OIL FIELD RESEARCH LABORATORIES
CHANUTE, KANSAS

March 13, 1951

The Ohio Oil Company
Thompson Building
Tulsa, Oklahoma

Attention: Mr. Fred Kluck

Gentlemen:

Enclosed herewith is the report of the analysis of the 2½" Rotary core taken from the Martindell Lease, Well No. W-33, Greenwood County, Kansas, and submitted to our laboratory on February 27, 1951.

Very truly yours,

OIL FIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:mm

c.c. to Mr. H. A. Scott

THE OHIO OIL COMPANY

CORE ANALYSIS REPORT

MARTINDELL LEASE WELL NO. W-33

GREENWOOD COUNTY, KANSAS

OIL FIELD RESEARCH LABORATORIES

CHANUTE, KANSAS

MARCH 13, 1951

Oil Field Research Laboratories

GENERAL INFORMATION & SUMMARY

Company The Ohio Oil Company Lease Martindell Well No. W-33

Location

Section 31 Twp. 23 Rge. 10 County Greenwood State Kansas

Name of Sand	Bartlesville
Top of Core	2346.00
Bottom of Core	2391.00
Top of Sand (According to strip log)	2344.00
Bottom of Sand	2484.73
Total Feet of Permeable Sand	32.74

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 2	5.81	5.81
2 - 4	2.75	8.56
4 - 8	6.65	15.21
8 - 12	3.73	18.94
12 - 24	5.04	23.98
24 - 48	6.58	30.56
48 & above	2.18	32.74

Average Permeability Millidarcys	15.54
Average Percent Porosity	16.32
Average Percent Oil Saturation	25.10
Average Percent Water Saturation	47.43
Average Oil Content, Bbls./A. Ft.	320.
Total Oil Content, Bbls./Acre	10,421.
Average Percent Oil Recovery by Laboratory Flooding Tests	3.76
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	50.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	871.
Total Calculated Oil Recovery, Bbls./Acre	2,450.
Casing Point ~~Packer Setting~~, Feet	2345.00
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation	1426.00

Fresh water was used in making up the 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
2344.00 - 2346.00	Drilled, according to strip log, sand.
2346.00 - 2347.80	Light brown medium grained micaceous sandstone.
2347.80 - 2348.30	Light brown medium grained micaceous slightly carbonaceous sandstone.
2348.30 - 2349.23	Light brown medium grained micaceous sandstone.
2349.23 - 2349.40	Light brown medium grained micaceous slightly carbonaceous sandstone.
2349.40 - 2354.00	Light brown medium grained micaceous sandstone.
2354.00 - 2354.50	Laminated sandy micaceous coal.
2354.50 - 2355.21	Gray fine grained micaceous slightly carbonaceous sandstone.
2355.21 - 2355.35	Finely laminated sandstone and shale.
2355.35 - 2355.68	Light brown fine grained micaceous carbonaceous sandstone.
2355.68 - 2355.78	Laminated sandy carbonaceous shale.
2355.78 - 2356.10	Light brown fine grained micaceous sandstone.
2356.10 - 2356.35	Laminated sandstone and shale.
2356.35 - 2357.60	Light brown fine grained micaceous slightly carbonaceous shaley sandstone.
2357.60 - 2357.77	Laminated sandy shale.
2357.77 - 2358.15	Gray laminated shaley sandstone.
2358.15 - 2358.55	Gray shale.
2358.55 - 2359.05	Light brown fine grained micaceous sandstone.

2359.05 - 2359.40 - Gray sandy shale.

2359.40 - 2359.60 - Light brown fine grained micaceous shaley sandstone.

2359.60 - 2360.27 - Gray shale.

2360.27 - 2361.00 - Light brown fine grained micaceous sandstone.

2361.00 - 2361.35 - Light brown fine grained micaceous slightly conglomeratic sandstone.

2361.35 - 2364.00 - Light brown fine grained micaceous sandstone.

