

# HALLIBURTON

## DUAL SPACED NEUTRON SPECTRAL DENSITY LOG

**RAMSHORN RESOURCES, LLC**  
**MARSH #1-27**  
**DEARHEAD**  
**BARBER**  
**KANSAS**

**COMPANY** RAMSHORN RESOURCES, LLC  
**WELL** MARSH #1-27  
**FIELD/BLOCK** DEARHEAD  
**COUNTY** BARBER  
**STATE** KANSAS

**API No.** 15-007-24325-00-00  
**Location** (SHL) 1840' FNL & 1685' FEL SW NE  
**Sect.** 27 **Twp.** 32S **Rge.** 15W  
**Elev.** 1869.0 ft  
**8.0 ft above perm. Datum**

**Other Services:**  
 GTET  
 DSNT  
 SDLT  
 MICROLOG  
 WSTT  
 ACRT

**Permanent Datum** GL  
**Log measured from** KB  
**Drilling measured from** KB

<b>Date</b>	20-Mar-18
<b>Run No.</b>	ONE
<b>Depth - Driller</b>	5218.0 ft
<b>Depth - Logger</b>	5220.0 ft
<b>Bottom - Logged Interval</b>	5158.0 ft
<b>Top - Logged Interval</b>	300.0 ft
<b>Casing - Driller</b>	8.625 in @ 305.0 ft
<b>Casing - Logger</b>	300.0 ft @
<b>Bit Size</b>	7.875 in @
<b>Type Fluid in Hole</b>	Water Based Mud @
<b>Density</b>	9.3 ppg @ 55.00 sl/qt
<b>PH</b>	10.50 pH @ 9.6 cphm
<b>Source of Sample</b>	MUD PIT
<b>Rm @ Meas. Temperature</b>	0.61 ohmm @ 75.00 degF
<b>Rmf @ Meas. Temperature</b>	0.50 ohmm @ 75.00 degF
<b>Rmc @ Meas. Temperature</b>	0.73 ohmm @ 75.00 degF
<b>Source Rmf</b>	MEAS
<b>Rm @ BHT</b>	0.18 ohmm @ 134.0 degF
<b>Time Since Circulation</b>	08:53 hr
<b>Time on Bottom</b>	20-Mar-18 10:49
<b>Max. Rec. Temperature</b>	130.00 degF @ 5220.0 ft
<b>Equipment</b>	12147634 EL RENO
<b>Recorded By</b>	SEAN WOLTEMATH
<b>Witnessed By</b>	JERRY AULD

Fold here

Service Ticket No.: 904705053      API No.: 15-007-24325-00-00      PGM Version: WL INSITE R5.0.5 (Build 8)

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.
Rmf @ Meas. Temp.	@	@		ONE	ACRT	N/A	CENT.
Rmc @ Meas. Temp.	@	@			I-11026095		
Source Rmf	Rmc				S-11005908		
Rm @ BHT	@	@					
Rmf @ BHT	@	@					
Rmc @ BHT	@	@					

EQUIPMENT DATA							
GAMMA		ACOUSTIC		DENSITY		NEUTRON	
Run No.	ONE	Run No.	ONE	Run No.	ONE	Run No.	ONE
Serial No.	11958947	Serial No.	10055644	Serial No.	10865873	Serial No.	11055304
Model No.	GTET	Model No.	WSTT	Model No.	SDLT	Model No.	DSNT
Diameter	3.625"	No. of Cent.	3.625"	Diameter	5.5"	Diameter	3.625"
Detector Model No.	GTET	Spacing	EVEN	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	15.0 Ci

LOGGING DATA															
GENERAL				GAMMA		ACOUSTIC				DENSITY			NEUTRON		
Run No.	Depth		Speed ft/min	Scale		Scale		Matrix	Scale		Matrix	Scale		Matrix	
	From	To		L	R	L	R		L	R		L	R		
ONE	TD	CSG	REC	0	150	30	-10	17.6 uSec/ft	30	-10	2.71 g/cc	30	-10	LIME	

ONE	TD	CSG	REC	0	150	30	-10	47.0 g/cc	30	-10	2.77 g/cc	30	-10	LIML
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DIRECTIONAL INFORMATION

Maximum Deviation @ KOP @

Remarks: ANNULAR HOLE VOLUME CALCULATED FOR 5.5 INCH CASING

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

CHLORIDES REPORTED AT 7500 ppm

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.

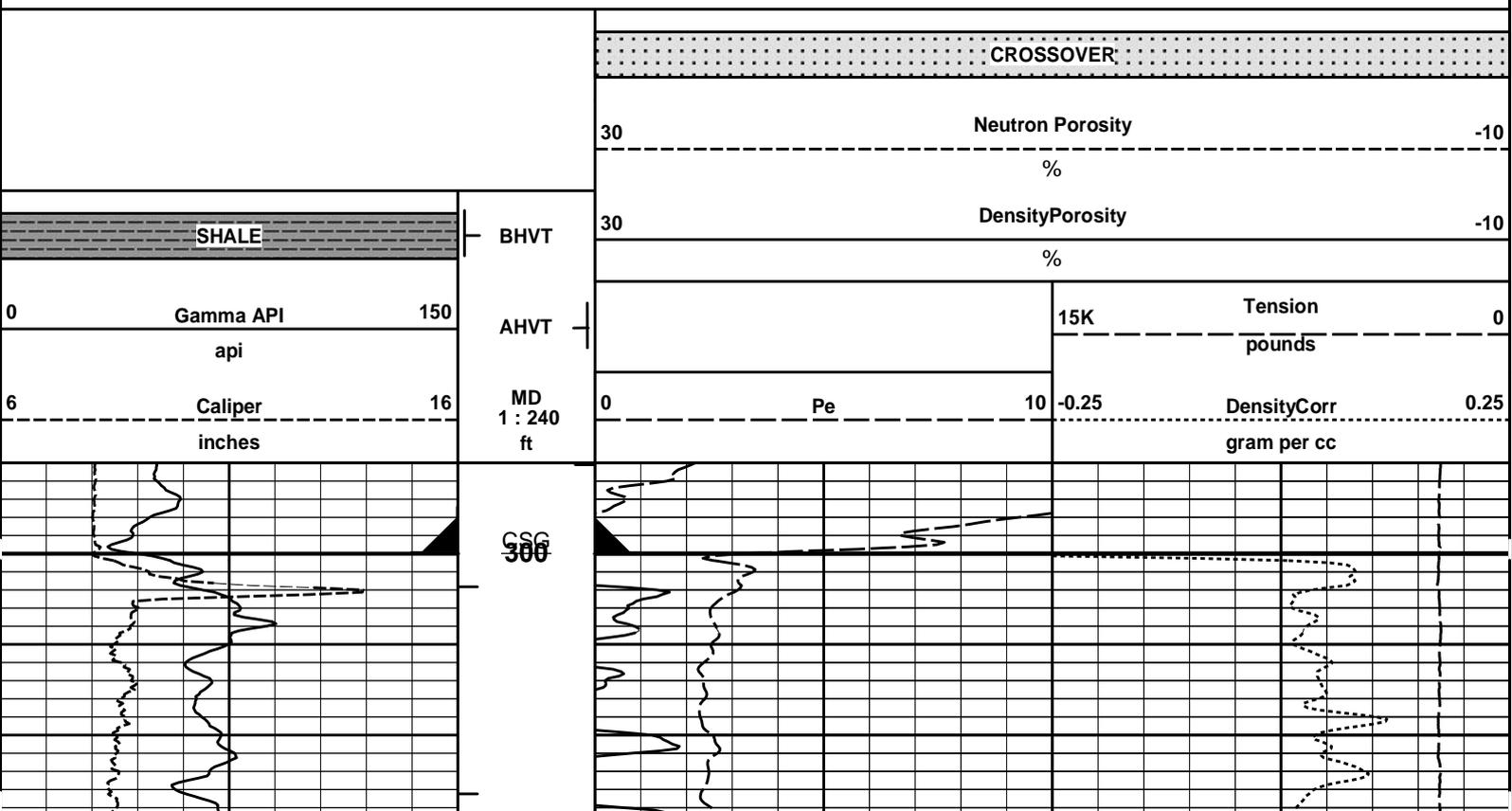
HALLIBURTON

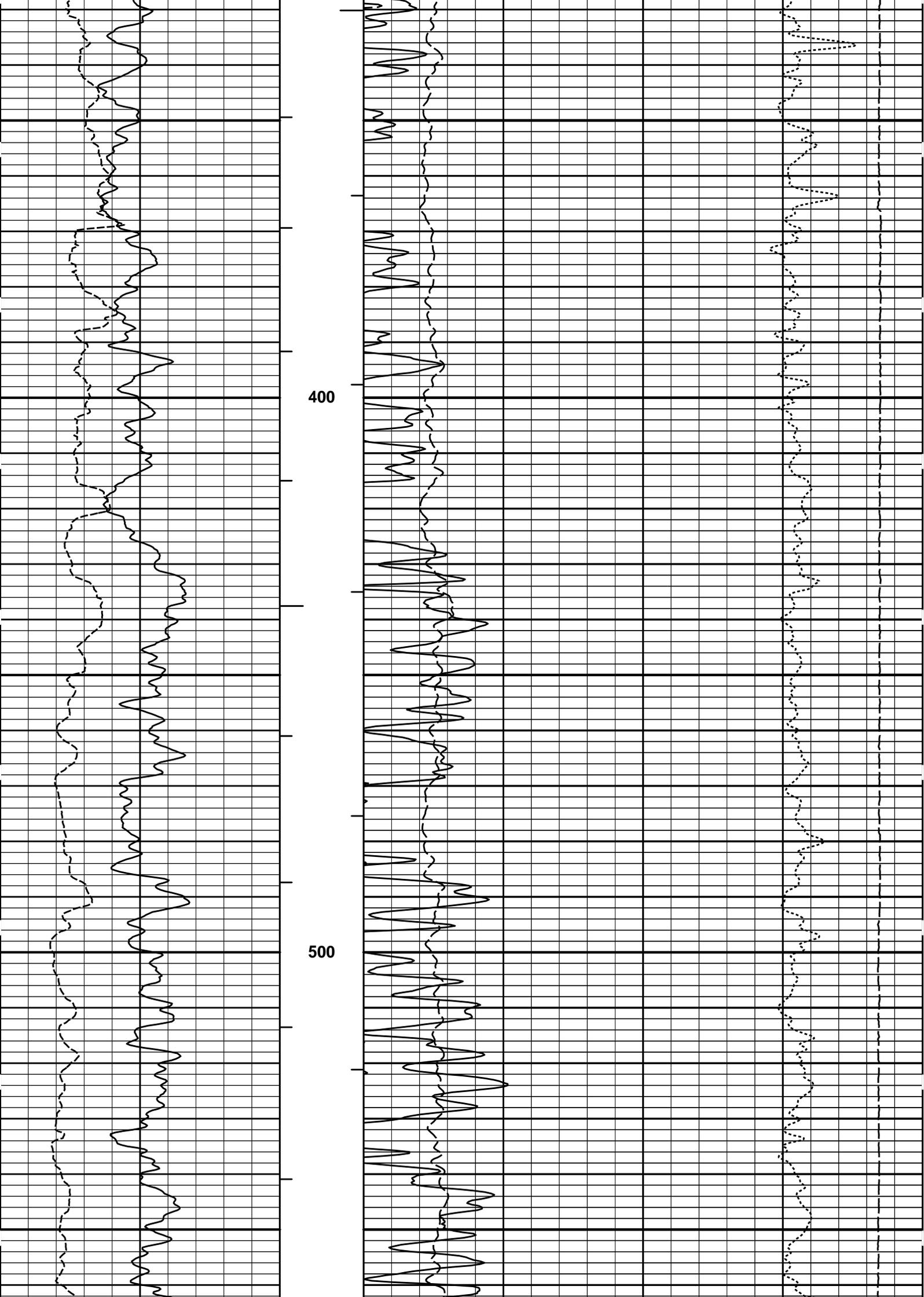
**HALLIBURTON**

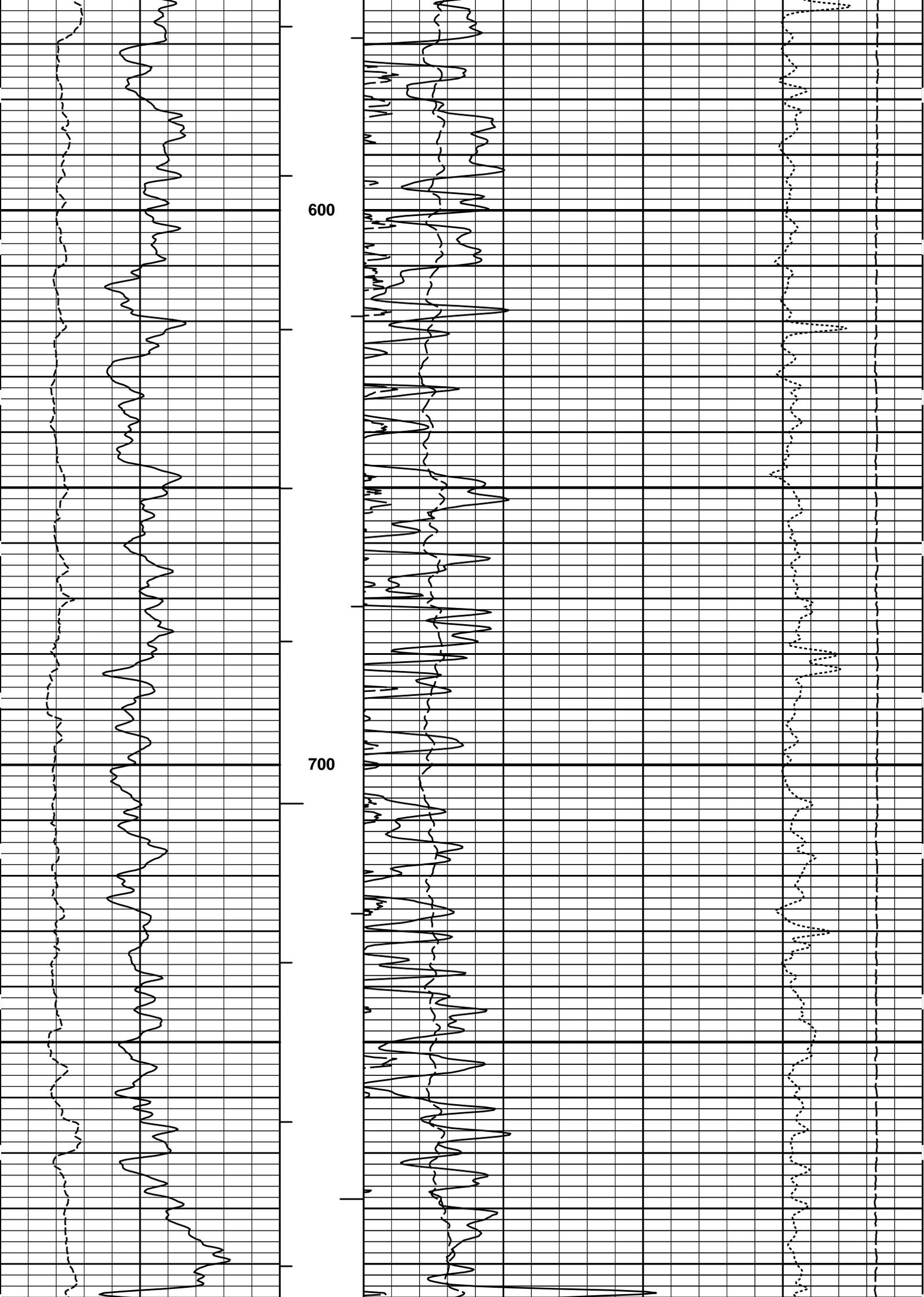
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 Plot Range: 290 ft to 5224.75 ft  
 Data: RAMSHORN\_MARSH\Well Based\MAIN SPLICE\  
 Plot File: \\PORO\Poro\_IQ\_5\_MAIN\_LIB

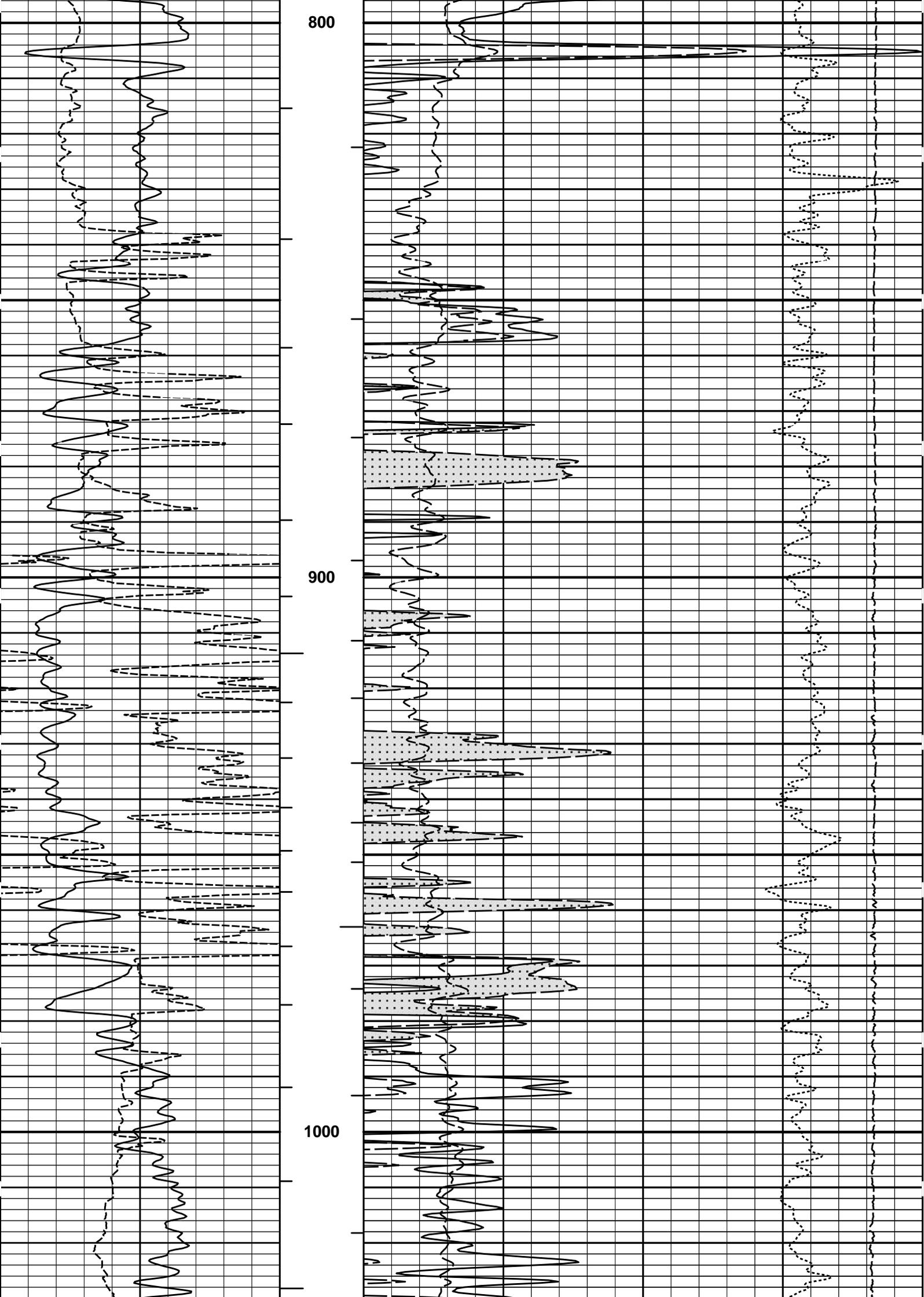
**5 INCH MAIN LOG**

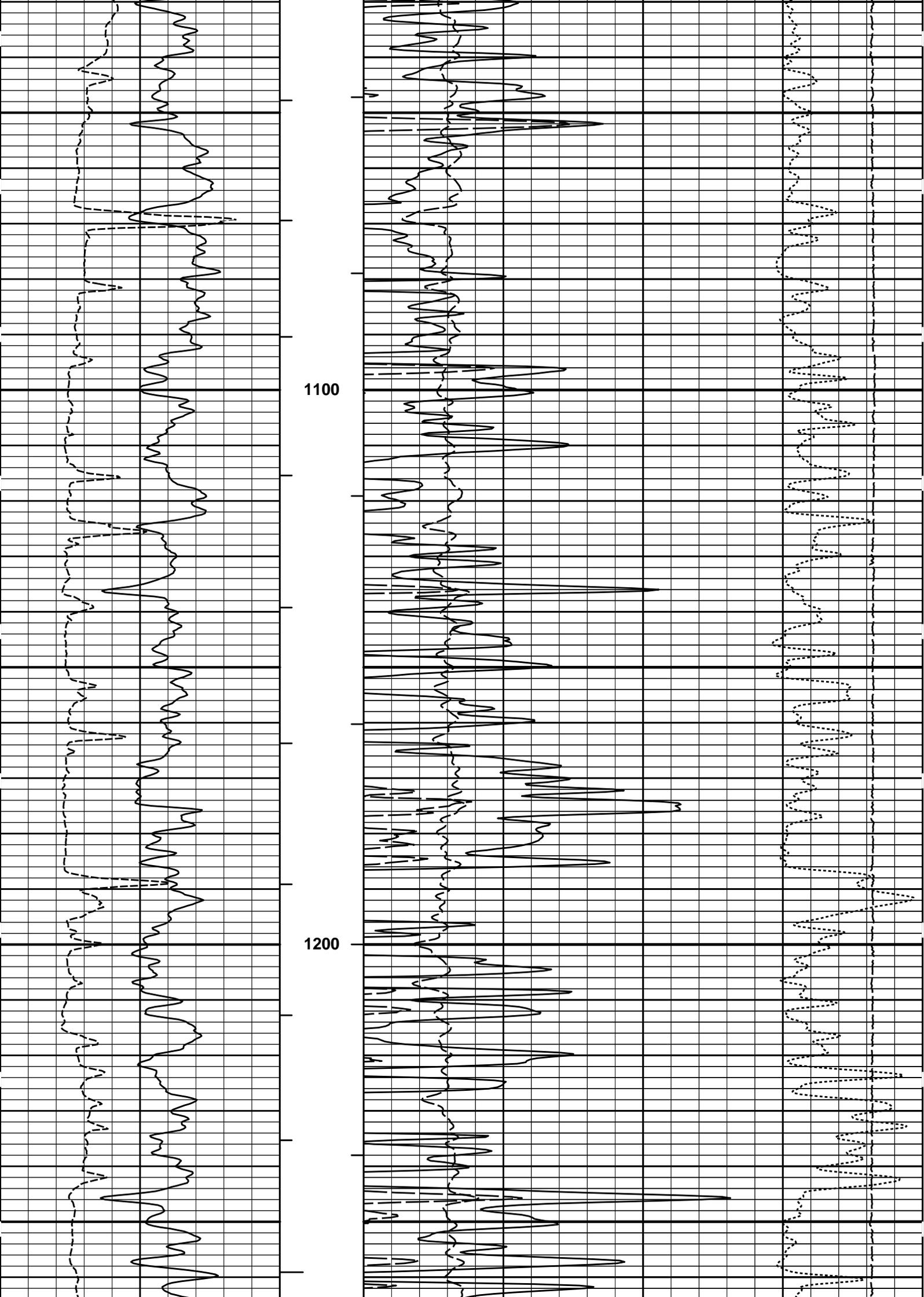
MEASURED DEPTH  
 MAIN SECTION 5" PER 100'

