OFFSHORE 82

330001

ESSO BASS-3 TASMANIA

WELL COMPLETION REPORT

by

Esso Exploration Australia Inc.

July 1967

OR - 0332

330002

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   by Esso Exploration Australia Inc.

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   by Esso Exploration Australia Inc.

5. Petrological Report
   by Department of Mines, Tasmania.

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I

SUMMARY

A. Drilling

Esso Bass-3 was spudded on February 11, 1967 in Tasmanian waters of the offshore Bass Basin, and after drilling to a total depth of 7978 feet was plugged and abandoned on April 2, 1967.

B. Geological

The well was drilled on the crest of a well-defined northwest-southeast closed anticlinal feature as mapped by seismic. Vertical closure on the mid-Eocene unconformity is 300+ feet and covers an area of 22 square miles.

The sedimentary section penetrated by Bass-3 was essentially as predicted. The section from 721 feet(-690) to 5304 feet (-5273) consisted of marine Tertiary sediments - principally limestone, calcareous mudstones and shales and minor sandstone. The Delta Complex from 5304 feet (-5273) to 7830 feet (-7799) consisted essentially of sandstone with interbedded shale and siltstone with rare coal seams. The top 300 feet of the Delta Complex, lying above the mid-Eocene unconformity, is partly marine sequence forming a transitional zone between the fine marine clastics of the Demons Bluff Formation and the underlying continental beds of the Delta Complex. Basement, extending from 7830 feet (-7799) to 7978 feet (-7947) total depth, consisted of metamorphics.

With the exception of basement, the various formations ran consistently low to those predicted by seismic. This was due entirely to the fact that the velocities of the various rock units were slightly greater than originally predicted.

Basement was actually some 270 feet higher than the seismic prediction of 8200 feet. This was due to the original basement top being picked one cycle too low on the seismic section.

Despite slight errors in the assumed rock velocities, the original structural picture of a closed anticline, having 300 feet of vertical closure on the mid-Eocene unconformity, remains valid.

II

INTRODUCTION

The Bass Basin is a separate and distinct geological province covering some 25,000 square miles and lying offshore between the Gippsland Basin on the east and the Otway Basin on the west.

The Tertiary stratigraphy of the Bass Basin, as seen in the wells Bass-1 and Bass-2, is similar to that of the Gippsland Basin in that the Lower Tertiary section is a delta complex which comprises the principal reservoir objective of the basin. In both basins the reservoir rocks are overlain by a marine sequence which provides both cap and potential hydrocarbon source rock.

After the drilling of Bass-1 and Bass-2, considerable information was available regarding the stratigraphy of the northeastern portion of the Bass Basin. However, little was known of the geology of the southwestern portion of the basin. Bass-3, located some 29 miles southwest of Bass-1, was partly designed to provide this much-needed information. The well was drilled on the crest of a seismic anticlinal closure, located on the southwestern side of the basin axis.

The well was in the optimum position to evaluate -

(1) Lithology of the entire sedimentary section to basement on the southwestern flank of the basin.

(2) Regional stratigraphy and structure of the southwestern flank of the basin.

(3) Presence or absence of hydrocarbons in several closed prospective horizons, namely sand developments within the Lower Tertiary deltaic complex.

(4) Partial hydrocarbon potential of the basin.

III

WELL HISTORY

(1) GENERAL DATA

a) Well Name & Number: Esso Bass-3

b) Name and Address of Operator:
Esso Exploration & Production (Australia) Inc.
G.P.O. Box 4249
SYDNEY, N.S.W.

c) Name & Address of Tenement Holder:
Hematite Explorations Pty. Ltd.
440 Collins Street
MELBOURNE, Victoria.

d) Details of Petroleum Tenement
EL 1/60 issued by the State of Tasmania covering an area of 25,134 square miles. Farmed-in by Esso Exploration Australia Inc. from Hematite Explorations.

e) District: Bass Strait.

f) Location: Latitude 39° 59' 51" S
Longitude 145° 16' 57" E

g) Elevation Permanent Datum:
Mean Sea Level
Rotary Table: 31 feet above mean sea level.

h) Total Depth: 7978 feet.

i) Date Drilling Commenced:
February 11, 1967.

j) Date Drilling Completed:
March 29, 1967.

k) Date Well Abandoned: April 2, 1967.

l) Date Rig Released: April 2, 1967.

m) Drilling Time to Total Depth:
46 days.

n) Status: Plugged and abandoned.

o) Total Cost: To be furnished later.

(2) DRILLING DATA

a) Drilling Contractor: Global Marine Australasia, Pty. Ltd.
380 Lonsdale Street
MELBOURNE, Victoria.

b) Drilling Plant:

Make	National
Type	1625 DE
Rated Capacity	20,000 feet with 5" D.P.
Motors	Cummins VT-12-GA-30 for electric power.

c) Derrick: 136' x 58' x 34' special design, galvanised, 1,000,000 lb. Hookload capacity.

d) Pumps: (2)

Make	National
Type	G-1000-C Duplex
Size	7-3/4" x 16"
Motors	Dual electric independent drives from above motors.

e) BOP Equipment:

Make	Hydril	Hydril	Cameron Triple U
Size	20" (MSP)	13-5/8"(GK)	13-5/8"
Working Pressure (PSI)	2,000	5,000	5,000

f) Hole Sizes & Depths: (Rotary Table Measurements). (third hole, first hole abandoned at 365', second hole abandoned at 365').

36" to 359'
26" to 759'
17½" to 2801'
12¼" to 7974'
7-3/4" to 7978'

g) Casing & Cementing Details:

Size	30"	20"	13-3/8"
Weight, lb/ft.	196 & 310	129 & 167	54.5
Grade	B	B	J-55
Range	2 & 3	2 & 3	3
Setting Depth	336'	721'	2750'.
Location of shoe Collar & Centralizers	Shoe @ 336'	Shoe & Collar @ 721'	Shoe @ 2750' Collar @ 2670' Centralizers @ 2730, 2710, 2630 & 2550.
Cement (sacks)	350	1221	1550
Cemented to	Ocean floor	Ocean floor	Ocean Floor
Method used	Displacement thru drill pipe.	Displacement thru drill pipe.	Two plug Displacement

h) Drilling Mud: Sea water and fresh water gel mud were used to drill to 759 feet. The remainder of the hole was drilled with a fresh water Spersene XP-20 mud system.

Weekly mud properties while drilling are summarized below:

	Feb.20/ Feb.27	Feb.27/ Mar. 6	Mar.6/ Mar.13	Mar.13 Mar.20	Mar.20/ Mar.27
Wt. - lb/gal	10.0	10.0	10.7	10.8	10.8
Viscosity-secs.	35	39	55	45	45
Filter loss -cc	8.5	8.5	8.0	8.3	7.5
Filter cake -1/32"	3	3	2	2	2
% sand	1	1	2	1	0.5
% solids	-	-	15	15	17
pH	9.7	9.7	10.0	9.5	9.3
NaCl	7750	2542	2500	2800	2500
Alkalinity	0.05	0.15	0.3	0.2	0.2

Mud & Chemicals Used:

Item	Pounds
Barite	381,700
Bentonite	132,500
Megcophos	1,300
Spersene	30,300
XP-20	14,400
CMC	1,150
Caustic	7,100

i) Water Supply: Fresh drill water was transported from Port Welshpool to the location by the MV "Pointe Coupee".

j) Perforation Record: No perforations.

k) Plugs:

Depth	6850-6650	5400-5200	2900-2600	450-250
Cement (sacks)	140	140	250	150
	0.3% HR-4		1.0% $CaCl_2$	
Checked	No	No	Yes @ 2645'	No

l) Fishing Operations: None

m) Side-tracked Hole: None

(3) LOGGING & TESTING

a) Ditch Cuttings: Cuttings were taken over a normal shale shaker at thirty foot intervals while drilling from under the 20" casing shoe at 721' to 2801', and at ten foot intervals from 2801' to 7978', total depth. While coring cuttings samples were taken at five foot intervals. All samples were lagged and caught by the mud logging personnel under the supervision of Esso geologists and are representative of the labelled depth. Representative suites of samples are stored with the Bureau of Mineral Resources, the Tasmanian Mines Department and with Esso in Melbourne.

b) Coring The original coring programme called for the taking of 16 cores - every 500 feet from 3000 to 4500 feet; every 300 feet from 4500 to 6000 feet, and every 500 feet from 6000 to the originally predicted total depth of 9500 feet.

14 cores were cut in Esso Bass-3. Considering that the total depth of the well was over 1500 feet shallower than predicted, these cores satisfied the demands of the original coring programme.

Core		Interval Cored	Feet Cut	Rec. (feet)	Rec. (%)
1		3000-3030	30	30	100
2		3500-3530	30	30	100
3		3997-4022	25	18	72
4		4516-4539	23	23	100
5		5009-5039	30	26	87
6		5315-5336	21	21	100
7		5620-5650	30	23	77
8		5905-5920	15	14	93
9	Run 1	6420-6429	9	2.5	27
Wireline	Run 2	6429-6442	13	11	84
10		6903-6933	30	30	100
11		7433-7453	20	20	100
12		7877-7892	15	0	0
13		7903-7914	11	5	45
14		7974-7978	4	4	100

The thirteen conventional cores cut a total of 274 feet and recovered 244 feet. The one wireline core (2 runs) cut a total of 22 feet and recovered 13.5 feet.

Representative slabs of these cores are stored with the Bureau of Mineral Resources, the Tasmanian Mines Department and with Esso in Melbourne.

c) Sidewall Sampling. One run for sidewall cores was made over the interval 3356 feet to 7914 feet using Schlumberger CST equipment. A total of 30 cores was attempted and 26 were recovered.

d) Electrical and Other Logging

Wireline logging was carried out by Schlumberger Seaco. The following types of logs were run -

IES	Interval
Run 1	721-2801
Run 2	2753-6235
Run 3	6235-7911
Run 4	7911-7985
SGRC	
Run 1	721-2792
Run 2	2753-6226
Run 3	6226-7976
MLL	
Run 1	2753-6235
Run 2	6235-7979
FDC	
Run 1	2753-7984
CDM	
Run 1	721-2801
Run 2	2801-7978

A specially designed device was used in all log runs to compensate for the movement of the vessel while logging.

e) Penetration Rate Log.

A drilling time log is included as part of the composite well log and also as part of Enclosure

f) Gas Log.

In addition to the continuous hot wire mud gas recorder, a chromatograph was used to detail mud gas shows. Cuttings gas was measured in a Waring blender and recorded.

The cuttings were examined for stain and fluorescence. The gas log is included as part of the Composite Well Log.

g) Formation Testing.

To obtain information concerning hydrocarbons, formation fluid and pressure characteristics, four wireline formation tests were run by Schlumberger at 5409 feet, 5736 feet, 5737 feet and 6740 feet.

Test No. 1 at 6740 feet

During drilling of the well a small but significant gas show was recorded at the top of a thick sandstone bed over the interval 6745 to 6760 feet.

Electrical log analysis indicated the gas sand to extend from 6739 to 6744 feet. The sand was tested at 6740 feet with the wireline formation tester.

29 feet of gas were recovered, together with 800 cc of condensate and 12,250 cc of discoloured water. The gas has the following composition -

Methane	77.8%
Ethane	8.35%
Propane	5.45%
L.-Butane	1.80%
n.-Butane	1.52%
i.-Pentane	0.56%
n.-Pentane	0.38%
Carbon dioxide	3.71%
TOTAL	99.57%

The recovered water was mud filtrate, having an equivalent NaCl content of 3300 ppm.

Sampling pressure during the test was 3025 psi and the final shut-in pressure was 3125 psi.

Test No.2 at 5737 feet

To obtain formation pressures within the Latrobe Delta Complex immediately below the mid Eocene unconformity, a test of a sandstone was made at 5737 feet. The initial test of this zone was unsatisfactory. While testing, erratic sampling pressures indicated plugging of the tool. This was confirmed when attempts were made to drain the tool at the surface. In all, 20,000 cc of mud and mud filtrate were recovered. No reliable pressure data were recorded during this test.

Test No.3 at 5409 feet

A sandstone above the unconformity was tested at 5409 feet. 20,000 cc of formation water were recovered, having an equivalent NaCl content of 17,500 ppm. While sampling, sampling pressure was 2300 psi and the final shut-in pressure 2400 psi.

Test No.4 at 5736 feet

Due to the inconclusive results of Test No.3, the same sand was tested again at 5736 feet. Again, due to a bad seal between the pad and the formation, the test was unsatisfactory. No reliable pressure data were recorded, and only mud was recovered in the sample chamber.

h) Derivation Surveys

The surveys were carried out with a Totco instrument and results are plotted on the composite log. The well had very little deviation to 7200 feet, being within the limits of 0 - 1°. At 7796 feet the deviation was 2°. Schlumberger deviation recordings taken in conjunction with the Dipmeter Survey indicated that no dog legs were present.

j) Temperature Surveys

None.

k) Velocity Surveys

A velocity survey was shot at a depth of 7914 feet on March 27, 1967 by Western Geophysical Company. Results are included as an Appendix.

l) Other Well Surveys

None.

m) Production Testing

None.

IV

GEOLOGY

(1) Summary of Previous Work

Petroleum Indications

No oil or gas had been recovered from the Bass Basin. Prior to drilling Bass-3 Esso had drilled two dry stratigraphic tests in the Bass Basin; one to 7717 feet near the basin centre, and one to 5910 feet near the northeastern flank of the basin. Minor background gas readings were recorded by the mud logging unit during the drilling of both Esso Bass-1 and Bass-2 wells. No seeps or other occurrences of hydrocarbons are known from the few Tertiary outcrops around the periphery of the Bass Basin. There have however been consistent reports of specimens of coastal bitumen stranding along the South Australian and Victorian coasts since white man's early occupation. It is believed by some geologists that these may represent bonafide oil seeps from submarine Tertiary rocks. The hydrocarbon show logged from 6739 to 6744 feet in the Bass-3 is the first valid show in the basin.

Existing Geophysical Data

The following is a summary of geophysical surveys completed by both Esso and Hematite -

Hematite Petroleum

a) Aeromagnetic Survey, completed in 1961.

b) 1765 miles of single fold coverage completed in 1963.

Esso

a) Esso Bass Survey
182 miles of 6 fold C.D.P.
37 miles of single fold.
3 velocity and refraction profiles completed 10-5-65.

b) Esso King Island East Survey
252 miles 6 fold C.D.P. completed 25-10-65.

c) Esso Bass Strait Survey
395 miles 6 fold C.D.P.
1115 single fold coverage completed 13-10-65.

Existing Geological Work

As the Bass Basin lies almost entirely under the continental shelf, direct geological work has been limited to studies of cores, samples and electric logs of the Bass-1 and Bass-2 wells. The major geological interpretations, therefore, have been based on seismic control in conjunction with geological information from the adjacent Gippsland and Otway Basins.

(2) Regional & Historical Geology

The Bass Basin lies at the southern end of the Paleozoic Tasman Geosyncline. The Paleozoic sequence probably exceeds 25,000 feet in thickness on the Mornington Peninsula on the northern side of the basin (Keble, 1950). The strata range in age from Cambrian through Carboniferous and are made up of a complexity of folded, faulted and intruded marine to non-marine sedimentary, metamorphic, extrusive and intrusive igneous rocks. In Tasmania similar complex rocks, tens of thousands of feet thick, occur along with more than 25,000 feet of pre-Cambrian sedimentary and metamorphic rocks. It is logical to expect the Bass Basin to be underlain by any of these rocks. They would extend from shallow depths at the basin edge, and downwards from 12,000 feet in its deepest part.

Bass is essentially a Cenozoic basin, although it may contain Permian, Triassic, Jurassic and Lower - mid Cretaceous rocks between the relatively undisturbed Tertiary above, and complexly folded and intruded pre-Permian rocks below. Permian "tillites" are known from small outcrops along the northern Tasmanian coastline. These may extend northward for some distance into the Bass Basin. The Triassic is represented by sandstone and shale with minor conglomerate and coal in Tasmania, and by minor glacial beds in Victoria. The Jurassic - Lower Cretaceous, generally non-marine, Otway Group occurs in the Gippsland and Otway Basins and may be present in the Bass Basin.

During the Paleocene and Eocene time, gentle regional down-warping occurred in the Gippsland and Otway Basins and similar downwarp occurred in the Bass Basin. Tasmania remained a positive area. Volcanism and lava flows were abundant from the western part of the Gippsland Basin to the eastern part of the Otway. Similarly, a few small flows occurred in Tasmania. No volcanic rocks of this age are known in the axial portion of the Bass Basin. During this time in Bass there were widespread swamp conditions under which peat, clay, sand, silt and gravel were deposited. During Lower and Middle Eocene occasional thin marine sediments may have intercalated with these non-marine rocks. Upper Eocene time saw a change in sedimentary conditions from non-marine to restricted marine.

Uplift and slight deformation took place in Gippsland after deposition of the Eocene coal measures. Deposition apparently was continuous during this time in the Otway basin. In the Bass Basin there is seismic evidence of an unconformity near the top of the Eocene.

During the Oligocene and Miocene time marine conditions prevailed in the Bass Basin with deposition of fossiliferous limestone, calcareous mudstone, marl, and minor siltstone beds. Local angularity beneath the Oligocene-Miocene contact on seismic sections indicates a regressive pulse at the beginning of Miocene time. At and near the present edges of the Bass Basin in Tasmania and Victoria are outcrops of mainly Miocene skeletal limestones and some marine, fossiliferous siltstone.

In the southwest part of the Bass Basin in the vicinity of Three Hummock Island, and in the northern half of the basin, tuffite cones of Upper Oligocene and Lower Miocene age indicate tectonic activity during this period.

During Pliocene time the marine transgression reached the end of its full cycle in Gippsland and Otway. During Middle Pliocene time these areas, and also the entire Bass Straits region, were subjected to uplift, probably accompanied by some gentle deformation and faulting. Volcanism and outpouring of lava was widespread in Tasmania and west - central Victoria.

The sea in general regressed to its present limits during late Pliocene and Pleistocene time.

(3)

Generalized Stratigraphy of the Bass Basin

Paleozoic Rocks

Paleozoic sediments (marine to non-marine) metasediments, metamorphics, and igneous intrusive and extrusive rocks are believed to comprise "economic" basement in the greater Bass Straits region.

In the Mesozoic - Tertiary Otway Basin, two wells reached the Paleozoics (Fergusons Hill-1 and Pretty Hill-1), as did the Arco S.W. Bairnsdale-1, Duck Bay-1 and others in the Gippsland Basin. Hence, it is reasonable to expect that the Paleozoics

will similarly be an unprospective complexity of sedimentary, metamorphic and igneous rocks in the Bass Basin.

Mesozoic Rocks

Mesozoic rocks are present in the surface in both Victoria and Tasmania. They have been penetrated or encountered in many wells in the Otway Basin and Gippsland Basin. In onshore Gippsland more than 8600 feet of the Jurassic and Lower Cretaceous Otway Group have been drilled. This group consists of non-marine felspathic sandstone, chloritic greywacke, siltstone, mudstone and carbonaceous shale, with fossil plants and thin black coal seams. In the Otway Basin the Cretaceous and Jurassic rocks have a maximum composite thickness of 15,000 feet. They consist of several marine and non-marine formations comprised of siltstones, sandstone and greywacke with lesser amounts of conglomerate, mudstone and coal. Plant fragments, spores and foraminifera are present. In the Bass Basin there are no Mesozoic sediments known at present.

Some thin non-marine Triassic rocks are present in west-central Victoria. In Tasmania the only known Mesozoic sedimentary rocks are of Triassic age. They consist of 1500 to 2000 feet of lacustrine and fluviatile protoquartzites, lithic arenites, lutytes, minor fine grained conglomerates and coal beds (Hale, Spry and Banks, 1962).

The volcanic association occurring at the base of Esso Bass-2 (from 5511 to 5910 feet) is possibly of Mesozoic age. It may be correlative with the widespread Jurassic dolerite of Tasmania.

Tertiary Rocks

Paleocene-Eocene

The Basal Tertiary section in the Bass Basin encountered by drilling is a thick deltaic complex. This unit is the principal reservoir objective in the basin.

The distribution of this sequence in the basin is largely controlled by the flanking down to basin fault systems, with the bulk of the sediment confined to central downdropped portions of the basin. The sequence may overlap the Mornington-King Island basement ridge to the northwest and be in part continuous with the Easternview Coal Measures.

This deltaic complex is made up of interbedded sandstone, siltstone, shale and coal, all of dominantly continental origin. Sparse microplankton were noted in cores from the Esso Bass-1 well, suggesting the paralic and/or marine conditions prevailed in the central part of the basin during the deposition of this interval. This sequence lies unconformably on economic basement and is transitional into the overlying marine Eocene sequence.

Upper Eocene

The Upper Eocene siltstones and mudstones overlie the deltaic complex over most of the Bass Basin. The contact between the two sequences is transitional. The fauna and lithology of this interval indicate that it is of restricted marine origin and is correlative with the Demon's Bluff Formation of the Anglesea area, Victoria.

Oligocene

The Oligocene series in the Bass Basin ranges in thickness to 2000± feet in the axial part of the basin. The interval is distributed throughout the basin proper and overlaps the basin margin in the northwest over the Mornington-King Island high, and possibly to the east over the basement ridge which extends from Wilson's Promontory to northeastern Tasmania.

The base of the marine Oligocene sequence in the Esso Bass-1 is marked by a thin tuffaceous, poorly sorted, tight sandstone. The remainder of the section is made up of argillaceous siltstone, silty mudstone and minor sandstone. 235 feet of tuffite was encountered in the upper part of the section in the Esso Bass-1.

In Esso Bass-2 the Oligocene period is represented by 632 feet of marine sandstone, siltstone and shale and the basal sand at this locality is 328 feet thick.

Miocene

At least 3000 feet of Miocene rocks were drilled in the Esso Bass-1 well from the 20 inch casing shoe to a depth of 3775 feet. The Lower Miocene is fossiliferous calcareous shale overlain by a thick (500 feet) tuffite interval; the mid Miocene is marl, calcareous mudstone and skeletal calcarenite and the Upper Miocene is skeletal calcarenite.

Pliocene-Pleistocene

Strata of Pliocene-Pleistocene age were not observed during the drilling of the Esso Bass wells. Doubtless strata of this age lie within the interval drilled prior to setting 20 inch casing.

Geology

Stratigraphy

Stratigraphic Table.

Depth	Thickness	Age	Lithology
721-3770	3000 +	Miocene	Skeletal calcarenite, micritic limestone & mudstone.
3770-4705	935	Oligocene	Shale & mudstone.
4705-5305	600	Eocene	Shale & siltstone, with minor sandstone.
5305-5590	285	Eocene	Sandstone, siltstone & shale.
5590 ----------Unconformity----------			
5590-7830	2240	Eocene, Paleocene older ?	Sandstone, siltstone & shale.
7830-7978	148 +	Basement	Quartzite and metamorphosed shale.

These depths are relative to R.T. (subtract 31 feet for M.S.L. depth.

Miocene 721-1040	Coarse calcarenite to fine calcirudite, light grey, composed of loose, calcareous skeletal debris (principally bryozoa with pelycopods, echinoids, foraminifera and gastropods). Trace of rounded to sub rounded, medium to very coarse grained quartz sand: glauconite and carbonaceous flecks and grains.
1040-1400	Coarse calcarenite to fine calcirudite as above, but light brown to buff in colour.

1400-2120 Limestone; light grey, argillaceous, skeletal, micritic, sparsely carbonaceous and glauconitic.

2120-2274 Interbedded limestone and marl.
Limestone; as above.
Marl; light grey to grey-green, in part silty, sparsely pyritic, richly fossiliferous. Very soft and plastic.

2274-2450 Marl; as above.

2450-3770 Mudstone; dark grey-green, calcareous, in part silty, sparsely micaceous and pyritic, very fossiliferous.

Oligocene

3770-4280 Mudstone; as above, but becoming more compact and less calcareous.

4280-4707 Shale; dark grey to dark grey-brown, silty, sparsely pyritic, sparsely carbonaceous with sparsely disseminated calcareous skeletal debris.

Eocene

4707-4733 Sandstone; light brown, slightly calcareous, argillaceous, silty, very fine grained, sub angular to sub rounded, sparsely glauconitic and fossiliferous. Porosity fair, permeability very poor.

4733-5304 Shale; with minor siltstone
Shale; dark brown, silty, sparsely micaceous and pyritic with sparsely disseminated calcareous skeletal debris.
Siltstone; light grey-brown, argillaceous, sparsely micaceous and pyritic.

Latrobe Delta Complex (undifferentiated)

5304-5589 Interbedded sandstone, siltstone and shale.
Sandstone; light brown, argillaceous, slightly dolomitic in part, very fine to fine grained, sub-angular to sub-rounded, generally fairly well sorted, but with scattered rounded medium to very coarse grained quartz sand. Moderately hard. Porosity good, permeability fair to poor.
Sandstone; light green, argillaceous, silty, very fine grained, sub-angular to sub-rounded, fairly well sorted, variably glauconitic, sparsely micaceous, friable, porosity fair, permeability poor.
Siltstone; light brown to white, argillaceous, very finely sandy in part, sparsely micaceous.
Shale; light to dark brown, silty, sparsely micaceous.

5589-7057 Interbedded sandstone, siltstone and shale, with rare coal seams.
Sandstone; light grey, finely pebbly to granular, fine to coarse grained, sub-angular to rounded, poorly sorted, generally abundant white clay matrix, sparsely micaceous, carbonaceous and felspathic in part. Moderately hard. Porosity good, permeability (dependant on clay matrix content), generally poor.
Sandstone; grey white, silty, fine to very fine grained, sub angular to sub rounded, generally fairly well sorted, moderately abundant white clay matrix, sparsely micaceous and carbonaceous. Moderately hard. Porosity fair, permeability poor.
Siltstone; light grey, argillaceous, in part very finely sandy, sparsely micaceous, pyritic and carbonaceous.
Shale; light grey to grey-brown, silty, sparsely micaceous, pyritic and carbonaceous.
Coal; black, brittle, brilliant lustre, irregular to sub-conchoidal fracture.

7057-7215	Shale with minor sandstone. Shale; dark grey to dark grey-brown, in part silty, sparsely micaceous. Shale; light grey as above. Sandstone; light grey, silty, fine to very fine grained, as for interval 5589-7057.
7057-7830	Interbedded sandstone, siltstone and shale. The sandstones are the same as for interval 5589-7057, except for a greater abundance of felspar, occurring as sub-rounded to enhedral grains, completely replaced by clay, and lithic grains and pebbles, principally dark grey shale, light grey quartzite and buff to green volcanics. Siltstone; light brown to light grey, argillaceous in part, very finely sandy, sparsely micaceous, pyritic and carbonaceous. Shale; light to mid-grey, in part silty, sparsely micaceous.
7830-7978	Interbedded quartzite and recrystallized siltstone and fine grained sandstone and black metamorphosed shale.

V

STRUCTURE

Esso Bass-3 was located on the crest of a well-defined northwest-southeast trending closed anticlinal feature as mapped by seismic. A structure map on the mid Eocene unconformity within the "Delta Complex" was the primary basis for selecting the well location. The structure is developed from basement through strata of lower to mid Miocene age and all of these sedimentary intervals thin over the crest of the feature.

The closure is in part dependant upon the normal fault which occurs along the southern flank of the feature. The fault intersects the late Eocene and older beds.

Vertical closure on the mid Eocene unconformity is 300+ feet and covers an area of 22 square miles. Vertical closure has decreased to 200+ feet at the top of the Eocene (top of Demons Bluff Formation) with an areal closure of 25 square miles. Vertical closure at the top of the Oligocene is less than 100 feet.

Continuous dipmeter results confirm that the Tertiary section was encountered on or near the crest of the structure.

With the exception of basement, the various formation tops ran consistently low to those predicted by seismic. This was due entirely to the fact that the velocities of the various rock units were slightly higher than originally predicted.

Basement was actually some 270 feet higher than the original seismic prediction of 8200 feet. This was due to the original basement top being picked one cycle too low on the seismic section.

Despite slight errors in the assumed velocities, the original structural picture of a closed anticlinal feature having 300 feet of vertical closure on the mid Eocene unconformity remains valid.

VI

RELEVANCE TO OCCURRENCE OF PETROLEUM

The primary objective of Bass-3 was to evaluate the hydrocarbon potential of a closed anticlinal feature. The potentially most prospective reservoir horizon, sandstone development at the top of the "Delta Complex" between the base of the Demons Bluff Formation and the mid Eocene intra-deltaic unconformity, was found to be water wet. However, one small non-commercial gas show from 6739 to 6744 feet was logged and wireline tested. This gas show is significant in that it represents the first legitimate show of hydrocarbons recorded in the Bass Basin. Seismic evidence indicates that the gas sand was penetrated at its structurally highest point. Pressures within the sand are only slightly above normal and it is probable that gas occurs as a small reservoir trapped under an impervious shale bed at the apex of the structure.

VII

POROSITY AND PERMEABILITY OF SECTION PENETRATED

Porosity and permeability measurements made on core samples by Corelab are included as an appendix.

The sandstones of the "Delta Complex" are generally coarse grained to granular with an abundance of white clay matrix. Porosities deduced from the F.D.C. log generally vary from 18-30% - values that correspond favourably with measured porosities where cores are available. Measured permeabilities, although as high as 328 md, are generally of the order of 2 to 30 md. These low permeabilities are due to the high clay matrix content of the sands.

The 27 feet thick bed of argillaceous, very fine grained sandstone, occurring at the top of the Eocene section, has poor reservoir characteristics, with fair porosity (20%) and very poor permeability

VIII

330020

CONTRIBUTIONS TO GEOLOGICAL CONCEPTS AS RESULTING FROM DRILLING

Stratigraphic and paleontological studies have lead to several conclusions regarding the environmental conditions and the prospect of hydrocarbons occurring in the geological sequence penetrated in the Bass-3 well.

The basement consisting of dark, weathered metamorphics and volcanics was encountered at 7830 feet. Above this the non-marine sandstone-quartzite-shale-siltstone series, extending to approximately 7060 feet, attains a generally more lithic character than that observed in either Bass-1 or Bass-2. In all other respects this series remains consistent with equivalent intervals thus far encountered in the Bass Basin.

The deltaic sandstones and shales of the Upper Paleocene and Lower Eocene between 5336 and 7060 feet are also similar to those of the Bass-1 and Bass-2. They contain however, little or no coal. The wireline test at 6740 feet, recoverying 29+ cubic feet of gas and 800 cc of condensate, indicates the capability of the shales of this interval to generate hydrocarbons. This is also the first valid hydrocarbon show in the basin.

The earliest traces of marine influence occurring in the uppermost middle Eocene is indicative of a marine encroachment in the non-marine environment of corresponding age observed in the other Bass wells. The dominance of arenaceous fossil assemblages during Upper Eocene give evidence of a 'barred basin'. Mixed fossil assemblages occurring sporadically at the close of the Eocene and in the lowermost Oligocene indicate periodic inundation from the open seas.

From the Oligocene through the Lower Miocene generally more open marine conditions prevailed than further to the east. The equivalent interval in the Bass-1 and Bass-2 reveals a restricted marine environment.

330021

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X

ENCLOSURES

(in pocket)

330022

David Taylor
STRATIGRAPHIC PALEONTOLOGIST
P.O. BOX 57 PARKVILLE VICTORIA PHONE 34 0484 ext 2343 HOME 51 3781

Subject: BASS - 3
18th April 1967

APPENDIX 1

PALEONTOLOGICAL REPORT

APPENDIX 1

330023

SUMMARY of

BASS BASIN SEQUENCES:

ZONULE	*BASS - 1	*BASS - 2	*BASS - 3	AGE
A	?	?	?	UPPER MIOCENE
B	1200	?	?	
C	1500	?	1500	MIDDLE MIOCENE
D	2000	?	2040	
E	2300	2200	2430	
volcanic	2530	-	-	LOWER MIOCENE
F	3090	2505	2610	
G	?	?	2900?	
H	3500	?	3356?	
I-1	3890	3035	3700	OLIGOCENE
I-2	4400	3390	3999	
J	4850	3500	4300	
K	5300	3600?	4516	uppermost EOCENE
[illegible] quma	5382	3600?	4794	
[illegible] of sequence	5905?	3828?	5175 to ? 5336	

*depth in feet of approximate tops:
datum (R.T.) +31'.

