

# HALLIBURTON

## SPECTRAL DENSITY DUAL SPACED NEUTRON LOG

COMPANY	<b>SANDRIDGE ENERGY</b>		
WELL	<b>TERESIA 3509 1-16H</b>		
FIELD/BLOCK	<b>AMORITA</b>		
COUNTY	<b>HARPER</b>		
STATE	<b>KANSAS</b>		
COMPANY	<b>SANDRIDGE ENERGY</b>	API No.	15-077-21797
WELL	<b>TERESIA 3509 1-16H</b>	Location	(SHL) 200 FSL & 660' FEL
FIELD/BLOCK	<b>AMORITA</b>		
COUNTY	<b>HARPER</b>		
STATE	<b>KANSAS</b>	Other Services:	MICROLOG ACRT XRMII MRIL
Sect.	16	Twp.	35S
Rge.	9W		
Elev.	1230.0 ft		
D.F.	1247.0 ft		
G.L.	1230.0 ft		

Permanent Datum	GL		
Log measured from	KB		
Drilling measured from	KB		18.0 ft above perm. Datum
Date	01-Aug-13		
Run No.	ONE		

Depth - Driller	5280.00 ft		
Depth - Logger	5266.0 ft		
Bottom - Logged Interval	5212.0 ft		
Top - Logged Interval	3000.0 ft		
Casing - Driller	9.625 in	@	830.0 ft
Casing - Logger	830.0 ft		
Bit Size	8.750 in	@	
Type Fluid in Hole	WATER BASED MUD		
Density	9.1 ppg	55.00	s/qt
PH	9.00 pH	8.0	cp/m
Source of Sample	MUD PIT		
Rm @ Meas. Temperature	0.050 ohmm	@	75.00 degF
Rmf @ Meas. Temperature	0.05 ohmm	@	75.00 degF
Rmc @ Meas. Temperature	0.050 ohmm	@	75.00 degF
Source Rmf	Rmc	MEASURED	MEASURED
Rm @ BHT	0.03 ohmm	@	140.0 degF
Time Since Circulation	5.0 hr		
Time on Bottom	01-Aug-13 05:06		
Max. Rec. Temperature	140.0 degF	@	5266.0 ft
Equipment	11072142	LIBERAL	
Recorded By	J. BOLLOW		
Witnessed By	T. WHITLOW		

Fold here

Service Ticket No.: 900629604      API Serial No.: 15-077-21797      PGM Version: WL INSITE R3.8.4 (Build 5)

CHANGE IN MUD TYPE OR ADDITIONAL SAMPLE					RESISTIVITY SCALE CHANGES				
Date	Sample No.				Type Log	Depth	Scale Up Hole	Scale Down Hole	
Depth-Driller									
Type Fluid in Hole									
Density	Viscosity								
Ph	Fluid Loss								
Source of Sample					RESISTIVITY EQUIPMENT DATA				
Rm @ Meas. Temp		@		@	Run No.	Tool Type & No.	Pad Type	Tool Pos.	Other
Rmf @ Meas. Temp.		@		@					
Rmc @ Meas. Temp.		@		@					
Source Rmf	Rmc								
Rm @ BHT		@		@					
Rmf @ BHT		@		@					
Rmc @ BHT		@		@					

### EQUIPMENT DATA

GAMMA		ACOUSTIC		DENSITY		NEUTRON	
Run No.	ONE	Run No.		Run No.	ONE	Run No.	ONE
Serial No.	11048627	Serial No.		Serial No.	10865884	Serial No.	11055304
Model No.	GTET	Model No.		Model No.	SDLT-I	Model No.	DSNT-I
Diameter	3.625"	No. of Cent.		Diameter	4.5"	Diameter	3.625"
Detector Model No.	T-102	Spacing		Log Type	GAM-GAM	Log Type	NEU-NEU
Type	SCINT			Source Type	CS137	Source Type	AM241BE
Length	8'	LSA [Y/N]		Serial No.	5168GW	Serial No.	DSN-424
Distance to Source	10'	FWDA [Y/N]		Strength	1.5 CI	Strength	15 CI

### LOGGING DATA

GENERAL			GAMMA		ACOUSTIC		DENSITY			NEUTRON				
Run	Depth		Speed	Scale		Scale		Matrix	Scale		Matrix	Scale		Matrix
No.	From	To	ft/min	L	R	L	R		L	R		L	R	
ONE	5266	3000	REC	0	150				30	-10	2.71	30	-10	LIME

DIRECTIONAL INFORMATION

Maximum Deviation @ KOP @

Remarks: ANNULAR HOLE VOLUME CALCULATED FOR 7-INCH CASING

CHLORIDES REPORTED AT 22,000 MG/L

LCM REPORTED AT 7.5 LB/BBL

GTET-DSNT-SDLT-XRMI-ACRT RUN IN COMBINATION

TODAY'S CREW: M. GRAHAM & T. GRAYSON

THANK YOU FOR CHOOSING HALLIBURTON ENERGY SERVICES LIBERAL, KS. 620-624-8123

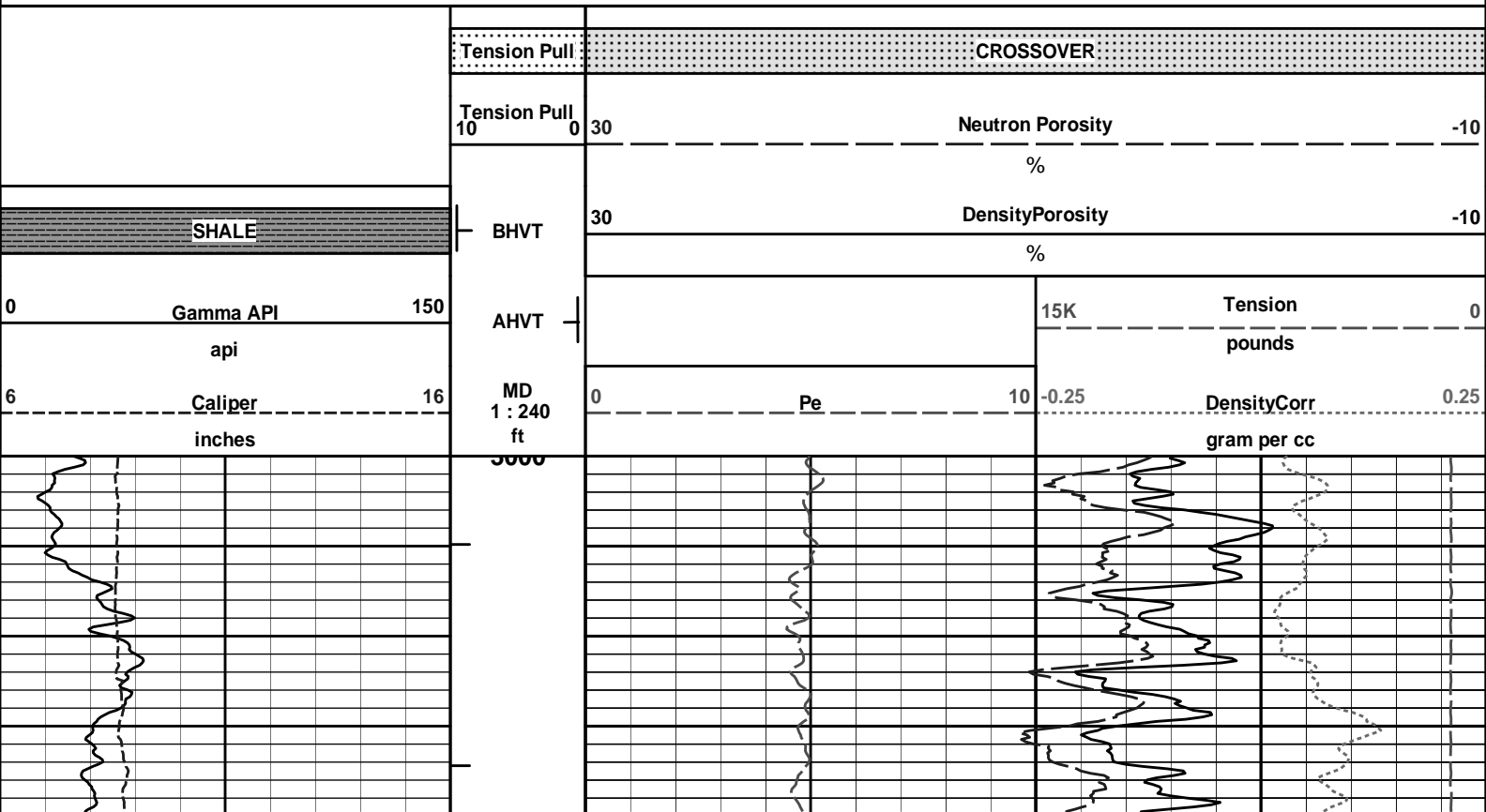
HALLIBURTON DOES NOT GUARANTEE THE ACCURACY OF ANY INTERPRETATION OF THE LOG DATA, CONVERSION OF LOG DATA TO PHYSICAL ROCK PARAMETERS OR RECOMMENDATIONS WHICH MAY BE GIVEN BY HALLIBURTON PERSONNEL OR WHICH APPEAR ON THE LOG OR IN ANY OTHER FORM. ANY USER OF SUCH DATA, INTERPRETATIONS, CONVERSIONS, OR RECOMMENDATIONS AGREES THAT HALLIBURTON IS NOT RESPONSIBLE EXCEPT WHERE DUE TO GROSS NEGLIGENCE OR WILLFUL MISCONDUCT, FOR ANY LOSS, DAMAGES, OR EXPENSES RESULTING FROM THE USE THEREOF.

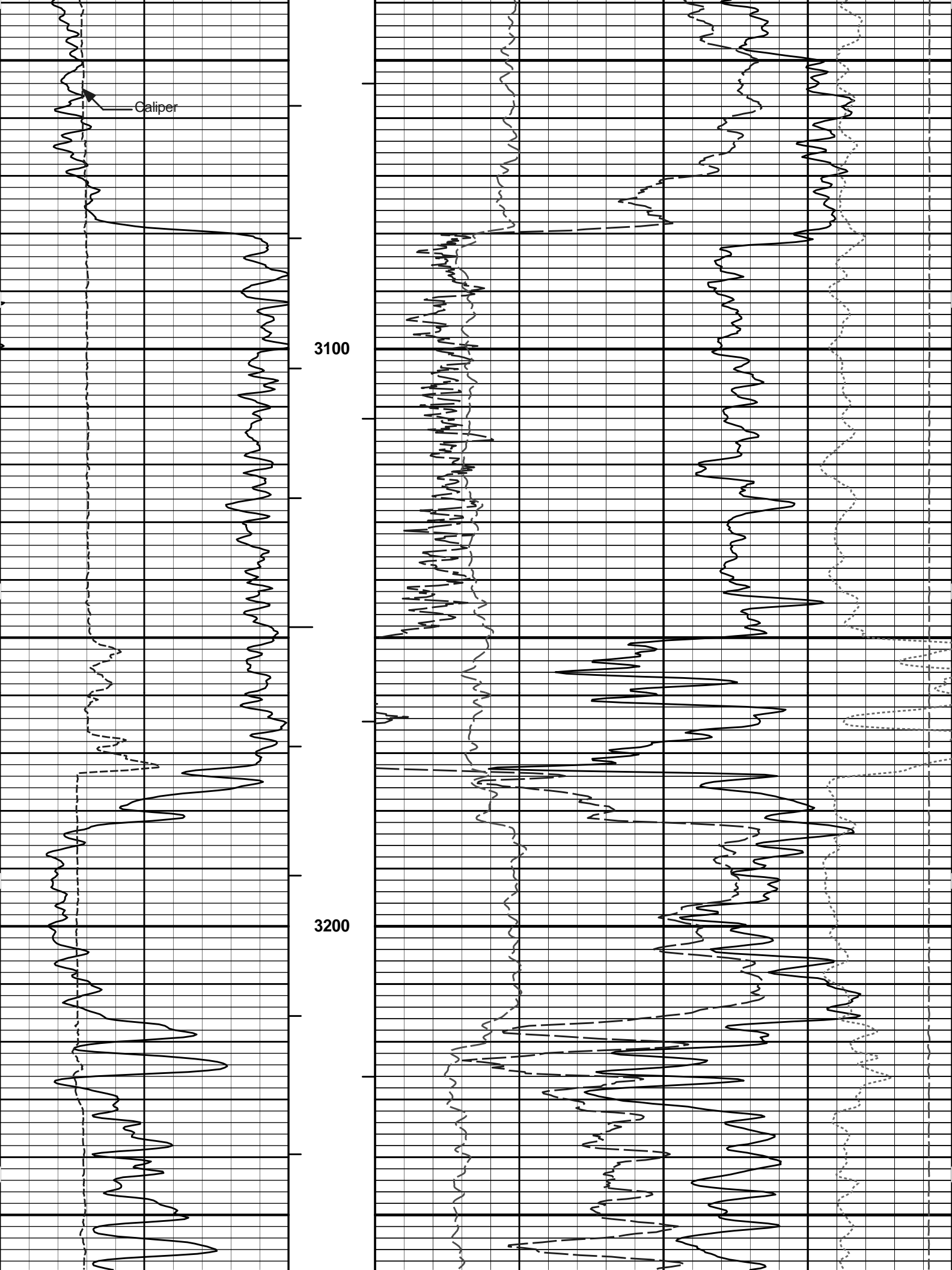
HALLIBURTON

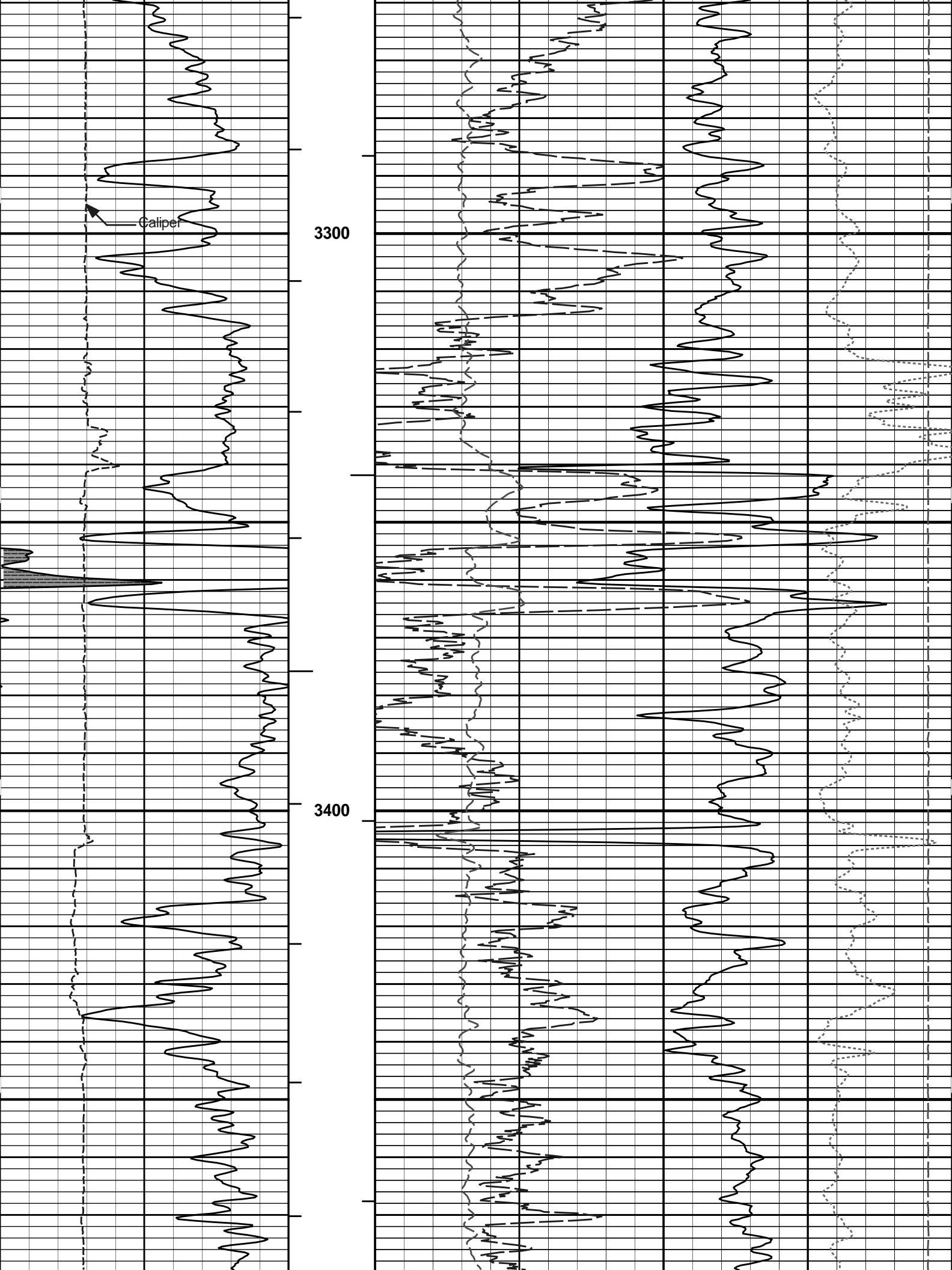


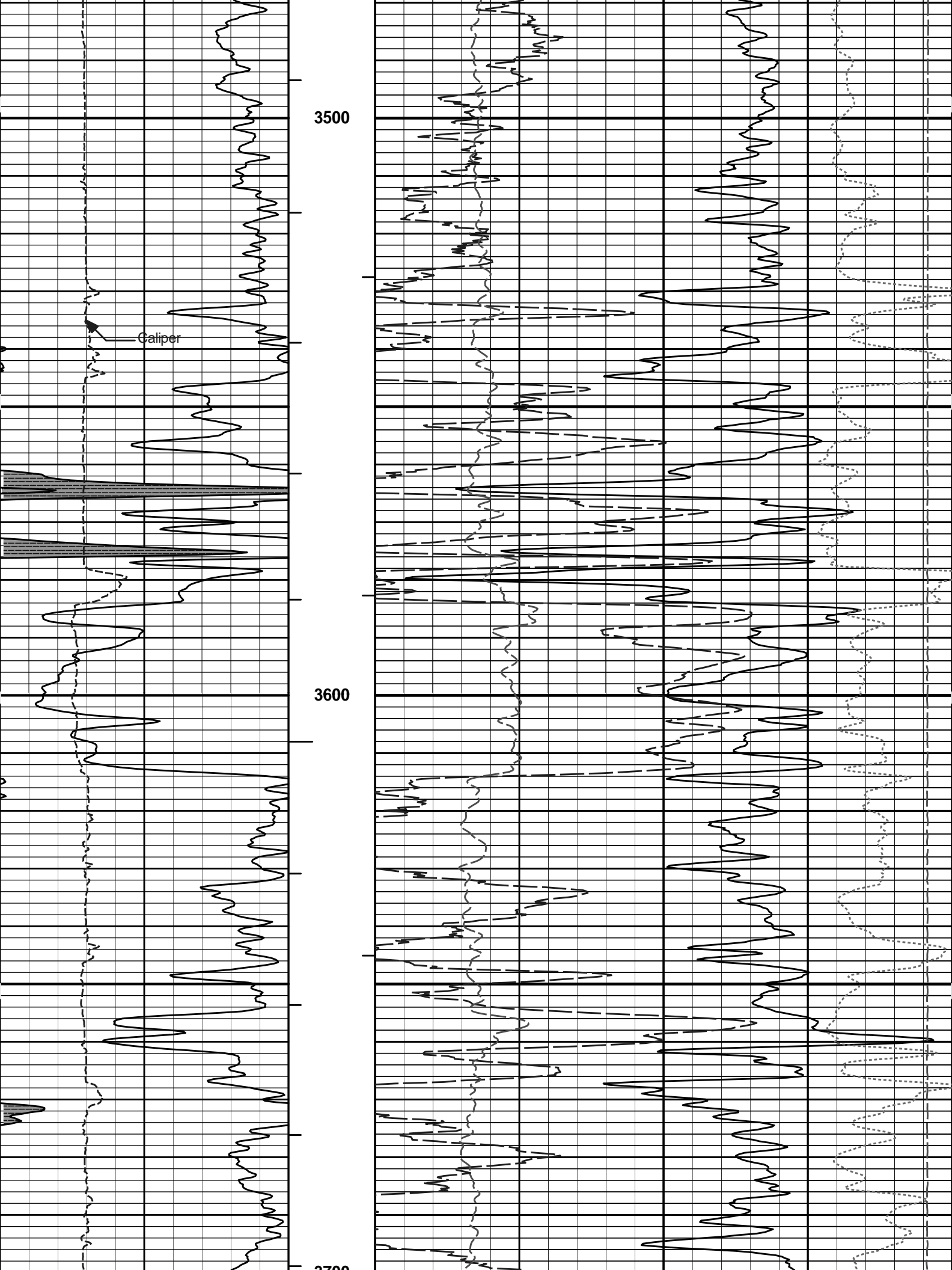
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 Plot Range: 3000 ft to 5268.83 ft  
 Data: TERESIA\_3509\Well Based\DETAIL\  
 Plot File: \\PORO\Poros\_IQ\_5\_MAIN\_LIB

