

# OILFIELD RESEARCH LABORATORIES

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

April 30, 1981

James E. Russell Petroleum, Inc.  
P. O. Box 2618  
Abilene, Texas 79604

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Unit 2 (H. V. Scully) Lease, Well No. R-23, located in Anderson County, Kansas and submitted to our laboratory on April 13, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/mkf

3 c to Abilene, Texas  
2 c to Chanute, Kansas

# Oilfield Research Laboratories

## GENERAL INFORMATION & SUMMARY

Company James E. Russell Petroleum, Inc. Lease Unit 2 (H. V. Scully) Well No. R-23

Location 2610' EWL & 1980' SNL SE $\frac{1}{4}$

Section 29 Twp. 22S Rge. 19E County Anderson State Kansas

Elevation, Feet . . Datum: Mean Sea Level (G. L.) 1079.3

Name of Sand . . . . . Squirrel

Top of Core . . . . . 778.0

Bottom of Core . . . . . 797.5

Top of Sand . . . . . 780.8

Bottom of Sand . . . . . 792.9

Total Feet of Permeable Sand . . . . . 12.1

Total Feet of Floodable Sand . . . . . 4.1

Distribution of Permeable Sand:  
Permeability Range  
Millidarcys

Feet

Cum. Ft.

0 - 12

7.3

7.3

25 - 35

1.8

9.1

50 - 63

3.0

12.1

Average Permeability Millidarcys . . . . . 21.4

Average Percent Porosity . . . . . 18.1

Average Percent Oil Saturation . . . . . 39.0

Average Percent Water Saturation . . . . . 41.2

Average Oil Content, Bbls./A. Ft. . . . . 545.

Total Oil Content, Bbls./Acre . . . . . 6,596.

Average Percent Oil Recovery by Laboratory Flooding Tests . . . . . 7.0

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. . . . . 103.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre . . . . . 421.

Total Calculated Oil Recovery, Bbls./Acre . . . . . See "Calculated Recovery " Section

The core was sampled by a representative of Oilfield Research Laboratories. Salt water mud was used as a drilling fluid. The core was 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>                   |
|---------------------------------|--------------------------------------|
| 778.0 - 780.8                   | Shale light gray.                    |
| 780.8 - 785.9                   | Sandstone brown.                     |
| 785.9 - 786.9                   | Sandstone shaly grayish light brown. |
| 786.9 - 787.7                   | Sandstone light brown.               |
| 787.7 - 792.9                   | Sandstone shaly grayish light brown. |
| 792.9 - 797.5                   | Shale gray.                          |

#### LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 421 barrels of oil per acre was obtained from 4.1 feet of sand. The weighted average percent oil saturation was reduced from 39.8 to 32.8, or represents an average recovery of 7.0 percent. The weighted average effective permeability of the samples is 5.79 millidarcys, while the average initial fluid production pressure is 31.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 12 sampled tested, 4 produced water and oil, and 1 sample produced water only. This indicates that approximately 33 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 1120 barrels of oil per acre.

This is an average recovery of 273 barrels per acre foot from 4.1 feet of floodable sand analyzed in this core.

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

|                                                |      |
|------------------------------------------------|------|
| Original formation volume factor, estimated    | 1.05 |
| Reservoir water saturation, percent, estimated | 30.0 |
| Average porosity, percent                      | 18.9 |
| Oil saturation after flooding, percent         | 32.8 |
| Performance factor, percent, estimated         | 55.0 |
| Net floodable sand, feet                       | 4.1  |

