27-17-32E

May 15, 1950

Deep Rock Oil Corporation
Tulsa, Oklahoma

Gentlemen:

Enclosed herewith is the report of the analysis made on the 2½ inch Rotary core taken from the Lloyd Lease, Well No. O-3, Miami County, Kansas, and submitted to our laboratory on May 8, 1950.

Very truly yours,

OIL FIELD RESEARCH LABORATORIES

William E. Sturdevant

WES:cc

c.c. to Mr. Neil Henderson

Lloyd O-3

DEEP ROCK OIL CORPORATION

CORE ANALYSIS REPORT

LLOYD LEASE WELL NO. C-3

MIAMI COUNTY, KANSAS

OIL FIELD RESEARCH LABORATORIES

CHANUTE, KANSAS

MAY 15, 1930

Oil Field Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Deep Rock Oil Corporation Lease Lloyd Well No. 0-3

Location 440' south of north line, 2,200' west of east line, NW¼,

Section 27 Twp. 17S Rge. 22E County Miami State Kansas

Name of Sand	Peru
Top of Core	286.79
Bottom of Core	317.74
Top of Pay Sand	305.60
Bottom of Sand	313.94
Total Feet of Permeable Sand	7.11

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	0.60	0.60
10 - 20	0.99	1.79
20 - 40	0.91	2.70
40 - 60	3.10	5.80
60 & above	1.31	7.11

Average Permeability, Millidarcys	39.93
Average Percent Porosity	19.32
Average Percent Oil Saturation	44.56
Average Percent Water Saturation	34.55
Average Oil Content, Bbls./A. Ft.	671.
Total Oil Content, Bbls./Acre	5,302.
Average Percent Oil Recovery by Laboratory Flooding Tests	19.33
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	270.
Aotal Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,620.
Total Calculated Oil Recovery, Bbls./Acre	1,350.
Packer Setting, Feet	305.50
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	

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

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
286.79 - 297.80	Discarded at well.
297.80 - 298.90	Laminated calcareous sandstone and shale.
298.90 - 300.30	Light brown fine grained laminated micaceous shaley calcareous sandstone.
300.30 - 300.63	Limestone.
300.63 - 301.52	Alternate thin layers of sandstone and shale.
301.52 - 304.06	Brown fine grained laminated micaceous shaley sandstone.
304.06 - 304.96	Hard gray limestone.
304.96 - 305.60	Hard brown finely laminated shaley sandstone.
305.60 - 307.30	Dark fine grained slightly laminated shaley sandstone.
307.30 - 308.39	Alternate thin layers of sandstone and shale.
308.39 - 309.44	Dark fine grained slightly laminated shaley sandstone.
309.44 - 311.36	Dark fine grained sandstone.
311.36 - 313.94	Brown fine grained laminated micaceous shaley sandstone.
313.94 - 314.47	Hard gray limestone.
314.47 - 315.08	Shale containing limestone inclusions.
315.08 - 315.60	Gray shale.
315.60 - 315.95	Shaley limestone.
315.95 - 317.74	Hard gray fractured limestone.

Coring was started at a depth of 286.79 feet and completed at 317.74 feet in hard gray fractured limestone. This core shows a total of 7.90 feet of sand. For the most part, the sand section is made up of dark fine grained slightly laminated shaley sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into two sections. The weighted average permeability of the upper and lower sections are 15.61 and 38.97 millidareys respectively; while that of the pay zone is 30.93 (See Table II). By observing the data given on the coregraph, it is noticeable that the sand has an irregular permeability profile and that the lower part of the sand section has a considerably higher permeability.

PERCENT SATURATION & OIL CONTENT

The pay sand in this core shows a good weighted average percent oil saturation, namely, 44.56. The weighted average percent oil saturation of the upper and lower sections are 24.78 and 44.59 respectively. The weighted average percent water saturation of the upper and lower sections are 64.78 and 34.72 respectively; while that of the pay sand is 34.55. This gives an overall weighted average total fluid saturation of 79.11 (See Table IV). This comparatively low total fluid saturation indicates that an appreciable amount of fluid was lost during coring which was probably oil.

In order to get some idea of the degree of flushing of the sand during coring, all of the saturation samples were analyzed for chloride content. The results of these tests are given in Tables VII and VIII. However, it is evident that salt water was used in the coring of this well and the chloride samples do not give us such information.

