33-20-21E

Kretchmer 32

December 13, 1950

Kewanee Oil Company
Kennedy Building
P. O. Box 2239
Tulsa 1, Oklahoma

Gentlemen:

Enclosed herewith is the report of the analysis of the No. 5 Baker barrel core taken from the Kretchmer-100 Acres Lease, Well No. 32, Anderson County, Kansas, and submitted to our laboratory on November 15, 1950.

Very truly yours,

OIL FIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:mm

c.c. to Mr. N. T. Harris
Garnett, Kansas

Kewanee Oil Company
Shidler, Oklahoma

KEWANEE OIL COMPANY

CORE ANALYSIS REPORT

KRETCHMER-100 ACRES LEASE WELL NO. 32

ANDERSON COUNTY, KANSAS

OIL FIELD RESEARCH LABORATORIES

GRANITE, KANSAS

DECEMBER 13, 1950

Oil Field Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Kewanee Oil Company Lease Kretchmer 100 Acres Well No. 38

Location

Section 35 Twp. 20S Rge. 21E County Anderson State Kansas

Name of Sand	Squirrel
Top of Core	603.00
Bottom of Core	647.20
Top of Sand	614.30
Bottom of Sand	645.10
Total Feet of Permeable Sand	18.24

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	2.98	2.98
10 - 15	1.80	4.78
15 - 20	5.20	9.98
20 - 25	3.21	13.19
25 - 30	2.30	15.49
30 - 35	0.75	16.24
35 & above	2.00	18.24

Average Permeability Millidarcys	20.30
Average Percent Porosity	19.60
Average Percent Oil Saturation	43.01
Average Percent Water Saturation	44.41
Average Oil Content, Bbls./A. Ft.	651.
Total Oil Content, Bbls./Acre	11,619.
Average Percent Oil Recovery by Laboratory Flooding Tests	19.01
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	280.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	4,179.
Total Calculated Oil Recovery, Bbls./Acre	3,950.
Packer Setting, Feet	614.00
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	

The above averages are for that part of the cored section extending from the packer setting to the top of the cement plug.

Fresh water was used as a circulating fluid in the coring of the sand in this well.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
603.00 - 607.95	According to log, gray shale (discarded at well).
607.95 - 612.10	Gray shale.
612.10 - 612.40	Finely laminated sandy shale.
612.40 - 612.70	Laminated sandy shale.
612.70 - 613.30	Gray shale.
613.30 - 613.65	Light brown fine grained micaceous shaley sandstone.
613.65 - 614.30	Laminated shaley sandstone.
614.30 - 615.05	Brown fine grained micaceous sandstone.
615.05 - 615.25	Light brown fine grained finely laminated micaceous shaley sandstone.
615.25 - 615.70	Brown fine grained micaceous sandstone.
615.70 - 615.90	Laminated sandy shale.
615.90 - 616.20	Brown fine grained micaceous sandstone.
616.20 - 616.54	Finely laminated shaley sandstone.
616.54 - 616.75	Light brown fine grained micaceous slightly shaley sandstone.
616.75 - 616.90	Light brown fine grained laminated micaceous shaley sandstone.
616.90 - 617.45	Finely laminated sandy shale.
617.45 - 617.70	Light brown fine grained laminated micaceous shaley sandstone.
617.70 - 618.80	Laminated sandy shale containing layers of sandstone.

618.80 - 619.00 - Brown fine grained micaceous sandstone.

619.00 - 619.15 - Light brown fine grained slightly laminated micaceous shaley sandstone.

619.15 - 619.45 - Light brown fine grained laminated micaceous shaley sandstone.

619.45 - 619.97 - Laminated sandy shale.

619.97 - 620.20 - Light brown fine grained laminated micaceous shaley sandstone.

620.20 - 620.45 - Light brown fine grained slightly laminated micaceous shaley sandstone.

620.45 - 621.02 - Laminated shaley sandstone.

621.02 - 621.40 - Brown fine grained micaceous sandstone.

621.40 - 622.00 - Gray sandy shale.

622.00 - 622.50 - Light brown fine grained micaceous sandstone.

622.50 - 622.65 - Light brown fine grained slightly laminated micaceous shaley sandstone.

622.65 - 622.95 - Light brown fine grained laminated micaceous shaley sandstone.

622.95 - 623.35 - Laminated sandy shale.

623.35 - 623.50 - Light brown fine grained laminated micaceous shaley sandstone.

623.50 - 623.85 - Laminated sandy shale.

