OILFIELD RESEARCH LABORATORIES
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December 23, 1976

Lincoln 77
8485 Kathy Lane
Lincoln, Nebraska 68526

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Remer Riverside Farms Lease, Well No. 2, Coffey County, Kansas, and submitted to our laboratory on December 14, 1976.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

James E. Russell

James E. Russell
by Larry S. Brigham

JER: gb
4 c to Lincoln, Nebraska
1 c to Topeka, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Lincoln 77 Lease Remer Riverside Farms Well No. 2

Location 50'E of Center, NE NW SE

Section 28 Twp. 22S Rge. 16E County Coffey State Kansas

Name of Sand	Squirrel
Top of Core	992.0
Bottom of Core	1017.0
Top of Sand (Analyzed)	993.7
Bottom of Sand	1011.4
Total Feet of Permeable Sand	13.3
Total Feet of Floodable Sand	8.1

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	4.1	4.1
10 - 25	4.8	8.9
25 - 125	1.2	10.1
125 & above	3.2	13.3

Average Permeability Millidarcys	48.5
Average Percent Porosity	19.0
Average Percent Oil Saturation	53.1
Average Percent Water Saturation	28.7
Average Oil Content, Bbls./A. Ft.	800.
Total Oil Content, Bbls./Acre	10,637.
Average Percent Oil Recovery by Laboratory Flooding Tests	9.7
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	159.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,291.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Secondary)	2,164.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

A fresh water mud was used as a circulating fluid in the coring of the sand in this well. The well was drilled in a virgin area, and the core was sampled by a representative of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
992.0 - 993.7	Gray sandy shale.
993.7 - 994.1	Grayish brown laminated very shaly sandstone.
994.1 - 994.6	Dark fine grained slightly shaly sandstone.
994.6 - 994.8	Brownish gray laminated very shaly sandstone.
994.8 - 997.7	Dark fine grained slightly laminated slightly shaly sandstone.
997.7 - 997.9	Brownish gray laminated very shaly sandstone.
997.9 - 1001.5	Dark fine grained slightly laminated slightly shaly sandstone.
1001.5 - 1006.1	Grayish brown laminated carbonaceous shaly sandstone.
1006.1 - 1009.2	Gray carbonaceous micaceous very sandy shale.
1009.2 - 1010.3	Dark slightly carbonaceous fine grained sandstone.
1010.3 - 1011.4	Dark carbonaceous micaceous fine grained sandstone.
1011.4 - 1017.0	Gray micaceous sandy shale.

Coring was started at a depth of 992.0 feet in gray sandy shale and completed at 1017.0 feet in gray micaceous sandy shale. This core shows a total of 13.8 feet of sandstone. For the most part, the pay is made up of dark fine grained slightly laminated slightly shaly sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into two sections. The weighted average permeability of the upper and lower sections is 92.1 and 6.8 millidarcys respectively; the overall average being 48.5 (See Table III). By observing the data given on the core-graph, it is noticeable that the sand has a wide permeability range. The permeability of the sand varies from 0.46 to a maximum of 143 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a very good weighted average percent oil saturation, namely, 53.1. The weighted average percent oil saturation of the upper and lower sections is 59.7 and 45.8 respectively. The weighted average percent water saturation of the upper and lower sections is 18.9 and 39.6 respectively; the overall average being 28.7 (See Table III). This gives an overall weighted average total fluid saturation of 81.8 percent.

The weighted average oil content of the upper and lower sections is 970 and 610 barrels per acre foot respectively; the overall average being 800. The total oil content, as shown by this core, is 10,637 barrels per acre of which 6,792 barrels are in the upper section and 3,845 barrels are in the lower section (See Table III).

LABORATORY FLOODING TESTS

The upper half of the sand section in this core did respond to laboratory flooding tests, as a total recovery of 1,291 barrels of oil per acre was obtained from 8.1 feet of sand. The weighted average percent oil saturation was reduced from 59.7 to 50.0, or represents

an average recovery of 9.7 percent. The weighted average effective permeability of the samples is 1.08 millidarcys, while the average initial fluid production pressure is 27.4 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 14 samples tested, 9 produced and 9 oil. This indicates that approximately 64.3 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a high residual oil saturation after laboratory flooding.

