

Company: Noble Energy Inc

Well: NCLP AA06-67-1AHNA

Field: Wattenberg

County: Weld State: Colorado

## Ultrasonic Imager

## CO State

## Gamma Ray - CCL Log

County: Weld  
Field: Wattenberg  
Location: NWNW Sec. 4, T6N, R63W  
Well: NCLP AA06-67-1AHNA  
Company: Noble Energy Inc

Location:		Elev.:		K.B.	
NWNW Sec. 4, T6N, R63W		Elev.:		4745.00 ft	
SHL: 847' FNL X 100' FWL		G.L.		4715.00 ft	
D.F.		4744.00 ft			
Permanent Datum:		Ground Level		Elev.: 4715.00 f	
Log Measured From:		Kelly Bushing		30.00 ft	
Drilling Measured From:		Kelly Bushing		above Perm.Datum	
API Serial No.	Section:	Township:		Range:	
05-123-39035-0000	4	6N		63W	

Logging Date	10-Jun-2014	
Run Number	Run 1: USIT	
Depth Driller	16390.00 ft	
Schlumberger Depth	16390.00 ft	
Bottom Log Interval	6812.00 ft	
Top Log Interval		
Casing Fluid Type	Brine	
Salinity		
Density	8.4 lbm/gal	
Fluid Level	0.00 ft	
BIT/CASING/TUBING STRING		
Bit Size	8.75 in	
From	0.00 ft	
To	16390.00 ft	
Casing/Tubing Size	7 in	
Weight	26 lbm/ft	
Grade	P110	
From	0.00 ft	
To	6989.00 ft	
Max Recorded Temperatures		
Logger on Bottom	Time	
Unit Number	Location:	
Recorded By		
Witnessed By		

## Disclaimer

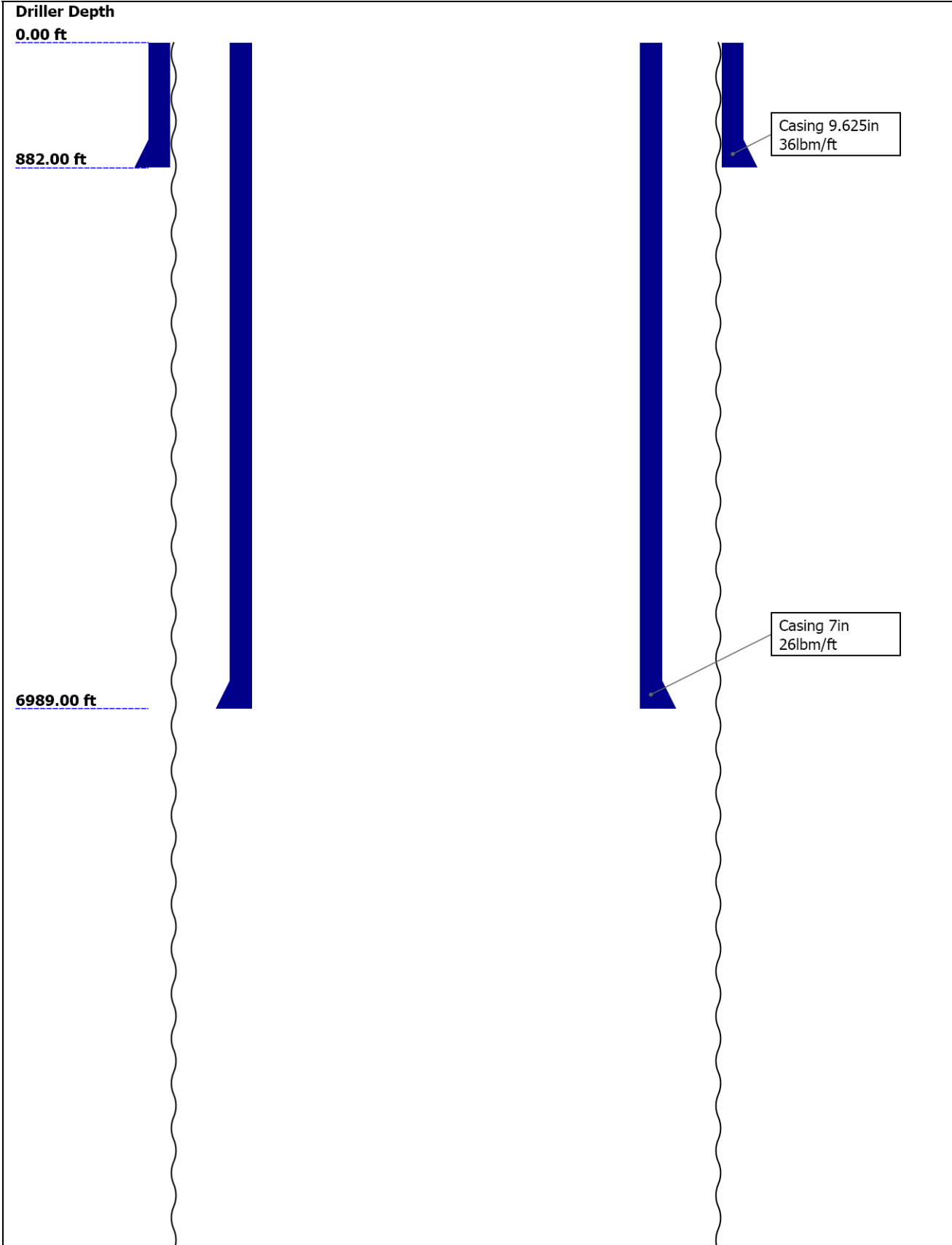
THE USE OF AND RELIANCE UPON THIS RECORDED-DATA BY THE HEREIN NAMED COMPANY (AND ANY OF ITS AFFILIATES, PARTNERS, REPRESENTATIVES, AGENTS, CONSULTANTS AND EMPLOYEES) IS SUBJECT TO THE TERMS AND CONDITIONS AGREED UPON BETWEEN SCHLUMBERGER AND THE COMPANY, INCLUDING: (a) RESTRICTIONS ON USE OF THE RECORDED-DATA; (b) DISCLAIMERS AND WAIVERS OF WARRANTIES AND REPRESENTATIONS REGARDING COMPANY'S USE AND RELIANCE UPON THE RECORDED-DATA; AND (c) CUSTOMER'S FULL AND SOLE RESPONSIBILITY FOR ANY INFERENCE DRAWN OR DECISION MADE IN CONNECTION WITH THE USE OF THIS RECORDED-DATA.

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Well Sketch





Borehole Size/Casing/Tubing Record						
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Bit						
Bit Size ( in )	8.75					
Top Driller ( ft )	0					
Top Logger ( ft )	0					
Bottom Driller ( ft )	16390					
Bottom Logger ( ft )	16390					
Casing						
Size ( in )	9.625	7				
Weight ( lbm/ft )	36	26				
Inner Diameter ( in )	8.921	6.276				
Grade	J55	P110				
Top Driller ( ft )	0	0				
Top Logger ( ft )	0	0				
Bottom Driller ( ft )	882	6989				
Bottom Logger ( ft )	882	6989				

Operational Run Summary						
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Parameter ( unit )	Run1: USIT					
Date Log Started	10-Jun-2014					
Time Log Started	08:01:04					
Date Log Finished	10-Jun-2014					
Time Log Finished	11:45:55					
Top Log Interval ( ft )	NaN					
Bottom Log Interval ( ft )	6812.00					
Total Depth ( ft )	16390.00					
Max Hole Deviation ( deg )	68.33					
Azimuth of Max Deviation ( deg )	264.96					
Bit Size ( in )	8.750					
Logging Unit Number	3022					
Logging Unit Location	Ft. Morgan, CO					
Recorded By	Tim Hoffman					
Witnessed By	Kelli Hale					
Service Order Number	CX03-00051					

Remarks and Equipment Summary

Run1: USIT: Toolstring			Run1: USIT: Remarks	
<div><div><div>Equip name Length</div><div>LEH-QT:31 32.75</div><div>23</div><div>LEH-QT:3123</div></div><div><div>DTC-H:938 29.84</div><div>6</div><div>ECH-KC:1047</div><div>2</div><div>DTC-H:9386</div></div><div><div>SGT-N:984 26.84</div><div>1</div><div>SGH-K:2693</div><div>SGC-TB:9841</div><div>SGD-TAA:213</div><div>65</div></div><div><div>CME-AF 21.34</div></div><div><div>AH-184:39 17.54</div><div>18</div></div><div><div>USIT-E:977 15.54</div><div>ECH-MFA:19</div><div>69</div><div>USAC-A:977</div><div>USIS-A:2797</div><div>USSC-B:1730</div><div>USRS-B:938</div><div>USI-SENSOR</div></div><div><div><div>USI Sens 0.38</div><div>or</div><div>TOOL_ZERO</div><div>Head Pen</div><div>USI Sens 0.38</div></div><div>Lengths are in ft</div><div>Maximum Outer Diameter = 4.645 in</div><div>Line: Sensor Location, Value: Gating Offset</div><div>All measurements are relative to TOOL_ZERO</div></div></div> <div><div>MP name Offset</div><div>CTEM 28.94</div><div>HV 0.00</div><div>ToolStat 26.84</div><div>us 26.84</div><div>TelStatus 26.84</div><div>GR 25.92</div></div>	<div>This is the first run in hole</div>			
	<div>Toolstring run as per tool sketch</div>			
	<div>13.6 ppg ELASTICEM cement</div>			
	<div>0 PSI full pass</div>			
	<div>2500 PSI full pass</div>			
	<div>Top of cement: 500 ft</div>			
	<div>Crew: Troy Ocanas, Alonzo Carrera</div>			

Depth Summary

Run1: USIT			
Depth Measuring Device			
Type	IDW-B		
Serial Number			
Calibration Date			
Calibrator Serial Number			
Calibration Cable Type			

Wheel Correction 1	0		
Wheel Correction 2	0		
<b>Tension Device</b>			
Type	CMTD-B/A		
Serial Number			
Calibration Date			
Calibrator Serial Number			
Number of Calibration Points	0		
<b>Logging Cable</b>			
Type	7-46NT-XS		
Serial Number			
Length	24000.00 ft		
Conveyance Type	Wireline		
Rig Type			
<b>Run1: USIT:Depth Control Parameters</b>		<b>Depth Control Remarks</b>	
Log Sequence	First Log In the Well	All Schlumberger depth control policies followed	
Rig Up Length At Surface		IDW used as primary depth reference. Z-chart used as secondary	
Rig Up Length At Bottom			
Rig Up Length Correction			
Stretch Correction			
Tool Zero Check At Surface			

## Run1: USIT

## ND State Log

Software Version			
Acquisition System		Version	
MaxWell		4.0.9163.3000	
Application Patch		Patch-SP-10767_13393-4.0.9163.3001	
Computation	Description	Version	
Cementation	Cementation Computation Application	4.0.9167.3000	
Tool Elements	Description	Software Version	Firmware Version
USI-SENSOR	USIT Transducer Element	4.0.9265.3000	DSP: v01.82
SGC-TB	Scintillation Gamma Cartridge	4.0.9033.3000	

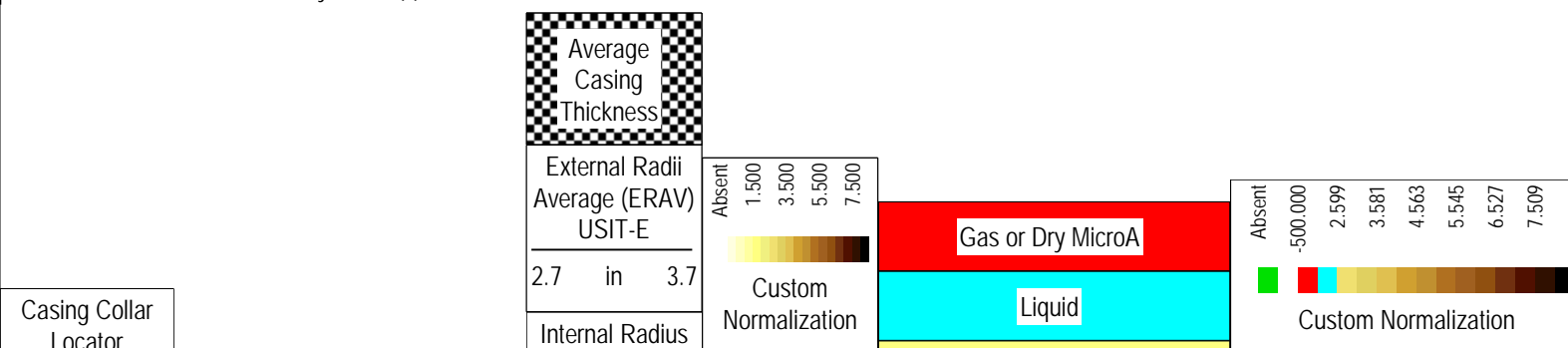
<b>Pass Summary</b>									
Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
Run1: USIT	Log[3]:Up	Up	61.20 ft	6825.58 ft	10-Jun-2014 10:38:20 AM	10-Jun-2014 11:45:20 AM	ON	8.33 ft	No

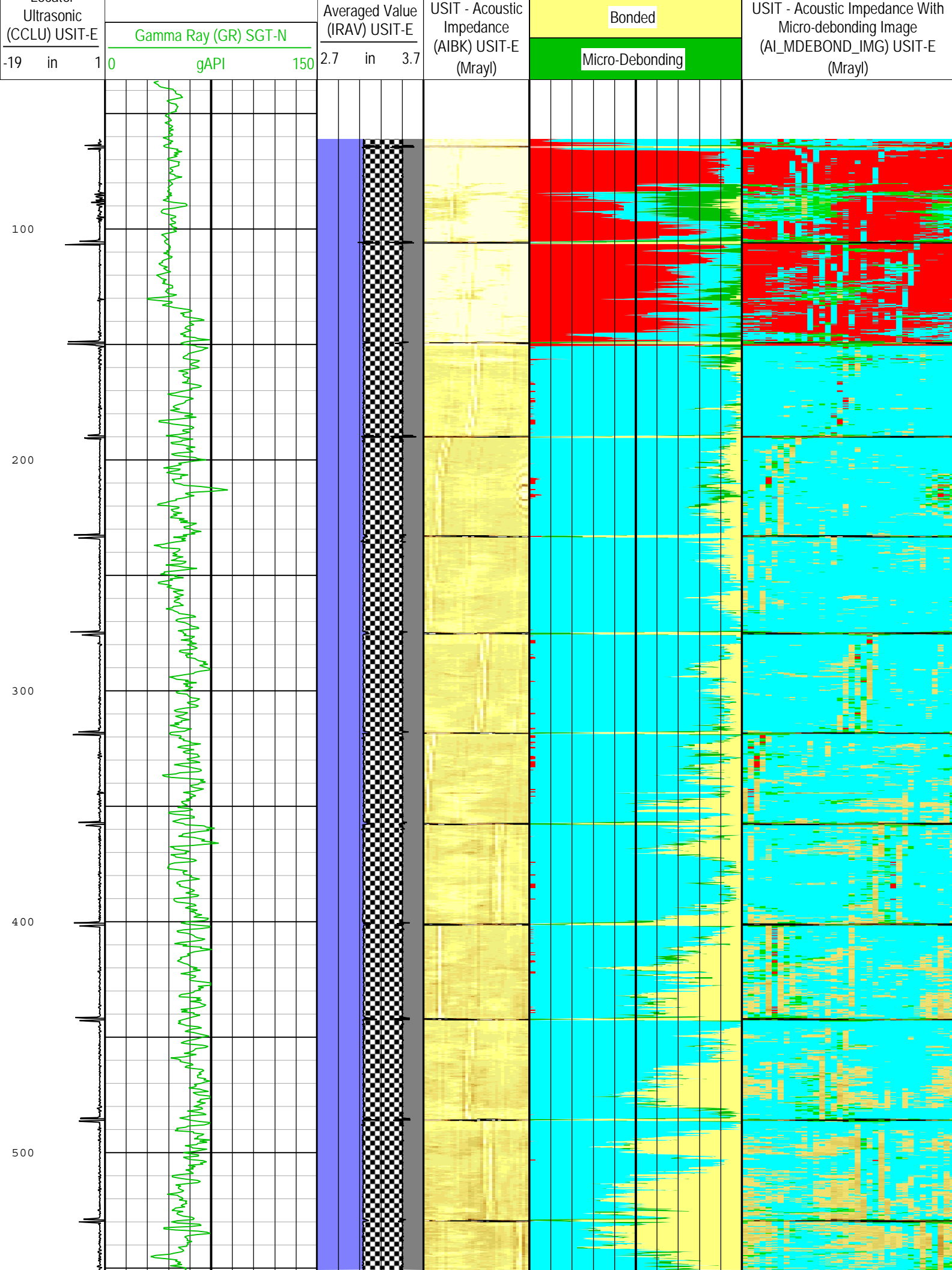
All depths are referenced to toolstring zero

<b>Log</b>	Company:Noble Energy Inc	Well:NCLP AA06-67-1AHNA
		Run1: USIT: Log[3]:Up:S003

Description: USI Corrosion   Format: Log ( ND State Only )   Index Scale: 2 in per 100 ft   Index Unit: ft   Index Type: Measured Depth   Creation Date: 10-Jun-2014 12:16:22

TIME\_1900 - Time Marked every 60.00 (s)





600

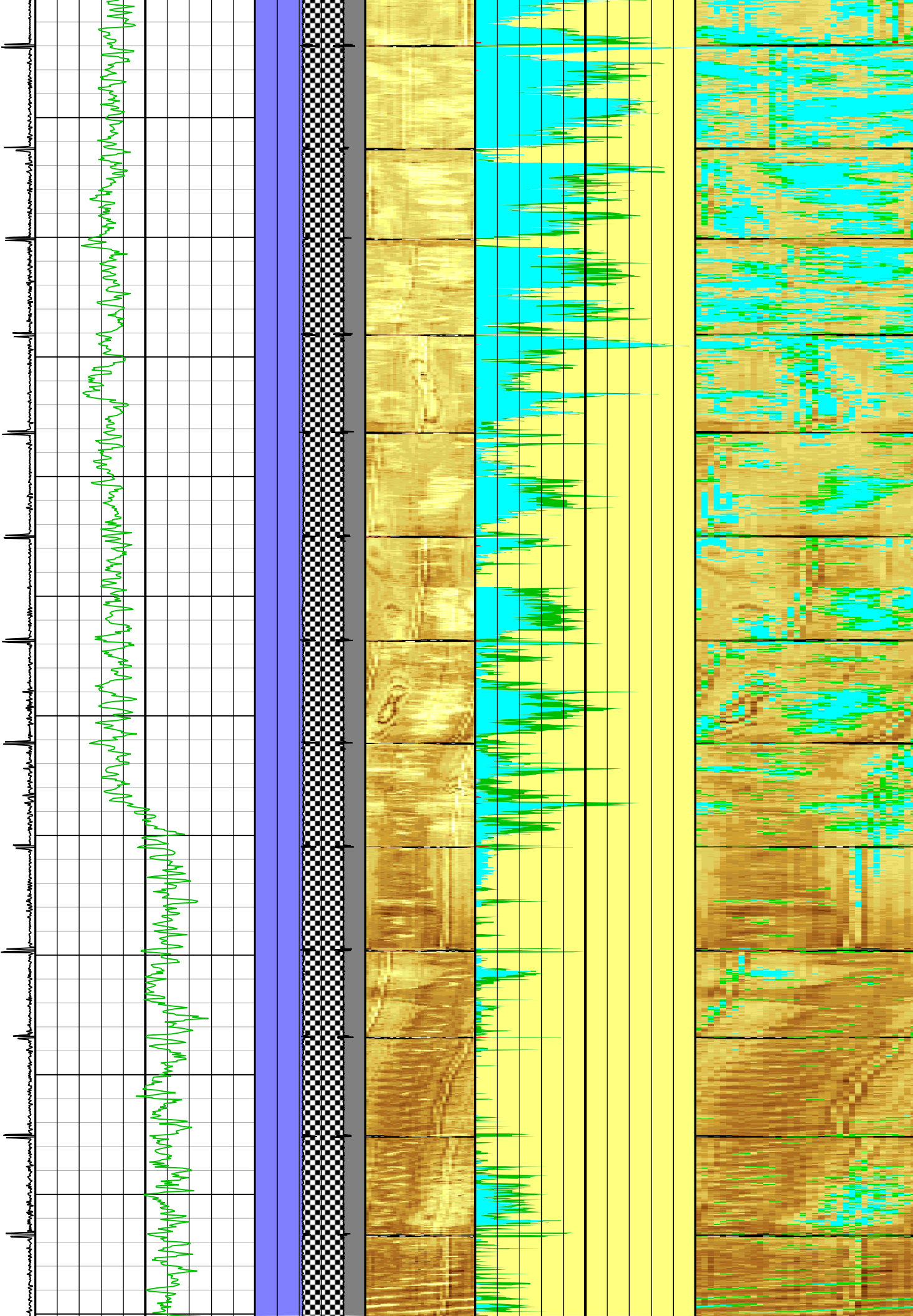
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800

