



# OILFIELD RESEARCH LABORATORIES

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December 20, 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 Alice Crotts Lease, Well No. 2, Coffey County, Kansas, and submitted to our laboratory on November 26, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

*Benjamin R. Pearman*  
Benjamin R. Pearman

BRP/tem  
4 c to Lincoln, Nebraska  
1 c to Topeka, Kansas

- REGISTERED ENGINEERS -

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



This core was sampled and the samples sealed in plastic bags by a representative of the client. The well was reported to have been drilled in virgin territory using fresh water mud as the circulating fluid.

#### FORMATION CORED

The detailed log of the formation cored is as follows:

| <u>Depth Interval,<br/>Feet</u> | <u>Description</u>                            |
|---------------------------------|---|
| 958.0 - 959.3                   | Gray very shaly sandstone.                    |
| 959.3 - 961.0                   | Alternate thin layers of sandstone and shale. |
| 961.0 - 962.4                   | Gray very shaly sandstone.                    |
| 962.4 - 964.9                   | Alternate thin layers of sandstone and shale. |

#### LABORATORY FLOODING TESTS

The lower portion of the sand in this core responded to laboratory flooding tests, as a total recovery of 107 barrels of oil per acre was obtained from 1.5 feet of sand. The weighted average percent oil saturation was reduced from 41.6 to 36.3, or represents an average recovery of 5.3 percent. The weighted average effective permeability of the samples is 0.13 millidarcys, while the average initial fluid production pressure is 45.0 pounds per square inch (See Table V).

#### CALCULATED RECOVERY

The results of the laboratory testing indicate that efficient primary and waterflooding operations in the vicinity of this well should recover approximately 370 barrels of oil per acre. This is an average recovery of 246 barrels per acre

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foot from the 1.5 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 | 20.0 |
| Average porosity, percent                      | 16.2 |
| Oil saturation after flooding, percent         | 36.3 |
| Performance factor, percent, estimated         | 50.0 |
| Net floodable pay sand, feet                   | 1.5  |

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## RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE I-B

Company Lincoln 77

Lease Alice Crotts

Well No. 2

| 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 |                           |              | Ft.          | Cum. Ft. |                   |                          |
| 1          | 958.5       | 10.4                       | 40                 | 35    | 323                       | Imp.         | 1.3          | 1.3      | 420               | 0.00                     |
| 2          | 959.5       | 14.5                       | 43                 | 35    | 484                       | 2.4          | 0.7          | 2.0      | 338               | 1.68                     |
| 3          | 960.4       | 14.0                       | 39                 | 44    | 424                       | 1.3          | 1.0          | 3.0      | 424               | 1.30                     |
| 4          | 961.9       | 14.1                       | 16                 | 39    | 175                       | Imp.         | 1.4          | 4.4      | 245               | 0.00                     |
| 5          | 962.8       | 14.7                       | 36                 | 40    | 411                       | 8.9          | 1.0          | 5.4      | 411               | 8.90                     |
| 6          | 963.8       | 17.5                       | 38                 | 32    | 516                       | 5.3          | 1.0          | 6.4      | 516               | 5.30                     |
| 7          | 964.7       | 19.0                       | 53                 | 21    | 781                       | 9.2          | 0.5          | 6.9      | 391               | 4.60                     |

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## SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Lincoln 77 Lease Alice Crotts Well No. 2

| Depth Interval,<br>Feet | Feet of Core<br>Analyzed | Average<br>Permeability,<br>Millidarcys | Permeability<br>Capacity<br>Ft. x Md. | 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 |
|-------------------------|--------------------------|---|---------------------------------------|--------------------------------------|--|---------------------------------------|------------------------------------|
| 958.0 - 964.9           | 4.2                      | 5.2                                     | 21.78                                 |                                      |  |                                       |                                    |
| 958.0 - 964.9           | 6.9                      |   |                                       | 35.4                                 | 36.4                                   | 398                                   | 2,745                              |
|                         |                          |   |                                       | 14.4                                 |  |                                       |                                    |

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**RESULTS OF LABORATORY FLOODING TESTS**

**TABLE IV**

Company **Lincoln 77**      Lease **Alice Crotts**      Well No. **2**

| 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          | 958.5       | 10.7                       | 39                      | 324          | 0            | 0            | 39                  | 38      | 0                             | Imp.                                 | -  |
| 2          | 959.5       | 14.5                       | 43                      | 484          | 0            | 0            | 43                  | 38      | 0                             | Imp.                                 | -  |
| 3          | 960.4       | 14.2                       | 39                      | 430          | 0            | 0            | 39                  | 45      | 0                             | Imp.                                 | -  |
| 4          | 961.9       | 14.2                       | 15                      | 165          | 0            | 0            | 15                  | 42      | 0                             | Imp.                                 | -  |
| 5          | 962.8       | 15.0                       | 36                      | 419          | 3            | 35           | 33                  | 59      | 12                            | 0.15                                 | 40   |
| 6          | 963.8       | 17.0                       | 39                      | 514          | 0            | 0            | 39                  | 36      | 0                             | Imp.                                 | -  |
| 7          | 964.7       | 18.6                       | 53                      | 765          | 10           | 144          | 43                  | 51      | 8                             | 0.10                                 | 50   |

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 | Alice Croatts | Well No. | 2 |
| Depth Interval, Feet                              | 962.4 - 964.9 |       |               |          |   |
| Feet of Core Analyzed                             | 1.5           |       |               |          |   |
| Average Percent Porosity                          | 16.2          |       |               |          |   |
| Average Percent Original Oil Saturation           | 41.6          |       |               |          |   |
| Average Percent Oil Recovery                      | 5.3           |       |               |          |   |
| Average Percent Residual Oil Saturation           | 36.3          |       |               |          |   |
| Average Percent Residual Water Saturation         | 56.4          |       |               |          |   |
| Average Percent Total Residual Fluid Saturation   | 92.7          |       |               |          |   |
| Average Original Oil Content, Bbls./A. Ft.        | 535.          |       |               |          |   |
| Average Oil Recovery, Bbls./A. Ft.                | 71.           |       |               |          |   |
| Average Residual Oil Content, Bbls./A. Ft.        | 464.          |       |               |          |   |
| Total Original Oil Content, Bbls./Acre            | 802.          |       |               |          |   |
| Total Oil Recovery, Bbls./Acre                    | 107.          |       |               |          |   |
| Total Residual Oil Content, Bbls./Acre            | 695.          |       |               |          |   |
| Average Effective Permeability, Millidarcys       | 0.13          |       |               |          |   |
| Average Initial Fluid Production Pressure, p.s.i. | 45.0          |       |               |          |   |

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