OILFIELD RESEARCH LABORATORIES
536 NORTH HIGHLAND - CHANUTE, KANSAS 66720 - PHONE (316) 431-2650

December 3, 1981

Jackson Brothers
514 North Main
Eureka, Kansas 67045

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Hendrickson Lease, Well No. 9, located in Greenwood County, Kansas and submitted to our laboratory on November 24, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel by B.L.

Sanford A. Michel

SAM/mkf

6 c to Eureka, Ks.

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Jackson Brothers Lease Hendrickson Well No. 9

Location 790' SNL & 976'WEL

Section 17 Twp. 25S Rge. 9E County Greenwood State Kansas

Elevation, Feet	
Name of Sand	BARTLESVILLE
Top of Core	2384.0
Bottom of Core	2401.4
Top of Sand (Tested)	2384.0
Bottom of Sand	2400.8
Total Feet of Permeable Sand	16.8
Total Feet of Floodable Sand	2.0

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 3	4.7	4.7
3 - 6	1.1	5.8
6 - 9	2.1	7.9
9 - 18	6.1	14.0
20 - 25	2.8	16.8

Average Permeability Millidarcys	9.5
Average Percent Porosity	16.0
Average Percent Oil Saturation	19.0
Average Percent Water Saturation	69.2
Average Oil Content, Bbls./A. Ft.	240.
Total Oil Content, Bbls./Acre	4,038.
Average Percent Oil Recovery by Laboratory Flooding Tests	2.5
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	34.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	67.
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 Oilfield Research Laboratories. Fresh water mud was used as a drilling fluid. The core was reported to be from a virgin area.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
2384.0 - 2385.0	Brown sandstone.
2385.0 - 2389.7	Grayish brown shaly sandstone.
2389.7 - 2391.0	Grayish brown slightly shaly sandstone.
2391.0 - 2392.0	Light brown sandstone.
2392.0 - 2393.1	Grayish brown shaly sandstone.
2393.1 - 2394.9	Light brown sandstone.
2394.9 - 2396.0	Grayish brown slightly shaly sandstone.
2396.0 - 2399.8	Light brown sandstone.
2399.8 - 2400.8	Grayish brown slightly shaly sandstone.
2400.8 - 2401.4	Gray shaly sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 6.7 barrels of oil per acre was obtained from 2.0 feet of sand. The weighted average percent oil saturation was reduced from 30.5 to 28.0, or represents an average recovery of 2.5 percent. The weighted average effective permeability of the samples is 0.90 millidarcys, while the average initial fluid production pressure is 37.5 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 17 samples tested, 2 produced water and oil, and 12 produced water only. This indicates that approximately 12 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 300 barrels of oil per acre. This is an average recovery of 149 barrels per acre foot from 2.0 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.10
Reservoir water saturation, percent, estimated	45.0
Average porosity, percent	17.4
Oil saturation after flooding, percent	28.0
Performance factor, percent, estimated	50.0
Net floodable sand, feet	2.0

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Jackson Brothers Lease Hendrickson Well No. 9

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	2384.6	16.8	20	62	82	261	17.	1.0	1.0	261	17.00
2	2385.6	12.7	14	80	94	138	0.35	1.0	2.0	138	0.35
3	2386.5	14.2	29	65	94	320	0.61	1.0	3.0	320	0.61
4	2387.6	15.8	1	97	98	12	1.2	1.0	4.0	12	1.20
5	2388.5	14.2	2	91	93	22	0.76	1.0	5.0	22	0.76
6	2389.6	15.3	18	78	96	214	2.0	0.7	5.7	150	1.40
7	2390.5	16.9	24	61	85	315	9.4	1.3	7.0	410	12.22
8	2391.5	17.6	19	61	80	259	24.	1.0	8.0	259	24.00
9	2392.5	14.3	5	88	93	55	4.6	1.1	9.1	61	5.06
10	2393.4	17.2	31	51	82	414	23.	1.0	10.1	414	23.00
11	2394.5	16.5	16	65	81	205	21.	0.8	10.9	164	16.80
12	2395.5	16.2	27	61	88	339	7.1	1.1	12.0	373	7.81
13	2396.5	17.1	28	58	86	372	9.6	0.8	12.8	298	7.68
14	2394.6	17.0	18	73	91	237	11.	1.0	13.8	237	11.00
15	2398.5	15.9	9	75	84	111	13.	1.0	14.8	111	13.00
16	2399.6	17.3	30	57	87	403	11.	1.0	15.8	403	11.00
17	2400.5	16.3	32	55	87	405	7.5	1.0	16.8	405	7.50