INTRODUCTION

Esso BASS - 3 was drilled in the south eastern quadrant of the Bass Basin at latitude 39°53"09' and longitude 146°18'15"E, which is some 52 miles north of Stanley, Tasmania. The well was drilled in a water depth of 192' M.S.L.

Sample Detail: Rotary cutting samples were sumbitted at 30' intervals from 840' to 2800' and examined at 90' intervals. Below 2800' "canned cuttings" were examined every 100'. The $13\frac{3}{8}$" casing shoe was set at 2753'. Down-hole contamination was extremely heavy between 3400' and T.D. (7978').

Small samples were submitted from cores 1 to 11. Further samples were selected where necessary. Foraminifera were isolated from cores 1 to 5. Side wall core selection was partially based on this preliminary examination and 8 side wall cores were examined. Scaled position of cores and side wall cores are shown on Fig.1.

All depths discussed here were those shown on submitted samples: datum given as +31' M.S.L. (R.T.). The stated tops of all biostratigraphic units must be considered as approximate depths.

FAUNAL SEQUENCE

No foraminifera were found between the top of the samples section (840') and 1290', where a sparse assemblage of upper Miocene benthonic species was recorded. There is an apparently uninterupted sequence from there into the upper Eocene at 4653' (side wall 29). Core-5 and side wall cores 28 to 23 reveal sporadic faunas. The base of the sequence is taken as 5175' (side wall 24). No definite or diagnostic fauna was isolated below this level, although core-6 (5315' to 5336') contained glauconite pellets which have the form of globigerinid foraminifera.

The Bass - 3 sequence will be discussed in the terms of the zonule scheme applied to Bass - 1 by Taylor (1965). Depth comparison of biostratigraphic units is tabulated on page 1 of this report. Distribution of selected species is shown on Fig.1.

UPPER MIOCENE: ? to 1500' - Below 1290' there are sparse assemblages of Elphidiidae with species typical of the Victorian upper Miocene to lower Pliocene. A precise zonule or age cannot be assigned, partially because of sampling and partially because of facies.

MIDDLE MIOCENE: 1500' to 2610' - All 3 zonules of the middle Miocene can be distinguished and most ranges are consistant with those of the other Bass wells. As noted in the other Bass wells, the top of Zonule E is marked by the abundance of Globigerinoides spp., all of which are virtually absent above this unit. It is now considered that the sudden disappearance of Globigerinoides bisphericus and G. ruber is of biostratigraphic value within the Bass Basin, even though these extinctions may be localized and due to decrease in water temperature. The first down-sequence appearance of these species in Bass - 3 is at 2430' and accompanied by the incoming of G. trilobus and Globoquadrina dehiscens. Sampling at 30' intervals confirms this "Globigerinoides level", so that the top of Zonule E is placed at 2430' as only rotary cutting samples were available it is impossible to identify the unit on the absence of Orbulina universa; a ubiquitous mud contaminant. The highest appearance of Globigerina ciperoensis at 2400' is considered as confirmatory evidence for this boundary placement.

LOWER MIOCENE: 2610' - 3700' - There is a marked change in the benthonic assemblages; generally speaking the species are more robust. This especially applies to Cibicides spp. C. opacus is replaced by by its probable ancestral form C. perforatus, C. "vortex formA" by C. "vortex form B", C. victoriensis (not noted in Bass - 3) by its probable ancestral form C. novozealandica. The former two "lineage fragmentation points"were picked at 2610'. C. novozealandica extends

100' higher.

Thus the top of Zonule F is placed at 2610'. Uvigerina sp.12 ranges to the top of the unit, whilst U. sp.10, Bolivina sp.14, Anomalinoides procolligera and Astrononion centroplax occur within this unit.

Core-1 (3000' - 3030') contains Globigerinoides trilobus without other species of the genus, indicating Zonule G, which is confirmed by the presence of Bdivina sp.13 and Uvigerina sp.12. The top of the zonule is placed arbitrarily at 2900'.

Core-2 (3500' - 3530') contains Globigerina ciperoensis and G. woodi with Globigerinoides trilobus immaturus without Globigerinoides (S.S.). These factors indicate Zonule H, but delimiting the Zonule is difficult because of heavy contamination and the absence of diagnostic planktonic species in the side wall core at 3356'. However, this side wall core marks the highest record of Bolivina sp.12 and Gyroidinoides sp.4 which rarely range above Zonule H. For this reason the top of Zonule H is placed at 3356'. The scarcity of planktonics at this level will be discussed later.

UPPER OLIGOCENE: 3700' to 4300' - Despite heavy contamination the incoming of Globigerina euapertura and Globorotalia opima opima was recorded at 3700, with that of G. extans 100' lower. The top of Zonule I is placed at 3700'.

Since the establishment of Taylor's scheme (1966), it appears that Zonule I can be divided into 2 units. The top unit, I-1, has mainly lower Miocene.benthonics associated with Oligocene planktonics. The lower Unit, I-2, contains a mixture of lower Miocene and lower Oligocene -upper Eocene benthonic species. From a restudy of Bass-1 and 2, as well as study of this section and ones in the Otway Basin, the following benthonic species have their highest appearances in I-2; Anglogenerina ototara, Bolivinopsis cubensis, Textularia sp.6, Uvigerina sp.13 and

Bolivina anastomosa before it develops into B. sp.13. The highest appearance of these species either corresponds with or is slightly above the apparent extinction level of "Guembelitra" sp. The distribution of this species is erratic, and though considered a planktonic species, its biostratigraphic and environmental significance is dubious.

In Bass-3, the highest appearance of the diagnostic I-2 species is 2' below the top of core-3 (3997' to 4022': rec. 18'), so that the top of I-2 has been placed at 3999'. The highest occurrence (=3999') is in "flood" proportions, with "Guembelitra" sp. comprising 30% of total fauna.

LOWER OLIGOCENE: 4300' to 4516' - A cutting sample at 4300' contains Globorotalia testarugosa and rare Chiloguembelina cubensis indicating proximity to the top of Zonule J. Normally the range of G. testarugosa extends some 50' above that of C. cubensis.

UPPERMOST EOCENE: 4516' to 4794' - The top of core-4 (4516' to 4539': rec. 100%) has a planktonic fauna dominated by Globigerina angiporoides Hornibrook (= G. angipora of previous reports), with a few Globigerina specimens probably referable to G. ampliapertura and G. linaperta. The two latter species are more discernible towards the base of the core. These two species have been regarded as the index of Zonule K. Hornibrook (1965) states that the typical form of G. angiporoides "occurs in the upper part of the range zone of Globigerina ampliapertura Bolli, i.e. in the lower part of the Whaingaroan Stage (uppermost Eocene to Lower Oligocene)" of the New Zealand Tertiary sequence.

It is concluded that core-4 probably represents the top of the Eocene and the top of Zonule K is thus placed at 4516'. Globigerina ampliapertura and G. linaperta are virtually absent at this level, and neither they nor G. angiporoides were isolated in cuttings at 4500'. At 4600' the typical Eocene benthonic species Bolivina pontis and Haeuserella ? sp. were noted. Side wall core at 4654' and at 4794' contain Zonule K planktonic

and benthonic species, but an intervening side wall core was barren. The presence of Cerobertina kakahoica was anticipated at 4700' but this upper Eocene species was not found, although it characterizes the equivalent level in Bass-1 & 2.

UPPER EOCENE facies fauna: 4794' to 5175' - An arenaceous Haplophragmoides fauna was present sporadically in both side wall cores and core-5 (5009' to 5039'). This equates with the "unnamed unit" in the previous Bass sections. The upper Eocene age for this interval is inferred as it is within the same lithological unit (ie. the Demons Bluff Formation) as the side wall core at 4794' which contains a diagnostic upper Eocene fauna.

BASE of FORAMINIFERAL SEQUENCE: The deepest level containing determinable foraminifera is at 5175'. Glauconitic moulds in the sandstone of core-6 (5315' to 5336') have globigerinid form, but this preservation precludes positive identification and thus comment regarding age. No trace of fauna was found in core below 5336' and the side wall cores were not examined because of the risk of wasting poor recoveries. No new fauna was isolated from cutting samples below 4800'.

D E P O S I T I O N A L H I S T O R Y

The Bass-3 sequence will be compared with the Bass-1 sequence of 4 broad biofacies discussed by Taylor (1965).

In Bass-3, the earliest record of marine influence is the glauconite and glauconitic moulds in core 6 (5315' to 5336': rec.100%). This could indicate a marine embayment or tongue into the broadly non-marine environments encountered at equivalent levels in the other Bass sequences.

"Barred basin" conditions are evident between 5175' and 4794' from the dominance of the arenaceous Haplophragmoides assemblages.

Periodic breaching of the "barred basin" is evident at and above 4794'. Side wall cores at 4794' and 4654' have "mixed" faunas composed of two distinct faunal elements (i) arenaceous and cassidulinid species which could have withstood anaerobic conditions; (ii) planktonic species represented by small sized specimens. It is concluded that the sea floor had an anaerobic environment, but that oceanic currents washed in "size-sorted" planktonic specimens.

In Oligocene times the benthonic fauna was characterized by shallow water calcareous species of Anomalinoides spp., Cibicides spp. and Notorotalia spp., as well as an abundance of arenaceous forms and miliolids. The sea floor was evidently well aerated. Even within one core, the planktonic percentage varies from 0 to 45%, and there is no pattern of gradual increase in planktonic percentage up the section. "Guembelitra"sp. comprises 30% of the total fauna at 3999' to 4000', suggesting "swarming", if in fact this species is a true planktonic. It is probable that open ocean circulation was still inhibited by the remnants of a barrier which was evidently affective during upper Eocene times. Oceanic overflowing would have brought in bursts of the planktonic element. The circulation inhibitor must have been active into the lower Miocene. The side wall core at 3356' has a sparse shallow water fauna with only 2 planktonic specimens and an abundance of spherical pyrite bodies.

The Bass-1 & 2 sequences do not contain such abundant planktonic faunas at the top of the Eocene or in the lower Oligocene. Even if abundant planktonic faunas are intermittent in Bass-3, one can still conclude that the marine influence is greater than in the other Bass sections.

Above 3356', lower Miocene sedimentation was on a shallow, open shelf in all 3 sections. This is also true for the middle Miocene, with a relatively undisturbed sea floor. Sedimentation was probably below the wave base as glauconite is common and worn byrozoal fragments uncommon.

Reworking by wave action is suggested in the sediment above 2000' (Zonule 6 - top of Middle Miocene). Foraminifera are infrequent and poorly preserved, glauconite is absent and worn, byrozoal fragments make up 90% of the prepared sample. As for the other Bass wells, shallowing of the late middle Miocene and upper Miocene seas is deduced. By the upper Miocene, foraminifera are extremely rare, becoming absent above 1290'. The prepared samples are composed entirely of worn byrozoal fragments. Heavy wave action and even exposure is suggested.

Note on "pyritic tubes": As mentioned in connection with the "barred basin" facies "pyritic tubes" are common in the upper Eocene sediment. Fragments of these tubes are up to 10mm long, with an average diameter of 1mm. The tubes are composed of fine grained pyrite with an irregular internal core of an opaque white, soft waxy substance. When placed in xylol the substance disseminates into fine grains which slowly disolve. The shape of the tubes could suggest burrows or coprolites of mud-browsing animals. The tubes are always associated with foraminifera including the morphologically simple, non-septate, tube-like Bathysiphon angleseanensis which has finely arenaceous wall structure. This species tends to be transversely flattened apparently due to wall collapse through lack of cement cohesion. If initially the B. angleseanensis tubes were transversely circular, then the average diameter would have approximated that of the "pyritic tubes". These observations are consistant in all 3 Bass wells.

G E O L O G I C A L S E T T I N G

The important conclusion regarding the geological setting of Bass-3 within the Bass Basin, is that the section was in close proximity to edge of the basin, when compared with Bass-1 & 2. This statement is based on the following facts:

(1) Marine influence is evident earlier in the Bass-3 sequence.

(2) Upper Eocene marine break-throughs are more widespread in the Bass-3 sequence.

(3) The upper Eocene Zonule K occupies a much thicker interval in Bass-3: 278' compared with 82' in Bass-1 and a very brief interval in Bass-2.

(4) Higher planktonic percentages in the Oligocene.

Above the Oligocene, the 3 sequences are similar, except that Bass-1 has volcanic flows in the lower Miocene.

It is not believed that Bass-3 was structurally separated from either of the other sections. However it is postulated that during the upper Eocene, oceanic water overflowed the apparent barrier in the west and did not extend far to the east. During the Oligocene the overflowing currents reached Bass-1 & 2, but not in the strength indicated in the Bass-3 section. Once again a water movement of west to east is the inference.

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APPENDIX 2

330032

LIST & INTERPRETATIONS OF LOGS (ELECTRICAL)

Induction Electric Log	721-7985	Runs 1, 2, 3, 4.
Borehole Compensated Sonic Log - Gamma Ray Caliper	721-7976	Runs 1, 2, 3.
Compensated Formation Density Log	2753-7984	Run 1.
Microlaterolog	2753-7979	Runs 1 & 2.
Continuous Dipmeter	721-7987	Runs 1, 2.
Formation Tester	6740	Run 1.

Interpretation

NOTE: Wave compensating device used displacement 2 - 3 feet.	Rm = 1.70 @ 66° F.
Sonic Log Caliper registered 7.5 ft. shallow on runs 1 & 2	Rm = .57 @ 208° F. (B.H.T.) Rmf = 1.31 @ 68° F.
Formation Tester Runs 2, 3, & 4 on log - no hydrocarbon shows.	Rmf = .46 @ 208° F. (calculated)

Interval	SP	R_t	ρ_B	$\triangle t$	Rw	ϕFDC	ϕs	Rt/Ro	Sw	Fr/Fs	Rwa/Rw	Rxo	ϕMLL
5324-29	-43	0.5	2.2	101	0.15	30	34	0.5/1.2	100			5.7	27
5406-12	-42	0.6	2.2	100	0.15	29	33	0.6/1.2	100			5.0	29
5502-08	-40	1.1	2.32	96	0.16	23	30	1.1/2.2	100			7.5	24
5592-98	-55	0.5	2.22	99	.097	29	32	0.5/0.8	100			5.2	28
5920-30	-65	0.4	2.22	90	.07	29	30	0.4/0.6	100			2.5	40
6100-10	-68	0.4	2.23	96	.065	28	29	0.4/0.7	100			4.0	32
6562-70	-63	1.8	2.37	90	.085	19	26	1.8/1.7	100	0.74	2.3	3.8	32
6739-44		4.8	2.3	103	.09	21	35	3.0	55	1.00	9.0	2.8	36
6780-88	-62	2.0	2.3	92	.09	21	27	1.3	85	0.7	2.4	3.0	35
7046-52	-60	2.0	2.26	93	0.1	24	28	1.5	80	0.82	2.1	3.7	32
7288-92	-46	2.0	2.23	93	0.15	28	28	1.5	80	0.51	1.4	2.3	40
7536-42	-33	5.1	2.4	85	0.22	17	22	0.9	100	0.55	1.5	4.2	30
7760-66	-38	3.6	2.35	85	0.19	21	22	1.1	95	0.46	1.3	3.5	32

APPENDIX 3

CONVENTIONAL CORE DESCRIPTIONS

ESSO BASS-3

Core No. 1 3000-3030 Recovery 30'

Mudstone: light to dark grey-green, slightly arenaceous, calcareous, slightly micaceous, very fossiliferous (Lamellibranchs, bryozoa, gastropods, foraminifera). Pyritic, some intercalations of orange-brown pyritic concretionary nodules.

Very faint irregular bedding showing no apparent dip, shown by more silt stringers. At 3005-3007' a slightly more indurated band is found. Probably due to its more siltier nature than above or below.

Core No. 2 3500-3530 Recovery 30'

Mudstone: dark to medium grey-green, silty in part, very fossiliferous, calcareous, pyritic, slightly glauconitic. Interbedded with shale are very thin (¼") bands of mudstone: light grey-green, slightly fossiliferous, calcareous, also interbedded are irregular bands of light coloured, very fossiliferous, glauconitic shale. Bedding generally flat.

Core No. 3 3997-4022 Cut 25' Recovery 18'

3997-4015 Shale/mudstone with slumped laminae and lenses of siltstone and rare bands of limestone.

Shale/mudstone: dark grey to dark grey-green, silty, slightly calcareous, sparsely glauconitic and pyritic, with sparse dissemination calcareous skeletal debris (consisting of poorly sorted, articulated pelycopods, foraminifera and bryozoa). Fairly soft, massive, with core breaking irregularly along poorly defined bedding planes.

Siltstone: buff to light grey, argillaceous, calcareous, glauconitic with sparsely disseminated calcareous skeletal debris.

Limestone: buff to light grey, micritic, argillaceous, in part silty, glauconitic and fossiliferous. Dense, hard and massive.

The micritic limestone occurs as thin bands from 4004-4004.6; 4011-4011.6; 4014.6-4015. Section generally massive throughout with poorly defined bedding, generally sub horizontal. Slumping occurs throughout section, particularly from 4006-4007.6 where dips reach 10°.

Core No. 4 4516-4539 Cut 23' Recovery 23'

4516-4539 Shale: with rare laminae and lenses of limestone

Shale: dark grey to dark grey-brown (dark brown streak), silty, sparsely pyritic, sparsely carbonaceous with sparsely disseminated calcareous skeletal debris. Thin bedded, hard, compact, fissile, breaking with splintery to sub-conchoidal fracture.

Throughout occur numerous pyritised "worm" trails.

Limestone: light brown to buff, argillaceous, micritic, sparsely fossiliferous, dense, hard and homogeneous. Bedding throughout horizontal.

Core No. 5 Next page.

Core No. 5 5009-5039 Cut 30' Recovery 26'

5009-5039 Shale with fine laminae of siltstone.
Shale: dark chocolate brown, micaceous, pyritic, with sparsely disseminated calcareous skeletal debris. Massive, hard, breaking with irregular to sub-conchoidal fracture. Pyrite occurs as fine concretions, and as infilling of irregular "worm" trails and burrows.

Throughout occur very irregularly dispersed fine lamellae and patches of shale: light grey to grey-green and siltstone: light brown, to grey brown, very argillaceous.
Bedding throughout sub-horizontal.

Core No. 6 5315-5336 Cut 21' Recovery 21'

5315-5325 Sandstone with irregular patches, stringers and lenses of shale.

Sandstone: light brown, argillaceous, slightly dolomitic, very fine grained, sub angular to sub rounded, generally fairly well sorted but with scattered, rounded medium to very coarse grained quartz sand: moderately hard. Porosity fair, permeability poor to fair.
No odour, taste or fluorescence.
Shale: dark brown, silty.

This section contains numerous pyritised worm burrows.

5325-5327 Thinly interbedded and laminated sandstone and shale.

Sandstone: light green to white, argillaceous, slightly glauconitic, very fine grained, sub angular to sub rounded, well sorted, moderately hard, porosity fair, permeability poor. No show.
Shale: as above.

5327-5336 Sandstone with fine irregular laminae of shale.

Sandstone: light green, very glauconitic, argillaceous, silty, very fine grained, sub angular to sub rounded, generally fairly well sorted; trace micaceous; soft and friable, porosity fair, permeability poor. No show.
Shale: as above.

In this section sandstone contains numerous worm burrows filled with white non glauconitic fine grained sandstone, giving the rock a distinct mottled aspect.

Core No. 7 5620-5650 Cut 30' Recovery 23'

5620-5650 Siltstone: light grey, slightly argillaceous in part very sandy, sparsely micaceous and pyritic with sparsely disseminated very fine grains and streaks of carbonaceous material. Porosity fair, permeability poor. No odour, taste or fluorescence. Bedding defined by very fine laminae of dark grey brown, carbonaceous, argillaceous siltstone and silty shale.

Laminae of silt and shale define micro cross bedding with foresets about 1" thick and foreset slopes up to 30°. Even bedding of sediment disturbed by rare worm burrows, and slumping with hydroplastic boudinage, microfaulting and balling.

Core No. 8 5905-5920 Cut 15' Recovery 14'

5905-5918.3 Siltstone: light grey to buff, argillaceous, very finely sandy in part, sparsely micaceous with lenses, laminae and thin bands of dark brown to black carbonaceous, micaceous, silty shale.

5918.3-5919 Sandstone: light grey to grey white, finely pebbly to granular, fine to coarse grained, sub angular to rounded, poorly sorted, moderately abundant white clay matrix, finely disseminated carbonaceous grains and streaks. Moderately hard. Porosity fair, permeability poor. No odour, taste or fluorescence.

Bedding throughout core sub-horizontal.

Core No. 9 - Wire Line Core Barrel

Run 1 6420-6429 Cut 9' Recovery 2.5'

1' Sandstone: light grey-brown, very fine, sub rounded to sub angular, fairly well sorted, few carbonaceous grains, white clay matrix, numerous laminae, shale, brown, carbonaceous, moderate discontinuous and wavy laminae.

3" Dolomite: brown, micritic, slightly argillaceous.

1.25' Sandstone: as above.
No apparent dip.

Run 2 6429-6442 Cut 13' Recovery 11'

2.5' Shale: mottled, dark grey to brown, micritic, pyritic, with numerous coal grains included, and few sand grains, friable, non calcareous, with occasional thin discontinuous laminae, light grey siltstone.

.5' Sandstone: light grey to brown, fine to medium, sub rounded to sub angular, fairly well sorted, with some clay matrix material, few coal grains, good porosity 25% and permeability.

1.5' Sandstone: mottled brown to light grey, fine to coarse, sub rounded to sub angular, poor sorting, quartz, felspar, smoky quartz grains, with rounded nodules of clay after felspar, non calcareous, choked with clay material, porosity and permeability nil.

½ Sandstone: with numerous laminae, brown shale.

2' Shale: brown, carbonaceous, micritic, with occasional thin discontinuous laminae of siltstone.

4' Shale: mottled brown to dark grey, micritic, carbonaceous, with few discontinuous coal laminae and few leaf impressions, occasional thin laminae, light brown siltstone.
No apparent dip.

Core No. 10 6903-6933 Cut 30' Recovery 30'

6903-6905.5 Shale: light grey

6905.5-6906 Shale: light brown, very carbonaceous.

6906-6920 Shale: light grey.

6920-6922 Sandstone: light brown to black

6922-6926 Shale: light grey, with discontinuous carbonaceous laminae.

6926-6931 Sandstone: light brown, with rare discontinuous laminae, carbonaceous material and shale.

6931-6932.5 Shale: as above (22-26)

6932.5-6933 Sandstone: as above
No apparent dip.

Microscopic

6903-6905.5 Shale: mottled, light grey to light brown, micaceous, carbonaceous, carbonaceous material occurs as thin discontinuous laminae on film, sub parallel and vertical to the bedding plane, very slightly dolomitic.

6905.5-6906 Shale: medium grained, brown to black, micaceous, carbonaceous, some slickenside.

6906-6920 Shale: medium grained, micaceous, carbonaceous as 03-05.5

6920-6920.5 Sandstone: mottled black, medium grained, very fine to medium to coarse, very shaly, quartz grains, sub rounded to sub angular, poor sorting, numerous detrital coal grains, micaceous, very carbonaceous, tight, no fluorescence, no cut, no odour.

6920.5-6922 Sandstone: mottled, light grey to white, medium to fine, fair sorting to fairly well sorted, slightly calcareous, pink felspar on dark mineral, smoky quartz (?), much clay matrix material, clay gives white mineral fluorescence, sandstone tight, no porosity or permeability.

6922-6923 Sandstone: as above, carbonaceous, carbonaceous material occurs as thin laminae and film, parallel to bedding.

6923-6924 Sandstone as above, (6920.5-6922), medium to fine to coarse, trace felspar, pink, slightly calcareous, poor porosity, nil permeability.

6924-6926 Shale: light brown, micaceous, carbonaceous as above.

6926-6927 Sandstone: light grey, fine to coarse, sub rounded to sub angular, numerous coal and shale grains, poor sorting, clay choked, matrix 20%, tight, slightly calcareous.

6927-6930 Sandstone: light grey, coarse to fine, chiefly coarse, fair sorting, sub rounded to sub angular, slightly calcareous, numerous coal grains, clay choked, trace shotty, porosity and permeability low to nil.

6930-6931 Shale: light grey, micaceous, carbonaceous, silty.

6931-6932.5 Shale: brown, micaceous, carbonaceous as above.

6932.5-6933 Sandstone: light grey, fine to medium, sub rounded to sub angular, fair sorting, micaceous, clay choked (20%) slightly calcareous.

Core No. 11 7433-7453 Cut 20' Recovery 20'

7433-7438 Thinly interbedded shale and sandstone.
Shale: medium grey, in part silty to very finely sandy, micaceous, sparsely pyritic with fine carbonaceous streaks and rare carbonised plant debris.

Sandstone: grey white to buff, coarse grained to granular, sub angular to rounded, generally fairly well sorted, but with scattered rounded to sub rounded fine pebbles of quartz, trace dark grey shale and carbonaceous grains, micaceous, rare accessory tourmaline, moderately abundant white clay matrix. Moderately hard, porosity good, permeability fair, no odour, taste or fluorescence.

Sandstone: grey white to buff, fine to medium grained as above.

Section shows affects of hydroplastic flow with boudinage, microfaulting and in places complete intermixing of the lithologies, described above.

7438-7442 Sandstone: grey white to buff, coarse grained to granular, as above, becoming gradually coarser towards base of section with an increase in percentage of fine pebbles. Increase in grain size accompanied by presence of white clay grains up to 2 mm pseudomorphous after euhedral felspar. Porosity good, permeability fair, no odour, taste or fluorescence.

7442-7450 Shale: medium grey, silty, very fine to coarsely sandy and conglomeratic, micaceous with abundant white clay grains up to 3 mm across, pseudomorphous after euhedral felspar. Sparsely carbonaceous with trace carbonised plant debris.

This rock is very poorly sorted and obviously produced by intermixing of lithologies during slumping.

7450-7450'3" Fine pebble conglomerate - consisting of sub angular to rounded pebbles up to 1 cm across set in a very poorly sorted, light brown, argillaceous, silty, fine to coarsely sandy, micaceous and sparsely carbonaceous matrix. Abundant accessory tourmaline. Porosity good, permeability fair, no odour, taste or fluorescence.

Detrital Pebbles

Quartz (50%): sub angular to rounded grains, many composite grains of quartz and quartz felspar.

Felspar (40%): euhedral to sub hedral grains up to 5 mm across, completely replaced by kaolonite.

Remaining 10% pebbles made up of dark grey shale, acid to intermediate volcanics, and red haematite stained quartzite.

Volcanics, made up of a very fine grained quartz and felspar, the latter replaced by clay. Certain volcanic grains have a definite andesitic texture.

Tourmaline: dark reddish brown, occurring as sub angular grains of vaguely prismatic form up to 2 to 3 mm.

7450-3" - 52'6" As for interval 7442-7450 with a rafted angular block 4 cm across, of finely banded shale and coarse grained to granular quartz sandstone.

7452'6" - 53' Sandstone: grey white to buff, coarse grained to granular, as above.

Core No. 12 7877-7892 Cut 15' Recovery 0'

Core No. 13 7903-7914 Cut 11' Recovery 5'

Contact metamorphosed thinly banded and laminated sequence of quartzite shale and sandstone.

↑ BASEMENT

Quartzite Light to dark grey to black, very fine grained, sparsely pyritic, dense, very hard. Certain bands of quartzite have the appearance of a silicified breccia. No trace of original grain boundaries.

Shale Dark grey to black, in part silty, carbonaceous, very finely sandy, dense, moderately hard, having a definite baked appearance.

Sandstone Light to dark grey, argillaceous, fine to very fine grained, cemented in part by secondary silica cement, developing as overgrowths of quartz grains. On many grains such overgrowths have developed euhedral crystal faces. Moderately hard, finely granular texture, porosity fair, permeability nil.

Whole sequence peppered with irregular shaped vugs giving the core a rough scoriaceous texture. Many vugs lined with veneer of euhedral quartz crystals. Rare discontinuous discordant veins of coarsely crystalline quartz. Bedding flat throughout.

In hole with W7R, drilled 6 hours from 7914-7946'. Interbedded quartzite and shale as in Core 13.

Core No. 14 7974-7978' Cut 4' Recovery 4'

Contact metamorphosed thick shale - dense, hard with recrystallised segregations of quartz-calcite-biotite and irregular bodies up to 4" across of light to dark grey quartzite. Irregular veins and veinlets of quartz-calcite and mica. Minor pyrite and rare chalcopyrite mineralisation.

Bottom 6" of core finely banded with bands of re-crystallised quartz-calcite-mica dipping 40°. In this section plates of mica give the rock a peculiar Schiller effect.

N.B. More metamorphosed than Core No. 13.

CORE ANALYSIS RESULTS

ESSO BASS-3

Sample No.	Depth Feet	Permeability md	Porosity %	Residual Saturation Oil	Water Saturation
1	5316	159	27.4	0.0	72.3
2	5638	4.4	27.8	0.0	94
3	5919	10.5	17.6	0.0	84.6
4	6432	328.2	27.0	0.0	93.1
5	6921	10.28	22.2	0.0	78.1
6	6922	0.45	16.3	0.0	70.0
7	6925	28.39	16.0	0.0	71.1
8.	6926	18.24	22.3	0.0	85.0
9	6928	42.10	18.9	0.0	83.8
10	6929	0.45	25.8	0.0	81.0
11	6930	2.30	15.5	0.0	73.5
12	6932	1.30	15.4	0.0	69.5
13	7433	28	19.3	0.0	76
14	7438	26	19.5	0.0	67.6
15	7439	24	20	0.0	67
16	7441	5	18.9	0.0	71.5

SIDEWALL CORE DESCRIPTION

ESSO BASS-3

Shot 30 Recovered 26.

No. 1 No recovery

No. 2 No recovery

No. 3 Recovered 1" Depth 7710'
Shale: light grey, in part silty, micaceous.

No. 4 Recovered 3/4" Depth 7617'
Siltstone: light grey, very argillaceous, very finely sandy, sparsely micritic and carbonaceous.

No. 5 Recovery 1" Depth 7311'
Shale: medium to dark grey, sparsely micritic.

No. 6 Recovery 3/4" Depth 7207'
Shale: as above.

No. 7 Recovery 1" Depth 7150'
Shale: dark grey to dark grey-brown, sparsely micaceous.

No. 8 Recovery ½" Depth 7090'
Shale: as above.

No. 9 Recovery 1" Depth 7006'
Shale: dark grey, sparsely micaceous.

No. 10 No recovery.

No. 11 Recovery 1½" Depth 6740'
Sandstone: grey white to buff, medium to very coarse grained, sub angular to rounded, generally fairly well sorted, abundant white to buff clay matrix, sparsely micaceous, carbonaceous, with trace dark grey to red lithic grains, trace argillaceous tourmaline?, friable, porosity fair to good, permeability poor, fair hydrocarbon odor, no fluorescence.

No. 12 Recovery ½" Depth 6710'
Shale: dark grey, sparsely micaceous.

No. 13 Recovery ½" Depth 6600'
Shale: as above.

No. 14 Recovery ½" Depth 6155'
Shale: dark grey to dark grey-brown, in part silty, with very fine black carbonaceous streaks.

No. 15 Recovery ½" Depth 6021'
Shale: dark brown, sparsely micaceous and pyritic, with very fine laminae of grey white, very argillaceous, sparsely micaceous siltstone.

No. 16 Recovery 1" Depth 5811'
Shale: dark brown, silty, sparsely micaceous with very fine laminae of siltstone, as above.

No. 17 Recovery 1" Depth 5737'
Sandstone: light brown, medium to very coarse grained, sub angular to rounded, generally fairly well sorted, but with scattered rounded granule to fine pebbly quartz sand, trace dark grey lithic grains, friable, porosity excellent, permeability excellent, colour due to filtrate staining. No show.

No. 18 Recovery ½" Depth 5607'
Finely laminated siltstone and shale.
Shale: medium brown, silty, sparsely micaceous.
Siltstone: grey white, very argillaceous, in part very finely sandy, sparsely micaceous.

No. 19 Recovery 1" Depth 5540'
Irregular laminae, light to dark brown shale,

Shale: dark brown, silty, sparsely micaceous.
Shale: light brown, very silty, sparsely micaceous.

