



ThruBit
A Schlumberger Company

**DUAL SPACED NEUTRON
SPECTRAL DENSITY
GAMMA RAY
MEMORY LOG**

Company	SANDRIDGE ENERGY	Location:	API #: 15-191-22709-0100	Other Services
Well	ANN 3404 2-21H	Well	ANN 3404 2-21H	THRUBIT
Field	BLUFF	Field	BLUFF	PORTAL BIT
County	SUMNER	County	SUMNER	
State	KANSAS	State	KANSAS	
Permanent Datum	G.L.	Elevation	1409'	
Log Measured From	K.B. 20' ABOVE PERM DATUM			
Drilling Measured From	K.B.			
	SEC 21 TWP 34S RGE 4W			
	SHL: 200' FSL & 700' FWL			
	PBHL: 330' FNL & 1980' FWL			

Date	27 NOVEMBER 2013
Run Number	ONE
Depth Driller	10633'
Depth Logger	10468'
Bottom Logged Interval	10451'
Top Log Interval	5419'
Casing Driller	7.0" @ 5430"
Casing Logger	5419'
Bit Size	6.125
Type Fluid in Hole	WBM
Density / Viscosity	9.3 / 27
PH / Fluid Loss	9.0 / 60
Source of Sample	MUD PIT
Rm @ Meas. Temp	0.13 ohms @ 45 degf
Rmf @ Meas. Temp	0.10 ohms @ 45 degf
Rmc @ Meas. Temp	0.16 ohms @ 45 degf
Source of Rmf / Rmc	CALCULATED
Rm @ BHT	0.05 ohms @ 129 degf
Time Circulation Stopped	00:30
Time Logger on Bottom	01:45
Maximum Recorded Temperature	129 degf
Equipment Number	T011
Location	OKC, OK
Recorded By	DENGLER
Witnessed By	CODY DAVIS

<<< Fold Here >>>

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

SERVICE: LEVEL 4- HORIZONTAL MEMORY PUMPDOWN - BIT DEPTH 10448' LOG TO 5419'
ALL SCALES AND PRESENTATION PER CLIENT REQUEST
LIMESTONE POROSITY , 2.71 G/CC, USED FOR POROSITY CALCULATIONS
LOG RAN WITH SWIVEL, SMALL DECENTRALIZER AND NO STANDOFFS
TBHV REPRESENTS TOTAL BOREHOLE VOLUME, FT3
ABHV REPRESENTS ANNULAR BOREHOLE VOLUME, FT3, CALCULATED FOR 4.50" CASING
RIGMINDER LITE AND PASON USED TO CREATE DEPTH LOG
LOG DEPTH CORRELATED TO MWD GR PROVIDED BY CUSTOMER
RIG HAD NO RETURNS AT TIME OF LOGGING. WAS PUMPING 300 GPM DOWN BACKSIDE WHILE LOGGING
DATA FROM 8018 TO 8060 IS INVALID DUE TO PASON LOCKING UP WHILE PULLING PIPE.
RIG: HORIZON 15
CREW: J. DENGLER, E. PRICE, Z. HOWARD

Service Ticket No.	2338	API No.	15-191-22709-0100	PGM Ver	WARRIOR 7.0
--------------------	------	---------	-------------------	---------	-------------

The Well Name, Location, Borehole Description, and / or Cementing Data Furnished by Client

EQUIPMENT DATA

GAMMA RAY	NEUTRON	DENSITY	INDUCTION
-----------	---------	---------	-----------

Run No.	ONE	Run No.	ONE	Run No.	ONE	Run No.	ONE
Serial No.	PS24T	Serial No.	PS29N	Serial No.	PS43D	Serial No.	PS15R
Model No.	PS	Model No.	PS	Model No.	PS	Model No.	PS
Diameter	2.125"	Diameter	2.125"	Diameter	2.125"	Diameter	2.125"

LOGGING DATA

General Data

Pass	Depths		Well Head	Speed	Logging Run Comments		
No.	From	To	Pressure	Ft/Min			
ONE	10468'	5419'	0	30 FPM			

	GAMMA RAY		NEUTRON		DENSITY		INDUCTION	
Pass	Scale		Scale		Scale		Scale	
No.	L	R	L	R	L	R	L	R
ONE	0 API	150 API	30 %	-10 %	30 %	-10 %	0.2 OHM-M	2000 OHM-M

DIRECTIONAL INFORMATION

Maximum Deviation	95.1	deg. @	8460	KOP	3508'	
-------------------	------	--------	------	-----	-------	--

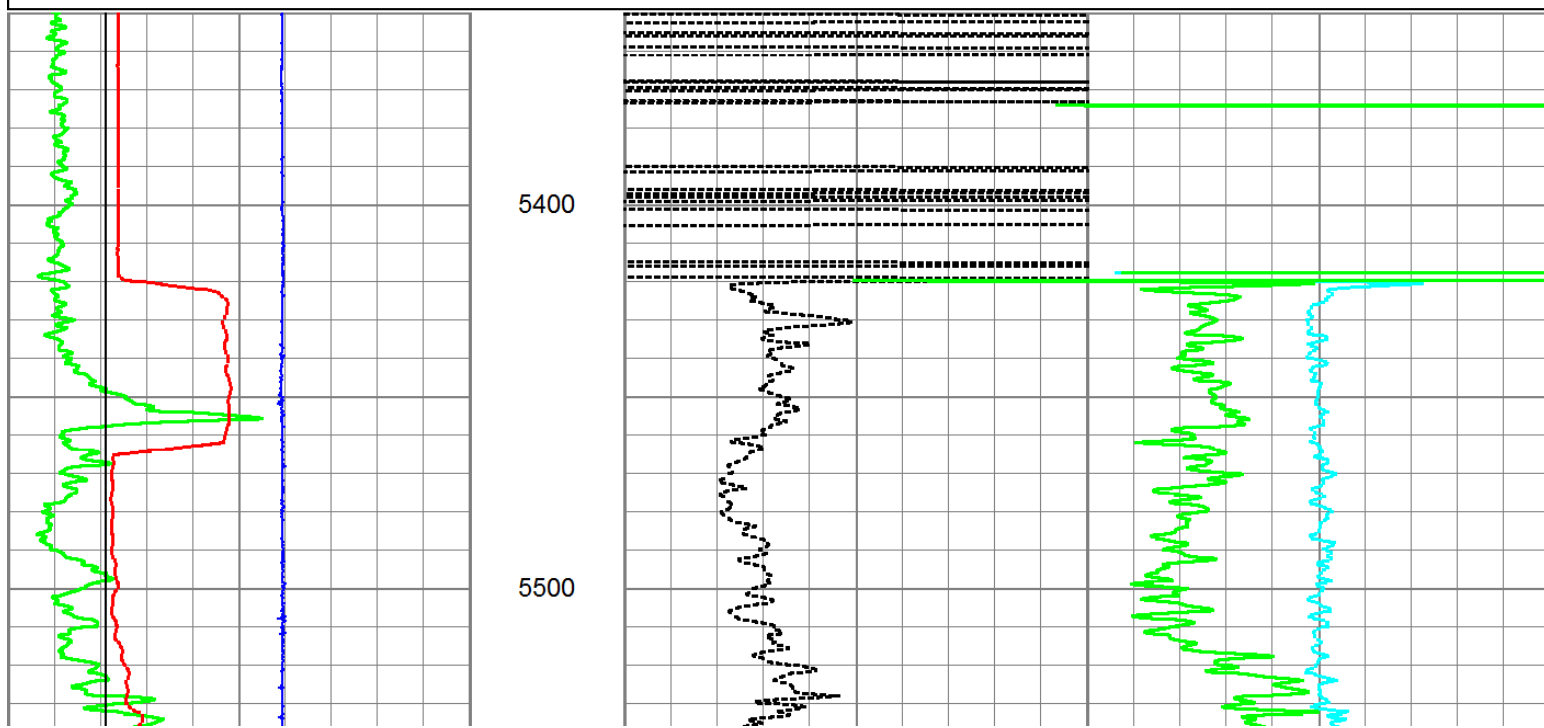


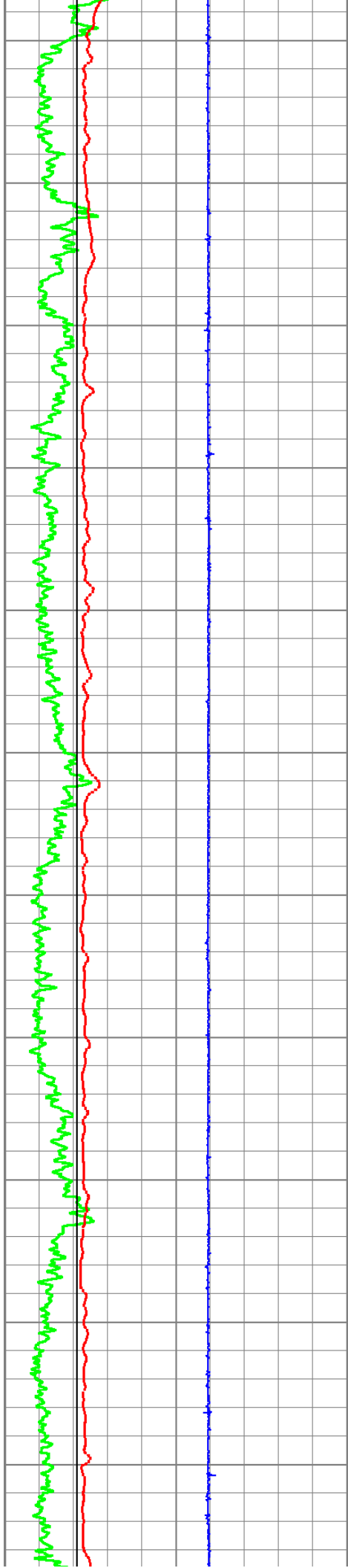
MAIN PASS

Database File: ann_mem.db
 Dataset Pathname: proc5/pass1.2
 Presentation Format: 6_2n_chk
 Dataset Creation: Wed Nov 27 11:55:16 2013
 Charted by: Depth in Feet scaled 1:600

0	GR (GAPI)	150
4	DCAL (in)	14
4	BOREID (in)	14
-5	ACCY	5

0	PEF (barn)	10	-0.5	DRHO (g/cc)	0.5
2	RHOB (g/cc)		3		





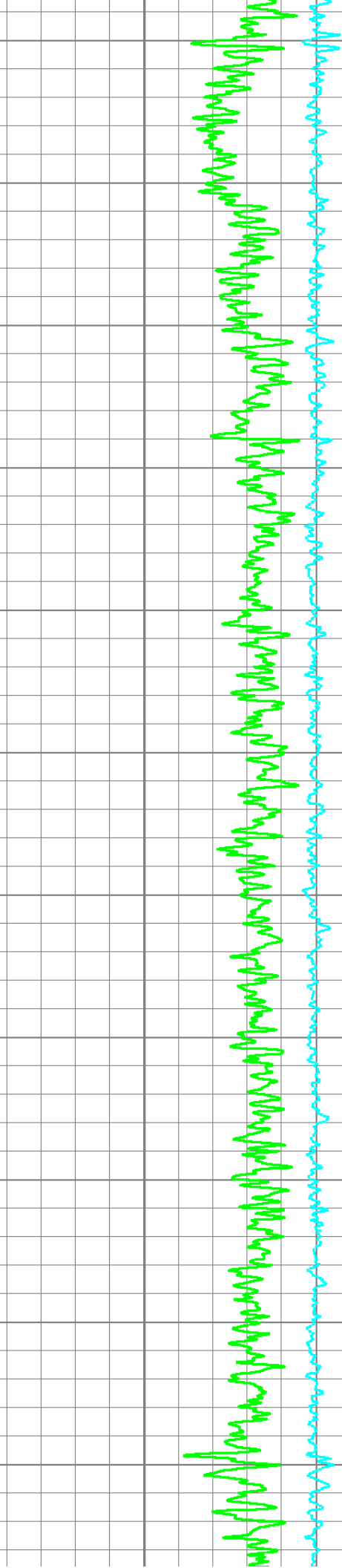
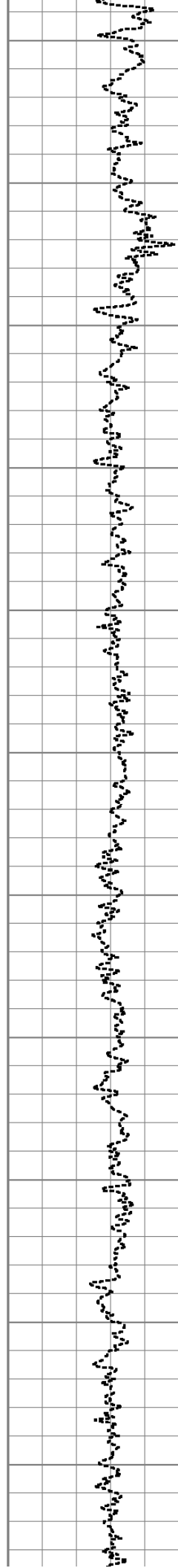
5600

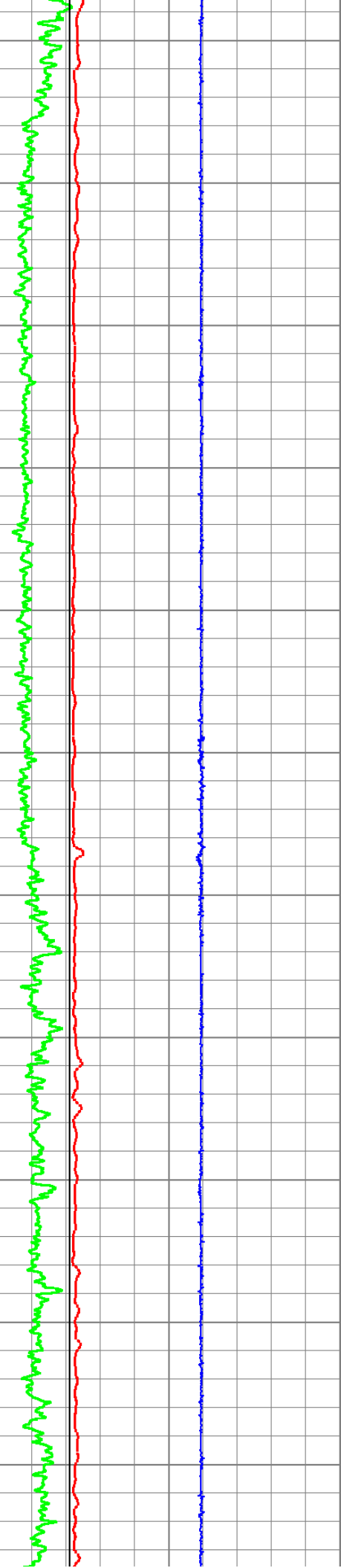
5700

5800

5900

6000





6100

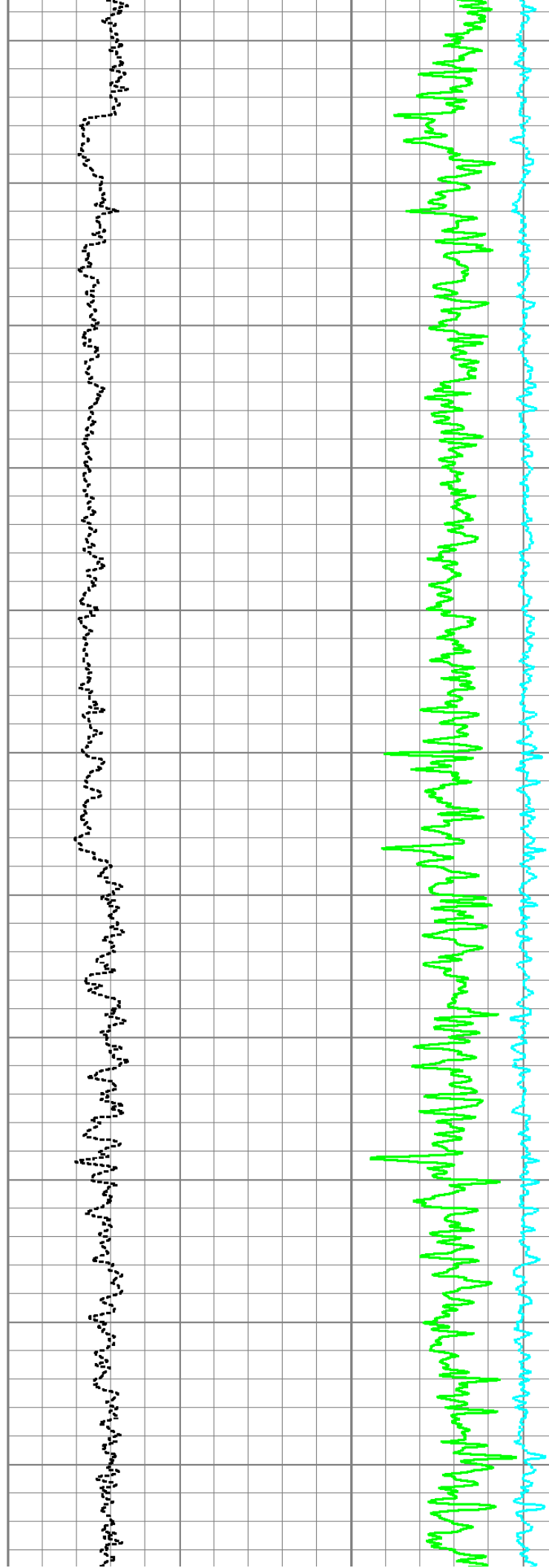
6200

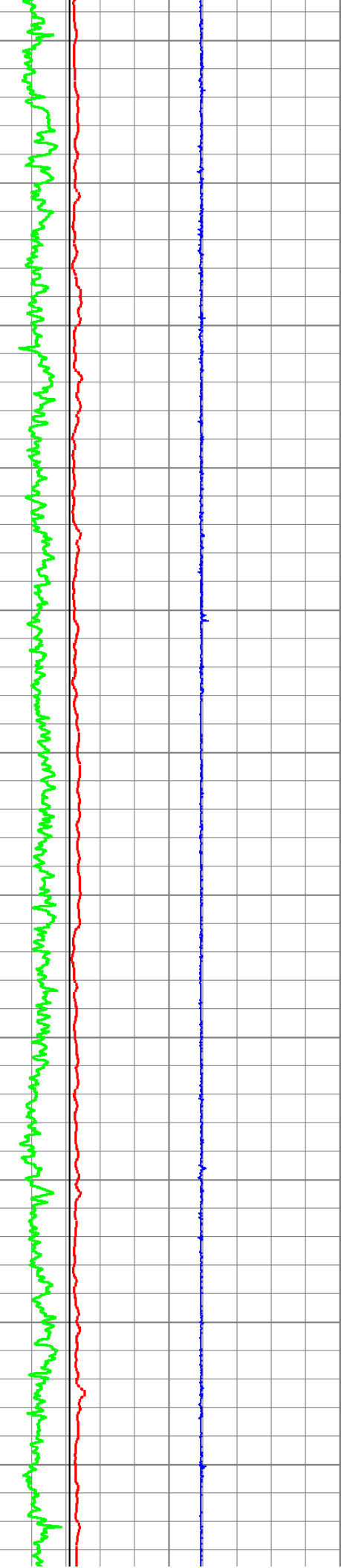
6300

6400

6500

6600





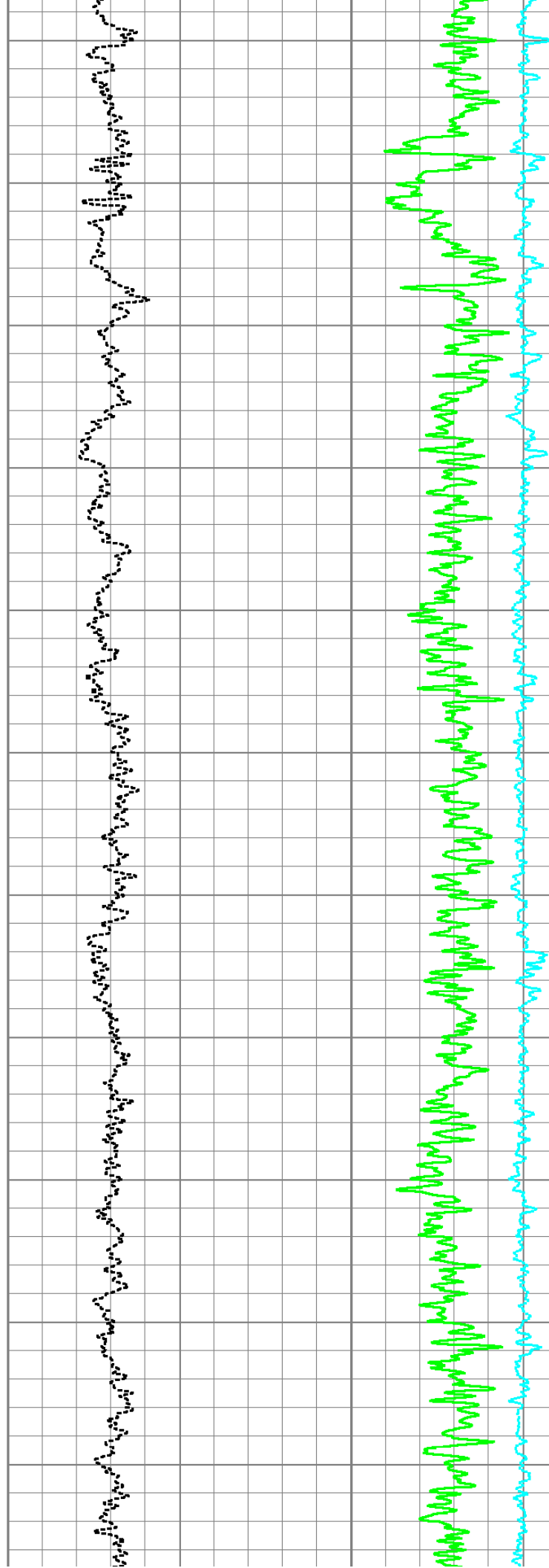
6700

6800

6900

7000

7100



7200

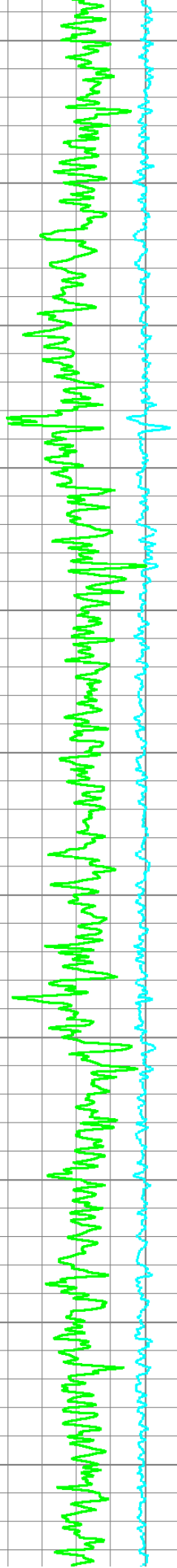
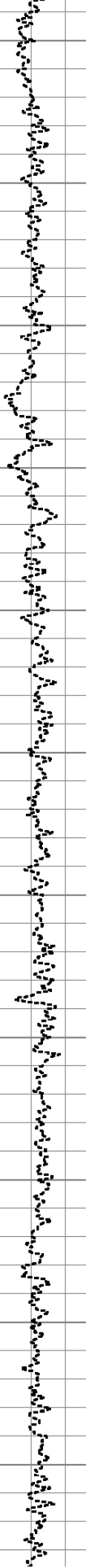
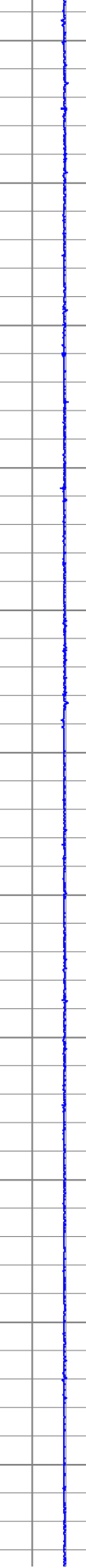
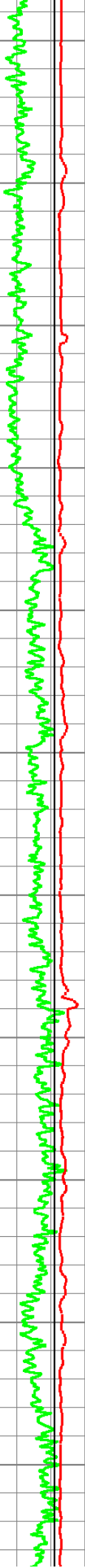
7300

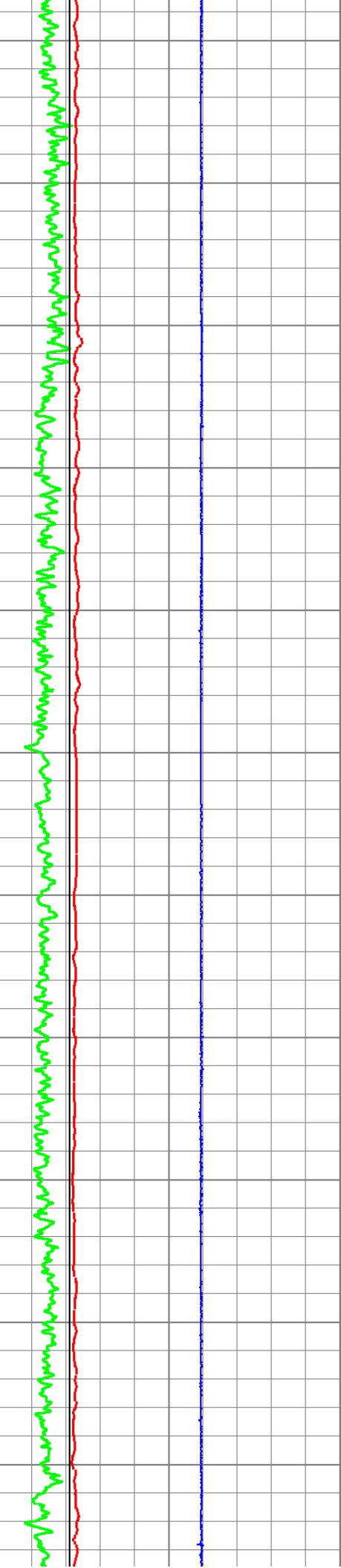
7400

7500

7600

7700





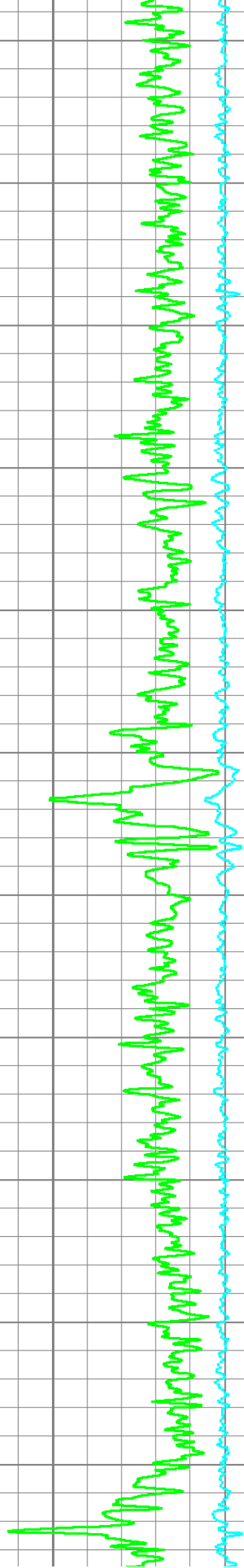
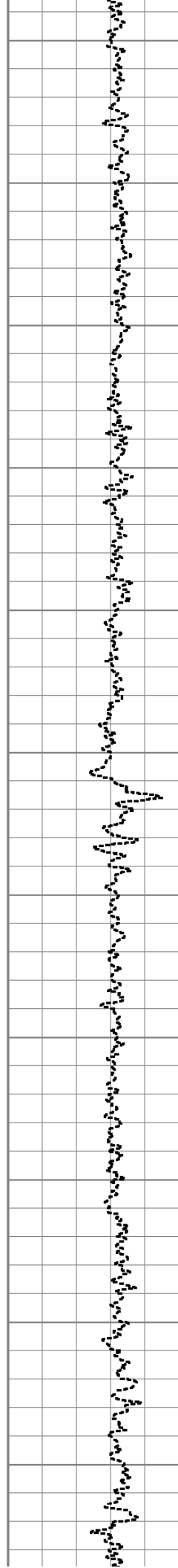
7800

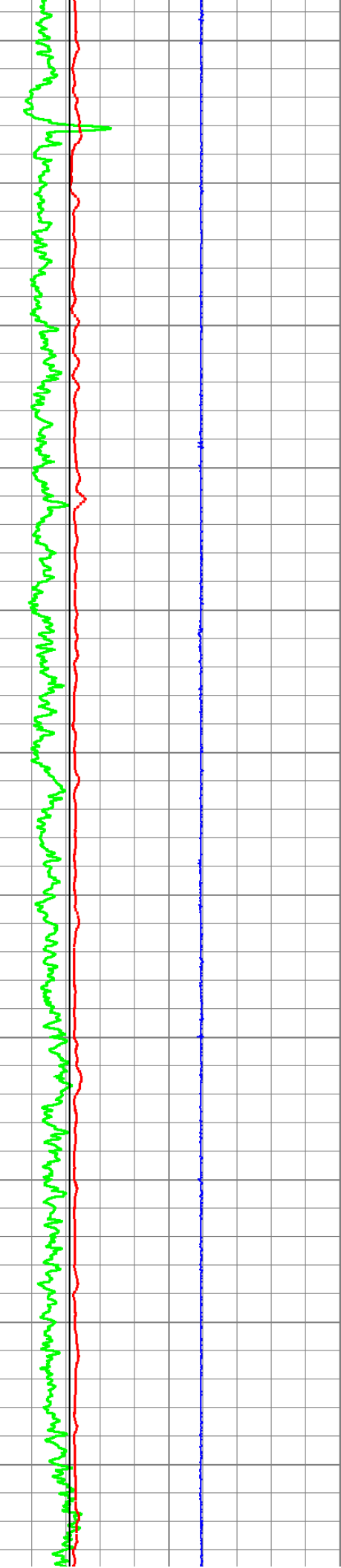
7900

8000

8100

8200





8300

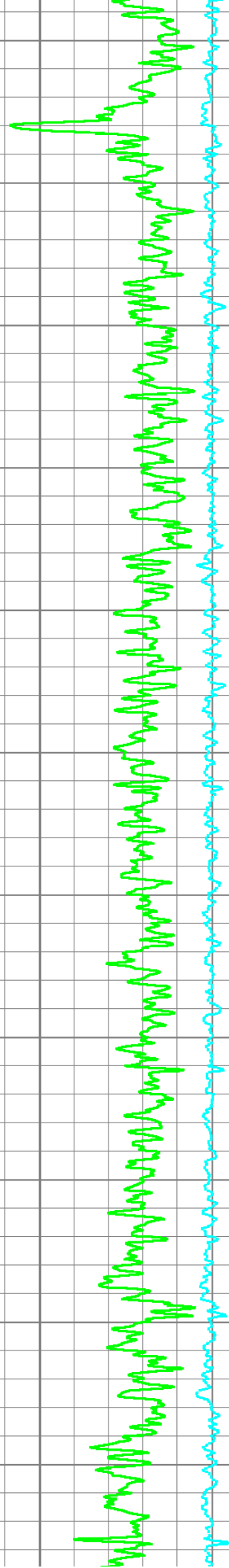
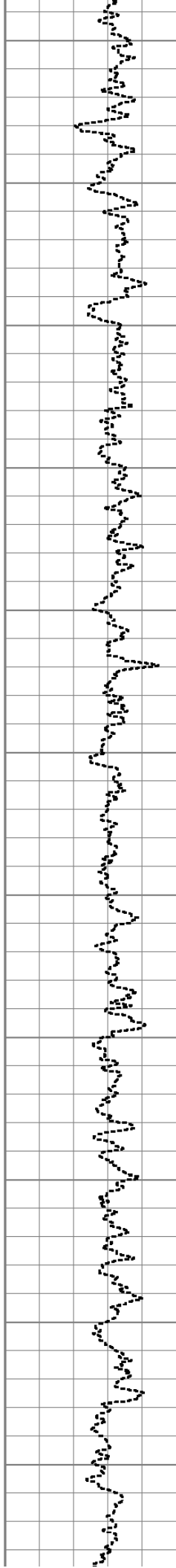
8400

