

HALLIBURTON

ARRAY COMPENSATED
TRUE RESISTIVITY
LOG

COMPANY		HERMAN L. LOEB, LLC.	
WELL		HEFT #4-5	
FIELD/BLOCK		EINSEL	
COUNTY		KIOWA	
STATE		KANSAS	
Permanent Datum		G.L.	
Log measured from		KB	
Drilling measured from		KB	
Date		06-Apr-14	
Run No.		ONE	
Depth - Driller		4875.00 ft	
Depth - Logger		4872.0 ft	
Bottom - Logged Interval		4861	
Top - Logged Interval		622	
Casing - Driller		8.625 in @ 622.0 ft	
Casing - Logger		622.0 ft	
Bit Size		7.875 in @	
Type Fluid in Hole		Water Based Mud	
Density		9.4 ppg 63.00 s/qt	
PH		11.00 pH 8.8 cp/m	
Source of Sample		MUD PIT	
Rm @ Meas. Temperature		0.515 ohmm @ 72.00 degF	
Rmf @ Meas. Temperature		0.44 ohmm @ 72.00 degF	
Rmc @ Meas. Temperature		0.590 ohmm @ 72.00 degF	
Source Rmf		CALCULATED	
Rm @ BHT		0.34 ohmm @ 111.0 degF	
Time Since Circulation		7.0000 hr	
Time on Bottom		06-Apr-14 22:08	
Max. Rec. Temperature		111.0 degF @ 4872.0 ft	
Equipment		11230668 LIBERAL	
Recorded By		SHELDON INGERSOLL	
Witnessed By		J. CHRISTENSEN	

COMPANY	HERMAN L. LOEB, LLC.
WELL	HEFT #4-5
FIELD/BLOCK	EINSEL
COUNTY	KIOWA
STATE	KANSAS
API No.	15-097-21790-00-00
Location	(SHL) 660' FNL & 1925' FEL W2-E2-NW-NE
Sect.	5
Twp.	28S
Rge.	18W
Other Services:	DSN / SDL MICROLOG ACRT MRIL

Fold here

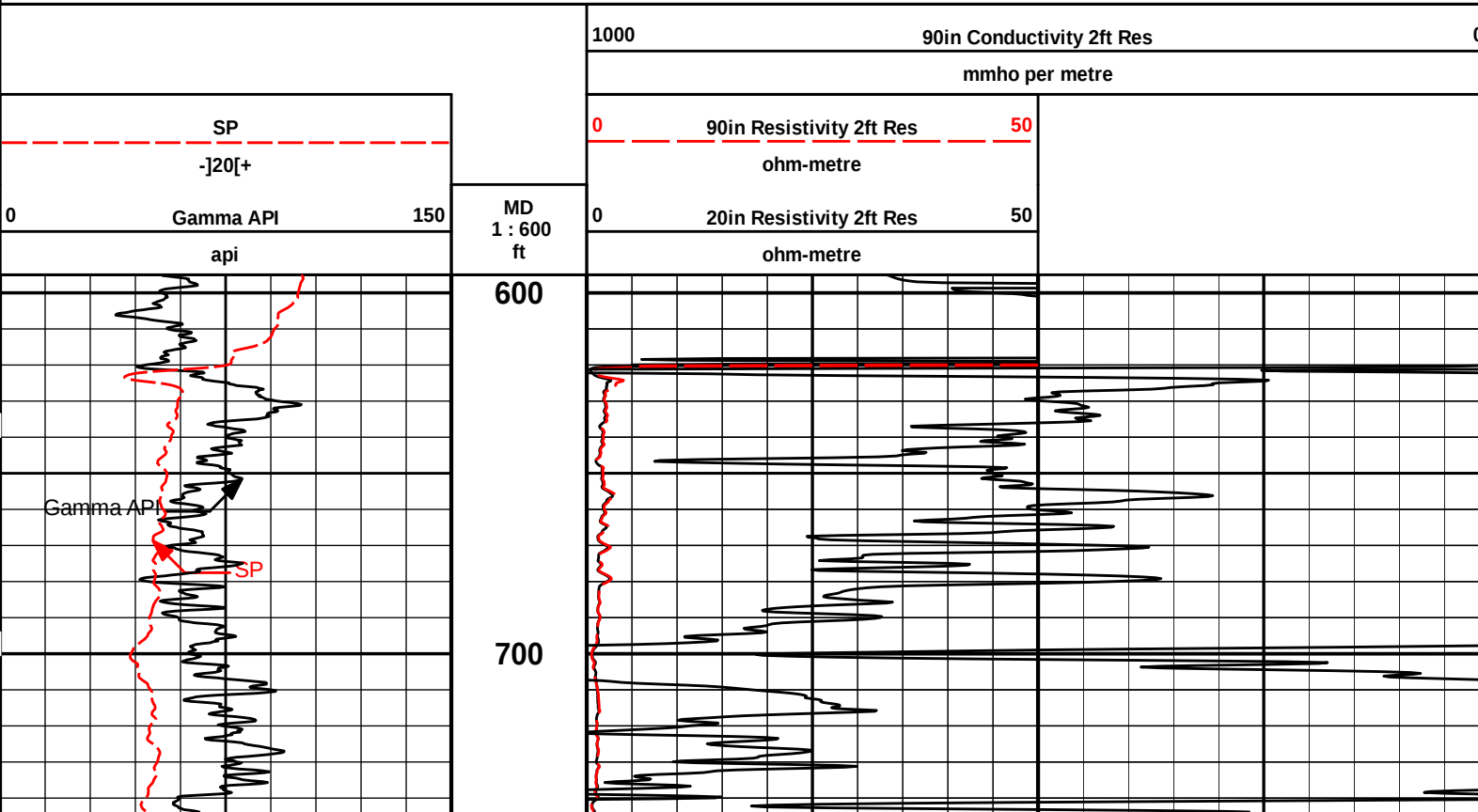
Service Ticket No.: 901250639				API Serial No.: 15-097-21790-00-00				PGM Version: WL INSITE R4.2.0 (Build 2)							
CHANGE IN MUD TYPE OR ADDITIONAL SAMPLE						RESISTIVITY SCALE CHANGES									
Date		Sample No.				Type Log		Depth		Scale Up Hole		Scale Down Hole			
Depth-Driller															
Type Fluid in Hole															
Density		Viscosity													
Ph		Fluid Loss													
Source of Sample						RESISTIVITY EQUIPMENT DATA									
Rm @ Meas. Temp		@		@		Run No.		Tool Type & No.		Pad Type		Tool Pos.		Other	
Rmf @ Meas. Temp.		@		@		ONE		ACRT		N/A		1.5" S.O.			
Rmc @ Meas. Temp.		@		@				10929775							
Source Rmf		Rmc													
Rm @ BHT		@		@											
Rmf @ BHT		@		@											
Rmc @ BHT		@		@											
EQUIPMENT DATA															
GAMMA				ACOUSTIC				DENSITY				NEUTRON			
Run No.		ONE		Run No.				Run No.				Run No.			
Serial No.		11039640		Serial No.				Serial No.				Serial No.			
Model No.		GTET		Model No.				Model No.				Model No.			
Diameter		3.625"		No. of Cent.				Diameter				Diameter			
Detector Model No.		T-102		Spacing				Log Type				Log Type			
Type		SCINT						Source Type				Source Type			
Length		8"		LSA [Y/N]				Serial No.				Serial No.			
Distance to Source		N/A		FWDA [Y/N]				Strength				Strength			
LOGGING DATA															

