OILFIELD RESEARCH LABORATORIES
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July 8, 1977

Kansas Crude Company
820 Meadowbrook
Iola, Kansas 66749

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Cummings "B" Lease, Well No. 7, Woodson County, Kansas, and submitted to our laboratory on June 24, 1977.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

James E. Russell

James E. Russell

by Larry L. Brigham

Geologist

JER:ss
5 c to Iola, Kansas

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GENERAL INFORMATION & SUMMARY

Company Kansas Crude Company Lease Cummings "B" Well No. 7

Location NE¼

Section 18 Twp. 25S Rge. 16E County Woodson State Kansas

Name of Sand	Squirrel
Top of Core	973.0
Bottom of Core	988.5
Top of Sand (Good)	974.9
Bottom of Sand (Good)	985.8
Total Feet of Permeable Sand (Analyzed)	9.2
Total Feet of Floodable Sand	8.5

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 50	2.2	2.2
50 - 75	2.8	5.0
75 - 100	2.4	7.4
100 & above	1.8	9.2

Average Permeability Millidarcys	71.6
Average Percent Porosity	18.7
Average Percent Oil Saturation	48.9
Average Percent Water Saturation	25.9
Average Oil Content, Bbls./A. Ft.	755.
Total Oil Content, Bbls./Acre	7,470.
Average Percent Oil Recovery by Laboratory Flooding Tests	9.4
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	150.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,275.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Secondary)	2,032.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

A fresh water mud was used as a circulating fluid in the coring of the sand in this well. The well was drilled in a virgin area and 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
973.0 - 974.5	Dark gray sandy shale.
974.5 - 974.9	Brown shaly calcareous sandstone.
974.9 - 977.5	Dark brown slightly laminated shaly sandstone.
977.5 - 978.5	Gray and brown laminated very shaly sandstone.
978.5 - 979.3	Gray calcareous shaly sandstone.
979.3 - 981.2	Dark brown laminated shaly sandstone.
981.2 - 981.4	Gray calcareous sandstone.
981.4 - 985.8	Dark brown slightly laminated shaly sandstone.
985.8 - 988.0	Gray and dark brown carbonaceous very shaly sandstone.
988.0 - 988.5	Gray sandy shale.

Coring was started at a depth of 973.0 feet in dark gray sandy shale and completed at 988.5 feet in gray sandy shale. This core shows a total of 9.9 feet of sandstone analyzed. For the most part, the pay is made up of dark brown slightly laminated shaly sandstone.

PERMEABILITY

The weighted average permeability of the sand section is 71.6 millidarcys (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a somewhat irregular permeability profile. The permeability of the sand varies from 14 to a maximum of 119 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a very good weighted average percent oil saturation, namely, 48.9. The weighted average percent water saturation of the cored section is 25.9 respectively (See Table III). This gives an overall weighted average total fluid saturation of 74.8 percent. This low total fluid saturation indicates considerable fluid was lost during coring which was probably oil.

The weighted average oil content of the sand section is 755 barrels per acre foot. The total oil content, as shown by this core, is 7,470 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded fair to laboratory flooding tests, as a total recovery of 1,275 barrels of oil per acre was obtained from 8.5 feet of sand. The weighted average percent oil saturation was reduced from 55.9 to 46.5, or represents an average recovery of 9.4 percent. The weighted average effective permeability of the samples is 4.79 millidarcys, while the average initial fluid production pressure is 25.9 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 11 samples tested, 10 produced water and oil. This indicates that approximately 91 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a high residual oil saturation after laboratory flooding tests.

CONCLUSION

On the basis of the enclosed information, we estimate that approximately 2,032 barrels of oil per acre can be recovered from the sand reservoir, as 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	1.04
Irreducible water saturation, percent	22.8
Primary recovery, estimated, percent	None
Present oil saturation, percent	74.2
Average porosity, percent	20.2
Oil saturation after flooding, percent	46.5
Performance factor	0.55
Net floodable pay sand, feet	8.5

The core shows a shaly pay sand section (974.9 to 985.8 feet) with a very good oil saturation, low water saturation, and fairly good porosity and permeability.

