

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

OKLAHOMA CITY, OKLAHOMA

December 13, 1983

REPLY TO
SUITE 133
400 SOUTH VERMONT
OKLAHOMA CITY, OK
73108

Cities Service Company
3545 N. W. 58th Street
Oklahoma City, Oklahoma 73132

Attn: Mr. Scott Kinney

Subject: Core Analysis Data
Gormen No. A-3 Well
Stevens County, Kansas
CLI File 3402-11874

Gentlemen:

Cores taken in the subject well in the Big Fork Sand formation were received in the Oklahoma City laboratory for special analytical testing described on the Procedure Page.

The accompanying Coregraph presents the Surface Core-Gamma Log and binomially averaged core analysis data in graphical form to aid correlation with downhole electrical surveys.

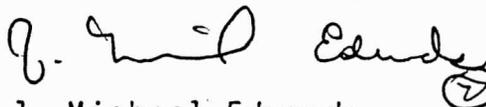
Tabular presentation of the measured physical properties may be found on pages one and two of this report.

Histograms of porosity and permeability in addition to a graph of permeability versus porosity may be found on pages three and four.

It is a pleasure to have this opportunity of serving you.

Very truly yours,

CORE LABORATORIES, INC.



J. Michael Edwards
District Manager

10 cc - Addressee

Cities Service Company
Gormen No. A-3 Well
CLI File 3402-11874

Procedure Page

Handling and Analytical Procedures

Diamond coring equipment and water base mud were used to obtain 4.0 inch diameter cores between 6,489.0 and 6,515.0 feet.

The cores were preserved at the well site in a CO₂ atmosphere by CLI personnel.

The cores were transported to Oklahoma City by CLI personnel.

A Core-Gamma Log was recorded for downhole electric log correlation.

Core analysis was made in the intervals requested on right cylinder full diameter samples.

Fluid removal was accomplished using vacuum retorts.

Porosity was determined by density balance method.

Air permeability in two horizontal directions was measured without Klinkenberg correction.

Cores have been shipped to:

Cities Service Technical Center
4500 S. 129th East Avenue
Tulsa, Oklahoma
Attn: Mr. Mike Cox

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
 DALLAS, TEXAS

PAGE 1

CITIES SERVICE COMPANY
 GORMEN NO. A-3 WELL
 W. LIBERAL FIELD
 STEVENS COUNTY, KANSAS

DATE: 12-12-83
 FORMATION: BIG FORK SAND
 DRLG. FLUID: WATER BASE MUD
 LOCATION: SEC. 36-34S-35W

FILE NO: 3402-11874
 ANALYST: EDWARDS
 LABORATORY: OKLAHOMA CITY

FULL DIAMETER ANALYSIS

SMP. NO.	DEPTH FEET	PERM. TO AIR MD.		POROSITY PERCENT	FLUID OIL	SATS. WATER	GRAIN DEN.	DESCRIPTION
		MAXIMUM	90 DEG.					
1	6489.0-90.0	0.13	0.03	6.5	9.1	72.7	2.72	SD,SLTY,PP VGS,SL/LMY, SH LAM
2	6490.0-91.0	0.09	0.09	6.1	9.2	67.0	2.71	SD,SLTY,PP VGS,SL/LMY, SH LAM
3	6491.0-92.0	1.40	1.10	10.0	8.0	39.1	2.69	SD,SLTY,PP VGS,SL/LMY, SH LAM
4	6492.0-93.0	0.35	0.33	7.4	9.5	57.3	2.70	SD,SLTY,PP VGS,SL/LMY, SH LAM
5	6493.0-94.0	0.12	0.09	6.8	6.1	65.7	2.70	SD,SLTY,PP VGS,SL/LMY, SH LAM
6	6494.0-95.0	0.09	0.07	6.1	9.6	68.2	2.71	SD,SLTY,PP VGS,SL/LMY, SH LAM
7	6495.0-96.0	0.14	0.10	7.3	9.7	67.3	2.71	SD,SLTY,PP VGS,SL/LMY, SH LAM
+ 8	6496.0-97.0	4.60	3.30	6.9	8.0	65.2	2.71	SD,SLTY,PP VGS,SL/LMY, CL INCL,SH LAM
9	6497.0-98.0	0.22	0.07	6.8	7.9	69.6	2.71	SD,SLTY,PP VGS,SL/LMY, SH LAM,VF
10	6498.0-99.0	0.35	0.23	5.4	8.7	65.6	2.69	SD,SLTY,PP VGS,SL/LMY, SH LAM
11	6499.0- 0.0	0.14	0.09	6.0	9.5	61.3	2.69	SD,SLTY,PP VGS,SL/LMY, SH LAM
+ 12	6500.0- 1.0	8.10	3.60	5.2	11.7	60.6	2.70	LM,FOSS,PP VGS,CL INCL, SH CLSP
13	6501.0- 2.0	0.12	0.01	4.7	14.5	62.9	2.67	SD,SLTY,PP VGS,SL/LMY, SH LAM,VF
+ 14	6502.0- 3.0	16	12	6.5	10.4	74.6	2.69	SD,SLTY,PP VGS,SL/LMY, CL INCL,SH LAM,VF

