CONFIDENTIAL

DELHI-SANTOS DULLINGARI NO. 1 WELL

SUBSURFACE STRATIGRAPHY AND MICROPALAEONTOLOGICAL STUDY

by

N. H. Ludbrook
Senior Palaeontologist

Rept. Bk. 679
G.S. 2423
S.R. 11/5/73
Pal. Rep. 10/62

17th August, 1962

CONTENTS

		Page
	Abstract	1
1.	Introduction	1
2.	Stratigraphy	2
3.	Quaternary	2
4.	Tertiary	3
5.	Cretaceous	3
	(1) Cenomanian. Winton equivalents	3
	(2) Upper Albian } Tambo equivalents	3
	(3) Middle Albian } Tambo equivalents	3
	(4) Lower Albian	4
	(5) Aptian. Roma equivalents	4
	(6) Aptian-Necomian. Transition beds	4
6.	Jurassic	5
	(1) Upper Jurassic. Blythesdale Group	5
	(2) Lower Jurassic. Wallooon equivalents	5
7.	Triassic ?Moolayember equivalents	6
8.	Permian	6
9.	Permian. Lower Sakmarian tillite	7
10.	Palaeozoic or Proterozoic siltstones	7
11.	Descriptions of the cores and cuttings	8
12.	References	20
13.	Micropalaeontological log	Plan 62-603
14.	Columnar Section	62-605

* * * * * *

Rept. Bk. 679
G.S. 2423
S.R. 11/5/73
Pal. Rep.10/62

CONFIDENTIAL

DELHI-SANTOS DULLINGARI NO. 1 WELL

SUBSURFACE STRATIGRAPHY AND MICROPALAEONTOLOGICAL STUDY

Progress Report

by

N. H. Ludbrook
Senior Palaeontologist

ABSTRACT:

Dullingari No. 1 Well to a depth of 9180 feet has intersected a sedimentary sequence of Tertiary, Mesozoic and Permian rocks, the age of the sediments below 9043 feet being at present uncertain.

After passing through 440 feet of mostly Tertiary sediments the well entered the Winton Formation at 440 feet. Marine Albian (Tambo equivalents) occurred from 2460 to 3540 feet and marine Aptian (Roma equivalents) from 3540 to 4755 feet. Below this level the sequence is entirely non-marine, consisting of Neocomian to Jurassic sandstones (4755-6182 feet), Triassic siltstones and sandstones (6182-6718 feet) and Permian (Upper and Lower) carbonaceous siltstones and sandstones with coal seams from 6718 to 8930 feet. At 8930 feet tillite of probable Sakmarian age occurs. This rests at 9043 feet on steeply dipping grey dolomitic slate with marcasite, the age of which is considered to be early Palaeozoic or Proterozoic.

1. INTRODUCTION

Dullingari No. 1 Well was spudded in on 26th March 1962 in continuation of the oil exploration programme by Delhi Australian Petroleum Limited and Santos Limited in the Great Artesian Basin. The well is sited 28 miles southerly from Innamincka, in the north east of South Australia, latitude 28°8'S, longitude 140°52'E.

This report presents lithological data and stratigraphic data based in the Cretaceous section on identification mainly of mollusca and foraminifera and otherwise on lithological comparison with Innamincka No. 1 Well and with wells on the western side of the Great Artesian Basin. Both core and cuttings samples were examined over the whole sequence, and

formation boundaries adjusted to conform with the electric logs.

A micropalaeontological log of the Cretaceous section is included to assist in the study of the faunas of the Great Artesian Basin and their distribution.

2. STRATIGRAPHY

Stratigraphic units in Dullingari No. 1 Well are as follows:-

	Depth (feet)
Quaternary	0 - 160
Tertiary	160 - 440
Cretaceous	
Winton Formation (Cenomanian)	440 - 2460
Albian rocks (Tambo equivalents)	2460 - 3540
Aptian rocks (Roma equivalents)	3540 - 4492
Transition beds (Aptian-Neocomian)	4492 - 4755
Jurassic	
Upper Jurassic (Blythesdale Group equivalents)	4755 - 5710
Lower Jurassic (Walloon Coal measures equivalents)	5710 - 6060
Lower Jurassic (basal member - ?Walloon Coal measures lower part)	6060 - 6182
Triassic	
Triassic rocks	6182 - 6718
Permian	
?Artinskian to Upper Permian freshwater sediments	6718 - 8190
Artinskian-Sakmarian freshwater	8190 - 8930
Sakmarian glacials	8930 - 9043
Palaeozoic or Proterozoic	9043 - 9180

3. QUATERNARY Thickness 160 feet

From the surface to 160 feet the well passed through coarse subangular quartz sand, red and yellow mottled clay and white clay. No direct evidence of the age of the material is present.

4. TERTIARY Thickness 280 feet.

Below 160 feet the sediments consist of brownish carbonaceous sandy clay and quartz sand. Below 330 feet the material is silty with carbonaceous matter, coaly fragments and pyrite. It is characteristic of Tertiary lacustrine sediments but needs further study to determine to which part of the Tertiary it belongs. A lower Tertiary age is suggested.

5. CRETACEOUS

The Cretaceous sequence is similar to that in Innamincka No. 1 Well.

(1) Cenomanian-Winton Formation Thickness 2020 feet

At 440 feet, with an abrupt change in lithology the well entered dolomitic siltstones of the Winton Formation.

