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

August 10, 1979

Lincoln 77
8485 Kathy Lane
Lincoln, Nebraska 68526

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the A. R. Mathias Lease, Well No. 2, Coffey County, Kansas, and submitted to our laboratory on August 6, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

BRP:dlb

4 c to Lincoln, Nebraska
1 c to Topeka, Kansas

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GENERAL INFORMATION & SUMMARY

Company Lincoln 77 Lease A. R. Mathias Well No. 2

Location W½ SE NW

Section 31 Twp. 22S Rge. 16E County Coffey State Kansas

Name of Sand	Upper Squirrel
Top of Core	1045.0
Bottom of Core	1057.0
Top of Sand	1045.0
Bottom of Sand	1055.0
Total Feet of Permeable Sand	9.1
Total Feet of Floodable Sand	4.3

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
1 - 7	4.3	4.3
15 - 70	3.5	7.8
70 & Above	1.3	9.1

Average Permeability Millidarcys	30.8
Average Percent Porosity	16.9
Average Percent Oil Saturation	39.7
Average Percent Water Saturation	42.0
Average Oil Content, Bbls./A. Ft.	539.
Total Oil Content, Bbls./Acre	4,903.
Average Percent Oil Recovery by Laboratory Flooding Tests	5.4
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	86.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	369.
Total Calculated Oil Recovery, Bbls./Acre	1,090.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

This core was sampled and the samples sealed in plastic bags by a representative of the client. Fresh water mud was used as the circulating fluid while taking the core. The well was reported to have been drilled in a semi-virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
1045.0 - 1048.8	Hard brown slightly calcareous sandstone containing thin barren streaks of calcareous sandstone.
1048.8 - 1049.7	Gray and brown laminated shale and sandstone.
1049.7 - 1050.2	Brown laminated shaly sandstone.
1050.2 - 1055.0	Dark brown sandstone.
1055.0 - 1057.0	Gray sandy shale.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 369 barrels of oil per acre was obtained from 4.3 feet of sand. The weighted average percent oil saturation was reduced from 46.6 to 41.2, or represents an average recovery of 5.4 percent. The weighted average effective permeability of the samples is 3.04 millidarcys, while the average initial fluid production pressure is 29.0 pounds per square inch (See Table V).

CALCULATED RECOVERY

The results of the laboratory testing indicates that efficient primary and waterflooding operations in the vicinity of this well should recover approximately 1,090 barrels of oil per acre. This is an average recovery of 254 barrels per acre foot from the 4.3 feet of floodable sand analyzed in this core.

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

Original formation volume factor	1.02
Reservoir water saturation, percent	25.0
Average porosity, percent	20.2
Oil saturation after flooding, percent	41.2
Performance factor, percent	50.0
Net floodable pay sand, feet	4.3

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Lincoln 77 Lease A. R. Mathias Well No. 2

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	1045.8	14.9	25	60	85	289	5.4	1.0	1.0	289	5.40
2	1046.5	12.6	19	71	90	186	5.4	1.0	2.0	186	5.40
3	1047.5	14.9	44	43	87	509	1.9	1.8	3.8	916	3.42
4	1049.8	16.2	42	45	87	529	6.7	0.5	4.3	265	3.35
5	1050.5	19.5	40	33	73	605	31.	0.5	4.8	303	15.50
6	1051.0	20.8	44	27	71	710	68.	1.0	5.8	710	68.00
7	1052.5	20.5	52	29	81	827	103.	1.3	7.1	1,078	133.90
8	1053.5	21.0	48	31	79	782	31.	1.0	8.1	782	31.00
9	1054.9	12.7	38	39	77	374	15.	1.0	9.1	374	15.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Lincoln 77 Lease A. R. Mathias Well No. 2

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
1045.0 - 1048.8	3.8	3.7	14.22
1049.2 - 1055.0	5.3	50.4	266.75
1045.0 - 1055.0	9.1	30.8	280.97

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
1045.0 - 1048.8	3.8	14.3	32.4	54.9	367	1,391
1049.2 - 1055.0	5.3	18.7	45.0	32.8	663	3,512
1045.0 - 1055.0	9.1	16.9	39.7	42.0	539	4,903

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Lincoln 77 Lease A. R. Mathias Well No. 2

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	1045.8	14.6	27	306	0	0	27	62	306	0	Imp.	—
2	1046.5	12.7	19	187	0	0	19	73	187	0	Imp.	—
3	1047.5	15.0	44	512	0	0	44	46	512	0	Imp.	—
4	1049.8	16.7	42	544	5	65	37	54	479	10	0.37	35
5	1050.5	20.0	40	621	5	78	35	62	543	74	1.50	20
6	1051.0	20.9	44	713	4	65	40	57	648	147	3.60	20
7	1052.5	20.8	52	839	8	129	44	53	710	265	6.37	20
8	1053.5	20.7	48	771	4	64	44	48	707	9	0.22	50
9	1054.9	13.0	37	373	0	0	37	42	373	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.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Lincoln 77 Lease A. R. Mathias Well No. 2

Depth Interval, Feet	1049.2 - 1054.0
Feet of Core Analyzed	4.3
Average Percent Porosity	20.2
Average Percent Original Oil Saturation	46.6
Average Percent Oil Recovery	5.4
Average Percent Residual Oil Saturation	41.2
Average Percent Residual Water Saturation	53.9
Average Percent Total Residual Fluid Saturation	95.1
Average Original Oil Content, Bbls./A. Ft.	735.
Average Oil Recovery, Bbls./A. Ft.	86.
Average Residual Oil Content, Bbls./A. Ft.	649.
Total Original Oil Content, Bbls./Acre	3,159.
Total Oil Recovery, Bbls./Acre	369.
Total Residual Oil Content, Bbls./Acre	2,790.
Average Effective Permeability, Millidarcys	3.04
Average Initial Fluid Production Pressure, p.s.i.	29.0

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