OILFIELD RESEARCH LABORATORIES

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

May 21, 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-154, and submitted to our laboratory on April 14, 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-154

Location –

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

Elevation, Feet - - - - - - - - - - - - - - - -

Name of Sand - - - - - - - - - - - - - - - - - -	
Top of Core - - - - - - - - - - - - - - - - - -	186.0
Bottom of Core - - - - - - - - - - - - - - - - - -	206.0
Top of Sand - - - - - - - - - - - - - - - - - -	190.9
Bottom of Sand - - - - - - - - - - - - - - - - - -	206.0
Total Feet of Permeable Sand - - - - - - - - - - - - - - - -	13.0
Total Feet of Floodable Sand - - - - - - - - - - - - - - - -	6.2

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 1	4.0	4.0
10 - 20	0.8	4.8
50 - 100	1.0	5.8
100 - 200	2.1	7.9
200 - 300	5.1	13.0

Average Permeability Millidarcys - - - - - - - - - - - -	121.4
Average Percent Porosity - - - - - - - - - - - - - - - -	20.3
Average Percent Oil Saturation - - - - - - - - - - - - - - - -	43.4
Average Percent Water Saturation - - - - - - - - - - - - - - - -	41.9
Average Oil Content, Bbls./A. Ft. - - - - - - - - - - - - - - - -	663.
Total Oil Content, Bbls./Acre - - - - - - - - - - - - - - - -	8,624.
Average Percent Oil Recovery by Laboratory Flooding Tests - - - -	5.7
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - -	101.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - -	624.
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
186.0 - 190.9	Gray sandy shale.
190.9 - 199.1	Dark brown slightly calcareous sandstone.
199.1 - 201.2	Gray sandy shale.
201.2 - 206.0	Grayish brown slightly calcareous shaly sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 624 barrels of oil per acre was obtained from 6.2 feet of sand. The weighted average percent oil saturation was reduced from 43.8 to 38.1, or represents an average recovery of 5.7 percent. The weighted average effective permeability of the samples is 15.76 millidarcys, while the average initial fluid production pressure is 10.8 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 13 samples tested, 6 produced water and oil, and 3 samples produced water only. This indicates that approximately 46 percent of the sand represented by these samples is floodable sand.

McGown #13

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 1,800 barrels of oil per acre. This is an average recovery of 290 barrels of oil per acre foot from 6.2 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	30.0/41.7
Average porosity, percent	22.8/22.9
Oil saturation after flooding, percent	38.1/38.0
Performance factor, percent, estimated	55.0
Net floodable pay sand, feet	6.2/6.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - M13 Well No. HCO-154

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	191.5	20.7	49	44	93	787	188.	1.1	1.1	866	206.80
2	192.5	22.1	39	50	89	669	235.	1.0	2.1	669	235.00
3	193.5	22.2	40	39	79	689	86.	1.0	3.1	689	86.00
4	194.5	24.5	47	38	85	893	158.	1.0	4.1	893	158.00
5	195.5	24.4	40	45	85	757	266.	1.0	5.1	757	266.00
6	196.5	24.1	37	42	79	692	266.	1.0	6.1	692	266.00
7	197.5	25.7	34	44	78	678	296.	1.0	7.1	678	296.00
8	198.5	23.0	47	34	81	839	288.	1.1	8.2	923	316.80
9	201.5	19.5	41	42	83	620	14.	0.8	9.0	496	11.20
10	202.5	16.4	37	52	89	471	0.32	1.0	10.0	471	0.32
11	203.5	11.7	56	40	96	508	0.50	1.0	11.0	508	0.50
12	204.5	10.2	61	37	98	482	0.63	1.0	12.0	482	0.63
13	205.5	18.4	35	38	73	500	0.87	1.0	13.0	500	0.87
	2577.5	262.9		545			1799.32				

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease - Well No. HCO-154

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
190.9 - 199.1	8.2	190.8	1564.60
201.2 - 206.0	4.8	2.8	13.52
190.9 - 206.0	13.0	121.4	1578.12

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
190.9 - 199.1	8.2	23.3	41.8	41.9	752	6,167
201.2 - 206.0	4.8	15.1	46.2	41.8	512	2,457
190.9 - 206.0	13.0	20.3	43.4	41.9	663	8,624

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company Lease -M13 Well No. HCO-154

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	191.5	20.5	49	779	9	143	40	49	636	419	5.70	10
2	192.5	22.1	39	669	3	51	36	59	618	256	19.65	10
3	193.5	22.0	40	683	5	85	35	55	598	383	7.00	15
4	194.5	24.9	47	908	7	135	40	56	773	486	10.40	10
5	195.5	24.6	40	763	2	38	38	56	725	381	27.98	10
~~6~~	~~196.5~~	~~24.3~~	~~37~~	~~698~~	~~0~~	~~0~~	37	~~57~~	~~698~~	~~425~~	~~28.32~~	~~10~~
7	197.5	25.2	35	684	0	0	34	60	684	468	34.31	10
8	198.5	23.0	47	839	8	143	39	55	696	246	24.00	10
9	201.5	20.0	40	621	0	0	40	44	621	0	Imp.	-
10	202.5	16.9	36	472	0	0	36	53	472	0	Imp.	-
11	203.5	11.5	56	500	0	0	56	42	500	0	Imp.	-
12	204.5	10.6	60	493	0	0	60	39	493	0	Imp.	-
13	205.5	18.4	35	500	0	0	35	40	500	47	0.40	25

