



OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

September 22, 1966

Rubein V. Johnson
2432 Court Street
Muskogee, Oklahoma

Dear Sir:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Klopfenstein Lease, Well No. 2-A, Linn County, Kansas, and submitted to our laboratory on September 16, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:rf

10 c.

6-22-24E
Klopfenstein, 2-A

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Rubein Johnson Lease Klopfenstein Well No. 2-A

Location 220' WEL & 220' NSL, S $\frac{1}{2}$ SW $\frac{1}{4}$

Section 6 Twp. 22S Rge. 24E County Linn State Kansas

Name of Sand	Upper Bartlesville
Top of Core	285.0
Bottom of Core	305.0
Top of Sand	285.5
Bottom of Sand	287.9
Total Feet of Permeable Sand	1.6
Total Feet of Floodable Sand	-

Distribution of Permeable Sand:
Permeability Range
Millidarcys

	Feet	Cum. Ft.
0 - 3	1.4	1.4
3 & above	0.2	1.6

Average Permeability Millidarcys	8.4
Average Percent Porosity	17.4
Average Percent Oil Saturation	64.5
Average Percent Water Saturation	31.1
Average Oil Content, Bbls./A. Ft.	877.
Total Oil Content, Bbls./Acre	1,666.
Average Percent Oil Recovery by Laboratory Flooding Tests	None
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	None
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	None
Total Calculated Oil Recovery, Bbls./Acre	-
Packer Setting, Feet	-
Viscosity, Centipoises @	-
A. P. I. Gravity, degrees @ 60 °F	-
Elevation, Feet	-

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GENERAL INFORMATION & SUMMARY

Company Rubein Johnson Lease Klopfenstein Well No. 2-A

Location 220' WEL & 220' NSL, S $\frac{1}{2}$ SW $\frac{1}{4}$

Section 6 Twp. 22S Rge. 24E County Linn State Kansas

Name of Sand - - - - - Lower Bartlesville

Top of Core - - - - - 418.0

Bottom of Core - - - - - (Recovered) 438.0

Top of Sand - - - - - (Cored) 418.0

Bottom of ^{better} Sand - - - - - 426.6

Total Feet of Permeable Sand - - - - - 19.4

Total Feet of Floodable ^{Day} Sand - - - - - 2.0

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 75	5.0	5.0
75 - 150	5.0	10.0
150 - 250	5.6	15.6
250 & above	3.8	19.4

Average Permeability Millidarcys - - - - - 206.3

Average Percent Porosity - - - - - 22.7

Average Percent Oil Saturation - - - - - 27.6

Average Percent Water Saturation - - - - - 55.1

Average Oil Content, Bbls./A. Ft. - - - - - 484.

Total Oil Content, Bbls./Acre - - - - - 9,390.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 8.0

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 144.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 289.

Total Calculated Oil Recovery, Bbls./Acre - (Primary) - - - - - 497.

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. The cores were sampled by an employee of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval,</u>	<u>Description</u>
<u>Feet</u>	

-UPPER BARTLESVILLE-

285.0 - 285.5	Gray sandy limestone.
285.5 - 285.7	Dark, fine grained sandstone.
285.7 - 286.0	Gray sandy shale.
286.0 - 287.0	Dark, fine grained sandstone.
287.0 - 287.9	Dark and gray, fine grained sandstone.
287.9 - 290.6	Gray, laminated, sandy shale.
290.6 - 305.0	Gray shale.

-LOWER BARTLESVILLE-

418.0 - 421.2	Brown, fine grained sandstone.
421.2 - 421.6	Light brown, shaly sandstone.
421.6 - 429.6	Brown, fine grained sandstone.
429.6 - 435.2	Light brown, shaly sandstone.
435.2 - 435.4	Laminated sandstone and shale.
435.4 - 438.0	Gray to brown, carbonaceous, shaly sandstone.
438.0 - 441.0	Loss.

LOWER BARTLESVILLE SAND

Coring was started at a depth of 418.0 feet in brown, fine grained sandstone and completed at 441.0 feet. There was a core loss

of three feet from 438 to 441 feet. This core shows a total of 19.8 feet of sandstone. The pay is made up of brown, fine grained 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 138.4 and 256.1 millidarcys respectively; the overall average being 206.3 (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 20. to a maximum of 899. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly low weighted average percent oil saturation, namely, 27.6. The weighted average percent oil saturation of the upper and lower sections is 33.8 and 23.0 respectively. The weighted average percent water saturation of the upper and lower sections is 45.9 and 61.8 respectively; the overall average being 55.1 (See Table III). This gives an overall weighted average total fluid saturation of 82.7 percent.

