



Weatherford

**COMPACT PHOTO DENSITY
COMPENSATED NEUTRON
MICRO-RESISTIVITY LOG**

COMPANY			LARSON ENGINEERING, INC.		
WELL			INDUSTRIAL PARK #1-19		
FIELD			WIDLCAT		
PROVINCE/COUNTY			LANE		
COUNTRY/STATE			USA / KANSAS		
LOCATION			936' FNL & 1163' FEL NW-SW-NE-NE		
SEC 19	TWP 18S	RGE 28W	Other Services		
			MA/MFE		
			MSG		
API Number			15-101-22575		
Permanent Datum GL, Elevation 2761 feet					
Log Measured From KB					
Drilling Measured From KB					
Date	06-DEC-2015				
Run Number	ONE				
Service Order	7055-136599778				
Depth Driller	4650.00		feet		
Depth Logger	4646.00		feet		
First Reading	3600.00		feet		
Last Reading	4627.00		feet		
Casing Driller	265.00		feet		
Casing Logger	264.00		feet		
Bit Size	7.875		inches		
Hole Fluid Type	WBM				
Density / Viscosity	9.25	lb/USg	56.00	sec/qt	
PH / Fluid Loss	9.50		6.80	ml/30Min	
Sample Source	MUD TANK				
Rm @ Measured Temp	2.50 @ 52.0		ohm-m		
Rmf @ Measured Temp	2.0 @ 52.0		ohm-m		
Rmc @ Measured Temp	3.0 @ 52.0		ohm-m		
Source Rmf / Rmc	CALC		CALC		
Rm @ BHT	1.20 @ 112.0		ohm-m		
Time Since Circulation	5 HOURS				
Max Recorded Temp	112.00		deg F		
Equipment / Base	13379		OKC		
Recorded By	JUSTIN HICKS				
Witnessed By	VERN SCHRAG				

BOREHOLE RECORD					Last Edited: 06-DEC-2015 12:19
Bit Size inches		Depth From feet		Depth To feet	
7.875		264.00		4650.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	8.625	0.00	264.00	24.00	

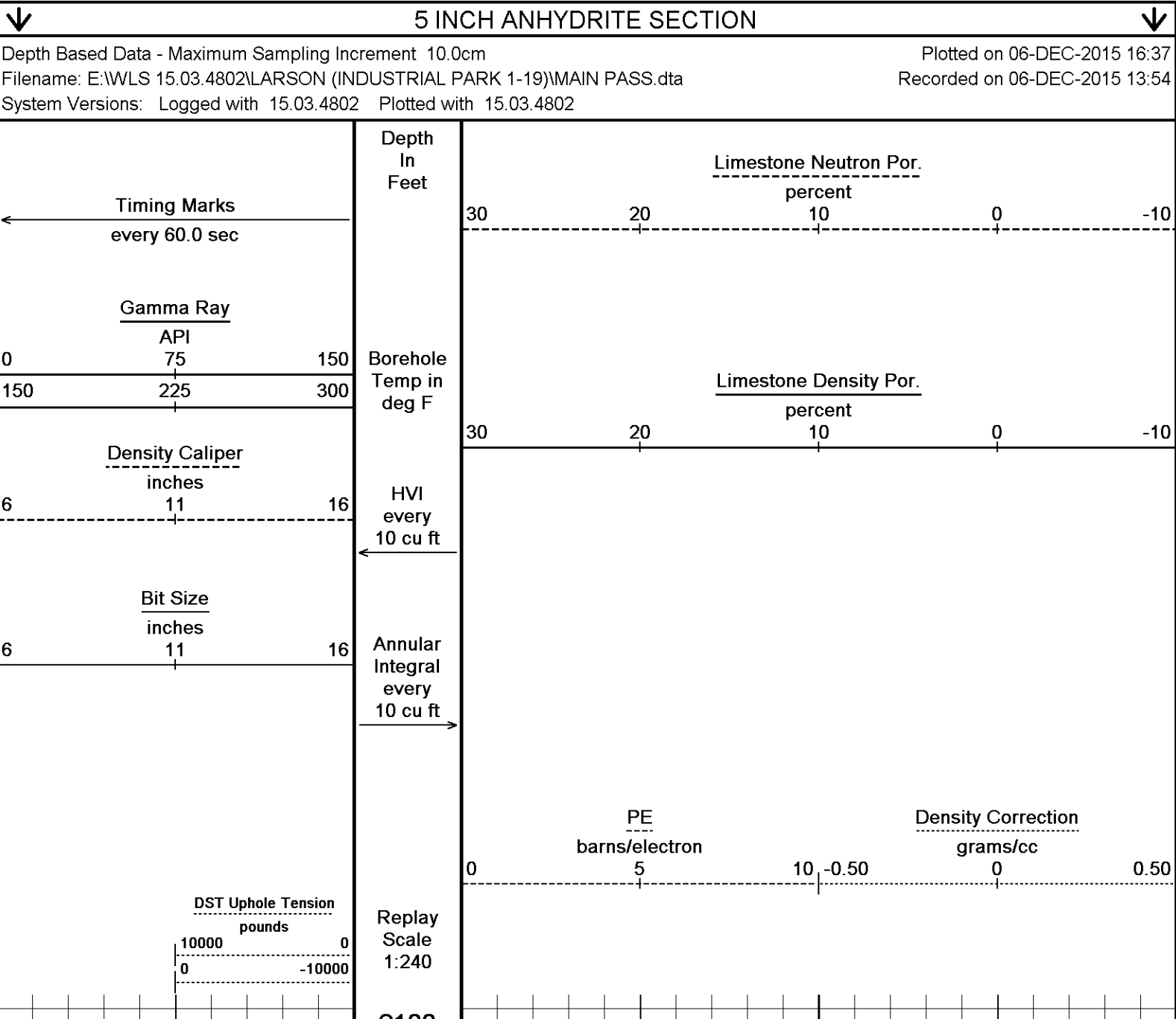
REMARKS
TOOLS RAN: CBH, SHA, MCG, MSG, MMR, MDN, MPD, MFE, MAI RAN IN COMBINATION.
HARDWARE USED: MAI: TWO 0.5 INCH STANDOFFS. MFE: ONE 0.5 INCH STANDOFF. MDN: DUAL NEUTRON BOWSPRING. MPD: 8 INCH PROFILE PLATE.
2.71 G/CC DENSITY MATRIX USED TO CALCULATE POROSITY. ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
TOTAL HOLE VOLUME FROM TD TO SURFACE CASING = 1783 CU.FT. ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO SURFACE CASING = 1062 CU.FT.
FIELD TICKET NUMBER: 7055-136599778
RIG: H AND D DRILLING, RIG #3

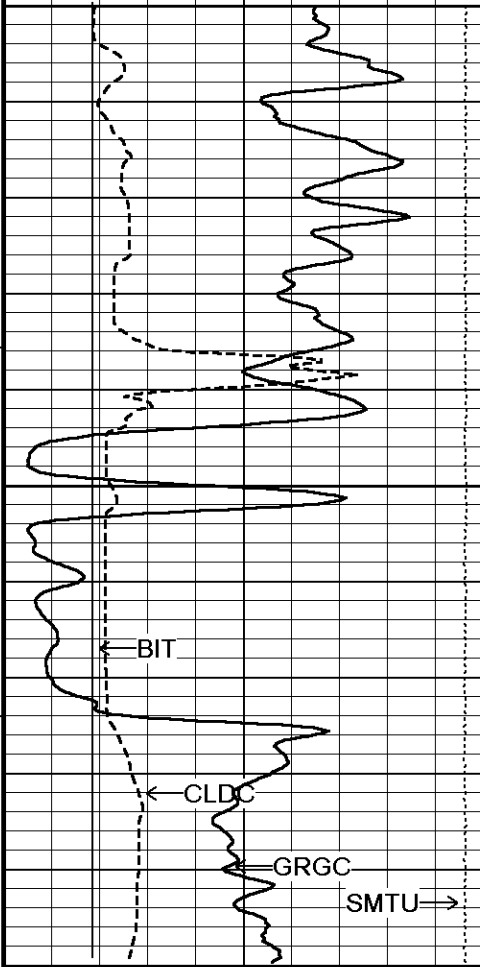
OPERATOR(S): R. BRADSHAW

MUD PROPERTIES:
CHLORIDES: 2400 MG/L
LCM: 2 PPB

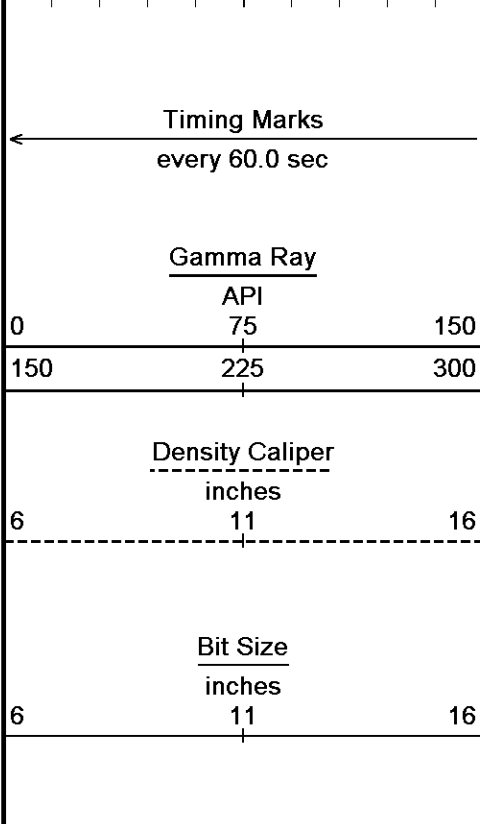
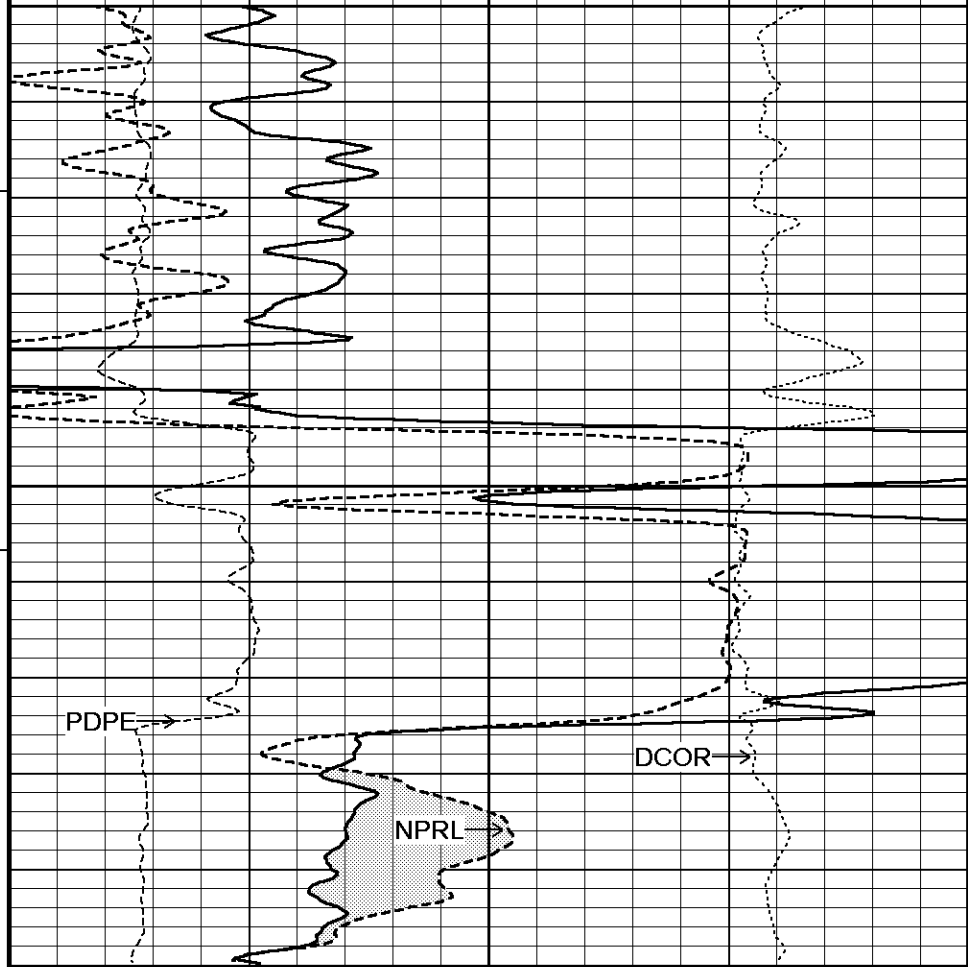
HOLE WASHOUTS AND RUGOSITY WILL AFFECT LOG QUALITY AND REPEATABILITY.

In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will give the Company the benefit of the Contractor's best judgment based on its experience and will perform all such Work in a good and workmanlike manner. Any interpretation of test or other data, and any recommendation or reservoir description based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions, which inferences and assumptions are not infallible, and with respect to which professional engineers and analysts may differ. ACCORDINGLY ANY INTERPRETATION OR RECOMMENDATION RESULTING FROM THE SERVICES WILL BE AT THE SOLE RISK OF THE COMPANY, AND THE CONTRACTOR CANNOT AND DOES NOT WARRANT THE ACCURACY, CORRECTNESS OR COMPLETENESS OF ANY SUCH INTERPRETATION OR RECOMMENDATION, WHICH INTERPRETATIONS AND RECOMMENDATIONS SHOULD NOT, THEREFORE, UNDER ANY CIRCUMSTANCES BE RELIED UPON AS THE SOLE OR MAIN BASIS FOR ANY DRILLING, COMPLETION, WELL TREATMENT, PRODUCTION OR FINANCIAL DECISION, OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING ACTIVITY, DRILLING RIG OR ITS CREW OR ANY OTHER INDIVIDUAL. THE COMPANY HAS FULL RESPONSIBILITY FOR ALL DECISIONS CONCERNING THE SERVICES.

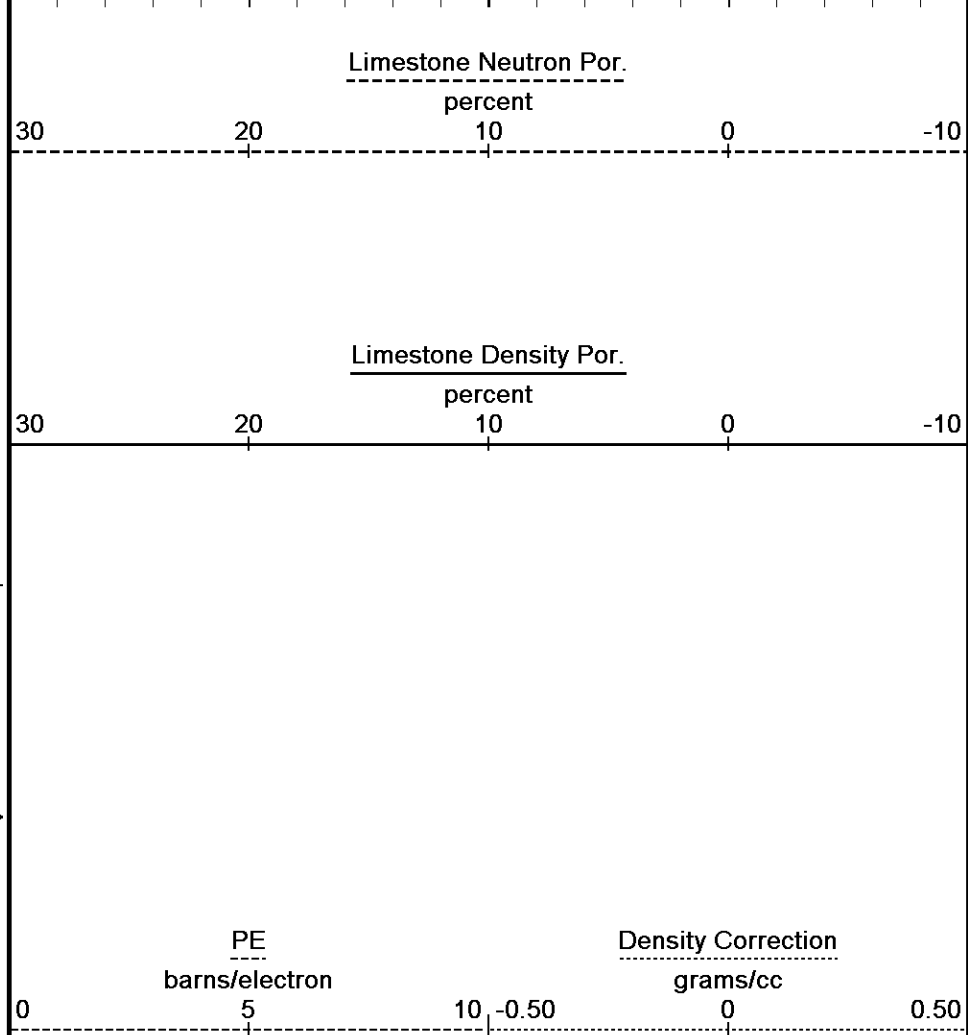


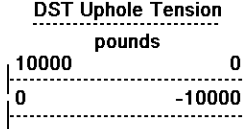


2100
98°
2150
98°
2200



Depth
In
Feet
Timing Marks
every 60.0 sec
Gamma Ray
API
0 75 150
150 225 300
Density Caliper
inches
6 11 16
Bit Size
inches
6 11 16
Borehole
Temp in
deg F
HVI
every
10 cu ft
Annular
Integral
every
10 cu ft





