



**Tuna-1  
(W518)**

**Well Summary Report**

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WELL COMPUETION REPORT

TUNA 1 WELL SUMMARY

Type of Well: Exploratory well.

Purpose of Well: Tuna 1 well was located some 12 miles north-east of the Marlin platform location. The structure, as mapped on the Latrobe Delta Topographic Surface, was a dome, slightly elongate east-west. At this horizon 180 feet of vertical closure was mapped, with a closure area of approximately 6.6 square miles. At depth the structure was essentially the same, apart from complication by normal faulting. Mapping on the Latrobe Delta Reflection No.5, 2700 feet below the top of Latrobe, showed a dome located on a broad horst block.

Reservoir sands were anticipated at the top of the Latrobe Delta Complex. Possible reservoirs were also anticipated lower in the section.

Well Statistics:

Status: Plugged and abandoned.

Location: Latitude 38° 10' 25" S  
Longitude 148° 25' 03" E  
Shot point 4430 on Line ET.64

Elevation: Rotary table 31 feet above sea level.

Drilling Unit: Glomar III.

Water Depth: 198 feet.

Spud Date: May 7, 1968.

Completion Date: October 25, 1968.

Operation Time: 172 days.

Total Depth: 11,947 feet.

Casing: 30" at 335 feet  
20" at 742 feet  
13<sup>3</sup>/<sub>8</sub>" at 2452 feet  
9<sup>5</sup>/<sub>8</sub>" at 6952 feet

Plugs: Plug No.1 Set at 11,646 feet with 125 sacks cement.  
Plug No.2 9040 to 9400 feet with 125 sacks cement.



Plug No.3 8500 to 9000 feet, with 200 sacks cement.

Plug No.4 Set at 8300 feet with 75 sacks cement.

Plug No.5 Set at 7500 feet with 75 sacks cement.

Plug No.6 6730 to 7075 feet with 100 sacks cement.

Plug No.7 6263 to 6700 feet with 160 sacks cement.

Plug No.8 4442 to 4630 feet with 75 sacks cement.

Plug No.9 221 to 365 feet with 50 sacks cement.

Mud Logging:

Core Laboratories logged the well from 760 feet to total depth.

Electric Logging:

IES	Run 1	725 - 2503 feet
	Run 2	2450 - 4922 feet
	Run 3	4800 - 7002 feet
	Run 4	6951 - 11281 feet
	Run 5	11080 - 11947 feet
SGR	Run 1	725 - 2492 feet
Sonic	Run 2	2450 - 4920 feet
	Run 3	4800 - 7003 feet
	Run 4	6951 - 11947 feet
FDC.GR	Run 1	2450 - 4921 feet
	Run 2	4850 - 7001 feet
	Run 3	6451 - 11282 feet
	Run 4	6951 - 11947 feet
CDM	Run 1	725 - 2499 feet
	Run 2	2450 - 4920 feet
	Run 3	4800 - 7000 feet
	Run 4	6951 - 11947 feet
GRN	Run 1	4150 - 4800 feet
	Run 2	6100 - 6800 feet
	Run 3	6951 - 11945 feet
CBL	Run 1	4100 - 6951 feet

Velocity Survey:

A survey was run at 7003 feet.

Coring:

A total of 33 conventional cores were cut. Total footage cut was 759 feet and recovery was 621½ feet or 82%.

120 sidewall cores were shot, with a recovery of 60 cores.

Juna - 1

Hydrocarbons:

High gas readings were encountered during drilling at 4295 feet. Continuous coring commenced at 4302 feet and was discontinued at 4622 feet after cutting 11 cores. Cores down to 4477 feet had no fluorescence, with very poor odour and cut. Below this depth cores had good fluorescence, odour, cut and taste down to 4600 feet. Core analysis through this zone indicates porosities in the range 25 to 29%, with permeabilities up to 1,000 millidarcies.

Log analysis of the zone indicates:

Gross gas zone 4295 - 4541 feet (?) - 246 feet (net 113 feet);  
 Gross oil zone (?) 4541 - 4600 feet - 59 feet (net 12 feet).  
 $\Sigma 125$

High gas readings were again encountered during drilling at 6420 feet. Continuous coring commenced at 6462 feet and was discontinued at 6659 feet after cutting 7 cores. Cores down to 6629 feet had good cut, odour, fluorescence and taste. Core analysis indicates porosities in the range of 20 to 28% and permeabilities in the range 20 to 30 millidarcies.

Log analysis of this zone indicates:

Gross gas zone 6323 - 6402 feet - 79 feet (net 45 feet);  
 Gross oil zone 6402 - 6634 feet - 233 feet (net 95 feet).

Below these two reservoir zones several hydrocarbon zones exist as indicated by gas readings and log analysis. Details of these zones are given below:

7392 - 7451 feet - 59 feet (net 36 feet) gas show tight.  
 8252 - 8284 feet - net 32 feet gas show.  
 8625 - 8639 feet - net 13 feet gas show.  
 8718 - 8745 feet - net 18 feet gas show tight.  
 8780 - 8798 feet - net 18 feet gas show.  
 8798 - 8888 feet - 90 feet (net 22 feet) gas shows over thin zones.  
 9328 - 9336 feet - net 8 feet gas show.  
 9410 - 9480 feet - 70 feet (net 50 feet) gas shows over thin zones.  
 11590 - 11625 feet - 35 feet (net 35 feet) gas show.

Stratigraphy:

<u>Formation</u>	<u>Age</u>	<u>Top(RT)</u>	<u>SubSea</u>	<u>Thickness</u>
Water		31 ft	0	198 ft
Gippsland	Miocene & younger.	229 ft	- 198 ft	3221 ft
Lakes Entrance	Oligocene	3450 ft	-3419 ft	845 ft
Lalrobe Delta Complex.	Eocene - Paleocene - U. Cretaceous.	4295 ft	-4264 ft	7652 ft +

Gippsland Formation

760 - 3450 feet: Marl, light grey, soft, argillaceous, very calcareous, fossiliferous, scattered sand, traces pyrite, mica and carbonaceous material.

Lakes Entrance Formation

3450 - 4295 feet: Mudstone, medium grey to grey green, firm, silty, calcareous, fossiliferous, traces pyrite and glauconite. Rare quartz grains.

Latrobe Delta Complex

4295 - 5210 feet: Sandstone and shale.  
Sandstone: white to clear, fine to coarse grained, sub-angular to sub-rounded, moderate to poor sorting, glauconitic near top, dolomitic in part, pyritic, slightly calcareous. Good porosity and permeability.  
Shale: dark brown, firm, pyritic, carbonaceous, micaceous.

5210 - 6950 feet: Interbedded sandstone and shale with coal.  
Sandstone: white to clear, coarse grained to fine, unconsolidated, sub-angular quartz, fair sorting, pyritic, micaceous.  
Shale: brown-grey, firm to moderately hard, silty, fissile, micaceous, carbonaceous, pyritic.  
Coal: black to dark brown, sub-bituminous.

6950 - 7820 feet: Sandstone with interbeds of shale and siltstone.  
Sandstone: white to clear to light grey, fine to coarse grained, hard, angular to sub-rounded quartz, poorly sorted, dolomite, cement, pyrite, chert.  
Shale: dark grey, hard, silty, carbonaceous, micaceous.  
Siltstone: dark grey to grey, hard, shaley.

Note: Volcanics 7320 - 7370 feet: dark grey to mottled green, chlorite, feldspar, some quartz. Weathered.

7820 - 11947 feet:

Shale and siltstone with interbeds of sandstone and minor coal.

Shale: olive grey, hard, slightly fissile, very argillaceous, carbonaceous, micaceous, massive.

Siltstone: light grey to pale brown, moderately hard, locally argillaceous, micaceous, carbonaceous.

Sandstone: light grey, fine to very fine grained, well sorted, sub-angular, carbonaceous matter, locally dolomitic, trace feldspar and lithics.

Coal: black, sub bituminous.

### Testing:

A total of 35 formation interval tests were run under open hole conditions. Of these, 23 were successful. Details are given below.

F.I.T. No. 1	4574 ft	- failed.
F.I.T. No. 2	4575 ft	- failed.
F.I.T. No. 3	4583 ft	- failed.
F.I.T. No. 4	4562.5 ft	- failed.
F.I.T. No. 5	4584 ft	- failed.
F.I.T. No. 6	4575.5 ft	- failed.
F.I.T. No. 7	4425 ft	- Recovered 3000 ccs mud, 150 ccs condensate.
F.I.T. No. 8	4529.5 ft	- failed.
F.I.T. No. 9	4530 ft	- failed.
F.I.T. No.10	4364 ft	- Recovered 84.6 c. ft gas, 350 ccs condensate, 3800 ccs mud.
F.I.T. No.11	4563 ft	- Recovered 16 c. ft gas, 4400 ccs oil, 1000 ccs water, 1000 ccs mud.
F.I.T. No.12	4539 ft	- failed.
F.I.T. No.13	4497 ft	- Recovered 15.2 c. ft gas, 20 ccs condensate, 425 ccs water, 700 ccs mud.
F.I.T. No.14	4549 ft	- tight.
F.I.T. No.15	4540 ft	- tight.
F.I.T. No.16	4529 ft	- Recovered 44.6 c. ft gas, 140 ccs condensate, 1000 ccs mud and water.
F.I.T. No.17	6494 ft	- Recovered 27 c. ft gas, 5200 ccs oil, 2500 ccs water, 500 ccs mud.
F.I.T. No.18	6327 ft	- Recovered 50.2 c. ft gas, 105 ccs condensate, 750 ccs mud.

June-1

F.I.T. No.19	6608 ft	- Recovered 32.3 c. ft gas, 8700 ccs oil, 6500 ccs water, 500 ccs mud.
F.I.T. No.20	6388.5 ft	- Recovered 106 c. ft gas, 300 ccs condensate, 2000 ccs mud and water.
F.I.T. No.21	6629 ft	- Recovered 0.2 c. ft gas, 9200 ccs water, 500 ccs mud.
F.I.T. No.22	6409 ft	- Recovered 30 c. ft gas, 8550 ccs oil, 8000 ccs water, 500 ccs mud.
F.I.T. No.23	6538 ft	- failed.
F.I.T. No.24	8907 ft	- Recovered 0.6 c. ft gas, 14,200 ccs filtrate.
F.I.T. No.25	8787 ft	- Recovered 145.5 c. ft gas, 700 ccs filtrate.
F.I.T. No.26	8721 ft	- Recovered 0.4 c. ft gas, 3000 ccs filtrate.
F.I.T. No.27	8635 ft	- failed.
F.I.T. No.28	8266 ft	- Recovered 105.8 c. ft gas, 250 ccs condensate, 4750 ccs filtrate.
F.I.T. No.29	7448 ft	- Recovered 0.6 c. ft gas, 1450 ccs filtrate.
F.I.T. No.30	8632 ft	- Recovered 82.4 c. ft gas, 200 ccs condensate, 7300 ccs filtrate.
F.I.T. No.31	8908 ft	- Recovered 2640 ccs filtrate.
F.I.T. No.32	8864 ft	- failed.
F.I.T. No.33	8864 ft	- Recovered 0.3 c. ft gas, 360 ccs filtrate.
F.I.T. No.34	8727.5 ft	- Recovered 29.3 c. ft gas, 4150 ccs filtrate, scum of condensate.
F.I.T. No.35	7446 ft	- failed.

In addition, formation interval tests were run through casing.  
Details of these are as follows:-

No. 1	6576 ft	- Failed.
No. 2	6608 ft	- Recovered 312.4 c. ft gas, 22 galls (U.S.) oil, 200 ccs mud, 50 ccs sand.
No. 3	6523 ft	- Failed.
No. 4	6506 ft	- Failed.
No. 5	6494 ft	- Failed.

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No. 6 6576 ft - Recovered 294 c. ft gas,  
21.1 galls (U.S.) oil,  
200 ccs mud, 50 ccs sand.

No. 7 6494 ft - Recovered 299 c. ft gas,  
19.4 galls (U.S.) oil,  
200 ccs mud, 50 ccs sand.

No. 8 6603 ft - Recovered 287 c. ft gas,  
21 galls (U.S.) oil,  
500 ccs mud, 50 ccs sand.

No. 9 6508 ft - Failed.

No.10 6573 ft - Failed.

No.11 6524 ft - Failed.

No.12 6600 ft - Recovered 264 c. ft gas,  
23.5 galls (U.S.) oil,  
500 ccs mud, 100 ccs sand.

No.13 6564 ft - Recovered 281 c. ft gas,  
16.8 galls (U.S.) oil,  
500 ccs mud, 100 ccs sand.

No.14 6492 ft - Failed.

No.15 6611 ft - Failed.

No.16 6611 ft - Recovered 282 c. ft gas,  
21.2 galls (U.S.) oil,  
500 ccs mud, 100 ccs sand.

No.17 6571 ft - Failed.

No.18 6605.5 ft - Recovered 279 c. ft gas,  
25.2 galls (U.S.) oil,  
500 ccs mud, 100 ccs sand.

No.19 4582 ft - Recovered 285 c. ft gas,  
21 galls (U.S.) oil,  
500 ccs mud, 100 ccs sand.

No.20 4576 ft - Failed.

No.21 4563.5 ft - Recovered 292 c. ft gas,  
18.5 galls (U.S.) oil,  
1500 ccs mud and sand.

No.22 4583.5 ft - Failed.

No.23 4561.5 ft - Failed.

No.24 6672 ft - Failed.

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TUNA-1.

TECHNICAL

MATERIAL.

PART-1 SPEC. 1968  
Comp. 25-76-1968

38° 10' 25" S  
178° 25' 00" E  
W.D. 198' RT 31'  
GLOMAR III

TUNA-1. ESSO. VIC. P/1. T.D. 11,947. 518

IES. RUN 1. 725' - 2503'. SEPARATE LOGS 2" AND 5"  
 " " 2. 2450' - 4922' " " 2" " 5"  
 " " 3. 4800' - 7002' " " 2" " 5"  
 " " 4. 6951' - 11,281' " " 2" " 5"  
 " " 5. 11080' - 11,947' " " 2" " 5"  
 B.H.C.S./GR. R1. 725' - 2492' " " 2" " 5"  
 B.H.C.S. " 2. 2450' - 4920' " " 2" " 5"  
 " " 3. 4800 - 7003' " " 2" " 5"  
 " " 4. 6951 - 11947' " " 2" " 5"  
 B.H.C.S./GR. R1, 2, 3, 4. 725' - 11947'. 2" ONLY.  
 FDC. R1. 2450' - 4921' SEPARATE LOGS 2" AND 5"  
 " 2. 4850 - 7001' " " 2" " 5"  
 " 3. 6751 - 11282' " " 2" " 5"  
 " 4. 6951 - 11947' " " 2" " 5"  
 GR/N R1. 4200 - 4800' " " 2" " 5"  
 " 2. 6200 - 6700' " " 2" " 5"  
 " 3. { 6951 - 11945' " " 2" " 5"  
 { 6100 - 6800' " " 2" " 5"  
 { 4150 - 4800' " " 2" " 5"  
 C.B.L. R1. 4100 - 6951' " " 2" " 5"  
 C.D.M. R1. 5" and 2" 725 - 2496' " " 2" " 5"  
 " R3. 5" and 2" 4800 - 7000' " " 2" " 5"  
 FIT. R1. TESTS 1-12.  
 " 2 " 1-4.  
 " 3 " 1-7.  
 " 4 " 1-12.  
 " 5 " 1-18.  
 " 5 " 19-24.

REPLACEMENT LOGS 11/11/79:  
(BECAUSE OF POOR PRINTS)  
 IES, RUNS 1-5. 2" SCALE  
 BHCS-GR. " 1-4. 2" AND 5"  
 FDC. " 1-3. 2" " 5"  
 GR-N. " 1-3. 2"  
 CBL. " 1. 2"

CORE LAB. MUDLOG. 760' - 11944.  
 " " COMPLETION COREGRAPHY.  
 CORE DESCRIPTIONS 1-28, 31-33.  
 TIME DEPTH CURVE.  
 FIT RESULTS RUN 3. \* PALYNOLOGY REPORT BY EVANS  
 WELL SUMMARY.  
 ROCK-EVAL DATA SHEET BY MOBIL OIL AUST.  
 S.W.C. SHOT 120. REC. 60  
 CORES. 33 CUT. RECEIVED ALL EXCEPT #29 - NIL. 1 1/2' OF 30.  
 CUTTING 750' - 11944' RECEIVED.

518

P.T.O.

PART-2

519

TUNA-1. CONTINUED.

VELOCITY SURVEY.

IES COMPLETION LOG WITH LITHOLOGY. 2" +1°

MICROPALAEONTOLOGICAL REPORT BY D. TAYLOR.

PALYNOLOGY REPORT BY P. R. EYANS.

PETROGRAPHIC DESCRIPTIONS OF A VOLCANIC ROCK @ 7,351' BY J. BARRY <sup>HOCKING</sup>

" " " " " " " " " " D. SMALE.

STRUCTURE CONTOUR MAP. LATROBE DELTA REFLECTION NOS.

" " " " " " " " " " TOPOGRAPHIC SURFACE.

{ HYDROCARBON REPORT - SUBSURFACE OIL EPR. 68 - PSI 06

{ GAS ANALYSIS. IN J. LE PAGE OFFICE

DRAFT. TUNA-1 WELL.

WEEKLY REPORT.

PALYNOLOGY REPORT REVISED BY A. D. PARTRIDGE.

PALYNOLOGY SHEET BY W. K. HARRIS

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NO CUTTING DESCRIPTIONS

" S.W.C " "

" MICROLATEROLOG. RI. 2" AND 5". 4800 - 4600 T.L.

" C.D.M. R2 & 4.

P.T.O.



CORE DESCRIPTIONS

CORE DESCRIPTION

Page 1 of 31

Core No. 1

WELL: TUNA A-1

Interval Cored 3795-3805 ft., Cut 10 ft., Recovered 10 ft., (100%) Fr. LAKES ENTRANCE

Bit Type C20 55051, Bit Size 8 5/16 in., Desc. by D.W.W. W.F.T. Date MAY 22 1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
3795 5 10 15 20 3805			3795-3805	MUDSTONE medium grey with slight greenish cast, very firm, very calcareous, very fossiliferous including abundant forams, occasional pelecypod (?) shell and sponge (?) spicules, mainly massive and homogeneous with some vague laminac due to slight color variations, extensively burrowed with some burrows infilled with pyrite, rare scattered glauconite grains No porosity and no shows.

REMARKS:

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Core No. 2

WELL: TUNA A-1

Interval Cored 4302-4330 ft., Cut 28 ft., Recovered 16 ft., (.57 %) Fr. LAIROBE

Bit Type C20 95051, Bit Size 8 5/16 in., Desc. by D.W.W. W.E.T. Date May 25, 1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
4302			4302 - 4311	Glauconitic Sandstone: medium to dark brown, very hard, quartzose with 20% glauconite grains, in parts of core glauconite has weathered to an orange brown color, fair sorting, quartz is fine to medium grained and subangular with occasional coarse grains, glauconite tends to be coarser grained being medium to coarse grained and mainly sub rounded, micaceous, slightly dolomitic, white clay matrix, appears burrowed in part, poor porosity and poor permeability, tiny pin points of bleeding gas, patchy to pin point fluorescence with patchy fluorescence confined to infilled burrows.
10			4311 - 4314	Glauconitic sandstone: mainly as previously but having poorer sorting and containing quite a few pebble size quartz grains, trace of pyrite, poor porosity and poor permeability, no fluorescence.
20			4314 - 4315	Sandstone: medium brown, fine-medium grained, glauconitic, subangular to subround, good sorting micaceous, slightly dolomitic, white clay matrix extensively pyritized and pyrite infilling numerous burrows, poor porosity and permeability, no fluorescence
4330			4315 - 4318	Sandstone: light-medium brown, fine to medium grained glauconitic, subangular to subround, good sorting micaceous, slightly dolomitic, white clay matrix, poor to fair porosity, poor permeability, no fluorescence soft and crumbles between fingers readily, Extensively broken up in recovering from core barrel
			4318 - 4330	No recovery

REMARKS:

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Core No. 3

WELL: TUNA A-1

Interval Cored 4330 - 4358 ft., Cut 28 ft., Recovered 13 ft., (46 %) Fr. LATROBE

Bit Type C20 95051, Bit Size 8 5/16 in., Desc. by W.F.T. W.F.T. Date MAY 25, 1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
			4330 - 4343	<p>Sandstone - Quartz Wacke: medium grey and mottled brown where very argillaceous, predominantly fine to medium grained, subangular to subround, occasional coarse round grain, moderate sorting. Abundant fine glauconite grains scattered randomly throughout. Individual pyrite crystals and as concretions. Extensive network of light to dark brown laminae of argillaceous material as wavy discontinuous laminae disrupted by a large amount of burrowing activity. Occasional carbonaceous inclusion and thin vertical root mottlings.</p>
4343 - 4358				<p>Firm to friable, breaks easily moderate porosity, poor permeability, no show may have faint odor</p>
			4343 - 4358	No recovery

REMARKS:

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Core No. 4

WELL: TUNA A1

Interval Cored 4361 - 4380 ft., Cut 19 ft., Recovered 0 ft., (0 %) Fr. LATROBE

Bit Type C-20, Bit Size 8 5/16 in., Desc. by WET & DUNN Date MAY 26<sup>th</sup>

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0	4360			
				No Recovery (junk in hole pushed catcher).
				[Samples caught indicate sandstone.]