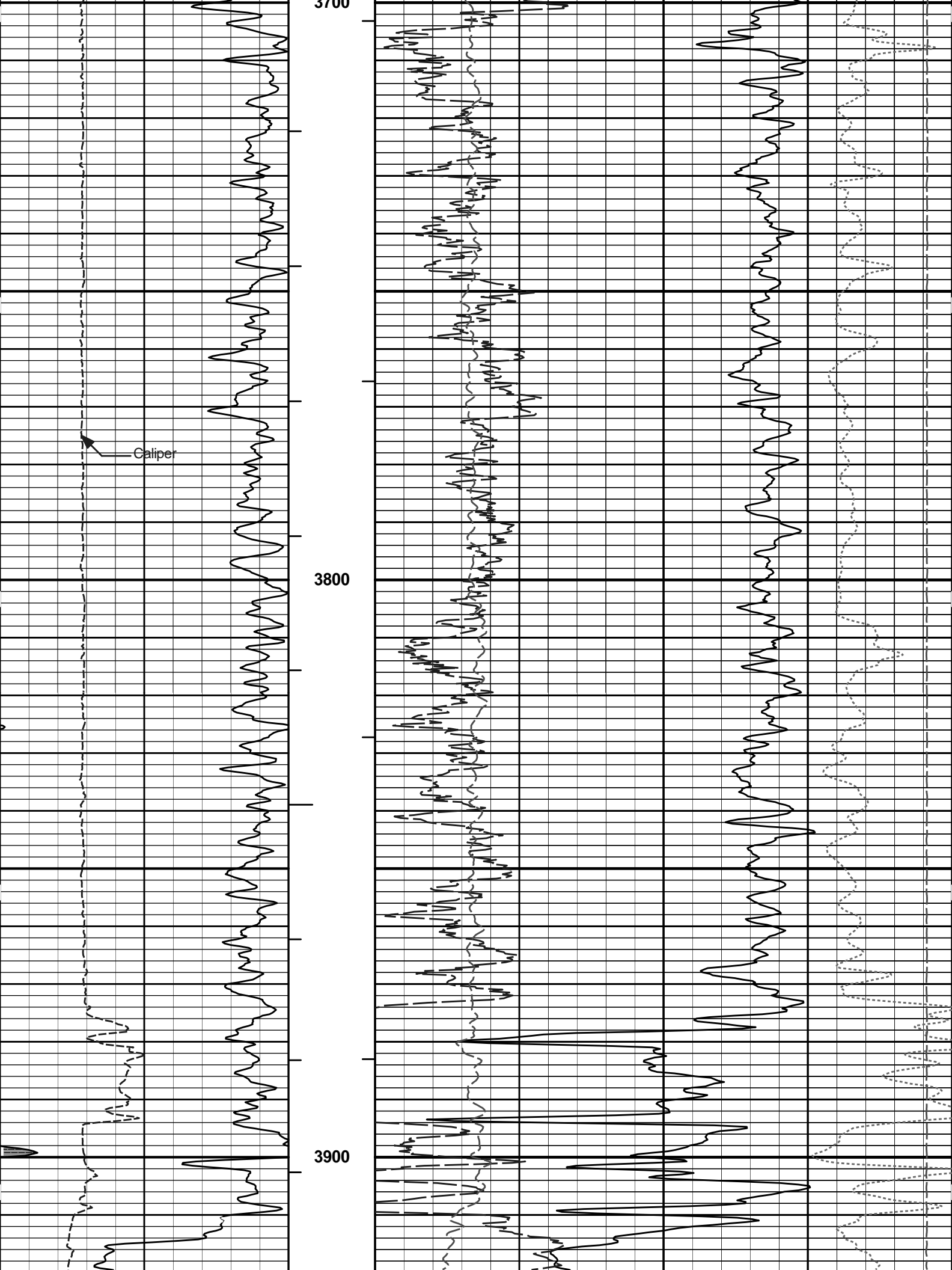
# 5 INCH MAIN LOG

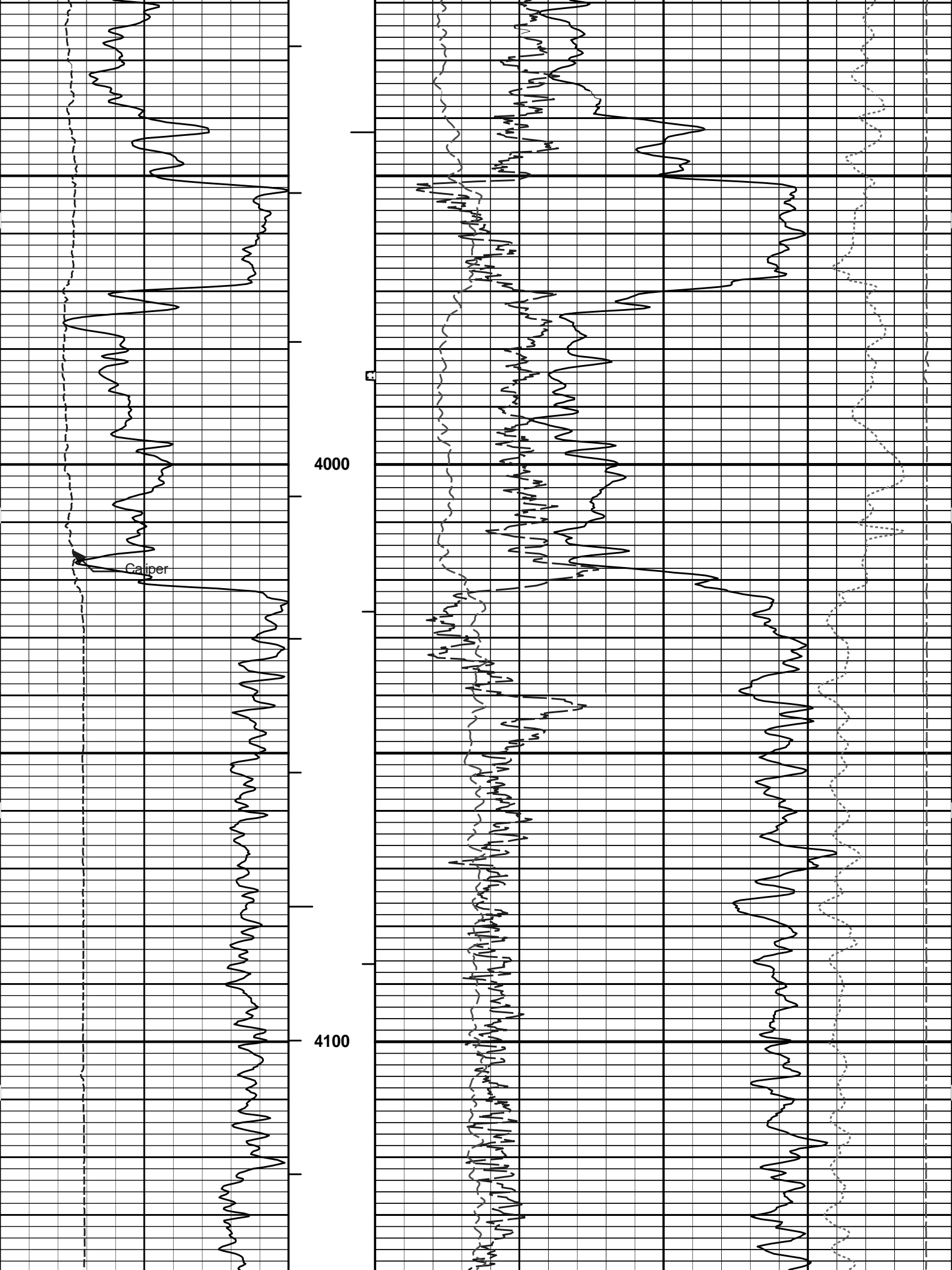


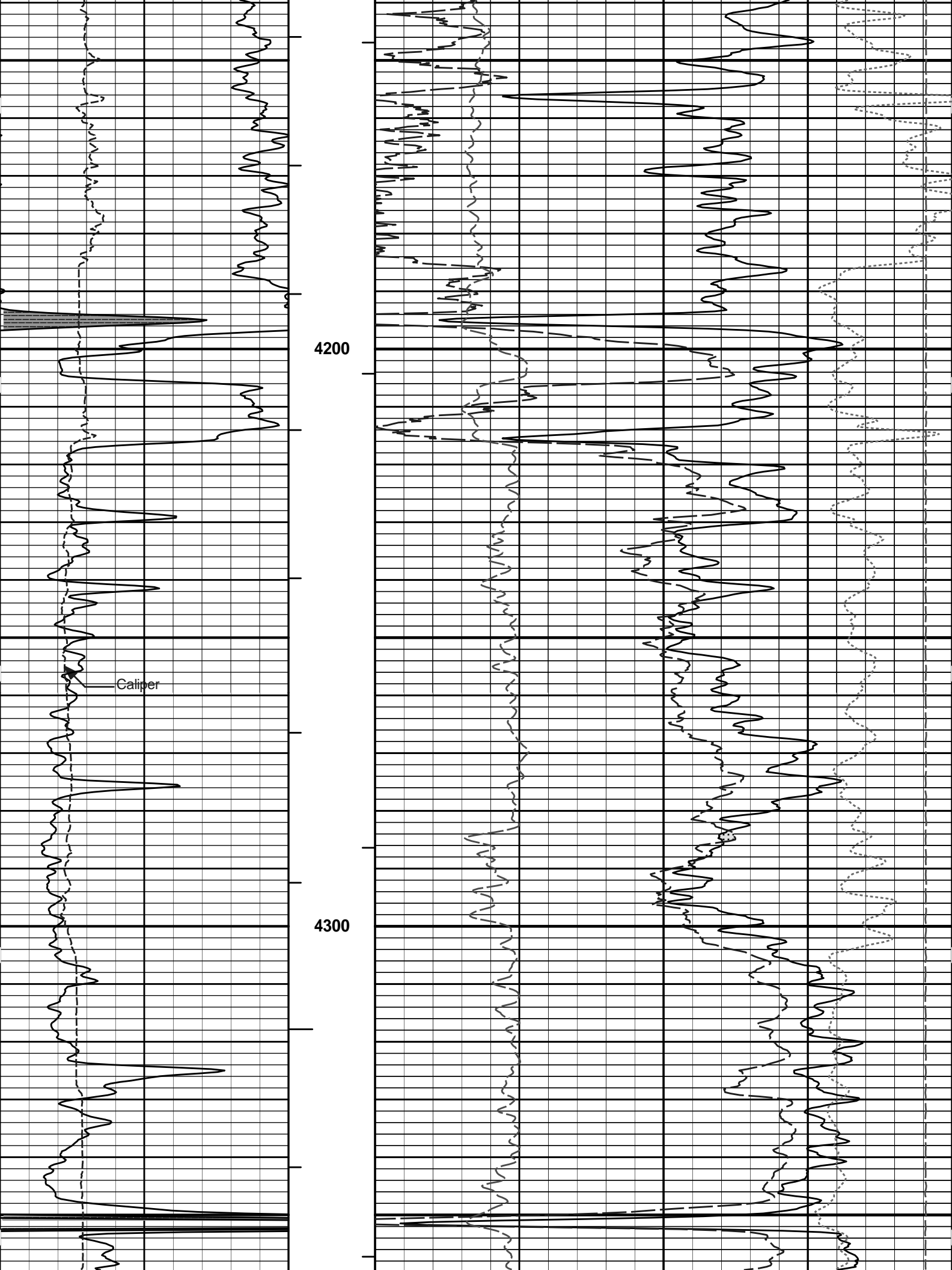


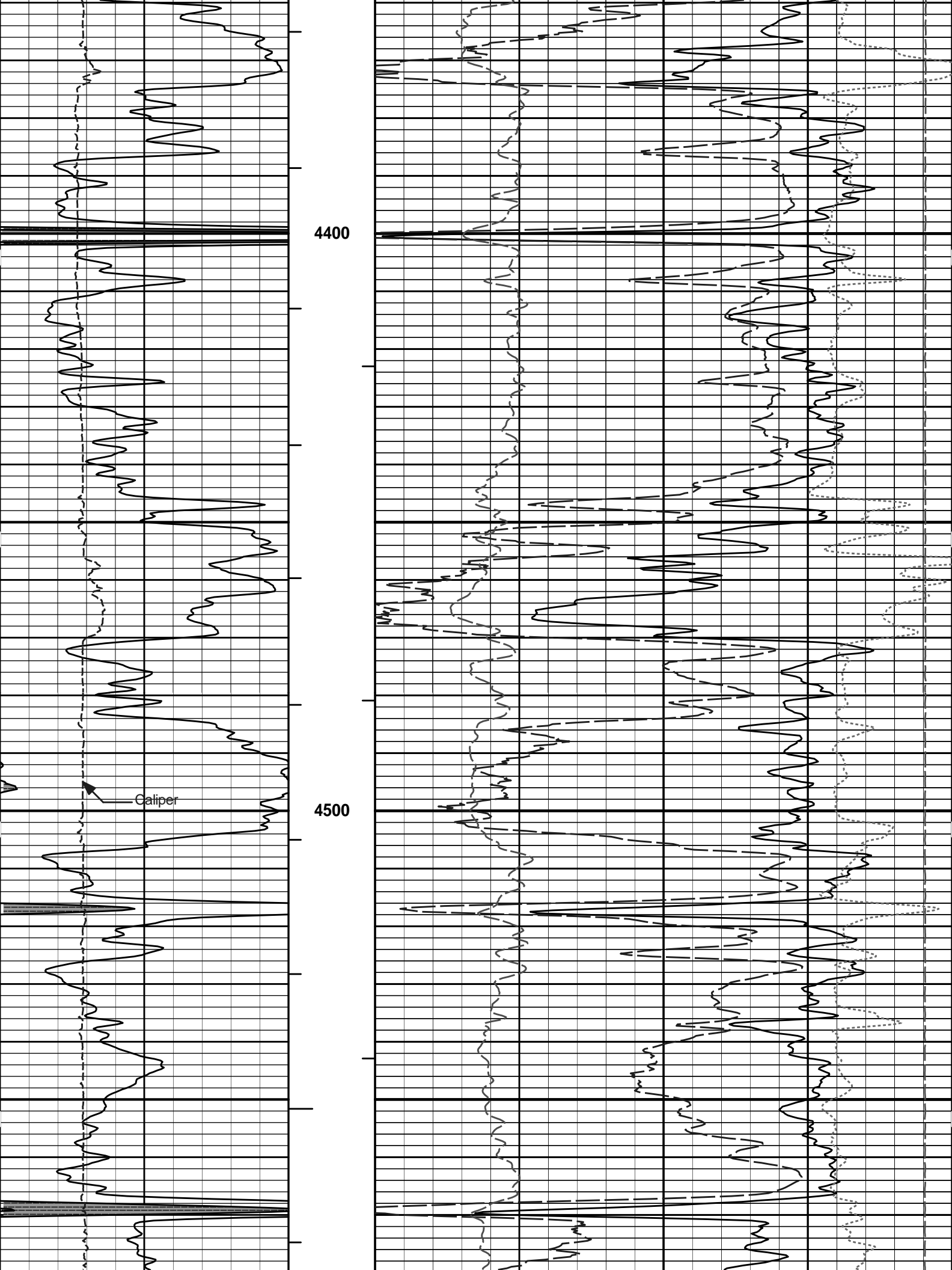


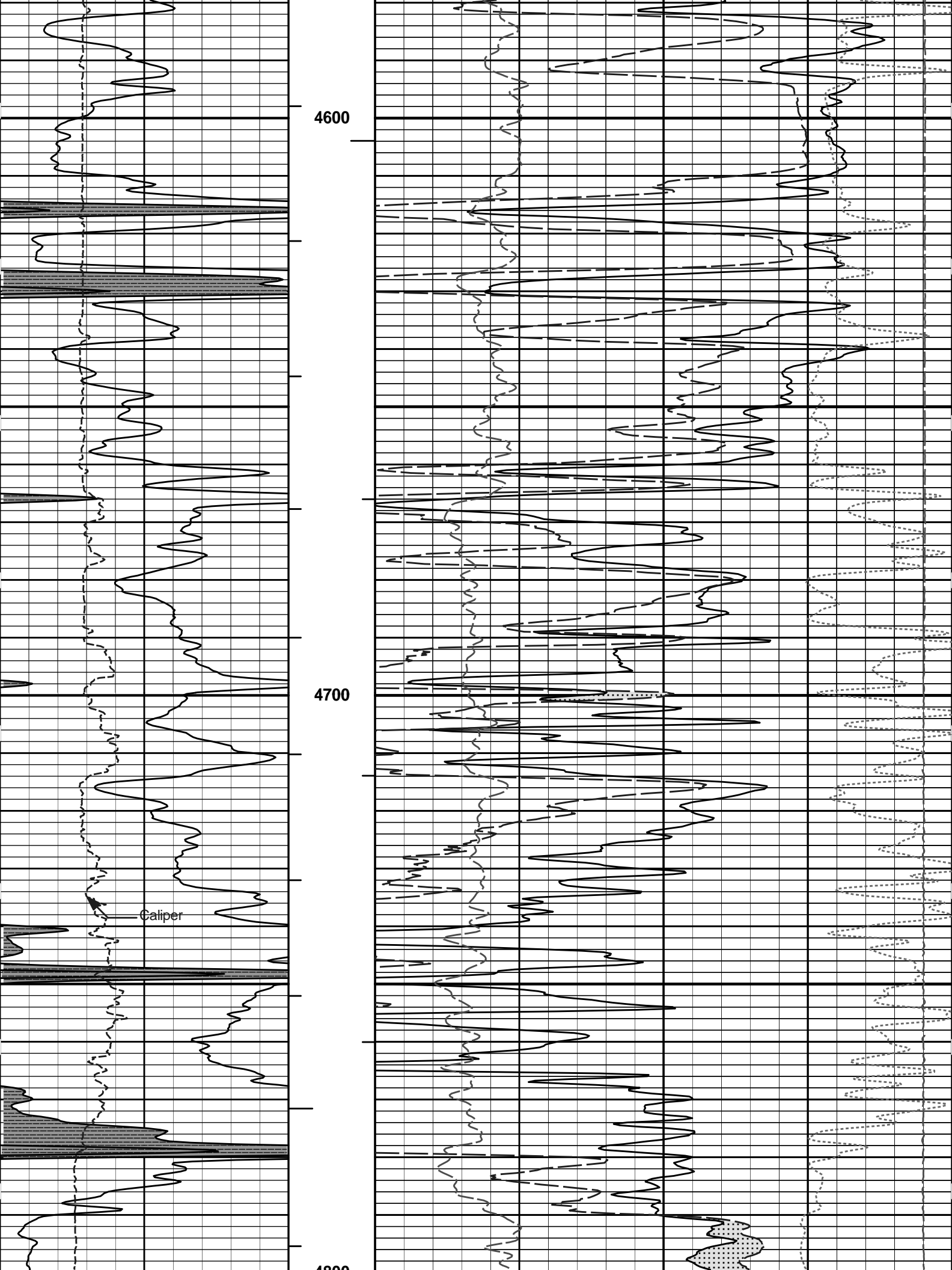


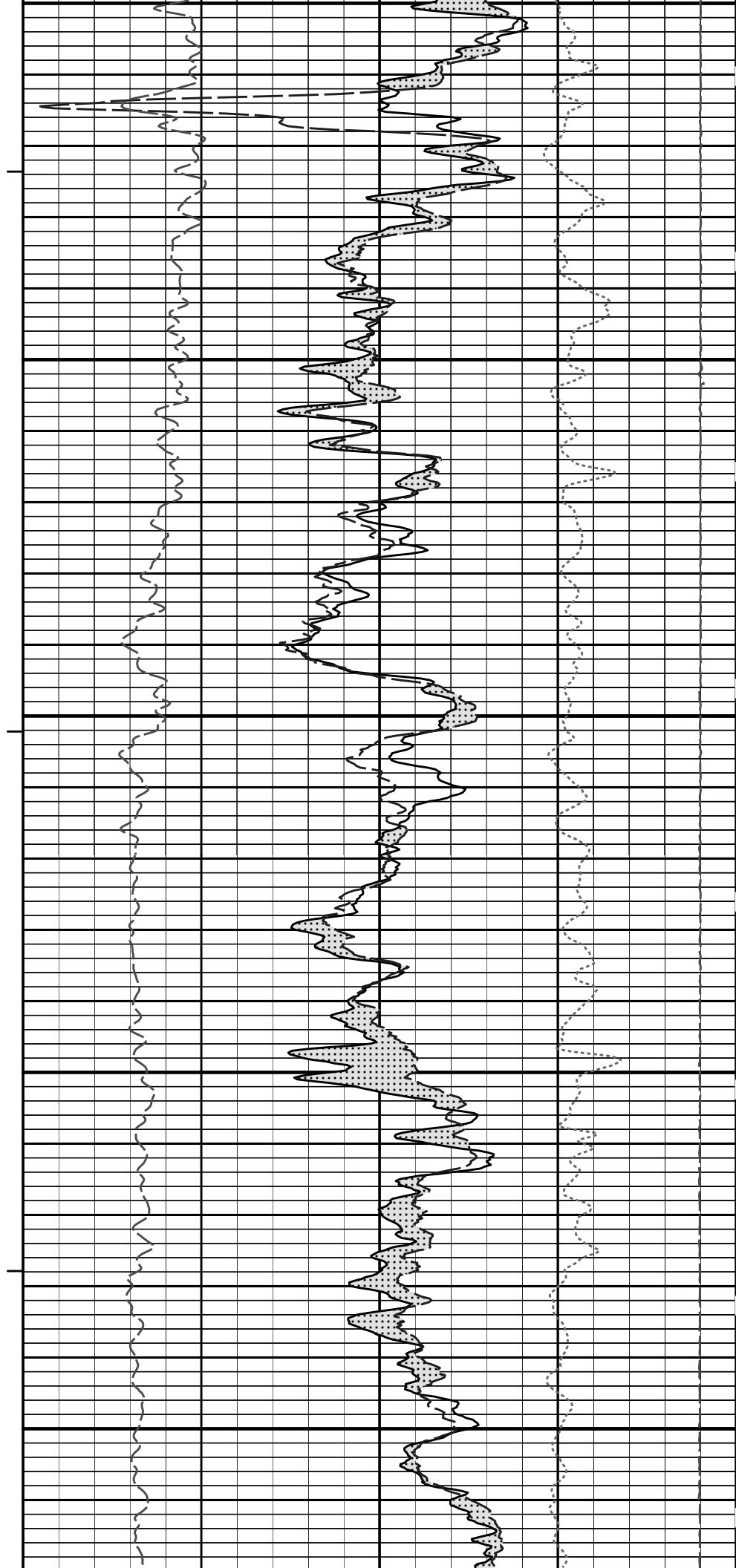
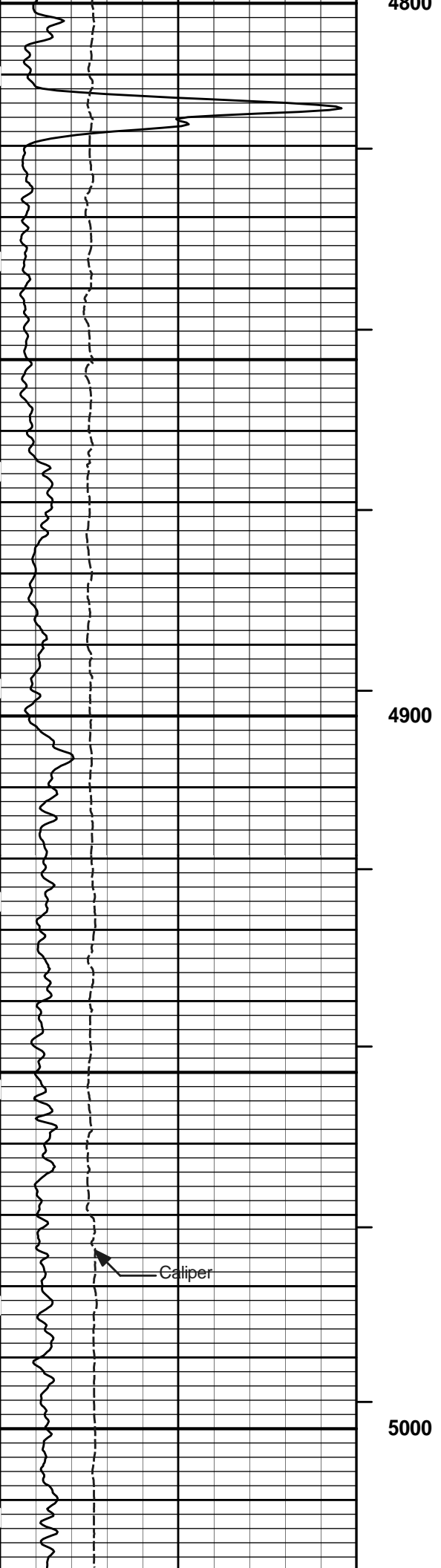


