

OILFIELD RESEARCH LABORATORIES

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

November 6, 1981

Don McGinnis
R. R. 1, Box 99
Rantoul, Kansas 66079

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary cores taken from the McGinnis Lease, Well No. 24, located in Franklin County, Kansas and submitted to our laboratory on October 29, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/mkf

5 c to Rantoul, Ks.

Oilfield Research Laboratories
GENERAL INFORMATION & SUMMARY

Company Don McGinnis Lease McGinnis Well No. 24
 Location 150' FEL & 645' FSL NE¼
 Section 32 Twp. 17S Rge. 21E County Franklin State Kansas

| | | | |
|------------------------------------|---------------------|----------|-------------------|
| Elevation, Feet | | | |
| Name of Sand | UPPER SQUIRREL | SQUIRREL | LOWER SQUIRREL |
| Top of Core | 587.0 | 657.0 | 708.0 |
| Bottom of Core | 593.0 | 663.5 | 717.2 |
| Top of Sand | 587.0 | 657.0 | 708.0 |
| Bottom of Sand | * (Tested) 593.0 | *662.0 | 717.2 |
| Total Feet of Permeable Sand | 6.0 | 3.5 | 7.3 |
| Total Feet of Floodable Sand | 2.1 | 2.5 | 7.3 |

Distribution of Permeable Sand:
 Permeability Range
 Millidarcys

| | Feet | Cum. Ft. |
|-----------|----------------|----------|
| | UPPER SQUIRREL | |
| 0 - 10 | 1.7 | 1.7 |
| 14 - 29 | 4.3 | 6.0 |
| | SQUIRREL | |
| 5 - 10 | 1.8 | 1.8 |
| 15 - 18 | 1.7 | 3.5 |
| | LOWER SQUIRREL | |
| 5 - 10 | 0.3 | 0.3 |
| 60 - 70 | 3.0 | 3.3 |
| 95 - 100 | 1.3 | 4.6 |
| 150 - 190 | 2.7 | 7.3 |

| | | | |
|--|---------------------------|--------|--------|
| Average Permeability Millidarcys | 16.7 | 11.3 | 105.9 |
| Average Percent Porosity | 18.6 | 16.8 | 19.3 |
| Average Percent Oil Saturation | 35.2 | 36.0 | 35.1 |
| Average Percent Water Saturation | 43.9 | 45.8 | 39.1 |
| Average Oil Content, Bbls./A. Ft. | 514. | 472. | 569. |
| Total Oil Content, Bbls./Acre | 3,086. | 2,123. | 5,232. |
| Average Percent Oil Recovery by Laboratory Flooding Tests | 3.0 | 6.0 | 7.9 |
| Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. | 46. | 76. | 131. |
| Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre | 97. | 191. | 958. |
| 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. 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,</u> <u>Feet</u> | <u>Description</u> |
|---------------------------------------|---|
| | UPPER SQUIRREL SAND |
| 587.0 - 588.0 | Gray-brown shaly sandstone. |
| 588.0 - 590.1 | Brown sandstone. |
| 590.1 - 592.3 | Gray and brown laminated shale and sandstone. |
| 592.3 - 593.0 | Grayish brown shaly sandstone. |
| | SQUIRREL SAND |
| 657.0 - 657.8 | Grayish brown slightly shaly sandstone. |
| 657.8 - 658.5 | Brown sandstone. |
| 658.5 - 659.0 | Gray shaly sandstone. |
| 659.0 - 663.5 | Gray and brown laminated shale and sandstone. |
| | LOWER SQUIRREL SAND |
| 708.0 - 709.5 | Dark brown sandstone |
| 709.5 - 709.8 | Gray-brown slightly shaly sandstone. |
| 709.8 - 715.3 | Dark brown sandstone. |
| 715.3 - 717.2 | Grayish brown shaly sandstone. |

LABORATORY FLOODING TESTS

UPPER SQUIRREL SAND

The Upper Squirrel sand in this core responded to laboratory flooding tests, as a total recovery of 97 barrels of oil per acre was obtained from 2.1 feet of sand. The weighted average percent oil saturation

was reduced from 36.0 to 33.0, or represents an average recovery of 3.0 percent. The weighted average effective permeability of the samples is 1.13 millidarcys, while the average initial fluid production pressure is 30.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 6 samples tested, 2 produced water and oil and 4 produced water only. This indicates that approximately 33.0 percent of the sand represented by these samples is floodable pay sand.

