COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Petroleum Search Subsidy Acts

PUBLICATION No. 78

SUMMARY OF DATA AND RESULTS

AMADEUS BASIN, NORTHERN TERRITORY

Ooraminna No. 1 Well

Palm Valley No. 1 Well

OF

EXOIL (N.T.) PTY LTD

AND

MAGELLAN PETROLEUM (N.T.) PTY LTD

Issued under the Authority of the Hon. David Fairbairn
Minister for National Development

1966

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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

MINISTER: THE HON. DAVID FAIRBAIRN, D.F.C., M.P.

SECRETARY: R. W. BOSWELL

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

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Canberra A.C.T.

FOREWORD

Under the Petroleum Search Subsidy Act 1959-1964, agreements relating to subsidized operations provide that the information obtained may be published by the Commonwealth Government six months after the completion of field work.

The growth of the exploration effort has greatly increased the number of subsidized projects and this increase has led to delays in publishing the results of operations.

The detailed results of subsidized operations may be examined at the office of the Bureau of Mineral Resources in Canberra (after the agreed period), and copies of the reports may be purchased.

In order to make the main results of operations available early, short summaries are being prepared for publication. These will be grouped by area and date of completion as far as practicable. Drilling projects and geophysical projects will be grouped separately. In due course, full reports will be published concerning those operations which have produced the more important new data.

This Publication contains summaries of data and results of two drilling operations undertaken in the Amadeus Basin, Northern Territory : Ooraminna No. 1, and Palm Valley No. 1. The information has been abstracted by the Petroleum Exploration Branch of the Bureau of Mineral Resources from well completion reports furnished by Exoil (N.T.) Pty Ltd, and Magellan Petroleum (N.T.) Pty Ltd.

J.M. RAYNER
Director

CONTENTS

ILLUSTRATIONS

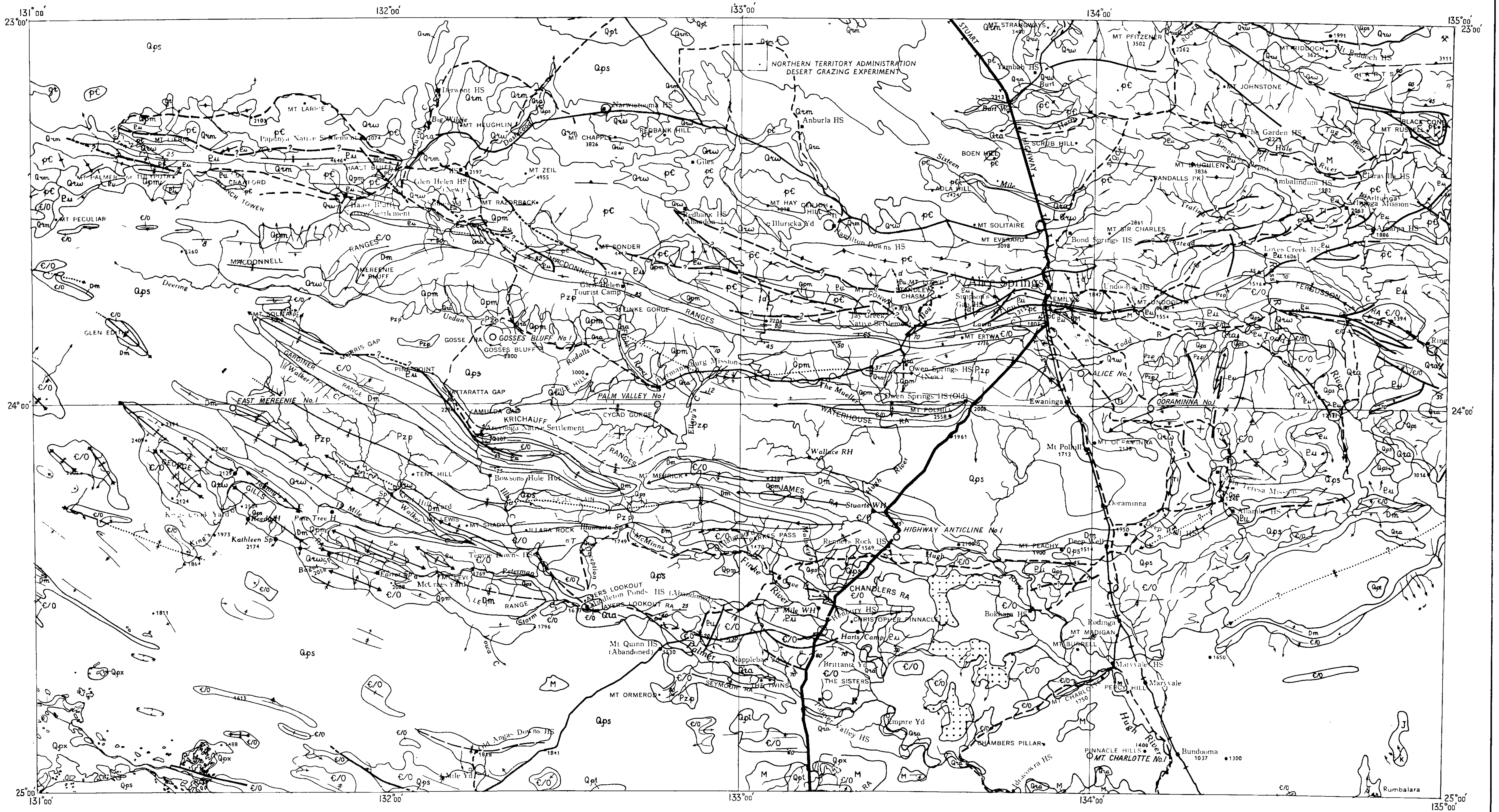
OORAMINNA NO. 1

of

EXOIL (N.T.) PTY LTD

SUMMARY OF DATA AND RESULTS

Fig 1



LOCALITY AND GEOLOGICAL MAP
OORAMINNA No.1 AND PALM VALLEY No.1

SCALE 1:1,000,000

10 0 10 20 30 40 MILES

Age	Unit	Symbol	Description
RECENT	Undifferentiated	Qra	*Alluvium*
		Qrw	*Wash*
		Qrm	*Soil*
RECENT TO PLEISTOCENE		Qps	*Aeolian sand.*
		Qpt	*Kunkar, calcrete, alluvium*
		Qpx	*Evaporite and clay*
PLEISTOCENE		Qpm	*Terrace gravels*
TERTIARY		Tl	*Chalcedony, calcareous silt gypsiferous silt*
		(dotted)	*Grey billy*
CRETACEOUS JURASSIC	Basin Sediments (in part)	M	*Sandstone, siltstone, claystone, arkose, gravel*
	Rumbalara Shale	K	*Shale, claystone fine-grained sandstone*
	De Souza Sandstone	J	*Sandstone*
(?) DEVONIAN	Pertnjara Fm	Pzp	*Sandstone, conglomerate siltstone*
(?)ORDOVICIAN	Mereenie Sandstone	Dm	*Sandstone*
ORDOVICIAN TO CAMBRIAN	Pertaoorrta, Larapinta Groups	€/O	*Sandstone, limestone, dolomite shale, quartz, greywacke*
UPPER PROTEROZOIC	Pertatataka Fm Bitter Springs Fm Heavitree Quartzite	Pu	*Sandstone, quartzite, shale, dolomite limestone, siltstone, boulder beds arkose, quartz greywacke*
UNDIFFERENTIATED	Arunta Complex	p€	*Gneiss, schist, amphibolite, granite granodiorite, basic intrusives pegmatite, dolerite, gabbro, phyllite*

After
T. Quinlan, 1962

OORAMINNA NO. 1

SUMMARY OF DATA AND RESULTS *

SUMMARY

Ooraminna No. 1 Well, located 42 miles south-east of Alice Springs on the Ooraminna Anticline, in the Amadeus Basin of the Northern Territory, was the first oil exploratory test drilled in the Amadeus Basin. The well was drilled by Oil Drilling and Exploration Limited for Exoil (N.T.) Pty Ltd, to a total depth of 6107 feet. Drilling commenced on 24th February, 1963 and was completed on 5th June, 1963. A full programme of logging, coring, and testing was undertaken.

