COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

PETROLEUM SEARCH SUBSIDY ACTS

Publication No. 1

KAUFANA No. 1 BORE, PAPUA

OF

PAPUAN APINAIPI PETROLEUM CO. LTD.

Issued under the Authority of Senator the Hon. W. H. Spooner,
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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 first bore is to be completed under the Petroleum Search Subsidy Act 1957-58 was put down by Papuan Apinaipi Petroleum Company Limited at Kaufana in Papua. The bore was drilled to a depth of 3,380 feet and finished in Lower Miocene sediments. This publication contains the information furnished by or on behalf of the Company and edited by the Bureau, and presents in detail the method of carrying out the drilling operation and the results obtained.

(J.M. RAYNER)
DIRECTOR.

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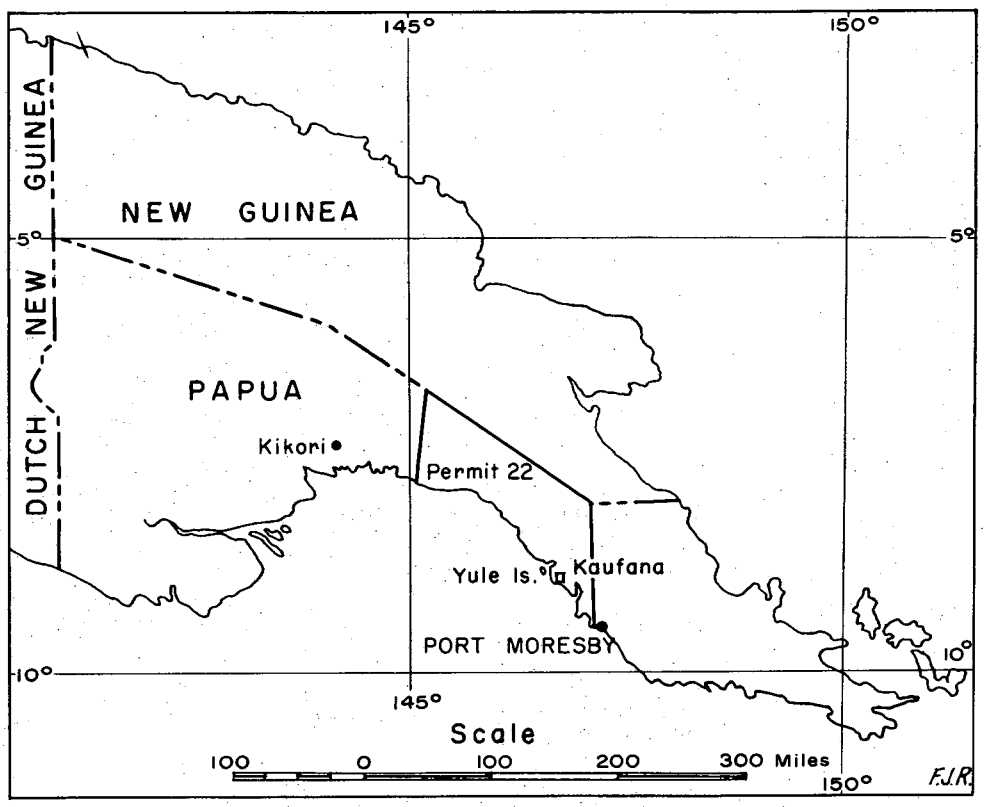

Fig. 1 Locality Map

F.J.R. PNG 8 H - 1

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SUMMARY

Kaufana No. 1 Bore was drilled to a depth of 3,380 feet. Thin Pliocene calcareous greywacke unconformably overlies Miocene "f-3" siltstone; this in turn disconformably overlies Miocene "f1-2" siltstone, shale, and greywacke. The Miocene "f-3" Bokama Limestone was not encountered, but may have been represented by a stratigraphic equivalent with a different lithology. No shows of hydrocarbons were observed.

INTRODUCTION

Geologists of Papuan Apinaipi Petroleum Ltd had determined the upper Tertiary sequence in the area south-east of Yule Island, Papua, (fig. 1) and had shown that the Kaufana Anticline was developed in the youngest (Pliocene) beds. A high gravity anomaly was found to coincide with the surface anticline (Starkey, 1957) and therefore it was expected that the anticline would continue downwards and that the full sequence exposed in outcrop would be present, although perhaps with somewhat different lithology and thicknesses.

The Kaufana Bore was planned to examine the stratigraphic sequence in the Kaufana Anticline and to test this sequence for hydrocarbons. On the basis of outcrops in the adjoining district, the expected sequence was :

Kaufana Beds (Pliocene) about 300 feet thick;
Vanuamai Siltstone (Miocene "g") about 600 feet;
Diumana Greywacke (Miocene "f-3") about 600 feet;
Bokama Limestone (Miocene "f-3") about 200 feet;
Kaieu Greywacke (Miocene "f1-2") more than 700 feet;

The Company applied for subsidy under the Petroleum Search Subsidy Act 1957 to drill the bore at Kaufana; the application was approved. The Kaufana No. 1 Bore was the first subsidized bore drilled under the Act. The publication of the results of the operation is one of the conditions under which subsidy is granted.

BORE HISTORY

General Data.

Bore name and number: Kaufana No. 1 Bore.
Location: 146°48'05"E; 9°00'32"S.
Name and address of Permit Holder: The Papuan Apinaipi Petroleum Company Limited, Pendennis Chambers, 375 George Street, Sydney.
Petroleum Tenement: Permit 22, Papua and New Guinea.
District: Central District, Papua.
Total Depth: 3,380 feet.
Date Spudded: 12th December, 1957.
Date Completed: 11th January, 1958.
Actual Drilling Time: 19 days.

Elevation rotary table: 94 feet above M.S.L. (datum for depths).

Status: Dry and abandoned. The hole was filled with non-corrosive (12pH) mud from 700' to surface. A cement plug was placed in the 9-5/8th" casing from 630' to 530', using 29 sacks of cement. 9-5/8th" casing shoe at 632'.

Drilling Data

Drilling by: Mines Administration Pty Ltd, 31 Charlotte St., Brisbane, Queensland.

Rig: National Supply Co. Ideal T-32.

Rated Capacity: 5,000 ft. with $4\frac{1}{2}$" drill pipe.

Pumps: One Ideal C-250 size 7-1/4" x 15".
One Ideal C-150-B size 7-1/4" x 12".
One Gardner Denver FDFXX size 8" x 5" (cementing).

Engines:
Draw-works: F.M. Model 12107 Twin 6-71 Diesel with Torque Convertor Unit, 320 B.H.P.
Pumps - C-250: G.M. Model 12107 Twin 6-71 Diesel with Torque Convertor Unit, 320 B.H.P.
- C-150-B: G.M. Model 12103 Twin 6-71 Diesel, 320 B.H.P.
G.D. FDFXX: G.M. Model 3082; 3-71 Diesel, with Torque Convertor Unit, 70 B.H.P.

Cost: Total cost of drilling estimated by the company including transportation of the rig etc: £103,011.

Subsidy: Subsidy paid to the company by the Commonwealth Government: £18,730.

Well Head Equipment: (i) Cameron S.S. 10" Series 900 B.O.P. equipped with blind and $4\frac{1}{2}$" pipe rams .p 00 p.s.i. (Hydrill M.S. 2,000, 10" series, 900 B.O.P.; W.P. 2,000 p.s.i.

Hole size, casing: Starting hole 12-1/4" to 637 feet; $8\frac{1}{2}$" from 637 feet to 3,380 feet. Casing 9-5/8th" x 40 lb. S.T.C., J.55; shoe at 632 feet and cemented to surface with 164 bags of cement.

Drill Pipe Size: $4\frac{1}{2}$", range 2 - 5,000 feet.
2-7/8th", range 2 - 4,000 feet.

Drill Collars: 6-1/4" O.D. x 30 ft. - 18 on site.
4-1/4" O.D. x 30 ft. - 10 on site.

Drilling mud: Water-bentonite - CMC mud. (See P. 5).

Water supply: Pumped water from nearby Aroa River.
Used Southern Cross/Forrers 5" x 8" pump and 4,000 ft. of pipe line.

Ditch Cuttings.