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## RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company James E. Russell Petroleum, Inc. Lease Unit 2 (H. V. Scully) Well No. R-23

| 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          | 781.5       | 17.3                       | 42                 | 44    | 86    | 564                       | 11.          | 1.1          | 1.1      | 620               | 12.10                    |
| 2          | 782.4       | 18.8                       | 46                 | 33    | 79    | 671                       | 34.          | 1.0          | 2.1      | 671               | 34.00                    |
| 3          | 783.6       | 20.4                       | 41                 | 40    | 81    | 649                       | 52.          | 1.0          | 3.1      | 649               | 52.00                    |
| 4          | 784.5       | 19.5                       | 30                 | 38    | 68    | 454                       | 62.          | 1.0          | 4.1      | 454               | 62.00                    |
| 5          | 785.6       | 21.7                       | 21                 | 36    | 57    | 354                       | 58.          | 1.0          | 5.1      | 354               | 58.00                    |
| 6          | 786.5       | 18.0                       | 39                 | 39    | 78    | 545                       | 2.4          | 1.0          | 6.1      | 545               | 2.40                     |
| 7          | 787.5       | 20.4                       | 50                 | 35    | 85    | 791                       | 28.          | 0.8          | 6.9      | 633               | 22.40                    |
| 8          | 788.5       | 18.8                       | 49                 | 24    | 73    | 715                       | 8.3          | 1.2          | 8.1      | 858               | 9.96                     |
| 9          | 789.6       | 16.2                       | 41                 | 46    | 87    | 515                       | 3.1          | 1.0          | 9.1      | 515               | 3.10                     |
| 10         | 790.6       | 18.0                       | 33                 | 52    | 85    | 461                       | 2.4          | 1.0          | 10.1     | 461               | 2.40                     |
| 11         | 791.5       | 14.3                       | 37                 | 55    | 92    | 410                       | 0.27         | 1.0          | 11.1     | 410               | 0.27                     |
| 12         | 792.4       | 14.1                       | 39                 | 54    | 93    | 426                       | 0.28         | 1.0          | 12.1     | 426               | 0.28                     |

**Oilfield Research Laboratories**  
**SUMMARY OF PERMEABILITY & SATURATION TESTS**

**TABLE III**

| Company                 |                          | James E. Russell Petroleum, Inc. |                          | Lease                                   | Unit 2 (H. V. Scully) Well No.        |                                        | R-23                                  |                                    |
|-------------------------|--------------------------|----------------------------------|--------------------------|-----------------------------------------|---------------------------------------|----------------------------------------|---------------------------------------|------------------------------------|
| Depth Interval,<br>Feet | Feet of Core<br>Analyzed | Average<br>Porosity<br>Percent   | Feet of Core<br>Analyzed | Average<br>Permeability,<br>Millidarcys | Permeability<br>Capacity<br>Ft. x Md. | Average<br>Percent Water<br>Saturation | Average<br>Oil Content<br>Bbl./A. Ft. | Total Oil<br>Content<br>Bbbl./Acre |
| 780.8 - 785.9           | 5.1                      | 19.5                             | 5.1                      | 42.8                                    | 218.10                                | 36.1                                   | 539                                   | 2,748                              |
| 785.9 - 792.9           | 7.0                      | 17.1                             | 7.0                      | 5.8                                     | 40.81                                 | 41.1                                   | 550                                   | 3,848                              |
| 780.8 - 792.9           | 12.1                     | 18.1                             | 12.1                     | 21.4                                    | 258.91                                | 39.0                                   | 545                                   | 6,596                              |

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## RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company James E. Russell Petroleum, Inc. Lease Unit 2 (H. V. Scully) Well No. R-23

| 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          | 781.5       | 17.2                       | 42                      | 560          | 7            | 93           | 35                  | 59      | 14                            | 0.75                                 | 50                                             |
| 2          | 782.4       | 18.9                       | 46                      | 674          | 10           | 147          | 36                  | 57      | 284                           | 12.74                                | 20                                             |
| 3          | 783.6       | 20.4                       | 41                      | 649          | 9            | 142          | 32                  | 64      | 250                           | 8.66                                 | 20                                             |
| 4          | 784.5       | 19.3                       | 30                      | 449          | 2            | 30           | 28                  | 65      | 68                            | 1.50                                 | 35                                             |
| 5          | 785.6       | 21.7                       | 21                      | 354          | 0            | 0            | 21                  | 61      | 312                           | 4.80                                 | 20                                             |
| 6          | 786.5       | 18.5                       | 38                      | 545          | 0            | 0            | 38                  | 42      | 0                             | Imp.                                 | -                                              |
| 7          | 787.5       | 20.0                       | 51                      | 791          | 0            | 0            | 51                  | 36      | 0                             | Imp.                                 | -                                              |
| 8          | 788.5       | 18.8                       | 49                      | 715          | 0            | 0            | 49                  | 25      | 0                             | Imp.                                 | -                                              |
| 9          | 789.6       | 16.6                       | 40                      | 515          | 0            | 0            | 40                  | 47      | 0                             | Imp.                                 | -                                              |
| 10         | 790.6       | 17.9                       | 33                      | 458          | 0            | 0            | 33                  | 52      | 0                             | Imp.                                 | -                                              |
| 11         | 791.5       | 14.0                       | 38                      | 413          | 0            | 0            | 38                  | 56      | 0                             | Imp.                                 | -                                              |
| 12         | 792.4       | 14.2                       | 39                      | 430          | 0            | 0            | 39                  | 55      | 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

