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

June 5, 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-165, and submitted to our laboratory on April 30, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/kas
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-165

Location –

Section – Twp. – Rge. – County – State –

Elevation, Feet

Name of Sand

Top of Core	190.0
Bottom of Core	238.5
Top of Sand	190.0
Bottom of Sand	232.7
Total Feet of Permeable Sand	19.3
Total Feet of Floodable Sand	12.4

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 – 5	3.4	3.4
5 – 100	5.0	8.4
100 – 300	6.4	14.8
300 – 600	4.5	19.3

Average Permeability Millidarcys	177.6
Average Percent Porosity	22.3
Average Percent Oil Saturation	42.5
Average Percent Water Saturation	46.3
Average Oil Content, Bbls./A. Ft.	723.
Total Oil Content, Bbls./Acre	14,676.
Average Percent Oil Recovery by Laboratory Flooding Tests	7.1
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	125.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,547.
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.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
190.0 - 206.9	Brown slightly calcareous sandstone.
206.9 - 209.8	Brown shaly sandstone.
227.0 - 228.8	Gray sandy shale.
228.8 - 229.0	Coal.
229.0 - 230.4	Gray sandy shale.
230.4 - 232.7	Brown shaly sandstone.
232.7 - 238.5	Gray sandy shale.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,547 barrels of oil per acre was obtained from 12.4 feet of sand. The weighted average percent oil saturation was reduced from 41.6 to 34.5, or represents an average recovery of 7.1 percent. The weighted average effective permeability of the samples is 19.27 millidarcys, while the average initial fluid production pressure is 10.6 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 15 samples tested, 9 produced water and oil, and 2 samples produced water only. This indicates that approximately 60 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 3,770 barrels of oil per acre. This is an average recovery of 304 barrels per acre foot from 12.4 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	30.0 / 46.7
Average porosity, percent	23.4
Oil saturation after flooding, percent	30.0 / 34.2
Performance factor, percent, estimated	50.0
Net floodable sand, feet	12.4 / 7

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - Long 18 Well No. HCO-165

3074.5 328.8 677 2620.62

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	190.5	17.6	43	50	93	587	199.	1.0	1.0	587	199.00
2	191.5	25.8	36	39	75	721	345.	1.0	2.0	721	345.00
3	192.5	25.7	31	55	86	618	556.	1.0	3.0	618	556.00
4	193.5	25.8	40	55	95	801	318.	1.0	4.0	801	318.00
5	194.5	22.5	44	46	90	768	99.	1.5	5.5	1152	148.50
7	196.5	21.6	56	35	91	938	90.	1.5	7.0	1407	135.00
9	198.5	23.9	30	61	91	556	203.	2.0	9.0	1112	406.00
11	200.5	20.7	51	35	86	819	415	1.5	10.5	1229	622.50
13	202.5	22.6	49	45	94	859	83.	2.0	12.5	1718	166.00
15	204.5	24.4	37	51	88	700	158.	1.5	14.0	1050	237.00
17	206.5	23.8	33	62	95	609	149.	1.9	15.9	1157	283.10
18	208.5	22.1	38	38	76	652	4.8	2.1	18.0	1369	10.08
20	230.5	15.6	52	33	85	629	0.22	0.6	18.6	377	0.13
21	231.5	15.6	58	36	94	702	Imp.	1.0	19.6	702	0.00
22	232.5	21.1	59	36	95	966	0.60	0.7	20.3	676	0.42

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease – Well No. HCO-165

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
190.0 - 209.0	18.0	190.3	3226.18
230.4 - 232.7	1.3	0.42	0.55
190.0 - 232.7	19.3	177.6	3426.73

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
90.0 - 209.0	18.0	23.0	40.7	47.7	718	12,921
30.4 - 232.7	2.3	17.3	56.7	35.2	763	1,755
90.0 - 232.7	20.3	22.3	42.5	46.3	723	14,676

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company. Lease - LONG 18 Well No. HCO-165

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	190.5	18.0	42	587	8	112	34	54	475	190	15.60	10
2	191.5	25.5	36	712	3	59	33	60	653	453	34.98	10
3	192.5	25.9	31	623	2	40	29	64	583	267	24.74	10
4	193.5	25.8	40	801	7	140	33	59	661	198	32.50	10
5	194.5	22.6	44	771	8	140	36	56	631	341	13.28	10
7	196.5	22.1	56	960	16	274	40	51	686	128	19.20	10
9	198.5	24.0	30	559	0	0	30	64	559	286	15.24	10
11	200.5	20.4	51	807	0	0	51	41	807	0	Imp.	-
13	202.5	23.0	49	874	10	178	39	53	696	318	8.75	15
15	204.5	24.2	37	695	4	75	33	62	620	491	12.50	10
17	206.5	23.9	33	612	3	56	30	65	556	315	24.29	10
18	208.5	22.2	38	654	0	0	38	46	654	14	0.15	45
20	230.5	16.0	51	633	0	0	51	34	633	0	Imp.	-
21	231.5	15.9	57	703	0	0	57	38	703	0	Imp.	-
22	232.5	20.9	59	957	0	0	59	36	957	0	Imp.	-