The well spudded in the Cambrian Arumbera Sandstone and entered the Upper Proterozoic Pertatataka Formation at 1530 feet, the Areyonga Formation at 3734 feet, and the Bitter Springs Formation at 4406 feet. Drilling stopped at 6107 feet in evaporites of the Bitter Springs Formation.

Four drillstem tests were run over intervals between 3761 and 3950 feet. The only successful test was DST. No. 4, over the interval 3761 to 3906 feet in the Areyonga Formation, when a flow of gas (84.2% methane) at a rate of 12,000 cubic feet per day was measured.

Salt was found in the Bitter Springs Formation, in the bottom 162 feet of the hole.

The stratigraphic drilling operation at Ooraminna No. 1 was subsidized under the Petroleum Search Subsidy Act 1959-1961, from surface to total depth.

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* Abstracted from : Well Completion Report, Exoil Ooraminna No. 1, by R.N. Planalp and R.L. Pemberton, Exoil (N.T.) Pty Ltd, October, 1963.

WELL HISTORY

General Data

Well name and number :	Ooraminna No. 1
Location :	Latitude 24°00'06"S. Longitude 134°09'50"E.
Name and address of Tenement Holder :	Magellan Petroleum (N.T.) Pty Ltd, Edward and Adelaide Streets, Brisbane, Queensland
Details of Petroleum Tenement :	Oil Permit No. 43, Northern Territory (6950 square miles)
Total Depth :	6095 feet (driller) 6107 feet (Schlumberger)
Date drilling commenced :	24th February, 1963
Date drilling completed :	5th June, 1963
Date well abandoned :	11th June, 1963
Date rig released :	11th June, 1963
Elevation (ground) :	1613 feet
Elevation (K.B.) :	1624 feet (datum for depths)
Status :	Dry hole, plugged and abandoned
Cost :	£183,881

Drilling Data

Drilling Plant :

Make :	National-Ideal
Type :	T.32
Hole sizes and depths :	17 1/2" to 402 feet 8 3/4" to 6085 feet 7 7/8" to 6095 feet (T.D.)

Casing details:

Size (in.):	13 3/8
Weight (lb./ft):	48
Grade:	H.40
Setting depth (ft):	401

Logging and Testing

Ditch Cuttings:

Interval:	Ten feet from surface to 4100 feet, and five feet from 4100 feet to total depth.
Coring :	Twenty-one cores were cut using a Hughes "J" Type core barrel with both hard and soft formation cutter heads. A total of 106'8" was cored and 84'7" (79%) recovered.
Sidewall Cores :	No sidewall samples were taken.
Electric and other logging (Schlumberger) :	
Electrical Log :	401 - 6106 feet (2 runs)
Microlog-Caliper :	402 - 6103 feet (2 runs)
Gamma Ray Log :	0 - 6087 feet (1 run)
Drilling Time and Gas Log:	Continuous drilling rate and gas plots were recorded during drilling.
Formation Testing :	Four formation tests were carried out during the drilling operation.
Deviation Survey :	Sixty-four readings (including three misruns) were taken with a Lane-Wells instrument during drilling. The maximum hole deviation of 6^{o} was recorded at 5315, 5351, and 5431 feet. The final reading at 6075 feet was 2^{o}.

GEOLOGY

Stratigraphy

General :

Ooraminna No. 1 Well spudded in the Cambrian Arumbera Sandstone and penetrated the Upper Proterozoic Pertatataka and Areyonga formations before reaching total depth at 6107 feet in evaporites of the Upper Proterozoic Bitter Springs Formation. The stratigraphic sequence encountered in the well is shown in the following Table.

Age	Formation	Depth Intervals (feet)	Thickness (feet)
Cambrian	Arumbera Sandstone	11-1530	1519+
Upper Proterozoic	Pertatataka Formation	1530-3734	2204
Upper Proterozoic	Areyonga Formation	3734-4406	672
Upper Proterozoic	Bitter Springs Formation	4406-6107 (T.D.)	1701+

Detailed :

Arumbera Sandstone (Cambrian): Surface to 1530 feet (1519 feet+)

Predominantly sandstone with shale and siltstone interbeds. The sandstone, of poor porosity, is generally ferruginous, orange to red and light grey to white, poorly sorted, fine to medium and coarse-grained, current bedded, and has a calcareous to siliceous cement. Feldspar, mica, pyrite, and ferromagnesian grains are common.

The siltstone is red and green, sandy to argillaceous and micaceous. The shale is commonly red, rarely green, micaceous, and silty.

Both shale and siltstone occur as streaks or laminae, and in beds up to 25 feet thick. Several thin, soft, chalky, orange to white limestone beds occur.

The base of the Arumbera Sandstone is marked by a five-foot bed of red, ferruginous, micaceous shale overlying massive, red sandstone.

Pertatataka Formation (Upper Proterozoic): 1530 to 3734 feet (2204 feet)

This unit consists of massive limestone, 194 feet thick, at the top, passing down through 216 feet of interbedded limestone, sandstone, and shale into 1637 feet of possible marine shale, and then into 157 feet of red continental shale. The limestone is dolomitic, white to pink and purple, massive, crypto to microcrystalline, slightly pyritic, with a few sand grains and a little vuggy porosity. The sandstone is white to grey, calcareous, poorly sorted, fine to coarse-grained, friable, and grades into limestone. The marine shale is well indurated, grey-green to black, silty, calcareous, micaceous, and pyritic, with a varved appearance. The continental shale is red-brown, with green mottling, ferruginous, micaceous, and silty.

Areyonga Formation (Upper Proterozoic): 3734 to 4406 feet (672 feet)

The Areyonga Formation in Ooraminna No. 1 can be subdivided into three units: 61 feet of limestone and limestone breccia; underlain by 300 feet of interbedded limestone and shale, gradational at the top with the overlying limestone; and then 311 feet of interbedded limestone, shale, siltstone, and sandstone. The base of the Areyonga Formation is placed at the base of the lowermost sandstone in the well section.

The limestone is sandy, dolomitic, buff to white, and micro to finely crystalline; and brown, argillaceous, and siliceous. Brecciated zones occur at the top and bottom of the main limestone bed. The shale is dark grey, laminated, silty, calcareous, and pyritic, red-brown in the lower section. The sandstone is variously white to grey, clean, fine to granular, siliceous, calcareous, and gradational into limestone; or brown-green, white, medium to fine-grained, lithic, argillaceous, micaceous. The siltstone is varicoloured and grades into sandstone.

Bitter Springs Formation (Upper Proterozoic): 4406 to 6107 feet (1701 feet+)

The Bitter Springs Formation in the well consists of the following: 904 feet of interbedded shale, cherty limestone, and minor siltstone, and three spilite beds; 610 feet of dolomite; and 187 feet of diapiric salt and red shale.

The shale is red-brown, silty, sandy, micaceous, and calcareous. The siltstone is green-grey and brown, sandy, calcareous, and argillaceous. The spilites are sericitized and chloritized albite dolerites. The limestone and dolomite are white to brown, siliceous and cherty, crypto to coarsely crystalline, gypsiferous, and sandy in parts. The evaporite sequence (5920 to 6107 feet) consists of 25 feet of red, ferruginous, dolomitic, gypsiferous shale overlying red-brown, transparent, coarsely crystalline halite in which are included fragments of red and yellowish-brown, soft clay.

Structure

The well was located on the Ooraminna Anticline; interpretation of gravity data indicated that the structure had a salt core. This core was encountered in the well at 5945 feet, and the well was still in salt at total depth. Lineation in the salt and abnormally high dips above it were interpreted as the result of flowage of the underlying salt.