The weighted average oil content of the upper and lower sections is 603 and 397 barrels per acre foot respectively; the overall average being 484. The total oil content, as shown by this core, is 9,390 barrels per acre (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 only 289 barrels of oil per acre was obtained from 2.0 feet of sand. The weighted average percent oil saturation was reduced from 45.0 to 37.0, or represents an average recovery of 8.0 percent. The weighted average effective permeability of the samples is 2.17 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 20 samples tested, 19 produced water and 2 oil. This indicates that approximately 10 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a wide variation in effective permeability.

CONCLUSION

On the basis of the above data, we estimate that approximately 497 barrels of oil per acre can be recovered from the area, represented by this core, by efficient primary production methods. Furthermore, special care would have to be exercised in the completion of the well as the tests indicate that the lower part of the sand section is water productive. The tests also indicate that this reservoir is not a good water-flood prospect.

The core of the upper Bartlesville sand shows only 1.6 feet of permeable sand. Chances are, this well was drilled on the edge of the reservoir as the core taken from the Klopfenstein No. 2 Well showed a good floodable sand section.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Rubein Johnson Lease Klopfenstein Well No. 2-A

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.		
					UPPER	BARTLESVILLE SAND-					
A	285.6	17.2	68	29	97	906	1.9	0.2	0.2	181	0.38
B-P	286.1	-	-	-	-	-	48.	0.2	0.4	-	9.60
B	286.3	18.3	74	20	94	1,050	-	0.5	0.9	525	-
C	287.1	17.2	60	36	96	800	2.9	1.2	2.1	960	3.48
					LOWER	BARTLESVILLE SAND-					
1	418.1	23.4	29	41	70	526	175.	0.6	2.7	315	105.00
2	419.1	22.1	30	62	92	514	195.	1.0	3.7	514	195.00
3	420.1	22.8	27	50	77	478	87.	1.0	4.7	478	87.00
4	421.1	22.1	26	49	75	445	63.	0.6	5.3	267	37.80
5	422.1	23.6	47	33	80	860	101.	1.0	6.3	860	101.00
6	423.1	23.4	43	38	81	780	76.	1.0	7.3	780	76.00
7	424.1	21.8	35	46	81	592	58.	1.0	8.3	592	58.00
8	425.1	23.8	25	49	74	461	284.	1.0	9.3	461	284.00
9	426.1	23.6	37	44	81	677	192.	1.0	10.3	677	192.00
10	427.1	23.5	28	51	79	510	176.	1.0	11.3	510	176.00
11	428.1	23.7	27	56	83	496	180.	1.0	12.3	496	180.00
12	429.1	23.2	27	55	82	485	119.	1.0	13.3	485	119.00
13	430.1	22.9	19	57	76	337	72.	1.0	14.3	337	72.00
14	431.1	20.8	25	73	98	403	169.	1.0	15.3	403	169.00
15	432.1	17.2	25	59	84	333	15.	1.0	16.3	333	15.00
16	433.1	23.4	19	68	87	345	75.	1.0	17.3	345	75.00
17	434.1	25.2	13	73	86	254	711.	1.0	18.3	254	711.00
18	435.1	24.6	19	71	90	362	407.	0.6	18.9	217	244.20
19	436.1	22.8	13	70	83	230	899.	1.2	20.1	276	1078.80
20	437.1	21.4	34	53	87	564	20.	1.4	21.5	790	28.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Rubein Johnson Lease Klopfenstein Well No. 2-A

<u>Depth Interval, Feet</u>	<u>Feet of Core Analyzed</u>	<u>Average Permeability, Millidarcys</u>	<u>Permeability Capacity Ft. x Md.</u>
	<u>-UPPER BARTLESVILLE-</u>		
285.5 - 287.9	1.6	8.4	13.46
	<u>-LOWER BARTLESVILLE-</u>		
418.0 - 426.6	8.2	138.4	1,135.00
426.6 - 438.0	11.2	256.1	2,868.00
418.0 - 438.0	19.4	206.3	4,003.00

