

OILFIELD RESEARCH LABORATORIES

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

April 14, 1980

Hickory Creek Oil Company
P.O. Box 379
Parsons, Kansas 67357

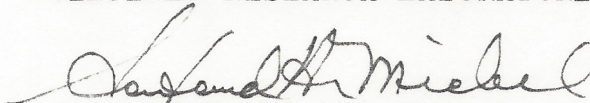
Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from Well No. HCO-140, and submitted to our laboratory on March 17, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Sanford A. Michel

SAM/tem

4 c to Parsons, Kansas
1 c to Chanute, Kansas

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GENERAL INFORMATION & SUMMARY

Company Hickory Creek Oil Company Lease - Well No HCO-140

Location -

Section - Twp - Rge - County - State -

Elevation, Feet - - - - -

Name of Sand - - - - -

Top of Core - - - - - 199.0

Bottom of Core - - - - - 251.5

Top of Sand - - - - - 199.3

Bottom of Sand - - - - - (Tested) 248.0

Total Feet of Permeable Sand - - - - - (Tested) 32.2

Total Feet of Floodable Sand - - - - - (Tested) 18.5

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 5 7.9 7.9

5 - 10 6.2 14.1

10 - 100 4.5 18.6

100 - 200 5.6 24.2

200 - 400 8.0 32.2

Average Permeability Millidarcys - - - - - 116.1

Average Percent Porosity - - - - - 19.8

Average Percent Oil Saturation - - - - - 40.1

Average Percent Water Saturation - - - - - 44.8

Average Oil Content, Bbls./A. Ft. - - - - - 608.

Total Oil Content, Bbls./Acre - - - - - 21,993.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 4.7

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 73.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 1,341.

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

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The core was sampled and the samples sealed in plastic bags by a representative of the client.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
199.0 - 199.3	Gray sandy shale.
199.3 - 212.8	Brown sandstone.
212.8 - 213.8	Brown slightly calcareous sandstone.
213.8 - 214.2	Hard gray calcareous sandstone.
214.2 - 216.0	Brown slightly calcareous sandstone.
216.0 - 217.0	Brown sandstone.
217.0 - 218.2	Grayish brown shaly sandstone.
218.2 - 219.8	Black carbonaceous shaly sandstone.
219.8 - 220.6	Brown sandstone.
220.6 - 228.0	Black carbonaceous shaly sandstone.
228.0 - 234.2	Gray sandy shale.
234.2 - 235.5	Brown shaly sandstone.
239.0 - 241.1	Brown shaly sandstone.
241.1 - 251.5	Brown and gray laminated sandstone and shale.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests as a total recovery of 1,341 barrels of oil per acre was obtained from 18.5 feet of sand. The weighted average percent oil saturation was reduced from 41.6 to 36.9, or represents an average recovery of 4.7 percent. The weighted average effective permeability of the samples is 10.88 millidar-

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cys, while the average initial fluid production pressure is 16.5 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 25 samples tested, 10 produced water and oil, and 4 samples produced water only. This indicates that approximately 40 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 6,050 barrels of oil per acre. This is an average recovery of 327 barrels per acre foot from 18.5 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	20.0
Average porosity, percent	20.7
Oil saturation after flooding, percent	36.9
Performance factor, percent, estimated	50.0 E
Net floodable sand, feet	18.5

