

Ritchie Exploration, Inc.

#1 Foos AP Twin

Sec. 31 T19S R21W

Ness County, Kansas

Precision Core Analysis, Inc.

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STANDARD LABORATORY PROCEDURES

- I. **Surface Core Gamma** - Upon arrival in the laboratory the core is arranged on a table and the core markings are verified. The core is sequentially placed upon a conveyor belt assembly and passed over a gamma radiation detector. The values are collected every 6 inches over the entire length of the full diameter core and recorded. The resulting measurements are processed by calculating a two-foot running average and again recorded. These calculations are presented function of core depth and displayed.
- II. **Fluid Saturation Determinations** - Approximately 125 grams of representative core material are selected from each interval to be analyzed. A small portion (20-25 gms) is sampled from the larger piece and injected with mercury up to 1000 psi. The volume of mercury injected is measured and calculated to be the proportionate gas saturation. The remaining sample (75-100 gms) is reduced to approximately 1/4 inch sized remnants then placed into a sealed stainless steel vessel and placed into a controlled-temperature retort oven. The oven temperature is raised to 350°F and 1000°F respectively. Fluids expelled from the vessels are collected in calibrated receiving tubes and fluid saturations are calculated.
- III. **Sample Preparation** - One inch diameter cylindrical core plugs are obtained adjacent to the samples selected for saturation analyses. The core plug samples are drilled with a diamond-tipped core bit using tap water as the bit coolant and lubricant. The samples are labeled with reference numbers corresponding to core depth and placed into a core cleaner. The samples are sealed in a large capacity stainless steel container which is pressurized with carbon dioxide gas up to 100 psig. The sample container is then flooded with toluene, a hydrocarbon solvent, and pressurized up to approximately 800 psig. The temperature within the container is raised to and maintained at 180°F. After one hour the container is allowed to drain and the cycle is repeated until the samples are determined to be sufficiently cleaned of extraneous fluids. Total cleaning times vary according to rock type, oil gravity and chemistry, as well as the specific coring objectives. The samples are removed from the core cleaner and placed into a sample oven for a minimum of four hours at 220°F.
- IV. **Basic Rock Property Determinations** - The cleaned and dried core samples are removed from the oven and allowed to cool in a sealed glass vessel. Specific physical properties (length, diameter, weight and bulk volume) of each plug sample are measured and recorded. The samples are then individually placed into a Coberly-Stevens Boyle's Law porosimeter and injected with helium at approximately 100 psig. Corresponding pressures and volumes are measured and utilized in the Boyle's Law equation to calculate sample grain volume. Pore volume is determined by subtracting the calculated grain volume from the measured bulk volume (determined by Archimedes Principle using mercury immersion). Grain density is calculated by dividing the calculated grain volume into the measured sample weight. The sample is next placed into a Hassler-Sleeve core holder. The annulus of the core holder is pressurized to a pre-determined value (400 psig minimum) to seal the sample. Nitrogen gas is forced through the sample at a given pressure under steady-state conditions, flow rate is measured and permeability to air is calculated. Utilizing the parameters thus measured, a Klinkenberg-corrected permeability value is calculated and reported.

ADDITIONAL REMARKS

When examining the full diameter results, you will note three permeability values (Max, 90, Vert) which represent three orthogonally-oriented measurements: two in a horizontal plane and one in the vertical plane. The full diameter results are shown on the "Petro-Log" depth plot (page 7) as points and indicate a general trend with the results from the core plugs. The full diameter samples were selected to represent different lithologies or features present within the cored interval which may be difficult to identify at the plug-size scale i.e. fractures or large vugs.