The lithology throughout the formation is typical, consisting of a sequence of dolomitic siltstones with abundant plant remains and coaly interbeds; green grey calcareous sandstones with medium quartz grains, goethite, green grey grains, chlorite, and occasional dolomite nodules; grey mudstones and brownish arkosic sandstones; thin coal bands occur near the base. Megaspores were absent in Dullingari No. 1 well, although they are usually common elsewhere in the formation.

The formation passes without apparent stratigraphic break into the Albian of the Tambo Formation and its equivalents at 2460 feet.

(2) Upper Albian Thickness 560 feet

The section regarded as Upper Albian in Innamincka is represented in Dullingari between 2460 and 3020 feet. It consists of grey calcareous siltstones, sandstones and carbonaceous mudstones with arenaceous foraminifera, Inoceramus prisms, fish teeth, bones and other fragments, and megaspores including Pyrobolospora reticulata.

(3) Middle Albian Thickness 420 feet.

The sequence of grey limestones, glauconitic siltstones and mudstones are pyritic mudstones between 3020 and

3540 are regarded as of Middle Albian age on the presence of Falciferella. The fauna is similar to that at the same level in Innamincka No. 1, containing calcareous foraminifera including "Globigerina" sp. 4, Pseudavicula alata, Aucellina hughendenensis, abundant Nuculana sp., belemnites, Falciferella breadeni, radiolaria and fish vertebrae and scales, which are present in Core 3 at 3500-3510 feet.

(4) Lower Albian

The presence of the Lower Albian cannot be identified with certainty as the glauconitic zone with brachiopods is not present in either Dullingari or Innamincka wells.

The Upper and Middle Albian are equivalent in part at least to the Tambo Formation.

(5) Aptian Roma Formation equivalents. Thickness 952 feet.

The top of the Aptian is interpreted at 3540 feet where the well passed into green-grey glauconitic siltstones. The foraminifera at this level are much recrystallized and very heavily stained with brown. Cuttings at 3600-3610 feet contain numerous pyrite filled narrow burrows. The glauconitic siltstones give way downwards to dark grey mudstones with green glauconitic siltstone pockets.

Foraminifera are the principal constituents of the fauna, and although they are not numerous, they follow the normal sequence for the Artesian Basin reasonably well.

(6) Aptian-Neocomian Transitional Beds Thickness 263 feet

These consist of green grey mudstones with very fine muscovite carbonaceous matter, glauconite and abundant pyrite interlaminated with green grey arkosic fine sandstone with coalified plant remains. They occur between 4492-4755 feet.

6. JURASSIC

(1) Upper Jurassic - Blythesdale Group equivalents

Thickness 955 feet.

The non marine carbonaceous sandstone and siltstone sequence between 4755 and 5710 feet is equivalent to part of the Blythesdale Group, probably the Mooga Sandstone. The "Fossil Wood Beds" and Gubberamunda Sandstone are not recognizable as such in Dullingari as they were in Betoota No. 1.

The sediments consist of dark grey very carbonaceous hard finely micaceous sandstone and siltstone, irregularly bedded and light grey irregularly laminated micaceous arkosic sandstone with carbonaceous laminae and coaly material.

Towards the base the formation becomes gritty, with buff gritty arkosic sandstones with occasional polished pebbles and bands of coarse grit showing in Core 8 near the bottom of the core at 5510 feet and in cuttings from 5690 to 5700 feet.

The grits are, however, not so coarse as in Innamincka at the same stratigraphic level.

(2) Lower Jurassic. Equivalents of Walloon Coal Measures,

Thickness 472 feet.

The light grey fine grained light grey arkosic micaceous sandstone interlaminated with carbonaceous siltstone carrying coalified plant remains is to be correlated with the Walloon Coal Measures. The lower member from 6060 to 6182 feet was intersected in Innamincka No. 1 well between 5490 and 5920 feet and tentatively correlated with the Marburg Formation as described by Whitehouse (Ludbrook, 1961b, p. 26). However the redescription of the Marburg Formation (V.G. Swindon, in Hill & Denmead ed. 1960, p. 289) makes it obvious that the name should not be applied to the bed at the base of the Jurassic in either Innamincka or Dullingari Wells.

7. TRIASSIC ?Equivalents of Moolayember Formation

Thickness 536 feet.

Below 6182 feet light grey finely laminated siltstone with carbonized plant fragments scattered on the laminae and fine to coarse sericitic sandstone with dolomite nodules pass downwards into red and grey dense mottled siltstone with quartz and dolomite grains scattered in a fine sericitic siliceous matrix.

These are considered to be stratigraphic equivalents of the Moolayember Formation. They were correlated partly with the Bundanba Group and partly with the Moolayember in Innamincka Well (Ludbrook, 1961b, p. 26).

However, Upper Triassic shales such as occur in South Australia in the Leigh Creek Coal Measures and in the Springfield Basin are not present in either Dullingari or Innamincka Wells and the Triassic red bed sequence which occurs in these two wells is not to be correlated with rocks of known Upper Triassic age in South Australia.

Correlation in part at least with the Lower Triassic Moolayember, for want of geographically closer correlation, is therefore reasonable.

8. PERMIAN Upper to Lower. Thickness 2212 feet.

A thickness of 2212 feet of continental Permian rocks was intersected between 6718 and 8930 feet.

The upper member consists of dark grey irregularly laminated micaceous siltstone and buff grey dark fine grained sandstone with carbonaceous micaceous patches. Coal seams occur at 6850-6853 and 6858-6861. Cuttings between 6850 and 6990 are mostly coal.