Samples were grouped in 10 ft. intervals and depths corrected for return-to-surface delay. An acetone test, an acid solubility test (hot 1 to 1 water/commercial HC1), and a fluorescence test were done on approximately every fifth sample.

Sample Depth	Acetone Test	Fluorescence	% Solubility
20 - 30	negative	negative	29.2
70 - 80	"	"	26.4
120 - 130	"	"	34.0
170 - 180	"	"	28.2
235 - 250	"	"	21.6
270 - 280	"	"	25.2
320 - 330	"	"	27.0
370 - 380	"	"	22.6
420 - 430	"	"	28.0
470 - 480	"	"	27.0
520 - 530	"	"	24.6
570 - 580	"	"	20.0
600 - 610	"	"	
610 - 620	"	"	
620 - 630	"	faint yellow	34.0
630 - 640	"	negative	
670 - 680	slight trace	"	34.8
720 - 730	"	"	31.0
780 - 790	"	"	30.0
817 - 829	"	"	24.0
868 - 876	"	"	34.0
918 - 926	"	"	25.8
967 - 977	"	"	17.0
1017 - 1029	"	"	25.0
1068 - 1077	"	faint blue	25.0
1116 - 1127	"	calcite fluorescence	24.6
1167 - 1177	slight trace	negative	19.2
1218 - 1228	"	"	25.0
1267 - 1277	"	negative	26.0
1317 - 1328	"	calcite fluorescence	26.6
1367 - 1377	"	negative	20.0
1419 - 1429	"	calcite fluorescence	27.0
1466 - 1476	"	negative	18.6
1516 - 1527	"	"	13.0
1567 - 1578	"	"	20.0
1618 - 1628	"	calcite fluorescence	22.0
1668 - 1677	"	negative	20.0
1715 - 1726	"	"	18.0
1766 - 1776	"	calcite fluorescence	25.0
1817 - 1827	"	negative	32.0

Sample Depth	Acetone Test	Fluorescence	% Solubility
1867 - 1876	slight trace	calcite fluores-cence	24.6
1916 - 1925	"	negative	32.0
1967 - 1977	negative	calcite fluores-cence	28.0
2017 - 2027	slight trace	"	46.0
2066 - 2076	"	negative	27.0
2115 - 2125	"	"	21.0
2165 - 2175	"	"	24.0
2215 - 2226	"	"	29.0
2266 - 2276	"	"	26.0
2315 - 2325	"	"	23.0
2365 - 2377	"	"	20.0
2418 - 2428	"	"	23.0
2468 - 2477	"	"	23.0
2513 - 2525	"	"	21.0
2565 - 2577	"	"	21.0
2617 - 2624	"	"	14.0
2663 - 2675	"	"	1.0
2712 - 2726	"	"	41.0
2766 - 2775	"	"	12.0
2816 - 2827	"	"	22.0
2866 - 2876	slight trace	negative	16.0
2916 - 2926	"	"	16.0
2967 - 2978	"	"	18.6
3017 - 3026	"	"	18.0
3065 - 3076	"	calcite fluores-cence	16.2
3115 - 3124	"	negative	11.0
3164 - 3175	"	"	19.0

Coring

It was originally intended to core formation tops or every 500 feet, but the condition of the hole did not permit this. This bit was pulled several times in order to core but hole condition so deteriorated during pulling out that a bit was re-run, to ream and drill ahead, without making up the core barrel (this is thus not shown in daily drilling logs.) When the core barrel was run it could not be bottomed because of caving and bridging.

Only one core was recovered; at 3,215 - 3,227 feet; recovery 6 feet or 50%.

Description: Interbedded soft argillaceous siltstone and fine grained greywacke with minor dark grey brittle compact shale. Dips range from 20° to vertical; shallow dips apparently due to contortion or slumping; most of recovered core dips at 70° - 80°, taken as true dips. Evidence of some minor faulting.

Soxhlet Extraction - Water - 18.3% by volume.
Hydrocarbons - trace.
Chloride - 1,690 ppm.

Electrical logging

Attempts were made to log self-potential and single-point resistivity surveys on 6/1/58, but the tool failed to go below 1,440 feet (T.D., then 3,220 feet). Later two runs were made to bottom for S.P. curve and single-point and 16" short normal resistivity curves but the results were featureless because of faulty cable and recorder. These curves were re-run on 11/1/58 after a successful gamma ray survey from 0 - 900 feet, but tool failed to bottom and recorder was defective.

The gamma ray log apparently indicates bedding of a silt and clay fractions between 390 and 480 feet. The conglomerate between 605 and 637 feet is also well defined.

Drilling Rate

See composite log.

Formation Tests

No formation test was made.

Deviation Records

At 1,500 feet $2^{o}15'$ and 2,000 feet $2^{o}15'$.

DRILLING FLUID

by

W.H. Lindhe

A conventional bentonite - water - CMC mud of medium characteristics was employed throughout. A typical daily test result was as follows :-

31/12/57	
S.G.	1.37
Viscosity stormer	46 ctp.
Gel strength	
Initial	0 gm.
10 minute	15 gm.
Expressed filtrate	7.1 c.c.
Filter cake	3/32nds inch
pH	9.5
Sand content	1%
Settling rate	Nil in. per 24 hrs.
Compaction rate	Trace in. per 24 hrs.
Chloride	600 ppm.

Operation

The sediments penetrated were of a poorly consolidated claystone-siltstone sequence containing appreciable percentages of puggy blue argillaceous material typical of the Miocene of Western Papua. In Kaufana No. 1, the drilling of these formations was complicated by the steep dips obtained (approximately 80^{o}), and squeezing of an unusual character occurred.

The usual build-up of argillaceous material to mudstream took place and soluble salts were also probably present in the blue argillaceous material described. Viscosity was affected, and more frequent reduction treatments needed, thereby severely limiting the treatment range.

Lime-based CMC mud would have been more efficient and permitted closer control under the circumstances.

Mud Maintenance

Orthodox treatments were applied to counteract continual build-up of viscosity and gel strength. These consisted of myrtan-caustic soda in the ratio 2:1. Large tylose CMC additions were required to stabilize water loss within the range 4-8 c.c. - a cumulative total of 1-1/2 lb. per cubic foot. Occasional bentonite-water "pills" at 4 lb. per cubic foot were necessary to rejuvenate the system. Gel strengths were rather high throughout and difficult to depress because of the continuous build-up of slightly reactive formation: treatment was water dilution and caustic soda.

No sodium chloride or gas cutting was encountered, nor did sand content present any problem (max. 2%).

Hole Condition.

The condition of the hole was poor from 1,360 feet to 2,220 feet and subsequently deteriorated further with tight hole intermittently from the 9-5/8" shoe to T.D. This can be attributed to the near-vertical dips, complicated perhaps by fault stresses within the environs. From the rates of penetration and the formation squeeze effect apparent when breaking circulation, it was obvious that some sections of the column were in a plastic condition. Progressive weight increases to S.G. 1.53 maximum stabilized the column to a considerable extent but by no means solved the problem.

Chemical Supply.

Mud chemicals on site were of excellent quality and covered an adquate range with the possible exception of the thinner used.

Suspension of Drilling

A non-corrosive mud was prepared by treating the mud in circulation from 700 feet to surface prior to setting cement plug at 632 feet.

Characteristics were :-	
S.G.	1.12
Viscosity stormer	14 ctp.
Expressed filtrate	12.0 c.c.
Filter cake	4/32nds inch
Gel strength	
Initial	0 gm.
Final	0 gm.
pH	12
Sand content	1%
Chloride	400 ppm.
Settling rate	Nil in. per 24 hrs.
Compaction rate	Trace in per 24 hrs.

Conclusion

The mud program employed performed satisfactorily under difficult drilling conditions and, compared with the usual cost incurred in Papua, was remarkably economical.

GEOLOGY*

by

P.E. Power

Previous Work

The Kaufana Structure was distinguished in 1941 by geologists of the Australasian Petroleum Company (Millward & Stach, 1941). Detailed geological and geophysical work was carried out in 1956 and 1957 (Matthews & Sturmfels, 1956; Power, Morgan, & Starkey, 1957). The detailed mapping at Kaufana established the structural configuration, the position of the axis and possibly of two culminations of the anticline, and the lithology of the Pliocene beds exposed; a closure was tentatively deduced at the southern end of the structure. No drilling was carried out before the drilling of Kaufana No. 1.

