W510

Natural Resources and Environment

AGRICULTURE • RESOURCES • CONSERVATION • LAND MANAGEMENT

DEPT. NAT. RES & ENV

PE905448

DOLPHIN A1

WELL SUMMARY

1 Folio No	2 Referred to	3 Date	4 Clearing Officer's Initials	1 Folio No	2 Referred to	3 Date	4 Clearing Officer's Initials

FILE COVER INSTRUCTIONS FOR ACTION OFFICERS

(1) FOLIO NUMBERS: Each subject paper attached to a file is to be given a consecutive number by the attaching officer. Papers must not be removed from or attached to a file without approval.

(2) REFERRAL TO OTHER OFFICERS: When an Officer completes action on the file and further action is required by some other Officer, please initial Column (4) and on the next vacant line, enter the relevant folio number in Column (1), indicate to whom the file is to be forwarded in Column (2) and record the date in Column (3).

(3) BRING UP MARKINGS: When action on a file is required at a later date, the officer will initial Column (4) and, on the next vacant line, enter the relevant folio number in Column (1), then write "B/U" followed by the action officer's name in Column (2) and the date the file is required in Column (3).

(4) PUTAWAY MARKINGS: When ALL action on a file is completed the officer concerned will initial Column (4) and, on the next vacant line, write "P/A" in column (2).

REGISTRY MUST BE NOTIFIED OF ANY FILE MOVEMENTS BETWEEN OFFICERS

LOCATION

EARLIER FILES	LATER FILES	RECORDS DISPOSITION

Fil...

EXECUT...
Secretary
Deputy Se...
Executive D...
Executive D...
Executive D...
Executive D...
Executive D...
Executive D...
Executive D...
Executive D...
Executive D...

CORPORA...
General Ma...
Chief Fina...
Manager I...
Director C...
Director H...
Director P...
Director In...
Director B...
Manager B...
Manager A...
Manager M...
Manager C...
Manager E...
Manager L...

MINERA...
Manager F...
Manager G...
Manager M...
Manager M...
Manager E...
Manager M...

PRIMAR...
SCIENT...
Manager C...
Manager P...
Chief Vete...
Director B...
Director F...
Director Q...
Director A...

Dol A

SPUD: 28-9-67
COMPLETED: 25-11-67.

38° 29' 32"S
147° 22' 43"E

DOLPHIN—A-1

ESSO. WILDCAT. 510

T.D. 9,46[illegible]
W.D. 134[illegible]

✓ IES	Run 1.	623' – 2324'.	Separate logs for 2" and 5"
✓ "	" 2.	2218 – 5405.	" " " 2" " 5"
✓ "	" 3.	5405 – 8830	" " " 2" " 5"
✓ "	" 4.	3900 – 9382	" " " 2" " 5"
✓ FDC.	" 2.	2215 – 5402	" " " 2" " 5"
✓ "	" 3.	5402 – 8804	" " " 2" " 5"
✓ "	" 4	8805 – 9370	" " " 2" " 5"
✓ BHCS/GR.	" 1	623 – 2315.	" " " 2" " 5"
✓ BHCS	" 2.	2217 – 5391	" " " 2" " 5"
✓ "	" 3.	5391 – 8671	" " " 2" " 5"
✓ "	" 4.	8671 – 9365	" " " 2" " 5"
✓ MLL	" 1.	3950 – 4250	" " " 2" " 5"
✓ GRN	" 1	3900 – 4600	" " " 2" " 5"
✓ Laterolog	" 1	3900 – 5400	" " " 2" " 5"
✓ FIT	" 1.	Tests 1 – 4	+ SAMPLING CONDITIONS
✓ "	" 2.	" 1 – 3	+ I/c
CCL/PR	" 2	8643–8645'	5" Scale.
✓ CDM	" 2.	2217 – 5397	Sep. 2" and 5" scale

✓ Core Lab. Mudlog 623 – 9450 — 18525-8975, 18770-9175

✓ Cores. 1, 2 & 3. 4009' – 4089'. IN STORE. Send to Aust.

✓ Cuttings 710 – 6880 & 8540 – 9450. IN STORE. " "

✓ Core descriptions 1, 2 & 3. in weekly Reports — W.R. 16/12

✓ Cutting descriptions 4089 – 5412. " " — "
S.W.C. "

✓ Core Analysis RESULTS. " " — "

S.W.C. Shot 10. Recovered 9. — " 27/4

" " 30 " 28. — " 20/1

✗ Well Completion Log. ? *SPECIES List Sp[illegible]
THIN SECTION EXAMINATION
* WATER ANALYSIS * CRUDE OIL ANALYSIS.

✗ Petrographic Descriptions 8350 – 8570.

✗ Paleontology Report by D. Taylor

✗ Palynology " " L. E. Stover. Plus revision.

✗ Weekly Reports

✓ Well Summary (unrestricted copy) SWC Descriptions?

Formation Evaluation

PALYNOLOGICAL SHEET BY W.K. HARRIS

No C.D.M. R1. 623–2322 R3 5430–8610. R4 8650'–9340'.

No S.W.C. Descriptions. No TL.

~~2" in Core Store~~

No Semi Depth Curve.

TABLE OF CONTENTS

W510

DOLPHIN A1

CONFIDENTIAL

5/0

WELL COMPLETION REPORT

ESSO DOLPHIN A-1 WELL SUMMARY

Type of Well	Exploratory Test (Wildcat)
Purpose of Well	New field Wildcat, Gippsland Basin. To test a Northeast-Southwest closed anticlinal structure. A maximum of 480 ft. of vertical closure, covering an area of 43 square miles, was mapped on the unconformity at the top of the Latrobe Valley Formation. The closure is primarily dependent on the erosional unconformity surface. This surface does not coincide or reflect the structural configuration within the Latrobe Valley Formation, which is primarily confined to a northeasterly plunging nose. The vertical closure within the Latrobe Valley Formation to the top of the upper cretaceous is probably in the order of 150 ft. Primary objective was the sand at the top of the Latrobe Valley Formation. Secondary objectives were the sandstone horizons within the Lakes Entrance Formation which, though having only a small amount of closure, is thinning over the top of this structure. The well was programmed to 9,500 ft.

Well Statistics:

Status	Plugged and abandonned.
Location	Latitude 38° 29' 32" S. Longitude 147° 22' 43" E. At seismic shotpoint 134 Line EG-24.
Elevation	Rotary table 31 ft. above mean sea level.
Water Depth	134 ft.
Spudded	28th September, 1967.
Completed	25th November, 1967.
Total Depth	9,461 ft.
Casing	30" at 280 ft. 20" at 623 ft. 13-3/8" at 2,210 ft.

Plugs

1. 6770 - 6400 ft. 330 sacks Aust. N. Cement 15.2 lbs/gallon.

2. 4150 - 3850 ft. 300 sacks Aust. N. Cement 200 lbs CFR2 100 lbs.HR4 15.6 lbs./gallon

3. 2300 - 2000 ft. 250 sacks Aust. N. Cement 2% Ca Cl2. 15.4 lbs/gallon

4. 175 - 375 ft. 144 sacks Aust. N. Cement 15.4 LBS./gallon.

Mud Logging

Core Laboratories, from 700 ft. to total depth.

Electric-Logging

IES	623 - 9382 ft.
BHC-SGR	623 - 9365 ft.
CDM	623 - 8670 ft.
GRN	3900 - 4600 ft.
LL	3900 - 5400 ft.
MLL	3950 - 4250 ft.
FDC	2215 - 9370 ft.

Hydrocarbons

Relative high gas readings were recorded at the interval 3990 - 4009 feet.

Total = 38 Chromatograph:= C1 = 646, C2 = 32 C3 = 22

(C4, C5, C02 = Nil)

Fluorescence, odour and cut were encountered in the intervals 4034 - 4045 ft., 4049 -4054 ft/ and 4064 - 4069 ft.
Following results were obtained by core analysis:-

Depth	Porosity	Permeability	Oil	Water
4017	31.8	---	36,4%	51.0%
4018	38.1	---	21.0%	59.3%
4026	32.8	---	22.6%	50.1%
4028	29.9	---	20.4%	41.5%

......../3.

Oil pick 3995 - 4035 but fluorescence occur & cut down to 4069 KB.

DOLPHIN - 1

In the payzone at top of Latrobe Valley Formation, in the interval 3992 - 4030 ft. the electric log showed a relative low resistivity. The sonic and density logs indicated no gas cap. The oil water contact was not evident. (4054?).

Wire-Line Tests

Test 1.	4074 ft.	Recovered Formation Water
Test 2.	4052 ft.	Mis run.
Test 3.	4000 ft.	Recovered 12.1 c. ft. gas. 1160 ccs oil. A.P.I. 46.8° GOR 170
Test 4.	4055 ft.	Recovered 12,000 ccs water with a salinity of 2,100 ppm. 500 ccs mud. (RW = 2.62 at 70° F.)
Test 5.	4030 ft.	Recovered 20.00 ccs of mud filtrate, 2,600 ccs of mud with film of oil.
Test 6.	4025 ft.	Tested im-permeable zone.
Test 7.	4027 ft.	Recovered 6.2 c.ft. gas 11,720 cc oil (A.P.I. 44.9°) 2,500 ccs mud 4,780 ccs filtrate.

STRATIGRAPHY

Age	Formation	Top (RT)	Subsea	Thickness
Miocene	Gippsland Fm.		-124	2,616 ft.
Oligocene	Lakes Entrance Fm.	2,740	-2,709	1,252 ft.
Eocene	Latrobe Valley Fm.	3,992	-3,961	2,278 ft.
Up Cretaceos)	Unnamed	6,270	-6,239	+3,191 ft.

Lithology

Gippsland Formation

710 - 1190 — Skeletal Limestone: (also detrital)

1190 - 1500 — Sandstone: grey, loose quartz grains, medium to very coarse, moderately sorted, subrounded to well rounded, glauconitic, slightly calcareous.

1500 - 2220 — Calcareous Sandstone: and Sandy Skeletal Limestone.

2220 - 2700 Skeletal calcarenite: grey to cream, coarse, locally consolidated.

2700 - 2740 Marl, calcareous mudstone; green grey, soft fossiliferous fine carbonaceous flakes.

Lakes Entrance Formation:

2740 - 3980 Calcareous Mudstone: green grey, fossiliferous, soft, slightly pyritic, glauconitic.

3980 - 3992 Sandstone: hard, tight, calcareous, micaceous matrix.

Latrobe Valley Formation:

3992 - 4280 Interbedded sandstone, silty shales, and coal.

Sandstone: white grey, loose quartz grains, medium to coarse, subangular to well rounded glauconite and pyrite. Argillaceous, micaceous matrix.
Shale: brown, silty, slightly carbonaceous, fine pyrite nodules, partly micaceous,

4280 - 6270 Interbedded, sandstone, siltstone and coal.

Sandstone: grey loose quartz, coarse, angular to subrounded.
~~coal~~, black brown.
minor shale.
(5185 - 3850 - Dolomitic Sandstone).

Upper Cretaceous:

6270 - 7000 Interbedded sandstone, shale and pyroclasts.
Sandstone: white brown, fine to coarse, subangular to rounded, poorly sorted, micaceous, slightly calcareous, partly with tuffaceous matrix.
Pyroclasts: grey, glassy minerals, devitrified, well-rounded, brown coarse nodules (dolomitic).
Minor shale: brown, carbonaceous micaceous.

7000 - 7940 Sandstone, siltstone, shale, tuffite, (Minor coal.)
Sandstone: grey, tuffaceous, argillaceous, fine to medium to coarse grained, micaceous matrix or clay, some kaolinitic matrix, traces of feldspar, interbedded with tuffite zones, aggregates of tuff.
Siltstone: brown grey.
minor shale (silty) and coal

....../5.

7940 - 8360	Interbedded siltstone, sandstone and shale. Sandstone: grey white, loose quartz grains, medium to granular, angular to subrounded, kaolinitic matrix, with aggregates of very fine grained lithified sandstone. Siltstone: brown grey, micaceous, carbonaceous, pyritic. Shale: silty, brown grey.
8360 - TD	Sandstone and Volcanics: Sandstone: loose quartz, also agglomerates of clay branded white grey, very fine grained sandstone. Quartz arenite: white, fine to very coarse, angular to subrounded, poorly sorted hard, firm, slightly calcareous, some Biotite. Volcanics: Tuff, tuffite, porphyritic basalt, grey, mottled, devitrified material in very fine to aphanitic matrix. Hard, dark green fresh basalt, microcrystalline, porphyritic dark opaque minerals, veins of calcite.

2.0. Sample Description

2.1. Sidewall Core Description

DOLPHIN A-1

SIDEWALL CORES

DESCRIPTIONS

Run #1

797'	Skeletal Mudstone; light grey to grey-green, in part calcareous, fossiliferous (bryozoa, forams, echinodermata, lamellibrachia). Glauconitic, sporadically distributed, fine, rounded dark to opaque accessory grains (coal ?). Rare mica flakes, soft, massive, homogeneous texture.
950'	Skeletal Mudstone; light grey - medium light grey, calcareous, fossiliferous (bryozoa, forams predominate) slightly glauconitic, very slightly silty, soft, massive, homogeneous.
1000'	Skeletal Mudstone.
1228'	Skeletal Mudstone; very light grey to light grey, otherwise as above.
1316'	Micritic Mudstone; medium grey, very fossiliferous (bryozoa, forams), slightly glauconitic, soft, faint sub parallel bedding planes distinguished by carbonate concentration.
1410'	Silty Micritic Mudstone; medium to medium dark grey, silt to very fine sub rounded quartz distributed randomly. Glauconite common. Fossils abundant (bryozoa, forams). Rare mica flakes and disseminated black opaques, soft, massive homogeneous texture.
1524'	Micritic Mudstone; as above, slightly pyritic, massive homogeneous texture.
1766'	Skeletal Mudstone; as above.
1810'	Skeletal Mudstone; or Micritic Mudstone; as above.
1880'	Micritic and Skeletal Mudstone.
1950'	Micritic Mudstone; light grey, very fossiliferous (bryozoa, forams predominate), slightly glauconitic, soft, faint sub-parallel bedding planes.
2024'	Skeletal Mudstone; as above. (Has peculiar striated texture due to alignment of fossils along sub-parallel planes.
2230'	Skeletal Mudstone; as above.

