

COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF NATIONAL DEVELOPMENT
BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Petroleum Search Subsidy Acts

PUBLICATION No. 53

**SUMMARY OF DATA AND RESULTS
SURAT BASIN, QUEENSLAND**

U-K-A. Wandoan No. 1

U-K-A. Burunga No. 1

**OF
UNION OIL DEVELOPMENT CORPORATION
KERN COUNTY LAND COMPANY
AND
AUSTRALIAN OIL AND GAS CORPORATION LIMITED**

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

1964

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

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

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ASSISTANT DIRECTOR: M. A. CONDON

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Canberra A.C.T.*

FOREWORD

Under the Petroleum Search Subsidy Act 1959-1961, 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 offices of the Bureau of Mineral Resources in Canberra and Melbourne (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 Surat Basin, Queensland: Union-Kern-A.O.G. Wandoan No. 1, and Union-Kern-A.O.G. Burunga No. 1. The information has been abstracted by the Petroleum Exploration Branch of the Bureau of Mineral Resources from well completion reports furnished by Union Oil Development Corporation.

J.M. RAYNER
Director

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UNION-KERN-A, O.G. WANDOAN NO. 1

of

UNION OIL DEVELOPMENT CORPORATION,

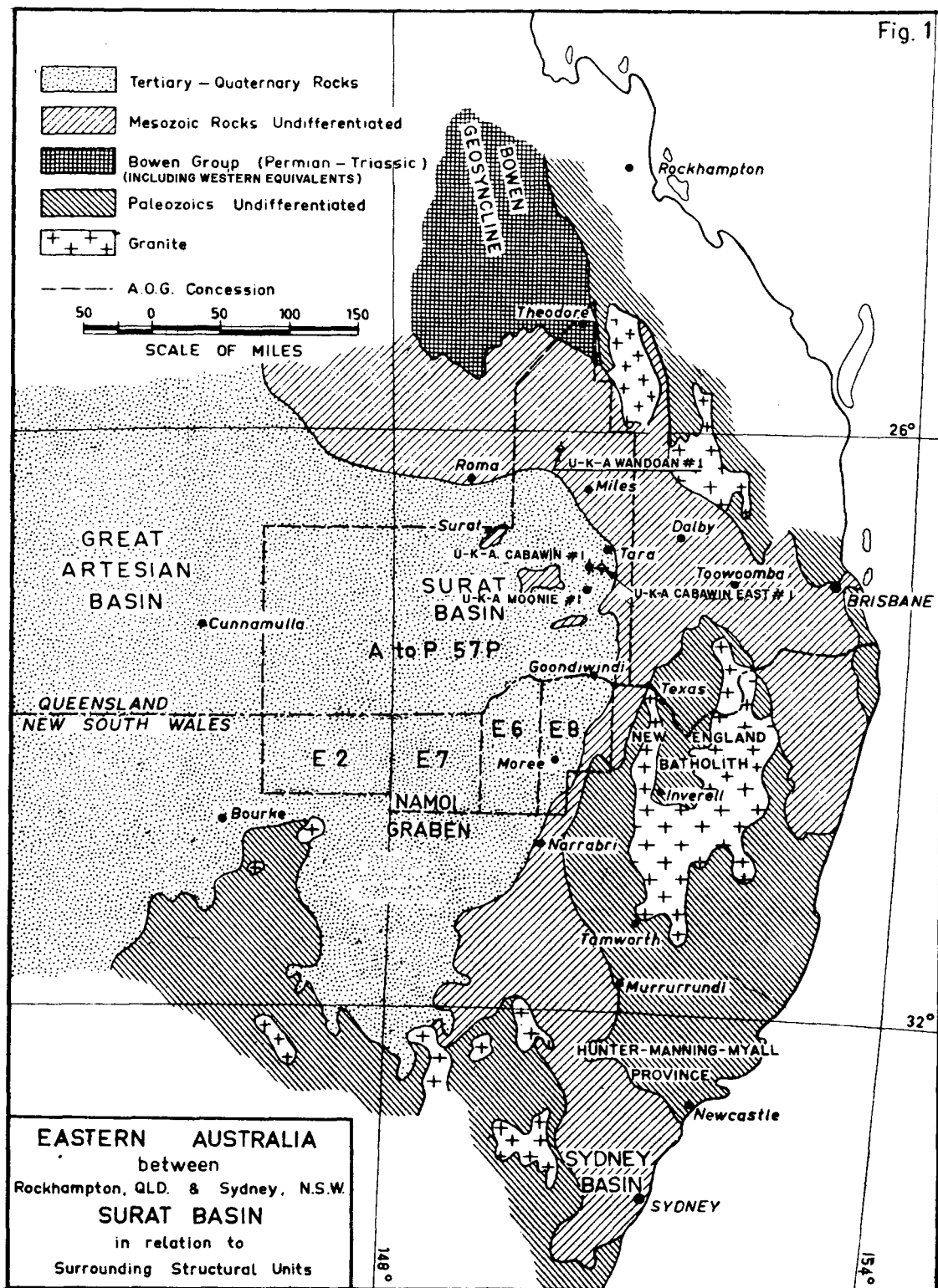
KERN COUNTY LAND COMPANY

and

AUSTRALIAN OIL AND GAS CORPORATION LIMITED

SUMMARY OF DATA AND RESULTS

Fig. 1



UNION-KERN-A.O.G. WANDOAN NO. 1

SUMMARY OF DATA AND RESULTS*

SUMMARY

Union-Kern-A.O.G. Wandoan No. 1 was the first wildcat drilled by Union Oil Development Corporation in the north-eastern part of the Surat Basin. Union-Kern-A.O.G. Moonie No. 1 had proven the potential of the Jurassic-Triassic Precipice Sandstone as an oil reservoir and it was necessary to evaluate this reservoir in other parts of the basin. In the Wandoan area seismic surveys defined a large north-plunging anticline in rocks of the Bowen Group (Triassic-Permian), with a domal closure in the Great Artesian Group superimposed on the north plunge of the feature. This domal closure shows more than 200 feet of vertical closure encompassing an area of 30 square miles.

Wandoan No. 1 Well, located approximately 73 miles east-north-east of Roma, was drilled by Oil Drilling and Exploration Limited for Union Oil Development Corporation to a total depth of 10,736 feet. Drilling commenced on 22nd April, 1962 and was completed on 18th June, 1962. A full programme of logging, testing and coring was undertaken.

The well penetrated 4798 feet of Mesozoic sediments of the Great Artesian Group, 4468 feet of tuffaceous shale, siltstone and sandstone of the Triassic Cabawin Formation of the Bowen Group and bottomed at 10,736 feet in the Lower Triassic-Upper Permian Kiangia Formation.

Wandoan No. 1 was drilled primarily to test the petroleum potential of the Precipice Sandstone. The test was continued for stratigraphic information through the Cabawin Formation into the Kiangia Formation.

A 60-minute open hole formation test was run over the interval 3260 to 3278 feet near the top of the main porous sandstone of the Precipice Sandstone. A net rise of 2830 feet of fresh water (10 gr./gal.) was recovered in the test. A subsequent analysis indicated traces of hydrocarbons in the formation water. Another 60-minute open hole formation test over the interval 6024 to 6095 feet in the upper part of the Cabawin Formation yielded a net rise of 105 feet of slightly gassy watery mud.

The stratigraphic drilling operation at Union-Kern-A.O.G. Wandoan No. 1 was subsidized under the Petroleum Search Subsidy Act 1959-1961, from surface to total depth.

* Abstracted from Well Completion Report No. 5, Union-Kern-A.O.G. Wandoan No. 1, by Union Oil Development Corporation, October, 1962.

WELL HISTORY

General Data

Well name and number :	Union-Kern-A.O.G. Wandoan No. 1.
Location :	Latitude $26^{\circ} 10' 31''$ S. Longitude $149^{\circ} 54' 21''$ E.
Name and address of Tenement Holder :	Australian Oil and Gas Corporation Limited, 261 George Street, Sydney, New South Wales.
Details of Petroleum Tenement :	Authority to Prospect 57P, Queensland (approximately 47,000 square miles).
Total Depth :	10,736 feet
Date drilling commenced :	22nd April, 1962
Date drilling completed :	18th June, 1962
Date well abandoned :	21st June, 1962
Date rig released :	21st June, 1962
Elevation (ground) :	958 feet
Elevation (top K.B.) :	977 feet (datum for depths)
Status:	Plugged and abandoned
Cost :	£113,857

Drilling Data

Drilling Plant :	
Make :	National-Ideal
Type :	80-B
Hole sizes and depths :	30" to 29 feet 17 1/2" to 1045 feet 12 1/4" to 2025 feet 9 7/8" to 10736 feet
Casing details :	
Size (in.) :	20 13 3/8
Weight (lb./ft) :	52 48
Grade :	10 H.40
Setting depth (ft) :	29 1036

Logging and Testing

Ditch Cuttings :

Interval :

Ten feet from surface to T.D.

Coring :

Twenty-five cores were cut using a Hughes "J" Type core barrel with both hard formation and soft formation cutter heads. A total of 182 feet was cored and 95.5 feet (52%) recovered.

Sidewall Cores :

Twenty-five sidewall samples were taken between 1920 and 10,567 feet using a Schlumberger Sidewall Coring Gun and hard formation sample takers.

Electric and other logging (Schlumberger) :

Electrical Log :

1035-10,736 feet (6 runs)

Microlog :

1700-10,736 feet (6 runs)

Sonic Log:

1036-10,730 feet (5 runs)

Velocity Survey :

Twelve horizons were tested at depths ranging from 1755 to 10,730 feet.

Drilling Rate, Oil and Gas Log :

Continuous drilling rate and hydrocarbon plots were recorded during drilling.

Formation Testing :

Two Halliburton formation tests were carried out during the drilling operation.

