

OILFIELD RESEARCH LABORATORIES

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March 18, 1982

M & M Drilling
Box 216
Mound City, Kansas 66056

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Jackson Lease, Well No. 3, located in Linn County, Kansas and submitted to our laboratory on March 13, 1982.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/kas

5 c to Mound City, Kansas

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GENERAL INFORMATION & SUMMARY

Company M & M Drilling Lease Jackson Well No. 3
 Location SW $\frac{1}{4}$
 Section 4 Twp. 20S Rge. 23E County Linn State Kansas

Elevation, Feet
 Name of Sand..... Peru
 Top of Core 244.0
 Bottom of Core 256.0
 Top of Sand 244.0
 Bottom of Sand 256.0
 Total Feet of Permeable Sand 8.7
 Total Feet of Floodable Sand..... 1.7

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 1	5.0	5.0
3 - 5	2.4	7.4
10 - 23	1.3	8.7

Average Permeability Millidarcys 3.7
 Average Percent Porosity 15.5
 Average Percent Oil Saturation 32.7
 Average Percent Water Saturation..... 51.9
 Average Oil Content, Bbls./A. Ft. 395.
 Total Oil Content, Bbls./Acre..... 3,829.
 Average Percent Oil Recovery by Laboratory Flooding Tests..... 10.5
 Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. 140.
 Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre 238.
 Total Calculated Oil Recovery, Bbls./Acre.....

See "Calculated Recovery"
Section

The core was sampled and the samples sealed in plastic bags by a representative of the client. Fresh water mud was used as a drilling fluid. Sample numbers 10, 11, and 12 were sampled in the laboratory.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
244.0 - 244.7	Brown slightly shaly sandstone.
244.7 - 245.0	Gray shale.
245.0 - 245.2	Brown sandstone.
245.2 - 245.5	Gray shale.
245.5 - 245.7	Brown sandstone.
245.7 - 246.2	Grayish brown slightly calcareous very shaly sandstone.
246.2 - 246.6	Brown sandstone.
246.6 - 247.0	Grayish brown very shaly sandstone.
247.0 - 247.6	Brown slightly shaly sandstone.
247.6 - 248.2	Grayish brown slightly calcareous very shaly sandstone.
248.2 - 248.9	Brown sandstone.
248.9 - 250.0	Gray and brown laminated shale and sandstone.
250.0 - 252.9	Grayish brown very shaly sandstone with scattered gray shale nodules.
252.9 - 256.0	Grayish light brown very shaly sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 238 barrels of oil per acre was obtained from 1.7 feet of sand. The weighted average percent oil saturation was reduced from 45.1 to 34.6, or represents an average recovery of 10.5 percent. The weighted average effective permeability of the samples is 0.23 millidarcys, while the average initial fluid production pressure is 40.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 12 samples tested, 3 produced water and oil. This indicates that approximately 25 percent of the sand represented by these samples is floodable pay sand.

CALCULATED RECOVERY

It would appear from a study of the core data, that efficient primary and waterflood operations in the vicinity of this well should recover approximately 360 barrels of oil per acre. This is an average recovery of 214 barrels per acre foot from 1.7 feet of floodable sand analyzed in this core.

These recovery values were calculated using the following data and assumptions:

Original formation volume factor, estimated	1.03
Reservoir water saturation, percent, estimated	35.0
Average porosity, percent	17.6
Oil saturation after flooding, percent	34.6
Performance factor, percent, estimated	55.0
Net floodable sand, feet	1.7

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company M & M Drilling Lease Jackson Well No. 3

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbls. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
1	244.5	21.3	32	49	81	529	4.6	0.7	0.7	370	3.22
2	245.6	22.1	36	40	76	617	19.	0.2	0.9	123	3.80
3	246.5	20.8	43	39	82	694	22.	0.4	1.3	278	8.80
4	247.5	16.8	41	52	93	534	4.3	0.6	1.9	320	2.58
5	248.6	16.4	50	39	89	636	10.	0.7	2.6	445	7.00
6	249.5	16.8	27	64	91	352	3.4	1.1	3.7	387	3.74
7	250.5	15.7	32	65	97	390	0.54	1.0	4.7	390	0.54
8	251.5	15.0	27	65	92	314	0.76	1.0	5.7	314	0.76
9	252.4	10.2	44	52	96	348	0.69	0.9	6.6	313	0.62
* 10	253.4	15.0	31	43	74	361	0.87	1.1	7.7	397	0.96
* 11	254.4	13.3	15	58	73	155	Imp.	1.0	8.7	155	0.00
* 12	255.5	13.2	33	35	68	337	0.16	1.0	9.7	337	0.16

NOTE: * SAMPLES WERE RECEIVED UNBAGGED.

