

OILFIELD RESEARCH LABORATORIES

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

October 22, 1982

Sand Bar Oil Company
Box 143
Canton, Kansas 67428

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Decker Lease, Well No. 1, located in Crawford County, Kansas and submitted to our laboratory on October 15, 1982.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/rmc

5 c to Canton, Kansas
2 c to Box 45, McCune, Kansas

- REGISTERED ENGINEERS -

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

Offield Research Laboratories
GENERAL INFORMATION & SUMMARY

Company Sand Bar Oil Company Lease Decker Well No. 1
 Location SW $\frac{1}{4}$
 Section 31 Twp. 30S Rge. 22E County Crawford State Kansas

Elevation, Feet
 Name of Sand Bartlesville
 Top of Core 209.0
 Bottom of Core 247.6
 Top of Sand (Tested) 210.0
 Bottom of Sand 246.5
 Total Feet of Permeable Sand 26.5
 Total Feet of Floodable Sand 16.0

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 7	9.6	9.6
10 - 20	4.0	13.6
20 - 40	7.9	21.5
40 - 60	3.0	24.5
60 - 85	2.0	26.5

Average Permeability Millidarcys 22.4
 Average Percent Porosity 18.4
 Average Percent Oil Saturation 43.9
 Average Percent Water Saturation 43.2
 Average Oil Content, Bbls./A. Ft. 641.
 Total Oil Content, Bbls./Acre 17,616.
 Average Percent Oil Recovery by Laboratory Flooding Tests 9.1
 Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. 142.
 Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre 2,278.

See "Calculated Recovery"
Section

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.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
209.0 - 211.0	Grayish brown very shaly sandstone.
211.0 - 212.0	Brown sandstone.
212.0 - 213.0	Brown shaly sandstone.
213.0 - 215.0	Brown sandstone.
215.0 - 216.1	Brown shaly sandstone.
216.1 - 230.0	Brown sandstone.
230.0 - 232.0	Brown (salt and pepper) shaly sandstone.
232.0 - 234.0	Grayish brown shaly sandstone.
234.0 - 234.7	Grayish brown slightly sandy shale.
234.7 - 236.0	Gray shale.
236.0 - 238.0	Gray and brown finely laminated shale and sandstone.
238.0 - 243.3	Gray shale.
243.3 - 245.0	Gray shaly sandstone.
245.0 - 246.5	Light brown very shaly sandstone.
246.5 - 247.6	Black shale.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 2,278 barrels of oil per acre was obtained from

16.0 feet of sand. The weighted average percent oil saturation was reduced from 47.1 to 38.0, or represents an average recovery of 9.1 percent. The weighted average effective permeability of the samples is 1.33 millidarcys, while the average initial fluid production pressure is 28.8 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 28 samples tested, 16 produced water and oil, and 4 samples water only. This indicates that approximately 57. 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 4,270 barrels of oil per acre. This is an average recovery of 267 barrels per acre foot from 16.0 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.03
Reservoir water saturation, percent, estimated	25.0
Average porosity, percent	19.8
Oil saturation after flooding, percent	38.0
Performance factor, percent, estimated	50.0
Net floodable sand, feet	16.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Sand Bar Oil Company Lease Decker Well No. 1

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	210.4	12.3	19	73	92	181	Imp.	1.0	1.0	181	0.00
2	211.5	19.7	47	37	84	718	20.	1.0	2.0	718	20.00
3	212.5	21.0	45	38	83	733	5.2	1.0	3.0	733	5.20
4	213.6	21.0	44	37	81	717	11.	1.0	4.0	717	11.00
5	214.7	22.4	50	29	79	869	44.	1.0	5.0	869	44.00
6	215.5	17.1	38	45	83	504	4.9	1.1	6.1	554	5.39
7	216.5	22.2	63	29	92	1085	37.	0.9	7.0	977	33.30
8	217.5	20.7	35	57	92	562	31.	1.0	8.0	562	31.00
9	218.5	19.6	44	40	84	669	13.	1.0	9.0	669	13.00
10	219.6	18.3	54	42	96	767	54.	1.0	10.0	767	54.00
11	220.5	20.5	55	32	87	875	21.	1.0	11.0	875	21.00
12	221.5	21.4	52	33	85	863	84.	1.0	12.0	863	84.00
13	222.6	15.5	61	34	95	734	62.	1.0	13.0	734	62.00
14	223.5	18.6	50	36	86	722	25.	1.0	14.0	722	25.00
15	224.6	19.0	37	43	80	545	28.	1.0	15.0	545	28.00
16	225.7	18.7	37	44	81	537	37.	1.0	16.0	537	37.00
17	226.6	21.6	45	43	88	754	15.	1.0	17.0	754	15.00
18	227.6	21.6	40	36	76	670	47.	1.0	18.0	670	47.00
19	228.4	18.9	40	37	77	587	26.	1.0	19.0	587	26.00
20	229.5	16.8	53	40	93	691	10.	1.0	20.0	691	10.00
21	230.5	17.9	53	43	96	736	5.2	1.0	21.0	736	5.20
22	231.3	17.4	44	45	89	594	6.0	1.0	22.0	594	6.00
23	232.5	18.3	54	34	88	767	5.2	1.0	23.0	767	5.20
24	233.6	16.1	62	34	96	774	2.4	1.0	24.0	774	2.40
25	236.5	16.8	36	44	80	469	1.6	1.0	25.0	469	1.60
26	237.8	14.9	28	65	93	324	0.42	1.0	26.0	324	0.42
27	245.6	15.3	15	77	92	178	0.28	0.8	26.8	142	0.22
28	246.4	9.2	17	80	97	121	0.52	0.7	27.5	85	0.36

