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Record 1971/143

SHALLOW STRATIGRAPHIC DRILLING, EASTERN CARPENTARIA BASIN, 1971

by

J. Smart and K.G. Grimes*

*Geological Survey of Queensland

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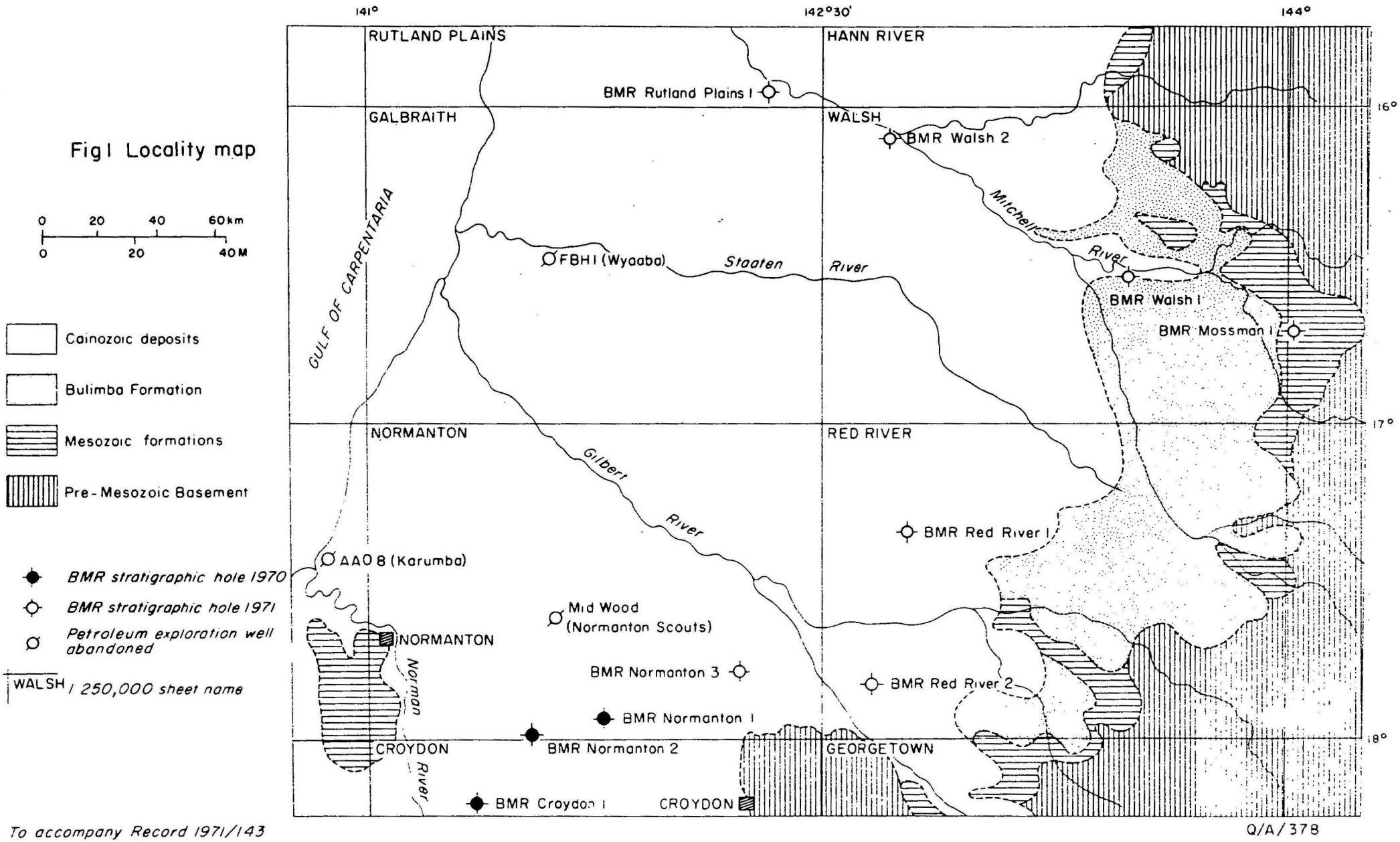
Contents

SUMMARY

Seven shallow stratigraphic holes drilled in 1971 in the eastern Carpentaria Basin produced fresh cores of Mesozoic and Cainozoic units for palaeontological examination, revealed the nature and depth of buried laterite horizons, and resulted in the discovery of an artesian aquifer in the late Cretaceous?-early Tertiary Bulimba Formation.

Fig 1 Locality map



To accompany Record 1971/143

Q/A/378

INTRODUCTION

General

Shallow stratigraphic drilling was carried out in the eastern part of the Carpentaria Basin during June, July and August 1971, using a Mayhew 1000 rig. During July a second Mayhew 1000 rig was used. Seven holes were drilled (Figure 1) to an aggregate depth of 1,128.5 m, with 158.5 m of coring, average recovery being 91.8%.

This program followed on from earlier drilling in 1969 and 1970 (Grimes & Smart, 1970; Needham et al., 1971). Its general object was to provide stratigraphic information in part of the area mapped in 1970 where the surface consists extensively of alluvial cover. Specific objectives were:

(1) to obtain fresh lithological samples from the unexposed or poorly exposed units;

(2) to check thicknesses of units and possible lateral variations, particularly close to basement outcrops or buried ridges;

(3) to check structural hypotheses in selected areas;

(4) to clarify the Mesozoic and Cainozoic geology of the Staaten Embayment and Gilbert-Mitchell Trough;

(5) to test artesian water supplies from Mesozoic and Cainozoic aquifers.

J. Smart (BMR) logged Normanton 3 and Red River 1 & 2, and K.G. Grimes (GSQ) the remainder. Cores and cuttings have yet to be re-examined petrologically and palaeontologically in more detail in the laboratory.

Naming of the holes is by 1:250,000 Sheet areas, i.e. B.M.R. Normanton 3 refers to the third shallow hole drilled by BMR in the Normanton 1:250,000 Sheet area. Localities of the Red River, Walsh and Mossman holes are shown on the Preliminary (1972) Editions of these Sheets. Holes on Normanton and Rutland Plains Sheet areas are shown on the First Editions of these Sheets. Latitudes and longitudes are given in the descriptions of individual holes. Approximate locations are shown in Figure 1.

Results

Cores were obtained of the Gilbert River Formation, the Wallumbilla Formation, the Allaru Mudstone, the Bulimba Formation and Wyaaba Beds. The laterite horizon formed on the Bulimba Formation and Mesozoic units in the area was penetrated in several holes; the depth and nature of this horizon is important to the understanding of the Cainozoic stratigraphy and structure of the region.

Artesian water was discovered in the Bulimba Formation in Walsh 2 and Rutland Plains 1. The results from holes sited on or near inferred basement highs (Red River 1, Normanton 3) have been inconclusive with regard to structure and thickness variations.

Stratigraphy

Stratigraphic terms used here are:

(1) Mesozoic: those of Smart et al., 1971

(2) Cainozoic: the Lynd Formation of Laing & Powers (1959)

has been shown to consist of the late Cretaceous? to early Tertiary Bulimba Formation and the late Cainozoic Wyaaba Beds (Smart et al., in prep.).

Regional mapping of the Carpentaria Basin has been in progress since 1969 and is continuing at present (Doutch et al., 1970, in prep.). As a result a number of new stratigraphic terms have arisen and several old names have been abandoned (Smart et al., 1971 and in prep.). Those used in this Record are shown in Table 1, together with the earlier formation names.

