

OILFIELD RESEARCH LABORATORIES

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

June 11, 1976

BMS Enterprises
8485 Kathy Lane
Lincoln, Nebraska 68526

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Remer Riverside Farms Lease, Well No. 1, Coffey County, Kansas, and submitted to our laboratory on June 7, 1976.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:bl
4 c to Lincoln, Nebraska
1 c to Topeka, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company BMS Enterprises Lease Remer Riverside Farms Well No. 1

Location 990' WEL & 330' SNL, SE $\frac{1}{4}$

Section 28 Twp. 22S Rge. 16E County Coffey State Kansas

Name of Sand - - - - - Squirrel

Top of Core - - - - - 998.0

Bottom of Core - - - - - 1019.0

Pay
Top of Sand - - - - - 1002.8

Pay
Bottom of Sand - - - - - 1009.4

Total Feet of Permeable Sand - - - - - 10.8

Total Feet of Floodable Sand - - - - - 6.6

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 10	3.6	3.6
10 - 100	3.6	7.2
100 & above	3.6	10.8

Average Permeability Millidarcys - - - - - 57.9

Average Percent Porosity - - - - - 19.3

Average Percent Oil Saturation - - - - - 49.5

Average Percent Water Saturation - - - - - 26.9

Average Oil Content, Bbls./A. Ft. - - - - - 714.

Total Oil Content, Bbls./Acre - - - - - 7,712.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 13.2

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 215.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 1,419.

Total Calculated Oil Recovery, Bbls./Acre (Primary & Waterflooding) 2,343.

Packer Setting, Feet - - - - -

Viscosity, Centipoises @ - - - - -

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

Elevation, Feet - - - - -

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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 by a representative of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
998.0 - 999.1	Gray sandy shale.
999.1 - 999.7	Brown shaly sandstone.
999.7 - 1002.8	Brown and gray broken sandstone and shale.
1002.8 - 1009.4	Dark brown slightly shaly sandstone.
1009.4 - 1013.0	Grayish dark brown very shaly sandstone.
1013.0 - 1019.0	Gray sandy shale.

Coring was started at a depth of 998.0 feet in gray sandy shale and completed at 1019.0 feet in the same type of material. This core shows a total of 10.8 feet of sandstone. For the most part, the pay is made up of dark brown slightly 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 82.3 and 9.1 millidarcys respectively; the overall average being 57.9 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a very irregular permeability profile. The permeability of the sand varies from 0.42 to a maximum of 125 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 49.5. The weighted average percent oil saturation of the upper and lower sections is 52.9 and 42.5 respectively. The weighted average percent water saturation of the upper and lower sections is 20.8 and 38.9 respectively; the overall average being 26.9 (See Table III). This gives an overall weighted average total fluid saturation of 76.4 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 779 and 583 barrels per acre foot respectively; the overall average being 714. The total oil content, as shown by this core, is 7,712 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

Part of the sand in this core responded rather well to laboratory flooding tests, as a total recovery of 1,419 barrels of oil per acre was obtained from 6.6 feet of sand. The weighted average percent oil saturation was reduced from 53.6 to 40.4, or represents an average recovery of 13.2 percent. The weighted average effective permeability of the samples is 2.64 millidarcys, while the average initial fluid production pressure is 27.1 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 11 samples tested, 8 produced water and 6 oil. This indicates that approximately 55 percent of the sand represented by these samples is

-4-

floodable pay sand. The tests also show that the sand samples, after flooding, had a rather high residual oil saturation.

CONCLUSION

On the basis of the above data, we estimate that approximately 2,343 barrels of oil per acre can be recovered from the sand reservoir, represented by this core, by efficient primary and waterflood operations. The following data and assumptions were used in calculating the above oil recovery value:

Present formation volume factor	1.06
Irreducible water saturation, percent	15.0
Primary recovery	None
Present oil saturation, percent	80.2
Average porosity, percent	20.9
Oil saturation after flooding, percent	40.4
Performance factor	0.55
Net floodable pay sand, feet	6.6

The core shows a rather thin pay sand section (1002.8 to 1009.4 feet) having a good oil saturation, a low water saturation and a good permeability and porosity.

