

CORE ANALYSIS REPORT
FOR
PENNZOIL PRODUCTS COMPANY
L. S. HOYT NO. 100 WELL
WETZEL COUNTY, WEST VIRGINIA

103-1685

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PETROLEUM SERVICES

November 10, 1995

PENNZOIL PRODUCTS COMPANY

P. O. Box 5519

Vienna, West Virginia 26105-5519

Attention: Mr. Bill Toomey

Re: Core Analysis Final Report
L. S. Hoyt No. 100 Well
Wetzel County, West Virginia
CL File: 57182-13832

Dear Mr. Toomey:

A core taken from the subject well in the Gordon Sand Formation was received at the Oklahoma City laboratory for analytical testing described on the Procedure page.

The accompanying coregraph presents the binomially averaged core analysis data in graphical form to aid correlation with the downhole electrical surveys.

Tabular presentation of the measured physical properties can be found on pages FINAL REPORT 1-1 and 1-2.

Data summaries and permeability versus porosity cross-plots are included.

It is a pleasure to have this opportunity of serving you. Should you have questions regarding these data call (405)946-5422.

Very truly yours,

CORE LABORATORIES, INC.

Lynn Antwine
Senior Laboratory Supervisor

CORE LABORATORIES

Company : PENNZOIL PRODUCTS COMPANY
Well : L. S. HOYT NO. 100 WELL

Field :
Formation : GORDON SAND

File No.: 57182-13832
Date : 9-NOV-1995

ANALYTICAL PROCEDURES AND QUALITY ASSURANCE

HANDLING & CLEANING

Core Transportation : Delivered (Motor Freight)
Solvent : Toluene
Extraction Equipment : Dean Stark Apparatus
Extraction Time : 48 Hours
Drying Equipment : Convection Oven
Drying Time : 24 Hours
Drying Temperature : 240 Deg.F.

ANALYSIS

Grain volume measured by Boyle's Law in a matrix cup using He
Bulk volume by Archimedes Principle
Water saturations by Dean Stark
Oil saturations by weight difference in Dean Stark
Permeabilities measured on 1 in. diameter drilled plugs
Core Gamma Composite
Dean Stark grain densities clean, dry solid mineral phase are measured

REMARKS

A Surface Core Gamma-Log was recorded to aid correlation with downhole electrical surveys.
The core was slabbed for future geological study. The core slabs were photographed under both natural light and ultra violet light for future reference.
Horizontal and vertical permeabilities were measured in Core Labs CMS 300 and both Kair and Klinkenberg corrected values are reported.
The slabs were sent to Core Laboratories' Advanced Technology Center in Carrollton, Texas for PDPK measurements.
Samples 10 & 16 were sent to Brian Stevens in Carrollton for advanced rock property measurements.
The PDPK data and billing will be sent from the ATC under separate cover.
The majority of the core has been preserved in Saran-Foil-CoreSeal™ for long term preservation.
The core and slabs will be returned via motor freight to Pennzoil in Vienna, West Virginia to the attention of Mr. Bill Toomey.

CORE LABORATORIES

Company : PENNZOIL PRODUCTS COMPANY
 Well : L. S. HOYT NO. 100 WELL
 Location :
 Co,State : WETZEL COUNTY, WEST VIRGINIA

Field :
 Formation : GORDON SAND
 Coring Fluid : WATER BASE MUD
 Elevation :

File No. : 57182-13832
 Date : 9-NOV-1995
 API No. : 47-103-1685
 Analysts: SB/LA

CORE ANALYSIS RESULTS (HYDROSTATIC CONFINEMENT)

