



**Radial Cement Bond Log  
Gamma Ray / CCL  
Temperature**

Company Antero Resources		Company Antero Resources	
Well Jim 3H	Well Jim 3H	Field Marcellus	Field Marcellus
County Tyler	County Tyler	State West Virginia	State West Virginia
State West Virginia	Location:	API #: 4709502410	Other Services
	Latitude:		
	Longitude:		
SEC	TWP	RGE	Elevation
Permanent Datum	Ground Level	Elevation	
Log Measured From	Ground Level		
Drilling Measured From	Kelly Bushing		
Date	13 - December - 2018		
Run Number	One		
Depth Driller	17,654 ft		
Depth Logger	6,640 ft		
Bottom Logged Interval	6,630 ft		
Top Log Interval	Surface		
Open Hole Size	N/A		
Type Fluid	Fresh Water		
Density / Viscosity	8.3 lbs/gal		
Max. Recorded Temp.	136 °F		
Estimated Cement Top	2,130 ft		
Time Well Ready	04:37		
Time Logger on Bottom	05:20		
Equipment Number	2612		
Location	Inwin, PA		
Recorded By	Jim Cleland		
Witnessed By	Curt Anderson		
Borehole Record		Tubing Record	
Run Number	Bit	From	To
		Size	Weight
		From	From
			To
Casing Record	Size	Wgt/Ft	Top
Surface String	13-3/8"	-	-
Prot. String	9-5/8"	-	-
Production String	5 1/2 in	23#	-
Liner			17,654 ft

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All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions set out in our current Price Schedule.

**Comments**

Bond tool centralized with three inline bowspring centralizers and two overbody rigid centralizers  
 Logged from 6,630 ft to Surface with a maximum temperature of 136° F  
 Tool zeroed at ground level and corrected 24 ft to KB  
 Estimated top of cement bond detected at 2,130 ft  
 Free pipe calibration taken at 821 ft  
 Marker joint detected from 5,529 ft to 5,539 ft then corrected to match casing tally  
 Casing tally denotes marker joint at 5,528 ft to 5,538 ft  
 1,500 psi applied

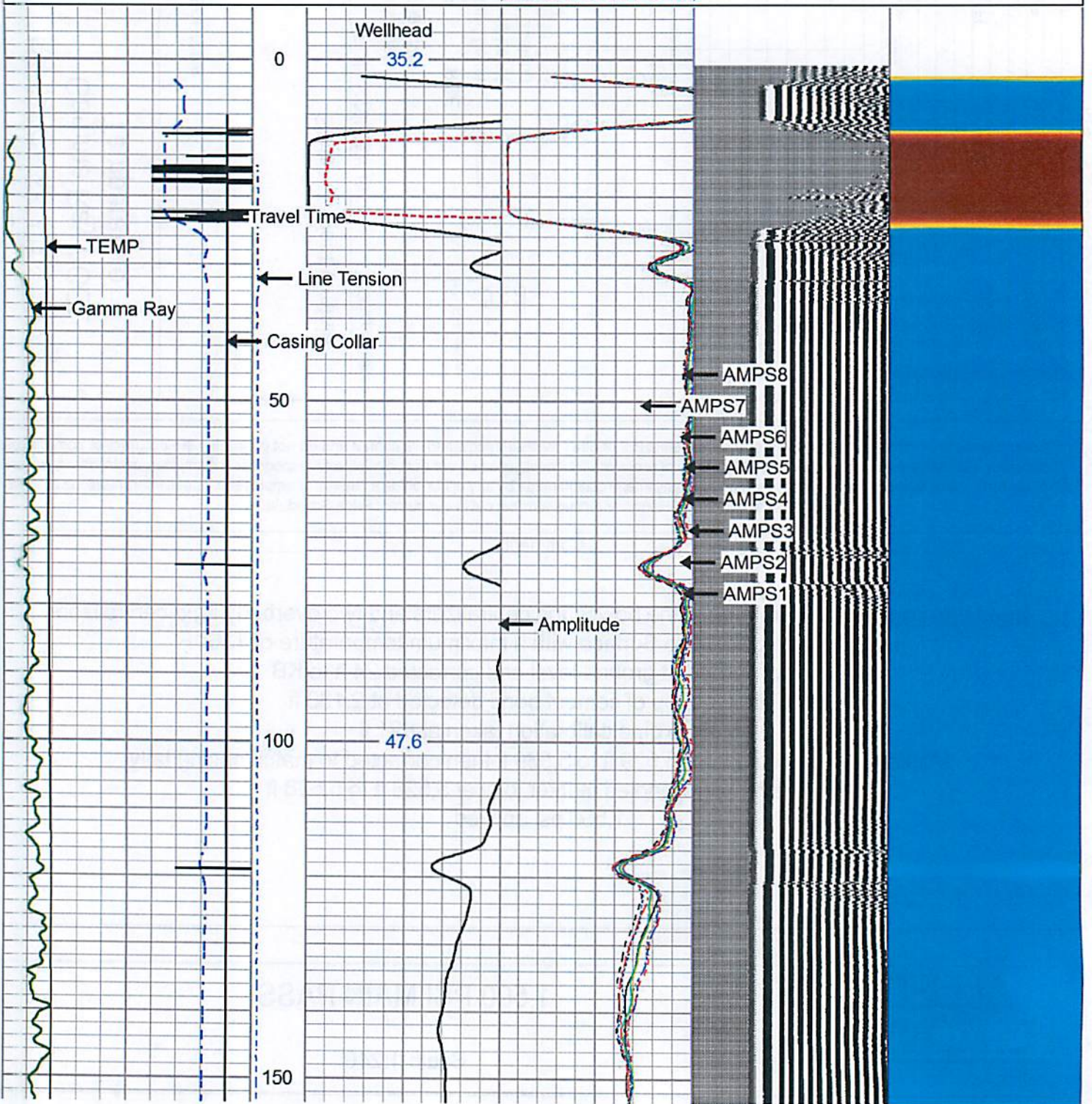


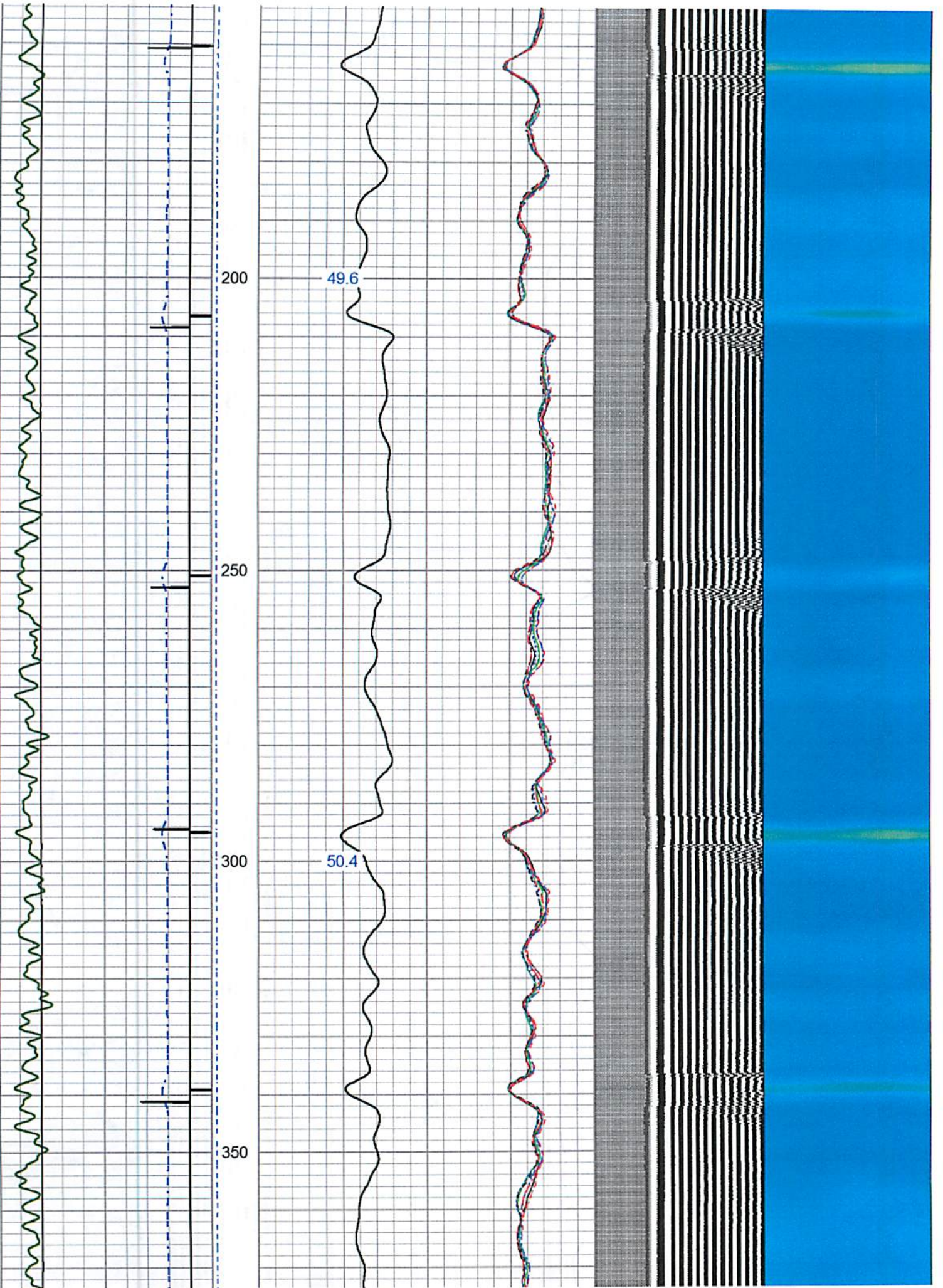
**1,500 PSI MAIN PASS**

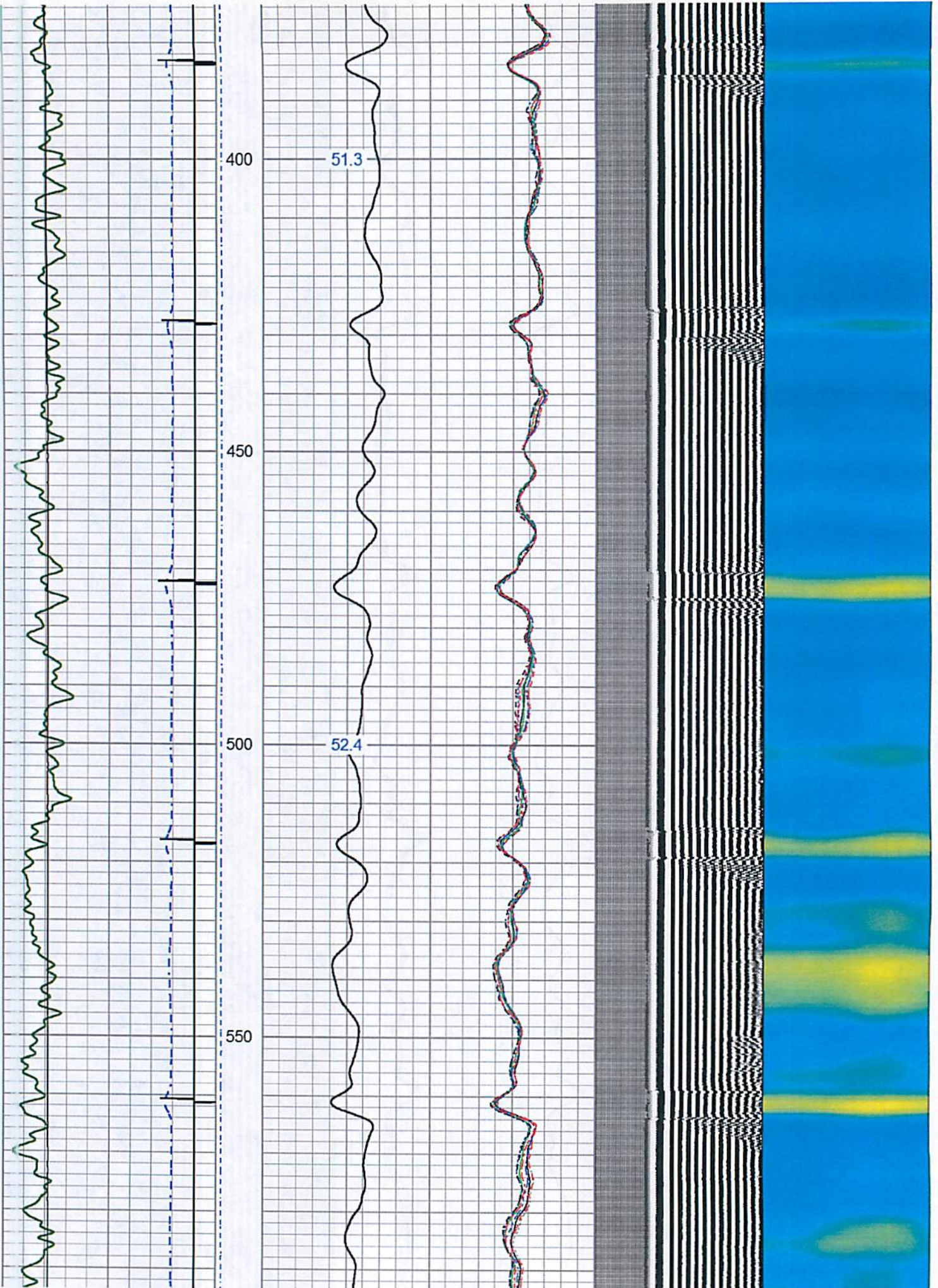
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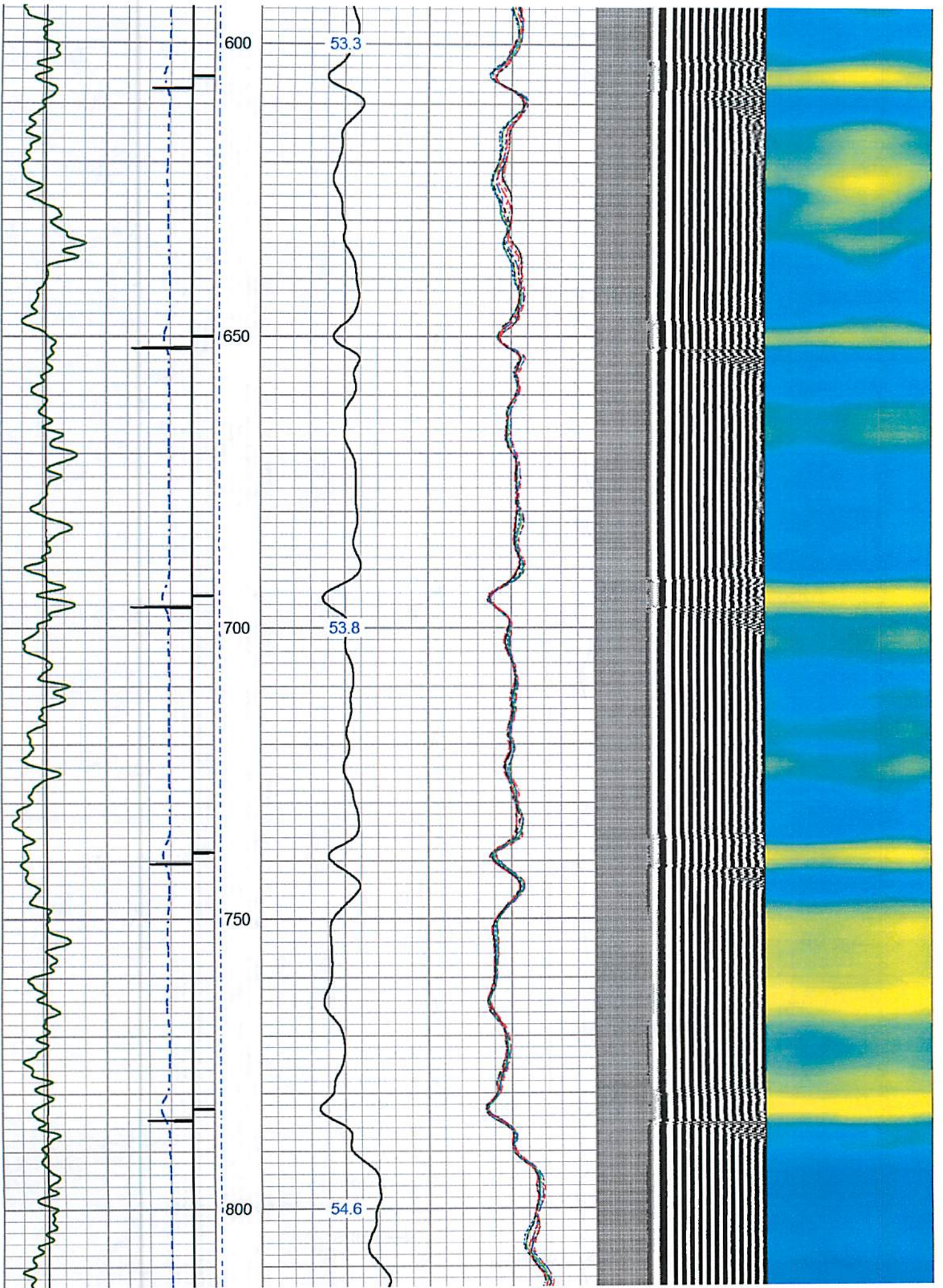
Database File c:\users\user\desktop\antero neat logs\antero resources\_jim unit 3h\_rcbl.db  
 Dataset Pathname Main Pass  
 Presentation Format ahws\_rcbl\_jc  
 Dataset Creation Thu Dec 13 07:21:22 2018  
 Charted by Depth in Feet scaled 1:240