REMARKS:  
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CORE DESCRIPTION

Core No. 5

B.P. OIL & GAS DIVISION  
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WELL: TONA A1

Interval Cored 4405 - 4418 ft., Cut 13 ft., Recovered 12 ft., (.92%) Fm. LATROBE

Bit Type C-20, Bit Size 8 5/16 in., Desc. by A.K.S Date 27.5.68

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
<p>0</p> <p>4405</p> <p>4410</p> <p>4415</p>		<p>Strong odour in whole core. No fluor wax out from core material at 4411. Strong taste from sands - condensate?</p>	<p>4405 - 4415'6". Sandstone - quartz arenite, gy, R, m.w.s to poorly sorted at base. Gradational in grain size from m.g at top. to c.g, pebbly &amp; rarer boulders of qtz &amp; quartzite, &amp; lithics at base. Unconsolidate, friable sand, little or no clay material, local calcite (dol) cement weakly developed, producing weakly firm sand. Abundant pyrite nodules &amp; pyrite cemented sand locally towards base. Carbonaceous, mildly argillaceous lamellae at 4411 - horz. bedding. Peat Intraclasts (caving bank material?) 6" in size at 4411 1/2'. Excellent F &amp; P.</p> <p>4415'6" - 17'. Mudstone - shaley, brn, firm to hard, sub fissile, well compacted, weakly calc, with gy silty &amp; more carbonaceous micro lamellae &amp; lensoid discontinuous thin lamellae. Leaf impressions v. common on bedding surfaces. Bedding horizontal to sub horizontal. Little or no indication of organic activity. Tight, mod. strong bet odour.</p>	

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Core No. #6

WELL: Tuna A-1

Interval Cored 4418 - 4442 ft., Cut 24' ft., Recovered 0 ft., ( 0 %) Fr. Latrobe

Bit Type C-20 , Bit Size 8 5/16" in., Desc. by A.K.S

Date 27/5/68

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0 4418 Drilling Time 3 1/2 hrs. 4442				No Recovery - junk in hole faulted catcher in core barrel.

REMARKS:

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CORE DESCRIPTION

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Core No. 7

WELL: Tuna A-1

Interval Cored 4447 - 4477 ft., Cut 30 ft., Recovered 12 ft., (40 %) Fm. Latrobe

Bit Type C-20, Bit Size 8 5/16 in., Desc. by A.K.S Date 29/5/68

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
<p>0 4447</p> <p>50</p> <p>55</p> <p>60</p> <p>65</p> <p>70</p> <p>75</p> <p>Drilling Time 1 hr</p>			<p>4447-56' Sandstone, quartz arenite, gy, dk gy, fg, ± minor mg streaks, a-R, dom t, friable, clean, only rare argillaceous microlamellae. Micaceous, carbonaceous, dk gy-bk lamellae define sub horizontal to horizontal bedding. Small scale x-bedding, minor ripples &amp; abundant worm? burrows - generally clay lined. Excellent - good P &amp; T. Weak-mod odour, weak-mod cut, weak taste, no fluor</p> <p>56' - 59' Inter laminated f.g. sands &amp; silts mudstone. Silty claystone-mudstone; brn-dk brown, tight, firm, sub fissile, laminations vary from mm - few cms in thickness. Abundant bk v. thin mic, carb, microlamellae. Bedding sub horizontal to horizontal - weakly developed low amplitude ripples &amp; small scale x bedd. Sands &amp; silts: gy, mildly argillaceous, m.w.s, a-r, ± weakly developed carb, mic microlamination. Minor small scale x-bedding &amp; low ampl ripples.</p> <p>Shows: Mod odour, weak-mod cut, weak taste, no fluor.</p>	

REMARKS:



ESSO STANDARD OIL (AUSTRALIA) LTD.

CORE DESCRIPTION

BHP OIL & GAS DIVISION  
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Core No. # 8

WELL: Tuna A-1

Interval Cored 4477-4507 ft., Cut 36 ft., Recovered 26 ft., ( 87 %) Fm. Latrobe  
Bit Type C-20 , Bit Size 8 5/16 in., Desc. by A.K.S Date 29/5/68

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0 4477				
80				
85				
90				
95				
1500				
96				
97				

Inter laminated and interbedded Sandstones, silt stones, silty mudstones & mudstones.  
Sandstones: quartz wacke, gy.-de gy, f.g. silty, clean to argillaceous locally, c minor clay lamellae. Quartz & minor lithics a-R, dom a-r, mod. well sorted, minor mg & pebble size sand inter laminations. Micaceous, carbonaceous micro lamellae define sub-horizonal to horizontal bedding, small scale x-bedding & minor ripples. Burrows & pyritised worm burrow casts common, becoming more prevalent below 4485'. Patchy fluor, mod. odour, yellow cut, good taste. Mod. P & P.  
Silty mudstone & Mudstone; mottled brown, tight, micromicaceous, carbonaceous, rare coaly stringers & leaf impressions. Pyritised burrows common. Minor ripples and small scale x bedding in silty laminae. Poor P & P, yellow fluor, cut, mod odour & taste in silty laminations.

Drilling Time 12 hrs

REMARKS:

ESSO STANDARD OIL (AUSTRALIA) LTD.

**CORE DESCRIPTION**

Core No. #9

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WELL: Tuna A-1

Interval Cored 4507-4537 ft., Cut 30 ft., Recovered 30 ft., (100%) Fr. Latrobe

Bit Type C-20, Bit Size 8 5/16 in., Desc. by A.K.S. Date 30/5/68

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0	4507			
10				
15				
20				
25				
30				
35				
Drilling Time 2 hrs				

Inter laminated and interbedded sandstones, siltstones, silty mudstones & mudstones.

Sandstones - quartz arenite: (4519', 4527', 4528-31')  
 Grey, soft, friable, mod. well compacted, massive to weakly laminated. Quartz sand fg-silt, a-R, mod. well sorted. Rare c.g. pebble lenses. Very minor mic, carbonaceous lamellae. Sub horizontal to horizontal bedding, minor x bedding & ripples. Common burrows, causing local disruption of bedding. P & P v. good. Good odour, yellow-white fluor, good cut, good taste.

Silty mudstones - mudstones:  
 mottled brown, firm-hard, tight, well compacted, sub fissile, micaceous, carbonaceous, locally pyritic. Burrows common, often pyritic & pyrite casts infilling burrow. Horizontal to horizontal bedding, except where disrupted by burrowing. Very large x-bedding? structure at 4537' - or slumping. mod odour, yellow fluor, good cut & taste in all silty laminations & interbeds.

REMARKS:

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**CORE DESCRIPTION**

Core No. # 10

WELL: Tuna A-1

Interval Cored 4537-4562 ft., Cut 25 ft., Recovered 25 ft., (100%) Frm. Latrobe

Bit Type C-20, Bit Size 8 5/16 in., Desc. by A.H.S. Date 30/5/68

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0 - 37				<u>Shale &amp; shale mudstone with interbedded and interlaminated silts &amp; sands.</u>
40 - 45				<u>Shale - shaly mudstone</u> (most of core) mottled brown to lt brown, firm to hard, well compacted, fissile to sub-fissile, micaceous, carbonaceous, pyritic & burrows commonly pyritised. Bedding horizontal & v. minor ripples. No Shows.
50 - 55				<u>Siltstone</u> : gy, friable, v. fg-silty, dom silty, a-r, mod well sorted. Usually as laminae 1mm - 2cm thick. Weakly argillaceous, micaceous, carbonaceous, micro-lamellae. Bedding horizontal to weakly x-bedded, except where disturbed by burrowing. mod-poor P & P, good odour, good yellow-white fluorescence, good cut, good taste.
55 - 60				<u>Sandstone</u> : (54-56, 58-60 1/2'). grey, f-m g, dom fg, silty locally - especially 55' interval, a-r, mod well sorted, clean - argillaceous, micaceous, carbonaceous. Horizontal to sub-horizontal bedding, burrows common. mod-good P & P. Strong odour, strong pale yellow fluor, good cut, good taste.
60 - 62				

Drilling time 1 1/2 hrs

REMARKS:

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Core No. C#11

WELL: Tuna A-1

Interval Cored 4562-4592 ft., Cut 30' ft., Recovered 28' ft., (93 %) Fm. Latrobe

Bit Type C-20, Bit Size 8 5/16 in., Desc. by A.K.S Date 31/5/68

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0				
62				Clayey Mudstone, with interlaminated and interbedded siltstones and silty sandstones.
65				Clayey Mudstone: mottled dk to lt brown, firm to hard, well compacted, sub fissile to fissile, tight micaceous, carbonaceous; locally strongly pyritic with disseminated v.f.g pyrite and pyrite infilled burrows. Very evenly bedded apart from burrowing. No shows.
70				
75				Silty Sandstone: gy, fg-silty, dom v.f.g, a-r, mod. well sorted, little argillaceous material, red. clean. Firm-friable, well compacted, massive to weakly laminated. Pyritic - v. strongly locally = solid pyrite nodules & lenticular nodules - infilled burrows? along bedding surfaces. (nodules 1"-1 1/2" long, 1/2" wide). Main sandstones: 4563-72'6", 4573'-74', 4578'6"-80'6" Mod-good P & P, Good odour, fluv., cut & taste. Pyritic dolomitic siltstone (4584-86') Grey, v. hard, pyritic dolomitic siltstone, completely cemented, no P & P.
80				
85				
90				
92				

Drilling time 1 1/4 hrs.

REMARKS:

ESSO STANDARD OIL (AUSTRALIA) LTD

CORE DESCRIPTION

Core No. # 12

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WELL: Tuna A-1

Interval Cored 4592-4622 ft., Cut 30' ft., Recovered 29' ft., (97%) Fm. Latrobe

Bit Type C-20, Bit Size 8 5/16 in., Desc. by A.K.S. Date 31/9/68

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0	92			
	95			Clayey mudstone with interbedded and inter-laminated silty sandstones, siltstones and dolomitic siltstones.
	4600	oil water		Clayey mudstones (most of core). Mottled brn - lt brown, firm-hard, well compacted, fissile to sub-fissile, micromicaceous, carbonaceous - fragmented leaf impressions on bedding planes. Pyritic - v.f.g. disseminated pyrite and local nodular concentrations in burrows. Horizontal, even, laminated bedding, disturbed locally by burrowing. V. little or no indication of current action - some very poorly developed ripples. Silty laminations in mudstone v-trin (1mm - 1cm thick), sporadic, gy, with micro-micaceous, carbonaceous partings. No shaws. - weak shaws in silty laminations above 4600'.
	5			
	10			Siltstone (4597, 4603, 4614) Grey - lt gy, v.f.g. - silt size, a-r, m.w.s, argillaceous to med. clean, firm - friable. Weakly pyritic, micromicaceous, carbonaceous. Generally extensively burrowed. Mod. P & P. Good pale yellow fluor, cut, odour, taste above 4600'. No shaws below 4600'.
	15			
	20			
	22			
				Dolomitic Siltstone (4595-96, 4607-09')
				Dk gy, gy, massive to weakly laminated, v. hard, pyritic, - disseminated v.f.g. pyrite and concentrations along rare laminae.

Drilling time 2 1/4 hrs

REMARKS:

ESSO STANDARD OIL (AUSTRALIA) LTD.

CORE DESCRIPTION

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Core No. 13

WELL: TUNA A-1

Interval Cored 5368-5398 ft., Cut 30 ft., Recovered 30 ft., (100.%) Fm. LAIROBE

Bit Type C 20 , Bit Size 8 5/16 in., Desc. by D.W.W. Date JUNE 10, 1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
68			5368-5375	Mudstone: medium grey to brown grey, firm to hard, noncalcareous, pyritic with finely disseminated pyrite and pyrite concretions, silty pods and lenses, burrowed with some burrows infilled with very fine to fine grained sandstone, carbonaceous and coaly with vertical coalified roots(?), essentially massive with vague lamination due to color variation and also some thin coal beds, a 5" dark brown to black coal bed at base of unit.
70			5375-5384	Sandstone: green grey to medium grey, hard, quartzose, fine to coarse grained with occasional pebble size, poor to fair sorting, subangular to subround, finely disseminated pyrite and pyrite concretions, micromicaceous carbonaceous and coaly, horizontal and vertical burrows many of which are infilled with light brown well sorted sandstone particularly in the upper 2' good porosity and permeability, no shows upper 4' of unit are massive but grade into well laminated zone with well defined dark argillaceous laminae exhibiting cross bedding. laminae occasionally interrupted by burrowing. Unit grades into following unit.
75			5384-5387	Mudstone with interbeds of fine grained sandstone black with medium grey, firm, laminae are horizontal burrowed, pyritic, micromicaceous, carbonaceous
80			5387-5392	Mudstone: medium grey to brown grey, firm, non calcareous, patches and streaks of coal with vertical coalified roots(?) pyritic, appears burrowed and churned, massive except in lower 1' where laminated due to color variations, 5" of coal at base of unit
85			5392-5398	Sandstone: brown grey to light grey, quartzose, fine to coarse grained, subangular to subround, fair sorting, pyritic, non calcareous, micromicaceous, upper 1' has thin coal laminae and is firm, remainder is massive and soft, crumbles between fingers, good porosity and permeability, no shows
90				
95				
98				

REMARKS:

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CORE DESCRIPTION

Core No. #14

WELL: Tuna A-1

Interval Cored 6190-6220 ft., Cut 30' ft., Recovered 30' ft., (100%) Fm. Latrobe  
Bit Type C-20, Bit Size 8 5/16" in., Desc. by A.K.E. Date 14/6/68

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0 6190			6190-92'	<u>Siltstone</u> : grey, f.g. silty quartz, massive to weakly laminated by discontinuous carbonaceous, micaceous microlamellae. Minor clay matrix. Poor P & T. Pyritic = large bulbous (post-depositional) pyrite-marcasite nodules, cross cutting - but not disrupting bedding. Horizontal to sub horizontal bedding. Minor v. small scale ripples & x-bedding. Burrows.
6195				
6200			6192-6206	<u>Shale</u> : dk gy bn, massive, firm-hard, sub fissile, weakly interlaminated with silty shale. Discontinuous carbonaceous lamellae - often = leaf impressions. Horizontal to sub horizontal bedding. Minor burrows in more silty laminations. Diapiric piercement by dk gy. v. carb mudstone into shale at 6200'.
6205				
6210			6206-6213	<u>Sandstone</u> : gy, firm-soft, a-R quartz, mod well sorted to poorly sorted at base. Gradational grain size from f.g. at top to c.g. & pebbles at base. Minor chert & quartzite lithic pebbles. Pale grey-yellow clay matrix minor weathered feldspar & f.g. disseminated pyrite. Interlaminated silty shales & silty mudstone at top of sand within slumped zone. Horizontal to sub horizontal bedding = well developed small & large scale x bedding. Good P & T.
6215				
6220			6213-15	<u>Coal</u> black, massive, conchoidal to rectilinear fracture Anthracitic.
			6215-20'	<u>Shale</u> : = interlaminated silts and silty shales at base. Lithology as above. Diapiric piercement of shales by silty shales and silty mudstones at 62.7'.

REMARKS:

Drilling time 2 3/4 hrs.

ESSO STANDARD OIL (AUSTRALIA) LTD.

CORE DESCRIPTION

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Core No. # 15

WELL: Tuna A-1

Interval Cored 6462-6492 ft., Cut 30' ft., Recovered 30' ft., (100%) Fm. Latrobe

Bit Type C-20, Bit Size 8 5/16 in., Desc. by A.K.S. Date 17/6/68

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
62			6462-64	Silty shale; dk gy, light, with inter laminated carb. shale & mudstone. Firm-hard, pyritic & v.f.g disseminated pyrite. Horizontal to sub-horizontal bedding, weakly developed ripple marks, abundant burrows. Shows in silty laminae - as below.
65			64-84	Shale, dk brn-gy, brn, gradational colour changes locally over 6" intervals as result of grading. Firm-hard, well compacted, sub-fissile carbonaceous & coaly stringers & contorted carbonaceous filaments. Relatively homogeneous texture. Pyritic & v.f.g disseminated pyrite & local nodular accretions & aggregates. Leaf impressions on bedding. Intense slumping & contorted bedding between 66-9'. No shows.
75			84-85	Silty shale and sandy siltstone: gy, gy-brn, transitional unit between above shales and underlying sands. Firm-soft, well compacted, m.w.s. pyritic shows as below.
80			85-90	Sandstone: gy, massive, clay cemented, a-r, mod-poor sorting, abundant coal chips and carbonaceous flecks. Sand grain-size gradational over 1ft intervals - stacked. Branded stream sand. Topmost sequence gradational into above silts. Weakly developed, discontinuous carb, micro-lamella showing large & small scale x-bedding, minor ripples. Erosional base to sandstone unit having a basal pebble layer containing some lithic pebbles of shale, siltstone & quartzite. mod to good P & T. Good odour, taste, pale yellow flour & cut.
90			90-92	Shale: a.a.

REMARKS:

90-92' - shale: a.a.



ESSO STANDARD OIL (AUSTRALIA) LTD.

CORE DESCRIPTION

Core No. # 16

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WELL: Tuha A-1

Interval Cored 6492 - 6522 ft., Cut 30 ft., Recovered 30 ft., (100%) Fm. Latrobe

Bit Type C-20, Bit Size 8 5/16 in., Desc. by A.K. Svalbe, Date 17/6/1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0	92		92-95	Shale: dark grey-brown - massive well compact firm-hard sub fissile, carbonaceous minor silty inter laminations. Tight. Horizontal to sub horizontal bedding, minor slumping. No burrows - No show - very weak fluorescence is silty laminae
	95			
	6500		95-6504'	Sandstone: grey, massive, well compacted, firm; quartz gradational fine grained-coarse grained, subrounded-rounded moderate-well-poorly sorted at base, dominant medium grained Pebbles of shale, quartzite and other lithics scattered throughout basal 4' - especially in basal pebble and boulder layer. Pale yellow grey clay matrix, tight-moderately tight. Minor carbonaceous shale and coal stringers - very rare. Sub horizontal bedding with minor small scale cross bedding. Good local porosity and permeability, good odour, good taste, good slightly patchy pale yellow fluorescence good cut.
	05			
Drilling Time 2 1/2 hours	10		6504-4 1/2	Shale - silty, dark grey brown as above
	15			
	20		6504 1/2-6509 1/2	Sandstone, grey massive fine-medium grained, dominant medium grained, subrounded-rounded, well sorted quartz minor lithics and minor coarse grained lenses. Firm-hard, clay matrix, moderate to good porosity and permeability. Sub horizontal-horizontal bedding, minor small scale cross bedding. Minor carbonaceous stringer at base - minor slumping at base
			6509 1/2-11'	Shale, dark grey-grey brown, as above, weakly developed silty inter laminations, carbonaceous, with minor very fine grained disseminated pyrite

REMARKS: 6511-22' Sandstone: grey, massive, firm medium-coarse grained with pebbles, subrounded-rounded, moderate-poor sorting. Small 6" silty-fine grained band at top - gradational immediately into medium grained sands. Abundant pebble layers with associated boulders, lithics, shale, quartzite etc. Clay choked with grey-yellow argillaceous matrix. Minor carbonaceous stringers. Pyritic matrix at base Good-very good porosity and permeability, bleeding oil, good odour pale yellow, fluorescence, cut, taste as above



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Core No. # 18

WELL: Tuna A-1

Interval Cored 6539-69 ft., Cut 30 ft., Recovered 30 ft., (100 %) Fm. Latrobe

Bit Type C-20, Bit Size 8 5/16 in., Desc. by A.K. Svalbe Date 18/6/1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0				
40			39-48 1/2'	Shale, dark grey-grey brown, massive to laminated, firm to hard, sub fissile, carbonaceous with minor coaly stringers and carbonaceous lamellae. Pyritic with disseminated very fine grained pyrite and local nodular aggregates (1-3 mm). Minor thin silty, light grey, laminae and thin interbeds. Bedding sub horizontal to horizontal locally intensely deformed and contorted by slumping - especially interval 6546-48'.
45				
50			48 1/2'-69'	Sandstone: grey to pale brown grey, massive to weakly laminated, subangular-subrounded quartz, minor lithics of shale, chert and other sediment rock types. Soft to firm not readily friable, well compacted with clay matrix (but less than previous cores) Grain size variable: - gradational sequence from fine grained-silty at 48 1/2' to medium-coarse grained at 60'. Grain size gradation progressive, with sands being well sorted. Basal medium-coarse grained sands associated with intra formation breccia having angular-mudstones and shale intraclasts (1 mm - 2 cms). Scattered pebbles moderately common. Truncated 2nd sequence 60 - 66' - starts again with medium grained sands with basal slumped shales and intraclasts of shale and mudstone with associated coarse grained sand and minor pebbles - besides those scattered in the rest of sand. 66-69' medium grained, moderate-well sorted sands, relatively clean, as above good porosity and permeability in all sands. Horizontal bedding with well developed small and large scale cross bedding, minor ripples.
55				
60				
65				
69				
Drilling Time 2 1/2 hours				

REMARKS:

Good fluorescence, cut, odour, taste, core bleeding oil

ESSO STANDARD OIL (AUSTRALIA) LTD.

