COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

PETROLEUM SEARCH SUBSIDY ACTS

Publication No. 4

H.B.R. No. 1 BORE WRECK ISLAND, QUEENSLAND

OF

HUMBER BARRIER REEF OILS PTY. LTD.

Issued under the Authority of Senator the Hon. W. H. Spooner,
Minister for National Development
1960

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

Minister : SENATOR THE HON. W. H. SPOONER, M.M.

Secretary : H. G. RAGGATT, C.B.E.

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Director : J. M. RAYNER

Deputy Director : H. TEMPLE WATTS

This Report was prepared for publication in the Geological Section

Chief Geologist : N. H. FISHER

FOREWORD.

In 1957, the Commonwealth Government enacted the Petroleum Search Subsidy Act, under which companies proposing to drill for new stratigraphic information could apply for and be granted subsidies in respect of the cost of drilling operations approved by the Minister for National Development.

The Bureau of Mineral Resources, Geology and Geophysics was required, on behalf of the Department of National Development, to examine the applications, maintain general oversight of the operations, receive the samples and information, and in due course publish the results of the drilling.

The bore to be described in the following pages was put down, under the Petroleum Search Subsidy Act 1957-58, by Mines Administration Pty Ltd for Humber Barrier Reef Oils Pty Ltd at Wreck Island off the eastern coast of Queensland. This publication was prepared from reports furnished by the Company and by specialists employed on certain phases of the operation, and presents in detail the method of carrying out the drilling operation and the results obtained.

J.M. RAYNER
Director.

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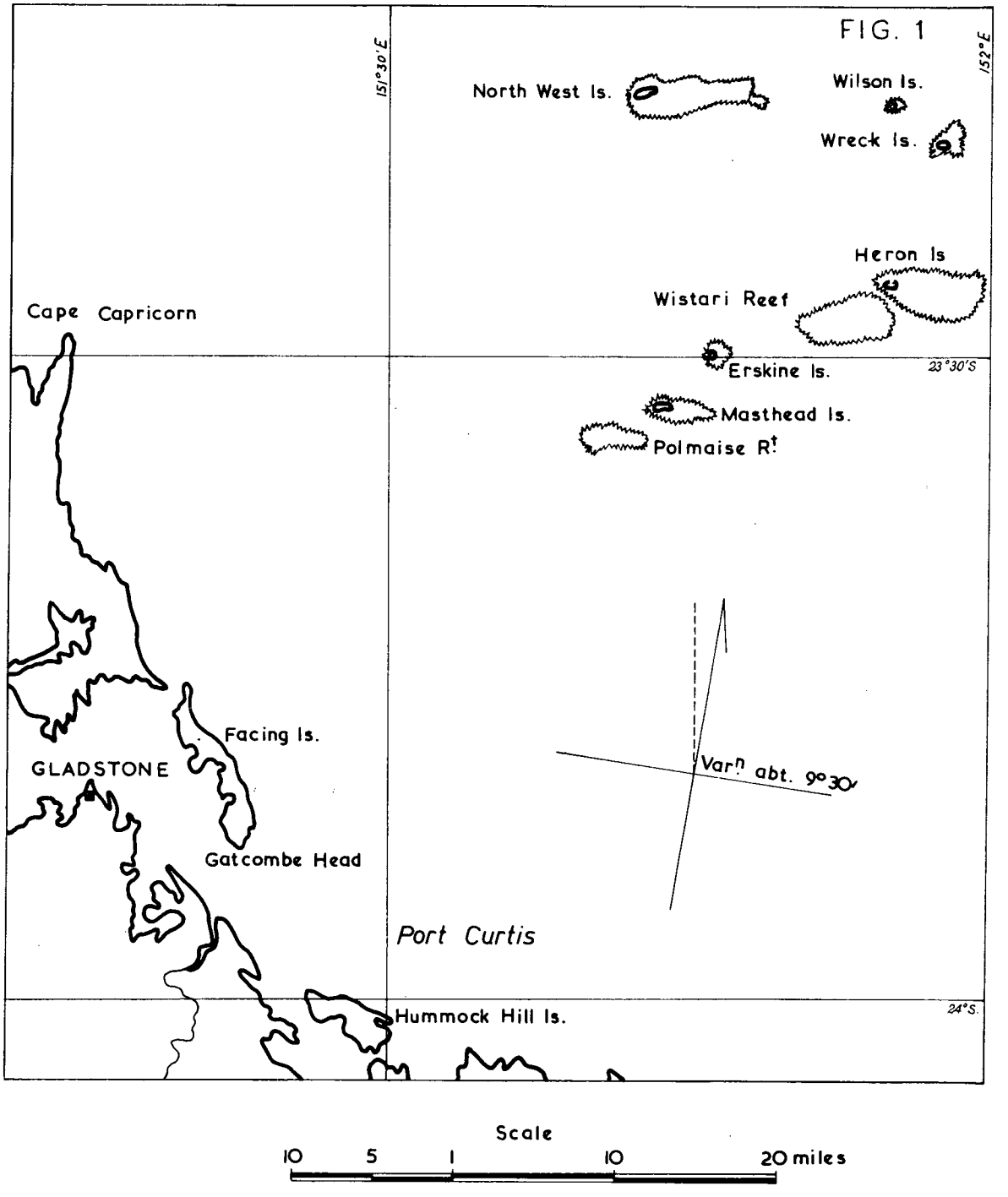
LOCALITY MAP



COMPLETION REPORT H.B.R. No. 1 WRECK ISLAND

by

S.S. Derrington*

INTRODUCTION

The rig and ancillary gear were shipped by the 300-ton landing barge "Wewak" from Kaufana, Papua, to Wilson Island, a distance of approximately 1,000 miles. They were thence transferred to Wreck Island by the drilling company's landing barge "Tamona" of 47.38 registered tonnage. All stores, supplies, and fresh water were transported 58 miles from Gladstone by the "Tamona". Communications were maintained by an A.W.A. 5A Transceiver with OTC Station VIR Rockhampton.