Oil and Gas Indications and Potential

Drillstem Test No. 4, over the interval 3761 to 3906 feet, yielded gas at the rate of 12 Mcf/D. This small, non-commercial flow of gas from the section thought to be the Upper Proterozoic Areyonga Formation, may be highly significant, as it was one of the first recorded hydrocarbon shows from the Proterozoic rocks of Australia. The shale above the Areyonga Formation, in the lower part of the Pertatataka Formation, is thought to be potential source rock but no suitable reservoir beds were encountered.

ADDITIONAL DATA FILED IN THE BUREAU OF MINERAL RESOURCES

The following additional data relating to Ooraminna No. 1 Well, have been filed in the Bureau of Mineral Resources, Canberra, and are available for reference :

(i) Well Completion Report, by R.N. Planalp and R.L. Pemberton — 20 pp.

Appendix A(i)	:	Core descriptions	5 pp.
Appendix A(ii)	:	Core analyses, by BMR.	3 pp.
Appendix B	:	Petrographic descriptions of cores, by W.B. Bryan, and W.R. Morgan	10 pp.
Appendix C	:	Core, mud, and cuttings analyses, by Core Laboratories Australia (Vic.) Ltd.	9 pp.
Appendix D	:	Gas analyses, by H.W. Sears	2 pp.

(ii) Daily drilling reports for period 21st February, 1963, to 11th June, 1963.

(iii) Well logs including the following :

(a) Electrical Log

Run 1, 401-3030 feet (scale 2", 5" : 100 ft)

Run 2, 3030-6106 feet (scale 2", 5" : 100 ft)

(b) Microlog-Caliper

Run 1, 402-3035 feet (scale 2", 5" : 100 ft)

Run 2, 3035-6103 feet (scale 2", 5" : 100 ft)

(c) Gamma Ray Log

Run 1, 0-6087 feet (scale 2", 5" : 100 ft)

PALM VALLEY NO. 1

of

MAGELLAN PETROLEUM (N.T.) PTY LTD

SUMMARY OF DATA AND RESULTS

PALM VALLEY NO. 1

SUMMARY OF DATA AND RESULTS *

SUMMARY

Palm Valley No. 1 Well, located in the Amadeus Basin about 75 miles west-south-west of Alice Springs, Northern Territory, was drilled by Richter Bawden Drilling Pty Ltd for Magellan Petroleum (N.T.) Pty Ltd. Air drilling was used to a depth of 5573 feet and mud was then used as the circulating fluid from 5573 feet to total depth at 6658 feet. Drilling commenced on 7th January, 1965, and was completed on 1st May, 1965. A full programme of logging, coring, and testing was undertaken.

Palm Valley No. 1 was spudded in the (?) Devonian Pertnjara Formation, and entered the (?) Ordovician Mereenie Sandstone at 1016 feet. The well then penetrated the Ordovician Stokes Formation at 3208 feet, the Stairway Sandstone at 4320 feet, the Horn Valley Siltstone at 5296 feet, and the Pacoota Sandstone at 5634 feet, in which the well bottomed at 6658 feet.

Gas was first encountered in the Stairway Sandstone while drilling at 5178 feet; an open hole test at 5193 feet indicated the zone to be producing gas at an approximate flow rate of 2.470 MMcf/D. After drilling to 5573 feet, a 16-hour open-hole test of the interval 3192 to 5573 feet exhibited a final flow rate of 11.700 MMcf/D.

Eight open-hole drillstem tests (while drilling with mud) were run over intervals between 5170 and 6658 feet. Five of the tests yielded gas, with measured flow rates of up to 1.550 MMcf/D. After reaching total depth, the well was plugged back to 6169 feet and the casing was perforated at selected intervals between 5178 and 5916 feet. During completion operations, three production tests were conducted to test three separate intervals, for the purpose of determining the productivity of each interval. The intervals tested were from 6134 to 6169 feet (open hole); 5550 to 5916 feet; and 5178 to 5916 feet. The first test yielded gas flowing at rates of up to 0.706 MMcf/D; flow rates of up to 3.689 MMcf/D were recorded during the second test, and 3.720 MMcf/D during the third test. Completion test data and data from subsequent tests have been studied and the current absolute open flow potential of Palm Valley No. 1 has been calculated to be approximately 6.300 MMcf/D.

The well was completed as a shut-in gas well on 21st May, 1965.

The stratigraphic drilling operation at Palm Valley No. 1 was subsidized under the Petroleum Search Subsidy Act 1959-1964, from surface to total depth.

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* Abstracted from : Well Completion Report, Palm Valley No. 1 Well, Northern Territory, by Magellan Petroleum (N.T.) Pty Ltd, August, 1965.

10129/66.—2

WELL HISTORY

General Data

Well name and number :	Palm Valley No. 1
Location :	Latitude 24°00'00"S. Longitude 132°46'20"E.
Name and address of Tenement Holder :	Magellan Petroleum (N.T.) Pty Ltd, Edward and Adelaide Streets, Brisbane, Queensland
Details of Petroleum Tenement :	Oil Permit No. 43, Northern Territory
Total Depth :	6658 feet
Date drilling commenced :	7th January, 1965
Date drilling completed :	1st May, 1965
Date well completed :	21st May, 1965
Date rig released :	21st May, 1965
Elevation (ground) :	1907 feet
Elevation (K.B.) :	1921 feet (datum for depths)
Status :	Completed as a shut-in gas well
Cost :	£326,336

Drilling Data

Drilling Plant :

Make :	National
Type :	55

Hole sizes and depths:

24"	to	20 feet
17 1/2"	to	408 feet
12 1/4"	to	3192 feet
8 3/4"	to	6168 feet
6 1/8"	to	6658 feet (T.D.)

Casing details :

Size (in.) :	20	13 3/8	9 5/8	7
Weight (lb./ft) :	40	48	36	26
Grade :		J.55	J.55	N.80 and J.55
Setting depth (ft) :	20	403	3192	6134

Logging and Testing

Ditch Cuttings :

Interval :	Ten feet from surface to 5640 feet, and five feet from 5640 feet to total depth.
Coring :	Twenty-four cores were cut using Hughes HFC 8 3/4" bits, and Christensen 6 3/4" to 6 1/16" diamond bits, and conventional barrels. A total of 319'8" was cored and 307 feet (96%) recovered.
Sidewall Cores :	No sidewall samples were taken.

Electric and other logging (Welex) :

Induction-Electric Log :	404-6651 feet (4 runs)
Guard Log :	3189-6651 feet (3 runs)
Caliper Log :	404-3190 feet (1 run)
FoRxo Log :	3000-6654 feet (3 runs)
Gamma Ray-Neutron Log :	200-6653 feet (3 runs)
Acoustic Velocity-Gamma Ray Log :	10-6650 feet (4 runs)
Temperature Log :	500-6072 feet (2 runs)

Velocity Survey :	A velocity survey (15 shots) was conducted by Compagnie Generale de Geophysique from 1016 to 6140 feet.
Drilling Time and Gas Log :	Continuous drilling time was recorded during drilling. Gas shows were detected by means of a pilot flare during air drilling.
Formation Testing :	The following tests were undertaken :

Empty Hole Flow Tests (while drilling with air)

Test Number	Test Interval (feet)	Gas Flow Rate (MMcf/D)	Remarks
--	3192*-5193	2,470	40-minute test
--	3192*-5290	1,630	60-minute test
--	3192*-5565	5,860	90-minute test
--	3192*-5573	11,700	16-hour test

* Bottom of casing - top of open hole. First gas show was at 5193 feet.

