δ Tgd = (Interval Velocity)
VΔ = Dgd / Tgd = (Average Velocity)
Vd = Datum reduction velocity

5 cm

COMPUTATION DIAGRAM

HEMATITE PETROLEUM Pty. Ltd.

AROO Nº1

by

AUSTRAL UNITED GEOPHYSICAL

Party 86 27-03-74 / 20-04-74

Fig-3

3741085

WELL VELOCITY DETERMINATION

WELL ARCO Nº1

Record No. 16

Shot Hole No. / Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 2942'

Below Datum 00ft. (A.S.L.) 2910'

Charge 20 Depth of Shot 45'

WELL GEOPHONE



WELL VELOCITY DETERMINATION

WELL ARCO Nº1

Record No. 13

Shot Hole No. / Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 5650'

Below Datum 00ft. (A.S.L.) 5618'

Charge 20 Depth of Shot 45'

WELL GEOPHONE



WELL VELOCITY DETERMINATION

WELL ARCO Nº1

Record No. 10

Shot Hole No. / Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 6840'

Below Datum 00ft. (A.S.L.) 6808'

Charge 20 Depth of Shot 45'

WELL GEOPHONE



WELL VELOCITY DETERMINATION

WELL ARCO Nº1

Record No. 11

Shot Hole No. / Offset & Bearing

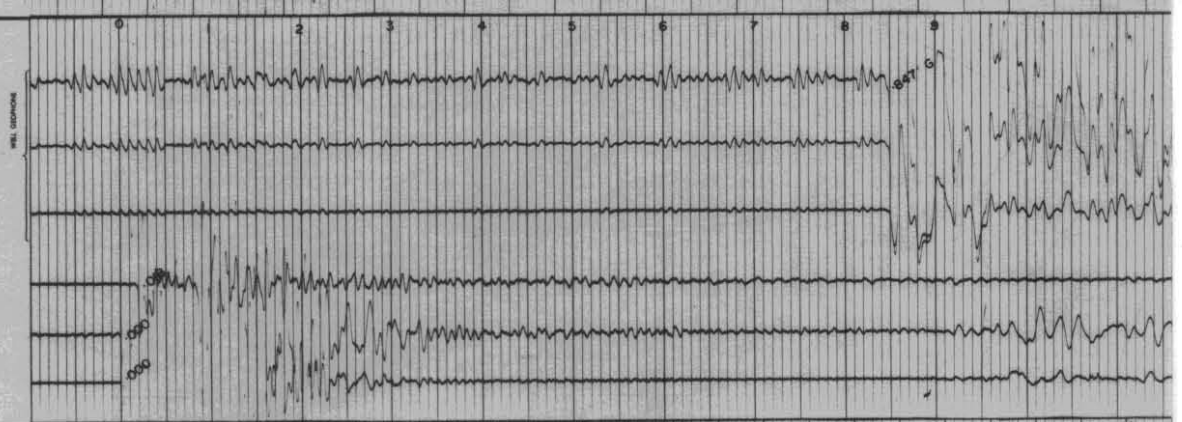
Depth of Well Seismometer

Below Kelly Bushing 6840'

Below Datum 00ft. (A.S.L.) 6808'

Charge 20 Depth of Shot 45'

WELL GEOPHONE



WELL VELOCITY DETERMINATION

WELL ARCO Nº1

Record No. 12

Shot Hole No. / Offset & Bearing

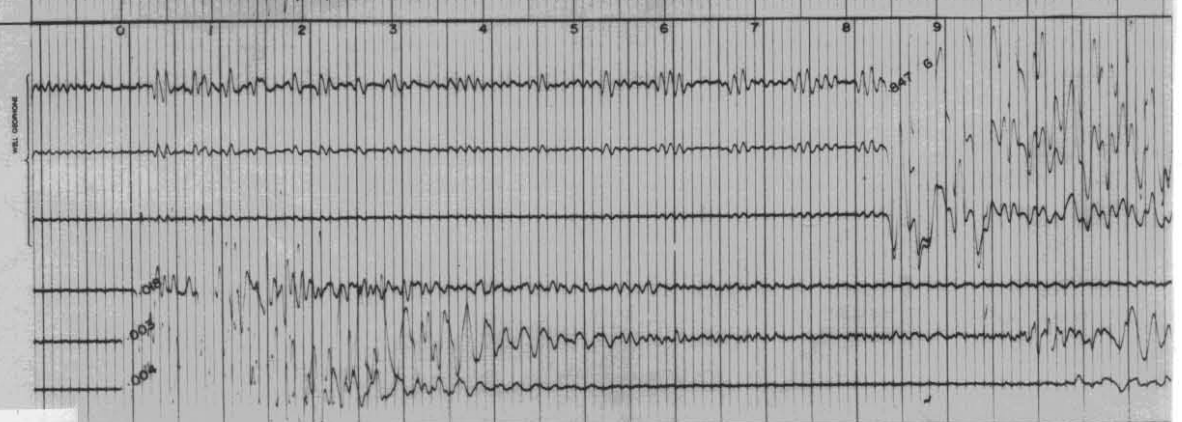
Depth of Well Seismometer

Below Kelly Bushing 6840'

Below Datum 00ft. (A.S.L.) 6808'

Charge 20' Depth of Shot 45'

WELL GEOPHONE



5 cm

5 cm

3741086

WELL VELOCITY DETERMINATION

WELL AROO Nº1

Record No. 8

Shot Hole No. / Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 7392'

Below Datum 00ft. (A.S.L.) 7360'

Charge 20 Depth of Shot 45'



WELL VELOCITY DETERMINATION

WELL AROO Nº1

Record No. 9

Shot Hole No. / Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 7392'

Below Datum 00ft. (A.S.L.) 7360'

Charge 20 Depth of Shot 45'



WELL VELOCITY DETERMINATION

WELL AROO Nº1

Record No. 6

Shot Hole No. / Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 7922'

Below Datum 00ft. (A.S.L.) 7890'

Charge 30 Depth of Shot 45'



WELL VELOCITY DETERMINATION

WELL AROO Nº1

Record No. 7

Shot Hole No. / Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 7922'

Below Datum 00ft. (A.S.L.) 7890'

Charge 30 Depth of Shot 45'



WELL VELOCITY DETERMINATION

WELL AROO Nº1

Record No. 5

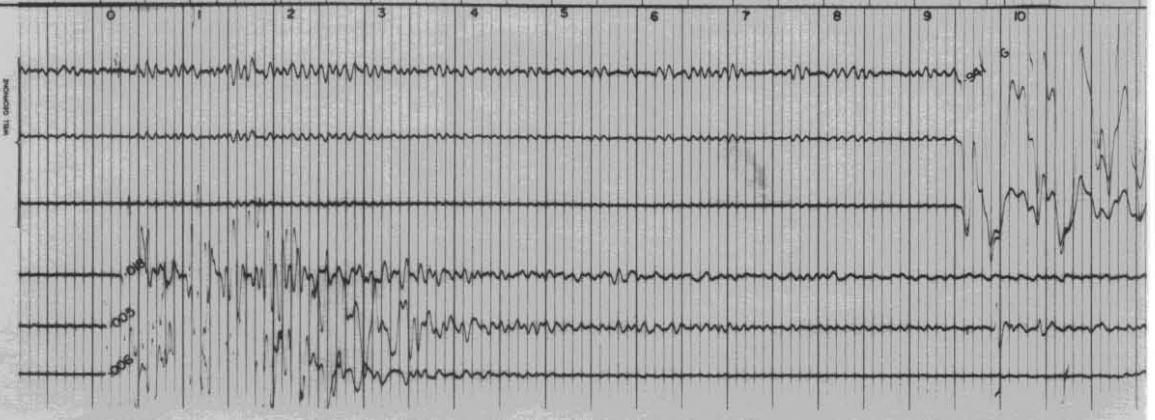
Shot Hole No. / Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 7922'

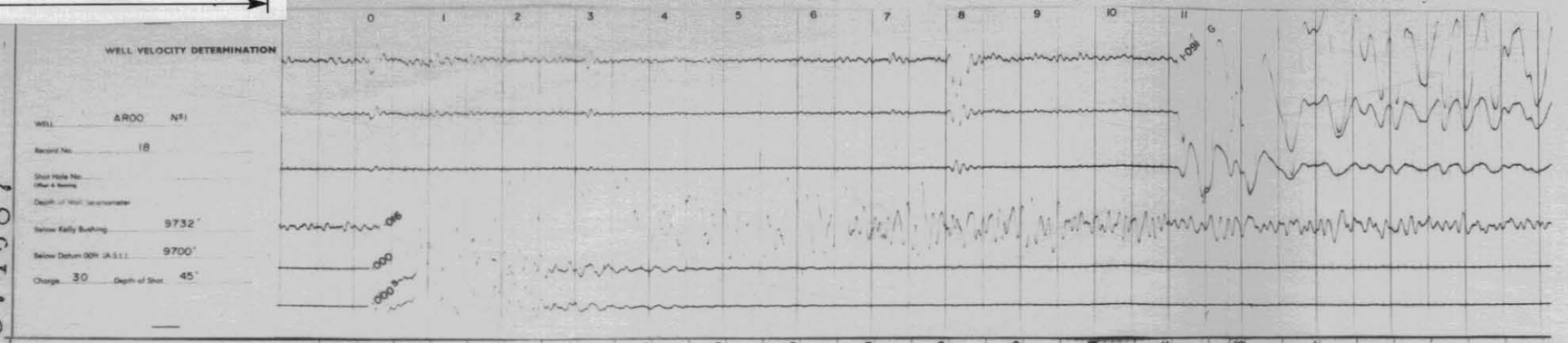
Below Datum 00ft. (A.S.L.) 7890'

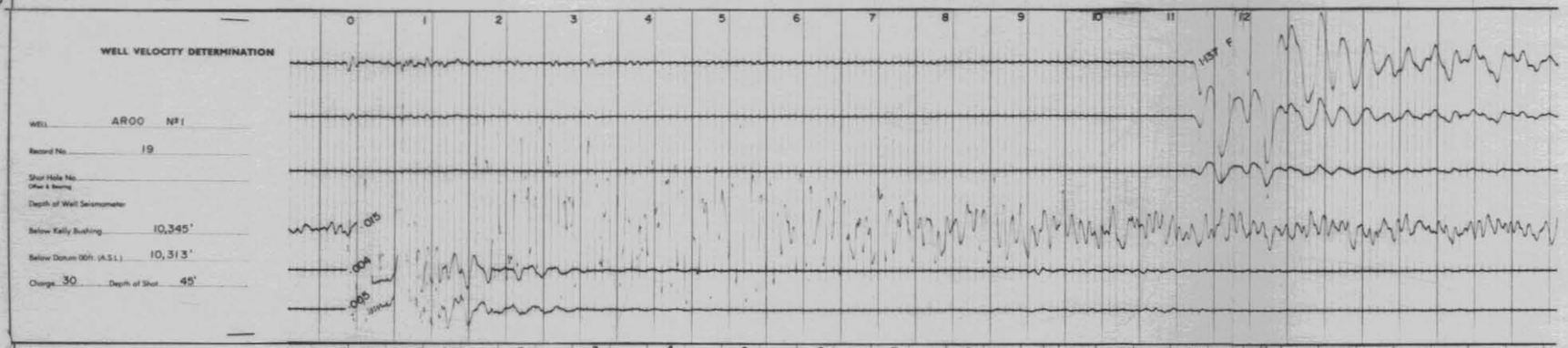
Charge 20 Depth of Shot 45'

