OILFIELD RESEARCH LABORATORIES
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November 5, 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-107, Miami County, Kansas and submitted to our laboratory on October 15, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

Benjamin R. Pearman

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Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Somerset Energy, Inc. Lease Big Lake Well No. S-107

Location 440' SNL & 2620' WEL

Section 29 Twp. 16S Rge. 24E County Miami State Kansas

Name of Sand	Big Lake
Top of Core	335.0
Bottom of Core	375.3
Top of Sand	335.5
Bottom of Sand	374.8
Total Feet of Permeable Sand	32.3
Total Feet of Floodable Sand	6.8

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 50	11.4	11.4
50 - 200	6.5	17.9
200 - 400	5.2	23.1
400 - 800	4.1	27.2
800 - 1200	3.1	30.3
1200 & Above	2.0	32.3

Average Permeability Millidarcys	351.8
Average Percent Porosity	18.5
Average Percent Oil Saturation	18.2
Average Percent Water Saturation	72.6
Average Oil Content, Bbls./A. Ft.	245.
Total Oil Content, Bbls./Acre	8,073.
Average Percent Oil Recovery by Laboratory Flooding Tests	4.9
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	95.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	647.
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:

Depth Interval, Feet	Description
335.0 - 335.5	Gray sandy shale.
335.5 - 336.0	Grayish calcareous shaly sandstone.
336.0 - 337.2	Gray calcareous sandy shale.
337.2 - 339.0	Grayish calcareous shaly sandstone.
339.0 - 341.0	Grayish calcareous sandstone.
341.0 - 342.0	Grayish calcareous shaly sandstone.
342.0 - 343.9	Grayish calcareous sandstone.
343.9 - 345.0	Grayish calcareous shaly sandstone.
345.0 - 345.8	Light brown sandstone.
345.8 - 346.2	White calcareous sandstone.
346.2 - 347.5	Brown sandstone.
347.5 - 347.9	White calcareous sandstone.
347.9 - 349.6	Brown sandstone.
349.6 - 349.9	White calcareous sandstone.
349.9 - 356.0	Light brown sandstone.
356.0 - 356.7	Light brown shaly slightly calcareous sandstone.
356.7 - 357.5	Gray calcareous sandstone.
357.5 - 358.0	Light brown slightly calcareous sandstone.
358.0 - 358.6	Light brown slightly calcareous slightly shaly sandstone.

358.6 - 359.1	Gray calcareous sandstone.
359.1 - 360.0	Light brown slightly calcareous slightly shaly sandstone.
360.0 - 361.7	Light brown calcareous sandstone.
361.7 - 362.1	Gray slightly calcareous sandy shale.
362.1 - 363.2	Light brown slightly calcareous sandstone.
363.2 - 363.4	Gray calcareous sandy shale.
363.4 - 364.0	Brown slightly calcareous sandstone.
364.0 - 364.9	Grayish calcareous shaly sandstone.
364.9 - 365.4	Gray calcareous sandstone.
365.4 - 367.0	Light brown calcareous shaly sandstone.
367.0 - 367.5	Light brown slightly calcareous sandstone.
367.5 - 368.2	White calcareous sandstone.
368.2 - 368.7	Light brown slightly calcareous shaly sandstone.
368.7 - 372.5	Light brown slightly calcareous sandstone.
372.5 - 373.5	Gray calcareous sandstone.
373.5 - 374.8	Light brown calcareous sandstone.
374.8 - 375.3	Gray 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 647 barrels of oil per acre was obtained from 6.8 feet of sand. The weighted average percent oil saturation was reduced from 23.4 to 18.5, or represents an average recovery of 4.9 percent. The weighted average effective permeability of the samples is 27.05 millidarcys, while the average initial fluid production pressure is 8.1 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 286 barrels of oil per acre foot.

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

Original formation volume factor	1.03
Reservoir water saturation, percent	45.0
Average porosity, percent	23.5
Oil saturation after flooding, percent	18.5
Performance factor, percent	45.0
Net floodable pay sand, feet	6.8

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Somerset Energy, Incorporated Lease Big Lake Well No. S-107

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	335.7	14.6	2	90	92	23	0.89	0.5	0.5	12	0.45
2	337.5	17.5	5	80	85	68	0.38	0.8	1.3	54	0.30
3	338.5	16.5	4	83	87	51	0.40	1.0	2.3	51	0.40
4	339.5	15.8	18	70	88	221	61.	1.0	3.3	221	61.00
5	340.5	17.1	2	92	94	27	11.	1.0	4.3	27	11.00
6	341.5	7.8	1	91	92	6	1.3	1.0	5.3	6	1.30
7	342.5	21.3	2	90	92	33	266.	1.0	6.3	33	266.00
8	343.5	24.6	4	91	95	76	259.	0.9	7.2	68	233.10
9	344.5	15.8	8	87	95	98	0.61	1.1	8.3	108	0.67
10	345.5	24.7	26	52	78	498	143.	0.8	9.1	398	114.40
11	346.5	22.8	27	69	96	478	99.	0.8	9.9	382	79.20
12	347.4	11.6	42	54	96	378	266.	0.5	10.4	189	42.00
13	348.5	11.7	33	58	91	300	84.	1.1	11.5	330	92.40
14	349.5	26.6	24	67	91	495	546.	0.6	12.1	297	327.60
15	350.5	24.3	14	71	85	264	955.	1.1	13.2	290	1050.50
16	351.5	27.9	24	71	95	520	1363.	1.0	14.2	520	1363.00
17	352.5	29.9	18	75	93	418	915.	1.0	15.2	418	915.00
18	353.5	27.6	17	72	89	364	721.	1.0	16.2	364	721.00
19	354.5	27.1	25	69	94	526	588.	1.0	17.2	526	588.00
20	355.5	26.8	24	67	91	499	505.	1.0	18.2	499	505.00
21	356.5	8.6	27	68	95	180	7.2	0.7	18.9	126	5.04
22	357.7	6.4	19	70	89	94	74.	0.5	19.4	47	37.00
23	358.5	7.6	20	71	91	118	5.5	0.6	20.0	71	3.30
24	359.5	9.9	29	66	95	223	6.0	0.9	20.9	201	5.40
25	360.5	22.2	27	60	87	465	305.	1.0	21.9	465	305.00
26	361.5	17.8	25	68	93	345	371.	0.7	22.6	242	259.70
27	362.5	19.1	18	74	92	267	241.	1.1	23.7	294	265.10
28	363.5	13.1	2	92	94	20	50.	0.6	24.3	12	30.00
29	364.5	14.6	6	89	95	68	0.18	0.9	25.2	61	0.16

