

# OILFIELD RESEARCH LABORATORIES

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

April 2, 1980

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

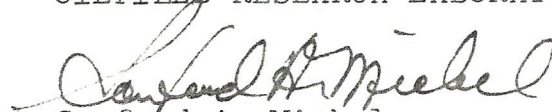
Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from Well No. HCO-136, and submitted to our laboratory on March 7, 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

# Oilfield Research Laboratories

## GENERAL INFORMATION & SUMMARY

Company Hickory Creek Oil Company Lease — Well No. HCO-136

Location —

Section — Twp. — Rge. — County — State —

Elevation, Feet	-	
Name of Sand	-	
Top of Core		182.0
Bottom of Core		262.2
Top of Sand		182.3
Bottom of Sand		254.9
Total Feet of Permeable Sand		67.9
Total Feet of Floodable Sand		17.7

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	34.4	34.4
5 - 10	3.0	37.4
10 - 30	9.0	46.4
30 - 60	12.1	58.5
60 - 100	3.7	62.2
100 - 150	5.7	67.9

Average Permeability Millidarcys	-	26.9
Average Percent Porosity	-	19.7
Average Percent Oil Saturation	-	45.5
Average Percent Water Saturation	-	37.2
Average Oil Content, Bbls./A. Ft.	-	699.
Total Oil Content, Bbls./Acre	-	47,453.
Average Percent Oil Recovery by Laboratory Flooding Tests	-	8.8
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	-	137.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	-	2,430.
Total Calculated Oil Recovery, Bbls./Acre	-	-

See "Calculated Recovery" Section.

OILFIELD RESEARCH LABORATORIES

-2-

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>
182.0 - 182.3	Gray sandy shale.
182.3 - 189.8	Dark brown sandstone.
189.8 - 197.8	Brown and gray laminated sandstone and shale.
197.8 - 198.8	Brown sandstone.
198.8 - 203.7	Grayish brown shaly sandstone.
203.7 - 204.7	Brown shaly sandstone.
204.7 - 220.7	Brown sandstone.
220.7 - 222.6	Brown shaly sandstone.
222.7 - 225.5	Brown sandstone.
225.5 - 226.0	Brown and gray laminated sandstone and shale.
226.0 - 228.0	Brown sandstone.
228.0 - 247.2	Dark brown carbonaceous shaly sandstone.
247.2 - 250.0	Black conglomeratic carbonaceous shaly sandstone.
250.0 - 250.6	Coal.
250.6 - 254.9	Black conglomeratic carbonaceous shaly sandstone.
254.9 - 262.2	Gray shale.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 2,430 barrels of oil per acre was obtained from 17.7 feet of sand. The weighted average per-

cent oil saturation was reduced from 47.0 to 38.2, or represents an average recovery of 8.8 percent. The weighted average effective permeability of the samples is 3.62 millidarcys, while the average initial fluid production pressure is 23.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 38 samples tested, 9 produced water and oil, and 10 samples produced water only. This indicates that approximately 24 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 5,930 barrels of oil per acre. This is an average recovery of 335 barrels per acre foot from 17.7 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	10.0 / 6.0 ✓
Average porosity, percent	19.5 / 18.8 ✓
Oil saturation after flooding, percent	38.2 / 37.8 ✓
Performance factor, percent, estimated	✓ 45.0 ✓
Net floodable sand, feet	17.7 / 6.0 ✓

