OILFIELD RESEARCH LABORATORIES

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December 11, 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 Ellis Lease, Well No. 3, Coffey County, Kansas, and submitted to our laboratory on November 20, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

Benjamin R. Pearman

BRP/tem
4 c to Lincoln, Nebraska
1 c to Topeka, Kansas

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GENERAL INFORMATION & SUMMARY

Company Lincoln 77 Lease Ellis Well No. 3

Location NW NW NE

Section 15 Twp. 23S Rge. 16E County Coffey State Kansas

Name of Sand	Squirrel
Top of Core	963.5
Bottom of Core	974.0
Top of Sand	963.5
Bottom of Sand	972.8
Total Feet of Permeable Sand	5.7
Total Feet of Floodable Sand	4.0

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
1 - 10	2.3	2.3
10 - 50	1.4	3.7
50 - 62	1.5	5.2
62 & Above	0.5	5.7

Average Permeability Millidarcys	40.4
Average Percent Porosity	18.0
Average Percent Oil Saturation	44.6
Average Percent Water Saturation	32.6
Average Oil Content, Bbls./A. Ft.	646.
Total Oil Content, Bbls./Acre	4337.
Average Percent Oil Recovery by Laboratory Flooding Tests	9.1
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	143.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	571.
Total Calculated Oil Recovery, Bbls./Acre	See "Calculated Recovery" Section.
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 this core.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
963.5 - 964.5	Gray and brown laminated shale and sandstone, 30% sandstone.
964.5 - 966.0	Brown sandstone.
966.0 - 967.5	Brown sandstone laminated with thin shale streaks.
967.5 - 968.3	Gray sandy shale.
968.3 - 968.7	Brown and gray laminated sandstone and shale, 60% sandstone.
968.7 - 969.7	Gray shaly sandstone.
969.7 - 971.5	Gray sandy shale.
971.5 - 972.8	Dark shaly carbonaceous sandstone.
972.8 - 974.0	Gray sandy shale.

LABORATORY FLOODING TESTS

The sand in the upper portion of this core responded to laboratory flooding tests, as a total recovery of 571 barrels of oil per acre was obtained from 4.0 feet of sand. The weighted average percent oil saturation was reduced from 51.4 to 42.3, or represents an average recovery of 9.1 percent. The weighted average effective permeability of the samples is 3.03 millidarcys, while the average initial fluid production pressure is 35.0 pounds per square inch (See Table V).

CALCULATED RECOVERY

A study of the results of the laboratory testing indicates that efficient primary and waterflooding operations in the vicinity of this well should recover approximately 1,550 barrels of oil per acre. This is an average recovery of 387 barrels per acre foot from the 4.0 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.02
Reservoir water saturation, percent, estimated	10.0
Average porosity, percent	19.8
Oil saturation after flooding, percent	42.3
Performance factor, percent, estimated	55.0
Net floodable pay sand, feet	4.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Lincoln 77 Lease Ellis Well No. 3

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	963.9	17.3	50	26	76	671	1.4	1.0	1.0	671	1.40
2	964.6	21.2	53	14	67	872	153.	0.5	1.5	436	76.50
3	965.3	21.4	54	16	70	897	49.	1.0	2.5	897	49.00
4	966.2	22.1	53	13	66	909	62.	1.0	3.5	909	62.00
5	967.3	17.4	44	32	76	594	61.	0.5	4.0	297	30.50
6	968.4	18.7	44	27	71	638	14.	0.4	4.4	255	5.60
7	969.5	12.4	14	81	95	135	2.2	1.0	5.4	135	2.20
8	971.7	16.4	47	34	81	598	8.7	0.3	5.7	179	2.61
9	972.6	15.3	47	38	85	558	Imp.	1.0	6.7	558	0.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Lincoln 77 **Lease** Ellis **Well No.** 3

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
963.5 - 972.8	5.7	40.4	229.81

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
963.5 - 972.8	6.7	18.0	44.6	32.6	646	4,337

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Lincoln 77 Lease Ellis 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	963.9	17.0	50	659	9	119	41	55	540	38	0.60	30
2	964.6	21.5	53	884	9	150	44	55	734	326	9.15	30
3	965.3	21.0	54	880	14	228	40	57	652	262	4.65	30
4	966.2	21.8	53	896	8	135	45	48	761	225	2.20	35
5	967.3	17.2	44	587	2	27	42	39	560	2	0.15	50
6	968.4	18.9	45	660	0	0	45	29	660	0	Imp.	-
7	969.5	12.4	14	135	0	0	14	82	135	0	Imp.	-
8	971.7	16.4	45	573	0	0	45	37	573	0	Imp.	-
9	972.6	15.2	47	554	0	0	47	40	554	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 Ellis Well No. 3

Depth Interval, Feet	963.5 - 967.5
Feet of Core Analyzed	4.0
Average Percent Porosity	19.8
Average Percent Original Oil Saturation	51.4
Average Percent Oil Recovery	9.1
Average Percent Residual Oil Saturation	42.3
Average Percent Residual Water Saturation	51.8
Average Percent Total Residual Fluid Saturation	94.1
Average Original Oil Content, Bbls./A. Ft.	793.
Average Oil Recovery, Bbls./A. Ft.	143.
Average Residual Oil Content, Bbls./A. Ft.	650.
Total Original Oil Content, Bbls./Acre	3,171.
Total Oil Recovery, Bbls./Acre	571.
Total Residual Oil Content, Bbls./Acre	2,600.
Average Effective Permeability, Millidarcys	3.03
Average Initial Fluid Production Pressure, p.s.i.	35.0

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