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Job: 9525
 Date: 30-Aug-95

| Reference Number | Depth (ft) | Permeability | | Helium Porosity (%) | Saturations | | Grain Density (g/cc) | Sample Description |
|--|------------|-------------------|------------|---------------------|-------------|---------|----------------------|--------------------------------|
| | | Air (md) | Klink (md) | | Water (%) | Oil (%) | | |
| Core No. 1 4387.0'-4421.0' Rec. 34.0'/34.0' | | | | | | | | |
| 1 | 4393.3 | 0.002 | <0.001 | 7.2 | 61.5 | 5.1 | 2.85 | Dol brn-gry vf xln arg pyr |
| 2 | 4395.6 | 0.086 | 0.047 | 5.1 | 41.4 | 24.5 | 2.61 | Dol brn-gry vf xln arg sh |
| 3 | 4396.7 | <i>Unsuitable</i> | | 14.2 | 47.4 | 23.7 | 2.60 | Dol brn-gry vf xln arg cht |
| 4 | 4397.2 | 4.07 | 3.10 | 17.3 | 39.8 | 18.9 | 2.60 | Dol brn-gry vf xln arg cht vu |
| 5 | 4398.0 | 0.130 | 0.077 | 6.0 | 39.7 | 26.4 | 2.66 | Dol brn-gry vf xln cht pyr |
| 6 | 4400.2 | 2.74 | 2.16 | 18.7 | 31.3 | 10.4 | 2.70 | Dol brn-gry vf xln arg cht |
| 7 | 4401.3 | 9.84 | 7.86 | 23.6 | 40.8 | 22.9 | 2.65 | Dol brn-gry vf xln arg cht |
| 8 | 4402.5 | 0.113 | 0.065 | 10.6 | 36.9 | 15.1 | 2.79 | Dol brn-gry vf xln arg lam pyr |
| 9 | 4403.6 | 16.1 | 13.1 | 17.2 | 33.0 | 22.0 | 2.87 | Dol brn-gry vf xln arg |
| 10 | 4404.7 | 21.5 | 17.7 | 21.7 | 36.6 | 16.0 | 2.77 | Dol brn vf xln arg cht |
| 11 | 4405.7 | 6.65 | 5.25 | 18.6 | 26.4 | 17.6 | 2.75 | Dol brn vf xln arg cht pp vug |
| 12 | 4406.3 | 2.27 | 1.77 | 16.6 | 43.0 | 18.2 | 2.76 | Dol brn vf xln arg cht pp vug |
| 13 | 4407.5 | 2.23 | 1.74 | 15.8 | 42.9 | 16.5 | 2.76 | Dol brn vf xln arg cht lam |
| 14 | 4408.6 | 43.2 | 36.5 | 22.8 | 43.9 | 16.5 | 2.84 | Dol brn vf xln arg vug |
| 15 | 4409.5 | 16.1 | 13.0 | 21.0 | 26.2 | 8.7 | 2.73 | Dol brn vf xln arg cht |
| 16 | 4410.6 | 44.1 | 37.3 | 23.5 | 26.2 | 13.1 | 2.84 | Dol brn vf xln arg styl lam |
| 17 | 4411.3 | 43.7 | 36.7 | 24.1 | 38.0 | 10.9 | 2.83 | Dol brn vf xln arg scat vug |
| 18 | 4413.2 | 53.1 | 45.2 | 24.2 | 49.1 | 19.6 | 2.84 | Dol brn vf xln arg pp vug |
| 19 | 4414.1 | 17.5 | 14.2 | 23.4 | 39.3 | 15.5 | 2.80 | Dol brn vf xln arg vug cht |
| 20 | 4416.4 | 76.1 | 65.8 | 24.5 | 33.1 | 20.1 | 2.84 | Dol brn vf xln arg mott |
| 21 | 4420.6 | 16.9 | 13.8 | 18.1 | 34.7 | 16.7 | 2.86 | Dol brn vf xln arg pp vug la |
| Core No. 2 4421.0'-4442.0' Rec. 21.0'/21.0' | | | | | | | | |
| 22 | 4421.8 | 10.0 | 8.02 | 23.4 | 61.3 | 11.0 | 2.83 | Dol brn vf xln arg mott |
| 23 | 4424.1 | 102. | 89.5 | 13.8 | 24.8 | 19.4 | 2.67 | Dol brn-gry vf xln cht lge vu |
| 24 | 4425.3 | 14.3 | 11.6 | 16.6 | 35.1 | 8.8 | 2.76 | Dol brn vf xln arg cht vug |
| 25 | 4426.5 | 31.0 | 25.8 | 21.1 | 49.8 | 5.7 | 2.84 | Dol brn vf xln arg lam |
| 26 | 4427.6 | 12.7 | 10.3 | 18.4 | 36.8 | 4.6 | 2.83 | Dol brn vf xln arg lam |
| 27 | 4430.2 | 1.80 | 1.42 | 14.4 | 72.5 | 4.7 | 2.81 | Dol brn vf xln arg sh lam |
| 28 | 4431.6 | 281. | 255. | 23.3 | 50.1 | 3.4 | 2.85 | Dol brn vf xln vug |

