OILFIELD RESEARCH LABORATORIES

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

March 13, 1980

TAK Oil Company
902 Main Street
Neodesha, Kansas 66757

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the M. Frankenberry Lease, Well No. 4, Wilson County, Kansas, and submitted to our laboratory on February 22, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/tem
5 c to Neodesha, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company TAK Oil Company Lease M. Frankenberry Well No. 4

Location –

Section 30 Twp. 29S Rge. 16E County Wilson State Kansas

Elevation, Feet	
Name of Sand	Lower Bartlesville
Top of Core	945.0
Bottom of Core	955.0
Top of Sand	945.0
Bottom of Sand	955.0
Total Feet of Permeable Sand	10.0
Total Feet of Floodable Sand	3.0

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 – 100	3.2	3.2
100 – 200	3.0	6.2
200 – 300	1.0	7.2
400 – 600	2.8	10.0

Average Permeability Millidarcys	212.1
Average Percent Porosity	22.8
Average Percent Oil Saturation	31.4
Average Percent Water Saturation	41.6
Average Oil Content, Bbls./A. Ft.	566.
Total Oil Content, Bbls./Acre	5,660.
Average Percent Oil Recovery by Laboratory Flooding Tests	3.3
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	66.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	198.
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. Fresh water mud was used as a drilling fluid. The core was reported to be from a virgin area.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
945.0 - 950.8	Brown sandstone.
950.8 - 955.0	Brown slightly carbonaceous sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests as a total recovery of 198 barrels of oil per acre was obtained from 3.0 feet of sand. The weighted average percent oil saturation was reduced from 40.0 to 36.7, or represents an average recovery of 3.3 percent. The weighted average effective permeability of the samples is 8.33 millidarcys, while the average initial fluid production pressure is 28.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 10 samples tested, 3 produced water and oil, and 7 samples produced water only. This indicates that approximately 30 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 990 barrels of oil per acre. This is an average recovery of 329 barrels per acre foot from 3.0 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.07
Reservoir water saturation, percent, estimated	25.0
Average porosity, percent	25.4
Oil saturation after flooding, percent	36.7
Performance factor, percent, estimated	50.0
Net floodable sand, feet	3.0

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company TAK Oil Company **Lease** M. Frankenberry **Well No.** 4

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	945.5	18.6	25	41	66	361	52.	1.0	1.0	361	52.00
2	946.5	18.6	30	31	61	433	137.	1.0	2.0	433	137.00
3	947.5	17.9	21	49	70	292	113.	1.0	3.0	292	113.00
4	948.5	24.4	40	39	79	757	118.	1.0	4.0	757	118.00
5	949.5	22.1	32	29	61	549	28.	1.0	5.0	549	28.00
6	950.5	21.6	28	45	73	469	556.	0.8	5.8	375	444.80
7	951.5	26.0	29	46	75	585	84.	1.2	7.0	702	100.80
8	952.5	27.2	39	39	78	823	415.	1.0	8.0	823	415.00
9	953.5	26.0	29	48	77	585	203.	1.0	9.0	585	203.00
10	954.5	24.6	41	49	90	783	509.	1.0	10.0	783	509.00

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company TAK Oil Company Lease M. Frankenberry Well No. 4

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
945.0 - 955.0	10.0	212.1	2120.60

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
945.0 - 955.0	10.0	22.8	31.4	41.6	566	5,660

Oilfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company TAK Oil Company Lease M. Frankenberry Well No. 4

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	945.5	18.6	25	361	0	0	25	66	361	66	1.27	35
2	946.5	19.0	30	442	0	0	30	53	442	39	0.60	35
3	947.5	18.4	21	300	0	0	21	75	300	340	8.25	30
4	948.5	24.2	40	751	2	38	38	49	713	191	13.28	20
5	949.5	22.0	31	529	0	0	31	48	529	302	4.12	20
6	950.5	22.0	28	478	0	0	28	67	478	157	2.55	25
7	951.5	25.7	30	598	0	0	30	67	598	232	14.99	10
8	952.5	27.0	39	817	3	63	36	54	754	130	1.50	35
9	953.5	25.7	29	578	0	0	29	67	578	45	0.75	35
10	954.5	25.0	41	795	5	97	36	57	698	257	10.20	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.