CORE DESCRIPTION

Core No. 19

B.P. OIL & GAS DIVISION  
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WELL: Tuna A-1

Interval Cored 6569-99 ft., Cut 30 ft., Recovered 30 ft., (100%) Fr. Latrobe  
Bit Type C-20, Bit Size 8 5/16 in., Desc. by A.K. Svalbe Date 19/6/1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0	69		69-74'	Shale: dark grey-grey brown, massive to laminated, sub fissile, firm-hard, well compacted, carbonaceous with carbonaceous stringers and coaly stringers. Locally pyritic with very fine grained disseminated pyrite and locally cone nodules. Horizontal to sub horizontal bedding, minor burrows and very minor slumping.
	75		74-77'	Silty shale: grey, well compacted firm-hard, sub fissile, with abundant very fine carbonaceous, dark grey lamellae. Fine grained disseminated pyrite. Abundant burrows and minor slumping.
	80		77-85'	Silty Sandstone: grey-dark grey, with interbedded and interlaminated silty shale and shaly siltstone. Siltstone grey, subangular-subrounded, well sorted with clay matrix tight. Shaly siltstone dark grey, grey with carbonaceous thin lamellae, showing small scale cross bedding and ripple marks. Abundant local burrowing and slumping. Pyritic at base (83-85') with abundant fine grained disseminated pyrite and abundant local medium grained size nodular concentrations.
Drilling Time 3 hours	85		85-99'	Sandstone: grey, massive, fine grained, subangular-sub rounded quartz, well sorted, with minor lithic grains of shale and siltstone. Carbonaceous lamellae and carbonaceous flecks as well as minor coal chips. Pale yellowclay matrix - clay choked. Local small shaly lenses and interbeds (94-96'). Large intraclasts (1"-4") of intra formational conglomerate - semi consolidated siltstone and silty shale fragments. Moderate porosity and permeability
	90			
	95			

REMARKS:

Shows: - All siltstones and sandstones have good odour, taste, fluorescence and cut. Core bleeding dark brown oil.

ESSO STANDARD OIL (AUSTRALIA) LTD.

CORE DESCRIPTION

Core No. #20

BHP OIL & GAS DIVISION  
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WELL: TUNA A1

Interval Cored 6599-6629 ft., Cut 30 ft., Recovered 30 ft., (100%) Fr. Latrobe  
Bit Type C-20, Bit Size 1 8 5/16 in., Desc. by DJG Date 20/6/68

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0			6599-6612	ss. ltgy - ltgy brk massive f.m. graded, sa-sr, med sorted qtz with minor lithics, occas band grades to c pebble size material (intrafa. congl); some are consolidated lithics; scattered frags of carbonaceous material & laminae are present, bedding hor. zontal - sub hor. zontal (dip indicating slump possible) minor clay matrix. Fair vis of c k. Fair - strong pale yellow even floor and cut. Trace oil stain.
0600		Floor & cut		
5		Trail st.		
10			6612-6614	ss. of c pebble size grains, p. sorted, very silty, high % argill matrix and interbedded shale ltgy-greenish, silty with diss. pyrite
15		Floor & cut	6614-6621	ss. ltgy, m-gr, med sorted occas grading to coarse 2"-4" interbeds, sa-sr, minor lithics, clay matrix, occas scattered wavy carbon laminae. Fair vis of c k. Fair even p. yellow floor & cut. Fair to oil stain
20		To floor oil st.	6621-6622	shale ltgy-medgy, silty, fissile and inter. laminations of sandy siltstone ltgy, pyritic. Tr. burrowing.
25		Floor & cut	6622-6629	ss ltgy, m-c gr, p. sorted, sa-sr with minor lithics with grad. to coarse at base. has carbonaceous flecks and occ. scattered lam. variations. Fair - good vis of c k. Fair even pale yellow floor & cut becoming spotty towards base.
30		Spotty floor & cut		
35				

REMARKS:

Spotty floor increasing towards base poss. indicates transition to water.

ESSO STANDARD OIL (AUSTRALIA) LTD.

CORE DESCRIPTION

Core No. 21

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WELL: LUTROBE

Interval Cored 6629 - 6659 ft., Cut 30 ft., Recovered 30 ft., (100% Fm. Lutrobe  
Bit Type C-20, Bit Size 8 5/16 in., Desc. by DIB Date 20/6/68

Depth & Coring Rate (min. ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0			6629 - 6629'10"	Congl. pebblic size grains of qtz minor lithics clay matrix
6630			6629'10" - 6635	Shale med. gy brn silty - with occ coal streaks & thin laminae increasingly silty to base, abundant carbonaceous micromic flecks to burrowing
5			6635 - 6636'6"	interlam. siltst & shale silt-stss with carb. streaks & micromic flecks consolidated distorted appearance with burrows
			6636'6" - 6638	shale Hgy, silty, occas coal streaks
40		No floor or cut	6638 - 6644	siltst - of-f ss Hgy, sr, mod. sorted clay matrix, interlam'd with shaly bands and streaks, occas coal lam., bedding sub horizontal sl. distorted in part
		burrows	6644 - 6647	ss. Hgy, m-c, mod sort, sr-sa qtz minor lithics, the coarse is sm. interbands, micromic carbon flecks on coal streak base fair vis & ck. massive
145		No floor or cut	6647 - 6650	ss. Hgy fine grained as sh. sm of sand shale, argill & carbon. streaks and thin bands, sub hor. bedding to sm scale bedding P.F. vis & φ
50			6650 - 6659	ss. Hgy med. f and coarse micromic interbands (cyclic, massive however thin carbon micromic indurate sub horizontal bedding) sa-sr qtz, poor sorting, minor lithics clay matrix, c-vc band at base with coal frags Fair vis & φ e k.
55		dip?		
		dip?		

REMARKS: No floor or cut in lower ss plus high S<sub>u</sub> of core analysis indicate water

M3

# ESSO STANDARD OIL (AUSTRALIA) LTD. CORE DESCRIPTION

EXPLORATION & GAS DIVISION  
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**FILE COPY**  
PLEASE RETURN TO  
EXTENSION 117  
WELL: Tuna #1

Core No. 22

Interval Cored 7409-39 ft., Cut 30 ft., Recovered 28 ft., (93 %) Fm. Lat Up k  
Bit Type \_\_\_\_\_, Bit Size 7 3/4 in., Desc. by H.L. Date July 7, 1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
7410			7409-10	Shale & siltstone, drk gry - gry, hard. Weak, faint cut.
15		*	7410-24	Sandstone, gry - lt. gry, hard, silt size to coarse grain, w/ few scattered pebbles (up to 1/2"), a-r, clear-frosted, grain size increasing downward. 5% lithics & carb frags, sli pyritic. Occasional discontinuous dark gry laminae. 10% - 20% clay matrix. Lt. gry, sli dolomitic. No fluor. Weak, faint cut. P&P poor - fair.
20			7424-29	Sandstone conglomerate, lt. gry, very hard, dense, coarse to pebble size (1" +), a-r, clear-milky. 5% lithics, carb frags. 10-20% matrix, white, sli dolo. Sli pyritic. Mineral fluor. No cut. P&P poor - none.
25		*	7429-37	Sandstone, gry - dark gry, hard, silt size to fine grain, a-r, clear-milky. Numerous, even parallel and discontinuous wavy laminae and thin beds of dark gry carb frags and lithics. Rare shale-filled burrow. 5% lithics and carb frags. 20% clay matrix, sli dolo. No fluor. Weak, faint cut. P&P poor - fair. 6" shale at base.
30				
35				
39				
			Very faint odor in core. Tight gas sand.	

REMARKS:

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# ESSO STANDARD OIL (AUSTRALIA) LTD CORE DESCRIPTION

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Core No. 23

WELL: Tuna A-1

Interval Cored 7439-55 ft., Cut 16 ft., Recovered 12 ft., (.75%) Fm. Lat Up K

Bit Type \_\_\_\_\_, Bit Size 7 3/4 in., Desc. by H.L. Date July 8, 1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0 10 25 35 40 50 7440			7439-40	Shale & siltstone, dark grey to grey, hard
45		☼	7440-45	Sandstone, lt grey, hard, silt size - coarse grain, w/ scattered pebbles (up to 1") a-r, clear - m. lky, grain size increasing downward. 5% lithic & carb frags. Few discontinuous dark laminae. 20% clay matrix. Lt grey, sh. dolomitic. very rare patchy good blue fluor. Weak, faint cut. No stain. P&P poor - fair.
50		☼	7445-51	Sandstone conglomerate, grey to brown, v. fine grain to pebble size (1"±), hard, a-r, clear - milky. 5% lithic, carb frags. 10%-20% clay matrix. Lt grey, sh. dol. Uneven good blue fluor, no cut or stain. P&P fair.
55				
				Very faint odor in core. Tight gas sand. Barrel jammed.

REMARKS:

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ESSO STANDARD OIL (AUSTRALIA) LTD.

# CORE DESCRIPTION

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Core No. 24

WELL: Tuna A-1

Interval Cored 7455-62 ft., Cut 7 ft., Recovered 5 ft., (.....%) Fr. Lat-up k

Bit Type C-8, Bit Size 7 3/4 in., Desc. by H.L. Date July 8-68

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
			<p><u>7455-60 Sandstone conglomerate, med gry-lite gry, hard, med grain. In pebble size (up to 2"), a-x, clear-milky, less than 5% lithics, carb frags. 5%-10% clay matrix, lt. gry-wh, sh. dolomitic. Poor sorting. No show. P&amp;P good.</u></p> <p><u>Barrel ganned.</u></p>	

REMARKS:  
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CORE DESCRIPTION

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Core No. 25

WELL: TUNA A-1

Interval Cored 8064 - 8076 ft., Cut 1/2 ft., Recovered 12 ft., (100 %) Fr. LATROBE  
Bit Type C 8 , Bit Size 5/8 in., Desc. by D.W.W. Date JUNE 14, 1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0 10 20 30 40 8065			8064 - 8065.5 1.5	Siltstone brown grey, hard, argillaceous, sandy with very fine to cobble size quartz grains, chert and shale, larger inclusions generally sub round, carbonaceous and coal inclusions, burrowed appearance with burrows infilled with light brown very fine to fine grained sandstone with white clay matrix
8070			8065.5 - 8067 1.5	Conglomerate light grey, hard, massive in appearance, approximately 50% quartz and dark grey chert ranging from 1/4" - 1" set in medium to very coarse grained quartzose sandstone, conglomerate material is subround, sandstone matrix subangular to subround with fair sorting, good porosity and permeability, no shows
8075			8067 - 8068 1	Sandstone brown grey, hard, medium to coarse grained with 5% pebble size (upto 1/2") at top of unit, subangular to subround, moderately well sorted, quartzose with < 5% dark chert grains good porosity and permeability, no shows
			8068 - 8069.5 1.5	Siltstone medium dark grey with occasional light grey laminae, hard, argillaceous, micaceous, carbonaceous horizontal laminae, burrowed
			8069.5 - 8070 0.5	Sandstone light grey, hard, fine grained, well sorted subangular to subround, quartzose, white clay matrix coaly streaks, massive, extensively burrowed, fair porosity and permeability, no shows
			8070 - 8074 4	Shale medium dark grey, firm, coaly streaks and laminae trace pyrite, coal bleeding gas, horizontal laminae due to color variations, yellow staining or mineralization associated with coal in places has yellow fluorescence
			8074 - 8076 2	Sandstone medium grey, hard, quartzose with abundant coal chips disseminated thruout very fine to medium grained, fair sorting subangular to subround, trace of mica, upper portion extensively burrowed while lower portion laminated and showing cross bedding argillaceous, fair porosity and permeability, no shows

REMARKS:

CORE DESCRIPTION

Core No. 26

26  
31

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E.P. 1 FTS  
WELL: TUNA A-1

Interval Cored 8734 - 8765 ft., Cut 31 ft., Recovered 31 ft., (100 % Fm. LATROBIE

Bit Type CB, Bit Size 8 5/16 in., Desc. by D.W.M., Date JULY 19, 1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0 3 6 9 12				
8735			8734-8740	Siltstone: medium grey to brown grey, very hard, micaceous argillaceous, coal inclusions and laminae, coal bleeding gas, burrowed in part with burrows infilled with lighter colored siltstone, coal rosen, clear to amber in color has bright blue fluorescence.
40			8740-8740.5	Sandstone: brown to grey brown, very hard, very fine to fine grained, moderately well sorted, subangular to subround, quartzose, trace mica and pyrite, coal laminae and inclusions, white clay matrix burrowed, poor porosity and permeability, good pale yellow fluorescence in burrowed part of interval, good cut. Grades downward to siltstone
45			8740.5-8741.5	Siltstone: as 8734-8740 except that it is sandy
50			8741.5-8742.5	Sandstone: light grey, hard, very fine to fine grained, well sorted, subangular to subround, trace pyrite, coal inclusions and laminae with coal bleeding gas, burrowed, white clay matrix, poor porosity and permeability, no fluorescence
55			8742.5-8743	Shale: dark brown grey, hard, silty, coal stringers and laminae, coal rosin fluorescence.
60			8743-8750	Sandstone: light grey, very hard, quartzose, very fine to fine grained, well sorted, subangular to subround, trace mica and pyrite, coal inclusions and laminae, varies from even parallel laminations to massive to extensively burrowed, laminae due to concentrations of carbonaceous material, white clay matrix, poor porosity and permeability no fluorescence.
65			8750-8753	Siltstone: as 8734-8740 but containing very fine - fine quartz grains
			8753-8754	Sandstone: as 8743-8750
			8754-8755	Siltstone: as 8750-8753

REMARKS: 8755-8765 Sandstone: as 8743-8750 some minor cross bedding, a scour surface noted at 8765, very carbonaceous and coaly interval at 8762

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CORE DESCRIPTION

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WELL: LUNA A-1

Core No. 27

Interval Cored 8765 - 8795 ft. Cut 30 ft., Recovered 26 ft., (87%) Fr. LAIROBE

Bit Type C 8, Bit Size 8 5/16 in., Desc. by D.W.W. Date JULY 20 1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0 3 6 9 12			8765 - 8767.5	Siltstone: medium dark grey, very hard, argillaceous, carbonaceous, micaceous, non-calcareous, a few sand size quartz grains dispersed thru out and concentrated in one 1/2" band, laminated due to faint color variation, burrowed; grades downward to silty shale.
70			8767.5 - 8769	Sandstone: light to medium grey, very hard, quartzose, very fine to fine grained, moderately well sorted, subangular to subround, micaceous, coal laminae and inclusions extensively burrowed, white clay matrix, poor porosity and permeability, no fluorescence, sharp scour contact at base.
75			8769 - 8771	Shale: medium grey to medium dark grey, very hard, silty, coal and carbonaceous inclusions and laminae, coal resin - clear to amber in color - with good fluorescence, grades to shaly siltstone to siltstone.
80			8771 - 8773	Siltstone: medium to medium dark grey, grades to shaly siltstone to silty shale, coal bleeding gas burrowed, as previously.
85			8773 - 8781	Shale: medium dark grey, very hard, coal and carbonaceous inclusions and laminae, silty in part, burrowed.
90			8781 - 8791	Sandstone: light grey, very hard, quartzose, fine to coarse grained, trace grey chert, coal inclusions and laminae, subangular to subround, moderately well sorted, mainly massive with occasional carbonaceous laminae from horizontal to inclined at up to 8°, near base of core a short interval containing up to pebble size quartz grains, white clay matrix, poor porosity and permeability, spotty pin point fluorescence, no cut, faint odor.
95				

REMARKS:

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CORE DESCRIPTION

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Core No. 28

WELL: TUNA A1

Interval Cored 9346-59 ft., Cut 13 ft., Recovered 13 ft., (100%) Fm. LATROBE  
Bit Type C8, Bit Size 8 5/16" in., Desc. by R.L.G. Date 1st AUGUST, 1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0 5 10 15 20		☉	9346-9354	INTERBEDDED SHALE, SHALY SILTSTONE + SANDSTONE. (8') Mainly shale with irregular sandstone bands up to 2" wide and v. irreg. shaly siltstone patches. Shale: black, carbonaceous, silty, sub fissile, minor burrows. Sandstone: lt grey-buff, qtz-feldspathic grains in a clay matrix, f-m gr, well sorted but with rare pebble sized qtz grains + shale clasts, ang-sub rounded, non-calc, carb, hard, tight. At times finely laminated with silty carb. mat. and coal. Sl. tr. amber. Min. fluor. only but gives a good yellow cut. No odour or taste. Siltstone: shaly, black-dk grey, sandy, carbonaceous, very irreg., contorted, bedding. The shale/sandstone contacts are v. irreg. + show evidence of slumping + pull apart. At 9348' a 2" S.S. bed shows m. crs. grains and numerous shale clasts.
			9354-9356	Sandstone: buff, v.f-f.gr, well sorted, qtz-feldspathic, ang-sub rounded, fine carbonaceous shaly lamellae and stringers, occ. shale clasts, non-calc. Some of the carb. lamellae show gas popping. No fluor. or cut.
			9356-59	Shale: silty, carbonaceous, with fine bands and irregular lamellae of Sandstone: v.f-f.gr. as above; + minor clay clasts; + Shaly siltstone: black, carbonaceous, sandy. No fluor. or cut.

REMARKS:

ESSO STANDARD OIL (AUSTRALIA) LTD.

**CORE DESCRIPTION**

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Core No. 31

WELL: TUNA A-1

Interval Cored 10,903-14 ft., Cut 11 ft., Recovered 11 ft., (100 %) Fr.

