

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

CORE ANALYSIS REPORT

FOR

PENNZOIL

R. G. LINN NO. 10 WELL
HENRIETTA FIELD
CALHOUN COUNTY, WEST VIRGINIA

013 2987

CORE LABORATORIES, INC.

P. O. Box 131
Mt. Pleasant, Mich. 48858

Pennzoil Company
P. O. Drawer 1588
Parkersburg, W. Va. 26101

File No: 3602-522
November 8, 1979

Att: Mr. Steven S. Holsclaw

Re: Core Analysis Report
Loyalhanna Big Injun Formation
R. G. Linn No. 10 Well
Henrietta Field
Calhoun Co., W. Wa.

Gentlemen:

A diamond core from this well between the depths of 1990 feet and 2019 feet (depth corrected to equal log depth) has been received in our Michigan laboratory for analysis. In accordance with your instructions the following analyses have been performed:

1. Full diameter analysis of porosity and vertical permeability every foot.
2. Full diameter analysis of horizontal permeability every foot (maximum and 90° to maximum).
3. Conventional plug type analysis of horizontal permeability every foot corresponding with the "maximum" full diameter orientation. Do not run plugs on shale section at end of core.
4. Determination of grain density every foot.
5. Gamma-Correlation log over entire core interval.

Results of these analyses are herein submitted in tabular and graphical form with a graph of the Surface-Gamma log.

In addition to the reports normally submitted you will note histograms with their respective tabular data and an explanation of our histogram usage. This additional data is primarily designed to aid in selecting "net pay cutoff" values of permeability and/or porosity for the reservoir. Your comments and suggestions regarding this additional information are solicited. We will be happy to incorporate such data in subsequent core analysis reports if it is helpful to you.

2.

Pennzoil Company

November 8, 1979

The core from this well is temporarily stored in our laboratory awaiting instructions for its disposition. The 1" O.D. cylindrical plugs utilized in the "plug analysis" are being shipped to your office via U.P.S.

The opportunity to be of service on this well is appreciated and please call if you have any questions.

Very truly yours,

CORE LABORATORIES, INC.



Mabre Maness
District Manager

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encl.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
 DALLAS, TEXAS

PENNZOIL
 R. G. LINN NO. 10 WELL
 HENRIETTA FIELD
 CALHOUN COUNTY, WEST VIRGINIA

DATE: 11-2-79
 FORMATION: LOYALMANNA BIG INJUN
 DRLG. FLUID:
 LOCATION:

FILE NO: 3002-522
 ENGINEER: MCCLURE
 ELEVATION:

* INDICATES PLUG PERM

S INDICATES PRESERVED SAMPLE

SMP. NO.	DEPTH	PERM. TO AIR MD.		POROSITY GEX. FLD.	FLUID SATS.		GR. DEN.	DESCRIPTION
		MAXIMUM	90 DEG VERT.		OIL	WTR.		
FULL DIAMETER ANALYSIS								
2 FEET ADDED TO CORE DEPTHS TO EQUAL E-LOG DEPTHS								
1	1990.0-91.0	0.2	0.2	<0.1	8.5		2.80	SS, LMY, HVY MNRLS
2	1991.0-92.0	0.5	0.2	<0.1	15.9		2.79	SS, SL/LMY, HVY MNRLS
3	1992.0-93.0	0.2	0.2	<0.1	6.6		2.87	SS, SL/LMY, HVY MNRLS
4	1993.0-94.0	0.7	0.5	0.2	11.4		2.87	SS, SL/LMY, HVY MNRLS
5	1994.0-95.0	1.6	1.3	1.4	19.9		2.86	SS, SL/LMY, HVY MNRLS
6	1995.0-96.0	2.6	2.4	1.8	21.5		2.82	SS, SL/LMY, HVY MNRLS
7	1996.0-97.0	3.8	3.6	3.1	23.2		2.82	SS, SL/LMY, HVY MNRLS
8	1997.0-98.0	4.3	3.2	4.2	24.4		2.80	SS, SL/LMY, HVY MNRLS
9	1998.0-99.0	→ 15.0	15.0	6.1	28.9		2.78	SS, SL/LMY, HVY MNRLS
10	1999.0-00.0	7.1	6.5	2.9	23.7		2.76	SS, SL/LMY, HVY MNRLS
11	2000.0-01.0	3.5	3.2	1.9	25.8		2.79	SS, SL/LMY, HVY MNRLS
12	2001.0-02.0	1.8	1.8	0.5	22.8		2.79	SS, SL/LMY, HVY MNRLS
13	2002.0-03.0	1.5	1.4	<0.1	22.6		2.82	SS, SL/LMY, HVY MNRLS
14	2003.0-04.0	2.2	2.0	0.5	21.9		2.79	SS, SL/LMY, HVY MNRLS
15	2004.0-05.0	1.8	1.4	0.8	24.6		2.85	SS, SL/LMY, HVY MNRLS
16	2005.0-06.0	3.0	2.7	1.6	26.6		2.84	SS, SL/LMY, HVY MNRLS
17	2006.0-07.0	3.8	3.4	1.3	23.8		2.79	SS, SL/LMY, HVY MNRLS
18	2007.0-08.0	3.7	0.4	1.1	22.7		2.79	SS, SL/LMY, HVY MNRLS
19	2008.0-09.0	7.7	4.4	2.3	25.8		2.83	SS, SL/LMY, HVY MNRLS
20	2009.0-10.0	3.9	3.8	2.3	25.5		2.84	SS, SL/LMY, HVY MNRLS
21	2010.0-11.0	4.4	4.4	3.0	25.6		2.82	SS, SL/LMY, HVY MNRLS
22	2011.0-12.0	7.5	5.9	5.3	27.2		2.82	SS, SL/LMY, HVY MNRLS
23	2012.0-13.0	4.9	4.9	3.2	25.6		2.82	SS, SL/LMY, HVY MNRLS