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - Well No. D49 HCO-136

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation		Oil Content Bbbs. / A Ft.	Perm. Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water			Ft.	Cum. Ft.		
1	182.5	18.5	51	34	732	136.	1.7	1.7	1244	231.20
3	184.5	20.4	62	17	981	125.	2.0	3.7	1962	250.00
5	186.5	21.2	61	13	1003	52.	2.0	5.7	2006	104.00
7	188.5	14.4	39	53	436	34.	1.8	7.5	785	61.20
9	190.5	15.5	48	39	577	2.5	1.7	9.2	981	4.25
11	192.5	15.1	34	49	398	0.74	1.5	10.7	597	1.11
13	194.5	15.8	26	56	319	4.8	2.0	12.7	638	9.60
15	196.5	18.2	45	38	635	3.5	2.0	14.7	1270	7.00
17	198.5	17.9	45	38	625	14.	1.0	15.7	625	14.00
19	200.5	15.9	27	52	333	4.3	2.2	17.9	733	9.46
21	202.5	16.0	48	49	596	2.9	2.0	19.9	1192	5.80
22	204.5	20.3	49	32	772	6.8	1.0	20.9	772	6.80
24	206.5	21.5	46	35	767	48.	2.3	23.2	1764	110.40
26	208.5	21.0	41	41	668	70.	2.0	25.2	1336	140.00
28	210.5	20.2	37	42	580	28.	2.0	27.2	1160	56.00
30	212.5	21.5	33	49	550	45.	2.0	29.2	1100	90.00
32	214.5	19.7	43	41	657	28.	2.0	31.2	1314	56.00
34	216.5	20.4	50	39	791	26.	2.0	33.2	1582	52.00
36	218.5	22.3	34	43	588	43.	2.0	35.2	1176	86.00
38	220.5	19.4	37	40	557	62.	1.7	36.9	947	105.40
40	222.5	16.8	44	46	574	4.5	1.9	38.8	1091	8.55
42	224.5	21.8	31	48	524	43.	2.0	40.8	1048	86.00
44	226.5	19.5	36	61	545	123.	2.0	42.8	1090	246.00
47	229.5	21.7	53	29	892	3.1	2.0	44.8	1784	6.20
49	231.5	20.1	40	49	624	11.	2.0	46.8	1248	22.00
51	233.5	23.5	63	16	1149	3.7	2.0	48.8	2298	7.40
53	235.5	21.6	57	26	955	5.0	2.0	50.8	1910	10.00
55	237.5	17.9	52	40	722	3.5	2.0	52.8	1444	7.00

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - Well No. HCO-136

8337.0 752.1 1370

D49

956.12

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.		
56	238.5	20.7	59	32	948	5.2	2.0	54.8	1896	10.40
58	240.5	22.3	59	25	1021	4.3	1.0	55.8	1021	4.30
59	241.5	22.0	72	17	1229	2.2	1.0	56.8	1229	2.20
61	243.5	16.9	58	33	760	2.2	2.0	58.8	1520	4.40
63	245.5	19.1	59	28	874	0.80	2.0	60.8	1748	1.60
65	247.5	22.4	51	32	886	3.4	1.8	62.6	1595	6.12
67	249.5	26.3	44	17	898	2.4	1.0	63.6	898	2.40
69	251.5	15.0	52	37	605	1.6	1.4	65.0	847	2.24
71	253.5	25.0	26	28	504	0.31	2.0	67.0	1008	0.62
72	254.5	24.3	35	6	660	0.37	0.9	67.9	594	0.33

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease --- Well No. HCO-136

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
182.3 - 189.8	7.5	86.2	646.40
189.8 - 228.0	35.3	31.0	1094.37
228.0 - 254.9	25.1	3.5	87.21
182.3 - 254.9	67.9	26.9	1827.98

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
182.3 - 189.8	7.5	18.8	53.5	28.4	800	5,997
189.8 - 228.0	35.3	19.0	39.3	44.6	578	20,416
228.0 - 254.9	25.1	21.0	52.0	29.3	873	21,040
182.3 - 254.9	67.9	19.7	45.5	37.2	699	47,453

