OILFIELD RESEARCH LABORATORIES
536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

April 26, 1967

George Sheehan Interests,
Robert K. Butcher, Operator
510 Thompson Building
Tulsa, Oklahoma

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Ellis Lease, Well No. 75, Greenwood County, Kansas, and submitted to our laboratory on April 20, 1967.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

BRP:rf

5 c. - Madison, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company George Sheehan Interests, Robert K. Bucher, Operator Lease Ellis Well No. 75

Location SW Corner SE NW

Section 26 Twp. 23S Rge. 11E County Greenwood State Kansas

Name of Sand	Bartlesville
Top of Core	1885.0
Bottom of Core	1919.0
Top of Sand (Analyzed)	1886.6
Bottom of Sand (Analyzed)	1915.9
Total Feet of Permeable Sand	12.6
Total Feet of Floodable Sand	6.9

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 1	1.6	1.6
1 - 4.1	11.0	12.6

Average Permeability Millidarcys	2.6
Average Percent Porosity	16.0
Average Percent Oil Saturation	19.5
Average Percent Water Saturation	61.9
Average Oil Content, Bbls./A. Ft.	244.
Total Oil Content, Bbls./Acre	4,751.
Average Percent Oil Recovery by Laboratory Flooding Tests	5.8
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	76.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	523.
Total Calculated Oil Recovery, Bbls./Acre	990.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

Fresh water mud was used as the circulating fluid while taking this core. The core was sampled and the samples sealed in cans by a representative of Oilfield Research Laboratories. The well was drilled in non-virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
1885.0 - 1886.6	Gray, finely laminated sandstone and shale.
1886.6 - 1889.3	Brownish gray, laminated, shaly sandstone.
1889.3 - 1895.4	Gray, finely laminated sandstone and shale.
1895.4 - 1897.5	Brownish gray, laminated, shaly sandstone.
1897.5 - 1897.9	Dark shale.
1897.9 - 1898.9	Brownish gray, slightly laminated, shaly sandstone.
1898.9 - 1900.7	Gray, fine grained sandstone.
1900.7 - 1902.2	Brownish gray, slightly conglomeratic sandstone.
1902.2 - 1903.8	Gray, carbonaceous, shaly sandstone.
1903.8 - 1908.8	Gray, fine grained sandstone with a vertical fracture from 1906.6 to 1908.5.
1908.8 - 1910.1	Dark shale.
1910.1 - 1911.0	Conglomeratic sandy shale.
1911.0 - 1915.9	Brownish gray, fine grained sandstone with a shale streak at 1913.3.
1915.9 - 1916.8	Gray, slightly conglomeratic sandstone.
1916.8 - 1919.0	Dark shale.

Coring was started at a depth of 1885.0 feet in laminated sand-

stone and shale and completed at 1919.0 feet in shale. For the most part, the pay is made up of gray 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 2.8 and 2.6 millidarcys respectively; the overall average being 2.6 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a rather uniform permeability profile. The permeability of the sand varies from impermeable to a maximum of 4.1 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a low weighted average percent oil saturation, namely, 19.5. The weighted average percent oil saturation of the upper and lower sections is 18.5 and 20.0 respectively. The weighted average percent water saturation of the upper and lower sections is 63.5 and 61.0 respectively; the overall average being 61.9 (See Table III). This gives an overall weighted average total fluid saturation of 81.4 percent.

The weighted average oil content of the upper and lower sections is 225 and 253 barrels per acre foot respectively; the overall average being 244. The total oil content, as shown by this core, is 4,751 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded rather poorly to laboratory flooding tests, as a total recovery of 523 barrels of oil per acre was obtained from 6.9 feet of sand. The weighted average percent oil sat-

uration was reduced from 21.8 to 16.0, or represents an average recovery of 5.8 percent. The weighted average effective permeability of the samples is 0.286 millidarcys, while the average initial fluid production pressure is 50.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 20 samples tested, 11 produced water and 7 oil. This indicates that approximately 35 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a fairly uniform effective permeability to water.

CONCLUSION

The results of the laboratory tests indicate that efficient water-flooding operations in the vicinity of this well should recover approximately 990 barrels of oil per acre or an average of 143 barrels per acre foot from the 6.9 feet of floodable pay sand analyzed in this core. These recovery values were calculated using the following data and assumptions:

Original formation volume factor	1.17
Present formation volume factor	1.05
Reservoir water saturation, percent	46.0
Primary recovery, estimated, percent	7.0
Present oil saturation, percent	41.5
Average porosity, percent	16.9
Oil saturation after flooding, percent	16.0
Performance factor, percent	45.0
Net floodable pay sand, feet	6.9

This core shows a rather tight pay sand section having a fairly

good oil saturation, a moderate water saturation and a uniform effective permeability to water.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company George Sheehan Interests
Robert K. Butcher, Operator Lease Ellis Well No. 75