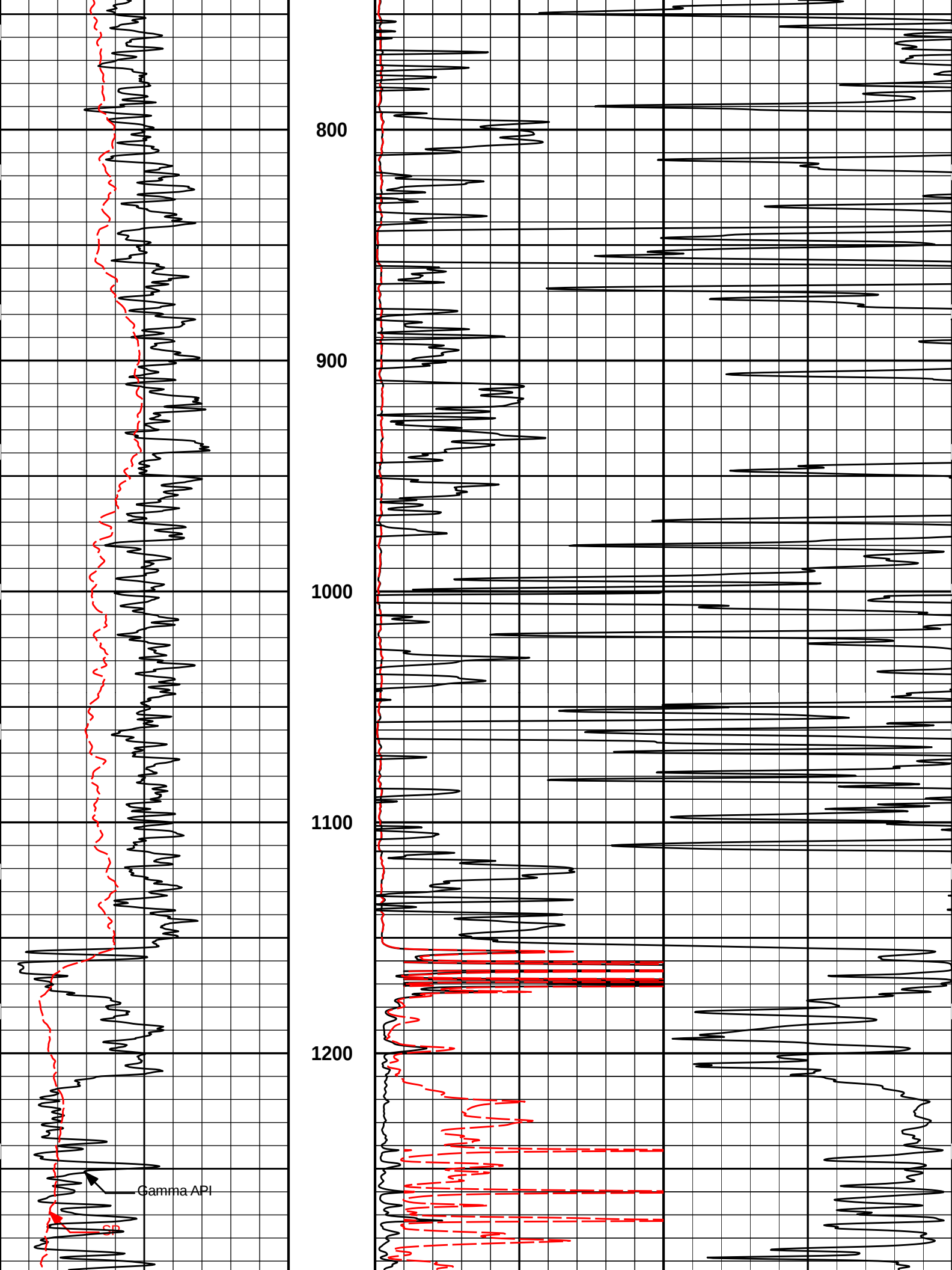
GENERAL			GAMMA	ACOUSTIC		DENSITY		NEUTRON			
Run	Depth		Speed	Scale		Scale		Matrix	Scale		Matrix
No.	From	To	ft/min	L	R	L	R		L	R	
ONE	4872	622	REC	0	150						
DIRECTIONAL INFORMATION											
Maximum Deviation @						KOP @					
Remarks: ANNULAR HOLE VOLUME CALCULATED FOR 5.5 INCH CASING.											
CHLORIDES REPORTED AT 7000 ppm.											
LCM REPORTED AT 2 #/BBL.											

