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RECORDS:

1956/94

STRATIGRAPHIC DRILLING IN THE WEST KIMBERLEY DIVISION, WESTERN AUSTRALIA.

by

S.D.HENDERSON.

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BOREHOLE BMR. 1, JURGURRA CREEK

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CONTENTS:

ILLUSTRATION:

SUMMARY

The boring established that the Jurassic formations mapped in the Edgar Ranges do not extend as far north as the boresite, which was in the Permian beds right from the surface.

The Noonkanbah Formation and Poole Sandstone were identified and the borehole possibly bottomed in the Grant Formation.

INTRODUCTION

The borehole is situated on the west bank of Wilson's Creek, a tributary of Jurgurra Creek, and two miles south-west of Wilson Yard, at Latitude 18°21' South, Longitude 123°42' East. Access is by the Freney track from Langey Crossing of the Fitzroy River. The drilling was done by the West Australian Petroleum Pty. Ltd. as contractor to the Bureau of Mineral Resources, in October and November, 1955. The drilling programme called for a borehole of 5⅛ inch diameter to be drilled to a minimum depth of 3,000 feet, with 20 feet of coring in each 100 feet. The object was to determine what lay under the Mesozoic sediments southwest of the "Fenton Fault" where West Australian Petroleum Pty. Ltd. seismic information indicated a low angle unconformity at about 4,000 feet. The borehole was sited at a point where the reflecting horizon was estimated to be 3,500 feet deep, 500 feet less than the rated capacity of the Bureau's Failing 2,500 rig.

When the location was selected it was thought that a small amount of Alexander Formation would be encountered before the friable Jurgurra Sandstone was penetrated. It was expected that the latter formation would be of considerable thickness, and possibly underlain by other Mesozoic formations.

PREVIOUS WORK

The Permian strata northeast of the "Fenton Fault" were examined in detail by A. Wade (1924, 1926, 1938) and further surveys were made by Findlay (1942) and Kraus (1942) and Reeves (1949, 1952).

As part of a programme to assess the oil possibilities in the Fitzroy Basin, geologists of the Bureau of Mineral Resources made a detailed survey of the Nerrima Structure (Guppy et al., 1950), and from 1949 to 1952 made a regional survey of the Fitzroy Basin and that part of the Canning Basin northeast of the Edgar Ranges (Guppy et al., 1957).

Reeves also made a traverse along Jurgurra Creek to the Edgar Ranges and described the "Buchia Beds" of the Upper Jurassic.

The Geophysical Section of the Bureau of Mineral Resources conducted a Gravity Survey which extended from Nerrima to south of the borehole (Wiebenga and van der Linden, 1953).

WATER SUPPLY

The nearest water was at Clanmeyer Pool, eight miles north of the site. Consequently it was decided to drill for water on the location, where water was expected at less than 100 feet in Jurassic sandstone.

However, Permian siltstone was encountered and only a very poor supply of salt water was obtained although drilling was continued to 230 feet. Analysis of the water gave 28,000 p.p.m. salts. (Appendix 1). It thus became necessary to transport water by tanker from Clanmeyer Pool until this was polluted when Jurgurra and Wilson's Creeks flowed following November rain. Water was then obtained from Lulugui homestead, 24 miles to the north-east.

DRILLING

The rig used was a Failing Model "2500" Holemaster Drilling Unit manufactured in Enid, Oklahoma, U.S.A. A Failing 10 inch rotary table and drawworks, and a Wheately 5 x 10, 2050 slush pump powered by two Hercules D W X D 6-cylinder diesel engines, are mounted on a Diamond T truck. The 58 feet 2-piece mast is of tubular steel with a platform and pipe rack for 41 feet stands of drill pipe. The rig is rated at 4,000 feet of $5\frac{5}{8}$ inch diameter hole, using Failing $2\frac{3}{8}$ inch O.D. exploration drillpipe which is manufactured in 20'6" lengths, two being racked as a stand. The drill collars available were $4\frac{5}{8}$ inch O.D. by 19 feet for $5\frac{5}{8}$ inch hole and $3\frac{3}{4}$ inch by 10 feet for $4\frac{3}{4}$ inch hole. For coring there were Reed Kor-King double tube core barrels, $5\frac{5}{8}$ inch O.D. by 20 feet and $4\frac{3}{4}$ inch O.D. by 10 feet. Rock bits used were $5\frac{5}{8}$ inch Reed T, Reed 2C, and Hughes OSQ2 while $4\frac{3}{4}$ inch Reed T, Hughes OW, Hughes OSC, and Hughes W7R were stocked. Kor-King coreheads for soft and hard formation manufactured by Reed, were used. The core size was $2\frac{3}{8}$ inch.