# Oilfield Research Laboratories

## RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company Lease D49 Well No. HCO-136

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	182.5	19.0	51	752	12	177	39	46	180	3.80	20
3	184.5	20.6	62	991	29	463	33	55	175	4.20	25
5	186.5	20.8	61	984	18	290	43	53	76	1.50	25
7	188.5	14.9	39	451	3	35	36	49	31	0.70	25
9	190.5	15.8	47	576	0	0	47	43	0	Imp.	-
11	192.5	15.3	34	404	0	0	34	50	0	Imp.	-
13	194.5	15.4	27	323	0	0	27	60	0	Imp.	-
15	196.5	18.4	45	642	0	0	45	42	0	Imp.	-
17	198.5	18.3	45	639	0	0	45	51	27	40.	40
19	200.5	16.0	27	355	0	0	27	60	0	Imp.	-
21	202.5	16.4	46	585	0	0	46	50	0	Imp.	-
22	204.5	20.0	50	776	0	0	50	36	0	Imp.	-
24	206.5	21.7	46	774	6	101	40	56	170	4.00	25
26	208.5	21.1	41	671	3	49	38	58	441	9.40	20
28	210.5	20.2	37	580	0	0	37	50	0	Imp.	-
30	212.5	21.7	33	556	0	0	33	50	252	10.00	20
32	214.5	19.9	43	664	3	46	40	55	51	1.40	30
34	216.5	20.7	50	803	0	0	50	48	76	1.10	30
36	218.5	22.2	34	589	0	0	34	59	422	10.40	20
38	220.5	19.7	37	565	0	0	37	57	433	6.00	10
40	222.5	17.0	44	580	3	40	41	45	32	0.60	30
42	224.5	21.7	31	522	0	0	31	62	245	4.00	20
44	226.5	19.7	36	550	2	31	34	63	469	6.50	10
47	229.5	21.4	53	880	0	0	53	39	8	0.20	50
49	231.5	20.3	40	630	0	0	40	45	12	0.30	50
51	233.5	24.0	61	1136	0	0	61	20	0	Imp.	-
53	235.5	21.3	57	942	0	0	57	30	0	Imp.	-

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.

50R  
= 37.8

# Oilfield Research Laboratories

## RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company Lease - D 49 Well No. HCO-136

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			
55	237.5	18.0	52	726	0	0	43	726	9	0.20	50
56	238.5	21.0	59	961	0	0	34	961	0	Imp.	-
58	240.5	22.1	59	1012	0	0	30	1012	0	Imp.	-
59	241.5	21.5	71	1201	0	0	32	1201	0	Imp.	-
61	243.5	17.0	58	765	0	0	35	765	0	Imp.	-
63	245.5	19.3	59	883	0	0	30	883	0	Imp.	-
65	247.5	22.8	50	884	0	0	35	884	0	Imp.	-
67	249.5	26.3	44	898	0	0	22	898	0	Imp.	-
69	251.5	14.6	52	589	0	0	39	589	9	0.20	50
71	253.5	24.8	26	500	0	0	33	500	0	Imp.	-
72	254.5	24.0	36	670	0	0	10	670	0	Imp.	-