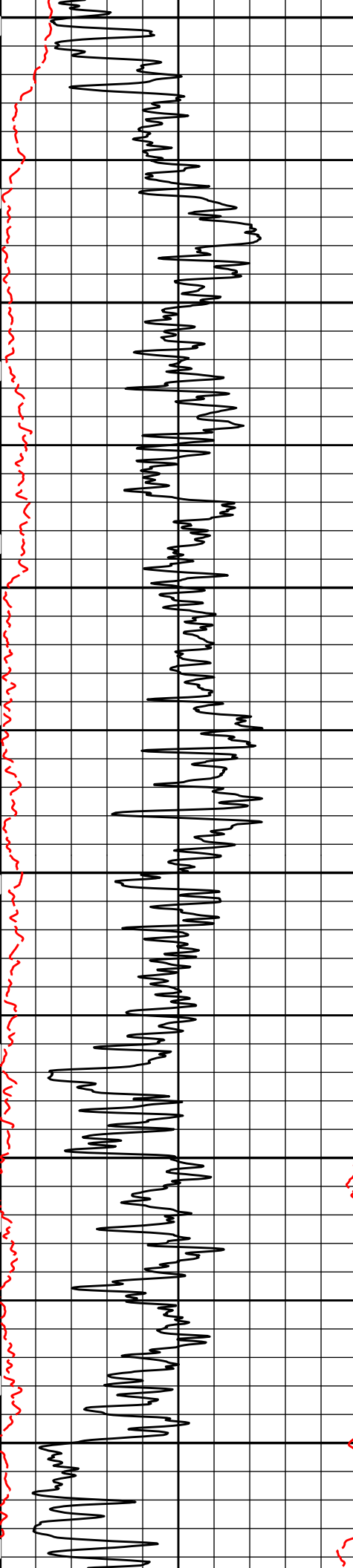
HALLIBURTON

Plot Time: 07-Apr-14 00:26:05
Plot Range: 595 ft to 4874.42 ft
Data: HEFT_#4-5\Well Based\ACRT CASING\
Plot File: \\LOCAL-l(not saved)\ACRT_2_lib