623.85 - 624.40 - Light brown fine grained slightly laminated micaceous shaley sandstone.

624.40 - 624.60 - Laminated sandy shale.

624.60 - 625.13 - Light brown fine grained laminated micaceous shaley sandstone.

625.13 - 625.45 - Light brown fine grained micaceous sandstone.

625.45 - 625.60 - Light brown fine grained slightly laminated micaceous shaley sandstone.

625.60 - 627.05 - Brown fine grained micaceous sandstone.

627.05 - 627.45 - Gray sandy shale.

627.45 - 627.75 - Light brown fine grained micaceous sandstone.

627.75 - 629.40 - Gray sandy shale.

629.40 - 629.60 - Light brown fine grained laminated micaceous shaley sandstone.

629.60 - 629.75 - Light brown fine grained micaceous sandstone.

629.75 - 629.90 - Light brown fine grained laminated micaceous shaley sandstone.

629.90 - 630.00 - Light brown fine grained micaceous sandstone.

630.00 - 631.10 - Laminated sandy shale.

631.10 - 632.00 - Brown fine grained micaceous sandstone.

632.00 - 632.25 - Light brown fine grained laminated micaceous shaley sandstone.

632.25 - 632.75 - Light brown fine grained slightly laminated micaceous shaley sandstone.

632.75 - 633.05 - Laminated sandy shale.

633.05 - 634.95 - Gray sandy shale.

634.95 - 637.30 - Brown fine grained micaceous sandstone.

637.30 - 637.70 - Gray sandy shale.

637.70 - 638.20 - Brown fine grained micaceous sandstone.

638.20 - 638.40 - Brown fine grained micaceous shaley sandstone.

638.40 - 640.10 - Brown fine grained slightly laminated micaceous shaley sandstone.

640.10 - 645.10 - Brown fine grained micaceous sandstone.

645.10 - 646.25 - Soft gray shale.

646.25 - 647.20 - Gray calcareous sandy shale.

Coring was started at a depth of 603.00 feet in gray shale and completed at 647.20 feet in calcareous sandy shale. This core shows a total of 20.47 feet of sand. For the most part, the pay sand is made up of fine grained micaceous to shaley sandstone. The upper part of the cored section is badly broken by layers of shale and sandy shale.

PERMEABILITY

For the sake of distribution, the core was divided into two sections. The weighted average permeability of the upper and lower sections are 21.37 and 19.30 millidarcys respectively while that of the pay sand, or that part of the cored section extending from the packer setting to the top of the cement plug, is 80.30 (See Table II). By observing the data given on the coregraph, it is noticeable that the sand has a very irregular permeability profile.

PERCENT SATURATION & OIL CONTENT

The pay sand in this core shows a good weighted average percent oil saturation, namely, 43.01. The weighted average percent oil saturation of the upper and lower sections are 41.21 and 44.78 respectively. The weighted average percent water saturation of the upper and lower sections are 41.78 and 46.87 respectively while that of the pay sand is 44.41 (See Table IV). This gives an overall weighted average total fluid saturation of 87.42 percent.

In order to determine whether or not any flushing of the sand occurred during coring, all of the saturation samples were analyzed for chloride content. The results of these tests are given in Tables VII and VIII. From the data given in these tables and on the coregraph, it is evident that considerable flushing of the sand did occur during coring as for the most part the zones of higher permeability have the lower chloride content.

The weighted average oil content of the upper and lower sections are 616 and 688 barrels per acre foot respectively while that of the pay sand is 651. The total oil content, as shown by this core, is 11,875 barrels per acre of which 11,619 barrels are in the pay sand section (See Table IV).

LABORATORY FLOODING TESTS

The pay sand in this core responded very well to laboratory flooding tests as a total recovery of 4,179 barrels of oil per acre was obtained from 14.91 feet of sand. The weighted average percent oil saturation was reduced from 45.42 to 26.41, or represents an average recovery of 19.01 percent. The weighted average effective permeability of the samples is 3.43 millidarcys while the average initial fluid production pressure is 20.9 pounds per square inch (See Table VI).

By observing the data given in Table V, you will note that of the 24 samples tested, 23 produced water and 22 oil. This indicates that practically all of the sand represented by these samples is floodable. The tests also show that most of the samples took water very freely.

CONCLUSION

From a study of the above data, we believe that an efficient water flood within the vicinity of this well will recover approximately 3,950 barrels of oil per acre or an average of 265 barrels per acre foot. In calculating this recovery, an allowance was made for oil lost during coring and it was assumed that the true water saturation of the sand is 37 percent and that the sand is not pressured up.

