

OILFIELD RESEARCH LABORATORIES

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March 10, 1980

Cabuda Oil Company, Inc.
Box 143
Niotaze, Kansas 67355

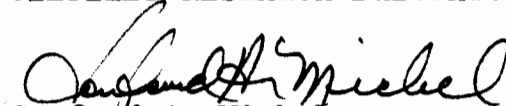
Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Rains Lease, Well No. 1, Montgomery County, Kansas, and submitted to our laboratory on February 21, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Sanford A. Michel

SAM/tem

5 c to Niotaze, Kansas

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GENERAL INFORMATION & SUMMARY

Company Cabuda Oil Company, Inc. Lease Rains Well No. 1

Location SW $\frac{1}{4}$ SW $\frac{1}{4}$

Section 10 Twp. 35S Rge. 15E County Montgomery State Kansas

Elevation, Feet - - - - -

Name of Sand - - - - - Wayside Bartlesville

Top of Core - - - - - 460.0 1149.5

Bottom of Core - - - - - 474.5 1220.0

Top of Sand - - - - - 460.0 1149.5

Bottom of Sand - - - - - 474.5 1220.0

Total Feet of Permeable Sand - - - - - 13.5 30.0

Total Feet of Floodable Sand - - - - - 4.0 -

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

WAYSIDE SAND

0 - 10	3.0	3.0
10 - 30	3.2	6.2
30 - 60	5.3	11.5
60 - 80	2.0	13.5

BARTLESVILLE SAND

0 - 5	16.0	16.0
5 - 10	4.0	20.0
10 - 30	5.0	25.0
30 - 60	2.0	27.0
60 - 90	1.0	28.0
90 - 120	2.0	30.0

Average Permeability Millidarcys - - - - - 31.6 117.7

Average Percent Porosity - - - - - 17.4 15.2

Average Percent Oil Saturation - - - - - 26.6 21.4

Average Percent Water Saturation - - - - - 51.4 48.0

Average Oil Content, Bbls./A. Ft. - - - - - 374. 266.

Total Oil Content, Bbls./Acre - - - - - 5,423. 8,776.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 2.8 -

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 44. -

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 176. -

Total Calculated Oil Recovery, Bbls./Acre - - - - - See "Calculated Recovery" Section.

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The core was sampled and the samples sealed in plastic bags by a representative of the client. Fresh water mud was used as a drilling fluid. The core was reported to be from a semi-virgin area.

At the request of the client, only the Wayside portion of the core was subjected to floodpot testing. Therefore, a calculated recovery is given for this portion only.

The Bartlesville core was submitted to the laboratory as samples only, and it is assumed that each sample represents one foot of core.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval,</u> <u>Feet</u>		<u>WAYSIDE SAND</u> <u>Description</u>
460.0 -	468.3	Dark brown slightly calcareous sandstone.
468.3 -	469.1	Brown shaly sandstone.
469.1 -	470.2	Brown slightly calcareous sandstone.
470.2 -	473.4	Hard brownish gray calcareous sandstone.
473.4 -	474.5	Brown slightly calcareous sandstone.

BARTLESVILLE SAND

1149.5 -	1150.5	Gray laminated sandstone and shale.
1154.5 -	1155.5	Gray laminated sandstone and shale.
1159.5 -	1160.5	Gray laminated sandstone and shale.
1161.5 -	1162.5	Gray laminated sandstone and shale.
1163.5 -	1164.5	Gray laminated sandstone and shale.
1165.5 -	1166.5	Gray laminated sandstone and shale.

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<u>Depth Interval, Feet</u>	<u>Description</u>
1167.5 - 1168.5	Gray laminated sandstone and shale.
1169.5 - 1170.5	Gray shaly sandstone.
1171.5 - 1172.5	Light brown shaly sandstone.
1173.5 - 1174.5	Brown sandstone.
1175.5 - 1176.5	Brown shaly sandstone.
1177.5 - 1178.5	Brown shaly sandstone.
1179.5 - 1180.5	Brown sandstone.
1181.5 - 1182.5	Brown shaly sandstone.
1183.5 - 1184.5	Brown shaly sandstone.
1185.5 - 1186.5	Brown sandstone.
1187.5 - 1188.5	Brown shaly sandstone.
1189.5 - 1191.5	Brown sandstone.
1192.5 - 1193.5	Black carbonaceous shaly sandstone.
1194.5 - 1195.5	Brown sandstone.
1196.5 - 1197.5	Brown sandstone.
1198.5 - 1199.5	Brown sandstone.
1200.5 - 1201.5	Black carbonaceous shaly sandstone.
1202.5 - 1203.5	Black carbonaceous shaly sandstone.
1204.5 - 1205.5	Hard gray sandy calcareous conglomerate.
1206.5 - 1207.5	Brown shaly sandstone.
1208.5 - 1209.5	Brown sandstone.
1211.0 - 1212.0	Brown shaly sandstone.
1213.0 - 1214.0	Brown shaly sandstone.