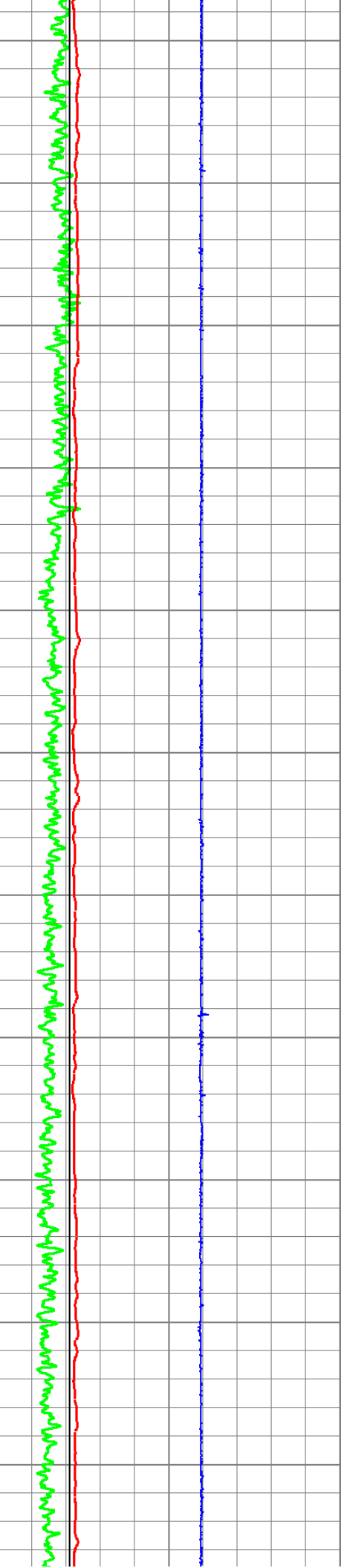
8500

8600

8700

8800





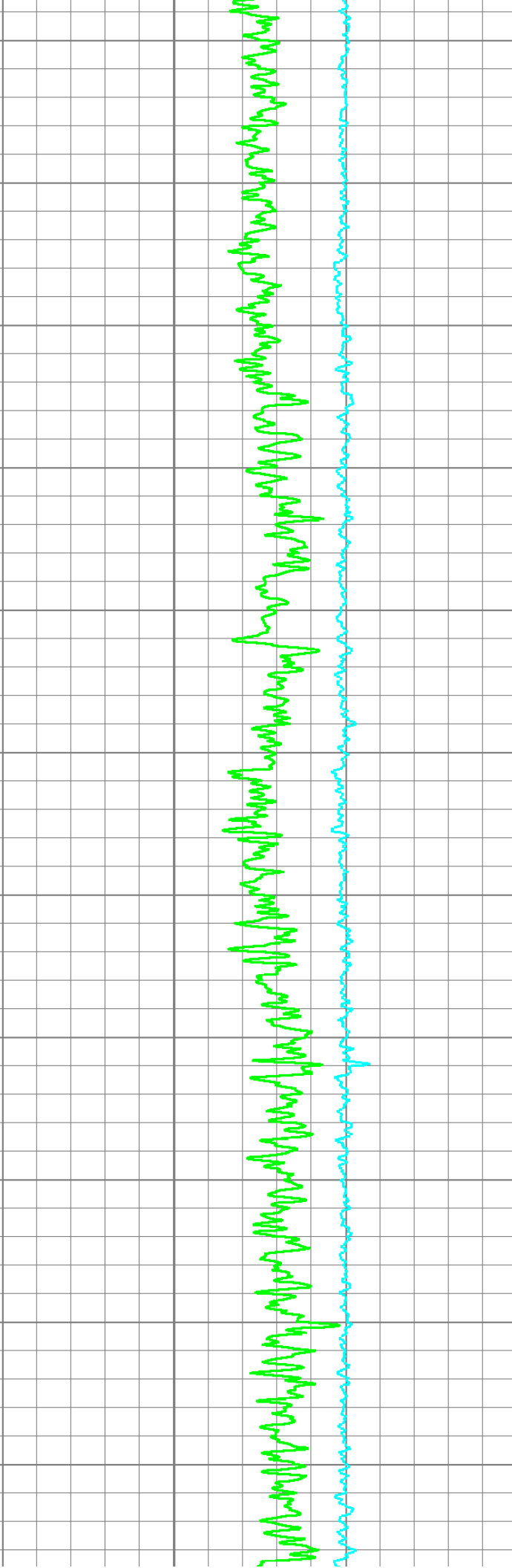
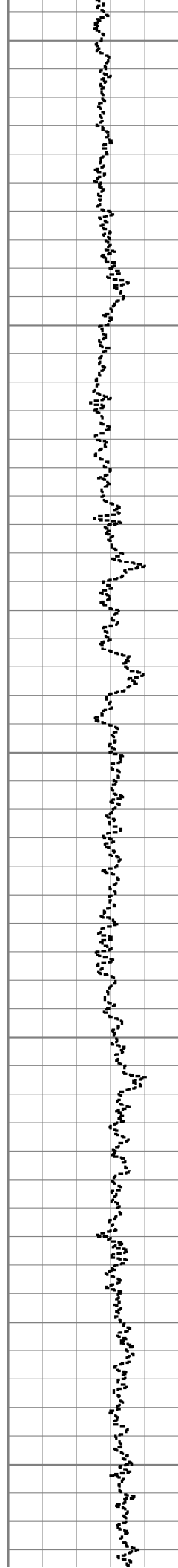
8900

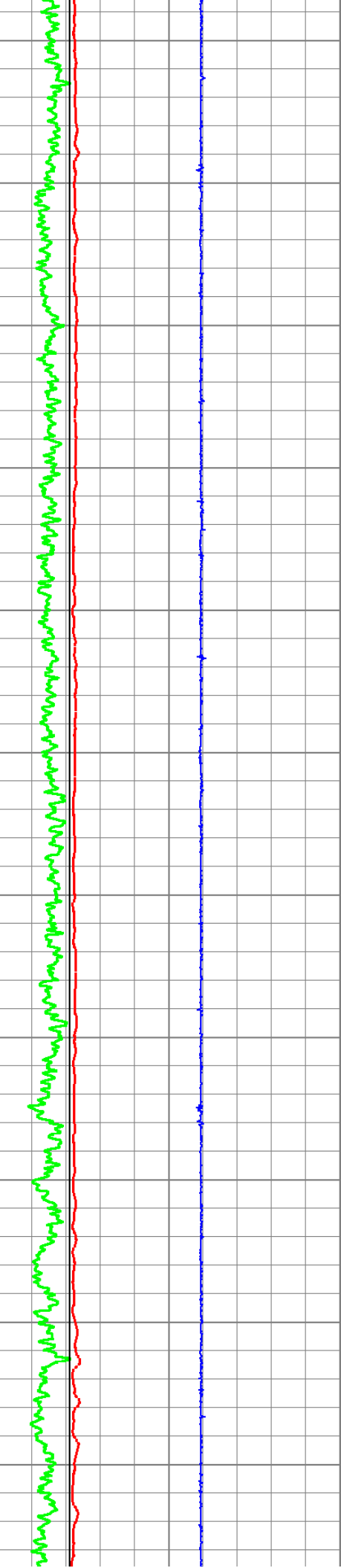
9000

9100

9200

9300





940

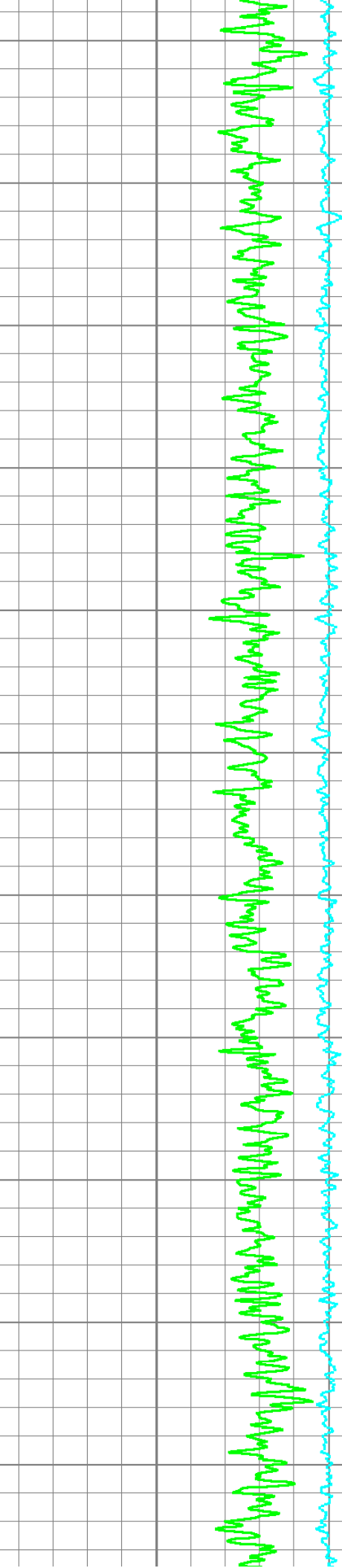
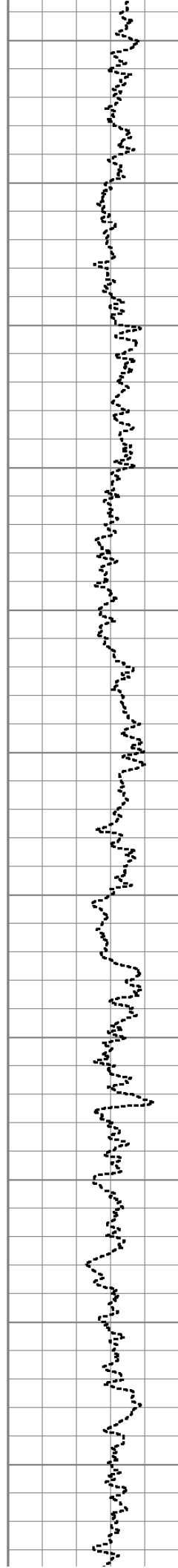
950

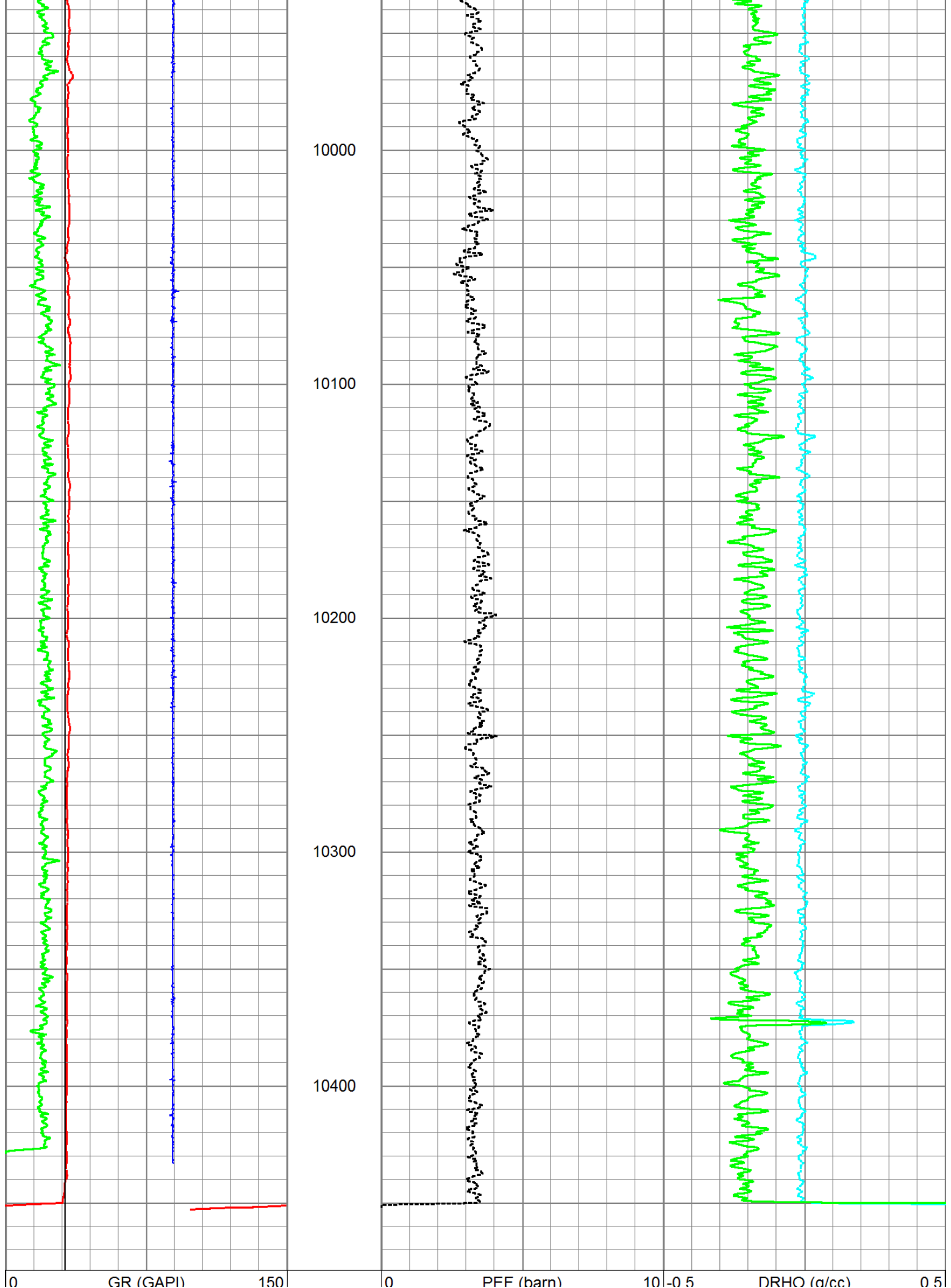
960

970

980

990





4	DCAL (in)	14
4	BOREID (in)	14
-5	ACCY	5

2	RHOB (g/cc)	3
---	-------------	---

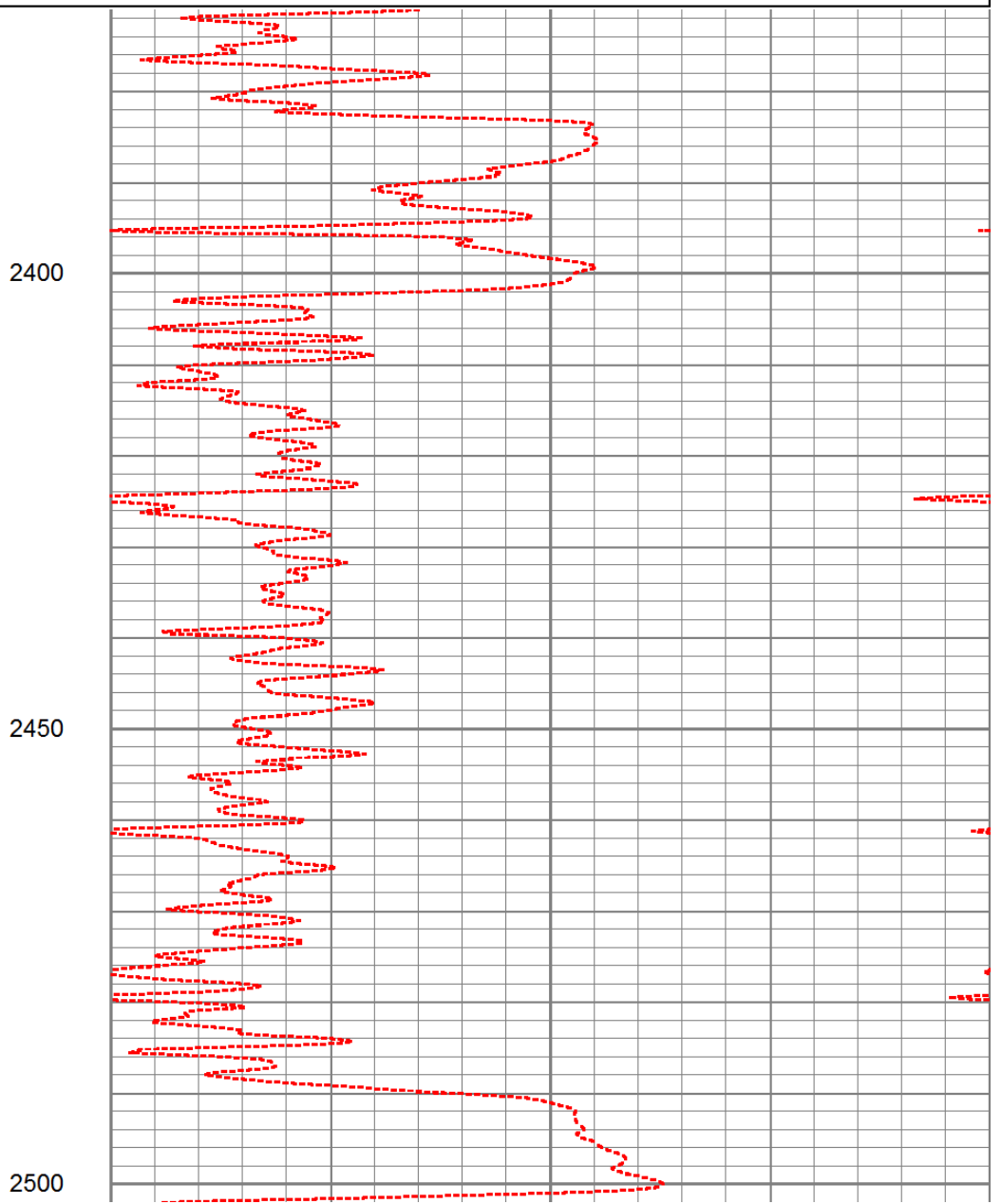
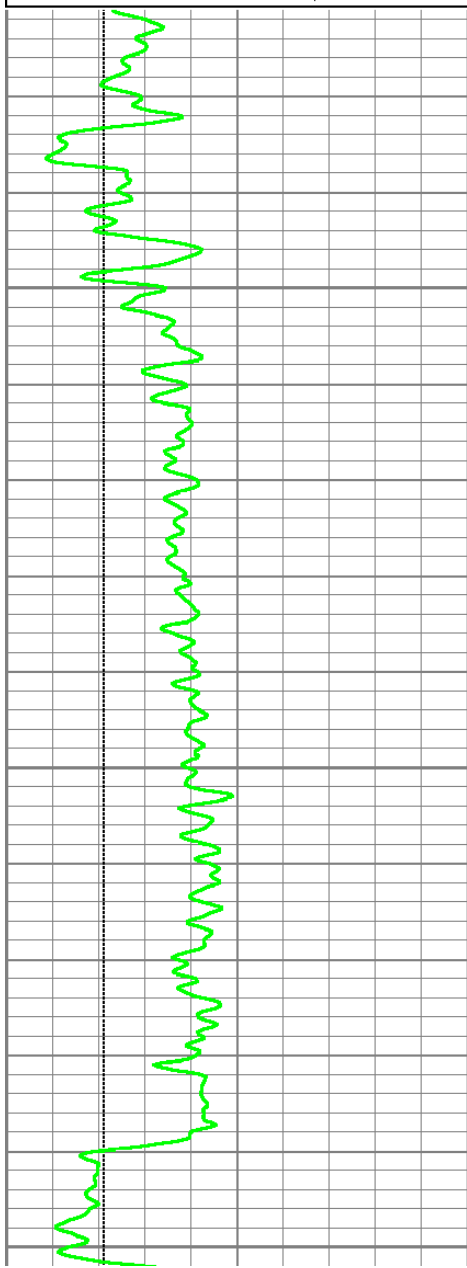


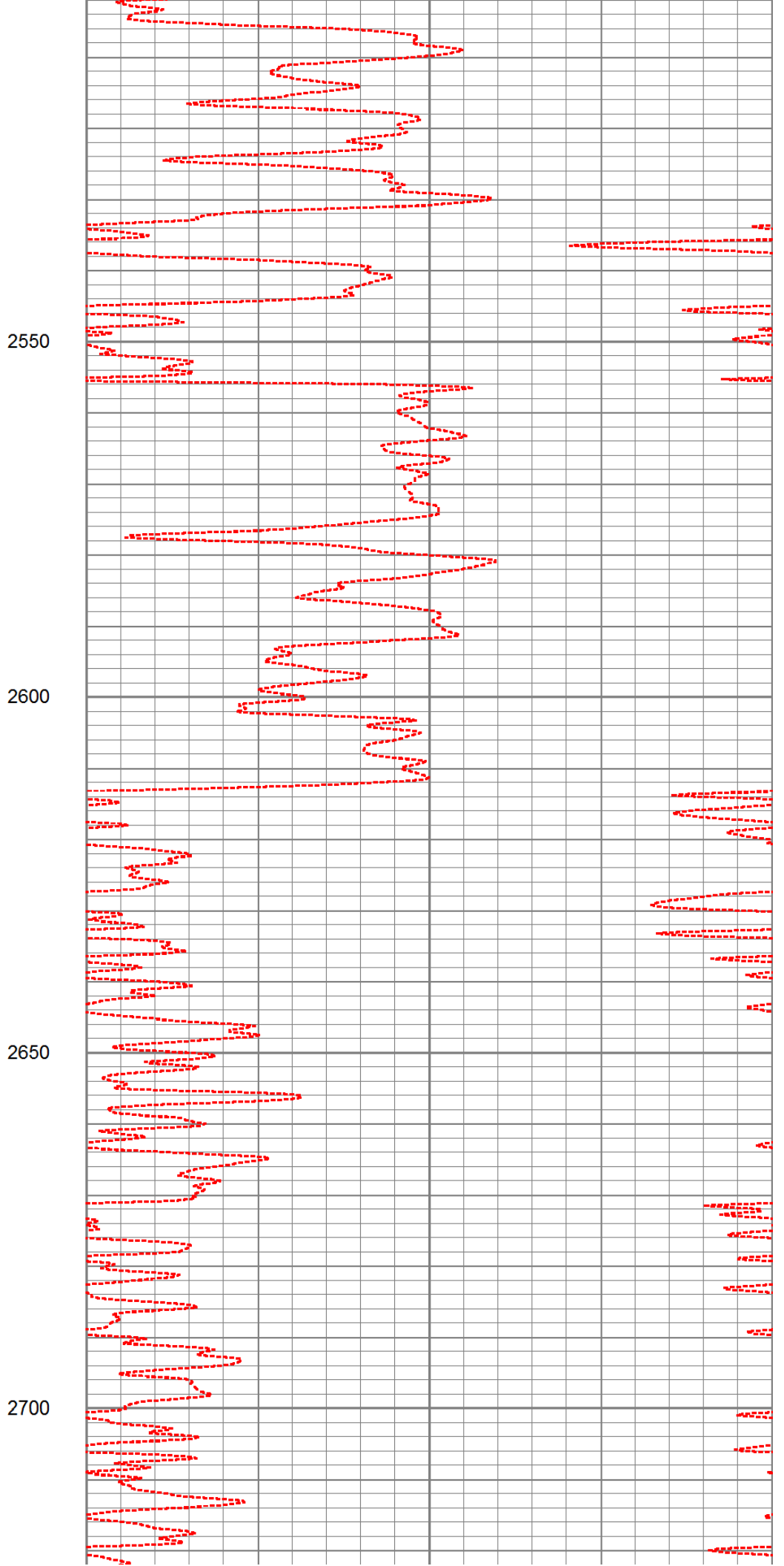
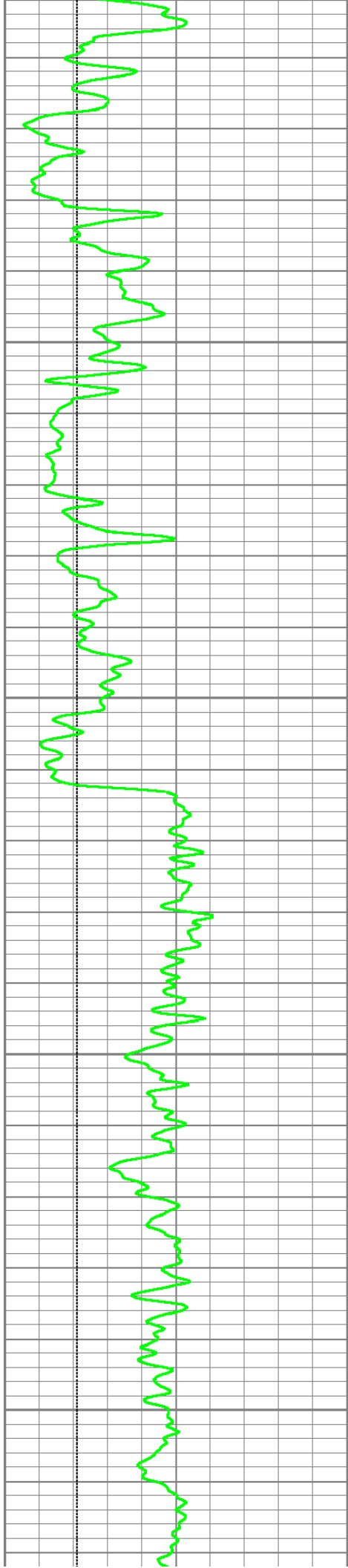
MAIN PASS

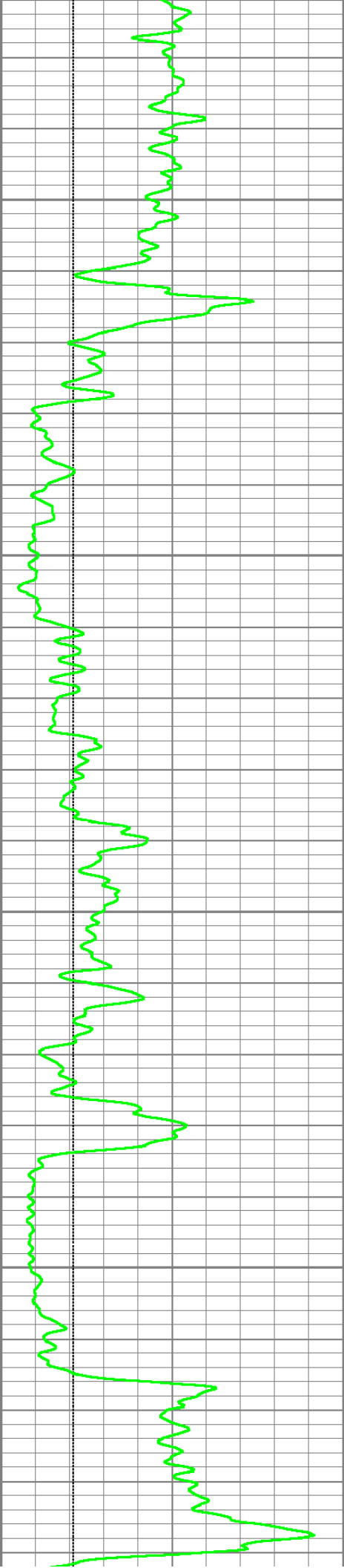
Database File: ann_mem.db
 Dataset Pathname: proc5/pass1.2
 Presentation Format: 6_5n_chk
 Dataset Creation: Wed Nov 27 11:55:16 2013
 Charted by: Depth in Feet scaled 1:240

