



OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

August 6, 1968

8-25-106

Stubbs & Fleming
680 Fourth National Building
Wichita, Kansas 67202

Gentlemen:

Enclosed herewith is the report of the analysis
of the Rotary core taken from the Fulhage Lease, Well
No. 5, Woodson County, Kansas, and submitted to our
laboratory on July 30, 1968.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:dlp

5 c.

Fulhage 5

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GENERAL INFORMATION & SUMMARY

Company Stubbs & Fleming Lease Fulhage Well No. 5

Location 440' West of Center, NW NW

Section 8 Twp. 25S Rge. 16E County Woodson State Kansas

Name of Sand - - - - - Squirrel

Top of Core - - - - - 953.0

Bottom of Core - - - - - 972.5

Top of Sand - - - - - 954.8

Bottom of Sand - - - - - (Analyzed) 968.5

Total Feet of Permeable Sand - - - - - 11.5

Total Feet of Floodable Sand - - - - - 11.5

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 40

3.0

3.0

40 - 60

4.1

7.1

60 - 80

1.4

8.5

80 & above

3.0

11.5

Average Permeability Millidarcys - - - - - 58.2

Average Percent Porosity - - - - - 20.6

Average Percent Oil Saturation - - - - - 58.3

Average Percent Water Saturation - - - - - 20.4

Average Oil Content, Bbls./A. Ft. - - - - - 930.

Total Oil Content, Bbls./Acre - - - - - 10,686.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 13.6

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 218.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 2,507.

Total Calculated Oil Recovery, Bbls./Acre - - (Primary & Secondary) 3,268.

Packer Setting, Feet - - - - -

Viscosity, Centipoises @ - - - - -

A. P. I. Gravity, degrees @ 60 °F - - - - -

Elevation, Feet - - - - -

-2-

A fresh water mud was used as a circulating fluid in the coring of the sand in this well. This well was drilled in a virgin area. The core was sampled and sealed in tin cans by an employee of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
953.0 - 954.8	Gray calcareous shale.
954.8 - 955.9	Dark brown fine grained micaceous sandstone.
955.9 - 958.1	Finely laminated sandy shale with very slight bleeding.
958.1 - 968.5	Dark brown fine grained micaceous slightly laminated shaly sandstone.
968.5 - 969.2	Dark carbonaceous shaly sandstone.
969.2 - 972.5	Gray sandy shale.

Coring was started at a depth of 953.0 feet in gray calcareous shale and completed at 972.5 feet in gray sandy shale. This core shows a total of 12.2 feet of sandstone. For the most part, the pay is made up of dark brown fine grained micaceous slightly laminated shaly sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into two sections. The weighted average permeability of the upper and lower sections is 41.9 and 74.7 millidarcys respectively; the overall average being 58.2 (See Table III). By observing the data given on

the coregraph, it is noticeable that the sand has a comparatively uniform permeability profile. The permeability of the sand varies from 24 to a maximum of 96 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a very good weighted average percent oil saturation, namely, 58.3. The weighted average percent oil saturation of the upper and lower sections is 58.6 and 58.0 respectively. The weighted average percent water saturation of the upper and lower sections is 19.3 and 21.4 respectively; the overall average being 20.4 (See Table III). This gives an overall weighted average total fluid saturation of 78.7 percent. This fairly low total fluid saturation indicates some fluid was lost during coring which was probably oil.

The weighted average oil content of the upper and lower sections is 900 and 959 barrels per acre foot respectively; the overall average being 930. The total oil content, as shown by this core, is 10,686 barrels per acre. (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded fairly well to laboratory flooding tests, as a total recovery of 2507 barrels of oil per acre was obtained from 11.5 feet of sand. The weighted average percent oil saturation was reduced from 58.2 to 44.6, or represents an average recovery of 13.6 percent. The weighted average effective permeability of the samples is 2.26 millidarcys, while the average initial fluid production pressure is 25.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 12 samples tested, all produced water and oil. This indicates that all of the sand represented by these samples is floodable pay sand. The tests also show that the sand samples had a rather high oil saturation after flooding.

CONCLUSION

From a study of the above data, we estimate that approximately 3268 barrels of oil per acre, or an average of 284 barrels per acre-foot, can be recovered from the area represented by this core by efficient primary and water flooding methods. The following data and assumptions were used in calculating the above oil recovery values.