2364.00 - 2365.00 - Loss.

2365.00 - 2365.15 - Gray shale.

2365.15 - 2365.90 - Light brown fine grained micaceous sandstone.

2365.90 - 2366.65 - Light brown fine grained micaceous slightly carbonaceous sandstone.

2366.65 - 2370.45 - Light brown fine grained micaceous sandstone.

2370.45 - 2370.75 - Light brown fine grained micaceous slightly carbonaceous sandstone.

2370.75 - 2373.35 - Light brown fine grained micaceous sandstone.

2373.35 - 2373.88 - Brown fine grained micaceous sandstone.

2373.88 - 2376.50 - Light brown fine grained micaceous sandstone.

2376.50 - 2377.15 - Dark fine grained micaceous carbonaceous sandstone.

2377.15 - 2377.75 - Light brown fine grained micaceous sandstone.

2377.75 - 2378.35 - Light brown fine grained micaceous calcareous sandstone.

2378.35 - 2379.00 - Light brown fine grained micaceous sandstone.

2379.00 - 2380.80 - Light brown fine grained micaceous slightly shaley sandstone.

2380.80 - 2382.00 - Light brown fine grained micaceous sandstone.

2382.00 - 2383.50 - Dark fine grained micaceous carbonaceous calcareous sandstone.

2383.50 - 2384.00 - Loss.

2384.00 - 2384.75 - Dark fine grained micaceous carbonaceous slightly calcareous sandstone.

2384.75 - 2390.50 - Finely laminated sandstone and shale containing a vertical fracture.

2390.50 - 2391.00 - Loss.

Coring was started at a depth of 2346.00 feet in medium grained micaceous sandstone and completed at 2391.00 feet, probably in laminated sandstone and shale. The core shows three losses, namely, from 2364.00 to 2365.00 feet, 2383.50 to 2384.00 feet and 2390.50 to 2391.00 feet. Chances are, the upper two losses were sandstone. There is a sandy coal layer extending from 2354.00 to 2354.50 feet. Furthermore, the core also contains a vertical fracture extending from 2386.53 to 2390.30 feet. This core shows a total of 34.10 feet of sand. For the most part, the pay sand is made up of fine to medium grained micaceous 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 are 27.99, 5.10 and 18.81 respectively; the overall average being 15.54 (See Table II). From the above data and that given on the coregraph, it is noticeable that the sand has a wide variation in permeability.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a low weighted average percent oil saturation, namely, 25.10 percent. The weighted average percent oil saturation of the upper, middle and lower sections are 24.92, 21.91 and 28.92 respectively. The weighted average percent water saturation of the upper, middle and lower sections are 46.83, 50.31 and 44.70 respectively; the overall average being 72.53 percent. This low total fluid saturation indicates that an appreciable amount of fluid was lost during coring, which was probably oil.

In an effort to determine whether or not any flushing of the sand occurred during coring, all of the saturation samples were analyzed for chloride content, which in turn were used in the determination of percent connate water. 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 show the higher degree of flushing. Inasmuch as the core shows a considerable void space, we are inclined to believe that most of the oil lost during coring was due to the expansion of gas carried in solution by the oil.

The weighted average oil content of the upper, middle and lower sections are 340, 265 and 372 barrels per acre foot respectively. The overall average being 320. The total oil content, as shown by this core, is 10,421 barrels per acre (See Table IV).

LABORATORY FLOODING TESTS

The sand in this core did not respond very well to laboratory flooding tests, as a total recovery of only 871 barrels of oil per acre was obtained from 17.41 feet of sand. The weighted average percent oil saturation was reduced from 26.36 to 22.60, or represents an average recovery of 3.76 percent. The weighted average effective permeacility of the samples is 2.51 millidarcys, while the average initial fluid production pressure is 26.6 pounds per scuare inch (See Table VI).