SQUIRREL

The Squirrel sand in this core responded to laboratory flooding tests, as a total recovery of 191 barrels of oil per acre was obtained from 2.5 feet of sand. The weighted average percent oil saturation was reduced from 37.6 to 31.6, or represents an average recovery of 6.0 percent. The weighted average effective permeability of the samples is 0.32 millidarcys, while the average initial fluid production pressure is 40.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 5 samples tested, 3 produced water and oil. This indicates that approximately 60 percent of the sand represented by these samples is floodable pay sand.

LOWER SQUIRREL

The Lower Squirrel sand in this core responded to laboratory flooding tests, as a total recovery of 958 barrels of oil per acre was obtained from 7.3 feet of sand. The weighted average percent oil saturation was reduced from 41.9 to 34.0, or represents an average recovery of 7.9 percent. The weighted average effective permeability

of the samples is 16.56 millidarcys, while the average initial fluid production pressure is 24.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 9 samples tested, 7 produced water and oil. This indicates that approximately 78 percent of the sand represented by these samples is floodable pay sand.

CALCULATED RECOVERY

UPPER SQUIRREL

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 630 barrels of oil per acre from the Upper Squirrel. This is an average recovery of 302 barrels per acre foot from 2.1 feet of floodable sand analyzed in this core.

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

| | UPPER SQUIRREL |
|--|----------------|
| Original formation volume factor, estimated | 1.04 |
| Reservoir water saturation, percent, estimated | 30.0 |
| Average porosity, percent | 20.6 |
| Oil saturation after flooding, percent | 33.0 |
| Performance factor, percent, estimated | 55.0 |
| Net floodable sand, feet | 2.1 |

CALCULATED RECOVERY

SQUIRREL

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 780 barrels of oil per acre from the Squirrel sand. This is an average recovery of 312 barrels per acre foot from 2.5 feet of floodable sand analyzed in this core.

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

| | SQUIRREL |
|--|----------|
| Original formation volume factor, estimated | 1.05 |
| Reservoir water saturation, percent, estimated | 25.0 |
| Average porosity, percent | 16.8 |
| Oil saturation after flooding, percent | 31.6 |
| Performance factor, percent, estimated | 60.0 |
| Net floodable sand, feet | 2.5 |

LOWER SQUIRREL

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 2560 barrels of oil per acre from the Lower Squirrel Sand. This is an average recovery of 350 barrels per acre foot from 7.3 feet of floodable sand analyzed in this core.

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

| | LOWER SQUIRREL |
|--|----------------|
| Original formation volume factor, estimated | 1.05 |
| Reservoir water saturation, percent, estimated | 20.0 |
| Average porosity, percent | 21.4 |
| Oil saturation after flooding, percent | 34.0 |
| Performance factor, percent, estimated | 50.0 |
| Net floodable sand, feet | 7.3 |

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Don McGinnis Lease McGinnis Well No. 24