SAMPLE NUMBER	DEPTH INTERVAL ft	NET OVERBURDEN (800 psi)				POROSITY (Boyle's Law) (Helium) %	SATURATION		GRAIN DENSITY (Measured) gm/cc	DESCRIPTION
		K _o md	K _{air} md	K _{o(v)} md	K _{air(v)} md		(Pore Volume) (Oil) %	(Water) (Water) %		
DEAN STARK PLUG ANALYSIS										
GORDON SAND FORMATION										
3130.0 - 3137.0 - No Analysis - Sh dk gry										
1	3137.0- 37.1	0.007	0.016			6.6	0.0	65.5	2.73	Sst lt gry v f gr Sh lam slily calc
1V	3137.0- 37.1			<.001	<.001	6.1	0.0	76.3	2.71	
2	3137.1- 37.9	0.009	0.019			4.4	7.1	58.8	2.67	Sst lt gry v f gr slily calc
2V	3137.1- 37.9			0.011	0.013	4.2	6.8	64.5	2.66	
3	3137.9- 38.8	0.038	0.063			4.5	44.7	30.0	2.65	Cgl lt gry gr/pbl size sdy slily calc
3V	3137.9- 38.8			0.023	0.039	5.2	35.4	42.8	2.65	
4	3138.8- 39.9	3.39	3.95			12.7	32.0	27.3	2.66	Sst lt gry v f gr slily calc tr cgl
4V	3138.8- 39.1			2.62	3.19	13.1	34.5	29.4	2.66	
3139.9 - 3140.1 - No Analysis - Sh dk gry										
5	3140.1- 41.0	0.688	0.855			11.6	40.1	30.9	2.66	Sst lt gry v f gr tr cgl
5V	3140.1- 41.0			0.298	0.451	12.0	36.7	34.0	2.66	
6	3141.0- 41.8	0.034	0.068			7.5	48.9	33.2	2.66	Sst lt gry v f gr
6V	3141.0- 41.8			0.026	0.054	7.6	48.6	32.8	2.66	

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CORE ANALYSIS RESULTS (HYDROSTATIC CONFINEMENT)

SAMPLE NUMBER	DEPTH INTERVAL ft	NET OVERBURDEN (800 psi)				POROSITY (Boyle's Law) (Helium) %	SATURATION		GRAIN DENSITY (Measured) gm/cc	DESCRIPTION
		K _o md	K _{air} md	K _{o(v)} md	K _{air(v)} md		(Pore Volume) (Oil) %	(Water) %		
3141.8 - 3142.0 - No Analysis - Sh dk gry										
7	3142.0- 43.0	4.37	5.03			12.0	39.3	28.6	2.67	Sst lt gry v f gr slily cgl
7V	3142.0- 43.0			7.90	9.10	14.5	25.5	34.4	2.66	
8	3143.0- 44.0	169.	176.			24.5	20.3	43.1	2.68	Sst lt gry v f gr
8V	3143.0- 44.0			141.	148.	24.8	19.5	44.7	2.67	
9	3144.0- 45.0	213.	221.			25.0	17.7	44.5	2.67	Sst lt gr v f gr
9V	3144.0- 45.0			184.	190.	25.4	22.2	41.8	2.67	
10	3145.0- 46.0	252.	258.			26.4	19.7	43.8	2.67	Sst lt gry v f gr
10V	3145.0- 46.0			141.	148.	25.0	20.6	44.4	2.67	
11	3146.0- 47.0	216.	223.			26.3	22.3	42.6	2.67	Sst lt gry v f gr slily calc
11V	3146.0- 47.0			178.	185.	26.1	24.8	40.4	2.67	
12	3147.0- 48.0	178.	186.			25.6	21.0	41.3	2.68	Sst lt gry v f gr
12V	3147.0- 48.0			136.	142.	25.5	22.7	40.8	2.67	
13	3148.0- 49.0	242.	248.			26.3	25.6	40.4	2.67	Sst lt gr v f gr slily calc
13V	3148.0- 49.0			181.	188.	25.8	25.1	40.1	2.67	
14	3149.0- 50.0	0.801	1.03			8.9	32.6	40.4	2.70	Sst lt gry v f gr Sid Nod
14V	3149.0- 50.0			46.1	49.3	19.2	38.0	27.9	2.66	
15	3150.0- 51.0	177.	185.			25.8	23.6	44.8	2.67	Sst lt gry v f gr
15V	3150.0- 51.0			137.	144.	25.6	23.7	42.1	2.67	
16	3151.0- 52.0	121.	128.			24.0	18.3	45.7	2.67	Sst lt gry v f gr slily calc
16V	3151.0- 52.0			71.7	76.4	23.3	20.1	43.2	2.67	
17	3152.0- 52.3	0.016	0.024			5.8	30.2	30.7	2.67	Sst lt gry v f gr
17V	3152.0- 52.3			0.006	0.015	4.7	18.1	51.1	2.71	
3152.3 - 3159.0 - No Analysis - Sh dk gry occ dns sdy zones										