These analyses, opinions or interpretations are based on observations and materials 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 operations, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
 DALLAS, TEXAS

PAGE 2

CITIES SERVICE COMPANY
 GORMEN NO. A-3 WELL

DATE: 12-12-83
 FORMATION: BIG FORK SAND

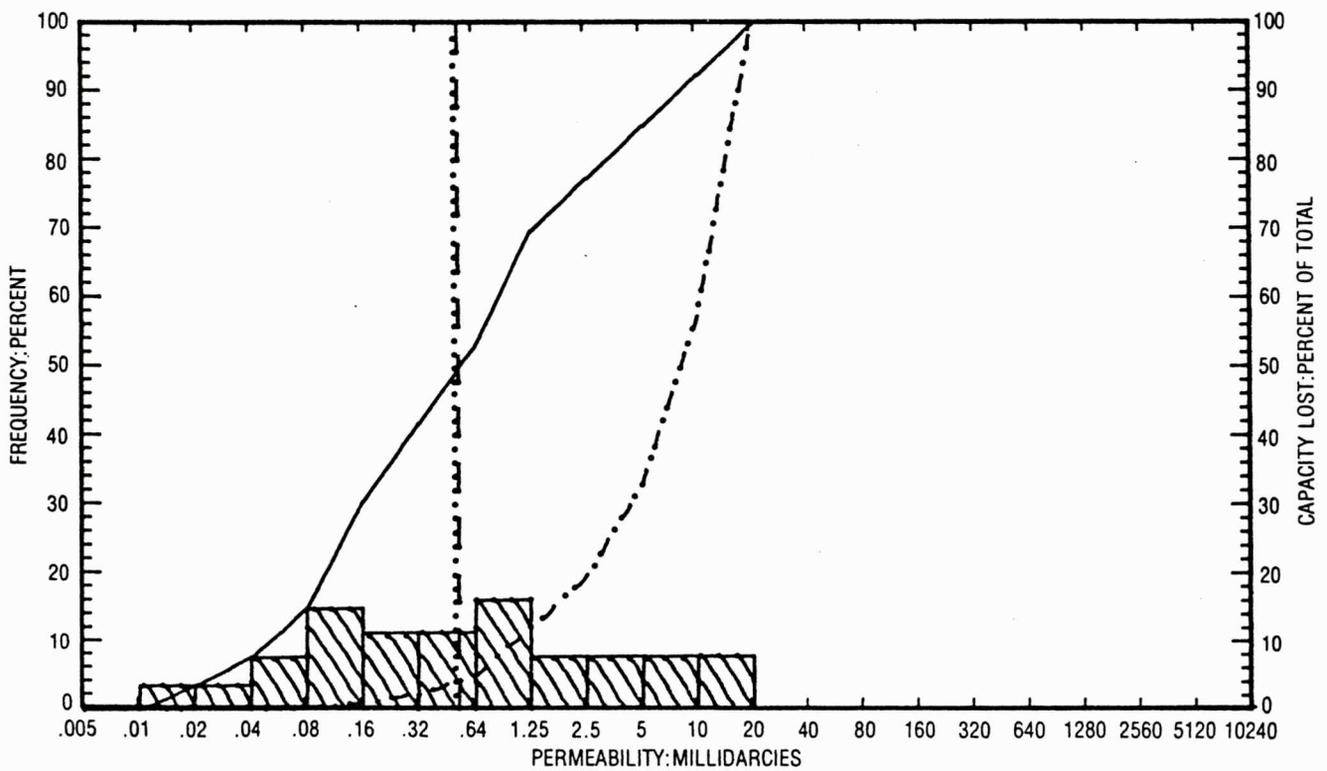
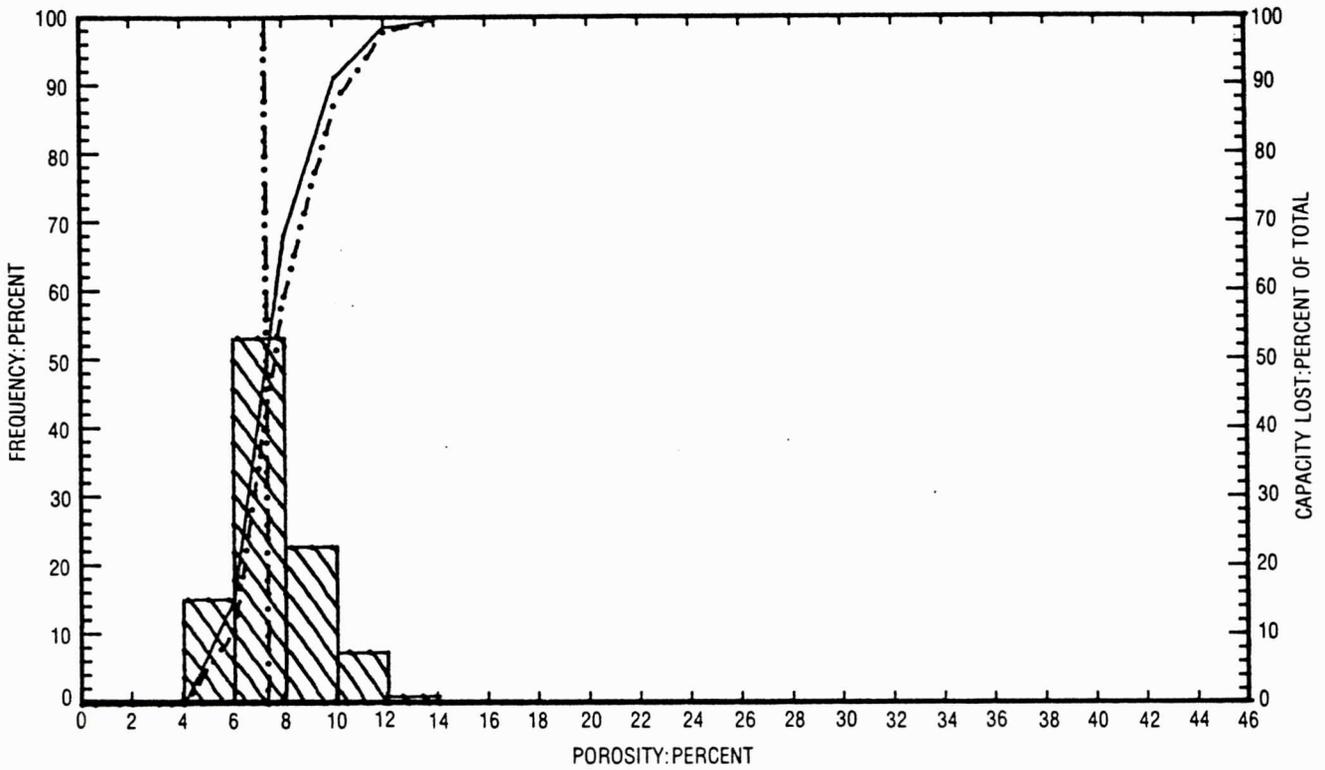
FILE NO: 3402-11874
 ANALYST: EDWARDS