GEOLOGY

Stratigraphy

General :

Union-Kern-A.O.G. Wandoan No. 1 was spudded in the Walloon Formation of Jurassic age. The drill subsequently penetrated the Hutton Sandstone, Evergreen Shale, Precipice Sandstone, and the Wandoan Formation to a disconformity at the base of the Great Artesian Group. Below the disconformity, the test entered the Triassic Cabawin Formation and then drilled into Permian coals and tuffs of the Kianga Formation in which the well was bottomed. Tabled below is the stratigraphic sequence encountered in the well:

<u>Age</u>	<u>Formation</u>	<u>Depth Intervals</u> (feet)	<u>Thickness</u> (feet)
Jurassic	Walloon Formation	19-1753	1734 +
Jurassic	Hutton Sandstone	1753-2618	865
Jurassic	Evergreen Shale	2618-3159	541
Jurassic-Triassic	Precipice Sandstone	3159-3530	371
Upper-Middle Triassic	Wandoan Formation	3530-4817	1287
Middle(?) - Lower Triassic	Cabawin Formation	4817-9285	4468
Lower Triassic - Upper Permian	Kianga Formation	9285-10736 (T.D.)	1451 +

Detailed:

Great Artesian Group

Walloon Formation (Jurassic) : 19 to 1753 feet (1734 feet +)

Interbedded, grey to brown, carbonaceous shale and siltstone, with minor beds of fine to medium-grained, quartzose sandstone. Coal seams up to 10 feet thick occur in the interval 470 to 1753 feet.

Hutton Sandstone (Jurassic): 1753 to 2618 feet (865 feet)

Mainly grey to brown, fine to coarse-grained, quartzose sandstone with interbeds of siltstone, carbonaceous shale, and occasional thin coal seams.

Evergreen Shale (Jurassic) : 2618 to 3159 feet (541 feet)

Grey to dark brown and black, carbonaceous shale and siltstone containing coal seams. Grey, fine to coarse-grained, quartzose sandstone beds occur in the interval 2828 to 3106 feet.

Precipice Sandstone (Jurassic-Triassic) : 3159 to 3530 feet (371 feet)

White to grey, fine to coarse-grained, quartzose, very porous and permeable sandstone with thin interbeds of greyish-brown, carbonaceous shale and siltstone in the upper part.

Wandoan Formation (Upper-Middle Triassic) : 3530 to 4817 feet (1287 feet)

The Wandoan Formation is defined by Union Oil Development Corporation to include 1287 feet of tuffaceous quartzose sandstone, carbonaceous shale, and siltstone penetrated between 3530 and 4817 feet in Union-Kern-A.O.G. Wandoan No. 1. A thinner sequence of the same unit was previously penetrated in Union-Kern-A.O.G. Cabawin No. 1 and Cabawin East No. 1, approximately 94 miles south of the Wandoan well. A feather edge of the unit has also been penetrated in

U.K.A. Burunga No. 1, 16 miles north-east of Wandoan No. 1. This sequence of rocks was previously assigned to the lower Bundamba in the Cabawin wells. The formation lies conformably below the Bundamba Formation and disconformably above the Cabawin Formation. The sandstones of the Wandoan Formation, in contrast to the porous sandstones of the Precipice Sandstone, are contaminated with an abundant tuffaceous clay matrix. The lower contact of the formation was picked at the top of mottled reddish-brown and green shales of the Cabawin Formation. On electric logs of both the Cabawin and Wandoan wells, rocks included within the Wandoan Formation are readily recognized as a separate unit. Since rocks of the Wandoan Formation have stronger lithologic affinity to rocks of the overlying Bundamba Formation than to the underlying Cabawin Formation, the formation is placed within the Great Artesian Group.

The Wandoan Formation is inferred to represent a transition from the fill and red-bed deposition which characterized the period of active downwarp in the Bowen geosyncline to the blanket deposition of the rocks of the Great Artesian Group subsequent to base-levelling of the Bowen Basin. The formation reflects the final stages of basinal fill and, consequently, is expected to be best developed in basinal positions and overlapped on the basin margins. The formation was not recognized below the Bundamba Formation in outcrop to the north.

Type section, Wandoan Formation

The type section of the Wandoan Formation consists of the following units as indexed to depths from K.B., in Union-Kern-A.O.G. Wandoan No. 1.

3530-3756 feet (226 feet)

SANDSTONE, grey to green-grey, white, fine to coarse-grained, subangular to rounded, quartzose (clear, translucent, pale orange, pale yellow and pale green quartz grains), white tuffaceous clay matrix. Minor interbeds of brown to dark grey, carbonaceous SILTSTONE and SHALE.

3756-4298 feet (542 feet)

Interbedded SANDSTONE, SILTSTONE and SHALE, as above, with SILTSTONE and SHALE becoming predominant towards the base of the interval; SANDSTONE between 4190 and 4225 feet is slightly calcareous.

4298-4338 feet (40 feet)

SANDSTONE, white to grey, fine to coarse-grained, quartzose, white clay matrix; grades to CONGLOMERATE, grey to green-grey, granules-pebbles of clear quartz, light green chert and tuff in a matrix of sandstone as above.

4338-4643 feet (305 feet)

SILTSTONE and SHALE, brown to grey, sandy, micaceous, carbonaceous. Interbeds of SANDSTONE, white to whitish-grey, silty, fine to medium-grained, few coarse streaks, quartzose, tuffaceous clay matrix, spot calcareous 4448-4497 feet.

4643-4817 feet (174 feet)

SANDSTONE, green-grey, fine-grained to granule size, few pebbles, angular to subround, poorly sorted, quartzose (clear, orange, pale green, pale rose quartz grains), tuffaceous clay matrix. Interbeds of SILTSTONE and SHALE, grey, green-grey, brown, with carbonaceous laminae.

Age, Wandoan Formation

Spores from 3923 feet within the Wandoan Formation indicate a Middle to Upper Triassic age. P.R. Evans of the Bureau of Mineral Resources (personal communication) states:

"Core No. 7, 3923'5" - 3923'7"

Leiotriletes directus

Granulatisporites sp.

Monoleti sp.

Pteruchipollenites sp.

were identified and characterize Upper-Middle Triassic "Zone 1" observed in Cabawin No. 1, Cores 22, 23 (7217-7414 feet). The relatively common Granulatisporites suggests comparison with Core No. 23 rather than Core No. 22".

Bowen Group

Cabawin Formation (Middle(?) - Lower Triassic) : 4817 to 9285 feet (4468 feet)

Interbedded, varicoloured, tuffaceous shale, siltstone and sandstone. The beds are considered to have been deposited in a continental environment. The base of the Cabawin Formation is intertonguing with the Kianga Formation and is picked at the top of the first well-developed coal sequence.

Kianga Formation (Lower Triassic - Upper Permian) : 9285 to 10,736 feet (1451 feet +)

The Kianga Formation is a sequence of coal measures, tuffaceous clastics and silicified white tuff. From 9285 to 9778 feet the formation consists of interbedded coal, carbonaceous shale, calcareous, tuffaceous siltstone and minor sandstone. From 9778 to 10,150 feet the section is predominantly white, silicified tuff with interbedded coal seams throughout and thin beds of tuffaceous siltstone and sandstone developed in the upper 200 feet of the interval. The interval 10,150 to 10,736 feet (T.D.) contains abundant tuff and coal.

Structure

The Wandoan Anticline is a major fold in rocks of the Bowen Group on the eastern flank of the Bowen Basin. The structure trends north-south and plunges markedly to the north. A domal closure in Mesozoic beds of the Great Artesian Group is superimposed on the north plunge of the anticline. Basement faults trending north to north-west may control major folds in the Palaeozoic beds. The Wandoan Anticline occupies a position on the north side of a major west-dipping basement horst.

Oil and Gas Indications and Potential

The Precipice Sandstone, the primary target in Wandoan No. 1 Well, showed a strong rise of fresh water (10 gr./gal.) on open hole formation test. Although this sandstone was flushed at the position of the well, bluish-yellowish-white fluorescence on samples from the main porous zone and traces of hydrocarbons noted in analysis of formation water from the zone indicate that hydrocarbons have migrated through it. Porosities in the zone tested range from 12.4% to 21.8% and permeabilities from 69 to 2330 md.

A trace of blue fluorescence was logged in the samples near the top of the Wandoan Formation and spotty white fluorescence occurred throughout Core No. 7 from 3923 to 3938 feet. Sandstone in the formation is generally impermeable because of an abundant clay matrix.

Electric and micrologs of the well indicate that both the Cabawin and Kiangra Formations are impermeable. The sandstone in these formations has a tuffaceous clay matrix. Below the disconformity at the base of the Great Artesian Group, sandstone in the upper 500 feet of the Cabawin Formation displayed bluish to yellowish-white fluorescence. An open hole formation test, made over the interval 6024 to 6095 feet to evaluate a dry gas show, yielded a net rise of 105 feet of slightly gassy watery mud. Methane gas shows were coincident with coal seams throughout the Kiangra Formation.

REFERENCES

- | | | |
|------------------------------------|--------|---|
| MACK, J.E., Jr, | 1963 : | Reconnaissance geology of the Surat Basin, Queensland and New South Wales. <u>Bur. Min. Resour. Aust. Petrol. Search Subs. Acts Publ.</u> 40. |
| UNION OIL DEVELOPMENT CORPORATION, | 1962 : | Well Completion Report No. 5, Union-Kern-A.O.G. Wandoan No. 1 (Unpubl.). |
| UNION OIL DEVELOPMENT CORPORATION, | 1964a: | Union-Kern-A.O.G. Cabawin No. 1, Queensland. <u>Bur. Min. Resour. Aust. Petrol. Search Subs. Acts Publ.</u> 43. |
| UNION OIL DEVELOPMENT CORPORATION, | 1964b: | Union-Kern-A.O.G. Cabawin East No. 1, Queensland. <u>Bur. Min. Resour. Aust. Petrol. Search Subs. Acts Publ.</u> 44. |
| UNION OIL DEVELOPMENT CORPORATION, | 1964c: | Union-Kern-A.O.G. Moonie No. 1, Queensland. <u>Bur. Min. Resour. Aust. Petrol. Search Subs. Acts Publ.</u> 45. |

ADDITIONAL DATA FILED IN THE BUREAU OF MINERAL RESOURCES

The following additional data relating to Union-Kern-A.O.G. Wandoan No. 1, have been filed in the Bureau of Mineral Resources, Canberra, and are available for reference:

(i) Well Completion Report

Part A	: Geology, by J.E. Mack, Jr, and P.S. Roy	16 pp.
Appendix A	: Prognosis	1 p.
Appendix B	: Description of cuttings	118 pp.
Appendix C	: Description of cores	25 pp.
Appendix D	: Description of sidewall cores	4 pp.
Appendix E	: Palynology by P.R. Evans, and N.J. de Jersey	9 pp.
Part B	: Engineering, by D.J. McGarry and D.E. Pyle	6 pp.
Appendix F	: Mud Record	1 p.
Appendix G	: Drilling Record	13 pp.
Appendix H	: Electrical Logging	8 pp.

