

April 25, 1950

Sunray Oil Corporation
1103 Philtower Building
Tulsa, Oklahoma

Attention: Mr. J. F. Adkisson

Gentlemen:

Enclosed herewith is the report of the partial analysis made on the 2 $\frac{1}{2}$ " rotary core taken from the Fankhauser Lease, Well No. W-21, Greenwood County, Kansas, and submitted to our laboratory on April 17, 1950.

In calculating the recovery for the sand within the vicinity of this well, an allowance was made for oil lost during coring; and it was assumed that the true water saturation of the sand is 40 percent.

Very truly yours,

OIL FIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:dt

c.c. to Mr. C. C. Shreve
Mr. L. T. Moffatt
2 - Mr. M. M. Hardin
Cities Service Oil Co.
Madison, Kansas

SUNRAY OIL CORPORATION

CORE ANALYSIS REPORT

FANKHAUSER LEASE

WELL NO. W-21

GREENWOOD COUNTY, KANSAS

OIL FIELD RESEARCH LABORATORIES

CHANUTE, KANSAS

APRIL 25, 1950

Oil Field Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Sunray Oil Corporation Lease Fankhauser Well No. W-21
 Location 1340 ft. north of south line, 50 ft. east of west line, SE $\frac{1}{4}$
 Section 4 Twp. 22S Rge. 12E County Greenwood State Kansas

Name of Sand	Bartlesville
Top of Core	1775.00
Bottom of Core	1841.00
Top of Sand	1800.75
Bottom of Sand	1836.25
Total Feet of Permeable Sand	23.13

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	2.60	2.60
10 - 20	1.12	3.72
20 - 60	8.70	12.42
60 - 120	4.26	16.68
120 - 180	3.00	19.68
180 - 240	3.15	22.83
240 & above	0.30	23.13

Average Permeability, Millidarcys	84.16
Average Percent Porosity	19.98
Average Percent Oil Saturation	23.34
Average Percent Water Saturation	71.99
Average Oil Content, Bbls./A. Ft.	363.
Total Oil Content, Bbls./Acre	8,624.
Average Percent Oil Recovery by Laboratory Flooding Tests	2.24
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	36.
Aotal Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	397.
Total Calculated Oil Recovery, Bbls./Acre	4,500.
Casing point, Racker Setting Feet	1802.00

Viscosity, Centipoises @

A. P. I. Gravity, degrees @ 60 °F

Note: The above averages are for that part of the sand section extending from the casing point to the bottom of the core.

OIL FIELD RESEARCH LABORATORIES

LOG

Company Sunray Oil Corporation Lease Fankhauser Well NO. W-21

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
1775.00 - 1799.00	- Discarded at well, containing vertical fractures from depths of 1775.00 to 1776.00; 1783.50 to 1785.50 and a loss which was probably sandy shale from 1793.00 to 1794.00.
1799.00 - 1800.75	- Gray sandy shale.
1800.75 - 1801.20	- Light brown fine grained laminated micaceous sandstone.
1801.20 - 1801.80	- Light brown fine grained slightly carbonaceous micaceous sandstone.
1801.80 - 1802.20	- Light brown fine grained micaceous sandstone.
1802.20 - 1802.52	- Laminated sandstone and shale.
1802.52 - 1802.70	- Light brown fine grained slightly laminated micaceous sandstone.
1802.70 - 1804.40	- Light brown fine grained laminated micaceous sandstone.
1804.40 - 1804.80	- Light brown fine grained micaceous slightly carbonaceous sandstone.
1804.80 - 1809.00	- Light brown fine grained micaceous sandstone.
1809.00 - 1809.16	- Gray shale.
1809.16 - 1809.30	- Light brown fine grained micaceous sandstone.
1809.30 - 1810.80	- Laminated sandstone and shale.
1810.80 - 1811.00	- Light brown fine grained shaley sandstone.
1811.00 - 1815.00	- Loss (probably sandstone).
1815.00 - 1825.00	- Light brown fine grained micaceous sandstone.
1825.00 - 1829.00	- Loss.

1829.00 - 1830.10 - Light brown fine grained micaceous slightly shaley sandstone.

1830.10 - 1830.30 - Gray shale.