2 INCH MAIN LOG







1300

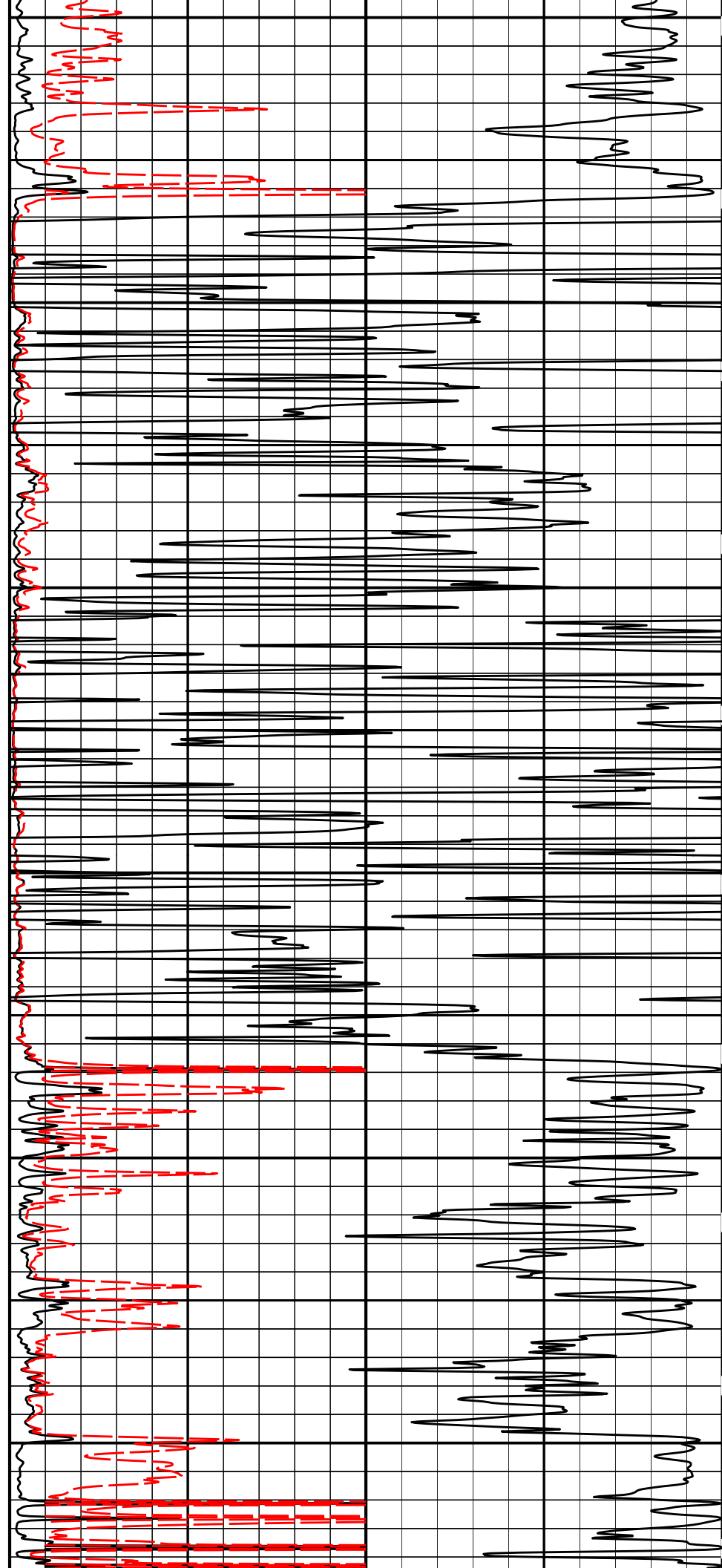
1400