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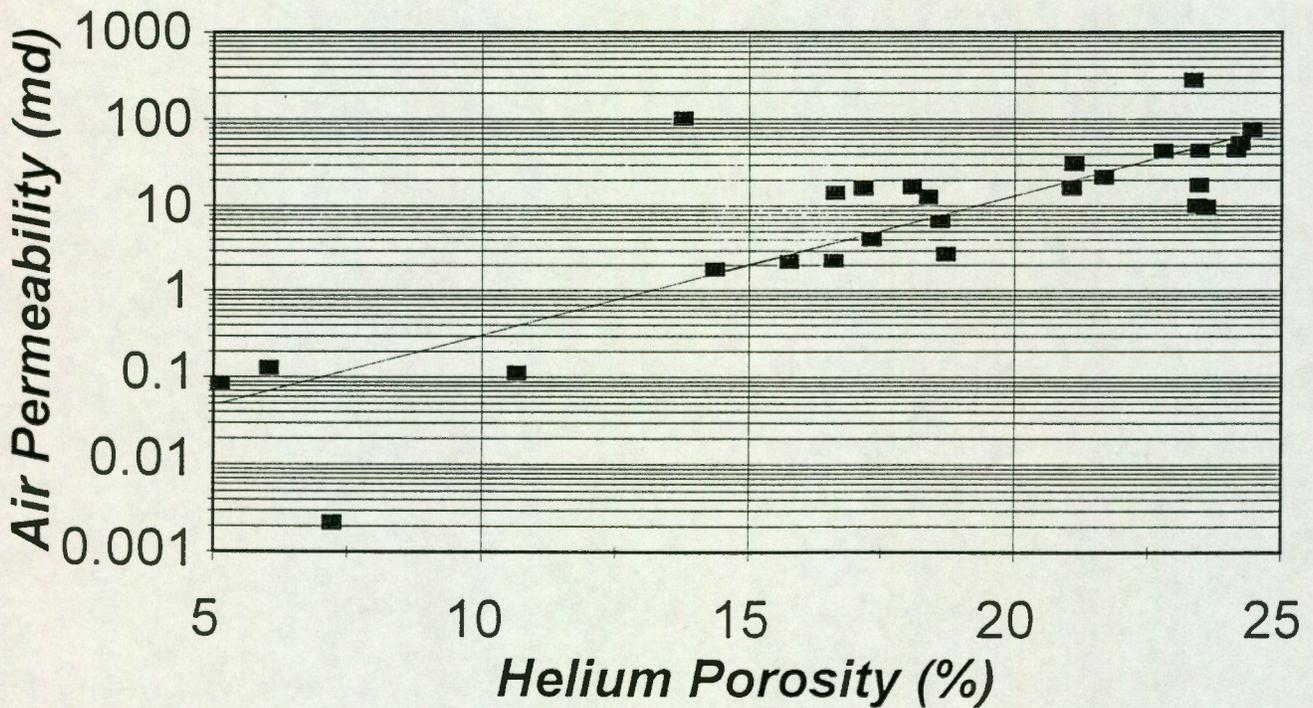
| Reference Number | Depth (ft) | Permeability | | | Helium Porosity (%) | Grain Density (g/cc) |
|--|------------|--------------|---------|-----------|---------------------|----------------------|
| | | Max (md) | 90 (md) | Vert (md) | | |
| <i>Full Diameter Sample Results</i> | | | | | | |
| 1F | 4399.0 | 27.0 | 11.3 | 0.977 | 12.4 | 2.66 |
| 2F | 4400.0 | 0.650 | 0.552 | <0.001 | 7.8 | 2.66 |
| 3F | 4406.0 | 23.1 | 15.3 | 14.2 | 18.7 | 2.79 |
| 4F | 4410.0 | 41.7 | 38.7 | 17.3 | 21.4 | 2.74 |
| 5F | 4414.0 | 48.7 | 37.2 | 51.4 | 16.7 | 2.69 |
| 6F | 4417.0 | 110 | 85.3 | 49.7 | 19.0 | 2.78 |
| 7F | 4422.0 | 26.1 | 10.8 | 2.10 | 17.8 | 2.80 |
| 8F | 4424.0 | 10.8 | 7.71 | 2.52 | 18.5 | 2.96 |
| 9F | 4432.0 | 9992 | 84.4 | 2.06 | 19.9 | 2.89 |