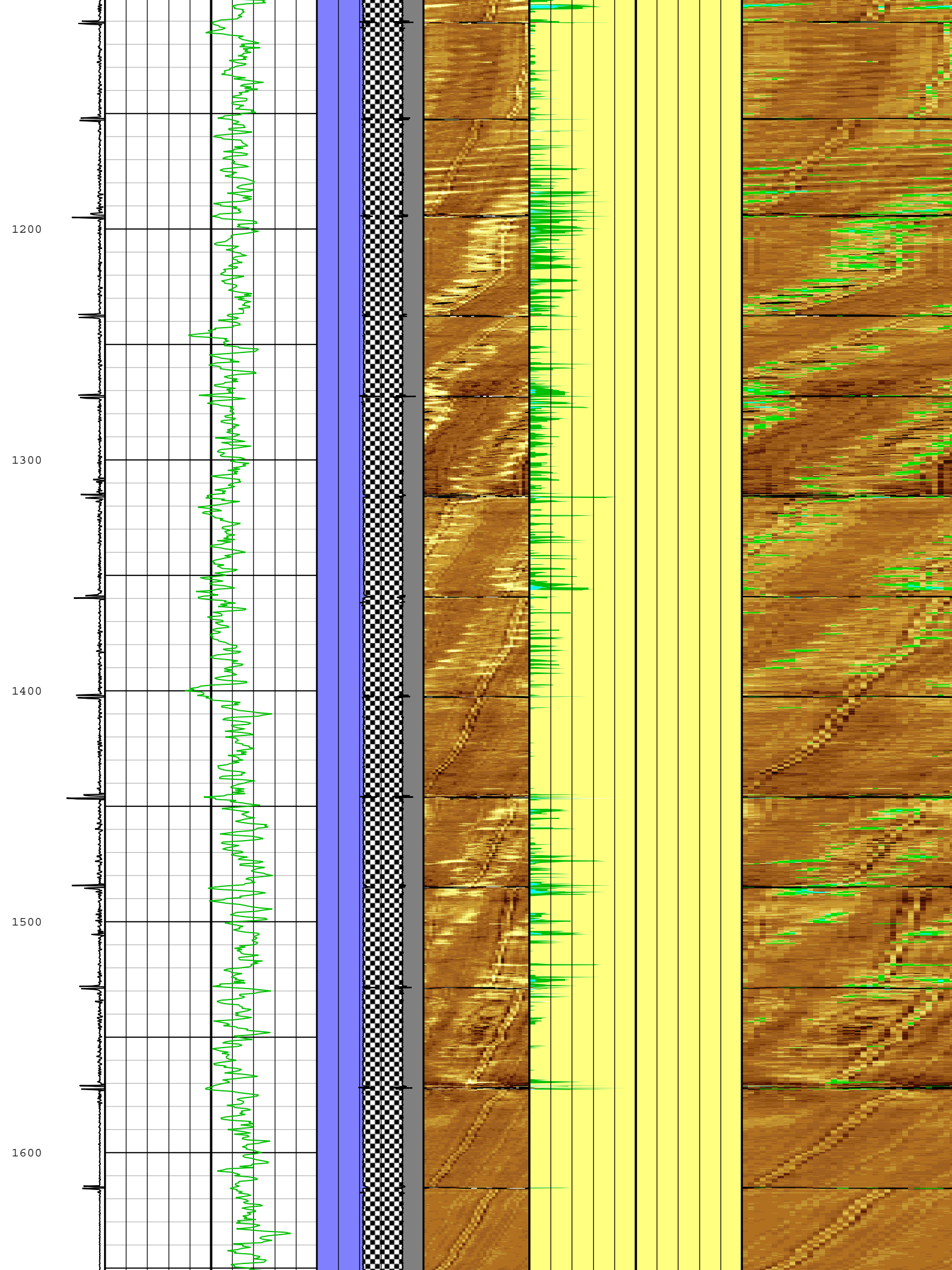
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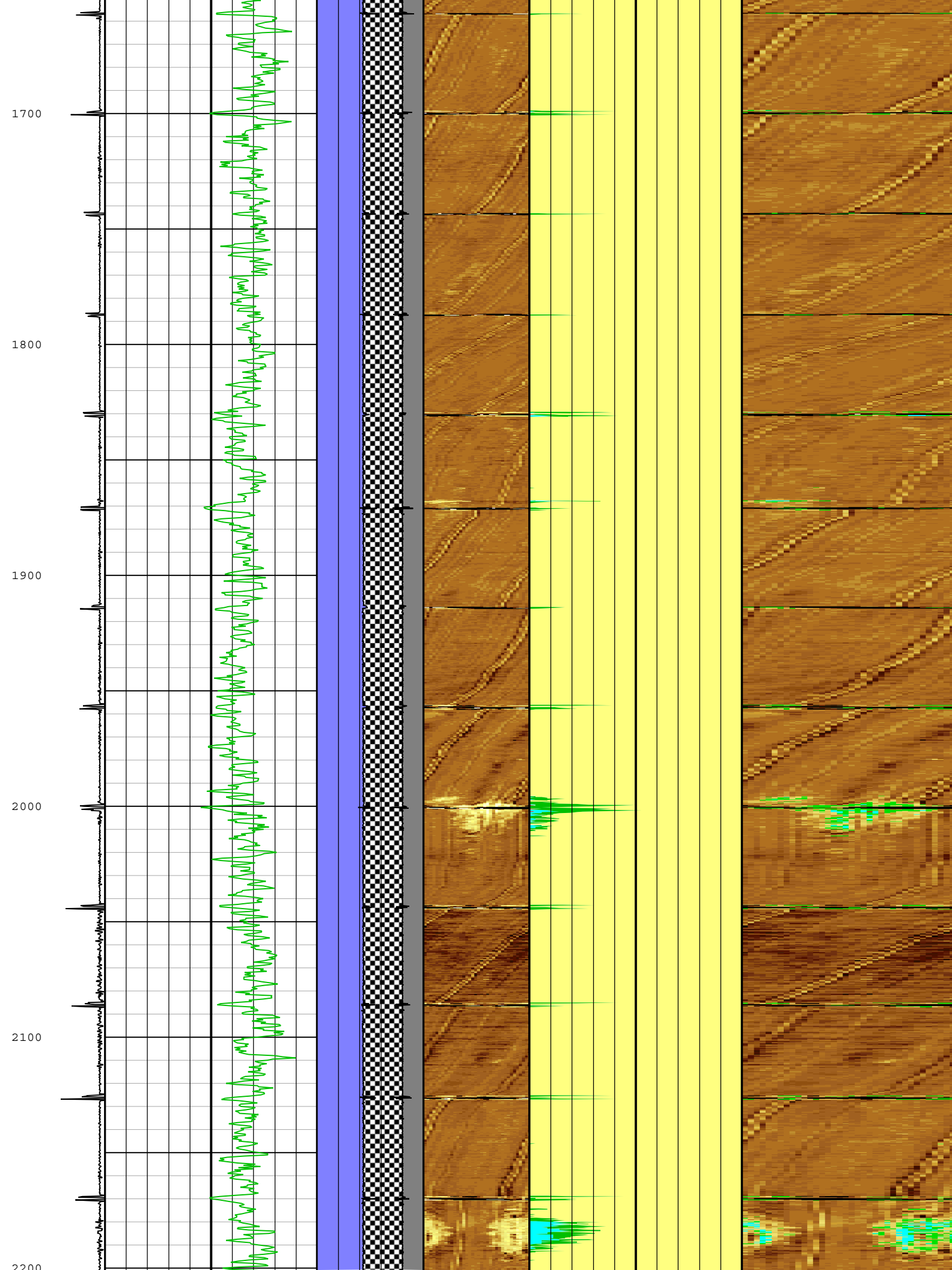
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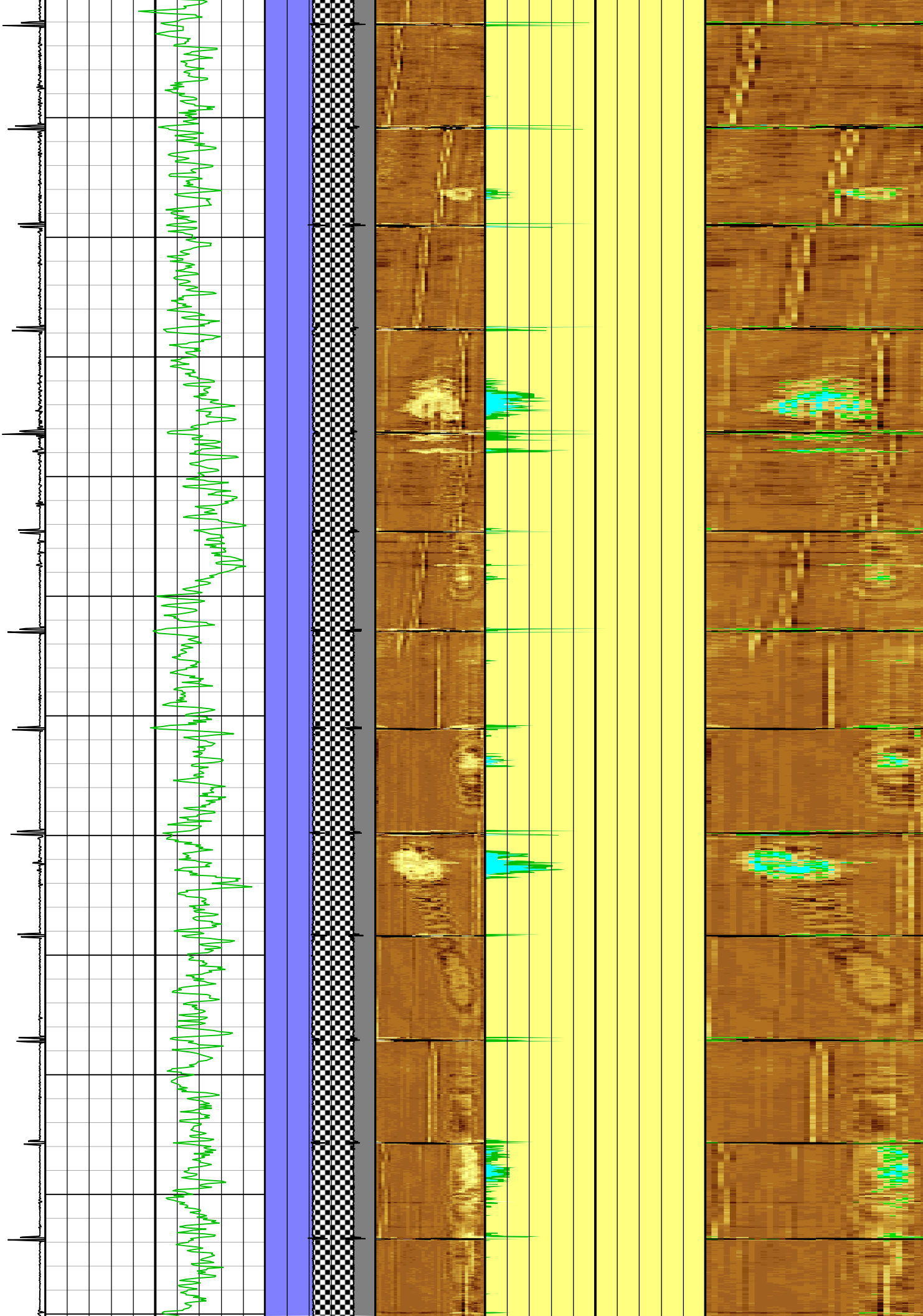
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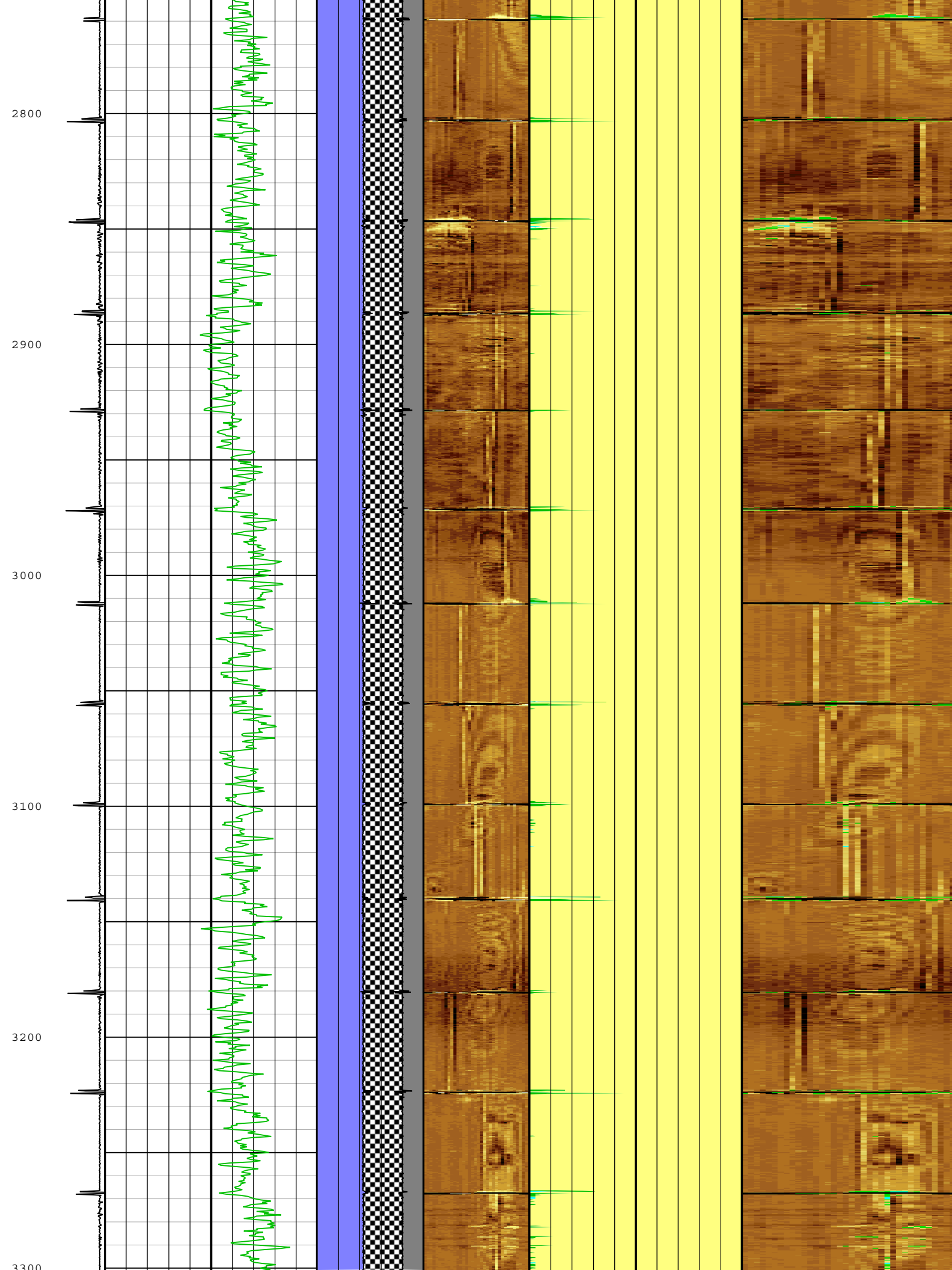
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2500

2600

2700





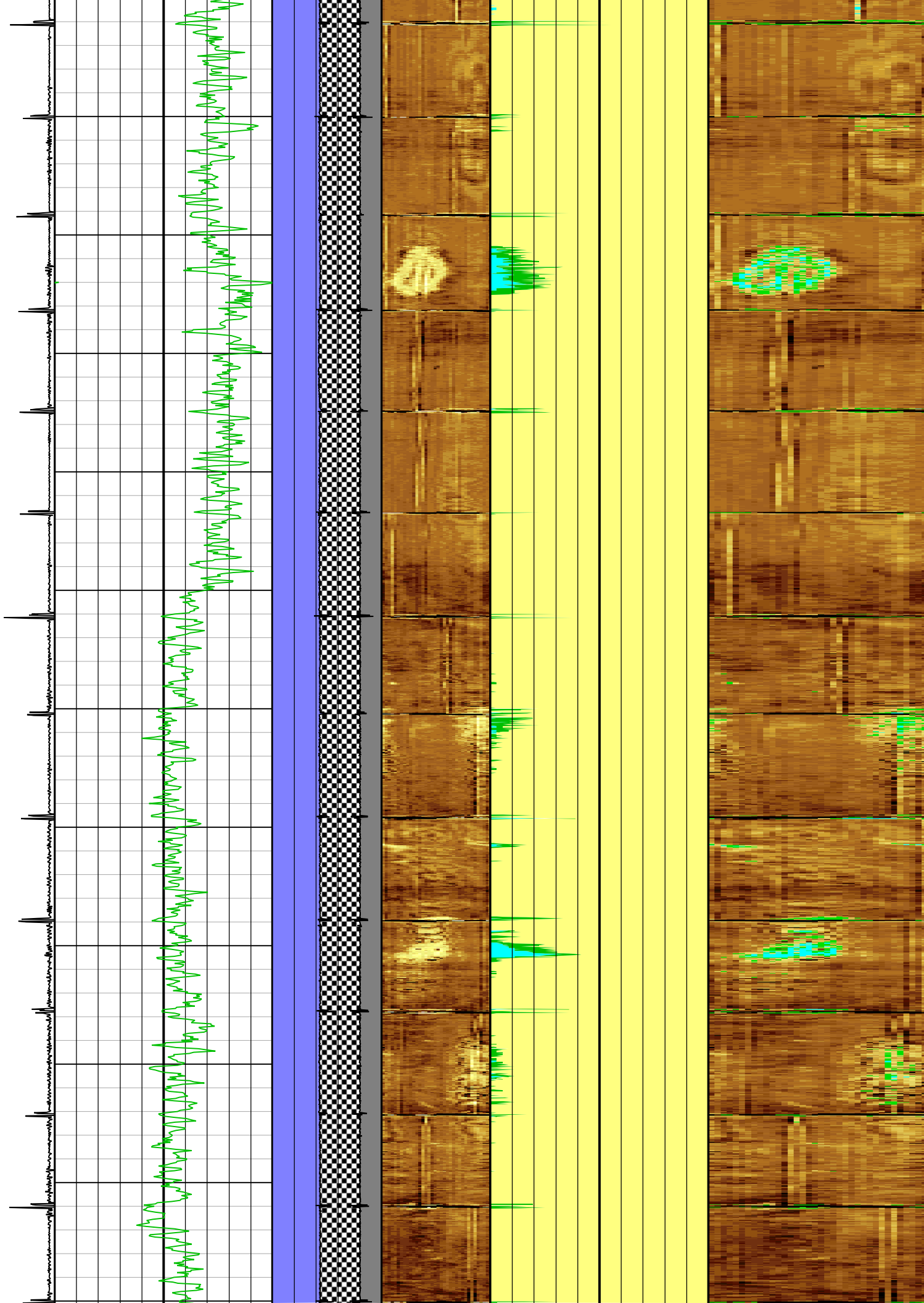
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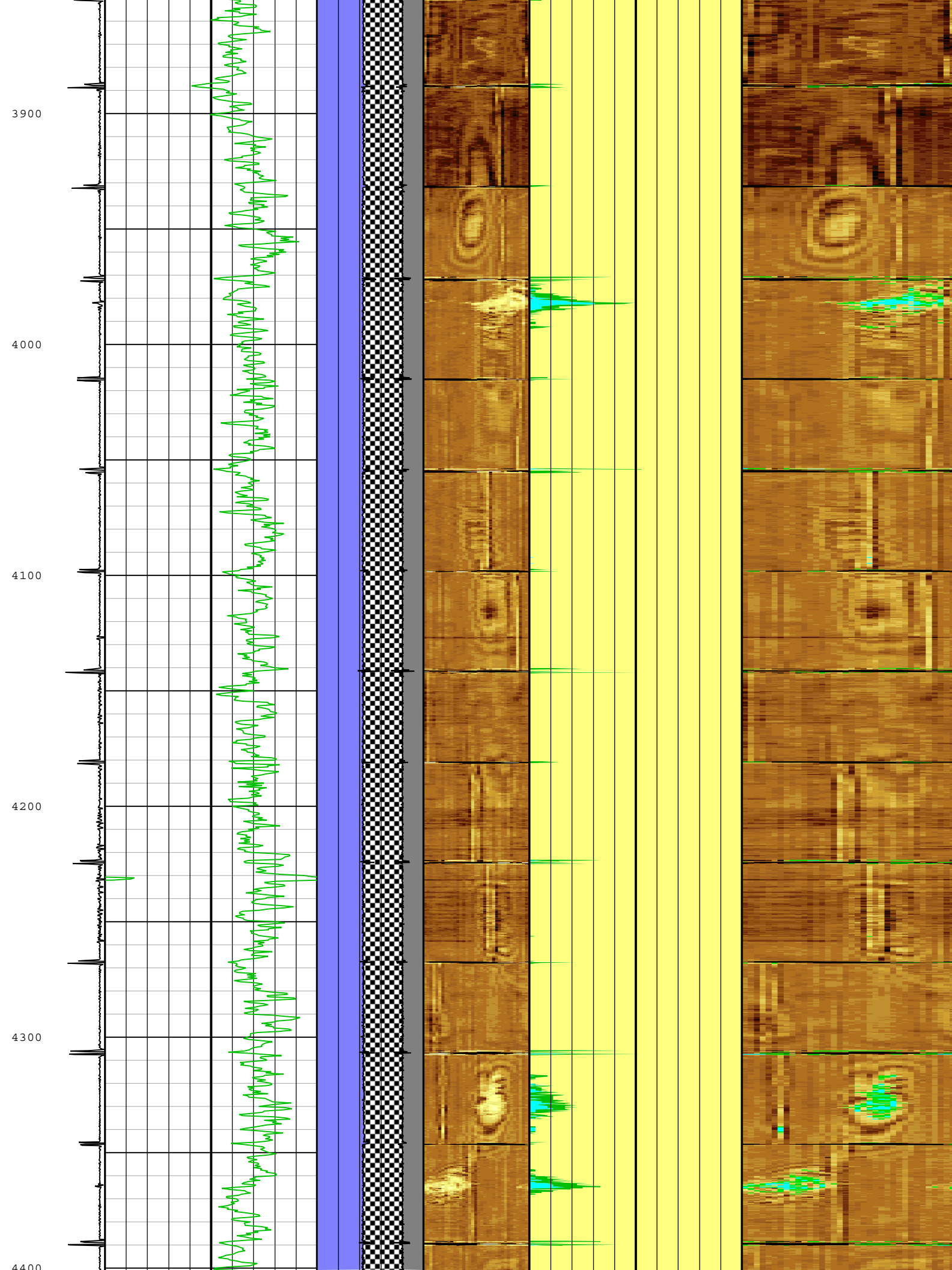
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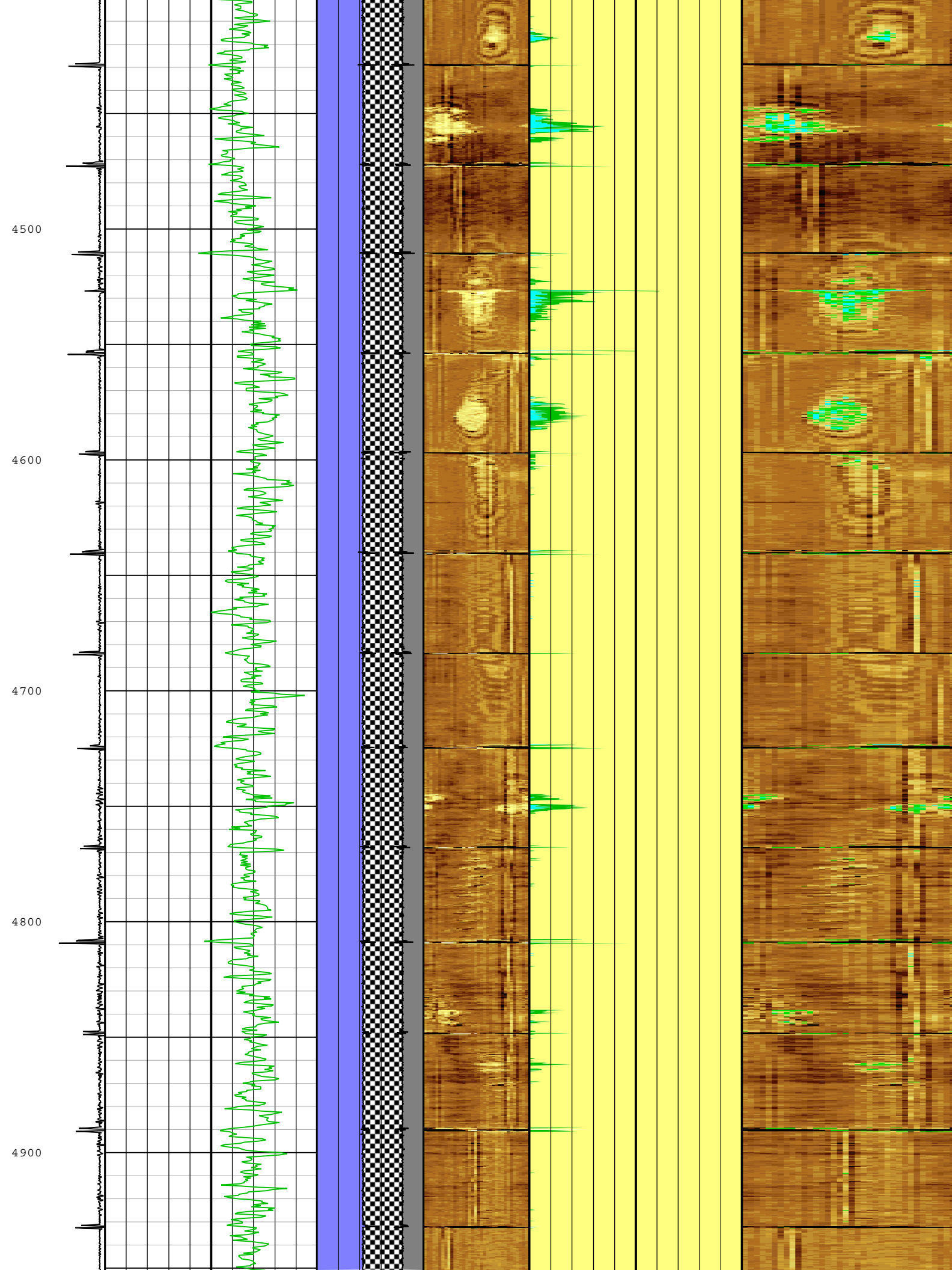
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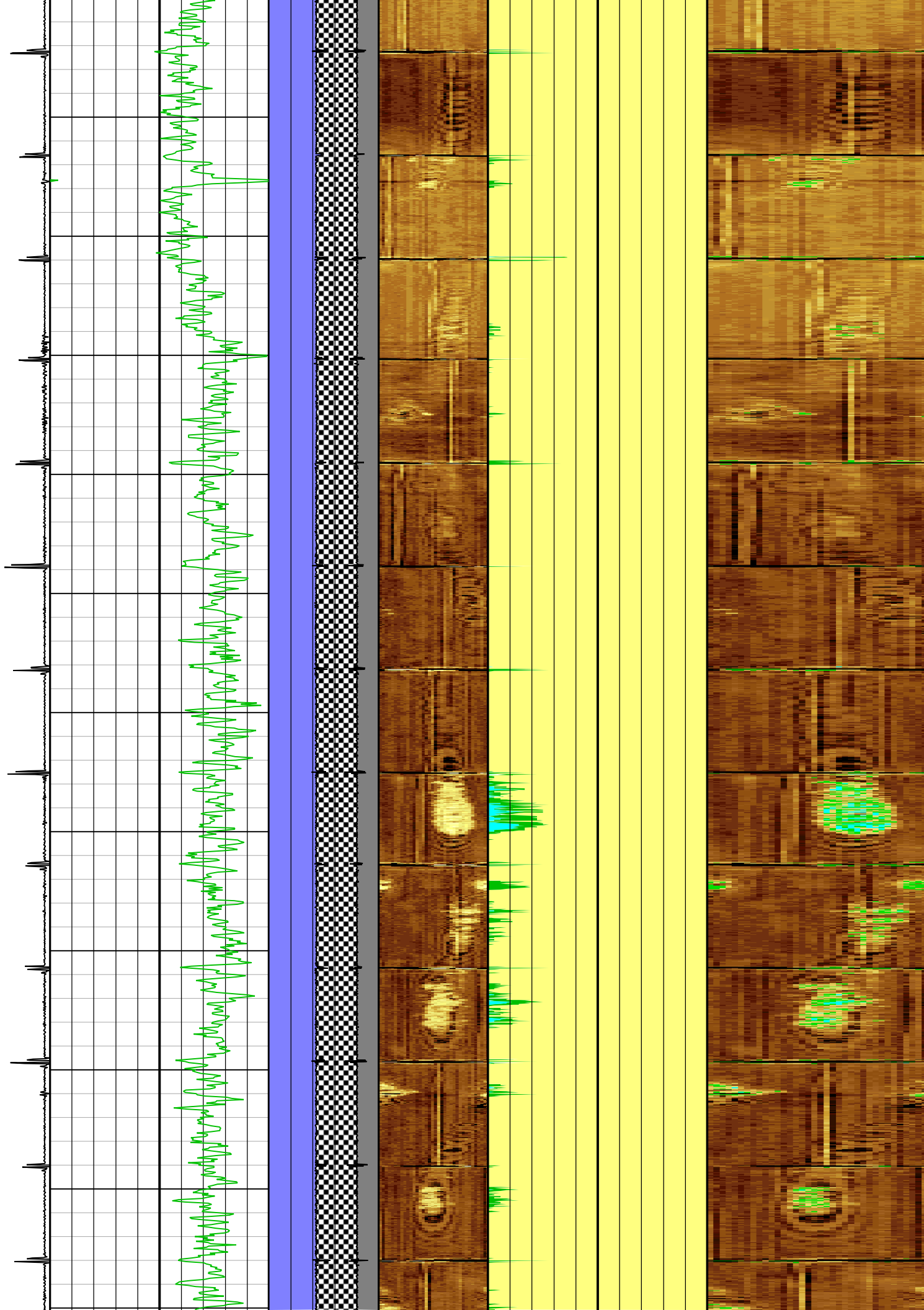
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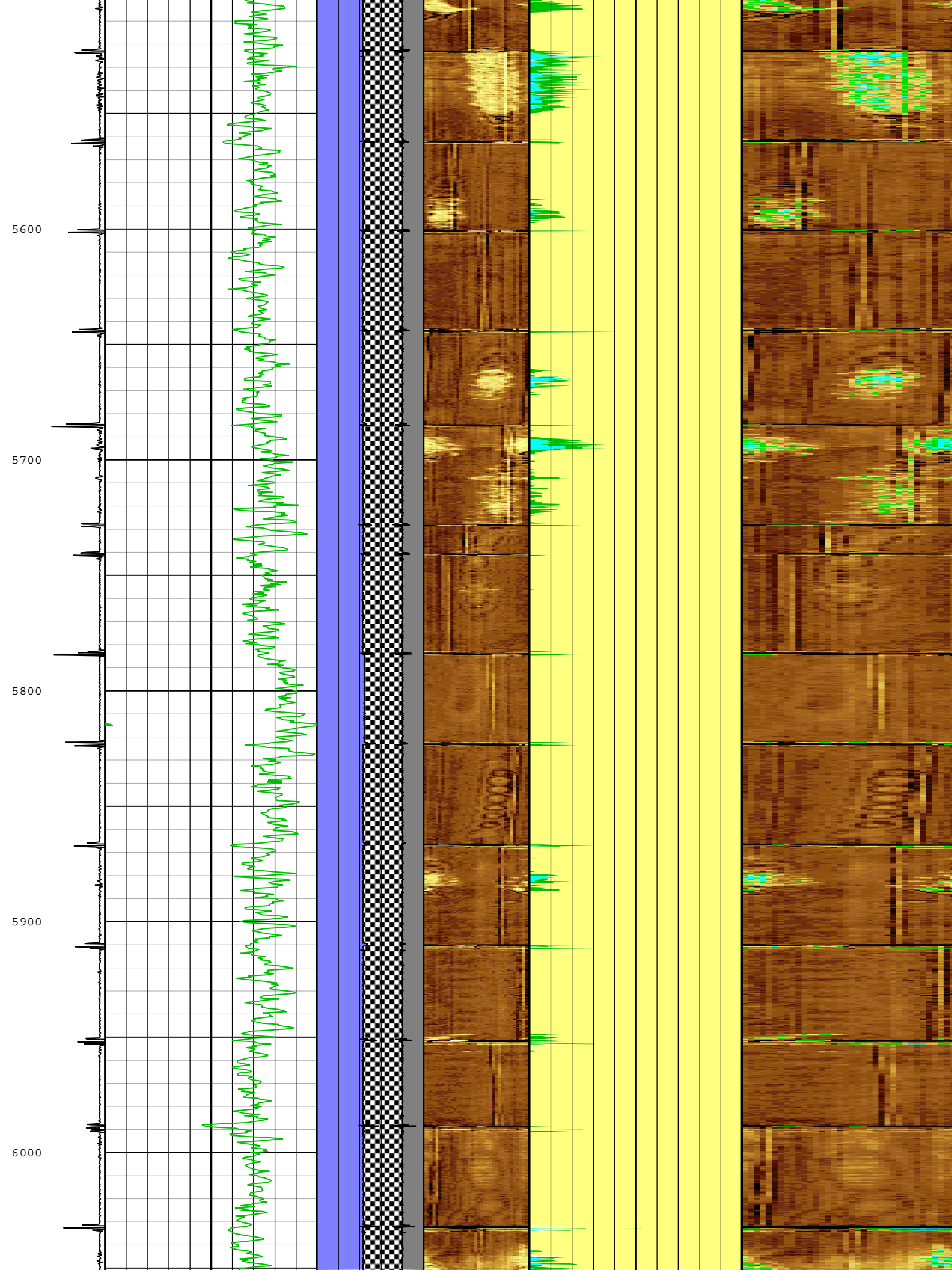
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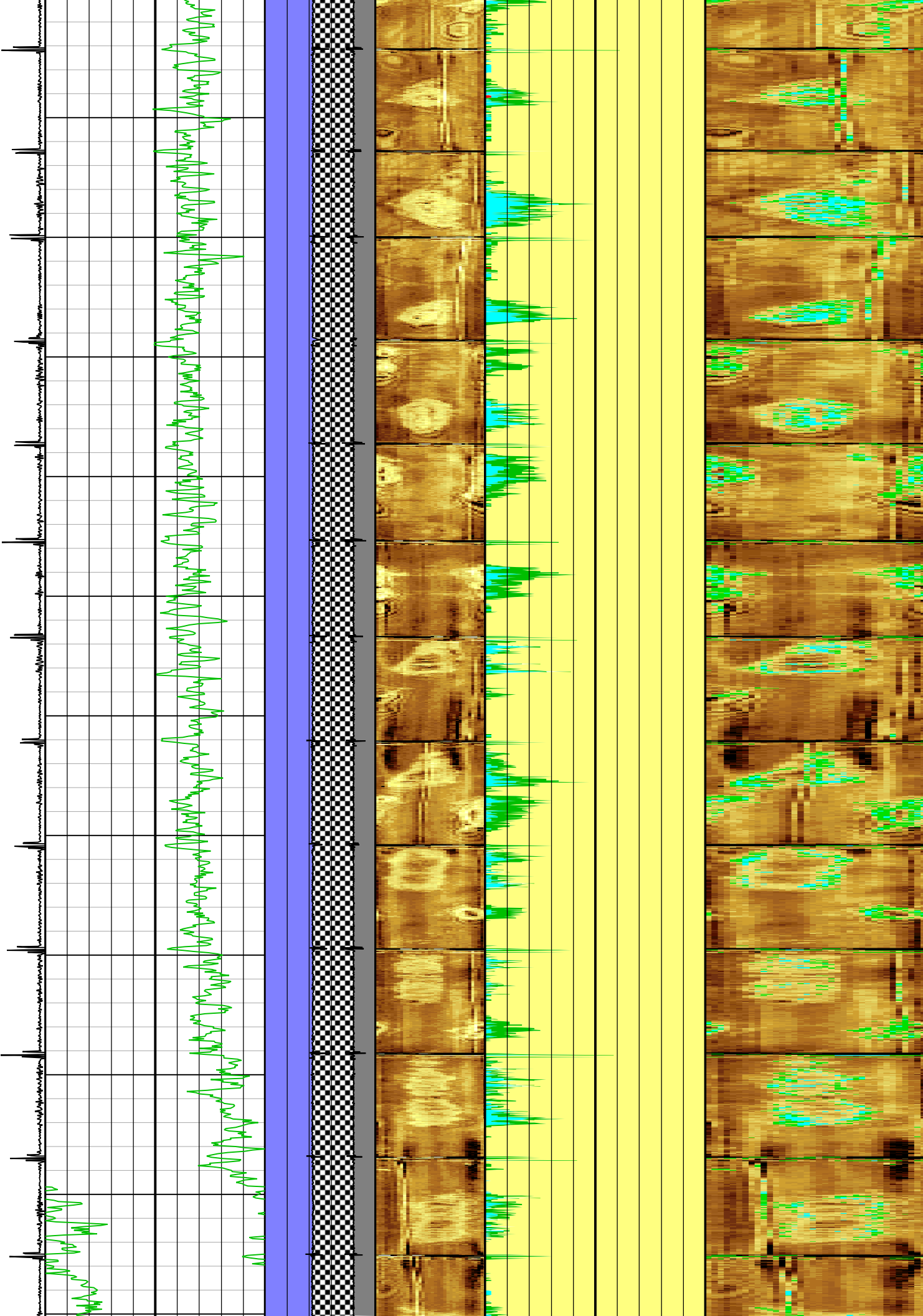
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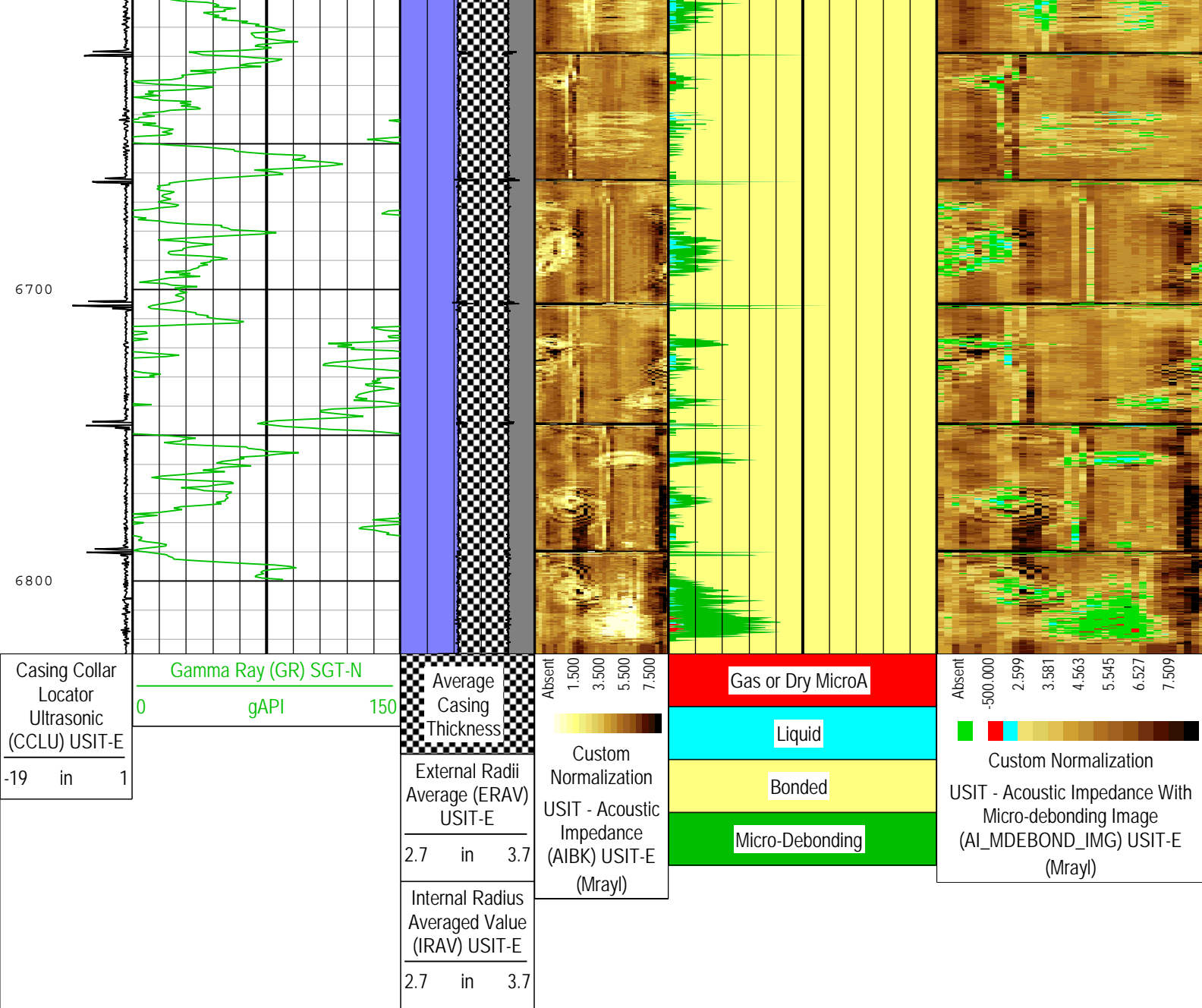
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6500