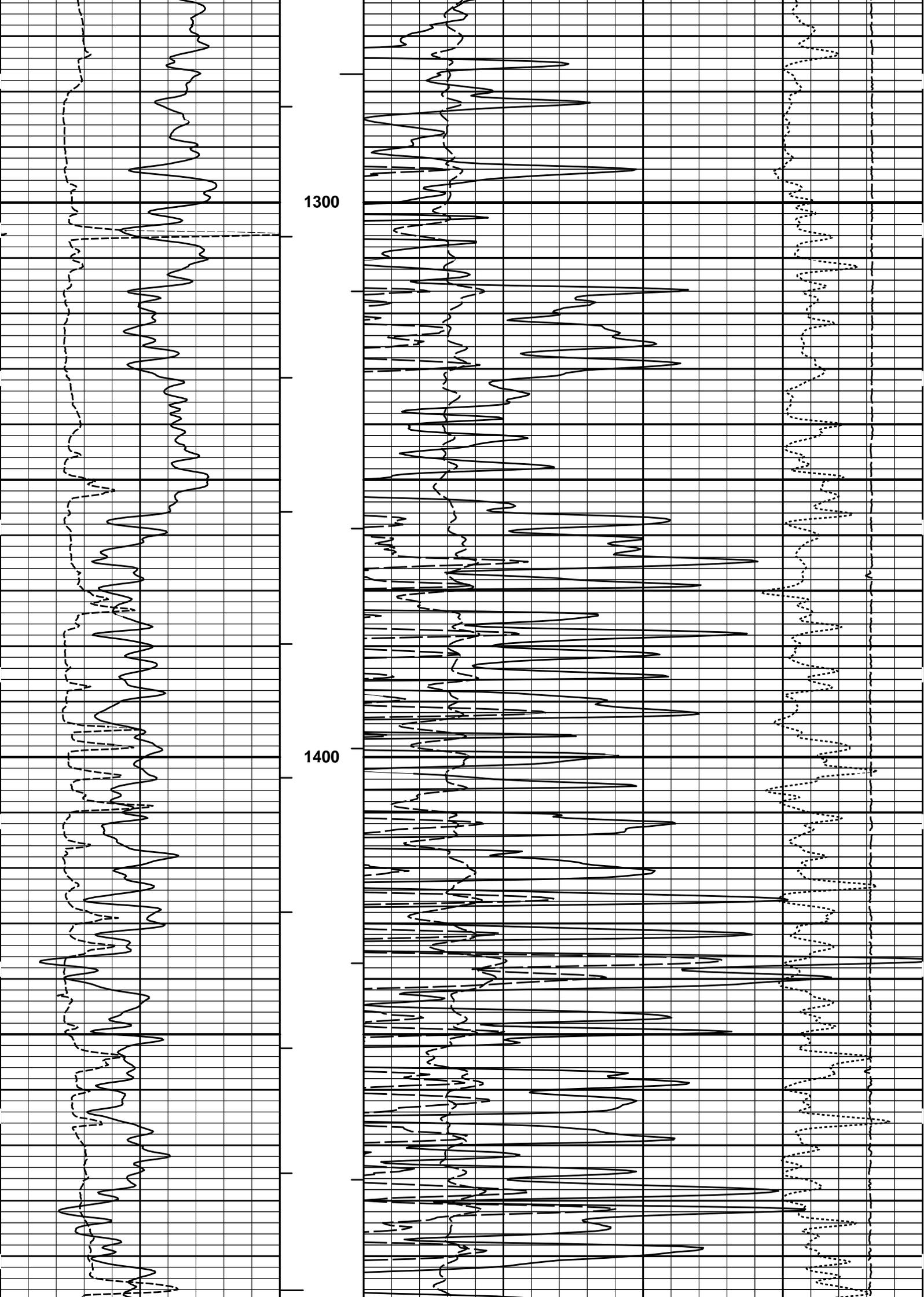


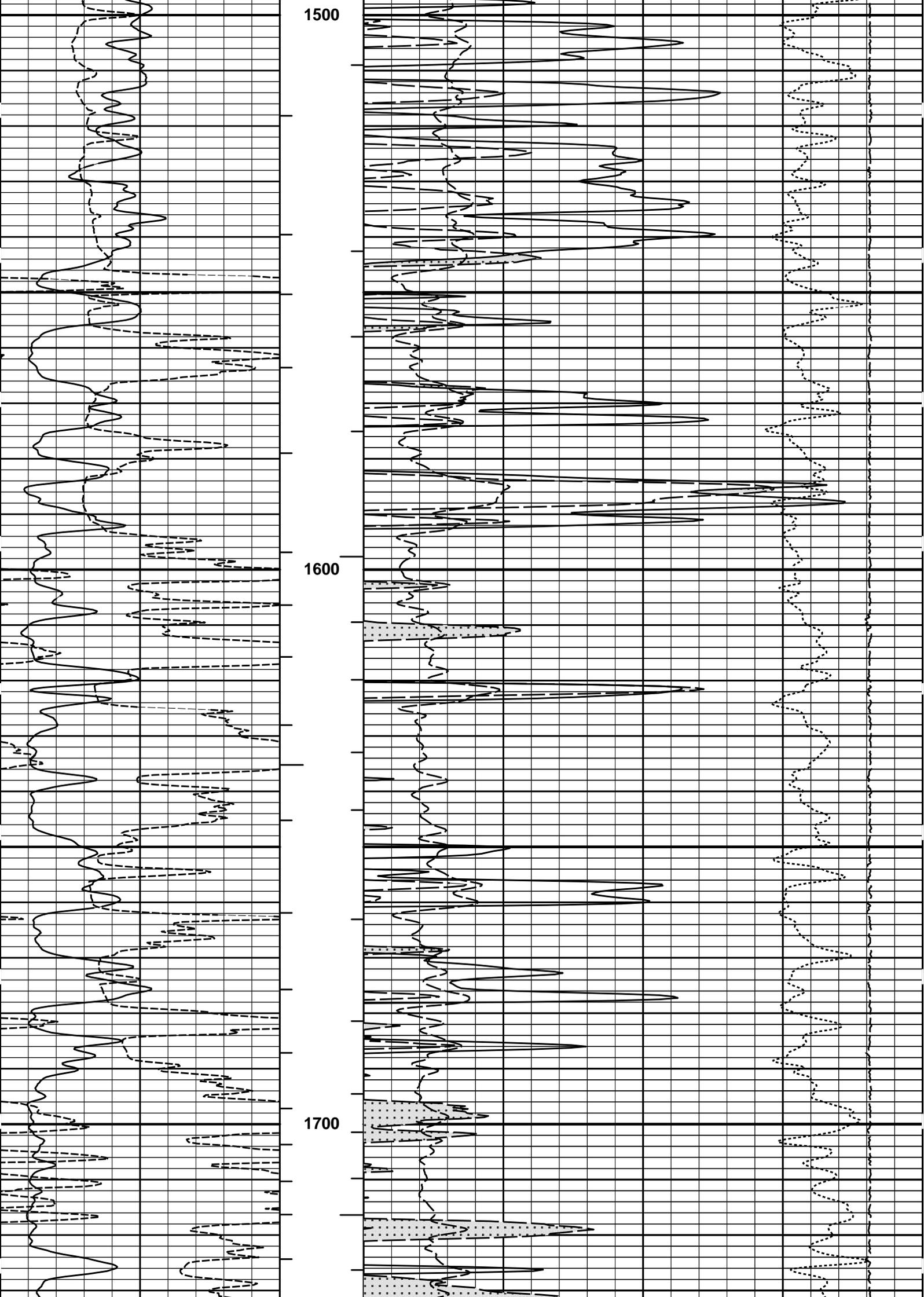


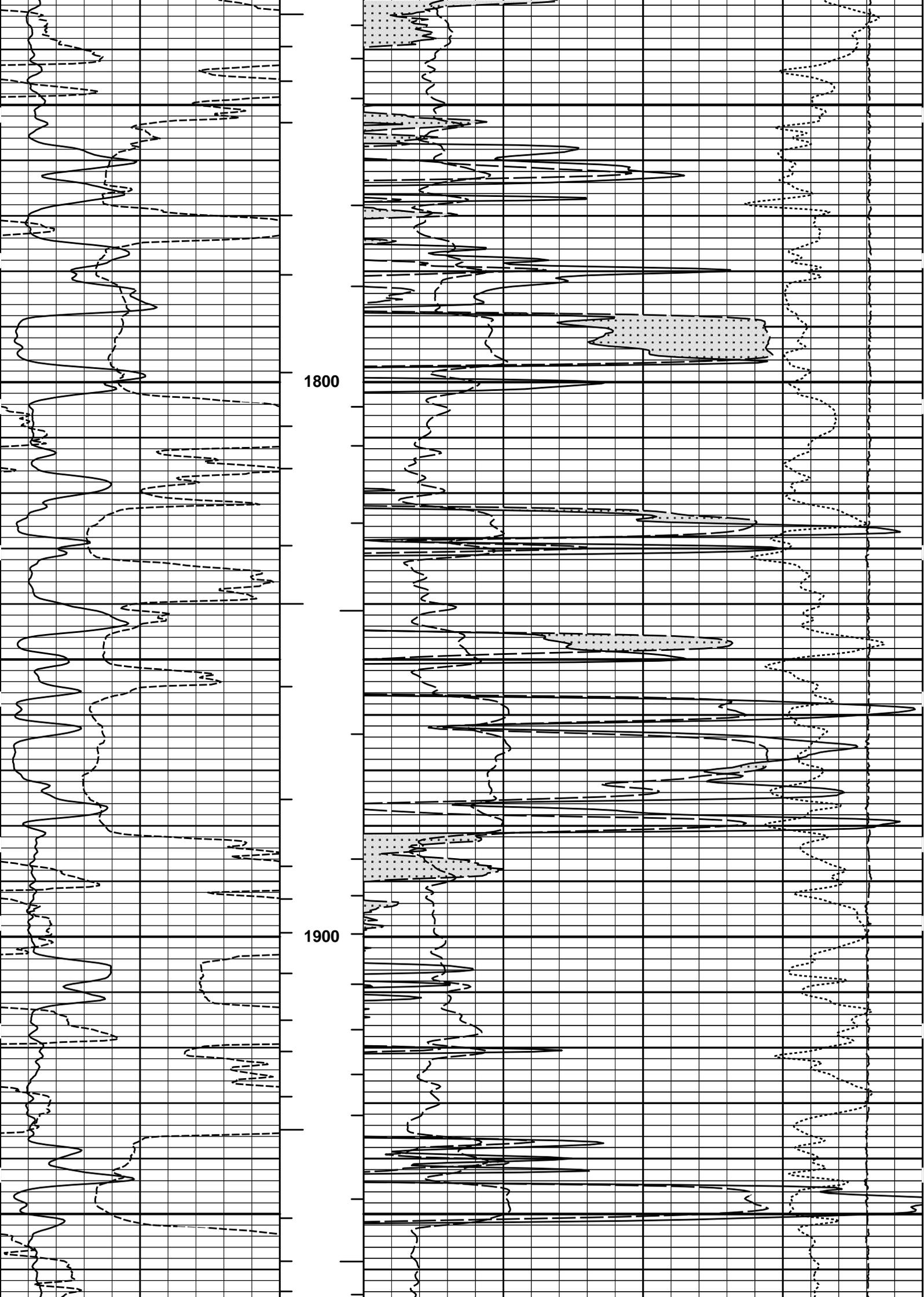


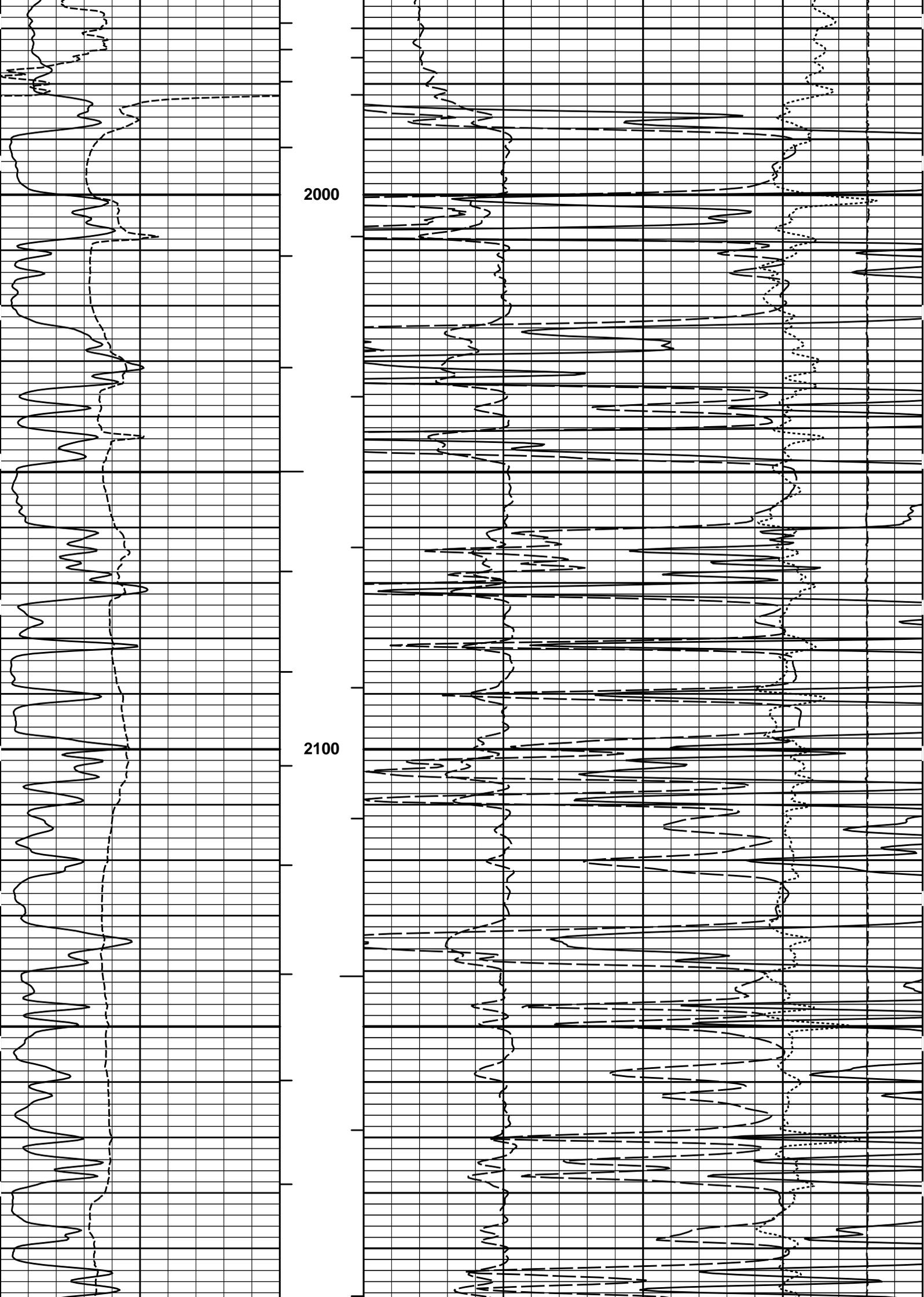


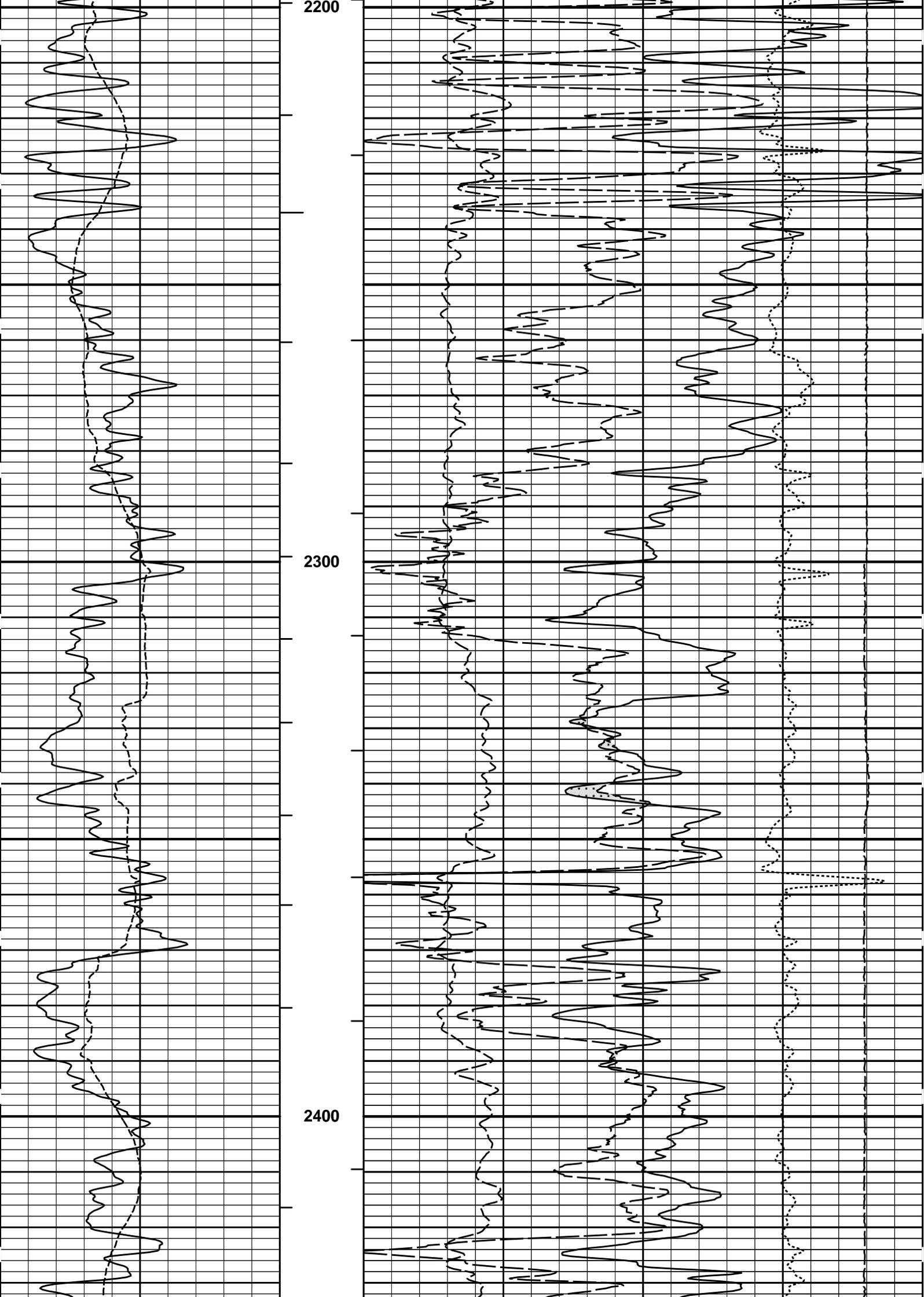


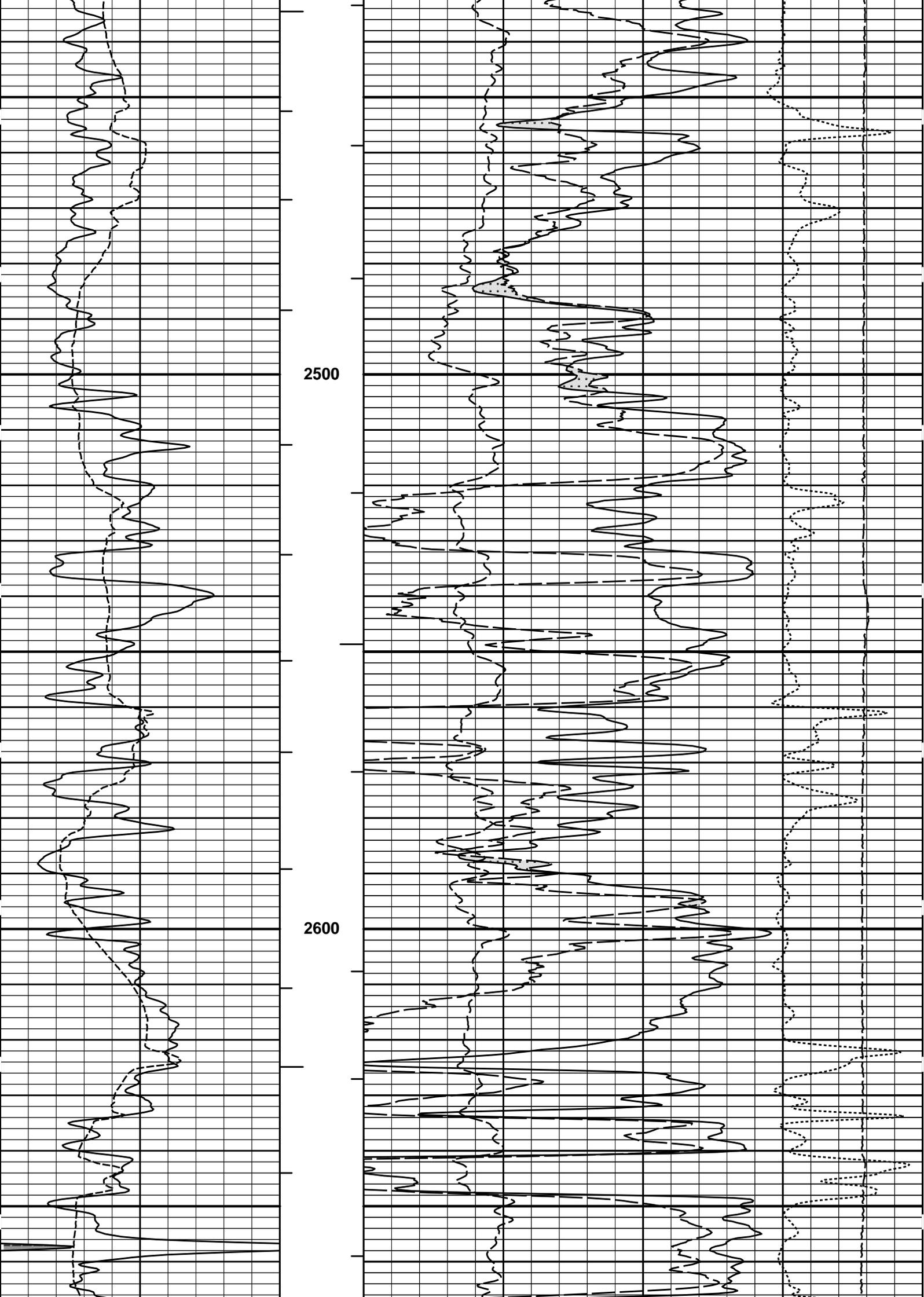


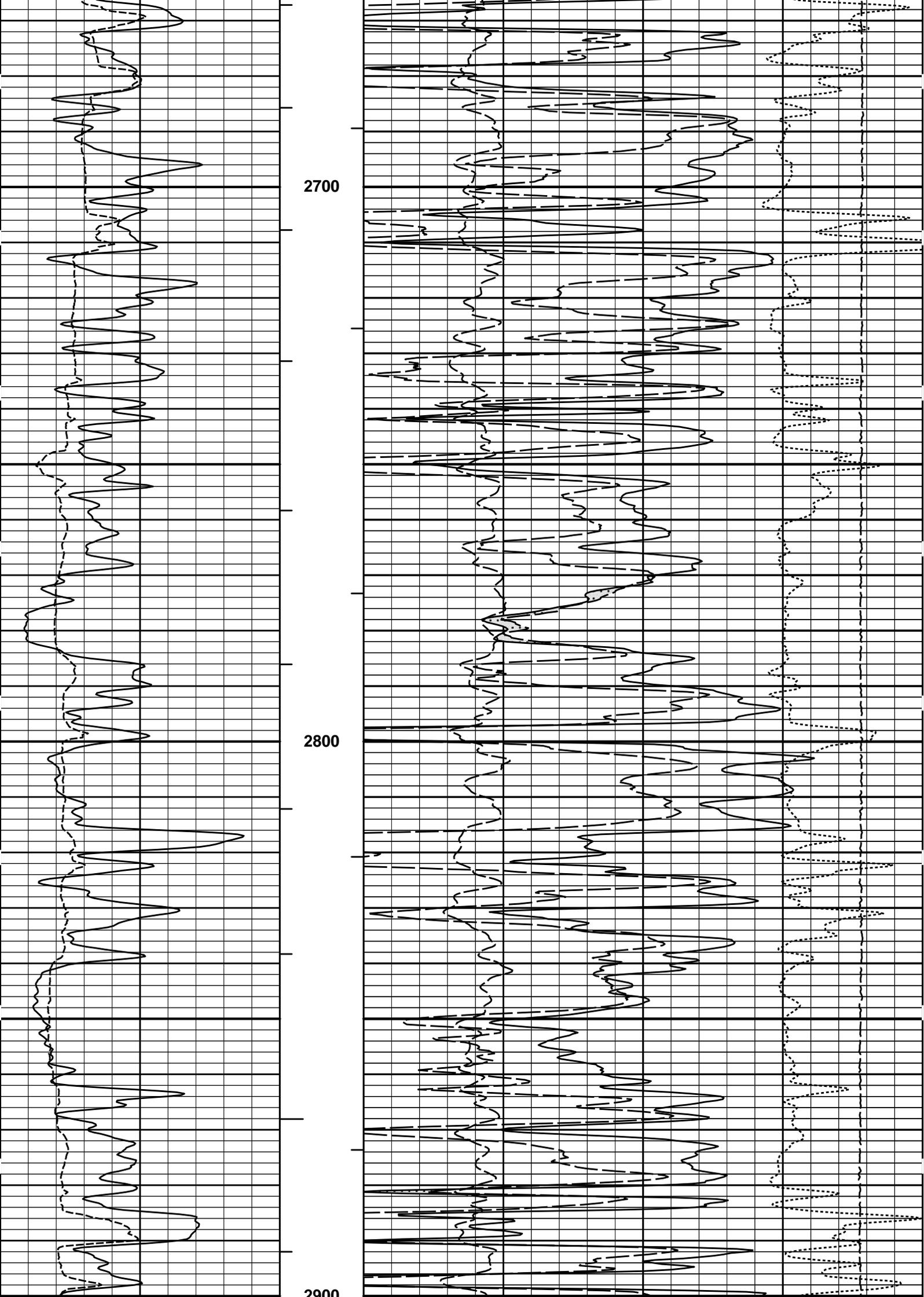


