



# OILFIELD RESEARCH LABORATORIES

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June 12, 1979

Lincoln 77  
8485 Kathy Lane  
Lincoln, Nebraska 68526

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Jerry Murray Lease, Well No. 7, Coffey County, Kansas, and submitted to our laboratory on June 6, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

*Benjamin R. Pearman*  
Benjamin R. Pearman

SAM:km

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

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## GENERAL INFORMATION & SUMMARY

|          |                                     |        |              |         |              |
|----------|-------------------------------------|--------|--------------|---------|--------------|
| Company  | Lincoln 77                          | Lease  | Jerry Murray | Well No | 7            |
| Location | S $\frac{1}{2}$ SE NW $\frac{1}{4}$ |        |              |         |              |
| Section  | 13                                  | Twp.   | 23S          | Rge.    | 16E          |
|          |                                     | County | Coffey       |         | State Kansas |

  

|                              |          |
|------------------------------|----------|
| Name of Sand                 | Squirrel |
| Top of Core                  | 941.0    |
| Bottom of Core               | 958.2    |
| Top of Sand                  | 941.0    |
| Bottom of Sand               | 955.6    |
| Total Feet of Permeable Sand | 14.0     |
| Total Feet of Floodable Sand | 3.4      |

  

| Distribution of Permeable Sand:<br>Permeability Range<br>Millidarcys | Feet | Cum. Ft. |
|----------------------------------------------------------------------|------|----------|
| 0 - 5                                                                | 2.1  | 2.1      |
| 5 - 20                                                               | 5.8  | 7.9      |
| 20 - 40                                                              | 3.7  | 11.6     |
| 40 & Above                                                           | 2.4  | 14.0     |

  

|                                                                     |        |
|---------------------------------------------------------------------|--------|
| Average Permeability Millidarcys                                    | 23.4   |
| Average Percent Porosity                                            | 15.6   |
| Average Percent Oil Saturation                                      | 32.9   |
| Average Percent Water Saturation                                    | 46.5   |
| Average Oil Content, Bbls./A. Ft.                                   | 413.   |
| Total Oil Content, Bbls./Acre                                       | 5,780. |
| Average Percent Oil Recovery by Laboratory Flooding Tests           | 4.1    |
| Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.     | 55.    |
| Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre         | 188.   |
| Total Calculated Oil Recovery, Bbls./Acre (Primary & Waterflooding) | 850.   |
| Packer Setting, Feet                                                |        |
| Viscosity, Centipoises @                                            |        |
| A. P. I. Gravity, degrees @ 60 °F                                   |        |
| Elevation, Feet                                                     |        |

The core was sampled and the samples sealed in plastic bags by an agent of the client. The drilling fluid consisted of fresh water mud. The core was reported to be from a virgin area.

#### FORMATION CORED

The detailed log of the formation cored is as follows:

| <u>Depth Interval,<br/>Feet</u> | <u>Description</u>                      |
|---------------------------------|-----------------------------------------|
| 941.0 - 941.6                   | Brown finely laminated shaly sandstone. |
| 941.6 - 942.6                   | Dark brown slightly shaly sandstone.    |
| 942.6 - 943.8                   | Dark brown sandstone.                   |
| 943.8 - 947.1                   | Dark brown slightly shaly sandstone.    |
| 947.1 - 947.7                   | Gray sandy shale.                       |
| 947.7 - 948.2                   | Dark brown sandstone.                   |
| 948.2 - 949.8                   | Dark brown slightly shaly sandstone.    |
| 949.8 - 951.0                   | Dark brown sandstone.                   |
| 951.0 - 951.6                   | Brown shaly sandstone.                  |
| 951.6 - 952.9                   | Dark brown sandstone.                   |
| 952.9 - 953.8                   | Brown very shaly sandstone.             |
| 953.8 - 954.7                   | Dark brown slightly shaly sandstone.    |
| 954.7 - 955.6                   | Dark brown sandstone.                   |
| 955.6 - 958.2                   | Gray sandy shale.                       |

#### LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 188 barrels of oil per acre was obtained from 3.4 feet of sand. The weighted average

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percent oil saturation was reduced from 39.8 to 35.7, or represents an average recovery of 4.1 percent. The weighted average effective permeability of the samples is 0.28 millidarcys, while the average initial fluid production pressure is 35.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 15 samples tested, 5 produced water and 3 oil. This indicates that approximately 20 percent of the sand represented by these samples is floodable pay sand.