Replay
Scale
1:240

Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: E:\WLS 15.03.4802\LARSON (INDUSTRIAL PARK 1-19)\MAIN PASS.dta
System Versions: Logged with 15.03.4802 Plotted with 15.03.4802

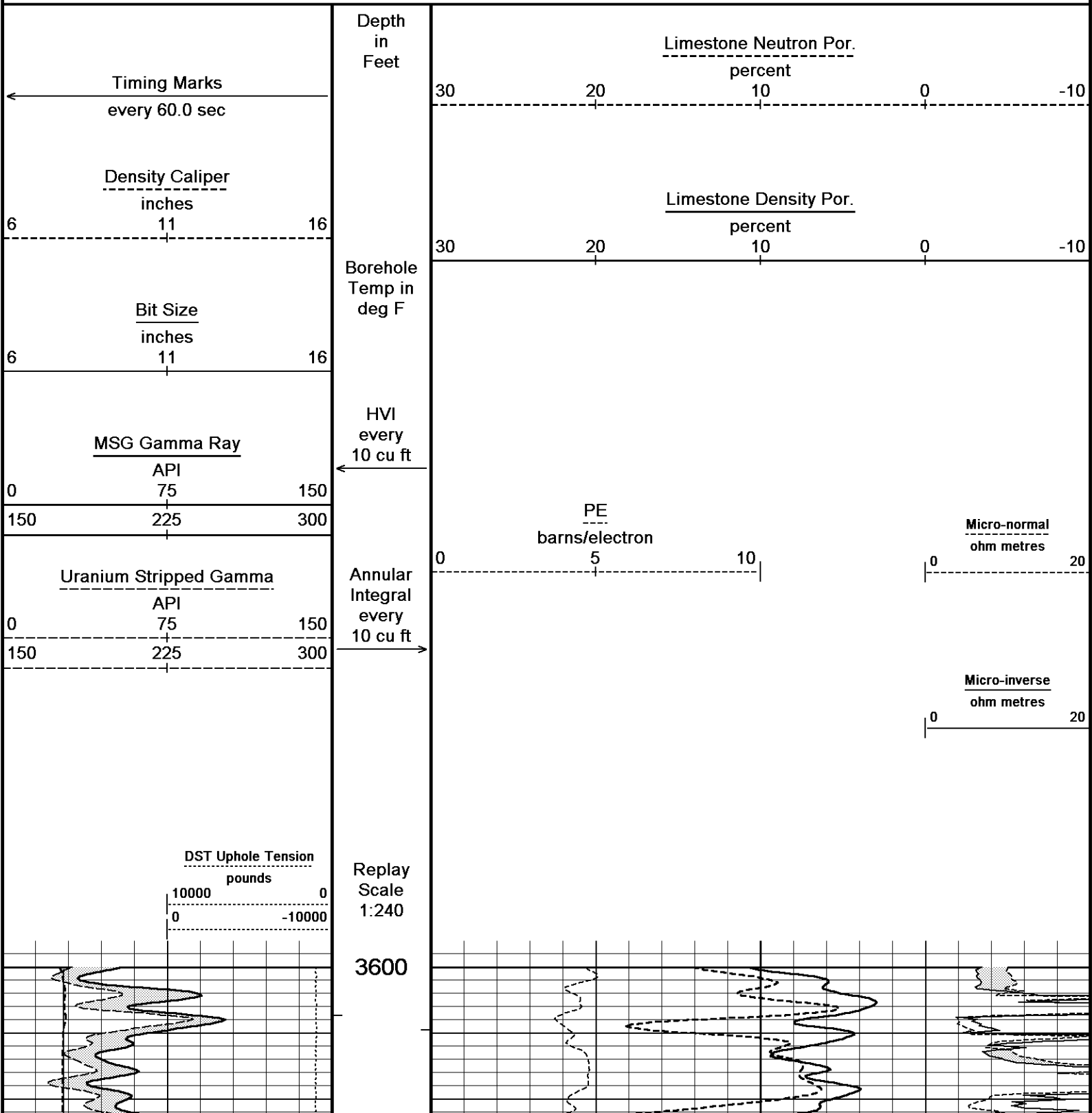
Plotted on 06-DEC-2015 16:37
Recorded on 06-DEC-2015 13:54

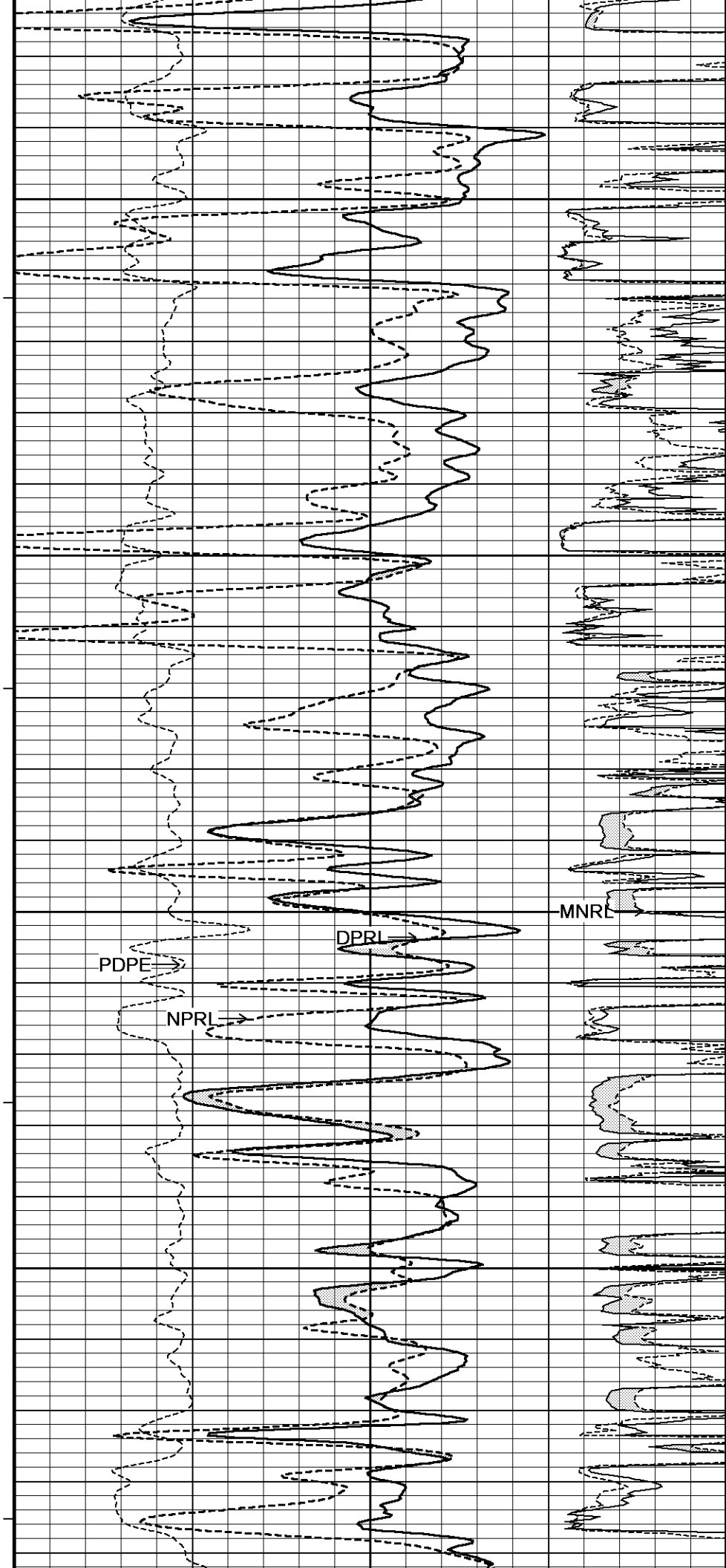
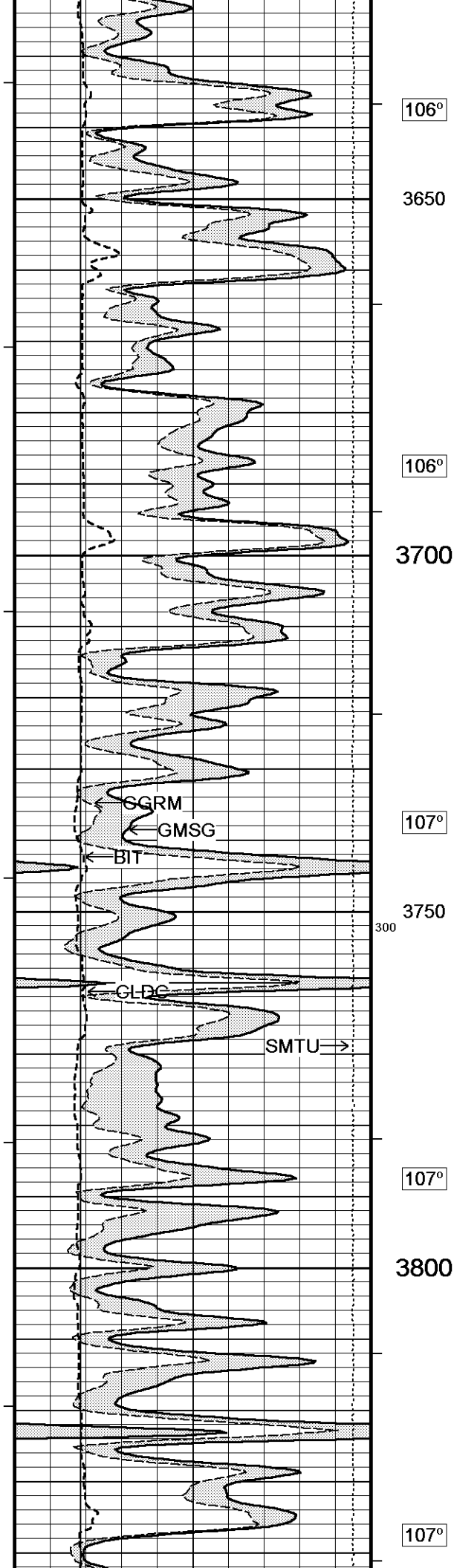
5 INCH ANHYDRITE SECTION

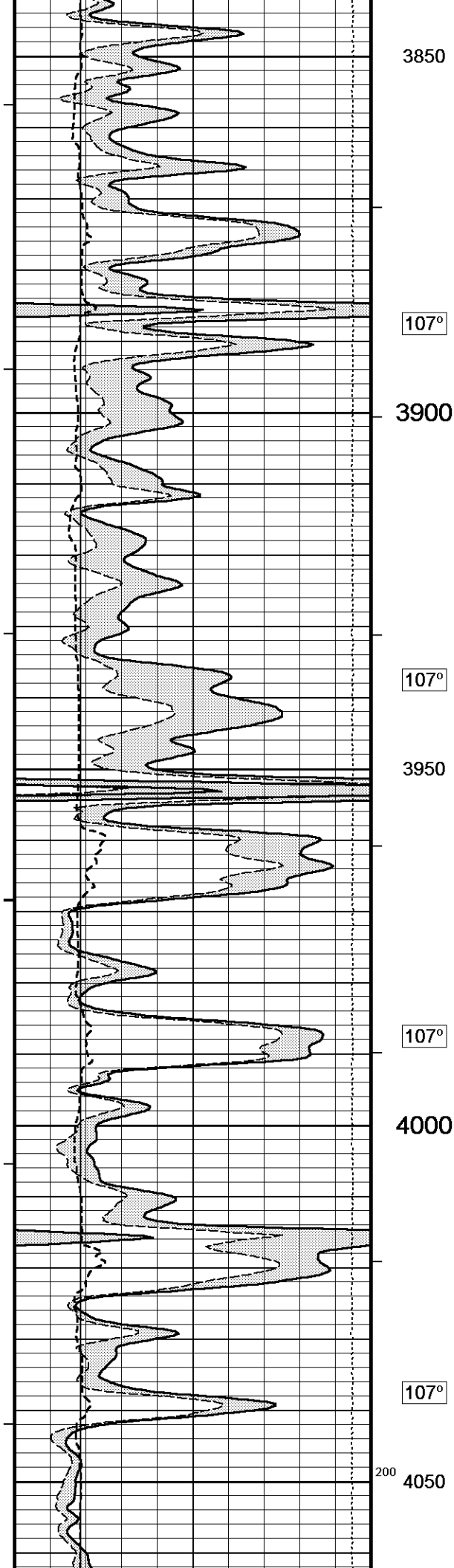
5 INCH POROSITY LOG

Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: E:\WLS 15.03.4802\LARSON (INDUSTRIAL PARK 1-19)\MAIN PASS.dta
System Versions: Logged with 15.03.4802 Plotted with 15.03.4802

