

OILFIELD RESEARCH LABORATORIES

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

October 6, 1980

Hazlett Oil Company
P. O. Box 707
Chanute, Kansas 66720

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Smith I Lease, Well No. 3, Allen County, Kansas and submitted to our laboratory on July 9, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Sanford A. Michel

SAM/ks

5 c to Chanute, Kansas

- REGISTERED ENGINEERS -

CORE ANALYSIS - WATER ANALYSIS - REPRESSURING ENGINEERING - SURVEYING & MAPPING - PROPERTY EVALUATION & OPERATION

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GENERAL INFORMATION & SUMMARY

Company Hazlett Oil Co. Lease Smith I Well No. 3

Location -

Section 17 Twp 26S Rge 18E County Allen State Kansas

Elevation, Feet -

Name of Sand - - - - - Bartlesville

Top of Core - - - - - 919.0

Bottom of Core - - - - - 953.3

Top of Sand - - - - - 919.0

Bottom of Sand - - - - - 953.3

Total Feet of Permeable Sand - - - - - 34.3

Total Feet of Floodable Sand - - - - - 20.0

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 100	8.0	8.0
100 - 200	6.0	14.0
200 - 500	7.0	21.0
500 - 1000	5.0	26.0
1000 - 1500	8.3	34.3

Average Permeability Millidarcys - - - - - 536.1

Average Percent Porosity - - - - - 22.8

Average Percent Oil Saturation - - - - - 34.0

Average Percent Water Saturation - - - - - 39.6

Average Oil Content, Bbls./A. Ft. - - - - - 603.

Total Oil Content, Bbls./Acre - - - - - 20,676.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 6.5

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 121.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 2411.

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

-2-

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, Foot</u>	<u>Description</u>
919.0 - 920.1	Brown slightly shaly sandstone.
920.1 - 920.9	Grayish brown sandstone.
920.9 - 922.0	Brown slightly shaly sandstone.
922.0 - 930.2	Brown slightly calcareous sandstone.
930.2 - 953.3	Brown sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 2411 barrels of oil per acre was obtained from 20.0 feet of sand. The weighted average percent oil saturation was reduced from 39.6 to 33.1, or represents an average recovery of 6.5 percent. The weighted average effective permeability of the samples is 23.29 millidarcys, while the average initial fluid production pressure is 13.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 34 samples tested, 20 produced water and oil, and 12 samples produced water only. This indicates that approximately 59 percent of the sand represented by these samples is floodable pay sand.

CALCULATED RECOVERY

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 6820 barrels of oil per acre. This is an average recovery of 341 barrels per acre foot from 20.0 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.07
Reservoir water saturation, percent, estimated	25.0
Average porosity, percent	23.8
Oil saturation after flooding, percent	33.1
Performance factor, percent, estimated	50.0
Net floodable sand, feet	20.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbbs. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
1	919.5	19.1	27	36	63	400	6.9	1.1	1.1	440	7.59
2	920.5	19.5	17	33	50	257	31.	0.8	1.9	206	24.80
3	921.5	17.3	36	43	79	483	5.4	1.1	3.0	531	5.94
4	922.5	15.8	22	75	97	270	23.	1.0	4.0	270	23.00
5	923.5	20.4	20	40	60	317	456.	1.0	5.0	317	456.00
6	924.5	20.7	23	33	56	369	230.	1.0	6.0	369	230.00
7	925.5	21.9	26	31	57	442	231.	1.0	7.0	442	231.00
8	926.5	20.7	33	33	66	530	142.	1.0	8.0	530	142.00
9	927.5	21.2	27	38	65	444	142.	1.0	9.0	444	142.00
10	928.5	19.2	39	28	67	581	58.	1.0	10.0	581	58.00
11	929.5	20.1	36	31	67	561	97.	1.2	11.2	673	116.40
12	930.5	22.4	59	29	88	1025	63.	0.8	12.0	820	50.40
13	931.5	19.8	40	30	70	614	163.	1.0	13.0	614	163.00
14	932.5	20.1	42	32	74	655	105.	1.0	14.0	655	105.00
15	933.5	20.5	45	26	71	716	117.	1.0	15.0	716	117.00
16	934.5	20.6	37	36	73	591	87.	1.0	16.0	591	87.00
17	935.5	22.6	42	31	73	736	127.	1.0	17.0	736	127.00
18	936.5	22.5	38	57	95	663	309.	1.0	18.0	663	309.00
19	937.5	22.7	35	39	74	616	273.	1.0	19.0	616	273.00
20	938.5	18.4	49	46	95	700	226.	1.0	20.0	700	226.00
21	939.5	25.2	38	26	64	743	346.	1.0	21.0	743	346.00
22	940.3	24.1	43	38	81	804	501.	1.0	22.0	804	501.00
23	941.7	25.7	32	44	76	638	514.	1.0	23.0	638	514.00
24	942.5	26.9	39	35	74	814	588.	1.0	24.0	814	588.00
25	943.3	27.5	37	39	76	789	973.	1.0	25.0	789	973.00
26	944.5	27.6	33	42	75	707	986.	1.0	26.0	707	986.00
27	945.5	28.7	39	38	77	868	1393.	1.0	27.0	868	1393.00
28	946.5	26.9	34	46	80	710	1392.	1.0	28.0	710	1392.00
29	947.5	28.1	47	42	89	1025	1426.	1.0	29.0	1025	1426.00
30	948.5	26.3	26	50	76	531	1333.	1.0	30.0	531	1333.00