The weighted average oil content of the upper and lower sections are 321 and 670 barrels per acre foot respectively; while that of the pay sand is 671 barrels per acre. The total oil content, as shown by this core, is 6,692 barrels per acre of which 5,302 barrels are in the

pay sand section.

LABORATORY FLOODING TESTS

The pay sand in this core responded very well to laboratory flooding tests as a total recovery of 1,620 barrels of oil per acre was obtained from 6.01 feet of sand. The weighted average percent oil saturation was reduced from 49.01 to 29.68, this representing an average recovery of 19.33 percent. The weighted average effective permeability of the samples is 4.83 millidarcys while the average initial fluid production pressure is 15.0 pounds per square inch (See Table VI). From the data given in this table, it is noticeable that the sand in the lower section produced most of the oil that was recovered by laboratory flooding tests.

By observing the data given in Table V, you will note that of the 9 samples tested, 8 produced oil and took water. This indicates that most of the sand tested is floodable.

CONCLUSION

From a study of the above data, we believe that an efficient water flood within the vicinity of this well will recover approximately 1,350 barrels of oil per acre. In calculating this recovery, an allowance was made for oil lost during coring and it is assumed that the sand within the vicinity of this well is not pressured up.

The principle drawback of this core is the thin sand section and the wide variation in permeability.

Oil Field Research Laboratories

SHOT RECOMMENDATION

Company Deep Rock Oil Corporation Lease Lloyd Well No. C-3

Depth Interval, Feet	Feet of Sand	Size of Shell Inches	Qts./Ft.	Total Quarts
310.0 - 312.0	2	4	2.5	5.0

Recommended Packer Setting - 305.50 feet
Note: Plug hole back to 313.50 feet

Oil Field Research Laboratories

RESULTS OF PERMEABILITY TESTS

TABLE I

Company Deep Rock Oil Corporation Lease Lloyd Well No. 0-3

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	299.00	0.53	0.30	0.30	0.16
2	299.41	1.6	0.55	0.85	0.38
3	300.10	2.5	0.55	1.40	1.38
4	300.70	8.3	0.37	1.77	3.07
5	301.28	7.5	0.52	2.29	3.90
6	301.65	31.	0.58	2.87	17.98
7	302.50	12.	0.45	3.32	5.40
8	302.65	14.	0.20	3.52	2.80
9	302.85	33.	0.45	3.97	14.85
10	303.50	1.7	0.50	4.47	0.85
11	303.95	13.	0.36	4.83	4.68
12	305.00	3.0	0.29	5.12	0.87
13	305.50	6.8	0.35	5.47	2.38
14	306.20	47.	0.80	6.27	37.60
15	306.55	30.	0.30	6.57	9.00
16	306.90	56.	0.60	7.17	33.60
17	307.90	6.9	0.20	7.37	1.38
18	308.45	28.	0.21	7.58	5.88
19	308.74	53.	0.84	8.42	44.52
20	309.50	51.	0.26	8.68	13.26
21	309.80	28.	0.20	8.88	5.60
22	310.05	69.	0.50	9.38	34.50
23	310.80	40.	0.60	9.98	24.00
24	311.20	67.	0.36	10.34	24.12
25	311.48	11.	0.44	10.78	4.84
26	312.10	63.	0.45	11123	28.35
27	312.45	6.8	0.50	11.73	3.20
28	313.10	15.	0.55	12.28	8.25
29	313.55	25.	0.40	12.68	10.00
30	313.90	7.1	0.24	12.92	1.70

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SUMMARY OF PERMEABILITY TESTS

TABLE II

Company Deep Rock Oil Corporation Lease Lloyd Well No. C-3

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.
300.63 - 304.06	3.43	15.61	53.53
305.60 - 313.94	7.45	38.97	289.90
305.80 - 313.80	7.11	39.93	283.88

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company Deep Rock Oil Corporation Lease Lloyd Well No. O-3