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Lease	Decker	Well No.		
Sand Bar Oil Company			1		
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.		
210.0 - 216.1	5.1	16.8	85.59		
216.1 - 227.0	10.9	37.0	403.30		
227.0 - 246.5	10.5	9.9	104.40		
210.0 - 246.5	26.5	22.4	593.29		
Depth Interval, Feet	Feet of Core Analyzed	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
210.0 - 216.1	6.1	18.9	40.5	618	3,772
216.1 - 227.0	10.9	19.6	48.3	734	8,005
227.0 - 246.5	10.5	16.9	41.3	556	5,839
210.0 - 246.5	27.5	18.4	43.9	641	17,616

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Sand Bar Oil Company Lease Decker Well No. 1

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			
1	210.4	12.7	18	177	0	0	18	76	0	Imp.	-
2	211.5	19.8	47	722	16	246	31	60	12	0.20	30
3	212.5	21.0	45	733	9	147	36	55	17	0.30	30
4	213.6	20.8	44	710	6	97	38	47	19	0.32	35
5	214.7	22.5	50	873	13	227	37	51	22	0.44	30
6	215.5	17.1	38	504	7	93	31	63	18	0.44	30
7	216.5	22.0	63	1075	24	410	39	55	48	0.90	30
8	217.5	20.8	35	565	4	65	31	63	158	3.10	20
9	218.5	19.7	44	672	6	92	38	51	50	0.89	20
10	219.6	18.1	54	758	10	140	44	52	228	5.00	25
11	220.5	20.5	55	875	11	175	44	49	152	3.00	20
12	221.5	21.2	52	855	17	280	35	52	104	2.40	25
13	222.6	15.6	61	738	14	169	47	50	64	1.40	30
14	223.5	18.7	50	725	4	58	46	44	14	0.30	40
15	224.6	19.9	37	571	2	31	35	53	16	0.30	35
16	225.7	18.8	37	540	2	29	35	51	72	1.40	30
17	226.6	21.8	45	761	3	51	42	49	46	0.90	30
18	227.6	21.5	40	667	0	0	18	71	8	0.20	50
19	228.4	19.0	40	590	0	0	40	55	16	0.40	40
20	229.5	16.5	54	691	0	0	54	41	0	Imp.	-
21	230.5	18.2	52	734	0	0	52	44	0	Imp.	-
22	231.3	17.8	43	594	0	0	43	46	0	Imp.	-
23	232.5	18.4	54	771	0	0	54	36	0	Imp.	-
24	233.6	15.9	63	777	0	0	63	34	0	Imp.	-
25	236.5	16.3	37	468	0	0	37	44	0	Imp.	-
26	237.8	15.4	27	323	0	0	27	66	0	Imp.	-
27	245.6	15.3	15	178	0	0	15	78	8	0.20	50
28	246.4	9.3	17	123	0	0	17	80	6	0.10	50

