OILFIELD RESEARCH LABORATORIES
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December 4, 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-116, Miami County, Kansas, and submitted to our laboratory on November 9, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

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GENERAL INFORMATION & SUMMARY

Company Somerset Energy, Inc. Lease Big Lake Well No. S-116

Location 2160' WEL & 300' SNL

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

Name of Sand	Big Lake
Top of Core	344.0
Bottom of Core	380.0
Top of Sand	344.0
Bottom of Sand	377.5
Total Feet of Permeable Sand	24.4
Total Feet of Floodable Sand (Tested)	5.8

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 100	5.7	5.7
100 - 300	5.6	11.3
300 - 600	7.8	19.1
600 - 900	1.0	20.1
900 - 1400	4.3	24.4

Average Permeability Millidarcys	416.7
Average Percent Porosity	23.1
Average Percent Oil Saturation	26.3
Average Percent Water Saturation	66.5
Average Oil Content, Bbls./A. Ft.	466.
Total Oil Content, Bbls./Acre	11,360.
Average Percent Oil Recovery by Laboratory Flooding Tests	10.8
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	194.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,127.
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
344.0 - 344.5	Light brown sandstone.
344.5 - 346.2	Brown sandstone.
346.2 - 347.1	White sandy limestone.
347.1 - 347.7	Brown slightly calcareous shaly sandstone.
347.7 - 350.8	Brown slightly calcareous sandstone.
350.8 - 357.3	Gray and brown laminated shaly limestone with brown sandstone stringers.
357.3 - 359.6	Brown calcareous sandstone.
359.6 - 360.3	Gray shale.
360.3 - 362.7	Brown calcareous sandstone.
362.7 - 363.1	Gray shale.
363.1 - 369.0	Brown calcareous sandstone.
369.0 - 369.9	White sandy limestone.
369.9 - 373.2	Brown calcareous sandstone.
373.2 - 373.8	Light brown gray laminated sandy shale.
373.8 - 377.5	Brown calcareous sandstone.
377.5 - 379.0	White sandy limestone.
379.0 - 380.0	White soft limestone.

LABORATORY FLOODING TESTS

At the request of the client, several samples were subjected to floodpot testing.

These samples responded to laboratory flooding tests, as a total recovery of 1,127 barrels of oil per acre was obtained from 5.8 feet of sand. The weighted average percent oil saturation was reduced from 30.6 to 19.8, or represents an average recovery of 10.8 percent. The weighted average effective permeability of the samples is 16.96 millidarcys, while the average initial fluid production pressure is 14.3 pounds per square inch (See Table V).

CALCULATED RECOVERY

(CUSTOMER SELECTED SAMPLES)

The results of the laboratory flooding tests indicate that efficient primary and waterflood operations in the vicinity of this well should recover approximately 267 barrels of oil per acre foot.

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

Original formation volume factor, estimated	1.03
Reservoir water saturation, percent, estimated	45.0
Average porosity, percent	22.8
Oil saturation after flooding, percent	19.8
Performance factor, percent, estimated	45.0
Net floodable sand, feet, tested	5.8

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Somerset Energy, Incorporated **Lease** Big Lake **Well No.** S-116