DOLPHIN A-1 — Run #2 — 2/6

Sidewall Cores

(NOTE: SUBTRACT 3' FOR FDC LOG DEPTHS.)

1.	5320' IES. DEPTH	Sandy Mudstone; white to light grey, mixture of white clay matrix (very slightly calcareous) and fine to coarse, sub angular quartz grains. Thin, discontinuous wavy stringers of soft, black, opaque material (carbonaceous ?) with concretions of mica flakes. Pyritic, soft, puggy in part.
2.	5221'	Sandy Mudstone; as above.
3.	5110'	No recovery.
4.	4938'	Muddy Sandstone; as above, with more quartz, porosity poor, permeability poor. Has a very weak, light yellow to green fluorescence which doesn't cut. Odour observed by gun powder smell.
5.	4802'	Coal; black to brown-black, brittle, irregular fracture.
6.	4634'	Sandstone; (quartz arenite); white, fine to coarse grained, sub angular quartz; moderately well sorted, (medium grain predominates), virtually no matrix material. Unconsolidated. Good porosity and permeability. Dull green-yellow fluorescence No cut.
7.	~~4305'~~ 4303'	Coal; as above.
8.	4061'	Argillaceous siltstone; light grey with streaks of brown materi defined by concretions of pyrite and clay in thin, irregular laminae, defining a sub-horizontal bedding attitude. Mica in part. Soft, crumbly. The more porous streaks have a dull yellow-green fluorescence, with a slow dull yellow cut.
9.	4032' 29'	Silty, muddy Sandstone; white, very fine to medium, sub angula to sub rounded quartz grains, with much silt sized quartz. Poorly sorted, white clay matrix. Soft, unconsolidated. Porosity moderate; permeability moderate. Strong light blue fluorescence immediate dull yellow cut.
10.	4028'	Mudstone; dark brown to chocolate brown, massive, only slightly fissile, sub-conchoidal cleavage.
11.	4000'	Sandy Mudstone; or Muddy Sandstone; dark green to brown, abundant dark green clay material with scattered fine to medium grained sub angular quartz. Poorly sorted. Glauconiti grains common. Mica. Soft, unconsolidated, patchy light blue fluorescence, weak cut.
12.	3994'	No recovery.
13.	3996'	Mudstone; dark grey to chocolate brown, very glauconitic, disseminated fine to medium, sub rounded quartz; slightly micaceous, sparsely pyritic, massive, soft to firm.
14.	3986'	Mudstone; as above.
15.	3950'	Mudstone; as above.
16.	3750'	Mudstone; light to medium ~~green~~ grey, very calcareous, fossiliferou (forams, bryozoa), pyritic, soft to firm.
17.	3540'	Mudstone; as above with abundant glauconitic grains.
18.	3000'	Mudstone; light to medium ~~green~~ grey, extremely calcareous, fossiliferous, rough bedding attitude, defined by alignment of bryozoan fragments.
19.		No recovery.

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20. 2828' Micritic Mudstone; light to medium graines, slightly fossiliferous, pyritic.

21. 2658' Muddy, micritic, skeletal limestone; light to medium grained, abundantly fossiliferous (bryozoa, forams), sparsely glauconitic and pyritic.

22. 2583' No recovery.

23. 2526' Micritic Skeletal Detrate; white, abundant fossiliferous fragments, (bryozoa, forams, mollusaka) in a white, calcareous matrix and disseminated fine to medium, sub rounded quartz grains, firm, crumbly.

24. 2434' Sandy, micritic, skeletal limestone; as above, possessing less quartz and fossiliferous fragments.

25. 2370' No recovery.

26. 2310' Skeletal mudstone or skeletal marlstone; dark green, soft, puggy, common fossiliferous fragments, very calcareous.

27. 2258' Micritic Skeletal limestone; white, abundant fossiliferous fragments, in white calcareous matrix. Occasional quartz fragment. Firm to crumbly.

Dolphin A-1 4/6

Sidewall Core Descriptions

CST Run No.3

5276	Bentonitic mudstone; light grey, fairly well compacted, silty, non calcareous, fine flecks of muscovite and clear mica. Efflouresces readily in fresh water in a soft white flocculant matter; fine carbonaceous flecks and occasional very thin carbonaceous laminae. No petroliferous odor.
5300	Sandstone; (lithic quartz arenite); light brown grey-white, soft and friable, very fine grained to granule size, angular to rounded, very poorly sorted, matrix choked. Bentonitic (kaolinitic) matrix, non calcareous. About 10% or less grey rock fragments which are quite soft (altered). No petroliferous odor. No fluorescence. No cut.
5400	Silty mudstone; light brown grey, fairly well compacted, contains abundant fine micaceous flecks and very fine carbonaceous flecks and grains. No petroliferous odor.
5428	Sandstone; (lithic quartz arenite); no petroliferous odor. Faint light blue yellow fluorescence. No cut. Faint fluorescence, probably from mud filtrate.
5540	Silty mudstone; light brown grey, fairly well compacted, non calcareo contains abundant fine flecks of carbonaceous material and occasional small plant remains. Occasional quartz grains to coarse grained, well rounded. No petroliferous odor.
5590	Sandstone;(lithic quartz arenite); light grey, fairly soft, fine to coarse grained, poorly sorted. Up to 10% grey lithic fragments, soft; soft masses of light orange brown kaolinite, altered after feldspar (?), minor finely disseminated carbonaceous flecks and biotite and muscovite flecks. No petroliferous odor. Faint fluorescence as above.
5760	Sandstone; (lithic quartz arenite); as above, grain size from very fine to granule to small pebbles; (conglomeratic). No petroliferous odor. Faint fluorescence as above.
5855	Argillaceous siltstone; light brown grey, fairly well compacted, abundant very finely disseminated carbonaceous material. Abundant fine mica flakes. Faint color banding. Laminae 1/16" to 1/4" thick. No petroliferous odor.
6090	Mudstone; dark brown grey, soft; micromicaceous, coaly plant remains to about 1/16" thick.
6105	Sandstone; (lithic quartz arenite); light grey, very fine to granule size as above. Faint fluorescence as above. No petroliferous odor.
6200	Mudstone; dark brown grey, fairly well compacted, micromicaceous, silty, fine carbonaceous flecks and grains. No petroliferous odor.
6280	Sandstone; (lithic quartz arenite); light grey, very fine to granule size. No petroliferous odor. Faint fluorescence. No cut.
6400	Argillaceous siltstone; brown grey, fairly soft, micromicaceous and contains flecks of mica to 1/4 mm across. Abundant fine carbonaceous flecks and grains and abundant fine quartz sand grains. Occasional fine carbonaceous plant remains, to about 1/4 mm thick.
6530	Argillaceous silty sandstone; brown grey, very well compacted - very fine to granule size, completely choked with matrix made up of argillaceous material, fine mica flecks and fine carbonaceous material. Large quartz grains very well rounded.

6660 Sandstone; (quartz arenite); light grey, fairly soft, fine to coarse grained, dominantly medium to coarse grained, fairly well sorted, minor amount of kaolinite matrix, contains about 5% grey lithic fragments. Very high porosity and permeability. No petroliferous odor. No fluorescence.

6765 Conglomeratic sandstone; (quartz arenite), very fine grained to pebble size, angular to rounded, soft, contains fractured pebble of brown grey chert to 3/4"; quartz pebbles, minor carbonaceous patches. No petroliferous odor. No fluorescence.

7050 Very argillaceous siltstone; light grey brown-light grey, faint color banding, fairly well compacted, very fine mica flecks, and very fine carbonaceous flecks. Sparse very fine disseminated pyrite. Occasional very fine sand grains. No petroliferous odor.

7278 Very argillaceous siltstone; light grey brown, soft, very finely disseminated carbonaceous grains and flecks, mica flecks and occasional mica crystals to 2 mm. Non calcareous.

7550 Silty mudstone; light brown grey, fairly soft, micromicaceous and abundant fine, carbonaceous flecks. Occasional carbonaceous plant remains. Mica flakes, as above.

7790 Argillaceous silty sandstone; light brown grey, very soft, color laminated, very fine to medium grained, clay choked, contains discontinuous dark grey laminae rich in disseminated carbonaceous material and mica flakes. Much kaolinitic matrix. No fluorescence, no petroliferous odor.

7930 Shale; (mudstone); dark brown grey, fairly well compacted, sub fissile micromicaceous and contains much finely disseminated carbonaceous material.

8075 Shale; as above.

8180 Shale; as above.

8320 Sandstone; (quartz arenite); fine to coarse grained, dominantly medium grained, fairly well sorted, fairly soft, contains abundance of kaolinitic matrix about 5% dark grey grains - carbonaceous flecks and grains and biotite and muscovite flakes. No fluorescence.

8381 Tuffaceous sandstone (greywacke) light grey, grey-grey green, dominant medium grained, very well compacted, consists of medium to coarse volcanic debris in a tuffaceous argillaceous matrix. No fluorescence, no show.

8503 Altered volcanic rock; very dark grey brown, microcrystalline, (aphanitic), heavily altered fractures and fractures infilled with white dolomitic veins to about 2 mm across.

8550 Tuffite; mottled grey green, light grey green, fairly hard, fine to medium grained, occasional lenses of very fine grained quartz sand.

8603 Sandstone; (quartz arenite); light grey white, fine grained to granule angular to rounded, very poorly sorted, white to light grey kaolinite matrix about 5% dark grey mineral fragments and occasional carbonaceou grains, very finely xrystalline pyrite aggregates, faint mineral fluorescence.

Dolphin A-1.

6/6.

SIDEWALL CORES - RUN # 4 SHOT 10 REC 10

4036' Shale: dark chocolate brown, carbonaceous, party micaceous, pyritic, homogeneous, firm with very thin parallel silty laminations.

4035' Sandstone (Quartz Arenite), light grey, very fine-silty, moderately well sorted, abundant micaceous flakes, and scattered black opaques, thin discontinuous laminations of dark brown shale, finely cross bedded. Firm to crumbly, dull light blue fluorescence; pale blue cut.

4033' Sandstone: as above, no laminations, uniform dull light blue fluorescence, slow pale blue cut.

4030' Sandstone: (Quartz Arenite), light grey, silty-very fine with occasional fine, moderately well sorted, slight pyritic and micaceous, soft uniform bright blue fluorescence, light blue cut.

4022' Mudstone: Chocolate brown, silty, slightly micaceous, abundant fine grained, rounded nodular pyritic concretions disseminated throughout. Firm, powders easily under probe.

4014' Sandstone (Quartz Arenite), light-medium grey, fine, well sorted homogeneous, unconsolidated, dull yellow fluorescence, strong light blue cut.

4011' Sandstone (Quartz Arenite), aggregate of fine-medium rounded quartz grains, well sorted, no clay matrix, homogeneous, unconsolidated. Strong light yellow fluorescence, immediate, streaming, strong light yellow cut.

4004' Sandstone (Quartz Arenite), light-medium grey, silty-very fine, sub angular to sub-rounded quartz grains, slightly pyritic, massive, unconsolidated. Strong light blue-white fluorescence, immediate, streaming, strong light blue-white cut.

4000' Sandstone (Quart Arenite), light-medium grey, predominantly fine with occasional medium-coarse grained rounded quartz, moderately sorted, slightly micaceous and pyritic, homogeneous, unconsolidated. Light blue fluorescence, immediate strong light blue cut.

3993' Mudstone: very dark brown to black, arenaceous, scattered fine-coarse rounded quartz grains, abundant glauconite and pyrite, soft.

2.2. CORE SAMPLE DESCRIPTIONS

DOLPHIN A-1

CORE DESCRIPTIONS

Core No.1 — 4009 - 4034' (drls.depth) Cut: 25' Recovery: 12'

(4016 - 4041' F.D.C.)

4009-4012 (FDC - 4016-4019)	Sandstone; light grey, medium to coarse grained, dominantly medium grained, sub angular to well rounded, well sorted, very soft, loosely consolidated, micaceous, pyritic, argillaceous matrix, uniform blue yellow fluorescence, instant cut, strong petroliferous odour.
4012-4018 (FDC - 4019-4025)	Silty shale; chocolate brown-grey, fairly well developed fissility, abnormally small pyritic nodules to about .25 mm, micromicaceous, slightly carbonaceous, strong petroliferous odour, spotty yellow fluorescence on bedding surfaces.
4017-1018	Silty shale; as above, contains irregular lenses of fine to medium grained sandstone, light grey, with micaceous, pyritic matrix.
4018-4019	Sandstone; brown grey, fine to granule, dominantly medium to granule size, very soft, friable, carbonaceous, micaceous matrix, uniform straw yellow fluorescence, instant cut, strong petroliferous odour.
4019-4021 (FDC - 4026-4028)	Sandstone; light grey, ~~fair~~ fine to coarse grained, poor sorting, sub angular to well rounded, kaolinitic, pyritic, micaceous matrix, yellowish stain, bright yellow uniform fluorescence, instant cut, strong petroliferous odour.

Definite oil slick on mud from core barrel and strong petroliferous odour when core removed from barrel.

Core No.2 — 4034 - 4064' (drls.depth) Cut: 30' Recovery: 23'

(4035 - 4065' F.D.C.)