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

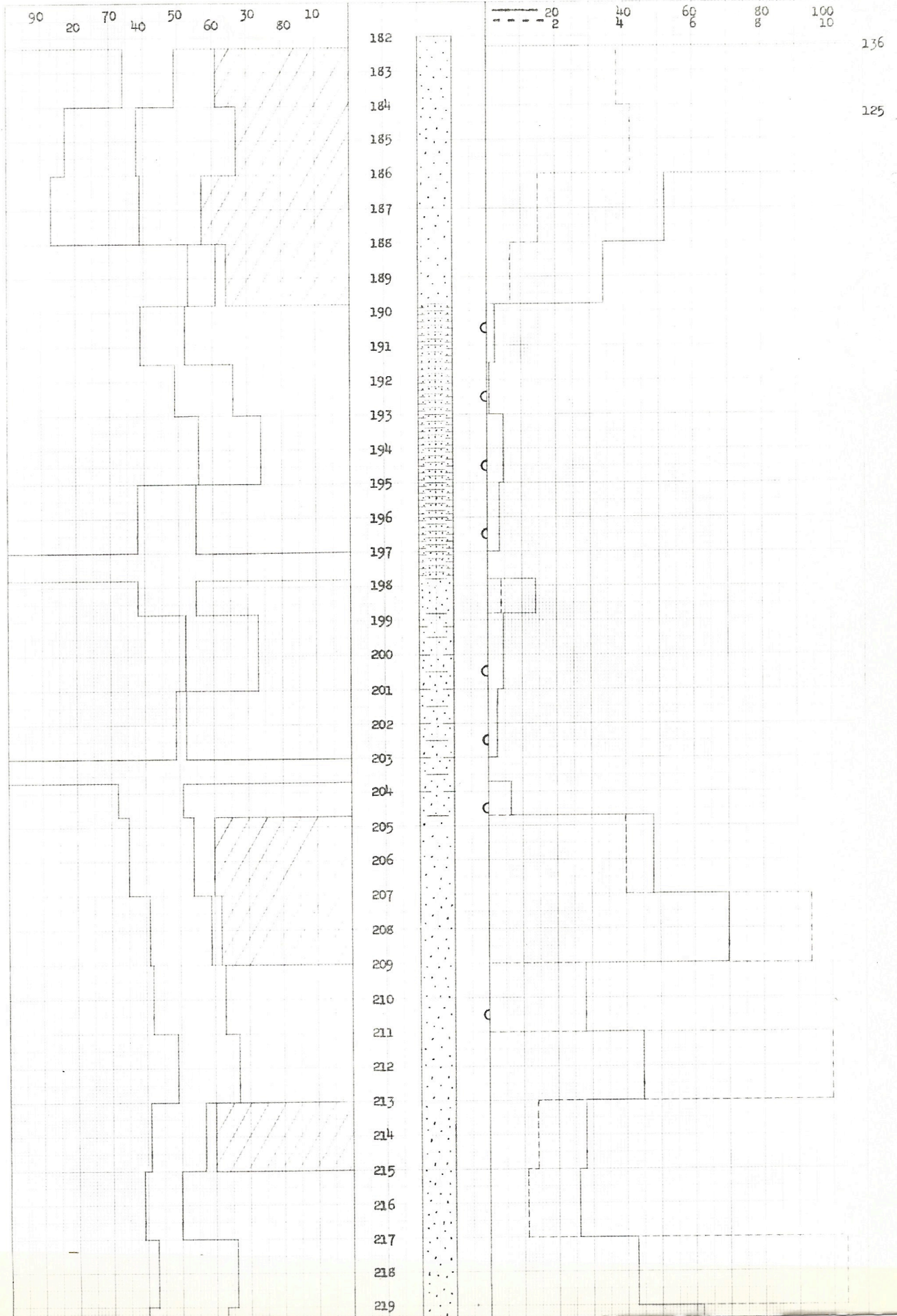
Company	Lease	Well No.
Hickory Creek Oil Company	-	HCO-136
Depth Interval, Feet	182.3 - 189.8	189.8 - 228.0
Depth of Core Analyzed	7.5	10.2
Average Percent Porosity	18.9	20.0
Average Percent Original Oil Saturation	53.7	42.1
Average Percent Oil Recovery	16.0	3.5
Average Percent Residual Oil Saturation	37.7	38.6
Average Percent Residual Water Saturation	51.0	55.5
Average Percent Total Residual Fluid Saturation	88.7	94.1
Average Original Oil Content, Bbls./A. Ft.	804.	652.
Average Oil Recovery, Bbls./A. Ft.	249.	55.
Average Residual Oil Content, Bbls./A. Ft.	556.	597.
Total Original Oil Content, Bbls./Acre	6,040.	6,652.
Total Oil Recovery, Bbls./Acre	1,870.	560.
Total Residual Oil Content, Bbls./Acre	4,170.	6,092.
Average Effective Permeability, Millidarcys	2.55	4.41
Average Initial Fluid Production Pressure, p.s.i.	23.8	23.0