BMR 1 Jurgurra Creek was spudded in on November 1st, 1955 and, despite trouble experienced with Wheately pump failures, was drilled to 1680 feet by the 14th of the month. While pulling out to core at 1680 feet the drill collars became jammed by sand, possibly from caving formation but probably from cuttings not removed from the borehole by poor mud and low pump pressure. Efforts to free the string failed and eventually the pipe was shot off at 991 feet, 580 feet of drill pipe and 80 feet of $4\frac{5}{8}$ drill collars being lost.

A core cut from 1580 feet to 1600 feet had recovered only 4 inches of rock but the inner barrel was choked with sand from reaming undersized $5\frac{5}{8}$ inch hole with the $5\frac{5}{8}$ inch core-barrel. The Petroleum Technology section of the Bureau of Mineral Resources interpreted the poor recovery and struck pipe as being due to soft formation although they had no representative on the site, basing their conclusions on information supplied by the contractor without consulting the wellsite geologist. The borehole was consequently abandoned by the Bureau. The deviation from vertical was measured using a Tro-Pari instrument, at 250 feet, 500 feet, 750 feet and 990 feet. A cement plug was then set inside the casing.

WELLSITE GEOLOGY

By arrangement with the Director of the Bureau of Mineral Resources, West Australian Petroleum Pty. Ltd. were given permission to have one of their wellsite geologists at the rig. It was understood he would help the Commonwealth geologist as much as possible, but there was no requirement that he should do so. At Jurgurra Creek, West Australian Petroleum Pty. Ltd. provided all the geological equipment except sample bags. The contractor's geologist was of great assistance in the early stages of the drilling as the author had been given insufficient time tp prepare for the drilling

programme and was not familiar with wellsite procedures for oil drilling. However, following the abandonment of the borehole, the West Australian Petroleum Pty. Ltd. geologist went on leave and the splitting of samples and crating of cores had to be done by the author. All results are derived from the writer's own work, each geologist having kept his own records.

Sample cuttings at 10 feet intervals were collected by the rig crews throughout the drilling from the shale-shaker supplied by the contractor. After being washed free of drilling fluid, each sample was examined under a low power binocular microscope to estimate the proportion of each rock type present, the result being recorded as the Percentage Log. The footage recorded against each sample was the depth of hole when the sample was collected. Because of the time lag in removing cuttings from the hole, the depth recorded is greater than the actual depth from which the sample came. The true depth can only be estimated from the relationship of the shape and specific gravity of the cutting to the viscosity, weight, and annular velocity of drilling fluid at the appropriate interval.

Each core was examined when removed from the borehole. The inner barrel was tested with a flame to determine if inflammable gas was present and the cores examined with fluorescent light to detect possible oil traces. As drilling could only be resumed after the geologist was satisfied that sufficient core had been obtained and oil traces were absent, this necessitated his being on call continually while drilling was in progress. The specific gravity of each core was determined in the dry state, and the dip of strata corrected for hole deviation was recorded. The percentage of constituents of each core was not normally plotted on the Percentage Log, the cutting being recorded only. The core was compared with equivalent cutting to determine how much contamination was taking place. The Drilling Time Rate for each five feet cut was plotted on the Percentage Log to assist in determining formation changes.

The final evaluation of the borehole follows the comparison of cores, percentage log, and drilling time rate with the Electric Log.

RESULTS

Plate 1. shows the location of the borehole on an 8-mile map of the Fitzroy Basin.

Plate 2. sets out the Drilling Time Rate, Self-Potential Curve, Percentage Log, Core Details, Resistivity Curve, and Descriptive Log.

Plate 3. is a list of symbols and abbreviations used in Plate 2.

Figure 1 illustrates the relation of the bore to the Fenton "Fault" and the Fitzroy Valley and also the stratigraphic relationship between Grant Formation and Jurgurra Sandstone. The extensions of the seismic unconformity illustrate the north-west trending ridge south-west of Mount Fenton. (Guppy et. al. 1957).