Three main structures known in the district are the Oroi, the Tabu, and the Kaufana anticlines. (1)

* : The footnotes throughout this section are comments by the Bureau of Mineral Resources.

(1) : Millward & Stach (1941) mapped and named the Delena (more than 10 miles long), Oroi (8 miles), Diumana (6 miles), Vanuamai (11 miles), Bokama (6 miles), Kaufana (3 miles), Diulu (2 miles), Bohoamahe (13 miles), Wonono (5 miles) and Kubuna (3 miles) Anticlines in this district, and east of the Aroa River Osborne (1946) mapped and named the Rorona Anticline (3 miles) and the Kanosia Anticline (3 miles). The regional geology is shown in Fig. 2, adapted from maps by Millward & Stach and Osborne.

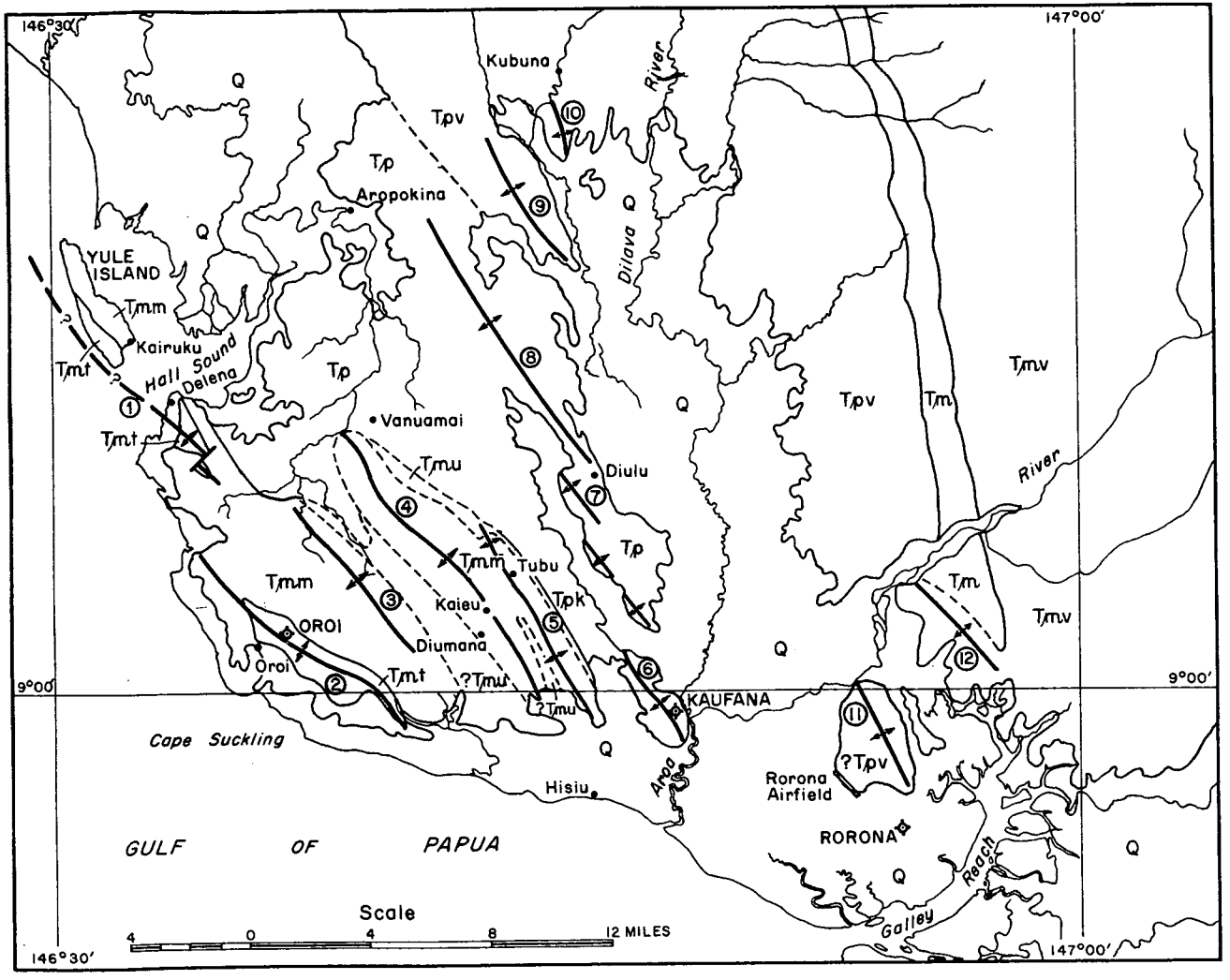

Fig. 2 Regional Geology , Yule Island – Galley Reach Area F.J.R. PNG 8 – 1

The Oroi structure was tested in 1959 by a well drilled by the Australasian Petroleum Company to a depth of 5,576 feet. The well began in Miocene strata and penetrated for the greater part Miocene beds of "f3" and "f1-2" stages. Neither the base of the Miocene nor crystalline basement was reached. (2)

In the Tubu area sedimentary rocks of Miocene "f1-2", "f3", and "g" stages and Pliocene age crop out.

A more or less similar stratigraphic sequence was expected in the Kaufana Bore; only Pliocene beds crop out.

Stratigraphy

The stratigraphic sequence exposed in the Tubu-Kaufana area (Figure 3) is as follows:

Recent	Alluvium		
Pliocene	Kaufana Beds	Volcanic conglomerate, greywacke, minor claystone, and coral limestone	1,600 feet thick
Miocene "g"	Vanuamai Siltstone	Siltstone with minor thin sandstone	600 feet
Miocene "f-3"	Diumana Greywacke	Quartz greywacke, minor coral limestone lenses	600 feet
Miocene "f-3"	Bokama Limestone	Coral limestone, minor calcarenite, chert	200 feet
Miocene "f1-2"	Kaieu Greywacke	Greywacke, claystone, siltstone	700 feet

The KAIEU GREYWACKE is defined as the formation of greywacke, claystone and siltstone conformably overlain by the Bokama Limestone. Its base is not exposed.

The name is taken from Kaieu village (3) at Lat. $8^{o}55'$ S., Long. $146^{o}41'$ E. (approximately); it was first used by Matthews and Sturmfels (1956).

The type locality is east and west of Kaieu village, where outcrop consists of poorly exposed and weathered medium-grained to fine-grained greywacke, mainly thick-bedded, with minor conglomeratic beds, fossiliferous calcareous beds, and siltstone beds.

(2) : In the Rorona area, Papuan Oil Development drilled a bore (Lat. $9^{o}04'$ S., Long. $146^{o}55'$ E.) to a total depth of 1,222 feet. Osborne (1946) refers to a report that this bore reached Eocene Port Moresby Beds.

(3) : Localities shown in Fig. 2.