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Air Permeability vs Helium Porosity

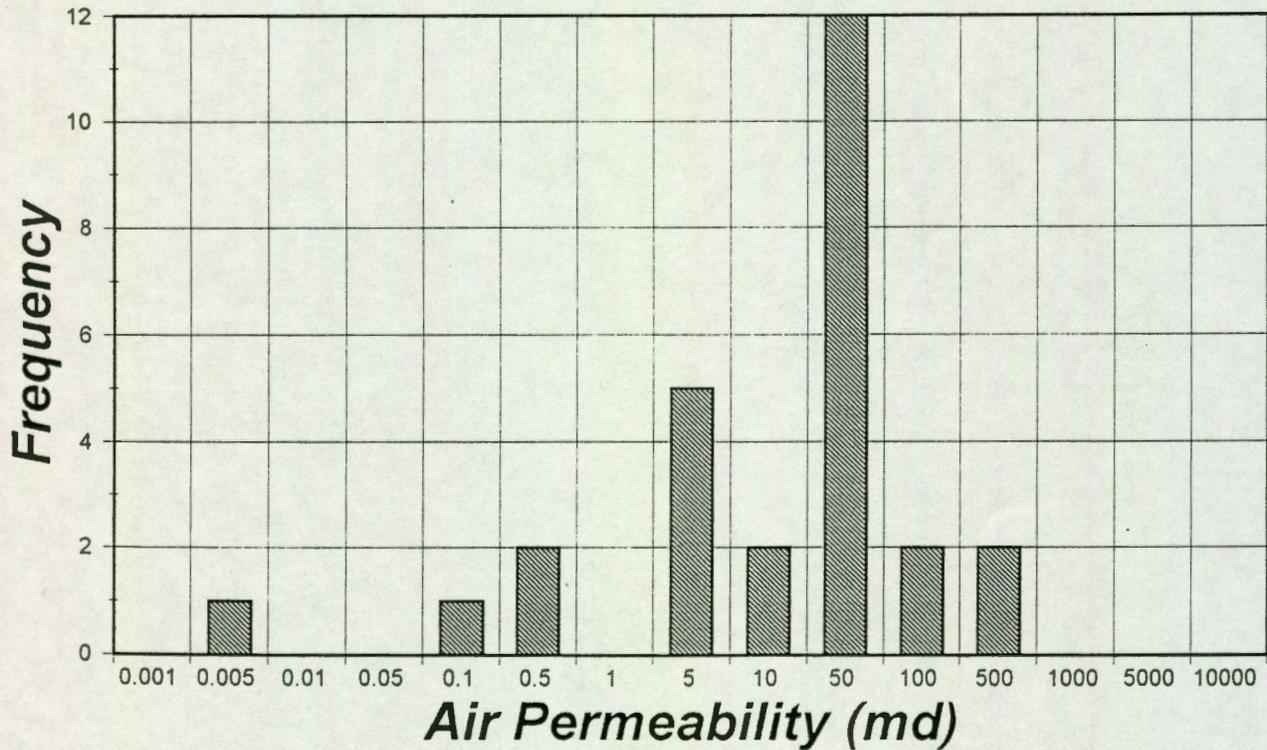


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Air