This material may be compared with the Upper Permian sandstone and siltstone with coal intersected in Innamincka No. 1 between 6750 and 7010 feet. It was regarded by B.E. Balme as of Kungurian-Kazanian age (Ludbrook, 1961b, p. 26).

Below 7200 the sediments consist almost entirely of dark grey carbonaceous siltstone, irregularly laminated, with coal and thin sandstone interbeds above 7300 and below 7515 feet.

At 8190 feet a coal measures sequence of buff arkosic sandstones with siltstone interbeds and coal seams occurs.

If these are to be correlated with the coal measures of the western margin of the Great Artesian Basin (Balme, 1957; Ludbrook, 1961a) they are of Lower Artinskian and Sakmarian age. No marine rocks were present in the Permian section, and palynological studies will need to be made to determine to what extent the Sakmarian is represented.

9. PERMIAN LOWER SAKMARIAN TILLITE. Thickness 113 feet

At 8930 the well passed into dark grey dense tillite with pebbles and boulders of various kinds, mostly grey quartzite, and white quartz. Small boulders are well faceted and striated and at 9000 feet in Core 25 the striations on one faceted boulder are reflected in the matrix. The matrix consists of dark grey siltstone with illsorted subrounded grains of quartz scattered throughout.

Correlating this tillite with Permian glacigenes on the western margin of the Great Artesian Basin (Ludbrook, 1961a) gives the age as lowermost Sakmarian.

10. PALAEOZOIC or PROTEROZOIC SLATE

The tillite rests at 9043 feet on grey dolomitic sericitic slate of uniform texture with occasional splashes of marcasite. The age has not yet been determined, but is early Palaeozoic or Proterozoic? The formation is steeply dipping. Drilling was proceeding in the formation at 9691 feet at the time of writing.

11. DESCRIPTIONS OF THE CORES AND CUTTINGS

Cuttings Depth(feet)	Core No.	
10 -	30	Coarse subangular quartz sand, with some calcite
30 -	41	Coarse subangular quartz sand, buff clay and gypsum.
40 -	60	Yellow and red mottled clay, some gypsum and quartz as above.
60 -	70	Coarse quartz sand as above, buff clay, some gypsum.
70 -	80	Red and yellow brown mottled clay with quartz sand.
80 -	90	Medium quartz sand with buff clay and gypsum.
90 -	98	Red and white ironstained clay.
98 -	130	White clay mottled with red.
130 -	150	Grey brown clay.
150 -	160	Mottled red and buff clay.
160 -	190	Brown carbonaceous sandy clay.
190 -	200	Light brown sandy clay with dark carbonaceous patches.
200 -	210	Brownish sandy clay.
210 -	220	Brown sandy clay; illsorted angular quartz, kaolinitic and ferruginous material.
220 -	230	Brown sandy clay, some coarse quartz sand.
230 -	240	Coarse quartz sand, some clay.
240 -	250	Medium to coarse subangular quartz sand.
250 -	260	As above, with carbonaceous clay.
260 -	270	Yellow and cream coarse subangular quartz with scattered yellow and red ironstained grains.
270 -	280	As above; some grit size grains.
280 -	300	Medium, red buff quartz sand with some clay.
300 -	310	Medium to coarse subangular quartz sand.
310 -	330	Grey sand.
330 -	340	Medium to coarse quartz sand with carbonaceous silty fragments and pyrite.

Cuttings Depth(feet)	Core No.	
340 - 360		Grey carbonaceous clay with coal fragments.
360 - 370		Light grey somewhat sandy clay
370 - 380		Brown grey carbonaceous clay with some quartz.
380 - 390		No sample.
390 - 400		Clay as above with coaly material.
400 - 410		Light grey pyritic sand with medium to coarse subangular to subrounded quartz grains and some grey quartz.
410 - 440		Off white coarse subangular to subrounded quartz sand.
440 - 450		Green grey dolomitic siltstone with abundant dolomite nodules, pyrite, chlorite, carbonized plant fragments.
450 - 500		Green grey dolomitic siltstone with abundant pyrite and dolomite nodules.
500 - 560		Green grey siltstone with abundant carbonaceous matter.
560 - 870		Green grey siltstone as above.
870 - 910		Green grey sandstone with medium quartz grains, green grey grains, kaolinitic matter, coal fragments.
910 - 1300		Green grey siltstone as above with sandstone interbeds.
1300 - 1350		Green grey calcareous arkosic sandstone with medium quartz grains, brick red grains (?goethite), green-grey grains, chlorite, occasional dolomite nodules.
1350 - 1360		Coal, sandstone with medium angular quartz grains, green grains, fragments of carbonaceous mudstone, lycopod megaspore.
1360 - 1400		Sandstone as above and carbonaceous mudstone.
1400 - 1410	1	Recovered 10 feet. Greenish grey very fine arkosic sandstone with abundant plant remains, green grey siltstone

Cuttings Depth(feet)	Core No.	
1400 - 1410	1 (Contd.)	with abundant fine carbonized plant remains scattered throughout. Leaf remains, "scales".
1410 - 1500		Grey mudstone with green grey grains, chlorite carbonaceous matter. Some interbedded sandstone.
1500 - 1560		Green grey calcareous sandstone with quartz and green grains in a kaolinitic calcareous matrix, grey grains, limonite pellets; mudstone and coal interbeds.
1560 - 1750		Grey arenaceous limestone, fine grained with carbonaceous specks and abundant coal fragments, interbedded with grey carbonaceous mudstone.
1750 - 1800		Brown mudstone and green-grey carbonaceous sandstone.
1800 - 1850		Green grey carbonaceous calcareous sandstone and mudstone with red grains (?goethite), some glauconite.
1850 - 2010		Brown calcareous siltstone interbedded with grey carbonaceous mudstone and calcareous sandstone.
2010 - 2110		As above, with bands of coal.
2110 - 2200		Carbonaceous mudstone, with coal.
2200 - 2250		Green grey arkosic sandstone, interbedded with mudstone and coal.
2250 - 2300		Green grey sandstone, arkosic, with some mudstone and coal, pyrite.
2300 - 2460		Brown mudstone with brown arkosic sandstone as above, coaly material, carbonized plant fragments.
2460 - 2500		Green grey siltstone with rare arenaceous foraminifera.