4034-4034.5 (4035-4035.5' FDC Log)	Siltstone; light grey, laminated dark grey, thin wavy, carbonaceous, argillaceous, laminae, brown-yellow fluorescence, good cut, slight petroliferous odour.
4034.5-4035 (4035.5'-4036' FDC Log)	Silty shale; brown grey, hard, well compacted, with thin, light grey silt to very fine grained sandstone lenses, and discontinuous laminae and 3" thick coal seam, black to bituminous sandstone lenses, fluorescence bright yellow, petroliferous odour, good cut.
4035-4036 (4036-4037 FDC Log)	Silty shale; chocolate brown-grey, hard, micromicaceous, carbonaceous plant impressions, fine carbonaceous flecks, very fine pyrite nodules, sub fissile, pyritic leaf ? fossil impressions on bedding surfaces.
4036-4040 (FDC - 4037-4038)	Silty shale; as above, contains thin lenses and discontinuous laminae of very fine grained to silty sandstone, fluoresces bright yellow, good cut, strong petroliferous odour.
4040-4043.5 (FDC - 4038-4051.5)	Silty shale; as above.
4043.5-4045.5 (FDC - 4051.5'-4053)	Silty shale; as above, with silty sand lenses as above.

4045-5-4046 (4046.5 4047 FDC)	Sandstone; dark brown-grey, friable, fairly well compacted, medium to granule size, poorly sorted, matrix made up of carbonaceous rich, argillaceous and micaceous material. Patchy straw yellow fluorescence, petroliferous odour, light blue yellow cut.
4046-4048.5 (FDC - 4047-4049.5)	Silty shale; as above.
4048.5-4049	Coal; black, brittle, sub conchoidal fracture, bituminous.
4049-4050.5	Sandstone; light grey, fine to medium grained, dominantly fine grained, very soft, friable, micaceous - argillaceous matrix, distinct mica flakes (muscovite), patchy yellow oil stain - disseminated fine coal grains and fine carbonaceous laminations (½ mm thick), bright yellow fluorescence throughout.
4050.5-4054 (FDC - 4051.5-4055)	Sandstone; light brown-grey, fine to granule, dominantly coarse to granule, abundant carbonaceous grains and mica flakes, very friable matrix of fine mica, pyritic and argillaceous material. Excellent porosity and permeability. Spotty bright yellow fluorescence, petroliferous odour with good cut. Mud permeated.
4054-4056 (FDC - 4055-4057)	Shale; chocolate brown-grey, fairly hard, silty, well developed fissility, micromicaceous, abundant carbonaceous plant impressions and fine carbonaceous flecks, very fine pyrite nodules, occacional pyritic worm impressions (?) grades to brittle mudstone with sub conchoidal fracture.
4056-4057	Sandstone; light grey, fine grained to coarse to granule, dominantly coarse to granule, angular to sub rounded, trace of pyrite, mica flakes, trace fine carbonaceous, kaolinite matrix soft, friable, very high porosity, spotty straw-yellow fluorescence, bright yellow cut, no distinct petroliferous odour, mud permeated.

Core No.3 4064 - 4089 (drls.depth) Cut: 25' Recovery: 20'

(4060 - 4085 F.D.C.)

4064-4069 (FDC - 4060-4065)	Sandstone; light grey, fine to granule, dominantly coarse grained, very soft, friable, very little matrix, of minor argillaceous and fine mica, occasional large white mica flakes, rare, coarse grains of blue-grey felspar, grades in part to fine sandstone, with very thin carbonaceous laminations to ½" thick, patchy fluorescence, faint petroliferous odour, light blue-yellow cut.
4069-4072 (FDC - 4065-4068)	Shale; chocolate brown-grey, silty, well compacted - sub-fissile, micromicaceous, abundant fine pyrite nodules grades to mass mudstone with sub-conchoidal fracture, contains thin discontinuous, light grey siltstone - very fine grained sandstone lenses and laminae. No show.
4072-4077 (FDC - 4068-4073)	Sandstone; light grey, fine to granule, very poor sorting, angular, well rounded, soft, friable, kaolinitic, carbonaceous, micaceous matrix, occasional flecks of white mica, grades to fine to medium grained sandstone, with shaly laminae - (discontinuous) to ½" thick. No show.
4077-4083.6 (FDC - 4073-4079.6)	Silty shale; as above, thin siltstone, very fine grained sandstone lenses and discontinuous laminae as above, in part very small scale cross beds. No show.
4083.6-4084	Bituminous coal; black.

3990-4009 ft: Loose quartz sand, white - light grey, medium - course - granule, predominantly coarse, subangular to well rounded, abundant glauconite and pyrite.

Core No. 1. 4009-4034 ft. Cut 25 ft, recovered 12 ft.

4009-4012 ft: Sandstone, light grey, medium to coarse, very soft, well sorted. Pyritic, argillaceous matrix. Blue yellow fluorescence, odour.

4012-4018 ft: Silty shale - chocolate brown, well developed fissility, small pyrite nodules, slightly carbonaceous. Spotty yellow fluorescence.

4018-4019 ft: Sandstone brown grey, fine to granule poorly sorted, straw yellow fluorescence.

4019-4021 ft: Sandstone light grey, fine to coarse, poorly sorted, subangular to well rounded, kaolinite pyrite and micaceous matrix.

Core No. 2. 4034-4064 ft: Cut 30 ft., recovered 23 ft.

4034-4045 ft: Silty shale, chocolate brown to grey, fairly hard, micro micaceous, fine pyrite nodules. Thin light grey very fine sandstone lenses; bright yellow fluorescence, odour and cut.

4045-4046 ft: Sandstone; dark brown to grey, friable, well compacted, medium granular, poorly sorted; patchy yellow fluorescence; good odour and cut.

4046-4048 ft: Silty shale as above.

4048-4049 ft: Coal.

4049-4054 ft: Sandstone; light grey, fine - medium grained, soft, friable, patchy stain, fluorescence, odour and cut.

4054-4056 ft: Shale; chocolate brown.

4056-4057 ft: Sandstone as above.

Core No. 3. 4064-4089 ft. Cut 25 ft., recovered 20 ft.

4064-4069 ft: Sandstone as above. Patchy fluorescence, faint odour, light blue yellow cut.

4069-4072 ft: Shale; chocolate brown, silty as above. Very fine grained sandstone laminae.

4072-4077 ft: Sandstone as above.

......../3

4077-4083.5 ft: Silty shale.

4083.5-4084 ft: Coal.

CUTTINGS DESCRIPTIONS :

4089-4130 ft: Coal and siltstone.

4130-4160 ft: Loose sandstone coarse.

4160-4170 ft: Coal.

4170-4180 ft: Loose sandstone.

4180-4190 ft: Coal minor sandstone and shale.

4190-4220 ft: Loose sandstone.

4220-4230 ft: Carbonaceous silty mudstone.

4230-4280 ft: Loose sandstone fairly hard.

4280-4430 ft: Sandstone, light grey, loose quartz sand grains, coarse to granular, angular to sub-rounded with minor black/brown coal and siltstone.

4430-4450 ft: Sandstone as above with 40% coal.

4450-4470 ft: Sandstone as above with minor coal and siltstone.

4470-4480 ft: Sandstone as above with 50% coal.

4480-4540 ft: Sandstone as above with minor coal and siltstone.

4540-4600 ft: Sandstone with minor coal.

4600-4620 ft: Sandstone and coal in equal amounts.

4620-4670 ft: Sandstone as above with siltstone.

4670-5285 ft: Sandstone, loose quartz coal and minor siltstone. Lower 100 ft. has hard light grey to buff dolomitic cement.

5285-5412 ft: Sandstone and coal.

CORE ANALYSIS :

The following depth corrections should be applied to the core analysis data in last week's report -

1 - 4	add 7 ft.
5 - 8	add 1 ft.
9 -12	subtract 4 ft.

Also the following analysis information should be added -

4038-4040	Perm.	10m.d.
	Por.	26.21
	Oil	14.5
	Water	61.8

2.3. Petrographic Descriptions

DOLPHIN – 1.

PETROGRAPHIC DESCRIPTION OF A VOLCANIC ROCK FROM BETWEEN 8,350 AND 8,570 FEET IN ESSO'S DOLPHIN 1 WELL

BY J.B. HOCKING

Sample: A chip from a junk basket sample of the interval 8,350–8,570 feet in Esso's Dolphin 1 well, Gippsland Basin.

Thin Section No.: 9361A (V.M.D. collection)

- - - - -

1. Hand Specimen – Summary

The rock is greenish black (5GY 2/1) to olive black (5Y 2/1), hard and crystalline, and seemingly basaltic in composition.

2. Thin Section Description

2.1. Review

The chip is from a basic igneous rock and is inequigranular-porphyritic and holocrystalline, with a pilotaxitic texture. It is relatively fresh and is composed of partially altered olivine phenocrysts set in a fine-grained groundmass consisting primarily of plagioclase feldspar, pyroxene, iron ore and chlorite[1].

A very approximate visual estimate of the proportion of the main mineral constituents is as follows :-

	%
Olivine	5
Plagioclase	45
Pyroxene	30
Iron Ore	10
Chlorite (groundmass)	10

2.2. Details

The colorless to pale green olivine phenocrysts are up to 2 mm. long and, although the original hexagonal outline is sometimes partially preserved, the crystals now possess characteristic peripheral embayments and irregular internal cracks. In addition, they are largely altered and replaced by a green to green brown chlorite mineral and also by carbonate, presumably calcite. A cloudy grey, probably titaniferous, material lines the internal cracks.

The plagioclase feldspar, consisting mainly of sodic labradorite, occurs as randomly orientated laths up to 1 mm. long or as shapeless interstitial crystals (often untwinned). In some parts of the thin-section there are pseudo-phenocrysts of cloudy brown material up to 1 mm. across. Examination under high power indicates that these represent relatively large crystals or crystal aggregates of plagioclase feldspar of the groundmass phase that have undergone alteration to kaolinite, sericite, and patchy, very fine-grained carbonate.

[1] minerals of the 'chlorite group' (sensu Winchell) which includes normal chlorites and normal serpentines as part of a continuous series.

 2/2.

The pyroxene is a very pale buff-colored augite (probably slightly titaniferous) in the form of equant crystals and stumpy laths that are generally subhedral. They range up to 0.5 mm. across but are usually closer to 0.1 mm. Ophitic texture is lacking.

Both skeletal iron ore (ilmenite), largely primary in origin, and chlorite are scattered throughout the groundmass. The former occurs as enhedral to subhedral crystals or crystal aggregates and the latter as vermicular growths and shapeless patches. The two are often closely associated and in some cases the vermicular chlorite forms haloes around ilmenite crystals.

The thin-section is transected by a thin (0.1 mm. wide) vein that is largely filled by granular mosaic of a ?zeolite mineral and, to a lesser extent, by finely-crystalline carbonate and rare pyrite.

3. Conclusions

3.1. Rock Classification: OLIVINE BASALT

3.2. Stratigraphic Implications

Assuming that the groundmass chlorite is derived from the devitrification of volcanic glass, as it could well be, then the Dolphin basalt most closely resembles the 'Flinders Type' of the 'Older Volcanic Series' of Victoria (Edwards, 1938).

- - - - -

Reference

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

Barry Hocking

J.B. Hocking
Geologist
Sedimentary Basin Studies Section

30th October, 1968.

DOLPHIN – 1.

Thin section examination

Dolphin A-1 - Volcanic samples (8300-8500) interval.

Dolerite and Basalt; intergranular to sub ophitic texture and holocrystalline, colourless, anhedral augite, hypidiomorphic plagioclase and interstitial black opaques. Other fragments on slide show coarse to microcrystalline calcite-dolomite.

This extrusive appears very similar to the Narracan group basalts of probable Paleocene age which occur overlying Strzelecki Group in the Narracan Range east central Victoria.

WFI
~~WHN~~:AW

29-12-67

3.0. Palynology Report

CONFIDENTIAL

INTERPRETATIVE

PALYNOLOGY REPORT

ON

DOLPHIN -1

BY

LEWIS E. STOVER

Palynology Report 1970/14

June 1970.

INTRODUCTION

As part of a regional study of dinoflagellates from the Nothofagidites asperus Zone in the Gippsland Basin, samples from Dolphin -1 between 3950 and 4075 feet were examined to determine the type of dinoflagellates. Previously, Dettmann (24 April, 1968) had reported rare microplankton at 4028 feet and the associated spore-pollen assemblage indicates that this sample can be assigned confidently to the N. asperus Zone.

SUMMARY

Sample	Drill Depth	Age	Dinoflagellate Zone
swc 15,14 & 12	3950/96 feet (composite residue)	Eocene	D. extensa
Core 2	4040 feet		No dinoflagellates
Core 3	4068-72 feet		Indeterminate
Core 3	4074-75 feet	Eocene	D. extensa

COMMENT

A reasonably diverse but poorly preserved dinoflagellate assemblage was identified in the residues from sidewall cores 15, 14 and 12 between 3950 and 3996 feet. The index fossil, Deflandrea extensa, occurs with three other species (Cordosphaeridium capricornum, Eisenackia ornata, Peridinium eocenicum). The combined occurrence of these species suggests that the assemblage is from near the top of the D. extensa Zone. Deflandrea extensa was the only dinoflagellate identified in the sample from core 3 at 4074-75 feet. The intervening samples contained no dinoflagellates or non-diagnostic forms.

Other occurrences of Deflandrea extensa from the Gippsland Basin are from Barracouta -3 at 3604 feet (sidewall core 18) and from the onshore well Glencoe -4 at 180 feet.