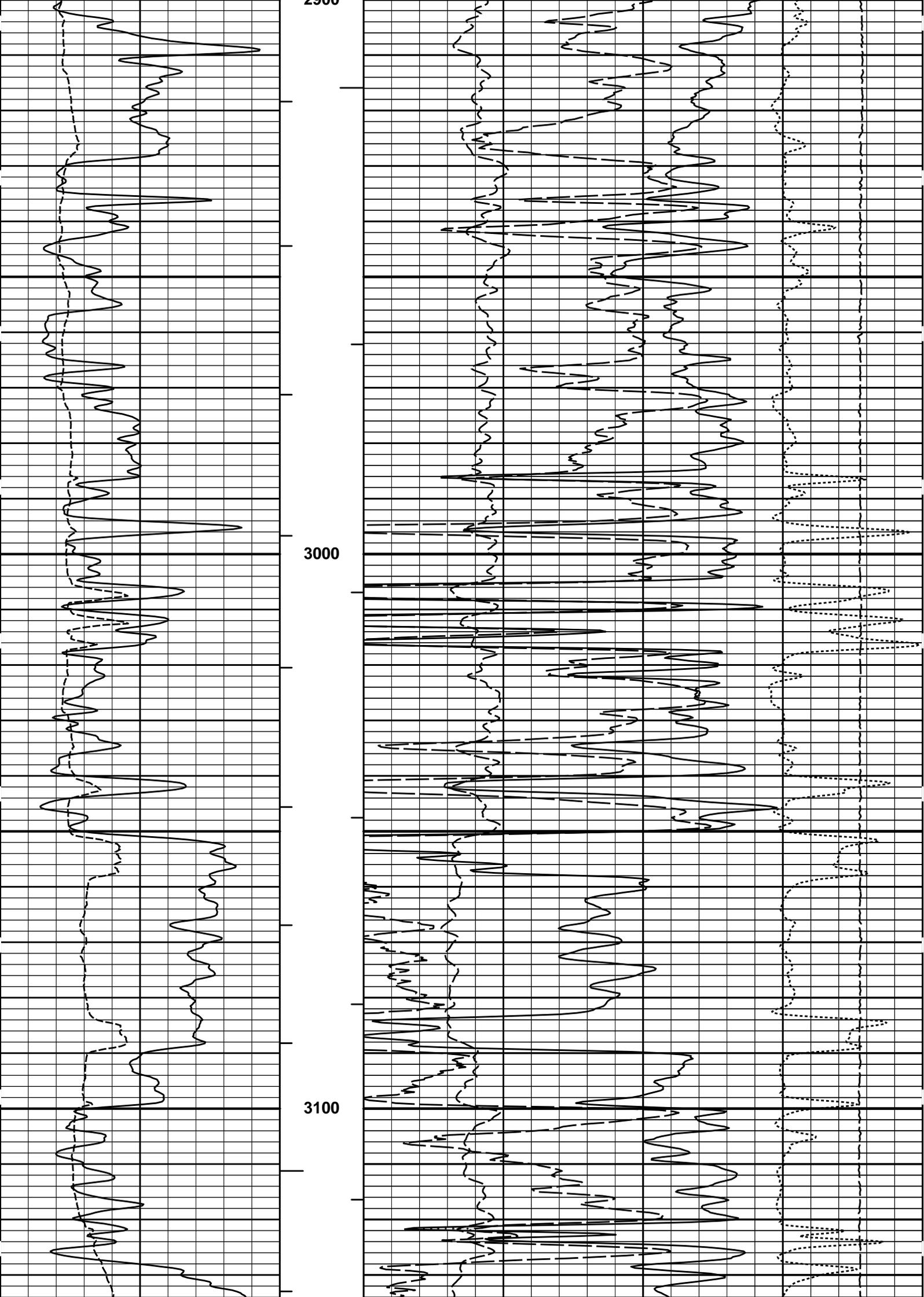


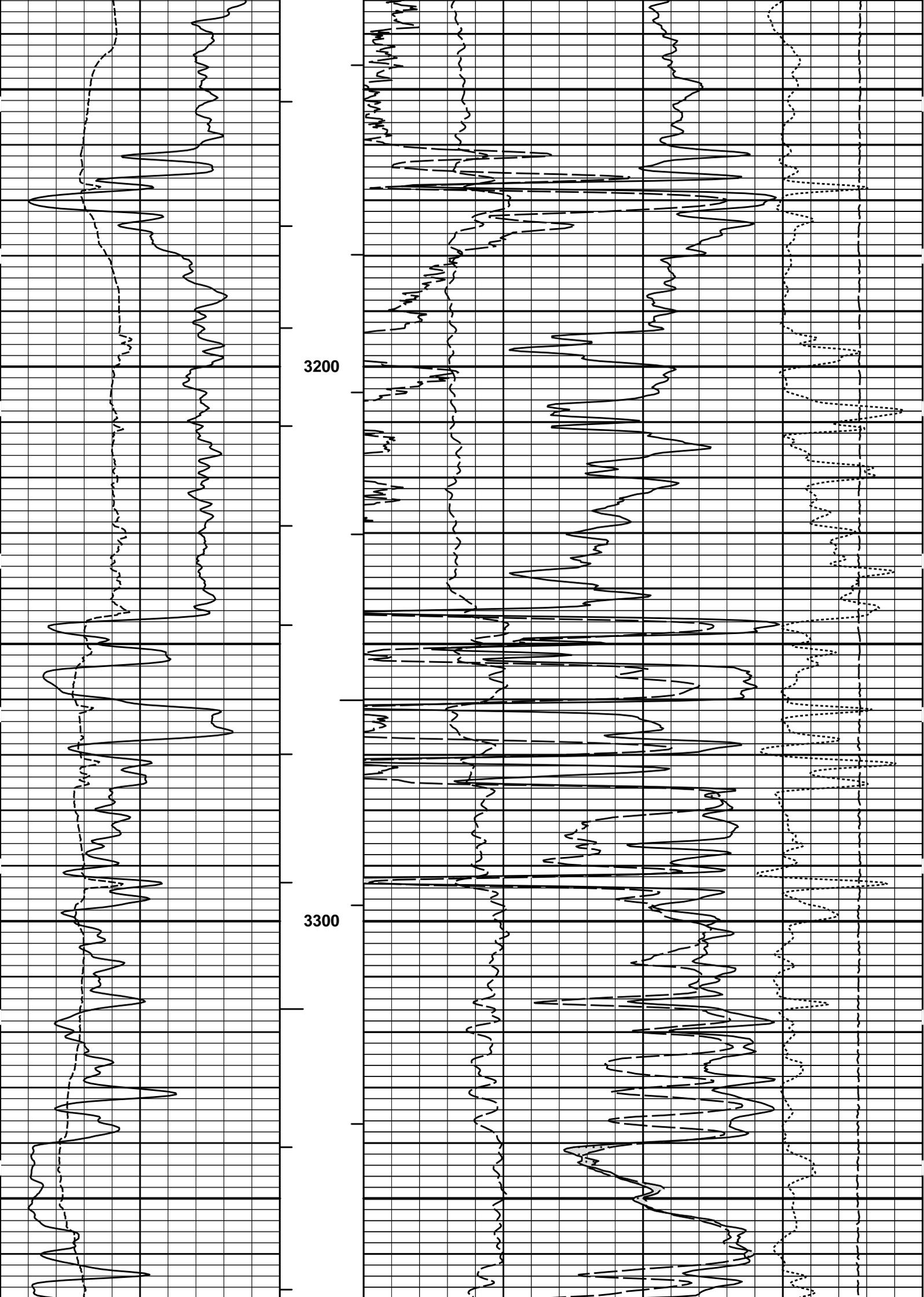


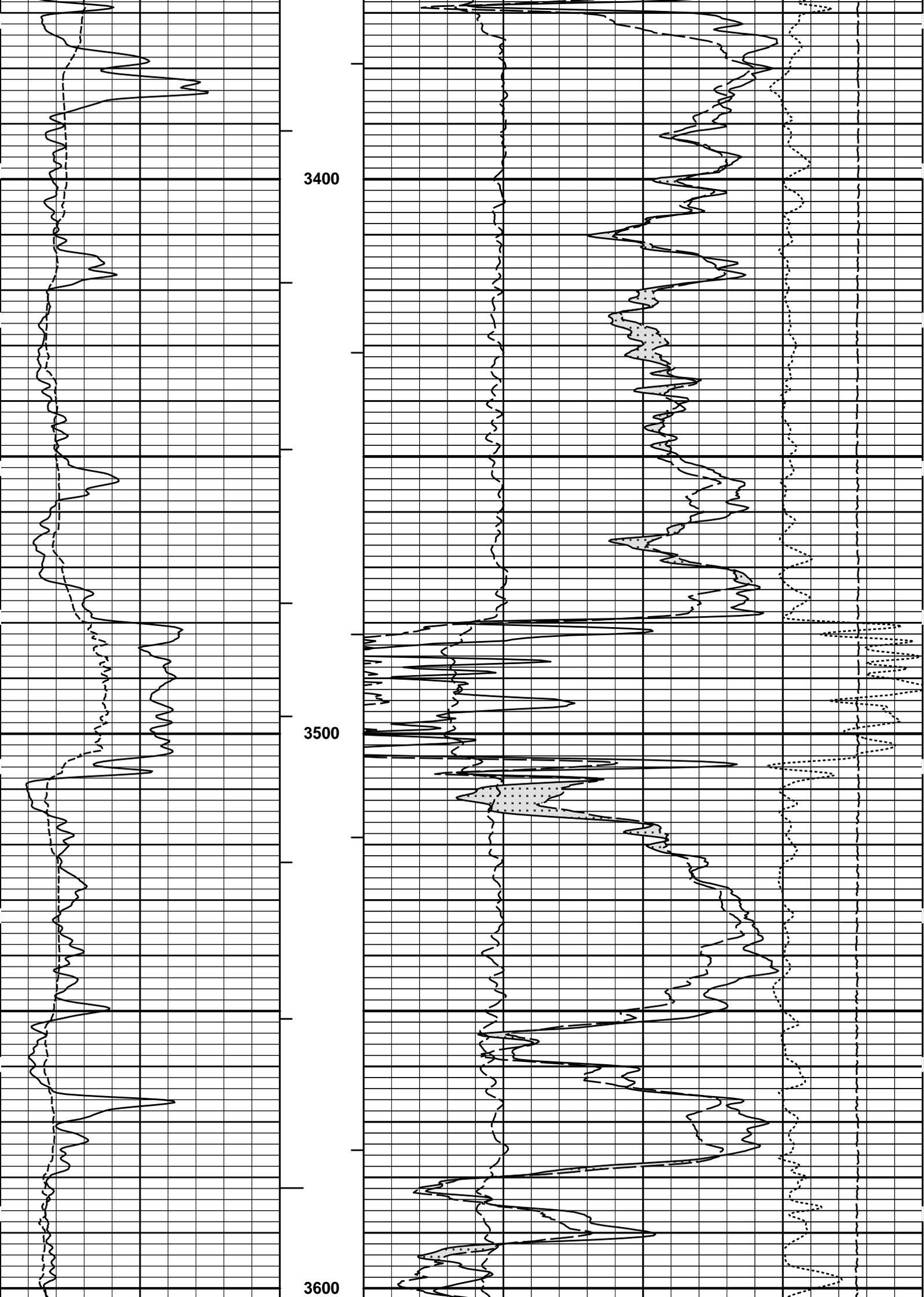


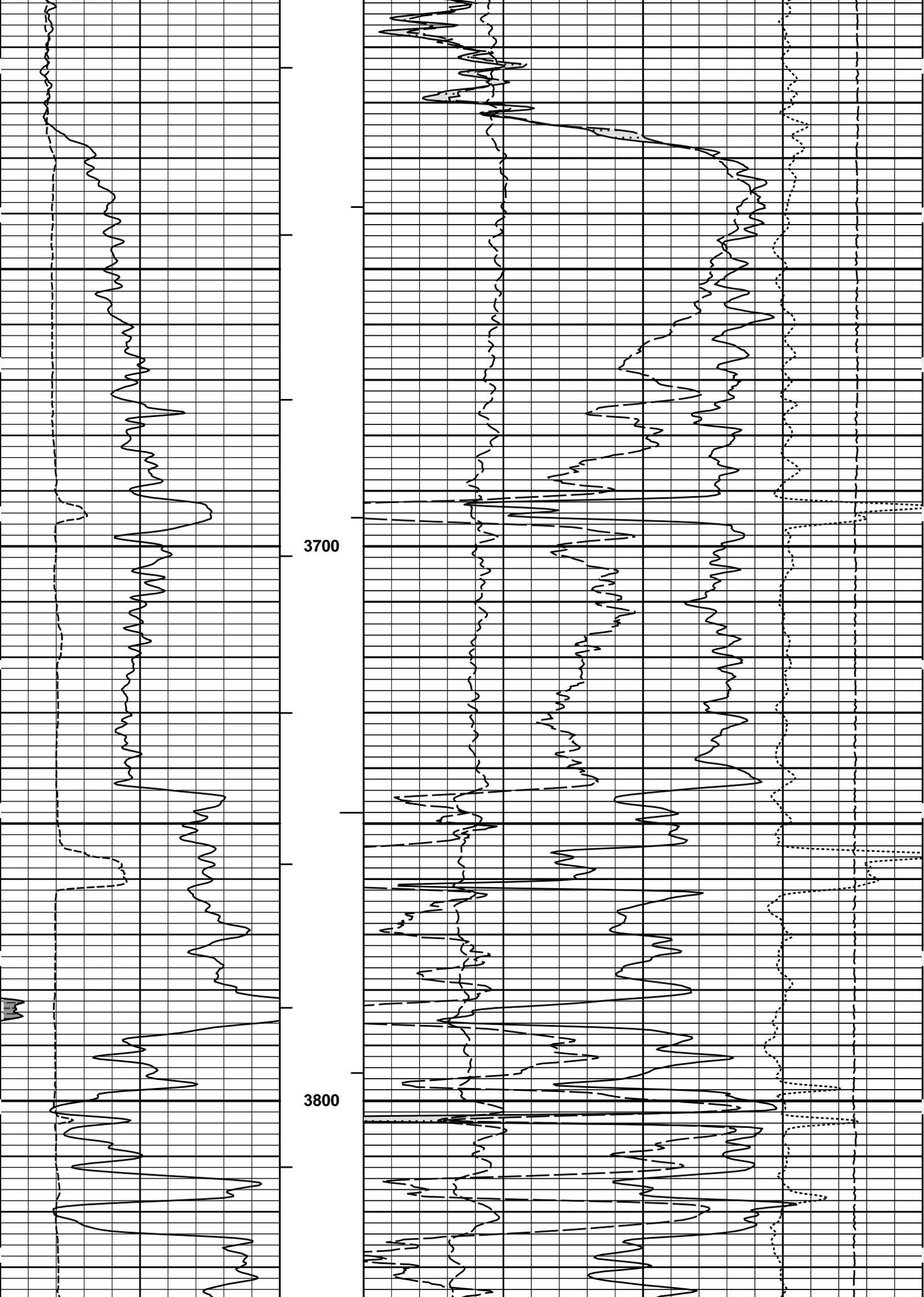


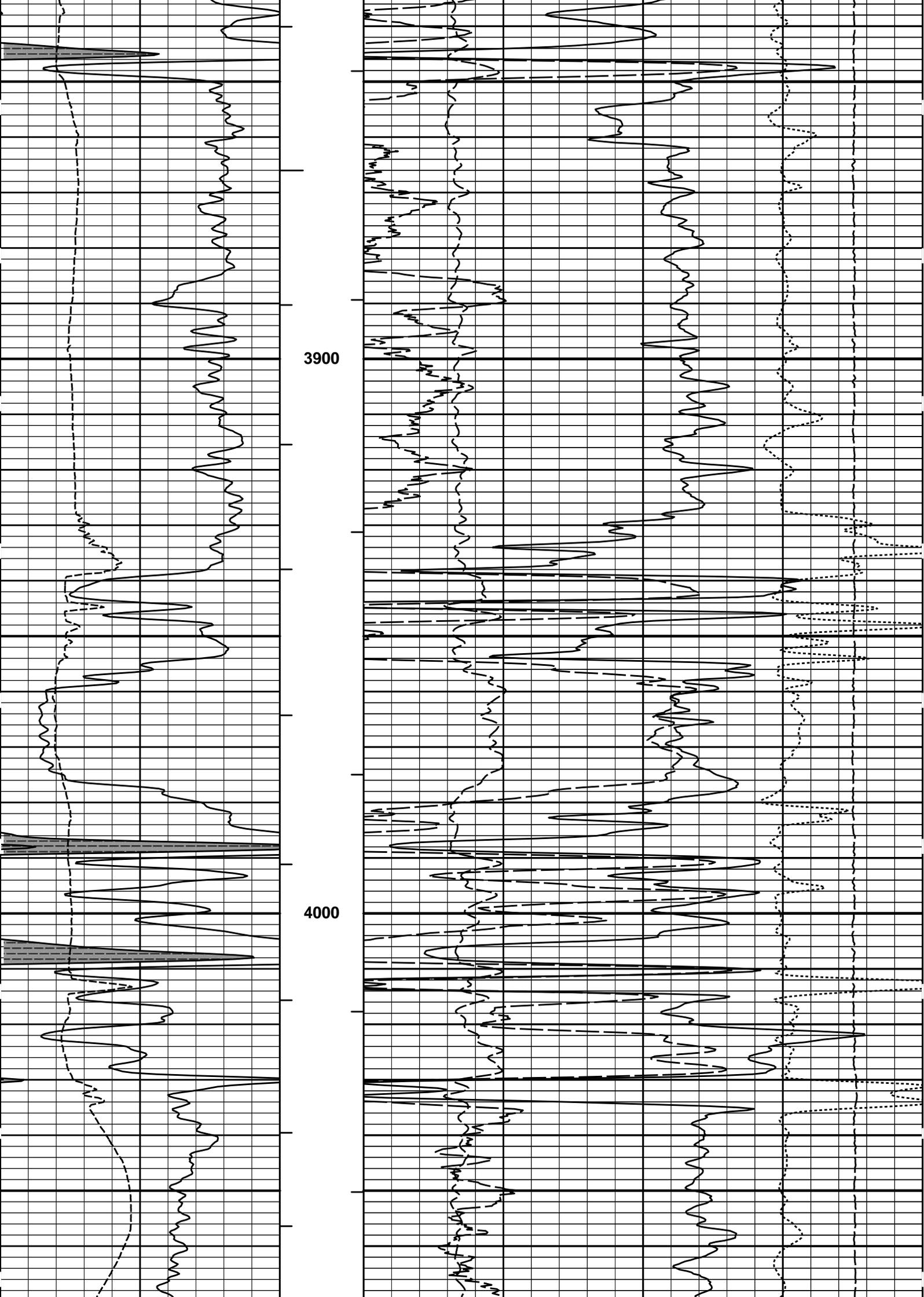


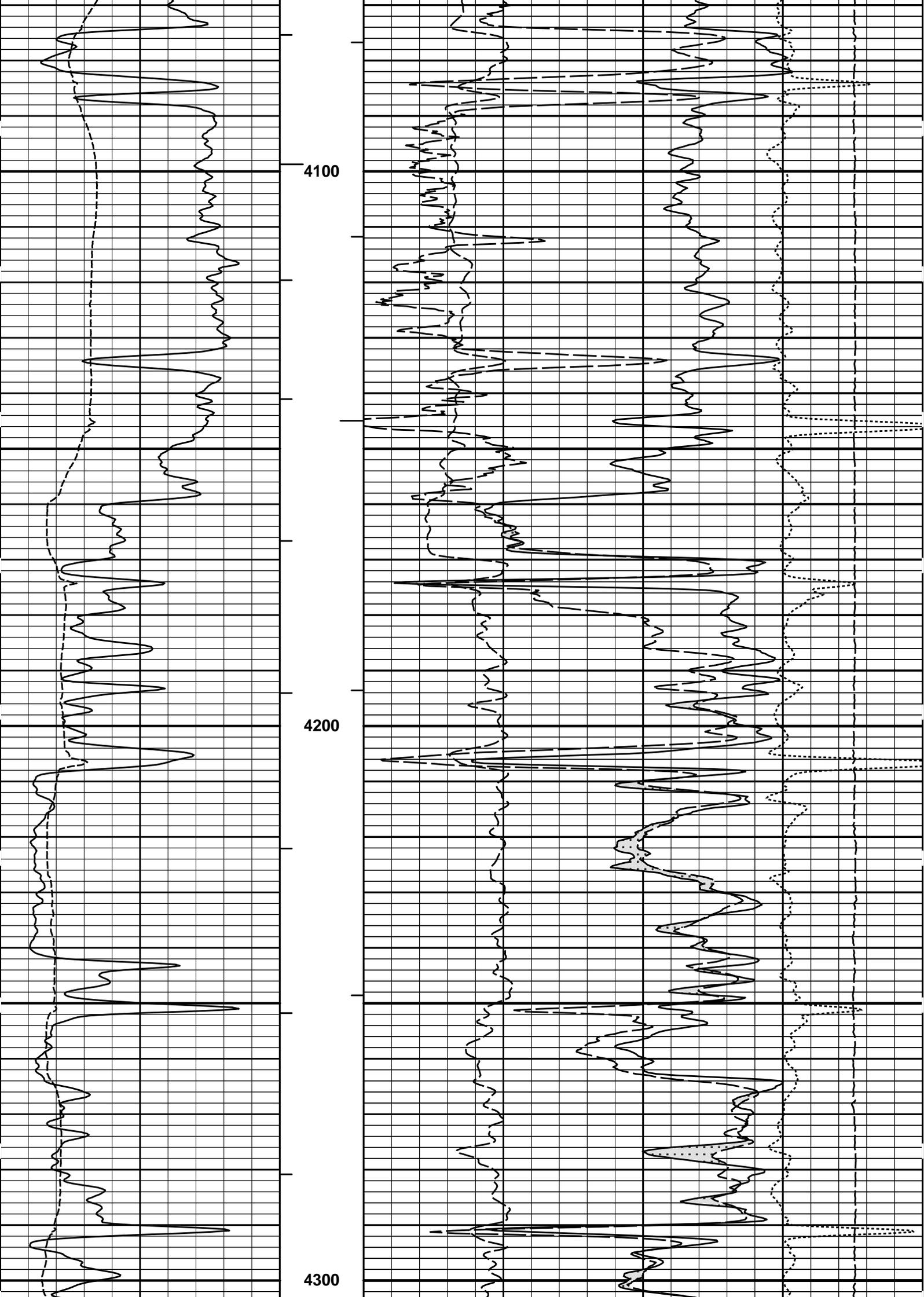


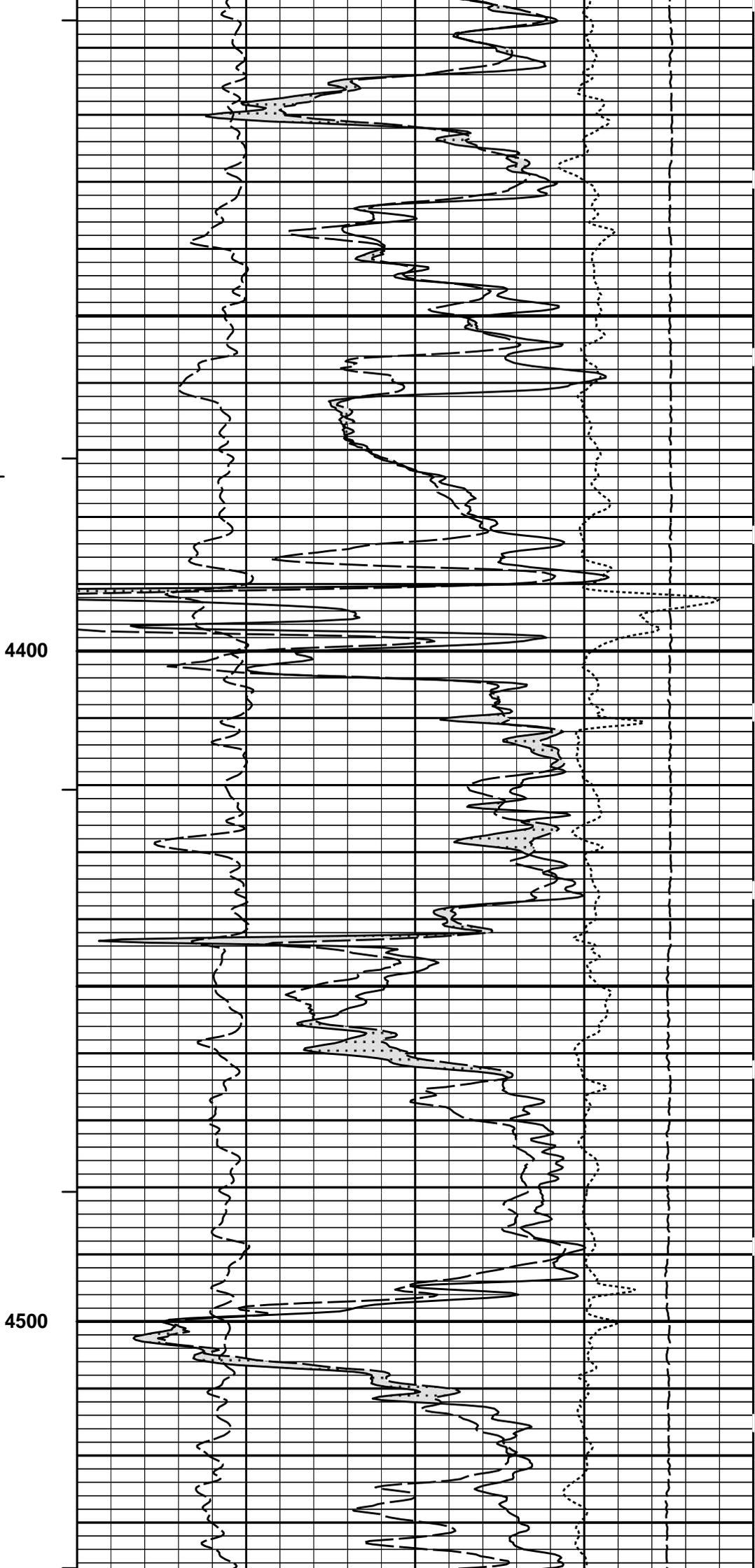
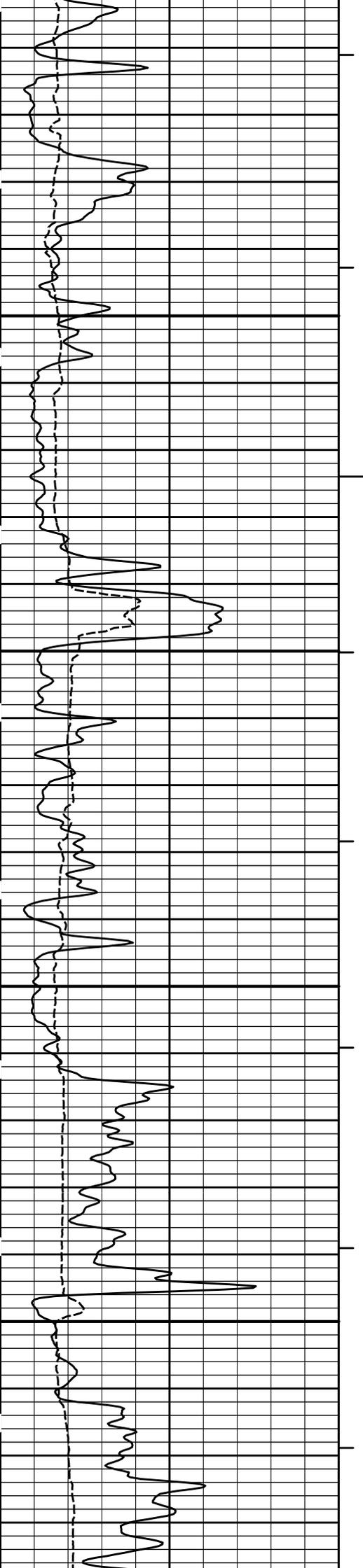