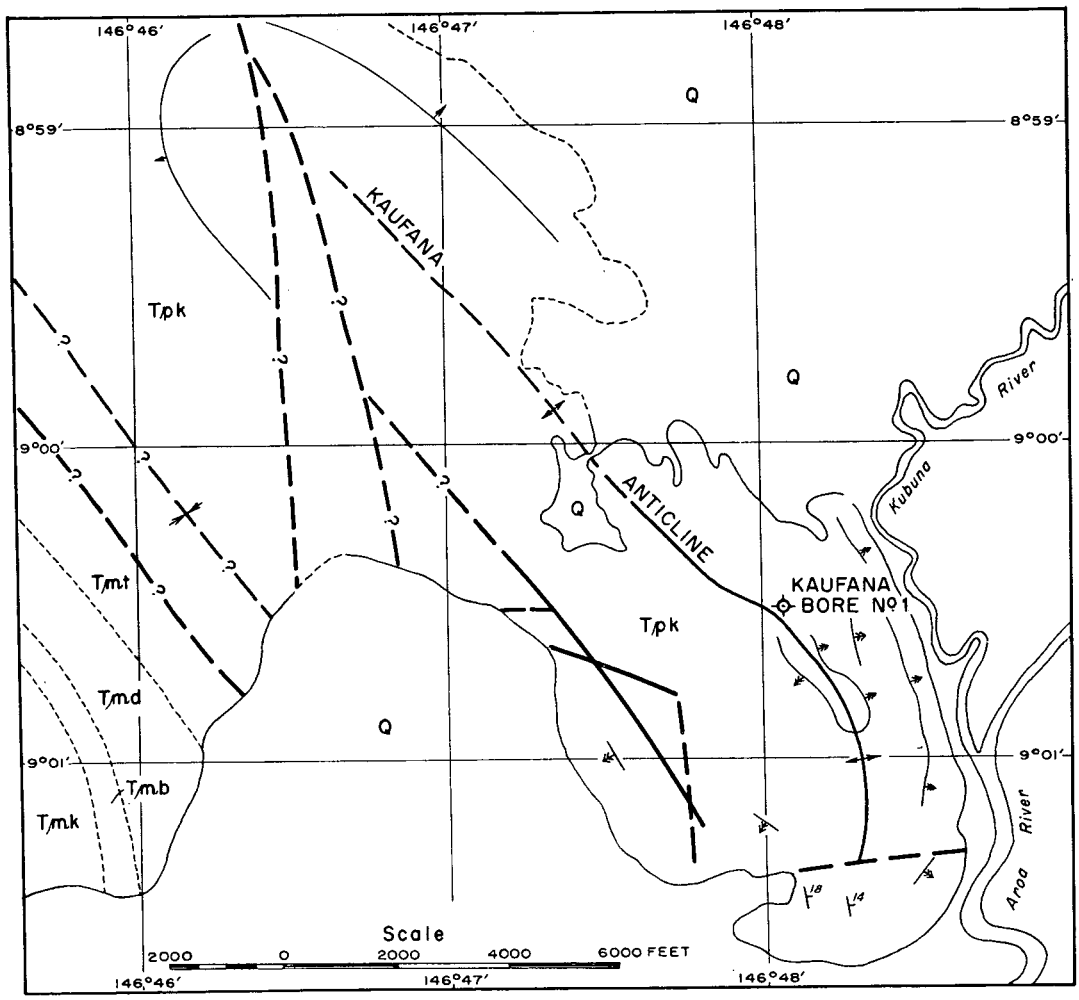

Fig. 3 Geology of the Kaufana Anticline

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The Kaieu Greywacke crops out in the cores of the Tubu and Vanuamai Anticlines; the maximum thickness measured was 700 feet, but the base is nowhere exposed. (4)

No fossils have been determined from this formation, but its relationship to the Bokama Limestone suggests a Miocene ("f1-2") age. (5)

The BOKAMA LIMESTONE is defined as the formation of coral limestone with minor calcarenite and chert conformably between the Kaieu Greywacke below and the Diumana Greywacke above.

The name (first used by Matthews & Sturmfels, 1956) is taken from the old name of a village in the Tubu-Kaieu area (Mayo et al., 1930) used by Millward & Stach (1941) to name the Bokama "Anticline."

The type locality is 500 yards west of Tubu village, where about 200 feet of light grey to yellow massive coral limestone with minor calcarenite and massive white to brown chert rests on Kaieu Greywacke and is overlain conformably by Diumana Greywacke.

The Bokama Limestone crops out as prominent strike ridges in the Kaieu-Tubu-Vanuamai area. It is very fossiliferous, and contains algae, abundant reef and solitary corals, bryozoa, mollusca (echinoid spines, and foraminifera. The only fossil at all diagnostic of age is Mogypsina sp. (determined by Belford, 1957). This indicates Miocene "f" stage. (6)

The DIUMANA GREYWACKE is the formation, consisting dominantly of quartz greywacke, in places fossiliferous, and with minor coral lenses, conformably between the Bokama Limestone below and the Vanuamai Siltstone above.

The name is taken from Diumana village (Lat.$8^{o}58\frac{1}{2}'$ S., Long. $146^{o}42'$ E.); an outcrop belt of the formation trends northwest about 500 yards northeast of the village. In the type locality 2,000 yards north of Diumana village about 400 feet is exposed, predominantly of fine-grained and coarse-grained quartz greywacke; some beds are conglomeratic and some contain abundant shelly fossils; there are minor thin beds of siltstone, hard calcareous quartz greywacke, and claystone. The Diumana Greywacke crops out along the flanks of the anticlines from Vanuamai to Diumana in a belt from 200 to about 500 yards wide.

(4) : Millward and Stach measured 425 feet as the full thickness of the Kaieu Greywacke at the north end of Vanuamai Anticline where it rests on a siltstone formation.

(5) : Millward & Stach (1941) found Miocene "f1-2" siltstone underlying the formation here called Kaieu Greywacke near the north end of Vanuamai Anticline. Stach (1941) reported Miogypsina indonesiensis, Lepidocyclina (Trybliolepidina) martini, and Lepidocyclina (Tryblioleпidina) sp. in the Kaieu Greywacke: this indicates that it is the Miocene "f-3" stage.

(6) : Stach (1941) found Lepidocyclina sp. and Miogypsina indonesiensis in the Bokama Limestone, indicating Miocene "f-3" stage.

Fossils found in the Diumana Greywacke include mollusca, bryozoa, foraminifera, and corals. Belford (1957) identified the following foraminifera:

Alveolinella quoyi d'Orbigny
Amphistegina lessoni d'Orbigny
Anomalinella rostrata (Brady)
Elphidium craticulatum (Fitchell and Moll)
Eponides berthelotianus (d'Orb.)
E. praecinctus (Karrer)
Globigerinoides trilobus (Reuss)
Operculina ammonoides d'Orb.
O. bartschi Cushman
Operculinella venosa (Fitchell and Moll)
Orbulina universa d'Orb.

This is an "f"-stage assemblage, and the presence of Alveolinella quoyi indicates "f-3" stage (probably roughly equivalent to the upper Middle Miocene).

The VANUAMAI SILTSTONE is the formation, dominantly of siltstone with minor thin claystone and greywacke, that rests conformably on the Diumana Greywacke and is unconformably overlain by the Kaufana Beds.

The name is taken from Vanuamai village (Lat. $8^{o}52'$ S., Long. $146^{o}39\frac{1}{2}'$ E.); the formation crops out in a belt about 1,000 yards wide trending southeast 1,500 yards southwest of Vanuamai. The type locality is 1,000 feet east of Tubu village (Lat. 8 $56\frac{1}{2}'$ S., Long. 146 43-3/4' E.), where about 600 feet of blue-grey and brown siltstone with minor thin quartz greywacke beds and few thin claystone beds overlies the Diumana Greywacke in a syncline. The Kaufana Beds unconformably overlie the Vanuamai Siltstone $1\frac{1}{2}$ mile northeast of Tubu Village.

The Vanuamai Siltstone contains an abundant fauna of smaller foraminifera; Belford (1957) has identified the following species:

Amphistegina lessonii d'Orb.
Anomalina glabrata Cushman
Anomalin ella rostrata (Brady)
Astrononion sp.
Bolivina alata (Seguenza)
B. dilatata Reuss
B. sp. cf. B. hebes MacFadyen
B. quadrilatera (Schwager)
B. schwageriana Brady
B. subreticulata Parr
B. tortuosa Brady
Bolivinopsis bulbosa (Cushman)
Cancris auriculus (Fitchell and Moll)
Cassidulina laevigata d'Orb.
C. subglobosa Brady
Ceratobulimina pacifica Cushman and Harris

Clavulinoides sp.
Elphidium craticulatum (Fitchel and Moll)
E. crispum (Linne)
Epistomina elegans (d'Orb.)
Eponides berthelotianus (d'Orb.)
E. margaritiferus (Brady)
E. praecinctus (Karrer)
Gyroidinoides soldanii (d'Orb.)
Nodosaria arundinea Schwager
N. vertebralis (Batsch)
Nonion incisum (Cushman)
Plectofrondicularia interrupta (Karrer)
Pseudoclavulina sp.
Pullenia bulloides (d'Orb.)
Pulleniatina obliquiloculata (Parker and Jones)
Reussella spinulosa (Reuss)
Robulus costatus (Fitchel and Moll)
R. vortex (Fitchel and Moll)
Siphogenerina dimorpha (Parker and Jones)
S. striata (Schwager)
Siphonina tubulosa Cushman
Siphonodosaria insecta (Schwager)
S. lepidula Schwager
Sphaeroidina bulloides d'Orb.
Sphaeroidinella seminulina (Schwager)
Streblus beccarii (Linn.)
Trifarina bradi Cushman
Uvigerina crassicostata Schwager
U. schwageri Brady
Vaginulinopsis sp.
Virgulina pauciloculaa Brady

This assemblage is considered by Belford to be Upper Miocene ("g" stage).

