# OILFIELD RESEARCH LABORATORIES

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


August 5, 1982

Lincoln 77
3633 O Street, Suite 4
P.O. Box 30538
Lincoln, Nebraska 68510

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Edwards Lease, Well No. B-6, located in Coffey County, Kansas and submitted to our laboratory on July 28, 1982.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/dlb

4 c to Lincoln, Nebraska
1 c to Topeka, Kansas

# Oilfield Research Laboratories

## GENERAL INFORMATION & SUMMARY

Company Lincoln 77 Lease Edwards Well No. B-6

Location

Section 17 Twp. 22S Rge. 16E County Coffey State Kansas

| | |
|---|---|
| Elevation, Feet | |
| Name of Sand | Lower Squirrel |
| Top of Core | 1006.0 |
| Bottom of Core | 1014.7 |
| Top of Sand (Tested) | 1007.5 |
| Bottom of Sand (Tested) | 1014.0 |
| Total Feet of Permeable Sand | 4.5 |
| Total Feet of Floodable Sand | 3.5 |

| Distribution of Permeable Sand: Permeability Range Millidarcys | Feet | Cum. Ft. |
|---|---|---|
| 0 - 10 | 2.3 | 2.3 |
| 70 - 146 | 2.2 | 4.5 |

| | |
|---|---|
| Average Permeability Millidarcys | 50.5 |
| Average Percent Porosity | 19.7 |
| Average Percent Oil Saturation | 48.8 |
| Average Percent Water Saturation | 28.8 |
| Average Oil Content, Bbls./A. Ft. | 761. |
| Total Oil Content, Bbls./Acre | 4,944. |
| Average Percent Oil Recovery by Laboratory Flooding Tests | 14.3 |
| Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. | 242. |
| Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre | 847. |
| 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.

## FORMATION CORED

The detailed log of the formation cored is as follows:

| Depth Interval, Feet | Description |
|---|---|
| 1006.0 - 1006.4 | Gray shale. |
| 1006.4 - 1007.5 | Grayish brown very shaly sandstone. |
| 1007.5 - 1007.7 | Brown sandstone. |
| 1007.7 - 1009.0 | Gray and brown laminated shale and sandstone. |
| 1009.0 - 1011.0 | Brown sandstone with scattered gray shale partings. |
| 1011.0 - 1012.0 | Grayish brown very shaly sandstone. |
| 1012.0 - 1013.0 | Brown slightly shaly sandstone. |
| 1013.0 - 1014.7 | Grayish brown very shaly sandstone. |

## LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 847 barrels of oil per acre was obtained from 3.5 feet of sand. The weighted average percent oil saturation was reduced from 55.2 to 40.9, or represents an average recovery of 14.3 percent. The weighted average effective permeability of the samples is 4.28 millidarcys, while the average initial fluid production pressure is 21.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 7 samples tested, 4 produced water and oil. This indicates that approximately 57 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 1,390 barrels of oil per acre. This is an average recovery of 397 barrels per acre foot from 3.5 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 | 15.0 |
| Average porosity, percent | 21.7 |
| Oil saturation after flooding, percent | 40.9 |
| Performance factor, percent, estimated | 60.0 |
| Net floodable sand, feet | 3.5 |

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### RESULTS OF SATURATION & PERMEABILITY TESTS

### TABLE 1-B

Company Lincoln 77 Lease Edwards Well No. B-6

| 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 | 1007.6 | 22.6 | 51 | 16 | 67 | 894 | 145. | 0.2 | 0.2 | 179 | 29.00 |
| 2 | 1008.5 | 18.0 | 56 | 21 | 77 | 782 | 3.9 | 1.3 | 1.5 | 1017 | 5.07 |
| 3 | 1009.6 | 24.8 | 60 | 16 | 76 | 1154 | 113. | 1.0 | 2.5 | 1154 | 113.00 |
| 4 | 1010.6 | 23.5 | 50 | 16 | 66 | 912 | 72. | 1.0 | 3.5 | 912 | 72.00 |
| 5 | 1011.5 | 14.4 | 32 | 53 | 85 | 358 | Imp. | 1.0 | 4.5 | 358 | 0.00 |
| 6 | 1012.8 | 19.7 | 39 | 38 | 77 | 596 | 8.2 | 1.0 | 5.5 | 596 | 8.20 |
| 7 | 1013.5 | 17.7 | 53 | 34 | 87 | 728 | Imp. | 1.0 | 6.5 | 728 | 0.00 |