The bore was spudded in at 1400 hours, 7th May, 1959.

12-1/4 inch hole was drilled to 493 feet. Owing to lost circulation, no cuttings could be recovered from the hole, and a laborious system of bailing was resorted to. The 12-1/4 inch pilot hole was opened to 17-1/2 inches, and 13-3/8 inch J55x54.5 lb. STC casing was run to 480 feet. 12-1/4 inch hole was drilled to 1,170 feet, but owing to porous unconsolidated sediments and lost circulation in higher zones it was decided to run and cement 9-5/8 inch J55x40 lb. STC casing at 1,110 feet. 8-1/2 inch hole was then drilled to total depth, 1,898 feet.

Recent, Pleistocene, Pliocene, and Miocene sediments were penetrated; basement was encountered at 1,795 feet.

Fourteen cores were cut during the drilling of the bore, using a 20-foot Reed K500 "Kor-King" barrel. Both hard and soft formation 5-5/8 inch core heads were used.

The hole was logged to total depth with a Failing Logmaster, giving the self-potential, 16 and 63 inch normal and single point resistivity, and gamma ray curves.

No shows of oil or gas were noted, and in consequence no drill stem tests were carried out. Three deviation surveys were made; the maximum deviation was 1/2 degree at 1,580 feet.

The bore was abandoned as a dry hole by placing cement plugs from 1,160 to 1,060 feet and from 50 feet to surface; a metal name plate affixed to a projecting pipe was welded on to the cap sealing the bore.

WELL HISTORY

General Data

(a) Bore Name and Number: Humber Barrier Reef No. 1 (Wreck Island).

(b) Location (map reference): Lat. 23° 20'S., Long. 151°57'30"E.

(c) Tenement holder: Humber Barrier Reef Oils Pty Ltd, E.S. & A. Bank Chambers, 62 Creek Street, Brisbane, Australia.

(d) Details of petroleum tenement: Authority to Prospect No. 53P

* Mines Administration Pty Ltd, Brisbane, Queensland.

(e) District: Great Barrier Reef, Queensland

(f) Total depth: 1,898 feet

(g) Date drilling commenced: 7th May 1959

(h) Date drilling completed: 12th June 1959

(i) Date well abandoned: 14th June 1959

(j) Date rig was released: 14th June 1959

(k) Drilling time to total depth: 37 days

(l) Elevation:

Rotary table	22 feet
Ground	11 feet

(m) Status: abandoned

Drilling Data

(a) Drilling contractor:

Mines Administration Pty Ltd,
31 Charlotte Street,
Brisbane.

(b) Drilling Plant:

Make: Ideal,
Type: T32,
Rated capacity with 4-1/2" drill pipe: 5,500 feet,
Rated capacity with 3-1/2" drill pipe: 6,500 feet,
Motors - One Twin-six Series 71 G.M. Diesel 320 H.P.

(c) Mast/Derrick:

Make: Lee C. Moore 94'
Type: Cantilever mast,
Rated Capacity: 300,000 lb.

(d) Pumps:

Make	(1) Ideal	(2) Ideal
Type	C-250	C-150
Size	7-1/4" x 15"	7-1/4" x 12"
Motors	Two twin-six series 71 G.M. Diesel 320 H.P.	

(e) Blow-out preventer equipment:

Make:	Hydril	Cameron
Size :	10"	10"
Series:	600	900

(f) Hole sizes and depths:

17-1/2" to 480 feet
12-1/4" to 1,170 feet
8-1/2" to 1,898 feet

(g) Casing and liner details:

Size:	13-3/8"	9-5/8"
Weight:	54.5 lb.	40 lb.
Grade:	J55	J55
Range:		
Setting Depth:	480 feet	1,110 feet.

(h) Casing and liner cementing details:-

13-3/8" casing cemented at 480 feet with 117 sacks - enough to bring cement 200 feet above shoe. However, owing to lost circulation, top of cement was much lower. Plug method used. 9-5/8" casing cemented at 1,110 feet with 187 sacks. Top of cement below calculated level owing to porous formation. Temperature survey to determine height of cement outside casing was not made.

(i) Drilling fluid:

The hole was drilled to 493 feet without returns. Circulation was lost at 37 feet, and with both pumps drawing sea water, it could not be regained. After the 13-3/8-inch casing was set, a mud made up of salt water, 2 - 3 lb/ cu. ft. saltgel, 6 - 8 lb./cu. ft bentonite and 1/2 lb./cu. ft sodium carboxymethylcellulose (C.M.C.) was used. This mud had the following average properties:

S.G.	1.20
Viscosity (Marsh)	50 seconds
Filtrate	65 cc.
Cake	10 mm.
pH	7.8
Sand	10%

Circulation was lost again at 971 feet, owing to breakdown of cement behind the 13-3/8-inch casing. After recementing behind the casing, the cement-cut mud was discarded and new mud mixed and used in the hole. This mud had the following average properties:

S.G.	1.15
Viscosity (Marsh)	50 seconds
Filtrate	25 cc.
Cake	3 - 4 mm.
pH	8.5
Sand	5%

After the 9-5/8-inch casing was set at 1,110 feet, the mud became cement-cut while the plug was being drilled out. This mud was treated with 1 lb./cu.ft. "Q-Broxin" (ferrochrome - lignosulphonate) and 1/2 lb./cu.ft. C.M.C. This gave a mud with average properties:

S.G.	1.17
Viscosity (Marsh)	45 seconds
Filtrate	9 cc.
Cake	1.5 mm.
pH	9.5
Sand	5%

Circulation was lost at 1,618 feet. Mud with lost circulation materials, cornhusks, and sawdust was circulated to the hole, but although the rate of mud loss was reduced to some extent, it was decided to spot-cement in order to conserve the stocks of dry mud chemicals. After drilling out cement, the contaminated mud was treated with Q-Broxin and C.M.C. and the mud then had the average properties:

S.G.	1.3
Viscosity (Marsh)	50 seconds
Filtrate	7 cc.
Cake	1.5 mm.
pH	9.5
Sand	1 - 5%

Circulation was again lost at 1,898 feet. Cement was spotted in the lost circulation zone, 1,540 - 1,780 feet, and circulation regained. While the mud was being treated with Q-Broxin, orders were received to abandon the bore.