Open Hole Drillstem Tests (while drilling with mud)

Test Number	Test Interval (feet)	Gas Flow Rate (MMcf/D)	Remarks
1	5500-5640	4.000-5.000 (est.)	Rec. 450 feet gas-cut mud
2	5170-5310	0.728	Rec. 1200 feet gas-cut mud
3	5630-5784	1.550	Rec. 420 feet mud
4	5784-5924	0.010 (est.)	Rec. 125 feet gassy mud
5	5924-6110	dry	No flow. Rec. 100 feet mud
6	6110-6318	0.250 (est.)	Rec. 90 feet water
7	6318-6476	-	No gas. Rec. 1080 feet salt water (112,150 ppm. Cl)
8	6530-6658	-	No gas. Rec. 270 feet gassy mud

Production Testing : Productive formations were grouped into three major zones for completion testing. A pressure build-up test and a four-point modified isochronal flow test were conducted on each zone after acidizing. An Amerada pressure bomb recorded bottom hole pressures throughout the tests. A brief summary of the completion test results is shown in the following Table :

Completion Test	No. 1	No. 2	No. 3
Date	10-11th May	14-15th May	19-20th May
Interval (gross feet)	6134-6169	5550-5916	5178-5916
Formation (zone)	Upper Pacoota	Horn Valley, and upper Pacoota	Lower Stairway, Horn Valley, and upper Pacoota
Acid (gallons)	1350	1350	1350
Depth recorder (feet)	6000	5470	5300
Stabilized BHP (psig)	2917	2889	2874
Calc. open flow (MMcf/D)	1.380	5.200	5.400

Temperature Survey : Bottom-hole temperatures were taken at ten levels between 3193 and 6651 feet during logging and testing. BHT at 6651 feet was 153° F.

Deviation Survey : Eighty-six readings were taken at intervals of less than 500 feet. The maximum hole deviation of $6\frac{1}{2}^{o}$ was recorded at 5660 feet. The final reading at 6561 feet was $4\frac{1}{2}^{o}$.

GEOLOGY

Stratigraphy

General :

Palm Valley No. 1 Well spudded in the (?) Devonian Pertnjara Formation, and subsequently penetrated the (?) Ordovician Mereenie Sandstone, the Ordovician Stokes Formation, Stairway Sandstone, and Horn Valley Siltstone, before bottoming in the Ordovician Pacoota Sandstone at 6658 feet. The stratigraphic sequence encountered in the well is shown in the Table below :

Age	Formation	Depth Intervals (feet)	Thickness (feet)
(?) Devonian	Pertnjara Formation	14-1016	1002+
(?) Ordovician	Mereenie Sandstone	1016-3208	2192
Ordovician	Stokes Formation	3208-4320	1112
Ordovician	Stairway Sandstone	4320-5296	976
Ordovician	Horn Valley Siltstone	5296-5634	338
Ordovician	Pacoota Sandstone	5634-6658 (T.D.)	1024+

Detailed :

Pertnjara Formation (? Devonian) [1] : Surface to 1016 feet (1002 feet+)

Mainly sandstone above 470 feet, and interbedded sandstone, siltstone, and shale below that depth. The sandstone is orange, red, or reddish-brown; fine to medium-grained; siliceous, dolomitic, or calcareous in parts; angular to subrounded with abundant grains of green feldspar (?). The siltstone is dark red-brown to grey-green, micaceous, and sandy; and the shale is dark red-brown, blocky to platy, micaceous and sandy. Gypsum occurs as flecks and veinlets above 860 feet.

(1) Footnote by Bureau of Mineral Resources:

The Pertnjara Formation is now considered by the Bureau of Mineral Resources to be of Upper Devonian to Carboniferous age.

Mereenie Sandstone (? Ordovician) [2] : 1016 to 3208 feet (2192 feet)

Dominantly sandstone, with shale and siltstone interbeds below 2984 feet. The sandstone is white to orange-red, fine to medium and coarse-grained, angular to subrounded, medium to well sorted, and variously siliceous, calcareous, or slightly dolomitic. White clay and green feldspar (?) grains occur in parts. The siltstone is red-green and micaceous; and the shale is reddish-brown, micaceous, silty in parts, and gypsiferous between 3050 and 3175 feet.

Carmichael Sandstone

Stokes Formation (Ordovician) : 3208 to 4320 feet (1112 feet)

Dominantly interbedded shale and siltstone, but below 4010 feet, the siltstone gives way to minor limestone interbeds. The shale and siltstone are red to brown, with green mottling in parts, micaceous in part, and slightly dolomitic. The shale is gypsiferous and the siltstone is slightly sandy, in parts. The limestone is white, brown, red, grey-green and green, cryptocrystalline, silty, dolomitic, and fossiliferous.

Stairway Sandstone (Ordovician) : 4320 to 5296 feet (976 feet)

Interbedded sandstone, siltstone, and shale, with sandstone predominant above 4400 and below 4860 feet. The sandstone is white to grey-green and red, mostly fine-grained, angular to subangular, well sorted, micaceous and argillaceous in parts, and dolomitic to calcareous in parts. The siltstone is white to grey-green and red, micaceous and dolomitic. The shale is grey to black with some red and green, blocky to platy, micaceous, and silty. The basal thirty feet of the sandstone is pyritic.

Horn Valley Siltstone (Ordovician) : 5296 to 5634 feet (338 feet)

Interbedded and fossiliferous shale, dolomite, and limestone. The shale is dark grey to black, micaceous and silty. The dolomite is light grey to dark greyish-brown, crypto to finely crystalline, argillaceous, calcareous, and silty in part. The limestone is white to brown, crypto to finely crystalline, argillaceous, and dolomitic. The section showed evidence of fracture. Some very fine to coarse-grained glauconitic and dolomitic sand occurs from 5570 to 5580 feet.

Pacoota Sandstone (Ordovician) : 5634 to 6658 feet (1024 feet+)

Interbedded sandstone and shale, with sandstone predominant below 6390 feet. The sandstone is white, grey, pink, and red, fine to coarse-grained, slightly dolomitic to calcareous in part, micaceous, silty and with black fossil debris. It is very glauconitic from 6220 to 6400 feet. The shale is grey to black, micaceous, and carbonaceous in part.

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(2) Footnote by Bureau of Mineral Resources:

The interval 1016 to 3208 feet, here recorded as (?) Ordovician Mereenie Sandstone, is regarded by the Bureau as consisting of two units separated by a regional unconformity indicated in this well by a major break in the Gamma Ray Log at 2925 feet. Above this break, the sediments are thought to be of (?) Silurian-Devonian age, while those sediments below the break are considered to be Ordovician. The stratigraphic nomenclature for this part of the section in the well is being modified by Wells, Forman, Ranford, and Cook (Bull. in prep.).

Structure

On the surface, the Palm Valley Anticline is expressed as an east-west trending ridge that makes up the eastern portion of the Krichauff Ranges. Surface mapping and photo-interpretation show the structure to plunge eastwards at the eastern end of the ridge and suggest a weak westerly plunge for the western portion of the structure. Dips determined from cores show the sediments penetrated by the well to be flat-lying. Surface closure is small, but closure below the Pertnjara Formation may exceed 1000 feet.

Oil and Gas Indications and Potential

Detailed results of empty-hole flow, drillstem, and production testing are given in the well completion report. The maximum flow rate of gas encountered during drilling was 11.7 MMcf/D, and during production testing, gas flows at rates of up to 3,720 MMcf/D were recorded. The current absolute open-flow potential of Palm Valley No. 1 Well is calculated to be approximately 6,300 MMcf/D. The well exhibited severe completion damage which restricted the ability of the well to produce. The minimum gas in place in reservoirs in communication with the well is estimated to be 13,200 MMcf. This minimum estimate is based on unsteady-state pressure transient calculations.

Porosity and Permeability of Sediments Penetrated

Intervals of good porosity and permeability in sandstones of the Mereenie Sandstone are indicated by samples, cores and log data, and by flows of fresh water encountered during drilling. The Stairway sandstones appear to be nonporous to 5193 feet. Below that depth the Stairway, Horn Valley, and Pacoota formations are fractured and also exhibit occasional zones of fair intergranular porosity in the sandstones.