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## SUMMARY OF PERMEABILITY & SATURATION TESTS

### TABLE III

Company Lincoln 77 Lease Edwards Well No. B-6

| Depth Interval, Feet | Feet of Core Analyzed | Average Permeability, Millidarcys | Permeability Capacity Ft. x Md. |
|---|---|---|---|
| 1007.5 - 1011.0 | 3.5 | 62.6 | 219.07 |
| 1011.0 - 1014.0 | 1.0 | 8.2 | 8.20 |
| 1007.5 - 1014.0 | 4.5 | 50.5 | 227.27 |

| 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 |
|---|---|---|---|---|---|---|
| 1007.5 - 1011.0 | 3.5 | 21.8 | 55.1 | 17.9 | 932 | 3,262 |
| 1011.0 - 1014.0 | 3.0 | 17.3 | 41.3 | 41.7 | 561 | 1,682 |
| 1007.5 - 1014.0 | 6.5 | 19.7 | 48.8 | 28.8 | 761 | 4,944 |

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## RESULTS OF LABORATORY FLOODING TESTS

### TABLE IV

Company Lincoln 77 Lease Edwards Well No. B-6

| 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 | 1007.6 | 22.5 | 51 | 890 | 12 | 209 | 39 | 54 | 681 | 480 | 6.82 | 20 |
| 2 | 1008.5 | 18.1 | 56 | 786 | 15 | 211 | 41 | 48 | 575 | 138 | 2.23 | 20 |
| 3 | 1009.6 | 24.7 | 60 | 1150 | 22 | 422 | 38 | 50 | 728 | 290 | 8.25 | 20 |
| 4 | 1010.6 | 23.4 | 50 | 907 | 6 | 109 | 44 | 47 | 798 | 146 | 2.47 | 25 |
| 5 | 1011.5 | 14.0 | 33 | 358 | 0 | 0 | 33 | 52 | 358 | 0 | Imp. | - |
| 6 | 1012.8 | 19.6 | 39 | 593 | 0 | 0 | 39 | 40 | 593 | 0 | Imp. | - |
| 7 | 1013.5 | 17.6 | 53 | 724 | 0 | 0 | 53 | 33 | 724 | 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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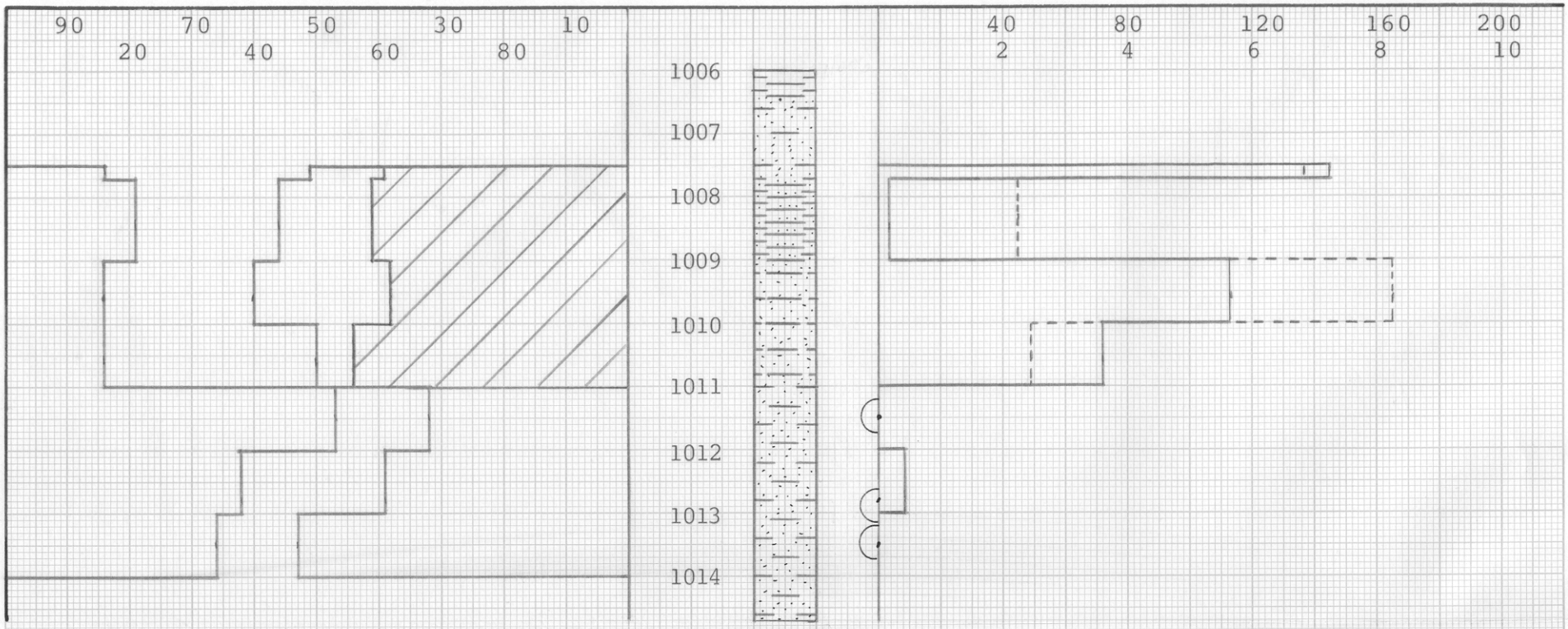
### SUMMARY OF LABORATORY FLOODING TESTS