Cuttings Depth(feet)	Core No.	
2500 - 2510	2	Recovered 5 feet 3 feet grey carbonaceous mudstone 2 feet grey siltstone and sandstone. The mudstone is irregularly interbedded with coarse siltstone with bright green glauconite pyrite, abundant plant remains. The siltstone contains muscovite, biotite, fine pale green glauconite, abundant pyrite chlorite. Inoceramus prisms, Pyrobolospora reticulata and lycopod megaspores present
2510 - 2560		Brownish calcareous sandstone with Inoceramus prisms and calcite vein.
2560 - 2580		Grey arkosic siltstone and mudstone with microscopic pyrite veins. Textularia sp., fish bone.
2580 - 2620		Grey calcareous sandstone and siltstone with Pyrobolcspora hexapartita; fine angular quartz, felspar, abundant glauconite, biotite, carbonaceous matter.
2620 - 2660		Grey carbonaceous mudstone with Pyrobolospora nuda.
2660 - 2720		Greenish grey fine siltstone with muscovite, biotite, fine pale green glauconite, abundant pyrite, chlorite.
2720 - 2850		Green grey carbonaceous pyritic mudstone with abundant Inoceramus and occasional coalified megaspores.
2850 - 2870		Green grey siltstone as above.
2870 - 2890		Brown mudstone.
2890 - 2920		Green grey limestone.
2920 - 2960		Brown mudstone with fish fragments.
2960 - 2980		Green-grey calcareous mudstone with abundant calcareous foraminifera.

Cuttings Depth(feet)	Core No.	
2980 - 2990		Green-grey glauconitic and pyritic siltstone with abundant foraminifera.
2990 - 3000		Pyritic mudstone with pyritized radiolaria.
3000 - 3020		Green-grey pyritic and glauconitic silstone with abundant pale green glauconite, "Globigerina" sp. 4
3020 - 3030		Grey limestone and mudstone with Aucellina.
3030 - 3040		Glauconitic mudstone rich in pale green glauconite.
3040 - 3070		Pyritic and glauconitic siltstone with belemnites, mollusca include small gastropod remains.
3070 - 3200		Grey limestone and glauconitic mudstone with Aucellina and calcareous foraminifera.
3200 - 3250		Brown pyritic mudstone with "Globigerina" sp. 4.
3250 - 3280		Grey limestone, mudstone and calcareous siltstone.
3280 - 3290		Green-grey pyritic and glauconitic silstone with abundant plant remains.
3290 - 3360		Brown carbonaceous mudstone with coal fragments, pyritized radiolaria.
3360 - 3500		Grey siltstone with angular quartz, kaolin, glauconite, biotite, pyrite, carbonaceous matter, abundant pale green glauconite grains, mollusca including Inoceramus, pyritized radiolaria.
3500 - 3510	3	Recovered 5 feet. 4 feet grey mudstone with Aucellina hughendenensis, Nuculana sp. (abundant), Pseudavicula alata, Falciferella breadeni, belemnites, fish vertebra and scla.e 1'2" Green-grey siltstone with kaolinitic material, fine angular quartz, coalified plant fragments, Aucellina hughendenensis, fish vertebra.

Cuttings Depth(feet)	Core No.	
3510 - 3600		Mudstone and siltstone as above.
3600 - 3610		Green grey glauconitic siltstone with fine angular quartz, kaolinitic matter, pale green glauconite, pyrite, carbonaceous matter. Pyrite infilled burrows.
3610 - 3700		Green grey glauconitic siltstone and carbonaceou mudstone.
3700 - 3750		Dark grey mudstone with abundant foraminifera including Haplophragmoides chapmani.
3750 - 3800		Grey brown carbonaceous mudstone and calcareous siltstone, cone-in-cone calcite.
3800 - 3900		Brownish highly carbonaceous siltstone and calcareous siltstone with Haplophragmoides locblichae, Verneuilina howchini and Ammodiscus.
3900 - 3962		Grey glauconitic siltstone even-grained with quartz, kaolinitic material, pale green glauconite, pyrite, few foraminifera, mollusca, radiolaria.
3962 - 3972	4	Recovered 10 feet. Dark grey irregularly interlaminated mudstone and glauconitic siltstone with pyrite filled trails and streaks. Siltstone consists of abundant fine pale green glauconite, abundant biotite and muscovite, plant remains, kaolinitic material, chlorite, pyrite.
3972 - 4500		Dark grey mudstone and siltstone as Core 4.
4500 - 4510	5	Recovered 2'6". Green grey mudstone with very fine muscovite, carbonaceous matter, glauconite, pyrite.
4510 - 4520	6	Recovered Green grey arkosic fine sandstone with inter-laminae of carbonaceous siltstone; abundant coalified plant remains on laminae; sandstone