Perry S. Brigham

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Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Kansas Crude Company Lease Cummings "B" Well No. 7

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	975.5	18.8	57	14	71	832	20.	1.1	1.1	915	22.00
2	976.5	18.6	52	22	74	751	86.	0.9	2.0	676	77.40
3	977.2	19.7	49	24	73	749	58.	0.6	2.6	449	34.80
F-4	978.1	19.5	40	–	–	605	–	0.7	3.3	424	–
4	978.3	14.4	23	63	86	257	14.	0.3	3.6	77	4.20
5	979.5	18.4	53	27	80	757	119.	0.8	4.4	605	95.20
6	980.7	16.8	33	41	74	430	64.	1.1	5.5	473	70.40
7	981.5	19.8	53	19	72	814	90.	0.6	6.1	488	54.00
8	982.6	19.0	57	40	97	840	62.	1.1	7.2	924	68.20
9	983.6	18.4	65	15	80	928	90.	0.9	8.1	835	81.00
10	984.5	19.6	61	16	77	928	115.	1.0	9.1	928	115.00
11	985.5	19.1	57	23	80	845	46.	0.8	9.9	676	36.80

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Kansas Crude Company Lease Cummings "B" Well No. 7

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
974.9 - 985.8	9.2	71.6	659.00

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
974.9 - 985.8	9.9	18.7	48.9	25.9	755	7,470

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Kansas Crude Company Lease Cummings "B" Well No. 7

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	975.5	19.4	57	858	13	196	44	52	662	247	8.40	20
2	976.5	20.7	57	916	18	290	39	55	626	231	8.43	20
3	977.2	20.0	52	807	9	140	43	53	667	101	3.17	20
4	978.2	19.5	40	605	2	30	38	47	575	5	0.33	45
5	979.5	17.7	53	728	4	55	49	49	673	7	0.25	40
6	980.7	16.8	33	430	0	0	33	41	430	0	Imp.	-
7	981.5	19.6	54	821	7	106	47	48	715	14	0.42	35
8	982.6	21.3	56	926	10	166	46	50	760	215	5.83	20
9	983.6	22.1	65	1115	16	275	49	48	840	317	11.11	20
10	984.5	21.0	61	994	8	130	53	43	864	119	3.92	20
11	985.5	19.3	57	854	2	30	55	39	824	43	1.25	30