The high residual oil saturation indicates the formation oil may have a rather high viscosity.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company BMS Enterprises Lease Remer Riverside Farms 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			Ft.	Cum. Ft.		
1	999.3	13.0	46	28	464	0.42	0.6	0.6	278	0.25
2	1003.5	21.0	52	16	847	101.	1.2	1.8	1,017	121.20
3	1004.5	21.3	55	18	909	125.	1.0	2.8	909	125.00
4	1005.5	18.6	46	23	663	70.	1.0	3.8	663	70.00
5	1006.5	21.1	54	17	884	74.	1.0	4.8	884	74.00
6	1007.5	20.8	55	28	887	58.	1.0	5.8	887	58.00
7	1008.5	20.9	58	20	896	103.	1.4	7.2	974	144.25
8	1009.5	18.7	30	40	435	24.	0.6	7.8	252	14.40
9	1010.5	16.1	44	46	550	7.2	1.0	8.8	550	7.20
10	1011.5	19.8	43	29	661	9.4	1.0	9.8	661	9.40
11	1012.5	17.1	48	41	637	1.7	1.0	10.8	637	1.70

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	BmS Enterprises		Lease		Remer Riverside Farms		Well No.	1
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.				
	999.1 - 1009.4	7.2	82.3	592.70				
	1009.4 - 1013.0	3.6	9.1	32.70				
	999.1 - 1013.0	10.8	57.9	625.40				
	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	
	999.1 - 1009.4	7.2	20.0	52.9	20.8	779	5,612	
	1009.4 - 1013.0	3.6	17.8	42.5	38.9	583	2,100	
	999.1 - 1013.0	10.8	19.3	49.5	26.9	712	7,712	

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company		BMS Enterprises		Lease		Remer Riverside Farms		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.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water			
1	999.3	13.7	42	446	0	0	42	35	0	Imp.	-
2	1003.5	21.9	52	884	16	272	36	63	150	5.00	20
3	1004.5	21.7	55	927	15	253	40	59	25	0.70	30
4	1005.5	20.0	46	714	14	217	32	68	70	2.30	25
5	1006.5	21.0	54	879	18	293	36	64	118	3.40	25
6	1007.5	20.3	55	866	7	110	48	52	12	0.40	40
7	1008.5	20.3	58	913	10	157	48	49	107	3.30	25
8	1009.5	17.6	33	451	0	0	33	40	0	Imp.	-
9	1010.5	16.4	42	535	0	0	42	53	5	0.30	45
10	1011.5	19.0	44	649	0	0	44	54	22	0.50	35
11	1012.5	16.4	45	573	0	0	45	47	0	Imp.	-

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	BMS Enterprises	Lease	Remer Riverside Farms	Well No.	1
Depth Interval, Feet	999.1 - 1013.0				
Feet of Core Analyzed	6.6				
Average Percent Porosity	20.9				
Average Percent Original Oil Saturation	53.6				
Average Percent Oil Recovery	13.2				
Average Percent Residual Oil Saturation	40.4				
Average Percent Residual Water Saturation	58.7				
Average Percent Total Residual Fluid Saturation	99.1				
Average Original Oil Content, Bbbls./A. Ft.	867.				
Average Oil Recovery, Bbbls./A. Ft.	215.				
Average Residual Oil Content, Bbbls./A. Ft.	652.				
Total Original Oil Content, Bbbls./Acre	5,725.				
Total Oil Recovery, Bbbls./Acre	1,419.				
Total Residual Oil Content, Bbbls./Acre	4,306.				
Average Effective Permeability, Millidarcys	2.64				
Average Initial Fluid Production Pressure, p.s.i.	27.1				

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

Core description
Lincoln 77 #1 Remar
NW NE SE ; 28-22S-16E
(Cherokee)

998 - 999	black fossiliferous shale
999 - 1001	sandstone w/ interbedded shaly ss
1001 - 1001.5	dk. grey shale - traces of plant fossils
1001.5 - 1002	shaly ss - traces of plant fossils
1002 - 1009	ss - heavy oil stain
1009 - 1012	silty ss - oil stain
1012 - 1014	shaly ss

500

550

600

Base KC

650

700

* THIS LOG IS FROM:

B&S OIL CO.

CROFTS 6

Coffey Co.

1100 FEL

1100 FAL NW 1/4

28 22S 16E

(LOW)

THIS LOG IS FROM:

Lincoln 9-7

Remer 2

NW NE SE 1/4

28 22S 16E

Coffey Co.