#### CALCULATED RECOVERY

From a study of the data, it would appear that efficient primary and waterflood operations in the vicinity of this well should recover approximately 850 barrels of oil per acre. This is an average recovery of 250 barrels per acre foot from 3.4 feet of floodable sand analyzed in this core.

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

|                                        |      |
|----------------------------------------|------|
| Original formation volume factor       | 1.06 |
| Reservoir water saturation, percent    | 20.0 |
| Average porosity, percent              | 18.0 |
| Oil saturation after flooding, percent | 35.7 |
| Performance factor, percent            | 45.0 |
| Net floodable pay sand, feet           | 3.4  |

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## RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Lincoln 77

Lease Jerry Murray

Well No. 7

| 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          | 941.5       | 13.5                       | 22                 | 70    | 92    | 230                       | 0.85         | 0.6          | 0.6      | 138               | 0.51                     |
| 2          | 942.5       | 18.1                       | 31                 | 48    | 79    | 435                       | 24.          | 1.0          | 1.6      | 435               | 24.00                    |
| 3          | 943.5       | 18.9                       | 42                 | 27    | 69    | 616                       | 42.          | 1.2          | 2.8      | 739               | 50.40                    |
| 4          | 944.5       | 19.0                       | 51                 | 24    | 75    | 752                       | 11.          | 1.2          | 4.0      | 902               | 13.20                    |
| 5          | 945.5       | 15.0                       | 34                 | 45    | 79    | 396                       | 12.          | 1.0          | 5.0      | 396               | 12.00                    |
| 6          | 946.5       | 14.9                       | 30                 | 50    | 80    | 347                       | 14.          | 1.1          | 6.1      | 382               | 15.40                    |
| 7          | 947.9       | 12.5                       | 16                 | 74    | 90    | 155                       | 31.          | 0.5          | 6.6      | 78                | 15.50                    |
| 8          | 948.5       | 14.3                       | 29                 | 51    | 80    | 322                       | 13.          | 0.8          | 7.4      | 258               | 10.40                    |
| 9          | 949.5       | 12.4                       | 23                 | 65    | 88    | 221                       | 6.1          | 0.8          | 8.2      | 177               | 4.88                     |
| 10         | 950.5       | 15.9                       | 45                 | 36    | 81    | 555                       | 84.          | 1.2          | 9.4      | 666               | 100.80                   |
| 11         | 951.5       | 11.9                       | 22                 | 60    | 82    | 204                       | 1.6          | 0.6          | 10.0     | 122               | 0.96                     |
| 12         | 952.5       | 14.9                       | 38                 | 41    | 79    | 439                       | 31.          | 1.3          | 11.3     | 571               | 40.30                    |
| 13         | 953.5       | 11.1                       | 13                 | 79    | 92    | 122                       | 1.2          | 0.9          | 12.2     | 101               | 1.08                     |
| 14         | 954.5       | 18.8                       | 34                 | 30    | 64    | 496                       | 13.          | 0.9          | 13.1     | 446               | 11.70                    |
| 15         | 955.4       | 16.5                       | 32                 | 43    | 75    | 410                       | 29.          | 0.9          | 14.0     | 369               | 26.10                    |

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## SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

| Company                 |                          | Lease                          |                                      | Jerry Murray                           |                                         | Well No.                              |                                    |
|-------------------------|--------------------------|--------------------------------|--------------------------------------|----------------------------------------|-----------------------------------------|---------------------------------------|------------------------------------|
| Lincoln 77              |                          |                                |                                      |                                        |                                         | 7                                     |                                    |
| Depth Interval,<br>Feet | Feet of Core<br>Analyzed | Average<br>Percent<br>Porosity | Average<br>Percent Oil<br>Saturation | Average<br>Percent Water<br>Saturation | Average<br>Permeability,<br>Millidarcys | Permeability<br>Capacity<br>Ft. x Md. | Total Oil<br>Content<br>Bbls./Acre |
| 941.0 - 955.6           | 14.0                     | 15.6                           | 32.9                                 | 46.5                                   | 23.4                                    | 327.23                                | 5,780                              |