Plotted on 06-DEC-2015 16:37
Recorded on 06-DEC-2015 13:54







3850

107°

3900

107°

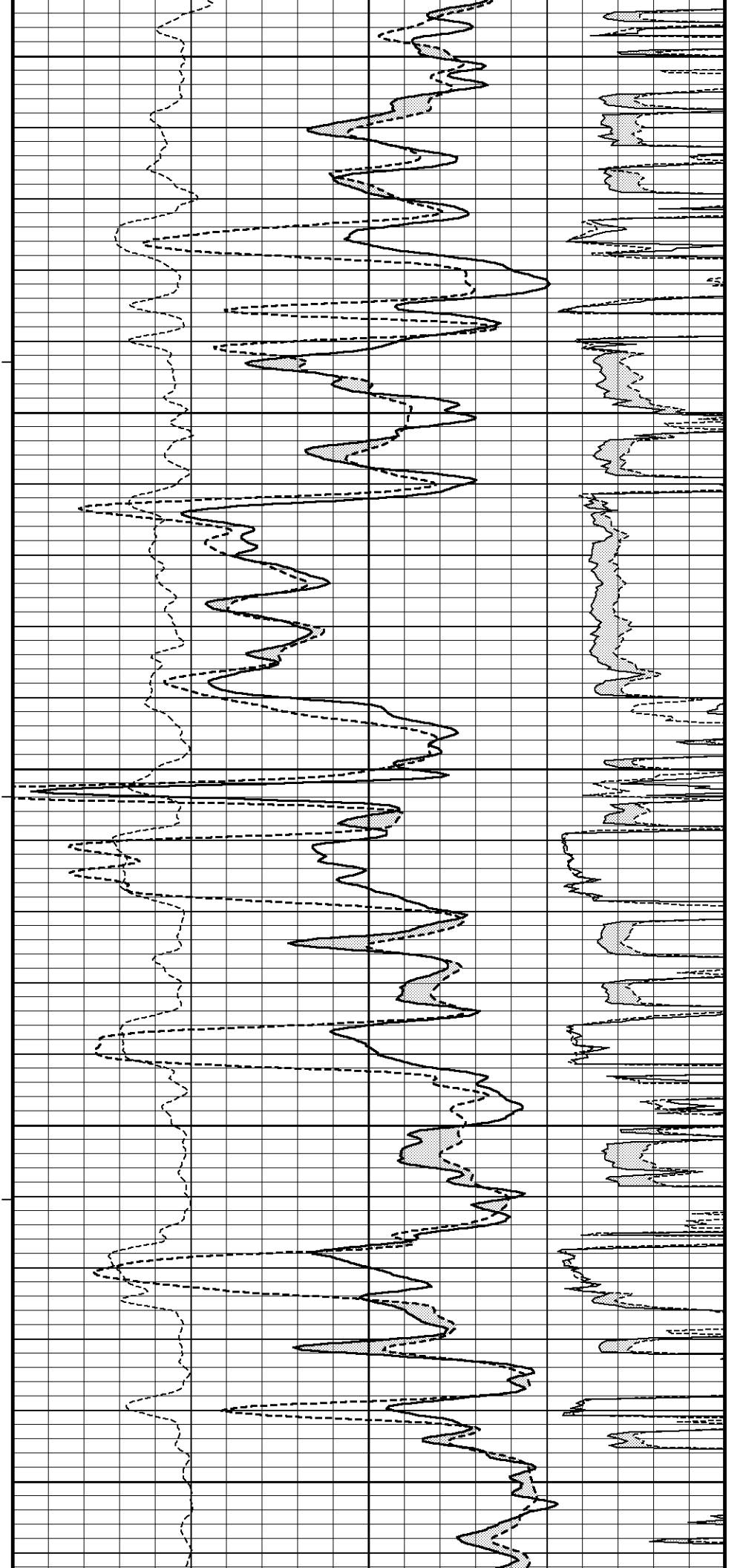
3950

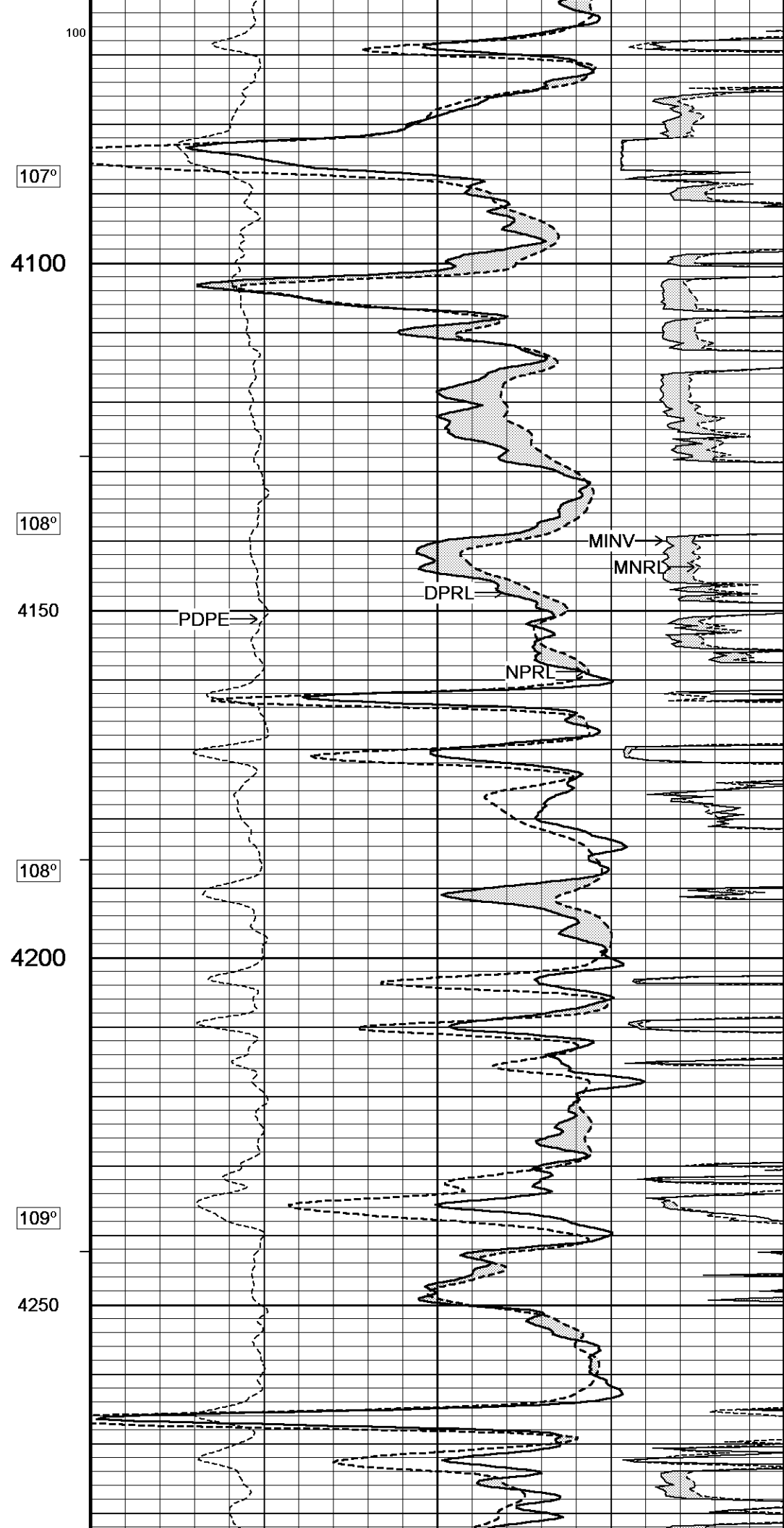
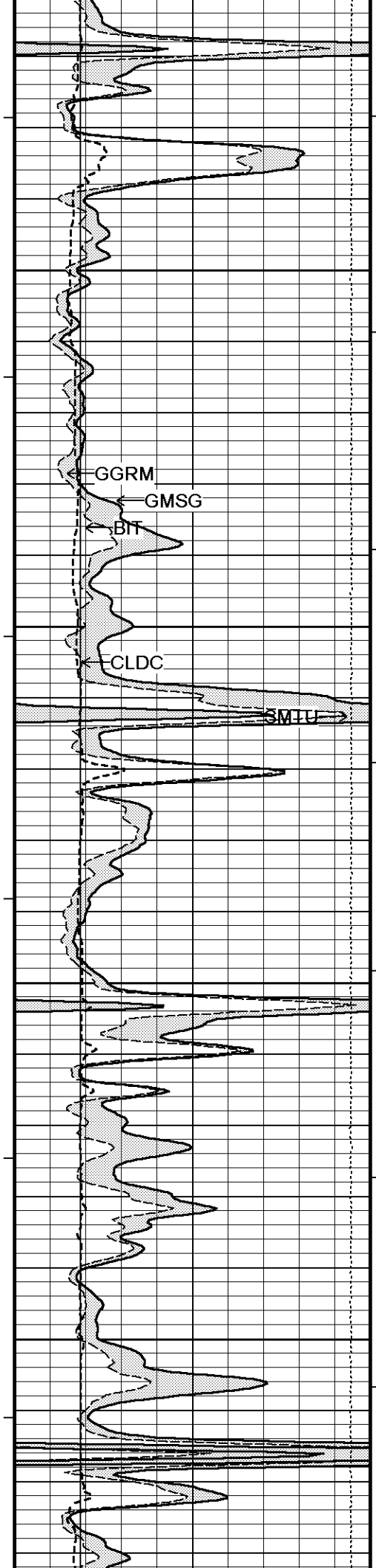
107°

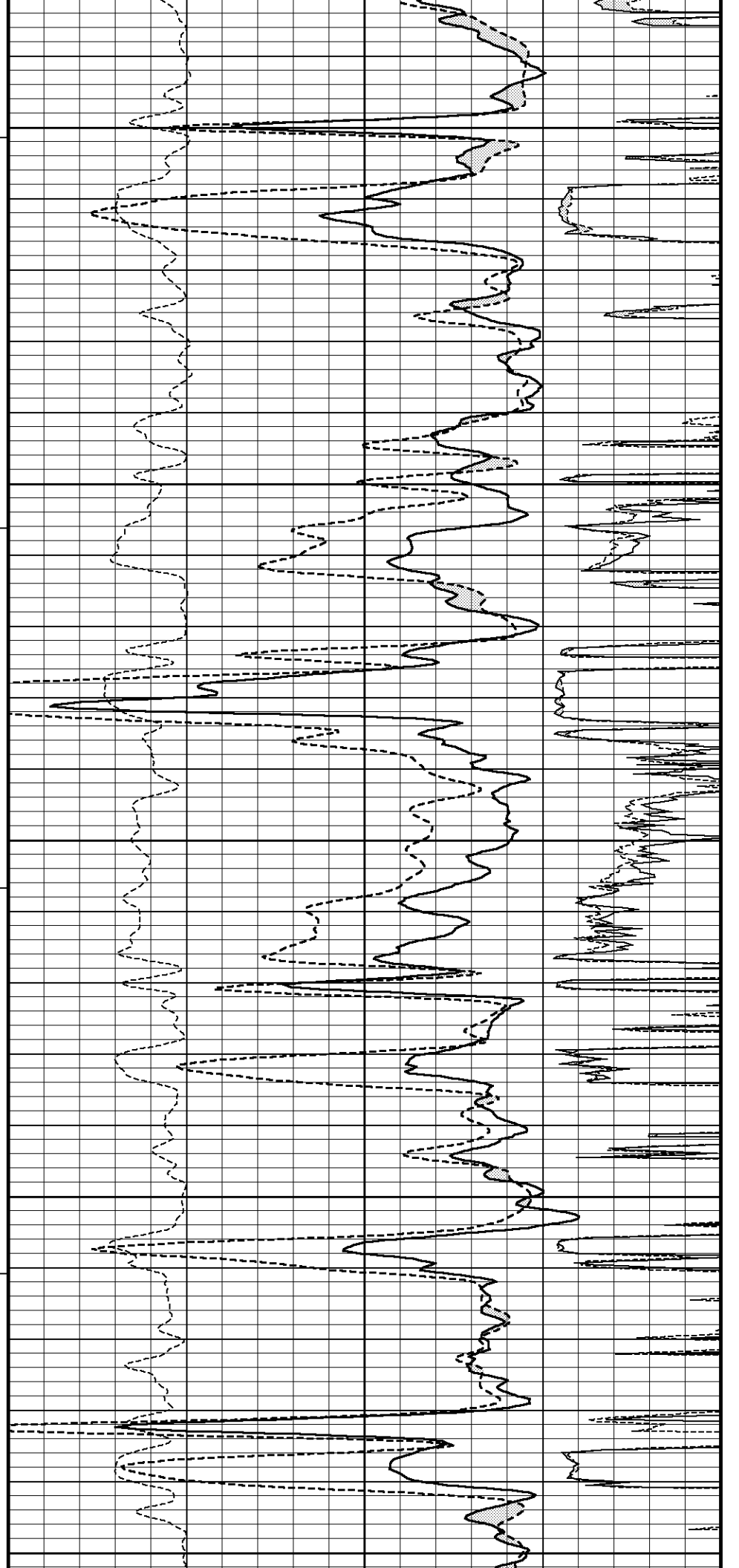
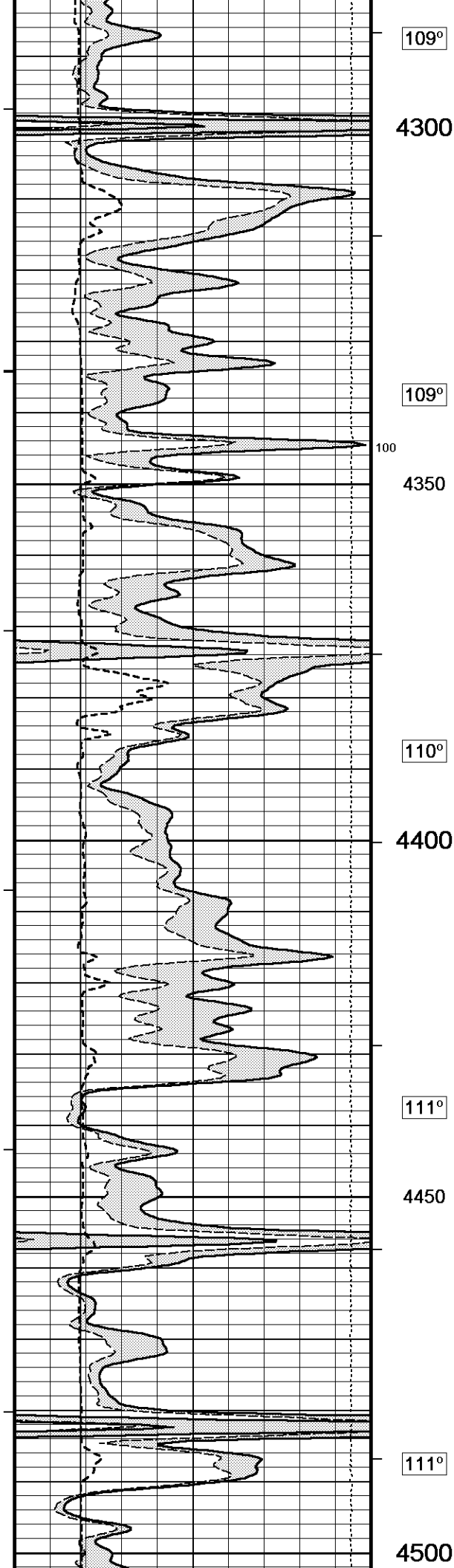
4000