The KAUFANA BEDS consist of conglomerate, quartz greywacke, pebbly claystone, and minor claystone, and lenses of coral limestone, resting unconformably on the Vanuamai Siltstone and overlain by Recent alluvium.

The name is taken from Kaufana Anticline (trending northwest from Lat. $9^{o}01\frac{1}{2}'$ S., Long. $146^{o}48\text{-}3/4'$ E.) which was named by Millward & Stach (1941). The stratigraphic name was first used (as Kaufana Sandstone) by Matthews & Sturmfels (1956, unpublished).

The thickness has not been measured but is estimated to be more than 1,600 feet.

The most prominent outcropping lithology is conglomerate consisting mainly of boulders, cobbles, and pebbles of volcanic rock. Quartz greywacke and claystone with pebbles of quartz and chert form an important part of the sequence; minor claystone and lenticular coral limestone are present.

Fossils observed include corals, mollusca, bryozoa, and foraminifera. No fossils from the Kaufana Beds have been determined but the relationship to the underlying Miocene sediments suggests a Pliocene age. (7)

The Kaufana Beds crop out on the Kaufana Anticline and north-westward towards Vanuamai.

Kaufana Bore No. 1

The stratigraphy of the sequence encountered in the Kaufana Bore may be summarised as follows :

UNIT	AGE	LITHOLOGY	DEPTH (feet)
Kaufana Beds	Pliocene	Calcareous quartz greywacke	10 to 50
	U N C O N F O R M I T Y		
	Miocene "f-3"	Calcareous siltstone	50 to 637
	?Lower Middle Miocene	Siltstone, shale, greywacke	637 to 3,380

The bore was spudded in Pliocene, which continues to a depth of 50 feet, as yellow calcareous quartz greywacke. Abundant Pliocene foraminifera found in a ditch sample from 90 to 100 feet (Belford, this report) are considered to have come from cavings from the upper part of the hole. (8)

The Pliocene quartz greywacke is underlain by grey calcareous siltstone with an abundant fauna of smaller foraminifera (Belford, this report, p. 20), which persists to 605 feet with definite "f-3" fossils at 340 feet. These "f-3" beds could be the lateral equivalent of the Diumana Greywacke and Bokama Limestone in a different lithology, or they could be stratigraphically higher.

(7) : Two miles south-south-east of Vanuamai village, Stach (1941) found a Pliocene assemblage of benthonic and pelagic foraminifera in beds equivalent to the Kaufana Beds.

(8) : M.A. Condon has examined the cuttings and finds no lithological indication of the caving required to introduce the foraminifera described by Belford. As no measured section of the Kaufana Beds is available, it is not known whether or not there are any siltstone members in the lower part of the Kaufana Beds. He agrees with Belford that the boundary between the Kaufana Beds and the Miocene beds in the bore should be located between 100 and 140 feet. There is a marked change in the drilling rate at 140 feet which may indicate the formation boundary, and a change from medium-hard coarse-grained greywacke-siltstone to soft fine-grained siltstone.

The Pliocene-Miocene "f-3" boundary is unconformable, as the Miocene "g" stage (Vanuamai Siltstone) is absent. There are no Miocene "g"-stage sediments on Oroi or Vanuamai Anticline (Millward & Stach, 1941); Glaessner (1941) suggests that they may occur in the synclines, masked by the Pliocene beds. The Vanuamai Siltstone was not seen on the western side of the Tubu Anticline by Power & Morgan (1957), but was mapped west of Tubu by Matthews & Sturmfels (1956): it appears to the east of Tubu, dipping eastwards under apparently conformable Kaufana Beds, and thus appears to crop out only in the syncline between the Tubu and Kaufana Anticlines. This distribution may have been effected by folding penecontemporaneous with deposition, or by erosion before the unconformable Pliocene sediments were laid down.

Pebble conglomerate (pebbles of andesite and quartz up to 1") was encountered between 605 and 637 feet and is assumed to be basal "f-3" stage. It may, however, be part of the Kaieu Greywacke or the equivalent of the topmost conglomerate member of the "f1-2" stage formation that was encountered in the Oroi Bore between 1,608 feet and total depth (5,516 feet). The age of the Kaieu Greywacke has not been determined and therefore only tentative correlations can be made between the sequences at Oroi, Tubu, and Kaufana.

No "f1-2" stage claystone is present, although it is 2,000 feet thick at Oroi (in outcrop and bore). Fossils are rare and not diagnostic of age in the Kaufana bore below 640 feet; Belford (below, p. 27) suggests that the small assemblage may be similar to that found in the "f1-2" stage of the Yule Island-Delena exposures. If this part of the Kaufana Bore sequence is indeed "f1-2" stage, the "f-3" stage sediments overlie it unconformably, as the thick "f1-2" stage claystone is missing.

The early "f-3" stage sediments are shallow marine, and it appears that, if "f1-2"-stage sediments were deposited, they were eroded during a general uplift in early "f-3" time.

Lithology

The lithologies of the section penetrated may be summarised as follows :-

0 - 10 feet	Rotary table to surface.
10 - 50 feet	Yellow, nodular calcareous, cherty lithic sandstone.
50 - 605 feet (9)	Medium grey argillaceous siltstone, fossiliferous, with rare minor lenses of quartzite and volcanic pebbles. Quartz grains in siltstone are sub-angular to sub-rounded, white, clear, or rarely pale green; lithic fragments of volcanic rock (andesite ?), minor white mica, very probably muscovite; small pelecypod valves and probable gastropods; sorting only fair with rare grains of sand size and prominent argillaceous matrix.

(9) : M.A. Condon reports on the cuttings as follows :

50 - 140 feet	Medium hard grey calcareous coarse-grained greywacke-siltstone and calcareous very-fine-grained greywacke; small gastropods, pelecypods, foraminifera, and small fragments of lignite.
140 - 605 feet	As described by Power for 50 - 605 feet but the siltstone is calcareous (see Appendix I).

605 - 637 feet — Poorly sorted grit and pebble conglomerate; pebbles up to 1" diameter, sub-angular to well-rounded; quartzite and volcanic pebbles, prominent greenish-grey argillaceous matrix.

637 - 790 feet (10) — Interbedded greenish-grey, argillaceous siltstone and thin grits and pebble conglomerates. Pebbles of andesite and milky quartzite, sub-rounded to rounded, with minor angular chert; minor thin soft brown coal bands between 670 - 710 feet; minor amounts of small fossil fragments; very thin bands of calcareous silt or silty limestone, crystalline calcite fissure fillings. Matrix greenish-grey, argillaceous, prominent. Quartz grains in siltstone are sub-angular to sub-rounded, white clear and rarely fawn; some red-brown chert, angular. Some pebbles appear fractured and striated or polished; some quartz filling fractures; very minor amounts of bright green mineral present, possibly glauconite or chlorite.

790 - 926 feet — Medium grey, poorly sorted, argillaceous siltstone with very minor sandstone; matrix argillaceous and prominent. Grains are quartz, volcanic fragments, and very minor white mica.

926 - 938 — Greenish-grey argillaceous siltstone with a few fractured, well-rounded quartzite pebbles ($\frac{1}{2}$" - 1").

938 - 998 — Interbedded, greenish-grey, argillaceous siltstone and minor fine-grained well-sorted sandstone.

998 - 1008 — Greenish-grey argillaceous siltstone with minor lenses of quartzite and volcanic pebbles.

1008 - 3380 — Interbedded dark grey brittle compact shale, argillaceous siltstone, and fine silty sandstone, very minor thin silty limestone bands, and thin blue-green plastic claystone, some calcite fissure filling; matrix prominent; sorting fair to good; some evidence of minor faulting. Soft claystone is evident throughout the section, though not contributing greatly to the cuttings, as the frilling fluid returned to surface with greatly increased viscosities and colour changed from brown to blue-grey. The matrix of the coarser cuttings was not washed out.