The E - log was run by West Australian Petroleum Pty. Ltd. using their Halliburton unit.

CORRELATION AND CONCLUSIONS

The following correlation is based on microfossil determination by Irene Crespin.

Micropalaeontological examination in the field by the writer revealed the presence of arenaceous foraminifera in the samples between 30 and 50 feet in BMR 1. These proved to be Permian Hyperammonoides and detailed examination by I. Crespin of cuttings from the surface to 60 feet gave the following results.

0 - 20 feet:	No foraminifera.
20 - 30 feet:	Hyperammonoides acicula Parr
30 - 40 feet:	Indeterminate foraminifera
40 - 50 feet:	Hyperammonoides acicula Parr
50 - 60 feet:	Hyperammonoides acicula Parr
	Thurammina sp. nov.

Samples of whitish silty fine sandstone collected by the writer from an outcrop one mile north of the borehole and previously mapped as Alexander Formation were also examined by Miss Crespin. The following species are present:

Ammodiscus nitidus Parr (common)

?Hyperammina rudis Parr

Hyperammonoides acicula Parr

Pelosina sp. nov.

Reophax cf. fittsi (Warthin)

Thurammina sp. nov.

This assemblage is Permian and is probably equivalent to that of the upper part of the Noonkanbah Formation.

Permian megafossils were also found in the water bore at 160 feet and in BMR 1 at 490 feet. These include bryozoa, corals and brachiopods.

Lithological examination revealed a change from blown sand to calcareous very fine grained sandstone with rounded very coarse quartz grains at 8 feet, and to very fine grained brown sandstone at 15 feet. At 50 feet there is a change from fine sandstone to siltstone, and another change, from siltstone to very fine sandstone seen in the percentage log at 645 feet is confirmed by the E log.

The strata becomes progressively coarser with depth and from 1450 feet the ditch samples are sand ranging from fine to coarse grained, representing a friable medium grained sandstone. These lithological units may be interpreted as follows:-

0 - 8 feet	Sand	Recent
8 - 15 "	Duricrust	? Jurassic
15 - 50 "	Upper Noonkanbah Formation	Permian

50 - 645	Feet	Lower Noonkanbah Formation	Permian
645 - 1450	"	Poole Sandstone	Permian
1450 - 1680	"	? Grant Formation	Permian

The core from 1480 feet to 1500 feet is lithologically similar to Grant Formation sandstones seen further east. It has a relatively large content of weathered white felspar grains which are also common in outcrop. The Poole Sandstone is normally mainly rounded quartz grains, possibly being re-worked Grant Formation. The correlation of the strata between 1450 and 1680 feet with the Grant Formation is only tentative.

The borehole confirmed the lack of major displacement on the "Fenton Fault" northwest of Moulamen Hill. The map and section show the general relation of formation and structures in the area. The stratigraphic relationship of the Noonkanbah Formation at BMR 1 to the Jurgurra Sandstone to the south indicates the possibility that the Jurgurra Sandstone may be equivalent to the Grant Formation. It has been stated that this sandstone is unlike Permian beds (Guppy et alii, 1957) but the Noonkanbah Formation was previously mistaken for Jurassic. Both Grant Formation and Jugurra Sandstone are friable sandstone and the possibility of their correlation must not be overlooked.

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APPENDIX 1.

Water Analysis Water Bore near BMR 1 Jurgurra Creek. (Analysis by L.W.Samuel, Deputy Government Agricultural Chemist, W.A.)

Reaction, pH	Faintly Alkaline 7.8
Specific resistance, ohms, at 20°C	34

Mineral Matter	Parts per million.
Calcium, Ca.	875
Magnesium, Mg.	1,247
Sodium, Na.	7,528
Potassium, K.	284
Bicarbonate, HCO3	366
Carbonate, CO3	Nil
Sulphate, SO4	3,435
Chloride, Cl	14,300
Nitrate, NO3	Trace
Silica, SiO2	8
Iron Oxide, Fe2 O3) Aluminium Oxide, Al_2O_3)	9
Total	28,052

Assumed combination on evaporation at N.T.P.

Calcium sulphate	2,564
Magnesium sulphate	2,037
Magnesium Chloride	3,271
Sodium Chloride	19,140
Others	1,040
Total	28,052

APPENDIX 2.

