OILFIELD RESEARCH LABORATORIES
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July 23, 1980

Mid-States Petroleum Corporation
P.O. Box 402
Paola, Kansas 66071

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Nelson Lease, Well No. 3, Miami County, Kansas, and submitted to our laboratory on June 20, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/tem

5 c to Paola, Kansas

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GENERAL INFORMATION & SUMMARY

Company Mid-States Petroleum Corp. Lease Nelson Well No. 3

Location SE ¼

Section 31 Twp. 16S Rge. 24E County Miami State Kansas

Elevation, Feet	
Name of Sand	Cattleman
Top of Core	588.0
Bottom of Core	618.0
Top of Sand	588.0
Bottom of Sand	616.3
Total Feet of Permeable Sand (Tested)	25.7
Total Feet of Floodable Sand	21.6

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	4.3	4.3
10 - 50	6.0	10.3
50 - 100	8.0	18.3
100 - 200	6.0	24.3
300 - 400	1.4	25.7

Average Permeability Millidarcys	76.4
Average Percent Porosity	21.5
Average Percent Oil Saturation	53.9
Average Percent Water Saturation	22.5
Average Oil Content, Bbls./A. Ft.	916.
Total Oil Content, Bbls./Acre	25,385.
Average Percent Oil Recovery by Laboratory Flooding Tests	7.4
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	132.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	2,854.
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. The core was reported to be from a virgin area.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
588.0 - 589.7	Brown slightly calcareous sandstone.
589.7 - 592.1	Brown and gray laminated sandstone and shale.
592.1 - 593.7	Brown calcareous sandstone.
593.7 - 594.3	Brown and gray conglomeratic sandstone and shale.
594.3 - 597.1	Brown calcareous sandstone.
597.1 - 604.0	Brown and gray laminated calcareous sandstone and shale.
604.0 - 612.7	Brown calcareous sandstone.
612.7 - 613.6	Brown and gray laminated calcareous sandstone and shale.
613.6 - 616.3	Brown calcareous sandstone with coal streaks.
616.3 - 618.0	Brown and gray conglomeratic calcareous fossiliferous sandstone and shale.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 2,854 barrels of oil per acre was obtained from 21.6 feet of sand. The weighted average percent oil saturation was reduced from 58.2 to 50.8, or represents an average recovery of 7.4 percent. The weighted average effective permeability of the samples is 6.48 millidarcys, while the average initial fluid production pressure is 23.9 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 28 samples tested, 22 produced water and oil, and 3 samples produced water only. This indicates that approximately 79 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 6,130 barrels of oil per acre. This is an average recovery of 284 barrels per acre foot from 21.6 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.04
Reservoir water saturation, percent, estimated	10.0
Average porosity, percent	22.8
Oil saturation after flooding, percent	50.8
Performance factor, percent, estimated	45.0
Net floodable pay sand, feet	21.6

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Mid-States Petroleum Corporation Lease Nelson Well No. 3

*NOTE: Permeability sample unobtainable.

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	588.5	25.2	65	9	74	1271	133.	1.0	1.0	1271	133.00
2	589.6	17.0	35	52	87	462	12.	0.7	1.7	323	8.40
3	590.6	16.5	42	47	89	538	7.7	1.3	3.0	699	10.01
4	591.5	15.9	40	51	91	493	8.0	1.1	4.1	542	8.80
5	592.5	21.8	57	16	73	964	61.	0.9	5.0	868	54.90
6	593.5	23.1	58	14	72	1039	70.	0.7	5.7	727	49.00
7	594.5	23.7	54	21	75	993	56.	0.7	6.4	695	39.20
8	595.5	21.4	54	21	75	897	68.	1.0	7.4	897	56.00
9	596.5	21.0	57	14	71	929	76.	1.1	8.5	1022	83.60
10	597.5	20.5	54	19	73	859	0.68	0.9	9.4	773	0.61
11	598.5	18.2	56	28	84	791	13.	1.0	10.4	791	13.00
12	599.6	21.0	51	24	75	831	4.4	1.0	11.4	831	4.40
13	600.5	18.4	40	48	88	571	*	1.0	12.4	571	*
14	601.6	19.6	31	41	72	471	31.	1.0	13.4	471	31.00
15	602.5	22.7	61	18	79	1074	*	1.0	14.4	1074	*
16	603.6	15.9	43	47	90	530	12.	1.0	15.4	530	12.00
17	604.5	23.7	61	10	71	1122	118.	1.0	16.4	1122	118.00
18	605.5	23.5	63	7	70	1149	69.	1.0	17.4	1149	69.00
19	606.5	23.6	56	13	69	1025	23.	1.0	18.4	1025	23.00
20	607.8	20.8	54	11	65	871	56.	1.0	19.4	871	56.00
21	608.5	23.2	58	17	75	1044	163.	1.0	20.4	1044	163.00
22	609.7	23.5	63	16	79	1149	105.	1.0	21.4	1149	105.00
23	610.5	23.9	60	16	76	1113	153.	1.0	22.4	1113	153.00
24	611.5	24.5	66	10	76	1255	141.	1.0	23.4	1255	141.00
25	612.5	25.2	62	10	72	1212	97.	0.7	24.1	848	67.90
26	613.4	27.3	63	10	73	1334	60.	0.9	25.0	1201	54.00
27	614.5	26.0	51	11	62	1029	324.	1.4	26.4	1441	453.60
28	615.7	18.5	58	24	82	832	43.	1.3	27.7	1082	55.90

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Mid-States Petroleum Corporation Lease Nelson Well No. 3

*NOTE: Permeability sample unobtainable.