23.4%

CORE LABORATORIES, INC.
 Petroleum Reservoir Engineering
 DALLAS, TEXAS

PENNZOIL
 R. G. LINN NO. 10 WELL

DATE: 11-2-79
 FORMATION: LOYALHANNA BIG INJUN

FILE NO: 3602-522
 ENGINEER: MCCLURE

SMP. NO.	DEPTH	PERM. MAXIMUM	TO AIR MD. 90 DEG	MD. VERT.	POROSITY GEX. FLD.	FLUID SATS. OIL WTR.	GR. DEN.	DESCRIPTION
24	2013.0-14.0	2.0	1.9	0.7	20.5		2.77	SS/SL/LMY/HVY MNRLS
25	2014.0-15.0	1.0	1.0	0.3	21.7		2.80	SS/SL/LMY/HVY MNRLS
26	2015.0-16.0	1.0	1.0	0.2	20.5		2.82	SS/SL/LMY/HVY MNRLS
	2016.0-2019.0	SHALE - CORE NOT SUBMITTED FOR ANALYSIS						

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

PENNZOIL
R. G. LINN NO. 10 WELL
HENRIETTA FIELD
CALHOUN COUNTY, WEST VIRGINIA

DATE: 11-2-79
FORMATION: LOYALHANNA BIG INJUN
ORLG. FLUID:
LOCATION:

FILE NO: 3602-522
ENGINEER: MCCLURE
ELEVATION:

* INDICATES PLUG PERM

S INDICATES PRESERVED SAMPLE

SMP. NO.	DEPTH	PERM. TO AIR MD. MAXIMUM	90 DEG VERT.	POROSITY GEX. FLD.	FLUID SATS. OIL WTR.	GR. DEN.	DESCRIPTION
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HORIZONTAL PLUG PERMEABILITIES

1	1990.0-91.0	<0.1	8.5
2	1991.0-92.0	0.2	15.9
3	1992.0-93.0	<0.1	6.6
4	1993.0-94.0	0.9	11.4
5	1994.0-95.0	2.2	19.9
6	1995.0-96.0	2.4	21.5
7	1996.0-97.0	4.7	25.2
8	1997.0-98.0	4.3	24.4
9	1998.0-99.0	15.0	28.9
10	1999.0-00.0	5.6	25.7
11	2000.0-01.0	4.7	25.8
12	2001.0-02.0	1.3	22.8
13	2002.0-03.0	0.7	22.6
14	2003.0-04.0	0.7	21.9
15	2004.0-05.0	1.1	24.6
16	2005.0-06.0	2.4	26.6
17	2006.0-07.0	2.3	25.8
18	2007.0-08.0	6.6	22.7
19	2008.0-09.0	3.6	25.8
20	2009.0-10.0	2.8	25.5
21	2010.0-11.0	3.9	25.6
22	2011.0-12.0	4.7	27.2
23	2012.0-13.0	3.9	26.6
24	2013.0-14.0	2.8	20.5
25	2014.0-15.0	1.1	21.7
26	2015.0-16.0	1.5	20.5