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Jackson Brothers Lease Hendrickson Well No. 9

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
2384.0 - 2393.1	9.1	6.9	62.60
2393.1 - 2400.8	7.7	12.7	97.79
2384.0 - 2400.8	16.8	9.5	160.39

Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
2384.0 - 2393.1	9.1	15.4	14.8	75.5	179	1,633
2393.1 - 2400.8	7.7	16.7	24.0	61.9	312	2,405
2384.0 - 2400.8	16.8	16.0	19.0	69.2	240	4,038

Oilfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Jackson Brothers Lease Hendrickson Well No. 9

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	Bbls./A. Ft.			
1	2384.6	16.7	20	259	0	0	20	64	259	22	0.33	45
2	2385.6	12.2	15	142	0	0	15	80	142	10	0.15	50
3	2386.5	14.1	29	317	0	0	29	66	317	0	Imp.	-
4	2387.6	15.9	1	12	0	0	1	97	12	0	Imp.	-
5	2388.5	14.5	2	22	0	0	2	92	22	0	Imp.	-
6	2389.6	15.4	18	215	0	0	18	79	215	10	0.15	50
7	2390.5	17.4	23	310	0	0	23	63	310	46	0.75	35
8	2391.5	17.7	19	261	0	0	19	62	261	50	0.94	35
9	2392.5	14.2	5	55	0	0	5	89	55	30	0.45	40
10	2393.4	17.3	31	416	3	40	28	55	376	46	0.67	40
11	2394.5	16.7	16	207	0	0	16	68	207	44	0.67	35
12	2395.5	16.3	27	341	0	0	27	62	341	40	0.52	40
13	2396.5	16.6	29	373	0	0	29	60	373	48	0.75	35
14	2397.6	17.1	18	239	0	0	18	79	239	40	0.75	40
15	2398.5	15.8	9	110	0	0	9	76	110	24	0.37	40
16	2399.6	17.4	30	405	2	27	28	55	378	72	1.12	35
17	2400.5	15.1	18	211	0	0	18	79	211	46	0.67	35

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.

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Jackson Brothers Lease Hendrickson Well No. 9

Depth Interval, Feet	2393.1 - 2400.8
Feet of Core Analyzed	2.0
Average Percent Porosity	17.4
Average Percent Original Oil Saturation	30.5
Average Percent Oil Recovery	2.5
Average Percent Residual Oil Saturation	28.0
Average Percent Residual Water Saturation	55.0
Average Percent Total Residual Fluid Saturation	83.0
Average Original Oil Content, Bbls./A. Ft.	411.
Average Oil Recovery, Bbls./A. Ft.	34.
Average Residual Oil Content, Bbls./A. Ft.	377.
Total Original Oil Content, Bbls./Acre	821.
Total Oil Recovery, Bbls./Acre	67.
Total Residual Oil Content, Bbls./Acre	754.
Average Effective Permeability, Millidarcys	0.90
Average Initial Fluid Production Pressure, p.s.i.	37.5