No. 20 Recovery 1" Depth 5504'
Laminated siltstone and shale.
Siltstone: grey brown, argillaceous, very finely sandy, sparsely micaceous.
Shale: medium brown, in part silty, sparsely micaceous.

No. 21 Recovery 1¼" Depth 5405'
Shale with fine laminae of siltstone.
Shale: grey brown, in part silty, sparsely micaceous.
Siltstone: grey white, very argillaceous, sparsely micaceous.

No. 22 Recover 1¼" Depth 5409'
Sandstone with very fine shale laminae
Sandstone: buff, medium to coarse grained, sub angular to sub rounded, generally fairly well sorted, trace micrite, moderately abundant buff clay matrix, friable, porosity good, permeability fair, no show.
Shale: dark brown, silty, sparsely micaceous.

No. 23 No recovery. Depth 5287'

No. 24 Recovery 1½" Depth 5175'
Shale/mudstone: dark brown, silty, in part very finely sandy, sparsely micaceous, carbonaceous, trace pyritic and calcarenite.

No. 25 Recover 1½" Depth 5085'
Shale: as above, noticeably more pyritic with very fine pyritic 'worm trails', trace calcite.

No. 26 Recover 2" Depth 4917'
Mudstone: as above, noticeably more calcareous.

No. 27 Recovery 2" Depth 4794'
Mudstone: dark brown, in part silty, pyritic, micaceous, calcareous.

No. 28 Recovery 1" Depth 4731'
Mudstone: as above

No. 29 Recovery 1½" Depth 4654'
Mudstone: dark brown, sparsely micaceous, calcareous.

No. 30 Recovery 1½" Depth 3356'
Mudstone: dark grey generally, calcareous, sparsely micaceous (smell of H_2S with acid).

CUTTING SAMPLE DESCRIPTIONS

810-1410	Calcarenite to fine calcirudite; composed of loose comminuted calcareous, skeletal debris; principally bryozoa with pelycopods and minor gastropods and foraminifera, and rare echinoid? spines. General size range 1 - 4 mm. Trace rounded to sub-rounded, medium to very coarse grained quartz sand, partly embedded in a light brown dolomitic? argillaceous matrix; grey-green, sparsely carbonaceous and glauconitic, calcareous mudstone.
1410-1440	50% calcarenite, as above. 50% limestone, (biosparite); light grey, skeletal, argillaceous, micritic, fine to very finely crystalline, slightly carbonaceous and glauconitic, moderately hard to friable. Scattered, very coarse skeletal debris. NB These limestone cuttings first noticed as trace in samples from 1350 feet when samples became noticeably muddier.
1440-1500	80% Argillaceous limestone; as above. 20% Calcarenite; as above.
1500-1530	90% Limestone; biomicrite, light grey, argillaceous, micritic, sparsely carbonaceous and glauconitic, fossiliferous (principally bryozoa and pelycopods). 10% Calcarenite; as above.
1530-1560	90% Micritic limestone; (biomicrite), as above. 10% Calcarenite; as above.
1560-1740	100% Micritic limestone; as above, very finely sandy in part.
1740-1770	60% Micritic limestone; as above 40% Limestone; light grey to grey-white, trace micritic, skeletal, fine to very finely crystalline, very finely 'granular' or saccharoidal.
1770-1830	100% Limestone; skeletal, as above, variable white micritic 'chalky' matrix. Porosity good, permeability poor to fair, depending on amount of sparry calcite cement and micritic matrix. Very finely sandy in part.
1830-1860	80% Limestone; skeletal, finely crystalline, as above. 20% Limestone; light to medium grey, argillaceous, micritic, sparsely carbonaceous, generally richly glauconitic, fossiliferous, very finely sandy in part. Moderately abundant disseminated microscopic foraminifera completely replaced by glauconite. Dense. Trace of very coarse, calcareous, skeletal debris.
1860-2250	100% Limestone; micritic, fossiliferous, as above.
2250-2310	100% Limestone; as above, but samples very muddy due probably to interstitial marl.
2310-2340	80% Limestone; as above. 20% Marl; grey-green and light grey, silty in part, sparsely pyritic, richly fossiliferous.

2340-2370	60% Limestone; as above. 40% Marl; as above.
2370-2400	30% Limestone; as above. 70% Marl; as above.
2400-2450	Marl; (approximately 60% grey-green, 40% light grey), as above, but becoming progressively more compact and less calcareous.
2450-2801	Mudstone; dark grey to grey-green, sparsely pyritic and richly fossiliferous.
2801-2810	50% Mudstone; light grey-green, slightly argillaceous, slightly calcareous, fossiliferous, glauconitic, pyritic. 50% Marl; as above. Forams, bryozoa (Farestrella).
2810-2820	60% Mudstone; as above. 40% Marl; as above.
2820-2830	80% Mudstone; (shale) light grey-green; slightly argillaceous, fossiliferous, becoming slightly calcareous. 20% Marl; as above.
2830-2840	80% Mudstone; as above. 20% Marl; as above. Trace siltstone; fine, light grey-green matrix, slightly calcareous.
2840-2850	80% Mudstone; as above. 20% Marl; as above. Trace siltstone; as above.
2850-2860	90% Mudstone; as above. 10% Marl; as above.
2860-2870	30% Mudstone; as above. 70% Marl; as above.
2870-2880	80% Marl; as above. 20% Mudstone; as above.
2880-2890	As above.
2890-2900	70% Mudstone; as above. 30% Marl; as above. Trace siltstone.
2900-2910	80% Mudstone; as above, grading into a siltstone, light brown, slightly calcareous matrix. 20% Marl;as above. Extremely fossiliferous.
2910-2920	80% Mudstone; as above, increasing amounts of siltstone as above. 20% Marl; as above.
2920-2930	95% Mudstone; grades into siltstone, as above, slightly calcareous. 5% Marl; as above.
2930-2940	95% Mudstone; as above, grading into siltstone, as above. 5% Marl; fossiliferous marl.
2940-2960	90% Mudstone; as above, grades into siltstone, as above. 10% Marl Trace dark black to red resinous material.

2960-3000	95% Mudstone; slightly fossiliferous, grading to siltstone, pyritic. 5% Marl; as above, very fossiliferous.
3000-3030	Ream samples.
3030-3040	90% Mudstone; as above, tending to become fissile, grading into siltstone, as above. 10% Marl; as above. Trace siltstone.
3040-3050	90% Mudstone; as above. 10% Marl; as above. Trace black shale.
3050-3060	As above. Trace of dark red-black resinous material, coaliferous.
3060-3070	50% Mudstone; as above. 40% Siltstone; slightly carbonaceous, light grey-brown, evenly grained. 10% Marl.
3070-3100	80% Mudstone; as above. 20% Marl; as above. Trace of siltstone, as above.
3100-3110	80% Mudstone; as above. 20% Marl; as above. Trace siltstone, as above. (Arenaceous, foraminifera types appearing, nor porcelaneous - indicate colder water).
3110-3120	80% Mudstone, as above. 20% Marl; as above. Trace siltstone, as above.
3120-3130	90% Mudstone; soft 10% Marl. Trace siltstone, light brown, white, slightly calcareous matrix. Evenly textured grains of quartz.
3130-3140	90% Mudstone; as above. 10% Marl;as above.
3140-3160	100% Mudstone; as above. (? slight change ?)
3160-3170	100% Mudstone; becoming very pale coloured, due to silty nature. Less calcareous than previously. Still very soft and puggy. Increase in amount of black specks.
3170-3180	100% Mudstone; as above. Very light to pale green and grey. Slightly calcareous only.
3180-3190	100% Mudstone; as above. Some mottling colouration of pale grey to green.
3190-3200	100% Mudstone; as above, pale grey-green, slightly silty. (Trace siltstone; light brown, pyritic, slightly arenaceous, large grains of sub rounded iron stained quartz).
3200-3210	100% Mudstone; as above.
3210-3220	100% Mudstone; as above. Some tending to be fissile. (unadulterated).
3220-3230	80% Mudstone; as above. 20% Siltstone; more fissile, calcareous, grey.

3230-3240 50% Mudstone; as above.
50% Siltstone; as above, pale grey green, calcareous.

MARKED CHANGE - SPECKLED WITH BLACK COALIFEROUS

3240-3250 70% shale; dark grey, slightly micaceous, slightly calcareous, slightly arenaceous.
30% Mudstone; as above.
Trace of siltstone, as above.

3250-3260 40% Mudstone; as above.
50% Shale; as above.
10% Siltstone as above.

3260-3270 As above.

3270-3280 Even mixture of mudstone and shale, as above.
Some siltstone as above (how much are cavings ?).

3280-3290 50% Mudstone; as above.
50% Shale; as above.
Trace of siltstone as above. Carbonaceous specks.

3300-3310 As above.

3310-3320 As above.

3320-3340 70% Shale; dark to medium grey, fissile, slightly calcareous, slightly micaceous, becoming silty in part.
30% Mudstone; as above, very fossiliferous.
Trace of siltstone.

3340-3350 80% Shale; as above. Very fossiliferous.
20% Mudstone; as above.

3350-3360 As above.
98% shale.

3360-3370 90% Shale; as above, light green.
10% Mudstone.

3370-3380 95% Shale; as above.
5% Siltstone; light brown, evenly textured grains, quartz.

3380-3390 95% Shale; as above.
5% Siltstone; as above.

3390-3400 90% Shale; as above.
10% Siltstone; as above.

3400-3410 As above.

3420-3430 95% Shale; as above.
5% Siltstone; as above.
Mudstone; pale grey, calcareous, very fossiliferous, very soft (caving).

3430-3440 90% Shale; as above.
10% Siltstone.
Mudstone as above.

3440-3450 90% Shale as above.
10% Siltstone.
Mudstone as above.

3450-3460 80% Shale.
20% Siltstone; as above.
Mudstone as above.

3460-3470 80% Shale; as above.
20% Siltstone.
Some mudstone.

3470-3480 90% Shale; as above.
10% Siltstone; as above. Trace of mudstone.

3480-3490	90% Shale. 10% Siltstone. Some Mudstone.
3490-3500	As above.
3530-3540	20% Shale; as above. 80% Mudstone; as above, pale green, grey, very fossiliferous, calcareous.
3540-3550	20% Shale; as above. 80% Mudstone; Trace siltstone, light grey-green, speckled with
3550-3560	As above.
3560-3590	As above.
3590-3620	50% Shale; as above. 50% Mudstone; as above.
3620-3650	40% Shale; becoming very silty. 40% Mudstone; as above. 20% Siltstone; light grey-green, speckled with dark green glauconite, calcareous.
3650-3660	50% Mudstone; as above. 50% Shale. Trace of siltstone.
3660-3670	80% Silty shale; slightly glauconitic. 10% Mudstone.
3670-3680	90% Shale; silty, light to medium grey-green, fissile, very fossiliferous, slightly glauconitic. 10% Mudstone; as above.
3680-3690	90% Shale; as above. 10% Mudstone; as above.
3690-3700	80% Shale; silty, slightly glauconitic. 20% Mudstone.
3700-3760	As above, trace siltstone.
3760-3770	80% Shale; very silty, as above. 20% Mudstone. Trace of siltstone as above.
3770-3780	As above.
3800-3810	90% Silty shale. 10% Mudstone.
3810-3820	60% Silty Shale; white, calcareous, siltstone matrix. 30% Mudstone; as above. Trace of siltstone.
3820-3830	As above.
3830-3840	As above. Siltstone; white matrix, speckled with dark green glauconite, slightly calcareous, argillaceous.
3840-3850	90% Mudstone; as above, very pale grey, arenaceous, speckled with green, glauconite, slightly calcareous, very soft. 10% Shale; silty, as above. Trace of siltstone, as above.
3850-3860	50% Mudstone; as above. 50% Shale; as above. Trace of siltstone.

3860-3870	As above.
3870-3880	As above.
3880-3890	As above.
3890-3900	50% Shale; as above, pale 40% Siltstone; light grey, very argillaceous, calcareous, speckled and glauconitic. 10% Mudstone.
3900-3910	As above.
3910-3920	70% Siltstone; as above. 20% Shale; as above, very glauconitic. 10% Mudstone.
3920-3930	90% Siltstone; light grey to brown, very argillaceous, slightly calcareous, fossiliferous, glauconitic, pyritic. 10% Shale; as above. Trace of mudstone.
3930-3940	80% Siltstone; pyritic. 20% Shale Trace of mudstone.
3940-3950	50% Shale; very silty. 50% Siltstone, as above.
3950-3960	70% Siltstone, as above. 30% Shale; as above. Trace of mudstone.
3960-3970	90% Siltstone; as above. 10% Shale; as above.
3970-3980	50% Siltstone. 50% very silty shale.
3980-3990	As above.
4020-4030	As above.
4030-4040	As above. 90% Shale. 10% Siltstone. Trace of sandstone, very fine grained, very argillaceous, calcareous, glauconitic.
4040-4050	70% Siltstone; as above. 20% Sandstone; as above. 10% Shale, as above.
4050-4060	70% Siltstone; as above. 20% Shale; as above. 10% Sandstone; as above, occasional coarse, rounded quartz grains.
4060-4070	50% Siltstone; as above. 40% Shale; as above. 10% Sandstone; as above, some fragments are illsorted. Some very soft white arenaceous, glauconitic clay.
4070-4080	80% Shale, very silty. 20% Sandstone; as above.
4080-4090	80% Shale; very silty, as above. 20% Siltstone; as above. Trace of sandstone, as above.
4090-4100	Predominantly silty shales as above. Trace of sandstone, as above.
4100-4110	Silty shale, as above. Very glauconitic. Trace of sandstone as above.

4110-4120	As above. Silty shale. Sandstone; very fine grained with occasional rounded coarse grained quartz, medium coarse grains of glauconite, very argillaceous, calcareous, fossiliferous.
4120-4130	As above.
4130-4140	As above.
4140-4150	As above, increase in amount of the mudstone (?) to 80%.
4150-4160	As above, trace of sandstone, as above.
4160-4170	50% Mudstone; white, arenaceous, glauconitic, calcareous, fossiliferous. 50% silty shale.
4170-4180	As above.
4180-4190	90% Siltstone; as above. 10% Shale; as above.
4190-4200	As above.
4200-4210	80% Shale; silty. 20% Siltstone; as above.
4210-4220	As above.
4220-4230	As above.
4230-4240	90% Shale; silty, pyritic, glauconitic, fossiliferous 10% Mudstone; trace of sandstone.
4240-4250	As above.
4250-5260	As above. (Marginopora).
4260-4270	As above.
4270-4280	As above.
4280-4290	As above.
4290-4300	90% Shale; silty, as above. 10% Mudstone; as above, trace of sandstone, as above.
4310-4320	90% Silty shale; very calcareous, fossiliferous, glauconitic, pyritic. 10% siltstone; as above.
4320-4330	As above.
4330-4340	100% Shale; dark grey to brown, silty, calcareous, fossiliferous, glauconitic, pyritic, as above. Trace of siltstone, as above. Shale; light to medium grey, calcareous, fossiliferous, sparsely glauconitic to pyritic, moderately soft.
4340-4350	90% Shale; silty, as above. 10% Shale; light to medium grey, calcareous, fossiliferous, sparsely glauconitic and pyritic, as above. Trace of rounded to sub rounded, coarse grained quartz sand. Siltstone; light brown to buff, argillaceous, calcareous, glauconitic and sparsely pyritic, fossiliferous.
4350-4360	90% Shale; silty, as above. 10% Shale; light to medium grey, as above. Trace of siltstone, as above.
4360-4370	100% Shale; dark grey, silty, as above. Fossils, forams, bryozoa, rare gastropod (Turitella).

4370-4380	100% Shale; dark grey, silty, as above. Trace of grey-green, very soft, calcareous mudstone. Sub rounded, coarse to very coarse quartz sand.
4380-4390	100% As above.
4390-4400	As above. Trace of sandstone, very fine, argillaceous.
4400-4410	Siltstone and shale as above. Trace of limestone, very argillaceous.
4410-4420	90% Shale; silty as above. 10% Limestone; as above, dark grey, very argillaceous, obviously interbedded with above.
4420-4430	As above.
4430-4440	100% Shale; silty, trace of limestone and sandstone.
4440-4450	As above.
4450-4460	As above.
4460-4470	As above.
4470-4480	100% Shale; silty, dark grey, very fossiliferous, pyritic, fissile, trace of limestone, as above.
4480-4490	100% Shale; very silty in part. Trace of limestone and sandstone, as above.
4490-4500	100% Shale; very silty. Trace of limestone, and sandstone, as above.
4500-4510	As above.
4540-4550	70% Shale; dark grey, silty, trace of calcarenite, sparsely carboniferous and pyritic, fossiliferous, as in Core No.4. 30% Siltstone; light grey, argillaceous, calcareous, slightly glauconitic, fossiliferous, dolomite; light brown, dense very hard, cryptocrystalline. Calcareous, fossiliferous debris.
4550-4560	50% Shale; dark grey as above. 50% Shale; light grey, in part silty, calcareous, sparsely pyritic, very fossiliferous and calcareous. Trace of dolomite as above.
4560-4570	50% Shale; dark brown, as above. 50% Shale; light grey, as above.
4570-4580	30% shale; dark grey. 70% Shale; light grey in part silty.
4580-4590	40% Shale; dark grey. 50% Shale; light grey as above. 10% Limestone; possibly carbonaceous rock, light brown, dense, hard, cryptocrystalline, micritic dolomite (?) argillaceous, pyritic.
4590-4600	60% Shale; dark grey to dark grey-brown, silty, trace of calcarenite fossiliferous, sparsely pyritic. 30% Shale; light grey, in part silty and slightly glauconitic, sparsely pyritic, calcareous, fossiliferous. 10% Limestone;light brown, possibly dolomitic as above. Trace of pyrite. Sandstone, grey-white, calcareous, argillaceous, sub angular to rounded, fairly well sorted, trace of glauconite to pyrite, fossiliferous, moderately hard, no porosity or permeability, calcareous skeletal debris.

4600-4610 60% shale; light grey as above.
30% Shale; dark grey as above.
10% Limestone; as above, slightly pyritic, trace of pyrite; sub rounded, very coarse grained quartz sand.

4610-4620 As above.
Trace of siltstone, light grey, argillaceous, calcareous, possibly slightly dolomitic ? slightly glauconitic and pyritic.

4620-4630 As above.

4630-4640 70% Shale; light grey as above.
15% Shale; dark grey as above.
15% Limestone; as above, pyritic, trace of pyrite, calcareous skeletal debris, dry foram pelycopod.

4640-4650 50% Shale; light grey as above.
40% Shale; dark grey to dark grey-brown as above.
10% Limestone;(light brown under light,) medium grey, micritic, argillaceous, dolomitic in part ? dense, hard, cryptocrystalline, hardness varying according to argillaceous content, grading to medium grey, fairly soft, falcareous mudstone. Trace of pyrite. Sandstone.

4650-4660 70% Shale; dark grey to dark grey brown.
Silty, trace of calcarenite; sparsely pyritic, sparsely carbonaceous, fossiliferous, as above.
20% Shale; light grey to light grey-green, silty, calcareous, fossiliferous, as above.
10% Limestone; medium grey (light brown under scope), Trace of pyrite.

4660-4670 90% Shale; dark grey to dark grey-brown, as above.
10% Shale; light grey as above.
Trace of medium grey limestone (dolomitic ?), as above.
Shale - grey-green, sparsely pyritic, glauconitic, calcareous, pyrite.

4670-4680 70% Shale; dark grey to brown, slightly calcareous, fossiliferous, pyritic.
30% Shale; light grey to grey green, silty, calcareous, fossiliferous.
Trace of limestone, as above, dolomite ? argillaceous, arenaceous.

4680-4690 40% Shale; dark grey to brown.
30% Shale; light grey to green.
20% Dolomite; light brown, very hard, argillaceous.
10% Siltstone; and silty shale.

4690-4700 50% Shale; as above.
40% Shale; as above.
10% light brown, argillaceous, slightly calcareous, very compace, pyritic.

4700-4710 70% Shale; dark grey.
20% Shale; light grey to green.
10% Dolomite; light brown, trace of siltstone.
Numerous coarse to very coarse, rounded quartz grains.

4710-4720 70% Shale and dark grey, slightly calcareous.
20% Shale.
10% Siltstone; buff to light brown, pyritic, glauconitic, very argillaceous, calcareous.
Trace of sandstone, very fine grained, buff to light brown, slightly argillaceous, glauconitic, no porosity, fossiliferous.
Numerous free coarse to very coarse, rounded quartz grains, some are milky and frosted.

4720-4730 70% Shale; dark grey to very dark brown, slightly calcareous, fossiliferous, as above.
20% Shale; light grey to green, as above.

10% Siltstone; as above.
Trace of sandstone as above, and numerous free quartz grains.

4730-4740 — 80% Shale; dark grey to very dark brown, as above.
10% shale; light grey to green.
10% Siltstone; as above.

4740-4750 — 80% Shale; dark grey to dark grey-brown, silty, trace of calcarenite, slightly pyritic, sparsely fossiliferous, as above.
20% Shale; light grey to light grey-green, in part silty, sparsely glauconitic to pyritic in part, soft, fossiliferous, calcareous, as above.
Trace of sub rounded, coarse grained quartz sand.
Limestone ? medium grey, in part silty.
Pyrite, argillaceous, pyritic, hard, cryptocrystalline, dense, possibly representing areas of carbonatization.
Calcareous, skeletal debris (Hystricho).

4750-4760 — 80% Shale; dark grey to dark grey-brown, as above.
20% Shale; light grey, in part silty, as above.
Trace of sub rounded to rounded, coarse to very coarse grained, quartz sand. Dolomitic limestone as above ??
Pyrite.
Sandstone; light grey to grey-white, silty, argillaceous, calcareous, fine to very fine grained, angular to sub angular, sparsely glauconitic, pyritic to fossiliferous.
Hard. No porosity or permeability.

4760-4770 — 80% Shale; dark grey to dark grey-brown, as above.
20% Limestone; light to medium grey (light brown in scope), silty in part, pyritic, argillaceous, possibly slightly dolomitic, dense, very hard, as above.
Trace of shale: light grey-green, sparsely glauconitic, calcareous, fossiliferous.
Quartz sand, as above.

4770-4780 — 50% Shale; light grey-green, trace of glauconite, fossiliferous, slightly calcareous.
(bad sample) — 30% Shale; dark grey to grey-brown, as above.
20% Limestone; as above.
Trace of rounded to sub rounded, medium to very coarse grained quartz sand.

4780-4790 — 50% Shale; light grey green, slightly calcareous, fossiliferous.
30% Shale; as above.
10%: Limestone; as above. Trace of siltstone.

4790-4800 — 50% Shale; dark grey as above.
40% Shale; light grey-green, as above.
10% Dolomite; very argillaceous, light brown, very hard. Trace of siltstone, and very fine grained sandstone.

4800-4810 — 50% Shale; as above.
40% Shale; as above.
10% Siltstone; light brown to buff coloured, very argillaceous, slightly calcareous, glauconitic. Trace of limestone.

4810-4820 — 40% Shale; as above.
30% Shale; as above.
20% Siltstone; as above.
10% Limestone.
Loose quartz grains and nodules of pyrite common.

4820-4830	60% Shale; light grey to brown and green. 30% Shale; dark grey. 10% Siltstone; as above. Loose quartz grains and nodules of pyrite common.
4830-4840	70% Shale; dark grey to dark grey-brown, silty, trace of calcarenite, sparsely pyritic, sparsely fossiliferous, as above. 20% Shale; light grey to grey-green, silty, calcareous, fossiliferous, sparsely glauconitic in part, soft. 10% Siltstone; light grey to grey-white, calcareous, very argillaceous, sparsely glauconitic and pyritic, fossiliferous. Trace of sandstone; grey white to buff, silty, fine to very fine grained, sub angular to sub rounded, calcareous, sparsely glauconitic, moderately hard, no porosity or permeability. Trace of rounded to sub rounded, coarse to very coarse grained quartz sand to pyrite, as above. Calcareous skeletal debris. Principally foram to bryozoa.
4840-4850	50% Shale; dark grey, as above. 40% Shale; light grey to grey-green, as above. 10% Siltstone, as above. Trace sandstone, as above; light brown, dense, hard, cryptocrystalline, dolomitic to silty dolomitic limestone rock, as above. Quartz sand and pyrite as above.
4850-4860	70% Shale; light to medium grey to grey-green, calcareous, in part slightly silty, sparsely fossiliferous to pyritic, moderately soft. 30% Shale; dark grey to dark grey-brown, as above. Trace of siltstone, as above, to calcareous sandstone, as above. No porosity or permeability. Light grey, dense, argillaceous dolomite ?? micritic, limestone as above, in part silty.
4860-4870	60% Shale; dark grey to dark grey-brown, trace of calcarenite, sparsely fossiliferous, as above. 40% Shale; light to medium grey to grey-green, as above. Trace of siltstone as above and micritic, slightly dolomitic, limestone, as above.
4870-4880	80% Shale; dark grey to dark grey-brown. 20% Shale; light to medium grey to grey-green.
4880-4890	60% Shale; dark grey as above. 30% Shale; light to medium grey to grey=green, as above. 10% Limestone; medium grey (light brown under scope) argillaceous, slightly dolomitic in part, silty, dense, very hard, with scattered sub-rounded, coarse to very coarse grained quartz sand. Trace of coarse to very coarse grained quartz sand as above.
4890-4900	20% Shale; dark grey, as above. 80% Shale; medium grey to grey-green, silty in part, sparsely pyritic, rarely glauconitic, calcareous, as above. Trace of limestone, as above. Rounded to sub-rounded, coarse to very coarse grained quartz sand. Calcareous skeletal debris (foram, bryozoa).
4900-4910	80% Shale; medium grey to grey-green, as above. 20% Shale; dark grey, as above. Trace limestone and quartz sand, as above.
4910-4920	60% Shale; dark grey brown as above. 40% Shale; medium grey to grey-green, as above. Trace of limestone and quartz sand, siltstone, as above.
4920-4930	50% Shale; dark grey to dark grey-brown, as above. 50% Shale; light to medium grey to green. Trace of quartz sand, limestone and pyrite to calcareous, skeletal debris, as above.

	4930-4940	80% Shale; dark grey to dark grey-brown, as above. 20% Shale; light to medium grey to grey-green, as above. Trace of quartz sand etc.. as above.
	4940-4950	80% Shale; dark grey as above. 20% Shale; light to medium grey to grey-green, as above.
	4950-4960	30% Shale; dark grey, as above. 70% Shale; light to medium grey, as above. Trace of siltstone as above, and sandstone, as above. Limestone; dolomitic, argillaceous, micritic, sparsely glauconitic to silty, as above.
	4960-4970	50% Shale; as above. 50% Shale; as above. Trace of limestone, sandstone and siltstone as above.
	5060-5070	50% Shale; as above becoming very silty in part. 40% Shale; buff to light grey, as above. 10% Siltstone; as above. Trace of dolomite as above (caving?)
	4970-4980	As above.
(5000-5100 no descriptions)	4980-4990	As above.
	4990-5100	As above.
	5100-5110	50% Shale; dark grey to dark brown. 40% Shale; light grey to buff, glauconitic. 10% Siltstone; as above.
	5110-5120	50% Shale; as above. 40% Shale; as above. 10% Siltstone; as above. Trace of light to dark brown, very fine grained sandstone, very argillaceous, no porosity or permeability.
	5120-5130	50% Shale; as above, very silty. 30% Shale; as above. 10% Siltstone; as above. 10% Sandstone; very fine grained, dark brown to buff, very argillaceous.
	5130-5140	50% Shale; dark brown, silty, as above. 50% Shale; light grey to buff, calcareous, glauconitic, as above.
	5140-5150	30% Shale; dark brown, as above. 70% Shale; light grey to buff, calcareous, sparsely glauconitic, fossiliferous, as above.
	5150-5160	30% Shale; dark brown. 70% Shale; light grey.
	5160-5170	50% Shale; dark brown. 50% Shale; light coloured.
	5170-5180	70% Shale 30% Shale
	5180-5190	60% Shale; 40% Shale; Much caved material, dolomite, etc.. light brown, argillaceous, calcareous, silt.
	5190-5200	80% Shale; dark brown; as above. 10% Shale; light grey. 10% Siltstone; light brown, in part very finely sandy, possibly slightly dolomitic, calcareous, argillaceous, dense, medium hard.
	5200-5210	80% Shale; dark brown, trace calcarenite, silty, in part very finely sand.

20% Shale; light grey, as above.
Trace of siltstone, as above.

5210-5220 As above.

5220-5230 75% Shale; dark brown, silty, trace calcarenite, sparsely fossiliferous, pyritic.
25% Shale; light grey, silty, as above.
Trace of dense, hard, cryptocrystalline, dolomitic, siltstone, as above.

5230-5240 30% Shale; dark brown, as above.
60% Shale; light grey, as above, calcareous, sparsely glauconitic.
10% Siltstone; medium brown, calcareous, argillaceous, in part very finely sandy.

5240-5250 40% Shale; dark brown, as above.
60% Shale; light grey, as above.
Trace siltstone.

5250-5260 40% Shale; dark brown, as above.
60% Shale; light grey as above.

5260-5270 40% Shale; dark brown, as above.
60% Shale; light grey, as above.
Trace of siltstone, as above and light brown dolomite.

5270-5280 As above.

5280-5290 90% Shale; dark brown, as above.
10% Shale; light grey as above.

5330-5340 20% Shale; dark brown, silty, as above.
80% Shale; light grey to grey-blue, silty, calcareous, fossiliferous.

Cave in

Trace of dark brown, dolomitic siltstone, sandstone, light grey, silty, argillaceous, calcareous, sparsely glauconitic, fossiliferous.

5340-5350 (Bad sample - multitude of rock types).
80% Shale; dark brown, silty as above.
20% Shale; light grey, silty, calcareous, as above.
Sub angular to rounded, medium to very coarse grained quartz sand, dolomitic.

5350-5360 50% Shale; as above.
50% Shale; as above.
Trace of sub angular to rounded to very coarse grained quartz sand. Sandstone; light green, silty, very fine grained, sub angular to sub rounded, fairly well sorted, abundant glauconite, moderately hard to friable, porosity fair, permeability poor.

5360-5370 50% poorly sorted, sub angular to rounded quartz silt and fine to very fine grained quartz sand, (milky to clear grains),
10% sandstone; light green, quartzose, sub angular to sub rounded, fairly well sorted, abundant glauconite, micritic and becoming light brown when dolomitic, moderately hard, porosity fair, permeability poor. No fluorescence.
30% cuttings - dark brown shale etc..
Trace of light brown dolomitic very fine grained sandstone, hard, no porosity or permeability, dolomitic, equivalent of above siltstone.

5370-5380

60% sand; fine to very coarse grained to granule, sub angular to rounded, quartz sand (dominantly coarse to very coarse grained).
10% Sandstone; glauconitic, as above.
30% Cavings, dark brown to light grey shale.
Trace of sandstone, medium brown, quartzose, dolomitic, very fine grained, sub angular to sub rounded, fairly well sorted, sparsely glauconitic and micaceous, hard, no porosity or permeability.

5380-5390

70% quartz sand; as above (80% milky, 20% clear).
20% sand; light green, glauconitic, as above.
10% cavings, dark brown shale as above.

5390-5400

100% Quartz sand, as above.
Trace of light green glauconitic, micritic sandstone.
Trace of shale, medium brown, micronnic, in part silty, sparsely carbonaceous.

5400-5410

60% Quartz sand; as above, with trace of light brown dolomitic cement.
10% Quartzose; light green, glauconitic sandstone.
10%Sandstone; medium brown, quartzose, dolomitic, very fine grained, sub angular to sub rounded, fairly well sorted, trace of glauconite and micritic. Hard, no porosity or permeability.
20% Cavings; dark brown shale and light grey shale as above.

5410-5420

40% Quartz sand; very fine grained, granule (dominantly coarse grained).
10% Sandstone; light brown to medium brown, dolomitic, as above, with scattered sub rounded, coarse grained quartz sand.
10% Sandstone; light green, glauconitic, as above.
40% Cavings; dark brown and light grey shale.

5420-5430

30% Quartz sand as above.
10% Shale; medium brown, in part silty, micronnic, sparsely carbonaceous.
10% Sandstone; light to medium brown, dolomitic, as above.
50% Cavings; dark brown and light grey, calcareous shale as above.

