

OILFIELD RESEARCH LABORATORIES

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

June 29, 1982

Edco
c/o Jackson Brothers
514 North Main
Eureka, Kansas 67045

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Hawthorne Lease, Well No. 16, located in Greenwood County, Kansas and submitted to our laboratory on June 23, 1982.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/dlb

5 c to Eureka, Kansas

Oilfield Research Laboratories
GENERAL INFORMATION & SUMMARY

Company Edco Lease Hawthorne Well No. 16
 Location SE 1/4, NE 1/4, SE 1/4
 Section 27 Twp. 25S Rgc. 8E County Greenwood State Kansas

Elevation, Feet

Name of Sand..... Bartlesville

Top of Core 2498.0

Bottom of Core 2513.0

Top of Sand 2498.0

Bottom of Sand 2509.0

Total Feet of Permeable Sand 11.0

Total Feet of Floodable Sand 7.0

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	6.0	6.0
5 - 10	3.0	9.0
10 - 15	2.0	11.0

Average Permeability Millidarcys 6.0

Average Percent Porosity 19.6

Average Percent Oil Saturation 20.8

Average Percent Water Saturation 60.3

Average Oil Content, Bbls./A. Ft. 315.

Total Oil Content, Bbls./Acre 3,470.

Average Percent Oil Recovery by Laboratory Flooding Tests 3.4

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. 50.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre 348.

Total Calculated Oil Recovery, Bbls./Acre See "Calculated Recovery"
 Section

The core was sampled by a representative of Oilfield Research Laboratories. Fresh water mud was used as a drilling fluid.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
2498.0 - 2501.0	Light brown shaly sandstone.
2501.0 - 2502.0	Light brown slightly shaly sandstone.
2502.0 - 2503.0	Light brown sandstone.
2503.0 - 2504.0	Light brown slightly shaly sandstone.
2504.0 - 2506.0	Light brown shaly sandstone.
2506.0 - 2507.0	Light brown sandstone.
2507.0 - 2509.0	Light brown shaly sandstone.
2509.0 - 2511.2	Black shale.
2511.2 - 2512.0	Gray shale.
2512.0 - 2513.0	Black shale.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 348 barrels of oil per acre was obtained from 7.0 feet of sand. The weighted average percent oil saturation was reduced from 22.4 to 19.0, or represents an average recovery of 3.4 percent. The weighted average effective permeability of the samples is 0.45 millidarcys, while the average initial fluid production pressure is 28.6 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 11 samples tested, 7 produced water and oil, and 1 sample water only. This indicates that approximately 64 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 1,320 barrels of oil per acre. This is an average recovery of 189 barrels per acre foot from 7.0 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.23
Reservoir water saturation, percent, estimated	50.0
Average porosity, percent	18.8
Oil saturation after flooding, percent	19.0
Performance factor, percent, estimated	60.0
Net floodable sand, feet	7.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Edco Lease Hawthorne Well No. 16

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	2498.4	22.6	19	58	77	333	4.5	1.0	1.0	333	4.50
2	2499.6	21.9	24	59	83	408	3.1	1.0	2.0	408	3.10
3	2500.7	20.2	19	67	86	298	2.8	1.0	3.0	298	2.80
4	2501.5	19.8	20	55	75	307	9.4	1.0	4.0	307	9.40
5	2502.5	20.7	21	62	83	337	11.	1.0	5.0	337	11.00
6	2503.5	20.0	9	64	73	140	8.3	1.0	6.0	140	8.30
7	2504.6	17.0	24	58	82	317	2.3	1.0	7.0	317	2.30
8	2505.5	18.8	25	58	83	365	4.2	1.0	8.0	365	4.20
9	2506.4	19.3	23	56	79	344	13.	1.0	9.0	344	13.00
10	2507.6	18.2	24	61	85	339	5.4	1.0	10.0	339	5.40
11	2508.5	17.3	21	65	86	282	1.8	1.0	11.0	282	1.80

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Edco Lease Hawthorne Well No. 16

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
2498.0 - 2509.0	11.0	6.0	65.80

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
2498.0 - 2509.0	11.0	19.6	20.8	60.3	315	3,470

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Edco Lease Hawthorne Well No. 16

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	2498.4	22.5	19	332	0	0	19	59	332	0	Imp.	-
2	2499.6	22.1	24	411	0	0	24	62	411	0	Imp.	-
3	2500.7	20.3	19	299	2	31	17	80	268	6	0.15	45
4	2501.5	19.8	20	307	0	0	20	58	307	0	Imp.	-
5	2502.5	20.6	21	336	3	48	18	73	288	21	0.22	15
6	2503.5	20.1	9	140	0	0	9	80	140	28	0.30	30
7	2504.6	17.1	24	318	3	40	21	67	278	11	0.15	40
8	2505.5	18.8	25	365	4	58	21	72	307	13	0.22	40
9	2506.4	19.4	23	346	4	60	19	73	286	50	0.53	20
10	2507.6	18.3	24	341	5	71	19	73	270	26	1.65	15
11	2508.5	17.3	21	282	3	40	18	80	242	25	0.22	25

