K-K DRILLING COMPANY

CORE ANALYSIS REPORT

BARKER LEASE WELL NO. CT-3

NEOSHO COUNTY, KANSAS

OILFIELD RESEARCH LABORATORIES
536 N. HIGHLAND CHANUTE, KANSAS

OILFIELD RESEARCH LABORATORIES
536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650
700 NORTH MISSION - OKMULGEE, OKLAHOMA - PHONE SK6-4444

Chanute, Kansas

September 25, 1965

K-K Drilling Company
P.O. Box 556
Chanute, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Barker Lease, Well No. CT-3, Neosho County, Kansas, and submitted to our laboratory on September 20, 1965.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:rf

5 c.

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company K-K Drilling Company Lease Barker Well No. CT-3

Location

Section 4 Twp. 27S Rge. 18E County Neosho State Kansas

Name of Sand	Lower Bartlesville
Top of Core	812.0
Bottom of Core	856.5
Top of Oil Sand	829.2
Bottom of Oil Sand	852.6
Total Feet of Permeable Sand	25.6
Total Feet of Floodable Sand	8.0

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	4.2	4.2
10 - 25	5.0	9.2
25 - 50	5.4	14.6
50 - 100	4.0	18.6
100 - 200	5.0	23.6
200 & above	2.0	25.6

Average Permeability Millidarcys	70.4
Average Percent Porosity	17.8
Average Percent Oil Saturation	31.6
Average Percent Water Saturation	46.6
Average Oil Content, Bbls./A. Ft.	445.
Total Oil Content, Bbls./Acre	11,831.
Average Percent Oil Recovery by Laboratory Flooding Tests	5.4
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	82.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	571.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Water-Flood)	2,000.
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. This well was drilled in a virgin area (in lower Bartlesville section). The core was sampled by an employee of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
812.0 - 813.5	Light brown, fine grained sandstone.
813.5 - 820.0	Laminated sandy shale.
820.0 - 823.0	Light brown, fine grained sandstone.
823.0 - 829.0	Laminated sandy shale.
829.0 - 852.6	Dark brown, laminated, shaly sandstone.
852.6 - 853.5	Gray, laminated, shaly sandstone.
853.5 - 856.5	Grayish brown, slightly shaly sandstone.

Coring was started at a depth of 812.0 feet in light brown, fine grained sandstone and completed at 856.5 feet in grayish brown, slightly shaly sandstone. This core shows a total of 32.0 feet of sandstone. For the most part, the pay is made up of dark brown, laminated, shaly sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into three sections. The weighted average permeability of the upper, middle and lower sections is 82.9, 60.6 and 79.6 millidarcys respectively; the overall average being 70.4 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a very irregular

permeability profile. The permeability of the sand varies from 4.7 to a maximum of 377. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fair weighted average percent oil saturation, namely, 31.6. The weighted average percent oil saturation of the upper, middle and lower sections is 38.1, 33.4 and 2.7 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 35.2, 46.0 and 87.4 respectively; the overall average being 46.6 (See Table III). This gives an overall weighted average total fluid saturation of 78.2 percent.

The results of the saturation tests (See Table 1-B) show that the bottom of the oil sand is 852.6 feet.

The weighted average oil content of the upper, middle and lower sections is 550, 460 and 38 barrels per acre foot respectively; the overall average being 445. The total oil content, as shown by this core, is 11,831 barrels per acre of which 11,716 barrels are in the oil sand section (See Table III).

LABORATORY FLOODING TESTS

The sand in this core did not respond very well to laboratory flooding tests, as a total recovery of 571 barrels of oil per acre was obtained from 7.0 feet of sand. The weighted average percent oil saturation was reduced from 42.3 to 36.9, or represents an average recovery of 5.4 percent. The weighted average effective permeability of the samples is 4.26 millidarcys, while the average initial fluid production pressure is 25.7 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 27 samples tested, 21 produced water and 7 oil. This indicates that approximately 26 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a rather wide variation in effective permeability.

