HALLIBURTON

DUAL SPACED NEUTRON SPECTRAL DENSITY LOG

COMPANY CIMAREX ENERGY CO.
WELL HAMMER 19-6
FIELD/BLOCK LETTE
COUNTY HASKELL
STATE KANSAS

COMPANY **CIMAREX ENERGY CO.**
WELL **HAMMER 19-6**
FIELD/BLOCK **LETTE**
COUNTY **HASKELL** STATE **KANSAS**

API No. 15-081-22032
Location (SHL) 1650' FSL & 1650' FEL

Sect. 19 Twp. 30S Rge. 31W

Other Services:
DSN / SDL
MICROLOG
DIPMETER
ACRT

Permanent Datum	GL	Elev. 2850.0 ft	Elev.: K.B. 2859.0 ft
Log measured from	KB	9.0 ft above perm. Datum	D.F. 2859.0 ft
Drilling measured from	KB		G.L. 2850.0 ft

Date		18-Sep-13					
Run No.		ONE					
Depth - Driller		5700.00 ft					
Depth - Logger		5704.0 ft					
Bottom - Logged Interval		5650					
Top - Logged Interval		4000					
Casing - Driller		8.625 in	@ 1850.0 ft	@		@	
Casing - Logger		1850.0 ft					
Bit Size		7.875 in		@		@	
Type Fluid in Hole		WATER BASED MUD					
Density	Viscosity	9.1 ppg	48.00 s/qt				
PH	Fluid Loss	11.00 pH	6.0 cptm				
Source of Sample		MUD PIT					
Rm @ Meas. Temperature		0.800 ohmm	@ 85.00 degF	@		@	
Rmf @ Meas. Temperature		0.68 ohmm	@ 85.00 degF	@		@	
Rmc @ Meas. Temperature		0.920 ohmm	@ 85.00 degF	@		@	
Source Rmf	Rmc	CALCULATED	CALCULATED				
Rm @ BHT		0.51 ohmm	@ 137.0 degF	@		@	
Time Since Circulation		6.0 hr					
Time on Bottom		18-Sep-13 04:09					
Max. Rec. Temperature		137.0 degF	@ 5704.0 ft	@		@	
Equipment	Location	11230668	LIBERAL				
Recorded By		S. INGERSOLL					
Witnessed By		T. KOLODZIEJ					

Fold here

Service Ticket No.: 900738824
API Serial No.: 15-081-22032
PGM Version: WL INSITE R3.8.4 (Build 5)

CHANGE IN MUD TYPE OR ADDITIONAL SAMPLE

Date	Sample No.				
Depth-Driller					
Type Fluid in Hole					
Density	Viscosity				
Ph	Fluid Loss				
Source of Sample					
Rm @ Meas. Temp		@	@	@	@
Rmf @ Meas. Temp.		@	@	@	@
Rmc @ Meas. Temp.		@	@	@	@
Source Rmf	Rmc				
Rm @ BHT		@	@	@	@
Rmf @ BHT		@	@	@	@
Rmc @ BHT		@	@	@	@

RESISTIVITY SCALE CHANGES

	Type Log	Depth	Scale Up Hole	Scale Down Hole

RESISTIVITY EQUIPMENT DATA

	Run No.	Tool Type & No.	Pad Type	Tool Pos.	Other
	ONE	ACRT	N/A	CENT	
		10800784			

EQUIPMENT DATA

GAMMA		ACOUSTIC		DENSITY		NEUTRON	
Run No.	ONE	Run No.		Run No.	ONE	Run No.	ONE
Serial No.	10748374	Serial No.		Serial No.	10714945	Serial No.	10755066
Model No.	GTET	Model No.		Model No.	SDLT	Model No.	DSNT
Diameter	3.625"	No. of Cent.		Diameter	5.3"	Diameter	3.625"
Detector Model No.	T-102	Spacing		Log Type	GAM-GAM	Log Type	NEU-NEU
Type	SCINT			Source Type	CS-137	Source Type	AM-241BE
Length	8"	LSA [Y/N]		Serial No.	5073GW	Serial No.	DSN-436
Distance to Source	N/A	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	5704	1850	REC	0	150				30	-10	2.71 gm/cc	30	-10	LIME

DIRECTIONAL INFORMATION

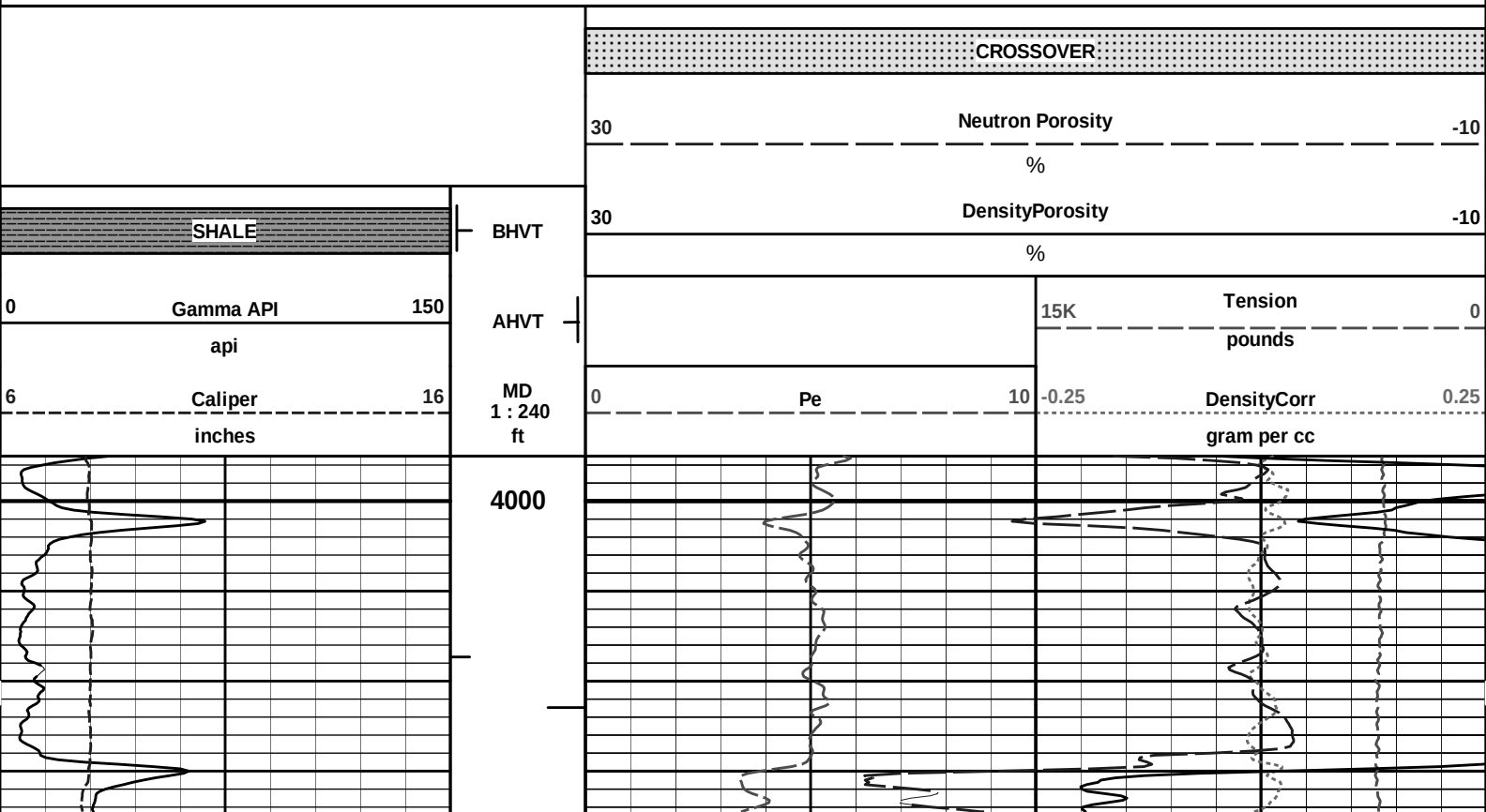
Maximum Deviation	@	KOP	@

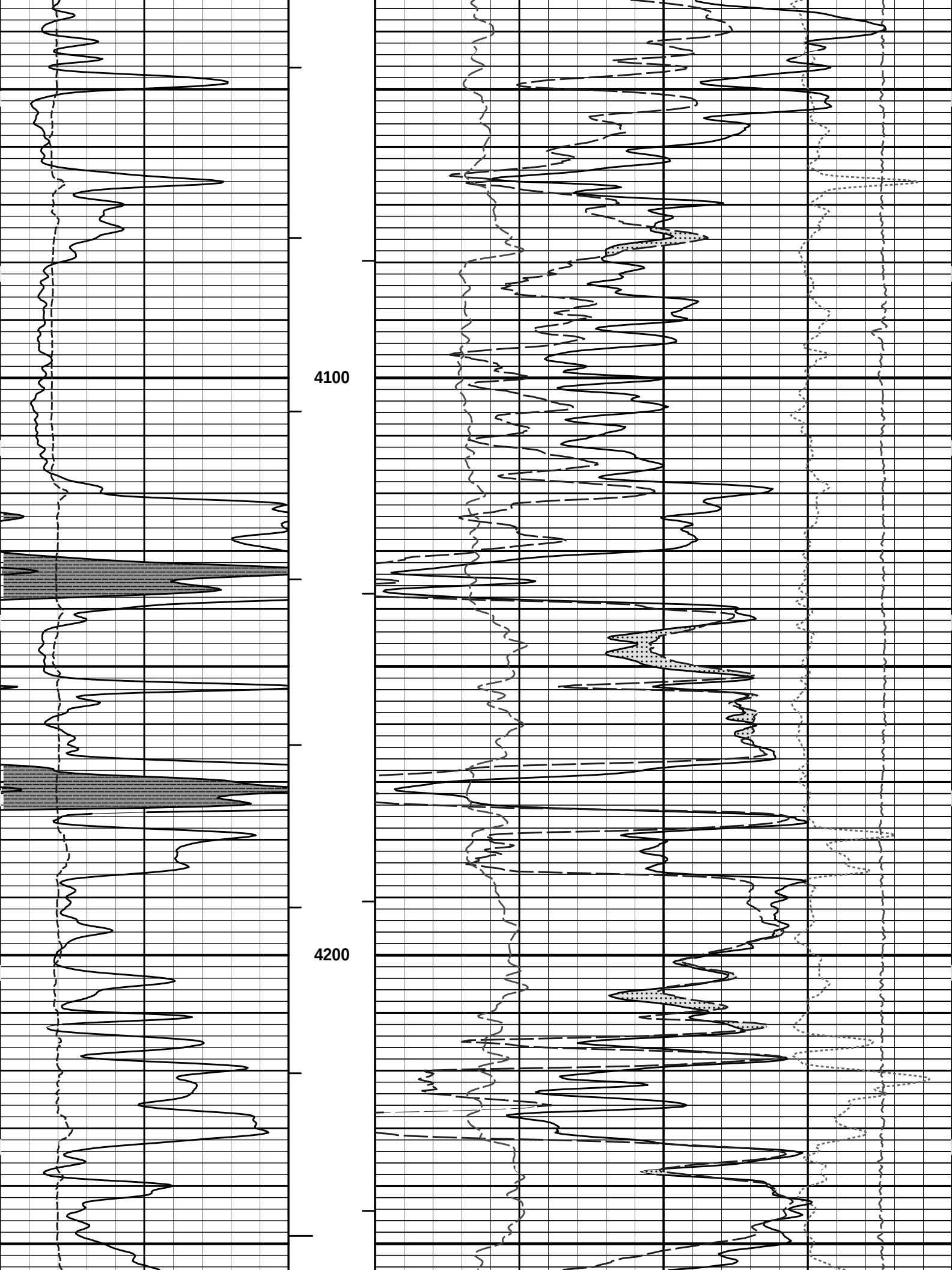
Remarks: ANNULAR HOLE VOLUME CACULATED FOR 5.5 INCH CASING.

HALLIBURTON

Plot Time: 18-Sep-13 06:25:35
Plot Range: 3995 ft to 5707.83 ft
Data: HAMMER 19-6\Well Based\R1 DETAIL
Plot File: \\POROSITY\Poro_IQ_5_MAIN_LIB