Present formation volume factor	1.06
Irreducible water saturation, percent	15.0
Primary recovery, percent	none
Present oil saturation, percent	80.2
Average porosity, percent	20.6
Oil saturation after flooding, percent	44.6
Performance factor	0.50
Net floodable pay sand, feet	11.5

This core shows a fairly clean sand section having a very good oil saturation, a low water saturation and a fairly good permeability.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Stubbs & Fleming Lease Fulhage Well No. 5

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.	Conn. Ft.		
1	955.4	16.6	58	17	75	747	50	1.1	1.1	822	55.00
2	958.3	20.5	58	16	74	922	67	0.7	1.8	645	46.90
3	959.3	21.1	62	21	83	1014	35	1.0	2.8	1014	35.00
4	960.3	21.1	56	21	77	917	24	1.0	3.8	917	24.00
5	961.3	18.3	61	23	84	866	31	1.0	4.8	866	31.00
6	962.3	22.0	56	18	74	956	51	1.0	5.8	956	51.00
7	963.3	21.9	59	16	75	1002	84	1.0	6.8	1002	84.00
8	964.3	20.9	59	18	77	957	58	1.0	7.8	957	58.00
9	965.3	21.4	59	19	78	980	96	1.0	8.8	980	96.00
10	966.3	20.1	57	26	83	888	87	1.0	9.8	888	87.00
11	967.3	23.9	53	25	78	983	54	1.0	10.8	983	54.00
12	968.3	19.5	62	26	88	938	67	0.7	11.5	656	46.90

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Stubbs & Fleming	Lease	Fulhage	Well No.	5
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.		
954.8 - 962.8	5.8	41.9	242.90		
962.8 - 968.5	5.7	74.7	425.90		
954.8 - 968.5	11.5	58.2	668.80		
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
954.8 - 962.8	5.8	19.8	58.6	19.3	5,220
962.8 - 968.5	5.7	21.4	58.0	21.4	5,466
954.8 - 968.5	11.5	20.6	58.3	20.4	10,686

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company			Stubbs & Fleming			Lease			Fulhage			Well No.		5	
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							
1	955.4	17.0	58	765	13	171	45	39	594	0.97	30				
2	958.3	20.7	58	932	15	241	43	54	691	0.97	30				
3	959.3	20.9	62	1006	23	373	39	57	633	2.33	30				
4	960.3	20.8	56	904	16	258	40	54	646	0.68	30				
5	961.3	18.8	61	890	10	146	51	47	744	1.12	30				
6	962.3	22.4	56	973	15	261	41	59	712	3.08	20				
7	963.3	21.6	59	981	18	302	41	55	679	4.42	20				
8	964.3	21.2	59	971	19	313	40	58	658	4.20	20				
9	965.3	21.0	59	962	13	212	46	52	750	1.12	30				
10	966.3	20.6	57	911	6	96	51	46	815	1.12	20				
11	967.3	23.5	53	966	5	91	48	50	875	5.17	20				
12	968.3	20.0	62	960	9	140	53	43	820	1.50	20				