Company Hazlett Oil Co.

Lease Smith I

Well No.

3

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hazlett Oil Co. Lease Smith I Well No. 3

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	949.5	26.3	23	51	74	469	1330.	1.0	31.0	469	1330.00
32	950.5	25.1	31	48	79	604	1495.	1.0	32.0	604	1495.00
33	951.5	25.7	19	50	69	379	1363.	1.0	33.0	379	1363.00
34	952.3	26.0	26	46	72	524	1426.	1.3	34.3	681	1853.80

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Hazlett Oil Co.	Lease	Smith I	Well No.	3
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	
	919.0 - 929.0	10.0	132.0	1,320.33	
	929.0 - 953.3	24.3	702.4	17,067.60	
	919.0 - 953.3	34.3	536.1	18,387.93	

	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
	919.0 - 929.0	10.0	19.6	27.3	39.1	413	4,130
	929.0 - 953.3	24.3	24.2	36.8	39.8	681	16,546
	919.0 - 953.3	34.3	22.8	34.0	39.6	603	20,676

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Hazlett Oil Co.			Lease		Smith I		Well No.		3		
Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volume of Water Recovered cc's	Effective Permeability Millidarcys**	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water			
1	919.5	19.0	27	398	0	0	27	40	0	Imp.	-
2	920.5	19.3	17	255	0	0	17	71	26	0.75	40
3	921.5	17.5	36	489	0	0	36	44	0	Imp.	-
4	922.5	16.2	21	264	0	0	21	71	204	13.49	10
5	923.5	20.3	20	315	0	0	20	74	106	39.73	10
6	924.5	20.7	23	369	0	0	23	68	146	25.49	10
7	925.5	22.0	26	444	0	0	26	69	426	45.58	10
8	926.5	20.9	33	535	0	0	33	65	444	24.36	20
9	927.5	21.2	27	444	0	0	27	68	336	19.67	15
10	928.5	19.3	39	584	0	0	39	51	64	1.35	30
11	929.5	20.0	36	559	3	47	33	63	108	2.25	25
12	930.5	22.5	59	1030	22	384	37	60	253	7.80	25
13	931.5	19.8	40	614	5	77	35	63	254	5.85	25
14	932.5	20.2	42	658	4	63	38	60	269	9.00	20
15	933.5	20.7	45	723	6	96	39	52	231	8.70	25
16	934.5	20.6	37	591	2	32	35	62	320	10.77	20
17	935.5	22.5	42	733	6	105	36	62	302	21.63	15
18	936.5	22.	38	663	5	87	33	64	328	17.99	15
19	937.5	22.8	35	619	6	106	29	68	220	16.28	15
20	938.5	18.6	49	707	14	202	35	61	200	14.35	15
21	939.5	25.1	38	740	6	117	32	62	150	15.89	10
22	940.3	24.0	43	801	6	112	37	61	316	22.99	10
23	941.7	25.9	32	643	2	40	30	61	150	27.99	5
24	942.5	26.8	39	811	9	187	30	62	146	27.49	5
25	943.3	27.6	37	792	5	107	32	60	324	44.98	5
26	944.5	27.6	33	707	4	86	29	65	290	37.49	5
27	945.5	28.7	39	868	9	200	30	65	364	48.73	5
28	946.5	27.0	34	712	3	63	31	63	414	59.98	5
29	947.5	28.2	47	1028	15	328	32	64	242	32.62	5

Hazlett Oil Co. Lease Smith I Well No. 3

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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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company <u>Hazlett Oil Co.</u>			Lease <u>Smith I</u>			Well No. <u>3</u>					
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			
30	948.5	26.5	26	535	0	0	26	71	344	44.98	5
31	949.5	26.4	23	471	0	0	23	73	282	37.49	5
32	950.5	25.3	31	608	2	39	29	68	260	34.11	5
33	951.5	25.7	19	379	0	0	19	77	250	32.61	5
34	952.3	26.5	25	514	0	0	25	71	278	35.61	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