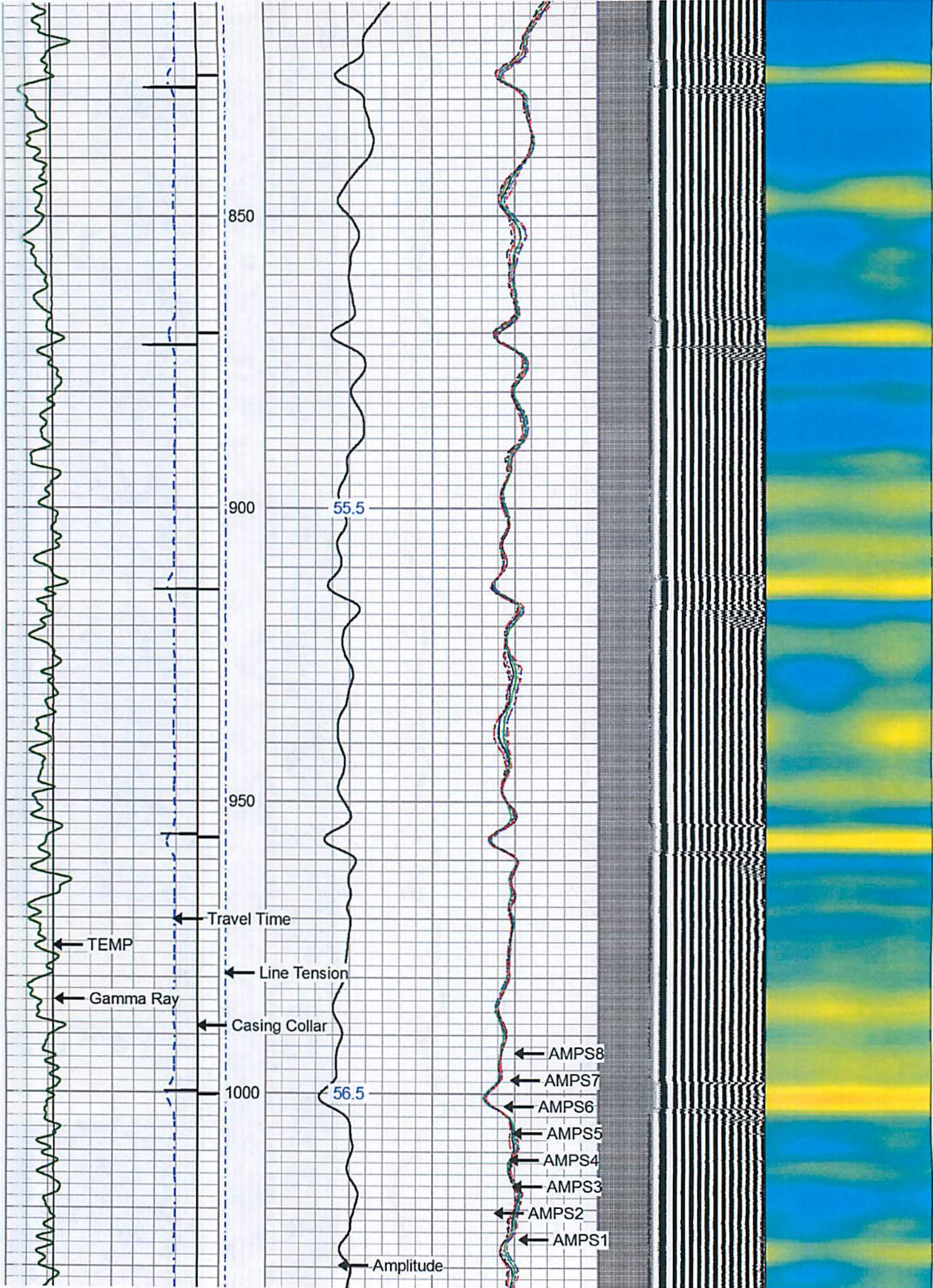
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9	Casing Collar	-1	(lb)	0	Amplified Amplitude	-5	AMPS2	150	200		1200	0	100
0	Gamma Ray (GAPI)	300	(2500)	0	(mV)	10	-5	AMPS3	150				
0	TEMP (degF)	250			TEMP		-5	AMPS4	150				
					(degF)		-5	AMPS5	150				
							-5	AMPS6	150				
							-5	AMPS7	150				
							-5	AMPS8	150				