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Lease	Well No.			
M & M Drilling	Jackson	3			
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.		
244.0 - 248.9	2.6	9.8	25.40		
248.9 - 256.0	6.1	1.1	6.78		
244.0 - 256.0	8.7	3.7	32.18		
Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
244.0 - 248.9	2.6	18.9	40.9	591	1,536
248.9 - 256.0	7.1	14.3	29.6	323	2,293
244.0 - 256.0	9.7	15.5	32.7	395	3,829

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company **M & M Drilling** Lease **Jackson** Well No. **3**

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volume of Water Recovered cc*	Effective Permeability Millidarcys**	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water			
1	244.5	21.4	32	531	0	0	32	50	0	Imp.	-
2	245.6	21.8	37	626	0	0	37	42	0	Imp.	75
3	246.5	20.9	43	697	7	113	36	50	16	0.22	45
4	247.5	16.8	41	534	10	130	31	64	5	0.15	30
5	248.6	16.3	50	632	13	164	37	55	24	0.30	-
6	249.5	16.9	27	354	0	0	27	65	0	Imp.	-
7	250.5	15.6	32	387	0	0	32	65	0	Imp.	-
8	251.5	15.5	26	313	0	0	26	66	0	Imp.	-
9	252.4	10.4	44	355	0	0	44	52	0	Imp.	-
*10	253.4	14.9	31	358	0	0	31	43	0	Imp.	-
*11	254.4	13.8	14	150	0	0	14	59	0	Imp.	-
*12	255.5	13.4	33	343	0	0	33	36	0	Imp.	-

NOTE: * SAMPLES WERE RECEIVED UNBAGGED.

Notes: cc—cubic centimeter.

*—Volume of water recovered at the time of maximum oil recovery.

**—Determined by passing water through sample which still contains residual oil.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