A freshwater bentonite mud, with 4 lb. bentonite/cu. ft, was mixed, weighted with barytes to an S.G. of 1.18, and pumped to the hole below the casing, to enable conventional electric logging to be carried out.

The following mud materials were used in the drilling of this well:

Saltgel	420 sacks	33,600 lb.
Bentonite	532 sacks	53,200 lb.
Tylose (C.M.C.)	163 sacks	8,150 lb.
Q-Broxin	50 sacks	2,500 lb.
Cornhusks	24 sacks	960 lb.
Sawdust	20 sacks	1,500 lb.
Barytes	43 sacks	4,820 lb.

(j) Water Supply: Ocean water

(k) Perforation and shooting record: Nil

(l) Plugging back and squeeze cementation jobs: Nil.

(m) Fishing Operations: Nil.

(n) Side-tracked hole: Nil.

Logging and Testing

(a) Ditch cuttings: Normal samples were collected from 505 feet to total depth. Samples from each 100 feet have been forwarded for micro-palaeontological examination, on which stratigraphy is established.

(b) Coring: Original program called for one core every 200 feet. 14 cores were cut (see Composite Log), with 20-foot Reed K500 "Kor-King" barrel with 5-5/8" hard and soft formation cutter heads.

(c) Side-wall sampling: Nil.

(d) Electrical and other logging:

Electric Log - 1,100 feet to total depth.
Gamma Log - surface to total depth.

(e) Drilling-time and gas log: See Composite Log.

(f) Formation testing: Nil.

(g) Deviation surveys: $1/4^{o}$ to $1/2^{o}$ deviation from vertical

(h) Temperature surveys: Nil.

(k) Other well surveys: Nil.

GEOLOGY

Previous work

An underwater gravity survey was conducted* in the area during October, November, and December 1958 and January 1959. The general results of this work indicated an increase in gravity seaward in accordance with the predictions of the theory of isostasy. One line through Wreck Island indicated that it lies on the east side of a local gravity high, suggesting that the islands of the Capricorn Group lie along the crest of a structural uplift.

Only one bore had been drilled in the area: on Heron Island, to a depth of 732 feet. It encountered reef and reef-derived sediments to 506 feet and land-derived sediments below that depth.

Lithology

The following sediments were encountered in the well (All measurements taken from Kelly Bushing, which was 11' above ground level):

11'	- 22'	surface sand, coarse-grained, calcium carbonate.
22'	- 244'	reef rock consisting of corals and associated organisms, cavernous.
244'	- 287'	calcite sand, coarse-grained, angular, grey.
287'	- 310'	buff calcarenite.
310'	- 398'	coralline limestone, pale brown.
398'	- 530'	quartz sandstone, fine-grained.
530'	- 735'	limestone, light grey; foraminifera; some interbeds of quartz sandstone.

* By the Bureau of Mineral Resources, Geology and Geophysics.

735'	- 945'	calcarenite; some minor interbeds of quartz sandstone.
945'	- 1025'	calcarenite, hard, medium-grained; some quartz sandstone.
1025'	- 1110'	quartz sandstone, friable, medium-grained.
1110'	- 1385'	calcarenite, white, medium-grained.
1385'	- 1540'	calcareous siltstone, well cemented, grey, tight.
1540'	- 1780'	quartz sandstone, calcareous, fine-grained, porous; very abundant foraminifera at base.
1780'	- 1795'	quartz sandstone, grey, coarse-grained.
1795'	- 1898'	volcanic breccia.

Structure

The gravity survey mentioned above suggests that Wreck Island is situated on the east side of an uplift which may trend along the reefs of the Capricorn Group. The occurrence of volcanic rocks at a shallow depth confirms this interpretation. It appears that sediments would be thicker both south-west and north-east of the islands of the Capricorn Group.

Occurrence of petroleum

The discovery of Tertiary marine sediments under the Barrier Reef is considered to be of great significance; the possibilities of the occurrence of petroleum are enhanced by the existence of Tertiary reef-derived sediments. In other areas of the Great Barrier Reef these sediments may be thicker. Furthermore, Tertiary reefs may be covered by impermeable shale beds farther north and closer to Papua, where great thicknesses of Tertiary shale occur. Such buried reefs, if they occur, would make excellent reservoirs for petroleum.

Porosity and permeability

The sediments penetrated above basement were largely highly porous and permeable. Occasional dense bands occurred, particularly at 1385' - 1540', but elsewhere the permeability was so high that drilling fluid was lost at all depths even after the last string of pipe was set.

General

The sediments examined indicate that the Barrier Reef is the site of a marine Tertiary basin, and that these sediments thicken away from the east coast of Queensland, since only brackish-water Tertiary rocks had been found previously in eastern Queensland. They also indicate that the Barrier Reef area was a site of reef deposition even as far back as Miocene time: so the Miocene shore must have been sufficiently far west of Wreck Island that the waters there were clear and not muddy, not very far in fact from where the shore is today.

This makes it highly probable that the Swain Reefs, which lie as far as 160 miles from shore and opposite the mouth of what may have been a large Tertiary river in eastern Queensland, rest on a substantial pile of sediments in which reef limestone may be overlain by marine muds derived from that river.

STRATIGRAPHY

The hole was drilled to 493 feet without circulation. Eventually a system of drilling 30 feet, and then bailing the accumulated cuttings and cavings from the hole, was devised.