(ii) Daily drilling reports for period 13th April, 1962 to 21st June, 1962.

(iii) Well logs including the following:

(a) Electrical Log

Run 1, 1035- 3643 feet (2" = 100 ft)

Run 2, 3543- 5902 feet (2" = 100 ft)

Run 3, 5802- 6107 feet (2" = 100 ft)

Run 4, 6007- 7785 feet (2" = 100 ft)

Run 5, 7685- 9381 feet (2" = 100 ft)

Run 6, 9281-10736 feet (2" = 100 ft)

Composite log, Runs 1 to 6 (2" = 100 ft)

Interpretive log, Runs 1 to 6 (2" = 100 ft)

(b) Microlog

Composite log, Runs 1 to 6 (2" = 100 ft)

Run 1, 1700- 3643 feet

Run 2, 3543- 5902 feet

Run 3, 5802- 6107 feet

Run 4, 6007- 7784 feet

Run 5, 7684- 9381 feet

Run 6, 9281-10736 feet

(c) Sonic Log

Composite log, Runs 1 to 5 (2" = 100 ft)

Run 1, 1036- 3623 feet

Run 2, 3523- 5890 feet

Run 3, 5802- 7771 feet

Run 4, 7671- 9230 feet

Run 5, 9130-10730 feet

(d) Drilling rate, hydrocarbon analysis log (2" = 100 ft)

(iv) Seismic Structure Map, Wandoan-Burunga Prospect, "L" Horizon (Upper Permian)

(v) Seismic Structure Map, Wandoan Prospect, "G" Horizon (Precipice Sandstone)

(vi) Correlation Section, Surat Basin :

U.K.A. Moonie No. 1 - U.K.A. Cabawin No. 1 - U.K.A. Wandoan No. 1

(vii) Velocity Survey determinations, U.K.A. Wandoan No. 1.

UNION-KERN-A.O.G. BURUNGA NO. 1

of

UNION OIL DEVELOPMENT CORPORATION,

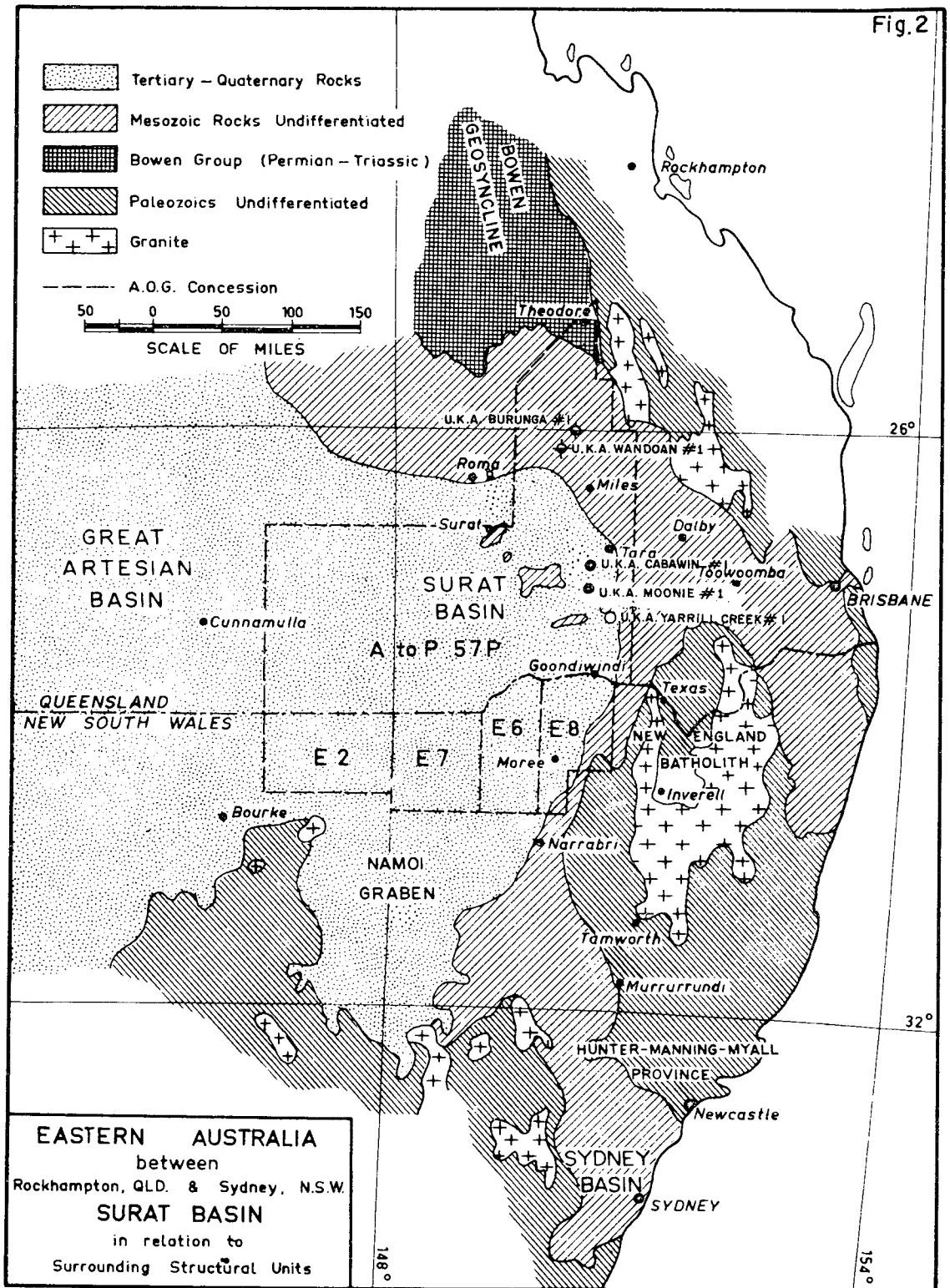
KERN COUNTY LAND COMPANY

and

AUSTRALIAN OIL AND GAS CORPORATION LIMITED

SUMMARY OF DATA AND RESULTS

Fig.2



UNION-KERN-A,O,G. BURUNGA NO. 1

SUMMARY OF DATA AND RESULTS *

SUMMARY

Following the completion of Wandoan No. 1, Union-Kern-A,O,G. Burunga No. 1 was programmed to evaluate further the petroleum potential of the Precipice Sandstone and to test the Permian section in this part of the Surat Basin. The well was located on one of the largest structures defined to date by seismic work in Authority to Prospect 57P. Domal closure in the Permian section extends over 144 square miles with at least 2300 feet of vertical closure. Areal closure in rocks of the Great Artesian Group, draped over the older "high", is approximately 50 square miles with a minimum of 200 feet of vertical closure.

Burunga No. 1 Well, located approximately 16 miles north-east of Union-Kern-A,O,G. Wandoan No. 1, was drilled by Oil Drilling and Exploration Limited for Union Oil Development Corporation to a total depth of 10,242 feet. Drilling commenced on 6th July, 1962 and was completed on 28th September, 1962. A full programme of logging, testing and coring was undertaken.

Union-Kern-A,O,G. Burunga No. 1 was spudded in the Walloon Formation of Jurassic age. The well was then drilled through 2066 feet of Mesozoic sediments to an unconformity at the base of the Great Artesian Group. Below the unconformity at 2083 feet, the well penetrated 2574 feet of freshwater sediments of the Lower Triassic-Upper Permian Kiangra Formation and 5144 feet of the marine Permian Back Creek Formation. The well bottomed at 10,242 feet in weathered volcanic flows of the Permo-Carboniferous Cracow Formation.

A 60-minute open hole formation test was run over the interval 1757 to 1792 feet in the upper part of the Precipice Sandstone. A net rise of 210 feet of fresh water (12 gr./gal.) was recovered in the test. Bluish-yellowish-white fluorescence on samples suggested that hydrocarbons might have migrated through the sandstone. Another 60-minute open hole formation test over the interval 4106 to 4214 feet in a fractured tuff in the Kiangra Formation yielded a net rise of 2720 feet of slightly gassy water (65 gr./gal.) and drilling mud.

A 43-minute open hole formation test was run between 7889 and 7911 feet to test a strong gas show in fractured white tuff within the Back Creek Formation. Inflammable gas surfaced in 11 minutes at an estimated rate of 250 Mcf/D. A formation test was run over the interval 10,065 to 10,242 feet to evaluate a dry gas show in the weathered top of the Cracow Formation; results were negative because of packer failure. After setting a cement plug at 4070 feet, a formation test was run between 3998 and 4070 feet, which yielded 360 feet of mud and watery mud. The well was subsequently plugged and abandoned.

The stratigraphic drilling operation at Union-Kern-A,O,G. Burunga No. 1 was subsidized under the Petroleum Search Subsidy Act 1959-1961, from surface to total depth.

* Abstracted from Well Completion Report No. 6, Union-Kern-A,O,G. Burunga No. 1, by Union Oil Development Corporation, December, 1962.