BASIN GIPPSLAND DATE

WELL NAME DOLPHIN -1 ELEVATION + 31 feet

AGE	PALYNOLOGIC ZONES	HIGHEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	2 way time	LOWEST DATA Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time
IG MIOC.	T. bellus										
	P. tuberculatus										
EOCENE	U. N. asperus										
	L. N. asperus	3950	0			1.012	4075	0	4305	1	[illegible]
	P. asperopolus	4509	2			1.127	4509	2			1.127
	U. M. diversus	4624	1			1.151	4624	1			1.151
	L. M. diversus	4902	2			1.202	4902	2			1.202
PALEO-	L. balmei	5276	1			1.270	6090	2			1.419
	T. longus	6130	2	6200	2	[illegible]	6200	2			1.424
LATE CRETACEOUS	T. lilliei	6400	2			[illegible]	7278	2			1.612
	N. senectus	7550	2			[illegible]	8180	2			1.750
	C. trip./T.pach.										
	C. distocarin.										
	T. pannosus										
EARLY ...ACEOUS	C. paradoxa										
	C. striatus										
	U. C. hughesii										
	L. C. hughesii										
	C. stylosus										
Pre-Cretaceous											

COMMENTS: Samples below 4075 feet not seen by ESOA palynologists; determinations based on report by M.E.Dettmann and should be regarded as provisional.

T.D. 9461 [illegible]

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 spores 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.

DATE RECORDED BY: L.E.S./A.D.P. DATE DEC. 1971

DATA REVISED BY: DATE

BASIN *GIPPSLAND* DATE

WELL NAME *DOLPHIN-1* ELEVATION *+31 feet*

AGE	PALYNOLOGIC ZONES	HIGHEST DATA Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time	LOWEST DATA Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time
OLIGO.	P. tuberculatus										
	U. N. asperus										
EOCENE	M. N. asperus	3950	2	3996	0		4075	0			
	L. N. asperus	4305	1				4305	1			
	P. asperopolus	4624	2				4624	2			
	U. M. diversus										
	M. M. diversus										
	L. M. diversus	4902	1				4902	1			
PALEOCENE	U. L. balmei	5276	1				5540	2	5400	1	
	L. L. balmei	6090	1				6090	1			
	T. longus	6400	1				6400	1			
LATE CRETACEOUS	T. lilliei	7050	2				7550	2			
	N. senectus	7930	1				8180	1			
	C. trip./T.pach.										
	C. distocarin.										
	T. pannosus										
EARLY CRETACEOUS											
PRE-CRETACEOUS											

COMMENTS: *Deflandrea extensa Dinoflagellate Zone 3996(1) - 4075(1)*

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

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

DATA RECORDED BY: *LES/ADP* DATE *June 1971; Dec. 1971*

DATA REVISED BY: *ADP.* DATE *Jan. 1971.*

FORM No R 315 12/72

CONFIDENTIAL

Form R 193 3/71

BASIN GIPPSLAND BASIN BY David TAYLOR

WELL NAME DOLPHIN-1 DATE 19 April 1971 ELEV. +31'

Foram Zonules

		Highest Data	Quality	2 Way Time	Lowest Data	Quality	2 Way Time
MIOCENE	A				950	2	
	Alternate						
	B	1000	2				
	Alternate						
	C				1950	2	
	Alternate						
	D_1	2024	2				
	Alternate						
	D_2				2526	2	
	Alternate						
	E	2658	1		2750	2	
	Alternate						
	F	2828	1		2950	3	
	Alternate						
	G	3000	1		3300	3	
	Alternate						
	H_1	3400	3				
	Alternate						
	H_2				3700	3	
	Alternate						
OLIGOCENE	I_1	3750	1				
	Alternate						
	I_2				3900	3	
	Alternate						
	J_1	3920	3		3950	3	
	Alternate						
	J_2						
	Alternate						
EOC.	K						
	Alternate						
	Pre K						

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 __________

WELL NAME: DOLPHIN # 1

W510

DEPTH (FT)	SAMPLE TYPE	PRESER-VATION	DIVERSITY	SPORE/POLLEN ZONE	DINOFLAGELLATE ZONE	CONFIDENCE LEVEL	ENVIRONMENT
3950-3996	SWC's 15,14,12	Good	High	N. asperus	D. extensa	5	Marine
4028	SWC	Good	Moderate	N. asperus	-	5	Marginal marine
4040-41	Core 2	Good	High	N. asperus	? D. extensa	5	Marginal marine
4068-72	Core 3A	Fair	Moderate	N. asperus	-	5	Marginal marine
4074-78	Core 3	Good	High	?U N. asperus	-	5	Marginal marine
4305	SWC	Good	High	L N. asperus	D. extensa	5	Marginal marine
4902	SWC	Good	High	?U M. diversus	-	5	Non-marine
6090	SWC	Fair	High	L. balmei	-	5	Non-marine
6200	SWC	Good	High	? T. longus	-	5	Non-marine
6400	SWC	Good	High	T. longus	-	5	Non-marine
7050	SWC	V. Poor	Low	Indeterminate - virtually barren	-	-	-
7278	SWC	V. Poor	V. low	Indeterminate - virtually barren	-	-	-
7550	SWC	V. Poor	Moderate	N. senectus	-	4	Non-marine
7930	SWC	V. Poor	Low	Indet. - not older than N. senectus	-	Non-marine	-
8075	SWC	V. Poor	V. Low	no older than N. senectus	-	Non-marine	-
8180	SWC	V. Poor	V. Low	no older than N. senectus	-	Non-marine	-

PALYNOLOGY SUMMARY.
Page 1 of 1.