### TABLE V

Company Lincoln 77 Lease Edwards Well No. B-6

| | |
|---|---|
| Depth Interval, Feet | 1007.5 - 1011.0 |
| Feet of Core Analyzed | 3.5 |
| Average Percent Porosity | 21.7 |
| Average Percent Original Oil Saturation | 55.2 |
| Average Percent Oil Recovery | 14.3 |
| Average Percent Residual Oil Saturation | 40.9 |
| Average Percent Residual Water Saturation | 48.6 |
| Average Percent Total Residual Fluid Saturation | 89.5 |
| Average Original Oil Content, Bbls./A. Ft. | 931. |
| Average Oil Recovery, Bbls./A. Ft. | 242. |
| Average Residual Oil Content, Bbls./A. Ft. | 689. |
| Total Original Oil Content, Bbls./Acre | 3,257. |
| Total Oil Recovery, Bbls./Acre | 847. |
| Total Residual Oil Content, Bbls./Acre | 2,410. |
| Average Effective Permeability, Millidarcys | 4.28 |
| Average Initial Fluid Production Pressure, p.s.i. | 21.3 |

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




# LINCOLN 77

EDWARDS LEASE

WELL NO. B-6

COFFEY 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 |
|---|---|---|---|---|---|---|

| 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 |
|---|---|---|---|---|---|---|
| 1007.5 - 1011.0 | 3.5 | 21.8 | 55.1 | 17.9 | 62.6 | |
| 1011.0 - 1014.0 | 3.0 | 17.3 | 41.3 | 41.7 | 8.2 | |
| 1007.5 - 1014.0 | 6.5 | 19.7 | 48.8 | 28.8 | 50.5 | 1390 (PRIMARY AND WATERFLOODING) |

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CHANUTE, KANSAS
AUGUST, 1982 PDC