5430-5440

10% Quartz sand; as above.
10% Shale; medium brown as above.
10% Sandstone; light brown, dolomitic, very hard, as above.
70% Cavings; dark brown and light grey, calcareous shale,
Trace of sandstone; grey-white to buff, quartzose, calcareous, fine to very fine grained, sub angular to sub rounded, well sorted, medium hard. Porosity and permeability poor to fair.

5440-5450

Trace loose quartz grains as above.
Trace of sandstone; as above, light green to white.
100% shale; dark grey to brown, light grey to buff, glauconitic, fossiliferous.

5450-5460

5% Sandstone; as above.
Trace of loose quartz grains.
95% shale; as above, cavings.

5460-5470

10% Loose quartz grains.
10% Sandstone; as above.
80% Shale; as above (cavings predominantly).

5470-5480

10% Loose quartz grains.
40% Sandstone (i) light green, well sorted.
(ii) White " "
(iii)Light brown, dolomitic, illsorted.
50% Shale; as above.

5480-5490

10% Loose quartz sand.
90% Shale; dark brown to light grey, calcareous, cavings.
Trace of dolomitic sandstone, pyrite.

5490-5500 As above.

5500-5510 Trace of loose quartz grains.
10% Sandstone; 3 types.
90% Shale; dark grey, chocolate, buff, (cavings), to light grey, silty shale.

5510-5520 No description.

5510-5520 Trip sample.
100% cavings, shale.

5520-5530 100% Cavings? composed of dark brown, silty shale and light grey, silty, fossiliferous, calcareous shale and calcareous, skeletal debris.
Trace of sub angular to sub rounded medium to very coarse grained quartz sand.
Sandstone; medium brown, calcareous, dolomitic, argillaceous, micritic, fine to very fine grained, angular to sub rounded, fairly well sorted, but with scattered, medium grained quartz sand, very hard and dense, porosity and permeability nil.
Sandstone; grey-white, calcareous, fine grained, sub angular, to sub rounded, well sorted, in hard to friable, porosity and permeability fair.

5530-5540 100% Cavings, as above.
Trace of sandstone; medium brown, calcareous and dolomitic, as above.
Sandstone; light grey, calcareous, silty, very fine grained, sub angular to sub rounded, fairly well sorted, argillaceous, sparsely glauconitic, friable, porosity fair, permeability poor.
Sand; quartz as above.

5540-5550 100% Cavings, as above.
60% dark brown, silty shale.
40% light grey silty, calcareous, shale, sparsely glauconitic.
Trace quartz sand, as above.
Sandstone; medium brown, calcareous and dolomitic, as above.
Sandstone; light grey, calcareous, silty, very fine grained, as above.

5550-5560 100% Cavings.
70% dark brown, silty shale, sparsely pyritic, moderately micaceous.
30% Shale; light grey, calcareous, sparsely fossiliferous, glauconitic.
Quartz sand; as above.
Siltstone; light grey, brown, slightly calcareous, very argillaceous, soft.
Sandstone; medium brown, dolomitic, as above.

5560-5570 Siltstone; light to medium brown, in part very finely sandy, argillaceous, moderately micritic, trace of dolomite.
Sandstone; medium brown, argillaceous, silty, fine to very fine, sub angular to sub rounded. Trace micrite, friable, porosity fair, permeability poor,
Sandstone; light to medium brown, dolomitic, as above.
Sand; as above.
Dolomite; light brown, dense, cryptocrystalline, very hard.
60% dark brown shale)
40% light grey calcareous shale) as above.

5570-5580 Sandstone; light brown, argillaceous, slightly dolomitic, silty, very fine grained sandstone, subangular to sub rounded fairly well sorted, friable, porosity fair, permeability poor, Grading to a siltstone.

10% Siltstone; dark grey-brown, very argillaceous, in part very finely sandy, sparsely pyritic, and micritic, sparsely carbonaceous, with thin light grey silty, very fine grained sandstone streaks.
Trace sandstone; medium brown, dolomitic, fine to coarse grained, angular to sub rounded, poor sorting, dense, hard, no porosity or permeability.
10% Siltstone; light brown, in part very finely sandy, argillaceous, calcareous.
60% light blue-grey, calcareous shale, in part silty.
20% Dark brown shale, as above.
Trace of quartz sand, as above.

5580-5590 10% Siltstone; dark grey brown, argillaceous, in part very finely sandy, as above.
10% Sandstone; light grey to grey-white, argillaceous, slightly calcareous, silty, fine to very fine grained, friable, porosity fair, no fluorescence, permeability fair. Interbedded with siltstone, as above.
80% Cavings; principally light bluish grey, calcareous shale, trace of quartz sand.

5590-5600 20% Siltstone; as above.
10% Sandstone; light grey to grey-white, argillaceous, slightly calcareous, as above.
70% light bluish grey, calcareous shale.
Trace of quartz sand.

5600-5610 20% Siltstone; as above.
10% Sandstone; as above.
10% Sandstone; light brown, argillaceous, slightly dolomitic, silty, very fine grained, sparsely micaceous, medium hard, porosity fair, permeability poor, trace quartz sand, as above.
Trace of medium brown, dolomitic sandstone, as above.
Cuttings?
50% bluish grey calcareous shale, as above.
10% dark brown silty shale, as above.

5610-5620 20% Siltstone; as above.
10% Siltstone; medium brown, slightly dolomitic, in part very finely sandy, sparsely micaceous, carbonaceous.
20% sandstone, light grey to grey-white, slightly calcareous, argillaceous, silty, grading to
Siltstone; fine to very fine grained, sub angular to sub rounded, fairly well sorted, trace of micrite, friable, porosity fair, permeability fair, trace of quartz sand, as above.
50% bluish grey to light grey, calcareous shale.

5640-5650 20% Siltstone; light grey, slightly argillaceous, sparsely micromicaceous, in part very finely sandy, as in Core No.7.
Cavings;
80% shale; light grey, silty, calcareous, fossiliferous,
20% shale; dark brown, silty, as above.

5650-5660 30% Siltstone; as above, grading to a silty, very fine grained sandstone, sub angular to sub rounded, with small trace micrite and carbonate. No show.
70% Shale, cavings.

5660-5670 30% Siltstone; light grey, slightly argillaceous, slightly micaceous, some very fine grained sandstone.
70% shale; as above, cavings.

5670-5680 40% Siltstone; white to light grey, as above, interbedded with silt, is a dark grey to black, carbonaceous ? material as stringers.
60% Shale; as above minor loose quartz grains.

5680-5690 40% Siltstone; as above, slightly micaceous.
60% shale; as above.

5690-5700 — 30% Siltstone; as above.
70% Shale; as above (cavings)

5700-5710 — 30% Siltstone; as above, light grey to white, argillaceous, interbedded with dark brown material.
70% Shale; as above, light grey to green, dark brown, slightly calcareous, silty in part, fossiliferous.

5710-5720 — 80% Shale; light grey, slightly silty and fossiliferous, slightly calcareous.
10% Shale; dark brown.
10% Siltstone; as above.
Trace of very fine grained sandstone, very argillaceous with interbedded carbonaceous material, as thin irregular stringers, slightly micaceous.

5720-5730 — 40% Coal;(fragments) black conchoidal fracture.
10% Siltstone; as above. Sandstone, as above.
40% light grey, shale, silty, glauconitic, slightly calcareous.
10% Shale; dark brown, no porosity, permeability.
Interbedded with coal fragments.

5730-5740 — 90% Shale, 70% light grey
20% dark brown
10% siltstone; as above, and sandstone as above.
Trace, 10%, coal, as above.
No porosity or permeability.

5740-5750 — 95% Shale; light grey and dark brown.
5% Siltstone and sandstone; light grey to buff, very argillaceous, slightly micaceous, speckled.

5750-5780 — 10% Coal; as above.
80% Shale; dark brown, tending to become silty, light brown, as above.
10% Siltstone; as above, sandstone, very fine grained argillaceous, slightly micaceous, sometimes pyritized.
Occasional loose very coarse granular quartz grains.
No porosity or permeability.

5780-5790 — 10% Coal; black, brittle to sub conchoidal fracture.
10% Shale; as above.
80% Cavings; light grey, calcareous, silty shale.
Trace of sub angular to rounded, coarse grained quartz sand.
Siltstone; as above (abundant trace).
Sandstone; light grey to grey-white, quartzose, silty, fine to very fine grained, sub angular to sub rounded, fairly well sorted, trace of carbon, micritic, moderately hard to friable, porosity fair, permeability fair to poor.

5790-5800 — As above.

---------- FIRST GOOD SANDSTONE ----------

5800-5810 — 80% Sandstone; composed of very coarse to granular, sub rounded to rounded quartz, milky and clear. Some grains have pyrite adhering. Probably high porosity and permeability.
20% Shale; light grey, silty, slightly calcareous.
Trace of coal fragments (cavings).
Trace of siltstone, as above.

5810-5820 — 80% Shale; (40% light grey, 40% chocolate brown), slightly carbonaceous layers.
10% Siltstone and sandstone; as above.
10% loose quartz grains, as above.

5820-5830 — 80% Shale; as above.
10% Sandstone; very fine grained, argillaceous, white to buff.
10% Siltstone; dark brown to brown, interbedded with chocolate shale.

5830-5840	10% Coal; as above, probably more, but floated off. 60% Shale; light grey to chocolate brown, (satiny golden and resinous lustre). Interbedded carbonaceous flecks and mica. 30% Siltstone and sandstone found to be interbedded with shale; loose quartz grains common.
5480-5490	60% Shale; light grey (cavings), with a predominantly dark brown carbonaceous material. 30% Sandstone; very fine to fine, non calcareous, argillaceous, white clay matrix, found interbedded with the dark brown to black carbonaceous shale, slightly micaceous. 10% Loose quartz grains, as above.
5850-5860	30% Coal, as above. 40% Quartz grains; loose. 20% Shale; as above. 10% Sandstone; very fine to fine grained, as above.
5860-5870	50% Sand; sub rounded to rounded, coarse grained to granular, to pebbly (dominantly coarse grained to granular), milky and clear. 50% Coal; as above.
5870-5880	20% Coal 10% Quartz sand 20% Shale; dark brown, carbonaceous, as above. 50% Cavings. Trace of sandstone; light grey to buff, quartzose, argillaceous, fine grained, sub angular to sub rounded, well sorted, sparsely micaceous and carbonaceous, friable, porosity good, permeability fair.
5880-5890	70% Shale 10% Quartz grains 20% Siltstone and sandstone, mainly cavings ?
5920-5930	Trip Sample. 90% Shale; light grey to dark brown (cavings) 10% Siltstone; and loose quartz grains as in Core No.8 (representative of drilled lithology).
5930-5940	20% Shale; as above, some dark chocolate brown carbonaceous shale as in 20% Siltstone; light grey, argillaceous, grading into very fine sandstone. 60% Loose quartz grains; sub angular to sub rounded, medium to very coarse to granular in size. (Clay matrix washed).
5940-5950	10% Shale; dark brown to light grey. 90% Loose quartz grains, as above. Trace of very fine grained sandstone and siltstone, as above. Trace of carbonaceous fragments.
5950-5960	100% Loose quartz grains, as above. Trace of siltstone and very fine grained sand as above. Trace of carbonaceous shale.
5960-5970	90% Loose sandstone; as above. 10% Shale; as above. Trace of siltstone and very fine sandstone.
5970-5980	30% Loose grains. 20% Sandstone; white, fine grained. Very argillaceous, (white clay matrix) calcareous. Porosity low, permeability low to medium. 40% shale; light grey to brown, as above. 10% Siltstone; grading to very fine grained sand.

7980-7990
40% Quartz sand; sub angular to rounded, coarse grained to granule, argillaceous.
20% Sandstone; grey white, calcareous, fine to medium grained, angular to sub rounded, generally fairly well sorted, but with scattered sub rounded to rounded trace lithic grains, coarse grained to granular quartz sand, moderately hard, porosity fair, permeability poor.
40% Cavings; as above.

5990-6000
20% Shale; dark brown, micaceous, carbonaceous.
20% Shale; cavings, light grey to green.
20% Loose quartz grains, as above.
20% Siltstone; and fine to medium grained sandstone, as above. Trace of carbonaceous fragments.

6000-6010
80% Shale.
20% Sandstone; as loose grains and as fine to medium argillaceous aggregates.
Trace of siltstone; light grey, very argillaceous.

6010-6020
30% Sandstone; Loose sand as above.
10% Sandstone; aggregates as above.
60% Shale; brown as above.
Trace of carbonaceous fragments.

6020-6030
80% Shale as above.
10% Siltstone; light brown to grey, argillaceous, sandy in part.
10% Sandstone; fine to very fine, argillaceous, slightly calcareous, light grey to white.
Trace of carbonate.

6030-6040
80% Shale; predominantly light grey.
10% Loose grains.
10% Sandstone aggregates, white as above.

6040-6050
80% Shale; grey to green, cavings, dark brown and carbonaceous and very fine grained sandstone interbeds.
10% Loose quartz grains as above.
10% Sandstone; very fine to silty and slightly calcareous. (or lithic fragments).

6050-6060
90% Shale; as above.
10% Sandstone; white and light brown, very fine grained. Argillaceous, slightly calcareous (lithic fragments).
Two sandstone types; white and light brown, glauconitic type.
Trace of siltstone, as above.

6060-6070
20% Quartz sand; granule, sub angular to rounded, (milky and clear quartz) as above.
20% Sandstone; grey white, fine to medium grained, angular to sub rounded, calcareous, argillaceous, white clay matrix, generally fairly well sorted, but with scattered, sub rounded, coarse grained and granule quartz sand. Moderately hard, porosity fair, permeability poor to fair.
10% Sandstone; grey white, trace of calcareous, argillaceous, white clay, silty, very fine grained, sub angular to sub rounded, fairly well sorted, moderately hard, porosity fair, permeability poor.

6070-6080
10% Quartz sand; as above.
Trace of sandstone; grey white, fair to medium grained, calcareous, as above.
Trace of sandstone; grey white, silty, very fine grained, as above.
20% Shale; as above.
70% Cavings; light grey shale.(calcareous, as above).
Trace of finely crystalline pyrite with scattered, sub angular, to rounded, medium grained to very coarse grained quartz sand.
Coal; black, brilliant lustre, irregular fracture.

6080-6090 — 80% Shale; composed mainly of cavings, light grey to green. Chocolate brown, slightly micaceous, slightly carbonaceous, interbedded with fine grained, argillaceous sandstone.
10% Sandstone; as loose grains of medium to very coarse quartz and as aggregates of white, fine to medium to very coarse quartz and as aggregates of white, fine to very fine quartz with clay matrix and brown argillaceous, slightly micritic, fine to medium grained quartz.
10% Siltstone; light to dark brown, argillaceous.

6090-6100 — 80% Sandstone; as loose grains, very coarse to granular, sub angular to rounded.
Sandstone; as aggregates, as above.
20% Shale; light brown, chocolate brown, carbonaceous fragments.

6100-6110 — 50% Loose sand grains as above.
50% Shale; cavings and dark brown, micaceous shale, with interbedded, very fine to fine grained argillaceous sandstone, slightly carbonaceous, trace of dolomite matrix.

6110-6120 — 100% Sand; loose grains as above, trace pyritized matrix (no dolomite).

6120-6130 — 90% Sand; as above.
10% Shale; predominantly light grey, (cavings). Some dark brown.
Trace of siltstone and very fine grained sandstone; light buff to brown.

6130-6140 — 60% Shale; cavings mainly.
30% Sandstone; loose grains as above.
10% Shale; dark brown, with interbedded very fine grained sandstone; slightly micaceous, carbonaceous.

6140-6150 — 80% Shale; light grey to grey-green, cavings, small amount of dark brown.
20% Sandstone; loose grains.

6150-6160 — 80% Shale; as above (cavings) (30% dark brown).
20% Loose quartz grains.

6160-6170 — 30% Quartz sand, as above.
20% Shale; dark brown, carbonaceous, silty, as above.
50% Cavings;
Trace of pyrite, as above with embedded medium to coarse grained quartz sand.
Dolomite; light brown, dense, very hard, cryptocrystalline.
Sandstone; light grey, quartzose, medium to fine grained, angular to sub rounded, fairly well sorted, composed of a tightly packed framework of grains cemented by clear silica cement. Dense, very hard, no porosity, permeability almost a 'quartzite'.

Samples becoming badly cut.

6170-6180 — 10% Coal
40% Quartz sand; sub angular to rounded, coarse grained to granular (dominantly very coarse grained)
50% Cavings, as above.

6180-6190 — 70% Quartz sand; as above with trace of white clay matrix and pyrite cement.
30% Cavings, as above.
Trace of pyrite.

6190-6200 — 10% Quartz sand.
90% Cavings; light grey, calcareous shale.
Trace of shale; medium brown, silty, speckled sandstone, grey white, argillaceous, silty, very fine grained, sub angular, to sub rounded, fairly well sorted, friable, porosity fair and permeability poor.
Pyrite; white clay.

6200-6210 40% Sandstone; grey white, calcareous, argillaceous. (white clay matrix) silty, very fine grained, sub angular to sub rounded, fairly well sorted, sparsely carbonaceous, and micritic. Moderately hard to friable, porosity fair, permeability poor; grading to very finely sandy siltstone.
20% Quartz sand, as above.
10% Shale; as above, dark brown, silty, carbonaceous, pyritic in part, as above.
30% Cavings, as above.

6210-6220 50% Sandstone; grading to siltstone, as above.
20% Shale; dark brown, silty, carbonaceous, as above.
10% Quartz sand, as above.
20% Cavings, as above, light grey, calcareous shale.

6220-6230 40% Quartz sand; as above.
20% Sandstone; as above, grading to siltstone.
70% Shale; as above.
30% Cavings, as above.

6250-6260 50% Shale; medium grey to light green, calcareous, trace glauconite, in part, fossiliferous.
40% Shale; brown, carbonaceous, slightly calcareous, pyritic, in part silty.
10% Marl; grey-green, fossiliferous, argillaceous.
Trace of quartz grains, sub angular, pebble to very coarse grained. Trace of sandstone, light grey, very fine, fairly well sorted, sub angular to sub rounded, carbonaceous, clay matrix, porosity very poor, permeability very poor.

6260-6270 50% Shale; brown as above.
40% Marl; grey-green, as above.
10% Sandstone; loose grains, coarse, sub rounded to angular, fairly well sorted.

6270-6280 60% Brown shale; as above.
40% Marl; as above.
Trace of sandstone grains, as above. Medium to coarse grained.

6280-6290 70% Brown shale as above.
10% Sandstone; light grey, very fine to fine, sub rounded, to sub angular, fairly well sorted, with trace disseminated carbonaceous grains.
20% Clay matrix material, porosity and permeability nil.
20% Marl.

6290-6300 50% Brown Shale; silty as above.
50% Marl; trace sandstone as above.

6300-6310 80% Shale; brown, as above.
10% Sandstone; light grey as above, with laminae of carbonaceous material. Trace of light grey, fine to medium, sub rounded to sub angular, fossiliferous, dolomitic, tight.

6310-6320 70% Shale; as above.
20% Sandstone, as above, with numerous shale laminae, brown, as above; porosity fair, permeability poor to nil.
10% Marl.

6320-6330 70% Shale; as above.
20% Sandstone, becoming fine;
Porosity and permeability as above.

6330-6340 50% Siltstone; as above.
10% Sandstone; as above.
10% Marl; as above.
Trace of coarse, loose sand grains.

6340-6350 90% Shale; as above.
10% Marl; trace of loose, coarse sand grains, pyritic.

6350-6360 — 90% Shale; as above.
10% Marl; as above.
Trace of loose coarse sand grains.

6360-6370 — As above.

6370-6380 — 80% Shale; as above.
10% Marl
10% Loose sand grains, sub rounded to sub angular, fairly well sorted, pyritic.

6380-6390 — 60% Sandstone; loose grains, coarse, sub rounded to sub-angular, fairly well sorted.
40% Shale; brown, as above.

6390-6400 — 40% Sandstone; as above.
40% Coal; black, shaly in part.
70% Shale; as above, brown.

6400-6410 — 60% Coal
30% Shale; brown.
10% Cavings.

6410-6420 — 60% Coal
10% Sandstone; shale as above.
20% Shale; brown.
10% Cavings.

6440-6450 — 50% Shale; brown, micritic, carbonaceous, laminae discontinuous.
10% Sandstone; loose grains, medium to coarse, fairly well sorted, sub rounded to sub angular.
30% Cavings, marl.
10% Coal.

6450-6460 — 50% Shale; as above.
10% Sandstone; as above.
10% Sandstone; light brown, fine to very fine, fair sorting sub angular to sub rounded, choked with clay matrix. Porosity and permeability nil.
10% Coal.
20% Marl; as above.

6460-6470 — 30% Sandstone; light green, fine to very fine, sub angular, to sub rounded, fair sorting, carbonaceous in part, interstices choked with clay matrix and thin shale laminae.
30% Sandstone; loose quartz, coarse, fairly well sorted, sub rounded to sub angular.
20% Marl; as above.
20% Shale; brown, as above.

6470-6480 — 40% Sandstone; light grey as above, some clean and porous with laminae, brown shale as above.
40% Shale; brown as above.
20% Marl; as above, trace dolomite, micritic.

6480-6490 — 50% Shale; brown, trace of sandstone as above.
20% Shale; light grey-green, fossiliferous, marly, glauconitic (cavings).

6490-6500 — 20% Shale; as above.
20% Glauconitic shale, marly as above.

6500-6510 — 50% Shale; as above, pyritic
10% Sandstone; loose grained, micritic, fairly well sorted, sub angular to sub rounded.
40% Marl and shale cavings.
Trace of dolomite, brown, micritic.

6510-6520 — 50% Shale; brown as above.
10% Sandstone; light grey, fine to very fine, tight.
40% Marl and shale cavings, trace of dolomite, brown, micritic.

6520-6530	70% Sandstone; light grey, fine to very fine, sub rounded to sub angular, fair sorting, with trace glauconite, dolomitic in part, most clay choked, with some clean, good porosity and permeability poor, 25%. 30% Shale; brown, interbedded with sandstone as above, in part pyritic.
6530-6540	70% Sandstone; as above. 30% Shale; as above.
6540-6550	70% Sandstone; as above. 20% Shale; as above. 10% Sandstone; loose grains, medium to coarse, sub rounded, to sub angular, trace of brown micritic dolomite.
6550-6560	40% Sandstone; as above. 40% Shale; brown, medium, carbonaceous as above, with thin laminae, light grey siltstone. 20% Marl; as above Trace of brown dolomite.
6560-6570	50% Sandstone; as above. 20% Shale; as above. Trace of dolomite ? 30% Marl; as above.
6570-6580	50% Sandstone; as above, slightly glauconitic, some clean. 20% Marl; as above (25%). 30% Shale; brown.
6580-6590	30% Shale; as above. 50% Sandstone; as above. 20% Marl; and shale, as above.
6590-6600	30% Shale; as above. 20% Sandstone; as above. 50% Marl; as above.
6600-6610	40% Brown shale; as above. 60% Marl and shale cavings. Trace of sandstone as above.
6610-6620	60% Shale; as above. Trace of sandstone, as above, dolomitic. 40% Marl.
6620-6630	60% Shale/ as above, with coal laminae, slightly silty. 40% Marl; as above, Trace of sandstone.
6630-6640	As above.
6640-6650	Some with excellent porosity and permeabilty (30% shale as above, fairly well sorted, sub rounded to sub angular, friable, dolomitic). 70% Sandstone; loose and clusters, light grey, medium to fine to coarse.
6650-6660	10% Sandstone; as above. 40% Shale; as above. 50% Marl.
6660-6670	50% Shale; brown, as above. Marl; as above. Trace of sandstone, as above, and trace of dolomite.
6670-6680	70% Marl; cavings as above. 30% Shale, as above. Trace of dolomite.
6680-6690	40% Shale; as above. 60% Cavings. Trace of sandstone, light grey, very fine, fairly well sorted, clay choked, tight, slightly calcareous.

6690-6700 As above.

6700-6710 Some micrite; some in good porosity and permeability.
30% Sandstone; light green, very fine to fine, as above.
20% Shale; brown, as above. Dolomitic in part.
50% Cavings, trace of dolomite, occasional sand grains.

6710-6720 30% Shale; as above.
70% Cavings as above.
Trace of loose, medium sand grains.

6720-6730 Mostly cavings, 5% dolomitic, brown, argillaceous, micritic, some pyrite,
Trace of sandstone, as above.
70% Shale, brown, micaceous, shale, silty,
30% Cavings, etc.. Trace dolomite, brown micritic, argillaceous, pyritic, trace coal.

6730-6740 70% Shale; brown, micaceous, slightly silty.
30% Cavings; trace dolomite, brown, micritic, argillaceous, pyrite,
Trace of coal.

6740-6750 20% Sandstone; loose quartz grains, medium, with few coarse grains, fair to well sorted, sub rounded to sub angular, no fluorescence, no cut. Possible very slight odour.
70% shale; as above.
10% Cavings, as above.
No fluorescence,
No cut.

67506760 70% Loose quartz sandstone grains, medium to well sorted, sub rounded to sub angular, occasional coarse to angular grain, slightly calcareous.
30% Shale; as above.
No fluorescence, no cut.

6760-6770 70% Sandstone; as above, becoming medium to coarse grained, and fairly well sorted.
20% Shale, as above.
10% Cavings.
No fluorescence, no cut.

6770-6780 70% Sandstone; as above.
Becoming coarse grained.
30% Shale; as above, no fluorescence, no cut.

6780-6790 100% Sandstone; as above, becoming well sorted.

6790-6800 Sandstone (100%) as above, becoming coarse to granule.

6800-6810 100% Sandstone; as above, with some smoky quartz grains.

6810-6820 100% Sandstone; as above, becoming medium to coarse to granule, with trace of black rock fragments, probably basalt.

6820-6830 90% Sandstone; as above.
10% Shale; brown, silty, carbonaceous and micaceous.

6830-6840 50% Sandstone; as above.
50% Shale; as above with discontinuous coal laminae.

6840-6850 70% Sandstone; as above, becoming medium to coarse.
30% Shale; as above.

6850-6860 70% Sandstone; becoming medium grained.
20% Shale; as above.
10% Cavings.

6860-6870 20% Sandstone; as above.
40% Shale; as above.
40% Cavings.

6870-6880	10% Sandstone; as above. 50% Sandstone; light grey, fine to very fine to silty, fair sorting, sub rounded to sub angular, slightly calcareous with thin laminae (carbonaceous). Clay choked and tight, for the most part with sparse amount, having good porosity and permeability. 30% Shale; brown as above. 10% Cavings.
6880-6890	As above.
6890-6900	As above.
6930-6940	90% Sandstone; light grey, loose grains, medium to coarse to fine, sub rounded to sub angular, fairly well sorted, 10% Shale, light grey, micaceous.
6940-6950	40% Shale; brown, micaceous, carbonaceous, slightly silty, as above. 30% Shale; light grey as above. 30% Sandstone; as above.
6950-6960	40% Coal 40% Shale, brown, as above. 20% Shale; light grey, as above.
6960-6970	70% Coal 30% Shale; brown, as above, trace of dolomite; micritic, sandy, silty, with occasional nodules of clay.
6970-6980	50% Shale, brown, as above. 50% Shale; light grey, carbonaceous as above. Trace of dolomite, as above.
6980-6990	50% Sandstone; loose grains, medium to coarse, sub rounded to sub angular, fairly well sorted, trace sandstone; light grey, fine fairly well sorted, sub rounded to sub angular, clay choked, with some carbonaceous grains. 50% Shale; light grey, micaceous, carbonaceous, silty.
6990-7000	20% Sandstone; as above. 10% Siltstone; light grey to light brown, dolomitic in part, and clayey in part. 70% Shale; brown and light grey, as above.
7000-7010	20% Siltstone; brown, slightly sandy, with few clay nodules dolomitic and hard. 50% Sandstone; as above. 30% Cavings as above.
7010-7020	90% Shale; as above. 10% Siltstone; as above.
7020-7070	Chiefly sandstone, loose quartz grains, as above. becoming medium to coarse, slightly dolomitic and slightly siliceous, some with clay matrix.
7070-7080	80% Shale; light grey to brown, as above. 10% Sandstone; as above, becoming medium grained. 10% Siltstone; as above, becoming slightly dolomitic.
7080-7170	Primarily shale, with a fine grained sand streak at approximately 7140 feet, composed of loose sand quartz grains, medium grained, sub rounded to sub angular, fairly well sorted.
7170-7180	90% Shale; as above. 10% Sandstone; as above and sandstone; light grey, very fine to fine, sub rounded to sub angular, fair sorting with a few shale and coal grains, very calcareous in part.

7180-7190 — 40% Sandstone; light grey to medium dark grey, very fine to fine, loose, fair sorting, sub rounded to sub angular, very carbonaceous, slightly calcareous, much clay matrix material, tight.
60% Shale; as above.

7190-7200 — 90% Shale; as above.
10% Sandstone; as above and loose, medium quartz grains, trace of dolomite.

7200-7210 — 50% Shale; medium grey, sparsely micaceous in part silty and sparsely pyritic.
50% Shale; dark grey-brown, dark brown, silty, sparsely pyritic, trace sand, medium grained to very coarse grained, angular to sub rounded.

7210-7220 — 70% Shale; medium grey, in part silty, sparsely pyritic,
20% Shale; dark brown, as above.
10% Sandstone; grey-white to light grey, fine to very fine grained, slightly dolomitic, sub angular to sub rounded, fairly well sorted, trace lithic grains (dark grey) moderately abundant white clay matrix, moderately hard, porosity fair, permeability poor.
Trace of sand, as above.

7220-7230 — 60% Shale; dark grey, as above.
30% Shale; dark brown, as above.
10% Sandstone; as above.
Trace of sand as above.

7230-7240 — 20% Sandstone; light grey-white to buff, slightly dolomitic, fine to very fine grained, angular to sub rounded, generally fairly well sorted, but with scattered angular to sub rounded, medium to very coarse grained quartz sand, trace of dark grey lithic grains, moderately abundant white clay matrix, moderately hard, porosity fair, permeability poor to fair, no sorting.
50% Shale; dark grey-brown, to dark brown, silty, sparsely pyritic, sparsely carbonaceous.
30% Shale; dark to medium grey, in part silty and sparsely pyritic, trace of coal; black, brilliant lustre, sub conchoidal fracture.
Dolomite; light brown, dense, very hard, cryptocrystalline,
Trace of sand, as below.

7240-7250 — 10% Sand; medium grained to very coarse grained, sub angular to sub rounded, trace white clay matrix.
10% Sandstone; light grey to grey-white, quartzose angular to sub rounded, medium to very coarse grained, poor sorting, trace to moderately abundant and trace dark grey lithic grains. White clay matrix, and pyritic cement, moderately hard to friable, porosity fair to good, permeability poor to fair.
10% Sandstone; as above.
20% Shale; dark grey, as above.
50% Shale; dark grey-brown, as above.
Trace of coal; dolomitic, as above.
Trace of siltstone; medium brown, in part very finely sandy, argillaceous, sparsely carbonaceous, sparsely micritic.

7250-7260 — 40% Shale; dark grey-brown, to dark brown, silty, sparsely carbonaceous, micromicaceous and pyritic, as above.
40% Shale; medium to dark grey, in part silty, sparsely micritic, carbonaceous and pyritic.
Sand as above.
10% Sandstone; light grey to grey-white, medium to very coarse grained, angular to sub rounded, as above.
No sorting.
10% Sandstone; light grey to buff, dolomitic, fine to very fine grained, as above.
Trace of coal; possibly higher percentage washed away.

7260-7270

50% Shale; dark grey-brown to dark brown, as above.
40% Shale; dark to medium grey, as above.
10% Siltstone; light grey to buff, argillaceous, in part very finely sandy, sparsely micro micaceous and pyritic, carbonaceous.

7270-7280

50% Shale; dark grey-brown, to dark brown, argillaceous, in part very finely sandy, lithic, sparsely micro micaceous, pyritic and carbonaceous.
30% Shale; medium to dark grey, in part silty, sparsely micro micaceous and carbonaceous.
10% Siltstone; light grey to buff, argillaceous, sparsely micro micaceous, pyritic and carbonaceous.
10% Coal; black, brilliant lustre, brittle, irregular to sub conchoidal fracture.