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	344.2	25.5	15	75	90	297	138.	0.5	0.5	148	69.00
2	344.9	25.9	17	77	94	342	138.	1.0	1.5	342	138.00
3	345.7	24.7	25	56	81	479	74.	0.7	2.2	335	51.80
4	347.5	16.7	36	54	90	466	7.6	0.6	2.8	280	4.56
5	348.0	25.5	36	56	92	712	305.	0.8	3.6	570	244.00
6	349.0	24.7	29	60	89	556	324.	1.0	4.6	556	324.00
7	350.0	23.9	34	62	96	630	173.	1.3	5.9	819	224.90
8	354.4	15.6	18	80	98	218	14.	0.4	6.3	87	5.60
9	355.3	15.9	33	49	82	407	24.	0.5	6.8	203	12.00
10	357.9	16.1	37	57	94	462	22.	1.3	8.1	601	28.60
11	359.0	13.0	24	74	98	242	13.	1.0	9.1	242	13.00
12	360.6	17.0	13	77	90	172	437.	0.6	9.7	103	262.20
13	361.5	26.1	30	65	95	608	470.	1.0	10.7	608	470.00
14	362.5	24.8	25	72	97	481	218.	0.8	11.5	385	174.00
15	363.5	25.3	31	64	95	609	1019.	0.9	12.4	548	917.10
16	364.7	26.1	19	74	93	385	470.	1.0	13.4	385	470.00
17	365.5	26.3	19	76	95	388	322.	0.8	14.2	310	257.60
18	366.0	22.7	23	67	90	405	1.2	0.7	14.9	283	0.84
19	367.0	27.1	26	67	93	547	291.	1.0	15.9	547	291.00
20	367.8	23.6	24	74	98	439	218.	1.0	16.9	439	218.00
21	368.9	16.0	27	65	92	335	5.8	0.5	17.4	167	2.90
22	370.0	13.0	33	63	96	333	556.	0.6	18.0	200	333.60
23	371.0	23.2	24	69	93	432	470.	1.0	19.0	432	470.00
24	372.0	25.3	29	60	89	569	408.	1.0	20.0	569	408.00
25	373.0	26.2	28	65	93	569	1175.	0.7	20.7	398	822.50
26	374.0	28.5	27	65	92	597	1301.	0.7	21.4	418	910.70
27	375.0	26.3	29	67	96	592	679.	1.0	22.4	592	679.00
28	376.0	25.2	21	66	87	411	1273.	1.0	23.4	411	1273.00
29	377.0	25.9	19	75	94	382	1092.	1.0	24.4	382	1092.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Somerset Energy, Incorporated Lease Big Lake Well No. S-116

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
344.0 - 365.8	14.2	258.2	3,666.16
365.8 - 377.5	10.2	637.4	6,501.54
344.0 - 377.5	24.4	416.7	10,167.70

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 - 365.8	14.2	22.3	26.9	65.9	459	6,522
365.8 - 377.5	10.2	24.2	25.5	67.3	474	4,838
344.0 - 377.5	24.4	23.1	26.3	66.5	466	11,360

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Somerset Energy, Incorporated Lease Big Lake Well No. S-116

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.			
5	348.0	25.3	36	707	13	255	23	69	452	287	18.73	10
8	354.4	16.0	18	223	1	12	17	76	211	36	0.67	30
10	357.9	16.3	37	468	12	152	25	76	316	26	1.57	20
13	361.5	25.9	30	603	14	281	16	75	322	219	20.30	10
15	363.5	24.9	31	599	12	232	19	78	367	264	29.99	10
18	366.0	23.2	23	414	5	90	18	76	324	210	28.74	10
20	367.8	23.1	24	430	0	0	24	70	430	373	18.74	10
23	371.0	22.8	26	460	0	0	26	65	460	207	19.68	10
26	374.0	28.0	27	587	11	239	16	76	348	211	19.49	10
29	377.0	14.5	19	214	0	0	19	73	214	258	13.74	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-116

Depth Interval, Feet	347.7 - 374.5
Feet of Core Analyzed	5.8
Average Percent Porosity	22.8
Average Percent Original Oil Saturation	30.6
Average Percent Oil Recovery	10.8
Average Percent Residual Oil Saturation	19.8
Average Percent Residual Water Saturation	75.1
Average Percent Total Residual Fluid Saturation	94.9
Average Original Oil Content, Bbls./A. Ft.	535.
Average Oil Recovery, Bbls./A. Ft.	194.
Average Residual Oil Content, Bbls./A. Ft.	341.
Total Original Oil Content, Bbls./Acre	3,107.
Total Oil Recovery, Bbls./Acre	1,127.
Total Residual Oil Content, Bbls./Acre	1,980.
Average Effective Permeability, Millidarcys	16.96
Average Initial Fluid Production Pressure, p.s.i.	14.3

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-116

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
1	344.2	4,556			
2	344.9	5,786			
3	345.7	5,950			
4	347.5	19,796			
5	348.0	9,416			
6	349.0	10,946			
7	350.0	10,788			
8	354.4	11,709			
9	355.3	16,205			
10	357.9	16,198			
11	359.0	13,776			
12	360.6	16,147			
13	361.5	7,943			
14	362.5	8,635			
15	363.5	8,353			
16	364.7	4,249			
17	365.5	6,656			
18	366.0	12,417			
19	367.0	10,908			
20	367.8	8,805			
21	368.9	13,125			
22	370.0	15,173			
23	371.0	7,802			
24	372.0	12,444			
25	373.0	8,561			
26	374.0	9,281			
27	375.0	8,975			
28	376.0	11,362			
29	377.0	4,489			

Note: ppm — parts per million