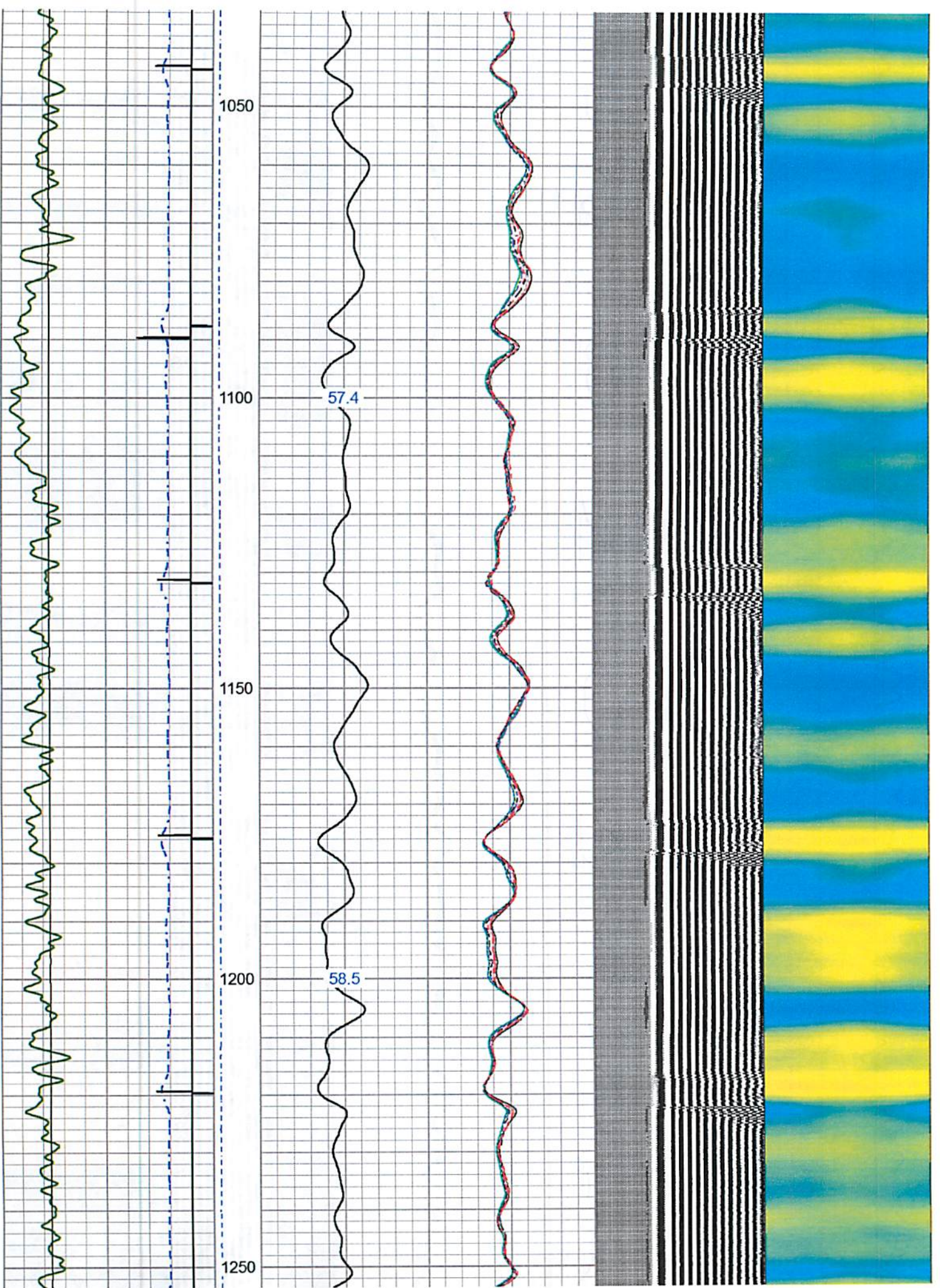


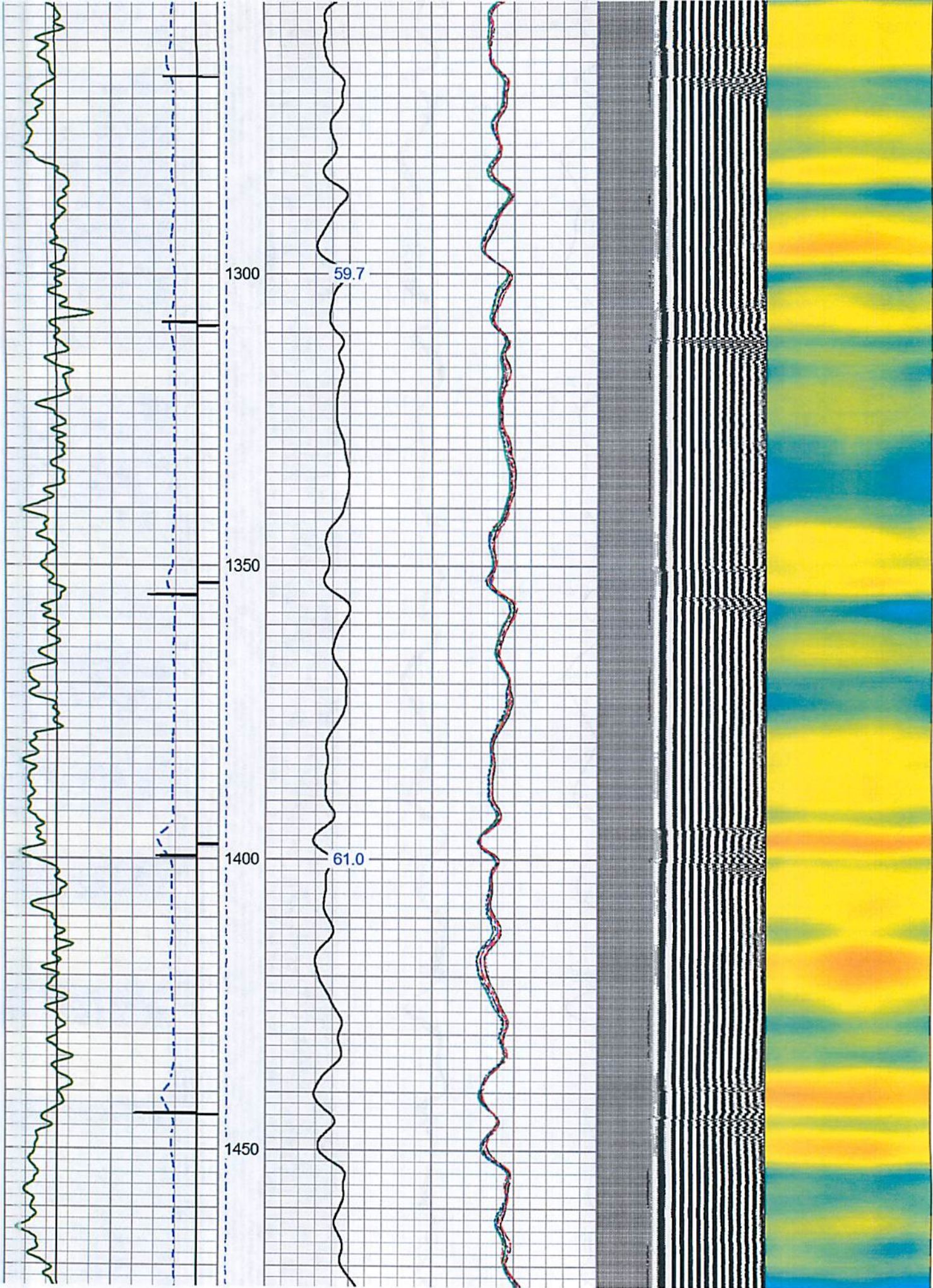




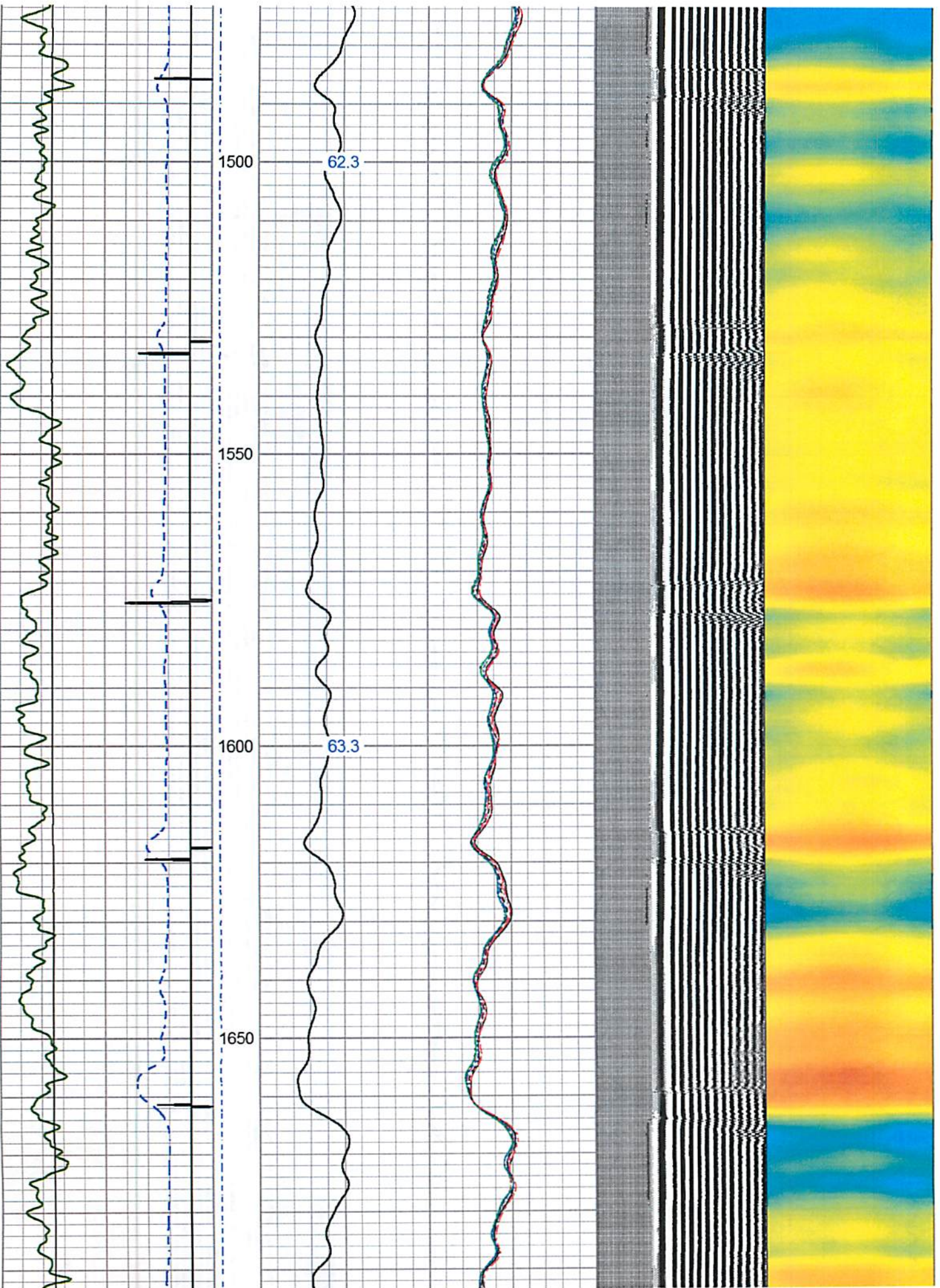


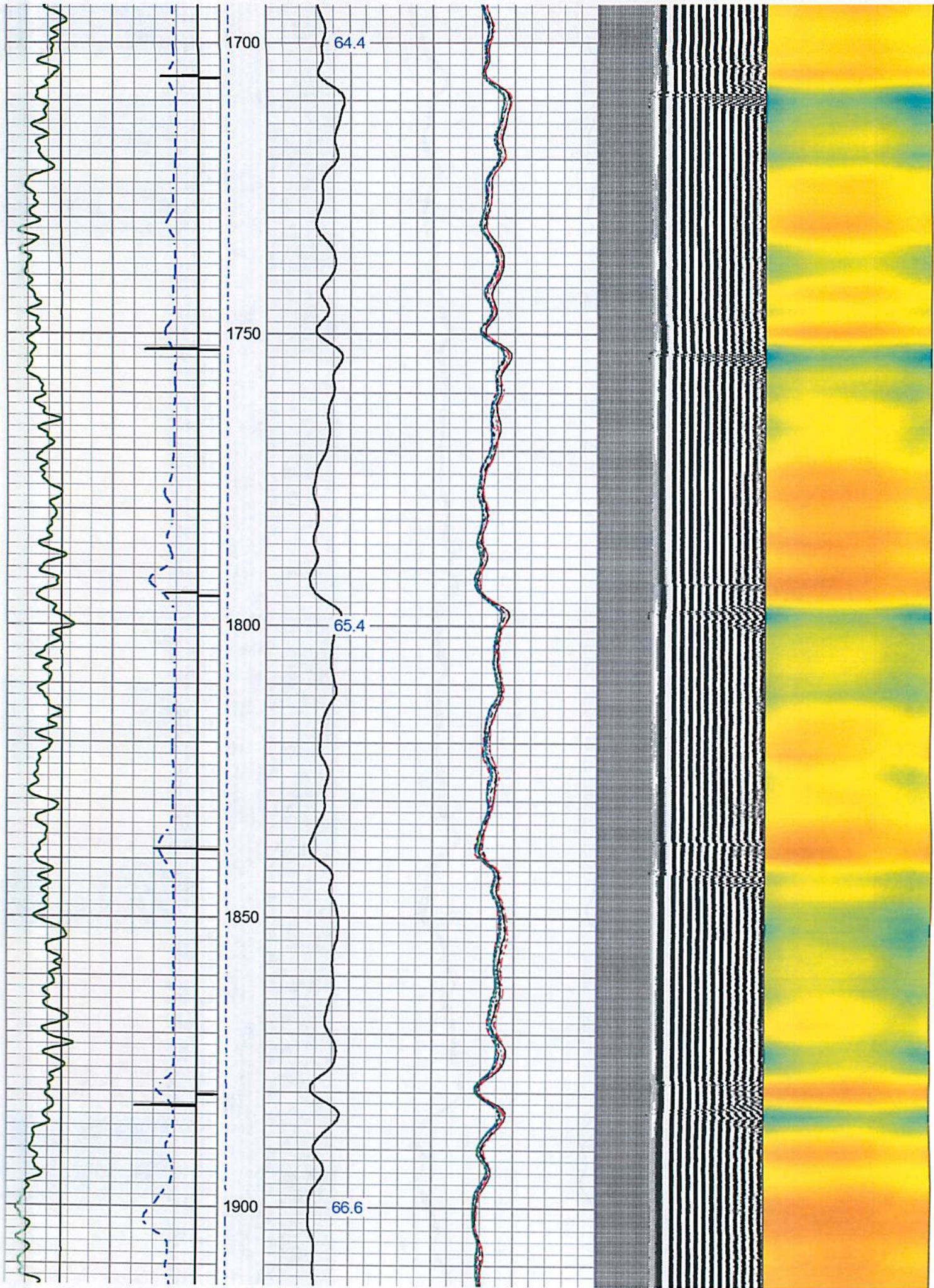


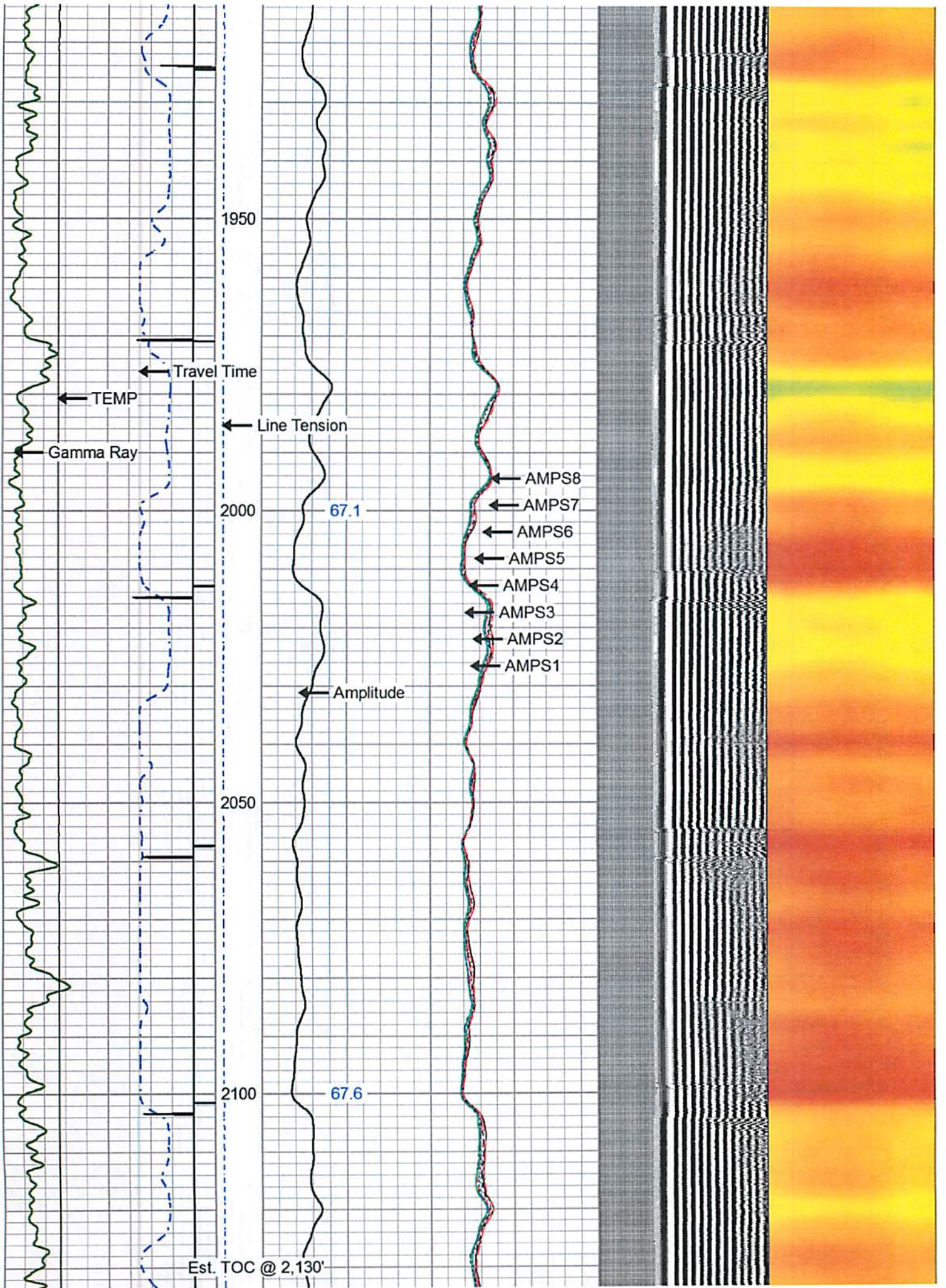


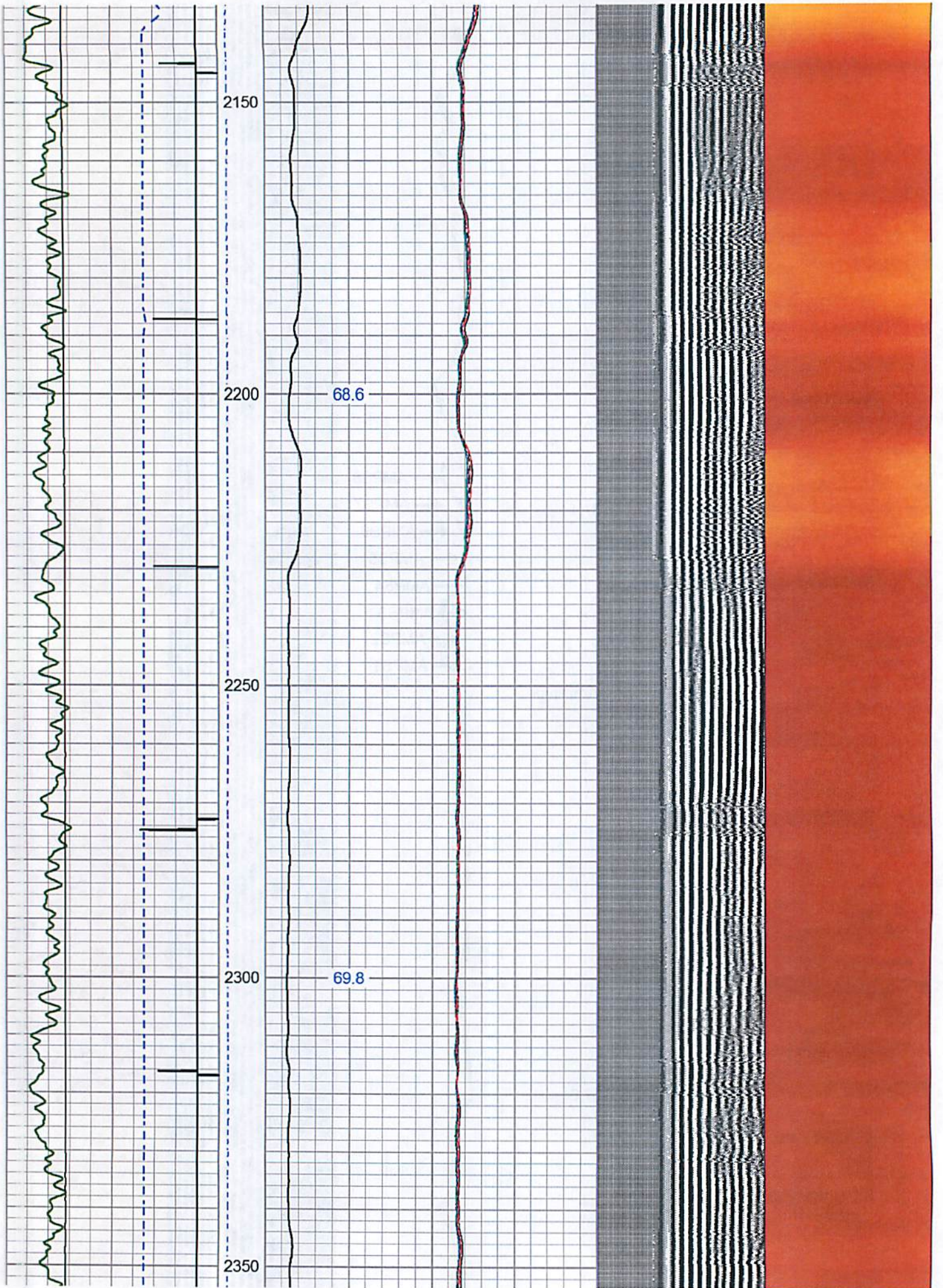


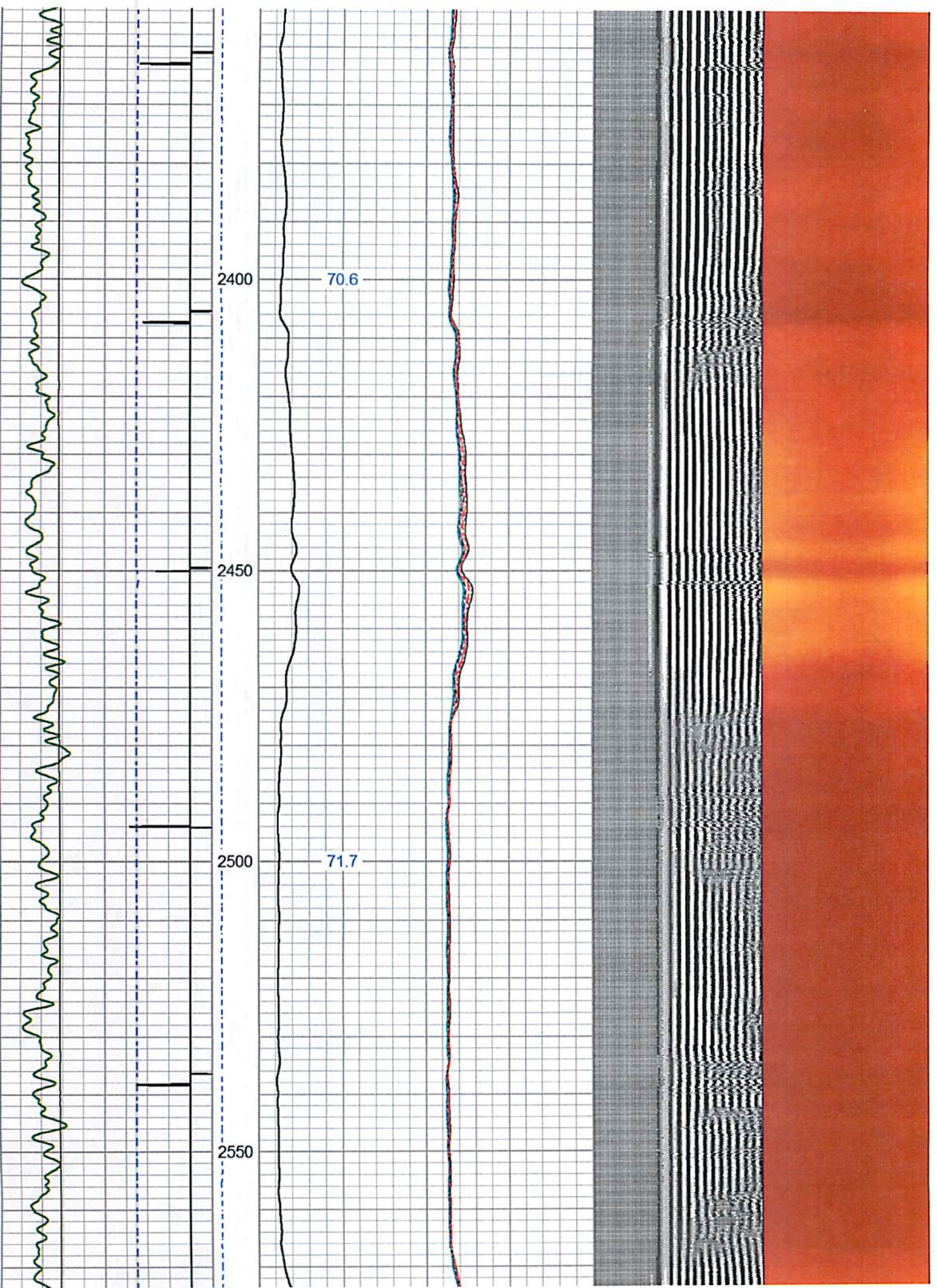