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company TAK Oil Company Lease M. Frankenberry Well No. 4

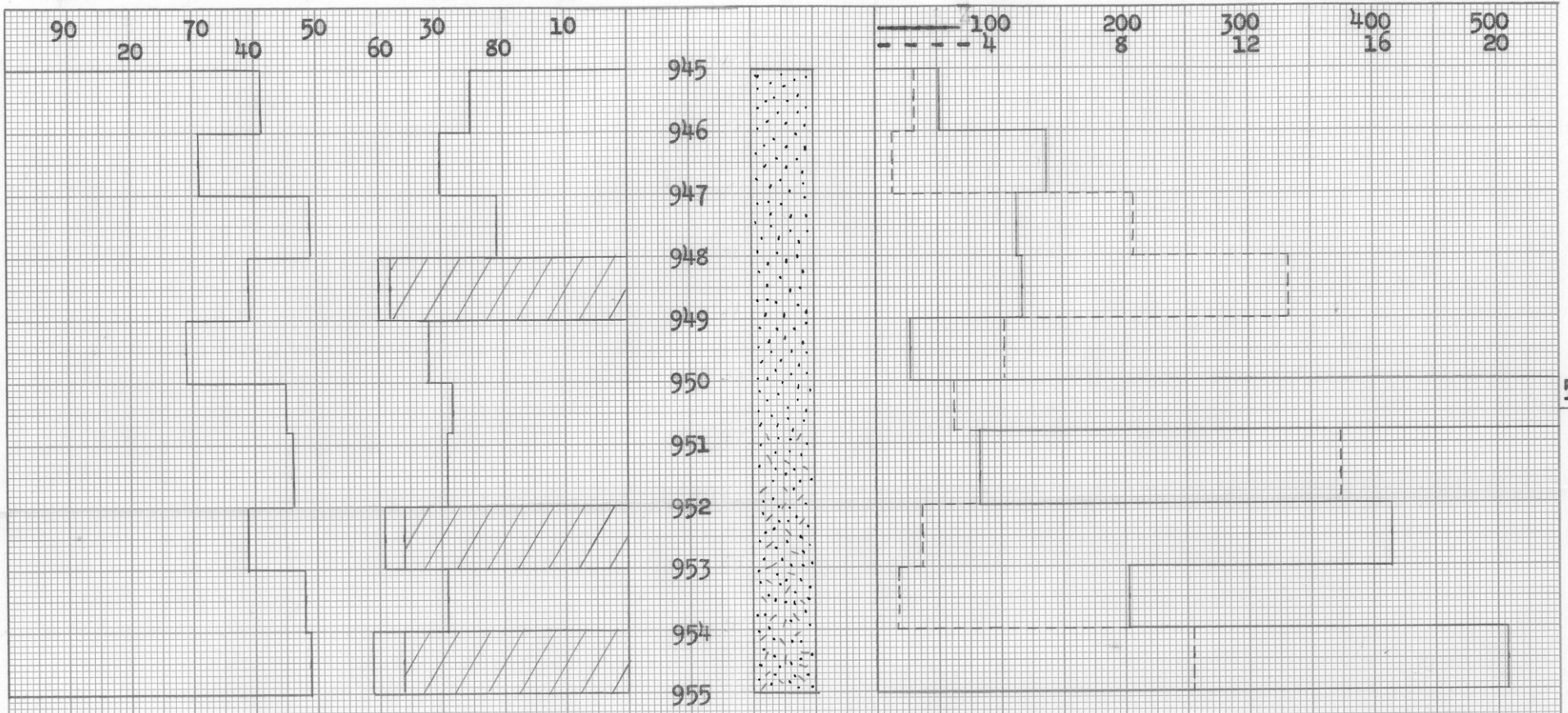
Depth Interval, Feet	945.0 - 955.0
Feet of Core Analyzed	3.0
Average Percent Porosity	25.4
Average Percent Original Oil Saturation	40.0
Average Percent Oil Recovery	3.3
Average Percent Residual Oil Saturation	36.7
Average Percent Residual Water Saturation	53.3
Average Percent Total Residual Fluid Saturation	90.0
Average Original Oil Content, Bbls./A. Ft.	788.
Average Oil Recovery, Bbls./A. Ft.	66.
Average Residual Oil Content, Bbls./A. Ft.	722.
Total Original Oil Content, Bbls./Acre	2,363.
Total Oil Recovery, Bbls./Acre	198.
Total Residual Oil Content, Bbls./Acre	2,165.
Average Effective Permeability, Millidarcys	8.33
Average Initial Fluid Production Pressure, p.s.i.	28.3

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



KEY:

SANDSTONE

FLOODPOT RESIDUAL OIL SATURATION

CARBONACEOUS SANDSTONE

TAK OIL COMPANY

M. FRANKENBERRY LEASE WELL NO. 4

WILSON 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
945.0 - 955.0	10.0	22.8	31.4	41.6	212.1	990 (PRIMARY AND WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
MARCH, 1980. HR