Permeability Frequency Distribution

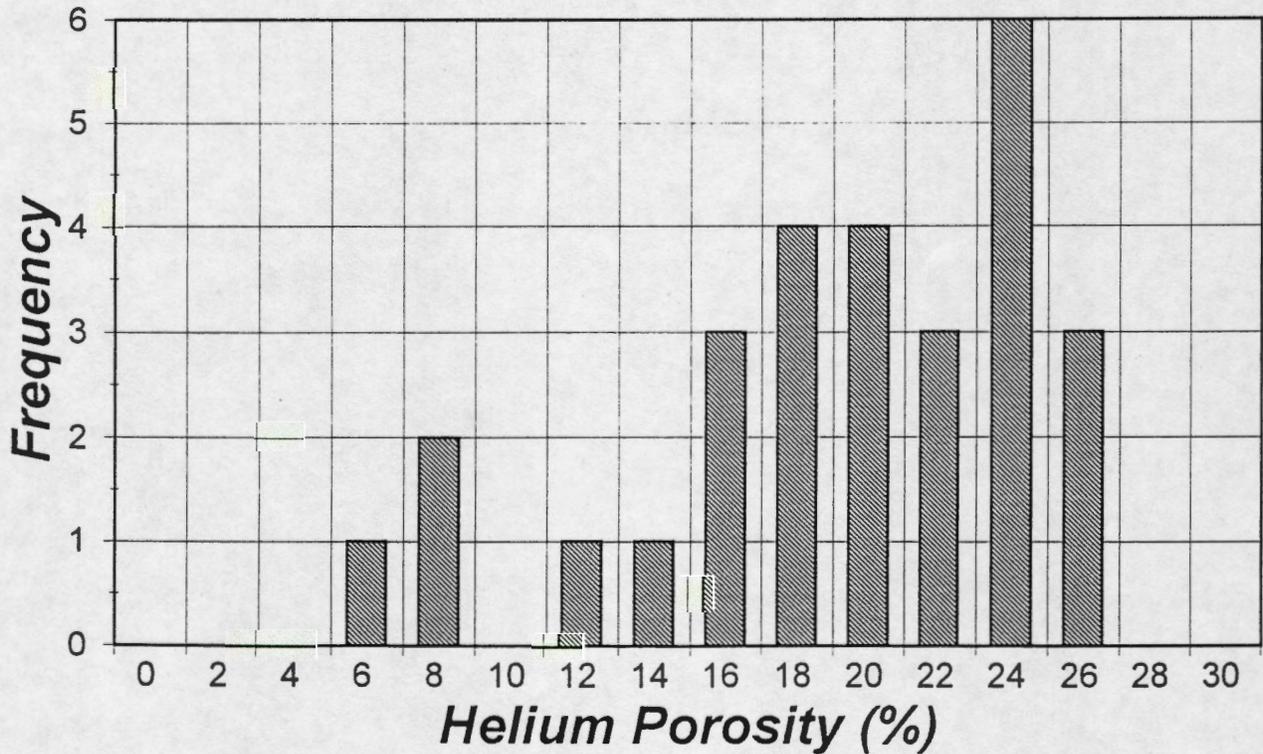


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Helium Porosity Frequency Distribution