Under such conditions, normal sampling was impossible. Random grab samples were taken from each bailing cycle, and an approximation of the lithology deduced. Although these samples have been retained,

they have not been submitted for micropalaeontological examination, because of the large-scale contamination to which they were exposed.

Normal samples were collected from 505 feet to total depth. Samples from each 100 feet have been forwarded for micropalaeontological examination, and it is on the basis of this examination that the stratigraphy is established. Naturally, the stratigraphy in the unsampled top portion of the hole is very tentative, and based only on gross lithology breaks.

As no geological control existed before the bore was drilled, sub-surface units cannot be correlated. Similarly, conventional geographical names cannot be given to the sub-surface stratigraphical units. In consequence, the lithological units in each age group have been designated numerically, with a prefix letter denoting the age; e.g., "M3" is the third highest unit of the Miocene.

The stratigraphical sequence penetrated is:

Age	Unit	Lithology	Depth	Thickness
RECENT	R1	calcarenite	11 - 310 feet	299 feet
	R2	limestone	310 - 398 "	88 "
PLEISTOCENE	Pl1	quartz sandstone	398 - 530 "	132 "
PLIOCENE (UPPER)	P1	limestone	530 - 735 "	205 "
PLIOCENE (LOWER)	P2	calcarenite	735 - 945 "	210 "
MIOCENE (UPPER & MIDDLE)	M1	calcarenite	945 -1025 "	80 "
	M2	sandstone	1025 -1110 "	85 "
MIOCENE (LOWER)	M3	calcarenite	1110 -1385 "	275 "
	M4	siltstone	1385 -1540 "	155 "
	M5	sandstone	1540 -1780 "	240 "
	M6	coarse sandstone	1780 -1795 "	15 "
BASEMENT			1795 -1898 "	103 "

RECENT R1 (11 - 310 feet)

Lithology: Calcarenite, tan to buff, medium-grained, porous and friable, with some interbeds of grey, fine-grained, calcareous quartz sandstone.

Palaeontology: Foraminifera; gastropod and pelecypod fragments; and coral fragments. Most of the grains making up the rock were originally derived from organic material.

Electrical Characteristics: No electric logs were run. The gamma ray log shows no significant variation above normal background, indicative of a uniform lithology.

RECENT R2 - (310 - 398 feet)

Lithology: Limestone, soft, pale brown, with abundant well preserved coralline detritus.

Palaeontology: Coral fragments and foraminifera.

Electrical Characteristics: No electric logs were run, but again the gamma ray curve shows no significant variation above normal background, indicative of a uniform lithology.

PLEISTOCENE Pl1 (398 - 530 feet).

Lithology: Quartz sandstone, pale brown to pale grey, fine-grained, calcareous. The quartz grains are clear and sub-angular; rare brown rounded lithic grains. Minor interbeds grey, slightly pyritic, fossiliferous limestone; rare interbeds black, slightly calcareous, plastic mudstone.

Palaeontology: Mainly unfossiliferous, with rare foraminifera, and coral and gastropod fragments.

Electrical Characteristics: No electric logs were run; the only significant variation in the gamma ray curve was a higher count between 485 and 490 feet, indicative of a shale/mudstone interbed.

PLIOCENE P1 (530 - 735 feet)

Lithology: Limestone, light grey and white, fine-grained, in part slightly pyritic, fossiliferous, with minor interbeds of grey, fine-grained, friable, micaceous, glauconitic, calcareous, quartz sandstone, and grey-green plastic, calcareous, glauconitic, fossiliferous mudstone.

Palaeontology: Foraminifera locally abundant; those in the interval 710 - 735 feet have chambers filled with glauconite. Coral fragments, pelecypod fragments, and unidentifiable spines also present.

Electrical Characteristics: No electric logs were run; the gamma ray curve again has no significant variation with the exception of a higher count between 593 and 600 feet, again probably indicative of an interbed of shale/mudstone.

PLIOCENE P2 (735 - 945 feet)

Lithology: Calcarenite, white to grey, fine to medium grained, friable, with a few small rounded grains of glauconite, and less than 10% of grains of medium, clear, well rounded quartz. Fossiliferous. A few minor interbeds of grey, coarse-grained, quartz sandstone, the quartz grains being well rounded and clear, with a few green rounded lithic grains. The limestone of P1 grades into the calcarenite of P2.

Palaeontology: Foraminifera, pelecypod fragments, and unidentified spines.

Electrical Characteristics: No electric logs were run. The only features in the gamma ray curve are the higher counts between 923 and 930 feet and at 945 feet.

MIOCENE M1 (945 - 1025 feet)

Lithology: Calcarenite, tan, white, cream, medium-grained, tight, hard, with minor interbeds of grey, brown, medium to coarse grained, friable quartz sandstone. The quartz grains are angular and clear, with subsidiary well rounded glauconitic and grey-green lithic grains. Rare interbeds of grey limestone.

Palaeontology: Foraminifera, gastropods, pelecypods, unidentified spines, together with unidentified organic fragments.

Electrical Characteristics: No electric logs were run. The gamma ray log shows a sharp drop at 945 feet and in general the section shows a diminution of radioactivity.

MIOCENE M2 (1025 to 1110 feet)

Lithology: Quartz sandstone, grey, brown, medium-grained, friable. The quartz grains are almost uniform in size, approximately 0.75 mm., and are well rounded and clear, although some appear to have a limonite coating. The sandstone is interbedded with white to cream, coarse-grained, friable calcarenite.

Palaeontology: Mainly unfossiliferous.

Electrical Characteristics: No electric logs were run. The gamma ray curve of this unit is of similar amplitude and character to that of unit M1, above.

MIOCENE M3 (1110 - 1385 feet)

Lithology: Calcarenite, white, medium-grained, very friable, soft and porous, fossiliferous. Between 1110 and 1175 feet, the calcarenite is fairly well cemented, with grain boundaries somewhat indistinct, so that it may locally grade into limestone. Towards the base of the unit, the calcarenite is brown and partly cemented, and is interbedded with grey-brown, fairly well cemented, slightly glauconitic, fossiliferous, calcareous siltstone. This probably represents gradation to the siltstone of unit M4.