Bit Type C-20, Bit Size 8 5/16 in., Desc. by C.K. Lunt Date 16 Sept 1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
<p>0 10 20</p>			<p><u>10,903-14</u></p>	<p><u>11' SILTSTONE: m. gry., hd. sli. dolomitic, micaceous; in part w/ finely disseminated carbonaceous material; finely inter-laminated w/ sli. lighter gry siltstone and silty shale.</u></p> <p><u>Almost entire section cross-faulted w/ displacements up to 2". Abundant slickensided surfaces. Core very shattered and broken up due to intensive microfaulting. Fault angle: approx. 37°. Dip of laminae: approx. 25°.</u></p>

REMARKS:

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CORE DESCRIPTION

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Core No. 32

WELL: Tuna A-1

Interval Cored 11531-11551 ft., Cut 20' ft., Recovered 6 ft., (30%) From Latrobe  
Bit Type C-20, Bit Size 8 5/16 in., Desc. by F.K. Swalbe Date 28th Sept 1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0 11532			11531-37	<p>Shale: drgy brown, massive to fissile, hard to v. hard. Homogeneous texture - little or no evidence of bedding in more massive section locally weakly burrowed &amp; associated weak colour mottling. Weakly carbonaceous &amp; minor carbonaceous flecks.</p> <p>micro faulting and some slickensided surfaces evident throughout core. orientation of fault planes variable from sub-horizontal to vertical. Randomly orientated fractures - associated with faulting infilled with lt. gy diagenetic clays - non calcareous.</p> <p>locally developed weak bedding has dips from 5-15° (hole deviated 5°)</p> <p>No shows.</p>
36				
40				
45				
51				

REMARKS:

ESSO STANDARD OIL (AUSTRALIA) LTD.  
**CORE DESCRIPTION**

Core No. 33

BHP OIL & GAS  
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EXTENSION FILES  
WELL: Tuna A-1

Interval Cored 11605-25 ft., Cut 20 ft., Recovered 17 ft., (85 %) Fm. Latrobe  
Bit Type C-20, Bit Size 8 5/16 in., Desc. by A.K. Swalbe Date 29th Sept 1968

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
0 11605		<p>Ø</p> <p>Ø</p>	<p>11605-11622 Sandstone, lt gy, hard - v. hard, well compacted, gradational from m.g. at top to fg silty at base. Homogeneous texture with exception of upper zones of core, where minor c.g. sand &amp; pebble size shale clasts are present. Sands are a-1, mod well sorted, &amp; the quartz grains being lt gy to dk gy, clear to frosted. Minor (2%) lithes of dk gy - blk shale chips; lt gen, pink chert, and lt brn quartzite. Carbonaceous lamellae and coaly stringers prevalent throughout core. Clay matrix throughout all sandstones &amp; locally associated, weakly developed dolomitic cement - gold-bronze min. fluor. shale interbed 1" thick at 11620', dk brn, hard, massive &amp; v. weakly developed horizontal bedding.</p> <p>Bedding features gradational down core from high energy large scale x bedding down to small scale x-bedding, current ripple &amp; bedding and minor ripples towards base. Even, parallel, horizontal bedding in silty sands at base of core.</p>	<p>Shows: Weak odour from fresh fractures, v. weak pale blue-white pin point fluor. weak pale blue-white cut. Infer dry gas show.</p>
10				
15				
20				
25				

REMARKS:



SIDEWALL CORE

DESCRIPTIONS

RUN 1 SWC

A

Pic - 17  
32

Depth	Rec	
11940	1"	Mudstone - dark grey, firm to soft, massive.
11930	NR	Misfire.
11921	3/4"	Mudstone - light to dark grey with pale grey silty laminae 1-2 mm thick, firm to soft, micaceous, slightly carbonaceous.
11911	3/4"	Siltstone - argillaceous, grey to dark grey, slightly laminated, micaceous, minor fine-grained disseminated pyrite, "tight", no show.
11888	NR	Misfire.
11819	1/2"	Sandstone - pale grey, fine grained to silty, massive, moderately well sorted, clay matrix, soft to firm, pale weak blue mineral fluorescence, no cut, slightly dolomitic, ± 12% porosity.
11798	1" (frag.)	Sandstone - fine grained to silty, grey, soft, friable, massive, weakly micaceous, carbonaceous flecks, weakly dolomitic with pale blue mineral fluorescence, no cut or odor, tight.
11698	NR	Misfire.
11592	1"	Sandstone - silty to fine grained, firm to soft, massive with "minute" shale laminations, 3% dark grey to pale green lithics, weakly micaceous and carbonaceous, clay matrix, very tight, pale blue mineral fluorescence, no cut, no odor, calcareous.
11584	3/4"	Sandstone - fine-very fine grained, light grey-brown, soft to firm, moderately well sorted, light brown clay matrix, tight, massive, no show, weak pinpoint pale blue fluorescence (mineral), dolomitic.
11481	NR	Misfire.
11391	3/4"	Siltstone - grey-brown, argillaceous, massive, carbonaceous, micaceous, tight, firm to soft, no show, weak blue mineral fluorescence, very weakly dolomitic.
11336	3/4"	Sandstone - fine to medium grained, stray coarse grains (3%), (predominantly fine-grain), grey to pale brown grey, soft, friable, carbonaceous clay matrix, fairly tight, subangular to angular coarse grains, grey to clear quartz with run lithics (dark grey to black), good blue green mineral fluorescence, no cut, no show.
11261	NR	Misfire.
10650	1 1/4"	Siltstone - buff to light brown grey, firm to soft, weakly laminated, well sorted, weakly carbonaceous, pale brown clay matrix, "tight", no show, "delta front".
10396	1 1/4"	Sandstone - argillaceous, dark to light grey brown, firm to soft with medium to silt size, poorly sorted, angular to subrounded quartz in grey brown argillaceous matrix,



3/6

237

1"

Interlaminated Sandstone and Shale -

Sandstone - fine to coarse grained, light grey, soft subangular to subrounded, quartzose, moderate to poor sorting, clay matrix, weakly carbonaceous, minor lithics, weak green-blue fluorescence, no cut, no odor.

Shale - grey to brown, massive, soft, slightly carbonaceous.

9193

3/4"

Sandstone - grey, fine-coarse grained with rare pebbles, poorly sorted, subangular-subrounded, massive, soft and friable, 10% lithics, micaceous, yellow clay matrix, porosity 20% <sup>+</sup> weak gas odor, splotchy pale blue green fluorescence and weak slow yellow cut.

8981 )

NR

Lost in hole.

8944 )

8906

1"

Interlaminated sandstone and mudstone -

Sandstone - grey, fine-pebble sized grains, poorly sorted, subangular-subrounded, carbonaceous chips, pale yellow clay matrix, rou pyrite, soft to friable, weak gas odor, greenish blue fluorescence with slow strong cut.

Shale - grey-brown, weakly laminated, pyritic, silty laminae.

8874

3/4"

Sandstone - dark grey, medium pebble size, poorly sorted, subangular-subrounded, massive, very argillaceous, dark grey silty matrix, pyritic, carbonaceous, pale weak pinpoint blue fluorescence and very slow cut. (?)

8854

3/4"

Siltstone - light grey brown, massive, soft to firm, moderately well sorted, rare medium quartz, quartzose, carbonaceous, trace lithics, weakly micaceous, tight weak gas odor, pinpoint pale blue fluorescence, very slow good pale yellow cut.

8822

NR

Lost in hole.

8806

3/4"

Siltstone - argillaceous, grey to brown, massive, firm to soft, well sorted, weakly micaceous, tight, moderate gas or oil odor, very weak bluish fluorescence, slow yellow cut, gas show.

8630

1"  
(frag.)

Sandstone - grey to brown, moderate to fine grained, rare coarse-grained, subangular to subrounded, poor sorting, massive, soft, pale yellow clay matrix, weakly carbonaceous, poor porosity, weak gas odor, weak greenish blue fluorescence and no cut.

8560

3/4"

Sandstone - pale grey-brown, silty, fine grained, weakly laminated, moderately sorted, soft and friable, pale brown clay matrix (5%), tight, no show.

8538

1/2"

Sandstone - light grey-brown, silty, fine grained with rare medium quartz, subangular-subrounded,

for, to soft, massive, weakly carbonaceous and micaceous, pale yellow minor clay matrix, 15% + porosity, no show.

- 8342 NR Lost in hole.
- 8263 3/4" Sandstone - light grey to brown, medium-coarse grain, soft and friable, subangular-subrounded, moderately sorted, massive, quartzose, carbonaceous, yellow clay matrix, weakly pyritic, 15-20% porosity, no show.
- 7980 3/4" Sandstone - grey to brown, medium to coarse grain, occasional pebbles, massive, soft to firm, quartzose, subangular to subrounded, moderately well sorted, clay matrix, weakly micaceous, porosity good + 20%, moderate gas odor, bluish white patchy fluorescence, and slow yellow cut.
- 7474 3/4" Siltstone - ~~at 7302~~ <sup>H.K.</sup> at 7302, strong gas odor, and weak green-blue fluorescence and weak slow yellow cut.
- 7474  
7302? 1" Siltstone - grey-brown, argillaceous, weakly micaceous, well sorted, tight, weak gas odor, weak greenish blue fluorescence and weak slow yellow cut.
- 7089 1/2" Sandstone - grey-brown, medium-pebble sized, subangular-subrounded, moderately poor sorting, massive, soft, clay matrix, weakly carbonaceous and micaceous, minor lithics, fairly tight, no shows, weak light blue mineral fluorescence.





SIDEWALL CORE DESCRIPTIONS

TUNA-1

Schlumberger

27/6/68

3

DJG

WELL

SERV. CO.

DATE

LOG RUN NO.

GEOLOGIST

FIELD

STATE

VICTORIA

ATT. 30

REC. 26

PAGE 2 OF 2 PAGES

NO.	DEPTH	REC	LITHOLOGY	COLOR	DISS CLAY	CONS	CALC	ODOR	FIDO	FLUORESCENCE			CUT		CUT FLUOR.		SHOW	PROB. PROD.
										DIST	INT	COL	QUAN	COL	INT	COL		
26	3600	1 3/4	mudst - sh. sl flky - st. ssile	H-gy														
27	3500	1 3/4	mudst.															
28	3406	1 1/2	mudst sl. silty w/ calc specks				r-											
29	3200	2	mudst															
30	2800	2	mudst.															

9/10

PALYNOLOGY



W 519

TUNA-1.  
TECHNICAL FILE

INTERPRETATIVE

PALYNOLOGY OF THE TUNA FIELD  
GIPPSLAND BASIN

by  
P.R. Evans

Palyn. Rept. 1970/29

July 1970.

## INTRODUCTION

Three wells have been drilled into the Tuna field. A full palynological report was written only for Tuna -1 (Palyn. Rept. 1969/2). Preliminary reports of data from Tuna -2 and -3 have been issued and the relationships between Tuna -1 and -2 were considered in discussions on the Flounder field (Palyn. Rept. 1969/9). Dinoflagellates from the Early Eocene upper M. diversus zone in Tuna -1 were described in Palyn. Rept. 1970/2 and from the Early-Late Eocene of Tuna -3 in Palyn. Rept. 1970/23.

The present report includes a revised view of all palynological data from the three Tuna wells.

Interest in Tuna has centred around two main problems: 1) The size, age and characteristics of the Eocene "channel fill". 2) The position of the top of the Cretaceous. Both problems have had a direct bearing on regional interpretations of the Gippsland Basin.

Other palynological features about Tuna have received less attention, but are at least recorded below for possible future study as need arises.

INTERPRETATIVE

SUMMARY

	Tuna -2	Tuna -1	Tuna -3
<u>N. goniatus</u> Zone			
<u>O. dictyoplokus</u> *			S.4450 S.4460 S.4470 S.4480
<hr/>			
<u>D. extensa</u> *			S.4490 S.4500
<hr/>			
Undiff.		C.4430 C.4439	
<hr/>			
Upper <u>M. diversus</u> Zone	C.4535 C.4565 C.4578 C.4590		
<hr/>			
<u>W. thompsonae</u> *		C.4507 4549 4565 4574 4588 4592 4597 4607 4621	C.4586 ?S.4606
<hr/>			
Undiff.	S.4726 S.4750 S.4800 S.4820 S.5098		
<hr/>			
Lower <u>M. diversus</u> Zone			S.4623 S.4654 S.4692 S.4719 ?S.4758

\* = dinoflagellate zone. C. = core; S. = sidewall core.  
 Depths are in feet.

INTERPRET

	Tuna -2	Tuna -1	Tuna -3
<u>L. balmei</u> Zone	S.5494	C.5390	S.4994
	S.5684	S.5618	S.5024
	S.6196	S.5708	S.5142
	C.6508	S.5927	S.5520
	S.6580	S.6118	S.5619
	C.6615	C.6190	S.5902
		C.6205	S.6015
		C.6220	S.6181
			S.6409
			S.6414
		C.6523	
		S.6530	
<u>T. lilliei</u> Zone	S.6968	C.6462	
	S.7150	C.6478	S.6579
	C.7246	C.6493	S.6594
		C.6510	S.6602
		C.6578	S.6646
			S.6652
			S.6674
<u>N. senectus</u> Zone	? S.7548	C.7409	S.7067
	? S 8200	C.7436	S.7824
		C.7439	S.8027
		C.8070	S.8044
		C.8074	
<u>T. pachyexinus</u> - <u>C. triplex</u>		C.9349	S.8382
		C.9358	8478
	C.10128	8770	
		9067	
		9192	
<u>A. distocarinatus</u> <u>T. pannosus</u>		C.10280	
		C.11621	
	S.11921		
	S.11940		

INTERPRETATIVE

COMMENT

Lower Cretaceous - Upper Cretaceous

There is no good evidence that Tuna -1, the deepest well, entered the Lower Cretaceous although it probably ended in sediments of the T. pannosus Zone. The T. pannosus Zone is thought to straddle the L-U. Cretaceous boundary, but at the time of drilling, evidence for the C. paradoxa Zone as a mark of distinct Lower Cretaceous was sought.

The deepest sample in Tuna -1, 11940 feet did not yield T. pannosus, but several of the spores present were atypical of the paradoxa Zone and hence even the bottom of the hole is tentatively referred to the pannosus Zone.

T. pannosus was positively identified at 11,621 feet.

The Lower Cretaceous is generally equated with the Strzlecki Group in most discussions about the Gippsland Basin. Basal section in Tuna -1 did not resemble the Strzlecki Group.

However, the T. pannosus Zone in the Otway Basin extends into the Otway Group, a lithological equivalent to the Strzelecki Group. Furthermore, a sequence in Golden Beach West -1 below a drill depth of about 5900 feet which represents in part the T. pannosus Zone has been regarded as either Strzlecki Group or an "intermediate" unit, the "Barracouta Sandstone".

It is possible, therefore, that a lower portion of the Tuna sequence, perhaps that below the lithological change at about 9800 in Tuna -1, is related to the intermediate type of lithology between the typical Strzlecki below (not encountered at Tuna) and the Latrobe Group above.

INTERPRETATIVE

UPPER CRETACEOUS

T. pachyexinus - C. triplex Zones

Studies in the Otway Basin have shown it is difficult to support the pachyexinus and triplex Zones as distinct units and insufficient data are available from Tuna by which separation might be attempted.

Representative samples of the interval are very poor in Tuna -1, but good in Tuna -3. The sidewall core from Tuna -3, 8770 feet is remarkable for its content of dinoflagellates. They have not been studied in detail, but are notable for the absence among their numbers of Deflandreid species by which equivalent levels in the Otway Basin are zoned. Nevertheless, this horizon in Tuna -3 is the only one in the Upper Cretaceous of the Gippsland Basin to yield this type of microfossil.

N. senectus - T. lilliei Zones

The limits and content of the senectus Zone are best demonstrated in Tuna -3,

Tuna -1 at 6462 feet has provided a "standard" for the lilliei zone in the eastern part of the basin. Revised determinations of the extent of the lilliei Zone undertaken during the first part of 1970 were largely based on Tuna.

The top of the zone, based on the decline in Nothofagidites spp. and the first stratigraphic appearance of Tripunctisporis sp. is documented to within an interval of about 50 feet. Main core no. 6 from within this interval could provide additional data about the top of the zone.

INTERPRETATIVE

## TERTIARY

Numerous samples are available from the balmei Zone and subdivision of the zone should be possible after further study. The uppermost section of the zone (previously referred to as Pla) is recognizable in Tuna -1 at 5390 feet and Tuna -2 at 5494 feet. Presumably it continues in younger horizons in Tuna - but has not been specifically identified there as a subdivision of the zone. The lower M. diversus Zone above the balmei Zone in Tuna -3 is, therefore, likely to be the result of continuous deposition from balmei to diversus times.

In contrast the presence of late M. diversus Zone above the balmei Zone in Tuna -2 is an indication of the break at the base of the "channel fill" (recognized in Palyn. Rept. 1969/9 in discussion of the Flounder wells).

The upper M. diversus Zone in Tuna -1 has long been noted for its content of dinoflagellates including Wetzeliella thompsonae, at least over a short interval. No dinoflagellates were identified in Tuna -2, but their "absence" is explicable in terms of sample position.

The thompsonae Zone is represented in Tuna -3 only in core at 4596 feet, but relatively abundant dinoflagellates of uncertain zonal position occur immediately below, at 4606 feet, and are provisionally assigned to the same zone.

If the "channel" was filled only with upper M. diversus sediments (as at Flounder) the base of the "channel" could lie as traced on the accompanying diagram. The "channel" has thus cut out the lower M. diversus and a portion of the L. balmei Zone at the locations of Tuna -1 and Tuna -2.

Unlike the "channel" at Flounder, a greater portion of sandstone comprises the fill at Tuna, fewer dinoflagellates are present and the cut was not so deep.

INTERPRETATIVE

The upper M. diversus Zone appears to continue above horizons which could bear W. thompsonae in Tuna -2. However, its relationship to the N. goniatus Zone is less clear. Core at 4439 feet in Tuna -1 is assigned to the goniatus Zone mainly because of its much higher Nothofagidites content. The numerous samples from the upper N. goniatus (= N. asperus) Zone in Tuna -3 are yet stratigraphically higher and are marked by the presence of dinoflagellates of both the extensa and dictyoplokus Zones. Thus the pay section at the top of the Tuna Eocene sequence appears to be referable to the N. goniatus Zone. Whether or not one or more breaks occur below or within the goniatus Zone cannot be determined, although they remain a possibility in view of the brevity of the sequence.

Taylor reports Miocene unit G at 4350 feet in Tuna -2, immediately above the "Latrobe". The extensa and dictyoplokus Zones appear to correlate with Eocene foraminiferal zonules L or K. An hiatus at the top of the "Latrobe" therefore represents the interval Oligocene unit J to Miocene unit H.

INTERPRETATIVE



BASIN GIPPSLAND

DATE 2518

WELL NAME TUNA-1

ELEVATION KB +31'

AGE	PALYNOLOGIC ZONES	HIGHEST DATA				LOWEST DATA					
		Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time	Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time
Eocene	<u>P. tuberculatus</u>										
	<u>U. N. asperus</u>										
	<u>M. N. asperus</u>										
	<u>L. N. asperus</u>	4315	1				4336	1			
	<u>P. asperopolus</u>	4414	1				4621	0			
	<u>U. M. diversus</u>										
	<u>M. M. diversus</u>										
	<u>L. M. diversus</u>										
Paleocene	<u>U. L. balmei</u>	5390	2				5390	2			
	<u>L. L. balmei</u>	5618	1				5708	2			
	<u>T. longus</u>	6118	1				6220	1			
Early Cretaceous	<u>T. lilliei</u>	6462	1				6534	1			
	<u>N. senectus</u>	7409	2				8070	2			
	<u>C. trip./T.pach.</u>	9349	2				10,050	2			
	<u>C. distocarin.</u>	10396	2				11,940	2			
	<u>T. pannosus</u>										
EARLY CRETACEOUS											
PRE-CRETACEOUS											
T.D.		11,944									

COMMENTS: Wetzeliella thompsonae Dinoflagellate Zone 4515(i) - 4621(i)

- RATINGS: 0; SWC or CORE, EXCELLENT CONFIDENCE, assemblage with zone species of spores, pollen and microplankton.  
 1; SWC or CORE, GOOD CONFIDENCE, assemblage with zone species of spores and pollen or microplankton.  
 2; SWC or CORE, POOR CONFIDENCE, assemblage with non-diagnostic spores, pollen and/or microplankton.  
 3; CUTTINGS, FAIR CONFIDENCE, assemblage with zone species of either spore and pollen or microplankton, or both.  
 4; CUTTINGS, NO CONFIDENCE, assemblage with non-diagnostic spores, pollen and/or microplankton.

NOTE: If a sample cannot be assigned to one particular zone, then no entry should be made. Also, if an entry is given a 3 or 4 confidence rating, an alternate depth with a better confidence rating should be entered, if possible.

DATA RECORDED BY: LES./ADP.

DATE June 1971; Dec. 1971.

DATA REVISED BY: ADP.

DATE Jan. 1975.

Tuna - 1

Palaeontological + Palynological Data.

Taken from Interpretal IES Log.  
(Well Depth)

<u>B</u>	900'
<u>C</u>	2500'
<u>D</u>	3500'
<u>E</u>	3980'
<u>F</u>	4304'
<u>M. diversus</u>	5375'
<u>L. balmei</u>	6323'
<u>T. lilliei</u>	7380'
<u>N. senectus</u>	8700'
<u>C. triplex</u>	9830'
<u>A. distocarinatus</u>	10690'
<u>T. hannosus</u>	
TD	

Miocene - Gifford and Fossiliferous.