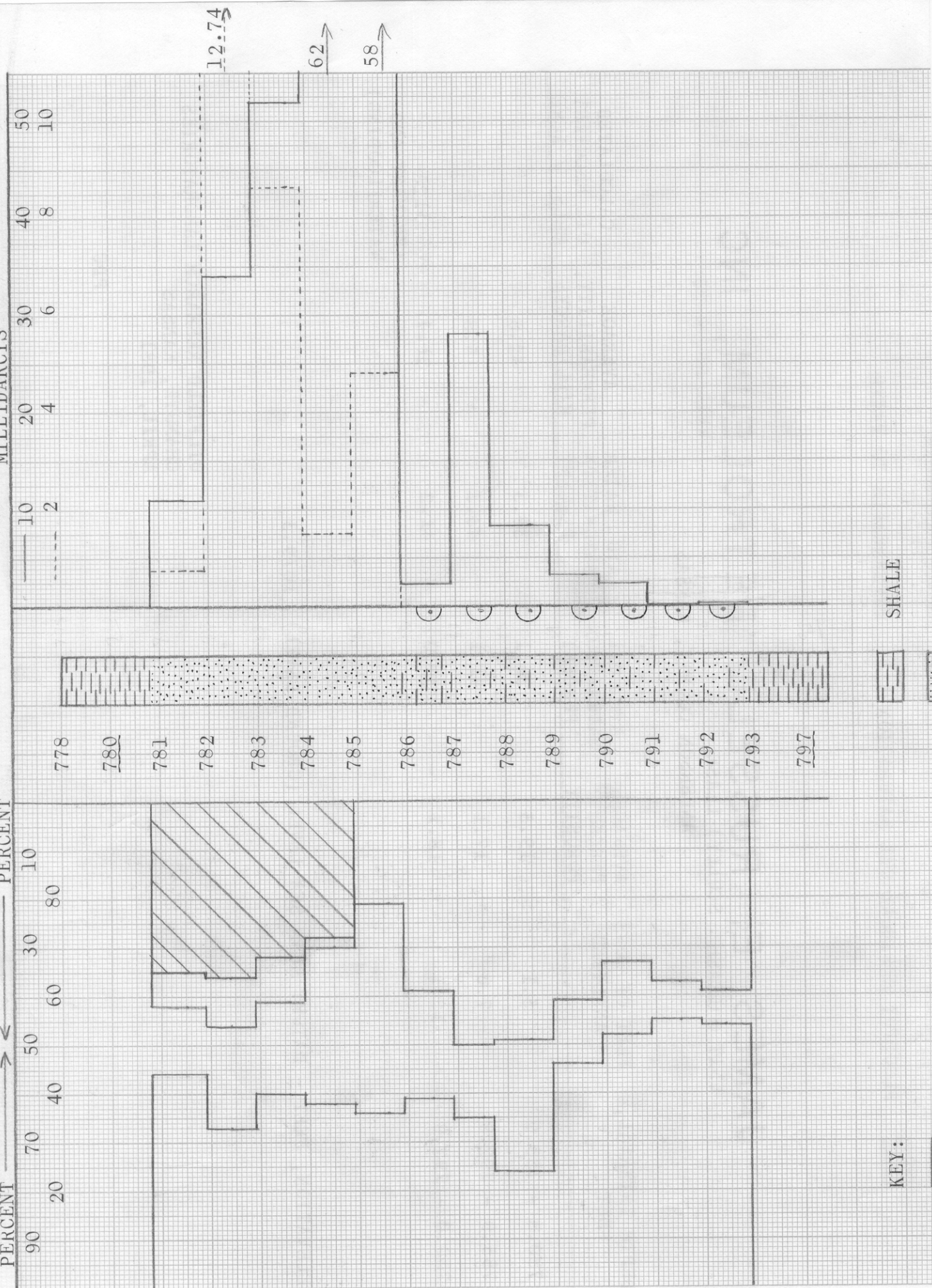
TABLE V

|                                                   |                                  |       |                       |          |      |
|---------------------------------------------------|----------------------------------|-------|-----------------------|----------|------|
| Company                                           | James E. Russell Petroleum, Inc. | Lease | Unit 2 (H. V. Scully) | Well No. | R-23 |
| Depth Interval, Feet                              | 780.8 - 785.9                    |       |                       |          |      |
| Feet of Core Analyzed                             | 4.1                              |       |                       |          |      |
| Average Percent Porosity                          | 18.9                             |       |                       |          |      |
| Average Percent Original Oil Saturation           | 39.8                             |       |                       |          |      |
| Average Percent Oil Recovery                      | 7.0                              |       |                       |          |      |
| Average Percent Residual Oil Saturation           | 32.8                             |       |                       |          |      |
| Average Percent Residual Water Saturation         | 61.2                             |       |                       |          |      |
| Average Percent Total Residual Fluid Saturation   | 94.0                             |       |                       |          |      |
| Average Original Oil Content, Bbls./A. Ft.        | 583.                             |       |                       |          |      |
| Average Oil Recovery, Bbls./A. Ft.                | 103.                             |       |                       |          |      |
| Average Residual Oil Content, Bbls./A. Ft.        | 480.                             |       |                       |          |      |
| Total Original Oil Content, Bbls./Acre            | 2,388.                           |       |                       |          |      |
| Total Oil Recovery, Bbls./Acre                    | 421.                             |       |                       |          |      |