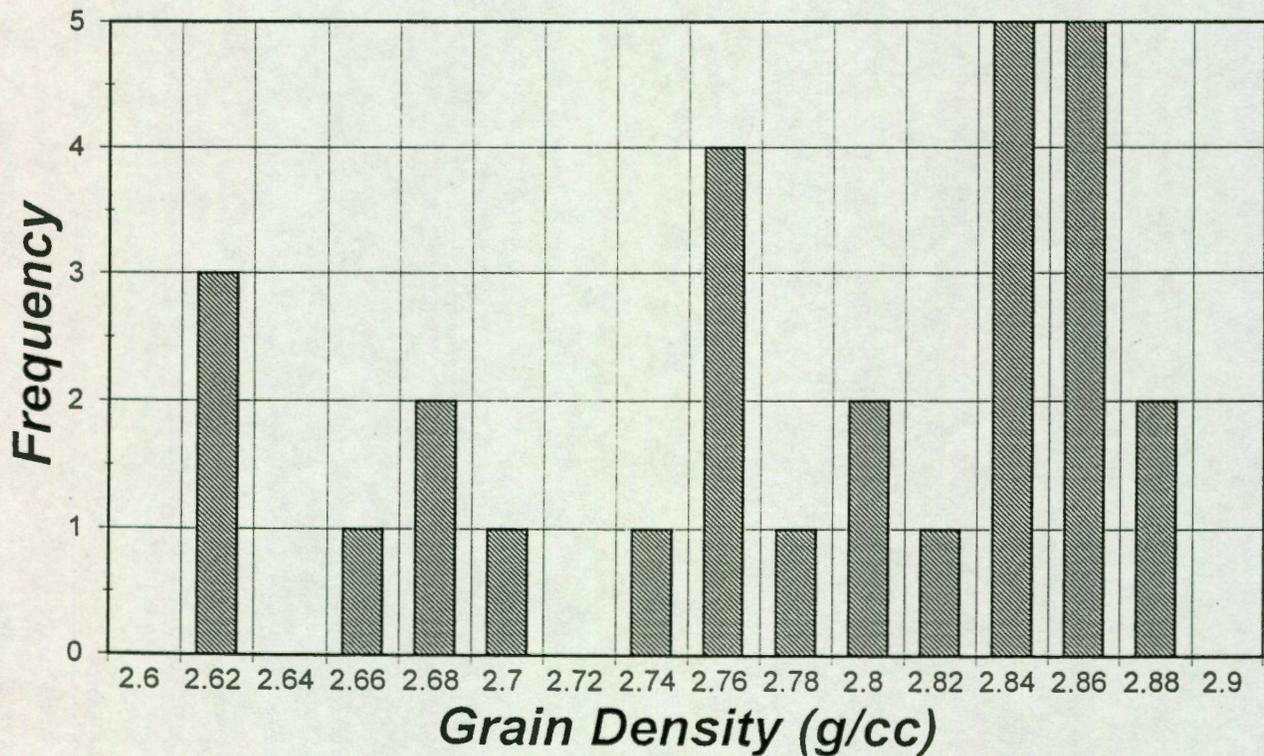


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Grain Density Frequency Distribution