Contribution to Geological Concepts resulting from Drilling

Palm Valley No. 1 Well provides the first subsurface information on much of the Ordovician and post-Ordovician section over a large area in the north-central part of the Amadeus Basin.

The section penetrated by the well is similar to that predicted from studies of outcrops. Valuable information regarding the thickness and lithology of the penetrated rocks was obtained.

Gas occurs over an interval of 1000 feet in the well, apparently in a simple communicated reservoir, indicating structural closure of 1000 feet at depth.

REFERENCES

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PRICHARD, C.E., and QUINLAN, T., 1962: The geology of the southern part of the Hermannsburg 1:250,000 Sheet. Bur. Min. Resour. Aust. Rep. 61.

RANFORD, L.C., COOK, P.J., and WELLS, A.T., 1964: The geology of the central part of the Amadeus Basin, Northern Territory. Bur. Min. Resour. Aust. Rep. 86.

WELLS, A.T., RANFORD, L.C., STEWART, A.J., COOK, P.J., and SHAW, R.D., 1965: The geology of the north-eastern part of the Amadeus Basin, Northern Territory. Bur. Min. Resour. Aust. Rep. 113. (In press).

ADDITIONAL DATA FILED IN THE BUREAU OF MINERAL RESOURCES

The following additional data relating to Palm Valley No. 1 Well, have been filed in the Bureau of Mineral Resources, Canberra, and are available for reference:

(i) Well Completion Report, by Magellan Petroleum (N.T.) Pty Ltd — 26 pp.

Appendix 1 : Water and gas analyses — 3 pp.

Appendix 2 : Descriptions of cuttings samples, by R. Hay — 63 pp.

Appendix 3 : Core descriptions and analyses, by R. Hay, and Core Laboratories, Inc. — 27 pp.

Appendix 4 : List and interpretation of electric logs and other surveys — 7 pp.

Appendix 5 : Formation testing and results — 45 pp.

Appendix 6 : Petrographic study, by A.J. Froelich and W.B. Bryan — 87 pp.

(ii) Daily drilling reports for period 7th January, 1965 to 21st May, 1965.

(iii) Well logs including the following :

(a) Induction-Electric Log

Run 1, 404-3188 feet (scale 2", 5" : 100 ft)
Run 2, 3189-5626 feet (scale 2", 5" : 100 ft)
Run 3, 5626-6162 feet (scale 2", 5" : 100 ft)
Run 4, 6132-6651 feet (scale 2", 5" : 100 ft)

(b) Guard Log

Run 1, 3189-5626 feet (scale 2", 5" : 100 ft)
Run 2, 5500-6162 feet (scale 2", 5" : 100 ft)
Run 3, 6132-6651 feet (scale 2", 5" : 100 ft)

(c) Caliper Log

Run 1, 404-3190 feet (scale 2", 5" : 100 ft)

(d) FoRxo Log

Run 1, 3000-5628 feet (scale 2", 5" : 100 ft)
Run 2, 5500-6159 feet (scale 2", 5" : 100 ft)
Run 3, 6132-6654 feet (scale 2", 5" : 100 ft)

(e) Gamma Ray-Neutron Log

Run 1, 3000-5627 feet (scale 2", 5" : 100 ft)
Run 2, 200-6167 feet (scale 2", 5" : 100 ft)
Run 3, 6167-6653 feet (scale 2", 5" : 100 ft)

(f) Acoustic Velocity-Gamma Ray Log

Run 1, 10-3185 feet (scale 2", 5" : 100 ft)
Run 2, 3184-5626 feet (scale 2", 5" : 100 ft)
Run 3, 5626-6162 feet (scale 2", 5" : 100 ft)
Run 4, 6132-6650 feet (scale 2", 5" : 100 ft)

(g) Temperature Log

Run 1, 500-2700 feet (scale 2" : 100 ft)
Run 2, 3200-6072 feet (scale 2" : 100 ft)

PLATE I
SHEET I

COMPOSITE WELL LOG

COMPANY: EXOIL (N.T) PTY. LTD., MAGELLAN PET. CORP, AUSTRAM OIL PTY. LTD.

PETROLEUM TENEMENT: O.P. 43

WELL NUMBER: OORAMINNA No.1

STATE: NORTHERN TERRITORY | 4-MILE SHEET: RODINGA | BASIN: AMADEUS | WELL STATUS: DRY AND ABANDONED

LOCATION: Lat. 24°00'06"S, Long: 134°09' 50"E.
ELEVATION: Reference Pt; K.B. 1624' A.S.L.
Ground 1613'

Date Spudded: 24. 2. 63.
Date Drilling Stopped: 5. 6. 63.
Date Rig Off: 14. 6. 63.

Total Depth: Driller 6095'
E.Log 6107'

Hole Size:

In	From	To
17½	Surface	402'
8¾	402'	6085'
7⅞	6085'	6095'

Casing:

In	Wt	Gr	Depth	Cmt	Cmt'd to
13⅜	48	H-40	401'	355	Surface

Cement Plugs:

From	To	Sacks
0'	20'	10
350'	300'	100
1450'	1600'	75
3550'	3750'	100
3906'	4090'	75
5700'	5900'	80

Well Head Fittings: Welded Steel Plate
Drilled by: Oil Drilling & Exploration Ltd.
Logged by: Schlumberger
Drilling Method: Rotary - Mud
Cemented by: Oil Drilling & Exploration Ltd.
Mud Logging by: Corelab

ELECTRIC LOG DATA

RUN NUMBER	1	2
DATE	6. 4. 63.	7. 6. 63.
FOOTAGE LOGGED	2629'	3076'
LOGGED FROM	3030'	6106'
LOGGED TO	401'	3030'
TOTAL DEPTH-ELECTRIC LOG	3031'	6107'
TOTAL DEPTH-DRILLER	3027'	6095'
CASING SHOE-ELECTRIC LOG	401'	401'
CASING SHOE-DRILLER	401'	401'
BIT SIZE	8¾"	8¾"
MUD-KIND	Gel.	Gel.
TREATMENT	—	Spersene X-E-20
WATER LOSS ccs./30min.	11.0	14.0
WEIGHT lbs./cu.ft.	9.5	10.0
VISCOSITY (Marsh)sec.	49	50
pH	10	9
RESISTIVITY Ω m²/m & TEMP	1.82 @ 93°F	0.19 @ 72°F
	1.48 @ 115°F	0.10 @ 140°F
MAXIMUM RECORDED TEMP.	115°F	140°F
ELECTRODE SPACING		
A SYMMETRICAL	16"	16"
	64"	64"
NON-SYMMETRICAL	18' 8"	18' 8"
RECORDED BY	Visage	White

RADIOMETRIC LOG DATA

TYPE OF LOG	GAMMA RAY
RUN NUMBER	1
DATE	7. 6. 63
TOTAL DEPTH-DRILLER	6095'
TOP OF LOGGED INTERVAL	0'
BOTTOM LOGGED INTERVAL	6087'
TYPE OF FLUID IN HOLE	Spersene X-E-20
FLUID LEVEL	Full
MAXIMUM RECORDED TEMPERATURE	140°F
NEUTRON SOURCE, STRENGTH & TYPE	—
SOURCE SPACING-IN	—
LENGTHOF MEASURING DEVICE	4'
O.D. OF INSTRUMENT-IN	1¾"
TIME CONSTANT - SECS.	3
LOGGING SPEED FT./MIN.	20
STATISTICAL VARIATION-IN	—
SENSITIVITY REFERENCE	200
RECORDED BY	WHITE

CASING RECORD

RUN No.	SIZE-IN.	WT-LBS.	INTERVAL-FT.		OPEN HOLE RECORD BIT SIZE	OPEN HOLE RECORD INTERVAL-FT.	
1	13⅜	48	Surface	401	8¾	402	6085
					7⅞	6085	6095