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

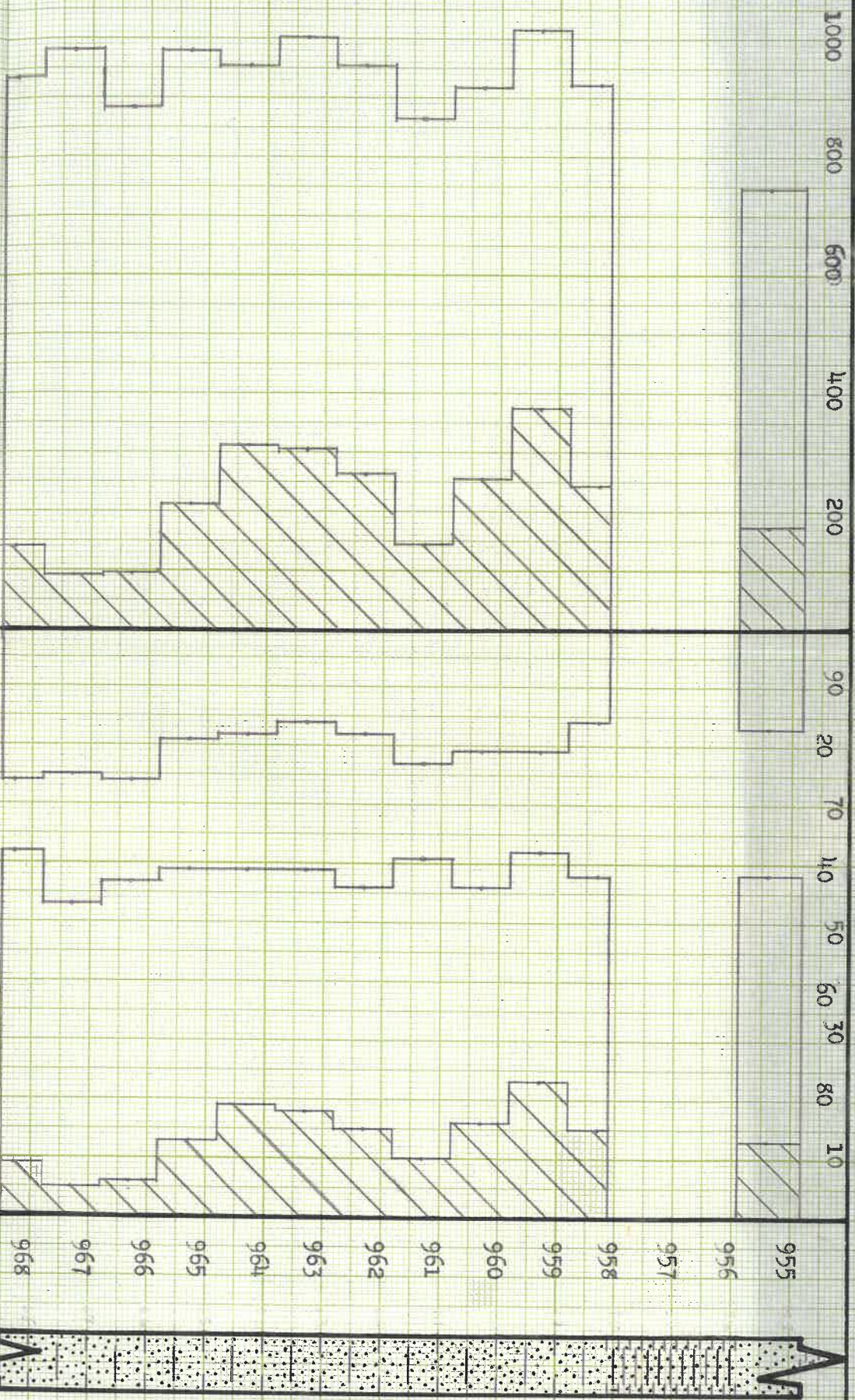
Company	Stubbs & Fleming	Lease	Fulhage	Well No.	5
Depth Interval, Feet	954.8 - 962.8	962.8	968.5	954.8	968.5
Feet of Core Analyzed	5.8	5.7	11.5		
Average Percent Porosity	20.0	21.4	20.7		
Average Percent Original Oil Saturation	58.5	58.0	58.2		
Average Percent Oil Recovery	15.3	11.8	13.6		
Average Percent Residual Oil Saturation	43.2	46.2	44.6		
Average Percent Residual Water Saturation	51.3	51.1	51.2		
Average Percent Total Residual Fluid Saturation	94.5	97.3	95.8		
Average Original Oil Content, Bbls./A. Ft.	909.	958.	934.		
Average Oil Recovery, Bbls./A. Ft.	241.	195.	218.		
Average Residual Oil Content, Bbls./A. Ft.	668.	763.	716.		
Total Original Oil Content, Bbls./Acre	5,268.	5,463.	10,731.		
Total Oil Recovery, Bbls./Acre	1,395.	1,112.	2,507.		
Total Residual Oil Content, Bbls./Acre	3,873.	4,351.	8,224.		
Average Effective Permeability, Millidarcys	1.54	3.00	2.26		
Average Initial Fluid Production Pressure, p.s.i.	28.2	21.8	25.0		

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

OIL CONTENT,
BBLS./A. FT.