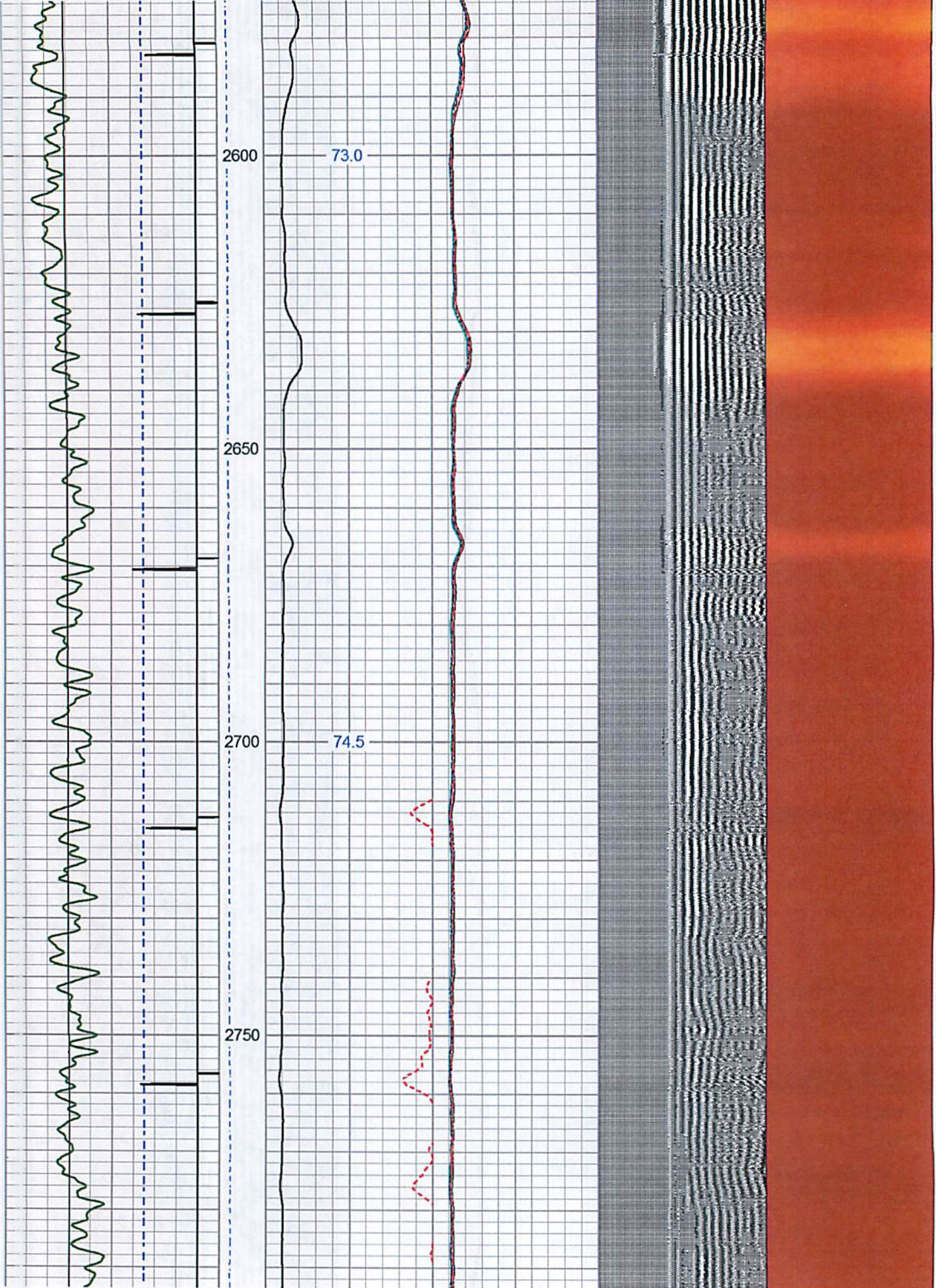


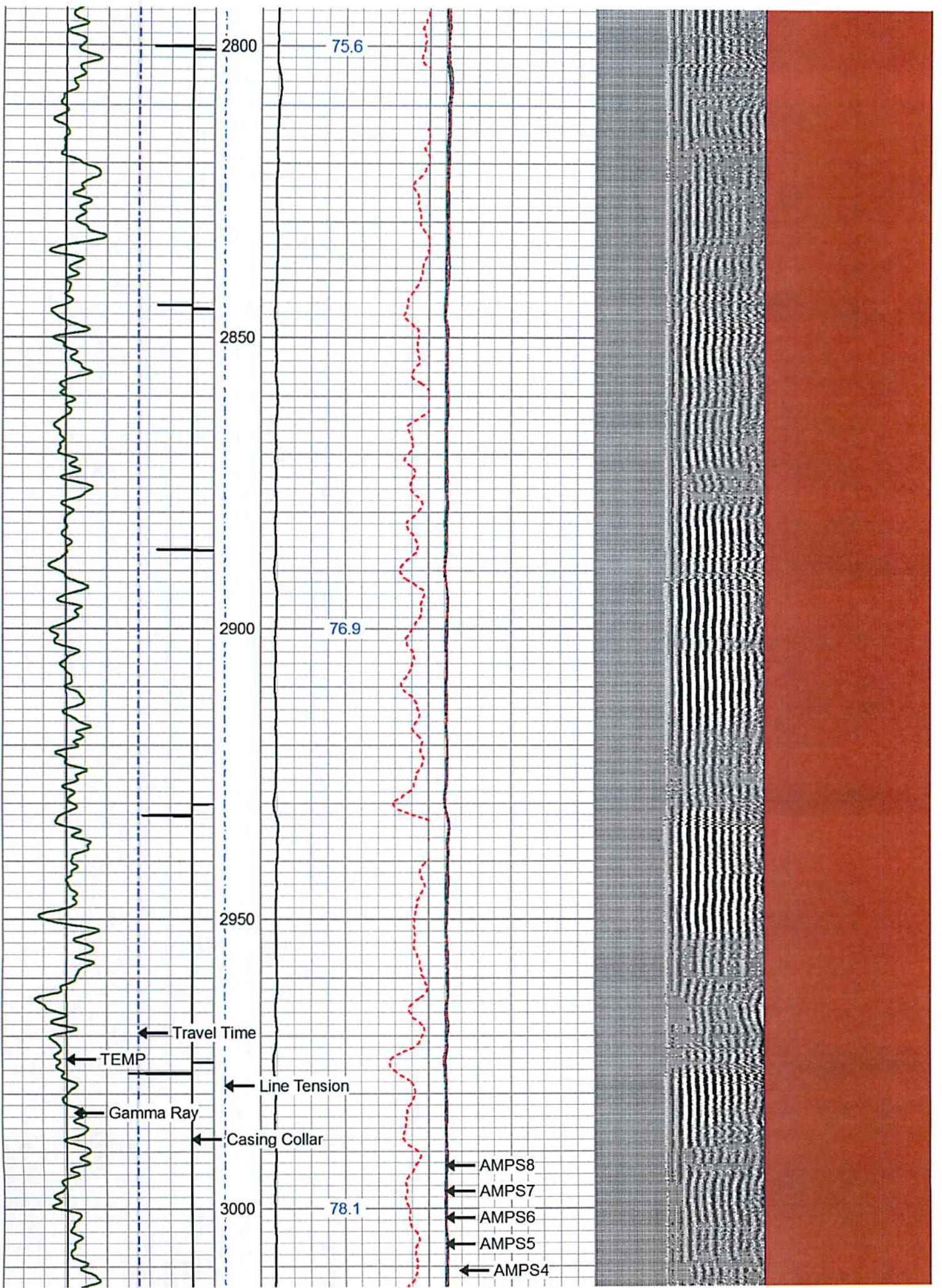


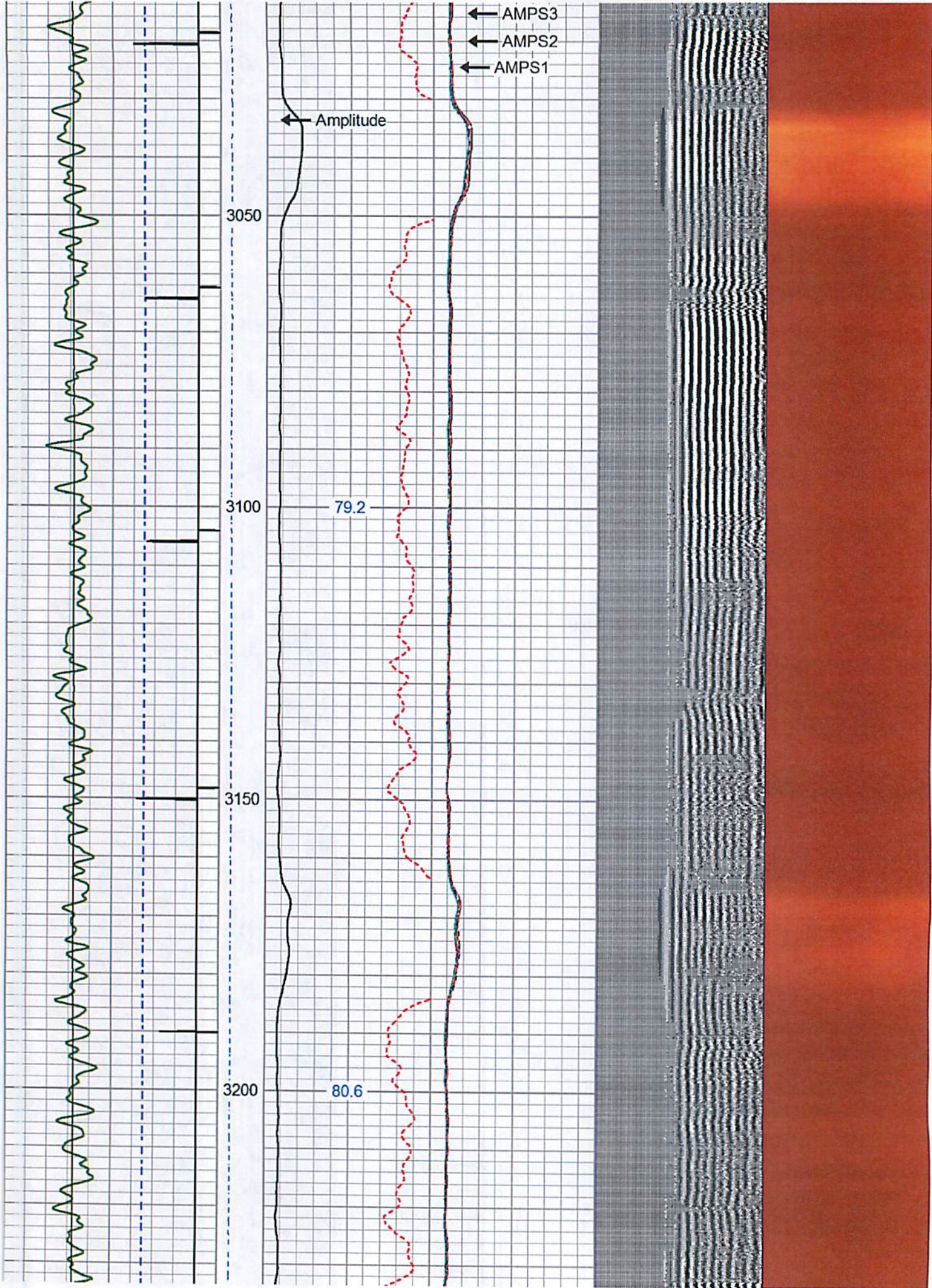




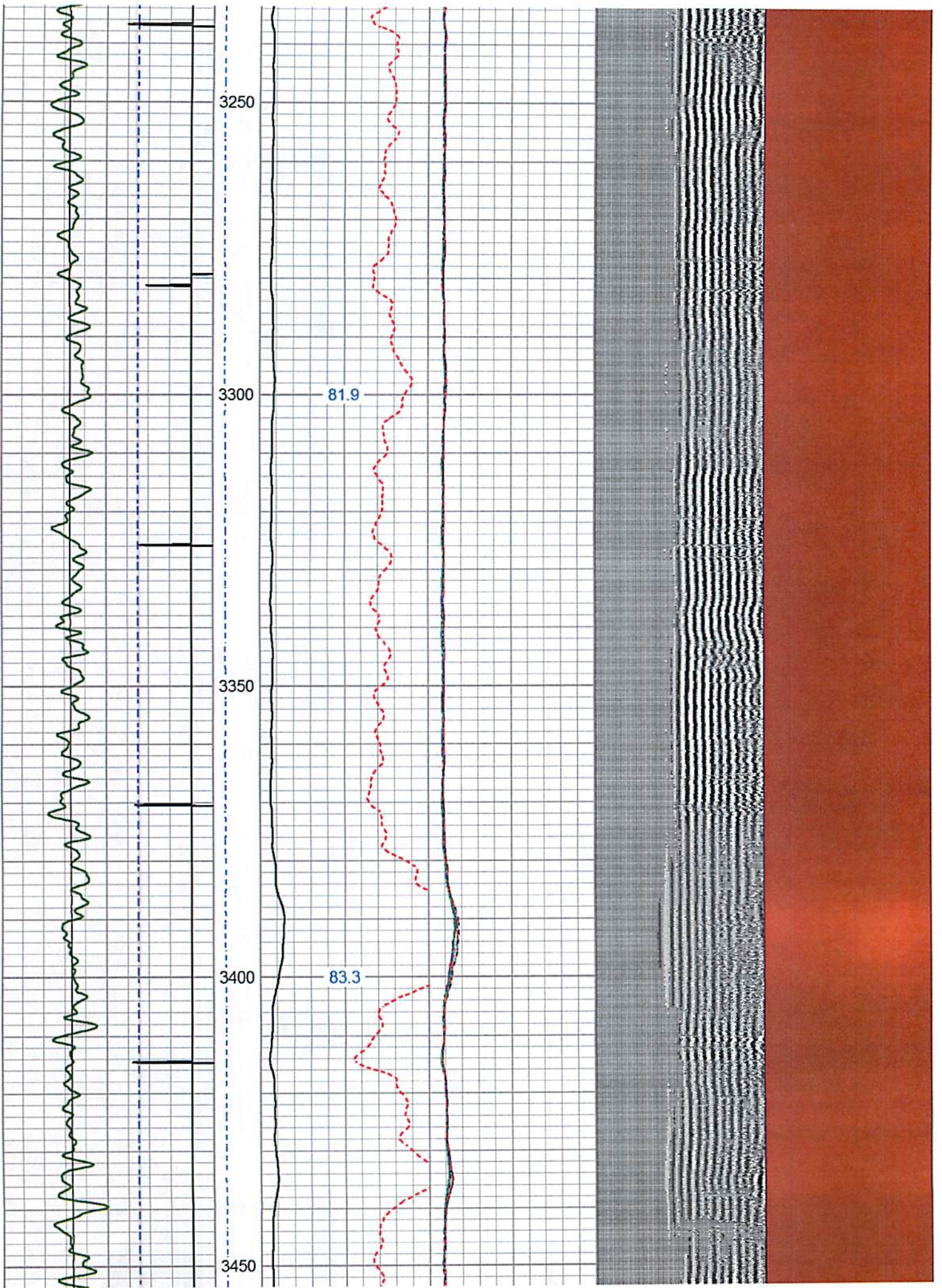


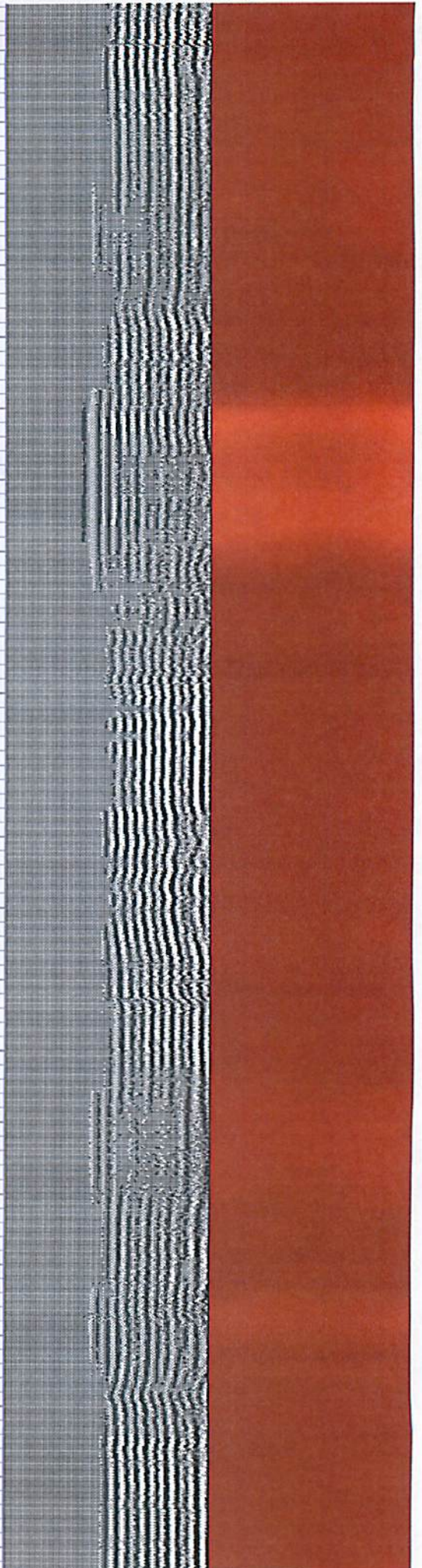
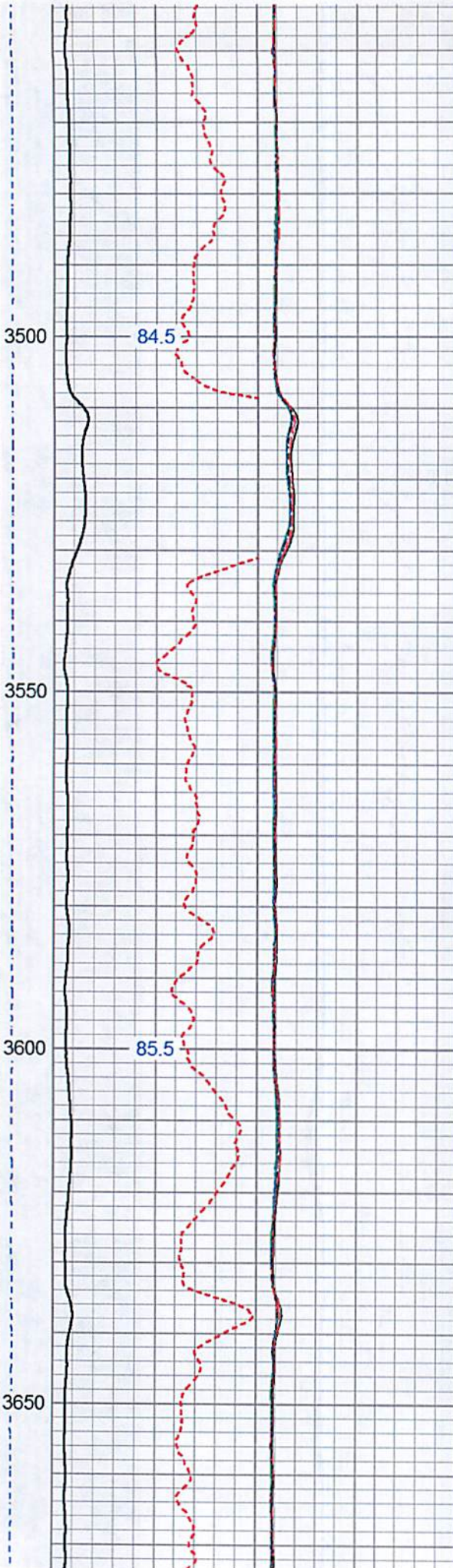
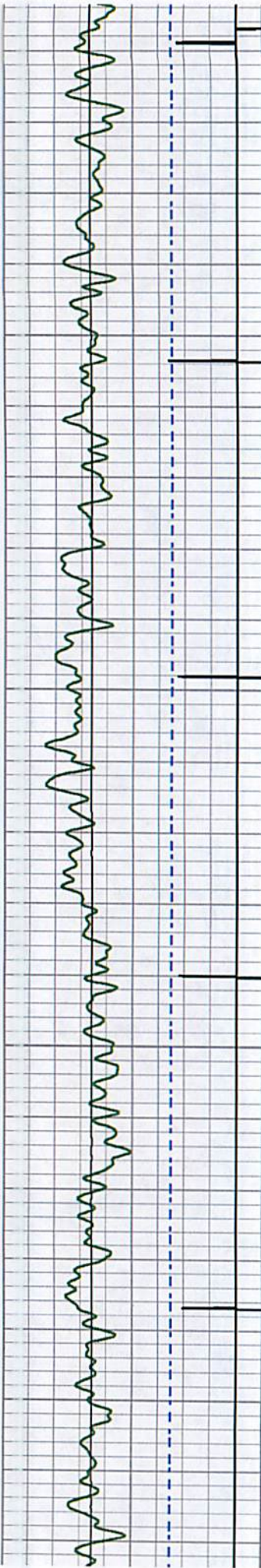


