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GEOLOGICAL, ROUTINE AND SPECIAL CORE ANALYSIS OF CONVENTIONAL CORE FROM THE PIONEER NATURAL RESOURCES USA, INC. STUART 3-34R WELL GRANT COUNTY, KANSAS

Prepared

for

Pioneer Natural Resources

Oklahoma City, Oklahoma

RSH 3928

RESERVOIRS INC.

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GEOLOGICAL, ROUTINE AND SPECIAL CORE ANALYSIS OF CONVENTIONAL CORE FROM THE PIONEER NATURAL RESOURCES USA, INC. STUART 3-34R WELL GRANT COUNTY, KANSAS

INTRODUCTION

This report, prepared for Pioneer Natural Resources USA, Inc., presents the results and conclusions obtained from the geological and petrophysical analysis of 289.8 feet of conventional core (2755.0 to 3044.8 feet) from the Pioneer Natural Resources USA, Inc. Stuart 3-34R Well, Grant County, Kansas.

The objectives of this study were to: 1) measure porosity, permeability and fluid saturations (routine core analysis), 2) describe the conventional core and delineate lithologies, textures, sedimentary structures, contact relationships, and depositional environments, 3) identify petrographic characteristics and diagenic alterations that influence pore system properties, 4) evaluate reservoir potential, 5) measure electrical properties (Archie's saturation exponents "m" and "n", 6) determine NMR parameters, and 7) measure capillary pressure characteristics to estimate irreducible water saturation. In order to meet these objectives, the following analytical program was utilized:

- Routine core analysis measurements were determined on 267 1-inch diameter plugs. Routine core analysis data are presented in Table 1.

- A core gamma log was obtained to allow for correlation of the core to the open-hole logs. Core to log correlation is presented in Figure 1.

- The conventional core was slabbed into one-third and two-third sections.

- The slabbed core was photographed under white light to create a permanent record of the cored interval (Plates 1 - 28). Close core photographs are presented in Plate 29.

- The core was described in detail. Rock types, depositional textures, sedimentary structures, and contact relationships were delineated. This description is presented in a panel at the end of this report.

- Twelve samples were selected for thin section analysis. Thin sections were prepared from core plug end trims. These samples were impregnated with blue-dyed epoxy to highlight pore space; they were then ground to 30 microns and stained with Alizarin Red-S, which aids in differentiating calcite from other carbonate minerals. A detailed petrographic characteristic was performed on each sample to provide information regarding grain types, texture, pore-filling constituents, diagenetic alterations and pore types (Plates 30 - 53).

- Formation resistivity factor and cementation exponent (m) were measured on twelve core plug samples. These measurements were conducted at a confining pressure of 1360 psi using a formation brine having an Rw of 0.046 ohm-m at 77° F.

- The formation resistivity index and saturation exponent (n) were also measured for the twelve core plug samples. These measurements were performed using a confining pressure of 1360 psi and a formation brine having an Rw of 0.046 ohm-m at 77° F.

- NMR T_2 distributions were generated at 100% water saturation and at an irreducible water saturation established at an air-brine capillary pressure of 200 psi. The data were collected at an echo spacing of 1.20 ms and at a signal to noise ratio of 100:1.

- Air-brine capillary pressure measurements were performed on the same twelve core plug samples for which electrical properties were measured. The air-brine capillary pressure measurements were performed using the porous plate cell method, with saturation data collected for pressures between 0 and 200 psi.

Reservoirs Job Number RSH 3928 was assigned to this study. Any communications regarding this report should refer to this Job Number. Three copies of this report have been forwarded to Mr. Randy Offenberger, Pioneer Natural Resources USA, Inc., Oklahoma City, Oklahoma. Additional copies may be obtained for reproduction costs. All data, interpretations, and other matters related to this study are considered highly confidential and the sole property of Pioneer Natural Resources USA, Inc., Oklahoma City, Oklahoma.

Paul W. Grover, Ph.D.
Geologist
RESERVOIRS, INC.

Lawrence Bruno
Vice-President - Geology
RESERVOIRS, INC.

SUMMARY

A total of 289.8 feet (2755.0 to 3044.8 feet) of conventional core from the Pioneer Natural Resources USA, Inc. Stuart 3-34R Well located in Grant County, Kansas were analyzed.

1. Examination of the conventional core indicates that five depositional environments can be distinguished. These are:

Depositional Environment	Percent of Cored Strata	Lithologic Characteristics	Porosity Range (%) (Average)	Permeability Range (%) (Average)	Estimated Reservoir Potential
Shoal	25%	Tan to gray-brown, skeletal limestone with some dolostone. Predominantly lime-packstone, with some wackestone and grainstone. Allochems include: oncoids, bryozoans, crinoids, forams, brachiopods, algal grains, peloids, and intraclasts. Packstones/grainstones are massive-bedded, while wackestones have undulatory bedding. Calcite, anhydrite, silica and dolomite can cement/replace the allochems. Grainstones with intergranular pores and vuggy pores have the highest porosity and permeability values.	2.2 - 23.6 (10.9)	<0.01 - 163 (7.44)	Fair to Good
Shoal Flank	8%	Light olive-brown, slightly silty limestone to tan dolostone. Argillaceous, bryozoan-rich wackestone texture, with some skeletal packstone. Ripple- to undulatory laminae. Gradational contacts with shoal units. No visible pores in silty limestone units, while dolomitic limestone and dolostone can have small intercrystalline pores and vugs.	2.2 - 19.0 (9.6)	<0.01 - 68.4 (4.49)	Poor to Good
Shelf/Lagoon	23%	Tan, olive-brown and dark gray, argillaceous wackestone, mudstone and shale. Skeletal wackestone and mudstone have undulatory wispy argillaceous seams. Shales and shaly siltstones are dark gray, flat- to undulatory laminated and occasionally have complete brachiopod shells. No visible pores.	4.0 - 21.9 (8.4)	<0.01 - 10.2 (0.22)	Poor
Paleosol to Coastal Plain	36%	Red-brown to gray-green, calcareous to dolomitic, argillaceous siltstone to silty shale. Caliche and anhydrite nodules give the rock a mottled texture. Burrows and rooting are occasionally noted. Poorly developed, small intergranular pores.	5.7 - 14.5 (8.6)	<0.01 - 12.9 (0.69)	Poor to Fair

Depositional Environment	Percent of Cored Strata	Lithologic Characteristics	Porosity Range (%) (Average)	Permeability Range (%) (Average)	Estimated Reservoir Potential
Tidal Flat - Carbonate-Dominated	5%	Tan, dolomitic, brecciated to algal-laminated wackestone to packstone. Anhydrite usually cements the cracks and fenestral pores. Brecciation is a result of both intertidal reworking and displacive anhydrite growths. Little open pore space.	1.1 - 16.3 (7.5)	<0.01 - 1.58 (0.19)	Poor to Fair
Tidal Flat - Siliciclastic-Dominated	3%	Tan to gray, calcareous siltstones to silty calcarenites interlaminated with argillaceous siltstone. Thin bedding that is flat- to undulatory to ripple-laminated. Occasionally bioturbated. No visible pores.			Poor

2. **Of the five depositional environments listed above the skeletal/oncoid grainstones of the shoal lithofacies have the best reservoir potential.** Eleven "shoal packages" were delineated in the core. These "shoal packages" include the shoal strata plus interbedded or adjacent shoal flank and carbonate tidal flat deposits if they have reasonable reservoir potential. Statistics tables have been generated for all eleven "shoal packages" (see Table 3 and Display Panels). The four "shoal packages" with the best reservoir potential are listed below. The higher porosity and permeability values are associated with grainstones that have open intergranular and moldic pores. "Shoal package 10" clearly has the best reservoir potential.

Shoal Package	Depth Interval, ft (Thickness, ft)	Reservoir Lithology	Porosity Range (Average) (%)	Permeability Range (Average) (md)	Estimated Reservoir Potential
Shoal Package 2	2784.0 - 2790.2 (6.7)	Limestone, Oncoid Packstone	5.4 - 23.6 (12.4)	0.01 - 3.77 (1.20)	Fair
Shoal Package 5	2842.3 - 2851.5 (9.2)	Limestone. Bryozoan Wackestone & Oncoid Packstone	4.6 - 18.6 (14.1)	0.01 - 3.27 (1.53)	Fair
Shoal Package 7	2907.8 - 2918.0 (10.2)	Limestone, Oncoid Grainstone/Packstone & Interclast Breccia	5.6 - 16.3 (11.5)	0.01 - 8.82 (1.26)	Fair
Shoal Package 10	2955.7 - 2972.2 (16.5)	Oncoid Lime-Grainstone Dolomitic Packstone/ Wackestone	2.9 - 22.4 (13.8)	0.01 - 163 (36.9)	Fair to Good

3. Saddle dolomite, found only in "shoal package 10", is interpreted to be a deep burial phase of diagenetic alteration. Fluids associated with this deep burial diagenetic event are interpreted to have enhanced pre-existing intergranular, moldic and vuggy pores, resulting in significantly higher permeability values.

4. Six shoal units are capped by, or interbedded with, calcrete profiles, carbonate tidal flat breccias or algal flat deposits. This indicates periods when the water was restricted and/or the shoals were exposed to intertidal sedimentation.

5. The argillaceous siltstones of the paleosol to coastal plain facies are characterized by an oxidized red-brown color, root mottling and caliche nodules typical of terrestrial deposition. The repeated stacking of paleosol to coastal plain units directly above and below shoal units indicates the close proximity of the shoals to the coast line. Induced fractures may have skewed the permeability values of some paleosol to coastal plain samples to unrepresentatively high values.

6. The shelf/lagoon and siliciclastic tidal flat deposits are judged to have poor reservoir potential due to the high clay/micrite matrix content and extensive calcite cementation.

7. Measure "m" values range from 1.77 to 2.24 (composite value of 1.98); "n" values range from 1.84 to 2.11 (composite value of 2.19). Swi values determined by porous plate air-brine capillary pressure tests range from 12.8 to 84.7%. This range of values reflects the variability in pore structure in this sample suite. NMR porosities range from 5.8 to 19.9%; the values are 0.6 to 1.8 pu lower than corresponding helium porosities. Many of the samples show close agreement between total NMR porosity and effective porosity (T_2 minimum of 3 ms). All of the samples that have T_{2ml} value in excess of 200 ms have permeability values greater than 1.0 md. T_2 cut-offs range from 10 to 175 ms, with an average T_2 cut-

off of 90 ms, a value close to the standard 92 ms T_2 cut-off employed for carbonates. BVI values at partial brine saturation range from 2.7 to 17.2 pu, and corresponding FFI's are 0.9 to 17.2 pu. The permeable samples have relatively high FFI:BVI ratios. Calculated Swi values are in good agreement with capillary pressure tests. Mean T_2 and Coates permeability models were constructed.

ROUTINE CORE ANALYSIS

Two hundred and sixty-seven, 1-inch diameter plugs were extracted from the conventional core to determine porosity, permeability, grain density and fluid saturation measurements (Table 1). Porosity values from the sampled portion of the core range from 1.1 to 23.6% (average of 9.3%) and permeability ranges from 0.01 to 163 md (average 4.73 md). A statistics table and a porosity and permeability crossplot of the 5 depositional facies are provided in Table 2 and Figure 2. A statistics table was generated for the eleven "shoal packages" (Table 3) and a porosity and permeability cross plot was created for five of the "shoal packages" that show gas cross-over on the neutron-density porosity curves. (Figure 3). Oil saturation values are all 0.0%, while water saturations range from 18.1 to 78.8%. Grain density values range from 2.60 to 2.91 g/cc.

GEOLOGICAL ANALYSIS

This section of the report presents the results of core description and thin section petrography performed on 289.8 feet (from between 2755.0 to 3044.8 feet) of conventional core from the Pioneer Natural Resources USA, Inc. Stuart 3-34R Well, Grant County, Kansas. A comparison of the conventional core to the open-hole logs indicates that log depth equals core depth (Figure 1). Log response is tied to the core description in the Core Description Panel. Facies are also shown along side the log suite in the Core to Log Correlation Panel.

Core Description and Interpretation

The cored interval is composed of limestone and siltstone, with rare dolostone and shale. Five depositional facies were delineated in the cored interval. Each depositional facies contains one or more lithologies. These are:

Depositional Environment	Percent of Cored Strata	Lithologic Characteristics	Porosity Range (%) (Average)	Permeability Range (%) (Average)	Estimated Reservoir Potential
Shoal	25%	Tan to gray-brown, skeletal limestone with some dolostone. Predominantly lime-packstone, with some wackestone and grainstone. Allochems include: oncoids, bryozoans, crinoids, forams, brachiopods, algal grains, peloids, and intraclast. Packstones/grainstones are massive-bedded, while wackestones have undulatory bedding. Calcite, anhydrite, silica and dolomite can cement/replace the allochems. Grainstones with intergranular pores and vuggy pores have the highest porosity and permeability values.	2.2 - 23.6 (10.9)	<0.01 - 163 (7.44)	Fair to Good
Shoal Flank	8%	Light olive-brown, slightly silty limestone to tan dolostone. Argillaceous, bryozoan-rich wackestone texture, with some skeletal packstone. Ripple- to undulatory laminae. Gradational contacts with shoal units. No visible pores in silty limestone units, while dolomitic limestone and dolostone can have small intercrystalline pores and vugs.	2.2 - 19.0 (9.6)	<0.01 - 68.4 (4.49)	Poor to Good

Depositional Environment	Percent of Cored Strata	Lithologic Characteristics	Porosity Range (%) (Average)	Permeability Range (%) (Average)	Estimated Reservoir Potential
Shelf/Lagoon	23%	Tan, olive-brown and dark gray, argillaceous wackestone, mudstone and shale. Skeletal wackestone and mudstone have undulatory wispy argillaceous seams. Shales and shaly siltstones are dark gray, flat- to undulatory laminated and occasionally have complete brachiopod shells. No visible pores.	4.0 - 21.9 (8.4)	<0.01 - 10.2 (0.22)	Poor
Paleosol to Coastal Plain	36%	Red-brown to gray-green, calcareous to dolomitic, argillaceous siltstone to silty shale. Caliche and anhydrite nodules give the rock a mottled texture. Burrows and rooting are occasionally noted. Poorly developed, small intergranular pores.	5.7 - 14.5 (8.6)	<0.01 - 12.9 (0.69)	Poor to fair
Tidal Flat - Carbonate-Dominated	5%	Tan, dolomitic, brecciated to algal-laminated wackestone to packstone. Anhydrite usually cements the cracks and fenestral pores. Brecciation is a result of both intertidal reworking and displacive anhydrite growth. Little open pore space.	1.1 - 16.3 (7.5)	<0.01 - 1.58 (0.19)	Poor to Fair
Tidal Flat - Siliciclastic-Dominated	3%	Tan to gray, calcareous siltstones to silty calcarenites interlaminated with argillaceous siltstone. Thin-bedding that is flat- to undulatory to ripple-laminated. Occasionally bioturbated. No visible pores.			Poor

Shoal Facies

Description:

Eleven shoal units, ranging in thickness from 4.6 to 16.5 feet, account for roughly 25% of the cored interval. These shoal units are tan to gray-brown limestones and dolomitic limestones. Oncoid and skeletal packstones predominate although wackestones and grainstones are also present. Framework grains include: oncoids, bryozoans, crinoids, forams, corals, brachiopods, algal grains, ostracodes, intraclasts and peloids (Plates 36, 29, and 40). There are also tan, intraclast-rich shoals that tend to be dolomitic limestones.

The packstones and grainstones are massive, with occasional wispy to sutured stylolitic partings (Plate 29C). Individual shoal units typically have sharp, possibly truncational, lower contacts, which generally fine-upward from the base and then coarsen-upward to the top of the shoal unit. The tops of some shoal units are capped by calcrete profiles, carbonate tidal flat and/or algal flat deposits (such as at 2781.0, 2830.0, 2883.4, 2908.5, 2947.3 and 2995.0 feet). Small euhedral dolomite rhombs are occasionally scattered throughout the wackestone and packstone, selectively replacing the micritic and organic-rich portions of the matrix (Plate 38). Larger saddle dolomite rhombs locally cements pores and partially replaces the matrix in "shoal package 10" (2955.7 - 2972.0 feet), (Plate 41). Anhydrite crystals and irregular anhydrite nodules replace and cement portions of the shoal units. The anhydrite is occasionally replaced by white to orange chert.

Pore System Properties

Routine core analysis measurements from the shoal facies (excluding one artificially fractured plug) show porosity values ranging from 2.2 to 23.6% (average of 10.9%) and permeability values ranging from <0.01 to 163 md (average of 7.44 md). The highest porosity and permeability values are from coarse-grained algal-skeletal grainstones that have well-developed intergranular pores and biomoldic pores (Plates 36, 39, 40 and 41). Wackestones and fine-grained packstones have a higher percentage of intraparticle and intercrystalline micropores within altered algal grains, peloids and micritic matrix (Plate 38). Intercrystalline micropores and intraparticle pores will increase porosity, but only marginally enhance permeability.

Calcite and anhydrite, along with lesser amounts of dolomite and chert, are the principal pore-filling cements. Thin section observations indicate a diagenetic sequence of, from earliest to latest, 1) microcrystalline dolomitization and anhydrite cementation associated with exposure surfaces (Plate 33); 2) occasional thin fringe cements in grainstones (Plates 37 and 40); 3) small, scattered dolomite rhombs associated with replacement of micritic, organic-rich sediments (Plate 38); 4) neomorphism and creation

of small intercrystalline pores and partial dissolution of grains to form moldic pores (Plate 34); 5) patchy chert replacement of calcite and anhydrite (Plate 32); 6) compaction and equant calcite cementation of larger pores (Plate 36); 7) localized moldic dissolution and pore enhancement (Plate 39); 8) localized saddle dolomite cements (Plate 42); 9) late stage anhydrite cementation/replacement; and 10) oil emplacement.

Because the shoal facies have the best reservoir potential, statistical tables were produced for all 11 "shoal packages" (Table 3). It should be noted that adjacent or interbedded shoal flank or carbonate tidal flat deposits were included in the "shoal package" statistics if they had reasonable reservoir potential. A porosity vs. permeability crossplot of the five shoal packages that show the neutron-density gas cross-over is displayed in Figure 3.

The routine core analysis data for these five "shoal packages" are listed below:

Shoal Package (Depth, ft)	Porosity Range (Average) (%)	Permeability Range (Average) (md)	Grain Density (g/cc)	Water Saturation (%)
Shoal Package 2 (2784.0 - 2790.7)	5.4 - 23.6 (12.4)	0.01 - 3.77 (1.20)	2.70	55.3
Shoal Package 3 (2801.7 - 2807.8)	3.5 - 15.2 (11.9)	0.06 - 1.16 (0.65)	2.73	66.7
Shoal Package 5 (2842.3 - 2851.5)	4.6 - 18.6 (14.1)	0.01 - 3.27 (1.53)	2.72	59.5
Shoal Package 7 (2907.8 - 2918.0)	5.6 - 16.3 (11.5)	0.01 - 8.82 (1.26)	2.73	57.4
Shoal Package 10 (2955.7 - 2972.2)	2.9 - 22.4 (13.8)	0.01 - 163 (36.9)	2.76	38.6

"Shoal package 10" has good reservoir potential, while shoal packages 2, 3, 5 and 7 have fair reservoir potential.

Interpretation:

The grain-supported, matrix-free textures and the presence of marine fossils indicate deposition in moderate- to high-energy, shallow marine, carbonate shoals. The abundance of oncoids, algal grains and ostracodes, along with the presence of capping and interstratified algal flat, tidal flat and calcrete deposits, indicate that at certain periods the water was restricted and the shoals were exposed to intertidal sedimentation. Shoals typically form "small-scale" topographic features that tend to parallel the shoreline. These shifting bars of carbonate sand often migrate in response to wind- or tide-driven currents. The significantly higher porosity and permeability values associated with "shoal package 10" is a result of the enhanced intergranular, moldic and vuggy pores. Saddle dolomite is only observed in "shoal package 10" and is associated with these secondary pores. Saddle dolomite is generally considered to form in a deep burial environment.

Shoal Flank Facies

Description:

Six shoal flank units, ranging in thickness from 1.5 to 5.0 feet, comprise 8% of the cored interval. This facies is composed of light olive-brown to tan, silty to argillaceous, limestone and dolostone. The strata are predominantly bryozoan-rich wackestones with occasional skeletal packstones. Undulatory to wispy, argillaceous, stylolitic partings are common (Plate 29,D). Portions of this facies show ripple-scale laminae, while other parts are bioturbated. The fossil constituents in the shoal flank strata include: abraded crinoids, brachiopods, bryozoans, forams and ostracodes (Plate 39).

Pore System Properties

Routine core analysis measurements from the shoal flank facies show porosity values ranging from 2.2 to 19.0% (average of 9.6%) and permeability values ranging from <0.01 to 68.4 md (average of 4.49 md). The higher porosity and permeability values are in the tan, dolomitic limestone to dolostone units that have small intercrystalline pores and occasionally moldic and vuggy pores. Light olive-brown, silty, argillaceous wackestones generally have no visible pores and poor reservoir potential.

Interpretation:

The: 1) small grain size, 2) high clay and silt content, 3) open marine fossil assemblage, and 4) burrows indicate low- to moderate-energy sedimentation, peripheral to the higher-energy shoal deposits.

Tidal Flat Facies

Description:

Four carbonate-dominated and two siliciclastic-dominated tidal flat units, ranging in thickness from 1.5 to 7.5 feet, account for roughly 8% of the cored interval. The siliciclastic tidal flat facies is composed of tan to gray, calcitic siltstones to silty calcarenites, interlaminated with argillaceous siltstones (Plate 30). The strata are usually thin-bedded, and can be flat, undulatory and ripple-laminated (Plate 29,B). Some sections are massive (such as at 2762 feet). Scattered brachiopod, ostracode, and crinoid bioclasts can be present, along with occasional vertical burrows.

The carbonate tidal flat facies is composed of tan, algal-laminated to brecciated wackestone to packstone (Plates 35 and 29,E). Brecciation reflects intertidal reworking of algal intraclasts (e.g. 2915, 2862.5, and 2863.8 feet) and/or possible in situ displacive anhydrite cementation/replacement and distention followed by dissolution

(2909 and 2883.4 feet). Breccia clasts range from algal wackestones to oncoid/peloid packstones and skeletal grains. Carbonate tidal flat deposits that cap shoal units can be dolomitic (such as at 2884.0 feet).

Pore System Properties:

Routine core analysis measurements from the tidal flat facies show porosity values ranging from 1.1 to 16.3% (average of 7.5%) and permeability values ranging from <0.01 to 1.58 md (average of 0.19 md). Most of the intergranular, fenestral and fracture pores are cemented by anhydrite and dolomite; this results in poor reservoir potential. The siliciclastic-dominated tidal flats have marginally better reservoir potential.

Interpretations:

The presence of algal laminae, fenestral pores and intraclast conglomerates indicate low- to high-energy, shallow-water to upper-intertidal sedimentation. The siliciclastic tidal flats consists of interlaminated silty calcarenite and argillaceous siltstone to sandstone that are interpreted to record suspension deposition alternating with traction transport. These processes are typical of the fluctuating energy conditions in a tidal flat environment.

Paleosol to Coastal Plain Facies

Description:

Eight paleosol to coastal plain units, ranging in thickness from 2.3 to 21.7 feet, account for roughly 36% of the cored interval. This facies is composed of red-brown to gray-green, calcareous to dolomitic, argillaceous siltstone to silty shale (Plate 29,A). Burrows and root mottling are occasionally noted. Caliche and anhydrite nodules are abundant in certain horizons, giving the rock a mottled texture. At 2952.2 to 2953.3 feet red-

brown siltstone clasts of the paleosol lithofacies are ripped-up and incorporated into the overlying shoal deposits. Rare anhydrite-filled fractures are present.

Pore System Properties:

Routine core analysis measurements from the paleosol to coastal plain facies show porosity values ranging from 5.7 to 14.5% (average of 8.6%) and permeability values ranging from <0.01 to 12.9 md (average of 0.69 md). The majority of this facies has low porosity and permeability. However, there are some units that have fairly high permeability and, to a lesser extent, porosity values (such as between 2870 - 2874, 2900 - 2907, and 2929 - 2932 feet). The anomalously high values may be due to the presence of fractures; experience with similar strata suggests that most or all of these fractures are artificial. Overall, this facies has poor, to occasionally, fair reservoir potential.

Interpretation:

The oxidized red-brown color, root mottling, caliche nodules and the lack of marine fossils indicate subaerial deposition in a paleosol to coastal plain setting.

Shelf/Lagoon

Description:

Four shelf/lagoon units, ranging in thickness from 8.7 to 39.2 feet, account for 23% of the cored interval. This facies is composed of tan, olive-brown and dark gray, wackestone, mudstone and shale. The skeletal wackestones and mudstones are argillaceous, containing wispy clay laminae (Plate 29,F). The shale and shaly siltstones are dark gray, flat and undulatory bedded and can contain fairly complete fossils. These skeletal constituents include: brachiopods, crinoids, bryozoans and occasionally corals. Rounded, irregular chert nodules give the bedding a more undulatory appearance. This

lithofacies generally has gradational contacts with adjacent the shoal flank deposits. The lowermost shelf/lagoon unit (between 3005.6 and 3044.8 feet)contains trace amounts of sphalerite [(Zn, Fe)S] and microscopic silver "needles" assumed to be millerite (NiS) or pyrite-replaced spines.

Pore System Properties:

Routine core analysis data from the shelf/lagoon facies show porosity values from 4.0 to 21.9% (average of 8.4%) and permeability values ranging from <0.01 to 10.2 md (average of 0.22 md). The high percentage of clay matrix and compaction seams, plus the paucity of interconnected macropores, give this facies poor reservoir potential (Plate 33).

Interpretation:

The carbonate mud and shale content, plus the marine biota, indicate suspension deposition in a low-energy shelf/lagoon. Lagoon and shelf sediments are both formed under low-energy, subtidal conditions; consequently, these facies have similar lithologic characteristics. Stacking sequences suggest that most of the shelf/lagoon sediments in this core formed seaward of the prograding shoals, in a shelf position.

Depositional Environment

The core is composed of eleven coarsening-upward sequences that record cyclic deposition on a shallow carbonate-dominated shelf. The oncoid- to skeletal-rich packstones/grainstones are interpreted as progradational shoals that are capped by tidal flat or paleosol to coastal plain deposits. A nearly complete sequence is shown from 2764 to 2800 feet; this interval grades up in this order: 1) shelf/lagoon wackestone, 2) shoal grainstone, 3) tidal flat siltstone/wackestone and 4) red-brown paleosol to coastal plain argillaceous siltstone. The shoal flank facies would normally be a transitional facies between the shelf/lagoon and the shoal facies. Figure 4 illustrates an idealized depositional model. The sharp boundaries and repeated stacking of the shoal and paleosol to coastal plain facies (2868 - 3005 feet) indicate the shoal was not very far from the shoreline. In a "normal" prograding sequence the shoal might be overlain by lagoon, beach, and/or tidal flat deposit and then capped by paleosol/coastal plain strata. The lack of beach deposits and the small percentage of tidal flat deposits (8%) indicates they were not well-developed or not preserved in this core. Interbedded calcretes, algal laminae, intraclast conglomerates, fenestral pores and truncational surfaces indicate that some shoals were exposed to intertidal sedimentation.

SPECIAL CORE ANALYSIS

This section of the report presents the results of electrical property measurements (m and n), air-brine capillary pressure tests, and NMR T_2 distribution measurements. The twelve test samples are:

Depth	F & m	RI & n	A-B Capillary Pressure	NMR
2782-83	X	X	X	X
2794-95	X	X	X	X
2796-97	X	X	X	X
2830-31	X	X	X	X
2848-49	X	X	X	X
2883-84	X	X	X	X
2910-11	X	X	X	X
2914-15	X	X	X	X
2935-36	X	X	X	X
2949-50	X	X	X	X
2958-59	X	X	X	X
2964-65	X	X	X	X

Thin section photomicrographs and whole thin section photographs are provided for these samples in the tabbed section for Plates.

Electrical Properties

Electrical properties were determined for all twelve samples. These measurements consisted of determining Formation Factor (F) and Resistivity Index (RI), along with the calculation of Archie exponents m and n. These measurements were conducted at a confining pressure of 1360 psi, using a simulated formation brine with an Rw of 0.0461 ohm-m at 77° F. The Formation Factors range from 22.11 to 327.92 for samples having porosity values (at confining pressure) of 6.3 to 20.8%. The calculated cementation exponents (m) range from 1.77 to 2.24. Ten of the twelve samples have m values between 1.87 and 2.13. The composite (average) m value is 1.98. These data are summarized in Table 4 and Figure 5. Eight samples from the Pioneer Natural

Resources Newby 2-28R Well in Stevens County, Kansas showed m values ranging from 1.84 to 2.11, with a composite m value of 1.99 (see Reservoirs' Job Number RSH 3821-January, 1998).

Resistivity Index and Archie saturation exponent "n" were also determined (Tables 5 through 16 and Figures 6 to 18). The n values range from 2.04 to 2.30. The average or composite n value is 2.19 (Figure 18). The n values for the eight samples from the Newby 2-28R well range from 2.05 to 2.30, with an average or composite value of 2.15. Water saturation values should be calculated using these laboratory values.

Capillary Pressure

Air-brine capillary pressure data were generated on the same twelve samples used to measure electrical properties. The air-brine capillary pressures were determined by the porous plate cell method, with capillary pressures ranging from 0 to 200 psi. The data are presented in Tables 17 through 28, and in Figures 19 through 30.

The sample from 2782-83 feet has the highest irreducible water saturation (84.7% at 200 psi). This sample has a porosity of 7.9% and the lowest permeability (0.02 md) within this sample suite. The sample at 2958-59 feet has the lowest irreducible water saturation (12.8% at 200 psi); this sample has the highest porosity (21.9%) and the highest permeability (122 md) the sample suite. The remaining 10 samples have irreducible water saturations between 18.1 and 80.1%. This broad range of values reflects the variability in pore structure as well as the underlying differences in depositional texture and diagenetic alterations.

NMR Analysis

NMR T_2 distributions were generated at 100% water saturation and partial water saturation (Swi) for the same twelve samples used for electrical properties and capillary pressure tests. The T_2 distributions are displayed by plotting the amplitude versus the T_2

relaxation times on a logarithmic scale (Figures 34 through 57). The T_2 distributions are used to calculate NMR porosity, free fluid index (FFI), bulk volume irreducible (BVI), and T_2 mean logarithmic relaxation times (T_{2ml}). Total NMR porosity is proportional to the area under the T_2 distribution curve. The NMR T_2 distributions were generated using a echo spacing of 1.20 ms and a signal to noise ratio of 100:1. In addition, the measured irreducible water saturations were determined at the end point values (200 psi) of the air-brine capillary pressure tests. The NMR data are summarized in Table 29.

NMR porosities range from 5.8 to 19.9%; these values are 0.6 to 1.8 pu lower than corresponding helium porosities measured during routine core analysis. "Effective" porosity was calculated from the T_2 distributions using a T_2 minimum of 3 ms, which is a standard cut-off used for "clay bound" water. Effective porosity values range from 3.5 to 19.9%. Many of the samples show close agreement between total NMR porosity and effective porosity (Table 29).

The analyzed samples have unimodal to multimodal T_2 relaxation curve profiles and exhibit a wide range of mean logarithmic T_2 values. T_{2ml} values range from a low of 5.6 ms for the dolomitic lime-mudstone sample at 2883 - 84 feet, to in excess of 200 ms for the more porous and permeable samples at 2910 - 11, 2949 - 50, 2958 - 59, and 2964 - 65 feet. All of the samples that have T_{2ml} values in excess of 200 ms have permeability values greater than 1 md.

T_2 measurements were also generated on the carbonates at irreducible brine saturation (Swi) in order to determine T_2 cut-offs for separating BVI from FFI, and to compare calculated NMR Swi values with measured core Swi data. The T_2 cut-offs range from 10 to 175 ms, with an average T_2 cut-off of 90 ms, a value close to the standard 92 ms T_2 cut-off employed for carbonates. Unlike the samples from the Newby 2-28R well, these samples from the Stuart 3-34R well show a poor statistical correlation between T_2 cut-off and T_{2ml} values (Figure 31).

The BVI values at partial brine saturation range from 2.7 to 17.2 pu and the corresponding FFI's are 0.9 to 17.2 pu. The permeable samples have relatively high FFI:BVI ratios. Deviations from this relationship (such as in the sample from 2883 - 84 feet) probably reflect the presence of induced (?) fractures. Calculated Swi values range from 13.4 to 86.9%. These irreducible water saturations are in good agreement with Swi values determined by air-brine capillary pressure tests.

Two permeability model have been evaluated for the carbonates in this well. These models are illustrated in Figures 32 and 33.

Mean T_2 Model

This model estimates permeability as a function of the mean logarithmic T_2 value. The equation tends to work well for intergranular pore systems and is in the form:

$$K = C\, T_{2ml}^{2}\, \emptyset^{4}$$

where T_{2ml} is the mean logarithmic T_2 value and C is a constant. The linear regression of this crossplot yields a very high correlation coefficient of 0.931 (Figure 32), although the spread of data points produces some uncertainties. Specifically, there are no samples with permeability values between 10 and 100 md.

Coate's Permeability Model

This model is referred to as the standard Coate's equation:

$$K = 10^{-4}\, \emptyset^{4}\, (FFI/BVI)^{2}$$

the Coate's equation can be arranged in the form of:

$$(FFI/BVI)^{0.5} = m(K^{.25}/\emptyset).$$

This calculation yields a slope of 12.686 and a correlation coefficient of 0.796 (after removing one extraneous data point) (Figure 33).

FIGURE 1

CORE TO LOG CORRELATION
PIONEER NATURAL RESOURCES USA, INC.
STUART 3–34R WELL
GRANT COUNTY, KANSAS

LOG DEPTH = CORE DEPTH

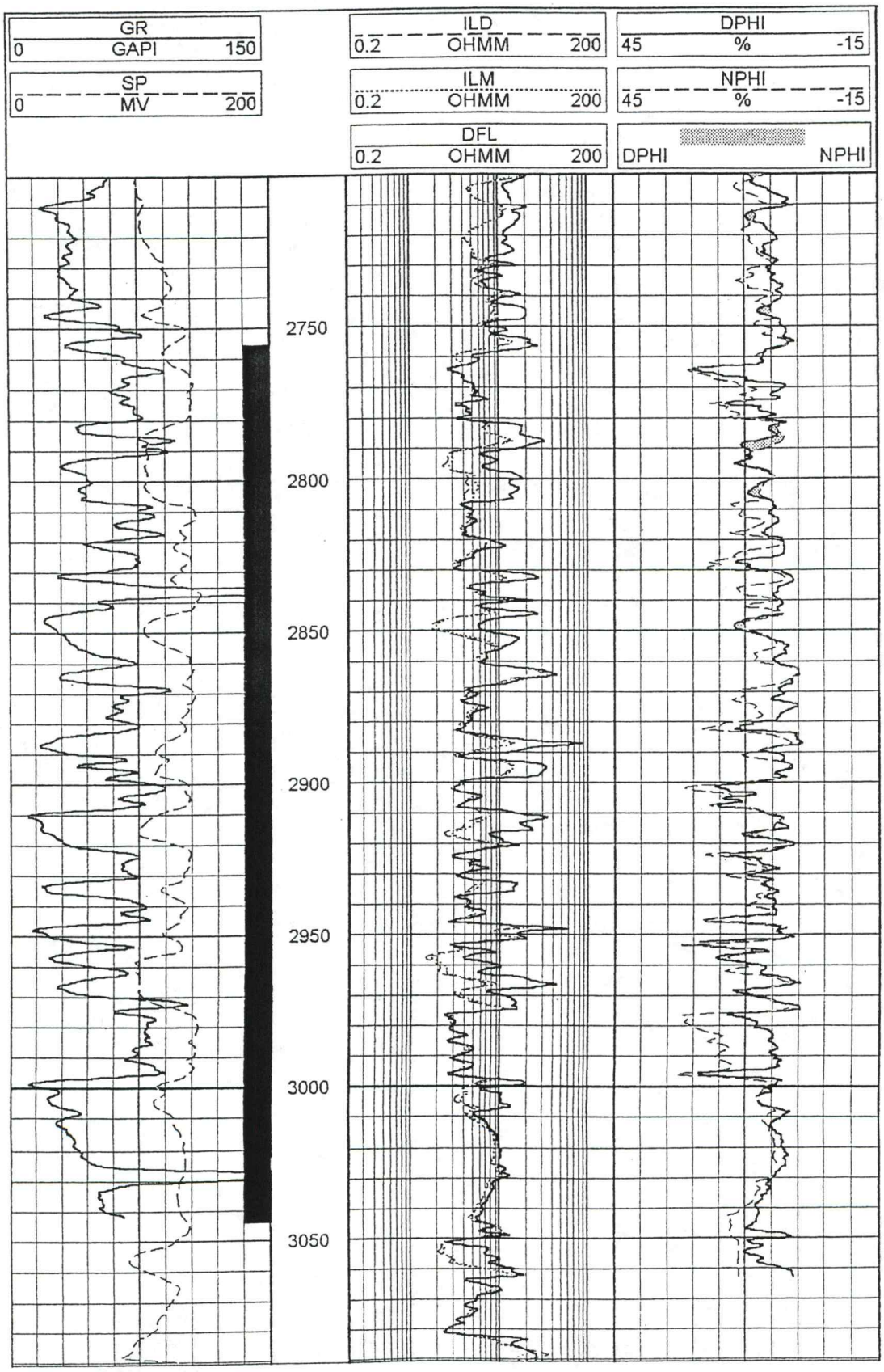

FIGURE 1

CORE TO LOG CORRELATION
PIONEER NATURAL RESOURCES USA, INC.
STUART 3–34R WELL
GRANT COUNTY, KANSAS
LOG DEPTH = CORE DEPTH

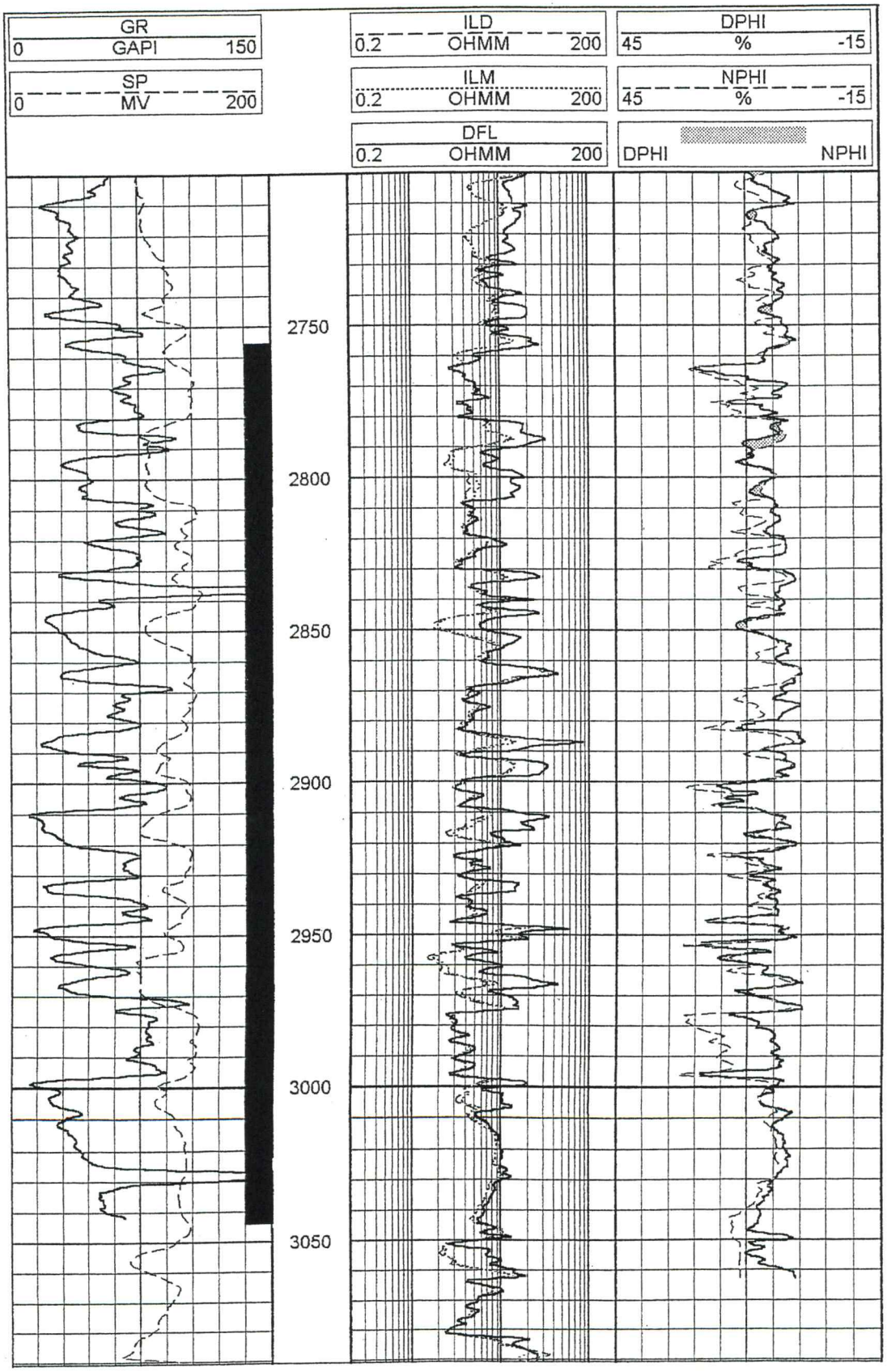

TABLE 1
PIONEER NATURAL RESOURCES
ROUTINE CORE ANALYSIS
Stuart 3-34R Well
Grant County, Kansas

Sample No.	Depth (ft)	Porosity (%BV)	Permeability (md)	Grain Density (g/cc)	% FLUIDS Water	% FLUIDS Oil	ROP	OIL FLOR	Facies	Shoal Package	LITHOLOGY
1	2755	4.5	0.71	2.71	53.8	0.0	5	0	SO1	1	Ls sl slty tr fos tr por
2	2756	8.1	0.03	2.72	42.4	0.0	5	0	SO1	1	Ls sl-mod slty tr fos tr-sct por
3	2757	9.4	0.08	2.69	61.5	0.0	5	0	SO1	1	Ls mod slty tr sdy tr-sct por
4	2758	9.	0.1	2.69	58.3	0.0	4	0	TF		Ls mod slty tr sdy tr-sct por
5	2759	10.1	0.01	2.70	69.8	0.0	4	0	TF		Ls mod slty sl-tr sdy sct por
6	2760	11.1	0.06	2.68	66.9	0.0	4	0	TF		Ls sl-mod slty sl sdy sct por
7	2761	9.1	0.02	2.68	67.8	0.0	5	0	TF		Ls sl-mod slty sl sdy tr-sct por
8	2762	9.5	0.01	2.68	71.5	0.0	4	0	TF		Ls sl-mod slty sl sdy tr-sct por
9	2763	10.9	0.52	2.69	70.8	0.0	5	0	TF		Ls sl-mod slty sl sdy sct por
	2764	NO ANALYSIS					4		PS		No sample selected for analysis
	2765	NO ANALYSIS					5		PS		No sample selected for analysis
11	2766	9.1	TBFA	2.72	71.5	0.0	5	0	PS		Rdbd brn-rdbrn mod slty sl calc frac tr por
12	2767	7.	TBFA	2.81	80.7	0.0	9	0	PS		Rdbd brn-rdbrn slty anhy incl calc frac tr por
13	2768	16.	TBFA	2.79	70.0	0.0	8	0	PS		Rdbd brn-rdbrn slty anhy incl calc frac tr por
14	2769	9.	TBFA	2.73	74.5	0.0	7	0	PS		Rdbd rdbrn-gygn mod slty mod calc frac tr por
15	2770	10.1	<0.01	2.79	72.9	0.0	6	0	PS		Rdbd brn-rdbrn slty anhy incl calc tr por
16	2771	8.9	<0.01	2.73	84.1	0.0	6	0	PS		Rdbd rdbrn-brn mod slty mod calc tr por
17	2772	8.8	9.02	2.72	89.9	0.0	12	0	PS		Rdbd rdbrn-brn mod slty mod calc frac tr por
18	2773	8.7	TBFA	2.74	78.4	0.0	9	0	PS		Rdbd rdbrn-brn mod slty mod calc frac tr por
19	2774	8.1	<0.01	2.72	77.7	0.0	8	0	PS		Rdbd rdbrn-brn mod slty tr calc tr por
20	2775	3.5	TBFA	2.91	91.0	0.0	10	0	PS		Rdbd rdbrn anhy incl sl calc frac tr por
21	2776	8.9	TBFA	2.74	91.2	0.0	13	0	PS		Rdbd brn-rdbrn mod slty sl sdy frac tr por
22	2777	13.6	TBFA	2.75	96.2	0.0	15	0	PS		Rdbd brn-rdbrn mod slty sl sdy frac sct por
23	2778	13.	TBFA	2.73	98.0	0.0	11	0	PS		Rdbd brn-rdbrn mod slty sl sdy frac sct por
24	2779	7.6	<0.01	2.73	89.9	0.0	15	0	PS		Rdbd brn-rdbrn mod slty sl sdy tr por
25	2780	16.2	TBFA	2.74	83.3	0.0	13	0	PS		Sh gy-gygn mod slty frac
26	2781	6.2	0.01	2.76	57.5	0.0	4	0	TF		Ls tr-sl slty sl dol tr por
27	2782	7.9	0.02	2.69	46.3	0.0	3	0	TF		Ls tr-sl slty tr fos tr por

TBFA = Too Broken For Analysis.
No Analysis = No analysis was done at this depth.

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TABLE 1 (CONTINUED)
PIONEER NATURAL RESOURCES
ROUTINE CORE ANALYSIS
Stuart 3-34R Well
Grant County, Kansas

Sample No.	Depth (ft)	Porosity (%BV)	Permeability (md)	Grain Density (g/cc)	% FLUIDS Water	% FLUIDS Oil	ROP	OIL FLOR	Facies	Shoal Package	LITHOLOGY
28	2783	8.9	0.03	2.69	62.0	0.0	3	0	TF		Ls tr-sl slty tr fos tr por
29	2784	8.	0.01	2.71	56.6	0.0	3	0	TF		Ls tr-sl slty tr fos tr por
30	2785	7.2	0.01	2.71	64.9	0.0	4	0	SO2	2	Ls tr-sl slty tr fos tr por
31	2786	5.4	<0.01	2.71	45.0	0.0	3	0	SO2	2	Ls tr-sl slty tr fos tr por
32	2787	10.8	0.56	2.71	43.6	0.0	2	0	SO2	2	Ls tr-sl slty sl fos sct por
33	2788	14.2	2.24	2.72	52.2	0.0	2	0	SO2	2	Ls tr-sl slty sl fos sct por
34	2789	16.	3.77	2.71	59.7	0.0	3	0	SO2	2	Ls tr-sl slty sl fos sct por
35	2790	14.1	1.01	2.71	51.9	0.0	4	0	SO2	2	Ls tr-sl slty sl fos sct por
36	2791	23.6	1.95	2.65	68.8	0.0	2	0	SO2	2	Ls sl slty slty lam tr fos sct por
37	2792	8.5	<0.01	2.73	75.5	0.0	3	0	SL		Ls tr-sl slty sl fos sct anhy tr por
38	2793	9.	0.02	2.72	63.2	0.0	3	0	SL		Ls sl slty sl fos tr lam tr-sct por
39	2794	12.1	0.09	2.72	65.4	0.0	2	0	SL		Ls sl slty sl fos slty lam sct por
40	2795	16.1	0.4	2.70	67.0	0.0	3	0	SL		Ls sl slty sl fos slty lam sct por
41	2796	21.9	0.4	2.67	76.3	0.0	2	0	SL		Ls sl slty sl fos slty lam sct por
42	2797	8.6	<0.01	2.76	66.7	0.0	4	0	SL		Ls mod-sl slty tr fos tr lam tr por
43	2798	8.8	0.02	2.72	59.0	0.0	3	0	SL		Ls mod-sl slty tr fos tr lam tr por
44	2799	10.4	0.23	2.71	54.8	0.0	3	0	SL		Ls sl-mod slty sl fos tr lam sct por
45	2800	8.4	0.04	2.72	51.0	0.0	3	0	SL		Ls mod-sl slty tr fos tr lam tr por
46	2801	17.6	0.84	2.68	70.7	0.0	3	0	SL		Ls sl-mod slty sl fos tr lam sct por
47	2802	14.4	0.94	2.71	64.2	0.0	3	0	SO3	3	Ls sl-mod slty sl fos tr lam sct por
48	2803	14.2	1.16	2.72	61.8	0.0	3	0	SO3	3	Ls sl-mod slty sl fos tr lam sct por
49	2804	15.2	1.16	2.72	61.9	0.0	3	0	SO3	3	Ls sl-mod slty sl fos tr lam sct por
50	2805	3.5	0.06	2.81	83.5	0.0	3	0	SO3	3	Ls sl slty anhy incl sl fos tr por
51	2806	12.9	0.41	2.71	64.2	0.0	3	0	SO3	3	Ls sl slty sl fos sct por
52	2807	11.2	0.19	2.71	64.4	0.0	3	0	SO3	3	Ls sl slty sl fos sct por
53	2808	8.9	TBFA	2.70	89.8	0.0	10	0	PS		Sh gy-dkgy mod slty frac tr calc
54	2809	9.	TBFA	2.72	85.7	0.0	15	0	PS		Sh gy-dkgy mod slty frac tr calc
55	2810	8.2	<0.01	2.74	82.8	0.0	21	0	PS		Sltst brn sl-tr sdy tr calc tr por

TBFA = Too Broken For Analysis.
No Analysis = No analysis was done at this depth.

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TABLE 1 (CONTINUED)
PIONEER NATURAL RESOURCES
ROUTINE CORE ANALYSIS
Stuart 3-34R Well
Grant County, Kansas

Sample No.	Depth (ft)	Porosity (%BV)	Permeability (md)	Grain Density (g/cc)	% FLUIDS Water	% FLUIDS Oil	ROP	OIL FLOR	Facies	Shoal Package	LITHOLOGY
56	2811	7.7	<0.01	2.72	92.7	0.0	20	0	PS		Sltst brn sl-tr sdy tr calc tr por
57	2812	10.9	TBFA	2.71	83.9	0.0	13	0	PS		Sltst brn sl-tr sdy tr calc frac tr por
58	2813	7.	2.41	2.72	87.7	0.0	3	0	PS		Sltst brn sl-tr sdy tr calc frac tr por
59	2814	8.5	<0.01	2.69	82.7	0.0	4	0	PS		Rdbd rdbrn-brn sl slty sl-mod sdy sl calc tr por
60	2815	8.3	0.01	2.69	88.5	0.0	4	0	PS		Rdbd rdbrn-brn sl slty sl-mod sdy sl calc tr por
61	2816	9.6	0.01	2.70	77.7	0.0	3	0	PS		Rdbd rdbrn-brn sl slty sl-mod sdy sl calc tr por
62	2817	9.1	<0.01	2.72	77.5	0.0	6	0	PS		Rdbd rdbrn-brn sl slty sl-mod sdy sl calc tr por
63	2818	6.2	0.25	2.71	80.0	0.0	4	0	PS		Rdbrn brn-rdbrn sl slty/sdy tr anhy sl calc tr por
64	2819	5.7	<0.01	2.69	65.2	0.0	3	0	PS		Rdbrn brn-rdbrn sl slty/sdy tr anhy sl calc tr por
65	2820	5.9	<0.01	2.70	74.2	0.0	3	0	PS		Rdbrn brn-rdbrn sl slty/sdy tr anhy sl calc tr por
66	2821	6.8	0.02	2.70	58.1	0.0	3	0	PS		Rdbrn brn-rdbrn sl slty/sdy tr anhy sl calc tr por
67	2822	6.6	<0.01	2.69	71.5	0.0	4	0	PS		Rdbrn brn-rdbrn sl slty/sdy tr anhy sl calc tr por
68	2823	9.2	12.95	2.71	95.6	0.0	5	0	PS		Rdbrn brn-rdbrn sl slty/sdy tr anhy sl calc tr por
69	2824	9.1	TBFA	2.73	96.0	0.0	15	0	PS		Sh gy-gygn sl slty frac tr calc
70	2825	11.	TBFA	2.72	93.6	0.0	12	0	PS		Sh gy-gygn sl slty frac tr calc
71	2826	14.5	0.09	2.81	65.5	0.0	14	0	PS		Dol tr slty tr fos slty lam sct por
72	2827	10.3	<0.01	2.75	58.8	0.0	15	0	PS		Sltst dkgy-gy sl calc tr-sl sdy sct por
73	2828	10.2	TBFA	2.77	74.9	0.0	10	0	PS		Ls sl-mod slty anhy incl sltst incl frac sct por
74	2829	13.1	0.02	2.79	71.3	0.0	7	0	SO4	4	Ls sl-mod slty anhy incl sct por
75	2830	15.6	0.29	2.82	62.1	0.0	4	0	SO4	4	Ls sl slty sl anhy sl dol sct por
76	2831	6.1	<0.01	2.71	62.9	0.0	4	0	SO4	4	Ls tr slty tr fos tr por
77	2832	6.	0.01	2.74	67.0	0.0	8	0	SO4	4	Ls tr slty tr anhy tr fos tr por
78	2833	6.1	0.01	2.76	55.8	0.0	9	0	SF		Ls tr slty sct anhy sl fos tr por
79	2834	8.	<0.01	2.77	77.6	0.0	7	0	SF		Ls tr slty sct anhy sl fos tr por
80	2835	10.6	0.01	2.75	80.6	0.0	8	0	SL		Ls sl slty sl anhy sl fos sct por
81	2836	9.4	TBFA	2.72	78.4	0.0	9	0	SL		Sltst gybrn slty lam sh ptg sl sdy frac tr por
82	2837	7.6	<0.01	2.74	75.8	0.0	6	0	SL		Sh blk-gyblk abnt fos sct Ls incl mod calc
83	2838	11.5	10.18	2.74	82.7	0.0	12	0	SL		Sh blk-gyblk abnt fos sct Ls incl mod calc

TBFA = Too Broken For Analysis.
No Analysis = No analysis was done at this depth.

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TABLE 1 (CONTINUED)
PIONEER NATURAL RESOURCES
ROUTINE CORE ANALYSIS
Stuart 3-34R Well
Grant County, Kansas

Sample No.	Depth (ft)	Porosity (%BV)	Permeability (md)	Grain Density (g/cc)	% FLUIDS Water	% FLUIDS Oil	ROP	OIL FLOR	Shoal Facies	Shoal Package	LITHOLOGY
84	2839	5.4	<0.01	2.71	73.2	0.0	4	0	SL		Ls mod slty tr fos slty lam tr por
85	2840	5.6	TBFA	2.60	95.5	0.0	5	0	SL		Ss gy-ltgy vfgr slty lam frac sl calc tr por
86	2841	9.8	<0.01	2.75	94.0	0.0	6	0	SL		Sltst gy sl-mod sdy sl calc tr por
87	2842	5.7	<0.01	2.71	61.5	0.0	7	0	SL		Ls mod slty tr fos slty lam tr por
88	2843	4.6	<0.01	2.77	53.8	0.0	3	0	SO5	5	Ls sl slty sct anhy tr fos tr por
89	2844	15.5	2.51	2.71	51.8	0.0	3	0	SO5	5	Ls tr slty sct fos sct por
90	2845	16.4	3.27	2.70	60.7	0.0	4	0	SO5	5	Ls tr slty sct fos sct por
91	2846	18.3	2.1	2.71	66.6	0.0	4	0	SF	5	Ls tr slty sct fos sct por
92	2847	18.6	2.77	2.70	61.7	0.0	3	0	SF	5	Ls tr slty sct fos sct por
93	2848	16.5	0.95	2.71	65.6	0.0	3	0	SF	5	Ls tr slty sct fos sct por
94	2849	17.1	1.16	2.72	62.9	0.0	2	0	SF	5	Ls tr slty sct fos sct por
95	2850	13.7	0.98	2.75	57.2	0.0	3	0	SF	5	Ls tr slty sl fos sl anhy sct por
96	2851	6.5	<0.01	2.75	55.6	0.0	2	0	SF	5	Ls tr slty tr fos sl anhy tr por
97	2852	10.2	0.06	2.69	72.6	0.0	3	0	SL		Ls sl-mod slty tr fos sct por
98	2853	6.7	<0.01	2.71	56.0	0.0	3	0	SL		Ls sl-mod slty tr fos tr por
99	2854	6.3	0.01	2.70	75.4	0.0	3	0	SL		Ls sl-mod slty tr fos tr por
100	2855	6.4	<0.01	2.69	84.9	0.0	6	0	SL		Ls sl-mod slty tr fos tr por
101	2856	8.9	0.05	2.77	81.2	0.0	9	0	SL		Ls mod-v slty sl anhy slty lam tr por
102	2857	7.4	TBFA	2.74	86.7	0.0	7	0	SL		Sh blk abnt Ls incl frac sct anhy
103	2858	8.	0.01	2.71	70.5	0.0	5	0	SL		Ls mod-v slty tr anhy slty lam tr por
104	2859	6.4	0.03	2.75	81.5	0.0	7	0	SL		Ls mod-v slty tr anhy slty lam tr por
105	2860	8.3	<0.01	2.72	74.1	0.0	12	0	SL		Ls mod-v slty tr anhy slty lam tr por
106	2861	1.9	<0.01	2.71	69.6	0.0	7	0	TF		Ls sl slty tr fos tr por
107	2862	1.1	<0.01	2.71	68.2	0.0	7	0	TF		Ls sl slty tr fos tr por
108	2863	1.4	<0.01	2.71	67.5	0.0	9	0	TF		Ls sl slty tr fos tr por
109	2864	4.	<0.01	2.71	61.1	0.0	16	0	TF		Ls sl slty tr fos tr por
110	2865	6.1	<0.01	2.74	60.1	0.0	22	0	TF		Ls sl slty tr fos tr por
111	2866	5.2	<0.01	2.75	67.9	0.0	12	0	TF		Ls sl slty tr fos tr por

TBFA = Too Broken For Analysis.
No Analysis = No analysis was done at this depth.