FULL DIAMETER ANALYSIS

SMP. NO.	DEPTH FEET	PERM. TO AIR MD.		POROSITY PERCENT	FLUID OIL	SATS. WATER	GRAIN DEN.	DESCRIPTION
		MAXIMUM	90 DEG.					
+ 15	6503.0- 4.0	18	6.80	6.7	10.8	66.4	2.69	SD,SLTY,PP VGS,SL/LMY, SHY,VF
16	6504.0- 5.0	0.18	0.18	5.4	11.5	42.9	2.68	SD,SLTY,PP VGS,SL/LMY, CL INCL
17	6505.0- 6.0	0.26	0.23	6.1	11.5	43.3	2.69	SD,SLTY,PP VGS,SL/LMY, CL INCL,SH LAM
18	6506.0- 7.0	0.57	0.52	7.1	11.3	49.4	2.69	SD,SLTY,PP VGS,SL/LMY, CL INCL,SH LAM
+ 19	6507.0- 8.0	12	2.30	8.1	7.1	57.5	2.68	SD,SLTY,PP VGS,SL/LMY, SH LAM
20	6508.0- 9.0	1.60	1.50	9.6	10.0	40.1	2.68	SD,SLTY,PP VGS,SL/LMY, SH LAM
21	6509.0-10.0	0.99	0.92	8.4	15.0	38.0	2.68	SD,SLTY,PP VGS,SL/LMY, SH LAM
22	6510.0-11.0	0.52	0.49	10.5	14.4	43.0	2.66	SD,SLTY,PP VGS,SL/LMY, SH LAM
+ 23	6511.0-12.0	10	10	8.8	17.3	51.3	2.69	SD,SLTY,PP VGS,SL/LMY, SH LAM
24	6512.0-13.0	0.92	0.64	9.9	16.8	40.6	2.66	SD,SLTY,PP VGS,SL/LMY, SH LAM
+ 25	6513.0-14.0	7.60	5.70	6.9	13.4	49.1	2.69	SD,SLTY,PP VGS,SL/LMY, CL INCL,SH LAM
26	6514.0-15.0	0.71	0.71	8.4	16.5	31.3	2.67	SD,SLTY,PP VGS,SL/LMY, SH LAM
27	6515.0-15.3	*	1.20	12.4	13.9	33.1	2.67	SD,SLTY,PP VGS,SL/LMY

* DENOTES PLUG PERM
 + DENOTES HORIZONTAL CRACKS

These analyses, opinions or interpretations are based on observations and materials 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 operations, or profitableness of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.



PERMEABILITY AND POROSITY HISTOGRAMS Page 3

CITIES SERVICE COMPANY
 GORMEN NO. A-3 WELL
 W. LIBERAL FIELD
 STEVENS COUNTY, KANSAS

LEGEND

ARITHMETIC MEAN POROSITY
 GEOMETRIC MEAN PERMEABILITY
 MEDIAN VALUE - - - - -
 CUMULATIVE FREQUENCY _____
 CUMULATIVE CAPACITY LOST - . - . - .