- Late Pleistocene Complex

WELL NAME: TUNA # 1

DEPTH (FT)	SAMPLE TYPE	PRESER-VATION	DIVERSITY	SPORE/POLLEN ZONE	DINOFLAGELLATE ZONE	CONFIDENCE LEVEL	ENVIRONMENT
4315-17	Core 2	Good	High	Lower N. asperus	Indet	5	Marginal marine
4333-36	Core 3	Good	High	Lower N. asperus	-	5	Non-marine
4415-17	Core 5	Good	High	Lower N. asperus	-	5	Non-marine
4456-59	Core 7	Good	Moderate	Lower N. asperus	-	5	Non-marine
4494	Core 8	Fair	High	Lower N. asperus	-	5	Non-marine
4514-17	Core 9	V. Good	High	P. asperopolus	Indet	5	Marginal marine
4544-47	Core 10	Good	High	P. asperopolus	-	5	?Non-marine
4565-68	Core 11	Good	High	Late M. diversus	W. edwardsii	5	Marginal marine
4618-21	Core 12	Good	High	Late M. diversus	W. edwardsii	5	Marginal marine
5390	Core 13	Good	High	L. balmei (? early)	-	4	Non-marine
5618	SWC 10	Barren	-	-	Indet	-	-
5708	SWC 18	Poor	Low	?L. balmei	-	3	Non-marine
6118	SWC 16	Fair	Low	T. longus	-	4	Non-marine
6200	Core 14	Fair	Moderate	T. longus	-	5	Non-marine
6462	Core 15	Fair	Moderate	T. lilliei	-	4	Non-marine
6510	Core 17	Poor	Low	T. lilliei	-	5	Non-marine
6544	Core 18	Fair	Low	T. lilliei	-	5	Non-marine
6578	Core 19	Barren	-	Indet	-	-	Non-marine
7409	Core 22	Poor	Low	?T. lilliei	-	3	-
8070	Core 25	V. Poor	V. low	Indet	-	-	Non-marine
8743	Core 26	Fair	Moderate	?T. lilliei	-	3	-
8780	Core 27	V. Poor	Low	Indet	-	-	Non-marine
9358	Core 28	V. Poor	Low	Indet	-	-	-
10128	Core 30	V. Poor	Low	Barren	-	-	-
10396	SWC	V. Poor	V. low	?N. senectus	-	3	-
10903-14	Core 31	Barren	-	-	-	-	Non-marine
11391	SWC	Barren	-	-	-	-	-
11530	Core 32	V. Poor	V. low	?N. senectus	-	3	Non-marine
11584	SWC	Barren	-	-	-	-	-
11621	Core 33	Poor	V. low	Indet	-	-	Non-marine
11911	SWC	V. Poor	V. low	Indet	-	-	Non-marine
11940	SWC	V. Poor	V. low	Indet	-	-	Non-marine

OIL and GAS DIVISION

BY W.K. HARRIS - 3 FEB 1983

FOR AQUITAINE, PHILLIPS, SHELCO

COMMENTS: SPECIMENS MOSTLY INDETERMINATE IN LOWER SECTIONS OF THE WELL. SOME SLIDES HAVE DRIED OUT AND SOME ARE VERY POOR PREPARATIONS

PALAEONTOLOGY

David Taylor,

PAGE 1 OF 3.

TUNA-1.  
SPECIES LIST

TUNA(A-1)

3

3

	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
ARENACEOUS																				
Amnosphaeroidina sphaeroidiniformis																				
Gaudryina heywoodensis	.																			
Haeuslerella pukeuriensis																				
Textularia semicarinata			.		.			.												
T. sp. 3					.	.		.												
Gaudryina convexa			.	.	.			.			.	.	.	.	.	.	.	.	.	.
Amnobaeculites sp. (large)														.	.	.	.	.	.	.
Haplophragmoides cf. incisa															.	.	.	.	.	.
Clavulinoides victoriensis					.	.	.				.	.	.	.	.	.	.	.	.	.
Pseudoclavulina rudis														.	.	.	.	.	.	.
Bathsiphon sp.														.			.	.	.	.
Vulvulina granulosa																				
Ammodiscus parri																				
Haplophragmoides (flat-coarse)																				

3000  
—30

3500  
—376

4000  
—440

4400  
—440



David Taylor,  
**TUNA - I.**  
**SPECIES LIST**  
 3/3

TUNA-(A-1) |

	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350			
PLANKTONICS																																																						
Orbulina universa																																																						
Globigerina praebulloides																																																						
Globorotalia miotumida																																																						
Globigerina apertura																																																						
Globigerinoides trilobus																																																						
Globorotalia menardii																																																						
G. mayeri																																																						
Globigerina woodi																																																						
Orbulina suturalis																																																						
Globorotalia conica																																																						
Globigerina angustumbrilicata																																																						
Globigerinoides rubrus																																																						
Globorotalia barisanensis																																																						
Globoquadrina dehiscens																																																						
Globorotalia miozea conoidea																																																						
Globigerinoides glomerosa glomerosa																																																						
Globorotalia miozea miozea																																																						
Globigerinoides bisphericus																																																						
G. glomerosa curva																																																						
Globorotalia praescitula																																																						
G. zealandica																																																						

no planktonic fauna

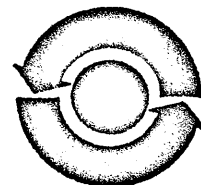
no fauna found

no

PETROGRAPHY



THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES



BASIC

PLEASE ADDRESS ALL CORRESPONDENCE TO THE DIRECTOR.

OUR REFERENCE: 3/178/0  
YOUR REFERENCE:

25th July, 1968.

TUNA-1

The Director and Exploration Manager,  
Esso Standard Oil (Australia) Ltd.,  
GPO Box 4047,  
SYDNEY, N.S.W. 2001.



REPORT MP214-69

YOUR REFERENCE:	Letter dated 10/7/68, Tuna X-1 323.11. Order 5380.
MATERIAL:	Rock sample.
LOCALITY:	Tuna A-1, 7351 ft.
DATE RECEIVED:	15/7/68.
WORK REQUIRED:	Detailed petrographic description.

Investigation and Report by: D. Smale.  
Acting Officer in Charge, Mineralogy Section: N. A. Trueman.

RE-NAMED  
(AUG. 1968)  
TUN 1

*P. A. Young*  
P. A. Young  
Director.

s1:4

*Dr. Bolten*

From: Mineralogy Museum P.L. 20/10/68

A MICROGABBRIO FROM TUNA A-1

AMDEL

Sample: Esso-BHP Tuna A-1 : 7351 ft : TS21285

RE-NAMED  
(AUG. 1968)  
TUNA 1

Rock Name:

Microgabbro

Hand Specimen:

A dark greenish grey (5GY 3.5/0.2) massive basaltic igneous rock; the greenish colour is probably due to chloritic alteration products.

Thin Section:

A visual estimate of the constituents gives the following:

	<u>5</u>
Plagioclase	60
Pyroxene	12
Opaques	4
Chlorite and serpentine	20
Sericite and titaniferous alteration products	4

The rock has subophitic to pilotaxitic texture. Large feldspar microlites have slightly smaller pyroxene and opaque grains between them. These are quite fresh, in contrast with the phenocrysts. Though phenocrysts have been present in this rock, forming perhaps 5% of it, they have now been altered to sericite and titaniferous material surrounded by chlorite which could well be serpentine. The original form of the phenocrysts can be detected in some relicts; they were in crystals fairly equant in shape, up to 1 mm across, and with little regular cleavage. However, from the shape of some of the crystals and the titaniferous alteration products, it is likely that they were titanite. In a few phenocrysts some yellow-green hornblende is present, probably pseudomorphing the original pyroxene, or it may be original. A few crystals may have been olivine; these are now altered entirely to chlorite with a trace of ziddingsite.

Plagioclase.

These are mainly labradorite, tending towards andesine. They are up to 0.5mm long, and generally not more than 0.06mm wide. Between the microlites the spaces are filled either with similar plagioclase without the lath-like form, or with pyroxene. A few crystals show some gradation in composition in their outer parts to a more sodic form.

AMDEL

Pyroxene.

The pyroxene in the groundmass is apparently different from that that was in the phenocrysts, as the former is unaltered. Its low optic axial angle ( $15^{\circ}$  to  $25^{\circ}$ ) suggests that it is most likely pigeonite. It occurs in anhedral to subhedral crystals 0.02 to 0.15mm across.

Opagues.

The opaque grains are similar in size to the pyroxene grains, but tend to be much narrower and more elongated in shape. They are probably mainly magnetite or other iron oxide.

Chlorite.

Little chlorite occurs except in association with the remains of phenocrysts. Some is pale blue-green, and the remainder is yellowish brown. Where the two varieties occur together, the yellow-brown chlorite is within a regular lining (0.01mm thick) of the pale blue-green; they both tend to have a fibrous form, the fibres of both types being elongated at right angles to the edge of the chlorite mass. The blue-green variety has slightly lower birefringence and refractive indices. The yellow-brown variety is altering direct from the yellow-green hornblende. A little chlorite could have altered from interstitial glass; this material has a greater proportion of the blue-green, and is definitely later than the pyroxene or plagioclase.

Accessory minerals.

A trace of orange-brown material is associated with some of the opaques. This could be iddingsite.

History:

The fact that this is a microgabbro indicates that it is probably a relatively slowly cooled intrusive rock, as indicated also by the comparatively large size of the feldspar microlites. The pyroxene in the groundmass is in slightly smaller grains, with indications texturally that it is somewhat later formed than the plagioclase. There is no sign of conversion of the pigeonite to orthopyroxene, and as pigeonite is unstable during cooling it appears that in its final stages of formation the rock must have been quickly cooled. Possibly it broke through to the surface at this stage. A change in environment of this kind would also be in keeping with the gradation in composition in the outer zone of some of the plagioclase crystals. It is likely that titanite was the dominant phenocryst mineral,

with possibly a small amount of olivine. Some hornblende may also have been present, but as any hornblende present in basic rocks is usually brown, this probably became altered to the green variety observed, which then became altered to chlorite or serpentine. It is likely that at about the time the brown hornblende became green, the titanite became completely altered to muscovite and titaniferous alteration products. It may be significant of a slightly unusual type of alteration that the pyroxene was not unaltered. The alteration could have been due to weathering at depth (as the iron is in a lower oxidation state than that generally found at the surface), or it could have been hydrothermal alteration. However, if the latter were true, this rock would be likely to be on the very edge of the zone of alteration, as there is no observable mineralization.

Note:

1. The terminology of Hatch, Wells and Wells is followed in igneous descriptions (Hatch, F.H., Wells, A.K., Wells, M.K. 1961, 3rd ed. "Petrology of the Igneous Rocks". Murby, London.
2. Colours are classified according to the Munsell system, as in the "Rock-Colour Chart" distributed by the Geological Society of America, 1963.

PETROGRAPHIC DESCRIPTION OF A VOLCANIC ROCK FROM  
7,351 FEET IN ESSO'S TUNA 1 WELL

BY J. B. HOCKING  
30-10-68

Sample: Thin section only, prepared from a sample taken at 7,351 feet in Esso's Tuna 1 well, Gippsland Basin.

Submitted by: Esso Standard Oil (Aust.) Ltd., at the writer's request, on 19th September, 1968, on loan only.

Thin Section No.: AMDEL TS21285

- - - - -

## 1. Thin Section Description

### 1.1. Review

The rock is a basic igneous type, and is inequigranular-porphyrritic and holocrystalline with a pilotaxitic texture. It is composed of altered olivine phenocrysts set in a fine-grained groundmass of plagioclase feldspar, pyroxene, iron ore and chlorite. The relative proportion of these constituents, based on a very approximate visual estimate, are:

	%
Phenocrysts	20
Plagioclase	45
Pyroxene	15
Iron ore	5
Chlorite (groundmass)	15

### 1.2. Details

The phenocrysts are up to 2.6 mm. long. They are strongly corroded and disaggregated such that the original outlines are poorly distinguishable. Nevertheless, some are seen to be hexagonal and, indeed, remnants of the fresh mineral indicate that the phenocrysts are of olivine. Alteration has proceeded in a somewhat complex fashion and the phenocrysts are either rimmed or subdivided by (a) pleochroic, green saponite mineral (Hocking, 1968b), (b) pale green, fibrous chlorite mineral, and (c) microcrystalline (but occasionally coarser) calcite which is usually a cloudy grey color due to the inclusion of disseminated ?titaniferous material. The order of replacement is that given above. In some instances the saponite replacement of the olivine is relatively advanced.

The plagioclase feldspar, which has the composition of sodic labradorite, consists predominantly of subhedral laths up to 1 mm. long (average approx. 0.55 mm.). The laths tend to be randomly orientated. Other than the laths there are subordinate interstitial crystals of plagioclase that are anhedral and poorly twinned. The feldspars are sometimes slightly replaced by the groundmass chlorite.

The pyroxenes are fresh, colorless to faint yellow crystals of augite that are perhaps slightly titaniferous. The crystals are generally subhedral, either equant or as stumpy laths, with a maximum size of 0.2 mm. (average approx. 0.1 mm.).

Iron ore is dispersed throughout as anhedral or subhedral crystals, as aggregates, and as narrow needles up to 0.5 mm. long. The ore appears to be skeletal magnetite

PETROGRAPHIC DESCRIPTION OF A VOLCANIC ROCK etc.

that has been altered - though the extent of alteration cannot be fully ascertained - to hematite.

More than one variety of chlorite mineral occurs as irregular patches in the groundmass and, rarely, as amygdalae. The patches are most prevalent adjacent to the altered olivine phenocrysts. Fibrous varieties are the most frequent and, as a rule, a very narrow lining of a very pale green, non-pleochroic variety encloses larger areas of a green brown, pleochroic variety with higher birefringence. The former has a vermicular habit whereas the latter is often radiating.

2. Conclusions

2.1. Rock Classification: OLIVINE BASALT

2.2. Stratigraphic Implications

Other than the different pattern of olivine alteration, the Tuna basalt closely resembles that from Dolphin 1 (Hocking, 1968a). Both can be assigned to the 'Older Volcanic Series' of Victoria (refer Edwards, 1938).

- - - - -

References

Edwards, A.B., 1938. Petrology of the Tertiary Older Volcanic rocks of Victoria.  
Proc.Roy.Soc.Vict., 51(1) : 73-98.

Hocking, J.B., 1968a. Petrographic description of a volcanic rock from between 8,350 and 8,570 feet in Esso's Dolphin 1 well.  
Vict.Mines Dept.Unpubl.Rept. 1968/32.

1968b. Petrographic description of volcanics from 4,850-4,860 feet in Esso's Perch 1 well.  
Vict.Mines Dept.Unpubl.Rept. 1968/33.

- - - - -

*Perry Hocking*

J.B. Hocking  
Geologist

Sedimentary Basin Studies Section

30th October, 1968.

TUNA FIELD CHARACTERISTICS

Gippsland Basin, Victoria

Tuna Oil Field

**Owners**

Esso Exploration and Prod. Aust. Inc. - 50% Operator.  
Hematite Petroleum Pty. Ltd. (B.H.P.) - 50%.

**Royalties and overrides**

6% to Victorian Government, 4% to Commonwealth Government, and 2½% O.R.R. to Lewis G. Weeks.

**Lease No.**

Exploration Permit for Petroleum (offshore) VIC/P1.

**Location**

12 mi (19 kms) northeast of Marlin Gas and Oil Field, and 27 mi (43 kms) offshore Victoria.

**Discovery well**

**Tuna No. 1**

Coordinates: 38° 10' 25" S; 148° 25' 03" E.  
Discovery date: September, 1968.  
Drilled by: Glomar III.  
Water depth: 198 ft (60.4 m)  
Total depth: 11,944 ft (3,640.5 m)

**Productive interval and maximum flow rates**

No test data announced. In Tuna No. 1, wireline formation tests recovered condensate and oil below 6,300 ft (1,920 m). Gas was detected below 4,300 ft (1,310.6 m) in Tuna No. 2 and oil was recovered in a wireline formation test at about 7,760 ft (2,365.2 m).

**Method of location**

Reflection seismic.

**GEOLOGICAL FACTORS**

**Producing zone**

Latrobe Group

**Age**

Eocene

**Environment of deposition**

Non-marine; fluvialite.

**Reservoir rock description**

Sandstone

**Source rock**

Lakes Entrance Formation and intra-Latrobe shale and coal.

**Cap rock**

N.A.

**Type of trap**

Structural; anticlinal closure.

**Regional setting**

Located in the east-central portion of the offshore Gippsland Basin.

**Relation to unconformities**

Producing sands in Latrobe Group lie directly below regional Eocene-Oligocene unconformity.

**Oldest formation penetrated**

N.A.

**RESERVOIR DATA**  
(data Company confidential)

**FIELD DESCRIPTION AND DEVELOPMENT DATA**

**Estimated ultimate recoverable reserves (Victorian Ministry of Fuel and Power, 1972)**

(Oil) 84,000,000 bbls (13,354,000 kls)  
(Gas) 0.5 trillion CFG (14.1 billion m<sup>3</sup>)

**Productive area**

16 ± sq mi; 10,250 ± acres; 41 ± sq kms\*

**Total area of closure**

16 ± sq mi; 41 ± sq kms\*

**Maximum vertical closure**

300 ± ft (91 ± m)\*

**Depth to top of pay zones**

Tuna No. 1: below 6,300 ft (1,920 m)  
Tuna No. 2: (gas) below 4,300 ft (1,310.6 m)  
(oil) 7,760 ± ft (2,365.2 m).

**Interfaces**

N.A.

**Total hydrocarbon column**

N.A.

**Number of wells**

Oil and gas - 3, dry - nil; Total - 3.

**Net pay thickness**

N.A.

**Number of reservoir beds**

Several

**Acro-feet**

N.A.

**Porosity (intergranular)**

Good

**Permeability**

Good

**Water saturation**

N.A.

**Reservoir temperature**

N.A.

**Initial-reservoir pressure**

N.A.

**Probable drive mechanism**

Water drive.

**Recovery factor**

(Oil) 500 ± bbls/acre-ft\*



Tuna Oil Field

Gippsland Basin, Victoria

FLUID PROPERTIES

OIL

Gravity: "high gravity"  
Base:  
Sulphur (% wt): "Low"  
Initial G.O.R.:  
Pour point:  
Viscosity:  
Bubble point:

GAS (associated)

Methane  
Ethane  
Propane  
Isobutane  
N-butane  
Isopentane  
N-pentane

% Volume

Hexanes +  
Nitrogen  
Oxygen  
Carbon dioxide  
Hydrogen sulphide  
Specific gravity  
BTU/cu ft (gross)  
(net)

CONDENSATE

Gravity:  
bbls/MMcfg:  
Specific gravity:

PRODUCTION DATA

None, no development plans for the field have been announced.

COSTS

N.A.

REMARKS

- 1. Tuna drilling and detail seismic survey were not subsidized, consequently data and results are company confidential.
- 2. After extensive subsurface and engineering studies, Tuna Gas Field was declared commercial in May, 1971.