5 INCH MAIN LOG

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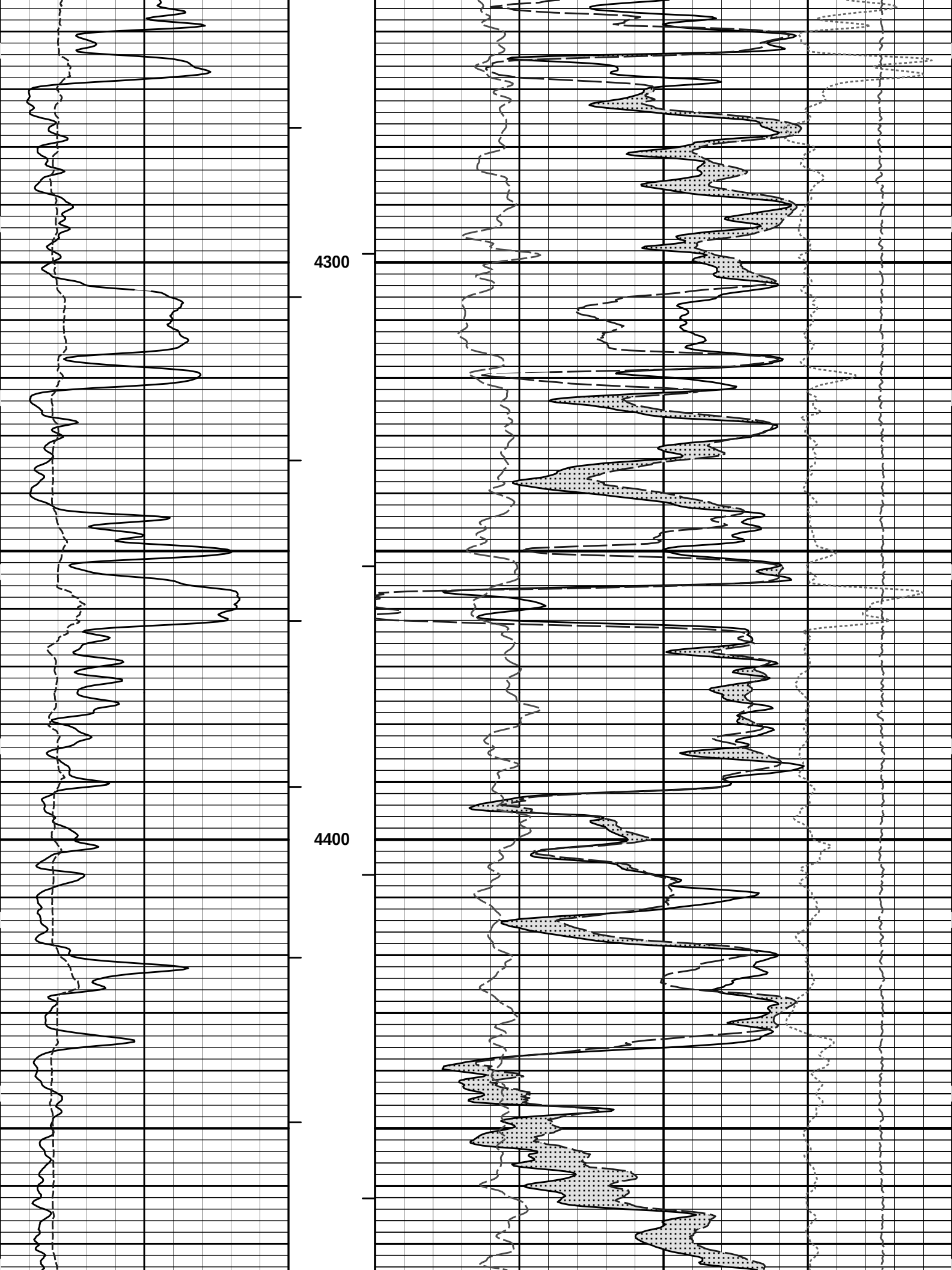
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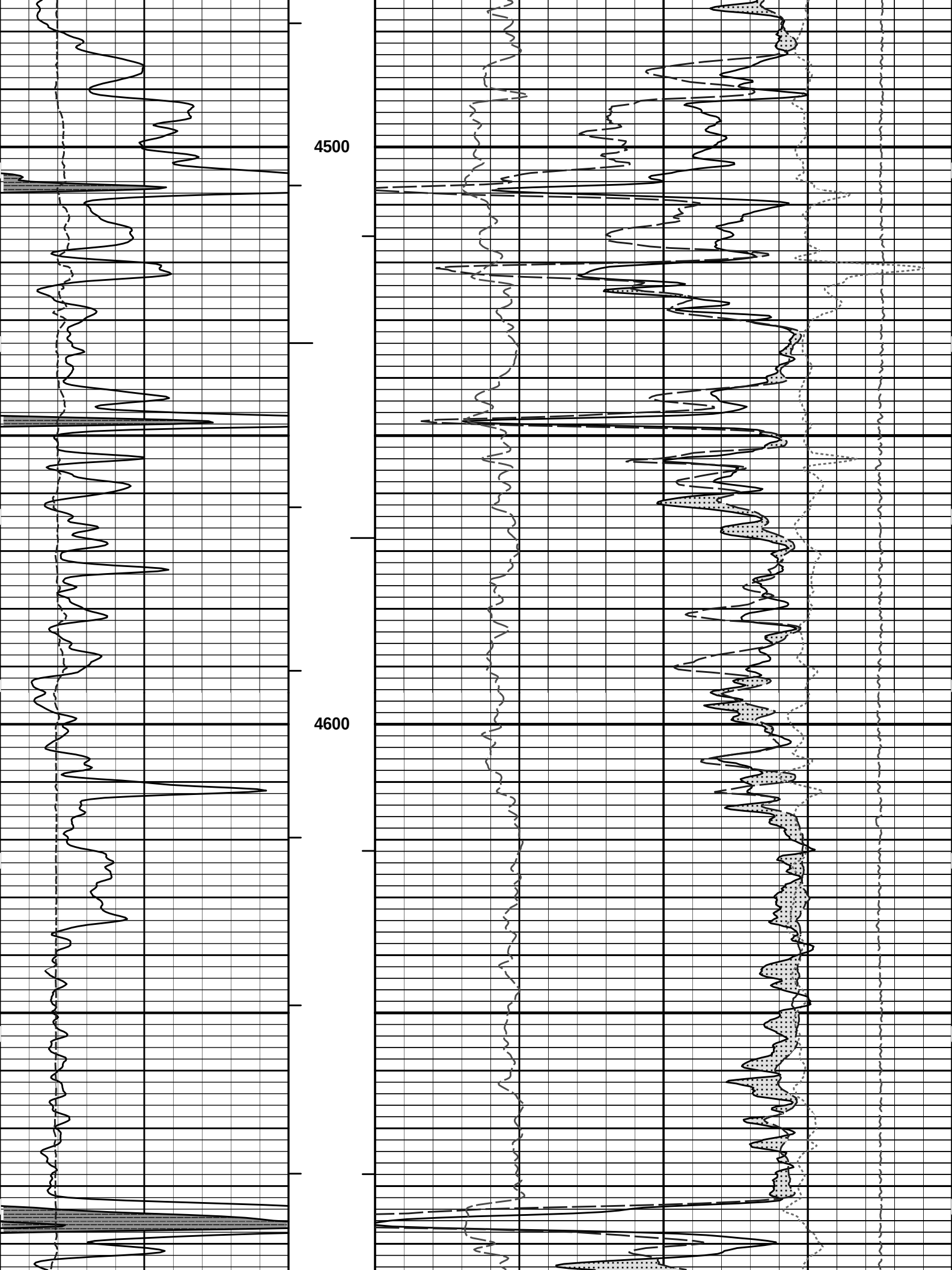
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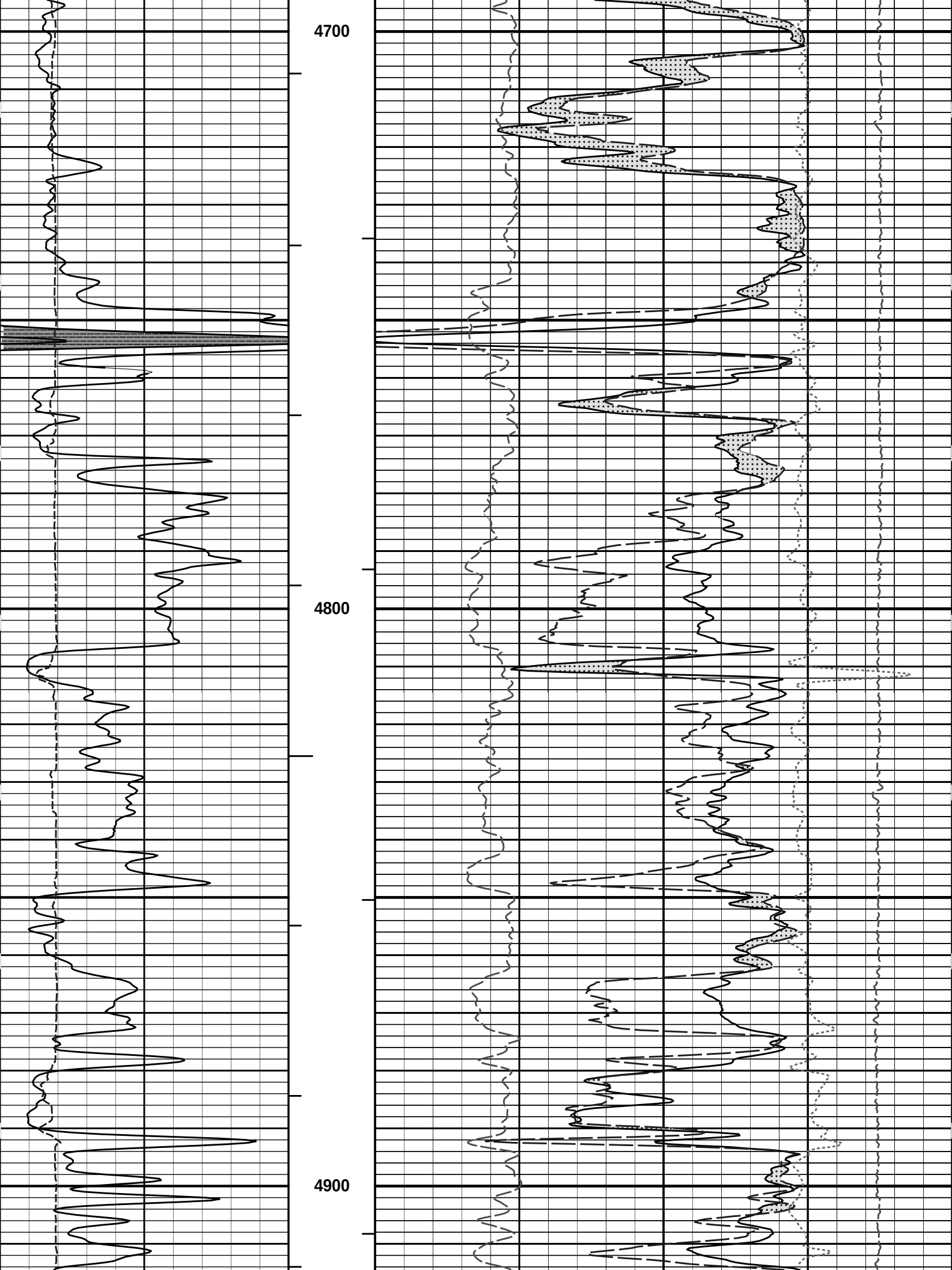
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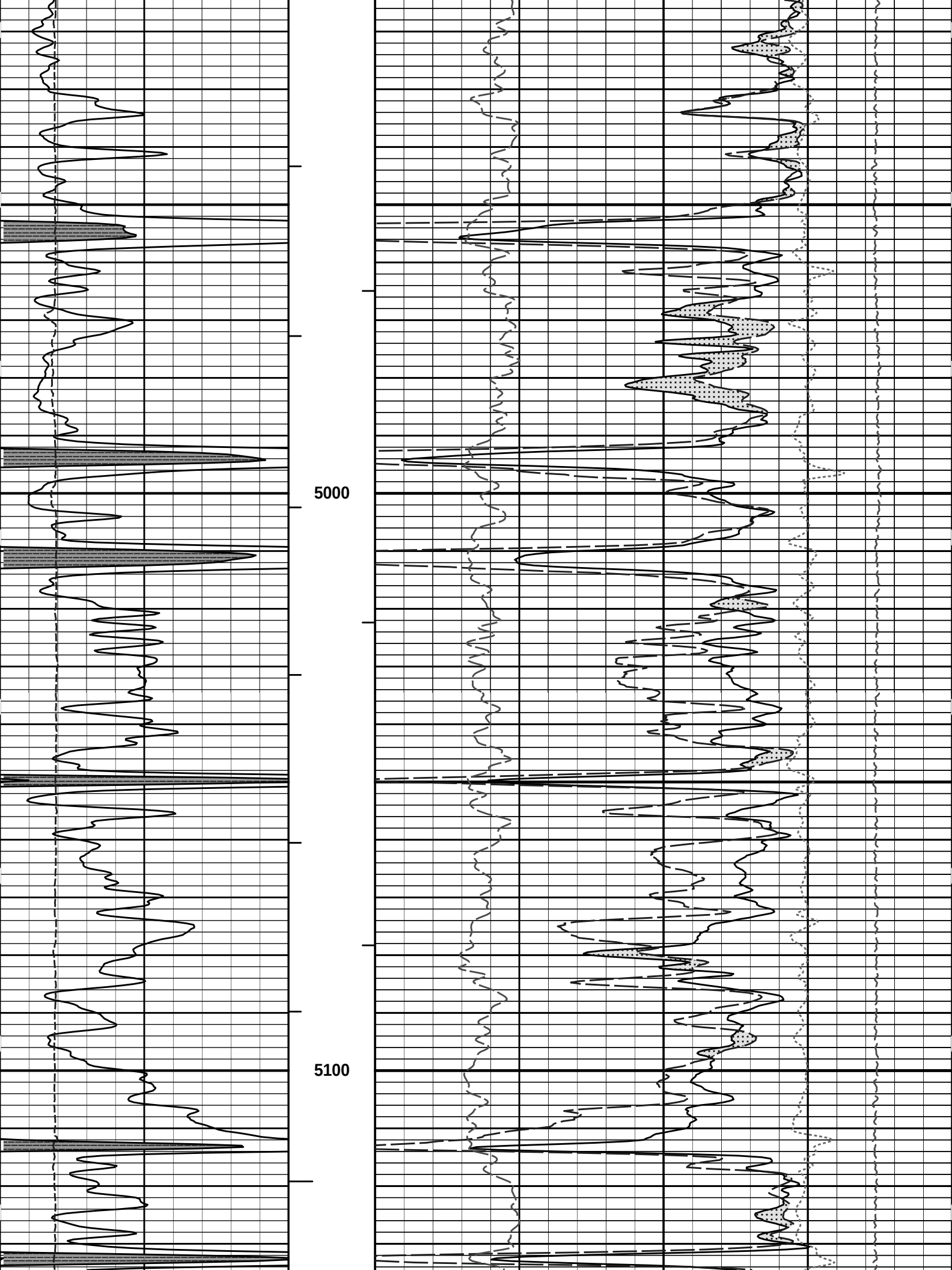
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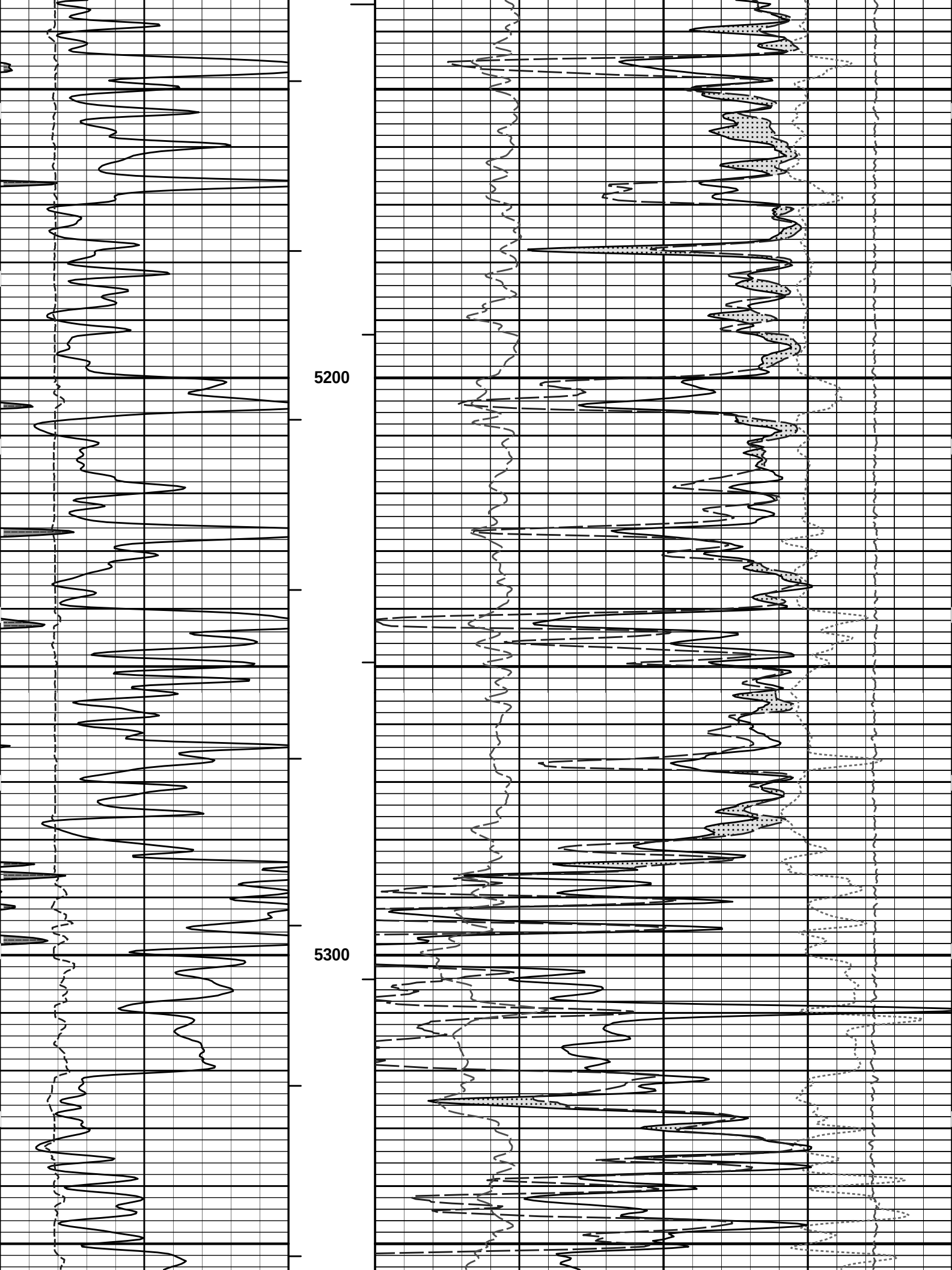
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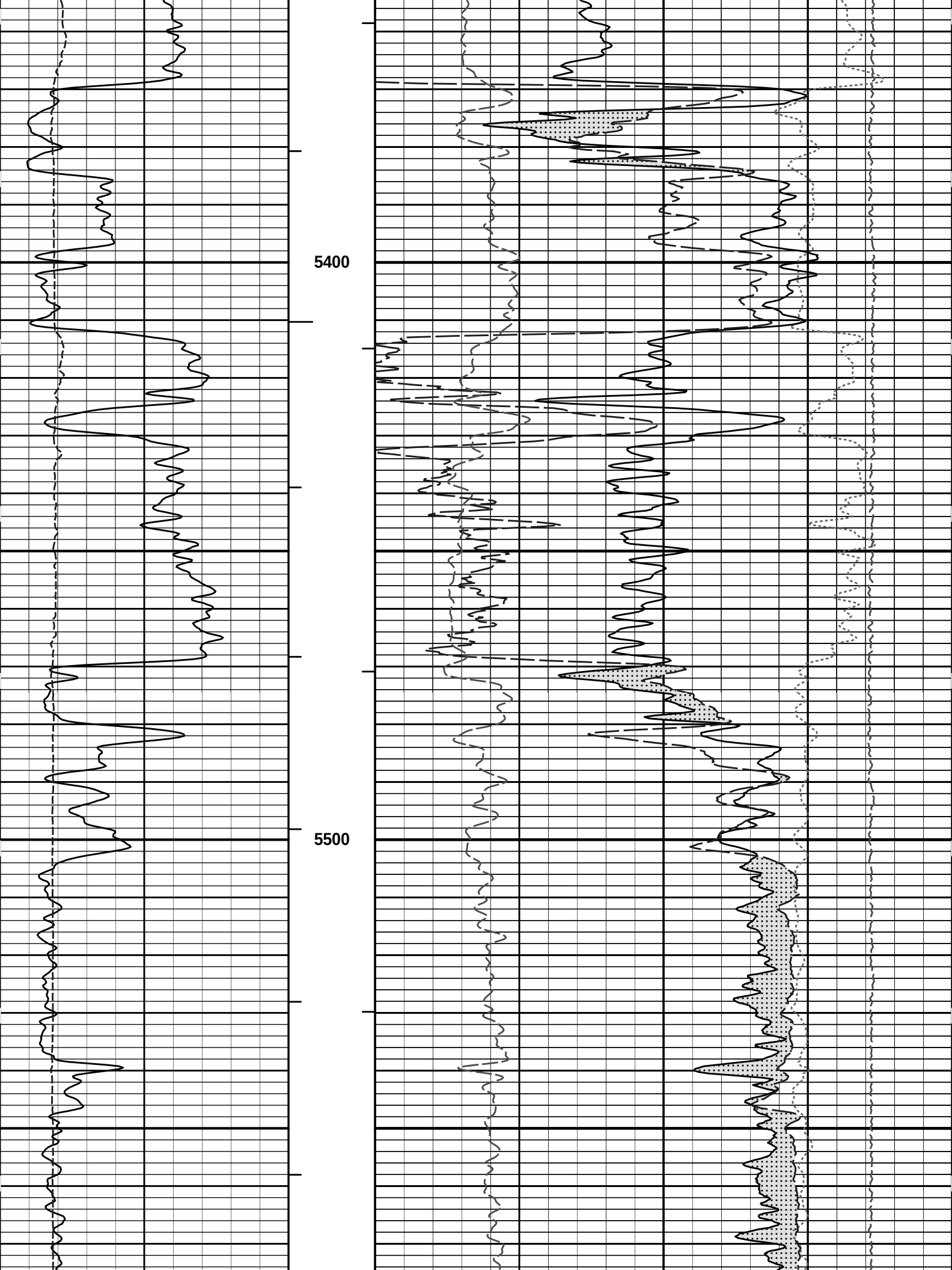
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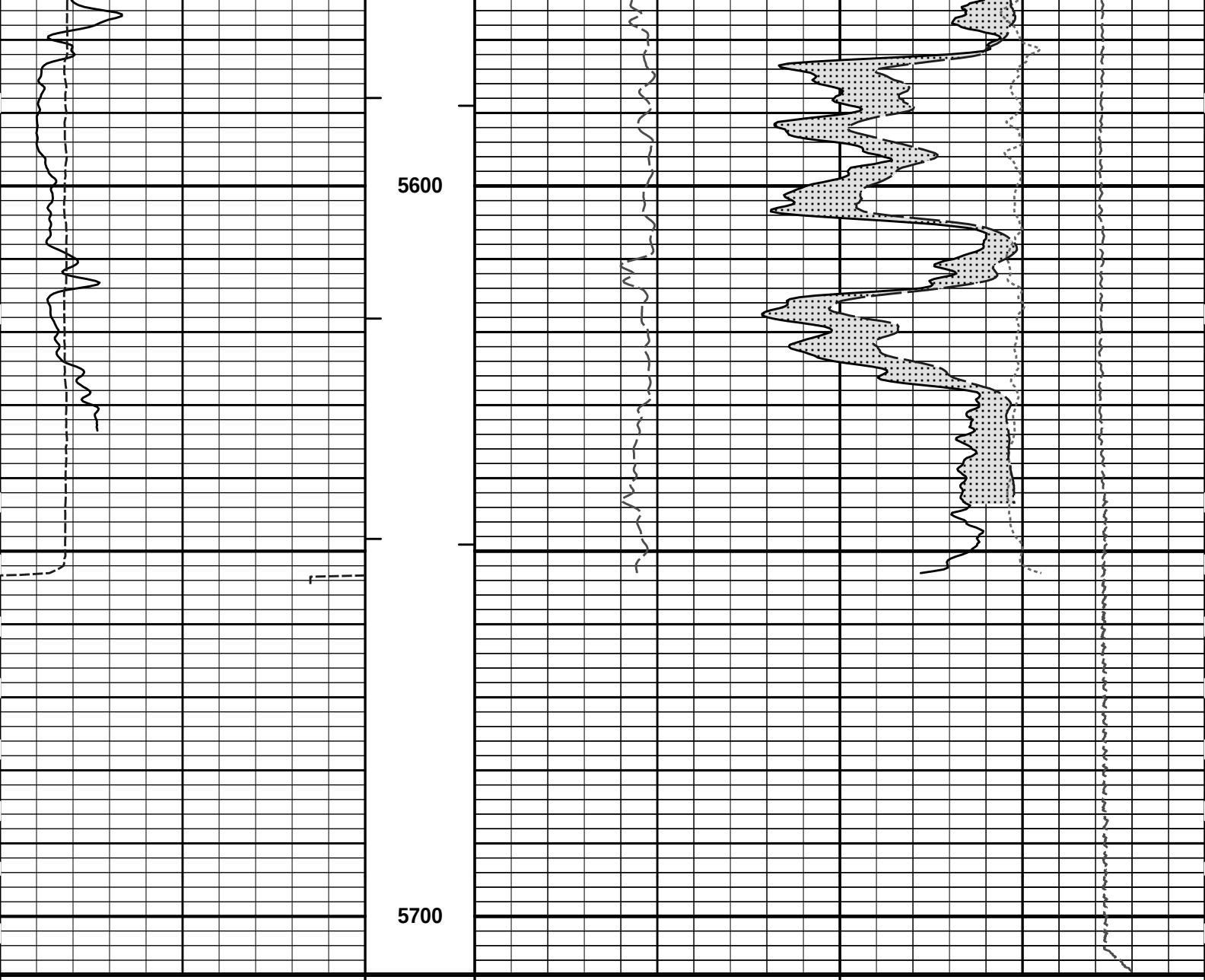