PERMEABILITY: MILLIDARCIES

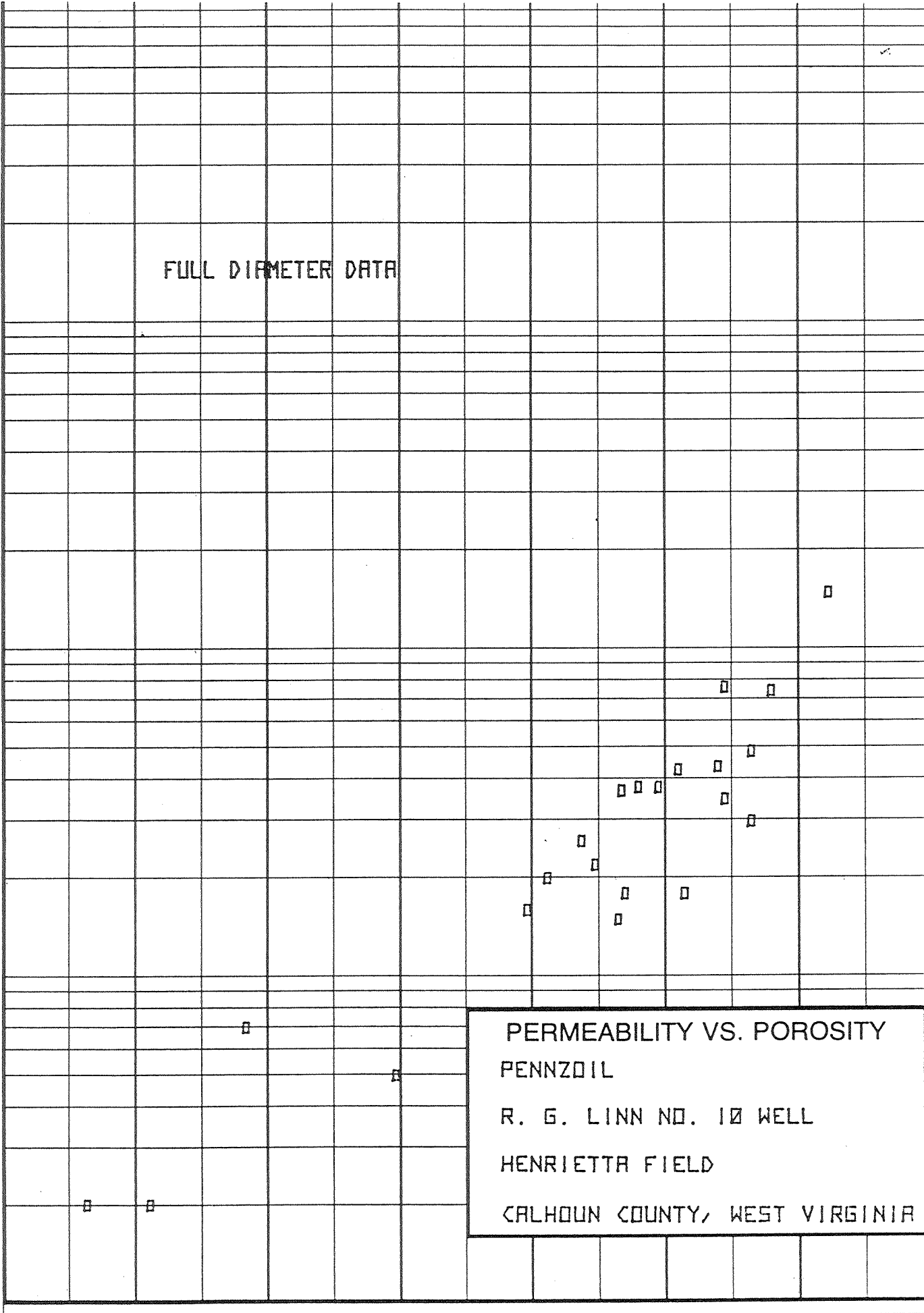
FULL DIAMETER DATA

100
10
1.0
0.10

PERMEABILITY VS. POROSITY
PENNZOIL
R. G. LINN NO. 10 WELL
HENRIETTA FIELD
CALHOUN COUNTY, WEST VIRGINIA

8.0 12.0 16.0 20.0 24.0 28.0

POROSITY: PERCENT



CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
 DALLAS, TEXAS

FULL DIAMETER DATA
 PERMEABILITY VS POROSITY

COMPANY: PENNZOIL
 FIELD : HENRIETTA FIELD

WELL : R. G. LINN NO. 10 WELL
 COUNTY STATE: CALHOUN COUNTY, WEST VIRGINIA

AIR PERMEABILITY : MD -Ka MAX
 POROSITY : PERCENT

(UNCORRECTED FOR SLIPPAGE)
 (GAS EXPANSION)

DEPTH INTERVAL	RANGE & SYMBOL	PERMEABILITY		POROSITY		POROSITY AVERAGE	PERMEABILITY AVERAGES		
		MAXIMUM	MINIMUM	MAX.	MIN.		ARITHMETIC	HARMONIC	GEOMETRIC
1990.0 - 2016.0	1 (0)	100.0	0.10	45.0	0.0	21.6	3.5	1.1	2.1

KA - MAX. (PLUG DATA) VS. FULL DIAMETER POROSITY

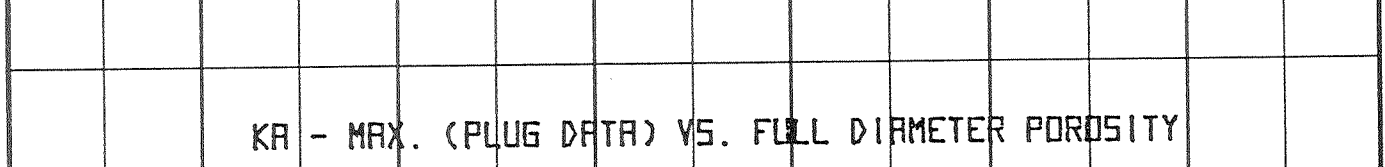
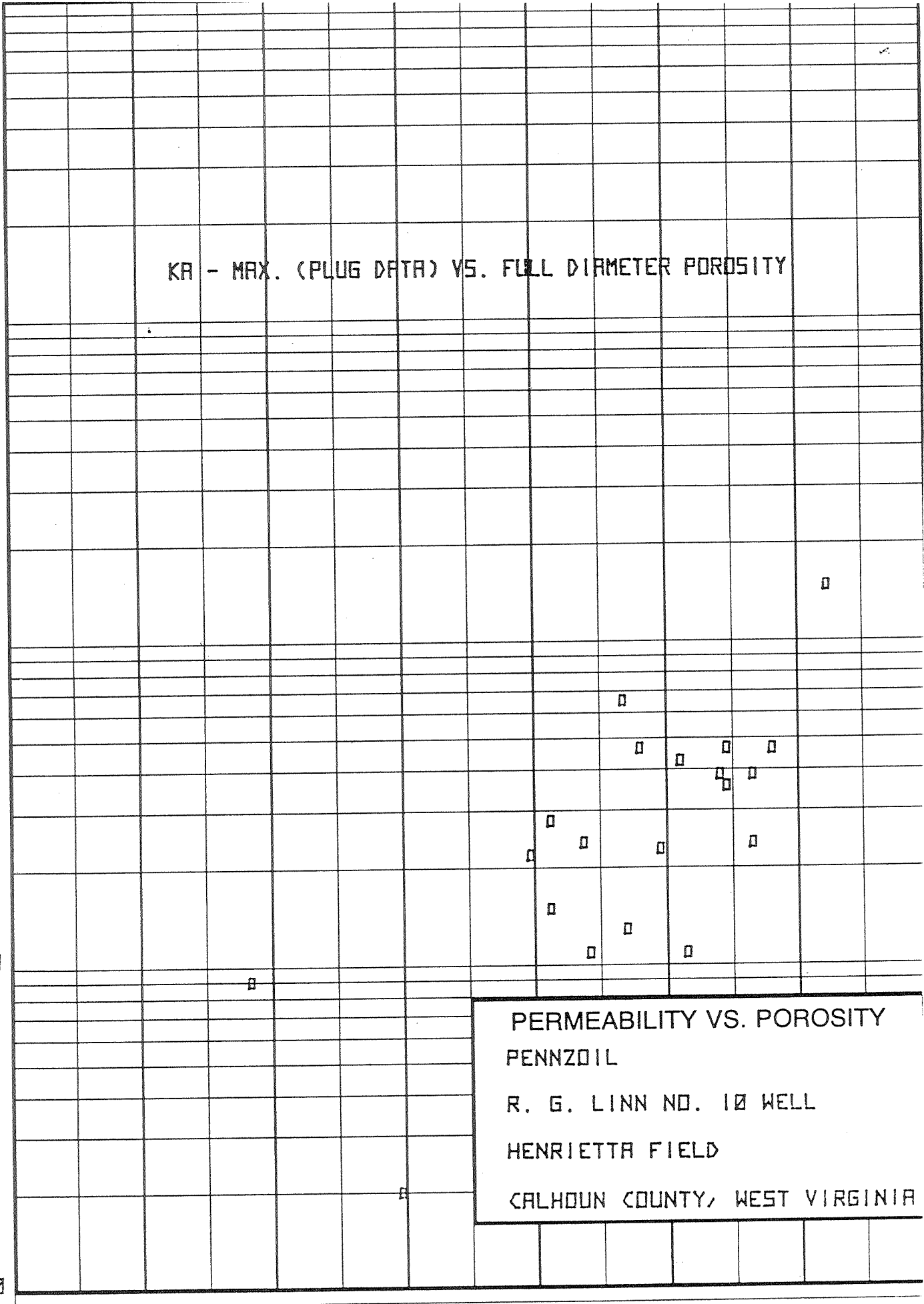
PERMEABILITY: MILLIDARCIES

