



OILFIELD RESEARCH LABORATORIES

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October 26, 1979

Somerset Energy, Inc.
P.O. Box 449
Moran, Kansas 66755

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Big Lake Lease, Well No. S-114, Miami County, Kansas, and submitted to our laboratory on October 9, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Benjamin R. Pearman

SAM:km
5 c to Moran, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Somerset Energy, Inc. Lease Big Lake Well No. S-114

Location 1800' WEL & 40' NSL

Section 20 Twp. 16S Rge. 24E County Miami State Kansas

Name of Sand	Big Lake
Top of Core	344.0
Bottom of Core	385.0
Top of Sand	344.0
Bottom of Sand	385.0
Total Feet of Permeable Sand	31.4
Total Feet of Floodable Sand	5.3

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 10	11.8	11.8
10 - 100	4.8	16.6
100 - 300	4.0	20.6
300 - 600	4.7	25.3
600 & Above	6.1	31.4

Average Permeability Millidarcys	336.2
Average Percent Porosity	16.3
Average Percent Oil Saturation	24.2
Average Percent Water Saturation	71.5
Average Oil Content, Bbls./A. Ft.	310.
Total Oil Content, Bbls./Acre	11,576.
Average Percent Oil Recovery by Laboratory Flooding Tests	8.8
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	124.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	655.
Total Calculated Oil Recovery, Bbls./Acre	See "Calculated Recovery" Section
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

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 non-virgin area.

FORMATION CORED

<u>Depth Interval, Feet</u>	<u>Description</u>
344.0 - 356.7	Light brown calcareous shaly sandstone.
356.7 - 358.3	Gray limestone.
358.3 - 361.3	Gray and light brown laminated shale and sandstone.
361.3 - 367.6	Light brown calcareous sandstone.
367.6 - 368.4	Gray shale.
368.4 - 370.6	Light brown calcareous sandstone.
370.6 - 371.4	Gray calcareous sandstone.
371.4 - 374.7	Light brown calcareous sandstone.
374.7 - 375.1	Gray sandy shale.
375.1 - 378.7	Light brown calcareous sandstone containing a vertical fracture.
378.7 - 379.9	Gray calcareous sandstone.
379.9 - 385.0	Brown slightly calcareous sandstone.

LABORATORY FLOODING TESTS

At the request of the client, several samples were subjected to flooding tests.

These samples responded to laboratory flooding tests, as a total recovery of 655 barrels of oil per acre was obtained from 5.3 feet of sand. The weighted average percent oil saturation was reduced from 32.4 to 23.6, or represents an average recovery of 8.8 percent. The weighted average effective permeability of the samples is 14.55 millidarcys, while the average initial fluid production pressure is 10.4 pounds per square inch (See Table V).

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CALCULATED RECOVERY

The results of the laboratory tests indicate that efficient primary and waterflood operations in the vicinity of this well should recover approximately 215 barrels of oil per acre foot.

This recovery value was calculated using the following data and assumptions:

Original formation volume factor	1.03
Reservoir water saturation, percent	40.0
Average porosity, percent	17.8
Oil saturation after flooding, percent	23.6
Performance factor, percent	45.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Somerset Energy, Inc. Lease Big Lake Well No. S-1114

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	344.5	11.6	2	93	95	18	0.28	1.0	1.0	18	0.28
2	345.5	13.2	3	92	95	31	Imp.	1.0	2.0	31	0.00
3	346.5	12.7	22	73	95	217	Imp.	1.0	3.0	217	0.00
4	347.5	14.0	7	90	97	76	0.80	1.0	4.0	76	0.80
5	348.5	14.0	10	84	94	109	Imp.	1.0	5.0	109	0.00
6	349.5	13.5	45	50	95	471	Imp.	1.0	6.0	471	0.00
7	350.5	15.5	15	82	97	180	Imp.	1.0	7.0	180	0.00
8	351.5	14.5	16	80	96	180	0.61	1.0	8.0	180	0.61
9	352.5	13.1	3	91	94	31	0.45	1.0	9.0	31	0.45
10	353.5	12.5	16	80	96	155	10.	1.0	10.0	155	10.00
11	354.5	14.5	3	89	92	34	0.69	1.0	11.0	34	0.69
12	355.5	11.8	16	80	96	147	Imp.	1.0	12.0	147	0.00
13	356.5	15.3	22	75	97	261	101.	0.7	12.7	183	70.70
14	358.5	20.8	3	92	95	48	322.	0.7	13.4	34	225.40
15	359.5	17.3	28	66	94	376	292.	1.0	14.4	376	292.00
16	360.5	16.0	20	72	92	248	13.	1.3	15.7	322	16.90
17	361.5	16.2	16	80	96	201	203.	0.7	16.4	141	142.10
18	362.5	17.1	25	70	95	332	2.9	1.0	17.4	332	2.90
19	363.5	18.8	51	45	96	744	926.	1.0	18.4	744	926.00
20	364.5	13.2	33	61	94	338	68.	1.0	19.4	338	68.00
21	365.5	22.6	23	70	93	403	130.	1.0	20.4	403	130.00
22	366.5	23.9	23	69	92	427	605.	1.0	21.4	427	605.00
23	367.5	19.4	26	69	95	391	460.	0.6	22.0	238	276.00
24	368.5	15.0	11	81	92	128	1.6	0.6	22.6	77	0.96
25	369.5	11.7	34	60	94	309	13.	1.0	23.6	309	13.00
26	370.5	22.3	38	56	94	657	36.	0.6	24.2	657	36.00
27	371.5	12.9	4	89	93	40	158.	0.6	24.8	40	158.00
28	372.5	23.6	23	71	94	421	415.	1.0	25.8	421	415.00
29	373.5	24.1	32	63	95	598	711.	1.0	26.8	598	711.00
30	374.5	17.9	34	61	95	472	522.	0.7	27.5	330	365.40