7280-7290

80% Shale; dark brown, as above.
20% Shale; dark grey, as above.
Trace of medium to very coarse grained, angular to sub rounded quartz sand.
Sandstone; grey white, fine grained to very fine grained, sub angular to sub rounded, generally fairly well sorted, moderately abundant, white clay matrix, moderately hard, porosity fair, permeability poor.

7290-7300

(Lithological break with siltstones to light grey silty shale).
40% Shale; dark brown, as above.
10% Siltstone; light grey to buff, argillaceous, very finely sandy, sparsely carbonaceous, slightly dolomitic in part, grading to a very fine grained sandstone, sub angular to sub rounded.
20% Sandstone; grey white, slightly calcareous to dolomitic in part, fine to very fine grained, sub angular to sub rounded, fairly well sorted, but with scattered angular to sub angular, medium to very coarse grained quartz sand, moderately abundant white clay matrix, moderately hard, porosity fair, permeability poor.
20% Shale; medium grey, silty, sparsely carbonaceous micro-micaceous and pyritic.
Trace angular to sub rounded, coarse to very coarse grained quartz sand.

7300-7310

50% Siltstone; light grey to buff, in part very finely sandy, argillaceous, sparsely carbonaceous, micro-micaceous.
20% Shale; light grey to medium grey, silty, sparsely carbonaceous (as flecks and streaks), sparsely micro-micaceous, massive.
30% Shale; dark brown, as above.
Trace sand to sandstone, as above.

7310-7320

70% Shale; medium grey, in part silty, sparsely carbonaceous, micro micaceous, with scattered coarse grained to medium grained sub rounded quartz sand.
20% Siltstone; as above.
10% Shale; dark brown, as above.
Trace of quartz sand, as above.
Coal, sandstone; grey white, calcareous, fine grained sub-angular to sub rounded, fairly well sorted, moderately abundant, white clay matrix, moderately hard, porosity fair, permeability poor.

7320-7330

20% Sandstone; grey white, calcareous and slightly dolomitic, fine to very fine grained, angular to sub rounded, generally fairly well sorted, sparsely micro micaceous, trace carbonaceous to lithic, moderately hard, porosity fair, permeability poor, no show.
10% Sandstone; grey white, medium to very coarse grained, angular to sub rounded, poor sorting, trace calcarenite, moderately abundant white clay matrix, moderately hard to friable, porosity fair to good, permeability poor, no show.
10% Sand, SUB ANGULAR TO ROUNDED, COARSE to granule quartz sand,

30% Shale; as above.
20% Siltstone; as above.
10% Shale; dark brown, as above.
Trace of dolomite.

7330-7340 — 70% Shale; medium grey to grey brown, in part silty, sparsely micaceous, carbonaceous as above.
20% Shale; dark brown, to dark grey brown, silty, carbonaceous, micro micaceous and pyritic as above.
10% Quartz sand; sub angular to rounded, coarse grained to granule as above.

7340-7350 — 60% Shale; medium grey as above.
10% Sandstone; grey white, quartzose, trace of dolomite and calcarenite, fine to very fine grained, angular to sub rounded, generally fairly well sorted, trace micrite and carbonate, but with scattered sub angular to rounded coarse grained to medium grained quartz sand, moderately hard, moderately abundant white clay matrix. Porosity good, permeability poor.
20% Siltstone; light grey, very finely sandy, argillaceous, sparsely micritic and carbonaceous with scattered sub angular to rounded, medium to coarse grained quartz sand, abundant white clay matrix,
10% Sand; medium grained, granule, sub angular to rounded as above.
Trace of white opaque calcite cement and white clay matrix, many grains are cemented together showing poor sorting nature of sandstone.
Trace of coal; as above.

7350-7360 — 10% Sandstone; as above.
40% Sand; as above with trace of pyrite and dolomitic cement. Again, several very poor sorted composite grains with fine to granule grained quartz sand, cemented together.
40% Shale; medium grey as above.
10% Shale; dark brown, carbonaceous, with coal streaks, satin lustre.
Trace of coal.

7360-7370 — Quartz sand, as above.
10% Sandstone; grey white, quartzose, slightly calcareous, fine to medium grained, sub angular to sub rounded, generally poorly sorted, with scattered coarse grained to granule quartz sand, trace lithic grains and carbonaceous grains.
10% Shale; dark brown, sparsely micro micaceous, carbonaceous, trace of sandstone; grey white, fine to very fine grained, as above.

7370-7380 — 90% Quartz sand; coarse grained to fine pebbles, some very coarse grained to granule, sub angular to rounded (dominantly clear quartz), with trace of white clay matrix.
10% Sandstone; grey white, fine to medium grained as above.

7380-7390 — 10% Quartz sand; as above.
70% Shale; medium grey, silty, sparsely carbonaceous and micaceous, with scattered rounded to sub rounded coarse grained to granule quartz sand.
10% Shale; dark brown, as above.
10% Siltstone; grey brown, argillaceous, sparsely carbonaceous and micro micaceous, in p art very finely sandy.

7390-7400 — 50% Shale; medium grey, silty, as above.
50% Shale; medium brown, silty, sparsely pyritic, carbonaceous, micro micaceous.
Trace of quartz sand and sandstone, as above.

7450-7460

60% Sand; quartz, sub angular to rounded, coarse grained, trace of white clay matrix.
20% Sandstone; light grey to grey white, fine to medium grained, sub angular to sub rounded, generally fairly well sorted, but with scattered granule to coarse grained quartz sand, trace of lithic grains, micritic, moderately abundant with clay matrix, moderately hard, porosity good, permeability fair.
20% Shale; medium grey, silty in part very sandy, sparsely carbonaceous, micro micaceous.

Trace of dolomite, light brown, dense very hard, cryptocrystalline.

6460-6470

30% Sand; as above.
20% Sandstone; as above.
50% Shale; medium grey to grey brown, silty, as above with trace of pyrite, worm trails.

7470-7480

20% Sand; as above.
10% Sandstone; as above.
70% Shale; as above, dark grey brown, silty, in part very finely sandy, sparsely carbonaceous and micritic.

7480-7490

20% Sand; as above.
10% Sandstone; as above, with trace dolomitic cement.
10% Sandstone; grey white, silty, fine to very fine grained, argillaceous, sub angular to sub rounded, fairly well sorted, but with scattered medium to coarse grained sub rounded quartz sand, moderately abundant white clay matrix, moderately hard, porosity fair, permeability poor.
70% Shale; as above.

7490-7500

20% Sand; as above.
10% Sandstone; grey white, silty argillaceous, very fine to fine grained, as above.
70% Shale; as above, dark brown, to dark grey brown.

7500-7510

10% Sand; as above.
10% Sandstone; grey white, silty, very fine grained, as above.
10% Siltstone; light grey to buff, argillaceous, very finely sandy in part, sparsely micritic and felspar, sparsely carbonaceous and pyritic.
20% Shale; medium grey, silty, sparsely carbonaceous micro micaceous.
50% Shale; dark brown to dark grey brown, silty in part and very finely sandy, sparsely micritic and pyritic.

7510-7520

70% Sand; sub angular to rounded, coarse grained to fine pebbly trace white clay matrix. Certain quartz grains have a very dull fluorescence, no cut.
10% Shale; medium grey brown, silty, carbonaceous, micritic,
10% Siltstone, as above.
10% Shale; dark brown as above.

7520-7530

10% Sand; as above.
10% Sandstone; grey white, medium to coarse grained, sub angular to rounded, generally fairly well sorted, but with scattered sub rounded, very coarse grained to granule quartz sand, trace of dark grey lithic grains (volcanic ?), to red haem. rt. "quartzite", moderately abundant white clay matrix, porosity good, permeability fair.
60% Shale; medium grey to grey brown, silty, carbonaceous, micritic to sparsely pyritic.
10% Shale; dark brown, as above.
10% Siltstone; as above.

7530-7540

10% Sand; as above.
60% Shale; grey brown, silty in part, very finely sandy.

sparsely felspathic, carbonaceous, micritic, with scattered lithic grains.
30% Shale; dark brown, carbonaceous, sparsely micritic.

7550-7560 10% Sand; coarse grained to granule, sub angular to rounded, trace white clay matrix, as above.
10% Sandstone; grey white, medium grained to coarse grained, sub angular to rounded, generally fairly well sorted, but with scattered granule to pebbly quartz sand, moderately abundant white clay matrix, trace of micrite and dark grey lithic grains, moderately hard, porosity good, permeability poor.
20% Shale; dark brown, in part silty, carbonaceous.
60% Shale; medium to dark grey, silty, in part very finely sandy, sparsely micaceous and carbonaceous.
Trace of dolomite, light brown, dense, very hard, pyritic, cryptocrystalline.

7560-7570 Bad sample, contaminated with light grey to black grey calcareous fossiliferous shale, traces of sand, sandstone and shale as above.

7570-7590 As above, badly contaminated with traces of sand, sandstone shale and coal, as above.

7590-7600 100% Shale; dark grey brown, silty in part, very finely sandy, sparsely micritic, pyritic and carbonaceous to sparsely calcareous, badly contaminated with cavings, as above, traces of coal.

7600-7610 50% Shale; dark brown, slightly calcareous, as above.
25% Shale; grey, calcareous, silty, fossiliferous.
25% Shale; light grey, grey blue, calcareous, fossiliferous.

7610-7620 10% Sand; as above.
10% Sandstone; grey white, silty, fine to very fine grained, sub angular to sub rounded, fairly well sorted, moderately abundant white clay matrix, trace of micaceous to red and dark grey lithic grains, porosity fair, permeability poor.
10% Sandstone; light grey to grey white, medium to coarse grained, as above.
70% Shale; dark brown, dark grey brown, silty, sparsely carbonaceous, micritic and pyritic, very finely sandy, in part and slightly calcareous.

7620-7630 80% Shale; as above.
10% Sand; as above.
10% Sandstone; light grey to grey white, coarse to very coarse grained to granule, as above, trace of pyrite cement.
Trace of sandstone; grey white, silty, fine to very fine grained as above.

7630-7640 70% Shale; as above.
10% Sand; as above.
10% Sandstone; light grey, grey-white, medium to coarse grained, sub angular to rounded, poor sorting with scattered sub rounded grains and pebbly quartz sand, moderately abundant white clay matrix. Trace of dark grey lithic grains, micritic, moderately hard, trace of pyritic cement, porosity fair, permeability poor.
10% Sandstone; grey white, silty, fine to very fine grained as above.

7640-7650 80% Shale; dark brown to dark grey-brown, as above.
20% Shale; medium grey, silty, sparsely micritic and carbonaceous and pyritic.

7650-7660 100% Shale; dark brown, to dark grey-brown, silty in part, very finely sandy, micro micaceous, sparsely carbonaceous, pyritic, grading to argillaceous siltstone, trace of green to dark grey lithic grains. Trace quartz sand to sandstone as above.

7660-7670 90% Shale; as above.
10% Siltstone; light grey to buff, argillaceous, very finely sandy, sparsely carbonaceous and micritic.
Trace of quartz sand and sandstone, pyrite and pyritized worm tubes as above.

7670-7680 90% Shale; as above, pyritic in part.
10% Siltstone; as above.
Trace of sandstone, light grey to buff, silty, fine to very fine grained, argillaceous, trace dolomite, sub angular to sub rounded, fairly well sorted, trace micrite and carbonaceous grains, moderately abundant, buff argillaceous matrix, porosity fair, permeability poor. Trace of pyrite.

7680-7690 30% Shale; dark brown, as above, slightly calcareous.
40% Shale; buff, silty in part, very finely sandy, calcareous and sparsely fossiliferous, slightly glauconitic.
30% Shale; light grey to light grey black, silty in part, fossiliferous, calcareous. Trace of sand, as above.

7690-7700 50% Shale; dark brown, dark grey brown, slightly calcareous, silty in part very finely sandy, sparsely carbonaceous, micritic, and pyritic with rare scattered dark green lithic grains.
50% Shale; buff, as above.
Trace of sand, coarse grained quartz sand.

7700-7710 60% Shale; dark brown to dark grey brown, silty, in part very finely sandy, trace calcarenite, sparsely carbonaceous and micritic.
40% Shale; buff, as above, cavings ?
Trace of sandstone, grey white, silty, very fine grained, sub angular to sub rounded, abundant white clay matrix, trace micrite, moderately hard, porosity fair, permeability poor. Sand as above.

7710-7720 50$ Shale; dark brown to dark grey brown, as above.
10% Sandstone; grey white, fine to medium grained, sub angular to sub rounded, poor sorting with scattered sub angular to sub rounded coarse grained to granule quartz sand, trace of dark grey lithic grains.
10% Sand, as above, trace white clay matrix.
30% Shale; buff, to light grey, silty, calcareous, fossiliferous as above.
Moderately abundant white clay matrix, porosity fair, permeability poor. Cavings ?

7720-7730 40% Shale; dark brown, to dark grey brown, as above.
10% Siltstone; light brown, argillaceous, in part very finely sandy, scattered very fine grained and dark grey lithic material, sparsely carbonaceous, micritic, and pyritic.
10% Sandstone; as above.
20% Sand, as above.
20% Shale; buff as above, cavings.
Trace of pyrite to pyritized worm tubes.

7730-7740 20% Sand; as above, trace white clay matrix and pyritic cement.
20% Sandstone; as above.
30% Shale; dark brown to dark grey brown, as above.
30% Shale; buff to light grey, silty in part, calcareous, fossiliferous.

7740-7750 10% Sand; as above.
10% Sandstone; as above.
10% Sandstone; light grey to grey white, fine to very fine grained, sub angular to sub rounded, generally fairly well sorted, lithic, micaceous, moderately abundant white clay

matrix, moderately hard, porosity fair, permeability poor.
40% Shale; dark grey brown, as above.
Cavings?
30% Shale; buff to light grey, silty, in part very finely sandy, sparsely glauconitic, calcareous, fossiliferous.
Trace of scattered calcareous skeletal debris, bryozoa gastropods.

7750-7760 70% Sand; coarse grained to granule, fine pebbles, sub angular, to rounded, trace white clay matrix, pyritic cement, trace rounded dark grey chert.
10% Sandstone; light grey to grey white, fine to very fine.
20% Shale; dark grey brown, as above.
Dull gold fluorescence in some grains, no cut.

7760-7770 100% Sand; as above.

7770-7780 70% Sand; coarse grained to granule, fine to pebbly, sub angular to rounded, trace white clay matrix, certain percentage of grains fluoresce, dull gold, no cut, transparent grains fluoresce, opaque grains do not - inclusion fluorescence.
30% Cavings; light grey to grey blue, calcareous shale.
Trace of dark brown shale as above.

7780-7790 100% light grey to grey blue, calcareous, silty in part, fossiliferous, cavings.
Trace of quartz sand and dark brown silty shale.

7790-7800 30% Quartz sand, coarse grained to granule, fine to pebbly angular to rounded, trace white clay matrix, certain grains have a perfect crystal form.
10% Buff calcareous shale; as above, cavings.
30% Shale; light grey, calcareous, as above.
10% "Metaquartzite" grains - dark grey, angular (broken), to rounded, dense.

7800-7810 90% Quartz sand.
10% Angular to rounded grains, dark grey, dense 'metaquartzite'. sparsely pyritic, very hard.
Trace of sandstone, light grey to grey-white, fine to coarse grained, angular to sub rounded, poor sorting, trace white clay matrix abundant.

7810-7820 90% Quartz sand; as above.
10% 'Metaquartzite' as above.
Trace of sandstone, light grey, fine to medium grained to coarse grained, angular to sub rounded, poor sorting, trace of white clay matrix, dense siliceous cement, trace dark grey, sub rounded metaquartzite pebbles (5 mm), hard, dense, no porosity or permeability. Certain quartz grains fluoresce dull gold, no cut.

7820-7830 60% Quartz sand; coarse grained, fine to pebbly, angular to sub rounded, as above. Trace white clay matrix.
10% 'Metaquartzite'; dark grey, dense, sparsely pyritic, very fine grained.
10% Sandstone; grey white to light grey, fine to medium grained, sub angular to sub rounded, poor sorting with scattered grains of fine pebbly quartz sand and sub rounded dark grey 'metaquartzite' pebbles (5 mm), trace of white clay matrix, siliceous and partly dolomitic cement, very hard, no porosity or permeability.
20% Shale; dark brown to dark grey brown, as above.

7830-7840 70% Quartz sand; angular to sub angular, coarse grained to granul with trace siliceous cement.
20% Quartzite; dark to light grey, mottled, dense, very hard, sparsely pyritic, occurring as argillaceous fragments and splinters, generally some have sub rounded aspect, one has trace of white siliceous cement.

7840-7850	Heavily contaminated with cavings - shale, but noticeable trace of argillaceous splinters,strands and fragments and dark grey-light grey and black quartzite.
7850-7860	40% Quartzite; dark grey and light grey, mottled, sometimes banded, dense, very fine grained, very hard. 60% Cavings; buff and light grey, calcareous shale. Trace of sandstone, grey white to light grey, fine to medium grained, angular to sub rounded, poor sorting with scattered grains quartz sand, lithic (argillaceous dark grey quartzite granules), dense, white, siliceous cement, very hard, no porosity or permeability.
7860-7870	90% Quartzite; as above. 10% cavings; shale, as above.
7870-7880	100% Quartzite; dark grey to light grey, mottled, very fine grained, dense, hard.
7880-7890	30% Quartzite; 70% Shale; dark grey to black, dense.
7890-7900	Cavings; dark brown, silty, shale; light grey, calcareous. 50% Quartzite; as above. 50% Shale; as above. Cavings.
7910-7920	20% Quartzite; black to dark grey to light grey, mottled, dense, sparsely pyritic, very hard, very fine grained as above. 60% Shale; black, contact met., (carbonaceous ?), as above. 20% Sandstone; dark grey to black, silty, very fine grained, consisting of quartz grains set in a secondary silica cement, as above.

FORMATION TEST RESULTS

Test 1 at 6740 feet

Pressure in chamber 1380 psi.
Pressure in chamber after filling 2 bombs and bleeding for analysis 1000 psi.
After filling 3rd bomb, pressure 800 psi.
Opened tool - gauged total of 29 cubic feet of gas and recovered 12,250 cc. water to 800 cc condensate (liquids placed in 5-gallon drum).

Gas Analysis (Core Lab.)

C1	C2	C3	C4	C5	CO_2
100	30	14	7	3	0.5

Water

Resistivity = 1.78 @ 74° F. (calculated 3200 ppm).
NaCl (Chem) = 2100 ppm.

Test 2 at 5737 feet

Pressure in chamber 400 psi. Filled one bomb, pressure dropped to < 200 psi, then tool plugged. Attempt to fill second bomb with indefinite results. Open tool - recovered 20,000 cc muddy water - placed in 5-gallon drum.

Resistivity = 1.27 @ 78° F. (calculated 4200 ppm).
NaCl (Chem) = 2150 ppm.

Test 3 at 5409 feet.

Pressure in chamber 9 psi.
Filled one bomb, opened tool, recovered 20,000 cc of salt water - placed in 1-gallon drum.

Water Analysis

Core Lab. - resistivity = 0.41 @ 72° F. (calculated 15,000 ppm).
Schlumberger " = 0.34 @ 74° F. (" 19,000 ppm).

Chem. Analysis = 20,500 ppm.

Waving Blender Analysis 38 H_1 OL_o

Trace C_1 on hot wore, 1 C_1 on PHD

Test 4 at 5736 feet.

Pressure in chamber approximately 80 psi - full of mud.

APPENDIX 4

330076

VELOCITY SURVEY

ESSO BASS # 3

by

P.E. Towey

A. INTRODUCTION

Esso Australia contracted Western Geophysical Co. to perform the velocity survey. Under the contract, Western agreed to furnish the following:

(1) Instruments

a. SSC Model GCE101 Pressure Sensitive Well Geophones
b. Twelve SIE GA-11 Amplifiers, Input Switching and Power Supply
c. Western 30 Channel Camera
d. Three 12 volt Batteries and Charger
e. Portable Developing System
f. Two 300 volt Blasters
g. Three Kaar TR 327 CB Radios
h. Two RC-5 Remote Control Units for Shooters Radio
i. Two TA-12 Break amplifier units
j. Adequate spare parts

(2) Personnel

One Marine Shooter, G. Jones and one Instrument Operator, A. Paar.

(3) One Licenced Shooting Boat

All equipment and personnel were assembled on March 26, 1967 and the survey was made on March 27.

B. SURVEY PROCEDURES

Weather was very good during the survey and no operational difficulties were encountered.

(1) Shot Positioning

The orientation of Glomar III was E-W during the survey. Buoys were positioned at 500 and 1000 feet on the north side of the boat and at 1000 feet on the south side. The position of shot point D was estimated by the shooter. Exact shot positions were obtained from water arrivals at the well, measured by a geophone in the moonpool.

(2) Shot Size

All shots were 25 lbs.

(3) Well Geophone Positioning

All depth measurements were made using the Schlumberger depth indicator. To minimize rig noise the marine riser was disconnected from the derrick floor and lowered to the casing top. The cable was clamped with a T-bar device which rested on the casing top at each geophone position.

(4) Time

The first shot was made at 1.25 p.m. and the last one at 4.05 p.m. All told the survey occupied four hours of rig time.

C. RESULTS

Eleven shots were made at six different levels. Shotholes B and D were used only for the shallowest shot.

The quality of the timebreak trace was variable and in the case of the first shot, so bad that the record was not used. Some rig noise was experienced on the well 'phone traces, for example, shot # 6, but did not effect the breaks. It will be noticed that there is a refraction break on all the records of shots above 5000 feet. Once it was recognised as such, no difficulties were experienced with it.

Copies of all records are included below.

The final checkshot times and the integrated sonic times are considered to be in good agreement as is shown by the error chart, Fig. 1.

D. CONCLUSIONS

The velocity survey was successful in tying the integrated sonic log into absolute time values.

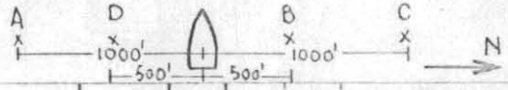
ESSO BASS # 3

FIGURE I

Depth below Sea Level in feet	Average Vertical Travel Time from Check Shots	Interval Time from Check Shots	Interval Time from Sonic Log	Difference in Miliseconds	Interval Size in feet	Error in Microseconds per foot
2003	.284					
		.201	.2045	-3.5	1498	-2.3
3501	.485					
		.147	.1470	0	1200	0
4701	.632					
		.088	.0870	+1.0	858	+1.2
5559	.720					
		.131	.1330	-2.0	1471	-1.4
7030	.851					
		.068	.0665	+1.5	809	+0.2
7839	.919					

330078

Shothole information - Elevation, Distance & Direction from Well

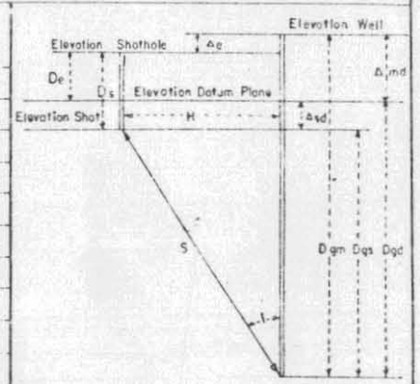


Company	Well	Elevation (Derrick Floor)	Total Depth
ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.	Bass # 3	31'	7978'

LOCATION

Coordinates	Section, Township, Range	County	Area or Field
39°59'51" 145°16'57"	DATUM : Sea Level		Bass Basin Tasmania

Record Number	Shothole Number	Time of Shot	Dgm	Ds	tus	tr	T Reading	T Polarity	T Grade	Dgs	H	TAN i	Cos i	Tgs	Δsd	Δsd/V	Tgd	Tgd Average	Dgd	ΔDgd	ΔTgd	Vi Interval Velocity	Vo Average Velocity
[illegible]	B	1325	2034	5		NOISEY TIME BREAK TRACE																	
11	D	1605	2034	5	001	105	293	D	P	1998	525	2628	9672	283	5	001	284	284	2003	1498	201	7453	7053
2	[illegible]	1335	3532	5	001	199	503	D	F	3496	995	2847	9617	484	5	001	485	485	3501	1200	147	8163	7219
3	C	1353	4732	5	001	201	647	D	G	4696	1005	2140	9778	633	5	001	634	632	4710				7438
10	A	1550	4732	5	001	215	644	D	G	4696	1075	2289	9747	628	5	001	629			858	088	9750	
4	C	1410	5590	5	001	198	731	D	G	5554	990	1783	9844	720	5	001	721	720	5559				7721
9	A	1525	5590	5	001	201	729	D	G	5554	1005	1810	9840	717	5	001	718			1471	131	11230	
5	C	1430	7061	5	001	203	859	D	G	7025	1015	1445	9897	850	5	001	851	851	7030				8261
6	C	1450	7870	5	001	205	928	D	G	7834	1025	1308	9915	920	5	001	921			809	068	11897	
7	C	1455	7870	5	001	199	926	D	G	7834	995	1270	9920	919	5	001	920	919	7839				8530
8	A	1505	7870	5	001	200	921	D	G	7834	1000	1276	9920	914	5	001	915						



Dgm = Geophone depth measured from well elevation
Dgs = " " " " shot "
Dgd = " " " " datum "
Ds = Depth of shot
De = Shothole elevation to datum plane
H = Horizontal distance from well to shotpoint
S = Straight line travel path from shot to well geophone
tus = Uphole time at shotpoint
T = Observed time from shotpoint to well geophone.
tr = " " to reference geophone.
Δe = Difference in elevation between well & shotpoint.
Δsd = " " " " shot & datum plane
Δsd = Ds - De
Dgs = Dgm - Ds ± Δe ; tan i = H / Dgs
Tgs = cos i T = Vert. travel time from shot elev. to geophone
Tgd = Tgs ± Δsd/V = " " " " datum plane " "
Dgd = Dgm - Δmd
Vi = Interval velocity = ΔDgd / ΔTgd
Vo = Average = Dgd / Tgd

Surveyed by: Western Geophysical
Date: March 27, 1967
Weathering Data:
Water Depth: 202'
Casing Record
2750'

5 cm

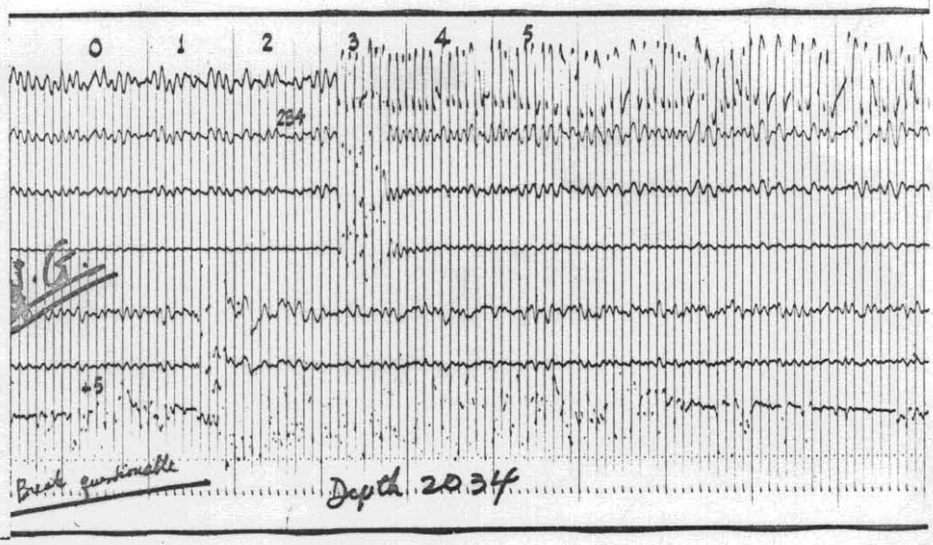
330079

ESSO BASS-3

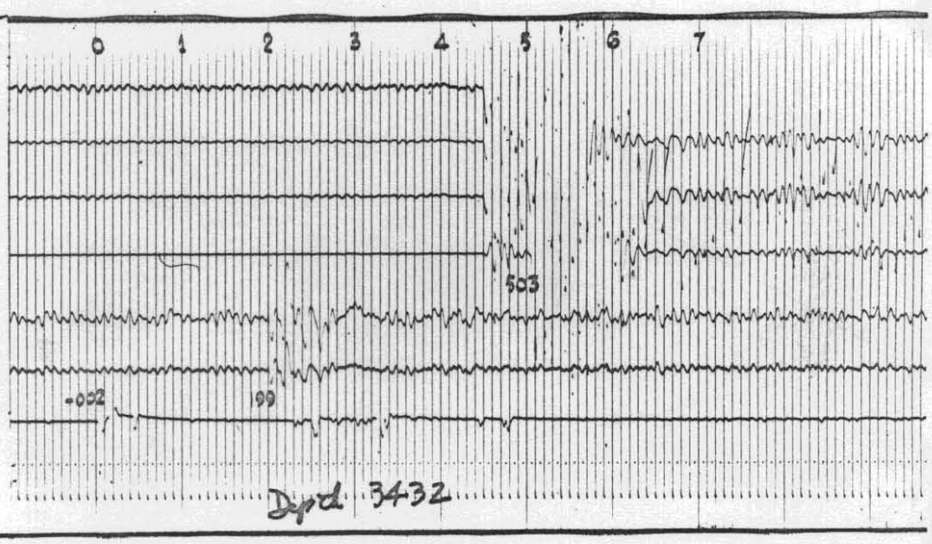
WELL VELOCITY RECORDS

330080

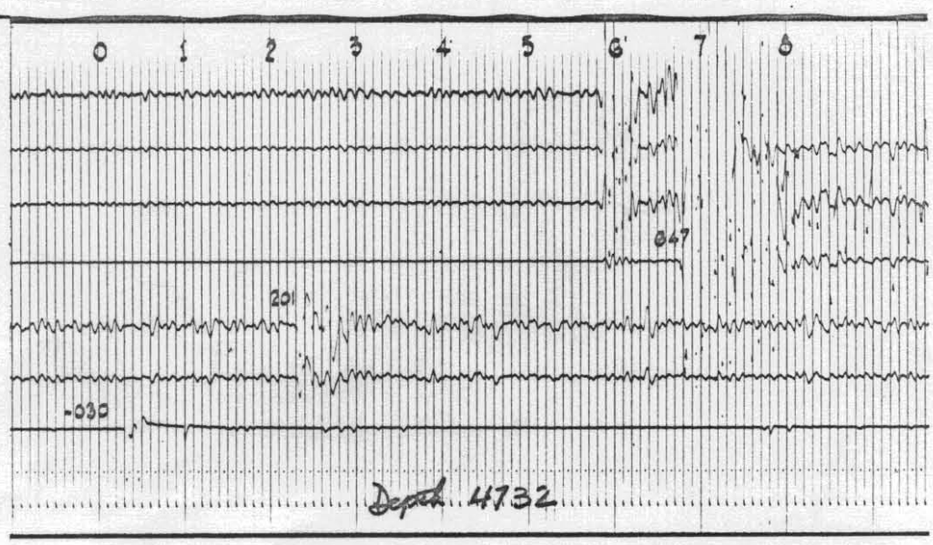
Shot N° 1
Depth: 2034' Below K.D.
25 lbs. @ 5'
Offset:
Time: 27 - 3 - 1967
BASS - 3



Shot N° 2
Depth: 3432' Below K.D.
25 lbs. @ 5'
Offset:
Time: 13·35 27 - 3 - 1967
BASS - 3



Shot N° 3
Depth: 4732' Below K.D.
25 lbs. @ 5'
Offset:
Time: 13·53 27 - 3 - 1967
BASS - 3