4	DCAL (in)	14
4	BOREID (in)	14
0	GR (GAPI)	150
-5	ACCY	5
	TBHV (ft3)	

30	CNPOR (pu)	-10			
30	DPHI (pu)	-10			
0	PEF (barn)	10	-0.5	DRHO (g/cc)	0.5
	ABHV (ft3)				





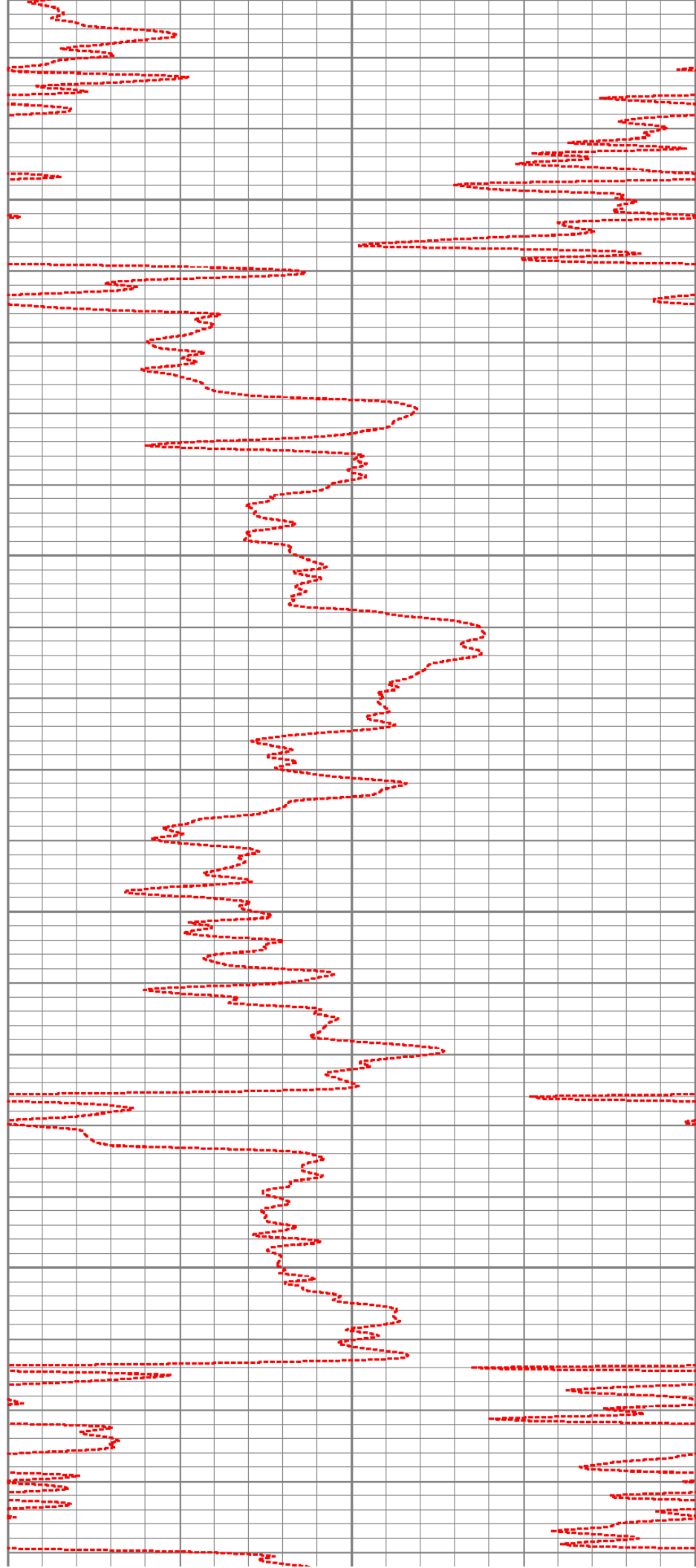


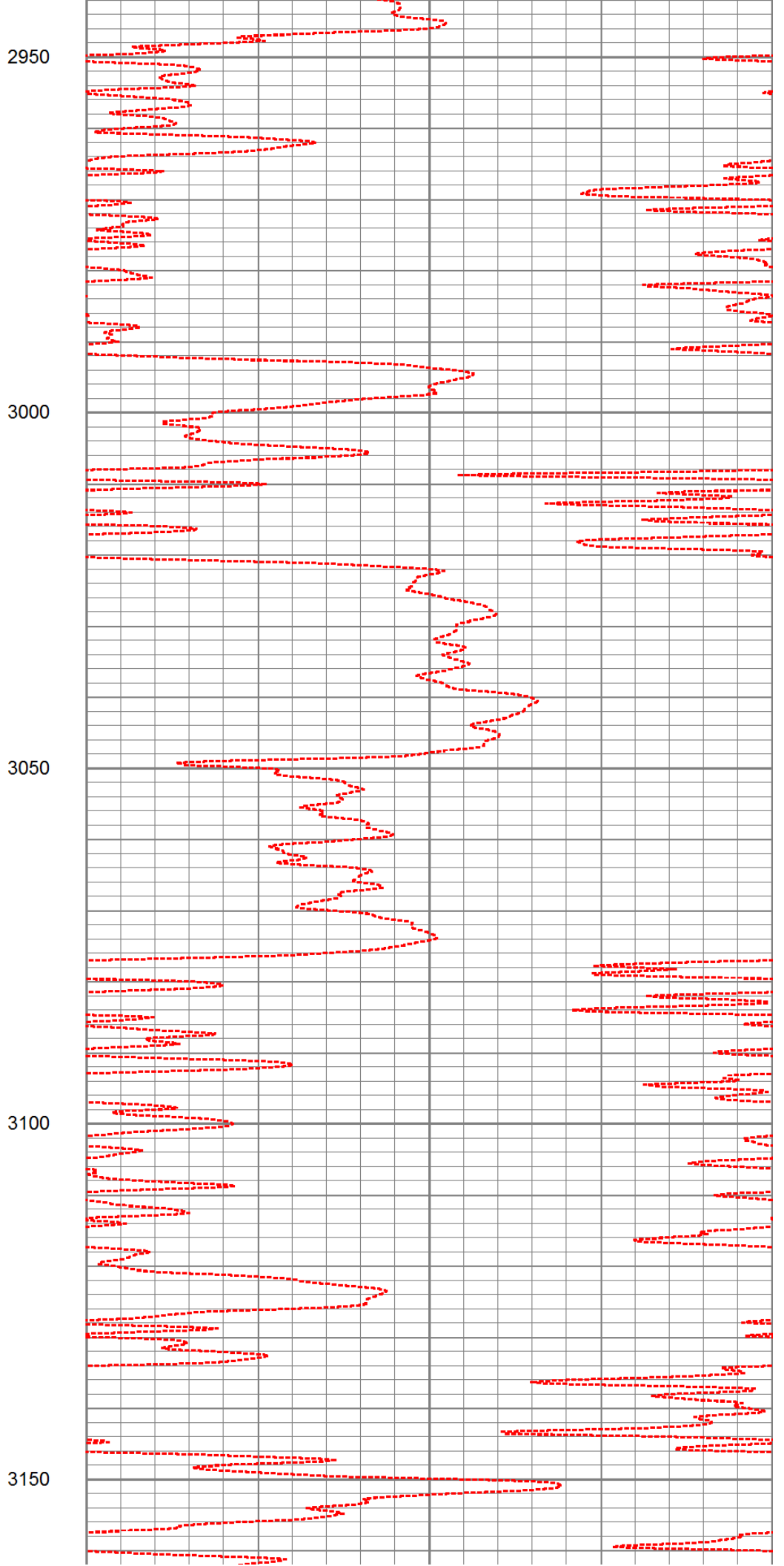
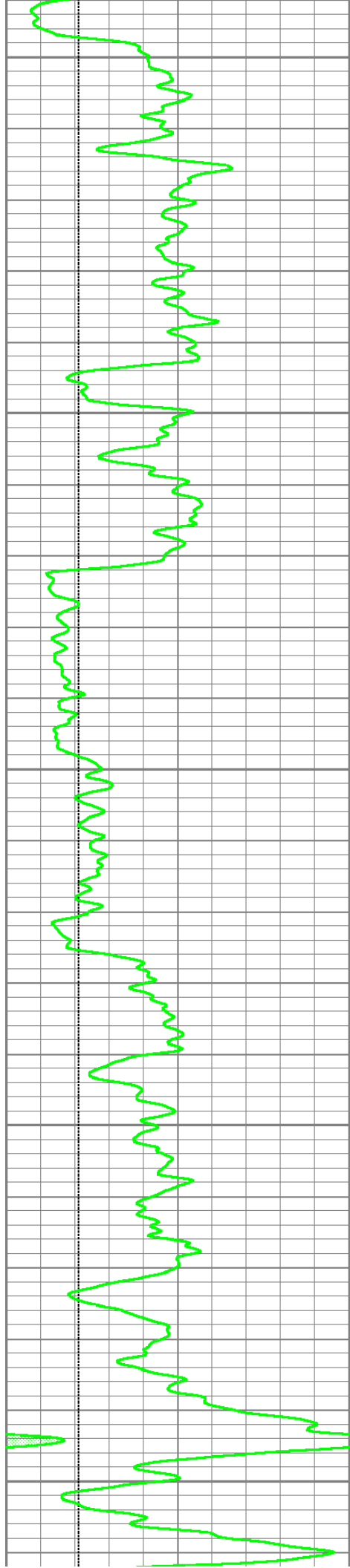
2750

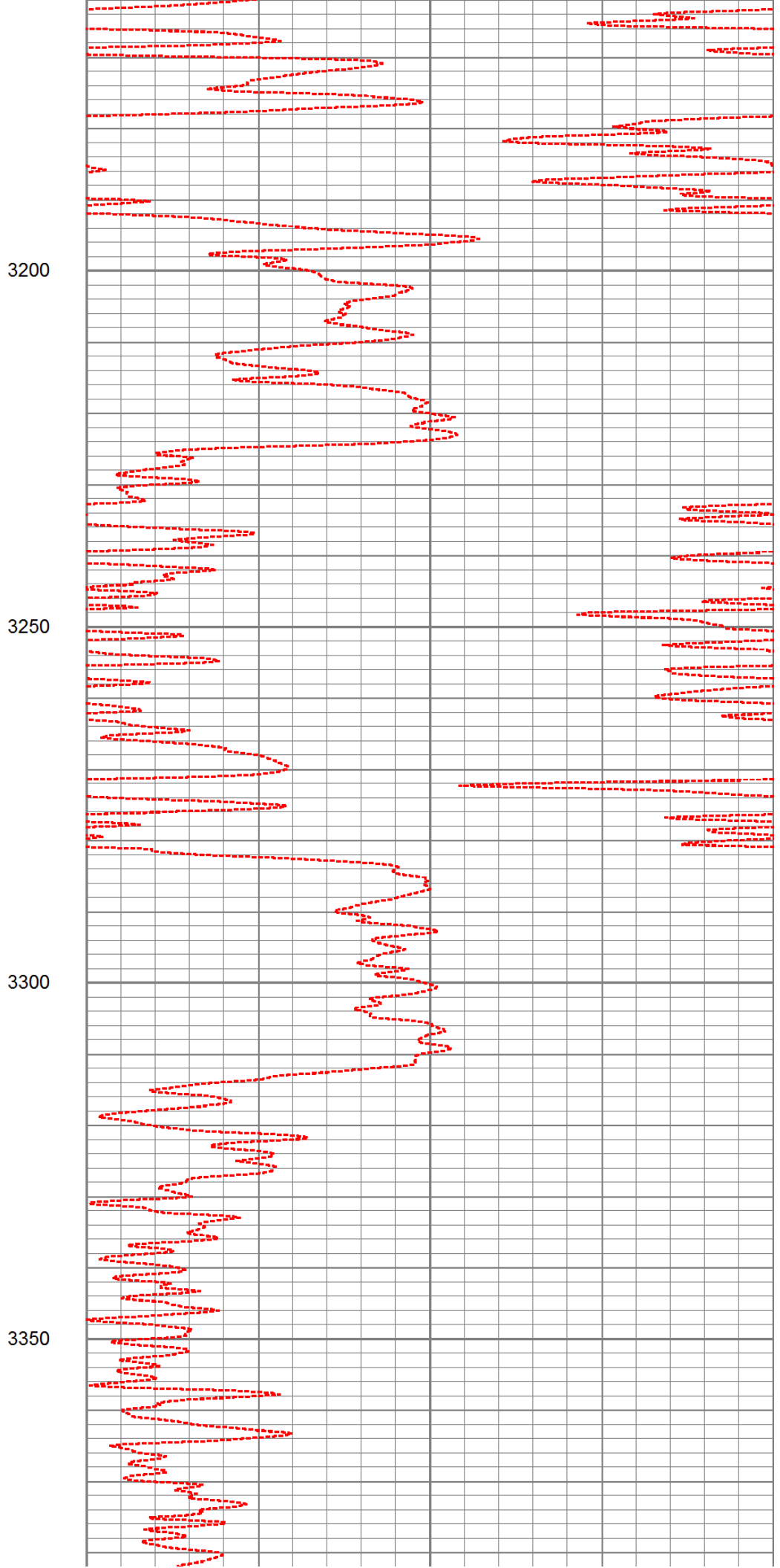
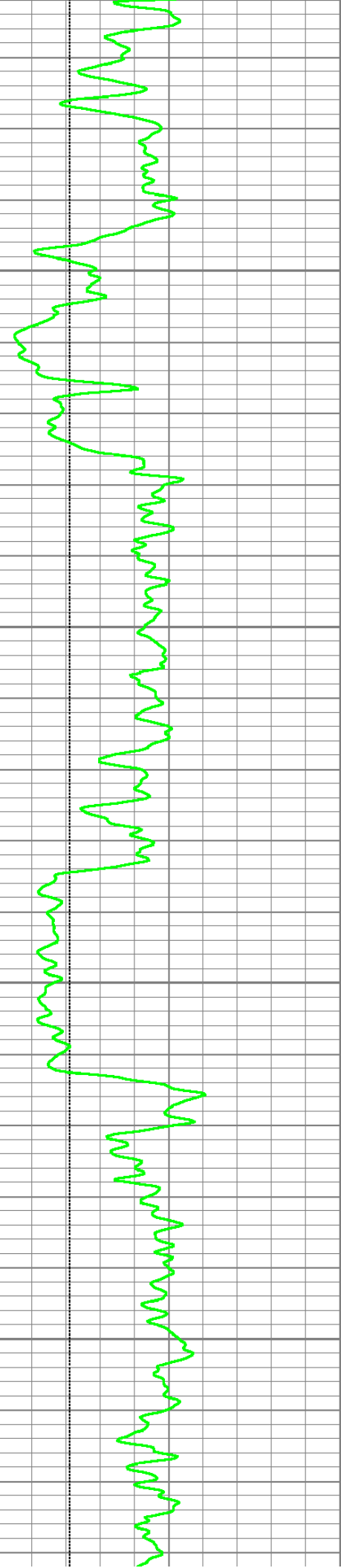
2800

