

# OILFIELD RESEARCH LABORATORIES

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

March 31, 1981

Don McGinnis  
Rural Route  
Rantoul, Kansas 66079

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Coddington Lease, Well No. DM-1, located in Miami County, Kansas and submitted to our laboratory on February 5, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/kas

5 c to Rantoul, Kansas

- REGISTERED ENGINEERS -

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

# Oilfield Research Laboratories

## GENERAL INFORMATION & SUMMARY

Company Don McGinnis Lease Coddington Well No. DM-1  
 Location \_\_\_\_\_  
 Section 21 Twp. 17S Rge. 22E County Miami State Kansas

Elevation, Feet .....

Name of Sand.....

Peru

Top of Core .....

323.0

Bottom of Core .....

341.0

Top of Sand .....

323.0

Bottom of Sand .....

340.7

Total Feet of Permeable Sand .....

16.9

Total Feet of Floodable Sand.....

8.8

| Distribution of Permeable Sand:<br>Permeability Range<br>Millidarcys | Feet | Cum. Ft. |
|----------------------------------------------------------------------|------|----------|
| 6 - 10                                                               | 1.5  | 1.5      |
| 20 - 35                                                              | 6.1  | 7.6      |
| 50 - 100                                                             | 4.0  | 11.6     |
| 150 - 335                                                            | 5.3  | 16.9     |

Average Permeability Millidarcys .....

78.6

Average Percent Porosity .....

23.8

Average Percent Oil Saturation .....

30.2

Average Percent Water Saturation.....

46.0

Average Oil Content, Bbls./A. Ft. ....

545.

Total Oil Content, Bbls./Acre.....

9,210.

Average Percent Oil Recovery by Laboratory Flooding Tests.....

8.9

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

162.

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

1,430.

Total Calculated Oil Recovery, Bbls./Acre.....

See "Calculated Recovery"  
Section

-2-

The core was sampled by a representative of Oilfield Research Laboratories. Salt 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,<br/>Feet</u> | <u>Description</u>                                                      |
|---------------------------------|-------------------------------------------------------------------------|
| 323.0 - 325.2                   | Light brown slightly calcareous sandstone.                              |
| 325.2 - 327.3                   | Dark brown slightly calcareous sandstone.                               |
| 327.3 - 329.8                   | Light brown and gray laminated slightly calcareous sandstone and shale. |
| 329.8 - 332.2                   | Grayish light brown calcareous sandstone.                               |
| 332.2 - 332.9                   | Hard gray limestone.                                                    |
| 332.9 - 338.3                   | Light brown and gray laminated slightly calcareous sandstone and shale. |
| 338.3 - 340.7                   | Dark brown slightly calcareous sandstone.                               |
| 340.7 - 341.0                   | Hard gray limestone.                                                    |

#### LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,430 barrels of oil per acre was obtained from 8.8 feet of sand. The weighted average percent oil saturation was reduced from 39.8 to 30.9, or represents an average recovery of 8.9 percent. The weighted average effective permeability of the samples is 11.41 millidarcys, while the average initial fluid production pressure is 21.7 pounds per square inch (See Table V).

-3-

By observing the data given in Table IV, you will note that of the 17 samples tested, 9 produced water and oil, and 7 samples produced water only. This indicates that approximately 53 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 3,410 barrels of oil per acre. This is an average recovery of 387 barrels per acre foot from 8.8 feet of floodable sand analyzed in this core.

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

|                                                |      |
|------------------------------------------------|------|
| Original formation volume factor, estimated    | 1.03 |
| Reservoir water saturation, percent, estimated | 20.0 |
| Average porosity, percent                      | 23.7 |
| Oil saturation after flooding, percent         | 30.9 |
| Performance factor, percent, estimated         | 45.0 |
| Net floodable sand, feet                       | 8.8  |