From the data given in Table V, you will note that of the 37 samples tested, 22 produced water and 20 oil. This indicates that only part of the sand represented by these samples is floodable. The tests also show that the sand has a wide variation in effective permeability.

CONCLUSION

From a study of the above data, we believe that an efficient water flood within the vicinity of this well will recover approximately 2,450 barrels of oil per acre, or an average of 141 barrels per acre foot from the 17.41 feet of good floodable sand analyzed. In calculating the recovery, an allowance was made for oil lost during coring, and it was assumed that the true water saturation of the sand is 38 percent.

The principle drawback of the sand in this core is that it has a wide variation in permeability and part of the cored section is badly broken. Inasmuch as the core shows a vertical fracture at the bottom, it is recommended that the hole be plugged back to a depth of 2385.00 feet. Chances are, the recovery for the area represented by this core could be increased by using proper selective plugging in the later stages of the flood. It is hoped that the layer of coal will not fracture under pressure.

Oil Field Research Laboratories

RESULTS OF PERMEABILITY TESTS

TABLE I

Company The Ohio Oil Company Lease Martindell Well No. W-33

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	2346.08	21.	0.30	0.30	6.30
3	2346.95	32.	0.50	0.80	16.00
4	2347.45	33.	0.60	1.40	19.80
5	2347.85	15.	0.20	1.60	3.00
6	2348.16	3.0	0.30	1.90	0.90
7	2348.62	27.	0.45	2.35	12.15
8	2348.92	24.	0.48	2.83	11.52
9	2349.23	19.	0.17	3.00	3.23
10	2349.75	20.	0.60	3.60	12.00
11	2350.21	25.	0.45	4.05	11.25
12	2350.68	18.	0.50	4.55	9.00
13	2351.20	47.	0.45	5.00	21.15
14	2351.67	34.	0.45	5.45	15.30
15	2352.06	53.	0.45	5.90	23.85
16	2352.53	40.	0.45	6.35	18.00
17	2352.97	24.	0.35	6.70	8.40
18	2353.28	18.	0.35	7.05	6.30
19	2353.66	33.	0.35	7.40	11.55
20.	2353.95	15.	0.20	7.60	3.00
21	2354.85	1.4	0.50	8.10	0.70
22	2355.14	0.8	0.21	8.31	0.17
23	2355.65	6.4	0.33	8.64	2.11
24	2355.96	6.4	0.32	8.96	2.05
25	2356.47	0.6	0.35	9.31	0.21
26	2356.88	1.1	0.40	9.71	0.44
27	2357.20	0.8	0.50	10.21	0.40
28	2358.93	Imp.	0.50	10.71	0.00
29	2360.65	8.4	0.73	11.44	6.13
30	2361.15	5.2	0.35	11.79	1.82
31	2361.50	4.4	0.30	12.09	1.32
32	2361.85	4.0	0.35	12.44	1.40
33	2362.25	1.4	0.60	13.04	0.84
34	2363.04	8.2	0.65	13.69	5.33
35	2363.49	1.3	0.45	14.14	0.59
36	2363.93	4.0	0.30	14.44	1.20
37	2365.30	2.7	0.35	14.79	0.95
38	2365.70	1.1	0.40	15.19	0.44
39	2366.23	1.9	0.50	15.69	0.95
40	2366.57	2.5	0.25	15.94	0.63