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Somerset Energy, Incorporated **Lease** Big Lake **Well No.** S-107

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.		
30	365.5	5.4	22	67	89	92	Imp.	0.6	25.8	55	0.00
31	366.5	9.7	23	35	58	173	11.	1.0	26.8	173	11.00
32	367.3	19.9	25	70	95	386	745.	0.5	27.3	87	372.50
33	368.3	12.3	24	65	89	229	2.8	0.5	27.8	115	1.40
34	369.5	7.4	43	48	91	247	188.	1.3	29.1	321	244.40
35	370.5	28.5	19	72	91	420	153.	1.0	30.1	420	153.00
36	371.5	27.3	10	80	90	212	1132.	1.0	31.1	212	1132.00
37	372.4	16.4	16	74	90	204	2991.	0.5	31.6	102	1495.50
38	373.7	2.7	17	78	95	36	1277.	0.5	32.1	18	638.50
39	374.7	20.8	20	70	90	323	39.	0.8	32.9	258	31.20

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Somerset Energy, Inc. Lease Big Lake Well No. S-107

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
335.5 - 345.0	8.3	69.2	574.12
345.0 - 374.8	24.0	449.5	10,788.30
335.5 - 374.8	32.3	351.8	11,362.42

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
335.5 - 345.0	8.3	16.8	5.4	85.9	70	580
345.0 - 374.8	24.6	19.1	22.5	68.1	305	7,493
335.5 - 374.8	32.9	18.5	18.2	72.6	245	8,073

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Somerset Energy, Inc. Lease Big Lake Well No. S-107

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.			
10	345.7	25.2	26	508	6	117	20	78	391	553	59.98	5
14	349.5	26.1	24	486	10	202	14	79	284	116	87.00	5
16	351.5	27.5	24	512	8	171	16	76	341	246	19.68	5
19	354.5	26.6	25	516	6	124	19	78	392	344	9.64	5
21	356.5	8.2	27	172	0	0	27	70	172	4	0.30	45
25	360.5	21.8	27	457	2	34	25	71	423	206	14.46	30
27	362.5	19.1	18	267	2	30	16	77	237	242	17.49	5
32	367.3	19.8	25	384	4	61	21	68	323	220	29.99	5
34	369.5	7.0	42	228	0	0	42	56	228	34	2.25	10
36	371.5	27.5	11	235	0	0	11	80	235	130	48.73	5
37	372.4	16.0	18	223	0	0	18	80	223	23	0.47	15
39	374.7	21.2	20	329	3	49	17	80	280	347	7.28	5

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-107

Depth Interval, Feet	345.0 - 374.8
Feet of Core Analyzed	6.8
Average Percent Porosity	23.5
Average Percent Original Oil Saturation	23.4
Average Percent Oil Recovery	4.9
Average Percent Residual Oil Saturation	18.5
Average Percent Residual Water Saturation	76.1
Average Percent Total Residual Fluid Saturation	94.6
Average Original Oil Content, Bbls./A. Ft.	431.
Average Oil Recovery, Bbls./A. Ft.	95.
Average Residual Oil Content, Bbls./A. Ft.	336.
Total Original Oil Content, Bbls./Acre	2,932.
Total Oil Recovery, Bbls./Acre	647.
Total Residual Oil Content, Bbls./Acre	2,285.
Average Effective Permeability, Millidarcys	27.05
Average Initial Fluid Production Pressure, p.s.i.	8.1

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-107

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation Connate	Drilling & Foreign	Total
1	335.7	10,289			
2	337.5	8,382			
3	338.5	8,091			
4	339.5	9,735			
5	340.5	8,547			
6	341.5	11,252			
7	342.5	8,952			
8	343.5	4,160			
9	344.5	9,307			
10	345.5	9,600			
11	346.5	8,434			
12	347.4	13,705			
13	348.5	12,548			
14	349.5	9,062			
15	350.5	6,627			
16	351.5	4,854			
17	352.5	1,777			
18	353.5	6,234			
19	354.5	2,970			
20	355.5	4,630			
21	356.5	11,470			
22	357.7	14,077			
23	358.5	15,833			
24	359.5	12,735			
25	360.5	11,138			
26	361.5	12,247			
27	362.5	11,471			
28	363.5	10,682			
29	364.5	11,003			
30	365.5	17,575			
31	366.5	17,793			
32	367.3	3,585			
33	368.3	7,445			
34	369.5	15,602			
35	370.5	2,654			
36	371.5	3,501			
37	372.4	2,822			
38	373.7	24,378			
39	374.7	11,443			

Note: ppm — parts per million