Sec. 1004

and Cherokee (994-1014')

Coffey Co.
1100 FEL
1100 FNL NW 1/4
28 22S 16E

(Lose) This log is near
Lincoln 9-7
Reno 2
NW NE SE 1/4
28 22S 16E
Coffey Co
elev. 1004'
and Cherokee (999 - 1014')

700

750

Top
Altamont

800

850

Pawnee
Top

900

850

Parmae
~~Top~~

900

950
Cherokee Top

1000

R.D. 1009.4'
T.D. 1018.4'

R.D. 1017.4'
T.D. 1018.4'

PERFORATIONS:
10 SHOTS - 993' to 1002'

WELLS LOG

- 77

VERSIDE NO. 1

STATE KANSAS

SE $\frac{1}{4}$ OTHER SERVICES

RGE 16E

ELEV 1 ABOVE PERM DATUM

ELEV X B
D1
G1 1605

6-15-76
1 NW
NEUTRON

6-15-76
1 NW
PERFORATE

1022.6'
1021.6'

101'
WTR.

WTR.

FULL

FULL

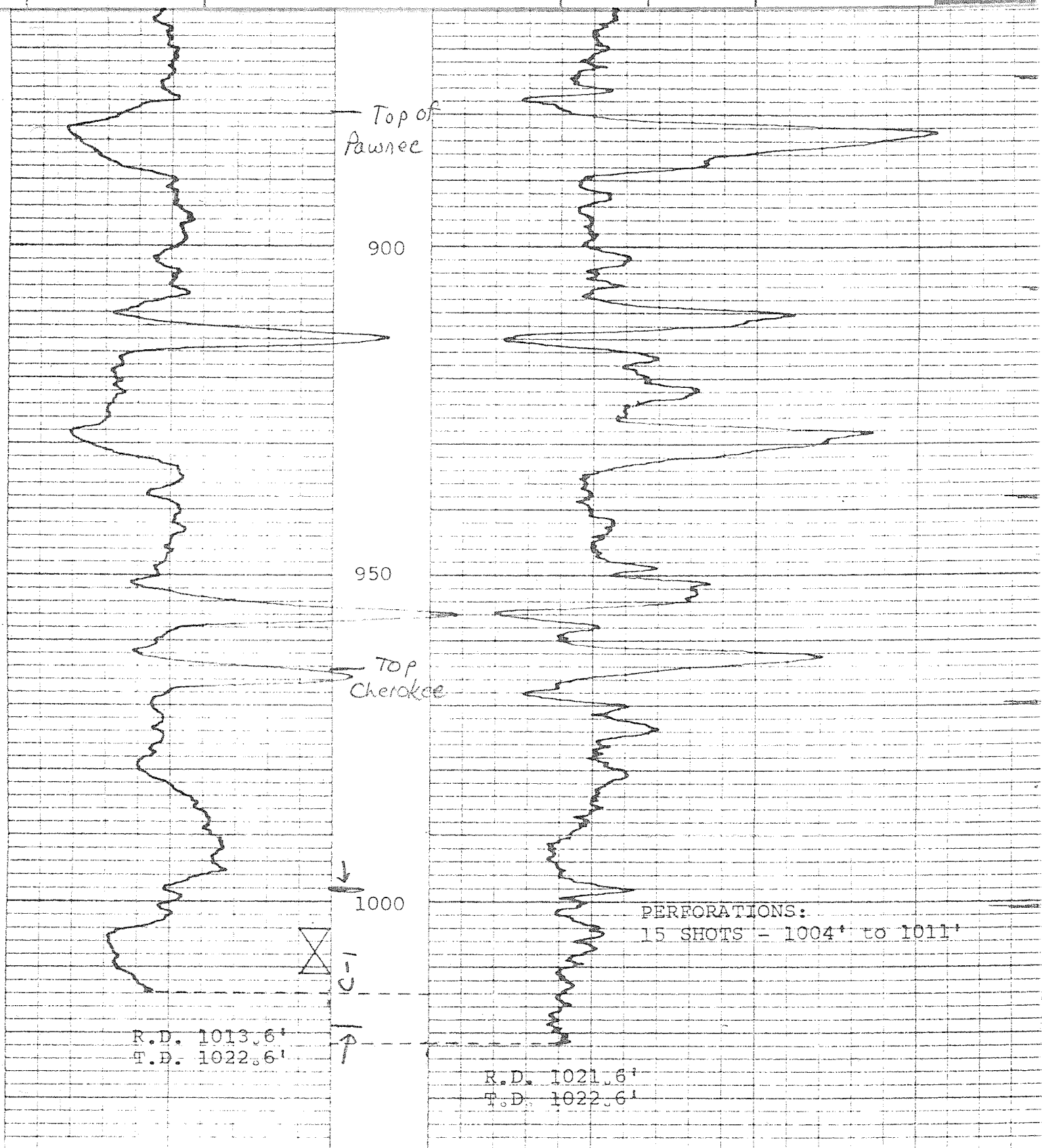
CORRISH
SCHMIDT

CORRISH
SCHMIDT

CASING RECORD

WGL FROM 0

T.D.