WELL HISTORY

General Data

Well name and number:	Union-Kern-A.O.G. Burunga No. 1
Location:	Latitude 26°00'00"S. Longitude 150°04'43"E.
Name and address of Tenement Holder:	Australian Oil and Gas Corporation Limited, 261 George Street, Sydney, New South Wales.
Details of Petroleum Tenement:	Authority to Prospect 57P, Queensland.
Total Depth:	10,242 feet
Date drilling commenced:	6th July, 1962
Date drilling completed:	28th September, 1962
Date well abandoned:	6th October, 1962
Date rig released:	6th October, 1962
Elevation (ground):	1074 feet
Elevation (top K.B.):	1091.5 feet (datum for depths)
Status:	Plugged and abandoned
Cost:	£105,562

Drilling Data

Drilling Plant:	
Make:	National-Ideal
Type:	80-B
Hole sizes and depths:	30" to 30 feet 17 1/2" to 1015 feet 12 1/4" to 2310 feet 9 7/8" to 2386 feet 8 3/4" to 10242 feet

Casing details:

Size (in.):	20	13 3/8	9 5/8
Weight (lb./ft):	52	48	36
Grade:	10	H,40	J,55
Setting depth (ft):	30	1008	2300

Logging and Testing

Ditch Cuttings:

Interval:

Ten feet from surface to T.D.

Coring:

Twenty-five cores were cut using a Hughes "J" Type core barrel with both soft and hard formation cutter heads. A total of 243 feet was cored and 207.5 feet (85.4%) recovered.

Sidewall Cores:

Fifteen sidewall samples were taken between 4016 and 4154 feet using a Schlumberger Sidewall Coring Gun and hard formation sample takers.

Electric and other logging

(Schlumberger):

Electrical Log:

100-10,230 feet (7 runs)

Microlog:

1009-10,227 feet (6 runs)

Sonic Log:

1009-10,220 feet (4 runs)

Velocity Survey:

Seventeen horizons were tested at depths ranging from 2310 to 10,231 feet.

Drilling Rate, Oil and Gas Log:

Continuous drilling rate and hydrocarbon plots were recorded during drilling.

Formation Testing:

Six Halliburton formation tests were carried out during the drilling operation.

GEOLOGY

Stratigraphy

General:

The stratigraphic sequence encountered in Union-Kern-A.O.G. Burunga No. 1, is summarized in the Table below:

<u>Age</u>	<u>Formation</u>	<u>Depth Intervals</u>	<u>Thickness</u>
		(feet)	(feet)
Jurassic	Walloon Formation	17- 296	279 +
Jurassic	Hutton Sandstone	296- 1058	762
Jurassic	Evergreen Shale	1058- 1598	540
Jurassic-Triassic	Precipice Sandstone	1598- 2030	432
Upper-Middle Triassic	Wandoan Formation	2030- 2083	53
Lower Triassic - Upper Permian	Kianga Formation	2083- 4657	2574
Permian	Back Creek Formation	4657- 9801	5144
Permo-Carboniferous	Cracow Formation	9801-10242	441 +
		(T.D.)	

Detailed :

Great Artesian Group

Walloon Formation (Jurassic) : 17 to 296 feet (279 feet +)

Interbedded, light grey to grey-brown, fine-grained, quartzose sandstone with slightly calcareous, gummy clay matrix, and grey-brown, carbonaceous siltstone and shale.

Hutton Sandstone (Jurassic) : 296 to 1058 feet (762 feet)

Mainly grey, fine to coarse-grained, quartzose sandstone with slightly calcareous clay matrix. Interbeds of carbonaceous shale and siltstone.

Evergreen Shale (Jurassic) : 1058 to 1598 feet (540 feet)

Grey to brown, carbonaceous shale and siltstone with thin coal seams. Light grey, fine to coarse-grained, quartzose sandstone beds in the interval 1394 to 1480 feet.

Precipice Sandstone (Jurassic-Triassic) : 1598 to 2030 feet (432 feet)

Light grey, medium to very coarse-grained, quartzose sandstone, highly porous and permeable from 1830 to 2030 feet. Carbonaceous shale and siltstone interbeds between 1640 and 1692 feet.

Wandoan Formation (Upper - Middle Triassic) : 2030 to 2083 feet (53 feet)

Light grey, silty, fine-grained, quartzose and tuffaceous sandstone with red-brown to grey, tuffaceous shale and siltstone interbeds.

Between Union-Kern-A.O.G. Wandoan No. 1 and Burunga No. 1, 1234 feet of the Wandoan Formation have wedged out (see Plate 3). At Burunga No. 1, the Wandoan Formation lies unconformably on the Kianga Formation.

Bowen Group

Kianga Formation (Lower Triassic - Upper Permian) : 2083 to 4657 feet (2574 feet)

Interbedded coal measures, tuffaceous clastics, and silicified white tuff. The section from 2744 to 2884 feet consists of coal with thin interbeds of carbonaceous siltstone and shale. Beds of conglomerate and conglomeratic sandstone, between 50 and 70 feet thick, with tuff and quartz pebbles in a tuffaceous matrix, are interbedded with carbonaceous shale and siltstone, of the same thickness, between 2884 and 3135 feet. The section from 3340 to 3874 feet consists of dark grey, carbonaceous siltstone and shale with thin interbedded coal seams; thin beds of tuff occur near the top and interbeds of sandstone near the base. Tuffaceous, light grey, fine to medium-grained, calcareous sandstone with thin

interbeds of tuff and dark grey, carbonaceous, tuffaceous siltstone and shale are present in the interval 3874 to 4657 feet. Siltstone and shale are more prominent towards the base.

Back Creek Formation (Permian) : 4657 to 9801 feet (5144 feet)

Tuffaceous shale and siltstone with few thin coal seams and thin beds of tuffaceous sandstone are present from 4657 to 7430 feet. Sandstone and conglomerate containing quartz, argillite, tuff, and tuffaceous sandstone pebbles in a poorly sorted tuffaceous and calcareous sandstone matrix are predominant from 7430 to 7882 feet. The section from 7882 to 8052 feet is mainly tuff. Siltstone and shale, grey to brown, calcareous, carbonaceous and tuffaceous, with thin sandstone interbeds and coal seams, are present from 8052 to 9801 feet. The Back Creek Formation lies unconformably on truncated and eroded volcanics of the Cracow Formation.

Horton Group

Cracow Formation (Permo-Carboniferous) : 9801 to 10,242 feet (441 feet +)

The section consists of white to green welded tuffs with minor andesite flows down to 9980 feet and weathered calcitic, hematitic andesite flow from 9980 to 10,242 feet.

Structure

The Burunga Anticline, a major north-trending fold in rocks of the Bowen Group, comprises two subordinate domes. It is bordered to the east by a well defined graben and may reflect Permo-Carboniferous fault trends. An elongated dome in Mesozoic beds of the Great Artesian Group is superimposed on the Burunga Anticline, with its apex above the north dome of the anticline.

Oil and Gas Indications and Potential

The Precipice Sandstone, one of the primary targets in Burunga No. 1 Well yielded fresh water on open hole formation test. Although this sandstone was flushed at the position of the well, bluish-yellowish-white fluorescence on samples in the upper part of the sandstone suggest that hydrocarbons might have migrated through it. Porosities in the upper part of the zone tested range from 7.2% to 17.2% and permeabilities from 0 to 64 md; the lower, more permeable part of the sandstone was not cored in the well.

Methane gas shows were coincident with coal seams throughout the Kianga Formation. Traces of blue to yellowish-white fluorescence were logged in white tuff and tight, tuffaceous sandstone of the formation. White tuff, recovered in Core No. 10 at 4179 feet, was bleeding gas and exhibited traces of oil on fractures. Analysis of this core showed porosities of 1.5% to 11.6%, no permeability, and oil/water ratios of 0.029 to 0.042.

As in the Kianga Formation, traces of white to bluish-white fluorescence were logged in tight, tuffaceous sandstone of the Back Creek Formation. Strong gas shows were recorded between 7480 and 8015 feet with 1600 units methane, 42 units ethane, 10 units propane

and trace butane measured on the chromatograph in a show from fractured tuff and tuffaceous sandstone at 7895 feet. Porosities in cores from the interval 7889 to 7911 feet ranged from 1% to 13.5% and permeabilities were negligible.

REFERENCES

- MACK, J.E., Jr, 1963 : Reconnaissance geology of the Surat Basin, Queensland and New South Wales. Bur. Min. Resour. Aust. Petrol. Search Subs. Acts Publ. 40.
- UNION OIL DEVELOPMENT CORPORATION, 1962 : Well Completion Report No. 6, Union-Kern-A.O.G. Burunga No. 1 (Unpubl.). ✓

ADDITIONAL DATA FILED IN THE BUREAU OF MINERAL RESOURCES

The following additional data relating to Union-Kern-A.O.G. Burunga No. 1, have been filed in the Bureau of Mineral Resources, Canberra, and are available for reference:

(i) Well Completion Report

Part A	: Geology, by J.E. Mack, Jr, and Allan Carey	19 pp.
Appendix A	: Prognosis	1 p.
Appendix B	: Description of cuttings	145 pp.
Appendix C	: Description of cores	25 pp.
Appendix D	: Description of sidewall cores	3 pp.
Appendix E	: Palynology by N.J. de Jersey and J.T. Woods	4 pp.
Appendix F	: Palaeontology by Dorothy Hill	1 p.
Part B	: Engineering, by D.J. McGarry and D.E. Pyle	8 pp.
Appendix G	: Mud Record	1 p.
Appendix H	: Drilling Record	19 pp.
Appendix I	: Electrical Logging	6 pp.
Appendix J	: Results of analyses	2 pp.
Appendix K	: Velocity Survey	1 p.

(ii) Daily drilling reports for period 22nd June, 1962 to 11th October, 1962.