CONCLUSION

On the basis of the above data as represented by this core, we estimate that approximately 2,164 barrels of oil per acre can be recovered from the sand reservoir. Efficient primary and secondary operations are assumed in this figure. The following data and assumptions were used in the calculation of the above oil recovery value:

Present formation volume factor	1.06
Irreducible water saturation, percent	14.8
Primary recovery	None
Present oil saturation, percent	80.4
Average porosity, percent	20.6
Oil saturation after flooding, percent	50.0
Performance factor	0.55
Net floodable pay sand, feet	8.1

This core shows an overall pay sand section extending from 994.1 to 1010.3 feet, having a good oil saturation, a low water saturation, and good porosity and permeability.

Perry S. Brigham

Perry S. Brigham

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Lincoln 77 Lease Remer Riverside Farms 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	994.5	19.9	56	20	76	865	88.	0.5	0.5	433	44.00
2	995.5	21.5	63	18	81	1051	127.	1.2	1.7	1261	152.40
3	996.5	18.3	60	16	76	852	22.	1.0	2.7	852	22.00
4	997.5	21.2	61	19	80	1004	113.	0.7	3.4	703	79.10
5	998.5	19.0	58	21	79	855	21.	1.1	4.5	941	23.10
6	999.5	23.7	61	17	78	1122	143.	1.0	5.5	1122	143.00
7	1000.5	22.7	58	19	77	1022	135.	1.0	6.5	1022	135.00
8	1001.4	20.7	57	24	81	916	-	0.5	7.0	458	-
P-8	1001.6	-	-	-	-	-	11.	0.5	7.5	-	5.50
9	1002.5	16.6	46	35	81	593	1.9	1.0	8.5	593	1.90
10	1003.5	16.3	38	51	89	481	1.5	1.0	9.5	481	1.50
11	1004.5	14.9	32	61	93	370	0.46	1.0	10.5	370	0.46
12	1005.5	17.2	31	57	88	414	3.5	1.1	11.6	455	3.85
13	1009.5	18.3	60	21	81	852	18.	1.1	12.7	937	19.80
14	1010.5	17.9	66	15	81	917	12.	1.1	13.8	1009	13.20

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Lincoln 77 Lease Remer Riverside Farms Well No. 2

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
994.1 - 1001.5	6.5	92.1	598.60
1001.5 - 1011.4	6.8	6.8	46.21
994.1 - 1011.4	13.3	48.5	644.81

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
994.1 - 1001.5	7.0	20.9	59.7	18.9	970	6,792
1001.5 - 1011.4	6.3	16.9	45.8	39.6	610	3,845
994.1 - 1011.4	13.3	19.0	53.1	28.7	800	10,637

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Lincoln 77 Lease Remer Riverside Farms 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	994.5	20.7	56	900	15	242	41	46	658	43	1.10	20
2	995.5	21.2	63	1036	16	263	47	45	773	34	1.29	25
3	996.5	18.6	60	866	8	116	52	45	750	10	0.33	30
4	997.5	21.6	61	1022	13	218	48	48	804	60	1.40	20
5	998.5	19.2	58	864	5	74	53	43	790	12	0.38	30
6	999.5	22.8	61	1079	12	212	49	43	867	76	2.20	20
7	1000.5	22.7	58	1022	12	212	46	49	810	70	1.80	20
8	1001.4	20.7	57	916	4	65	53	43	851	58	1.60	20
9	1002.5	16.6	46	593	0	0	46	35	593	0	Imp.	-
10	1003.5	16.3	38	481	0	0	38	51	481	0	Imp.	-
11	1004.5	14.9	32	370	0	0	32	61	370	0	Imp.	-
12	1005.5	17.2	31	414	0	0	31	57	414	0	Imp.	-
13	1009.5	18.6	60	866	3	43	57	40	823	1	0.10	50
14	1010.5	17.9	66	917	0	0	66	15	917	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