100
10
1.0
0.10

8.0 12.0 15.0 20.0 24.0 28.0

POROSITY: PERCENT

PERMEABILITY VS. POROSITY
PENNZOIL
R. G. LINN NO. 10 WELL
HENRIETTA FIELD
CALHOUN COUNTY, WEST VIRGINIA



CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
 DALLAS, TEXAS

Ka - MAX (PLUG DATA) W/FULL DIAMETER POROSITY

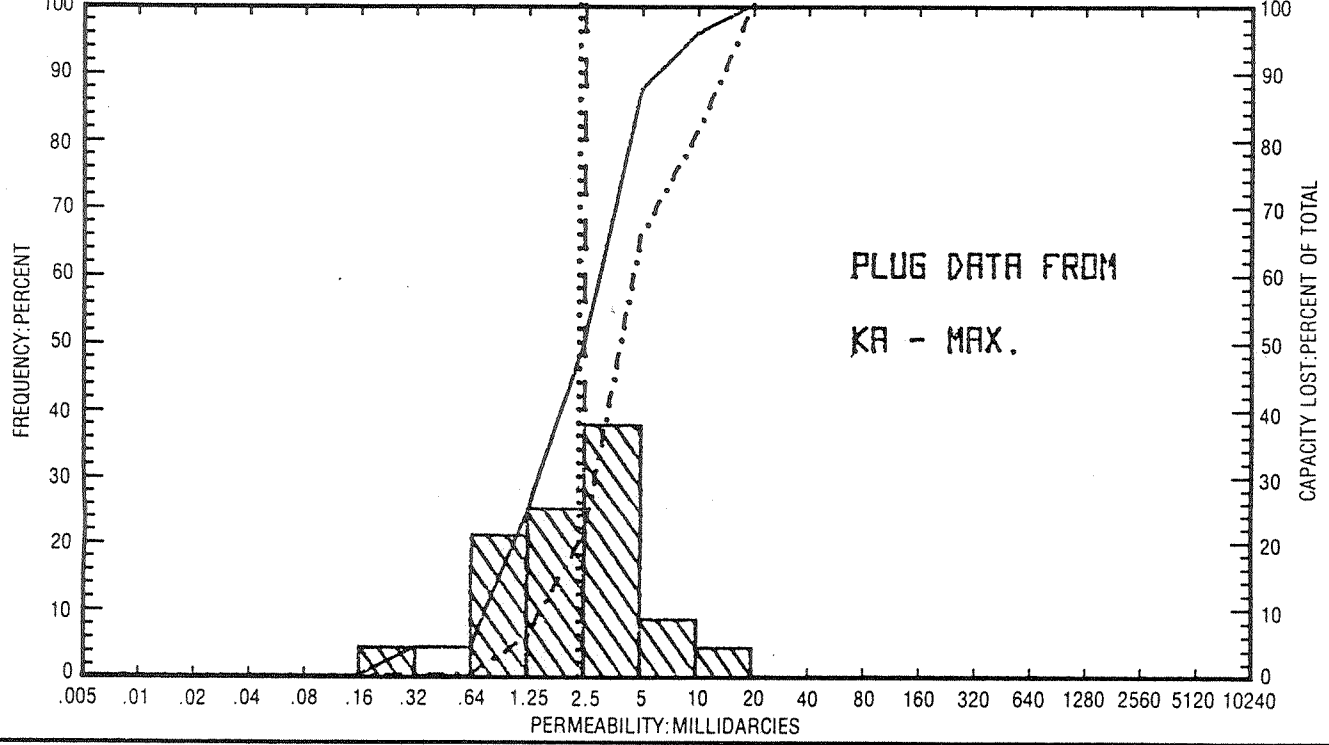
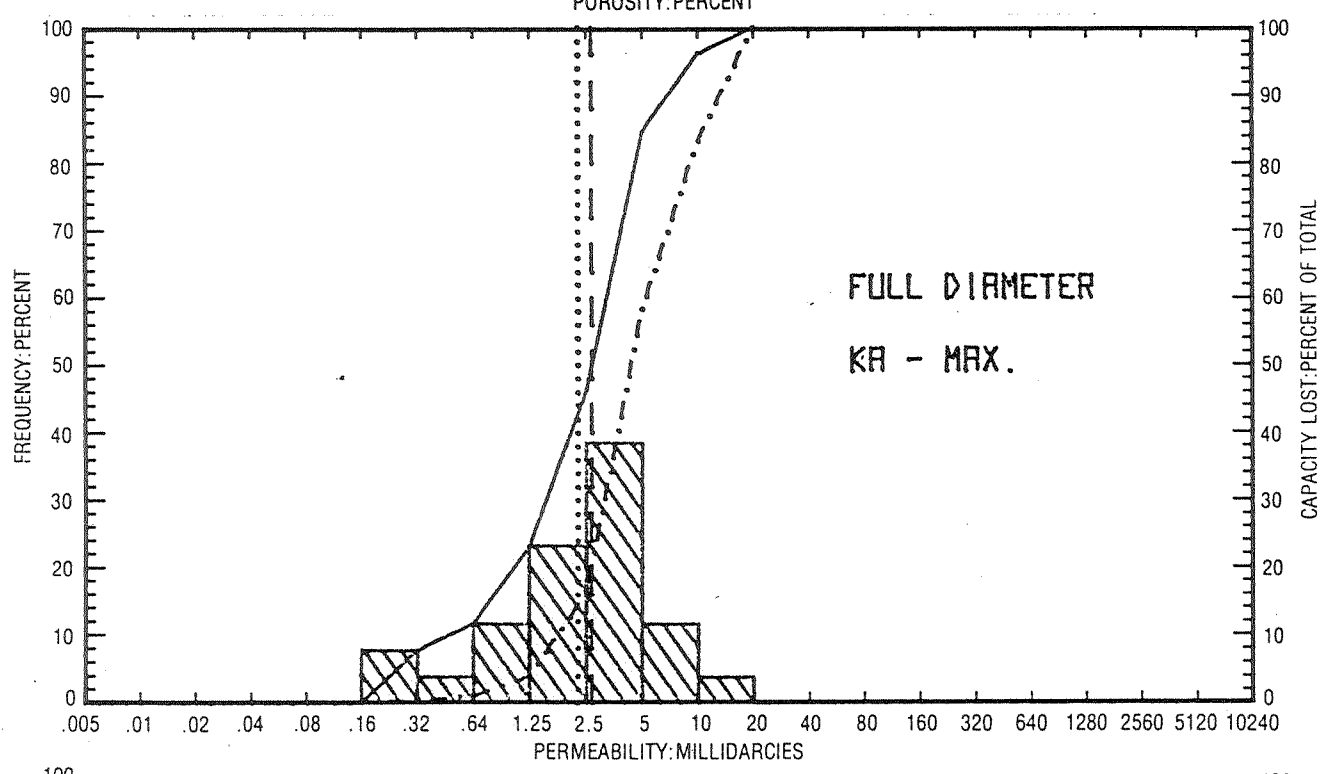
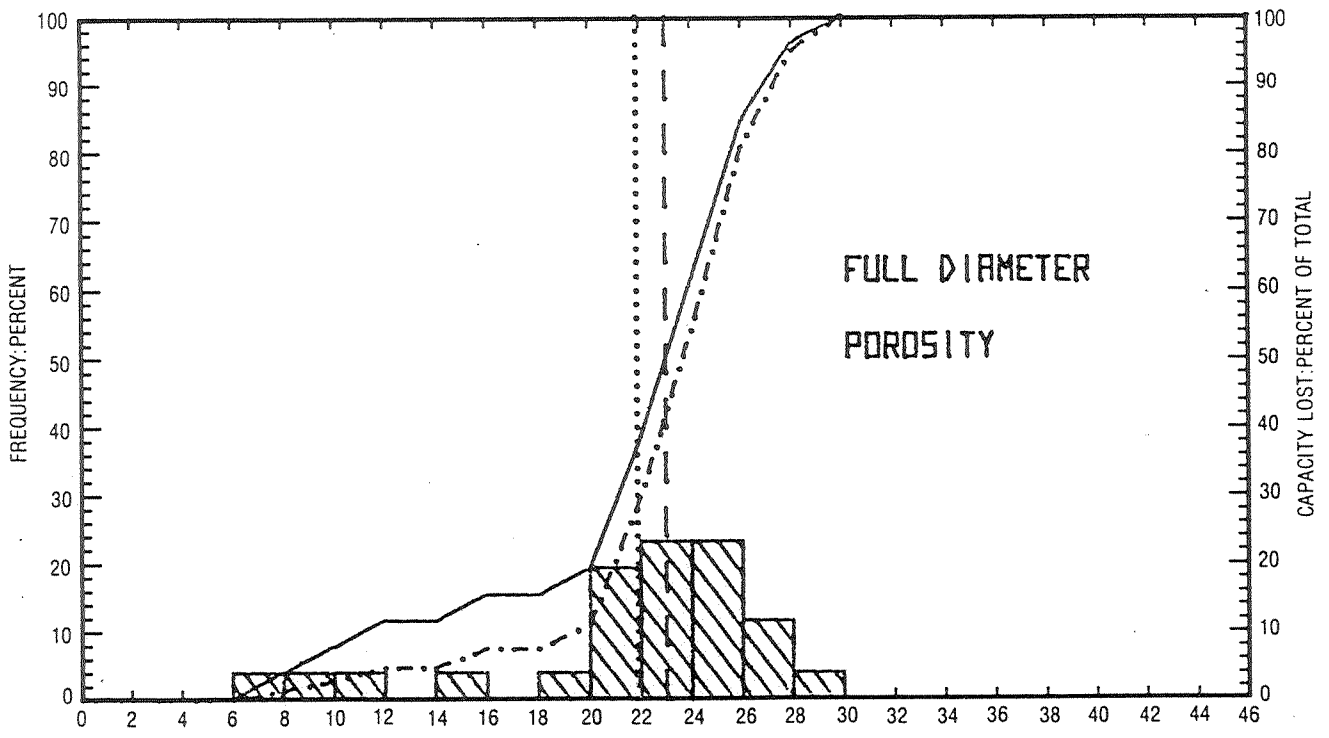
PERMEABILITY VS POROSITY