(iii) Well logs including the following :

(a) Electrical log

Composite log, Runs 1 to 7 (2" = 100 ft)

Run 1, 100- 1017 feet

Run 2, 1009- 1410 feet

Run 3, 1310- 2387 feet

Run 4, 2306- 4175 feet

Run 5, 4075- 6592 feet

Run 6, 6500- 8416 feet

Run 7, 8300-10230 feet

Interpretive log, Runs 1 to 7, (2" = 100 ft)

(b) Microlog

Composite log, Runs 1 to 5 (2" = 100 ft)

Run 1, 1009-1410 feet

Run 2, 1310-2387 feet

Run 3, 2306-4175 feet

Run 4, 4075-6592 feet

Run 5, 6500-8416 feet

(c) Sonic Log

Composite log, Runs 1 to 3 (2" = 100 ft)

Run 1, 1009-2380 feet

Run 2, 2306-4165 feet

Run 3, 4050-8400 feet

(d) Drilling rate, hydrocarbon analysis log (2" = 100 ft)

(iv) Seismic Structure Map, Burunga Prospect, "G" Horizon (Upper Permian)

(v) Seismic Structure Map, Burunga Prospect, "G" Horizon (Precipice Sandstone)

(vi) Velocity Survey determinations, U.K.A. Burunga No. 1.

PETROLEUM TENEMENT: A. to P 57P
MILITARY 4-MILE SHEET: ROMA

WELL No.: UNION-KERN-A.O.G. WANDOAN No.1
BASIN: BOWEN-SURAT

STATE: QUEENSLAND

WELL STATUS: PLUGGED AND ABANDONED

DATUM: K.B

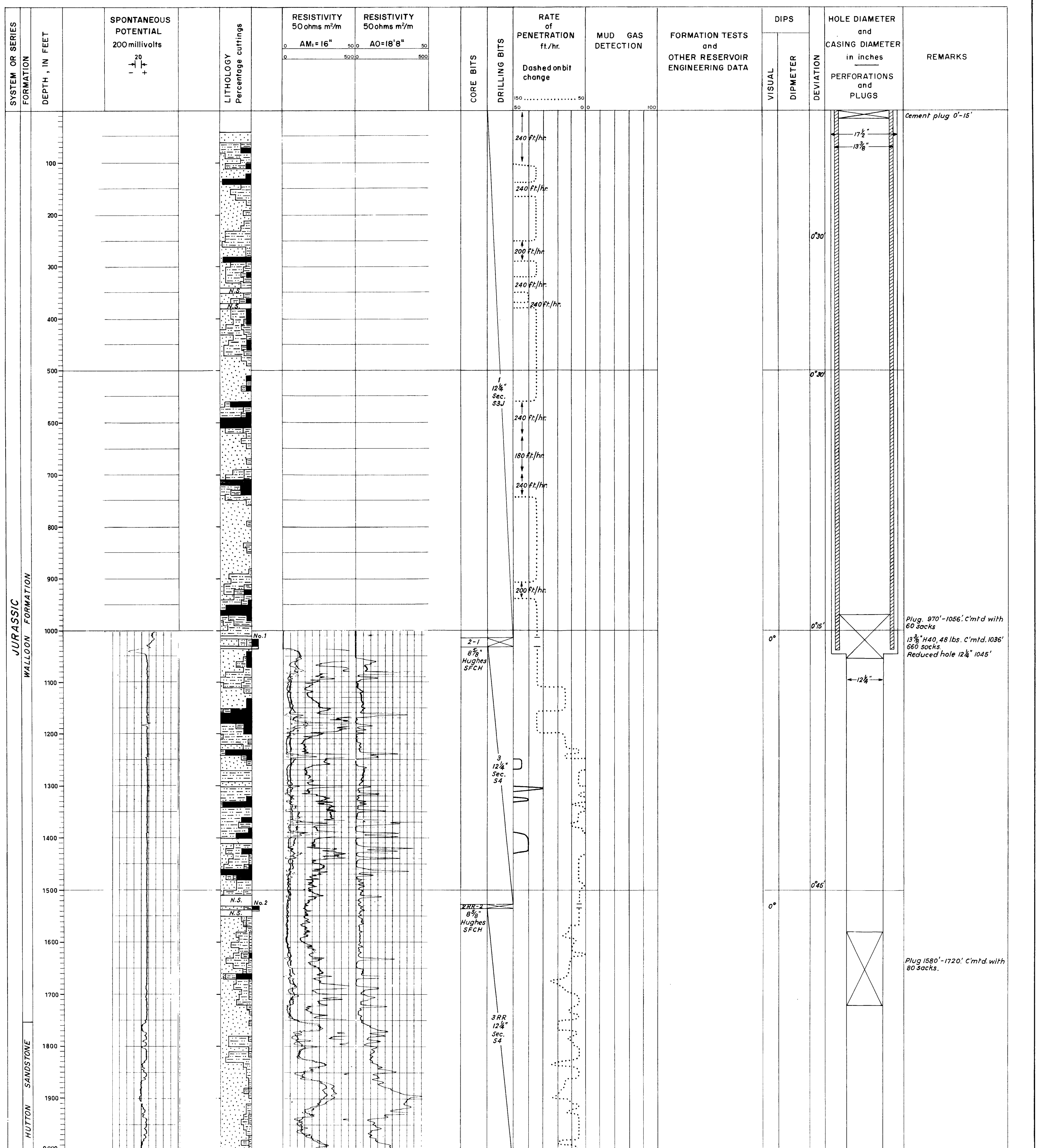
NAME OF WELL : *Union-Kern-A.O.G. Wandoan No.1*
STATE : *Queensland*
COUNTRY : *Australia*
COUNTY : *Fortescue*
PARISH : *Wandoan*
POSITION : *105*
LATITUDE : *26° 10' 31" S*
LONGITUDE : *148° 54' 21" E*
ELEVATION : *K. 8. 977' (datum)*
G.L. 958'
T.D. : *10736'*
DATE SPUDDED : *April 22, 1962*
DATE T.D. : *June 18, 1962*
DATE RIG RELEASED : *June 21, 1962*
STATUS OF WELL : *Plugged and abandoned*
DRILLED BY : *Oil Drilling and Exploration Limited*
DRILLING METHOD : *Rotary National 80 B*
LOGGING : *Schlumberger*
CEMENTING : *Halliburton*
MUD LOGGING : *Union Oil Development Corporation*

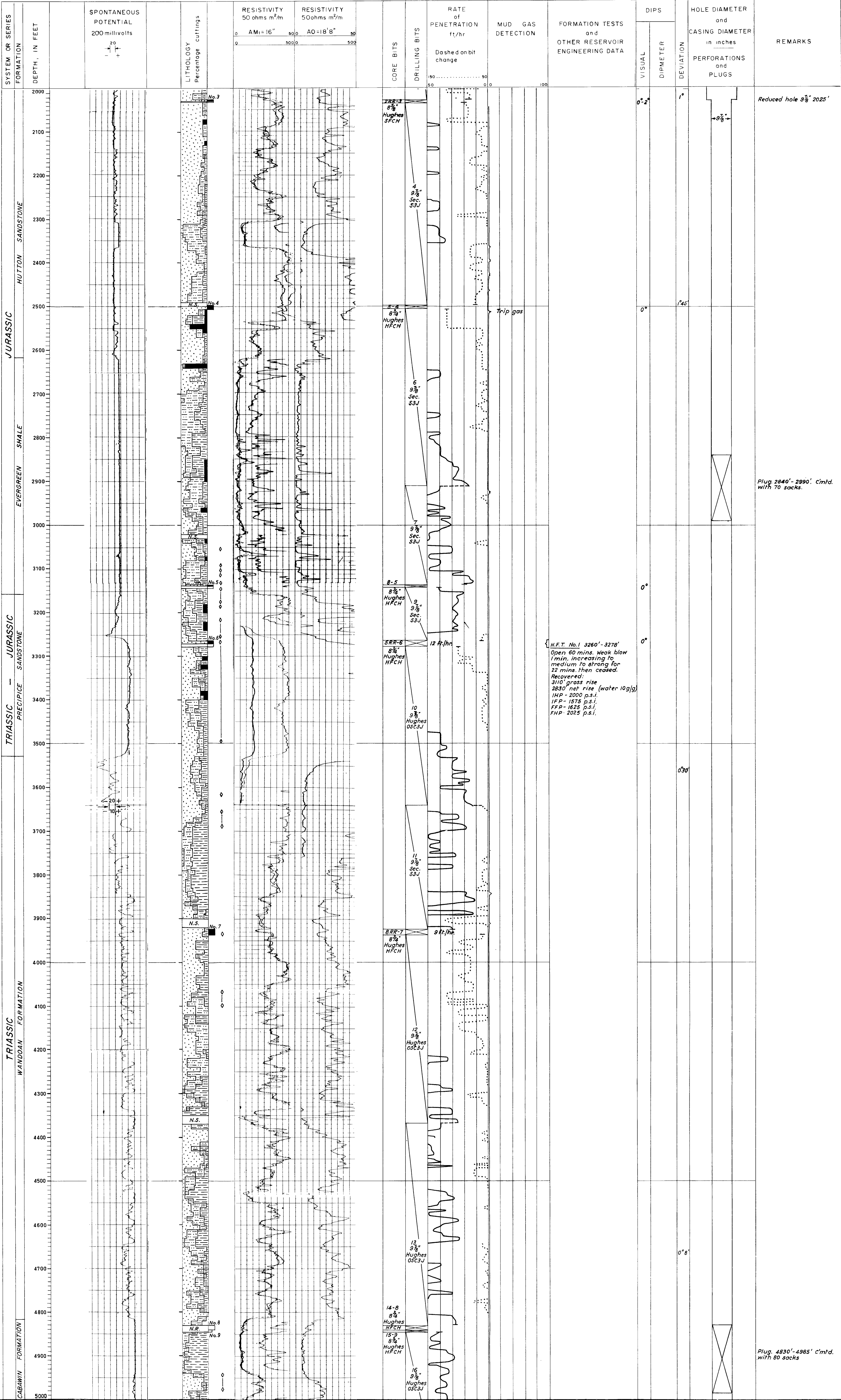
OTHER ELECTRICAL LOGS
SONIC LOG: 1036' - 10730'
VELOCITY SURVEY: 1755' - 10730'
MICROLOG: 1700' - 10736'