| 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. | | |
| | | | | | | | | | | | |
| | | | | | | UPPER SQUIRREL SAND | | | | | |
| 1 | 587.5 | 21.0 | 48 | 23 | 71 | 782 | 9.6 | 1.0 | 1.0 | 782 | 9.60 |
| 2 | 588.5 | 20.4 | 39 | 32 | 71 | 617 | 28. | 1.0 | 2.0 | 617 | 28.00 |
| 3 | 589.5 | 20.3 | 34 | 43 | 77 | 536 | 14. | 1.1 | 3.1 | 590 | 15.40 |
| 4 | 590.4 | 20.8 | 25 | 52 | 77 | 403 | 22. | 1.2 | 4.3 | 484 | 26.40 |
| 5 | 591.5 | 16.3 | 38 | 52 | 90 | 481 | 20. | 1.0 | 5.3 | 481 | 20.00 |
| 6 | 592.5 | 9.0 | 27 | 67 | 94 | 189 | 0.78 | 0.7 | 6.0 | 132 | 0.55 |
| | | | | | | SQUIRREL SAND | | | | | |
| 7 | 657.5 | 15.3 | 39 | 53 | 92 | 463 | 8.0 | 0.8 | 0.8 | 370 | 6.40 |
| 8 | 658.3 | 16.0 | 48 | 27 | 75 | 596 | 17. | 0.7 | 1.5 | 417 | 11.90 |
| 9 | 659.4 | 18.9 | 43 | 39 | 82 | 631 | 5.1 | 1.0 | 2.5 | 631 | 5.10 |
| 10 | 660.6 | 14.6 | 26 | 60 | 86 | 294 | Imp. | 1.0 | 3.5 | 294 | 0.00 |
| 11 | 661.5 | 18.9 | 28 | 46 | 74 | 411 | 16. | 1.0 | 4.5 | 411 | 16.00 |
| | | | | | | LOWER SQUIRREL SAND | | | | | |
| 12 | 708.5 | 21.3 | 33 | 28 | 61 | 543 | 153. | 1.5 | 1.5 | 815 | 229.50 |
| 13 | 709.6 | 16.5 | 37 | 37 | 74 | 474 | 9.4 | 0.3 | 1.8 | 142 | 2.82 |
| 14 | 710.5 | 21.7 | 41 | 30 | 71 | 690 | 69. | 1.0 | 2.8 | 690 | 69.00 |
| 15 | 711.5 | 21.0 | 48 | 26 | 74 | 782 | 63. | 1.0 | 3.8 | 782 | 63.00 |
| 16 | 712.5 | 20.5 | 49 | 25 | 74 | 779 | 62. | 1.0 | 4.8 | 779 | 62.00 |
| 17 | 713.5 | 21.1 | 39 | 29 | 68 | 638 | 184. | 1.2 | 6.0 | 766 | 220.80 |
| 18 | 714.5 | 23.7 | 46 | 24 | 70 | 846 | 97. | 1.3 | 7.3 | 1100 | 126.10 |
| 19 | 715.4 | 11.8 | 14 | 79 | 93 | 128 | Imp. | 1.0 | 8.3 | 128 | 0.00 |
| 20 | 716.4 | 10.5 | 4 | 90 | 94 | 33 | Imp. | 0.9 | 9.2 | 30 | 0.00 |

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Don McGinnis Lease McGinnis Well No. 24

| Depth Interval, Feet | Feet of Core Analyzed | Average Permeability, Millidarcys | Permeability Capacity Ft. x Md. | Depth Interval, Feet | Feet of Core Analyzed | Average Permeability, Millidarcys | Permeability Capacity Ft. x Md. | Depth Interval, Feet | Feet of Core Analyzed | Average Porosity | Average Percent Oil Saturation | Average Percent Water Saturation | Average Oil Content Bbl./A. Ft. | Total Oil Content Bbls./Acre |
|-------------------------|--------------------------|---|---------------------------------------|-------------------------|--------------------------|---|---------------------------------------|-------------------------|--------------------------|---------------------|--------------------------------------|--|---------------------------------------|------------------------------------|
| | | <u>UPPER SQUIRREL SAND</u> | | | | | | | | | | | | |
| 587.0 - 593.0 | 6.0 | 16.7 | 99.95 | | | | | | | | | | | |
| | | <u>SQUIRREL SAND</u> | | | | | | | | | | | | |
| 657.0 - 662.0 | 3.5 | 11.3 | 39.40 | | | | | | | | | | | |
| | | <u>LOWER SQUIRREL SAND</u> | | | | | | | | | | | | |
| 708.0 - 717.2 | 7.3 | 105.9 | 773.22 | | | | | | | | | | | |
| | | <u>UPPER SQUIRREL SAND</u> | | | | | | | | | | | | |
| 587.0 - 593.0 | 6.0 | 35.2 | 514 | | | | | | | 18.6 | 43.9 | | 3,086 | |
| | | <u>SQUIRREL SAND</u> | | | | | | | | | | | | |
| 657.0 - 662.0 | 4.5 | 36.0 | 472 | | | | | | | 16.8 | 45.8 | | 2,123 | |
| | | <u>LOWER SQUIRREL SAND</u> | | | | | | | | | | | | |
| 708.0 - 717.2 | 9.2 | 35.1 | 569 | | | | | | | 19.3 | 39.1 | | 5,232 | |

Oilfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company **Don McGinnis** Lease **McGinnis** Well No. **24**

| 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 | 587.5 | 21.1 | 48 | 786 | 0 | 0 | 48 | 24 | 42 | 0.67 | 30 |
| 2 | 588.5 | 20.9 | 38 | 616 | 4 | 65 | 34 | 46 | 116 | 1.87 | 25 |
| 3 | 589.5 | 20.4 | 34 | 538 | 2 | 32 | 32 | 57 | 32 | 0.45 | 35 |
| 4 | 590.4 | 20.9 | 25 | 405 | 0 | 0 | 25 | 60 | 20 | 0.37 | 40 |
| 5 | 591.5 | 16.4 | 38 | 483 | 0 | 0 | 38 | 53 | 14 | 0.22 | 45 |
| 6 | 592.5 | 9.1 | 27 | 191 | 0 | 0 | 27 | 68 | 10 | 0.37 | 50 |
| 7 | 657.5 | 15.4 | 39 | 466 | 4 | 48 | 35 | 58 | 14 | 0.21 | 50 |
| 8 | 658.3 | 16.1 | 48 | 600 | 11 | 137 | 37 | 43 | 20 | 0.30 | 20 |
| 9 | 659.4 | 18.8 | 43 | 627 | 0 | 0 | 43 | 40 | 0 | Imp. | - |
| 10 | 660.6 | 14.5 | 26 | 292 | 0 | 0 | 26 | 61 | 0 | Imp. | - |
| 11 | 661.5 | 18.4 | 29 | 414 | 4 | 57 | 25 | 60 | 32 | 0.43 | 50 |
| 12 | 708.5 | 20.8 | 34 | 549 | 8 | 129 | 26 | 70 | 18 | 0.30 | 20 |
| 13 | 709.6 | 16.6 | 37 | 476 | 3 | 39 | 34 | 46 | 92 | 0.78 | 35 |
| 14 | 710.5 | 21.8 | 41 | 693 | 5 | 85 | 36 | 36 | 268 | 8.55 | 20 |
| 15 | 711.5 | 21.5 | 47 | 784 | 10 | 167 | 37 | 46 | 206 | 57.97 | 25 |
| 16 | 712.5 | 20.4 | 49 | 775 | 13 | 206 | 36 | 53 | 184 | 35.24 | 30 |
| 17 | 713.5 | 21.2 | 39 | 641 | 4 | 66 | 35 | 47 | 272 | 11.66 | 25 |
| 18 | 714.5 | 23.6 | 46 | 842 | 9 | 165 | 37 | 37 | 316 | 3.45 | 15 |
| 19 | 715.4 | 11.9 | 14 | 129 | 0 | 0 | 14 | 80 | 0 | Imp. | - |
| 20 | 716.4 | 10.7 | 4 | 33 | 0 | 0 | 4 | 91 | 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.