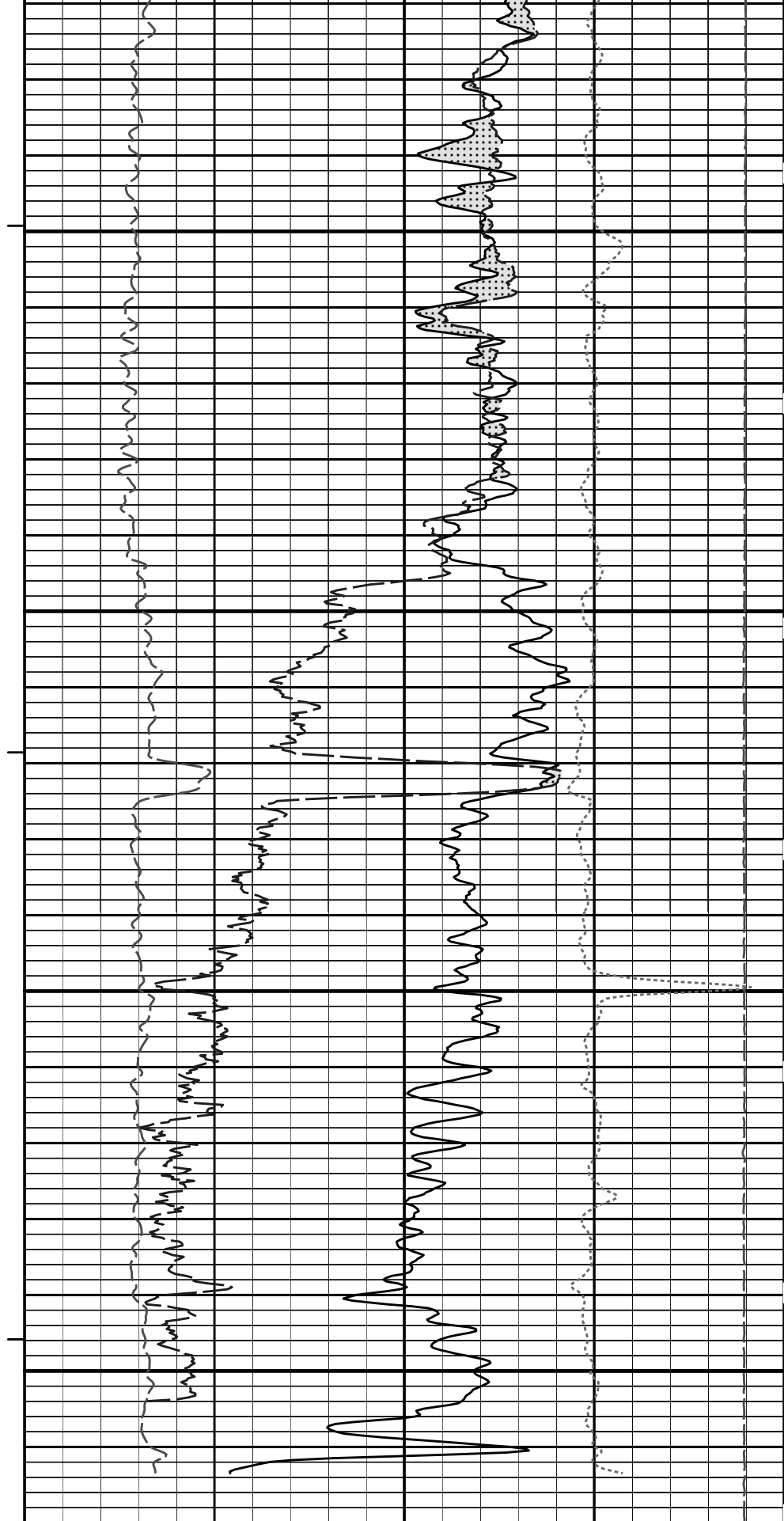
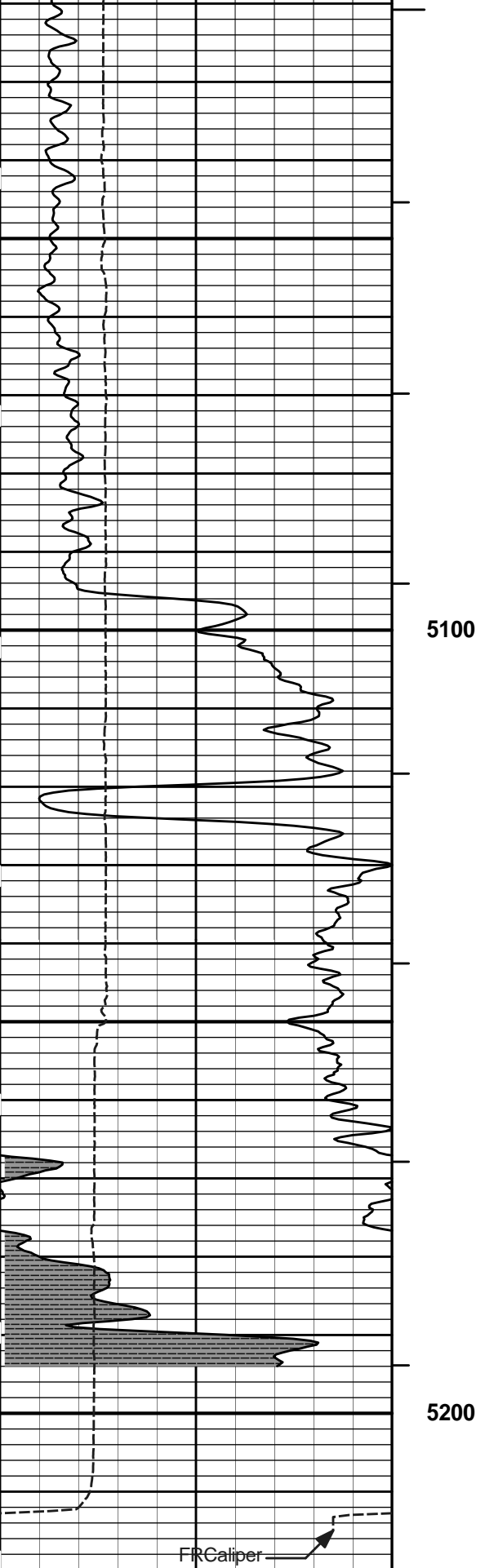






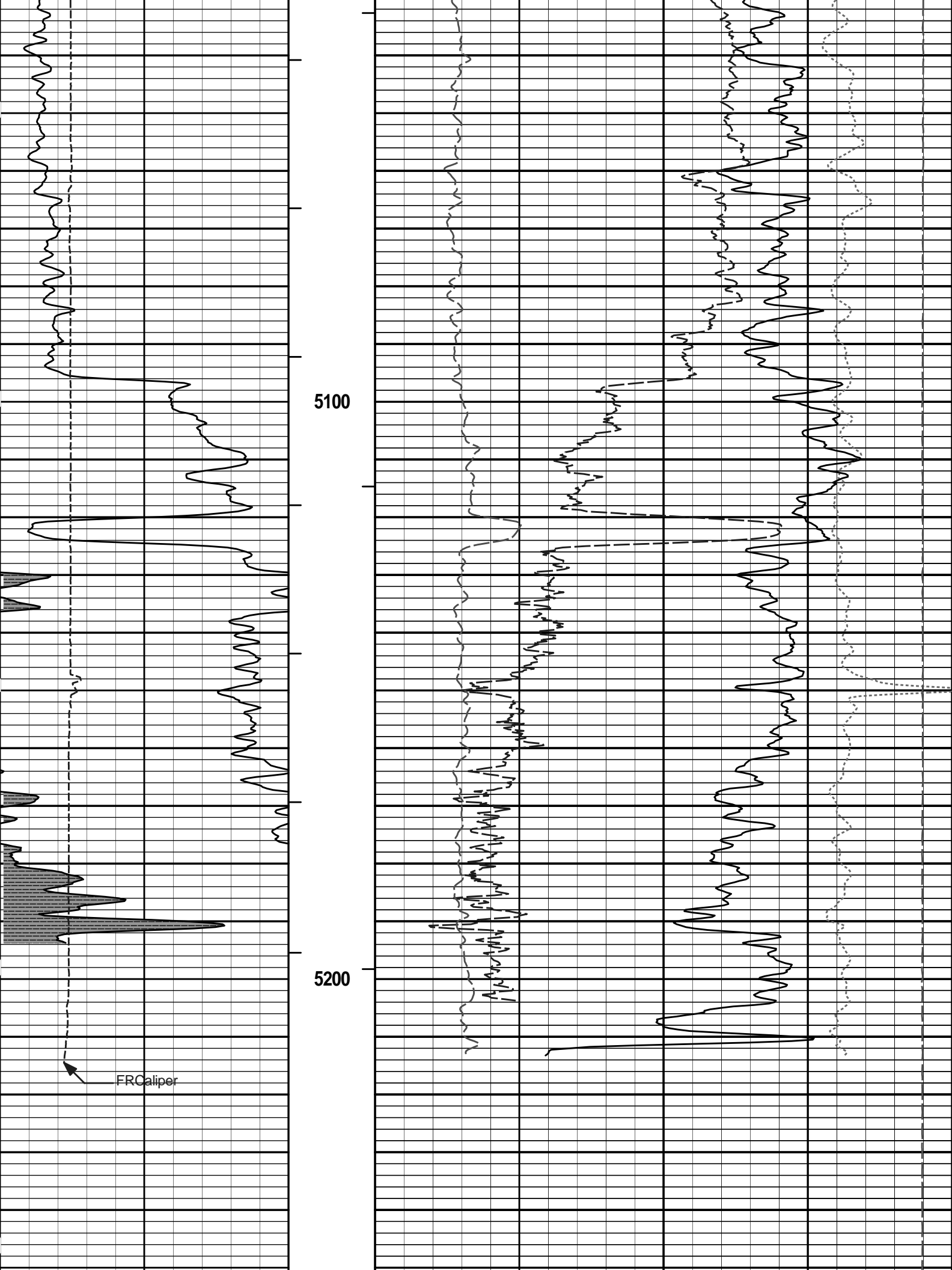






FRCaliper





6	Caliper	16
	inches	
0	Gamma API	150
	api	
SHALE		

MD	1 : 240	ft
AHVT		
BHVT		

0	Pe	10
15K		
30	DensityPorosity	-10
	%	
30	Neutron Porosity	-10
	%	
CROSSOVER		

-0.25	DensityCorr	0.25
	gram per cc	
15K	Tension	0
	pounds	

**HALLIBURTON**

Plot Time: 01-Aug-13 07:21:01  
 Plot Range: 5000 ft to 5268.83 ft  
 Data: TERESIA\_3509\Well Based\REPEAT\  
 Plot File: \\PORO\Poro\_IQ\_5\_REP\_LIB

## REPEAT SECTION

**HALLIBURTON**

Plot Time: 01-Aug-13 07:21:01  
 Plot Range: 3000 ft to 5268.83 ft  
 Data: TERESIA\_3509\Well Based\DETAIL\  
 Plot File: \\LOCAL\TERESIA\_3509\0001 SP-GTET-DSN-SDL-FLEX-XRMI-ACRT-CHIPORO\BULKD\_5\_MAIN\_LIB

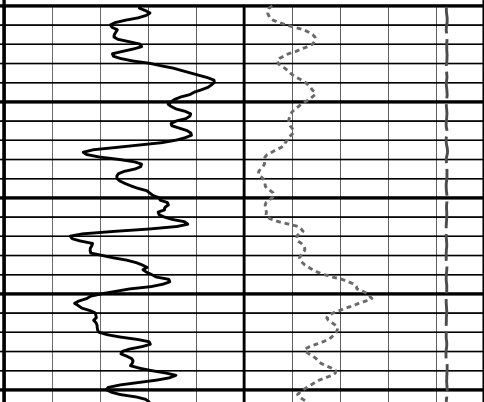
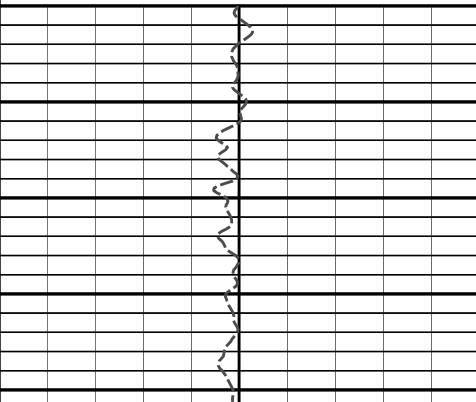
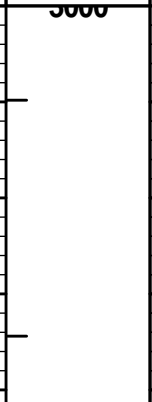
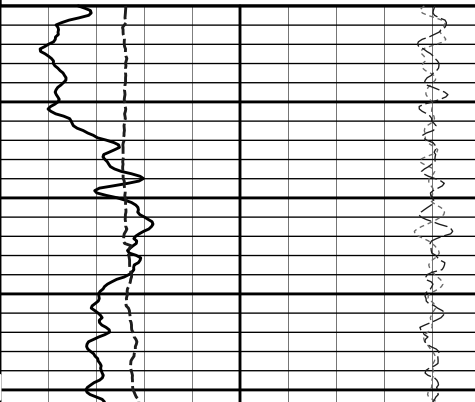
## 5 INCH MAIN LOG

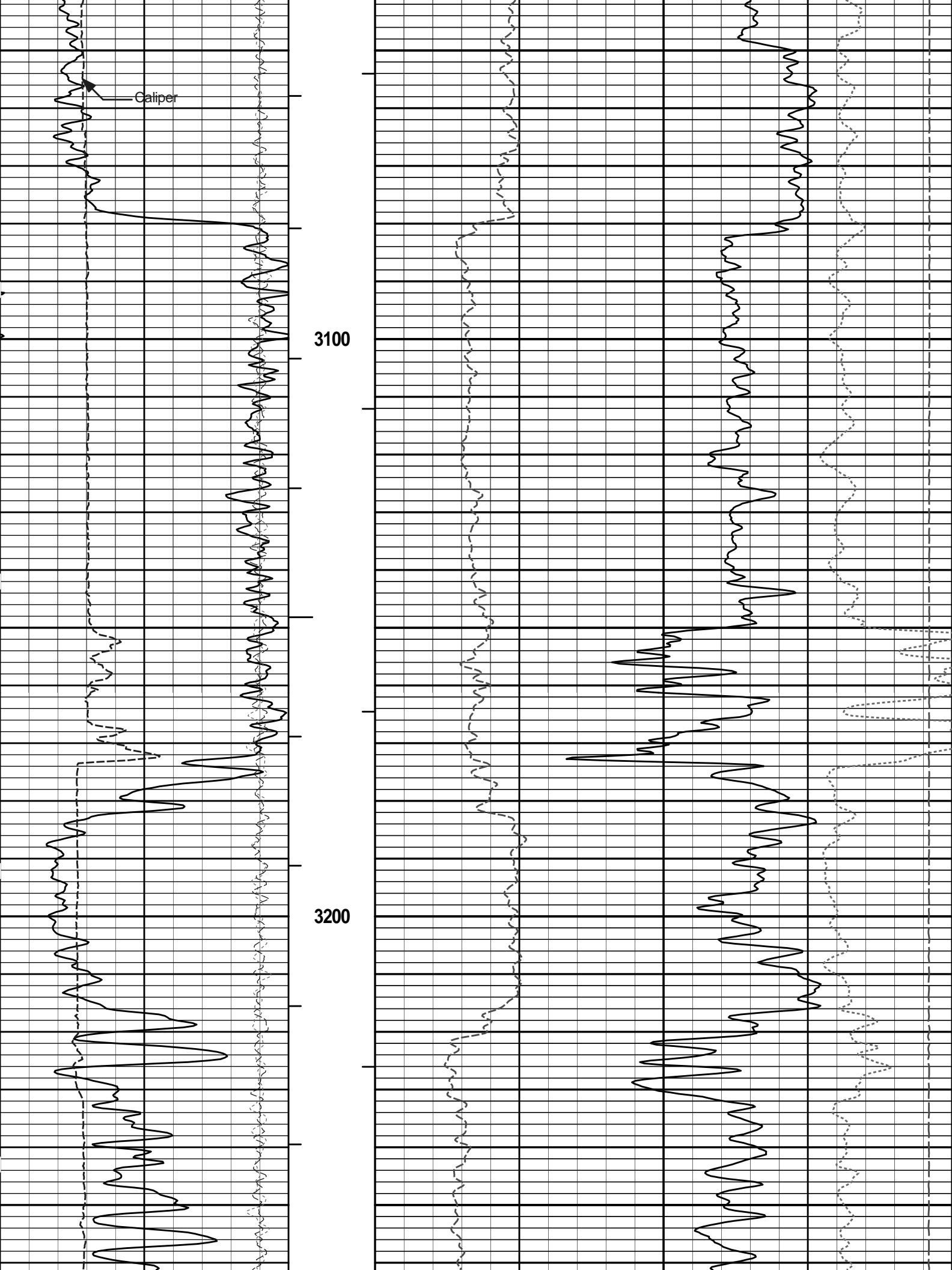
SHALE		
0	Gamma Ray	150
	api	
18	FarQuality	-2
-18	NearQuality	2
6	Caliper	16
	inches	

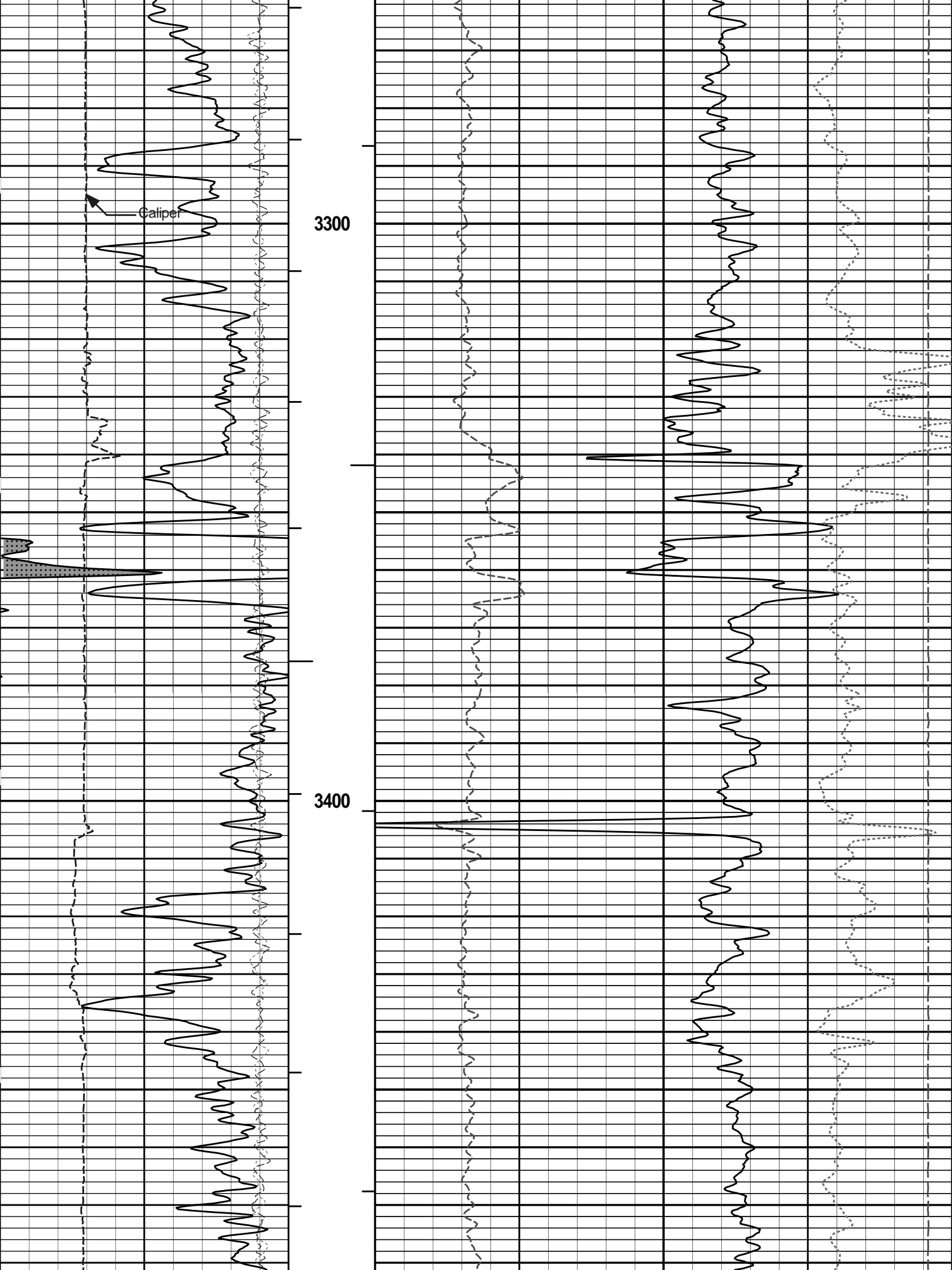
Tension Pull	10
BHV	ft3
AHV	ft3
MD	1 : 240
	ft