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TABLE 1 (CONTINUED)
PIONEER NATURAL RESOURCES
ROUTINE CORE ANALYSIS
Stuart 3-34R Well
Grant County, Kansas

Sample No.	Depth (ft)	Porosity (%BV)	Permeability (md)	Grain Density (g/cc)	% FLUIDS Water	% FLUIDS Oil	ROP	OIL FLOR	Shoal Facies	Shoal Package	LITHOLOGY
112	2867	5.7	<0.01	2.72	71.9	0.0	8	0	TF		Ls sl slty tr fos tr por
113	2868	11.1	TBFA	2.75	91.7	0.0	4	0	PS		Sltst gy tr dol tr sdy grdg to sh
114	2869	8.2	TBFA	2.76	90.0	0.0	15	0	PS		Sltst gy tr dol tr sdy grdg to sh
115	2870	9.8	<0.01	2.79	51.8	0.0	6	0	PS		Rdbd rdbrn mod slty sl sdy sl anhy sct por
116	2871	10.2	0.02	2.75	77.5	0.0	18	0	PS		Ls mod-v slty sct fos grdg to sh sct por
117	2872	11.7	TBFA	2.72	92.0	0.0	10	0	PS		Rdbd brn-rdbrn sl slty tr calc frac sct por
118	2873	14.	0.05	2.80	73.7	0.0	13	0	PS		Rdbd slty tr sdy sl dol sct por
119	2874	5.8	0.49	2.86	95.9	0.0	13	0	PS		Rdbd slty tr sdy sl dol sct anhy tr por
120	2875	6.9	TBFA	2.86	81.1	0.0	11	0	PS		Rdbd slty tr sdy sl dol sct anhy frac tr por
121	2876	5.	TBFA	2.82	93.4	0.0	7	0	PS		Rdbd slty tr sdy sl dol sl anhy frac tr por
122	2877	9.	0.01	2.73	87.7	0.0	8	0	PS		Rdbd brn-rdbrn mod slty tr sdy sl calc tr por
123	2878	7.6	<0.01	2.74	90.4	0.0	8	0	PS		Rdbd brn-rdbrn mod slty tr sdy sl calc tr por
124	2879	10.4	0.01	2.76	78.1	0.0	23	0	PS		Rdbd brn-rdbrn mod slty tr sdy sl calc sct por
125	2880	12.8	TBFA	2.73	92.0	0.0	17	0	PS		Rdbd brn-rdbrn mod slty tr sdy frac sct por
126	2881	8.9	<0.01	2.75	85.5	0.0	27	0	PS		Rdbd brn-rdbrn mod slty tr sdy sl calc tr por
	2882	NO ANALYSIS					10		PS		No sample selected for analysis
127	2883	6.4	1.58	2.78	79.3	0.0	6	0	TF		Ls sl slty tr dol tr-sl anhy frac tr por
128	2884	5.8	<0.01	2.78	61.4	0.0	5	0	TF		Ls sl slty tr dol sl-tr anhy tr por
129	2885	7.8	<0.01	2.75	56.8	0.0	5	0	TF		Ls sl slty tr dol sl-tr anhy tr por
130	2886	4.	<0.01	2.75	61.4	0.0	5	0	SO6	6	Ls sl slty tr dol sl-tr anhy tr por
131	2887	2.2	0.02	2.87	52.0	0.0	3	0	SO6	6	Ls sl slty tr dol anhy incl tr por
132	2888	13.8	0.79	2.71	60.5	0.0	4	0	SO6	6	Ls tr slty sct fos sct por
133	2889	11.3	0.25	2.74	63.3	0.0	4	0	SO6	6	Ls tr slty sct fos sct por
134	2890	12.4	0.17	2.80	53.0	0.0	5	0	SO6	6	Dol sl slty tr fos sl calc sct por
135	2891	10.6	0.01	2.80	82.5	0.0	5	0	SO6	6	Dol sl-mod slty tr fos sl calc sct por
136	2892	4.8	<0.01	2.75	85.5	0.0	4	0	SF	6	Ls sl slty sl dol tr fos tr por
137	2893	6.2	0.02	2.71	61.5	0.0	4	0	SF	6	Ls sl slty tr fos tr por
138	2894	4.9	<0.01	2.71	63.5	0.0	5	0	SF	6	Ls sl slty tr fos tr por

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TABLE 1 (CONTINUED)
PIONEER NATURAL RESOURCES
ROUTINE CORE ANALYSIS
Stuart 3-34R Well
Grant County, Kansas

Sample No.	Depth (ft)	Porosity (%BV)	Permeability (md)	Grain Density (g/cc)	% FLUIDS Water	% FLUIDS Oil	ROP	OIL FLOR	Facies	Shoal Package	LITHOLOGY
139	2895	5.	0.14	2.71	62.0	0.0	4	0	SO6	6	Ls sl slty tr fos tr por
140	2896	8.9	0.06	2.71	64.7	0.0	4	0	SO6	6	Ls sl slty tr fos tr-sct por
141	2897	9.1	0.08	2.71	66.5	0.0	4	0	SO6	6	Ls sl slty tr fos tr-sct por
142	2898	4.1	<0.01	2.72	62.9	0.0	7	0	SO6	6	Ls sl slty tr fos tr por
143	2899	12.8	TBFA	2.69	91.8	0.0	10	0	PS		Sltst gy sl sdy non calc frac sct por
144	2900	9.	8.13	2.68	90.8	0.0	18	0	PS		Sltst gy sl sdy sl calc frac sct por
	2901	NO ANALYSIS					19		PS		No sample selected for analysis
145	2902	11.	TBFA	2.71	91.3	0.0	10	0	PS		Rdbd rdbrn gygn mod slty tr anhy frac sct por
146	2903	6.2	0.05	2.70	93.2	0.0	13	0	PS		Rdbd rdbrn mod slty tr sdy tr por
147	2904	8.5	TBFA	2.70	88.9	0.0	20	0	PS		Rdbd rdbrn mod slty tr sdy frac tr por
148	2905	11.9	TBFA	2.69	87.5	0.0	13	0	PS		Rdbd rdbrn mod slty sl sdy frac sct por
149	2906	13.1	TBFA	2.67	89.4	0.0	13	0	PS		Rdbd rdbrn mod slty sl-mod sdy frac sct por
150	2907	9.6	0.07	2.81	82.7	0.0	3	0	PS		Dol sl slty tr rdbd tr-sct por
151	2908	10.4	0.48	2.73	47.3	0.0	5	0	TF	7	Ls sl slty sl fos sct por
152	2909	15.6	1.21	2.71	50.9	0.0	5	0	SO7	7	Ls sl slty sl fos sct por
153	2910	14.2	8.82	2.71	43.4	0.0	4	0	SO7	7	Ls sl slty sl fos sct por
154	2911	5.6	0.01	2.71	55.0	0.0	4	0	SO7	7	Ls sl slty tr fos tr por
155	2912	11.1	0.22	2.71	54.9	0.0	4	0	SO7	7	Ls sl slty sl fos sct por
156	2913	9.9	0.28	2.76	57.3	0.0	4	0	SO7	7	Ls sl slty sl fos sl anhy sct por
157	2914	10.4	0.56	2.82	58.0	0.0	4	0	TF	7	Ls sl slty sl fos sct anhy incl sct por
158	2915	6.9	0.44	2.79	62.8	0.0	4	0	TF	7	Ls sl slty sl fos sct anhy tr por
159	2916	16.3	0.56	2.71	72.1	0.0	5	0	TF	7	Ls sl slty sl fos sct por
160	2917	16.3	1.08	2.70	69.1	0.0	5	0	SO7	7	Ls tr-sl slty sct fos sct por
161	2918	10.	0.21	2.68	60.7	0.0	7	0	SO7	7	Ls tr-sl slty sl fos sct por
162	2919	4.2	0.01	2.71	67.6	0.0	7	0	SF		Ls sl slty tr fos slty lam tr por
163	2920	2.2	<0.01	2.72	67.6	0.0	8	0	SF		Ls sl slty tr fos tr por
164	2921	6.1	0.01	2.71	79.1	0.0	16	0	SF		Ls mod slty sl fos slty lam tr por
165	2922	7.	0.01	2.71	80.2	0.0	24	0	PS		Rdbd rdbrn-brn slty tr sdy sl-mod calc tr por

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TABLE 1 (CONTINUED)
PIONEER NATURAL RESOURCES
ROUTINE CORE ANALYSIS
Stuart 3-34R Well
Grant County, Kansas

Sample No.	Depth (ft)	Porosity (%BV)	Permeability (md)	Grain Density (g/cc)	% FLUIDS Water	% FLUIDS Oil	ROP	OIL FLOR	Facies	Shoal Package	LITHOLOGY
166	2923	7.6	0.01	2.70	80.3	0.0	13	0	PS		Rdbd rdbrn-brn slty tr sdy sl-mod calc tr por
167	2924	13.2	TBFA	2.70	90.8	0.0	10	0	PS		Rdbd rdbrn-brn slty tr sdy tr calc frac sct por
168	2925	6.7	0.01	2.69	89.4	0.0	15	0	PS		Rdbd rdbrn-brn slty sl sdy sl-mod calc tr por
169	2926	7.1	<0.01	2.70	90.5	0.0	8	0	PS		Rdbd rdbrn-brn slty tr sdy sl-mod calc tr por
170	2927	7.8	<0.01	2.70	73.6	0.0	8	0	PS		Rdbd rdbrn-brn slty tr sdy sl-mod calc tr por
171	2928	6.9	0.01	2.71	79.9	0.0	13	0	PS		Rdbd rdbrn-brn slty tr sdy sl-mod calc tr por
172	2929	11.6	0.02	2.72	86.0	0.0	17	0	PS		Rdbd rdbrn-brn slty tr sdy sl calc sct por
173	2930	12.7	0.08	2.74	83.0	0.0	10	0	PS		Rdbd rdbrn-brn slty tr sdy sl calc sct por
174	2931	10.8	TBFA	2.72	79.0	0.0	4	0	PS		Rdbd rdbrn-brn slty tr sdy tr calc frac sct por
175	2932	4.5	TBFA	2.71	75.8	0.0	4	0	PS		Rdbd rdbrn-brn slty tr sdy tr calc frac tr por
176	2933	10.5	1.16	2.73	47.7	0.0	6	0	SO8	8	Ls tr-sl slty sl fos sct por
177	2934	13.8	2.39	2.71	43.6	0.0	5	0	SO8	8	Ls tr-sl slty sl fos sct por
178	2935	11.4	0.16	2.72	53.6	0.0	4	0	SO8	8	Ls tr-sl slty sl fos sct por
179	2936	9.5	0.08	2.75	43.1	0.0	4	0	SO8	8	Ls tr-sl slty sl fos sl anhy sct por
180	2937	9.1	0.06	2.75	47.9	0.0	6	0	SO8	8	Ls tr-sl slty sl fos sl anhy sct por
181	2938	7.1	0.04	2.67	88.3	0.0	8	0	PS		Rdbd rdbrn mod slty sl-mod sdy mod calc tr por
182	2939	7.4	0.02	2.69	84.7	0.0	5	0	PS		Rdbd rdbrn mod slty sl-mod sdy mod calc tr por
183	2940	8.1	1.73	2.69	81.9	0.0	5	0	PS		Rdbd rdbrn mod slty sl-mod sdy mod calc tr por
184	2941	11.1	TBFA	2.70	88.5	0.0	5	0	PS		Sh rdbrn slty tr sdy tr calc frac
185	2942	6.6	0.02	2.68	70.2	0.0	7	0	PS		Rdbd rdbrn mod slty sl-mod sdy mod calc tr por
186	2943	7.3	0.01	2.70	55.2	0.0	8	0	PS		Rdbd rdbrn mod slty sl-mod sdy mod calc tr por
187	2944	7.2	0.01	2.70	62.7	0.0	6	0	PS		Rdbd rdbrn mod slty sl-mod sdy mod calc tr por
188	2945	9.7	0.01	2.71	61.7	0.0	3	0	PS		Rdbd rdbrn mod slty mod sdy mod calc sct por
189	2946	6.9	TBFA	2.71	72.6	0.0	3	0	PS		Ls mod slty-slty tr anhy frac tr por
190	2947	5.1	<0.01	2.72	24.7	0.0	3	0	SO9	9	Ls tr-sl slty tr fos tr por
191	2948	7.3	0.22	2.73	22.7	0.0	4	0	SO9	9	Ls tr-sl slty tr fos tr por
192	2949	10.2	1.29	2.71	23.6	0.0	4	0	SO9	9	Ls tr-sl slty tr fos sct por
193	2950	11.1	0.28	2.70	25.4	0.0	3	0	SO9	9	Ls tr-sl slty tr fos sct por

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TABLE 1 (CONTINUED)
PIONEER NATURAL RESOURCES
ROUTINE CORE ANALYSIS
Stuart 3-34R Well
Grant County, Kansas

Sample No.	Depth (ft)	Porosity (%BV)	Permeability (md)	Grain Density (g/cc)	% FLUIDS Water	% FLUIDS Oil	ROP	OIL FLOR	Facies	Shoal Package	LITHOLOGY
194	2951	3.9	<0.01	2.73	30.6	0.0	6	0	SO9	9	Ls tr-sl slty tr fos tr por
195	2952	3.7	<0.01	2.72	54.3	0.0	6	0	SO9	9	Ls tr-sl slty tr fos tr por
196	2953	3.	<0.01	2.73	72.5	0.0	5	0	SO9	9	Ls tr-sl slty tr fos tr por
197	2954	8.3	TBFA	2.71	88.7	0.0	3	0	PS		Rdbd rdbrn-brn slty mod calc frac tr por
198	2955	4.8	TBFA	2.71	80.0	0.0	3	0	PS		Ls mod slty tr fos frac tr por
199	2956	19.7	26.9	2.70	34.8	0.0	4	0	SO10	10	Ls tr slty sct fos sct por
200	2957	22.4	162.58	2.71	42.8	0.0	3	0	SO10	10	Ls tr slty sct fos sct por
201	2958	21.9	122.39	2.71	46.6	0.0	4	0	SO10	10	Ls tr slty sct fos sct por
202	2959	18.3	10.37	2.77	44.0	0.0	3	0	SO10	10	Ls tr slty sct fos sl anhy sct por
203	2960	11.4	3.5	2.81	32.3	0.0	3	0	SF	10	Ls tr slty sl fos anhy incl sct por
204	2961	19.	68.43	2.81	36.5	0.0	3	0	SF	10	Ls tr slty sct fos anhy incl sct por
205	2962	17.4	9.56	2.78	27.0	0.0	4	0	SF	10	Ls tr slty sct fos sl anhy sct por
206	2963	2.9	0.15	2.84	48.3	0.0	4	0	SF	10	Ls tr slty tr fos sct anhy incl tr por
207	2964	8.4	1.6	2.81	32.3	0.0	5	0	SO10	10	Ls tr slty tr fos sct anhy incl tr por
208	2965	4.	TBFA	2.90	57.6	0.0	3	0	SO10	10	Anhy xln sct Ls incl frac tr por
209	2966	4.6	0.65	2.78	46.9	0.0	4	0	SO10	10	Ls tr slty tr fos sct anhy incl tr por
210	2967	14.6	34.73	2.71	35.9	0.0	4	0	SO10	10	Ls tr slty sct fos sct por
211	2968	18.3	142.2	2.71	43.1	0.0	3	0	SO10	10	Ls tr slty sct fos sct por
212	2969	9.	5.98	2.71	38.5	0.0	3	0	SO10	10	Ls tr slty sl fos tr-sct por
213	2970	12.7	0.64	2.78	34.4	0.0	3	0	SO10	10	Ls tr slty tr-sl fos sl dol sct por
214	2971	14.5	1.49	2.72	32.3	0.0	3	0	SO10	10	Ls tr slty sct fos sct por
215	2972	5.2	0.01	2.74	41.8	0.0	5	0	SO10	10	Ls tr slty sl fos tr por
216	2973	4.3	<0.01	2.72	55.1	0.0	6	0	SF		Ls tr slty sl fos tr por
217	2974	4.9	<0.01	2.75	55.9	0.0	14	0	SF		Ls sl slty tr fos tr anhy tr por
218	2975	12.1	0.04	2.76	74.9	0.0	13	0	PS		Sltst gy sl-mod sdy tr calc sct por
	2976	NO ANALYSIS					16		PS		No sample selected for analysis
	2977	NO ANALYSIS					14		PS		No sample selected for analysis
	2978	NO ANALYSIS					13		PS		No sample selected for analysis

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TABLE 1 (CONTINUED)
PIONEER NATURAL RESOURCES
ROUTINE CORE ANALYSIS
Stuart 3-34R Well
Grant County, Kansas

Sample No.	Depth (ft)	Porosity (%BV)	Permeability (md)	Grain Density (g/cc)	% FLUIDS Water	% FLUIDS Oil	ROP	OIL FLOR	Shoal Facies	Shoal Package	LITHOLOGY
	2979	NO ANALYSIS					10		PS		No sample selected for analysis
	2980	NO ANALYSIS					9		PS		No sample selected for analysis
219	2981	11.2	TBFA	2.72	89.1	0.0	7	0	PS		Rdbd rdbrn-gybrn slty tr calc frac sct por
220	2982	8.9	TBFA	2.75	78.8	0.0	12	0	PS		Rdbd rdbrn-gybrn slty tr calc sl anhy frac tr por
221	2983	6.9	<0.01	2.73	54.5	0.0	15	0	PS		Rdbd rdbrn-gybrn slty tr calc tr por
222	2984	12.6	TBFA	2.73	65.2	0.0	12	0	PS		Rdbd rdbrn-gybrn slty tr calc frac sct por
223	2985	10.7	<0.01	2.76	47.3	0.0	14	0	PS		Rdbd rdbrn-gybrn slty tr calc sl anhy sct por
224	2986	13.8	<0.01	2.80	33.9	0.0	17	0	PS		Rdbd rdbrn-gybrn slty tr calc sl anhy sct por
225	2987	7.9	<0.01	2.75	48.5	0.0	13	0	PS		Rdbd rdbrn-gybrn slty tr calc sl anhy tr por
226	2988	6.9	0.01	2.76	51.1	0.0	10	0	PS		Rdbd rdbrn-gybrn slty tr calc sl anhy tr por
	2989	NO ANALYSIS					20		PS		No sample selected for analysis
227	2990	9.1	TBFA	2.72	65.9	0.0	6	0	PS		Rdbd rdbrn-gybrn slty tr calc frac tr por
228	2991	8.9	TBFA	2.70	57.8	0.0	7	0	PS		Rdbd rdbrn-gybrn slty tr calc frac tr por
	2992	NO ANALYSIS					8		PS		No sample selected for analysis
	2993	NO ANALYSIS					6		PS		No sample selected for analysis
	2994	NO ANALYSIS					5		PS		No sample selected for analysis
231	2995	13.5	1.18	2.77	24.2	0.0	5	0	SO11	11	Ls tr-sl slty sl fos sct anhy sct por
232	2996	10.2	0.98	2.72	24.1	0.0	3	0	SO11	11	Ls tr-sl slty sl fos sct por
233	2997	12.2	2.65	2.76	34.9	0.0	3	0	SO11	11	Ls tr-sl slty sl fos sct anhy sct por
234	2998	12.8	1.42	2.72	36.4	0.0	3	0	SO11	11	Ls tr-sl slty sl fos sct por
235	2999	8.6	0.07	2.73	31.1	0.0	3	0	SO11	11	Ls sl slty tr fos tr por
236	3000	9.8	0.34	2.72	24.1	0.0	4	0	SO11	11	Ls sl slty tr fos sct por
237	3001	13.6	0.7	2.72	32.1	0.0	2	0	SO11	11	Ls sl slty tr fos sct por
238	3002	13.5	0.65	2.71	37.9	0.0	3	0	SO11	11	Ls sl slty tr fos sct por
239	3003	12.8	0.33	2.73	35.6	0.0	3	0	SO11	11	Ls sl slty tr fos sct por
240	3004	9.2	0.44	2.70	23.3	0.0	2	0	SO11	11	Ls sl slty tr fos sct-tr por
241	3005	7.6	0.01	2.76	53.7	0.0	3	0	SO11	11	Ls sl slty tr fos tr anhy tr por
242	3006	6.4	0.11	2.72	50.9	0.0	3	0	SL		Ls sl slty tr fos tr por

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TABLE 1 (CONTINUED)
PIONEER NATURAL RESOURCES
ROUTINE CORE ANALYSIS
Stuart 3-34R Well
Grant County, Kansas

Sample No.	Depth (ft)	Porosity (%BV)	Permeability (md)	Grain Density (g/cc)	% FLUIDS Water	% FLUIDS Oil	ROP	OIL FLOR	Shoal Facies	Shoal Package	LITHOLOGY
243	3007	9.2	0.02	2.73	46.2	0.0	2	0	SL		Ls sl slty tr fos tr por
244	3008	10.	0.03	2.72	43.3	0.0	2	0	SL		Ls sl slty tr fos sct por
245	3009	9.8	0.02	2.69	53.9	0.0	3	0	SL		Ls sl slty tr fos sct por
246	3010	8.8	0.01	2.70	63.3	0.0	3	0	SL		Ls sl slty tr fos tr-sct por
247	3011	8.2	0.01	2.72	69.2	0.0	2	0	SL		Ls sl slty tr fos tr-sct por
248	3012	7.5	0.01	2.71	65.2	0.0	3	0	SL		Ls sl slty tr fos tr por
249	3013	6.2	0.01	2.71	72.9	0.0	3	0	SL		Ls sl slty tr fos tr por
250	3014	7.9	<0.01	2.68	59.9	0.0	3	0	SL		Ls sl slty tr fos tr por
251	3015	6.1	<0.01	2.69	70.7	0.0	3	0	SL		Ls sl slty tr fos tr por
252	3016	6.2	<0.01	2.70	71.4	0.0	4	0	SL		Ls sl slty tr fos tr por
253	3017	6.2	<0.01	2.70	64.1	0.0	4	0	SL		Ls sl slty tr fos tr por
254	3018	6.4	<0.01	2.69	61.5	0.0	4	0	SL		Ls sl slty tr fos tr por
255	3019	4.	<0.01	2.68	79.8	0.0	4	0	SL		Ls sl slty tr fos tr por
256	3020	6.9	<0.01	2.75	71.4	0.0	3	0	SL		Ls sl slty tr fos tr anhy tr por
257	3021	5.6	<0.01	2.70	61.4	0.0	3	0	SL		Ls sl slty tr fos tr por
258	3022	4.4	<0.01	2.69	80.0	0.0	4	0	SL		Ls sl slty tr fos tr por
259	3023	6.4	0.09	2.70	84.9	0.0	3	0	SL		Ls mod slty tr fos tr por
260	3024	4.8	<0.01	2.70	70.6	0.0	4	0	SL		Ls mod slty tr fos tr por
261	3025	5.9	TBFA	2.69	70.8	0.0	5	0	SL		Ls mod slty tr fos frac tr por
262	3026	6.5	<0.01	2.71	59.6	0.0	3	0	SL		Ls mod slty-slty grdg to Sltst tr por
263	3027	8.4	<0.01	2.70	61.2	0.0	4	0	SL		Ls mod slty-slty grdg to Sltst tr por
264	3028	6.5	<0.01	2.69	66.3	0.0	2	0	SL		Ls mod slty-slty grdg to Sltst tr por
265	3029	8.1	<0.01	2.69	65.2	0.0	3	0	SL		Sltst gy-dkgy mod-v calc grdg to arg Ls
266	3030	8.2	<0.01	2.68	62.9	0.0	3	0	SL		Sltst gy-dkgy mod-v calc grdg to arg Ls
267	3031	8.8	<0.01	2.68	67.3	0.0	3	0	SL		Sltst gy-dkgy mod-v calc grdg to arg Ls
268	3032	7.8	<0.01	2.68	62.3	0.0	2	0	SL		Sltst gy-dkgy mod-v calc grdg to arg Ls
269	3033	7.9	<0.01	2.69	65.8	0.0	2	0	SL		Sltst gy-dkgy mod-v calc grdg to arg Ls
270	3034	8.6	<0.01	2.68	67.2	0.0	3	0	SL		Sltst gy-dkgy mod-v calc grdg to arg Ls

TBFA = Too Broken For Analysis.
No Analysis = No analysis was done at this depth.

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TABLE 1 (CONTINUED)
PIONEER NATURAL RESOURCES
ROUTINE CORE ANALYSIS
Stuart 3-34R Well
Grant County, Kansas

Sample No.	Depth (ft)	Porosity (%BV)	Permeability (md)	Grain Density (g/cc)	% FLUIDS Water	% FLUIDS Oil	ROP	OIL FLOR	Shoal Facies	Shoal Package	LITHOLOGY
271	3035	8.5	<0.01	2.68	66.9	0.0	2	0	SL		Sltst gy-dkgy mod-v calc grdg to arg Ls
272	3036	8.4	<0.01	2.68	69.0	0.0	3	0	SL		Sltst gy-dkgy mod-v calc grdg to arg Ls
273	3037	9.7	<0.01	2.66	64.6	0.0	2	0	SL		Sh gy-dkgy sl slty mod calc
274	3038	8.1	<0.01	2.68	65.2	0.0	2	0	SL		Sltst gy-dkgy mod-v calc grdg to arg Ls
275	3039	8.8	<0.01	2.68	65.7	0.0	5	0	SL		Sltst gy-dkgy mod-v calc grdg to arg Ls
276	3040	9.7	<0.01	2.66	74.6	0.0	5	0	SL		Sh gy-dkgy sl slty mod calc
277	3041	10.2	0.06	2.66	72.4	0.0	5	0	SL		Sh gy-dkgy sl slty mod calc
278	3042	10.	TBFA	2.67	69.1	0.0	5	0	SL		Sh gy-dkgy sl slty mod calc frac
279	3043	10.6	TBFA	2.66	57.5	0.0	5	0	SL		Sh gy-dkgy sl slty mod calc frac
280	3044	10.3	TBFA	2.65	64.2	0.0	5	0	SL		Sh gy-dkgy sl slty mod calc frac
	Min:	1.1	0.01	2.60	22.7	0.0	2	0.0			
	Max:	23.6	162.58	2.91	96.0	0.0	27	0.0			
	Avg:	9.3	4.73	2.72	65.6	0.0	6	0.0			

Key
SO = Shoal
SF = Shoal Flank
TF = Tidal Flat
PS = Paleosol
SL = Shelf/Lagoon

TBFA = Too Broken For Analysis.
No Analysis = No analysis was done at this depth.

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TABLE 2
CONVENTIONAL CORE ANALYSIS
STATISTIC BY DEPOSITIONAL FACIES
Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

		Porosity (%BV)	Permeability (md)	Grain Density (g/cc)	% FLUIDS Water	% FLUIDS Oil	ROP	OIL FLOR	Count
	Min:	2.2	0.01	2.65	22.7	0.0	2.0	0	
SO	Max:	23.6	163	2.87	83.5	0.0	8.0	0	75
	Avg:	10.9	7.44	2.73	49.5	0.0	4.0	0	
	Min:	2.2	0.01	2.70	27.0	0.0	2.0	0	
SF	Max:	19.0	68.4	2.84	85.5	0.0	16.0	0	20
	Avg:	9.6	4.49	2.74	59.1	0.0	5.6	0	
	Min:	1.1	0.01	2.68	46.3	0.0	3.0	0	
TF	Max:	16.3	1.58	2.82	79.3	0.0	22.0	0	24
	Avg:	7.5	0.19	2.72	63.8	0.0	6.4	0	
	Min:	5.7	0.01	2.67	33.9	0.0	3.0	0	
PS	Max:	14.5	12.9	2.86	95.9	0.0	27.0	0	52
	Avg:	8.6	0.69	2.73	76.1	0.0	10.4	0	
	Min:	4.0	0.01	2.66	43.3	0.0	2.0	0	
SL	Max:	21.9	10.2	2.77	94.0	0.0	12.0	0	59
	Avg:	8.4	0.22	2.70	68.0	0.0	3.9	0	

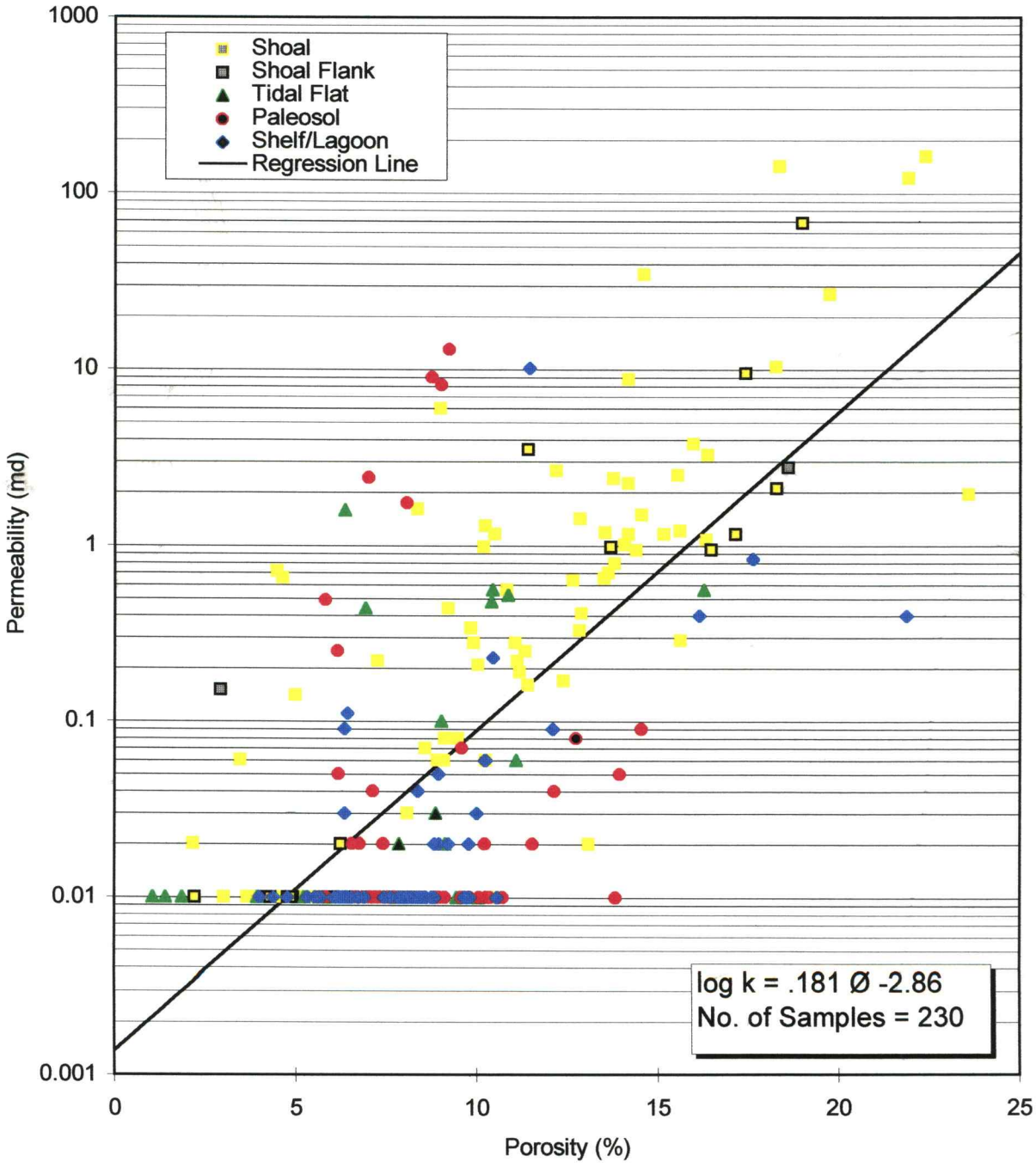
Key
SO = Shoal
SF = Shoal Flank
TF = Tidal Flat
PS = Paleosol
SL = Shelf/Lagoon

NOTE: Broken and fractured samples were not included in these statistics.

RSH 3928

FIGURE 2

POROSITY - PERMEABILITY CROSSPLOT
BY DEPOSITIONAL FACIES
Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas



NOTE: Broken and fractured samples removed.

RSH 3928

TABLE 3
CONVENTIONAL CORE ANALYSIS STATISTICS
BY "SHOAL PACKAGES"
Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Shoal Number Depth Interval (Thickness)		Porosity (%BV)	Permeability (md)	Grain Density (g/cc)	% FLUIDS Water	% FLUIDS Oil	ROP	OIL FLOR	Count
Shoal 1	Min:	4.5	0.03	2.69	42.4	0.0	5.0	0	
2755.0-2757.0	Max:	9.4	0.71	2.72	61.5	0.0	5.0	0	3
(2.0'+)	Avg:	7.3	0.27	2.71	52.6	0.0	5.0	0	
Shoal 2	Min:	5.4	0.01	2.65	43.6	0.0	2.0	0	
2784.0-2790.7	Max:	23.6	3.77	2.72	68.8	0.0	4.0	0	8
(6.7')	Avg:	12.4	1.20	2.70	55.3	0.0	2.9	0	
Shoal 3	Min:	3.5	0.06	2.71	61.8	0.0	3.0	0	
2801.7-2807.8	Max:	15.2	1.16	2.81	83.5	0.0	3.0	0	6
(6.1')	Avg:	11.9	0.65	2.73	66.7	0.0	3.0	0	
Shoal 4	Min:	6.0	0.01	2.71	62.1	0.0	4.0	0	
2829.0-2833.6	Max:	15.6	0.29	2.82	71.3	0.0	8.0	0	4
(4.6')	Avg:	10.2	0.08	2.77	65.8	0.0	5.8	0	
Shoal 5	Min:	4.6	0.01	2.70	51.8	0.0	2.0	0	
2842.3-2851.5	Max:	18.6	3.27	2.77	66.6	0.0	4.0	0	9
(9.2')	Avg:	14.1	1.53	2.72	59.5	0.0	3.0	0	
Shoal 6	Min:	2.2	0.01	2.71	52.0	0.0	3.0	0	
2886.0-2898.9	Max:	13.8	0.79	2.87	85.5	0.0	7.0	0	13
(12.9')	Avg:	7.5	0.12	2.75	64.5	0.0	4.5	0	
Shoal 7	Min:	5.6	0.01	2.68	43.4	0.0	4.0	0	
2907.8-2918.0	Max:	16.3	8.82	2.82	72.1	0.0	7.0	0	11
(10.2')	Avg:	11.5	1.26	2.73	57.4	0.0	4.6	0	
Shoal 8	Min:	9.1	0.06	2.71	43.1	0.0	4.0	0	
2931.6-2937.6	Max:	13.8	2.39	2.75	53.6	0.0	6.0	0	5
(6.0')	Avg:	10.8	0.77	2.73	47.2	0.0	5.0	0	
Shoal 9	Min:	3.0	0.01	2.70	22.7	0.0	3.0	0	
2946.9-2953.4	Max:	11.1	1.29	2.73	72.5	0.0	6.0	0	7
(6.5')	Avg:	6.3	0.26	2.72	36.3	0.0	4.4	0	
Shoal 10	Min:	2.9	0.01	2.70	27.0	0.0	3.0	0	
2955.7-2972.2	Max:	22.4	163	2.84	48.3	0.0	5.0	0	16
(16.5')	Avg:	13.8	36.9	2.76	38.6	0.0	3.6	0	
Shoal 11	Min:	7.6	0.01	2.70	23.3	0.0	2.0	0	
2995.8-3005.6	Max:	13.6	2.65	2.77	53.7	0.0	5.0	0	11
(9.8')	Avg:	11.3	0.80	2.73	32.5	0.0	3.1	0	

NOTE: Broken and fractured samples were not included in these statistics.

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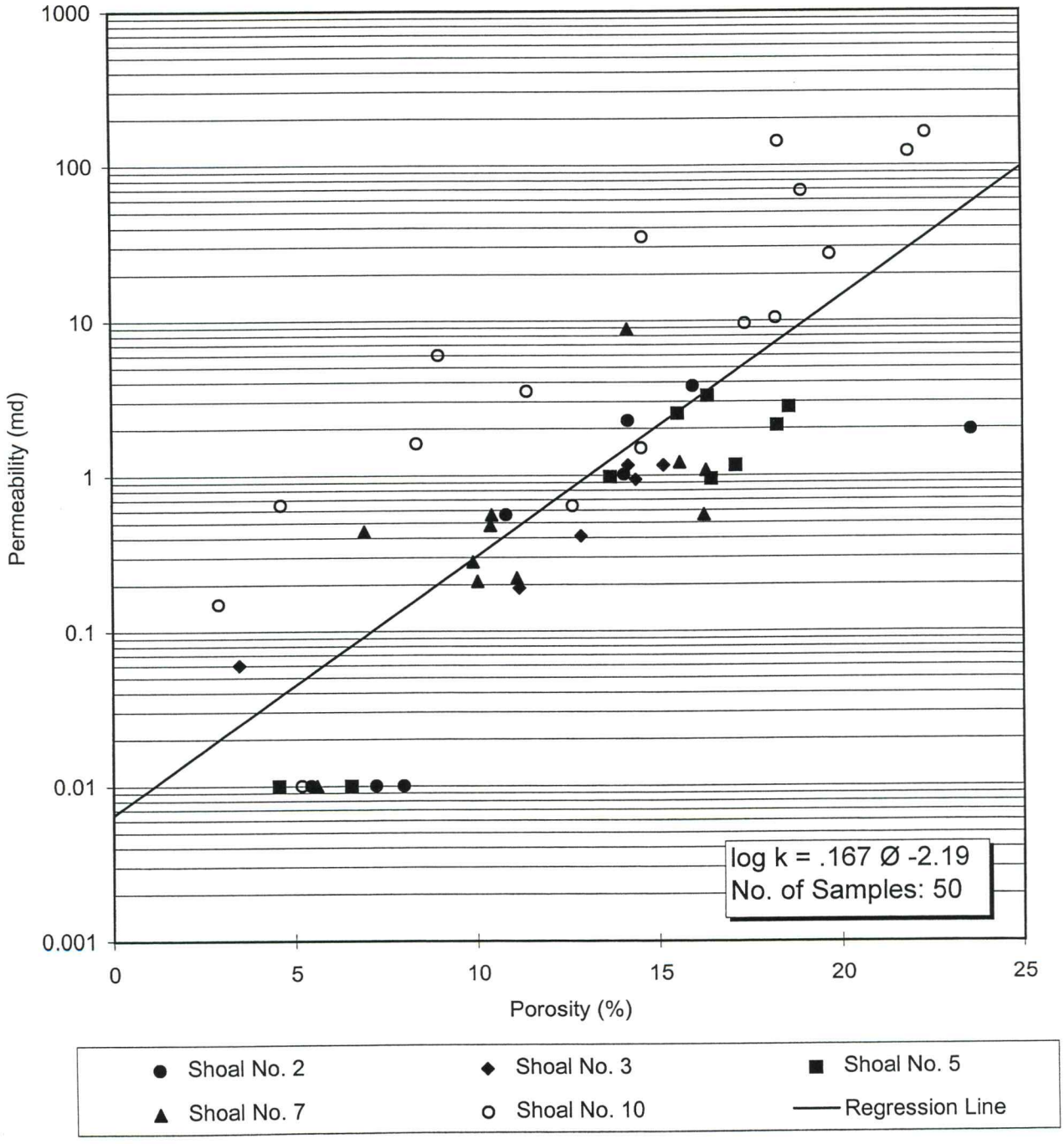
FIGURE 3

POROSITY - PERMEABILITY CROSSPLOT OF SHOAL PACKAGES THAT SHOW CROSS-OVER ON NEUTRON-DENSITY CURVES

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas



NOTE: Broken and fractured samples removed.

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FIGURE 4

IDEALIZED DEPOSITIONAL MODEL
PIONEER NATURAL RESOURCES, INC.
STUART 3-34R WELL
GRANT COUNTY, KANSAS

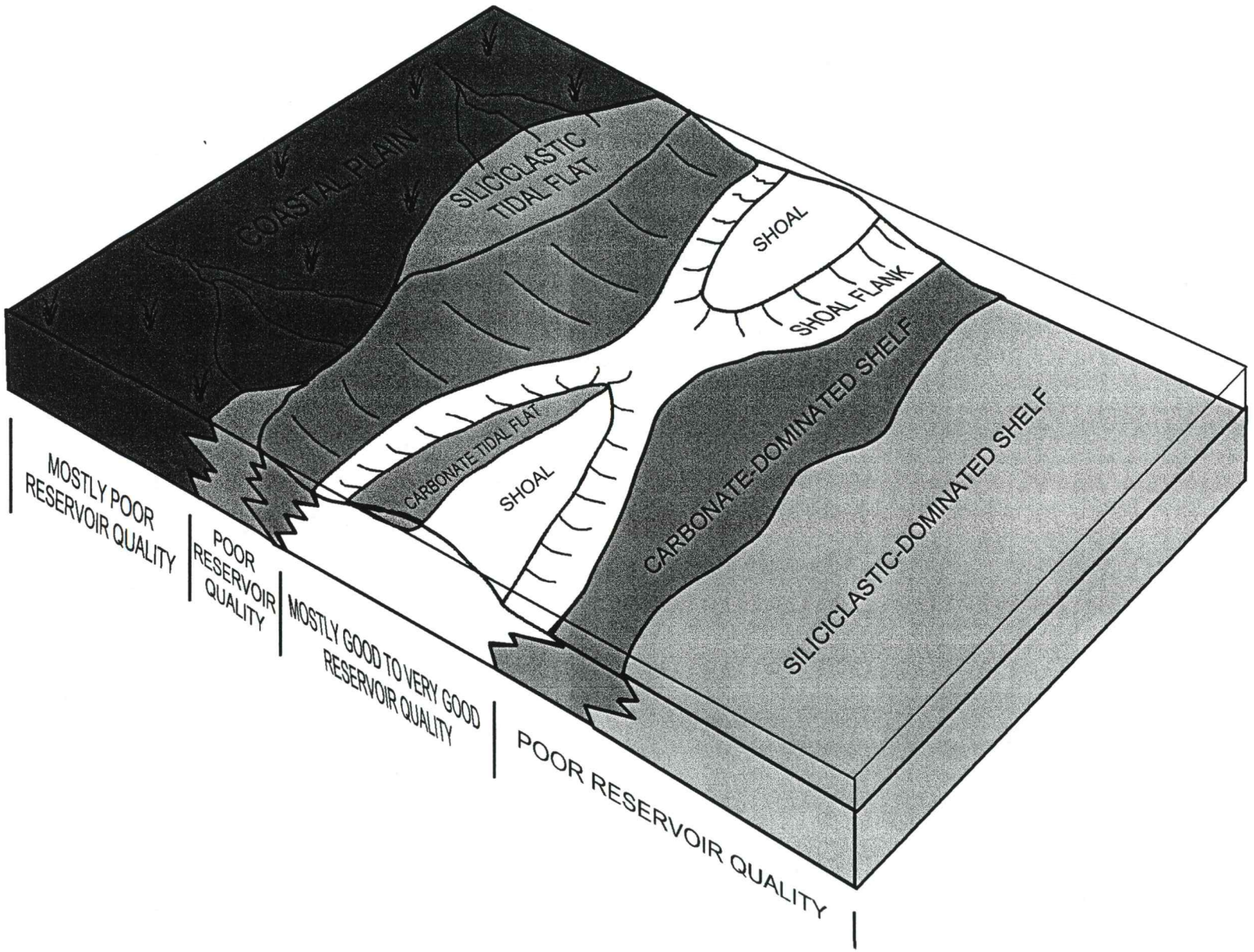

FIGURE 4

IDEALIZED DEPOSITIONAL MODEL
PIONEER NATURAL RESOURCES, INC.
STUART 3-34R WELL
GRANT COUNTY, KANSAS

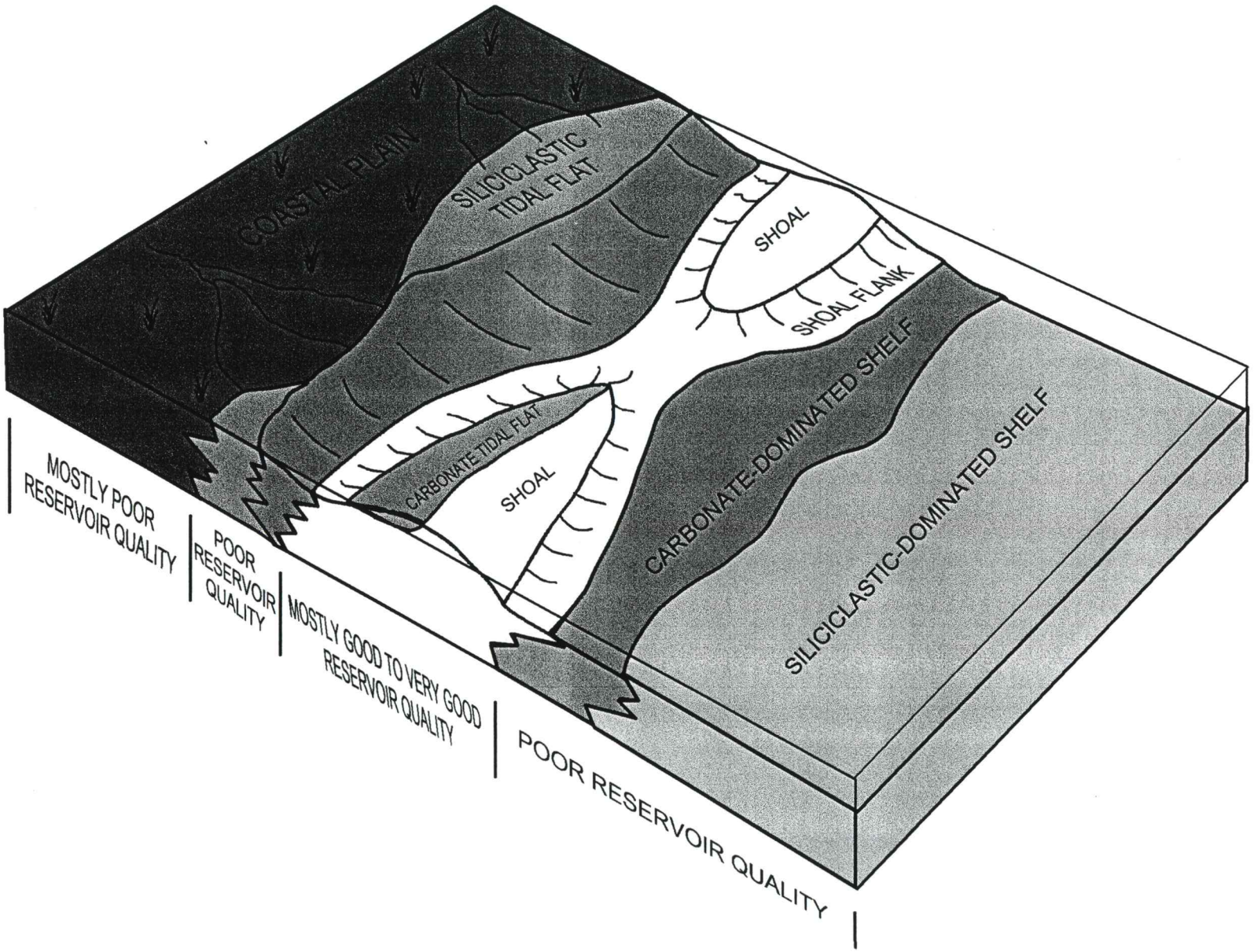

FIGURE 4

IDEALIZED DEPOSITIONAL MODEL
PIONEER NATURAL RESOURCES, INC.
STUART 3-34R WELL
GRANT COUNTY, KANSAS

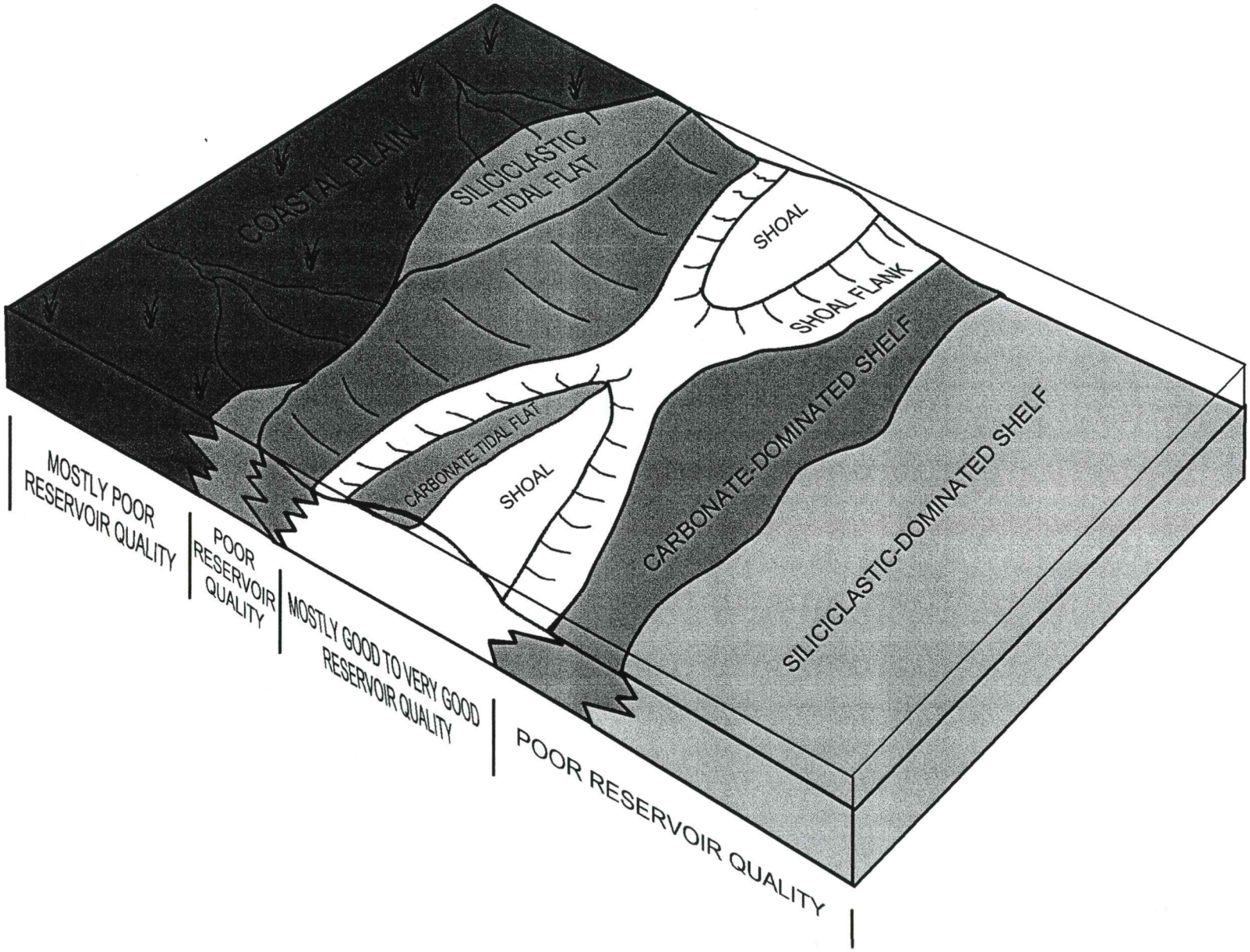

TABLE 4

FORMATION RESISTIVITY FACTOR - POROSITY RELATIONSHIP AT CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample	Depth (ft.)	Confining Pressure (psig)	Formation Resistivity Factor (F)	Porosity (%BV)	Cementation Exponent (m)
Y 968	2782-83	1360	111.73	7.0	1.77
Y 969	2794-95	1360	63.19	11.3	1.90
Y 970	2796-97	1360	28.23	20.8	2.13
Y 971	2830-31	1360	48.97	14.6	2.02
Y 972	2848-49	1360	37.33	14.7	1.88
Y 973	2883-84	1360	196.55	6.3	1.90
Y 974	2910-11	1360	61.07	13.4	2.05
Y 975	2914-15	1360	106.17	10.1	2.04
Y 976	2935-36	1360	65.41	10.7	1.87
Y 977	2949-50	1360	123.73	9.3	2.03
Y 978	2958-59	1360	22.11	21.6	2.02
Y 979	2964-65	1360	327.92	7.5	2.24

Rw = 0.0461 ohm-meters @ 77 degrees Fahrenheit

FIGURE 5

FORMATION RESISTIVITY FACTOR - POROSITY RELATIONSHIP

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

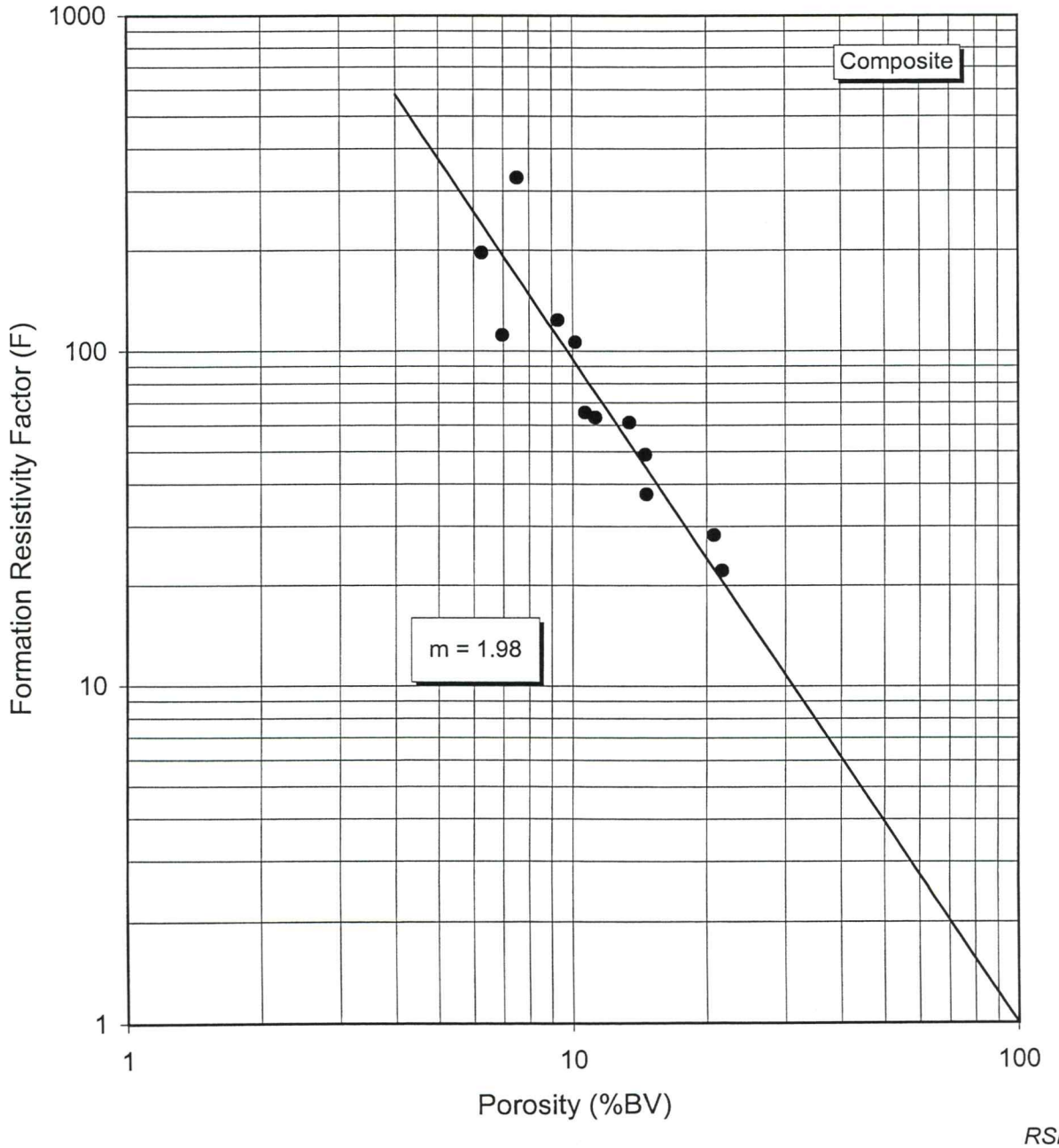

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TABLE 5

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 968	Porosity (%BV):	7.0
Depth (ft):	2782-83	Perm. to gas (md):	0.02*

Formation Resistivity Index (I)	Water Saturation (%PV)	Saturation Exponent (n)
1.00	100.0	--
1.09	96.2	2.22
1.25	90.9	2.34
1.45	85.0	2.29

Rw = 0.0461 ohm-meters @ 77 degrees Fahrenheit

* Permeability to gas measured at 400 psig confining pressure.

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FIGURE 6

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

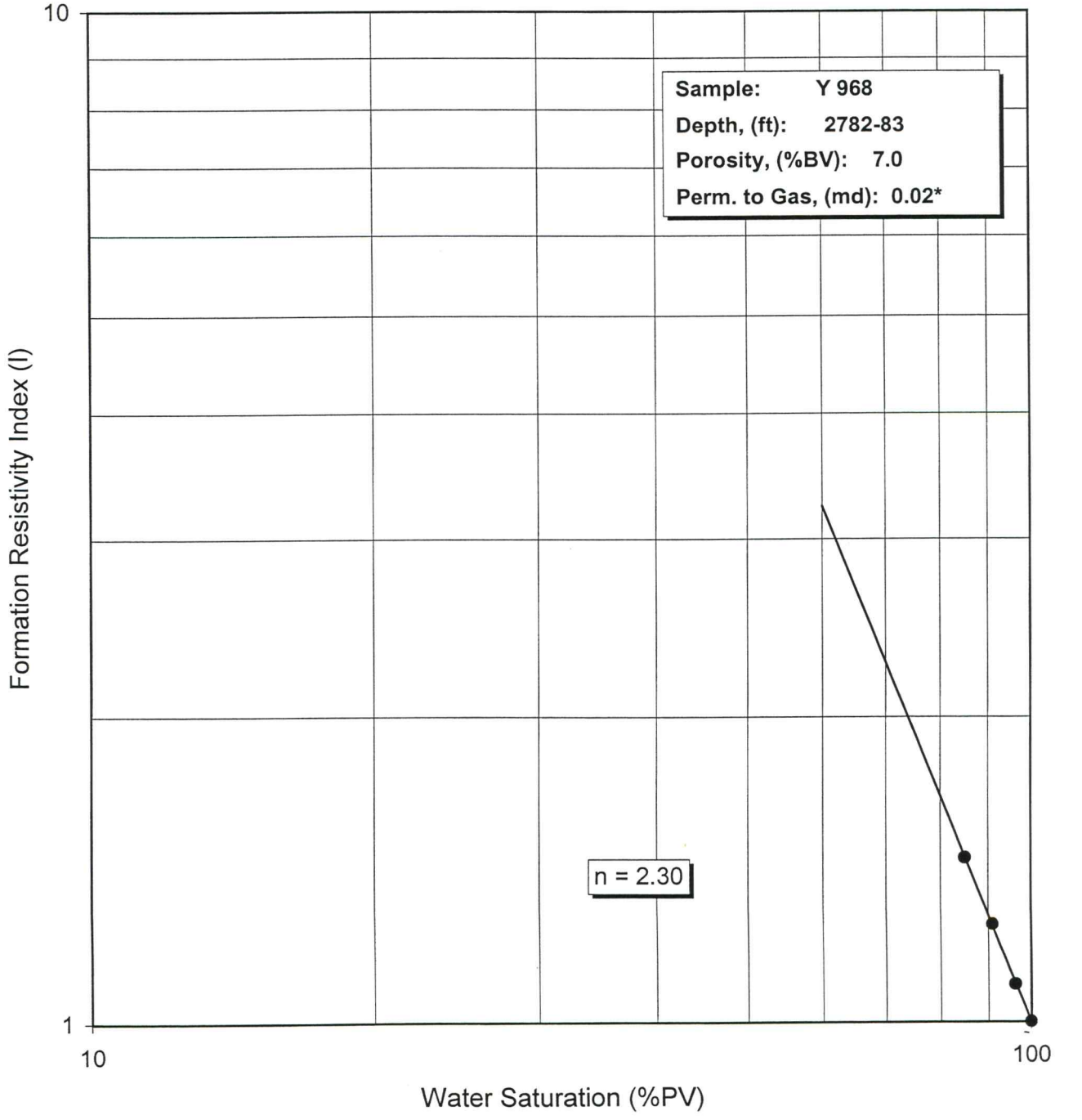

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TABLE 6

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 969	Porosity (%BV):	11.3
Depth (ft):	2794-95	Perm. to Gas (md):	0.09 *

Formation Resistivity Index (I)	Water Saturation (%PV)	Saturation Exponent (n)
1.00	100.0	--
1.09	96.3	2.29
1.26	90.1	2.22
1.43	84.7	2.15
1.89	75.2	2.23

Rw = 0.0461 ohm-meters @ 77 degrees Fahrenheit

* Permeability to gas measured at 400 psig confining pressure.

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FIGURE 7

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

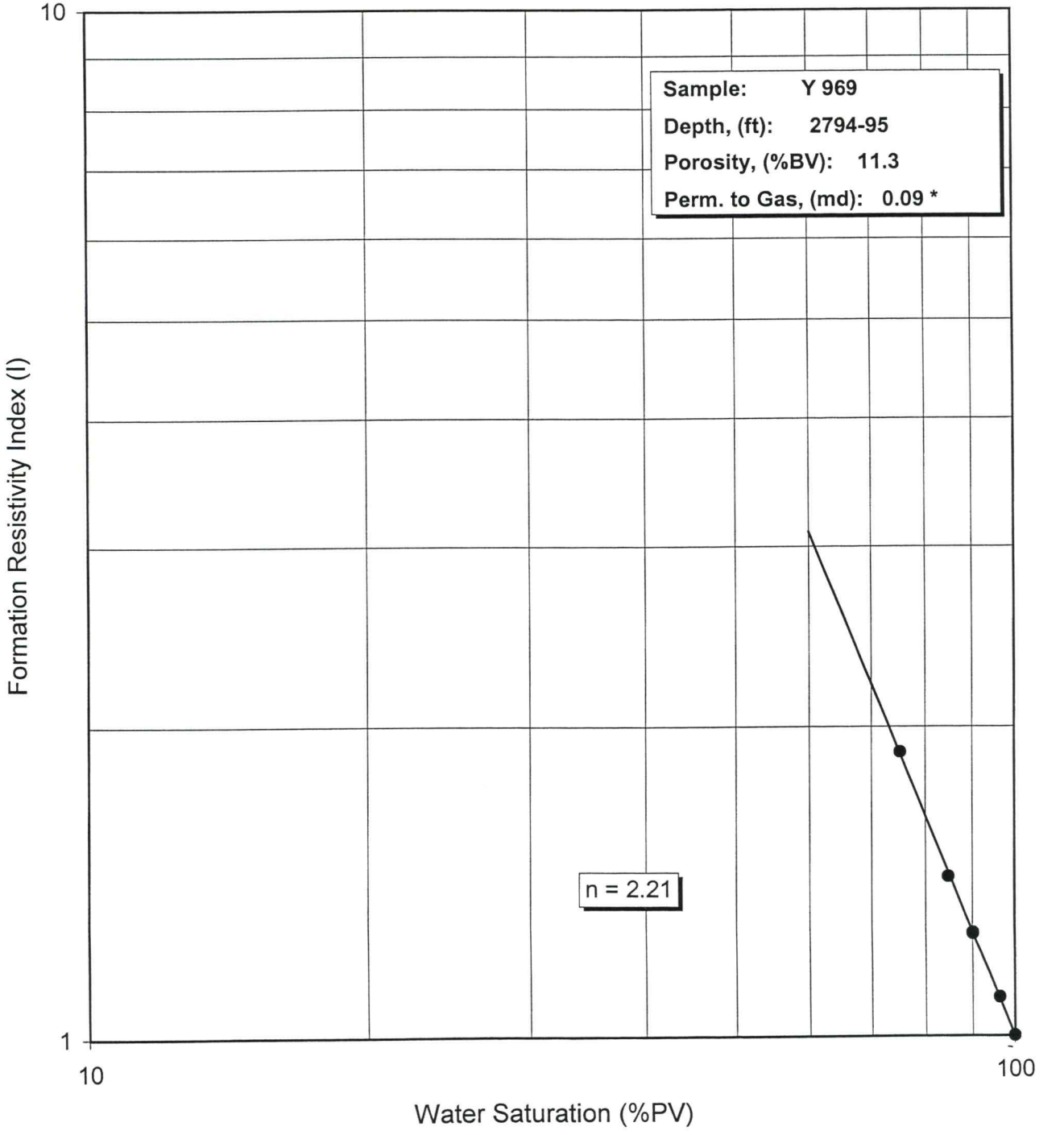

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TABLE 7

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 970	Porosity (%BV):	20.8
Depth (ft):	2796-97	Perm to Gas (md):	0.40 *

Formation Resistivity Index (I)	Water Saturation (%PV)	Saturation Exponent (n)
1.00	100.0	--
1.06	97.7	2.50
1.23	91.5	2.33
1.40	86.4	2.30
1.61	81.2	2.29

Rw = 0.0461 ohm-meters @ 77 degrees Fahrenheit

* Permeability to gas measured at 400 psig confining pressure.

