

OILFIELD RESEARCH LABORATORIES

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February 28, 1981

Rader Exploration

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Andrews Lease, Well No. 1-W, located in Johnson County, Kansas and submitted to our laboratory on February 17, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

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- REGISTERED ENGINEERS -

CORE ANALYSIS - WATER ANALYSIS - REPRESSURING ENGINEERING - SURVEYING & MAPPING - PROPERTY EVALUATION & OPERATION

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Rader Exploration Lease Andrews Well No. 1-W

Location SW SW NE SE

Section 10 Twp. 14 S Rge. 22 E County Johnson State Kansas

Elevation, Feet - - - - -

Name of Sand	Third Squirrel
Top of Core	690.0
Bottom of Core	695.8
Top of Sand	690.0
Bottom of Sand	695.8
Total Feet of Permeable Sand	5.8
Total Feet of Floodable Sand	5.8

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	3.5	3.5
16 & Above	2.3	5.8

Average Permeability Millidarcys	16.2
Average Percent Porosity	19.6
Average Percent Oil Saturation	59.9
Average Percent Water Saturation	32.0
Average Oil Content, Bbls./A. Ft.	917.
Total Oil Content, Bbls./Acre	5,320.
Average Percent Oil Recovery by Laboratory Flooding Tests	22.4
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	346.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	2,008.
Total Calculated Oil Recovery, Bbls./Acre	See "Calculated Recovery" Section

The core was sampled by a representative of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
690.0 - 690.7	Brown slightly calcareous shaly sandstone.
690.7 - 693.0	Brown slightly calcareous sandstone.
693.0 - 694.9	Brown slightly calcareous shaly sandstone.
694.9 - 695.8	Grayish brown shaly sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 2,008 barrels of oil per acre was obtained from 5.8 feet of sand. The weighted average percent oil saturation was reduced from 59.9 to 37.5, or represents an average recovery of 22.4 percent. The weighted average effective permeability of the samples is 0.57 millidarcys, while the average initial fluid production pressure is 26.7 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 6 samples tested, 6 produced water and oil. This indicates that approximately 100 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 1,650 barrels of oil per acre. This is an average recovery of 284 barrels per acre foot from 5.8 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	25.0
Average porosity, percent	19.6
Oil saturation after flooding, percent	37.5
Performance factor, percent, estimated	55.0
Net floodable sand, feet	5.8

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Rader Exploration Lease Andrews Well No. 1-W

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	690.6	18.8	65	27	92	948	8.7	0.7	0.7	664	6.09
2	691.3	22.4	58	27	85	1008	44.	1.3	2.0	1310	57.20
3	692.3	20.1	64	27	91	998	16.	1.0	3.0	998	16.00
4	693.3	19.3	69	29	98	1033	7.2	1.0	4.0	1033	7.20
5	694.8	19.8	61	33	94	937	8.0	0.9	4.9	843	7.20
6	695.7	15.7	43	51	94	524	0.20	0.9	5.8	472	0.18
<u>VERTICAL PERMEABILITY</u>											
1	690.6						6.7				
2	691.3						8.7				
3	692.3						8.5				

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Rader Exploration	Lease	Andrews	Well No.	1-W	
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.		
	690.0 - 695.8	5.8	16.2	93.87		
	Depth Interval, Feet	Feet of Core Analyzed	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
	690.0 - 695.8	5.8	59.9	32.0	917	5,320

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

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	690.6	18.9	65	953	30	440	35	60	513	4	0.40	30		
2	691.3	22.2	58	999	24	413	34	64	526	4	0.40	30		
3	692.3	20.0	64	993	25	388	39	57	605	16	0.50	15		
4	693.3	19.4	69	1038	31	467	38	58	571	4	0.40	20		
5	694.8	19.8	61	937	16	246	45	52	691	34	1.33	30		
6	695.7	15.7	43	524	8	97	35	62	427	14	0.44	35		