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Somerset Energy, Inc. Lease Big Lake Well No. S-1114

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.		
31	375.5	19.4	45	47	92	677	23.	0.9	28.4	609	20.70
32	376.5	14.2	32	56	88	353	0.49	1.0	29.4	353	0.49
33	377.5	9.6	40	45	85	298	5.2	1.0	30.4	298	5.20
34	378.5	22.1	36	60	96	617	305.	0.7	31.1	432	213.50
35	379.5	14.0	6	78	84	65	3.8	1.2	32.3	78	4.56
36	380.5	16.4	25	68	93	320	2,358.	1.1	33.4	352	2593.80
37	381.5	24.0	43	51	94	801	1,752.	1.0	34.4	801	1752.00
38	382.5	18.2	38	57	95	537	936.	1.0	35.4	537	936.00
39	383.5	12.0	41	49	90	382	556.	1.0	36.4	382	556.00
40	384.5	3.8	39	53	92	115	5.9	1.0	37.4	115	5.90

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company — Somerset Energy, Incorporated		Lease — Big Lake		Well No. S-1114	
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.		
344.0 - 356.0	6.0	2.1	12.83		
356.0 - 385.0	25.4	415.1	10,542.51		
344.0 - 385.0	31.4	336.2	10,555.34		

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
344.0 - 356.0	12.0	13.4	13.2	82.0	137	1,649
356.0 - 385.0	25.4	17.6	29.5	66.5	391	9,927
344.0 - 385.0	37.4	16.3	24.2	71.5	310	11,576

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company		Somerset Energy, Inc.		Lease		Big Lake		Well No.		S-1114	
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			
14	358.5	21.2	4	66	0	0	4	89	224	29.99	5
17	361.5	16.3	15	190	0	0	15	81	0	Imp.	10
20	364.5	13.6	33	348	4	42	29	67	335	6.37	5
23	367.5	19.8	26	399	4	61	22	73	350	33.74	10
26	370.5	22.0	38	649	10	171	28	58	396	9.58	5
29	373.5	24.5	32	608	13	247	19	76	208	28.74	50
33	377.5	10.0	40	310	0	0	40	55	14	0.90	15
36	380.5	16.9	25	328	5	66	20	76	61	0.92	10
39	383.5	12.4	41	394	16	154	25	70	381	14.99	

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	Somerset Energy, Inc.	Lease	Big Lake	Well No.	S-114
Depth Interval, Feet	358.3 - 385.0 (Client Selected Samples)				
Feet of Core Analyzed	5.3				
Average Percent Porosity	17.8				
Average Percent Original Oil Saturation	32.4				
Average Percent Oil Recovery	8.8				
Average Percent Residual Oil Saturation	23.6				
Average Percent Residual Water Saturation	58.2				
Average Percent Total Residual Fluid Saturation	81.8				
Average Original Oil Content, Bbls./A. Ft.	442.				
Average Oil Recovery, Bbls./A. Ft.	124.				
Average Residual Oil Content, Bbls./A. Ft.	318.				
Total Original Oil Content, Bbls./Acre	2,340.				
Total Oil Recovery, Bbls./Acre	655.				
Total Residual Oil Content, Bbls./Acre	1,685.				
Average Effective Permeability, Millidarcys	14.55				
Average Initial Fluid Production Pressure, p.s.i.	10.4				

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 Somerset Energy, Inc. Lease Big Lake Well No. S-114

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation Connate Drilling & Foreign	Total
1	344.5	12,011.		
2	345.5	11,232.		
3	346.5	12,749.		
4	347.5	10,377.		
5	348.5	13,145.		
6	349.5	16,041.		
7	350.5	15,334.		
8	351.5	12,104.		
9	352.5	12,531.		
10	353.5	9,594.		
11	354.5	10,864.		
12	355.5	13,700.		
13	356.5	11,718.		
14	358.5	12,942.		
15	359.5	9,482.		
16	360.5	12,320.		
17	361.5	11,670.		
18	362.5	12,397.		
19	363.5	12,118.		
20	364.5	10,898.		
21	365.5	9,490.		
22	366.5	12,582.		
23	367.5	13,087.		
24	368.5	11,806.		
25	369.5	14,565.		
26	370.5	11,509.		
27	371.5	11,509.		
28	372.5	11,526.		
29	373.5	8,552.		
30	374.5	12,772.		
31	375.5	13,017.		
32	376.5	13,484.		
33	377.5	19,006.		
34	378.5	10,877.		
35	379.5	15,198.		
36	380.5	12,122.		
37	381.5	11,751.		
38	382.5	9,242.		
39	383.5	14,339.		
40	384.5	15,819.		
Note: Water Sample Contained 7,446 Mg/L Chlorides.				

Note: ppm — parts per million