

OILFIELD RESEARCH LABORATORIES

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

September 11, 1981

Hearne Christopher
13130 Metcalf
Shawnee Mission, Kansas 66213

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Christopher Lease, Well No. 3, located in Johnson County, Kansas and submitted to our laboratory on September 3, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/mkf

5 c to Shawnee Mission, Ks.

Oilfield Research Laboratories
GENERAL INFORMATION & SUMMARY

Company Hearne Christopher Lease Christopher Well No. 3

Location _____

Section 30 Twp. 13S Rge. 25E County Johnson State Kansas

Elevation, Feet

Name of Sand.....

SQUIRREL

Top of Core

545.0

Bottom of Core

577.0

Top of Sand

545.0

Bottom of Sand (Tested)

574.4

Total Feet of Permeable Sand

25.4

Total Feet of Floodable Sand

9.4

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 15	7.8	7.8
15 - 30	4.8	12.6
30 - 45	3.4	16.0
45 - 60	3.3	19.3
60 - 100	4.5	23.8
110 - 130	1.6	25.4

Average Permeability Millidarcys

37.9

Average Percent Porosity

20.5

Average Percent Oil Saturation

38.3

Average Percent Water Saturation

44.9

Average Oil Content, Bbls./A. Ft.

629.

Total Oil Content, Bbls./Acre

15,976.

Average Percent Oil Recovery by Laboratory Flooding Tests

7.9

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

136.

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

1,282.

Total Calculated Oil Recovery, Bbls./Acre

See "Calculated Recovery"
Section

The core was sampled and the samples sealed in plastic bags by a representative of the client.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
545.0 - 546.3	Gray and brown laminated shale and sandstone.
546.3 - 546.7	Brown sandstone.
546.7 - 549.0	Gray and brown laminated shale and sandstone.
549.0 - 549.8	Brown sandstone.
549.8 - 551.7	Gray and light brown laminated shale and sandstone.
551.7 - 553.7	Grayish light brown shaly sandstone.
553.7 - 554.2	Gray and light brown laminated shale and sandstone.
554.2 - 554.5	Brown sandstone.
554.5 - 557.1	Gray and brown laminated shale and sandstone.
557.1 - 560.8	Brown sandstone.
560.8 - 562.5	Gray and brown laminated shale and sandstone.
565.0 - 569.7	Dark brown sandstone.
569.7 - 570.7	Gray shale.
570.7 - 577.0	Brown sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1282 barrels of oil per acre was obtained from 9.4 feet of sand. The weighted average percent oil saturation was reduced from 49.3 to 41.4, or represents an average recovery of 7.9 percent. The weighted average effective permeability of the samples is 2.33 millidarcys, while the average initial fluid

production pressure is 34.4 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 26 samples tested, 9 produced water and oil, and 5 samples produced water only. This indicates that approximately 35 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 2780 barrels of oil per acre. This is an average recovery of 296 barrels per acre foot from 9.4 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	25.0
Average porosity, percent	22.6
Oil saturation after flooding, percent	41.4
Performance factor, percent, estimated	55.0
Net floodable sand, feet	9.4

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE I-B

Company Hearne ChristopherLease

Christopher

Well No. 3

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	545.4	17.0	28	60	88	369	6.1	1.3	1.3	480	7.93
2	546.4	20.2	24	49	73	376	27.	0.4	1.7	150	10.80
3	547.6	18.3	30	52	82	426	3.4	1.3	3.0	554	4.42
4	548.4	20.4	23	48	71	364	19.	1.0	4.0	364	19.00
5	549.5	22.4	41	35	76	713	27.	0.8	4.8	570	21.60
6	550.5	19.3	34	44	78	509	13.	0.9	5.7	458	11.70
7	551.6	18.4	25	58	83	357	8.4	1.0	6.7	357	8.40
8	552.5	15.4	17	80	97	203	1.5	1.0	7.7	203	1.50
9	553.5	15.0	21	75	96	244	0.75	1.0	8.7	244	0.75
10	554.4	22.6	43	37	80	754	51.	0.3	9.0	226	15.30
11	555.4	16.0	16	72	88	199	2.5	1.3	10.3	259	3.25
12	556.5	18.2	36	54	90	508	16.	1.3	11.6	660	20.80
13	557.4	22.5	42	32	74	733	47.	1.0	12.6	733	47.00
14	558.4	21.1	50	32	82	819	34.	1.4	14.0	1147	47.60
15	559.6	21.1	53	35	88	868	27.	1.3	15.3	1128	35.10
16	561.4	18.9	64	32	96	938	89.	0.7	16.0	657	62.30
17	562.4	20.6	56	41	97	895	31.	1.0	17.0	895	31.00
18	565.4	22.7	41	36	77	722	44.	1.0	18.0	722	44.00
19	566.4	23.4	44	35	79	799	71.	1.0	19.0	799	71.00
20	567.5	23.3	54	28	82	976	55.	1.0	20.0	976	55.00
21	568.5	23.1	44	36	80	789	63.	1.0	21.0	789	63.00
22	569.4	24.9	27	51	78	522	127.	0.7	21.7	365	88.90
23	570.8	25.5	47	29	76	930	113.	0.9	22.6	837	101.70
24	571.7	24.0	53	32	85	987	96.	0.8	23.4	790	76.80
25	572.5	23.3	47	32	79	850	66.	1.0	24.4	850	66.00
26	573.5	23.4	42	32	74	763	48.	1.0	25.4	763	48.00