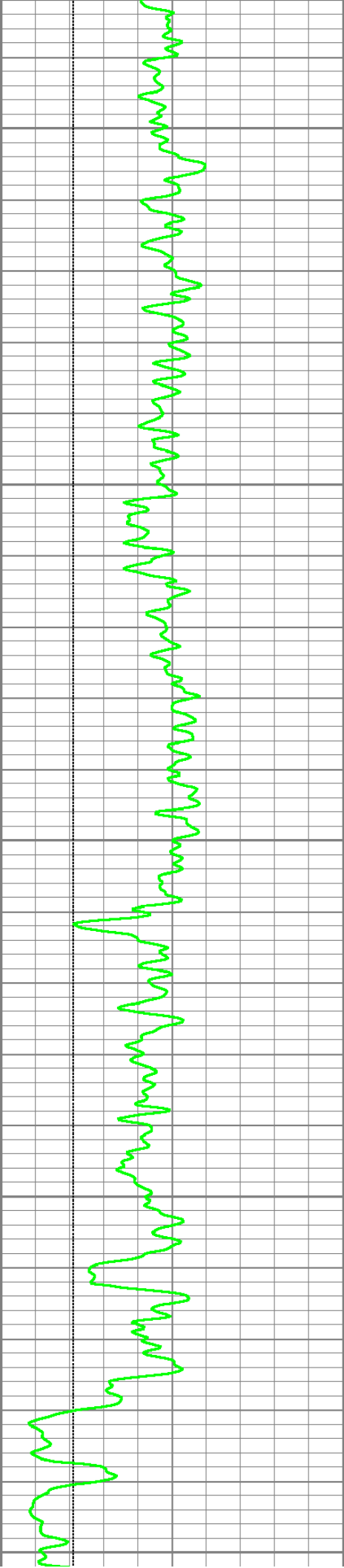
2850

2900









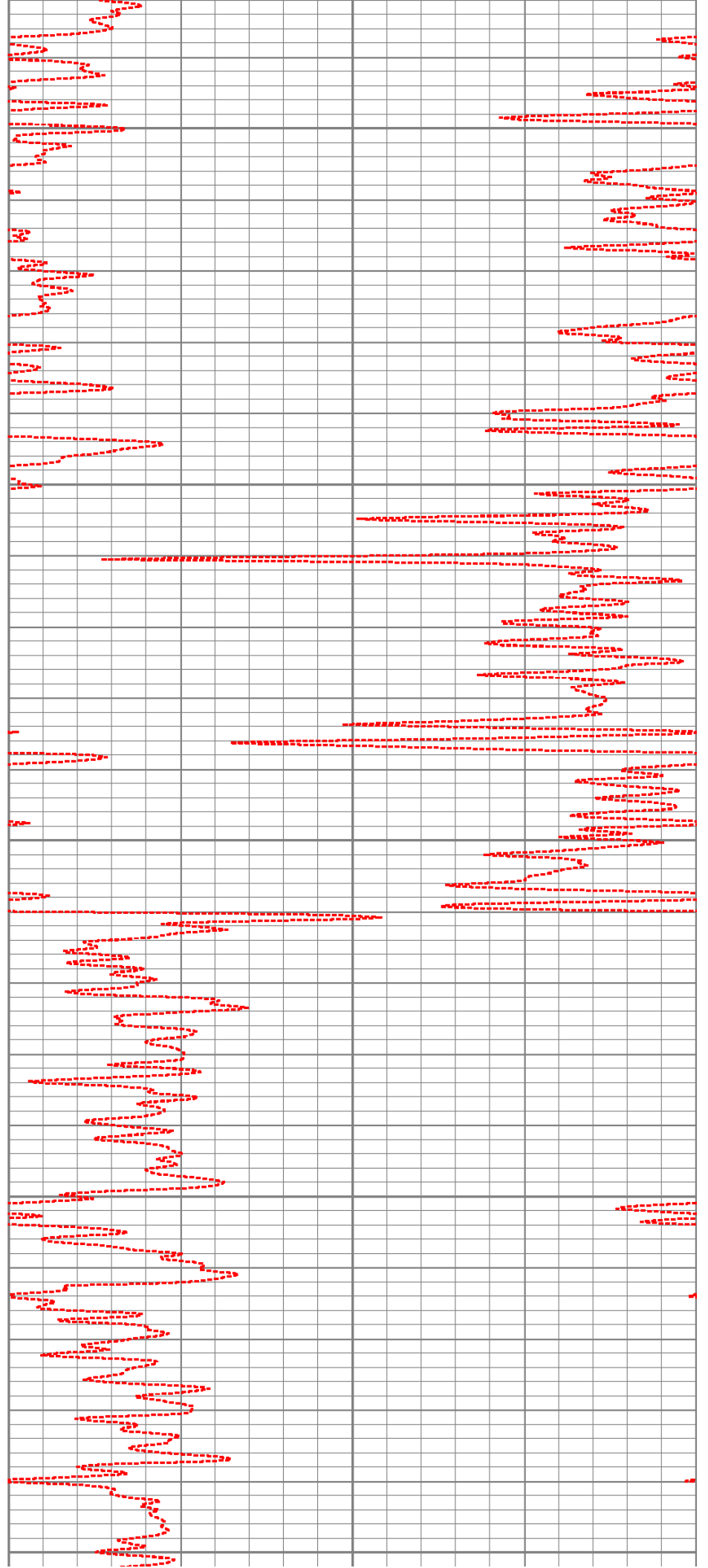
3400

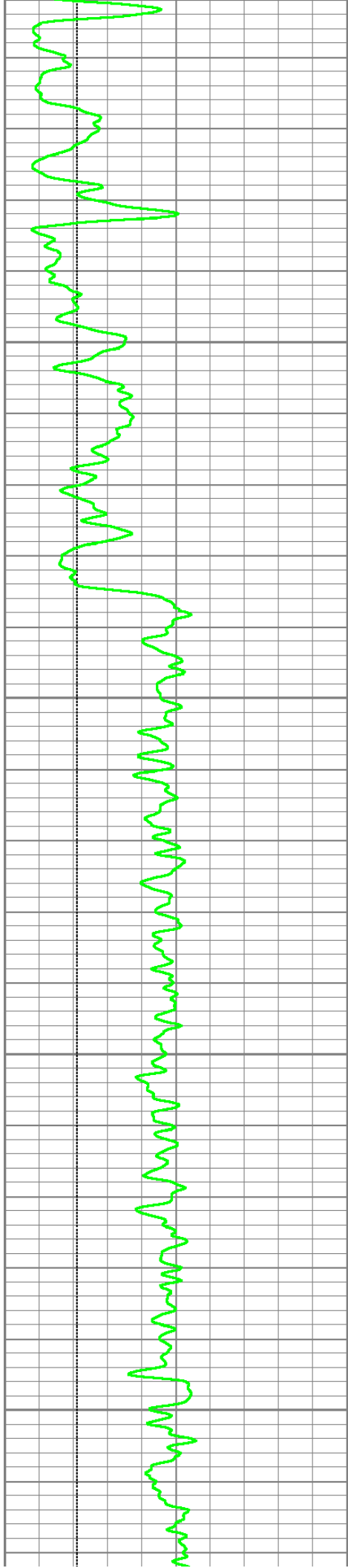
3450

3500

3550

3600



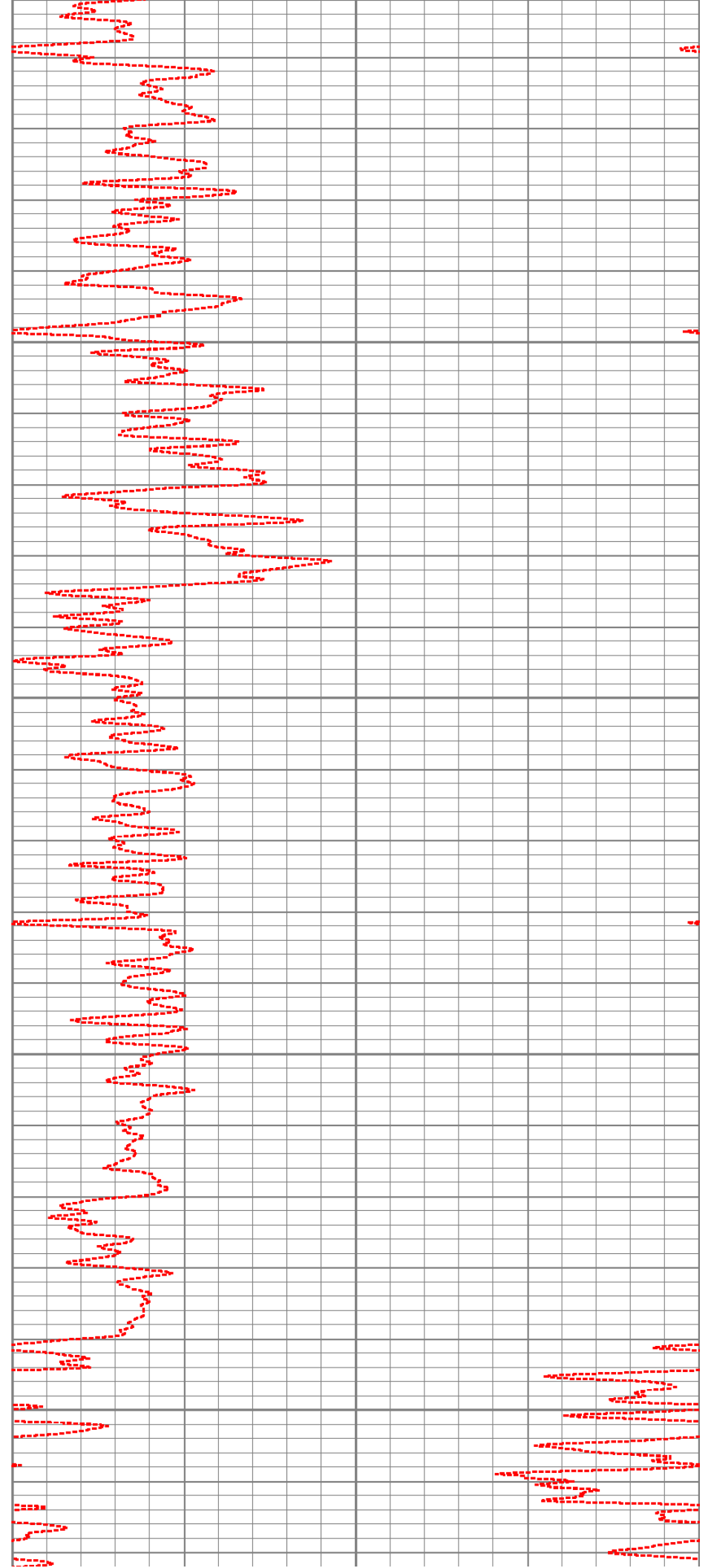


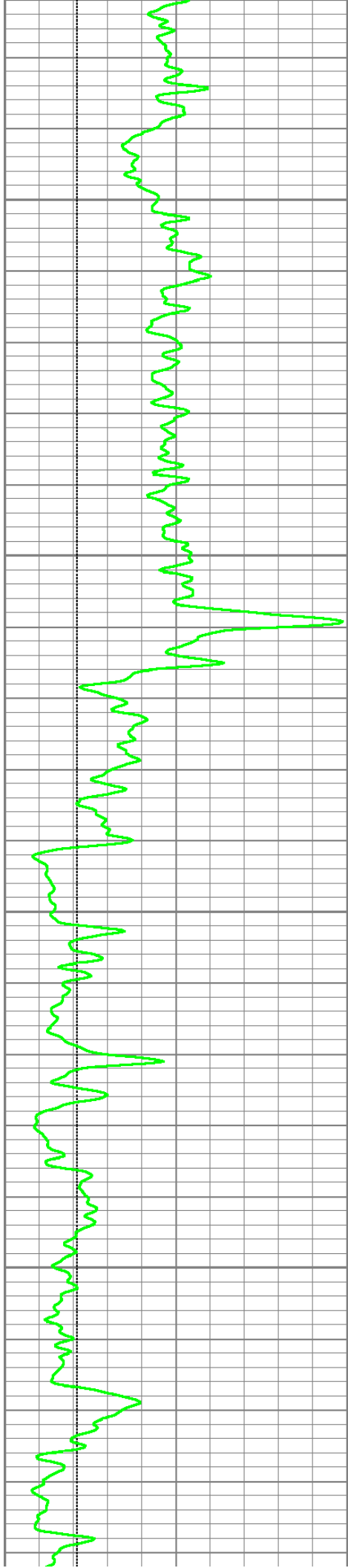
3650

3700

3750

3800



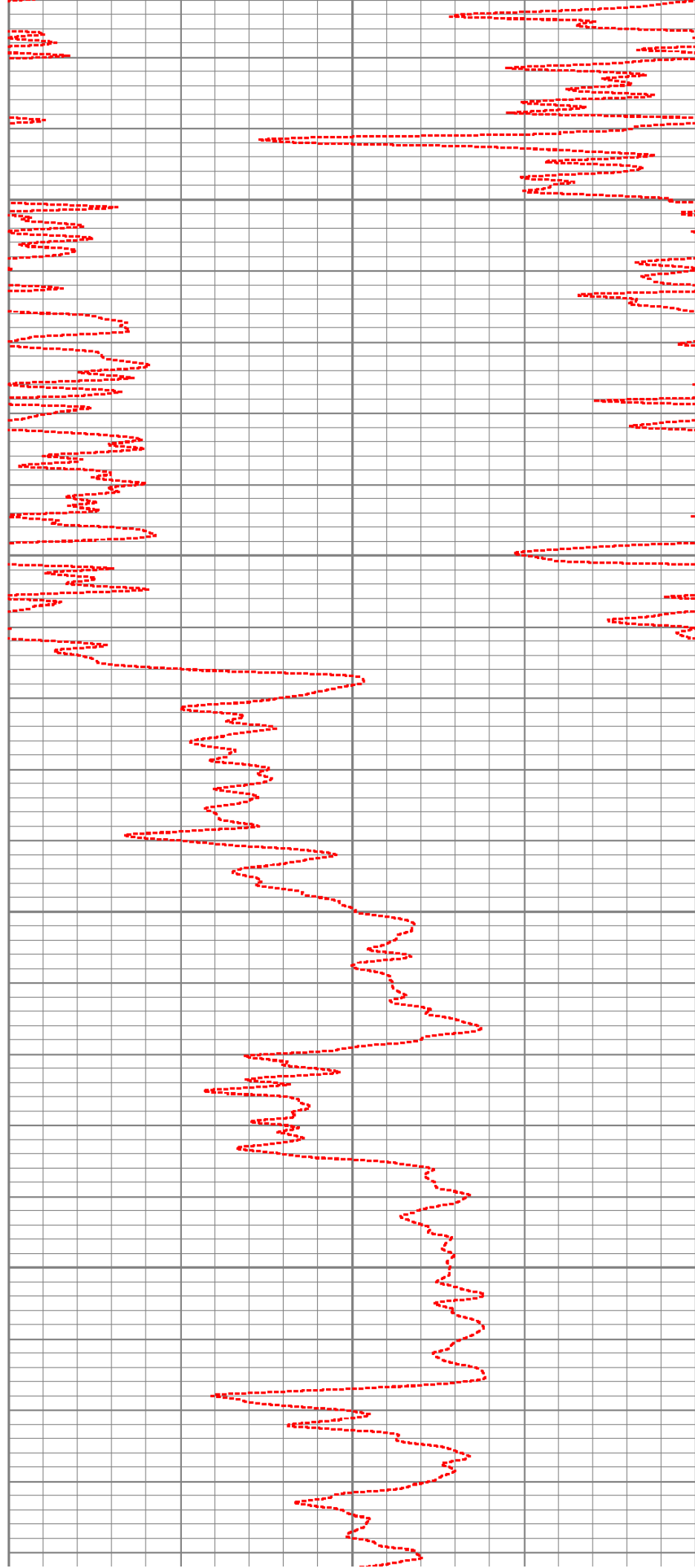


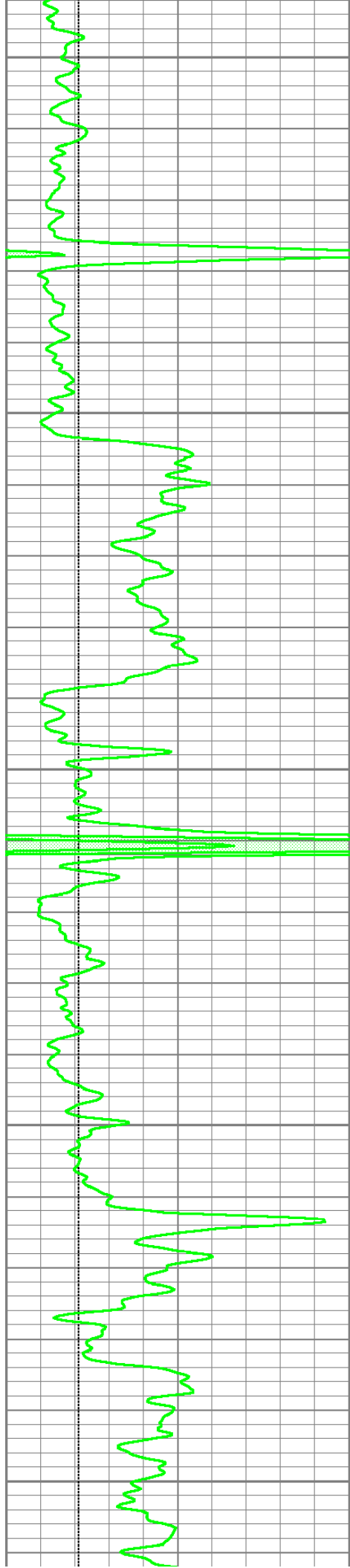
3850

3900

3950

4000





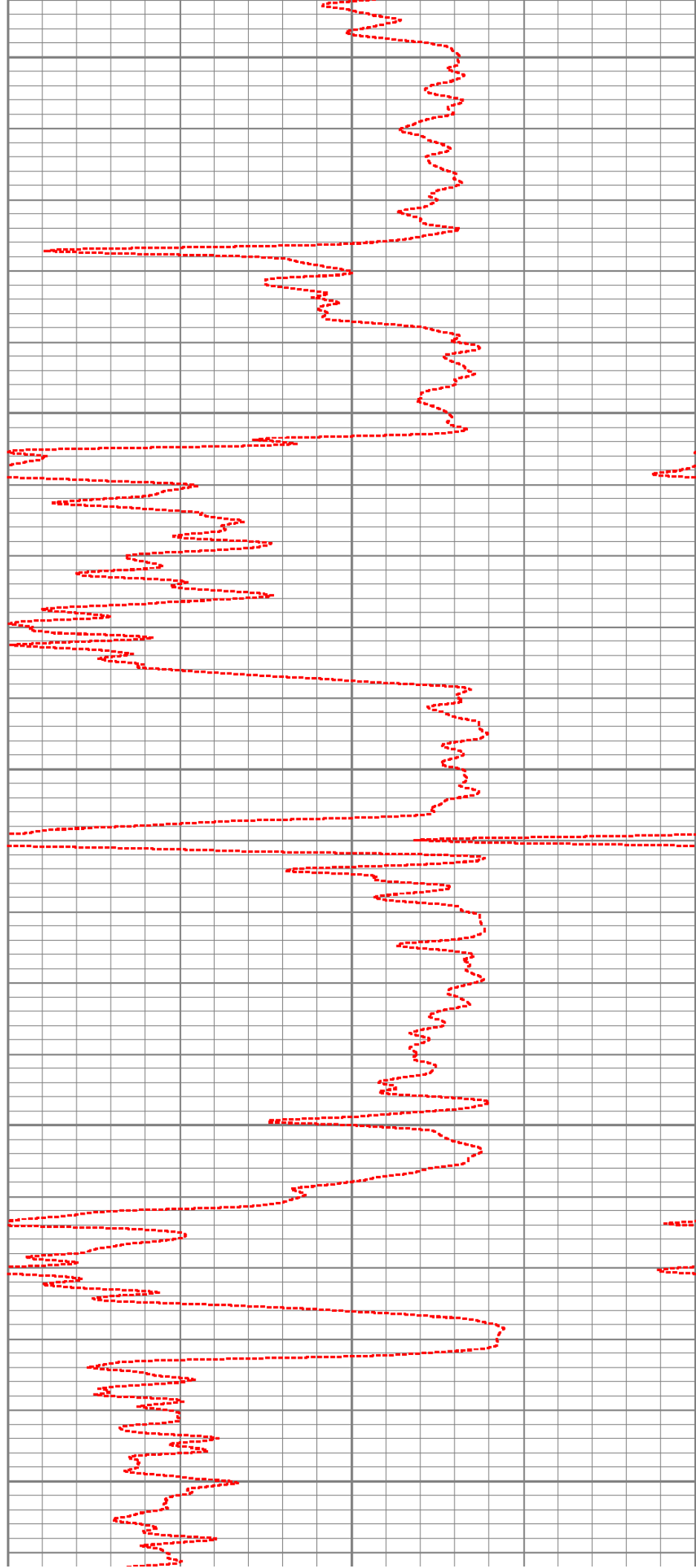
4050

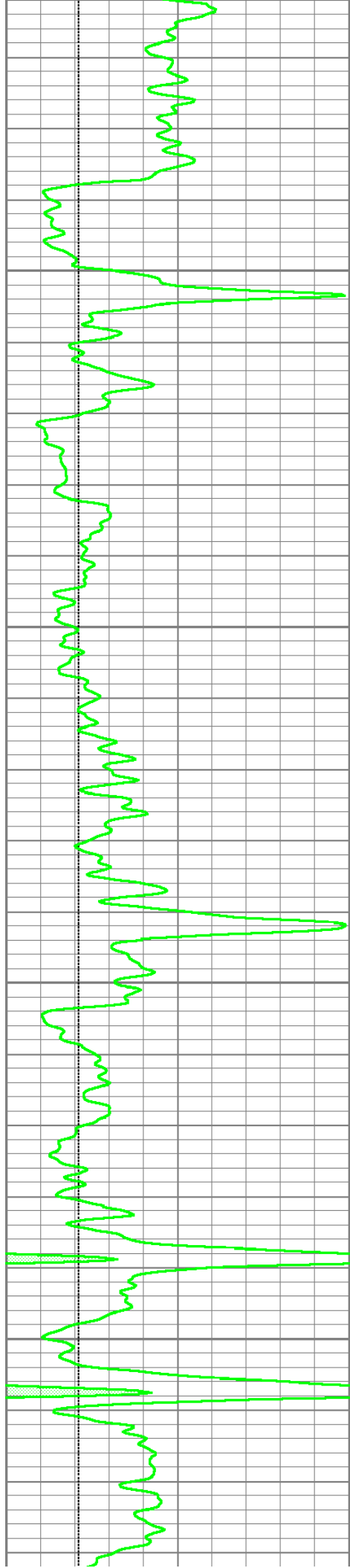
4100

4150

4200

4250



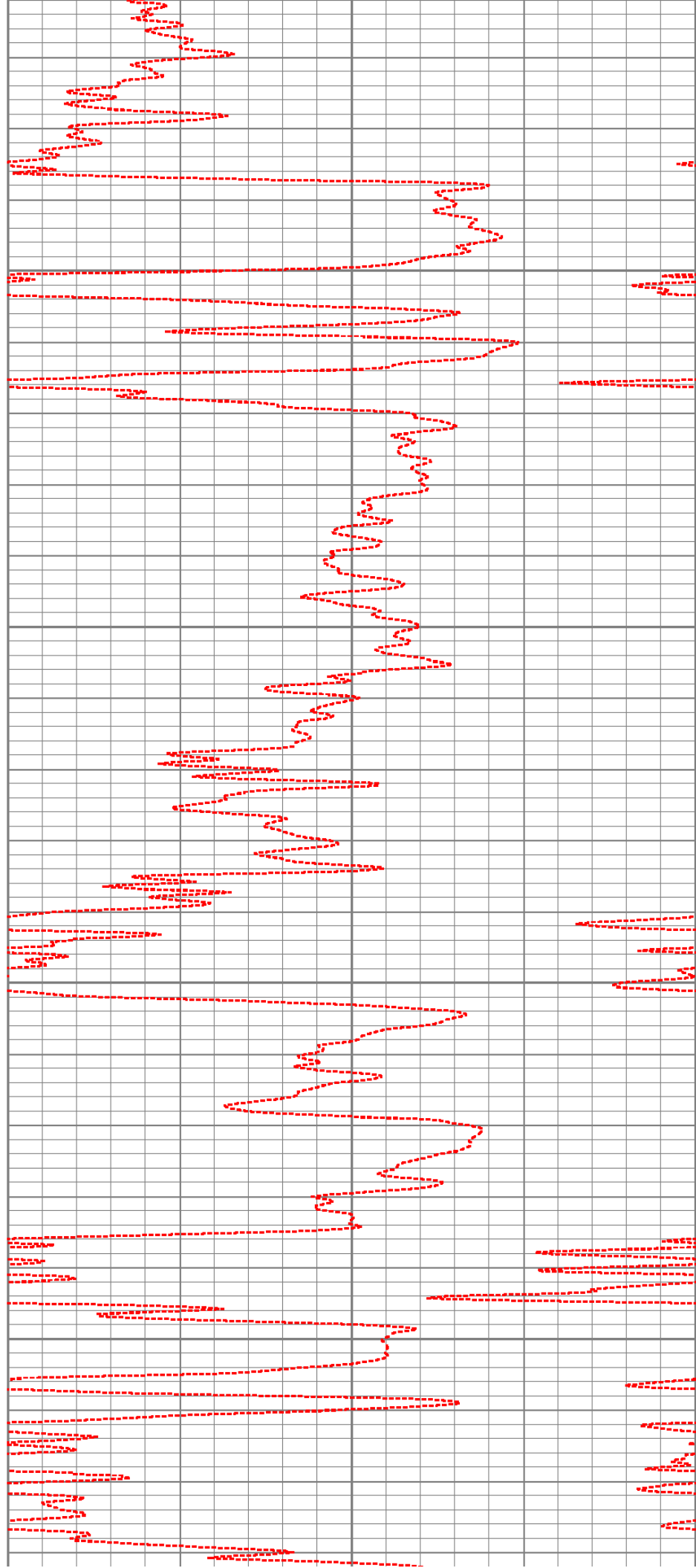


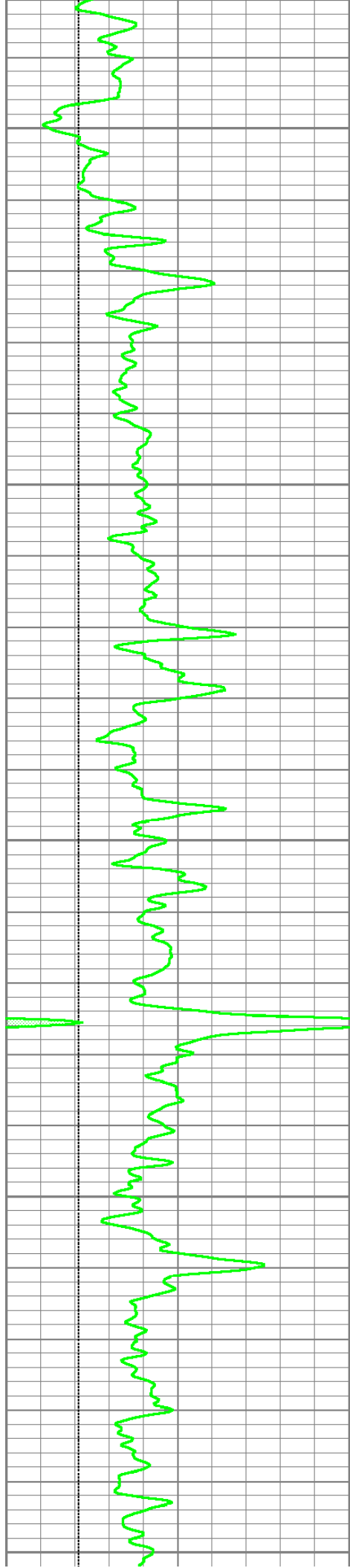
4300

4350

4400

4450





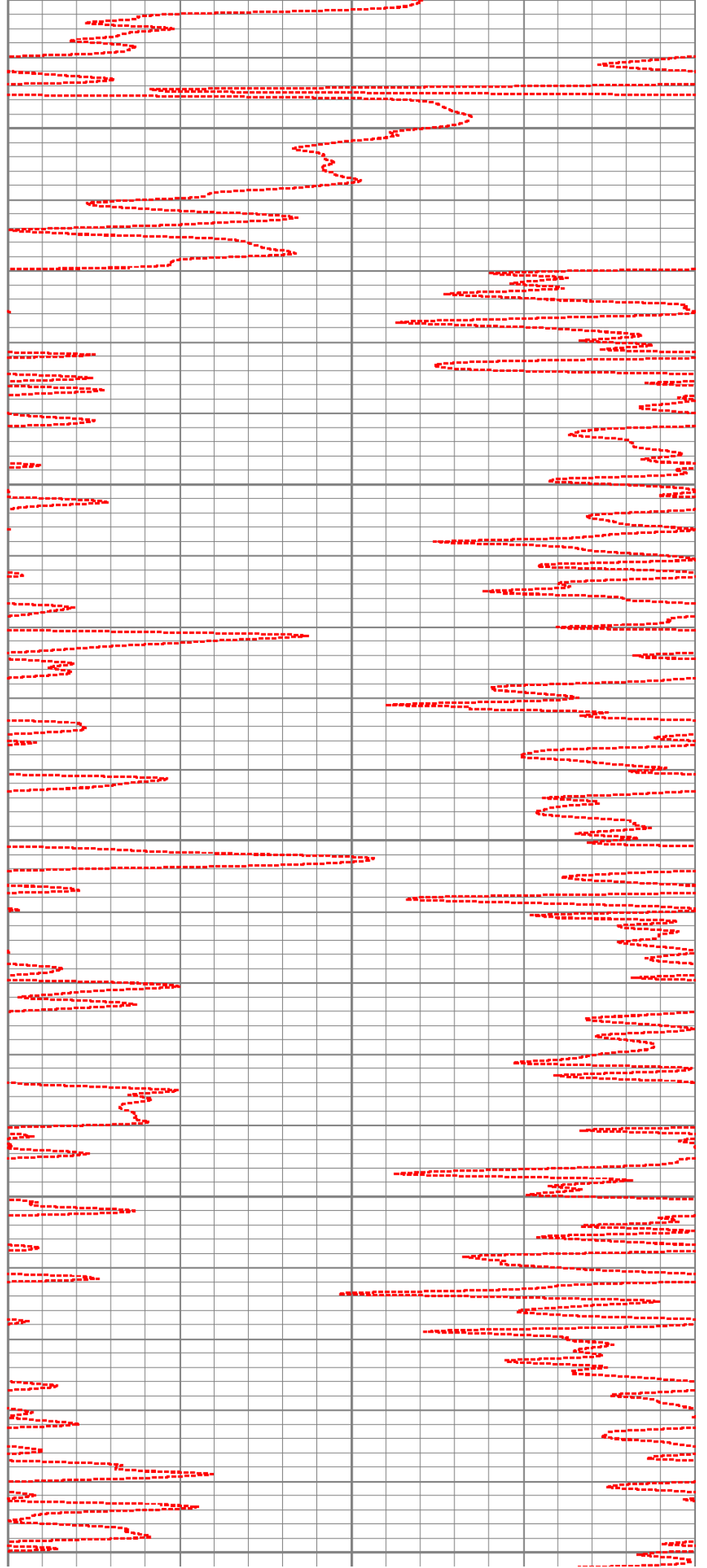
4500

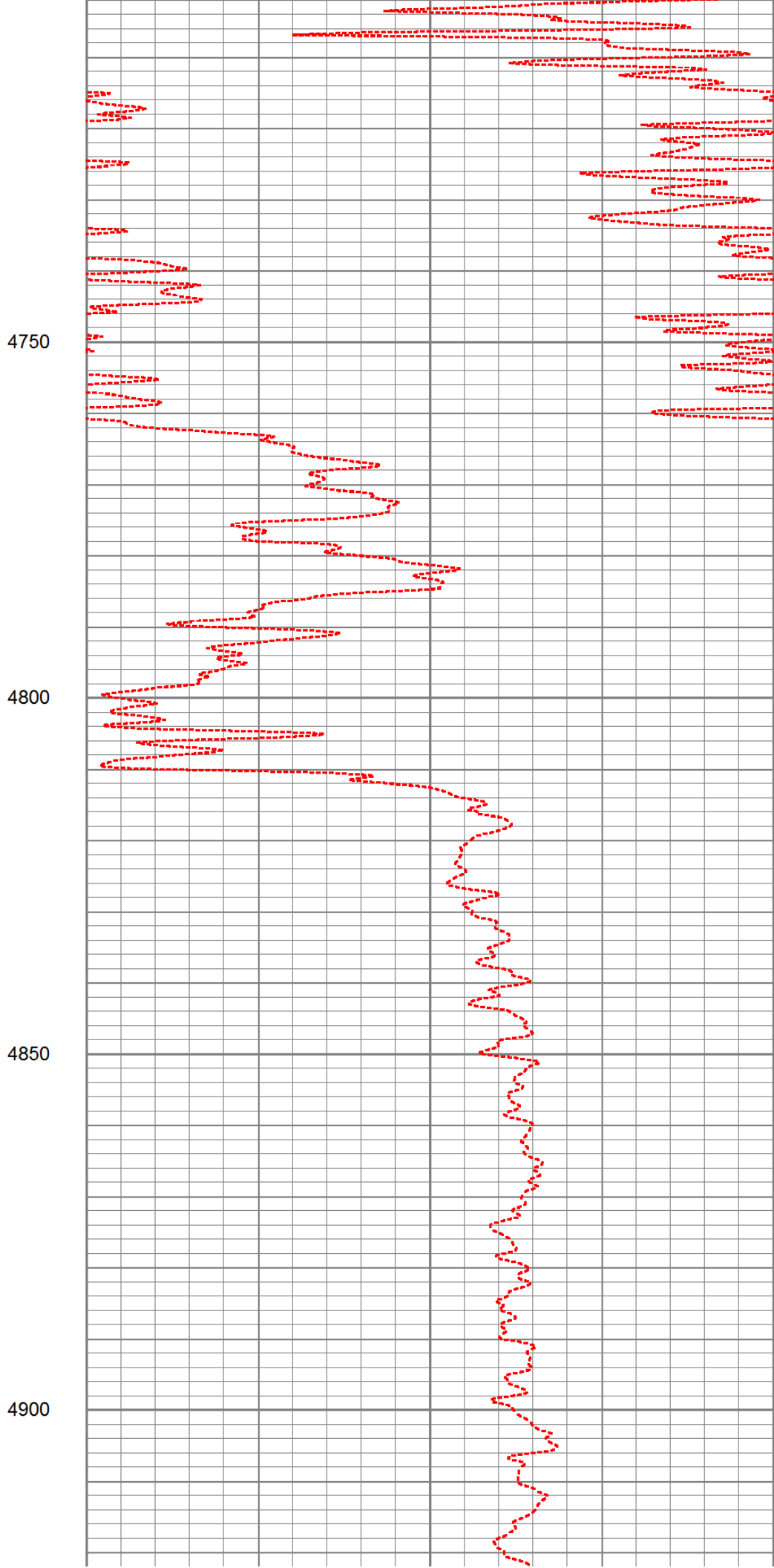
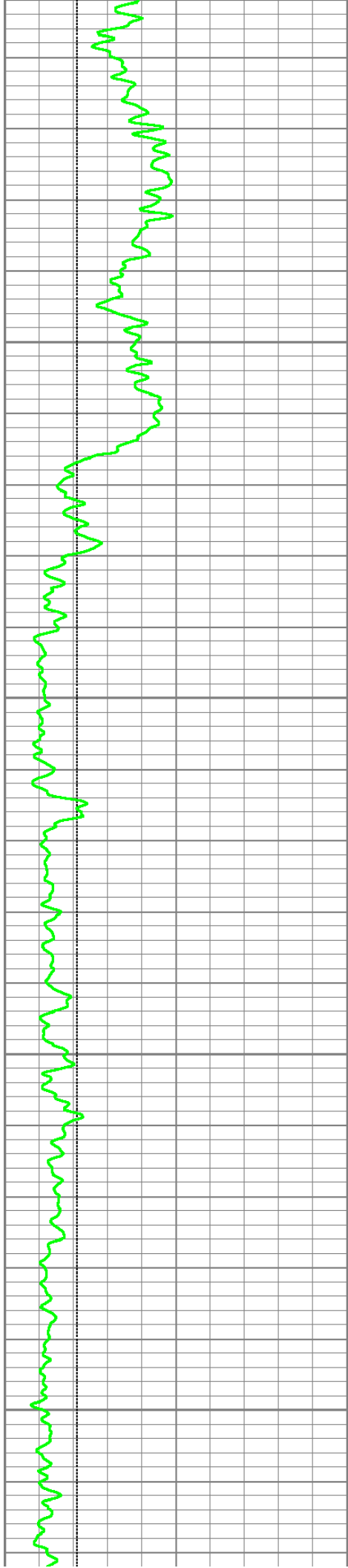
4550

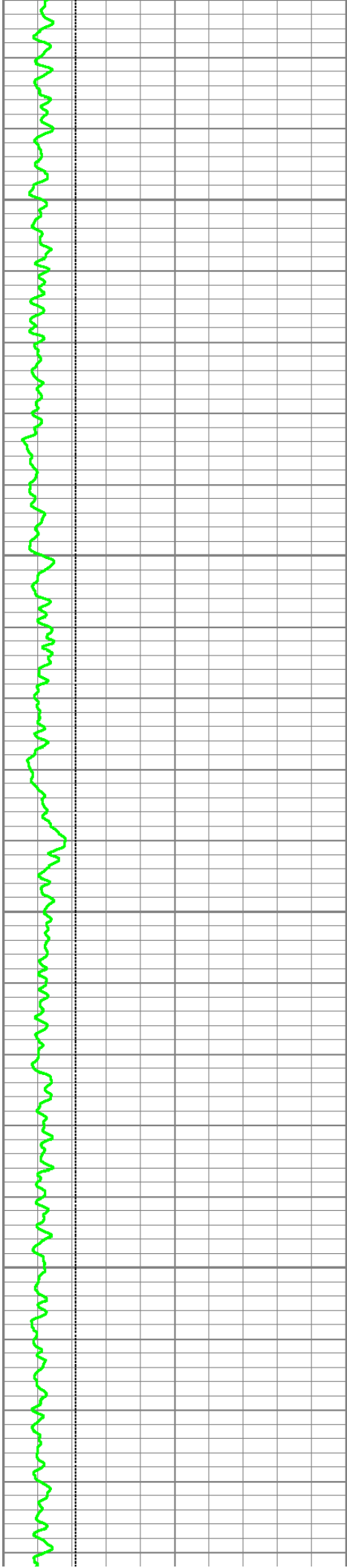
4600

4650

4700





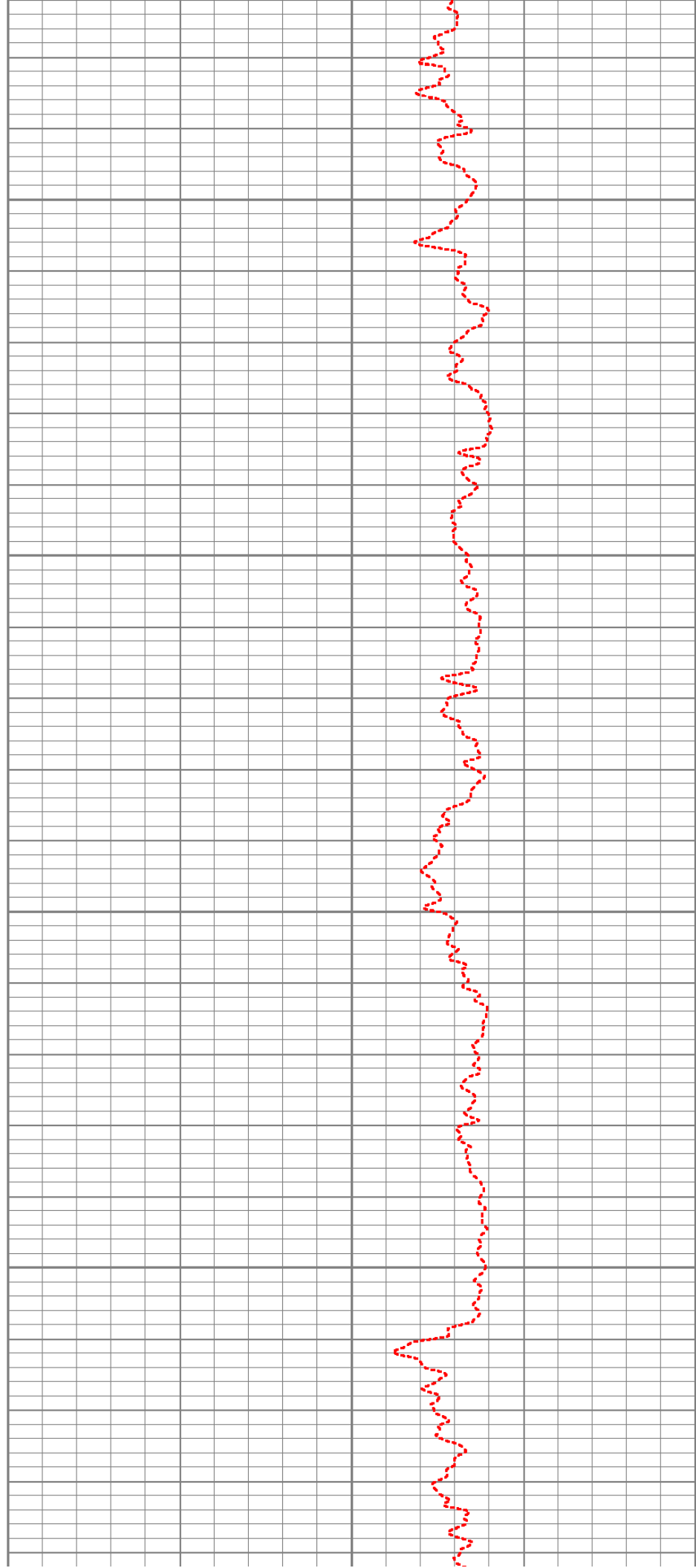


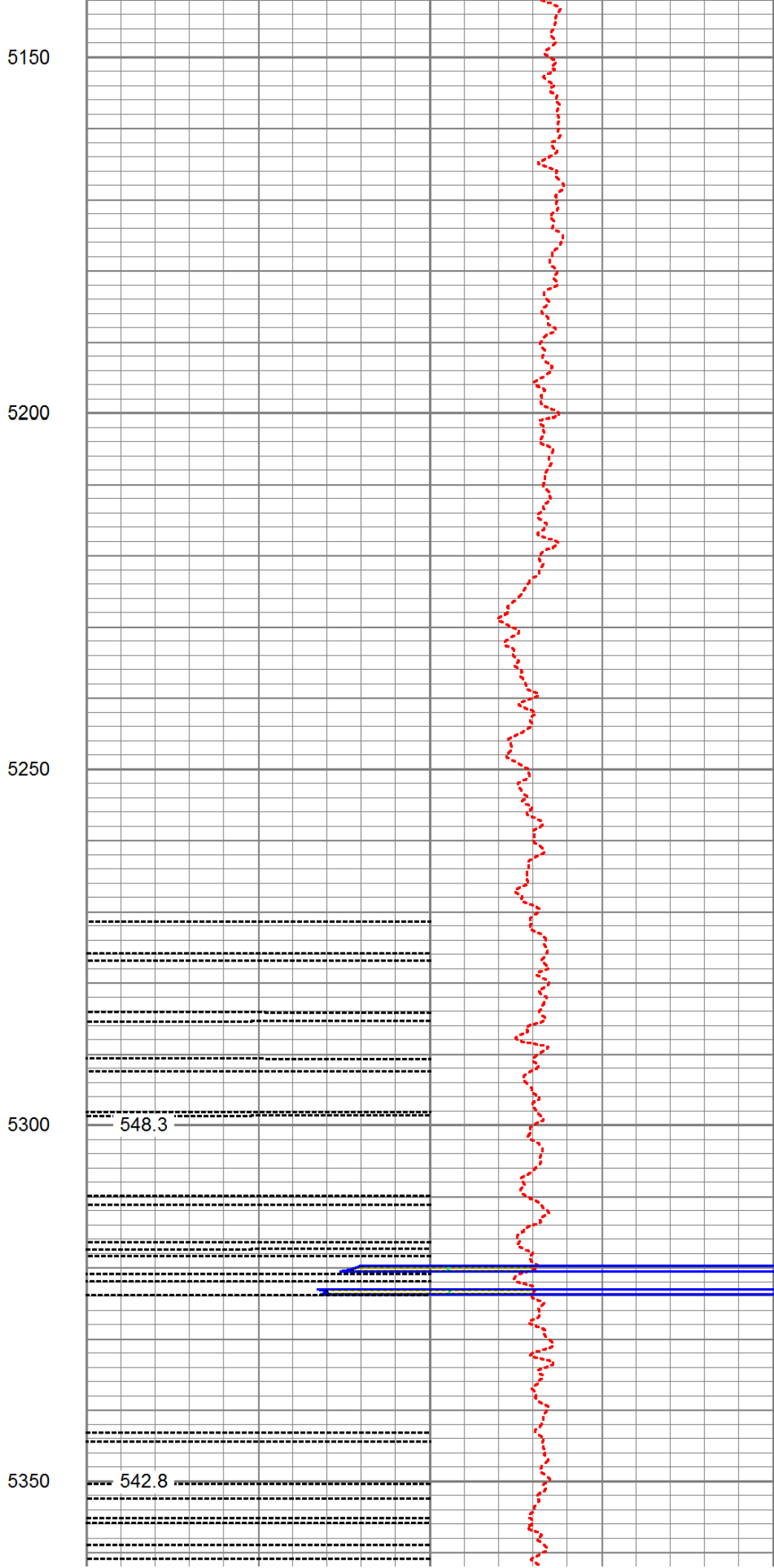
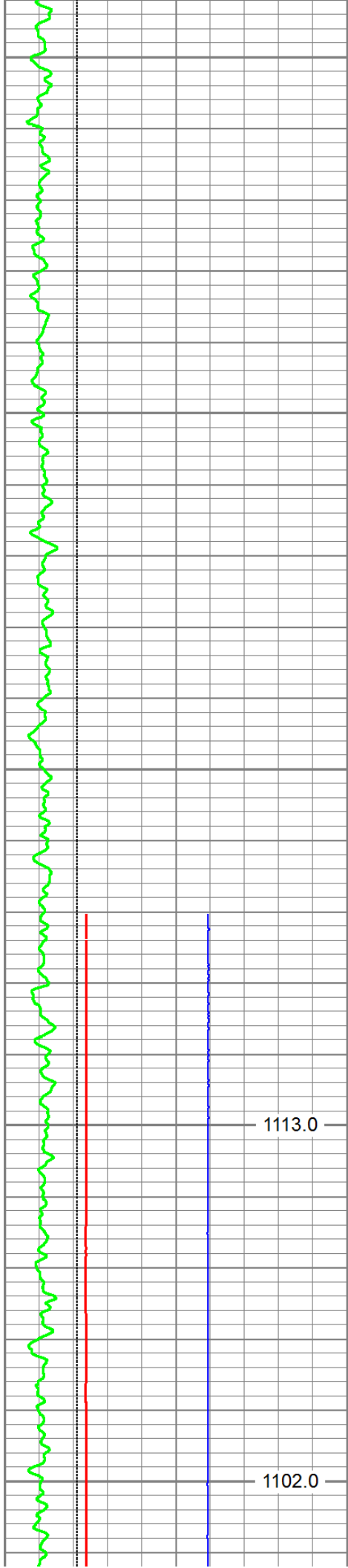
4950