	<i>Conglomerate</i>		<i>Shale or mudstone</i>
	<i>Sandstone</i>		<i>Limy shale</i>
	<i>Limy sandstone</i>		<i>Siltstone</i>
	<i>Tuffaceous sandstone</i>		<i>Coal and carbonaceous matter</i>
	<i>Tuff</i>		<i>Volcanic flows</i>

○	Gas show slight		Core interval, No. and recovery
○○	Gas show strong		Sidewall core
●	Oil show slight		
●●	Oil show strong		Perforated interval
●●	Oil and gas show		
⬇	Fluorescence		Formation test or production test
	Blowout		O.H. and in casing
	Macrofossil		
	Spore, pollen		Plugged interval

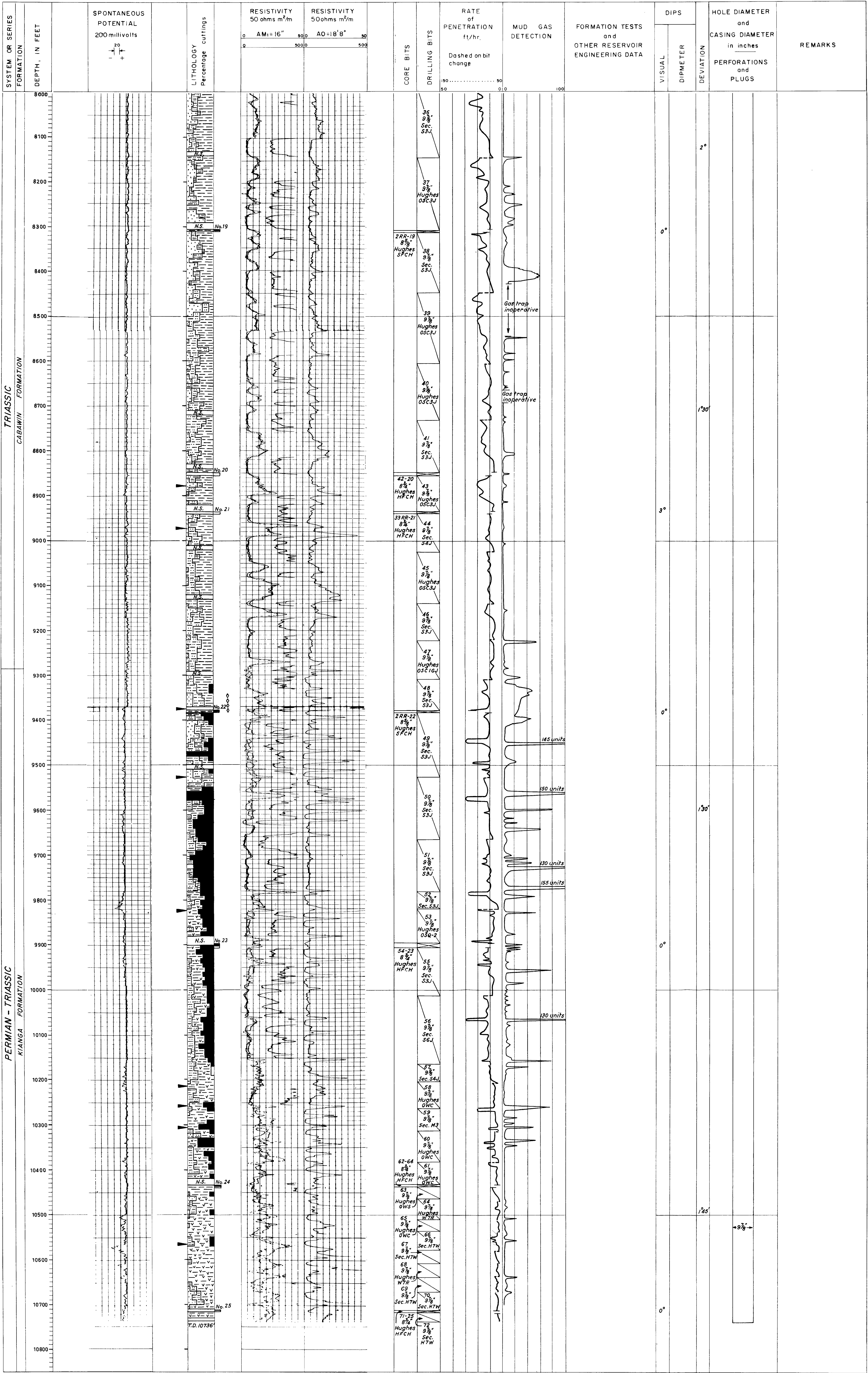
*Lithology by
J.E. Mack, Jr. & Peter Roy*





H.F.T. No.1 3260' - 3278'
Open 60 mins. Weak blow
1 min. increasing to
medium to strong for
22 mins. then ceased.
Recovered:
3110' gross rise
2830' net rise (water 10g/g)
IHP - 2000 p.s.i.
IFP - 1575 p.s.i.
FFP - 1625 p.s.i.
FHP - 2025 p.s.i.

[illegible]



COMPANY: UNION OIL DEVELOPMENT CORPORATION

PETROLEUM TENEMENT: A to P 57 P
MILITARY 4-MILE SHEET: CHINCHILLA

WELL No. UNION - KERN - A.O.G. BURUNGA No.1
BASIN: BOWEN-SURAT

STATE: QUEENSLAND
WELL STATUS: PLUGGED AND ABANDONED

DATUM: K.B.

ELECTRIC LOG DATA

RUN No.	1	2	3	4	5	6	7
DATE	July 7, 1962	July 12, 1962	July 17, 1962	July 28, 1962	August 17, 1962	Sept. 13, 1962	Oct. 1, 1962
FIRST READING	101.7	141.0	238.7	417.5	659.2	841.6	1023.0
LAST READING	100	100.9	131.0	230.6	407.5	650.0	830.0
INTERVAL MEASURED	91.7	401	107.7	18.69	251.7	191.6	193.0
Csg. SCHLUMBERGER	-	100.9	100.9	230.6	230.6	230.6	230.6
Csg. DRILLER	-	100.8	100.8	230.0	230.0	230.0	230.0
DEPTH REACHED	101.8	141.1	238.8	417.6	659.3	841.7	1023.1
BOTTOM DRILLER	101.6	141.1	239.0	417.9	659.2	842.4	1024.2
MUD NATURE	Gel.	Gel.	Gel.	Gel.	Gel.	Gel.	Gel.
DENSITY-VISCOSITY	75-35	71-38	72-50	76-37	80-42	80-52	80-46
MUD RESISTIVITY	7.75 @ 75°F	4.5 @ 70°F	4.1 @ 71°F	5.2 @ 59°F	3.1 @ 85°F	2.8 @ 75°F	4.0 @ 62°F
MUD RESIST. M.T.	6.0 @ 85°F	3.1 @ 102°F	2.9 @ 104°F	2.3 @ 125°F	1.7 @ 144°F	1.2 @ 170°F	1.4 @ 181°F
PH FLUID LOSS	10cc/30min	11/10cc/30min	8.5/9cc/30min	9/10cc/30min	9.5/8cc/30min	9.5/70cc/30min	9/75cc/30min
ORIGIN OF SAMPLE	Shaker	Shaker	Shaker	Shaker	Shaker	Flow Line	Flow Line
R.M.F.	-	-	-	-	-	2.6 @ 73°F	3.2 @ 62°F
R.M.C.	-	-	-	-	-	2.5 @ 73°F	2.7 @ 62°F
BIT SIZE.....1	17 1/2" to 10 1/2"	12 1/4" to 14 1/4"	13 1/4" to 23 1/4"	12 1/4" to 23 1/4"	12 1/4" to 23 1/4"	12 1/4" to 23 1/4"	12 1/4" to 23 1/4"
2	12 1/4" to 10 1/2"	13 1/4" to 10 1/2"	9 1/4" to 23 1/4"	8 1/4" to 23 1/4"	8 1/4" to 23 1/4"	8 1/4" to 23 1/4"	8 1/4" to 23 1/4"
Csg. SIZE	13 1/4" c. 1008'	13 1/4" c. 1008'	13 1/4" c. 1008'	13 1/4" c. 1008'	13 1/4" c. 1008'	13 1/4" c. 1008'	13 1/4" c. 1008'
OPR. RIG TIME	100	100	130	200	200	400	400
TRUCK No.	2513	2513	2513	2513	2513	6611	6611
RECORDED BY	Ollier	Ollier	Ollier	Ollier	Ollier	Kont-Chareyon	Kont-Chareyon
WITNESSED BY	E. Mack Jr.	E. Mack Jr.	E. Mack Jr.	E. Mack Jr.	J. Turk-D. H. Garry	E. Mack-D. H. Garry	D. H. Garry

NAME OF WELL: Union - Kern - A.O.G. - Burunga No.1
STATE: Queensland
COUNTRY: Australia
COUNTY: Fortescue
PARISH: Gerrard
PORTION: 4
LATITUDE: 26° 00' 00" S
LONGITUDE: 150° 04' 43" E
ELEVATION: K.B. 1091.5'
G.L. 1074'
T.D.: 1024.2'
DATE SPUDDED: July 6, 1962
DATE T.D.: September 28, 1962
DATE RIG RELEASED: October 6, 1962
STATUS OF WELL: Plugged and abandoned
DRILLED BY: Oil Drilling and Exploration Limited
DRILLING METHOD: Rotary National 808.
LOGGING: Schlumberger
CEMENTING: Halliburton
MUD LOGGING: Union Oil Development Corporation

OTHER ELECTRICAL LOGS
SONIC LOG: 1008'-10220'
VELOCITY SURVEY: 2310'-10231'
MICROLOG: 1009'-10227'