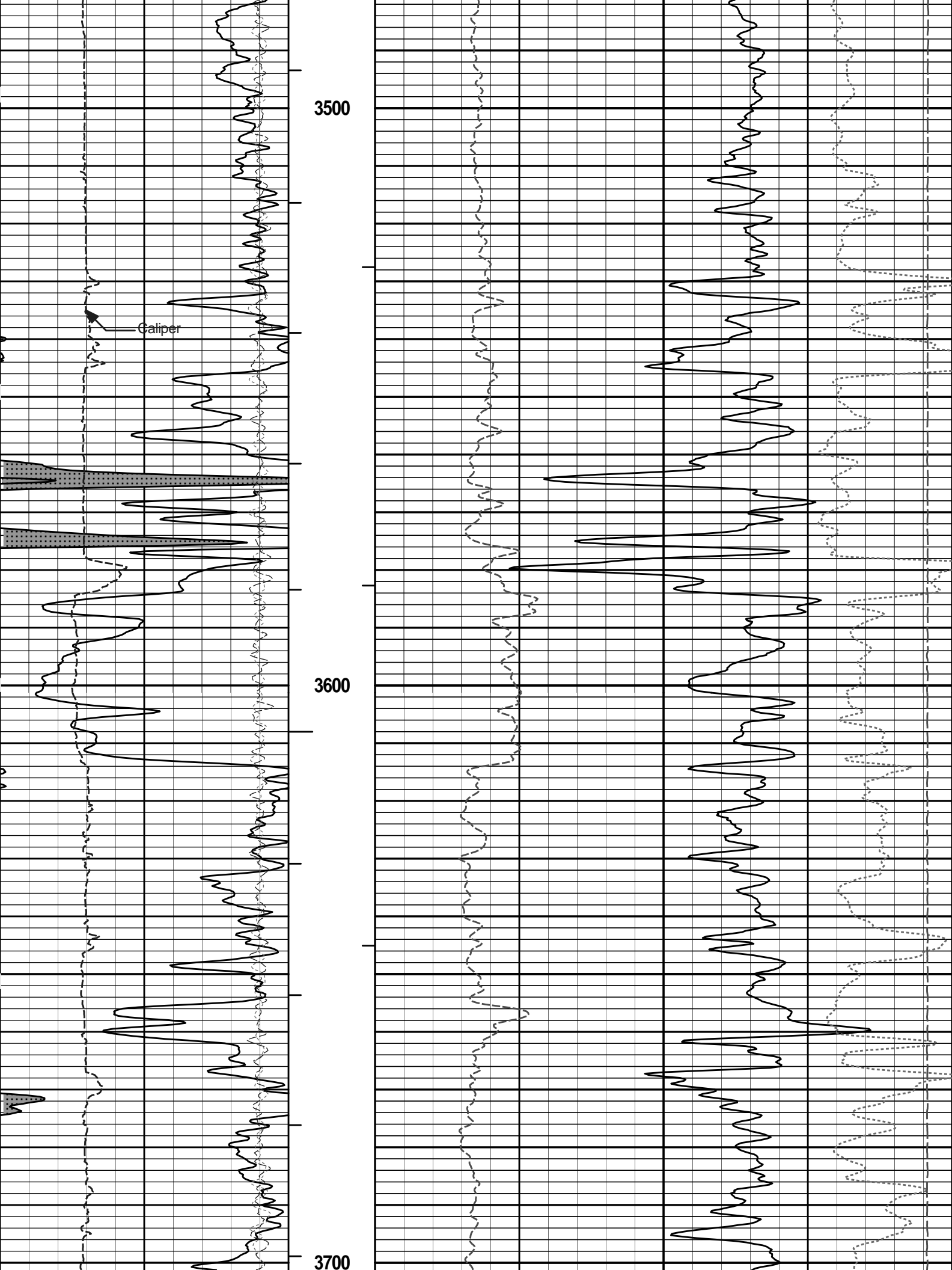
2	Bulk Density	3
	g/cc	
15K	Tension	0
	pounds	
0	Pe	10
-0.25	DensityCorr	0.25
	g/cc	