# Oilfield Research Laboratories

## RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Don McGinnis Lease Coddington Well No. DM-1

| 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          | 323.5       | 29.4                       | 14                 | 57    | 71    | 319                       | 56.          | 1.0          | 1.0      | 319               | 56.00                    |
| 2          | 324.5       | 30.1                       | 20                 | 59    | 79    | 467                       | 247.         | 1.2          | 2.2      | 560               | 247.00                   |
| 3          | 325.4       | 26.5                       | 41                 | 26    | 67    | 843                       | 335.         | 1.0          | 3.2      | 843               | 335.00                   |
| 4          | 326.5       | 30.4                       | 29                 | 33    | 62    | 684                       | 253.         | 1.1          | 4.3      | 752               | 4.73                     |
| 5          | 327.5       | 20.5                       | 37                 | 56    | 93    | 588                       | 6.8          | 1.0          | 5.3      | 588               | 6.80                     |
| 6          | 328.5       | 27.8                       | 18                 | 52    | 70    | 388                       | 158.         | 1.0          | 6.3      | 388               | 158.00                   |
| 7          | 329.5       | 20.4                       | 17                 | 57    | 74    | 269                       | 8.9          | 0.5          | 6.8      | 135               | 4.45                     |
| 8          | 330.6       | 20.5                       | 19                 | 51    | 70    | 302                       | 27.          | 1.0          | 7.8      | 302               | 27.00                    |
| 9          | 331.5       | 14.2                       | 29                 | 41    | 70    | 320                       | 30.          | 1.4          | 9.2      | 448               | 42.00                    |
| 10         | 333.4       | 23.1                       | 18                 | 61    | 79    | 323                       | 25.          | 1.0          | 10.2     | 323               | 25.00                    |
| 11         | 334.4       | 27.5                       | 17                 | 52    | 69    | 363                       | 99.          | 1.0          | 11.2     | 363               | 99.00                    |
| 12         | 335.6       | 23.7                       | 43                 | 48    | 91    | 791                       | 50.          | 1.0          | 12.2     | 791               | 50.00                    |
| 13         | 336.5       | 25.8                       | 42                 | 40    | 82    | 841                       | 153.         | 1.0          | 13.2     | 841               | 153.00                   |
| 14         | 337.6       | 21.6                       | 48                 | 38    | 86    | 804                       | 23.          | 1.3          | 14.5     | 1045              | 29.90                    |
| 15         | 338.5       | 21.2                       | 29                 | 46    | 75    | 477                       | 58.          | 1.0          | 15.5     | 477               | 58.00                    |
| 16         | 339.6       | 20.6                       | 45                 | 36    | 81    | 719                       | 22.          | 1.0          | 16.5     | 719               | 22.00                    |
| 17         | 340.5       | 20.8                       | 49                 | 23    | 72    | 791                       | 28.          | 0.4          | 16.9     | 316               | 11.20                    |

# Oilfield Research Laboratories

## SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

| Company                 |                          | Don McGinnis                            | Lease                                  | Coddington                            | Well No.                           | DM-1  |
|-------------------------|--------------------------|-----------------------------------------|----------------------------------------|---------------------------------------|------------------------------------|-------|
| Depth Interval,<br>Feet | Feet of Core<br>Analyzed | Average<br>Permeability,<br>Millidarcys | Permeability<br>Capacity<br>Ft. x Md.  |                                       |                                    |       |
| 323.0 - 335.0           | 11.2                     | 89.7                                    | 1,004.98                               |                                       |                                    |       |
| 335.0 - 340.7           | 5.7                      | 56.6                                    | 324.10                                 |                                       |                                    |       |
| 323.0 - 340.7           | 16.9                     | 78.6                                    | 1,329.08                               |                                       |                                    |       |
| Depth Interval,<br>Feet | Feet of Core<br>Analyzed | Average<br>Percent Oil<br>Saturation    | Average<br>Percent Water<br>Saturation | Average<br>Oil Content<br>Bbl./A. Ft. | Total Oil<br>Content<br>Bbls./Acre |       |
| 323.0 - 335.0           | 11.2                     | 24.5                                    | 24.0                                   | 48.9                                  | 448                                | 5,021 |
| 335.0 - 340.7           | 5.7                      | 22.4                                    | 42.3                                   | 40.1                                  | 735                                | 4,189 |
| 323.0 - 340.7           | 16.9                     | 23.8                                    | 30.2                                   | 46.0                                  | 545                                | 9,210 |