OIL and GAS DIVISION

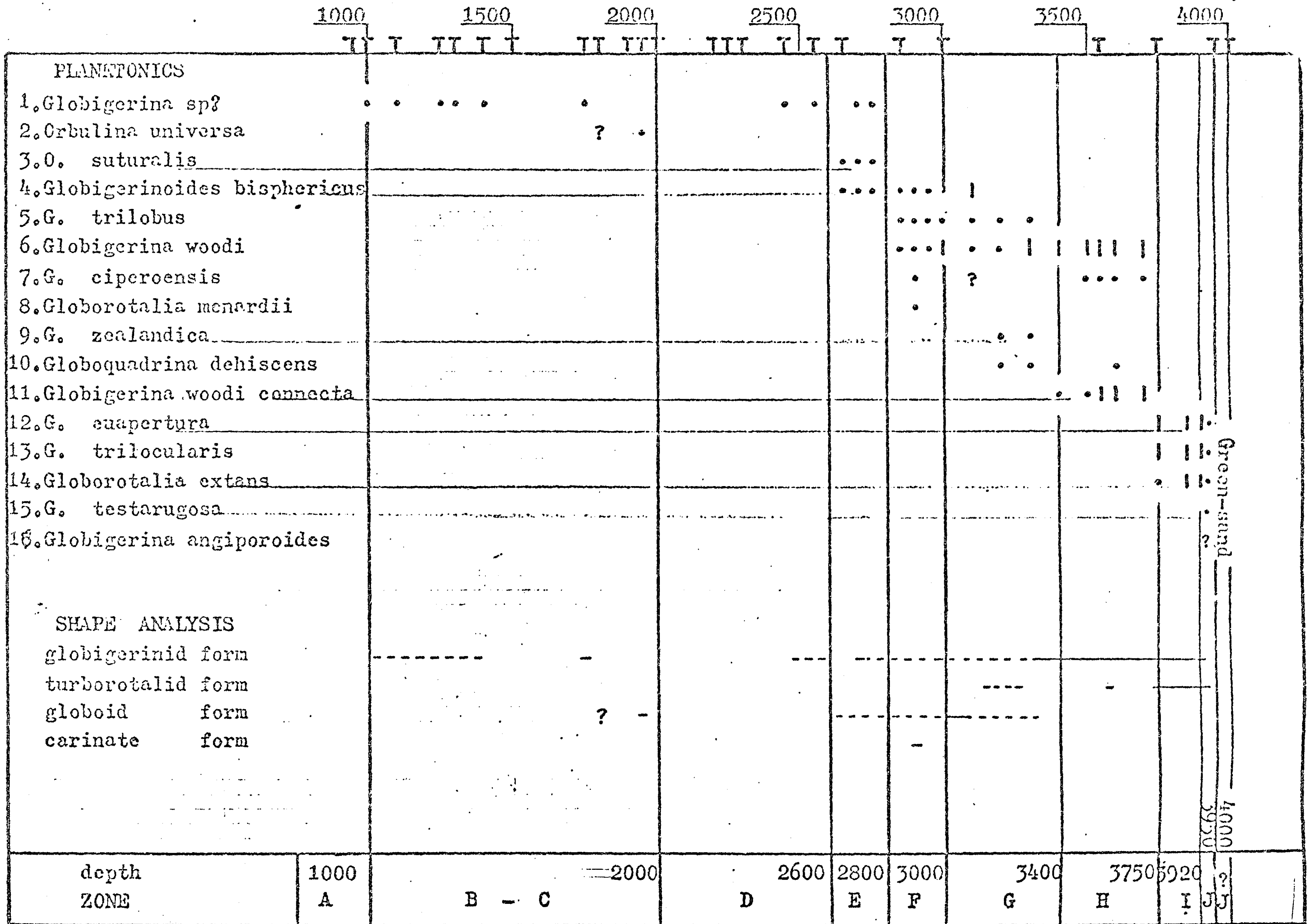
3 FEB 1983

BY W.K. HARRIS

FOR AQUITAINE, PHILLIPS, SHEL

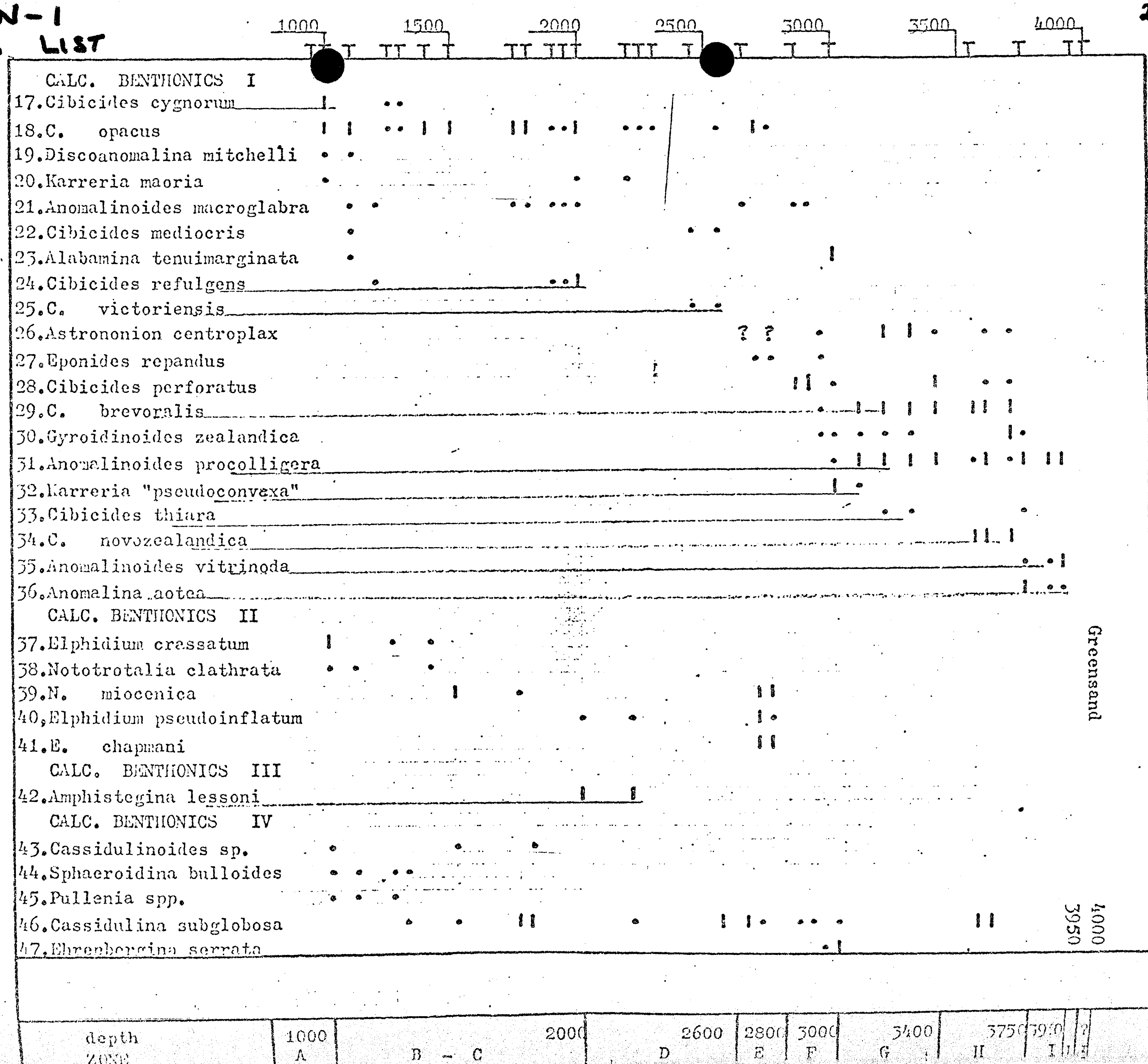
3-1. Species List

DOLPHIN - 1 SPECIES LIST



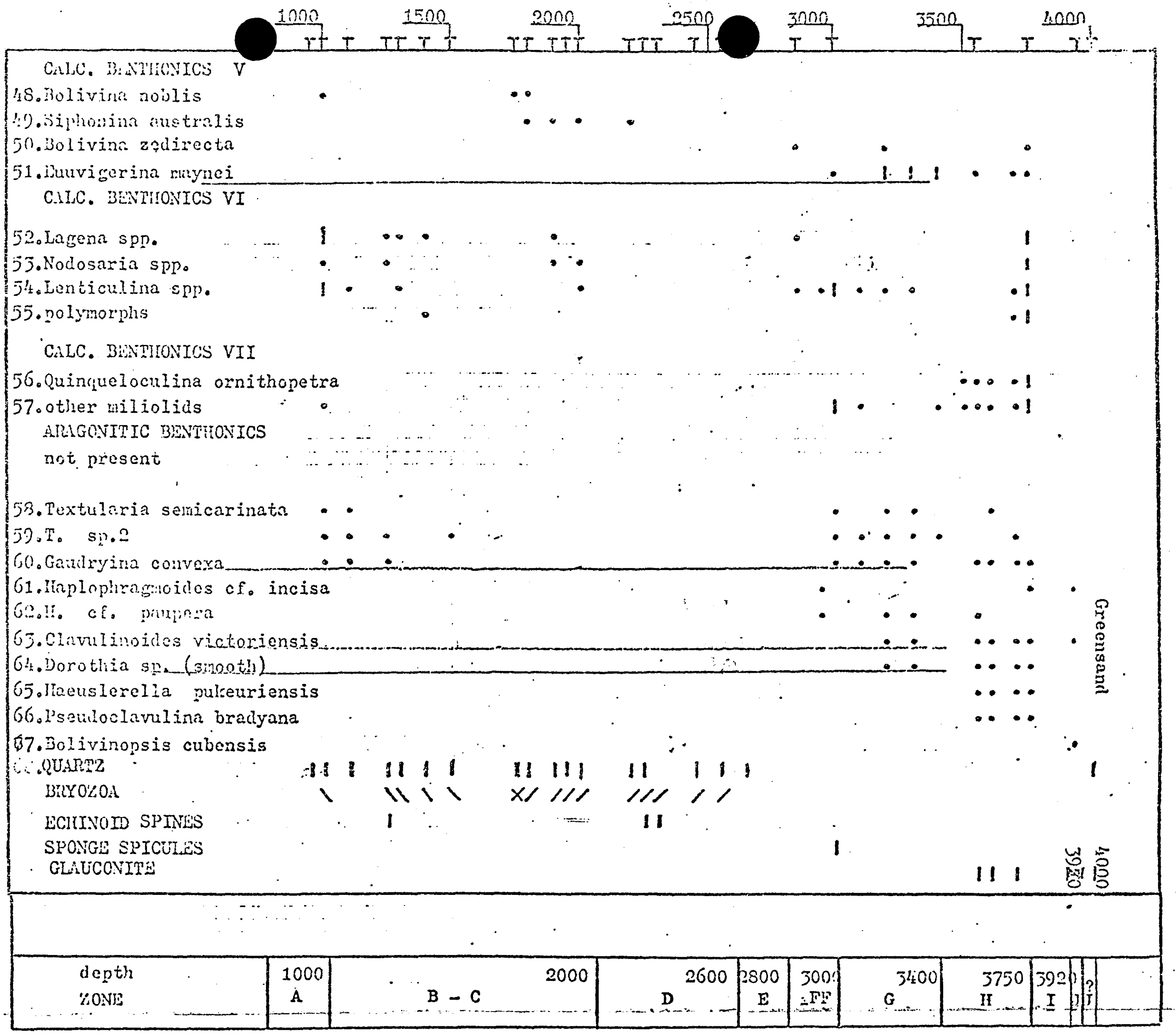
Dolphin-1. Species List.

DOLPHIN-1
SPECIES LIST



2/3

DOLPHIN – 1 SPECIES LIST



All depths are at datum of +31'

T = side wall cores at:- 797, 950, 1000, 1103, 1228, 1316, 1410, 1524, 1766, 1810, 1880, 1950, 2024, 2230, 2258, 2310, 2434, 2526, 2658, 3000, 3540, 3750, 3960, 3986, 3996, 4000.

Conventional cores at:-

Core -1	- 4009	Nothing found
Core -2	- 4041	Nothing found
Core -3	-4068 & 4074	- Nothing found

• = 1 – 20   ▌= over 20   \ = fresh   / = worn

Data Sheets

4.0. Miscellaneous

DOLPHIN A-1

DESCRIPTION OF SAMPLING CONDITIONS FITS

FIT #1	4074'	Recovered only water and mud with no show of oil. Pressure on tool at surface was 400 psi. When opened, pressure dropped to zero after 0.1 cu.ft. of gas had been released (solution gas from water). Collected water sample for analysis.
FIT #2	4052'	Pads sealed but sampling pressure dropped to practically zero. Recovered only a little mud. No samples taken.
FIT #3	4000'	Recovered a full tool of liquid. Pressure on tool was 200 psi at surface. Repressured tool to ± 1000 psi and took 3 samples (2 - one liter and 1 - two liter) under pressure. The first sample contained some free gas which had not redissolved when chamber was repressured. Second and third samples were all oil. Released pressure on remaining liquid in tool and determined gas-oil ratio to be 170 cu.ft. per bbl. Saved residual oil in gallon cans.
FIT #4	4055'	Recovered 12,000 cc water and 500 cc mud with no show of oil. Tool did not fill completely and pressure at surface was zero. Collected two samples of water for analysis. The first water from the tool (last to enter) was collecte to check any possible difference in salinity from the rest of the contents.

DOLPHIN A-1

RESULTS OF WATER ANALYSES

	FIT #1 4074 Ft. (First Water) mg/ltr	FIT #4 4055 Ft. (First Water) mg/ltr	FIT #4 4055 Ft. (Rem.Water) mg/ltr
Suspend matter	1907	1468	976
Dissolved Solids *	7218	2734	2808
Sodium as Na^{+}	872	726	725
Calcium as Ca^{++}	64	124	96
Magnesium as Mg^{++}	44	17	34
Chloride as NaCl	1845	1335	1335
Sulphate as $SO_4^{=}$	978	244	236
Bicarbonate HCO_3^{-}	1130	429	702
Carbonate as $CO_3^{=}$	144	144	Nil
Conductivity, mho/cm, at 25°C	7300	3760	3740
pH	8.3	8.3	7.7

* Includes some organic matter which could not be filtered out.

DOLPHIN A-1

CRUDE OIL ANALYSIS

Sample From FIT #3

Reservoir Oil Composition:

	Mol %	Weight %
Methane	11.9	1.83
Ethane	0.2	0.05
Propane	1.3	0.52
Butanes	4.9	2.71
Pentanes	4.8	3.30
Hexanes	12.8	10.53
Heptanes	6.4	6.11
Octanes	9.8	10.76
Nonanes	6.0	7.32
Decanes plus	41.9	56.87
	100.0	100.00

Gas-Oil ratio (flash at 15 psia, 73°F) : 170 SCF/STB

Properties at standard conditions (14.7 psia, 60°F):

API Gravity	46°
Pour point	less than -45°F
Sulphur content	0.22% wt.
Wax content	8.1% wt.
Viscosity (at 20°C)	1.77 centistokes
Naptha content (ASTM distillation to 375°F)	46.7% vol.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Page 1 of 1

Company ESSO STANDARD OIL — Formation — Page 1 of
Well DOLPHIN A-1 — Cores 1,2& 3 — File
Field WILDCAT — Drilling Fluid FRESH WATER GEL — Date Report 13 OCT.,67
~~County~~ AUSTRALIA — State VICTORIA — Elevation 31" KB — Analysts JKM,ES,DS.
Location BASS STRAIT — Remarks

CORE ANALYSIS RESULTS

(Figures in parentheses refer to footnote remarks)

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCYS		POROSITY PERCENT	RESIDUAL SATURATION		PROBABLE PRODUCTION	REMARKS
		HORIZONTAL	VERTICAL		OIL % VOLUME % PORE	TOTAL WATER % PORE		
1	4009-10 (16-17)	*		37.9	36.4	51.0		SS.LT OLIVE GY,MED GR,SUB RN
2	~~[illegible]11-12~~ (18-19)	*		3[illegible].1	21.0	59.3		SS.GY V/CRSE GR,MICACOUS
3	4018-19 (25-26)	*		32.8	22.6	50.1		SS.BRN GY,CRSE GRN,CALC,MICA
4	4020-21 (27-28)	*		29.9	20.4	46.5		SS.BUFF,FN-MED GRN,ANG-SUBRN
5	~~404[illegible]~~ (46-47)	356		24.1	2.7	82.1		SS.DK BRN,MED GRN,SUB RND.
6	~~4050-51~~ (51-52)	*		29.9	3.0	72.0		SS.GY,V/CRSE GRN,SL MICA.
7	~~4051-52~~ (52-53)	104		29.2	5.8	70.6		SS.GY,FN GRN,CALC,MICACOUS.
8	~~4052-53~~ (53-54)	1.2		25.3	9.1	70.7		SS.GY; V/FN GRN,ANG-SUB RND.
9	~~4064-65~~ (60-61)	*		32.6	0	85.8		SS.LT-MED GY,MED-CRSE GRN.
10	~~4066-67~~ (62-63)	722		30.2	4.3	74.9		SS.LT GY,V/FN-FN GRN,SILTY.
11	~~4073-74~~ (69-70)	501		32.0	0	78.4		SS.LT GY,FN-V/CRSE GRN,MICA.
12	~~[illegible]075-76~~ (71-72)	781		30.2	0.7	91.0		SS.LT GY,V/FN GRN,SILTY.
13.	4038-40 (conv)	<10 md.		26.2	14.5	61.8		Ss, 14.5%, v.f.g. laminae in dirty (<2mm) slts.

*TOO FRIABLE FOR PERMEABILITY MEASUREMENT.

NOTE:
(*) REFER TO ATTACHED L[illegible]
(1) INCOMPLETE [illegible] RECOVERY-INTERPRETATION RESERVED.
(2) OFF LOCATION ANALYSES-NO INTERPRETATION OF RESULTS

5.0. Detailed Formation Evaluation of the La Trobe Valley Fm – Dolphin A1, Gippsland Basin, Victoria, Australia.

Detailed Formation Evaluation of the Latrobe Valley Formation, Dolphin A-1, Gippsland Basin, Victoria, Australia

A detailed formation evaluation has been made for the Dolphin A-1 well as per the October 23, 1967, request of Esso Standard Oil (Australia) Ltd. The evaluation of the Latrobe Valley formation from 3992' to 5400' is based on a detailed examination of the well logs, core descriptions and analysis, sample descriptions, mud gas log, and wireline formation tests. This memorandum presents both a summary and a detailed tabulation of the log interpretation results. The methods used in obtaining these results are discussed.

Summary of Results

The Latrobe Valley formation in the Dolphin A-1 well is a sequence of highly porous sandstone, silty shales, shales, and bituminous coal beds, according to the core and sample descriptions. The porous sands from 3997' to 4034' (32' net) have been interpreted to be oil bearing. All other sands in the Latrobe Valley formation are interpreted to be primarily water bearing. These interpretations are in reasonable agreement with the core data, mud gas log, and wireline formation tester results.

A summary of the log interpretation results for the formation containing hydrocarbon are presented below.

Depth Interval (ft)	Net Pay (ft)	Average Porosity (%)	Average Water Saturation (%)
3997-4005	8	29.9	53
4005-4011	6	29.4	30
4011-4018	7	31.8	28
4023-4028	5	31.0	37
4028-4034	6	31.2	47
Total	32		

A slight oil show interpreted for three sand intervals from 4038' to 4040', 4059' to 4066', and 4085' to 4088' is not considered to be significant. All other sandstones below 4040' are interpreted to be 100% water saturated.

Formation water resistivities are high for the Latrobe Valley formation in the Dolphin A-1 well. A calculated resistivity value of 1.35 ohm-m at 150°F was used in the saturation calculations for the hydrocarbon-bearing sands. This value was the minimum R_{wa} for the sand intervals from 4038' to 4088'. The equivalent NaCl concentration of 1900 ppm is not greatly different from one water sample recovered on a wireline test at

4055' which had a reported equivalent NaCl concentration of 2,300 ppm. Sandstones below 4088' had apparent water resistivities which were much higher.

Discussion

Scope of Log Interpretation

Detailed log interpretations were made for all porous formations considered to be sandstone for the Latrobe Valley formation from 3992' to 5400'. All well logs, sample descriptions, core data, mud gas log, and wireline test results were utilized in the interpretation. Results of the detailed study include interpretations of lithology, porosity, apparent water resistivity, water saturation, and net pay.

Data for Interpretation

The following well logs were available for study; all were run by Schlumberger in open hole conditions during October, 1967.

6FF40 Induction Electrical log	2218-5405'
Laterolog 7 (with SP)	3900-5401'
Microlaterolog (with caliper)	3950-4250'
Borehole Compensated Sonic log (BHC - with caliper)	2217-5391'
Compensated Formation Density log (FDC with GR and caliper)	2218-5402'
Gamma Ray-Neutron log	3900-4600'

Other data available for study were descriptions of conventional cores, sample descriptions, conventional core analysis data, wireline test data, and a mud gas log.

Lithology Interpretations

A study was made comparing all of the available logging curves with the core and sample descriptions to delineate the different lithologies. The sample descriptions and core descriptions (4016'-4085') provided the primary source of information for lithological identification shown in Table II.

Coal beds were identified by sample description and by high resistivity, low gamma radiation, low bulk density, low transit time, and borehole enlargement. The range of log readings for the coal beds is listed on the following page.

Resistivity (ohm-m)	130+
Gamma ray (API units)	12-13
Neutron (API units)	445-520
Density (gm/cc)	1.38-1.8
Transit time (microsec/ft)	133-143
Hole Diameter (inches)	12.5-16.0+

Shale and siltstone beds were identified by the high gamma radiation and high bulk density. Resistivities were in the range of 12 to 16 ohm-m for the interval 3992' to 4381' and increased to a range of 18 to 60 ohm-m for the interval 4381' to 5405'. The increase in resistivity may possibly be due to a change in the mineralogical content of the shale and/or to a decrease in the salinity of the water contained in the shale. Characteristic log measurements for the shales and siltstones are as follows:

Resistivity (ohm-m)	12-16	(3992-4381')
	18-60	(4381-5405')
Gamma ray (API units)	80-130	
Density (gm/cc)	2.24-2.50	
Transit time (microsec/ft)	80-120	

Permeable sandstones were identified by sample and core descriptions and by relatively low gamma ray anomalies, low bulk densities, and by the presence of a filter cake.