Resident Geologist:	S.D.Henderson, Geological Section, B.M.R.
West Australian Petroleum Pty. Ltd. Geologist:	I.Campbell.
Petroleum Engineer:	D.Woodward, West Australian Petroleum Pty. Ltd.
Toolpusher:	A.D.Dale, Brown Drilling Co. for W.A.Pet.
	O.Wilkerson, " " "
	H. Works, " " "
	M. Stetson, " " "

APPENDIX 3.

CORES FROM WATER BORE.

Core 1. 30 - 50 feet. Recovery 5'3" (26.3%)

Light grey and brown, violet tinged SILTSTONE with SAND grains and CLAY.

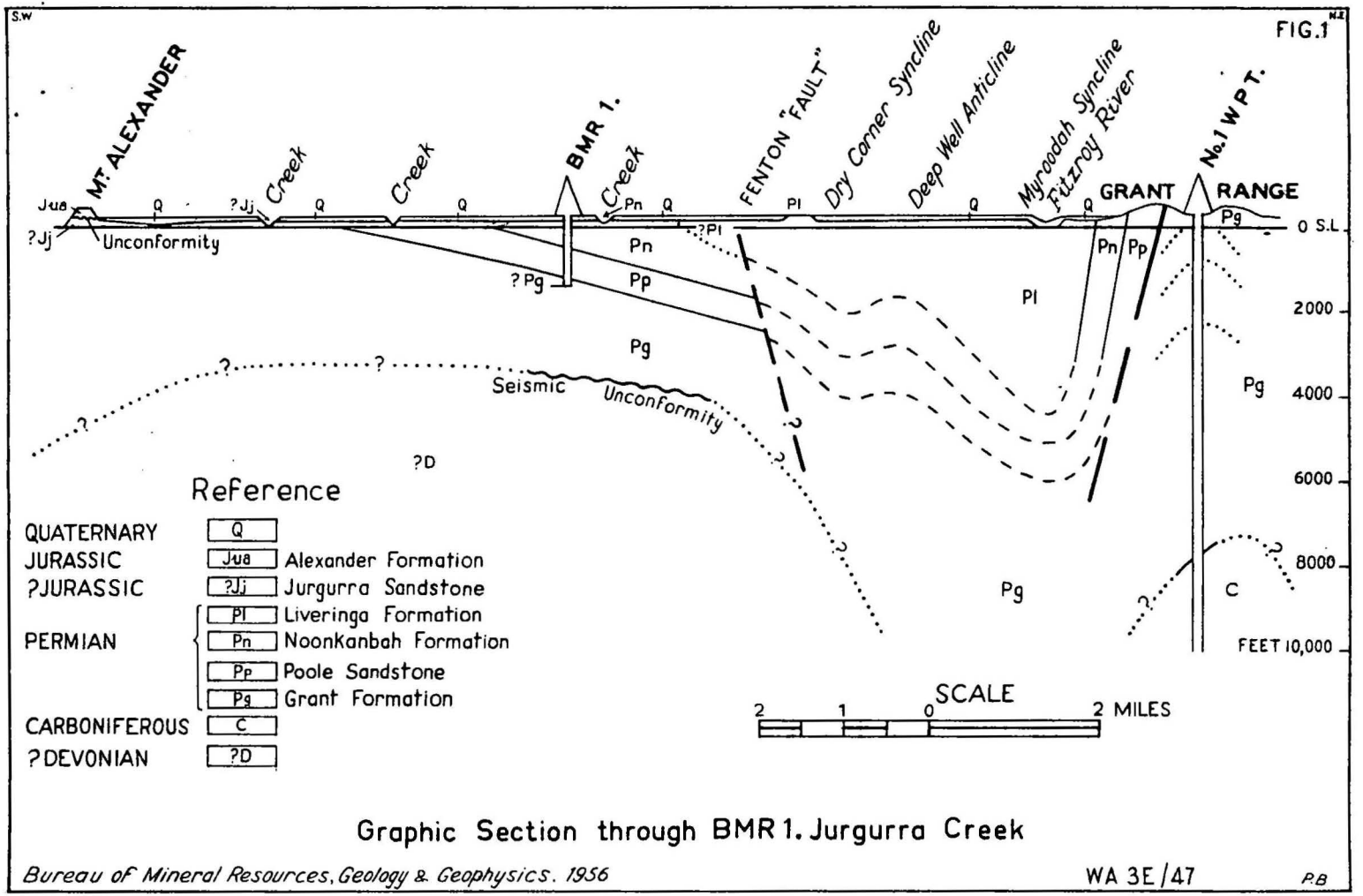
Core 2. 155 - 165 feet. Recovery 5'3" (52.5%)

Grey micaceous SILTSTONE with beds of light grey very fine grained cross-laminated SANDSTONE. Fossiliferous. Dip 10°.