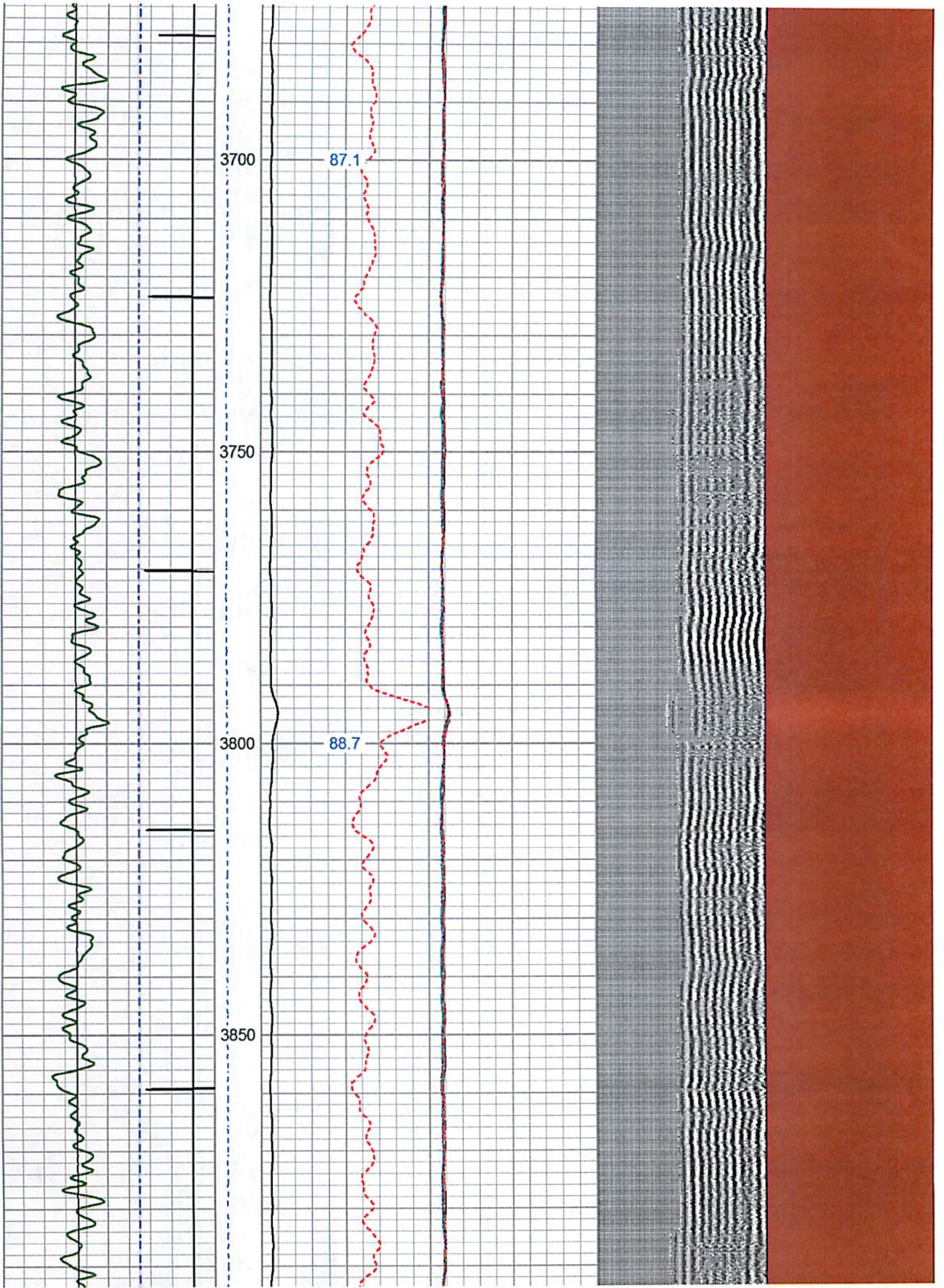


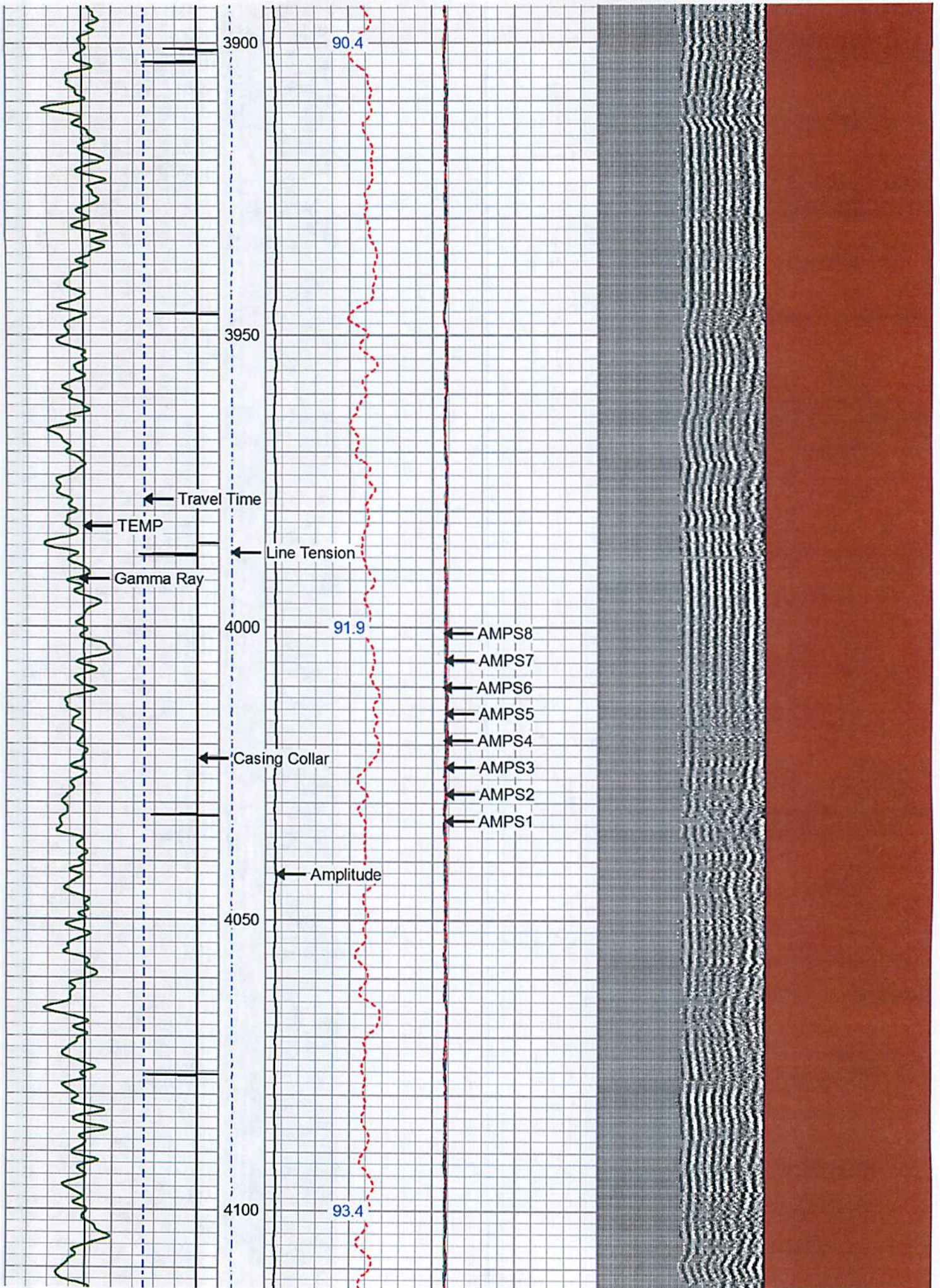


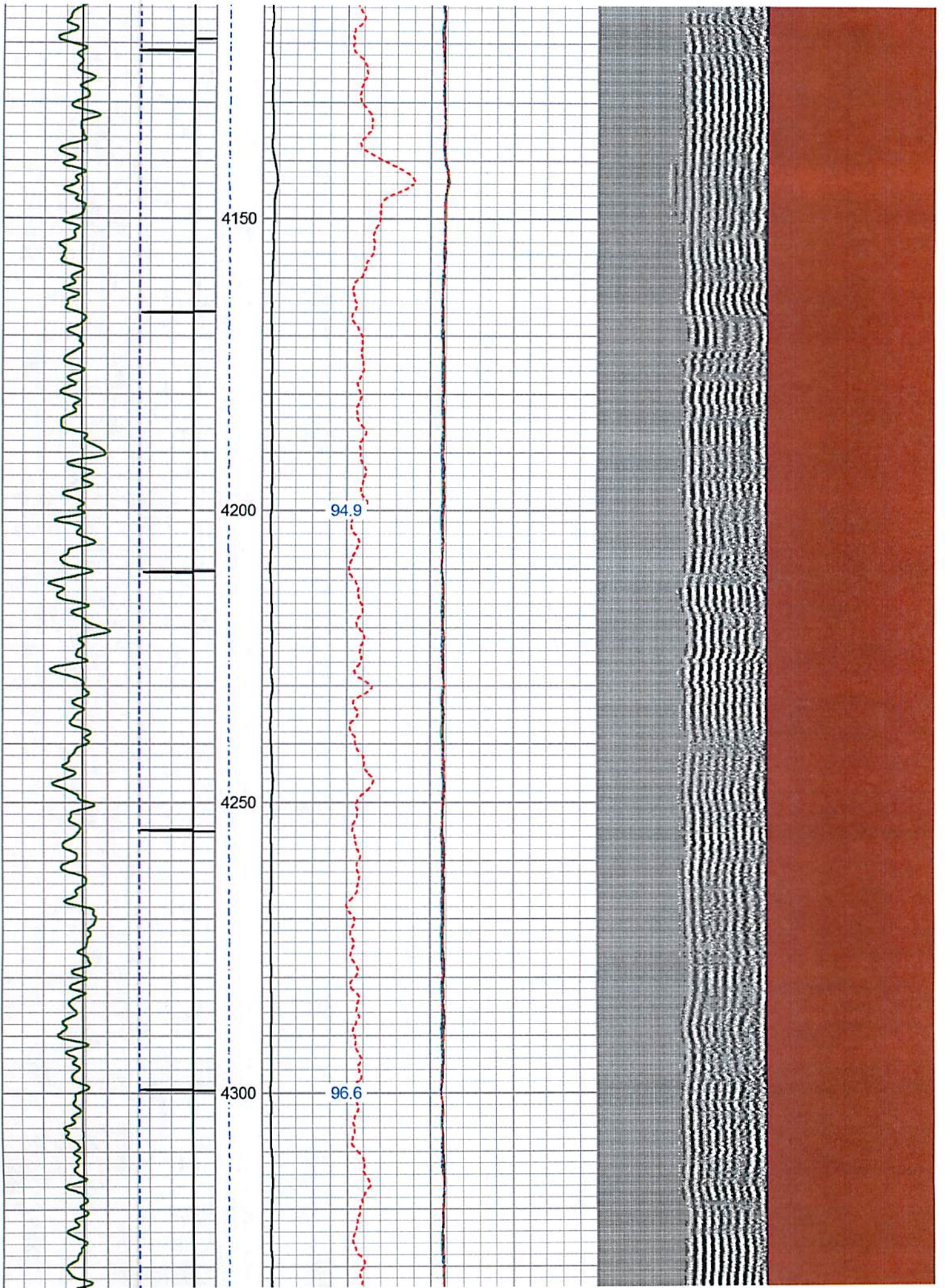


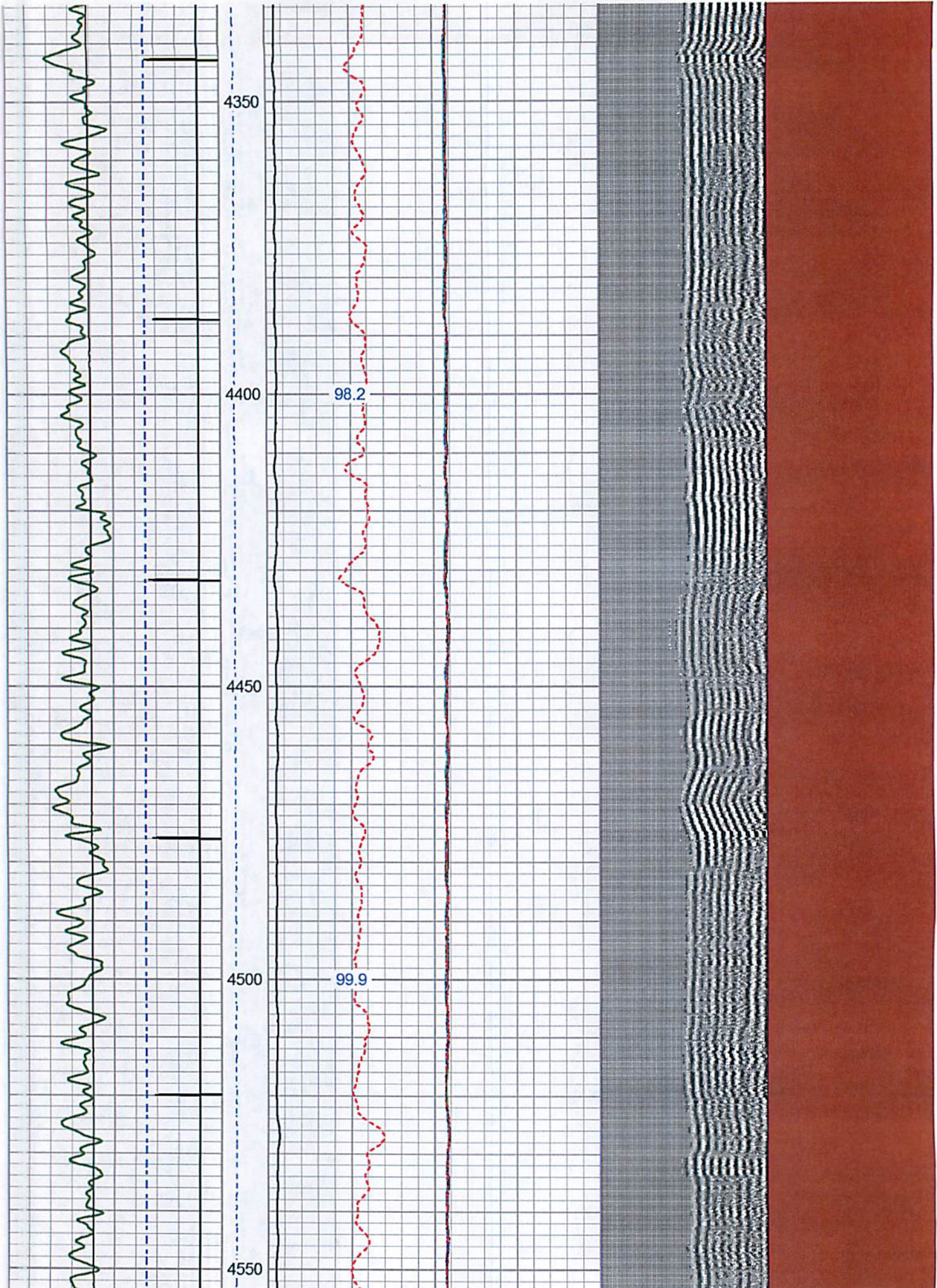


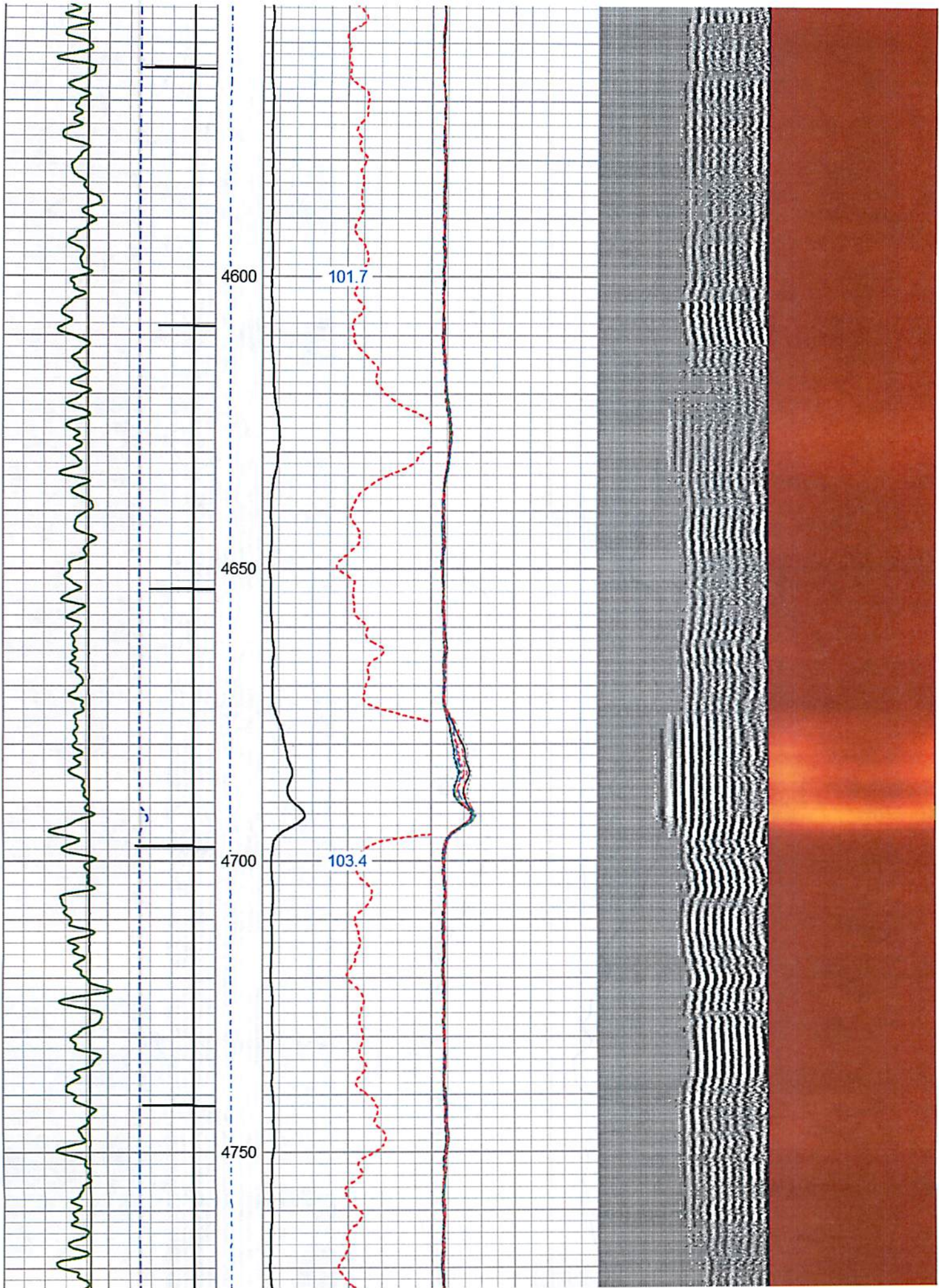


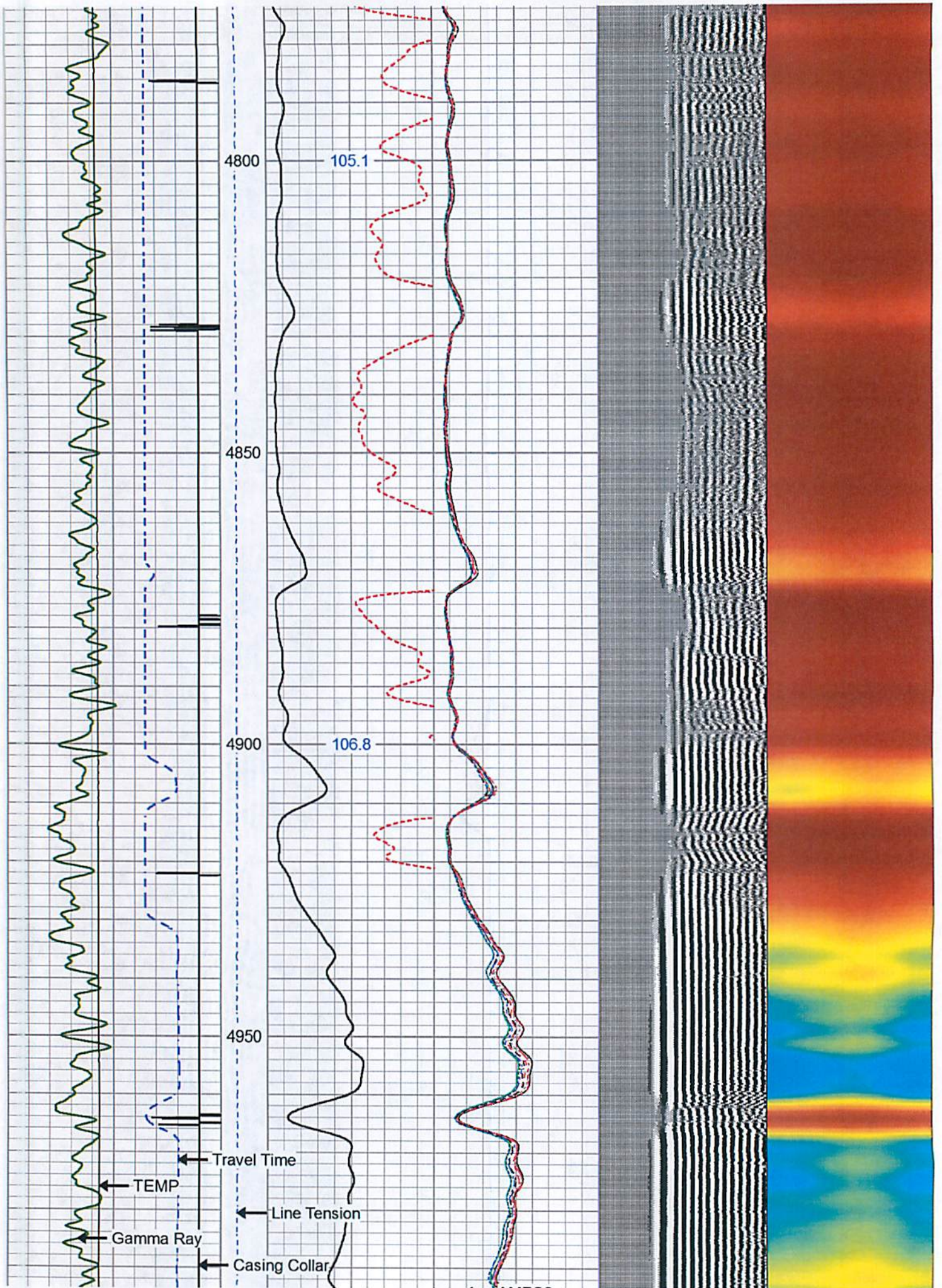




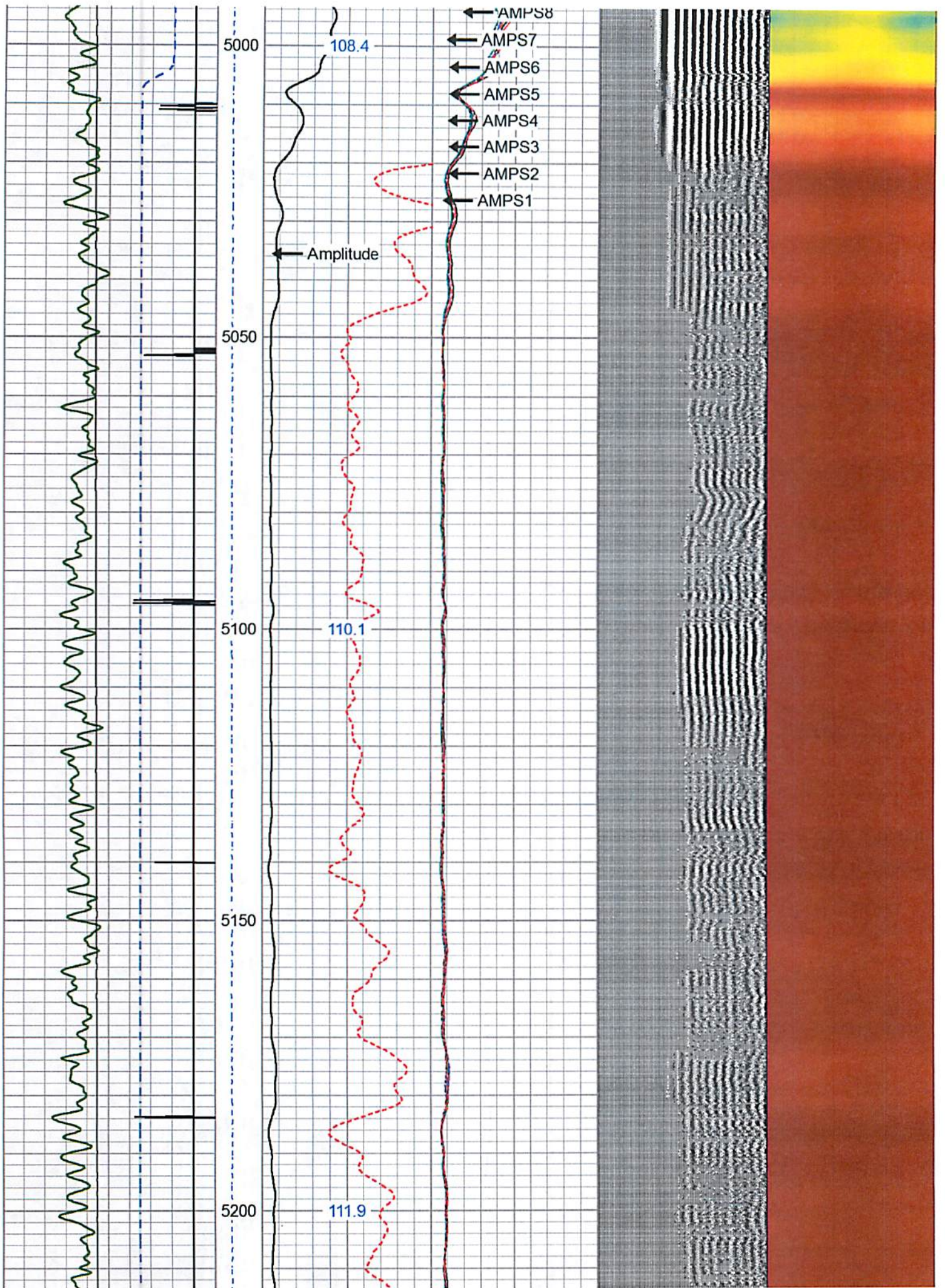


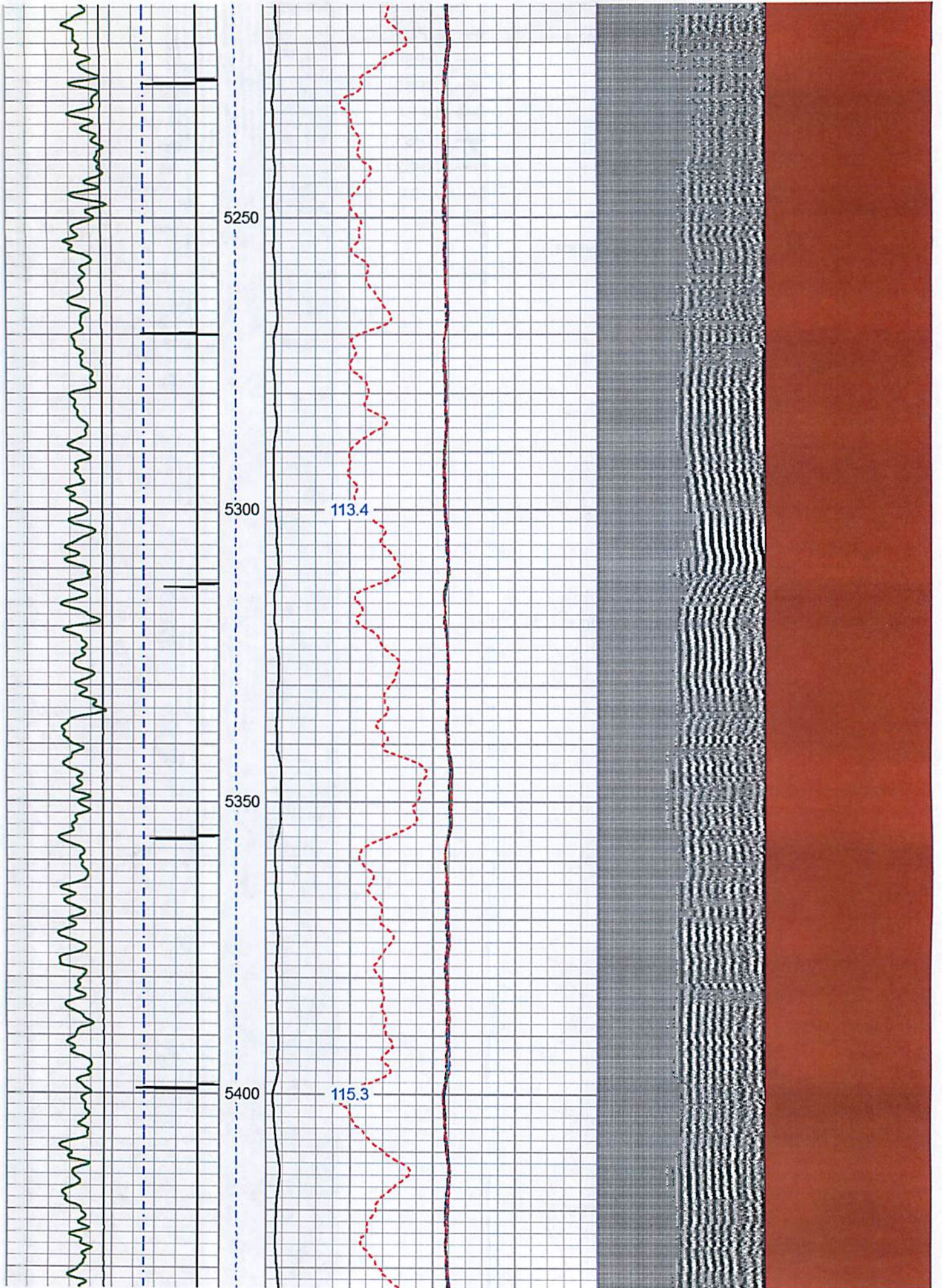


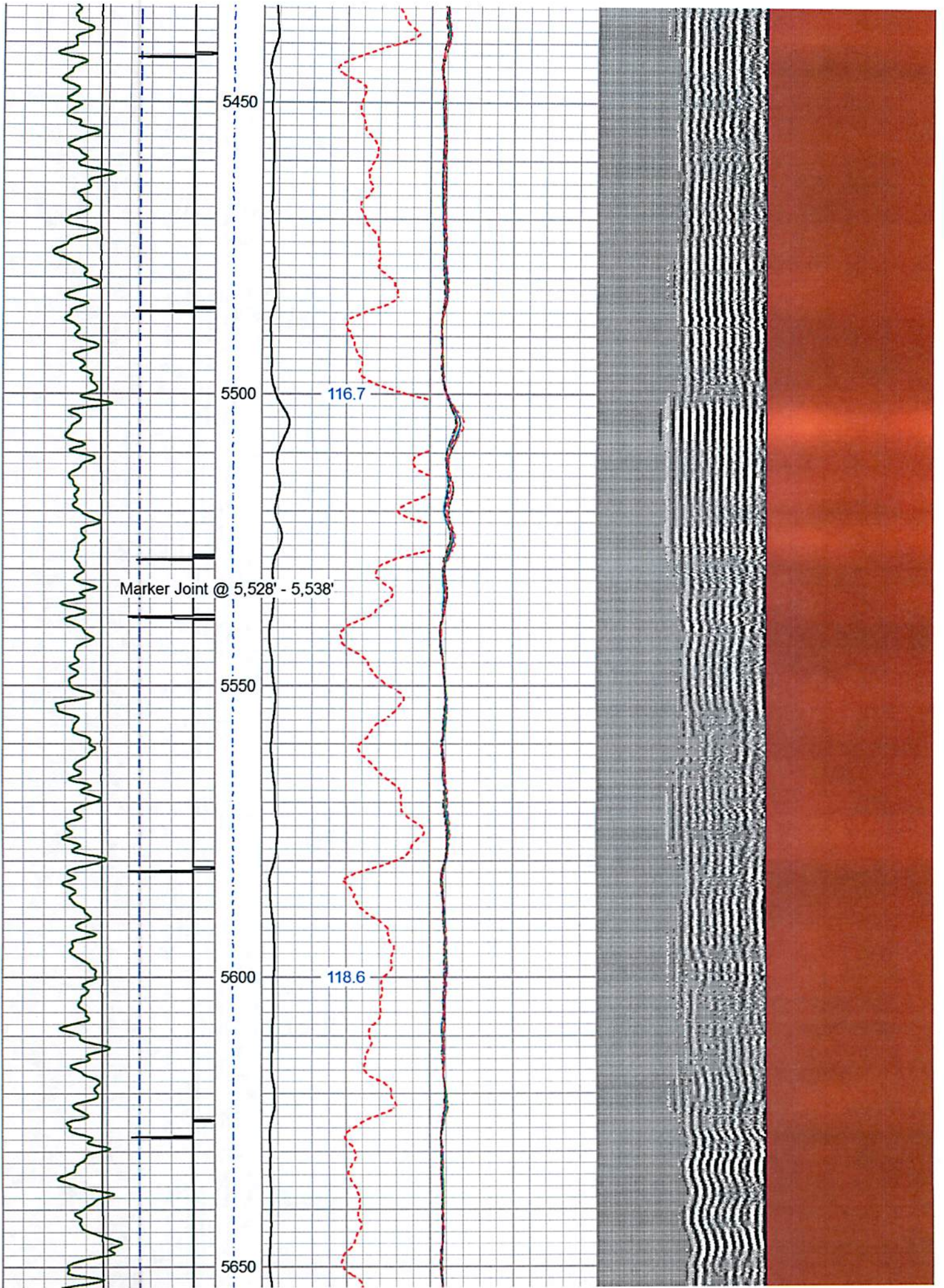


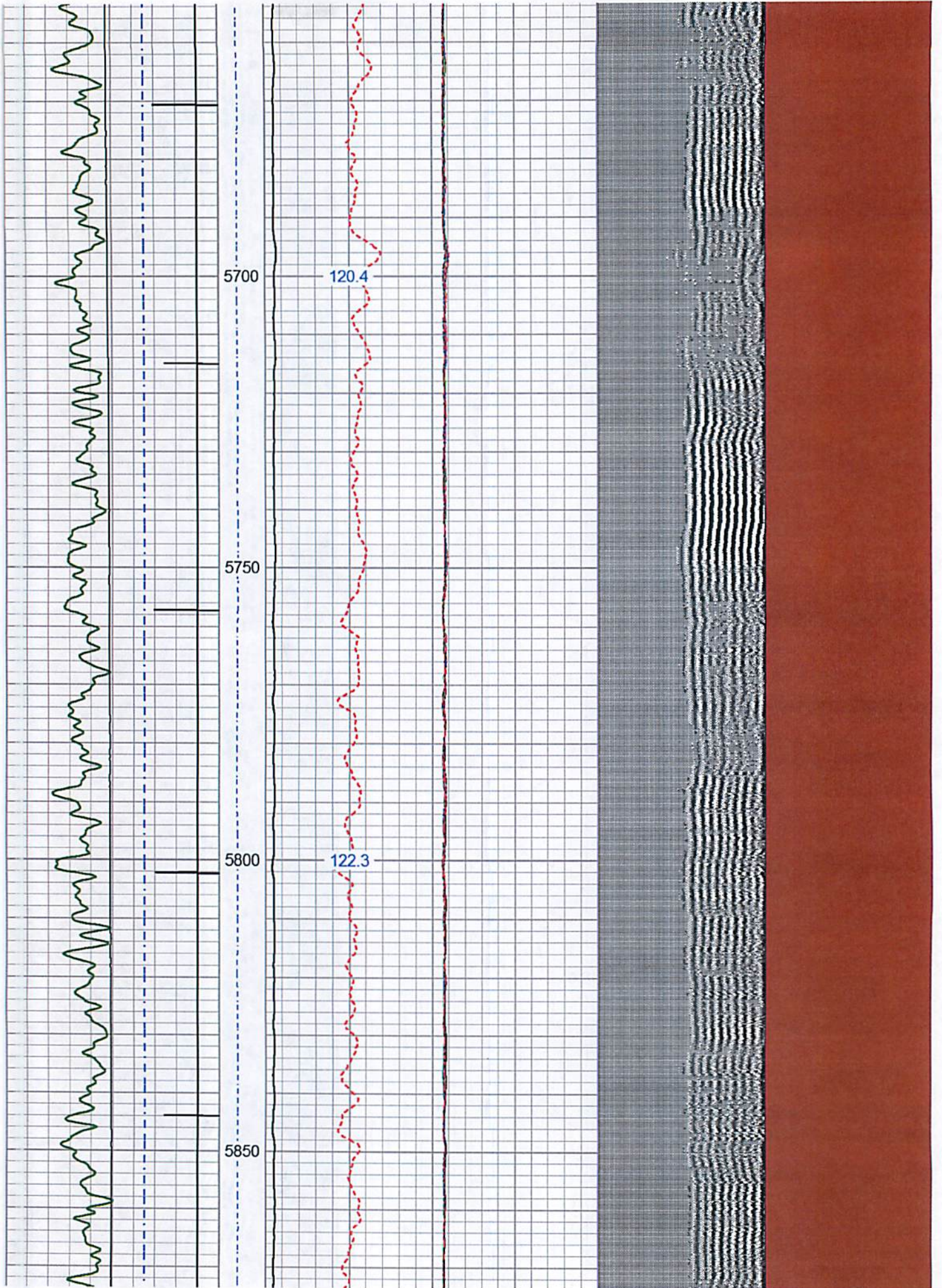


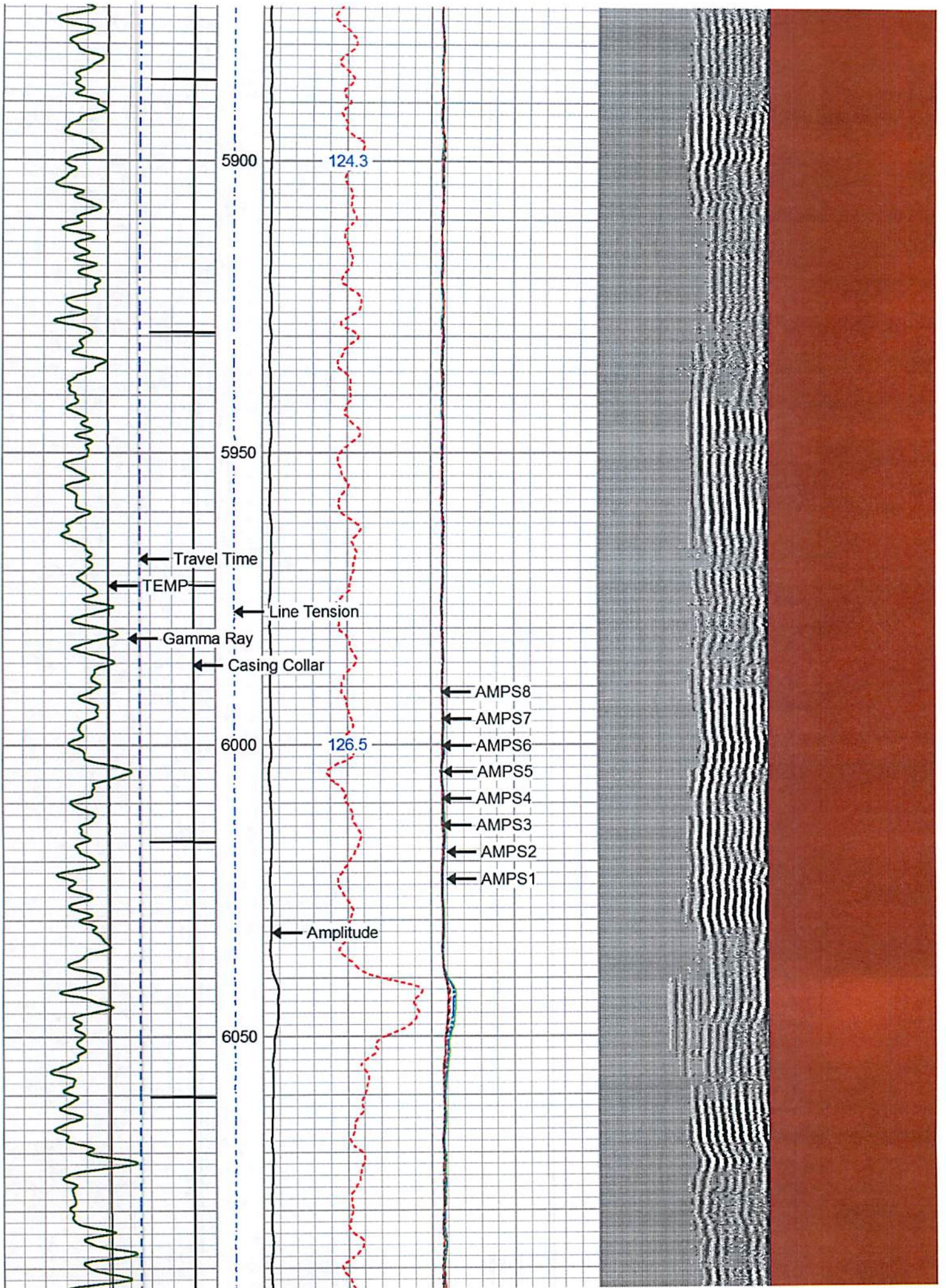


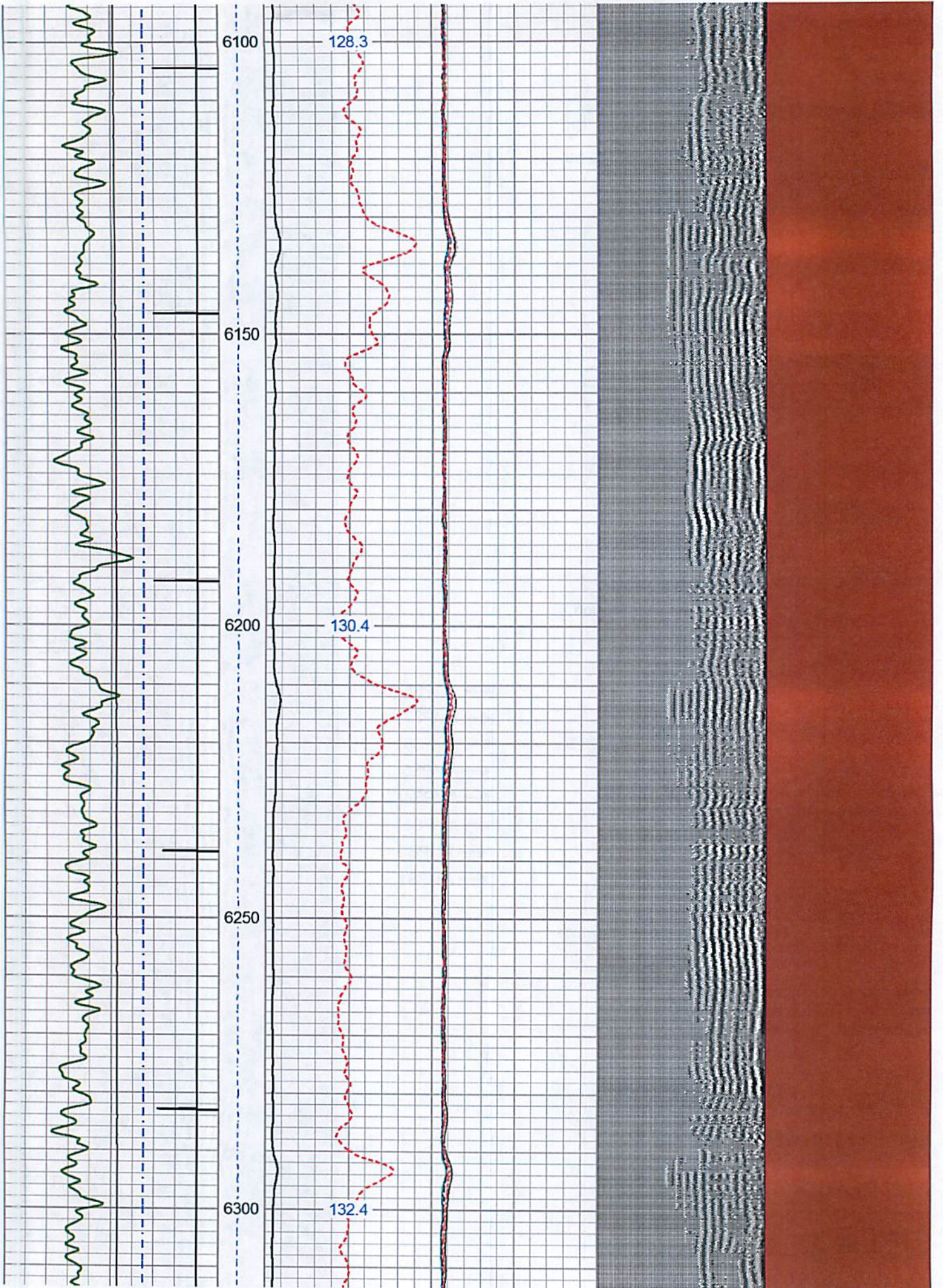


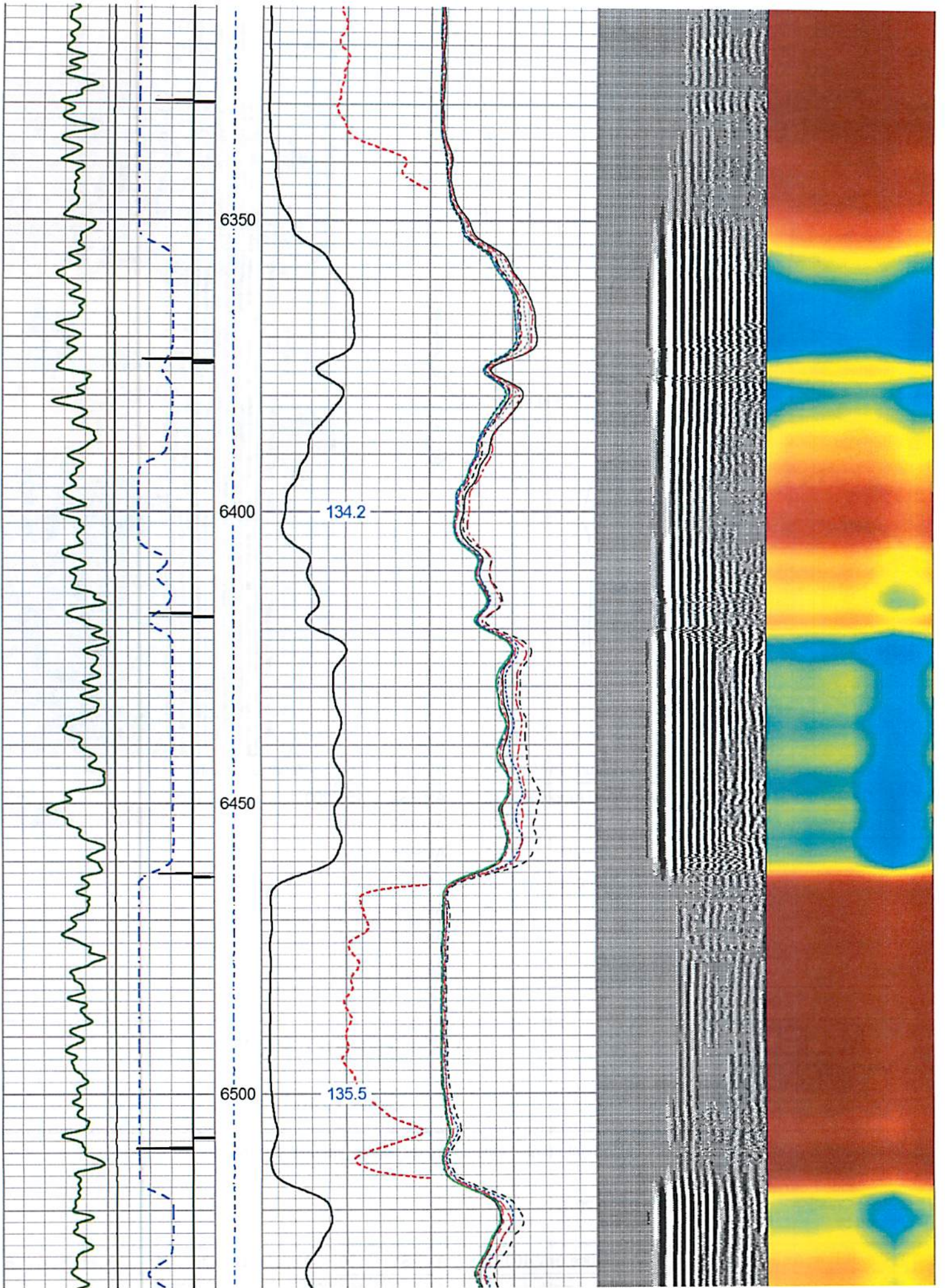


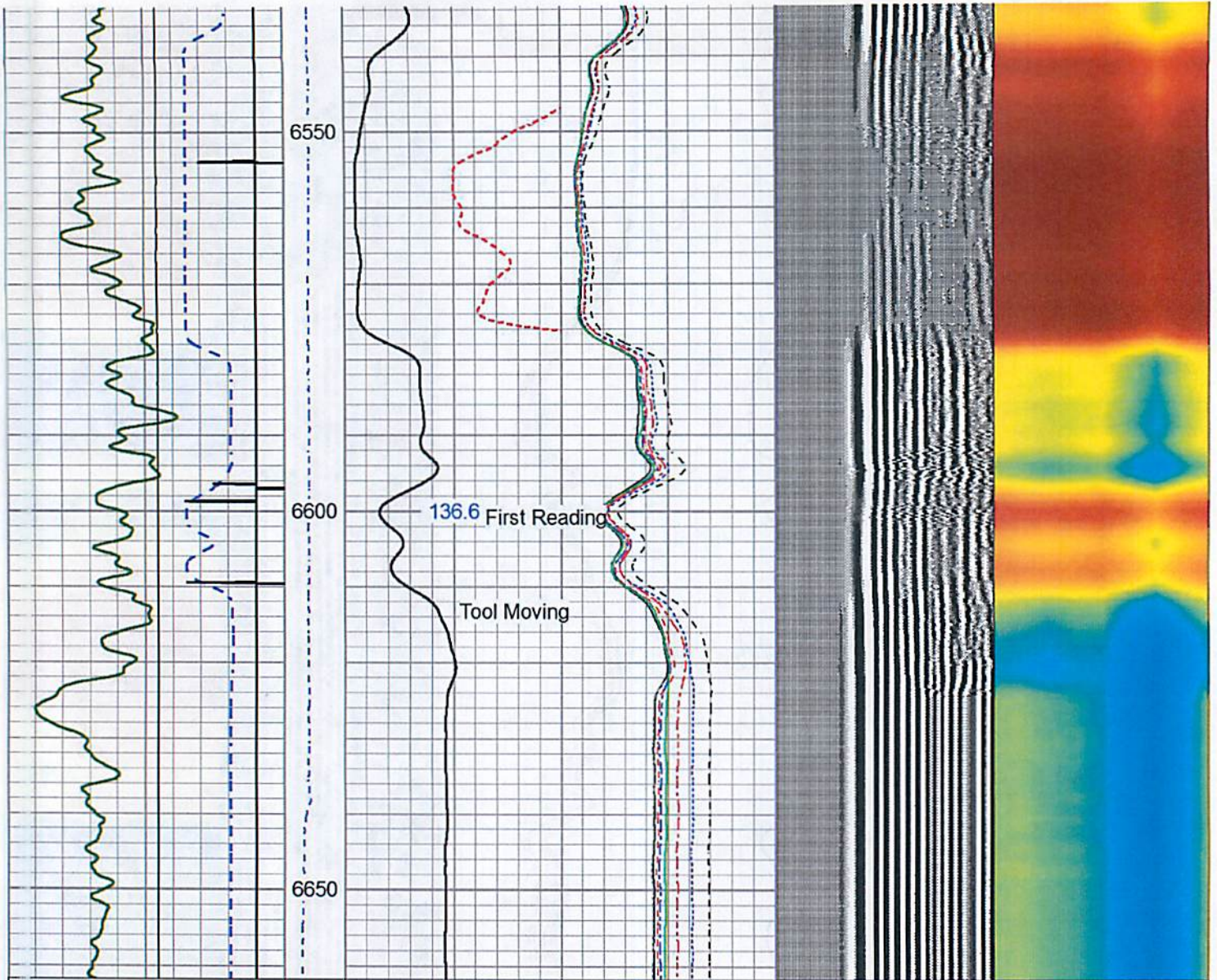












420	Travel Time (usec)	220	e Tens	0	Amplitude (mV)	100	-5	AMPS1	150	Variable Density	1	Cement Map	8
9	Casing Collar	-1	(lb)	0	Amplified Amplitude	-5	AMPS2	150	200	1200	0		100
0	Gamma Ray (GAPI)	300	(2500)	0	(mV)	10	-5	AMPS3	150				
0	TEMP (degF)	250			TEMP		-5	AMPS4	150				
					(degF)		-5	AMPS5	150				
							-5	AMPS6	150				
							-5	AMPS7	150				
							-5	AMPS8	150				

### 0 PSI REPEAT PASS

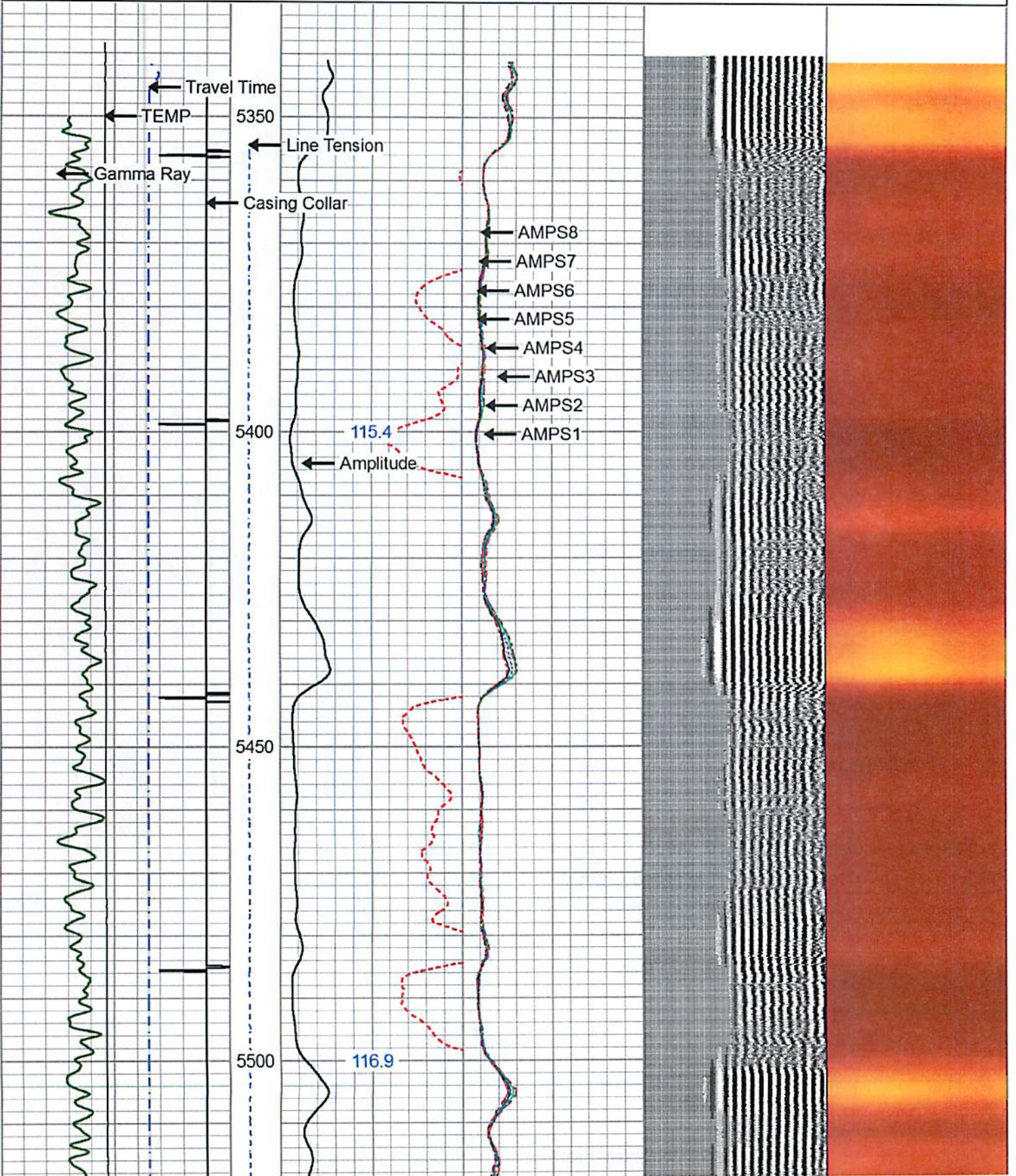
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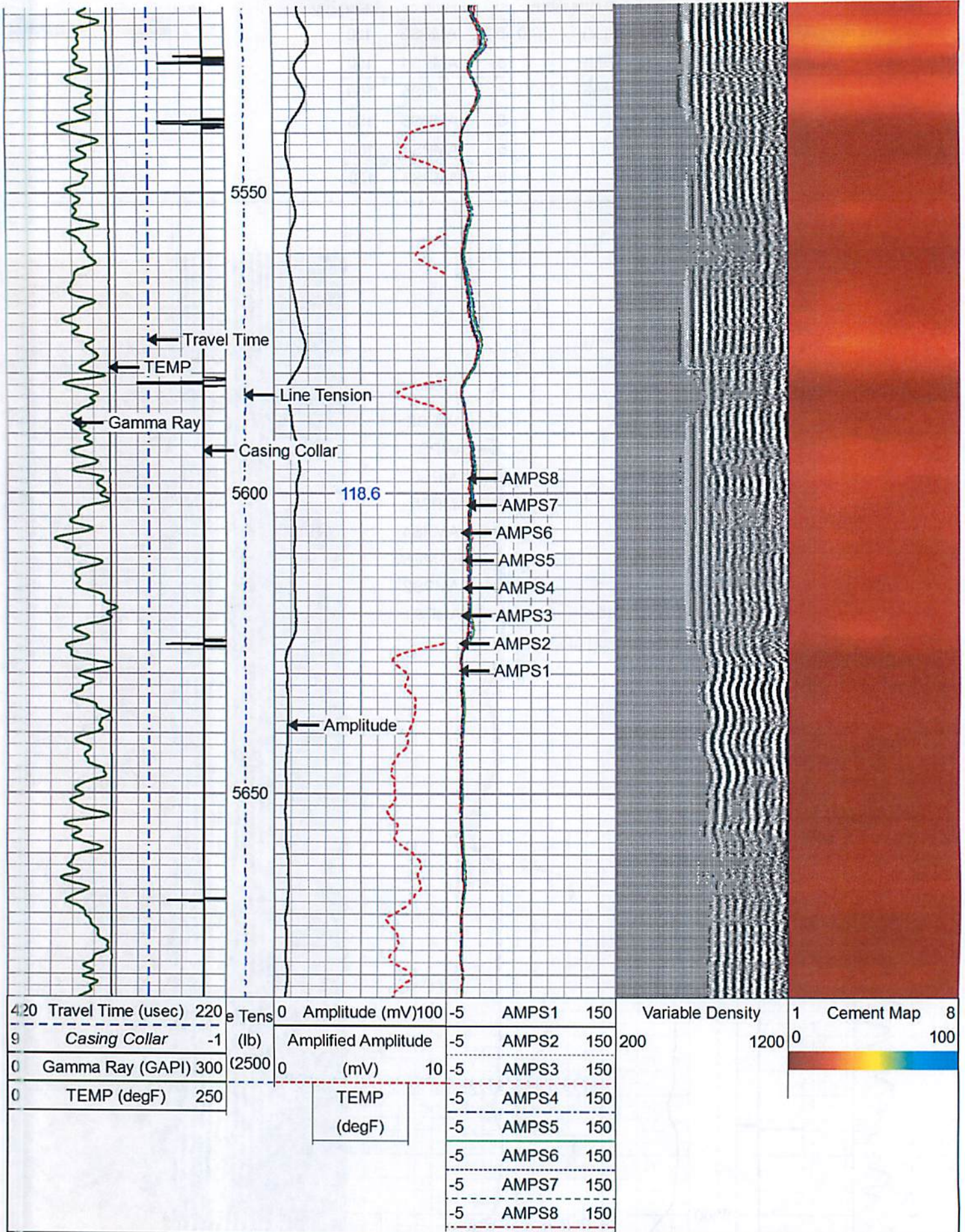
Database File	c:\users\user\desktop\antero neat logs\antero resources_jim unit 3h_rcbl.db
Dataset Pathname	pass5
Presentation Format	ahws_rcbl_jc