<u>Depth Interval, Feet</u>	<u>Feet of Core Analyzed</u>	<u>Average Percent Porosity</u>	<u>Average Percent Oil Saturation</u>	<u>Average Percent Water Saturation</u>	<u>Average Oil Content Bbl./A. Ft.</u>	<u>Total Oil Content Bbls./Acre</u>
	<u>-UPPER BARTLESVILLE-</u>					
285.5 - 287.9	1.9	17.4	64.5	31.1	877	1,666
	<u>-LOWER BARTLESVILLE-</u>					
418.0 - 426.6	8.2	23.0	33.8	45.9	603	4,944
426.6 - 438.0	11.2	22.5	23.0	61.8	397	4,446
418.0 - 438.0	19.4	22.7	27.6	55.1	484	9,390

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Rubein Johnson Lease Klopfenstein Well No. 2-A

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.			
-UPPER BARTLESVILLE-												
A	285.6	16.8	64	834	0	0	64	34	834	0	Imp.	-
B	286.3	18.0	70	877	0	0	70	27	877	0	Imp.	-
C	287.1	17.4	56	756	0	0	56	42	756	0	Imp.	-
-LOWER BARTLESVILLE-												
1	418.1	23.0	29	518	0	0	29	63	518	310	11.53	20
2	419.1	22.4	31	539	0	0	31	64	539	111	3.30	20
3	420.1	23.0	25	446	0	0	25	69	446	148	4.05	20
4	421.1	21.7	28	472	0	0	28	63	472	38	1.05	20
5	422.1	23.5	47	857	8	146	39	56	711	53	1.42	20
6	423.1	23.0	43	768	8	143	35	57	625	141	2.92	20
7	424.1	21.3	33	546	0	0	33	55	546	19	0.374	30
8	425.1	24.0	27	503	0	0	27	65	503	338	16.90	10
9	426.1	23.8	34	628	0	0	34	64	628	479	14.10	10
10	427.1	23.9	25	464	0	0	25	68	464	238	11.23	10
11	428.1	23.4	24	436	0	0	24	70	436	256	10.90	10
12	429.1	23.7	24	441	0	0	24	69	441	600	24.85	10
13	430.1	23.0	21	375	0	0	21	76	375	236	4.87	10
14	431.1	20.8	21	339	0	0	21	79	339	403	10.05	10
15	432.1	16.8	23	300	0	0	23	69	300	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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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Rubein Johnson Lease Klopfenstein Well No. 2-A

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.			
16	433.1	23.0	22	393	0	0	22	70	393	244	9.76	10
17	434.1	25.0	15	291	0	0	15	81	291	229	34.10	10
18	435.1	24.1	16	299	0	0	16	82	299	239	4.65	10
19	436.1	23.0	14	250	0	0	14	72	250	256	10.12	10
20	437.1	21.9	33	560	0	0	33	57	560	219	6.30	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