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - Long 9 Well No. HCO-140

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			Ft.	Cum. Ft.		
1	199.5	23.5	37	23	675	97.	1.7	1.7	1148	164.90
3	201.5	23.2	40	42	720	324.	2.0	3.7	1440	648.00
5	203.5	24.7	39	40	747	314.	2.0	5.7	1494	628.00
7	205.5	21.9	41	48	697	399.	2.0	7.7	1394	798.00
9	207.4	20.0	44	45	683	105.	2.0	9.7	1366	210.00
11	209.5	24.9	29	57	560	310.	2.0	11.7	1120	620.00
13	211.5	23.5	40	49	729	153.	1.8	13.5	1312	275.40
15	213.5	20.7	35	54	562	160.	1.0	14.5	562	160.00
17	215.5	15.1	42	45	492	32.	1.8	16.3	886	57.60
19	217.5	17.6	51	46	696	10.	2.2	18.5	1531	22.00
21	219.4	21.3	57	20	942	3.4	1.6	20.1	1507	5.44
22	220.5	20.8	35	45	565	105.	0.8	20.9	452	84.00
24	222.4	21.0	48	21	782	9.6	2.0	22.9	1564	19.20
25	223.5	17.8	34	42	470	7.4	2.0	24.9	940	14.80
27	225.3	18.3	36	42	511	2.0	1.0	25.9	511	2.00
28	226.6	19.6	57	27	867	19.	1.0	26.9	867	19.00
29	227.5	18.7	49	29	711	3.0	1.0	27.9	711	3.00
30	234.5	19.6	40	50	608	0.52	1.3	29.2	790	0.68
31	239.3	17.8	30	51	414	0.77	1.0	30.2	414	0.77
32	240.5	17.0	35	51	462	3.4	1.1	31.3	508	3.74
33	241.5	16.9	46	38	603	0.87	0.9	32.2	543	0.78
34	242.5	12.6	17	80	166	Imp.	1.0	33.2	166	0.00
35	245.6	14.8	31	67	356	Imp.	1.0	34.2	356	0.00
36	246.5	13.9	8	85	86	Imp.	1.0	35.2	86	0.00
37	247.3	13.5	31	63	325	Imp.	1.0	36.2	325	0.00

5587.8

478.7

1160

2058.96

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Hickory Creek Oil Company		Lease	Well No.		HCO-140
			-			
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.		
	199.3 - 225.0	24.9	148.9	3707.34		
	225.0 - 248.0	7.3	4.1	29.97		
	199.3 - 248.0	32.2	116.1	3737.31		

	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 Bbbs./Acre
	199.3 - 225.0	24.9	21.2	41.1	41.0	671	16,716
	225.0 - 248.0	11.3	16.7	37.9	53.0	467	5,277
	199.3 - 248.0	36.2	19.8	40.1	44.8	608	21,993

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company

Lease LONG - 9

Well No. HCO-140

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			
1201	199.5	23.0	38	678	4	71	34	63	248	8.33	15
3	201.5	23.5	40	729	5	91	35	56	231	10.31	10
5	203.5	24.5	39	741	3	57	36	55	284	16.49	10
7	205.5	22.0	41	700	0	0	41	57	257	18.59	10
9	207.4	20.3	44	693	7	110	37	59	344	36.36	10
11	209.5	25.0	29	562	0	0	29	59	196	28.00	10
13	211.5	23.2	40	720	4	72	36	55	377	13.07	10
15	213.5	20.5	35	557	3	48	32	66	380	10.50	15
17	215.5	15.0	42	489	12	140	30	58	79	0.75	25
19	217.5	18.0	51	712	4	56	47	50	338	10.87	10
21	219.4	21.1	57	933	0	0	57	23	0	Imp.	-
22	220.5	21.2	35	576	0	0	35	59	232	5.55	15
24	222.4	20.8	48	775	3	48	45	38	31	0.45	30
25	223.5	17.9	34	472	2	28	32	57	22	0.30	30
27	225.3	18.5	36	517	0	0	36	50	20	0.30	40
28	226.6	19.1	58	859	0	0	58	30	0	Imp.	-
29	227.5	19.0	49	722	0	0	49	32	0	Imp.	-
30	234.5	19.5	40	605	0	0	40	51	0	Imp.	-
31	239.3	18.1	29	407	0	0	29	53	0	Imp.	-
32	240.5	17.0	35	462	0	0	35	51	0	Imp.	-
33	241.5	16.4	47	598	0	0	47	49	0	Imp.	-
34	242.5	13.0	16	161	0	0	16	82	0	Imp.	-
35	245.6	14.5	31	349	0	0	31	67	0	Imp.	-
36	246.5	13.6	9	95	0	0	9	90	0	Imp.	-
37	247.3	13.1	32	325	0	0	32	64	0	Imp.	-