6 Caliper 16 inches	MD 1 : 240 ft	0 Pe 10 -0.25 DensityCorr 0.25 gram per cc
0 Gamma API 150 api	AHVT	15K Tension 0 pounds
SHALE	BHVT	30 DensityPorosity -10 % 30 Neutron Porosity -10 % CROSSOVER

HALLIBURTON

Plot Time: 18-Sep-13 06:25:52
Plot Range: 3995 ft to 5707.83 ft
Data: HAMMER 19-6\Well Based\R1 DETAIL\
Plot File: \\POROSITY\Poro_IQ_5_MAIN_LIB

5 INCH MAIN LOG

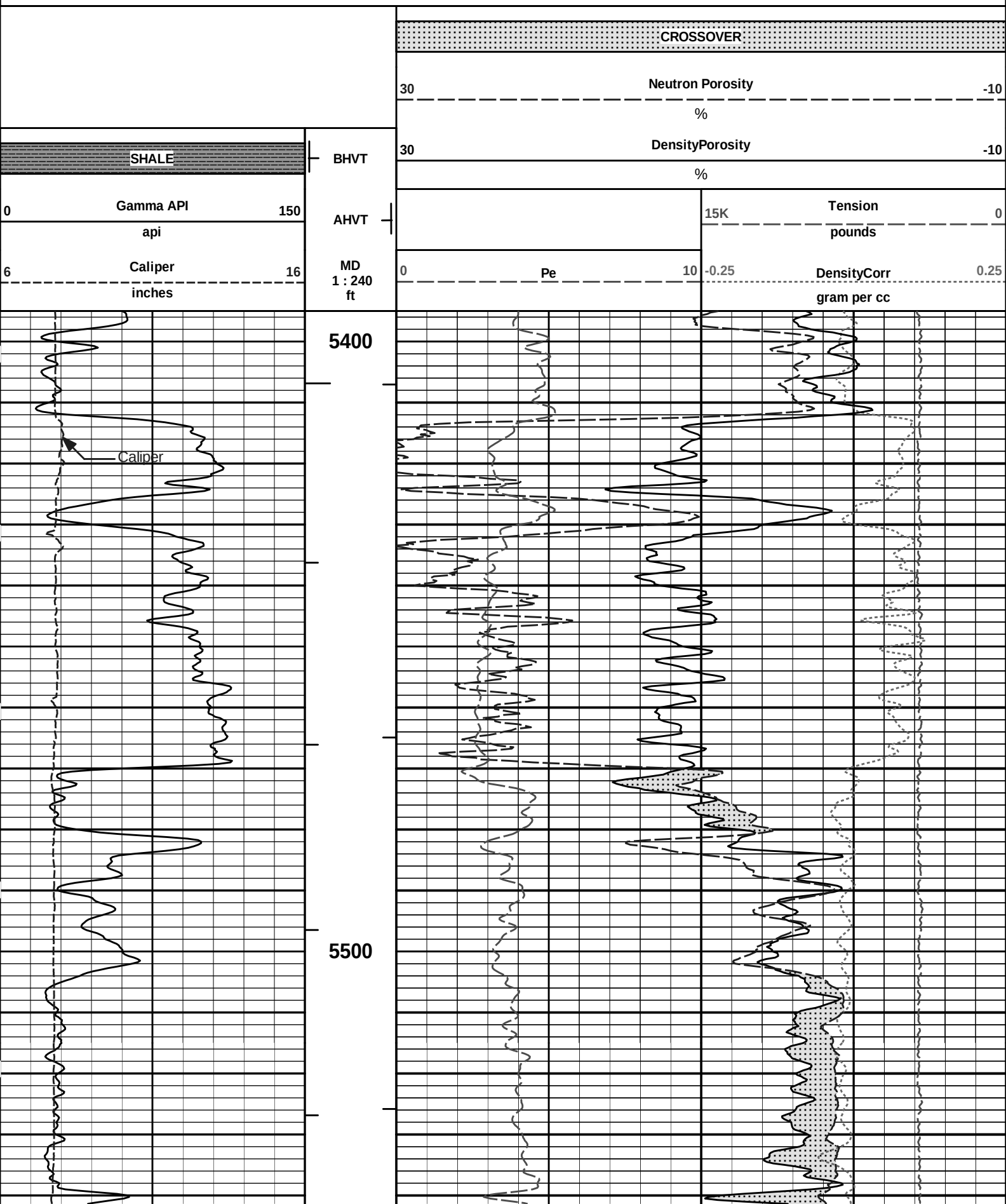
HALLIBURTON

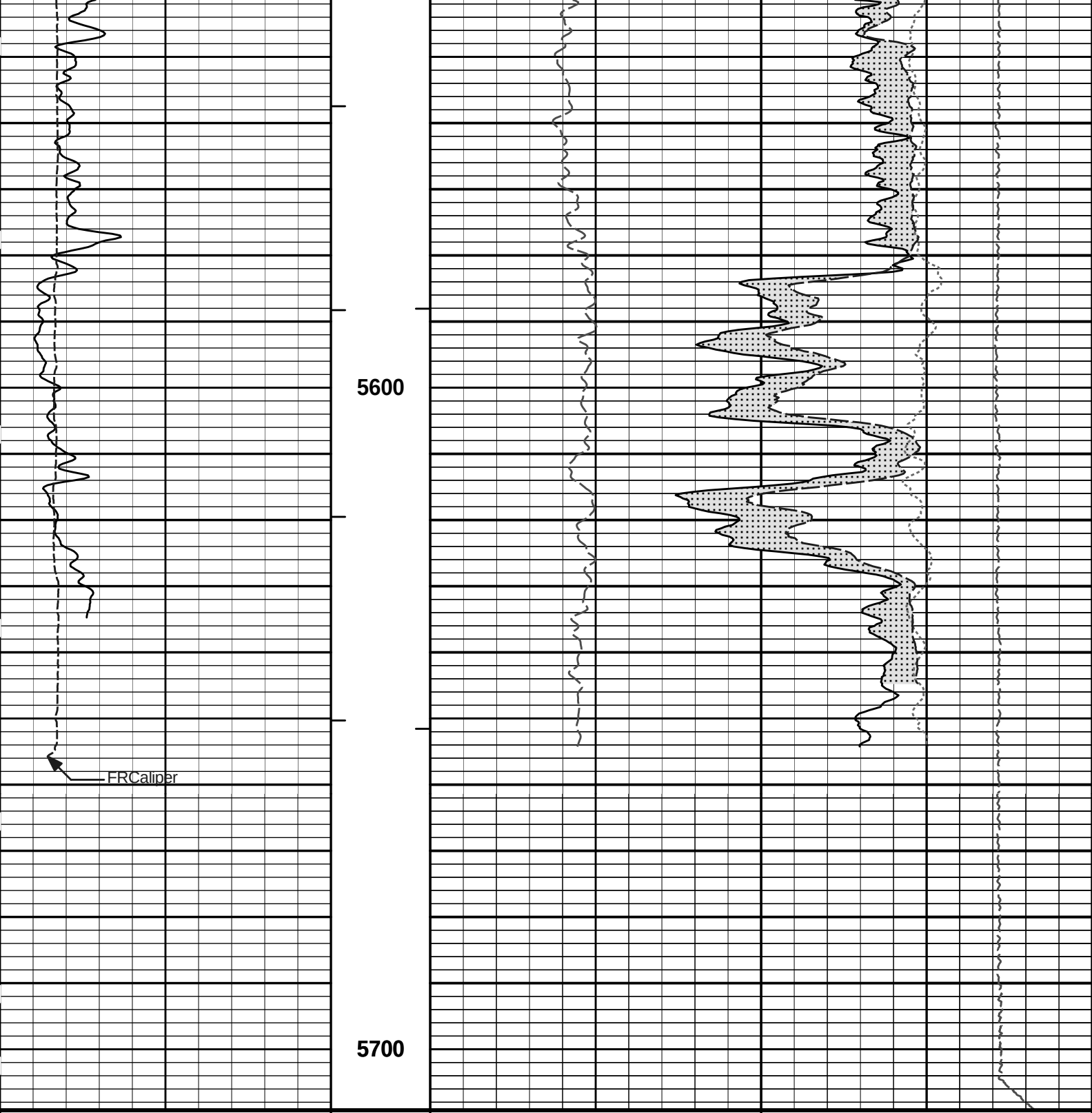
Plot Time: 18-Sep-13 06:25:52
Plot Range: 5395 ft to 5709.08 ft

Data: HAMMER 19-6\Well Based\R1 REPEAT\

Plot File: \\POROSITY\Poro_IQ_5_REP_LIB

REPEAT SECTION





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

HALLIBURTON

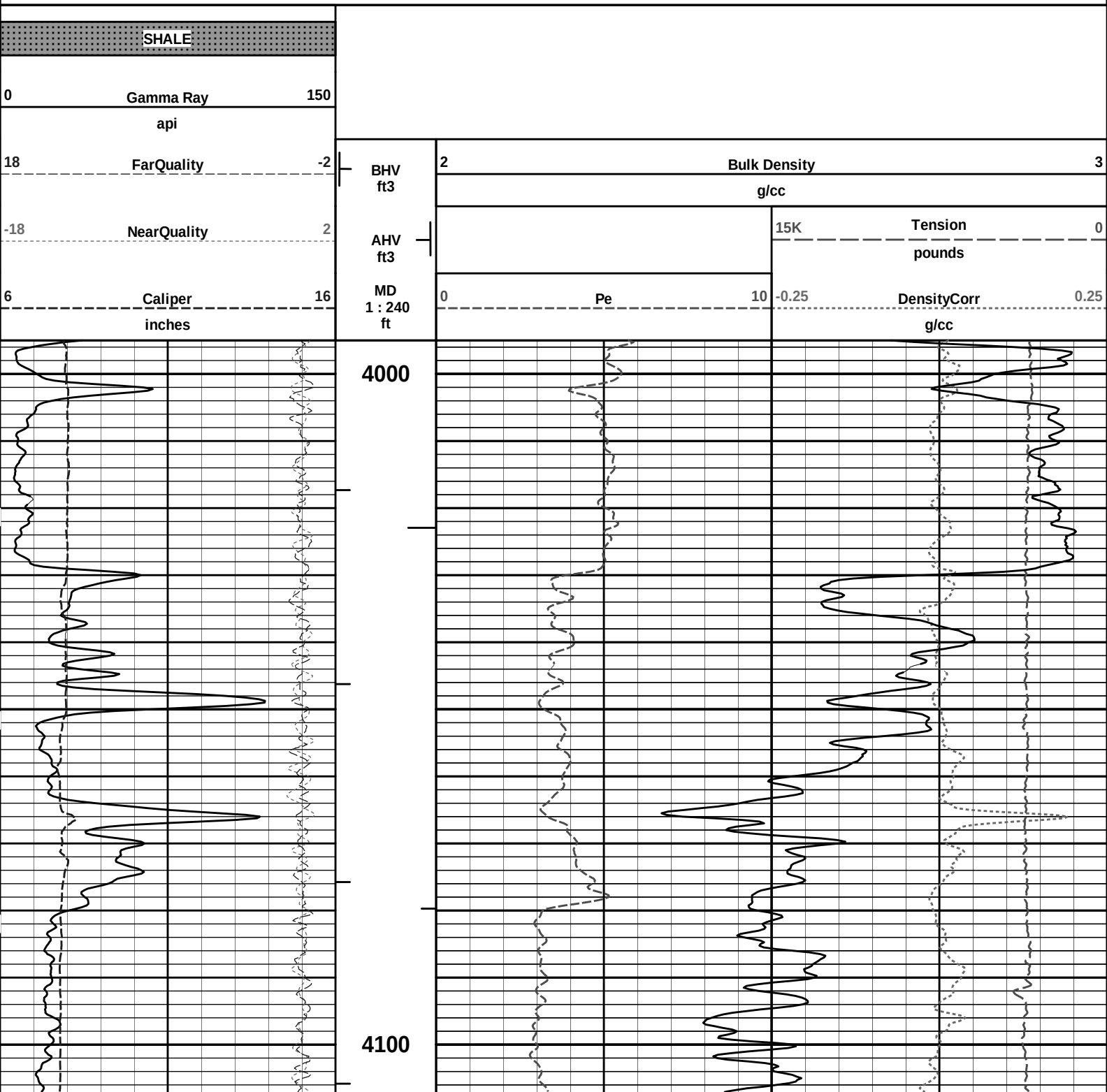
Plot Time: 18-Sep-13 06:25:56
Plot Range: 5395 ft to 5709.08 ft
Data: HAMMER 19-6\Well Based\R1 REPEAT\
Plot File: \\POROSITY\Poro_IQ_5_REP_LIB

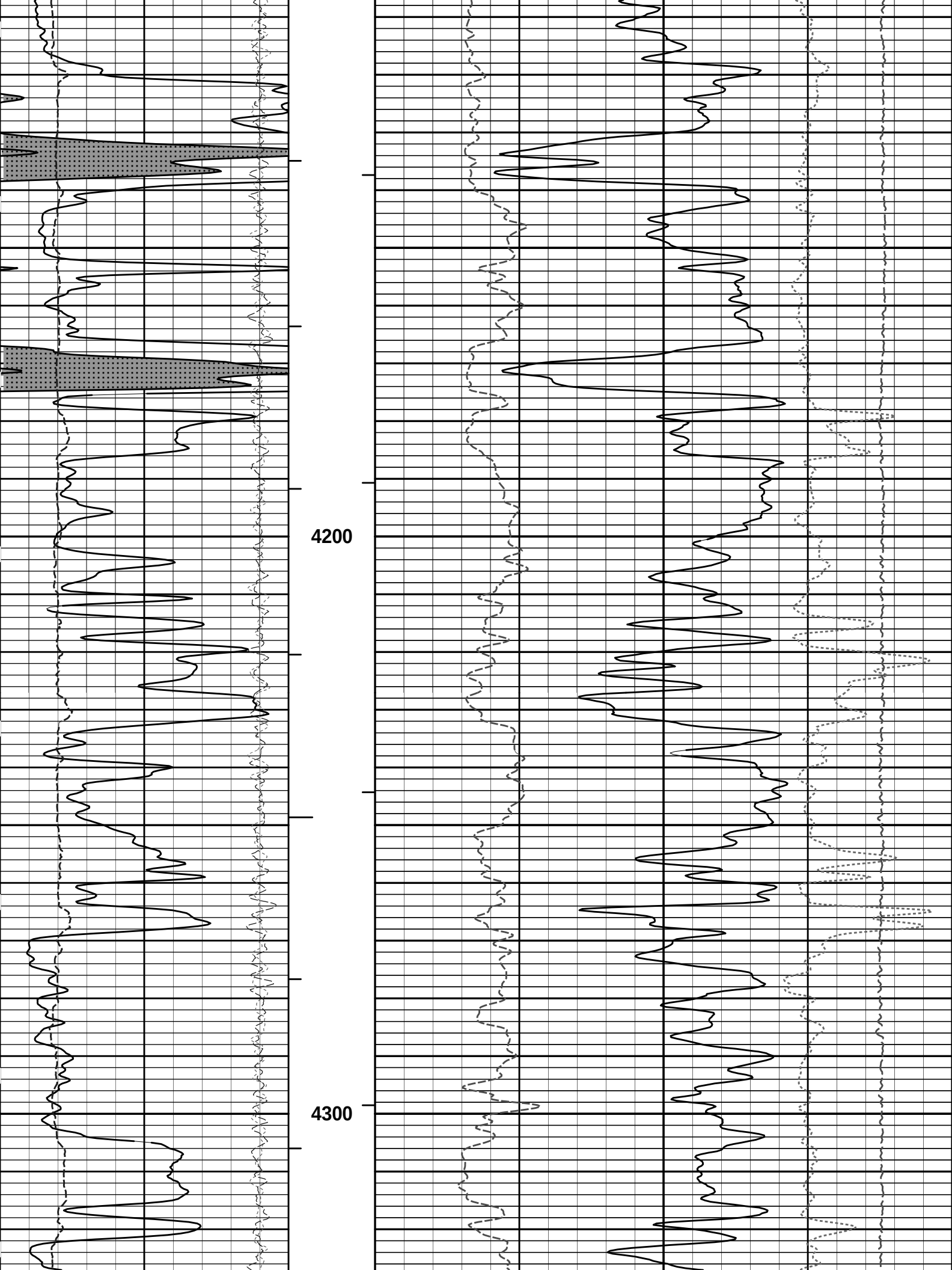
REPEAT SECTION

HALLIBURTON

Plot Time: 18-Sep-13 06:25:56
Plot Range: 3995 ft to 5707.83 ft
Data: HAMMER 19-6\Well Based\R1 DETAIL\
Plot File: \\-LOCAL-\HAMMER 19-6\Well Based\POROSITY\BULKD_5_MAIN_LIB