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	Edco	Lease	Hawthorne	Well No.	16
Depth Interval, Feet	2498.0 - 2509.0				
Feet of Core Analyzed	7.0				
Average Percent Porosity	18.8				
Average Percent Original Oil Saturation	22.4				
Average Percent Oil Recovery	3.4				
Average Percent Residual Oil Saturation	19.0				
Average Percent Residual Water Saturation	74.0				
Average Percent Total Residual Fluid Saturation	93.0				
Average Original Oil Content, Bbls./A. Ft.	327.				
Average Oil Recovery, Bbls./A. Ft.	50.				
Average Residual Oil Content, Bbls./A. Ft.	277.				
Total Original Oil Content, Bbls./Acre	2,287.				
Total Oil Recovery, Bbls./Acre	348.				
Total Residual Oil Content, Bbls./Acre	1,939.				
Average Effective Permeability, Millidarcys	0.45				
Average Initial Fluid Production Pressure, p.s.i.	28.6				

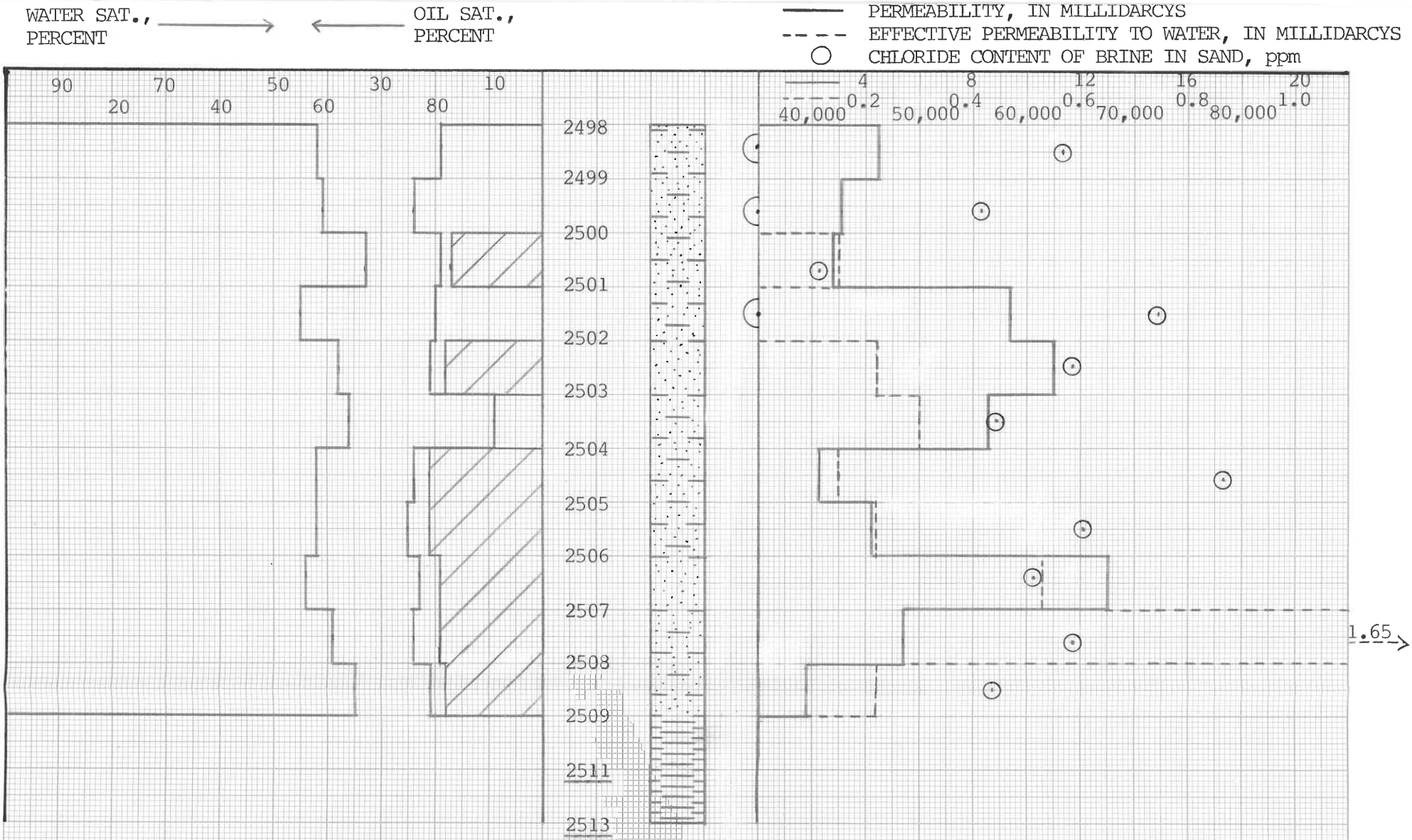
NOTE: Only those samples which recovered oil were used in calculating the above averages.

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RESULTS OF WATER DIFFERENTIATION TESTS
TABLE VI

Company Edco Lease Hawthorne Well No. 16

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation	
			Connate	Drilling & Foreign
1	2498.4	63,404.		
2	2499.6	55,864.		
3	2500.7	40,680.		
4	2501.5	72,164.		
5	2502.5	64,263.		
6	2503.5	57,169.		
7	2504.6	78,311.		
8	2505.5	65,302.		
9	2506.4	60,519.		
10	2507.6	64,400.		
11	2508.5	56,803.		

Note: ppm — parts per million



EDCO

HAWTHORNE LEASE

GREENWOOD COUNTY, KANSAS

WELL NO. 16

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
2498.0 - 2509.0	11.0	19.6	20.8	60.3	6.0	1320 (PRIMARY AND WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
JUNE, 1982

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