Oil Field Research Laboratories

RESULTS OF PERMEABILITY TESTS

TABLE I

Company The Ohio Oil Company Lease Martindell Well No. W-33

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
41	2366.93	3.7	0.60	16.54	2.22
42	2367.54	4.6	0.55	17.09	2.53
43	2368.15	6.1	0.60	17.69	3.66
44	2368.65	12.	0.40	18.09	4.80
45	2369.05	11.	0.45	18.54	4.95
46	2369.43	8.5	0.35	18.89	2.98
47	2369.84	9.7	0.50	19.39	4.85
48	2370.38	20.	0.35	19.74	7.00
49	2370.85	6.9	0.35	20.09	2.42
50	2371.35	4.8	0.50	20.59	2.40
51	2371.84	0.6	0.40	20.99	0.24
52	2372.25	31.	0.50	21.49	15.50
53	2372.75	6.5	0.50	21.99	3.25
54	2373.27	6.7	0.35	22.34	2.35
55	2373.62	53.	0.53	22.87	28.09
56	2374.12	12.	0.47	23.34	5.64
57	2374.55	37.	0.40	23.74	14.80
58	2375.05	46.	0.55	24.29	25.30
59	2375.55	58.	0.60	24.89	34.80
60	2376.30	60.	0.60	25.49	36.00
61	2376.85	16.	0.65	26.14	10.40
62	2277.25	18.	0.35	26.49	6.30
63	2377.70	6.2	0.25	26.74	1.55
64	2378.25	0.5	0.60	27.34	0.30
65	2378.90	2.3	0.65	27.99	1.50
66	2379.35	1.1	0.60	28.59	0.66
67	2379.94	2.1	0.60	29.19	1.26
68	2380.46	4.5	0.60	29.79	2.70
69	2380.90	1.4	0.30	30.09	0.42
70	2381.36	28.	0.60	30.69	16.80
71	2381.95	11.	0.30	30.99	3.30
72	2382.18	12.	0.50	31.49	6.00
73	2382.74	4.3	0.50	31.99	2.15
74	2383.24	9.7	0.50	32.49	4.85
75	2384.06	10.	0.25	32.74	2.50
76	2384.40	7.9	0.50	33.24	3.95

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SUMMARY OF PERMEABILITY TESTS

TABLE II

Company The Ohio Oil Company Lease Martindell Well No. W-33

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.
2346.00 - 2354.00	7.60	27.99	212.70
2354.50 - 2372.00	12.89	5.10	65.73
2372.00 - 2384.75	12.25	18.81	230.37
2346.00 - 2384.75	32.74	15.54	508.80

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RESULTS OF SATURATION TESTS

TABLE III

Company The Ohio Oil Company Lease Martindell Well No. W-33

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	2346.62	17.5	26.6	44.0	66.6	361	1.10	1.10	397
2	2347.62	17.5	25.3	51.7	77.0	344	0.70	1.80	240
3	2348.35	17.1	23.2	42.6	65.8	308	0.93	2.73	286
4	2349.45	17.6	24.0	55.7	79.7	328	0.50	3.23	164
5	2350.39	18.2	23.8	45.0	68.8	336	1.00	4.23	336
6	2351.39	18.4	25.6	44.1	69.7	365	1.10	5.33	402
7	2352.69	17.4	24.6	45.0	69.6	332	1.05	6.38	348
8	2353.42	17.0	25.7	53.1	78.8	339	0.95	7.33	322
9	2354.54	14.6	14.0	56.2	70.2	159	0.71	8.04	113
10	2355.42	14.1	21.3	57.6	78.9	233	0.33	8.37	77
F-11A	2356.60	13.5	19.5	-	-	204	0.65	9.02	133
12	2357.43	12.7	17.3	56.1	73.4	171	0.60	9.62	103
13	2358.65	15.4	21.4	53.4	74.8	256	0.50	10.12	128
14	2359.45	13.2	20.8	58.2	78.2	213	0.20	10.32	43
15	2360.40	16.6	22.6	33.6	56.2	291	0.73	11.05	212
16	2361.30	15.7	21.7	45.0	66.7	265	0.35	11.40	93
F-16	2361.40	16.8	21.9	-	-	285	0.40	11.80	114
17	2362.00	15.4	19.4	49.0	68.4	232	0.85	12.65	197

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company The Ohio Oil Company Lease Martindell Well No. W-33