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FIGURE 8

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

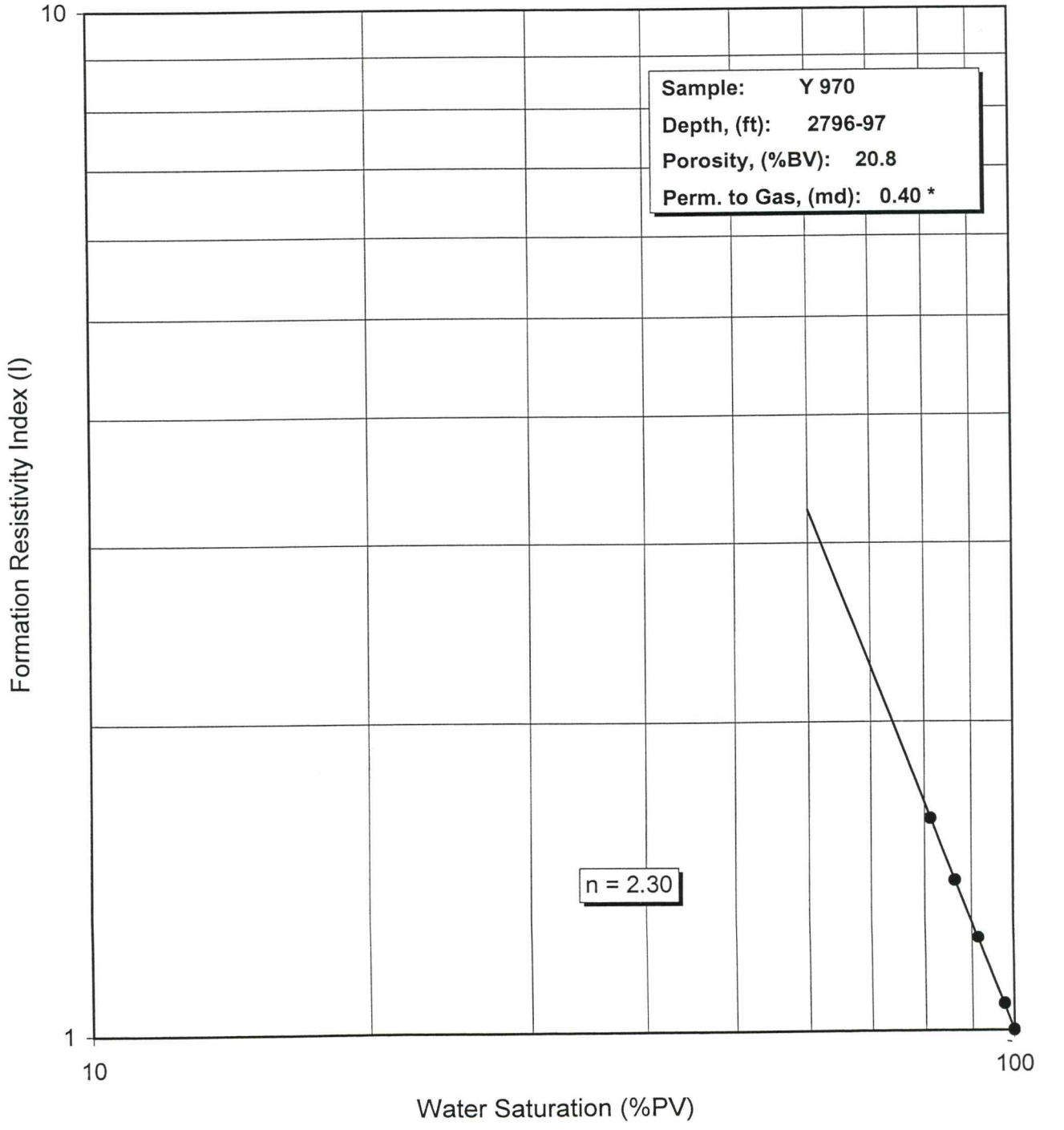

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TABLE 8

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 971	Porosity (%BV):	14.6
Depth (ft):	2830-31	Perm to Gas (md):	0.29 *

Formation Resistivity Index (I)	Water Saturation (%PV)	Saturation Exponent (n)
1.00	100.0	--
1.13	94.7	2.24
1.29	88.1	2.01
1.51	81.3	1.99
1.85	74.2	2.06

Rw = 0.0461 ohm-meters @ 77 degrees Fahrenheit

* Permeability to gas measured at 400 psig confining pressure.

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FIGURE 9

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

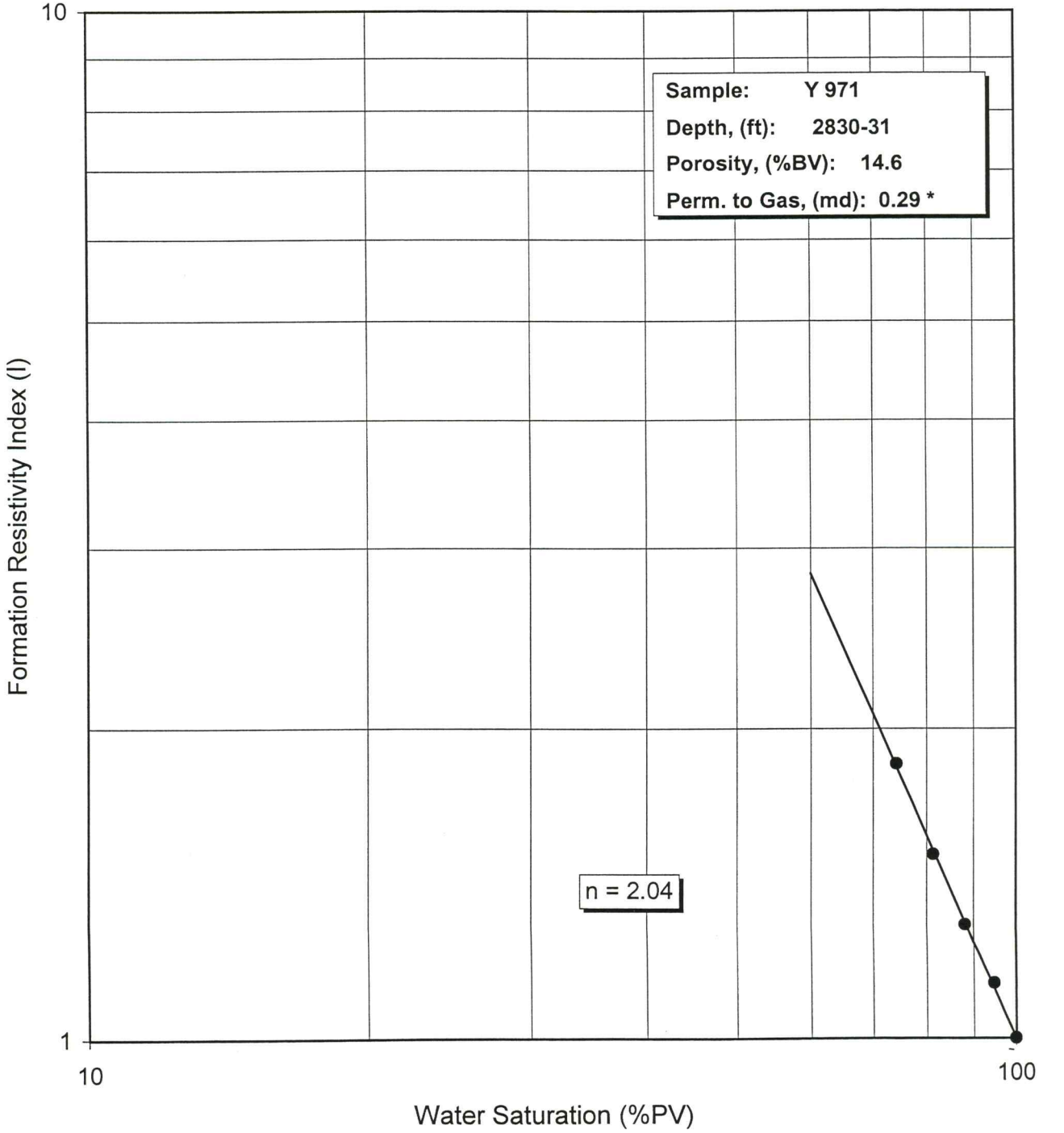

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TABLE 9

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 972	Porosity (%BV):	14.7
Depth (ft):	2848-49	Perm to Gas (md):	0.95 *

Formation Resistivity Index (I)	Water Saturation (%PV)	Saturation Exponent (n)
1.00	100.0	--
1.23	90.1	1.99
1.49	83.7	2.24
2.26	68.7	2.17
3.39	58.6	2.28
4.72	50.9	2.30
5.38	48.3	2.31
8.53	38.0	2.22

Rw = 0.0461 ohm-meters @ 77 degrees Fahrenheit

* Permeability to gas measured at 400 psig confining pressure.

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FIGURE 10

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

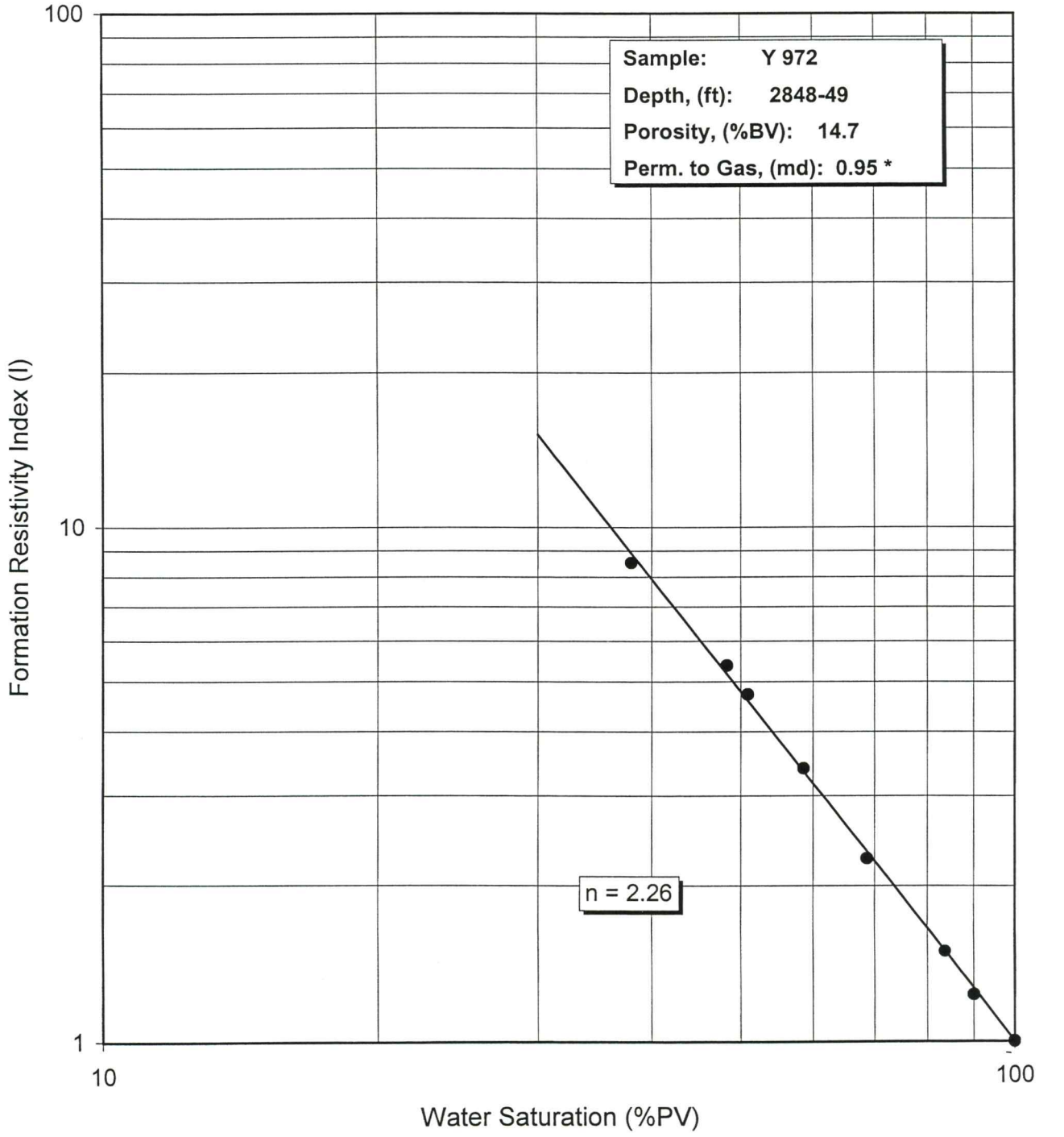

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TABLE 10

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 973	Porosity (%BV):	6.3
Depth (ft):	2883-84	Perm to Gas (md):	1.58 *

Formation Resistivity Index (I)	Water Saturation (%PV)	Saturation Exponent (n)
1.00	100.0	--
1.19	93.0	2.40
1.49	84.2	2.32
1.73	78.5	2.26
2.16	71.5	2.30

Rw = 0.0461 ohm-meters @ 77 degrees Fahrenheit

* Permeability to gas measured at 400 psig confining pressure.

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FIGURE 11

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

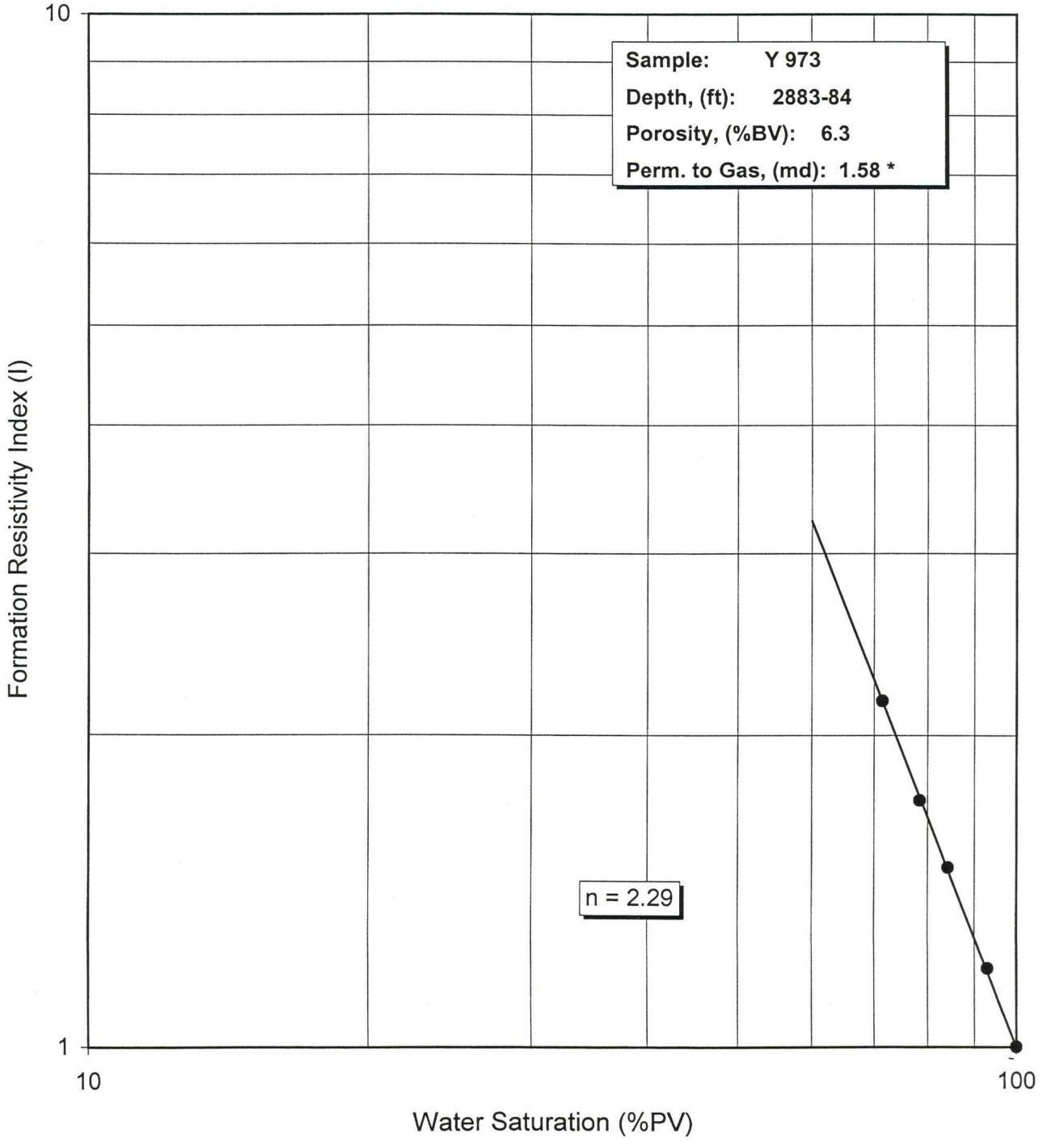

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TABLE 11

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 974	Porosity (%BV):	13.4
Depth (ft):	2910-11	Perm to Gas (md):	8.82 *

Formation Resistivity Index (I)	Water Saturation (%PV)	Saturation Exponent (n)
1.00	100.0	--
1.21	92.4	2.41
1.58	82.9	2.44
2.35	68.0	2.21
3.87	54.9	2.26
5.69	47.1	2.31
8.77	35.3	2.08
30.88	22.2	2.28

Rw = 0.0461 ohm-meters @ 77 degrees Fahrenheit

* Permeability to gas measured at 400 psig confining pressure.

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FIGURE 12

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

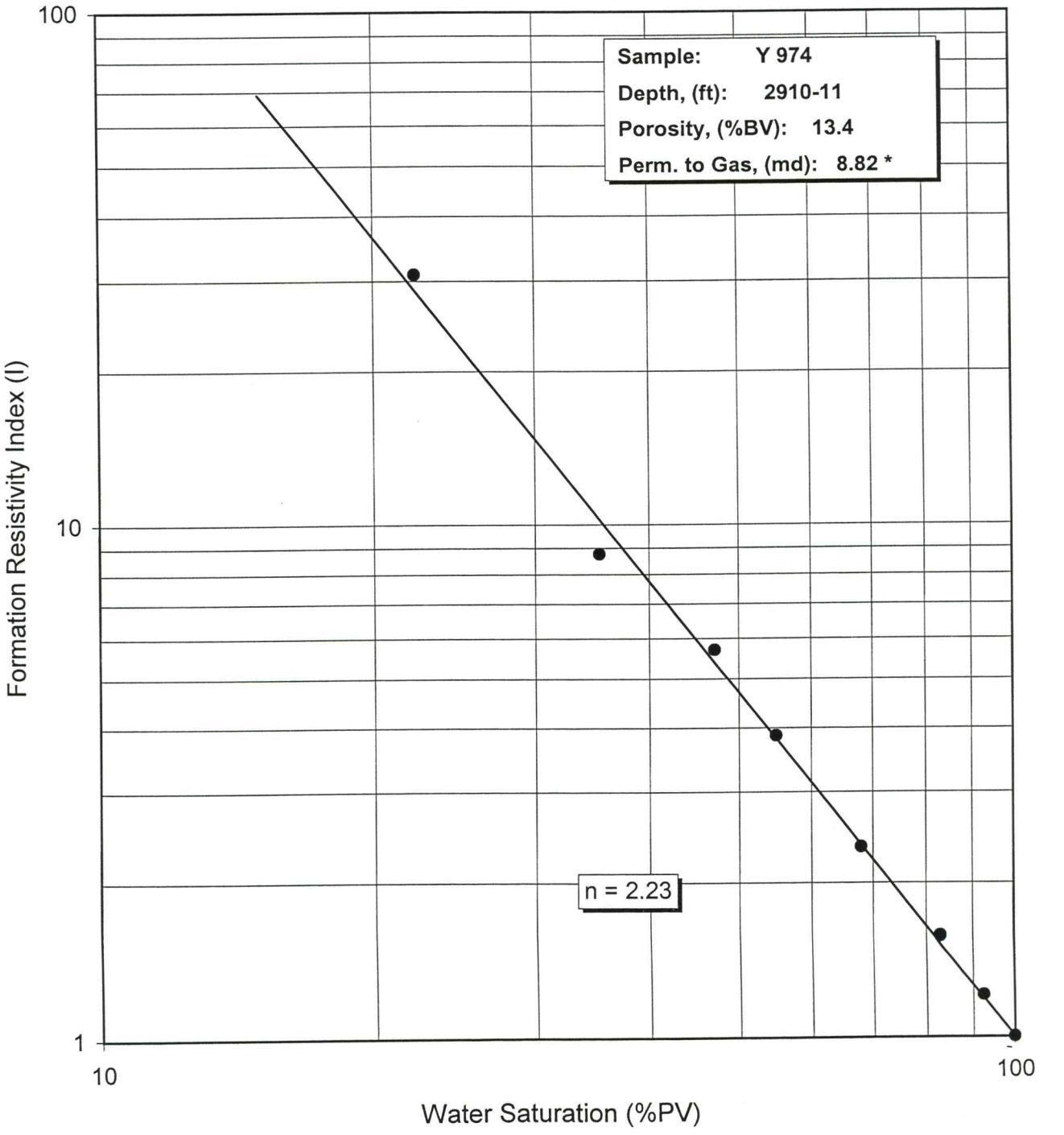

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TABLE 12

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 975	Porosity (%BV):	10.1
Depth (ft):	2914-15	Perm to Gas (md):	0.56 *

Formation Resistivity Index (I)	Water Saturation (%PV)	Saturation Exponent (n)
1.00	100.0	--
1.58	80.3	2.08
2.45	68.5	2.37
4.13	51.6	2.15
5.13	49.4	2.32
6.70	44.1	2.32
8.06	38.1	2.16
11.40	33.2	2.21

Rw = 0.0461 ohm-meters @ 77 degrees Fahrenheit

* Permeability to gas measured at 400 psig confining pressure.

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FIGURE 13

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

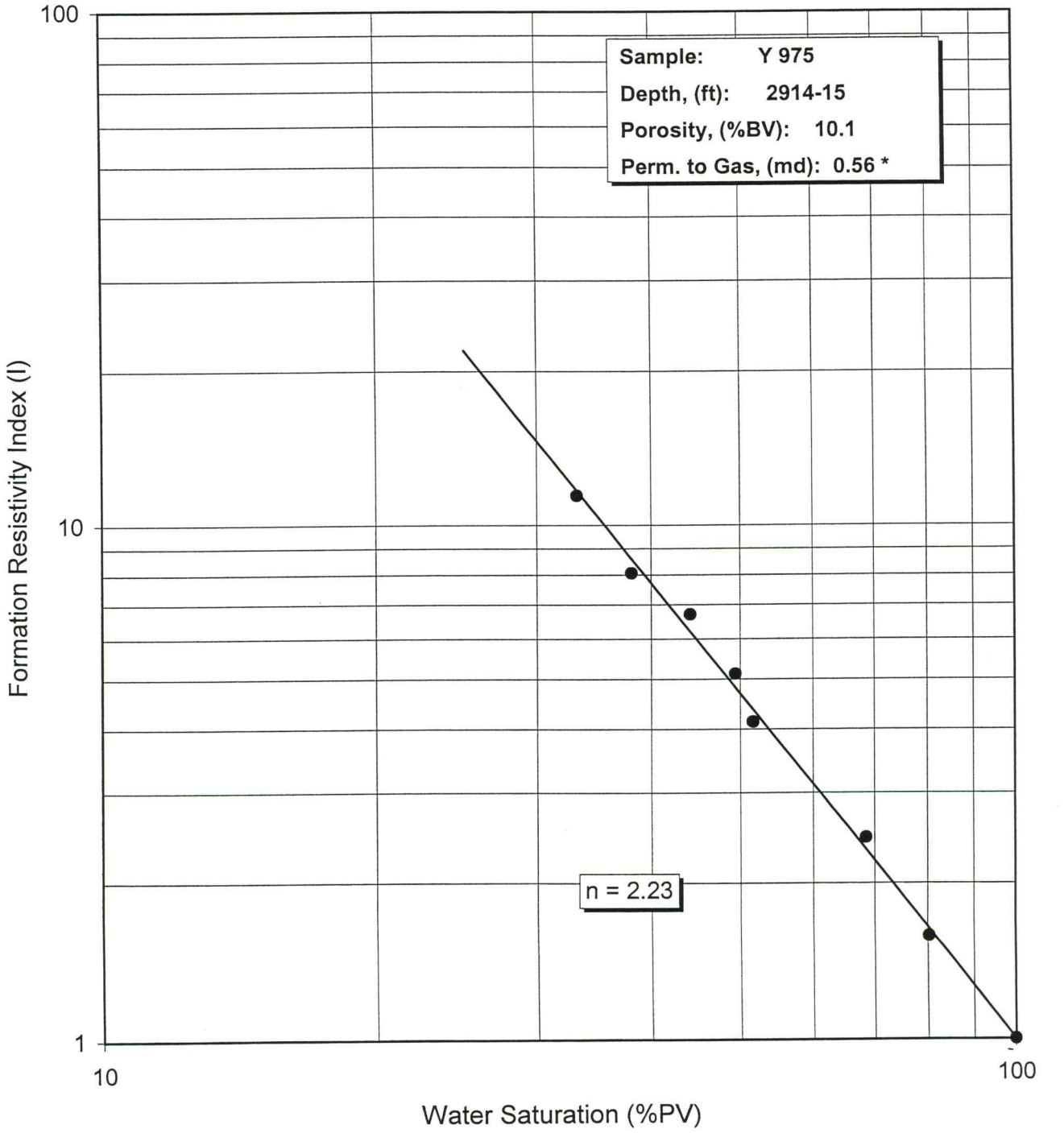

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TABLE 13

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 976	Porosity (%BV):	10.7
Depth (ft):	2935-36	Perm to Gas (md):	0.16 *

Formation Resistivity Index (I)	Water Saturation (%PV)	Saturation Exponent (n)
1.00	100.0	--
1.08	97.0	2.53
1.38	86.0	2.14
1.71	78.9	2.26
2.46	65.9	2.16

Rw = 0.0461 ohm-meters @ 77 degrees Fahrenheit

* Permeability to gas measured at 400 psig confining pressure.

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FIGURE 14

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

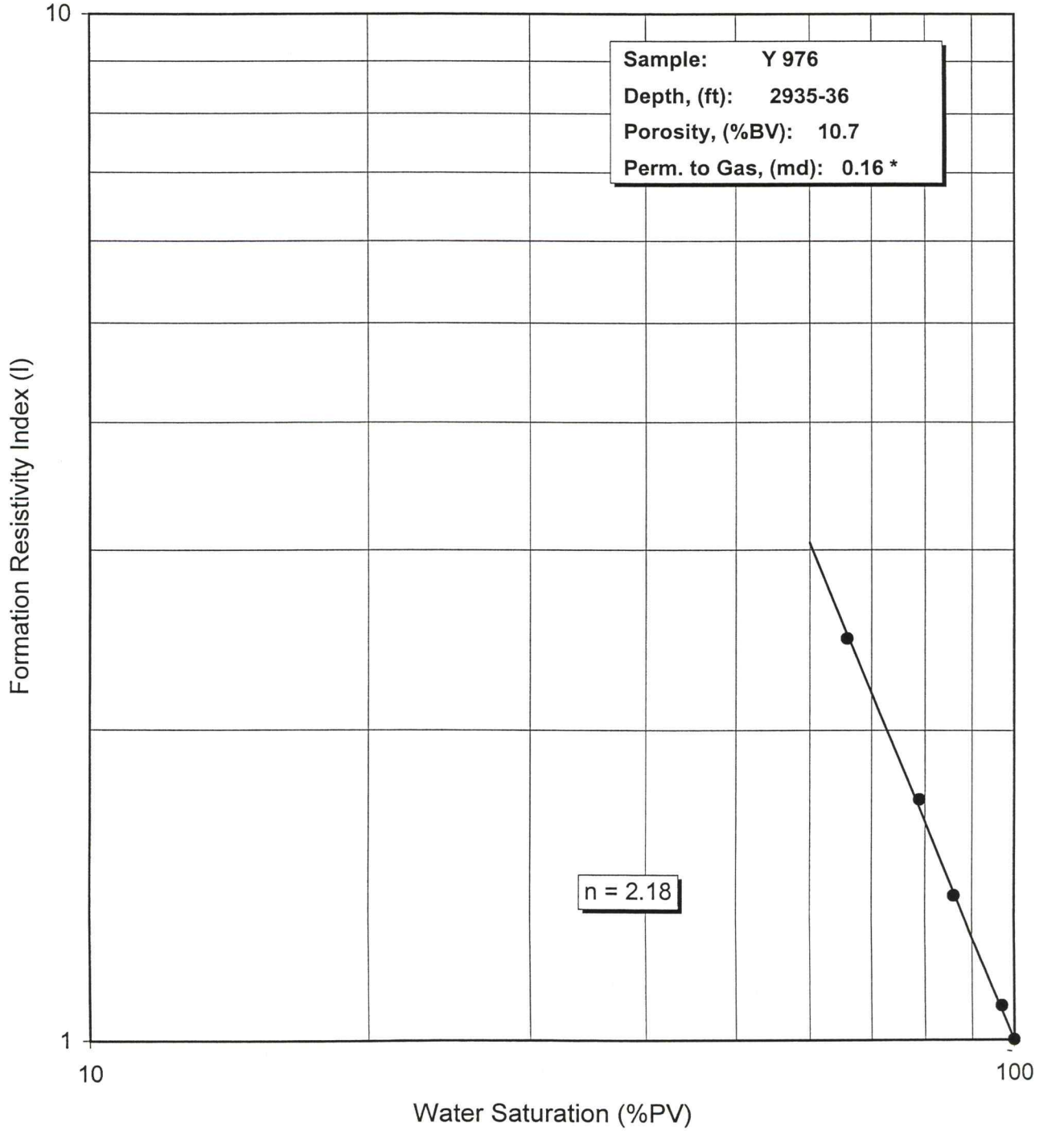

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TABLE 14

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 977	Porosity (%BV):	9.3
Depth (ft):	2949-50	Perm to Gas (md):	1.29 *

Formation Resistivity Index (I)	Water Saturation (%PV)	Saturation Exponent (n)
1.00	100.0	--
1.21	91.1	2.05
1.55	80.2	1.99
2.38	65.1	2.02
4.01	49.2	1.96
9.69	34.7	2.15
13.57	28.6	2.08

Rw = 0.0461 ohm-meters @ 77 degrees Fahrenheit

* Permeability to gas measured at 400 psig confining pressure.

FIGURE 15

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

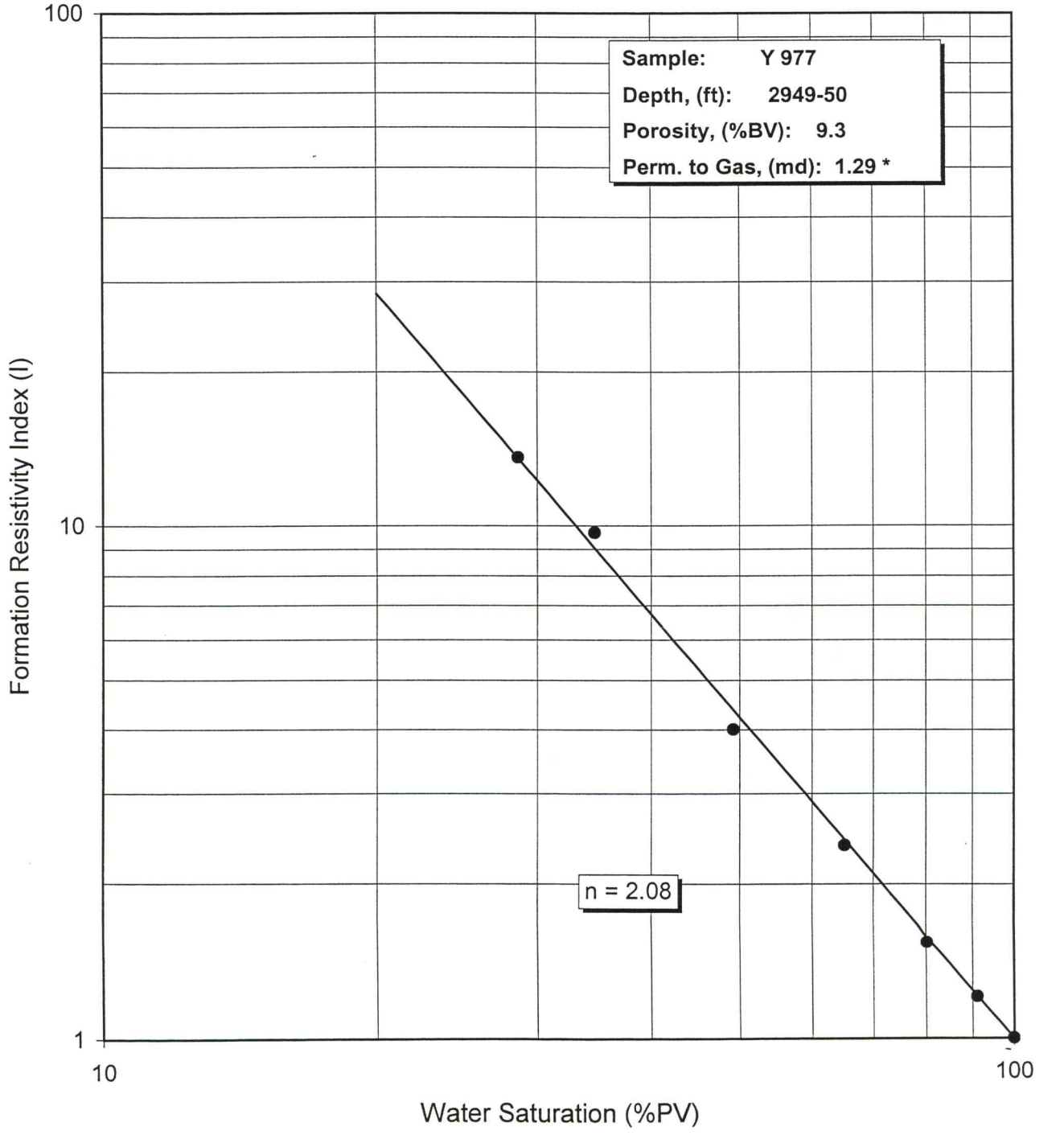

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TABLE 15

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 978	Porosity (%BV):	21.6
Depth (ft):	2958-59	Perm. to Gas (md):	122 *

Formation Resistivity Index (I)	Water Saturation (%PV)	Saturation Exponent (n)
1.00	100.0	--
1.22	91.7	2.29
1.53	82.1	2.15
2.35	65.7	2.03
4.36	50.8	2.17
13.42	33.7	2.39
34.60	17.8	2.05
86.52	13.4	2.22

Rw = 0.0461 ohm-meters @ 77 degrees Fahrenheit

* Permeability to gas measured at 400 psig confining pressure.

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FIGURE 16

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

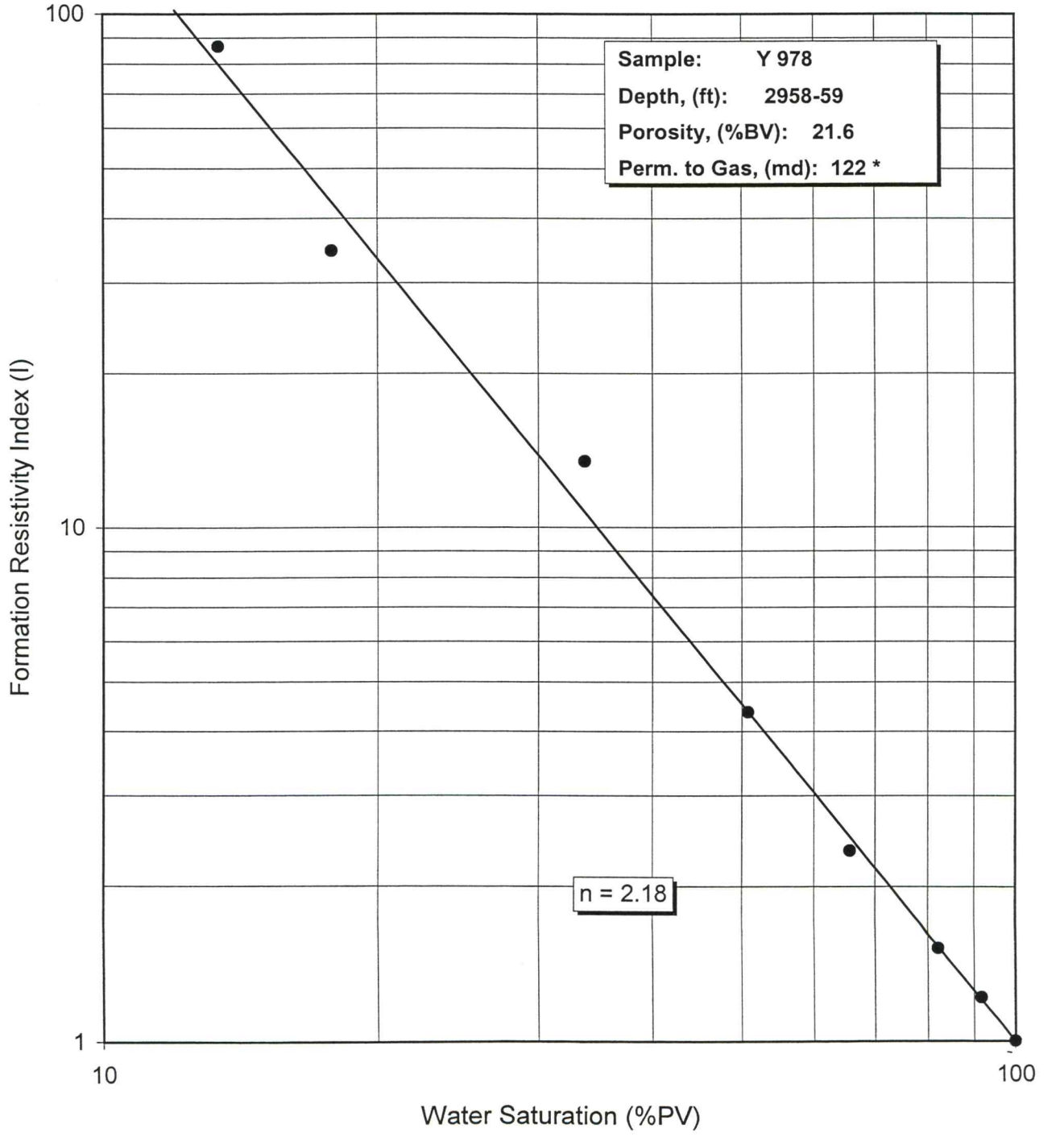

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TABLE 16

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 979	Porosity (%BV):	7.5
Depth (ft):	2964-65	Perm to Gas (md):	1.60*

Formation Resistivity Index (I)	Water Saturation (%PV)	Saturation Exponent (n)
1.00	100.0	--
1.29	88.6	2.07
1.78	75.3	2.03
2.51	64.1	2.07
4.36	50.6	2.16
6.22	45.0	2.29
8.49	38.2	2.22

Rw = 0.0461 ohm-meters @ 77 degrees Fahrenheit

* Permeability to gas measured at 400 psig confining pressure.

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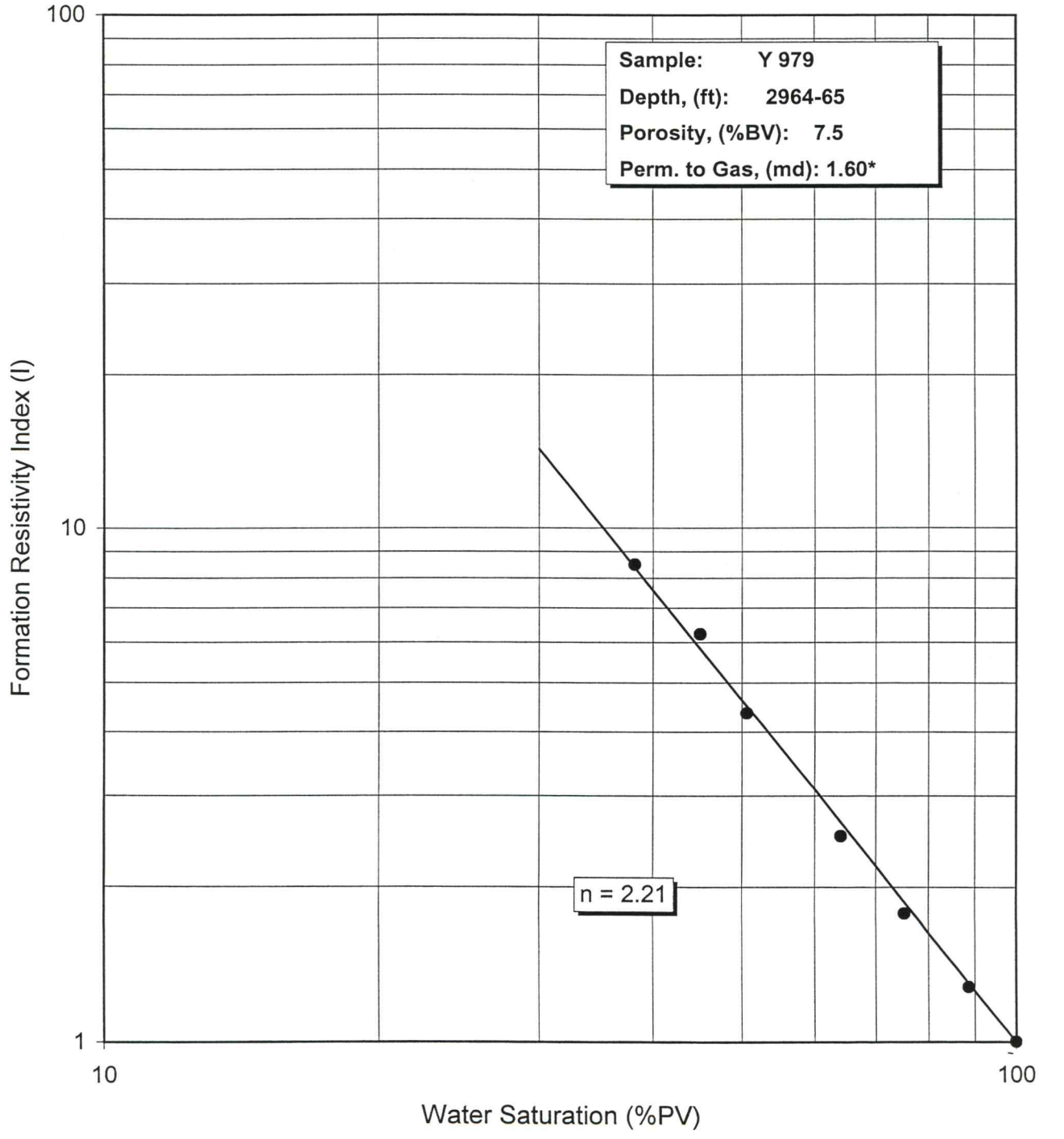
FIGURE 17

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP AT 1360 psig CONFINING PRESSURE

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

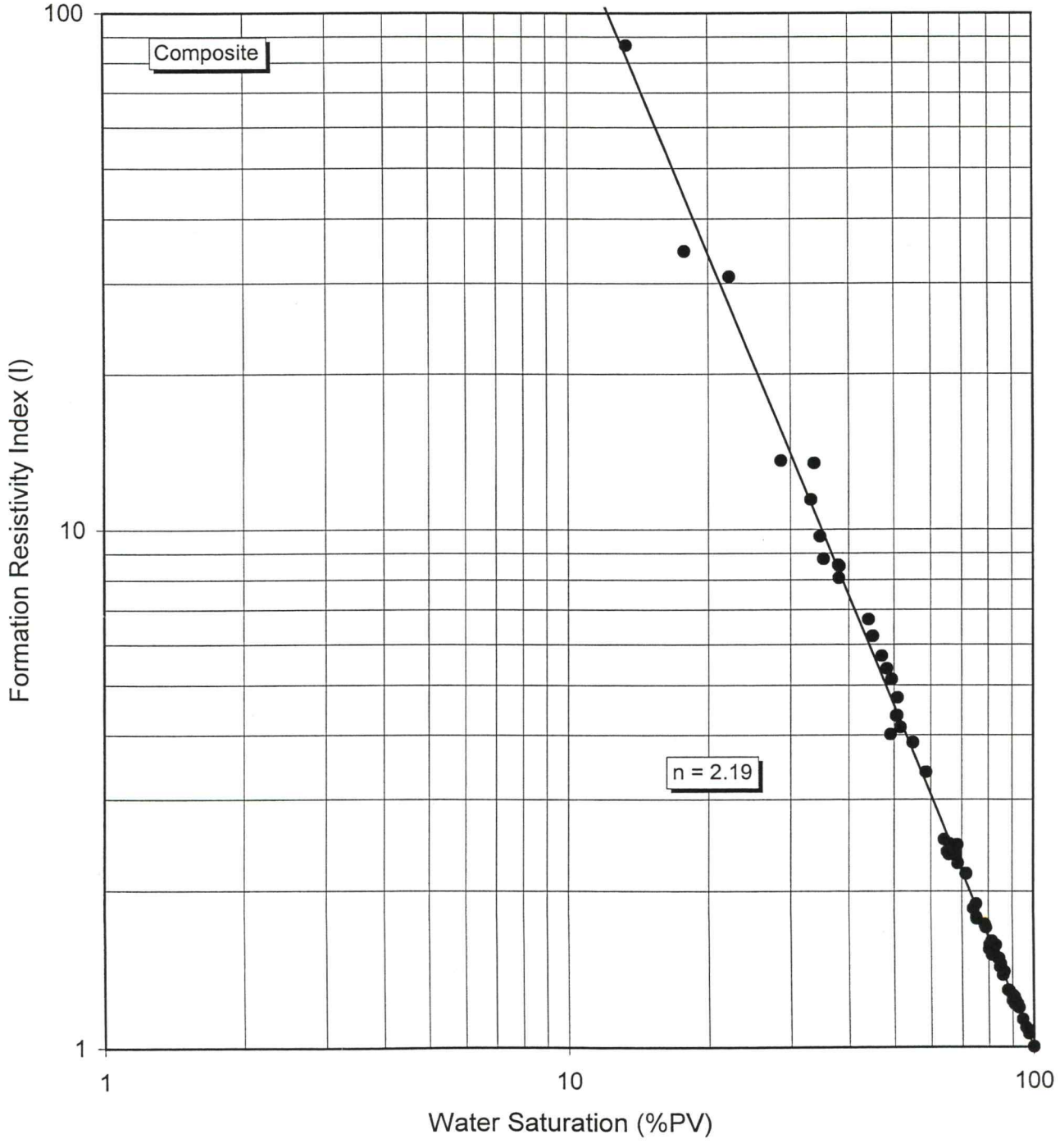


RSH 3928

FIGURE 18

FORMATION RESISTIVITY INDEX - SATURATION RELATIONSHIP

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas



RSH 3928

CAPILLARY PRESSURE DATA
PIONEER 3-34R STUART

2782-83'

PC (a/b)	SW%	BV%	PC (a/b)
1	100	0	1
2	100	0	2
4	100	0	4
8	100	0	8
15	100	0	15
35	97.5	0.1975	35
75	93.3	0.5293	75
125	89.2	0.8532	125
200	84.7	1.2087	200

POR 7.9%
PERM 0.02 md.

2794-95'

PC (a/b)	SW%	BV%	PC (a/b)
1	100	0	1
2	100	0	2
4	100	0	4
8	98.9	0.1331	8
15	97.4	0.3146	15
35	94.2	0.7018	35
75	89.8	1.2342	75
125	83.7	1.9723	125
200	74.5	3.0855	200

POR 12.1%
PERM 0.09

2796-97

PC (a/b)	SW%	BV%	PC (a/b)
1	100	0	1
2	100	0	2
4	100	0	4
8	98.6	0.3066	8
15	97.2	0.6132	15
35	93.7	1.3797	35
75	90.2	2.1462	75
125	85.9	3.0879	125
200	80.1	4.3581	200

POR 21.9%

PERM 0.40 md.

2830-31'

PC (a/b)	SW%	BV%	PC (a/b)
1	97.6	0.3744	1
2	96.2	0.5928	2
4	95.8	0.6552	4
8	93.3	1.0452	8
15	91	1.404	15
35	87.1	2.0124	35
75	84.2	2.4648	75
125	80.7	3.0108	125
200	73.8	4.0872	200

POR 15.6%
PERM 0.29 md.

2848-49'

PC (a/b)	SW%	BV%	PC (a/b)
1	100	0	1
2	100	0	2
4	100	0	4
8	97.3	0.4455	8
15	91.7	1.3695	15
35	82.4	2.904	35
75	68.2	5.247	75
125	51.6	7.986	125
200	36.2	10.527	200

POR 16.5%
PERM 0.95 md.

2883-84'

PC (a/b)	SW%	BV%	PC (a/b)
1	91.9	0.5184	1
2	91	0.576	2
4	89.1	0.6976	4
8	88.3	0.7488	8
15	85.6	0.9216	15
35	81.8	1.1648	35
75	79.2	1.3312	75
125	74.8	1.6128	125
200	70.6	1.8816	200

POR 6.4%
PERM 1.58 md.

2910-11'

PC (a/b)	SW%	BV%	PC (a/b)
1	91.4	1.2212	1
2	83.4	2.3572	2
4	60.6	5.5948	4
8	48	7.384	8
15	36.3	9.0454	15
35	23.9	10.8062	35
75	19.4	11.4452	75
125	18.6	11.5588	125
200	18.1	11.6298	200

POR 14.40%
PERM 8.82 md.

2914-15'

PC (a/b)	SW%	BV%	PC (a/b)
1	90.2	1.0192	1
2	83.7	1.6952	2
4	77	2.392	4
8	72.5	2.86	8
15	61.8	3.9728	15
35	48.5	5.356	35
75	37.9	6.4584	75
125	36.1	6.6456	125
200	33.2	6.9472	200

POR 10.4%
PERM 0.56 md.

2935-36'

PC (a/b)	SW%	BV%	PC (a/b)
1	98.4	0.2964	1
2	96.7	0.3762	2
4	96.2	0.4332	4
8	93.2	0.7752	8
15	90.2	1.1172	15
35	84.2	1.8012	35
75	77.6	2.5536	75
125	72	3.192	125
200	62.1	4.3206	200

POR 11.4%
PERM 0.16 md.

2949-50'

PC (a/b)	SW%	BV%	PC (a/b)
1	90	1.02	1
2	81.4	1.8972	2
4	72.8	2.7744	4
8	66.8	3.1824	8
15	51.2	4.9776	15
35	36.9	6.4362	35
75	29	7.242	75
125	27.7	7.3746	125
200	26.5	7.497	200

POR 10.2%
PERM 1.29 md.

2958-59'

PC (a/b)	SW%	BV%	PC (a/b)
1	92.5	1.6425	1
2	51.7	10.5777	2
4	34.7	14.3007	4
8	27.4	15.8994	8
15	24.1	16.6221	15
35	19.1	17.7171	35
75	14.3	18.7683	75
125	13.5	18.9435	125
200	12.8	19.0968	200

POR 21.9%
PERM 122 md.

2964-65'

PC (a/b)	SW%	BV%	PC (a/b)
1	96.2	0.3192	1
2	83.2	1.4112	2
4	72.3	2.3268	4
8	64.1	3.0156	8
15	53.8	3.8808	15
35	45.6	4.5696	35
75	38.2	5.1912	75
125	37.4	5.2584	125

200	37.1	5.2836	200

POR 8.4%
PERM 1.60 md.

CAPILLARY PRESSURE DATA
PIONEER 3-34R STUART

2782-83'

PC (a/b)	SW%	BV%	PC (a/b)
1	100	0	1
2	100	0	2
4	100	0	4
8	100	0	8
15	100	0	15
35	97.5	0.1975	35
75	93.3	0.5293	75
125	89.2	0.8532	125
200	84.7	1.2087	200

POR 7.9%
PERM 0.02 md.

2794-95'

PC (a/b)	SW%	BV%	PC (a/b)
1	100	0	1
2	100	0	2
4	100	0	4
8	98.9	0.1331	8
15	97.4	0.3146	15
35	94.2	0.7018	35
75	89.8	1.2342	75
125	83.7	1.9723	125
200	74.5	3.0855	200

POR 12.1%
PERM 0.09

2796-97

PC (a/b)	SW%	BV%	PC (a/b)
1	100	0	1
2	100	0	2
4	100	0	4
8	98.6	0.3066	8
15	97.2	0.6132	15
35	93.7	1.3797	35
75	90.2	2.1462	75
125	85.9	3.0879	125
200	80.1	4.3581	200

POR 21.9%

PERM 0.40 md.

2830-31'

PC (a/b)	SW%	BV%	PC (a/b)
1	97.6	0.3744	1
2	96.2	0.5928	2
4	95.8	0.6552	4
8	93.3	1.0452	8
15	91	1.404	15
35	87.1	2.0124	35
75	84.2	2.4648	75
125	80.7	3.0108	125
200	73.8	4.0872	200

POR 15.6%
PERM 0.29 md.

2848-49'

PC (a/b)	SW%	BV%	PC (a/b)
1	100	0	1
2	100	0	2
4	100	0	4
8	97.3	0.4455	8
15	91.7	1.3695	15
35	82.4	2.904	35
75	68.2	5.247	75
125	51.6	7.986	125
200	36.2	10.527	200

POR 16.5%
PERM 0.95 md.

2883-84'

PC (a/b)	SW%	BV%	PC (a/b)
1	91.9	0.5184	1
2	91	0.576	2
4	89.1	0.6976	4
8	88.3	0.7488	8
15	85.6	0.9216	15
35	81.8	1.1648	35
75	79.2	1.3312	75
125	74.8	1.6128	125
200	70.6	1.8816	200

POR 6.4%
PERM 1.58 md.

2910-11'

PC (a/b)	SW%	BV%	PC (a/b)
1	91.4	1.2212	1
2	83.4	2.3572	2
4	60.6	5.5948	4
8	48	7.384	8
15	36.3	9.0454	15
35	23.9	10.8062	35
75	19.4	11.4452	75
125	18.6	11.5588	125
200	18.1	11.6298	200

POR 14.40%
PERM 8.82 md.

2914-15'

PC (a/b)	SW%	BV%	PC (a/b)
1	90.2	1.0192	1
2	83.7	1.6952	2
4	77	2.392	4
8	72.5	2.86	8
15	61.8	3.9728	15
35	48.5	5.356	35
75	37.9	6.4584	75
125	36.1	6.6456	125
200	33.2	6.9472	200

POR 10.4%
PERM 0.56 md.

2935-36'

PC (a/b)	SW%	BV%	PC (a/b)
1	98.4	0.2964	1
2	96.7	0.3762	2
4	96.2	0.4332	4
8	93.2	0.7752	8
15	90.2	1.1172	15
35	84.2	1.8012	35
75	77.6	2.5536	75
125	72	3.192	125
200	62.1	4.3206	200

POR 11.4%
PERM 0.16 md.

	2949-50'		
PC (a/b)	SW%	BV%	PC (a/b)
1	90	1.02	1
2	81.4	1.8972	2
4	72.8	2.7744	4
8	66.8	3.1824	8
15	51.2	4.9776	15
35	36.9	6.4362	35
75	29	7.242	75
125	27.7	7.3746	125
200	26.5	7.497	200

POR 10.2%
PERM 1.29 md.

	2958-59'		
PC (a/b)	SW%	BV%	PC (a/b)
1	92.5	1.6425	1
2	51.7	10.5777	2
4	34.7	14.3007	4
8	27.4	15.8994	8
15	24.1	16.6221	15
35	19.1	17.7171	35
75	14.3	18.7683	75
125	13.5	18.9435	125
200	12.8	19.0968	200

POR 21.9%
PERM 122 md.

	2964-65'		
PC (a/b)	SW%	BV%	PC (a/b)
1	96.2	0.3192	1
2	83.2	1.4112	2
4	72.3	2.3268	4
8	64.1	3.0156	8
15	53.8	3.8808	15
35	45.6	4.5696	35
75	38.2	5.1912	75
125	37.4	5.2584	125

200	37.1	5.2836	200

POR 8.4%
PERM 1.60 md.