COMPANY: PENNZOIL
 FIELD : HENRIETTA FIELD

WELL : R. G. LINN NO. 10 WELL
 COUNTY, STATE: CALHOUN COUNTY, WEST VIRGINIA

AIR PERMEABILITY : MD - Ka MAX (PLUG) (UNCORRECTED FOR SLIPPAGE)
 POROSITY : PERCENT (GAS EXPANSION)

DEPTH INTERVAL	RANGE & SYMBOL	PERMEABILITY		POROSITY		POROSITY AVERAGE	PERMEABILITY AVERAGES		
		MAXIMUM	MINIMUM	MAX.	MIN.		ARITHMETIC	HARMONIC	GEOMETRIC
1990.0 - 2016.0	1 (0)	100.0	0.10	46.0	0.0	22.9	3.2	1.4	2.2



PERMEABILITY AND POROSITY HISTOGRAMS

PENNZOIL
R. G. LINN NO. 10 WELL
HENRIETTA FIELD
CALHOUN COUNTY, WEST VIRGINIA

- LEGEND
- ARITHMETIC MEAN POROSITY (dotted line)
 - GEOMETRIC MEAN PERMEABILITY (dotted line)
 - MEDIAN VALUE (dashed line)
 - CUMULATIVE FREQUENCY (solid line)
 - CUMULATIVE CAPACITY LOST (dash-dot line)

FULL DIAMETER DATA
 STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL
 FIELD : HENRIETTA FIELD

WELL : R. G. LIHN NO. 10 WELL
 COUNTY: STATE: CALHOUN COUNTY, WEST VIRGINIA

GROUPING BY POROSITY RANGES

POROSITY RANGE	FEET IN RANGE	AVERAGE POROSITY	AVERAGE PERM. (GEOM.)	AVERAGE PERM. (ARITH)	FREQUENCY (PERCENT)	CUMULATIVE FREQUENCY (%)
-----	-----	-----	-----	-----	-----	-----
6.0 - 8.0	1.0	6.6	0.200	0.200	3.8	3.8
8.0 - 10.0	1.0	8.5	0.200	0.200	3.8	7.7
10.0 - 12.0	1.0	11.4	0.700	0.700	3.8	11.5
14.0 - 16.0	1.0	15.9	0.500	0.500	3.8	15.4
18.0 - 20.0	1.0	19.9	1.6	1.6	3.8	19.2
20.0 - 22.0	5.0	21.2	1.6	1.8	19.2	38.5
22.0 - 24.0	6.0	23.1	3.2	3.6	23.1	61.5
24.0 - 26.0	6.0	25.3	3.9	4.3	23.1	84.6
26.0 - 28.0	3.0	26.8	4.8	5.1	11.5	96.2
28.0 - 30.0	1.0	26.9	15	15	3.8	100.0

TOTAL NUMBER OF FEET = 26.0

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL
 FIELD : HENRIETTA FIELD

WELL : R. G. LINN NO. 10 WELL
 COUNTY: STATE: CALHOUN COUNTY, WEST VIRGINIA

GROUPING BY PERMEABILITY RANGES

PERMEABILITY RANGE	FEET IN RANGE	AVERAGE PERM. (GEOM.)	AVERAGE PERM. (ARITH)	AVERAGE POROSITY	FREQUENCY (PERCENT)	CUMULATIVE FREQUENCY (%)
0.156 - 0.313	2.0	0.200	0.200	7.6	7.7	7.7
0.313 - 0.625	1.0	0.500	0.500	15.9	3.8	11.5
0.625 - 1.250	3.0	0.888	0.900	17.9	11.5	23.1
1.250 - 2.500	6.0	1.8	1.8	22.1	23.1	46.2
2.500 - 5	10.0	3.7	3.8	24.6	38.5	84.6
5 - 10	3.0	7.4	7.4	25.6	11.5	95.2
10 - 20	1.0	15	15	28.9	3.8	100.0