Company Rader Exploration
Lease Andrews
Well No. 1-W

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

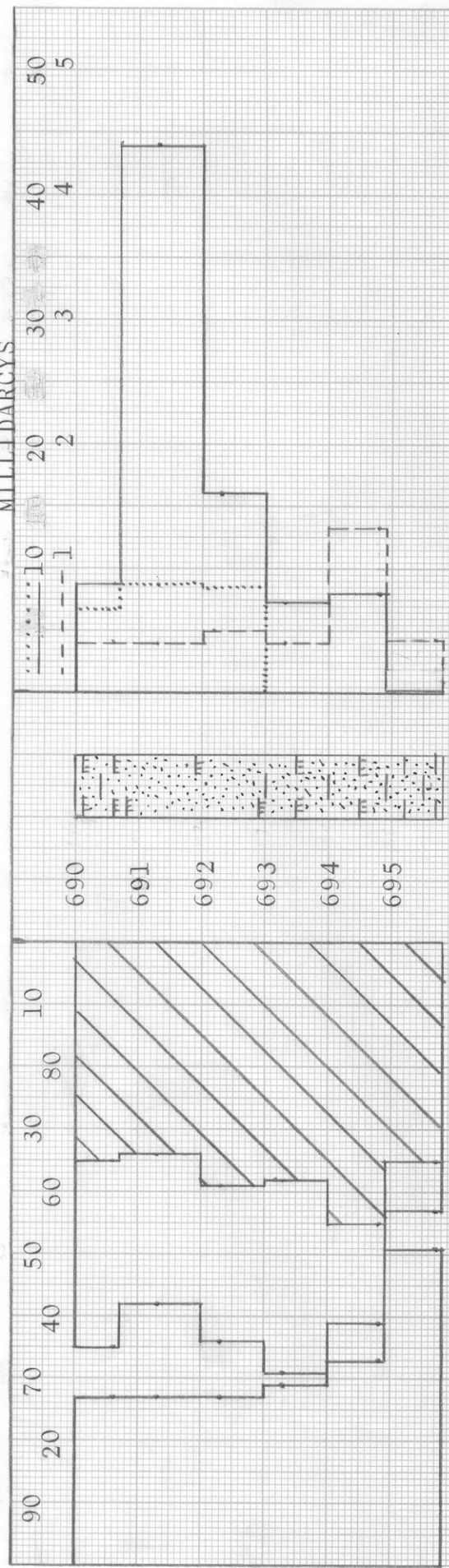
Company Rader Exploration Lease Andrews Well No. 1-W

Depth Interval, Feet	690.0 - 695.8
Feet of Core Analyzed	5.8
Average Percent Porosity	19.6
Average Percent Original Oil Saturation	59.9
Average Percent Oil Recovery	22.4
Average Percent Residual Oil Saturation	37.5
Average Percent Residual Water Saturation	59.1
Average Percent Total Residual Fluid Saturation	96.6
Average Original Oil Content, Bbls./A. Ft.	902.
Average Oil Recovery, Bbls./A. Ft.	346.
Average Residual Oil Content, Bbls./A. Ft.	556.
Total Original Oil Content, Bbls./Acre	5,233.
Total Oil Recovery, Bbls./Acre	2,008.
Total Residual Oil Content, Bbls./Acre	3,225.
Average Effective Permeability, Millidarcys	0.57
Average Initial Fluid Production Pressure, p.s.i.	26.7

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

..... VERTICAL PERMEABILITY, IN MILLIDARCYS
 PERMEABILITY, IN MILLIDARCYS
 --- EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS

WATER SAT., OIL SAT.,
 PERCENT PERCENT



KEY:
 [Pattern] SHALY SANDSTONE
 [Pattern] CALCAREOUS SANDSTONE
 [Pattern] SHALY CALCAREOUS SANDSTONE
 [Pattern] FLOODPOT RESIDUAL OIL SATURATION

RADER EXPLORATION

ANDREWS LEASE

WELL NO. W - 1

JOHNSON COUNTY, KANSAS

(PRIMARY AND WATERFLOODING)