REFERENCES

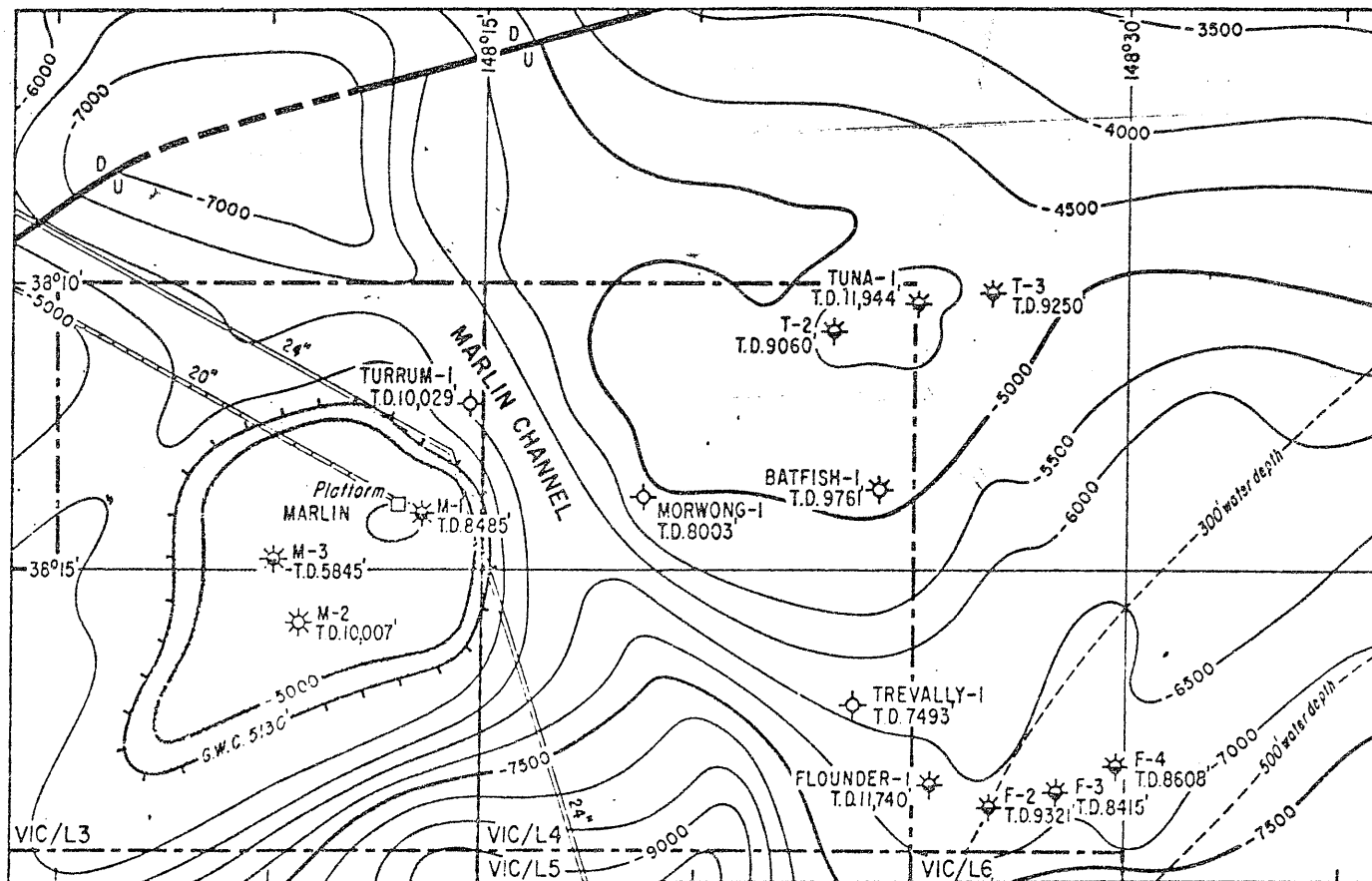
Stratton, M.A., 1972.  
Victorian Ministry of Fuel and Power, 1972.

FOOTNOTES

- Editor's estimate

# MARLIN, TUNA AND FLOUNDER FIELDS GIPPSLAND BASIN, VICTORIA

## STRUCTURE MAP: TOPOGRAPHIC SURFACE AT TOP OF LATROBE DELTAIC COMPLEX



NOTE: Productive limits at TUNA partially controlled by stratigraphy

20" Gas pipeline (20inch)  
24" Oil pipeline (24inch)

Contour interval: 500ft.



Tuna - 1.  
3/3

**OIL and GAS DIVISION**

**ROCK-EVAL DATA SHEET**

BY MOBIL OIL AUSTR.

05 JUL 1984

Sample No. or Depth	% TOC	S <sub>1</sub> (mg/g)	S <sub>2</sub> (mg/g)	S <sub>3</sub> (mg/g)	T max (°C)	Hydrogen Index	Oxygen Index	S <sub>2</sub> /S <sub>3</sub>
<i>Halebut-1 Well</i>								
8320-8370c	67.27	13.26	194.86	5.61	419	289.6	8.3	34.72
" S	3.08	0.26	1.67	9.11	432	54.2	295.7	0.18
8680-8720c	59.07	11.14	183.91	5.52	421	311.6	9.4	33.29
" S	2.84	0.28	2.35	4.19	435	82.9	147.4	0.56
9450-9460c	70.50	7.85	161.89	5.21	419	229.6	67.4	24.48
" S	10.95	1.36	24.05	2.04	427	219.6	18.7	11.77
9510-9520c	70.35	6.24	141.19	5.77	424	200.7	8.2	3.42
" S	8.56	0.48	14.41	1.93	432	168.3	22.5	7.48
9630-9670c	72.87	11.40	176.62	6.88	422	242.4	9.4	25.68
" S	7.05	0.60	10.07	2.09	434	142.8	29.6	4.82
9750-9790c	64.55	8.37	157.76	6.26	426	244.4	9.7	25.21
" S	7.40	0.79	10.26	1.97	431	138.6	26.6	5.22
<i>Tuna-1 Well</i>								
5200-5230c	62.84	4.22	85.92	14.77	428	136.7	23.5	5.82
" S								
5660-5710c	64.81	4.71	76.75	9.12	424	118.4	14.1	8.42
" S								
5800-5830c	60.09	3.67	45.10	16.78	425	75.1	27.9	2.69
" S								
6020-6040c	48.53	6.00	91.43	8.54	425	188.4	17.6	10.71
" S								
6200-6230c	62.65	3.07	65.42	19.14	424	104.4	30.6	7.22
" S								
6370-6390c	64.49	5.04	98.32	13.62	423	152.5	21.1	10.44
" S								
9150-9170c	64.22	2.70	94.44	9.86	424	147.1	15.4	9.58
" S								
9410-9430c	65.33	3.78	92.41	13.25	431	141.5	20.3	6.97
" S								

C = COAL  
S = SHALE

LOG ANALYSIS

TUNA A1 WELL.

An examination of the electrical and other logs run over the interval 4800 ft. to 7000 feet.

The following logs were examined:-

- |     |                                   |       |               |
|-----|-----------------------------------|-------|---------------|
| (a) | Induction Electrical log          | Run 3 | 4800' - 7002' |
| (b) | Borehole compensated Sonic log    | Run 3 | 4800' - 7003' |
| (c) | Compensated Formation Density log | Run 2 | 4850' - 7001' |
| (d) | Gamma Ray - Neutron log           | Run 2 | 6200' - 6700' |

1. Examine for Reversed S.P. deflections

The S.P. curve and the gamma ray curve (run on FD log) were compared and no reversal was found.

2. Inspection of Induction - Electrical log.

The following intervals are those showing high resistivities together with -ve S.P. deflection and low gamma ray readings (Adjusted depths to nearest 5 feet).

4980' - 5045'

5115' - 5145'

5160' - 5180'

6200' - 6700' - Several Intervals in this gross section.

6770' - 6780'

Each of these zone areas examined:-

(a) 4980'-5045', 5115'-5145', and 5160'-5180'.

The S.P. curve records - 53 MV at this level as compared with - 60 MV in the sand immediately above. There is a change in lithology at the level which can explain the high resistivities. The lithological log of the well shows Dolomitic sandstone with interbedded siltstone and shale.

(b) 6200' -6700' and 6770'-6780'.

The core analysis results cover the interval 6209'-6213' indicated no oil saturation and water saturation of 70.7% - 80.5%. However, over the interval 6462' - 6629' the oil saturations were present while below 6645' no oil saturations were ~~recorded~~ recorded.

Thus with this background information it is seen that gas may be present in the interval cored from 6209'-6213' and that oil may be present in the cored interval 6462' to 6629'.

The intervening interval which was not cored (i.e. 6220'-6462') several gas peaks were recorded over the gross interval 6235'-6330'.

3. A plot of Sonic versus conductivity was made and the 100% water saturation line determined and from it the 50% water saturation line determined. (Copy attached).


The tabulation, below was prepared.

<u>No.</u>	<u>Depth.</u>	<u>SW%.</u>
1	6064	100%
7	6092	Near 100%
2	6100	Near 100%
3	6144	Near 100%
4	6170	Near 100%
5	6181	100%
6	6218	50% - 100%
9	6265	450%
10	6283	450%
29	6327	450%
11	6328	450%
30	6388.5	450%
8	6390	450%
31	6409	450%
26	6464	50% - 100%
20	6494	450%
25	6580	450%
32	6608	450%
21	6629	50%
22	6637	Near 100%
23	6658.5	Near 100%
24	6701	Near 100%

From this it can be seen that the top of the hydrocarbon-bearing zone is between 6181' and 6265' and that the Hydrocarbon/Water content is between 6629' and 6637'.

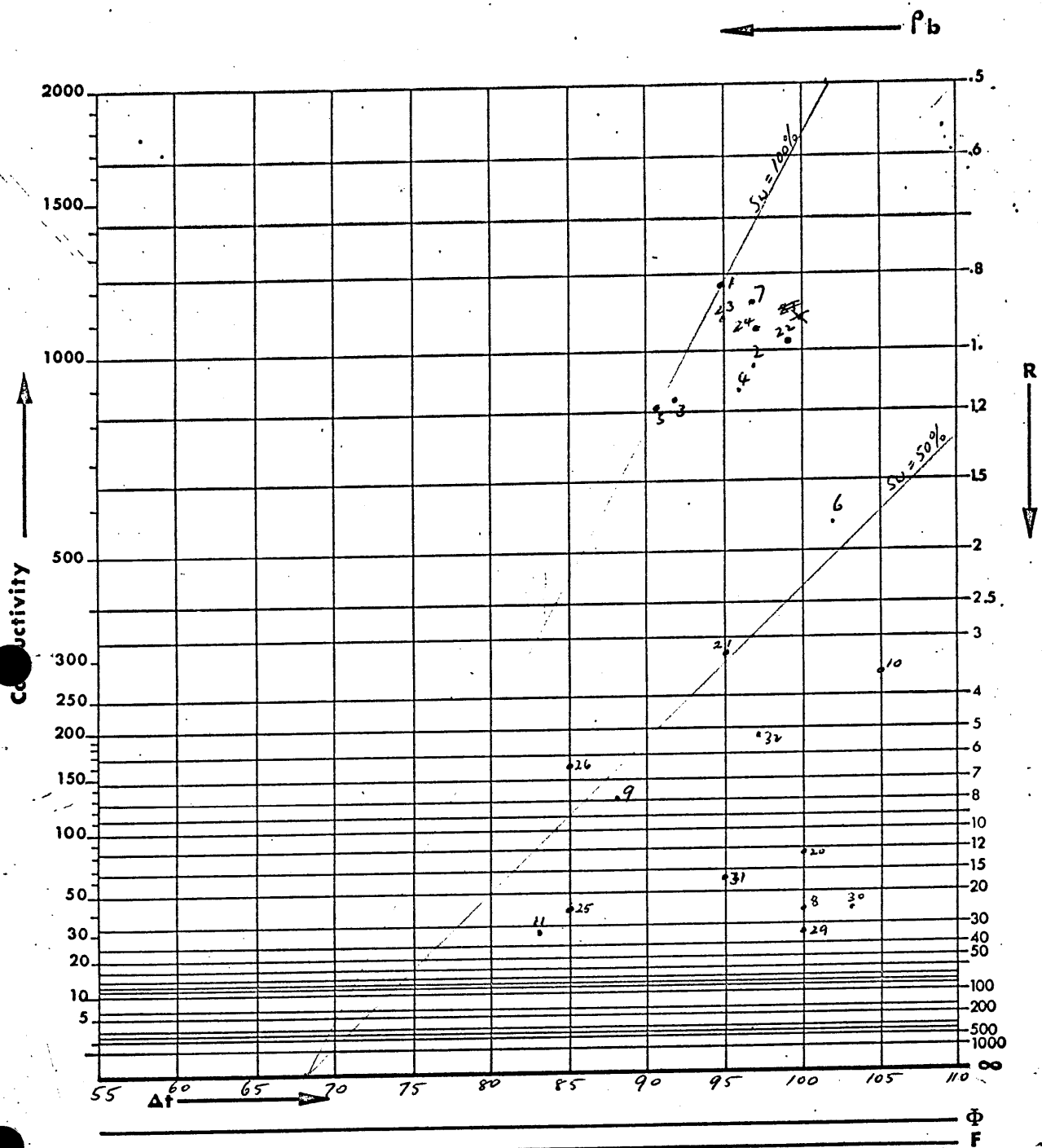
From the logs these contents are selected at:-

Top of Hydrocarbon Zone = 62<sup>2</sup>2 feet  
Hydrocarbon Water Contact = 6630 feet.

  
P.W. BOLLEN.  
22/7/68.

*Check.*  
6322'-6630'

# GRID FOR SONIC — RESISTIVITY OR FD — RESISTIVITY PLOTS



Grid for Resistivity vs Sonic or vs Formation Density Plot

$$F = \frac{.62}{\phi^{2.15}}$$

Tuna AI Well.

No	Depth	$\Delta E$	C	No	Depth	$\Delta E$	C	No.	Depth	$\Delta E$	C	FIT.	No
20	6494	100	80	29	6327	100	30					18	29
21	6629	95	300	30	6385	103	40					20	30
22	6637	99	1025	31	6409	95	60					22	31
23	6658.5	95	1099	32	6608	97	190					17	20
24	6701	98	1050									19	32
25	6580	85	40									21	21
26	6464	85	160										
27													
28													
1	6064	95	1200	8	6390	100	40	15					
2	6100	97	950	9	6265	88	130	16					
3	6144	92	875	10	6283	105	275	17					
4	6170	96	895	11	6328	83	30	18					
5	6181	91	850	12				19					
6	6218	102	550	13									
7	6092	1150	97	14									

TUNA A1 WELL.

The selection of pay zones in the interval 6261'-6630'.

The interval 6261'-6630' (i.e. 369') is considered to be a hydrocarbon-bearing column in this well and this exercise is to select those zones within this gross interval that may be considered as pay zones.

From the results of 6 wire-line tests made over the interval 6327'-6629' it can be seen that both oil and gas are present.

These tests recovered:-

Gas and condensate from 6327' and 6388.5'

Gas and oil from 6409', 6494' and 6608'

Gas, oil, water from 6629'.

Thus a Gas/Oil contact occurs between 6388.5' and 6409', and from the logs it is seen that a shale bed occurs from 6392' to 6407' and it can be assumed that this separates the oil and gas.

From a study of the SP curve and the Gamma Ray curve an estimate of the nett amount of pay zones was made.

(a) Gas pay zones in the gross 131 feet from 6261' - 6392'.

<u>Interval.</u>	<u>Thickness (ft.).</u>
6261' - 6265'	4
6278' - 6295'	17
6310' - 6314'	4
6323' - 6332'	9
6352' - 6360'	8
6364' - 6369'	5
6380' - 6392'	<u>12</u>
	59 feet Nett.
	==

(b) Oil pay zones in the gross footage of 223' from 6407' - 6630'.

<u>Interval.</u>	<u>Thickness (ft.).</u>
6407' - 6413'	6
6491' - 6498'	7
6502' - 6518'	16
6520' - 6543'	23
6546' - 6548'	2
6560' - 6580'	20
6586' - 6588'	2
6592' - 6630'	<u>38</u>
	94 feet Nett.
	===

  
P.W. Bollen.

23/7/68.



*Main Tuna Valley Gas Zone*

TUNA A1 WELL - Interval 4300' - 4650'

RE-NAMED  
(AUG. 1963)  
TUNA 1

Examination of Logs. i. e.

- (a) Induction Electrical log Run 2 : 2450' - 4922'
- (b) Borehole Compensated Sonic log Run 2 : 2450' - 4920'
- (c) Gamma Ray-Neutron log Run 1 : 4200' - 4800'
- (d) Compensated Formation Density log Run 1: 2450' - 4921'

- (a) From a study of the Induction Electrical log it can be seen that resistivity increase gradually over the interval of approximately 4280 and show a marked increase at 4344 feet.

These resistivities show a marked decrease from about 4450 and a gradual increase from about 4455' and reaches an average constant value at about 4480'.

Below 4480' occur 3 and possibly 4 points of *i.e.* interest:-

- 4496' - 4498'
- 4528' - 4530'
- 4563 (Possibly)
- 4572' - 4574'

- (b) From the examination of the Gamma-Ray log and description of bores and cuttings it can be seen that the following lithologies are present.

- At 4300 - Base of calcareous mudstones
- 4300' - 4345' - Glauconitic sandstone
- 4345' - 4460' - Sandstone with 2 shale beds:-
  - 4405' - 4406' and 4416' - 4420'
- 4460' - 4630' - Shaley section with 5 sandstone zones:-
  - 4465' - 4472'
  - 4496.5' - 4498.5'
  - 4528.5' - 4530'
  - 4563' - 4564'
  - 4574' - 4575.5'

- (c) By using the technique of Storseth (1957) also given in Gatlir (1960, p. 225) the following porous zones are present.

- |                  |                 |
|------------------|-----------------|
| 4345' - 4368'    | 4446' - 4460'   |
| 4371' - 4379'    | 4465' - 4472'   |
| 4386' - 4387'    | 4496.5' - 4499' |
| 4403' - 4405.65' | 4529' - 4530'   |
| 4405' - 4408'    | 4563' - 4564'   |
| 4412' - 4415'    | 4574' - 4575.5' |
| 4424' - 4427'    |                 |
| 4429' - 4441'    |                 |

However this technique is considered by the writer as underestimating these porous zones due to the reaction of the Neutron log opposite gas-bearing formations.

Consequently the Neutron log was compared with the Sonic log in the manner as described by Fitzgerald (1965). This method is based on the opposite effects that gas has on the two logs.

The intervals and results of this study are given below:-

4368' - 4371'	-	gas bearing, porous sandstone
4379' - 4386'	-	" " " "
4387' - 4403'	-	" " " "
4408' - 4412'	-	" " " "
4415' - 4424'	-	" " " "
4427' - 4429'	-	" " " "
4441' - 4446'	-	" " " "

Thus the porous Hydrocarbon bearing interval is considered to be

4345' - 4405'	
4406' - 4410'	
4420' - 4460'	<u>110'</u>
4465' - 4472'	
4496.5' - 4499'	
4529' - 4530'	
4563' - 4564'	
4574' - 4575.5'	<u>13'</u>
Total	<u>123 feet Nett Pay.</u>

This nett pay can be divided into a Gas/Condensate section and a Gas/Oil section based on the results of wire-line tests (Summary sheet attached) and bore analysis data.

Oil is present in the bottom two sections i. e. 4563'-4564' and 4574'-4575.5'. The remainder is gas/condensate.

*[Signature]*  
P. W. Bollen.

1/7/68

*Noted. The applicability of this method to this case is open to question.*

*[Signature]* 8/8/68.

WIRE-LINE FORMATION TEST

WELL TUNA A1

SUMMARY SHEET

No.	Depth	Gas(cu. ft)	Condensate (c. c.)	Oil (c. c.)	Water (c. c.)	Mud (c. c.)	Sand (c. c.)
Test Failed at:- 4529' : 4530' : 4540" : 4596. 5' : 4562. 5' : 4574' : 4575' : 4575. 5' : 4583' : 4584'.							
10	4363	87. 5	350			3800	
7	4425	Lost	150			3000	
13	4497	15. 2	20		4250	700	
16	4529	44. 6	144			1000	
8	4529. 5					5800cc	
15	4540					500cc	
14	4549					250cc	
11	4563	16		4400	1000	1000	

FORMATION TESTER RESULTS

## FORMATION TESTER RESULTS

BASIC

X 1/4  
TUNA-1

Run 3 - June 25 to 27, 1968

FIT#1

June 25

Depth: 6494'

Remarks: Ran 5 1/2" gun block with dual packers, 5 1/2 gallon main sample chamber, 1/2 gallon segregator chamber and 10,000 psi Amerada pressure recorder. Used reverse fire technique. Segregator failed to hold seal when opened. Surface pressure on main chamber = 1600 psi

Recovery: 3900 cc Oil & gas under pressure in three separate containers.

27.0 cu. ft. Gas

5200 cc Oil

2500 cc Filtrate

500 cc Mud

Properties:

Gas Analysis

C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	iC <sub>4</sub>	C <sub>4</sub>	iC <sub>5</sub>	C <sub>5</sub>	CO <sub>2</sub>
?(XS)	750	195	14	20	3	3	2190

Oil Analysis

Gravity = 40° 4PI

Field Pourpoint = 74° F

GOR = 825 cu ft./Bbl.

Filtrate Resistivity = 0.96 @ 60° F

FIT#2

June 26

Depth: 6327'

Remarks: Ran 5 1/2" Gun block with dual packers, 2 1/2 gallon main sample chamber, 1/2 gallon segregator chamber and 10,000 psi Amerada pressure recorder. Used reverse fire technique. Segregator failed to hold seal when opened. Surface pressure on main chamber = 1700 psi.