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

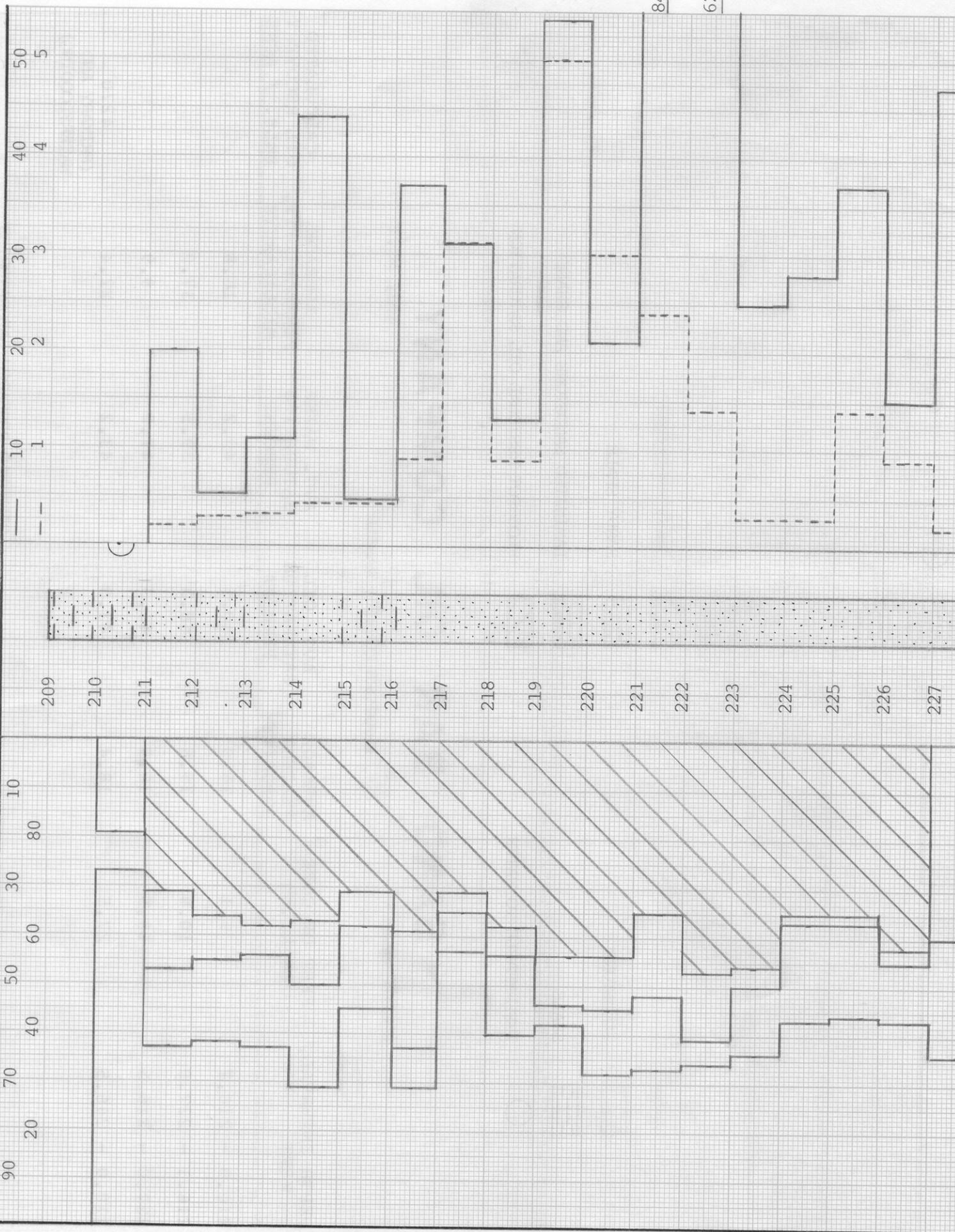
Company	Lease	Decker	Well No.
Sand Bar Oil Company	210.0 - 216.1	216.1 - 227.0	210.0 - 227.0
	5.1	10.9	16.0
Depth Interval, Feet	20.0	19.7	19.8
Feet of Core Analyzed	44.6	48.3	47.1
Average Percent Porosity	10.1	8.7	9.1
Average Percent Original Oil Saturation	34.5	39.6	38.0
Average Percent Oil Recovery	55.4	51.7	52.9
Average Percent Residual Oil Saturation	89.9	91.3	90.9
Average Percent Residual Water Saturation	705.	737.	726.
Average Total Residual Fluid Saturation	161.	134.	142.
Average Original Oil Content, Bbls./A. Ft.	544.	603.	584.
Average Oil Recovery, Bbls./A. Ft.	3,592.	8,028.	11,620.
Average Residual Oil Content, Bbls./A. Ft.	819.	1,459.	2,278.
Total Original Oil Content, Bbls./Acre	2,773.	6,569.	9,342.
Total Oil Recovery, Bbls./Acre	0.34	1.79	1.33
Total Residual Oil Content, Bbls./Acre	31.0	27.7	28.8
Average Effective Permeability, Millidarcys			
Average Initial Fluid Production Pressure, p.s.i.			