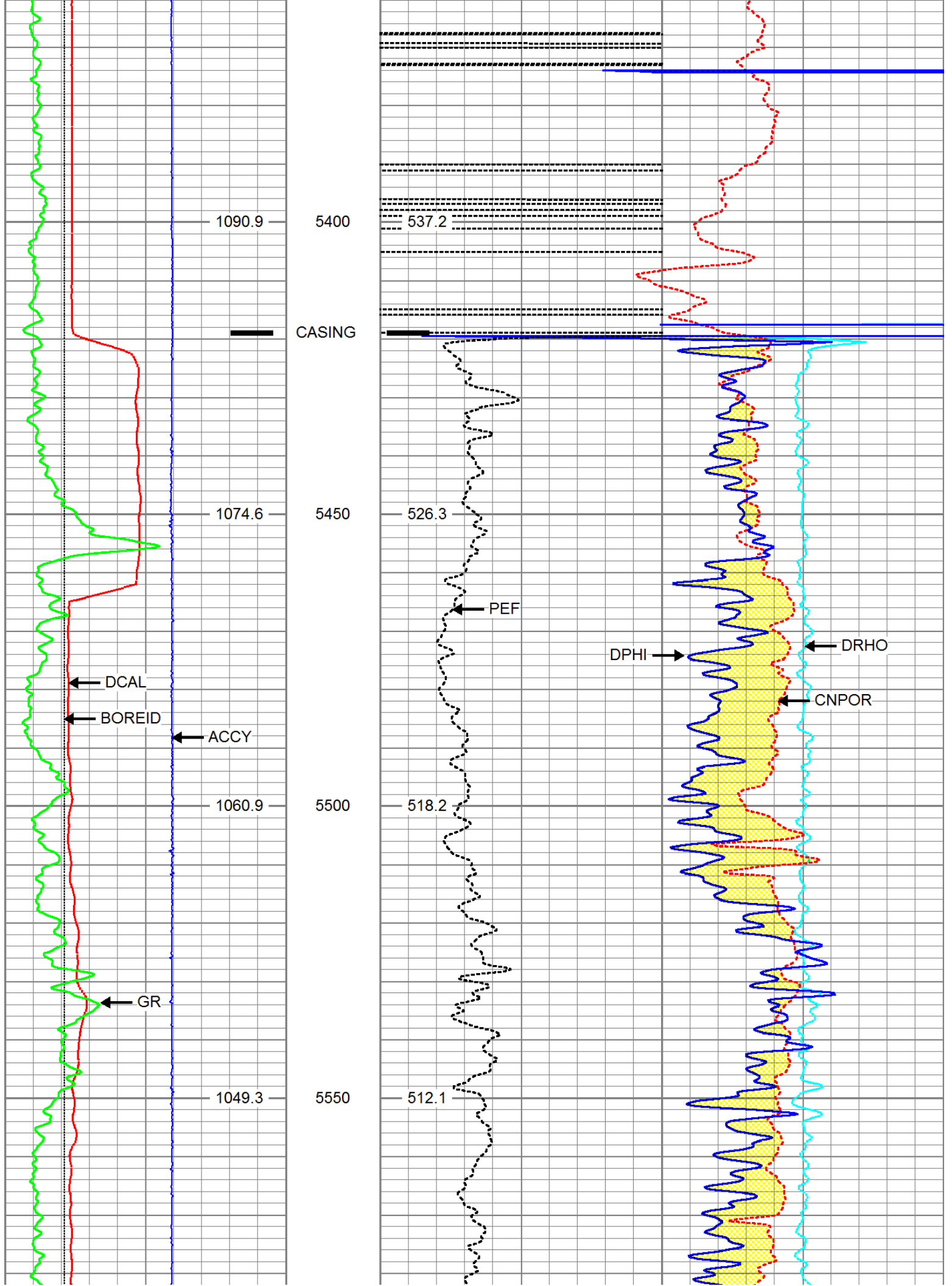
5000

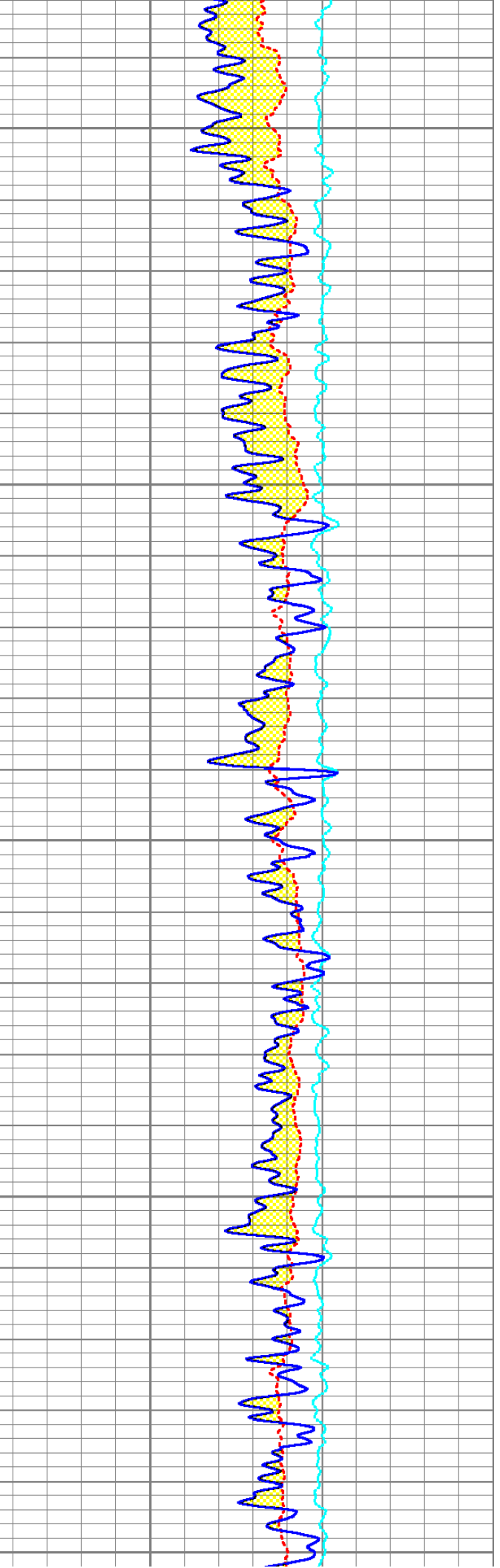
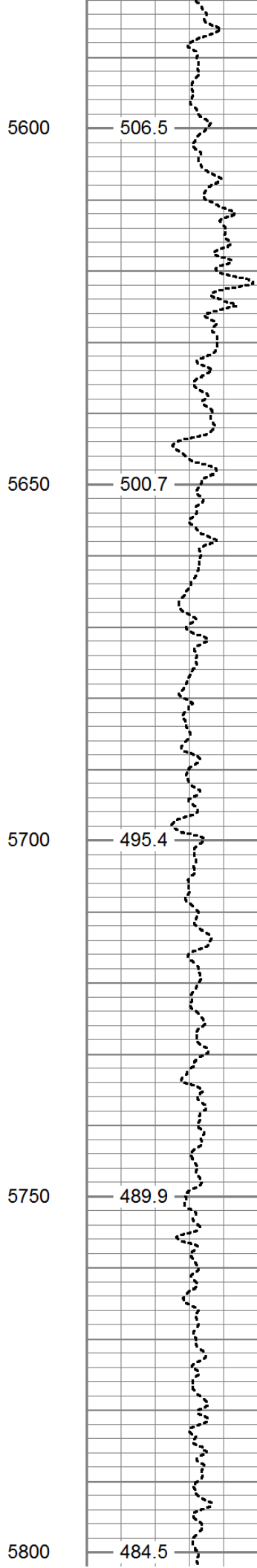
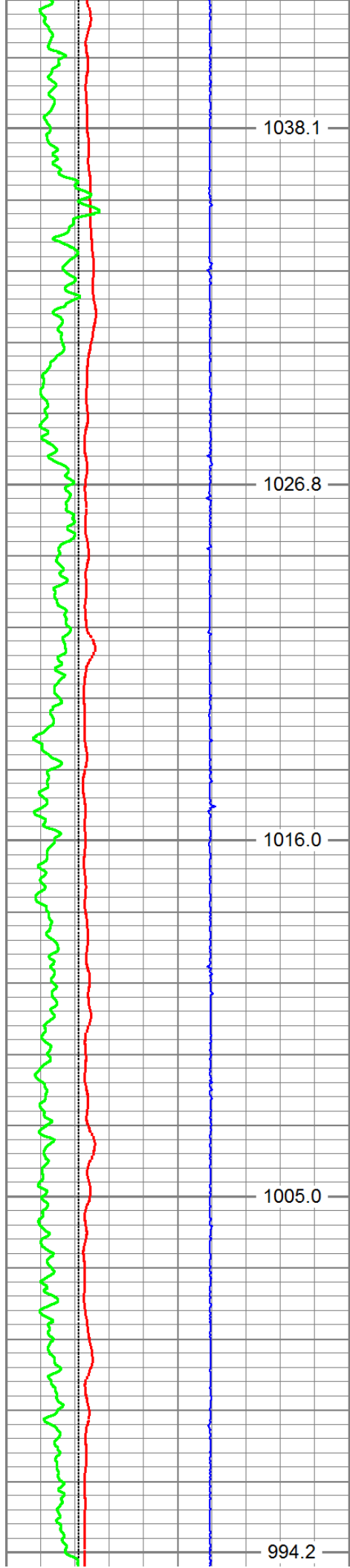
5050

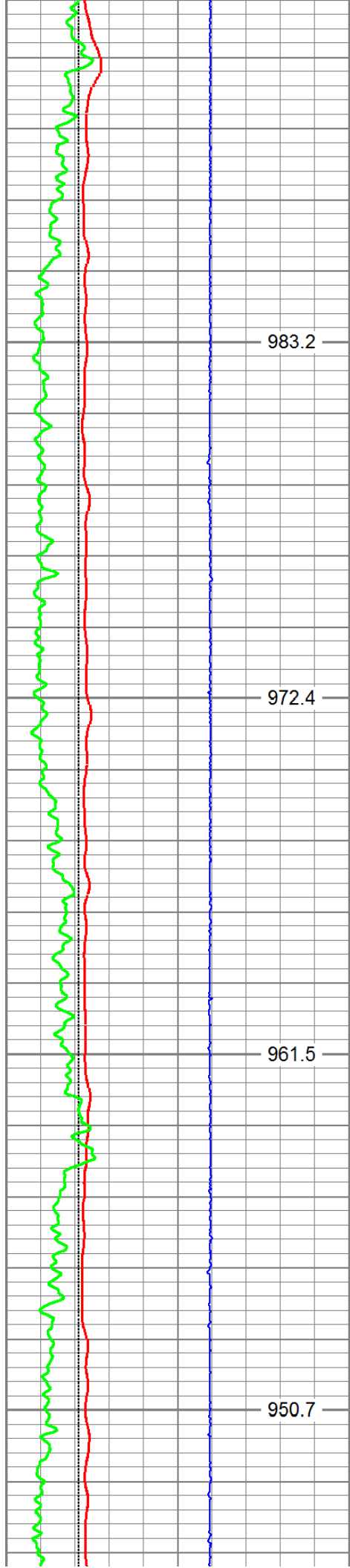
5100









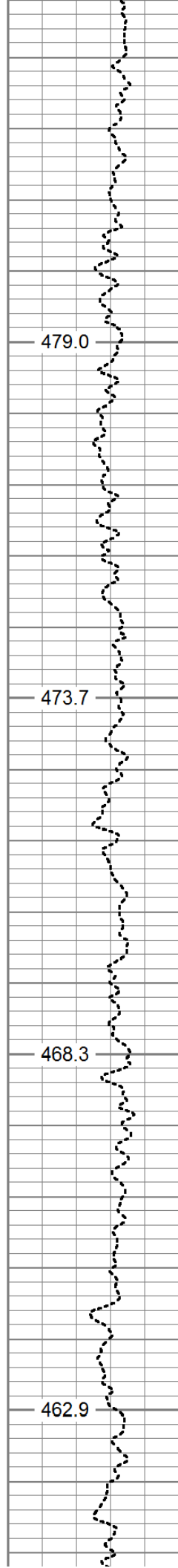


5850

5900

5950

6000

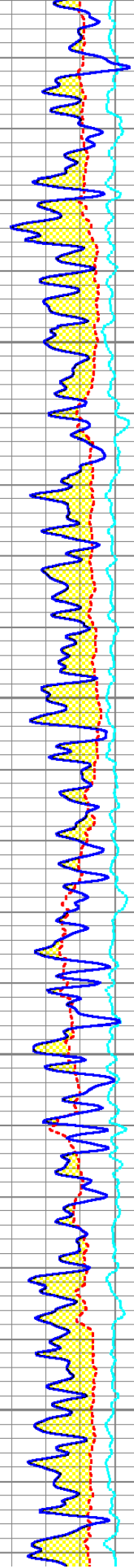


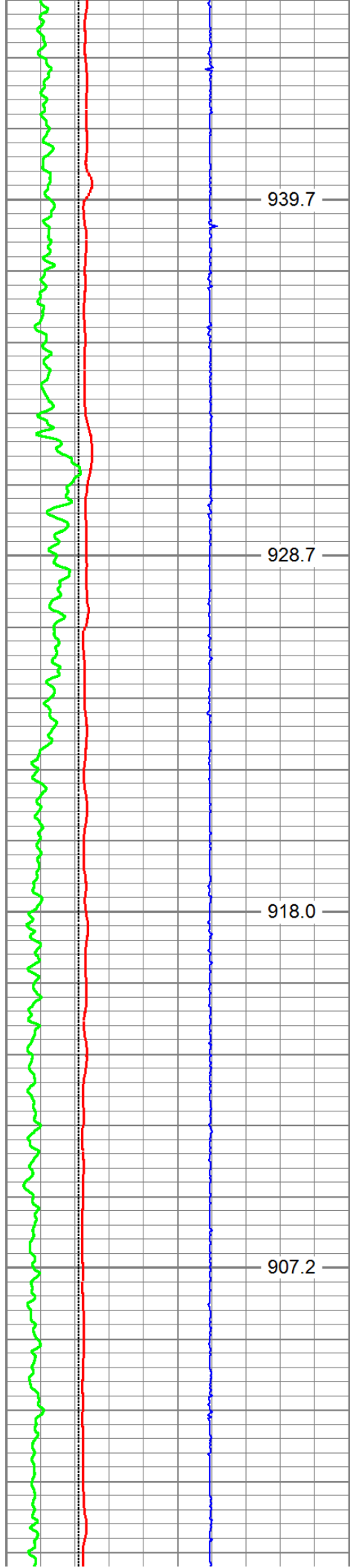
479.0

473.7

468.3

462.9



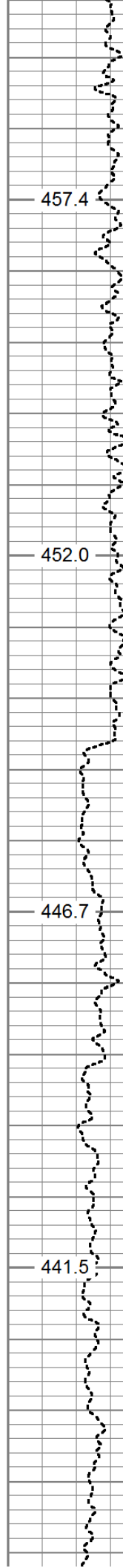


6050

6100

6150

6200

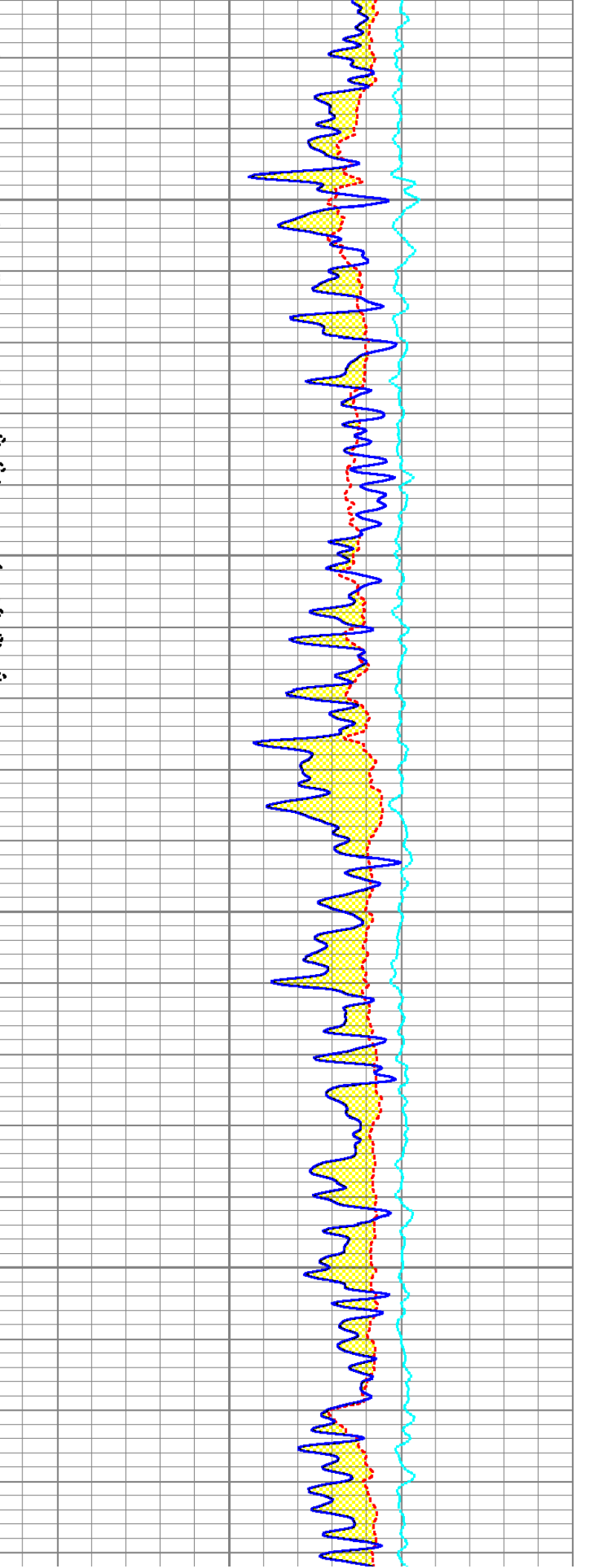


457.4

452.0

446.7

441.5

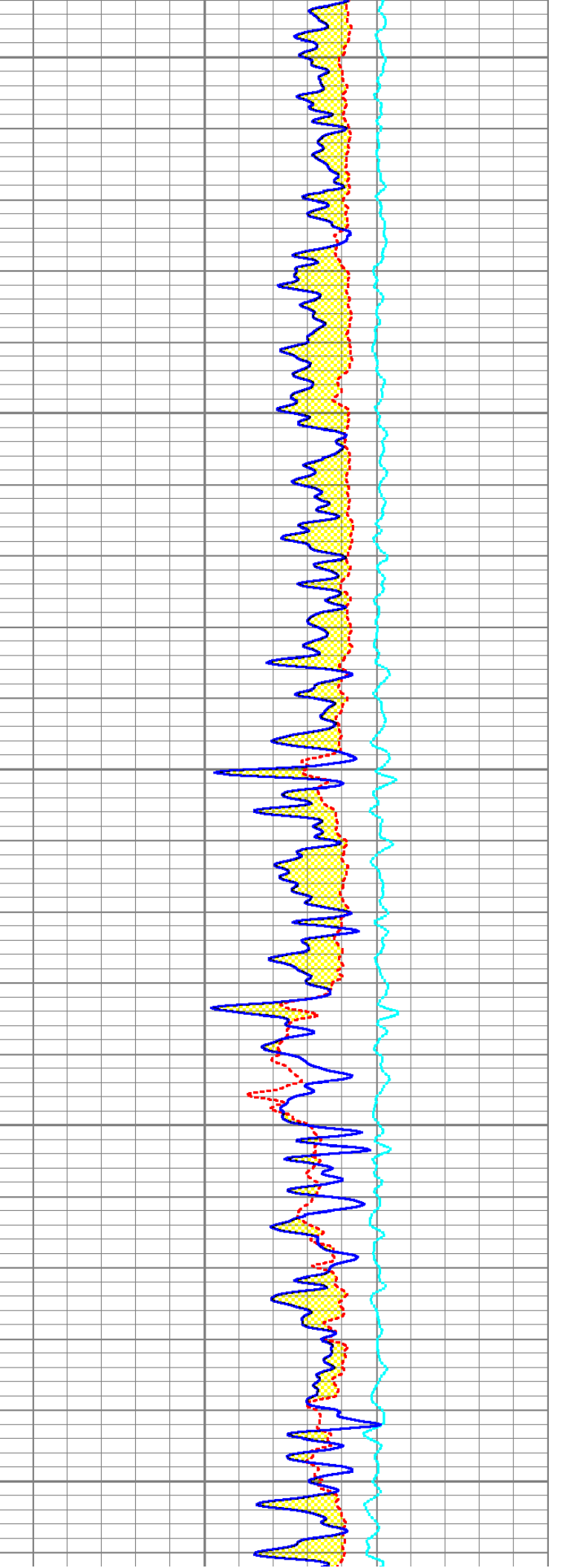
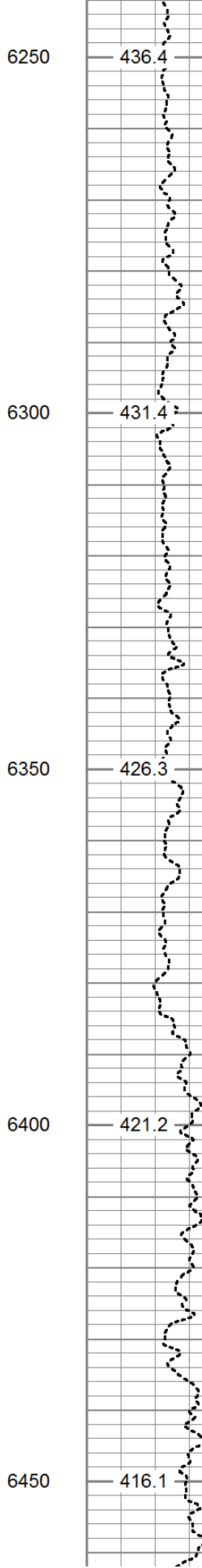
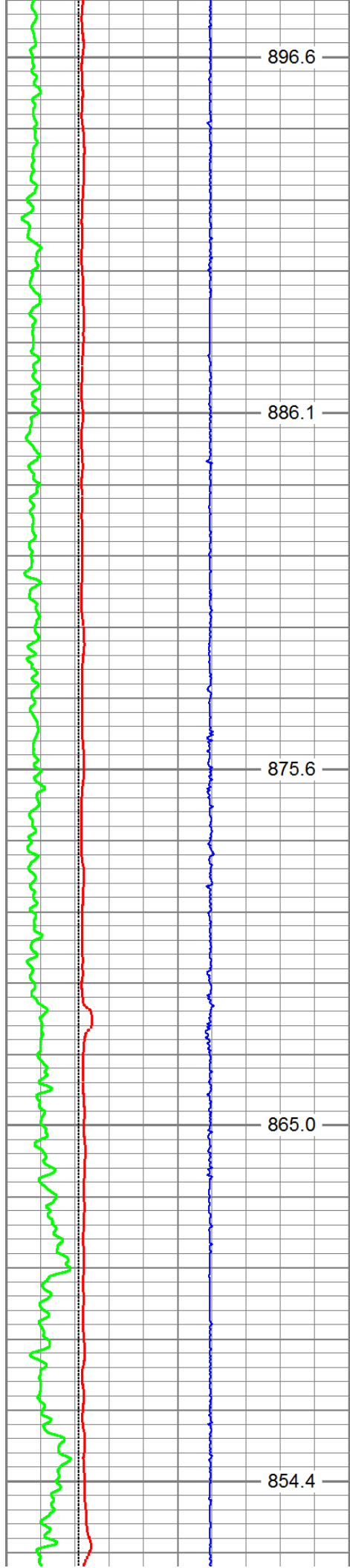


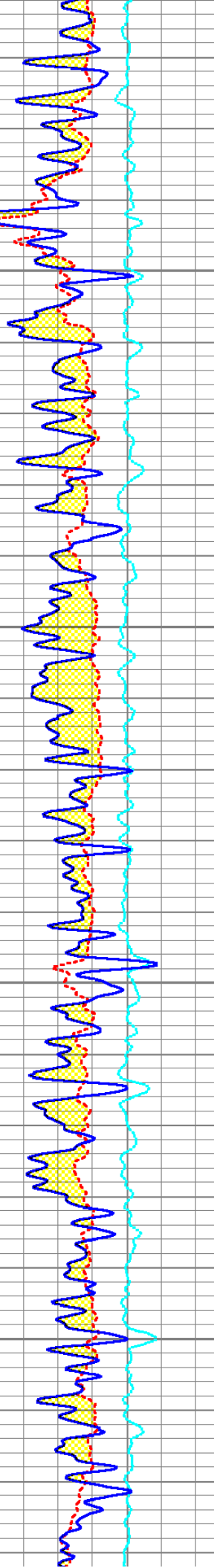
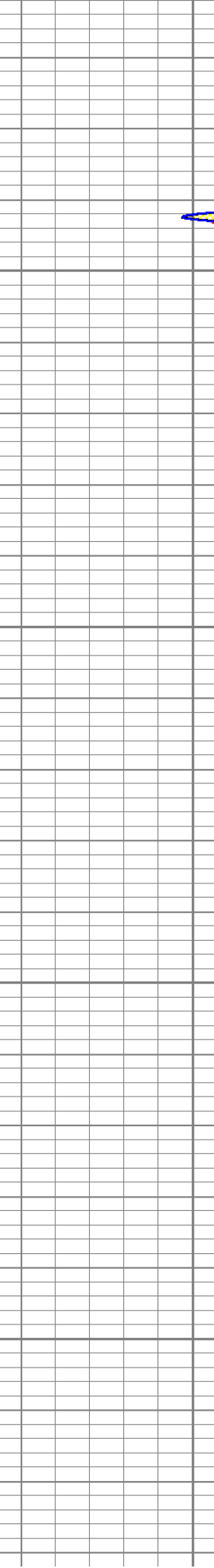
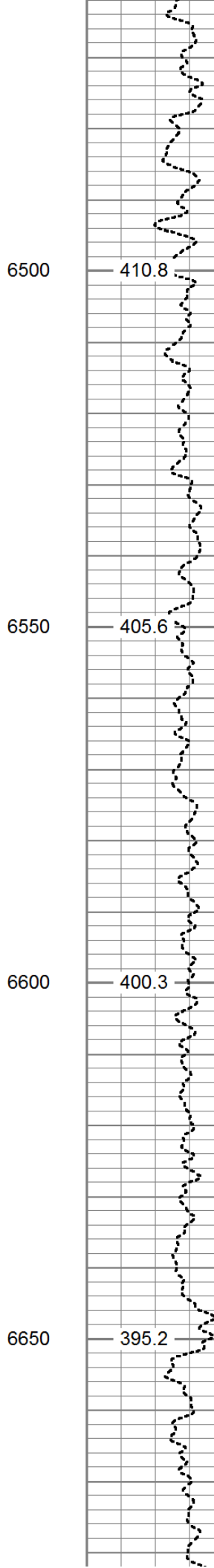
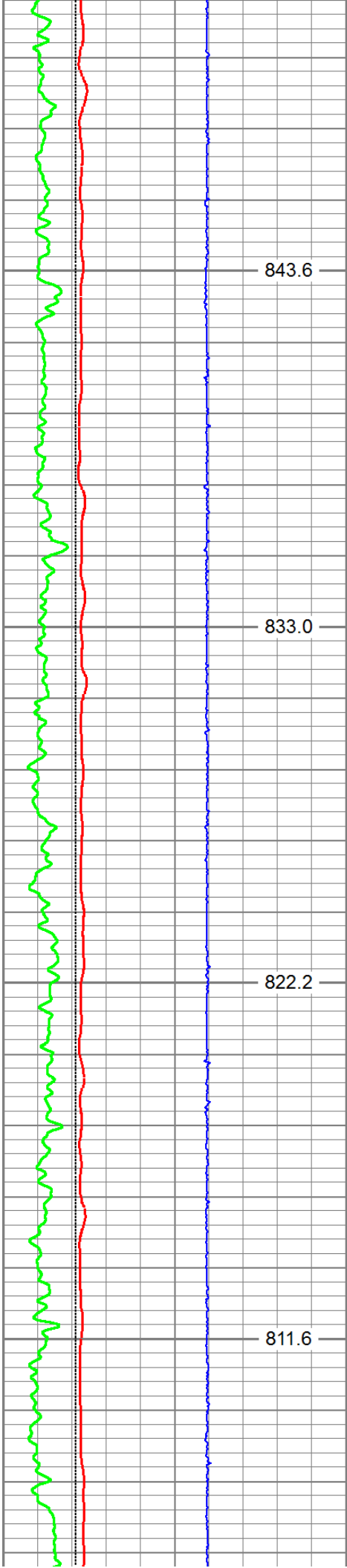
457.4