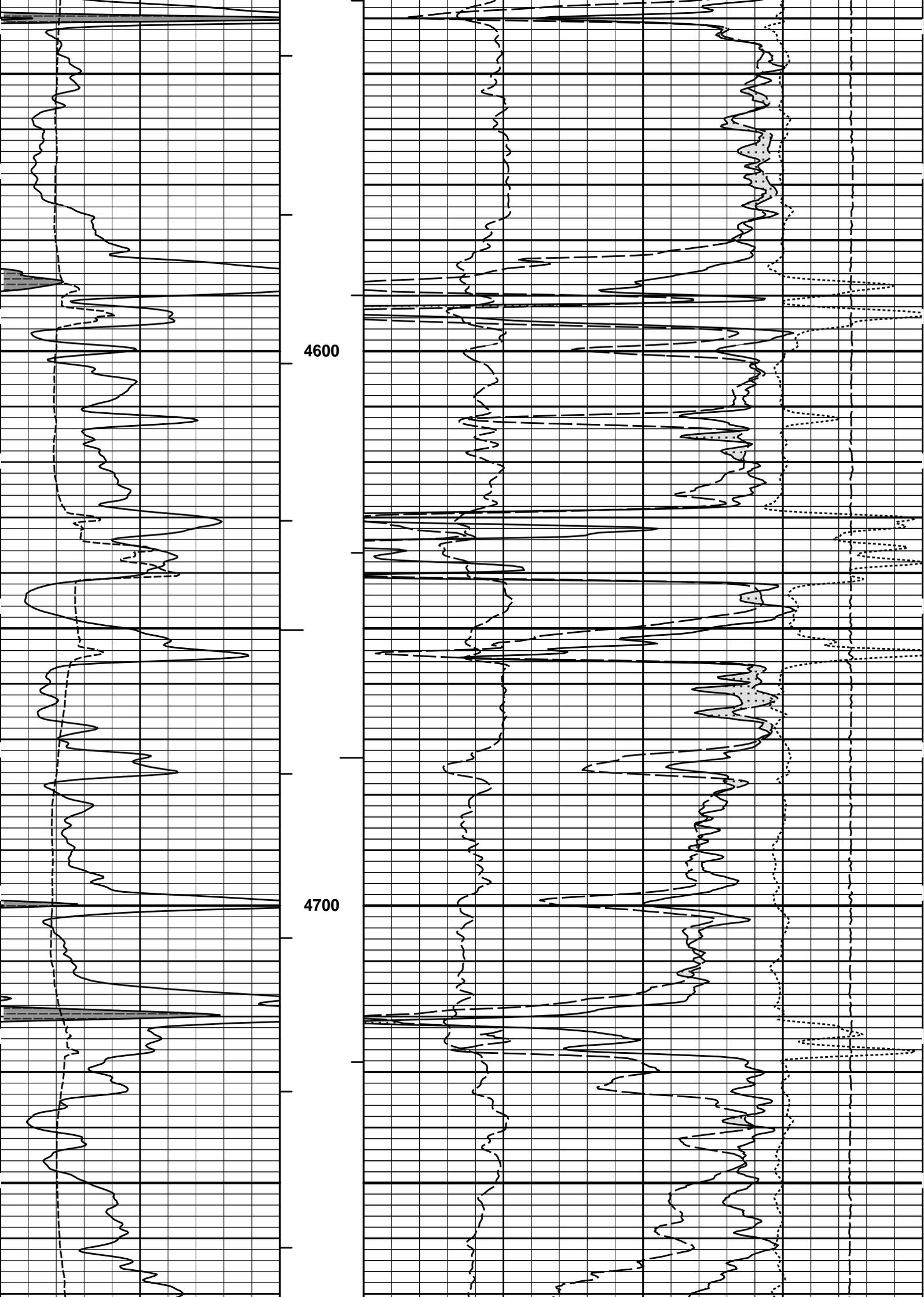


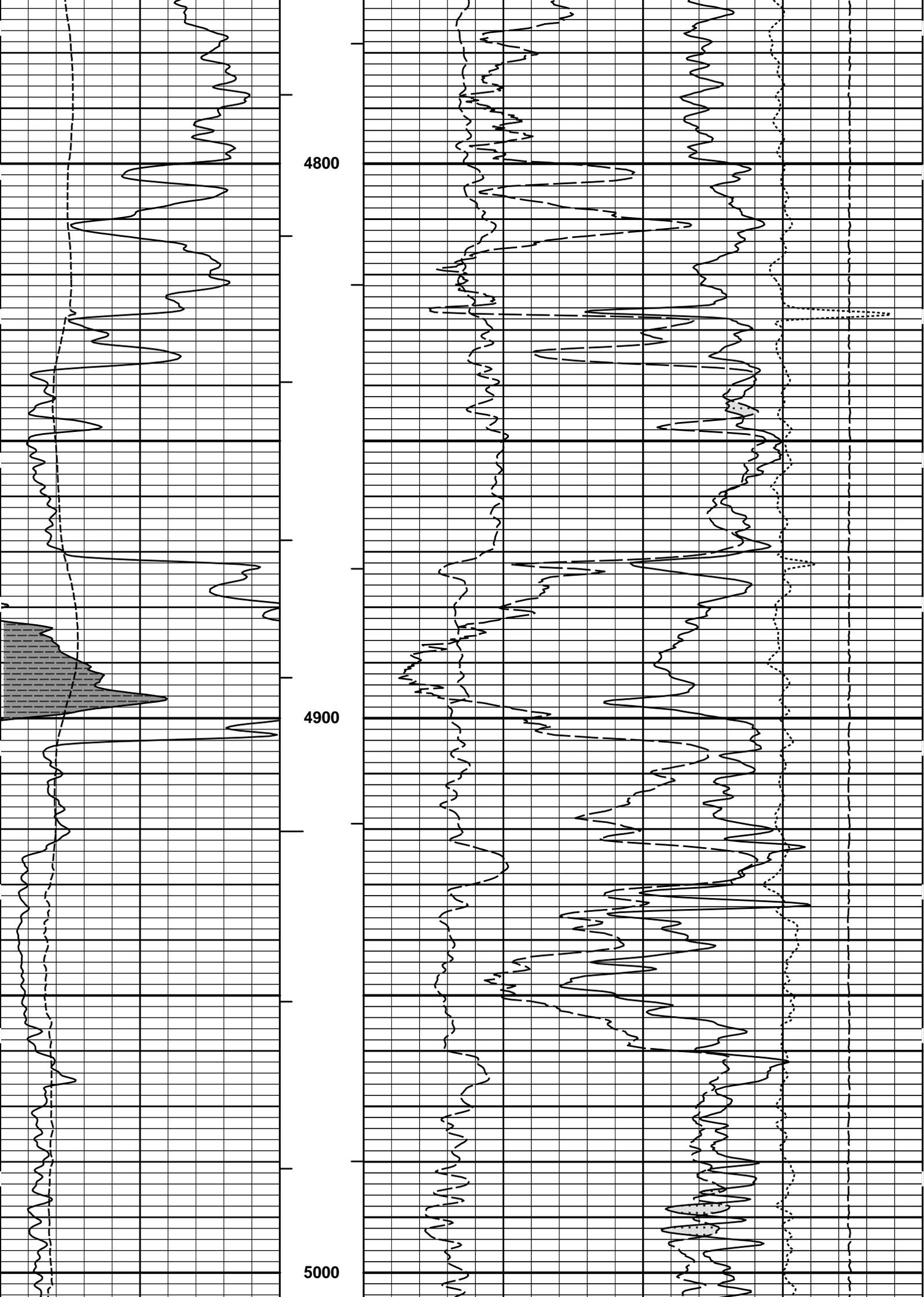


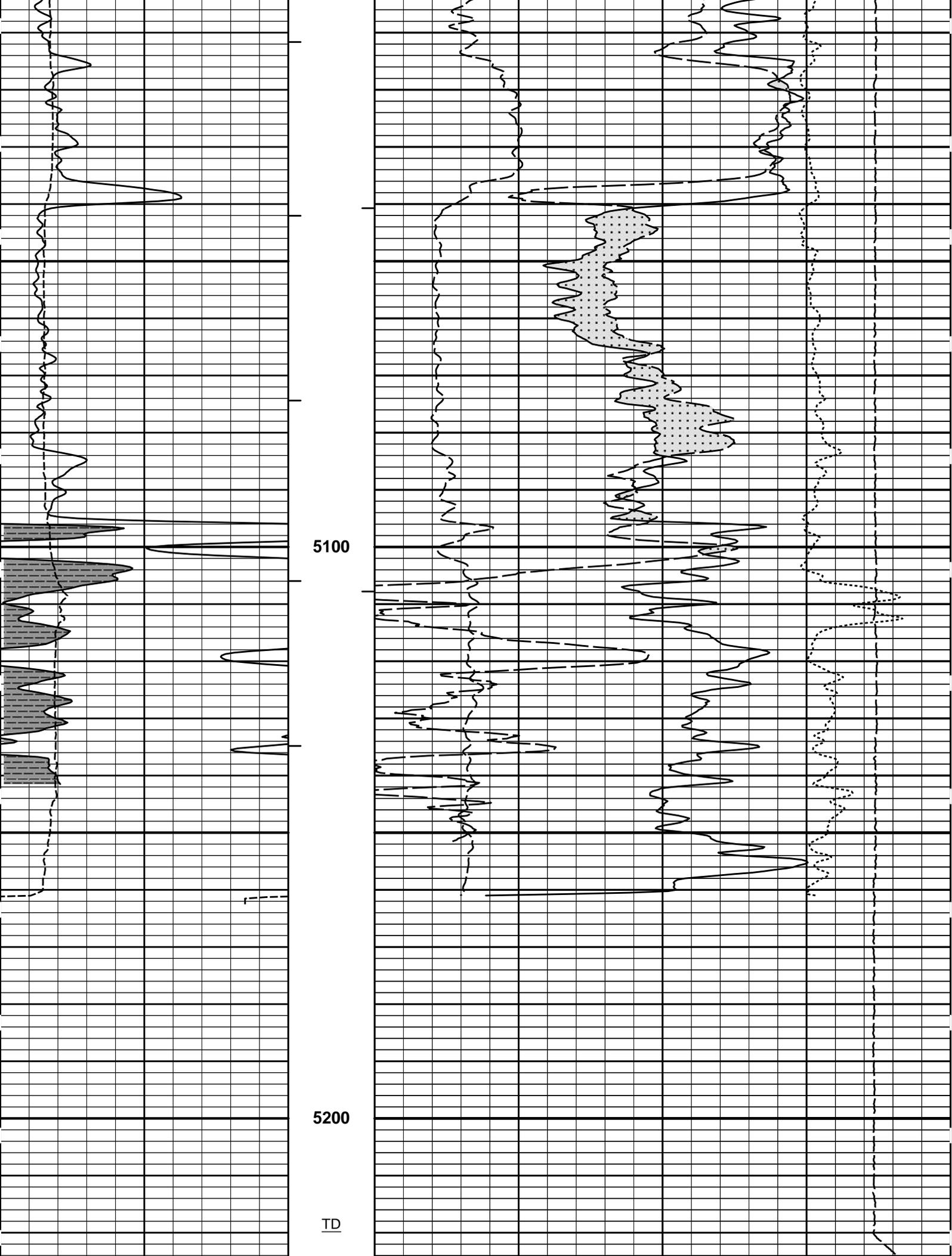












6	Caliper	16	MD	0	Pe	10	-0.25	DensityCorr	0.25
	inches		1 : 240					gram per cc	
			ft					Tension	

Gamma API	150	AHVT		15K	Tension	0
api					pounds	
SHALE		BHVT	30	Density Porosity		-10
				%		
			30	Neutron Porosity		-10
				%		
				CROSSOVER		

**HALLIBURTON**

Plot Time: 20-Mar-18 17:06:18  
 Plot Range: 290 ft to 5224.75 ft  
 Data: RAMSHORN\_MARSH\Well Based\MAIN SPLICE\  
 Plot File: \\PORO\Poro\_IQ\_5\_MAIN\_LIB

**5 INCH MAIN LOG**

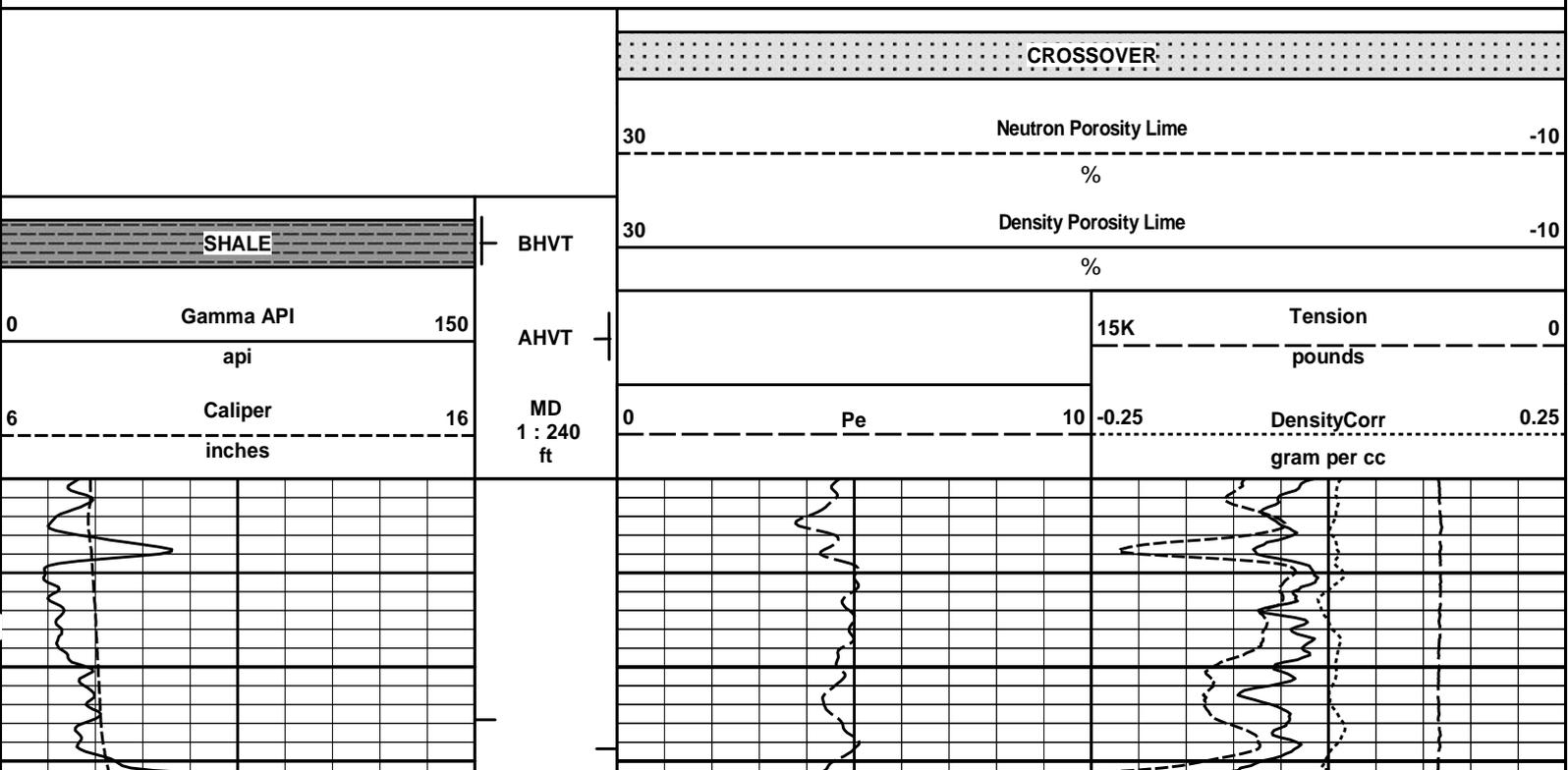
MEASURED DEPTH  
 MAIN SECTION 5" PER 100'

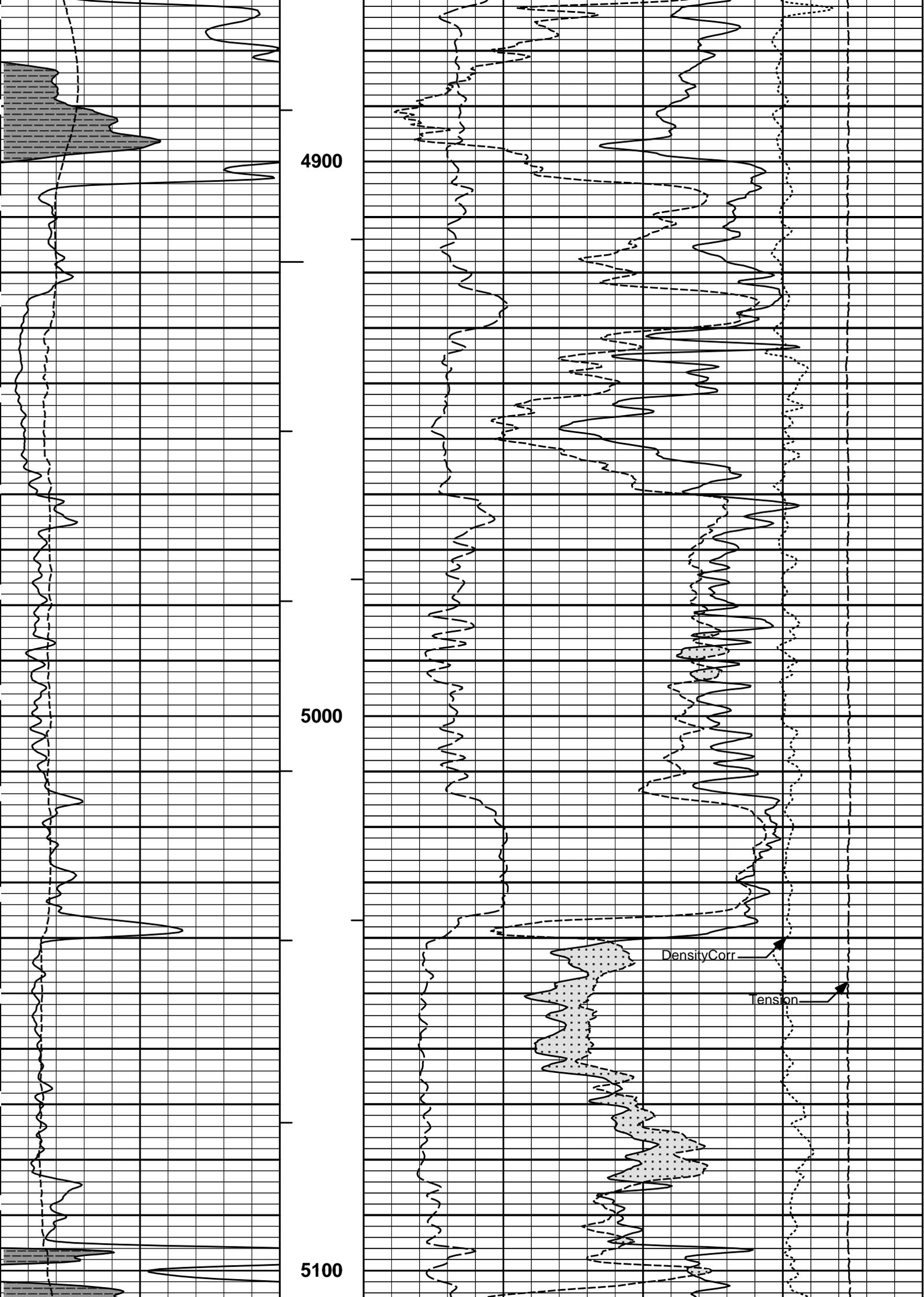
**HALLIBURTON**

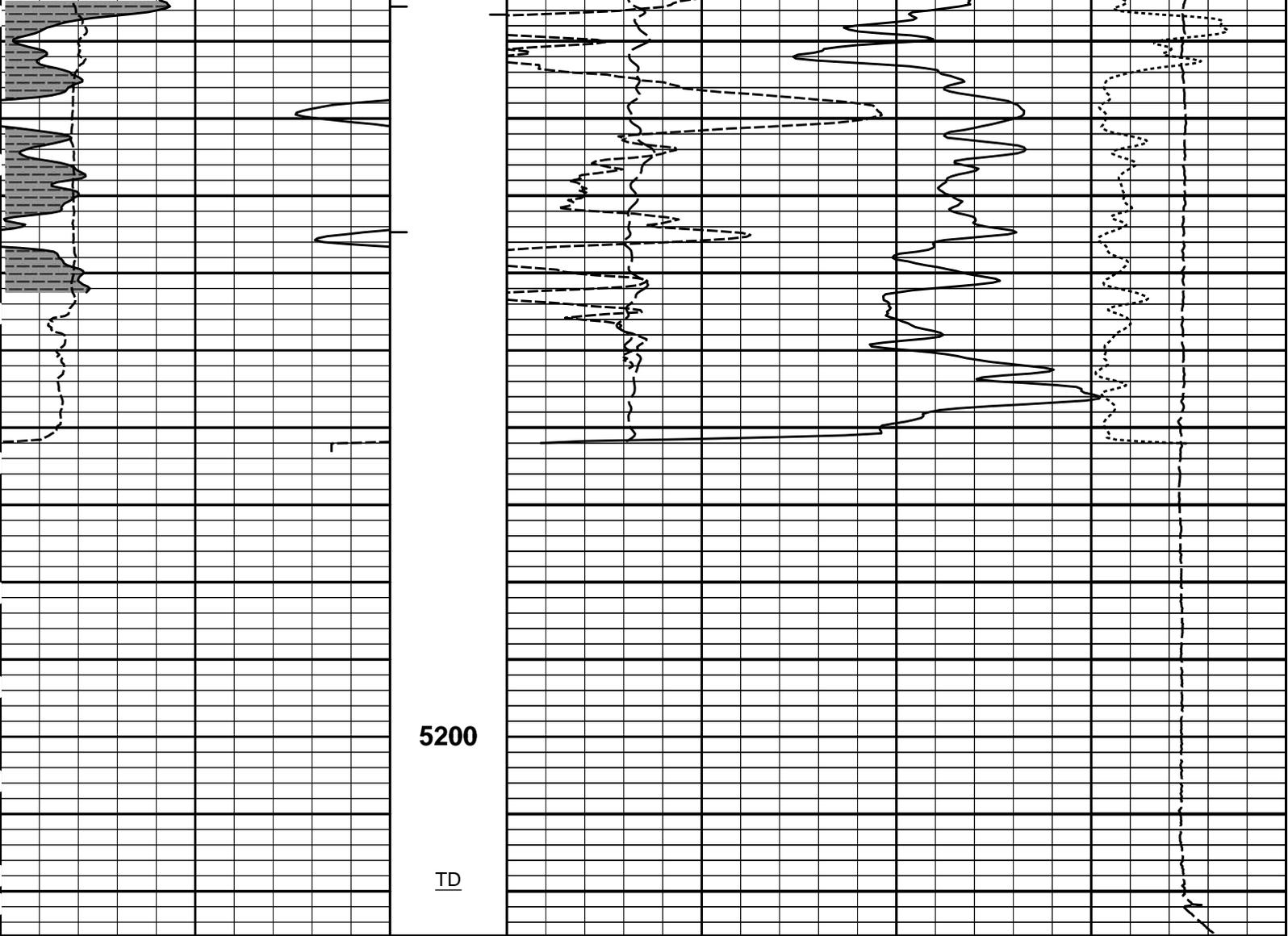
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 Plot Range: 4840 ft to 5225.75 ft  
 Data: RAMSHORN\_MARSH\Well Based\REPEAT\  
 Plot File: \\PORO\Poro\_IQ\_5\_REP\_LIB\_LIME

**REPEAT SECTION**

MAIN SECTION 5" PER 100'  
 LIMESTONE MATRIX







6	Caliper	16	MD	0	Pe	10	-0.25	DensityCorr	0.25
	inches		1 : 240					gram per cc	
0	Gamma API	150	AHVT				15K	Tension	0
	api							pounds	
	SHALE		BHVT	30	Density Porosity Lime				-10
					%				
				30	Neutron Porosity Lime				-10
					%				
					CROSSOVER				

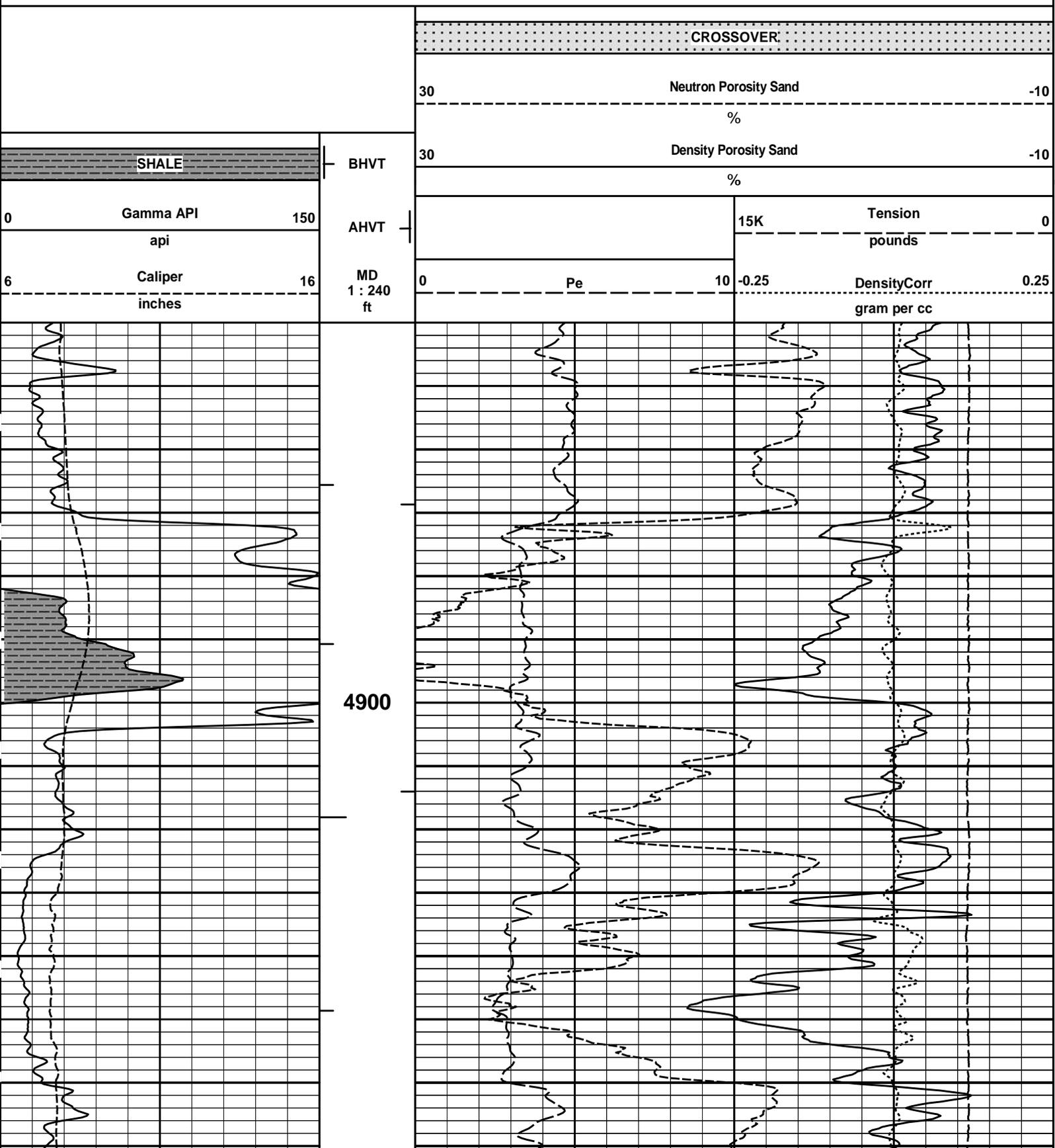
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 Plot Range: 4840 ft to 5225.75 ft  
 Data: RAMSHORN\_MARSH\Well Based\REPEAT\  
 Plot File: \\PORO\Poro\_IQ\_5\_REP\_LIB\_LIME

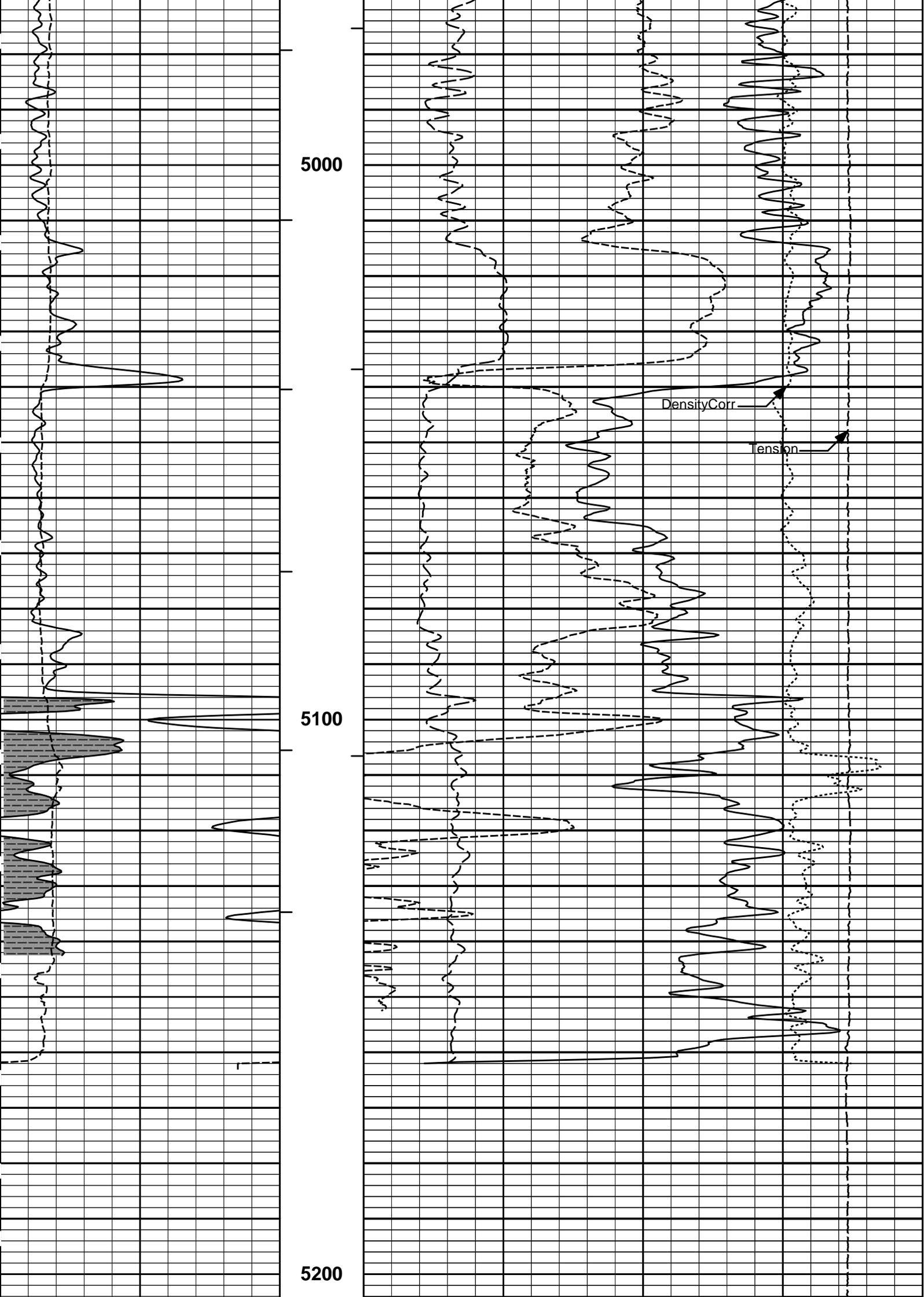
**REPEAT SECTION**

MAIN SECTION 5" PER 100'  
 LIMESTONE MATRIX

# REPEAT SECTION

MAIN SECTION 5" PER 100'  
 SANDSTONE MATRIX





		TD							
6	Caliper	16	MD	0	Pe	10	-0.25	DensityCorr	0.25
inches			1 : 240					gram per cc	
0	Gamma API	150	AHVT			15K		Tension	0
api								pounds	
SHALE			BHVT	30	Density Porosity Sand				-10
								%	
				30	Neutron Porosity Sand				-10
								%	
						CROSSOVER			