6600





Description: USI Corrosion Format: Log ( ND State Only ) Index Scale: 2 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 10-Jun-2014 12:16:22

Channel Processing Parameters				
Parameter	Description	Tool	Value	Unit
AFVU	Automatic Fluid Velocity Update	USIT-E	On	
BARI	Barite Mud Presence Flag	Borehole	No	
BERJ	Bad Echo Rejection	USIT-E	On	
BHS	Borehole Status (Open or Cased Hole)	Borehole	Cased	
BS	Bit Size	WLSESSION	8.75	in
CASING_PRATIO	Casing Poisson Ratio	USIT-E	Standard Poisson ratio	
CBLO	Casing Bottom (Logger)	WLSESSION	6989	ft
CDEN	Cement Density	SGT-N	16.69	lbm/gal
CMTY	Cement Type	USIT-E	Regular Cement	
CTHILGR	Nominal Casing Thickness - Zoned along logger depths	WLSESSION	0.352	in
DFD	Drilling Fluid Density	Borehole	8.4	lbm/gal
DFT	Drilling Fluid Type	Borehole	Water	
DTMD	Borehole Fluid Slowness	Borehole	190	us/ft
EDM	EDM Data	USIT-E	0	0

FDI	FPM Data Interpolation Interval	USIT-E	0	ft
GCSE_DOWN_PASS	Generalized Caliper Selection for WL Log Down Passes	Borehole	BS	
GCSE_UP_PASS	Generalized Caliper Selection for WL Log Up Passes	Borehole	BS	
GR_MULTIPLIER	Gamma Ray Multiplier	SGT-N	1	
HEMA	Hematite Presence Flag	Borehole	No	
ICE_PROCESS	ICE Processing	USIT-E	Yes	
IMAR	Image Rotation	USIT-E	Off	
MEAS_WLEN	Tcube Processing Window Length in Measurement Mode	USIT-E	Depth Zoned	us
MUD_N_FRP	Free Pipe Mud Normalization Factor	USIT-E	0	
MUD_N_THE	Theoretical Mud Normalization Factor	USIT-E	1	
RAPID_OPTION	Rapid Access Computation Option	USIT-E	Off	
RCOD	Reference Calibrator Outer Diameter	USIT-E	7	in
RCSO	Reference Calibrator Standoff	USIT-E	1.181	in
RCTH	Reference Calibrator Thickness	USIT-E	0.295	in
SDNV	Number of Vertical Samples used for Micro-debonding Computation	USIT-E	5	
SDTHOR	Acoustic Impedance STD Horizontal Threshold for Micro-debonding	USIT-E	0.5	Mrayl
SDTVER	Acoustic Impedance STD Vertical Threshold for Micro-debonding	USIT-E	0.3	Mrayl
SOGR	Standoff Distance of the Gamma Ray Tool	SGT-N	0	in
TCUB	T^3 Processing Level	USIT-E	Loop	
THDH	Maximum Search Thickness (percentage of nominal)	USIT-E	130	%
THDL	Minimum Search Thickness (percentage of nominal)	USIT-E	70	%
TPOS	Tool Position: Centered or Eccentered	SGT-N	Centered	
UDFSZ	Drilling Fluid Specific Acoustic Impedance	USIT-E	0	Mrayl
UFGDE	Fiberglass Density	USIT-E	16.27	lbm/gal
UFGPS	Fiberglass Processing Selection	USIT-E	No	
UFGVL	Fiberglass Velocity	USIT-E	9678.48	ft/s
USI_FSOD	USIT USI Fluid Slowness Fits Casing Outer Diameter	USIT-E	0_OFF	
USI_FVEL_SEL	USI Fluid Velocity Selection	USIT-E	Automatic	
USI_ZMUD_SEL	USI Mud Impedance Selection	USIT-E	Manual	
UTHDP	Thickness Detection Policy	USIT-E	Fundamental	
VCAS	Ultrasonic Transversal Velocity in Casing	USIT-E	51.4	us/ft
ZCAS	Acoustic Impedance of Casing	USIT-E	46.25	Mrayl
ZINI	Initial Estimate of Cement Impedance	USIT-E	-1	Mrayl
ZMUD	Acoustic Impedance of Mud	Borehole	Depth Zoned	Mrayl
ZTCM	Acoustic Impedance Threshold for Cement	USIT-E	2.6	Mrayl
ZTGS	Acoustic Impedance Threshold for Gas	USIT-E	0.3	Mrayl

Depth Zone Parameters			
Parameter	Value	Start ( ft )	Stop ( ft )
MEAS_WLEN	22.5	35.5	6825
ZMUD	1.65	35.5	400
ZMUD	1.66	400	700
ZMUD	1.68	700	1000
ZMUD	1.7	1000	1500
ZMUD	1.72	1500	2000
ZMUD	1.74	2000	2500
ZMUD	1.76	2500	3000
ZMUD	1.77	3000	4000
ZMUD	1.78	4000	6825
All depth are actual.			

Tool Control Parameters

Parameter	Description	Tool	Value	Unit
AGMN	Minimum Gain of Cartridge	USIT-E	-12	dB
AGMX	Maximum Gain of Cartridge	USIT-E	18	dB
DDT5	USIC Downhole Decimation for T5 only	USIT-E	0_NONE	
DOTF	Distance between Opposite Transducer Faces	USIT-E	2.874	in
EMXV	EMEX Voltage	USIT-E	50	V
HRES	Horizontal Resolution	USIT-E	10 deg	
ULOG	Logging Objective	USIT-E	MEASUREMENT	
UMFR	Modulation Frequency	USIT-E	333333	Hz
USFR	Ultrasonic Sampling Frequency	USIT-E	500000	Hz
USI_UPAT	USIT Emission Pattern	USIT-E	Pattern 375 KHz	
USI_UWKM	USIT Working Mode	USIT-E	Uncompressed 10 deg at 3.0 in LF	
USIT_DEPTHLOG	Starting Depth Log for Ultrasonics	USIT-E	6812	ft
VRES	Vertical Resolution	USIT-E	3.0 in	
WINB	Window Begin Time	USIT-E	33.87	us
WINE	Window End Time	USIT-E	73.87	us

USI Goodwin

USIT - Fluid Properties Measurement

Run Name	Pass Name	Start Depth(ft)	Stop Depth(ft)
Run 1	Log[3]:Up	6825.58	61.20

Fluid Velocity = "Automatic".  
CFVL equals DFSL channel

Start Depth(ft)	Stop Depth(ft)	Start Value(us/ft)	End Value(us/ft)
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Mud Impedance = "Manual".  
CZMD uses ZMUD parameter zoned table below

Start Depth(ft)	Stop Depth(ft)	Start Value(Mrayl)	End Value(Mrayl)
0	200	1.65	1.65
200	400	1.65	1.65
400	700	1.66	1.66
700	1000	1.68	1.68
1000	1500	1.7	1.7
1500	2000	1.72	1.72
2000	2500	1.74	1.74
2500	3000	1.76	1.76
3000	4000	1.77	1.77
4000		1.78	1.78

Run1: USIT

USI Goodwin Compressed

Log	Company:Noble Energy Inc	Well:NCLP AA06-67-1AHNA
		Run1: USIT: Log[3]:Up:S003

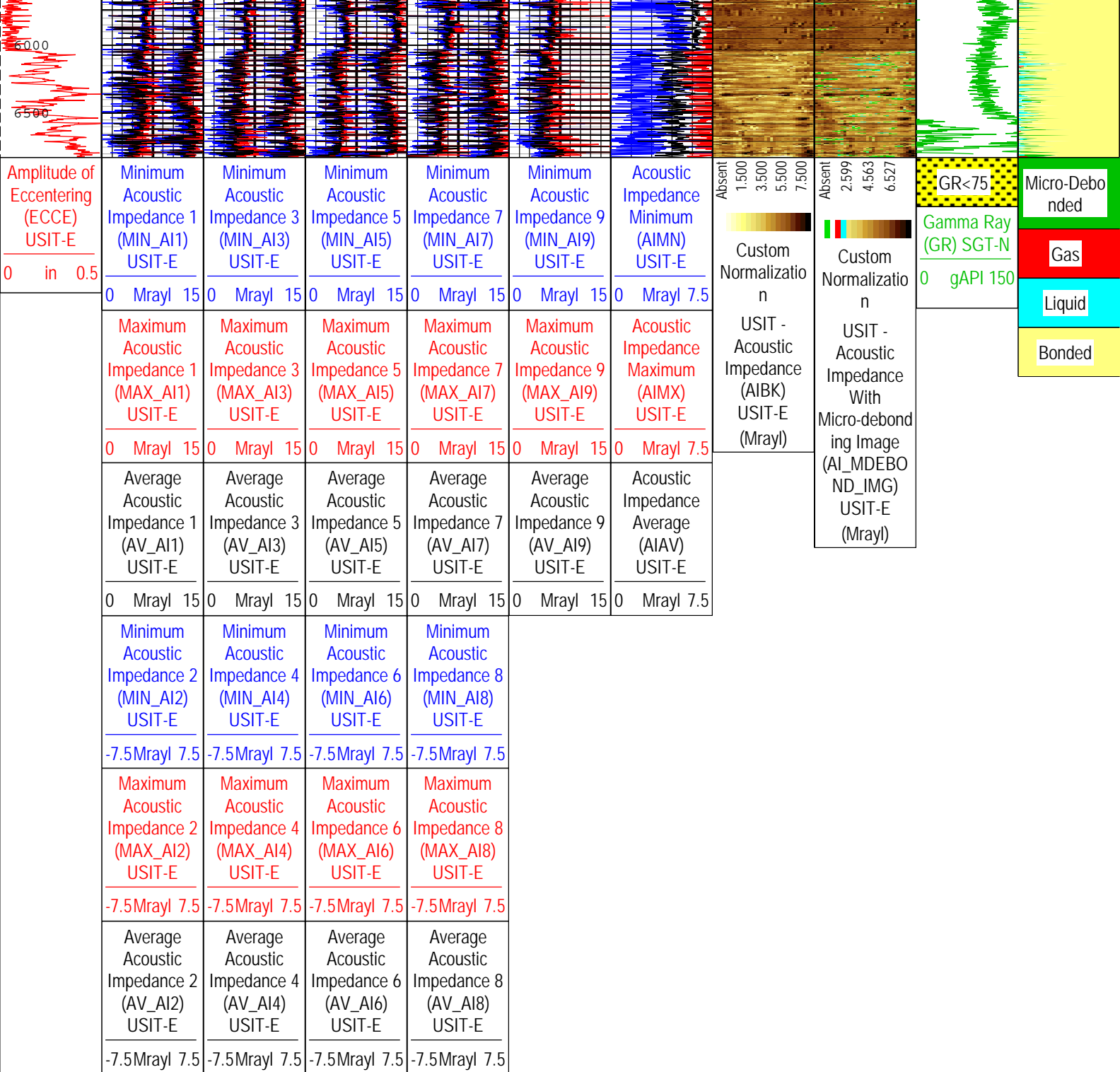
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TIME\_1900 - Time Marked every 60.00 (s)

Minimum Acoustic Impedance 1 (MIN_AI1) USIT-E	Minimum Acoustic Impedance 3 (MIN_AI3) USIT-E	Minimum Acoustic Impedance 5 (MIN_AI5) USIT-E	Minimum Acoustic Impedance 7 (MIN_AI7) USIT-E
0   Mrayl 15	0   Mrayl 15	0   Mrayl 15	0   Mrayl 15
Maximum Acoustic	Maximum Acoustic	Maximum Acoustic	Maximum Acoustic



Amplitude of Eccentering (ECCE) USIT-E	Acoustic Impedance 1 (MAX_AI1) USIT-E				Acoustic Impedance 3 (MAX_AI3) USIT-E				Acoustic Impedance 5 (MAX_AI5) USIT-E				Acoustic Impedance 7 (MAX_AI7) USIT-E				Acoustic Impedance 9 (MAX_AI9) USIT-E		Acoustic Impedance Minimum (AIMN) USIT-E		Acoustic Impedance Maximum (AIMX) USIT-E		Acoustic Impedance Average (AIAV) USIT-E		Acoustic Impedance Micro-debonding Image (AI_MDEBOND_IMG) USIT-E		Acoustic Impedance Gamma Ray (GR) SGT-N		Acoustic Impedance Bonded					
	0 Mrayl 15				0 Mrayl 15				0 Mrayl 15				0 Mrayl 15																					
	Average Acoustic Impedance 1 (AV_AI1) USIT-E				Average Acoustic Impedance 3 (AV_AI3) USIT-E				Average Acoustic Impedance 5 (AV_AI5) USIT-E				Average Acoustic Impedance 7 (AV_AI7) USIT-E																					
	Minimum Acoustic Impedance 2 (MIN_AI2) USIT-E				Minimum Acoustic Impedance 4 (MIN_AI4) USIT-E				Minimum Acoustic Impedance 6 (MIN_AI6) USIT-E				Minimum Acoustic Impedance 8 (MIN_AI8) USIT-E																		Minimum Acoustic Impedance 9 (MIN_AI9) USIT-E		Acoustic Impedance Minimum (AIMN) USIT-E	
	-7.5Mrayl 7.5				-7.5Mrayl 7.5				-7.5Mrayl 7.5				-7.5Mrayl 7.5																		0 Mrayl 15		0 Mrayl 7.5	
Maximum Acoustic Impedance 2 (MAX_AI2) USIT-E				Maximum Acoustic Impedance 4 (MAX_AI4) USIT-E				Maximum Acoustic Impedance 6 (MAX_AI6) USIT-E				Maximum Acoustic Impedance 8 (MAX_AI8) USIT-E				Maximum Acoustic Impedance 9 (MAX_AI9) USIT-E		Acoustic Impedance Maximum (AIMX) USIT-E		Custom Normalization		Custom Normalization		USIT - Acoustic Impedance With Micro-debonding Image (AI_MDEBOND_IMG) USIT-E		GR<75		Gas						
-7.5Mrayl 7.5				-7.5Mrayl 7.5				-7.5Mrayl 7.5				-7.5Mrayl 7.5				0 Mrayl 15		0 Mrayl 7.5		1.500 3.500 5.500 7.500		1.500 3.500 5.500 7.500		0 gAPI 150		Bonded								
Average Acoustic Impedance 2 (AV_AI2) USIT-E				Average Acoustic Impedance 4 (AV_AI4) USIT-E				Average Acoustic Impedance 6 (AV_AI6) USIT-E				Average Acoustic Impedance 8 (AV_AI8) USIT-E				Average Acoustic Impedance 9 (AV_AI9) USIT-E		Acoustic Impedance Average (AIAV) USIT-E		Custom Normalization		Custom Normalization		USIT - Acoustic Impedance With Micro-debonding Image (AI_MDEBOND_IMG) USIT-E		GR<75		Gas						
-7.5Mrayl 7.5				-7.5Mrayl 7.5				-7.5Mrayl 7.5				-7.5Mrayl 7.5				0 Mrayl 15		0 Mrayl 7.5		1.500 3.500 5.500 7.500		1.500 3.500 5.500 7.500		0 gAPI 150		Bonded								
0 in 0.5				0 Mrayl 15				0 Mrayl 15				0 Mrayl 15				0 Mrayl 15				0 Mrayl 15		0 Mrayl 7.5		1.500 3.500 5.500 7.500		1.500 3.500 5.500 7.500		0 gAPI 150		Bonded				
0 in 0.5				0 Mrayl 15				0 Mrayl 15				0 Mrayl 15				0 Mrayl 15				0 Mrayl 15		0 Mrayl 7.5		1.500 3.500 5.500 7.500		1.500 3.500 5.500 7.500		0 gAPI 150		Bonded				