TABLE 17

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 968	Porosity (%BV):	7.9
Depth (ft):	2782-83	Perm. to Gas (md):	0.02

Capillary Pressure (psig)	Brine Saturation (% PV)
0.0	100.0
1.0	100.0
2.0	100.0
4.0	100.0
8.0	100.0
15.0	100.0
35.0	97.5
75.0	93.3
125.0	89.2
200.0	84.7

FIGURE 19

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

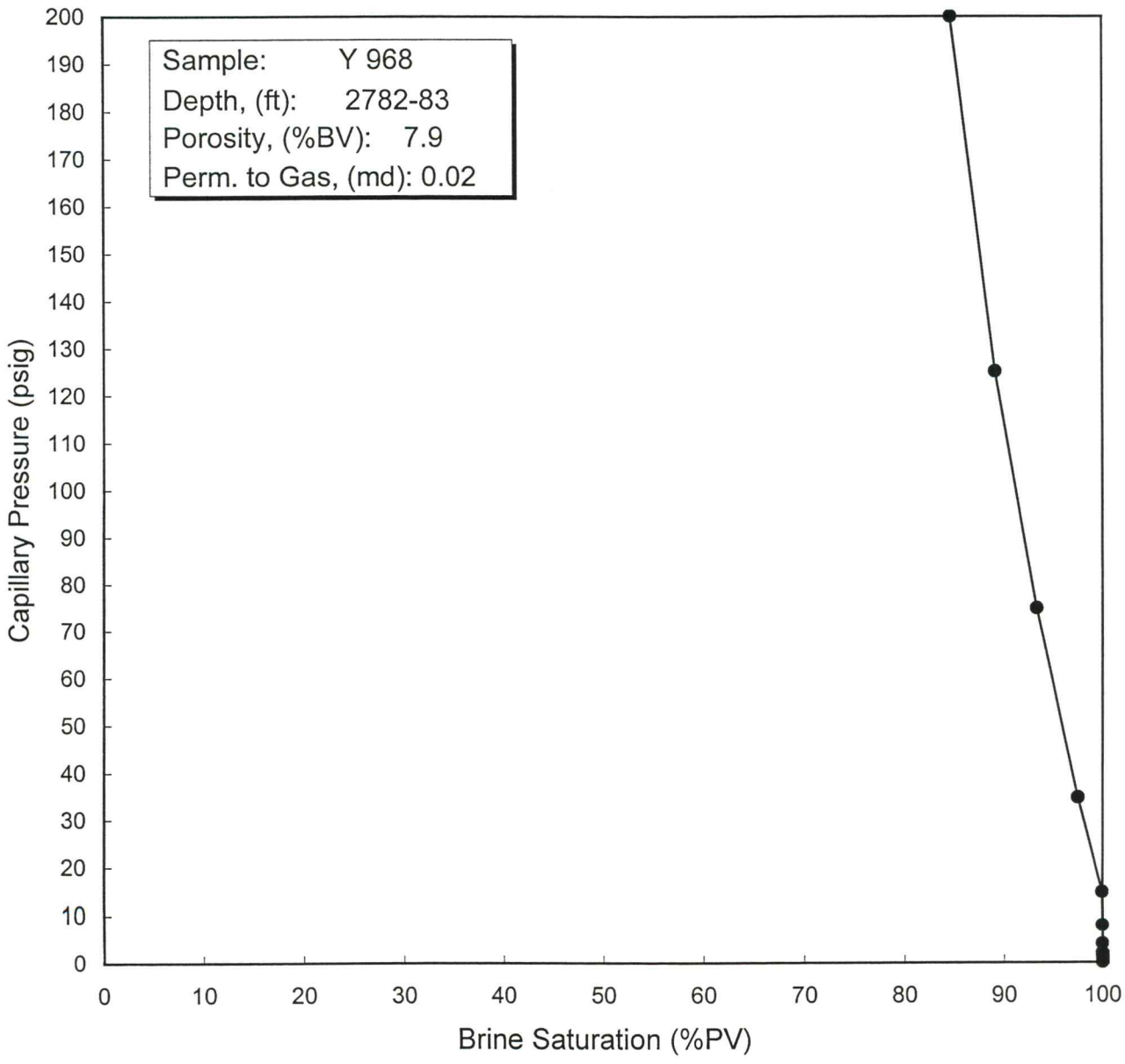


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TABLE 18

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 969	Porosity (%BV):	12.1
Depth (ft):	2794-95	Perm. to Gas (md):	0.09

Capillary Pressure (psig)	Brine Saturation (% PV)
0.0	100.0
1.0	100.0
2.0	100.0
4.0	100.0
8.0	98.9
15.0	97.4
35.0	94.2
75.0	89.8
125.0	83.7
200.0	74.5

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FIGURE 20

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

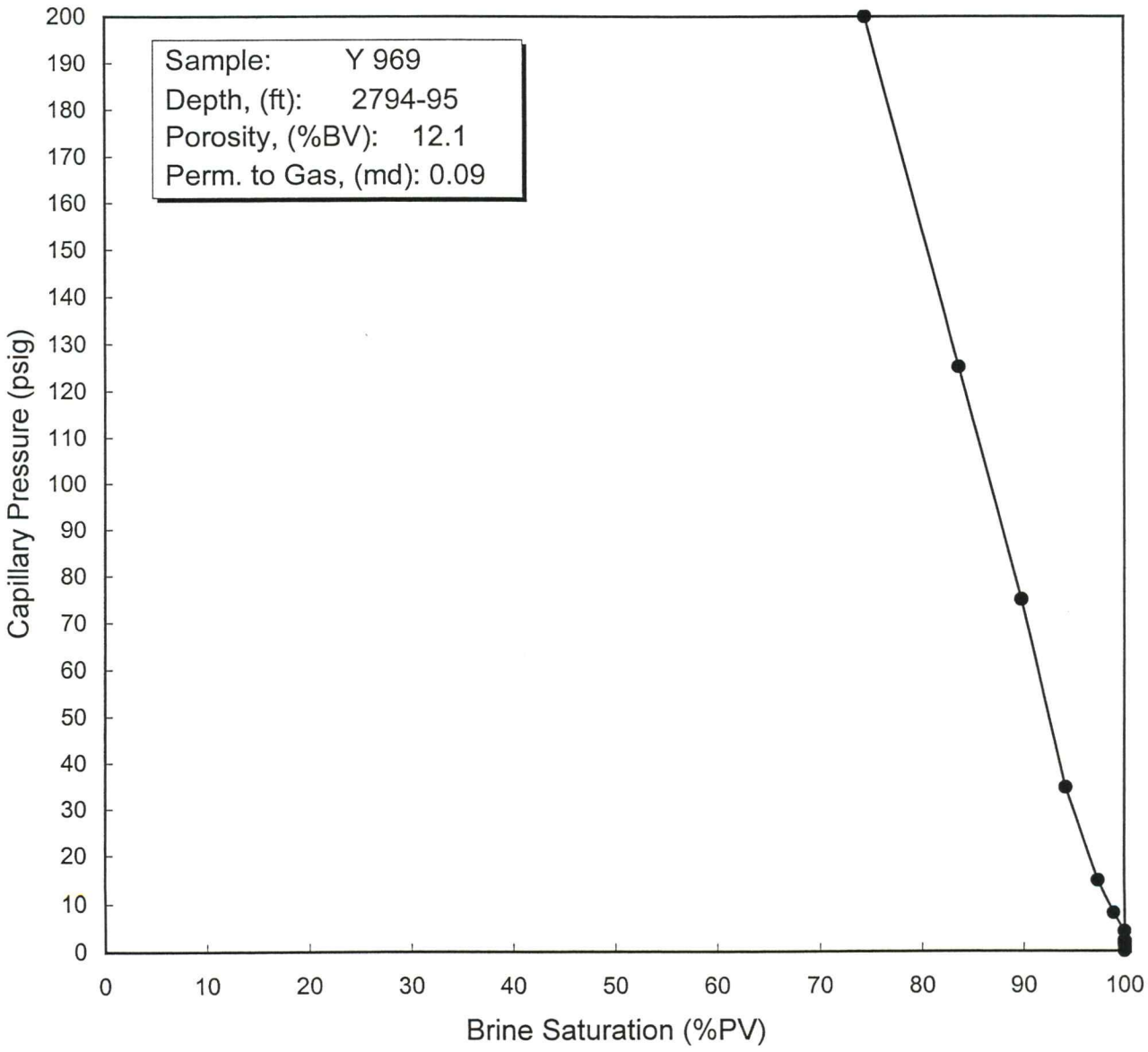

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TABLE 19

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 970	Porosity (%BV):	21.9
Depth (ft):	2796-97	Perm. to Gas (md):	0.40

Capillary Pressure (psig)	Brine Saturation (% PV)
0.0	100.0
1.0	100.0
2.0	100.0
4.0	100.0
8.0	98.6
15.0	97.2
35.0	93.7
75.0	90.2
125.0	85.9
200.0	80.1

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FIGURE 21

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

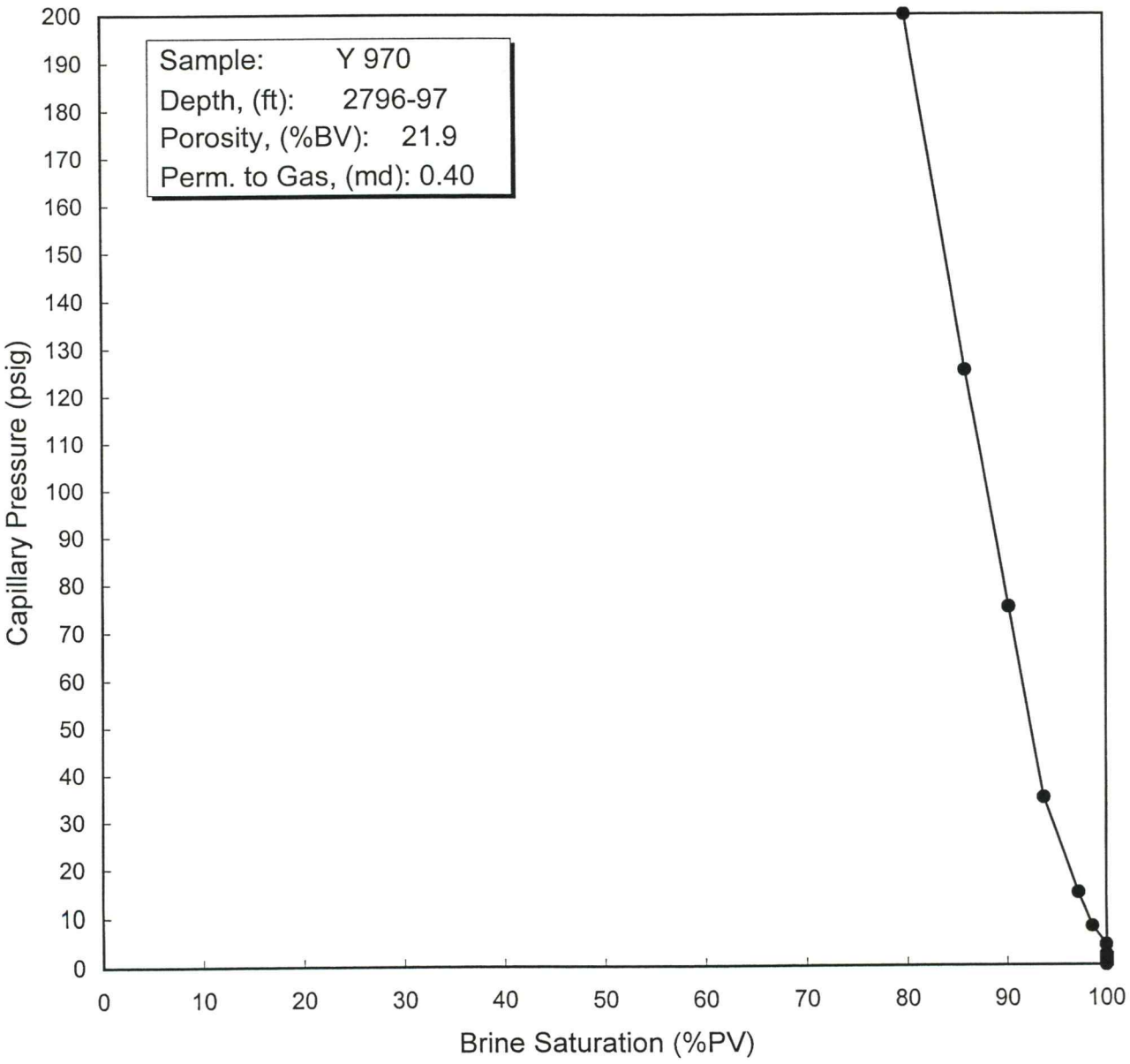

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TABLE 20

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 971	Porosity (%BV):	15.6
Depth (ft):	2830-31	Perm. to Gas (md):	0.29

Capillary Pressure (psig)	Brine Saturation (% PV)
0.0	100.0
1.0	97.6
2.0	96.2
4.0	95.8
8.0	93.3
15.0	91.0
35.0	87.1
75.0	84.2
125.0	80.7
200.0	73.8

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FIGURE 22

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

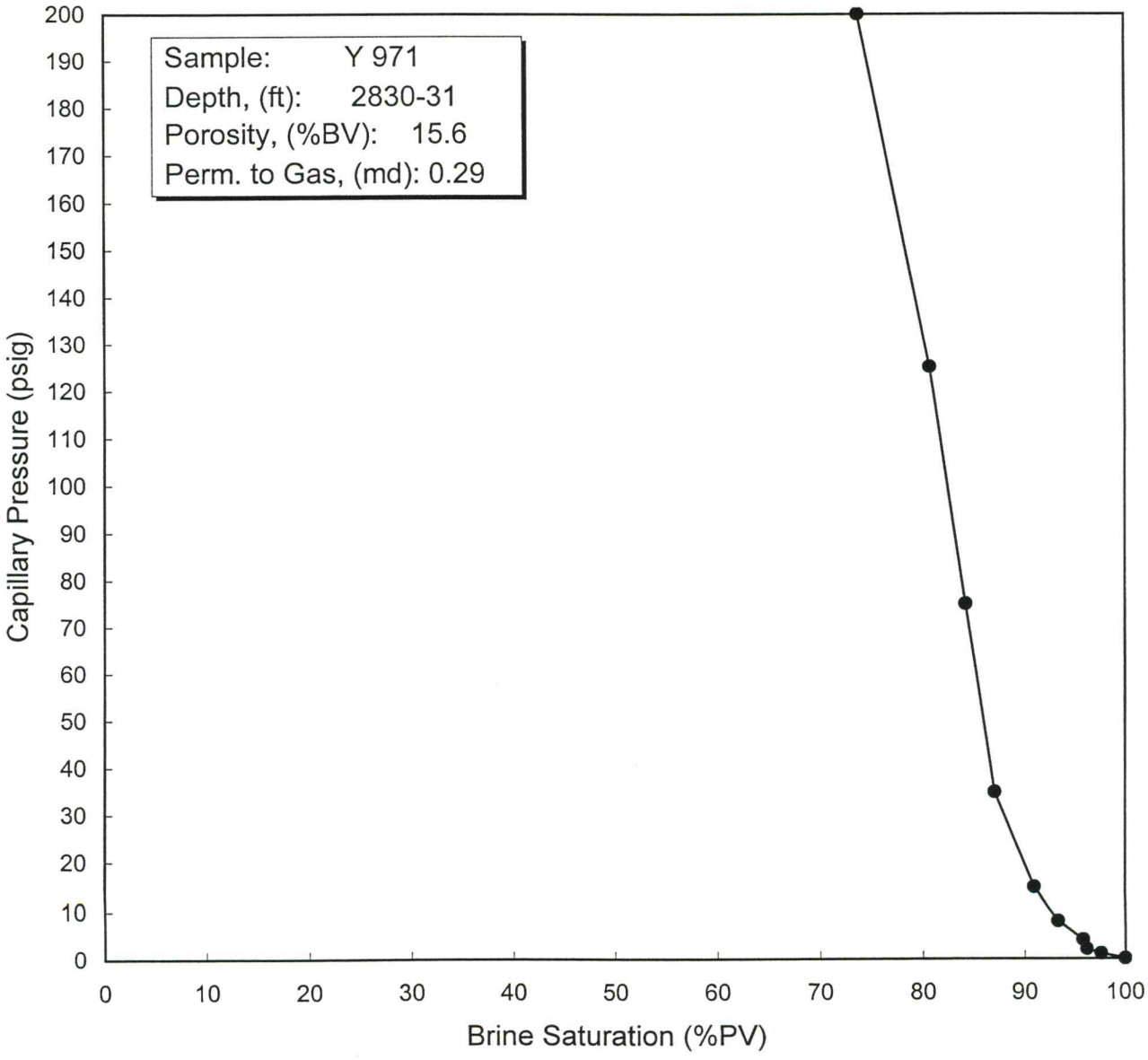

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TABLE 21

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 972	Porosity (%BV):	16.5
Depth (ft):	2848-49	Perm. to Gas (md):	0.95

Capillary Pressure (psig)	Brine Saturation (% PV)
0.0	100.0
1.0	100.0
2.0	100.0
4.0	100.0
8.0	97.3
15.0	91.7
35.0	82.4
75.0	68.2
125.0	51.6
200.0	36.2

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FIGURE 23

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

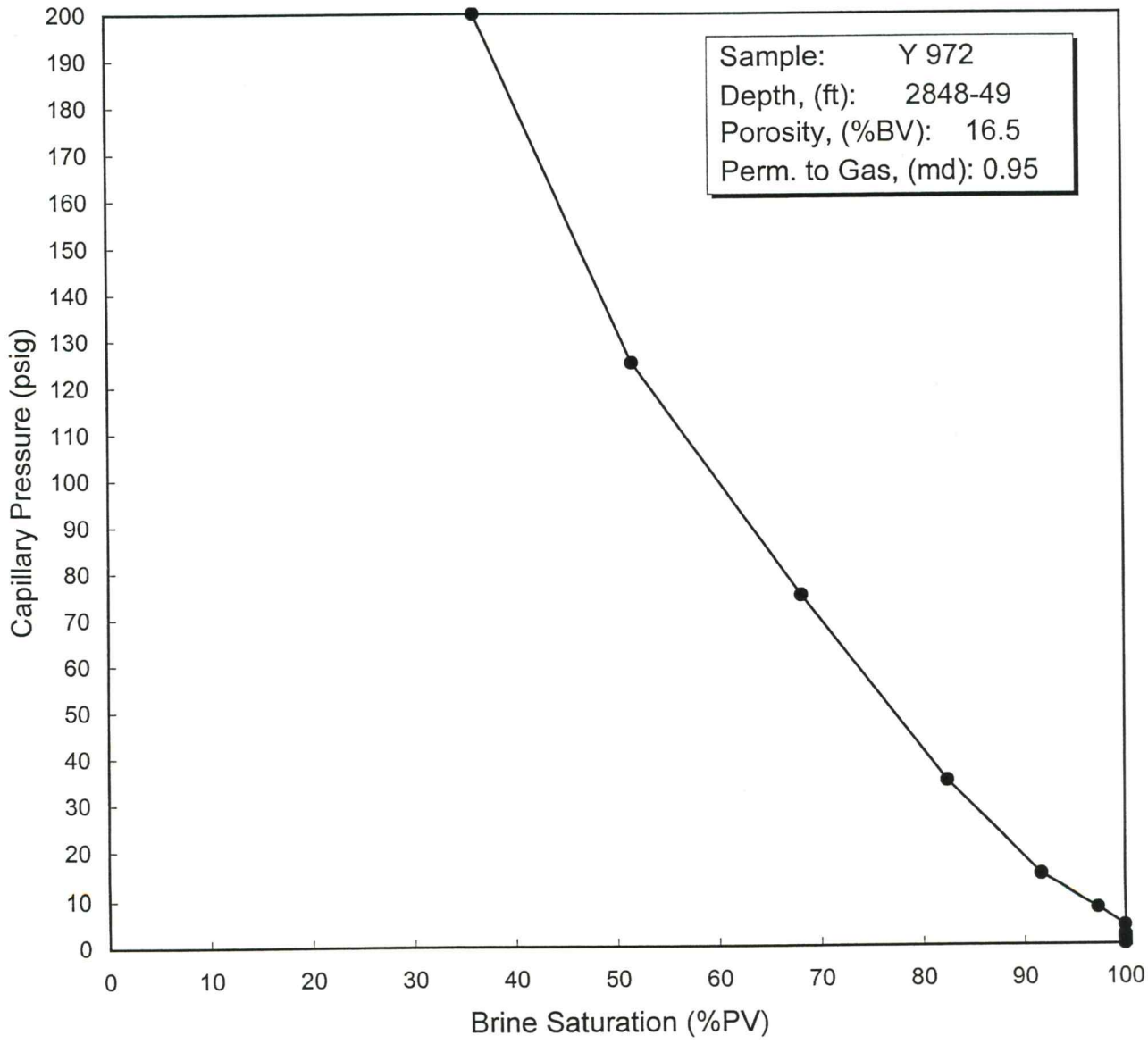

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TABLE 22

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 973	Porosity (%BV):	6.4
Depth (ft):	2883-84	Perm. to Gas (md):	1.58

Capillary Pressure (psig)	Brine Saturation (% PV)
0.0	100.0
1.0	91.9
2.0	91.0
4.0	89.1
8.0	88.3
15.0	85.6
35.0	81.8
75.0	79.2
125.0	74.8
200.0	70.6

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FIGURE 24

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

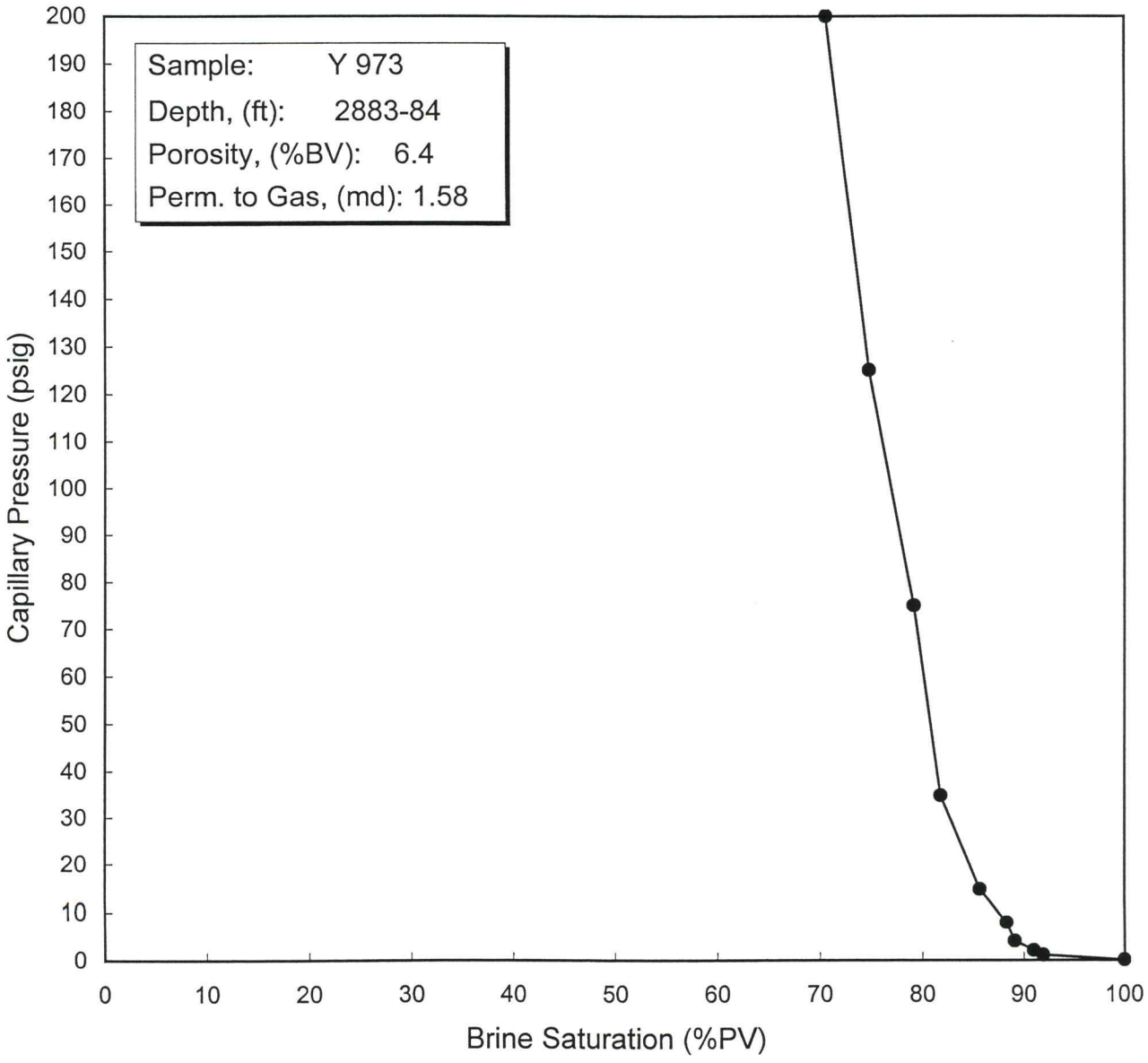

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TABLE 23

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 974	Porosity (%BV):	14.2
Depth (ft):	2910-11	Perm. to Gas (md):	8.82

Capillary Pressure (psig)	Brine Saturation (% PV)
0.0	100.0
1.0	91.4
2.0	83.4
4.0	60.6
8.0	48.0
15.0	36.3
35.0	23.9
75.0	19.4
125.0	18.6
200.0	18.1

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FIGURE 25

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

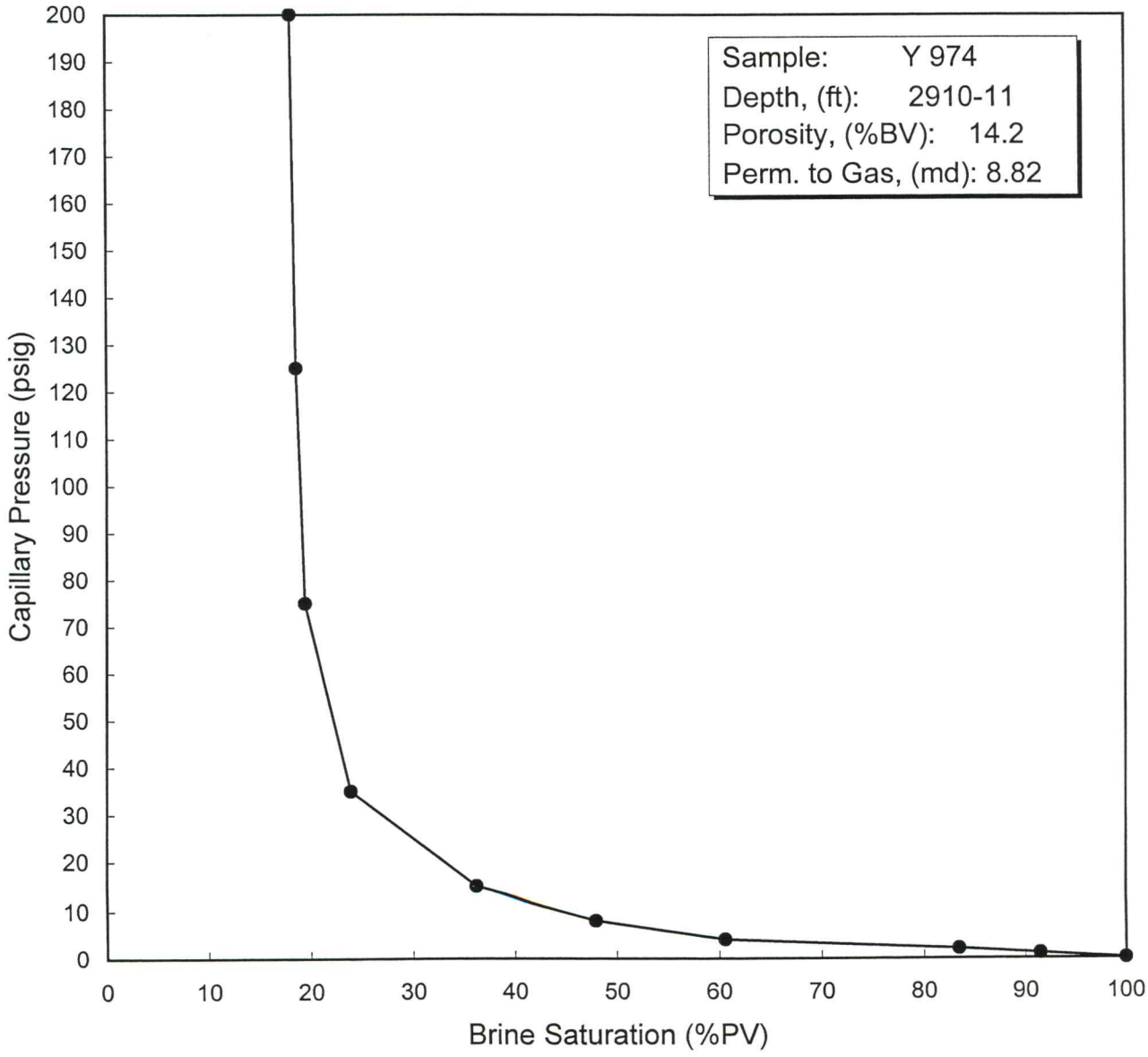

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TABLE 24

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 975	Porosity (%BV):	10.4
Depth (ft):	2914-15	Perm. to Gas (md):	0.56

Capillary Pressure (psig)	Brine Saturation (% PV)
0.0	100.0
1.0	90.2
2.0	83.7
4.0	77.0
8.0	72.5
15.0	61.8
35.0	48.5
75.0	37.9
125.0	36.1
200.0	33.2

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FIGURE 26

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

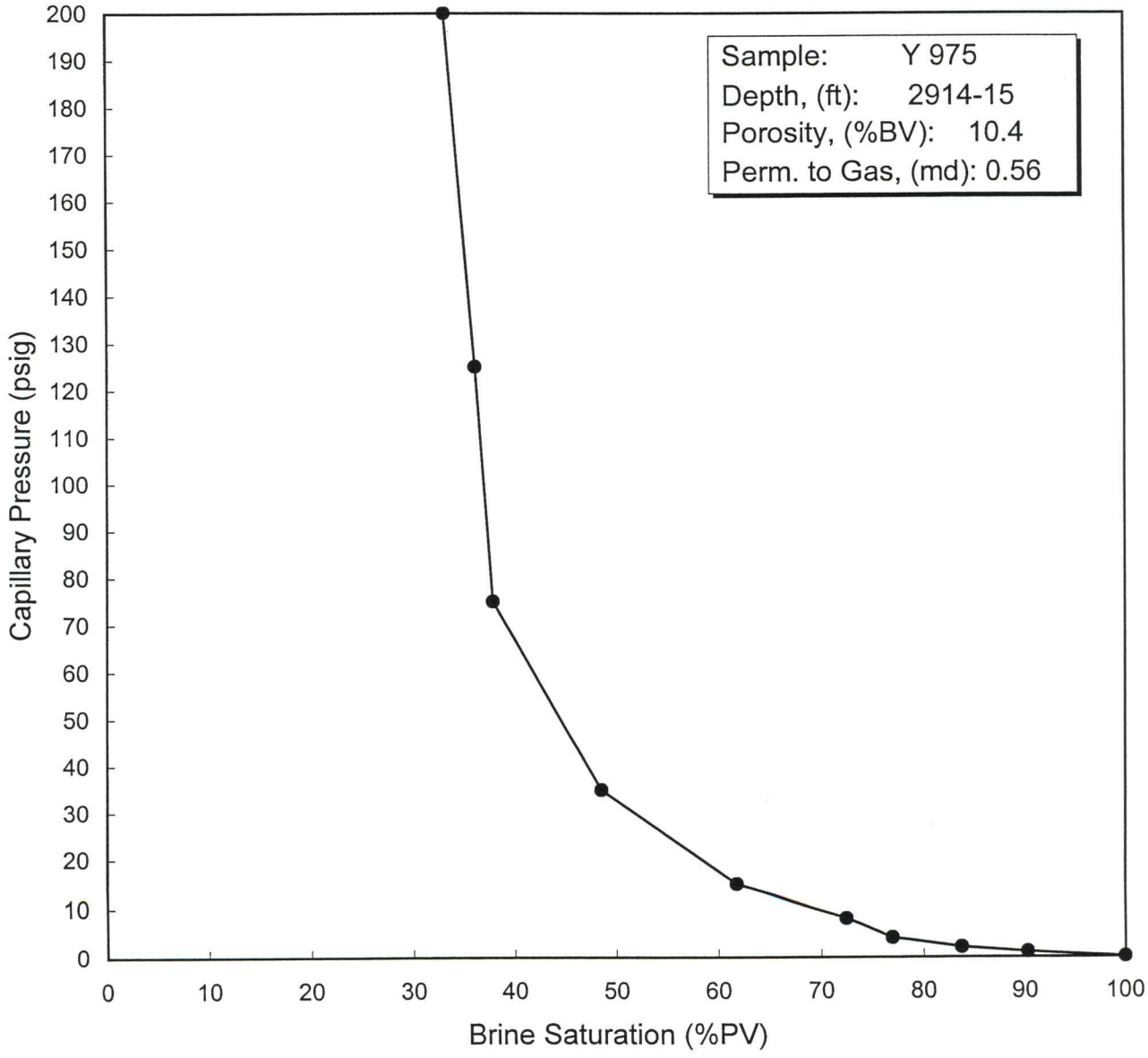

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TABLE 25

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 976	Porosity (%BV):	11.4
Depth (ft):	2935-36	Perm. to Gas (md):	0.16

Capillary Pressure (psig)	Brine Saturation (% PV)
0.0	100.0
1.0	98.4
2.0	96.7
4.0	96.2
8.0	93.2
15.0	90.2
35.0	84.2
75.0	77.6
125.0	72.0
200.0	62.1

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FIGURE 27

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

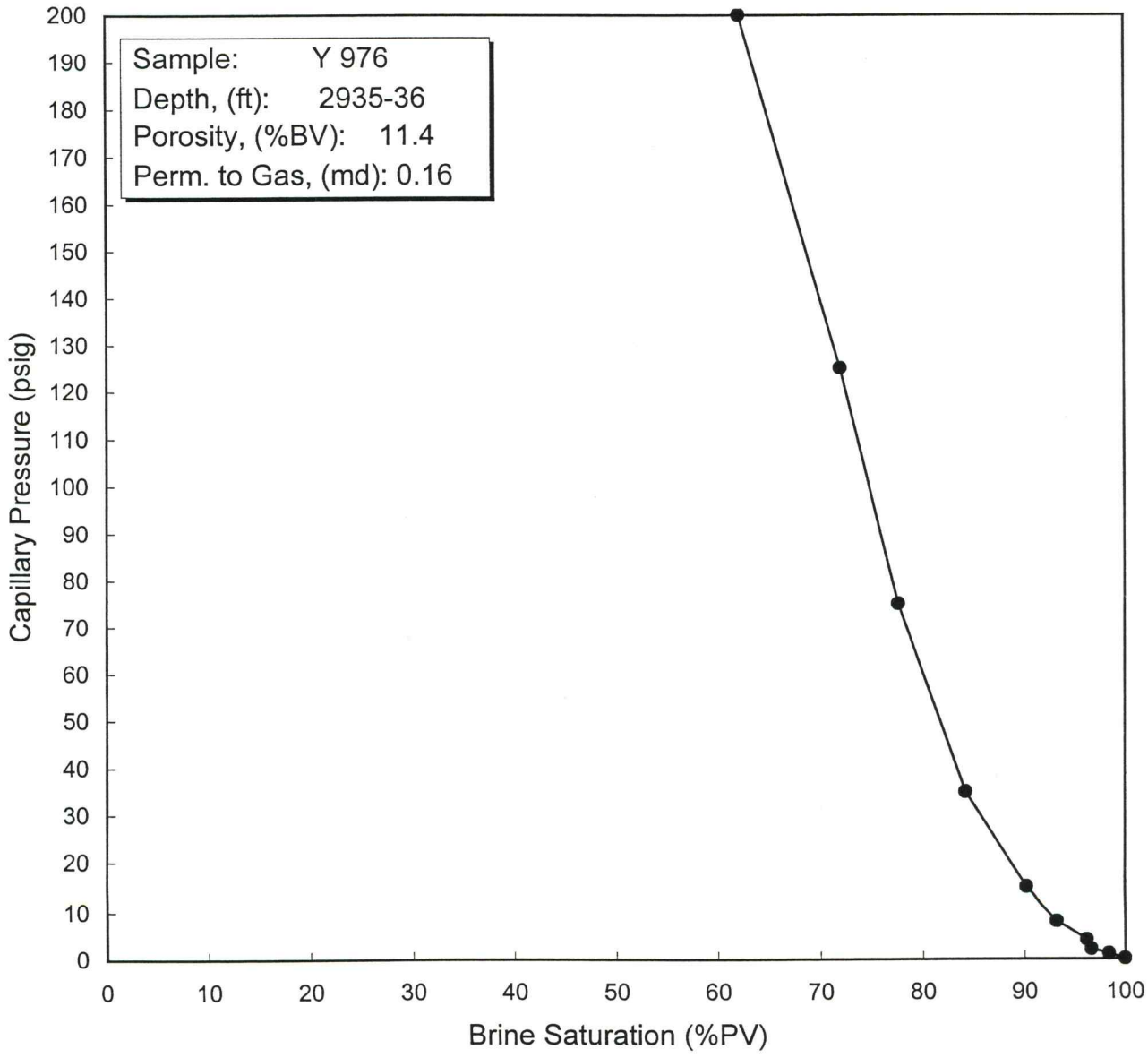

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TABLE 26

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 977	Porosity (%BV):	10.2
Depth (ft):	2949-50	Perm. to Gas (md):	1.29

Capillary Pressure (psig)	Brine Saturation (% PV)
0.0	100.0
1.0	90.0
2.0	81.4
4.0	72.8
8.0	66.8
15.0	51.2
35.0	36.9
75.0	29.0
125.0	27.7
200.0	26.5

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FIGURE 28

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

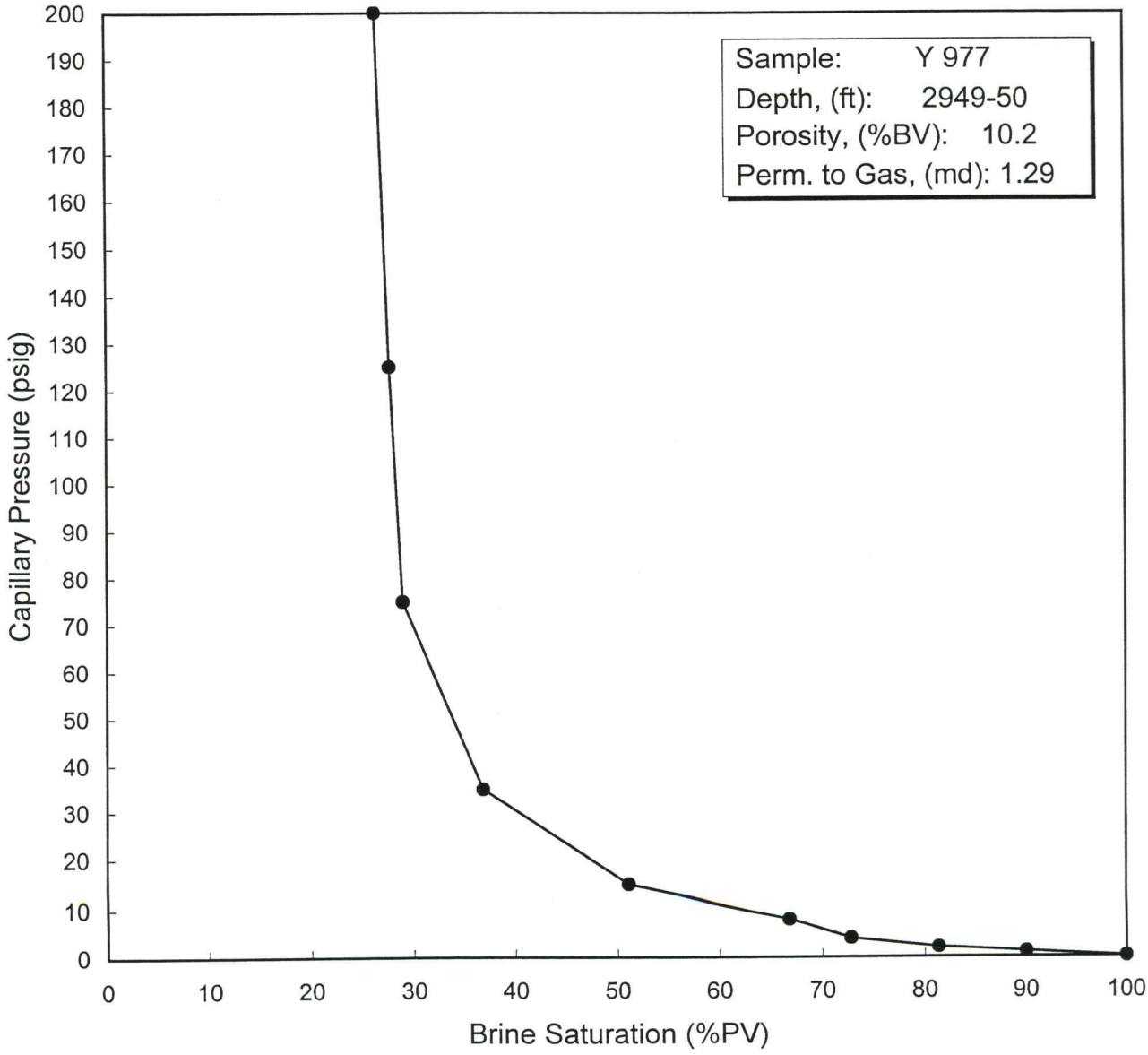

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TABLE 27

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 978	Porosity (%BV):	21.9
Depth (ft):	2958-59	Perm. to Gas (md):	122

Capillary Pressure (psig)	Brine Saturation (% PV)
0.0	100.0
1.0	92.5
2.0	51.7
4.0	34.7
8.0	27.4
15.0	24.1
35.0	19.1
75.0	14.3
125.0	13.5
200.0	12.8

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FIGURE 29

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

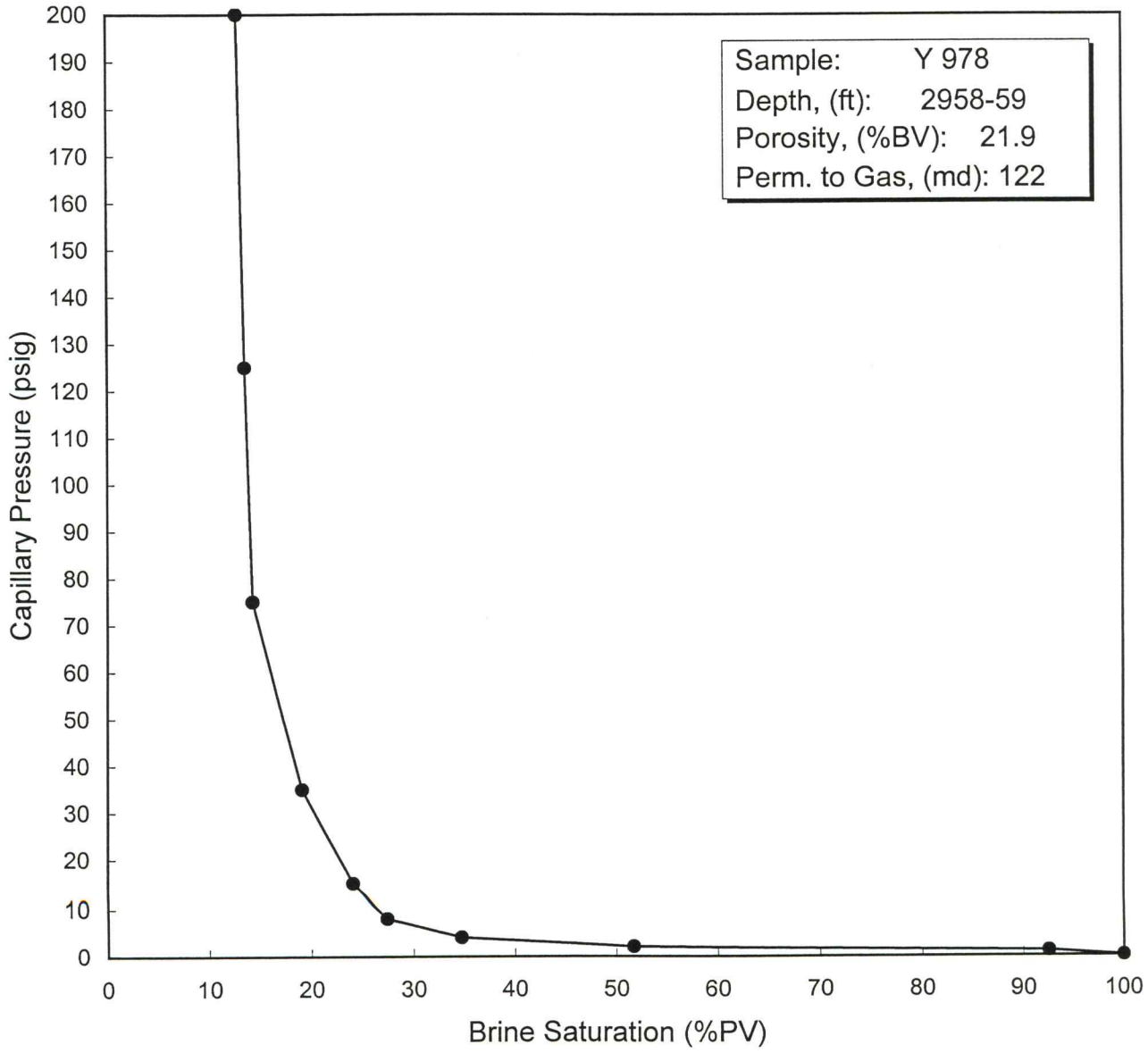

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TABLE 28

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

Sample:	Y 979	Porosity (%BV):	8.4
Depth (ft):	2964-65	Perm. to Gas (md):	1.60

Capillary Pressure (psig)	Brine Saturation (% PV)
0.0	100.0
1.0	96.2
2.0	83.2
4.0	72.3
8.0	64.1
15.0	53.8
35.0	45.6
75.0	38.2
125.0	37.4
200.0	37.1

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FIGURE 30

AIR-BRINE CAPILLARY PRESSURE RELATIONSHIP AT AMBIENT CONDITIONS

Pioneer Natural Resources
Pioneer Stuart 3-34R Well
Grant County, Kansas

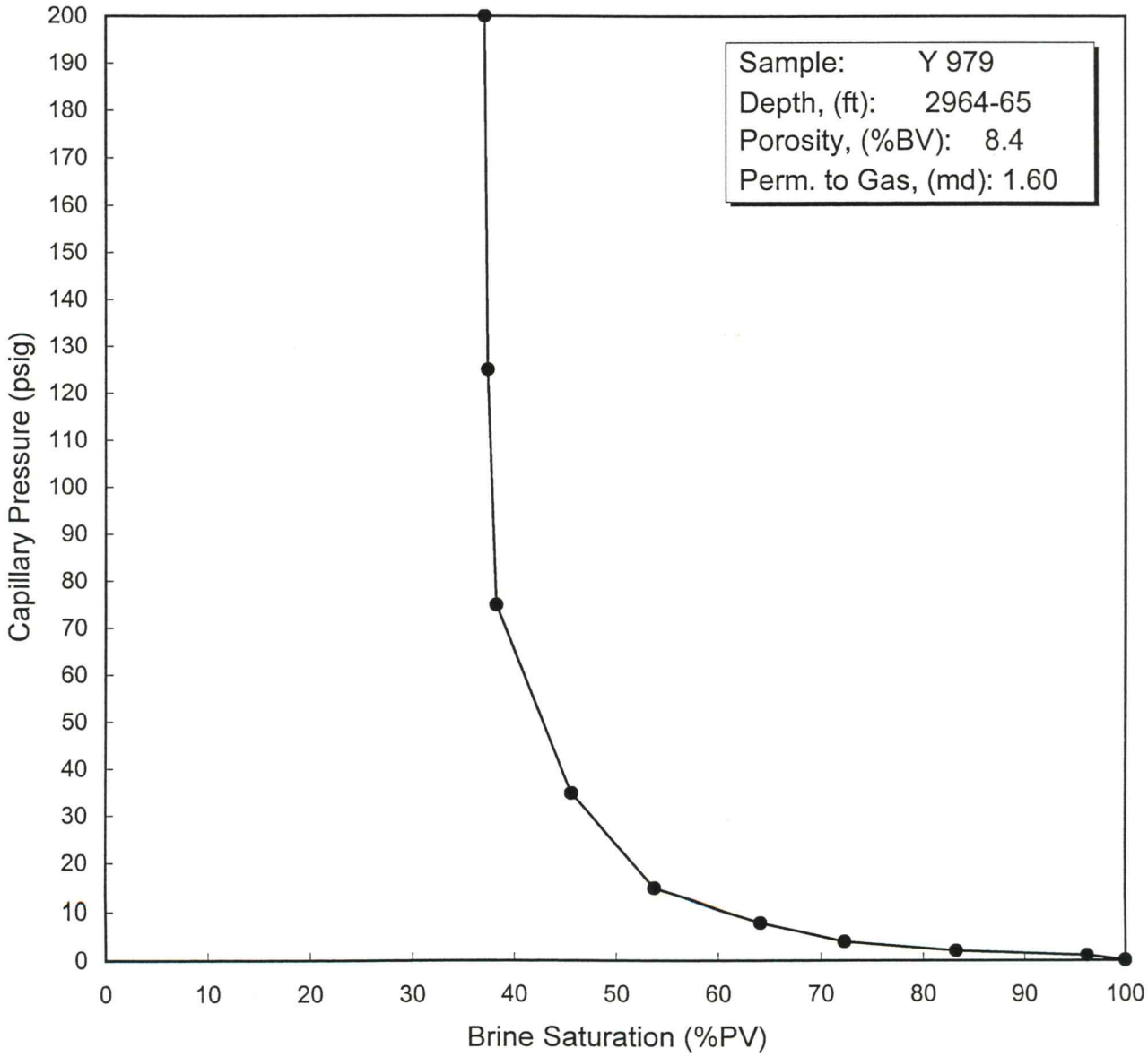

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FIGURE 31

NMR MEAN T2 AND T2 CUTOFF RELATIONSHIP
PIONEER STUART 3-34R

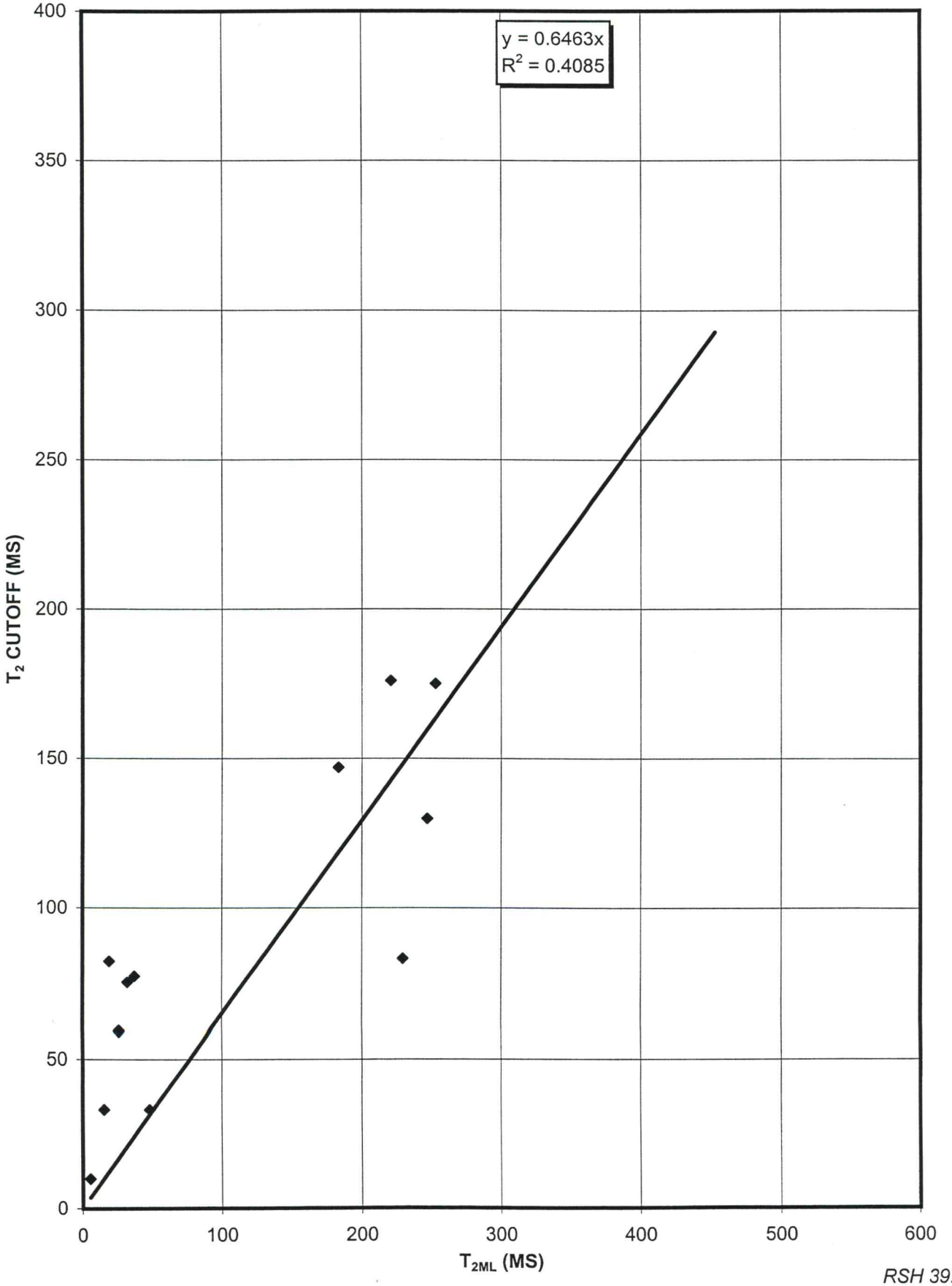

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FIGURE 32
MEAN T_2 PERMEABILITY MODEL
PIONEER STUART 3-34R

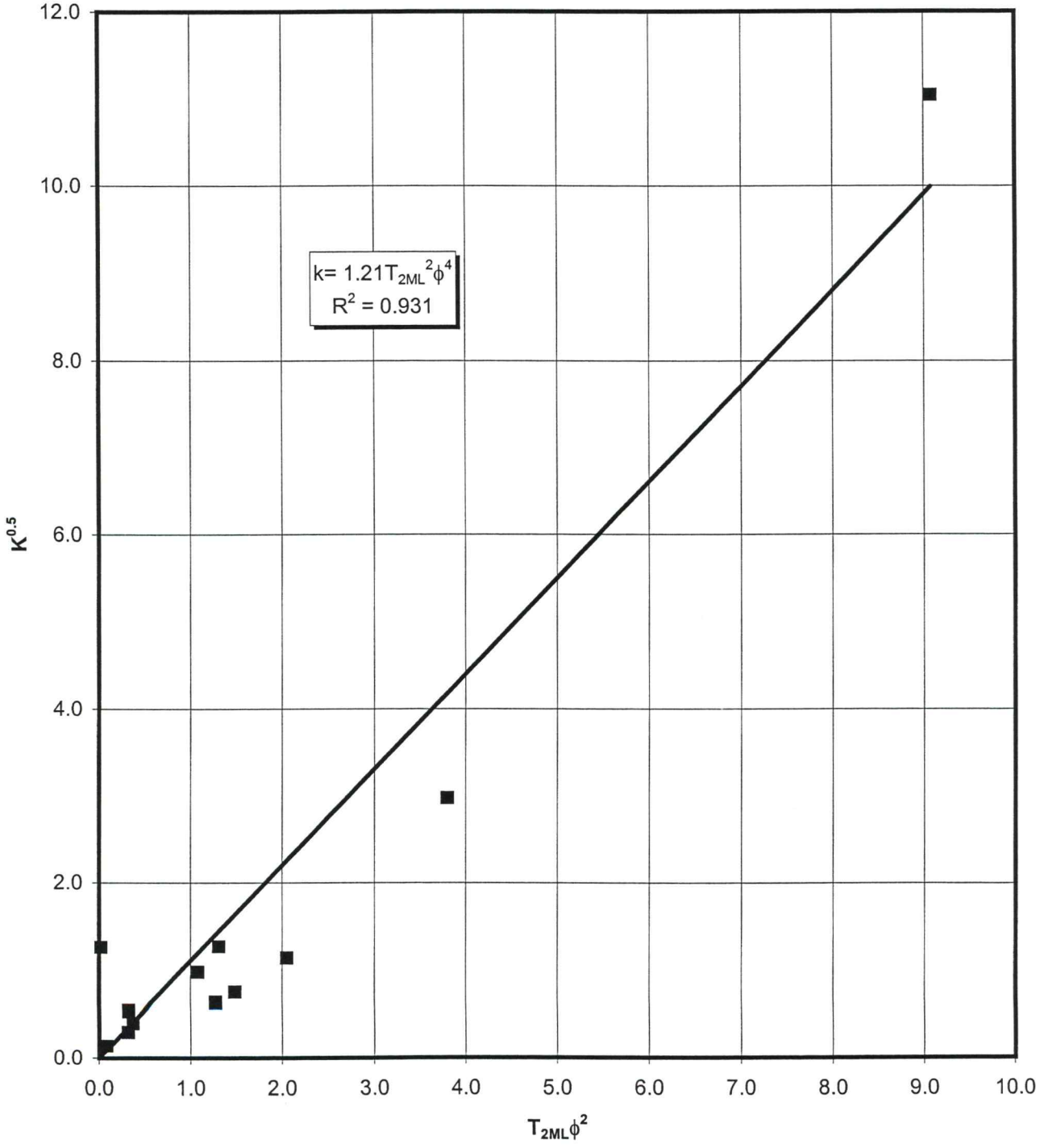

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FIGURE 33
COATES PERMEABILITY MODEL
PIONEER STUART 3-34R

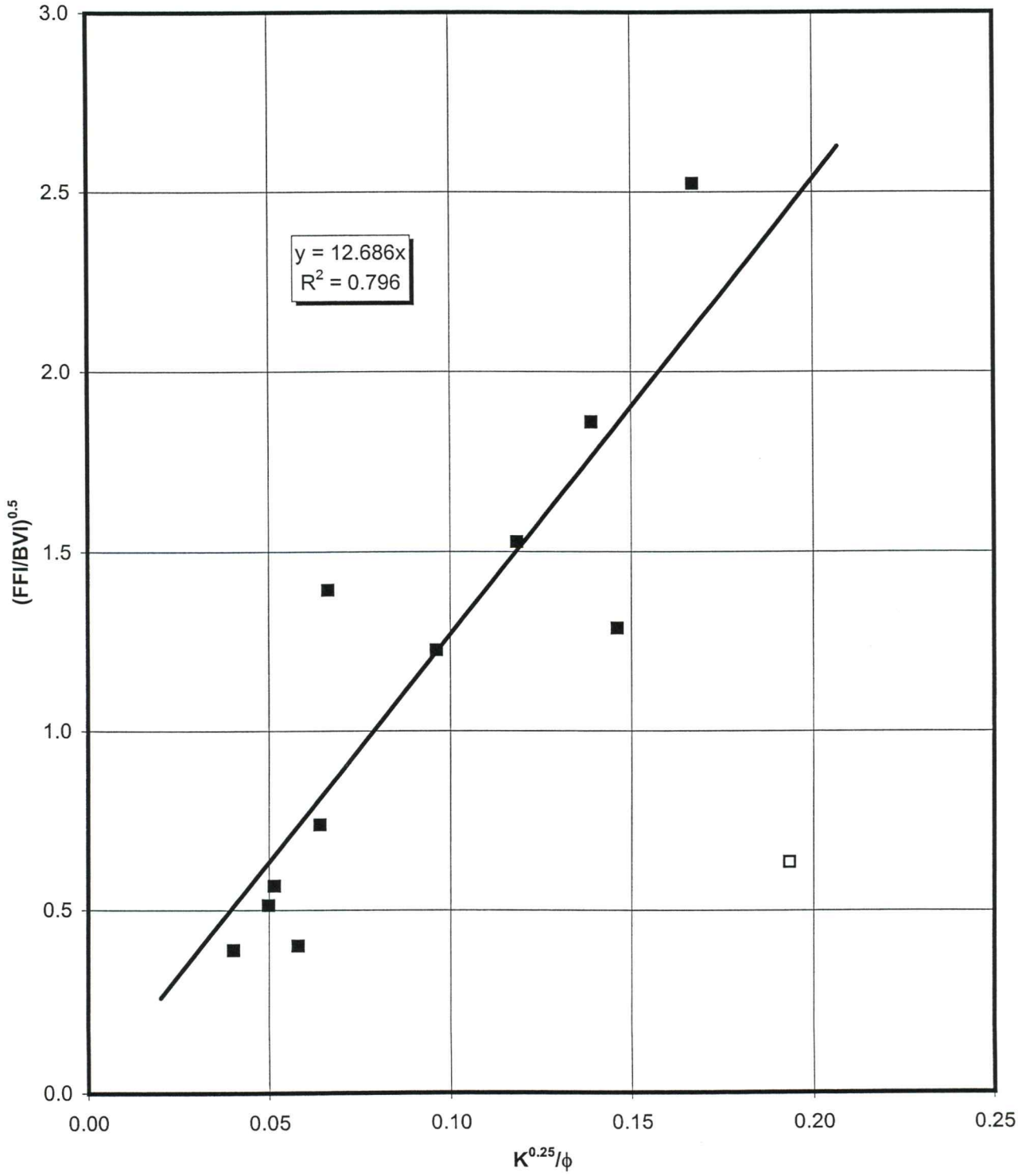

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TABLE 29

NMR SUMMARY
PIONEER STUART 3-34R

Core Depth (ft)	Core Analysis Data				NMR Data									
					100% Brine Saturation						Partial Brine Saturation			
	Porosity (%)	Permeability (md)	Grain Density (g/cc)	Swi (%)	Porosity (%)	Effective Porosity (%)	T_{2ML} (ms)	BVI % (92 ms)	FFI % (92 ms)	Swi % (92 ms)	BVI (%)	FFI (%)	Swi (%)	T_2 Cutoff (ms)
2782-83	7.9	0.02	2.68	84.7	6.5	5.8	19.5	5.8	0.7	89.2	5.6	0.9	86.3	82
2794-95	12.1	0.09	2.72	74.5	11.0	10.6	26.4	10.0	1.0	90.9	8.7	2.3	79.3	59
2796-97	21.9	0.40	2.67	80.1	19.8	19.2	32.5	18.4	1.4	92.9	17.2	2.6	86.9	75
2830-31	15.6	0.29	2.82	73.8	14.3	12.6	15.8	12.2	2.1	85.3	10.8	3.5	75.4	33
2848-49	16.5	0.95	2.71	36.2	14.9	14.4	48.6	10.6	4.3	71.1	5.1	9.9	33.9	33
2883-84	6.4	1.58	2.78	70.6	5.8	3.4	5.6	5.3	0.5	91.4	4.2	1.7	71.6	10
2910-11	14.2	8.82	2.71	18.1	12.4	12.1	246.8	2.3	10.1	18.5	2.8	9.7	22.2	130
2914-15	10.4	0.56	2.82	33.2	9.0	9.0	183.2	2.4	6.6	26.7	3.6	5.4	39.8	147
2935-36	11.4	0.16	2.72	62.1	9.9	9.2	37.6	6.9	3.0	69.7	6.4	3.5	64.7	77
2949-50	10.2	1.29	2.71	26.6	9.0	8.7	252.8	2.0	7.0	22.2	2.7	6.3	30.0	175
2958-59	21.9	122	2.71	12.8	19.9	19.9	229.2	2.9	17.0	14.6	2.7	17.2	13.4	83
2964-65	8.4	1.60	2.81	37.1	7.7	7.7	220.6	1.9	5.8	24.7	2.9	4.8	37.7	176

