

OILFIELD RESEARCH LABORATORIES

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

April 5, 1980

Wells-Battlestein Oil & Gas, Inc.
7700 San Felipe Blvd.
Houston, Texas 77002

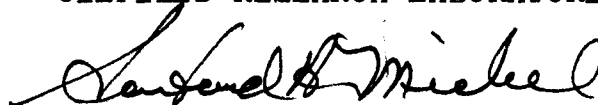
Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Richey Lease, Well No. SWI-45, Neosho County, Kansas, and submitted to our laboratory on March 12, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Sanford A. Michel

SAM/tem

6 c to Houston, Texas
1 c to Chanute, Kansas

- REGISTERED ENGINEERS -

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

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Wells-Battlestein Oil & Gas, Inc. Lease SWI-45 Well No. SWI-45
 Location O'FEL & 1485' ENL SW $\frac{1}{4}$
 Section 4 Twp 28S Rge 19E County Neosho State Kansas

Elevation, Feet - - - - -

Name of Sand - - - - -

Bartlesville

Top of Core - - - - -

616.0

Bottom of Core - - - - -

650.0

Top of Sand - - - - -

619.3

Bottom of Sand - - - - -

648.9

Total Feet of Permeable Sand - - - - -

25.8

Total Feet of Floodable Sand - - - - -

11.0

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 30

9.9

9.9

30 - 50

6.2

16.1

50 - 100

7.4

23.5

100 - 200

2.3

25.8

Average Permeability Millidarcys - - - - -

34.3

Average Percent Porosity - - - - -

19.1

Average Percent Oil Saturation - - - - -

29.2

Average Percent Water Saturation - - - - -

62.7

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

434.

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

11,815.

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

5.4

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

85.

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

931.

Total Calculated Oil Recovery, Bbls./Acre - - - - -

See "Calculated Recovery" Section.

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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>
616.0 - 619.3	Gray laminated sandstone and shale.
619.3 - 620.7	Brown and gray laminated sandstone and shale.
620.7 - 622.0	Dark brown slightly carbonaceous sandstone.
622.0 - 625.2	Brown sandstone.
625.2 - 625.8	Brown slightly shaly sandstone.
625.8 - 633.8	Brown sandstone.
633.8 - 634.8	Brown and gray laminated sandstone and shale.
634.8 - 635.3	Brown sandstone.
635.3 - 636.3	Gray sandy shale.
636.3 - 641.2	Brown sandstone.
641.2 - 641.9	Brown slightly shaly sandstone.
641.9 - 643.2	Brown sandstone.
643.2 - 644.1	Brown shaly sandstone.
644.1 - 645.0	Brown slightly shaly sandstone.
645.0 - 647.9	Brownish gray sandstone.
647.9 - 648.9	Gray conglomeratic sandstone.
648.9 - 650.0	Light brown shaly sandstone.

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LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 931 barrels of oil per acre was obtained from 11.0 feet of sand. The weighted average percent oil saturation was reduced from 35.1 to 29.7, or represents an average recovery of 5.4 percent. The weighted average effective permeability of the samples is 3.06 millidarcys, while the average initial fluid production pressure is 15.0 pounds per square inch. (See Table V).

By observing the data given in Table IV, you will note that of the 27 samples tested, 11 produced water and oil, and 13 samples produced water only. This indicates that approximately 41 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 2,860 barrels of oil per acre. This is an average recovery of 260 barrels per acre foot from 11.0 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.04
Reservoir water saturation, percent, estimated	30.0
Average porosity, percent	19.8
Oil saturation after flooding, percent	29.7
Performance factor, percent, estimated	45.0
Net floodable sand, feet	11.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Wells-Battlestein Oil & Gas, Inc. Lease Richey Well No. SWI-45