5 INCH MAIN LOG

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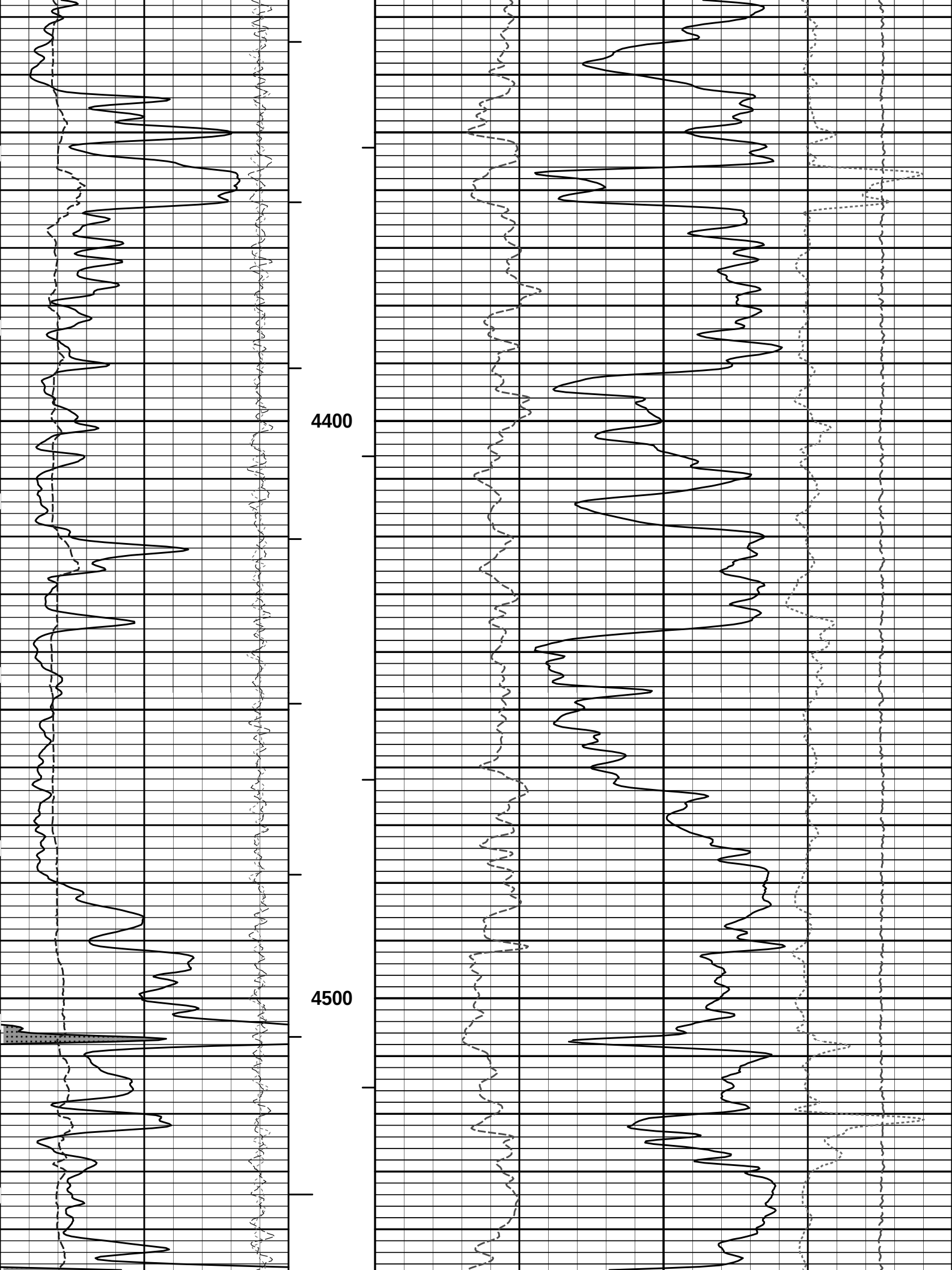
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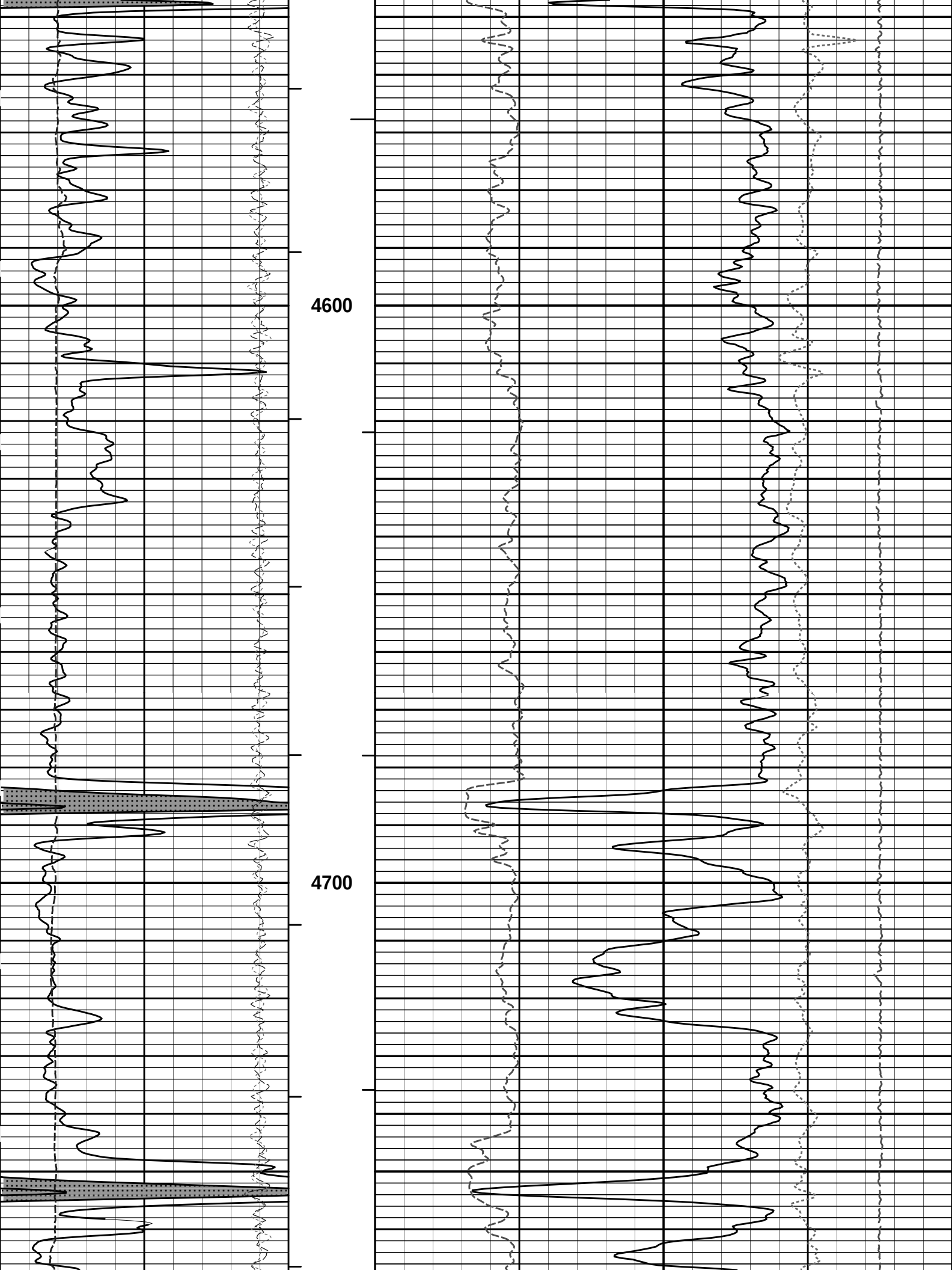
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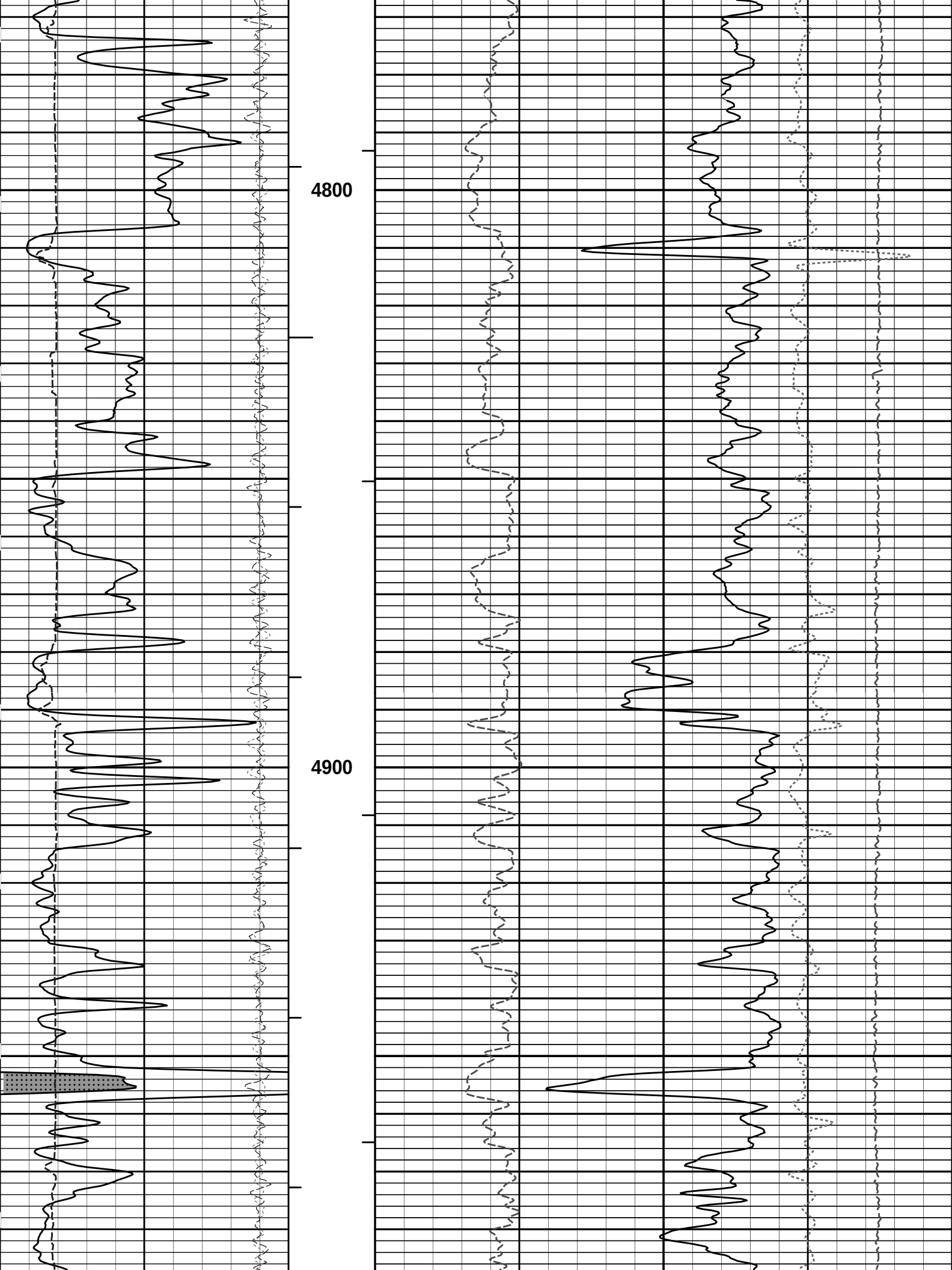
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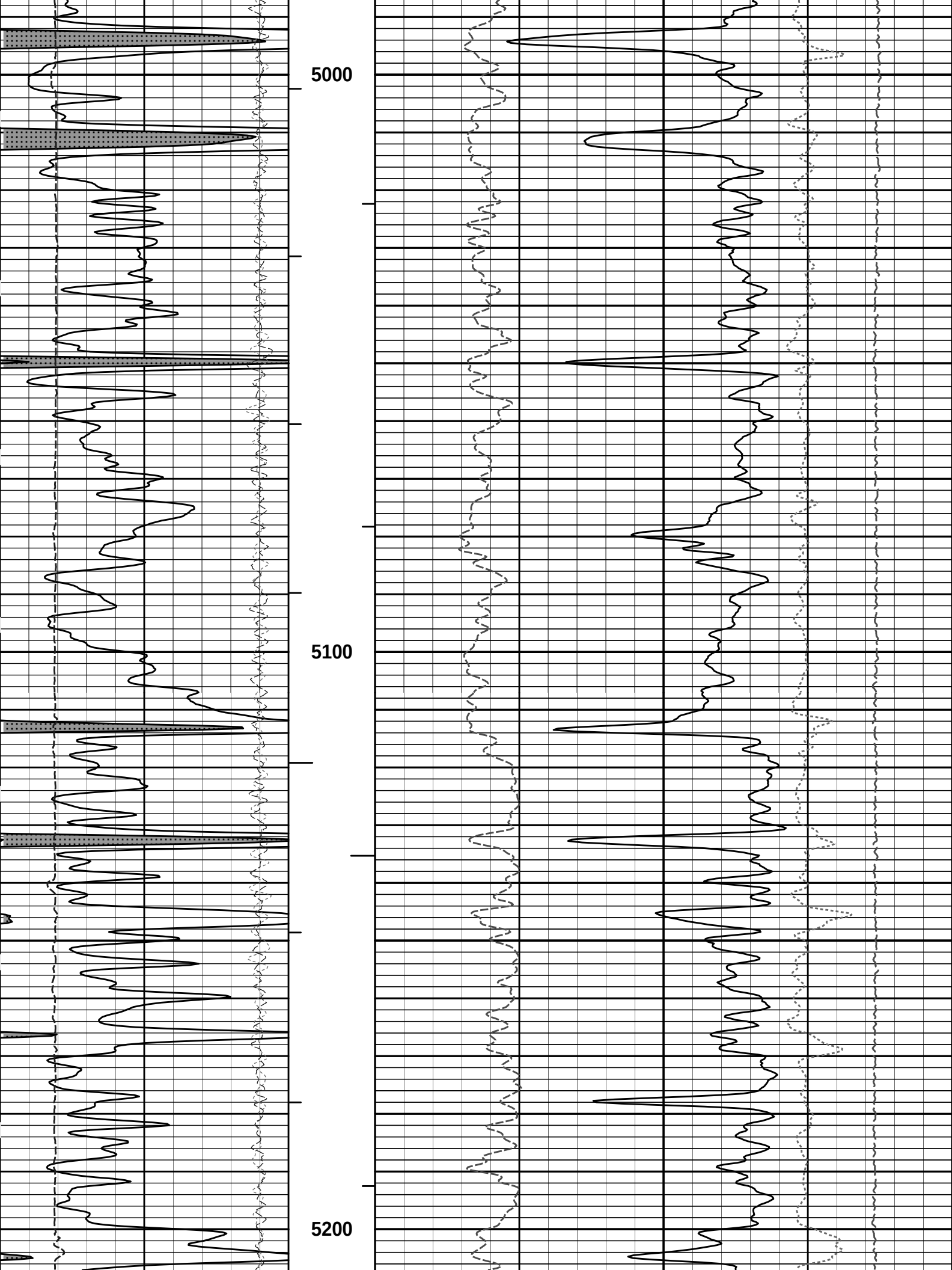
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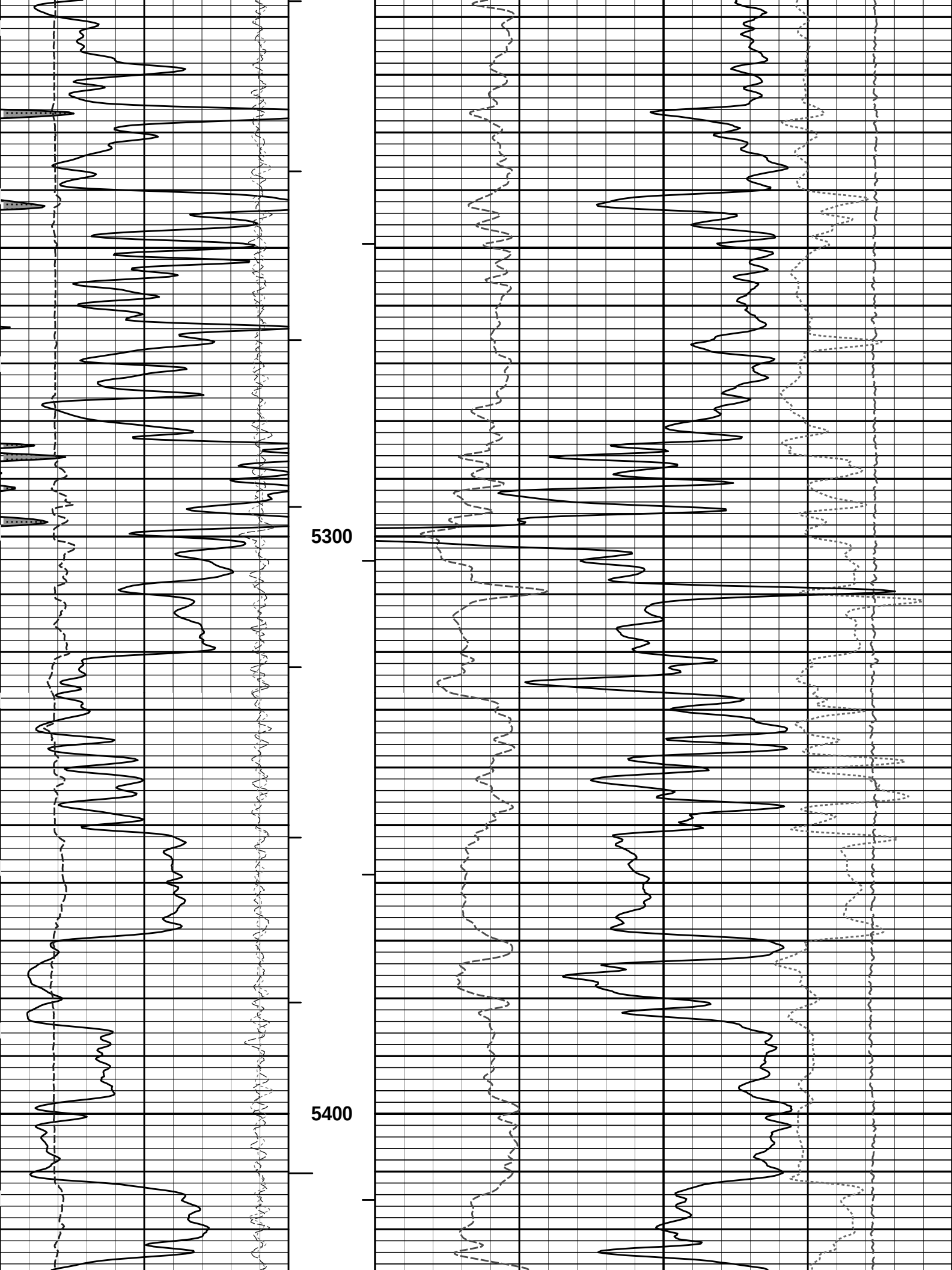
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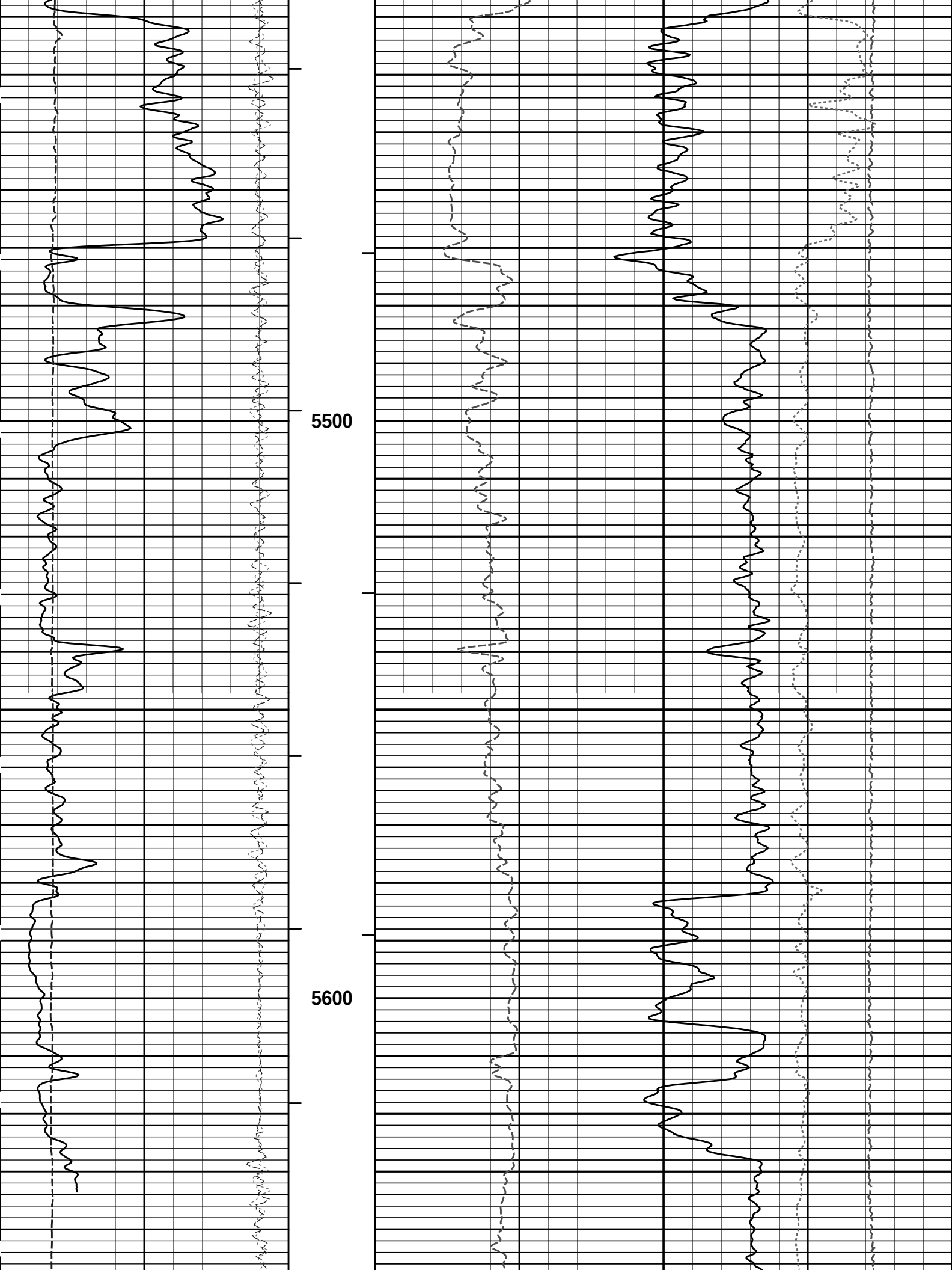
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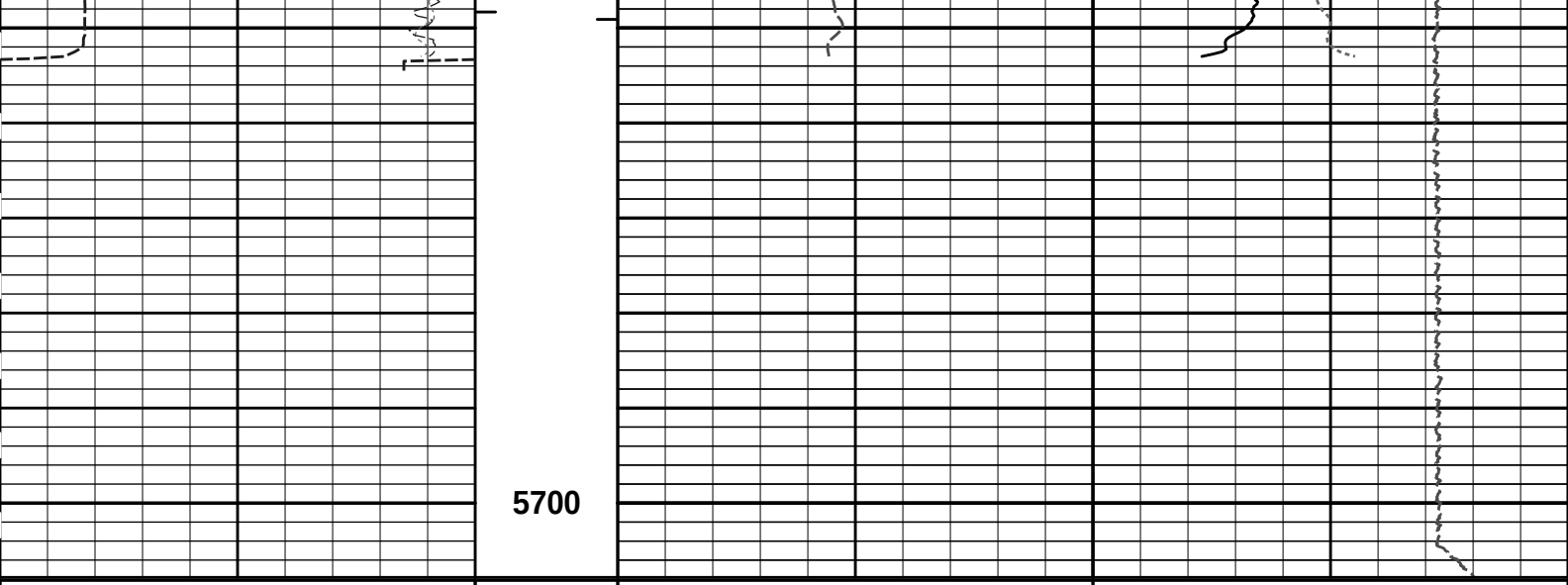