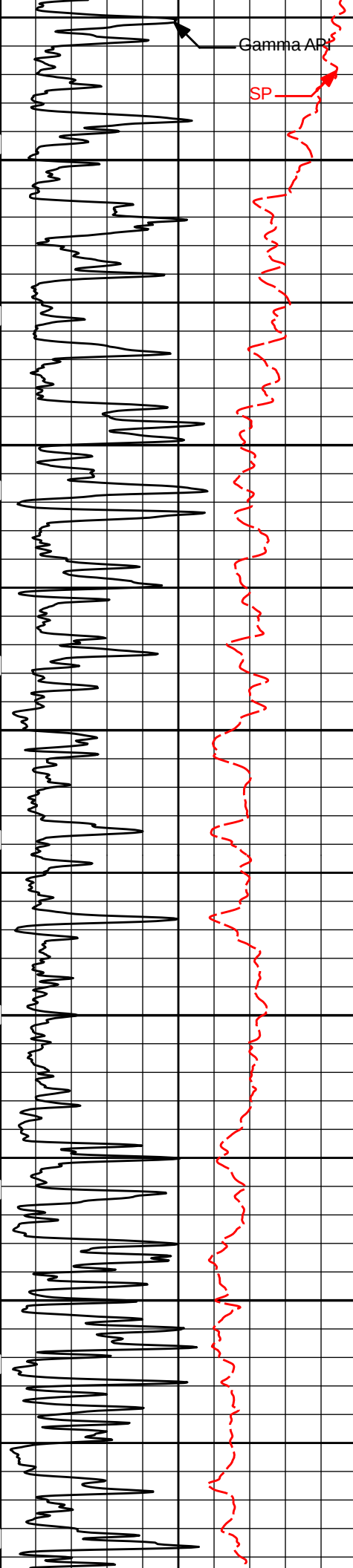
1500

1600

1700

1800





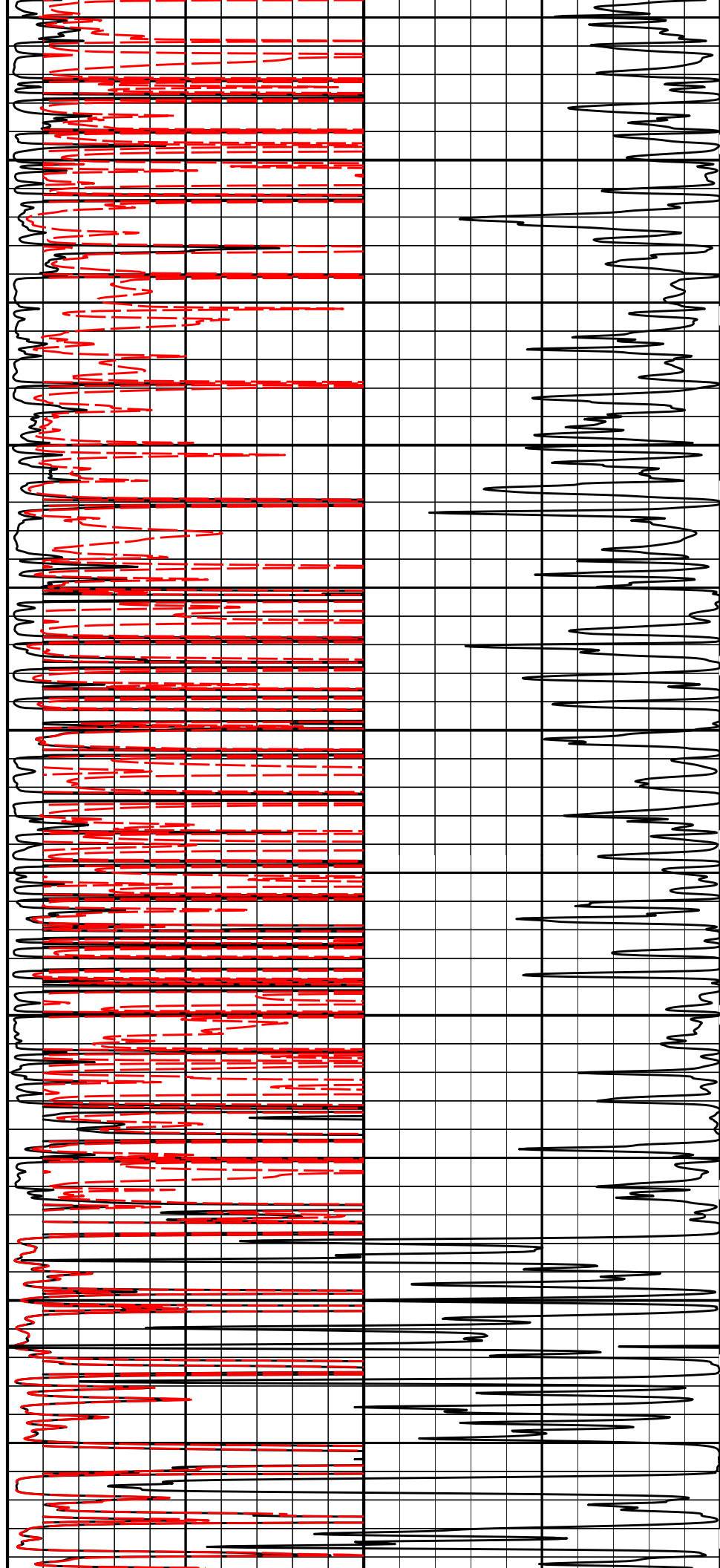