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

WATER SAT., PERCENT

OIL SAT., PERCENT

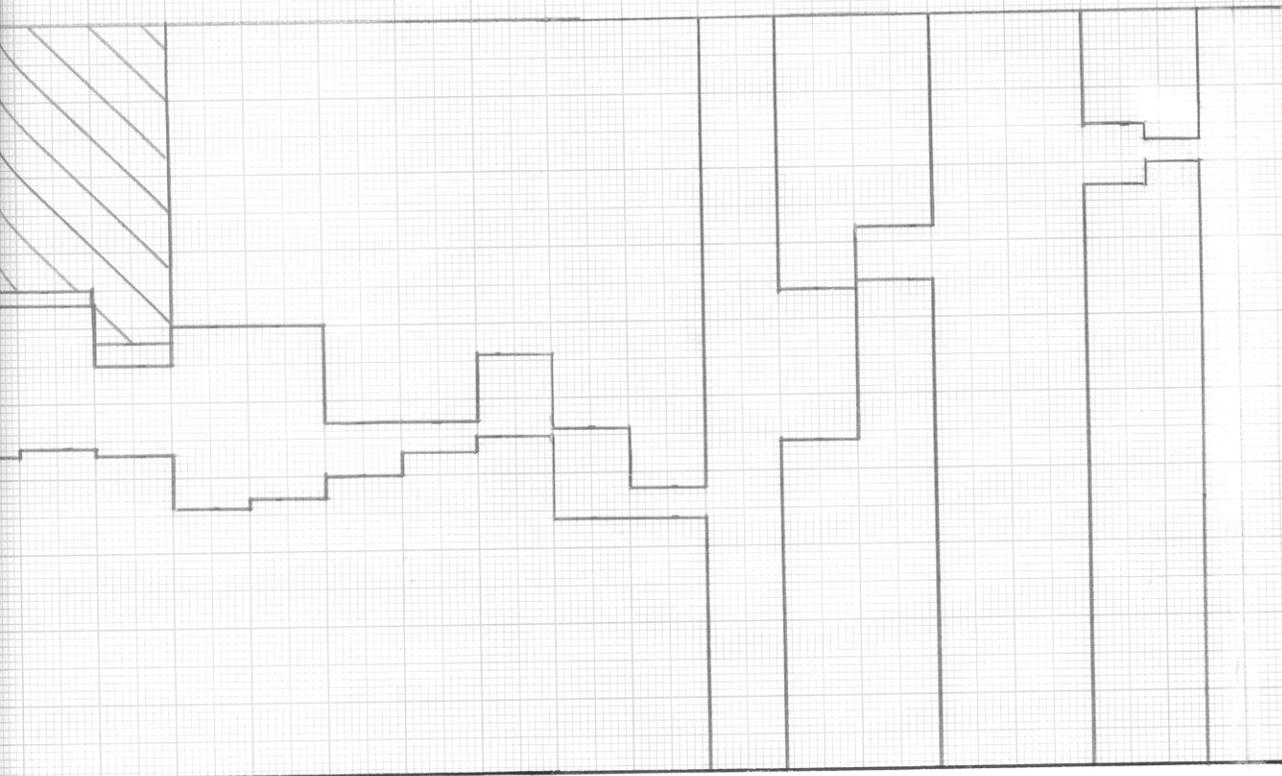
PERMEABILITY, IN MILLIDARCYS
EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS



84

62

225
226
227
228
229
230
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246
247



KEY:

-  SANDSTONE
-  SHALE
-  IMPERMEABLE TO WATER

SHALY SANDSTONE

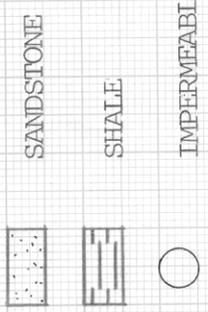
SANDY SHALE

LAMINATED SANDSTONE AND SHALE

FLOODPOT RESIDUAL OIL SATURATION

245
246
247

KEY:



SHALY SANDSTONE

SANDY SHALE

LAMINATED SANDSTONE AND SHALE

FLOODPOT RESIDUAL OIL SATURATION

SAND BAR OIL COMPANY

DECKER LEASE

CRAWFORD COUNTY, KANSAS

WELL NO. 1

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY EBLS. / ACRE
210.0 - 216.1	6.1	18.9	40.5	43.2	16.8	
216.1 - 227.0	10.9	19.6	48.3	39.5	37.0	
227.0 - 246.5	10.5	16.9	41.3	47.2	9.9	
210.0 - 246.5	27.5	18.4	43.9	43.2	22.4	4270 (PRIMARY AND WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
OCTOBER, 1982
PDC