6 Caliper 16 inches	MD 1 : 240 ft	0 Pe 10
-18 NearQuality 2	AHV ft3	
18 FarQuality -2	BHV ft3	2 Bulk Density 3 g/cc
0 Gamma Ray 150 api		
SHALE		

-0.25 DensityCorr 0.25 g/cc
15K Tension 0 pounds

HALLIBURTON

Plot Time: 18-Sep-13 06:25:59
Plot Range: 3995 ft to 5707.83 ft
Data: HAMMER 19-6\Well Based\R1 DETAIL\
Plot File: \\-LOCAL-\HAMMER 19-6\Well Based\POROSITY\BULKD_5_MAIN_LIB

5 INCH MAIN LOG

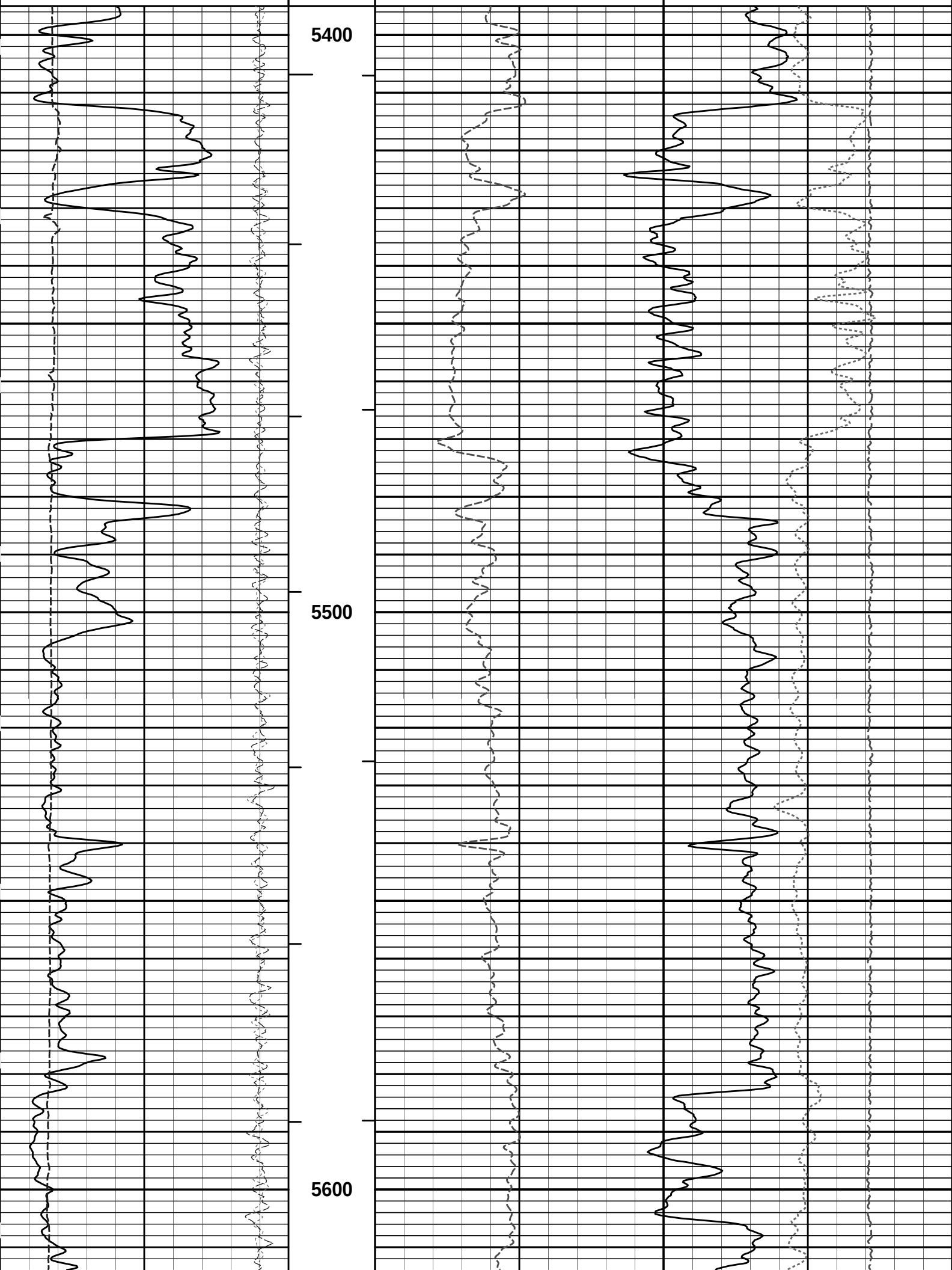
HALLIBURTON

Plot Time: 18-Sep-13 06:25:59
Plot Range: 5395 ft to 5709.08 ft
Data: HAMMER 19-6\Well Based\R1 REPEAT\
Plot File: \\-LOCAL-\HAMMER 19-6\Well Based\POROSITY\BULKD_5_REP_LIB

REPEAT SECTION

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

15K Tension 0 pounds
-0.25 DensityCorr 0.25 g/cc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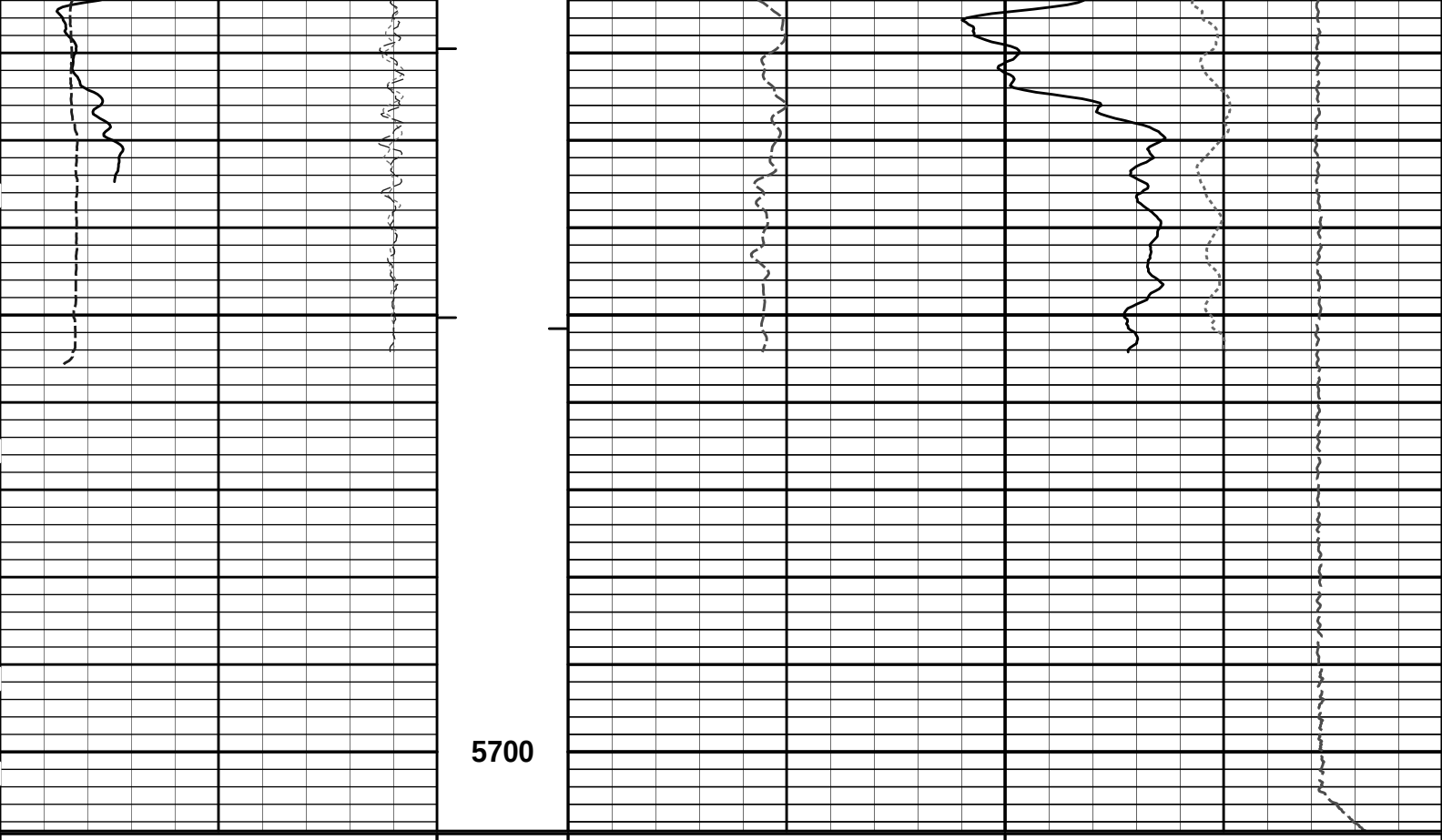


6 Caliper 16	MD 1 : 240 ft	0 Pe 10 / -0.25 DensityCorr 0.25
inches		g/cc
-18 NearQuality 2	AHV ft3	15K Tension 0
		pounds
18 FarQuality -2	BHV ft3	2 Bulk Density 3
		g/cc
0 Gamma Ray 150		
api		
SHALE		

HALLIBURTON

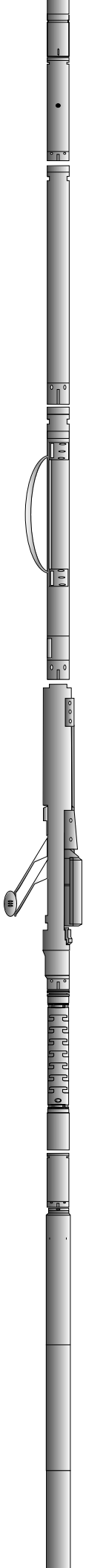
Plot Time: 18-Sep-13 06:26:00
Plot Range: 5395 ft to 5709.08 ft
Data: HAMMER 19-6\Well Based\R1 REPEAT\
Plot File: \\-LOCAL-\HAMMER 19-6\Well Based\POROSITY\BULKD_5_REP_LIB

REPEAT SECTION

HALLIBURTON

TOOL STRING DIAGRAM REPORT

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
RWCH-12027542 135.00 lbs		Ø 3.625 in	Load Cell @ 86.04 ft BH Temperature @ 85.48 ft	6.25 ft		89.73 ft