TABLE 1. STRATIGRAPHIC NOMENCLATURE - CARPENTARIA BASIN (1971)

AGE		PREVIOUS TERMS (various authors)	TERMINOLOGY IN THIS PAPER		GENERALIZED LITHOLOGIES
CAINOZOIC	?Cretaceous to Tertiary – Pliocene to Pleistocene	Lynd Formation	Wyaaba Beds		Sandy clay, clayey sand, quartzose granules
			UNCONFORMITY		
			Bulimba Formation		Laterite at top Sandy claystone, clayey sandstone and granule conglomerate
		MAJOR UNCONFORMITY			
MESOZOIC	Lower Cretaceous	Normanton Formation	Rolling Downs Group	Normanton Formation	Labile sandstone and mudstone
				Allaru Mudstone	Mudstone
		Kamileroi Limestone		Toolebuc Limestone	Calcareous shale and limestone
		Trimble Formation Blackdown Formation		Wallumbilla Formation	Mudstone, minor labile sandstone and limestone
	Jurassic to Lower Cretaceous	Wrotham Park Sand-stone	Gilbert River Formation	Coffin Hill Member	Medium-grained clayey quartz sandstone (marine)
				Yappar Member	Coarse to medium-grained clayey quartz sandstone (terrestrial)

BMR Normanton 3 (Figure 2)

Position: Lat. 17°48'S , Long. 142°12'E , 6.4 km (4 miles) west of Fords Mill, immediately north of Rocky Creek, Normanton 1:250,000 Sheet area. Sited on the northern flank of the Croydon-Smithburne High. (Simpson, in prep.). Spudded into Wyaaba Beds.

Objectives: (a) To determine depth and nature of the laterite horizon.

(b) To determine thickness and nature of the Cainozoic units.

(c) To determine depth, thickness and nature of the Toolebuc Limestone.

The hole was planned as a **shallow** hole, and due to equipment problems, it was impossible to continue drilling to basement.

Drilling: Drilled with air to 21.9 m, then with mud. Drilling speeds were fairly high throughout, although cavings from the Cainozoic units caused delays.

The Cainozoic units were wet throughout, but no estimate of possible yields can be made. The Mesozoic sandstone was not tested for water.

Stratigraphy: 0- 40.5 m Wyaaba Beds clayey quartzose sandstone, minor sandy claystone. Lower part reddish, with pebbles of igneous and lateritic material.

40.5-67 m Bulimba Formation white-grey claystone, sandy in part, minor clayey sand. Upper part is partly silicified, and with some red staining. This represents the eroded remnant of a major lateritic horizon.

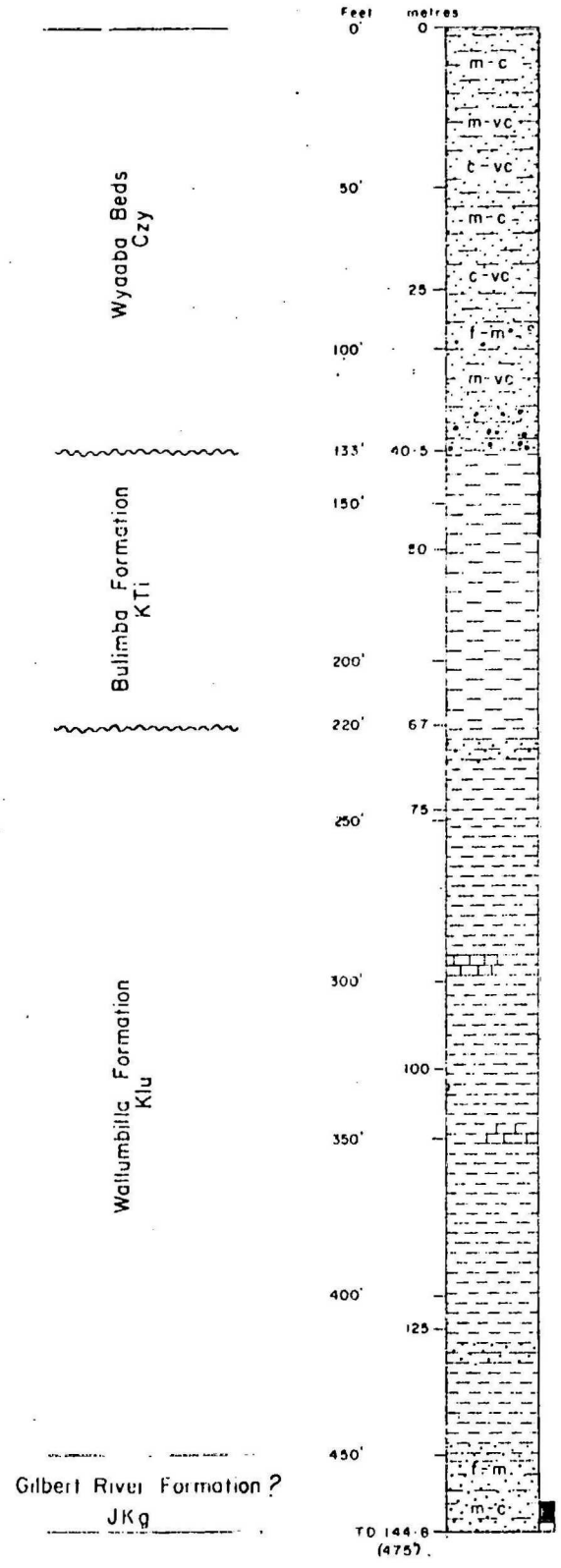
67-137.1 m Wallumbilla Formation, grey silty mudstone, with minor thin calcareous bands.

137.1-144.8 m Gilbert River Formation(?), grey, cross-bedded, quartzose, clayey micaceous sandstone, with carbonaceous partings.

The sandstone unit from 137.1 m onwards is tentatively assigned to the Gilbert River Formation because it is a sandstone and is quartzose and cross-bedded. In view of structural complications in the area (Doutch et al., in prep.; Simpson, in prep.) it may be younger than the Gilbert River Formation elsewhere.

Palynomorphs suggest an (?early) Aptian age, but the evidence is inconclusive (Burger, pers. comm.). A brackish water, near-shore environment is indicated.

The Toolebuc Limestone was not penetrated, and if the sandstone unit is Gilbert River Formation, the Toolebuc subcrops below the Cainozoic much farther west than previously supposed.



Brown, quartzose clayey sand

Grey sandy clay, with yellow-brown stains sand m-vc and granules
Traces white lst at 6·0-9·1m (20'-30')

Soft yellow-grey clayey quartzose sand

Grey quartzose clayey sand, minor pebble bands

Grey quartzose clayey sand and sandy clay, reddish in colour from 22·3m (73')

Yellow and red sandy clay, some pebbles

From 39·6m (130'), sandy clay, with pebbles - quartzose, basalt, opaline silica etc.

White porcellaneous claystone, hard, silicified ? some red staining

a/a, less red-stained material

Soft white and yellow clay

a/a

Soft white and yellow clay. Formation appears to be hard white claystone

Dark grey mudstone, mixed with yellow clay to 68·6m (225'), then sandy, silty, yellow-brown clay, to 71·8m (235')

Dark grey silty mudstone

a/a minor calcareous bands

a/a minor calcareous bands

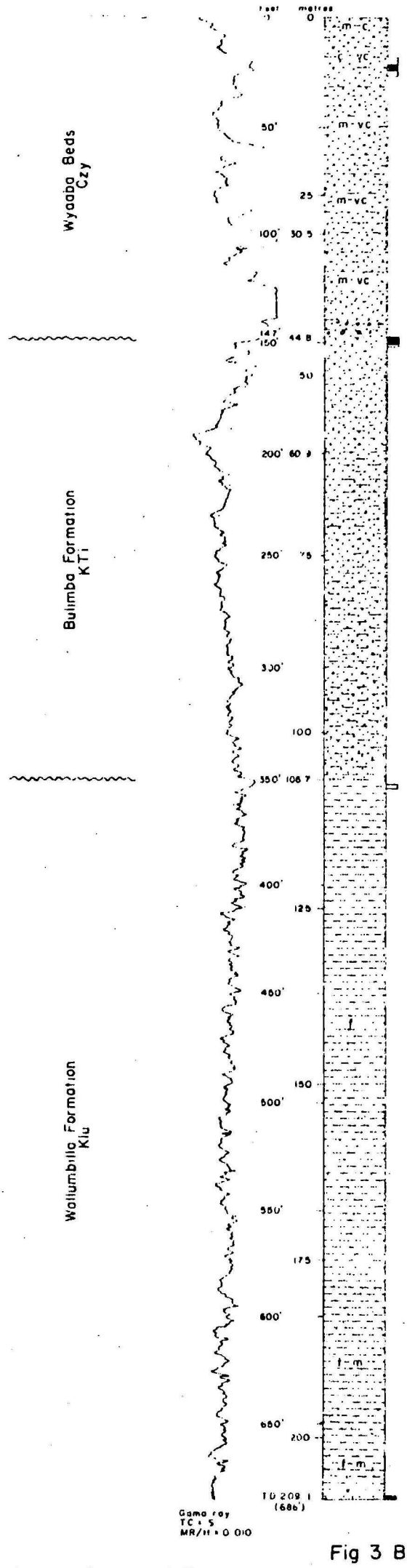
a/a with minor greenish-white sandy clay, glauconitic (?)