This core shows more good floodable sand than most of the cores we have analyzed from this lease. Furthermore, the sand has a fairly uniform effective permeability profile.

Oil Field Research Laboratories

SHOT RECOMMENDATION

Company Kewanee Oil Company Lease Kretchmer 100 Acres Well No. 32

Depth Interval, Feet	Feet of Sand	Size of Shell Inches	Qts./Ft.	Total Quarts
617.0 - 644.0	27.0	4	2.5	67.5

Recommended Packer Setting 614.0 feet
Note: Plug hole back to 645.0 feet

Oil Field Research Laboratories

RESULTS OF PERMEABILITY TESTS

TABLE I

Company Kewanee Oil Company Lease Kretchmer 100 Acres Well No. 32

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	613.25	Imp.	0.30	0.30	0.00
2	613.90	Imp.	0.30	0.60	0.00
3	614.04	Imp.	0.35	0.95	0.00
4	614.36	21.	0.30	1.25	6.30
5	614.75	17.	0.25	1.50	4.25
6	615.00	29.	0.20	1.70	5.80
7	615.30	26.	0.45	2.15	11.70
8	615.96	22.	0.30	2.45	6.60
9	616.55	24.	0.21	2.66	5.04
10	617.65	3.4	0.25	2.91	0.85
11	618.03	14.	0.05	2.96	0.70
12	618.95	37.	0.35	3.31	12.95
13	619.43	7.8	0.30	3.61	2.34
14	620.42	9.1	0.25	3.86	2.28
15	621.07	21.	0.38	4.24	7.98
16	622.06	17.	0.50	4.74	8.50
17	622.60	15.	0.15	4.89	2.25
18	624.00	19.	0.20	5.09	3.80
19	624.20	21.	0.35	5.44	7.35
20	624.73	9.2	0.53	5.97	4.88
21	625.13	23.	0.32	6.29	7.36
22	625.63	38.	0.15	6.44	5.70
23	625.86	20.	0.25	6.69	5.00
24	626.14	30.	0.35	7.04	10.50
25	626.63	48.	0.45	7.49	21.60
26	627.00	28.	0.25	7.74	7.00
27	627.50	28.	0.30	8.04	8.40
28	629.40	5.4	0.20	8.24	1.08
29	629.95	14.	0.10	8.34	1.40
30	631.40	34.	0.40	8.74	13.60
31	631.70	15.	0.50	9.24	7.50
32	632.30	13.	0.25	9.49	3.25
33	632.72	7.5	0.25	9.74	1.88
34	634.95	37.	0.25	9.99	9.25
35	635.40	44.	0.40	10.39	17.60
36	635.77	19.	0.40	10.79	7.60
37	636.20	19.	0.45	11.24	8.55
38	636.74	22.	0.55	11.79	12.10
39	637.20	25.	0.30	12.09	7.50
40	638.05	26.	0.50	12.59	13.00

Oil Field Research Laboratories

RESULTS OF PERMEABILITY TESTS

TABLE I

Company Kewanee Oil Company Lease Kretchmer 100 Acres Well No. 32

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
41	638.46	21.	0.15	12.74	3.15
42	638.63	14.	0.35	13.09	4.90
43	639.20	7.4	0.50	13.59	3.70
44	639.65	7.4	0.70	14.29	5.18
45	640.13	17.	0.20	14.49	3.40
46	640.50	15.	0.40	14.89	6.00
47	640.84	19.	0.30	15.19	5.70
48	641.31	16.	0.50	15.69	8.00
49	641.70	14.	0.30	15.99	4.20
50	641.94	11.	0.35	16.34	3.85
51	642.35	25.	0.30	16.64	7.50
52	642.60	18.	0.25	16.89	4.50
53	642.90	12.	0.40	17.29	4.80
54	643.40	21.	0.40	17.69	8.40
55	643.60	16.	0.50	18.19	8.00
56	644.40	18.	0.60	18.79	10.80
57	644.95	37.	0.50	19.29	18.50

Oil Field Research Laboratories

SUMMARY OF PERMEABILITY TESTS

TABLE II

Company Kewanee Oil Company Lease Kretchmer 160 Acres Well No. 32

Depth Interval Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.
613.30 - 632.75	8.79	21.37	187.84
634.95 - 645.10	9.55	19.50	186.18
614.00 - 645.00	18.24	20.30	370.32