TIME\_1900 - Time Marked every 60.00 (s)

Description: USI Goodwin    Format: USI Goodwin    Index Scale: 0.1 in per 100 ft    Index Unit: ft    Index Type: Measured Depth    Creation Date: 10-Jun-2014 12:16:28

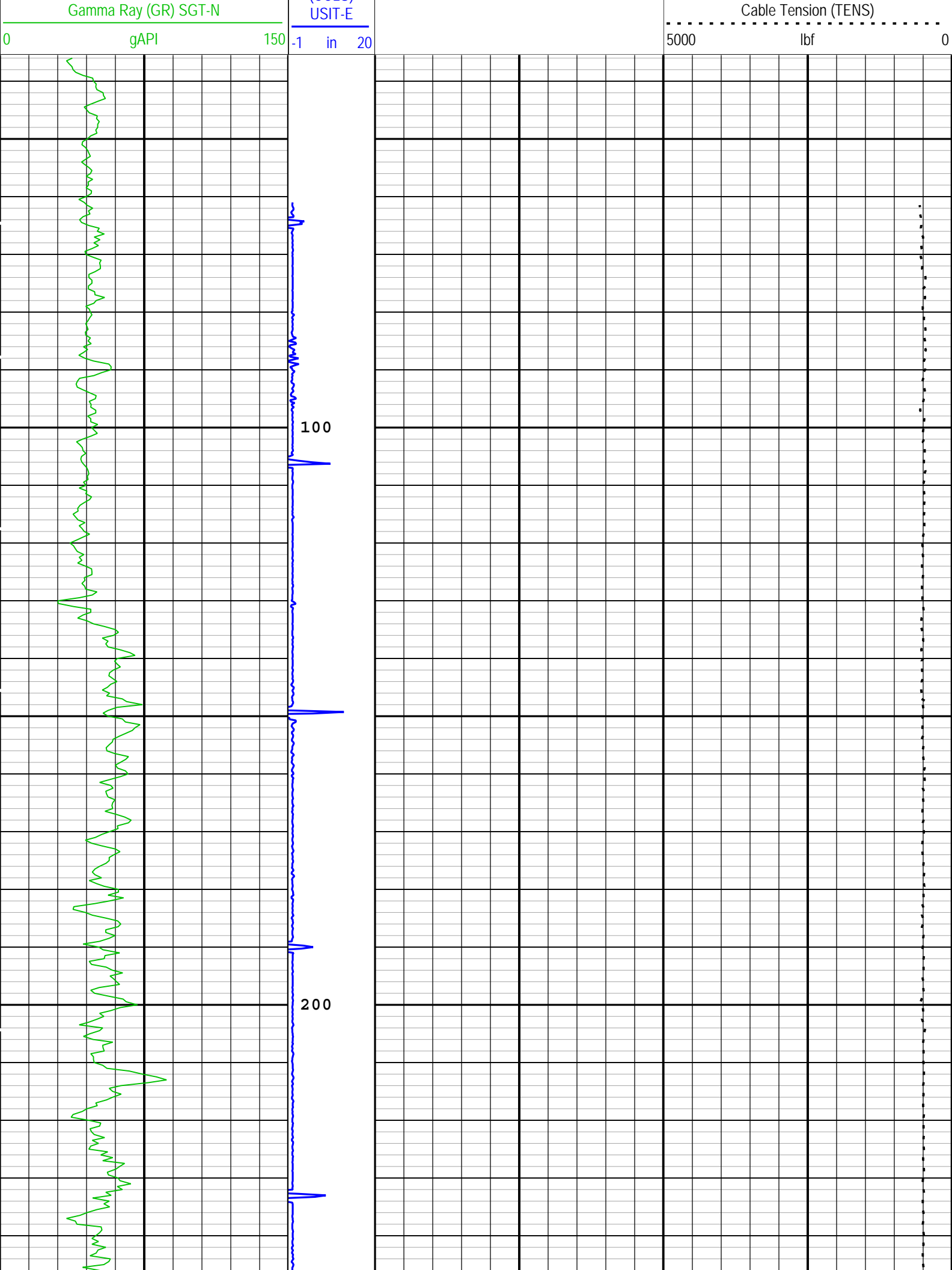
Run1: USIT	
Correlation Log	
Log	Company:Noble Energy Inc    Well:NCLP AA06-67-1AHNA Run1: USIT: Log[31:Up:S003

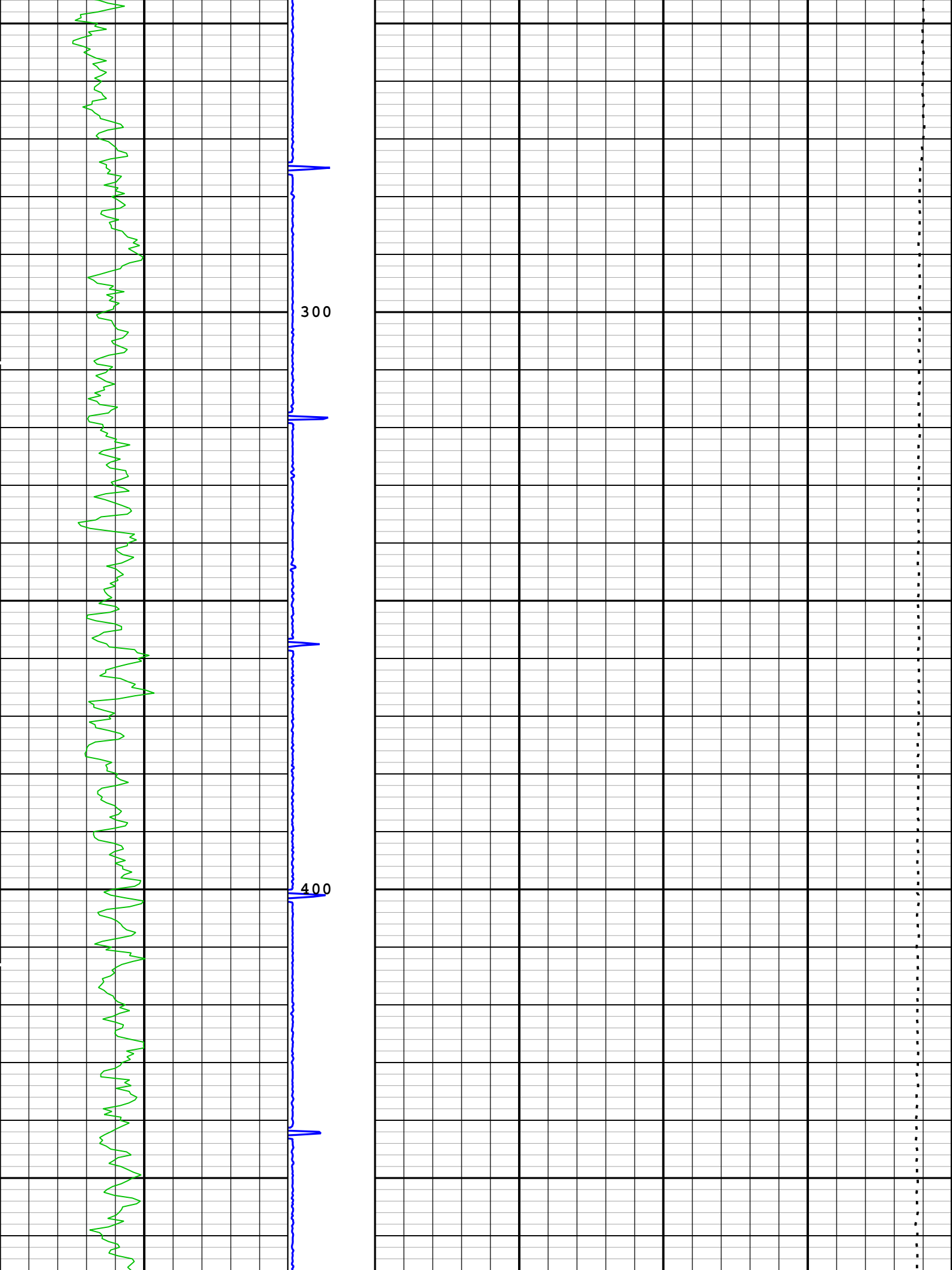
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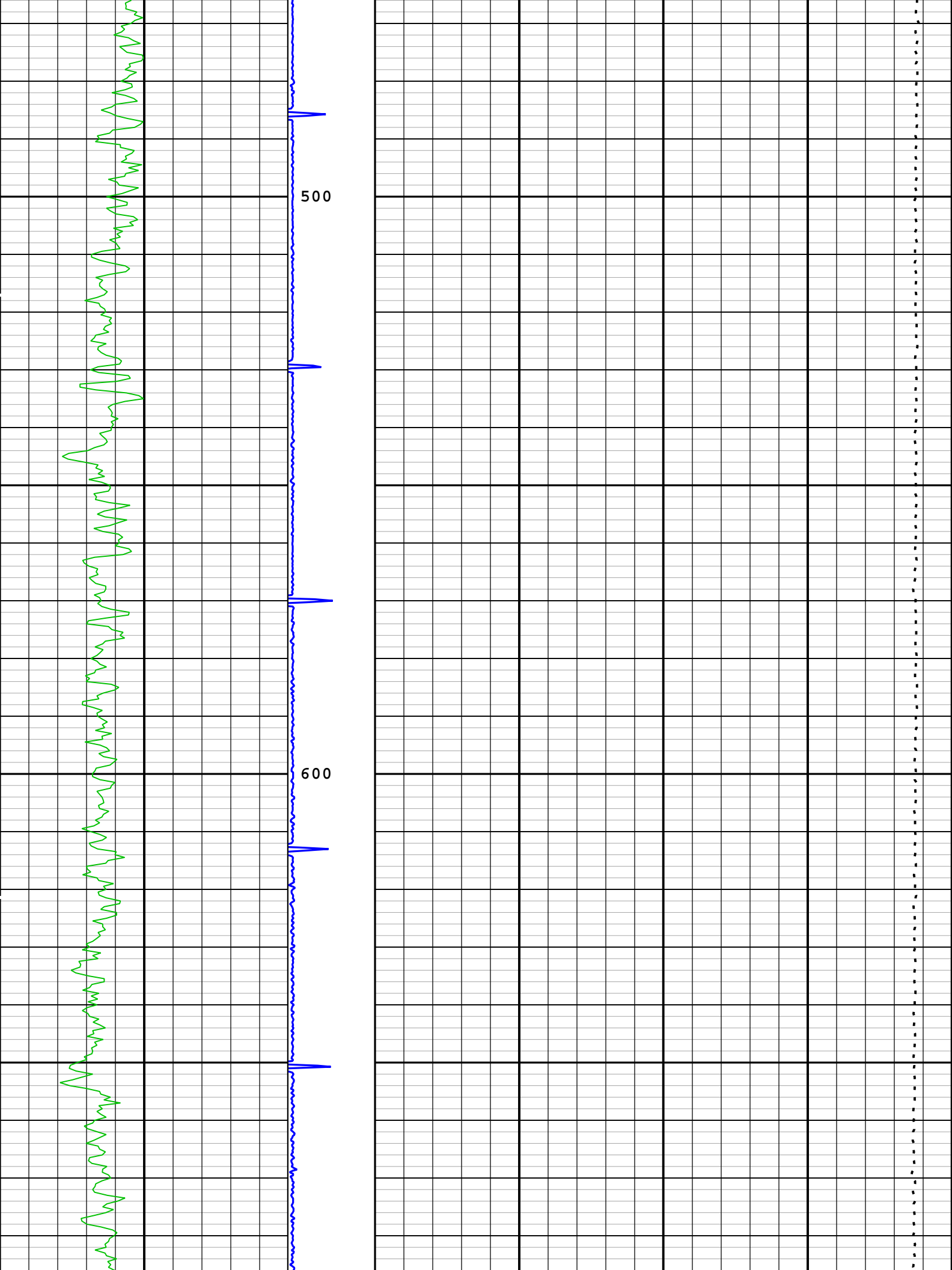
TIME\_1900 - Time Marked every 60.00 (s)

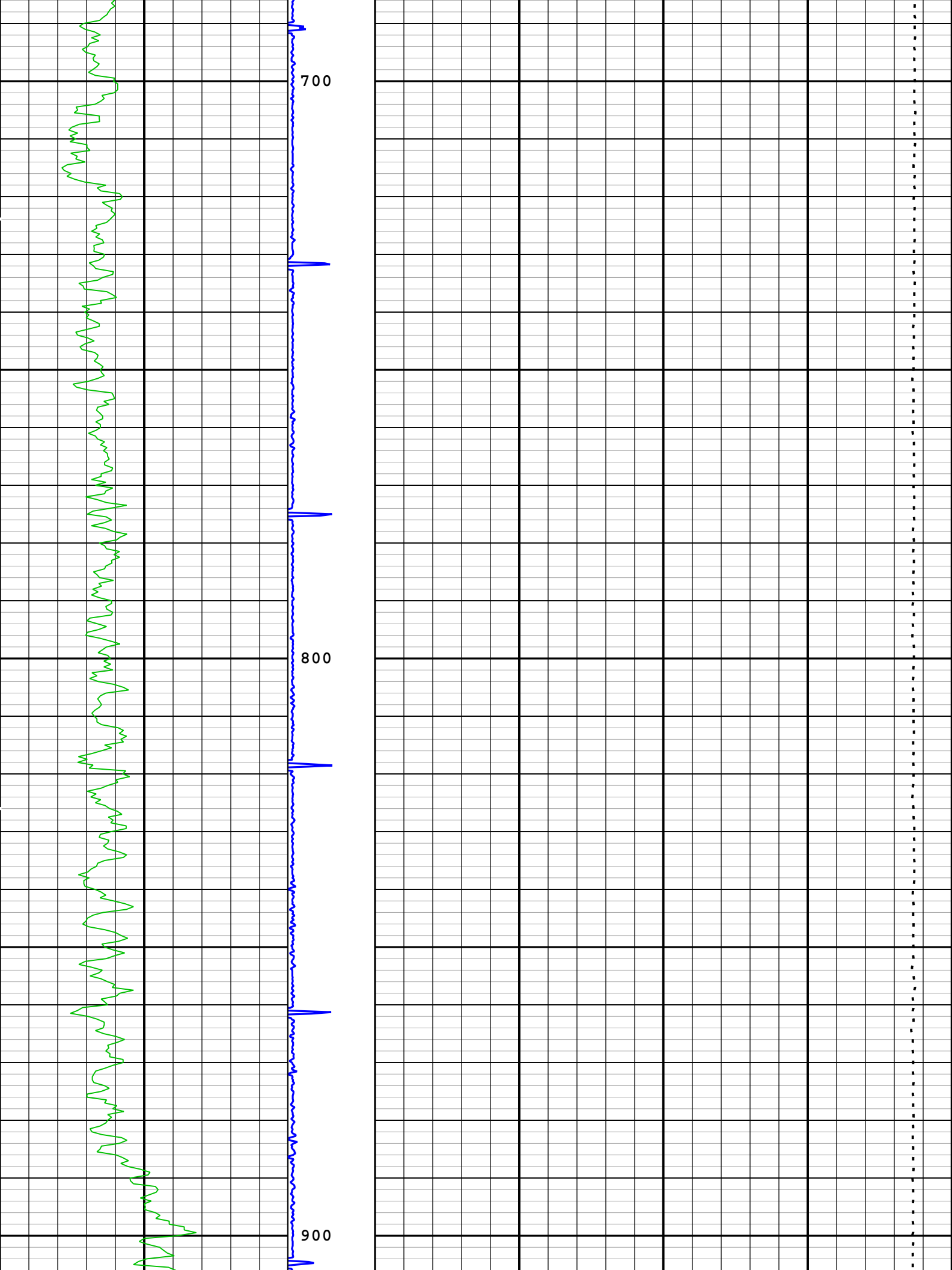
Casing Collar  
Locator  
Ultrasonic  
(CCLU)