$\frac{23.0}{21.0} = 1.09$
 $\frac{34}{35.9} = 0.94$

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

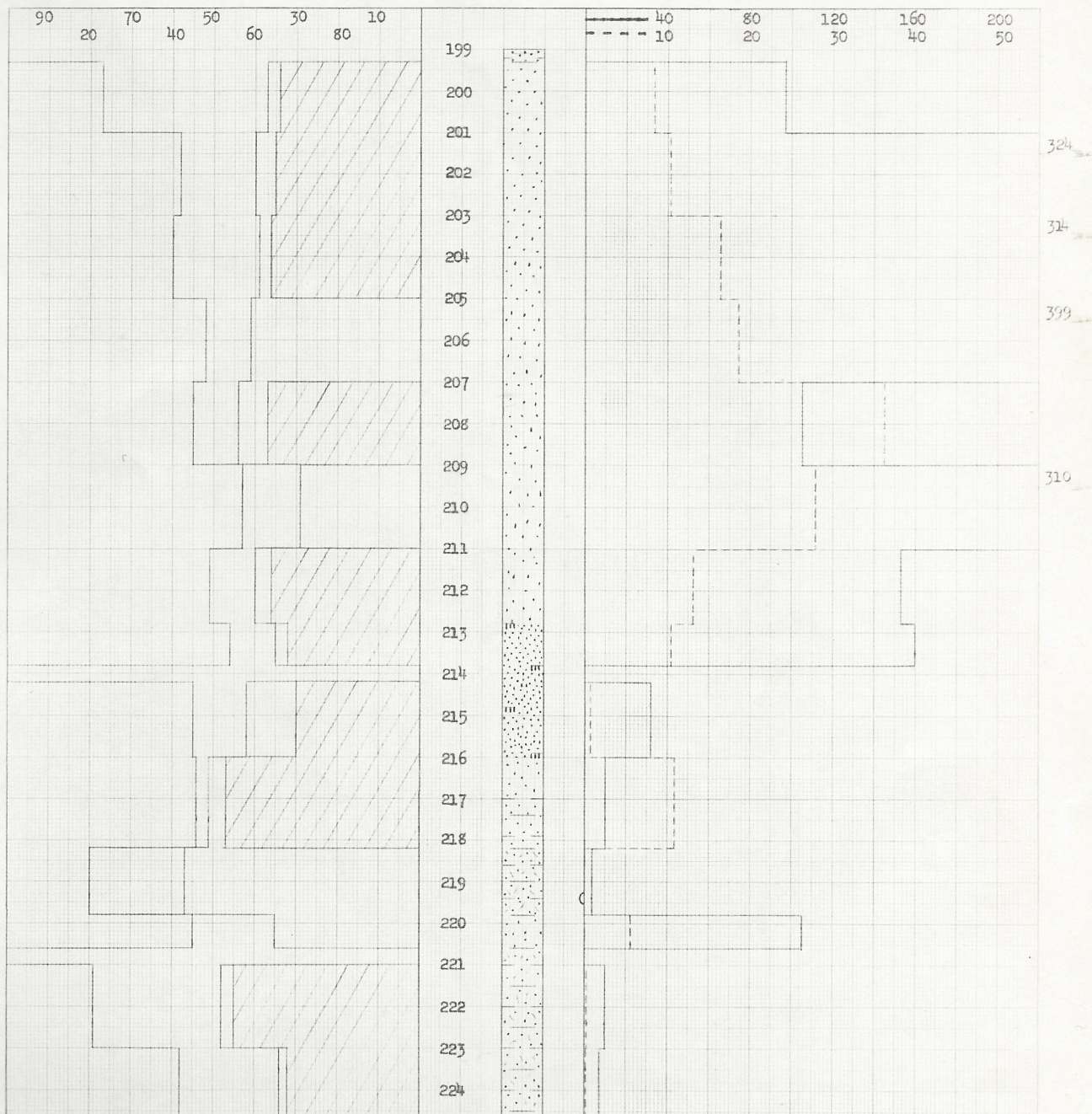
Company	Hickory Creek Oil Company	Lease	-	Well No.	HCO-140
Depth Interval, Feet	199.3 - 225.0				
Feet of Core Analyzed	18.5				
Average Percent Porosity	20.7				
Average Percent Original Oil Saturation	41.6				
Average Percent Oil Recovery	4.7				
Average Percent Residual Oil Saturation	36.9				
Average Percent Residual Water Saturation	55.0				
Average Percent Total Residual Fluid Saturation	91.9				
Average Original Oil Content, Bbls./A. Ft.	684.				
Average Oil Recovery, Bbls./A. Ft.	73.1				
Average Residual Oil Content, Bbls./A. Ft.	591.				
Total Original Oil Content, Bbls./Acre	12,272.				
Total Oil Recovery, Bbls./Acre	1,341.				
Total Residual Oil Content, Bbls./Acre	10,931.				
Average Effective Permeability, Millidarcys	10.88				
Average Initial Fluid Production Pressure, p.s.i.	16.5				