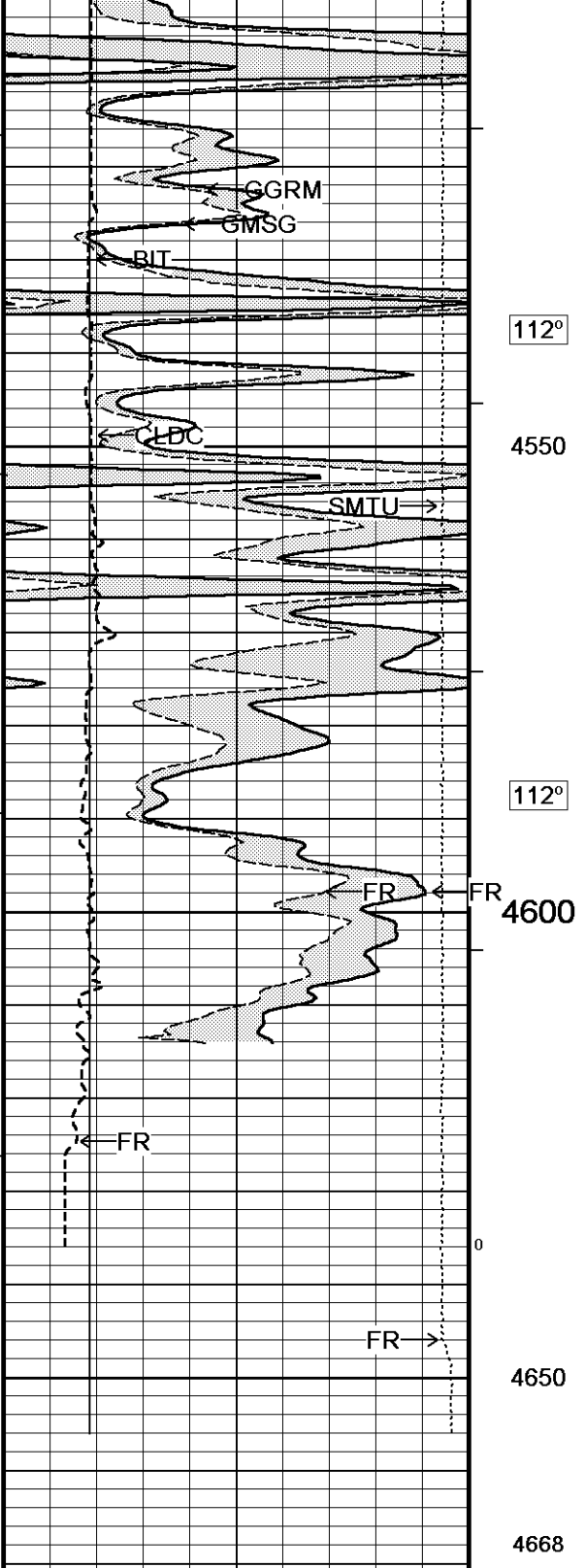
107°

200 4050









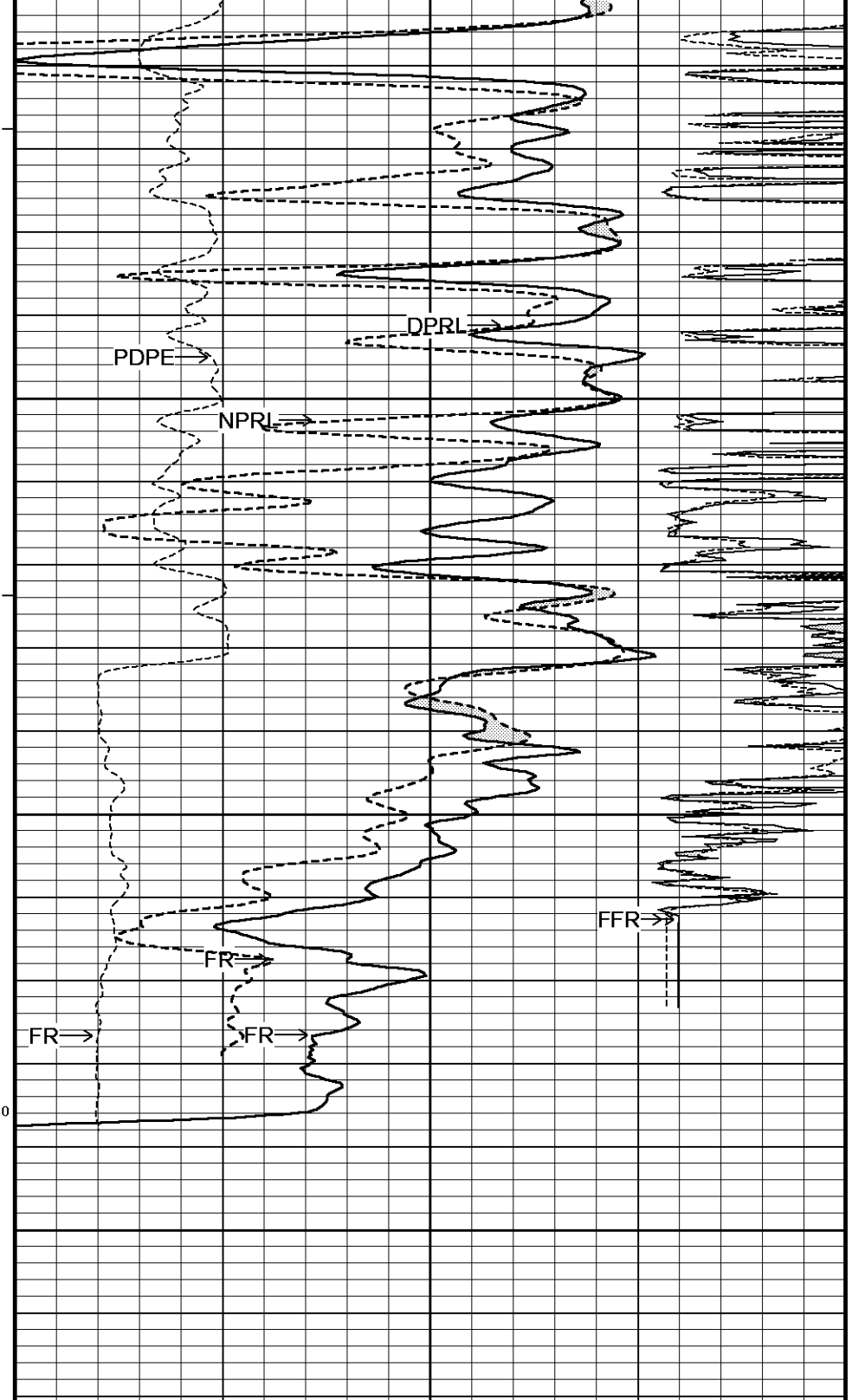
Timing Marks
every 60.0 sec

Density Caliper
inches
6 11 16

Bit Size
inches

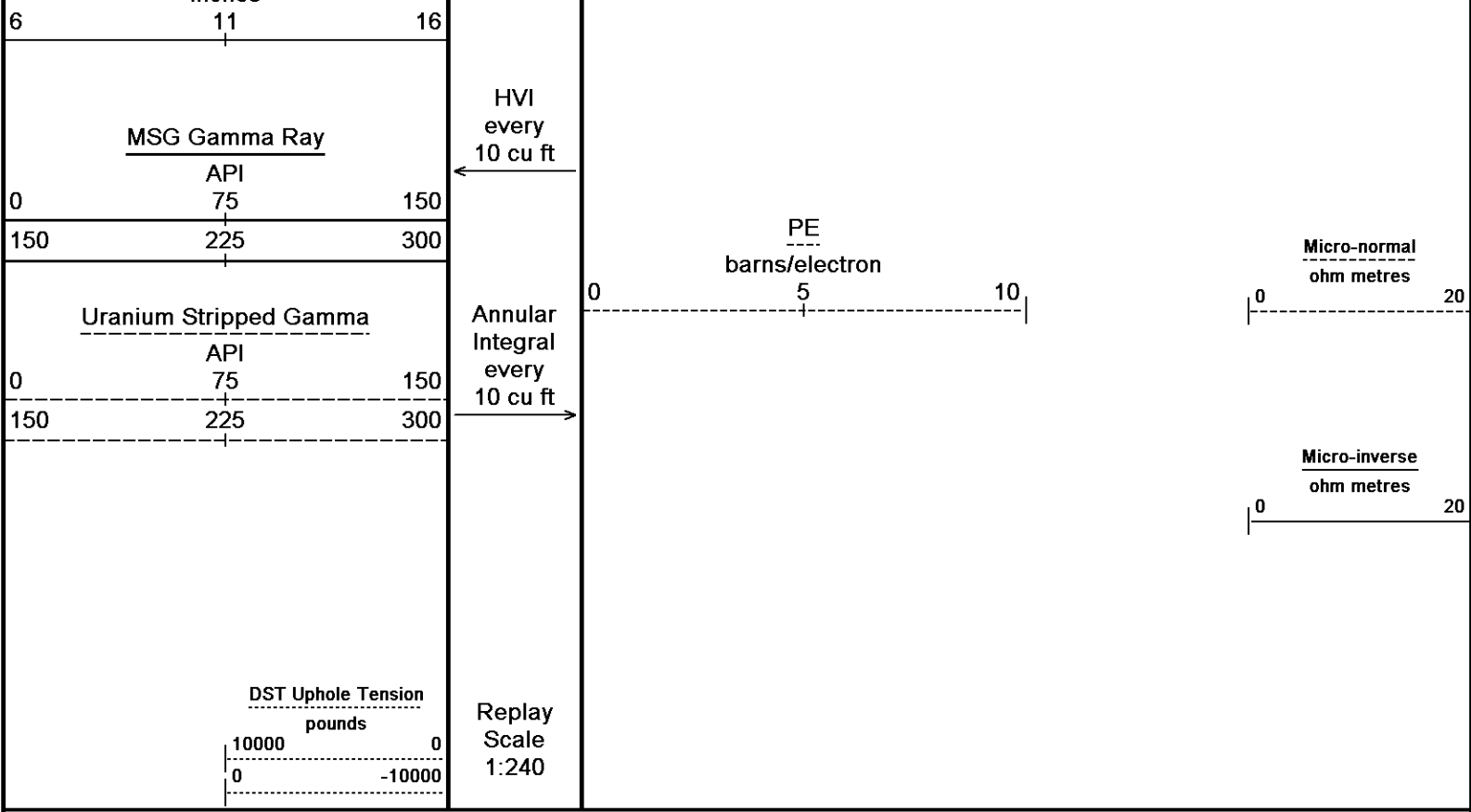
Depth
in
Feet

Borehole
Temp in
deg F



Limestone Neutron Por.
percent
30 20 10 0 -10

Limestone Density Por.
percent
30 20 10 0 -10



Depth Based Data - Maximum Sampling Increment 10.0cm

Filename: E:\WLS 15.03.4802\LARSON (INDUSTRIAL PARK 1-19)\MAIN PASS.dta

System Versions: Logged with 15.03.4802 Plotted with 15.03.4802

Plotted on 06-DEC-2015 16:37

Recorded on 06-DEC-2015 13:54

↑

5 INCH POROSITY LOG

↑

↓

REPEAT SECTION

↓

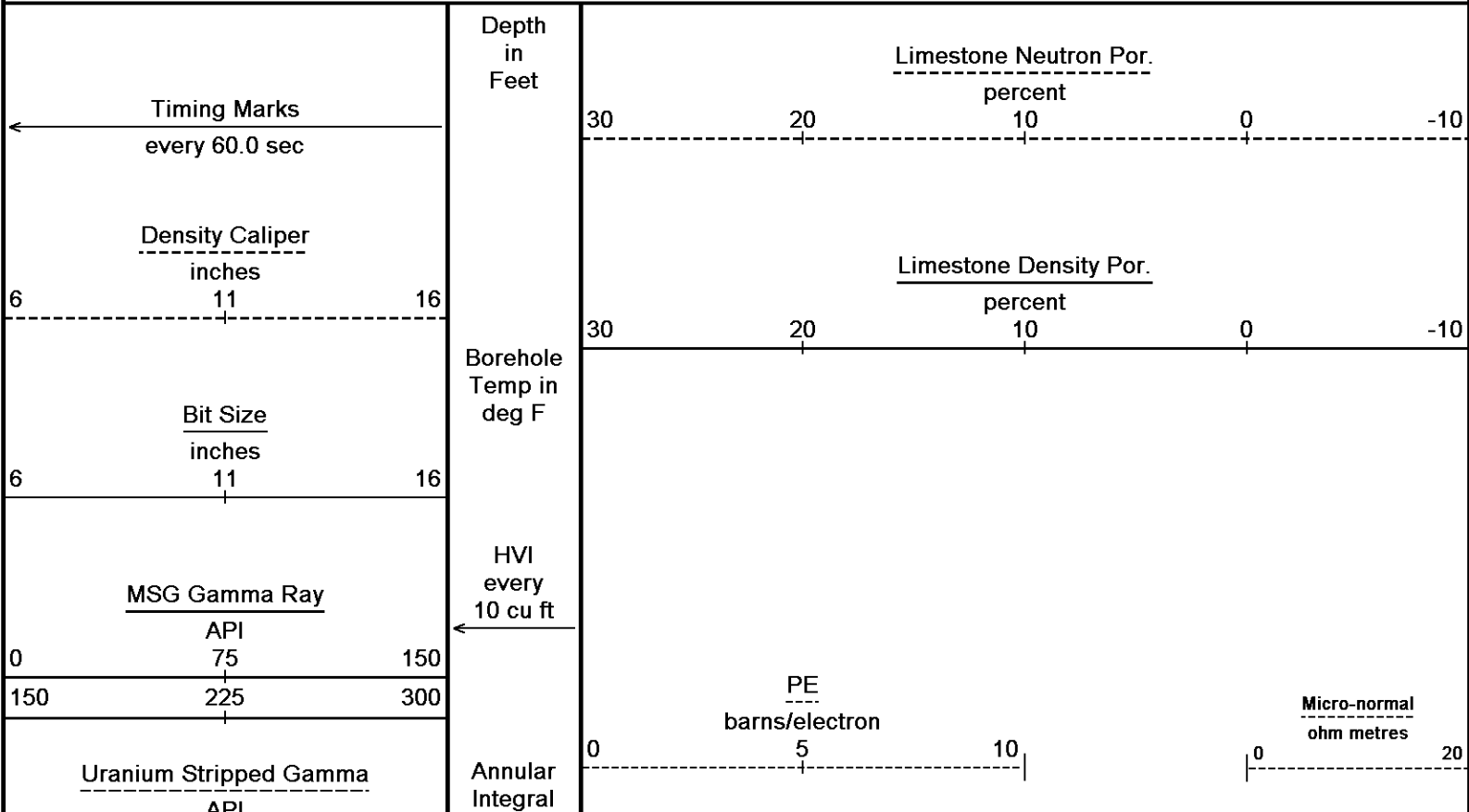
Depth Based Data - Maximum Sampling Increment 10.0cm