Core 3. 165 - 175 feet. Recovery 10'-0" (100%)

Interbedded grey and light grey sandy SILTSTONE with thin beds very fine grained SANDSTONE. Dip subhorizontal to 5°.

No ditch samples. Total depth 230 feet.



Graphic Section through BMR 1. Jurgurra Creek

Bureau of Mineral Resources, Geology & Geophysics. 1956

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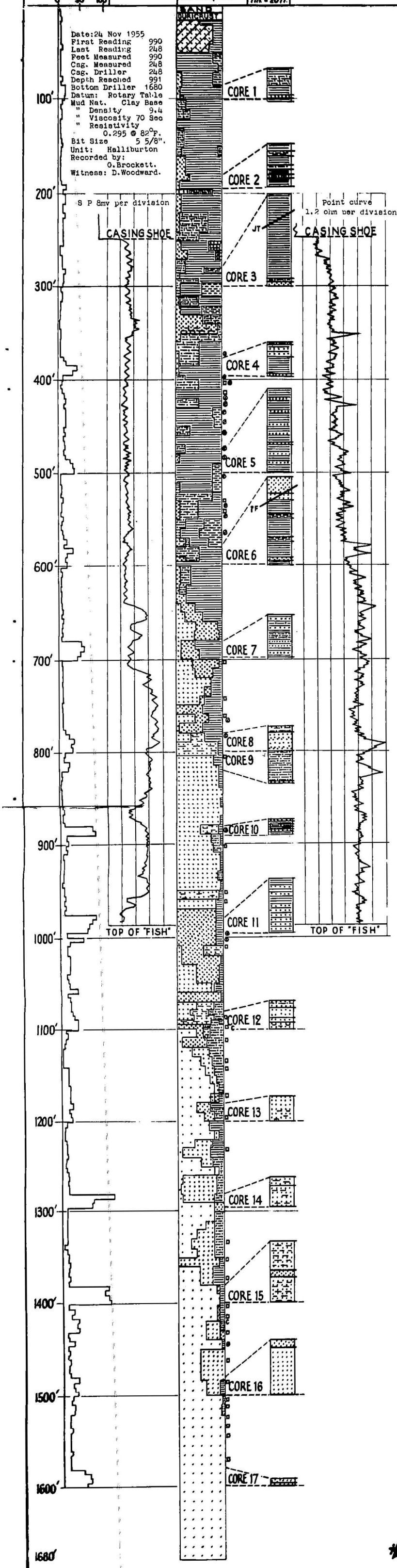
STRATIGRAPHIC DRILLING
WEST KIMBERLEY DIVISION · WESTERN AUSTRALIA
B.M.R.1 JURGURRA CREEK

PLATE 2

For Reference see Plate 5.