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	620.5	17.0	45	38	83	Imp.	1.4	1.4	832	0.00
2	621.5	22.0	50	33	83	145.	1.3	2.7	1109	188.50
3	622.5	21.9	33	47	80	100.	1.0	3.7	561	100.00
4	623.5	21.5	33	49	82	52.	1.0	4.7	550	52.00
5	624.5	20.4	21	63	84	90.	1.2	5.9	398	108.00
6	625.5	19.9	27	71	98	7.1	0.6	6.5	250	4.26
7	626.5	20.2	25	70	95	87.	1.2	7.7	470	104.40
8	627.5	19.0	28	65	93	44.	1.0	8.7	413	44.00
9	628.5	18.8	30	67	97	44.	1.0	9.7	438	44.00
10	629.5	20.5	32	57	89	52.	1.0	10.7	507	52.00
11	630.5	19.8	23	71	94	52.	1.0	11.7	353	52.00
12	631.5	17.3	31	58	89	18.	1.0	12.7	416	18.00
13	632.5	19.4	28	67	95	52.	1.0	13.7	421	52.00
14	633.5	17.2	40	51	91	25.	0.8	14.5	427	20.00
15	634.5	20.3	33	63	96	11.	1.0	15.5	520	11.00
16	636.7	17.3	38	58	96	3.9	0.7	16.2	357	2.73
17	637.5	18.5	14	69	83	38.	1.0	17.2	201	38.00
18	638.5	20.4	24	73	97	40.	1.0	18.2	380	40.00
19	639.5	17.6	36	60	96	28.	1.0	19.2	492	28.00
20	640.5	14.4	34	62	96	44.	1.2	20.4	456	52.80
21	641.5	15.6	31	65	96	8.5	0.7	21.1	263	5.95
22	642.5	21.1	36	61	97	29.	1.3	22.4	766	37.70
23	643.3	20.7	28	69	97	0.39	0.9	23.3	405	0.35
24	644.5	18.9	22	75	97	8.6	0.9	24.2	291	7.74
25	645.5	20.1	15	82	97	54.	1.0	25.2	234	54.00
26	646.5	19.0	12	85	97	35.	1.0	26.2	177	35.00
27	648.5	16.2	10	84	94	1.7	1.0	27.2	126	1.70

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company		Wells-Battlestein Oil & Gas, Incorporated		Lease	Richey	Well No.	SWI-45
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.				
619.3 - 634.8	14.1	60.3	850.16				
636.3 - 648.9	11.7	26.0	303.97				
619.3 - 648.9	25.8	34.3	884.13				

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
619.3 - 634.8	15.5	19.7	32.4	57.0	495.	7,667
636.3 - 648.9	11.7	18.4	25.0	70.3	355	4,148
619.3 - 648.9	27.2	19.1	29.2	62.7	434.	11,815

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company			Wells-Battlestein Oil & Gas, Inc.			Lease			Richey			Well No.			SWI--45		
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.					
1	620.5	17.3	44	591	0	0	44	50	0	Imp.	-						
2	621.5	21.5	50	834	20	334	30	65	293	5.32	15						
3	622.5	21.7	33	556	5	84	28	69	406	5.70	20						
4	623.5	21.5	33	550	4	67	29	67	256	3.37	20						
5	624.5	20.9	21	340	0	0	21	72	355	9.74	10						
6	625.5	19.7	27	413	2	31	25	65	191	2.02	15						
7	626.5	20.2	25	398	0	0	25	70	223	3.67	10						
8	627.5	19.3	28	419	0	0	28	70	297	3.45	15						
9	628.5	19.0	30	442	2	29	28	70	483	4.05	15						
10	629.5	20.5	32	509	4	64	28	70	272	2.55	15						
11	630.5	20.0	23	357	0	0	23	64	495	6.07	15						
12	631.5	17.7	31	426	2	27	29	68	64	0.75	20						
13	632.5	19.3	28	419	0	0	28	66	160	1.95	15						
14	633.5	17.0	40	528	10	132	30	68	81	1.05	25						
15	634.5	20.2	33	517	2	31	31	67	251	3.30	10						
16	636.7	17.8	37	511	0	0	37	60	0	Imp.	-						
17	637.5	18.1	14	197	0	0	14	70	452	5.70	10						
18	638.5	20.3	24	378	0	0	24	74	201	3.00	10						
19	639.5	18.1	36	506	3	42	33	61	206	2.40	10						
20	640.5	14.6	34	385	0	0	34	63	38	0.52	30						
21	641.5	16.0	30	372	0	0	30	68	175	2.92	10						
22	642.5	19.8	36	553	3	46	33	62	146	2.02	10						
23	643.3	20.6	28	447	0	0	28	67	283	3.75	10						
24	644.5	18.9	22	323	0	0	22	75	357	4.05	10						
25	645.5	19.9	15	232	0	0	15	83	164	2.40	15						
26	646.5	19.0	12	177	0	0	12	86	642	6.90	10						
27	648.5	16.7	9	117	0	0	9	86	0	Imp.	-						

Company Wells-Battlestein Oil & Gas, Inc. Lease Richey Well No. SWI-45

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.