1900

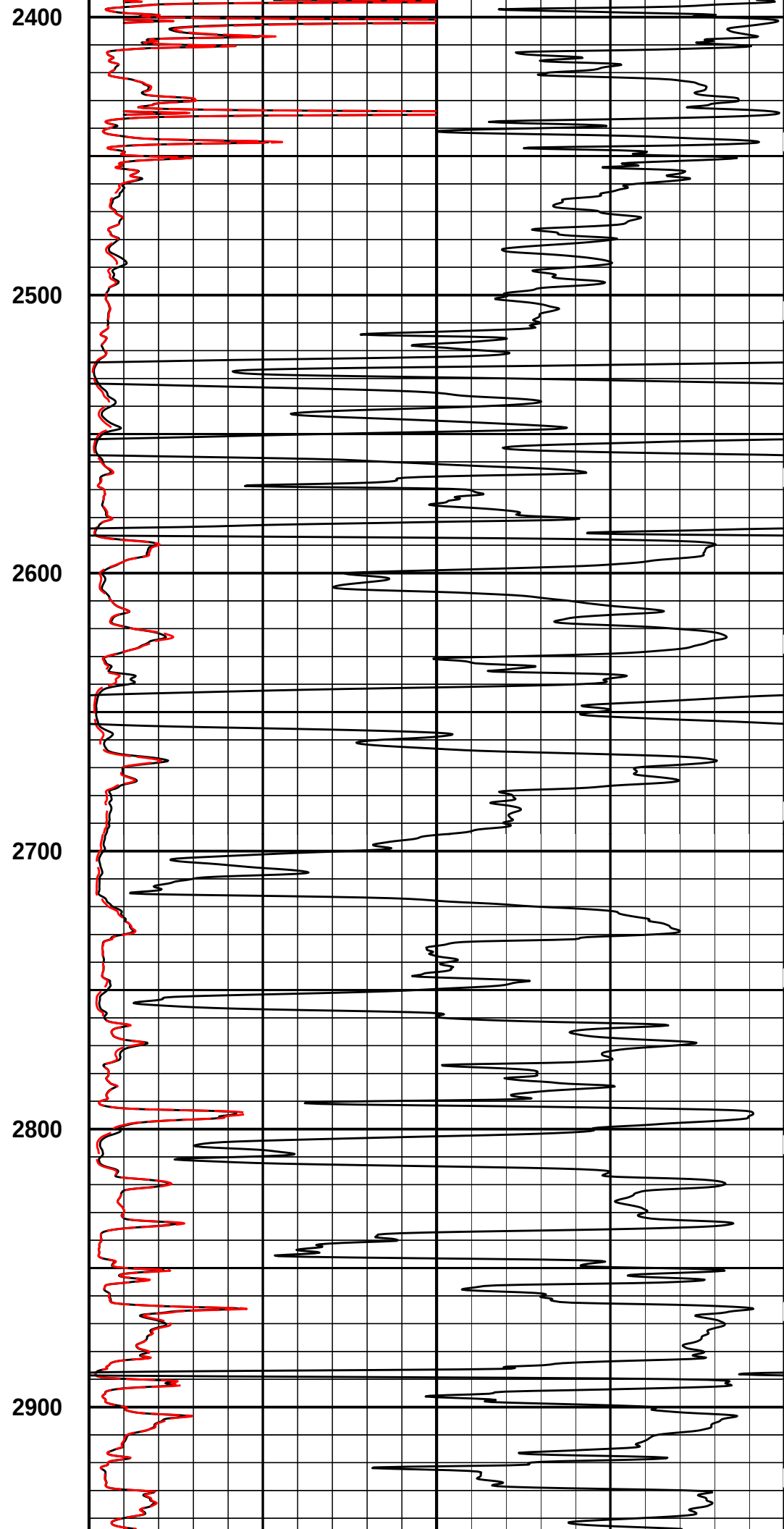
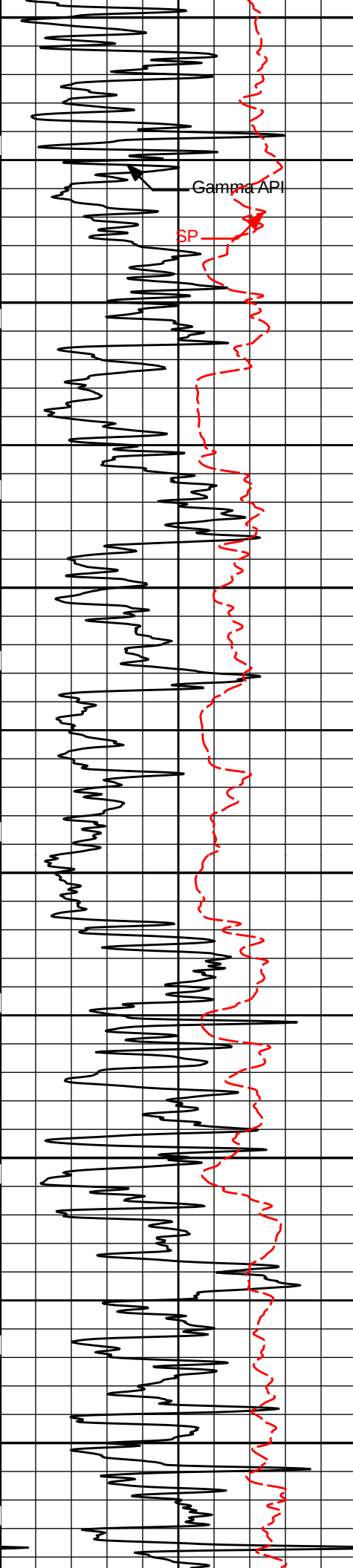
2000