Cuttings Depth(feet)	Core No.	
4510 - 4520	6	(Contd.) consists of tightly packed quartz, kaolinitic matter, glauconite, biotite, carbonaceous silt, muscovite.
4520 - 4755		As above.
4755 - 4956		Grey micaceous sandstone and carbonaceous siltstone.
4956 - 4966	7	Recovered 7 feet. Dark grey very carbonaceous hard finely micaceous siltstone irregularly banded with light dirty grey micaceous sandstone.
4966 - 5500		As above.
5500 - 5510	8	Recovered 9 feet 3 feet Light grey micaceous arkosic sandstone. 1 foot As above, with coal. 2 feet Buff gritty arkosic sandstone with occasional polished pebbles and bands of coarse grit to the bottom of the core.
5510 - 5814		Sandstone as above, gritty 5690 - 5700 feet.
5800 - 5809	9	No recovery.
5814 - 5824	10	Recovered 8 feet. 3 feet. Fine grained light grey micaceous sandstone interlaminated with carbonaceous siltstone with coalified plant remains. 5 feet. Light grey medium grained arkosic sandstone with irregular carbonaceous siltstone bands.
5824 - 6060		As above.
6060 - 6091		Fine grained light grey to buff arkosic sandstone, loosely cemented with angular medium grains and occasional coarse grains.

Cuttings Depth(feet)	Core No.	
6091 - 6101	11	Recovered 10 feet.
		1 foot. Fine grained medium grey arkosic sandstone grading to siltstone; interbeds of dark grey carbonaceous micaceous siltstone.
		2 feet. Mainly dark grey interbedded with light grey siltstone.
		4 feet. Mainly very fine grey sandstone with irregular bands of carbonaceous siltstone.
		3 feet. Dark grey carbonaceous siltstone with thin sandstone bands.
6101 - 6182		As above.
6182 - 6277		Grey finely laminated siltstone.
6277 - 6286'612		Recovered 9'6"
		3'6" Grey finely laminated siltstone with coaly fragments.
		2'6" Buff grey fine to coarse sandstone, sericitic, with dolomite nodules.
6286'6-6590		As above.
6590 - 6592	13	Recovered 1 foot.
		Red and dark grey tight mottled siltstone with quartz and dolomite grains scattered in a fine sericitic siliceous matrix.
6592 - 6598	14	Recovered 6 feet.
		3 feet. Grey dense hard massive siltstone grading to light grey sericitic sandstone with occasional slump structures.
		3 feet Grey fine grained sandstone as above with 3" siltstone band at 1' and 3" at bottom of core.
6598 - 6718		Siltstone and sandstone as above.

Cuttings Depth(feet)	Core No.	
6718 - 6900		Grey fine-grained sandstone with angular quartz grains and finely micaceous carbonaceous siltstone. Coal at 6850-6853 feet and 6858-6861 feet. Cuttings 6850-6900 are mostly coal.
6900 - 6901	15	No recovery.
6901 - 6911	16	Recovered 6 feet. Dark grey irregularly laminated carbonaceous siltstone bottom 1 foot buff grey fine-grained sandstone with carbonaceous micaceous siltstone patches.
6911 - 7200		Carbonaceous siltstone as above.
7200 - 7210	17	Recovered 7 feet. Dark grey irregularly laminated carbonaceous siltstone.
7210 - 7220		As above.
7220 - 7230		Coal.
7230 - 7240		Coal and light grey fine grained sandstone.
7240 - 7250		Coal, some sandstone.
7250 - 7300		Grey fine grained sandstone and siltstone as above.
7300 - 7474		Dark grey to black carbonaceous siltstone, micaceous, of uniform texture.
7474 - 7484	18	Recovered 9 feet. Dark grey irregularly laminated carbonaceous siltstone.
7484 - 7515		Siltstone as above.
7515 - 7549		Light grey sandstone with medium subangular quartz, kaolinitic cement, interbeds of siltstone and coal.
7549 - 7607		Siltstone with sandstone interbeds.
7607 - 7617	19	Recovered 9 feet. Dark grey irregularly laminated highly carbonaceous siltstone with abundant coal fragments.

Cuttings Depth(feet)	Core No.	
7617 - 7900		Siltstone with fine sandstone laminae as above.
7900 - 7910	20	Recovered 9 feet.
		Dark grey carbonaceous siltstone with fine sandstone at 2'6".
7910 - 7930		Siltstone as above.
7930 - 7960		Grey fine sandstone.
7960 - 7970		Dark grey siltstone.
7970 - 7976	21	Recovered 4½ feet.
		Grey fine to medium carbonaceous sandstone with uniform fine texture, interlaminated with fine siltstone. 6" siltstone at 7972-7272½.
7976 - 8070		Dark grey carbonaceous siltstone.
8070 - 8080		Interlaminated sandstone and siltstone.
8080 - 8190		Interlaminated sandstone, siltstone and coal.
8190 - 8220		Buff to brownish grey sandstone with medium angular quartz, kaolinitic cement, coal, siltstone interbeds.
8220 - 8230		Dark grey carbonaceous siltstone.
8230 - 8276		Interlaminated sandstone and highly carbonaceous siltstone.
8276 - 8286	22	Recovered 3 feet.
		5" Buff gritty sandstone.
		7" Dark grey to black carbonaceous siltstone, with slump structures.
		12" Dirty grey micaceous sandstone showing some cross bedding.
8286 - 8313		Sandstone and siltstone as above.
8313 - 8317		Coal.
8317 - 8360		Coarse angular quartz sandstone, finer-grained buff grey interbeds, and siltstone interbeds.
8360 - 8370		Coal.
8370 - 8450		Sandstone as above and coal.
8450 - 8480		Interbedded siltstone and sandstone; coal.