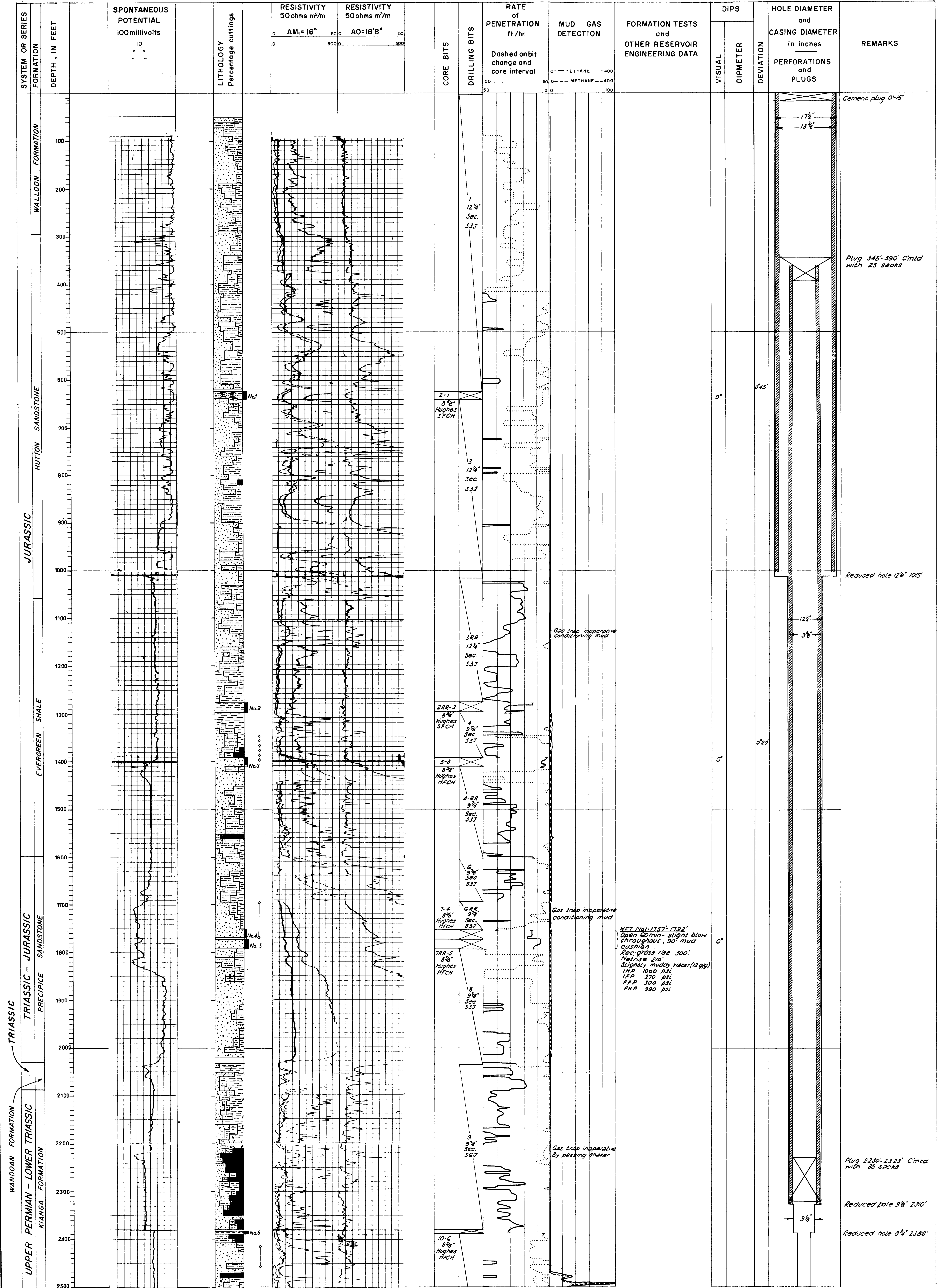
LITHOLOGIC REFERENCE

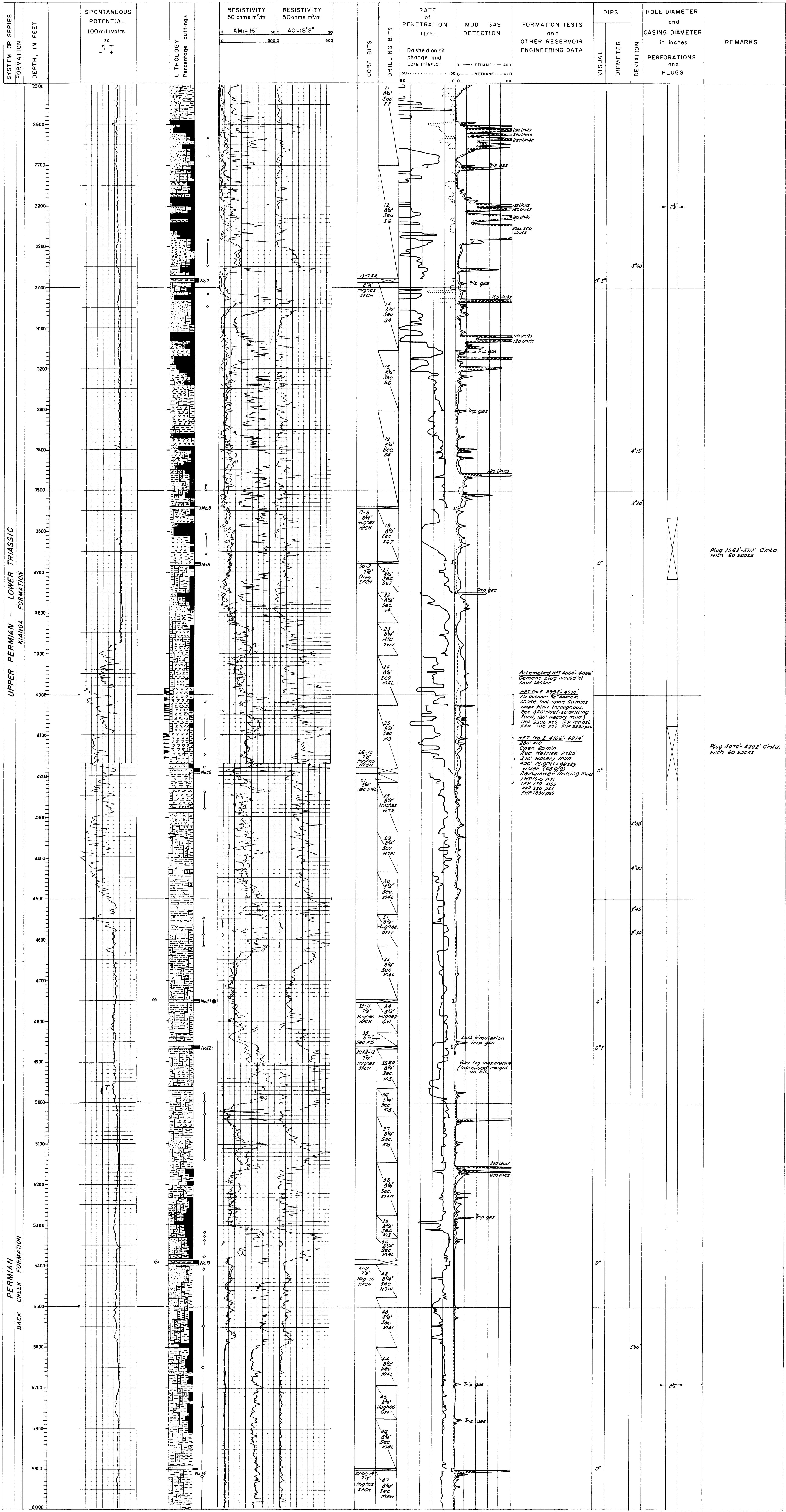
	Conglomerate		Shale or mudstone
	Sandstone		Lime shale
	Lime sandstone		Siltstone
	Tuffaceous sandstone		Coal and carbonaceous matter
	Tuff		Volcanic flows

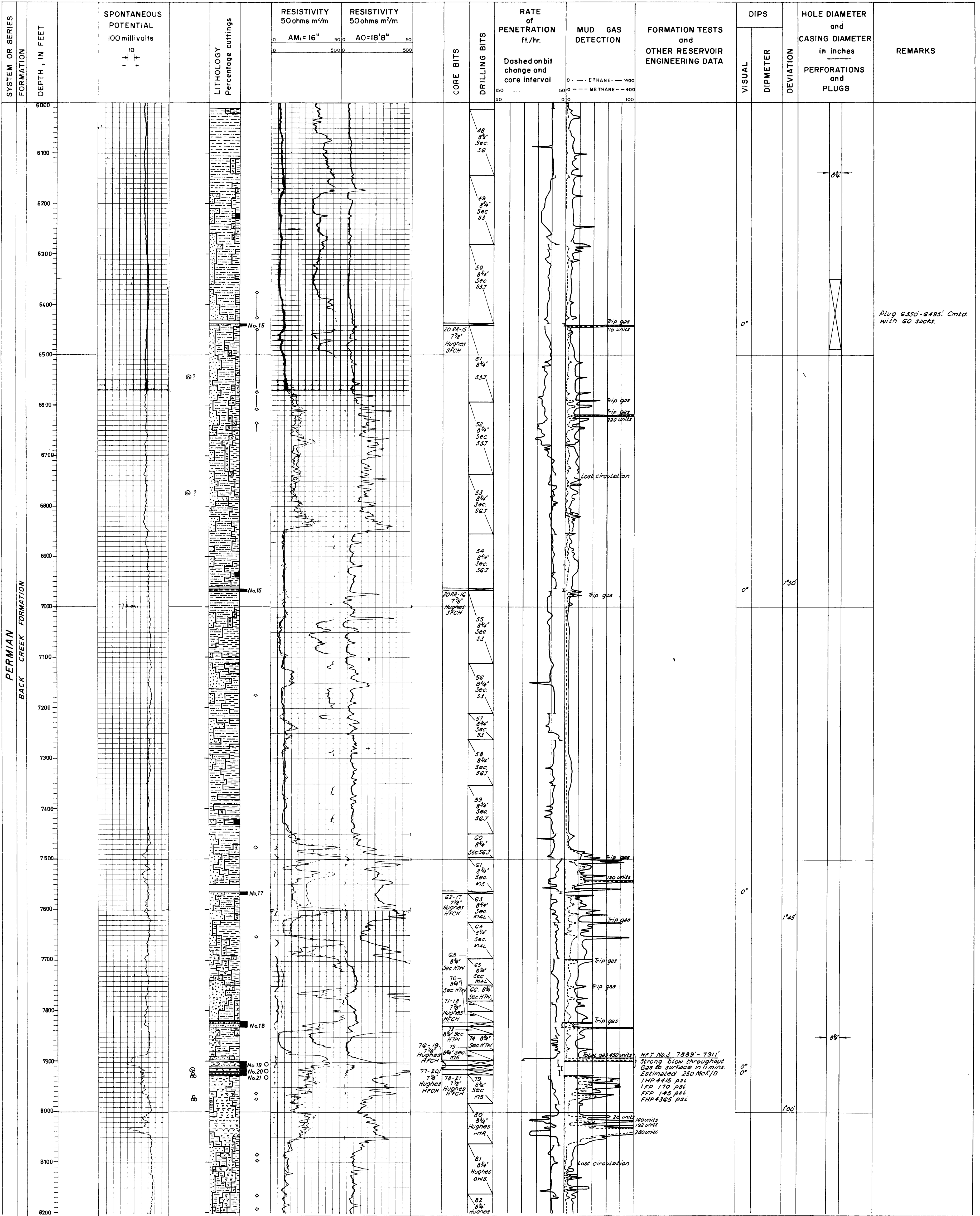
Lithology by E. Mack Jr.
R. G. and A. Carey