BH Temperature @ 85.46 ft

83.48 ft

SP Sub-12345678
60.00 lbs

Ø 3.625 in

SP @ 81.70 ft

3.74 ft

79.74 ft

GTET-10748374
165.00 lbs

Ø 3.625 in

8.52 ft

GammaRay @ 73.67 ft

71.22 ft

DSN Decentralizer-10755066
6.60 lbs

Ø 5.000 in*

DSNT-10755066
174.00 lbs

Ø 3.625 in

9.69 ft

DSN Far @ 64.28 ft

DSN Near @ 63.53 ft

61.53 ft

SDLT-10685803
360.00 lbs

Ø 4.500 in

10.81 ft

SDLT Pad-10714945
65.00 lbs

Microlog Pad-10685803
8.00 lbs

Ø 4.750 in*

Ø 4.750 in*

Microlog @ 53.72 ft

SDL Caliper @ 53.53 ft

SDL @ 53.52 ft

50.72 ft

IQ Flex-10000954
140.00 lbs

Ø 3.625 in

5.67 ft

45.05 ft

XRMI Isolator-00000001
32.50 lbs

Ø 4.500 in

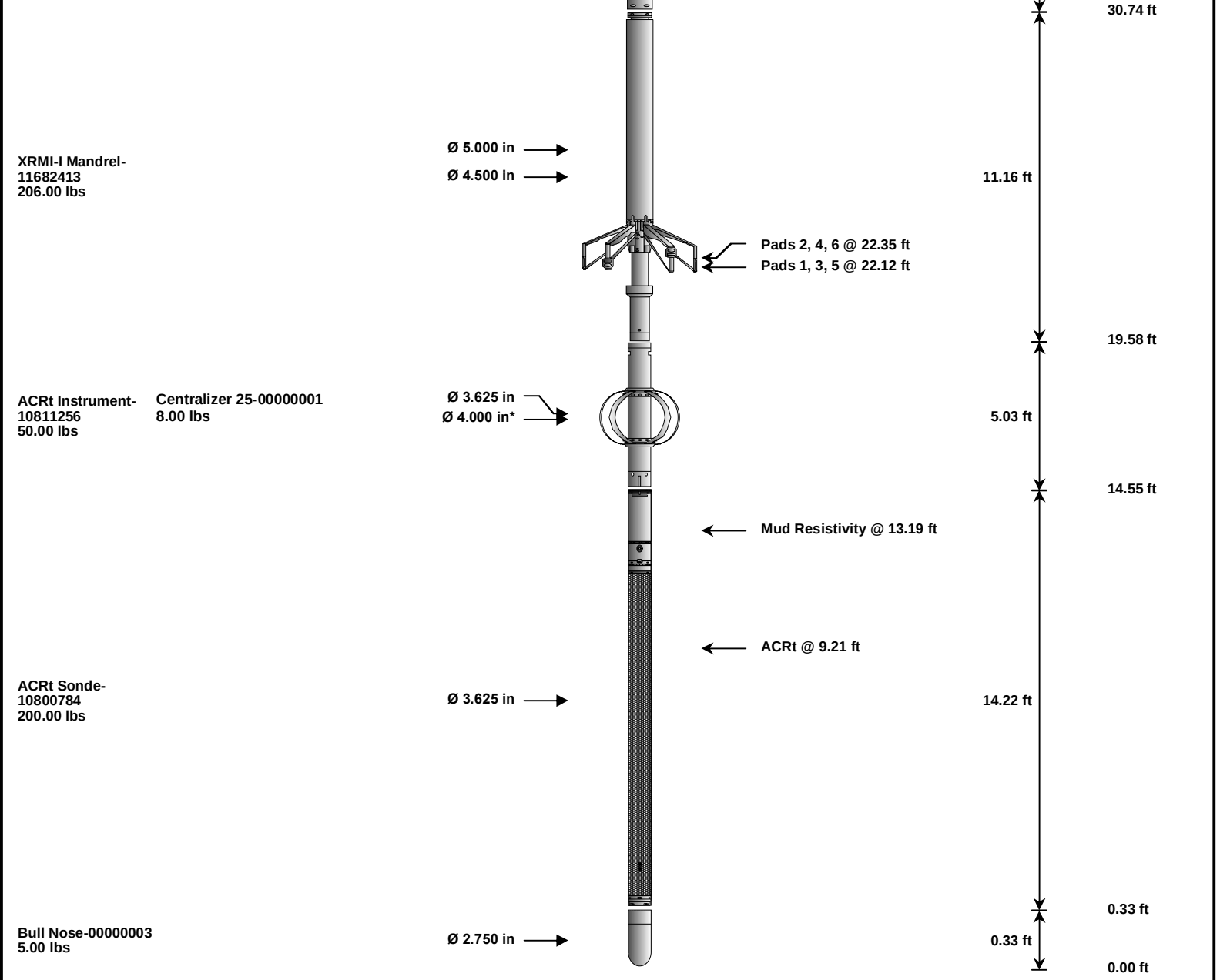
1.30 ft

43.74 ft

XRMI-I Instrument-11682412
290.00 lbs

Ø 4.500 in

13.00 ft



Mnemonic	Tool Name	Serial Number	Weight (lbs)	Length (ft)		Accumulated Length (ft)	Max.Log. Speed (fpm)
RWCH	Releasable Wireline Cable Head	12027542	135.00	6.25		83.48	300.00
SP	SP Sub	12345678	60.00	3.74		79.74	300.00
GTET	Gamma Telemetry Tool	10748374	165.00	8.52		71.22	60.00
DSNT	Dual Spaced Neutron	10755066	174.00	9.69		61.53	60.00
DCNT	DSN Decentralizer	10755066	6.60	5.13	*	64.86	300.00
SDLT	Spectral Density Tool	10685803	360.00	10.81		50.72	60.00
SDLP	Density Insite Pad	10714945	65.00	2.55	*	52.93	60.00
MICP	Microlog Pad	10685803	8.00	1.00	*	53.22	60.00
IQF	IQ Flex tool	10000954	140.00	5.67		45.05	300.00
	Isolator for the XRMI tool	00000001	32.50	1.30		43.74	300.00
XRMI	XRMI Navigation - Insite	11682412	290.00	13.00		30.74	30.00
XRMI-I	XRMI Imager - Insite	11682413	206.00	11.16		19.58	30.00
ACRt	Array Compensated True Resistivity Instrument Section	10811256	50.00	5.03		14.55	300.00
OBCEN	Centralizer - 25 in. Overbody	00000001	8.00	2.08	*	15.92	300.00
ACRt	Array Compensated True Resistivity Sonde Section	10800784	200.00	14.22		0.33	300.00
BLNS	Bull Nose	00000003	5.00	0.33		0.00	300.00
Total			**1,905.10**	**89.73**			

* Not included in Total Length and Length Accumulation.

Data: HAMMER 19-6\0001 SP-GTET-DSN-SDL-XRMI-ACRT-BN\006 18-Sep-13 04:08 Up @5708.3f **Date: 18-Sep-13 05:58:37**

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	9.100	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	1.000	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	ST	Surface Temperature	75.0	degF
	SHARED	TD	Total Well Depth	5700.00	ft
	SHARED	BHT	Bottom Hole Temperature	130.0	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	
	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
Microlog Pad	MLOK	Process MicroLog Outputs?	Yes	
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	ROTI	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

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CALIBRATION REPORT

NATURAL GAMMA RAY TOOL SHOP CALIBRATION

Tool Name: GTET - 10748374 **Reference Calibration Date:** 02-Aug-13 14:20:06

Engineer: THOMAS HYDE **Calibration Date:** 03-Sep-13 10:36:47

Software Version: WL INSITE R3.8.4 (Build 5) **Calibration Version:** 1

Calibrator Source S/N: TB-185

Calibrator API Reference:228.00 api

Equivalent Calibrator API Reference:232.0 api

Measurement	Measured	Calibrated	Units
Background	44.2	44.4	api
Background + Calibrator	275.0	276.4	api
Calibrator	230.8	232.0	api

NATURAL GAMMA RAY TOOL FIELD CALIBRATION

Tool Name: GTET - 10748374 **Reference Calibration Date:** 03-Sep-13 10:36:47

Engineer: S. INGERSOLL **Calibration Date:** 17-Sep-13 21:39:14

Engineer:	**S. INGERSOLL**	**Calibration Date:**	**17-Sep-13 21:39:14**
Software Version:	**WL INSITE R3.8.4 (Build 5)**	**Calibration Version:**	**1**

Calibrator Source S/N: TB-185

Calibrator API Reference:228.00 api

Equivalent Calibrator API Reference:232.0 api

Field Verification	Shop	Field	Units
Background	44.4	35.1	api
Background + Calibrator	276.4	273.7	api
Calibrator	232.0	238.6	api

Shop	Field	Difference	Tolerance
232.0	238.6	-6.6	+/- 9.00

DUAL SPACED NEUTRON SHOP CALIBRATION

Tool Name:	**DSNT - 10755066**	**Reference Calibration Date:**	**01-Jul-13 16:27:31**
Engineer:	**THOMAS HYDE**	**Calibration Date:**	**05-Sep-13 10:15:26**
Software Version:	**WL INSITE R3.8.4 (Build 5)**	**Calibration Version:**	**1**

Logging Source S/N: DSN-436

Tank Serial Number: 105060

Reference value assigned to Tank: 51.680

Snow Block S/N: 08910

Calibration Tank Water Temperature: 70 degF

Min. Tool Housing Outside Diameter: 3.620 in

CALIBRATION CONSTANTS			
Measurement	**Prev. Value**	**New Value**	**Control Limit On New Value**
Gain:	0.952	0.949	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):	0.2114	0.2107	0.0008	+/- 0.0020
Calibrated Ratio:	9.74	9.72	0.026	+/- 0.050

VERIFIER		
Measurement	**Value**	**Control Limit**
Snow-Block Porosity (decp):	0.0594	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 - 10755066**	**Reference Calibration Date:**	**05-Sep-13 10:15:26**
Engineer:	**S. INGERSOLL**	**Calibration Date:**	**17-Sep-13 21:45:25**
Software Version:	**WL INSITE R3.8.4 (Build 5)**	**Calibration Version:**	**1**

Logging Source S/N: DSN-436

Snow Block S/N: 08910

NEUTRON FIELD-CHECK SUMMARY				
	Shop	**Field**	**Difference**	**Control Limit On Change**

				On Change
Snow-Block Porosity (decp):	0.0594	0.0689	0.0095	+/- 0.0150

PASS/FAIL SUMMARY	
Block Change Check:	Passed
Snow Block Stat Check:	Passed
Temperature Check:	Passed

DENSITY CALIPER SHOP CALIBRATION

Tool Name: SDLT - 10685803 **Reference Calibration Date:** 07-Aug-13 16:03:28

Engineer: THOMAS HYDE **Calibration Date:** 05-Sep-13 09:46:41

Software Version: WL INSITE R3.8.4 (Build 5) **Calibration Version:** 1

Host Tool Name: DSNT - 10755066

CALIBRATION COEFFICIENTS

Measurement	Previous Value	New Value	Control Limit On New Value
Pad Offset	-4540.73	-5035.21	-7000.00 - -1000.00
Pad Gain	0.0003893	0.0004015	0.000200 - 0.000600
Arm Offset	-2828.82	-2028.23	-5000.00 - 3000.00
Arm Gain	0.0005533	0.0005309	0.000300 - 0.000700
Arm Power	-0.000007296	-0.000006519	-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)	2.13	2.00	-0.13	+/- 0.20
Medium Ring (in)	3.83	3.75	-0.08	+/- 0.20
RING DIAMETER:				
Small Ring (in)	6.36	6.50	0.14	+/- 0.20
Medium Ring (in)	8.19	8.25	0.06	+/- 0.20
Large Ring (in)	15.10	15.00	-0.10	+/- 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 - 10685803 **Reference Calibration Date:** 05-Sep-13 09:46:41

Engineer: S. INGERSOLL **Calibration Date:** 17-Sep-13 21:48:24

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	3.67	-0.08	+/- 0.10
Ring Diameter	8.25	8.28	0.03	+/- 0.15

PASS/FAIL SUMMARY	
Pad Extension Check:	Passed
Diameter Check:	Passed

Diameter Check:	Passed

SPECTRAL DENSITY SHOP CALIBRATION

Tool Name:	**SDLT Pad - 10714945**	**Reference Calibration Date:**	**08-Aug-13 14:33:02**
Engineer:	**THOMAS HYDE**	**Calibration Date:**	**05-Sep-13 09:09:01**
Software Version:	**WL INSITE R3.8.4 (Build 5)**	**Calibration Version:**	**1**

Logging Source S/N: 5073GW

Aluminum Block S/N: LIBERAL ALUMINUM	Density: 2.598g/cc	Pe: 3.170
Magnesium Block S/N: LIBERAL MAG BLOCK	Density: 1.684g/cc	Pe: 2.598

DENSITY CALIBRATION SUMMARY

Measurement	Previous Value	New Value	Control Limit
Near Bar Gain	1.0388	1.0085	0.90 - 1.10
Near Dens Gain	1.0170	0.9997	0.90 - 1.10
Near Peak Gain	1.0228	0.9751	0.90 - 1.10
Near Lith Gain	0.9941	0.9320	0.90 - 1.10
Far Bar Gain	1.0113	1.0097	0.90 - 1.10
Far Dens Gain	1.0021	0.9993	0.90 - 1.10
Far Peak Gain	0.9966	0.9933	0.90 - 1.10
Far Lith Gain	0.9720	0.9693	0.90 - 1.10
Near Bar Offset	-0.0733	0.2064	NONE
Near Dens Offset	0.0979	0.2553	NONE
Near Peak Offset	0.0284	0.4332	NONE
Near Lith Offset	0.2218	0.7457	NONE
Far Bar Offset	0.0922	0.1155	NONE
Far Dens Offset	0.1623	0.1874	NONE
Far Peak Offset	0.2014	0.2290	NONE
Far Lith Offset	0.3537	0.3758	NONE
Near Bar Background	969.80	966.00	700 - 1450
Near Dens Background	321.20	319.70	230 - 480
Near Peak Background	141.23	140.22	100 - 210
Near Lith Background	172.03	169.95	125 - 260
Far Bar Background	493.95	494.14	450 - 900
Far Dens Background	192.00	191.86	175 - 345
Far Peak Background	75.79	75.83	70 - 140
Far Lith Background	79.52	79.76	75 - 145

CALIBRATION BLOCK SUMMARY

Measurement	Current Reading (Previous Coef)	Calibrated (New Coef)	Change	Control Limit On Change
MAGNESIUM				
Density (g/cc)	1.682	1.684	0.002	+/- 0.015
Pe	2.571	2.564	-0.007	+/- 0.150
ALUMINUM				
Density (g/cc)	2.588	2.598	0.010	+/- 0.01500
Pe	3.185	3.133	-0.052	+/- 0.150

TOOL SUMMARY

Measurement	Near Detector		Far Detector	
	Value	Control Limits	Value	Control Limits
QUALITY				

Background	-0.0007	+/- 0.0110	-0.0031	+/- 0.0140
Magnesium Block	-0.0014	+/- 0.0110	0.0001	+/- 0.0140
Aluminum Block	-0.0002	+/- 0.0110	0.0007	+/- 0.0140
Resolution	9.84	6.00 - 11.50	9.12	6.00 - 11.50
Internal Verifier(B+D+P+L)	1596	1200 - 2700	842	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 - 10714945 **Reference Calibration Date:** 05-Sep-13 09:09:01

Engineer: S. INGERSOLL **Calibration Date:** 17-Sep-13 21:52:06

Software Version: WL INSITE R3.8.4 (Build 5) **Calibration Version:** 1

Pad Temperature: 78.8 degF

DENSITY FIELD CALIBRATION SUMMARY

Measurement	Shop	Field	Change	Control Limit +/-
Near (B+D+P+L) cps	1595.873	1589.336	-6.537	16.065
Far (B+D+P+L) cps	841.591	836.048	-5.543	15.940
Near Resolution	9.84	9.80	-0.040	0.50
Far Resolution	9.12	9.27	0.150	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
GTET-10748374						
Gamma Ray Calibrator	232.0	238.6	----------	-6.6	+/- 9.00	api
DSNT-10755066						
Snow-Block Porosity	0.0594	0.0689	----------	-0.0095	+/- 0.0150	decp
SDLT-10685803						
Pad Extension	3.75	3.67	----------	0.08	+/-0.10	in
Ring Diameter	8.25	8.28	----------	-0.03	+/-0.15	in
SDLT Pad-10714945						
Near(B+D+P+L)	1595.873	1589.336	----------	6.537	+/-16.065	cps
Far(B+D+P+L)	841.591	836.048	----------	5.543	+/-15.940	cps

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INPUTS, DELAYS AND FILTERS TABLE

Mnemonic	Input Description	Delay	Filter Type	Filter Length

Mnemonic	Input Description	(ft)	Filter Type	(ft)
Depth Panel				
TENS	Tension	0.00	NO	
RWCH				
DHTN	DownholeTension	0.00	BLK	0.000
SP Sub				
PLTC	Plot Control Mask	81.70	NO	
SP	Spontaneous Potential	81.70	BLK	1.250
SPR	Raw Spontaneous Potential	81.70	NO	
SPO	Spontaneous Potential Offset	81.70	NO	
GTET				
TPUL	Tension Pull	73.67	NO	
GR	Natural Gamma Ray API	73.67	TRI	1.750
GRU	Unfiltered Natural Gamma Ray API	73.67	NO	
EGR	Natural Gamma Ray API with Enhanced Vertical Resolution	73.67	W	1.416 , 0.750
ACCZ	Accelerometer Z	0.00	BLK	0.083
DEVI	Inclination	0.00	NO	
DSNT				
TPUL	Tension Pull	63.43	NO	
RNDS	Near Detector Telemetry Counts	63.53	BLK	1.417
RFDS	Far Detector Telemetry Counts	64.28	TRI	0.583
DNTT	DSN Tool Temperature	63.53	NO	
DSNS	DSN Tool Status	63.43	NO	
ERND	Near Detector Telemetry Counts EVR	63.53	BLK	0.000
ERFD	Far Detector Telemetry Counts EVR	64.28	BLK	0.000
ENTM	DSN Tool Temperature EVR	63.53	NO	
SDLT				
TPUL	Tension Pull	53.53	NO	
PCAL	Pad Caliper	53.53	TRI	0.250
ACAL	Arm Caliper	53.53	TRI	0.250
XRMI-I Mandrel				
TPUL	Tension Pull	22.35	NO	
PAD1	XRMI Pad 1 values	22.12	NO	
PAD2	XRMI Pad 2 values	22.12	NO	
PAD3	XRMI Pad 3 values	22.12	NO	
PAD4	XRMI Pad 4 values	22.12	NO	
PAD5	XRMI Pad 5 values	22.12	NO	
PAD6	XRMI Pad 6 values	22.12	NO	
OD1	EMI Odd Button Values Pad 1	22.12	NO	
OD2	EMI Odd Button Values Pad 2	22.35	NO	
OD3	EMI Odd Button Values Pad 3	22.12	NO	
OD4	EMI Odd Button Values Pad 4	22.35	NO	
OD5	EMI Odd Button Values Pad 5	22.12	NO	
OD6	EMI Odd Button Values Pad 6	22.35	NO	
EV1	EMI Even Button Values Pad 1	22.14	NO	
EV2	EMI Even Button Values Pad 2	22.32	NO	
EV3	EMI Even Button Values Pad 3	22.14	NO	
EV4	EMI Even Button Values Pad 4	22.32	NO	
EV5	EMI Even Button Values Pad 5	22.14	NO	
EV6	EMI Even Button Values Pad 6	22.32	NO	

ITMP	Instrument Temperature	19.58	NO	
EMIM	Tool Mode	19.58	NO	
HAZI	Hole Azimuth	21.87	NO	
HAZI	Hole Azimuth - Down Delay	22.37	NO	
ZACC	Accelerometer Z	22.12	NO	
TPUL	Tension Pull	22.35	NO	
FIR1	Current Button R - Pad 1	22.12	NO	
FIR2	Current Button R - Pad 2	22.35	NO	
FIR3	Current Button R - Pad 3	22.12	NO	
FIR4	Current Button R - Pad 4	22.35	NO	
FIR5	Current Button R - Pad 5	22.12	NO	
FIR6	Current Button R - Pad 6	22.35	NO	
FIX1	Current Button X - Pad 1	22.12	NO	
FIX2	Current Button X - Pad 2	22.35	NO	
FIX3	Current Button X - Pad 3	22.12	NO	
FIX4	Current Button X - Pad 4	22.35	NO	
FIX5	Current Button X - Pad 5	22.12	NO	
FIX6	Current Button X - Pad 6	22.35	NO	
SIR1	Current Slow Button R - Pad 1	22.12	BLK	3.000
SIR2	Current Slow Button R - Pad 2	22.35	BLK	3.000
SIR3	Current Slow Button R - Pad 3	22.12	BLK	3.000
SIR4	Current Slow Button R - Pad 4	22.35	BLK	3.000
SIR5	Current Slow Button R - Pad 5	22.12	BLK	3.000
SIR6	Current Slow Button R - Pad 6	22.35	BLK	3.000
SIX1	Current Slow Button X - Pad 1	22.12	BLK	3.000
SIX2	Current Slow Button X - Pad 2	22.35	BLK	3.000
SIX3	Current Slow Button X - Pad 3	22.12	BLK	3.000
SIX4	Current Slow Button X - Pad 4	22.35	BLK	3.000
SIX5	Current Slow Button X - Pad 5	22.12	BLK	3.000
SIX6	Current Slow Button X - Pad 6	22.35	BLK	3.000
EMMR	Phasor Voltage - Real Part	22.12	NO	
EMMX	Phasor Voltage - Imaginary Part	22.12	NO	
PADV	Pad Voltage	19.58	BLK	0.250
ITMP	Instrument Temperature	19.58	BLK	0.000
CON1	Conductivity Pad 1	22.12	BLK	3.000
CON2	Conductivity Pad 2	22.35	BLK	3.000
CON3	Conductivity Pad 3	22.12	BLK	3.000
CON4	Conductivity Pad 4	22.35	BLK	3.000
CON5	Conductivity Pad 5	22.12	BLK	3.000
CON6	Conductivity Pad 6	22.35	BLK	3.000
UIR2	Current Button R No Delay - Pad 2	22.12	NO	
UIR4	Current Button R No Delay - Pad 4	22.12	NO	
UIR6	Current Button R No Delay - Pad 6	22.12	NO	
UIX2	Current Button X No Delay - Pad 2	22.12	NO	
UIX4	Current Button X No Delay - Pad 4	22.12	NO	
UIX6	Current Button X No Delay - Pad 6	22.12	NO	
TPUL	Tension Pull	22.35	NO	
ARM1	Caliper 1 measurement	22.12	BLK	0.000
ARM2	Caliper 2 measurement	22.12	BLK	0.000
ARM3	Caliper 3 measurement	22.12	BLK	0.000
ARM4	Caliper 4 measurement	22.12	BLK	0.000
ARM5	Caliper 5 measurement	22.12	BLK	0.000
ARM6	Caliper 6 measurement	22.12	BLK	0.000
MOTV	Motor Voltage Monitor 1	22.12	BLK	0.000
PRES	Caliper percentage of total compression of the spring	19.58	BLK	0.000