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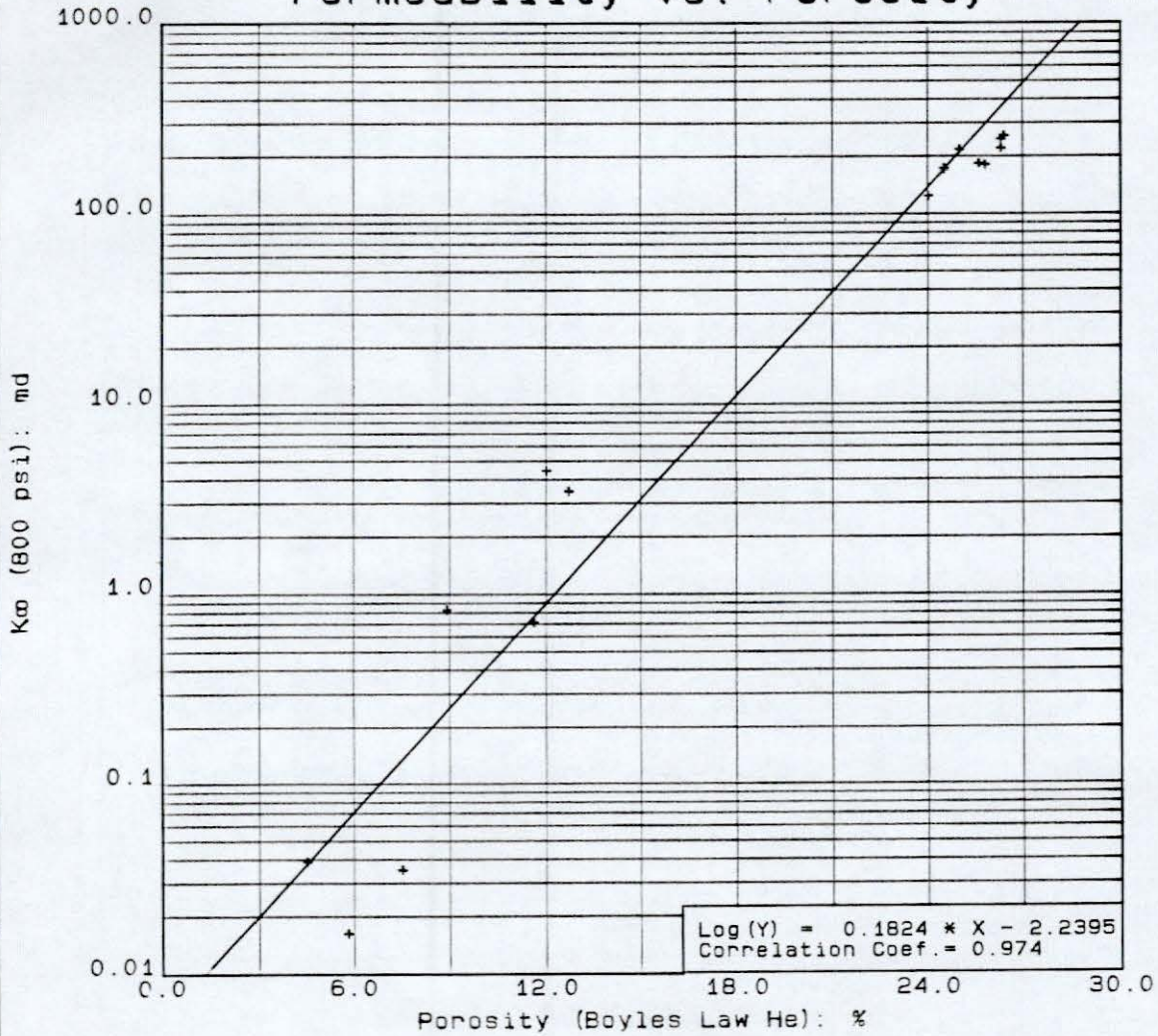
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TABLE I