# Oilfield Research Laboratories

## RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

| Company    |             | Don McGinnis               |                         | Lease        |              | Coddington   |                     | Well No. |                               | DM-1                                 |                                                |
|------------|-------------|----------------------------|-------------------------|--------------|--------------|--------------|---------------------|----------|-------------------------------|--------------------------------------|------------------------------------------------|
| 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. |
|            |             |                            | %                       | BbIs./A. Ft. | %            | BbIs./A. Ft. | % Oil               | % Water  |                               |                                      |                                                |
| 1          | 323.5       | 29.3                       | 14                      | 318          | 0            | 0            | 14                  | 74       | 414                           | 10.31                                | 10                                             |
| 2          | 324.5       | 29.7                       | 21                      | 484          | 0            | 0            | 21                  | 64       | 360                           | 17.49                                | 10                                             |
| 3          | 325.4       | 26.4                       | 41                      | 840          | 10           | 205          | 31                  | 45       | 576                           | 26.23                                | 15                                             |
| 4          | 326.5       | 30.2                       | 29                      | 679          | 2            | 47           | 27                  | 55       | 106                           | 39.73                                | 10                                             |
| 5          | 327.5       | 20.6                       | 37                      | 591          | 4            | 64           | 33                  | 62       | 114                           | 2.17                                 | 10                                             |
| 6          | 328.5       | 27.6                       | 18                      | 385          | 0            | 0            | 18                  | 67       | 472                           | 13.68                                | 10                                             |
| 7          | 329.5       | 20.4                       | 17                      | 269          | 0            | 0            | 17                  | 77       | 304                           | 4.05                                 | 10                                             |
| 8          | 330.6       | 20.4                       | 19                      | 301          | 0            | 0            | 19                  | 75       | 350                           | 6.00                                 | 10                                             |
| 9          | 331.5       | 14.1                       | 29                      | 315          | 0            | 0            | 29                  | 56       | 214                           | 3.15                                 | 10                                             |
| 10         | 333.4       | 23.0                       | 18                      | 321          | 0            | 0            | 18                  | 72       | 372                           | 4.95                                 | 15                                             |
| 11         | 334.4       | 27.1                       | 18                      | 378          | 0            | 0            | 18                  | 54       | 0                             | Imp.                                 | -                                              |
| 12         | 335.6       | 23.9                       | 43                      | 797          | 16           | 297          | 27                  | 60       | 78                            | 1.50                                 | 30                                             |
| 13         | 336.5       | 25.8                       | 42                      | 841          | 12           | 240          | 30                  | 56       | 386                           | 16.86                                | 15                                             |
| 14         | 337.6       | 21.7                       | 48                      | 808          | 15           | 253          | 33                  | 57       | 108                           | 1.80                                 | 25                                             |
| 15         | 338.5       | 21.2                       | 29                      | 477          | 3            | 49           | 26                  | 71       | 178                           | 3.30                                 | 25                                             |
| 16         | 339.6       | 20.5                       | 45                      | 716          | 4            | 64           | 41                  | 50       | 18                            | 0.50                                 | 45                                             |
| 17         | 340.5       | 21.0                       | 49                      | 798          | 20           | 326          | 29                  | 59       | 214                           | 9.56                                 | 20                                             |