WELL SYMBOLS

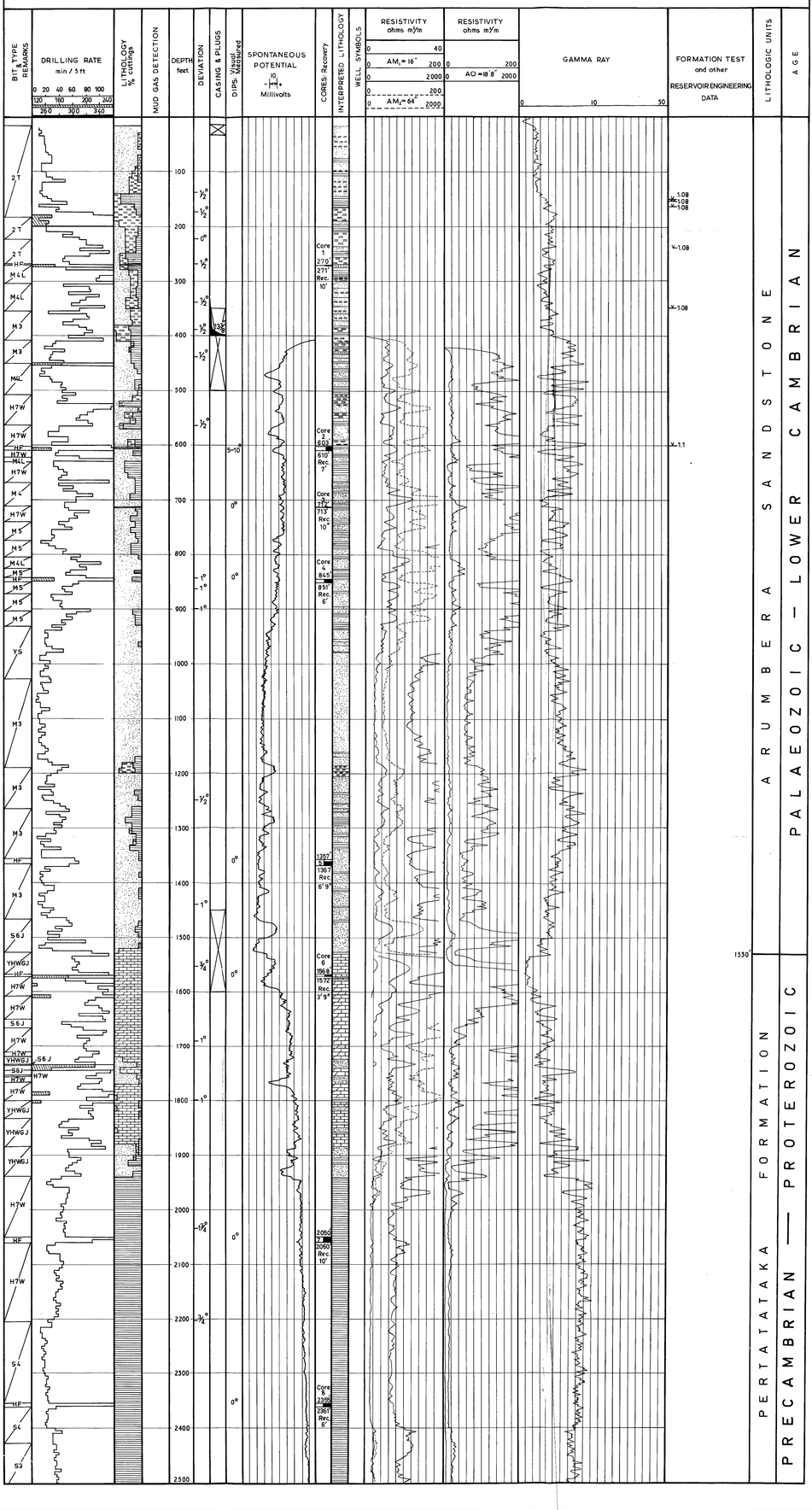
- Plugged interval
- Casing shoe
- Core, interval, number, and recovery
- 1.08 — Circulation loss, partial, and s.g. mud
- 1.08 — Circulation loss, complete, and s.g. mud
- Formation test interval and number

LITHOLOGIC REFERENCE

- Quartz sandstone
- Siltstone
- Shale
- Limestone
- Dolomite
- Evaporite - salt
- Volcanic Rocks
- Quartzite
- ch: Cherty

Lithology by: R. L. Pemberton

Drafting by: GEODRAFTING SERVICES
Drawn: I.R.
Date: July, 1963
SHEET 1 OF 2



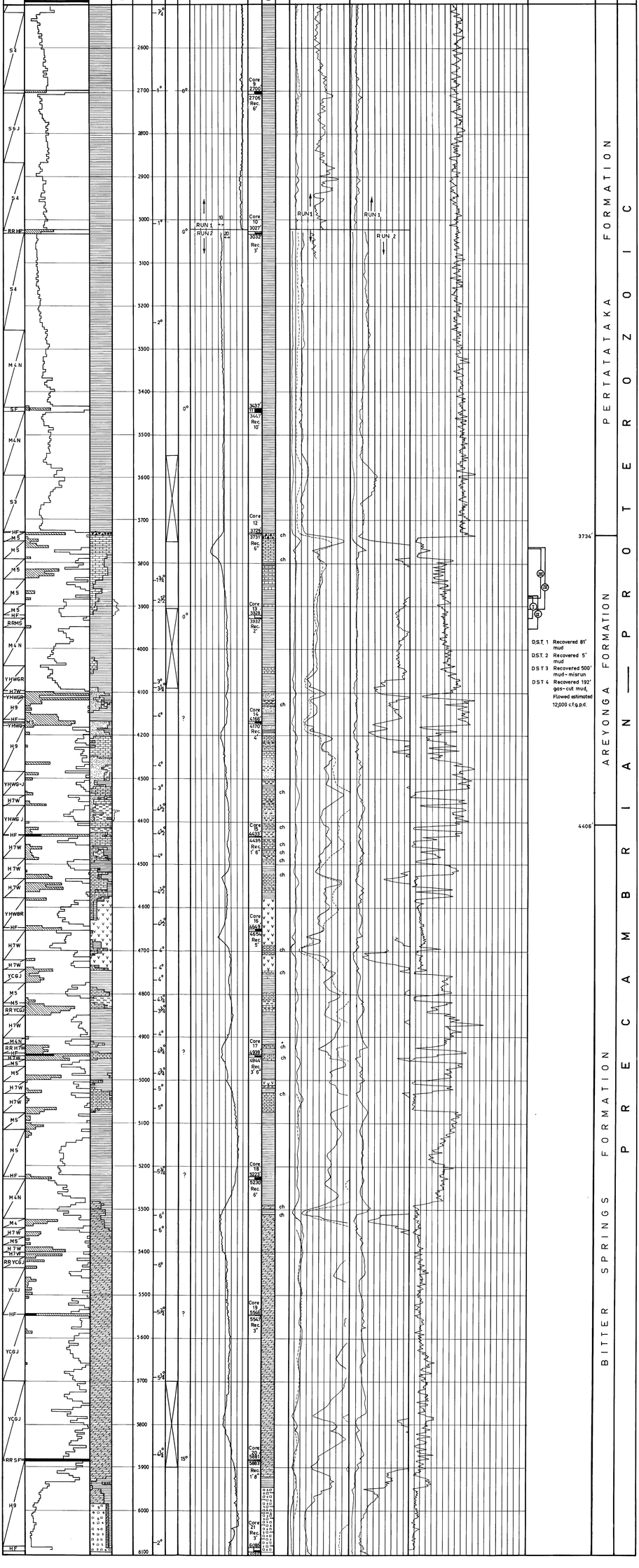
COMPOSITE WELL LOG

OORAMINNA WELL No.1

2500 — 6095′

SHEET 2 OF 2

PLATE I
SHEET 2



MAGELLAN PETROLEUM (N.T.) PTY. LTD.