(10) : The cuttings from 637 feet to total depth include a varying proportion (10 to about 30%) of very-fine-grained and fine-grained greywacke, and much of the siltstone is coarse greywacke-siltstone. - M.A. Condon.

Structure

The Kaufana Anticline was thought to be a draped structure with medium to steep dips (30^{o}-50^{o}). Though some steep axial dips were mapped, the mean surface dip is about 20^{o}. No axial faulting is apparent on the surface.

The only dip of the strata recorded was a dip of 70^{o}-80^{o} at 3,215-3,227 feet (Core No. 1), (11) and drilling conditions (see Summary of Operations) indicated steep dips for most of this section above this.

Some fault breccia appeared about 1,380 feet, but the dimensions and disposition of the fault are unknown.

Since unconformities exist between the Pliocene and the "f2" Miocene, and between the "f3" and the "f1-2" Miocene, it is unlikely that the subsurface structure bears any relationship to that mapped on the surface.

Relevance to Occurrence of Oil and Gas

Kaufana No. 1 was a dry hole with no shows of oil or gas. Acetone tests on cuttings gave slight traces from 67^{o} feet to total depth.

Porosity and Permeability

No formations were encountered of sufficient porosity or permeability to warrant testing.

Conclusions

Information from the hole has added the following to the knowledge of the stratigraphy of the area:

1. The Pliocene is very thin at Kaufana (40 feet), confirming the suggestion made by Power & Morgan (1957) that "an horizon which directly overlies the uppermost exposed Miocene at Tubu, may be the same as the lowermost exposed Pliocene of Kaufana." "..... It is possible that (Miocene) is very shallowly buried by Pliocene at Kaufana".

2. The Miocene "g" stage is not present on Kaufana, though it occurs on Oiapu, Popo, Malalaua, and probably other anticlines to the north and north-west, and in the syncline to the west and north.

3. The Pliocene unconformably overlies the Miocene "f3" stage.

(11) : M.A. Condon considers that the dip at the top of Core No. 1 - 20^{o} - is close to the true dip as it is similar to the dips reported from outcrop at the surface. The very steep bedding in the remainder of Core No. 1 includes small slump-contortions which suggest that the steep bedding may be part of a large slump fold.

4. The Miocene "f3"-stage sediments at Kaufana differ lithologically from the exposures at Tubu.

5. Upper "f1-2" sediments are absent at Kaufana.

6. The Miocene "f3"-stage sediments probably unconformably overlie sediments of lower "f1-2" age.

7. The general thinning of the upper part of the section suggests deposition penecontemporaneous with folding.

8. The sediments were deposited in a trough, not, as previously thought, on a shelf.

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APPENDIX 1

Micropalaeontology of Samples from Kaufana Bore

No. 1.

by

D.J. Belford

Samples of cuttings from the Papuan Apinaipi Petroleum Company's Kaufana No. 1 Bore were forwarded by Mines Administration Pty. Ltd. The cuttings were taken between the depths of 40 feet and 3,348 feet; two samples of core No. 1 between the depths of 3,215 and 3,227 feet were also received.

Determination of foraminiferal content:

40 feet - 50 feet — Foraminifera rare.

Globigerinoides trilobus (Reuss)
Globigerina sp.
Globorotalia menardii (d'Orbigny)
Anomalina glabrata Cushman

90 feet - 100 feet — Foraminifera common.

Orbulina universa d'Orgibny
Globigerina bulloides d'Orbigny
Globigerinoides trilobus (Reuss)
G. sacculiferus (Brady)
Globigerinella aequilateralis (Brady)
Globorotalia menardii (d'Orbigny)
Globoquadrina altispira (Cushman and Jarvis)
Hoglundia elegans (d'Orbigny)
Triloculina tricarinata d'Orbigny
Textularia agglutinans d'Orbigny
Operculina sp. cf. O. gainmardi d'Orbigny
Ammonia beccarii (Linne)
Praeglobobulimina ovata (d'Orbigny)
Trifarina bradyi Cushman
Cassidulina laevigata d'Orbigny
C. subglobosa Brady
C. oblonga Reuss
Astrononion sp.
Nonion incisum (Cushman)
Anomalina balthica (Schroeter)
Sphaeroidinella seminulina (Schwager)
Discorbis sp.

The change in fauna between these two samples and those below, and the occurrence of such forms as Textularia agglutinans, Tribculina tricarinata and Operculina sp. cf. O. gainmardi lead the writer to regard these two samples as Pliocene; the base of the Pliocene is placed between the depths of 100 and 140 feet.

140 feet - 150 feet — Abundant smaller foraminifera

Orbulina universa d'Orbigny
Globigerinoides trilobus (Reuss)
G. sacculiferus (Brady)
Globigerina subcretacea Chapman
G. bulloides d'Orbigny
Globigerinella aequilateralis (Brady)
Globoquadrina altispira (Cushman and Jarvis)
Globorotalia menardii (d'Orbigny)
Globorotalia scitula (Brady)
Pulleniatina obliquiloculata (Parker and Jones)
Sphaeroidinella seminulina (Schwager)
Bolivina tortuosa Brady
Loxostomum amygdalaeforme (Brady)
Siphogenerina raphanus (Parker and Jones)
S. striata (Schwager)
Cassidulina laevigata d'Orbigny
C. subglobosa Brady
C. oblonga Reuss
Astrononion sp.
Ammonia beccarii (Linne)
Anomalina glabrata Cushman
Sphaeroidina bulloides d'Orbigny
Uvigerina gemmaeformis Schwager
Bolivinita quadrilatera (Schwager)
Hoglundia elegans (d'Orbigny)
Nonion incisum (Cushman)
Gyroidinoides soldanii (d'Orbigny)
Stilostomella lepidula (Schwager)
Reussella spinulosa (Reuss)
Virgulina schreibersiana Czjcek
Praeglobobulimina ovata (d'Orbigny)
Buliminella sp.
Siphonina tubulosa Cushman

190 feet - 200 feet — Frequent smaller foraminifera

Globigerinoides trilobus (Reuss)
G. sacculiferus (Brady)
Globigerina subcretacea Chapman
Globoquadrina altispira (Cushman and Jarvis)
Globorotalia menardii (d'Orbigny)

Pulleniatina obliquiloculata (Parker and Jones)
Cibicides pseudoungerianus (Cushman)
Eponides margaritiferus (Brady)
Stilostomella insecta (Schwager)
Siphogenerina raphanus (Parker and Jones)
S. dimorpha (Parker and Jones)
Uvigerina gemmaeformis Schwager

235 feet - 250 feet — Abundant smaller foraminifera.

Orbulina universa d'Orbigny
Globigerinoides trilobus (Reuss)
G. sacculiferus (Brady)
Globigerina subcretacea Chapman
G. bulloides d'Orbigny
Globoquadrina altispira (Cushman and Jarvis)
Globorotalia menardii (d'Orbigny)
Pulleniatina obliquiloculata (Parker and Jones)
Bolivina dilatata Reuss
B. tortuosa Brady
Bolivinita quadrilatera (Schwager)
Praeglobobulimina ovata (d'Orbigny)
Uvigerina gemmaeformis Schwager
Anomalina glabrata Cushman
A. balthica (Schroeter)
Astrononion sp.
Pullenia bulloides (d'Orbigny)
Cassidulina laevigata d'Orbigny
C. subglobosa Brady
Nonion incisum (Cushman)
Pleurostomella alternans Schwager
Sphaeroidina bulloides (d'Orbigny)
Hoglundia elegans (d'Orbigny)
Reussella spinulosa (Reuss)
Trifarina bradyi Cushman
Ammonia beccarii (Linne)

290 feet - 300 feet — Abundant smaller foraminifera

Orbulina universa (d'Orbigny)
Globigerinoides trilobus (Reuss)
G. sacculiferus (Brady)
Globigerina subcretacea Chapman
Globoquadrina altispira (Cushman and Jarvis)
Globorotalia menardii (d'Orbigny)
Pulleniatina obliquiloculata (Parker and Jones)
Eponides margaritiferus (Brady)
Pseudoclavulina sp.
Operculinella venosa (Fichtel and Moll)
Operculina ammonoides (Gronovius)

Stilostomella lepidula (Schwager)
Bolivina tortuosa Brady
Praeglobobulimina ovata (d'Orbigny)
Uvigerina gemmaeformis Schwager
Siphogenerina raphanus (Parker and Jones)
Astrononion sp.
Cassidulina laevigata d'Orbigny
Sphaeroidina bulloides d'Orbigny
Ammonia beccarii (Linne)
Anomalina glabrata Cushman

340 feet - 350 feet — Abundant smaller foraminifera, rare larger foraminifera.