Cuttings a/a, but with f-m quartzose sand

Core 1 141·7-144·8m (465'-475') rec 1·9m (6'2"). Light grey quartzose clayey sandstone, m-c grain, sl micaceous and cross bedded. Thinly bedded 2-20cms (1"-9") with carbonaceous partings

Legend as on Fig 4

Fig 2 BMR Normanton Stratigraphic hole 3



Soft, clayey sand

Core 1 5 7 - 8 4m (18'6"-27'6"), recovered 0 35m (1'6")
Soft clayey sand, quartzose pebbles up to 15mm (0·5") pebbles to 8mm (0 3")
Soft v clayey quartzose sand; some quartzose granules

Sandy clay
and
clayey sand

a/a, but more clayey
Lateritic fragments from 42 2m (140')
Hard drilling from 44 2m (145')' vc sand and pebbles· quartzose granitic and volcanic, sandy clay, lateritic fragments

Core 2 44 8 - 46 2m (147'-151'6") recovered 1 3m (4'6") Hard, sandy claystone, yellow· brown colour, red – brown staining to 48m (157'), then white sandy claystone

White sandy claystone a/a

White sandy claystone a/a

a/a

Core 3 Dk grey silty mudstone, yellow brown staining
107 6 - 108 2m (353' - 355') no recovery

a/a

Dk grey silty mudstone a/a, minor dk grey fine sandstone

a/a

Dk grey silty mudstone a/a, minor sandstone

a/a

Mudstone a/a minor dk greenish clayey glauconitic sandstone

a/a

Core 4 208 8 - 209 1m (685'-686') recovered 0 30m (1')
dk grey silty mudstone a/a

Legend as on Fig 4

Fig 3 BMR Red River Stratigraphic hole 1

To Accompany Record 1971/143

BMR Red River 1 (Figure 3)

Position: Lat. 17°22'S, Long. 142°E; 1.6 km (1 mile) south of Retreat Waterhole on Pelican Creek.

Spudded into Wyaaba Beds.

Objectives: (a) To determine the depth and nature of the laterite horizon.

(b) To determine the depth and thickness of the Gilbert River Formation.

(c) To determine depth to basement.

(d) To determine thickness and nature of the Cainozoic units.

The hole was sited on the expected continuation of a basement high centred on the Abingdon area to the southeast. However, as a considerable thickness of Mesozoic was encountered, the possible continuation of the structure is in doubt.

Drilling: Drilled with air to 2.5 m, then with mud. Drilling speeds were fairly good, but continuous caving of the Cainozoic units caused some delays.

The Cainozoic units were wet throughout, but no estimates of possible water supplies were obtained.

Stratigraphy 0-44.8 m Wyaaba Beds. Soft clayey quartzose sand, minor sandy clay. Lowest part contains lateritic fragments, and pebbles of igneous basement rocks.

44.8-106.7 m Bulimba Formation firm to hard sandy claystone, minor clayey sandstone. Upper part is stained yellow-brown and red-brown and is the eroded remnant of a major laterite horizon.

106.7-209.1 m TD. Wallumbilla Formation grey silty mudstone, minor fine glauconitic sandstone, particularly in lower part.

Basement was not reached, but assuming the Wallumbilla Formation to be about 140-150 m thick, the top of the Gilbert River Formation would be at 250-260 m and basement at 280-300 m.

Palynomorphs from core 4 indicate a Late to uppermost Aptian age, probably spore unit K1b-c (Burger, pers. comm.). A brackish-marine environment is indicated. Core 3 yielded palynomorphs, suggestive of a late Aptian age, possibly spore unit K 26 (Burger, pers. comm.) and a brackish to marine environment is indicated.

BMR Red River 2 (Figure 4)

Position: Lat. 17°49'S, Long. 142°39'E. On west bank of Jam Tin Creek, sited below a low scarp of lateritized Wyaaba Beds.

Objectives: (a) To determine depth and nature of the main laterite horizons.

(b) To determine thickness and nature of the Cainozoic units.

(c) To determine depth and nature of the uppermost Mesozoic.

The hole was planned as a quick, shallow hole with a depth limit of 76.2 m due to limitations of the drilling equipment.

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Drilling: Drilled with air to 26.5 m, then with water. Caving of sand from the upper part of the hole was considerable and the cuttings were badly contaminated, especially from 61 m onwards. Drilling speeds were high. The Cainozoic units were wet but no estimate of possible water yield could be made.

Stratigraphy: 0.18.3 m Wyaaba Beds clayey quartzose sand, minor sandy clay. Lowest part contains lateritic fragments.

18.3-82.3 m.TD. Bulimba Formation. Grey-white sandy clay and claystone, minor clayey sand. Top portion is red-brown stained, representing the eroded remnant of a major laterite horizon. Mesozoic rocks were not reached, but would probably be at about 95-100 m.

BMR Mossman 1 (Figure 5)

Position: Lat. 16°42'S , Long. 144°01'E ; 5 km SSE of Wrotham Park homestead. Barometer elevation 177 m (± 2m).

Spudded into Quaternary alluvium.

Objectives:

(a) To core the basal Wallumbilla Formation and both members of the Gilbert River Formation for lithological investigations.

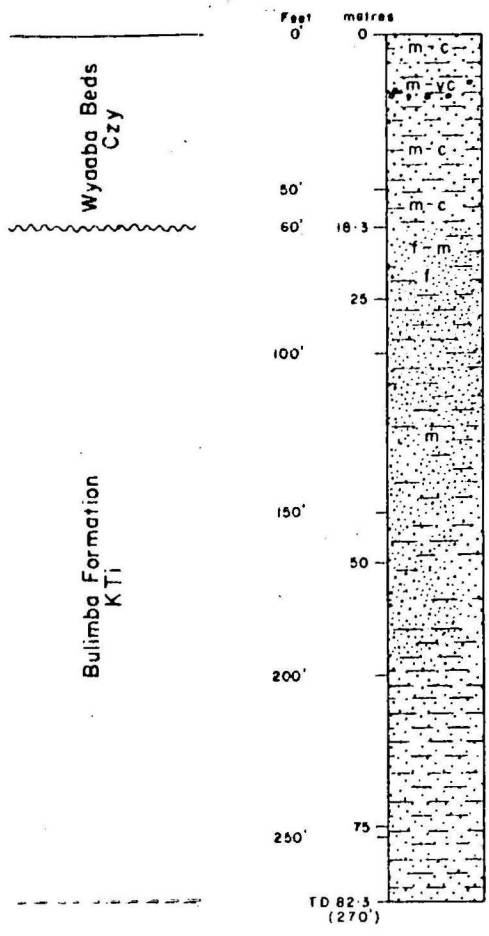
(b) To obtain structural data on the dip of a sandstone marker bed within the Wallumbilla Formation.

(c) To determine the depth to basement and thickness of the Gilbert River Formation and its members.

(d) To test artesian water supplies from the Gilbert River Formation.

The hole was sited a short distance down dip from outcrop of the lustre-mottled, pebbly sandstone marker bed in the Wallumbilla Formation, and in an area where basement was thought to be at about 140 m on aeromagnetic information (Shelly et al., in prep.). As artesian water was expected, an arrangement had been made with the Queensland Irrigation and Water Supply Commission for the BMR to complete the hole for use by the IWSC as an observation bore.