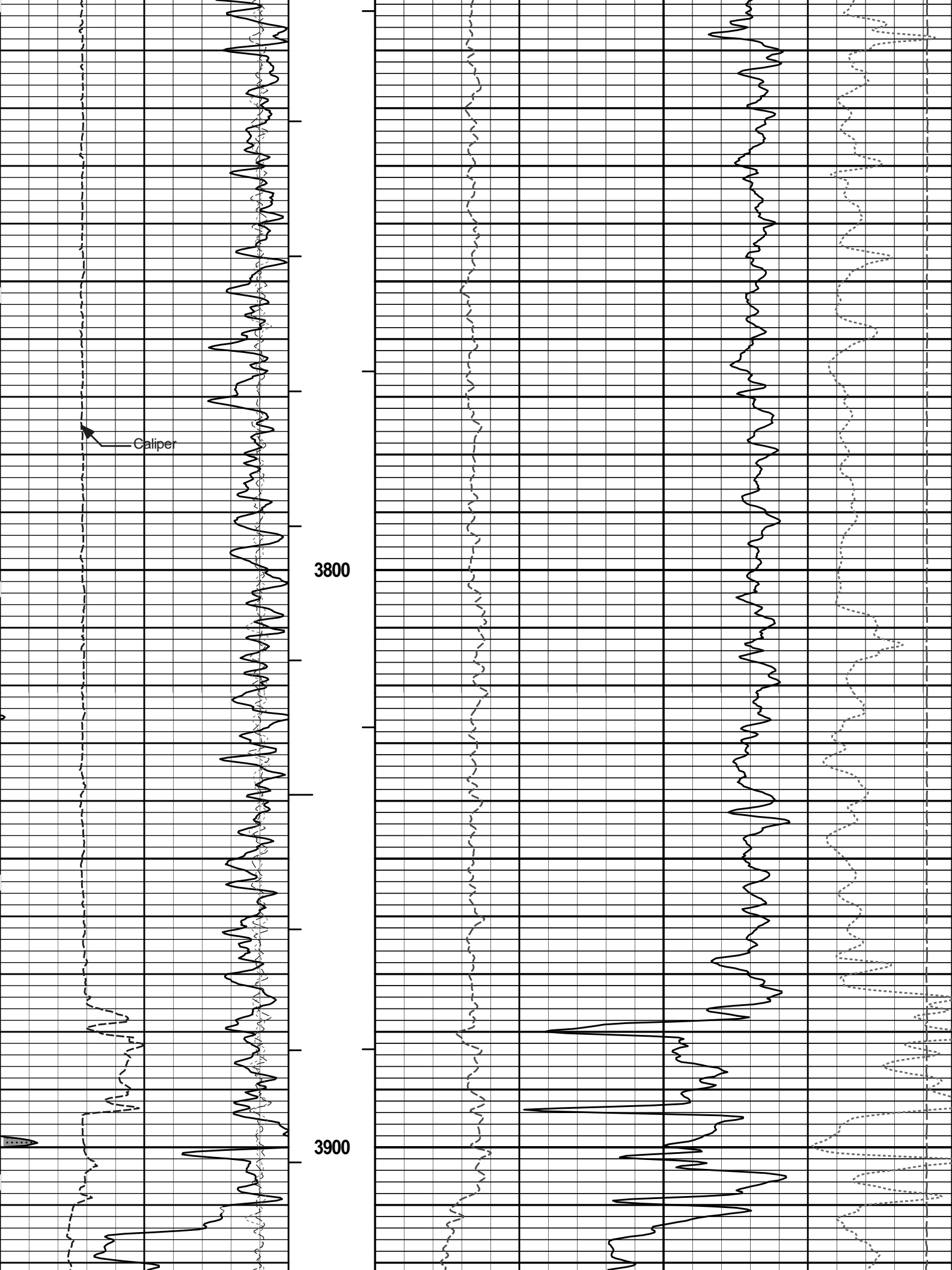
0.25	DensityCorr	0.25
	g/cc	

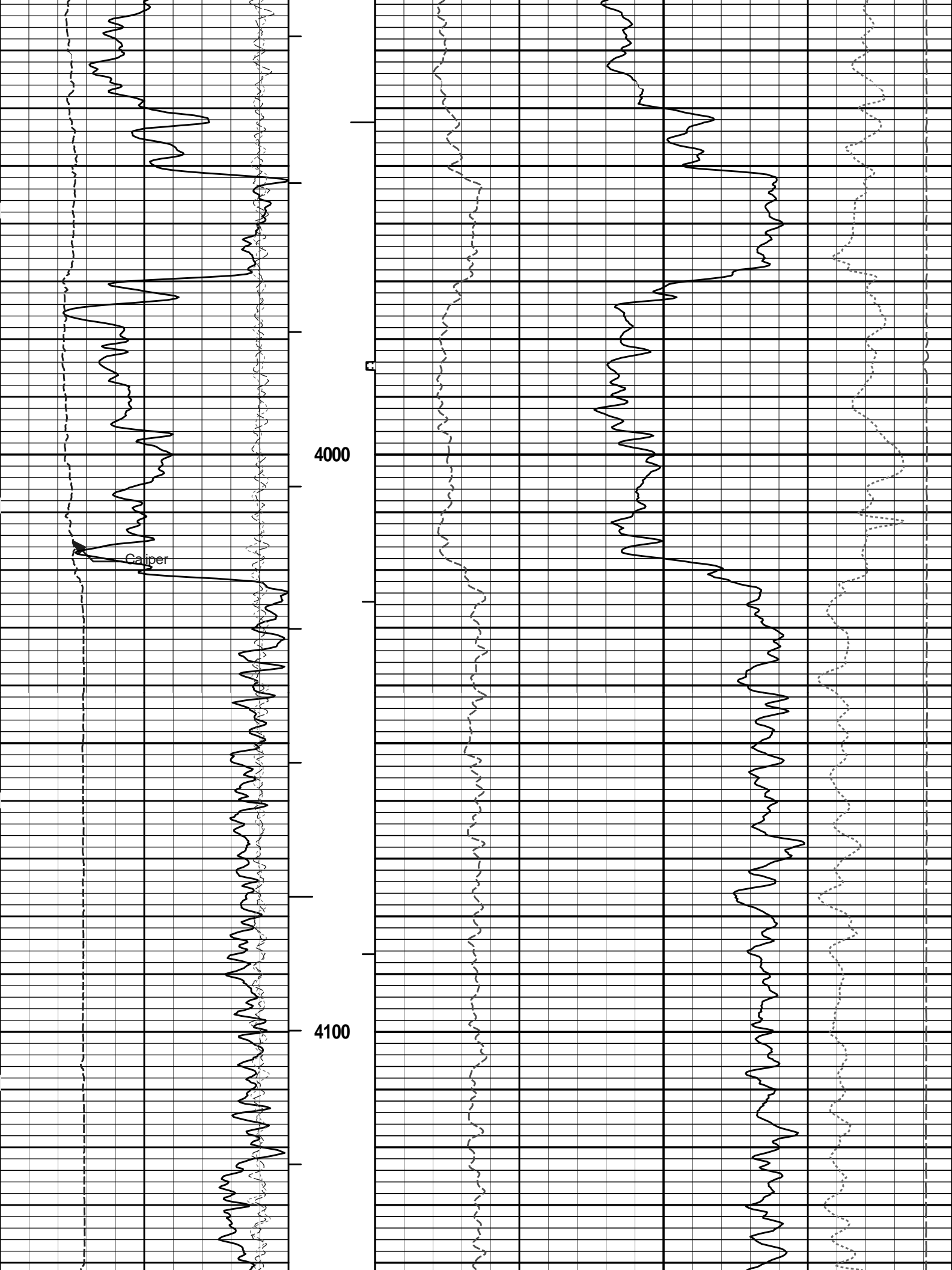


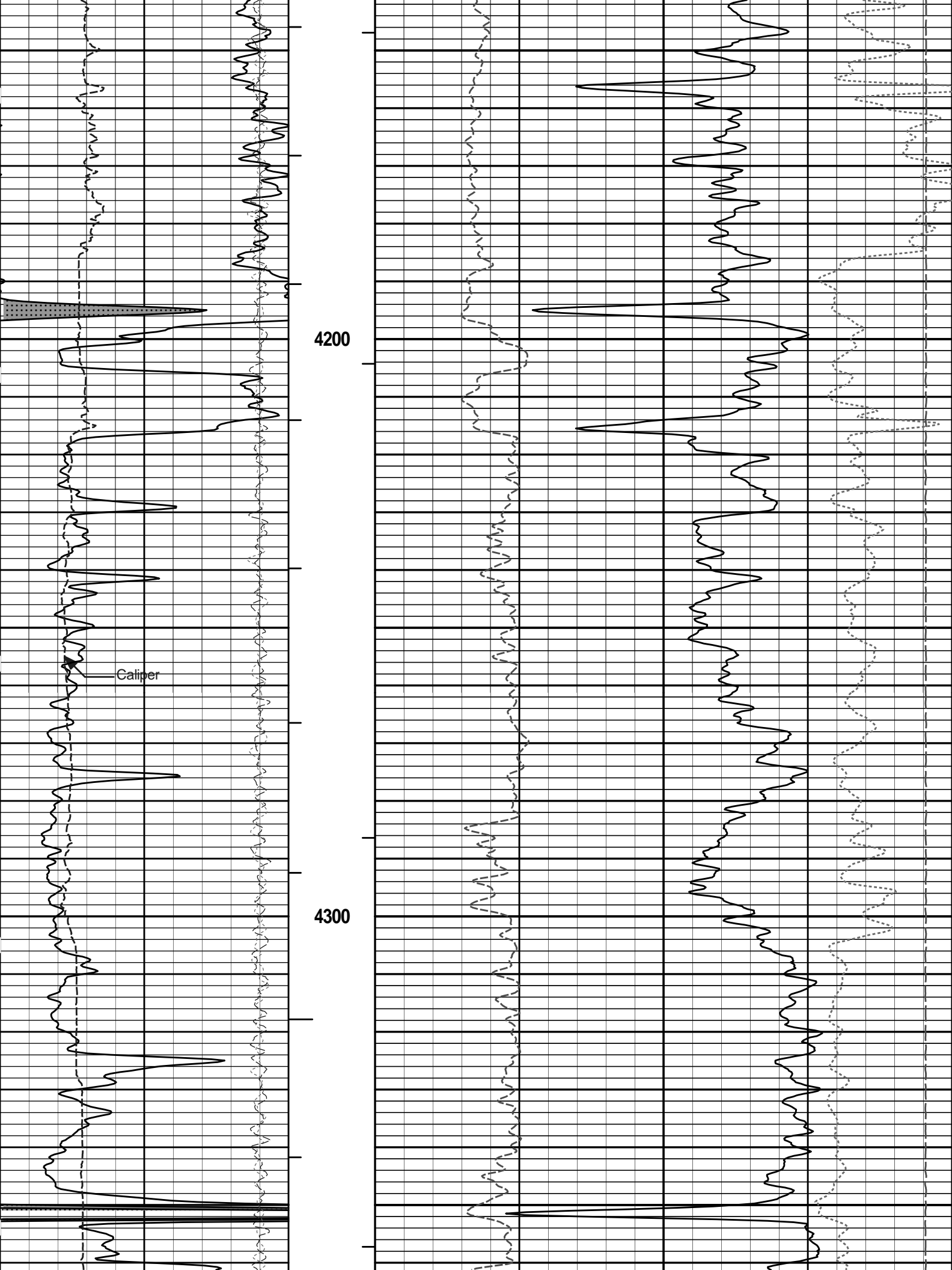


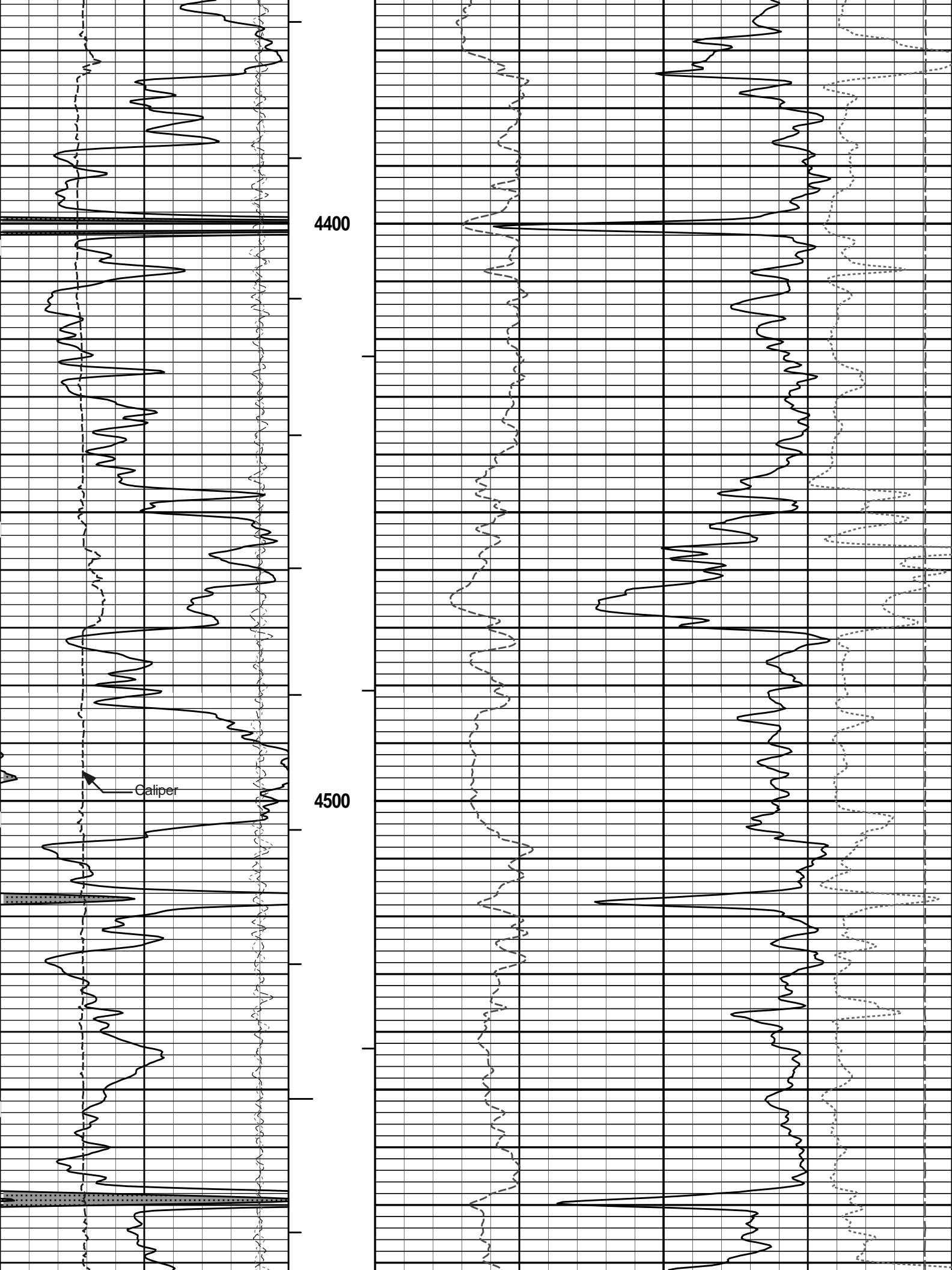


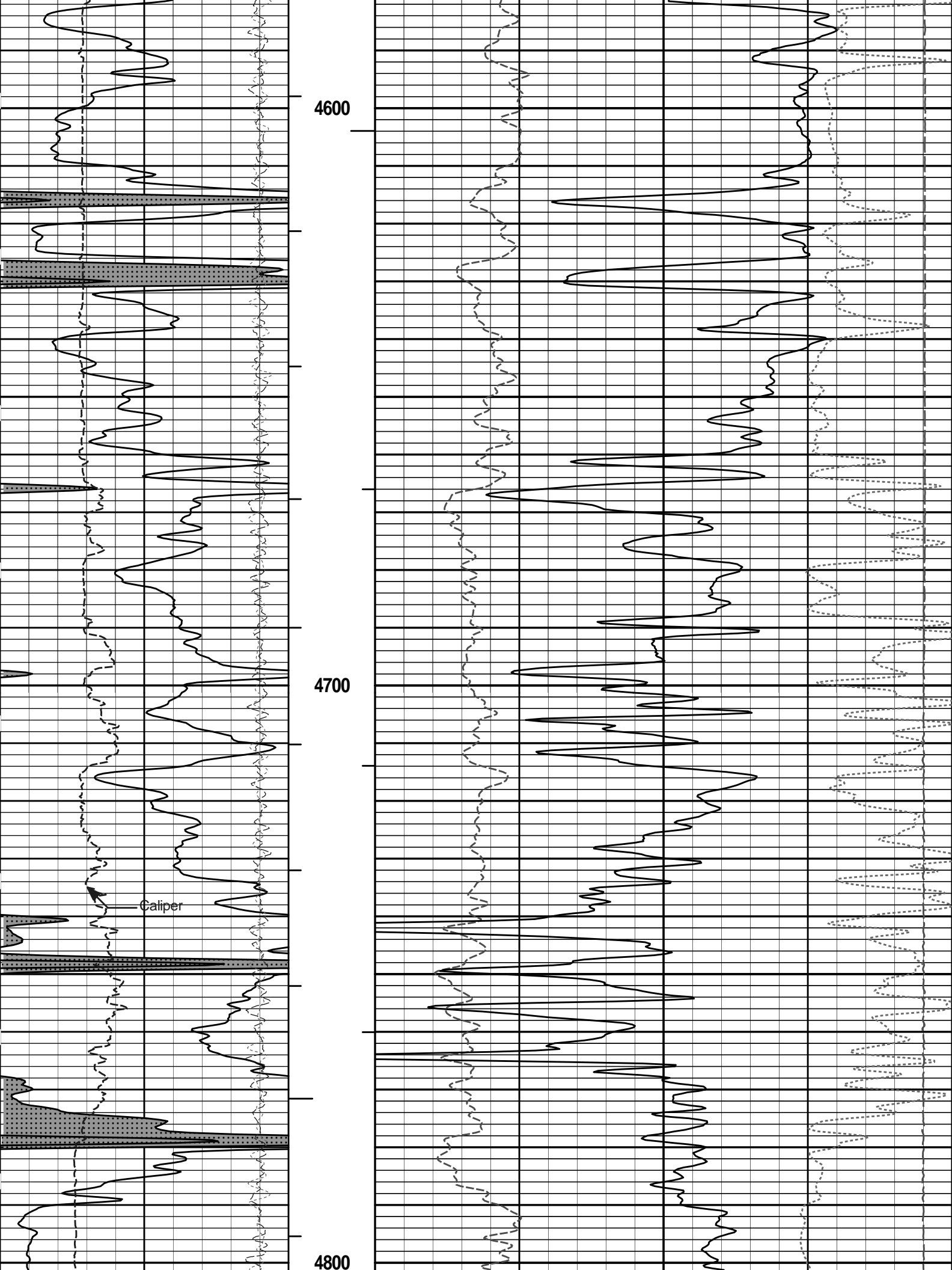


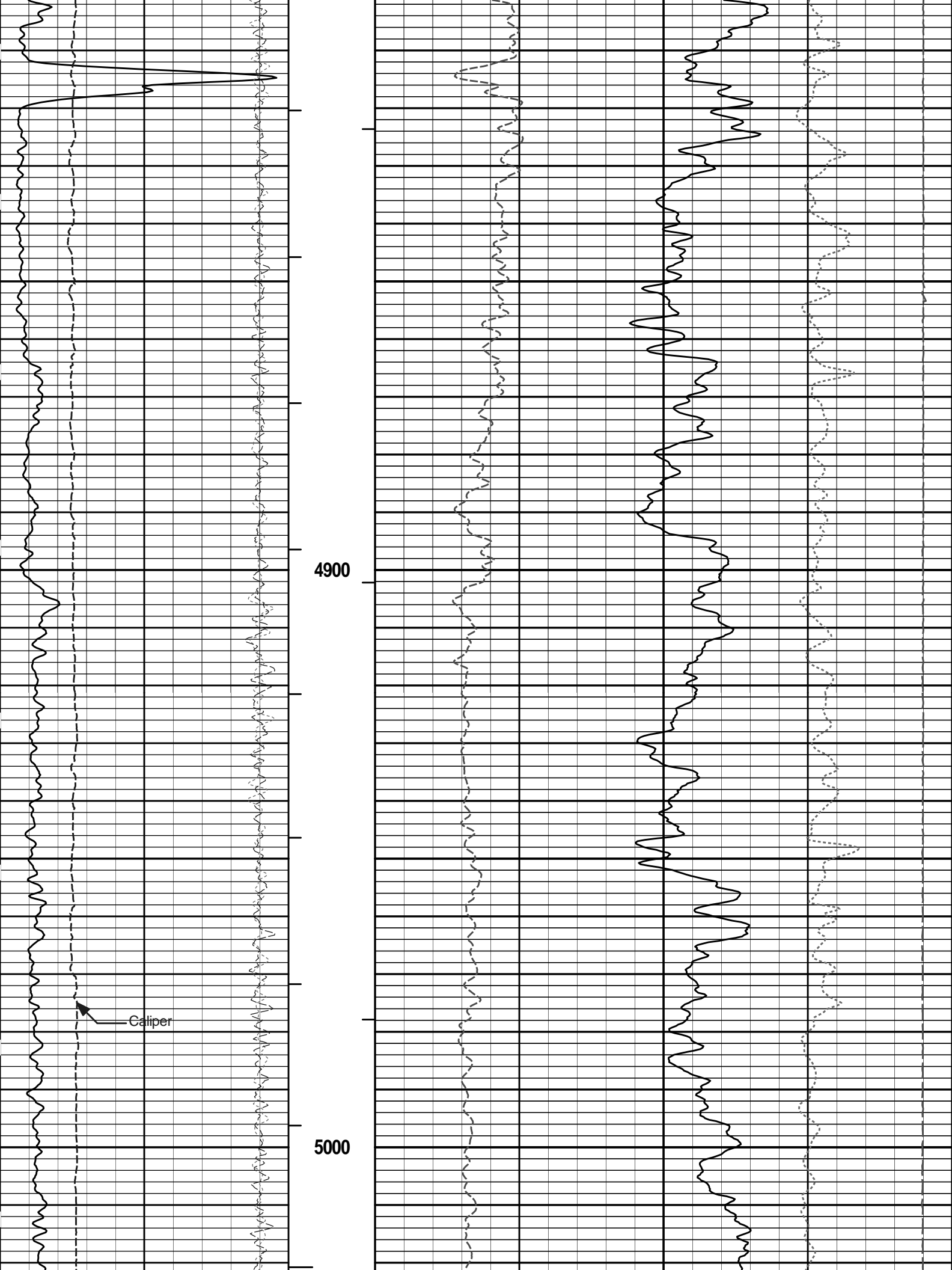


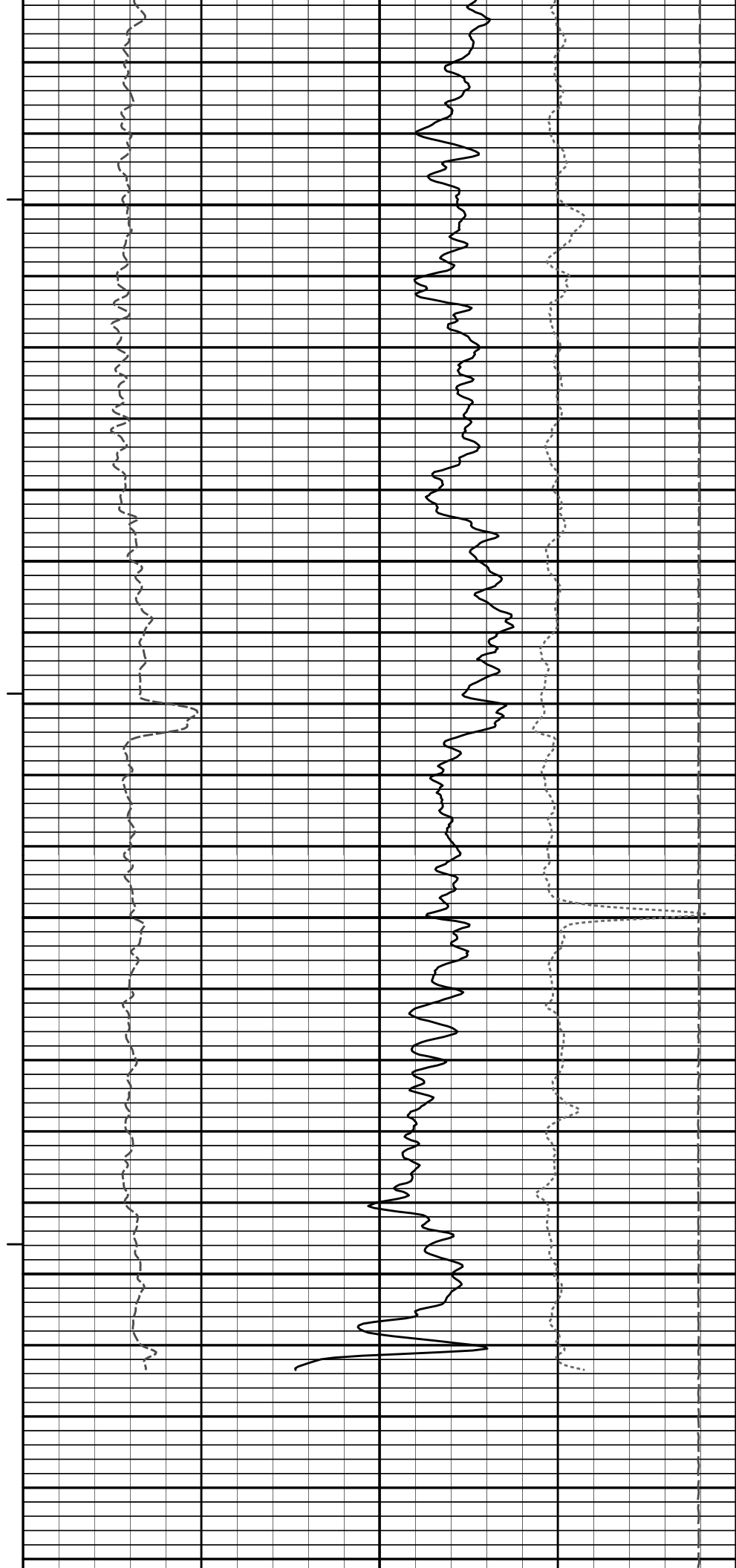
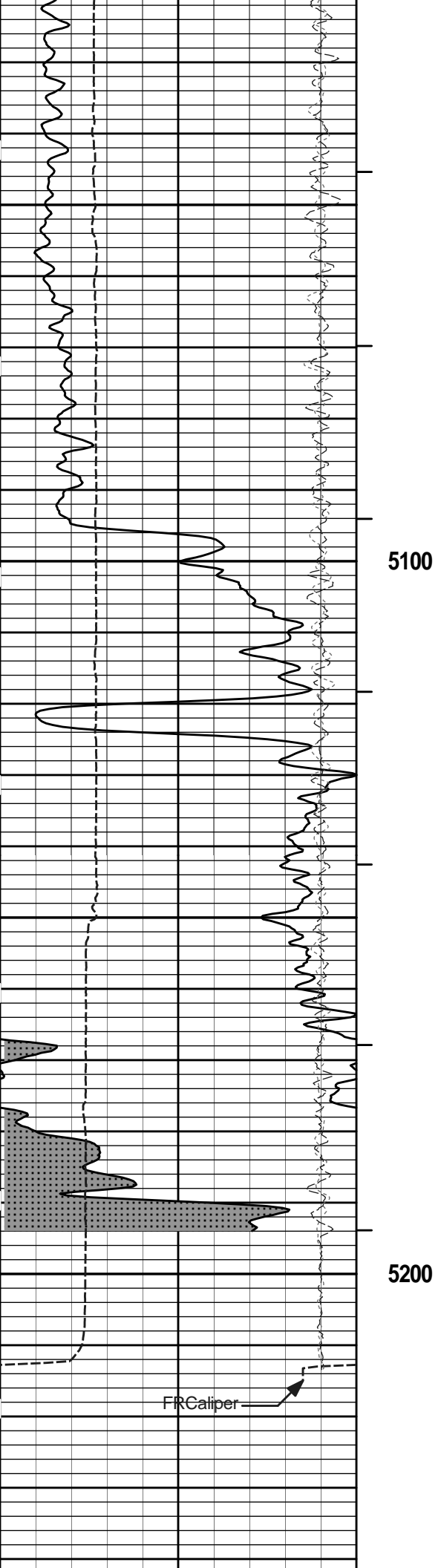












6	Caliper	16
	inches	
-18	NearQuality	2
18	FarQuality	-2
0	Gamma Ray	150
	api	
SHALE		

MD 1 : 240 ft
AHV ft3
BHV ft3
Tension Pull 10
Tension Pull

0	Pe	10	-0.25	DensityCorr	0.25
				g/cc	
			15K	Tension	0
				pounds	
2	Bulk Density				3
	g/cc				

**HALLIBURTON**

Plot Time: 01-Aug-13 07:21:07  
 Plot Range: 3000 ft to 5268.83 ft  
 Data: TERESIA\_3509Well Based\DETAIL\  
 Plot File: \\LOCAL\TERESIA\_3509\0001 SP-GTET-DSN-SDL-FLEX-XRMI-ACRT-CHIPORO\BULKD\_5\_MAIN\_LIB

## 5 INCH MAIN LOG

**HALLIBURTON**

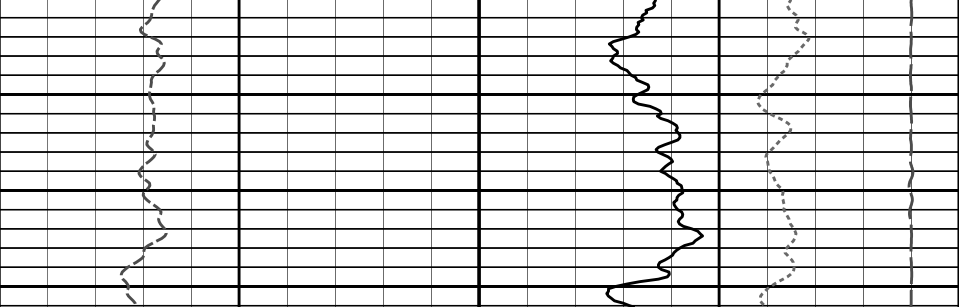
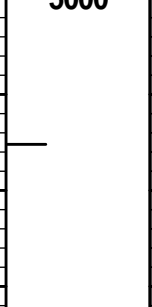
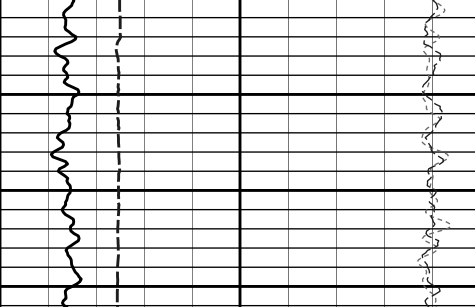
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 Data: TERESIA\_3509Well Based\REPEAT\  
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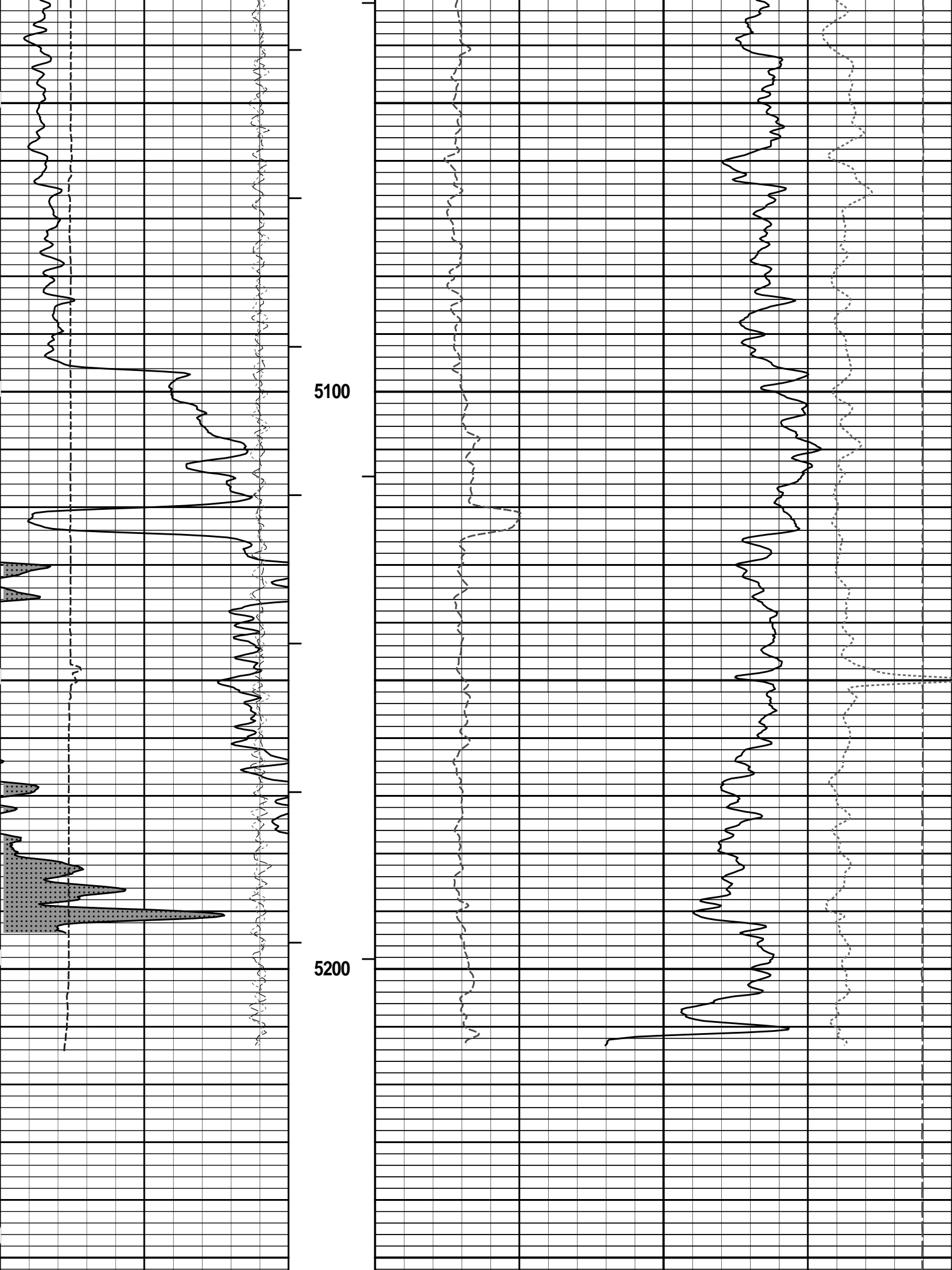
## REPEAT SECTION

SHALE		
0	Gamma Ray	150
	api	
18	FarQuality	-2
-18	NearQuality	2
6	Caliper	16
	inches	

BHV ft3
AHV ft3
MD 1 : 240 ft

2	Bulk Density				3
	g/cc				
			15K	Tension	0
				pounds	
0	Pe	10	-0.25	DensityCorr	0.25
				g/cc	





6	Caliper	16	MD	0	Pe	10	-0.25	DensityCorr	0.25
	inches		1 : 240					g/cc	
-18	NearQuality	2	AHV				15K	Tension	0
			ft3					pounds	
18	FarQuality	-2	BHV	2	Bulk Density				3
			ft3		g/cc				
0	Gamma Ray	150							
	api								
	SHALE								

**HALLIBURTON**

Plot Time: 01-Aug-13 07:21:10  
 Plot Range: 5000 ft to 5268.83 ft  
 Data: TERESIA\_3509\Well Based\REPEAT\  
 Plot File: \\-LOCAL-TERESIA\_3509\0001 SP-GTET-DSN-SDL-FLEX-XRMI-ACRT-CHIPORO\BULKD\_5\_REP\_LIB

## REPEAT SECTION

**HALLIBURTON**

## TOOL STRING DIAGRAM REPORT

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
Cable Head- 00000021 30.00 lbs		Ø 3.625 in →			1.92 ft	85.64 ft
SP Sub-11441455 60.00 lbs		Ø 3.625 in →		← SP @ 81.94 ft	3.74 ft	83.72 ft
GTET-11048627 165.00 lbs		Ø 3.625 in →		← GammaRay @ 73.92 ft	8.52 ft	79.98 ft
DSN Decentralizer- 11005605 6.60 lbs		Ø 5.000 in* →				71.46 ft
DSNT-11055304 174.00 lbs		Ø 3.625 in →		← DSN Far @ 64.53 ft ← DSN Near @ 63.78 ft	9.69 ft	61.78 ft

SDLT-11014296  
360.00 lbs

SDLT Pad-10865884  
65.00 lbs  
Microlog Pad-11014296  
8.00 lbs

Ø 4.500 in →  
Ø 4.750 in\* →  
Ø 4.750 in\* →

Microlog @ 53.96 ft  
SDL Caliper @ 53.78 ft  
SDL @ 53.77 ft

10.81 ft

50.96 ft

IQ Flex-00000696  
140.00 lbs

Ø 3.625 in →

5.67 ft

45.29 ft

XRMI Isolator-  
00000029  
32.50 lbs

Ø 4.500 in →

1.30 ft

43.99 ft

XRMI-I Instrument-  
10967399  
290.00 lbs

Ø 4.500 in →

13.00 ft

30.99 ft

XRMI-I Mandrel-  
262-90296662  
206.00 lbs

Ø 5.000 in →  
Ø 4.500 in →

11.16 ft

19.83 ft

Pads 2, 4, 6 @ 22.60 ft  
Pads 1, 3, 5 @ 22.37 ft

ACRt Instrument-  
11022962  
50.00 lbs

Regal Standoff 6\_75-  
00000044  
20.00 lbs

Ø 6.750 in\* →  
Ø 3.625 in →

5.03 ft

14.80 ft

← Mud Resistivity @ 13.44 ft

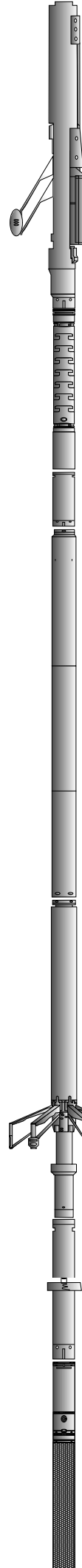
← ACRt @ 9.46 ft

ACRt Sonde-  
11005909

Ø 3.625 in →

14.22 ft

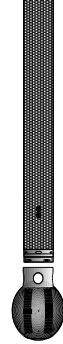
01.78 ft



200.00 lbs

Cabbage Head-  
TRK696  
10.00 lbs

Ø 3.625 in  
Ø 6.000 in



0.58 ft  
0.58 ft  
0.00 ft

Mnemonic	Tool Name	Serial Number	Weight (lbs)	Length (ft)	Accumulated Length (ft)	Max.Log. Speed (fpm)
CH	Standard OH Cable Head	00000021	30.00	1.92	83.72	300.00
SP	SP Sub	11441455	60.00	3.74	79.98	300.00
GTET	Gamma Telemetry Tool	11048627	165.00	8.52	71.46	60.00
DSNT	Dual Spaced Neutron	11055304	174.00	9.69	61.78	60.00
DCNT	DSN Decentralizer	11005605	6.60	5.13	* 65.11	300.00
SDLT	Spectral Density Tool	11014296	360.00	10.81	50.96	60.00
SDLP	Density Insite Pad	10865884	65.00	2.55	* 53.17	60.00
MICP	Microlog Pad	11014296	8.00	1.00	* 53.46	60.00
IQF	IQ Flex tool	00000696	140.00	5.67	45.29	300.00
	Isolator for the XRMI tool	00000029	32.50	1.30	43.99	300.00
XRMI	XRMI Navigation - Insite	10967399	290.00	13.00	30.99	30.00
XRMI-I	XRMI Imager - Insite	262-90296662	206.00	11.16	19.83	30.00
ACRt	Array Compensated True Resistivity Instrument Section	11022962	50.00	5.03	14.80	300.00
RSOF	Regal Standoff 6.75in	00000044	20.00	0.52	* 17.17	300.00
ACRt	Array Compensated True Resistivity Sonde Section	11005909	200.00	14.22	0.58	300.00
CBHD	Cabbage Head	TRK696	10.00	0.58	0.00	300.00

**Total** **1,817.10** **85.64**

\* Not included in Total Length and Length Accumulation.