Dataset Creation	Thu Dec 13 05:07:30 2018
Charted by	Depth in Feet scaled 1:240

420	Travel Time (usec)	220	e Tens	0	Amplitude (mV)	100	-5	AMPS1	150	Variable Density	1	Cement Map	8
9	Casing Collar	-1	(lb)	0	Amplified Amplitude	-5	AMPS2	150	200	1200	0		100



9	Casing Collar	-1	(lb)	Amplified Amplitude	-5	AMPS2	150	200	1200	100
0	Gamma Ray (GAPI)	300	(2500)	(mV)	10	AMPS3	150			
0	TEMP (degF)	250		TEMP		AMPS4	150			
				(degF)		AMPS5	150			
						AMPS6	150			
						AMPS7	150			
						AMPS8	150			





Calibration Report

Database File c:\users\user\desktop\antero neat logs\antero resources\_jim unit 3h\_rcbl.db  
 Dataset Pathname Main Data

Gamma Ray Calibration Report

Serial Number: FW1408-38 Corr  
 Tool Model: GC\_C3  
 Performed: Thu May 25 15:00:07 2017

Calibrator Value: 1636.0 GAPI

Background Reading: 40.1 cps  
 Calibrator Reading: 1964.2 cps

Sensitivity: 0.8503 GAPI/cps

Segmented Cement Bond Log Calibration Report

Serial Number: FW1406-126  
 Tool Model: RBTC3 Temp

Calibration Casing Diameter: 5.500 in  
 Calibration Depth: 799.242 ft

Master Calibration, performed (Derived):

	Raw (v)		Calibrated (mv)		Results	
	Zero	Cal	Zero	Cal	Gain	Offset
3'	-0.007	0.226	1.000	72.000	304.897	3.209
CAL	-0.010	0.382				
5'	-0.006	0.204	1.000	72.000	338.068	3.172
SUM						
S1	-0.007	0.241	0.000	100.000	403.797	2.772