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FIGURE 34
NMR T_2 MEASUREMENT
100% Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2782-83
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition (%):	100
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	0.02
Porosity (%):	7.9
Pore Volume (cm^3):	1.35
Bulk Volume (cm^3):	19.13
Grain Density (g/cm^3):	2.68
Bulk Density (g/cm^3):	2.47
S_{wir} @ P_c =200 psi A/B:	84.7
Lithology:	Limestone

NMR Data	
NMR Porosity (%):	6.5
Effective Porosity, T_{2min} = 3 ms (%):	5.8
T_{2ml} (ms):	19.5
FFI, T_2 @ 92 ms (%):	0.7
BVI, T_2 @ 92 ms (%):	5.8
S_{wir}, T_2 @ 92 ms (%):	89.2
Permeability, T_{2ml} (md):	0.03
Permeability, Coates (md):	0.00

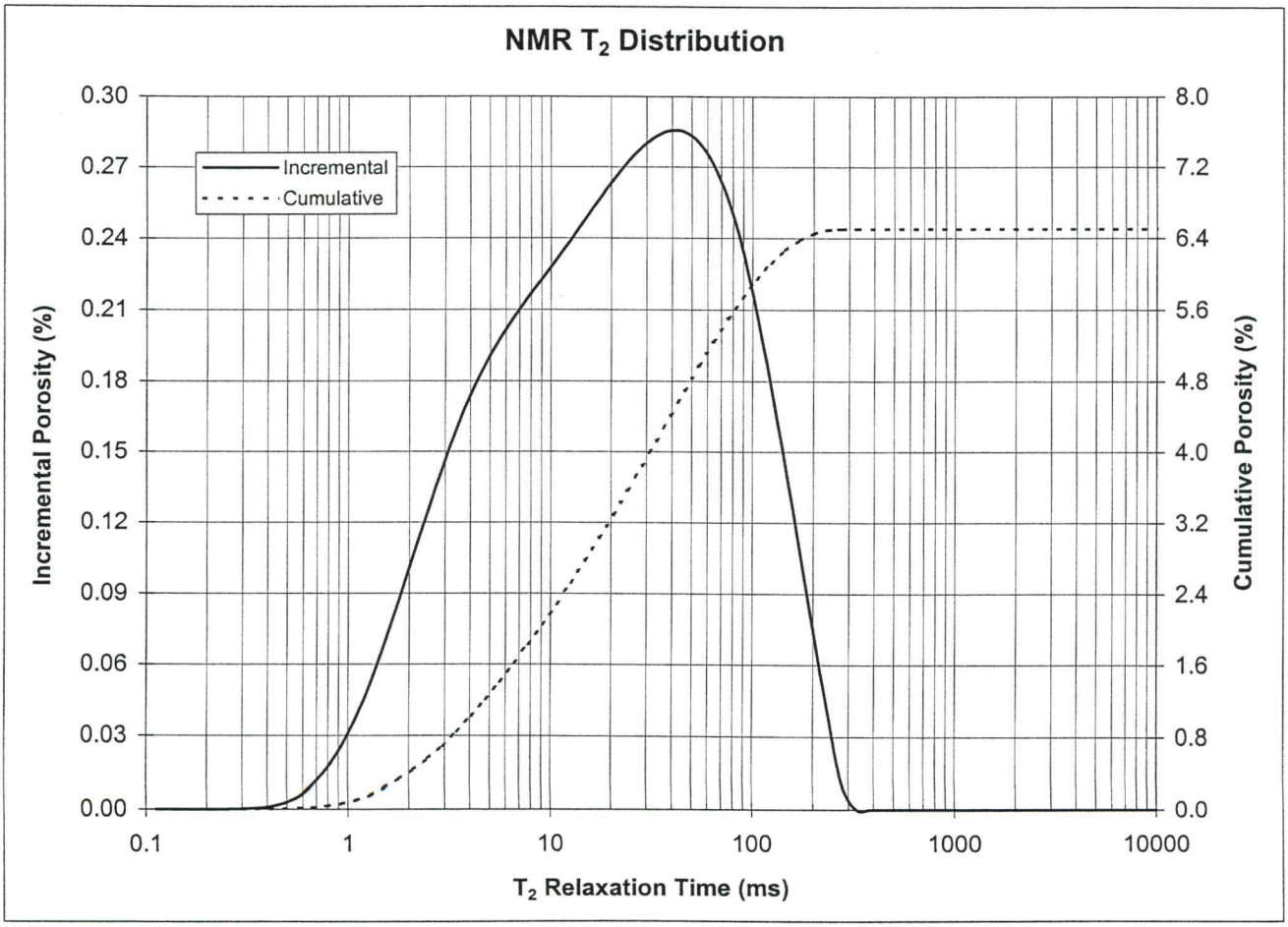

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FIGURE 35
NMR T_2 Measurement
Partial Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2782-83
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition:	Partial
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	0.02
Porosity (%):	7.9
Pore Volume (cm^3):	1.35
Bulk Volume (cm^3):	19.13
Grain Density (g/cm^3):	2.68
Bulk Density (g/cm^3):	2.47
S_{wir} @ P_c = 200 psi A/B:	84.7
Lithology:	Limestone

NMR Data	
NMR Porosity Saturated (%):	6.5
BVI Partial Saturated (%):	5.6
FFI (%):	0.9
S_{wir} @ BVI (%):	86.3
T_2 Cutoff (ms):	82
Permeability, Coates @ T_{2C}(md):	0.00

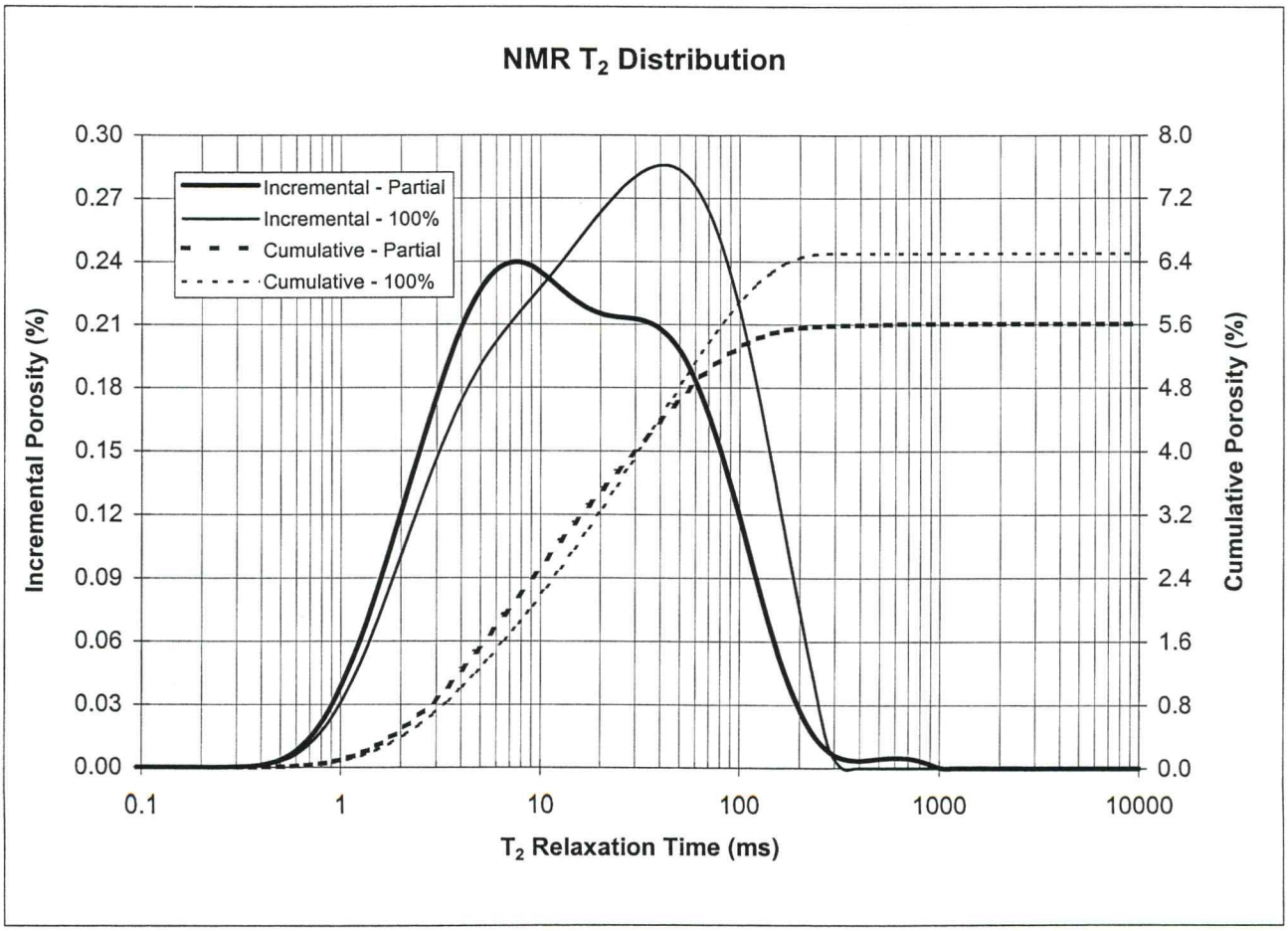

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FIGURE 36
NMR T_2 MEASUREMENT
100% Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2794-95
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition (%):	100
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	0.09
Porosity (%):	12.1
Pore Volume (cm^3):	1.77
Bulk Volume (cm^3):	15.41
Grain Density (g/cm^3):	2.72
Bulk Density (g/cm^3):	2.39
S_{wir} @ P_c =200 psi A/B:	74.5
Lithology:	Limestone

NMR Data	
NMR Porosity (%):	11.0
Effective Porosity, T_{2min} = 3 ms (%):	10.6
T_{2ml} (ms):	26.4
FFI, T_2 @ 92 ms (%):	1.0
BVI, T_2 @ 92 ms (%):	10.0
S_{wir}, T_2 @ 92 ms (%):	90.9
Permeability, T_{2ml} (md):	0.47
Permeability, Coates (md):	0.01

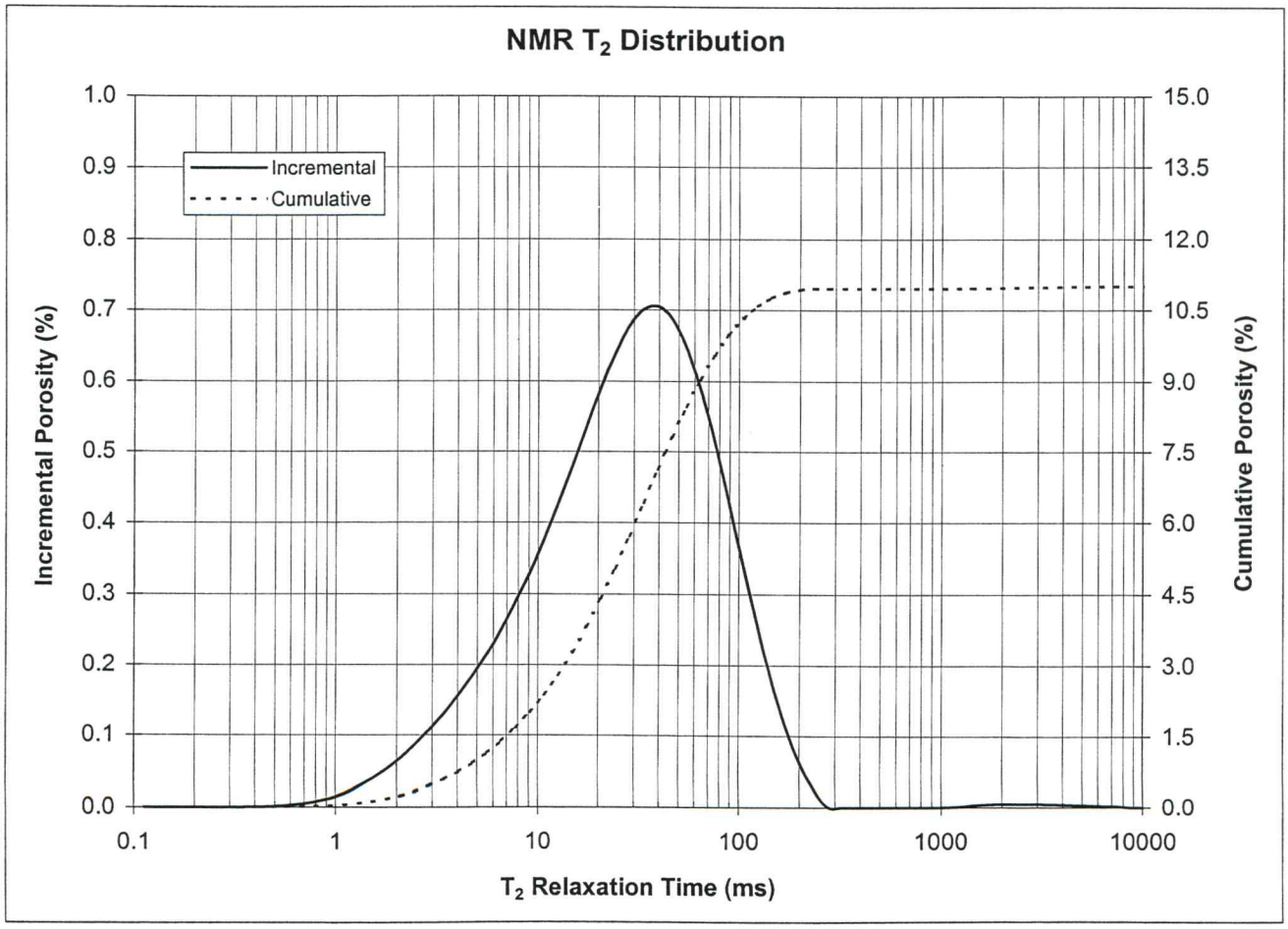

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FIGURE 37
NMR T_2 Measurement
Partial Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2794-95
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition:	Partial
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	0.09
Porosity (%):	12.1
Pore Volume (cm^3):	1.77
Bulk Volume (cm^3):	15.41
Grain Density (g/cm^3):	2.72
Bulk Density (g/cm^3):	2.39
S_{wir} @ P_c = 200 psi A/B:	74.5
Lithology:	Limestone

NMR Data	
NMR Porosity Saturated (%):	11.0
BVI Partial Saturated (%):	8.7
FFI (%):	2.3
S_{wir} @ BVI (%):	79.3
T_2 Cutoff (ms):	59
Permeability, Coates @ T_{2C}(md):	0.10

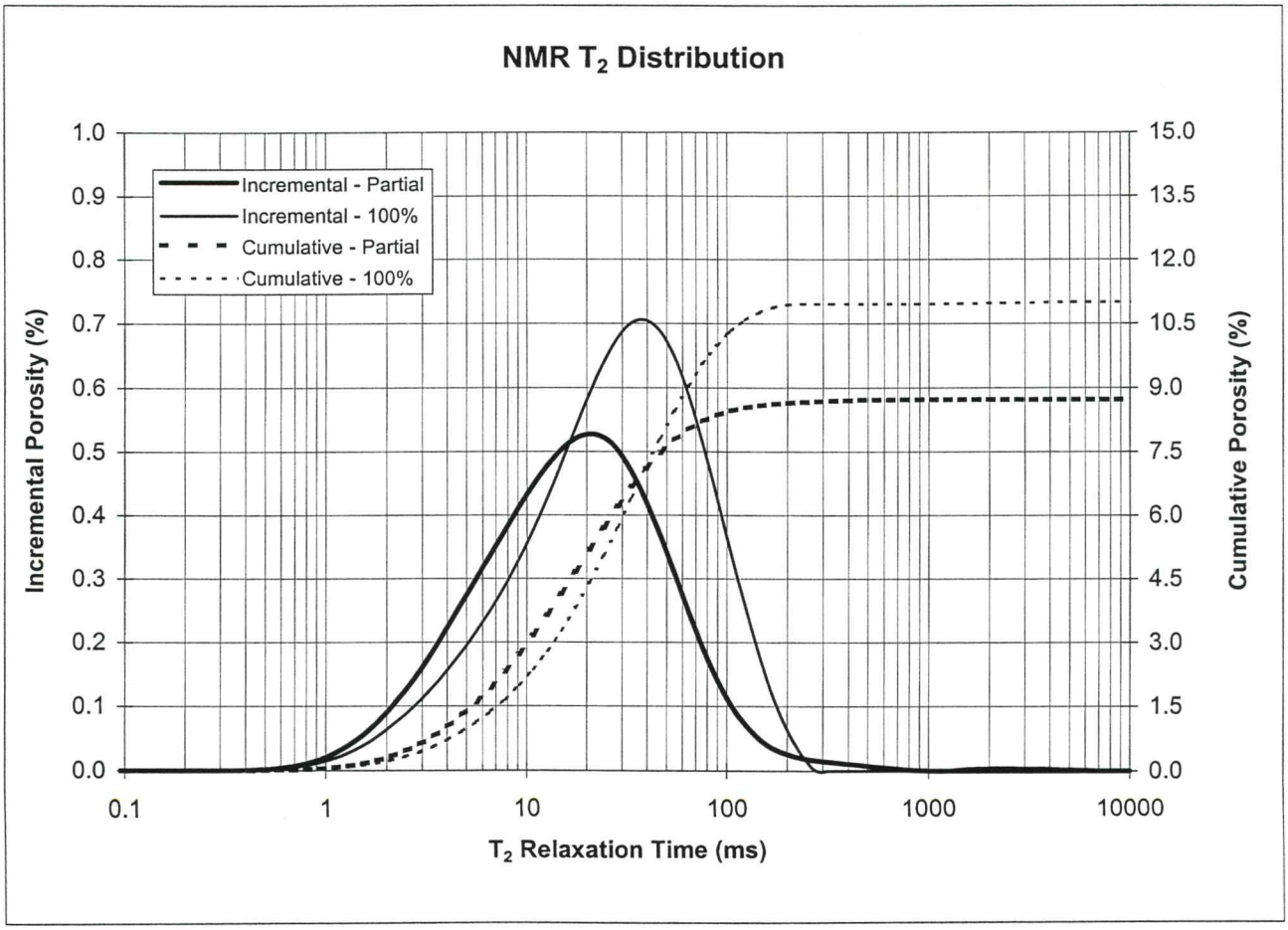

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FIGURE 38
NMR T_2 MEASUREMENT
100% Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2796-97
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition (%):	100
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	0.40
Porosity (%):	21.9
Pore Volume (cm^3):	2.98
Bulk Volume (cm^3):	14.12
Grain Density (g/cm^3):	2.67
Bulk Density (g/cm^3):	2.09
S_{wir} @ P_c =200 psi A/B:	80.1
Lithology:	Limestone

NMR Data	
NMR Porosity (%):	19.8
Effective Porosity, T_{2min} = 3 ms (%):	19.2
T_{2ml} (ms):	32.5
FFI, T_2 @ 92 ms (%):	1.4
BVI, T_2 @ 92 ms (%):	18.4
S_{wir}, T_2 @ 92 ms (%):	92.9
Permeability, T_{2ml} (md):	7.47
Permeability, Coates (md):	0.09

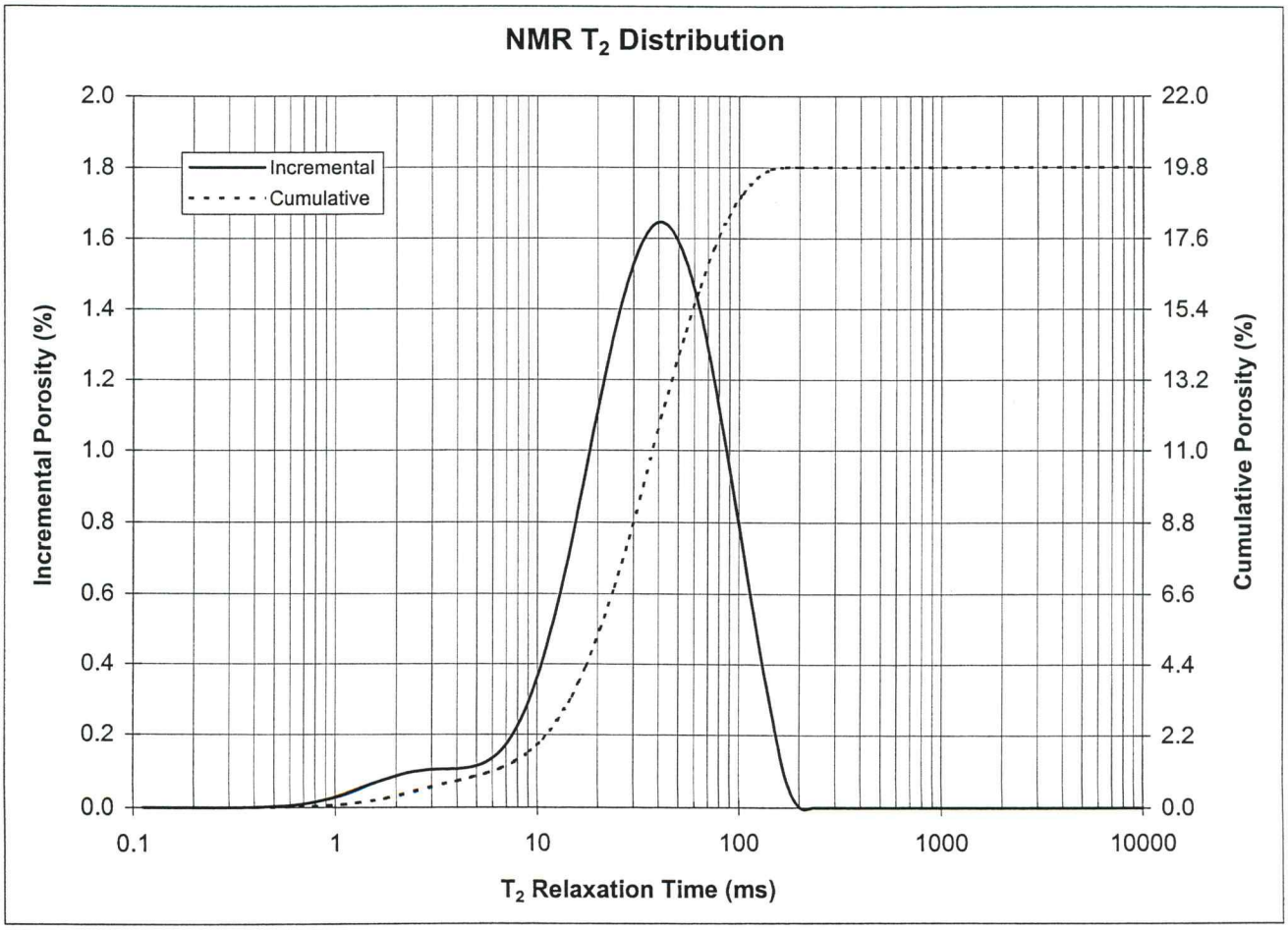

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FIGURE 39
NMR T_2 Measurement
Partial Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2796-97
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition:	Partial
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	0.40
Porosity (%):	21.9
Pore Volume (cm^3):	2.98
Bulk Volume (cm^3):	14.12
Grain Density (g/cm^3):	2.67
Bulk Density (g/cm^3):	2.09
S_{wir} @ P_c = 200 psi A/B:	80.1
Lithology:	Limestone

NMR Data	
NMR Porosity Saturated (%):	19.8
BVI Partial Saturated (%):	17.2
FFI (%):	2.6
S_{wir} @ BVI (%):	86.9
T_2 Cutoff (ms):	75
Permeability, Coates @ T_{2C}(md):	0.30

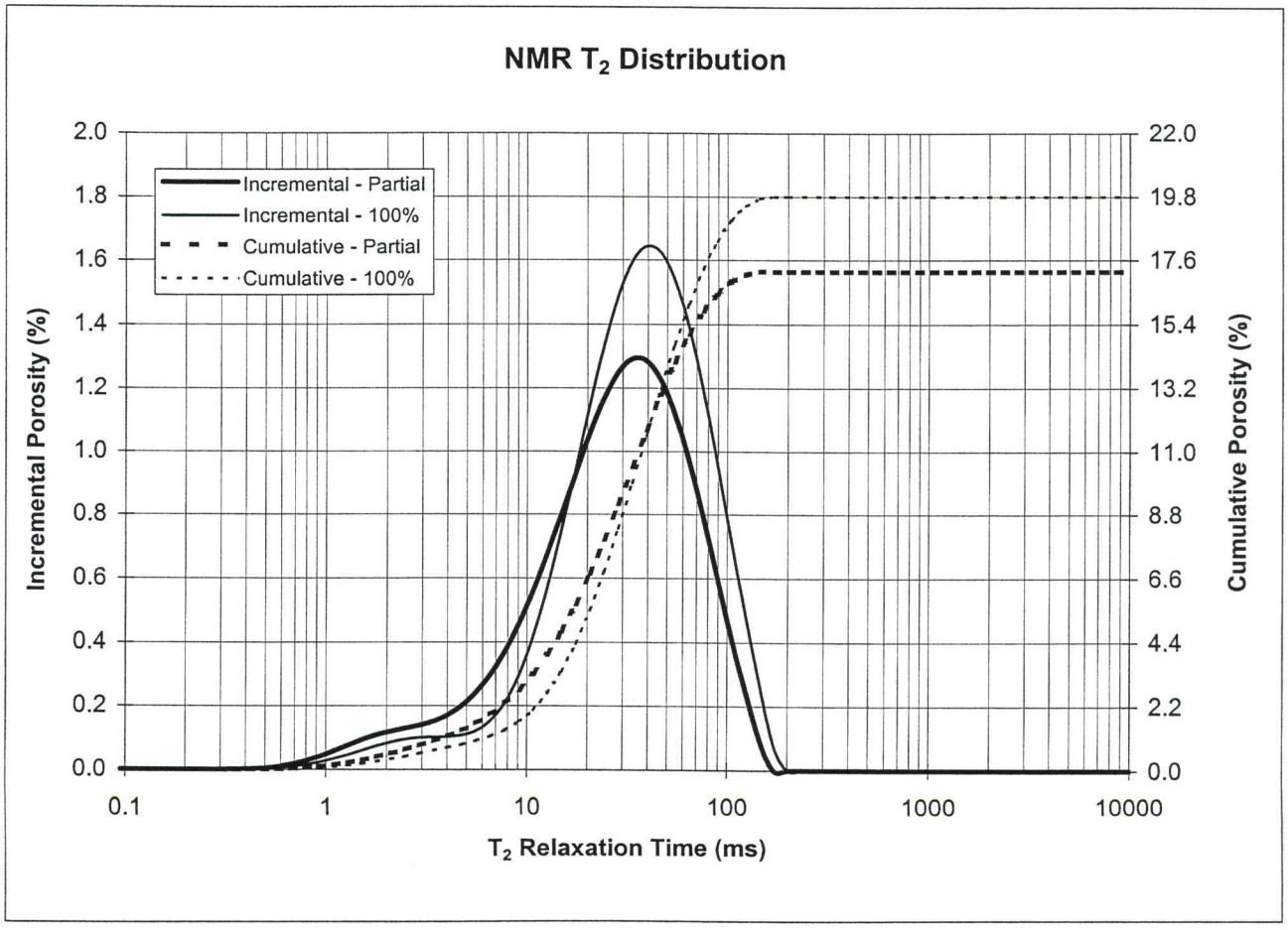

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FIGURE 40
NMR T_2 MEASUREMENT
100% Brine Saturation

Sample ID		NMR Parameters	
Well Name:	Pioneer Stuart 3-34 R	Echo Spacing (ms):	1.20
Formation:	Council Grove	Saturation Condition (%):	100
Depth (ft):	2830-31	Signal/Noise:	100
Sample Type:	1.0 inch plug	Gradient:	None

Core Analysis Data		NMR Data	
Permeability (md):	0.29	NMR Porosity (%):	14.3
Porosity (%):	15.6	Effective Porosity, T_{2min} = 3 ms (%):	12.6
Pore Volume (cm^3):	1.63	T_{2ml} (ms):	15.8
Bulk Volume (cm^3):	10.83	FFI, T_2 @ 92 ms (%):	2.1
Grain Density (g/cm^3):	2.82	BVI, T_2 @ 92 ms (%):	12.2
Bulk Density (g/cm^3):	2.38	S_{wir}, T_2 @ 92 ms (%):	85.3
S_{wir} @ P_c =200 psi A/B:	73.8	Permeability, T_{2ml} (md):	0.48
Lithology:	Dolomitic Limestone	Permeability, Coates (md):	0.12

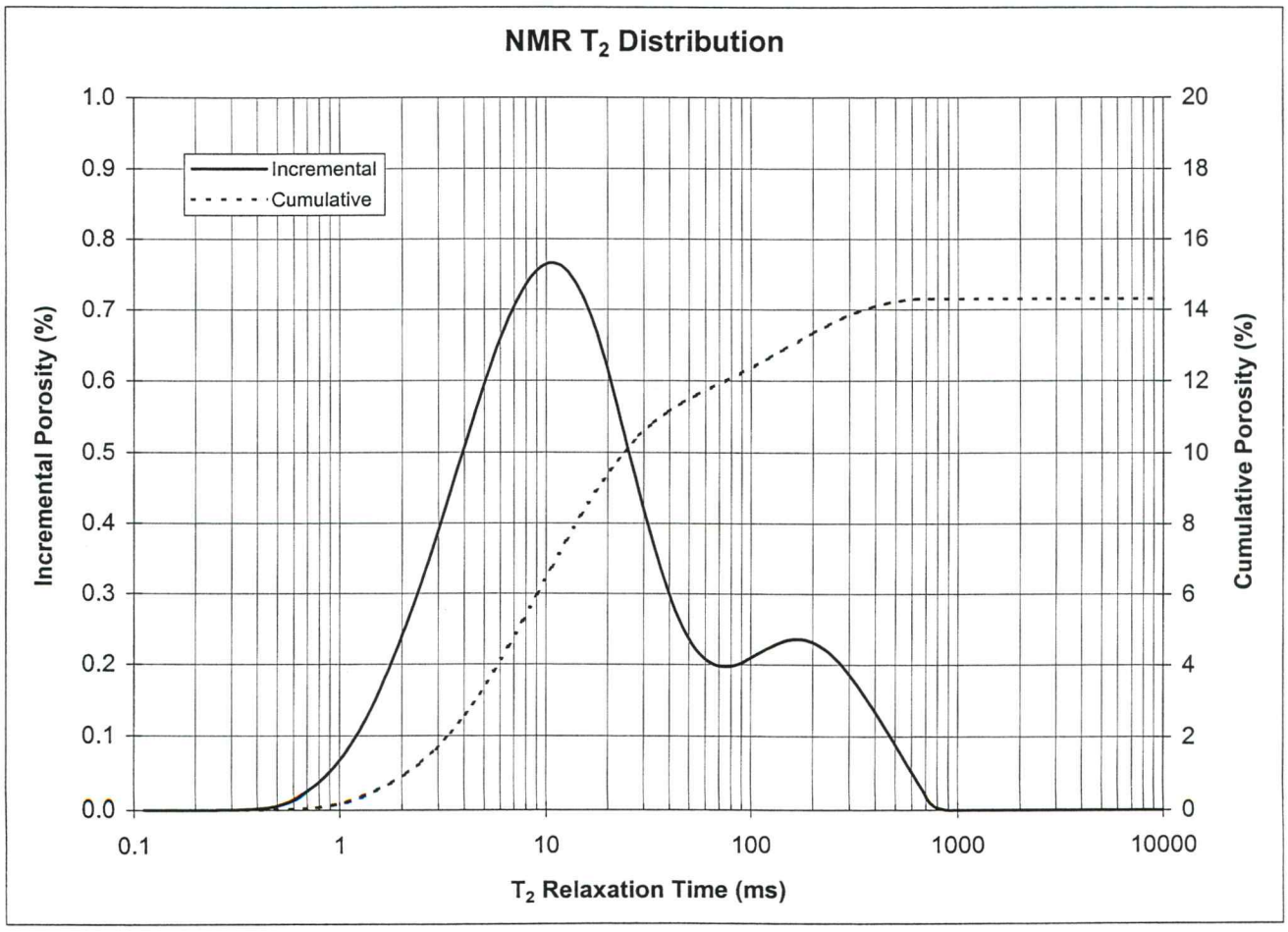

FIGURE 41
NMR T_2 Measurement
Partial Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2830-31
Sample Type:	1.0 inch plug

Core Analysis Data	
Permeability (md):	0.29
Porosity (%):	15.6
Pore Volume (cm^3):	1.63
Bulk Volume (cm^3):	10.83
Grain Density (g/cm^3):	2.82
Bulk Density (g/cm^3):	2.38
S_{wir} @ P_c = 200 psi A/B:	73.8
Lithology:	Dolomitic Limestone

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition:	Partial
Signal/Noise:	100
Gradient:	None

NMR Data	
NMR Porosity Saturated (%):	14.3
BVI Partial Saturated (%):	10.8
FFI (%):	3.5
S_{wir} @ BVI (%):	75.4
T_2 Cutoff (ms):	33
Permeability, Coates @ T_{2C}(md):	0.40

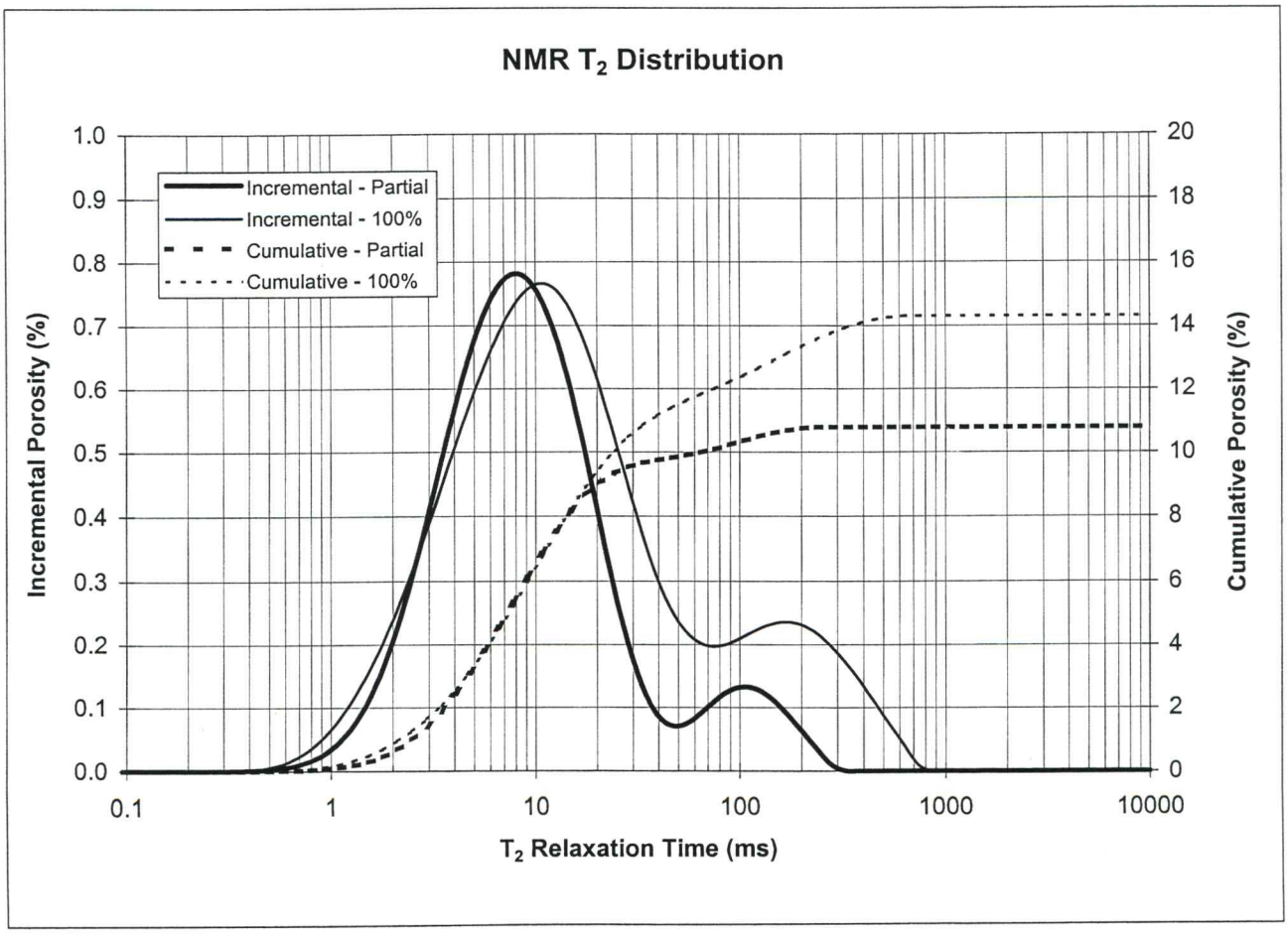

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FIGURE 42
NMR T_2 MEASUREMENT
100% Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2848-49
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition (%):	100
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	0.95
Porosity (%):	16.5
Pore Volume (cm^3):	1.89
Bulk Volume (cm^3):	11.88
Grain Density (g/cm^3):	2.71
Bulk Density (g/cm^3):	2.26
S_{wir} @ P_c =200 psi A/B:	36.2
Lithology:	Limestone

NMR Data	
NMR Porosity (%):	14.9
Effective Porosity, T_{2min} = 3 ms (%):	14.4
T_{2ml} (ms):	48.6
FFI, T_2 @ 92 ms (%):	4.3
BVI, T_2 @ 92 ms (%):	10.6
S_{wir}, T_2 @ 92 ms (%):	71.1
Permeability, T_{2ml} (md):	5.36
Permeability, Coates (md):	0.81

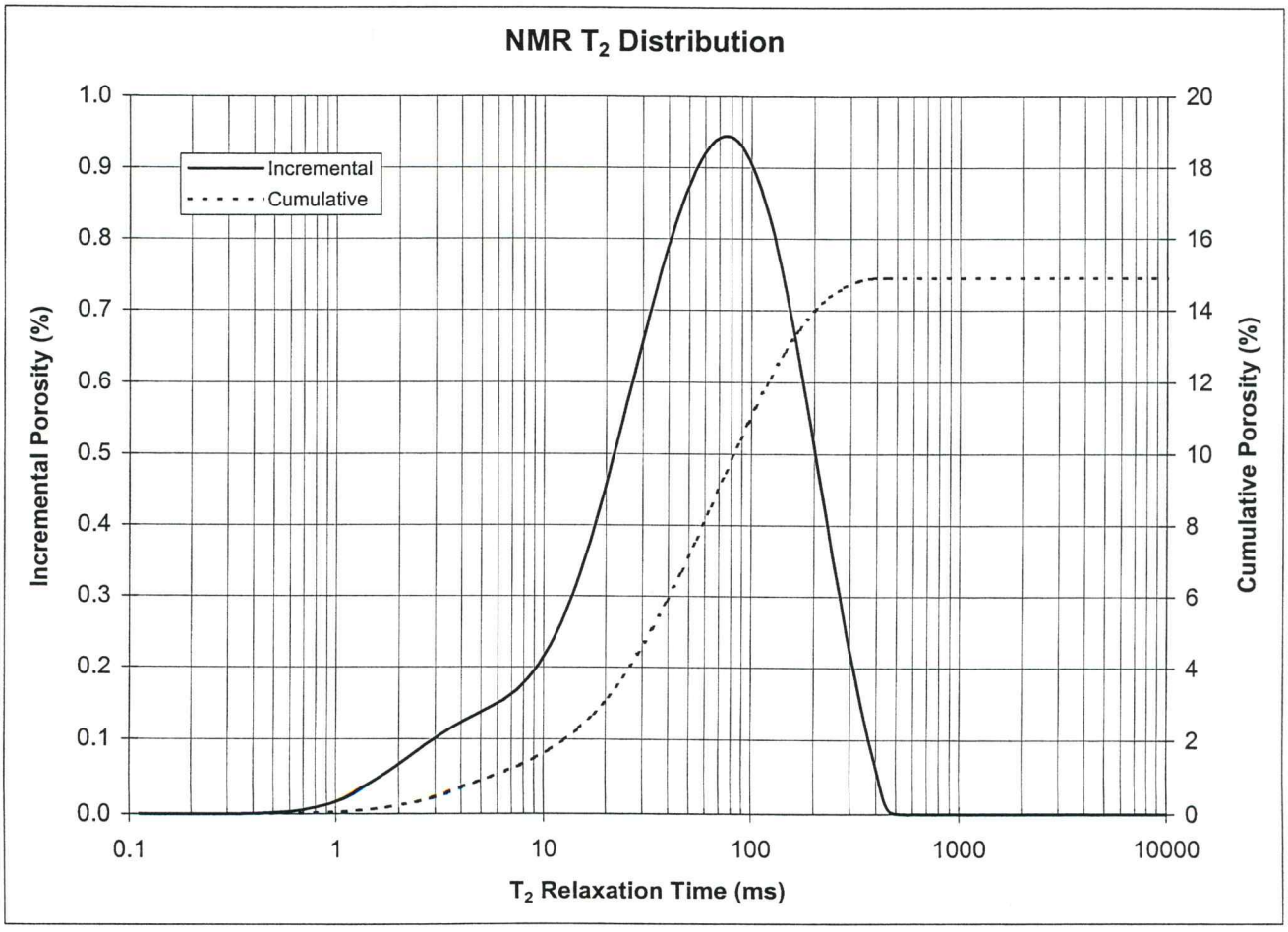

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FIGURE 43
NMR T_2 Measurement
Partial Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2848-49
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition:	Partial
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	0.95
Porosity (%):	16.5
Pore Volume (cm^3):	1.89
Bulk Volume (cm^3):	11.88
Grain Density (g/cm^3):	2.71
Bulk Density (g/cm^3):	2.26
S_{wir} @ P_c = 200 psi A/B:	36.2
Lithology:	Limestone

NMR Data	
NMR Porosity Saturated (%):	14.9
BVI Partial Saturated (%):	5.1
FFI (%):	9.9
S_{wir} @ BVI (%):	33.9
T_2 Cutoff (ms):	33
Permeability, Coates @ T_{2C}(md):	18.8

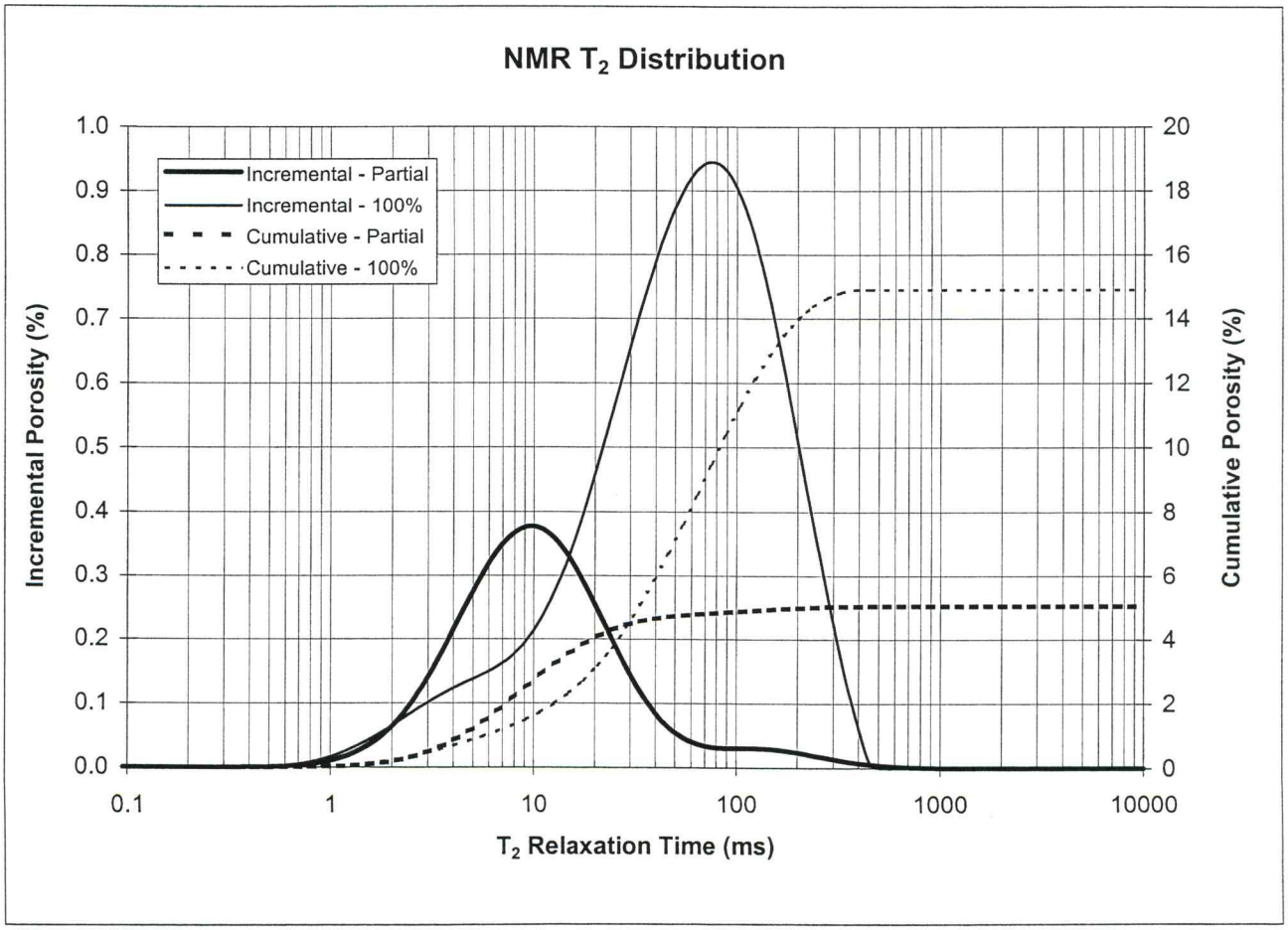

FIGURE 44
NMR T_2 MEASUREMENT
100% Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2883-84
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition (%):	100
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	1.58
Porosity (%):	6.4
Pore Volume (cm^3):	1.21
Bulk Volume (cm^3):	19.03
Grain Density (g/cm^3):	2.78
Bulk Density (g/cm^3):	2.60
S_{wir} @ P_c =200 psi A/B:	70.6
Lithology:	Limestone

NMR Data	
NMR Porosity (%):	5.8
Effective Porosity, T_{2min} = 3 ms (%):	3.4
T_{2ml} (ms):	5.6
FFI, T_2 @ 92 ms (%):	0.5
BVI, T_2 @ 92 ms (%):	5.3
S_{wir}, T_2 @ 92 ms (%):	91.4
Permeability, T_{2ml} (md):	0.00
Permeability, Coates (md):	0.00

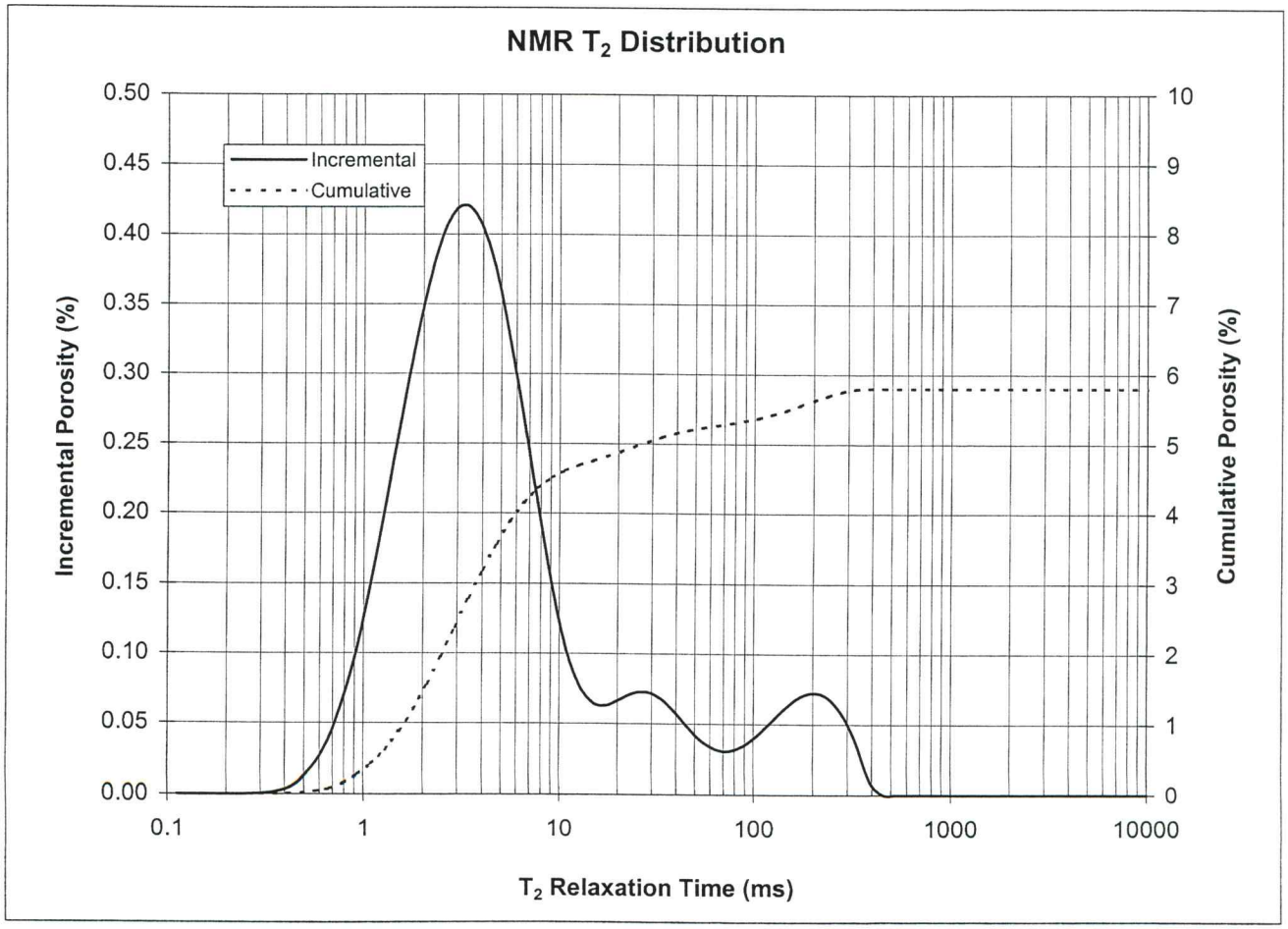

FIGURE 45
NMR T_2 Measurement
Partial Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2883-84
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition:	Partial
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	1.58
Porosity (%):	6.4
Pore Volume (cm^3):	1.21
Bulk Volume (cm^3):	19.03
Grain Density (g/cm^3):	2.78
Bulk Density (g/cm^3):	2.60
S_{wir} @ P_c = 200 psi A/B:	70.6
Lithology:	Limestone

NMR Data	
NMR Porosity Saturated (%):	5.8
BVI Partial Saturated (%):	4.2
FFI (%):	1.7
S_{wir} @ BVI (%):	71.6
T_2 Cutoff (ms):	10
Permeability, Coates @ T_{2C}(md):	0.00

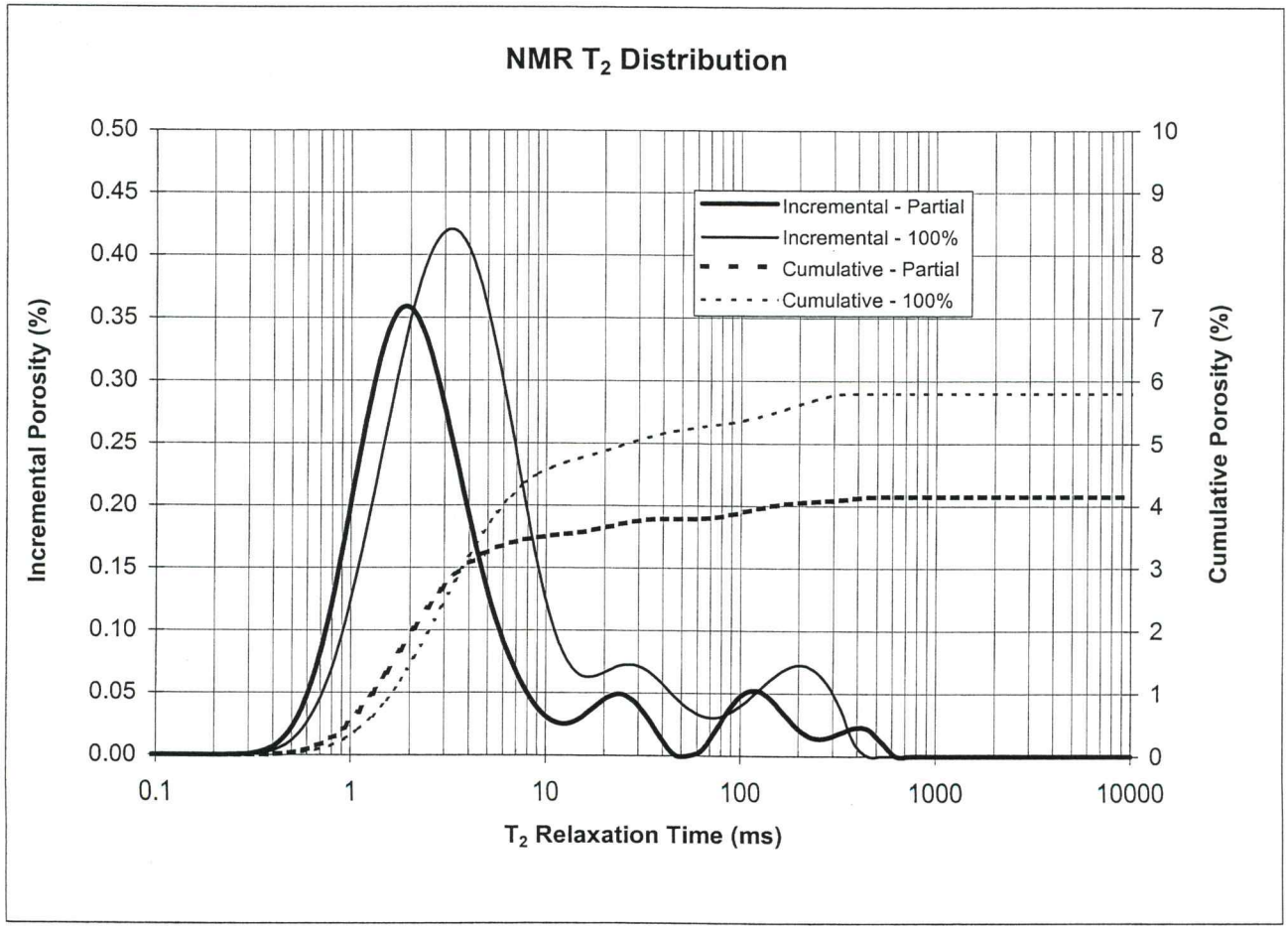

FIGURE 46
NMR T_2 MEASUREMENT
100% Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2910-11
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition (%):	100
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	8.82
Porosity (%):	14.2
Pore Volume (cm^3):	2.68
Bulk Volume (cm^3):	19.30
Grain Density (g/cm^3):	2.71
Bulk Density (g/cm^3):	2.33
S_{wir} @ P_c =200 psi A/B:	18.1
Lithology:	Limestone

NMR Data	
NMR Porosity (%):	12.4
Effective Porosity, T_{2min} = 3 ms (%):	12.1
T_{2ml} (ms):	246.8
FFI, T_2 @ 92 ms (%):	10.1
BVI, T_2 @ 92 ms (%):	2.3
S_{wir}, T_2 @ 92 ms (%):	18.5
Permeability, T_{2ml} (md):	66.2
Permeability, Coates (md):	45.6

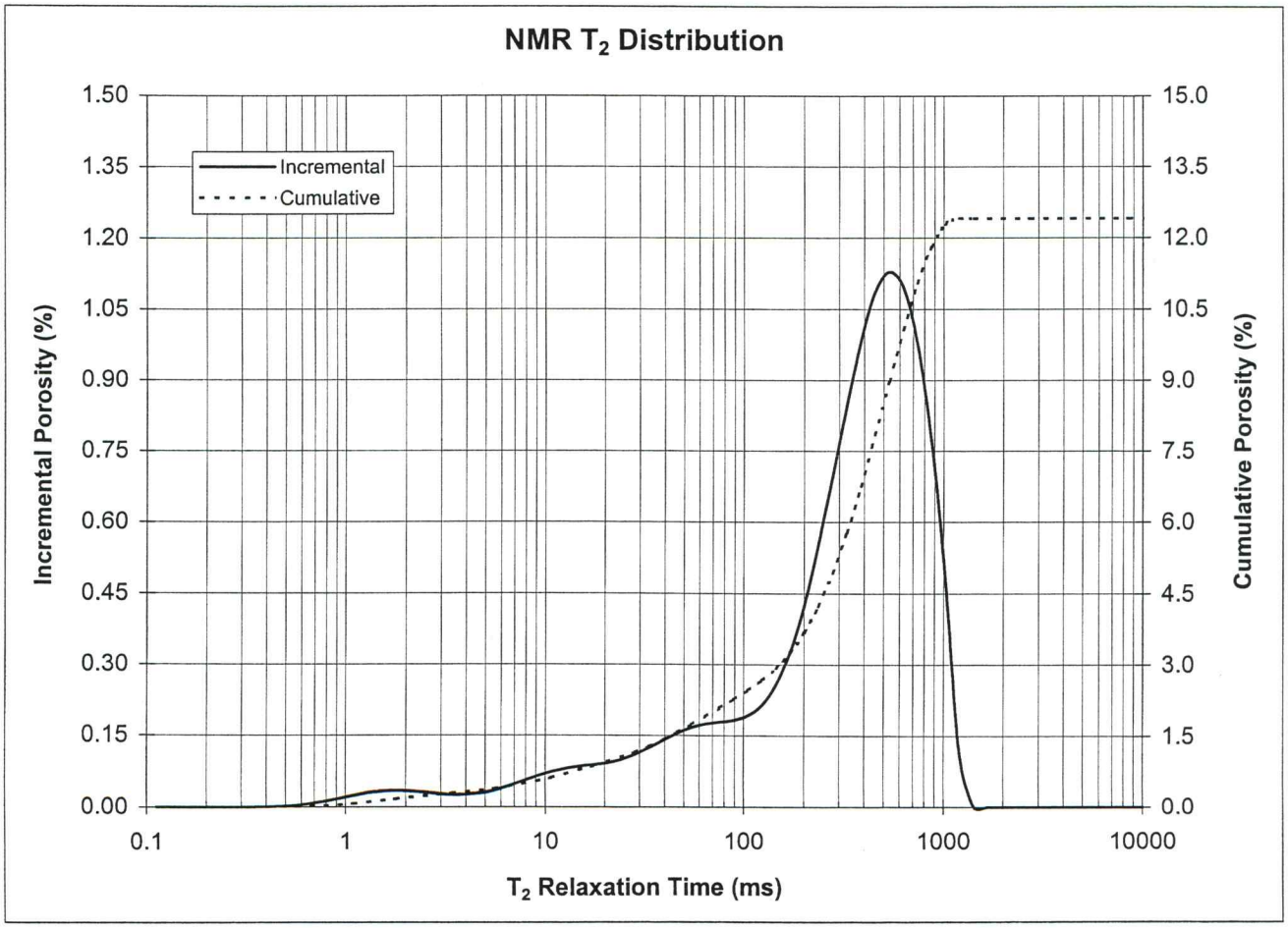

FIGURE 47
NMR T_2 Measurement
Partial Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2910-11
Sample Type:	1.0 inch plug