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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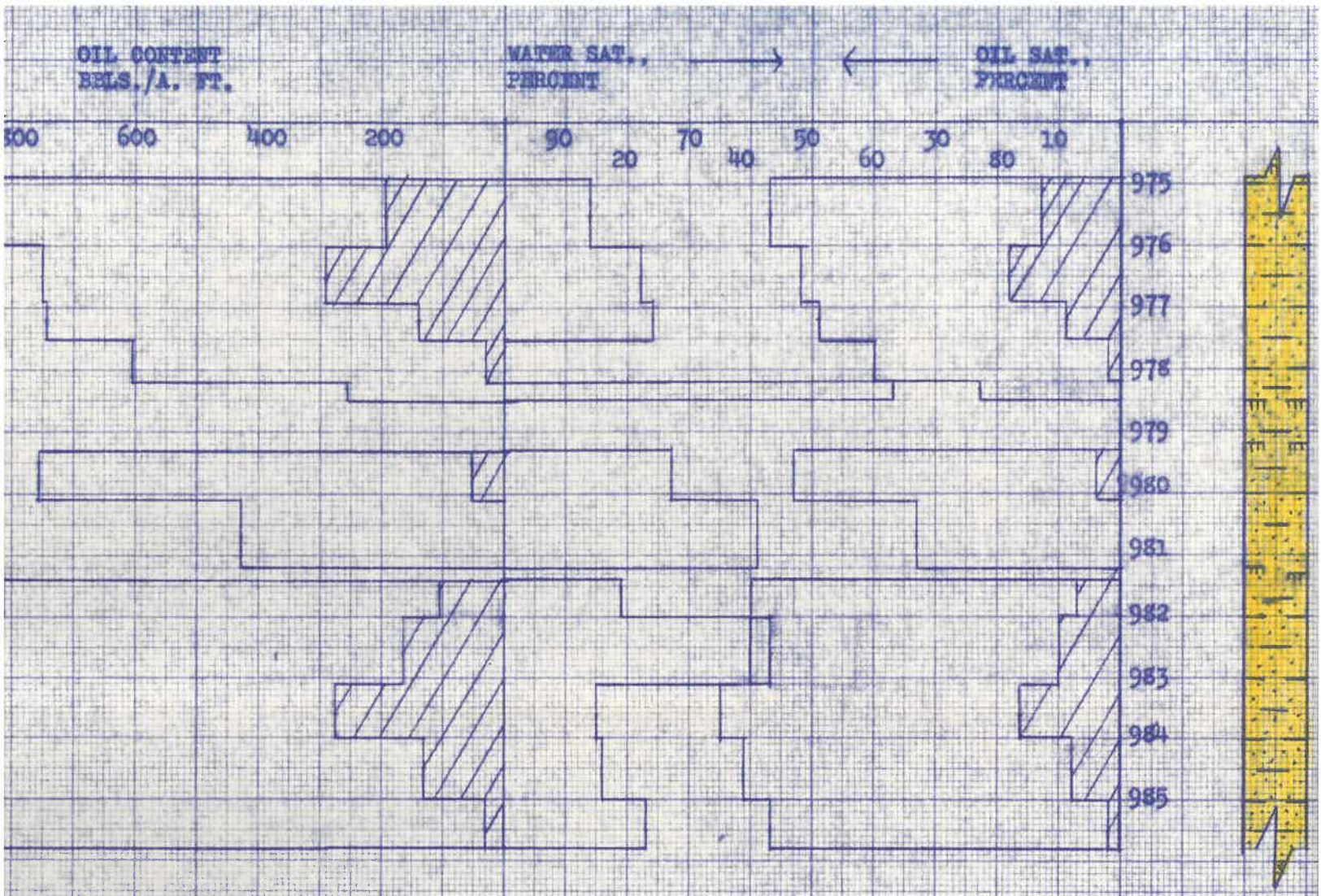
SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Kansas Crude Company Lease Cummings "B" Well No. 7

Depth Interval, Feet	974.9 - 985.8
Feet of Core Analyzed	8.5
Average Percent Porosity	20.2
Average Percent Original Oil Saturation	55.9
Average Percent Oil Recovery	9.4
Average Percent Residual Oil Saturation	46.5
Average Percent Residual Water Saturation	48.4
Average Percent Total Residual Fluid Saturation	94.9
Average Original Oil Content, Bbls./A. Ft.	876.
Average Oil Recovery, Bbls./A. Ft.	150.
Average Residual Oil Content, Bbls./A. Ft.	726.
Total Original Oil Content, Bbls./Acre	7,450.
Total Oil Recovery, Bbls./Acre	1,275.
Total Residual Oil Content, Bbls./Acre	6,175.
Average Effective Permeability, Millidarcys	4.79
Average Initial Fluid Production Pressure, p.s.i.	25.9