5 cm

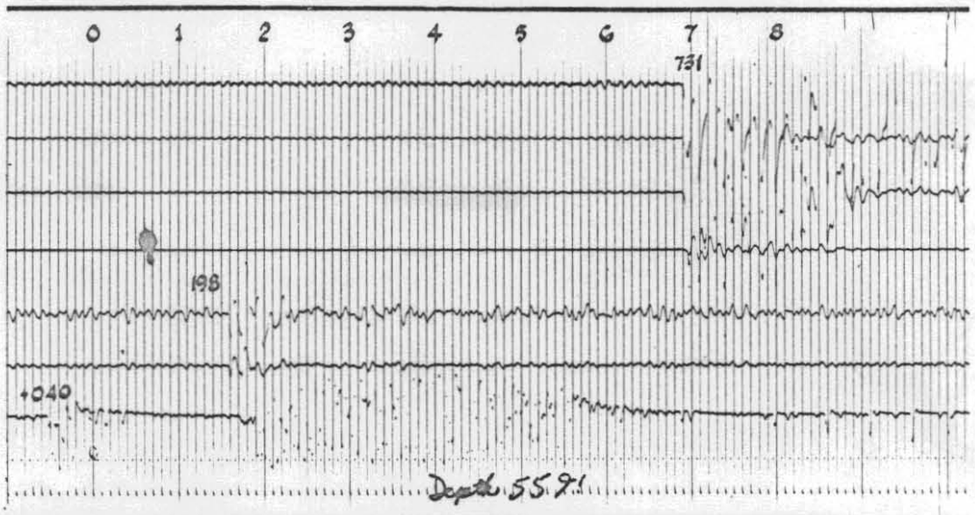
330081

ESSO BASS-3

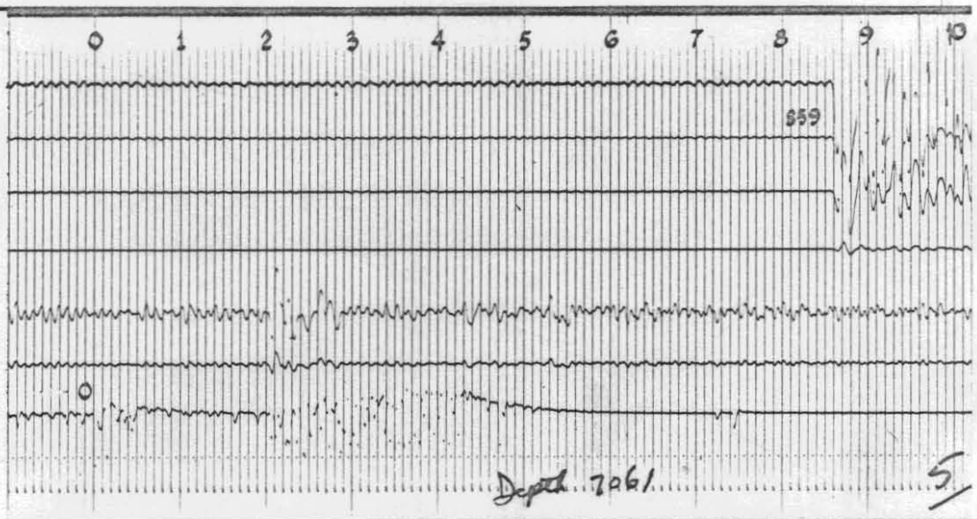
WELL VELOCITY RECORDS

5 cm

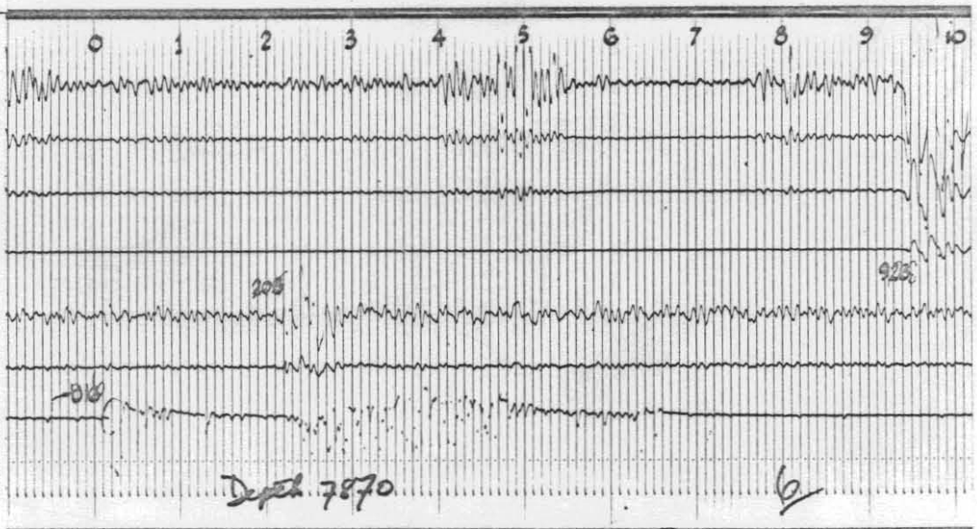
Shot N° 4
Depth: 5591' Below K.B.
25 lbs. @ 5'
Offset:
Time: 14·10 27-3-1967
BASS - 3



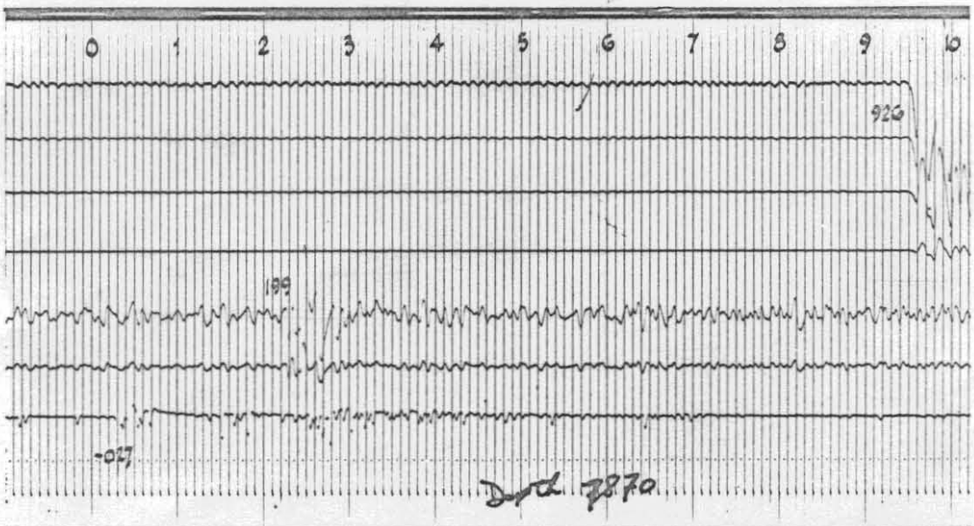
Shot N° 5
Depth: 7061' Below K.B.
25 lbs. @ 5'
Offset:
Time: 14·30 27-3-1967
BASS - 3



Shot N° 6
Depth: 7870' Below K.B.
25 lbs. @ 5'
Offset:
Time: 14·50 27-3-1967
BASS - 3



Shot N° 7
Depth: 7870' Below K.B.
25 lbs. @ 5'
Offset:
Time: 14·55 27-3-1967
BASS - 3



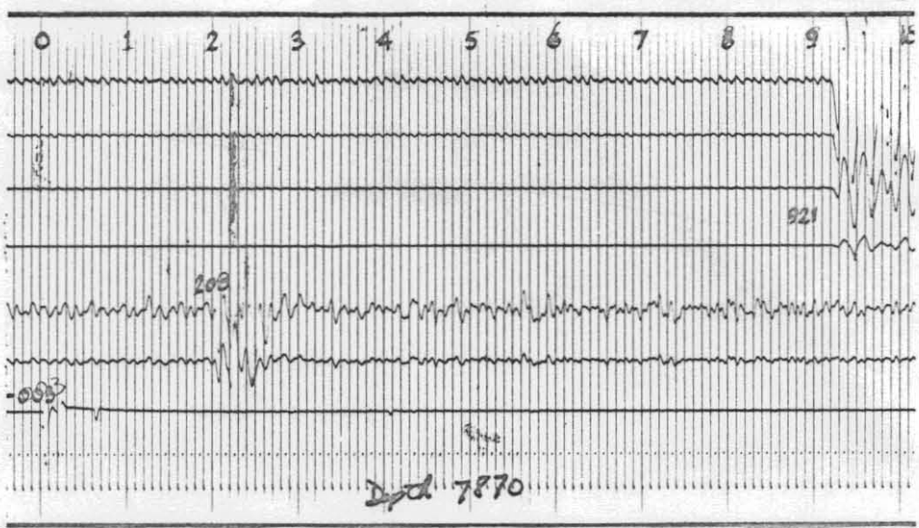
330082

ESSO BASS-3

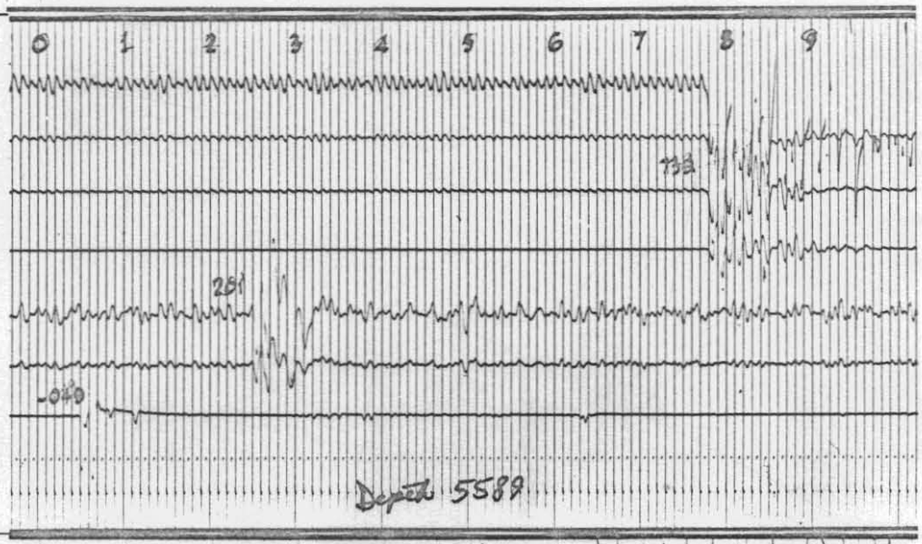
WELL VELOCITY RECORDS

5 cm

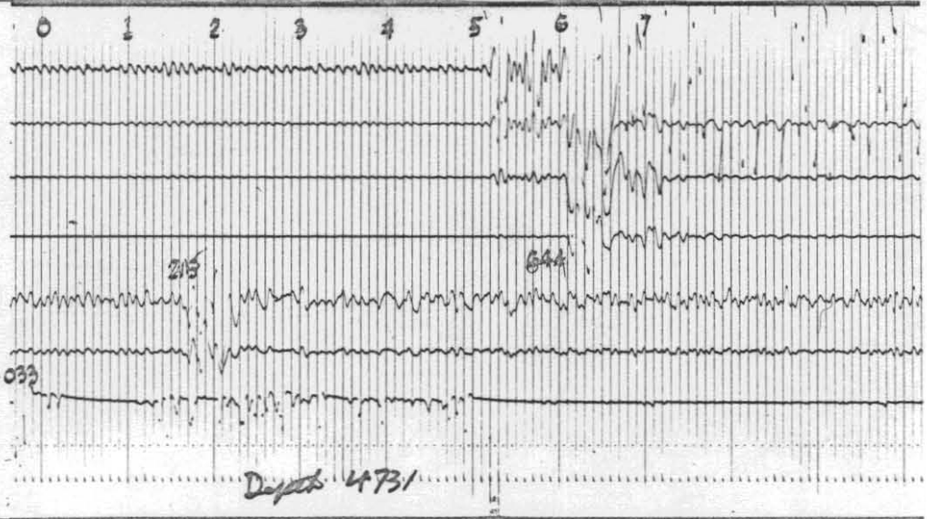
Shot N° 8
Depth: 7870' Below K.B.
25 lbs. @ 5'
Offset:
Time: 15·05 27-3-1967
BASS - 3



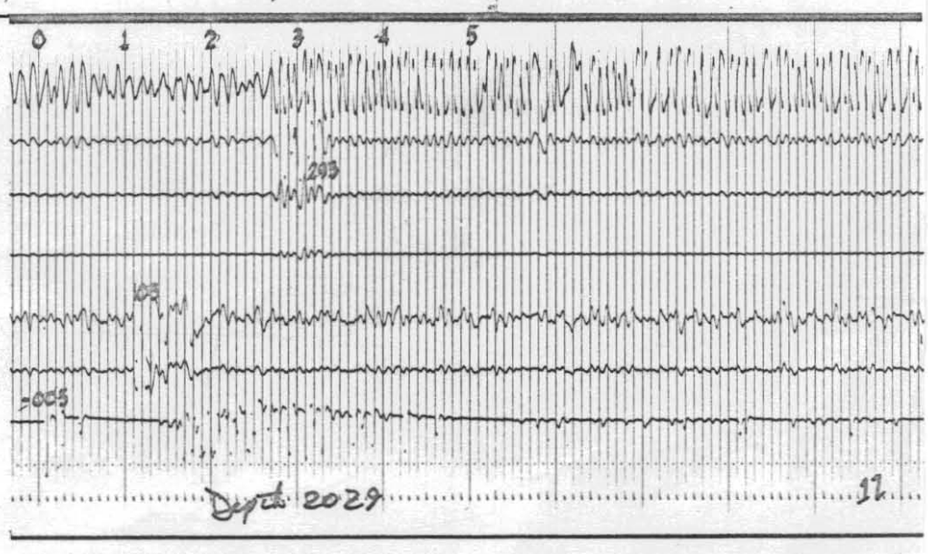
Shot N° 9
Depth: 5589' Below K.B.
25 lbs. @ 5'
Offset:
Time: 15·25 27-3-1967
BASS - 3



Shot N° 10
Depth: 4731' Below K.B.
25 lbs. @ 5'
Offset:
Time: 15·50 27-3-1967
BASS - 3



Shot N° 11
Depth: 2029' Below K.B.
25 lbs. @ 5'
Offset:
Time: 16·05 27-3-1967
BASS - 3



ESSO BASS-3

WELL VELOCITY RECORDS

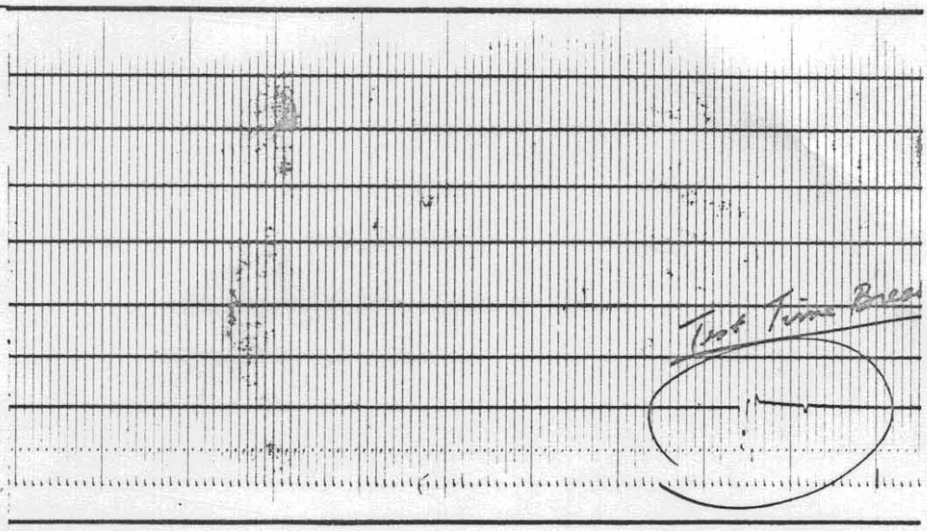
330083

5 cm

TIME BREAK TEST

27-3-67

BASS-3



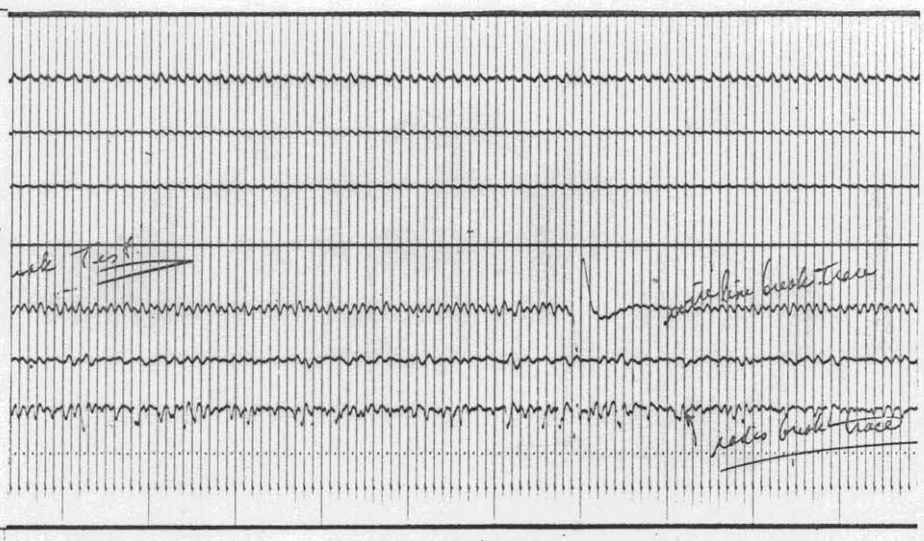
TIME BREAK TEST

27-3-67

Trace 7 - Radio T.B

Trace 5 - Wire line break through Amplifier

BASS-3.

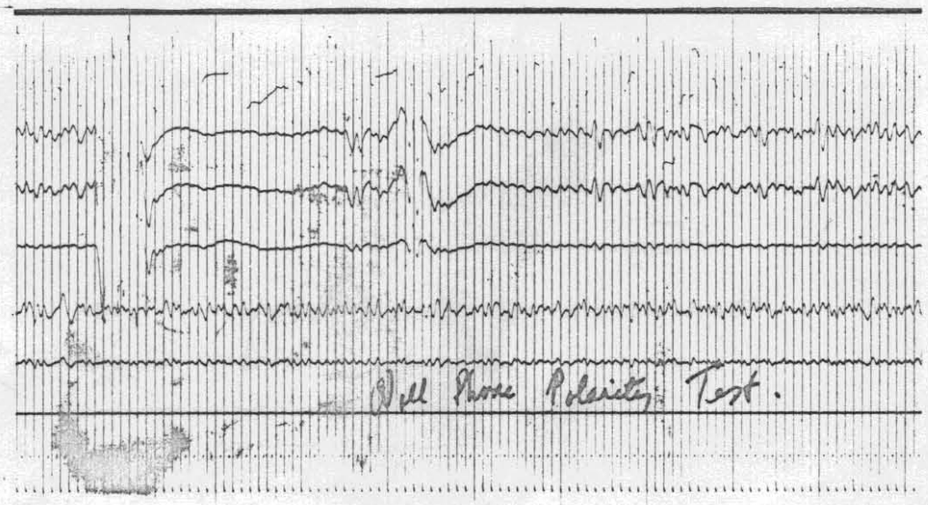


TAP TEST OF WELL PHONE FOR POLARITY

12.55 27/3/67

All Power still on on Rig.

BASS-3



APPENDIX 5.

330084

24468

NOTE.—All communications on Departmental business to be Addressed to the Director of Mines, G.P.O., Box 124B, Hobart.

Department of Mines, Tasmania

Hobart, 18th April, 1967.

TELEPHONES:
Chief Inspector of Mines
Chief Inspector of Explosives
Chief Geologist
Secretary and Accountant
Registrar of Mines
General Office
Director of Mines
303011
B-4041, B-4042

Copy in EB-3 321.3
L4/4 { and Petrology file
also copy to R. Hopkins

Mr. A. Phillips,
ESSO Standard Australia Ltd.,
G.P.O. Box 4249,
SYDNEY, N.S.W.

Dear Sir,

We have cut a further three sections from Core 13 of Bass No. 3. These sections, when examined petrologically, consist of chert and disaggregated chert.

The spots on the slides you examined in Hobart have not been determined precisely but are considered to be possible cordierite. We could not detect any trace of volcanic material.

Yours faithfully,

(J.G. Symons)
DIRECTOR OF MINES.

APPENDIX 6.

OFFSHORE 82

HAEMATITE EXPLORATIONS PTY. LTD.

330085

REGISTERED OFFICE:

TELEPHONES
60 0701
(21 LINES)

ESSINGTON LEWIS HOUSE
500 BOURKE STREET
MELBOURNE, C.1

April 4, 1967.

YOUR REF.

OUR REF.

The Director of Mines,
Department of Mines,
G.P.O. Box 124B,
HOBART.

Dear Sir,

EO5/1 Bass Basin - Drilling.

We attach hereto, copy of the four weekly reports for the period ending April 2, 1967 ie. to the completion of the drilling of Bass-3 Well.

Yours faithfully,

W.M. Lonie.

330086

DRILLING REPORT - DEPARTMENT OF MINES, TASMANIA

TENEMENT NUMBER: Exploration Licence No. 1/60.

HOLDER: Haematite Explorations Pty. Ltd.

OPERATOR: Esso Exploration and Production Australia Inc.

WELL: Esso Bass 3

LOCATION: Latitude: 39° 59' 51" South

Longitude: 145° 16' 57" East

DATE OF REPORT: April 2, 1967

DRILLING PROGRESS:

At Date of Report:	7978 ft. (T.D.)
Previous:	7914 ft.
	64 ft.

DRILLING DATA:

Core No. 14 7974 - 7978 ft. Cut 4 ft. Rec. 4 ft. Total depth (7978 ft.) reached on 29 March. Logging completed 0745 hrs. on 31 March. Glomar III off location 2135 hrs. April 2

Sidewall Cores

Recovered 27 out of 30 No descriptions to date.

Formation Tests

1. 6740 feet. Filled 3 bombs for analysis and gauged 29 cu. ft. of gas 12,250 cc of filtrate, and 800 cc of condensate.
   Pressure on chamber 1380 p.s.i.
   Rw = 1.78 at 74° - 3200 ppm NaCl
   chemical analysis 2100 ppm NaCl
   Chromatograph
   C1 = 100
   C2 = 30
   C3 = 14
   C4 = 7
   C5 = 3
   CO2 = 0.5

2. 5737 ft. Tool plugged - 400 p.s.i. at surface. recovered 20,000 cc of muddy water. Rw = 1.27 at 78° = 4200 ppm NaCl Chemical 2150 ppm NaCl

3. 5409 ft. Pressure 9 p.s.i. at surface
   Recovered 20,000 ccs salt water
   Core Lab Rw = 0.41 at 72° = 15,000 ppm NaCl
   Schlumberger Rw = 0.34 at 74° = 19,000 ppm NaCl
   Chemical 20,500 ppm NaCl
   Log interpretation 20,000 ppm NaCl

4. 5736 ft. Still plugging 60 p.s.i. at surface
   Recovered 20,000 ccs of mud filtrate.

LITHOLOGICAL SUMMARY:

Core No. 13 7903 - 7914 ft. Cut 11 ft. Rec. 5 ft.

Evidence of contact metamorphism. Thinly bedded laminated sandstone, quartzite and shale

Quartzite. light dark grey to black; very finely crystalline sparsely pyritic, dense, very hard
In part appearance of solidified breccia
No trace of original grain structure.

Shale. dark grey to black in part silty carbonaceous dense hard with definate baked appearance

Sandstone. light to dark grey fine to very fine argillaceous in part cemented in part much silica overgrowth crystals quartz euhedral. Hard, no porosity or permeability.

Vughs throughout core rough scoria texture lined with euhed ral quartz

Rare discontinuous and discordant veins of quartz:

Bedding is flat.

7914 - 7946 ft.

Cuttings indicate over 50% quartzite

7974 - 7946 ft. Core No. 14 Cut 4 ft. Rec. 4 ft.

Massive metamorphosed black shale small bodies of quartzite, more indurated than Core 13.

330089

WELL DATUM:

31 feet above sea level

WATER DEPTH:

193 feet.

DRILLING FLUID PROPERTIES - Refer daily drilling mud log.

CASING AND CEMENTING OPERATIONS:

Set 4 cement plugs prior to abandenment

6850 - 6650 ft. - 140 sacks cement 15.7 lbs/gallon
5400 - 5200 ft. - 140 sacks cement 15.5 lbs/gallon
2900 - 2600 ft. - 250 sacks cement 15.5 lbs/gallon
450 - 250 ft. - 150 sacks cement 15.3 lbs/gallon

LOGS RUN:

IES	7911 - 7985 ft.
SGRC	6226 - 7976 ft.
MLL	6235 - 7979 ft.
FDC	2750 - 7984 ft.
CDM	2750 - 7984 ft.

Sidewall Cores 30 Recovered 27.
Formation Tests at 6740 ft., 5737 ft., 5409 ft., 5736 ft.

STAND-BY TIME:

W. M. Lonie, General Manager.

330090

DRILLING REPORT - DEPARTMENT OF MINES, TASMANIA

TENEMENT NUMBER: Exploration Licence No. 1/60.

HOLDER: Haematite Explorations Pty. Ltd.

OPERATOR: Esso Exploration and Production Australia Inc.

WELL: Esso Bass 3

LOCATION: Latitude: 39° 59' 51" South

Longitude: 145° 16' 57" East

DATE OF REPORT: 27th March, 1967

DRILLING PROGRESS:

At Date of Report:	7914 feet
Previous:	7053 feet
	861 feet

DRILLING DATA:

Cores No. 11, 12, and 13 have been cut.

Core No. 11	7433-7453 feet	Cut 20 feet Rec. 20 feet
Core No. 12	7877-7892 feet	Cut 15 feet Rec. zero (damaged core barrel)
Core No. 13	7903-7914 feet	Cut 11 feet Rec. 5 feet

Minor gas readings have been observed including some CO_2 from 7000-7080 feet.
Drilling rates tend to indicate top of survey indicated seismic basement 200-300 feet.
IES was also run, but this was not conclusive as to basement.
Drillingwill continue below 7914 feet.

LITHOLOGICAL SUMMARY:

7053-7070 feet. Sandstone: light grey, fine to very fine subrounded to subangular, fairly well sorted clay choked coarser down section grading to medium to coarse, loose grains, calcareous and siliceous.

7070-7200 feet. Shale interbedded with sandstone as above.

7200-7240 feet. Shale, minor sandstone. Shale is dark grey to brown, very fine sandy in part sparsely micaceous, carbonaceous, pyritic. Also mid-dark grey silty in part. Sandstone is grey white, fine to very fine, sunrounded to subangular, fairly well sorted some medium to coarse loose white clay matrix moderately abundant, porosity fair to good, permeability good.

7240-7290 feet. Shale minor sandstone, siltstone coal 25%, siltstone is light grey to buff, argillaceous, sparsely carbonaceous, micaceous pyritic.

7290-7315 feet. Interbedded siltstone, shale, minor sandstone as above.

7315-7433 feet. Interbedded shale, siltstone, sandstone and some loose sand, porosity fair permeability poor, clay choked.

7433-7453 feet. Core No. 11, Cut 20 feet, Rec. 20 feet.

7433-7438 feet. Thinly interbedded shale and sandstone as above, porosity good, permeability poor.

7438-7442 feet. Sandstone grey white to buff, coarse to granular grading to coarse with depth, clay grains 2 mm derived from felspar, permeable fair to poor porosity good.

7442-7450 feet. Shale mid grey abundant white clay grains to 3 mm across in their conglomeratic lenses. Trace carbonaceous plant debris. Intermixing lithology due to stripping.

7450-7450.3 feet. Subangular fine pebble conglomerate. Poorly sorted, light brown argillaceous matrix with abundant tourmaline. Porosity good permeability poor. Pebbles are 50% quartz and quartz felspar 40% feldspar - euhedral to subeuhedral up to 5 mm. 10% dark grey shale, acid - intermediate volcanics and red hematite stained quartzite tourmaline, dark red brown subangular grains up to 2-3 mm appears granite wash.

LITHOLOGICAL SUMMARY: cont.

7450.3-7452.6 ft. Shale as above.

7452.6-7453 feet. Sandstone, coarse to granular as above.

7453-7550 feet. Sandstone, shale interbedded as in core 11.

7550-7720 feet. Shale, dark grey brown silty with minor sandstone.

7720-7770 feet. Sandstone, with minor dark brown grey shale.

7770-7800 feet. Sand, loose grains, coarse to granular also finely pebble conglomerate. White clay matrix 2% mineral fluorescence. No cut.

7800-7830 feet. Sand and sandstone, fine, medium to coarse plum some quartzite pebbles. Dark grey dense, siliceous cement. No porosity, permeability, very hard, dense.

7830-7850 feet. Sandstone sand plus 15% quartzite angular splinters not rounded.

7858 feet. Hard grey quartzite.

7877-7892 feet. Core No. 12. Cut 15 feet. Rec. zero.

7903-7914 feet. Core No. 13. Cut 11 feet. Rec. 5 feet.

Black altered shale with minor sand and quartzite. Shale vuggy in part lined with calcite. Appears as scoria in part.

330094

WELL DATUM:

31 feet above sea level.

WATER DEPTH:

193 feet.

DRILLING FLUID PROPERTIES - Refer daily drilling mud log.

CASING AND CEMENTING OPERATIONS:

LOGS RUN:

IES 7914 feet
SONIC 7914 feet but failed
VELOCITY SURVEY at 7914 feet.

STAND-BY TIME:

W. M. Lonie, General Manager.

330095

DRILLING REPORT - DEPARTMENT OF MINES, TASMANIA

TENEMENT NUMBER: Exploration Licence No. 1/60.

HOLDER: Haematite Explorations Pty. Ltd.

OPERATOR: Esso Exploration and Production Australia Inc.

WELL: Esso Bass 3

LOCATION: Latitude: 39° 59' 51" South

Longitude: 145° 16' 57" East

DATE OF REPORT: 20th March, 1967

DRILLING PROGRESS:

At Date of Report:	7053 feet
Previous:	5750 feet
	1303 feet

DRILLING DATA:

Cores No. 8, 9 and 10 have been cut.

Core No. 8	5905 - 5920 ft.	Cut 15 ft.	Rec. 14 ft.
Core No. 9	6420 - 6442 ft.	Cut 22 ft.	Rec. 13½ ft.
Core No.10	6903 - 6933 ft.	Cut 30 ft.	Rec. 30 ft.

Low gas readings up to 8 were observed in the section. Localised high readings (up to 60), associated with coal were also noted.

LITHOLOGICAL SUMMARY:

5750-5790 feet. Interbedded sandstone - siltstone, shale and coal - no gas readings in coal. Shale: dark brown very carbonaceous with satin lustre. Coal: black - subconchoidal (30% coal 10' thick).

5790-5905 feet. Sand with interbedded sandstone, siltstone, shale and coal. Sand: subangular to rounded, coarse grained to fine pebble.

5905-5920 feet. Core No. 8 Cut 15' Rec. 14'.

5905-5918.3 feet. Siltstone: light grey to buff, argillaceous, very finely sandy in part sparsely micaceous, thin laminae dark brown to black carbonaceous shale, micaceous, silty shale.

5918.3-5919 feet. Sandstone: white to light grey, finely pebbly to granular, fine to coarse subangular to rounded, well sorted, moderately abundant white clay matrix, slightly micaceous finely disseminated carbonaceous streaks, massive hard, porosity fair, permeability poor choked clay. Bedding subhorizontal, wavy irregular - no apparent dip.

5920-5970 feet. Sand: unconsolidated with minor interbedded siltstone and shale. Sand: unconsolidated, subrounded, coarse to granular trace white clay matrix. Siltstone: light grey argillaceous, very finely sandy as in Core No. 8. Shale: dark brown, silty, carbonaceous.

5970-6000 feet. Sand: with interbedded sandstone. Sandstone: grey to white, calcareous argillaceous, fine to medium, angular to subrounded, fairly well sorted, sparse coarse to granular, trace lithic grains, porosity fair, permeability poor to fair. No show.

6000-6090 feet. Sand: sandstone, siltstone, shale as above except, sandstone: light grey to grey white silty calcareous argillaceous, silty, fine to very fine subangular to subrounded, porosity fair permeability poor.

6090-6200 feet. Sand: with minor siltstone and shale, as above, except sand pyritic white clay matrix dolomitic cement.

6200-6237 feet. Sand, siltstone, shale sandstone as 6000-6090 ft.

LITHOLOGICAL SUMMARY: cont.

6237-6280 feet. 60% shale: brown carbonaceous silty, pyritic in part trace of sandstone: loose quartz, coarse subrounded to subangular, 40% marl and shale cavings.

6280-6380 feet. Interbedded shale and sandstone 70% shale as above. Sandstone: light grey, fine to very fine, subrounded to subangular, fairly well sorted with carbonaceous grains and clay matrix. Porosity poor. Permeability poor. Streaks of coarse pebble quartz grains, trace sandstone: light grey, fine to medium subrounded to subangular fair to poor porosity and permeability.