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.	
18	2363.22	15.7	18.1	51.4	69.5	220	1.40	14.05	308
19	2365.50	14.8	19.9	56.5	76.4	228	0.75	14.80	171
20	2366.35	14.7	20.2	65.2	85.4	230	0.75	15.55	173
21	2367.70	17.7	22.3	44.7	67.0	306	1.35	16.90	413
22	2368.38	17.1	25.4	46.3	71.7	337	1.00	17.90	337
23	2369.58	15.9	24.3	49.0	73.3	300	1.45	19.35	435
24	2370.58	16.4	32.5	40.7	73.2	415	0.30	19.65	125
25	2371.54	14.6	29.6	51.0	80.6	336	1.25	20.90	420
26	2372.43	15.0	29.8	39.6	69.4	347	1.35	22.25	469
27	2373.40	19.1	29.5	42.9	72.4	438	0.53	22.78	232
28	2374.25	19.2	28.4	35.6	64.0	423	0.87	23.65	368
29	2375.25	18.4	28.9	42.9	71.8	427	1.75	25.40	749
30	2376.56	14.9	37.1	30.3	67.4	429	0.65	26.05	279
31	2377.40	15.1	27.8	47.6	75.4	326	0.60	26.65	196
32	2378.42	16.0	29.9	43.5	73.4	371	0.65	27.30	241
33	2379.72	14.6	22.1	57.4	79.5	251	1.20	28.50	301
34	2380.62	15.3	22.8	48.0	70.8	271	0.60	29.10	163
35	2381.50	17.1	20.6	47.8	68.4	274	1.20	30.30	329
36	2382.38	17.1	36.2	42.2	78.4	480	1.50	31.80	720
37	2384.57	13.8	35.3	57.8	93.1	379	0.75	32.55	284
							Total - - - - -		10,421

Note: "A" sample was drilled from the core after it was received in the laboratory.

Oil Field Research Laboratories

SUMMARY OF SATURATION TESTS

TABLE IV

Company The Ohio Oil Company Lease Martindell Well No. W-33

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
2346.00-2354.00	7.33	17.63	24.92	46.83	340	2,495
2354.50-2372.00	13.57	15.50	21.91	50.31	265	3,595
2372.00-2384.75	11.65	16.45	28.92	44.70	372	4,331
2346.00-2384.75	32.55	16.32	25.10	47.43	320	10,421

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TAB

Company The Ohio Oil Company Lease Mart

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery	
			Percent	Bbls./A. Ft.	Percent	Bbls./A. F
1	2346.72	17.2	26.0	347	3.8	51
2	2347.72	17.7	26.3	361	4.3	59
3	2348.45	17.5	23.3	316	0.9	12
4	2349.63	17.5	24.8	337	2.0	27
5	2350.55	18.4	24.5	350	2.7	39
6	2351.53	18.0	26.7	373	5.7	80
7	2352.83	17.1	25.4	337	3.6	48
8	2353.55	16.7	25.0	324	3.7	48
9	2354.66	14.6	13.7	155	0.0	0
10	2355.54	14.0	22.8	248	0.0	0
11A	2356.60	13.5	19.5	204	0.0	0
12	2357.52	13.2	18.2	186	0.0	0
13A	2359.03	15.6	22.4	271	0.0	0
14	2359.55	13.5	20.2	212	0.0	0
15	2360.50	15.9	24.1	297	3.0	37
16	2361.40	16.8	21.9	285	1.1	14
17	2362.10	15.3	19.5	232	0.0	0
18	2363.33	15.4	18.6	222	0.0	0
19	2365.60	14.7	20.6	235	0.0	0
20	2366.45	14.7	19.8	226	0.0	0
21	2367.80	16.2	24.9	313	5.7	72
22	2368.54	17.1	24.7	328	0.0	0
23	2369.72	17.0	23.7	313	5.6	74
24	2370.72	16.9	32.9	431	11.3	148
25	2371.65	14.6	28.0	317	0.0	0
26	2372.55	15.4	28.3	338	1.1	13
27	2373.50	19.3	29.4	441	2.4	36
28	2374.38	18.6	29.0	418	2.1	30
29	2375.37	18.3	28.2	400	5.2	74
30	2376.74	15.0	36.0	419	0.0	0
31	2377.52	15.4	27.5	329	0.8	10
32	2378.55	15.5	29.5	355	0.0	0