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Wells-Battlestein Oil & Gas, Inc.	Lease	Richey	Well No.	SWI-45
Depth Interval, Feet	619.3 - 634.8	636.3 - 648.9	619.3 - 648.9		
Feet of Core Analyzed	8.7	2.3	11.0		
Average Percent Porosity	20.0	19.0	19.8		
Average Percent Original Oil Saturation	34.9	36.0	35.1		
Average Percent Oil Recovery	6.0	3.0	5.4		
Average Percent Residual Oil Saturation	28.9	33.0	29.7		
Average Percent Residual Water Saturation	67.7	61.6	66.4		
Average Percent Total Residual Fluid Saturation	96.6	94.6	96.1		
Average Original Oil Content, Bbls./A. Ft.	543.	532.	541.		
Average Oil Recovery, Bbls./A. Ft.	95.	44.	85.		
Average Residual Oil Content, Bbls./A. Ft.	448.	488.	456.		
Total Original Oil Content, Bbls./Acre	4,723.	1,225.	5,948.		
Total Oil Recovery, Bbls./Acre	829.	102.	931.		
Total Residual Oil Content, Bbls./Acre	3,894.	1,123.	5,017.		
Average Effective Permeability, Millidarcys	3.29	2.19	3.06		
Average Initial Fluid Production Pressure, p.s.i.	17.2	10.0	15.0		

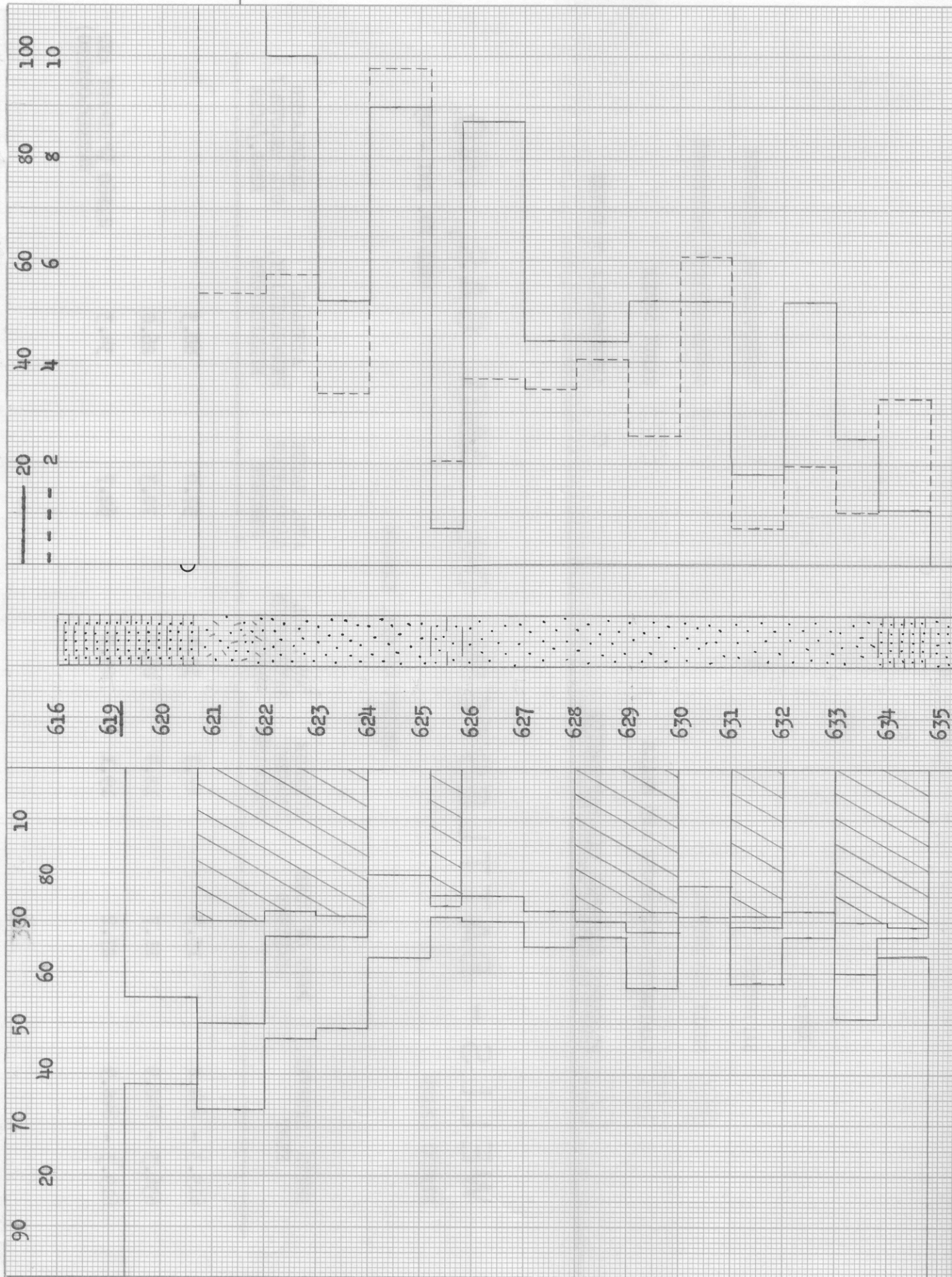
NOTE: Only those samples which recovered oil were used in calculating the above averages.