Data: TERESIA\_3509\0001 SP-GTET-DSN-SDL-FLEX-XRMI-ACRT-CHNDLE Date: 01-Aug-13 04:29:53

# HALLIBURTON

## CALIBRATION REPORT

### NATURAL GAMMA RAY TOOL SHOP CALIBRATION

Tool Name: GTET - 11048627 Reference Calibration Date: 17-Jun-13 14:38:32  
 Engineer: THOMAS HYDE Calibration Date: 02-Jul-13 07:19:00  
 Software Version: WL INSITE R3.8.4 (Build 5) Calibration Version: 1

Calibrator Source S/N: TB146  
 Calibrator API Reference:265.00 api  
 Equivalent Calibrator API Reference:269.6 api

Measurement	Measured	Calibrated	Units
Background	51.2	51.2	api
Background + Calibrator	320.3	320.9	api
Calibrator	269.2	269.6	api

### NATURAL GAMMA RAY TOOL FIELD CALIBRATION

Tool Name: GTET - 11048627 Reference Calibration Date: 02-Jul-13 07:19:00  
 Engineer: SHELDON INGERSOLL Calibration Date: 30-Jul-13 18:30:49  
 Software Version: WL INSITE R3.8.4 (Build 5) Calibration Version: 1

Calibrator Source S/N: TB146  
 Calibrator API Reference:265.00 api  
 Equivalent Calibrator API Reference:269.6 api

Field Verification	Shop	Field	Units
Background	51.2	53.6	api
Background + Calibrator	320.9	320.7	api
Calibrator	269.6	267.2	api

Shop	Field	Difference	Tolerance
269.6	267.2	2.4	+/- 9.00

### DUAL SPACED NEUTRON SHOP CALIBRATION

Tool Name: DSNT - 11055304

Reference Calibration Date: 20-May-13 10:05:01

Engineer: THOMAS HYDE

Calibration Date: 02-Jul-13 09:34:44

Software Version: WL INSITE R3.8.4 (Build 5)

Calibration Version: 1

Logging Source S/N: 696

Tank Serial Number: LIBERAL\_NEUTRON

Reference value assigned to Tank: 51.680

Snow Block S/N: 696

Calibration Tank Water Temperature: 72 degF

Min. Tool Housing Outside Diameter: 3.620 in

#### CALIBRATION CONSTANTS

Measurement	Prev. Value	New Value	Control Limit On New Value
Gain:	0.975	0.977	0.900 - 1.100

#### WATER TANK SUMMARY (Horizontal Water Tank)

Measurement	Current Reading (Previous Coef.)	Calibrated (New Coef.)	Change	Control Limit On Change
Porosity (decp):	0.2100	0.2107	0.0007	+/- 0.0020
Calibrated Ratio:	9.70	9.72	0.022	+/- 0.050

#### VERIFIER

Measurement	Value	Control Limit
Snow-Block Porosity (decp):	0.0592	0.02000 - 0.09000

#### PASS/FAIL SUMMARY

Background Check:	Passed
Gain-Range Check:	Passed
Snow-Block Check:	Passed

### DUAL SPACED NEUTRON FIELD CALIBRATION

Tool Name: DSNT - 11055304

Reference Calibration Date: 02-Jul-13 09:34:44

Engineer: SHELDON INGERSOLL

Calibration Date: 30-Jul-13 18:36:06

Software Version: WL INSITE R3.8.4 (Build 5)

Calibration Version: 1

Logging Source S/N: 696

Snow Block S/N: 696

#### NEUTRON FIELD-CHECK SUMMARY

	Shop	Field	Difference	Control Limit On Change
Snow-Block Porosity (decp):	0.0592	0.0682	0.0090	+/- 0.0150

#### PASS/FAIL SUMMARY

Block Change Check:	Passed
---------------------	--------

Block Change Check:

Passed

Snow Block Stat Check:

Passed

Temperature Check:

Passed

**DENSITY CALIPER SHOP CALIBRATION**

Tool Name: SDLT - 11014296

Reference Calibration Date: 02-Jul-13 08:47:44

Engineer: THOMAS HYDE

Calibration Date: 02-Jul-13 08:56:23

Software Version: WL INSITE R3.8.4 (Build 5)

Calibration Version: 1

Host Tool Name: DSNT - 11055304

**CALIBRATION COEFFICIENTS**

Measurement	Previous Value	New Value	Control Limit On New Value
Pad Offset	-3994.72	-4029.83	-7000.00 - -1000.00
Pad Gain	0.0003864	0.0003862	0.000200 - 0.000600
Arm Offset	-1588.68	-2150.63	-5000.00 - 3000.00
Arm Gain	0.0003590	0.0004206	0.000300 - 0.000700
Arm Power	0.000007737	0.000001591	-0.000010000 - 0.000010000

The ring diameter is computed from:  $\text{DIAMETER} = \text{PAD EXTENSION} + \text{ARM EXTENSION} + \text{TOOL DIAMETER}$ 

Tool Diameter: 4.50 in

**CALIBRATION RINGS**

Measurement	Current Reading (Previous Coeff.)	Calibrated (New Coeff.)	Change	Control Limit On New Value
PAD EXTENSION:				
Small Ring (in)	2.01	2.00	-0.01	+/- 0.20
Medium Ring (in)	3.77	3.75	-0.02	+/- 0.20
RING DIAMETER:				
Small Ring (in)	6.48	6.50	0.02	+/- 0.20
Medium Ring (in)	8.12	8.25	0.13	+/- 0.20
Large Ring (in)	15.00	15.00	0.00	+/- 0.20

**PASS/FAIL SUMMARY**

Calibration-Coefficients Range Check: Passed

Ring-Measurement Check: Passed

**PASS/FAIL SUMMARY**

Calibration-Coefficients Range Check: Passed

**SDLT CALIPER FIELD CALIBRATION**

Tool Name: SDLT - 11014296

Reference Calibration Date: 02-Jul-13 08:56:23

Engineer: SHELDON INGERSOLL

Calibration Date: 30-Jul-13 18:41:21

Software Version: WL INSITE R3.8.4 (Build 5)

Calibration Version: 1

**MEASURED CALIPER VALUES**

Measurement	Shop	Field	Change	Control Limit On New Value
Pad Extension	3.75	3.75	-0.00	+/- 0.10
Ring Diameter	8.25	8.20	-0.05	+/- 0.15

**PASS/FAIL SUMMARY**

Pad Extension Check: Passed

Diameter Check: Passed

**SPECTRAL DENSITY SHOP CALIBRATION**

Tool Name: SDLT Pad - 10865884

Reference Calibration Date: 02-Jul-13 08:02:39

Engineer: THOMAS HYDE

Calibration Date: 02-Jul-13 08:23:04

Logging Source S/N: 5168GW

Aluminum Block S/N: LIBERAL

Density: 2.598g/cc

Pe: 3.170

Magnesium Block S/N: LIBERAL

Density: 1.684g/cc

Pe: 2.598

**DENSITY CALIBRATION SUMMARY**

Measurement	Previous Value	New Value	Control Limit
Near Bar Gain	1.0462	1.0424	0.90 - 1.10
Near Dens Gain	1.0164	1.0151	0.90 - 1.10
Near Peak Gain	1.0269	1.0032	0.90 - 1.10
Near Lith Gain	1.0077	0.9769	0.90 - 1.10
Far Bar Gain	1.0106	1.0105	0.90 - 1.10
Far Dens Gain	0.9990	0.9990	0.90 - 1.10
Far Peak Gain	0.9932	0.9935	0.90 - 1.10
Far Lith Gain	0.9691	0.9686	0.90 - 1.10
<hr/>			
Near Bar Offset	-0.2173	-0.1830	NONE
Near Dens Offset	0.0248	0.0348	NONE
Near Peak Offset	-0.0835	0.1140	NONE
Near Lith Offset	0.0314	0.2870	NONE
Far Bar Offset	0.0502	0.0518	NONE
Far Dens Offset	0.1209	0.1216	NONE
Far Peak Offset	0.1339	0.1302	NONE
Far Lith Offset	0.2676	0.2676	NONE
<hr/>			
Near Bar Background	826.00	825.17	700 - 1450
Near Dens Background	273.42	273.92	230 - 480
Near Peak Background	119.55	119.89	100 - 210
Near Lith Background	145.87	145.76	125 - 260
Far Bar Background	509.93	510.22	450 - 900
Far Dens Background	197.78	199.46	175 - 345
Far Peak Background	78.17	78.04	70 - 140
Far Lith Background	81.35	81.01	75 - 145

**CALIBRATION BLOCK SUMMARY**

Measurement	Current Reading (Previous Coef)	Calibrated (New Coef)	Change	Control Limit On Change
<b>MAGNESIUM</b>				
Density (g/cc)	1.685	1.684	-0.001	+/- 0.015
Pe	2.525	2.561	0.036	+/- 0.150
<b>ALUMINUM</b>				
Density (g/cc)	2.597	2.598	0.001	+/- 0.01500
Pe	3.138	3.129	-0.009	+/- 0.150

**TOOL SUMMARY**

Measurement	Near Detector		Far Detector	
	Value	Control Limits	Value	Control Limits
<b>QUALITY</b>				
Background	0.0008	+/- 0.0110	0.0008	+/- 0.0140
Magnesium Block	-0.0013	+/- 0.0110	-0.0010	+/- 0.0140
Aluminum Block	0.0003	+/- 0.0110	0.0001	+/- 0.0140
Resolution	9.21	6.00 - 11.50	8.96	6.00 - 11.50
Internal Verifier(B+D+P+L)	1365	1200 - 2700	869	800 - 1700

**PASS/FAIL SUMMARY**

Background Quality Check:	Passed
Background Range Check:	Passed
Background Resolution Check:	Passed
Background Verification Check:	Passed
Magnesium Quality Check:	Passed
Aluminum Quality Check:	Passed
Gains Check:	Passed
Changes in Calibration Blocks:	Passed

**SPECTRAL DENSITY FIELD CHECK**Tool Name: **SDLT Pad - 10865884**Reference Calibration Date: **02-Jul-13 08:23:04**Engineer: **SHELDON INGERSOLL**Calibration Date: **30-Jul-13 18:30:41**Software Version: **WL INSITE R3.8.4 (Build 5)**Calibration Version: **1**

Pad Temperature: 84.2 degF

**DENSITY FIELD CALIBRATION SUMMARY**

Measurement	Shop	Field	Change	Control Limit +/-
Near (B+D+P+L) cps	1364.751	1364.392	-0.359	14.932
Far (B+D+P+L) cps	868.728	869.632	0.904	16.115
Near Resolution	9.21	9.04	-0.170	0.50
Far Resolution	8.96	9.12	0.160	1.00

**PASS/FAIL SUMMARY**

Bkg Quality Check:	Passed
Bkg Resolution Check:	Passed
Bkg Verification Check:	Passed

**CALIBRATION SUMMARY**

Sensor	Shop	Field	Post	Difference	Tolerance	Units
<b>GTET-11048627</b>						
Gamma Ray Calibrator	269.6	267.2	-----	2.4	+/- 9.00	api
<b>DSNT-11055304</b>						
Snow-Block Porosity	0.0592	0.0682	-----	-0.0090	+/- 0.0150	decp
<b>SDLT-11014296</b>						
Pad Extension	3.75	3.75	-----	0.00	+/-0.10	in
Ring Diameter	8.25	8.20	-----	0.05	+/-0.15	in
<b>SDLT Pad-10865884</b>						
Near(B+D+P+L)	1364.751	1364.392	-----	0.359	+/-14.932	cps
Far(B+D+P+L)	868.728	869.632	-----	-0.904	+/-16.115	cps

Data: TERESIA\_3509\0001 SP-GTET-DSN-SDL-FLEX-XRMI-ACRT-CH\001 01-Aug-13 04:52 Dn @480.3f

Date: 01-Aug-13 04:53:00

**HALLIBURTON****PARAMETERS REPORT**

Depth (ft)	Tool Name	Mnemonic	Description	Value	Units
TOP					
	SHARED	BS	Bit Size	8.750	in
	SHARED	UBS	Use Bit Size instead of Caliper for all applications.	No	

SHARED	MDBS	Mud Base	Water	
SHARED	MDWT	Borehole Fluid Weight	9.100	ppg
SHARED	WAGT	Weighting Agent	Natural	
SHARED	BSAL	Borehole salinity	0.00	ppm
SHARED	FSAL	Formation Salinity NaCl	0.00	ppm
SHARED	KPCT	Percent K in Mud by Weight?	0.00	%
SHARED	RMUD	Mud Resistivity	2.000	ohmm
SHARED	TRM	Temperature of Mud	75.0	degF
SHARED	CSD	Logging Interval is Cased?	No	
SHARED	ICOD	AHV Casing OD	7.000	in
SHARED	ST	Surface Temperature	75.0	degF
SHARED	TD	Total Well Depth	5280.00	ft
SHARED	BHT	Bottom Hole Temperature	200.0	degF
SHARED	SVTM	Navigation and Survey Master Tool	XRMI-I Instrument	
SHARED	AZTM	High Res Z Accelerometer Master Tool	XRMI-I Instrument	
SHARED	TEMM	Temperature Master Tool	NONE	
SHARED	BHSM	Borehole Size Master Tool	NONE	
Rwa / CrossPlot	XPOK	Process Crossplot?	Yes	
Rwa / CrossPlot	FCHO	Select Source of F	Automatic	
Rwa / CrossPlot	AFAC	Archie A factor	0.6200	
Rwa / CrossPlot	MFAC	Archie M factor	2.1500	
Rwa / CrossPlot	RMFR	Rmf Reference	0.10	ohmm
Rwa / CrossPlot	TMFR	Rmf Ref Temp	75.00	degF
Rwa / CrossPlot	RWA	Resistivity of Formation Water	0.05	ohmm
Rwa / CrossPlot	ADP	Use Air Porosity to calculate CrossplotPhi	No	
GTET	GROK	Process Gamma Ray?	Yes	
GTET	GRSO	Gamma Tool Standoff	0.000	in
GTET	GEOK	Process Gamma Ray EVR?	No	
GTET	TPOS	Tool Position for Gamma Ray Tools.	Eccentered	
DSNT	DNOK	Process DSN?	Yes	
DSNT	DEOK	Process DSN EVR?	No	
DSNT	NLIT	Neutron Lithology	Limestone	
DSNT	DNSO	DSN Standoff - 0.25 in (6.35 mm) Recommended	0.250	in
DSNT	DNTP	Temperature Correction Type	None	
DSNT	DPRS	DSN Pressure Correction Type	None	
DSNT	SHCO	View More Correction Options	No	
DSNT	UTVD	Use TVD for Gradient Corrections?	No	
DSNT	LHWT	Logging Horizontal Water Tank?	No	
SDLT	CLOK	Process Caliper Outputs?	Yes	
Microlog Pad	MLOK	Process MicroLog Outputs?	Yes	
SDLT Pad	DNOK	Process Density?	Yes	
SDLT Pad	DNOK	Process Density EVR?	No	
SDLT Pad	CB	Logging Calibration Blocks?	No	
SDLT Pad	SPVT	SDLT Pad Temperature Valid?	Yes	
SDLT Pad	DTWN	Disable temperature warning	No	
SDLT Pad	DMA	Formation Density Matrix	2.710	g/cc
SDLT Pad	DFL	Formation Density Fluid	1.000	g/cc
XRMI-I Instrument	WRTI	Survey Writing Interval	30	ft
XRMI-I Instrument	SOPT	Smoothing Option	None	
XRMI-I Mandrel	DIMG	Process XRMI?	Yes	
XRMI-I Mandrel	DSTI	Process XRMI (DSTI)?	Yes	

XRMI-I Mandrel	RO	Rotate Image (N-E-S-W-N)?	Yes	
XRMI-I Mandrel	AGN	Use Button Auto Gain?	Yes	
XRMI-I Mandrel	BCLR	Button Auto Gain Color	127	
XRMI-I Mandrel	BFIL	Button Auto Gain Filter	0.020	
XRMI-I Mandrel	BGAN	Button Gain Value	0.001	
XRMI-I Mandrel	BOFF	Button Offset	0	
XRMI-I Mandrel	DIPE	Process Dipmeter Calculations?	Yes	
XRMI-I Mandrel	BHCS	Process Borehole Corrections?	Yes	
XRMI-I Mandrel	CLOK	Process Caliper Outputs?	Yes	
XRMI-I Mandrel	CMAX	Caliper Maximum Limit	100.0	in
XRMI-I Mandrel	CMIN	Caliper Mimimum Limit	3.5	in
XRMI-I Mandrel	NAVS	Navigation Source Tool	XRMI-I Instrument	
XRMI-I Mandrel	BHVC	Radius type for borehole volume calcuations	Elliptical	
ACRt Sonde	RTOK	Process ACRt?	Yes	
ACRt Sonde	MNSO	Minimum Tool Standoff	1.50	in
ACRt Sonde	TCS1	Temperature Correction Source	FP Lwr & FP Upr	
ACRt Sonde	TPOS	Tool Position	Free Hanging	
ACRt Sonde	RMOP	Rmud Source	Mud Cell	
ACRt Sonde	RMIN	Minimum Resistivity for MAP	0.20	ohmm
ACRt Sonde	RMIN	Maximum Resistivity for MAP	200.00	ohmm
ACRt Sonde	THQY	Threshold Quality	0.50	
ACRt Sonde	MRFX	Fixed mud resistivity	2000	ohmm

BOTTOM

Data: TERESIA\_3509\0001 SP-GTET-DSN-SDL-FLEX-XRMI-ACRT-CH\IDLE

Date: 01-Aug-13 04:49:20

## HALLIBURTON

### INPUTS, DELAYS AND FILTERS TABLE

Mnemonic	Input Description	Delay (ft)	Filter Type	Filter Length (ft)
<b>Depth Panel</b>				
TENS	Tension	0.00	NO	
<b>SP Sub</b>				
PLTC	Plot Control Mask	81.94	NO	
SP	Spontaneous Potential	81.94	BLK	1.250
SPR	Raw Spontaneous Potential	81.94	NO	
SPO	Spontaneous Potential Offset	81.94	NO	
<b>GTET</b>				
TPUL	Tension Pull	73.92	NO	
GR	Natural Gamma Ray API	73.92	TRI	1.750
GRU	Unfiltered Natural Gamma Ray API	73.92	NO	
EGR	Natural Gamma Ray API with Enhanced Vertical Resolution	73.92	W	1.416 , 0.750
ACCZ	Accelerometer Z	0.00	BLK	0.083
DEVI	Inclination	0.00	NO	
<b>DSNT</b>				
TPUL	Tension Pull	63.68	NO	
RNDS	Near Detector Telemetry Counts	63.78	BLK	1.417
RFDS	Far Detector Telemetry Counts	64.53	TRI	0.583
DNTT	DSN Tool Temperature	63.78	NO	
DSNS	DSN Tool Status	63.68	NO	
ERND	Near Detector Telemetry Counts EVR	63.78	BLK	0.000