**HALLIBURTON** Plot Time: 20-Mar-18 17:06:27  
 Plot Range: 4840 ft to 5225.75 ft  
 Data: RAMSHORN\_MARSH\Well Based\REPEAT\  
 Plot File: \\PORO\Porosity\_IQ\_5\_REP\_LIB\_SAND

**REPEAT SECTION**

MAIN SECTION 5" PER 100'  
 SANDSTONE MATRIX

**HALLIBURTON** Plot Time: 20-Mar-18 17:06:27  
 Plot Range: 4840 ft to 5225.75 ft  
 Data: RAMSHORN\_MARSH\Well Based\REPEAT\  
 Plot File: \\PORO\Porosity\_IQ\_5\_REP\_LIB\_DOLO

**REPEAT SECTION**

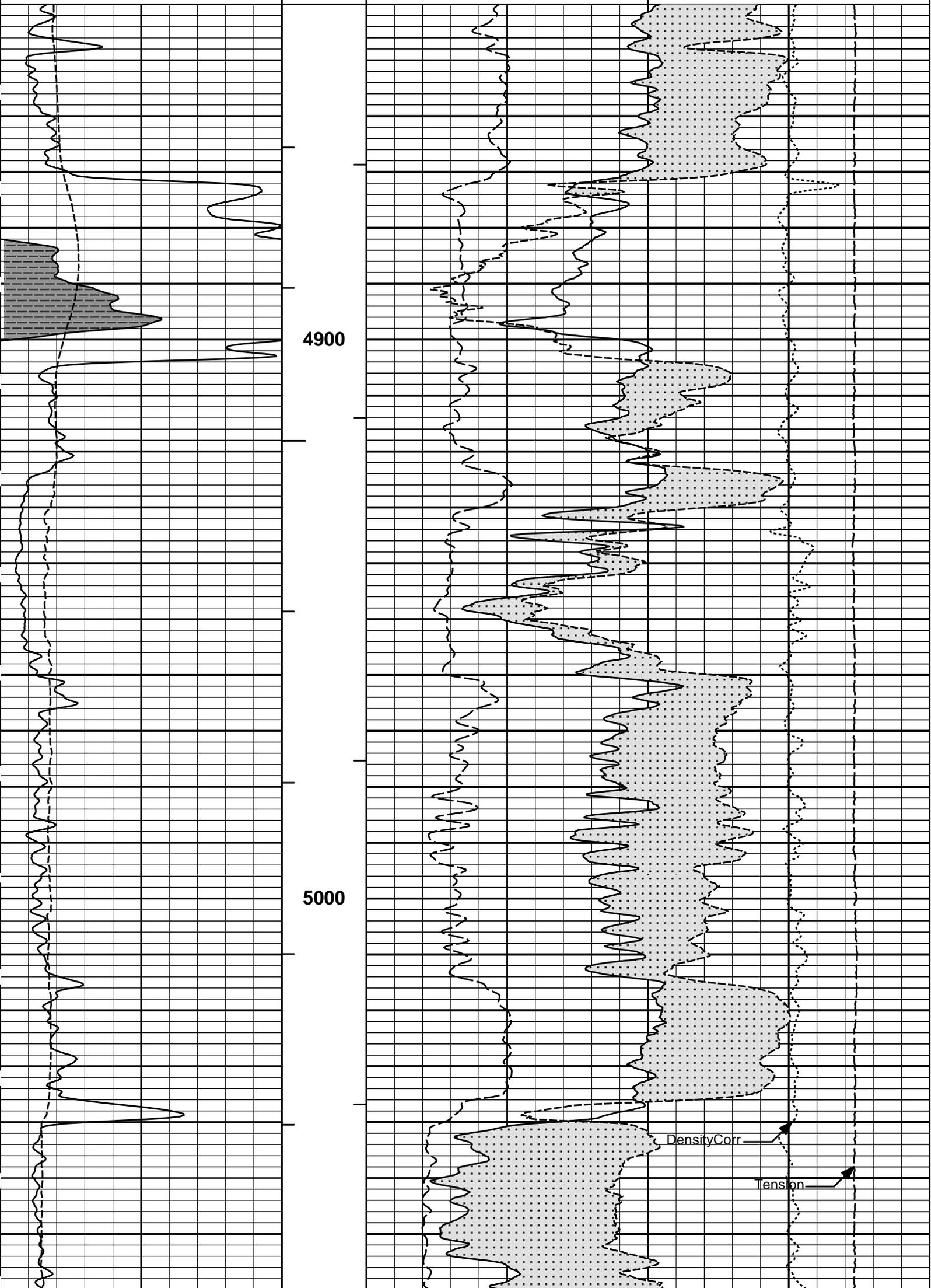
MAIN SECTION 5" PER 100'  
 DOLOMITE MATRIX

						CROSSOVER			
				30	Neutron Porosity Dolomite				-10
								%	
SHALE			BHVT	30	Density Porosity Dolomite				-10
								%	
0	Gamma API	150	AHVT			15K		Tension	0
api								pounds	
6	Caliper	16	MD	0	Pe	10	-0.25	DensityCorr	0.25
inches			1 : 240						

inches

ft

gram per cc

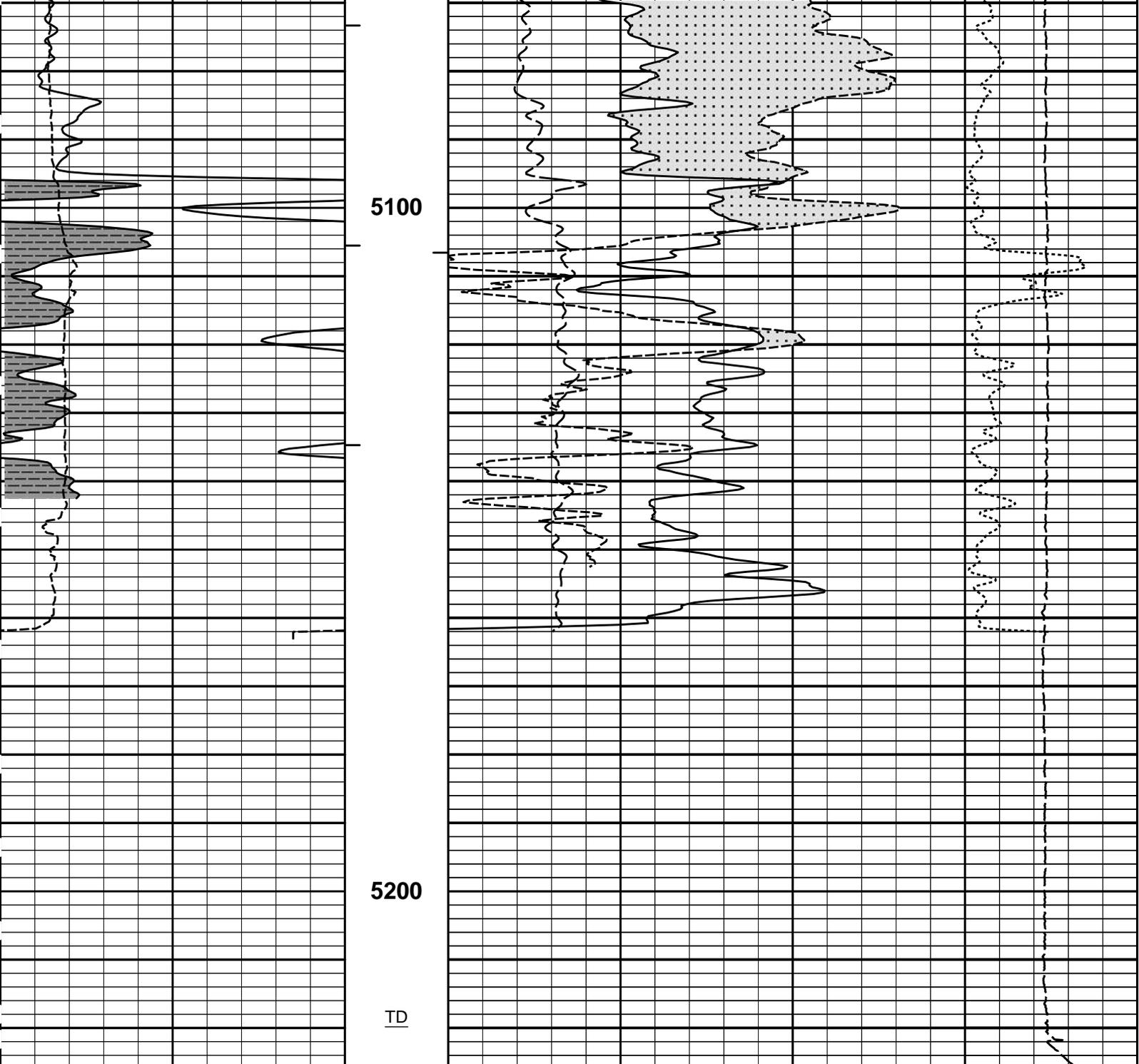


4900

5000

DensityCorr

tension



6	Caliper	16	MD	0	Pe	10	-0.25	DensityCorr	0.25
	inches		1 : 240					gram per cc	
0	Gamma API	150	AHVT				15K	Tension	0
	api							pounds	
	SHALE		BHVT	30	Density Porosity Dolomite				-10
						%			
				30	Neutron Porosity Dolomite				-10
						%			
					CROSSOVER				

**HALLIBURTON**

Plot Time: 20-Mar-18 17:06:31  
 Plot Range: 4840 ft to 5225.75 ft  
 Data: RAMSHORN\_MARSH\Well Based\REPEAT\  
 Plot File: \\PORO\Porosity\_IQ\_5\_REP\_LIB\_DOLO

**REPEAT SECTION**

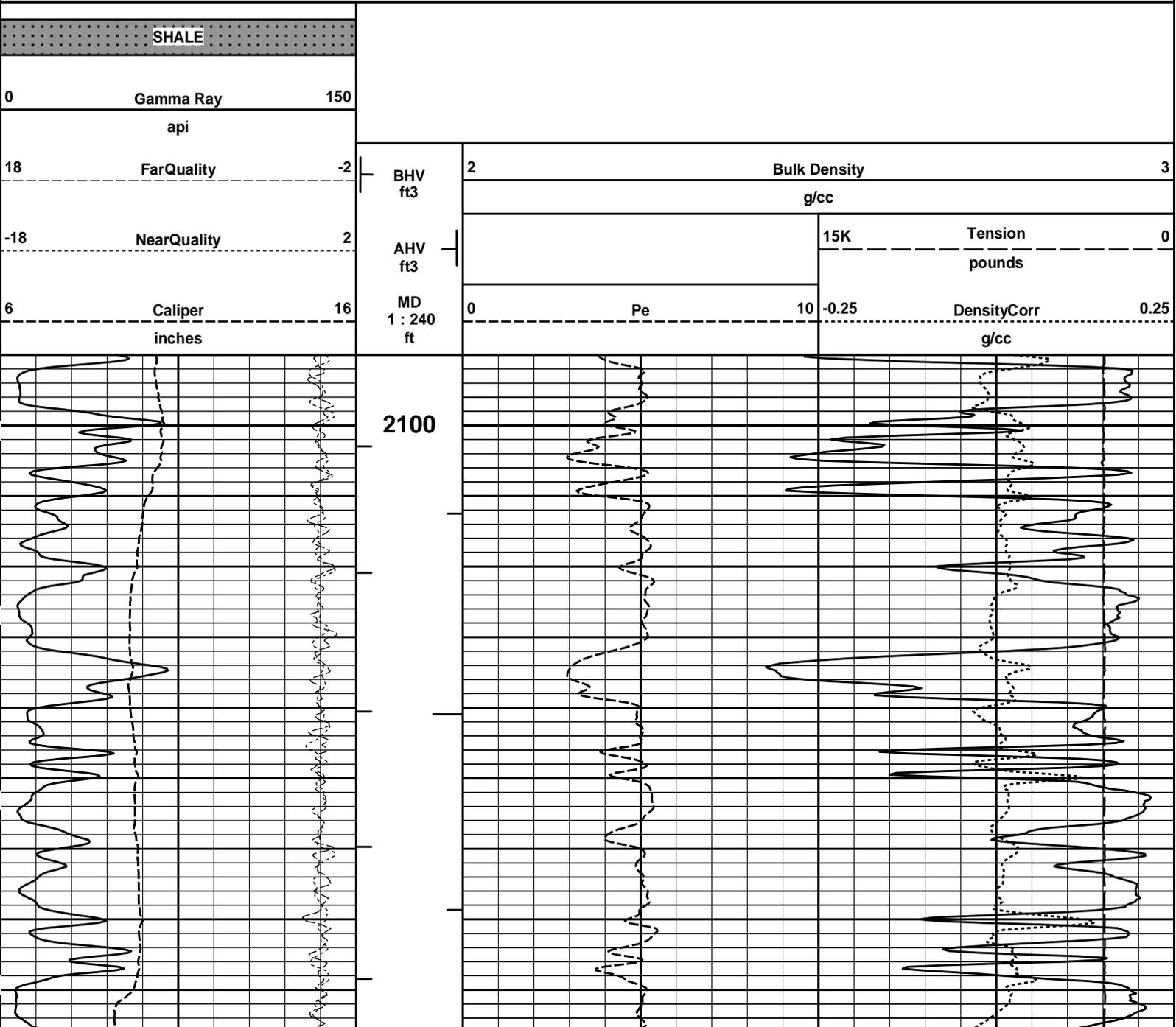
MAIN SECTION 5" PER 100'  
DOLOMITE MATRIX

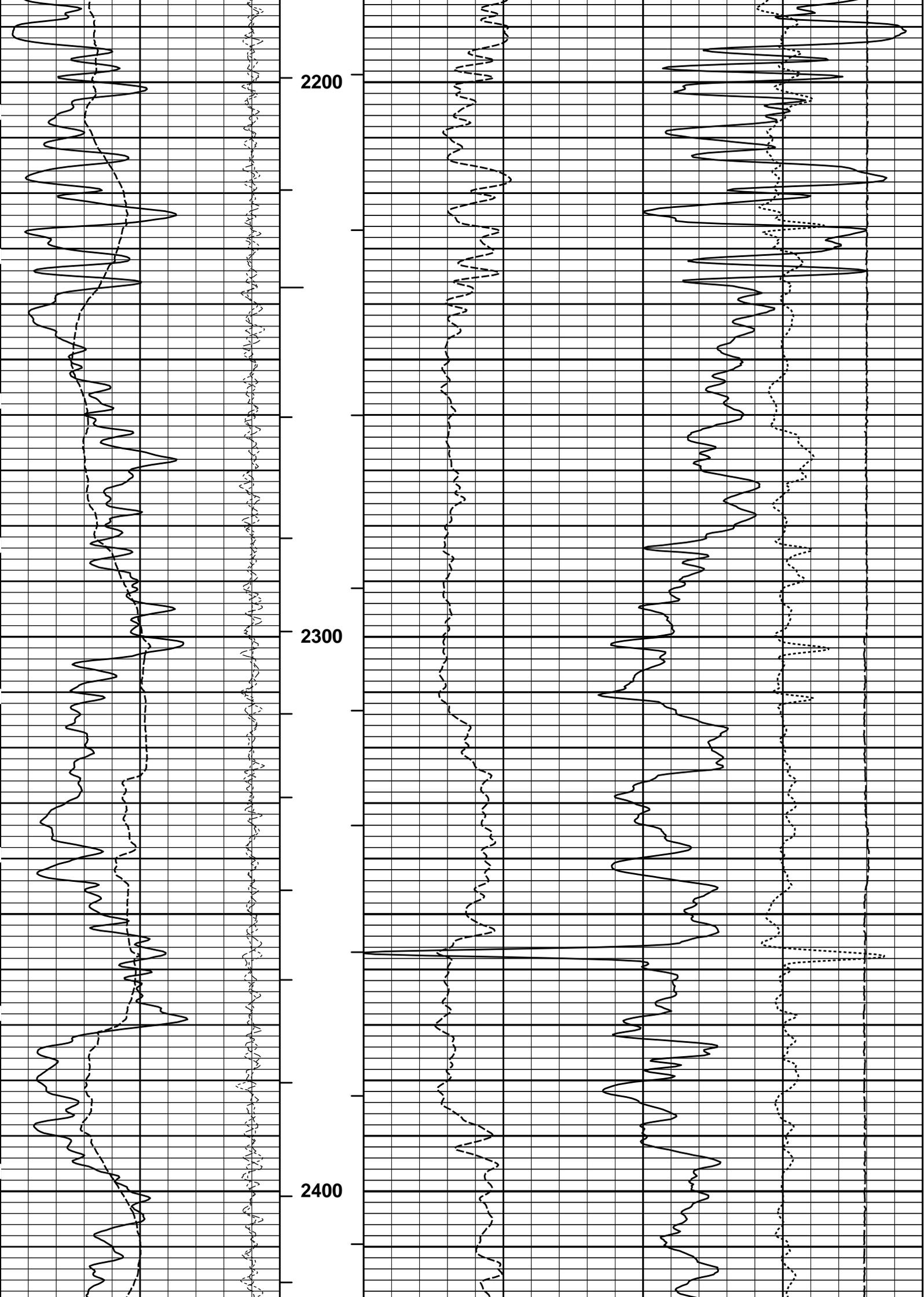
**HALLIBURTON**

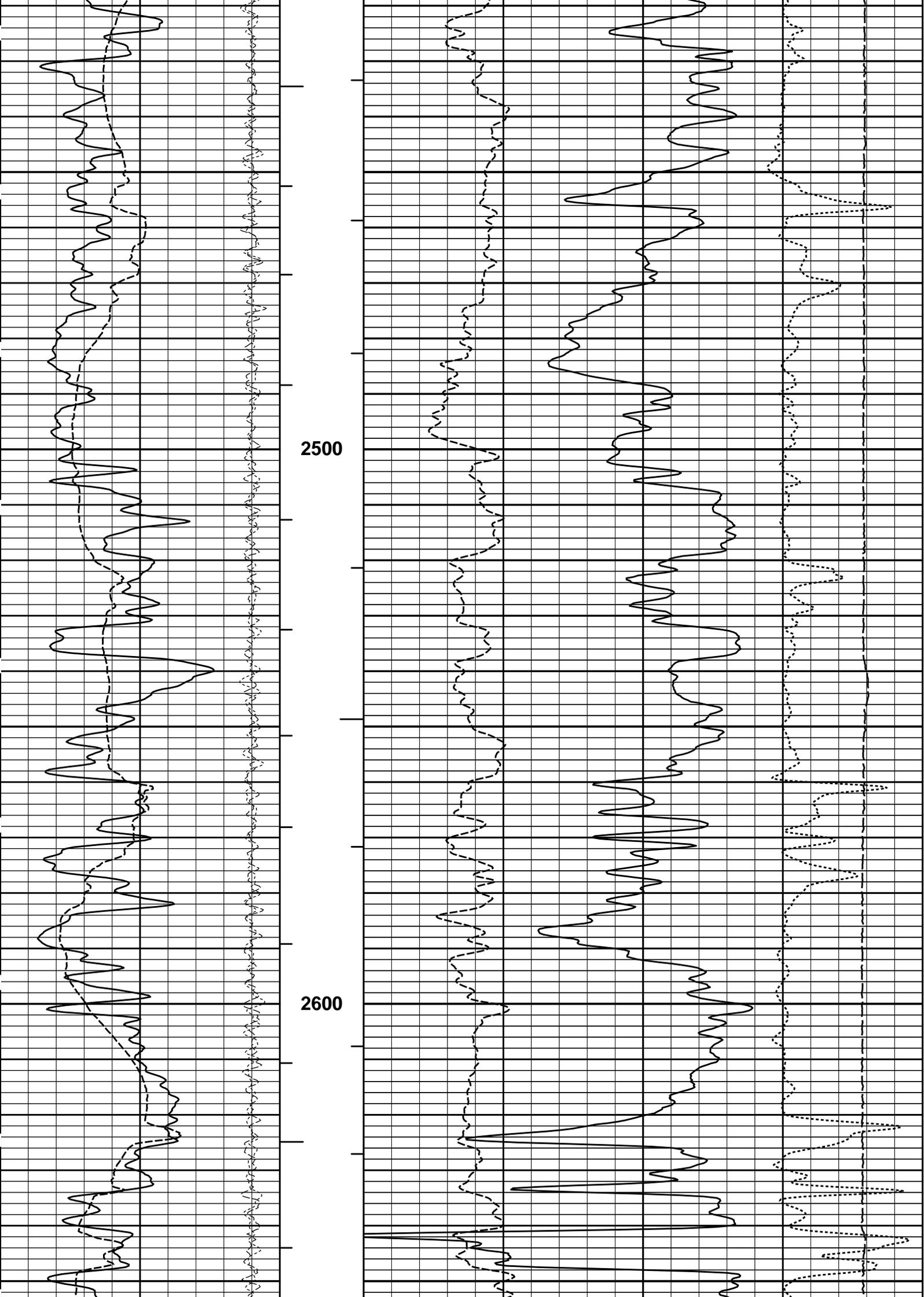
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 Plot Range: 2090 ft to 5224.75 ft  
 Data: RAMSHORN\_MARSHWell Based\MAIN SPLICE\  
 Plot File: \\-LOCAL-\\RAMSHORN\_MARSHWell Based\POROIBULKD\_5\_MAIN\_LIB

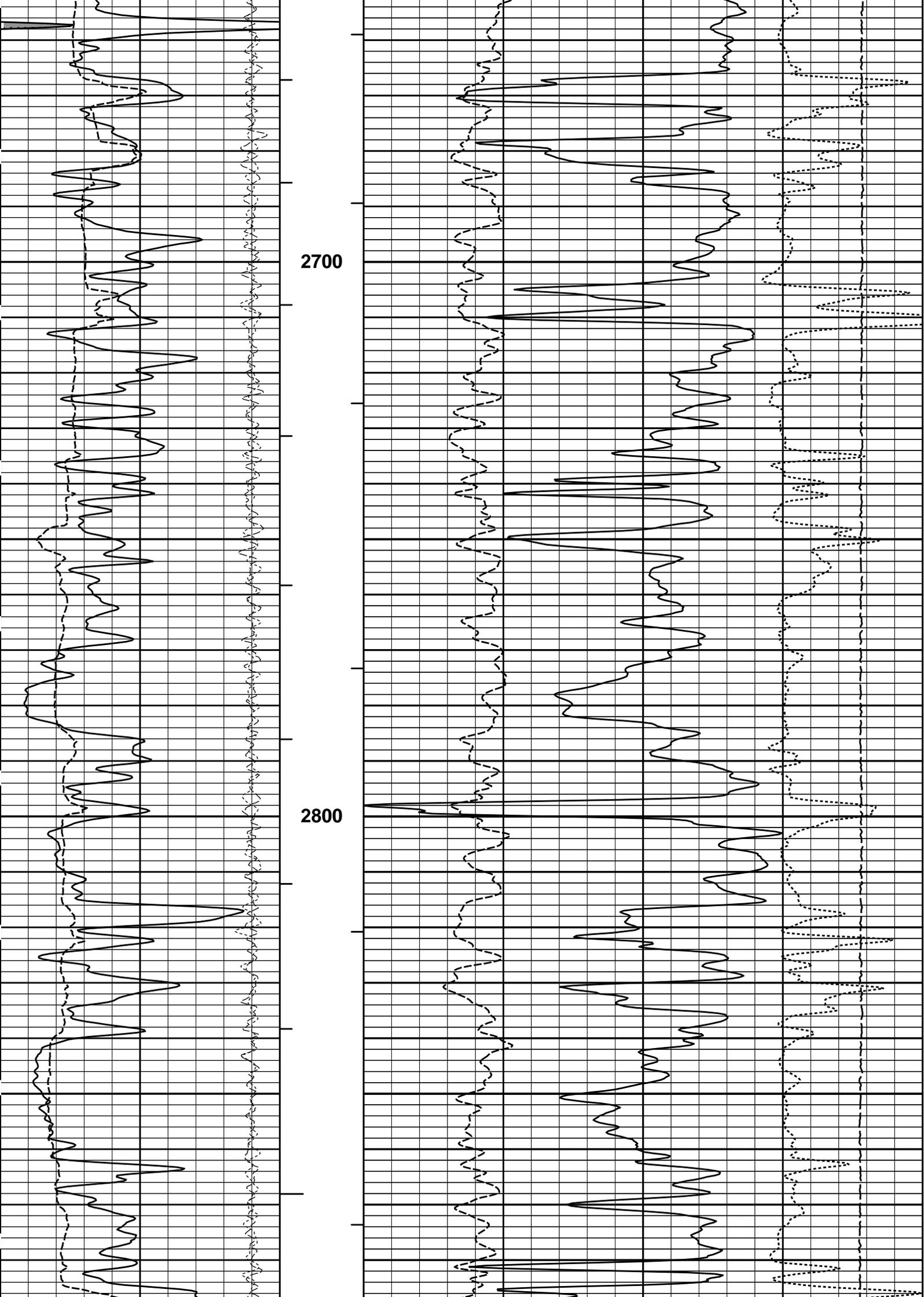
## 5 INCH MAIN LOG

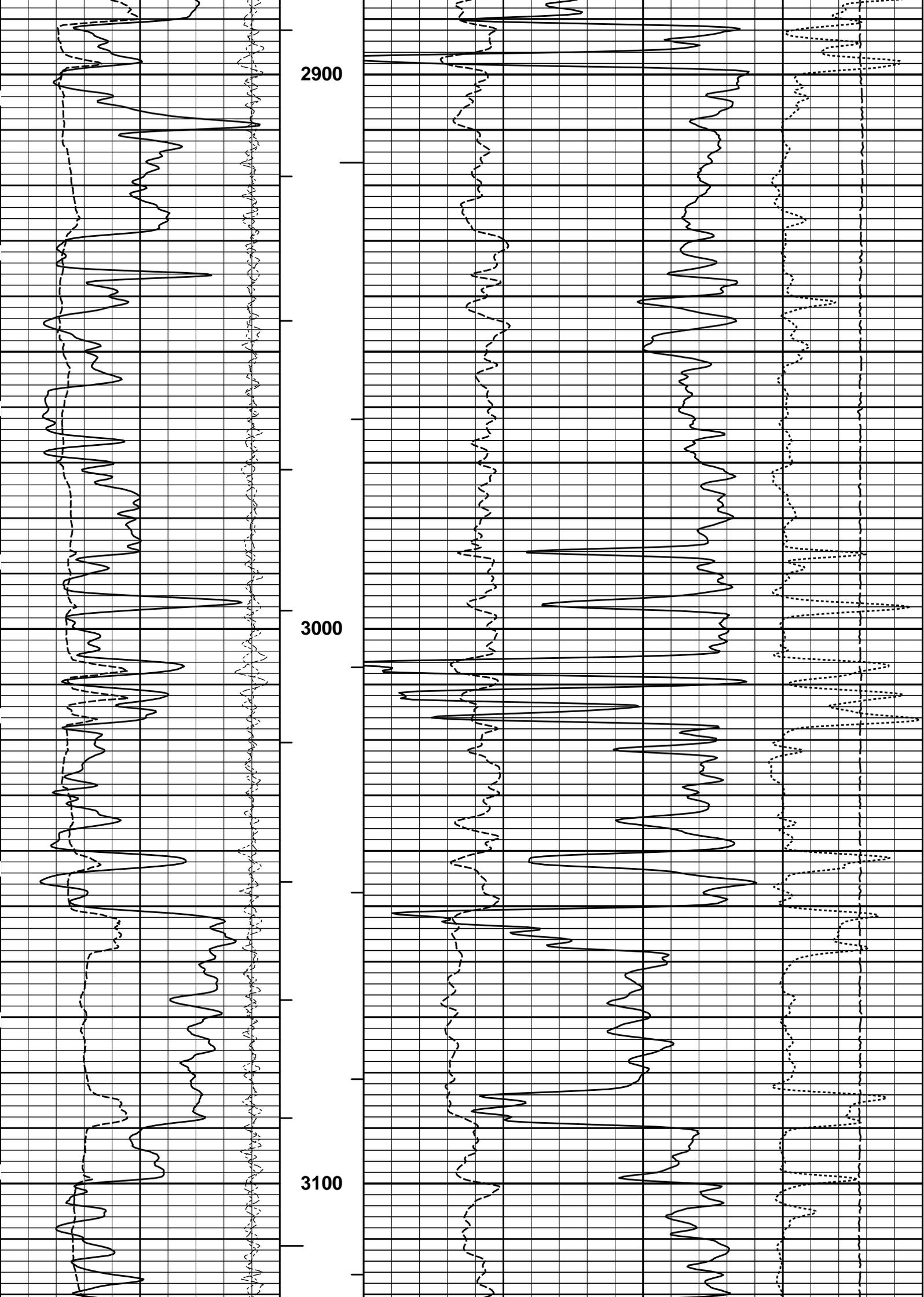
MEASURED DEPTH  
MAIN SECTION 5" PER 100'