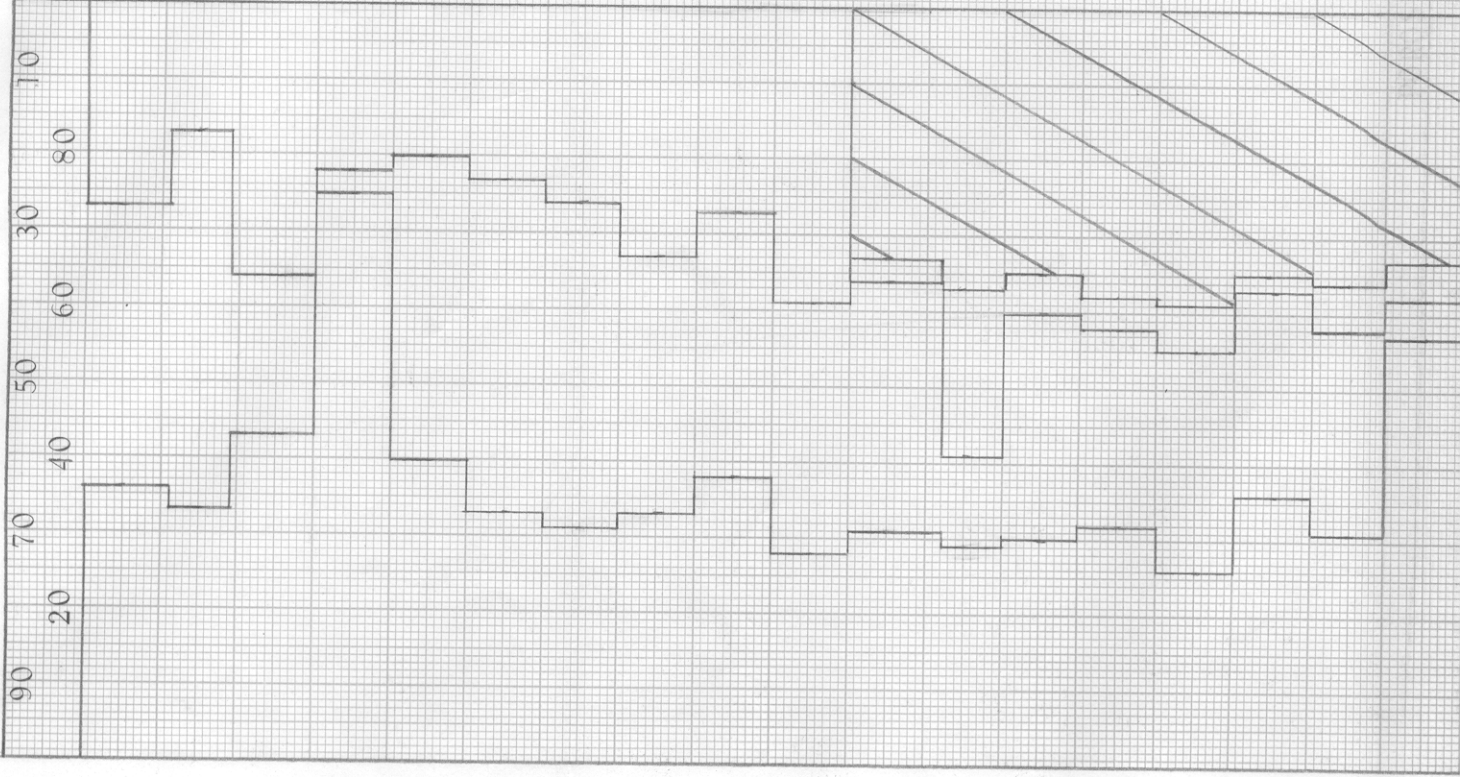
TABLE V

Company	Hazlett Oil Co.	Lease	Smith I	Well No.	3
Depth Interval, Feet	929.0 - 953.3				
Feet of Core Analyzed	20.0				
Average Percent Porosity	23.8				
Average Percent Original Oil Saturation	39.6				
Average Percent Oil Recovery	6.5				
Average Percent Residual Oil Saturation	33.1				
Average Percent Residual Water Saturation	62.5				
Average Percent Total Residual Fluid Saturation	95.4				
Average Original Oil Content, Bbls./A. Ft.	726.				
Average Oil Recovery, Bbls./A. Ft.	121.				
Average Residual Oil Content, Bbls./A. Ft.	605.				
Total Original Oil Content, Bbls./Acre	14,513.				
Total Oil Recovery, Bbls./Acre	2,411.				
Total Residual Oil Content, Bbls./Acre	12,102.				
Average Effective Permeability, Millidarcys	23.29				
Average Initial Fluid Production Pressure, p.s.i.	13.0				