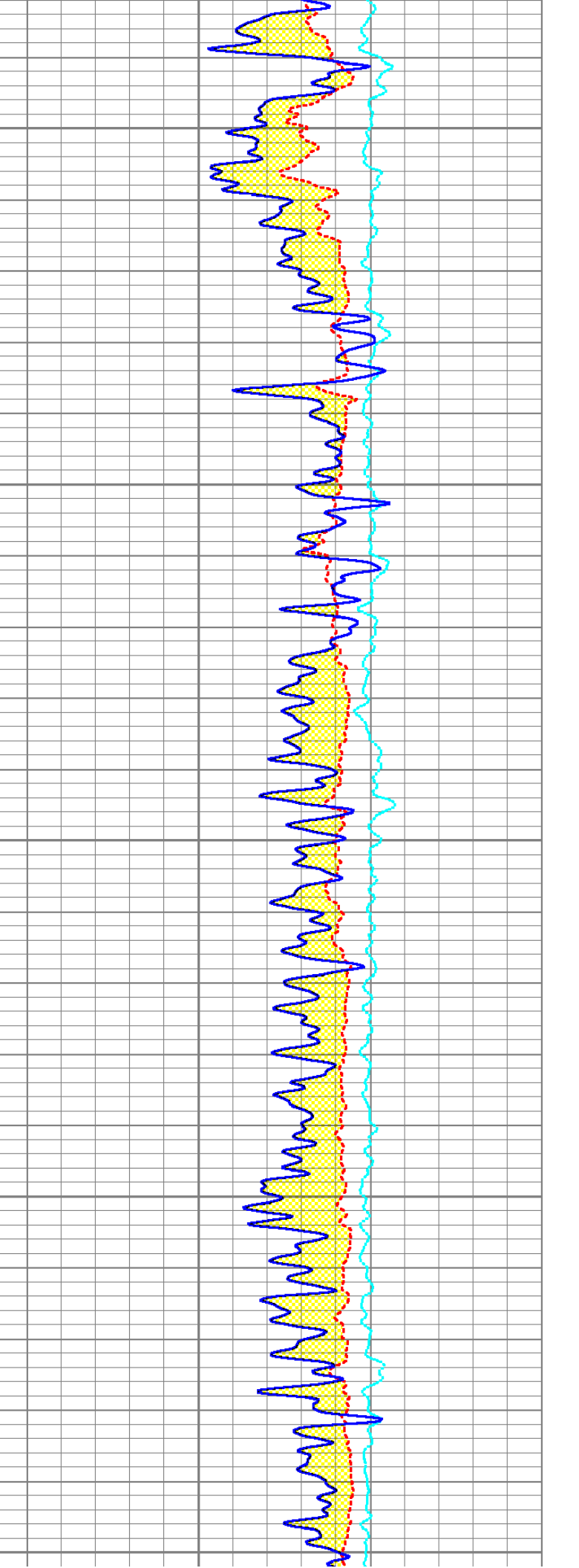
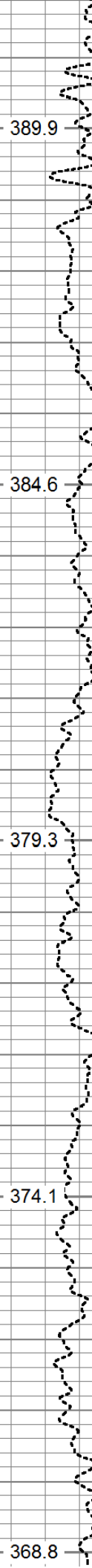
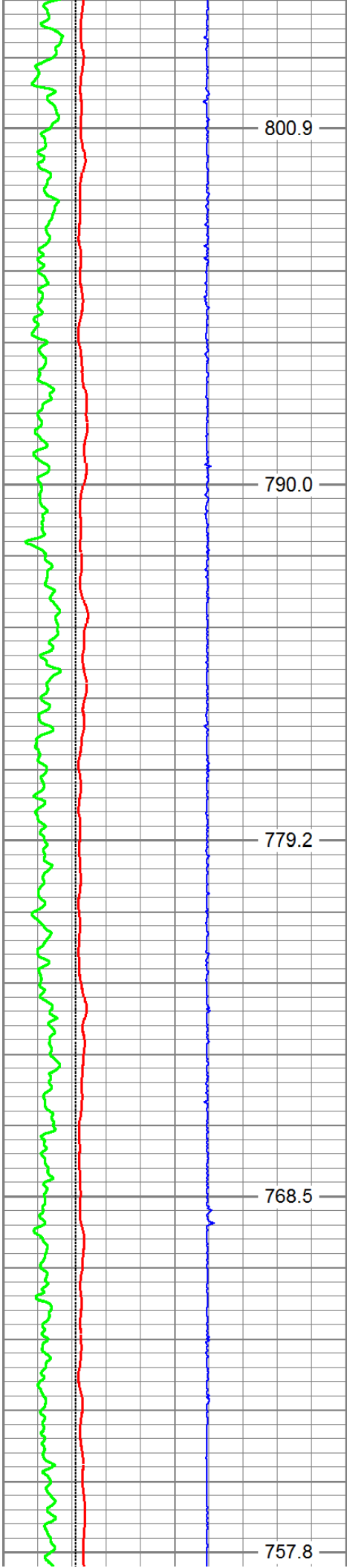
452.0

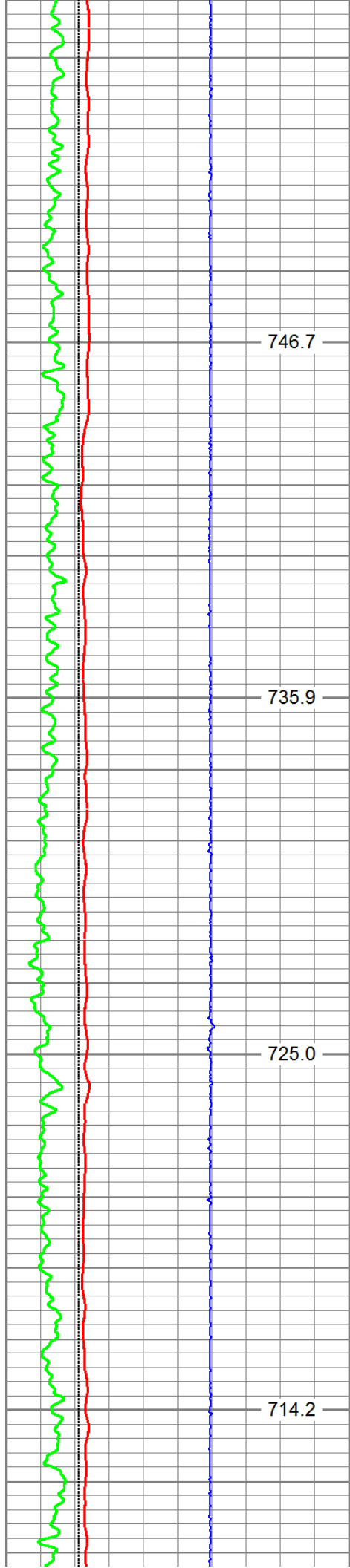
446.7

441.5







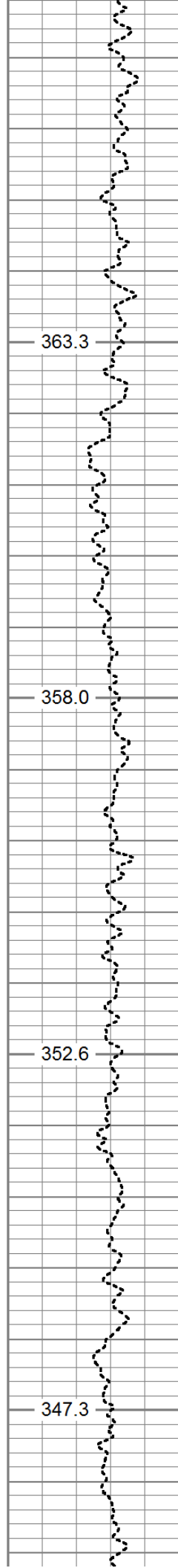


6950

7000

7050

7100

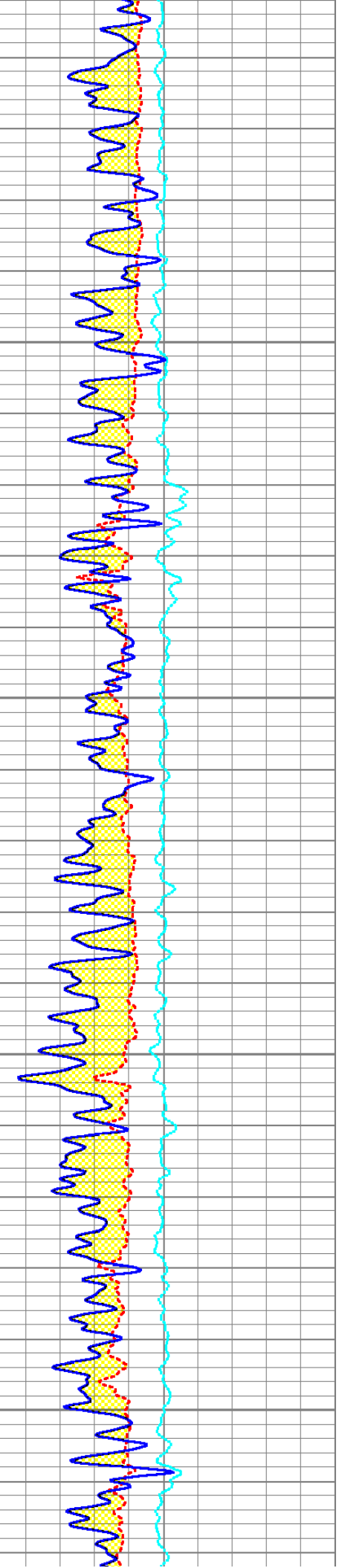


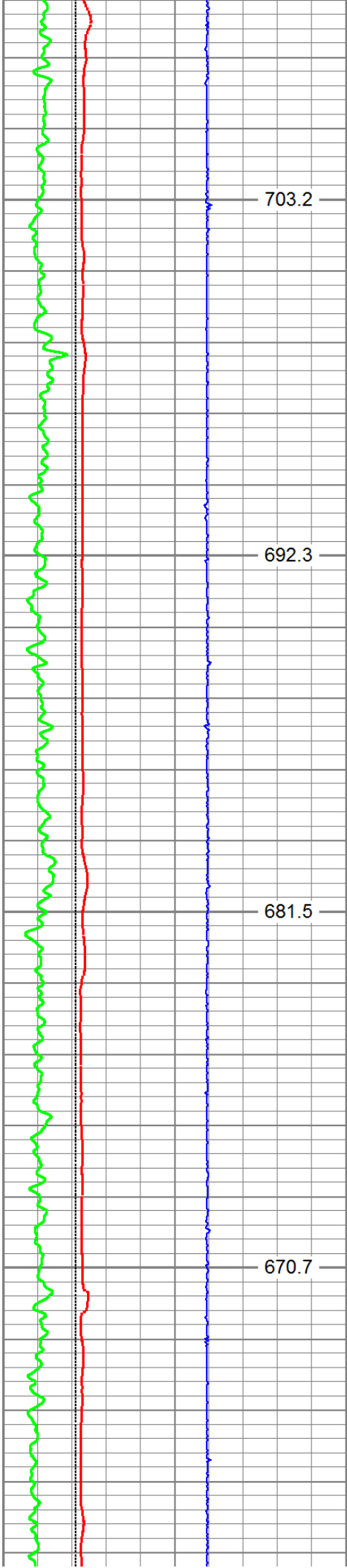
363.3

358.0

352.6

347.3



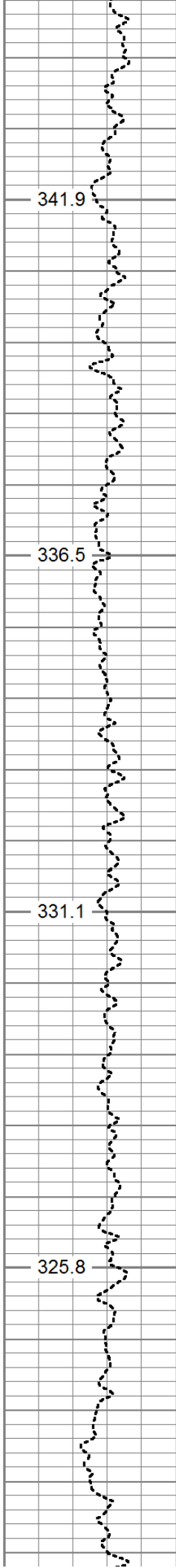


7150

7200

7250

7300

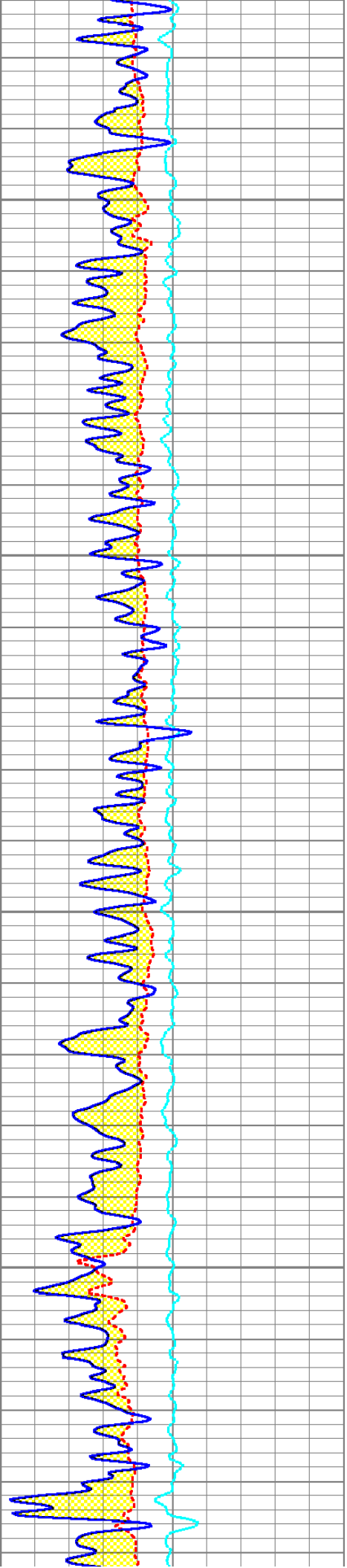


341.9

336.5

331.1

325.8

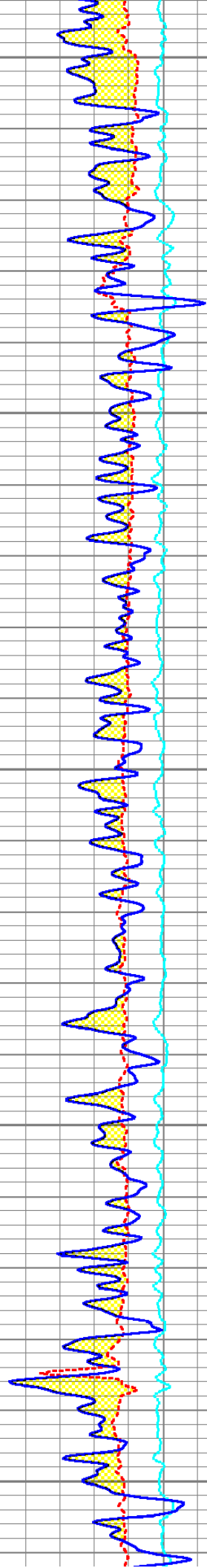
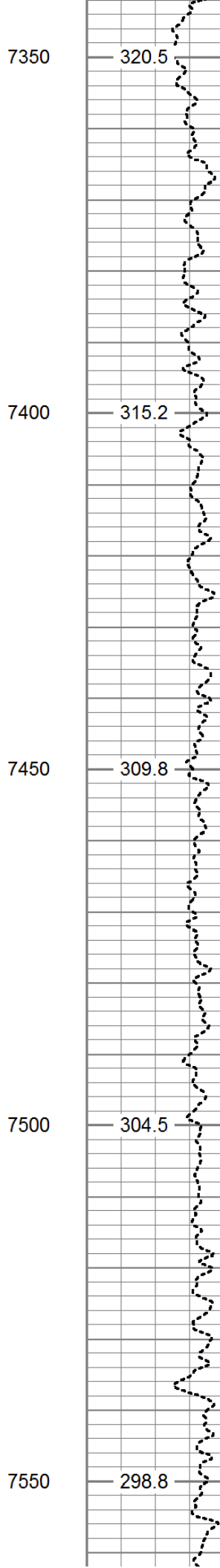
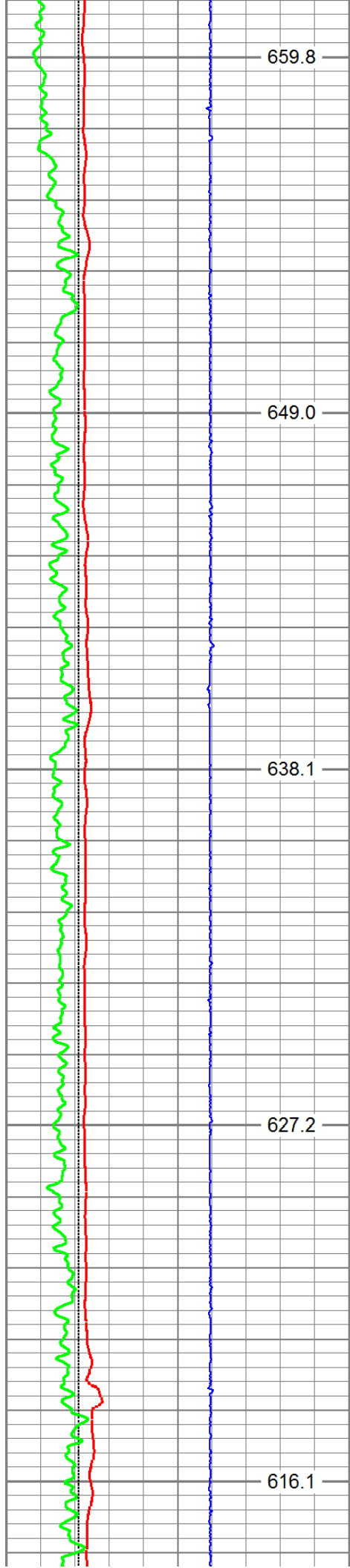


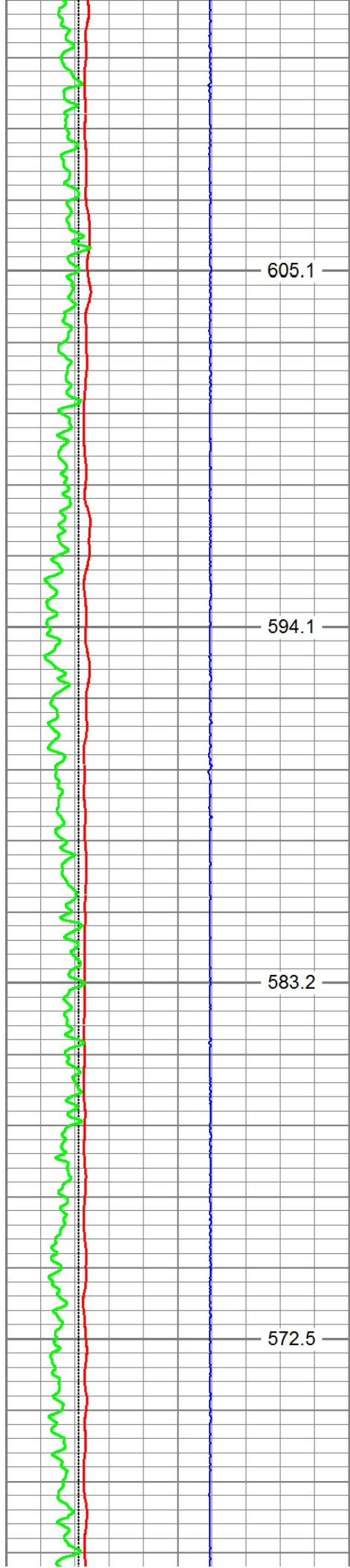
341.9

336.5

331.1

325.8



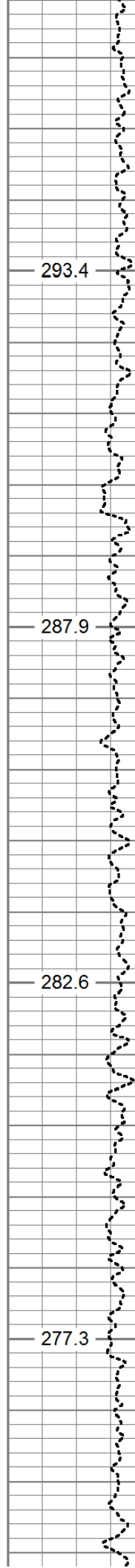


7600

7650

7700

7750

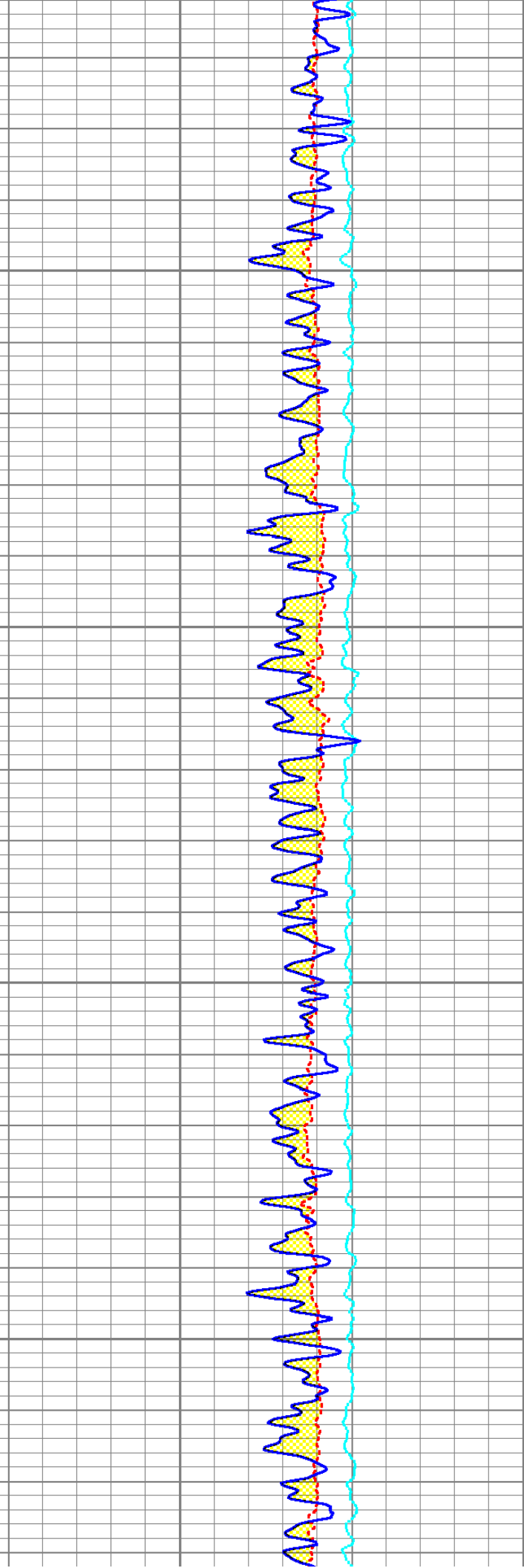


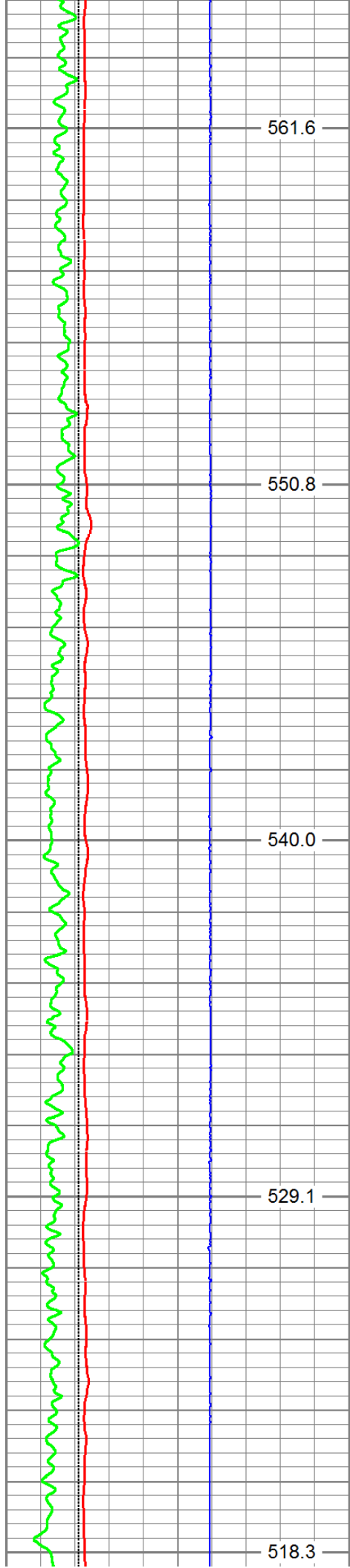
293.4

287.9

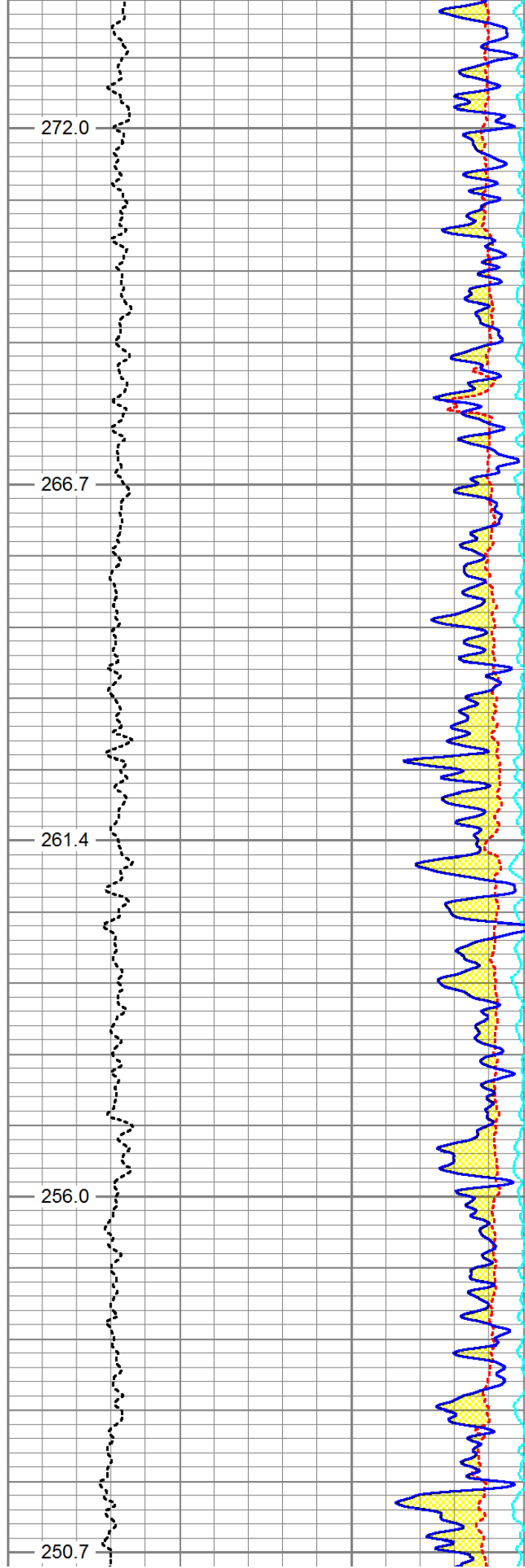
282.6

277.3





7800
7850
7900
7950
8000



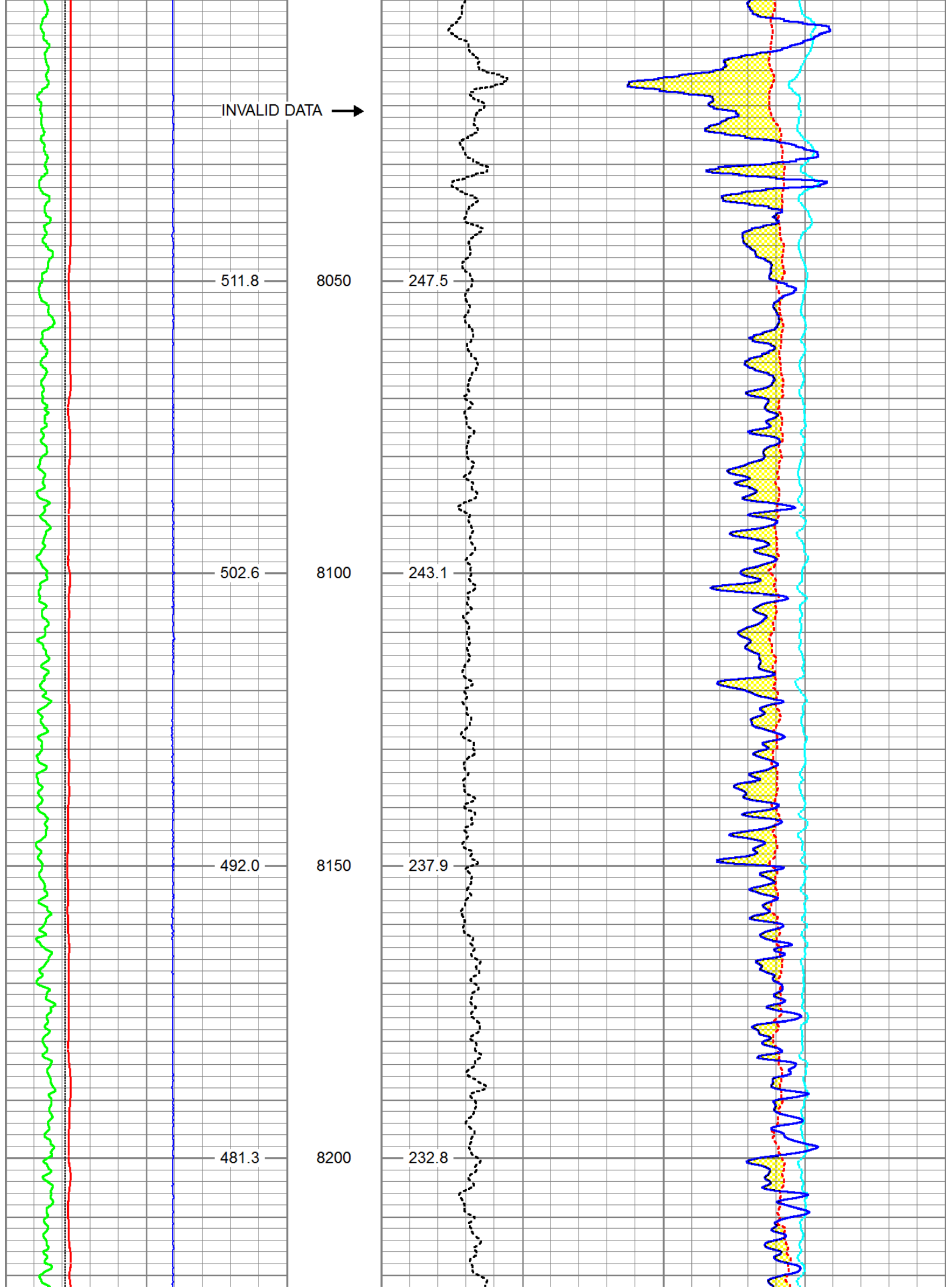
INVALID DATA →

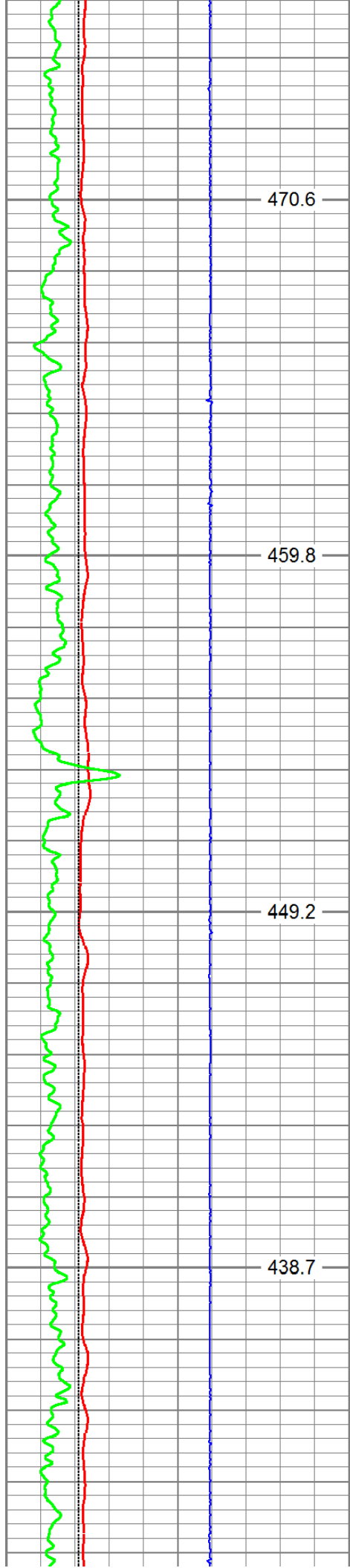
511.8 8050 247.5

502.6 8100 243.1

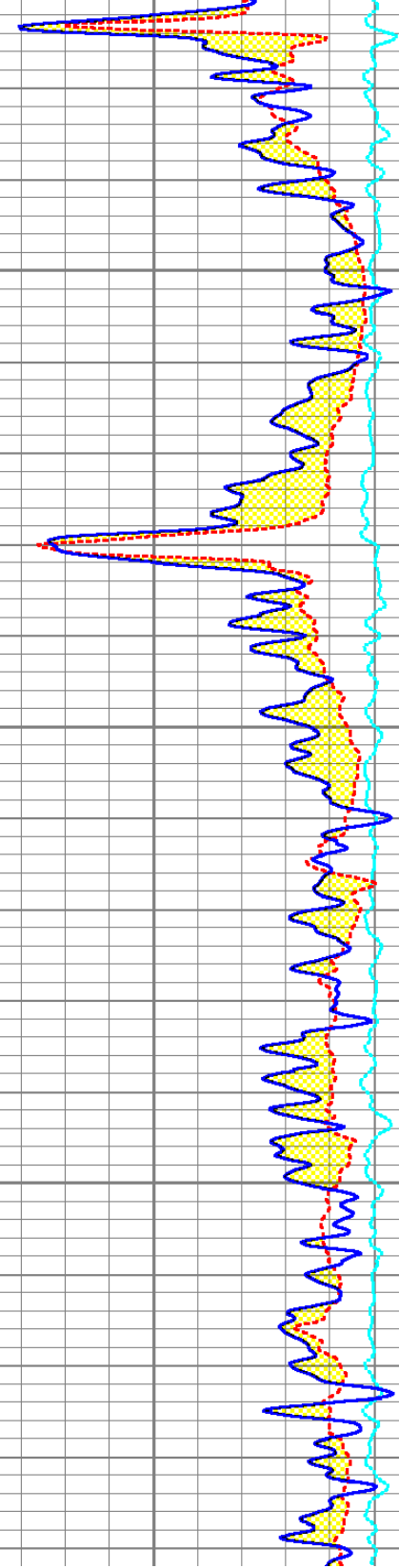
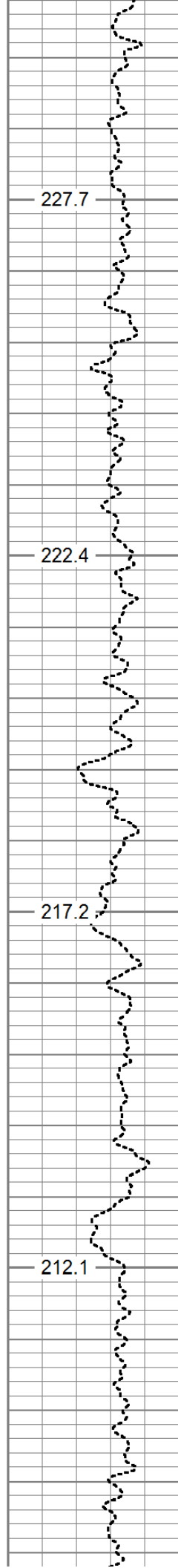
492.0 8150 237.9