Drilling: Drilled with air to 17 m and with mud from there to total depth. Continuous cores were drilled below 59 m. Surface 6" casing was cemented at 12.7 m, and 3" galvanized iron piping was cemented to 92 m. A smaller diameter diamond bit was used below this depth with a wireline core barrel. Drilling proved to be very slow, as no tungsten core bits had been provided for this diameter pipe and the diamonds were not suited to the mudstone beds. The hole was abandoned at 180.2 m when drilling in the conglomerate sequence proved too slow and threatened to hold up the rest of the drill programme. Details of cores are given in Table 3.



Yellow-brown clayey quartzose sand, minor vc, and granules

a/a minor pebbles

Soft brown clayey quartzose sand

Harder drilling from 13·1m (43'), cuttings a/a, with fragments of red ferruginous sandstone, minor pisolitic fragments

Red-brown ferrug. clayey sst, minor grey sandy claystone and clayey sst

Grey - yellow hard siltstone - fine sandstone with red-brown clayey material; red-brown lateritic fragments

Hard white - light grey siltstone, minor purple siltstone

Soft white sandy clay

a/a

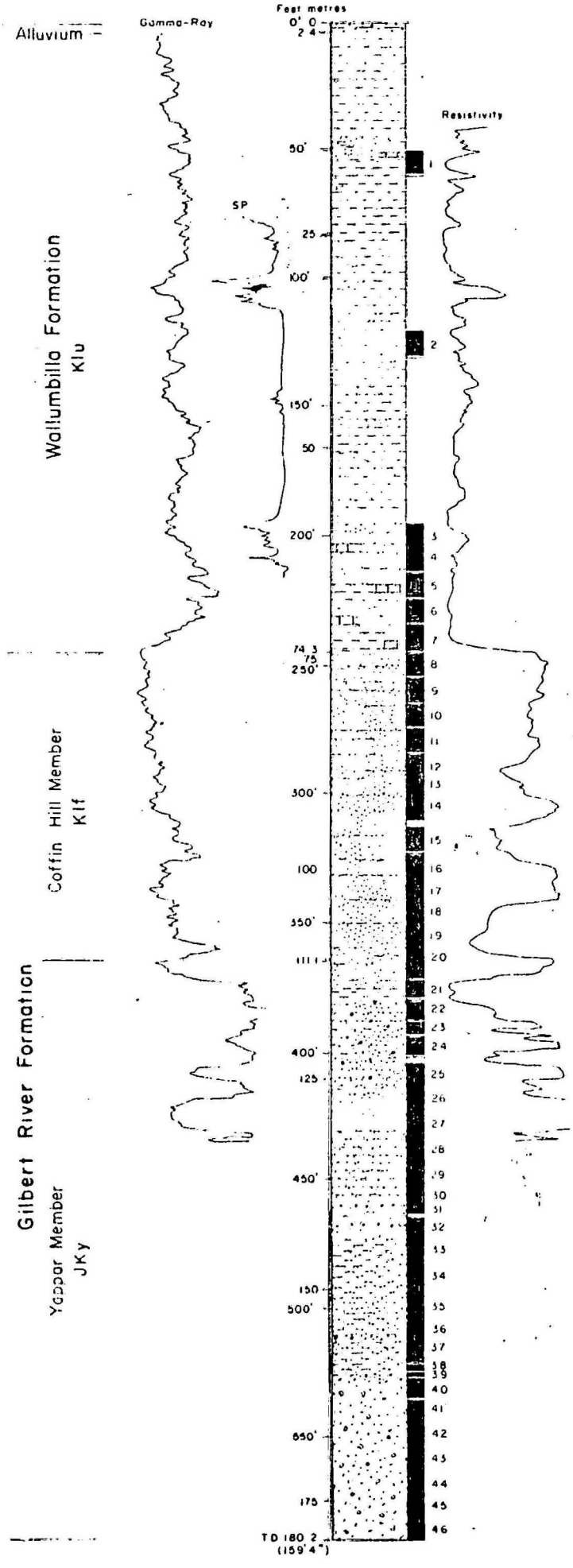
a/a soft white sandy clay

Soft white clay and sand (m-vc) cuttings mostly sand, but appear to be cavings as top of hole collapsing

LEGEND

f	Fine grained 0·125-0·25mm
m	Medium grained 0·25-0·5mm
c	Coarse grained 0·5-1·0mm
vc	Very coarse grained 1·0-2·0mm
a/a	As above
dk	Dark
rec	Recovery

Fig 4 BMR Red River Stratigraphic hole 2



0-2·4m (0'-8') Yellow brown sandy clay

2·4-13·7m (8'-45') Grey mudstone

13·7-15·8m (45'-52') Green-grey pebbly m-vc sublabile sandstone, with minor shale and limestone

15·8-60·6m (52'-199') Grey mudstone with thin beds of m-f glauconitic sandstone

60·6-67·8m (199'-223') Grey f-m glauconitic labile sandstone with interbedded mudstone, minor limestone

67·8-74·3m (223'-244') Grey mudstone, minor limestone

74·3-111·1m (244'-364'6") Grey m-f clayey glauconitic quartz sandstone with numerous streaks and blebs of grey mudstone; trace fossils

111·1-114·3m (364'6"-375') Grey m-vc, clayey, slightly glauconitic quartz sandstone, with minor mudstone
114·3-115·8m (375'-380') Grey shale and mudstone. Trace fossils

115·8-127·6m (380'-418') Interbedded sequence of m-vc quartz sandstone, pebbly and granular in parts, and grey mudstone

127·6-131·5m (418'-431') Light grey, very porous, coarse quartz sandstone Artesian flow

131·5-137·6m (431'-458') Interbedded m-f, partly glauconitic, quartz sandstone, and grey mudstone

137·6-143·7m (458'-472') m-vc quartz sandstone with some granular and pebbly bands

143·7-155·5m (472'-511') Interbedded vf-vc quartz sandstone, glauconitic in parts and grey mudstone, and carbonaceous siltstone

155·5-155·8m (511'-512') Polymictic pebble conglomerate
155·8-160·3m (512'-527') vf-vc sublabile sandstone with minor thin beds of carbonaceous siltstone, and mudstone - some pebbles towards base

160·3-180·2 (527'-591'4") (TD) Green polymictic conglomerate (dominantly volcanic pebbles)

Legend as on Fig 4

Fig 5 BMR Mossman Stratigraphic hole 1

TABLE 2: B.M.R. MOSSMAN 1, CORE DETAILS

Core	Interval		Length		% Recovery
	From	To	Cored	Recovered	
1	15.24m	18.29m	3.05m	2.92m	95.7%
2	36.57	39.62	3.05	3.00	98.4
3	59.44	62.41	2.97	2.92	98.4
4	62.41	65.46	3.05	2.99	98.0
5	65.46	68.50	3.05	3.00	98.4
6	68.50	71.55*	3.05	2.94	96.3
7	71.63 *	74.68	3.05	3.00	98.4
8	74.68	77.72	3.05	3.00	98.4
9	77.72	80.77	3.05	3.02	99.0
10	80.77	83.82	3.05	2.72	89.2
11	83.82	86.87	3.05	2.92	95.8
12	86.87	89.92	3.05	2.75	90.2
13	89.92	92.35	2.44	2.77	113.5
14	92.35	95.40	3.05	2.23	73.2
15	95.40	98.45	3.05	2.77	90.8
16	98.45	101.50	3.05	3.05	100.0
17	101.50	104.55	3.05	3.12	102.2
18	104.55	107.59	3.05	3.02	99.0
19	107.59	110.64	3.05	3.07	100.6
20	110.64	113.69	3.05	3.01	98.7
21	113.69	115.90	2.21	2.14	96.8
22	115.90	118.80	2.90	2.67	92.0
23	118.80	120.40	1.60	1.52	95.0
24	120.40	122.83 *	2.44	2.14	87.7
25	123.60 *	126.49	2.90	2.49	84.8
26	126.49	129.54	3.05	3.05	100.0
27	129.54	132.59	3.05	3.00	98.4
28	132.59	135.64	3.05	3.15	103.3
29	135.64	138.74	3.10	3.09	99.7
30	138.74	139.60	0.86	0.87	101.2
31	139.60	142.04	2.44	2.06	84.4
32	142.04	144.48	2.44	2.21	90.6
33	144.48	147.52	3.05	3.10	101.7
34	147.52	150.57	3.05	3.16	103.6
35	150.57	153.62	3.05	3.05	100.0
36	153.62	156.67	3.05	3.05	100.0

TABLE 2. (Cont'd)

Core	Interval		Length		% Recovery
	From	To	Cored	Recovered	
37	156.67	159.72	3.05	3.03	99.4
38	159.72	160.55	0.84	0.79	94.0
39	160.55	160.93	0.38	0.25	65.8
40	160.93	163.68	2.74	2.39	87.2
41	163.68	166.73	3.05	3.12	102.3
42	166.73	169.16	2.44	2.49	102.1
43	169.16	172.21	3.05	3.10	101.6
44	172.21	175.26	3.05	3.12	102.3
45	175.26	177.19	1.93	1.91	99.0
46	177.19	180.24	3.05	3.05	100.0

Note. Recoveries greater than 100% are due to pick up of material lost from earlier cores.