Porosity Calculations

Interpretations of porosity were obtained from the density, sonic, microlaterolog, and neutron log over the intervals which were logged. The density and sonic logs were considered to be most reliable, whereas the neutron log is considered to be least reliable.

Density log porosity was based on a cross plot of core porosity and log measured bulk density as shown in Fig. 1. Data used for the plot are given in Table I. The straight line relationship assumes that the matrix density is 2.65 gm/cc, a standard value for quartz sandstones. The straight line drawn in Fig. 1 is identical to that reported for the Halibut A-1 well. This relationship gives a fluid density of 1.05 gm/cc, a value which may be slightly higher than the actual density of the fluids in the formations.

Sonic log porosity was obtained by using the core porosity-sonic log transit time calibration curve shown in Fig. 2. A matrix transit time of 55.0 microsec/ft and an apparent fluid transit time of 227.0 microsec/ft was used for the curve. The calibration curve is not in agreement with the one established for the Halibut A-1. Higher transit time values are encountered in the Dolphin A-1, probably because the sands in this well are less compacted than those in the Halibut A-1 well. Our experience has shown that compaction corrections are normally needed at depths of 5000' to 6000' or less for Tertiary and Cretaceous sediments along the U.S. Gulf coast, in the North Sea, and in other parts of the world. We believe that the difference between the calibration curves for the Halibut and Dolphin wells is primarily due to compaction.

Neutron log porosity was obtained from the Schlumberger calibration curve for limestone designed for the GNT neutron tool. The calibration curve labeled limestone in Fig. 3 was taken from Schlumberger's neutron chart book for the GNT-F sonde, 15½" spacing, Am-Be source, 12½" borehole diameter, 10.5 lb/gal mud, and a temperature of 150°F. A second curve shown in Fig. 3, which is labeled sandstone, corrects for the effect of a sandstone matrix and was used in the porosity interpretation of the neutron log. This calibration curve is identical to the one developed for the Halibut A-1 well. A cross plot of core porosity and neutron counting rate was also made in Fig. 3. The correlation between core porosity and neutron counting rate is poor and does not agree too well with the Schlumberger calibration curve developed for sandstone. Porosity values obtained from the neutron calibration curve give porosity values which tend to be too high when compared with the density and sonic log results. This difference may be due to the presence of shale or silt in the sandstones or to other lithological variations.

Porosity values were also calculated using the microlaterolog. The Humble formation factor-porosity relationship was used in this report. Porosity values obtained from the microlaterolog could be compared with the other log-calculated porosities only to a depth of 4250', since the microlaterolog was not run below this depth. Microlaterolog calculated porosity values are much less than the other log-derived porosities for the hydrocarbon sands from 3997' to 4034'. The difference is interpreted to be due to the effect of residual hydrocarbon saturation on the microlaterolog readings. An average correction of 30% residual hydrocarbon saturation brings the microlaterolog porosity values into good agreement with the density and sonic log-derived porosity values. Sand intervals from 4038' to 4040', 4059' to 4060', and 4085' to 4088' also appear to have some minor amounts of residual hydrocarbon saturation because the microlaterolog porosity values are slightly lower than for the density and sonic log porosity values.

A comparison of the porosity interpretation of the density, sonic, and neutron logs revealed no indication of gas saturation. It was concluded, therefore, that there is no gas cap present in the Dolphin A-1 well.

The best estimate of porosity for each of the sands analyzed was assumed to be the arithmetic average of density and sonic log porosity.

The neutron log porosity values were higher than the density and sonic values and were considered to be less reliable because of the adverse effect of shaliness. Porosity values calculated from the microlaterolog were not used because of the effect of residual hydrocarbons. All results of the porosity calculations are shown in Table II.

Water Saturation Calculation

Water saturation calculations were obtained through the standard Archie relationship:

$$S_w = \left[\frac{FR_w}{R_t}\right]^{1/n}$$

where S_w is water saturation as a fraction of pore space,
F is formation resistivity factor,
R_w is formation water resistivity,
R_t is resistivity of non-invaded formation, and
n is saturation exponent.

Average readings from the induction log were used for R_t except in a few cases where the induction log read 100 ohm-m or more. In these cases, readings from the Laterolog 7 were used for R_t.

The Humble equation was used to relate formation factor and porosity, where

$$F = 0.62\phi^{-2.15} .$$

This equation works reasonably well for the interpretation from 3997' to 4250' where porosity values from the density and sonic log compare favorably with the microlaterolog porosity in sands considered to be water bearing. Comparisons below 4250' cannot be made because the microlaterolog was not run below 4250'.

Three sources of R_w data (and water salinity data) were considered for this investigation: (1) interpretation of the SP log, (2) resistivity of recovered water on wireline tests, and (3) apparent water resistivity, R_{wa}, calculated for sandstones considered to be water bearing. Of these sources, the R_{wa} approach provided the most complete and reliable information.

The SP appeared to give a slight negative voltage for the sandstones from 3997' to 4040'. It then decreases to a very low value, possibly zero millivolts, and at 4120' appears to develop a positive voltage which probably increases with depth. Unfortunately, a definite shale base line could not be recognized from the SP curve and, therefore, the SP was not used to calculate R_w.

Wireline formation tests taken at 4055' and 4074' recovered water as follows:

Test 4055', recovered 12000 c.c. water, 500 c.c. mud, water resistivity 2.62 ohm-m at 70°F, 1.2 ohm-m at 152°F (2200 ppm equivalent NaCl)

Test 4074', recovered 20,000 c.c. water, 500 c.c. mud, water resistivity 1.50 ohm-m at 70°F, 0.69 ohm-m at 152°F (4000 ppm equivalent NaCl)

The measured filtrate resistivity value was 0.44 ohm-m at 152°F which was much lower than the water resistivity values of 1.2 and 0.69 for the water recovered on the tests. Because of possible contamination by mud filtrate, water data obtained from the wireline tests were considered to be unsuitable for use in the log interpretation. However, the data confirm that the formation water resistivities are much higher than normally experienced in the Latrobe Valley formation.

In view of the uncertainty of the SP curve and wireline test data, we used the R_{wa} approach to estimate the value of R_w. R_{wa} values were obtained for all sandstones by dividing the induction log resistivity values by the corresponding formation factor. Theoretically, R_{wa} will equal R_w if the formation contains only formation water and the true resistivity and formation factors are used in the calibration. These assumptions were considered to be valid for all sands below 4120'. A minimum R_{wa} value of 1.35 ohm-m (at 152°F) was calculated for the sands from 3997' to 4088', and it was therefore used in the calculations for S_w in Table II. The equivalent NaCl concentration for an R_w of 1.35 ohm-m at 152°F is 1950 ppm, which indicates that the formation water is less saline than previously reported for the Latrobe Valley formation in other wells. The resistivity measurements of the formation water recovered on the wireline tests at 4055' and 4074' also help to confirm our observations.

R_{wa} values increase below 4088' and vary from 1.05 to 3.05 ohm-m for the sandstones from 4120' to 4910'. A further increase from 5.0 to 7.7 ohm-m was calculated for sandstones from 4919 to 5385'. These apparent water resistivity values (R_{wa}) are much higher than can be calculated from the SP curve. This discrepancy may be due to the presence of the bivalent ions Ca and Mg as explained in Ref. 1. Complete chemical analysis of the water recovered from the wireline tests and, if possible, additional wireline tests in the lower sandstones may be useful in order to accurately determine the chemical make-up of the formation water and its resistivity.

Water saturation calculations were made using (1) the calculated R_{wa} value for R_w, (2) formation factor obtained from the average log porosity,

(3) true formation resistivity from the induction log or laterolog, and (4) a saturation exponent of 1.8.

Hydrocarbon Saturation and Net Pay

A study of the lithology, porosity, and water interpretations showed that the Latrobe Valley formation in Dolphin A-1 contains oil-bearing sands from 3997' to 4034' with a net thickness of 32'. Minor shows were encountered for sandstone intervals from 4038' to 4040', 4059' to 4066', and 4085' to 4088'. All other sandstones were interpreted to be water bearing.

Detailed Results

The detailed results of all log interpretations are presented in Table II. Included in the results are porosity, water saturation, net thickness, and lithology for individual beds.

FSMillard:pc
November 13, 1967

Ref. 1 Gondouin, M., Tixier, M. P., Simard, G. L., "An Experimental Study on the Influence of the Chemical Composition of Electrolytes on the SP Curve," Trans. AIME (1957), Vol. 210, pp. 58-72.

Table I

Core Depth (feet)	Log Depth[1] (feet)	Core Porosity (%)	ρ_b gm/cc	Δt microsec/ft	N API units
4010	4017	37.8	2.12	109	660
4012	4019	38.1	2.10	109	600
4019	4026	32.8	2.125	110	600
4021	4028	29.9	2.175	109	570
4040	4040	26.2	2.24	107	600
4046	4047	24.1	2.20	107	540
4051	4052	29.9	2.22	107	720
4052	4053	29.2	2.22	107	660
4053	4054	25.3	2.20	107	630
4065	4061	32.6	2.16	108	700
4067	4063	30.2	2.16	111	660
4074	4070	32.0	2.22	104	650
4076	4072	30.2	2.22	105	650

(1) Log depth for FDC, BHC, and N.

Table II: Detailed Log Interpretation, Latrobe Valley Formation,
Esso Standard Oil (Australia) Ltd., Dolphin A-1, Gippsland Shelf, Victoria, Australia

Depth Interval (Density Log) ft	Net Sand ft	d in	ρ_b gm/cc	Δt μsec/ft	R_{MLL} ohm-m	R_{IL} ohm-m	R_{LL} ohm-m	GR API	N API	SP MV	(1) ϕ_D %	(2) ϕ_S %	(3) ϕ_{MLL} %	(4) ϕ_N %	(5) ϕ_{AVG} %	(6) F	(7) R_w	(8) R_{wa}	R_o	$\frac{R_t}{R_o}$	(9) S_w n=1.8	Remarks
3992-3997	(5)	12.5	2.42	93	7.0	7.0	7.0	60	770	- 8	44.5	22.4	22.0	28.0	18.4	23.0	1.35	0.30	31.0	--	--	Sandstone,very shaly
3997-4005	8	12.0	2.19	105	8.0	35.0	26.0	32	660	-11	30.0	29.7	21.0	37.0	29.9	8.2	1.35	4.25	11.0	3.2	53.	Sandstone,shaly
4005-4011	6	12.0	2.17	103	9.0	350+	100.0	24	775	-12	30.3	28.5	20.0	28.0	29.4	8.5	1.35	11.8	11.4	8.8	30.	Sandstone
4011-4018	7	12.0	2.13	107	5.7	230+	100.0	28	695	-11	32.8	30.8	24.0	34.0	31.8	7.3	1.35	13.7	9.8	10.2	28.	Sandstone
4018-4023		12.7	2.3	117	14.0	12.5	15.0	120	560	--	--	--	--									Silty shale
4023-4028	5	12.0	2.16	109	6.2	65.0	50.0	40	660	-10	30.9	32.0	23.0	37.0	31.0	7.8	1.35	8.35	10.5	6.2	37.	Sandstone
4028-4034	6	12.3	2.17	109	6.0	40.0	25.0	128	600	-10	30.3	32.0	23.5	41.0	31.2	7.6	1.35	5.36	10.3	3.9	47.	Sandstone,shaly to very shaly
4034-4038		13.0	2.18	117	18.0	14.0	17.0	108	590		--	--	--									Siltstone,silty shale
4038-4040	(2)	12.3	2.24	107	10.5	15.0	16.0	108	610	- 5	29.7	30.8	18.0	41.0	30.0	8.0	1.35	1.75	10.8	1.4	82.	Silty sandstone
4040-4049		13.0	2.25	115	16.0	14.0	17.0	100	540		--	--	--									Silty shale
4049-4055	(6)	12.5	2.22	105	4.6	13.5	14.5	40	810	0	27.2	29.7	27.0	26.0	27.4	10.0	1.35	1.35	13.5	1.0	100.	Sandstone
4055-4059		13.0	2.24	120	90.0	19.5	30.0	112	540		--	--	--									Shale,siltstone
4059-4066	(7)	12.3	2.16	110	4.1	12.8	13.0	40	710	0	30.9	32.8	28.0	32.0	30.6	8.0	1.35	1.6	10.8	1.2	91.	Sandstone
4066-4070		13.0	2.27	135	15.0	15.0	20.0	102	540		--	--	--									Shale,siltstone
4070-4074	(4)	12.0	2.23	105	5.0	13.9	13.5	84	650	0	26.5	29.7	26.0	37.0	27.4	10.0	1.35	1.39	13.5	1.0	100.	Sandstone
4074-4081		12.5	2.29	112	50+	16.2	23.5	92	480		--	--	--									Silty shale
4081-4083		12.5	1.80	133	100+	30.0	50.0	80	495		--	--	--									Coal
4083-4085		12.5	--	109	30.0	--	--	80	--		--	--	--									Silty shale
4085-4088	(3)	12.0	2.15	105	4.8	17.0	17.0	40	720	0	31.5	29.7	27.0	32.0	29.3	8.4	1.35	2.0	11.3	1.5	80.	Sandstone
4088-4094		13.0	--	70	40+	29.0		92	--		--	--	--									Silty shale
4094-4116		17.0+	1.38	145	--	140.+	130.±	14	460		--	--	--									Coal
4116-4120		13.5	2.33	--	15.0	15.0	15.0	88	580		--	--	--									Silty shale
4120-4142	(22)	12.0	2.33	93	4.8	24.0	25.0	50	740	+ 6	20.2	22.5	26.0	30.0	22.9	14.0	--	1.72	24.0	1.0	100.	Sandstone,silty sand
4142-4159	(17)	11.8	2.24	93	4.0	25.0	22.0	24	810	+13	26.0	22.5	28.0	26.0	25.3	11.0	--	2.27	25.0	1.0	100.	Sandstone
4159-4166		13.0	1.48	141	--	220.±	230.±	16	450		--	--	--									Coal
4166-4182	(16)	12.0	2.17	111	4.0	21.0	16.0	28	750	+12	30.4	27.2	28.0	30.0	28.5	9.0	--	2.34	21.0	1.0	100.	Sandstone
4182-4196	(14)	11.7	2.27	90	4.5	30.0	22.0	24	815	+11	24.0	21.0	27.0	26.0	23.7	13.0	--	2.30	30.0	1.0	100.	Sandstone
4196-4216	(20)	11.7	2.16	99	3.4	20.0	18.0	32	695	+12	31.0	26.2	31.0	34.0	29.4	8.4	--	2.40	20.0	1.0	100.	Sandstone
4216-4219		13.2	1.65	138	--	50.+	100.±	26	520		--	--	--									Coal
4219-4226		15.0	1.85	94	--	14.0	19.0	108	565		--	--	--									Mudstone