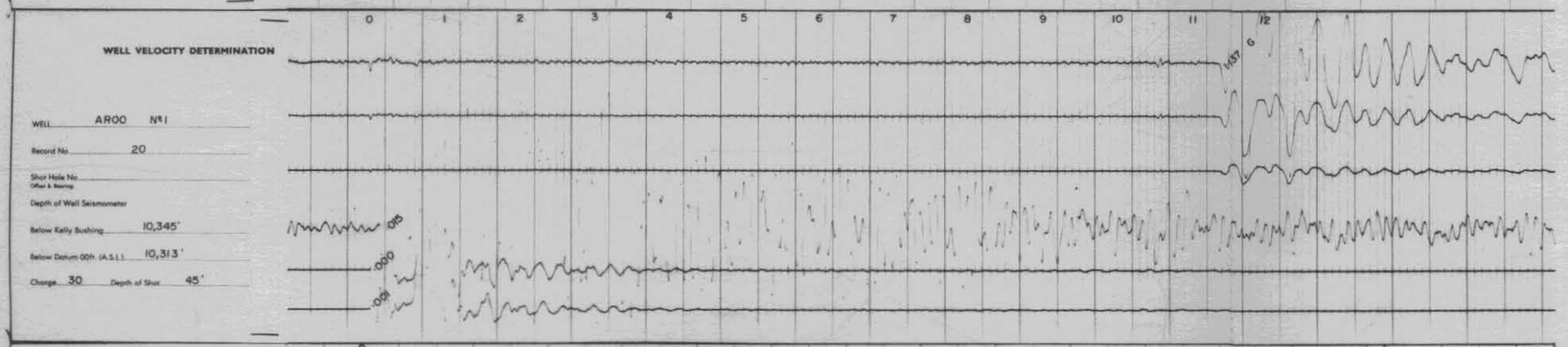


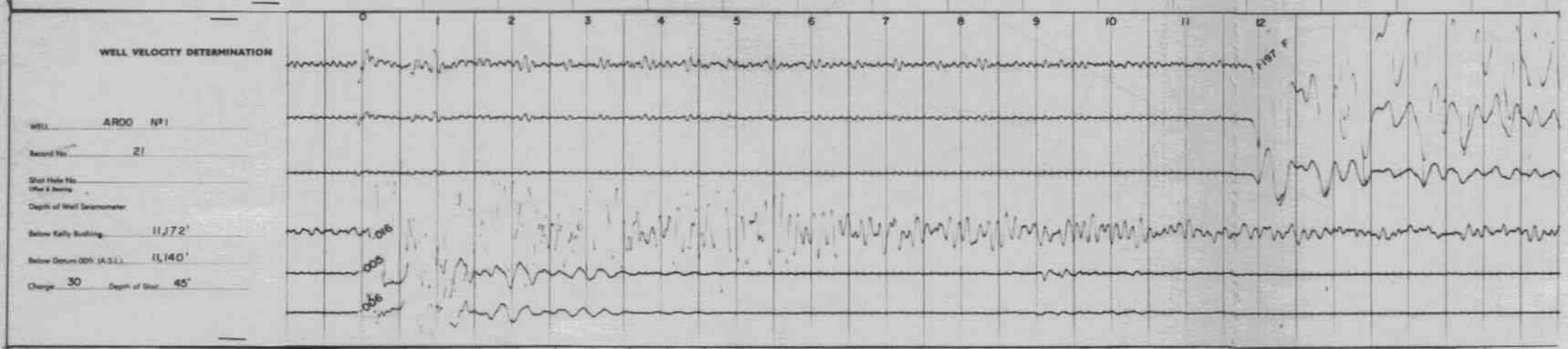
5 cm

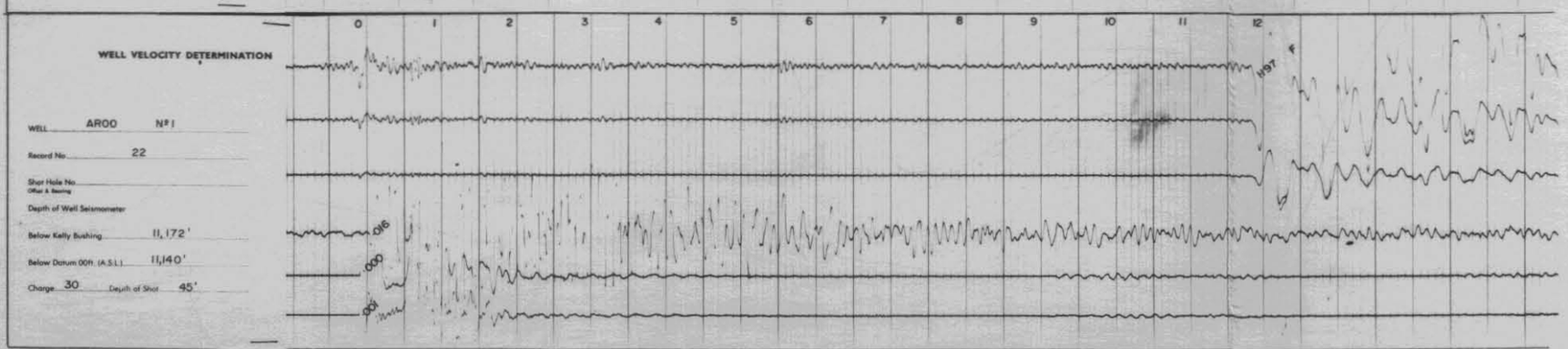
374087


WELL VELOCITY DETERMINATION
WELL AR00 Nº1
Record No. 18
Shot Hole No.
Offset & Bearing
Depth of Well Seismometer
Below Kelly Bushing 9732'
Below Datum 00ft. (A.S.L.) 9700'
Charge 30 Depth of Shot 45'
0 1 2 3 4 5 6 7 8 9 10 11
1.091 G
.016
.000
.000


WELL VELOCITY DETERMINATION
WELL AR00 Nº1
Record No. 19
Shot Hole No.
Offset & Bearing
Depth of Well Seismometer
Below Kelly Bushing 10,345'
Below Datum 00ft. (A.S.L.) 10,313'
Charge 30 Depth of Shot 45'
0 1 2 3 4 5 6 7 8 9 10 11 12
1.137 F
.015
.004
.005


WELL VELOCITY DETERMINATION
WELL AR00 Nº1
Record No. 20
Shot Hole No.
Offset & Bearing
Depth of Well Seismometer
Below Kelly Bushing 10,345'
Below Datum 00ft. (A.S.L.) 10,313'
Charge 30 Depth of Shot 45'
0 1 2 3 4 5 6 7 8 9 10 11 12
1.137 G
.015
.000
.001


WELL VELOCITY DETERMINATION
WELL AR00 Nº1
Record No. 21
Shot Hole No.
Offset & Bearing
Depth of Well Seismometer
Below Kelly Bushing 11,172'
Below Datum 00ft. (A.S.L.) 11,140'
Charge 30 Depth of Shot 45'
0 1 2 3 4 5 6 7 8 9 10 11 12
1.197 F
.016
.005
.006


WELL VELOCITY DETERMINATION
WELL AR00 Nº1
Record No. 22
Shot Hole No.
Offset & Bearing
Depth of Well Seismometer
Below Kelly Bushing 11,172'
Below Datum 00ft. (A.S.L.) 11,140'
Charge 30 Depth of Shot 45'
0 1 2 3 4 5 6 7 8 9 10 11 12
1.197 F
.016
.000
.001

5 cm

3741088

WELL VELOCITY DETERMINATION

WELL ARCO Nº 1
Record No. 4
Shot Hole No.
Offset & Bearing
Depth of Well Seismometer
Below Kelly Bushing 9250'
Below Datum 00ft. (A.S.L.) 9218'
Charge 20 Depth of Shot 45'



WELL VELOCITY DETERMINATION

WELL ARCO Nº 1
Record No. 3
Shot Hole No.
Offset & Bearing
Depth of Well Seismometer
Below Kelly Bushing 9250'
Below Datum 00ft. (A.S.L.) 9218'
Charge 30 Depth of Shot 45'



WELL VELOCITY DETERMINATION

WELL ARCO Nº 1
Record No. 1
Shot Hole No.
Offset & Bearing
Depth of Well Seismometer
Below Kelly Bushing 9670'
Below Datum 00ft. (A.S.L.) 9638'
Charge 30 Depth of Shot 45'



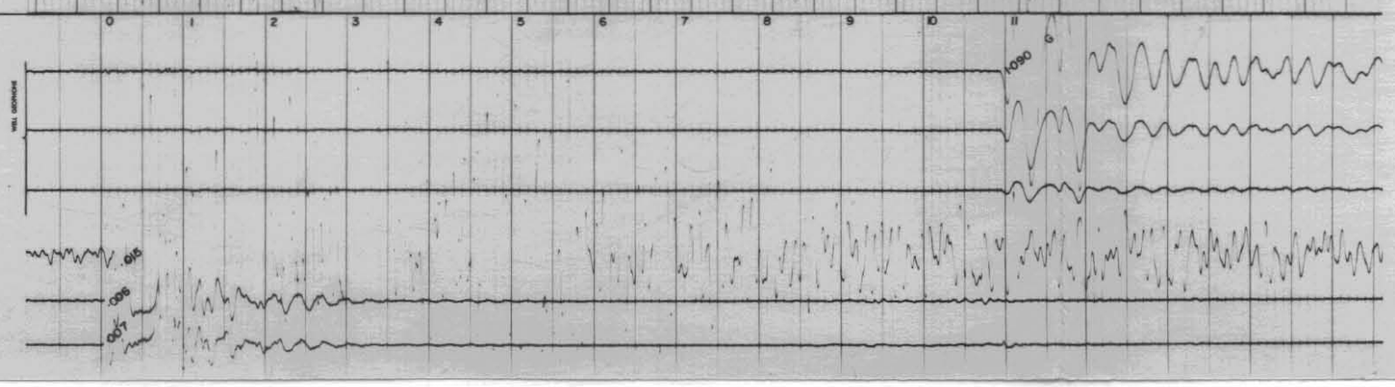
WELL VELOCITY DETERMINATION

WELL ARCO Nº 1
Record No. 2
Shot Hole No.
Offset & Bearing
Depth of Well Seismometer
Below Kelly Bushing 9670'
Below Datum 00ft. (A.S.L.) 9638'
Charge 30 Depth of Shot 45'



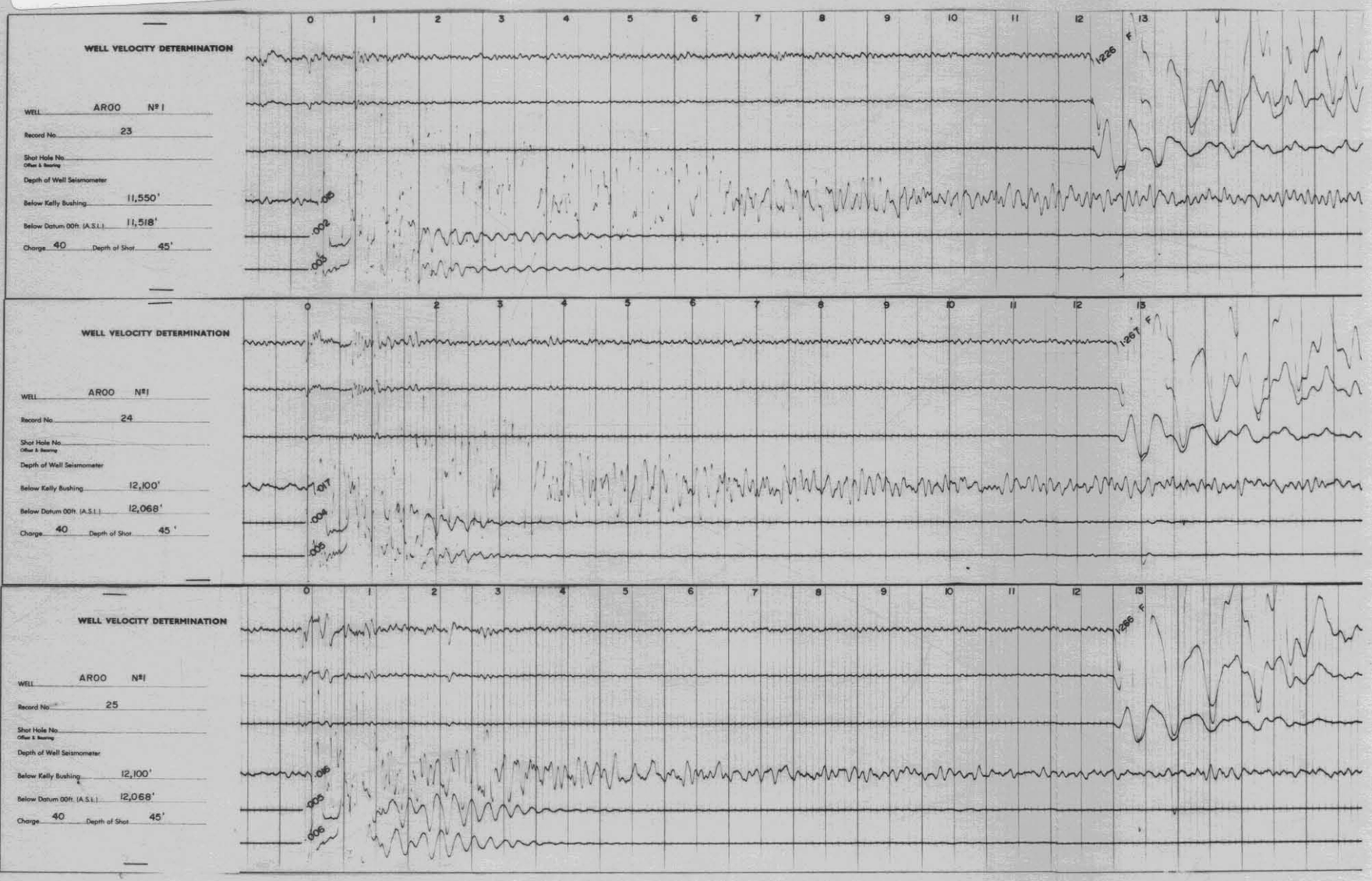
WELL VELOCITY DETERMINATION

WELL ARCO Nº 1
Record No. 17
Shot Hole No.
Offset & Bearing
Depth of Well Seismometer
Below Kelly Bushing 9732'
Below Datum 00ft. (A.S.L.) 9700'
Charge 30 Depth of Shot 45'