Filename: E:\WLS 15.03.4802\LARSON (INDUSTRIAL PARK 1-19)\REPEAT PASS.dta

System Versions: Logged with 15.03.4802 Plotted with 15.03.4802

Plotted on 06-DEC-2015 16:37

Recorded on 06-DEC-2015 13:38



0 75 150
150 225 300

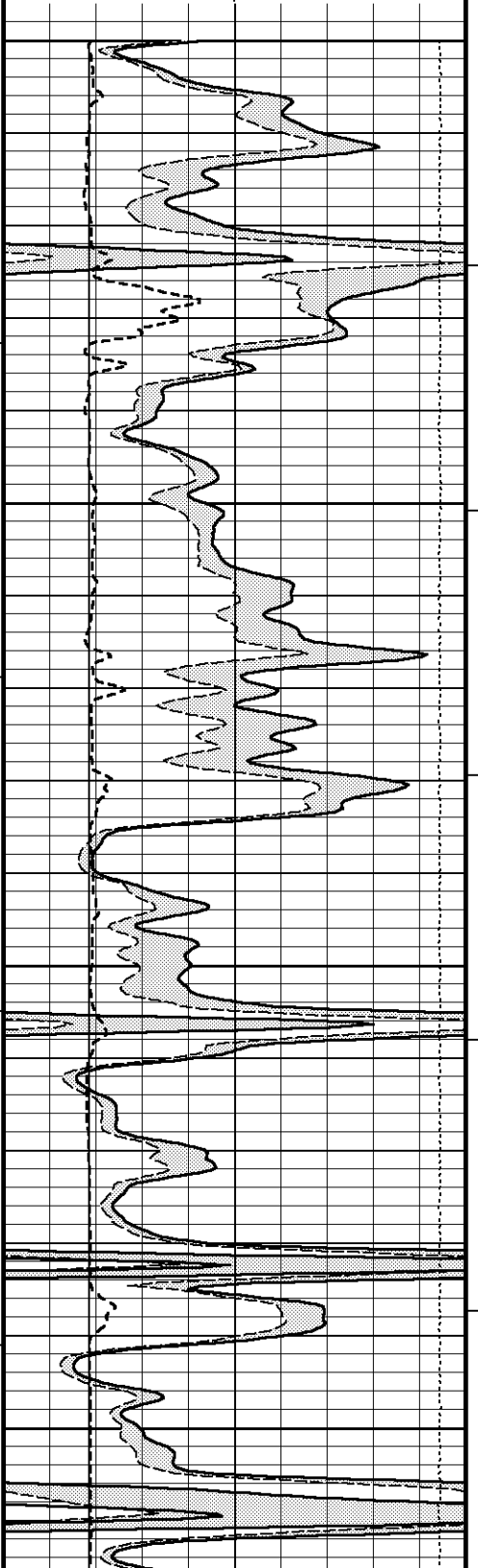
every
10 cu ft →

Micro-inverse
ohm metres

0 20

DST Uphole Tension
pounds
10000 0
0 -10000

Replay
Scale
1:240



4350

109°

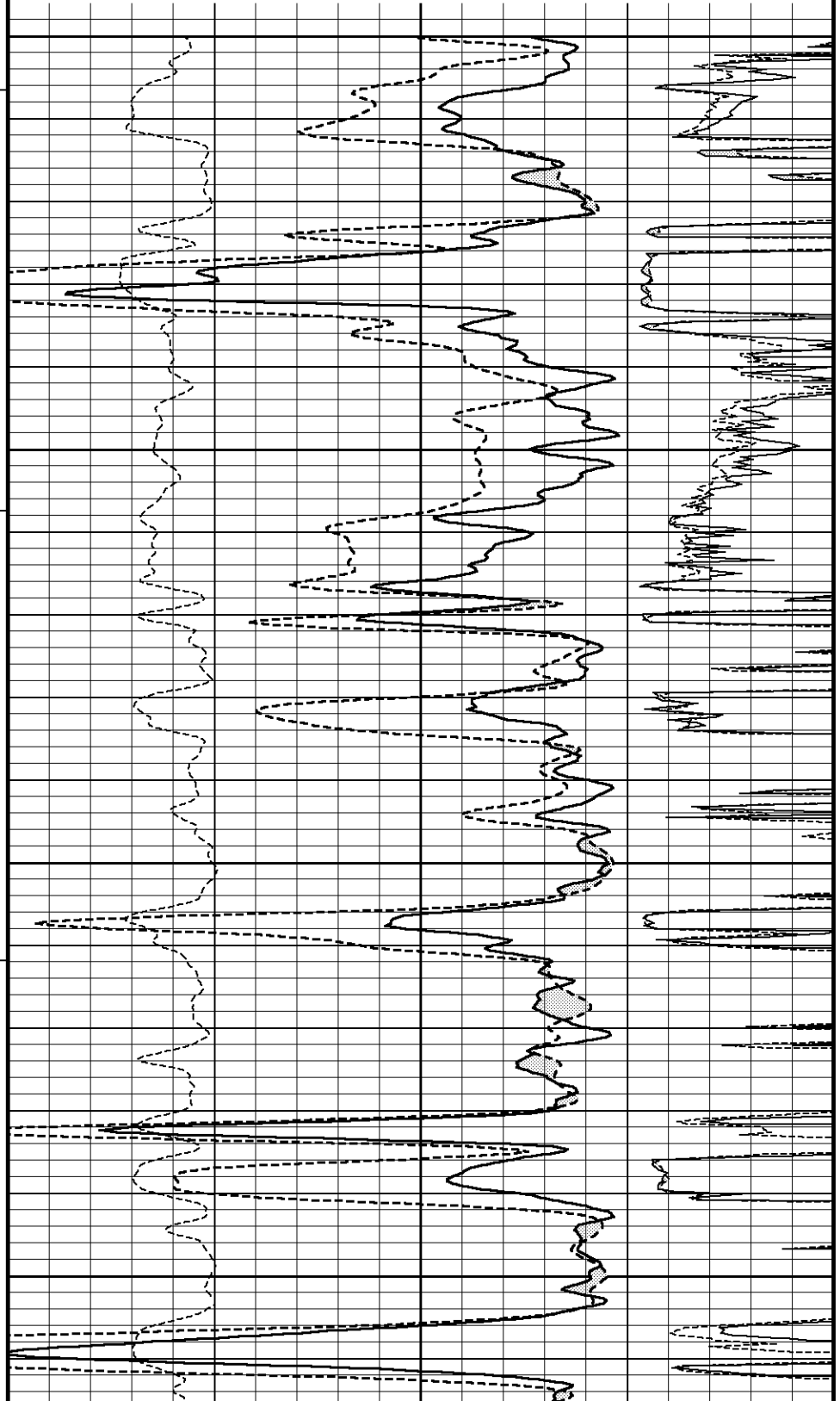
4400

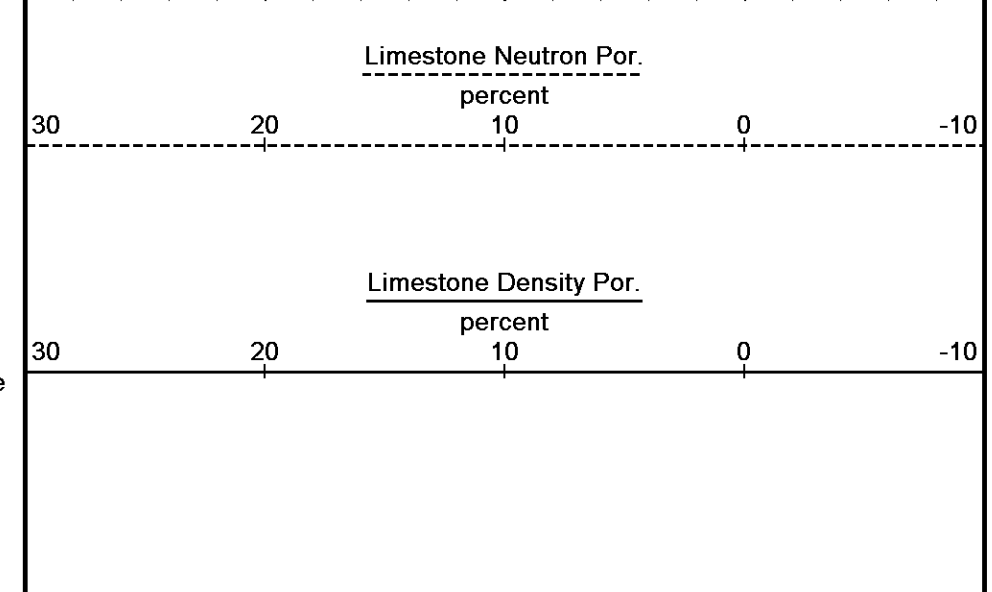
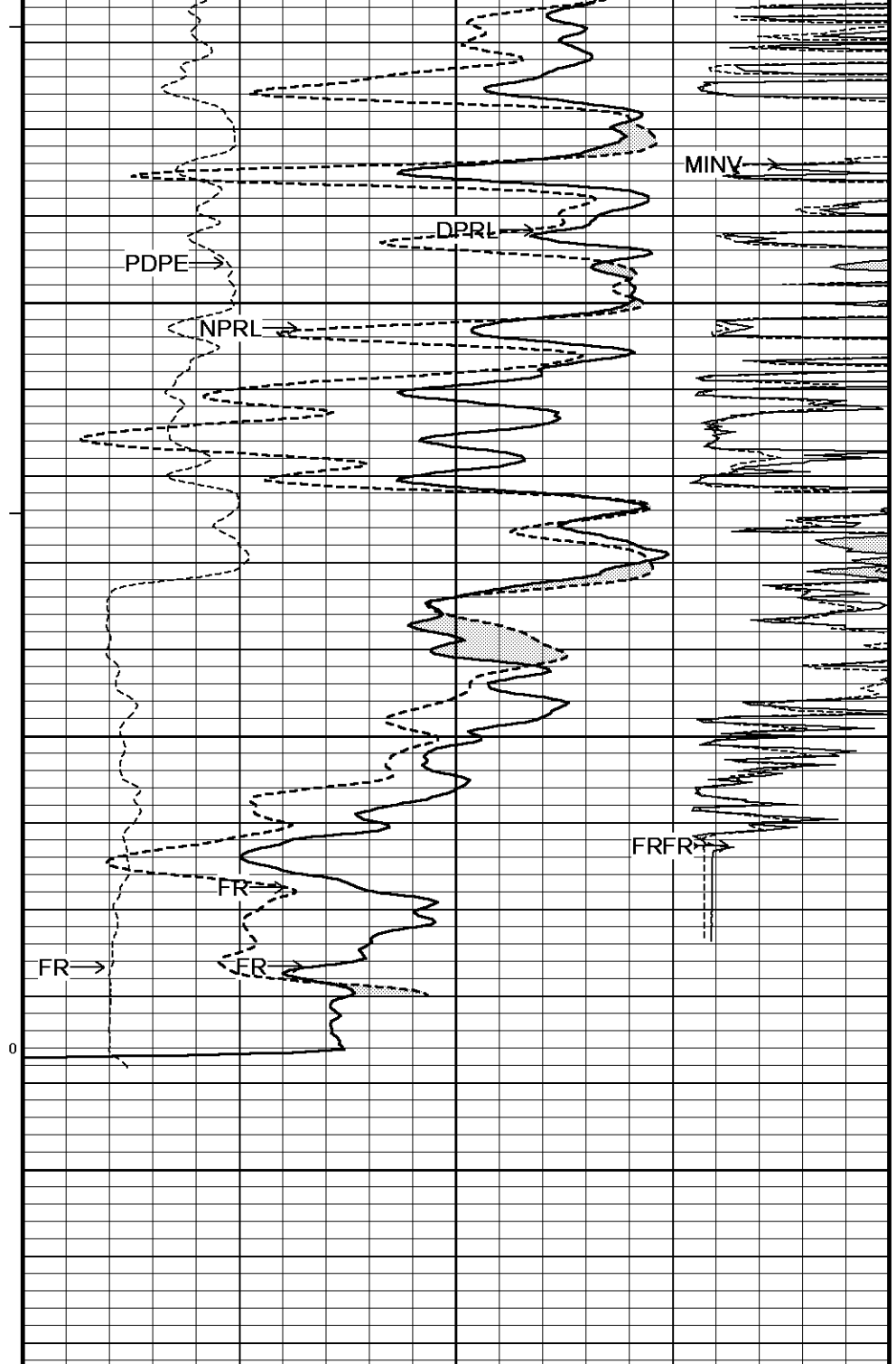
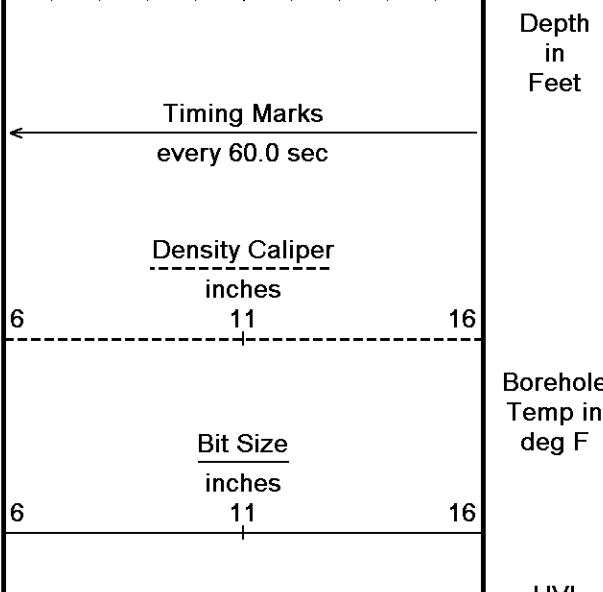
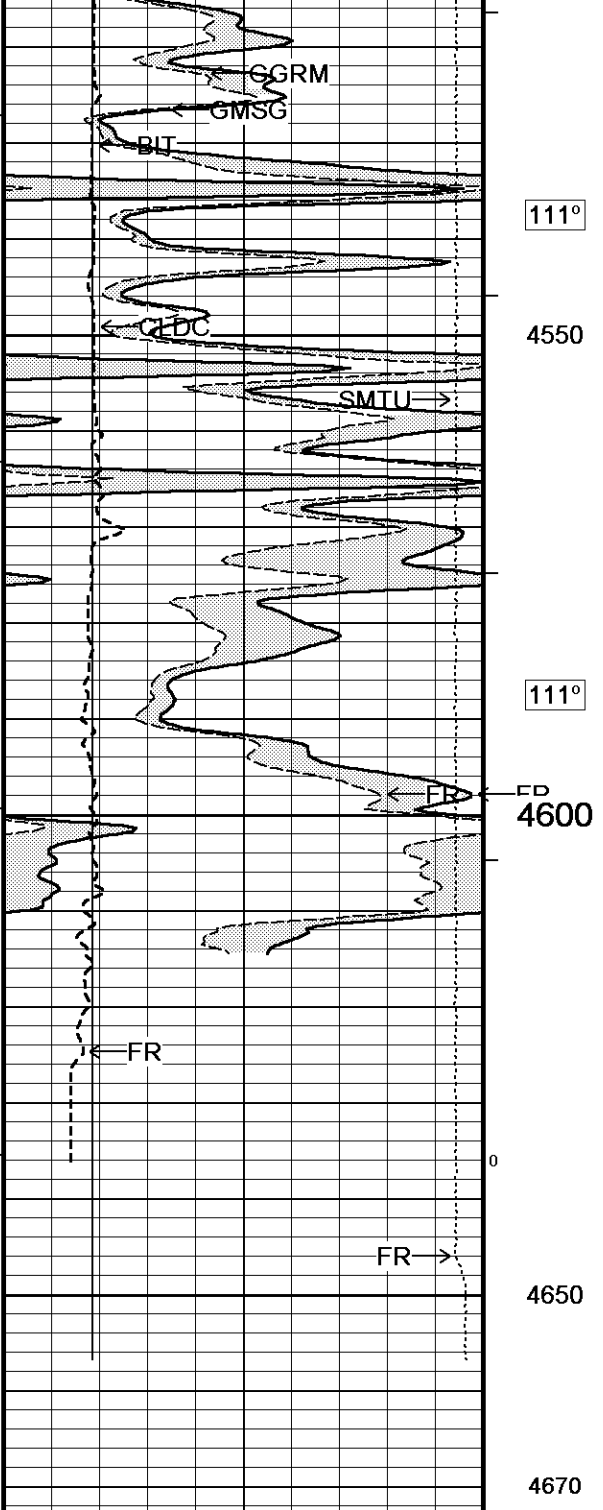
109°

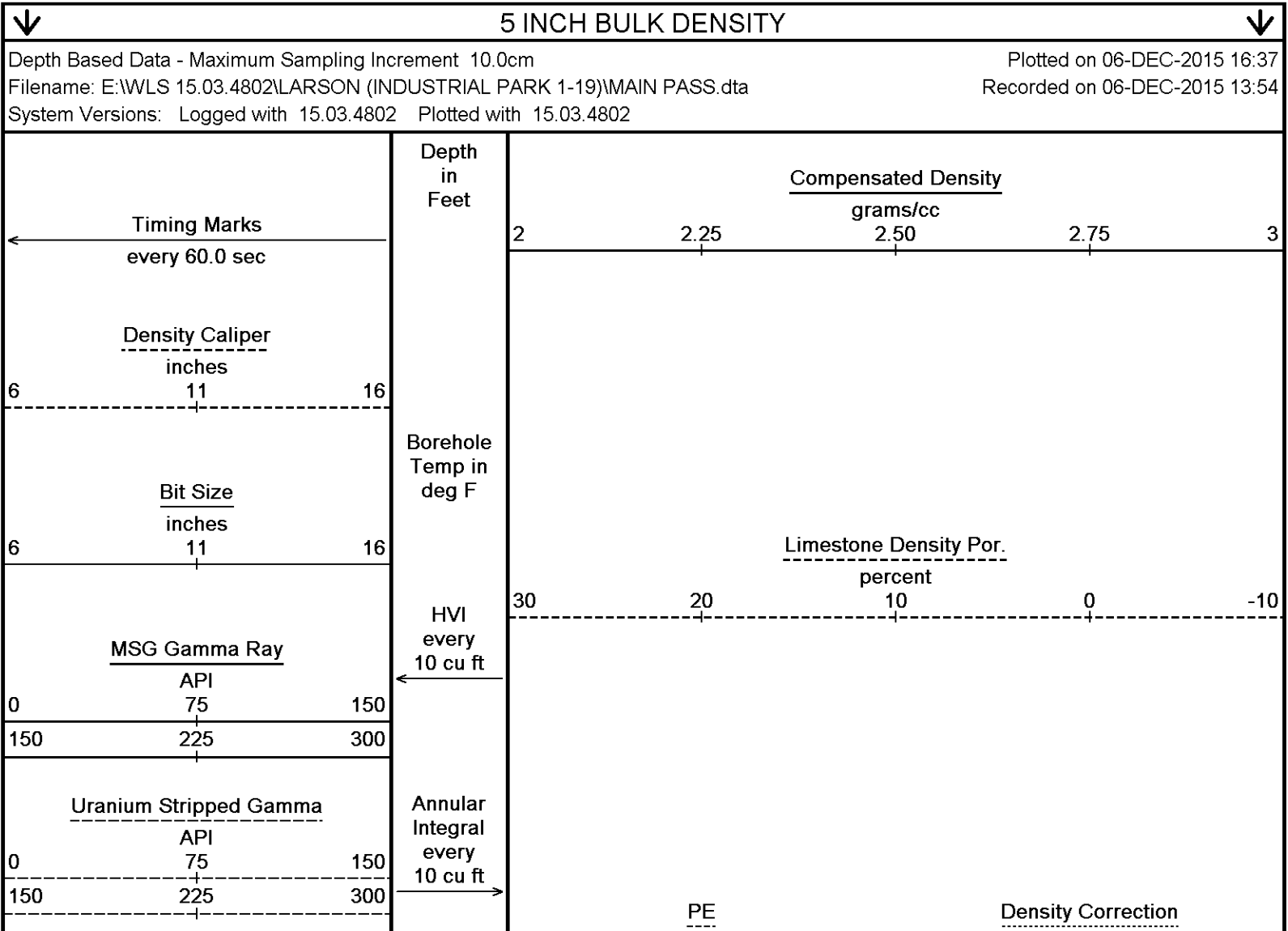
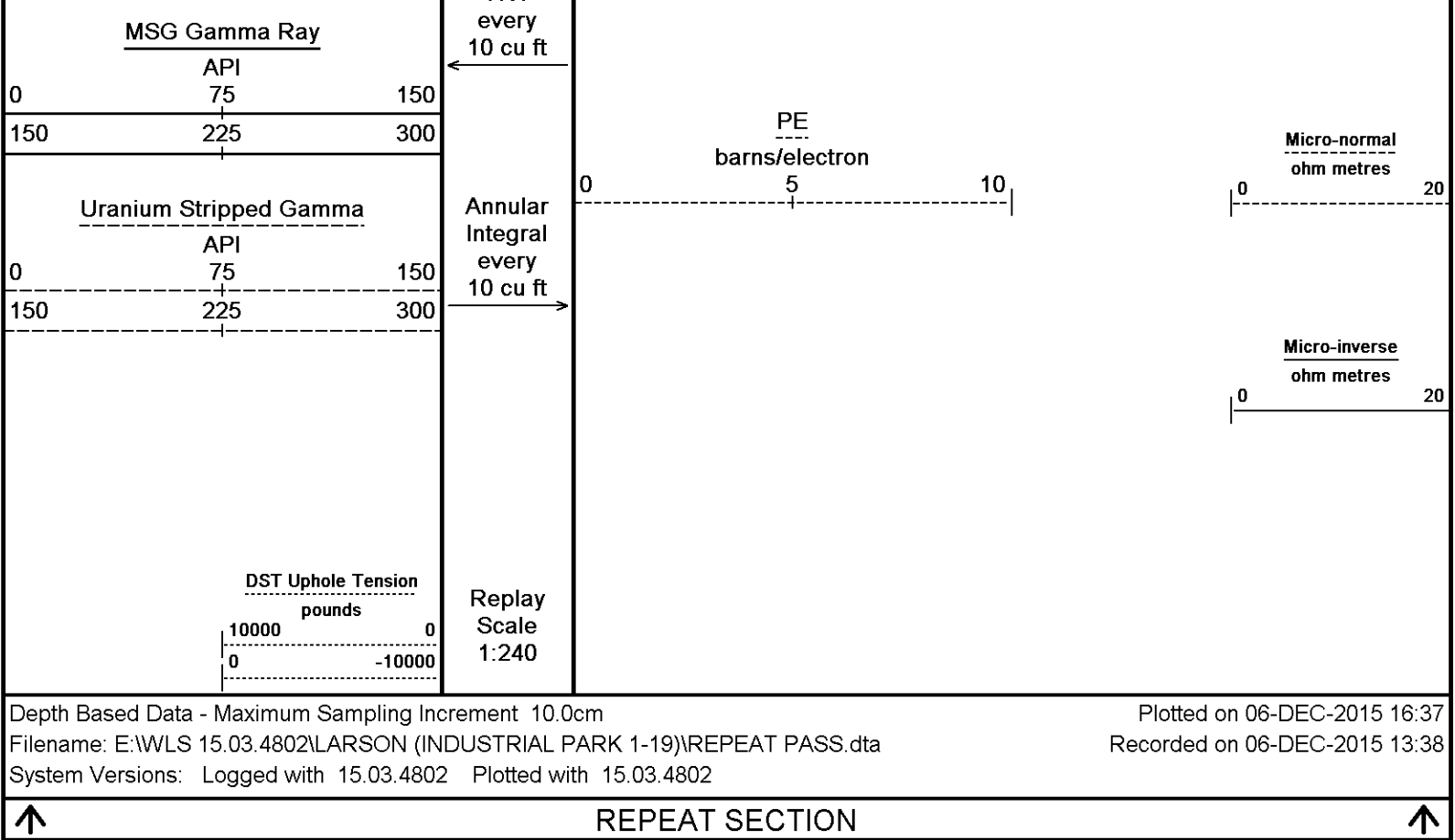
4450