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

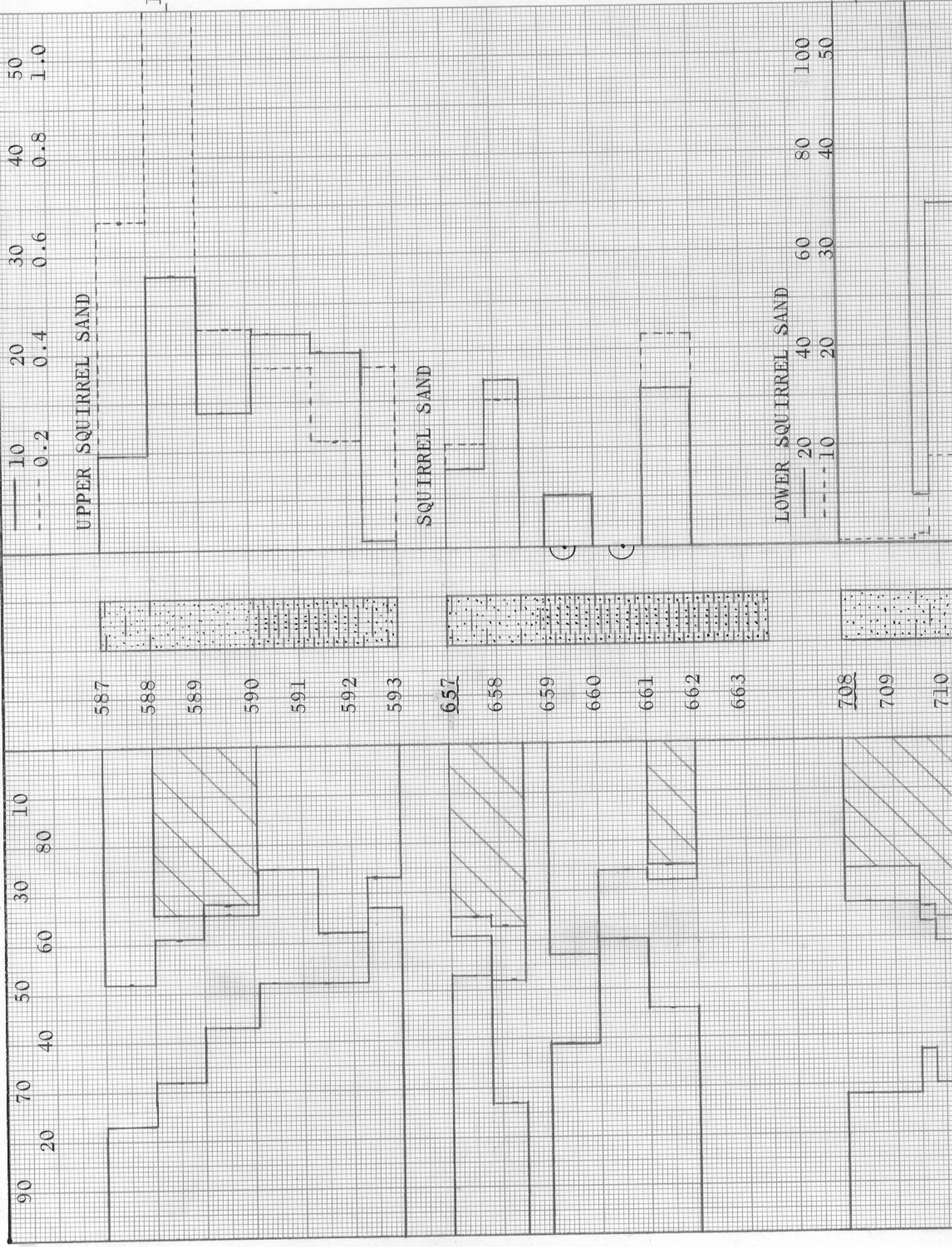
TABLE V

| Company | Lease | McGinnis | Well No. |
|---|---------------------|---------------|---------------------|
| | UPPER SQUIRREL SAND | SQUIRREL SAND | LOWER SQUIRREL SAND |
| Depth Interval, Feet | 587.0 - 593.0 | 657.0 - 662.0 | 708.0 - 712.2 |
| Feet of Core Analyzed | 2.1 | 2.5 | 7.3 |
| Average Percent Porosity | 20.6 | 16.8 | 21.4 |
| Average Percent Original Oil Saturation | 36.0 | 37.6 | 41.9 |
| Average Percent Oil Recovery | 3.0 | 6.0 | 7.9 |
| Average Percent Residual Oil Saturation | 33.0 | 31.6 | 34.0 |
| Average Percent Residual Water Saturation | 51.8 | 54.6 | 49.1 |
| Average Percent Total Residual Fluid Saturation | 84.8 | 86.2 | 83.1 |
| Average Original Oil Content, Bbls./A. Ft. | 574. | 482. | 696. |
| Average Oil Recovery, Bbls./A. Ft. | 46. | 76. | 131. |
| Average Residual Oil Content, Bbls./A. Ft. | 528. | 406. | 565. |
| Total Original Oil Content, Bbls./Acre | 1,205. | 1,206. | 5,083. |
| Total Oil Recovery, Bbls./Acre | 97. | 191. | 958. |
| Total Residual Oil Content, Bbls./Acre | 1,108. | 1,015. | 4,125. |
| Average Effective Permeability, Millidarcys | 1.13 | 0.32 | 16.56 |
| Average Initial Fluid Production Pressure, p.s.i. | 30.0 | 40.0 | 24.3 |