Cuttings Depth(feet)	Core No.	
8480 - 8505		Grey sandstone with coarse angular, well-packed quartz grains in a little kaolinitic
8505 - 8515	23	Recovered 10 feet. Dirty grey fine to medium-grained sandstone with angular quartz grains, tightly packed with kaolin cement. Finely cross-bedded with interlaminae of carbonaceous micaceous siltstone.
8515 - 8530		As above.
8530 - 8550		Coal.
8550 - 8560		Sandstone as above.
8560 - 8605		Dark grey carbonaceous and micaceous siltstone and sandstone. Coal at 8590-8593 feet.
8605 - 8630		Sandstone, siltstone and coal as above. Coal at 8610-8627, 8643-8645, 8664-8675 feet.
8630 - 8700		Sandstone, siltstone and coal as above.
8700 - 8790		Grey sandstone with thin bands of coal.
8790 - 8820		Highly carbonaceous siltstone.
8820 - 8877		Interlaminated sandstone and siltstone.
8877 - 8887	24	Recovered 10 feet Dirty buff-grey medium to coarse sandstone with thin carbonaceous bands. $\frac{1}{4}$" band at 8884 feet; 2 feet coal at 8885-8887.
8887 - 8900		Sandstone with coal as above.
8900 - 8910		Dirty buff grey sandstone as above.
8910 - 8920		Interbedded coal and sandstone.
8920 - 8930		Highly carbonaceous shale and coal.
8930 - 9000		Tillite.

Cuttings Depth(feet)	Core No.	
9000 - 9010	25	Recovered 10 feet. Dark grey tillite, with pebbles and small boulders well facetted and striated. At 9000 feet striations on large pebbles are reflected in the matrix; pebbles are of grey quartzite and white quartz for the most part, but various litholcgies and represented; matrix consists of dark grey siltstone with illsorted subrounded grains of quartz scattered throughout.
9010 - 9043		Tillite as above.
9043 - 9191		Grey calcareous (or dolomitic) sericitic slate, dense, of uniform texture with occasional splashes of marcasite.
9191 - 9211	26	Recovered 20 feet. Dark grey dolomitic slate with apparently low grade metamorphism as slump structures and laminae well preserved. Splashes of marcasite. Unfossiliferous. Dip 60°
9211 - 9496		Dark grey dolomitic slate as above.
9496 - 9506	27	Recovered 10 feet. Dark grey dolomitic slate with marcasite. Dip (from geologist's log) 44°.
9506 - 9668		Slate as above.
9668 - 9678	28	Recovered 10 feet. Dark grey dolomitic slate as above.
9678 - 9691		As above.

Well in progress 27/8/62.

12. REFERENCES

BALME, B.E., 1957 - Upper Palaeozoic Microfloras in Sediments from the Lake Phillipson Bore, South Australia.
Aust. J. Sci. 20, (2), pp. 61-62.

LUDBROOK, N.H., 1961a - Permian to Cretaceous Subsurface Stratigraphy between Lake Phillipson and the Peake and Denison Ranges, South Australia.
Trans. roy. Soc. S. Aust., 85, pp. 67-80.

LUDBROOK, N.H., 1961b - Innamincka No. 1 Well, South Australia of Delhi-Frome-Santos.
Subsurface Stratigraphy and Micro-palaeontological Study.
Dept. Nat. Devel. Bur. Min. Res. Geol. Geophys. Pet. Search. Subs. Acts. Pub. No. 9 Appendix 2, pp. 24-29.

SWINDON, V.G., 1960 - Marburg Sandstone of the Type Area.
In D. Hill & A. K. Denmead, (ed.)
The Geology of Queensland.
Journ. geol. Soc. Aust. 7, pp. 288-290.