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

Oilfield Research Laboratories

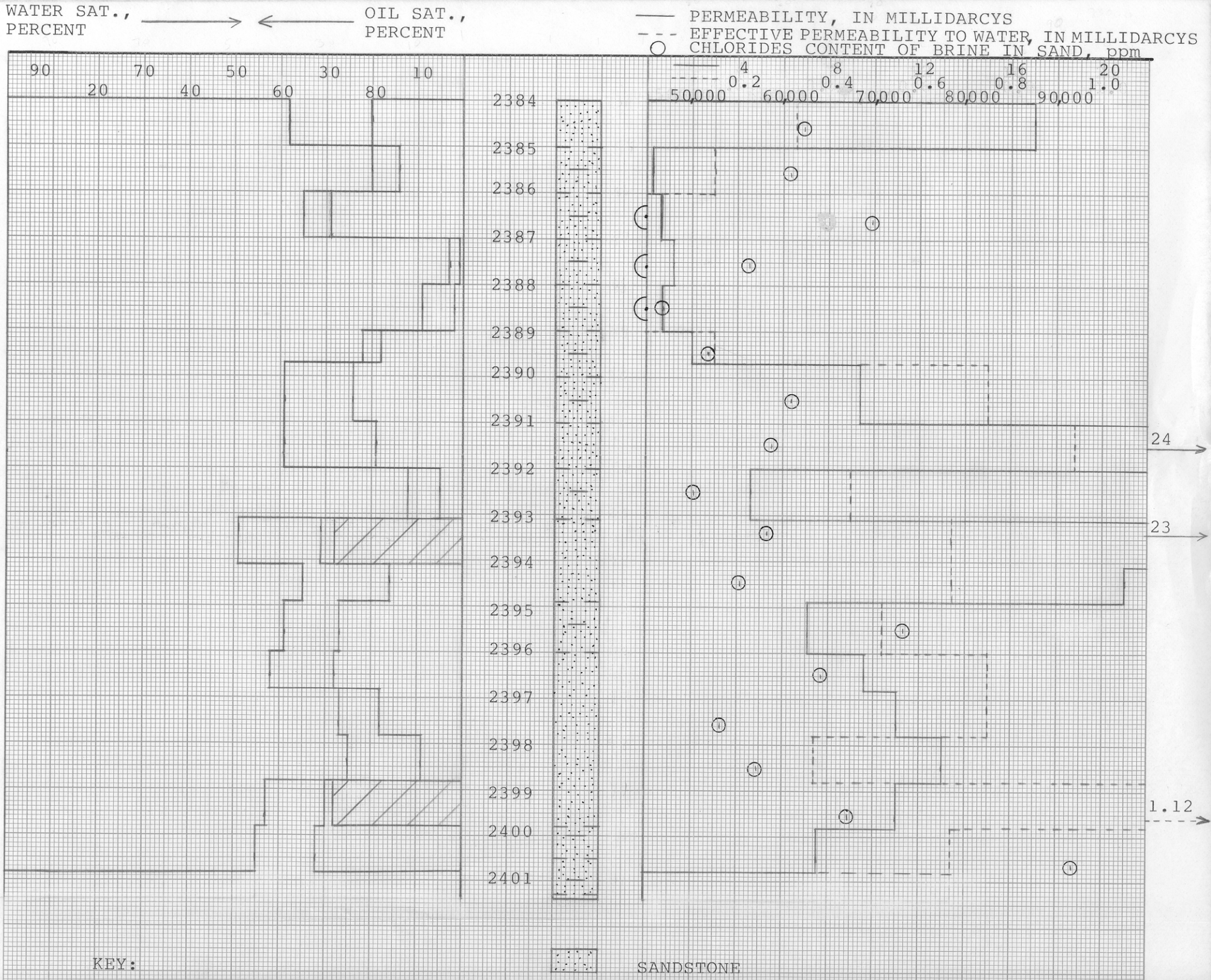
RESULTS OF WATER DIFFERENTIATION TESTS

TABLE VI

Company Jackson Brothers Lease Hendrickson Well No. 9

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
1	2384.6	62,220			
2	2385.6	60,782			
3	2386.6	69,793			
4	2387.6	56,229			
5	2388.5	46,725			
6	2389.6	51,718			
7	2390.5	60,821			
8	2391.5	58,760			
9	2392.5	50,169			
10	2393.4	58,306			
11	2394.5	55,327			
12	2395.5	73,249			
13	2396.5	64,347			
14	2397.6	53,215			
15	2398.5	57,333			
16	2399.6	67,148			
17	2400.5	91,752			

Note: ppm — parts per million


WATER SAT., PERCENT
OIL SAT., PERCENT
PERMEABILITY, IN MILLIDARCYS
EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS
CHLORIDES CONTENT OF BRINE IN SAND, ppm
90 70 50 30 10
20 40 60 80
4 8 12 16 20
0.2 0.4 0.6 0.8 1.0
50,000 60,000 70,000 80,000 90,000
2384
2385
2386
2387
2388
2389
2390
2391
2392
2393
2394
2395
2396
2397
2398
2399
2400
2401
24
23
1.12
KEY:
SANDSTONE

KEY:

IMPERMEABLE TO WATER

FLOODPOT RESIDUAL OIL SATURATION

SANDSTONE

SHALY SANDSTONE

JACKSON BROTHERS

HENDRICKSON LEASE

WELL NO. 9

GREENWOOD 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
2384.0 - 2393.1	9.1	15.4	14.8	75.5	6.9	
2393.1 - 2400.8	7.7	16.7	24.0	61.9	12.7	
2384.0 - 2400.8	16.8	16.0	19.0	69.2	9.5	300 (PRIMARY AND WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
DECEMBER, 1981

PDC