3740089

5 cm


WELL VELOCITY DETERMINATION
WELL AROO Nº 1
Record No. 23
Shot Hole No.
Offset & Bearing
Depth of Well Seismometer
Below Kelly Bushing 11,550'
Below Datum 00ft. (A.S.L.) 11,518'
Charge 40 Depth of Shot 45'
0 1 2 3 4 5 6 7 8 9 10 11 12 13
1226 F
001
002
003
WELL VELOCITY DETERMINATION
WELL AROO Nº1
Record No. 24
Shot Hole No.
Offset & Bearing
Depth of Well Seismometer
Below Kelly Bushing 12,100'
Below Datum 00ft. (A.S.L.) 12,068'
Charge 40 Depth of Shot 45'
0 1 2 3 4 5 6 7 8 9 10 11 12 13
1267 F
004
005
WELL VELOCITY DETERMINATION
WELL AROO Nº1
Record No. 25
Shot Hole No.
Offset & Bearing
Depth of Well Seismometer
Below Kelly Bushing 12,100'
Below Datum 00ft. (A.S.L.) 12,068'
Charge 40 Depth of Shot 45'
0 1 2 3 4 5 6 7 8 9 10 11 12 13
1286 F
006
007
008

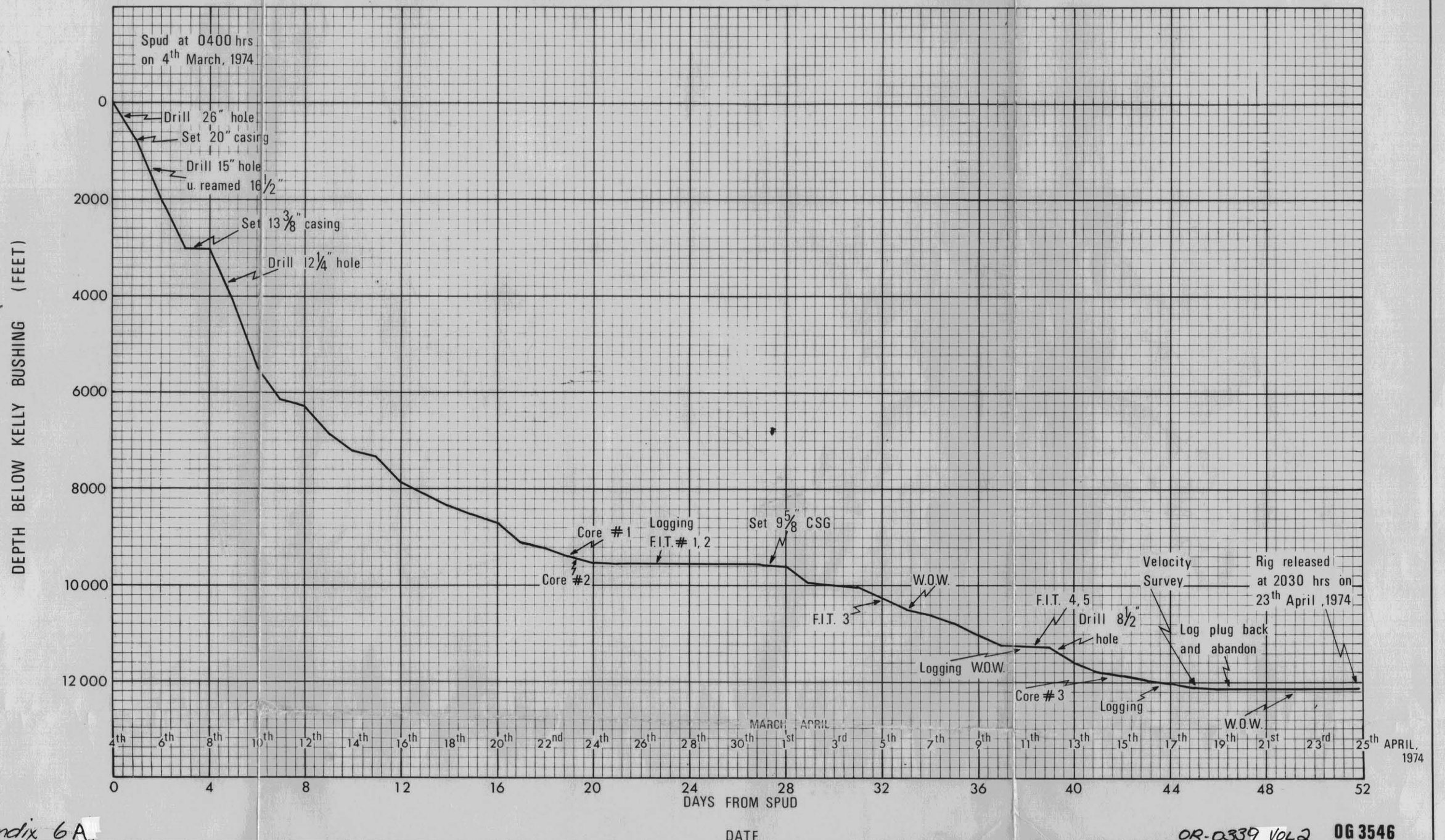
THE BROKEN HILL PROPRIETARY CO. LTD.

OIL AND GAS DIVISION
(HEMATITE PETROLEUM PTY LTD)

DRILLING TIME CURVE
AROO No. 1

374090

Area	:	Bass Basin			
Permit	:	T/3P	Rig	:	Glomar Conception
Latitude	:	39°47'30"	Contractor	:	Global Marine
Longitude	:	145°26'48"	Well Spudded	:	4th March, 1974
Total Depth	:	12112' (KB)	Rig Released	:	23rd April, 1974

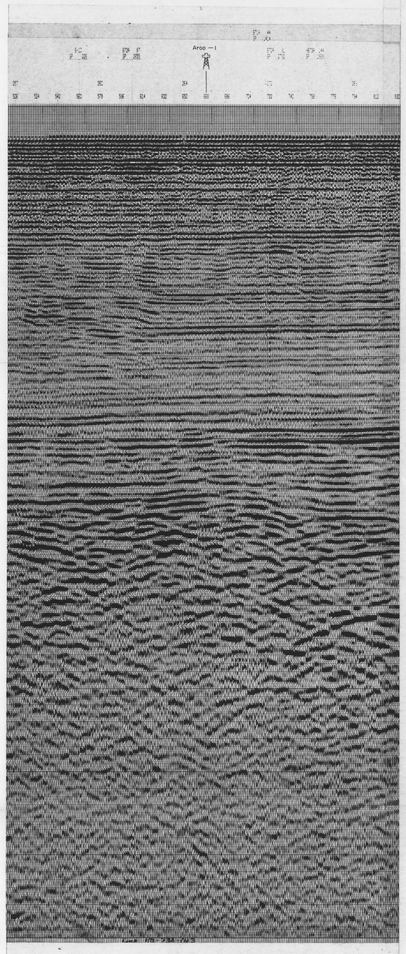


Appendix 6A

OR-0339 VOL 2 OG 3546

Appendix 6 B)

374091



K.B. = +32·0' M.S.L.
DATUM = Sea Level.

ONE WAY TRAVEL TIME IN SECONDS

VERTICAL REFLECTION TIME IN SECONDS

0·1 0·2 0·3 0·4 0·5 0·6 0·7 0·8 0·9 1·0 1·1 1·2 1·3 1·4 1·5 1·6 1·7 1·8 1·9
0·2 0·4 0·6 0·8 1·0 1·2 1·4 1·6 1·8 2·0 2·2 2·4 2·6 2·8 3·0 3·2 3·4 3·6 3·8

SONIC CALIBRATION in Msecs
-40 -30 -20 -10 0 +10

Seabed

VERTICAL DEPTH BELOW DATUM WELL SEISMOMETER

1,000'
2,000'
3,000' 2,910'
4,000'
5,000'
5,618'
6,000'
6,808'
7,000'
7,360'
7,890'
8,000'
8,500'
9,000'
9,218'
9,636'
9,700'
10,000'
10,313'
11,000'
11,140'
11,518'
12,000'
12,068'
13,000'
14,000'

Interval velocities derived from Sonic Log (M.M Nicol, Hematite Petroleum Pty. Ltd.)

Top Demons Bluff Formation

Top Eastern View Coal Measures

Red Horizon

Brown Horizon

Average Velocity Vs Time

Average Velocity Vs Depth

Interval velocities derived from well velocity survey (Austral United Geophysical Pty. Ltd.)

Total Depth Time Vs Depth

VELOCITY IN FEET PER SECOND

5,000 6,000 7,000 8,000 9,000 10,000 11,000 12,000 13,000 14,000 15,000 16,000 17,000 18,000 19,000 20,000 21,000 22,000 23,000 24,000

VELOCITY IN FEET PER SECOND

1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 10,000 11,000 12,000 13,000

WELL VELOCITY DETERMINATION

HEMATITE PETROLEUM Pty. Ltd.

AROO No1.

Latitude 39° 47' 31" S

Longitude 145° 26' 51" E

AUSTRAL UNITED GEOPHYSICAL Pty. Ltd.

Party 86 27 March and 20 April 1974.

* Seismic Times

TIE (SRD)

SONIC LOG UNCALIBRATED — HOLE CHECK SURVEY (SRD - 4500')

CUMULATIVE CORRECTION PLOT (SECONDS) TIME WHICH SONIC TIME PERIODS DEPART

-40 -30 -20 -10 0 +10
— Milliseconds —

CR-0339 Vol 2
1 copy

374092

Appendix 6 c)

HEMATITE PETROLEUM PTY LTD. AROO NO1 27-03-74 / 20-04-74

LATITUDE 39 47 31 S KELLY BUSHING 32 FEET WEATHERING VELOCITY 0 FEET/SEC

LONGITUDE 145 26 51 E SEABED ELEVATION -250 FEET REPLACEMENT VELOCITY 0 FEET/SEC

CASING DEPTH $13\frac{3}{8}$ – 2,979' DATUM ELEVATION MSL 0 FT DATUM VELOCITY 5000 FEET/SEC

$9\frac{5}{8}$ – 9,635'

EW	R	DGM	TC	DS	AE	DWS	ASD	DGS	H	TANI	COSI	T	Q	TGS	ASD/DV	TGD	DGD	ADGD	ATGD	V1	VA
		732						SONIC	TIME							0.1125					
																0.1125	700	700	0.1125	6222.	6222.
		1232						SONIC	TIME							0.1870					
																0.1870	1200	500	0.0745	6711.	6417.
		1732						SONIC	TIME							0.2525					
																0.2525	1700	500	0.0655	7634.	6733.
		2232						SONIC	TIME							0.3110					
																0.3110	2200	500	0.0585	8547.	7074.
0	16	2942	0.0000	45	32	77	45	2865	90	0.0314	0.9995	0.385	G	0.3848	0.009	0.3938					
																0.3938	2910	710	0.0828	8574.	7389.
		3432						SONIC	TIME							0.4550					
																0.4550	3400	490	0.0612	8008.	7473.
		4032						SONIC	TIME							0.5430					
																0.5430	4000	600	0.0880	6818	7366
		4532						SONIC	TIME							0.6025					
																0.6025	4500	500	0.0595	8403	7469.
		5032						SONIC	TIME							0.6620					
																0.6620	5000	500	0.0595	8403.	7553.
0	13	5650	0.0000	45	32	77	45	5573	100	0.0179	0.9998	0.726	G	0.7258	0.009	0.7348					
																0.7348	5618	618	0.0729	8479.	7645.
		6232						SONIC	TIME							0.7990					
																0.7990	6200	582	0.0641	9077.	7760.
0	10	6840	0.0000	45	32	77	45	6763	100	0.0148	0.9999	0.847	G	0.8469	0.009	0.8559					
0	11	6840	0.0000	45	32	77	45	6763	100	0.0148	0.9999	0.847	G	0.8469	0.009	0.8559					
0	12	6840	0.0000	45	32	77	45	6763	100	0.0148	0.9999	0.847	G	0.8469	0.009	0.8559					
																0.8559	6808	608	0.0569	10684.	7954.
0	8	7392	0.0000	45	32	77	45	7315	100	0.0137	0.9999	0.895	F	0.8949	0.009	0.9039					
0	9	7392	0.0000	45	32	77	45	7315	95	0.0130	0.9999	0.895	G	0.8949	0.009	0.9039					
																0.9039	7360	552	0.0480	11497.	8142.
0	6	7922	0.0000	45	32	77	45	7845	95	0.0121	0.9999	0.941	G	0.9409	0.009	0.9499					
0	7	7922	0.0000	45	32	77	45	7845	100	0.0127	0.9999	0.941	G	0.9409	0.009	0.9499					
0	5	7922	0.0000	45	32	77	45	7845	100	0.0127	0.9999	0.941	G	0.9409	0.009	0.9499					
																0.9499	7890	530	0.0460	11520.	8306.
		8532						SONIC	TIME							1.0020					
																1.0020	8500	610	0.0521	11714.	8483.
0	4	9250	0.0000	45	32	77	45	9173	100	0.0109	0.9999	1.051	G	1.0509	0.009	1.0599					
0	3	9250	0.0000	45	32	77	45	9173	95	0.0104	0.9999	1.051	G	1.0509	0.009	1.0599					
																1.0599	9218	718	0.0579	12392.	8697.
0	1	9670	0.0000	45	32	77	45	9593	95	0.0099	1.0000	1.086	G	1.0859	0.009	1.0949					
0	2	9670	0.0000	45	32	77	45	9593	95	0.0099	1.0000	1.085	G	1.0849	0.009	1.0939					
																1.0944	9638	420	0.0345	12172.	8806.
0	17	9732	0.0000	45	32	77	45	9655	85	0.0088	1.0000	1.090	G	1.0899	0.009	1.0989					
0	18	9732	0.0000	45	32	77	45	9655	90	0.0093	1.0000	1.091	G	1.0909	0.009	1.0999					
																1.0994	9700	62	0.0050	12379.	8823.
0	19	10345	0.0000	45	32	77	45	10268	85	0.0083	1.0000	1.137	F	1.1369	0.009	1.1459					
0	20	10345	0.0000	45	32	77	45	10268	85	0.0083	1.0000	1.137	G	1.1369	0.009	1.1459					
																1.1459	10313	613	0.0465	13181.	8999.
0	21	11172	0.0000	45	32	77	45	11095	90	0.0081	1.0000	1.197	F	1.1969	0.009	1.2059					
0	22	11172	0.0000	45	32	77	45	11095	90	0.0081	1.0000	1.197	F	1.1969	0.009	1.2059					
																1.2059	11140	827	0.0600	13783.	9237.
0	23	11550	0.0000	45	32	77	45	11473	85	0.0074	1.0000	1.226	F	1.2259	0.009	1.2349					
																1.2349	11518	378	0.0290	13032.	9327.
0	24	12100	0.0000	45	32	77	45	12023	95	0.0079	1.0000	1.267	F	1.2669	0.009	1.2759					
0	25	12100	0.0000	45	32	77	45	12023	90	0.0075	1.0000	1.266	F	1.2659	0.009	1.2749					
																1.2754	12068	550	0.0405	13582.	9462.