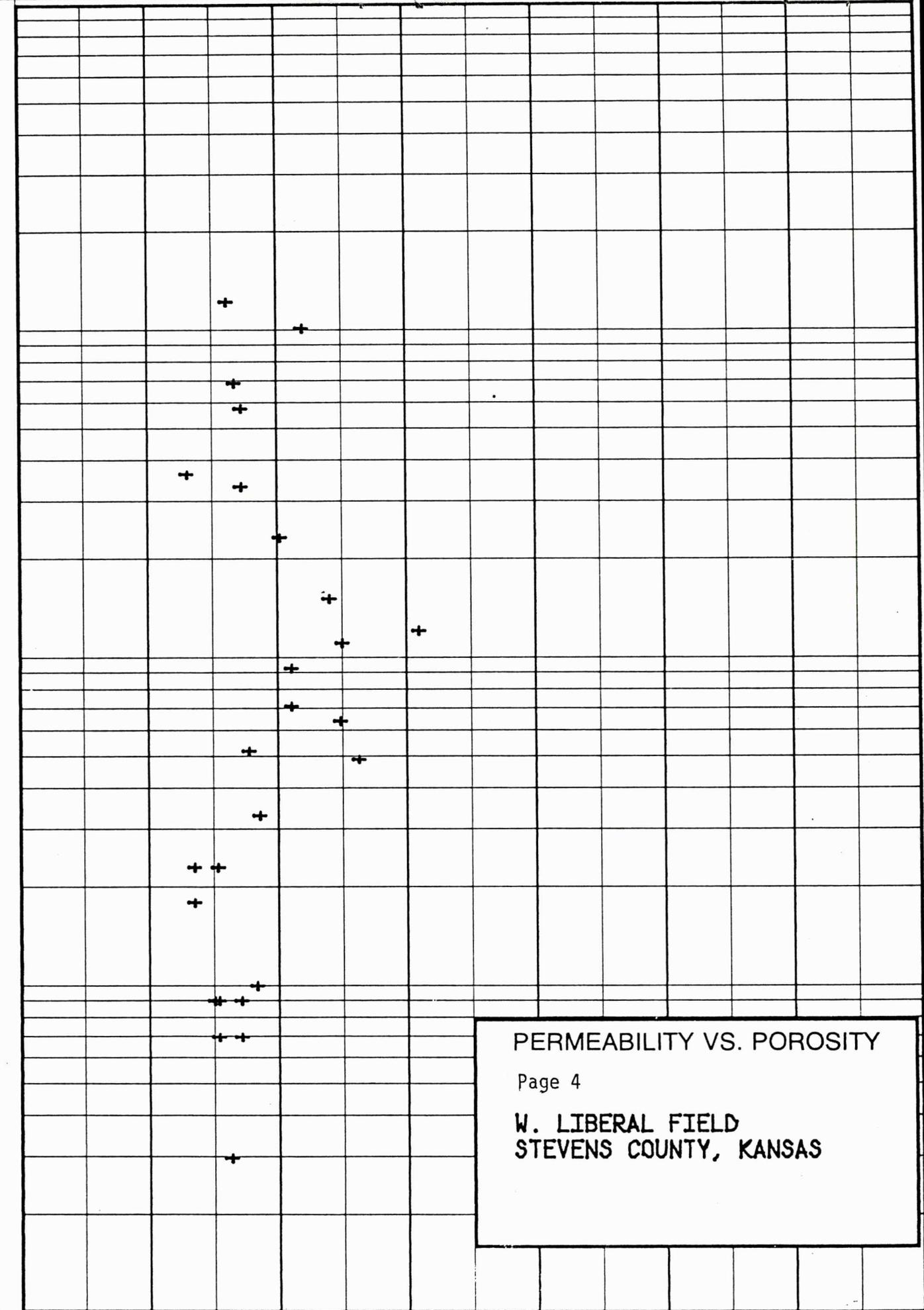
PERMEABILITY: MILLIDARCIES

10.

1.

0.1

0.01



0.0 4.0 8.0 12.0 16.0 20.0 24.0

POROSITY: PERCENT

PERMEABILITY VS. POROSITY

Page 4

W. LIBERAL FIELD
STEVENS COUNTY, KANSAS

COMPANY CITIES SERVICE COMPANY FILE NO. 3402-11874
 WELL GORMEN NO. A-3 WELL DATE 12-12-83
 FIELD W. LIBERAL FORMATION BIG FORK SAND ELEV. _____
 COUNTY STEVENS STATE KANSAS DRLG. FLD. WATER BASE MUD CORES _____
 LOCATION SEC. 36-34S-35W

CORRELATION COREGRAPH

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 or 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'

Gamma Ray
RADIATION INCREASE →

Permeability _____
MILLIDARCIES

Porosity _____
PERCENT

Total Water _____
PERCENT PORE SPACE

Oil Saturation _____
PERCENT PORE SPACE

