

# OILFIELD RESEARCH LABORATORIES

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

October 15, 1981

M. T. Kilby  
401 West Park  
Yates Center, Kansas 66783

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary cores taken from the Blake Lease, Well No. 13, located in Woodson County, Kansas and submitted to our laboratory on September 26, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/kas

5 c to Yates Center, Kansas

- REGISTERED ENGINEERS -

CORE ANALYSIS - WATER ANALYSIS - REPRESSURING ENGINEERING - SURVEYING & MAPPING - PROPERTY EVALUATION & OPERATION

**Gifford Research Laboratories**  
**GENERAL INFORMATION & SUMMARY**

Company M. T. Kilby Lease Blake Well No. 13  
 Location C SW $\frac{1}{4}$   
 Section 28 Twp. 23S Rge. 16E County Woodson State Kansas

Elevation, Feet .....		
Name of Sand .....	Upper Squirrel	Lower Squirrel
Top of Core .....	1076.0	1120.0
Bottom of Core .....	1085.0	1130.0
Top of Sand .....	1076.0	1120.0
Bottom of Sand .....	1084.7	1128.0
Total Feet of Permeable Sand .....	8.7	3.6
Total Feet of Floodable Sand .....	6.7	0.0

Distribution of Permeable Sands: Permeability Range Millidarcys	Feet	Cum. Ft.
	<u>UPPER SQUIRREL SAND</u>	
0 - 13	3.7	3.7
30 - 70	5.0	8.7
	<u>LOWER SQUIRREL SAND</u>	
0 - 52	1.5	1.5
82 - 111	2.1	3.6

Average Permeability Millidarcys .....	36.5	77.4
Average Percent Porosity .....	18.2	18.8
Average Percent Oil Saturation .....	41.1	42.7
Average Percent Water Saturation .....	36.0	14.3
Average Oil Content, Bbls./A. Ft. ....	583.	624.
Total Oil Content, Bbls./Acre .....	5,070.	2,246.
Average Percent Oil Recovery by Laboratory Flooding Tests .....	4.5	0.
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. ....	65.	0.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre .....	436.	0.
Total Calculated Oil Recovery, Bbls./Acre .....	See "Cal. Rec." Section	0.

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 non-virgin area.

#### FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
<u>UPPER SQUIRREL SAND</u>	
1076.0 - 1078.1	Brown sandstone with fine shale and micaceous partings.
1078.1 - 1078.9	Grayish brown shaly sandstone.
1078.9 - 1084.7	Brown sandstone with shale partings.
1084.7 - 1085.0	Gray shale.

#### LOWER SQUIRREL SAND

1120.0 - 1123.1	Grayish brown sandstone with some micaceous and shale partings.
1123.1 - 1127.5	Grayish brown slightly sandy shale with some brown sand partings.
1127.5 - 1128.0	Brown sandstone with shale partings.
1128.0 - 1130.0	Gray slightly sandy shale.

#### LABORATORY FLOODING TESTS

At the request of the client, only the Upper Squirrel sand was subjected to flooding tests. The Upper Squirrel sand in this core responded to laboratory flooding tests, as a total recovery of 436 barrels of oil per acre was obtained from 6.7 feet of sand. The weighted average percent oil saturation was reduced from 46.9 to 42.4,

or represents an average recovery of 4.5 percent. The weighted average effective permeability of the samples is 3.98 millidarcys, while the average initial fluid production pressure is 24.3 pounds per square inch (See Table V).

CALCULATED RECOVERY

UPPER SQUIRREL SAND

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 1,560 barrels of oil per acre. This is an average recovery of 237 barrels per acre foot from 6.7 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.06
Reservoir water saturation, percent, estimated	20.0
Average porosity, percent	18.5
Oil saturation after flooding, percent	42.4
Performance factor, percent, estimated	50.0
Net floodable sand, feet	6.7

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company M. T. Kilby Lease Blake Well No. 13