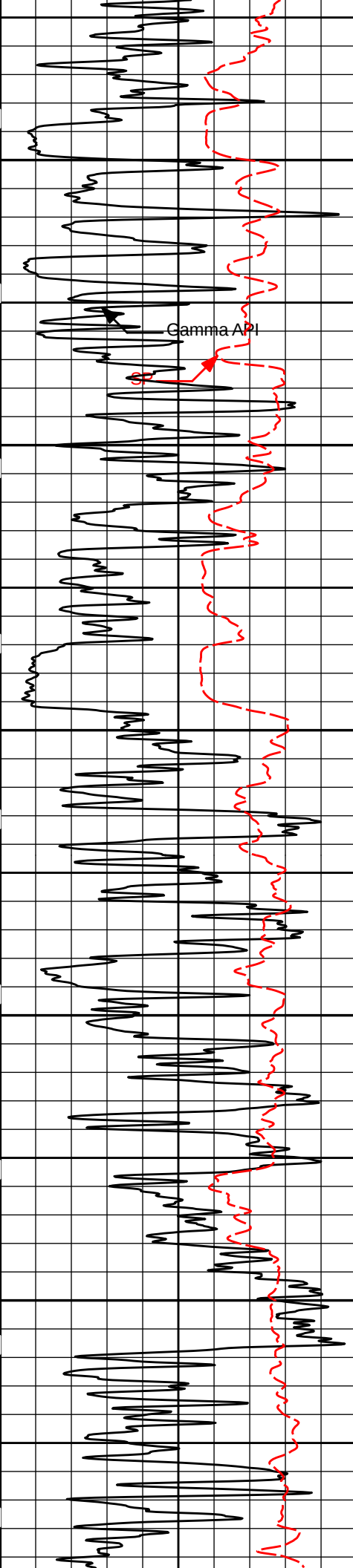
2100

2200

2300







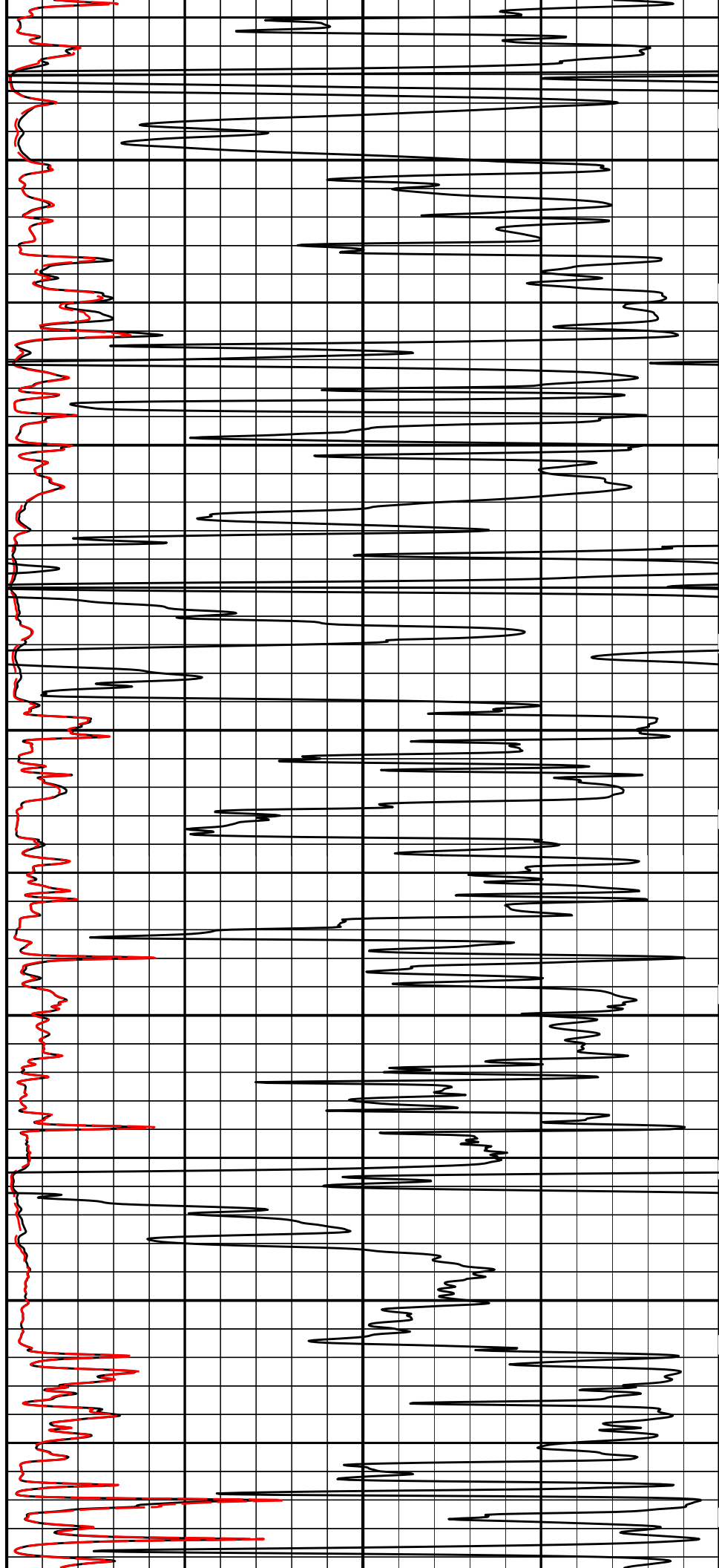
3000

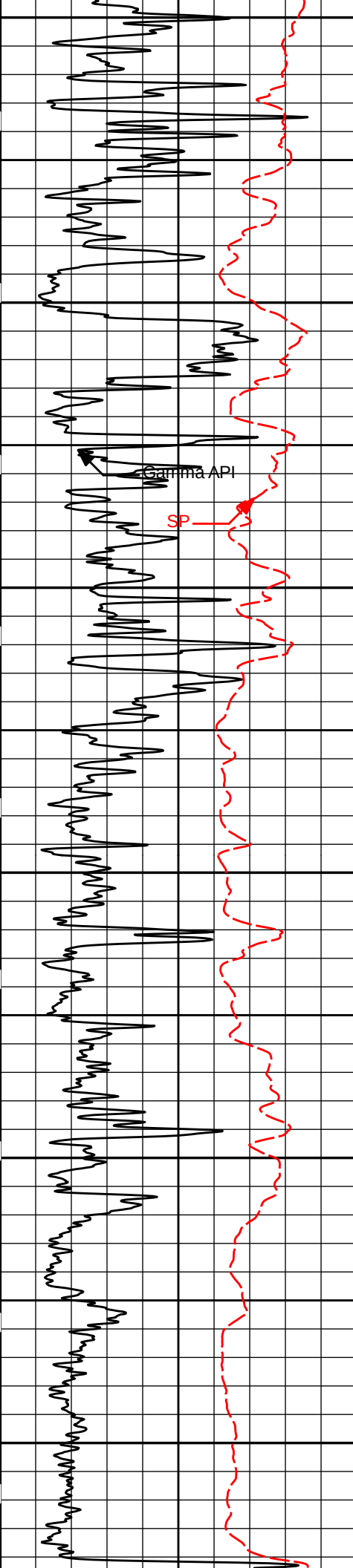