1830.30 - 1832.40 - Light brown fine grained micaceous sandstone.

1832.40 - 1832.80 - Light brown fine grained micaceous slightly carbonaceous sandstone.

1832.80 - 1836.25 - Light brown fine grained micaceous sandstone.

1836.25 - 1838.00 - Gray shale.

1838.00 - 1840.00 - Loss.

1840.00 - 1841.00 - Dense black shale (discarded at well).

Oil Field Research Laboratories
RESULTS OF PERMEABILITY TESTS
TABLE I

Company Sunray Oil Corporation Lease Fankhauser Well No. W-21

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	1800.80	9.7	0.10	0.10	0.97
2	1800.95	3.8	0.35	0.45	1.33
3	1801.25	22.	0.10	0.55	2.20
4	1801.40	50.	0.50	1.05	25.00
5	1801.90	53.	0.40	1.45	21.20
6	1802.60	19.	0.18	1.63	3.42
7	1802.92	4.6	0.40	2.03	1.84
8	1803.35	12.	0.50	2.53	6.00
9	1803.75	15.	0.30	2.83	4.50
10	1804.05	217.	0.30	3.13	65.10
11	1804.32	34.	0.20	3.33	6.80
12	1804.75	44.	0.40	3.73	17.60
13	1805.05	34.	0.40	4.13	13.60
14	1805.35	42.	0.30	4.43	12.60
15	1805.70	49.	0.30	4.73	14.70
16	1805.95	52.	0.35	5.08	18.20
17	1806.30	50.	0.35	5.43	17.50
18	1806.68	47.	0.30	5.73	14.10
19	1806.95	50.	0.35	6.08	17.50
20	1807.33	62.	0.35	6.43	21.70
21	1807.70	67.	0.50	6.93	33.50
22	1808.20	147.	0.35	7.28	51.45
23	1808.55	47.	0.35	7.63	16.45
24	1808.85	105.	0.46	8.09	48.30
25	1809.22	17.	0.14	8.23	2.38
26	1815.12	48.	0.40	8.63	19.20
27	1815.52	257.	0.30	8.93	77.10
28	1815.87	162.	0.40	9.33	64.80
29	1816.30	234.	0.40	9.73	93.60
30	1816.65	97.	0.30	10.03	29.10
31	1817.00	208.	0.30	10.33	62.40
32	1817.30	32.	0.40	10.73	12.80
33	1817.70	130.	0.50	11.23	65.00
34	1818.30	83.	0.50	11.73	41.50
35	1818.95	26.	0.60	12.33	15.60
36	1819.30	4.4	0.40	12.73	1.76
37	1819.70	38.	0.50	13.23	19.00
38	1820.25	41.	0.40	13.63	16.40
39	1820.70	52.	0.45	14.08	23.40
40	1821.00	26.	0.35	14.43	9.10

Oil Field Research Laboratories
RESULTS OF PERMEABILITY TESTS
TABLE I

Company Sunray Oil Corporation Lease Fankhauser Well No. W-21

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
41	1821.32	73.	0.30	14.73	21.90
42	1821.70	52.	0.50	15.23	26.00
43	1822.31	39.	0.80	16.03	31.20
44	1823.12	6.3	0.40	16.43	2.52
45	1823.35	7.2	0.30	16.73	2.16
46	1823.70	163.	0.60	17.33	97.80
47	1829.15	28.	0.40	17.73	11.20
48	1829.65	9.9	0.35	18.08	3.47
49	1829.90	3.7	0.35	18.43	1.30
50	1830.20	Imp.	0.20	18.63	0.00
51	1830.55	182.	0.40	19.03	72.80
52	1830.85	95.	0.40	19.43	38.00
53	1831.34	122.	0.40	19.83	48.80
54	1831.70	208.	0.40	20.23	83.20
55	1832.05	164.	0.30	20.53	49.20
56	1832.30	110.	0.20	20.73	22.00
57	1832.65	7.0	0.40	21.13	2.80
58	1833.10	116.	0.50	21.63	58.00
59	1833.50	29.	0.40	22.03	11.60
60	1833.95	101.	0.40	22.43	40.40
61	1834.30	206.	0.40	22.83	82.40
62	1834.62	236.	0.50	23.33	118.00
63	1835.24	205.	0.45	23.78	92.25
64	1835.65	115.	0.35	24.13	40.25
65	1836.11	128.	0.45	24.58	57.60