* These were short non-cored intervals between cores 6-7, and 24-25.

Stratigraphy: 0-2.4 m Quaternary Alluvium

0-2.4 m (2.4m) Yellow-brown clay, slightly sandy.

2.4-74.3 m Wallumbilla Formation

2.4-13.7 m (11.3 m) Grey mudstone

13.7-15.5 m (1.8 m) Pale green-grey pebbly m-vc sublabile sandstone, with lustre mottled calcite cement in parts, and interbeds of grey shale. Porous bands, subartesian water.

15.5-15.8 m (0.3 m) Hard grey limestone (calcilutite).

15.8-60.6 m (44.8 m) Grey mudstone with thin partings of f-m glauconitic sandstone, and a few thicker beds of sandstone.

60.6-67.8 m (7.3 m) Light grey f-m glauconitic clayey labile sandstone with streaks of grey mudstone becoming more common towards the bottom. Some nodules of hard brown-grey limestone.

67.8-74.3 m (6.4 m) Grey mudstone with a few limestone nodules.

74.3-180.2 m Gilbert River Formation

74.3-111.1 m Coffin Hill Member

74.3-111.1 m (36.8 m) Green-grey m-f clayey glauconitic quartz sandstone with numerous streaks and blebs of grey mudstone. Bedding commonly disturbed by numerous burrows. Rhizocorallium tubes were identified in two cores. The beds are mostly tight but have a few porous zones near the top.

111.1-180.2 m Yappar Member

111.1-114.3 m (3.2 m) Green-grey m-vc clayey slightly glauconitic quartz sandstone with a few streaks of grey mudstone, borings present, tight.

114.3-115.8 m (1.5 m) Grey shale and mudstone with burrows filled with m-f glauconitic sandstone.

115.8-117.6 m (1.8 m) Light grey, clayey poorly sorted m-vc granular and pebbly sublabile sandstone with a few thin beds of mudstone.

117.6-121.0 m (3.4 m) Interbedded sequence of grey well sorted c-m quartz sandstone, massive and slightly porous, and grey mudstone with thin lenses of clayey m-c sandstone. Individual beds range in thickness from 3cm to 52cm. The mud-sand contacts are often sinusoidal, suggesting ripple structures. Some surface trails on bed junctions.

Stratigraphy (contd):

121.0-123.7 m (2.7 m) Green-grey m. clayey glauconitic quartz sandstone with blebs of pyrite. Interbedded with grey carbonaceous mudstone. A few patches of brown mudstone.

123.7-125.2 m (1.5 m) Porous light grey pebbly vc-m quartz sandstone, with a few thin mudstone beds. Artesian flow, about 19 litres/hour.

125.2-127.3 m (2.1 m) Grey m. glauconitic, pyritic, clayey quartz sandstone with interbeds of grey mudstone.

127.3-127.6 m (0.3 m) Grey mudstone.

127.6-131.5 m (3.9 m) Light grey, very porous, massive coarse quartz sandstone. Artesian flow of 136 litres/hour (main aquifer).

131.5-132.7 m (1.2 m) Interbedded light grey m. glauconitic quartz sandstone and grey mudstone.

132.7-133.6 m (0.9 m) Grey mudstone with minor m-f sandstone.

133.6-135.7 m (2.1 m) Light grey, massive m-f clayey slightly glauconitic sublabile sandstone, with interbeds of grey mudstone.

135.7-137.6 m (2.1 m) Grey mudstone with a few thin beds of hard white m-f clayey ?labile sandstone.

137.6-139.4 m (1.8 m) Light grey massive m-vc quartz sandstone, with pyrite grains, and interbeds of grey mudstone, a few surface trails.

139.4-143.7 m (4.3 m) Light grey massive m-vc quartz sandstone with some granular and pebbly beds. A few beds of fine sandstone and siltstone.

143.7-144.6 m (0.9 m) Grey f-vf sandstone and grey siltstone and mudstone; some carbonaceous material.

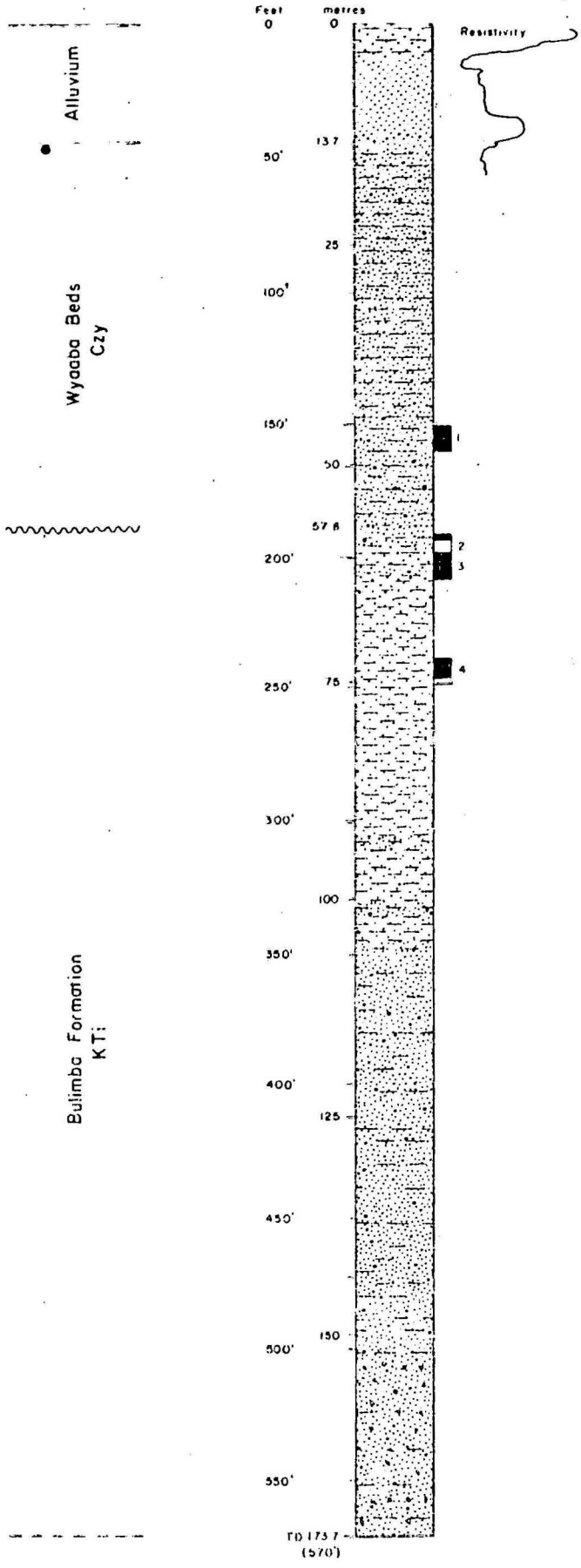
144.6-145.8 m (1.2 m) Green-grey to grey vc-f quartz sandstone with thin beds and streaks of grey mudstone; some glauconite in parts.