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

WATER SAT., PERCENT \longrightarrow \longleftarrow OIL SAT., PERCENT

PERMEABILITY, IN MILLIDARCS
EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCS

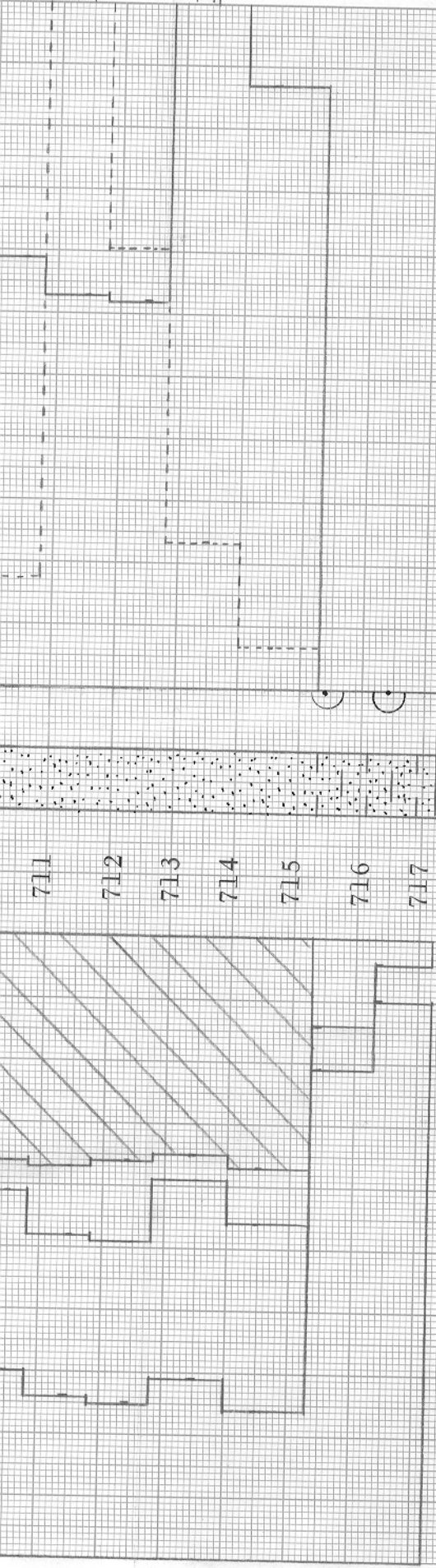


1.87

153

57.97

184



711
712
713
714
715
716
717

KEY:



SANDSTONE



SHALY SANDSTONE



LAMINATED SANDSTONE AND SHALE



FLOODPOT RESIDUAL OIL SATURATION



IMPERMEABLE TO WATER

DON MC GINNIS

MC GINNIS LEASE

FRANKLIN COUNTY, KANSAS

WELL NO. 24

| DEPTH INTERVAL, FEET | FEET OF CORE ANALYZED | UPPER SQUIRREL SAND | | AVG. WATER SATURATION PERCENT | AVERAGE PERMEABILITY, MILLIDARCYS | CALCULATED OIL RECOVERY BBLs. / ACRE |
|-------------------------|--------------------------|---------------------|-----------------------------------|-------------------------------------|---|--|
| | | AVERAGE POROSITY | AVG. OIL SATURATION PERCENT | | | |
| 587.0 - 593.0 | 6.0 | 18.6 | 35.2 | 43.9 | 16.7 | 630 (PRIMARY AND WATERFLOODING) |
| 657.0 - 662.0 | 4.5 | 16.8 | 36.0 | 45.8 | 11.3 | 780 (PRIMARY AND WATERFLOODING) |
| 708.0 - 717.2 | 9.2 | 19.3 | 35.1 | 39.1 | 105.9 | 2560 (PRIMARY AND WATERFLOODING) |

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
NOVEMBER, 1981

PDC