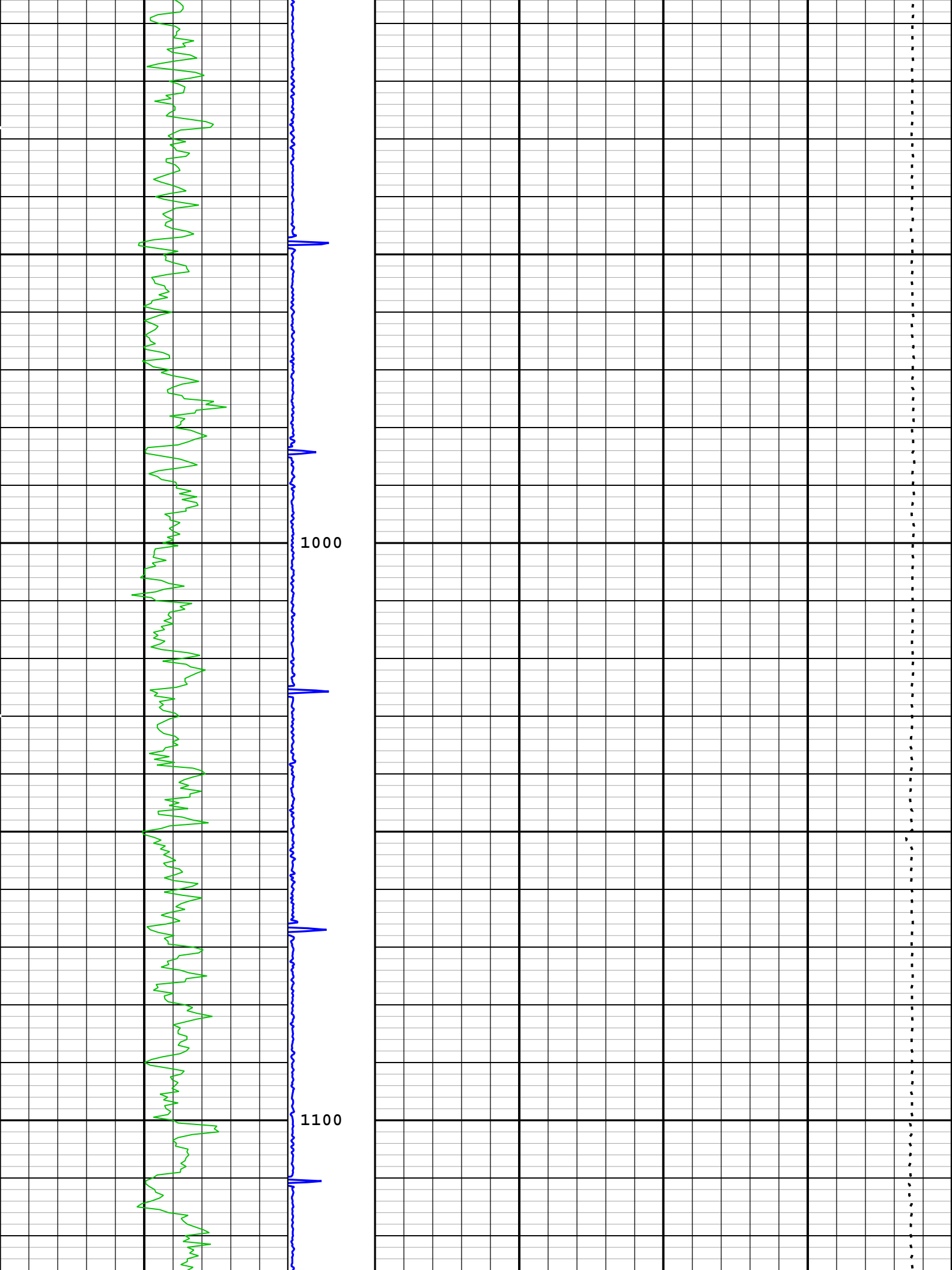


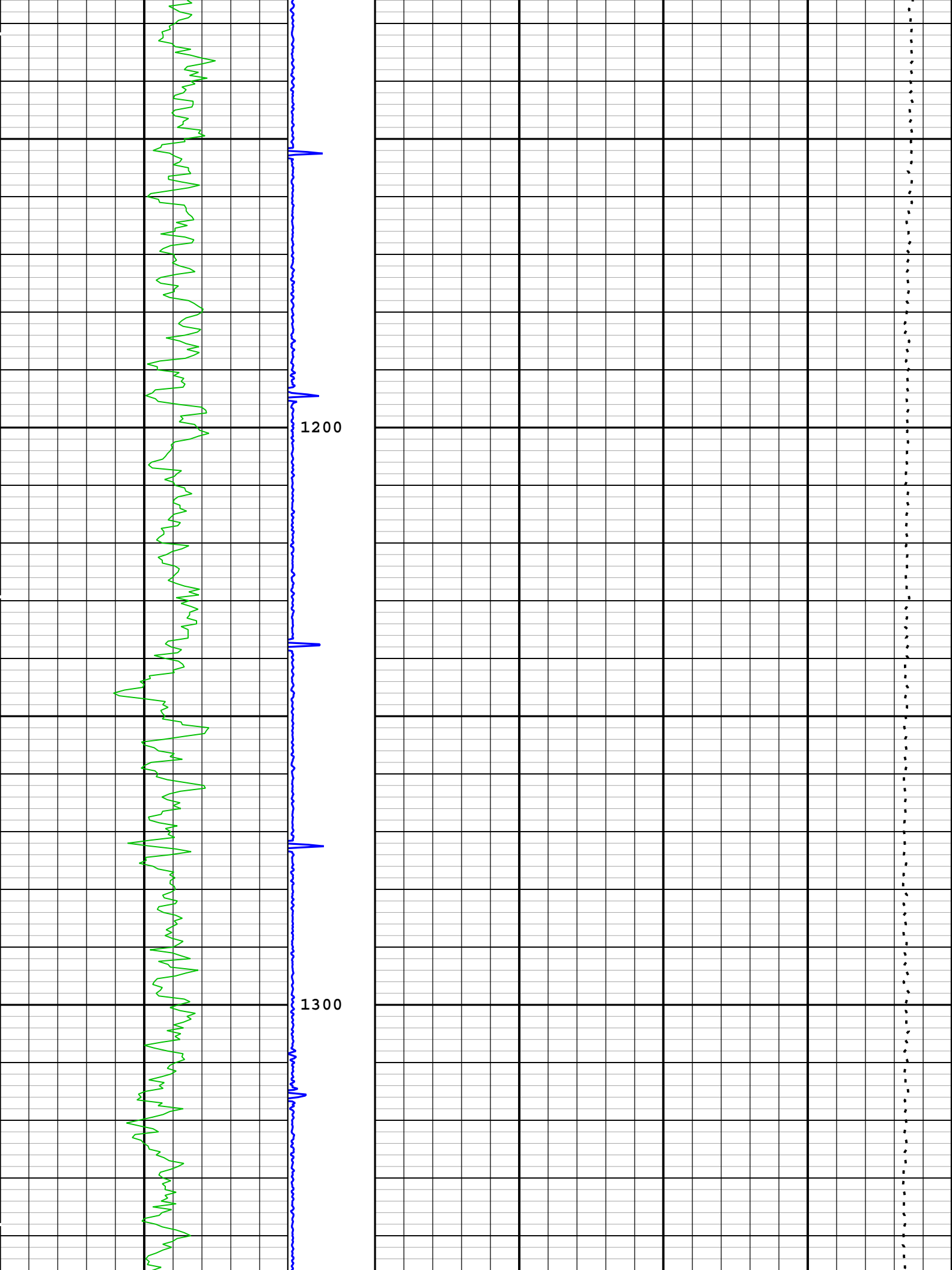


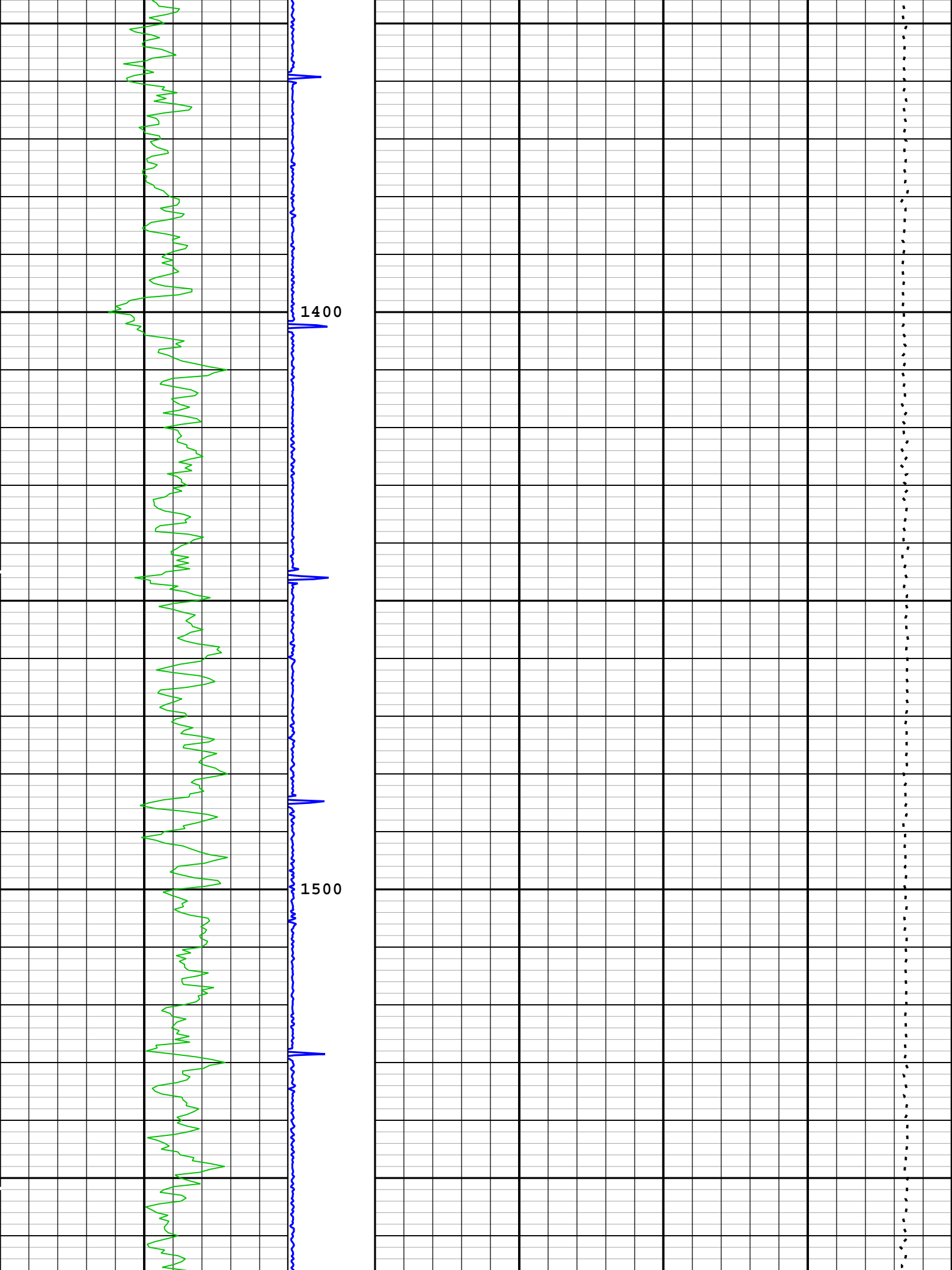




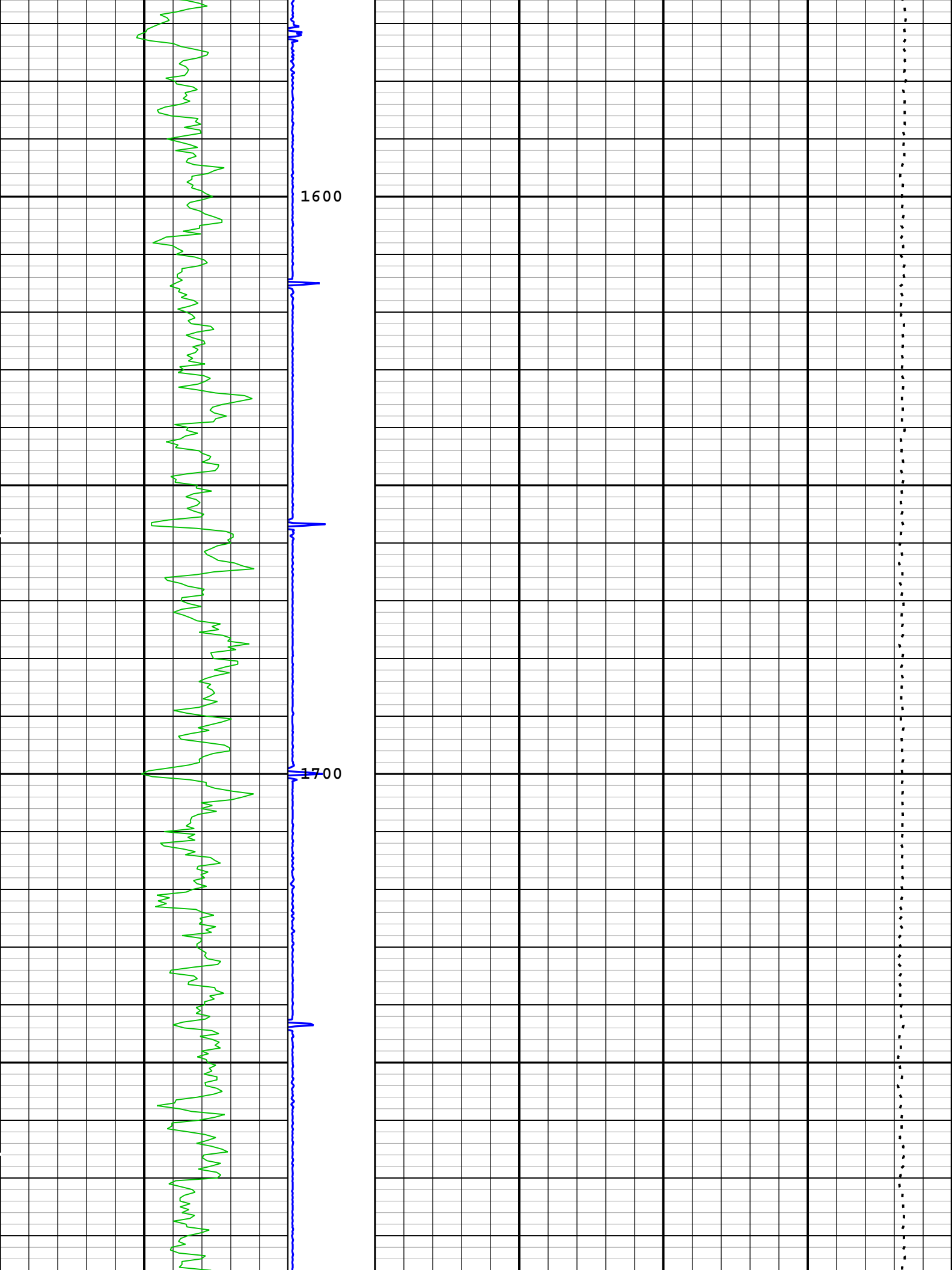


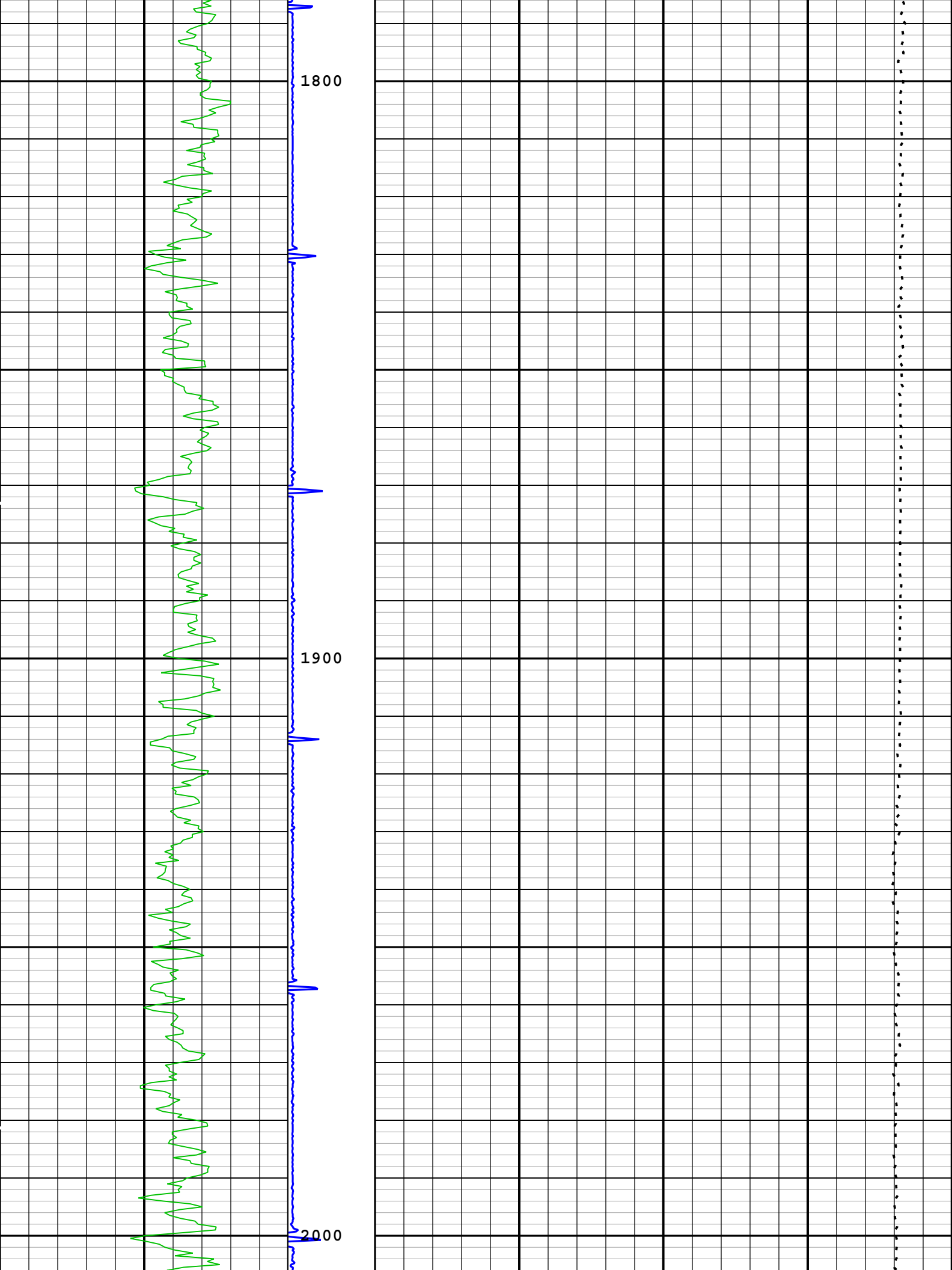


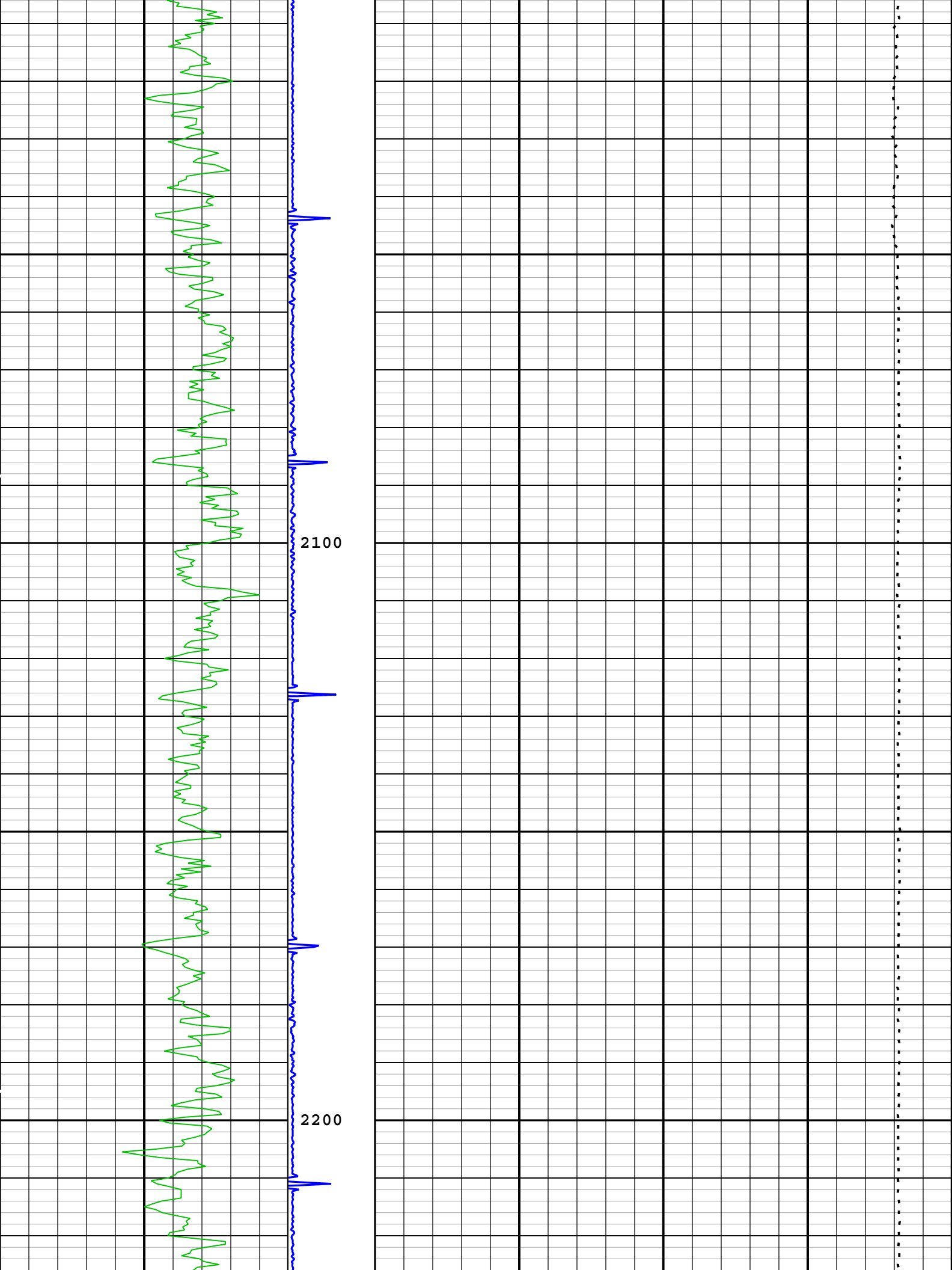


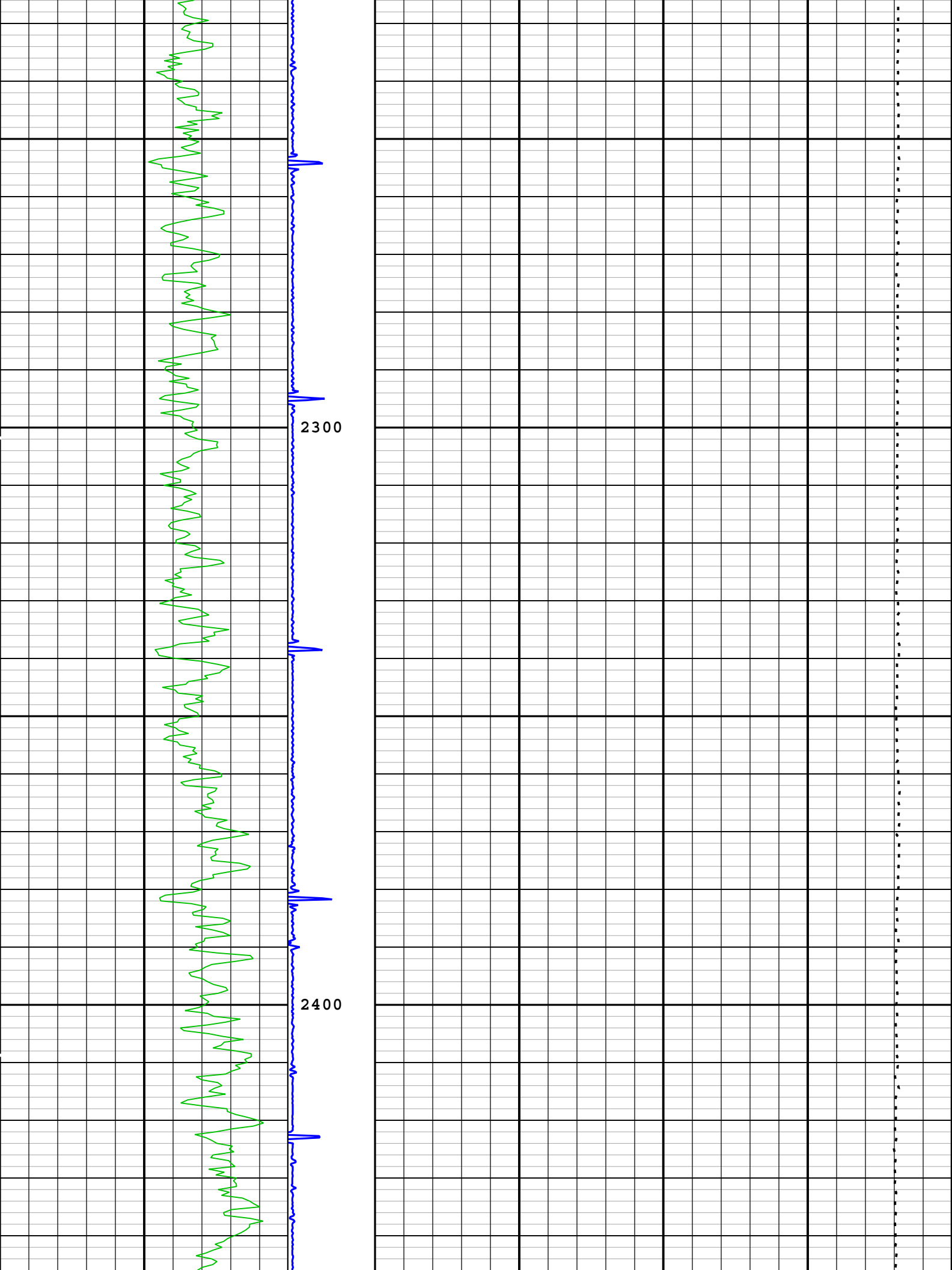


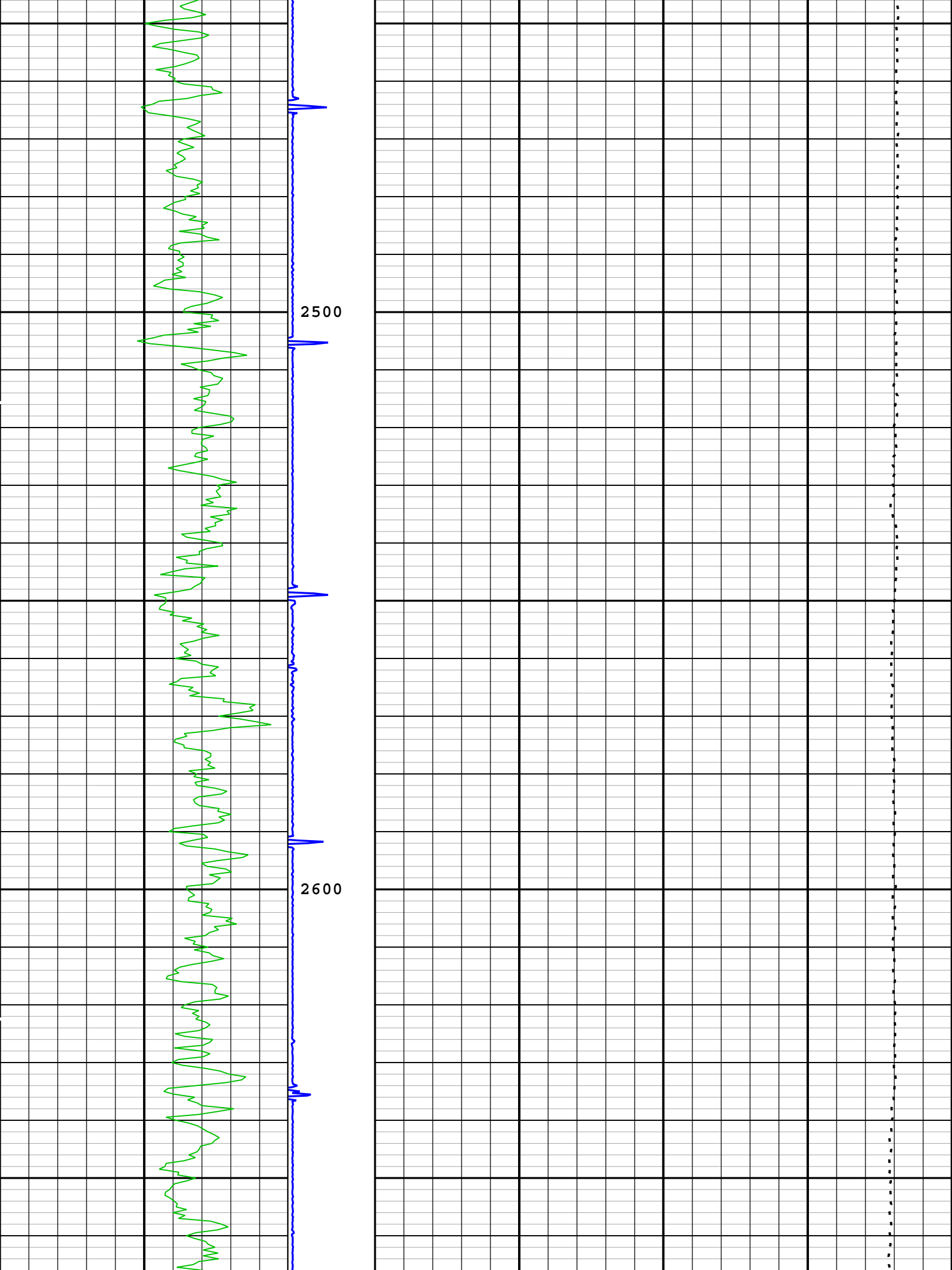


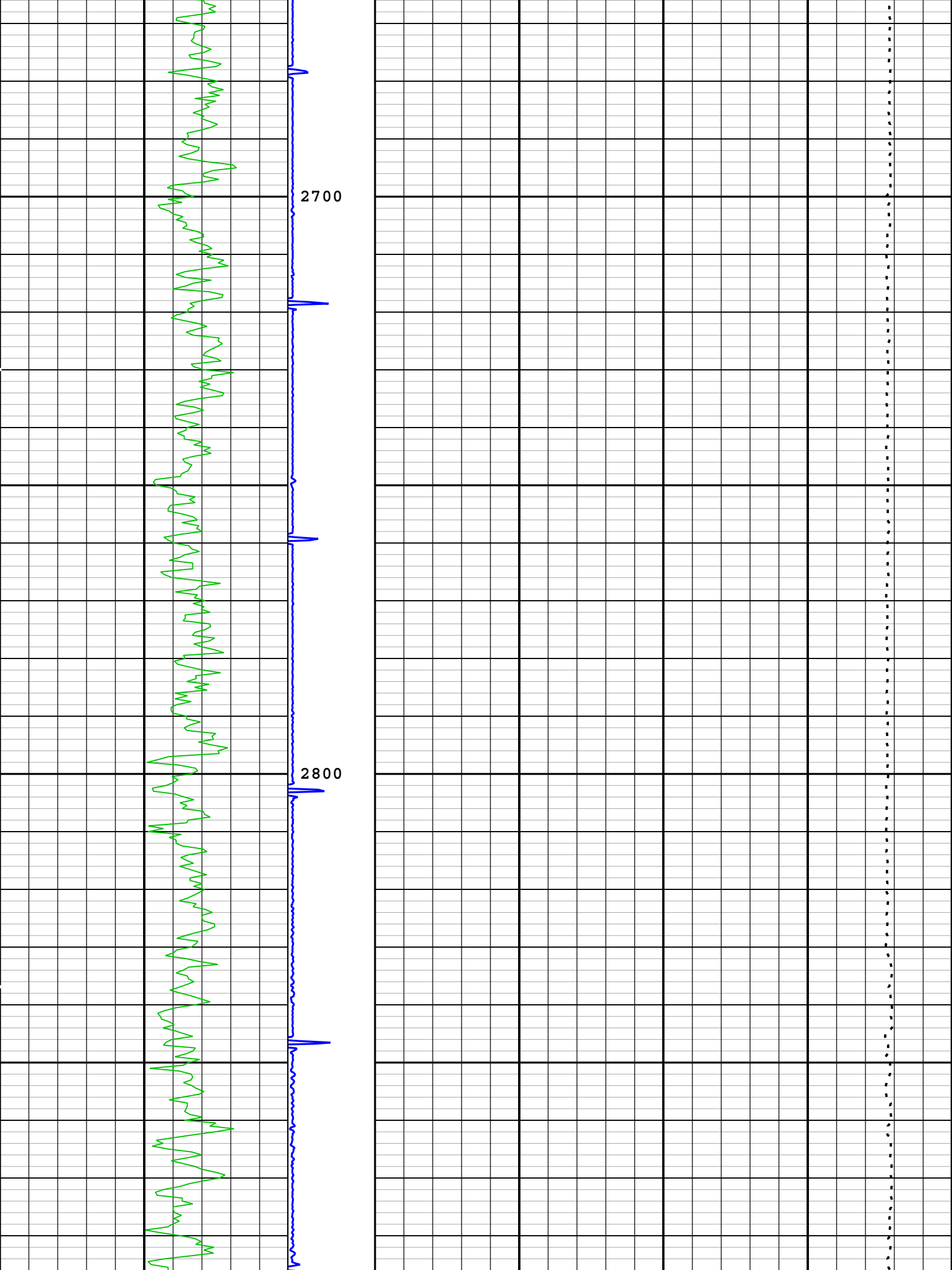