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.	
1	300.85	16.3	25.9	65.2	91.1	328	0.89	0.89	292
2	301.85	16.7	23.2	68.2	91.4	302	0.98	1.87	296
3	303.05	16.8	25.2	68.1	93.3	329	1.56	3.43	514
4	305.75	18.7	50.0	22.6	72.6	727	0.90	4.33	655
5	307.13	20.6	36.8	43.0	81.8	589	0.80	5.13	470
F-5	307.46	17.4	32.2	-	-	435	1.09	6.22	474
6	308.92	18.8	50.0	36.9	85.9	729	1.05	7.27	765
7	310.26	20.1	49.8	33.7	83.5	779	1.92	9.19	1,495
8	311.62	20.5	44.3	33.3	77.6	706	0.74	9.93	523
9	312.62	19.1	44.2	37.1	81.3	656	1.84	11.77	1,208
								Total -	6,692

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SUMMARY OF SATURATION TESTS

TABLE IV

Company Deep Rock Oil Corporation Lease Lloyd Well No. O-3

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
300.63-304.06	3.43	16.65	24.78	64.78	321	1,102
305.60-313.94	8.34	19.30	44.59	34.72	670	5,590
305.50-313.50	7.90	19.32	44.56	34.55	671	5,302

Oil Field Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE V

Company Deep Rock Oil Corporation Lease Lloyd Well No. D-3

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation			Volume of Water Recovered cc*	[redacted] Effective Permeability, Millidarcys **	Initial Fluid Production Pressure Lbs./Sq. In.
			Percent	Bbls./A. Ft.	Percent	Bbls./A. Ft.	% Oil	% Water	Bbls./A. Ft.			
1	301.07	17.5	26.0	353	2.6	35	23.4	71.4	318	84	1.92	15
2	302.20	18.0	22.3	311	0.6	8	21.7	73.3	303	104.5	10.69	5
3	302.30	17.1	26.8	356	0.2	3	26.6	70.3	353	4	0.096	40
4	306.00	19.3	45.4	681	12.8	192	32.6	66.6	489	52	12.10	10
5	307.46	17.4	32.2	435	0.0	0	32.2	66.3	435	0	Imp.	50+
6	309.19	17.8	56.3	777	31.1	429	25.2	71.3	348	92	8.08	10
7	310.54	17.3	50.8	681	24.2	324	26.6	70.7	357	35	3.80	10
8	311.86	19.2	45.2	674	20.9	312	24.3	72.3	362	63	3.00	15
9	312.88	18.4	45.5	650	7.2	103	38.3	56.3	547	3.5	0.098	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.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE VI

Company Deep Rock Oil Corporation Lease Lloyd Well No. O-3

Depth, Interval, Feet	300.63 - 304.06	305.60 - 313.94	305.50 - 313.50
Feet of Core Analyzed	3.43	6.45	6.01
Average Percent Porosity	17.46	18.19	18.19
Average Percent Original Oil Saturation	25.30	48.78	49.01
Average Percent Oil Recovery	0.93	18.50	19.33
Average Percent Residual Oil Saturation	24.37	30.28	29.68
Average Percent Residual Water Saturation	71.57	66.40	67.10
Average Percent Total Residual Fluid Saturation	95.94	96.68	96.78
Average Original Oil Content, Bbls./A. Ft.	343.	687.	690.
Average Oil Recovery, Bbls./A. Ft.	13.	258.	270.
Average Residual Oil Content, Bbls./A. Ft.	330.	429.	420.
Total Original Oil Content, Bbls./Acre	1,176.	4,435.	4,144.
Total Oil Recovery, Bbls./Acre	44.	1,666.	1,620.
Total Residual Oil Content, Bbls./Acre	1,132.	2,769.	2,524.
Average Effective Permeability, Millidarcys	3.60	4.51	4.83
Average Initial Fluid Production Pressure, p.s.i.	20.0	13.0	13.0

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

Oil Field Research Laboratories

RESULTS OF WATER DIFFERENTIATION TESTS

TABLE VII

Company Deep Rock Oil Corporation Lease Lloyd Well No. C-3

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
1	300.85	12,600			
2	301.85	13,200			
3	303.05	13,700			
4	305.75	23,800			
5	307.13	13,800			
6	308.92	17,100			
7	310.26	13,400			
8	311.62	15,500			
9	312.62	18,500			

Note: ppm - parts per million

Oil Field Research Laboratories

SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VIII

Company Deep Rock Oil Corporation Lease Lloyd Well No. O-3

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
300.63 - 304.06	13,213		
305.60 - 313.94	16,784		
305.90 - 313.50	16,664		

Note: ppm - parts per million