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

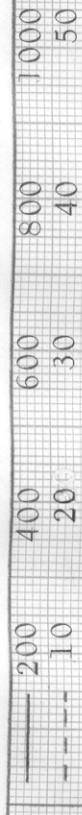
K= 10 X 10 TO THE CENTIMETER • 25 X 38 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.

WATER SAT., PERCENT → OIL SAT., PERCENT ←

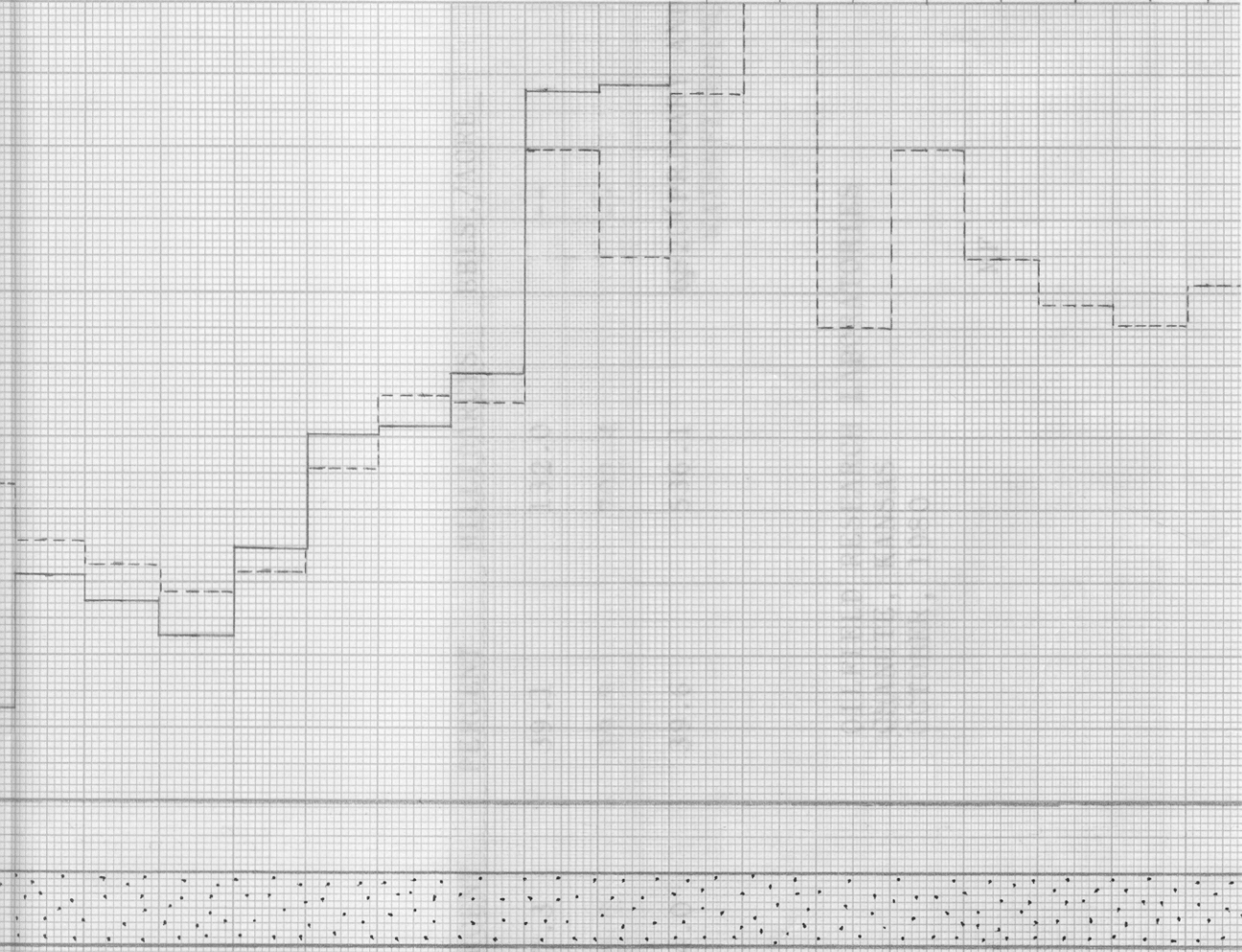
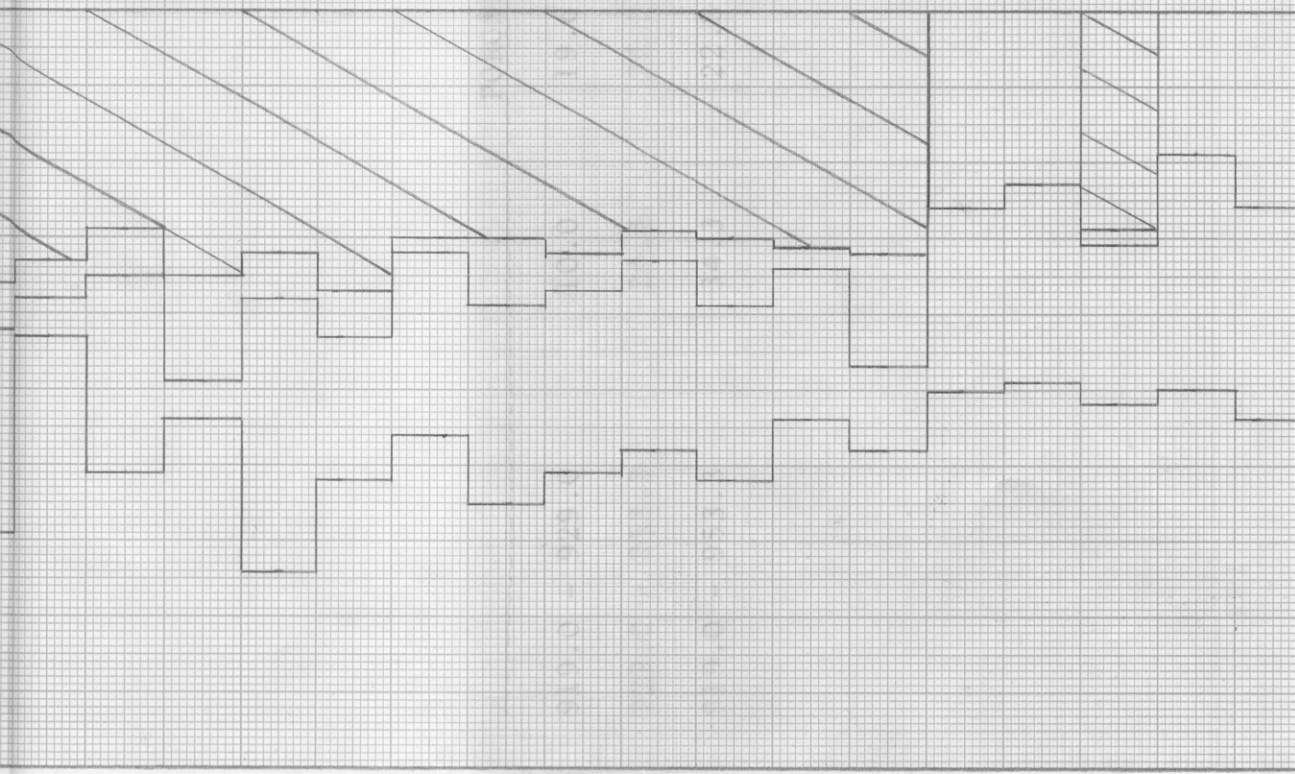


47 1512
PERMEABILITY, IN MILLIDARCYS

--- EFFECTIVE PERMEABILITY TO WATER, IN M



936
937
938
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940
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943
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951
952



1393
1392
5998
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1495
1363
1426

KEY:

 SANDSTONE

 CALACREOUS SANDSTONE

 SHALY SANDSTONE

 FLOODPOT RESIDUAL OIL SATURATION
 IMPERMEABLE TO WATER

HAZLETT OIL COMPANY

SMITH I LEASE

WELL NO. 3

ALLEN COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE		AVG. OIL		AVG. WATER		AVERAGE		CALCULATED OIL RECOVERY BBLs./ACRE
		POROSITY PERCENT	SATURATION PERCENT	SATURATION PERCENT	SATURATION PERCENT	PERMEABILITY MILLIDARCYS	PERMEABILITY MILLIDARCYS			

919.0 - 929.0

10.0

19.6

27.3

39.1

132.0

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929.0 - 953.3

24.3

24.2

36.8

39.8

702.4

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919.0 - 953.3

34.3

22.8

34.0

39.6

536.1

6820

(PRIMARY AND
WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CLEANUTE, KANSAS
OCTOBER, 1980

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