

# OILFIELD RESEARCH LABORATORIES

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

December 2, 1981

Lincoln 77  
3633 O Street, Suite 4  
P. O. Box 30538  
Lincoln, Nebraska 68510

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Martz Lease, Well No. 5, located in Coffey County, Kansas and submitted to our laboratory on November 24, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/kas

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

**Oilfield Research Laboratories**  
**GENERAL INFORMATION & SUMMARY**

Company Lincoln 77 Lease Martz Well No. 5  
 Location 220' NSL, SE, SW, NE  
 Section 13 Twp. 23S Rge. 16E County Coffey State Kansas

Elevation, Feet .....

Name of Sand..... LOWER SQUIRREL  
 Top of Core ..... 932.0  
 Bottom of Core ..... 943.8  
 Top of Sand ..... (Tested) 935.8  
 Bottom of Sand ..... (Tested) 939.5  
 Total Feet of Permeable Sand ..... 2.7  
 Total Feet of Floodable Sand ..... 1.0

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 4	1.0	1.0
28 - 62	1.7	2.7

Average Permeability Millidarcys ..... 28.0  
 Average Percent Porosity ..... 17.2  
 Average Percent Oil Saturation ..... 62.0  
 Average Percent Water Saturation ..... 24.3  
 Average Oil Content, Bbls./A. Ft. .... 821.  
 Total Oil Content, Bbls./Acre ..... 2,217.  
 Average Percent Oil Recovery by Laboratory Flooding Tests ..... 22.6  
 Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. .... 353.  
 Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre ..... 353.  
 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. Fresh water mud was used as a drilling fluid. The core was reported to be from a semi-virgin area.

#### FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
932.0 - 935.8	Grayish brown very shaly sandstone.
935.8 - 936.5	Dark brown sandstone with fine micaceous partings.
936.5 - 937.0	Grayish brown shaly sandstone.
937.0 - 937.5	Alternate layers gray shale and brown sandstone.
937.5 - 937.8	Dark brown sandstone with fine shale partings.
937.8 - 939.5	Alternate layers gray shale and brown sandstone.
939.5 - 943.8	Grayish brown shaly sandstone.

#### LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 353 barrels of oil per acre was obtained from 1.0 feet of sand. The weighted average percent oil saturation was reduced from 71.3 to 48.7, or represents an average recovery of 22.6 percent. The weighted average effective permeability of the samples is 5.02 millidarcys, while the average initial fluid production pressure is 20.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 4 samples tested, 2 produced water and oil, and 1 sample water only. This indicates that approximately 50 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 316 barrels of oil per acre. This is an average recovery of 316 barrels per acre foot from 1.0 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.05
Reservoir water saturation, percent, estimated	10.0
Average porosity, percent	20.0
Oil saturation after flooding, percent	48.7
Performance factor, percent, estimated	55.0
Net floodable sand, feet	1.0

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## RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Lincoln 77 Lease Martz Well No. 5

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbbls. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
1	935.9	20.1	71	11	82	1107	61.	0.7	0.7	775	42.70
2	937.7	20.0	72	15	87	1117	32.	0.3	1.0	335	9.60
3	938.7	13.4	68	26	94	707	3.7	1.0	2.0	707	3.70
4	939.4	18.4	40	39	79	571	28.	0.7	2.7	400	19.60

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## SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Lease	Martz	Well No.
Lincoln 77			5
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
935.8 - 939.5	2.7	28.0	75.60
Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Water Saturation
935.8 - 939.5	2.7	17.2	24.3
Depth Interval, Feet	Feet of Core Analyzed	Average Oil Saturation	Average Oil Content Bbl./A. Ft.
935.8 - 939.5	2.7	62.0	821
			Total Oil Content Bbls./Acre
			2,217