OR-0339 VOL 2.

374093

APPENDIX NO. 7

Lithological Description

Lithological Description

374094

Based on cores, sidewall cores, log interpretation and cuttings descriptions. The latter were submitted to the B.M.R. as progress material during the drilling of the well.

(All depths in feet K.B.).

772 - 2358	CALCIRUDITE, white to grey, cream, unconsolidated, bioclastic, mainly bryozoal fragments with some complete, well preserved foraminifera.
2358 - 2545	CALCARENITE, light grey, fossiliferous, glauconitic, silty, with pelagic foraminiferal molds.
2545 - 4120	MARL, light to mid grey, very soft to firm, dense, abundantly flecked with microfossils, chiefly foraminifera. Minor dolomitic streaks.
4120 - 4177	MARL, light to mid grey, very soft to firm, dense, abundantly flecked with microfossils, chiefly foraminifera, silty.
4177 - 5617	SILTSTONE, dark grey to brown, soft to firm, slightly to very calcareous, grading to marl, glauconitic, pyritic in part, minor dolomitic streaks.
5617 - 6723	SILTSTONE, dark grey to brown, soft to firm, slightly to very calcareous, grading to marl, micaceous, glauconitic, pyritic in part, minor dolomitic streaks.
6723 - 6903	SANDSTONE, light grey to dark brown, greenish in part, firm to hard, mostly very fine to medium grained though very coarse in part, micaceous, variably glauconitic, in part calcareous and dolomitic minor COAL, black, silty.
6903 - 7148	Interbedded SANDSTONE, SILTSTONE and MUDSTONE. SANDSTONE, greenish grey to light brown, firm to friable, fine to medium grained, carbonaceous and dolomitic in part. Pale yellow fluorescence in sample from 6950 - 6960. SILTSTONE, white to light brown, firm to soft, in part thinly interbedded with MUDSTONE, brown, soft, silty.

7148 - 7569	SANDSTONE, light brown, hard, very fine, micaceous, silty, carbonaceous, in part dolomitic, DOLOMITE, tan, hard, coarsely crystalline, strong yellow mineral fluorescence. SAND, clear to milky quartz, coarse, subrounded to rounded. Minor SILTSTONE, white to light brown, firm to soft. Minor MUDSTONE, brown, soft, silty. Minor COAL.
7569 - 8340	Interbedded SANDSTONE, SAND, SILTSTONE, MUDSTONE and COAL. SANDSTONE, white to light brown, firm to hard, very fine to medium, silty, micaceous, argillaceous. SAND, white, clear milky quartz, medium to coarse. SILTSTONE, white to dark brown, firm to hard, micaceous, variably carbonaceous, grading to coal in part. MUDSTONE, light to dark brown, soft, silty, variably carbonaceous. COAL, black, conchoidal fracture.
8340 - 8477	MUDSTONE, firm, slightly fissile, silty. Minor COAL, black, sooty, slightly fissile resinous.
8477 - 8919	Interbedded SANDSTONE, SILTSTONE, MUDSTONE and COAL. SANDSTONE, tan to light brown, firm to hard very fine to fine, silty, partly friable, partly well cemented. Glauconitic, pyritic and argillaceous (clay choked) in part. Dull bluish fluorescence in sandstone at 8878. SILTSTONE, dark brown, firm to hard, micaceous, variably carbonaceous, glauconitic in part. MUDSTONE, chocolate brown to grey, soft to firm, fissile in part, micaceous. COAL, black, friable sooty.
8919 - 9514	MUDSTONE, dark brown, soft to firm, slightly fissile in part, carbonaceous, micaceous. Minor interbedded SANDSTONE, white to light grey, firm to soft, calcareous in part, carbonaceous, slightly glauconitic in part, slightly micaceous, limonitic in part, fine to medium grained, well cemented in part, tight. Limonitic in part. Yellow fluorescence in sandstone at 9447, 9451 and 9180 feet (K.B.).

	Minor interbedded SILTSTONE, grey to light brown, firm, slightly micaceous, slightly carbonaceous, rare pyrite filled burrow-like structures, some carbonaceous bedding planes.
9514 - 9918	Interbedded SANDSTONE, SILTSTONE, MUDSTONE and COAL. SANDSTONE, cream to brown, soft to firm, medium to fine, carbonaceous in part, micaceous, clay choked in part, well cemented in part, slightly calcareous, pale blue to bright yellow fluorescence, weak to strong, fast cut. SILTSTONE, grey to light brown, firm, slightly carbonaceous. MUDSTONE, grey to chocolate brown, soft to hard (conchoidal fracture). COAL, black, hard to friable, waxey, conchoidal fracture.
9918 - 10327	Interbedded SILTSTONE, SANDSTONE and SHALY MUDSTONE. SILTSTONE, brown, soft, clayey, carbonaceous. SANDSTONE, cream to brown, soft to firm, medium to fine, micaceous, argillaceous, well cemented in part. SHALY MUDSTONE, chocolate brown, soft to firm, fissile in part.
10327 - 10703	VOLCANICS, weathered and unweathered, green to grey, very soft to hard, chloritic kaolinitic, associated with coarsely crystalline calcite.
10703 - 10886	Interbedded SANDSTONE and SILTSTONE. SANDSTONE, buff, silty, very fine to very coarse, calcareous, carbonaceous, micaceous, lithic, minor fluorescence and cut. SILTSTONE, white, grey and brown, clayey.
10886 - 11361	VOLCANICS, weathered and unweathered, very soft to hard, green to grey, also mottled with cream and red, calcareous, kaolinitic.
11361 - 11397	SILTSTONE, dark grey to chocolate brown, very clayey, moderately soft.
11397 - 11441	VOLCANICS, weathered and unweathered, mottled green and grey green with minor red and brown, soft to hard, calcite veinlets.
11441 - 11471	SANDSTONE, light green to brown, medium to coarse, clay choked, silty.

11471 - 11848	VOLCANICS, weathered and unweathered, dark grey to light green, calcite amygdules and veinlets. Weathered zones are soft, kaolinitic, calcareous.
11848 - 11920	SANDSTONE, white to light brown, firm to soft, fine to coarse, clay choked, carbonaceous, lithic, in part well cemented, slightly calcareous and pyritic in part.
11920 - 12112	VOLCANICS, weathered and unweathered, dark grey to light green, kaolitic in part, calcareous.

374098

Additional Drilling Information & Logs

DA

374099

BAROID DIVISION
N L INDUSTRIES, INC.

ADT REPORT

Report No. 15

Time 0600

Date APRIL 2, 1974

OPERATOR HEMATITE PETROLEUM		WELL NAME & NO. AROO #1
Depth 9,825'	Contractor GLOBAL MARINE	Parish-Offshore Area BASS BASIN
Operation DRILLING	Rig No. CONCEPTION / Start Date APR 9 '74	Field ~~or Block No.~~ AROO W/C
ADT Engineer CHARLES ASKEW PE	Sec. — Twp — Rng. —	State TASMANIA

LOGGING DATA							
Trip Chloride	4500	ppm	Drill Rate 20.7 AVG	Ft. Hr. ~~Min. Ft.~~	GAS		
Lag Down D. P.	813	Strokes	"d" Exponent 1.59-1.98		Background 5-10 UNITS		
Lag Off Bottom	2,610	Strokes	Shale Density 2.52	gm/cc	Connection NONE		
			Shale Factor 1-2	ml. /gm	Trip 45 UNITS		

BIT DATA	Type	Size	Jets	Hours	Feet Drilled	Depth Out	Avg. Ft. /Hr.	Condition T-B-G
Bit No 11	XDV	8½"	2-13/32 & 1-11/32	6.7	139	—	20.7	—
Last Bit No. 10	XD7	12¼"	3-14/32	8.2	116'	9686'	13.2	2-2-I

DRILLING DATA 278' 17.625" ID RISER 79.20' 6.5" OD BUMPER SUBS 2.75" ID

DRILL PIPE			DRILL COLLARS				Weight On Bit 40K lbs.
Weight (lbs. /ft.) HW 50.0 / 19.5	Capacity 0.0087 / 0.01776 bbl. /ft.		Weight (lbs. /ft.) 92	Capacity 0.0073 bbl. /ft			Rotary Speed 80 RPM.
O. D 5.0 HW / 5.0 in.	Disp. 0.0156 / 0.0075 bbl. /ft.		O. D. 6.5 in.	Disp. 0.0337 bbl. /ft.			Hook Load 220K lbs.
I. D. 3.0 HW / 4.276 in.	Length 305 / 8,909 ft.		I. D. 2.75 in.	Length 522.69 ft.			BHA - 611.19

PUMPS	Size	Bbls. /Cycle	Cycles /Min	Bbls. /Min.	Gal./Min.	Pressure	Reduced Rate
No. 1	6¾ x 16	0.203	62	12.58	529	2,500	psi @ cpm
No. 2	6¾ x 16	0.203					psi @ cpm

CASING	SURFACE	INTERMEDIATE	LINER
Size I.D. - O.D.	12.415" - 13.375"	8.681" - 9.625"	
Weight (lbs./ft.)	68.0	47.0	
Depth	2,979' KB	9635' KB - 9357'	
Volume (bbls./ft.)	0.1497	0.0732	

ANNULAR VOLUMES		
Between Drill Pipe & Casing —	0.0489	bbls./ft.
Between Drill Pipe & Open Hole —	0.0459	bbls./ft.
Between Drill Pipe & Liner —		bbls./ft.
Between Drill Collars & Open Hole —	0.0292	bbls./ft.

MUD DATA		Type: LIGNOSULFONATE		Flowline Temp. 140 °F			COST
Time	0600	Vis - 44 SEC/QT	Oil-Water-Solids	0 - 91 - 9			Daily $ 596.40
Weight - In/Out	9.8 / 9.8	pH / 12.5	API Filtrate Cake	9.0 / 2/32"	/		Total $ 22,189.55
PV/YP	12 / 7	SAND / Tr. %	HT-HP Filtrate @ 250 °F	14.4			Per bbl./day
Gels 0/10 Min.	0 / 8	/	Avg. Sp. Gr. Solids	2.95			40.53
E. C. D.	10.2		Chloride Ion. Conc.	4500			1120 BBL AVG.

HYDRAULICS — ANNULAR VELOCITY: 17.625" ID RISER - 45 FT/MIN

PRESSURE DROP			Jet Velocity 415 ft. sec	Est. Fracture Pressure @ Casing Seat
Surface Equipt. -	100	psi	Annular Velocity D.P. 256 D.C. 432	9635' - 7515 psi = 15.0 ppg.
Drill String	720	psi	Hydraulic Horsepower - —	Est. Formation Pore Pressure
Bit Jets	1,484	psi	Surge Pressure @ Casing Seat @ 10 Sec Std	9825' 4598 psi = 9.0 ppg.
Annulus	196	psi	5614 psi = 11.2 ppg	Critical Velocity D.P. 190 D.C. 211

RECOMMENDATIONS

Mud weight 9.8-10.0 ppg.	Pipe ~~Casing~~ Speed 15 sec. ~~min.~~ std.	Rotary Speed — RPM	W.O.B. — lbs.