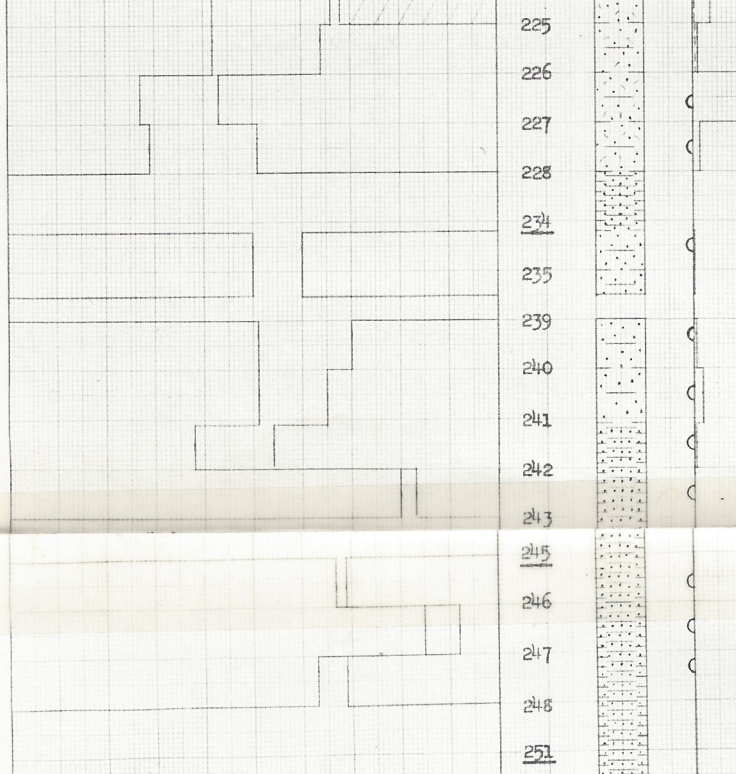
NOTE: Only those samples which recovered oil were used in calculating the above averages.

WATER SAT.,
PERCENTOIL SAT.,
PERCENT

PERMEABILITY, IN MILLIDARCYs

EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYs





KEY:



SANDSTONE



CALCAREOUS SANDSTONE



SANDY SHALE



FLOODPOT RESIDUAL OIL SATURATION



SHALY SANDSTONE



CARBONACEOUS SHALY SANDSTONE



LAMINATED SANDSTONE AND SHALE



IMPERMEABLE TO WATER

HICKORY CREEK OIL COMPANY

-- LEASE

-- COUNTY, --

WELL NO. HCC - 140

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
199.3 - 225.0	24.9	21.2	41.1	41.0	148.9	
225.0 - 248.0	11.3	16.7	37.9	53.0	4.1	
199.3 - 248.0	36.2	19.8	40.1	44.8	116.1	6,050 (PRIMARY AND WATERFLOODING)

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CHANUTE, KANSAS
APRIL, 1980. HR