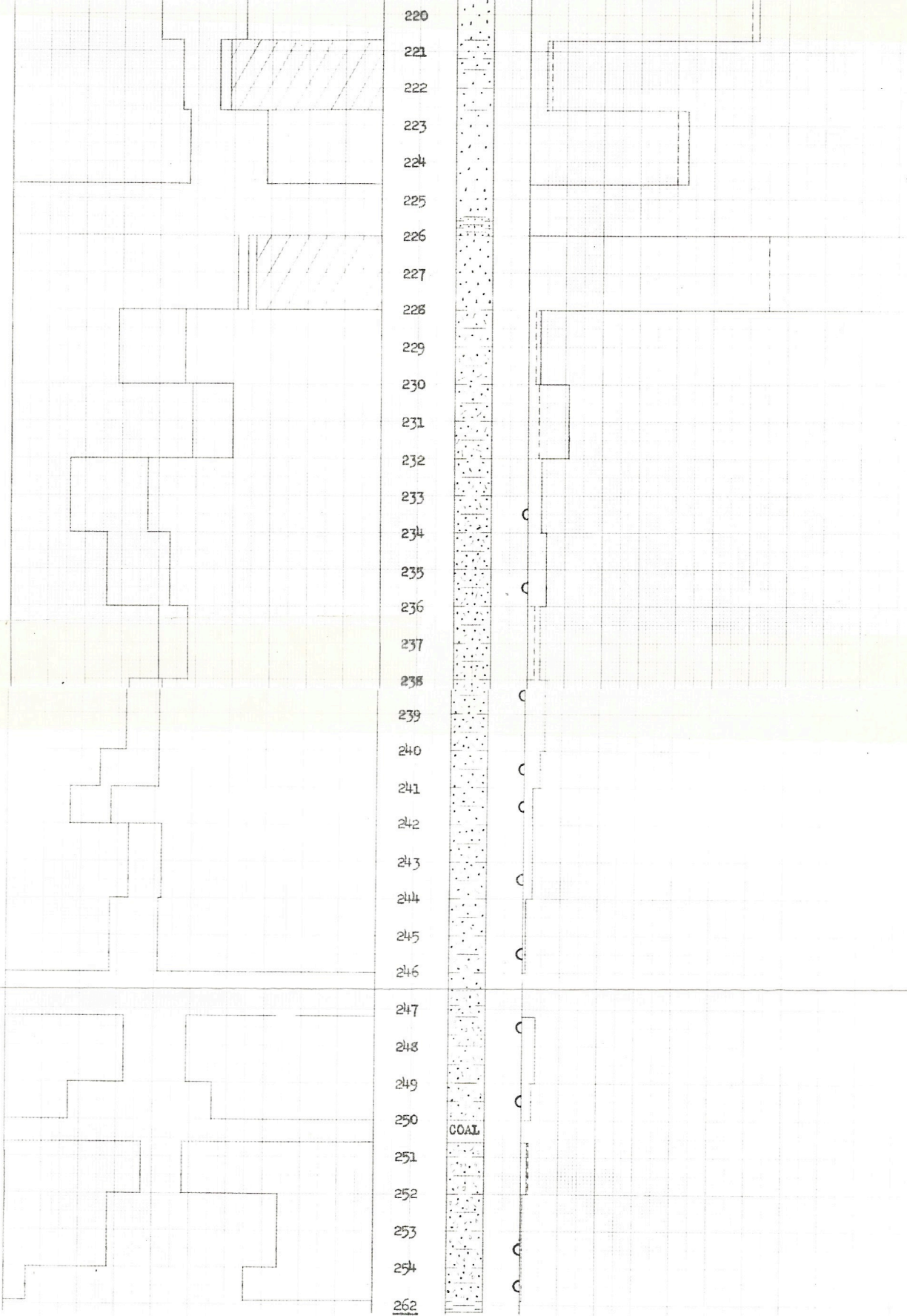
NOTE: Only those samples which recovered oil were used in calculating the above averages.

WATER SAT.,  
PERCENT

OIL SAT.,  
PERCENT

47 1512  
PERMEABILITY, IN MILLIDARCY  
EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCY





# HICKORY CREEK OIL COMPANY

WELL NO. HCO - 136

-- LEASE

-- COUNTY, --

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY BBL./ACRE
182.3 - 189.3	7.5	18.8	53.5	28.4	86.2	
189.8 - 228.0	35.3	19.0	39.3	44.6	31.0	
228.0 - 254.9	25.1	21.0	52.0	29.3	3.5	
182.3 - 254.9	67.9	19.7	45.5	37.2	26.9	5,930 (PRIMARY & WATERFLOODING)

OILFIELD RESEARCH LABORATORIES  
 CHANUTE, KANSAS  
 APRIL, 1980. HR