145.8-152.5 m (6.7 m) Interbeds of green-grey, f-m, glauconitic clayey sandstone with streaks of mudstone, grey mudstone and minor grey carbonaceous siltstone.

152.5-153.7 m (1.2 m) Grey, hard, carbonaceous and micaceous siltstone, with minor thin beds of vf siltstone.

153.7-155.5 m (1.8 m) Finely interbedded grey mudstone and grey siltstone, and light grey vf sandstone (mud:silt:sand = 2:2:1).

155.5-155.8 m (0.3 m) Light to dark grey polymict pebble conglomerate and pebbly m-vc poorly sorted clayey labile sandstone; calcareous in parts.



0-4.6m (0'-15') Chocolate-brown, m-f sandy clay, and yellow-brown sandy clay, calcareous nodules 1.5-3.0m (5'-10')

4.6-13.7m (15'-45') Yellow-brown and light grey m-vc sand, with pebbles and granules in lower part

13.7-22.9m (45'-75') Light grey, with some brown and orange mottlings, clay (sandy, c-m) with some beds of brown and grey c-vc sand, granules and gravel

22.9-36.6m (75'-120') Interbedded grey and brown sandy clay and m-vc sand, granules and pebbles

36.6-45.1m (120'-148') Brown vc-m sand with gravel and some very sandy clay

45.1-53.3m (148'-175') Mottled grey and buff-brown clay (sand m-vc)

53.3-56.4m (175'-185') Brown m-vc sand and granules, plus sandy clay

56.4-57.6m (185'-189') Brown sandy clay and m-vc sand and granules

57.6-58.8m (189'-193') Hard, mottled, light grey and red-brown sandy claystone

58.8-63.7m (193'-209') Grey and buff-brown sandy clay

63.7-65.2m (209'-214') Light brown clayey granules and sand

65.2-72.5m (214'-238') Mottled light grey and red-brown sandy claystone

72.5-72.8m (238'-239') Very hard, light grey silicified claystone

72.8-94.5m (239-310') Hard, mottled light grey and red-brown sandy claystone

94.5-105.2m (310'-345') Hard, mottled light grey and red-brown sandy claystone, with beds of m-vc sand and granules

105.2-121.9m (345'-400') Interbedded, grey m-vc sand and light grey and red, or buff-brown sandy clay

121.9-153.9m (400'-505') Light grey, soft granules and v. m quartz sand with minor patches of grey or light brown sandy clay

153.9-173.7m (505'-570') As above, but with small pebbles Artesian flow

Legend as on Fig 4

Fig 6 BMR Rutland Plains Stratigraphic hole 1

Stratigraphy (contd):

155.8-158.5 m (2.7 m) Slightly greenish grey vf-m ?sublabile sandstone with thin streaks and beds of grey carbonaceous siltstone.

158.5-160.3 m (1.8 m) Light grey vc-m quartzose to sublabile sandstone, with carbonized plant fragments. Calcareous in parts. Minor beds of grey carbonaceous and micaceous siltstone. Some pebbles towards the base.

160.3-180.2 m (19.9 m) Green (fading rapidly to white in the air) polymict pebble conglomerate. The pebbles are generally well rounded and are composed dominantly of green volcanic rocks, with minor quartzites, quartz, jasper, metamorphic and sedimentary pebbles and a few agates. The matrix is green, white, or red, poorly sorted clayey vc sublabile sandstone.

Electric and gamma-ray logs were run to 133 m, at which depth the hole was blocked. The gamma-ray and resistivity logs show an excellent correlation with the lithologies and with each other. The S.P. log only functioned for part of the hole but appears satisfactory for that interval. Basement was not reached but is probably within 20 m of the bottom of the hole. The basal 19 m of conglomerate have no outcrop equivalents in the area. They are probably an isolated gravel deposit in a valley cut into basement. The pebbles are mostly derived from the Permo-Carboniferous Nychum Volcanics which underly the Gilbert River Formation to the east. The sequence appears to be continuous, and the conglomerate is regarded as the basal part of the Gilbert River Formation. Artesian water was struck at 130 m with a final flow of 136 litres/hour (see section on ground water for details). The Yappar Member was much more argillaceous in the hole than in the outcrops to the east. This is possibly due to a facies change within the beds.

BMR Rutland Plains 1 (Figure 6)

Position: Lat. 15°57'S, Long. 142°19'E, 13 km NW of Dunbar and 2 km north of Dunbar-Rutland Plains Road. Barometer elevation 47 m (± 2 m).

Spudded into Quaternary alluvium.

Objectives:

(a) To sample the Cainozoic units in the area.

(b) To find the depth to, and nature of, the laterite horizon of the Bulimba Formation.

(c) To penetrate through the Cainozoic beds and sample and identify the top of the Mesozoic beds.

(d) To obtain structural information about the Gilbert-Mitchell Trough.

The hole was sited on the north flank of the Gilbert-Mitchell Trough where it was expected that the Cainozoic beds would be only 150 m thick, allowing penetration to the Mesozoic.

Drilling: Drilled with air to 10.7 m and then changed to mud in order to lift gravel found at that depth. The clayey formation made it necessary to thin the mud at regular intervals. The well started to flow artesian water at 110,000 litres/hour after thinning the mud at 173.7 m, and it was necessary to abandon and plug the hole without drilling deeper. Details of cores are given in Table 3.

Stratigraphy: 0-13.7 m Quaternary alluvium. Brown sandy clay overlying brown and grey m-vc sand with pebbles and granules towards the base.

13.7-57.6 m Wyaaba Beds. An alternating sequence of mottled light grey and yellow-brown soft sandy clay, and brown vc-m sand with granules and gravel.

57.6-173 m Bulimba Formation. 57.5-105 m, hard mottled light grey and red-brown lateritized sandy claystone with minor m-vc sand and granule beds towards base. 105-173.7 m, softer light grey granules and vc-m sand with minor clay. Pebbly and porous in lower part.

The hole did not reach the Mesozoic sequence and there is insufficient data to predict its depth accurately. The artesian flow is from a previously unknown aquifer (see section on groundwater).

TABLE 3 : BMR RUTLAND PLAINS 1, CORE DETAILS

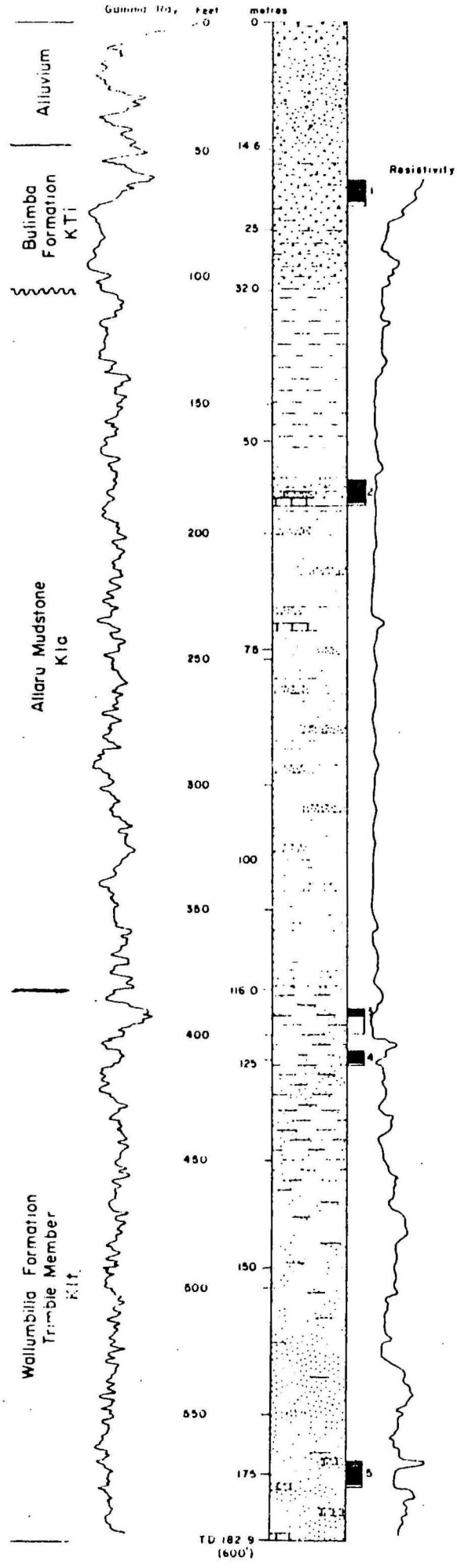
Core	Interval		Length		% Recovery
	From	To	Cored	Recovered	
1	45.72m	48.77m	3.05m	3.05	100.0
2	58.06	61.11	3.05	0.80	26.2
3	61.11	63.55	2.44	3.05	125.0
4	72.75	75.79	3.05	2.45	80.4

Note: Recoveries greater than 100% are due to pick up of material lost from earlier core

BMR Walsh 1 (Figure 7)

Position: Lat. 16°23'S , Long. 163°28'E , 100 m north of Dunbar road, 21 km west of Gamboola. Barometer elevation 122 m (± 2 m).