ACTIVITY & REMARKS

MARCH 26 - RAN ISF-SONIC, FDC-CNL, AND DIPMETER. MADE TRIP IN HOLE TO CONDITION MUD AND HOLE. TRIP GAS - 50 UNITS

MARCH 27 - POH AND RAN VELOCITY SURVEY, MICRO-LATERAL LOG, AND TOOK SIDE WALL CORES - 2 GUNS. GIH TO CONDITION MUD AND HOLE.

MARCH 28 - CONDITION MUD AND HOLE. TRIP GAS - 55 UNITS. POH AND RUN FIT's FIT #1 - 9530' - SHUT IN PRESSURE - 4444 psi - 8.96 #/GAL EQUIV.. INITIAL HYDROSTATIC - 4917 psi - 9.9 #/GAL EQUIV.. FINAL HYDROSTATIC - 4886 psi - 9.8 #/GAL EQUIV. ~~FAILED TO RUN~~. FIT #2 - 9133' - SHUT IN PRESSURE - 3966 psi - 8.35 #/GAL EQUIV.. INITIAL HYDROSTATIC - 4720 psi - 9.9 #/GAL EQUIV.. FINAL HYDROSTATIC - 4702 psi - 9.9 #/GAL EQUIV. GIH TO CONDITION MUD & HOLE - TRIP GAS - 60 UNITS.

MARCH 29 - CIRCULATE AND CONDITION MUD AND HOLE. POH AND RUN 9⅝" CASING.

MARCH 30 - RUN AND CEMENT 9⅝" CASING AT 9635' KB. TEST BOP's - NEG. PULL FOR REPAIRS.

MARCH 31 - REPAIR SHEAR RAMS. RUN STACK - HUNG UP ON W/B. PULL STACK & RETRIEVE W/B.

APRIL 1 - RUN STACK & RISER, TEST C & K LINES AND CASING. RUN W/B, GIH & DRILL OUT CMT. TEST FORMATION TO 15.0 PPG EQUIV. - O.K. DRILLING AHEAD. MIDNIGHT DEPTH - 9713

APRIL 2 - DRILLING AHEAD WITH BIT #11.

BB 6008 A

DA

AGNEW-GO-WESTERN PTY. LTD. 374100

WIRELINE SURVEY REPORT

Owner: ESSO AUST LTD Field: ANOO Well No.: 1#

Type and Purpose of Survey: F.I.T. N°1 Date: 28·3·74

Instrument No.: 8282 Type: ALMADA Range: 11,500

Recorder No.: 23877 T.L.S.: 7½ Clock No.: 11994 Range: 12 Hrs.

Clock Wound: Stylus Engaged: 0508. Stylus Disengaged:

Maximum Temperature: °F @

TIME	M.D.	TVD	Defl. + Base	True Defl.	K	P.S.I.G.	GRAD.	REMARKS
0545								RUN IN HOLE
				·1800		4917·1		INITIAL HYDROSTATIC
0746	9530'							SET PACKER.
0748				·007		42·0		OPEN TOOL
0749				·007		42·0		
0750				·007		42·0		
0751								FIRE SHAPE CHARGE
0752				·023		139·6		
0757				·017		102·8		
0802				·017		102·8		
0804				·017		102·8		
0805								SEAL TOOL - OPEN SEC.
0806				·007		42·0		
0811				·024		145·7		
0816				·084		522·0		
0821				·209		1297·2		
0826				·378		2331·8		FLOW LINE PLUGGING
0831				·614		3776·2		
0836				·693		4260·4		
0841				·717		4407·5		
0842				·723		4444·3		
0843								SEAL SEC. CHOKE
0844				·795		4886·3		FINAL HYDROSTATIC

Company Representative

Service Co. Supervisor

AGNEW-GO-WESTERN PTY. LTD.

374101

WIRELINE SURVEY REPORT

Owner: ESSO AUST LTD Field: HARO Well No.: 1 #

Type and Purpose of Survey: F.I.T. N° 2 Date: 28.2.74

Instrument No.: 9403 Type: HEWLETT PACKARD Range: 10,300

Recorder No.: 26146 T.L.S.: 7½ Clock No.: 24702 Range: 12 Hrs.

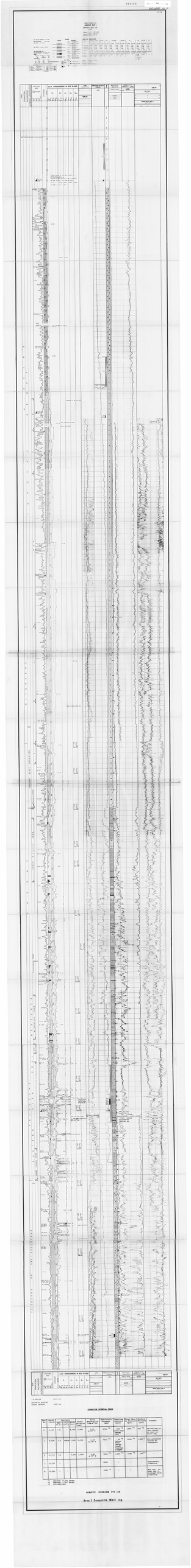
Clock Wound: Stylus Engaged: 1455 Stylus Disengaged: 1720

Maximum Temperature: °F @

TIME	M.D.	TVD	Defl. + Base	True Defl.	K	P.S.I.G.	GRAD.	REMARKS
1505								RUN IN HOLE
				.908		47271		INITIAL HYDROSTATIC
1552	9133.							TIE IN PASSES.
1554								OPEN TOOL
1555				.009		45.5		
1557				.009		45.5		
1559				.009		45.5		
1600								FIRE SHAPE CHARGE
1601								
1602								
1603								UNABLE TO READ CHART THROUGH THIS PERIOD. STYLUS NOT SCRIBING
1604								
1605								
1606				.763		39694		
1608				.764		3974.0		
1610				"		"		
1612				"		"		
1614				"		"		
1616				"		"		
1617								SEAL TOOL
1619				.90		4700.9		FINAL HYDROSTATIC - UNSEAT TOOL.

Company Representative

Service Co. Supervisor



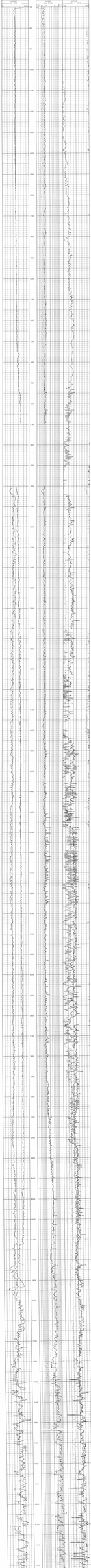
FORMATION INTERVAL TESTS

Run No.	Depth (m)	Recovery Gas (cu. ft.)	Recovery Oil (bbls)	Recovery Water (bbls)	Remarks	Bottom Hole Temperature (°F)	Initial Shut-in Pressure (psig)	Flow Pressure (psig)	Final Shut-in Pressure (psig)	Comment
1	6,410	1.4	0.1	5,000	Gas to surface in 5 min. Oil to surface in 10 min. Rec. 0.1 bbl oil & 5,000 cc water	222 °F	2,975 psig	2,975 psig	2,975 psig	Interval was dry gas during flow. Oil cut in water.
2	6,230	1.4	0.1	5,000	Gas to surface in 5 min. Oil to surface in 10 min. Rec. 0.1 bbl oil & 5,000 cc water	222 °F	2,975 psig	2,975 psig	2,975 psig	Oil, gas-cut mud. Chlorides 44,000 ppm.
3	6,230	1.4	0.1	5,000	Gas to surface in 5 min. Oil to surface in 10 min. Rec. 0.1 bbl oil & 5,000 cc water	222 °F	2,975 psig	2,975 psig	2,975 psig	Oil, gas-cut mud. Chlorides 44,000 ppm.
4	6,230	-	-	-	Gas to surface in 5 min. Oil to surface in 10 min. Rec. 0.1 bbl oil & 5,000 cc water	222 °F	2,975 psig	2,975 psig	2,975 psig	Oil, gas-cut mud. Chlorides 44,000 ppm.
5	6,230	-	-	-	Gas to surface in 5 min. Oil to surface in 10 min. Rec. 0.1 bbl oil & 5,000 cc water	222 °F	2,975 psig	2,975 psig	2,975 psig	Oil, gas-cut mud. Chlorides 44,000 ppm.
6	6,230	-	-	-	Gas to surface in 5 min. Oil to surface in 10 min. Rec. 0.1 bbl oil & 5,000 cc water	222 °F	2,975 psig	2,975 psig	2,975 psig	Oil, gas-cut mud. Chlorides 44,000 ppm.

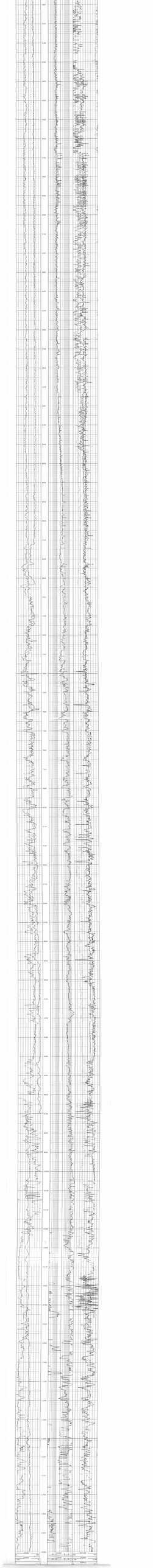
Note: Rec. - Recovered
BHT - Bottom Hole Temperature
IHP - Initial Hydrostatic Pressure
IFP - Initial Flow Pressure
ISIP - Initial Shut-in Pressure
FFP - Final Flow Pressure
FSIP - Final Shut-in Pressure

SCHLUMBERGER OVERSEAS S.A.

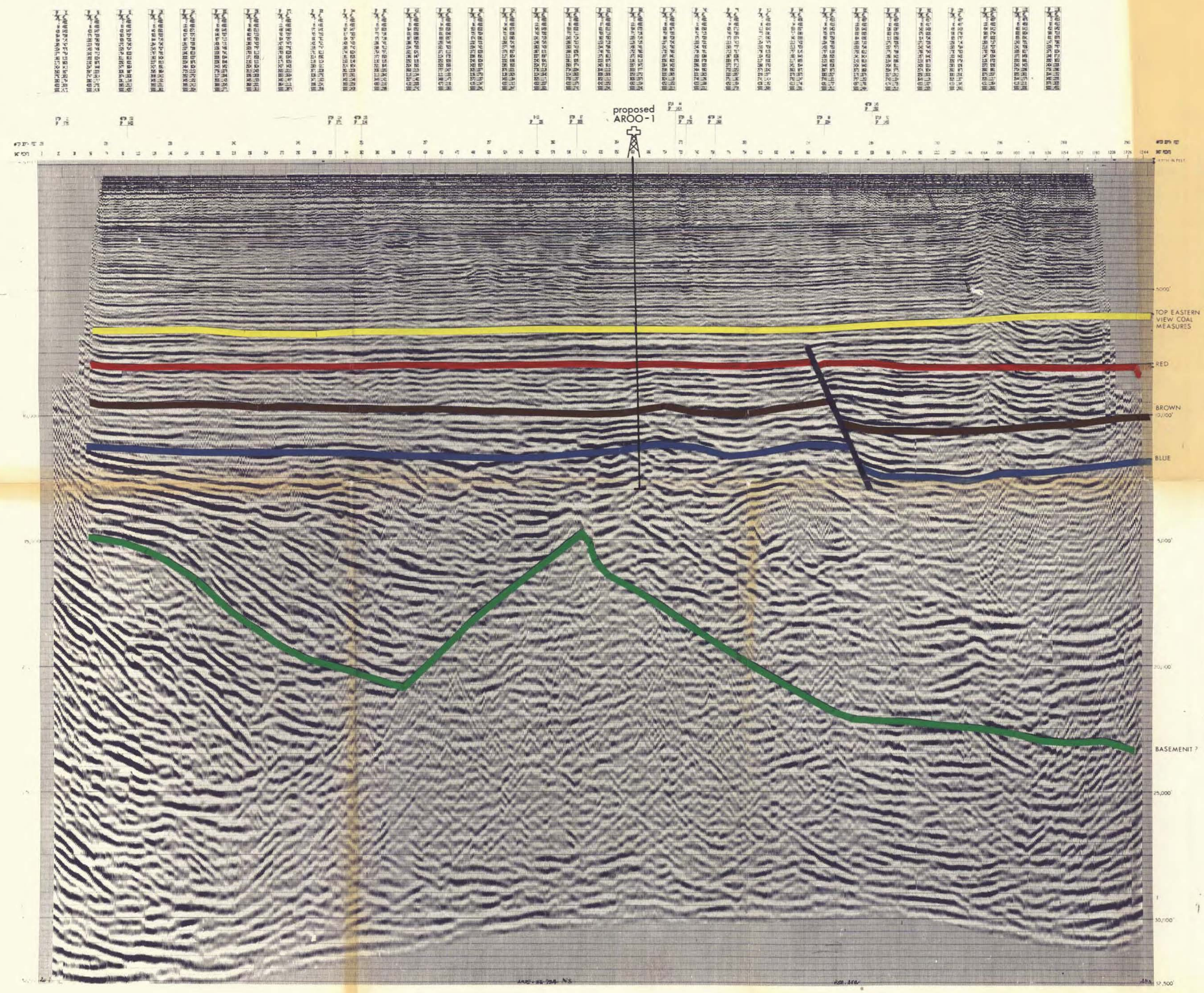
Area.1 Composite Well Log



Enclosure 3a
CALCOMP
CONTINENTAL SHELF
WELL PRODUCTION COMPANY
ARMOUR PETROLEUM CORPORATION
WELL 1



OFFSHORE 38



HEMATITE PETROLEUM PTY. LTD.