TOTAL NUMBER OF FEET = 26.0

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL
 FIELD : HENRIETTA FIELD

WELL : R. G. LINN NO. 10 WELL
 COUNTY, STATE: CALHOUN COUNTY, WEST VIRGINIA

POROSITY-FEET OF STORAGE CAPACITY LOST FOR SELECTED POROSITY CUT OFF

POROSITY CUT OFF	FEET LOST	CAPACITY LOST (%)	FEET REMAINING	CAPACITY REMAINING (%)	ARITH MEAN	MEDIAN
0.0	0.0	0.0	26.0	100.0	21.9	23.0
2.0	0.0	0.0	26.0	100.0	21.9	23.0
4.0	0.0	0.0	26.0	100.0	21.9	23.0
6.0	0.0	0.0	26.0	100.0	21.9	23.0
8.0	1.0	1.2	25.0	98.8	22.5	23.2
10.0	2.0	2.7	24.0	97.3	23.0	23.3
12.0	3.0	4.7	23.0	95.3	23.6	23.5
14.0	3.0	4.7	23.0	95.3	23.6	23.5
16.0	4.0	7.5	22.0	92.5	23.9	23.7
18.0	4.0	7.5	22.0	92.5	23.9	23.7
20.0	5.0	11.0	21.0	89.0	24.1	23.8
22.0	10.0	29.6	16.0	70.4	25.0	24.7
24.0	16.0	54.1	10.0	45.9	26.1	
26.0	22.0	80.8	4.0	19.2	27.3	
28.0	25.0	94.9	1.0	5.1	28.9	
30.0	26.0	100.0	0.0	0.0		

TOTAL STORAGE CAPACITY IN POROSITY-FEET = 568.2

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL
 FIELD : HENRIETTA FIELD

WELL : R. G. LINN NO. 10 WELL
 COUNTY, STATE: CALHOUN COUNTY, WEST VIRGINIA

MILLIDARCY-FEET OF FLOW CAPACITY LOST FOR SELECTED PERMEABILITY CUT-OFF

PERMEABILITY CUT OFF	FEET LOST	CAPACITY LOST (%)	FEET REMAINING	CAPACITY REMAINING (%)	GEOM MEAN	MEDIAN
0.005	0.0	0.0	26.0	100.0	2.26	2.68
0.010	0.0	0.0	26.0	100.0	2.26	2.66
0.020	0.0	0.0	26.0	100.0	2.26	2.66
0.039	0.0	0.0	26.0	100.0	2.26	2.68
0.078	0.0	0.0	26.0	100.0	2.26	2.68
0.156	0.0	0.0	26.0	100.0	2.26	2.68
0.313	2.0	0.4	24.0	99.6	2.76	2.87
0.625	5.0	1.0	23.0	99.0	2.98	2.97
1.250	6.0	4.0	20.0	96.0	3.57	3.30
2.500	12.0	16.2	14.0	83.8	4.75	
5	22.0	58.4	4.0	41.6	6.86	
10	25.0	83.3	1.0	16.7	15.00	
20	26.0	100.0	0.0	0.0		

TOTAL FLOW CAPACITY IN MILLIDARCY-FEET (ARITHMETIC) = 89.70

Ka - MAX (PLUG DATA)

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL
 FIELD : HENRIETTA FIELD

WELL : R. G. LINN NO. 10 WELL
 COUNTY, STATE: CALHOUN COUNTY, WEST VIRGINIA

GROUPING BY PERMEABILITY RANGES

PERMEABILITY RANGE	FEET IN RANGE	AVERAGE PERM. (GEOM.)	AVERAGE PERM. (ARITH)	AVERAGE POROSITY	FREQUENCY (PERCENT)	CUMULATIVE FREQUENCY (%)
0.156 - 0.313	1.0	0.200	0.200	15.9	4.2	4.2
0.625 - 1.250	5.0	0.882	0.900	20.4	20.6	25.0
1.250 - 2.500	6.0	2.0	2.0	22.5	25.0	50.0
2.500 - 5	9.0	3.9	3.9	25.0	37.5	87.5
5 - 10	2.0	6.1	6.1	23.2	8.3	95.8
10 - 20	1.0	15	15	25.9	4.2	100.0

TOTAL NUMBER OF FEET = 24.0

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL
 FIELD : HENRIETTA FIELD

WELL : R. G. LINN NO. 10 WELL
 COUNTY, STATE: CALHOUN COUNTY, WEST VIRGINIA

MILLIDARCY-FEET OF FLOW CAPACITY LOST FOR SELECTED PERMEABILITY CUT OFF

PERMEABILITY CUT OFF	FEET LOST	CAPACITY LOST (%)	FEET REMAINING	CAPACITY REMAINING (%)	GEOM MEAN	MEDIAN
0.005	0.0	0.0	24.0	100.0	2.33	2.50
0.010	0.0	0.0	24.0	100.0	2.33	2.50
0.020	0.0	0.0	24.0	100.0	2.33	2.50
0.039	0.0	0.0	24.0	100.0	2.33	2.50
0.078	0.0	0.0	24.0	100.0	2.33	2.50
0.156	0.0	0.0	24.0	100.0	2.33	2.50
0.313	1.0	0.3	23.0	99.7	2.59	2.60
0.625	1.0	0.3	23.0	99.7	2.59	2.60
1.250	6.0	5.9	18.0	94.1	3.49	3.15
2.500	12.0	21.2	12.0	75.8	4.67	
5	21.0	65.7	3.0	34.3	6.21	
10	23.0	81.1	1.0	16.9	15.00	
20	24.0	100.0	0.0	0.0		

TOTAL FLOW CAPACITY IN MILLIDARCY-FEET (ARITHMETIC) = 79.40

DISTRIBUTION OF FINAL REPORTS

5 Copies

Mr. Steven S. Holsclaw
Pennzoil Company
P. O. Drawer 1588
Parkersburg, W. Va. 36101

CORE LABORATORIES, INC.