Spudded in Quaternary alluvium.



0-3·0m (0'-10') Cream clay (sandy, m-f)

3·0-14·6m (10'-48') Yellow c-vc sand and granules, gravel below 35'

14·6-32·0m (48'-105') Mottled light grey, red-brown and yellow-brown sandy claystone Ironstone nodules in upper part Becoming yellow towards base

32·0-51·8m (105'-170') Yellow-brown and green-brown clay Becoming darker towards base

51·8-115·2m (170'-378') Grey mudstone and siltstone with numerous thin partings and beds of lighter grey fine labile sandstone, and some limestone nodules

115·2-137·2m (378'-450') Interbedded grey mudstone, and light grey clayey m-f slightly glauconitic labile sandstone with son hard calcareous bands

137·2-158·5m (450'-520') As above, but sandstone dominar

158·5-173·1m (520'-568') Sandstone, as above, with minor mudstone

173·1-182·9m (568'-600') Grey, medium, labile sandstone, with hard calcareous bands

Legend as on Fig 4

Fig 7 BMR Walsh Stratigraphic hole 1

Objectives: (a) To penetrate the Mesozoic section and obtain samples of the units present.

(b) To attempt to intersect the Toolebuc Limestone if present, for structural and lithological control.

(c) To obtain samples of the laterite horizon of the Bulimba Formation, if present.

As local outcrop information on the Mesozoic units of this site is completely lacking, this was basically a 'wildcat' hole to determine the Mesozoic stratigraphy below the Cainozoic cover.

Drilling: Drilled with air to 13.7 m and then changed to mud as the formation became very sticky. Coring was very slow in the Mesozoic rocks. Details of cores are given in Table 4.

Stratigraphy: 0-14.6 m Quaternary alluvium. Yellow c-vc sand and granules; sandy clay gravel below 11 m.

14.6-32 m Bulimba Formation. Mottled light grey and red- and yellow-brown sandy claystone. Laterite horizon at the top; becomes more yellow towards the base and the lower boundary with weathered Mesozoic mudstone is difficult to identify.

32-116.4 m ?Allaru Mudstone. Top 20 m are deeply weathered yellow-brown and green-brown clays grading into fresh dark grey mudstones below. Numerous partings and thin beds of lighter grey, fine-grained labile sandstone. Some limestone nodules.

116.4-182.9 m Wallumbilla Formation (Trimble equivalent?) Interbedded light grey m-f clayey slightly glauconitic labile sandstone and grey mudstone with some hard calcareous bands. Below 158 m it is mostly massive labile sandstone. The Toolebuc Limestone appears to be absent in this area and the Wallumbilla Formation directly underlies the Allaru Mudstone.

The above interpretation of the Mesozoic stratigraphy is tentative and awaits support from palynological studies.

The core in the upper part of the Bulimba Formation contained ferruginous nodules and mottled clays of the laterite horizon. Resistivity and gamma-ray logs were run to total depth.

TABLE 4 : BMR WALSH 1, CORE DETAILS

Core	Interval From	Interval To	Length Cored	Length Recovered	% Recovery
1	19.10m	21.56m	2.46m	2.46	100.0
2	54.86	57.91	3.05	3.00	98.4
3	118.87	121.92	3.05	0.40	13.1
4	123.90	125.42	1.52	1.46	96.0
5	173.43	176.48	3.05	2.84	93.1

Palynomorphs from core 5 suggest an Albian age, probably late Albian, spore unit K 2a (Burger, pers. comm.). Cores 4 and 5 could not be dated. Core 2 yielded palynomorphs suggestive of uppermost Albian age, probably spore unit K 2c (Burger, pers. comm.), and indicate shallow, open marine condition of deposition.

BMR Walsh 2 (Figure 8)

Position: Lat. 16°06'S , Long. 162°43'E , beside the Marlborough Yards, 37 km east of Dunbar. Barometer elevation 68 m (± 2 m).

Spudded in Quaternary alluvium.

Objectives:

(a) To test the extent of the artesian aquifer discovered in BMR Rutland Plains 1.

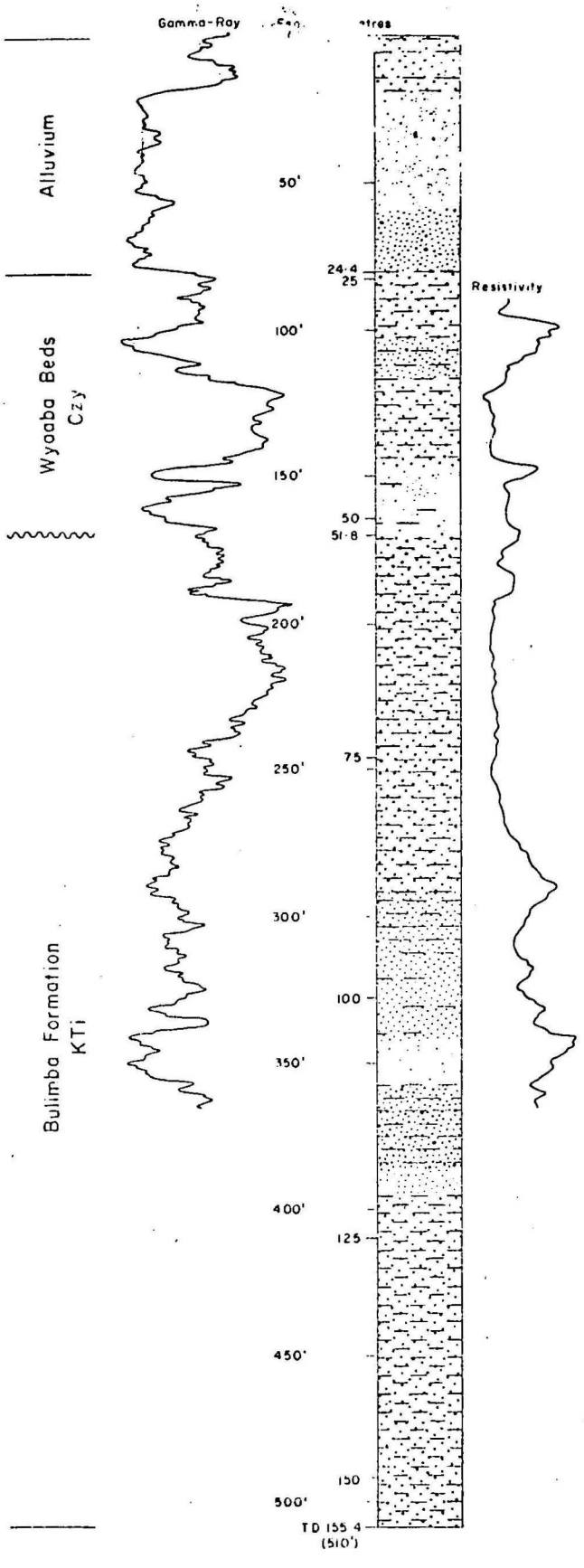
(b) To obtain structural and lithological information on the Cainozoic sequence.