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.		
1	1886.7	18.3	34	58	92	483	Imp.	0.6	0.6	290	0.00
2	1887.8	14.7	15	61	76	171	Imp.	1.0	1.6	171	0.00
3	1888.5	14.5	23	66	89	259	Imp.	1.1	2.7	285	0.00
4	1896.9	14.2	16	68	84	176	Imp.	1.0	3.7	176	0.00
5	1898.7	15.0	14	68	82	163	Imp.	1.0	4.7	163	0.00
6	1899.2	16.7	28	64	92	363	1.8	0.8	5.5	290	1.44
7	1900.1	15.8	7	57	64	86	3.6	1.0	6.5	86	3.60
8	1901.1	16.6	17	58	75	219	3.2	0.9	7.4	197	2.88
9	1902.1	16.7	22	58	80	285	Imp.	0.6	8.0	171	0.00
10	1903.1	15.4	19	57	76	227	Imp.	1.6	9.6	363	0.00
11	1904.1	17.2	25	55	80	334	2.5	0.8	10.4	267	2.00
12	1905.1	16.5	26	58	84	333	4.0	1.0	11.4	333	4.00
13	1906.1	16.6	20	62	82	258	4.1	1.0	12.4	258	4.10
14	1907.1	16.0	17	66	83	211	0.98	1.0	13.4	211	0.98
15	1908.1	17.5	21	61	82	285	2.3	1.2	14.6	342	2.76
16	1911.1	16.1	24	54	78	300	0.74	0.6	15.2	180	0.44
17	1912.1	15.8	17	67	84	208	1.8	1.0	16.2	208	1.80
18	1913.1	14.8	15	64	79	172	1.4	1.0	17.2	172	1.40
19	1914.1	16.5	27	60	87	346	3.3	1.0	18.2	346	3.30
20	1915.1	16.0	15	67	82	186	3.4	1.3	19.5	242	4.42
								Total--	------	4,751	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company George Sheehan Interests, Robert K. Butcher, Operator Lease Ellis Well No. 75

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
1886.6 - 1900.7	1.8	2.8	5.04
1900.7 - 1915.9	10.8	2.6	28.08
1886.6 - 1915.9	12.6	2.6	33.12

Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
1886.6 - 1900.7	6.5	15.4	18.5	63.5	225	1,461
1900.7 - 1915.9	13.0	16.2	20.0	61.0	253	3,290
1886.6 - 1915.9	19.5	16.0	19.5	61.9	244	4,751

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company George Sheehan Interests, Robert K. Butcher, Operator Lease Ellis Well No. 75

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.			
1	1886.7	18.0	33	460	0	0	33	60	460	0	Imp.	-
2	1887.8	14.8	16	184	0	0	16	60	184	0	Imp.	-
3	1888.5	14.8	22	252	0	0	22	69	252	0	Imp.	-
4	1896.9	14.0	16	174	0	0	16	67	174	0	Imp.	-
5	1898.7	15.3	16	190	0	0	16	66	190	0	Imp.	-
6	1899.2	16.5	26	332	0	0	26	63	332	0	Imp.	-
7	1900.1	16.0	9	112	0	0	9	86	112	5	0.200	50
8	1901.1	16.8	17	222	2	26	15	78	196	6	0.300	50
9	1902.1	16.4	21	267	0	0	21	60	267	0	Imp.	-
10	1903.1	15.2	20	236	0	0	20	57	236	0	Imp.	-
11	1904.1	17.0	25	329	9	119	16	76	210	5	0.300	50
12	1905.1	16.8	26	339	9	117	17	75	222	6	0.300	50
13	1906.1	17.0	20	264	6	79	14	75	185	9	0.300	50
14	1907.1	16.2	17	214	0	0	17	78	214	3	0.200	50
15	1908.1	17.2	21	280	5	67	16	77	213	5	0.300	50
16	1911.1	15.8	24	294	0	0	24	56	294	0	Imp.	-
17	1912.1	16.3	17	215	2	25	15	78	190	3	0.200	50
18	1913.1	15.3	15	178	0	0	15	79	178	3	0.200	50
19	1914.1	16.7	27	349	8	104	19	78	245	4	0.300	50
20	1915.1	16.3	16	202	0	0	16	77	202	4	0.300	50

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 V

Company George Sheehan Interests
Robert K. Butcher, Operator Lease Ellis Well No. 75

Depth Interval, Feet	1900.7 - 1915.9
Feet of Core Analyzed	6.9
Average Percent Porosity	16.9
Average Percent Original Oil Saturation	21.8
Average Percent Oil Recovery	5.8
Average Percent Residual Oil Saturation	16.0
Average Percent Residual Water Saturation	76.6
Average Percent Total Residual Fluid Saturation	92.6
Average Original Oil Content, Bbls./A. Ft.	286.
Average Oil Recovery, Bbls./A. Ft.	76.
Average Residual Oil Content, Bbls./A. Ft.	210.
Total Original Oil Content, Bbls./Acre	1,965.
Total Oil Recovery, Bbls./Acre	523.
Total Residual Oil Content, Bbls./Acre	1,442.
Average Effective Permeability, Millidarcys	0.286
Average Initial Fluid Production Pressure, p.s.i.	50.0

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