Palaeontology: Dominantly foraminifera. Miss Crespin records Cycloclypeus, Miogypsina, and Lepidocyclina from 1150 feet, and 1175 to 1187 feet.

Electrical Characteristics: The electric log is characterized by low amplitudes in all resistivity curves, and relatively low S.P. curve. It will be noted that all curves fall off abruptly at 1138 feet. This is thought to be the interface of the fresh- and salt-water muds (fresh-water mud was pumped to the hole below the casing before logging). The gamma ray curve shows some activity towards the base, indicating interbeds.

MIOCENE M4 (1385 - 1540 feet)

Lithology: Calcareous siltstone, grey, brown, well cemented, mainly tight; slightly glauconitic, fossiliferous, grading to a non-calcareous siltstone at depth; with minor interbeds of white, friable, medium-grained calcarenite, which grades locally to a limestone.

Palaeontology: Only a few foraminifera were seen; some well preserved, entire pelecypods were noted in Core 10.

Electrical Characteristics: Amplitude and variation in all resistivity curves increase slightly, particularly in the interval 1390 - 1500 feet. The S.P. curve shows only minor fluctuations. The gamma ray curve is of low amplitude, although there is an overall increase below 1507 feet.

MIOCENE M5 (1540 - 1780 feet)

Lithology: Quartz sandstone, grey to dark grey, very fine to fine-grained, extremely friable, porous, glauconitic, calcareous, which becomes slightly silty and contains erratically distributed large rounded grains of quartz in the basal 30 feet. The interval 1715 - 1745 feet is characterized by an abundance of large foraminiferal tests, making up 80% of the volume of the cuttings recovered. This may possibly have been a foraminiferal ooze.

Palaeontology: The only fossils observed are foraminifera. Miss Crespin has recognised Lepidocyclina, Operculina, and Elphidium cf. E.reginum var. caucasicum.

MIOCENE M5 (Cont'd)

Electrical Characteristics: All resistivity curves are of low amplitude and show little character. The S.P. curve, which is at a large scale, shows only minor fluctuations, although a change in character occurs at 1705 feet. The gamma ray curve has a somewhat greater amplitude than that for unit M4, but is comparatively featureless. A progressive increase in radioactivity occurs below 1750 feet.

MIOCENE M6 (1780 - 1795 feet)

Lithology: Quartz sandstone, grey, coarse grained, friable. Grains are mainly composed of clear well rounded quartz, sub-angular grey pyritic quartzite, angular pyrite, and green rounded lithic material.

Palaeontology: Some foraminifera were observed, but they may have been derived from the richly foraminiferal zone at 1715 - 1745 feet.

Electrical Charcteristics: Generally similar to those of unit M5. All resistivity curves increase abruptly, and the S.P. curve correspondingly decreases at 1790 - 1795 feet.

AGE UNCERTAIN - BASEMENT (1795 - 1898 feet)

Lithology: There is some divergence of opinion as to the lithology of the rock designated as basement in this well. Preliminary wellsite determination was a silicified or metamorphosed conglomerate. Morgan (p.13) considered the rock to be pyroclastic, and classified it as acid? devitrified welded lapilli tuff. Bock and Houston (p.15) considered the rock to be dacite lapilli tuff.

For practical considerations however, the rock is basement.

Palaeontology: Barren.

Electrical Characteristics: All resistivity curves show large increments, and the S.P. curve is completely shorted. This is indicative of a uniformly non-porous lithology. The gamma ray curve shows a significant increase in radioactivity.

General

The bore penetrated 415 feet of marine Pliocene, and 850 feet of marine Miocene sediments: marine Tertiary sediments have not been previously recognised in Eastern Australia.

The entire sedimentary section penetrated is dominantly calcareous. Units R1 and R2 are derived from reef detritus; Unit P11 is composed mainly of terriginous material; Units P1, P2, M1, M2, and M3 are composed essentially of reef-derived detritus, although minor amounts of terriginous material are present; and Units M4, M5, and M6 are composed dominantly of terriginous material.

The only other bore in the area is the 732-foot Heron Island bore, 7 miles away, which was drilled for the Great Barrier Reef Committee in 1937, and was designed mainly to supply information on the depth of coral.

A rough correlation is apparent between the two bores:

WRECK ISLAND				HERON ISLAND.	
R1	calcarenite 11 - 310)				
R2	limestone 310 - 384)	–		Reef Rock	0 - 506
P11	sandstone 384 - 530	–		Sandstone	506 - 732

A small sandstone band at 244 feet at Wreck Island may be compared with a similar band at 292 feet at Heron Island.

Age determinations of the fauna at Heron Island imply (but not definitely) that the whole section is Recent. Therefore, either the postulation of Pleistocene at Wreck Island is wrong; or the age of the fauna, and particularly of the foraminifera of the sandstone, at Heron Island, should be more critically examined.

PRELIMINARY NOTE ON MICROPALAEONTOLOGY

by

Irene Crespin*

Cores 4 to 11 (660 feet to 1610 feet) and cuttings from 550 feet to 1750 feet from Wreck Island No. 1 Bore have been examined for microfossils. This examination has proved nearly 800 feet of marine Miocene sediments.

A tentative determination of the stratigraphical sequence in the bore is as follows :-

Upper Pliocene or younger	-	550 - 625 feet (including cores 4 and 5).
Lower Pliocene	-	800 - 850 feet (core 6).
Middle to Upper Miocene	-	962 -1050 feet (including core 7).
Lower Miocene	-	1150 -1750 feet (including cores 8, 9, 10, 11).
? Basement	-	1800 -1898 feet (cores 12, 13, 14).