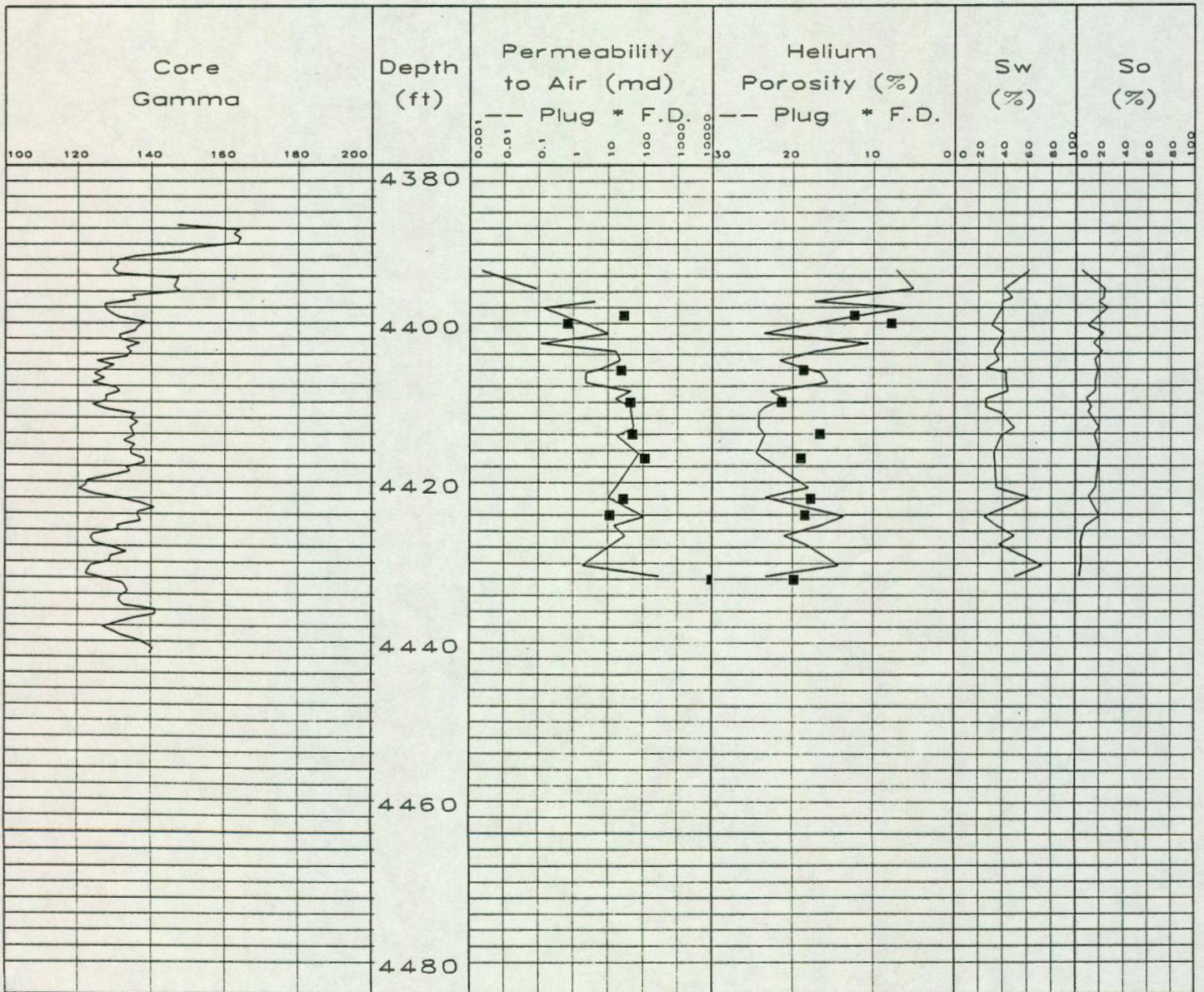
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PETRO-LOG

Scale 1:240



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Zone1 Air Permeability Regression

Regression Output:

| | |
|---------------------|-----------|
| Constant | -2.141069 |
| Std Err of Y Est | 0.631329 |
| R Squared | 0.691708 |
| No. of Observations | 27.000000 |
| Degrees of Freedom | 25.000000 |

| | |
|------------------|----------|
| X Coefficient(s) | 0.162983 |
| Std Err of Coef. | 0.021762 |

Zone1 Klinkenberg Permeability Regression

Regression Output:

| | |
|---------------------|-----------|
| Constant | -2.533328 |
| Std Err of Y Est | 0.705365 |
| R Squared | 0.680940 |
| No. of Observations | 27.000000 |
| Degrees of Freedom | 25.000000 |

| | |
|------------------|----------|
| X Coefficient(s) | 0.177599 |
| Std Err of Coef. | 0.024314 |