from feet	to feet	DESCRIPTIVE LOG Details of strata.	SPECIFIC GRAVITY
Nil	8	Medium-grained brown wind-rounded quartz SAND.	
8	15	SANDSTONE very fine grained, flesh coloured with very coarse rounded quartz grains. Calcareous.	
15	50	Very fine grained poorly sorted brown quartz SANDSTONE, slightly calcareous.	
50	83	Soft slightly micaceous grey SILTSTONE weathering to brown. Some CLAY bands and very fine grained SANDSTONE.	
		Core 1,83' - 103', Recovery 7'-5" (36.3%) Negative flame test.	
83	98	Grey and light grey banded SILTSTONE with beds of light grey very fine grained QUARTZ SANDSTONE.	
98	99	Light grey hard fine grained QUARTZ SANDSTONE.	S.G. 2.34
99	103	Grey and light SILTSTONE with thin sandy beds.	
103	180	Grey and light grey SILTSTONE, shaley, clayey in parts with bands of calcareous very fine grained QUARTZ SANDSTONE.	
		Core 2,180' - 194' Recovery 9'6" (67.9%). Negative flame test.	
180	194	Interbedded grey and light grey SILTSTONE and dark grey CLAYEY SILTSTONE. Badly crushed.	S.G. 2.02
194	280	Grey and light grey SILTSTONE, clayey parts and very fine grained QUARTZ SANDSTONE. Trace pyrite and $CaCO_3$. Possibly shelly at 200'.	
		Core 3, 280' - 300', Recovery 20'- 0" (100%) Negative flame test.	
280	299	Grey massive SILTSTONE with vertical jointing between 285' and 286'. Some graded bedding. Dips from subhorizontal to 15°.	S.G. 2.20
299	300	Interbedded grey SILTSTONE and light grey very fine grained QUARTZ SANDSTONE.	
300	378	Grey sandy SILTSTONE and light grey very fine grained hard, slightly calcareous QUARTZ SANDSTONE.	
		Core 4, 378'- 398', Recovery 7'6" (37.5%) Negative flame test.	
378	381	Light grey sandy SILTSTONE.	
381	382	Light grey cross-bedded very fine grained QUARTZ SANDSTONE.	
382	395	Massive grey SILTSTONE with thin sandy beds. Subhorizontal.	S.G. 2.15
395	398	Grey SILTSTONE interbedded with whitish fine grained quartz SANDSTONE.	
398	480	Grey SILTSTONE and SANDY SILTSTONE with shell fragments. Bryozoan or coral, fenestellid, pelecypods?, brachiopods.	
		Core 5, 480' - 500', Recovery 18'- 0". (90-0%). Flame test unsuccessful.	
480	492	Nearly massive grey SILTSTONE with irregular subhorizontal patches of fine grained SANDSTONE. Occasional beds of the fine grained quartz sandstone are cross-bedded with dips from 15° to 20°.	
492	493	Shelly SILTSTONE. Fossils are Permian, Noonkanbah Formation or Nura Nura Member of Poole Sandstone.	
493	500	Grey SILTSTONE with occasional sandy beds. Some graded bedding. Near massive.	S.G. 2.05
500	580	Grey SILTSTONE, dark grey SHALEY SILTSTONE and light grey sandy SILTSTONE, shelly and appreciable pyrites. Corals and Bivalves.	
		Core 6, 580' - 600, Recovery 19'- 0" (95.0%) Negative flame test.	
580	584	Grey SILTSTONE and light grey very fine grained QUARTZ SANDSTONE. Irregular bedding structures,	
584	585	Cross-bedded fine grained QUARTZ SANDSTONE with occasional silt bands. Cross-beds dip up to 20°. Base of sandstone inclined at about 45° may be a FAULT but is not likely.	
585	598	Soft grey SILTSTONE with some clay, mainly massive. Very slightly micaceous.	
598	599	Irregularly interbedded grey SILTSTONE with whitish fine grained QUARTZ SANDSTONE.	
599	600	Softish grey SILTSTONE. Slightly micaceous. Pyrites disseminated throughout core.	S.G.2.18 and 2.50
600	645	Grey SILTSTONE slightly sandy, dark grey clayey SILTSTONE and very fine grained QUARTZ SANDSTONE, slightly calcareous.	
645	680	Fine grained and very fine grained slightly calcareous SANDSTONE and grey SILTSTONE.	
		Core 7, 680' - 698'.Recovery 9'0" (50.0%) Negative flame test.	
680	698	Interbedded grey SILTSTONE and very fine grained QUARTZ SANDSTONE. Sandstone has occasional cross-bedding. Short thin vertical tubes of sand occur in the siltstone.	S.G. 2.13
698	770	Light greyish green fine and very fine grained QUARTZ SANDSTONE, grains subrounded and medium sorting, and grey SILTSTONE. All slightly calcareous. Traces pyrites. Coralline shell fragments may be cavings.	
770	780	Fine grained semifriable light grey-green SANDSTONE.	
		Core 8, 780'- 800', Recovery 5'3" (26.3%) Negative flame test. Details at foot of column.	
		Core 9, 800'- 820'. Recovery 7' (includes possibly 6'- 9" cavings) (35.0% or 1.3%) Negative flame test.	
800	818	Grey sandy SILTSTONE (6'9" ?cavings)	
818	820	Light green fine grained QUARTZ SANDSTONE, very slightly micaceous. Friable.	S.G. 2.10
820	880	Fine grained light greenish QUARTZ SANDSTONE, moderate sorting and grains subrounded, with small amount soft sandy siltstone, probably cavings. Traces iron pyrites.	
		Core 10, 880' - 890'. Recovery 3'6" (35.0%) Negative flame test.	
880	885	Friable very fine rounded grains greenish QUARTZ SANDSTONE.	