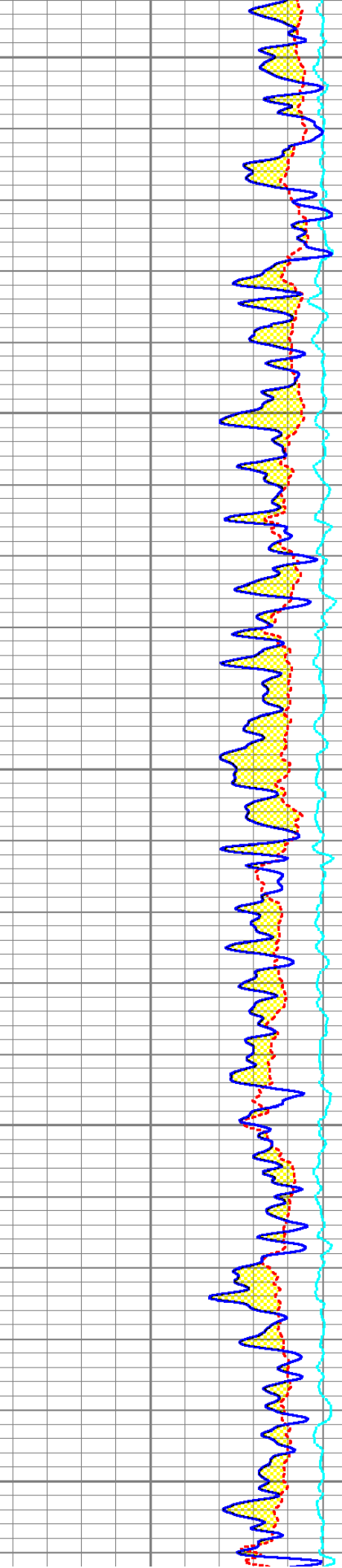
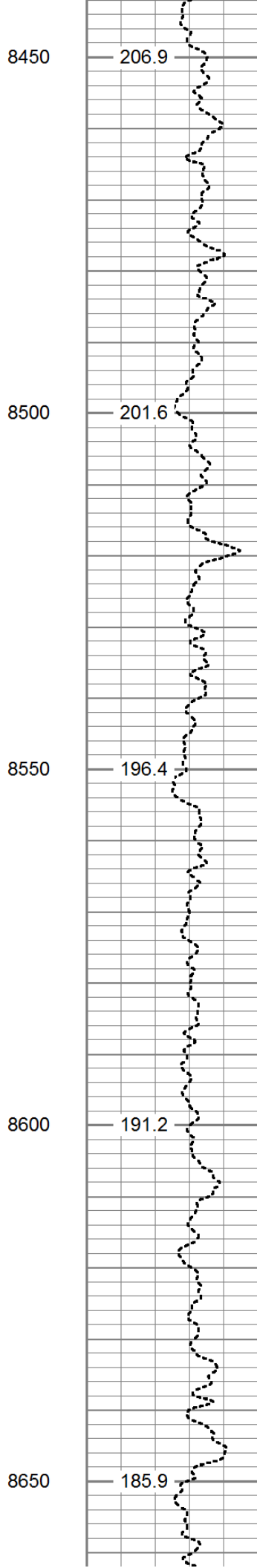
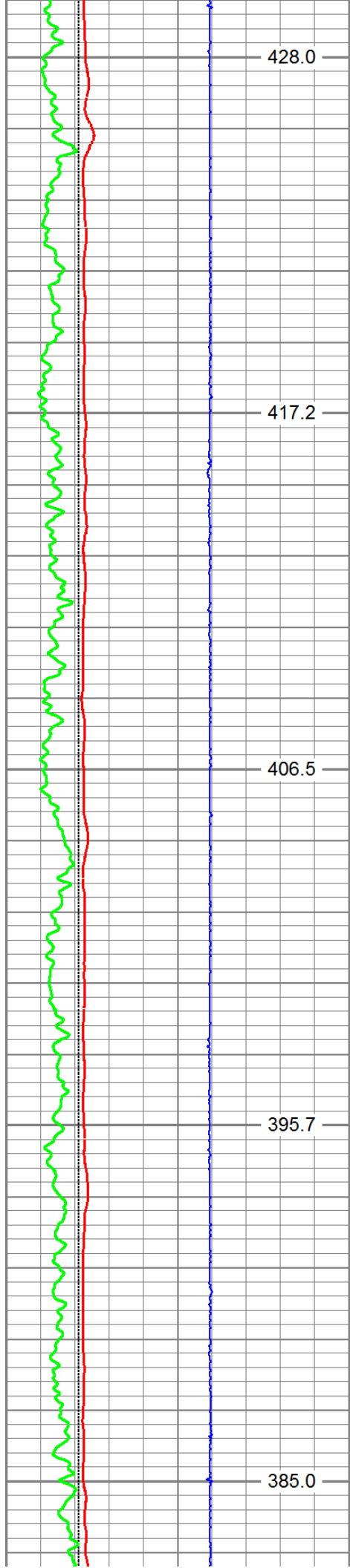
481.3 8200 232.8

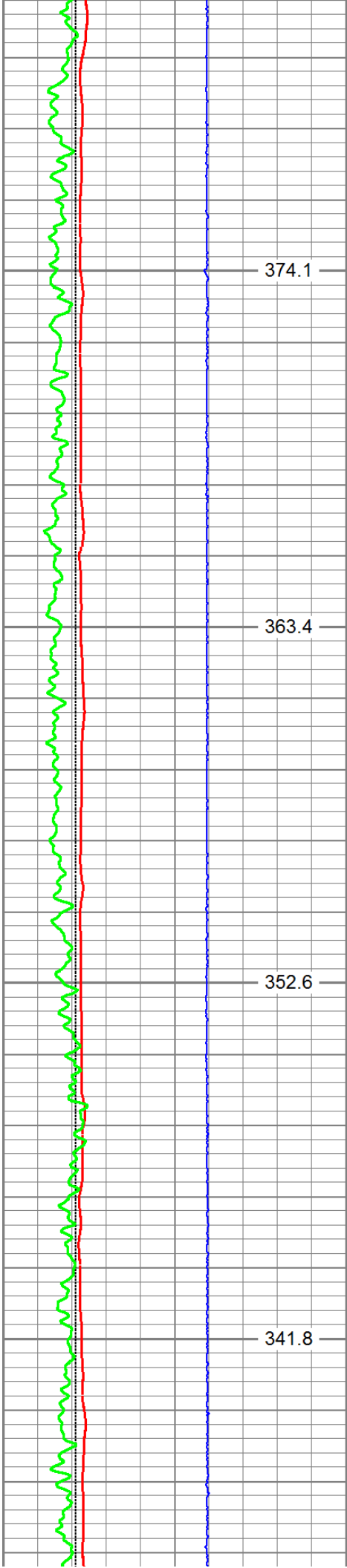




8250
8300
8350
8400





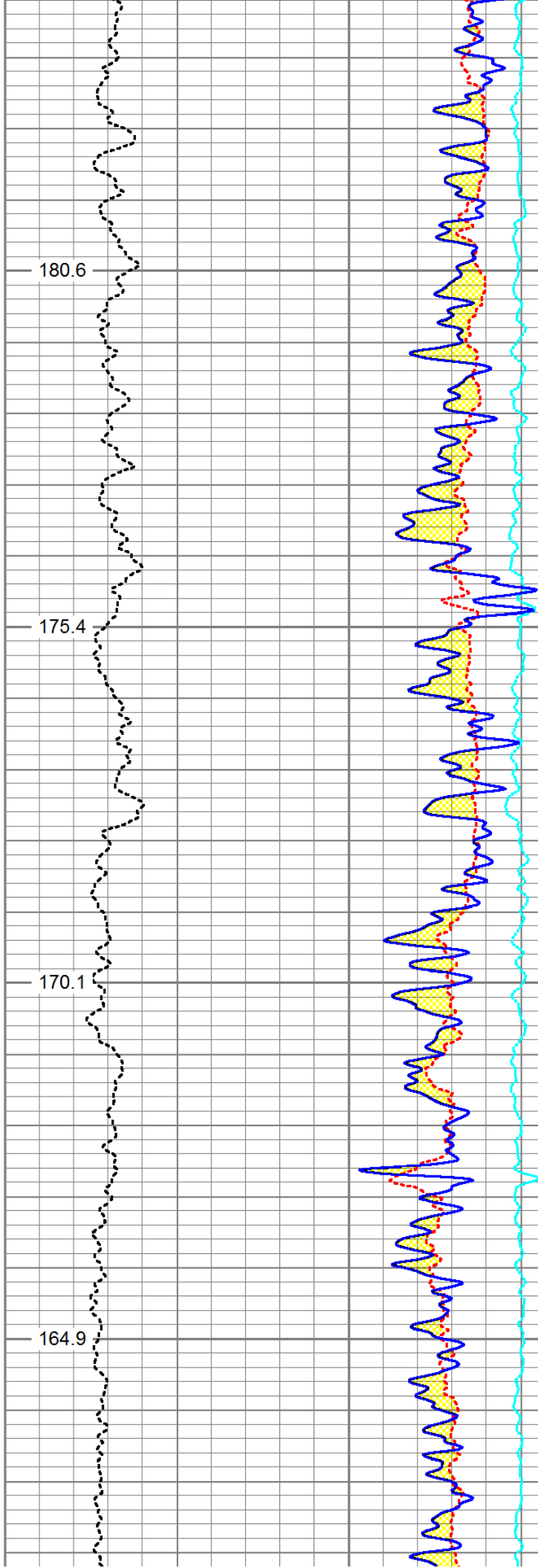


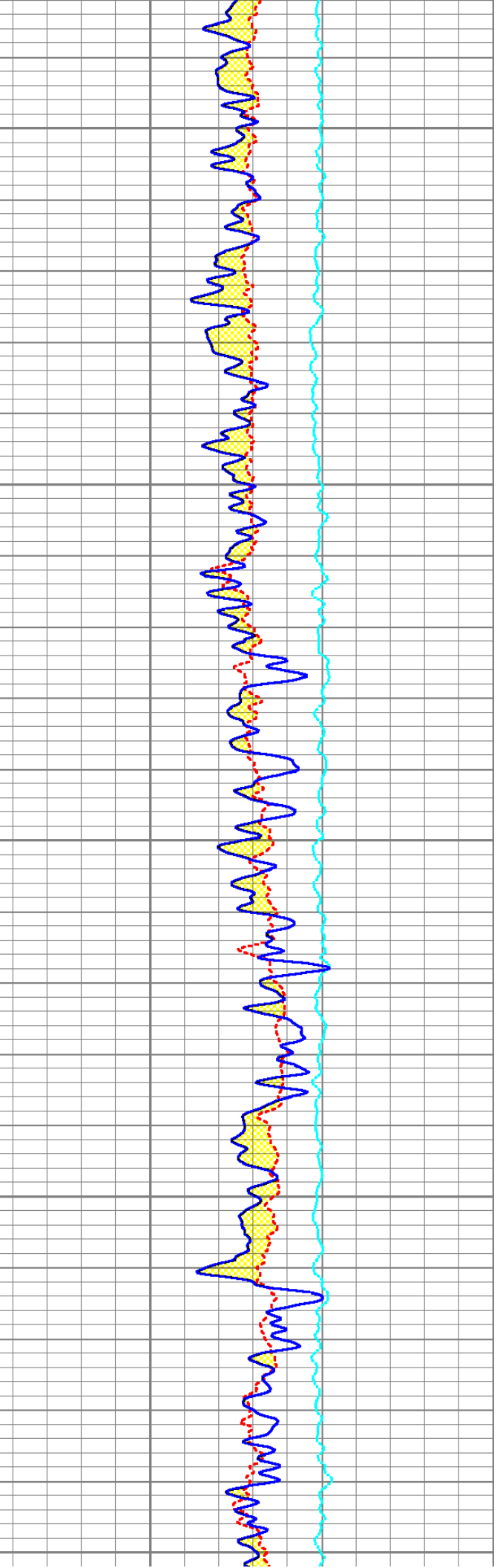
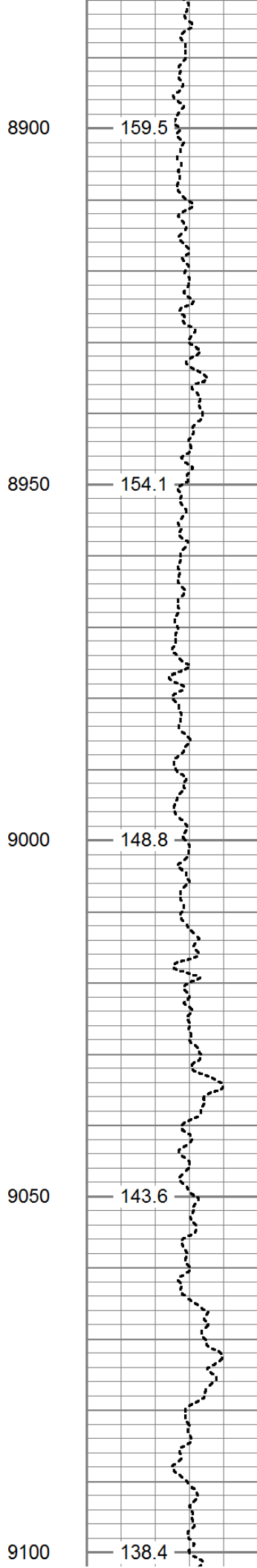
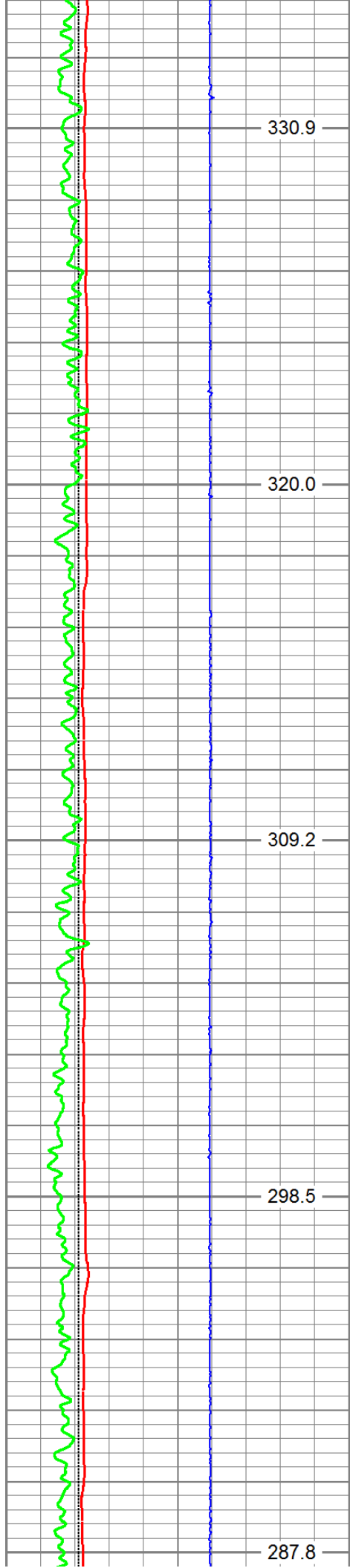
8700

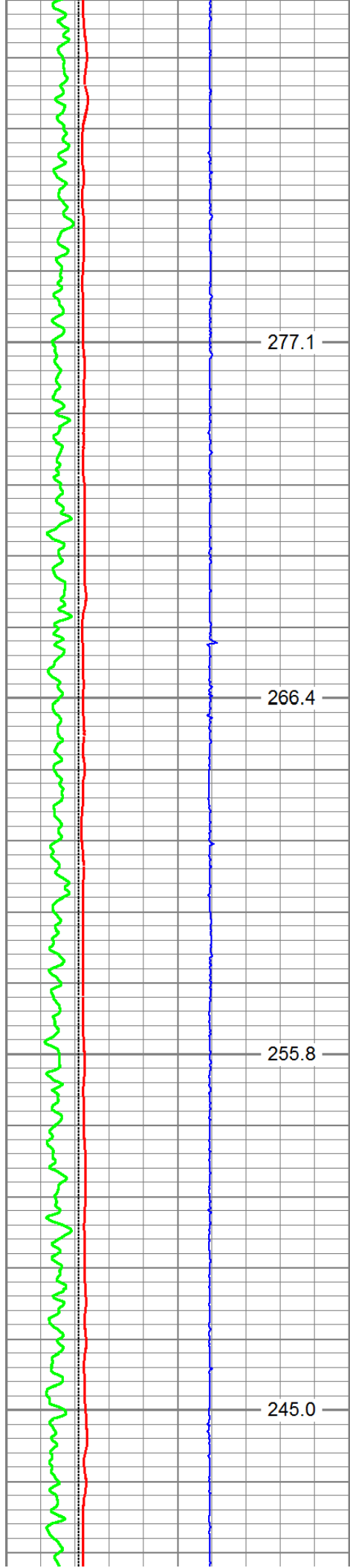
8750

8800

8850





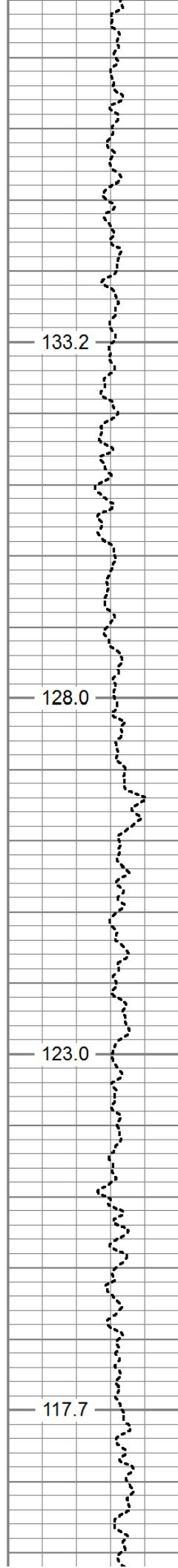


9150

9200

9250

9300

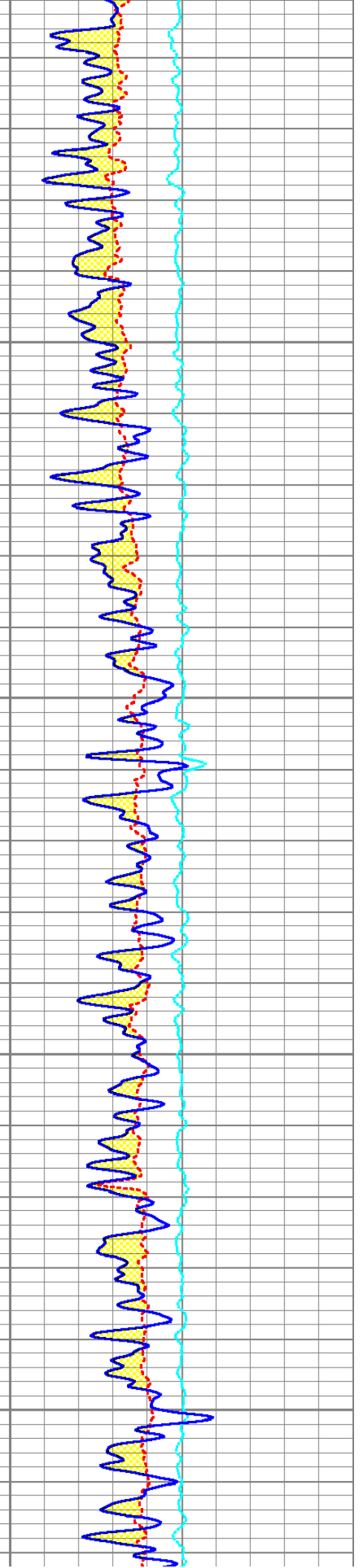


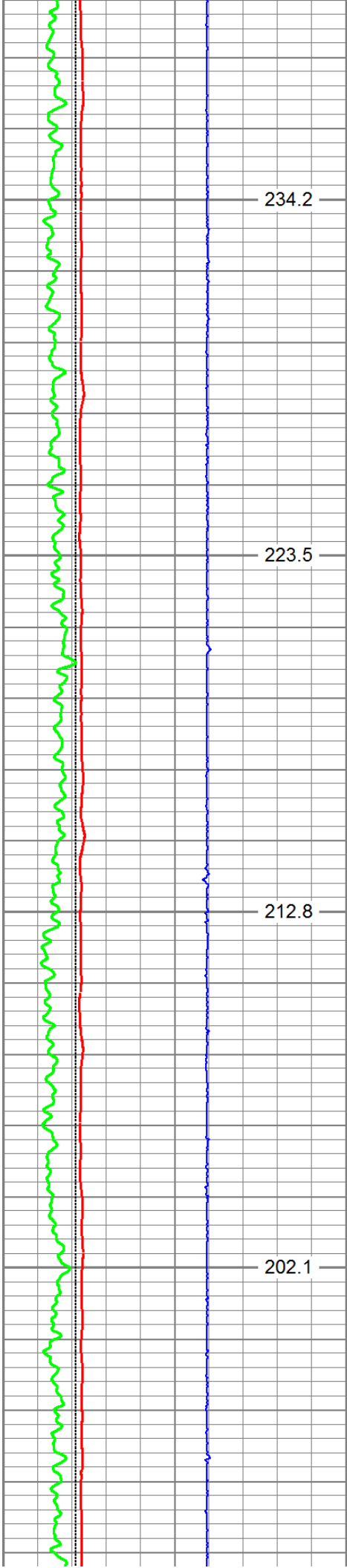
133.2

128.0

123.0

117.7





9350

234.2

9400

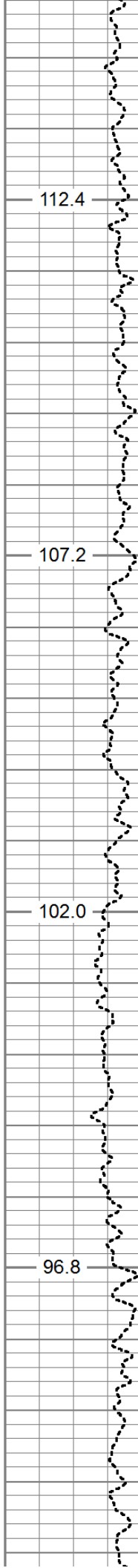
223.5

9450

212.8

9500

202.1

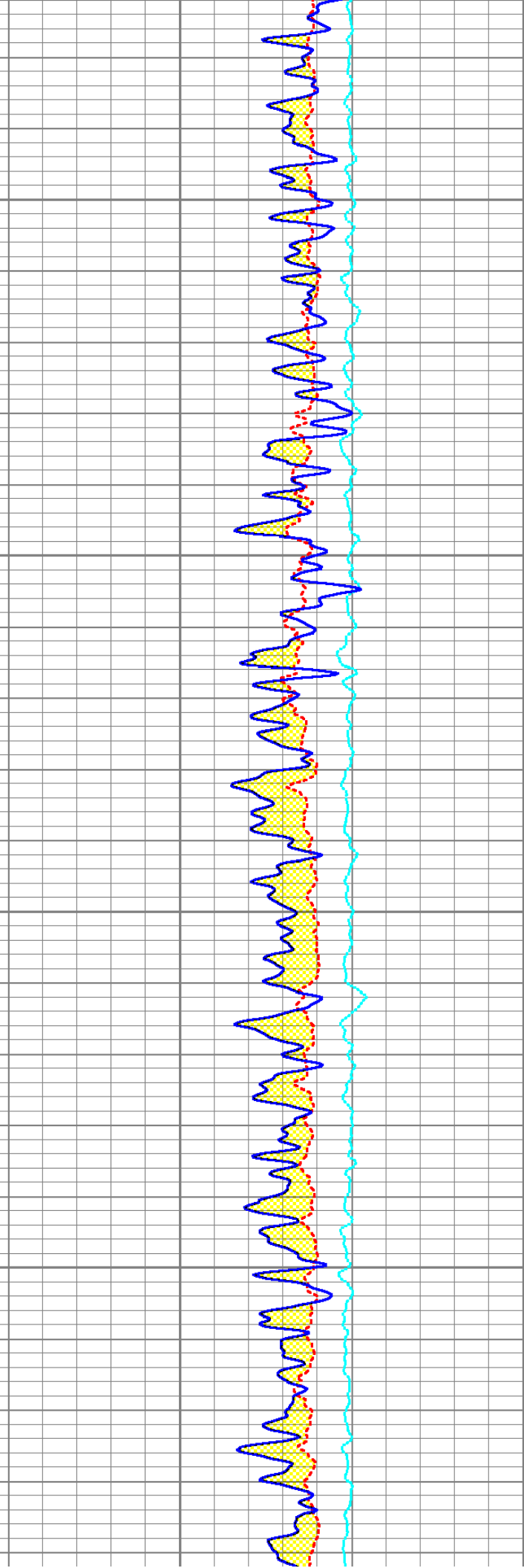


112.4

107.2

102.0

96.8

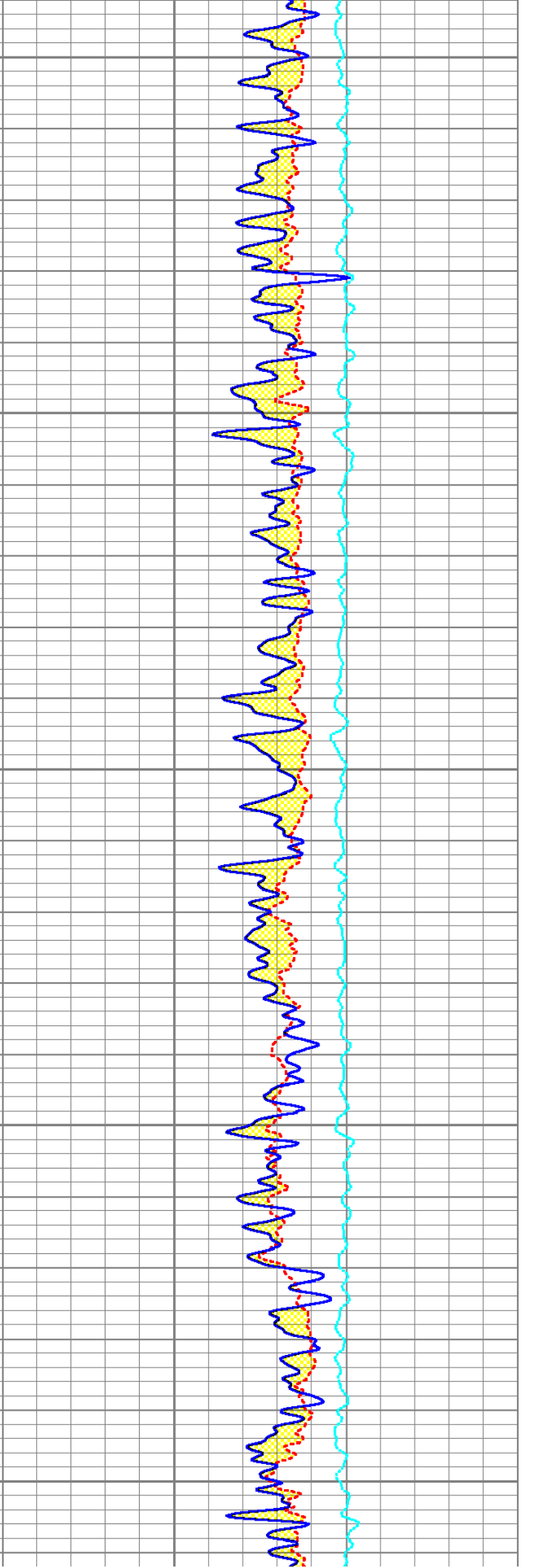
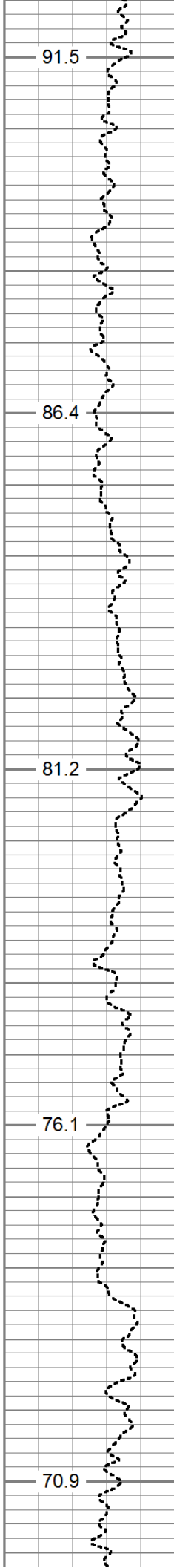
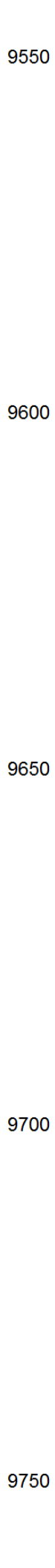
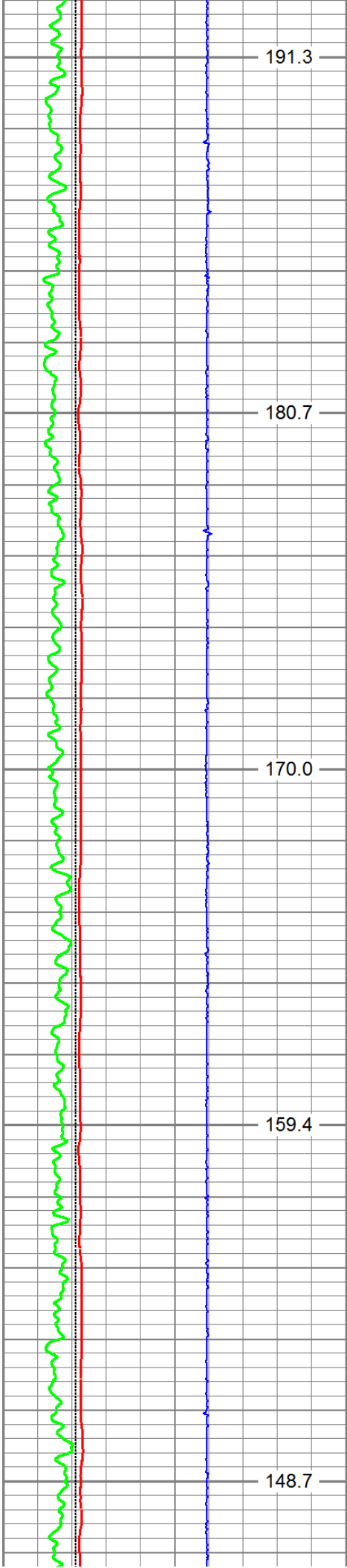