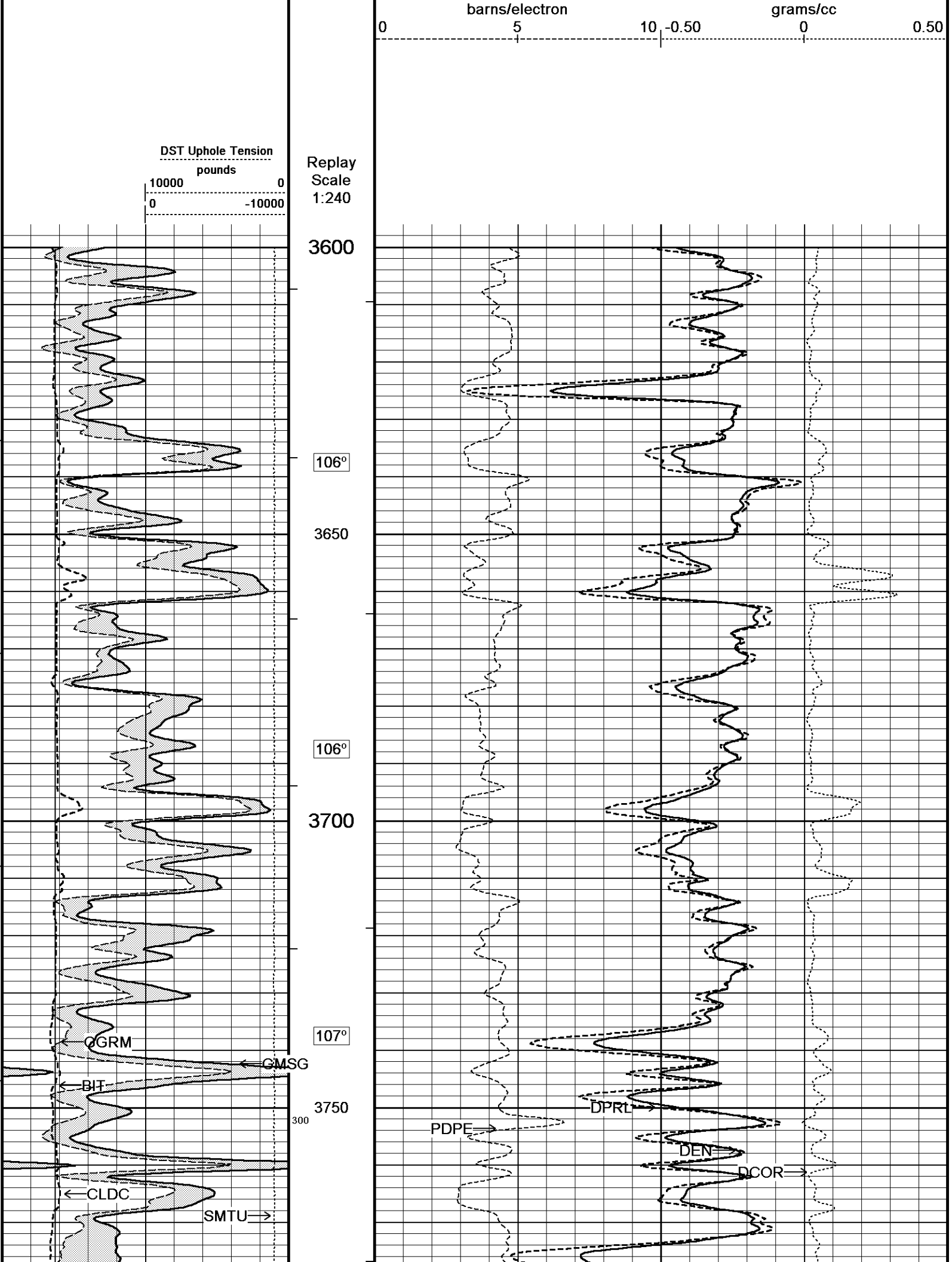
110°

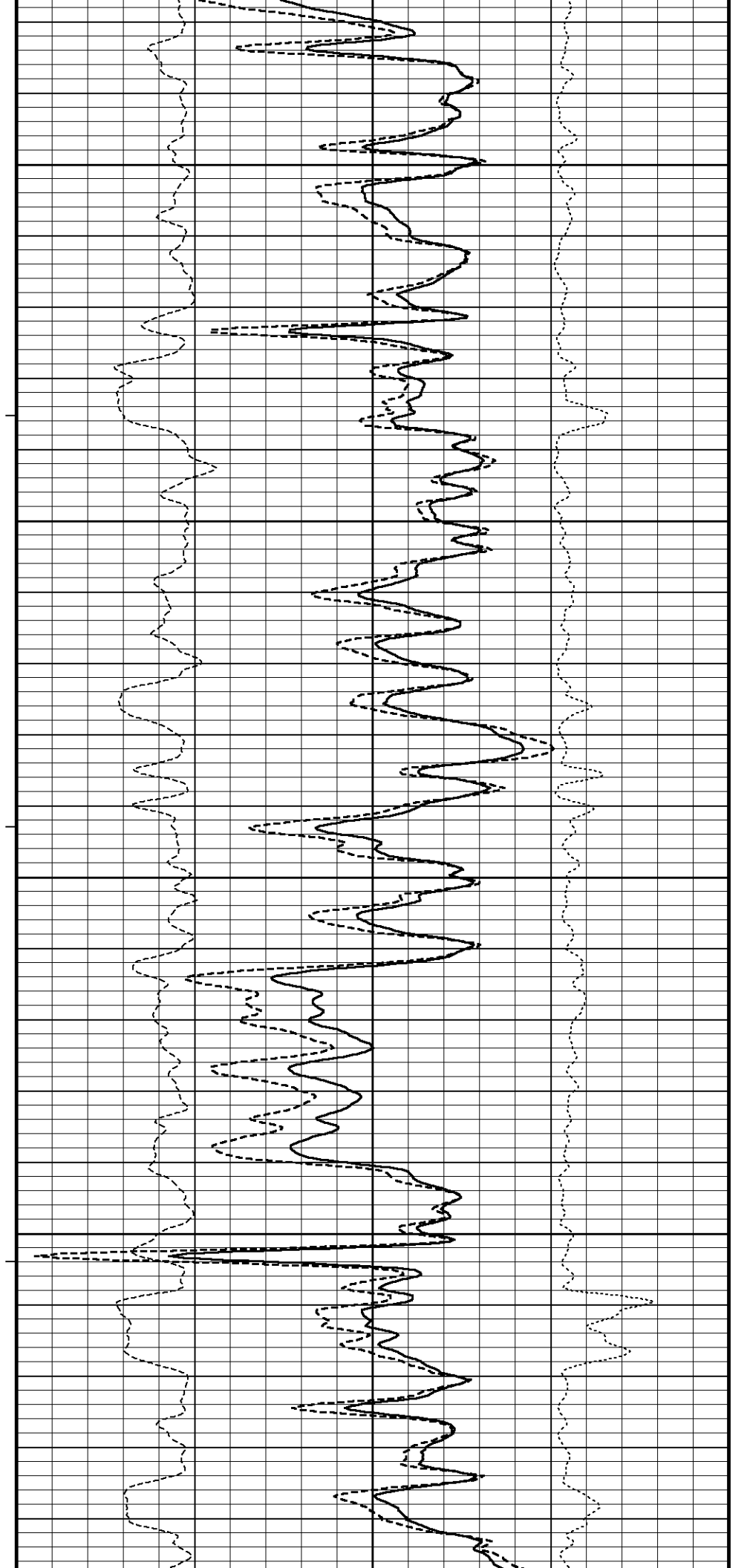
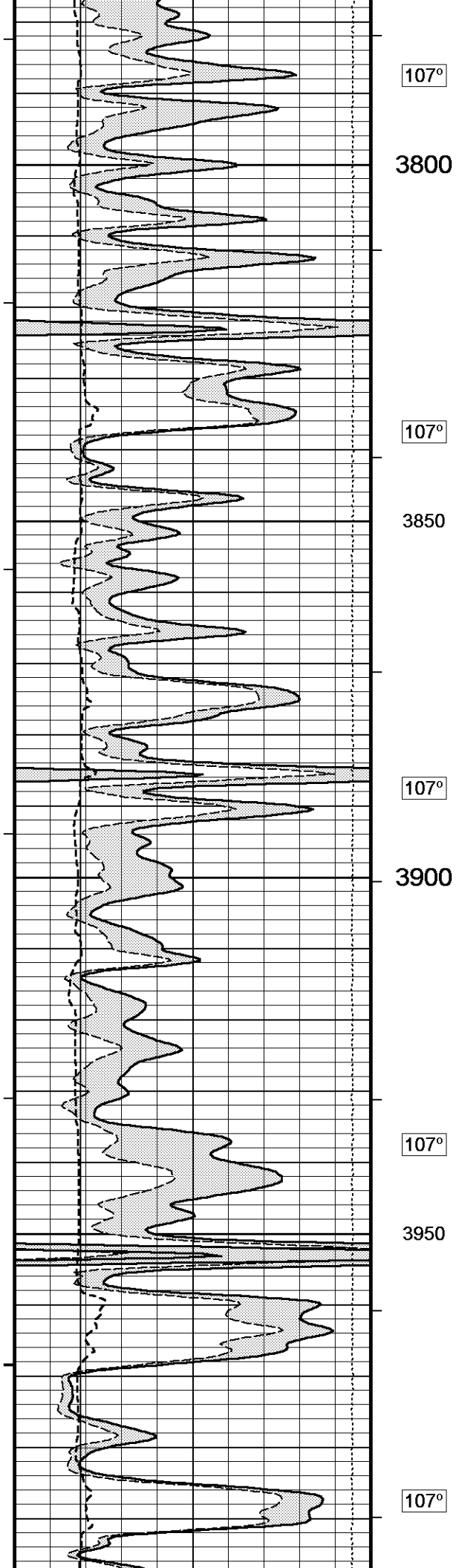
4500

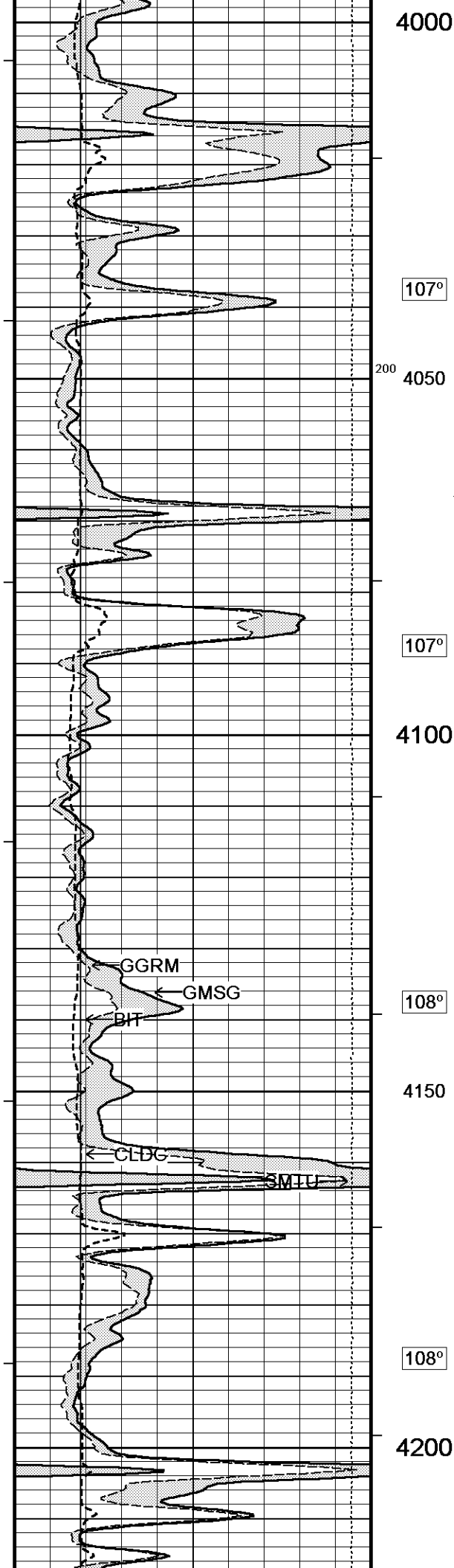












4000

107°

200 4050

100

107°

4100

108°

4150

108°

4200

GGRM

GMSG

BIT

CLDG

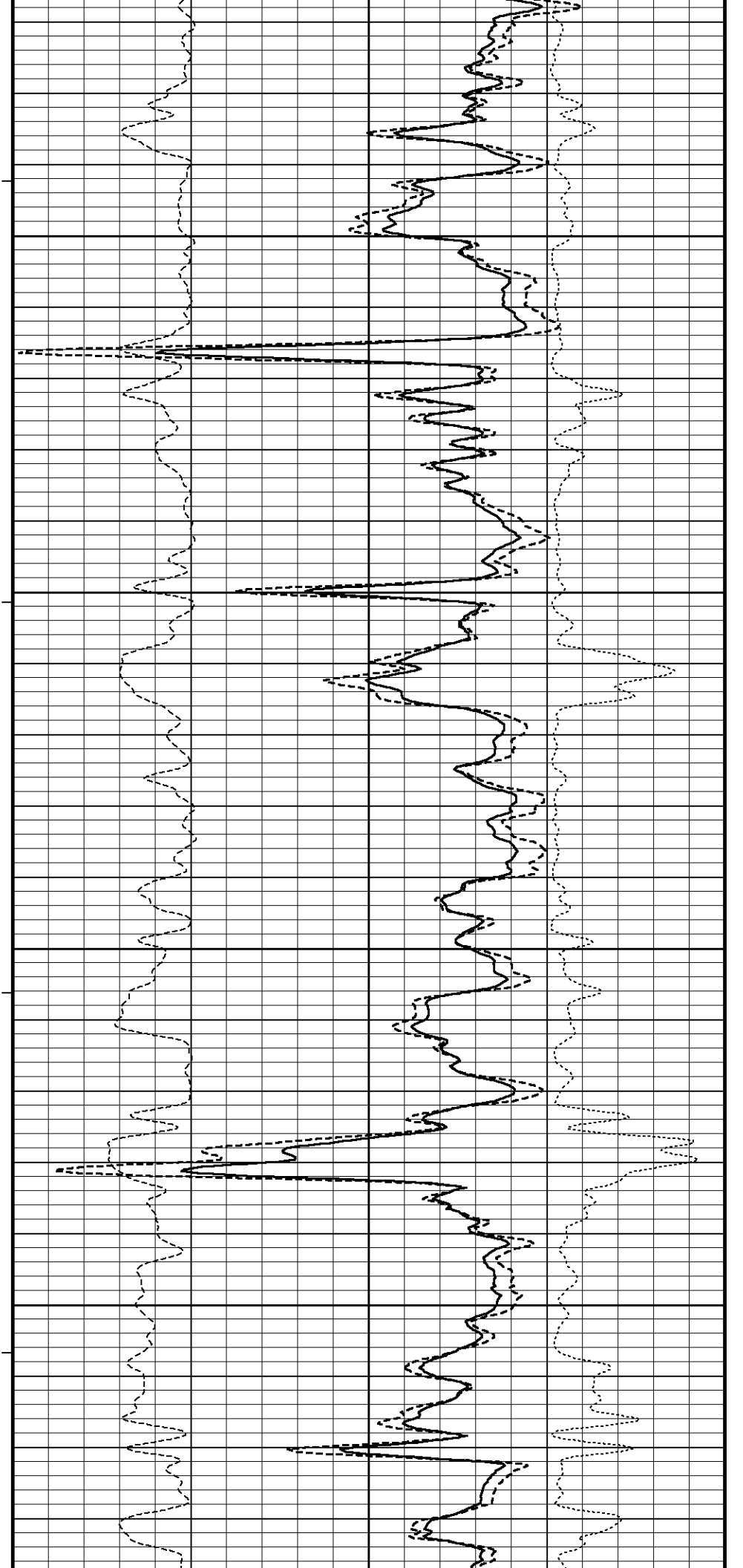
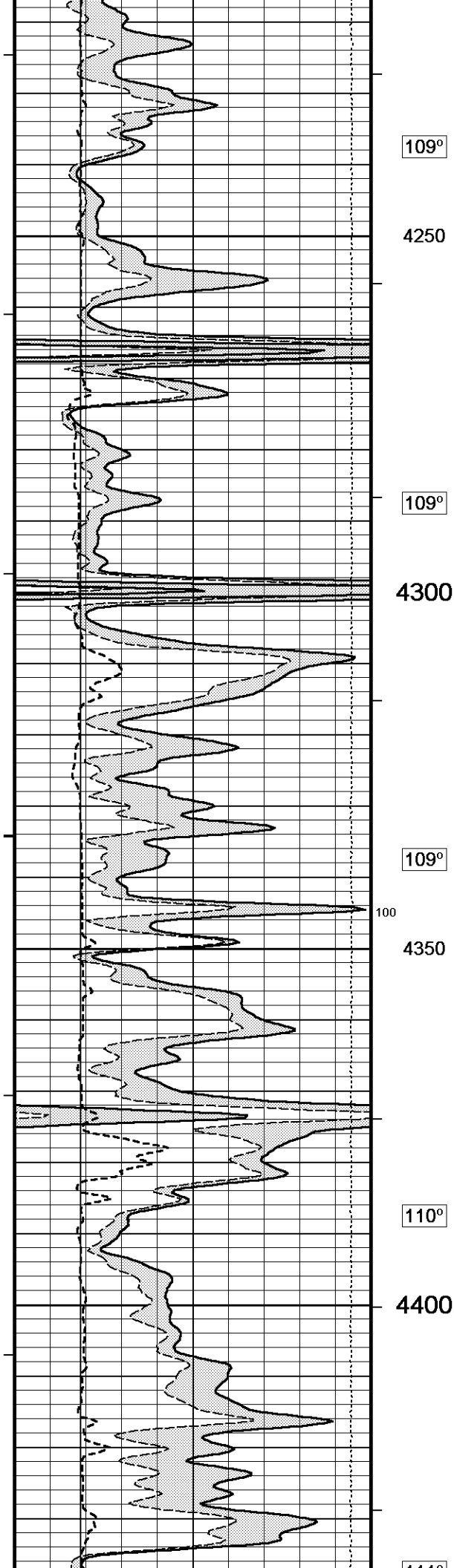
SMTU