HAZI	Hole Azimuth	22.12	NO	
RB	Relative Bearing	22.12	NO	
AZI1	PAD1 Azimuth	22.12	NO	
DEVI	Inclination	22.12	NO	
	ACRt Sonde			
TPUL	Tension Pull	2.73	NO	
F1R1	ACRT 12KHz - 80in R value	8.98	BLK	0.000
F1X1	ACRT 12KHz - 80in X value	8.98	BLK	0.000
F1R2	ACRT 12KHz - 50in R value	6.48	BLK	0.000
F1X2	ACRT 12KHz - 50in X value	6.48	BLK	0.000
F1R3	ACRT 12KHz - 29in R value	4.98	BLK	0.000
F1X3	ACRT 12KHz - 29in X value	4.98	BLK	0.000
F1R4	ACRT 12KHz - 17in R value	3.98	BLK	0.000
F1X4	ACRT 12KHz - 17in X value	3.98	BLK	0.000
F1R5	ACRT 12KHz - 10in R value	3.48	BLK	0.000
F1X5	ACRT 12KHz - 10in X value	3.48	BLK	0.000
F1R6	ACRT 12KHz - 6in R value	3.23	BLK	0.000
F1X6	ACRT 12KHz - 6in X value	3.23	BLK	0.000
F2R1	ACRT 36KHz - 80in R value	8.98	BLK	0.000
F2X1	ACRT 36KHz - 80in X value	8.98	BLK	0.000
F2R2	ACRT 36KHz - 50in R value	6.48	BLK	0.000
F2X2	ACRT 36KHz - 50in X value	6.48	BLK	0.000
F2R3	ACRT 36KHz - 29in R value	4.98	BLK	0.000
F2X3	ACRT 36KHz - 29in X value	4.98	BLK	0.000
F2R4	ACRT 36KHz - 17in R value	3.98	BLK	0.000
F2X4	ACRT 36KHz - 17in X value	3.98	BLK	0.000
F2R5	ACRT 36KHz - 10in R value	3.48	BLK	0.000
F2X5	ACRT 36KHz - 10in X value	3.48	BLK	0.000
F2R6	ACRT 36KHz - 6in R value	3.23	BLK	0.000
F2X6	ACRT 36KHz - 6in X value	3.23	BLK	0.000
F3R1	ACRT 72KHz - 80in R value	8.98	BLK	0.000
F3X1	ACRT 72KHz - 80in X value	8.98	BLK	0.000
F3R2	ACRT 72KHz - 50in R value	6.48	BLK	0.000
F3X2	ACRT 72KHz - 50in X value	6.48	BLK	0.000
F3R3	ACRT 72KHz - 29in R value	4.98	BLK	0.000
F3X3	ACRT 72KHz - 29in X value	4.98	BLK	0.000
F3R4	ACRT 72KHz - 17in R value	3.98	BLK	0.000
F3X4	ACRT 72KHz - 17in X value	3.98	BLK	0.000
F3R5	ACRT 72KHz - 10in R value	3.48	BLK	0.000
F3X5	ACRT 72KHz - 10in X value	3.48	BLK	0.000
F3R6	ACRT 72KHz - 6in R value	3.23	BLK	0.000
F3X6	ACRT 72KHz - 6in X value	3.23	BLK	0.000
RMUD	Mud Resistivity	12.52	BLK	0.000
F1RT	Transmitter Current Raw 12K X Receiver	2.73	BLK	0.000
F1XT	Transmitter Reference 12 KHz Imaginary Signal	2.73	BLK	0.000
F2RT	Transmitter Reference 36 KHz Real Signal	2.73	BLK	0.000
F2XT	Transmitter Reference 36 KHz Imaginary Signal	2.73	BLK	0.000
F3RT	Transmitter Reference 72 KHz Real Signal	2.73	BLK	0.000
F3XT	Transmitter Reference 72 KHz Imaginary Signal	2.73	BLK	0.000
TFPU	Upper Feedpipe Temperature Calculated	2.73	BLK	0.000
TFPL	Lower Feedpipe Temperature Calculated	2.73	BLK	0.000
ITMP	Instrument Temperature	2.73	BLK	0.000
TCVA	Temperature Correction Values Loop Off	2.73	NO	
TIDV	Instrument Temperature Derivative	2.73	NO	
TUDV	Upper Temperature Derivative	2.73	NO	

TLDV	Lower Temperature Derivative	2.73	NO	
TRBD	Receiver Board Temperature	2.73	NO	

SDLT Pad				
TPUL	Tension Pull	53.52	NO	
NAB	Near Above	53.35	BLK	0.920
NHI	Near Cesium High	53.35	BLK	0.920
NLO	Near Cesium Low	53.35	BLK	0.920
NVA	Near Valley	53.35	BLK	0.920
NBA	Near Barite	53.35	BLK	0.920
NDE	Near Density	53.35	BLK	0.920
NPK	Near Peak	53.35	BLK	0.920
NLI	Near Lithology	53.35	BLK	0.920
NBAU	Near Barite Unfiltered	53.35	BLK	0.250
NLIU	Near Lithology Unfiltered	53.35	BLK	0.250
FAB	Far Above	53.70	BLK	0.250
FHI	Far Cesium High	53.70	BLK	0.250
FLO	Far Cesium Low	53.70	BLK	0.250
FVA	Far Valley	53.70	BLK	0.250
FBA	Far Barite	53.70	BLK	0.250
FDE	Far Density	53.70	BLK	0.250
FPK	Far Peak	53.70	BLK	0.250
FLI	Far Lithology	53.70	BLK	0.250
PTMP	Pad Temperature	53.53	BLK	0.920
NHV	Near Detector High Voltage	52.93	NO	
FHV	Far Detector High Voltage	52.93	NO	
ITMP	Instrument Temperature	52.93	NO	
DDHV	Detector High Voltage	52.93	NO	

Microlog Pad				
TPUL	Tension Pull	53.72	NO	
MINV	Microlog Lateral	53.72	BLK	0.750
MNOR	Microlog Normal	53.72	BLK	0.750

Data: HAMMER 19-6\0001 SP GTET DSN SDL XPML ACRT BN\006 18-Sep-13 04:08 Up @5708.3f Date: 18-Sep-13 05:44:57

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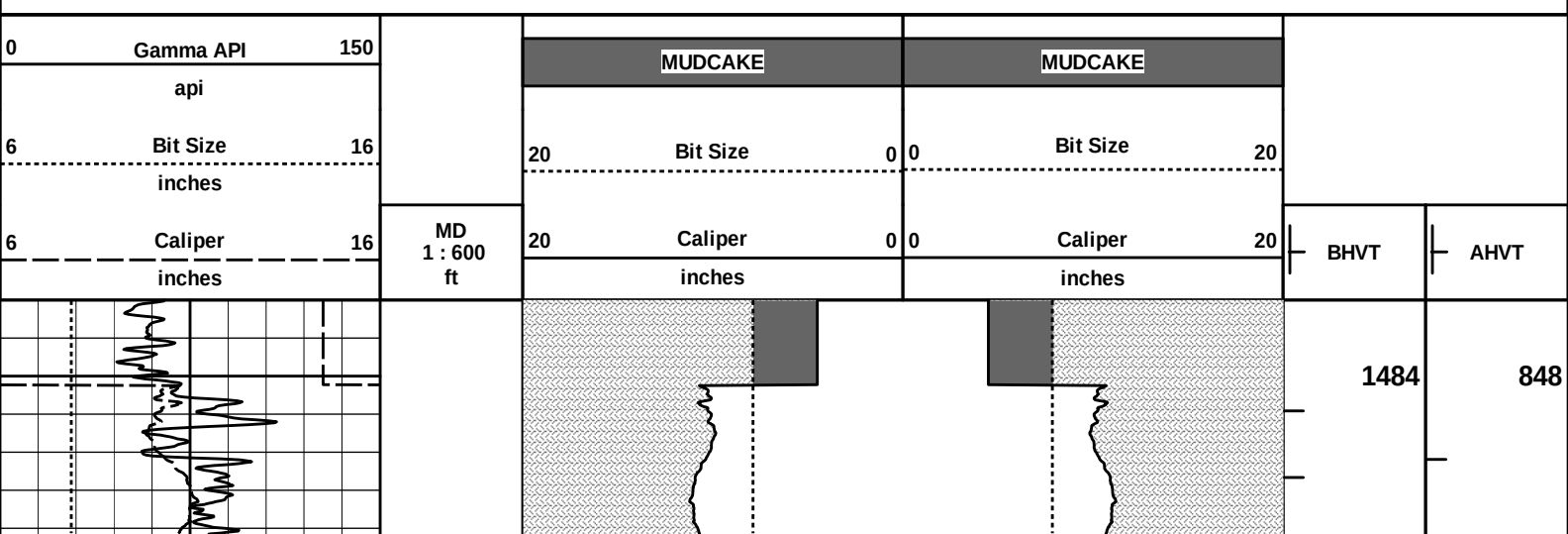
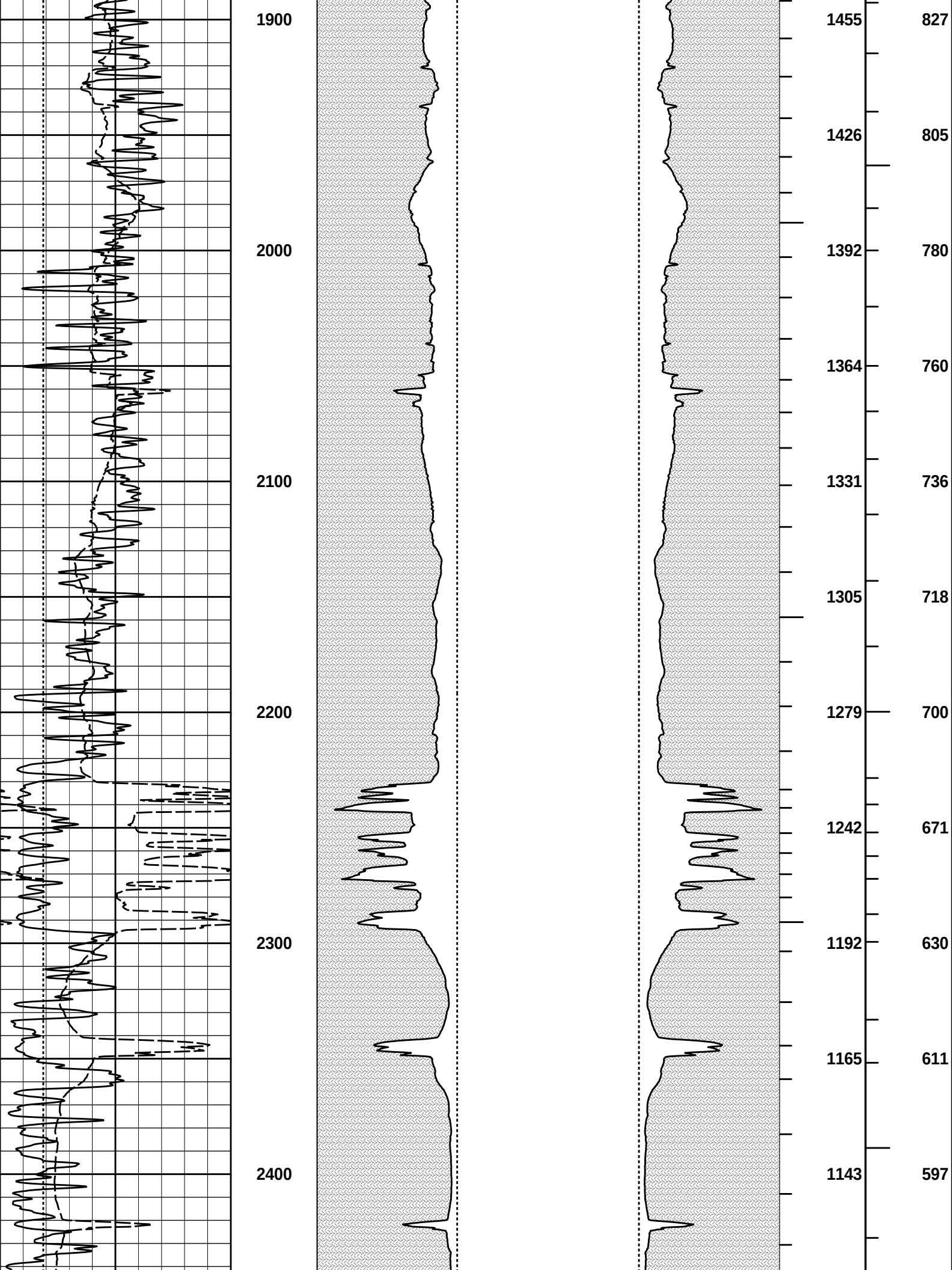
Plot Time: 18-Sep-13 06:26:01
Plot Range: 1830 ft to 5707.83 ft
Data: HAMMER 19-6\Well Based\R1 CASING
Plot File: \\-LOCAL-\HAMMER 19-6\Well Based\POROSITY\AHV_2_IQ_LIB