Oil Field Research Laboratories

SUMMARY OF PERMEABILITY TESTS

TABLE II

Company Sunray Oil Corporation Lease Fankhauser Well No. W-21

Depth Interval Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.
1800.75 - 1811.00	8.23	53.21	437.94
1815.00 - 1825.00	9.10	80.48	732.34
1829.00 - 1836.25	7.05	118.19	833.27
1802.00 - 1836.25	23.13	84.89	1,963.45

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company Sunray Oil Corporation Lease Fankhauser Well No. W-21

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-1	1801.70	20.1	23.6	-	-	368	1.45	1.45	534
2	1803.50	17.5	21.0	78.5	99.5	286	1.70	3.15	486
F-3	1804.50	19.8	23.1	-	-	355	0.40	3.55	142
4	1805.50	20.6	26.9	71.2	98.1	431	1.20	4.75	518
F-5	1806.50	20.2	26.1	-	-	408	1.00	5.75	408
6	1807.50	20.7	27.0	69.1	96.1	435	1.10	6.85	479
F-7	1808.70	20.9	28.5	-	-	462	0.90	7.75	416
8	1810.90	19.5	23.1	68.5	91.6	350	0.20	7.95	70
F-9	1815.70	22.5	24.6	-	-	431	1.10	9.05	475
10	1816.50	22.5	20.1	73.4	93.5	352	0.90	9.95	316
F-11	1817.50	19.6	25.8	-	-	393	1.00	10.95	393
12	1818.50	23.1	24.8	67.3	92.1	445	1.00	11.95	445
F-13	1819.50	17.3	25.4	-	-	342	1.00	12.95	342
14	1820.50	18.8	17.1	80.3	97.4	250	1.00	13.95	250
F-15	1821.50	17.7	21.1	-	-	290	1.00	14.95	290
16	1822.50	19.4	18.1	78.2	96.3	273	1.00	15.95	273
F-17	1823.50	20.6	25.2	-	-	404	0.80	16.75	324
18	1824.10	20.1	19.2	73.5	92.7	300	1.20	17.95	360
F-19	1829.50	18.3	22.1	-	-	315	1.10	19.05	347

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company Sunray Oil Corporation Lease Fankhauser Well No. W-21

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.	
20	1830.40	21.3	22.7	68.9	91.6	376	0.65	19.70	244
F21	1831.50	20.5	23.8	-	-	379	1.45	21.15	550
22	1832.50	16.0	20.4	74.8	95.2	253	0.40	21.55	101
F23	1833.30	21.4	23.5	-	-	391	1.10	22.65	430
24	1834.50	20.3	22.1	57.6	79.7	348	1.30	23.95	453
F25	1835.90	19.5	27.5	-	-	417	1.05	25.00	438
						Total	Total	- - - -	9,084

Oil Field Research Laboratories

SUMMARY OF SATURATION TESTS

TABLE IV

Company	Sunray Oil Corporation	Lease	Fankhauser	Well No.	W-21	
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
1800.75-1811.00	7.95	19.80	24.84	73.52	384	3,053
1815.00-1825.00	10.00	20.16	22.06	74.55	347	3,468
1829.00-1836.25	7.05	19.97	23.48	63.70	364	2,563
1802.00-1836.25	23.75	19.98	23.34	71.99	363	8,624

Oil Field

RESULTS OF LOGGING

Company Sunray Oil CorporationLease F

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery	
			Percent	Bbls./A. Ft.	Percent	Bbl
1	1801.70	20.1	23.6	368	4.6	
3	1804.50	19.8	23.1	355	2.2	
5	1806.50	20.2	26.1	408	2.7	
7	1808.70	20.9	28.5	462	3.7	
9	1815.70	22.5	24.6	431	2.0	
11	1817.50	19.6	25.8	393	1.8	
13	1819.50	17.3	25.4	342	0.7	
15	1821.50	17.7	21.1	290	0.0	
17	1823.50	20.6	25.2	404	4.1	
19	1829.50	18.3	22.1	315	0.6	
21	1831.50	20.5	23.8	379	2.2	
23	1833.30	21.4	23.5	391	2.2	
25	1835.90	19.5	27.5	417	2.7	