Depth Interval (Density Log) ft	Net Sand ft	d in	ρ_b gm/cc	Δt μsec/ft	R_{MLL} ohm-m	R_{IL} ohm-m	R_{LL} ohm-m	GR API	N API	SP MV	(1) ϕ_D %	(2) ϕ_S %	(3) ϕ_{MLL} %	(4) ϕ_N %	(5) ϕ_{AVG} %	(6) F	(7) R_w	(8) R_{wa}	R_o	$\frac{R_t}{R_o}$	(9) S_w n=1.8	Remarks
4228-4239		12.5	--	--	--	--	--	64	--	--	--	--	--									Coal streaks and mudstone
4239-4244	(5)	11.7	2.23	98	4.0	20.0	19.0	64	720	+ 7	26.5	25.6	--	32.0	26.0	10.0	--	2.0	20.0	1.0	100.	Sandstone, calcareous and dolomitic
4244-4259	(15)	11.7	2.35	93	8.7	35.0	32.0	68	690	+ 7	19.0	22.4	--	34.0	20.7	18.0	--	1.95	35.0	1.0	100.	Sandstone, calcareous and dolomitic
4259-4268		13.5+	1.48	141	--	150.±	240.±	12	445		--	--	--									Coal
4268-4293	(25)	13.5+	2.27	97	--	28.0	26.0	34	775	+10	24.0	25.0	--	28.0	24.5	11.5	--	2.44	28.0	1.0	100.	Sandstone
4293-4300		13.0	1.48	143	--	360.±	290.±	12	445		--	--	--									Coal
4300-4320	(20)	12.3	2.21	101	--	27.5	22.0	32	740	+10	28.0	27.3	--	30.0	27.7	9.5	--	2.90	27.5	1.0	100.	Sandstone
4320-4360	(40)	12.3	2.32	91	--	30.0	25.0	40	780	+ 8	21.6	21.5	--	27.5	21.6	17.0	--	1.75	30.0	1.0	100.	Sandstone
4360-4381	(21)	12.3	2.20	103	--	16.0	14.0	44	650	+ 9	28.4	28.4	--	38.0	28.4	9.0	--	1.80	16.0	1.0	100.	Sandstone
4381-4387		12.7	2.42	--	--	36.+	45.+	132	600													Shale, siltstone
4387-4450	(63)	12.4	2.33	89	--	20.0	18.0	38	780	+ 3	20.1	20.3	--	27.5	20.2	19.0	--	1.05	20.0	1.0	100.	Sandstone
4450-4505	(55)	12.4	2.24	96	--	29.0	24.0	38	735	+10	26.0	24.4	--	31.0	25.2	11.5	--	2.50	29.0	1.0	100.	Sandstone
4505-4540	(35)	12.5	2.30	88	--	21.0	17.0	44	775	- 7	22.0	19.8	--	28.0	20.9	18.0	--	1.12	21.0	1.0	100.	Sandstone
4540-4549		13.0+	1.50	138	--	500.±	140.±	12	460													Coal
4549-4552		12.5	2.37	89		25.0	21.0	92	690													Shale, siltstone
4552-4556	(4)	12.5	2.29	94		37.0	45.0	34	780	+10	22.8	23.2	--	27.5	23.0	14.5	--	2.56	37.0	1.0	100.	Sandstone
4556-4563		12.8	2.4	93		25.0	27.0	130	595													Shale, siltstone
4563-4586	(23)	12.5	2.26	92	--	40.0	35.0	44	750	+14	24.8	22.2	--	30.0	23.5	14.0	--	2.85	40.0	1.0	100.	Sandstone
4586-4592		12.8	2.5	83	--	28.0	29.0	120	640													Shale, siltstone
4592-4606	(14)	12.5	2.23	97	--	36.0	32.0	46	690	+15	26.5	24.9	--	34.0	25.7	10.5	--	3.13	36.0	1.0	100.	Sandstone
4606-4610		13.5	1.50	139	--	320.±	160.±	18	--													Coal
4610-4617		14.0	2.50	83	--	18.0	22.0	110	--													Shale, siltstone
4617-4635	(18)	12.5	2.29	97	--	35.0	29.0	36	--	+12	22.8	24.9	--	--	23.9	13.5	--	2.59	35.0	1.0	100.	Shaly sand
4635-4642	(7)	12.5	2.17	102	--	32.5	28.0	36	--	+12	30.3	28.0	--	--	29.2	8.5	--	3.82	32.5	1.0	100.	Sandstone
4642-4684		13.0+	2.40	96	--	21.0	25.0	92	--													Shale, sandy shale
4684-4730	(46)	12.5	2.23	94	--	45.0	36.0	40	--	+11	26.5	23.2	--	--	24.9	12.0	--	3.75	45.0	1.0	100.	Sandstone
4730-4769	(39)	12.5	2.28	88	--	48.0	38.0	38	--	+10	23.4	20.1	--	--	21.8	16.0	--	3.00	48.0	1.0	100.	Sandstone
4769-4789		13.0	2.50	--	--	21.0	22.0	70	--													Shale, siltstone
4789-4800		16.0+	1.47	140	--	500.±	190.±	12	--													Coal
4800-4810		13.3	2.47	88	--	29.0	31.0	104	--													Shale, siltstone

Depth Interval (Density Log) ft	Net Sand ft	d in	ρ_b gm/cc	Δt μsec/ft	R_{MLL} ohm-m	R_{IL} ohm-m	R_{LL} ohm-m	GR API	N API	SP MV	(1) ϕ_D %	(2) ϕ_S %	(3) ϕ_{MLL} %	(4) ϕ_N %	(5) ϕ_{AVG} %	(6) F	(7) R_w	(8) R_{wa}	R_o	$\frac{R_t}{R_o}$	(9) Sw n=1.8	Remarks
4810-4823	(13)	12.5	2.28	92	--	45.0	42.0	42	--	+ 8	23.4	22.2	--	--	22.8	14.5	--	3.10	45.0	1.0	100.	Sandstone
4823-4826		13.0	1.50	142	--	500.+	400.+	16	--													Coal
4826-4910	(84)	12.5	2.23	96	--	35.0	31.0	40	--	+ 8	26.5	24.4	--	--	25.5	11.5	--	3.05	35.0	1.0	100.	Sandstone,shaly sand
4910-4919		13.3	2.52	83	--	23.0	27.0	120	--													Shale,siltstone
4919-4960	(21)	12.5	2.23	93	--	62.0	40.0	48	--	+ 8	26.5	22.4	--		24.5	12.5	--	5.0	62.0	1.0	100.	Sandstone,shaly sand
4960-4965		13.0	2.43	80	--	45.0	33.0	120	--													Shale
4965-4990	(25)	12.5	2.29	90	--	95.0	50.0	46	--	+ 8	22.8	21.0	--	--	21.7	16.0	--	5.9	95.0	1.0	100.	Sandstone,shaly sand
4990-4994		12.5	2.36	95	--	70.0	33.0	88	--													Shale,sandy shale
4994-5000	(6)	12.5	2.17	105	--	64.0	50.0	46	--	+ 8	30.3	29.7	--	--	30.0	8.0	--	8.0	64.0	1.0	100.	Sandstone
5000-5007		13.0	2.43	87	--	30.0	27.0	108	--													Shale,siltstone
5007-5014	(7)	12.4	2.22	100	--	67.0	40.0	44	--	+ 8	27.2	26.8	--	--	27.0	10.0	--	6.7	67.0	1.0	100.	Sandstone
5014-5019		12.5	2.47	85	--	36.0	30.0	112	--													Shale
5019-5047	(28)	12.4	2.26	95	--	70.0	42.0	56	--	+ 8	24.8	24.0	--	--	24.4	12.5	--	5.6	70.0	1.0	100.	Sandstone,shaly sand
5047-5060		13.0	2.50	80	--	23.0	26.0	108	--													Shale,siltstone
5060-5081	(21)	12.4	2.22	94	--	75.0	48.0	40	--	+ 8	27.2	23.2	--	--	25.2	12.0	--	6.3	75.0	1.0	100.	Sandstone
5082-5094		13.0	2.5	85	--	20.0	26.0	108	--													Shale
5094-5140	(46)	12.4	2.27	88	--	100.0	55.0	42	--	+ 8	24.0	19.7	--	--	21.9	16.5	--	6.1	100.0	1.0	100.	Sandstone
5140-5160		13.0	2.57	79	--	21.0	23.0	112	--													Shale,siltstone
5160-5200	(40)	12.5	2.24	92	--	80.0	45.0	50	--	+ 8	26.0	22.0	--	--	24.0	13.0	--	6.2	80.0	1.0	100.	Sandstone,shaly sand
5200-5209		13.3	2.49	80	--	40.0	37.0	112	--													Shale, siltstone
5209-5257	(48)	12.6	2.27	90	--	95.0	45.0	50	--	+ 8	24.0	21.0	--	--	22.5	14.5	--	6.5	95.0	1.0	100.	Sandstone,shaly sand
5257-5290		13.3	2.55	78	--	25.0	29.0	116	--													Shale,siltstone
5290-5312	(22)	12.6	2.25	89	--	88.0	50.0	40	--	+ 8	25.2	20.3	--	--	22.8	14.5	--	6.1	88.0	1.0	100.	Sandstone
5312-5325		12.5	2.40	85	--	60.0	42.0	96	--													Shale,siltstone, sandy shale
5325-5334	(9)	12.5	2.27	90	--	80.0	55.0	48	--	+ 8	24.0	21.0	--	--	22.5	14.5	--	5.5	80.0	1.0	100.	Sandstone
5334-5350		12.5	2.52	85	--	37.0	37.0	120	--													Shale, siltstone
5350-5356	(6)	12.5	2.20	97	--	70.0	50.0	48	--	+ 8	28.4	25.0	--	--	26.7	10.5	--	6.7	70.0	1.0	100.	Sandstone
5356-5359		12.5	2.40	82	--	50.0	45.0	112	--													Shale, siltstone
5359-5370	(11)	12.5	2.27	87	--	90.0	50.0	46	--	+ 8	24.0	19.2	--	--	21.6	17.0	--	5.3	90.0	1.0	100.	Sandstone
5370-5377		12.5	2.48	90	--	34.0	37.0	104	--													Shale,siltstone
5377-5385	(8)	12.5	2.18	94	--	85.0	55.0	40	--	+ 8	29.6	23.2	--	--	26.4	11.0	--	7.7	85.0	1.0	100.	Sandstone
5385-5400		12.5	2.52	80	--	32.0	37.0	116	--													Shale,siltstone

(1) Equation for porosity using bulk density: $\phi_D = \frac{\rho_{ma}-\rho_b}{\rho_{ma}-\rho_f} = \frac{2.65-\rho_b}{2.65-1.05}$

(2) Equation for porosity using transit time: $\phi_S = \frac{\Delta t-\Delta t_{ma}}{\Delta t_f-\Delta t_{ma}} = \frac{\Delta t-55.0}{227.0-55.0}$

(3) Equation for porosity using R_{xo} from MLL: $\phi^{2.15} = \frac{0.62}{F} = \frac{0.62}{R_{MLL}/R_{mf}}$

(4) Porosity from neutron log (ϕ_N) by using Schlumberger calibration curve (Fig. 3)

(5) Average porosity value (ϕ_{AVG}) is arithmetic average of ϕ_S and ϕ_D.

(6) Formation factor for average porosity value (ϕ_{AVG}) using Humble equation: $F = \frac{0.62}{\phi^{2.15}}$

(7) Formation water resistivity $R_w = R_{wa}$ unless otherwise stated.