Recovery: 1500 cc Gas under pressure (1 container)  
50.2 cu. ft. gas  
105 cc condensate (light brown in colour)  
750 cc Mud

Properties:

Gas Analysis

C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	iC <sub>4</sub>	C <sub>4</sub>	iC <sub>5</sub>	C <sub>5</sub>	CO <sub>2</sub>
?(XS)	1020	350	38	58	10	6	3120

2  
4  
TUNA-1

FIT#3

June 26, 1968

Depth: 6603'

Remarks: Ran 5½" gun block with Dual Packers, 5½ gallon main sample chamber, ½ gallon segregator chamber and 10,000 psi Amerada pressure recorder. Used reverse fire technique.  
Surface pressure on main chamber = 1300 psi

Recovery: a) Main chamber  
32.3 cu. ft. Gas  
8700 cc oil  
6500 cc filtrate  
500 cc mud

b) Segregator chamber  
This chamber was not opened and has been stored for future high pressure transfer

Properties:

Gas Analysis -

C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	iC <sub>4</sub>	C <sub>4</sub>	iC <sub>5</sub>	C <sub>5</sub>	CO <sub>2</sub>
?(XS)	930	365	32	42	3	3	2580

Oil Analysis -

Gravity = 40°API  
GOR = 590 cu ft/B61

Filtrate Resistivity = 1.27 @ 60°F

FIT#4

June 27

Depth: 6388½'

Remarks: Ran 5½" Gun Block with dual packers, 5½ gallon main chamber, and 10,000 psi Amerada Pressure Recorder.  
Used Reverse Fire Technique  
Surface pressure on main chamber = 1800 psi

Recovery: 106.0 cu. ft. gas  
300 cc condensate (light brown in colour)  
2000 cc filtrate and mud

TUNA-1 <sup>3</sup>/<sub>4</sub>  
TUNA-1

FIT#5

June 27

Depth: 6629'

Remarks: Ran 4" gun block with single hydraulic extension packer, 2 3/4 gallon main chamber, 1/2 gallon segregator chamber; Amerada pressure recorder cannot be fitted when segregator chamber is part of tool.

Recovery: a) Main chamber (surface pressure = 200 psi)  
0.2 cu. ft. Gas (?)  
9200 cc water with oil scum  
500 cc mud  
b) segregator chamber (surface pressure = 100 spi)  
0.1 cu. ft. gas (?)  
2250 cc water with oil scum

Properties: Water Resistivity  
Main chamber = 0.90 @ 65°F, NaCl = 4800 ppm  
Segregator chamber = 0.755 @ 65.5°F, NaCl = 6675 ppm

These values are slightly different from the mud filtrate value, but Schlumberger interpreted the above values as indicating less than 3% formation water.

The Chromatograph detected small amounts of C<sub>1</sub> and CO<sub>2</sub> in the recovered water.

FIT#6

June 27

Depth: 6409'

Remarks: Ran 5 1/2" gun block with dual packers, 5 1/2 gallon main sample chamber and 10,000 psi Amerada pressure recorder.  
Surface pressure on main chamber = 1400 psi.

Recovery: 30.0 cu. ft. Gas  
8550 cc Oil  
8500 cc Filtrate and mud

Properties: Gas Analysis  
C<sub>1</sub> C<sub>2</sub> C<sub>3</sub> iC<sub>4</sub> C<sub>4</sub> iC<sub>5</sub> C<sub>5</sub> CO<sub>2</sub>  
1120 1360 200 38 36 4 3 ?

Oil Analysis -  
Gravity = 41.8° API  
GOR = 560 cu ft./Bbl

FIT#7

June 27

TUNA - 1

Depth: 6538'

Remarks: Ran 4" gun block with single hydraulic extension packer, 2 $\frac{3}{4}$  gallon main chamber and  $\frac{1}{2}$  gallon segregator chamber

When the back-up shoe of the tool was set the recorded pressure continued to indicate a pressure close to the hydrostatic pressure. This was interpreted as indicating a seal failure, but when the tool was dismantled on the surface it was found that the flow line valve had failed to open.

TRANSFER OF SAMPLE FROM SEGREGATOR CHAMBER (FIT#3)

Depth: 6608'

Date Transferred: July 4, 1968

Remarks: Chamber pressure at ATM temp. (approx. 55<sup>o</sup>F) = 1200 psi. The chamber was heated to approx. 100<sup>o</sup>F for 2 hours, as a result the chamber pressure rose to a stable level of 1900 psi. As pressure was applied to the chamber no linear, well defined increases in the pressure occurred until the pressure reached 2000 psi. This allows a rough interpretation of the saturation pressure as 2000 psi at 90 - 100<sup>o</sup>F.

Description of Samples Transferred: In order Transferred -

1. Corelab Container #843  
Total Container Volume = 690 cc  
Volume transferred = 600 cc  
Volume of Water = 70 cc  
Drained off to Relieve Pressure
2. Corelab container #629  
Total container volume = 730 cc  
Volume transferred = 600 cc  
Volume of water = 80cc  
Drained off to relieve pressure
3. Corelab container #32  
Total container volume = 700 cc  
Volume transferred = 600 cc  
Volume of water = 70 cc  
Drained off to Relieve Pressure



VELOCITY SURVEY

VELOCITY SURVEY

Well ..... TUNA A-1 .....  
Basin ..... GIPPSLAND .....

RE-NAMED  
(AUG. 1968)  
TUNA 1

INTRODUCTION

Esso personnel ..... P. J. BIRMINGHAM .....  
Contractor ..... UNITED GEOPHYSICAL .....  
Supplied (1) Instruments  
(2) Personnel  
    Seismic Observer H. Van Willigan  
    Marine Shooter L. Moore  
(3) Licenced Shooting Boat  
    name Wendy Maree  
    date loaded 18/6/68  
    date released 2/7/68  
    Agent Desma Engineering  
    amount of powder 750 lbs  
    size of cans 16-2/3 lbs  
    number of cans 45  
    number of caps 45  
    number of boosters 45

Personnel and Instruments

assembled at Melbourne date 21/6/68  
boarded (rig) Glomar III date 22/6/68  
date of survey 27/6/68  
casing depth 2450 feet  
T.D. when shot 7005 FTD  
water depth 190 feet

SURVEY PROCEDURE

Weather: sea Moderate  
rig movement Slight  
rig noise Noisy  
Hydrophones: number Two  
depth below sea level 20 ft  
position One in Moanpool  
One over side of boat

Shot Positioning and Charges:

marker buoys (number Nil  
(distance  
(direction  
charge depth 10 ft  
number of shots 15 charge size 16-2/3 lbs  
number of shots charge size lbs  
number of misfires One  
amount of powder used 250 lbs

amount of powder dumped ..... Nil... lbs.

Well-phone positioning :

T-bar ..... Not used

number of depths ..... six

Time: first shot ..... 8.50 am

last shot ..... 10.55 am

rig time ..... 2 hours 5 minutes

RESULTS

Quality of records ( good ..... 4.....

( fair ..... 7.....

( poor ..... 3.....

( not used ..... 2.....

Comparison of Interval Times

with sonic log

/Δ/average ..... 2.1.....microsec/foot

/Δmax/ ..... 3.6.....microsec/foot

CONCLUSION

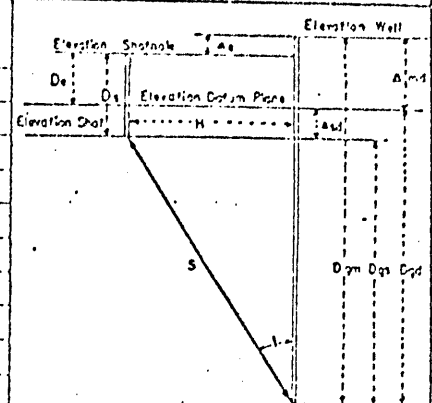
Reliability of T-D curve .Fair.to.good.....

COMMENTS:

Shot 6-12 \* Shot 1-6  
 Hydrophones \*  
 Shot 6-12 \* Shot 1-6  
 Company: ESSO EXPLORATION AUSTRALIA INC.  
 Well: TUNA A-1  
 Elevation (Derrick Floor): 31' (6ms)  
 Total Depth: 7005  
 Coordinates: Lat 38° 10' 25.5" Long 147° 25' 35"  
 LOCATION: Section, Township, Range, County Area or Field  
 Gippsland  
 DATUM: Mean Sea Level

Record Number	Shot Number	Time of Shot	Dgm	Ds	tus	tr	T		Dgs	H	TAN I	Cos i	Tgs	Asd	Δsd V	Tgd	Tgd Average	Dgd	ΔDgd	ΔTgd	Vi Interval Velocity	Va Average Velocity
							Reading	Purity/Grade														
1		8.50 am	2700	10'	.002	.147	.371	D F	2659	735	.276	.964	.358	10'	.002	.360	.361	2669				
12		10.55	2700	10'	.002	.104	.366	D G	2659	520	.196	.981	.359	10'	.002	.361						7393
2		9.00	3470	10'	.002	.111	.456	D F	3429	555	.162	.987	.450	10'	.002	.452	.451	3439				
11		10.45	3470	10'	.002	.118	.455	D G	3429	590	.172	.986	.448	10'	.002	.450						7625
3	No mir lines	9.10	4300	10'	.002	.109	.553	D P	4259	545	.128	.992	.549	10'	.002	.551						
3A		9.20	4300	10'	.002	.126	.553	D F	4259	630	.148	.989	.547	10'	.002	.549	.549	4269				
10		10.40	4300	10'	.002	.118	.552	D F	4259	590	.139	.991	.547	10'	.002	.549						
4		9.25	5210	10'	.002	.190	.640	D G	5169	950	.184	.984	.629	10'	.002	.631	.631	5179				
9		10.25	5210	10'	.002	.212	.641	D P	5169	1060	.205	.980	.628	10'	.002	.630						8208
9A		10.30	5210	10'	.002	.197	.643	D P	5169	985	.191	.982	.632	10'	.002	.634						
5		9.35	6360	10'	.002	.215	.746	D F	6319	1075	.170	.986	.736	10'	.002	.738	.738	6329				
8		10.00	6360	10'	.002			D														8576
8A		10.15	6360	10'	.002	.187	.758	D F	6319	935	.148	.989	.750	10'	.002	.752 (NOT USED)						
6		9.45	6900	10'	.002	.227	.794	D G	6859	1135	.165	.987	.784	10'	.002	.786	.786	6869				
7		9.55	6900	10'	.002	.206	.807	D F	6859	1030	.150	.989	.798	10'	.002	.800 (NOT USED)						

Need 1561' offset to correct 14Ms.



Dgm = Gasphone depth measured from well elevation  
 Dgs = " " " " " shot " "  
 Dgd = " " " " " datum " "  
 Ds = Depth of shot  
 De = Shotpoint elevation to datum plane  
 H = Horizontal distance from well to shotpoint  
 S = Straight line travel path from shot to well gasphone  
 tus = Uphole time of shotpoint  
 T = Observed time from shotpoint to well gasphone  
 tr = " " " " " to reference gasphone  
 Δe = Difference in elevation between well & shotpoint.  
 Δsd = " " " " " shot & datum plane  
 Δsd = Ds - De  
 Dgs = Dgm - Dst Δe; tan i =  $\frac{H}{Dgs}$   
 Tgs = cos i Ts Vert. travel time from shot elev to gasphone  
 Tgd =  $Tgs \pm \frac{\Delta e}{V}$  " " " datum plane " "  
 Dgd = Dgm - Δsd  
 Vi = Interval velocity =  $\frac{\Delta Dgd}{\Delta Tgd}$   
 Va = Average =  $\frac{Dgd}{Tgd}$

Surveyed by: \_\_\_\_\_  
 Date: \_\_\_\_\_  
 Weathering Data: OVERCAST  
 MODERATE SEA  
 Casing Record: 2450'

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RE-NAMED  
(AUG. 1968)  
TUNJA 1

UNITED GEOPHYSICAL COMPANY, S.A.

UGCC - SA

OBSERVER'S REPORT

Date 27 June 68 Time Left Town..... Time Arrived Field.....

Sheet No..... Of.....

Seismograph Party No. 141 Base Bristane Province Chilend Prospect Tunja A1

Truck No. Inst. Series No. Type Geo. Geo. Group Trace Wind Strong Weather

LINE AND SHOT POINT No.	BEARING		SPREAD	GROUP SEPARATION	RECORD No.	TAPE No.	FILTER	CHARGE	DEPTH	TIME	Altitude in ft.	
	TOP	BOTTOM									REMARKS	
2700								1645	10'	8.45	46	50
3470								1643	10'	8.53	46	56
4300								1643	10'	9.08	44	54
5210								1643	10'	9.18	38	48
6360								1621	10'	9.27	32	44
6900								1643	10'	9.36	24	33
6900								1643	10'	9.46	24	38
6360			<i>multiple</i>					1643	10'	9.53	32	44
6300								1643	10'	10.02	32	44
5210								1643	10'	10.12	38	52
5210								1643	10'	10.20	38	52
4300								1643	10'	10.28	44	58
3470								1643	10'	10.35	50	64
2700								1643	10'	10.42	54	68
TOTALS												

HOLES      PROFILES      FIELD CONDITIONS      RECORDS      DYNAMITE

Distribution ..... Time Left Field ..... Time Arrived Town ..... Signed H. A. ... OBSERVER

ORIGINAL - To Client  
 DUPLICATE - Party File ..... Wind ..... Weather .....  
 TRIPPLICATE - Supervisor  
 QUADRUPLICATE - Remains in Book

( REPORT ALL ACCIDENTS, HOWEVER SLIGHT )

PARTY CHIEF/MGR.

# ESSO Tuna-1

## Well Velocity Records

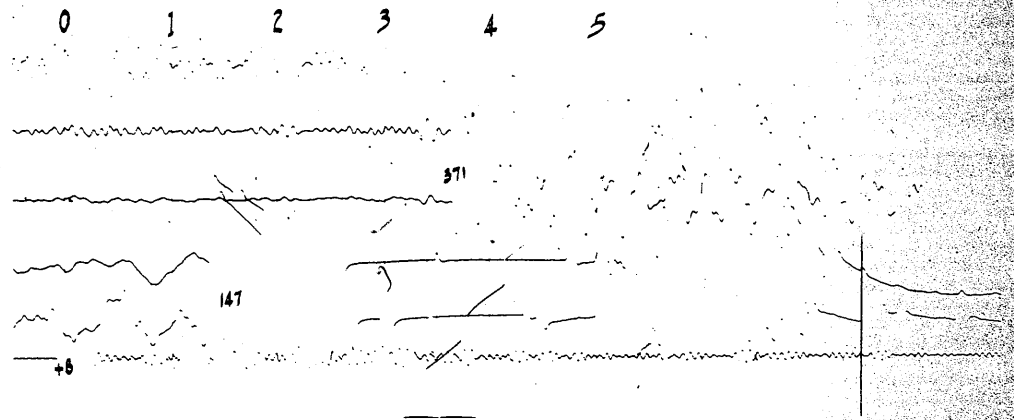
SHOT:- 1

OFFSET:- 500'

DEPTH OF GEOPHONE:- 2700'

CHARGE:- 16 2/3 lb @ 10'

TIME:- 8:50



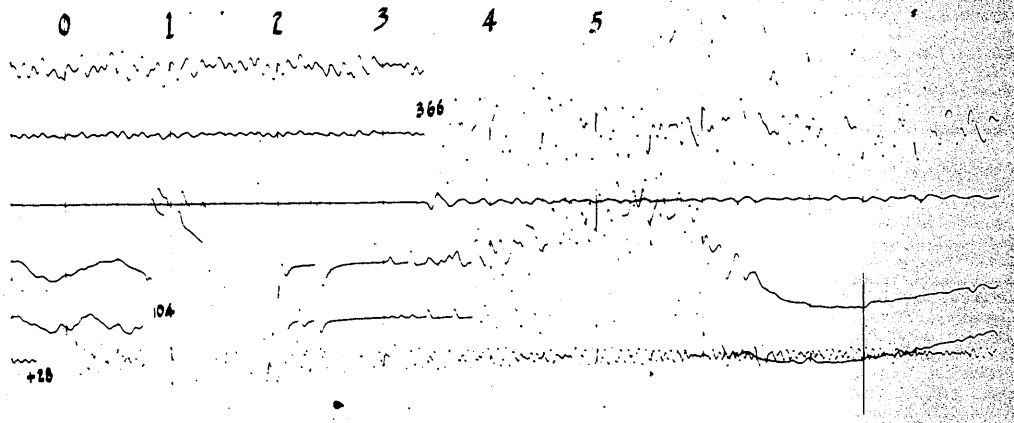
SHOT:- 12

OFFSET:- 500'

DEPTH OF GEOPHONE:- 2700'

CHARGE:- 16 2/3 lb @ 10'

TIME:- 10:55



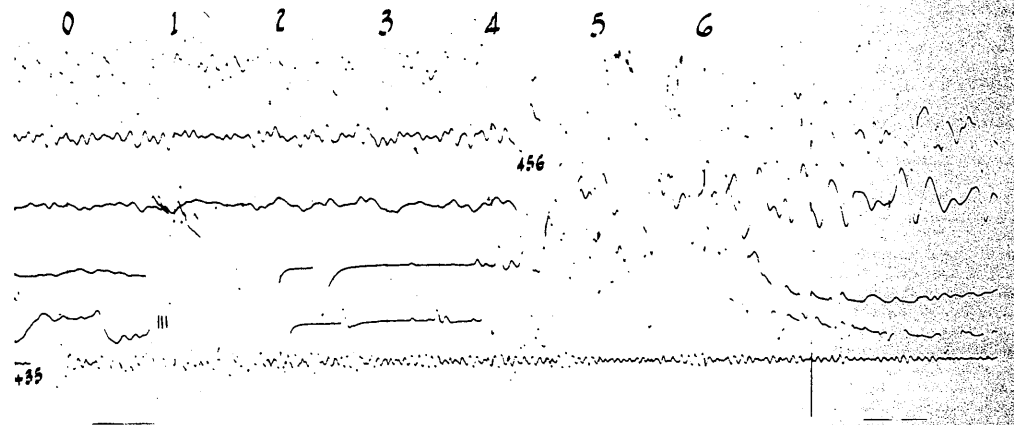
SHOT:- 2

OFFSET:- 500'

DEPTH OF GEOPHONE:- 3470'

CHARGE:- 16 2/3 lb @ 10'

TIME:- 9:00



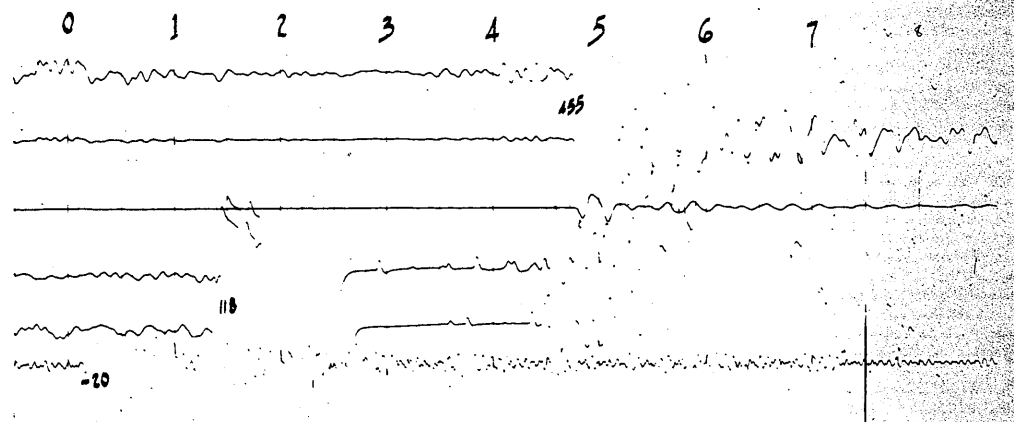
SHOT:- 11

OFFSET:- 500'

DEPTH OF GEOPHONE:- 3470'

CHARGE:- 16 2/3 lb @ 10'