| Total Residual Oil Content, Bbls./Acre            | 1,967.                           |       |                       |          |      |
| Average Effective Permeability, Millidarcys       | 5.79                             |       |                       |          |      |
| Average Initial Fluid Production Pressure, p.s.i. | 31.3                             |       |                       |          |      |

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

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

— PERMEABILITY, IN MILLIDARCYS  
 --- EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS



KEY:

SHALE

CARTOON

SEAL SANDSTONE  
FLOODPOT RESIDUAL OIL SATURATION 0 IMPERMEABLE TO WATER

JAMES E. RUSSELL PETROLEUM, INC.  
UNIT 2 ( H. V. SCULLY ) LEASE  
ANDERSON COUNTY, KANSAS  
WELL NO. R-23

| DEPTH INTERVAL,<br>FEET | FEET OF CORE<br>ANALYZED | AVERAGE<br>PERCENT<br>POROSITY | AVG. OIL<br>SATURATION<br>PERCENT | AVG. WATER<br>SATURATION<br>PERCENT | AVERAGE<br>PERMEABILITY,<br>MILLIDARCYS | CALCULATED<br>OIL RECOVERY<br>BELS. / ACRE |
|-------------------------|--------------------------|--------------------------------|-----------------------------------|-------------------------------------|-----------------------------------------|--------------------------------------------|
| 780.8 - 785.9           | 5.1                      | 19.5                           | 36.1                              | 38.3                                | 42.8                                    |                                            |
| 785.9 - 792.9           | 7.0                      | 17.1                           | 41.1                              | 43.3                                | 5.8                                     |                                            |
| 780.8 - 792.9           | 12.1                     | 18.1                           | 39.0                              | 41.2                                | 21.4                                    | 1120<br>(PRIMARY AND<br>WATERFLOODING)     |

ELEVATION, FEET - DATUM: MEAN SEA LEVEL (GROUND LEVEL) 1079.3

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CHANUTE, KANSAS  
APRIL, 1981

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