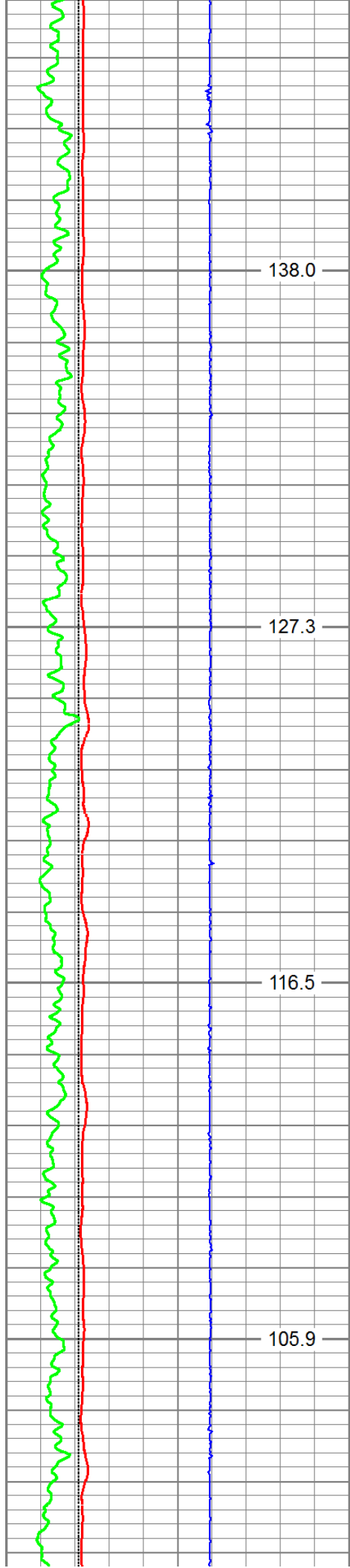
112.4

107.2

102.0

96.8



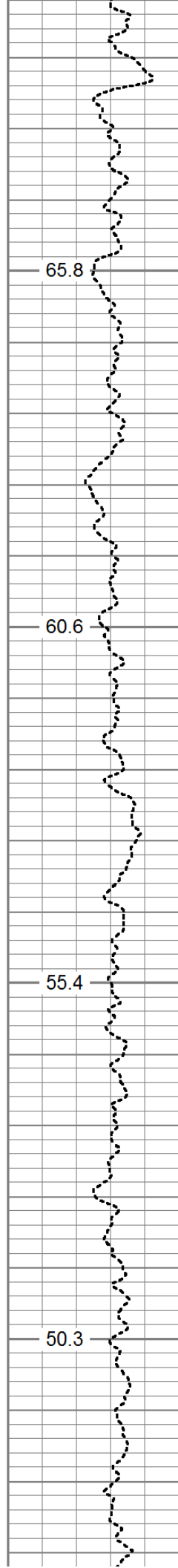


9800

9850

9900

9950

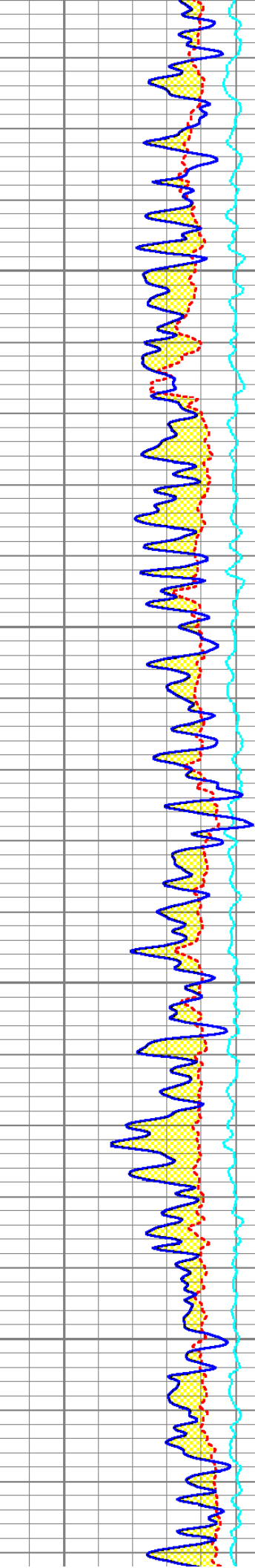


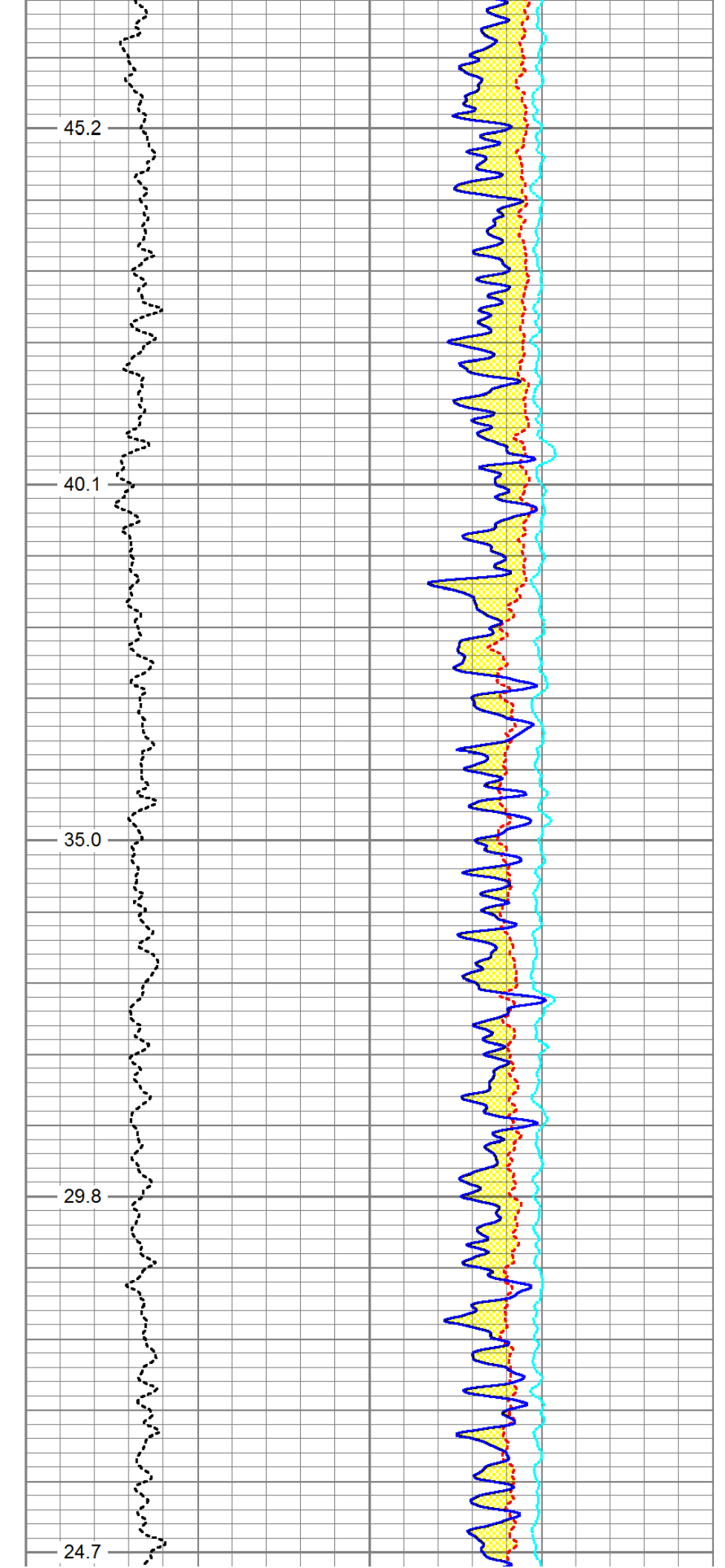
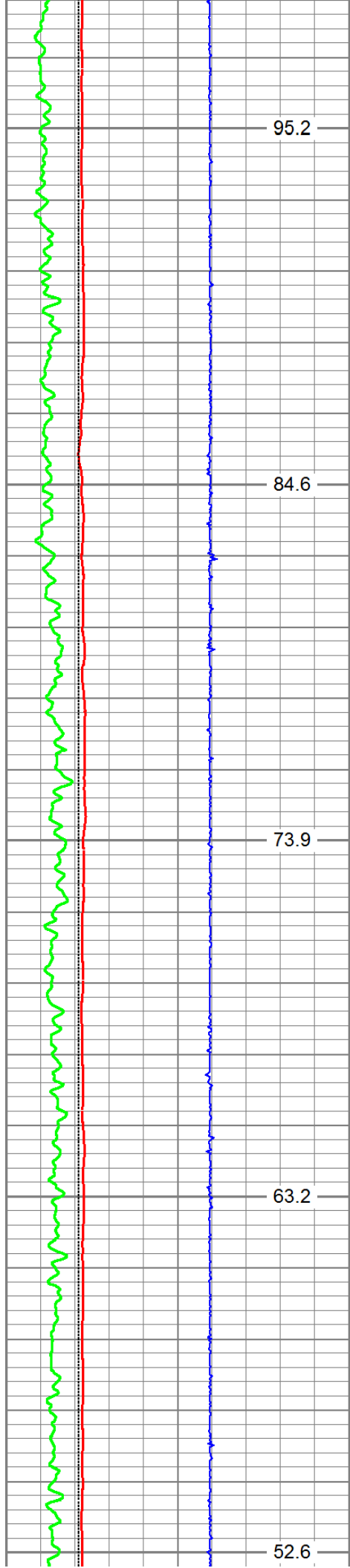
65.8

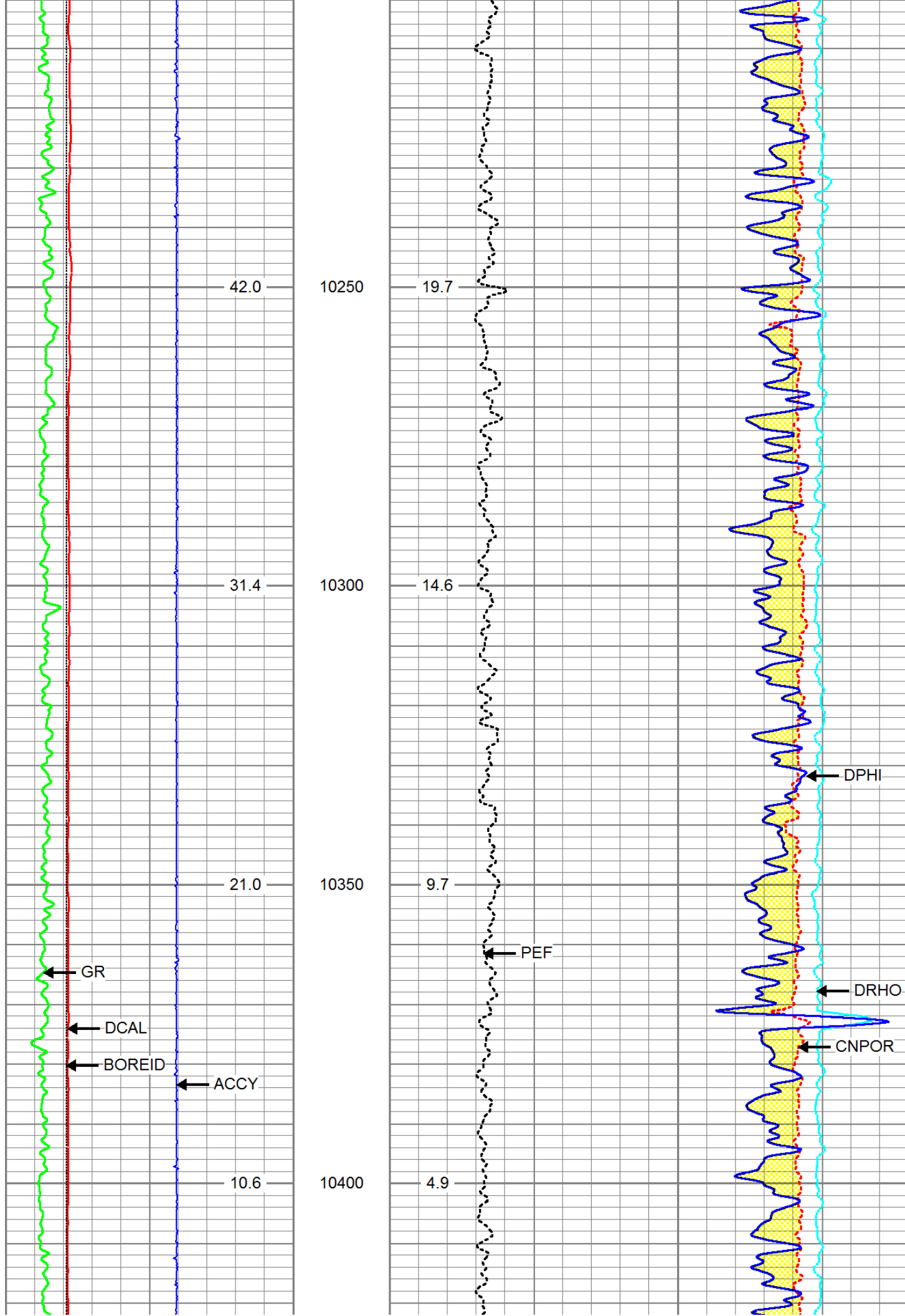
60.6

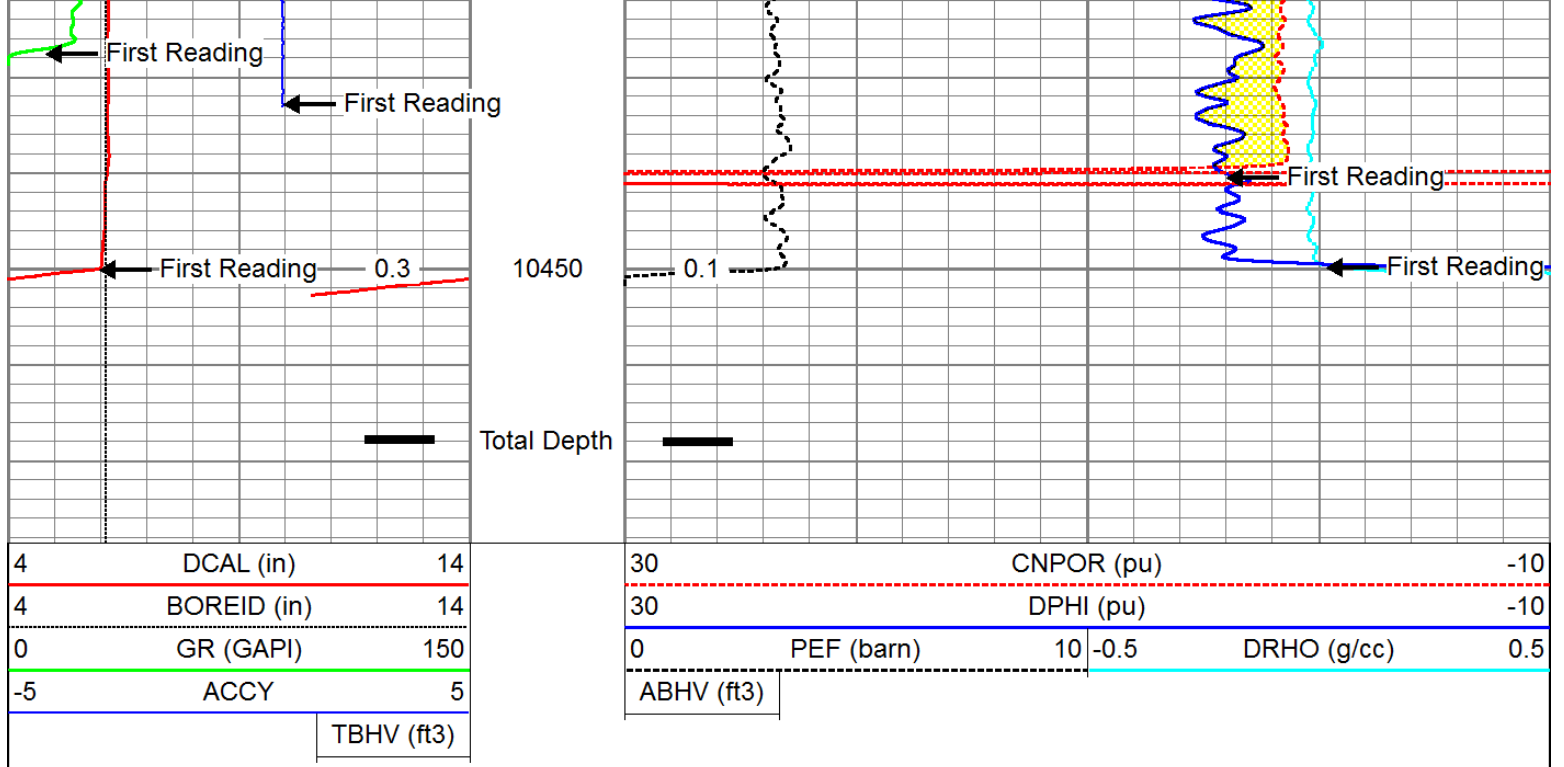
55.4

50.3









Log Variables

Database: C:\Warrior\Data\ann_mem.db
Dataset: field/well/proc5/pass1.2

Top - Bottom

A	BHCOR	BHFL_TYPE	BHFLRES Ohm-m	BHFLRESSRC	BHIDSRC	BOREID in
1	On	WBM	1	MUDCELL	CURVE	6.125
BOTTEMP degF	CASED?	CASEOD in	CASETHCK in	CEMWATERSA kppm	CMNTTHCK in	DNBHC?
129	No	4.5	0	0	0	NO
DPORSEL	FLUIDDEN g/cc	FRMSALIN kppm	LATNOR	M	MATRXDEN g/cc	MUDSALIN kppm
RHOB	1	0	Off	2	2.71	7
MudWgt lb/gal	NPORSEL	PEBHC?	PERFS	RESTMPSRC	SO in	SRFTEMP degF
9.3	Limestone	YES	0	INTERNAL	0.5	65
SZCOR	TDEPTH ft	TMPCOR	TOOLPOS			
On	10633	On	Ec-centered			

Calibration Report

Database File: ann_mem.db
Dataset Pathname: proc5/pass1.2
Dataset Creation: Wed Nov 27 11:55:16 2013

ThruBit Induction Calibration Report

Tool Model-Serial Number: PS-PS15R
Shop Calibration Performed: Tue Sep 24 08:36:59 2013

BASELINE

	R	Expected	X	Expected
Freq 1				
A1	-446.0340	[-500.00, -400.00]	156.3040	[-500.00, 500.00]
A2	-152.0180	[-180.00, -100.00]	16.5327	[-500.00, 500.00]
A3	-35.7402	[-50.00, -10.00]	-141.3930	[-500.00, 500.00]
A4	-15.8976	[-30.00, -10.00]	209.5470	[-500.00, 500.00]
A5	-13.3007	[-30.00, -10.00]	132.7320	[-500.00, 500.00]
Freq 2				
A1	-231.8750	[-280.00, -180.00]	68.0321	[-500.00, 500.00]
A2	-97.8308	[-130.00, -50.00]	-19.0236	[-500.00, 500.00]
A3	-25.2110	[-50.00, -10.00]	-146.3820	[-500.00, 500.00]
A4	-19.1524	[-30.00, -10.00]	53.1096	[-500.00, 500.00]
A5	-18.1899	[-30.00, -10.00]	-6.1345	[-500.00, 500.00]
Freq 3				
A1	-145.5070	[-180.00, -80.00]	-20.2509	[-500.00, 500.00]
A2	-72.8319	[-130.00, -30.00]	-57.3178	[-500.00, 500.00]
A3	-19.6761	[-50.00, -10.00]	-168.2330	[-500.00, 500.00]
A4	-19.9772	[-30.00, -10.00]	-52.1516	[-500.00, 500.00]
A5	-20.0964	[-30.00, -10.00]	-106.2330	[-500.00, 500.00]
Freq 4				
A1	-77.7044	[-120.00, -40.00]	-172.1640	[-500.00, 500.00]
A2	-51.8524	[-110.00, -10.00]	-125.2290	[-500.00, 500.00]
A3	-15.1353	[-50.00, -10.00]	-222.2020	[-500.00, 500.00]
A4	-22.7003	[-30.00, -10.00]	-209.4270	[-500.00, 500.00]
A5	-24.8546	[-30.00, -10.00]	-272.1340	[-500.00, 500.00]

CALIBRATION COEFFICIENTS

	R	Expected	X	Expected
Freq 1				
A1	0.9910	[0.95, 1.05]	0.0027	[-0.05, 0.05]
A2	0.9893	[0.95, 1.05]	0.0026	[-0.05, 0.05]
A3	0.9969	[0.95, 1.05]	-0.0044	[-0.05, 0.05]
A4	0.9865	[0.95, 1.05]	0.0044	[-0.05, 0.05]
A5	0.9908	[0.95, 1.05]	0.0039	[-0.05, 0.05]
Freq 2				
A1	0.9854	[0.95, 1.05]	-0.0073	[-0.05, 0.05]
A2	0.9833	[0.95, 1.05]	-0.0071	[-0.05, 0.05]
A3	0.9853	[0.95, 1.05]	-0.0068	[-0.05, 0.05]
A4	0.9804	[0.95, 1.05]	-0.0053	[-0.05, 0.05]
A5	0.9881	[0.95, 1.05]	-0.0049	[-0.05, 0.05]
Freq 3				
A1	0.9918	[0.95, 1.05]	-0.0076	[-0.05, 0.05]
A2	0.9899	[0.95, 1.05]	-0.0072	[-0.05, 0.05]
A3	0.9918	[0.95, 1.05]	-0.0075	[-0.05, 0.05]
A4	0.9836	[0.95, 1.05]	-0.0054	[-0.05, 0.05]
A5	0.9957	[0.95, 1.05]	-0.0040	[-0.05, 0.05]
Freq 4				
A1	0.9866	[0.95, 1.05]	-0.0110	[-0.05, 0.05]
A2	0.9856	[0.95, 1.05]	-0.0101	[-0.05, 0.05]
A3	0.9895	[0.95, 1.05]	-0.0119	[-0.05, 0.05]
A4	0.9745	[0.95, 1.05]	-0.0083	[-0.05, 0.05]
A5	1.0034	[0.95, 1.05]	-0.0075	[-0.05, 0.05]
Temperature	27.7897 degC			

ThruBit Density Calibration Report

Tool Model-Serial Number:

PS-PS43D

Source Number:

Shop Calibration Performed:

Fri Nov 08 10:57:42 2013

REFERENCE

	Density	Units
Aluminium	2.607	g/cc
Magnesium	1.752	g/cc

READINGS

Outputs	Counts	Units	Expected
SS1 Background	135.84	cps	[130.00, 170.00]
LS1 Background	146.41	cps	[130.00, 170.00]
LS4 Background	29.84	cps	[27.00, 35.00]
SS1 Aluminium	4478.32	cps	[4500.00, 5500.00]
LS1 Aluminium	898.25	cps	[750.00, 950.00]
LS4 Aluminium	948.42	cps	[843.00, 1068.00]
SS1 Magnesium	7466.94	cps	[7000.00, 9000.00]
LS1 Magnesium	5867.16	cps	[5250.00, 6250.00]
LS1 Al + Fe	808.16	cps	[650.00, 800.00]
LS4 Al + Fe	454.68	cps	[382.00, 471.00]

RESULTS

SS Slope	1.63	[1.52, 1.77]
LS Slope	0.42	[0.38, 0.45]
PEF K Factor	4.655	[3.510, 6.170]
PEF B Factor	-0.534	[-0.700, -0.410]

Caliper Shop Calibration performed:

Fri Nov 08 10:57:42 2013

RESULTS

Reference	Reading	Units
12.00	1883.87	in
9.00	2044.17	in
6.00	2204.76	in

DENSITY PRE-SURVEY CHECK Performed:

Sat Nov 23 12:42:10 2013

Outputs	Counts	Units	Expected
SS1 Background	137.54	cps	[131.76, 139.91]
LS1 Background	147.19	cps	[142.01, 150.80]
LS4 Background	29.23	cps	[28.05, 31.63]

CALIPER PRE-SURVEY CHECK Performed:

Sat Nov 23 12:39:43 2013

Reference	Readings	Units	Expected
6.00	6.05	in	[5.80, 6.20]

Compensated Neutron Calibration Report

Tool Model-Serial Number:

PS-PS29N

Source Number:

Calibration Tank Temperature:
Shop Calibration Performed:

60.0 degF
Fri Nov 08 09:52:11 2013

BACKGROUND MEASUREMENT

Outputs	Measured	Units	Expected
SS Counts	0.0	cps	<10
LS Counts	0.1	cps	<4

WATER TANK REFERENCE

Outputs	Measured	Units	Expected
SS Counts	2314.2	cps	
LS Counts	79.4	cps	
Tank Ratio Ref	30.9580	SS/LS	
Tank Ratio	29.1513	SS/LS	
Tank Ratio Gain	1.0620		[0.85, 1.15]

ALUMINUM SLEEVE REFERENCE

Outputs	Measured	Units	Expected
SS Counts	27460.9	cps	
LS Counts	2600.3	cps	
Al Ratio Ref	10.797	SS/LS	
Al Ratio	11.215	SS/LS	
Al Ratio Gain	0.96		[0.90, 1.10]
Sleeve Porosity	14.46	pu	

PRE-SURVEY BACKGROUND CHECK Performed:

Sat Nov 23 12:47:09 2013

Outputs	Measured	Units	Expected
SS Counts	0.0	cps	<10
LS Counts	0.1	cps	<4

Gamma Ray Calibration Report

Tool Model-Serial Number:	PS-PS24T	
Performed:	Fri Nov 08 12:35:25 2013	
Calibrator Value:	162.7	GAPI
Background Reading:	65.6	cps
Calibrator Reading:	462.9	cps
Sensitivity:	0.3750	GAPI/cps

Inclinometer Calibration Report

Performed:	Sun Jun 13 14:33:21 1993
------------	--------------------------

	Low Read.	High Read.	Low Ref.	High Ref.	
X Accelerometer	0.00	1.00	0.00	1.00	gee
Y Accelerometer	0.00	1.00	0.00	1.00	gee
Z Accelerometer	0.00	1.00	0.00	1.00	gee

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
ThruBit	67.59		Cablehead-S Solid Weakpoint	2.31	2.13	5.00
ThruBit	65.28		PSBDOT	3.87	2.25	35.00
ThruBit	61.41		HangOff_Tool	5.00	2.38	60.00
ThruBit	56.41		Swivel	2.25	2.06	25.00
ThruBit	54.16		10-1	0.75	2.13	3.95
TBBAT	53.41		TBBAT-A (PS30B) ThruBit Battery	6.13	2.13	38.20
TBBAT2	47.29		TBBAT2-A (PS29B) ThruBit Battery	6.13	2.13	40.00
TMG	41.16		TMG-PS (PS24T) ThruBit Telemetry Gamma Ray	6.13	2.13	45.00
GR	41.04					
GRTEMP	40.20					
ThruBit	35.04		Decentralizer Decentralizer (Small)	4.50	2.13	70.00
CNLSC	28.60		TBN-PS (PS29N) ThruBit Neutron	4.77	2.13	63.00
			TBD-PS (PS43D) ThruBit Density	10.48	2.13	91.00
LSW1	18.04		TBI-PS (PS15R) ThruBit Induction	15.29	2.13	94.00
DCAL	17.13					
A1_P	10.60					
A2_P	10.10					
A3_P	9.35					
A4_P	8.35					
A5_P	6.60					

Dataset:	ann_mem.db: field/well/proc5/pass1.2
Total Length:	67.59 ft
Total Weight:	570.15 lb
O.D.	2.38 in



ThruBit

A Schlumberger Company

Company	SANDRIDGE ENERGY
Well	ANN 3404 2-21H
Field	BLUFF
County	SUMNER
State	KANSAS