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.		
					VERTICAL PERMEABILITY						
1	588.5						96.				
2	589.6						0.69				
3	590.6						Imp.				
4	591.5						Imp.				
5	592.5						31.				
6	593.5						14.				
7	594.5						41.				
8	595.5						5.1				
9	596.5						27.				
10	597.5						1.4				
11	598.5						*				
12	599.6						*				
13	600.5						*				
14	601.6						*				
15	602.5						12.				
16	603.6						*				
17	604.5						27.				
18	605.5						94.				
19	606.5						58.				
20	607.8						*				
21	608.5						9.9				
22	609.7						77.				
23	610.5						119.				
24	611.5						71.				
25	612.5						133.				
26	613.4						5.2				
27	614.5						47.				
28	615.7						54.				

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Mid-States Petroleum Corporation Lease Nelson Well No. 3

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
588.0 - 604.0	13.4	37.6	503.92
604.0 - 616.3	12.3	118.7	1,459.40
588.0 - 616.3	25.7	76.4	1,963.32

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
588.0 - 604.0	15.4	20.0	49.7	29.9	785	12,085
604.0 - 616.3	12.3	23.5	59.2	13.2	1,081	13,300
588.0 - 616.3	27.7	21.5	53.9	22.5	916	25,385

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Mid-States Petroleum Corporation Lease Nelson Well No. 3

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	588.5	25.0	65	1261	14	272	51	42	989	222	3.90	25
2	589.6	17.0	35	462	0	0	35	54	462	0	Imp.	-
3	590.6	16.9	41	538	0	0	41	49	538	11	0.15	50
4	591.5	16.0	40	497	0	0	40	54	497	11	0.15	50
5	592.5	21.8	57	964	7	118	50	41	846	33	0.52	35
6	593.5	23.0	58	1035	7	125	51	45	910	131	2.62	30
7	594.5	23.5	54	984	10	182	44	50	802	193	5.32	20
8	595.5	21.6	54	905	5	84	49	45	821	159	2.92	25
9	596.5	21.1	57	933	8	131	49	41	802	124	2.10	20
10	597.5	20.6	54	863	3	48	51	39	815	23	0.30	30
11	598.5	18.5	56	804	7	100	49	35	704	45	0.60	30
12	599.5	20.7	51	819	4	64	47	46	755	14	0.15	35
13	600.5	18.8	39	569	0	0	39	50	569	0	Imp.	-
14	601.6	19.5	31	469	0	0	31	46	469	0	Imp.	-
15	602.5	22.4	61	1060	10	174	51	40	886	62	0.97	30
16	603.6	16.1	43	537	0	0	43	47	537	22	0.30	35
17	604.5	23.6	61	1117	9	165	52	44	952	392	10.49	20
18	605.5	23.4	63	1144	7	127	56	38	1017	162	5.70	20
19	606.5	23.4	56	1017	11	200	45	47	817	143	2.02	25
20	607.8	20.9	54	876	9	146	45	46	730	297	7.12	20
21	608.5	23.4	58	1053	4	73	54	39	980	256	9.15	20
22	609.7	23.5	63	1149	11	201	52	39	948	338	13.49	20
23	610.5	23.9	60	1112	6	111	54	35	1001	347	13.33	20
24	611.5	24.7	66	1265	7	134	59	37	1131	246	10.87	20
25	612.5	25.0	62	1202	8	155	54	35	1047	300	13.12	15
26	613.4	27.1	63	1325	10	210	53	38	1115	426	34.98	10
27	614.5	26.0	51	1029	5	101	46	32	928	611	6.90	10
28	615.7	18.6	58	837	3	43	55	33	794	18	0.30	45

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 Mid-States Petroleum Corporation Lease Nelson Well No. 3

Depth Interval, Feet	588.0 - 604.0	604.0 - 616.3	588.0 - 616.3
Feet of Core Analyzed	9.3	12.3	21.6
Average Percent Porosity	21.7	23.5	22.8
Average Percent Original Oil Saturation	56.8	59.2	58.2
Average Percent Oil Recovery	7.5	7.3	7.4
Average Percent Residual Oil Saturation	49.3	51.9	50.8
Average Percent Residual Water Saturation	42.1	38.3	40.0
Average Percent Total Residual Fluid Saturation	91.4	90.2	90.8
Average Original Oil Content, Bbls./A. Ft.	960.	1,081.	1,029.
Average Oil Recovery, Bbls./A. Ft.	129.	134.	132.
Average Residual Oil Content, Bbls./A. Ft.	831.	947.	897.
Total Original Oil Content, Bbls./Acre	8,933.	13,295.	22,228.
Total Oil Recovery, Bbls./Acre	1,202	1,652.	2,854.
Total Residual Oil Content, Bbls./Acre	7,731.	11,643.	19,374.
Average Effective Permeability, Millidarcys	1.84	9.99	6.48
Average Initial Fluid Production Pressure, p.s.i.	28. 0	20.4	23.9

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 Mid-States Petroleum Corp. Lease Nelson Well No. 3

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation Connate	Drilling & Foreign	Total
1	588.5	49,507			
2	589.6	21,410			
3	590.6	20,712			
4	591.5	22,647			
5	592.5	35,345			
6	593.5	42,607			
7	594.5	31,077			
8	595.5	33,030			
9	596.5	37,578			
10	597.5	39,835			
11	598.5	32,036			
12	599.6	29,779			
13	600.5	21,190			
14	601.6	23,842			
15	602.5	33,117			
16	603.6	24,697			
17	604.5	54,404			
18	605.5	58,691			
19	606.5	43,793			
20	607.8	51,603			
21	608.5	28,435			
22	609.7	29,621			
23	610.5	27,165			
24	611.5	50,673			
25	612.5	24,813			
26	613.4	38,742			
27	614.5	40,803			
28	615.7	37,499			

Note: ppm — parts per million