Notes: - cc -

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Research Laboratories

LABORATORY FLOODING TESTS

TABLE V

Frankhauser Well No. W-21

Depth, A. Ft.	Residual Saturation			Volume of Water Recovered cc*	Effective Permeability, Millidarcys **	Initial Fluid Production Pressure Lbs./Sq. In.
	% Oil	% Water	Bbls./A. Ft.			
72	19.0	73.5	296	182.5	6.23	10
34	20.9	76.6	321	157	7.24	5
42	23.4	72.4	366	190	4.70	5
60	24.8	68.4	402	193.5	11.30	5
35	22.6	65.7	396	188.5	17.91	5
27	24.0	72.4	366	174	5.77	5
9	24.7	75.0	333	51	0.846	10
0	21.1	75.7	290	46	0.727	10
66	21.1	73.4	338	220	5.88	5
9	21.5	75.5	306	65	0.982	10
35	21.6	75.3	344	226	6.45	5
37	21.3	71.3	354	128	4.68	5
41	24.8	65.6	376	107.5	6.23	5

cubic centimeter

Volume of water recovered at the time of maximum oil recovery.

Determined by passing water through sample until it still contains residual oil.

Oil Field Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE VI

Company	Sunray Oil Corporation	Lease	Fankhauser	Well No.	W-21
Depth, Interval, Feet	1800.75-1809.00	1815.00-1823.80	1829.00-1836.25	1802.00-1836.25	
Feet of Core Analyzed	3.75	3.90	4.70	11.10	
Average Percent Porosity	20.29	20.05	20.02	20.11	
Average Percent Original Oil Saturation	25.42	25.23	24.15	24.94	
Average Percent Oil Recovery	3.63	2.05	1.94	2.24	
Average Percent Residual Oil Saturation	21.79	23.18	22.21	22.70	
Average Percent Residual Water Saturation	72.27	71.38	72.26	71.82	
Average Percent Total Residual Fluid Saturation	94.06	94.56	94.47	94.52	
Average Original Oil Content, Bbls./A. Ft.	400.	393.	376.	391.	
Average Oil Recovery, Bbls./A. Ft.	57.	33.	31.	36.	
Average Residual Oil Content, Bbls./A. Ft.	343.	360.	345.	355.	
Total Original Oil Content, Bbls./Acre	1,500.	1,532.	1,765.	4,336.	
Total Oil Recovery, Bbls./Acre	214.	128.	145.	397.	
Total Residual Oil Content, Bbls./Acre	1,286.	1,404.	1,620.	3,939.	
Average Effective Permeability, Millidarcys	7.15	7.96	4.71	6.50	
Average Initial Fluid Production Pressure, p.s.i.	6.3	6.3	6.3	6.3	

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 Sunray Oil Corporation Lease Fankhauser Well No. W-21

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Connate	Percent Water Saturation Drilling & Foreign	Total
2	1803.50	16,500	43.1	35.4	78.5
4	1805.50	3,090	7.3	63.9	71.2
6	1807.50	3,680	8.5	60.6	69.1
8	1810.90	18,900	43.1	25.4	68.5
10	1816.50	2,600	6.3	67.1	73.4
12	1818.50	2,820	6.3	61.0	67.3
14	1820.50	22,500	60.1	20.2	80.3
16	1822.50	6,060	15.8	62.4	78.2
18	1824.10	3,100	7.6	65.9	73.5
20	1830.40	6,100	14.0	54.9	68.9
22	1832.50	23,250	66.3	8.5	74.8
24	1834.50	4,160	8.7	48.9	57.6

Note: ppm - parts per million

Oil Field Research Laboratories

SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VIII

Company Sunray Oil Corporation Lease Fankhauser Well No. W-21

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
1802.70-1811.00	9,414	23.86	49.71
1816.10-1825.00	7,341	19.02	57.31
1830.30-1835.20	7,949	20.00	43.62
1802.00-1835.20	8,211	20.96	51.81

Note : ppm - parts per million