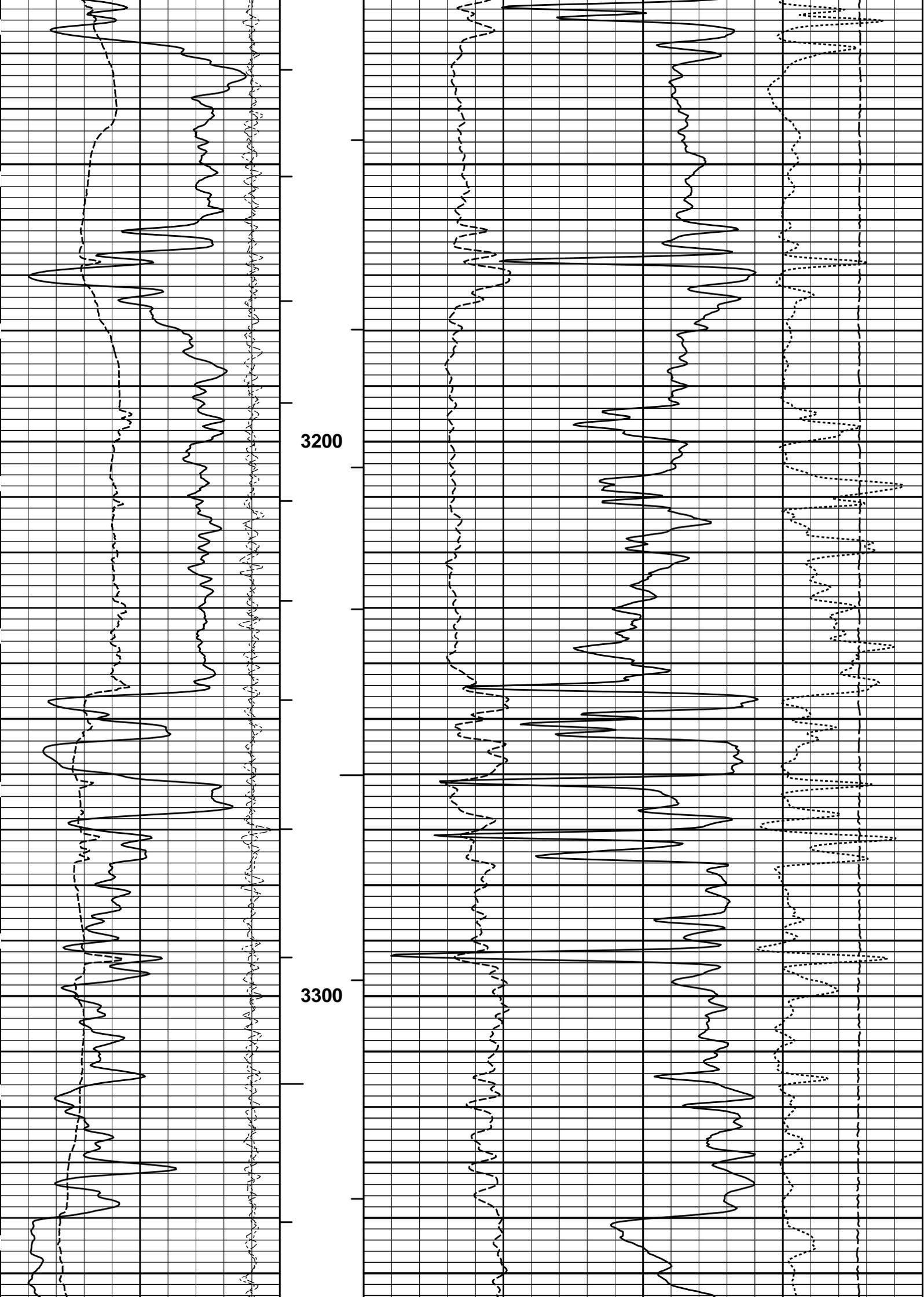


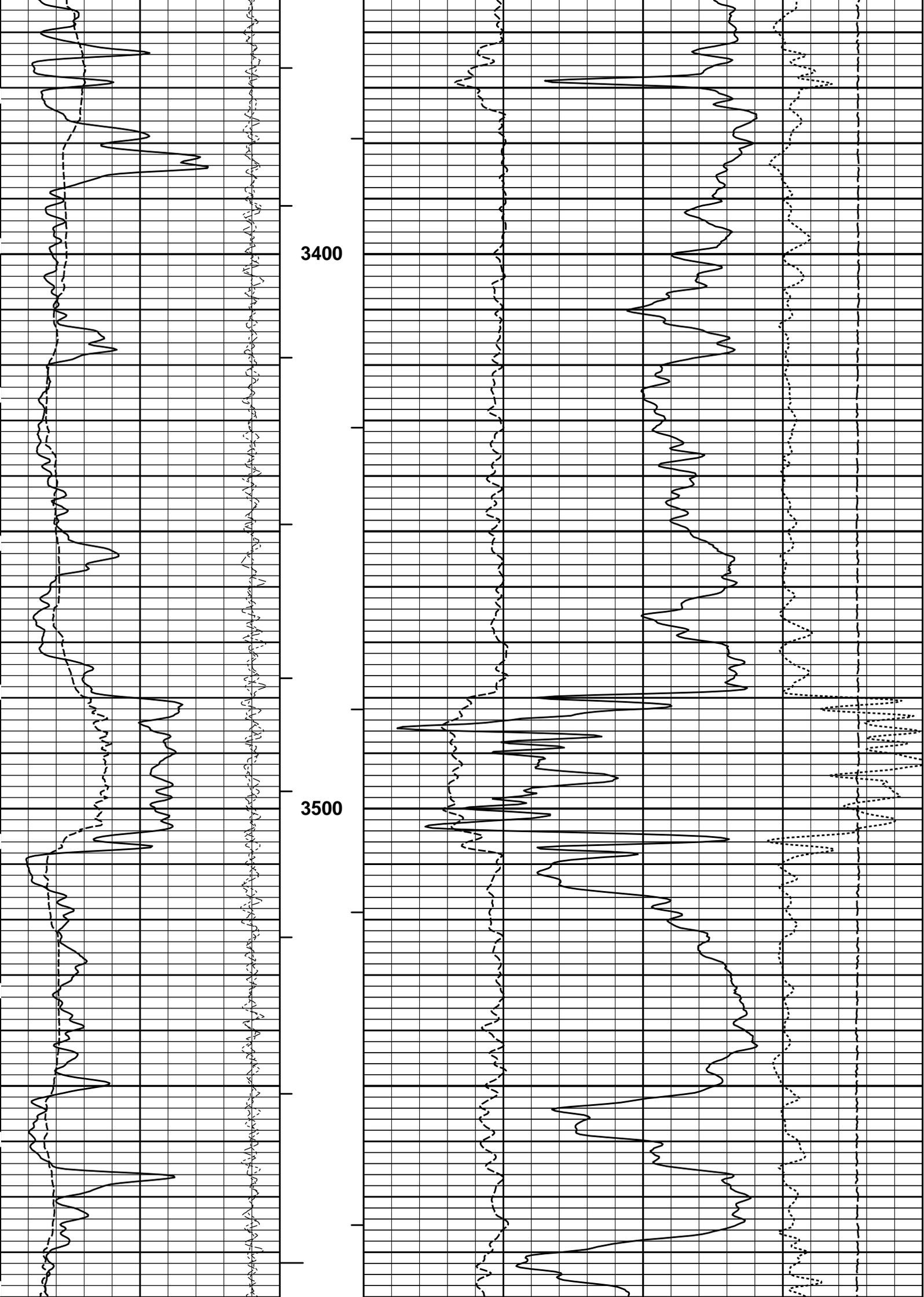


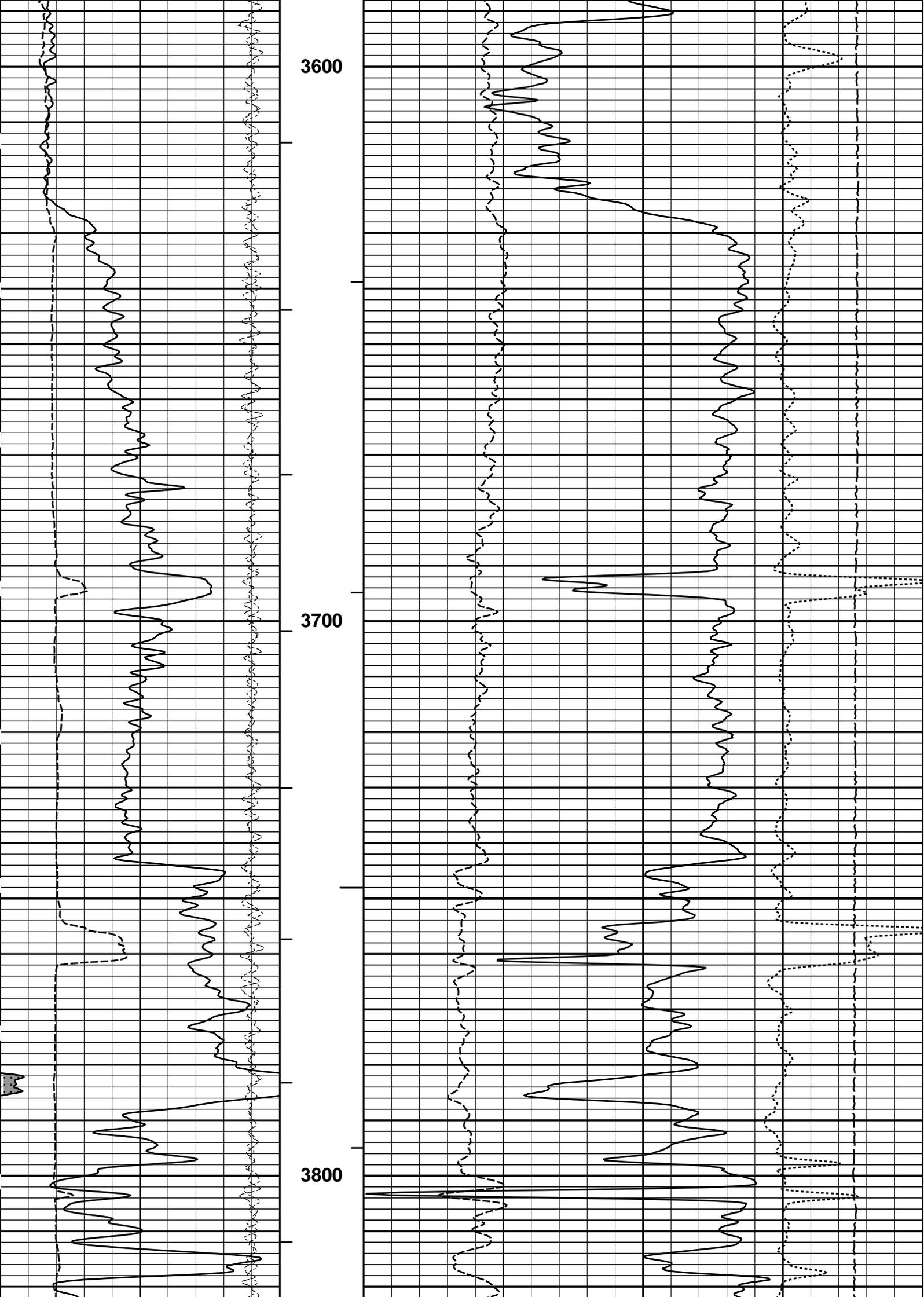


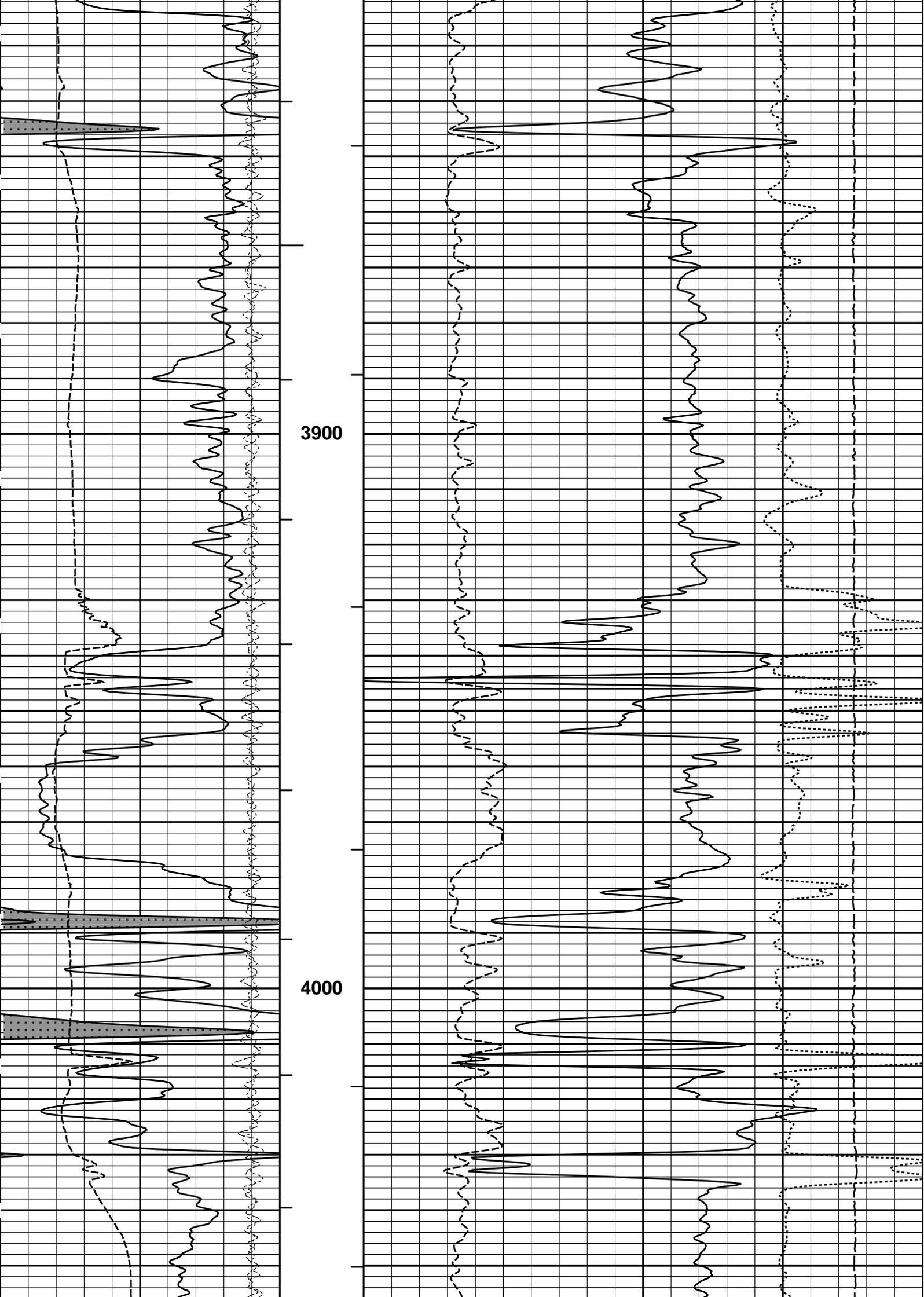


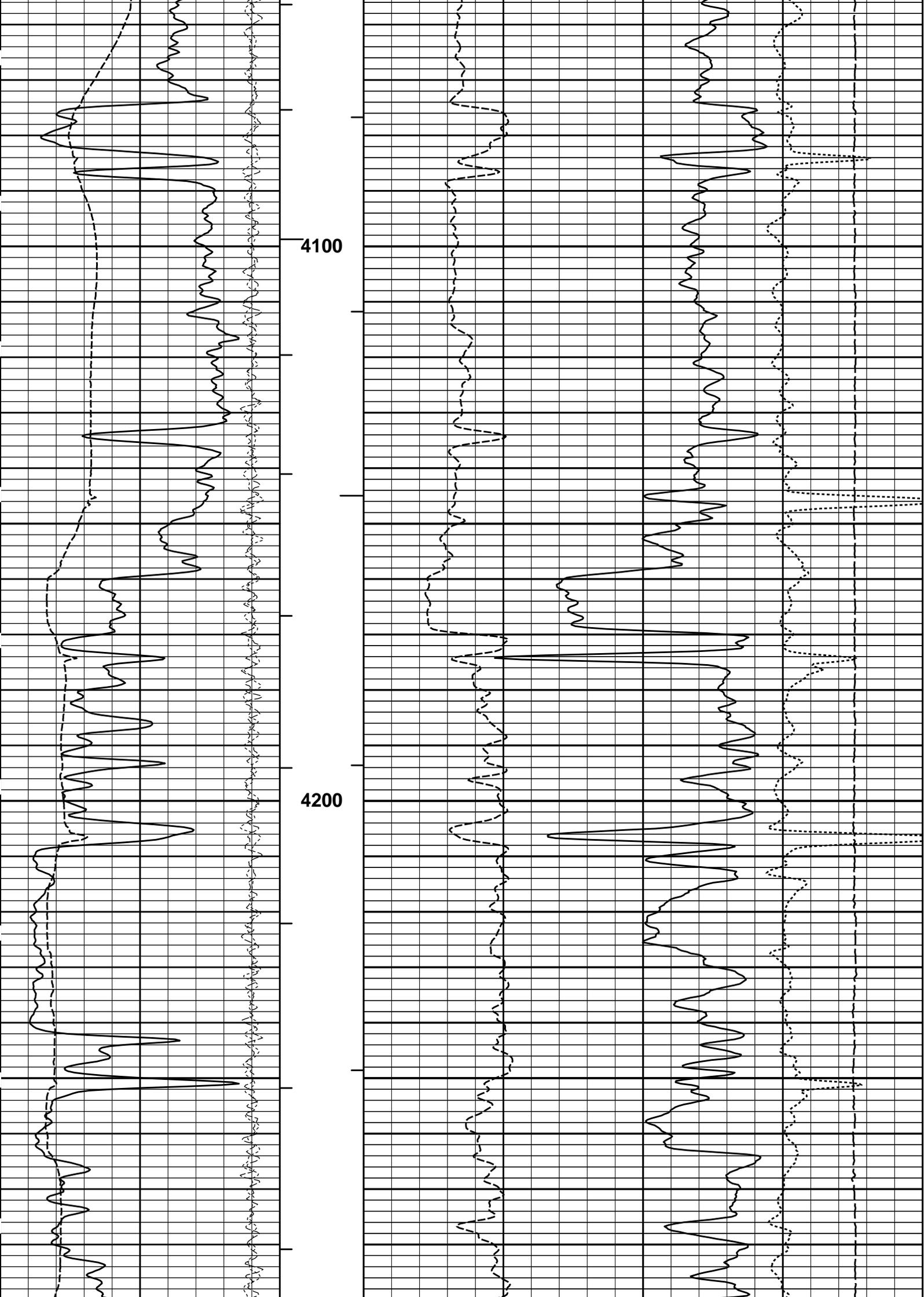


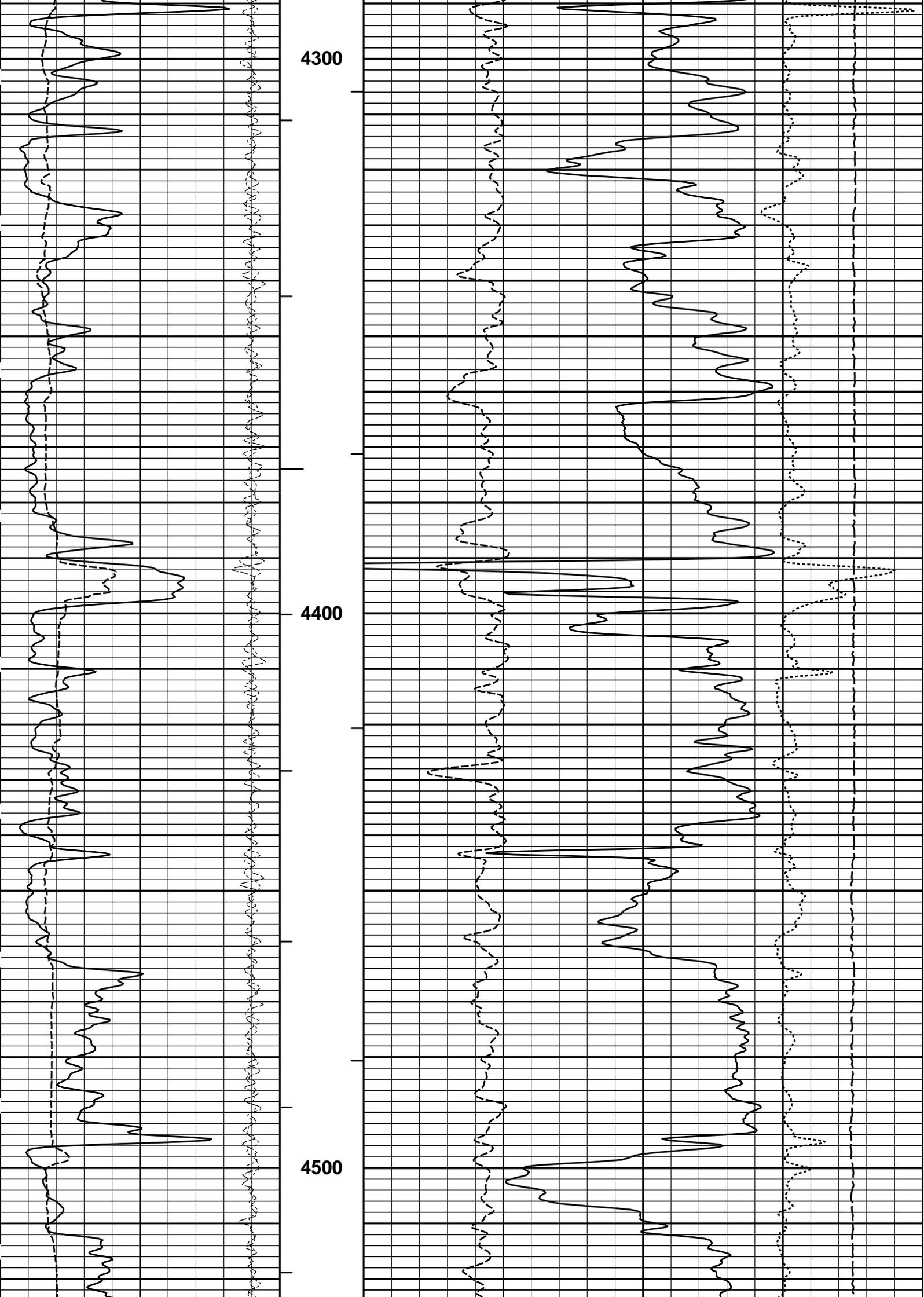


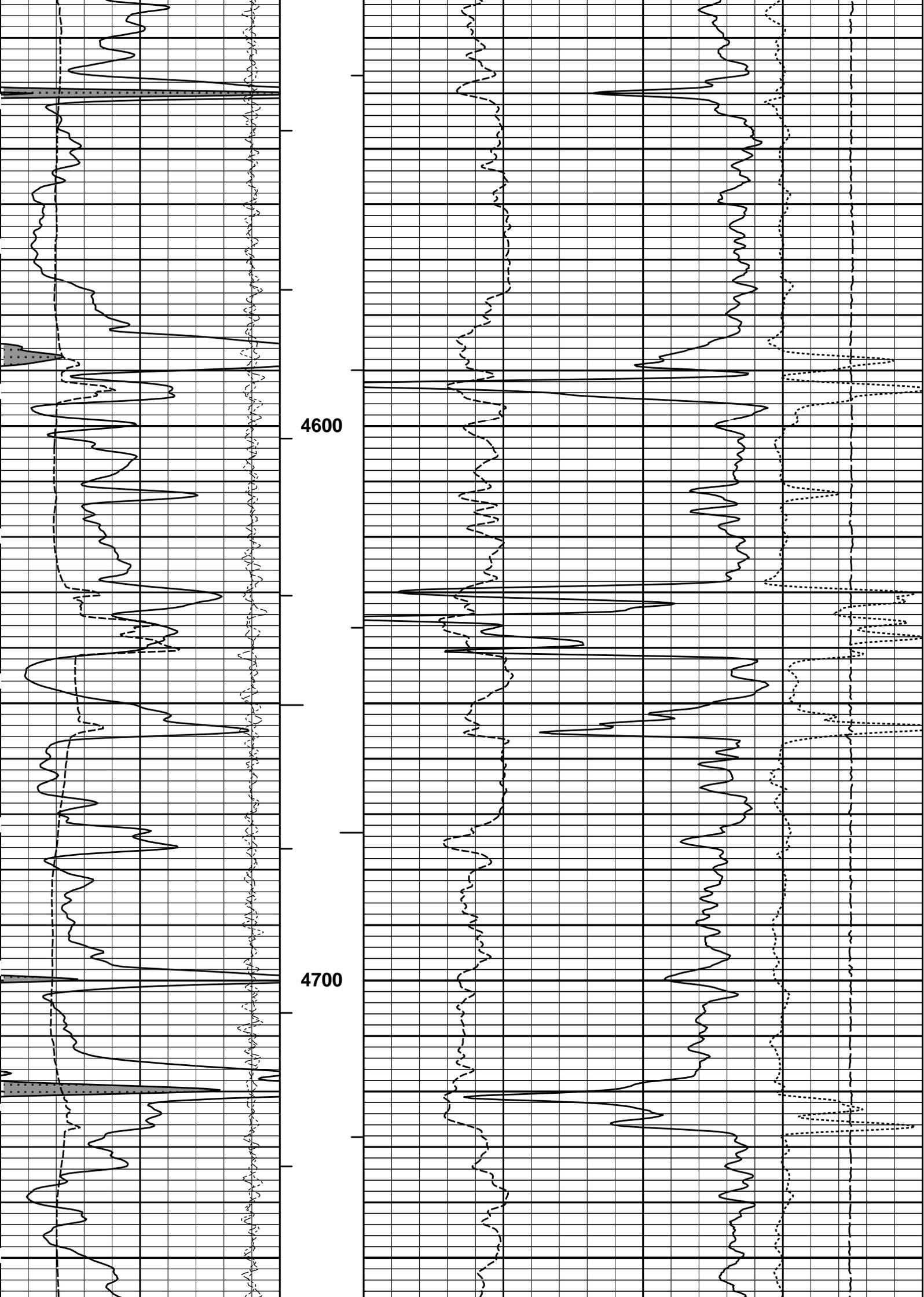


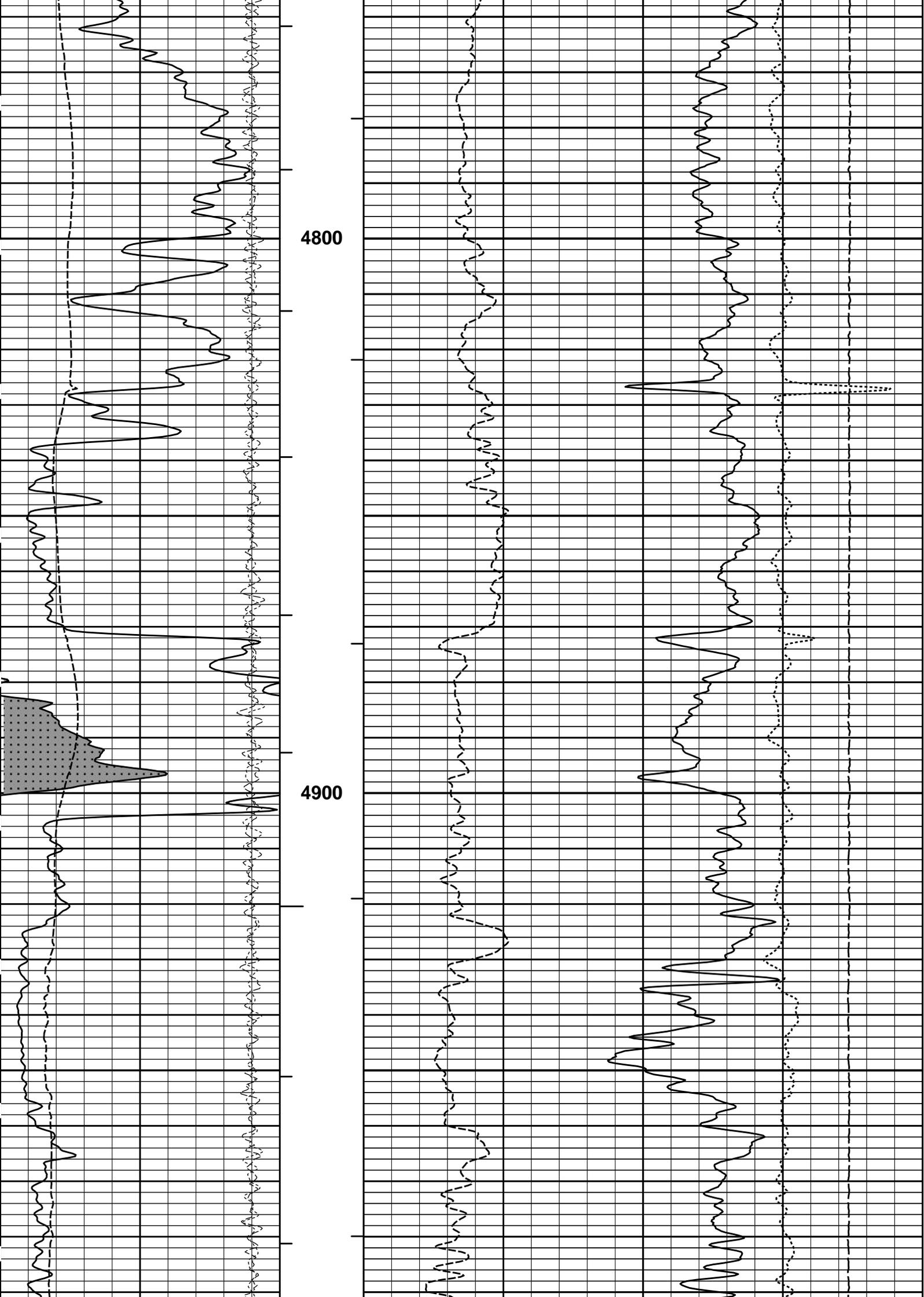


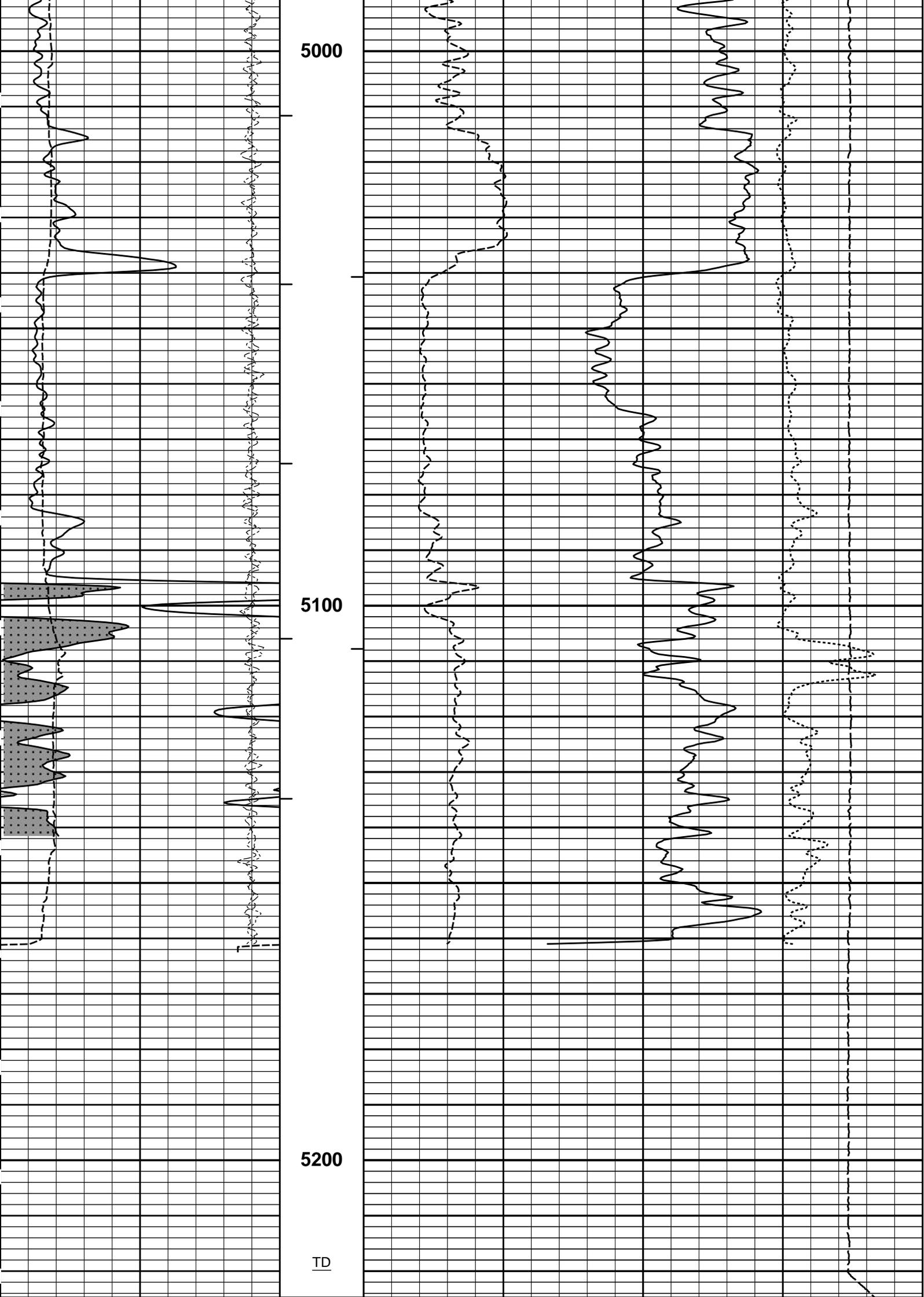












6	Caliper	16	MD 1 : 240 ft	0	Pe	10	-0.25	DensityCorr	0.25
	inches							g/cc	
-18	NearQuality	2	AHV ft3				15K	Tension	0
								pounds	
18	FarQuality	-2	BHV ft3	2	Bulk Density				3
					g/cc				
0	Gamma Ray	150							
	api								
	SHALE								

**HALLIBURTON**

Plot Time: 20-Mar-18 17:06:43  
Plot Range: 2090 ft to 5224.75 ft  
Data: RAMSHORN\_MARSHWell Based\MAIN SPLICE\  
Plot File: \\-LOCAL-\\RAMSHORN\_MARSHWell Based\PORO\BULKD\_5\_MAIN\_LIB

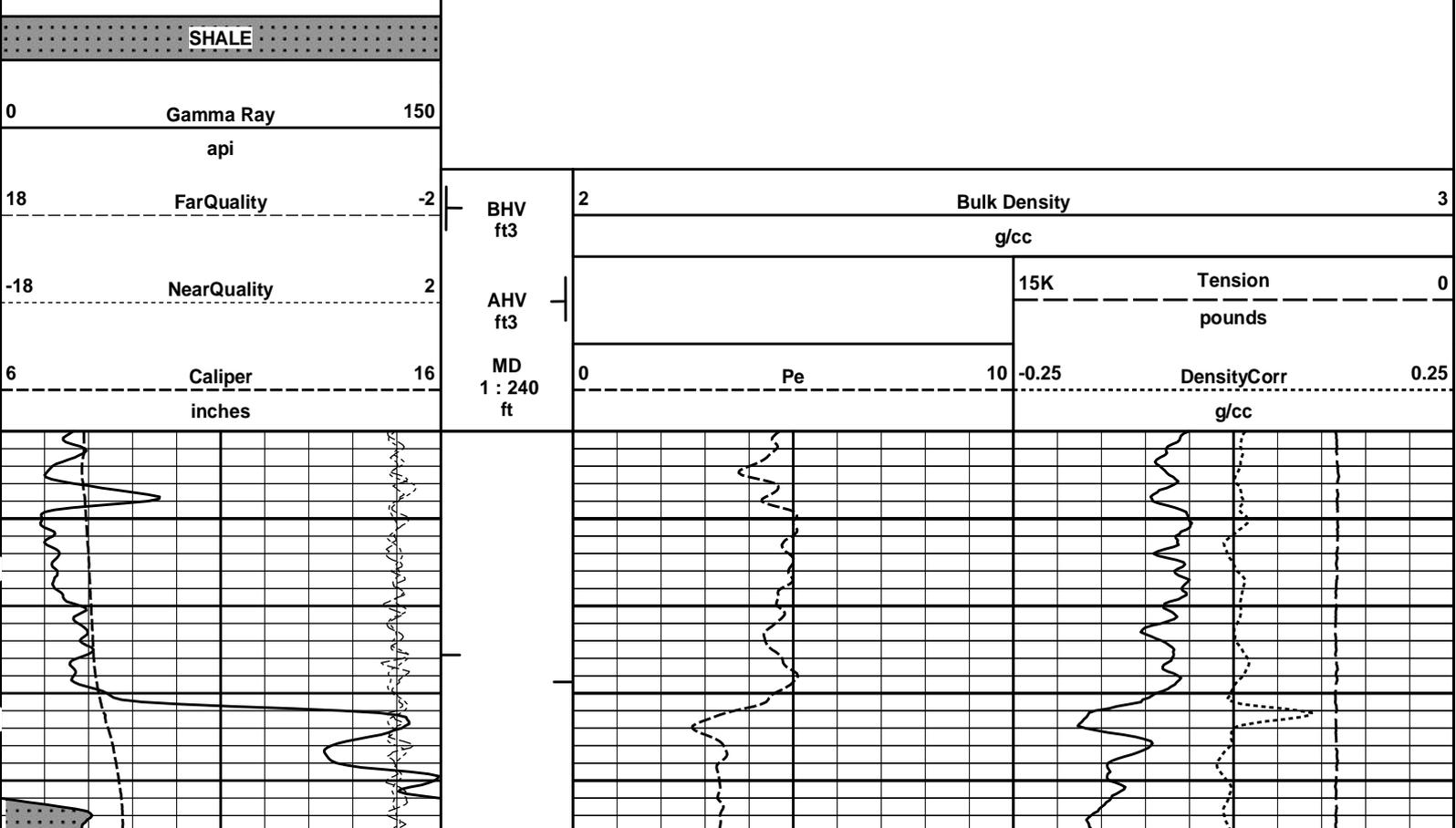
## 5 INCH MAIN LOG

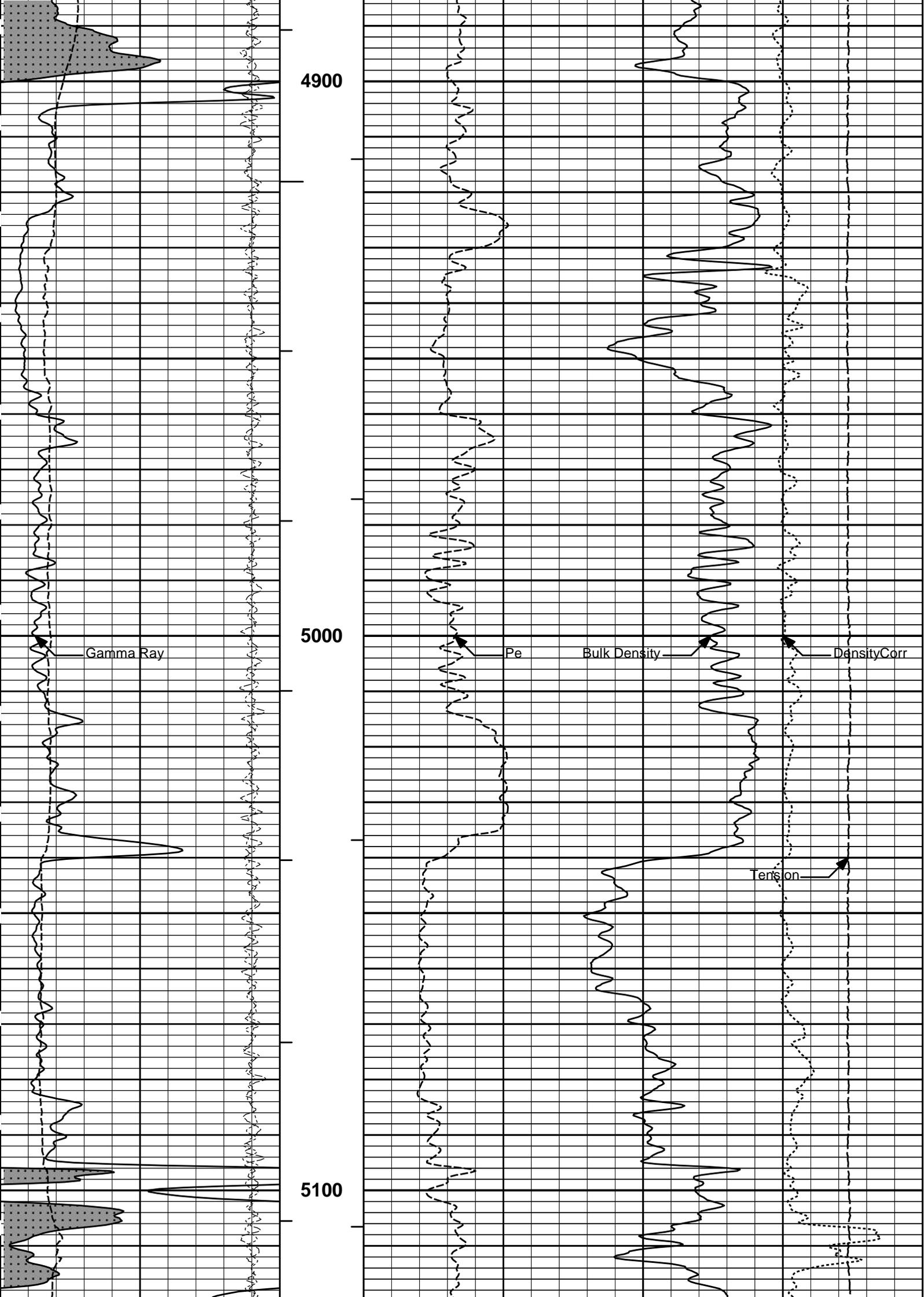
MEASURED DEPTH  
MAIN SECTION 5" PER 100'

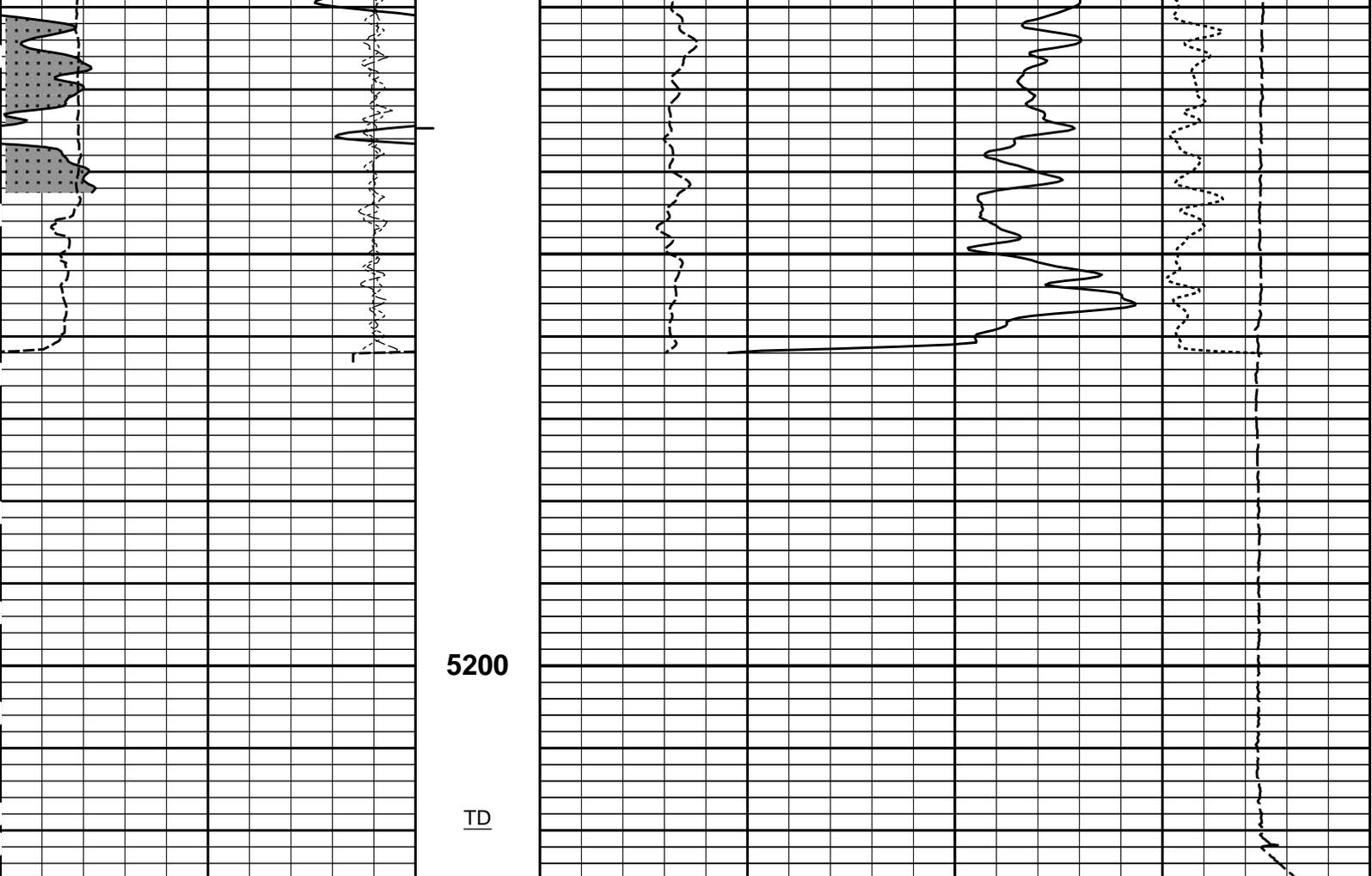
**HALLIBURTON**

Plot Time: 20-Mar-18 17:06:43  
Plot Range: 4840 ft to 5225.75 ft  
Data: RAMSHORN\_MARSHWell Based\REPEAT\  
Plot File: \\-LOCAL-\\RAMSHORN\_MARSHWell Based\PORO\BULKD\_5\_REP\_LIB

## REPEAT SECTION







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

**HALLIBURTON**

Plot Time: 20-Mar-18 17:06:46  
 Plot Range: 4840 ft to 5225.75 ft  
 Data: RAMSHORN\_MARSHWell Based\REPEAT\  
 Plot File: \\-LOCAL-\\RAMSHORN\_MARSHWell Based\PORO\BULKD\_5\_REP\_LIB

**REPEAT SECTION**

**HALLIBURTON**

**PARAMETERS REPORT**

Depth (ft)	Tool Name	Mnemonic	Description	Value	Units
TOP					
	SHARED	BS	Bit Size	7.875	in
	SHARED	UBS	Use Bit Size instead of Caliper for all applications.	No	
	SHARED	MDBS	Mud Base	Water	
	SHARED	MDWT	Borehole Fluid Weight	9.300	ppg
	SHARED	WACT	Weighting Agent	Natural	

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	0.610	ohmm
SHARED	TRM	Temperature of Mud	75.0	degF
SHARED	CSD	Logging Interval is Cased?	No	
SHARED	ICOD	AHV Casing OD	5.500	in
SHARED	CSTR	Compressive Strength	1000.00	psia
SHARED	ST	Surface Temperature	75.0	degF
