



OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND - CHANUTE, KANSAS 66720 - PHONE (316) 431-2650

November 27, 1979

Somerset Energy Incorporated
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-118, Miami County, Kansas and submitted to our laboratory on November 5, 1979.

Your business is greatly appreciated.

Very truly yours

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Benjamin R. Pearman

SAM/tem
5 c to Moran, Kansas

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GENERAL INFORMATION & SUMMARY

Company Somerset Energy, Inc. Lease Big Lake Well No. S-118

Location 2060' EWL & 100' NSL

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

Name of Sand - - - - - Big Lake

Top of Core - - - - - 348.0

Bottom of Core - - - - - 390.0

Top of Sand - - - - - 348.0

Bottom of Sand - - - - - 387.7

Total Feet of Permeable Sand - - - - - 31.5

Total Feet of Floodable Sand - - - - - (Tested) 8.3

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 10	4.7	4.7
10 - 200	13.9	18.6
200 - 400	4.7	23.3
400 - 800	6.5	29.8
1200 - 1600	1.7	31.5

Average Permeability Millidarcys - - - - - 281.2

Average Percent Porosity - - - - - 18.5

Average Percent Oil Saturation - - - - - 25.5

Average Percent Water Saturation - - - - - 67.0

Average Oil Content, Bbls./A. Ft. - - - - - 382.

Total Oil Content, Bbls./Acre - - - - - 12,034.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 10.0

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 160.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 1,325.

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

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
348.0 - 349.9	Brown slightly calcareous sandstone.
349.9 - 352.8	Gray calcareous sandstone.
352.8 - 355.7	Gray laminated shaly slightly calcareous sandstone.
355.7 - 356.3	Light brown slightly calcareous sandstone.
356.3 - 358.8	Gray slightly calcareous sandstone.
358.8 - 359.4	Light brown slightly calcareous sandstone.
359.4 - 361.5	Gray slightly calcareous sandstone.
361.5 - 363.7	Gray shaly slightly calcareous sandstone.
363.7 - 364.3	Light brown slightly calcareous sandstone.
364.3 - 365.3	Gray shaly slightly calcareous sandstone.
365.3 - 367.2	Brown slightly calcareous sandstone.
367.2 - 368.7	Gray calcareous sandstone.
368.7 - 369.5	Light brown laminated slightly calcareous sandstone.
369.5 - 370.0	Gray shaly slightly calcareous sandstone.
370.0 - 376.4	Brown slightly calcareous sandstone.
376.4 - 376.8	Gray and brown laminated shale and sandstone.
376.8 - 378.7	Brown slightly shaly slightly calcareous sandstone.
378.7 - 379.0	Gray sandy shale.

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379.0 - 380.5	Brown slightly calcareous sandstone.
380.5 - 380.9	Gray sandy shale.
380.9 - 381.2	Brown slightly calcareous sandstone.
381.2 - 382.4	Gray calcareous sandstone.
382.4 - 383.5	Brown slightly calcareous sandstone.
383.5 - 384.9	Gray calcareous sandstone laminated with thin widely scattered streaks of oil saturated sandstone.
384.9 - 387.2	Brown slightly calcareous sandstone.
387.2 - 387.7	Light brown slightly calcareous sandstone.
387.7 - 390.0	Gray calcareous shale.

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 1,325 barrels of oil per acre was obtained from 8.3 feet of sand. The weighted average percent oil saturation was reduced from 35.6 to 25.6, or represents an average recovery of 10.0 percent. The weighted average effective permeability of the samples is 22.09 millidarcys, while the average initial fluid production pressure is 12.2 pounds per square inch (See Table V).

CALCULATED RECOVERY

The results of the laboratory tests indicate that efficient primary and waterflood operations in the vicinity of this well should recover approximately 296 barrels of oil per acre foot.

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

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Original formation volume factor	1.03
Reservoir water saturation, percent	30.0
Average porosity, percent	20.0
Oil saturation after flooding, percent	25.6
Performance factor, percent	45.0
Net floodable pay sand, feet	8.3

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Somerset Energy, Incorporated Lease Big Lake Well No. S-1118

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.		
1	348.1	17.5	33	60	448	695.	0.9	0.9	403	625.50
2	349.0	26.8	30	52	624	784.	1.0	1.9	624	784.00
3	350.2	23.7	19	72	349	408.	0.6	2.5	209	244.80
4	351.0	15.1	7	88	82	253.	1.0	3.5	82	253.00
5	352.0	16.9	15	80	197	78.	1.3	4.8	256	101.40
6	353.0	17.1	26	67	345	0.22	0.7	5.5	242	0.15
7	354.0	16.0	23	71	286	0.55	1.0	6.5	286	0.55
8	354.9	16.6	4	85	52	0.84	1.2	7.7	62	1.01
9	355.9	21.2	30	64	493	72.	0.6	8.3	296	43.20
10	357.0	16.8	12	84	156	15.	1.0	9.3	156	15.00
11	358.0	16.9	8	88	105	31.	1.5	10.8	158	46.50
12	359.0	20.6	21	71	336	102.	0.6	11.4	202	61.20
13	360.0	17.7	17	77	233	3.1	1.0	12.4	233	3.10
14	361.4	16.0	6	73	75	62.	1.1	13.5	83	68.20
15	363.8	19.4	11	79	166	145.	0.6	14.1	100	87.00
16	365.5	24.3	45	44	848	288.	1.0	15.1	848	288.00
17	366.6	14.0	42	48	456	50.	0.9	16.0	763	259.20
18	369.2	15.9	12	82	148	8.5	0.8	16.8	118	6.80
19	370.5	23.1	32	54	574	509.	1.0	17.8	574	509.00
20	371.5	21.0	32	66	521	467.	1.0	18.8	521	467.00
21	372.5	17.5	30	67	407	61.	1.0	19.8	407	61.00
22	373.5	15.7	59	34	719	72.	1.0	20.8	719	72.00
23	374.6	13.9	40	54	431	31.	1.0	21.8	431	31.00
24	375.7	21.9	28	66	476	195.	1.4	23.2	666	273.00
25	376.6	17.0	13	63	172	305.	0.4	23.6	69	122.00
26	377.6	22.0	33	63	563	599.	1.2	24.8	676	718.80
27	378.6	25.0	28	69	543	280.	0.7	25.5	380	196.00
28	379.6	19.3	33	65	494	288.	1.0	26.5	494	288.00