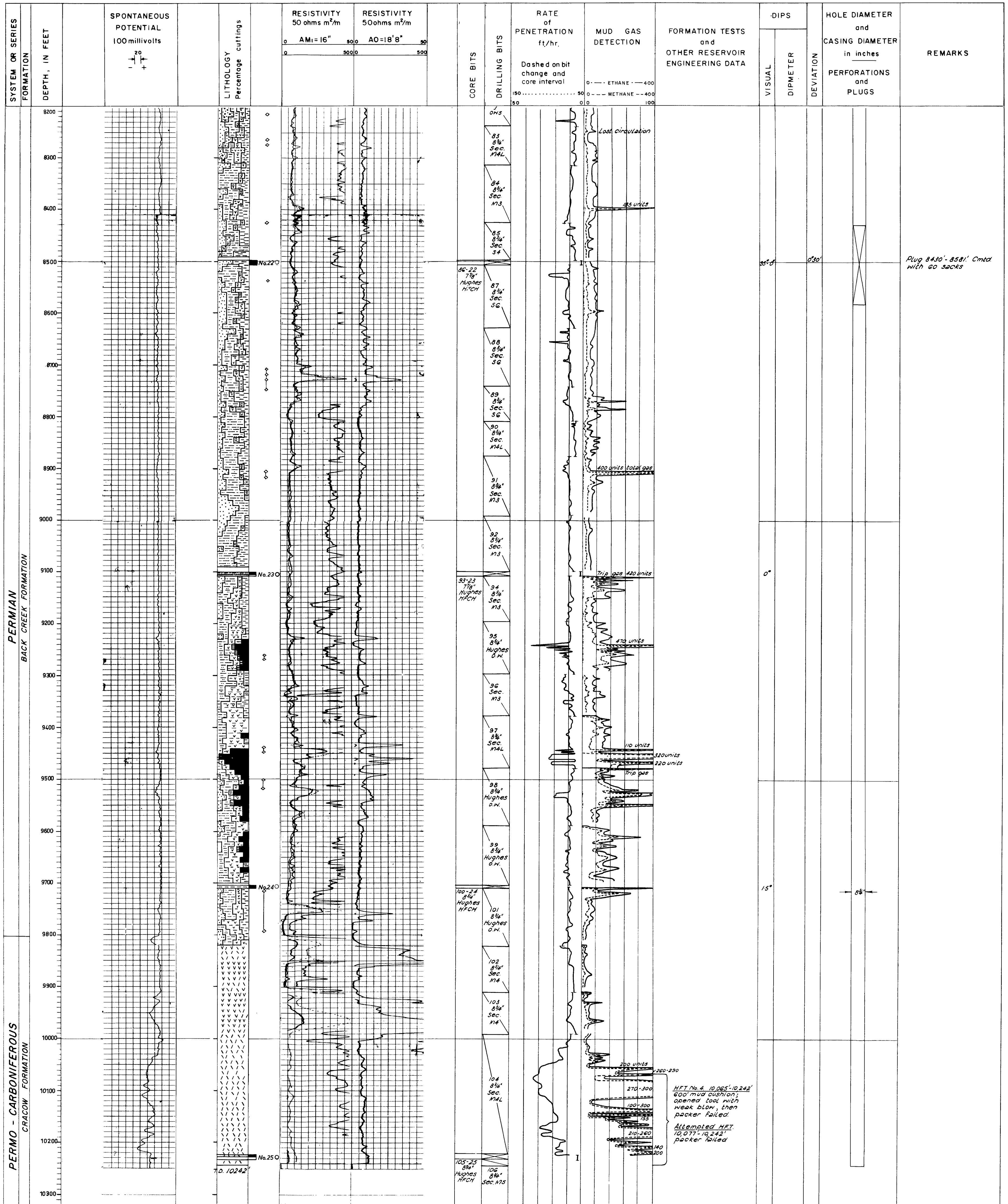
WELL SYMBOLS

	Gas show slight		Core interval, No and recovery
	Gas show strong		Sidewall core
	Oil show slight		Perforated interval
	Oil show strong		Formation test or production test
	Oil and gas show		O.H. and in csg.
	Fluorescence		Plugged interval
	Blowout		
	Macrofossil		
	Microfossil		
	Spore, pollen		



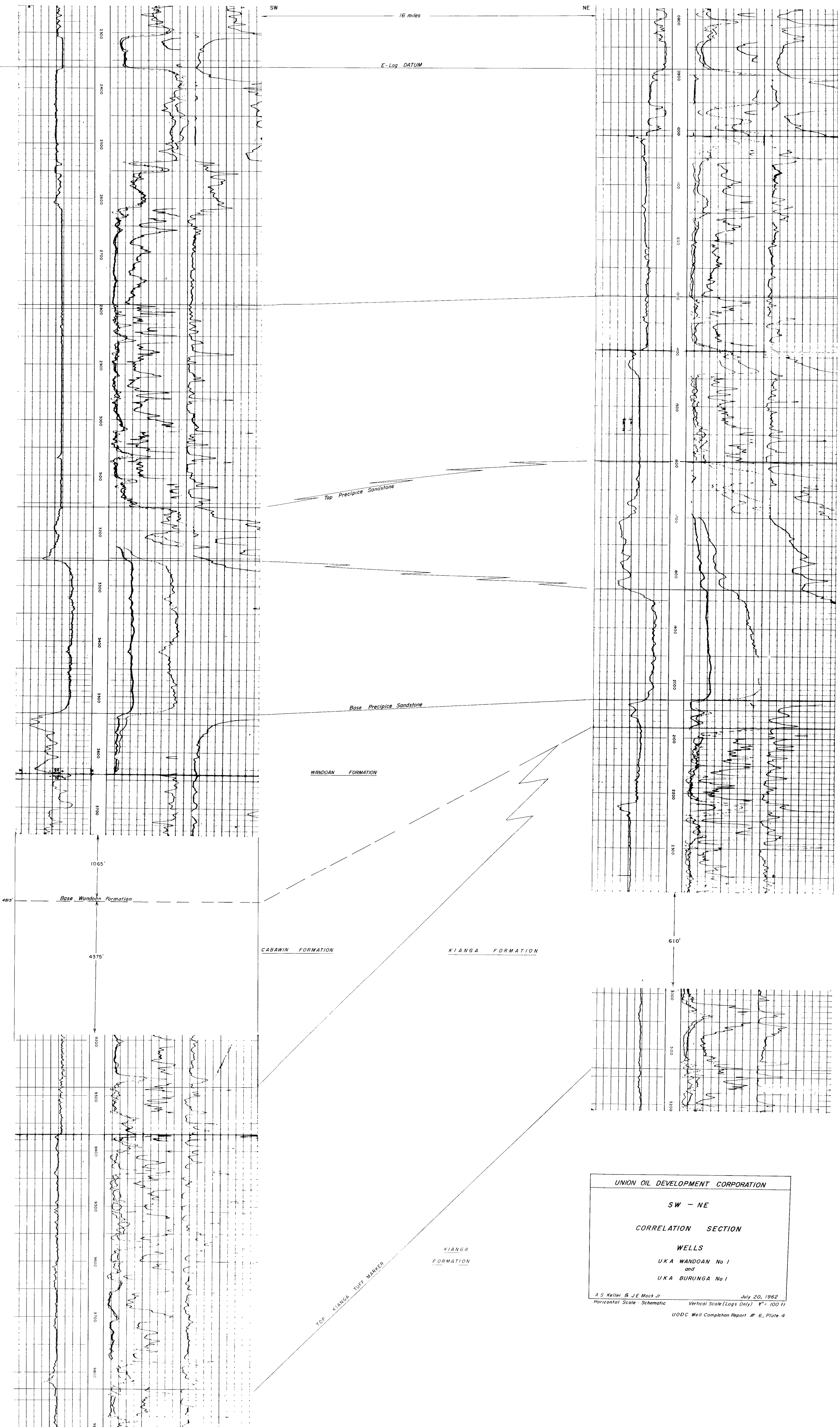






UKA WANDOAN No 1
KB 977

UKA BURUNGA No 1
KB 1092



UNION OIL DEVELOPMENT CORPORATION

SW - NE

CORRELATION SECTION

WELLS

UKA WANDOAN No 1
and
UKA BURUNGA No 1

A. S. Keller & J. E. Mack, Jr. July 20, 1962
Horizontal Scale - Schematic Vertical Scale (Logs Only) 1" = 100 ft
UODC Well Completion Report # 6, Plate 4