COAL SEAM TO WEST of WELL

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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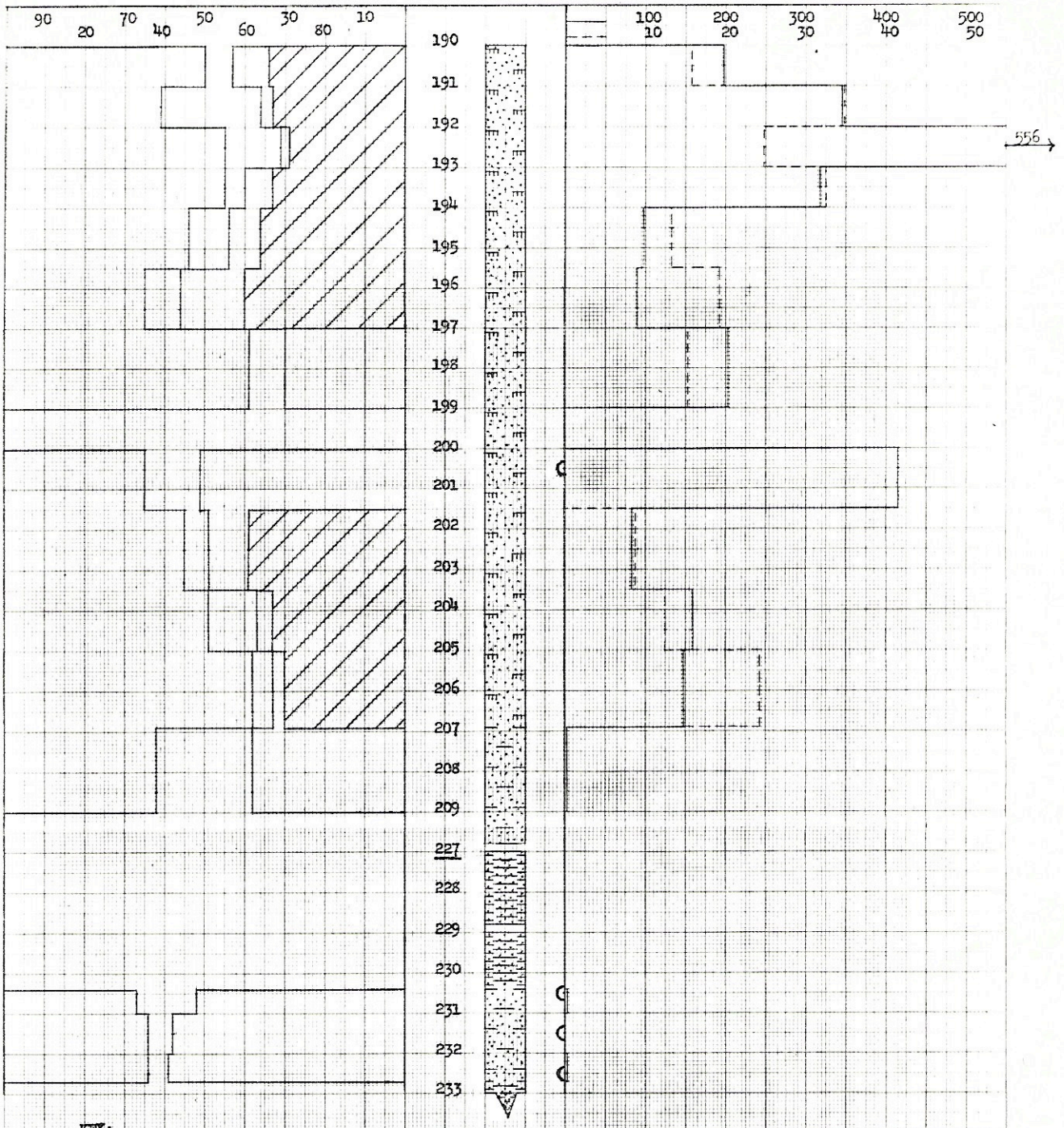
SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Hickory Creek Oil Company Lease -- Well No. HCO-165

Depth Interval, Feet	190.0 - 209.0
Feet of Core Analyzed	12.4
Average Percent Porosity	23.4
Average Percent Original Oil Saturation	41.6
Average Percent Oil Recovery	7.1
Average Percent Residual Oil Saturation	34.5
Average Percent Residual Water Saturation	58.1
Average Percent Total Residual Fluid Saturation	92.6
Average Original Oil Content, Bbls./A. Ft.	748.
Average Oil Recovery, Bbls./A. Ft.	125.
Average Residual Oil Content, Bbls./A. Ft.	623.
Total Original Oil Content, Bbls./Acre	9,273.
Total Oil Recovery, Bbls./Acre	1,547.
Total Residual Oil Content, Bbls./Acre	7,726.
Average Effective Permeability, Millidarcys	19.27
Average Initial Fluid Production Pressure, p.s.i.	10.6

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



KEY:

- CALCAREOUS SANDSTONE
- SHALY SANDSTONE
- SANDY SHALE
- COAL
- FLOODPOT RESIDUAL OIL SATURATION
- IMPERMEABLE TO WATER

HICKORY CREEK OIL COMPANY

LEASE — COUNTY, — WELL NO. HCO-165

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
190.0 - 209.0	18.0	23.0	40.7	47.7	190.3	
230.4 - 232.7	2.3	17.3	56.7	35.2	0.42	
190.0 - 232.7	20.3	22.3	42.5	46.3	177.6	3770 (PRIMARY & WATERFLOODING)

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CHANUTE, KANSAS
JUNE, 1930

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