885	900	Crushed dark grey silty CLAYSTONE and medium grained QUARTZ SANDSTONE. (The silty claystone may be mud contaminated cavings).	S.G. 2.20
900	970	Light grey-green fine grained QUARTZ SANDSTONE with thin beds of sandy siltstone. Traces pyrites. Non-calcareous.	
970	976	Very fine grained light grey-green QUARTZ SANDSTONE with thin beds of slightly calcareous grey SILTSTONE.	
		Core 11, 976' - 996'. Recovery 11'9" (58.8%). Negative flame test.	
976	982	Well bedded subhorizontal dark grey micaceous SILTSTONE with a few beds of very fine grained QUARTZ SANDSTONE showing cross-lamination.	S.G. 2.13
982	982	1" brown sideritic CLAYSTONE.	
982	996	Interbedded grey and dark grey SILTSTONE with beds fine and very fine grained whitish micaceous SANDSTONE. Slightly Calcareous. Well bedded - shaley. Dips 0°- 8°. Silt injection structures near base.	
996	1045	Very fine grained light grey-green SANDSTONE and sandy SILTSTONE. Shell fragments may be cavings.	
1045	1080	Fine and very fine grained greenish QUARTZ SANDSTONE, grains subrounded. Sorting fair. Scattered pyrites. Small amount of grey SILTSTONE.	
		Core 12, 1080' - 1100'. Recovery 6'3" (31.3%). Negative flame test.	
1080	1083	Fine grained light grey silty QUARTZ SANDSTONE, cross-bedded. some silt bands.	S.G. 2.22
1083	1098	Interbedded grey-green soft micaceous QUARTZ SANDSTONE, dark grey SILTSTONE, and grey CLAYEY SILTSTONE. Bedding distorted and some sand veining.	
1098	1100	Finely interbedded light grey silty CLAYSTONE and grey SILTSTONE.	
1100	1105	Grey sandy SILTSTONE, and fine grained greenish QUARTZ SANDSTONE.	
1105	1125	Grey Sandy SILTSTONE, fine grained quartz SANDSTONE and medium to coarse grained rounded QUARTZ SAND. Pyrites traces.	
1125	1180	Greenish and flesh coloured medium and coarse grained very friable QUARTZ SANDSTONE, rounded and subrounded grains, with thin beds of SILTSTONE and light grey fine grained SANDSTONE.	
		Core 13, 1180' - 1200'. Recovery 5'6" (27.5%). Negative flame test.	
1180	1200	Whitish fine to medium grained QUARTZ SANDSTONE, grains subrounded to rounded, sorting good. Massive but with a few silty beds.	S.G. 2.05
1200	1280	Fine and medium grained QUARTZ SANDSTONE. grains rounded and subrounded, occasional coarse to very coarse grains with light grey sandy SILTSTONE band. Pyrites.	
		Core 14, 1280' - 1295'. Recovery 6'6" (43.3%) Negative flame test.	
1280	1295	Subhorizontal fine to medium grained light grey QUARTZ SANDSTONE. grains rounded to subrounded, sorting fair. Silty beds and some cross-bedding.	S.G.2.00-2.06
1295	1380	Fine grained light grey QUARTZ SANDSTONE. grey sandy SILTSTONE, and fine to medium grains of rounded to subrounded QUARTZ SAND.	
		Core 15, 1380' -1400'. Recovery 13'5" (67.1%) Negative flame test.	
1380	1400	Fine to medium grained poorly sorted light grey QUARTZ SANDSTONE with sub-rounded grains, with about 30% grey SANDY SILTSTONE giving irregular bedded structure. Pyrites nodules to ½". S.G. Silty Sandstone 2.23 : S.G. Sandstone 2.05	
1400	1480	Fine grained and very fine grained QUARTZ SANDSTONE, medium grained subrounded QUARTZ SAND, some grey SILTSTONE. Trace Pyrites.	
		Core 16, 1480' - 1500'. Recovery 11'9" (98.8%). Negative flame test.	
1480	1500	Fine to medium grained friable SANDSTONE of quartz with weathered white felspar and bands of green quartz grains.	S.G. 2.19
1500	1580	Fine medium and coarse grained QUARTZ SAND mainly clear but also white, flesh and green. Subrounded. Trace Pyrites.	
		Core 17, 1580' - 1600', Recovery 1'7" (possibly includes 1'5" cavings or recmings.) (7.9% or 1.7%) Negative flame test.	
1580	1600	Medium grained QUARTZ SANDSTONE, well sorted subrounded grains. Some interstitial quartz flour. Very friable.	S.G.(small sample) 2.57
1600	1680 (T.D.)	Fine, medium and few coarse grains subrounded clear, white, flesh and light green QUARTZ SAND. Trace pyrites.	
		Core 8, 780' - 800'. Recovery 5'- 3" (26.3%) Negative flame test.	
780	790	Grey semi-friable fine grained QUARTZ SANDSTONE.	
790	791	Fine grained poorly sorted QUARTZ SANDSTONE with dark minerals 3-4%. Flat disc-like SILTSTONE nodules on bedding planes.	
791	792	Interbedded grey SILTSTONE with light grey laminae fine-grained QUARTZ SANDSTONE.	
792	793	Fine-grained poorly sorted QUARTZ SANDSTONE with dark minerals 3-4%. Disc-like SILTSTONE nodules on bedding planes.	
793	794	Graded bedded, coarse, grey SILTSTONE. Dip 5° - 6°.	
794	795	Fine grained poorly sorted QUARTZ SANDSTONE with dark minerals. SILTSTONE laminae cross bedding planes.	
795	800	Greenish fine grained fairly well sorted [illegible] QUARTZ SANDSTONE with flesh coloured laminae, usually [illegible]	