The cream calcarenite of core 8 at 1175 - 1187 feet and cuttings at 1150 feet contained a rich assemblage of larger foraminifera, including the genera Cycloclypeus, Miogypsina, and Lepidocyclina. This assemblage contains species characteristic of the Lower Miocene, and is also present in cores 9 and 10. The grey glauconite sandstone of core 11 at 1600 - 1610 feet and of cuttings at 1550 feet contained glauconitic replacements of numerous large and small tests of Lepidocyclina and Operculina, many of the tests showing evidence of abrasion.

The cuttings of sandstone at 1750 feet contained numerous well-preserved specimens of a large species of Elphidium, probably new but closely related to a form described from the Miocene of the Kuban River area, Russia: Elphidium reginum (d'Orbigny) var. caucasicum Bogdanowicz.

This discovery of marine Miocene sediments in the Wreck Island Bore is of considerable importance in Indo-Pacific Tertiary stratigraphy. No such sediments have previously been recorded from surface outcrop or sub-surface section in the eastern coastal area of Australia. Sediments bearing Lepidocyclina and Miogypsina occur to the north of Wreck Island, in south-eastern Papua, and are well developed to the east, in the New Hebrides. To the south of the area, the nearest known Lepidocyclina-bearing rocks are to be found in south-east Gippsland, Victoria. A greater thickness of Miocene and even lower Tertiary beds may exist in sub-surface sediments immediately east of Wreck Island.

* Bureau of Mineral Resources, Geology and Geophysics.

PETROGRAPHY OF CORE SAMPLES

by

W.R. Morgan *

Hand Specimens

Core 12 (1805 feet) has a whitish-green, extremely fine-grained groundmass enclosing numerous grains of quartz and pinkish white feldspar; the largest grains are 5 mm. across. The specimen contains numerous sub-angular to sub-rounded rock fragments, ranging from 1 mm. to 20 mm. in size. One fragment is composed of black, charcoal-like material that may be easily scratched by a finger nail. Pyrite is present as irregular grains along some apparent fracture zones.

Cores 13a to 14b (14b at 1893 feet) are all rather similar to one another. Like core 12, they have a fine-grained groundmass, but the enclosed crystal grains are far more numerous. Likewise, rock fragments are present, and they are rather larger than those in Core 12, some attaining a size of 40 mm. Commonly, the fragments consist of acid porphyritic igneous rocks, although some appear to be more basic; in one core, a fine-grained banded rock was noted.

Core 14c (1896 feet) appears to be an agglomerate; it consists of large sub-angular fragments of apparently acid igneous rock, some of which are over 7 cm. in size. The fragments are enclosed by a matrix similar to that found in the other cores.

Thin Sections

Core 12 is represented by slides 4601 and 4602. A very fine-grained groundmass is seen to enclose numerous mineral grains that range in size between 0.5 mm. and 2.0 mm.; the sections also show small, somewhat rounded rock fragments, and portions of larger ones, enclosed by the groundmass.

The mineral grains are composed mainly of albite and quartz; orthoclase is possibly present, although none was positively identified, as the section was not stained prior to examination. Albite forms tabular to anhedral grains, some showing fracturing, and most having margins that show the results of corrosion. Albite is commonly partly or wholly carbonated; some alteration to sericite may be seen. Quartz occurs as anhedral, rarely subhedral, grains that contain pseudoinclusions, and commonly have embayed margins. In places, the embayments contain a granophyric intergrowth. (?)Orthoclase forms roughly tabular, somewhat kaolinized grains.

The groundmass is exceedingly fine-grained, and consists of felsitic and sericitic material. The sericite forms curvilinear aggregates and trails of minute flakes that could be interpreted as a magmatic flow texture. However, the texture seems more likely to have resulted from the devitrification of welded tuffaceous matter (Martin, 1959, figs. 4, 5 and 6, pp. 400-401; Williams, Turner, Gilbert, 1954, fig. 50C, p.155).

Some accessory zircon and (?)leucoxene were seen.

The rock fragments range down to 0.6 mm. in size. On the two slides examined, the fragments observed were dacite, fine-grained aplitic material, and trachyte; one fragment consisted of a fine-grained intergrowth of quartz, but otherwise no sedimentary rocks were seen.

The specimen contains veins and granular aggregates of calcite that are sometimes seen to connect, and be in optical continuity with, the calcite replacing albite.

* Bureau of Mineral Resources, Geology and Geophysics.

Core 14b (slide number 4603) is fairly similar to core 12 in that mineral grains and rock fragments are enclosed by a very fine-grained and apparently flow-textured groundmass. A larger amount of mineral grains are present: one grain, composed of intergrown calcite and leucoxene, pseudomorphs a possible basal section of pyroxene. The rock fragments observed were porphyritic dacites and trachytes, (?)andesite, rare granophyre, a rhyolite, and a laminated siltstone. Irregular granular aggregates, and veins, of calcite are present.

Core 14c (slide number 4604) is seen to be composed mainly of coarse rock fragments, with small amounts of interstitial, apparently flow-textured material similar to that found in the other specimens. Irregular veins of calcite are present. Some of the fragments appear to have been in a pliable state when they were deposited, as their margins are slightly deformed and indented by neighbouring fragments. The fragments consist of dacite, trachyte, rhyolite, crystal tuff, and, rarely, quartzite. In some of the dacitic fragments, (?) cognate xenoliths of trachyte may be seen. One or two of the trachyte fragments appear to be partly silicified.

The specimens described are pyroclastic. Those represented by cores 12 and 14b appear to be acid (?)devitrified welded lapilli tuffs, and 14c is an agglomerate with a matrix composed of apparently welded tuff.

REFERENCES.

MARTIN, R.C. 1959 Some field and petrographic features of American and New Zealand ignimbrites. N.Z.J. Geol. Geophys., 2(2), 394-411.

WILLIAMS, H., TURNER, F.J., and GILBERT, C.M. 1954 Petrography, an Introduction to the Study of Rocks in Thin Section. San Francisco, Freeman.