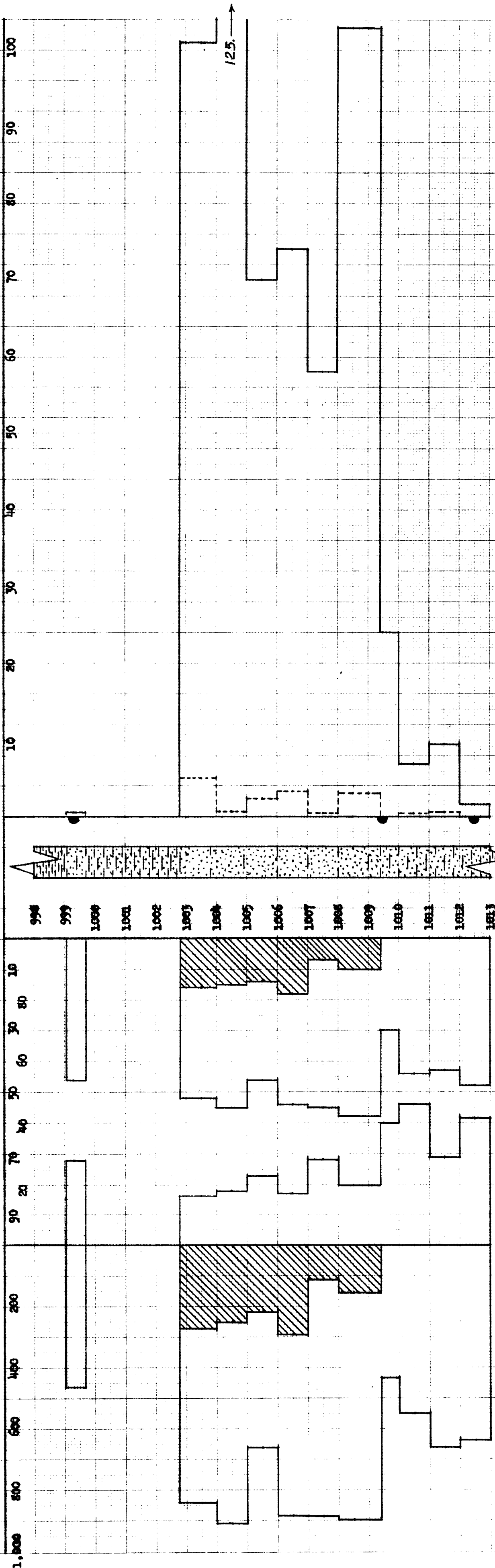
REMER RIVERSIDE NO. 1
LINCOLN - 77
COFFEY COUNTY, KANSAS
JUNE 15, 1976

INLS./A. IN.

PERCENT

PERCENT

EFFECTIVE PERMEABILITY, IN MILLIDARIES



KEY:
SANDY SANDSTONE

BROKEN SANDSTONE AND SHALE

SANDY SHALE

INCREASING TO WATER

BMS ENTERPRISES
RIVER RIVERSIDE FARM LEASE WELLS NO. 1
COTTEY COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVG. OIL CORRECTED INLS./A. FT.	TOTAL OIL CORRECTED INLS./A. FT.	AVG. AIR PERMEABILITY, MILLIDARIES	CALCULATED OIL RESERVE, INLS./A. FT.
999.1 - 1009.4	7.2	20.0	52.9	20.8	779	5,612	52.3	
1009.4 - 1013.0	3.6	17.6	42.5	34.9	583	2,100	9.1	
999.1 - 1013.0	10.8	19.3	49.5	26.9	714	7,712	57.9	2,343 (Primary & waterflooding)

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JUNE, 1976.