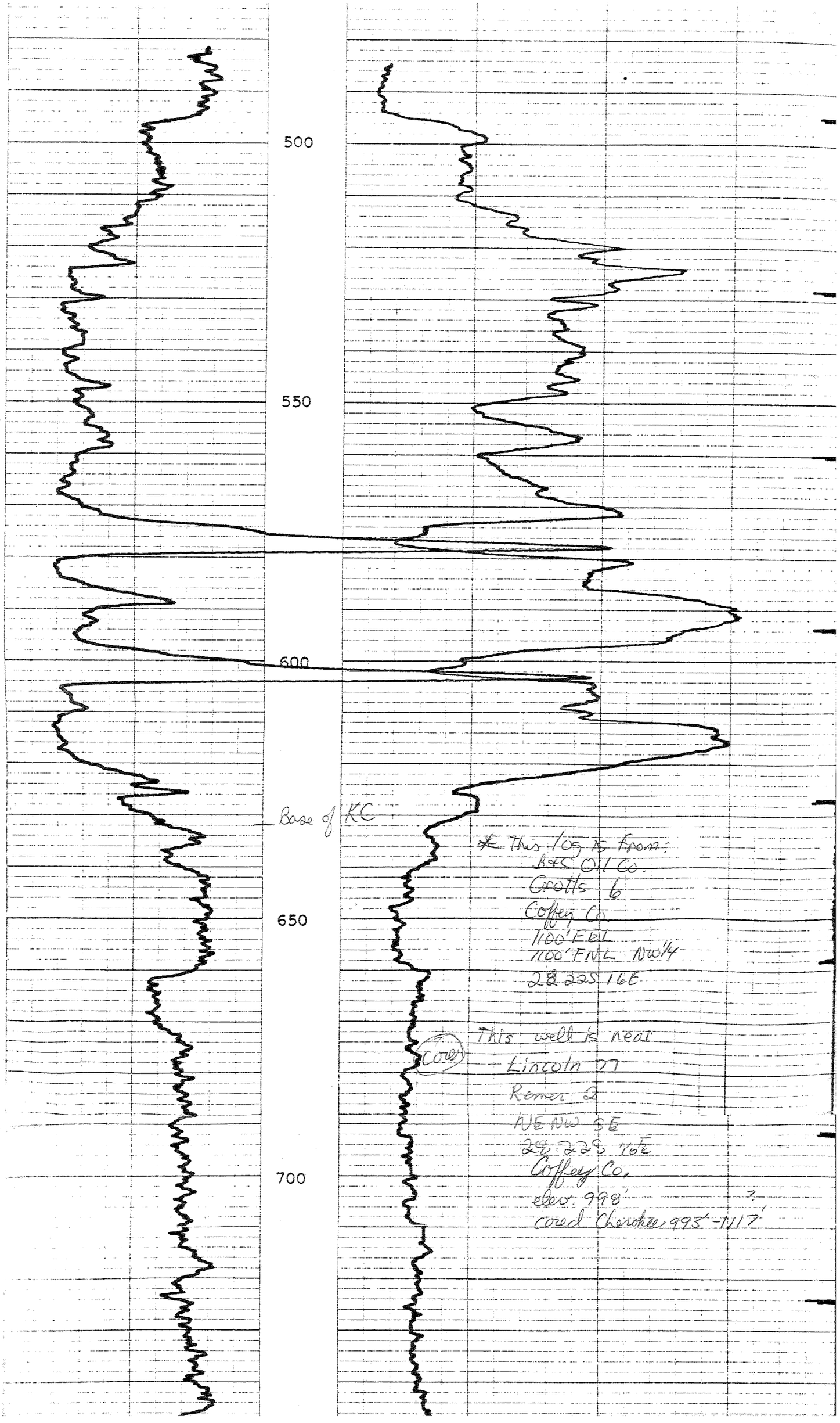
Company Lincoln 77 Lease Remer Riverside Farms Well No. 2

Depth Interval, Feet	994.1 - 1011.4
Feet of Core Analyzed	8.1
Average Percent Porosity	20.6
Average Percent Original Oil Saturation	59.7
Average Percent Oil Recovery	9.7
Average Percent Residual Oil Saturation	50.0
Average Percent Residual Water Saturation	44.5
Average Percent Total Residual Fluid Saturation	94.5
Average Original Oil Content, Bbls./A. Ft.	955.
Average Oil Recovery, Bbls./A. Ft.	159.
Average Residual Oil Content, Bbls./A. Ft.	796.
Total Original Oil Content, Bbls./Acre	7,738.
Total Oil Recovery, Bbls./Acre	1,291.
Total Residual Oil Content, Bbls./Acre	6,447.
Average Effective Permeability, Millidarcys	1.08
Average Initial Fluid Production Pressure, p.s.i.	27.4