WATER SAT.,
PERCENT

OIL SAT.,
PERCENT



FLOOD POT RECOVERY
SANDSTONE

SEALY SANDSTONE
CARBONACEOUS SEALY SANDSTONE

STUBBS

FULHAGE LEASE

WOODSON COUNT

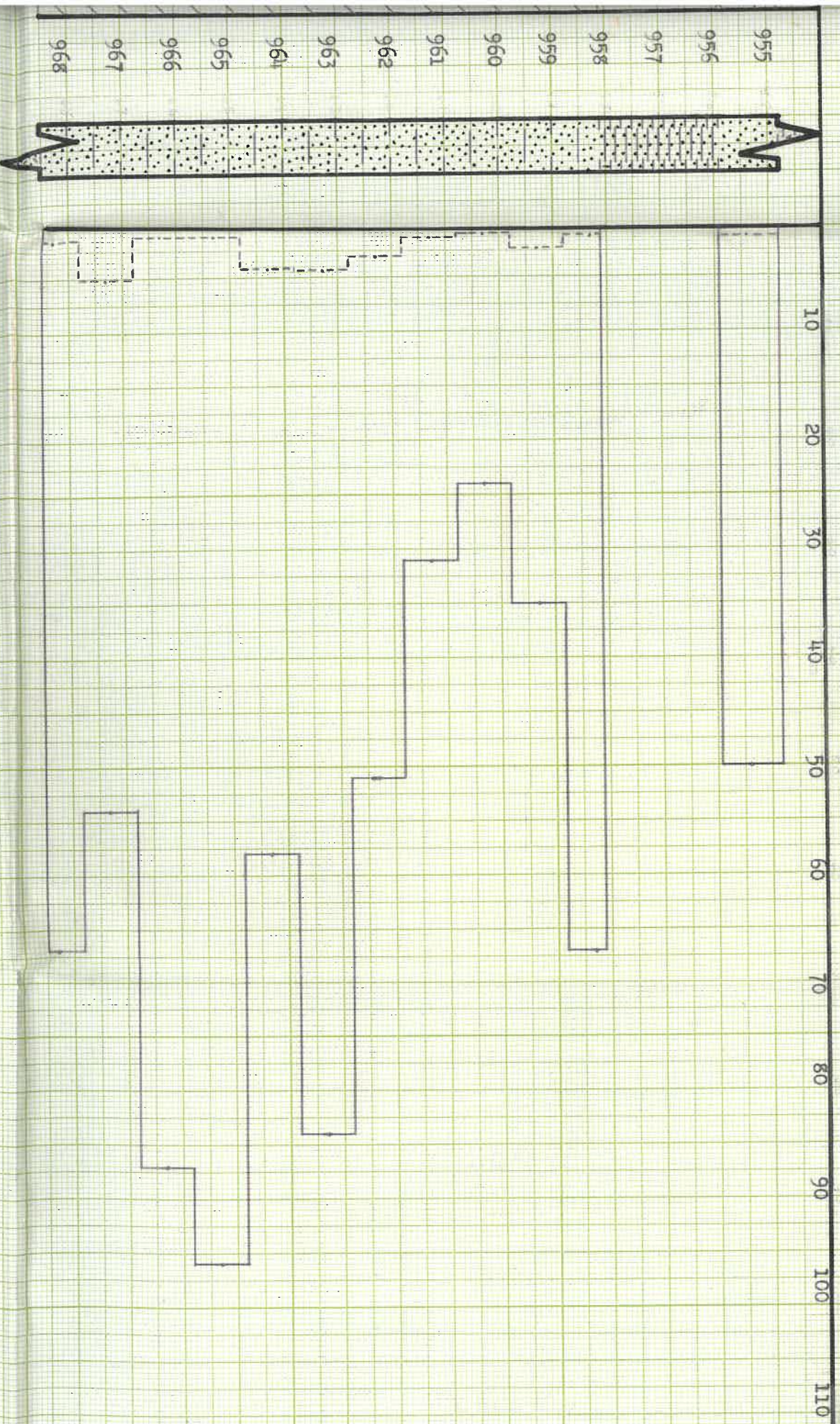
DEPTH INTERVAL,
FEET

FEET OF CORE
ANALYZED

AVERAGE
POROSITY
PERCENT

954.8 - 962.8	5.8	19.8
962.8 - 968.5	5.7	21.4
954.8 - 968.5	11.5	20.6

AIR PERMEABILITY, IN MILLIDARCS
 EFFECTIVE PERMEABILITY, IN MILLIDARCS



STONE

USSELY SANDSTONE

TUBBS & FLEMING

LEASE

WELL NO. 5

WOODSON COUNTY, KANSAS



CALCAREOUS SHALE

SANDY SHALE

T OF CORE ANALYZED	AVERAGE POROSITY PERCENT	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVG. OIL CONTENT BBLs./A. FT.	TOTAL OIL CONTENT BBLs./ACRE	AVG. AIR PERMEABILITY MILLIDARCS	CALCULATED OIL RECOVERY, BBLs./ACRE
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8	19.8	58.6	19.3	900	5,220	41.9	
7	21.4	58.0	21.4	959	5,466	74.7	
5	20.6	58.3	20.4	930	10,686	58.2	3,268 (PRIMARY AND SECONDARY)

OILFIELD RESEARCH LABORATORIES
 CHAUTAU, KANSAS
 AUGUST, 1968