CONCLUSION

On the basis of the above data, it is evident that approximately 576 barrels of oil per acre can be recovered from the area, represented by this core, by efficient primary production methods. An additional oil recovery of 1,424 barrels per acre or an average of 178 barrels per acre foot can be expected from efficient water-flooding. The following data and assumptions were used in calculating the above oil recovery values:

Original formation volume factor	1.07
Irreducible water saturation, percent	32.0
Primary recovery, estimated, percent	None
Present oil saturation, percent	66.0
Average porosity, percent	19.6
Oil saturation after flooding, percent	36.9
Performance factor	0.50
Net floodable pay sand, feet	8.0

The core shows a shaly oil sand section having a fair oil saturation, a moderate water saturation and a good average permeability. The tests show that the zone extending from a depth of 852.6 to 856.5 feet (bottom of core) is water sand.

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company K-K Drilling Company Lease Barker Well No. CT-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	829.1	22.8	14	32	46	248	4.7	0.2	0.6	50	0.94
F-1	329.3	17.9	34	-	-	472	-	0.4	0.4	189	-
2	830.1	16.9	38	39	77	498	-	0.6	1.2	299	-
P-2	830.3	-	-	-	-	-	44.	0.4	1.6	-	17.60
3	831.1	19.2	49	43	92	730	60.	1.0	2.6	730	60.00
4	832.1	16.2	33	48	81	414	6.5	1.0	3.6	414	6.50
5	833.1	21.0	40	25	65	651	101.	1.0	4.6	651	101.00
6	834.1	18.1	40	34	74	561	41.	1.0	5.6	561	41.00
7	835.1	17.3	47	36	83	631	33.	1.0	6.6	631	33.00
8	836.1	17.0	34	43	77	448	26.	1.0	7.6	448	26.00
9	837.1	19.2	40	37	77	596	108.	1.0	8.6	596	108.00
10	838.1	21.4	43	28	71	713	319.	1.0	9.6	713	319.00
11	839.1	13.5	35	56	91	366	23.	1.0	10.6	366	23.00
12	840.1	16.3	36	47	83	454	13.	1.0	11.6	454	13.00
13	841.1	17.0	37	46	83	489	9.5	1.0	12.6	489	9.50
14	842.1	17.5	34	47	81	462	8.1	1.0	13.6	462	8.10
15	843.1	16.6	48	45	93	620	24.	1.0	14.6	620	24.00
16	844.1	18.3	26	48	74	370	33.	1.0	15.6	370	33.00
17	845.1	17.3	21	53	74	282	53.	1.0	16.6	282	53.00
18	846.1	16.0	33	46	79	410	6.9	1.0	17.6	410	6.90
19	847.1	20.2	38	41	79	596	45.	1.0	18.6	596	45.00
20	848.1	18.8	39	40	79	570	50.	1.0	19.6	570	50.00
21	849.1	18.2	29	45	74	410	112.	1.0	20.6	410	112.00
22	850.1	17.3	25	53	78	336	10.	1.0	21.6	336	10.00
23	851.1	20.2	30	43	73	471	377.	1.0	22.6	471	377.00

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company K-K Drilling Company Lease Barker Well No. CT-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.		
24	852.1	20.8	37	34	71	598	83.	1.0	23.6	598	83.00
25	853.1	18.1	5	90	95	70	18.	1.0	24.6	70	18.00
26	854.1	19.5	2	85	87	30	111.	1.0	25.6	30	111.00
27	855.1	19.6	1	87	88	15	110.	1.0	26.6	15	110.00
								Total-------		11,831	

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company K-K Drilling Company Lease Barker Well No. CT-3

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
829.0 - 838.6	8.6	82.9	713.04
838.6 - 852.6	14.0	60.6	847.50
852.6 - 855.6	3.0	79.6	239.00
829.0 - 855.6	25.6	70.4	1,799.54

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
829.0 - 838.6	9.6	17.8	38.1	35.2	550	5,282
838.6 - 852.6	14.0	17.7	33.4	46.0	460	6,434
852.6 - 855.6	3.0	19.0	2.7	87.4	38	115
829.0 - 855.6	26.6	17.8	31.6	46.6	445	11,831

Oilfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company K-K Drilling Company Lease Barker Well No. CT-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	829.3	17.9	34	472	0	0	34	52	472	19	0.40	40
2	830.1	16.9	28	367	0	0	28	63	367	8	0.20	50
3	831.1	18.8	49	715	12	175	37	57	540	65	1.40	30
4	832.1	16.0	33	409	0	0	33	54	409	0	Imp.	-
5	833.1	20.5	40	637	4	64	36	55	573	80	2.00	30
6	834.1	17.7	38	522	0	0	38	38	522	0	Imp.	-
7	835.1	17.8	43	594	0	0	43	47	594	4	0.20	50
8	836.1	16.7	31	401	0	0	31	50	401	0	Imp.	-
9	837.1	19.3	40	599	4	60	36	53	539	114	5.10	20
10	838.1	21.0	43	701	8	130	35	63	571	481	9.80	20
11	839.1	18.0	37	517	0	0	37	53	517	9	0.30	50
12	840.1	16.0	33	409	0	0	33	53	409	0	Imp.	-
13	841.1	17.3	33	443	0	0	33	53	443	0	Imp.	-
14	842.1	17.1	32	425	0	0	32	51	425	0	Imp.	-
15	843.1	17.1	48	637	6	80	42	55	557	49	1.00	30
16	844.1	18.4	24	343	0	0	24	56	343	146	3.60	20
17	845.1	17.8	18	249	0	0	18	79	249	298	7.80	20
18	846.1	15.8	30	368	0	0	30	55	368	5	0.30	50
19	847.1	19.7	35	535	0	0	35	53	535	35	0.70	30
20	848.1	19.0	39	574	2	29	37	51	545	44	1.20	30
21	849.1	18.6	27	390	0	0	27	70	390	329	7.50	20

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.

Oilfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company K-K Drilling Company Lease Barker Well No. CT-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.			
22	850.1	16.8	23	300	0	0	23	73	300	34	0.80	30
23	851.1	19.8	32	492	0	0	32	60	492	149	4.00	30
24	852.1	21.2	37	576	2	33	35	61	543	429	9.30	20
25	853.1	18.6	6	87	0	0	6	91	87	132	2.40	20
26	854.1	19.4	3	45	0	0	3	96	45	220	21.00	10
27	855.1	19.3	2	30	0	0	2	96	30	370	18.40	10

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.