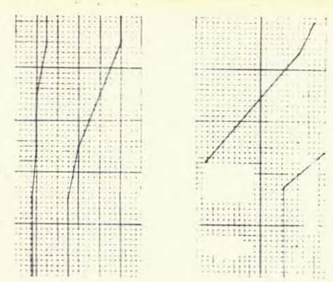
FLINDERS SEISMIC SURVEY

HB-73A-143

FIELD DATA Shot By Geo Party 93, M.J. McDermott
Recorded 48 Trace DFS III L.P. System
Sample Rate 4 msecs Record Length 5 secs
Filter HI 62 Hz / 72 db/oct, LO 8 Hz / 18 db/oct
Gain Binary
Energy Source Airgun, 1200 cub in
Source Depth 30 - 35 ft Streamer Depth 55 - 60 ft
Group Interval 219 ft Shot Interval 73 ft
Streamer 3200 m, 48 groups, towing group 48
Average Offset to centre of group 48 955 ft
Date Sept '73

PROCESSING INFORMATION
1. True Amplitude Recovery
2. Vertical Stack (3 on 1)
3. Deconvolution Before Stack
   Gap = 0 msec
   2 Operators / Trace, 64 pts
4. 24 Fold Common Depthpoint Gather
5. Sealevel Static and Airgun Delay Corrections
6. Preliminary Normal Moveout Corrections
7. Preliminary 24-Fold Stack of Alternate Depthpoints
8. Velocity Analysis Continuous 700 Pkg on Alternate Depthpoints
9. Normal Moveout Corrections
10. 24 Fold CDP Stack
11. Deconvolution After Stack, 2 Operators / Trace, 70 pts
    Gap = 0 msecs
12. Time Variant Filter
13. Time Migration
14. Depth Conversion

15. Display Normal Polarity, 10 traces/cm (1.06 miles/inch) Horizontal Scale
V/H = 2:1



Jan. '74

5 cm

374104

OG 3346

OR-0399 Vol II

Encl. 2

BAROID ppm LOG

WELL: ARCO, INC.
FIELD: WILDCAT
COUNTY: JEFFERSON
STATE: TEXAS

API SERIAL NUMBER
LOCATION
SEC. TWP. RGE.
PERMANENT DATUM
LOG MEASURED FROM
DRILLING MEASURED FROM

ELEVATION: K.B. 20' G.L. 10'
D.F. 19'
RUN NO. ONE
DATE LOGGED
DEPTH DRILLER
DEPTH LOGGER
BTM. LOG INTERVAL
TOP LOG INTERVAL
CASING DRILLER
CASING LOGGER
BIT SIZE
TYPE MUD
MUD DENSITY
MUD VISCOSITY
MUD PH
FLUID LOSS
SOURCE OF SAMPLE
RM @ MEAS. TEMP.
RMF @ MEAS. TEMP.
RMC @ MEAS. TEMP.
SOURCE RMF & RMC
RM @ BHT
TIME SINCE CIRC.
TIME ON BOTTOM
MAX. REC. TEMP.
EQUIP. LOCATION
RECORDED BY
WITNESSED BY

LEGEND

LITHOLOGY
SAND
SHALE
LIMESTONE
DOLOMITE
ANHYDRITE
GYPSUM
COAL OR LIGNITE
IGNEOUS ROCK
CONGLOMERATE

ABBREVIATIONS

DIA - DIAMETER	
DEV - DEVIATION	
MEAS - MEASURED	
DRILLED INTERVAL - DRILLED	
CSG - CASING	
CSGD - CASED	
OPEN HOLE - UNCASED	
DEPTH CORRECTION - CORR	

TRACK 1

DEPTH IN FEET
1" = 100'

TRACK 2

GAMMA RAY (API UNITS)
0 — 100

TRACK 3

RESISTIVITY (OHMS)
0.2 — 2000

TRACK 4

ppm HYDROCARBONS IN MUD
0 — 1000

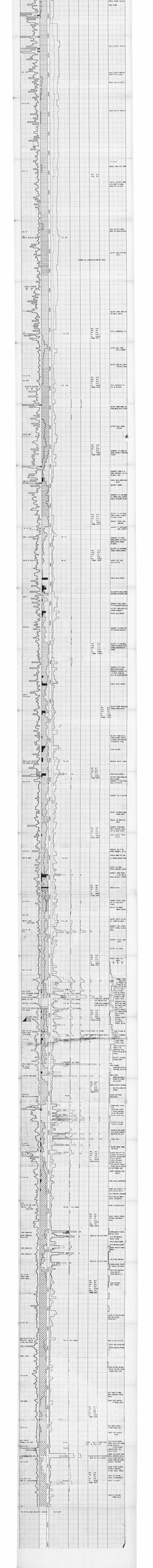
CURRENT ANALYSIS

DEPTH	GAS UNITS	TYPE GAS

TRACK 5

DEPTH IN FEET
1" = 100'

CASING SHOE @ 1450 ppm, FORMAT TOP @ 1450 ppm
CASING SHOE @ 1450 ppm, FORMAT TOP @ 1450 ppm
MUD WT. 9.0 PPG
MUD WT. 9.0 PPG
MUD WT. 9.0 PPG



145°15' 20' 25' 30' 35' 145°40'
39°34'
350000 m.E. 360000 m.E. 370000 m.E. 380000 m.E.
40' 45' 50' 55'
5 610 000 m.N. 5 600 000 m.N. 5 590 000 m.N. 5 580 000 m.N.
40°00'

Cormorant

Aroo 1 (Proposed)

7000 7200 7250 7500 7750 7900 8000 8050 8100 8150 8250 8300

H H H H H H

L L L L L L L L

Bass 3

Scale 1 : 50 000

MILES 0 1 2 3

KILOMETRES 0 1 2 3 4

Compiled by Hematite Petroleum Pty Ltd

Projection UTM Zone 55 C.M. 147°E

VICTORIA

TASMANIA

Sheet index

7720 7719 7718 7717 7817 7816 7916 8016 8116 8216 8316 8416 8516 8115 8215

144° 148° 39° 41°

LEGEND

- Oil Well
- Gas Well
- Oil & Gas Well
- Oil show
- Gas show
- Oil & Gas shows
- Drilling
- Dry hole (Abandoned

HEMATITE PETROLEUM PTY. LTD.

BASS BASIN

AROO PROSPECT

RED HORIZON

Contours in feet below sea level Contour Interval 50 feet

Author E Urschel Date November 1973

5 cm

374106

Encl. 6 OG 3259

OR-0039 Vol II

145°15' 20' 25' 30' 35' 145°40'
39°34'
40°00'

360000 m.E. 370000 m.E. 380000 m.E.

5 610 000 m.N. 5 600 000 m.N. 5 590 000 m.N. 5 580 000 m.N.

Cormorant 1

Aroo 1

FAULT ZONE

8000 8250 8300 8500 8600 8700 8800 8200

H L U D

Bass 3

Scale 1 : 50 000

MILES 0 1 2 3

KILOMETRES 0 1 2 3 4

Compiled by Hematite Petroleum Pty. Ltd.

Projection UTM Zone 55 C.M. 147°E

VICTORIA TASMANIA

Sheet index

7720 7719 7718 7717 7817 7816 7916 8016 8116 8216 8316 8416 8516 8515 8215

144° 148° 39° 41°

LEGEND

- Oil Well
- Gas Well
- Oil & Gas Well
- Oil show
- Gas show
- Oil & Gas shows
- Drilling
- Dry hole (Abandoned

THE BROKEN HILL PROPRIETARY CO. LTD.

OIL AND GAS DIVISION

(HEMATITE PETROLEUM PROPRIETARY LIMITED)

Bass Basin

AROO STRUCTURE

ORANGE HORIZON

Contour Interval : 50' Datum : Sea level

Author : M. McNicol Date : July, 1974

5 cm

374107

Encl. 7 OG 3241

OR-0339 Vol 2.

145°15' 20' 25' 30' 35' 145°40'
39°34'

350000 m.E. 360000 m.E. 370000 m.E. 380000 m.E.

5 610 000 m.N.

40'

5 600 000 m.N.

45'

5 590 000 m.N.

50'

5 580 000 m.N.

55'

40°00'

Cormorant H1

Aroo 1

FAULT ZONE

10 250
10000
10150
9750
9600
9850
10500
10750
11000
11250

Bass 3

Line B—2 Line B—21 Line B—14 Line B—10 Line B—3 Line B—20 Line B—15
Line EB—8 Line EB—7 Line EB—11 Line EB—13 Line EB—16 Line EB—19
Line EK—33 Line EK—35 Line EK—36 Line EK—37

B 72A—83 B 72A—84 B 72A—85 B 72A—86 B 72A—87 B 72A—88 B 72A—89 B 72A—90 B 72A—91 B 72A—92 B 72A—93 B 72A—94 B 72A—95 B 72A—96
B 69B—10 B 69B—11 B 69B—12
B 71A—36 B 71A—44 B 71A—50 B 71A—51 B 71A—52 B 71A—56
B 70A—24 B 70A—27 B 70A—28 B 70A—21 B 70A—17
HB 73A—156 HB 73A—157 HB 73A—142 HB 73A—145 HB 73A—150 HB 73A—151 HB 73A—153 HB 73A—154 HB 73A—155 HB 73A—137
HB 73A—87 HB 73A—132 HB 73—154

Scale 1 : 50 000

MILES 0 1 2 3

KILOMETRES 0 1 2 3 4

Compiled by Hematite Petroleum Pty. Ltd

Projection UTM Zone 55 C.M. 147°E

VICTORIA

TASMANIA

Sheet index

7720 7719 7718 7717 7817 7816 7916 8016 8116 8216 8316 8416 8516 8215 8115

144° 148° 39° 41°

LEGEND

- Oil Well
- Gas Well
- Oil & Gas Well
- Oil show
- Gas show
- Oil & Gas shows
- Drilling
- Dry hole (Abandoned

THE BROKEN HILL PROPRIETARY CO. LTD.

OIL AND GAS DIVISION

(HEMATITE PETROLEUM PROPRIETARY LIMITED)

Bass Basin

AROO STRUCTURE

BROWN HORIZON

Contour Interval : 50' Datum : Sea level

Author : M. McNicol Date : July, 1974

5 cm

Encl. 8 OG 3257a

OR-0399 Vol II

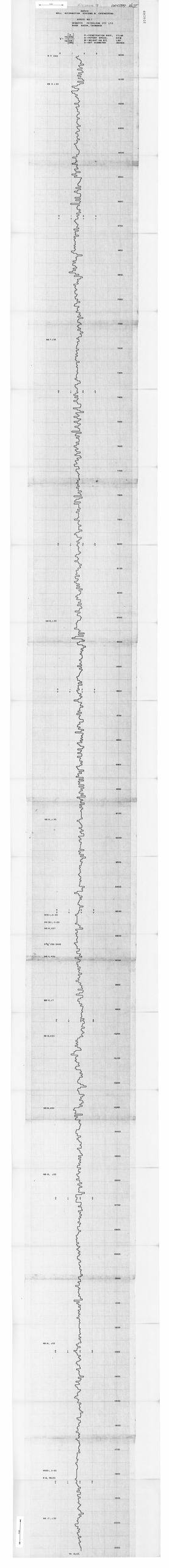
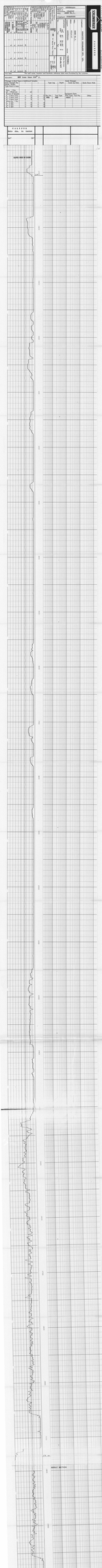