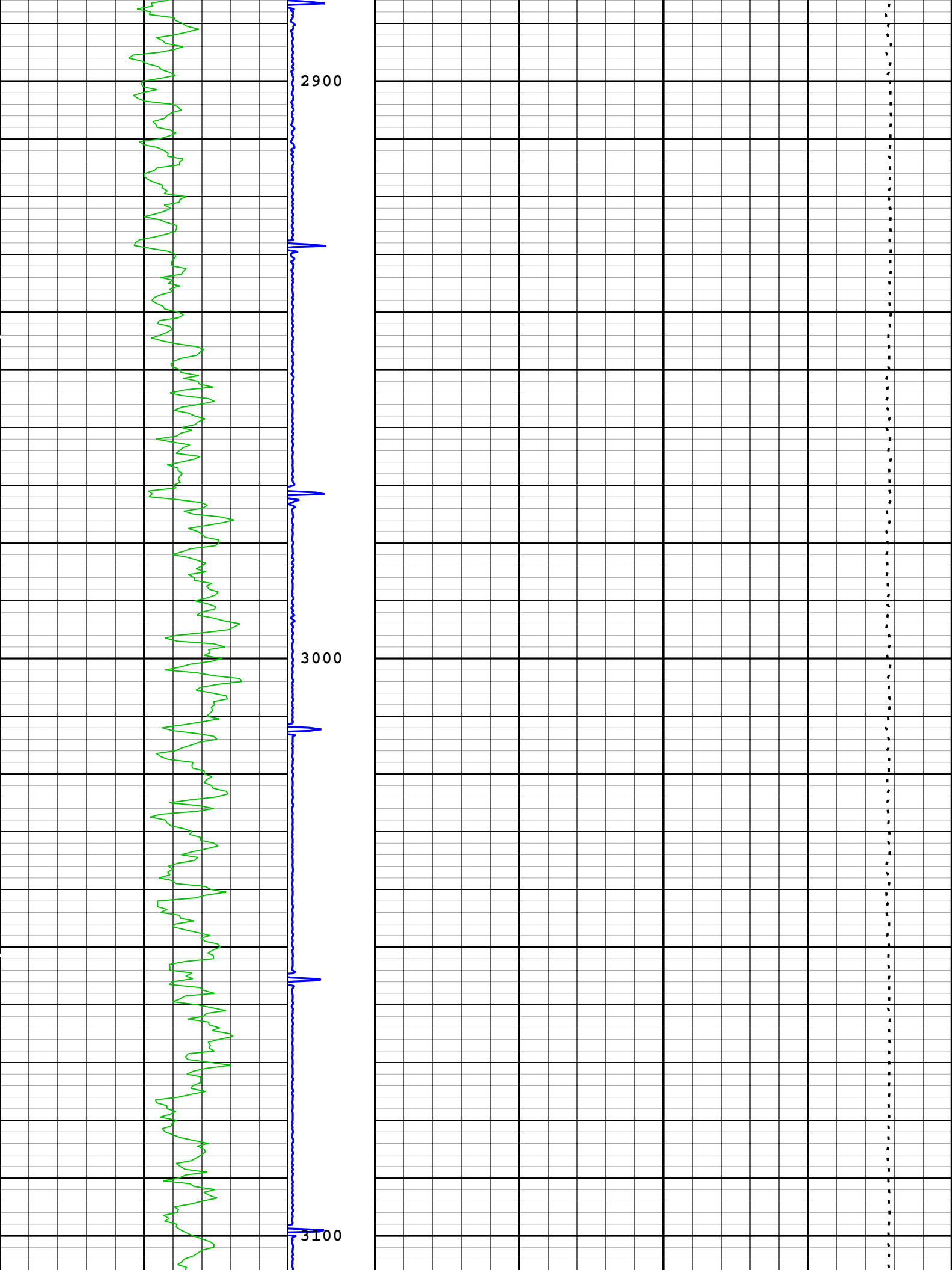




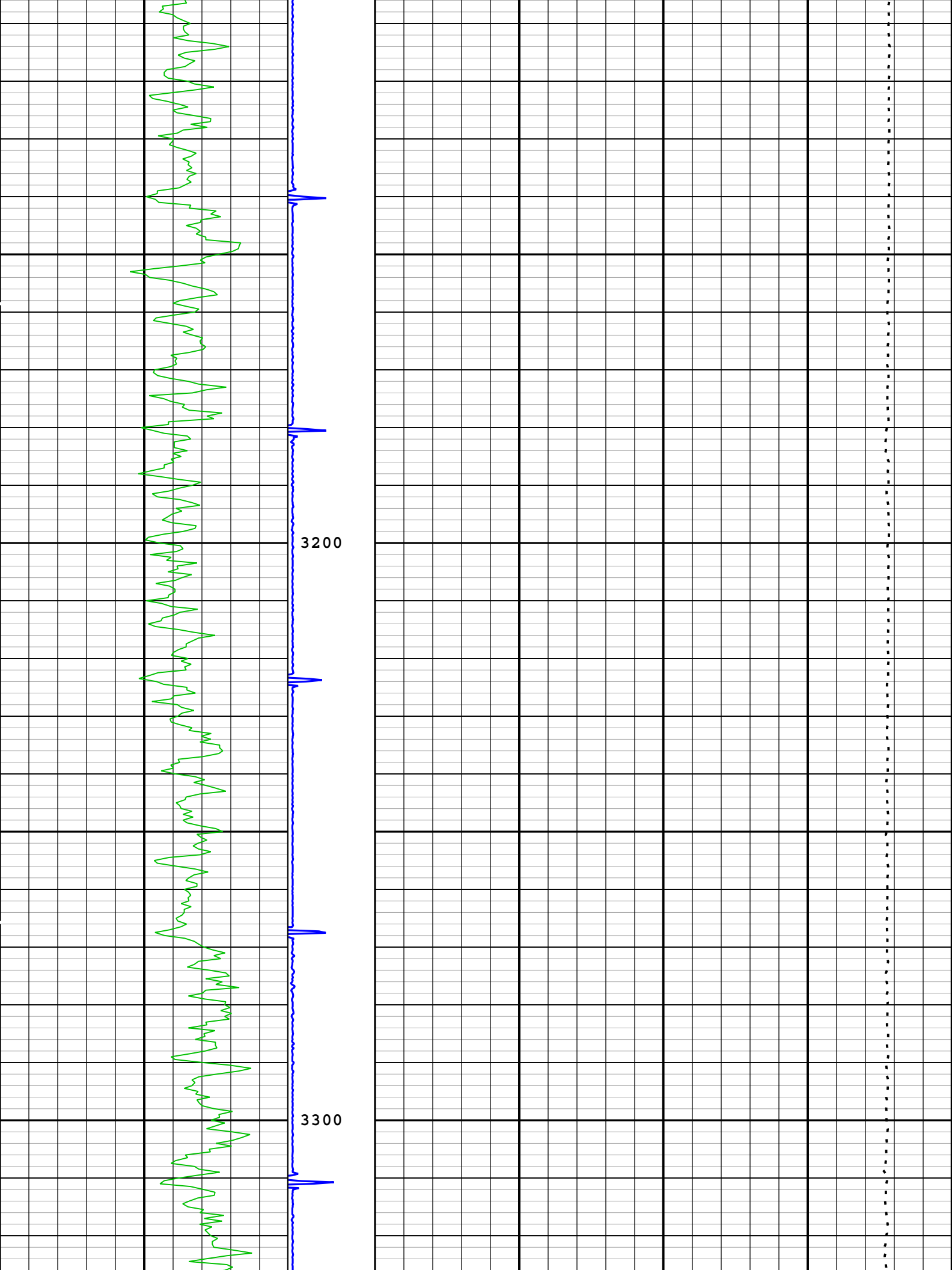


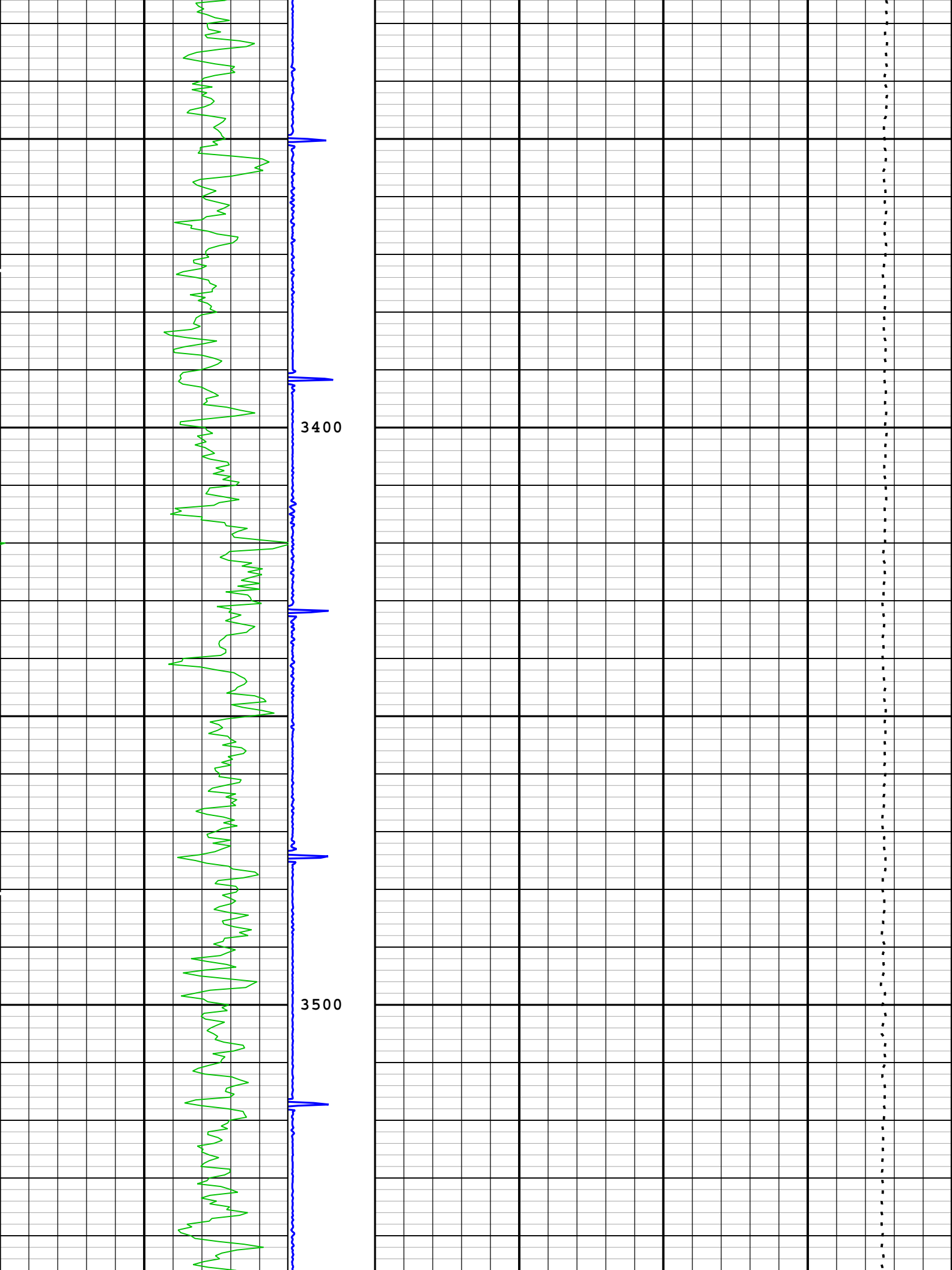


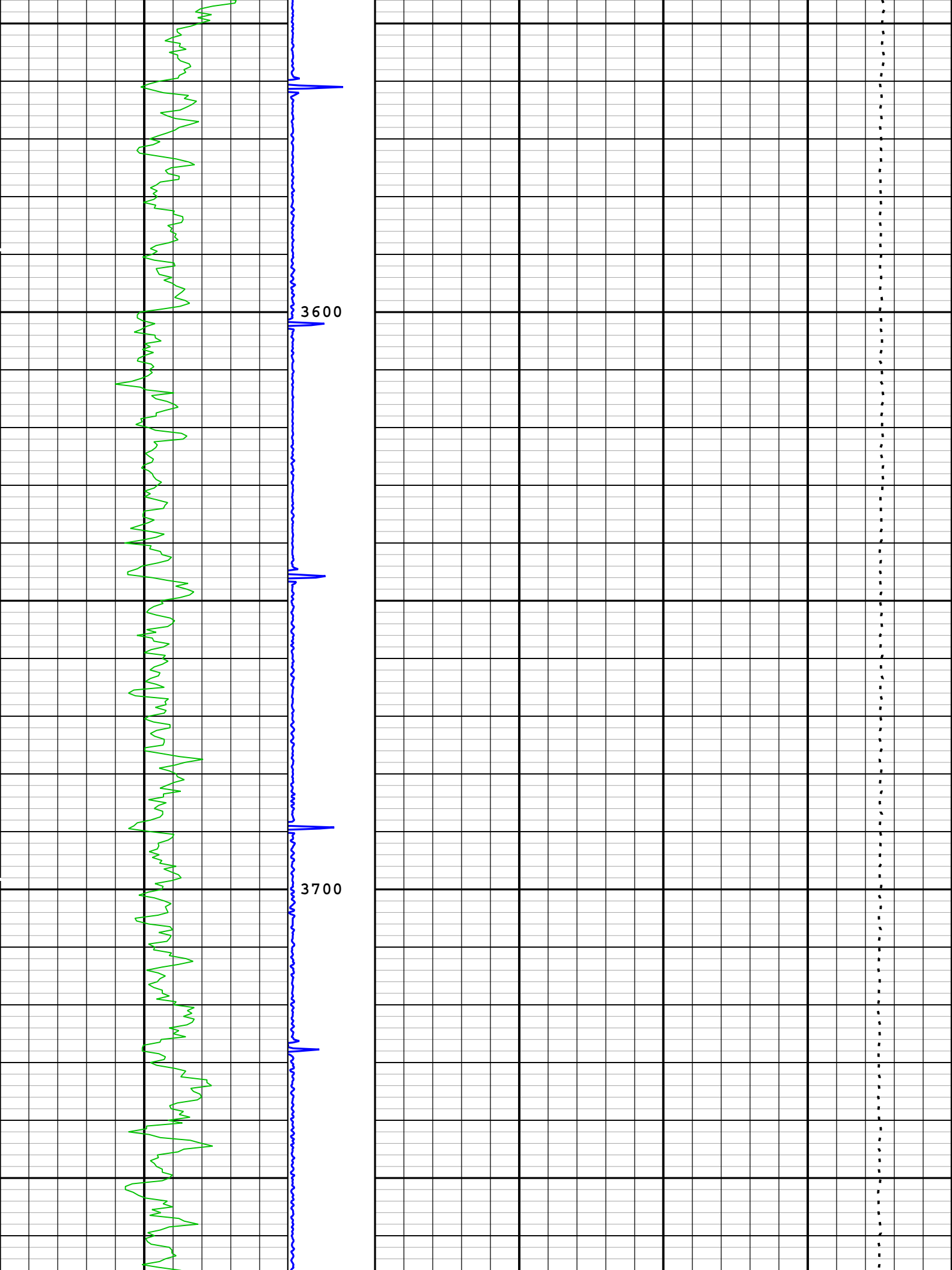


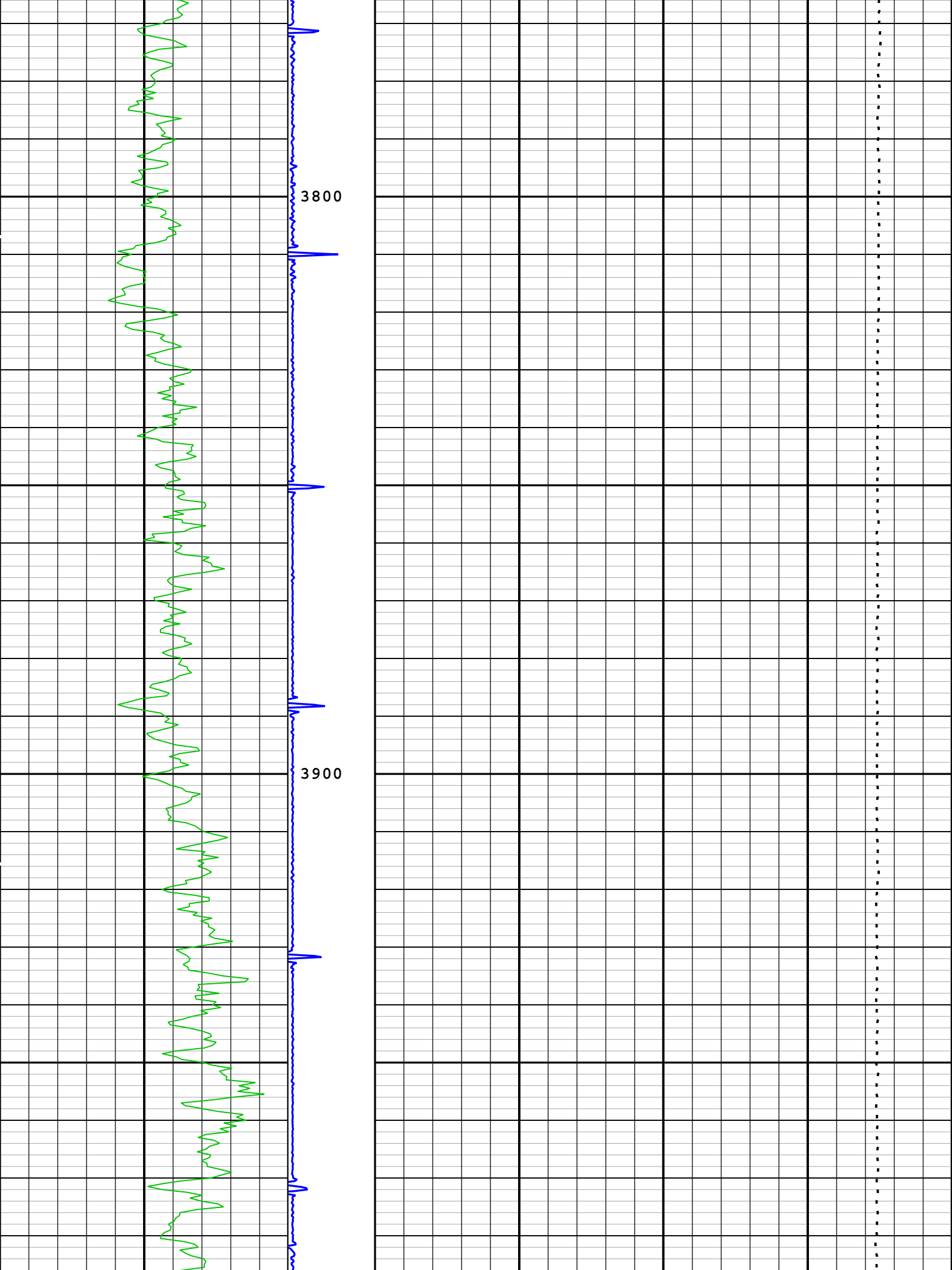


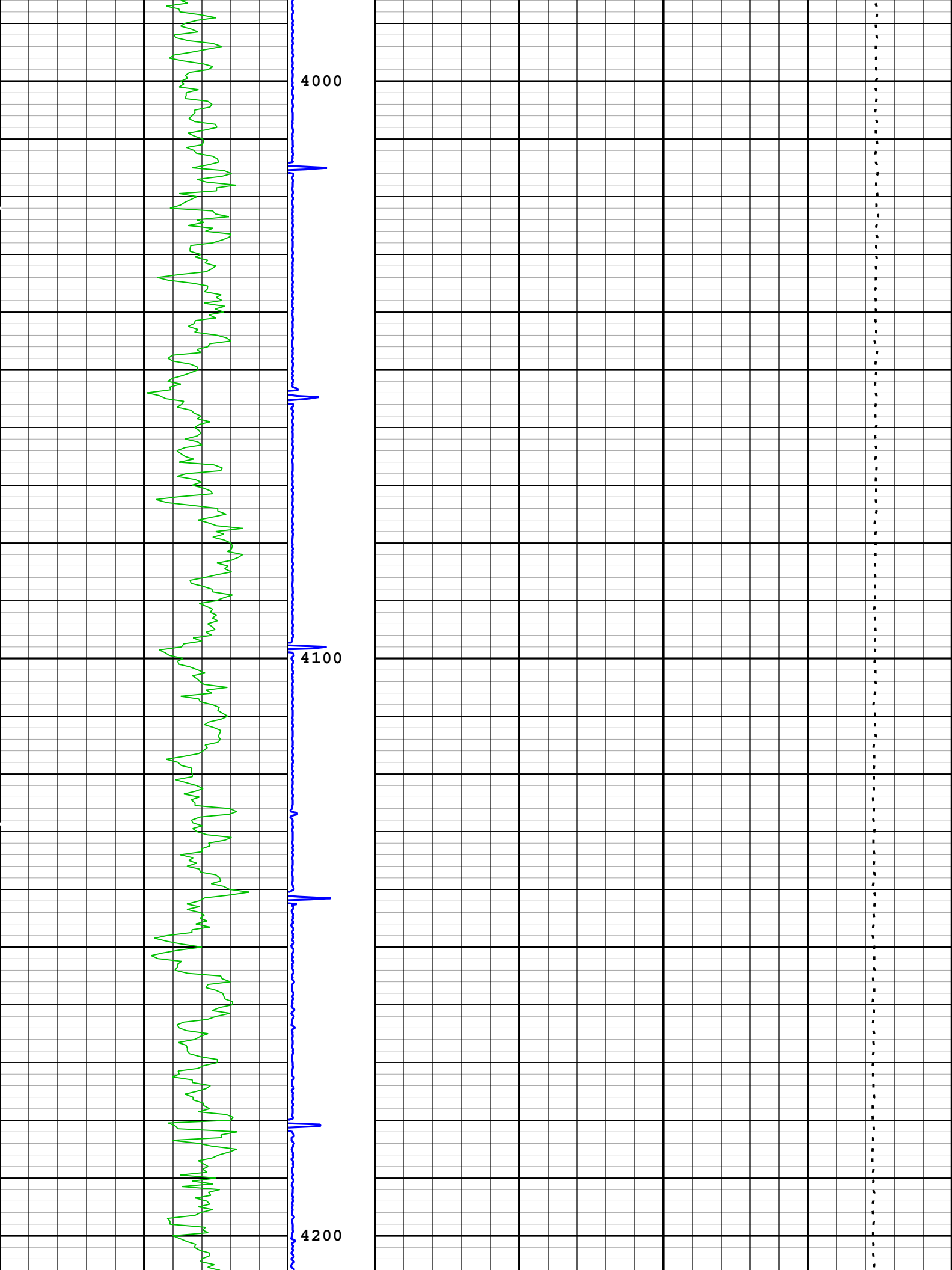


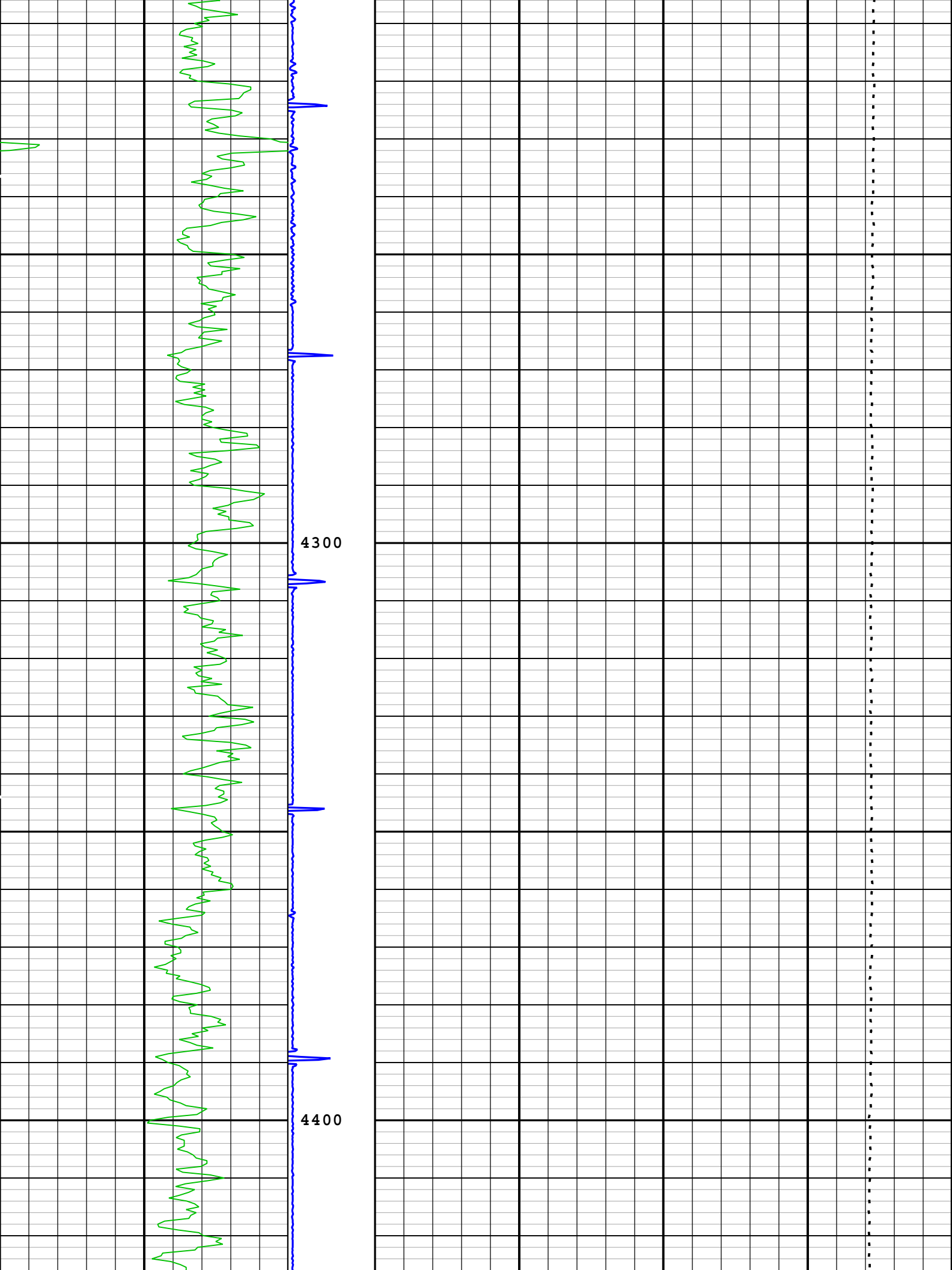


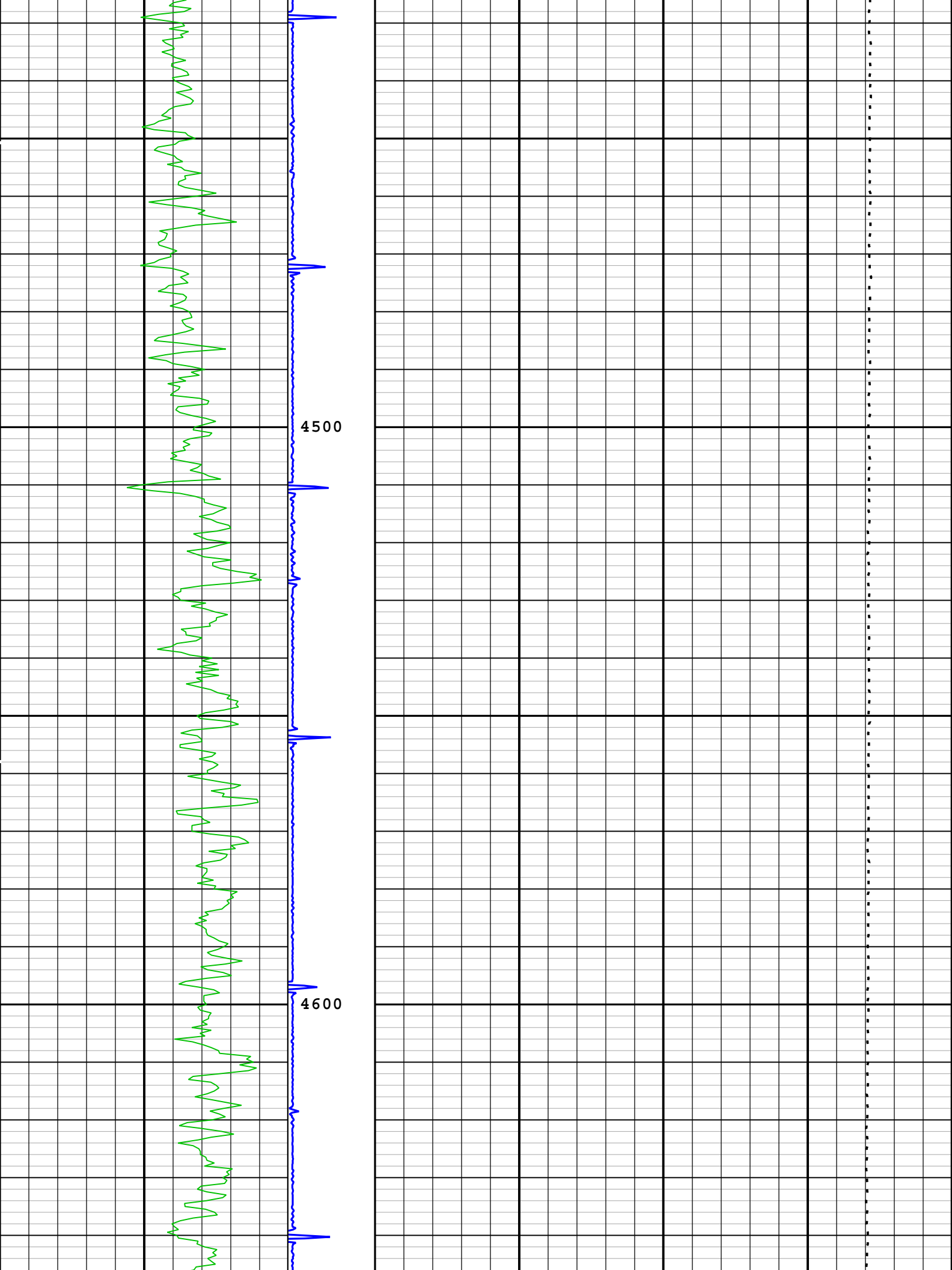


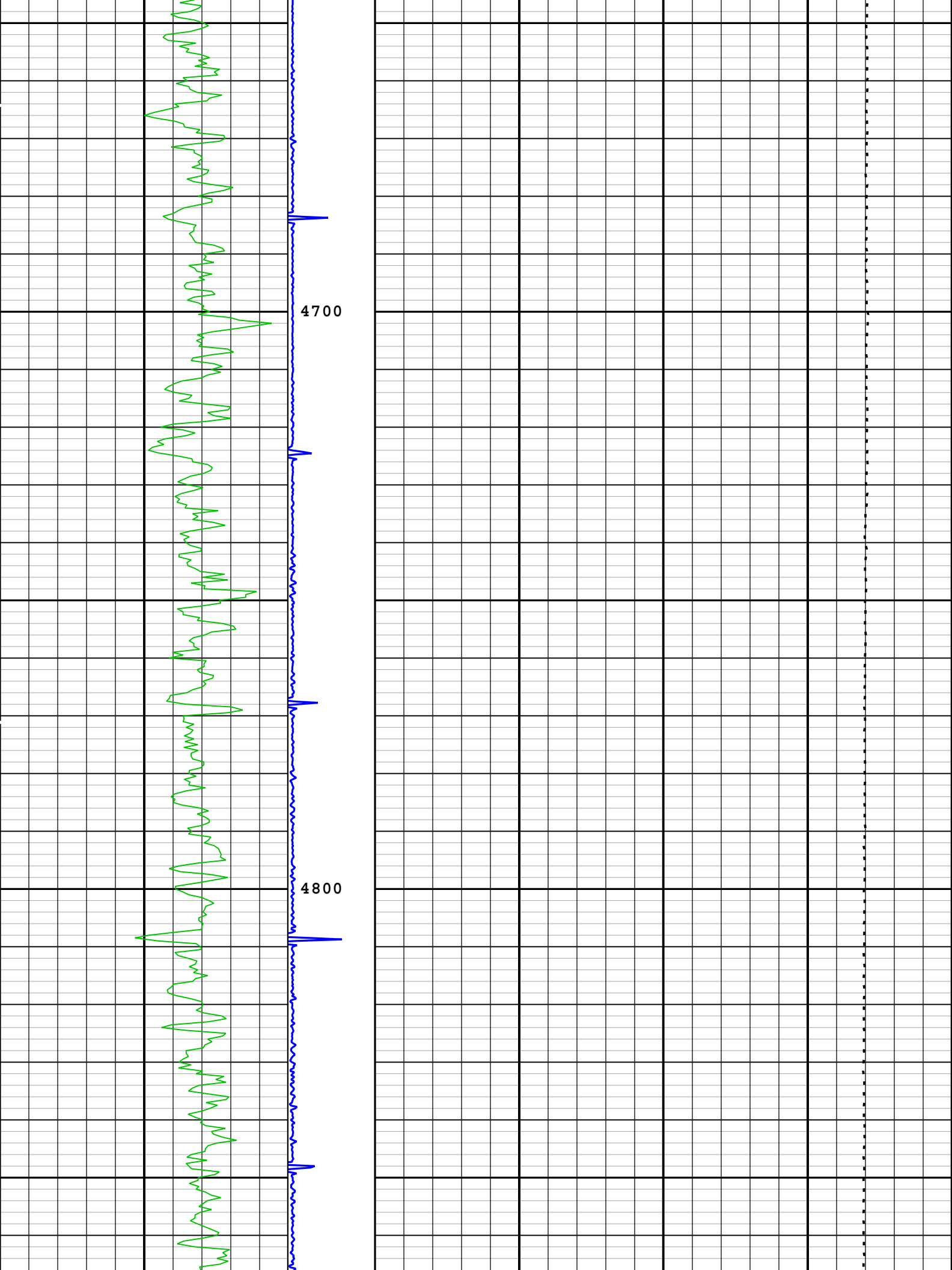




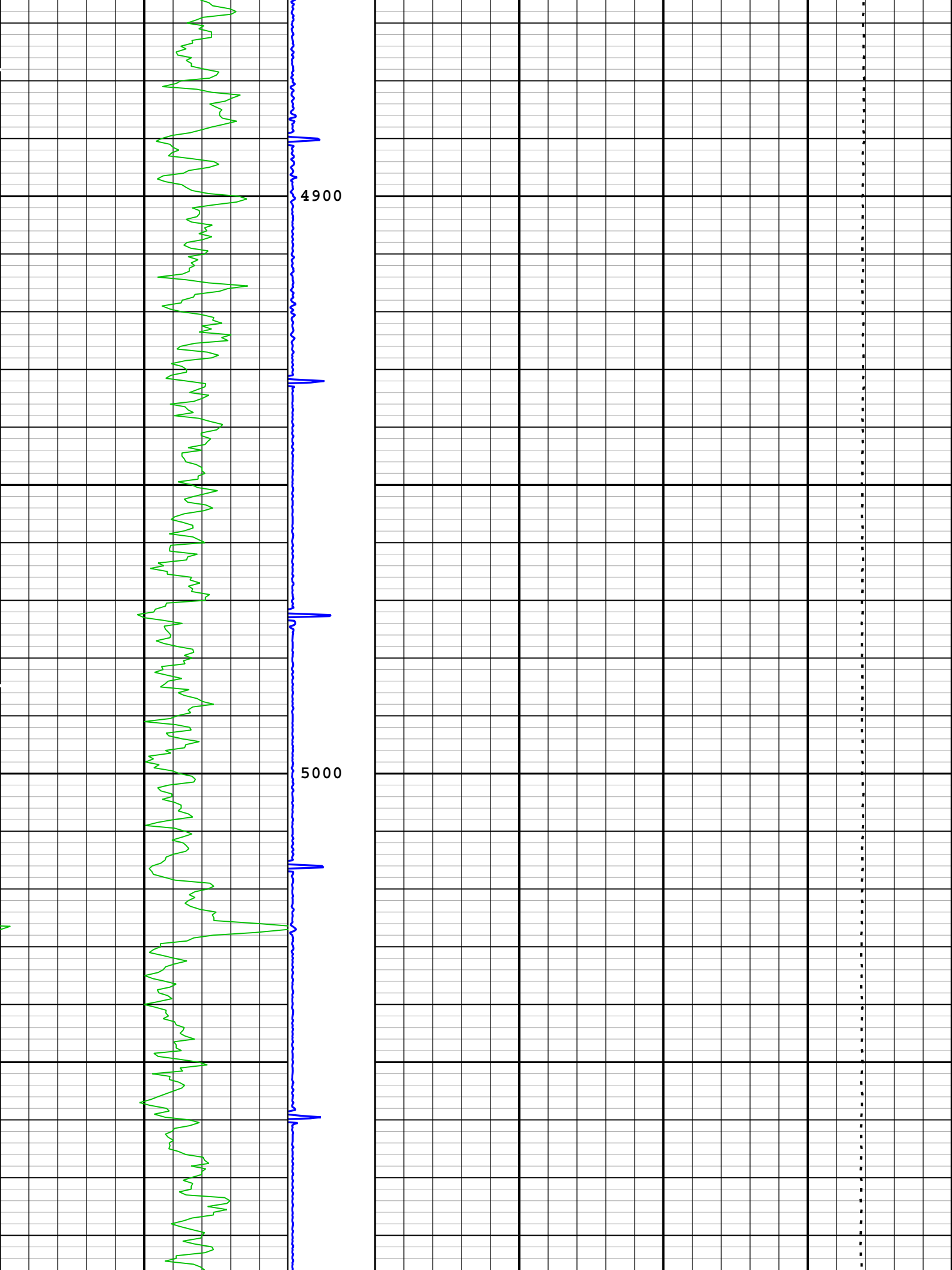