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<u>Depth Interval, Feet</u>	<u>Description</u>
1215.0 - 1216.0	Brown shaly sandstone.
1217.0 - 1218.0	Brown sandstone.
1219.0 - 1220.0	Brown shaly sandstone.

LABORATORY FLOODING TESTSWAYSIDE SAND

The sand in this core responded to laboratory flooding tests, as a total recovery of 176 barrels of oil per acre was obtained from 4.0 feet of sand. The weighted average percent oil saturation was reduced from 30.6 to 27.8, or represents an average recovery of 2.8 percent. The weighted average effective permeability of the samples is 3.02 millidarcys, while the average initial fluid production pressure is 22.5 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 14 samples tested, 4 produced water and oil, and 9 samples produced water only. This indicates that approximately 29 percent of the sand represented by these samples is floodable pay sand.

CALCULATED RECOVERYWAYSIDE SAND

It would appear from a study of the core data, that efficient primary and waterflood operations in the vicinity of this well should recover approximately 950 barrels of oil per acre.

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This is an average recovery of 237 barrels per acre foot from 4.0 feet of floodable sand analyzed in this core.

These recovery values were calculated using the following data and assumptions:

Original formation volume factor, estimated	1.04
Reservoir water saturation, percent, estimated	40.0
Average porosity, percent	20.4
Oil saturation after flooding, percent	27.8
Performance factor, percent, estimated	50.0
Net floodable sand, feet	4.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Cabuda Oil Company, Inc. Lease Rains Well No. 1

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			Ft.	Cum. Ft.		
WAYSIDE SAND										
1	460.5	19.7	31	48	79	62.	1.0	1.0	474	62.00
2	461.5	20.7	32	42	74	15.	1.0	2.0	514	15.00
3	462.5	21.5	29	46	75	73.	1.0	3.0	484	73.00
4	463.5	19.2	30	50	80	41.	1.0	4.0	447	41.00
5	464.5	19.0	33	44	77	39.	1.0	5.0	486	39.00
6	465.5	17.9	23	55	78	31.	1.0	6.0	319	31.00
7	466.5	19.1	23	53	76	47.	1.0	7.0	341	47.00
8	467.5	17.0	27	52	79	50.	1.3	8.3	463	65.00
9	468.5	18.9	23	52	75	5.2	0.8	9.1	270	4.16
10	469.5	18.7	33	43	76	24.	1.1	10.2	527	26.40
11	470.5	16.3	16	63	79	5.6	0.8	11.0	162	4.48
12	471.5	8.3	10	76	86	Imp.	1.0	12.0	64	0.00
13	472.5	11.7	19	57	76	1.6	1.4	13.4	242	2.24
14	473.5	18.0	41	40	81	15.	1.1	14.5	630	16.50
BARTLESVILLE SAND										
1	1150.0	3.3	20	75	95	0.65	1.0	1.0	51	0.65
2	1155.0	12.5	19	46	65	0.46	1.0	2.0	184	0.46
3	1160.0	10.7	6	75	81	Imp.	1.0	3.0	50	0.00
4	1162.0	12.4	14	41	55	3.1	1.0	4.0	135	3.10
5	1164.0	12.8	16	45	61	2.8	1.0	5.0	159	2.80
6	1166.0	11.9	13	44	57	0.71	1.0	6.0	120	0.71
7	1168.0	10.0	27	67	94	Imp.	1.0	7.0	210	0.00
8	1170.0	8.5	7	86	93	7.6	1.0	8.0	46	7.60

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Cabuda Oil Company, Inc. Lease Rains Well No. 1