ERFD	Far Detector Telemetry Counts EVR	64.53	BLK	0.000
ENTM	DSN Tool Temperature EVR	63.78	NO	
<b>SDLT</b>				
TPUL	Tension Pull	53.78	NO	
PCAL	Pad Caliper	53.78	TRI	0.250
ACAL	Arm Caliper	53.78	TRI	0.250
<b>XRMI-I Mandrel</b>				
TPUL	Tension Pull	22.60	NO	
PAD1	XRMI Pad 1 values	22.36	NO	
PAD2	XRMI Pad 2 values	22.36	NO	
PAD3	XRMI Pad 3 values	22.36	NO	
PAD4	XRMI Pad 4 values	22.36	NO	
PAD5	XRMI Pad 5 values	22.36	NO	
PAD6	XRMI Pad 6 values	22.36	NO	
OD1	EMI Odd Button Values Pad 1	22.36	NO	
OD2	EMI Odd Button Values Pad 2	22.60	NO	
OD3	EMI Odd Button Values Pad 3	22.36	NO	
OD4	EMI Odd Button Values Pad 4	22.60	NO	
OD5	EMI Odd Button Values Pad 5	22.36	NO	
OD6	EMI Odd Button Values Pad 6	22.60	NO	
EV1	EMI Even Button Values Pad 1	22.39	NO	
EV2	EMI Even Button Values Pad 2	22.57	NO	
EV3	EMI Even Button Values Pad 3	22.39	NO	
EV4	EMI Even Button Values Pad 4	22.57	NO	
EV5	EMI Even Button Values Pad 5	22.39	NO	
EV6	EMI Even Button Values Pad 6	22.57	NO	
ITMP	Instrument Temperature	19.83	NO	
EMIM	Tool Mode	19.83	NO	
HAZI	Hole Azimuth	22.11	NO	
HAZI	Hole Azimuth - Down Delay	22.61	NO	
ZACC	Accelerometer Z	22.36	NO	
TPUL	Tension Pull	22.60	NO	
FIR1	Current Button R - Pad 1	22.36	NO	
FIR2	Current Button R - Pad 2	22.60	NO	
FIR3	Current Button R - Pad 3	22.36	NO	
FIR4	Current Button R - Pad 4	22.60	NO	
FIR5	Current Button R - Pad 5	22.36	NO	
FIR6	Current Button R - Pad 6	22.60	NO	
FIX1	Current Button X - Pad 1	22.36	NO	
FIX2	Current Button X - Pad 2	22.60	NO	
FIX3	Current Button X - Pad 3	22.36	NO	
FIX4	Current Button X - Pad 4	22.60	NO	
FIX5	Current Button X - Pad 5	22.36	NO	
FIX6	Current Button X - Pad 6	22.60	NO	
SIR1	Current Slow Button R - Pad 1	22.36	BLK	3.000
SIR2	Current Slow Button R - Pad 2	22.60	BLK	3.000
SIR3	Current Slow Button R - Pad 3	22.36	BLK	3.000
SIR4	Current Slow Button R - Pad 4	22.60	BLK	3.000
SIR5	Current Slow Button R - Pad 5	22.36	BLK	3.000
SIR6	Current Slow Button R - Pad 6	22.60	BLK	3.000
SIX1	Current Slow Button X - Pad 1	22.36	BLK	3.000
SIX2	Current Slow Button X - Pad 2	22.60	BLK	3.000
SIX3	Current Slow Button X - Pad 3	22.36	BLK	3.000

SIX4	Current Slow Button X - Pad 4	22.60	BLK	3.000
SIX5	Current Slow Button X - Pad 5	22.36	BLK	3.000
SIX6	Current Slow Button X - Pad 6	22.60	BLK	3.000
EMMR	Phasor Voltage - Real Part	22.36	NO	
EMMX	Phasor Voltage - Imaginary Part	22.36	NO	
PADV	Pad Voltage	19.83	BLK	0.250
ITMP	Instrument Temperature	19.83	BLK	0.000
CON1	Conductivity Pad 1	22.36	BLK	3.000
CON2	Conductivity Pad 2	22.60	BLK	3.000
CON3	Conductivity Pad 3	22.36	BLK	3.000
CON4	Conductivity Pad 4	22.60	BLK	3.000
CON5	Conductivity Pad 5	22.36	BLK	3.000
CON6	Conductivity Pad 6	22.60	BLK	3.000
UIR2	Current Button R No Delay - Pad 2	22.36	NO	
UIR4	Current Button R No Delay - Pad 4	22.36	NO	
UIR6	Current Button R No Delay - Pad 6	22.36	NO	
UIX2	Current Button X No Delay - Pad 2	22.36	NO	
UIX4	Current Button X No Delay - Pad 4	22.36	NO	
UIX6	Current Button X No Delay - Pad 6	22.36	NO	
TPUL	Tension Pull	22.60	NO	
ARM1	Caliper 1 measurement	22.36	BLK	0.000
ARM2	Caliper 2 measurement	22.36	BLK	0.000
ARM3	Caliper 3 measurement	22.36	BLK	0.000
ARM4	Caliper 4 measurement	22.36	BLK	0.000
ARM5	Caliper 5 measurement	22.36	BLK	0.000
ARM6	Caliper 6 measurement	22.36	BLK	0.000
MOTV	Motor Voltage Monitor 1	22.36	BLK	0.000
PRES	Caliper percentage of total compression of the spring	19.83	BLK	0.000
HAZI	Hole Azimuth	22.36	NO	
RB	Relative Bearing	22.36	NO	
AZI1	PAD1 Azimuth	22.36	NO	
DEVI	Inclination	22.36	NO	

ACRt Sonde				
TPUL	Tension Pull	2.97	NO	
F1R1	ACRT 12KHz - 80in R value	9.22	BLK	0.000
F1X1	ACRT 12KHz - 80in X value	9.22	BLK	0.000
F1R2	ACRT 12KHz - 50in R value	6.72	BLK	0.000
F1X2	ACRT 12KHz - 50in X value	6.72	BLK	0.000
F1R3	ACRT 12KHz - 29in R value	5.22	BLK	0.000
F1X3	ACRT 12KHz - 29in X value	5.22	BLK	0.000
F1R4	ACRT 12KHz - 17in R value	4.22	BLK	0.000
F1X4	ACRT 12KHz - 17in X value	4.22	BLK	0.000
F1R5	ACRT 12KHz - 10in R value	3.72	BLK	0.000
F1X5	ACRT 12KHz - 10in X value	3.72	BLK	0.000
F1R6	ACRT 12KHz - 6in R value	3.47	BLK	0.000
F1X6	ACRT 12KHz - 6in X value	3.47	BLK	0.000
F2R1	ACRT 36KHz - 80in R value	9.22	BLK	0.000
F2X1	ACRT 36KHz - 80in X value	9.22	BLK	0.000
F2R2	ACRT 36KHz - 50in R value	6.72	BLK	0.000
F2X2	ACRT 36KHz - 50in X value	6.72	BLK	0.000
F2R3	ACRT 36KHz - 29in R value	5.22	BLK	0.000
F2X3	ACRT 36KHz - 29in X value	5.22	BLK	0.000
F2R4	ACRT 36KHz - 17in R value	4.22	BLK	0.000
F2X4	ACRT 36KHz - 17in X value	4.22	BLK	0.000

F2R5	ACRT 36KHz - 10in R value	3.72	BLK	0.000
F2X5	ACRT 36KHz - 10in X value	3.72	BLK	0.000
F2R6	ACRT 36KHz - 6in R value	3.47	BLK	0.000
F2X6	ACRT 36KHz - 6in X value	3.47	BLK	0.000
F3R1	ACRT 72KHz - 80in R value	9.22	BLK	0.000
F3X1	ACRT 72KHz - 80in X value	9.22	BLK	0.000
F3R2	ACRT 72KHz - 50in R value	6.72	BLK	0.000
F3X2	ACRT 72KHz - 50in X value	6.72	BLK	0.000
F3R3	ACRT 72KHz - 29in R value	5.22	BLK	0.000
F3X3	ACRT 72KHz - 29in X value	5.22	BLK	0.000
F3R4	ACRT 72KHz - 17in R value	4.22	BLK	0.000
F3X4	ACRT 72KHz - 17in X value	4.22	BLK	0.000
F3R5	ACRT 72KHz - 10in R value	3.72	BLK	0.000
F3X5	ACRT 72KHz - 10in X value	3.72	BLK	0.000
F3R6	ACRT 72KHz - 6in R value	3.47	BLK	0.000
F3X6	ACRT 72KHz - 6in X value	3.47	BLK	0.000
RMUD	Mud Resistivity	12.76	BLK	0.000
F1RT	Transmitter Current Raw 12K X Receiver	2.97	BLK	0.000
F1XT	Transmitter Reference 12 KHz Imaginary Signal	2.97	BLK	0.000
F2RT	Transmitter Reference 36 KHz Real Signal	2.97	BLK	0.000
F2XT	Transmitter Reference 36 KHz Imaginary Signal	2.97	BLK	0.000
F3RT	Transmitter Reference 72 KHz Real Signal	2.97	BLK	0.000
F3XT	Transmitter Reference 72 KHz Imaginary Signal	2.97	BLK	0.000
TFPU	Upper Feedpipe Temperature Calculated	2.97	BLK	0.000
TFPL	Lower Feedpipe Temperature Calculated	2.97	BLK	0.000
ITMP	Instrument Temperature	2.97	BLK	0.000
TCVA	Temperature Correction Values Loop Off	2.97	NO	
TIDV	Instrument Temperature Derivative	2.97	NO	
TUDV	Upper Temperature Derivative	2.97	NO	
TLDV	Lower Temperature Derivative	2.97	NO	
TRBD	Receiver Board Temperature	2.97	NO	
<b>Microlog Pad</b>				
TPUL	Tension Pull	53.96	NO	
MINV	Microlog Lateral	53.96	BLK	0.750
MNOR	Microlog Normal	53.96	BLK	0.750
<b>SDLT Pad</b>				
TPUL	Tension Pull	53.77	NO	
NAB	Near Above	53.59	BLK	0.920
NHI	Near Cesium High	53.59	BLK	0.920
NLO	Near Cesium Low	53.59	BLK	0.920
NVA	Near Valley	53.59	BLK	0.920
NBA	Near Barite	53.59	BLK	0.920
NDE	Near Density	53.59	BLK	0.920
NPK	Near Peak	53.59	BLK	0.920
NLI	Near Lithology	53.59	BLK	0.920
NBAU	Near Barite Unfiltered	53.59	BLK	0.250
NLIU	Near Lithology Unfiltered	53.59	BLK	0.250
FAB	Far Above	53.94	BLK	0.250
FHI	Far Cesium High	53.94	BLK	0.250
FLO	Far Cesium Low	53.94	BLK	0.250
FVA	Far Valley	53.94	BLK	0.250
FBA	Far Barite	53.94	BLK	0.250
FDE	Far Density	53.94	BLK	0.250
EPK	Far Peak	53.94	BLK	0.250

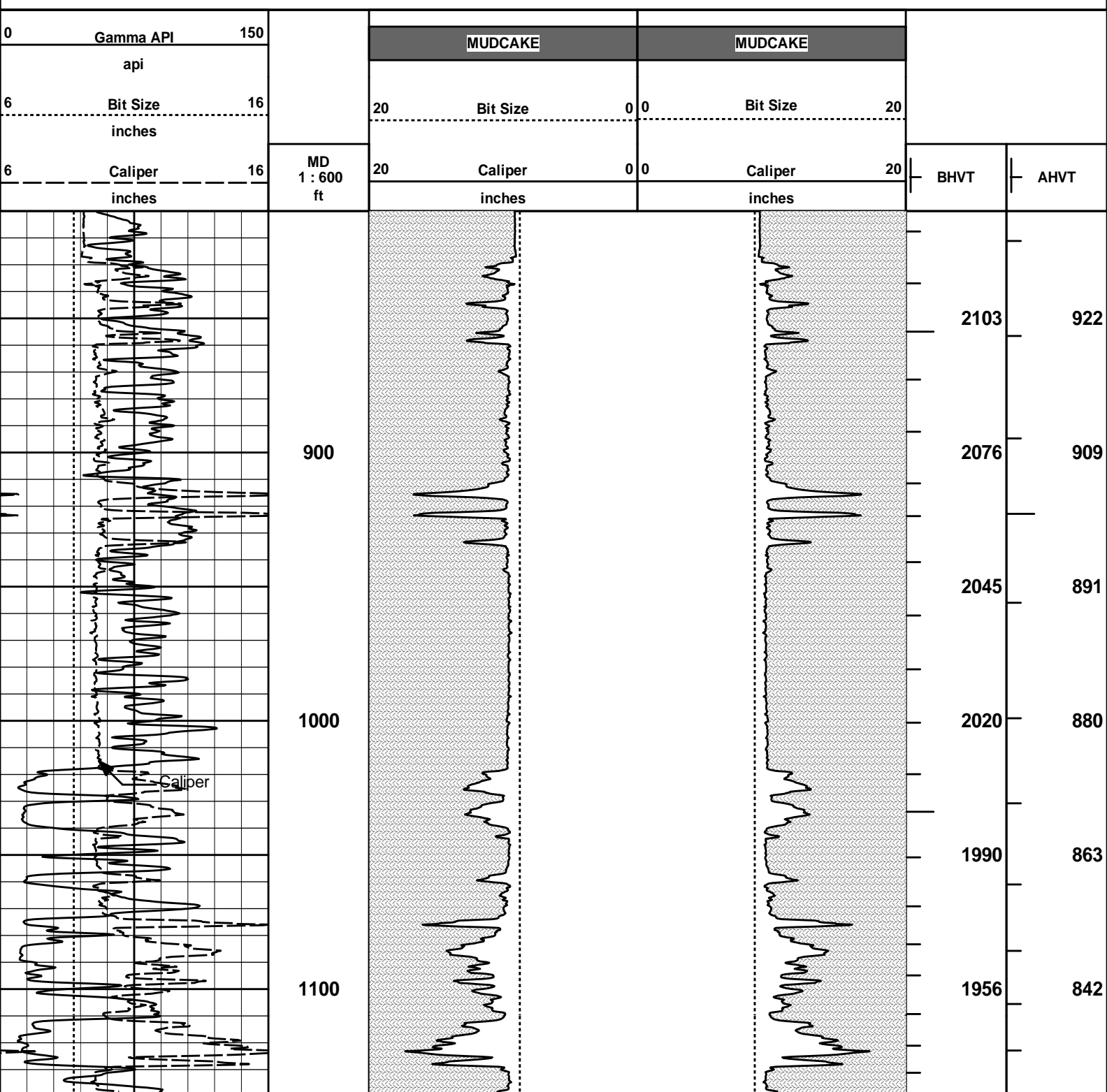
FLI	Far Lithology	53.94	BLK	0.250
PTMP	Pad Temperature	53.78	BLK	0.920
NHV	Near Detector High Voltage	53.17	NO	
FHV	Far Detector High Voltage	53.17	NO	
ITMP	Instrument Temperature	53.17	NO	
DDHV	Detector High Voltage	53.17	NO	

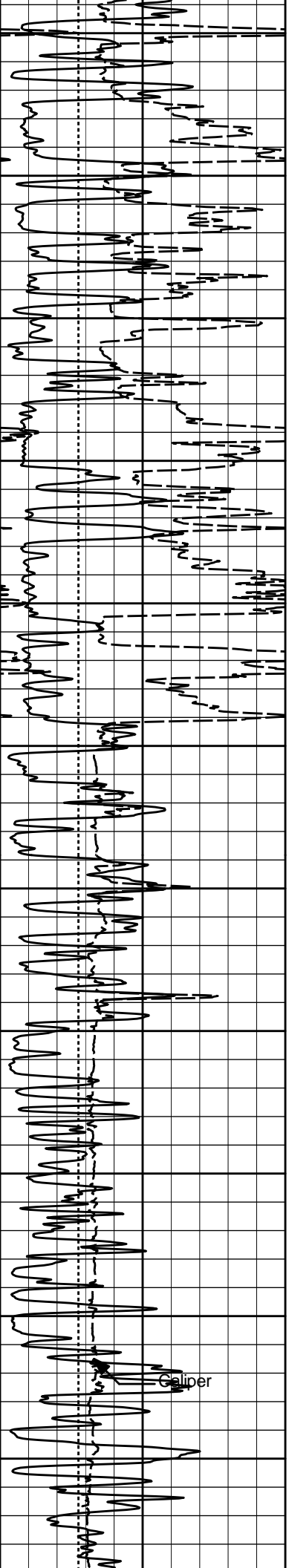
Date: TERESIA\_35090001 SP-GTET-DSN-SDL-FLEX-XRMI-ACRT-CHIPOR Date: 01-Aug-13 04:46:59



Plot Time: 01-Aug-13 07:21:11  
 Plot Range: 810 ft to 5268.83 ft  
 Data: TERESIA\_3509\Well Based\CASING\  
 Plot File: \\-LOCAL-TERESIA\_35090001 SP-GTET-DSN-SDL-FLEX-XRMI-ACRT-CHIPOR\AHV\_2\_IQ\_LIB

## ANNULAR HOLE VOLUME PLOT





1200

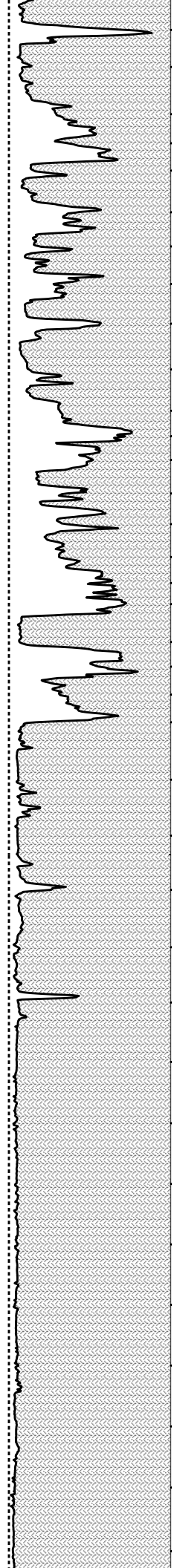
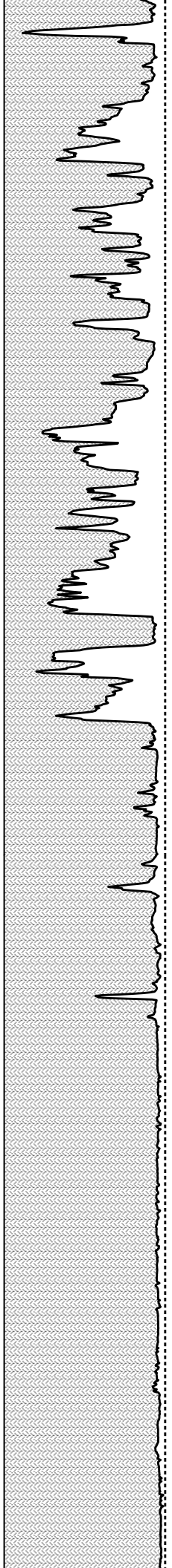
1300