> 2 Ft. Shale 199.1-201

Sor 5.26 %6 = 38.0

157.76

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

ompany Hickory Creek Oil Company Lease - Well No. HCO-154

epth Interval, Feet	190.9 - 199.1
eet of Core Analyzed	6.2
verage Percent Porosity	22.8
verage Percent Original Oil Saturation	43.8
verage Percent Oil Recovery	5.7
verage Percent Residual Oil Saturation	38.1
verage Percent Residual Water Saturation	54.9
verage Percent Total Residual Fluid Saturation	93.0
verage Original Oil Content, Bbls./A. Ft.	775.
verage Oil Recovery, Bbls./A. Ft.	101.
verage Residual Oil Content, Bbls./A. Ft.	674.
otal Original Oil Content, Bbls./Acre	4,803.
otal Oil Recovery, Bbls./Acre	624.
otal Residual Oil Content, Bbls./Acre	4,179.
verage Effective Permeability, Millidarcys	15.76
verage Initial Fluid Production Pressure, p.s.i.	10.8

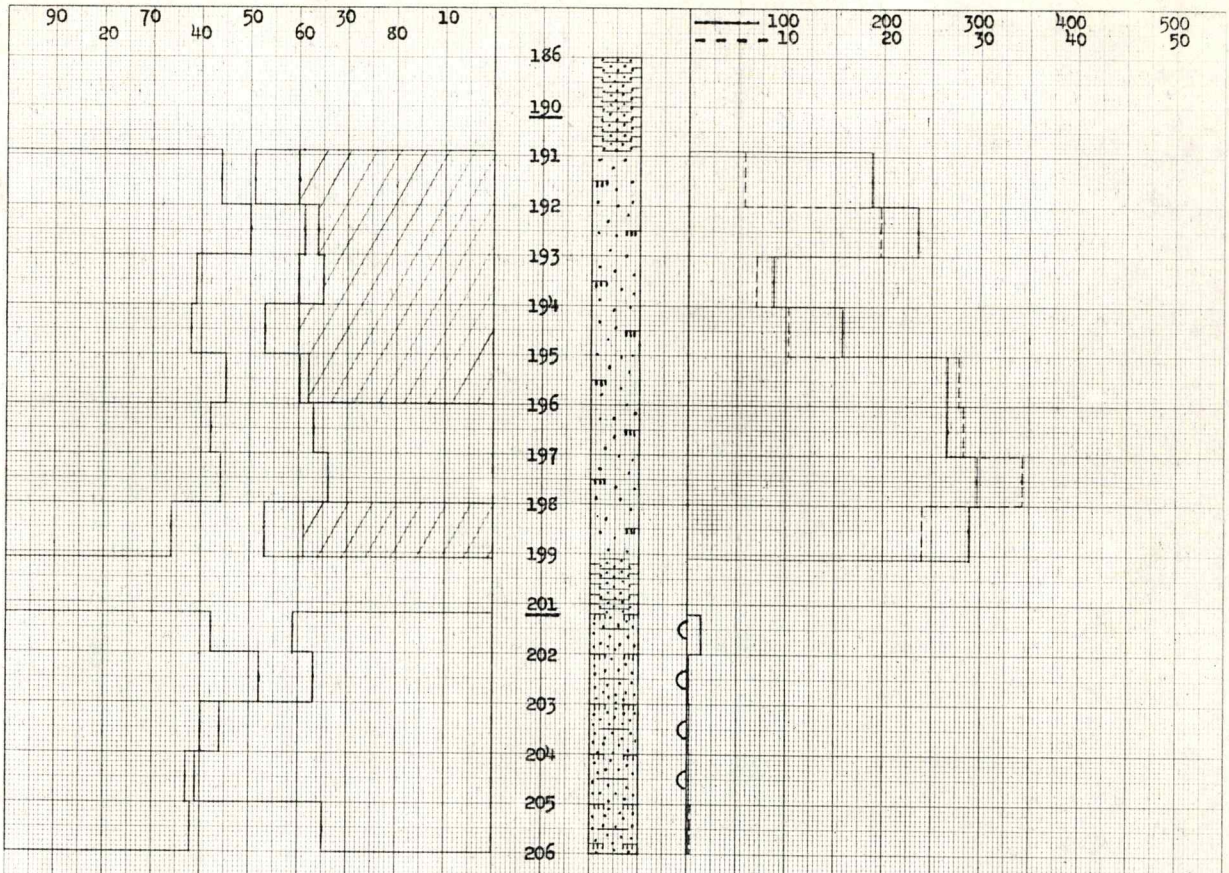
NOTE: Only those samples which recovered oil were used in calculating the above averages.

47 1512

WATER SAT., PERCENT ——> <—— OIL SAT., PERCENT

PERMEABILITY, IN MILLIDARCYS

EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS



KEY:

GALCAREOUS SANDSTONE

SANDY SHALE

IMPERMEALE TO WATER

CALCAREOUS SHALY SANDSTONE

FLOODPOT RESIDUAL OIL SATURATION

HICKORY CREEK OIL COMPANY

-- LEASE

WELL NO. HCO - 154

-- 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 BBLS./ACRE
190.9 - 199.1	8.2	23.3	41.8	41.9	190.8	
201.2 - 206.0	4.8	15.1	46.2	41.8	2.8	
190.9 - 206.0	13.0	20.3	43.4	41.9	121.4	1,800 (PRIMARY & WATERFLOODING)

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CHANUTE, KANSAS
MAY, 1960. HR