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbbs. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
						<u>UPPER SQUIRREL SAND</u>					
1	1076.4	18.0	43	38	81	601	10.	1.0		601	10.00
2	1077.7	17.4	44	39	83	594	11.	1.1		653	12.10
3	1078.3	16.6	52	26	78	670	6.9	0.8		536	5.52
4	1079.4	15.6	43	38	81	520	12.	0.8		416	9.60
5	1080.4	19.4	53	42	95	798	52.	1.0		798	52.00
6	1081.5	19.5	51	25	76	772	60.	1.0		772	60.00
7	1082.6	16.3	21	48	69	266	32.	1.0		266	32.00
8	1083.5	20.8	47	21	68	758	68.	1.0		758	68.00
9	1084.4	19.3	18	45	63	270	68.	1.0		270	68.00
						<u>LOWER SQUIRREL SAND</u>					
10	1120.4	19.0	44	16	60	649	82.	1.0		649	82.00
11	1121.4	18.6	40	14	54	577	50.	1.0		577	50.00
12	1122.4	18.5	41	14	55	588	110.	1.1		647	121.00
13	1127.6	19.6	49	12	61	745	51.	0.5		373	25.50

NOTE: \* SAMPLES WERE UNBAGGED.

\* \* \* \*

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## SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company M. T. Kilby Lease Blake Well No. 13

Depth Interval, Feet	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	Average Percent Oil Saturation	Average Percent Water Saturation	Total Oil Content Bbls./Acre
			<u>UPPER SQUIRREL SAND</u>				
	1076.0 - 1084.7	8.7	36.5	317.22			
			<u>LOWER SQUIRREL SAND</u>				
	1120.0 - 1128.0	3.6	77.4	278.50			
			<u>UPPER SQUIRREL SAND</u>				
	1076.0 - 1084.7	8.7	41.1	583	36.0		5,070
			<u>LOWER SQUIRREL SAND</u>				
	1120.0 - 1128.0	3.6	42.7	624	14.3		2,246

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## RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company M. T. Kilby Lease Blake Well No. 13

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	1076.4	18.5	42	603	3	43	39	44	178	3.30	20
2	1077.7	17.9	43	597	3	42	40	45	192	4.05	20
3	1078.3	17.0	51	673	5	66	46	35	141	2.85	25
4	1079.4	15.7	43	524	5	61	38	44	23	0.22	35
5	1080.4	19.5	53	802	8	121	45	51	152	7.50	20
6	1081.5	19.6	51	775	5	76	46	36	74	1.50	30
7	1082.6	16.4	21	267	0	0	21	58	80	1.35	25
8	1083.5	20.7	47	755	3	48	43	43	444	7.42	20
9	1084.4	19.2	18	268	0	0	18	46	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