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



FLOOD PET RECOVERY

IMPERMEABLE TO WATER

CALCAREOUS SHALY SANDSTONE

SHALY SANDST

KANSAS

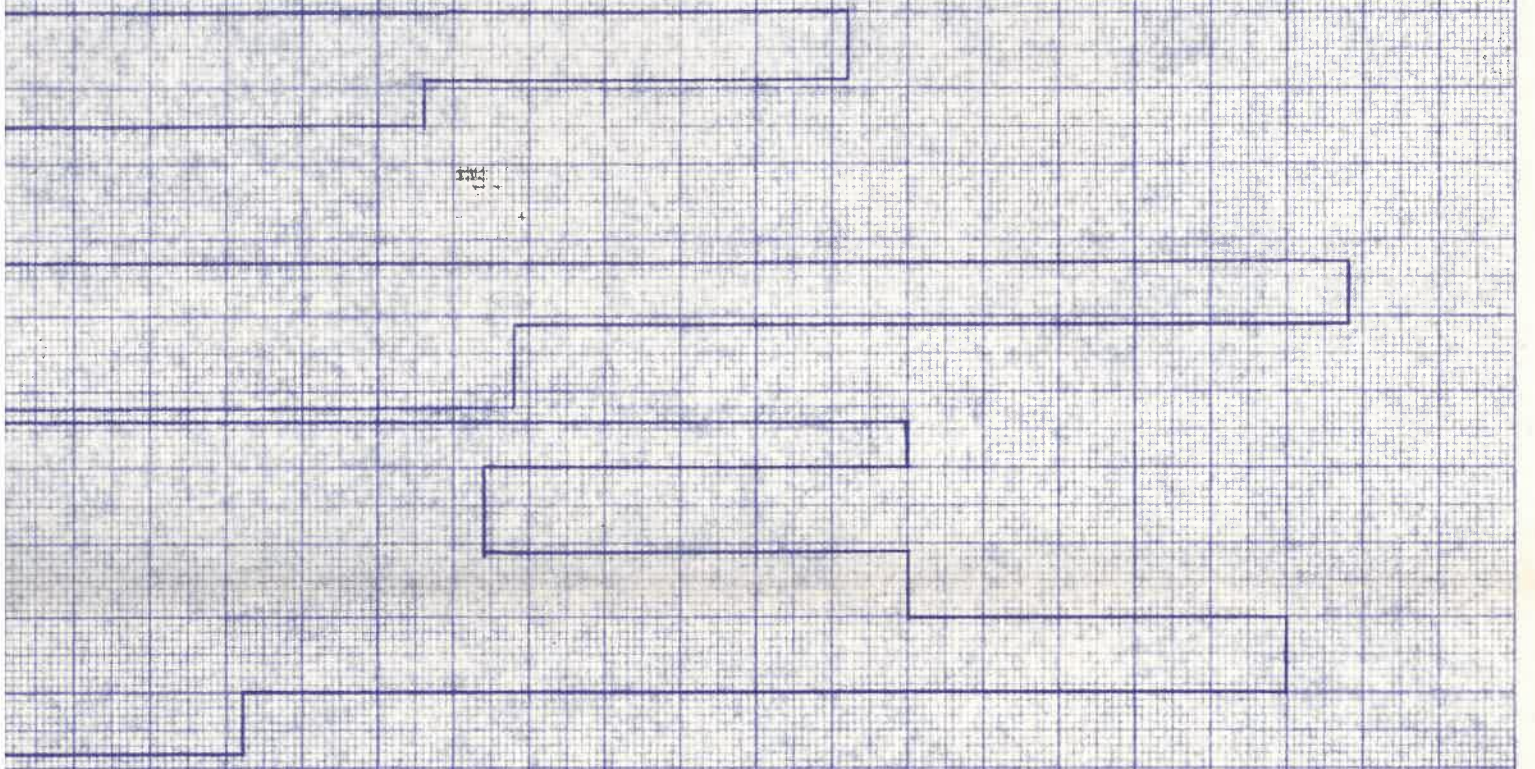
CUMMINGS "B" LEAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVE PER POR
974.9 - 985.8	9.9	1

AIR PERMEABILITY, IN MILLIDARCYS

EFFECTIVE PERMEABILITY, IN MILLIDARCYS

40 50 60 70 80 90 100 110 120 130



LCAREOUS SANDSTONE

CARBONACEOUS SHALY SANDSTONE

PANY

ELL NO. 7

AVG. OIL CONTENT BBLS./A.FT.	TOTAL OIL CONTENT BBLS./ACRE	AVG. AIR PERMEABILITY MILLIDARCYS	CALCULATED OIL RECOVERY BBLS./ACRE	
755	7,470	71.6	2,032	(PRIMARY & SECONDARY)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
JULY, 1977.