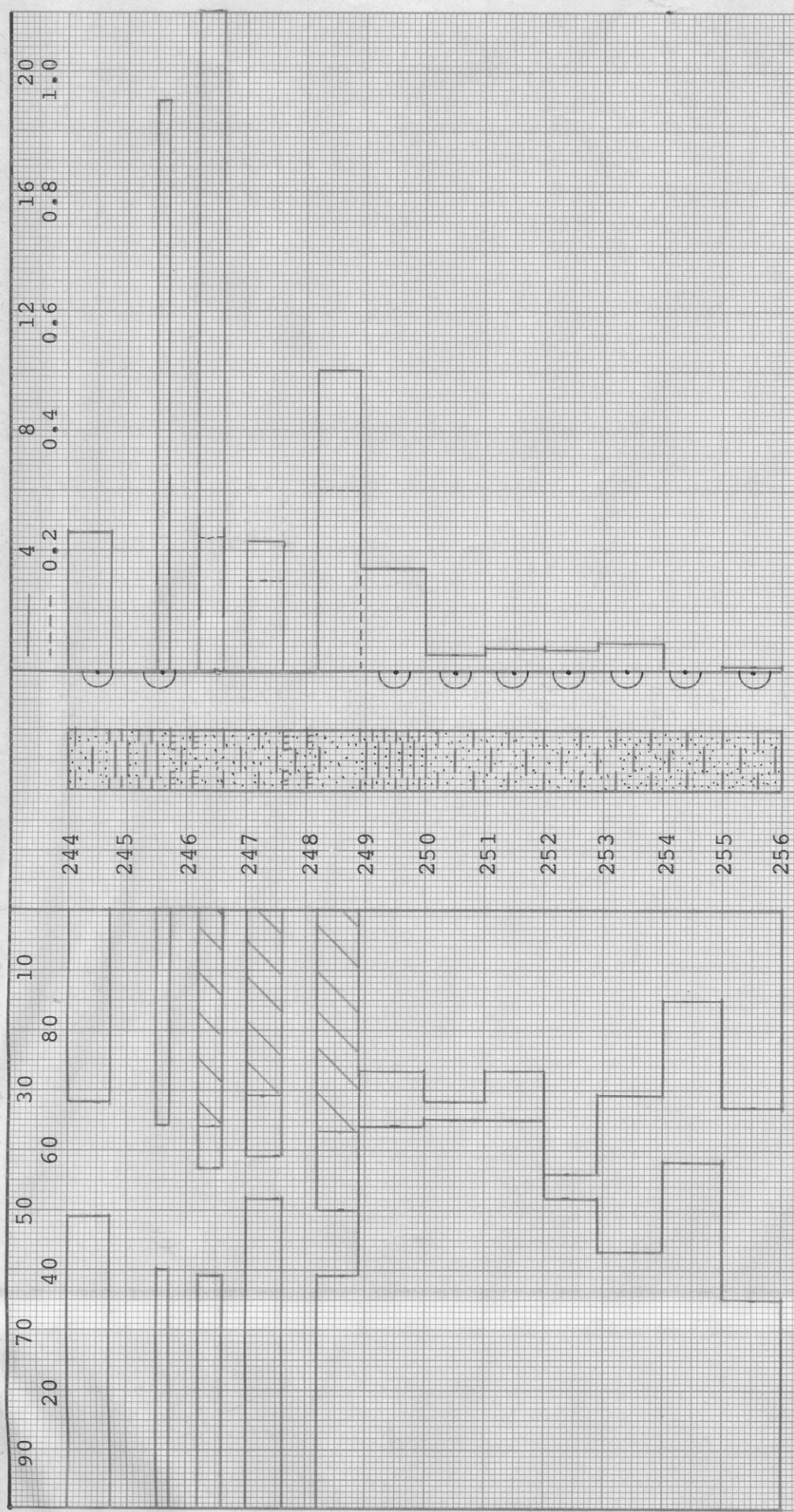
Company M & M Drilling Lease Jackson Well No. 3

Depth Interval, Feet	244.0 - 248.9
Feet of Core Analyzed	1.7
Average Percent Porosity	17.6
Average Percent Original Oil Saturation	45.1
Average Percent Oil Recovery	10.5
Average Percent Residual Oil Saturation	34.6
Average Percent Residual Water Saturation	57.0
Average Percent Total Residual Fluid Saturation	91.6
Average Original Oil Content, Bbls./A. Ft.	613.
Average Oil Recovery, Bbls./A. Ft.	140.
Average Residual Oil Content, Bbls./A. Ft.	473.
Total Original Oil Content, Bbls./Acre	1,042.
Total Oil Recovery, Bbls./Acre	238.
Total Residual Oil Content, Bbls./Acre	804.
Average Effective Permeability, Millidarcys	0.228
Average Initial Fluid Production Pressure, p.s.i.	40.0

NOTE: Only those samples which recovered oil were used in calculating the above averages.

PERMEABILITY, IN MILLIDARCYS
EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS

WATER SAT., PERCENT
OIL SAT., PERCENT



SHALY SANDSTONE

LAMINATED SANDSTONE AND SHALE

SHALY CALCAREOUS SANDSTONE

FLOODPOT RESIDUAL OIL SATURATION

SHALY SANDSTONE

LAMINATED SANDSTONE AND SHALE

SHALY CALCAREOUS SANDSTONE

FLOODPOT RESIDUAL OIL SATURATION

KEY:

SANDSTONE

SHALE

IMPERMEABLE TO WATER

M & M DRILLING



IMPERMEABLE TO WATER

FLOODPOT RESIDUAL OIL SATURATION

M & M DRILLING

JACKSON LEASE

WELL NO. 3

LINN COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY BBLs. / ACRE
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244.0 - 248.9

2.6

18.9

40.9

44.8

9.8

248.9 - 256.0

7.1

14.3

29.6

54.6

1.1

244.0 - 256.0

9.7

15.5

32.7

51.9

3.7

360
(PRIMARY AND
WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
MARCH, 1982

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