SUMMARY OF CORE DATA

ZONE AND CUTOFF DATA	CHARACTERISTICS REMAINING AFTER CUTOFFS	
ZONE:	ZONE:	PERMEABILITY:
Identification ----- NOT SPECIFIED	Number of Samples ----- 17	Flow Capacity ----- 1576.9 md-ft
Top Depth ----- 3134.0 ft	Thickness Represented - 14.9 ft	Arithmetic Average ---- 106. md
Bottom Depth ----- 3152.3 ft		Geometric Average ----- 9.25 md
Number of Samples ----- 34	POROSITY:	Harmonic Average ----- 0.086 md
	Storage Capacity ----- 265.2 ϕ -ft	Minimum ----- 0.007 md
DATA TYPE:	Arithmetic Average ---- 17.8 %	Maximum ----- 252. md
Porosity ----- (Boyle's Law) (Helium)	Minimum ----- 4.4 %	Median ----- 4.37 md
Permeability ----- K_w (800 psi)	Maximum ----- 26.4 %	Standard Dev. (Geom) -- $K \cdot 10^{\pm 1.847}$ md
	Median ----- 12.7 %	
CUTOFFS:	Standard Deviation ---- ± 9.3 %	HETEROGENEITY (Permeability):
Porosity (Minimum) ----- 0.0 %		Dykstra-Parsons Var. -- 0.998
Porosity (Maximum) ----- 100.0 %	GRAIN DENSITY:	Lorenz Coefficient ---- 0.332
Permeability (Minimum) --- 0.0000 md	Arithmetic Average ---- 2.67 gm/cc	
Permeability (Maximum) --- 100000. md	Minimum ----- 2.65 gm/cc	AVERAGE SATURATIONS (Pore Volume):
Water Saturation (Maximum) 100.0 %	Maximum ----- 2.73 gm/cc	Oil ----- 24.5 %
Oil Saturation (Minimum) - 0.0 %	Median ----- 2.67 gm/cc	Water ----- 40.9 %
Grain Density (Minimum) -- 2.00 gm/cc	Standard Deviation ---- ± 0.02 gm/cc	
Grain Density (Maximum) -- 3.00 gm/cc		
Lithology Excluded ----- NONE		

Permeability vs. Porosity



<p>PENNZOIL PRODUCTS COMPANY L. S. HOYT NO. 100 WELL WETZEL COUNTY, WEST VIRGINIA GORDON SANDSTONE (3130-3159 feet) Core Laboratories</p>	<p>- LEGEND - GORDON SAND</p>
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CORRELATION COREGRAPH