(c) To attempt to reach the Mesozoic beds and identify and obtain lithological samples from them.

Following the discovery of artesian water in Rutland Plains 1 and its subsequent abandonment, Walsh 2 was drilled in an attempt to achieve some of the aims not realized in Rutland Plains 1 and to determine the extent of the aquifer.

Drilling: Drilled with air to 18.3 m when water was struck, and then with mud for the rest of the hole. Drilling was very slow in the claystones of the Bulimba Formation. Artesian water was struck at 105 m with a flow of 36,000 litres/hour. Below this depth drilling was hampered by caving gravels which threatened to jam the pipes, and the hole was abandoned at 155.4 m.

Stratigraphy: 0-24.4 m Quaternary alluvium. 6 m of brown and green-grey sandy clay overlying yellowish sand and gravel, becoming very gravelly at the base. Water was encountered; it appeared to constitute a good supply, but no measurements were made.



0 – 2·4m (0 – 8') Chocolate – brown sandy clay
2·4 – 4·3m (8' – 14') Brown m-c sand and minor gravel
4·3 – 6·1m (14' – 20') Grey and green – grey sandy clay

6·1 – 19·8m (20' – 65') Green – grey, and green – yellow c – vc quartz sand and gravel, with some granules

19·8 – 24·4m (65' – 80') Gravel, and granules

24·4 – 32·0m (80' – 105') Mottled light grey and yellow – brown sandy clay

32·0 – 35·1m (105' – 115') Light grey vc sand and gravel; plus light grey and yellow – brown sandy clay

35·1 – 45·7m (115' – 150') Mottled light grey and yellow – brown very sandy clay

45·7 – 51·8m (150' – 170') Light brown vc sand, with minor gravel, and clay

51·8 – 56·4m (170' – 185') Hard, mottled grey and red – brown, and yellow claystone

56·4 – 71·6m (185' – 235') Hard, mottled light grey and red – brown sandy claystone

71·6 – 86·9m (235' – 285') Hard, mottled light grey and red – brown sandy clay and m-c sand

86·9 – 94·5m (285' – 310') Soft, light grey and pink sandy clay and m – vc sand

94·5 – 105·2m (310' – 345') Pink and white f – m quartz sand with minor clay

105·2 – 109·4m (345' – 359') White and pink m sand – Artesian flow

109·4 – 118·8m (359' – 390') Grey and pink v sandy clay and m – vc sand and gravel Very fast drilling 114·3 – 118·8m (375' – 390')

118·8 – 120·4m (390' – 395') Purple – red clayey m-c sandstone

120·4 – 155·4 (395' – 510') Hard, light grey slightly sandy claystone with mottlings of red – purple and yellow – brown

Legend as on Fig 4

Fig 8 BMR Walsh Stratigraphic hole 2

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Stratigraphy (contd): 24.4 m -51.8 m Wyaaba Beds Mottled light grey and yellow-brown sandy clay with beds of vc sand and gravel.

51.8-155.4 m Bulimba Formation.
52-87 m, hard, mottled, light grey and red-brown sandy claystone with a few sand beds towards the bottom.

87-120 m, softer grey and pink m-vc sand, clayey sand, and gravel. Artesian water from a grey medium-grained sand between 105 and 109 m.

120-155 m, hard, light grey with mottlings of red, purple, and yellow-brown, slightly sandy claystone.

The Mesozoic rocks were not reached, but are probably within 30 m of the bottom of the hole. The aquifer sands are much thinner in this hole than in Rutland Plains 1. This could be due to a regional thinning of the whole sequence, or, more likely, to a decrease in sand from west to east, with a corresponding increase in the amount of clay.

GROUNDWATER

Three of the stratigraphic holes drilled in 1971 struck artesian water. BMR Mossman No. 1 was completed as an observation hole for the Queensland Irrigation and Water Supply Commission; BMR Rutland Plains No. 1, and BMR Walsh No. 2 were plugged and abandoned.

BMR Mossman No. 1 had been predicted as an artesian hole in the Mesozoic sandstone, but the final flow of 136 litres/hour was much less than expected. The poor supply is probably due to the overall lack of permeability within the Gilbert River Formation in this hole. Only a few porous beds were intersected and the main flow was obtained from the largest of these between 127.6 m and 131.5 m. A water sample was taken and the analysis is given in Table 5.

In addition to the artesian supply, subartesian water was found in a sandstone bed within the Wallumbilla Formation at 13.7-15.5 m. No pump tests or sampling were done. This appears to be the same bed as that being pumped in a station bore near the old CSIRO farm about 3 km to the west. Most of the station bores in the area appear to produce from similar sandstone beds within the mudstones of the Wallumbilla Formation. In view of the poor results from the Gilbert River Formation in this hole there would appear to be little point in drilling deeper to intersect it elsewhere unless the sandstone beds above proved to be dry or contained salt water.

BMR Rutland Plains No. 1 and BMR Walsh No. 2 both struck strong flows of very good quality water in the Bulimba Formation in the northern part of the Gilbert-Mitchell Trough. These are the first artesian flows recorded from rocks younger than the Rolling

Downs Group. The extent of the aquifer is likely to be restricted by the structure of the trough and by permeability changes. The water was sampled from both holes and the analyses are given in Table 5.

No other bores have been drilled in the discovery area; however water bores drilled in the vicinity of Vanrook and Stirling, about 120 km to the south, have penetrated either clays or tight sands within the Bulimba Formation with little production of water. Between Vanrook and Rutland Plains, on the south side of the Staaten River, is F.B.H. No. 1 (Wyaaba) Bore. The log of this hole lists a continuous claystone sequence within the Bulimba Formation (Derrington, 1957). However, Derrington (op. cit.) draws attention to a reversal in the S.P. log between 460' and 475' (140-145 m) which he considers could represent a water-bearing sandy bed. Further, a re-examination of the cuttings of this hole shows that the samples are mainly sandy and the absence of sand from Derrington's clays is surprising in view of the nature of the electric logs.

370 km north of Rutland Plains 1, at Weipa, shallow subartesian supplies have been obtained from a similar sandy aquifer within the Bulimba Formation.

The aquifer sands could therefore extend as far south as the Staaten River, but further south the Bulimba Formation becomes less permeable. The extent of aquifers to the north cannot be predicted accurately at present but the formation extends as a continuous body along most of the western side of Cape York and is likely to contain permeable sands throughout much of this region. However, artesian flows could be restricted to the northern part of the Staaten River Embayment. Re-charge probably occurs in the outcrop areas along the eastern edge of the formation.

In addition to the artesian supplies in the Bulimba Formation, subartesian water was observed in sand and gravel of the Wyaaba Beds at 37-45 m in BMR Rutland Plains No. 1. Good water supplies (unmeasured) were also encountered at shallow depth from recent alluvial sand and gravel deposits in BMR Walsh No. 1 (11-14 m) and BMR Walsh No. 2 (14-24 m). These waters are probably from river sands representing old channels of the Mitchell River, and similar shallow supplies are likely to be found in sand bodies adjacent to the river over much of its length.

TABLE 5

WATER ANALYSES - By Queensland Government Chemical Laboratory

SAMPLE NO.	Mossman 1 (Gilbert River Formation) 49718	Rutland Plains 1 (Bulimba Formation) 49717	Walsh 2 (Bulimba Formation) 49719
Total Solids*, p.p.m.	322	131	137
Na, p.p.m.	102	49	46
Ca, p.p.m.	12	Trace	3
Mg, p.p.m.	12	2	4
Cl, p.p.m.	65	50	46
F, p.p.m.	1.7ø	0.35	0.3
SO_4, p.p.m.	15	6	10
CO_3, p.p.m.	-	-	-
HCO_3, p.p.m.	232	49	56
Total hardness as CA CO_3, p.p.m.	80	10	22
Alkalinity as Ca CO_3, p.p.m.	190	40	46
Conductivity @ 25°C micromhos/cm	570	237	245
pH	7.4	7.4	7.3

* Estimated from conductivity measurement

ø Fluorine level considered too high for human consumption.

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