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## RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company		Lease										Well No.
Lincoln 77		Martz										5
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.	
			%	Bbbs./A. Ft.	%	Bbbs./A. Ft.	% Oil	% Water				Bbbs./A. Ft.
1	935.9	20.2	71	1113	22	345	49	40	292	3.60	20	
2	937.7	19.8	72	1106	24	369	48	41	272	8.33	20	
3	938.7	13.5	68	712	0	0	60	36	12	0.75	50	
4	939.4	18.9	39	582	0	0	39	41	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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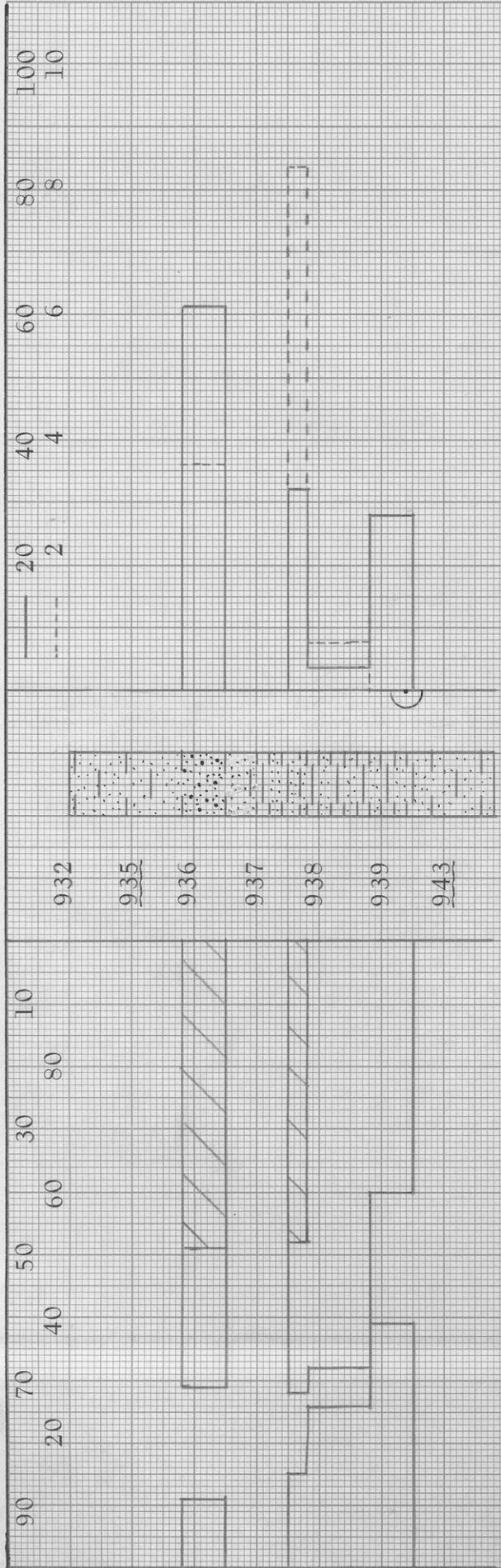
## SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Lincoln 77	Lease	Martz	Well No.	5
Depth Interval, Feet	935.8 - 939.5				
Feet of Core Analyzed	1.0				
Average Percent Porosity	20.0				
Average Percent Original Oil Saturation	71.3				
Average Percent Oil Recovery	22.6				
Average Percent Residual Oil Saturation	48.7				
Average Percent Residual Water Saturation	40.3				
Average Percent Total Residual Fluid Saturation	89.0				
Average Original Oil Content, Bbls./A. Ft.	1,112.				
Average Oil Recovery, Bbls./A. Ft.	353.				
Average Residual Oil Content, Bbls./A. Ft.	759.				
Total Original Oil Content, Bbls./Acre	1,112.				
Total Oil Recovery, Bbls./Acre	353.				
Total Residual Oil Content, Bbls./Acre	759.				
Average Effective Permeability, Millidarcys	5.02				
Average Initial Fluid Production Pressure, p.s.i.	20.0				

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

WATER SAT., PERCENT → ← OIL SAT., PERCENT  
 ----- EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCS



KEY:

-  MICACEOUS SANDSTONE
-  IMPERMEABLE TO WATER

SHALY SANDSTONE

 ALTERNATE LAYERS OF SANDSTONE AND SHALE

 SANDSTONE WITH SHALE PARTINGS

 FLOODPOT RESIDUAL OIL SATURATION

# LINCOLN 77

MARTZ LEASE

WELL NO. 5

COFFEY COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCS	CALCULATED OIL RECOVERY BBLs. / ACRE
935.8 - 939.5	2.7	17.2	62.0	24.3	28.0	316 (PRIMARY AND WATERFLOODING)

KEY:

MICACEOUS SANDSTONE

SHALY SANDSTONE

IMPERMEABLE TO WATER

SANDSTONE WITH SHALE PARTINGS

FLOODPOT RESIDUAL OIL SATURATION

# LINCOLN 77

MARTZ LEASE

WELL NO. 5

COFFEY COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCS	CALCULATED OIL RECOVERY BBLs. / ACRE
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935.8 - 939.5

2.7

17.2

62.0

24.3

28.0

316

(PRIMARY AND  
WATERFLOODING)

OILFIELD RESEARCH LABORATORIES  
CHANUTE, KANSAS  
DECEMBER, 1981

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