SHARED	TD	Total Well Depth	5218.00	ft
SHARED	BHT	Bottom Hole Temperature	140.0	degF
SHARED	SVTM	Navigation and Survey Master Tool	NONE	
SHARED	AZTM	High Res Z Accelerometer Master Tool	GTET	
SHARED	TEMM	CBM Temperature Master Tool	GTET	
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	
Rwa / CrossPlot	BHSM	Borehole Size Source Tool	SDLT	
Rwa / CrossPlot	ROIN	Input for RO Calculation	Rwa	
GTET	GROK	Process Gamma Ray?	Yes	
GTET	GEOK	Process Gamma Ray EVR?	Yes	
GTET	TPOS	Tool Position for Gamma Ray Tools.	Eccentered	
GTET	BHSM	Borehole Size Source Tool	SDLT	
DSNT	DNOK	Process DSN?	Yes	
DSNT	DEOK	Process DSN EVR?	Yes	
DSNT	NLIT	Neutron Lithology	Limestone	
DSNT	DNSO	DSN Standoff - 0.25 in (6.35 mm) Recommended	0.250	in
DSNT	DNTT	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	
DSNT	BHSM	Borehole Size Source Tool	SDLT	
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?	Yes	
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
SDLT Pad	BHSM	Borehole Size Source Tool	SDLT	
WSTT-I Receivers	WSOK	Process WSTT?	Yes	
WSTT-I Receivers	AFIL	Adaptive Filtering?	No	
WSTT-I Receivers	PINT	Process 1 Sample and Skip	0	
WSTT-I				

Process Mode: M=1,MX=2,MY=3,MXY=4				
WSTT-I Receivers	PROM		4	
WSTT-I Receivers	DTSH	Delta -T Shale	100.00	uspf
WSTT-I Receivers	DTMT	Delta -T Matrix Type	User define	
WSTT-I Receivers	DTMA	Delta -T Matrix	57.00	uspf
WSTT-I Receivers	DTFL	Delta -T Pore Fluid	189.00	uspf
WSTT-I Receivers	RHOM	Matrix Density	2.7100	g/cc
WSTT-I Receivers	RHOF	Fluid Density	1.0000	g/cc
WSTT-I Receivers	SMTH	Semblance Threshold	0.25	
WSTT-I Receivers	VPVS	VPVS Ratio for Porosity	1.40	
WSTT-I Receivers	APEQ	Acoustic Porosity Equation	Wylie	
WSTT-I Receivers	NAVS	Navigation Source Tool	GTET	
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	Centered	
ACRt Sonde	RMOP	Rmud Source	Mud Cell	
ACRt Sonde	RMIN	Minimum Resistivity for MAP	0.20	ohmm
ACRt Sonde	RMAX	Maximum Resistivity for MAP	200.00	ohmm
ACRt Sonde	THQY	Threshold Quality	0.50	
ACRt Sonde	MRFX	Fixed mud resistivity	2000	ohmm
ACRt Sonde	BHSM	Borehole Size Source Tool	SDLT	
ACRt Sonde	MBFL	Apply Corkscrew Effect?	No	