(8) Apparent formation water resistivity $R_{wa} = \frac{R_{IL}}{F}$

(9) Water saturation: $S_w = \sqrt[1.8]{\frac{R_o}{R_t}}$

R_{mf} = 1.12 ohm-m at 62°F
R_{mf} = 0.44 ohm-m at 152°F (BHT)

FSMillard:pc
November 8, 1967

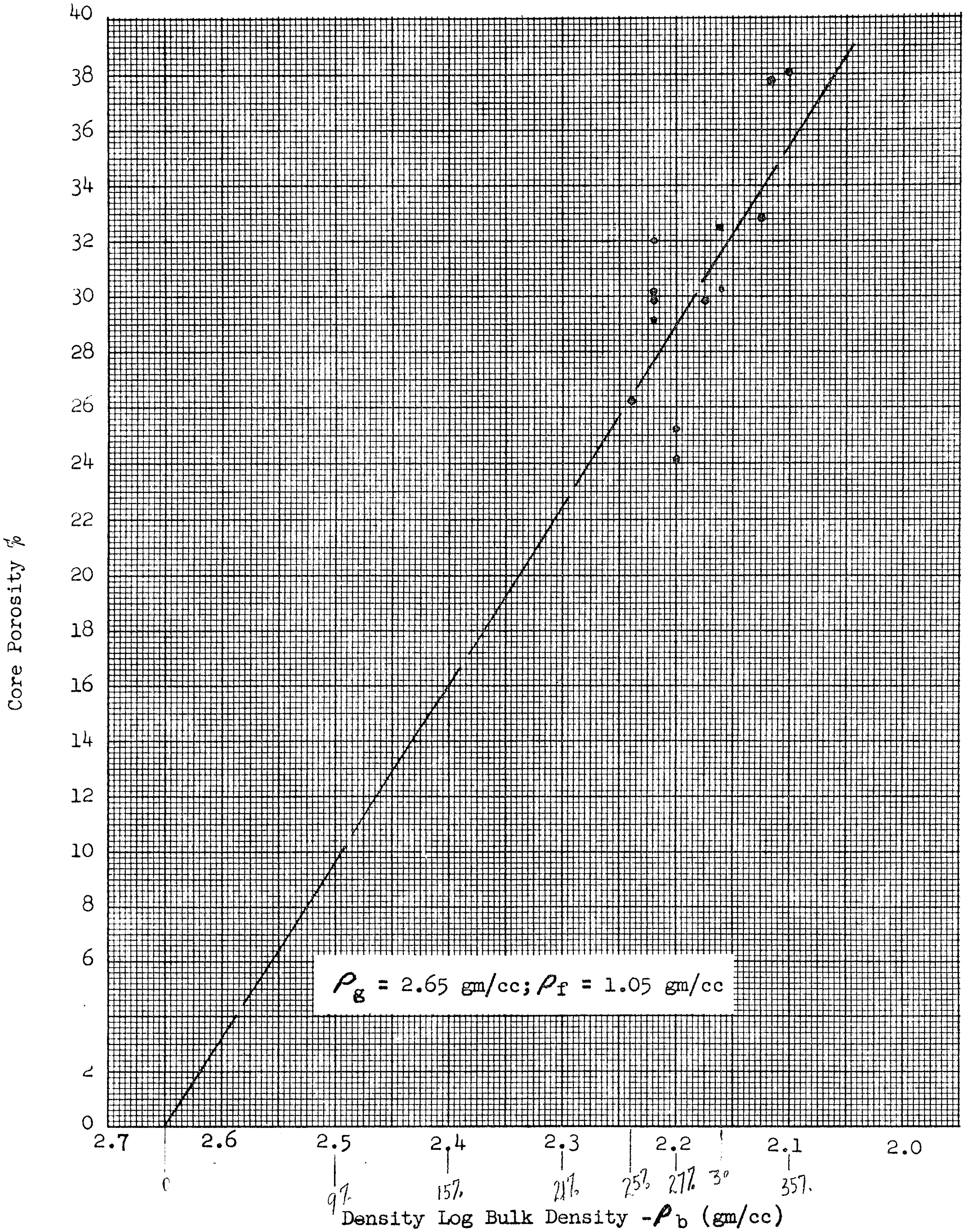


Figure 1. Core Porosity and Density Log Bulk Density, Dolphin A-1

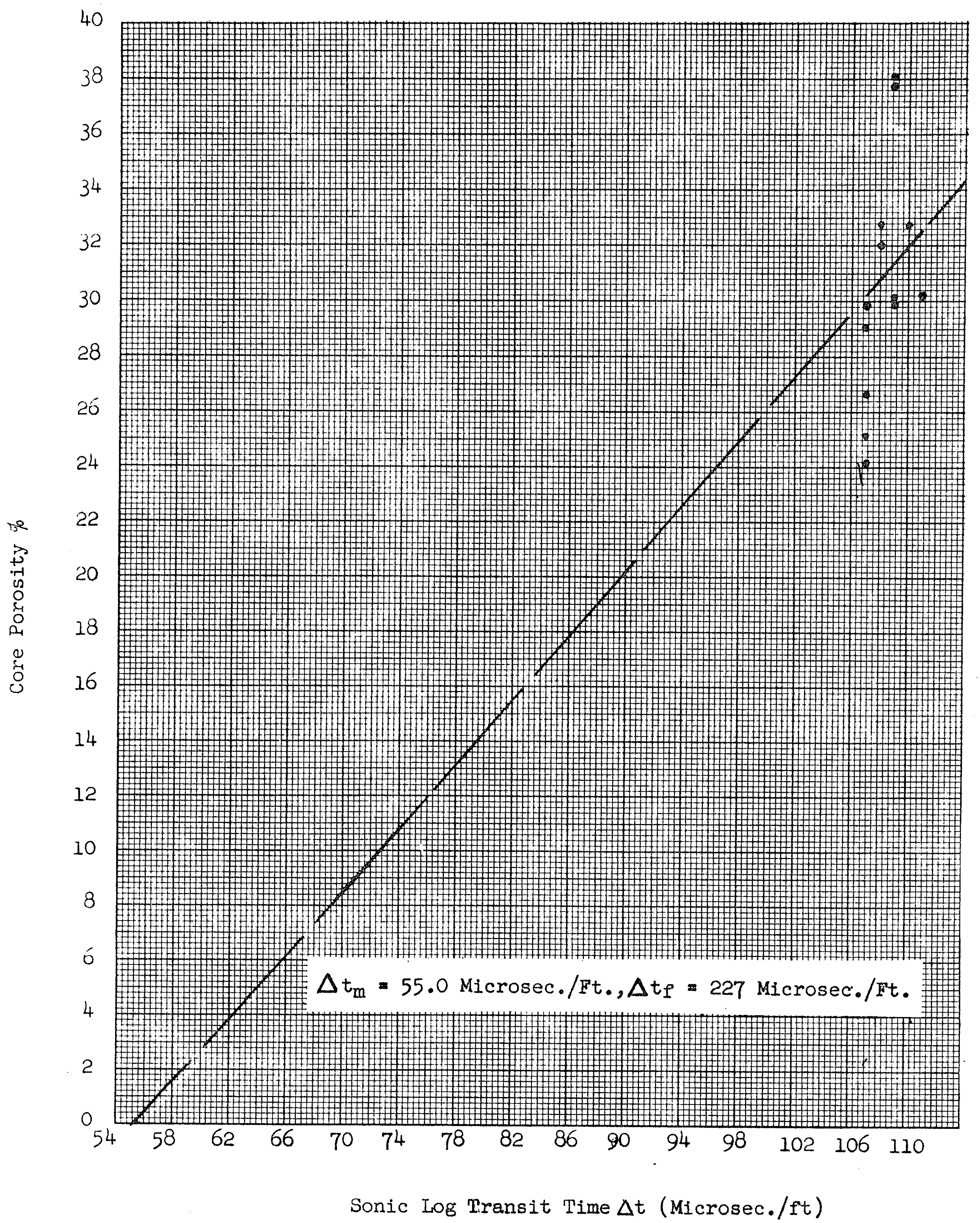


Figure 2. Core Porosity and Sonic Log Transit Time, Dolphin A-1

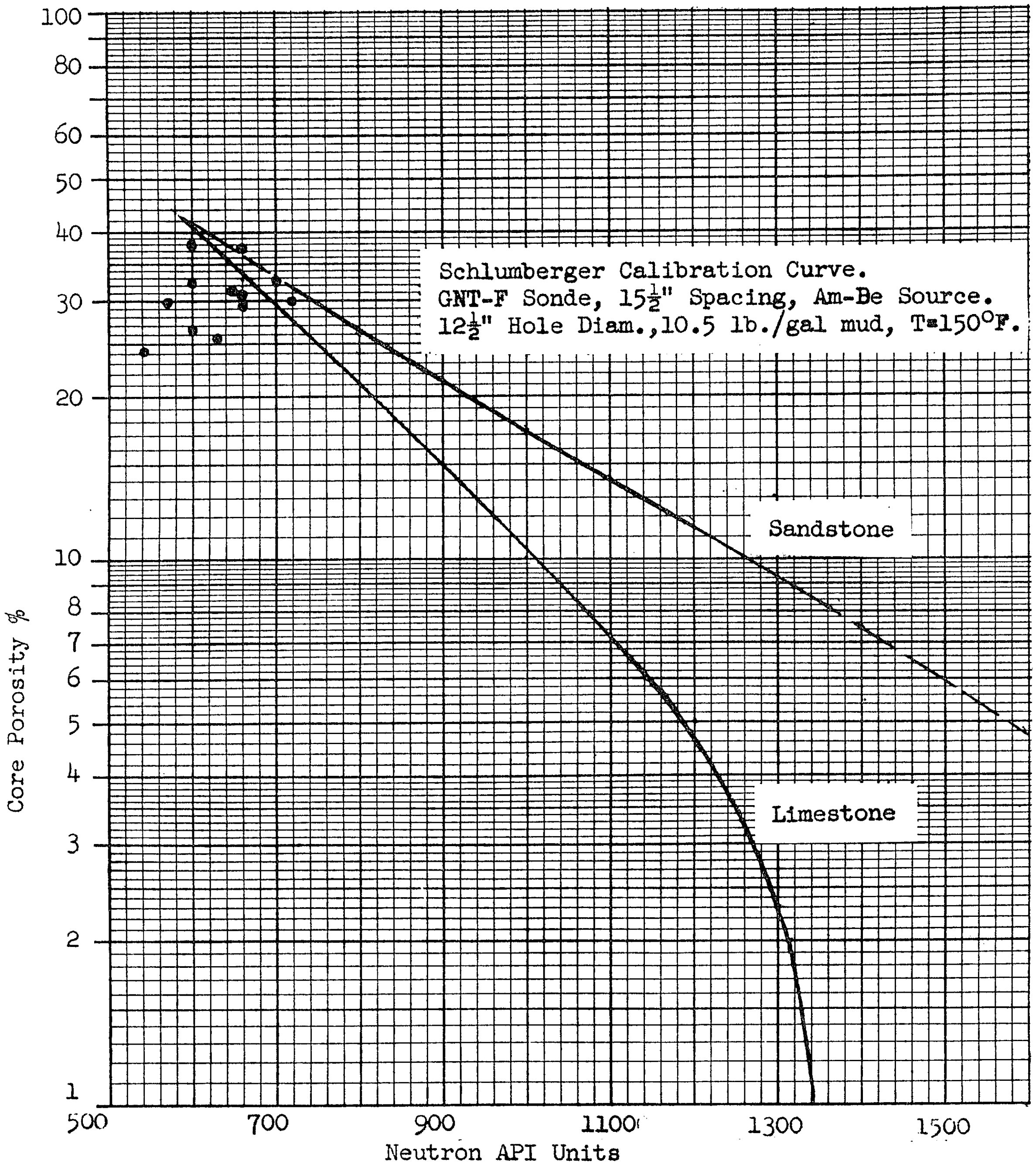


Figure 3. Core Porosity and Neutron Log API Units, Dolphin A-1

ENCLOSURES

1. FIT Data
2. Mud Log (2" : 100 ft)
3. Composite log (2" : 100 ft)

PE905449

This is an enclosure indicator page.
The enclosure PE905449 is enclosed within the container PE905448 at this location in this document.

The enclosure PE905449 has the following characteristics:

ITEM_BARCODE = PE905449
CONTAINER_BARCODE = PE905448
NAME = Dolphin A1 Formation Tester Data
BASIN = GIPPSLAND
ON_OFF = OFFSHORE
PERMIT = PEP38
TYPE = WELL
SUBTYPE = REPORT
DESCRIPTION = Dolphin A1 Formation Tester Data (FIT Data). Enclosure 1 of Summary.
REMARKS =
DATE_CREATED =
DATE_RECEIVED =
W_NO = W510
WELL_NAME = Dolphin A1
CONTRACTOR = Schlumberger
CLIENT_OP_CO = Esso Australia Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE603723

This is an enclosure indicator page.
The enclosure PE603723 is enclosed within the container PE905448 at this location in this document.

The enclosure PE603723 has the following characteristics:

ITEM_BARCODE = PE603723
CONTAINER_BARCODE = PE905448
NAME = Dophin A1 Grapholog (Mud Log)
BASIN = GIPPSLAND
ON_OFF = OFFSHORE
PERMIT = PEP38
TYPE = WELL
SUBTYPE = LOG
DESCRIPTION = Dolphin A1 Grapholog (Mud Log). Enclosure 2 of summary.
REMARKS =
DATE_CREATED =
DATE_RECEIVED =
W_NO = W510
WELL_NAME = Dolphin A1
CONTRACTOR = Core Laboratories Inc
CLIENT_OP_CO = Esso Australia Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE603724

This is an enclosure indicator page.
The enclosure PE603724 is enclosed within the container PE905448 at this location in this document.

The enclosure PE603724 has the following characteristics:

ITEM_BARCODE = PE603724
CONTAINER_BARCODE = PE905448
NAME = Dolphin A1 Induction-Electrical log (composite)
BASIN = GIPPSLAND
ON_OFF = OFFSHORE
PERMIT = PEP38
TYPE = WELL
SUBTYPE = LOG
DESCRIPTION = Dolphin A1 Induction-Electrical log (composite well log). Enclosure 3 of summary.
REMARKS =
DATE_CREATED =
DATE_RECEIVED =
W_NO = W510
WELL_NAME = Dolphin A1
CONTRACTOR = Schlumberger
CLIENT_OP_CO = Esso Australia Ltd

(Inserted by DNRE - Vic Govt Mines Dept)