6380-6390 feet. Sandstone: 60% loose, coarse quartz, subrounded to subangular fairly well sorted. Shale 40% brown as above.

6390-6400 feet. Sandstone as above (40%). Coal (40%). Shale as above (20%). Coal is black, thin streak, gas increased from 8 to 12.

6400-6442 feet. Core No. 9. Cut 22 feet. Rec. 13½ feet.
(Two Runs with wire line core barrel).

6420-6421 feet. Sandstone: light grey to brown, very fine subrounded to subangular, moderately well sorted scattered grains of carbonaceous shale, white clay matrix, numerous shale laminae poor porosity.

6421-6421 feet 3 inches.
Dolomite, brown fine grain hard.

6421 feet 3 inches-6422 feet 6 inches.
Sandstone as above.

6422 feet 6 inches-6429 feet.
(No recovery on first Run).

6429-6431 feet 6 inches.
Shale, mottled dark grey to brown, micaceous, pyritic, numerous coal grains, thin lenses of fine sand, occasionally thin siltstone laminae.

6431 feet 6 inches - 6432 feet.
Sandstone, as above, but porosity improves to 25%.

6432-6433 feet 6 inches.
Sandstone as above, but no porosity due to clay matrix.

6433 feet 6 inches - 6434 feet.
Sandstone as above with numerous brown shale laminae.

6434-6436 feet. Shale as above.

LITHOLOGICAL SUMMARY: cont.

6436-6440 feet. Shale, as above with thin coal laminae occasional leaf impressions.

No apparent dip in core and no hyrocarbon shows.

6442-6500 feet. Interbedded sand and shale as above.

6500-6580 feet. Sandstone: light grey fine to very fine, subrounded to subangular, fair sorting. Trace Glauconitic, dolomite mostly clay choked some streaks.

6580-6640 feet. Shale interbedded sandstone as above.

6640-6660 feet. Sandstone, light grey, medium to fine to coarse, subrounded to subangular, well sorted. Dolomitic in part, friable, good porosity and permeability.

6660-6740 feet. Sandstone, light grey, quartzose, medium to coarse, subrounded to subangular, very friable loose coarse grains only.

6740-6860 feet. Sandstone as above, becoming medium grained.

6860-6870 feet. Sandstone as above with shale, brown carbonaceous as before some coal laminae.

6870-6890 feet. Sandstone light grey fine to very fine fair sorting subrounded to subangular, occasional shale laminae. Poor porosity and part clay choked.

6890-6900 feet. Sandstone, some carbonaceous shale.

6903-6933 feet. Core No. 10, Cut 30 feet, Rec. 30 feet.

6903-6920 feet. Shale brown to light grey, micaceous, carbonaceous slightly dolomitic carbonaceous, material in thin laminae parallel and perpendicular to bedding occasional thin coal some slickensides.

6920-6930 feet. Sandstone, light grey medium fine to coarse, fair sorting subrounded to subangular quartzose with some smoky quartz and frace pink felspar. Abundant clay matrix up to 20%. No odour and no fluorescence no cut. Tight thin shale laminae.

6930-6932.6 ft. Shale as above.

6932.6 -6933 ft. Sandstone as above.

6933-6940 feet. Sandstone as above.

6940-6950 feet. Shale as above.

6950-6970 feet. 50% shale as above and 50% black coal.

6970-6980 feet. Shale as above.

6980-7000 feet. 70% Shale, 30% sandstone light coloured, medium to coarse subrounded to subangular fairly well sorted.

330100

WELL DATUM:

31 feet above sea level.

WATER DEPTH:

193 feet.

DRILLING FLUID PROPERTIES - Refer daily drilling mud log.

CASING AND CEMENTING OPERATIONS:

LOGS RUN:

Run 2 at depth 6237 feet.

IES	2801	6237 feet
SGRC	2801	6237 feet
MLL	2801	6237 feet
FDC	Not working.	

STAND-BY TIME:

W. M. Lonie, General Manager.

330101

DRILLING REPORT - DEPARTMENT OF MINES, TASMANIA

TENEMENT NUMBER: Exploration Licence No. 1/60.

HOLDER: Haematite Explorations Pty. Ltd.

OPERATOR: Esso Exploration and Production Australia Inc.

WELL: Esso Bass 3

LOCATION: Latitude: 39° 59' 51" South

Longitude: 145° 16' 57" East

DATE OF REPORT : March 13, 1967.

DRILLING PROGRESS:

At Date of Report:	5750 feet
Previous:	3030 feet
	2720 feet

DRILLING DATA:

Cores No. 2, 3, 4, 5, 6 and 7 have been cut.

3500 - 3530 feet	Core No.	2	Cut	30	feet	Rec.	30	feet
3997 - 4022 feet	"	3	"	25	"	"	18	"
4516 - 4539 feet	"	4	"	23	"	"	23	"
5009 - 5039 feet	"	5	"	30	"	"	26	"
5315 - 5336 feet	"	6	"	21	"	"	21	"
5620 - 5650 feet	"	7	"	30	"	"	23	"

Minor methane readings have been recorded in the section. The maximum reading being only 12 units.

LITHOLOGICAL SUMMARY:

3000 - 3030 feet Core 1 Rec. 30'

Mudstone and marl, light to dark grey-green, slightly calcareous, arecaceous, very fossiliferous, pyritic nodular concretions. Very fine irregular bedding, no apparent dip; silty in part.

3030 - 3240 feet

Mudstone, light grey-green, slightly calcareous, micaceous, very fine, very soft.

3240 - 3500 feet

Shale, medium-dark grey, slightly calcareous and arenaceous, micaceous, fissile, very fossiliferous. Siltstone, light brown, slightly calcareous argillaceous.

3500 - 3530 feet Core 2 Rec. 30'

Shale, dark-medium grey green fissile, silty in part, very fossiliferous. Interbedded mudstone. Thin bands. Light grey green slightly fossiliferous, calcareous: irregular bands of pale grey very glauconitic fossiliferous shale : bedding flat.

3530 - 3880 feet

Shale, light-medium grey green fissile, very silty, fossiliferous, glauconitic soft, calcareous, pyritic, minor interbedded mudstone.

3880 - 3997 feet

Siltstone, light grey buff, very argillaceous, calcareous, glauconitic, occasional quartz grains : silty shale as above.

3997 - 4022 Core No. 3 Cut 25 feet Rec. 184 feet (approx.)

Shale (as above), with slumped laminae siltstone and micritic limestone.

(i) Shale dark grey to dark grey green, silty calcareous fossiliferous, sparsely glauconitic, pyritic; forams, palecypods bryozoa and calcareous debris.

(ii) Siltstone buff - light grey, fossiliferous glauconitic.

(iii) Limestone buff light grey argillaceous, silty

micritic, 6" band at 4011 feet - 4014 feet.

Cored section is massive, breaks irregularly along poorly defined sub-horizontal bedding planes: slumping noticeable throughout.

Dips up to 10° at 4006 - 4007.5 feet locally.

4022 - 4516 feet

Shale as above, minor siltstone plus rare sandstone. Sandstone is light buff argillaceous, silty, calcareous very fine fossiliferous, glauconitic. No porosity, permeability.

4516 - 4539 feet Core No. 4 Cut 23 feet Rec. 23 feet

Shale : dark grey, silty, pyritic, sparsely disseminated flecks, thinly bedded, compact, fissile, splintey to sub-conchoidal fractures, trace calcareous debris, moderately abundant pyrotized worm trails and burrows rare laminae of buff dense, argillaceous, micritic lime-stone, bedding sub-horizontal.

4539 - 5009 feet

Shale : dark grey, with minor interbedded siltstone, micritic limestone and sandstones.

Shale : dark grey as in Core No. 4 above, plus light grey to grey-green, silty, calcareous, pyritic rarely glauconitic, fossiliferous.

Siltstone : light grey to buff calcareous argillaceous sparsely pyritic and glauconitic, fossiliferous.

Limestone : micritic, medium grey to grey brown, silty dolomitic, pyritic rarely glauconitic, dense and hard rare coarse sub-rounded to rounded quartz in limestone.

Sandstone : light grey to buff. Calcareous, silty, very fine grained sparsely glauconitic and pyritic, dense no porosity or permeability.

4700 - 5009 feet

Traces of sub-rounded coarse to very coarse quartz sand probably from limestone.

5009 - 5039 feet Core No. 5 Cut 30 feet Recovery 26 feet

Shale : dark chocolate brown massive micaceous, fossiliferous, silty, calcareous, very pyritic in thin tubes and concretions. Probably worm burrows, then laminae of light grey to green micaceous shale.

Siltstone : light brown to grey, very argillaceous. Patches of buff-light brown.

Sandstone : very fine very argillaceous, silty, calcareous few very coarse grains; generally flat dipping - erratic due to lense nature of sediments.

5039 - 5315 feet

Shale : dark chocolate brown as above.

Siltstone : dark brown to buff argillaceous.

Sandstone : very fine very argillaceous (minor amounts only).

5315 - 5336 feet Core No. 6 Cut 21 Rec. 21 feet

Sandstone : light brown, very fine, dirty, trace mud, very coarse, friable, silty, dolomitic, argillaceous poorly sorted pyritic, burrows, bedding irregular with lensing dark chocolate brown shale: porosity very poor; permeability nil, no show, odor, fluorescence.

5325 - 5327 feet

Interbedded thin streaks 4 cm. thick of shale and sandstone.

Sandstone : light grey to white, silty, glauconitic, very fine grained, well sorted, porosity and permeability poor to nil.

Shale : dark chocolate brown as above.

5327 - 5336 feet

Sandstone : light green, very fine, friable, well sorted. Very glauconitic, silty micaceous, thin laminae. 1 - 3 cms, dark brown argillaceous.

Shale : very irregular sand filled burrows very fine grained white.

5336 - 5360 feet

Shale : as above.

5360 - 5430 feet

Sandstone : 40% light green to buff, very fine grained glauconitic well sorted with light brown dolomitic patches, occasional rounded granular quartz.

Shale : 60% possibly cavings.

5430 - 5526 feet

Shale : as above with minor traces very fine sandstone, dolomitic loose quartz grains.

5526 - 5620 feet

Interbedded siltstone and sandstone.

Siltstone : light grey argillaceous in part, very finely sandy, sparsely micaceous and carbonaceous, with fine laminae of dark brown silty shale.

Sandstone : grey white, argillaceous, silty calcareous in part. Silty, fine to very fine, well sorted sparsely micaceous and carbonaceous, moderately hard and friable, porosity fair to good permeability poor.

Sandstone : medium brown, silty argillaceous dolomitic poorly sorted fine to coarse sparsely micaceous and pyritic dense, no porosity and permeability.

5620 - 5650 feet Core No. 7 Cut 30 feet Rec. 23 feet

Siltstone : light grey to white grey in part. Very finely sandy, silty, argillaceous, sparsely micaceous and pyritic, sparsely fine grain and streaks of carbon material. Bedding is defined by fine laminae, dark grey brown argillaceous siltstone and silty shale. Porosity poor, permeability, poor, no show, odor taste nor fluorescence, bedding sub-horizontal, well defined foreset bedding to 30° in about one inch thick laminae worm burrows, also slumping and micro faulting.

5650 - 5680 feet

Siltstone : as above in Core 7

5680 - 5750 feet

Interbedded siltstone and sandstone as above.

. . . . . .

330108

WELL DATUM: 31 feet above sea level

WATER DEPTH: 193 feet

DRILLING FLUID PROPERTIES - Refer daily drilling mud log.

CASING AND CEMENTING OPERATIONS:

LOGS RUN:

STAND-BY TIME:

P. M. Lonie

W. M. Lonie, General Manager.

Melbourne
April 3, 1967.

Appendix I

Form K IV J 3/71

BASIN BASS BY David TAYLOR

WELL NAME BASS-3 DATE 26-7-71 ELEV. _____

330109

Foram Zonules

		Highest Data	Quality	2 Way Time	Lowest Data	Quality	2 Way Time
MIOCENE	A						
	Alternate						
	B						
	Alternate						
	C	1500	3		2010	3	
	Alternate						
	D_1	2040	3				
	Alternate						
	D_2				2400	3	
	Alternate						
	E	2430	3		2520	3	
	Alternate						
	F	2610	3		2900	3	
	Alternate						
	G	3000	1		3300	3	
	Alternate						
	H_1	3356	2				
	Alternate	3500	1				
	H_2				3600	3	
	Alternate						
OLIGOCENE	I_1	3700	3		3900	3	
	Alternate						
	I_2	3997	1		4200	3	
	Alternate						
	J_1	4300	3		~~4400~~	4	
	Alternate						
	J_2				4400	3	
	Alternate						
EOC.	K	4516	1		4654	1	
	Alternate						
	Pre K	4794	2		5175	2	

COMMENTS:

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

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

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

Date Revised _____

By _____

330110

BASIN BASS DATE March 30, 1973

WELL NAME BASS-3 ELEVATION + 31 feet

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
OLIG-MIO.	P. tuberculatus	4022	1				4022	1			
EOCENE	U. N. asperus	4516	2				4539	2			
	M. N. asperus	4731	1				5465	1			
	L. N. asperus	5540	2	5811	1		5907	1			
	P. asperopolus	6021	2	6155	1		6155	1			
	U. M. diversus										
	M. M. diversus	6421	1				6437	1			
	L. M. diversus										
PALEOCENE	U. L. balmei	6600	1				6600	1			
	L. L. balmei	6710	1				7203	2	7150	1	
	T. longus	7311	1				7710	2	7439	1	
LATE CRETACEOUS	T. lilliei										
	N. senectus										
	C. trip./T.pach.										
	C. distocarin.										
	T. pannosus										
EARLY CRETACEOUS											
PRE-CRETACEOUS											

COMMENTS:

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: L.E. Stover & A.D. Partridge DATE June, 1971

DATA REVISED BY: A.D. Partridge DATE March, 1973

FORM No R 315 .12/72

330111

Age dating BASS-3

Results recently received from Esso Australia Limited

		Age million years	Age
	7907 feet	49.0 (±5)	Eocene
K/Ar	7974 feet	418.0	Silurian*

*Devonian and Ordovician possible.

16 April 1973.

330112

OR-0332

5 cm

BASS STRAIT AREAS S.E. AUSTRALIA

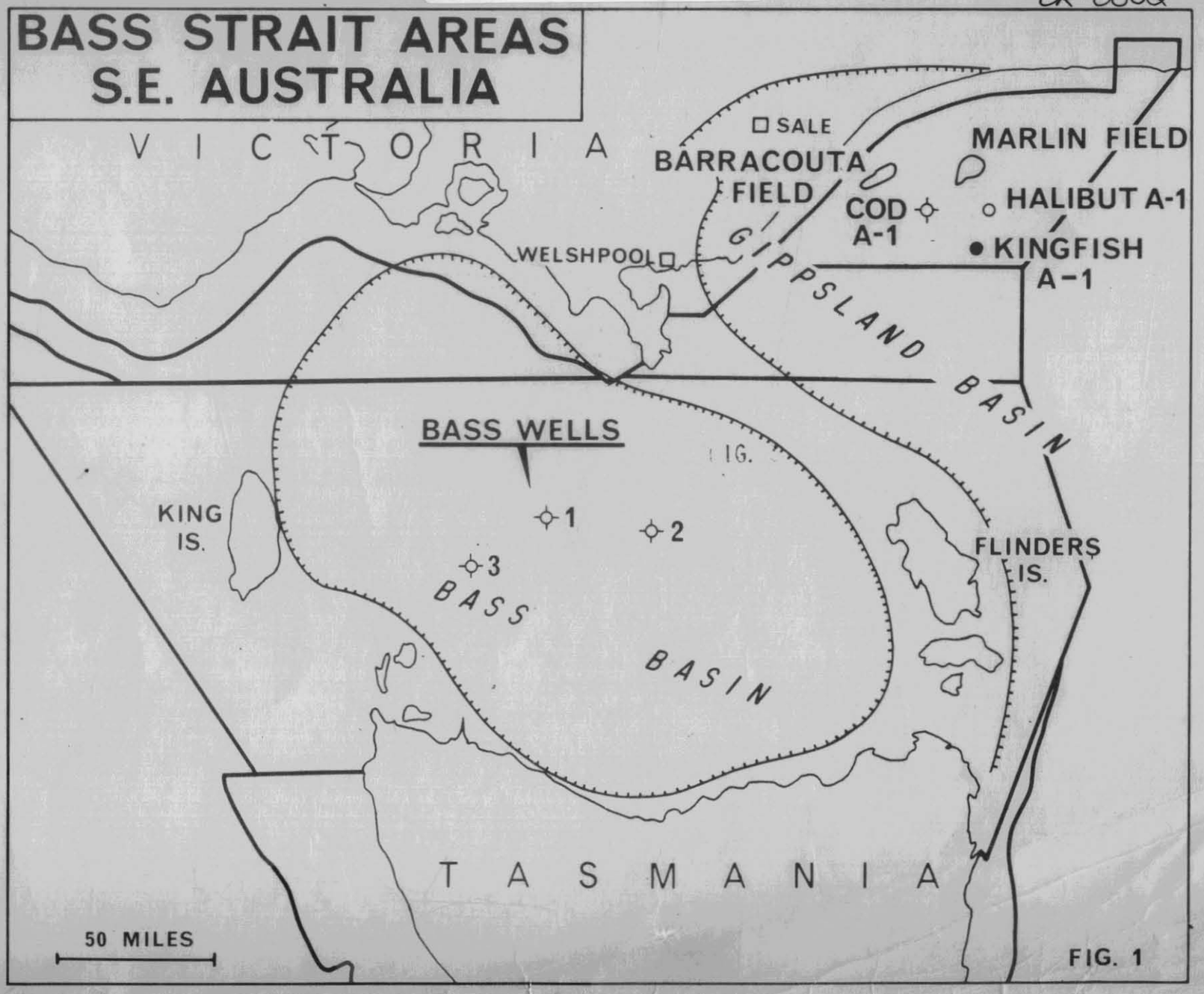
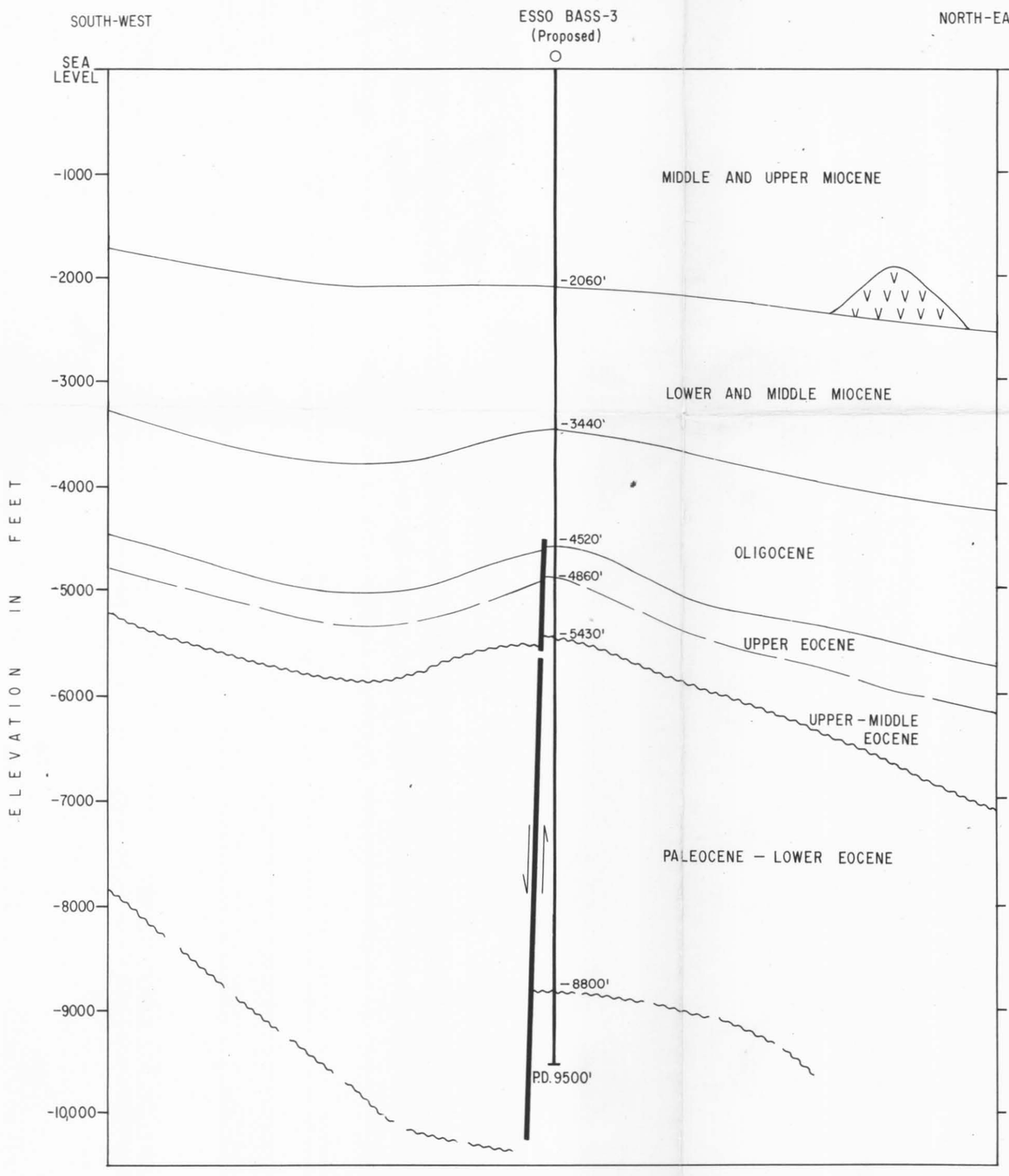
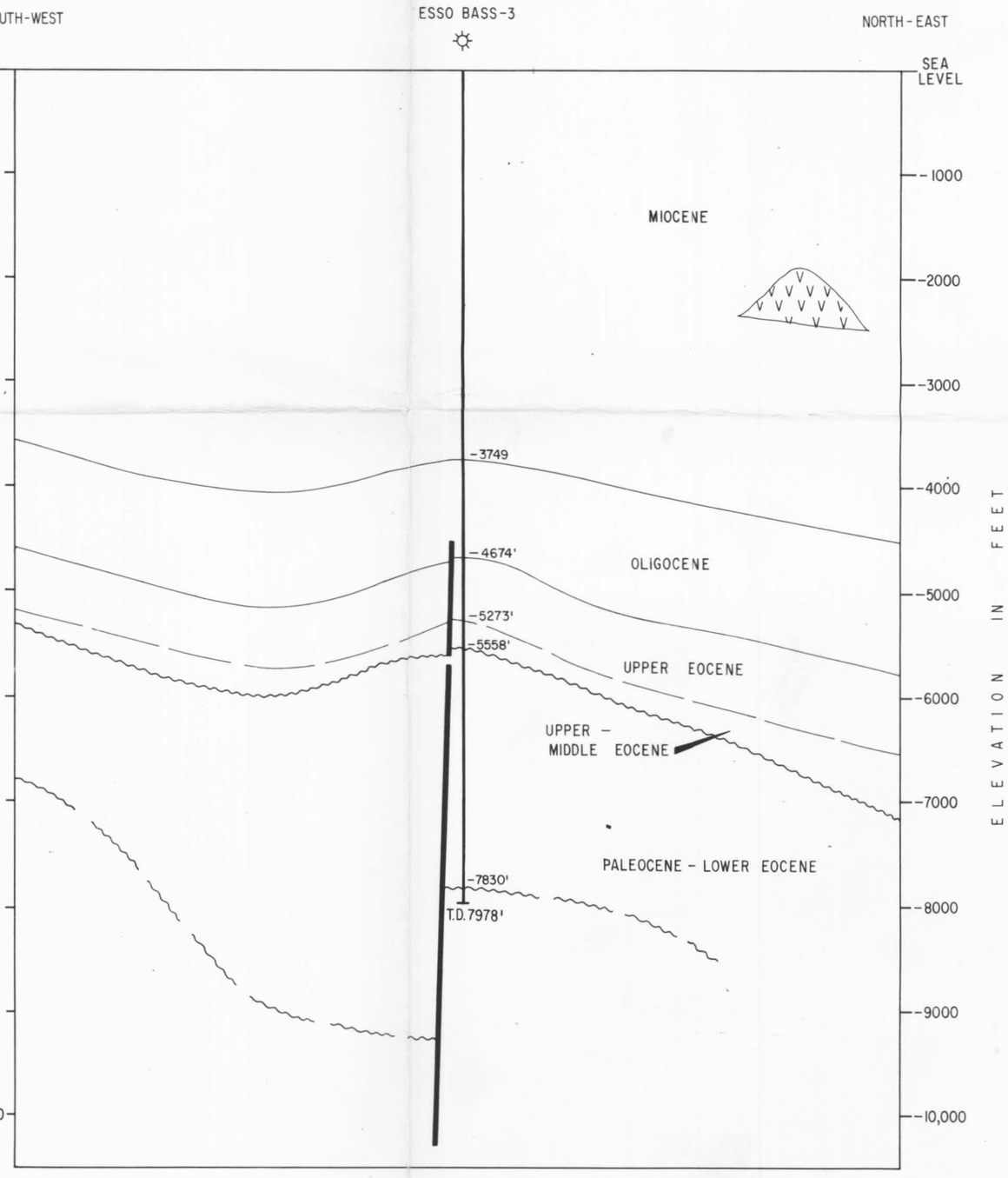


FIG. 1

SECTION BEFORE DRILLING



SECTION AFTER DRILLING



ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

CROSS-SECTIONS BEFORE AND AFTER DRILLING
ESSO BASS-3

2 1 0 2 4

MILES

5 cm

220113

OR-0338

Dwg. 899/OP/1 **FIG. 2**

GR 0332

330114

FIG. 3

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

WELL COMPLETION LOG

ESSO BASS — 3

ESSO BASS — 3

CONCESSION : E.L. 1/80 — STATE : TASMANIA — BASIN : BASS BASIN

LOCATION : Lat. 38° 36' 54"S — Long. 146° 46' 02"E

ELEVATION : +1 25' — +/- M.S.L. — WATER DEPTH : 285'

SPUDDED : 2-2-81 — COMPLETED : 2-4-81 — DRILLED BY : GLOBAL MARINE AUSTRALASIA PTY. LTD.

CLASSIFICATION : EXPLORATORY TEST — STATUS : PLUGGED AND ABANDONED

TOTAL DEPTH : 7570'

0 1cm

STRUCTURAL REASONS FOR DRILLING/OBJECTIVE ETC.

THE WELL WAS DRILLED ON THE CREST OF A WELL DEFINED NORTHWEST—SOUTHEAST CLOSED ANTICLINAL FEATURE AS MAPPED BY SEISMIC IT WAS DESIGNED TO TEST THE HYDRO-CARBON POTENTIAL AND STRATIGRAPHY OF AN UNKNOWN AREA WITHIN THE BASS BASIN.

RESULTS

THE OBJECT OF TESTING THE STRATIGRAPHY IN THIS PART OF THE BASIN WAS ACCOMPLISHED. HOWEVER, THE POTENTIALLY MOST PROSPECTIVE RESERVOIR HORIZON WAS FOUND TO BE WATER-WET. SECONDARY RESERVOIR TARGETS WITHIN THE SANDS OF THE UPPER CAMPLE BELOW THE EOCENE UNCONFORMITY WERE ALSO FOUND TO BE WATER-WET. THE SEISMIC INTERPRETATION OF THE AREA WAS GOOD AND THE WELL WAS DRILLED ON THE CREST OF THE STRUCTURE. THE FAULT ANTICLINAL FORMATION TOPS WERE CONSISTENTLY LOWER THAN THOSE PREDICTED BY SEISMIC BUT THE OVERALL STRUCTURAL PICTURE OF A CLOSED ANTICLINAL FEATURE REMAINS VALID.

LITHOLOGY

	Limestone & fine calcarenite		Mudstone
	Fossiliferous marly limestone		Siltstone
	Finely crystalline limestone		Silty mudstone
	Dolomite		Coal
	Chert		Basement
	Marl		

CASING AND LINERS

Size	Weight	Grade	Thread	Depth Set	Hole Size
30"	310	K-55 WELDED	BUTT	1037	36"
20"	133	K-55 BUTTRESS	BUTT	2037	26"
13 3/8"	72	K-55 BUTTRESS	BUTT	5000	17 1/2"
9 5/8"	47	N-80 BUTTRESS	BUTT	7570	12 1/4"

PLUGS

Type	Depth
Cement	7570
Cement	7370
Cement	5000
Cement	2037
Cement	1037
Cement	1000
Cement	100

PERFORATIONS

Depth	Interval	Shots
7370	7370	4
7370	7370	4

TESTS

DRILL STEM TEST — Interval: 7370' - 7570' (200') — Tool: 5" DP, 4 1/2" IF, 4 1/2" FH, 9 5/8" PACKER, 7" PBR, 4 1/2" FH, 4 1/2" IF, 5" DP — Fluid: 5" DP & 7" PBR: Nil; 4 1/2" FH: Nil; 4 1/2" IF: Nil; 5" DP: Nil — Gauges: 4 1/2" IF: Kuster K-10 #2 7370' (Inside); 4 1/2" FH: Kuster K-10 #1 7370' (Outside) — Remarks: Packers set in 12.5 ppg mud. Tool opened with 1000 psi. 1/2" choke. Flowed gas to surface in 1 min. 30 sec. Gas burned at flare. Flowed gas at rate of 1.5 MMCFD. Shut in tool for 1 hr. Pressure build up. Reversed out 1 bbl. condensate.

MUD AND LOGGING SERVICES

Company	Service	Unit No.
ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.	Mud Logging	1
SCHLUMBERGER	Wireline	1004
SCHLUMBERGER	Wireline	1006
SCHLUMBERGER OVERSEAS	Wireline	1008

WELL SITE GEOLOGISTS: R.D.L. HALL / J.F. STANLEY / M.J. WILLIAMS / J.M. BOYD

MUD LOGGING BY CORE LABORATORIES AUSTRALIA PTY.LTD.