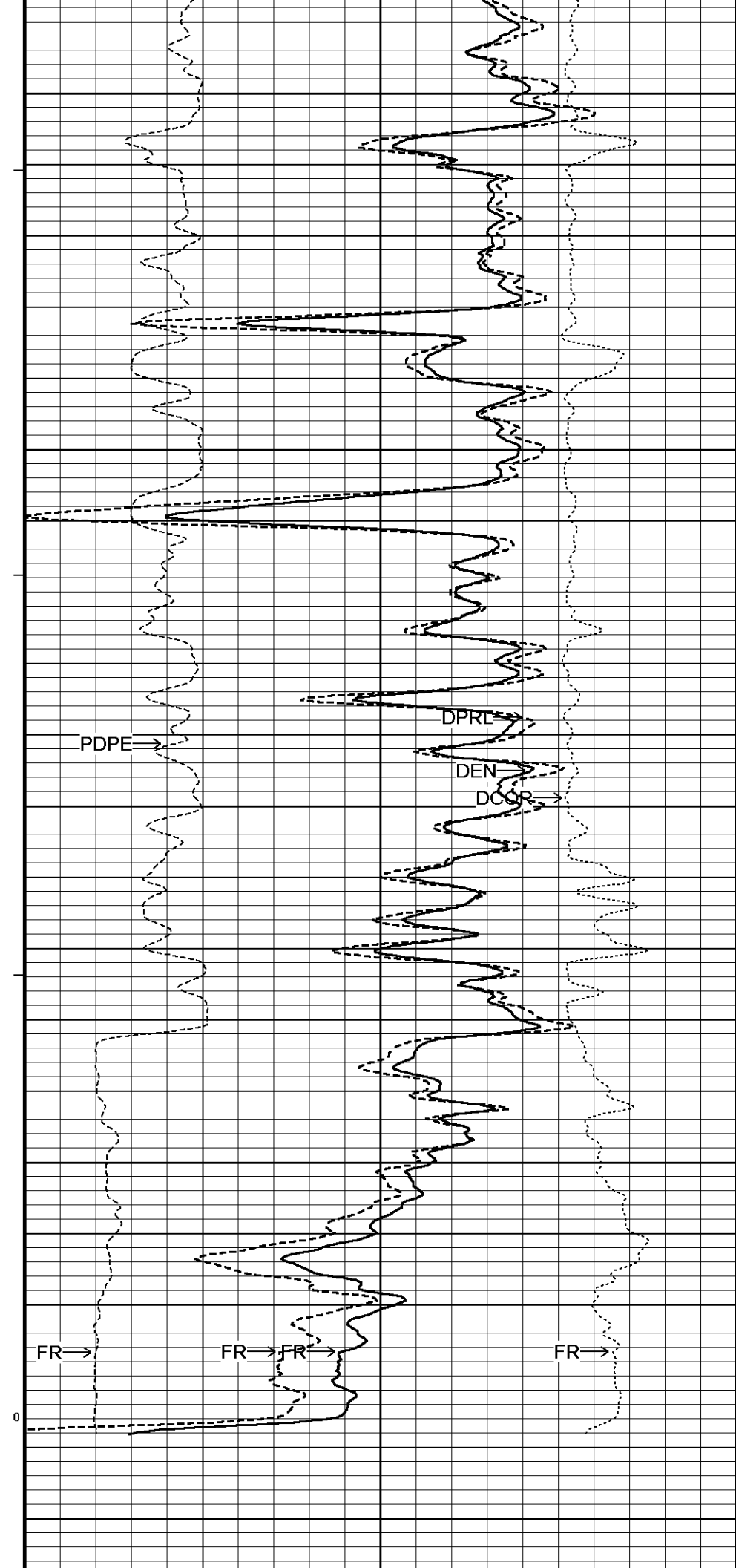
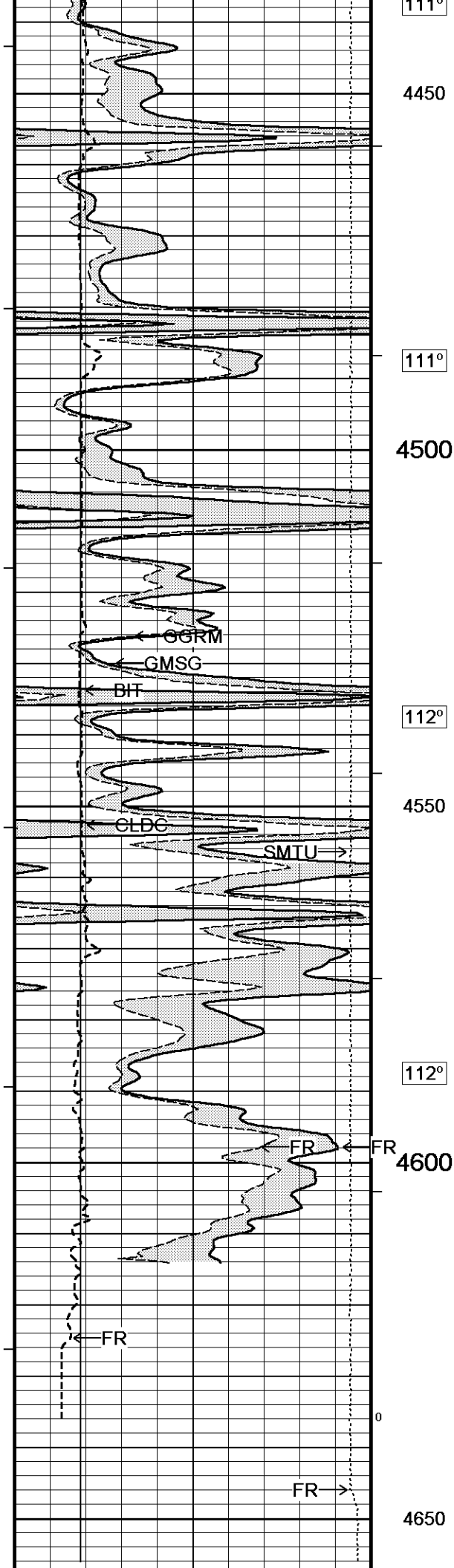
PDPE

DPRL

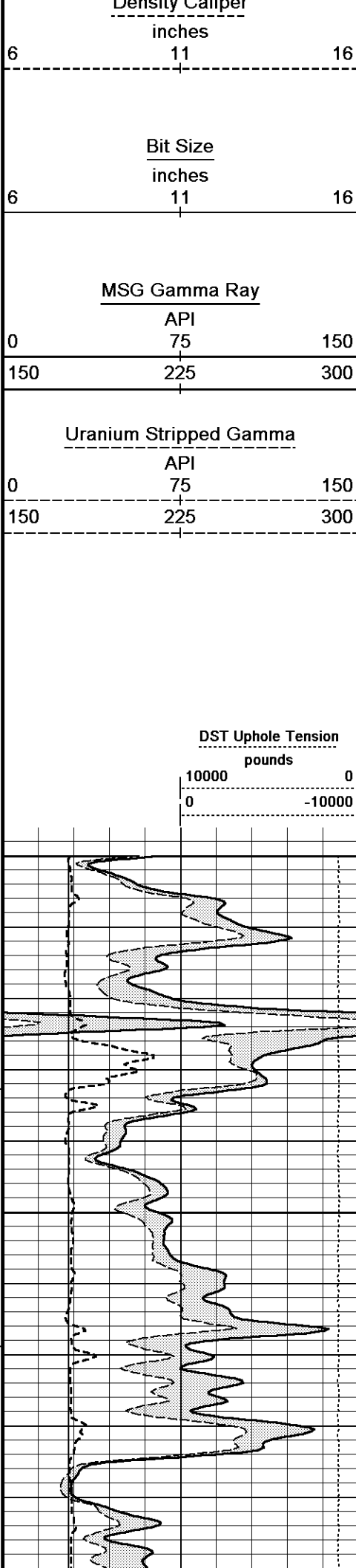
DEN

DCOR





Timing Marks every 60.0 sec Density Caliper	Depth in Feet	<u>Compensated Density</u> grams/cc				
		2	2.25	2.50	2.75	3

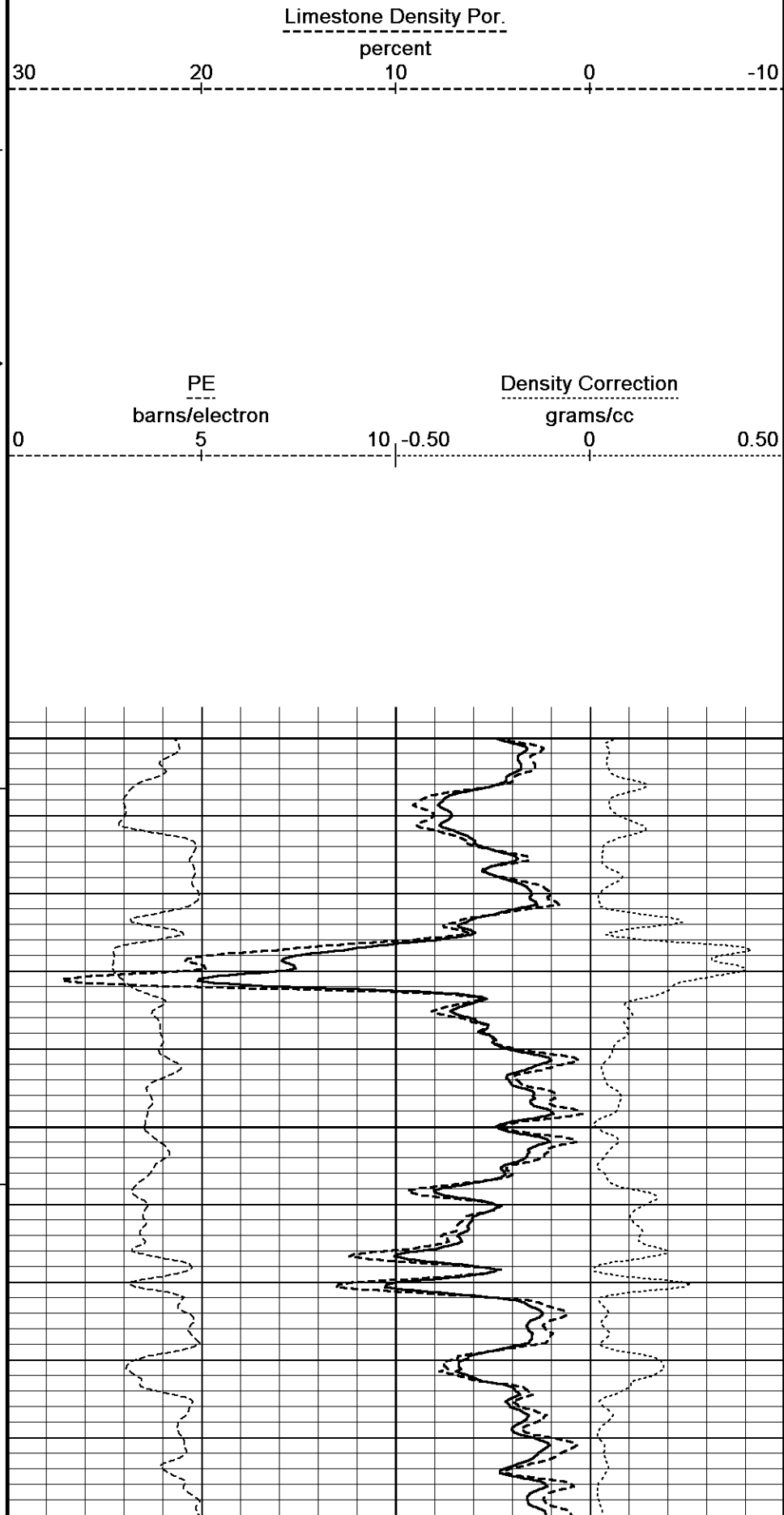


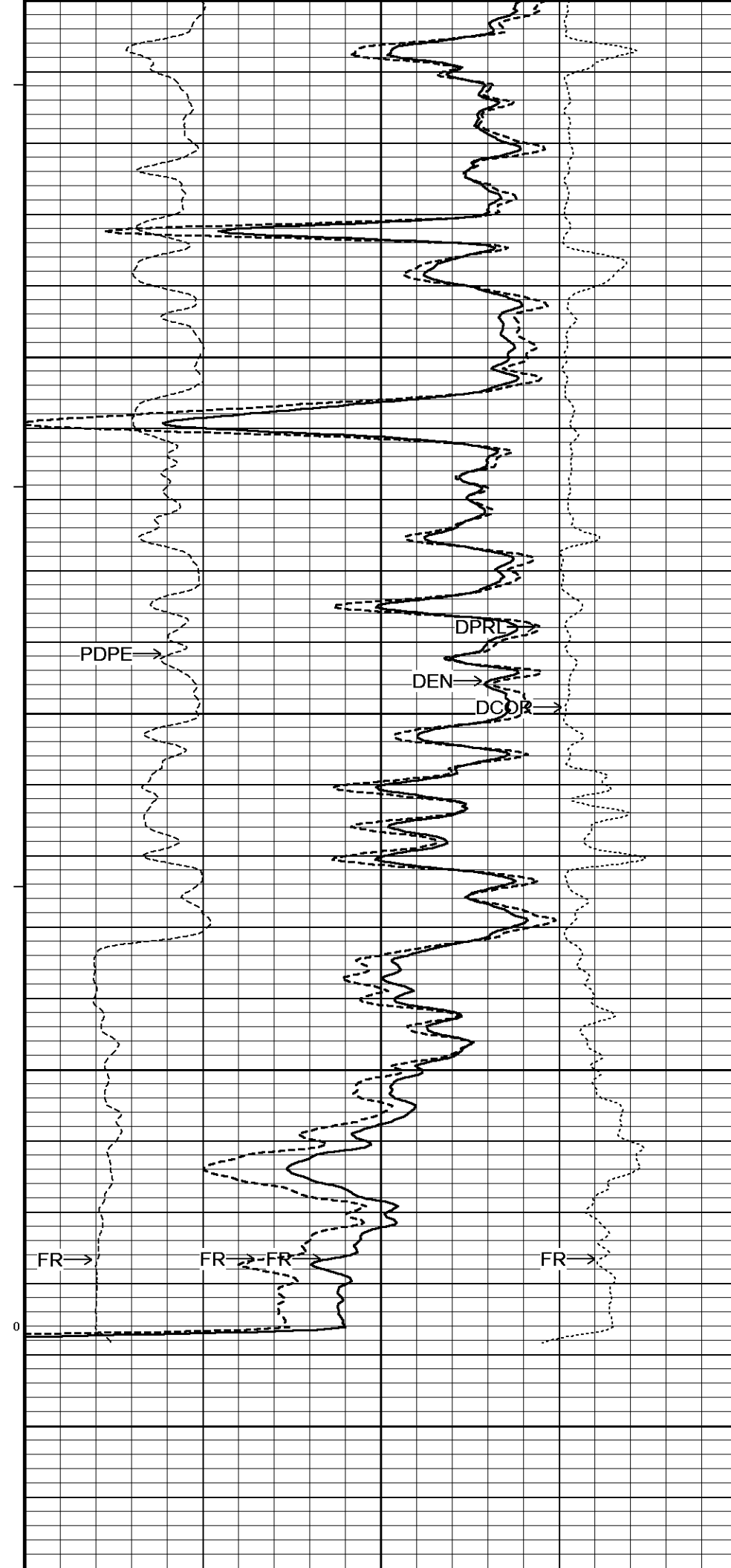
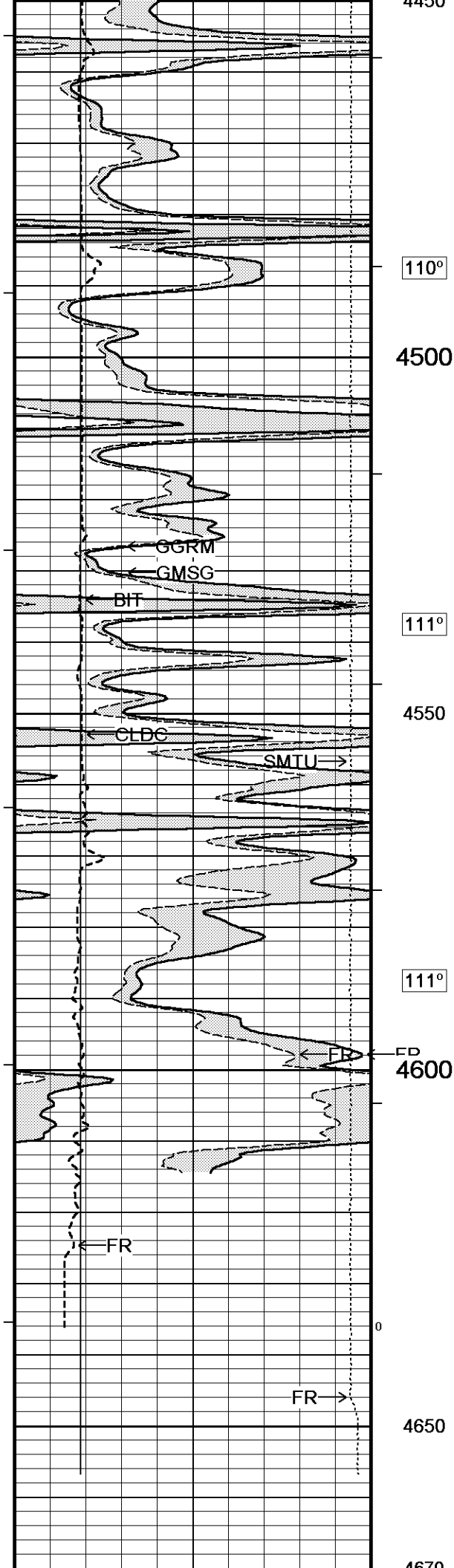
Borehole
Temp in
deg F