Oilfield Research Laboratories

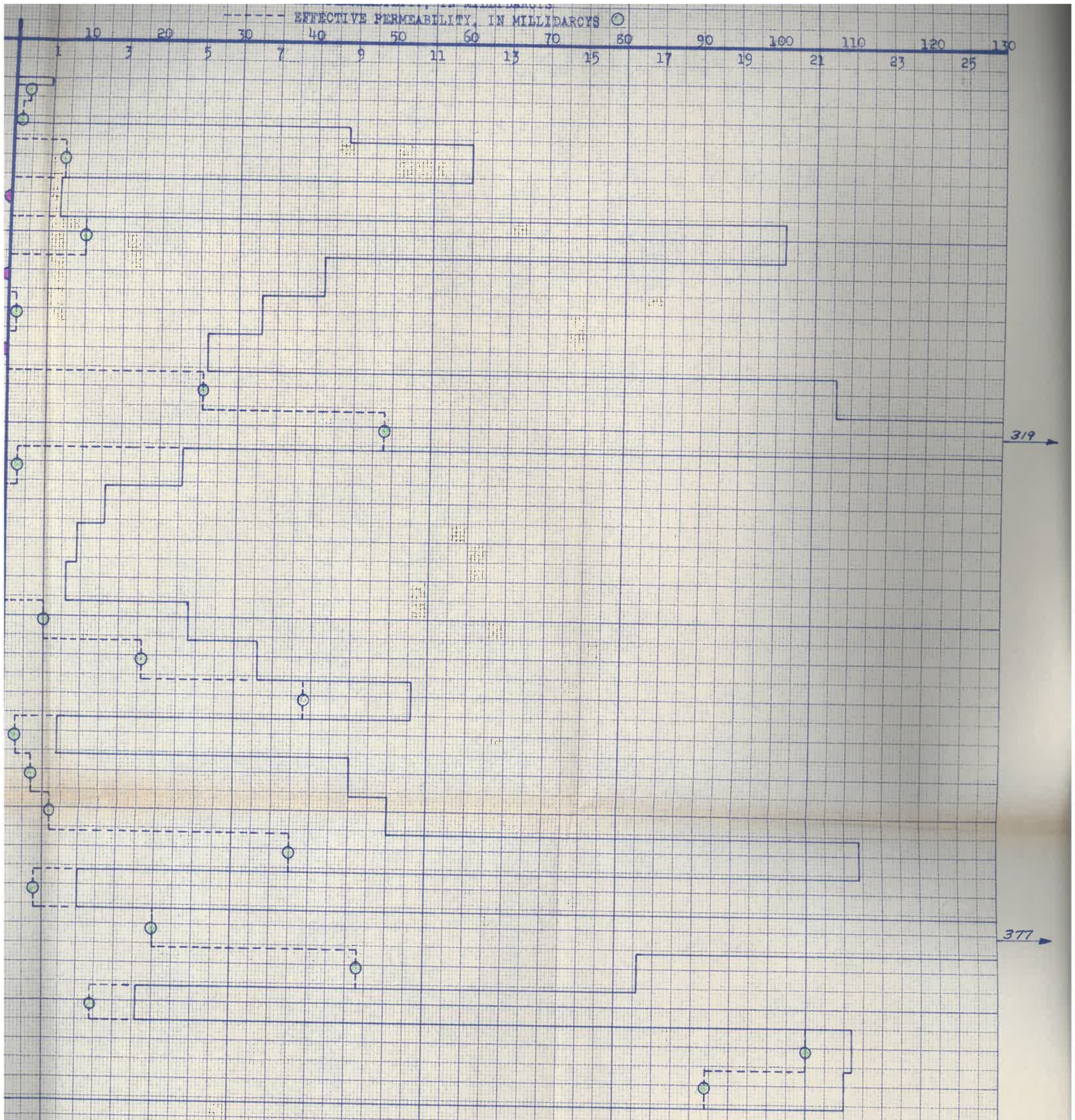
SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company K-K Drilling Company Lease Barker Well No. CT-3

Depth Interval, Feet	830.6 - 838.6	842.6 - 852.6	830.6 - 852.6
Feet of Core Analyzed	4.0	3.0	7.0
Average Percent Porosity	19.9	19.1	19.6
Average Percent Original Oil Saturation	43.0	41.3	42.3
Average Percent Oil Recovery	7.0	3.3	5.4
Average Percent Residual Oil Saturation	36.0	38.0	36.9
Average Percent Residual Water Saturation	57.0	55.7	56.4
Average Percent Total Residual Fluid Saturation	93.0	93.7	93.3
Average Original Oil Content, Bbls./A. Ft.	663.	596.	634.
Average Oil Recovery, Bbls./A. Ft.	107.	47.	82.
Average Residual Oil Content, Bbls./A. Ft.	556.	549.	552.
Total Original Oil Content, Bbls./Acre	2,652.	1,787.	4,439.
Total Oil Recovery, Bbls./Acre	429.	142.	571.
Total Residual Oil Content, Bbls./Acre	2,223.	1,645.	3,868.
Average Effective Permeability, Millidarcys	4.58	3.83	4.26
Average Initial Fluid Production Pressure, p.s.i.	25.0	26.7	25.7