1400

1500

1600

Galper



1918

1879

1842

1800

1750

1706

1680

1655

1632

1608

1585

818

792

768

739

703

672

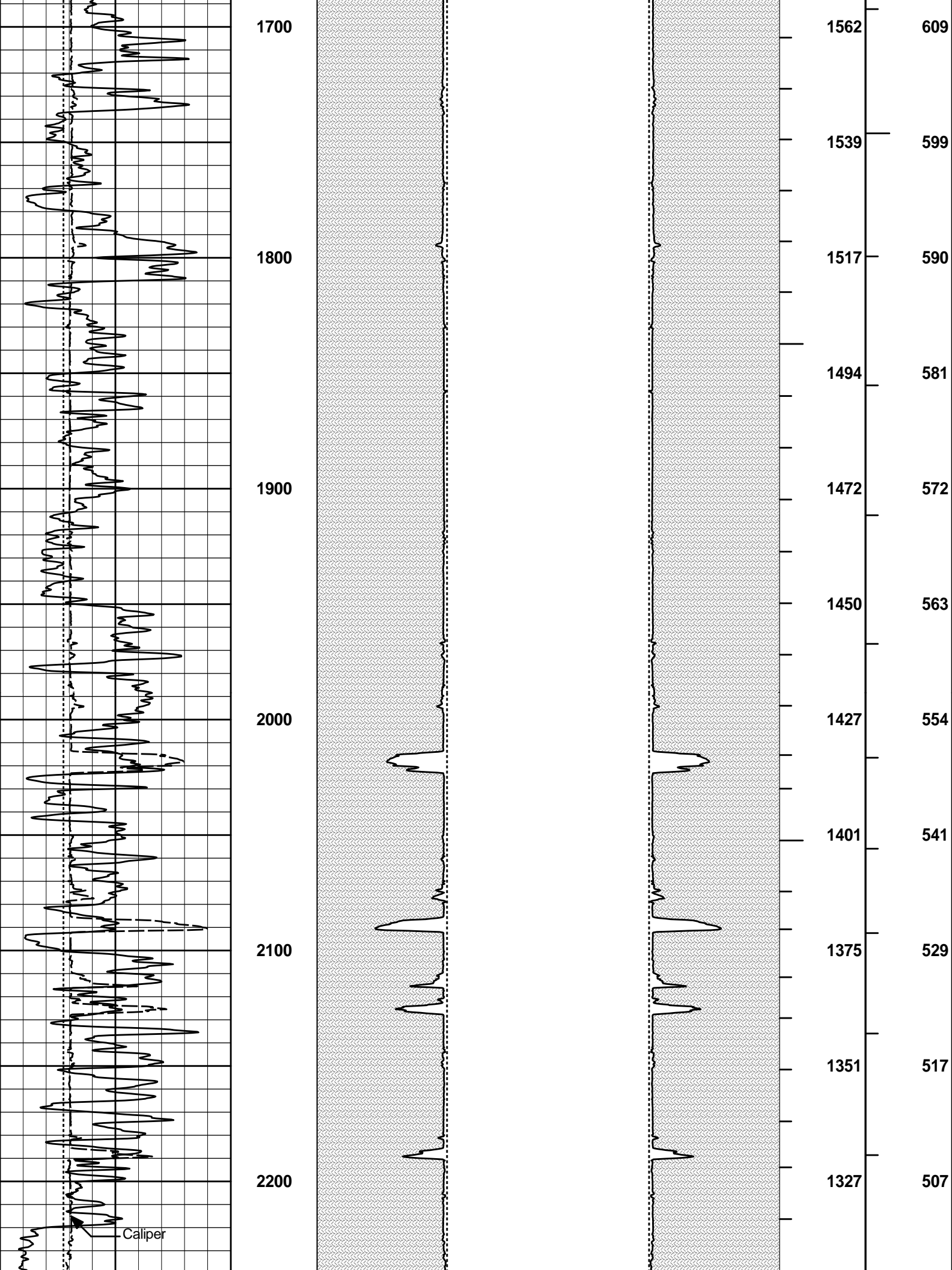
660

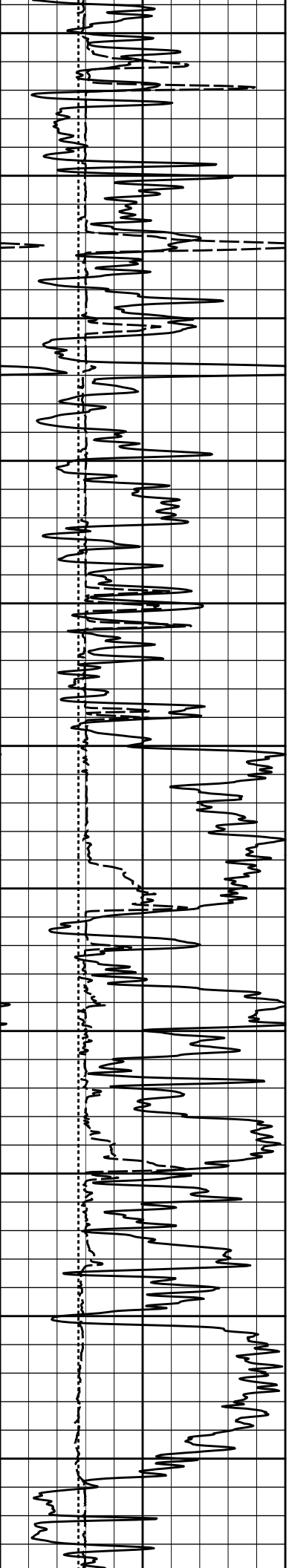
648

638

628

618





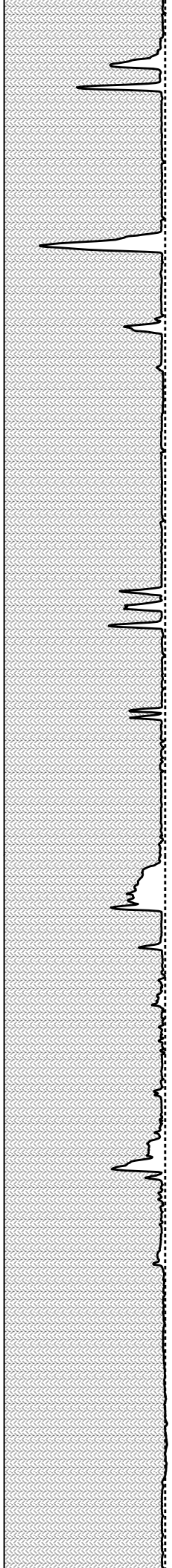
2300

2400

2500

2600

2700



1305 499

1280 487

1254 475

1232 465

1209 456

1185 446

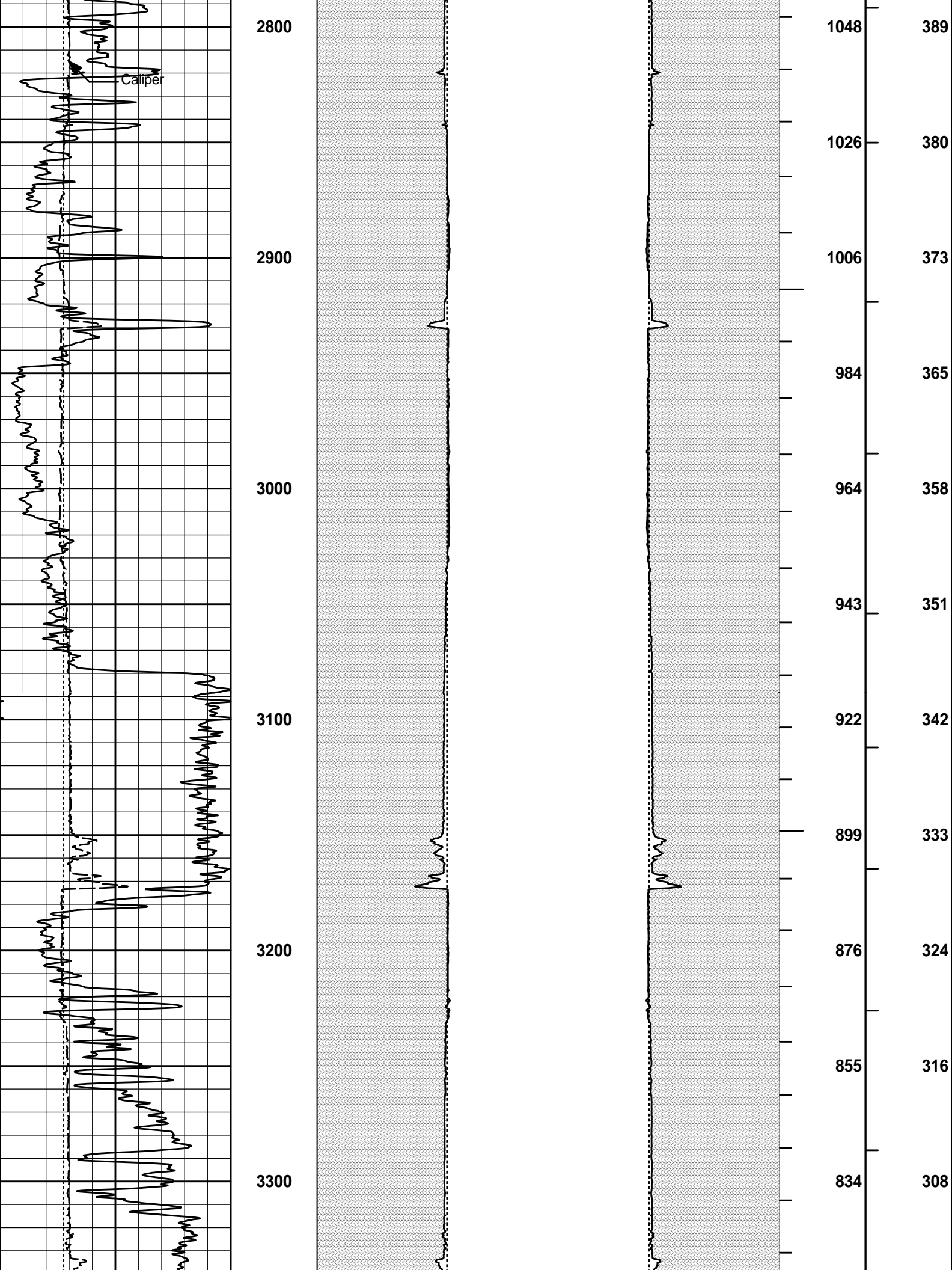
1162 435

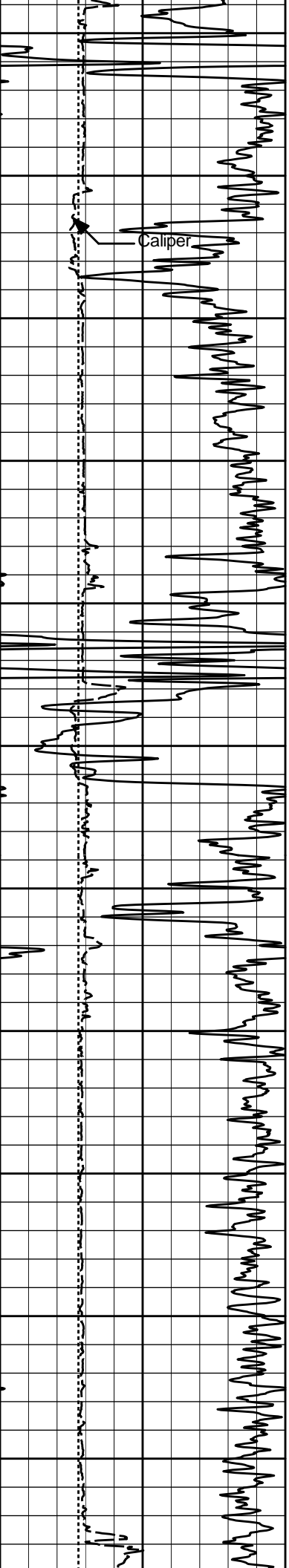
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1113 414

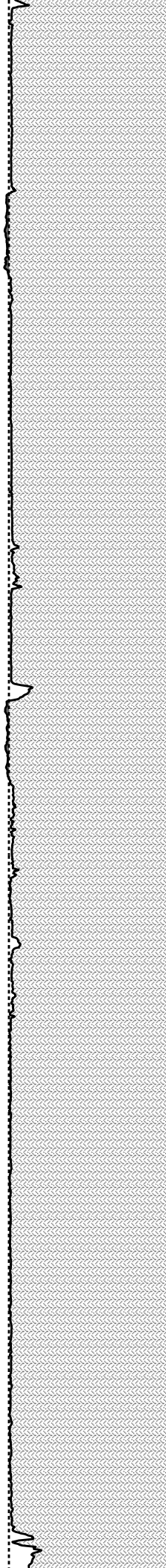
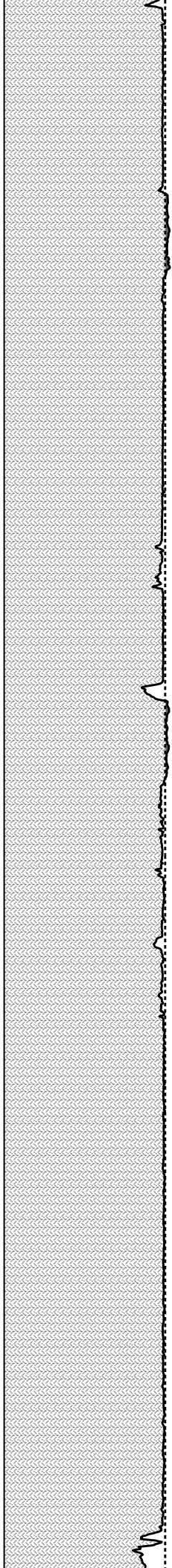
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1070 397

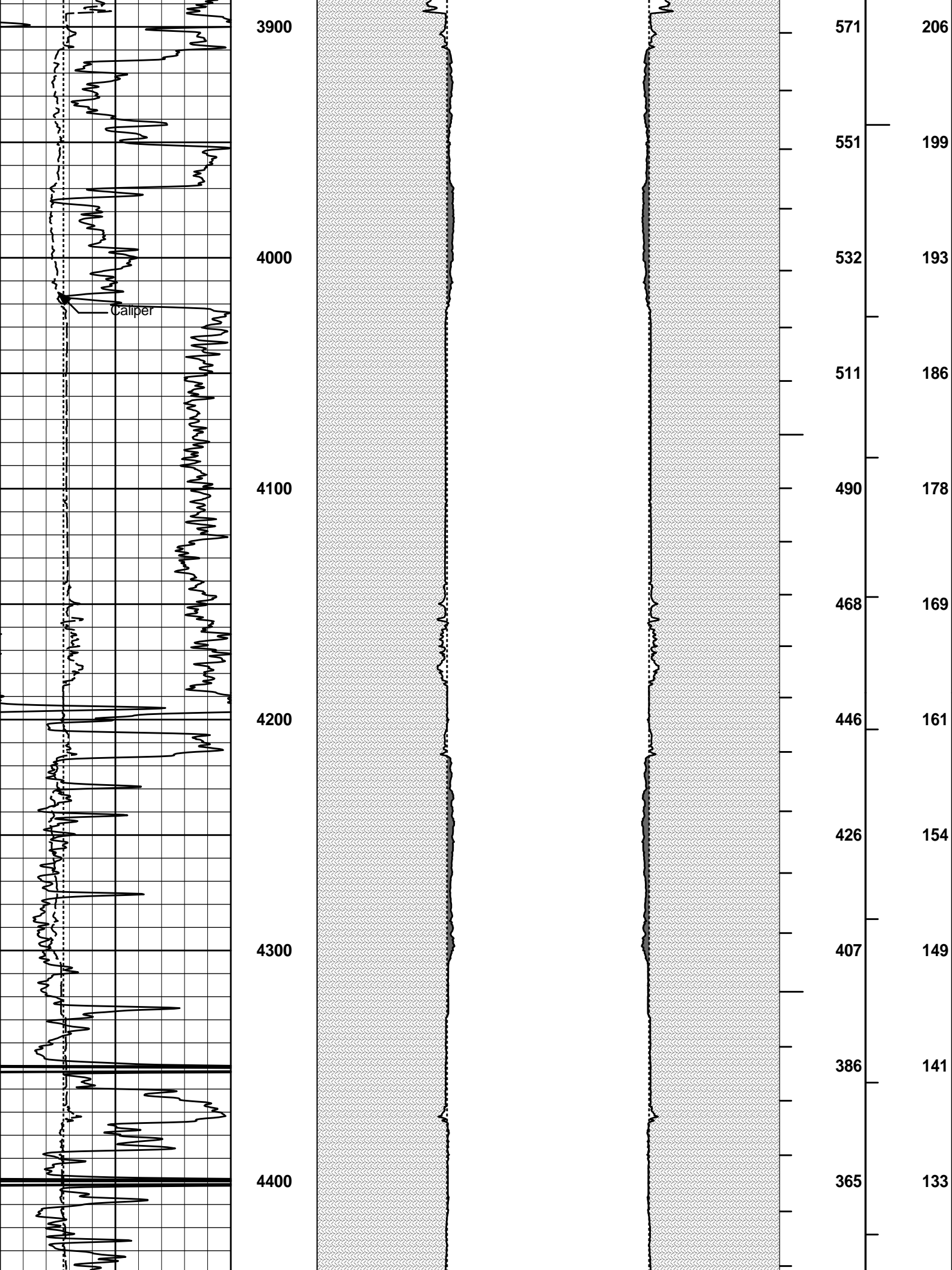


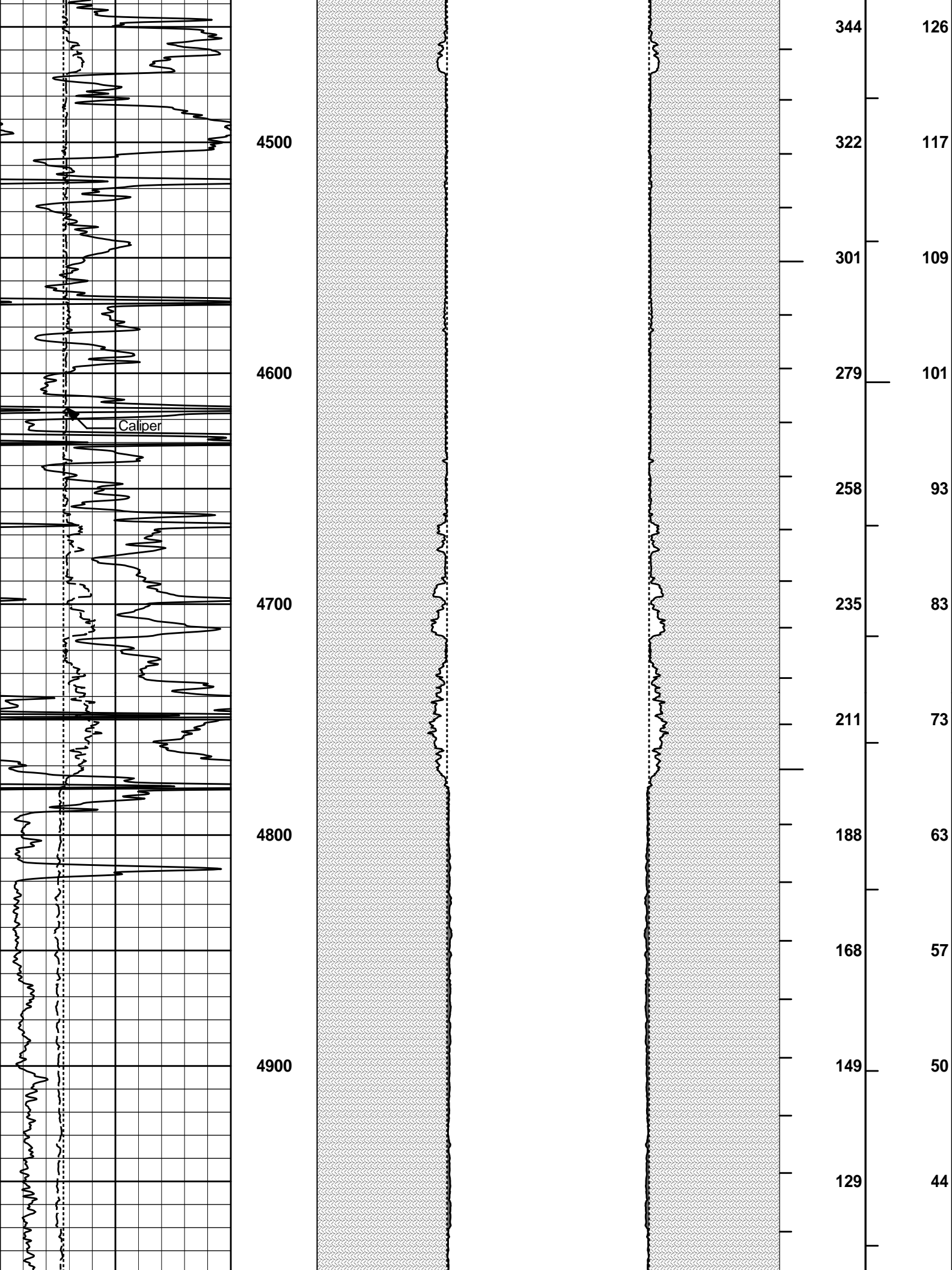


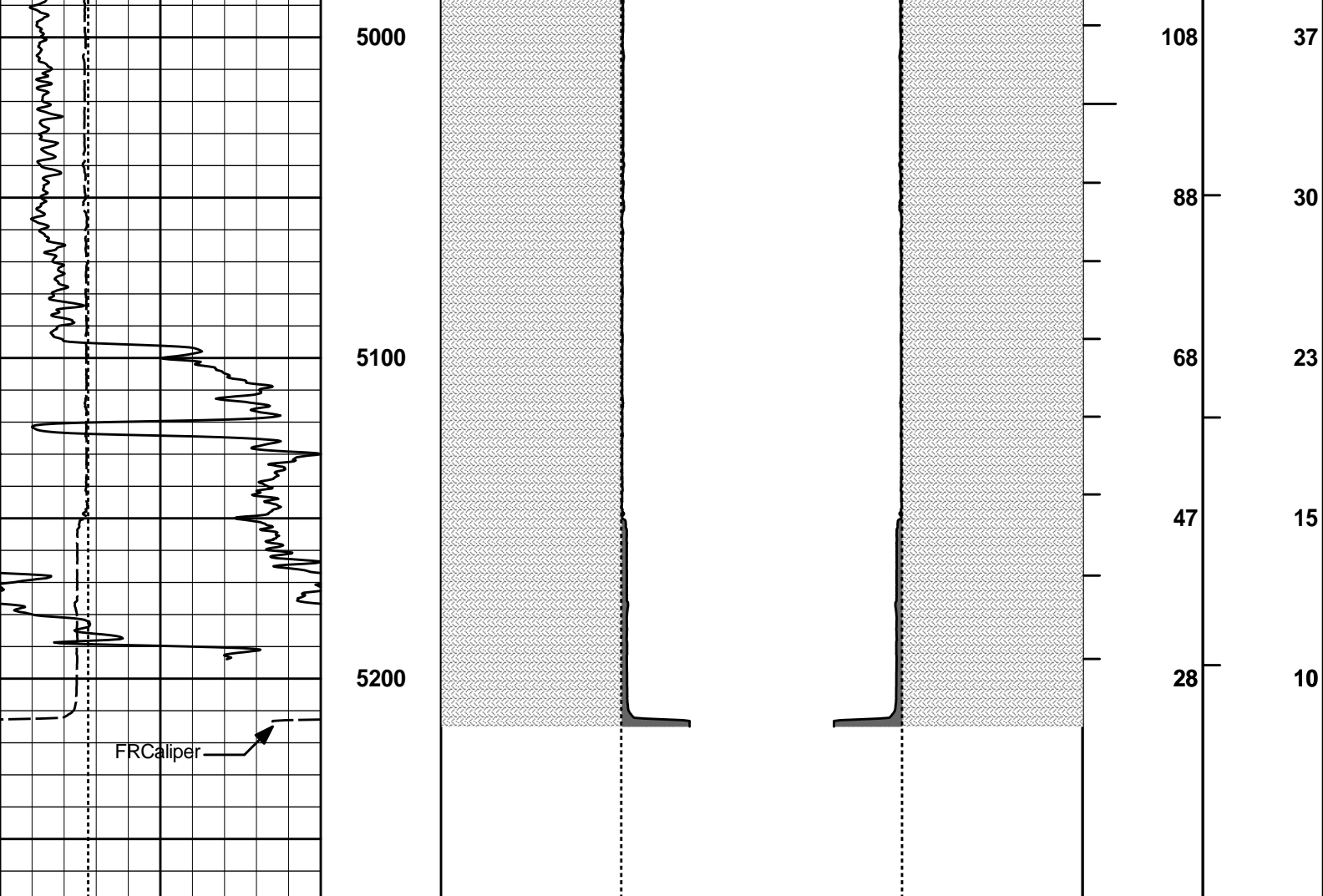
3400  
3500  
3600  
3700  
3800



811 299  
789 290  
769 283  
747 275  
725 266  
703 257  
682 249  
660 241  
638 232  
617 224  
595 216







6	Caliper	16	MD 1 : 600 ft	20	Caliper	0 0	20	BHVT	AHVT
	inches								
6	Bit Size	16		20	Bit Size	0 0	20		
	inches								
0	Gamma API	150							
	api								

**MUDCAKE**                      **MUDCAKE**

**HALLIBURTON**

Plot Time: 01-Aug-13 07:21:20  
 Plot Range: 810 ft to 5268.83 ft  
 Data: TERESIA\_3509\Well Based\CASING\  
 Plot File: \\LOCAL\TERESIA\_3509\0001 SP-GTET-DSN-SDL-FLEX-XRMI-ACRT-CHIPORVAHV\_2\_IQ\_LIB

## ANNULAR HOLE VOLUME PLOT

COMPANY	SANDRIDGE ENERGY		
WELL	TERESIA 3509 1-16H		
FIELD	AMORITA		
COUNTY	HARPER	STATE	KANSAS

**HALLIBURTON**

SPECTRAL DENSITY  
 DUAL SPACED NEUTRON  
 LOG