DELHI-SANTOS DULLINGARI No.1 WELL

MICROPALAEONTOLOGICAL LOG

CRETACEOUS SECTION

	CENOMANIAN			UPPER ALBIAN																													
DEPTH IN FEET CUTTINGS	1350-1360	2430-2440	2440-2450	2470-2480	2500-2510	2560-2570	2580-2590	2590-2600	2610-2620	2620-2630	2630-2640	2640-2650	2650-2660	2660-2670	2670-2680	2690-2700	2720-2730	2760-2770	2770-2780	2780-2790	2790-2800	2800-2810	2810-2820	2820-2830	2840-2850	2850-2860	2860-2870	2890-2900	2960-2970	2970-2980	2980-2990	2990-3000	3000-3010
CORE					2																												
FORAMINIFERA																																	
SPIROPLECTAMMINA EDGELLI				X											X													X					
TROCHAMMINA SP.2				X	X																X		X	X				X					
REOPHAX SP.2					X			X	X				X	X	X		X					X	X			X							
HAPLOPHRAGMOIDES SP.2					X	X			X					X																			
HAPLOPHRAGMOIDES SP.8					X										X						X												
TEXTULARIA SP.					X																												
SARACENARIA SP.1					X																												
TEXTULARIA SP.2						X						X															X						
HAPLOPHRAGMOIDES SP.1										X										X		X		X		X	X					X	
AMMOBACULITES SP.3																								X									
VERNEUILINOIDES SP.1											X														X	X					X	X	X
MARGINULINA SP.6											X				X																		
AMMOBACULITES SP.3													X		X					X		X	X			X	X						X
HYPERAMMINA SP.															X																	X	
VALVULINERIA SP.2																X		X			X	X	X		X			X			X		X
TEXTULARIA SP.1																		X				X	X	X			X	X			X	X	X
ROBULUS SP.1																		X															
ROBULUS SP.4																		X		X													
GYROIDINA SP.1																		X							X								
AMMODISCUS SP.1																					X										X		
AMMOBACULITES FISHERI																					X												
HAPLOPHRAGMOIDES DICKINSONI																							X			X		X	X		X		X
BULIMINA SP.A																									X				X				
RAMULINA GLOBULIFERA CRETACEA																										X					X		X
LENTICULINA SP.1																										X	X						
GAUDRYINA SP.1																												X					
AMMODISCUS SP																												X					
TROCHAMMINA SP.1																													X				
LENTIGULINA SP.4																													X	X			
MARGINULINA SP.1																													X				
MARGINULINA SP.3																													X				X
GLOBIGERINA SP.4																													X	X		X	
ANOMALINA SP.1																													X				
ANOMALINA SP.2																													X		X	X	X
SARACENARIA SP.1																														X			
VAGINULINA SP.1																														X			
DISCORBIS SP.1																														X			
VERNEUILINA HOWCHINI																															X		
NODOSARIA SP.5																															X		
CIBICIDES SP.1																															X	X	
LINGULINA SP.2																																X	
GAUDRYINELLA SP.2																																	
MARGINULINA SP.2																																	
PSEUDOGLANDULINA SP.2																																	
HAPLOPHRAGMOIDES SP.5																																	
DENTALINA SP.1																																	
LINGULINA SP.																																	
MARGINULINOPSIS SUBGRETACEUS																																	
GUTTULINA SP.1																																	
PATELLINA SP.1																																	
MARGINULINA SP.5																																	
VALVULINERIA INFRACRETACEA																																	
NODOSARIA SP.1																																	
HAPLOPHRAGMOIDES CHAPMANI																																	
SARACENARIA SP.3																																	
SPIROPLECTAMMINA SP.2																																	
NODOSARIA SP.7																																	
GAUDRYINELLA SP.3																																	
AMMOBACULOIDES SP.1																																	
MARGINULINA SP.6																																	
LENTICULINA AUSTRALIENSIS																																	
HAPLOPHRAGMOIDES SP.9																																	
AMMOBACULOIDES ROMAENSIS																																	
AMMOBACULITES MINIMUS																																	
LENTICULINA SP.7																																	
BIGENERINA LOEBLICHAE																																	
CF BIGENERINA SP.2																																	
AMMOMARGINULINA SP.1																																	
TEXTULARIA ANACOORAENSIS																																	
AMMOBACULITES AUSTRALIS																																	
TROCHAMMINA MINUTA																																	
PSEUDO GLANDULINA SP.3																																	
GLOBULINA SP.1																																	
TROCHOLINA JONESI																																	
LENTICULINA CF GUNDERBOOKAENSIS																																	
LINGULINA SP.3																																	
RADIOLARIA																																X	
MOLLUSCA																																	
INOCERAMUS PRISMS					X				X	X	X	X			X			X															
FRAGMENTS								X																	X						X		
BELEMNITES																									X								
OSTRACODES											X					X			X				X		X		X				X		X
CRUSTACEA																																	
FISH SCALES																																	
FISH TEETH VERTEBRAE BONES					X			X		X					X								X			X		X					
DISCS																									X								
?TURTLE SHELL																																	
BURROWS																																	
PLANTS																																	
MEGASPORES NOT IDENTIFIED	X											X											X										
PYROBOLOSPORA RETICULATA					X				X												X												
PYROBOLOSPORA NUDA					X							X																					
PYROBOLOSPORA HEXAPARTITA							X																										
SCALES	X				X																												
?SEEDS		X	X																														