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company Kewanee Oil Company Lease Kretchmer 100 Acres Well No. 32

Sat. No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content, Bbls./A. Ft.	Feet of Core		Total Oil Content Bbls./Acre
			Oil	Water	Total		Ft.	Cum. Ft.	
2	613.52	16.6	43.7	51.2	94.9	563	0.35	0.35	197
3	614.63	18.9	47.6	29.8	77.4	698	0.75	1.10	524
4	615.63	20.7	51.0	39.6	90.6	820	0.45	1.55	369
F-5	616.58	17.1	42.4	-	-	563	0.21	1.76	118
5	616.82	16.7	42.2	51.6	93.8	547	0.15	1.91	82
F-7	619.08	19.2	37.2	-	-	555	0.35	2.26	194
7	619.23	17.1	33.7	65.0	98.7	447	0.30	2.56	134
8	620.27	18.5	44.1	55.5	99.6	634	0.48	3.04	304
9	621.34	21.5	44.3	48.2	92.5	740	0.38	3.42	282
10	622.42	20.5	42.9	43.1	86.0	683	0.65	4.07	444
11	623.42	16.4	36.0	54.7	90.7	459	0.15	4.22	69
F-12	624.33	17.4	40.6	-	-	548	0.55	4.77	302
F-13	625.37	20.9	44.6	-	-	724	0.32	5.09	232
13	625.53	18.9	48.2	51.5	99.7	708	0.15	5.24	106
14	626.52	19.7	47.7	29.8	77.5	730	1.45	6.69	1,060
F-15A	627.71	19.4	30.1	-	-	453	0.30	6.99	136
F-17	629.66	20.6	35.0	-	-	544	0.15	7.14	82
17	629.83	17.1	28.5	62.2	90.7	378	0.25	7.39	95

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company Kewanee Oil Company Lease Kretchmer 100 Acres Well No. 32

Sat. No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content, Bbls./A. Ft.	Feet of Core		Total Oil Content Bbls./Acre
			Oil	Water	Total		Ft.	Cum. Ft.	
F-18A	631.25	20.2	33.9	-	-	522	0.50	7.89	266
19	631.97	20.6	53.0	35.0	88.0	848	0.40	8.29	340
F-20A	632.60	17.9	22.1	-	-	307	0.75	9.04	230
F-21A	635.06	21.0	35.3	-	-	575	0.40	9.44	230
22	635.67	20.2	40.6	50.7	91.3	636	0.75	10.19	477
F-22A	636.60	20.7	44.0	-	-	707	1.20	11.39	850
23	637.77	21.9	33.5	34.8	68.3	570	0.70	12.09	399
24	638.93	18.3	46.0	53.0	99.0	653	1.00	13.09	653
25	640.02	18.5	48.7	46.7	95.4	700	0.70	13.79	490
26	641.17	18.9	47.9	47.6	95.5	704	1.05	14.84	739
27	642.23	19.8	47.3	48.2	95.5	727	1.05	15.89	764
28	643.23	20.5	55.5	37.2	92.7	884	1.05	16.94	927
29	644.26	18.3	40.7	52.5	93.2	577	1.35	18.29	780
									11,875

Note: "A" samples were taken from the core after it was received in the laboratory.

Oil Field Research Laboratories

SUMMARY OF SATURATION TESTS

TABLE IV

Company Kewanee Oil Company Lease Kretchmer 100 Acres Well No. 32

Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbls./A. Ft.	Total Oil Content Bbls./Acre
613.30 - 632.75	9.04	19.25	41.21	41.78	616	5,566
634.95 - 645.10	9.25	19.60	44.78	46.87	682	6,309
614.00 - 645.00	17.84	19.50	43.01	44.41	651	11,619