Core Analysis Data	
Permeability (md):	8.82
Porosity (%):	14.2
Pore Volume (cm^3):	2.68
Bulk Volume (cm^3):	19.30
Grain Density (g/cm^3):	2.71
Bulk Density (g/cm^3):	2.33
S_{wir} @ P_c = 200 psi A/B:	18.1
Lithology:	Limestone

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition:	Partial
Signal/Noise:	100
Gradient:	None

NMR Data	
NMR Porosity Saturated (%):	12.4
BVI Partial Saturated (%):	2.8
FFI (%):	9.7
S_{wir} @ BVI (%):	22.2
T_2 Cutoff (ms):	130
Permeability, Coates @ T_{2C}(md):	29.1

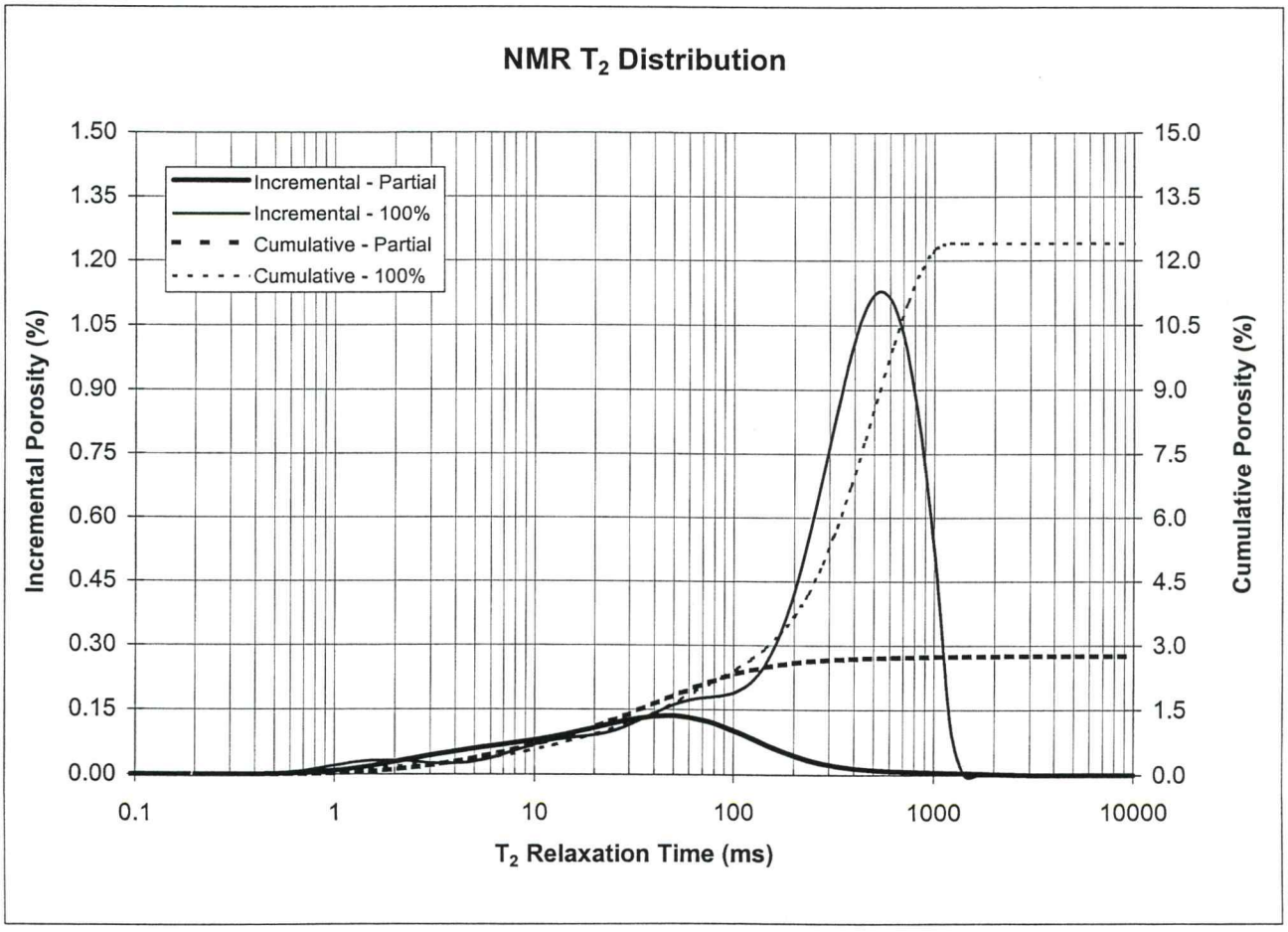

FIGURE 48
NMR T_2 MEASUREMENT
100% Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2914-15
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition (%):	100
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	0.56
Porosity (%):	10.4
Pore Volume (cm^3):	1.96
Bulk Volume (cm^3):	19.01
Grain Density (g/cm^3):	2.82
Bulk Density (g/cm^3):	2.53
S_{wir} @ P_c =200 psi A/B:	33.2
Lithology:	Limestone

NMR Data	
NMR Porosity (%):	9.0
Effective Porosity, T_{2min} = 3 ms (%):	9.0
T_{2ml} (ms):	183.2
FFI, T_2 @ 92 ms (%):	6.6
BVI, T_2 @ 92 ms (%):	2.4
S_{wir}, T_2 @ 92 ms (%):	26.7
Permeability, T_{2ml} (md):	10.1
Permeability, Coates (md):	4.96

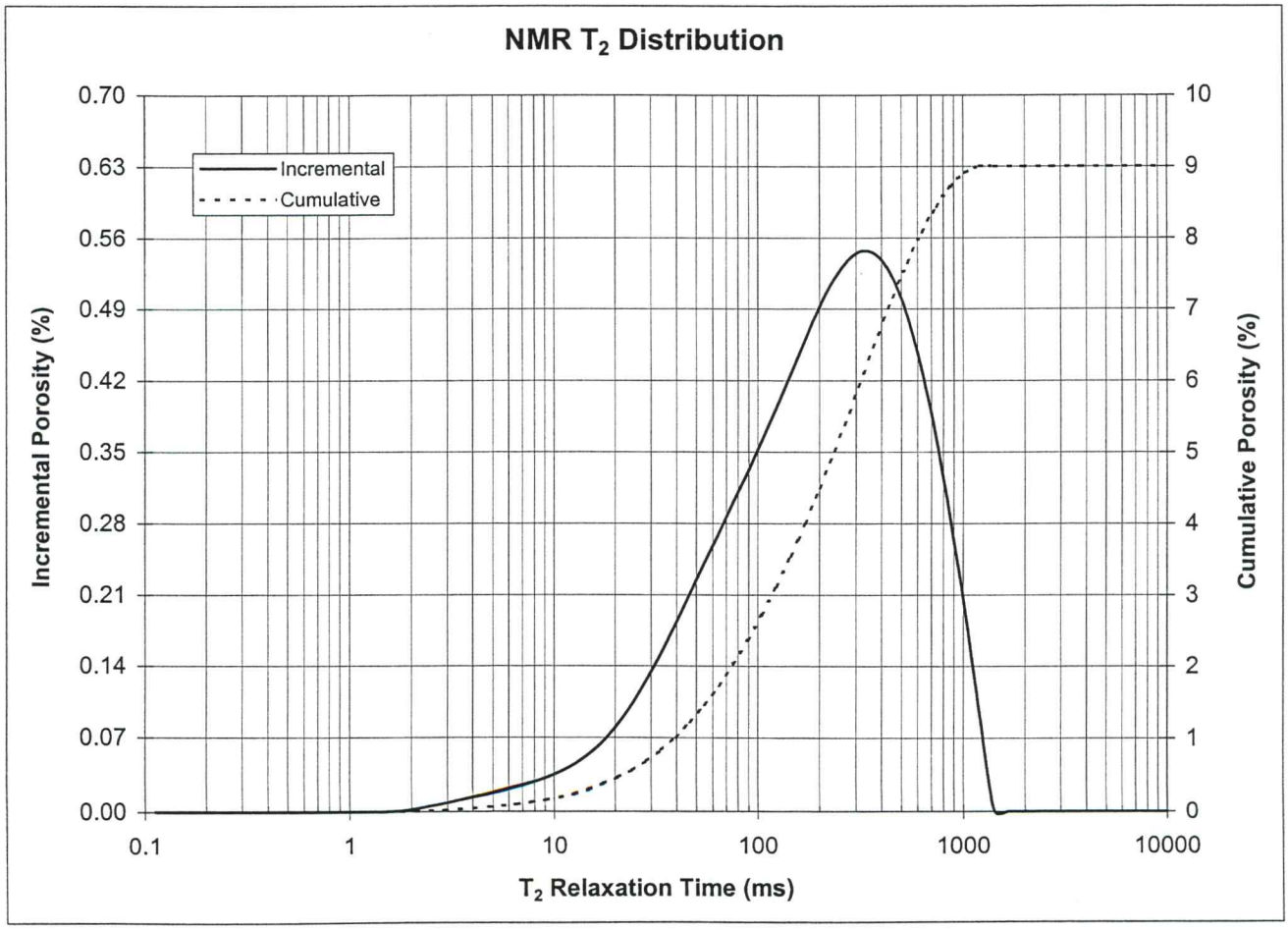

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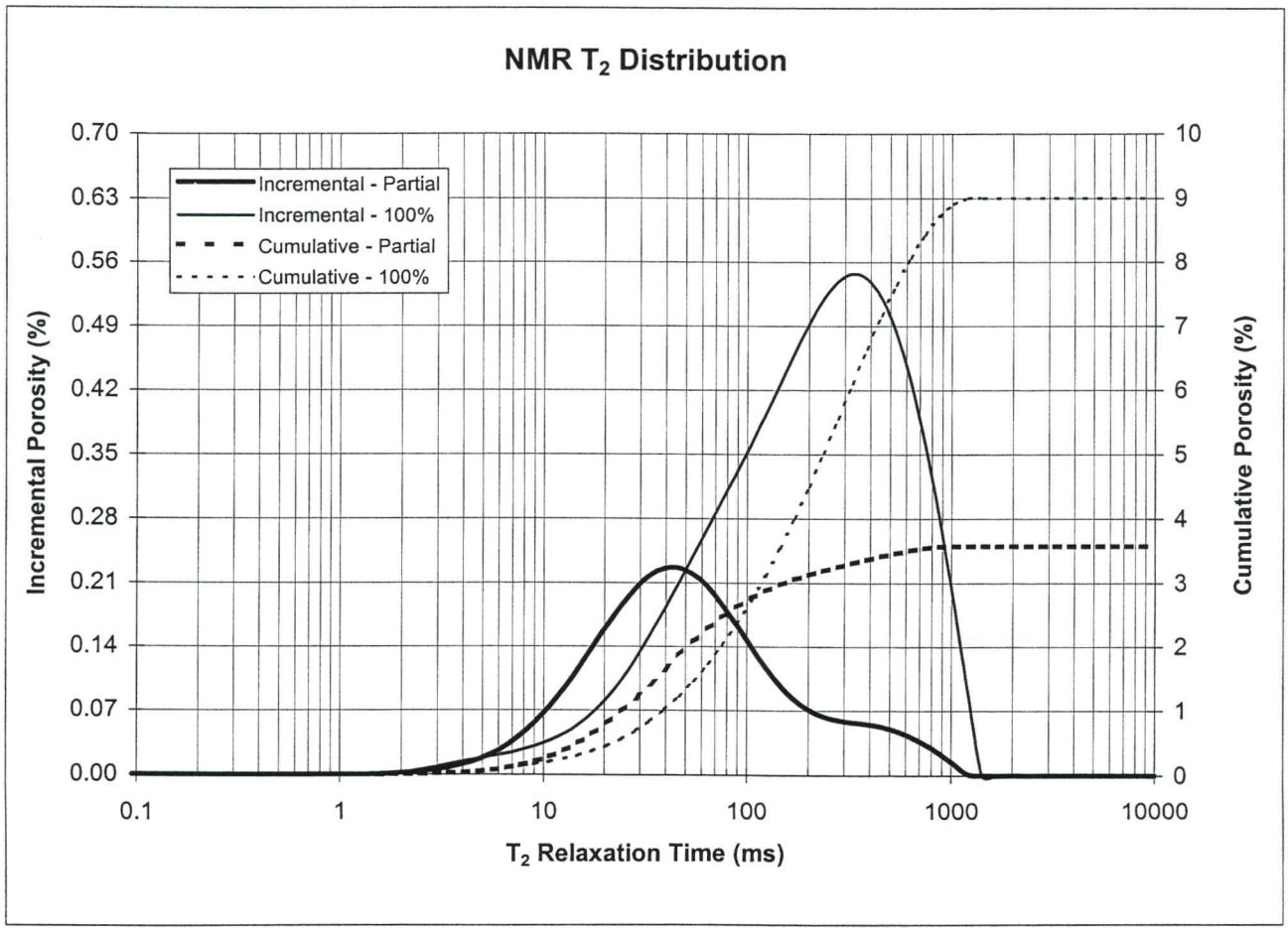
FIGURE 49
NMR T_2 Measurement
Partial Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2914-15
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition:	Partial
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	0.56
Porosity (%):	10.4
Pore Volume (cm^3):	1.96
Bulk Volume (cm^3):	19.01
Grain Density (g/cm^3):	2.82
Bulk Density (g/cm^3):	2.53
S_{wir} @ P_c = 200 psi A/B:	33.2
Lithology:	Limestone

NMR Data	
NMR Porosity Saturated (%):	9.0
BVI Partial Saturated (%):	3.6
FFI (%):	5.4
S_{wir} @ BVI (%):	39.8
T_2 Cutoff (ms):	147
Permeability, Coates @ T_{2C}(md):	1.50



RSH 3928

FIGURE 50
NMR T_2 MEASUREMENT
100% Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2935-36
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition (%):	100
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	0.16
Porosity (%):	11.4
Pore Volume (cm^3):	2.12
Bulk Volume (cm^3):	19.32
Grain Density (g/cm^3):	2.72
Bulk Density (g/cm^3):	2.41
S_{wir} @ P_c =200 psi A/B:	62.1
Lithology:	Limestone

NMR Data	
NMR Porosity (%):	9.9
Effective Porosity, T_{2min} = 3 ms (%):	9.2
T_{2ml} (ms):	37.6
FFI, T_2 @ 92 ms (%):	3.0
BVI, T_2 @ 92 ms (%):	6.9
S_{wir}, T_2 @ 92 ms (%):	69.7
Permeability, T_{2ml} (md):	0.62
Permeability, Coates (md):	0.18

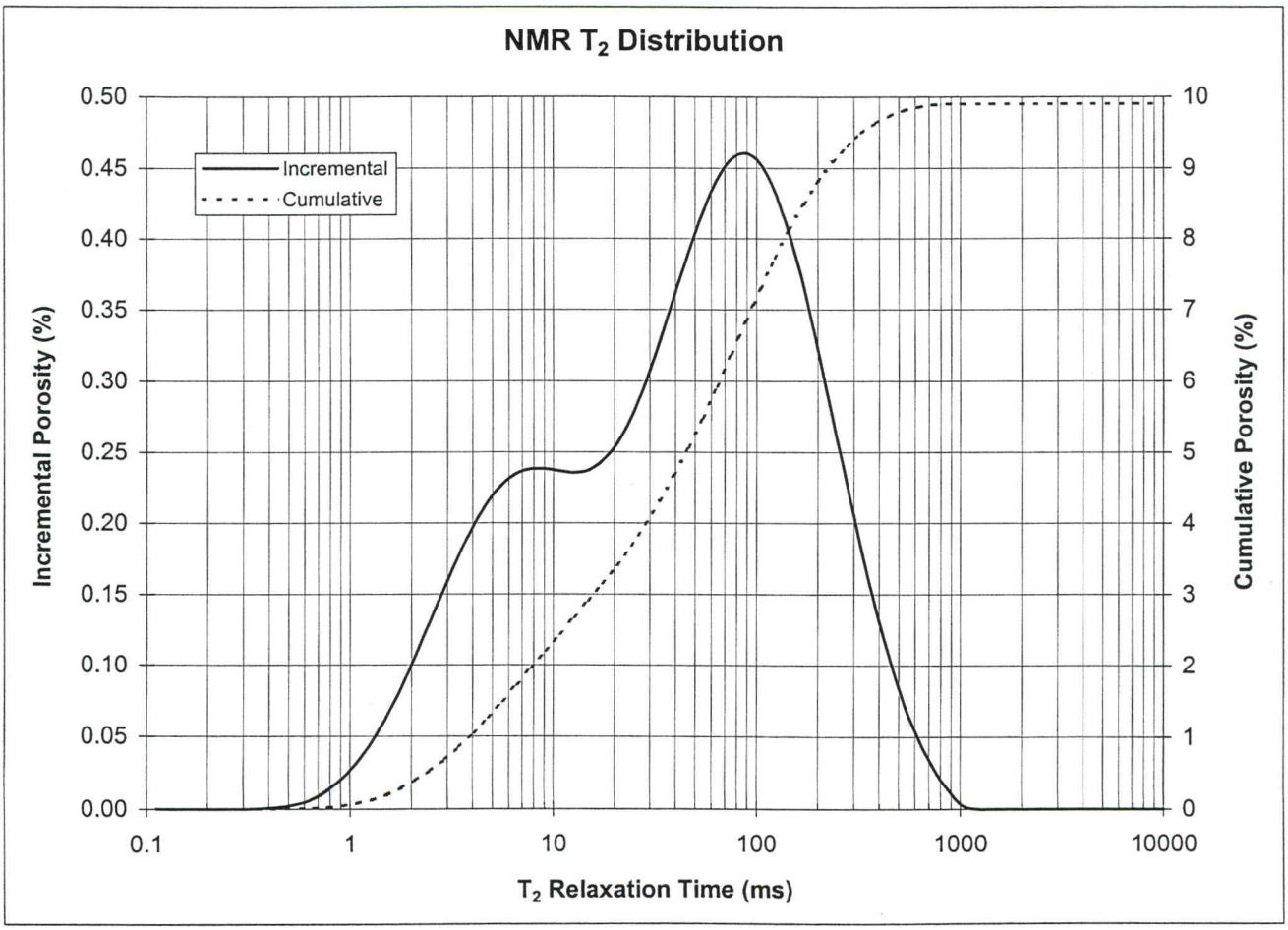


FIGURE 51

NMR T_2 Measurement

Partial Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2935-36
Sample Type:	1.0 inch plug

Core Analysis Data	
Permeability (md):	0.16
Porosity (%):	11.4
Pore Volume (cm^3):	2.12
Bulk Volume (cm^3):	19.32
Grain Density (g/cm^3):	2.72
Bulk Density (g/cm^3):	2.41
S_{wir} @ P_c = 100 psi A/B:	62.1
Lithology:	Limestone

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition:	Partial
Signal/Noise:	100
Gradient:	None

NMR Data	
NMR Porosity Saturated (%):	9.9
BVI Partial Saturated (%):	6.4
FFI (%):	3.5
S_{wir} @ BVI (%):	64.7
T_2 Cutoff (ms):	77
Permeability, Coates @ T_{2C}(md):	0.30

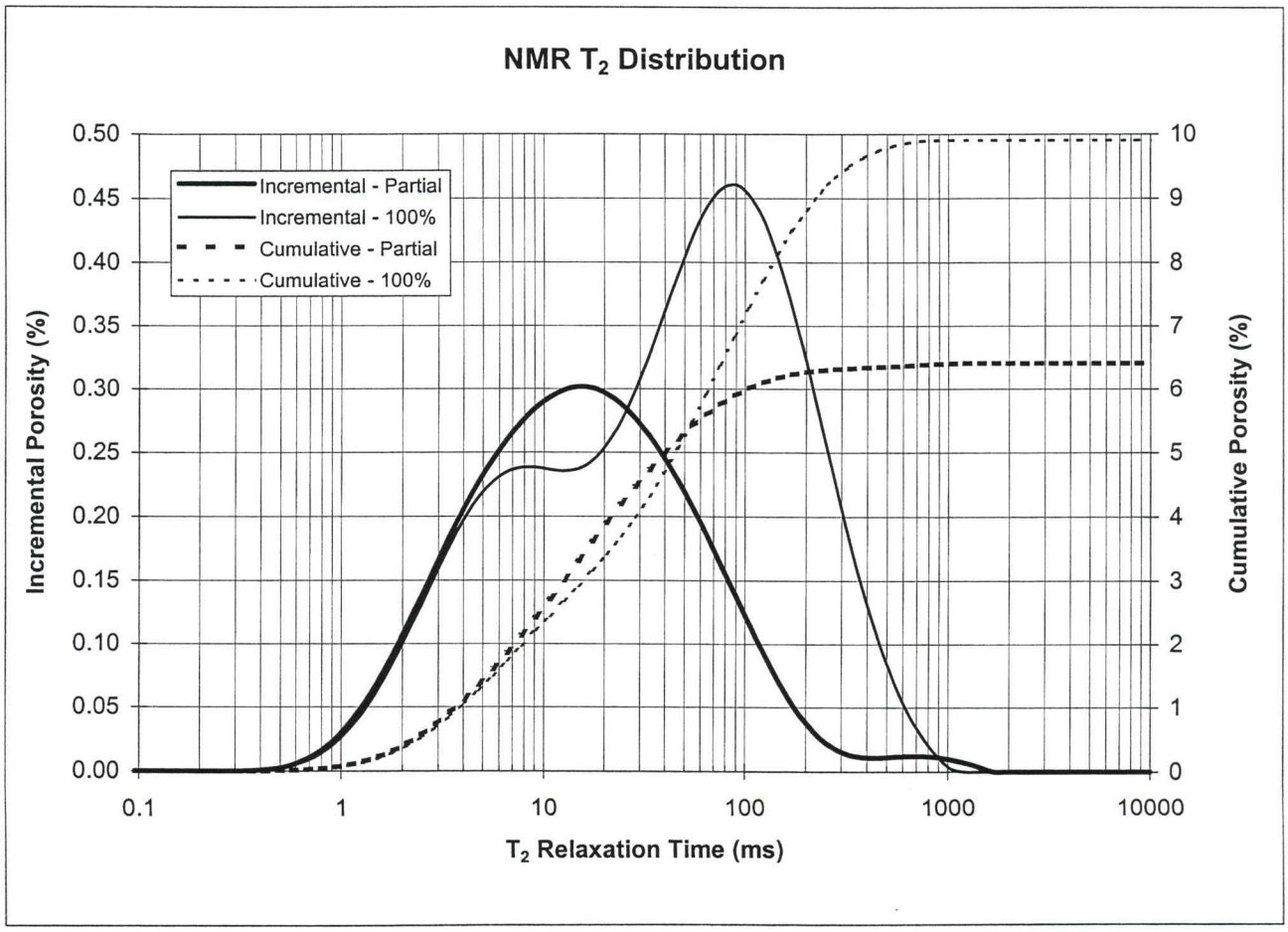


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FIGURE 52
NMR T_2 MEASUREMENT
100% Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2949-50
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition (%):	100
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	1.29
Porosity (%):	10.2
Pore Volume (cm^3):	1.82
Bulk Volume (cm^3):	19.08
Grain Density (g/cm^3):	2.71
Bulk Density (g/cm^3):	2.43
S_{wir} @ P_c =200 psi A/B:	26.6
Lithology:	Limestone

NMR Data	
NMR Porosity (%):	9.0
Effective Porosity, T_{2min} = 3 ms (%):	8.7
T_{2ml} (ms):	252.8
FFI, T_2 @ 92 ms (%):	7.0
BVI, T_2 @ 92 ms (%):	2.0
S_{wir}, T_2 @ 92 ms (%):	22.2
Permeability, T_{2ml} (md):	19.3
Permeability, Coates (md):	8.04

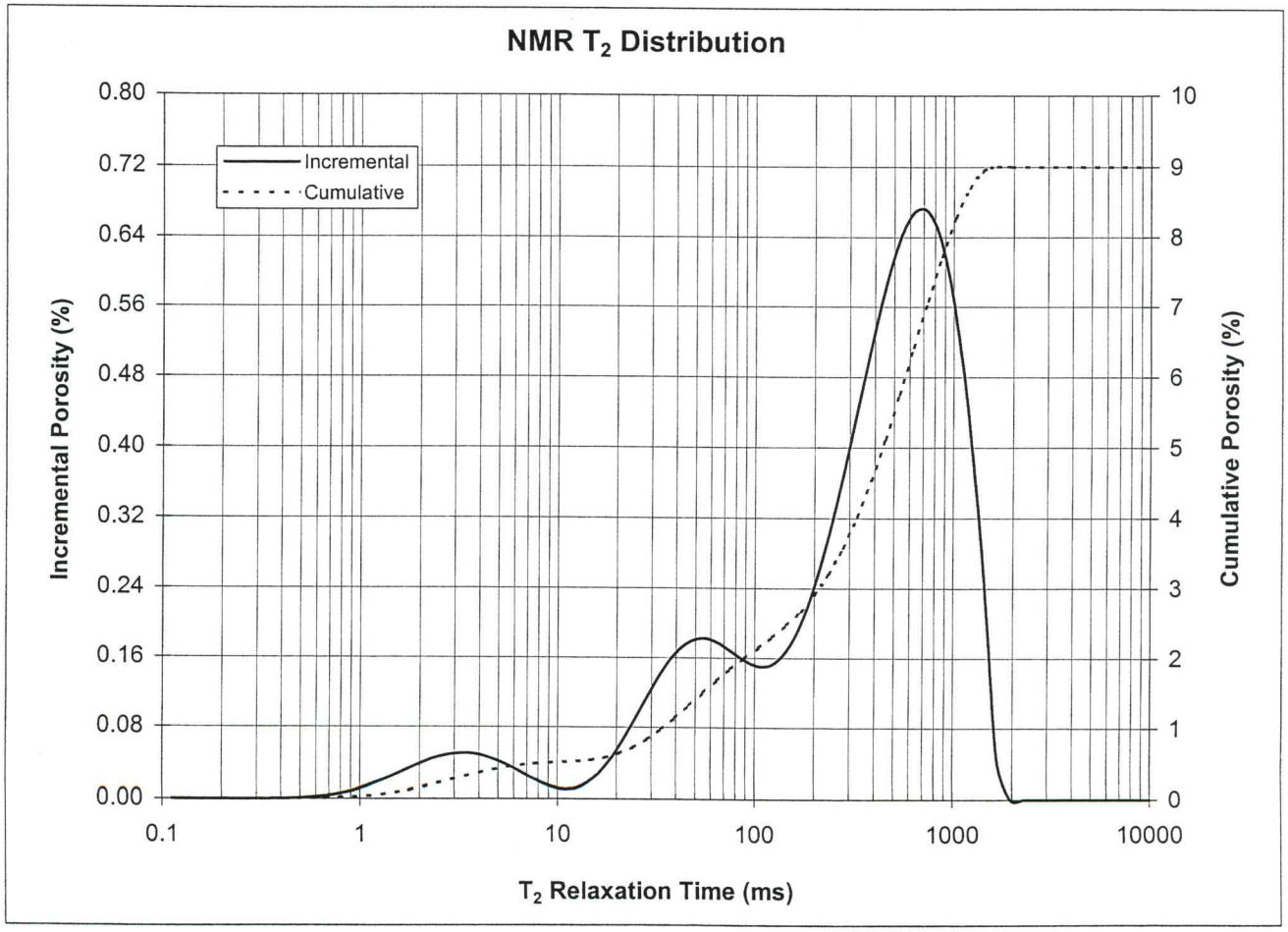


FIGURE 53
NMR T_2 Measurement
Partial Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2949-50
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition:	Partial
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	1.29
Porosity (%):	10.2
Pore Volume (cm^3):	1.82
Bulk Volume (cm^3):	19.08
Grain Density (g/cm^3):	2.71
Bulk Density (g/cm^3):	2.43
S_{wir} @ P_c = 200 psi A/B:	26.6
Lithology:	Limestone

NMR Data	
NMR Porosity Saturated (%):	9.0
BVI Partial Saturated (%):	2.7
FFI (%):	6.3
S_{wir} @ BVI (%):	30.0
T_2 Cutoff (ms):	175
Permeability, Coates @ T_{2C}(md):	3.60

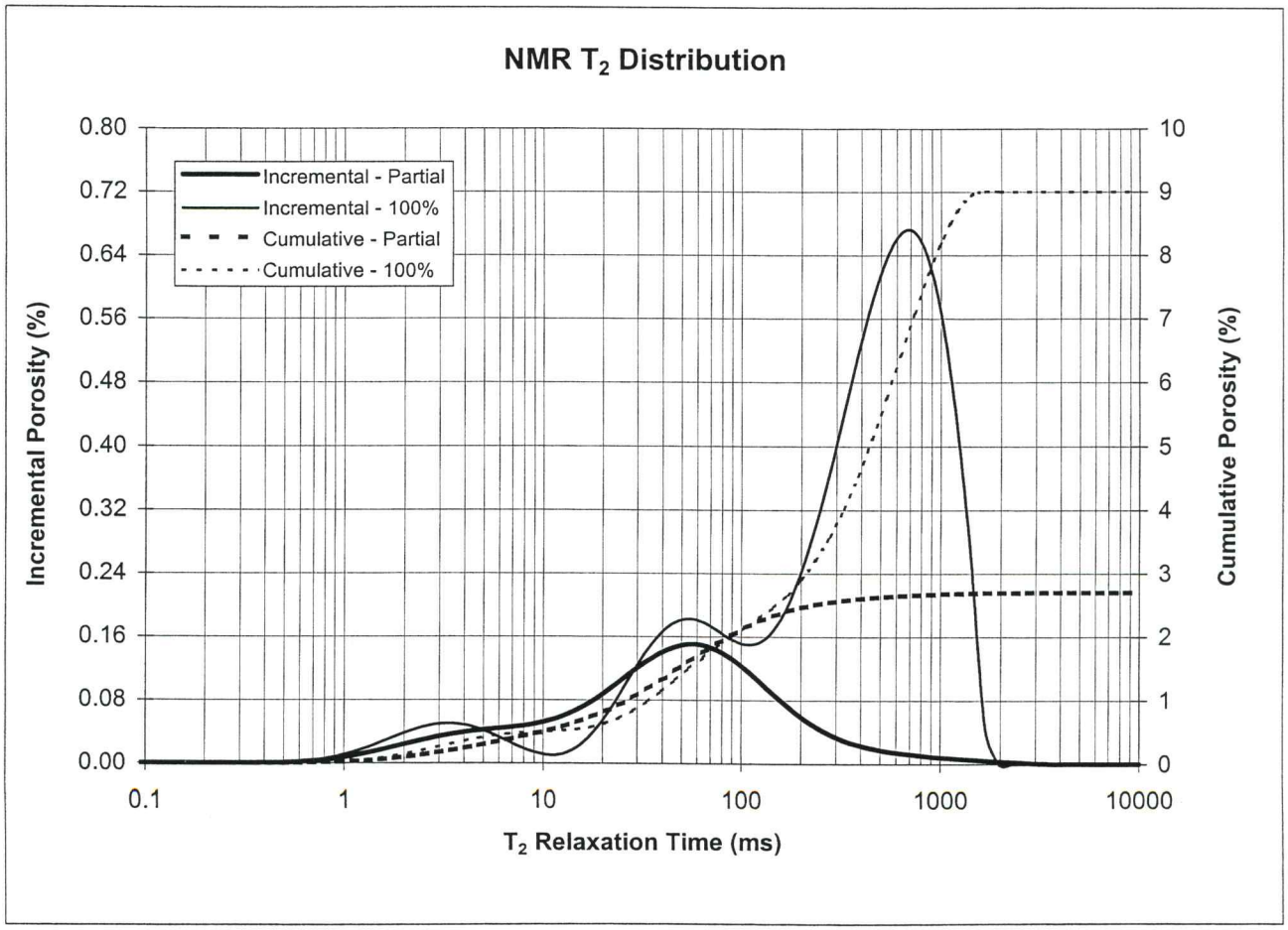


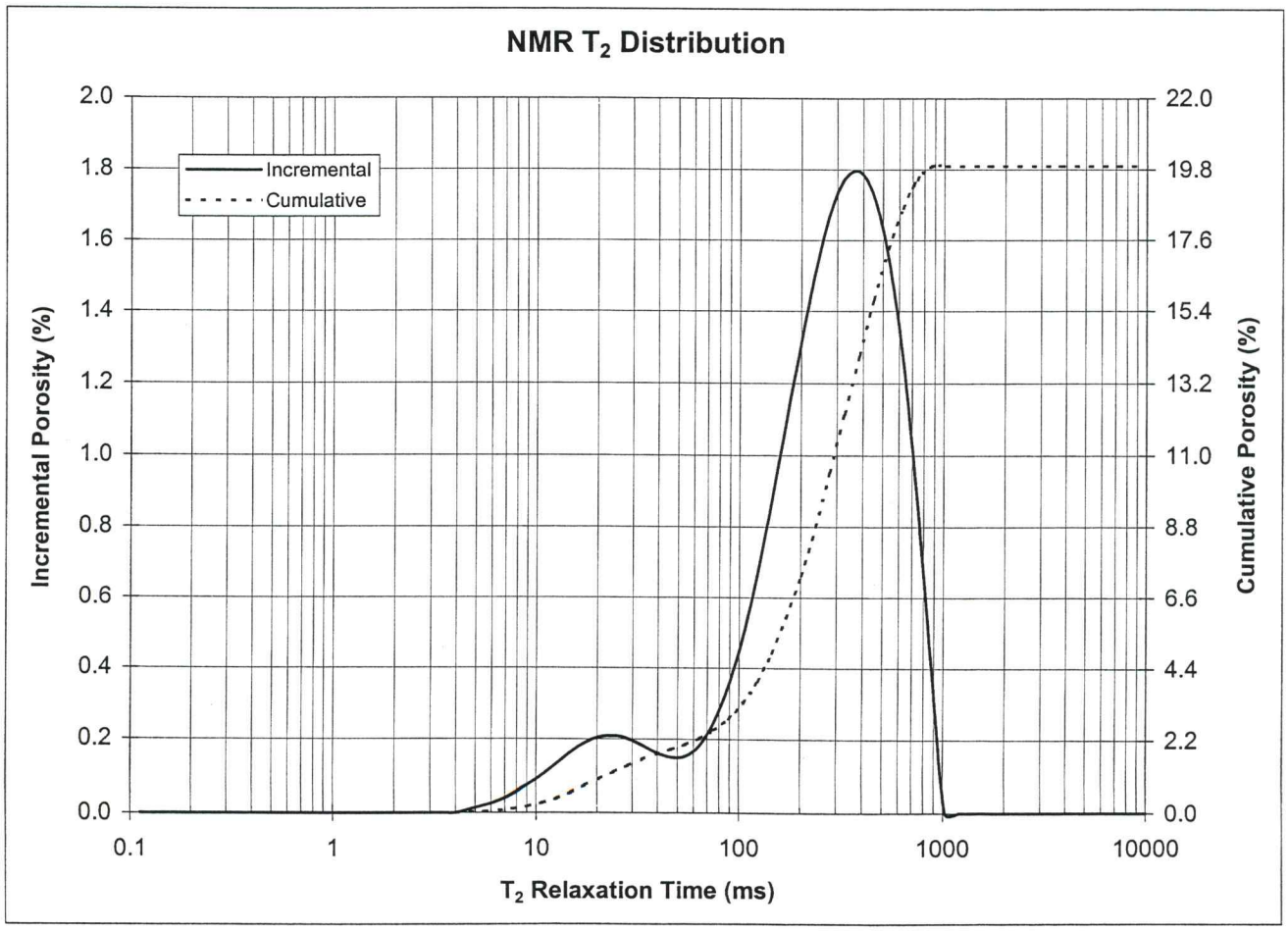
FIGURE 54
NMR T_2 MEASUREMENT
100% Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2958-59
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition (%):	100
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	122
Porosity (%):	21.9
Pore Volume (cm^3):	4.24
Bulk Volume (cm^3):	19.17
Grain Density (g/cm^3):	2.71
Bulk Density (g/cm^3):	2.12
S_{wir} @ P_c =200 psi A/B:	12.8
Lithology:	Limestone

NMR Data	
NMR Porosity (%):	19.9
Effective Porosity, T_{2min} = 3 ms (%):	19.9
T_{2ml} (ms):	229.2
FFI, T_2 @ 92 ms (%):	17.0
BVI, T_2 @ 92 ms (%):	2.9
S_{wir}, T_2 @ 92 ms (%):	14.6
Permeability, T_{2ml} (md):	379
Permeability, Coates (md):	539



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FIUGRE 55
NMR T_2 Measurement
Partial Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2958-59
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition:	Partial
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	122
Porosity (%):	21.9
Pore Volume (cm^3):	4.24
Bulk Volume (cm^3):	19.17
Grain Density (g/cm^3):	2.71
Bulk Density (g/cm^3):	2.12
S_{wir} @ P_c = 200 psi A/B:	12.8
Lithology:	Limestone

NMR Data	
NMR Porosity Saturated (%):	19.9
BVI Partial Saturated (%):	2.7
FFI (%):	17.2
S_{wir} @ BVI (%):	13.4
T_2 Cutoff (ms):	83
Permeability, Coates @ T_{2C}(md):	653

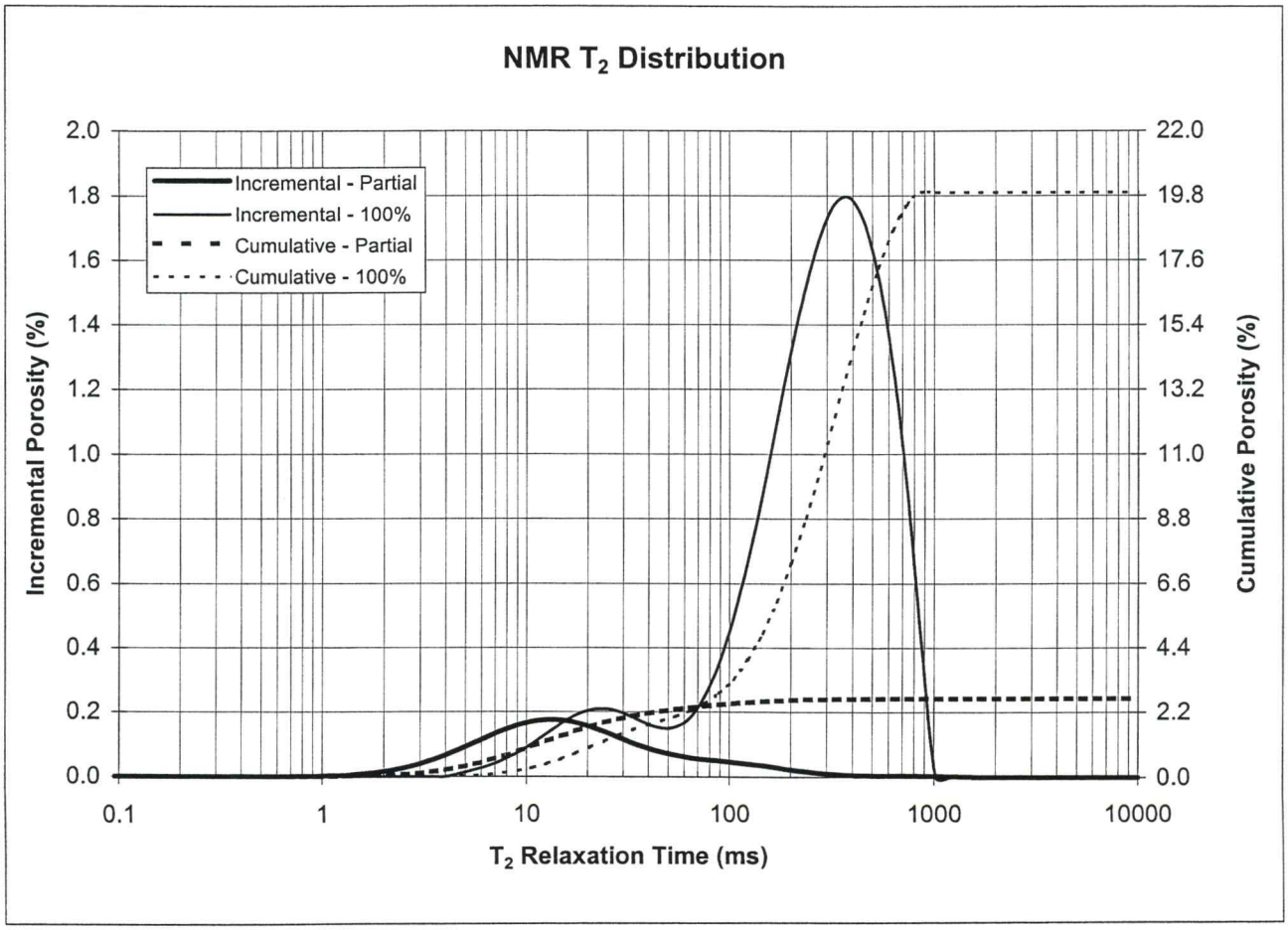

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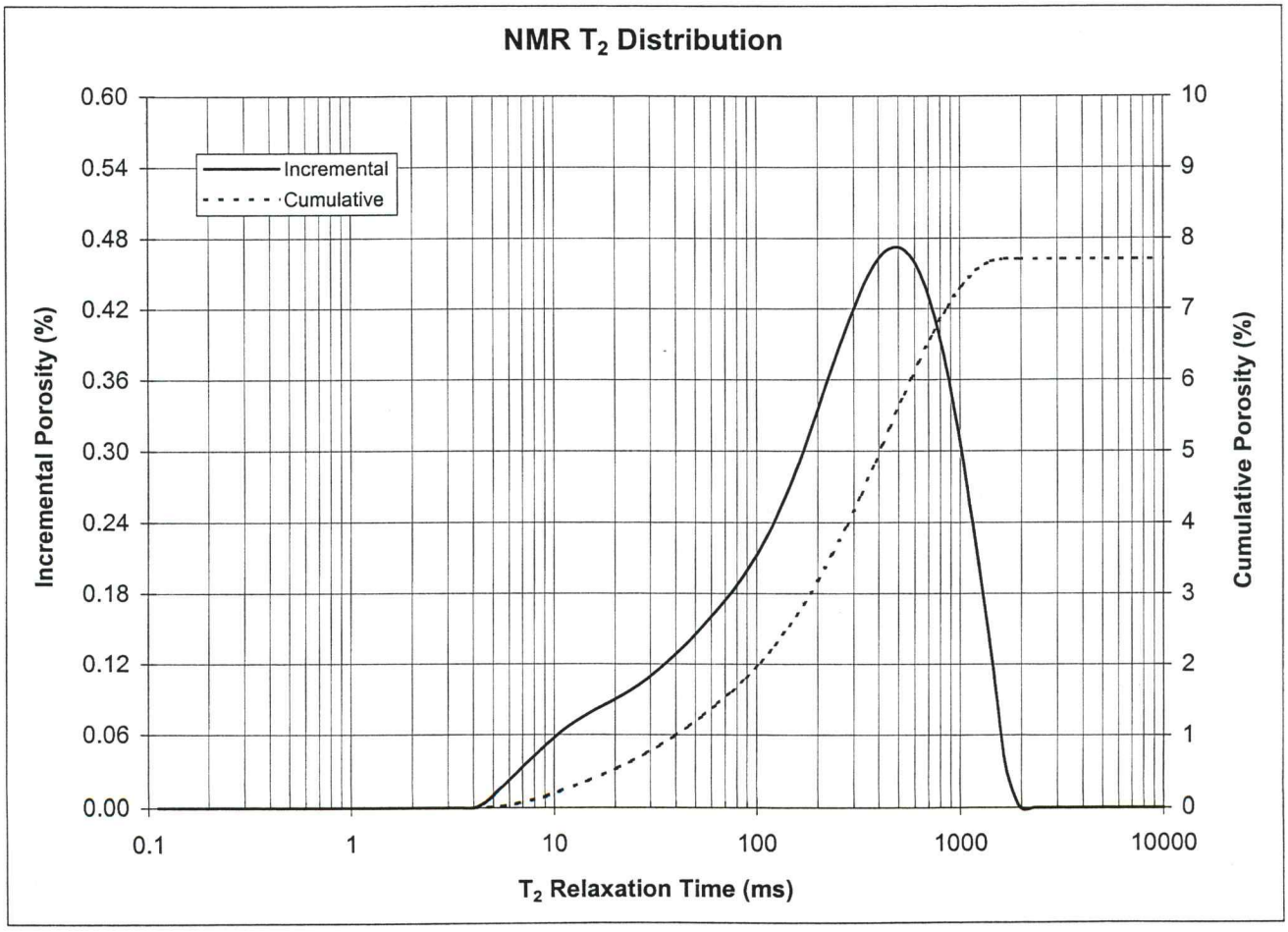
FIGURE 56
NMR T_2 MEASUREMENT
100% Brine Saturation

Sample ID	
Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2964-65
Sample Type:	1.0 inch plug

NMR Parameters	
Echo Spacing (ms):	1.20
Saturation Condition (%):	100
Signal/Noise:	100
Gradient:	None

Core Analysis Data	
Permeability (md):	1.60
Porosity (%):	8.4
Pore Volume (cm^3):	1.40
Bulk Volume (cm^3):	17.78
Grain Density (g/cm^3):	2.81
Bulk Density (g/cm^3):	2.57
S_{wir} @ P_c =200 psi A/B:	37.1
Lithology:	Limestone

NMR Data	
NMR Porosity (%):	7.7
Effective Porosity, T_{2min} = 3 ms (%):	7.7
T_{2ml} (ms):	220.6
FFI, T_2 @ 92 ms (%):	5.8
BVI, T_2 @ 92 ms (%):	1.9
S_{wir}, T_2 @ 92 ms (%):	24.7
Permeability, T_{2ml} (md):	7.87
Permeability, Coates (md):	3.28



RSH 3928

FIGURE 57
NMR T_2 Measurement
Partial Brine Saturation

Sample ID

Well Name:	Pioneer Stuart 3-34 R
Formation:	Council Grove
Depth (ft):	2964-65
Sample Type:	1.0 inch plug

Core Analysis Data

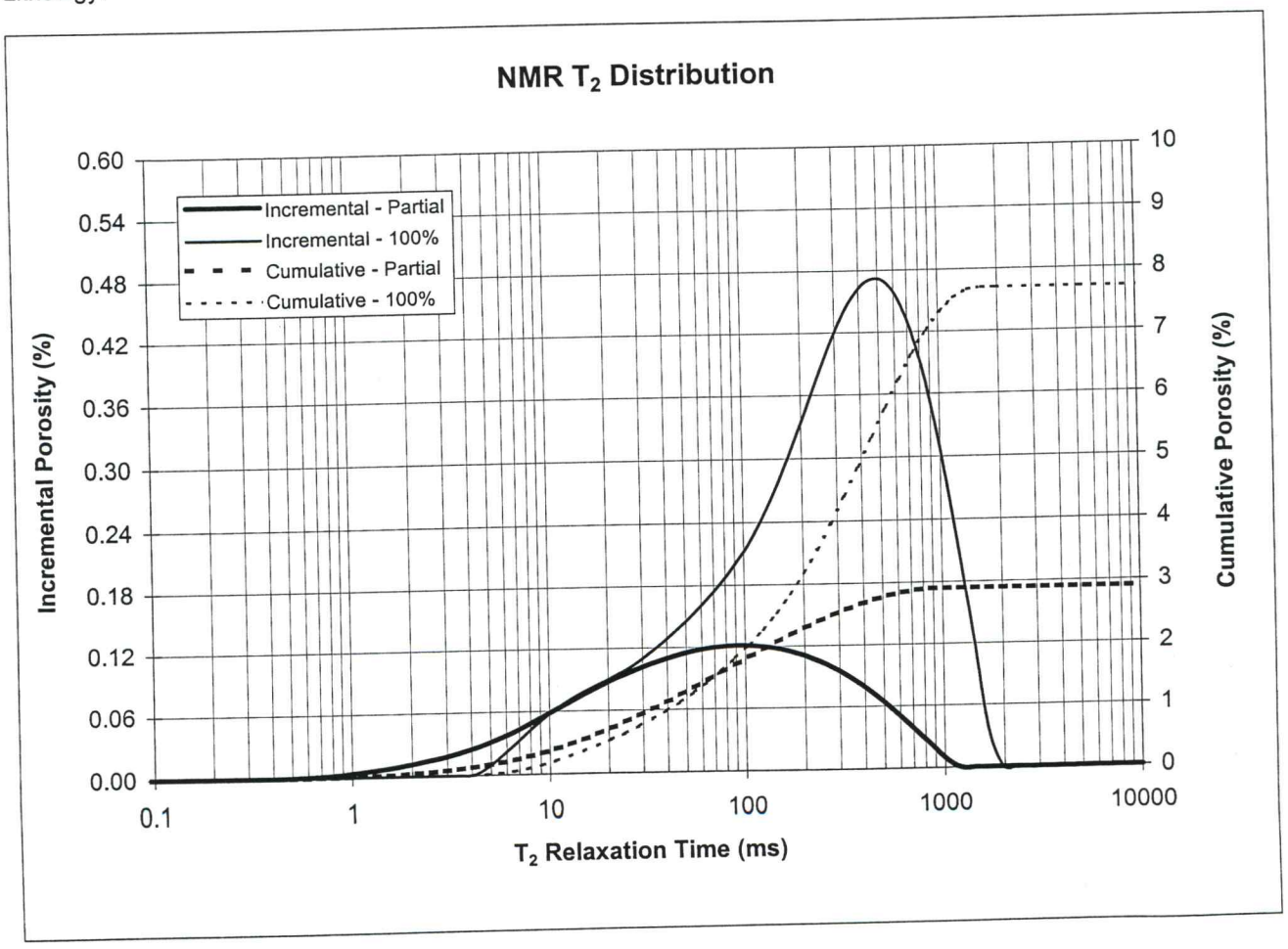
Permeability (md):	1.60
Porosity (%):	8.4
Pore Volume (cm^3):	1.40
Bulk Volume (cm^3):	17.78
Grain Density (g/cm^3):	2.81
Bulk Density (g/cm^3):	2.57
S_{wir} @ P_c = 200 psi A/B:	37.1
Lithology:	Limestone

NMR Parameters

Echo Spacing (ms):	1.20
Saturation Condition:	Partial
Signal/Noise:	100
Gradient:	None

NMR Data

NMR Porosity Saturated (%):	7.7
BVI Partial Saturated (%):	2.9
FFI (%):	4.8
S_{wir} @ BVI (%):	37.7
T_2 Cutoff (ms):	176
Permeability, Coates @ T_{2C}(md):	1.00



RSH 3928

PLATE 29

CLOSE CORE PHOTOGRAPHS

Pioneer Natural Resources USA, Inc.
Stuart 3-34R Well
Grant County, Kansas

Sample A

Depth: 2878 feet

Depositional Facies: Paleosol to Coastal Plain

This massively bedded, red-brown, argillaceous siltstone is typical of the paleosol to coastal plain lithofacies. Irregular anhydrite nodules may be following root traces or burrows. Faint vertical, cylindrical, insect (?) burrows were noted at the base of the sample. This sample has a measured porosity of 7.6% and a measured permeability of <0.01 md.

Sample B

Depth: 2757 feet

Depositional Facies: Siliciclastic Tidal Flat

The upper part of this calcareous siltstone contains dark gray, flat to undulatory, argillaceous siltstone laminae. The lower portion contains slightly burrowed, slightly carbonaceous siltstone. This sample has a measured porosity of 9.4% and a measured permeability of 0.08 md.

2878

A

Reservoirs

Inc.

M-109

2757

B

PLATE 29 (CONTINUED)

CLOSE CORE PHOTOGRAPHS

Pioneer Natural Resources USA, Inc.
Stuart 3-34R Well
Grant County, Kansas

Sample C

Depth: 2788 feet

Depositional Environment: Shoal

This massive oncoid packstone to grainstone is from "shoal package 2" and has fair reservoir potential. Small dark brown laths are anhydrite crystals replacing and cementing the limestone. The small dark gray spots are oncoids composed of slightly pyritic lime micrite. This sample has a measured porosity of 14.2% and a measured permeability of 2.24 md.

Sample D

Depth: 2834 feet

Depositional Environment: Shoal Flank

This light olive-brown, slightly silty to argillaceous wackestone is typical of the shoal flank facies. Scattered skeletal debris includes: crinoids, bryozoans, ostracodes and brachiopods. Small, scattered anhydrite crystals are replacing the limestone in the upper and lower portions of the core. The orange color of some crystals indicates that chert is replacing the anhydrite. This sample has poor reservoir potential.

2788
C

Reservoirs
Inc.

D
2634

PLATE 29 (CONTINUED)

CLOSE CORE PHOTOGRAPHS

Pioneer Natural Resources USA, Inc.
Stuart 3-34R Well
Grant County, Kansas

Sample E

Depth: 2915 feet

Depositional Environment: Carbonate Tidal Flat

This tan limestone breccia has clasts composed of algal grains, peloid/oncoid packstones, and skeletal grains. The "matrix" is peloidal grainstone. Anhydrite and calcite cements partially occlude intergranular pores, moldic pores and cracks. Note the rugose coral and sutured stylolite at the base of the sample. This limestone has a measured porosity of 6.9% and a measured permeability of 0.44 md.

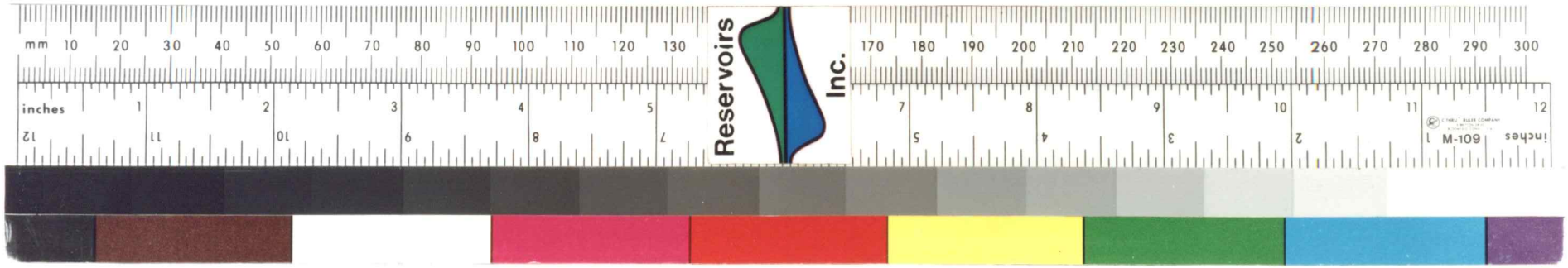
Sample F

Depth: 2856 feet

Depositional Environment: Shelf/Lagoon

This sample is a silty, very argillaceous wackestone to mudstone. Dark gray, undulatory argillaceous laminae increase toward the bottom of the sample. Light brown nodules are calcite- and chert-replaced wackestone. The white nodules at the bottom are probably chert-replaced anhydrite nodules. Scattered silica-replaced crinoids are more common toward the top of the sample. This lithofacies has poor reservoir potential.


F


mm 10 20 30 40 50 60 70 80 90 100 110 120 130
inches 1 2 3 4 5
170 180 190 200 210 220 230 240 250 260 270 280 290 300
7 8 9 10 11 12
Reservoirs Inc.
M-109


E
2915

PLATE 30

WHOLE THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2782-83 Feet

Lithology: Very Silty, Slightly Dolomitic Limestone
Texture: Packstone
Facies: Siliciclastic Tidal Flat

Porosity: 7.9 %
Permeability: 0.02 md
Grain Density: 2.69 g/cc

This thinly laminated, silty calcarenite is typical of the tidal flat facies. The red-colored laminae have a higher percentage of carbonate grains and calcite cement. The lighter laminae have a higher percentage of quartz grains and dolomite cement. A small burrow disrupts the laminations. The sample is composed of approximately 50% calcite grains, 35% quartz silt and 15% dolomite cement. The small fractures are probably induced. The gap in the bar at the bottom of the photograph is 1.0 mm.

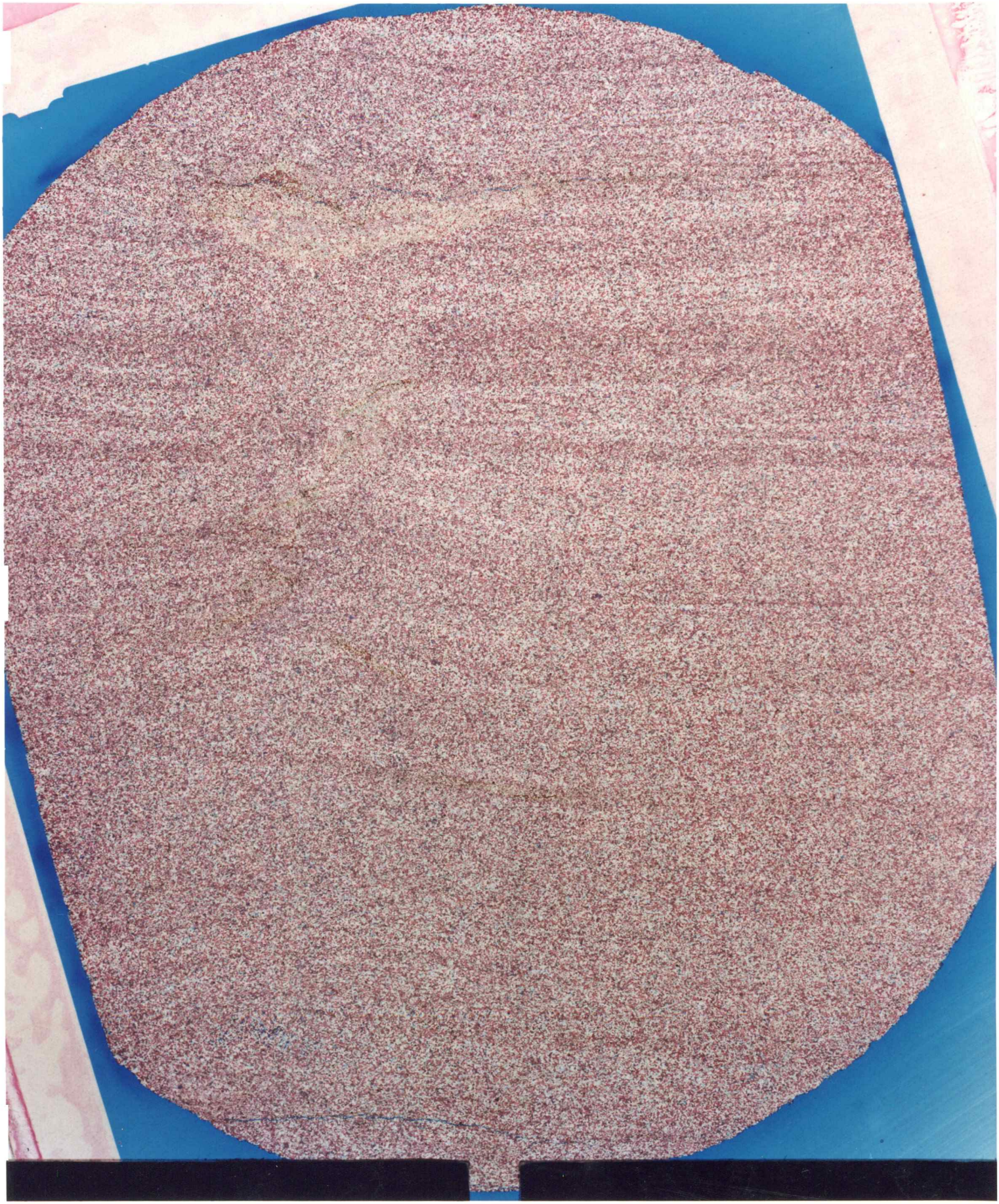


PLATE 31

THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2782-83 Feet

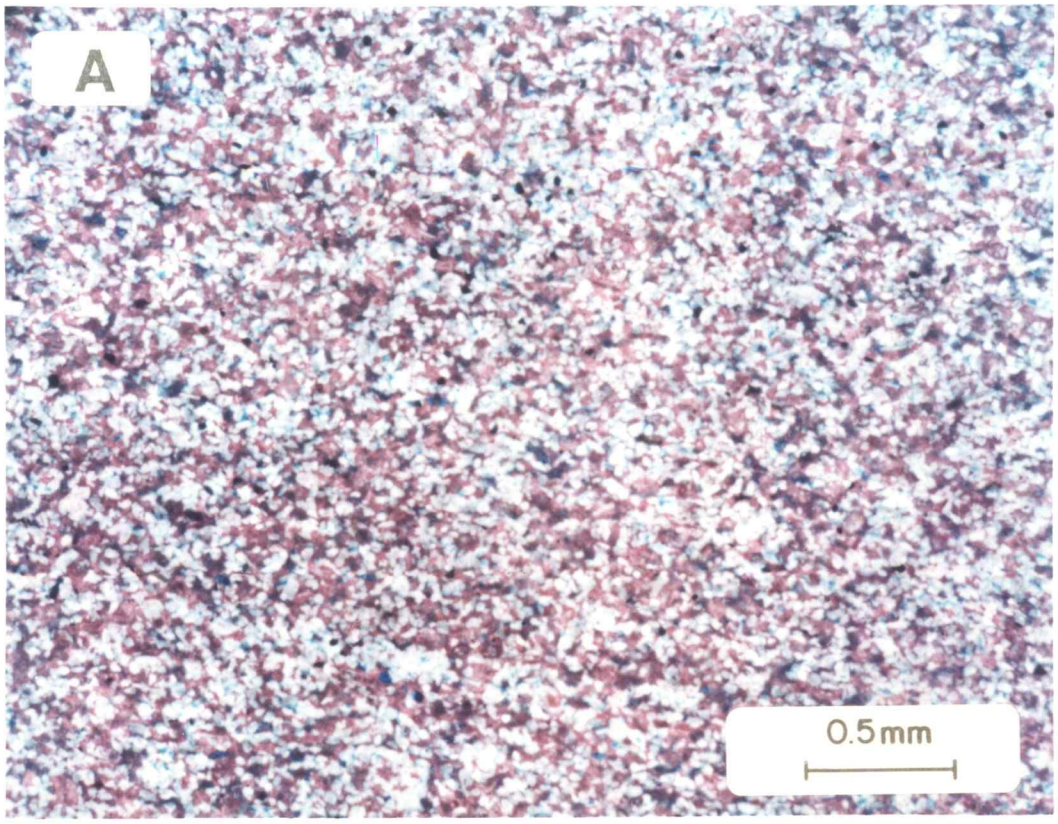
Lithology: Very Silty Limestone
Texture: Packstone
Facies: Tidal Flat

Porosity: 7.9 %
Permeability: 0.02 md
Grain Density: 2.69 g/cc

This very silty calcarenite consists of well sorted, silt- to very fine-grained sand-sized, highly abraded skeletal grains and peloids. Very thin, horizontal interlaminae are predominantly quartz silt. A white filter was used to highlight the small, thin nature of partially filled intergranular (Ig) pores. Partial feldspar dissolution (Fd) is occasionally noted along with biomoldic (M) pores. Calcite and scattered, euhedral dolomite (D) rhombs are the principal cementing agents.