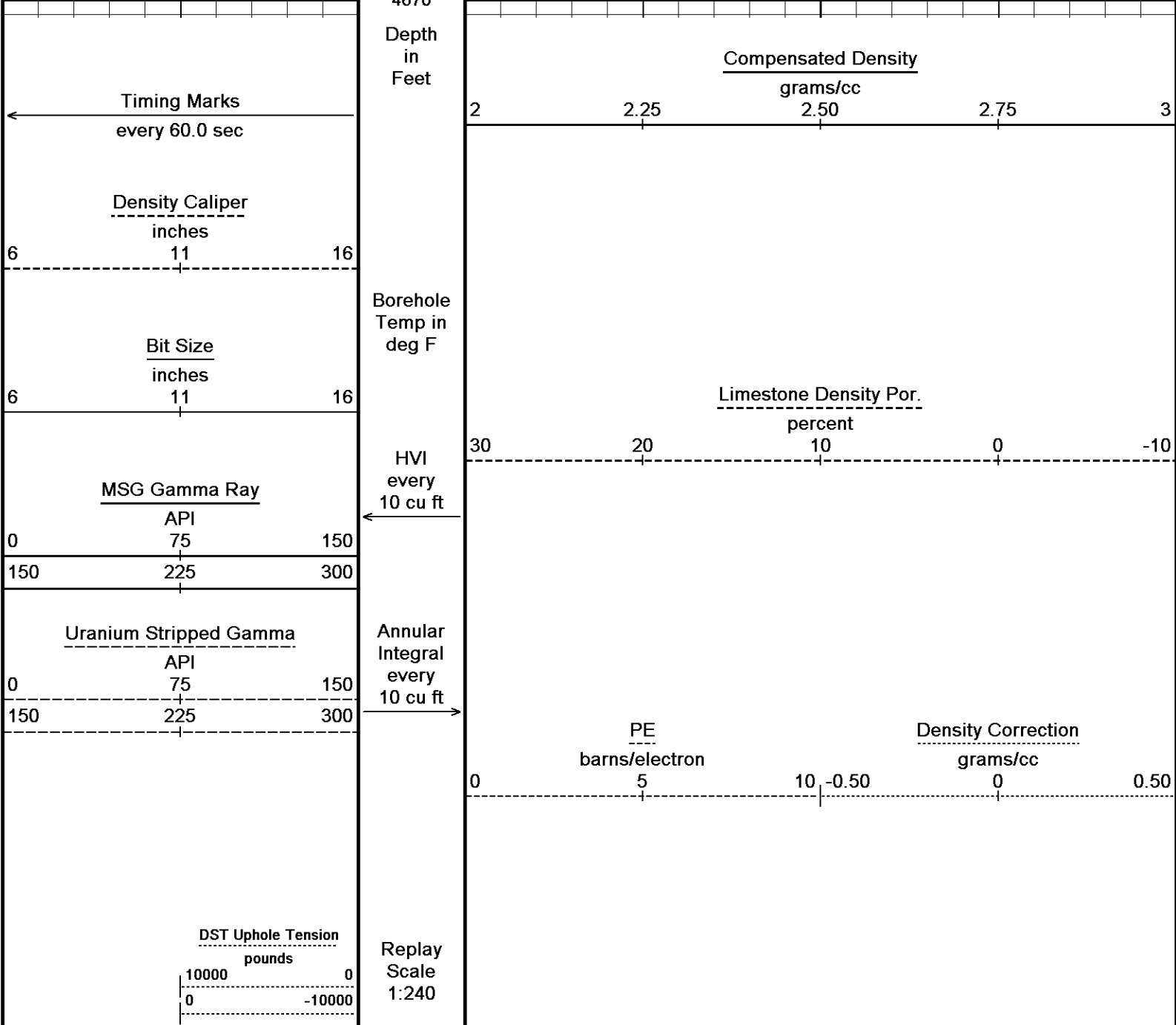
HVI
every
10 cu ft

Annular
Integral
every
10 cu ft

Replay
Scale
1:240







Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: E:\WLS 15.03.4802\LARSON (INDUSTRIAL PARK 1-19)\REPEAT PASS.dta
System Versions: Logged with 15.03.4802 Plotted with 15.03.4802

Plotted on 06-DEC-2015 16:37
Recorded on 06-DEC-2015 13:38

↑ REPEAT SECTION ↑

BEFORE SURVEY CALIBRATION		
E:\WLS 15.03.4802\LARSON (INDUSTRIAL PARK 1-19)\DATA.dta		
General Constants All 000		Last Edited on 06-DEC-2015,12:25
General Parameters		
Mud Resistivity	2.500	ohm-metres
Mud Resistivity Temperature	52.000	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	
Hole/Annular Volume and Differential Caliper Parameters		
HVOL Method	Single Caliper	
HVOL Caliper 1	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	Density Caliper	

Rwa Parameters	
Porosity used	Base Density Porosity
Resistivity used	Array Ind. One Res Rt
RWA Constant A	0.610
RWA Constant M	2.150
SW/APOR Tool Source	0.000

High Resolution Temperature Calibration MCG-E.A 571		Field Calibration on 26-NOV-2015,09:10
	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	100.00	100.00

High Resolution Temperature Constants MCG-E.A 571		Last Edited on 22-JUL-2014,14:44
Pre-filter Length	11	

Compact Spectral Gamma Calibration MSG-A.A 119		Base Calibration on 25-AUG-2015 12:42	Field Calibration on
--	--	---------------------------------------	----------------------

Base Calibration

Gamma Ray

	Measured	Calibrated (API)
Background	42	18
Calibrator (Gross)	730	314
Calibrator (Net)	688	296

Mixture Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	34.2	5.2	1.4	0.4	0.5
Calibrator (Gross)	580.8	100.0	29.9	9.0	10.0
Calibrator (Net)	546.5	94.8	28.5	8.6	9.5
	K %	U ppm	Th ppm		
Concentrations	6.0	17.1	40.5		

Potassium Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	34.2	5.2	1.4	0.4	0.5
Calibrator (Gross)	108.2	34.5	15.8	0.4	0.6
Calibrator (Net)	74.0	29.3	14.4	0.1	0.0
	K %	U ppm	Th ppm		
Concentrations	5.8	0.0	0.0		

Uranium Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	34.2	5.2	1.4	0.4	0.5
Calibrator (Gross)	322.2	44.6	10.7	6.0	2.4
Calibrator (Net)	288.0	39.4	9.3	5.6	1.9
	K %	U ppm	Th ppm		
Concentrations	0.0	17.0	0.0		

Thorium Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	34.2	5.2	1.4	0.4	0.5
Calibrator (Gross)	240.0	34.7	6.6	3.7	9.0
Calibrator (Net)	205.8	29.4	5.2	3.3	8.5
	K %	U ppm	Th ppm		
Concentrations	0.0	0.0	41.1		

Field @ Base Calibration

Calibration Type

496
525

Gamma Ray

	Measured	Calibrated (API)
Background	41.8	18.0
Calibrator (Gross)	729.7	314.0
Calibrator (Net)	687.9	296.1

Mixture Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	34.2	5.2	1.4	0.4	0.5
Calibrator (Gross)	580.8	100.0	29.9	9.0	10.0
Calibrator (Net)	546.5	94.8	28.5	8.6	9.5

Field Calibration

Calibration Type

000

Gamma Ray

	Measured	Calibrated (API)
Background	0.0	0.0
Calibrator (Gross)	0.0	0.0
Calibrator (Net)	0.0	0.0

Mixture Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	0.0	0.0	0.0	0.0	0.0
Calibrator (Gross)	0.0	0.0	0.0	0.0	0.0
Calibrator (Net)	0.0	0.0	0.0	0.0	0.0

Compact Spectral Gamma Calibration Tolerances MSG-A.A 119

Base Check K	5.81		%	Field @ Base Check K	0.00		%
Base Check U	17.03		ppm	Field @ Base Check U	0.00		ppm
Base Check T	36.71		ppm	Field @ Base Check T	0.00		ppm
Field Check K	0.00		%				
Field Check U	0.00		ppm				
Field Check T	0.00		ppm				

Compact Spectral Gamma Constants MSG-A.A 119

Last Edited on 06-DEC-2015,12:20

Background Calibrator Number	496	
Mixture Calibrator Number	525	
Potassium Calibrator Number	499	
Uranium Calibrator Number	505	
Thorium Calibrator Number	502	
Mud Density	1.11	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Potassium Equivalence	Chloride	
K Mud Concentration	0.00	%

Caliper Calibration MPD-B 120

Base Calibration on 04-DEC-2015 15:09

Field Calibration on 06-DEC-2015 06:01

Base Calibration	Measured	Calibrator Size (in)
Reading No		
1	19248	3.99
2	27792	5.96
3	36736	8.03
4	44688	9.86
5	54049	11.93
6	N/A	N/A
Field Calibration		
	Measured Caliper (in)	Actual Caliper (in)
	8.02	8.03

Caliper Calibration Tolerances MPD-B 120

Long Arm Field Cal.	8.02		in
---------------------	------	--	----

Photo Density Calibration MPD-B 120

Base Calibration on 04-DEC-2015 14:56

Field Check on 04-DEC-2015 15:03

Density Calibration	Measured	Calibrated (sdu)
Base Calibration		
	Near	Far
	0.42	0.174

Background	942	1171		
Reference 1	53061	26273	59494	30754
Reference 2	21830	2391	24557	2522

Field Check at Base

941.6 1171.1

Field Check

943.0 1173.0

PE Calibration

Base Calibration

Measured

Calibrated

	WS	WH	Ratio	Ratio
Background	171	840		
Reference 1	20067	52911	0.382	0.367
Reference 2	5749	21721	0.267	0.271

Field Check at Base

170.9 839.9

Field Check

169.2 840.0

Photo Density Calibration Tolerances MPD-B 120

Near Density Ratio 2.50

-5%	2.52	+5%
0.089	0.110	0.131

PE Calibration 0.110

Far Density Ratio 20.58

-5%	21.00	+5%
-----	-------	-----

Near Den. Field Check 943.0

-3%	941.6	+3%
-----	-------	-----

PE WS Field Check 169.2

-6%	170.9	+6%
-----	-------	-----

Far Den. Field Check 1173.0

-3%	1171.1	+3%
-----	--------	-----

PE WH Field Check 840.0

-6%	839.9	+6%
-----	-------	-----

Density Constants MPD-B 120

Last Edited on 06-DEC-2015,12:20

Density Source Id	P56135B
Nylon Calibrator Number	766
Aluminium Calibrator Number	633
Density Shoe Profile	8 inch
Caliper Source for Processing	Density Caliper
PE Correction to Density	Not Applied
Mud Density	1.11 gm/cc
Mud Density Z/A Multiplier	1.11
Mud Filtrate Density	1.00 gm/cc
Dry Hole Mud Filtrate Density	1.00 gm/cc
DNCT	0.00 gm/cc
CRCT	0.00 gm/cc
Density Z/A Correction	Hybrid

Matrix Density (gm/cc)	Depth (ft)
2.71	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00

DOWNHOLE EQUIPMENT

E:\WLS 15.03.4802\LARSON (INDUSTRIAL PARK 1-19)\DATA.dta

Cablehead, 11 pin
CBH-C 175 LG: 2.40 ft WT: 24.3 lb OD: 2.240 in

Compact Swivel Head Adaptor
SHA-J.B 719 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in



54.43 ft GRGC - MCG Gamma Ray

Compact Comms Gamma
MCG-E.A 571 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Spectral Gamma
MSG-A.A 119 LG: 10.94 ft WT: 90.4 lb OD: 2.244 in

Compact Micro-Resistivity
MMR-A 33 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

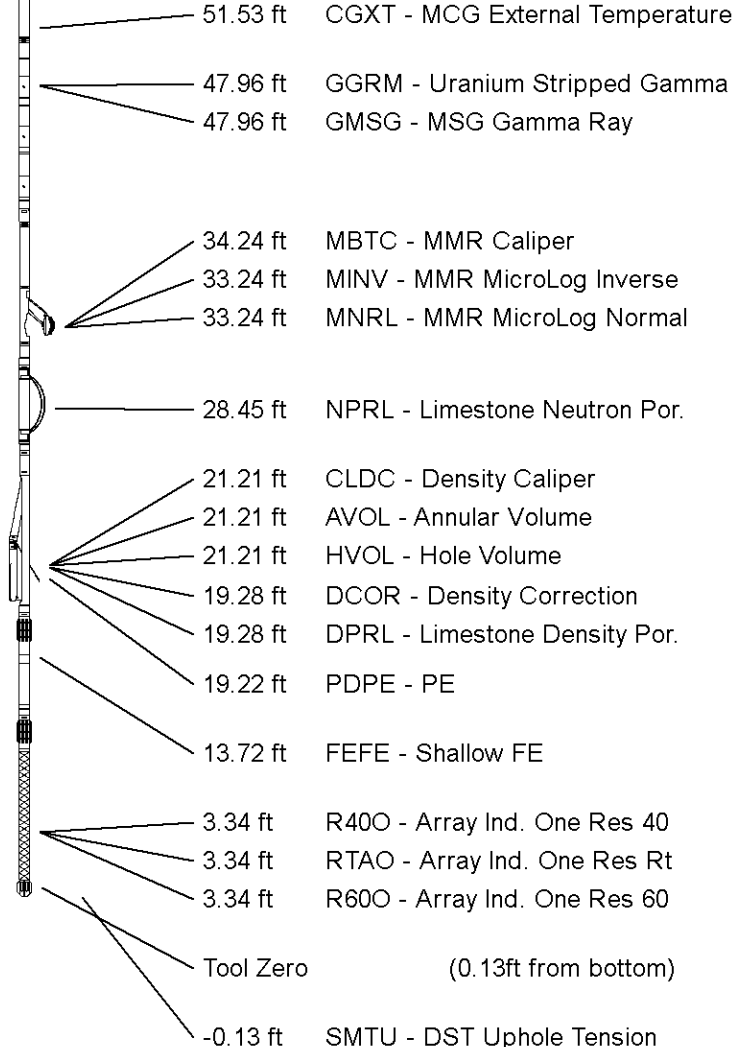
Compact Neutron
MDN-B.J 391 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper
MPD-B 120 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Focussed Electric
MFE-B.J 359 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Induction
MAI-B.J 392 LG: 10.81 ft WT: 48.5 lb OD: 2.240 in

Total Length: 64.41 ft Weight: 520.3 lb



All measurements relative to tool zero.

COMPANY	LARSON ENGINEERING, INC.
WELL	INDUSTRIAL PARK #1-19
FIELD	WIDL CAT
PROVINCE/COUNTY	LANE
COUNTRY/STATE	USA / KANSAS

Elevation Kelly Bushing	2770.00	feet	First Reading	3600.00	feet
Elevation Drill Floor	2768.00	feet	Depth Driller	4650.00	feet
Elevation Ground Level	2761.00	feet	Depth Logger	4646.00	feet



Weatherford®

COMPACT PHOTO DENSITY
COMPENSATED NEUTRON
MICRO-RESISTIVITY LOG