Oil Field Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE V

Company Kewanee Oil Company Lease Kretchmer- 100 Acres Well No. 32

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.
			Percent	Bbls./A. Ft.	Percent	Bbls./A. Ft.	% Oil	% Water	Bbls./A. Ft.			
2	613.37	15.8	43.6	535	0.0	0	43.6	51.8	535	0	Imp.	50
3	614.47	18.6	47.4	685	21.1	305	26.3	72.5	380	124	4.25	20
4	615.47	19.9	52.7	815	27.6	427	25.1	74.3	388	104	4.49	15
5	616.58	17.1	42.4	563	9.8	130	32.6	57.9	433	2	0.222	35
7	619.08	19.2	37.2	555	14.0	209	23.2	64.0	346	31	1.06	25
9	621.18	21.5	45.8	765	20.7	346	25.1	65.3	419	100	4.71	15
10	622.28	20.6	41.4	662	14.5	232	26.9	66.9	430	136	3.78	15
12	624.33	17.4	40.6	548	6.4	86	34.2	56.1	462	9	0.274	40
13	625.37	20.9	44.6	724	21.2	344	23.4	66.7	380	100	3.93	15
14	626.36	19.7	46.3	708	22.5	344	23.8	73.3	364	143	6.59	10
15A	627.71	19.4	30.1	453	6.6	99	23.5	66.7	354	136	7.41	15
17	629.66	20.0	35.0	544	6.8	106	28.2	56.5	438	2	0.194	50
18A	631.25	20.2	33.9	532	6.6	104	27.3	67.4	428	69	4.19	20
19	631.82	20.5	53.6	854	27.4	437	26.2	67.5	417	90	3.28	15
20A	632.60	17.9	22.1	307	0.0	0	22.1	63.4	307	79	1.87	25
21A	635.06	21.0	35.3	576	6.5	106	28.8	64.6	470	65	3.96	25
22	635.53	20.0	40.3	626	14.4	224	25.9	66.4	402	77	3.62	20
22A	636.60	20.7	44.0	707	20.1	323	23.9	61.1	384	102	5.96	15
24	638.77	18.7	46.2	671	19.5	283	26.7	60.8	388	70	2.56	20
25	639.86	17.7	50.8	698	25.0	344	25.8	67.9	354	36	1.16	25
26	641.03	18.6	48.5	701	19.4	280	29.1	57.8	421	73	2.01	20
27	642.07	20.2	45.0	706	19.2	301	25.8	55.7	405	180	2.92	15
28	643.07	20.6	54.5	871	29.6	473	24.9	68.9	398	58	3.18	10
29	644.13	18.2	41.2	582	12.3	174	28.9	63.0	408	37	1.05	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.
"A" samples were taken from the core after it was received in the laboratory.

Oil Field Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE VI

Company Kewanee Oil Company Lease Fretchner 100 Acres Well No. 32

Depth Interval, Feet	614.30 - 632.00	634.95-645.10	614.00-645.00
Feet of Core Analyzed	6.46	8.55	14.91
Average Percent Porosity	19.63	19.44	19.53
Average Percent Original Oil Saturation	45.11	45.60	45.42
Average Percent Oil Recovery	18.87	19.04	19.01
Average Percent Residual Oil Saturation	26.24	26.56	26.41
Average Percent Residual Water Saturation	67.85	62.44	64.79
Average Percent Total Residual Fluid Saturation	94.09	89.00	91.20
Average Original Oil Content, Bbls./A. Ft.	666.	688.	679.
Average Oil Recovery, Bbls./A. Ft.	268.	288.	280.
Average Residual Oil Content, Bbls./A. Ft.	398.	400.	399.
Total Original Oil Content, Bbls./Acre	4,301.	5,886.	10,129.
Total Oil Recovery, Bbls./Acre	1,733.	2,463.	4,179.
Total Residual Oil Content, Bbls./Acre	2,568.	3,423.	5,950.
Average Effective Permeability, Millidarcys	4.10	2.89	3.43
Average Initial Fluid Production Pressure, p.s.i.	22.3	18.9	20.9

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

Oil Field Research Laboratories

RESULTS OF WATER DIFFERENTATION TESTS

TABLE VII

Company Kewanee Oil Company Lease Fretchwer 100 Acres Well No. 32

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation Connate	Drilling & Foreign	Total
2	613.52	17,800			
3	614.63	11,000			
4	615.63	7,200			
5	616.82	12,900			
7	619.23	10,100			
8	620.27	8,400			
9	621.34	5,700			
10	622.42	7,900			
11	623.42	12,500			
13	625.53	5,500			
14	626.52	6,800			
17	629.83	12,800			
19	631.97	8,600			
22	635.67	7,400			
23	637.77	15,600			
24	638.93	8,000			
25	640.02	8,100			
26	641.17	8,800			
27	642.23	11,100			
28	643.23	5,200			
29	644.26	8,800			

Note: ppm - parts per million

Oil Field Research Laboratories

SUMMARY OF WATER DIFFERENTATION TESTS

TABLE VIII

Company Kewanee Oil Company Lease Kretchmer 160 Acres Well No. 32

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
613.30 - 632.00	10,257		
635.35 - 645.10	8,941		
614.00 - 645.00	9,297		

Notes: ppm - parts per million