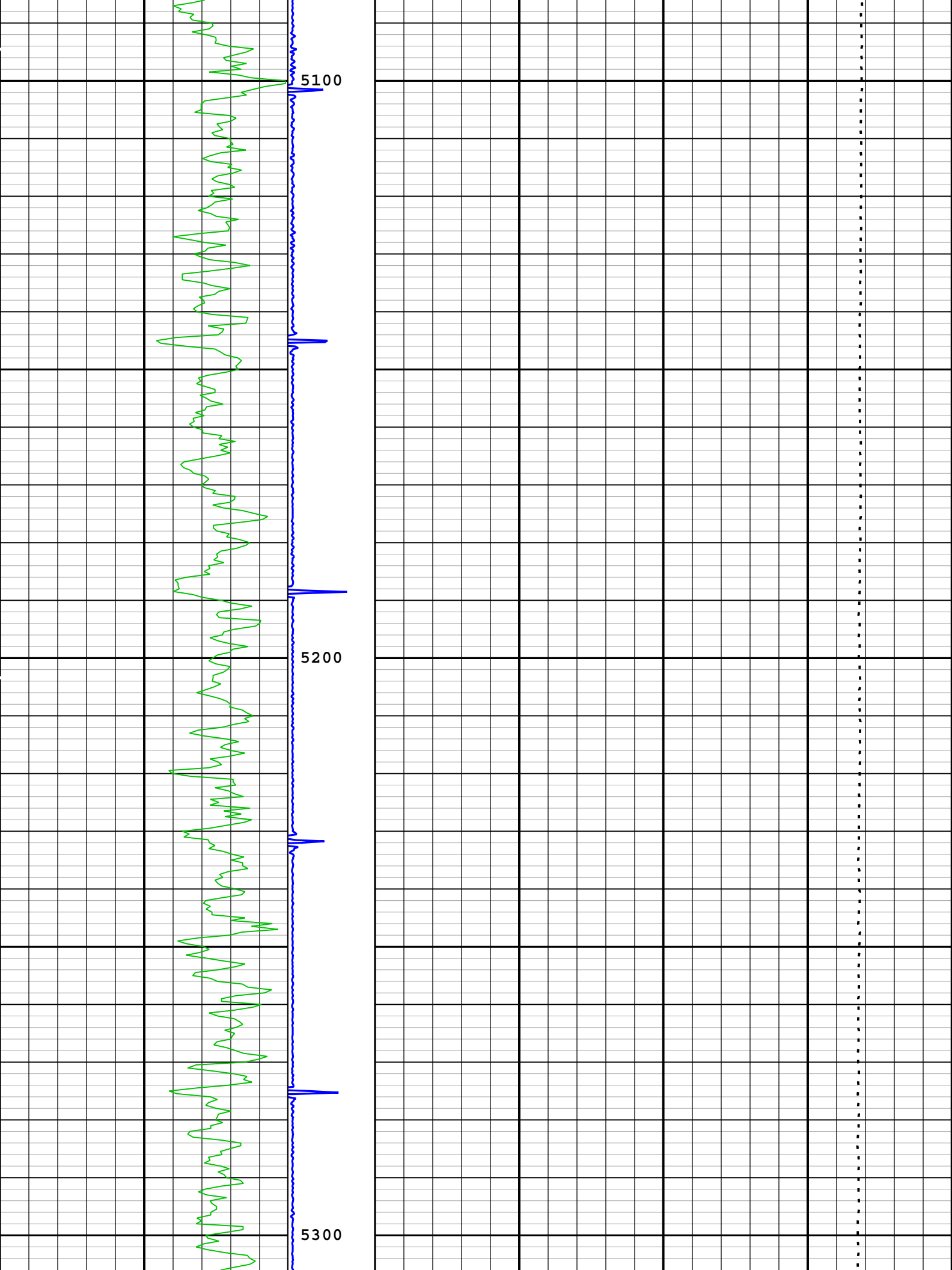


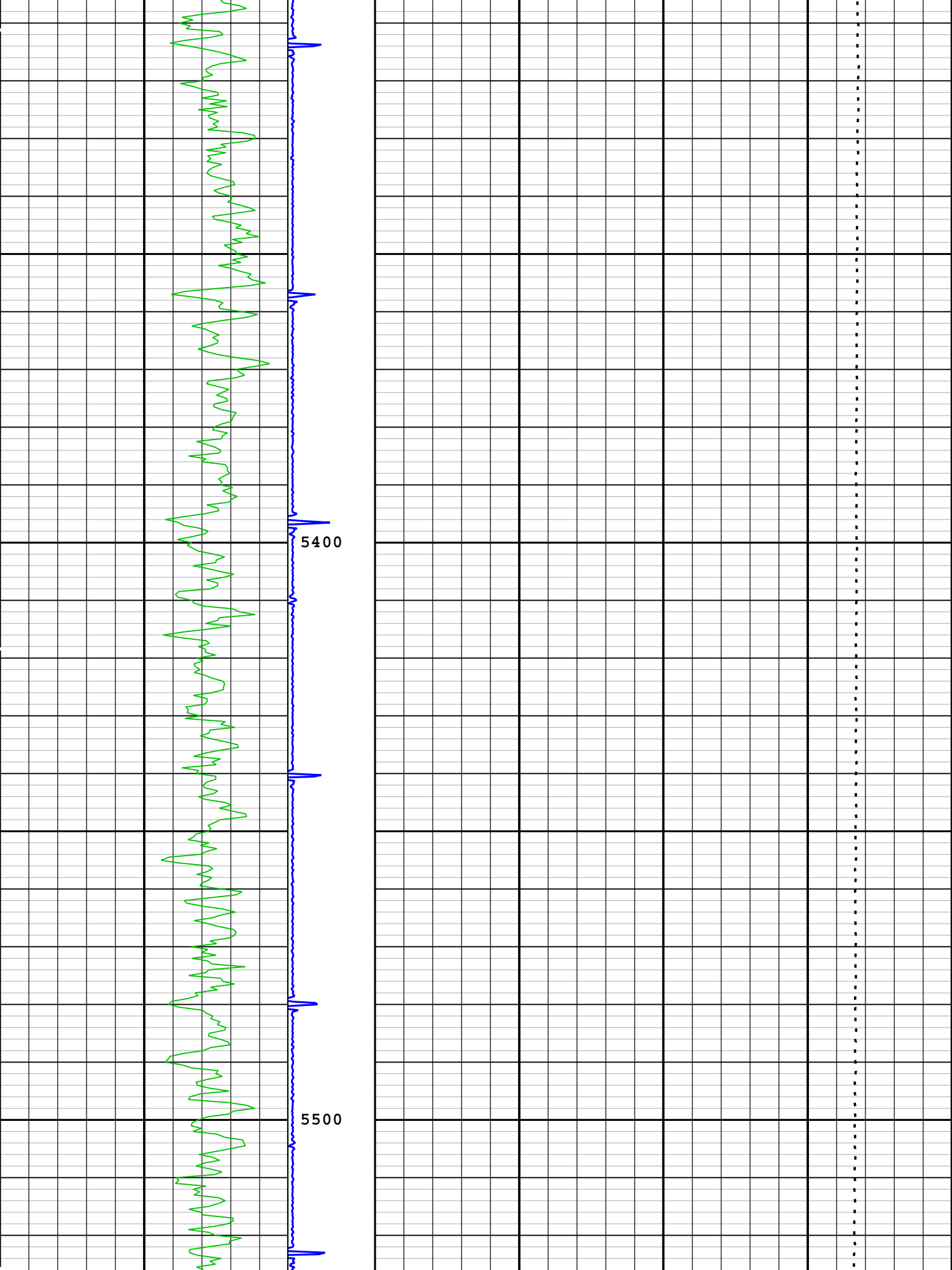


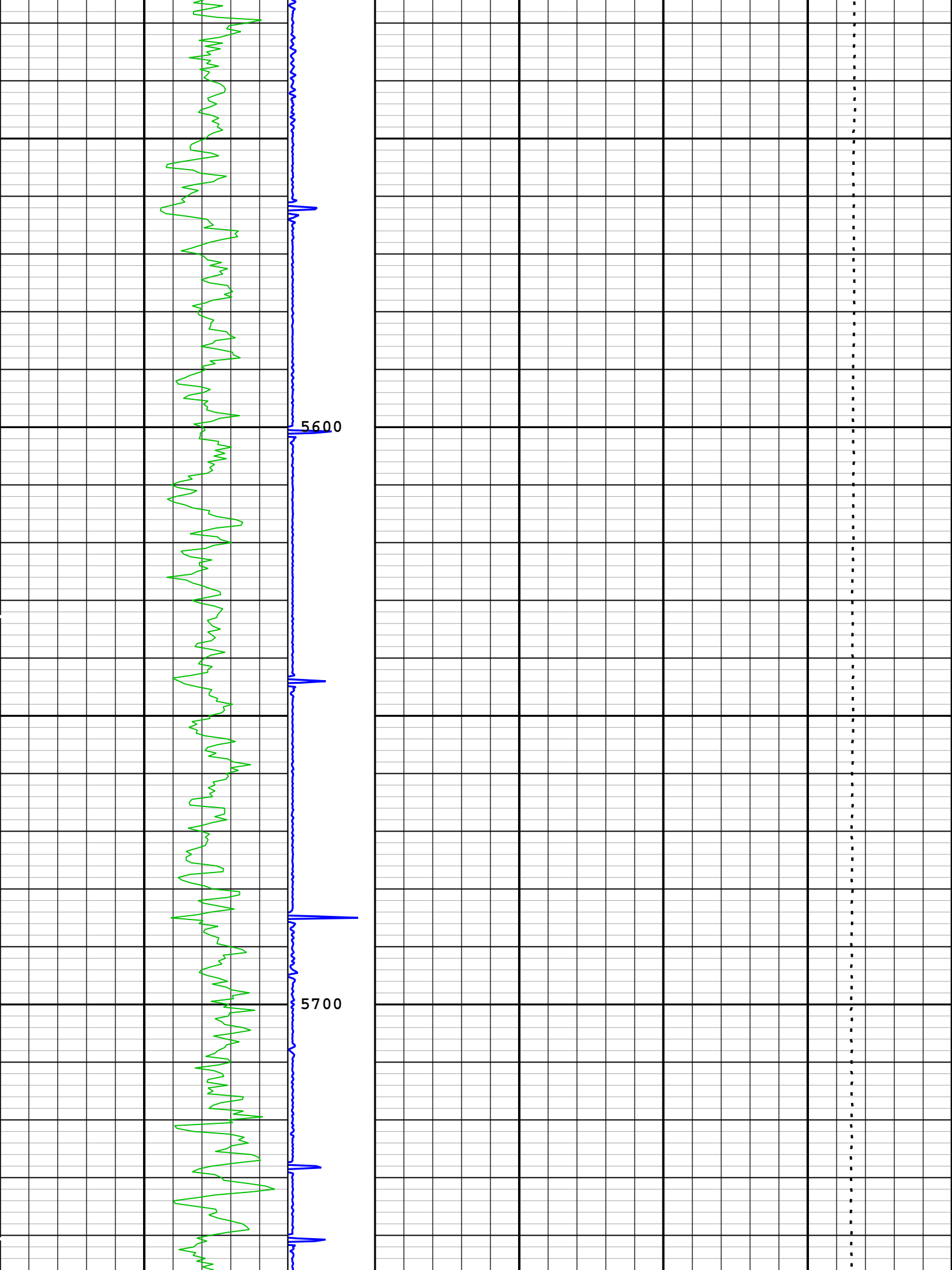


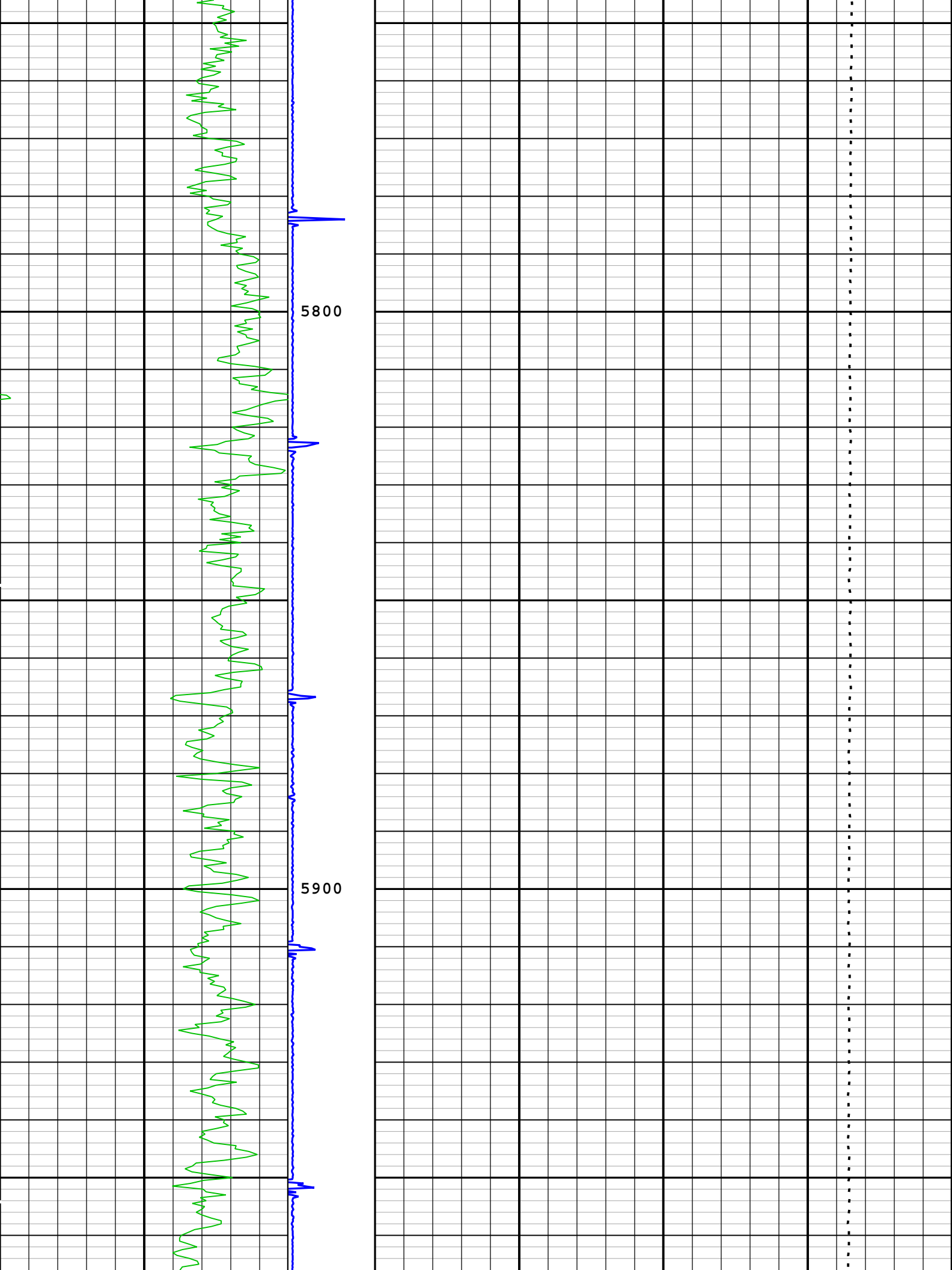


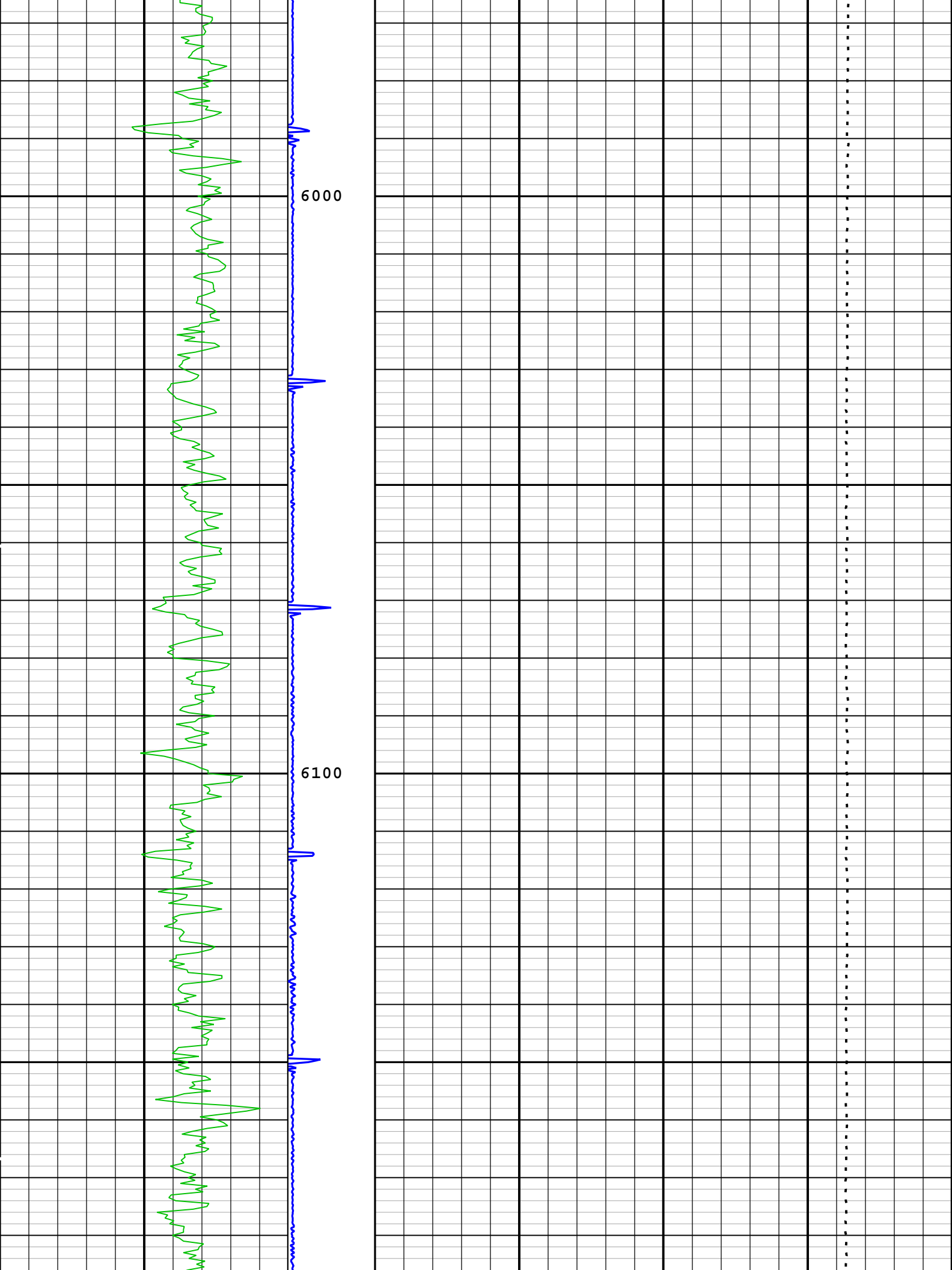


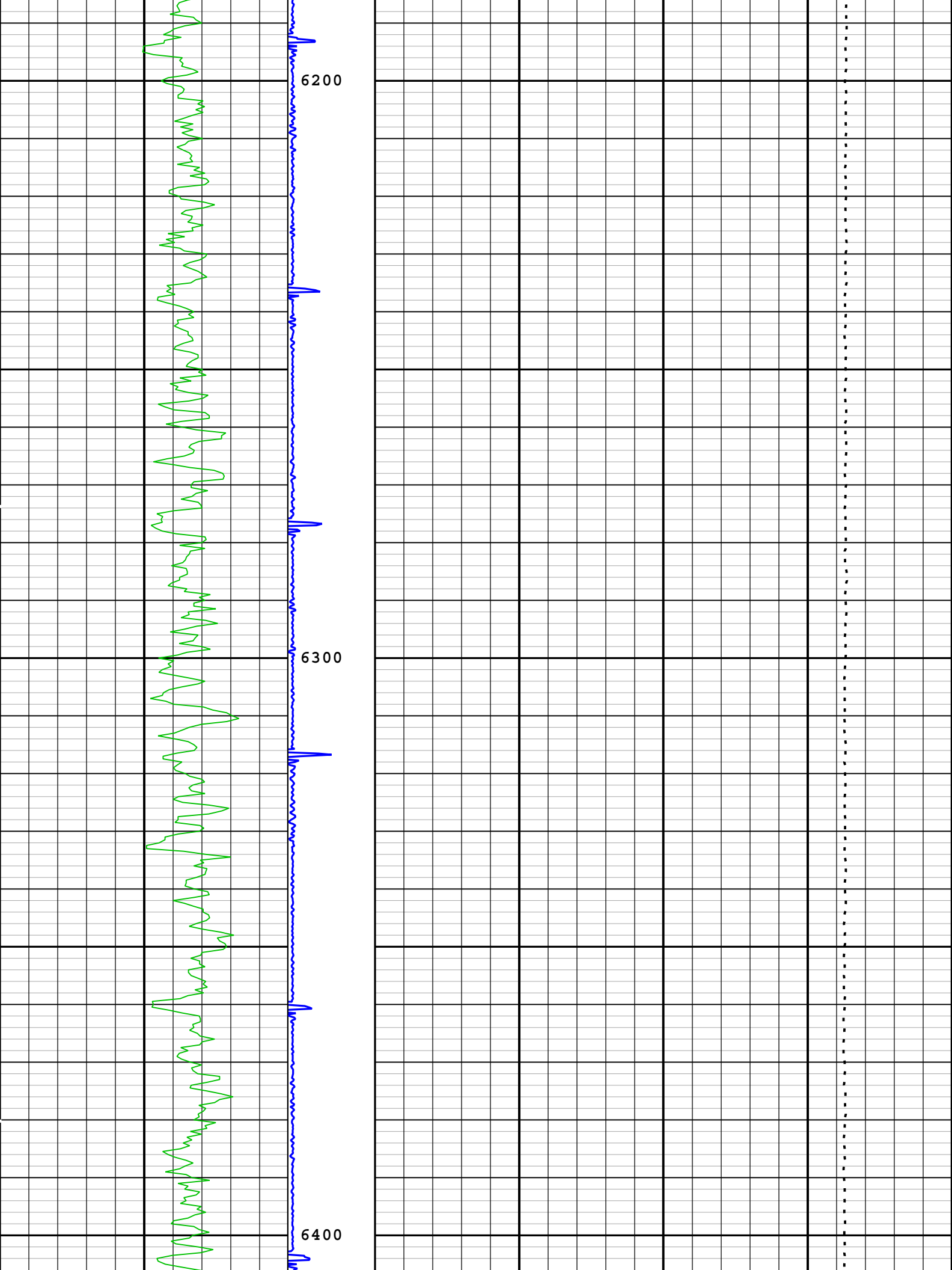


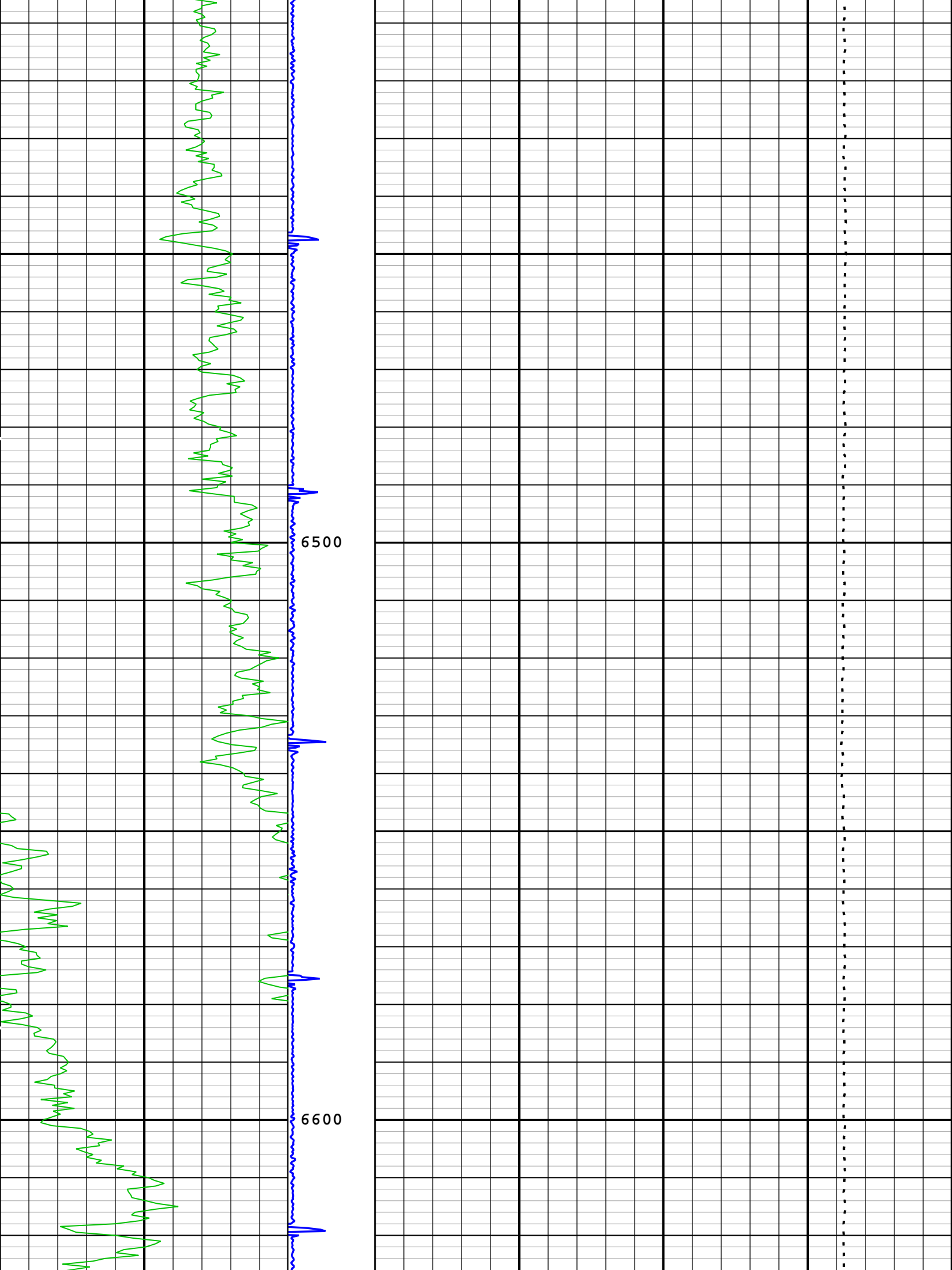




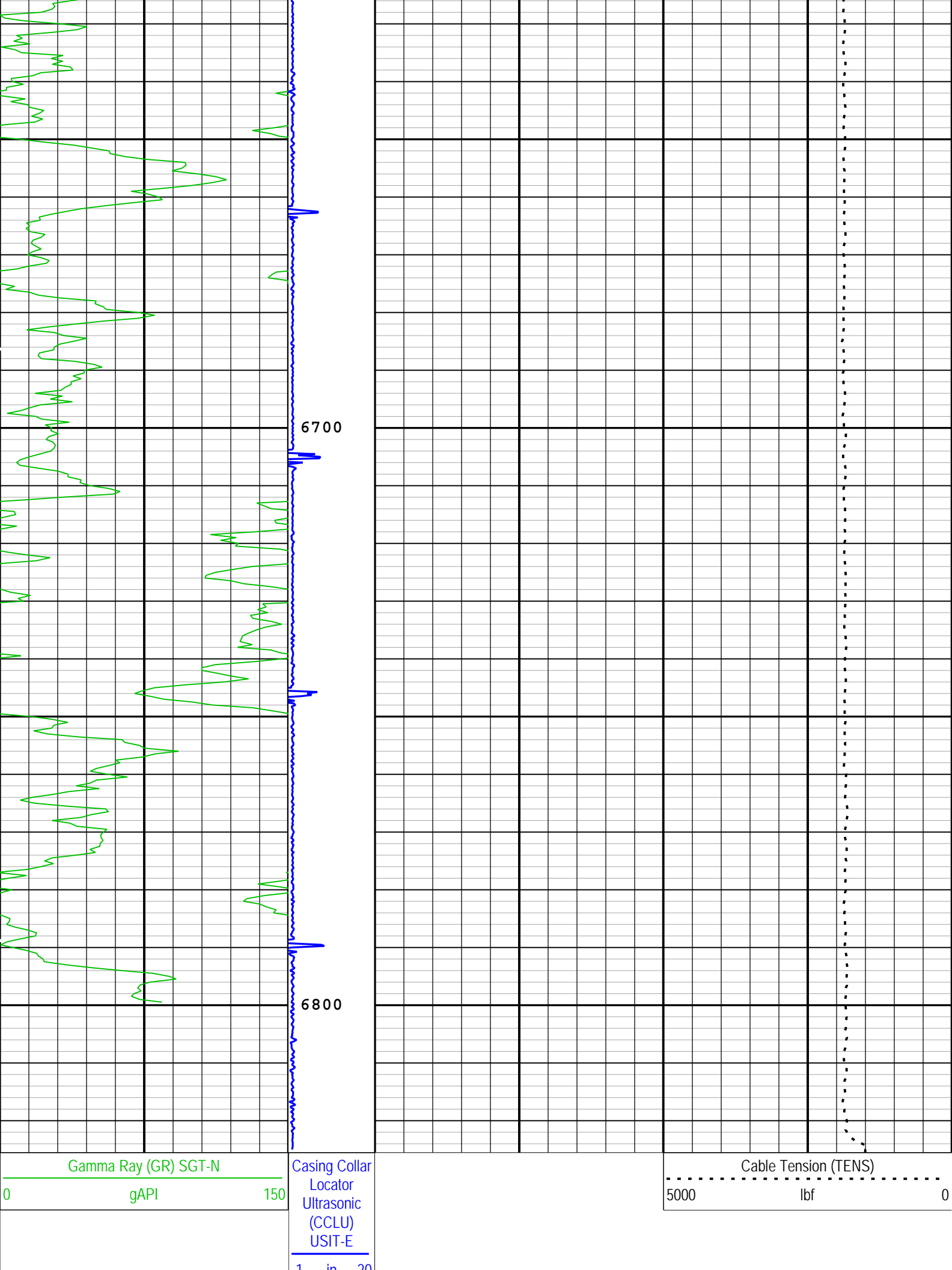








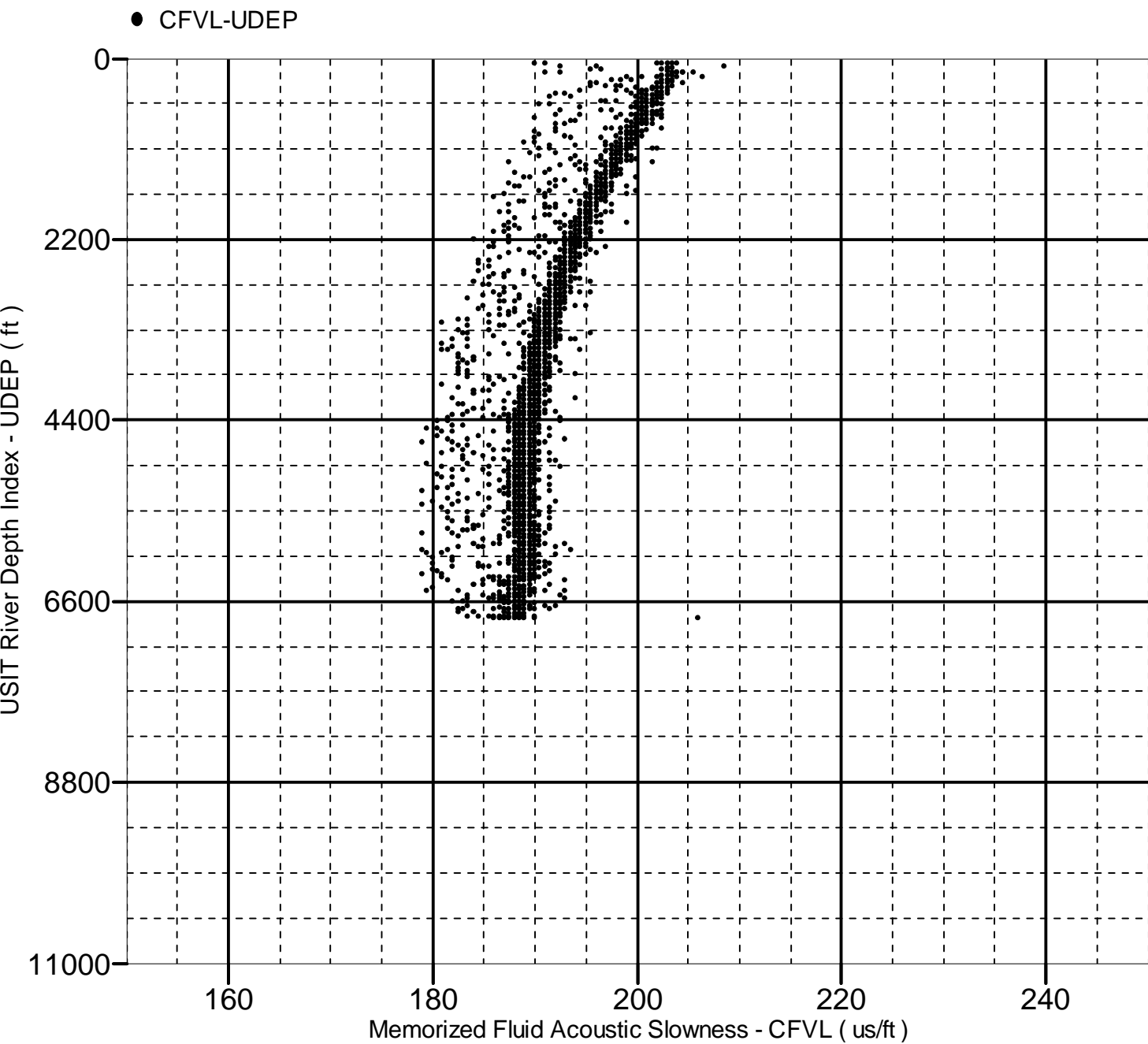