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

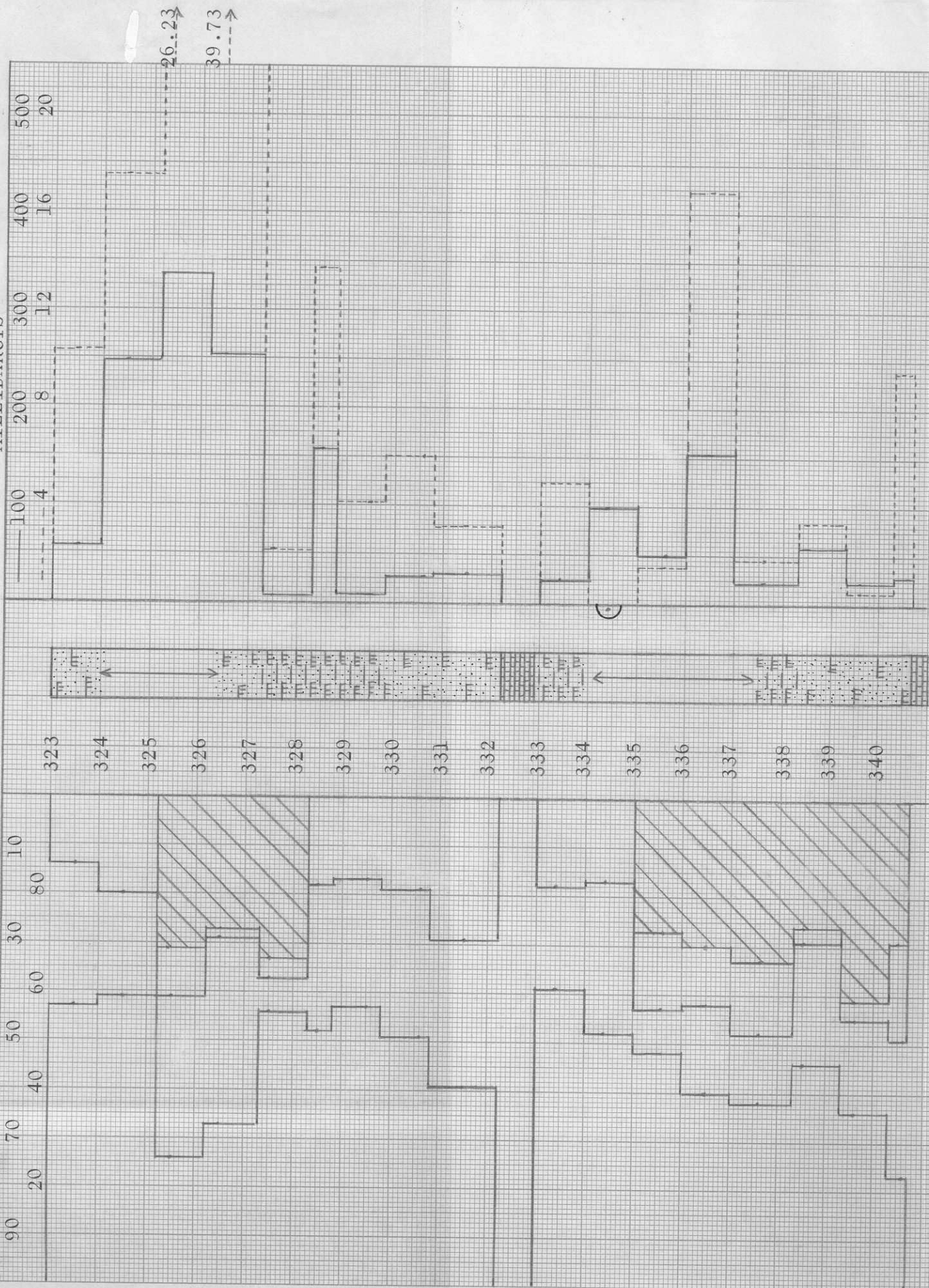
TABLE V

| Company                                           | Don McGinnis  | Lease         | Coddington    | Well No. | DM-1 |
|---------------------------------------------------|---------------|---------------|---------------|----------|------|
| Depth Interval, Feet                              | 323.0 - 335.0 | 335.0 - 340.7 | 323.0 - 340.7 |          |      |
| Feet of Core Analyzed                             | 3.1           | 5.7           | 8.8           |          |      |
| Average Percent Porosity                          | 25.9          | 22.5          | 23.7          |          |      |
| Average Percent Original Oil Saturation           | 35.4          | 42.3          | 39.8          |          |      |
| Average Percent Oil Recovery                      | 5.2           | 11.0          | 8.9           |          |      |
| Average Percent Residual Oil Saturation           | 30.2          | 31.3          | 30.9          |          |      |
| Average Percent Residual Water Saturation         | 54.0          | 58.7          | 57.1          |          |      |
| Average Percent Total Residual Fluid Saturation   | 84.2          | 90.0          | 88.0          |          |      |
| Average Original Oil Content, Bbls./A. Ft.        | 702.          | 737.          | 724.          |          |      |
| Average Oil Recovery, Bbls./A. Ft.                | 103.          | 195.          | 162.          |          |      |
| Average Residual Oil Content, Bbls./A. Ft.        | 599.          | 542.          | 562.          |          |      |
| Total Original Oil Content, Bbls./Acre            | 2,178.        | 4,201.        | 6,379.        |          |      |
| Total Oil Recovery, Bbls./Acre                    | 321.          | 1,109.        | 1,430.        |          |      |
| Total Residual Oil Content, Bbls./Acre            | 1,857.        | 3,092.        | 4,949.        |          |      |
| Average Effective Permeability, Millidarcys       | 23.3          | 5.0           | 11.4          |          |      |
| Average Initial Fluid Production Pressure, p.s.i. | 11.7          | 26.7          | 21.7          |          |      |

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

WATER SAT., PERCENT ———> <—— OIL SAT., PERCENT

WATER SAT., PERCENT ———> <—— OIL SAT., PERCENT



KEY:

340

KEY:



LIMESTONE



CALCAREOUS SANDSTONE



FLOODPOT RESIDUAL OIL SATURATION



LAMINATED CALCAREOUS SANDSTONE AND SHALE



IMPERMEABLE TO WATER

# DON MCGINNIS

CODDINGTON LEASE

WELL NO. DM - 1

MIAMI COUNTY, KANSAS

| DEPTH INTERVAL,<br>FEET | FEET OF CORE<br>ANALYZED | AVERAGE  |         | AVG. OIL   |         | AVG. WATER |         | AVERAGE       |             | CALCULATED     |              |
|-------------------------|--------------------------|----------|---------|------------|---------|------------|---------|---------------|-------------|----------------|--------------|
|                         |                          | POROSITY | PERCENT | SATURATION | PERCENT | SATURATION | PERCENT | PERMEABILITY, | MILLIDARCYS | OIL RECOVERY   | BELS. / ACRE |
| 323.0 - 335.0           | 11.2                     | 24.5     | 24.0    | 48.9       | 89.7    |            |         |               |             |                |              |
| 335.0 - 340.7           | 5.7                      | 22.4     | 42.3    | 40.1       | 56.6    |            |         |               |             |                |              |
| 323.0 - 340.7           | 16.9                     | 23.8     | 30.2    | 46.0       | 78.6    |            |         |               |             |                |              |
|                         |                          |          |         |            |         |            |         |               |             | 3410           |              |
|                         |                          |          |         |            |         |            |         |               |             | (PRIMARY AND   |              |
|                         |                          |          |         |            |         |            |         |               |             | WATERFLOODING) |              |

OILFIELD RESEARCH LABORATORIES  
CHANUTE, KANSAS  
MARCH, 1981