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company		Hearne Christopher		Lease		Christopher		Well No.	
								3	
Depth Interval, Feet		Feet of Core Analyzed		Average Permeability, Millidarcys		Permeability Capacity Ft. x Md.			
545.0 - 557.1		11.6		10.8		125.45			
557.1 - 574.4		13.8		60.7		837.40			
545.0 - 574.4		25.4		37.9		962.85			
Depth Interval, Feet		Feet of Core Analyzed		Average Percent Porosity		Average Percent Oil Saturation		Average Percent Water Saturation	
545.0 - 557.1		11.6		18.1		27.1		57.6	
557.1 - 574.4		13.8		22.6		47.6		34.2	
545.0 - 574.4		25.4		20.5		38.3		44.9	
								Average Oil Content Bbl./A. Ft.	
545.0 - 557.1								390	
557.1 - 574.4								830	
545.0 - 574.4								629	
								Total Oil Content Bbls./Acre	
545.0 - 557.1								4,525	
557.1 - 574.4								11,451	
545.0 - 574.4								15,976	

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company			Hearne Christopher			Lease			Christopher			Well No.		3	
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	545.4	17.5	27	357	0	0	27	62	0	Imp.	-				
2	546.4	20.1	24	374	0	0	24	50	0	Imp.	-				
3	547.6	17.9	31	430	0	0	31	52	0	Imp.	-				
4	548.4	20.5	23	366	0	0	23	50	0	Imp.	-				
5	549.5	22.4	41	712	0	0	41	37	0	Imp.	-				
6	550.5	19.8	33	507	0	0	33	48	0	Imp.	-				
7	551.6	18.0	26	363	0	0	26	58	0	Imp.	-				
8	552.5	15.3	17	202	0	0	17	80	0	Imp.	-				
9	553.5	15.3	20	237	0	0	20	76	0	Imp.	-				
10	554.4	22.7	43	757	0	0	43	40	5	0.30	50				
11	555.4	16.5	15	192	0	0	15	73	0	Imp.	-				
12	556.5	17.8	37	511	0	0	37	55	0	Imp.	-				
13	557.4	22.5	42	733	0	0	42	34	0	Imp.	-				
14	558.4	21.2	50	822	7	115	43	43	12	0.30	50				
15	559.6	21.3	53	876	8	132	45	46	30	0.60	40				
16	561.4	19.0	64	943	0	0	64	33	14	0.30	40				
17	562.4	20.5	56	891	16	254	40	57	8	0.30	50				
18	565.4	22.7	41	722	2	35	39	46	20	0.30	40				
19	566.4	23.3	44	795	4	72	40	42	32	0.60	25				
20	567.5	23.5	54	984	9	164	45	40	124	3.30	25				
21	568.5	23.0	44	785	5	89	39	43	182	5.55	25				
22	569.4	25.1	27	526	0	0	27	61	310	13.19	25				
23	570.8	25.4	47	926	8	158	39	45	288	10.20	25				
24	571.7	23.9	53	983	13	241	40	47	70	1.80	30				
25	572.5	25.8	37	741	0	0	37	42	244	5.70	25				
26	573.5	24.8	33	635	0	0	33	41	44	0.75	35				

Hearne Christopher

Lease

Christopher

Well No.

3

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	Hearne Christopher	Lease	Christopher	Well No.	3
Depth Interval, Feet	557.1 - 574.4				
Feet of Core Analyzed	9.4				
Average Percent Porosity	22.6				
Average Percent Original Oil Saturation	49.3				
Average Percent Oil Recovery	7.9				
Average Percent Residual Oil Saturation	41.4				
Average Percent Residual Water Saturation	45.3				
Average Percent Total Residual Fluid Saturation	86.7				
Average Original Oil Content, Bbls./A. Ft.	860.				
Average Oil Recovery, Bbls./A. Ft.	136.				
Average Residual Oil Content, Bbls./A. Ft.	724.				
Total Original Oil Content, Bbls./Acre	8,087.				
Total Oil Recovery, Bbls./Acre	1,282.				
Total Residual Oil Content, Bbls./Acre	6,805.				
Average Effective Permeability, Millidarcys	2.33				
Average Initial Fluid Production Pressure, p.s.i.	34.4				