BOTTOM

Data: RAMSHORN\_MARSH\0001 GTET-DSNT-SDLT-WSTT-ACRT\005 20-Mar-18 10:49 Up @5225.3f

Date: 20-Mar-18 12:32:46

# HALLIBURTON

## CALIBRATION REPORT

### NATURAL GAMMA RAY TOOL SHOP CALIBRATION

<b>Tool Name:</b>	<b>GTET - 11958947</b>	<b>Reference Calibration Date:</b>	<b>20-Feb-18 09:19:12</b>
<b>Engineer:</b>	<b>JORGE ORLANDO PEREZ</b>	<b>Calibration Date:</b>	<b>20-Feb-18 09:23:22</b>
<b>Software Version:</b>	<b>WL INSITE R5.0.5 (Build 8)</b>	<b>Calibration Version:</b>	<b>1</b>

Calibrator Source S/N: TB-146  
 Calibrator API Reference:225.00 api  
 Equivalent Calibrator API Reference:228.9 api

Measurement	Measured	Calibrated	Units
Background	29.2	29.5	api
Background + Calibrator	256.0	258.4	api
Calibrator	226.8	228.9	api

### NATURAL GAMMA RAY TOOL FIELD CALIBRATION

<b>Tool Name:</b>	<b>GTET - 11958947</b>	<b>Reference Calibration Date:</b>	<b>20-Feb-18 09:23:22</b>
<b>Engineer:</b>	<b>JORGE ORLANDO PEREZ</b>	<b>Calibration Date:</b>	<b>07-Mar-18 09:29:45</b>
<b>Software Version:</b>	<b>WL INSITE R5.0.5 (Build 8)</b>	<b>Calibration Version:</b>	<b>1</b>

Calibrator Source S/N: TB-146  
 Calibrator API Reference:225.00 api  
 Equivalent Calibrator API Reference:228.9 api

Field Verification	Shop	Field	Units
Background	29.5	23.3	api
Background + Calibrator	258.4	253.5	api
Calibrator	228.9	230.1	api

Shop	Field	Difference	Tolerance
228.9	230.1	-1.2	+/- 9.00

### DUAL SPACED NEUTRON SHOP CALIBRATION

**Tool Name:** DSNT - 11055304      **Reference Calibration Date:** 13-Mar-18 15:42:08  
**Engineer:** JORGE ORLANDO PEREZ      **Calibration Date:** 13-Mar-18 16:05:22  
**Software Version:** WL INSITE R5.0.5 (Build 8)      **Calibration Version:** 1

Logging Source S/N: DSN-424  
 Tank Serial Number: 12345678  
 Reference value assigned to Tank: 56.100  
 Snow Block S/N: 12345678  
 Calibration Tank Water Temperature: 68 degF  
 Min. Tool Housing Outside Diameter: 3.625 in

#### CALIBRATION CONSTANTS

Measurement	Prev. Value	New Value	Control Limit On New Value
Gain:	1.04035	1.03906	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):	0.2362	0.2358	0.0004	+/- 0.0020
Calibrated Ratio:	10.5726	10.5595	0.013	+/- 0.050

#### VERIFIER

Measurement	Value	Control Limit
Snow-Block Porosity (decp):	0.0642	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:** 13-Mar-18 16:05:22  
**Engineer:** JORGE ORLANDO PEREZ      **Calibration Date:** 13-Mar-18 16:06:43  
**Software Version:** WL INSITE R5.0.5 (Build 8)      **Calibration Version:** 1

Logging Source S/N: DSN-424  
 Snow Block S/N: 12345678

#### NEUTRON FIELD-CHECK SUMMARY

	Shop	Field	Difference	Control Limit On Change
Snow-Block Porosity (decp):	0.0642	0.0649	0.0007	+/- 0.0150

#### PASS/FAIL SUMMARY

Block Change Check: Passed  
 Snow Block Stat Check: Passed  
 Temperature Check: Passed

### DENSITY CALIPER SHOP CALIBRATION

Tool Name: SDLT - 10951315

Reference Calibration Date: 07-Mar-18 09:39:58

Engineer: JORGE ORLANDO PEREZ

Calibration Date: 07-Mar-18 09:48:53

Software Version: WL INSITE R5.0.5 (Build 8)

Calibration Version: 1

Host Tool Name: DSNT - 11055304

**CALIBRATION COEFFICIENTS**

Measurement	Previous Value	New Value	Control Limit On New Value
Pad Offset	-3522.85	-3549.59	-7000.00 - -1000.00
Pad Gain	0.0003722	0.0003749	0.0002000 - 0.0006000
Arm Offset	-3023.66	-2454.88	-5000.00 - 3000.00
Arm Gain	0.0005295	0.0004796	0.0003000 - 0.0007000
Arm Power	-0.000006101	-0.000003067	-0.000010000 - 0.000010000

The ring diameter is computed from: DIAMETER = PAD EXTENSION + ARM EXTENSION + 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)	2.00	2.00	0.00	+/- 0.20
Medium Ring (in)	3.73	3.75	0.02	+/- 0.20
RING DIAMETER:				
Small Ring (in)	6.40	6.50	0.10	+/- 0.20
Medium Ring (in)	8.27	8.25	-0.02	+/- 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 - 10951315

Reference Calibration Date: 07-Mar-18 09:48:53

Engineer: JORGE ORLANDO PEREZ

Calibration Date: 07-Mar-18 09:51:03

Software Version: WL INSITE R5.0.5 (Build 8)

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	8.25	0.00	+/- 0.15

**PASS/FAIL SUMMARY**

Pad Extension Check: Passed

Diameter Check: Passed

**MICRO LOG SHOP CALIBRATION**

Tool Name: Microlog Pad - 10951315

Reference Calibration Date: 13-Mar-18 17:19:18

Engineer: JORGE ORLANDO PEREZ

Calibration Date: 13-Mar-18 17:22:52

Software Version: WL INSITE R5.0.5 (Build 8)

Calibration Version: 1

Host Tool Name: DSNT - 11055304

**CALIBRATION COEFFICIENT SUMMARY**

Measurement	Micro Log Normal		Micro Log Lateral		Units
	Measured	Calibrated	Measured	Calibrated	
Tool Zero	-0.09	-0.10	-0.01	-0.01	ohmm
Calibration Point #1	0.01	0.00	0.00	0.00	ohmm

Calibration Point #1	20.02	20.00	20.03	20.00	ohmm
Calibration Point #2	20.02	20.00	20.03	20.00	ohmm
Internal Reference	19.91	19.88	20.00	19.97	ohmm

Measurement	Micro Log Normal Tool Value	Micro Log Lateral Tool Value	Units
Tool Zero	2.05	-1.17	V
Calibration Point #1	27.43	1.85	V
Calibration Point #2	5351.08	6909.42	V
Internal Reference	5319.92	6898.68	V

### MICRO LOG FIELD CHECK

**Tool Name:** Microlog Pad - 10951315      **Reference Calibration Date:** 13-Mar-18 17:22:52  
**Engineer:** JORGE ORLANDO PEREZ      **Calibration Date:** 13-Mar-18 17:24:28  
**Software Version:** WL INSITE R5.0.5 (Build 8)      **Calibration Version:** 1

Measurement	Micro Log Normal		Micro Log Lateral		Units
	Shop	Field	Shop	Field	
Tool Zero	-0.10	-0.07	-0.01	-0.02	ohmm
Internal Reference	19.88	19.89	19.97	19.98	ohmm

### Summary

Signal	Shop	Field	Difference	Tolerance
Microlog Normal	19.88	19.89	-0.01	+/- 0.80
Microlog Lateral	19.97	19.98	-0.01	+/- 0.80

### SPECTRAL DENSITY SHOP CALIBRATION

**Tool Name:** SDLT Pad - 10865873      **Reference Calibration Date:** 13-Mar-18 10:51:36  
**Engineer:** JORGE ORLANDO PEREZ      **Calibration Date:** 13-Mar-18 11:16:20  
**Software Version:** WL INSITE R5.0.5 (Build 8)      **Calibration Version:** 1

Logging Source S/N: 5168GW

Aluminum Block S/N: EL RENO STD ALUMINUM

Density: 2.581g/cc

Pe: 3.170

Magnesium Block S/N: EL RENO

Density: 1.687g/cc

Pe: 2.594

### DENSITY CALIBRATION SUMMARY

Measurement	Previous Value	New Value	Control Limit
Near Bar Gain	1.0157	1.0357	0.90 - 1.10
Near Dens Gain	1.0196	1.0142	0.90 - 1.10
Near Peak Gain	1.0395	1.0317	0.90 - 1.10
Near Lith Gain	1.0541	1.0327	0.90 - 1.10
Far Bar Gain	1.0110	1.0122	0.90 - 1.10
Far Dens Gain	1.0025	1.0022	0.90 - 1.10
Far Peak Gain	0.9984	0.9998	0.90 - 1.10
Far Lith Gain	0.9749	0.9761	0.90 - 1.10
<hr/>			
Near Bar Offset	0.1609	-0.0201	NONE
Near Dens Offset	0.1178	0.1665	NONE
Near Peak Offset	-0.0532	0.0109	NONE
Near Lith Offset	-0.1910	-0.0138	NONE
Far Bar Offset	0.1786	0.1672	NONE
Far Dens Offset	0.2184	0.2226	NONE
Far Peak Offset	0.2132	0.2040	NONE
Far Lith Offset	0.3427	0.3343	NONE
<hr/>			
Near Bar Background	823.98	821.51	700 - 1450
Near Dens Background	269.05	269.15	230 - 480
Near Peak Background	119.85	118.90	100 - 210
Near Lith Background	144.86	144.31	125 - 260
Far Bar Background	600.14	599.08	450 - 900

Far Bkg Background	236.51	236.11	175 - 345
Far Peak Background	92.88	92.59	70 - 140
Far Lith Background	96.04	96.48	75 - 145

### CALIBRATION BLOCK SUMMARY

Measurement	Current Reading (Previous Coef)	Calibrated (New Coef)	Change	Control Limit On Change
<b>MAGNESIUM</b>				
Density (g/cc)	1.687	1.687	0.000	+/- 0.015
Pe	2.525	2.551	0.026	+/- 0.150
<b>ALUMINUM</b>				
Density (g/cc)	2.580	2.581	0.001	+/- 0.01500
Pe	3.157	3.123	-0.034	+/- 0.150

### TOOL SUMMARY

Measurement	Near Detector		Far Detector	
	Value	Control Limits	Value	Control Limits
<b>QUALITY</b>				
Background	0.0003	+/- 0.0110	-0.0014	+/- 0.0140
Magnesium Block	-0.0011	+/- 0.0110	-0.0013	+/- 0.0140
Aluminum Block	-0.0011	+/- 0.0110	-0.0008	+/- 0.0140
Resolution	10.05	6.00 - 11.50	9.01	6.00 - 11.50
Internal Verifier(B+D+P+L)	1354	1200 - 2700	1024	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

<b>Tool Name:</b> SDLT Pad - 10865873	<b>Reference Calibration Date:</b> 13-Mar-18 11:16:20
<b>Engineer:</b> JORGE ORLANDO PEREZ	<b>Calibration Date:</b> 13-Mar-18 11:19:41
<b>Software Version:</b> WL INSITE R5.0.5 (Build 8)	<b>Calibration Version:</b> 1

Pad Temperature: 68.2 degF

### DENSITY FIELD CALIBRATION SUMMARY

Measurement	Shop	Field	Change	Control Limit +/-
Near (B+D+P+L) cps	1353.863	1357.958	4.095	14.876
Far (B+D+P+L) cps	1024.257	1029.378	5.121	17.069
Near Resolution	10.05	9.94	-0.110	0.50
Far Resolution	9.01	8.96	-0.050	1.00

### PASS/FAIL SUMMARY

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

### ARRAY COMPENSATED TRUE RESISTIVITY SHOP CALIBRATION

<b>Tool Name:</b> ACRt Sonde - 11005908	<b>Reference Calibration Date:</b> 24-Jan-18 11:50:13
<b>Engineer:</b> JORGE ORLANDO PEREZ	<b>Calibration Date:</b> 16-Mar-18 10:34:00

Host Tool Name: ACRt Instrument - 11026095

**TYPICAL GAIN RANGE**

Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper
A1 (80")	0.95	1.0415	1.05	0.95	1.0202	1.05	0.95	1.0109	1.05
A2 (50")	0.95	1.0485	1.05	0.95	1.0233	1.05	0.95	1.0144	1.05
A3 (29")	0.95	1.0353	1.05	0.95	1.0139	1.05	0.95	1.0048	1.05
A4 (17")	0.95	1.0423	1.05	0.95	1.0194	1.05	0.95	1.0121	1.05
A5 (10")	N/A	N/A	N/A	0.95	1.0134	1.05	0.95	1.0048	1.05
A6 (6")	N/A	N/A	N/A	0.95	1.0044	1.05	0.95	0.9956	1.05

**SONDE OFFSET**

Subarray	R12KHz	R36KHz	R72KHz
	(mmho/m)	(mmho/m)	(mmho/m)
A1 (80")	1.428	-4.149	-5.990
A2 (50")	-0.217	-4.118	-5.417
A3 (29")	-14.051	-4.501	-3.906
A4 (17")	-92.668	-28.984	-24.290
A5 (10")	N/A	-111.115	-48.871
A6 (6")	N/A	354.229	183.875

**TRANSMITTER CURRENT GAIN**

Signal	Lower	R	Upper
12K	0.6	0.92	1.3
36K	1.0	1.93	2.0
72K	1.0	1.27	2.0

**R-MUD VERIFICATION**

Signal	Lower (ohm-m)	Measured (ohm-m)	Upper (ohm-m)
Mud Cell	0.95	1.00	1.05

**PASS/FAIL SUMMARY**

GAIN RANGE CHK PASS  
 SONDE OFFSET CHK PASS  
 TOOL OK TO LOG

**QUALITY CHECK SHOP CALIBRATION**

Tool Name: ACRt Sonde - 11005908 Reference Calibration Date: 16-Mar-18 10:35:27  
 Engineer: JORGE ORLANDO PEREZ Calibration Date: 16-Mar-18 10:36:37  
 Software Version: WL INSITE R5.0.5 (Build 8) Calibration Version: 1  
 Host Tool Name: ACRt Instrument - 11026095

**STANDARD DEVIATIONS**

	R12KHz			R36KHz			R72KHz		
	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail
A1 (80")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A2 (50")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A3 (29")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A4 (17")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A5 (10")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A6 (6")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass

**AVERAGES**

	R12KHz			R36KHz			R72KHz		
	Measured	Expected	Pass/Fail	Measured	Expected	Pass/Fail	Measured	Expected	Pass/Fail

	(mmho/m)	(mmho/m)	Pass/Fail	(mmho/m)	(mmho/m)	Pass/Fail	(mmho/m)	(mmho/m)	Pass/Fail
A1 (80")	0.000	< 0.500	Pass	-0.001	> -0.500	Pass	-0.006	> -0.500	Pass
A2 (50")	0.000	< 0.500	Pass	-0.001	> -0.500	Pass	-0.005	> -0.500	Pass
A3 (29")	-0.000	< 0.500	Pass	-0.001	> -0.500	Pass	-0.004	> -0.500	Pass
A4 (17")	-0.002	> -0.500	Pass	-0.007	> -0.500	Pass	-0.024	> -0.500	Pass
A5 (10")	-0.013	> -0.500	Pass	-0.026	> -0.500	Pass	-0.049	> -0.500	Pass
A6 (6")	0.016	< 0.500	Pass	0.078	< 0.500	Pass	0.169	< 0.500	Pass

**GAIN TOLERANCE**

**R12KHz**

	Measured (mmho/m)	Last Month (mmho/m)	Difference (mmho/m)	Tolerance (mmho/m)	Pass/Fail
A1 (80")	-212634064.000	-212633888.000	176.000	10631694.400	Pass
A2 (50")	-209134528.000	-209132944.000	1584.000	10456647.200	Pass
A3 (29")	-209198784.000	-209198864.000	80.000	10459943.200	Pass
A4 (17")	-212472320.000	-212469504.000	2816.000	10623475.200	Pass
A5 (10")	-215806928.000	-215805120.000	1808.000	10790256.000	Pass
A6 (6")	-216964560.000	-217024160.000	59600.000	10851208.000	Pass

**R36KHz**

	Measured (mmho/m)	Last Month (mmho/m)	Difference (mmho/m)	Tolerance (mmho/m)	Pass/Fail
A1 (80")	45945148.000	45942224.000	2924.000	2297111.200	Pass
A2 (50")	42617908.000	42614540.000	3368.000	2130727.000	Pass
A3 (29")	35212352.000	35209964.000	2388.000	1760498.200	Pass
A4 (17")	36200304.000	36198396.000	1908.000	1809919.800	Pass
A5 (10")	42031348.000	42028092.000	3256.000	2101404.600	Pass
A6 (6")	42711908.000	42592740.000	119168.000	2129637.000	Pass

**R72KHz**

	Measured (mmho/m)	Last Month (mmho/m)	Difference (mmho/m)	Tolerance (mmho/m)	Pass/Fail
A1 (80")	-93057816.000	-93058472.000	656.000	4652923.600	Pass
A2 (50")	-87051256.000	-87047392.000	3864.000	4352369.600	Pass
A3 (29")	-89096656.000	-89095584.000	1072.000	4454779.200	Pass
A4 (17")	-87151120.000	-87148272.000	2848.000	4357413.600	Pass
A5 (10")	-86683120.000	-86681608.000	1512.000	4334080.400	Pass
A6 (6")	-87306328.000	-87322176.000	15848.000	4366108.800	Pass

**PASS/FAIL SUMMARY**

Std Deviation Verification	Pass
Average Verification	Pass
Gain Tolerance Verification	Pass

**CALIBRATION SUMMARY**

Sensor	Shop	Field	Post	Difference	Tolerance	Units
<b>GTET-11958947</b>						
Gamma Ray Calibrator	228.9	230.1	-----	-1.2	+/- 9.00	api
<b>DSNT-11055304</b>						
Snow-Block Porosity	0.0642	0.0649	-----	-0.0007	+/- 0.0150	decp
<b>SDLT-10951315</b>						
Pad Extension	3.75	3.75	-----	0.00	+/-0.10	in
Ring Diameter	8.25	8.25	-----	0.00	+/-0.15	in
<b>Microlog Pad-10951315</b>						
MicroLog Normal	19.88	19.89	-----	-0.01	+/-0.80	ohmm
MicroLog Lateral	19.97	19.98	-----	-0.01	+/-0.80	ohmm
<b>SDLT Pad-10865873</b>						
Near(B+D+P+L)	1353.863	1357.958	-----	-4.095	+/-14.876	cps

Far(B+D+P+L)	1024.257	1029.378	-----	-5.121	+/-17.069	cps
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**ACRt Sonde-11005908**

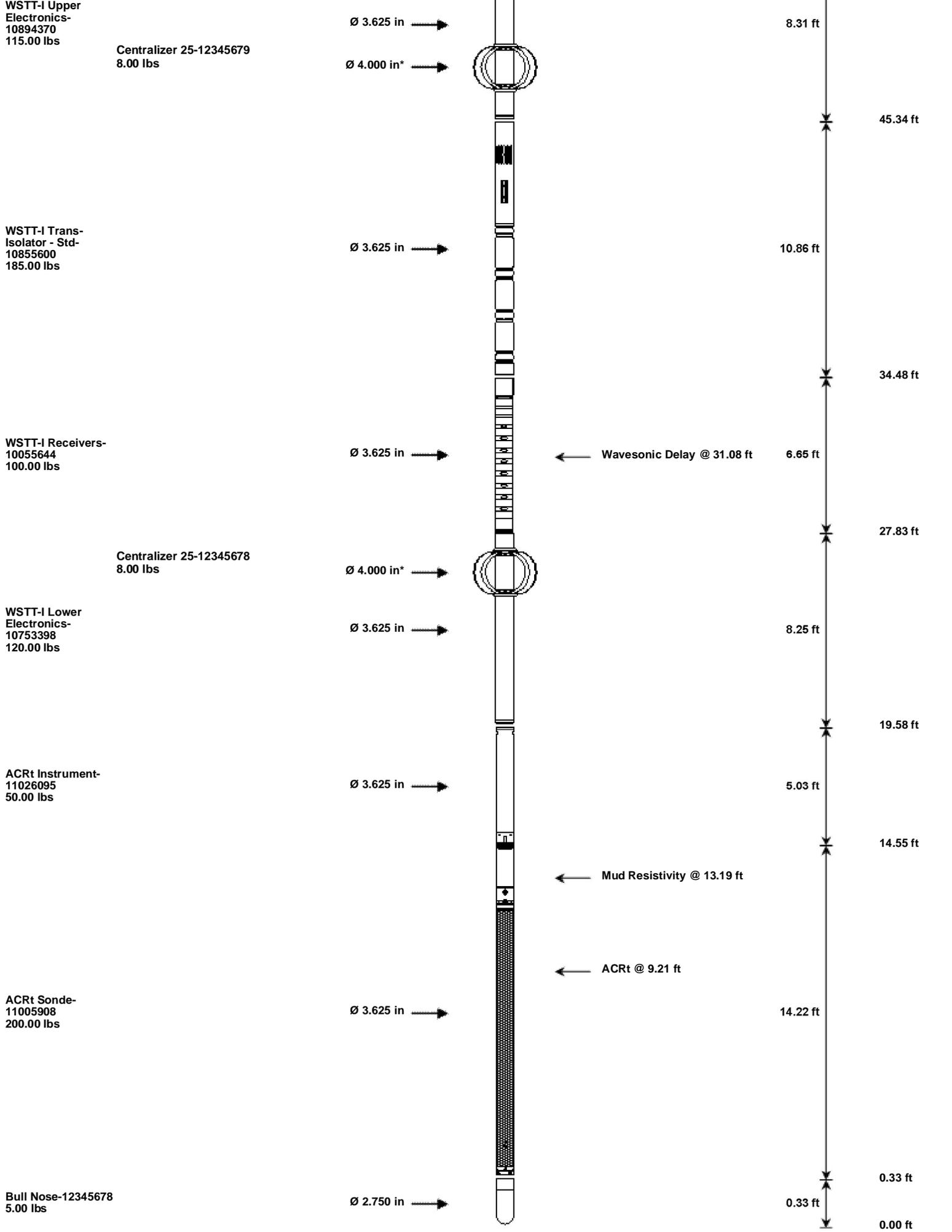
Mud Cell	1.00	-----	-----	0	-----	ohm-m
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Data: RAMSHORN\_MARSH0001 GTET-DSNT-SDLT-WSTT-ACRTIDLE Date: 20-Mar-18 12:34:04

# HALLIBURTON

## TOOL STRING DIAGRAM REPORT

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
CH_HOS-11459024 37.50 lbs	Weak Point 7000 lbs- 00000025 0.01 lbs	Ø 2.750 in Ø 0.010 in*		← Temperature @ 95.03 ft	2.50 ft	95.53 ft
XOHD-11569312 20.00 lbs		Ø 2.750 in Ø 3.625 in			0.95 ft	93.03 ft
SP Sub-11153357 60.00 lbs		Ø 3.625 in		← SP @ 90.30 ft	3.74 ft	92.08 ft
				← Z-Accelerometer @ 87.89 ft		88.34 ft
GTET-11958947 165.00 lbs		Ø 3.625 in			8.52 ft	
				← GammaRay @ 82.28 ft		79.82 ft
DSNT-11055304 174.00 lbs	DSN Decentralizer- 11055304 6.60 lbs	Ø 5.000 in* Ø 3.625 in			9.69 ft	
				← DSN Far @ 72.89 ft ← DSN Near @ 72.14 ft		70.14 ft
SDLT-10951315 360.00 lbs	SDLT Pad-10865873 65.00 lbs Microlog Pad-10951315 8.00 lbs  RAM-Cs137-00005168 1.00 lbs	Ø 4.500 in Ø 4.500 in* Ø 4.750 in* Ø 0.800 in*			10.81 ft	
				← Microlog @ 62.32 ft ← SDL Caliper @ 62.14 ft ← SDL @ 62.13 ft		59.32 ft
IQ Flex-11005585 140.00 lbs		Ø 3.625 in		5.67 ft	53.65 ft	



Mnemonic	Tool Name	Serial Number	Weight (lbs)	Length (ft)	Accumulated Length (ft)	Max.Log. Speed (fpm)
CH_HOS	Hostile Cable Head with Load Cell	11459024	37.50	2.50	93.03	300.00
WP7K	Weak Point 7000 lbs	00000025	0.01	0.01	* 93.83	300.00
XOHD	Hostile to Dits Cross Over	11569312	20.00	0.95	92.08	300.00
SP	SP Sub	11153357	60.00	3.74	88.34	300.00

GTET	Gamma Telemetry Tool	11958947	165.00	8.52	79.82	60.00
DSNT	Dual Spaced Neutron	11055304	174.00	9.69	70.14	60.00
DCNT	DSN Decentralizer	11055304	6.60	5.13 *	73.47	300.00
SDLT	Spectral Density Tool	10951315	360.00	10.81	59.32	60.00
SDLP	Density Insite Pad	10865873	65.00	2.55 *	61.53	60.00
Cs137	Logging Source, SDLT-I, 1.78 Ci - Cs137	00005168	1.00	0.80 *	61.76	300.00
MICP	Microlog Pad	10951315	8.00	1.00 *	61.82	60.00
IQF	IQ Flex tool	11005585	140.00	5.67	53.65	300.00
WSTT	WaveSonic Insite - Upper Electronics	10894370	115.00	8.31	45.34	100.00
OBCEN	Centralizer - 25 in. Overbody	12345679	8.00	2.08 *	46.64	300.00
WSTT	WaveSonic Insite - Trans-Isolator - Std	10855600	185.00	10.86	34.48	100.00
WSTT	WaveSonic Insite - Receivers	10055644	100.00	6.65	27.83	30.00
WSTT	WaveSonic Insite - Lower Electronics	10753398	120.00	8.25	19.58	100.00
OBCEN	Centralizer - 25 in. Overbody	12345678	8.00	2.08 *	25.14	300.00
ACRt	Array Compensated True Resistivity Instrument Section	11026095	50.00	5.03	14.55	120.00
ACRt	Array Compensated True Resistivity Sonde Section	11005908	200.00	14.22	0.33	120.00
BLNS	Bull Nose	12345678	5.00	0.33	0.00	300.00
<b>Total</b>			<b>1,828.11</b>	<b>95.53</b>		

\* Not included in Total Length and Length Accumulation.

Data: RAMSHORN\_MARSH0001 GTET-DSNT-SDLT-WSTT-ACRT005 20-Mar-18 10:49 Up @5225.3f

Date: 20-Mar-18 12:33:11

COMPANY	RAMSHORN RESOURCES, LLC		
WELL	MARSH #1-27		
FIELD	DEARHEAD		
COUNTY	BARBER	STATE	KANSAS
<b>HALLIBURTON</b>		<b>DUAL SPACED NEUTRON SPECTRAL DENSITY LOG</b>	