PETROLOGY OF CORES 14, 13 AND 12

(Summary of macroscopic description by P.E. Bock,* and microscopic description by Miss B.R. Houston*).

Texture

Massive unsorted coarse fragmental rock showing no preferred orientation of fragments. The rock is jointed at irregular intervals; angle of jointing is approximately 60 degrees to normal to core axis.

Composition

Matrix: is a dacite crystal tuff, composed essentially of plagioclase, potash feldspar, and quartz, with a size range of 0.05 to 3 mm., and a mode of about 1.5 mm., set in cryptocrystalline quartzo-feldspathic material. The feldspar crystals are euhedral to subhedral, commonly corroded slightly, calcitized at 1896 feet, 1893 feet, 1828 feet, and 1821 feet, and replaced by clay minerals and sericite at 1802 - 1798 feet. The quartz "crystals" are anhedral and corroded; the degree of corrosion increases upwards markedly.

The percentage of crystals increases upwards to 1821 feet, but at 1802 - 1798 feet it has decreased; there is a corresponding change in the ratio feldspar-quartz. Between 1893 feet and 1828 feet, there is a marked increase in minimum size of crystals.

At 1896 feet, the cryptocrystalline feldspar is almost completely altered to clay minerals.

Fragments: include: dacite, rhyolite, trachite, crystal tuff, quartzite, and carbonaceous argillite. (Intergrowths between quartz and potash feldspar are unusually common in the volcanic fragments). Many of the fragments were altered before deposition. Some show slight secondary silicification, and one is partly recrystallized, with formation of albite. The proportion of sedimentary fragments apparently decreases from bottom to top of the section.

The outlines of the dacite fragments are sharp though embayed; those of the rhyolite, trachyte, and tuff fragments generally are diffuse and may be embayed; those of the quartzite and argillite fragments are sharp and show re-entrants.

Average roundness of fragments is 0.3, and average sphericity ranges from 0.3 at 1896 feet to 0.5 at 1828 feet and above.

The fragments range in size from 270 mm. to 1 mm; average size is very approximately 15 mm.

Miscellaneous: Potash feldspar is by far the most abundant mineral present in the whole rock. There is a noticeable paucity of ferromagnesian minerals. Apatite is present as an accessory in an unexpectedly large amount.

Porosity

Slight porosity was revealed during the preparation of thin sections.

Origin

Aeolian pyroclastic rock derived from acid volcanic material erupted through quartzite and argillite. The shape of the volcanic fragments, and the similarity in composition between these fragments and the matrix, indicate that all the volcanic material is derived from the same source.

Name

Dacitic lapilli tuff.

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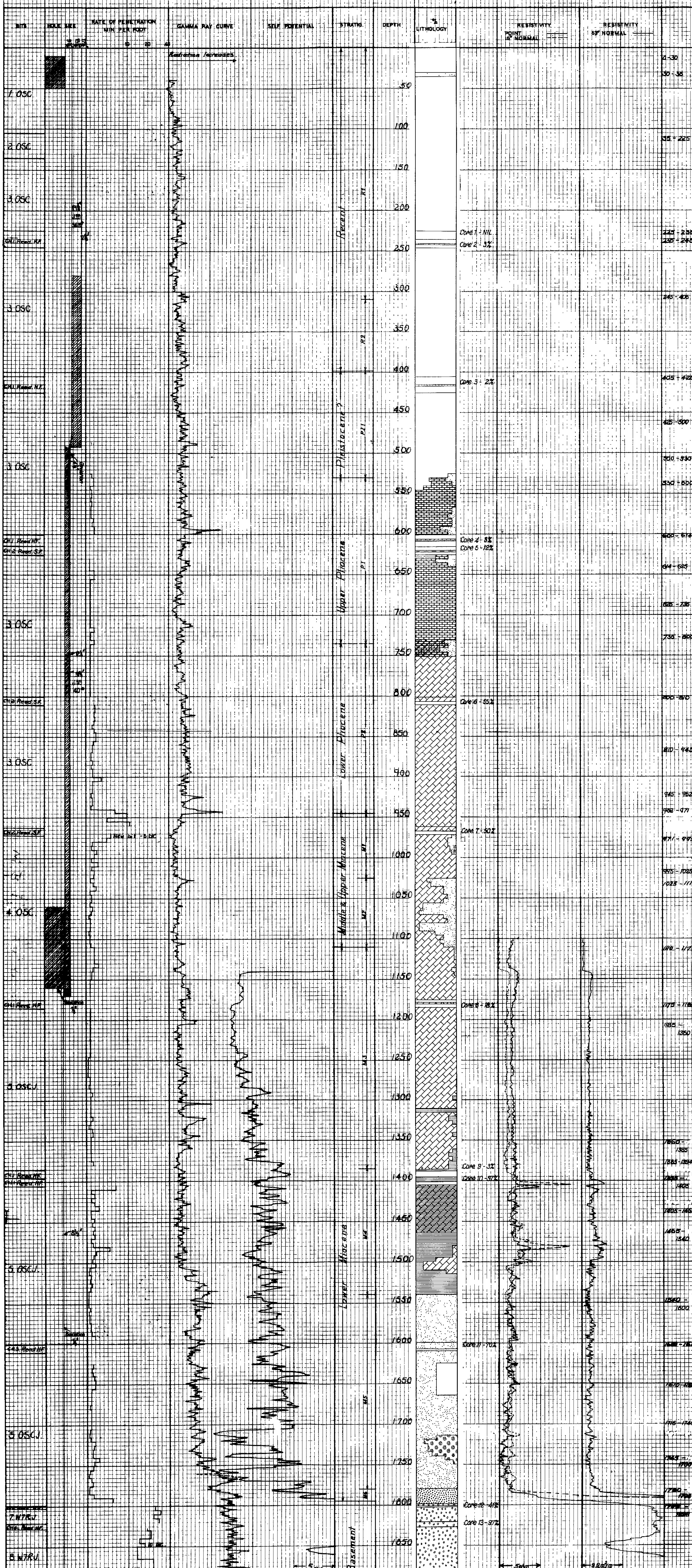
* Geologists, Geological Survey of Queensland.