COMPOSITE WELL LOG

PETROLEUM TENEMENT: OIL PERMIT NO. 43

WELL NUMBER: PALM VALLEY NO. 1

STATE: NORTHERN TERRITORY

4-MILE SHEET: HENBURY AND HERMANNSBURG

BASIN: AMADEUS

WELL STATUS: SHUT-IN GAS WELL

LOCATION: Lat. 24° 00' SOUTH Long. 132° 46' 20" EAST
ELEVATION: Reference Pt. (R.T.), 1921 FEET
Ground, 1907 FEET

Date Spudded: 7 JANUARY 1965
Date Drilling Stopped: 1 MAY 1965
Date Rig Off: 21 MAY 1965
Total Depth: 6658', AB. T.D.: 6169'

Hole Size:

In.	From (KB=0)	To
24	14'	20'
17 1/2	20'	408'
12 1/4	408'	3192'
8 3/4	3192'	6168'
6 1/8	6168'	6658'

Casing In	Wt.	Gr.	Depth	Cmt.	Cmt. To (Ft.)
20	40	MILN	20	5	G.L.
13 3/8	48	J-55	403	310	G.L.
9 5/8	36	J-55	3192	600	2225
7	26	N80+J55	6134	360	4400

Cement Plugs	From	To	Top	Sacks	
NO. 1	6168	6108	6165	25	
NO. 2	6165	6110	6165	20	
GRAVEL	6165	6160	6160	1 BBL	Loose Gravel
NO. 3	6160	6105	6130	25	
RAN 7" CASING AND DRILLED OUT					
NO. 4	6658	6165	6169	85	

Perforations:	Type	Size	From	To	No/Ft.
Open hole: Welex	Torpedo-Jet	5-3/8"	6146	6156	2
Casing: Welex	Super Dyna-Jet	4"	5910	5916	4
			5865	5870	4
			5765	5771	4
			5706	5718	4
			5644	5654	4
			5632	5642	4
			5550	5575	4
			5296	5300	4
			5270	5280	4
			5246	5250	4
			5228	5240	4
			5195	5224	4
			5178	5184	4

Well Head Fittings: National Type B (2 inch)
Drilled by: Richter-Bowden Drilling Pty. Ltd.
Logged by: Halliburton-Welex Division
Drilling Method: Rotary (Air and Mud)
Cement by: B.J. Service (Aust.) Pty. Ltd.

ELECTRIC LOG DATA

Run Number	1	2	3	4	5	6
Date	21 FEB, 1965	20 MAR, 1965	6 APR, 1965	2 MAY, 1965		
Footage Logged	2784	2437	536	519		
Logged From	3188	5626	6162	6651		
Logged To	404	3189	5626	6132		
Total Depth-Electric Log	3193	5631	6167	6657		
Total Depth-Driller	3192	5640	6168	6657		
Casing Shoe-Electric Log	404	3189	3189	6132		
Casing Shoe-Driller	13-3/8 at 403	9-5/8 at 3192	9-5/8 at 3192	7" at 6134		
Bit Size	12-1/4	8-3/4	8-3/4	6-1/8		
Mud-Type	F.M. WATER	WATER-BASE	WATER-BASE	WATER-BASE		
-Treatment	Natural Fill	Unical-Caustic	Unical-Caustic	Unical-Caustic		
-Water loss ccs/30m	N/A	8.4		22.5		
-Weight lbs/cu. ft.	N/A	11.4	11.4	10.1		
-Viscosity (marsh)sec.	N/A	55	48	38		
-pH	N/A	9.0		9.0		
Rm	3.15 at 90° F	1.84 at 94° F	2.12 at 76° F	0.51 at 78° F		
Rm_f Resistivity $\Omega m^2/m$	N/A	1.30 at 94° F	1.90 at 76° F	0.46 at 78° F		
Rm_c & Temp.	N/A	2.90 at 94° F	1.80 at 76° F	0.80 at 78° F		
Rm at BHT	N/A	1.15 at 152° F	1.05 at 158° F	0.27 at 153° F		
Max. Record Temperature	126° F at 3193	152° F at 5640	158° F 6100	153° 6651		
Electrode Spacing						
Symmetrical	18"	18"	18"	18"		
	40" IND.	40" IND.	40" IND.	40" IND.		
Non-Symmetrical	18' 8"	18' 8"	18' 8"	18' 8"		
Recorded	T. J. WALL	T. J. WALL	T. J. WALL	C.M. MYERS		

RADIOMETRIC LOG DATA

Type of Log	GAMMA-AC	GAMMA-NEUT.	GAMMA-NEUT.	GAMMA-NEUT.		
Run Number	1	2	3	4	5	6
Date	21 FEB, 1965	29 MAR, 1965	6 APR, 1965	2 MAY, 1965		
Total Depth-Driller	3192	5640	6168	6657		
Top of Logged Interval	10	3000	5627 200	6167		
Bottom of Logged Interval	3185	5627	6167 3000	6653		
Type of Fluid in hole	WATER	MUD	MUD	MUD		
Fluid level		SURFACE	SURFACE	SURFACE		
Max. recorded temp.	126° at 3193	152° F 5640	158° F 6100	153 at 6651		
Neutron source, streng. type	N/A	6.1 x 10^6, RaBe	6.1 x 10^6, RaBe	6.1 x 10^6, RaBe		
Source spacing	N/A	12"	12"	12"		
Length of measuring device	28"	14"	14"	14"		
O.D. of instrument-in	3-5/8"	3-5/8"	3-5/8"	3-5/8"		
Time Constant-Secs.	2	2	2	2		
Logging speed-ft/min	40	23	23	29		
Statistical Variation-in	N/A	N/A	N/A	N/A		
Sensitivity reference	100	100 2000	100 2000	100 1500		
Recorded by	T. J. WALL	T. J. WALL	T. J. WALL	C. M. MYERS		

CASING RECORD					BORE HOLE RECORD		
Run No.	Size-In	Wt. Lbs.	Interval, - ft. to		Bit Size-in	Interval - ft. to	
1	13 3/8	48	0	403	17 1/2	20	408
					12 1/4	408	3192
2	9 5/8	36	0	3192	8 3/4	3192	6168
3	7	26	0	6134	6 1/8	6168	6658