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## RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Lincoln 77 Lease Jerry Murray Well No. 7

| 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          | 941.5       | 13.5                       | 23                      | 241          | 0            | 0            | 23                  | 68      | 0                             | Imp.                                 | -                                              |
| 2          | 942.5       | 18.2                       | 31                      | 438          | 2            | 28           | 29                  | 62      | 8                             | 0.15                                 | 35                                             |
| 3          | 943.5       | 19.4                       | 42                      | 632          | 3            | 45           | 39                  | 49      | 15                            | 0.30                                 | 30                                             |
| 4          | 944.5       | 18.8                       | 48                      | 700          | 0            | 0            | 48                  | 41      | 0                             | Imp.                                 | -                                              |
| 5          | 945.5       | 15.3                       | 34                      | 403          | 0            | 0            | 34                  | 58      | 0                             | Imp.                                 | -                                              |
| 6          | 946.5       | 15.0                       | 31                      | 361          | 0            | 0            | 31                  | 60      | 0                             | Imp.                                 | -                                              |
| 7          | 947.9       | 12.8                       | 19                      | 189          | 0            | 0            | 19                  | 71      | 0                             | Imp.                                 | -                                              |
| 8          | 948.5       | 14.7                       | 29                      | 330          | 0            | 0            | 29                  | 53      | 0                             | Imp.                                 | -                                              |
| 9          | 949.5       | 12.8                       | 25                      | 248          | 0            | 0            | 25                  | 63      | 0                             | Imp.                                 | -                                              |
| 10         | 950.5       | 16.3                       | 45                      | 569          | 7            | 88           | 38                  | 60      | 18                            | 0.37                                 | 40                                             |
| 11         | 951.5       | 12.4                       | 24                      | 231          | 0            | 0            | 24                  | 61      | 0                             | Imp.                                 | -                                              |
| 12         | 952.5       | 15.4                       | 38                      | 454          | 0            | 0            | 38                  | 61      | 17                            | 0.37                                 | 40                                             |
| 13         | 953.5       | 11.3                       | 15                      | 132          | 0            | 0            | 15                  | 77      | 0                             | Imp.                                 | -                                              |
| 14         | 954.5       | 18.4                       | 34                      | 486          | 0            | 0            | 34                  | 51      | 5                             | 0.22                                 | 50                                             |
| 15         | 955.4       | 16.3                       | 32                      | 405          | 0            | 0            | 32                  | 57      | 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    | Lense | Jerry Murray | Well No. | 7 |
| Depth Interval, Feet                              | 941.0 - 955.6 |       |              |          |   |
| Feet of Core Analyzed                             | 3.4           |       |              |          |   |
| Average Percent Porosity                          | 18.0          |       |              |          |   |
| Average Percent Original Oil Saturation           | 39.8          |       |              |          |   |
| Average Percent Oil Recovery                      | 4.1           |       |              |          |   |
| Average Percent Residual Oil Saturation           | 35.7          |       |              |          |   |
| Average Percent Residual Water Saturation         | 56.7          |       |              |          |   |
| Average Percent Total Residual Fluid Saturation   | 92.4          |       |              |          |   |
| Average Original Oil Content, Bbbls./A. Ft.       | 553.          |       |              |          |   |
| Average Oil Recovery, Bbbls./A. Ft.               | 55.           |       |              |          |   |
| Average Residual Oil Content, Bbbls./A. Ft.       | 498.          |       |              |          |   |
| Total Original Oil Content, Bbbls./Acre           | 1,880.        |       |              |          |   |
| Total Oil Recovery, Bbbls./Acre                   | 188.          |       |              |          |   |
| Total Residual Oil Content, Bbbls./Acre           | 1,692.        |       |              |          |   |
| Average Effective Permeability, Millidarcys       | 0.28          |       |              |          |   |
| Average Initial Fluid Production Pressure, p.s.i. | 35.0          |       |              |          |   |

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