COMPOSITE LOG

WELL No. H.B.R. No.1 WRECK ISLAND

COORDINATES: 23°20' S, 151°37'30" E
ROTARY TABLE ELEVATION: 22 FEET
TOTAL DEPTH: 1898 FEET
DATE SPUDDED: MAY 7 1959
DATE COMPLETED: JUNE 14 1959
LITHOLOGIC LOGGING: S.S. DERRINGTON
ELECTRIC LOGGING: J.E. BURBURY



DESCRIPTIVE LITHOLOGY

Depth	Description
0-30	No samples.
30-35	SAND GRAINS, white, pink, fine to medium grained, calcareous. Fossiliferous - forams & small pelecypods.
35-225	No samples.
225-235	Core 1 - No Recovery.
235-245	Core 2. Rec. 3" LIMESTONE, buff to tan, porous, slightly vugular. Slight dolomitisation in vugs.
245-405	No circulation samples.
405-425	Core 3 - Rec. 6". SANDSTONE, brown, medium grained, tight, very calcareous quartz sandstone - some vugular porosity.
425-500	No circulation samples.
500-530	CAVINGS.
530-600	LIMESTONE, grey, fine grained, slightly pyritic, fossiliferous, (forams, corals), with minor interbeds of SANDSTONE, grey, medium grained, friable, glauconitic, calcareous, quartz.
600-614	Core 4 - Rec. 3" SANDSTONE, fine grained, grey, friable, micaceous, glauconitic, calcareous quartz. 1" LIMESTONE, grey, fossiliferous. 1" SANDSTONE, as above.
614-625	Core 5 - Rec.15" MUDSTONE, soft, plastic, grey-green, glauconitic, calcareous, fossiliferous, lower 4" slightly sandy.
625-735	LIMESTONE, white and grey, fossiliferous. Slightly glauconitic 710-735. Forams here have glauconitic infillings.
735-800	CALCARENITE, white, fine to medium grained, friable, with a few grains glauconite < 10% grains clear, rounded quartz. Fossiliferous. Minor interbeds SANDSTONE, coarse grained, quartz. Quartz grains clear and rounded; a few green lithic grains.
800-810	Core 6 - Rec.66" CALCARENITE, white to grey, fine to medium grained, friable. Contains a few grains glauconite. 5% grains clear rounded quartz. Fossiliferous.
810-945	CALCARENITE, as for Core 6.
945-952	CALCARENITE, tan, medium grained, tight, hard.
952-971	Core 7. Rec.54" CALCARENITE, white, cream, medium grained, mainly tight, hard. Highly fossiliferous.
971-995	CALCARENITE, as for Core 7. Minor interbeds SANDSTONE, medium to coarse grained, friable. Quartz grains round and clear. Subsidiary lithic and glauconitic grains. Minor LIMESTONE, grey.
995-1025	CALCARENITE, as above.
1025-1110	INTERBEDS. CALCARENITE, as above, and SANDSTONE, grey brown, medium grained, friable; quartz grains uniform in size, well rounded and clear. Minor lithic and glauconitic grains.
1110-1175	CALCARENITE, - may in part be transitional to LIMESTONE, white, medium grained, well cemented, grain boundaries indistinct. Slightly glauconitic. Fossiliferous.
1175-1185	Core 8 - Rec.18". CALCARENITE, white, medium grained, very friable, fossiliferous.
1185-1360	CALCARENITE, white, medium grained, very friable soft, fossiliferous, becoming brown and more cemented towards base, with interbeds of CALCAREOUS SILTSTONE, grey brown, fairly well cemented, slightly glauconitic, fossiliferous.
1360-1385	INTERBEDS CALCARENITE and CALCAREOUS SILTSTONE, as above.
1385-1394	Core 9 - Rec. 7" CALCAREOUS SILTSTONE, as above.
1394-1405	Core 10 - Rec.69" CALCAREOUS SILTSTONE, grey brown, well cemented, mainly tight, slightly glauconitic, fossiliferous.
1405-1455	CALCAREOUS SILTSTONE, as for Core 10.
1455-1540	SILTSTONE, similar to above, but less calcareous. Minor interbeds of soft, white, glauconitic CALCARENITE, grading to a LIMESTONE. (1490-1525: siltstone is red brown in colour).
1540-1600	SANDSTONE, very fine to fine grained, friable, slightly glauconitic and calcareous quartz sandstone.
1600-1610	Core 11- Rec. 84" SANDSTONE, dark grey, fine grained, friable, uncemented, slightly glauconitic calcareous quartz sandstone.
1610-1716	SANDSTONE, as above.
1716-1746	SANDSTONE, as above, containing an abundance of foraminiferal tests - can possibly be classed as a FORAMINIFERAL OOZE.
1746-1790	SANDSTONE, fine grained, silty, containing large rounded quartz grains.
1790-1798	SANDSTONE, coarse grained, friable, grains quartz, quartzite, & metamorphic rock.
1798-1898	SILICIFIED CONGLOMERATE. Rock hard, grey green, fractured, with calcite and pyrite veins. Pebbles -3 - 25m.m. mainly angular and sub-rounded of quartzite, quartz, felspar, chert. This rock considered to be BASEMENT.

FOOTAGE PER DAY

10 20 40

- Bailing cuttings from hole.
- Cement Job No.1.
- Hole caving - shut down, opening hole to 17½". Ran 13⅜" casing. Cement Job No.2.
- Cement Job No.3.
- Circulation partly restored. Cement Job No.4.
- Ran 9⅝" casing. Cement Job No.5.
- Cement Job No.6.
- Reamed and cleaned hole.
- Cement Job No.7. Logged well. Plugged and abandoned.