A - 40X (white filter)

B - 160X (white filter)


A
0.5mm

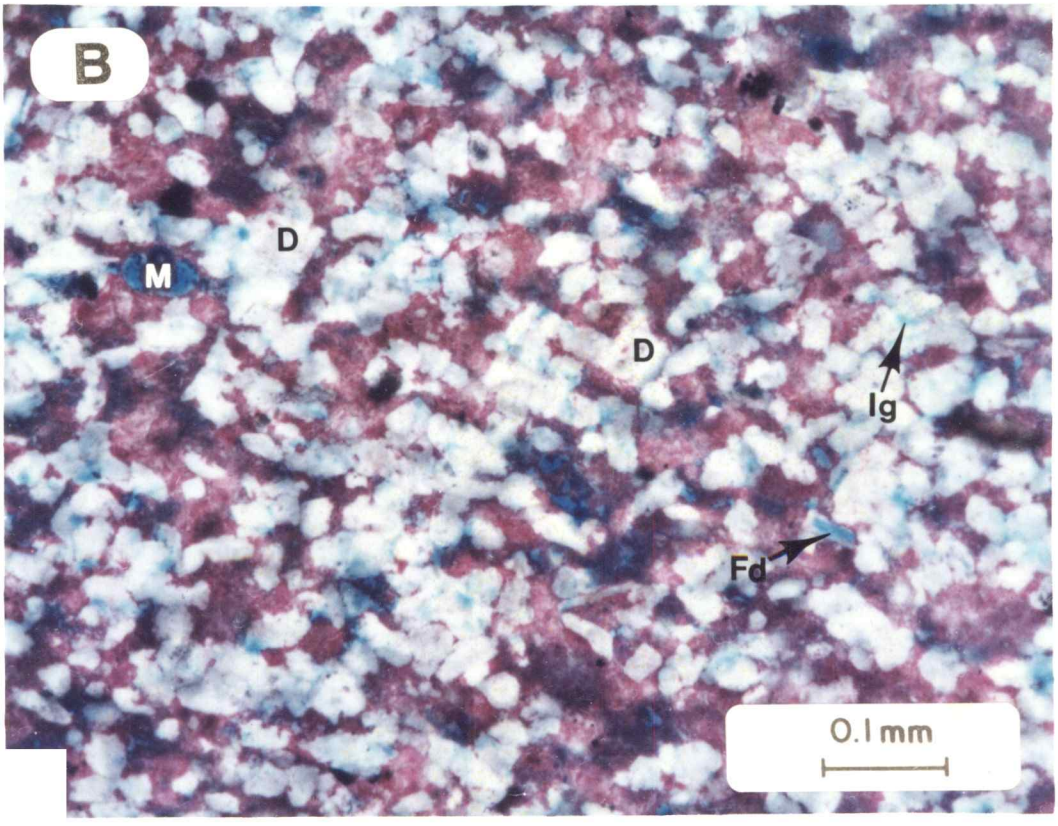

B
M
D
D
Ig
Fd
0.1mm

PLATE 32

WHOLE THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2794-95 Feet

Lithology: Limestone
Texture: Wackestone
Facies: Shelf/Lagoon

Porosity: 12.1%
Permeability: 0.09 md
Grain Density: 2.72 g/cc

The pore system in this skeletal wackestone consists of intercrystalline micropores (within the micritic matrix) and lesser amounts of intraparticle pores. The white, irregular areas in the middle of the photomicrograph are anhydrite crystals. The white area at the bottom of the sample is a chert-replaced brachiopod shell. Fenestrate bryozoans transect the sample. The space between the back bars equals 1.0 mm.

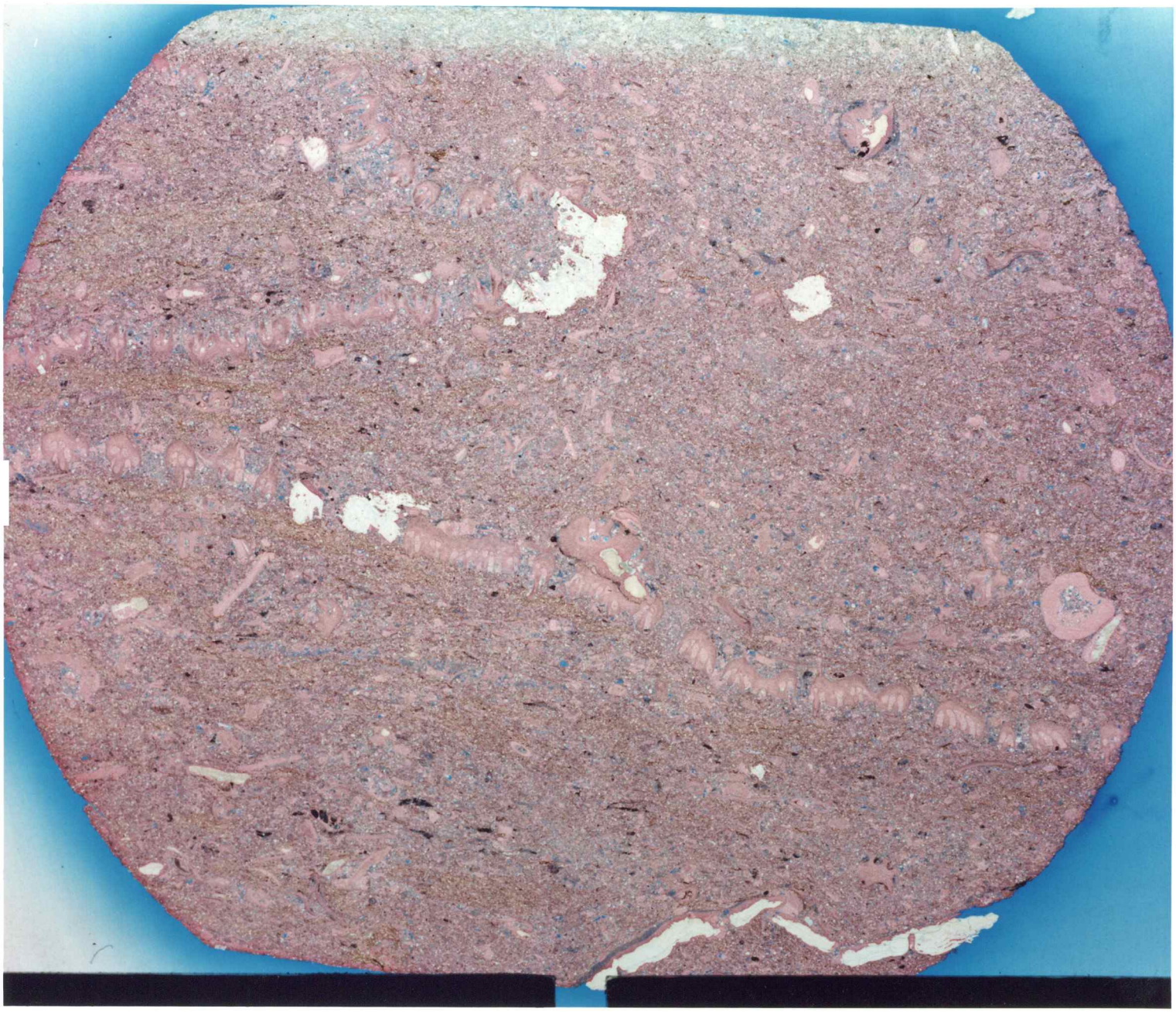


PLATE 33

THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2794-95 Feet

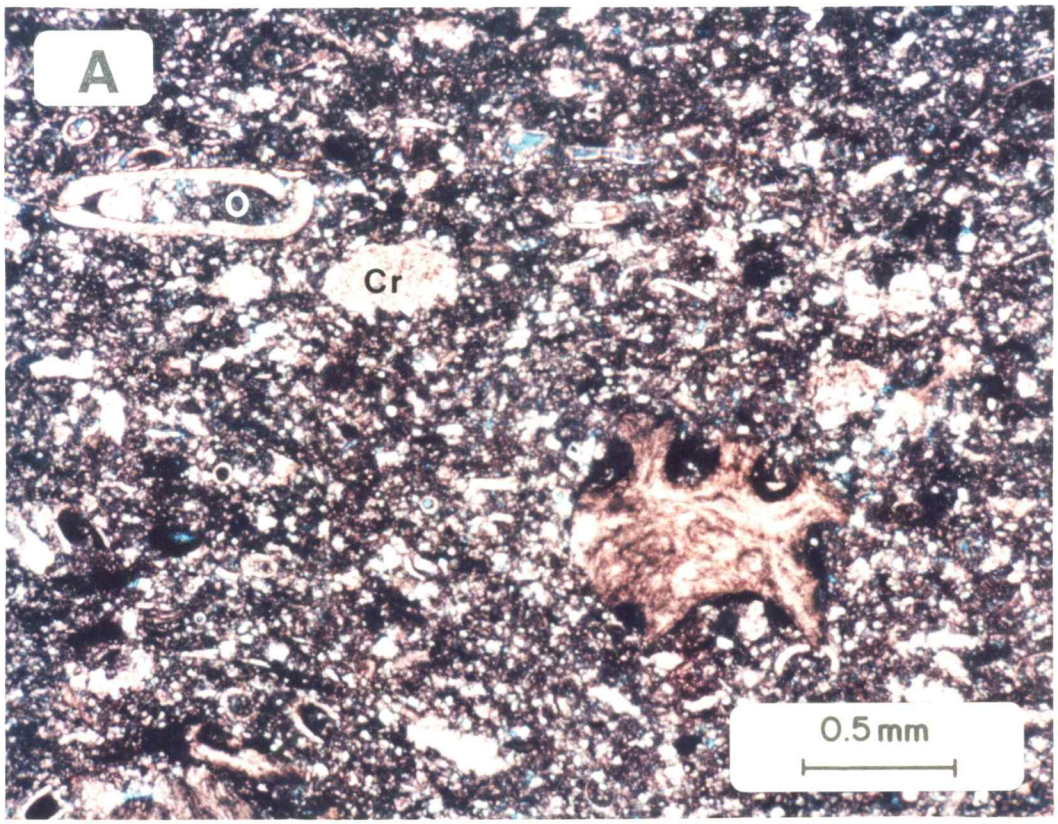
Lithology: Limestone
Texture: Wackestone
Facies: Shelf/Lagoon

Porosity: 12.1%
Permeability: 0.09 md
Grain Density: 2.72 g/cc

This slightly silty lime wackestone contains fairly complete fenestrate bryozoans (By) and ostracodes (O). Crinoid (Cr) osicles are also present. Very small dolomite (D) rhombs tend to replace the micritic matrix. Most of the pore volume consists of intercrystalline micropores within the neomorphosed micritic matrix. Remnant peloids can be distinguished within the matrix.

A - 40X

B - 160X


A
O
Cr
0.5 mm

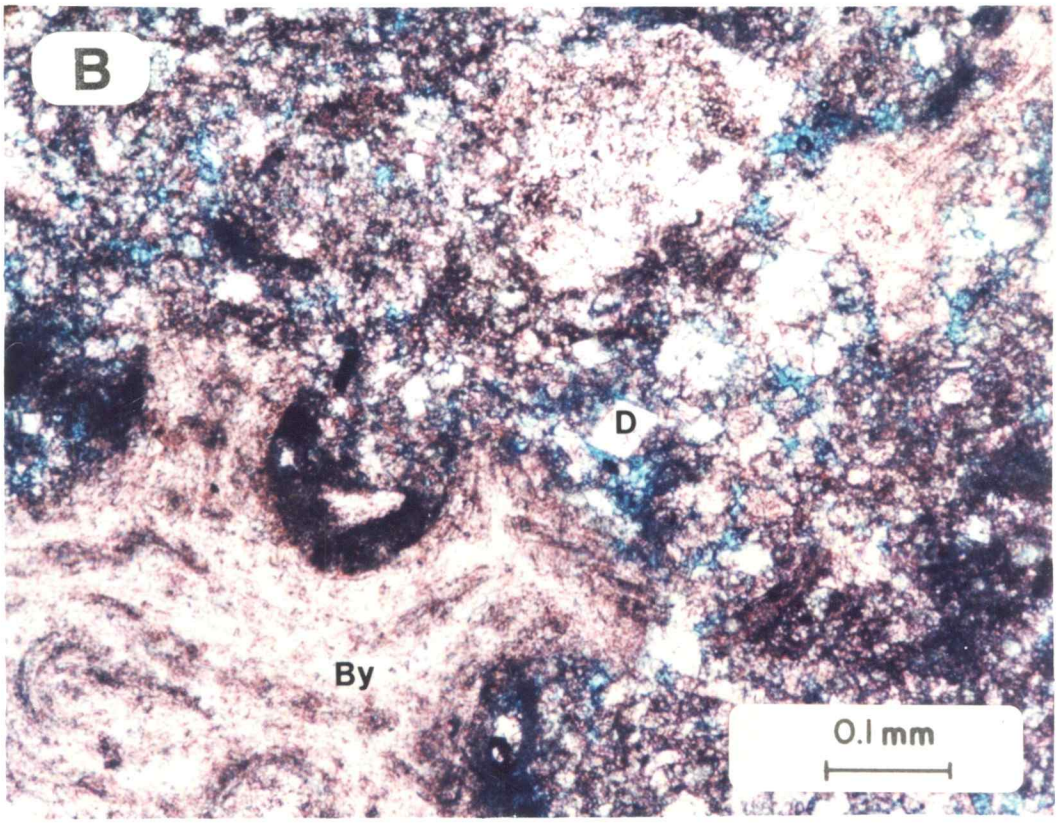

B
D
By
0.1 mm

PLATE 34

WHOLE THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2796-97 Feet

Lithology: Limestone
Texture: Packstone
Facies: Shelf/Lagoon

Porosity: 21.9 %
Permeability: 0.40 md
Grain Density: 2.67 g/cc

The light blue portion of this thin section is a porous, slightly fractured chert nodule. Fractures range from open to anhydrite-filled. The chert tends to preserve the original texture of this bryozoan and ostracode-rich skeletal packstone. Note the slightly argillaceous, wispy compaction seams in the limestone while the chert has an open grain packing; this implies early silica replacement, prior to significant burial compaction. The space between the black bars equals 1.0 mm.

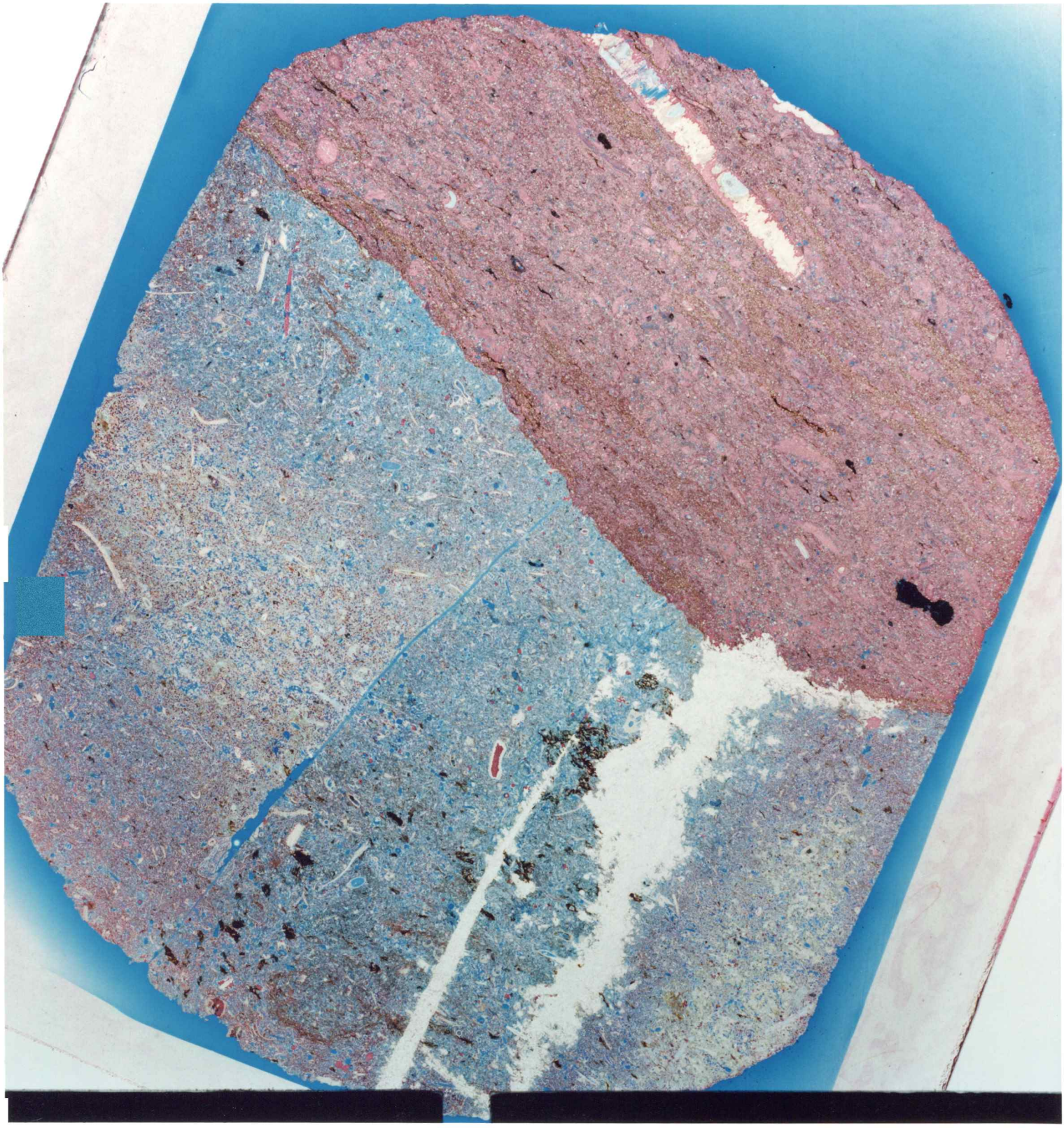


PLATE 35

THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2796-97 Feet

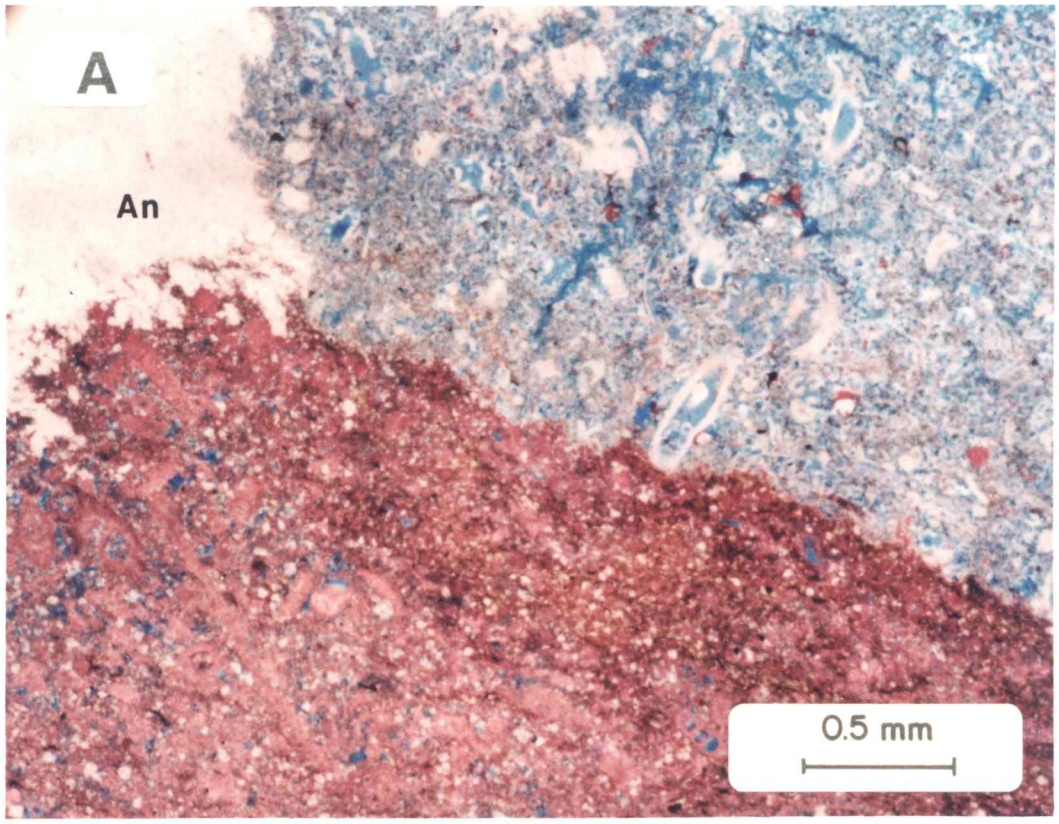
Lithology: Limestone
Texture: Packstone
Facies: Shelf/Lagoon

Porosity: 21.9 %
Permeability: 0.40 md
Grain Density: 2.67 g/cc

The high porosity in this bryozoan-rich skeletal packstone is due to intraparticle (Ia) and intercrystalline (Ic) pores within the chert-replaced portion of the sample. A white filter was used to highlight the smaller intercrystalline pores. Fractures within the chert can be filled with anhydrite (An). Small, euhedral dolomite (D) rhombs are scattered throughout the chert and limestone, indicating an early stage of dolomitization. The dolomite is concentrated in the more micritic and organic-rich (Or) laminae.

A - 40X (white filter)

B - 160X (white filter)


A
An
0.5 mm

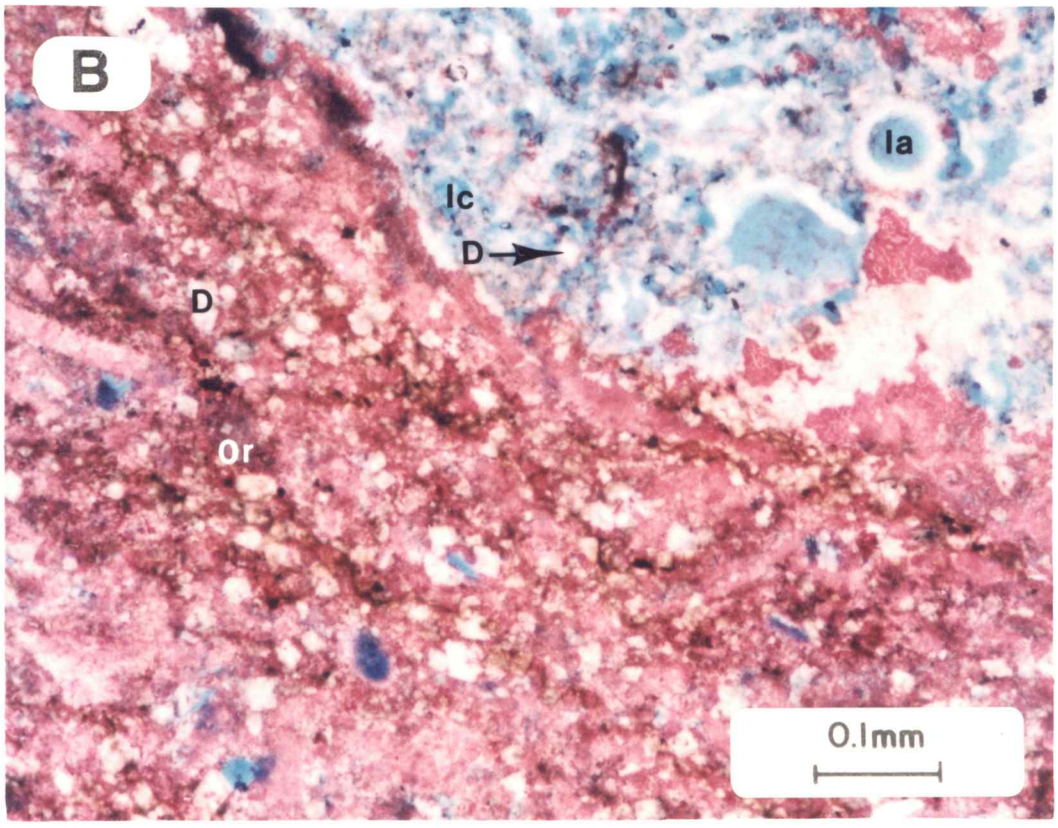

B
Ia
Ic
D
D
Or
0.1mm

PLATE 36

WHOLE THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2830-31 Feet

Lithology: Dolostone
Texture: Wackestone (Boundstone ?)
Facies: Algal Flat Shoal

Porosity: 15.6%
Permeability: 0.29 md
Grain Density: 2.82 g/cc

About 40% of this thin section is composed of in situ, clotted algal overgrowths that have been replaced by microcrystalline dolomite. Small intercrystalline and vuggy pores are better developed within the algal tufts. The white patches are anhydrite laths that have replaced the carbonate. Red-colored patches are calcite-filled vugs. The space between the black bars equals 1.0 mm.

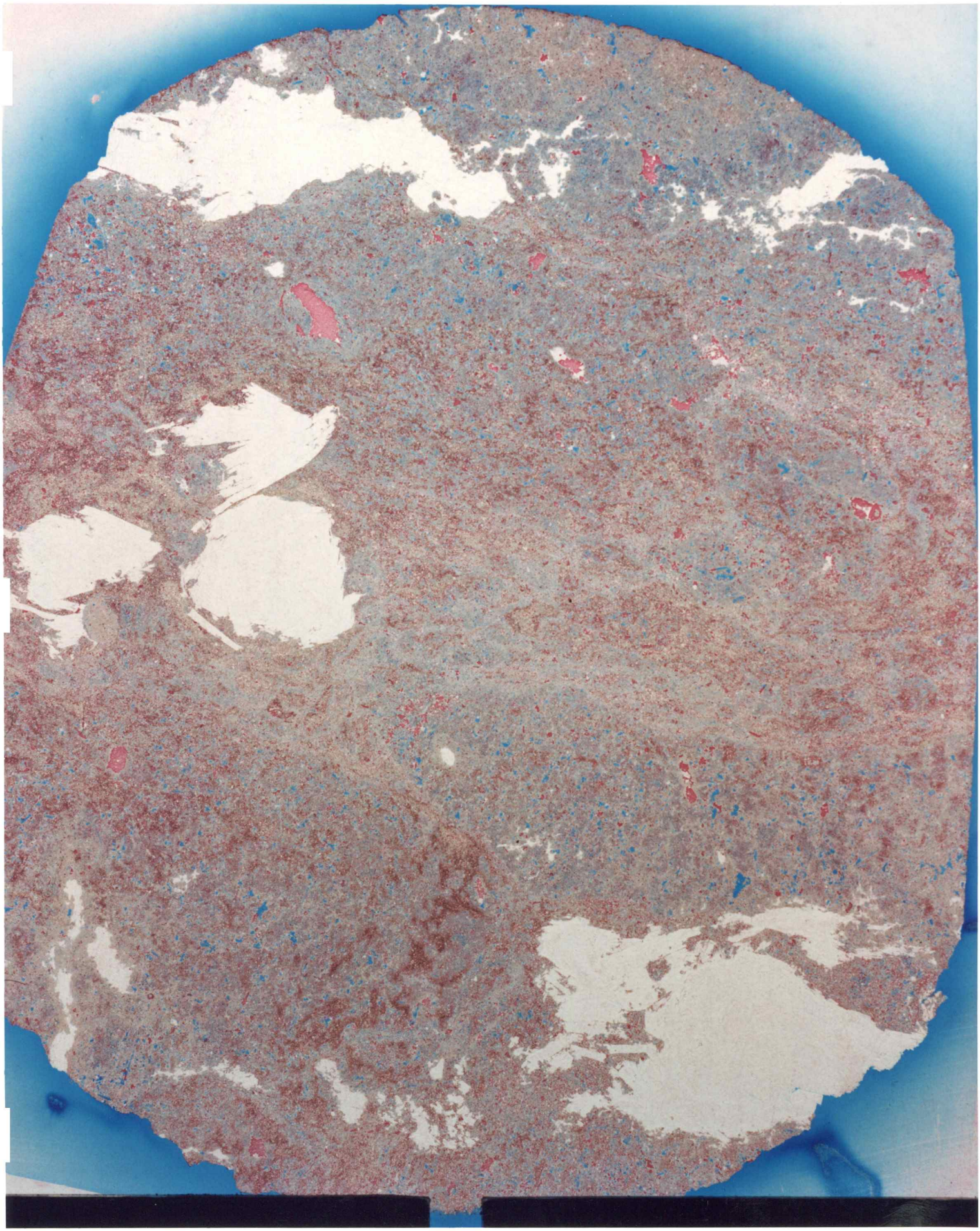


PLATE 37

THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2830-31 Feet

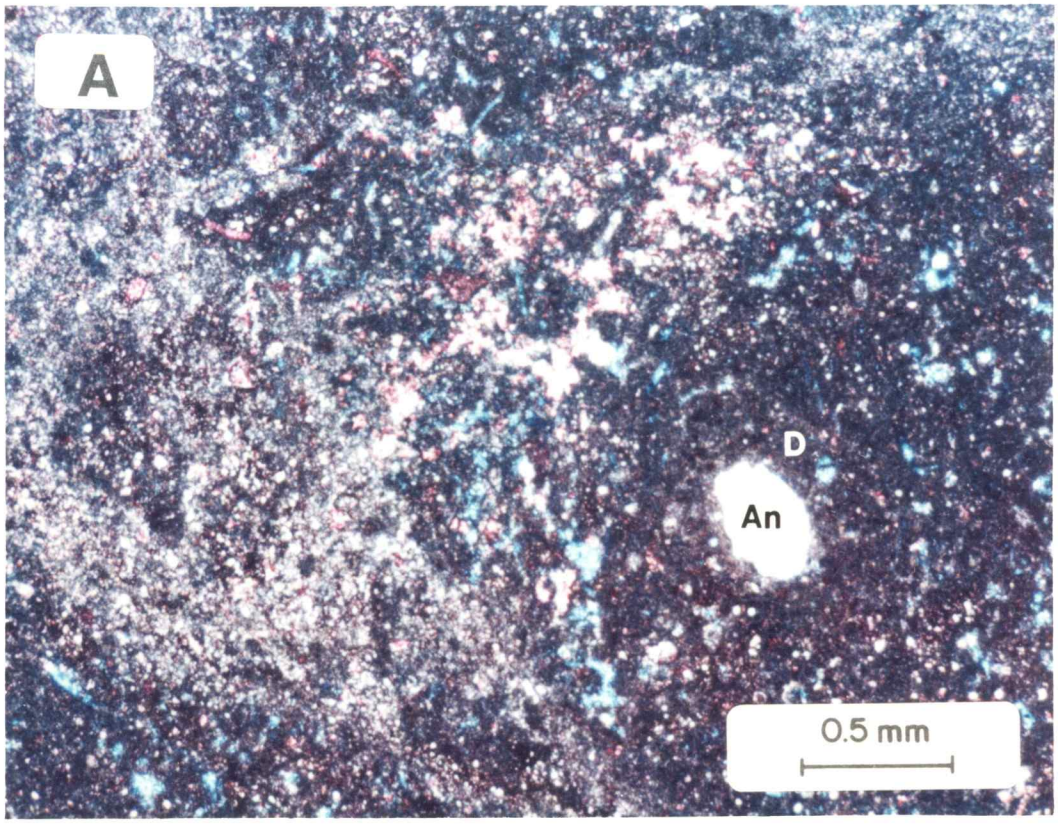
Lithology: Dolostone
Texture: Wackestone (Boundstone ?)
Facies: Algal Flat

Porosity: 15.6%
Permeability: 0.29 md
Grain Density: 2.82 g/cc

The anhydrite (An)-filled oncoid in photo A is the nucleus for a larger clotted algal overgrowth. Most of this algal wackestone (boundstone?) is replaced by microcrystalline dolomite (D). The pore system is composed of poorly connected intercrystalline pores, small irregular vuggy pores within the algal overgrowths and occasional moldic pores. Patches of anhydrite and calcite cements tend to fill the larger vuggy pores.

A - 40X

B - 160X


A
D
An
0.5 mm

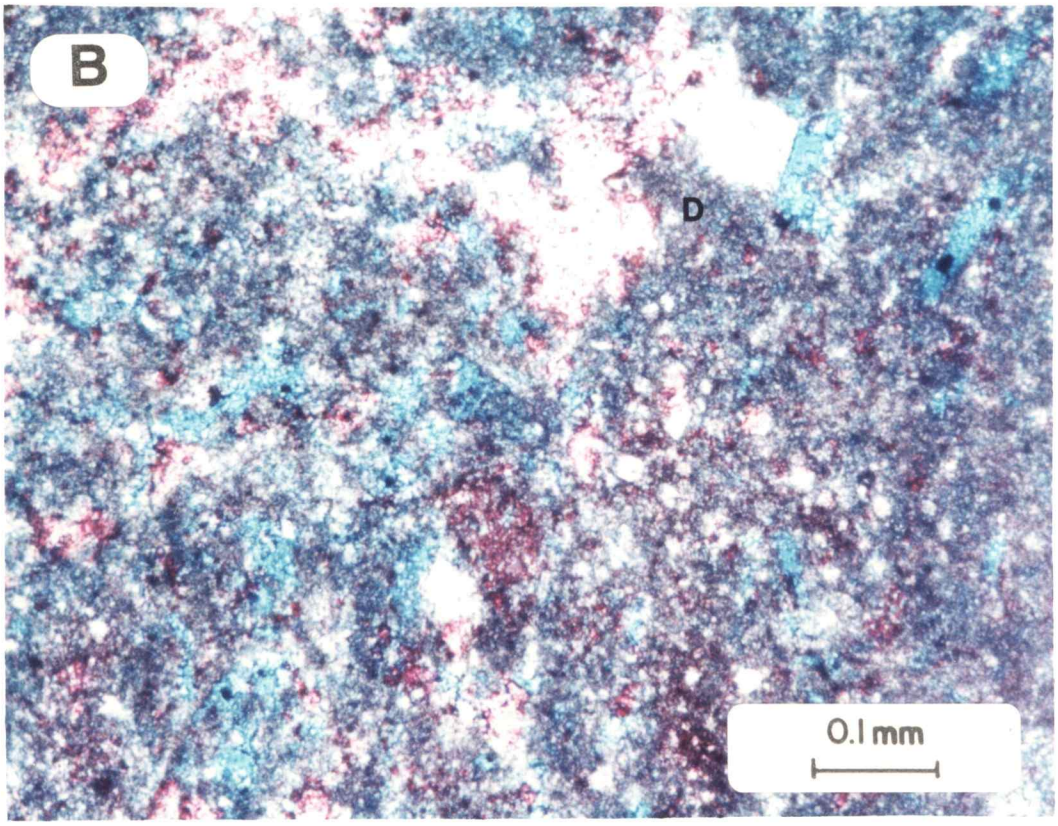

B
D
0.1 mm

PLATE 38

WHOLE THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2848-49 Feet

Lithology: Limestone
Texture: Wackestone
Facies: Shoal Flank

Porosity: 16.5%
Permeability: 0.95 md
Grain Density: 2.71 g/cc

This bryozoan and ostracode-rich wackestone is typical of the shoal flank facies. Note the uneven distribution of intercrystalline and intergranular pores (bluish area). The small pore size and lack of interconnection yield a rock with moderately high porosity, but low permeability. Darker purplish areas are algal clasts. Small white patches are anhydrite. Trace amounts of intraparticle pores are also noted. The space between the black bars equals 1.0 mm.

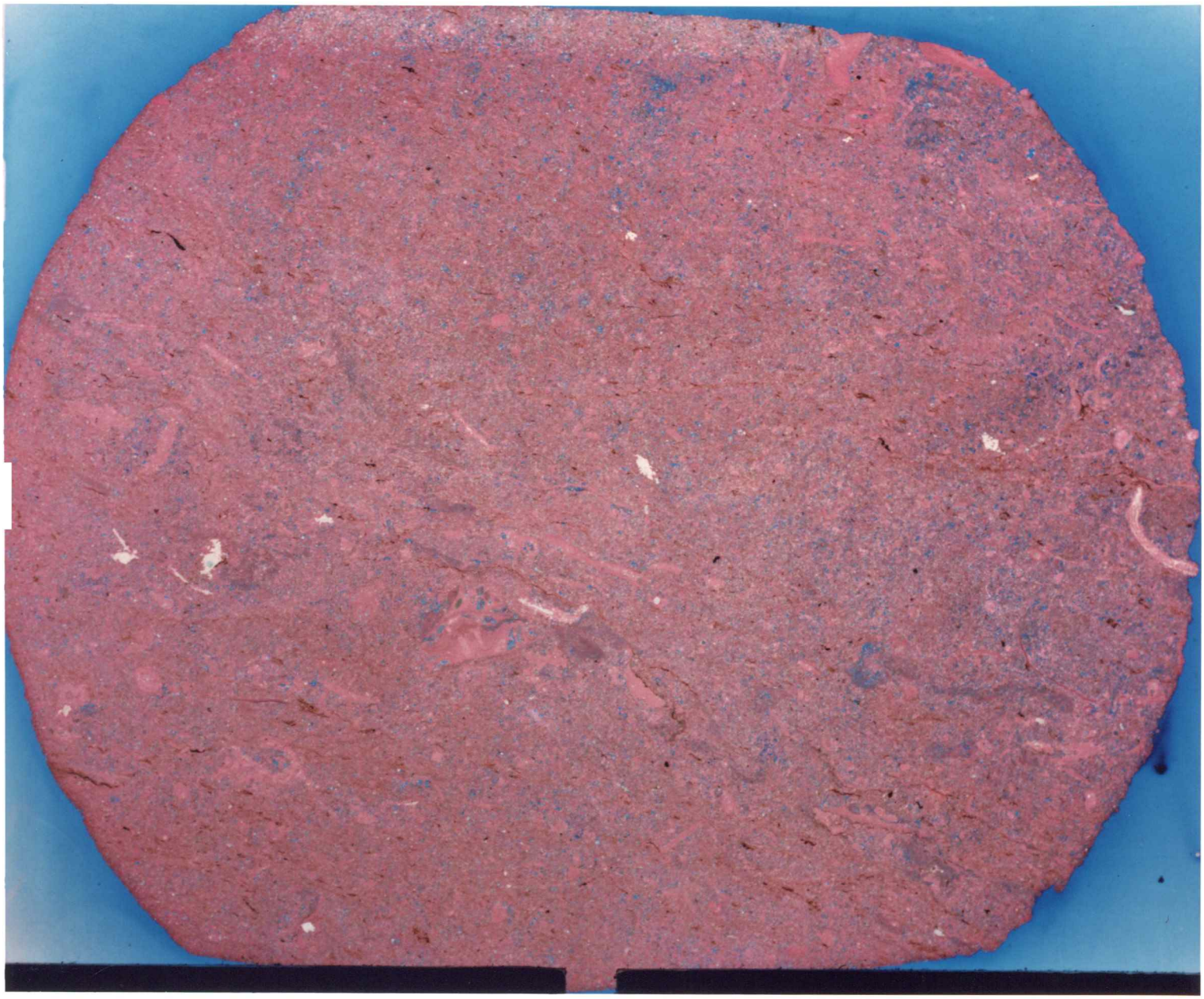


PLATE 39

THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2848-49 Feet

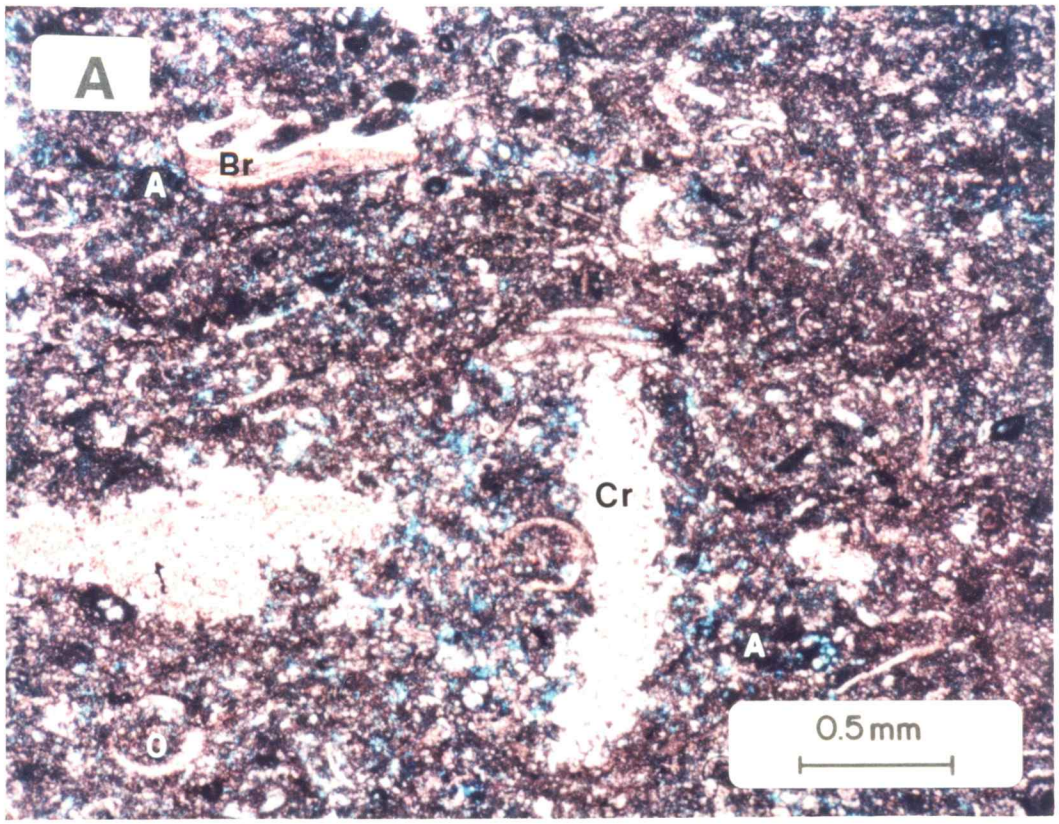
Lithology: Limestone
Texture: Wackestone
Facies: Shoal Flank

Porosity: 16.5%
Permeability: 0.95 md
Grain Density: 2.71 g/cc

The principal allochems in this lime wackestone include: ostracodes (O), bryozoans (By), peloids (P), crinoids (Cr) and algal clasts (A). The majority of the pore space is composed of intergranular pores and intercrystalline micropores within neomorphosed (mud matrix, peloids and algal clasts). Pore space is partially cemented with calcite spar (Sp) and scattered dolomite (D) rhombs.

A - 40X

B - 160X


A
Br
A
Cr
A
0
0.5 mm

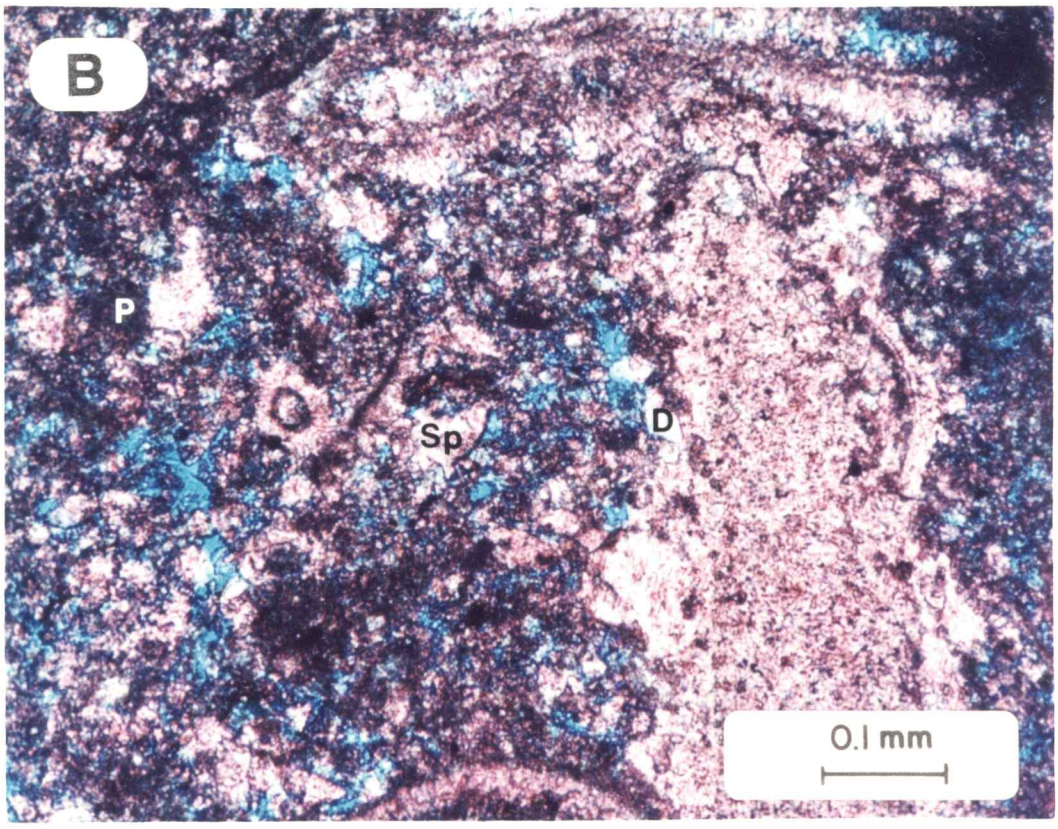

B
P
Sp
D
0.1 mm

PLATE 40

WHOLE THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2883-84 Feet

Lithology: Dolomitic Limestone
Texture: Mudstone
Facies: Carbonate Tidal Flat (Calcrete)

Porosity: 6.4%
Permeability: 1.58 md
Grain Density: 2.78 g/cc

This whole thin section photomicrograph clearly shows the clotted texture of this dolomitic mudstone. Dolomitization (white to light blue area) is uneven, following horizontal, skeletal-rich layers. Intercrystalline micropores (light blue area) tend to follow the more dolomitized portion of the sample. White areas are replacement anhydrite. Red areas are calcite-filled vugs. This is a typical calcrete profile. The space between the black bars equals 1.0 mm.

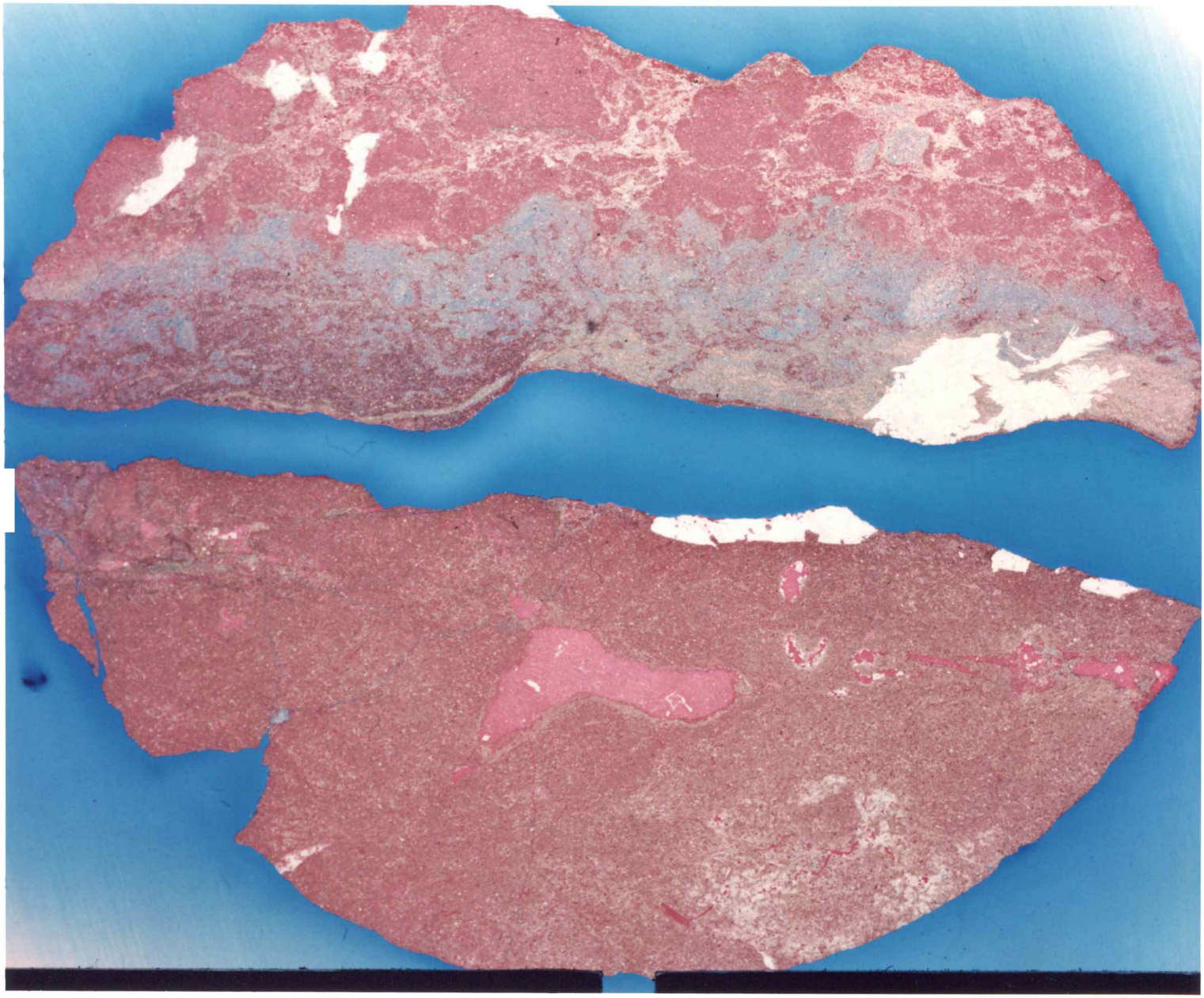


PLATE 41

THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2883-84 Feet

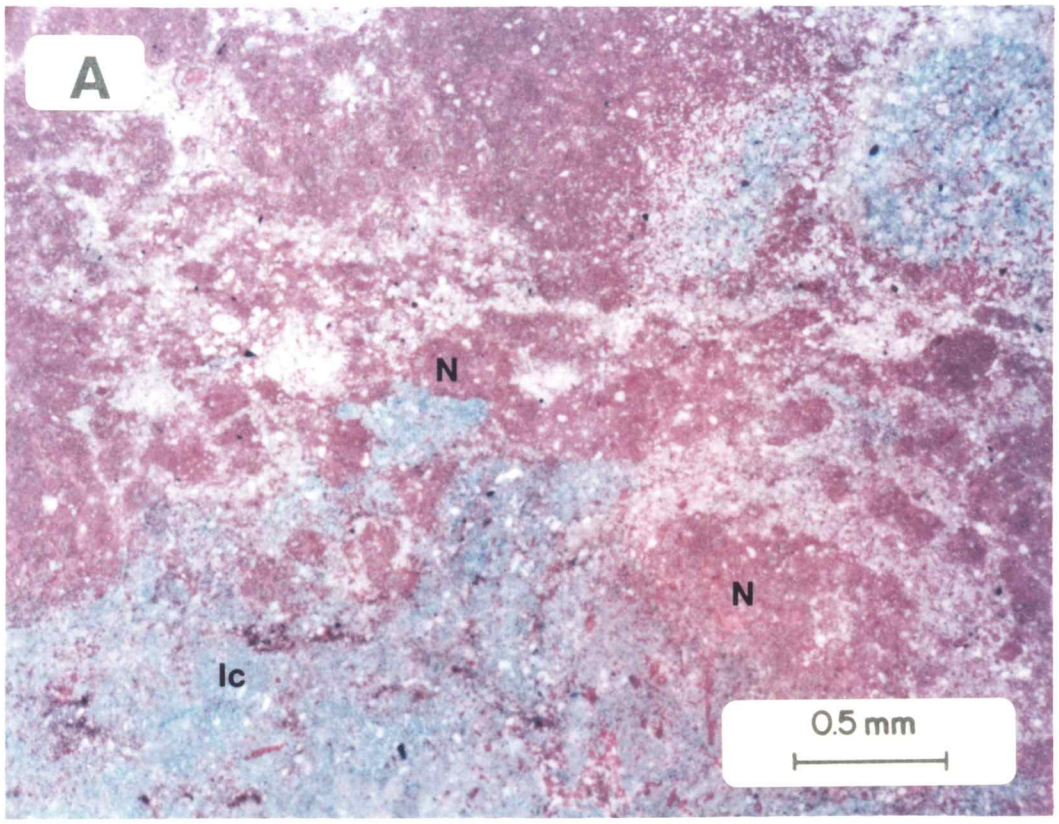
Lithology: Dolomitic Limestone
Texture: Mudstone
Facies: Carbonate Tidal Flat (Calcrete)

Porosity: 6.4%
Permeability: 1.58 md
Grain Density: 2.78 g/cc

Intercrystalline (Ic) micropores (light blue areas) are developed in the dolomitized (D) portions of this slightly silty limestone. The nodular (N) texture of this mudstone is typical of calcrete profiles that cap the carbonate tidal flat. Paleosol to coastal plain deposits cap this calcrete. Inter-nodular vuggy pores are usually cemented with calcite or anhydrite.

A - 40X, white filter

B - 160X, white filter


A
N
N
lc
0.5 mm

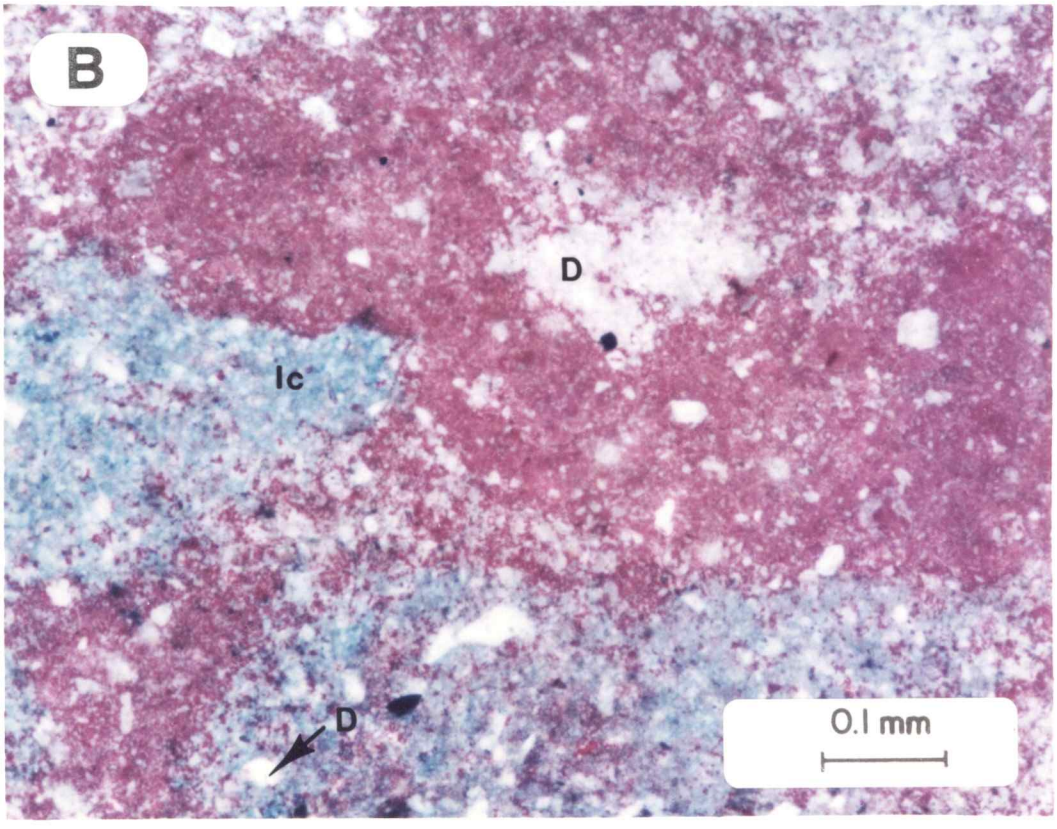

B
D
lc
D
0.1 mm

PLATE 42

WHOLE THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2910-11 Feet

Lithology: Limestone
Texture: Grainstone
Facies: Shoal

Porosity: 14.2%
Permeability: 8.82 md
Grain Density: 2.71 g/cc

Large oncoids and small peloids are the dominant allochems in this limestone. Note the open packing of the framework grains, indicating early partial cementation or partial dissolution of the matrix. Intergranular pores and to a lesser extent, moldic pores have been partially cemented by equant calcite. The space between the black bars equals 1.0 mm.