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LABORATORY FLOODING TESTS

TABLE V

Martindell Well No. W-33

y Bbls./A. Ft.	Residual Saturation % Oil	% Water	Bbls./A. Ft.	Volume of Water Recovered cc*	Effective Permeability, Millidarcys **	Initial Fluid Production Pressure Lbs./Sq. In.
51	22.2	76.0	296	142	5.54	20
59	22.0	76.8	302	166	5.99	20
12	22.4	72.6	304	84	2.92	20
27	22.8	74.0	310	26	0.753	25
39	21.8	73.5	311	82	3.18	20
80	21.0	77.1	293	179	6.05	15
48	21.8	76.0	289	172	5.27	20
48	21.3	77.1	276	86	3.03	20
0	13.7	66.8	155	0	Imp.	50+
0	22.8	62.5	248	0	Imp.	50+
0	19.5	57.6	204	0	Imp.	50+
0	18.2	58.8	186	0	Imp.	50+
0	22.4	62.0	271	0	Imp.	50+
0	20.2	71.6	212	0	Imp.	50+
37	21.1	63.9	260	3	0.305	40
14	20.8	69.5	271	2	0.252	50
0	19.5	64.5	232	0	Imp.	50+
0	18.6	64.3	222	0	Imp.	50+
0	20.6	66.2	235	0	Imp.	50+
0	19.8	73.2	226	0	Imp.	50+
72	19.2	62.5	241	3	0.305	30
0	24.7	58.5	328	0	Imp.	50+
74	18.1	62.4	239	4	0.390	30
148	21.6	71.5	283	21	0.600	20
0	28.0	55.9	317	0	Imp.	50+
13	27.2	70.2	325	9	0.260	35
36	27.0	64.7	405	163	12.83	15
30	26.9	70.6	388	18	0.483	30
74	23.0	63.7	326	40	1.52	25
0	36.0	50.0	419	10	0.268	35
10	26.7	61.2	319	6	0.148	35
0	29.5	53.6	355	0	Imp.	50+

Oil Field Resec

RESULTS OF LABORA

TA

Company The Ohio Oil Company Lease Mart

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery	
			Percent	Bbls./A. Ft.	Percent	Bbls./A. F
33	2379.82	14.3	22.6	251	2.0	22
34	2380.72	15.4	23.3	279	0.0	0
35	2381.60	16.9	21.2	278	0.0	0
36	2382.53	17.1	36.4	483	0.0	0
37	2384.72	14.3	34.2	378	5.6	62

Notes: cc - cubic centimeter.
*Volume of water recovered at the time of ma
**Determined by passing water through sample
"A" samples were taken from core after it wa

eld Research Laboratories

' LABORATORY FLOODING TESTS

TABLE V

Martindell Well No. W-33

ery Bbls./A. Ft.	Residual Saturation % Oil	% Water	Bbls./A. Ft.	Volume of Water Recovered cc*	Effective Permeability, Millidarcys **	Initial Fluid Production Pressure Lbs./Sq. In.
22	20.6	66.5	229	0	0.008	50
0	23.3	57.8	279	0	Imp.	50
0	21.2	66.8	278	18	0.550	25
0	36.4	53.4	483	14	0.280	30
62	28.6	68.4	316	9	0.274	35

ıe of maximum oil recovery.
. sample which still contains residual oil.
ır it was received in the laboratory.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE VI