Exhibit 9
CASE NO.
SCHLUMBERGER
WELL INFORMATION RECORDED ON CARTRIDGE
CARTRIDGE NO.
FORMATION : PETROLEUM PTY LTD
BASE BASIN, TASMANIA
R = PENETRATION RATE, FT/HR
WOB = WEIGHT ON BIT, 1,000 LBF
RPM = ROTARY SPEED, REVOLUTIONS PER MINUTE
BIT = BIT DIAMETER, INCHES
WOB 4,000
WOB 7,000
WOB 9,000
WOB 11,000
WOB 13,000
WOB 15,000
WOB 17,000
WOB 19,000
WOB 21,000
WOB 23,000
WOB 25,000
WOB 27,000
WOB 29,000
WOB 31,000
WOB 33,000
WOB 35,000
WOB 37,000
WOB 39,000
WOB 41,000
WOB 43,000
WOB 45,000
WOB 47,000
WOB 49,000
WOB 51,000
WOB 53,000
WOB 55,000
WOB 57,000
WOB 59,000
WOB 61,000
WOB 63,000
WOB 65,000
WOB 67,000
WOB 69,000
WOB 71,000
WOB 73,000
WOB 75,000
WOB 77,000
WOB 79,000
WOB 81,000
WOB 83,000
WOB 85,000
WOB 87,000
WOB 89,000
WOB 91,000
WOB 93,000
WOB 95,000
WOB 97,000
WOB 99,000
WOB 101,000
WOB 103,000
WOB 105,000
WOB 107,000
WOB 109,000
WOB 111,000
WOB 113,000
WOB 115,000
WOB 117,000
WOB 119,000
WOB 121,000
WOB 123,000
WOB 125,000
WOB 127,000
WOB 129,000
WOB 131,000
WOB 133,000
WOB 135,000
WOB 137,000
WOB 139,000
WOB 141,000
WOB 143,000
WOB 145,000
WOB 147,000
WOB 149,000
WOB 151,000
WOB 153,000
WOB 155,000
WOB 157,000
WOB 159,000
WOB 161,000
WOB 163,000
WOB 165,000
WOB 167,000
WOB 169,000
WOB 171,000
WOB 173,000
WOB 175,000
WOB 177,000
WOB 179,000
WOB 181,000
WOB 183,000
WOB 185,000
WOB 187,000
WOB 189,000
WOB 191,000
WOB 193,000
WOB 195,000
WOB 197,000
WOB 199,000
WOB 201,000
WOB 203,000
WOB 205,000
WOB 207,000
WOB 209,000
WOB 211,000
WOB 213,000
WOB 215,000
WOB 217,000
WOB 219,000
WOB 221,000
WOB 223,000
WOB 225,000
WOB 227,000
WOB 229,000
WOB 231,000
WOB 233,000
WOB 235,000
WOB 237,000
WOB 239,000
WOB 241,000
WOB 243,000
WOB 245,000
WOB 247,000
WOB 249,000
WOB 251,000
WOB 253,000
WOB 255,000
WOB 257,000
WOB 259,000
WOB 261,000
WOB 263,000
WOB 265,000
WOB 267,000
WOB 269,000
WOB 271,000
WOB 273,000
WOB 275,000
WOB 277,000
WOB 279,000
WOB 281,000
WOB 283,000
WOB 285,000
WOB 287,000
WOB 289,000
WOB 291,000
WOB 293,000
WOB 295,000
WOB 297,000
WOB 299,000
WOB 301,000
WOB 303,000
WOB 305,000
WOB 307,000
WOB 309,000
WOB 311,000
WOB 313,000
WOB 315,000
WOB 317,000
WOB 319,000
WOB 321,000
WOB 323,000
WOB 325,000
WOB 327,000
WOB 329,000
WOB 331,000
WOB 333,000
WOB 335,000
WOB 337,000
WOB 339,000
WOB 341,000
WOB 343,000
WOB 345,000
WOB 347,000
WOB 349,000
WOB 351,000
WOB 353,000
WOB 355,000
WOB 357,000
WOB 359,000
WOB 361,000
WOB 363,000
WOB 365,000
WOB 367,000
WOB 369,000
WOB 371,000
WOB 373,000
WOB 375,000
WOB 377,000
WOB 379,000
WOB 381,000
WOB 383,000
WOB 385,000
WOB 387,000
WOB 389,000
WOB 391,000
WOB 393,000
WOB 395,000
WOB 397,000
WOB 399,000
WOB 401,000
WOB 403,000
WOB 405,000
WOB 407,000
WOB 409,000
WOB 411,000
WOB 413,000
WOB 415,000
WOB 417,000
WOB 419,000
WOB 421,000
WOB 423,000
WOB 425,000
WOB 427,000
WOB 429,000
WOB 431,000
WOB 433,000
WOB 435,000
WOB 437,000
WOB 439,000
WOB 441,000
WOB 443,000
WOB 445,000
WOB 447,000
WOB 449,000
WOB 451,000
WOB 453,000
WOB 455,000
WOB 457,000
WOB 459,000
WOB 461,000
WOB 463,000
WOB 465,000
WOB 467,000
WOB 469,000
WOB 471,000
WOB 473,000
WOB 475,000
WOB 477,000
WOB 479,000
WOB 481,000
WOB 483,000
WOB 485,000
WOB 487,000
WOB 489,000
WOB 491,000
WOB 493,000
WOB 495,000
WOB 497,000
WOB 499,000
WOB 501,000
WOB 503,000
WOB 505,000
WOB 507,000
WOB 509,000
WOB 511,000
WOB 513,000
WOB 515,000
WOB 517,000
WOB 519,000
WOB 521,000
WOB 523,000
WOB 525,000
WOB 527,000
WOB 529,000
WOB 531,000
WOB 533,000
WOB 535,000
WOB 537,000
WOB 539,000
WOB 541,000
WOB 543,000
WOB 545,000
WOB 547,000
WOB 549,000
WOB 551,000
WOB 553,000
WOB 555,000
WOB 557,000
WOB 559,000
WOB 561,000
WOB 563,000
WOB 565,000
WOB 567,000
WOB 569,000
WOB 571,000
WOB 573,000
WOB 575,000
WOB 577,000
WOB 579,000
WOB 581,000
WOB 583,000
WOB 585,000
WOB 587,000
WOB 589,000
WOB 591,000
WOB 593,000
WOB 595,000
WOB 597,000
WOB 599,000
WOB 601,000
WOB 603,000
WOB 605,000
WOB 607,000
WOB 609,000
WOB 611,000
WOB 613,000
WOB 615,000
WOB 617,000
WOB 619,000
WOB 621,000
WOB 623,000
WOB 625,000
WOB 627,000
WOB 629,000
WOB 631,000
WOB 633,000
WOB 635,000
WOB 637,000
WOB 639,000
WOB 641,000
WOB 643,000
WOB 645,000
WOB 647,000
WOB 649,000
WOB 651,000
WOB 653,000
WOB 655,000
WOB 657,000
WOB 659,000
WOB 661,000
WOB 663,000
WOB 665,000
WOB 667,000
WOB 669,000
WOB 671,000
WOB 673,000
WOB 675,000
WOB 677,000
WOB 679,000
WOB 681,000
WOB 683,000
WOB 685,000
WOB 687,000
WOB 689,000
WOB 691,000
WOB 693,000
WOB 695,000
WOB 697,000
WOB 699,000
WOB 701,000
WOB 703,000
WOB 705,000
WOB 707,000
WOB 709,000
WOB 711,000
WOB 713,000
WOB 715,000
WOB 717,000
WOB 719,000
WOB 721,000
WOB 723,000
WOB 725,000
WOB 727,000
WOB 729,000
WOB 731,000
WOB 733,000
WOB 735,000
WOB 737,000
WOB 739,000
WOB 741,000
WOB 743,000
WOB 745,000
WOB 747,000
WOB 749,000
WOB 751,000
WOB 753,000
WOB 755,000
WOB 757,000
WOB 759,000
WOB 761,000
WOB 763,000
WOB 765,000
WOB 767,000
WOB 769,000
WOB 771,000
WOB 773,000
WOB 775,000
WOB 777,000
WOB 779,000
WOB 781,000
WOB 783,000
WOB 785,000
WOB 787,000
WOB 789,000
WOB 791,000
WOB 793,000
WOB 795,000
WOB 797,000
WOB 799,000
WOB 801,000
WOB 803,000
WOB 805,000
WOB 807,000
WOB 809,000
WOB 811,000
WOB 813,000
WOB 815,000
WOB 817,000
WOB 819,000
WOB 821,000
WOB 823,000
WOB 825,000
WOB 827,000
WOB 829,000
WOB 831,000
WOB 833,000
WOB 835,000
WOB 837,000
WOB 839,000
WOB 841,000
WOB 843,000
WOB 845,000
WOB 847,000
WOB 849,000
WOB 851,000
WOB 853,000
WOB 855,000
WOB 857,000
WOB 859,000
WOB 861,000
WOB 863,000
WOB 865,000
WOB 867,000
WOB 869,000
WOB 871,000
WOB 873,000
WOB 875,000
WOB 877,000
WOB 879,000
WOB 881,000
WOB 883,000
WOB 885,000
WOB 887,000
WOB 889,000
WOB 891,000
WOB 893,000
WOB 895,000
WOB 897,000
WOB 899,000
WOB 901,000
WOB 903,000
WOB 905,000
WOB 907,000
WOB 909,000
WOB 911,000
WOB 913,000
WOB 915,000
WOB 917,000
WOB 919,000
WOB 921,000
WOB 923,000
WOB 925,000
WOB 927,000
WOB 929,000
WOB 931,000
WOB 933,000
WOB 935,000
WOB 937,000
WOB 939,000
WOB 941,000
WOB 943,000
WOB 945,000
WOB 947,000
WOB 949,000
WOB 951,000
WOB 953,000
WOB 955,000
WOB 957,000
WOB 959,000
WOB 961,000
WOB 963,000
WOB 965,000
WOB 967,000
WOB 969,000
WOB 971,000
WOB 973,000
WOB 975,000
WOB 977,000
WOB 979,000
WOB 981,000
WOB 983,000
WOB 985,000
WOB 987,000
WOB 989,000
WOB 991,000
WOB 993,000
WOB 995,000
WOB 997,000
WOB 999,000
WOB 1,001,000
WOB 1,003,000
WOB 1,005,000
WOB 1,007,000
WOB 1,009,000
WOB 1,011,000
WOB 1,013,000
WOB 1,015,000
WOB 1,017,000
WOB 1,019,000
WOB 1,021,000
WOB 1,023,000
WOB 1,025,000
WOB 1,027,000
WOB 1,029,000
WOB 1,031,000
WOB 1,033,000
WOB 1,035,000
WOB 1,037,000
WOB 1,039,000
WOB


CALIBRATION DATA

3741111 Run 1 2357

Enclosed (Dlis)

SCHLUMBERGER

CALIPER LOG

COUNTY AUSTRALIA
FIELD or LOCATION WILDCAT
WELL ABDD 1

COMPANY HEMATITE PETROLEUM PTY. LTD.

COMPANY	HEMATITE PETROLEUM PTY. LTD.
WELL	ABDD No. 1
FIELD	WILDCAT
COUNTY	AUSTRALIA
STATE	TASMANIA
Other Services	GR
Permanent Datum	G.L.
Elev.	117'/97'/89'
Log Measured From	K.B.
Drilling Measured From	K.B.
Date	6-5-74
Run No.	ONE
Depth—Driller	11252
Depth—Logger	11252
Bottom Logged Interval	11252
Top Logged Interval	10400
Type Fluid in Hole	FRESH POLYMER
Salinity, PPM Cl	2000
Density	9.5
Viscosity	45
Fluid Loss	6
Source of Sample	CIRC
Rm @ Meas. Temp.	.45 @ 70°F
Rmf @ Meas. Temp.	.35 @ 70°F
Rmc @ Meas. Temp.	.55 @ 70°F
Source Rmf / Rmc	MEAS / MEAS
Rm @ BHT	.19 @ 220°F
Rmf @ BHT	.14 @ 220°F
Rmc @ BHT	.23 @ 220°F
Time Since Circ.	12 HRS
Max. Rec. Temp.	220°F
Equip. Location	0460
Recorded By	R. SMITH
Witnessed By	MR. BOWDEN

Location: Sec. 15 Twp. 26 Rge. 5 — 30° 02' S, 51° 08' E

FIELD NOTE The well name, location and borehole reference data were furnished by the customer.