ABBREVIATIONS

BS - B.S.W.	DC - DRILLING MUD	MW MW
BHA - BOTTOM HOLE ASSEMBLY	DP - DRILL PIPE	NC NC
BIT - BIT	DST - DRILL STEM TEST	PDC - POLYCRYSTALLINE DIAMOND COMPACT
CC - CIRCULATING CONDITIONS	DW - DRILLING WATER	PP - PUMP PRESSURE
CM - CEMENT	FC - FLOAT COLLAR	PV - PLASTIC VISCOSITY
CP - CASING PRESSURE	FW - FRESH WATER	SC - SHOE
CSG - CASING	GEL - GELATIN	SPM - STROKES PER MINUTE
CT - CORE TOOL	HWDP - HEAVY WEIGHT DRILL PIPE	WOB - WEIGHT ON BIT
DA - DRILLING ASSEMBLY	LCM - LOST CIRCULATION MATERIAL	YP - YIELD POINT

ASSOCIATED ANALYSES

CC - CUTTINGS CHIP	MC - MECHANICAL	SW - SWC
CO - CORE	MI - MICROSCOPIC	TS - THIN SECTION
DC - DRILLING MUD	PA - PALYNOLOGICAL	

(SEE ANALYSIS REPORTS FOR DETAILED RESULTS)

ACCUMULATOR ANALYSIS

Initial Pressure	Pressure After Closure	Pressure After Closure	Time to Regain Initial Pressure	Number of Pumps Used	Time to Regain Initial Pressure	Number of Pumps Used
3000	1500	1200	1 min. 30 sec.	1	2 min. 30 sec.	2

REMARKS

SPONTANEOUS POTENTIAL

RESISTIVITY

RESISTIVITY: DEEP (ILD) / MEDIUM (ILM) / SHALLOW (SFL)

CONDUCTIVITY

CONDUCTIVITY: DEEP (CILD) / MEDIUM (CILM)

RESISTIVITY: MEDIUM (AM) / SHALLOW (AO)

CONDUCTIVITY: MEDIUM (C1) / SHALLOW (C2)

RESISTIVITY: MEDIUM (LL8) / SHALLOW (SN

E 2223 DRUS

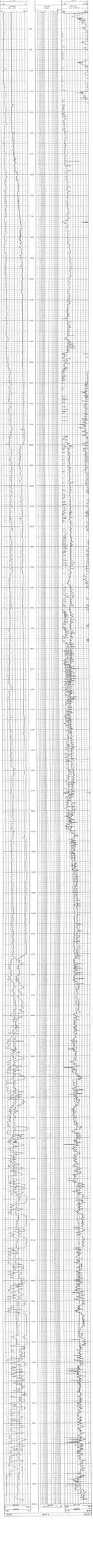
09-2-87

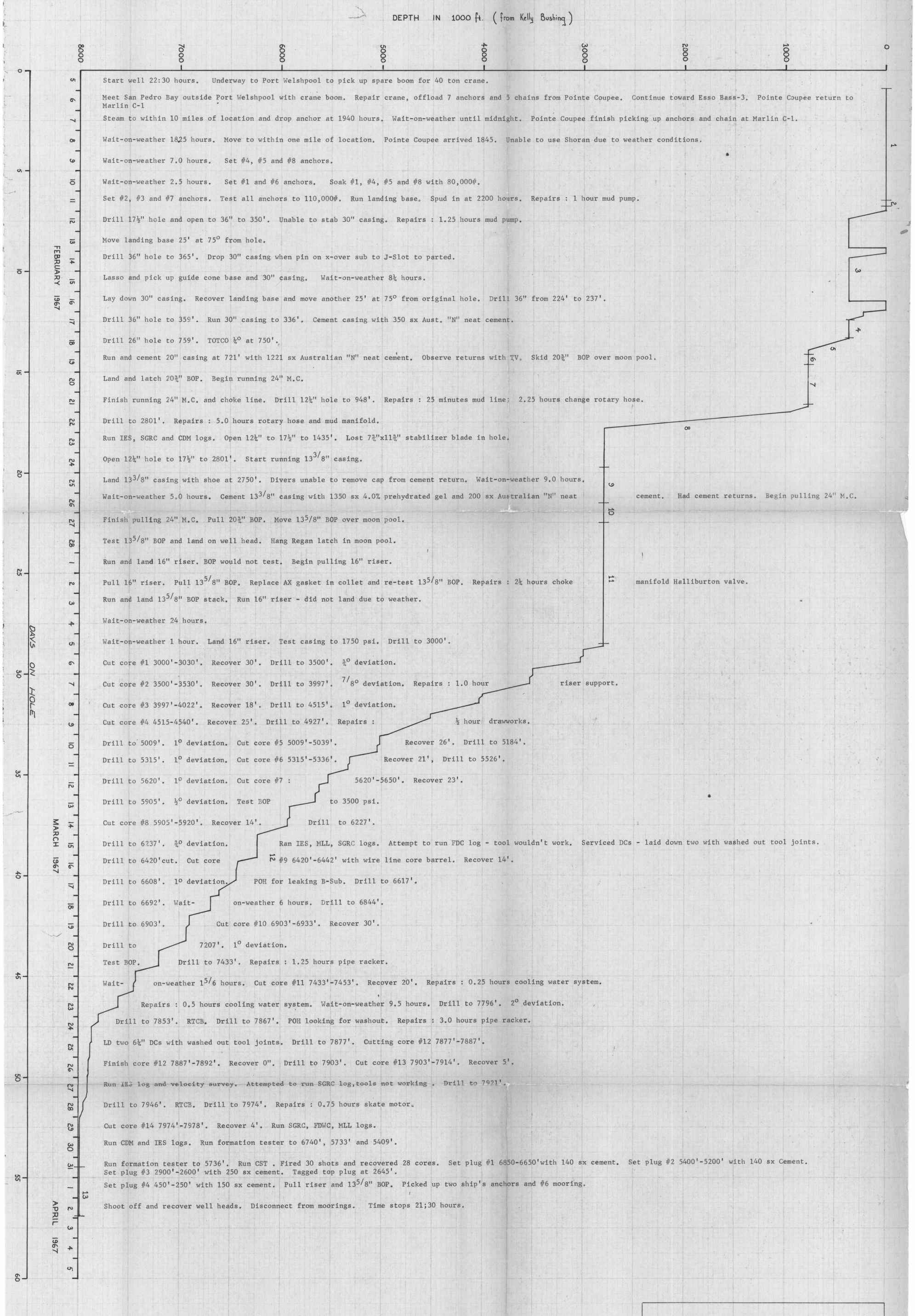
FIG. 2a

COMPOSITE MAIN LOG

SHELL PRODUCTION COMPANY

2-1-87		2-21-87
1-1-87		





DRILLING ANALYSIS

OPERATION	Total Days	Percent of Total Time
1. Install moorings	5.69	10.18
2. Install landing base	0.13	0.23
3. Drill 36" hole	5.71	10.20
4. Run and cement 30" conductor	0.69	1.20
5. Drill 26" hole	0.94	1.70
6. Run and cement 20" conductor	0.54	0.96
7. Install 20" BOP and marine conductor	1.98	3.49
8. Drill and log 17½" hole	3.25	5.72
9. Run and cement 13 3/8" casing	1.85	3.32
10. Retrieve marine conductor and 20" BOP	0.79	1.41
11. Run 13 3/8" BOP and marine conductor	5.84	10.42
12. Drill, core and log 12¼" hole	26.01	46.60
13. Plug, retrieve 16" marine conductor, 13 5/8" BOP, shoot well head and retrieve, release anchors.	2.54	4.57
	55.96	100.00

NOTE : Wait-on-weather time of 4.67 days is included in the above operations.

RVR/ng. 25/4/67

ESSO BASS-3

LONGITUDE: 145° 16' 57" E
LATITUDE: 39° 59' 51" S
COORDS: X 332 972 Y 1071 798
WATER DEPTH: 193'
RIG R'LSE PREVIOUS WELL: 2230HRS ; 5FEB 1967
RIG R'LSE THIS WELL: 2130 HRS ; 2APR 1967
TOTAL DEPTH: 7978'

5 cm

330116

OR-0332

FIG. 4

OR-0332 FIG. 5

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

BASS – 3

TIME – DEPTH CURVE

DATUM: SEA LEVEL

AUTHOR: P.E. TOWEY

COORDINATES:
39° 59' 51" SOUTH
145° 16' 57" EAST

ELEVATION: K.B. = 31'

LEGEND

WATER DEPTH = 202'

⊙ SHOT

5 cm

All data for the Time Depth and Interval Velocity curves as well as average velocities above 2000' are taken from the Sonic Log tied to check shots

330117

ONE WAY TIME BELOW SEA LEVEL

.05 .10 .15 .20 .25 .30 .35 .40 .45 .50 .55 .60 .65 .70 .75 .80 .85 .90 .95

TWO WAY TIME BELOW SEA LEVEL

0 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9

TIME DEPTH CURVE

INTERVAL VELOCITY

AVERAGE VELOCITY

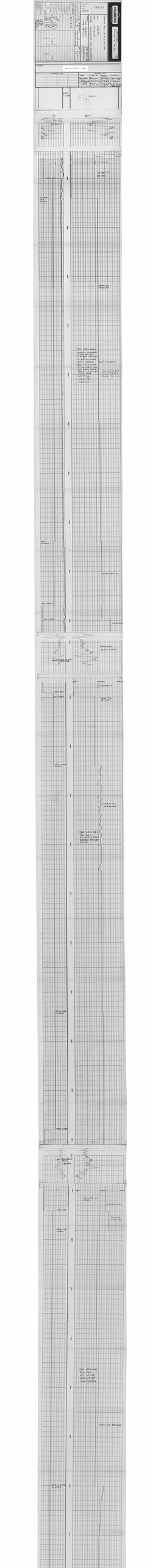
DEPTH IN FEET BELOW SEA LEVEL

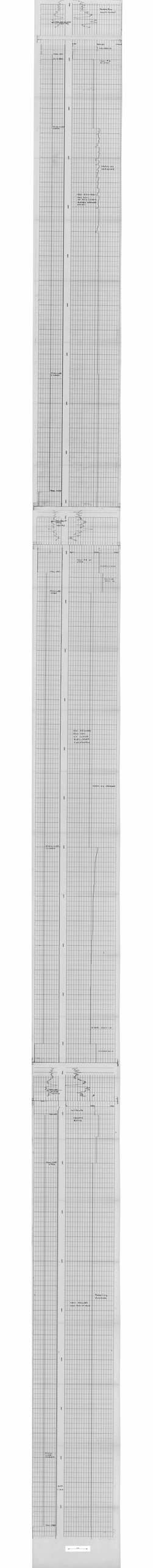
500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500 7000 7500 8000 8500

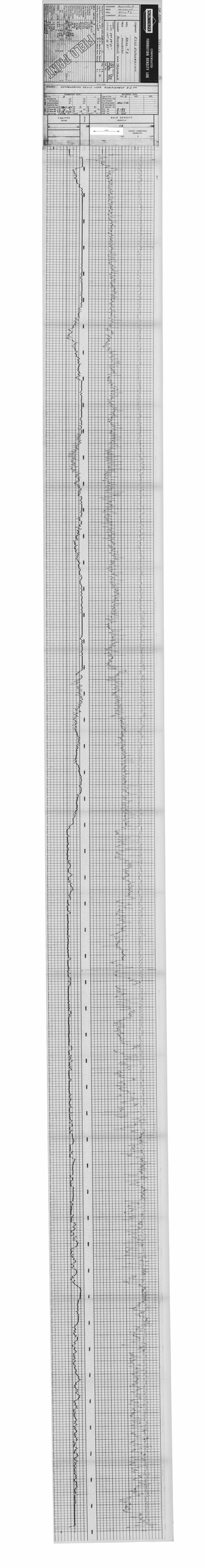
6000 7000 8000 9000 10,000 11,000 12,000 13,000 14,000 15,000 16,000 17,000 18,000 19,000 20,000 21,000 22,000 23,000 24,000

AVERAGE AND INTERVAL VELOCITY — FEET PER SECOND

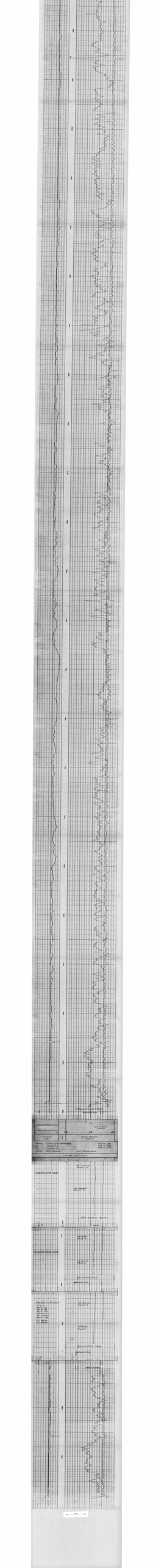
Dwg. 899/OP/3






FIELD PRINT
SCHLUMBERGER
FORMATION DENSITY LOG
COMPENSATED DENSILOG
CALIPER
BULK DENSITY
DENSITY CORRECTION

COMPENSATED
FORMATION DENSITY LOG
Schlumberger
COMPANY
WELL
FIELD
COUNTY
STATE
LOCATION
Other Services
Permanent Datum
Elev.: K.B.
D.F.
G.L.
Log Measured From
Drilling Measured From
Date
Run No.
Depth-Driller
Depth-Logger
Bottom Logged Interval
Top Logged Interval
Type Fluid in Hole
Salinity, PPM Cl
Density
Viscosity
Fluid Loss
Source of Sample
Rm @ Meas. Temp.
Rmf @ Meas. Temp.
Rmc @ Meas. Temp.
Source of Rmf and Rmc
Rm @ BHT
Time Since Circ.
Max. Rec. Temp. Deg. F
Equipment No.
Location
Recorded By
Witnessed By
RUN
BIT
CASING
TYPE FLUID IN HOLE
DENS
VISC
PH
FLUID LOSS
SOURCE OF SAMPLE
RM @ MEAS. TEMP.
RMF @ MEAS. TEMP.
RMC @ MEAS. TEMP.
SOURCE RMF
SOURCE RMC
RM @ BHT
TIME SINCE CIRC.
MAX. REC. TEMP. DEG. F
EQUIP. NO.
LOCATION
RECORDED BY
WITNESSED BY
CALIPER
GAMMA RAY
NEUTRON
DENSITY
RECORDED
PROCESSED
PROCESSED BY
PROCESSING CENTER
PROCESSING CENTER
PROCESSING CENTER



SCHLUMBERGER

MICROLATEROLOG

COUNTRY AUSTRALIA
FIELD WYNYARD
WELL BASS # 2
COMPANY ESSO

FIELD PRINT

COMPANY ESSO EXPLORATION
WELL BASS # 2
FIELD WYNYARD
COUNTRY AUSTRALIA
STATE TASMANIA

Other Services: DIPLOG

Permanent Datum: GROUND LEVEL
Elev.: 0
Log Measured From: K.B.
Drilling Measured From: K.B.
K.B.: 0
G.L.: 0

Date: 27-11-74
Run No.: ONE
Depth-Driller: 2000
Depth-Logger: 2000
Bottom Logged Interval: 1999
Top Logged Interval: 1000
Type Fluid in Hole: MUD
Salinity, PPM Cl: 2000
Density: 9.6
Level: FULL
Max. Rec. Temp. Deg. F: 120
Operating Rig Time: 12 HRS
Recorded By: R. BLAKE
Witnessed By: MR. BOWDEN

REMARKS: WAVE CONDITIONS DELAYED LOGS DISPLACEMENT 2-3 FT

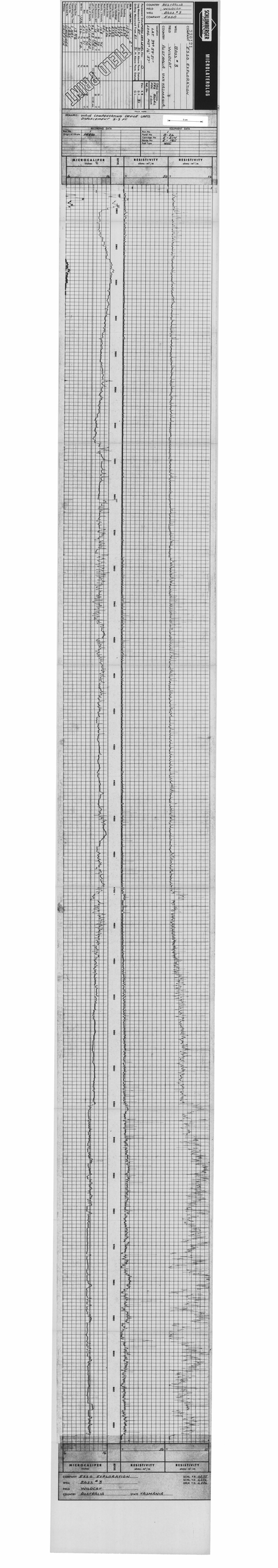
RECORDING DATA

Run No.: ONE
Depth of Shoe: 1999.5

EQUIPMENT DATA

Run No.: ONE
Pad(s) No.: E-204
Cartridge No.: E-204
Caliper No.: E-204
Pad Type.: WIDE

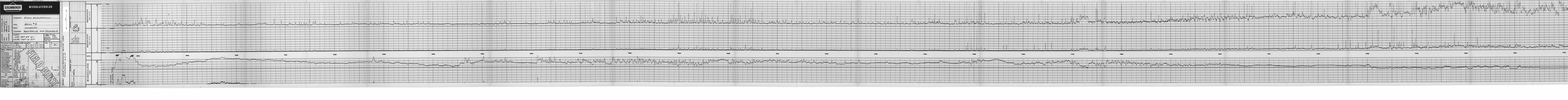
MICROCALIPER (Inches) | SCALE | RESISTIVITY (ohms-m²/m) | RESISTIVITY (ohms-m²/m)

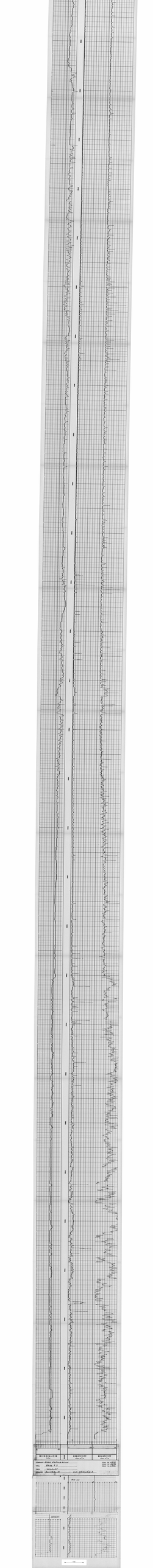


MICROCALIPER (Inches) | SCALE | RESISTIVITY (ohms-m²/m) | RESISTIVITY (ohms-m²/m)

COMPANY ESSO EXPLORATION
WELL BASS # 2
FIELD WYNYARD
COUNTRY AUSTRALIA
STATE TASMANIA

SCHL. FILE 6637
SCHL. I.D. 2-226
DRILL I.D. 4-226


MICROLATEROLOG
FIELD BOOT


MINERALOGIE
RADIOACTIVITY
RADIOACTIVITY
Compteur
Filtre
Temps
Observateur
Observations
Max. 1/2 échelle
Max. 1 échelle
Max. 2 échelle
Max. 5 échelle
Max. 10 échelle
Max. 20 échelle
Max. 50 échelle
Max. 100 échelle
Max. 200 échelle
Max. 500 échelle
Max. 1000 échelle
Max. 2000 échelle
Max. 5000 échelle
Max. 10000 échelle
Max. 20000 échelle
Max. 50000 échelle
Max. 100000 échelle
Max. 200000 échelle
Max. 500000 échelle
Max. 1000000 échelle
Max. 2000000 échelle
Max. 5000000 échelle
Max. 10000000 échelle
Max. 20000000 échelle
Max. 50000000 échelle
Max. 100000000 échelle
Max. 200000000 échelle
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Max. 1000000000 échelle
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SCHLUMBERGER

MICROLATEROLOG

COUNTRY AUSTRALIA
FIELD WILDCAT
WELL BASS 3#
COMPANY ESSO

COMPANY ESSO EXPLORATION
3301.23
BASS 3#
WILDCAT
AUSTRALIA
STATE TASMANIA

LOCATION
LAT. 39° 59' 51"
LONG 146° 16' 47"

Other Services
DIFL BHC GR CAL
DIFL BHC GR CAL

Permanent Datum: GROUND LEVEL Elev. 0
Log Measured From: RT 31 Ft. Above Perm. Datum
Drilling Measured From: RT

Date: 3-31-74
Run No. 3
Depth-Driller 7990
Depth-Logger 7990
Bottom Logged Interval 7990
Top Logged Interval 1435
Type Fluid in Hole GEL CHEM
Salinity, PPM Cl 7400
Density 9.6
Viscosity 53
Fluid Loss 6.8 cc
Source of Sample CIRC
Rm @ Meas. Temp. .7 @ 68°F
Rmf @ Meas. Temp. .6 @ 68°F
Rmc @ Meas. Temp. .8 @ 68°F
Source of Rmf & Rmc CALC CALC
Rm @ BHT .4 @ 150°F
Time Since Circ. 8 HRS
Max. Rec. Temp. Deg. F 150
Equip. Location KARRATHA
Recorded By R. SEARL
Witnessed By MR. TEAGUE

Bit No. 1 2
Type Bit 8½" 8½"
Size 8½" 8½"
Make HTC HTC
Type Mud Gel Chem
Weight 9.6 9.6
Viscosity 53 53
Water Loss 6.8 6.8
Filter Cake 2/32" 2/32"
Rm @ Meas. Temp. .7 @ 68°F .7 @ 68°F
Rmf @ Meas. Temp. .6 @ 68°F .6 @ 68°F
Rmc @ Meas. Temp. .8 @ 68°F .8 @ 68°F
Source of Rmf & Rmc CALC CALC
Rm @ BHT .4 @ 150°F .4 @ 150°F
Time Since Circ. 8 HRS 8 HRS
Max. Rec. Temp. Deg. F 150 150
Equip. Location KARRATHA KARRATHA
Recorded By R. SEARL R. SEARL
Witnessed By MR. TEAGUE MR. TEAGUE

Run No. 3
Depth-Driller 7990
Depth-Logger 7990
Bottom Logged Interval 7990
Top Logged Interval 1435
Casing Driller 2500 @
Casing Logger 2500
Bit Size 8½"
Type Fluid in Hole GEL CHEM
Density 9.6
Viscosity 53
Ph 7
Fluid Loss 6.8 cc
Source of Sample CIRC
Rm @ Meas. Temp. .7 @ 68°F
Rmf @ Meas. Temp. .6 @ 68°F
Rmc @ Meas. Temp. .8 @ 68°F
Source of Rmf & Rmc CALC
Rm @ BHT .4 @ 150°F
Time Since Circ. 8 HRS
Max. Rec. Temp. Deg. F 150
Equip. Location KARRATHA
Recorded By R. SEARL
Witnessed By MR. TEAGUE

FOLD HERE

REMARKS: WAVE COMPENSATING DEVICE USED
DISPLACEMENT 2-3 FT.

5 cm

RECORDING DATA
Run No. 3
Origin of Mtrate. PASS

EQUIPMENT DATA
Run No. 3
Panel No DC-76
Cartridge No DC-76
Sonde No E-185
Pad Type VIII

MICROCALIPER
Inches
6 16

DEPTH

RESISTIVITY
ohms - m²/m
0 100

RESISTIVITY
ohms - m²/m
0 20

8000
8100
8200
8300
8400
8500
8600
8700
8800
8900
7000
7100
7200
7300
7400
7500
7600
7700
7800
7900

MICROCALIPER
Inches
6 16

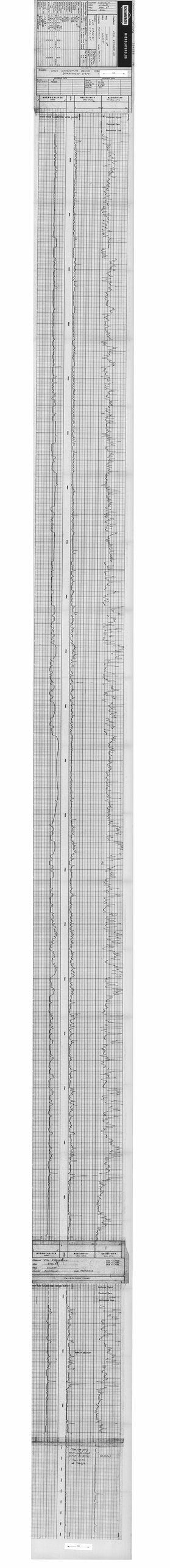
DEPTH

RESISTIVITY
ohms - m²/m
0 100

RESISTIVITY
ohms - m²/m
0 20

COMPANY ESSO EXPLORATION
WELL BASS#3
FIELD WILDCAT
COUNTRY AUSTRALIA STATE TASMANIA

SCHL FR 7929
SCHL TD 7990
DRLR TD 7990



SCHLUMBERGER **CONTINUOUS DIPMETER**

Location of Well

COMPANY: ESSO RESOURCES CANADA LIMITED — 141° 07' 6" W, 64° 07' 8"

WELL: Bear No. 3

FIELD: Wildcat

LOCATION:

Elevation: K.B. 24'
D.F.
G.L.
(Datum is M.S.L.)

STATE: Territories

COUNTRY: Canada

Permanent Datum: Ground, Log Measured From: K.B., 24' Above Perm. Datum

Run No.	One	Two	Three
Date	25-3-1969		
Depth Driller	10000'		
Depth Logger	10000'		
Bottom Logged Interval	9997'		
Top Logged Interval	1000'		
Type Fluid in Hole	Gel Chem		
Salinity, PPM Cl	1000		
Density	10.0		
Level	Full		
Max. Rec. Temp. Deg. F.	170°		
Operating Rig Time	12 HRS		
Recorded By	GRIFFITH		
Witnessed By	MR. ESSO REP.		

Correlation Chart: 1 Inch = 5 Feet

Scale: 1 Inch = 100 Feet

1800' 1850' 1900' 1950' 2000' 2050' 2100' 2150' 2200' 2250' 2300' 2350' 2400' 2450' 2500' 2550' 2600' 2650' 2700' 2750' 2800' 2850' 2900' 2950' 3000' 3050' 3100' 3150' 3200' 3250' 3300' 3350' 3400' 3450' 3500' 3550' 3600' 3650' 3700' 3750' 3800' 3850' 3900' 3950' 4000' 4050' 4100' 4150' 4200' 4250' 4300' 4350' 4400' 4450' 4500' 4550' 4600' 4650' 4700' 4750' 4800' 4850' 4900' 4950' 5000' 5050' 5100' 5150' 5200' 5250' 5300' 5350' 5400' 5450' 5500' 5550' 5600' 5650' 5700' 5750' 5800' 5850' 5900' 5950' 6000' 6050' 6100' 6150' 6200' 6250' 6300' 6350' 6400' 6450' 6500' 6550' 6600' 6650' 6700' 6750' 6800' 6850' 6900' 6950' 7000' 7050' 7100' 7150' 7200' 7250' 7300' 7350' 7400' 7450' 7500' 7550' 7600' 7650' 7700' 7750' 7800' 7850' 7900' 7950' 8000' 8050' 8100' 8150' 8200' 8250' 8300' 8350' 8400' 8450' 8500' 8550' 8600' 8650' 8700' 8750' 8800' 8850' 8900' 8950' 9000' 9050' 9100' 9150' 9200' 9250' 9300' 9350' 9400' 9450' 9500' 9550' 9600' 9650' 9700' 9750' 9800' 9850' 9900' 9950' 10000'

OR-0332

SCHLUMBERGER CONTINUOUS DIPMETER

COUNTRY	Australia
FIELD	Wildcat
WELL	Bass No. 3
COMPANY	Esso Exploration Australia Ltd.

330126

COMPANY Esso Exploration Australia Inc.

WELL Bass No. 3

FIELD Wildcat

LOCATION

STATE Tasmania

COUNTRY Australia

Location of Well

39° 59' 51" S

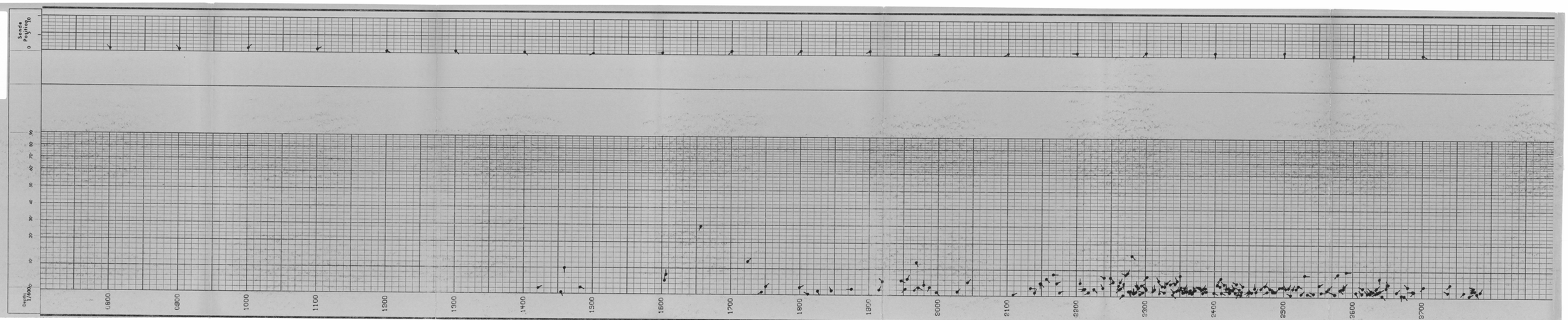
145° 16' 57" E

Elevation : R.T. : D.F. : 31' K.B. : or G.L. :

FILING No. SAL-67-02-1

RUN No.	ONE	TWO	THREE
DATE	23.2.67.		
Casing Depth Schlumberger	721'		
" " Driller	721'		
Total Depth Schlumberger	2793'		
" " Driller	2801'		
" " Reached	2790'		
Bit Size	to 12 to T.D.	to to T.D.	to to T.D.
Mud Nature	GEL		
" Density | viscosity	10.1 | 35	|	|
" Resistivity	0.8 at 76 °F.	at °F.	at °F.
B.H.T.	115°F		
Logging Speed	2400ft/hr.		
First Reading	2790'		
Last Reading	721'		
Interval measured	2069'		
Equipment	DCT-C		
Truck number	2035		
Observer	Schneider		
Correlated by	Bell		
Computed by	IBM-1620-564,4		
Plotted by	IBM-1627-564,3		
Magnetic Declination	11°East		
Levels	204		
Reference	4096		

Correlation Class : 1, Good 2, Fair 3, Possible



OR-0332

SCHLUMBERGER

BOREHOLE COMPENSATED SONIC LOG—GAMMA RAY

COUNTRY AUSTRALIA
FIELD WILDCAT
WELL BASS #3
COMPANY ESSO

COMPANY ESSO EXPLORATION
WELL BASS #3
FIELD WILDCAT
COUNTRY AUSTRALIA STATE TASMANIA

Location: LONG. 148° 14' 57"

Permanent Datum: MSL
Elev.: 0
Log Measured From: RT
31 ft. Above Perm. Datum
Drilling Measured From: RT
31 ft. Above Perm. Datum
Elev.: K.B. 31
D.F. 31
G.L. 31

Run No.	Date	Depth-Driller	Depth-Logger	Bottom Logged Interval	Top Logged Interval	Type Fluid in Hole	Salinity, PPM Cl	Density	Level	Max. Rec. Temp. Deg. F.	Equip. No.	Location	Recorded By	Witnessed By
ONE	30-12-62	2792	2791	2791	0	GEL	2000	9.5	FULL	120	3804			
ONE	31-12-62	2792	2791	2791	0	GEL	2000	9.5	FULL	120	3804			
ONE	1-1-63	2792	2791	2791	0	GEL	2000	9.5	FULL	120	3804			
ONE	2-1-63	2792	2791	2791	0	GEL	2000	9.5	FULL	120	3804			

FOLD HERE

REMARKS: WAVE COMPENSATING DEVICE USED.
BOREHOLE 24 FT
CALIPER RECORDED 7.5" SHALLOW

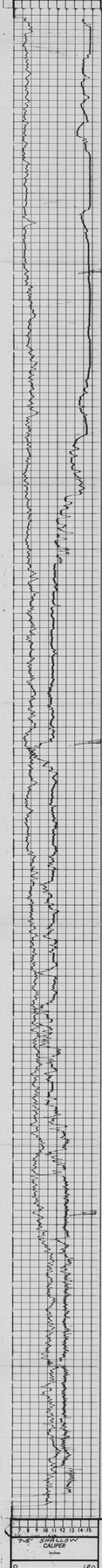
Velocity = 1000000 / Interval Transit Time (microsec. ft.)

GAMMA RAY CALIBRATION DATA				GAMMA RAY RECORDING DATA	
Background	30	api	api	Run No.	ONE
U. Std. Source	490	api	api	Hand Level	FULL
Calib Increase	265	div.	div.	Sensitivity Tap	300
Sensitivity Tap	300			Time Constant	2
BHC SONIC RECORDING DATA				GR Panel No.	D-803
Centralizers	CAL. 7.5 CALIPER			GR cartridge No.	G-113
Cartridge No.	A-46			GR detector No.	T-469
Sonde No.	A-20				
Panel No.	A-58				

GAMMA RAY
API UNITS
GAMMA RAY ZERO 0
DIVISIONS TO LEFT OF THIS LINE
0 120

INTERVAL TRANSIT TIME
microseconds per foot
Spacing: 2 ft.
140 90
1 millisecond Integrated Transit Time
10 milliseconds
190 140

CALIPER
7.5" SHALLOW
inches
7 8 9 10 11 12 13 14 15



7 8 9 10 11 12 13 14 15
7.5" SHALLOW
CALIPER
inches
0 120
GAMMA RAY ZERO 0
DIVISIONS TO LEFT OF THIS LINE
GAMMA RAY
API UNITS
10 milliseconds Integrated Transit Time
1 millisecond
140 190 140
90
INTERVAL TRANSIT TIME
microseconds per foot
Spacing: 2 ft.

COMPANY ESSO EXPLORATION
WELL BASS #3
FIELD WILDCAT
COUNTRY AUSTRALIA STATE TASMANIA

SCHL. F.B. 2792
SCHL. T.D. 2812
DRLR. T.D. 2801