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Somerset Energy, Incorporated Lease Big Lake Well No. S-1118

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.		
29	380.4	18.8	20	75	95	292	755.	0.8	27.3	234	604.00
30	381.0	16.5	34	57	91	435	130.	0.3	27.6	131	39.00
31	382.5	13.6	45	53	98	475	384.	0.6	28.2	285	230.40
32	383.3	13.2	47	45	92	481	19.	0.5	28.7	241	9.50
33	385.5	13.6	28	63	91	295	101.	1.1	29.8	325	111.10
34	386.5	21.6	32	61	93	536	1226.	1.2	31.0	643	1471.20
35	387.5	16.7	18	75	93	233	1532.	0.5	31.5	117	766.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company		Somerset Energy, Incorporated		Lease		Big Lake		Well No.		S-118	
Depth Interval, Feet		Feet of Core Analyzed		Average Permeability, Millidarcys		Permeability Capacity Ft. x Md.					
348.0 - 364.3		14.1		165.6		2,334.61					
365.3 - 387.7		17.4		374.9		6,523.00					
348.0 - 387.7		31.5		281.2		8,857.61					

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	
348.0 - 364.3		14.1		18.2		16.2		75.4		241		3,392	
365.3 - 387.7		17.4		18.7		33.0		60.1		497		8,642	
348.0 - 387.7		31.5		18.5		25.5		67.0		382		12,034	

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company			Somerset Energy, Incorporated			Lease			Big Lake			Well No.			S-118		
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.					
			%	Bbbls./A. Ft.	%	Bbbls./A. Ft.	% Oil	% Water	Bbbls./A. Ft.								
6	353.0	17.4	26	351	0	0	26	57	351	0	Imp.	-					
16	365.5	24.3	45	848	19	358	26	62	490	334	33.74	10					
19	370.5	23.5	32	583	7	128	25	70	455	408	41.23	10					
21	372.5	17.6	30	410	6	82	24	72	328	285	4.72	15					
23	374.5	14.1	40	438	6	66	34	62	372	126	2.25	20					
26	377.6	22.5	33	576	9	157	24	70	419	159	26.24	10					
28	379.6	19.8	33	507	8	123	25	71	384	225	3.07	15					
30	381.0	17.0	34	448	14	185	20	77	263	235	11.14	10					
31	382.5	14.0	45	489	12	130	33	59	359	183	23.43	10					
34	386.5	22.0	32	546	12	205	20	65	341	110	41.20	10					

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, Incorporated	Lease	Big Lake	Well No.	S-118
Depth Interval, Feet	365.3 - 387.7				
Feet of Core Analyzed	8.3				
Average Percent Porosity	20.0				
Average Percent Original Oil Saturation	35.6				
Average Percent Oil Recovery	10.0				
Average Percent Residual Oil Saturation	25.6				
Average Percent Residual Water Saturation	67.2				
Average Percent Total Residual Fluid Saturation	92.8				
Average Original Oil Content, Bbls./A. Ft.	550.				
Average Oil Recovery, Bbls./A. Ft.	160.				
Average Residual Oil Content, Bbls./A. Ft.	390.				
Total Original Oil Content, Bbls./Acre	4,560.				
Total Oil Recovery, Bbls./Acre	1,325.				
Total Residual Oil Content, Bbls./Acre	3,235.				
Average Effective Permeability, Millidarcys	22.09				
Average Initial Fluid Production Pressure, p.s.i.	12.2				

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-118

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Connate Water Saturation Drilling & Foreign	Total
1	348.1	4,632.		
2	349.0	6,634.		
3	350.2	3,728.		
4	351.0	6,816.		
5	352.0	8,699.		
6	353.0	8,122.		
7	354.0	13,346.		
8	354.9	11,732.		
9	355.9	10,840.		
10	357.0	15,849.		
11	358.0	13,650.		
12	359.0	13,730.		
13	360.0	14,236.		
14	361.4	15,426.		
15	363.8	12,105.		
16	365.5	11,733.		
17	366.6	14,290.		
18	369.2	14,372.		
19	370.5	7,722.		
20	371.5	4,629.		
21	372.5	11,591.		
22	373.5	16,206.		
23	374.6	14,311.		
24	375.7	10,912.		
25	376.6	14,065.		
26	377.6	6,119.		
27	378.6	11,526.		
28	379.6	11,351.		
29	380.4	11,683.		
30	381.0	12,242.		
31	382.5	10,211.		
32	383.3	8,781.		
33	385.5	18,889.		
34	386.5	5,840.		
35	387.5	3,631.		

Note: ppm — parts per million