REMARKS

Changes in Mud Type or Additional Samples
Date / Sample No.
Depth—Driller
Type Fluid in Hole
Dens. / Visc.
ph / Fluid Loss ml
Source of Sample
Rm @ Meas. Temp. @ °F
Rmf @ Meas. Temp. @ °F
Rmc @ Meas. Temp. @ °F
Source Rmf / Rmc
Rm @ BHT @ °F
Rmf @ BHT @ °F
Rmc @ BHT @ °F

Scale Changes

Type Log	Depth	Scale Up Hole	Scale Down Hole

Run No. ONE
Tool Type FOUR
Equipment Data
Pad Type PAD
Tool Pos. 1.5
Other

CALIPER

DEPTH

HOLE DIAMETER IN INCHES

6" 16" 5"

5 cm

Bit Size

REPEAT SECTION

12" RING

8" RING

Mechanical Zero

CALIBRATION BEFORE SURVEY

CALIBRATION DATA

COMPANY HEMATITE PETROLEUM PTY. LTD.
WELL ABDD 1
FIELD WILDCAT
COUNTY AUSTRALIA STATE TASMANIA

SCHL FB 11,251
SCHL TD 11,250
DRLR TD 11,252
Elev:
KB 32
DF 31
GL -250

5 cm

COUNTY AUSTRALIA
State or Province
LOCATION BLOCK 1
Other Services
COMPANY SUNBATTLE PETROLEUM

Schlumberger

WELL AGOO 1
FIELD WILDCAT
COUNTY SUNBATTLE STATE SUNBATTLE

Company: SUNBATTLE PETROLEUM PTY LTD

FORMATION TESTER

Permanent Datum: GL Elevation: 1,000 ft above Perm. Datum
Log Measured From: KB 12 ft above Perm. Datum
Drilling Measured From: KB

Run No. 1
Depth-Driller 9,530 ft
Depth-Logger 9,530 ft
Bottom Log Interval 9,530 ft
Top Log Interval 9,000 ft
Casing-Driller 13⅜ in @ 3,000 ft
Casing-Logger 3,000 ft
Bit Size 12¼ in
Type Fluid in Hole WATER BASED MUD
Density 10.0 lb/gal
Viscosity 45 s
Fluid Loss 6.0 cc
Source of Sample CIRCULATION
Rm @ Meas. Temp. 0.25 @ 120 °F
Rmf @ Meas. Temp. 0.20 @ 120 °F
Rmc @ Meas. Temp. 0.30 @ 120 °F
Source of Rmf & Rmc MEASURED
Rm @ BHT 0.15 @ 180 °F
Time Since Circulation 24 HOURS
Time on Bottom 24 HOURS
Maximum Recorded Temp. 180 °F
Equipment Number 2
Location 2
Recorded By J. CHISHOLM
Witnessed By J. BARNES

REMARKS:

TEST# 1 VERY LITTLE PERMEABILITY - SHUT IN MUD CHOKED AND SET INTO UP IN DISSOCIATION. ALL PRESSURES RELATIVE TO DISSOCIATION SURFACE.

TEST #2 TWO ATTEMPTS AT THIS DEPTH AND BOTH SET INITIAL SHUT. BOTH MUD CHOKED. SUB CHAMBER SAMPLES IN BOTH SHUT-INS. TOOLS TEST GOOD AT 9530 PROVED SUCCESSFUL. FAIR CHAMBER RUN ONLY.

RECORDED TESTER POSITION

Test No. 1

GAMMA RAY (API) 0 — 100
CASING
PACKER
GAMMA RAY RADIOACTIVITY INCREASES
TOOL SET AT

SURFACE CONTROLS

PAD ACTION
FIRING
PRESSURE HORIZONTAL
STATION NO. (TIME)

PRESSURE RECORDING

PSI x 1000

Test No. 1

CALIBRATION
INITIAL HYDROSTATIC PRESSURE
TOOL SET
FLOW PERIOD
NO PRESS
EXPLOSION PRESSURE
SAMPLE SHOES SQUEEZE(THE SEPARATOR)
SAMPLING PRESSURE
FINAL SHUT-IN PRESSURE
PROVED SHUT-IN PRESSURE
TOOL COLLAPSED TOOL YIELD
HYDROSTATIC PRESSURE

RECORDED TESTER POSITION

Test No. 2

GRADIENTOMETER THERMAL
S.P. (MV) 0 — 100
CASING
PACKER
TOOL SET AT 9530

SURFACE CONTROLS

PAD ACTION
FIRING
PRESSURE HORIZONTAL
STATION NO. (TIME)

PRESSURE RECORDING

PSI x 1000

Test No. 2

CALIBRATION
HYDROSTATIC PRESSURE
TOOL SET
FLOW PERIOD
NO PRESS
SAMPLING PRESSURE
FINAL SHUT-IN PRESSURE
SAMPLE SHOES
PROVED SHUT-IN PRESSURE
TOOL COLLAPSED TOOL YIELD
HYDROSTATIC PRESSURE

FORMATION TESTER RECOVERY DATA

	Test No. 1	Test No. 2
Test No.	1	2
Test Depth	9530	9,133
Open Hole Test	X	
Cased Hole Test		
Pressure Data		
Initial Shut-in	psi	psi
Shut-in Time	min	min
Flow Period	30 min	min
Sampling	1,200 psi	psi
Final Shut-in	1,200 psi	psi
Shut-in Time	1,200 min	min
Hydrostatic	1,200 psi	psi
Surface Chamber	psi	psi

RECOVERY DATA

	Test No. 1	Test No. 2
Gas (Total)	1.8 cuft	cuft
Condensate	TRACE cc	cc
Oil	cc	cc
Water	1,200 cc	cc
Mud	cc	cc
Sand	cc	cc

RECOVERY ANALYSIS

	Test No. 1	Test No. 2
Gas Gravity		
Oil		
API Gravity		
Water	50 ppm Cl	ppm Cl
Mud		
Sand		
Resistivity (Measured)	0.25 @ 80 °F	@ °F
Resistivity (Equivalent)	0.5600 ppm	ppm

TOOL DATA

	Test No. 1	Test No. 2
Type of Test	CASED HOLE	
Type of Sample Shoe	STD SAMPLE SHOES	
Sample Chamber	10,000 PSI 2.125in.	
Choke Size	1/4" 1/2" 3/4" 1"	
Bottom Hole	1/4" 1/2" 3/4" 1"	
Surface	1/4" 1/2" 3/4" 1"	
Recorder Number	10,000 PSI 2,000	
Recorder Depth	9,530 ft	ft

MUD PITTRATE DATA

	Test No. 1	Test No. 2
Mud	10 @ 72	@
Equivalent Cl	9,200 ppm	ppm
Pittrate		
Equivalent Cl	ppm	ppm

REMARKS: ALL PRESSURES RELATIVE TO DISSOCIATION.

COMPANY	SUNBATTLE PETROLEUM PTY LTD
WELL	AGOO 1
FIELD	WILDCAT
COUNTY	SUNBATTLE STATE SUNBATTLE

Schlumberger

FORMATION TESTER

© SCHLUMBERGER 1967

371113 OR-0339 Enclosure IIb

Schlumberger

FORMATION TESTER

COMPANY HEMATITE PETROLEUM PTY. LTD.
WELL AROO No. 1
FIELD WILDCAT
COUNTY AUSTRALIA STATE TASMANIA
LOCATION Sec. 35 Twp. 14S Rge. 26E
30.62 mN S
51.68 mE E
Other Services: FDC/CNL/GR

COUNTY AUSTRALIA
Field or LOCATION WILDCAT
WELL AROO 1
COMPANY HEMATITE PETROLEUM

Permanent Datum: KB Elev. 0
Log Measured From: KB 32 Ft. Above Perm. Datum
Drilling Measured From: KB Elev.: K.B. 32 G.L. -2580

| | | |

3-7114 OR-0339 Enclosure IIc

Schlumberger

FORMATION TESTER

COUNTY AUSTRALIA
Field or LOCATION WILDCAT
WELL ARDO No. 1
COMPANY HEMATITE PETROLEUM PTY LTD

LOCATION 40° 42' 30.60" S
Twp. 146° 26' 51.48" E
Rge.

COMPANY HEMATITE PETROLEUM PTY LTD
WELL ARDO No. 1
FIELD WILDCAT
COUNTY AUSTRALIA
STATE TASMANIA

Other Services: DIFF/RES/GR CALIPER

Permanent Datum: MSL
Log Measured From: K.B. 32 Ft. Above Perm. Datum
Drilling Measured From: K.B.

Elev. K.B. 32
D.F. 32
G.L. -325

Date: 3-7-71
Run No.: ONE
Type of Test: DST
Type Fluid in Hole: LIGHT MUD

Open Hole X | Cased Hole | Open Hole | Cased Hole

BOTTOM HOLE CONDITIONS
Recorded By: C. CHISHOLM
Witnessed By: SAL

RUN No.	Bit From	Bit To	Size	Wgt.	Type Fluid	Visc.	Loss	pH	Fluid Rm @ °F	Rmf @ °F	Rmc @ °F	Source of Sample	Rm @ Meas. Temp.	Rmf @ Meas. Temp.	Rmc @ Meas. Temp.	Time Since Circ.	Max. Rec. Temp. °F	Equip. Location	Recorded By	Witnessed By
ONE	0	11,160	8.5"	9.7	LIGHT MUD	10	5	10				FLOWLINE				7 HOURS	250	SAL	C. CHISHOLM	

CASING RECORD

Size	Wgt.	From	To
9 5/8"	36	0	1005

BORE HOLE RECORD

Bit	From	To
8.5"	1005	11,160

FOLD HERE — The well name, location and borehole reference data were furnished by the customer.

Run No. THREE
Operating rig time 7 HOURS
Logging Truck No. 2080
F.T. Truck No.
F.T. Engineer J. CHISHOLM
F.T. Operator L. BROWNE
Location SAL

REMARKS:
FIRST RUN TEST #4 NO SEAL WHEN TOOL SET, LATER RUN WITH CALIPER SHOWED WASH OUT.

SURFACE CONTROLS
PAD ACTION | FIRING
Pressure Increase

TIME IN MINUTES

PRESSURE RECORDING
PSI x 1000
5 cm
Test No. 4
MUD RUN

HYDROSTATIC PRESSURE
FLOW LINE OPENED
TOOL COLLAPSED
TOOL FREE

RECORDED TESTER POSITION
Test No. 5

DEPTHS

GAMMA RAY ZERO
22'
PACKER
Sample CHAMBER 1 LOWER THAN OPEN HOLE
GAMMA RAY RADIOACTIVITY INCREASES
GAMMA RAY RADIOACTIVITY INCREASES
10700
TOOL SET AT 10,709

SURFACE CONTROLS
PAD ACTION | FIRING
Pressure Increase

TIME IN MINUTES

PRESSURE RECORDING
PSI x 1000
Test No. 5

TOOL SET
CALIBRATION
FLOW LINE OPENED
SAMPLING PRESSURE
SC FIRED
SAMPLE SEALED
TOOL COLLAPSED
TOOL FREE
HYDROSTATIC PRESSURE

FORMATION TESTER RECOVERY DATA

TEST No	4
TEST DEPTH	10,090
OPEN HOLE TEST	X
CASED HOLE TEST	

RECOVERY DATA

Gas (Total)	—	cuft
Condensate	—	cc
Oil	—	cc
Water	—	cc
Mud	—	cc
Sand		cc

TOOL DATA

Type of tool		
Type of Sample shot		
Sample Unit size		cc
Choke size		

PRESSURE DATA

Initial Shut in		psi
Shut in Time		min
Sampling		psi
Sampling Time		min
Final Shut in		psi
Shut in Time		min
Hydrostatic	6,450	psi
Surface Chamber		psi

RECOVERY ANALYSIS

Free Gas		cuft
Oil		
API Gravity	@	°F
GOR		
Water		
Rrf (Filtered)	@	°F
Equivalent Cl		ppm

MUD FILTRATE DATA

Rmf	@	°F
Equivalent Cl		ppm
Rw	@	°F
Equivalent Cl		ppm

REMARKS NO SEAL MUD RUN. CALIPER, FOUND TO BE WASHED OUT AT THIS DEPTH.

FORMATION TESTER RECOVERY DATA

TEST No	5
TEST DEPTH	10,700
OPEN HOLE TEST	X
CASED HOLE TEST	

RECOVERY DATA

Gas (Total)	3	cuft
Condensate		cc
Oil		cc
Water	DRY TEST	cc
Mud		cc
Sand		cc

TOOL DATA

Type of tool	FIT - COMBO	
Type of Sample shot	CONTACT S.C.	
Sample Unit size	10,250	cc
Choke size	0.030	

PRESSURE DATA

Initial Shut in	—	psi
Shut in Time	—	min
Sampling	—	psi
Sampling Time	—	min
Final Shut in	—	psi
Shut in Time	—	min
Hydrostatic	6,130	psi
Surface Chamber		psi

RECOVERY ANALYSIS

Free Gas	—	cuft
Oil		
API Gravity	@	°F
GOR		
Water		
Rrf (Filtered)	@	°F
Equivalent Cl		ppm

MUD FILTRATE DATA

Rmf	@	°F
Equivalent Cl		ppm
Rw	@	°F
Equivalent Cl		ppm

REMARKS SUPERVISABLE POSITION WELL IN EVEN TO FLOWLINE AFTER THIRTY MINS.

COMPANY HEMATITE PETROLEUM PTY. LTD.
WELL ARDO No. 1
FIELD WILDCAT
COUNTRY AUSTRALIA STATE TASMANIA

Schlumberger
FORMATION TESTER

C. 70.419 - SEPT. 69 - OH

5 cm