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

NO CORE

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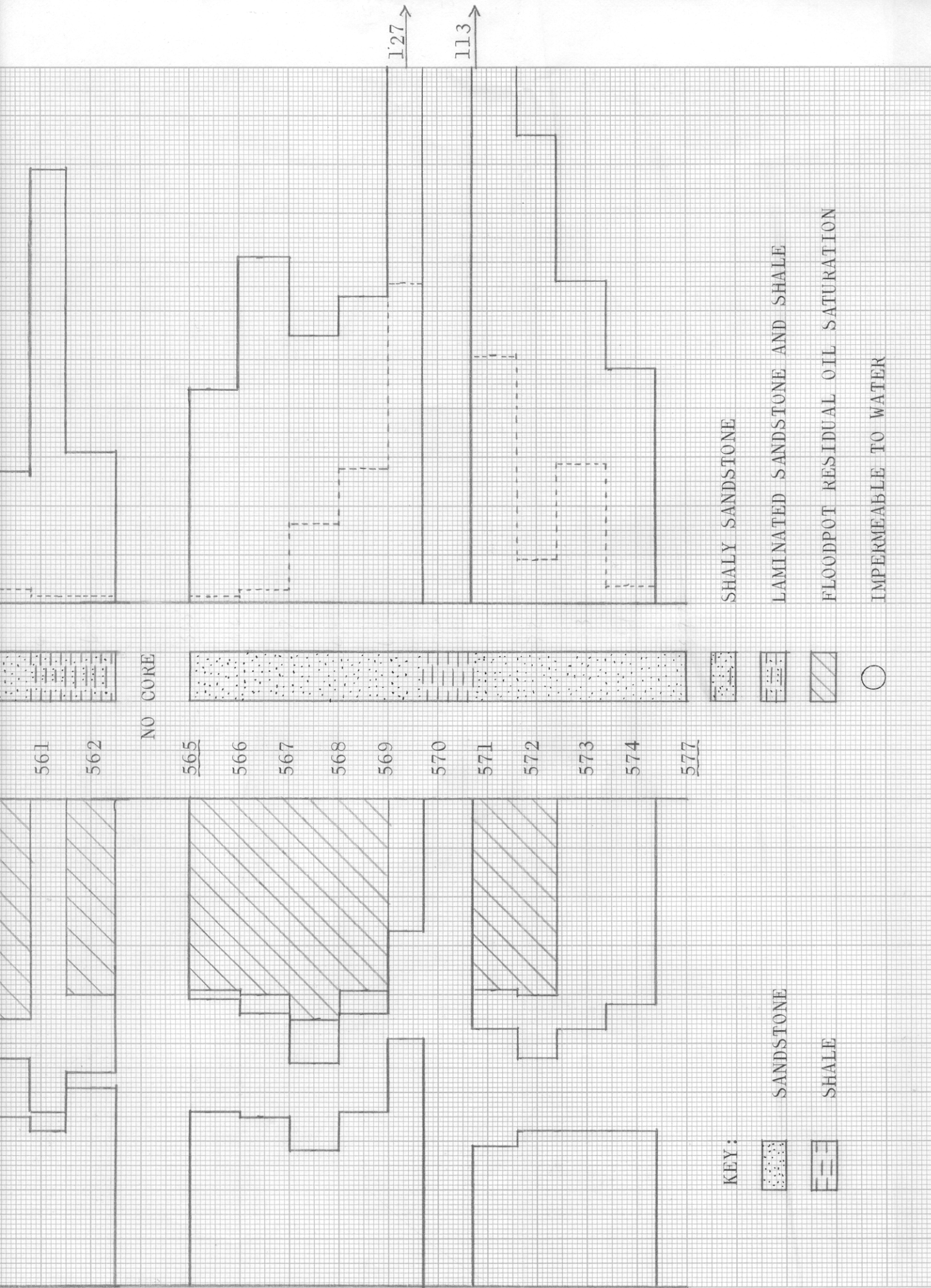
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HEARNE CHRISTOPHER

CHRISTOPHER LEASE
JOHNSON COUNTY, KANSAS
WELL NO. 3



SHALE



FLOODPOT RESIDUAL OIL SATURATION



IMPERMEABLE TO WATER

HEARNE CHRISTOPHER

CHRISTOPHER LEASE

WELL NO. 3

JOHNSON COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY BBLs. / ACRE
545.0 - 557.1	11.6	18.1	27.1	57.6	10.8	
557.1 - 574.4	13.8	22.6	47.6	34.2	60.7	
545.0 - 574.4	25.4	20.5	38.3	44.9	37.9	2780 (PRIMARY AND WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
SEPTEMBER, 1981

PDC