PENNZOIL PRODUCTS COMPANY

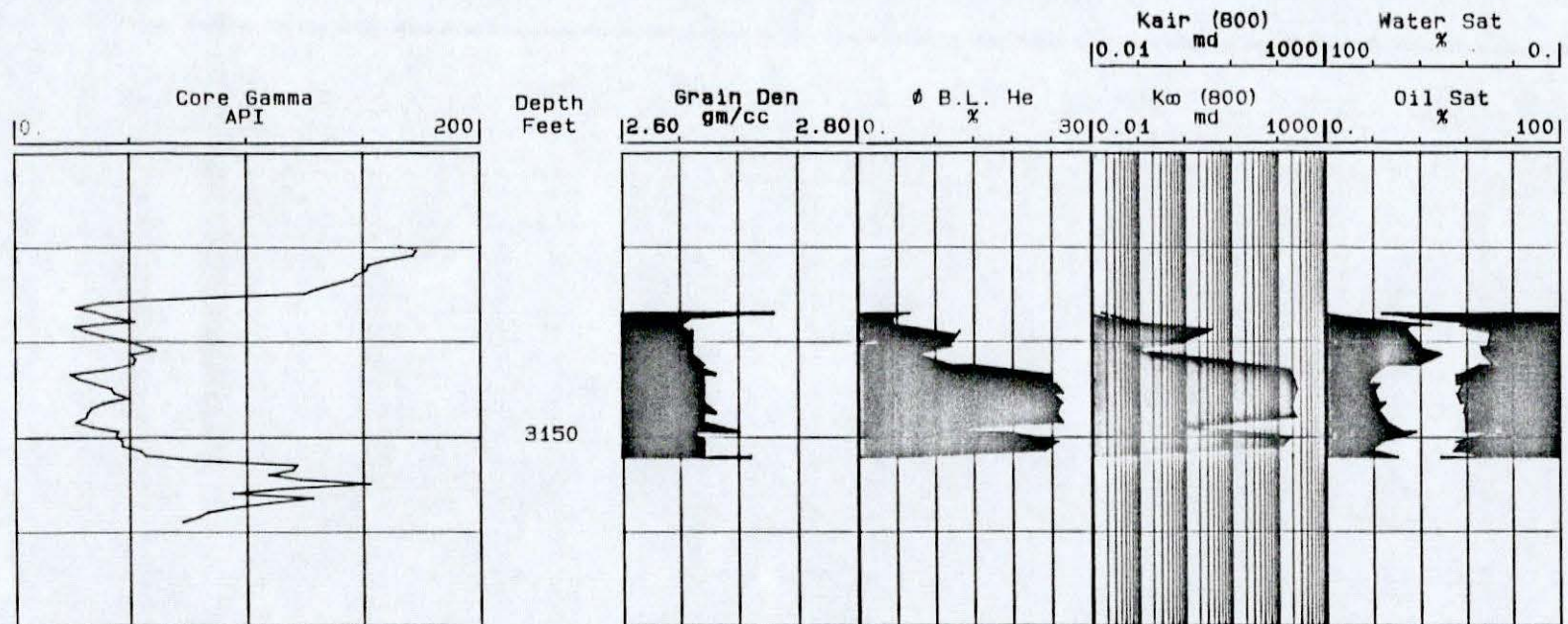
L. S. HOYT NO. 100 WELL

WETZEL COUNTY, WEST VIRGINIA

GORDON SANDSTONE (3130-3159 feet)

Core Laboratories

Vertical Scale
5.00 in = 100.0 ft



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Field :
 Formation : GORDON SAND

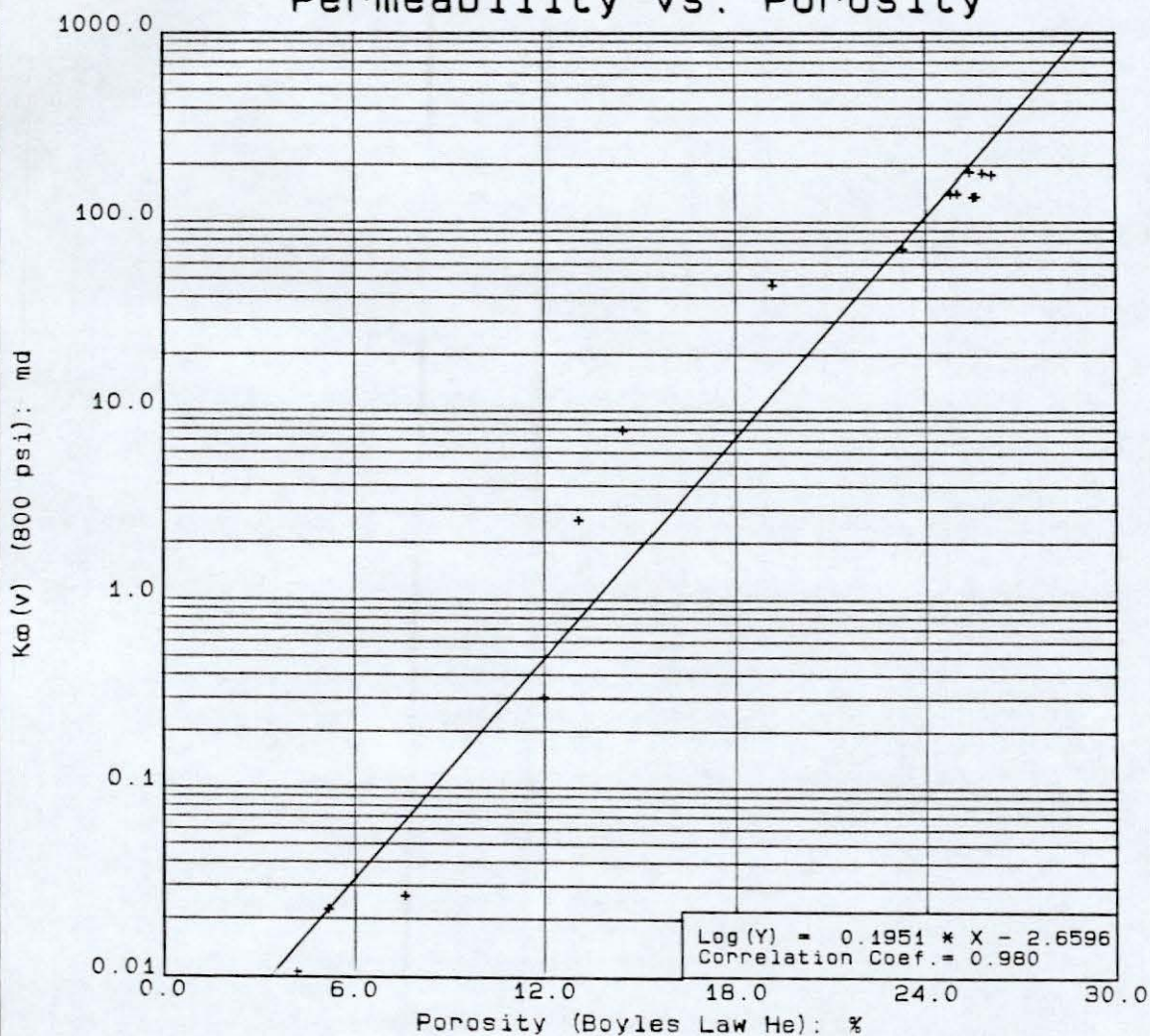
File No.: 57182-13832
 Date : 9-NOV-1995