	MIDDLE ALBIAN											APTIAN																
DEPTH IN FEET CUTTINGS	3100-3110	3200-3210	3210-3220	3220-3230	3230-3240	3240-3250	3260-3270	3350-3360	3360-3370	3490-3500	3500-3510	3550-3560	3600-3610	3650-3660	3700-3710	3750-3760	3800-3810	3850-3860	3900-3910	3950-3960	3962-3972	4000-4010	4050-4060	4100-4110	4150-4160	4200-4210	4350-4360	4500-4510
CORE											3										4							5
FORAMINIFERA																												
SPIROPLECTAMMINA EDGELLI																												X
TROCHAMMINA SP.2																						X						
REOPHAX SP.2										X																		X
HAPLOPHRAGMOIDES SP.2																												
HAPLOPHRAGMOIDES SP.8					X				X																			
TEXTULARIA SP.																												
SARACENARIA SP.1																												
TEXTULARIA SP.2															X							X						
HAPLOPHRAGMOIDES SP.1																												
AMMOBACULITES SP.3					X																							X
VERNEUILINOIDES SP.1			X							X					X	X					X	X	X			X		X
MARGINULINA SP.6																												
AMMOBACULITES SP.3		X						X	X														X					
HYPERAMMINA SP.											X																	X
VALVULINERIA SP.2	X	X		X	X																							
TEXTULARIA SP.1					X	X		X	X		X	X										X		X				X
ROBULUS SP.1																												
ROBULUS SP.4																												
GYROIDINA SP.1		X			X	X									X		X											
AMMODISCUS SP.1		X															X					X						
AMMOBACULITES FISHERI								X													X		X					X
HAPLOPHRAGMOIDES DICKINSONI		X				X		X		X	X				X	X				X				X				X
BULIMINA SP.A		X																										
RAMULINA GLOBULIFERA CRETACEA				X		X																						
LENTICULINA SP.1																					X	X						
GAUDRYINA SP.1																												X
AMMODISCUS SP																												
TROCHAMMINA SP.1																												
LENTIGULINA SP.4							X		X			X											X		X			
MARGINULINA SP.1															X													
MARGINULINA SP.3			X																									
GLOBIGERINA SP.4					X																							
ANOMALINA SP.1	X					X	X			X																X		
ANOMALINA SP.2	X	X			X						X				X													
SARACENARIA SP.1																												X
VAGINULINA SP.1																												
DISCORBIS SP.1																												
VERNEUILINA HOWCHINI		X					X									X	X	X										
NODOSARIA SP.5		X										X																
CIBICIDES SP.1		X		X																								
LINGULINA SP.2							X																					
GAUDRYINELLA SP.2	X																											
MARGINULINA SP.2	X			X																								
PSEUDOGLANDULINA SP.2	X																											
HAPLOPHRAGMOIDES SP.5		X									X	X																
DENTALINA SP.1		X						X			X	X			X		X				X			X				
LINGULINA SP.		X																										
MARGINULINOPSIS SUBGRETACEUS		X	X																									
GUTTULINA SP.1		X																										
PATELLINA SP.1		X																										
MARGINULINA SP.5				X						X					X													
VALVULINERIA INFRACRETACEA				X																				X	X		X	X
NODOSARIA SP.1				X																								
HAPLOPHRAGMOIDES CHAPMANI					X							X			X	X		X	X			X						X
SARACENARIA SP.3						X									X													
SPIROPLECTAMMINA SP.2							X																					
NODOSARIA SP.7								X																				
GAUDRYINELLA SP.3											X																	
AMMOBACULOIDES SP.1											X																	
MARGINULINA SP.6											X				X													
LENTICULINA AUSTRALIENSIS											X																	
HAPLOPHRAGMOIDES SP.9													X		X									X				X
AMMOBACULOIDES ROMAENSIS															X	X	X			X		X		X			X	
AMMOBACULITES MINIMUS																	X											
LENTICULINA SP.7																							X					
BIGENERINA LOEBLICHAE																					X							
CF BIGENERINA SP.2																					X							
AMMOMARGINULINA SP.1																					X							X
TEXTULARIA ANACOORAENSIS																											X	
AMMOBACULITES AUSTRALIS																												X
TROCHAMMINA MINUTA																												X
PSEUDO GLANDULINA SP.3																												X
GLOBULINA SP.1																												X
TROCHOLINA JONESI																												X
LENTICULINA CF GUNDERBOOKAENSIS																												X
LINGULINA SP.3																												X
RADIOLARIA		X								X																		
MOLLUSCA																												
INOCERAMUS PRISMS																												
FRAGMENTS	X									X																		
BELEMNITES										X	X																	
OSTRACODES	X				X								X		X	X				X				X				
CRUSTACEA											X			X														
FISH SCALES											X																	
FISH TEETH VERTEBRAE BONES	X				X						X																X	
DISCS	X																											
?TURTLE SHELL													X															
BURROWS													X															
PLANTS																												
MEGASPORES NOT IDENTIFIED																												
PYROBOLOSPORA RETICULATA											X																	
PYROBOLOSPORA NUDA																												
PYROBOLOSPORA HEXAPARTITA																												
SCALES																												
?SEEDS																												

62- 603
Cb.

To accompany report by N.H. Ludbrook.

21-8-62

DELHI - SANTOS DULLINGARI No.1 WELL

COLUMNAR SECTION

Sand, clay and gypsum
Brownsandy clay
Medium to coarse sand
Grey carbonaceous clay
Light grey pyritic sand

Green-grey dolomitic siltstone

Green-grey arkosic siltstone and sandstone

Green-grey calcareous sandstone
Coal
Green-grey arkosic sandstone and siltstone
Grey mudstone and coal
Grey limestone
Grey carbonaceous mudstone and sandstone

Grey carbonaceous mudstone, siltstone, and calcareous sandstone

Coal
Coal, brown siltstone and arkosic sandstone

Grey siltstone
Grey calcareous sandstone

Grey carbonaceous mudstone

Green-grey siltstone, mudstone and limestone

Grey limestone and glauconitic mudstone

Brown siltstone and mudstone

Grey carbonaceous mudstone and siltstone

Brownish carbonaceous siltstone
Grey glauconitic siltstone

Green grey mudstone
Grey laminated sandstone and siltstone

Dark grey very carbonaceous micaceous sandstone and siltstone

Light grey micaceous arkosic sandstone

Light grey micaceous sandstone

Medium grey arkosic sandstone and micaceous siltstone

Grey laminated siltstone and sandstone

Red and dark grey mottled siltstone
Grey dense massive siltstone

Coal

Dark grey laminated siltstone and sandstone

Dark grey carbonaceous siltstone

Grey carbonaceous sandstone with siltstone interbeds

Buff kaolinitic sandstone and coal.

Dark grey tillite

Dark grey dolomitic slate

62 - 605
Cb
21-8-62.

To accompany report by N.H. Ludbrook.