S2	-0.007	0.235	0.000	100.000	412.179	2.951
S3	-0.007	0.225	0.000	100.000	430.689	3.030
S4	-0.007	0.221	0.000	100.000	439.308	3.054
S5	-0.007	0.219	0.000	100.000	441.497	3.186
S6	-0.007	0.219	0.000	100.000	442.315	3.315
S7	-0.007	0.227	0.000	100.000	428.473	2.927
S8	-0.007	0.233	0.000	100.000	416.903	2.905

Internal Reference Calibration, performed (Not Performed):

	Raw (v)		Calibrated (v)		Results	
	Zero	Cal	Zero	Cal	Gain	Offset
CAL	0.000	0.000	-0.010	0.382	1.000	0.000

Air Zero Calibration, performed Thu Feb 15 08:40:59 2018:

	Raw (v)		Calibrated (v)		Results	
	Zero		Zero		Offset	
3'	0.000		0.000			0.000
5'	0.000		0.000			0.000
SUM						
S1	0.000		0.000			0.000
S2	0.000		0.000			0.000
S3	0.000		0.000			0.000
S4	0.000		0.000			0.000
S5	0.000		0.000			0.000
S6	0.000		0.000			0.000

S7  
S8

0.000  
0.000

0.000  
0.000

0.000  
0.000

# Log Variables

Database:\users\user\desktop\antero neat logs\antero resources\_jim unit 3h\_rcbl.db  
Dataset field/well/run1/Main Pass/\_vars\_

## Top - Bottom

BHTEMP_Src	BOREID	BOTTEMP	CASEOD	CASETHCK	CASEWGHT	MAXAMPL	MINAMPL
TEMP	in 8.625	degF 136	in 5.5	in 0.415	lb/ft 23	mV 72	mV 1
MINATTN	PERFS	PPT	SRFTEMP	TDEPTH			
db/ft 0.8	0	usec 260	degF 0	ft 0			

## Variable Description

BHTEMP\_Src : BHTEMP Input Source Selector  
BOREID : Borehole I.D.  