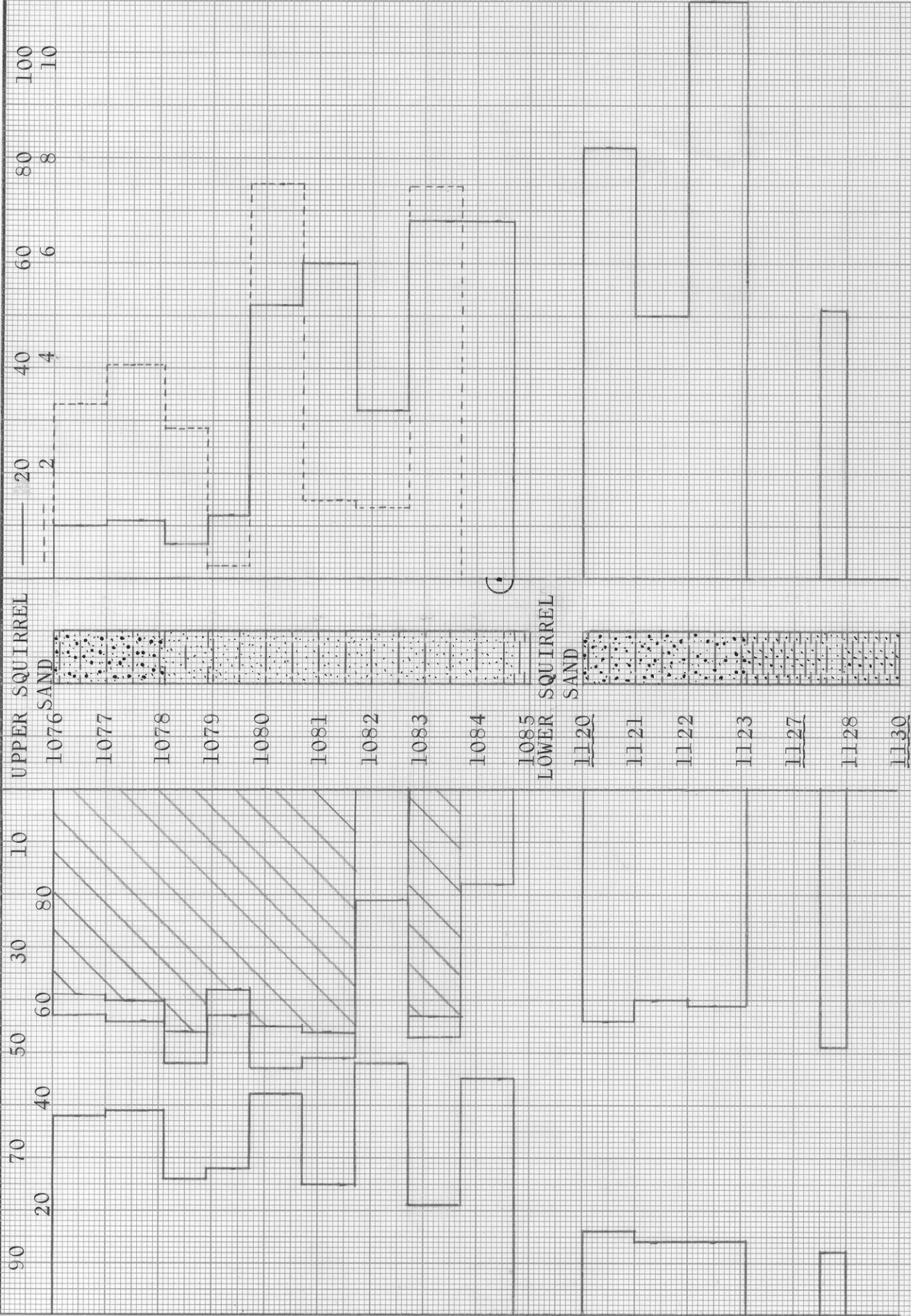
TABLE V

Company	M. T. Kilby	Lease	Blake	Well No.	13
		UPPER SQUIRREL SAND			
Depth Interval, Feet	1076.0 - 1084.7				
Feet of Core Analyzed	6.7				
Average Percent Porosity	18.5				
Average Percent Original Oil Saturation	46.9				
Average Percent Oil Recovery	4.5				
Average Percent Residual Oil Saturation	42.4				
Average Percent Residual Water Saturation	42.8				
Average Percent Total Residual Fluid Saturation	85.2				
Average Original Oil Content, Bbls./A. Ft.	679.				
Average Oil Recovery, Bbls./A. Ft.	65.				
Average Residual Oil Content, Bbls./A. Ft.	614.				
Total Original Oil Content, Bbls./Acre	4,550.				
Total Oil Recovery, Bbls./Acre	436.				
Total Residual Oil Content, Bbls./Acre	4,114.				
Average Effective Permeability, Millidarcys	3.98				
Average Initial Fluid Production Pressure, p.s.i.	24.3				

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

WATER SAT., PERCENT → ← OIL SAT., PERCENT

— PERMEABILITY, IN MILLIDARCS  
 - - - - - EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCS






KEY:

SHALE

SANDSTONE WITH SHALE PARTINGS

SANDY SHALE

1130

KEY:  SANDSTONE WITH SHALE PARTINGS  
 SHALE  
 SHALY SANDSTONE  
 FLOODPOT RESIDUAL OIL SATURATION  
 IMPERMEABLE TO WATER

 SANDY SHALE  
 MICACEOUS SANDSTONE WITH SHALE PARTINGS

# M. T. KILBY

BLAKE LEASE

WELL NO. 13

WOODSON COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE		AVG. OIL		AVG. WATER		AVERAGE		CALCULATED OIL RECOVERY BBLs. / ACRE
		POROSITY PERCENT	SATURATION PERCENT	SATURATION PERCENT	SATURATION PERCENT	PERMEABILITY, MILLIDARCS	PERMEABILITY, MILLIDARCS			

### UPPER SQUIRREL SAND

1076.0 - 1084.7	8.7	18.2	41.1	36.0	36.5	1560	(PRIMARY AND WATERFLOODING)			
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### LOWER SQUIRREL SAND

1120.0 - 1128.0	3.6	18.8	42.7	14.3	77.4					
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 CHANUTE, KANSAS  
 OCTOBER, 1981

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