Orbulina universa d'Orbigny
Globigerinoides trilobus (Reuss)
G. sacculiferus (Brady)
Globigerina bulloides d'Orbigny
Globigerinella aequilateralis (Brady)
Globoquadrina altispira (Cushman and Jarvis)
Globorotalia menardii (d'Orbigny)
G. scitula (Brady)
Operculina ammonoides (Gronovius)
O. bartschi Cushman
Elphidium craticulatum (Fichtel and Moll)
Amphistegina lessonii d'Orbigny
Pseudoclavulina sp.
Bathysiphon sp.
Sphaeroidina bulloides d'Orbigny
Nodosaria arundinea Schwager
Stilostomella insecta (Schwager)
S. lepidula (Schwager)
Virgulina schreibersiana Czjcek
Plectofrondicularia interrupta (Karrer)
Bolivina tortuosa Brady
B. dilatata Reuss
Bolivinita quadrilatera (Schwager)
Loxostomum amygdalaeforme (Brady)
Siphogenerina striata (Schwager)
S. raphanus (Parker and Jones)
Uvigerina gemmaeformis Schwager
Anomalina glabrata Cushman
Nonion incisum (Cushman)
Astrononion sp.
Ceratobulimina pacifica Cushman and Harris
Cassidulina laevigata d'Orbigny
C. subglobosa Brady
C. oblonga Reuss
Reussella spinulosa (Reuss)
Trifarina bradyi Cushman
Gyroidinoides soldanii (d'Orbigny)

Hoglundia elegans (d'Orbigny)
Praeglobobulimina ovata (d'Orbigny)
Ammonia beccarii (Linne)
Lepidocyclina (Multilepidina) sp. cf. L.(M.). luxurians Tobler

390 feet - 400 feet — Abundant smaller foraminifera

Globigerinoides trilobus (Reuss)
Globigerina bulloides d'Orbigny
Globigerinella aequilateralis (Brady)
Elphidium craticulatum (Fichtel and Moll)
E. advenum (Cushman)
Eponides berthelotianus (d'Orbigny)
Pseudoclavulina sp.
Amphistegina lessonii d'Orbigny
Operculinella venosa (Fichtel and Moll)
Operculina bartschi Cushman
Uvigerina gemmaeformis Schwager
Bolivinita quadrilatera (Schwager)
Nonion incisum (Cushman)
Cassidulina laevigata d'Orbigny
C. subglobosa Brady
Pullenia bulloides (d'Orbigny)
Ammonia beccarii (Linne)
Siphogenerina raphanus (Parker and Jones)
Anomalina glabrata Cushman
Hoglundia elegans (d'Orbigny)
Stilostomella lepidula (Schwager)
Alveolinella quoyi (d'Orbigny)
Gyroidinoides soldanii (d'Orbigny)

440 feet - 450 feet — Abundant smaller foraminifera

Orbulina universa d'Orbigny
Globigerinoides trilobus (Reuss)
G. sacculiferus (Brady)
Globigerinella aequilateralis (Brady)
Globorotalia menardii (d'Orbigny)
Bolivina alata (Seguenza)
B. dilatata Reuss
Siphogenerina striata (Schwager)
S. indica Le Roy
S. raphanus (Parker and Jones)
Uvigerina schwageri Brady
Stilostomella lepidula (Schwager)
S. insecta (Schwater)
Gyroidinoides soldanii (d'Orbigny)
Plectofrondicularia interrupta (Karrer)
Virgulina schreibersiana Czjcek

Trifarina bradyi Cushman
Ceratobulimina pacifica Cushman and Harris
Astrononion sp.
Sphaeroidina bulloides d'Orbigny
Hoglundia elegans (d'Orbigny
Cassidulina laevigata d'Orbigny
Praeglobobulimina ovata (d'Orbigny)
Alveolinella quoyi (d'Orbigny)
Elphidium craticulatum (Fichtel and Moll)
Frondicularia sp.
Planulina wullerstorfi (Schwager)

490 feet - 500 feet — Abundant smaller foraminifera, very rare larger foraminifera.

Orbulina universa d'Orbigny
Globigerinoides trilobus (Reuss)
G. sacculiferus (Brady)
Globigerina subcretacea Chapman
Globorotalia menardii (d'Orbigny)
Cibicides pseudoungerianus (Cushman)
Planulina wullerstorfi (Schwager)
Pseudoclavulina sp.
Hoglundia elegans (d'Orbigny)
Sphaeroidina bulloides d'Orbigny
Sphaeroidinella seminulina (Schwager)
Uvigerina schwageri Brady
Operculina ammonoides (Gronovius)
Bolivina dilatata Reuss
Bolivinita quadrilatera (Schwager)
Siphogenerina raphanus (Parker and Jones)
S. dimorpha (Parker and Jones)
Trifarina bradyi Cushman
Astrononion sp.
Stilostomella lepidula (Schwager)
Cassidulina laevigata d'Orbigny
C. subglobosa Brady
C. oblonga Reuss
Pleurostomella alternans Schwager
Nonion incisum (Cushman)
Nodosaria arundinea Schwager
Lepidocyclina (Multilepidina) sp. cf. L.(M.). luxurians Tobler

540 feet - 550 feet

Orbulina universa d'Orbigny
Globigerinoides trilobus (Reuss)
G. sacculiferus (Brady)
Globigerina bulloides d'Orbigny
G. subcretacea Chapman
Globigerinella aequilateralis (Brady)
Globoquadrina altispira (Cushman and Jarvis)

Globorotalia menardii (d'Orbigny)
G. scitula Brady
Sphaeroidinella seminulina (Schwager)
Bolivina alata (Seguenza)
B. dilatata Reuss
Bolivinita quadrilatera (Schwager)
Planulina wullerstorfi (Schwager)
Nodosaria arundinea Schwager
Uvigerina schwageri Brady
Sphaeroidina bulloides d'Orbigny
Siphogenerina raphanus (Parker and Jones)
S. dimorpha (Parker and Jones)
S. striata (Schwager)
Praeglobobulimina ovata (d'Orbigny)
Trifarina bradyi Cushman
Stilostomella lepidula (Schwager)
Pleurostomella alternans Schwager
Cassidulina laevigata d'Orbigny
C. subglobosa Brady
Nonion incisum (Cushman)
Gyroidinoides soldanii (d'Orbigny)
Astrononion sp.
Ceratobulimina pacifica Cushman and Harris
Hoglundia elegans (d'Orbigny)

590 feet - 600 feet — Abundant smaller foraminifera.

Orbulina universa d'Orbigny
Globigerinoides trilobus (Reuss)
G. sacculiferus (Brady)
Globigerina subcretacea Chapman
Globorotalia menardii (d'Orbigny)
Pulleniatina obliquiloculata (Parker and Jones)
Sphaeroidina bulloides d'Orbigny
Hoglundia elegans (d'Orbigny)
Cibicides pseudoungerianus (Cushman)
Bolivina dilatata Reuss
Bolivinita quadrilatera (Schwager)
Praeglobobulimina ovata (d'Orbigny)
Uvigerina schwageri Brady
Planulina wullerstorfi (Schwager)
Siphogenerina raphanus (Parker and Jones)
S. dimorpha (Parker and Jones)
Nonion incisum (Cushman)
Astrononion sp.
Trifarina bradyi Cushman
Cassidulina laevigata d'Orbigny
C. subglobosa Brady
Gyroidinoides soldanii (d'Orbigny)

The assemblage occurring in the beds from 140 feet to 600 feet is considered to indicate the "f3" stage, that is, Middle Miocene. Features which are more characteristic of this stage in the Papuan region are the abundance of the genus Orbulina, and the occurrence of such species as Planulina wullerstorfi and Nodosaria arundinea. In the present samples Orbulina does not dominate the assemblages to the extent that it does in other areas, but reference to previous work indicates that these assemblages are of Middle Miocene age. To the writer's knowledge, this is the first record of the subgenus Multilepidina from the Tubu area; this subgenus of Lepidocyclina occurs in other localities in Papua in "f1-2" and "f3" stages.