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

Lincoln 77 - #2 Reimer
28-22S-1E
(Cherokee)

992 - 994	sandstone, fine-grained, shaly (shale laminations)
994 - 1104	sandstone, med grained, cross-bedded, heavy oil saturated
1104 - 1110.5	sandstone, fine-med. grained, cross-bedded, light oil saturation
1110.5 - 1113	sandstone, fine-med grained, heavy oil saturation
1113 - 1116	shale, silty, gray


500
550
600
Base of KC
650
700
core
* This log is from:
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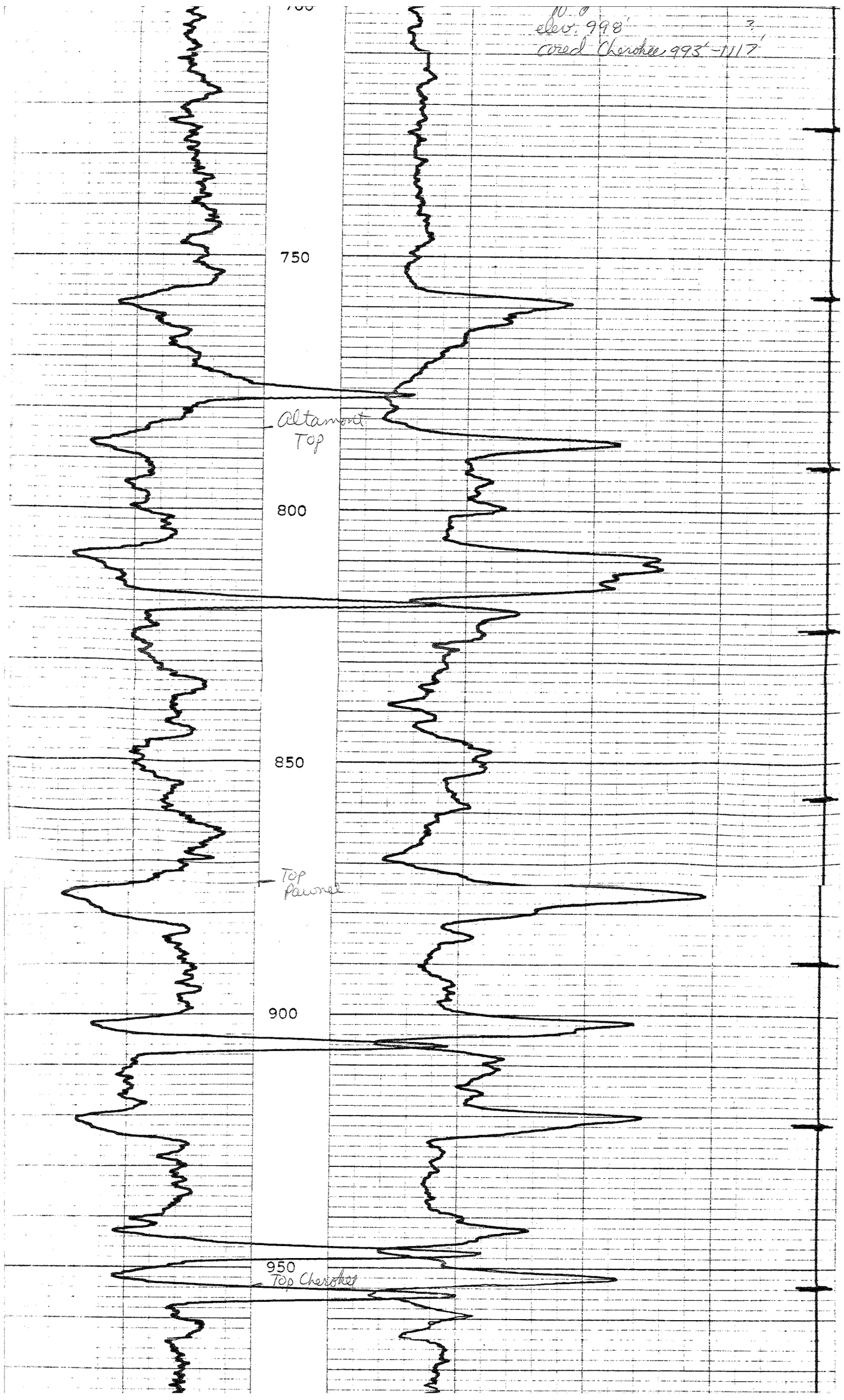
Crotts 6
Coffey Co.
1100' FEL
1100' FNL NW¼
28 22S 16E
This well is near
Lincoln 27
Romer 2
NE NW SE
28 22S 16E
Coffey Co.
elev. 998'
cored Cherokee 993'-1117'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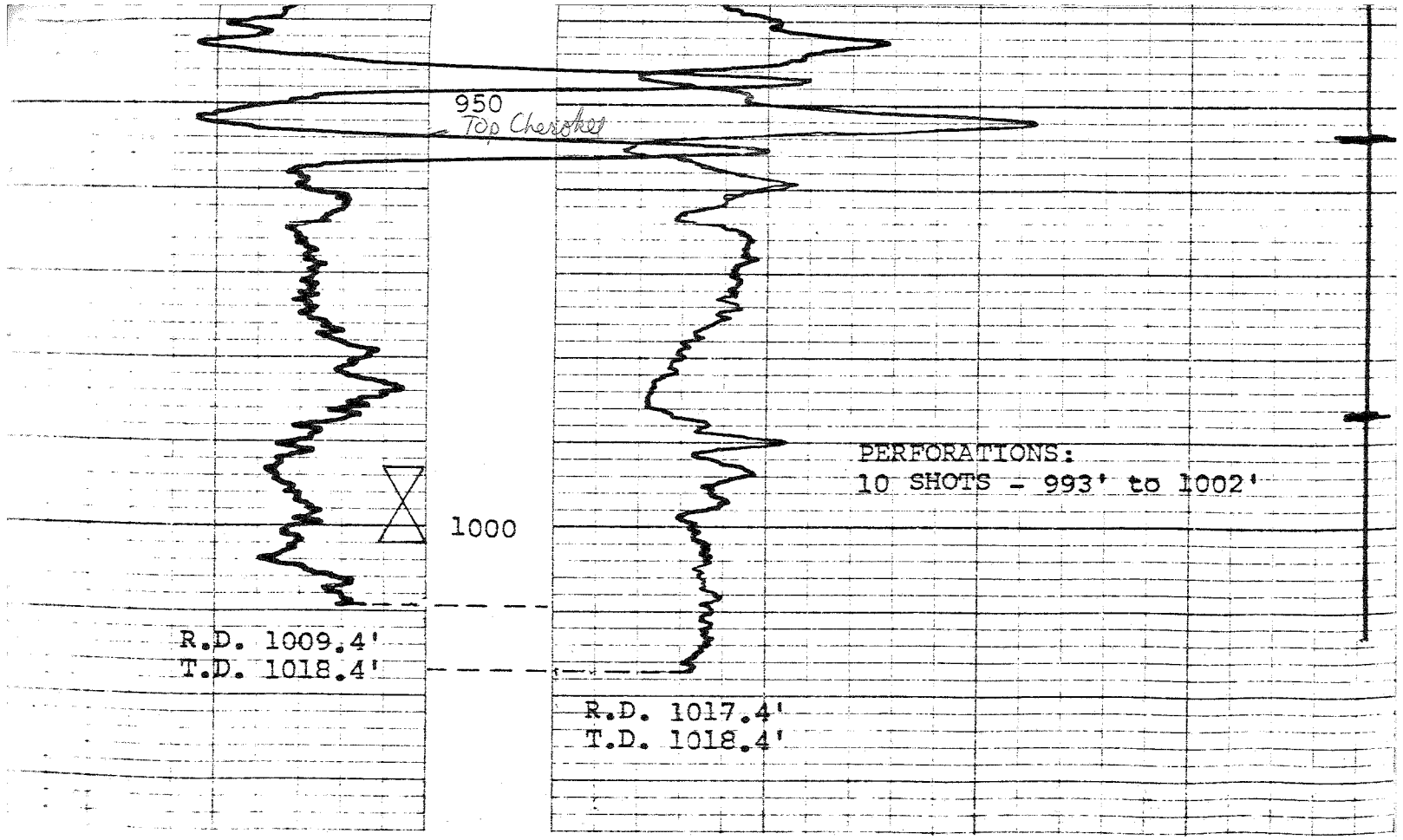
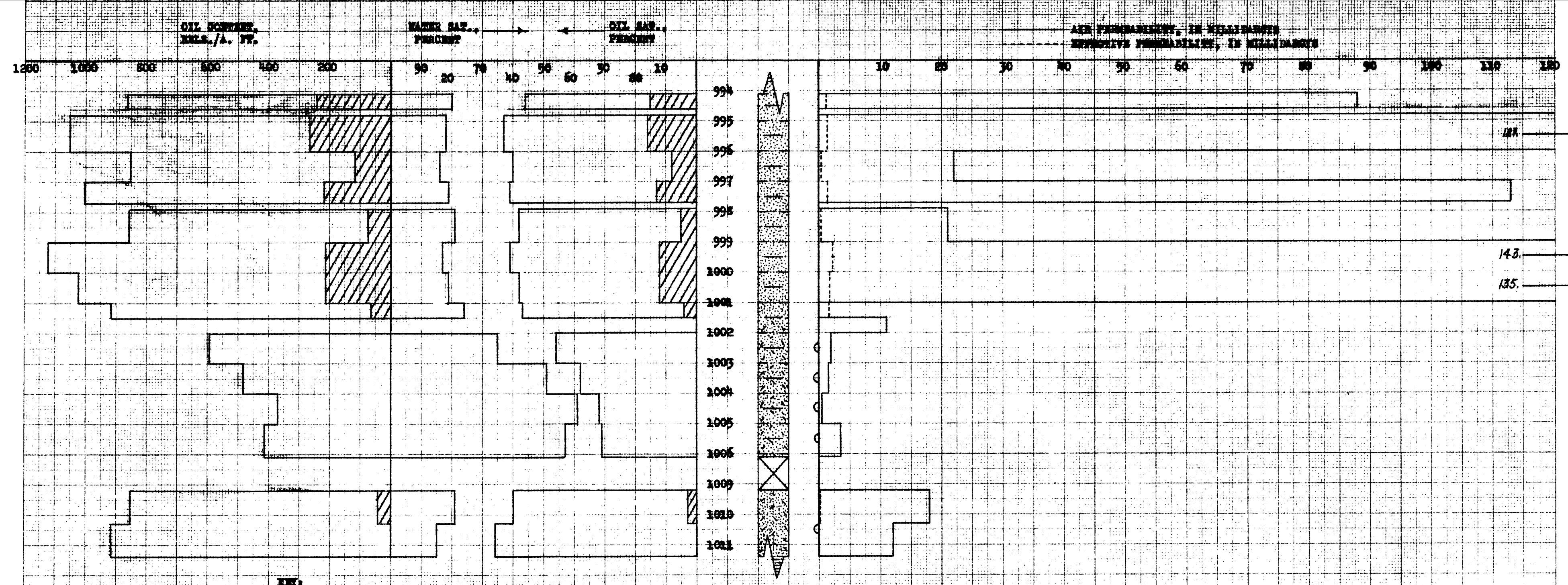


CROTTS NO. 6

B & S OIL COMPANY



LINCOLN 77

KRUGER RIVERSIDE FARMS LEASE WELL NO. 2

GOVE COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVG. OIL CONTENT BBLS./A.FT.	TOTAL OIL CONTENT BBLS./ACRE	AVG. AIR PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY BBLS./ACRE
994.1 - 1002.5	7.0	20.9	59.7	16.9	970	6,132	98.1	
1002.5 - 1011.4	6.3	16.9	45.8	39.6	610	3,845	6.8	
994.1 - 1011.4	13.3	19.0	53.1	26.7	800	10,637	46.5	2,124 (PRIMARY & SECONDARY)

OIL-WELL RESEARCH LABORATORIES
CHANUTE, KANSAS
DECEMBER, 1954.