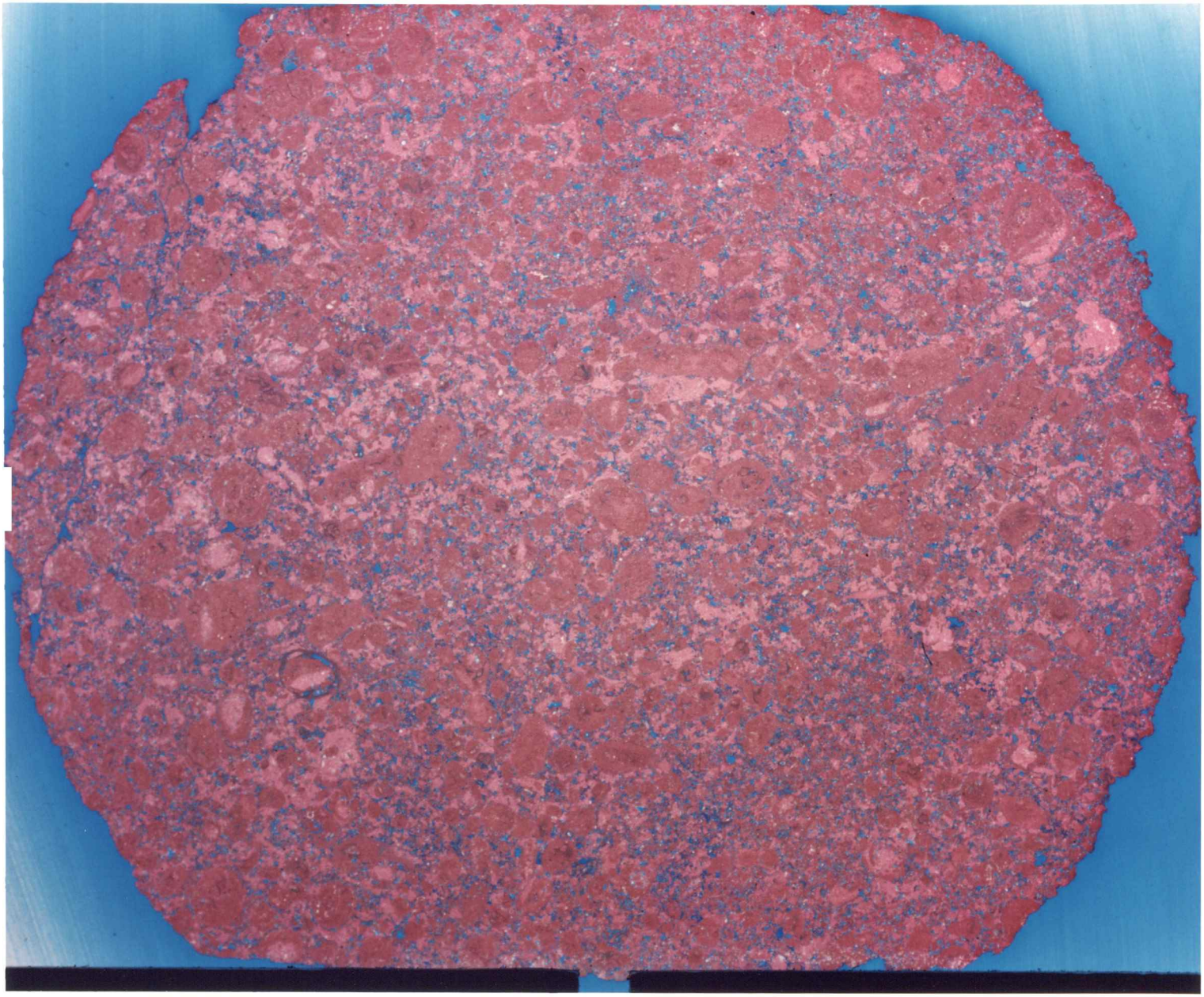


PLATE 43

THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2910-11 Feet

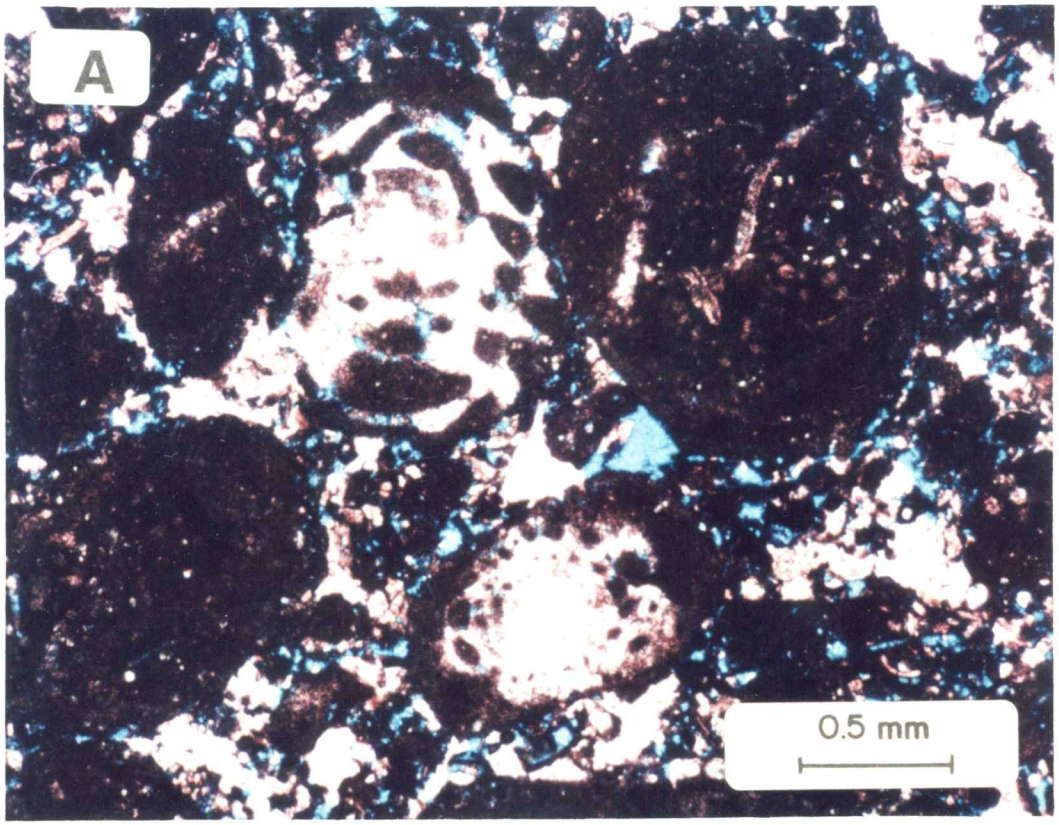
Lithology: Limestone
Texture: Grainstone
Facies: Shoal

Porosity: 14.2%
Permeability: 8.82 md
Grain Density: 2.71 g/cc

This oncoid-rich grainstone has well-developed intergranular (Ig) and moldic pores that are partially filled with equant (Eq) calcite cement. The large, well-connected pores result in one of the higher permeabilities of the sample set. Framework grains include: oncoids, peloids, bryozoans, ostracodes, forams, algal grains and bivalves.

A - 40X

B - 160X


A
0.5 mm

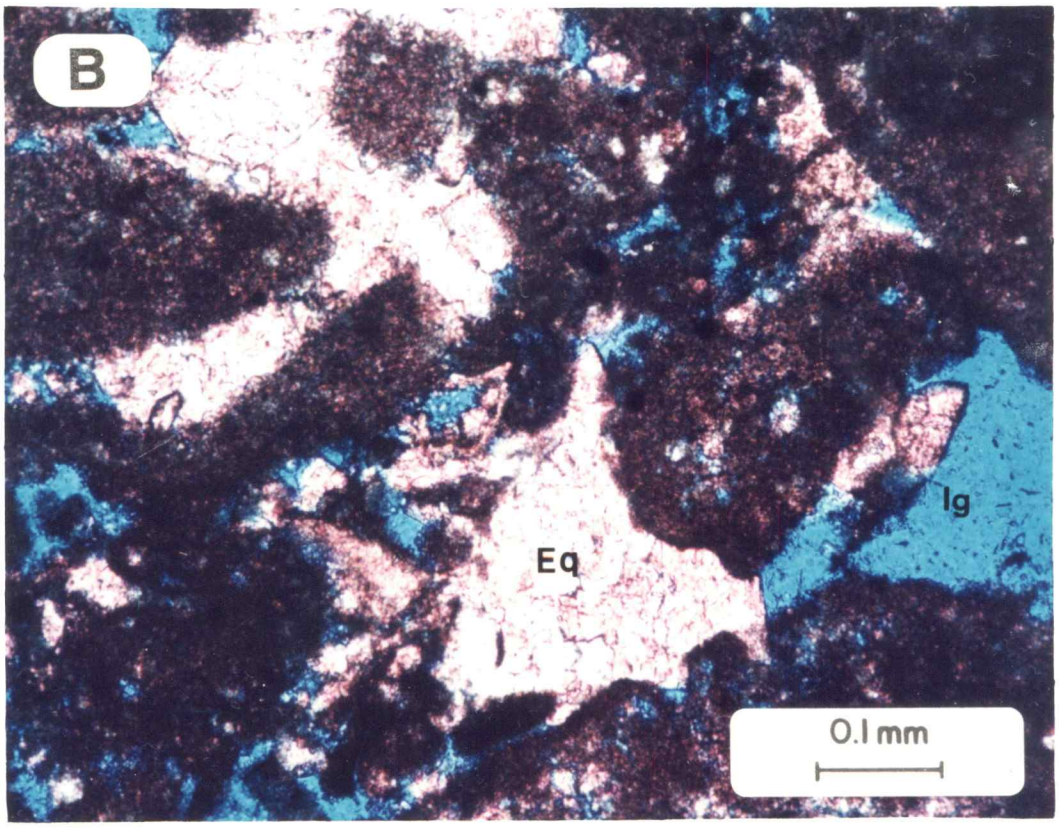

B
Eq
Ig
0.1 mm

PLATE 44

WHOLE THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2914-15 Feet

Lithology: Limestone
Texture: Grainstone
Facies: Carbonate Tidal Flat

Porosity: 10.4%
Permeability: 0.56 md
Grain Density: 2.82 g/cc

This sample is typical of the carbonate tidal flat facies. It is a lime grainstone composed of ripped-up skeletal/peloidal packstone lithoclasts (large fracture-filled clasts), algal clasts (darker purple clasts), and skeletal grains. The interstitial areas are filled with a "matrix" of peloids. White areas are gypsum crystals. Pore space is being partially filled with equant calcite crystals. The space between the black bars equals 1.0 mm.

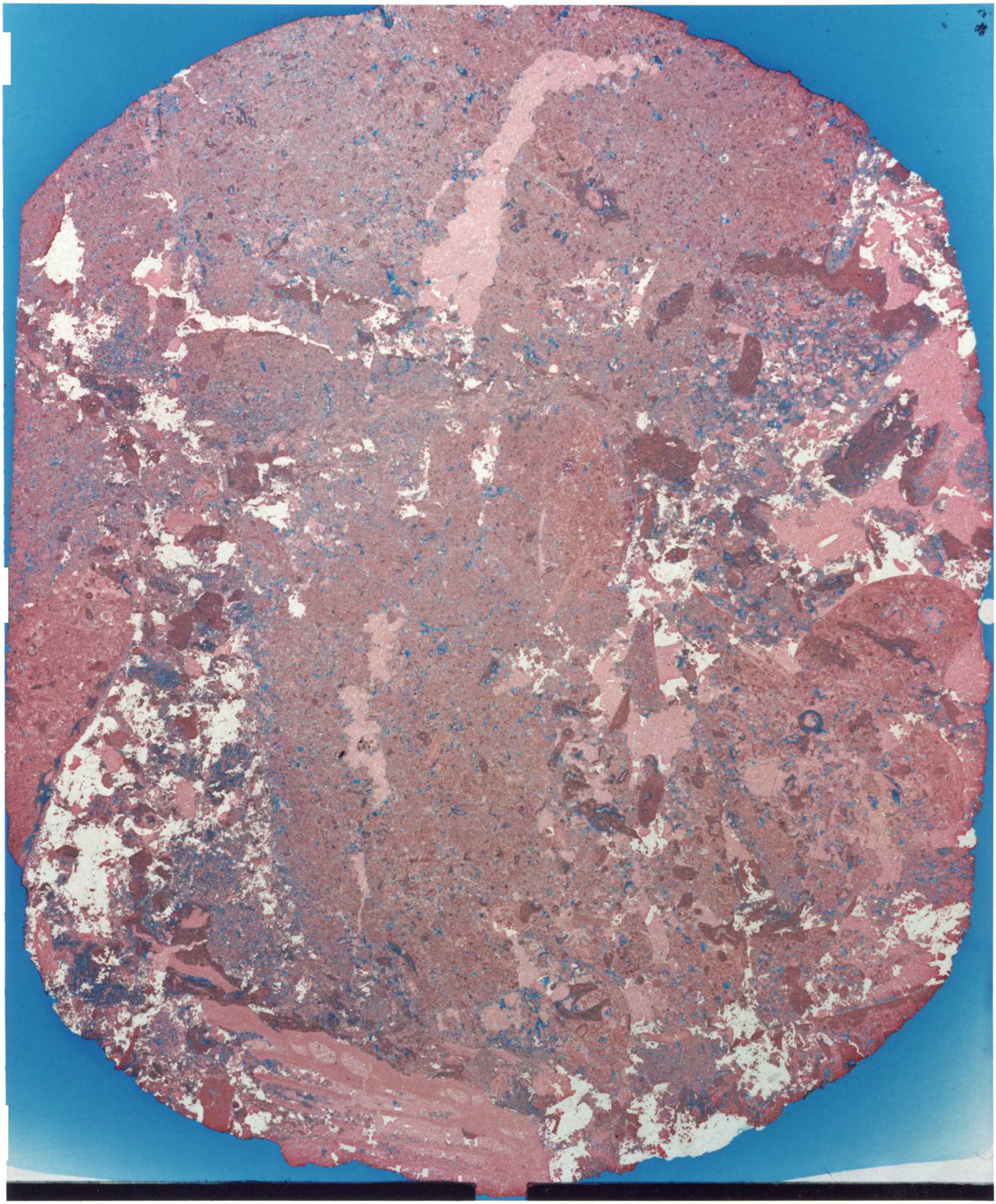


PLATE 45

THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2914-15 Feet

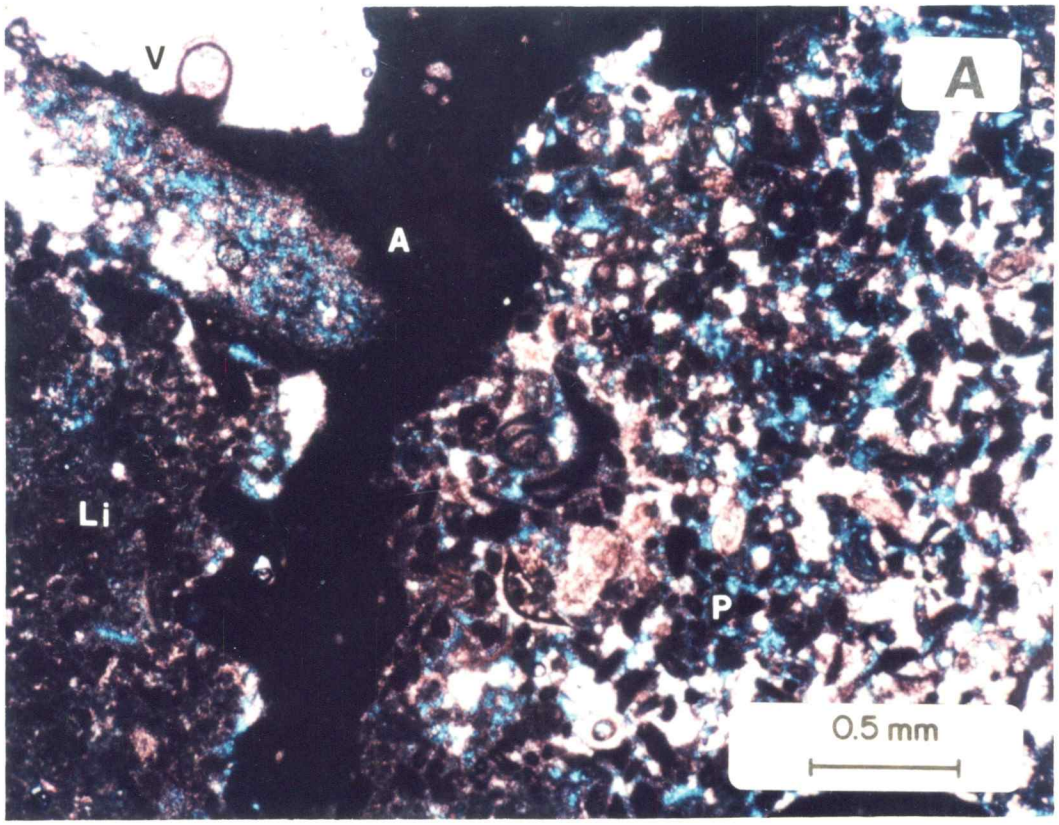
Lithology: Limestone
Texture: Grainstone
Facies: Carbonate Tidal Flat

Porosity: 10.4%
Permeability: 0.56 md
Grain Density: 2.82 g/cc

This grainstone is composed of ripped-up algal clasts (A), peloids, skeletal/peloidal packstone lithoclasts (Li), bivalves, ostracodes, and worm tubes. The "matrix" is a peloidal (P) grainstone. The pore system consists of intergranular pores and moldic pores in partially leached-skeletal grains. Large vuggy (V) pores are predominately filled with equant calcite. Smaller intergranular pores are partially filled with equant calcite (Ca), anhydrite (An), and a thin calcite fringe (Fr) cement.

A - 40X

B - 160X


V
A
A
Li
P
0.5 mm

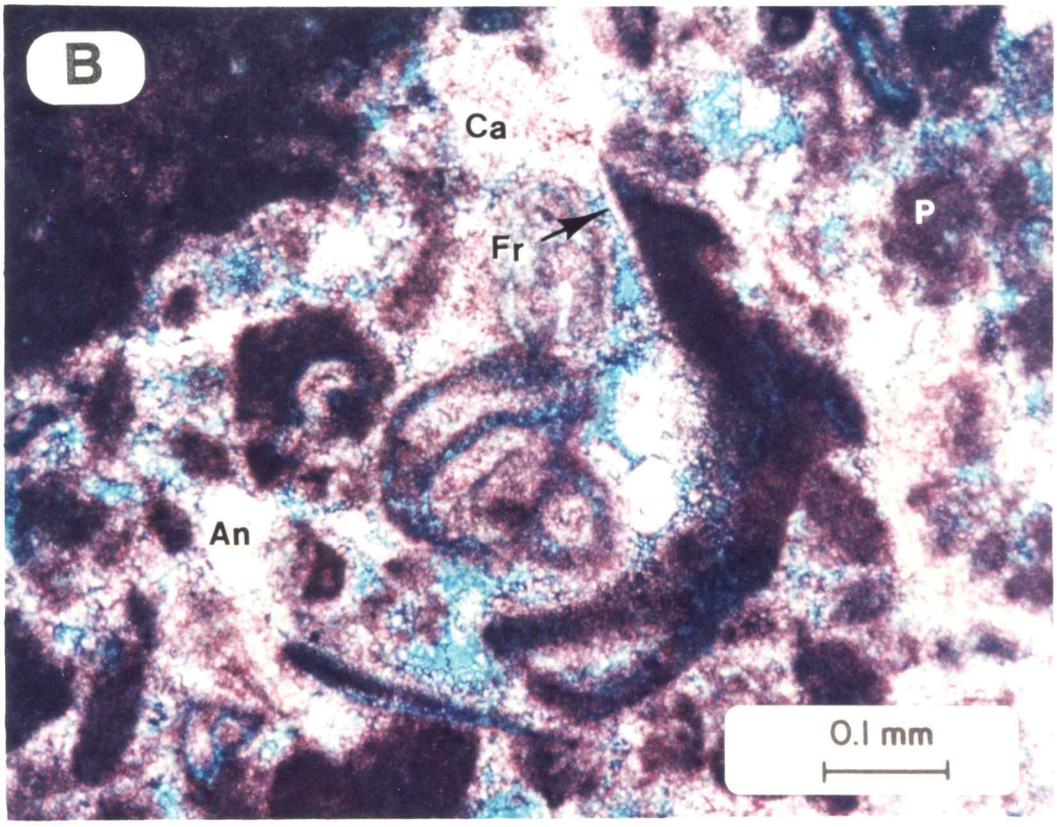

B
Ca
Fr
P
An
0.1 mm

PLATE 46

WHOLE THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2935-36 Feet

Lithology: Silty Limestone
Texture: Packstone
Facies: Shoal

Porosity: 11.4%
Permeability: 0.16 md
Grain Density: 2.72 g/cc

The irregular, white-colored layers in this silty packstone have a higher percentage of quartz silt and dolomite cement/replacement. Intergranular pores are well-developed in the silty lenses The irregular shape is probably a result of soft sediment deformation and/or bioturbation. The limestone is composed of highly abraded skeletal debris. The small white grains/crystals scattered throughout are approximately 50% quartz silt and 50% dolomite rhombs. The space between the black bars equals 1.0 mm.

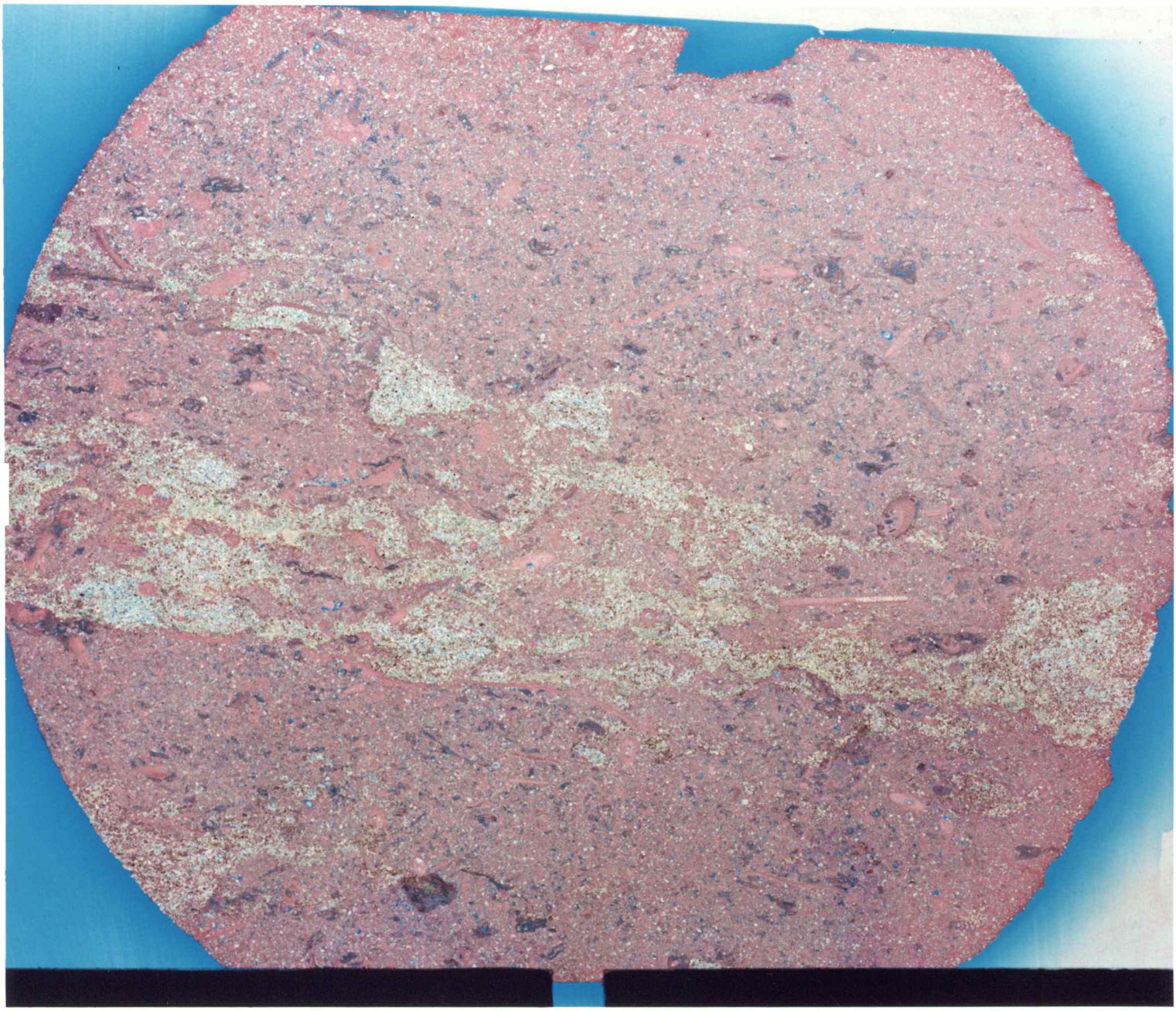


PLATE 47

THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2935-36 Feet

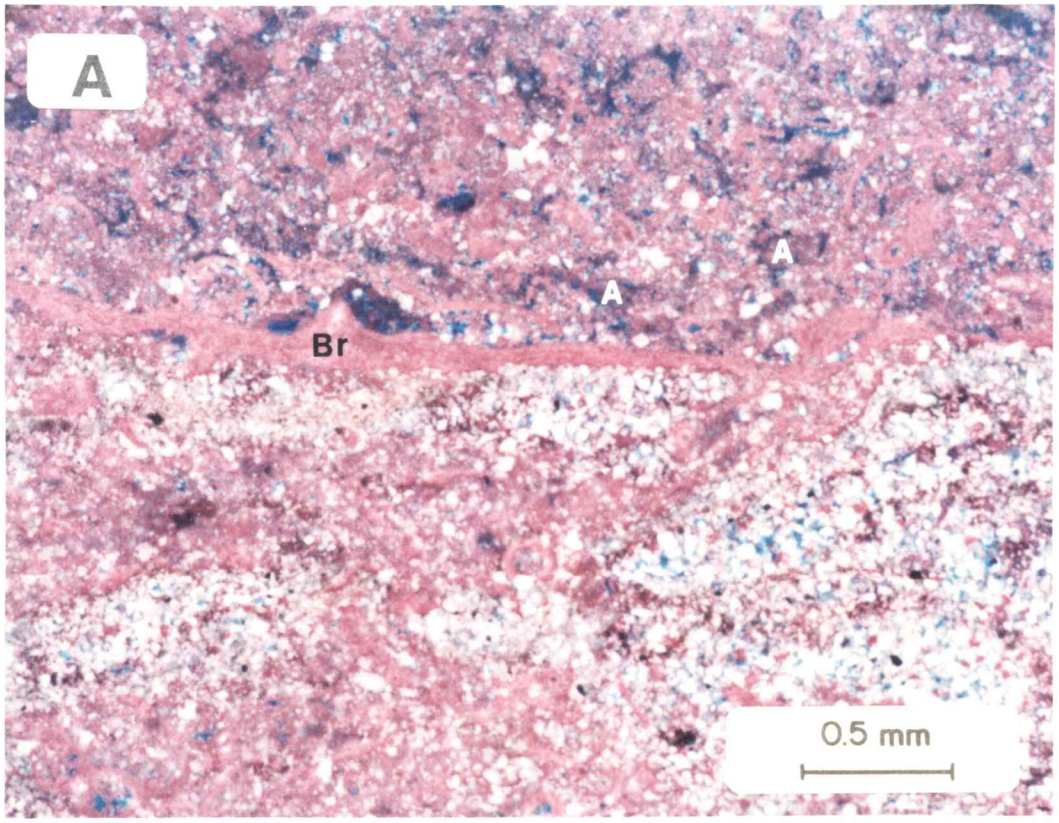
Lithology: Silty Limestone
Texture: Packstone
Facies: Shoal

Porosity: 11.4%
Permeability: 0.16 md
Grain Density: 2.72 g/cc

The framework grains in this silty packstone consist of abraded brachiopods (Br), bryozoans, algal clasts (A), ostracodes, crinoids and oncoids. The quartz silt is segregated into discrete, horizontally elongated pods. Small intergranular (Ig) pores are fairly well-developed in the silty pods. Intraparticle and intercrystalline (Ic) pores are poorly developed in the limestone. Calcite is the principal cement, with trace amounts of dolomite (D).

A - 40X

B - 160X


A
A
A
Br
0.5 mm

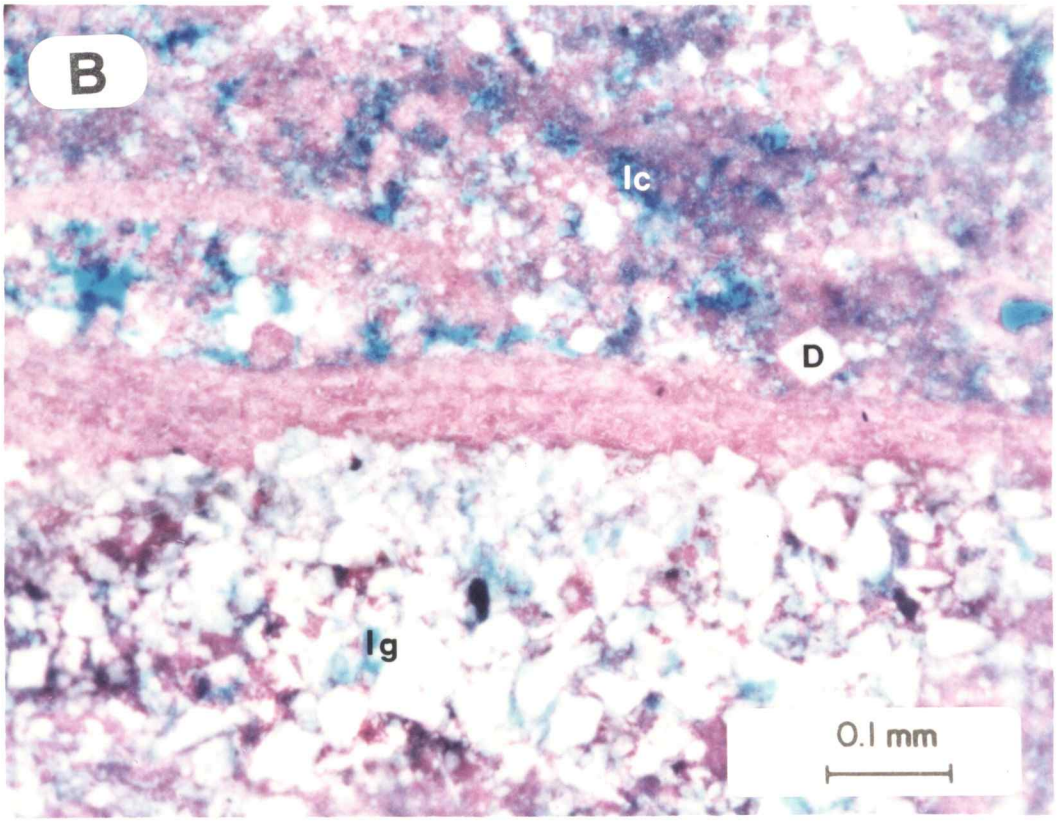

B
Ic
D
Ig
0.1 mm

PLATE 48

WHOLE THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2949-50 Feet

Lithology: Limestone
Texture: Grainstone
Facies: Shoal

Porosity: 10.2%
Permeability: 1.29 md
Grain Density: 2.71 g/cc

This poorly sorted skeletal grainstone displays a wide range of clast size. Peloids, forams and oncoids are present, along with wackestone intraclasts. Note the preferential dissolution of unstable algal grains and pelecypod shells creating biomoldic pores. The white patches are gypsum.

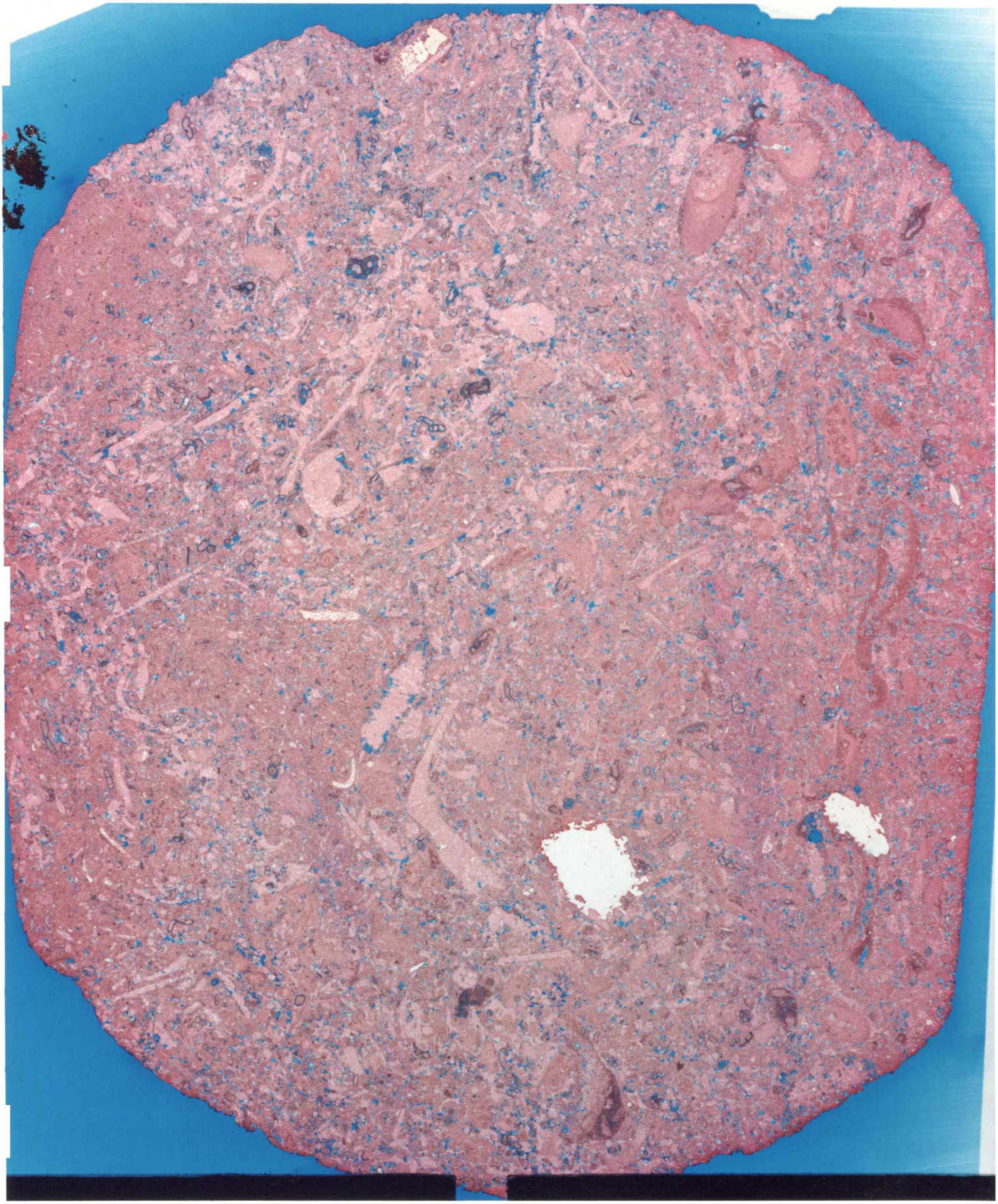


PLATE 49

THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2949-50 Feet

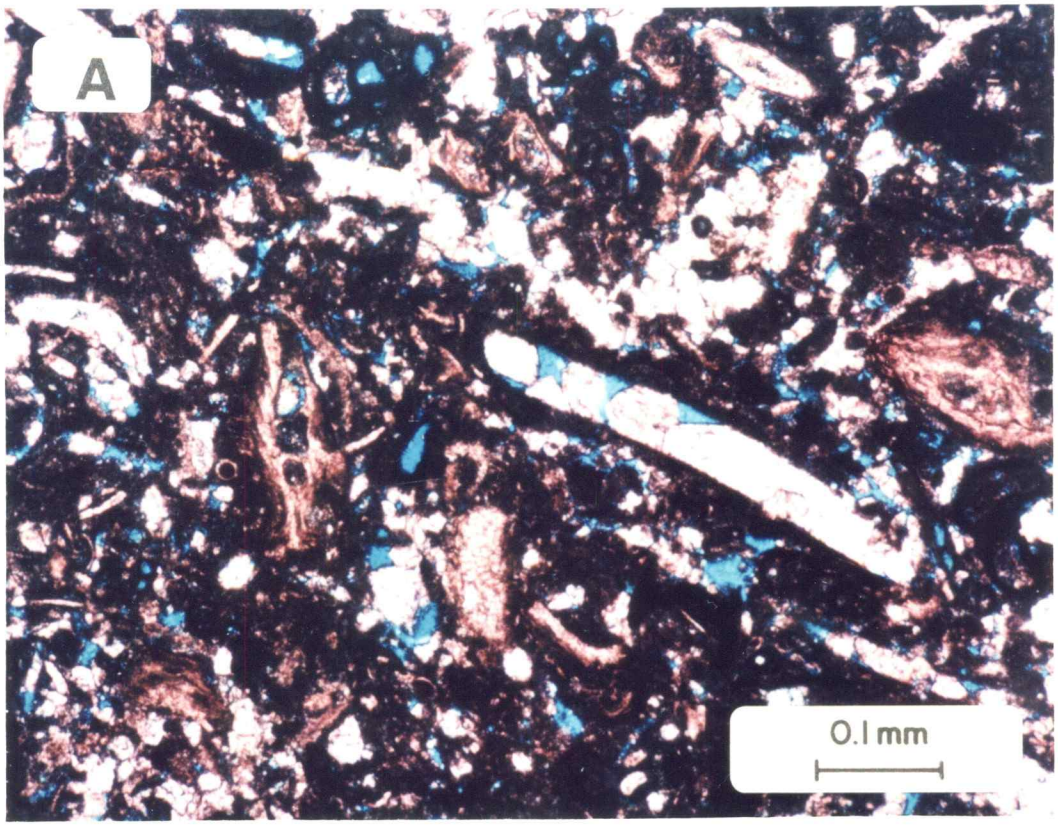
Lithology: Limestone
Texture: Grainstone
Facies: Shoal

Porosity: 10.2%
Permeability: 1.29 md
Grain Density: 2.71 g/cc

The pore system in this skeletal grainstone is composed of moldic (M) pores, intergranular (Ig) pores, and occasional intraparticle pores. Equant calcite cement partially fills pore space. Small patches of anhydrite crystals also replace the limestone. Framework grains include: bryozoans, bivalves, oncoids, algal grains and occasional wackestone intraclasts.

A - 40X

B - 160X


A
0.1 mm

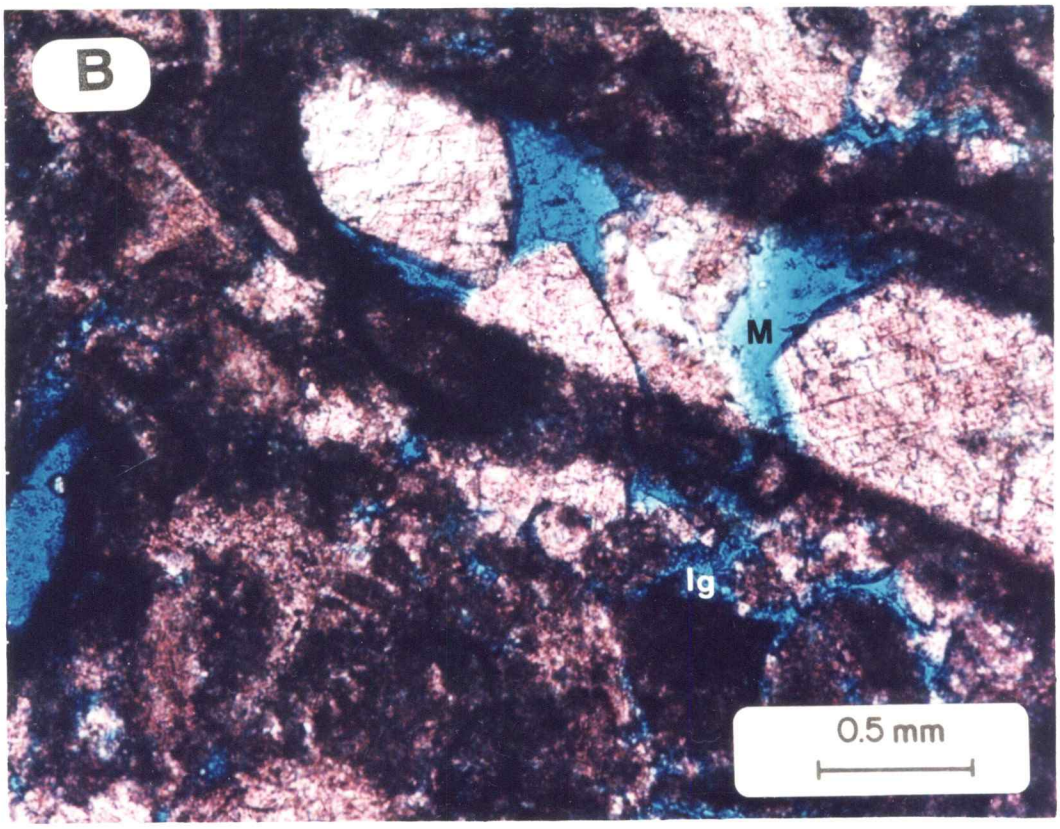

B
M
Ig
0.5 mm

PLATE 50

WHOLE THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2958-59 Feet

Lithology: Limestone
Texture: Grainstone
Facies: Shoal

Porosity: 21.9%
Permeability: 122 md
Grain Density: 2.71 g/cc

Note the fairly open grain packing in this peloid-oncoid grainstone. Open intergranular pores and lesser amounts of biomoldic pores account for most of the pore volume. Small white "dots" are scattered dolomite crystals. White patches in the center of some grains are chert replacement. The space between the black bars equals 1.0 mm.

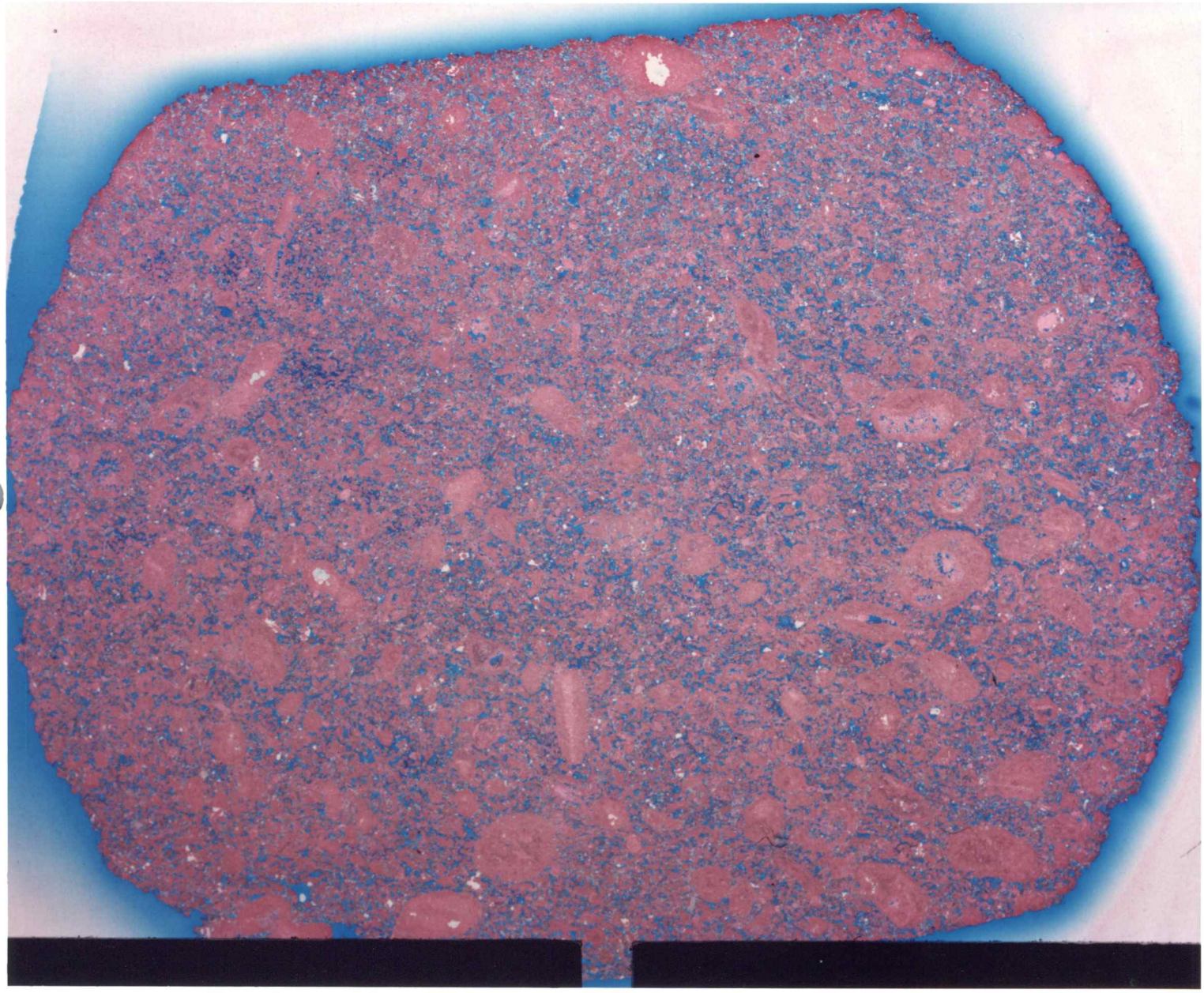


PLATE 51

THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2958-59 Feet

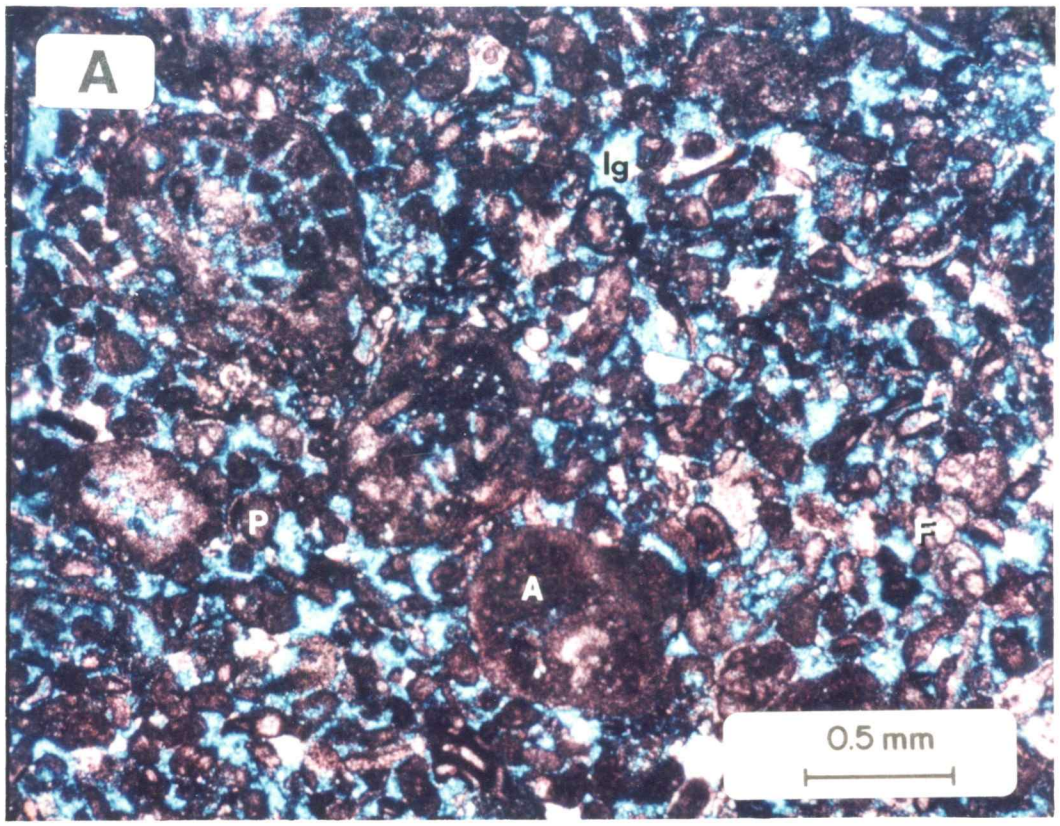
Lithology: Limestone
Texture: Grainstone
Facies: Shoal

Porosity: 21.9%
Permeability: 122 md
Grain Density: 2.71 g/cc

This oncoid-peloid grainstone has one of the higher permeability values of the sampled core due to the open grain packing and the paucity of cement in the intergranular (Ig) and moldic (M) pores. Pore space is occasionally rimmed by very fine calcite crystals. Framework grains include: peloids (P), algal grains (A), forams and oncoids.

A - 40X

B - 160X


A
lg
P
A
F
0.5 mm

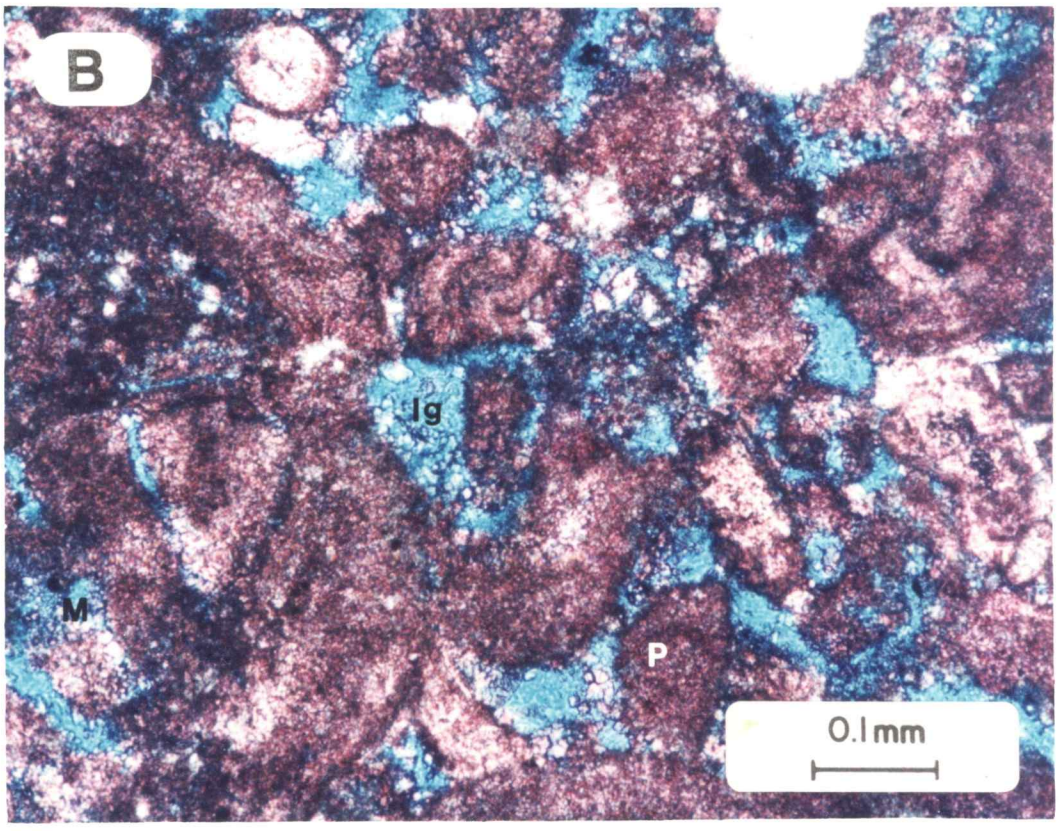

B
lg
M
P
0.1 mm

PLATE 52

WHOLE THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2964-65 Feet

Lithology: Dolomitic Limestone
Texture: Grainstone
Facies: Shoal

Porosity: 8.4%
Permeability: 1.60 md
Grain Density: 2.81 g/cc

The dominant framework grains in this dolomitic grainstone are peloids, skeletal grains, oncoids, and algal grains (purplish grains). Larger white areas are replacive anhydrite laths while the small white crystals are dolomite rhombs. Moldic, intergranular and intraparticle pores are preserved in parts of this sample.

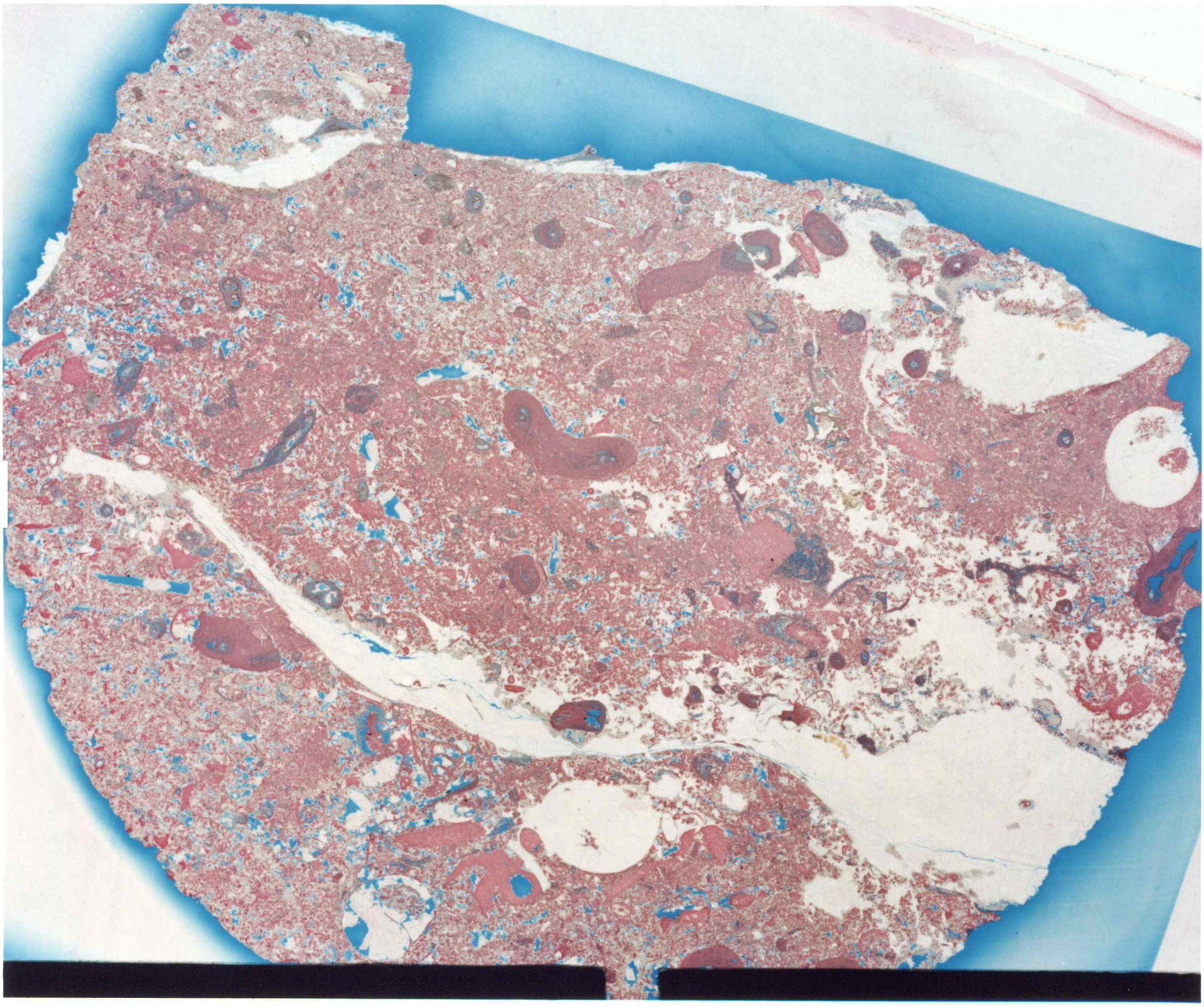


PLATE 53

THIN SECTION PHOTOMICROGRAPHS

Pioneer Natural Resources
Stuart 3-34R Well
Grant County, Kansas

Core Sample Depth: 2964-65 Feet

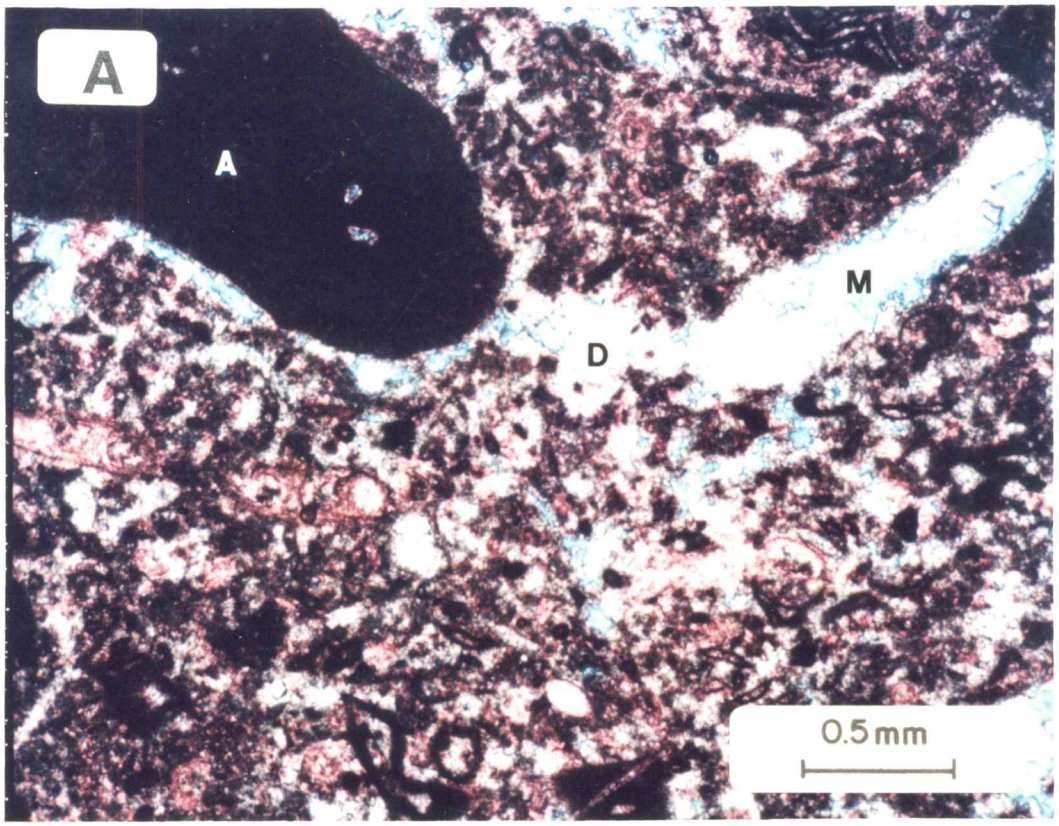
Lithology: Dolomitic Limestone
Texture: Grainstone
Facies: Shoal

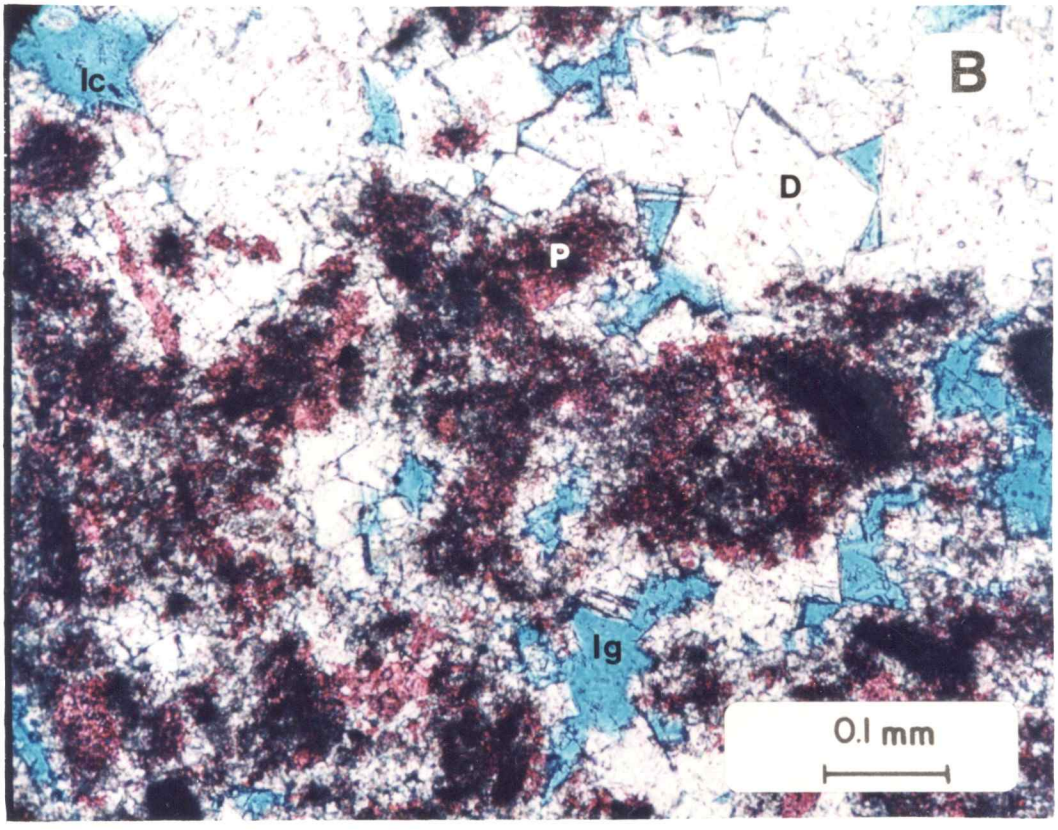
Porosity: 8.4%
Permeability: 1.60 md
Grain Density: 2.81 g/cc

This very dolomitic limestone is composed of peloids (P), algal grains (A) (tubiphtes?), ostracodes, gastropods, forams, crinoids and bivalves. Creation of biomoldic (M) and vuggy pores was followed by partial cementation/replacement by saddle dolomite (D) and anhydrite. Anhydrite replaces approximately 20% of the sample; this, combined with dolomite replacement/cementation, results in a higher grain density measurement. Moldic pores, intergranular pores (Ig) and intercrystalline (Ic) pores are noted. Saddle dolomite is interpreted to be a deep burial cement as opposed to the smaller, disseminated dolomite crystals that are interpreted to be early diagenetic alteration.

A - 40X

B - 160X


A
A
M
D
0.5 mm


Ic
B
D
P
Ig
0.1 mm