PLATE 1

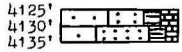
EXPLANATION OF LOGS FOR BOREHOLES BMR1, BMR2, BMR3.

WEST KIMBERLEY DIVISION, WESTERN AUSTRALIA

Drilling Time Rate: This is given as number of minutes required to drill each 5 feet. Note that coring time is much greater than open hole drilling time.

S.P. Curve: Details given with log.

Percentage Log: This is compiled from the percentage constituents of samples collected at 10 feet intervals at BMR1 or 5 feet intervals at BMR2 and BMR3. E.g.:-



4125' - 4130': 40% Medium Sandstone, 30% Fine Sandstone.
15% Siltstone. 15% Limestone.

4130' - 4135'; 30% Medium Sandstone, 45% Fine Sandstone.
15% Siltstone. 10% Limestone.

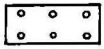
Core Details: The actual core recovered is plotted vertically at 5 times the scale of the Percentage Log.

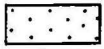
Resistivity Curve: Details given with S.P. curve on Log.

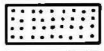
Descriptive Log: This summarises results obtained from percentage log and interprets strata represented by core recovered. Dips are given as plus or minus deviation. Specific gravity was determined for dry specimens.

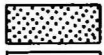
Grain Sizes:- 4 mm. - 2 mm. Very Coarse.
2 mm. - 1 mm. Coarse.
1 mm. - 1/4 mm. Medium
1/4mm. - 1/8 mm. Fine.
1/8mm. - 1/16mm. Very Fine.

SYMBOLS USED IN PERCENTAGE LOG


Coarse Sandstone
Pebbles


Medium Sandstone


Fine Sandstone

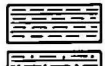

Very Fine Sandstone
Coarse Siltstone


Silty (overprint)


Sandy Siltstone


Siltstone


Shale

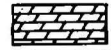

Claystone

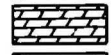

Silty or Sandy Claystone

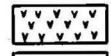

Limestone

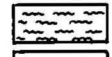

Calcarenite

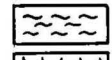

Calcareous (overprint)

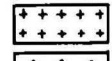

Dolomite

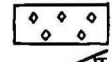

Dolomitic (overprint)

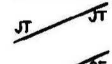

Volcanics


Schist

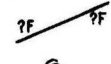

Schist


Granitic Vein


Hornfels



Joint



?Fault


Marine Fossils


Plant Remains

Pyrites

Calcite

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS, AUGUST 1956.

WA 3A-20

FITZROY BASIN

WESTERN AUSTRALIA

PLATE I

Bureau of Mineral Resources, Geology and Geophysics. July 1956.

WA 3E-17