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			Ft.	Cum. Ft.		
					<u>BARTLESVILLE SAND</u>					
9	1172.0	13.1	10	52	62	3.7	1.0	9.0	102	3.70
10	1174.0	18.5	41	25	66	12.2	1.0	10.0	588	12.00
11	1176.0	18.1	38	28	66	8.2	1.0	11.0	534	8.20
12	1178.0	16.7	32	33	65	4.3	1.0	12.0	415	4.30
13	1180.0	13.2	10	51	61	28.	1.0	13.0	102	28.00
14	1182.0	17.4	1	63	64	3.3	1.0	14.0	14	3.30
15	1184.0	18.0	33	33	66	5.7	1.0	15.0	461	5.70
16	1186.0	17.5	32	35	67	29.8	1.0	16.0	434	29.00
17	1188.0	13.0	30	46	76	2.8	1.0	17.0	303	2.80
18	1190.0	19.2	29	30	59	41.	1.0	18.0	432	41.00
19	1191.0	19.6	27	32	59	62.	1.0	19.0	415	62.00
20	1193.0	17.7	21	50	71	0.35	1.0	20.0	288	0.35
21	1195.0	19.4	27	37	64	114.	1.0	21.0	406	114.00
22	1197.0	19.2	23	44	67	105.	1.0	22.0	343	105.00
23	1199.0	19.5	26	52	78	26.	1.0	23.0	393	26.00
24	1201.0	17.5	33	50	83	0.92	1.0	24.0	446	0.92
25	1203.0	16.6	26	35	61	3.5	1.0	25.0	335	3.50
26	1205.0	14.9	22	39	61	Imp.	1.0	26.0	254	0.00
27	1207.0	12.2	10	85	95	0.97	1.0	27.0	95	0.97
28	1209.0	15.4	23	46	69	36.	1.0	28.0	275	36.00
29	1211.5	18.3	22	44	66	3.6	1.0	29.0	312	3.60
30	1213.5	16.8	29	41	70	1.9	1.0	30.0	378	1.90
31	1215.5	19.7	13	38	51	2.8	1.0	31.0	199	2.80
32	1217.5	12.8	5	71	76	13.	1.0	32.0	50	13.00
33	1219.5	14.5	22	44	66	7.4	1.0	33.0	248	7.40

SUMMARY OF PERMEABILITY & SATURATION TESTS

Company Cabuda Oil Company, Inc. Lease Rains Well No. 1

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
<u>WAYSIDE SAND</u>			
460.0 - 470.2	10.2	39.6	403.56
470.2 - 474.5	3.3	7.0	23.22
460.0 - 474.5	13.5	31.6	426.78
<u>BARTLESVILLE SAND</u>			
1149.5 - 1182.5	12.0	6.2	74.82
1183.5 - 1203.5	11.0	35.5	390.27
1204.5 - 1220.0	7.0	9.4	65.67
1149.5 - 1220.0	30.0	17.7	530.76
<u>WAYSIDE SAND</u>			
460.0 - 470.2	10.2	28.5	424
470.2 - 474.5	4.3	22.0	255
460.0 - 474.5	14.5	26.6	374
<u>BARTLESVILLE SAND</u>			
1149.5 - 1182.5	14.0	18.1	194
1183.5 - 1203.5	11.0	27.9	387
1204.5 - 1220.0	8.0	18.3	226
1149.5 - 1220.5	33.0	21.4	266
			Total Oil Content Bbls./Acre
			4,325
			1,098
			5,423
			2,710
			4,255
			1,811
			8,776

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

[illegible]

Notes: co—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	Cabuda Oil Company, Inc.	Lease	Rains	Well No.
				1
Depth Interval, Feet	WAYSIDE SAND			
	460.0 - 470.2			
Feet of Core Analyzed	4.0			
Average Percent Porosity	20.4			
Average Percent Original Oil Saturation	30.6			
Average Percent Oil Recovery	2.8			
Average Percent Residual Oil Saturation	27.8			
Average Percent Residual Water Saturation	67.5			
Average Percent Total Residual Fluid Saturation	95.3			
Average Original Oil Content, Bbls./A. Ft.	482.			
Average Oil Recovery, Bbls./A. Ft.	44.			
Average Residual Oil Content, Bbls./A. Ft.	438.			
Total Original Oil Content, Bbls./Acre	1,926.			
Total Oil Recovery, Bbls./Acre	176.			
Total Residual Oil Content, Bbls./Acre	1,750.			
Average Effective Permeability, Millidarcys	3.02			
Average Initial Fluid Production Pressure, p.s.i.	22.5			

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

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RESULTS OF WATER DIFFERENTIATION TESTS
TABLE VI

Company Cabuda Oil Company, Inc. Lease Rain Well No. 1

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
		<u>WAYSIDE SAND</u>			
1	460.5	61,022			
2	461.5	58,895			
3	462.5	48,633			
4	463.5	59,027			
5	464.5	64,484			
6	465.5	50,390			
7	466.5	49,678			
8	467.5	55,839			
9	468.5	51,847			
10	469.5	64,958			
11	470.5	58,806			
12	471.5	57,036			
13	472.5	63,672			
14	473.5	66,876			

Note: ppm — parts per million