TABLE I

SUMMARY OF CORE DATA

ZONE AND CUTOFF DATA	CHARACTERISTICS REMAINING AFTER CUTOFFS	
<p>ZONE: Identification ----- GORDON SAND Top Depth ----- 3130.0 ft Bottom Depth ----- 3159.0 ft Number of Samples ----- 17</p> <p>DATA TYPE: Porosity ----- (Boyle's Law) (Helium) Permeability ----- $K_v(v)$ (800 psi)</p> <p>CUTOFFS: Porosity (Minimum) ----- 0.0 % Porosity (Maximum) ----- 100.0 % Permeability (Minimum) --- 0.0100 md Permeability (Maximum) --- 100000. md Water Saturation (Maximum) 100.0 % Oil Saturation (Minimum) - 0.0 % Grain Density (Minimum) -- 2.00 gm/cc Grain Density (Maximum) -- 3.00 gm/cc Lithology Excluded ----- NONE</p>	<p>ZONE: Number of Samples ----- 15 Thickness Represented - 13.7 ft</p> <p>POROSITY: Storage Capacity ----- 264.0 ϕ-ft Arithmetic Average ---- 19.3 % Minimum ----- 4.2 % Maximum ----- 26.1 % Median ----- 23.3 % Standard Deviation ---- ± 8.3 %</p> <p>GRAIN DENSITY: Arithmetic Average ---- 2.67 gm/cc Minimum ----- 2.65 gm/cc Maximum ----- 2.67 gm/cc Median ----- 2.67 gm/cc Standard Deviation ---- ± 0.01 gm/cc</p>	<p>PERMEABILITY: Flow Capacity ----- 1224.0 md-ft Arithmetic Average ---- 89.3 md Geometric Average ---- 12.6 md Harmonic Average ----- 0.092 md Minimum ----- 0.011 md Maximum ----- 184. md Median ----- 71.7 md Standard Dev. (Geom) -- $K \cdot 10^{\pm 1.616}$ md</p> <p>HETEROGENEITY (Permeability): Dykstra-Parsons Var. -- 0.686 Lorenz Coefficient ---- 0.307</p> <p>AVERAGE SATURATIONS (Pore Volume): Oil ----- 25.1 % Water ----- 40.2 %</p>

Permeability vs. Porosity



<p style="text-align: center;">PENNZOIL PRODUCTS COMPANY L. S. HOYT NO. 100 WELL WETZEL COUNTY, WEST VIRGINIA</p> <p style="text-align: center;">GORDON SANDSTONE (3130-3159 feet)</p> <p style="text-align: center;">Core Laboratories</p>	<p style="text-align: center;">- LEGEND - GORDON SAND</p>
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CORRELATION COREGRAPH

PENNZOIL PRODUCTS COMPANY

L. S. HOYT NO. 100 WELL

WETZEL COUNTY, WEST VIRGINIA

GORDON SANDSTONE (3130-3159 feet)

Core Laboratories

Vertical Scale
5.00 in = 100.0 ft