Company The Ohio Oil Company Lease Martindell Well No. W-33

Depth Interval, Feet	2346.00 - 2354.00	2360.27 - 2370.75	2372.00 - 2384.75	2346.00 - 2384.75
Feet of Core Analyzed	7.33	4.23	5.85	17.41
Average Percent Porosity	17.53	16.50	16.96	17.09
Average Percent Original Oil Saturation	25.28	24.63	29.12	26.36
Average Percent Oil Recovery	3.45	5.15	3.14	3.76
Average Percent Residual Oil Saturation	21.83	19.48	25.98	22.60
Average Percent Residual Water Saturation	75.47	63.99	66.70	69.74
Average Percent Total Residual Fluid Saturation	97.30	83.47	92.68	92.34
Average Original Oil Content, Bbls./A. Ft.	344.	315.	382.	350.
Average Oil Recovery, Bbls./A. Ft.	47.	66.	42.	50.
Average Residual Oil Content, Bbls./A. Ft.	297.	249.	340.	300.
Total Original Oil Content, Bbls./Acre	2,519.	1,336.	2,234.	6,089.
Total Oil Recovery, Bbls./Acre	345.	281.	245.	871.
Total Residual Oil Content, Bbls./Acre	2,174.	1,055.	1,989.	5,218.
Average Effective Permeability, Millidarcys	4.32	0.350	1.80	2.51
Average Initial Fluid Production Pressure, p.s.i.	20.0	34.0	29.2	26.6

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

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RESULTS OF WATER DIFFERENTATION TESTS

TABLE VII

Company The Ohio Oil Company Lease Martindell Well No. W-33

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
1	2346.62	58,500	41.0	3.0	44.0
2	2347.62	51,000	41.9	9.8	51.7
3	2348.35	53,000	35.9	6.7	42.6
4	2349.45	27,500	24.4	31.3	55.7
5	2350.39	35,300	25.3	19.7	45.0
6	2351.39	21,800	15.3	28.8	44.1
7	2352.69	41,400	29.6	15.4	45.0
8	2353.42	52,100	44.0	9.1	53.1
9	2354.54	66,300	56.2	0.0	56.2
10	2355.42	54,200	49.6	8.0	57.6
12	2357.43	53,600	48.0	8.1	56.1
13	2358.65	54,400	46.1	7.3	53.4
14	2359.45	50,500	46.7	11.5	58.2
15	2360.40	58,100	31.1	2.5	33.6
16	2361.30	60,500	43.3	1.7	45.0
17	2362.00	59,300	46.2	2.8	49.0
18	2363.22	59,900	49.0	2.4	51.4
19	2365.50	50,600	45.5	11.0	56.5
20	2366.35	49,600	51.5	13.7	65.2
21	2367.70	50,600	36.0	8.7	44.7
22	2368.38	50,700	37.3	9.0	46.3
23	2369.58	52,000	40.5	8.5	49.0
24	2370.58	48,800	31.6	9.1	40.7
25	2371.54	52,400	42.5	8.5	51.0
26	2372.43	41,800	26.3	13.3	39.6
27	2373.40	44,500	30.4	12.5	42.9
28	2374.25	50,400	28.5	7.1	35.6
29	2375.25	42,000	28.6	14.3	42.9
30	2376.56	70,800	30.3	0.0	30.3
31	2377.40	57,100	43.3	4.3	47.6
32	2378.42	63,700	43.5	0.0	43.5
33	2379.72	56,500	51.5	5.9	57.4
34	2380.62	56,700	43.3	4.7	48.0
35	2381.50	53,400	40.5	7.3	47.8
36	2382.38	57,300	38.5	3.7	42.2
37	2384.57	52,100	47.9	9.9	57.8

Note: ppm - parts per million

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SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VIII

Company The Ohio Oil Company Lease Martindell Well No. W-33

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
2346.00-2354.00	43,042	32.05	14.79
2354.50-2372.00	54,512	43.40	6.92
2372.00-2384.75	52,343	36.95	7.73
2346.00-2384.75	51,041	38.37	9.05

Note: ppm - parts per million.