WELL SYMBOLS

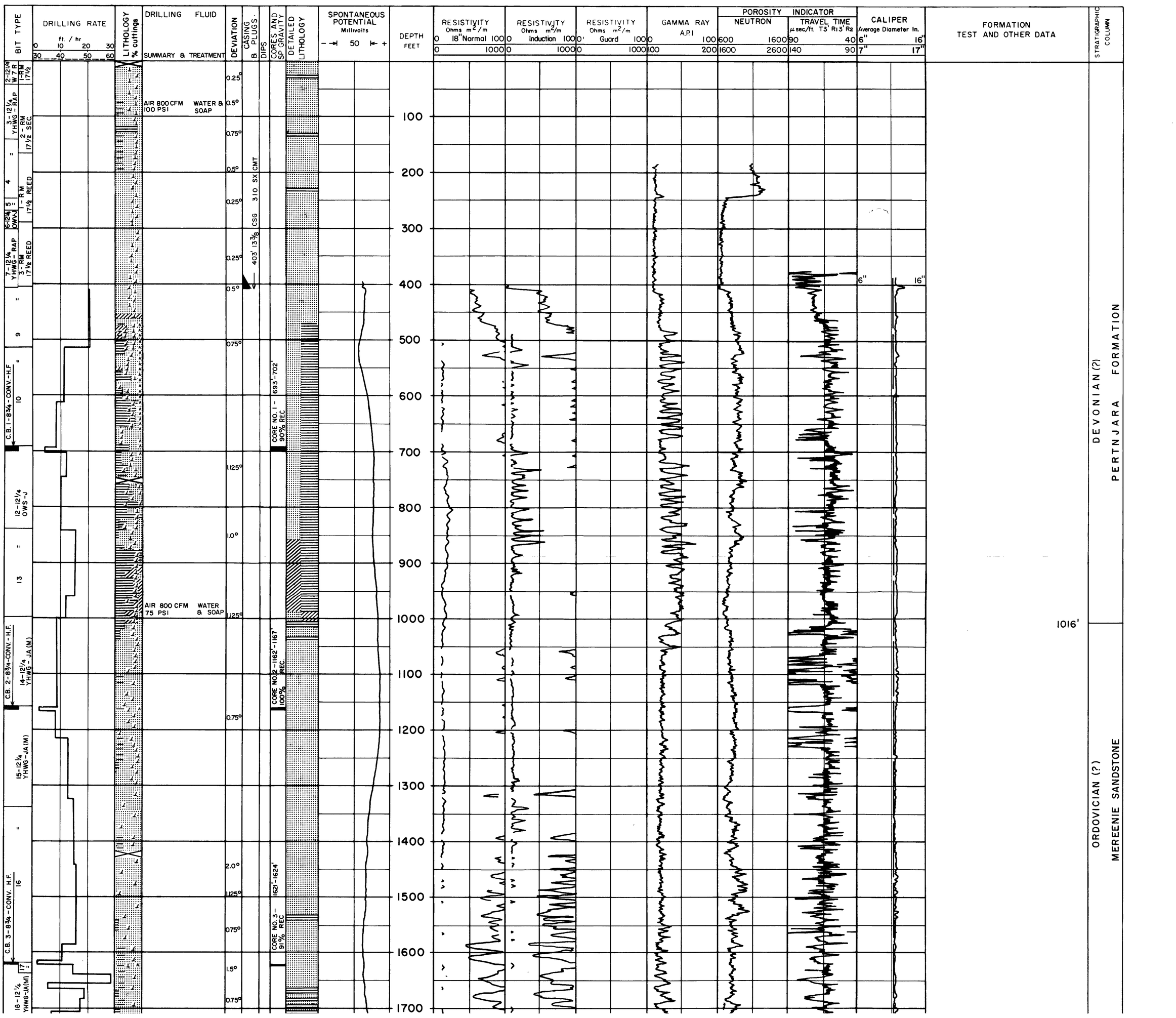
- ○ Gas show, slight
- ○○ Gas show, strong
- ◎ Oil show, slight
- ◎◎ Oil show, strong
- ◎○ Oil and gas show
- ◊ Fluorescence
- 11.2v Circulation loss partial and s.g. mud
- 11.2vv Circulation loss complete and s.g. mud
- Casing shoe
- RR Rerun bit
- Blowout
- Core, interval, No. and recovery
- Sidewall core
- Perforated interval
- Formation test Interval and no (1) O.H (2) in. CSG.
- Plugged interval
- RM Reamer
- CB Core Bit
- Fossils: Macro, Micro, Plant, Spore, pollen

LITHOLOGIC REFERENCE

Sandstone	Coal	Siliceous	
Siltstone	mi: Micaceous	Dolomite Bed	
Limestone	dol: Dolomitic	Fracturing	
Shale	Cal: Calcareous	No Samples	
Conglomerate	gl: Glauconitic		
Dolomite	py: Pyritic		
Evaporite S: Salt	Limestone Bed		

OTHER ELECTRICAL LOGS:
TEMPERATURE
FORXO
18' 8" LATERAL

LITHOLOGY BY: RON HAY
MAGELLAN PETROLEUM (N.T.) PTY. LTD.

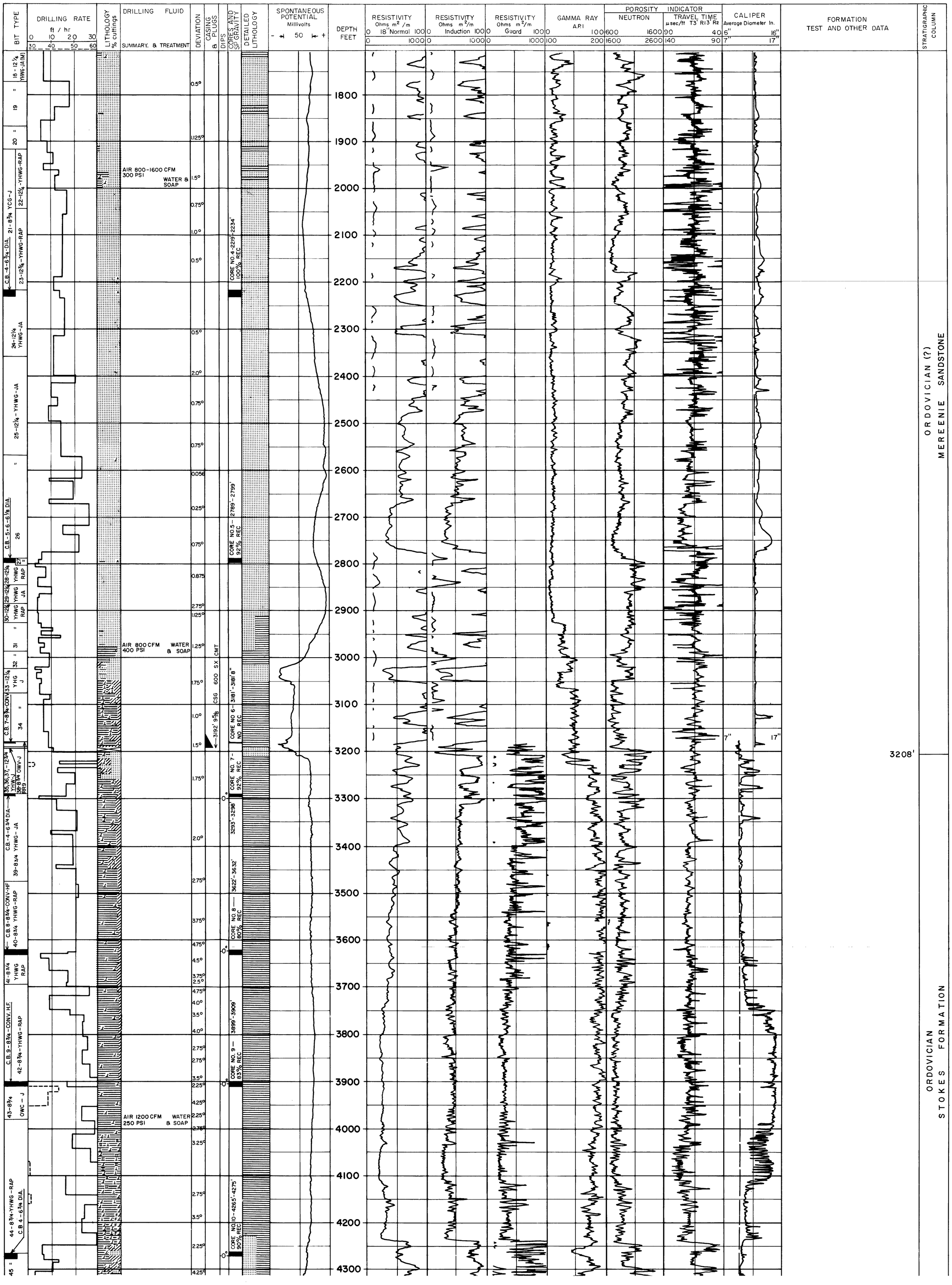


COMPOSITE WELL LOG

PALM VALLEY No. 1

1700 — 4300'

SHEET 2 of 3



COMPOSITE WELL LOG

PALM VALLEY No. 1

4300 — 6658'

SHEET 3 of 3