BOTTEMP : Bottom Hole Temperature  
CASEOD : Casing O.D.  
CASETHCK : Casing Thickness  
CASEWGHT : Casing Weight  
MAXAMPL : Maximum Amplitude

MINAMPL : Minimum Amplitude  
MINATTN : Minimum Attenuation  
PERFS : Perforation Flag  
PPT : Predicted Pipe Time  
SRFTEMP : Surface Temperature  
TDEPTH : Total Depth

Sensor	Offset (ft)	Schematic	Description	Length (ft)	O.D. (in)	Weight (lb)
			CHD-STNDRD (GOI) Standard Cable Head	1.00	1.69	10.00
			CENT-Probe275 Probe 2.75" 4 Arm Bow Spring Centralizer	2.88	1.69	36.00
Temp	17.35		RBT-RBTC3 Temp (FW1406-126) Probe 2.75" Corrosion RCBL With Integral Temp Sub	9.39	2.75	90.00
WVFS8	15.12					
WVFS7	15.12					
WVFS6	15.12					
WVFS5	15.12					
WVFS4	15.12					
WVFS3	15.12					
WVFS2	15.12					
WVFS1	15.12					
WVFCAL	15.12					
WVF3FT	15.12					
WVF5FT	14.12					
			CENT-Probe275	2.88	1.69	36.00

CCL	7.09		Probe 2.75" 4 Arm Bow Spring Centralizer			
GR	6.01		GR-GC_C3 (FW1408-38 Corr) Probe 2.75" Gamma Ray-CCL Corrosion Modified	5.10	2.75	55.00
			CENT-Probe275 Probe 2.75" 4 Arm Bow Spring Centralizer	2.88	1.69	36.00
Dataset: antero resources_jim unit 3h_rcbl.db: field/well/run1/Main Pass Total length: 24.15 ft Total weight: 263.00 lb O.D.: 2.75 in						

	Company	Antero Resources	
	Well	Jim 3H	
	Field	Marcellus	
	County	Tyler	
	State	West Virginia	Country