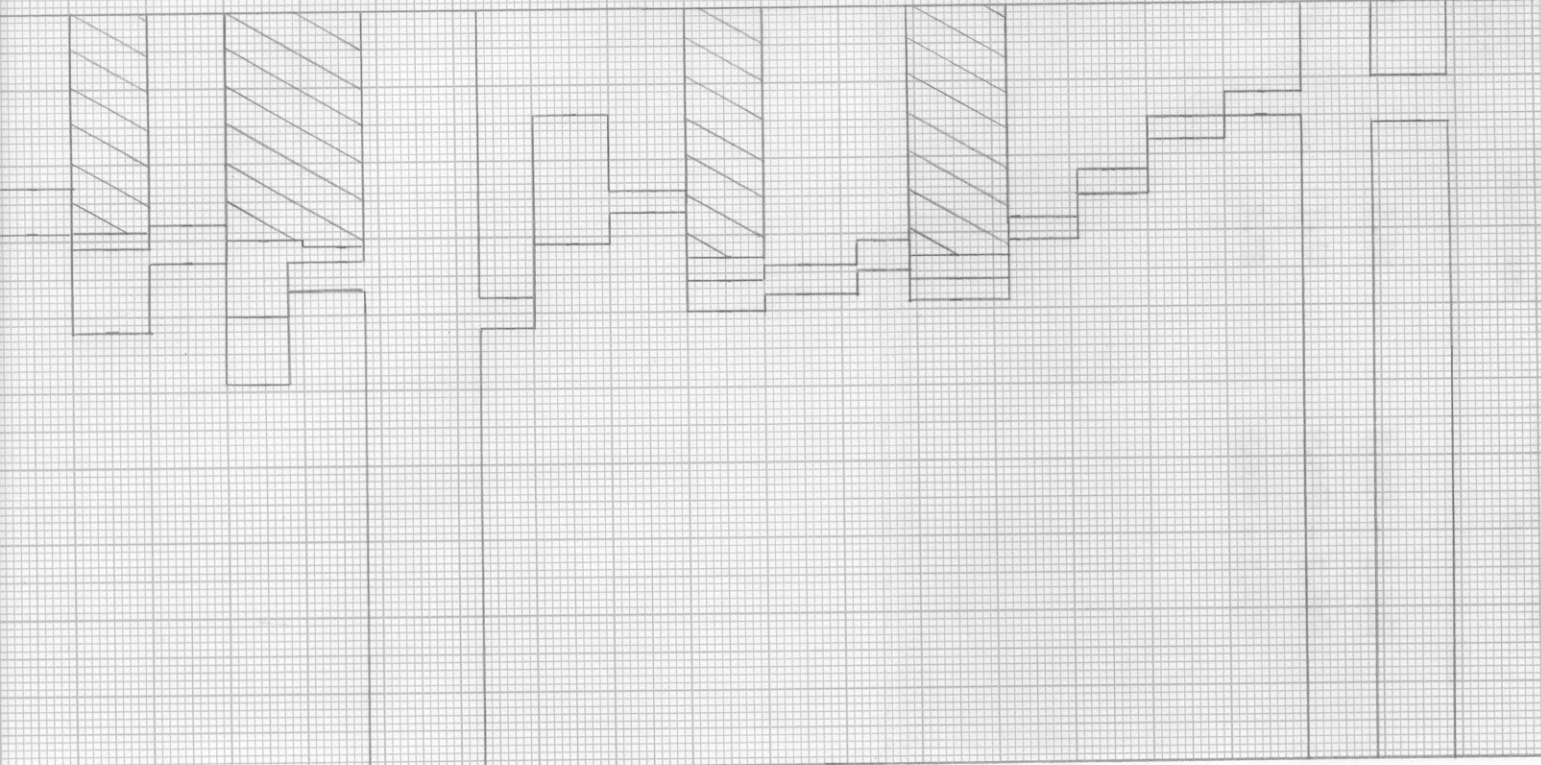
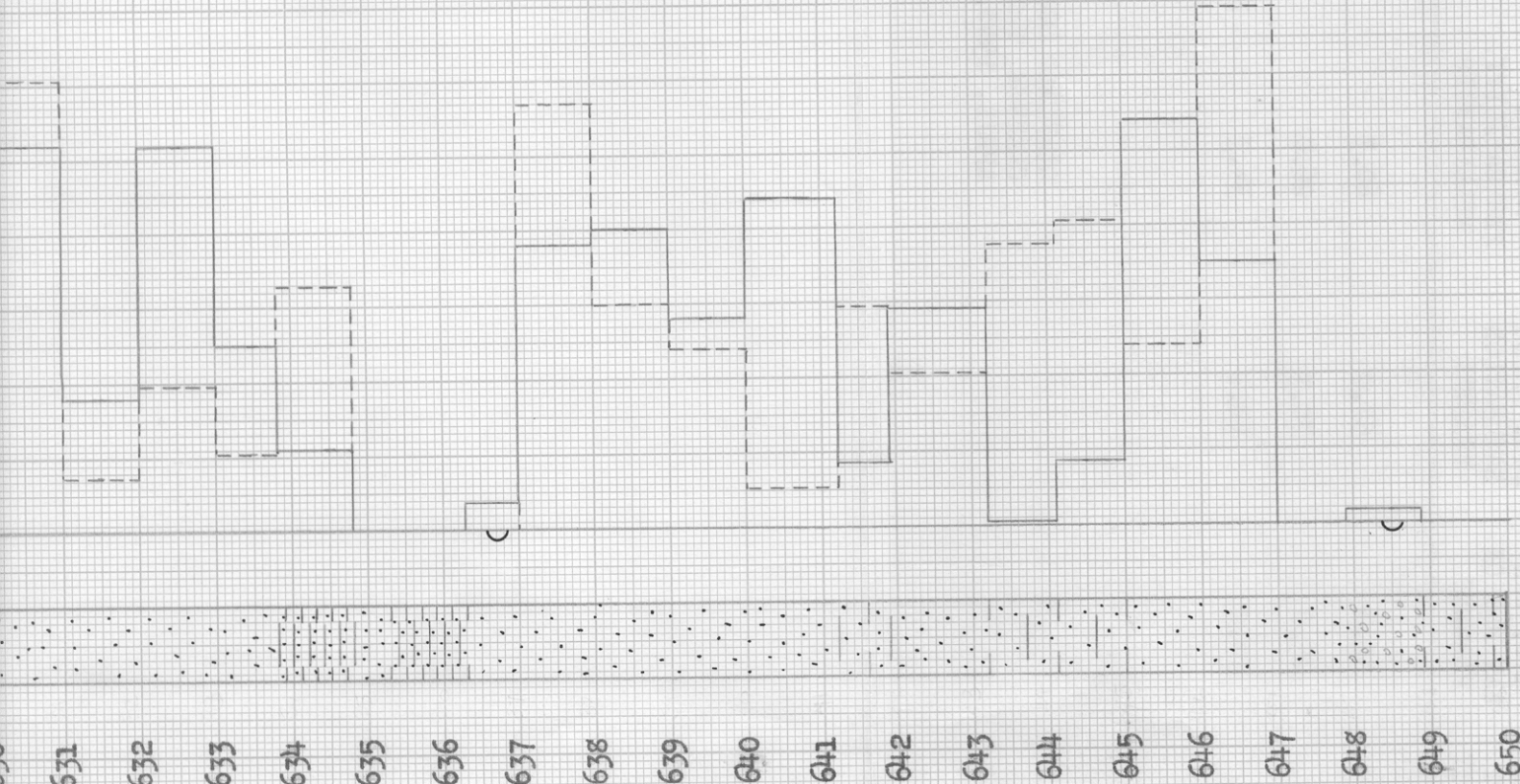
WATER SAT.,
PERCENT

OIL SAT.,
PERCENT

PERMEABILITY, IN MILLIDARCS

EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCS





KEY:

648
649
650

KEY:

-  SANDSTONE
-  SHALY SANDSTONE
-  LAMINATED SANDSTONE AND SHALE
-  FLOODPOT RESIDUAL OIL SATURATION
-  CARBONACEOUS SANDSTONE
-  CONGLOMERATIC SANDSTONE
-  SANDY SHALE
-  IMPERMEABLE TO WATER

WELLS - BATTLESTEIN OIL AND GAS, INC.

RICHEY LEASE

WELL NO. SWI - 45

NEOSHO COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE POROSITY PERCENT	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCY BBL./ACFE	CALCULATED OIL RECOVERY BBL./ACFE
619.3 - 634.8	15.5	19.7	32.4	57.0	60.3	
636.3 - 648.9	11.7	18.4	25.0	70.3	26.0	
619.3 - 648.9	27.2	19.1	29.2	62.7	34.3	2,860 (PRIMARY AND WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
APRIL, 1980. HR