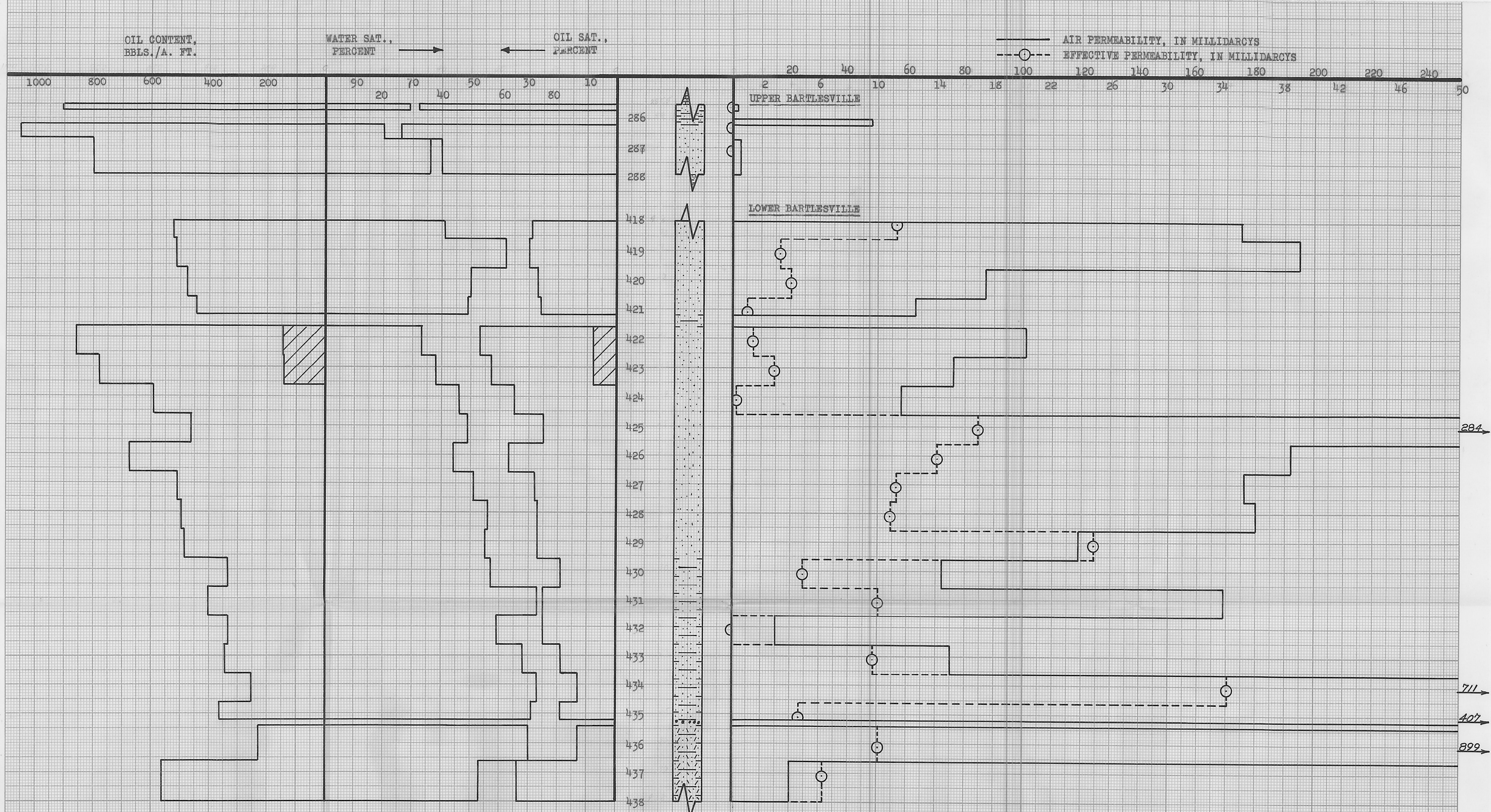
SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Rubein Johnson	Lease	Klopfenstein	Well No.	2-A
Depth Interval, Feet	421.6 - 423.6				
Feet of Core Analyzed	2.0				
Average Percent Porosity	23.2				
Average Percent Original Oil Saturation	45.0				
Average Percent Oil Recovery	8.0				
Average Percent Residual Oil Saturation	37.0				
Average Percent Residual Water Saturation	56.0				
Average Percent Total Residual Fluid Saturation	93.0				
Average Original Oil Content, Bbls./A. Ft.	804.				
Average Oil Recovery, Bbls./A. Ft.	144.				
Average Residual Oil Content, Bbls./A. Ft.	660.				
Total Original Oil Content, Bbls./Acre	1,625.				
Total Oil Recovery, Bbls./Acre	289.				
Total Residual Oil Content, Bbls./Acre	1,336.				
Average Effective Permeability, Millidarcys	2.17				
Average Initial Fluid Production Pressure, p.s.i.	20.0				

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

KEIFFEL & ESSER CO.
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- CARBONACEOUS SHALY SANDSTONE
- SANDY LIMESTONE
- SANDY SHALE
- IMPERMEABLE TO WATER

RUBEIN JOHNSON
KLOPFENSTEIN LEASE WELL NO. 2-A
LINN 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.	TOTAL OIL CONTENT BBLs./ACRE	AVG. AIR PERMEABILITY, MILLIDARCY	CALCULATED OIL RECOVERY, BBLs./ACRE
UPPER BARTLESVILLE	285.5 - 287.9	1.9	17.4	64.5	31.1	877	1,666	8.4	
LOWER BARTLESVILLE	418.0 - 426.6	8.2	23.0	33.8	45.9	603	4,944	138.4	
	426.6 - 438.0	11.2	22.5	23.0	61.8	397	4,446	256.1	
	418.0 - 438.0	19.4	22.7	27.6	55.1	484	9,390	206.3	497 (Primary)

K&E STANDARD 1/2" CROSS SECTION

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
SEPTEMBER, 1966