# Fluid Acoustic Slowness vs Depth

2D Cross Plot

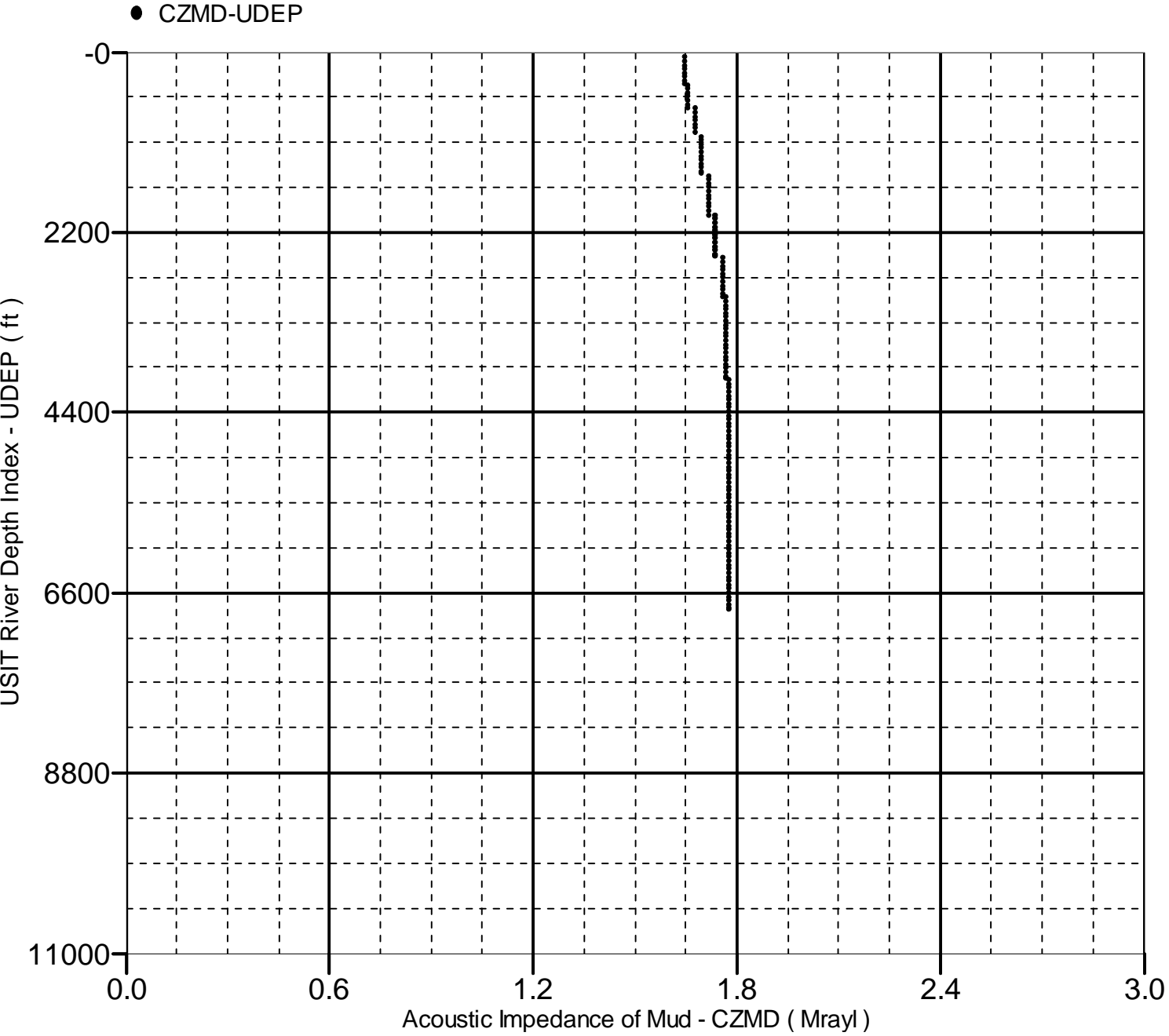
Index Range: From 6825.25 to 61.00 ft



# Acoustic Impedance of Mud vs Depth

2D Cross Plot

Index Range: From 6825.25 to 61.00 ft



Company:	Noble Energy Inc	Schlumberger
Well:	NCLP AA06-67-1AHNA	
Field:	Wattenberg	
County:	Weld	
State:	Colorado	
Ultrasonic Imager		
CO State		
Gamma Ray - CCL Log		