Between 600 feet and 640 feet there is an abrupt change in the foraminiferal assemblage. The abundant calcareous smaller foraminifera disappear, and are replaced by a poor fauna of mainly arenaceous forms. This assemblage continues with little change to 3,348 feet. Forms recorded over the interval 640 feet - 3,348 feet are :-

Bathysiphon sp.
?Haplophragmoides sp.
Trochammina sp.
Globigerina sp.
Arenaceous indeterminate forms.

No comparable fauna is known from adjacent sections, and in the absence of any distinctive larger foraminifera, it is not possible to give any precise age determination or correlation. Arenaceous indeterminate forms have not previously been recorded above the lowermost formation on Yule Island, which is of "f1-2" age, and it is possible that the bore entered equivalents of this formation between the depths of 600 feet and 640 feet. This does not necessarily mean that the boundary between the "f1-2" and "f3" stages also occurs between 600 feet and 640 feet; with the available evidence, it is not possible to fix this boundary. In the opinion of the writer, the bore ended at 3,348 feet in sediments of "f1-2" age, that is, the upper part of the Lower Miocene.

APPENDIX II

Cementation Logs

Appended to Drilling Report for week ending: 21st December, 1957

WELL: KAUFANA - K.1. Cement Job No.: One

Object: To cement 9-5/8" casing from shoe to surface

Date: 15th December, 1957

Total Depth of Hole: 637 feet Diameter of hole: 12-1/4 inches

Casing: 9-5/8" x 40 lb. STC. J. 55 Shoe at: 632 feet Float Collar at: Nil used

Capacity 12-1/4" hole: 521 3 cu. ft. Capacity Casing:

Capacity of Annulus plus 5 ft. hole: 201 cu. feet.

Volume Slurry required: Plus 20% 240 cu. feet.

Theoretical Specific Gravity of Slurry: 1.70

Amount Cement required (bags): 164 bags

Volume Water required: (Cubic feet) 161 cu. feet

Volume of following mud required: (Cubic feet) 268 cu. feet

OPERATIONS:

Started mixing and pumping cement:	0817 hours
Finished mixing cement:	0838 hours
Average Specific Gravity:	1.62
Amount of Cement used:	164 bags
Volume of Water:	194 cu. feet
Total Volume of slurry:	272 cu. feet
Plug released at:	0840 hours
Started pumping following mud:	0842 hours
Completed pumping following mud:	0857 hours
Plug bumped at:	did not bump
Differential pressure:	137 p.s.i.

REMARKS: Cement returns obtained.

Cementation Logs (Contd.)

Appended to Drilling Report for week ending: 11th January, 1958.

WELL: KAUFANA - K. 1. Cement Job No.: Two

Object: To place 100 lineal foot plug cement at casing shoe

Date: 11th January, 1958

Total Depth of Hole: 3,380 feet Diameter of hole: 8-1/2"

Casing: 9-5/8" x 40 lb. STC. J.55 Shoe at: 632 feet Float Collar at: -

Capacity hole: Capacity Casing:

Capacity of Annulus plus hole:

Volume Slurry required: 42.57 Plus 20% -

Theoretical Specific Gravity of Slurry: 1.70

Amount Cement required (bags): 29 bags

Volume Water required: (Cubic feet) 28 cu. feet

Volume of following mud required: (Cubic feet) 49 cu. feet

OPERATIONS:

Started mixing and pumping cement:	0740 hours
Finished mixing cement:	
Average Specific Gravity:	1.70
Amount of Cement used:	29 bags
Volume of Water:	28 cu. feet
Total Volume of slurry:	42.57 cu. ft.
Plug released at:	-
Started pumping following mud:	-
Completed pumping following mud:	0830
Plug bumped at:	-
Differential pressure:	-

REMARKS: Ran open end drill pipe to 630 feet pumped cement slurry followed by 49 cubic feet following mud. Pulled pipe from hole.

THE PAPUAN APINAIPI PETROLEUM CO. LTD.

WELL N°1 (KAUFANA)

LOCATION: 146° 48' 05" E – 9° 00' 35" S

DATE SPUDDED: 12th December 1957

DATE SUSPENDED: 11th January 1958

ROTARY TABLE ELEVATION: 94 FT

ELECTRIC LOGGING: Failing Logmaster (see note *)

TOTAL DEPTH 3380'

COMPOSITE LOG

LITHOLOGIC LOGGING & COMPILATION: PE POWER-MINES ADMINISTRATION Pty Ltd.

LEGEND

- sandstone
- shale
- mudstone
- limestone
- conglomerate
- siltstone

H S M H N

BITS	HOLE SIZE CASING DIAMETER	RATE OF PENETRATION MINUTES PER FOOT	GAMMA RAY LOG RADIATION INCREASES →	DEPTH FEET	% LITHOLOGY	DESCRIPTIVE LITHOLOGY	STRATIGRAPHY	CORES and EXTRACTIONS	FOOTAGES PER WORKING DAY
Hughes OSQ2 12-1/4 inch diameter	12-1/4 in. O.H. to 637			100		0-10 Rotary table to surface 10-50 Yellow, nodular, calcareous, lithic, silty, argillaceous sandstone	Pliocene		Spudded in at 11am 7th
	9-5/8 in. 40 lb. casing & shoe to 632' cemented			200		50-605 Medium grey, fossiliferous, (shell fragments and possible foraminifera: see appendix No. IV); argillaceous, sandy siltstone with minor pebble lenses. Pebbles are of quartzite and volcanics; subangular to subrounded.	Miocene (3 equivalent		
	Cement Plug 529 to shoe			300					
				400					
				500					
				600		605-637 Pebble conglomerate (up to 1") Pebbles of quartzite and volcanics sub to well rounded. Grit matrix of identical material.			
	8-1/2 inch open hole to T.D.			700		637-790 Interbedded greeny-grey, argillaceous siltstone and thin pebble grits and conglomerates. Pebbles of volcanic origin (andesite) and smoky blue quartzite, sub to well rounded, chert angular. Minor soft, brown coal between 670-710. Fossil fragments; minor thin bands of calcareous siltstone, very minor pyrites.			Running casing, cementing 7" standing cemented
				800		790-926 Medium grey, argillaceous siltstone, matrix prominent; quartz, lithic volcanic fragments, very minor white mica.			
			*Self potential, single-point resistivity and 16" short normal resistivity logs were run, but recorder was defective. Results not shown.	900		926-938 Interbedded greeny-grey siltstone, argillaceous: minor, dark grey, well rounded quartzite pebbles.			
Hughes OSQ2J 8-1/2 inch diameter				1000		938-998 Interbedded greeny-grey, argillaceous siltstone; minor very fine sandstone.			
				1100		998-1008 Interbedded greeny-grey, argillaceous siltstone with minor lenses of quartzite and volcanics pebbles.			
				1200					
				1300					
				1400					11th day round trip reaming
				1500				Deviation 2° 15'	
				1600					
				1700					
Hughes OSCJ 8-1/2 inch diameter				1800					
				1900					
				2000		1008-3380 Interbedded dark grey, britile, compact shale; soft, argillaceous siltstone; soft, fine, grey, silty sandstone; thin, plastic mudstone; very minor thin, silty limestone bonds; some calcite filling fissures.	(Miocene ?)	Deviation 2° 15'	
				2100					
				2200					
				2300					16th day round trip reaming
				2400					
				2500					
				2600					
				2700					
Hunt Drag 8-1/2 inch diameter				2800					
				2900					
				3000					21st day
				3100				Core No.1 3215-3227 recovery 50% dip 70° - 80°.	25th day Pulling out reaming back
Reed H.F.C.H.7				3200				Extraction hydrocarbons - trace water 18.3% by volume	26th day attempted to E-log Core No. 1.
Hunt Drag 8-1/2 inch diameter				3300				Chloride 1690 p.p.m.	30th day E- Gamma logs.
				3400					