Petroleum Reservoir Engineering

COMPANY PENNZOIL FIELD HENRIETTA FILE 3602-522
 WELL R. G. LINN NO. 10 COUNTY CALHOUN DATE 11-2-79
 LOCATION _____ STATE WEST VIRGINIA ELEV. _____

CORE-GAMMA CORRELATION

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or land in connection with which such report is used or relied upon.

VERTICAL SCALE: 5" = 100'

TOTAL WATER 0000
 PERCENT PORE SPACE
 80 60 40 20 0

GAMMA RAY
 RADIATION INCREASE
 →

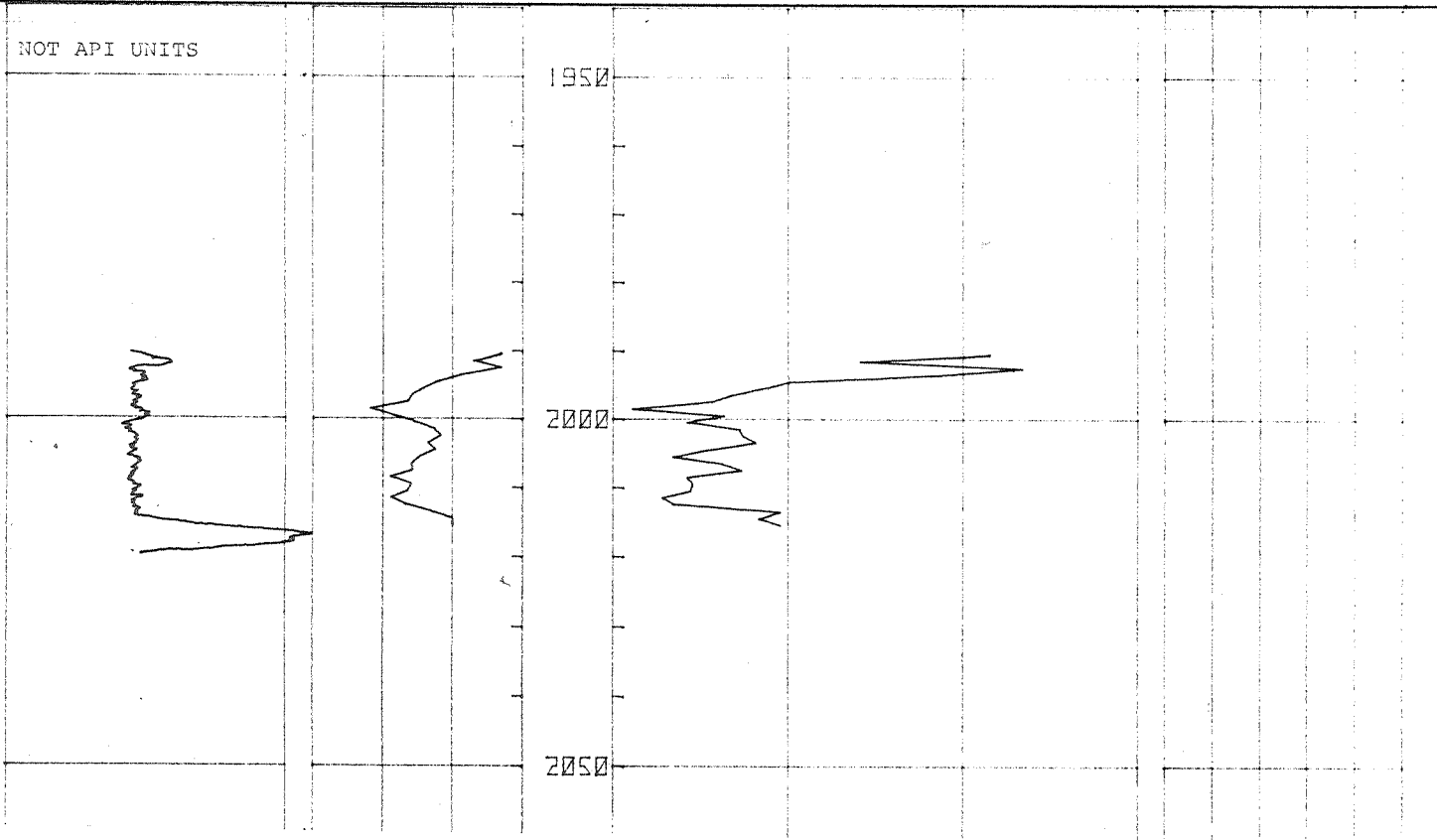
PERMEABILITY Ka - MAX
 MILLIDARCYS

POROSITY GEX
 PERCENT

OIL SATURATION XXX
 PERCENT PORE SPACE

100.0 10.0 1.0 0.1 30 20 10 0 0 20 40 60 80

NOT API UNITS



CORE LABORATORIES, INC.**Petroleum Reservoir Engineering**COMPANY PENNZOILFIELD CENTERPOINT-FLINTFILE 3602-533WELL SILAS ASH NO. 17COUNTY DODDRIDGEDATE 12-3-79

LOCATION _____

STATE WEST VIRGINIA

ELEV. _____

CORE-GAMMA CORRELATION

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted), but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

VERTICAL SCALE: 5" = 100'

TOTAL WATER 0000
PERCENT PORE SPACE

80 60 40 20 0

GAMMA RAY
RADIATION INCREASE
→

PERMEABILITY K_a - MAX
MILLIDARCS

100.0 10.0 1.0 0.1

30

POROSITY GEX
PERCENT

20

10

OIL SATURATION $XXXX$
PERCENT PORE SPACE

0 0 20 40 60 80

NOTE: NOT API UNITS

1900

1950

2000

Handwritten notes:
M
N

N

N