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



SANDY SHALE

IMPERMEABLE TO WATER

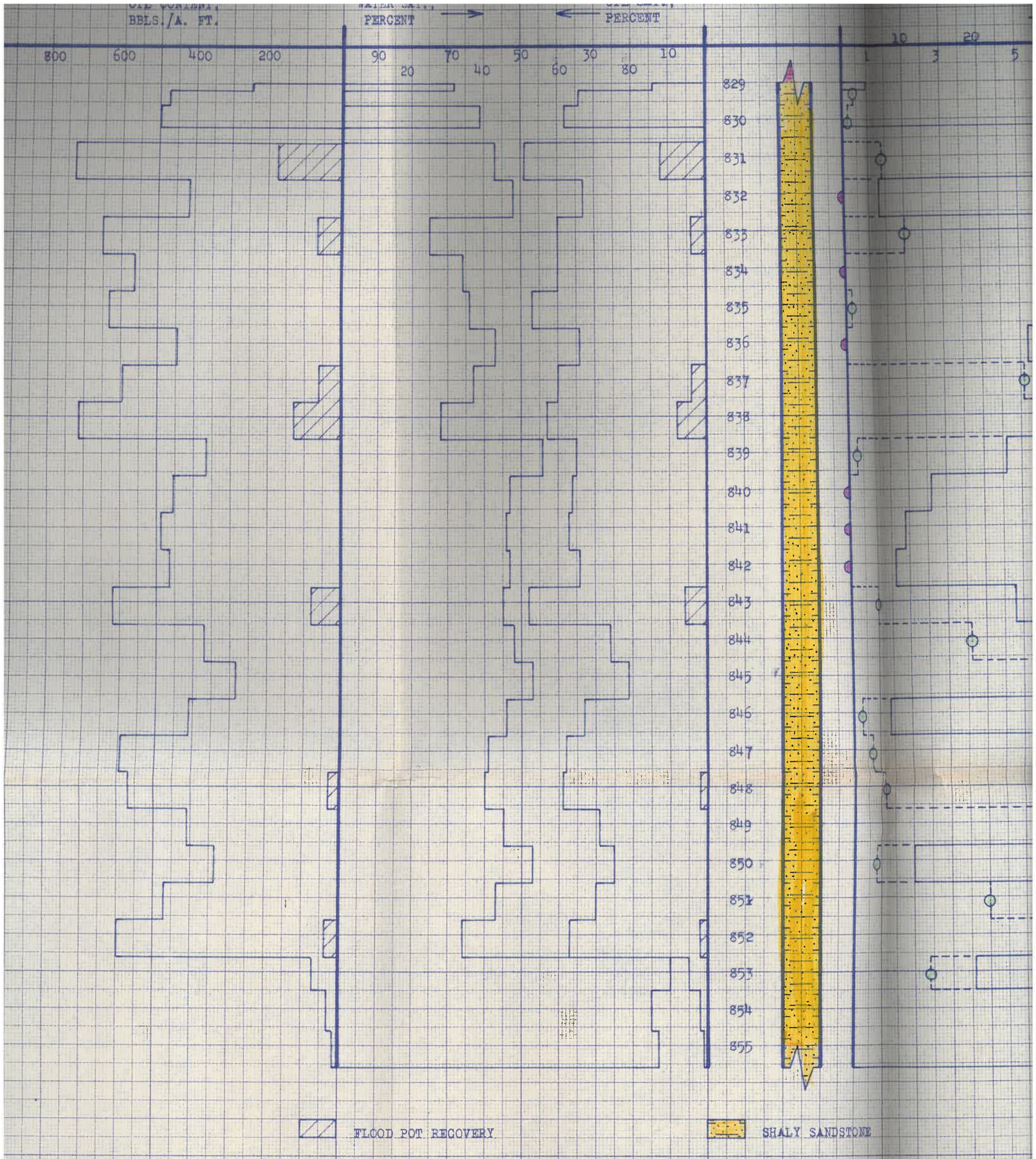
.ING COMPANY

WELL NO. CT-3

COUNTY, KANSAS

. WATER URATION RCENT	AVG. OIL CONTENT BBLS./A.FT.	TOTAL OIL CONTENT BBLS./ACRE	AVG. AIR PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY, BBLS./ACRE
35.2	550	5,282	82.9	
46.0	460	6,434	60.6	
57.4	38	115	79.6	
6.6	445	11,831	70.4	2,000 (Primary & Water-Flood)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
SEPTEMBER, 1965



K-K DRILLING COMPA

BARKER LEASE WELL NO.

NEOSHO COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE POROSITY PERCENT	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVG. OIL CONTENT BBLS./A.FT.
829.0 - 838.6	9.6	17.8	38.1	35.2	550
838.6 - 852.6	14.0	17.7	33.4	46.0	460
852.6 - 855.6	3.0	19.0	2.7	87.4	38
829.0 - 855.6	26.6	17.8	31.6	46.8	445