ANNULAR HOLE VOLUME PLOT




1900
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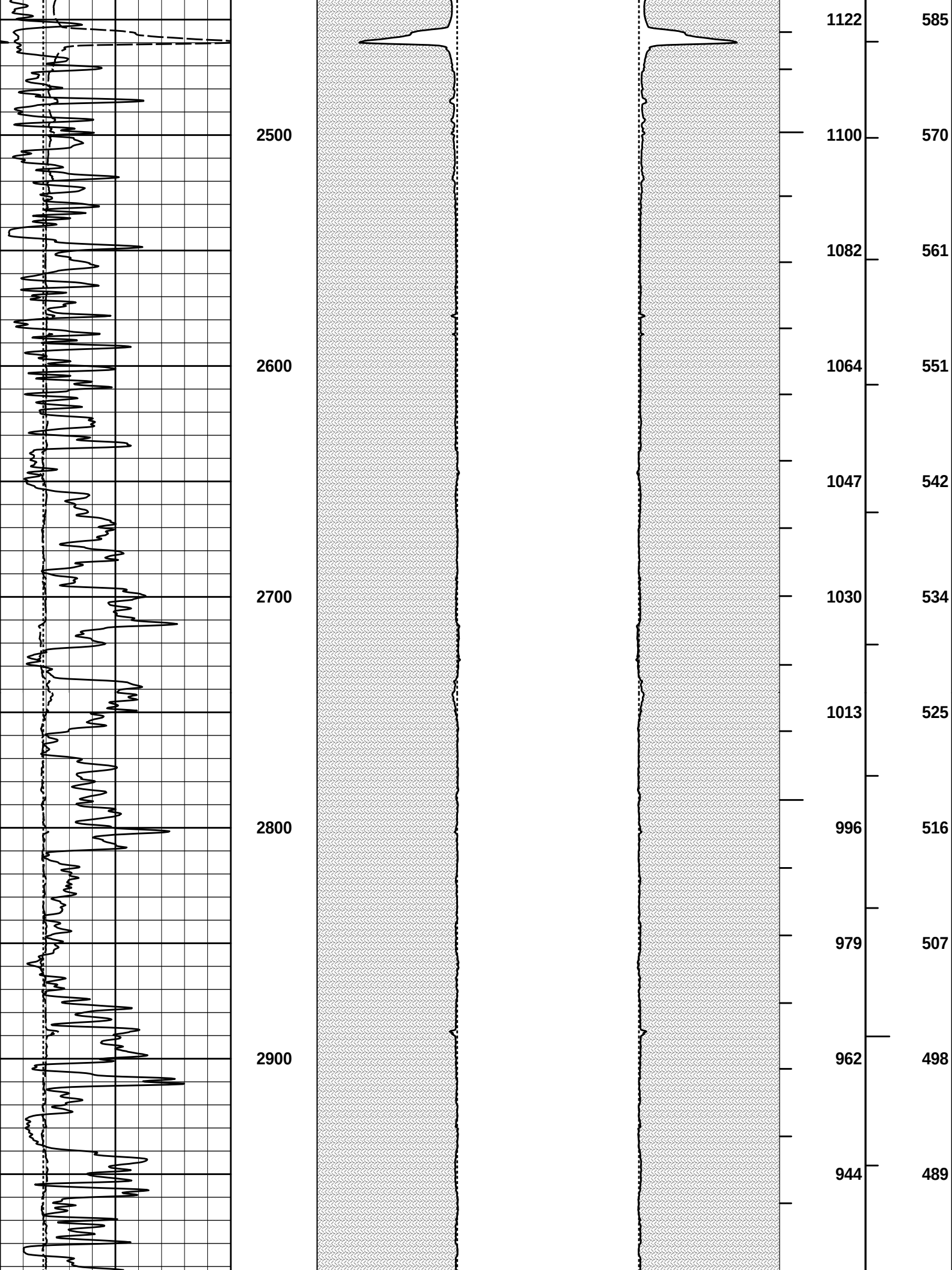
827
805
780
760
736
718
700
671
630
611
597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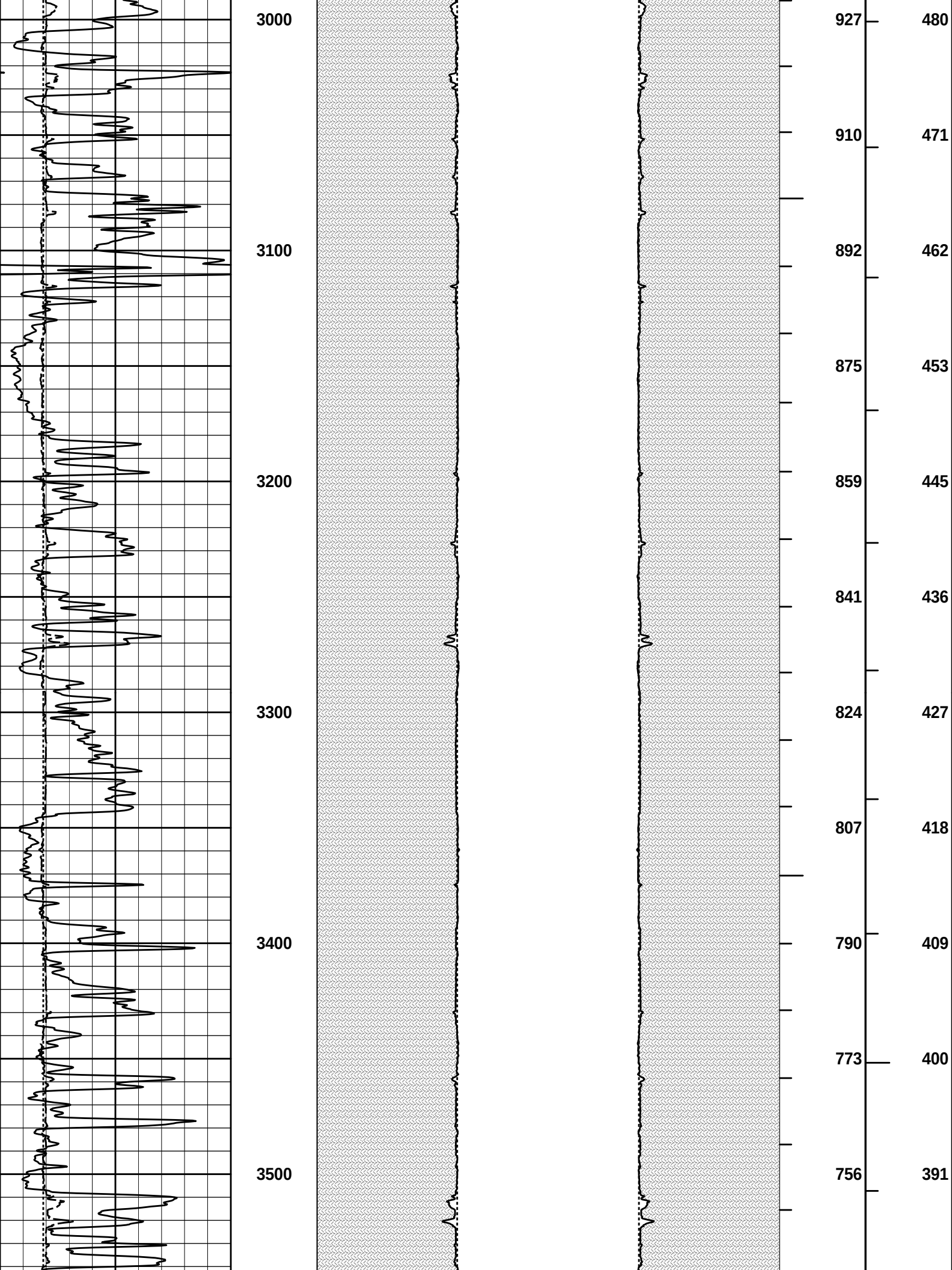
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3100
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3400
3500
927
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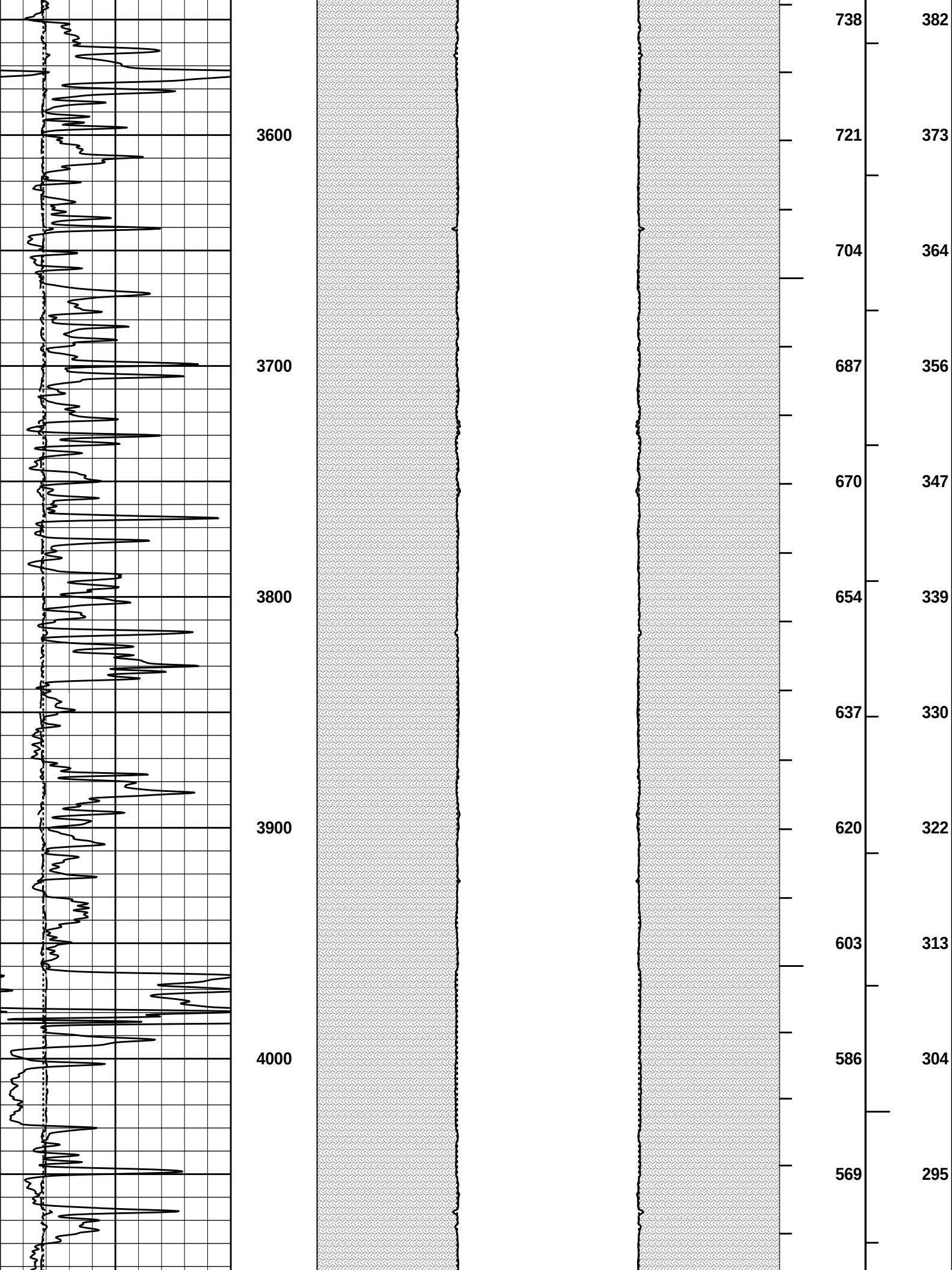
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3700
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3900
4000
738
721
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687
670
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620
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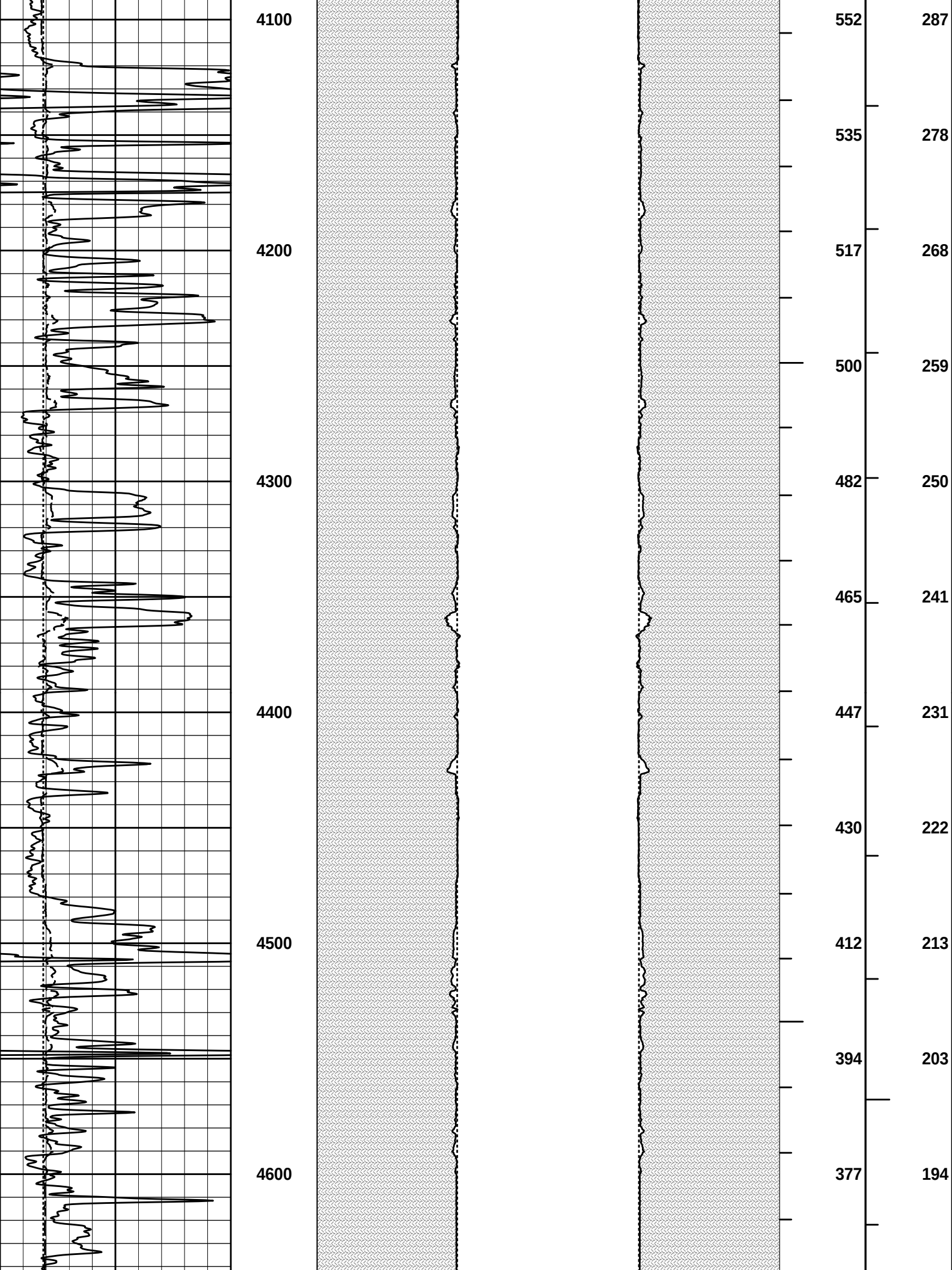
304
295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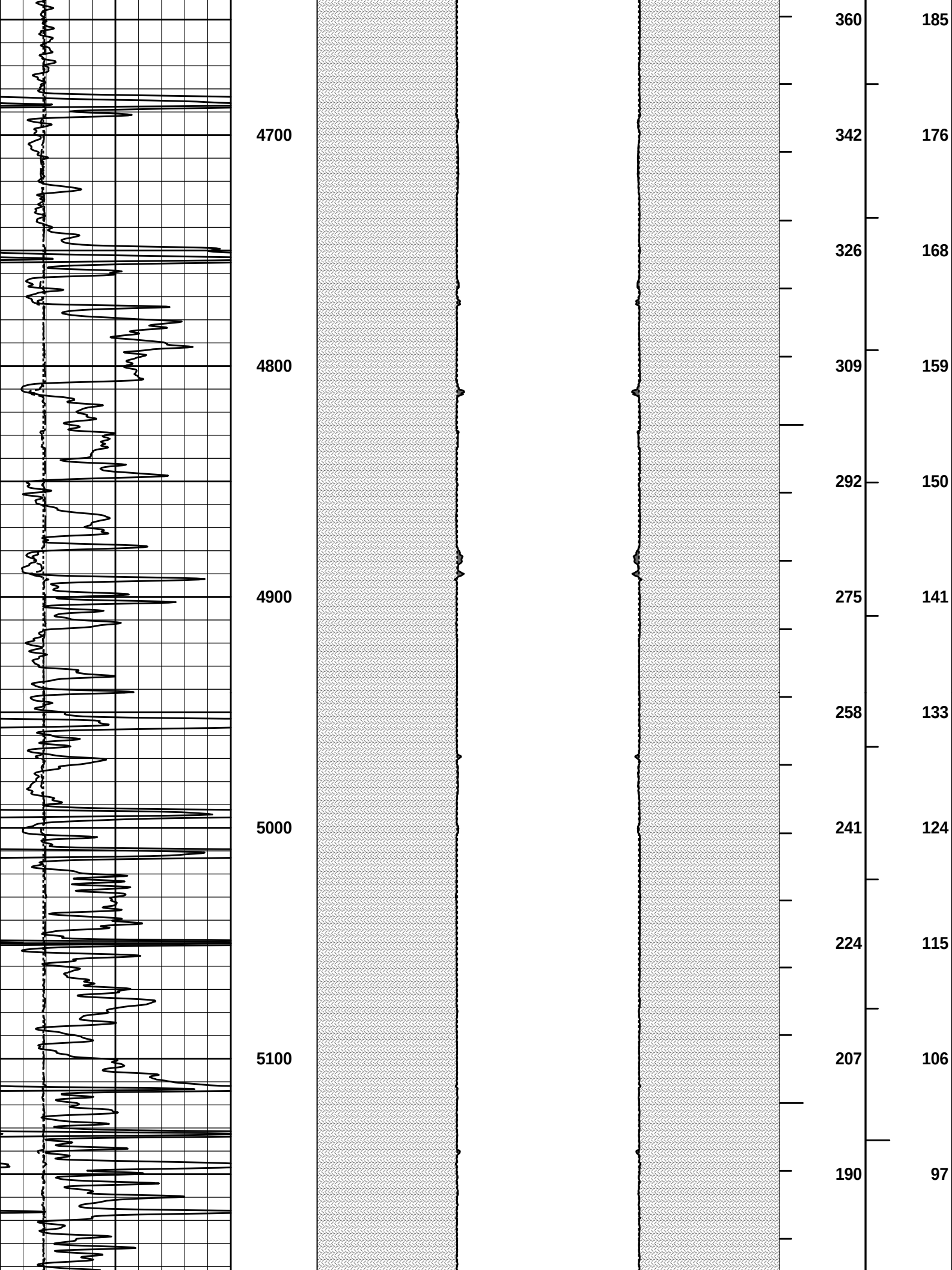
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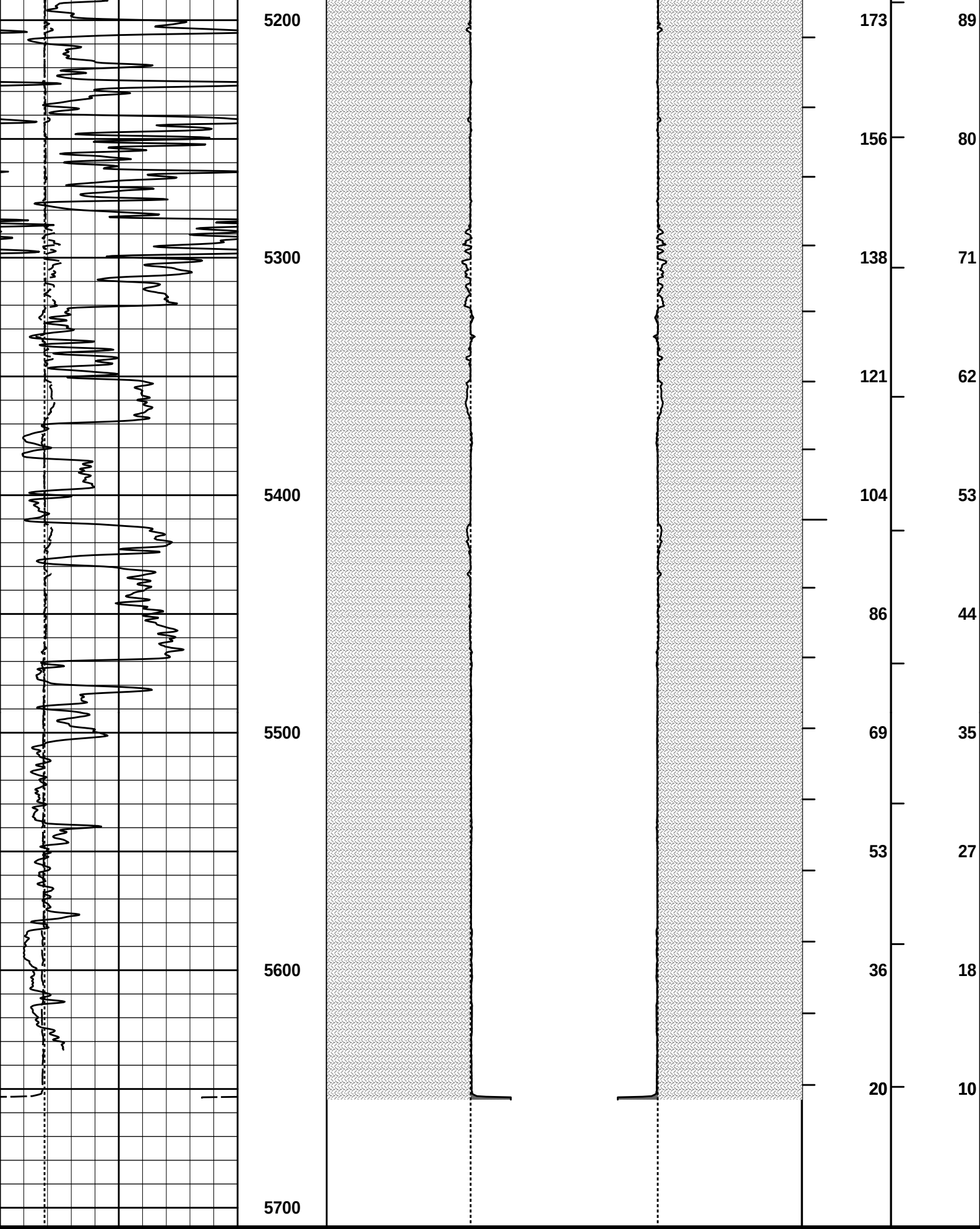
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53
36
20
89
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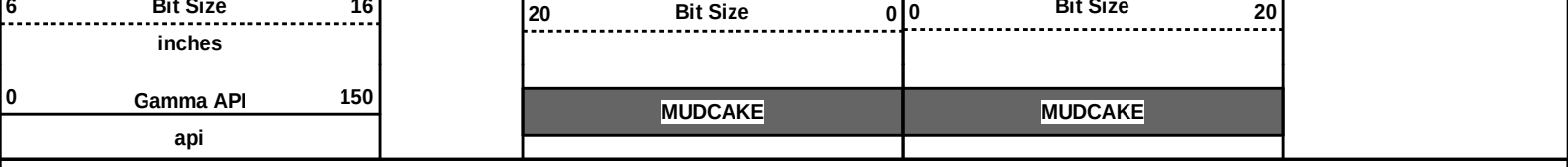
71
62
53
44
35
27
18
10
6
Caliper
16
inches
MD
1 : 600
ft
20
Caliper
0
inches
0
Caliper
20
inches
BHVT
AHVT



HALLIBURTON

Plot Time: 18-Sep-13 06:26:18
Plot Range: 1830 ft to 5707.83 ft
Data: HAMMER 19-6\Well Based\R1 CASING
Plot File: \\-LOCAL-\HAMMER 19-6\Well Based\POROSITY\AHV_2_IQ_LIB

ANNULAR HOLE VOLUME PLOT

COMPANY	**CIMAREX ENERGY CO.**		
WELL	**HAMMER 19-6**		
FIELD	**LETTE**		
COUNTY	**HASKELL**	STATE	**KANSAS**

HALLIBURTON

DUAL SPACED NEUTRON
SPECTRAL DENSITY
LOG