TIME:- 10:45



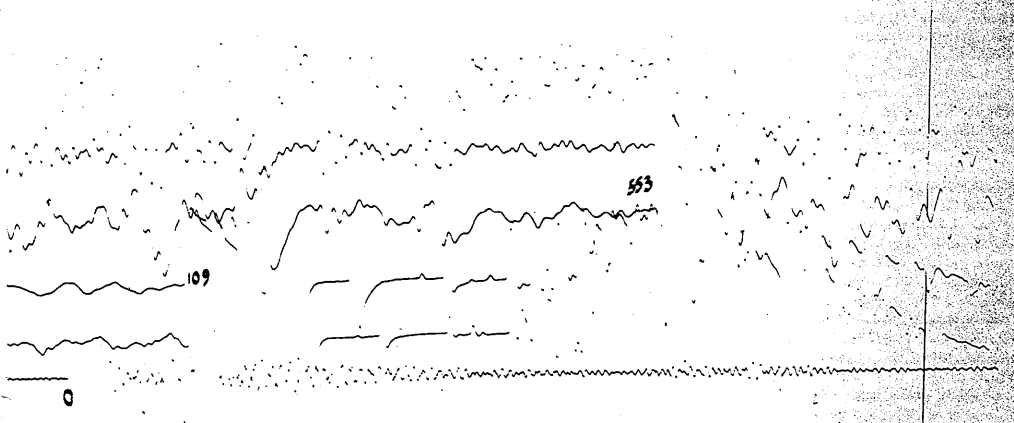
SHOT:- 3

OFFSET:- 500'

DEPTH OF GEOPHONE:- 4300'

CHARGE:- 16 2/3 lb @ 10'

TIME:- 9:10



# ESSO Tuna-1

## Well Velocity Records

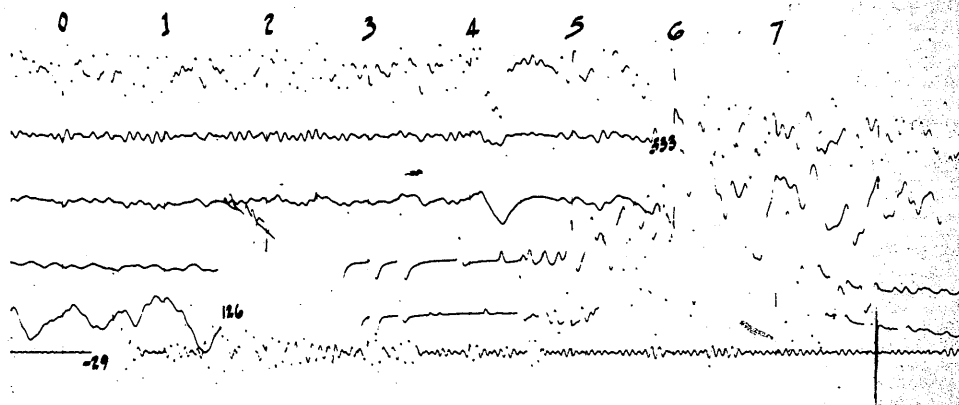
SHOT :- 3A

OFFSET :- 500'

DEPTH OF GEOPHONE :- 4300'

CHARGE :- 16 2/3 lb @ 10'

TIME :- 9-20



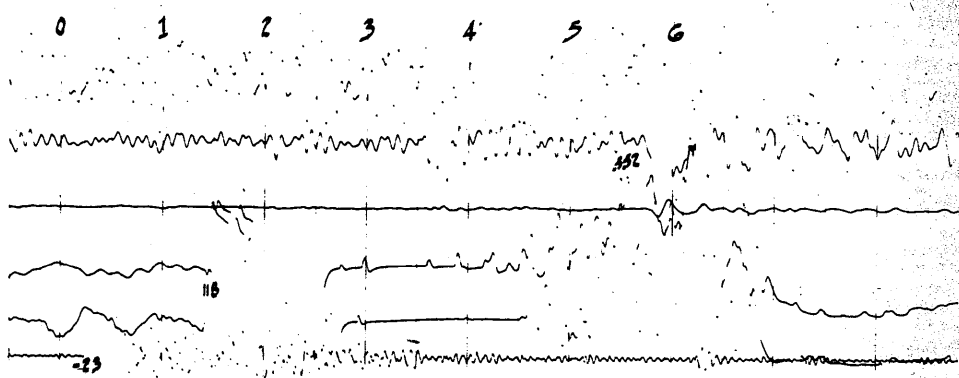
SHOT :- 10

OFFSET :- 500'

DEPTH OF GEOPHONE :- 4300'

CHARGE :- 16 2/3 lb @ 10'

TIME :- 10-40



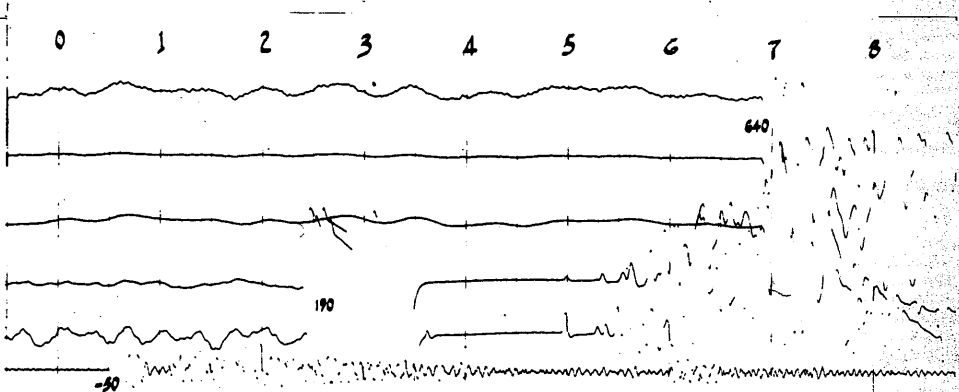
SHOT :- 4

OFFSET :- 1000'

DEPTH OF GEOPHONE :- 5210'

CHARGE :- 16 2/3 lb @ 10'

TIME :- 9-25



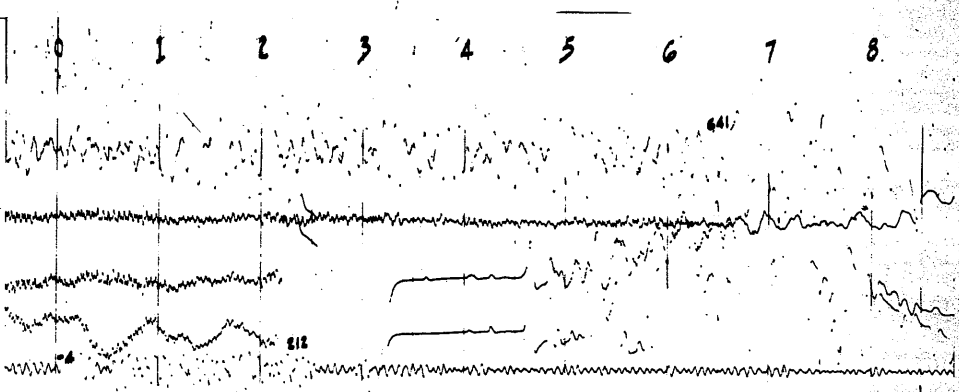
SHOT :- 9

OFFSET :- 1000'

DEPTH OF GEOPHONE :- 5210'

CHARGE :- 16 2/3 lb @ 10'

TIME :- 10-25



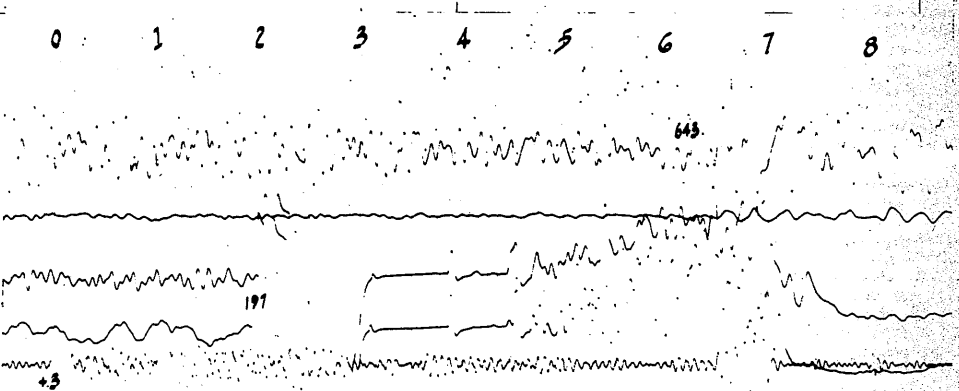
SHOT :- 9A

OFFSET :- 1000'

DEPTH OF GEOPHONE :- 5210'

CHARGE :- 16 2/3 lb @ 10'

TIME :- 10-30

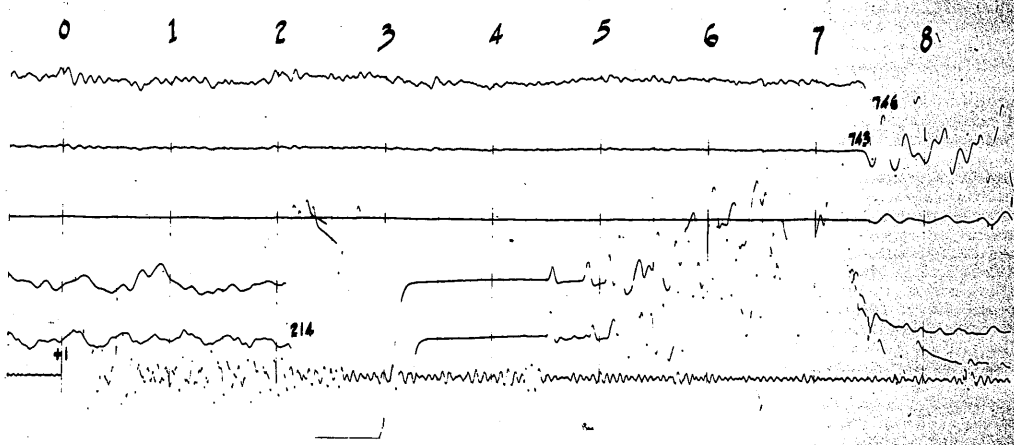




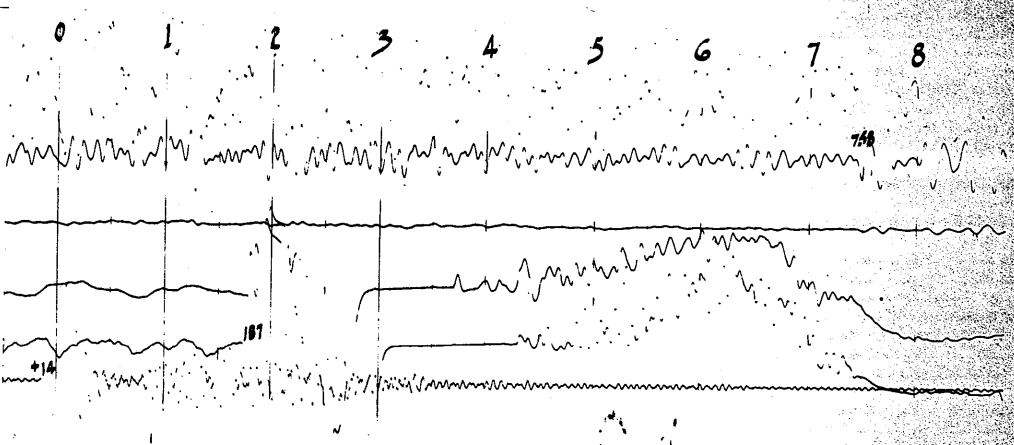
# ESSO Tuna-1

## Well Velocity Records

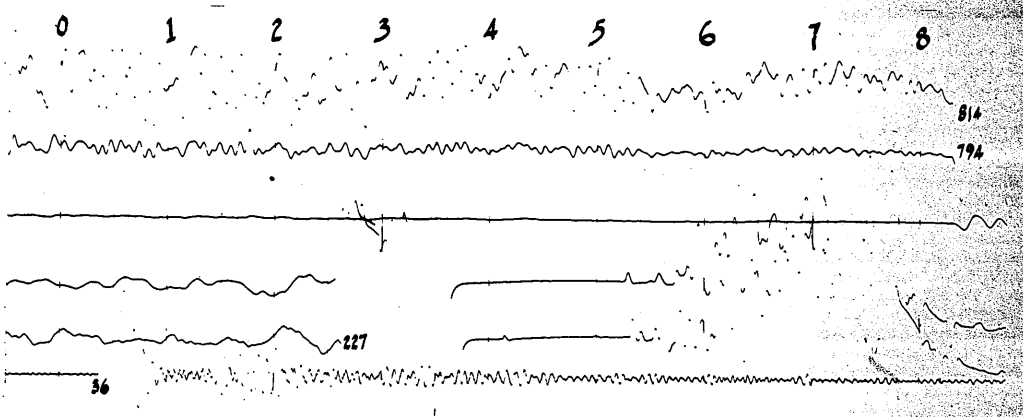
SHOT:- 5  
OFFSET:- 1000'  
DEPTH OF GEOPHONE:- 6360'  
CHARGE:- 16 2/3 lb @ 10  
TIME:- 10:35



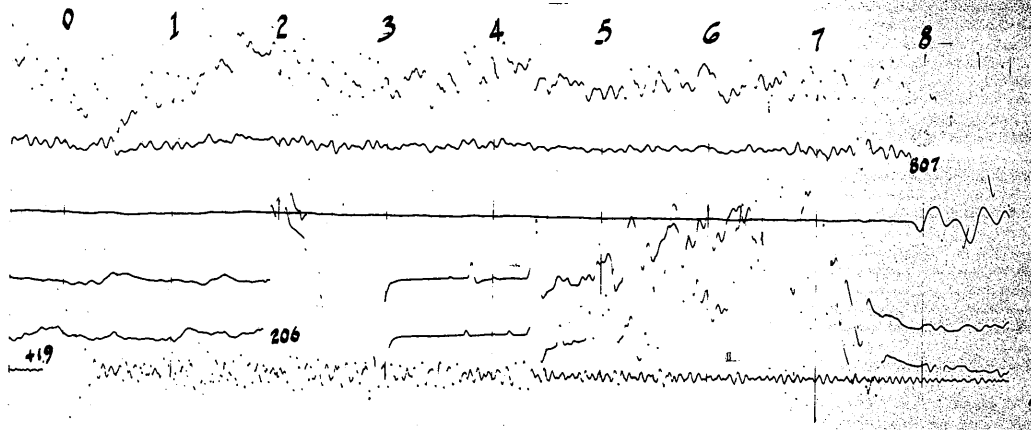
SHOT:- 8A  
OFFSET:- 1000'  
DEPTH OF GEOPHONE:- 6360'  
CHARGE:- 16 2/3 lb @ 10  
TIME:- 10:15



SHOT:- 6  
OFFSET:- 1000'  
DEPTH OF GEOPHONE:- 6900'  
CHARGE:- 16 2/3 lb @ 10  
TIME:- 9:45



SHOT:- 7  
OFFSET:- 500'  
DEPTH OF GEOPHONE:- 6900'  
CHARGE:- 16 2/3 lb @ 10  
TIME:- 10:55



ENCLOSURES

PE603819

This is an enclosure indicator page.  
The enclosure PE603819 is enclosed within the  
container PE906446 at this location in this  
document.

The enclosure PE603819 has the following characteristics:

ITEM\_BARCODE = PE603819  
CONTAINER\_BARCODE = PE906446  
NAME = Well Completion Log  
BASIN = GIPPSLAND  
PERMIT = VIC/P1  
TYPE = WELL  
SUBTYPE = COMPLETION\_LOG  
DESCRIPTION = Well Completion Log  
(Induction-Electical Log, enclosure  
from Well Summary) for Tuna-1  
REMARKS =  
DATE\_CREATED = 13/10/68  
DATE\_RECEIVED = 21/05/69  
W\_NO = W518  
WELL\_NAME = TUNA-1  
CONTRACTOR = SCHLUMBERGER  
CLIENT\_OP\_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE603820

This is an enclosure indicator page.  
The enclosure PE603820 is enclosed within the  
container PE906446 at this location in this  
document.

The enclosure PE603820 has the following characteristics:

ITEM\_BARCODE = PE603820  
CONTAINER\_BARCODE = PE906446  
NAME = Mud Log (Grapholog)  
BASIN = GIPPSLAND  
PERMIT = VIC/P1  
TYPE = WELL  
SUBTYPE = MUD\_LOG  
DESCRIPTION = Mud Log (Grapholog, enclosure from Well  
Summary) for Tuna-1  
REMARKS =  
DATE\_CREATED = 13/10/68  
DATE\_RECEIVED =  
W\_NO = W518  
WELL\_NAME = TUNA-1  
CONTRACTOR = CORE LABORATORIES  
CLIENT\_OP\_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE906447

This is an enclosure indicator page.  
The enclosure PE906447 is enclosed within the  
container PE906446 at this location in this  
document.

The enclosure PE906447 has the following characteristics:

- ITEM\_BARCODE = PE906447
- CONTAINER\_BARCODE = PE906446
- NAME = Time-Depth Curve
- BASIN = GIPPSLAND
- PERMIT = VIC/P1
- TYPE = WELL
- SUBTYPE = VELOCITY \_CHART
- DESCRIPTION = Time-Depth Curve (basic) enclosure from  
Well Summary for Tuna-1
- REMARKS =
- DATE\_CREATED =
- DATE\_RECEIVED = 31/08/68
- W\_NO = W518
- WELL\_NAME = TUNA-1
- CONTRACTOR =
- CLIENT\_OP\_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE603821

This is an enclosure indicator page.  
The enclosure PE603821 is enclosed within the  
container PE906446 at this location in this  
document.

The enclosure PE603821 has the following characteristics:

ITEM\_BARCODE = PE603821  
CONTAINER\_BARCODE = PE906446  
NAME = Completion Coregraph  
BASIN = GIPPSLAND  
PERMIT = VIC/P1  
TYPE = WELL  
SUBTYPE = WELL\_LOG  
DESCRIPTION = Completion Coregraph (enclosure from  
Well Summary) for Tuna-1  
REMARKS =  
DATE\_CREATED = 27/05/68  
DATE\_RECEIVED =  
W\_NO = W518  
WELL\_NAME = TUNA-1  
CONTRACTOR = CORE LABORATORIES  
CLIENT\_OP\_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE603822

This is an enclosure indicator page.  
The enclosure PE603822 is enclosed within the  
container PE906446 at this location in this  
document.

The enclosure PE603822 has the following characteristics:

ITEM\_BARCODE = PE603822  
CONTAINER\_BARCODE = PE906446  
NAME = Continuous Dipmeter, 1 of 2  
BASIN = GIPPSLAND  
PERMIT = VIC/P1  
TYPE = WELL  
SUBTYPE = WELL\_LOG  
DESCRIPTION = Continuous Dipmeter for , 1 of 2  
(enclosure from Well Summary) for  
Tuna-1  
REMARKS =  
DATE\_CREATED = 12/05/68  
DATE\_RECEIVED =  
W\_NO = W518  
WELL\_NAME = TUNA-1  
CONTRACTOR = SCHLUMBERGER  
CLIENT\_OP\_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE603823

This is an enclosure indicator page.  
The enclosure PE603823 is enclosed within the  
container PE906446 at this location in this  
document.

The enclosure PE603823 has the following characteristics:

ITEM\_BARCODE = PE603823  
CONTAINER\_BARCODE = PE906446  
    NAME = Continuous Dipmeter, 2 of 2  
    BASIN = GIPPSLAND  
    PERMIT = VIC/P1  
    TYPE = WELL  
    SUBTYPE = WELL\_LOG  
DESCRIPTION = Continuous Dipmeter for , 2 of 2  
              (enclosure from Well Summary) for  
              Tuna-1  
REMARKS =  
DATE\_CREATED = 22/06/68  
DATE\_RECEIVED =  
    W\_NO = W518  
    WELL\_NAME = TUNA-1  
    CONTRACTOR = SCHLUMBERGER  
    CLIENT\_OP\_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)



PE906448

This is an enclosure indicator page.  
The enclosure PE906448 is enclosed within the  
container PE906446 at this location in this  
document.

The enclosure PE906448 has the following characteristics:

ITEM\_BARCODE = PE906448  
CONTAINER\_BARCODE = PE906446  
NAME = FIT Data  
BASIN = GIPPSLAND  
PERMIT = VIC/P1  
TYPE = WELL  
SUBTYPE = RFT  
DESCRIPTION = FIT Data (enclosure form Well Summary)  
for Tuna-1  
REMARKS =  
DATE\_CREATED =  
DATE\_RECEIVED =  
W\_NO = W518  
WELL\_NAME = TUNA-1  
CONTRACTOR =  
CLIENT\_OP\_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)