3100

3200

3300

3400





3500

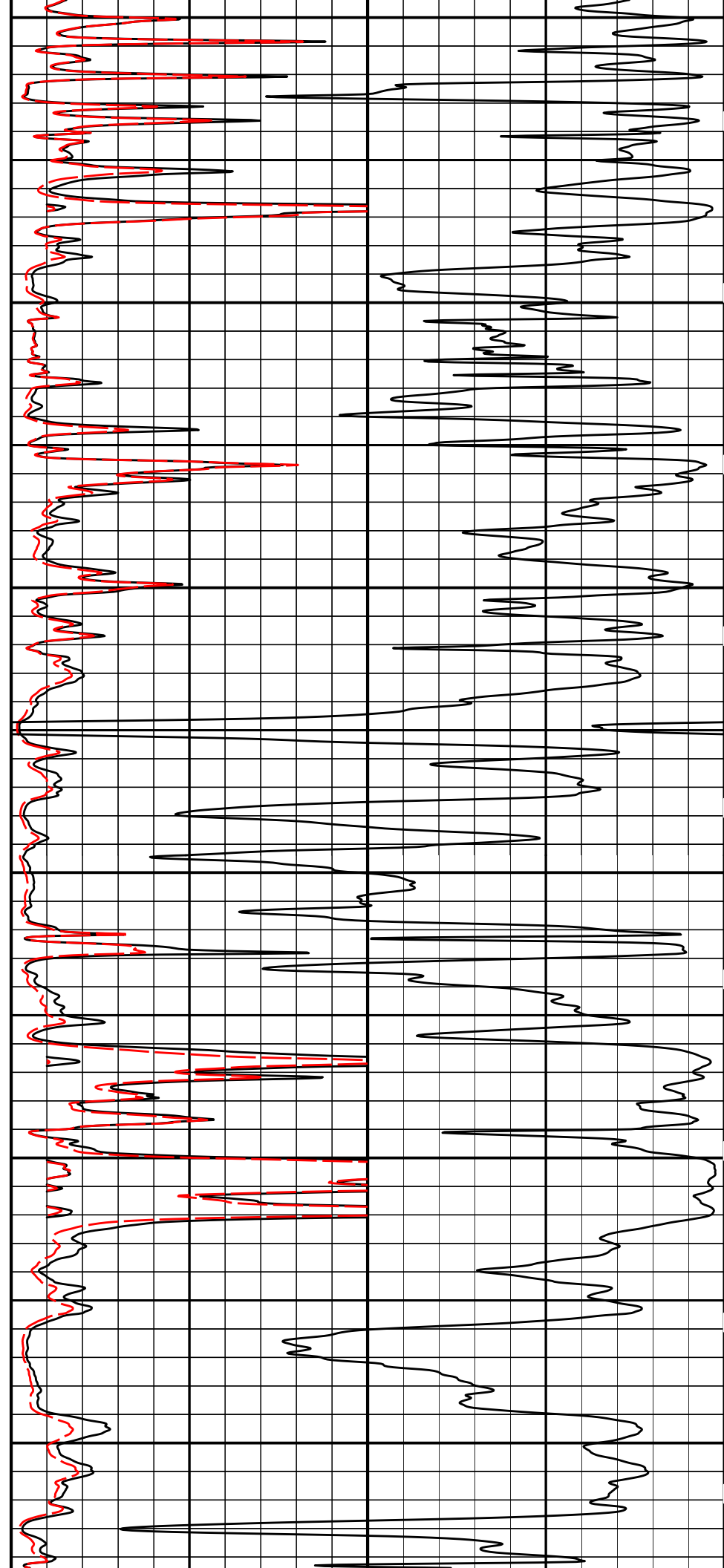
3600

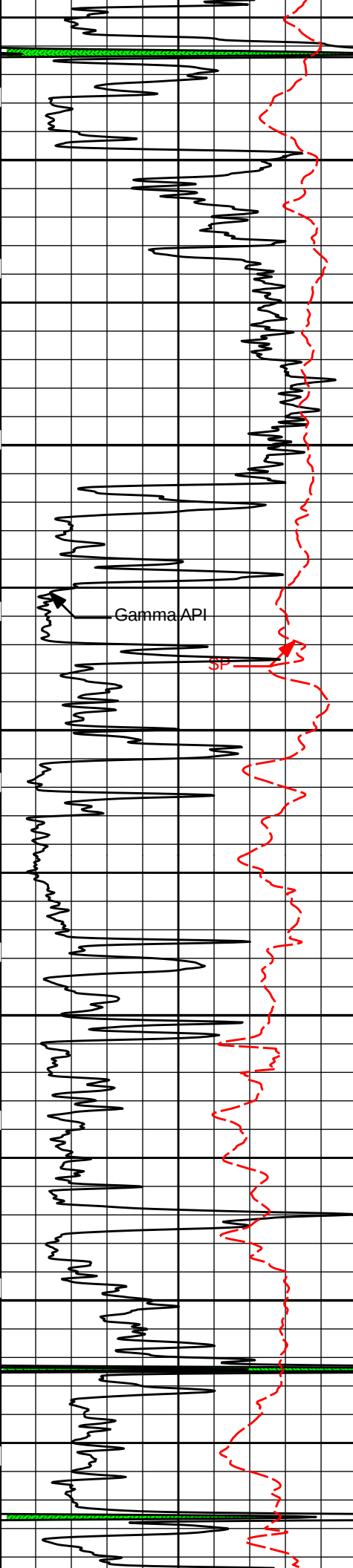
3700

3800

3900

4000





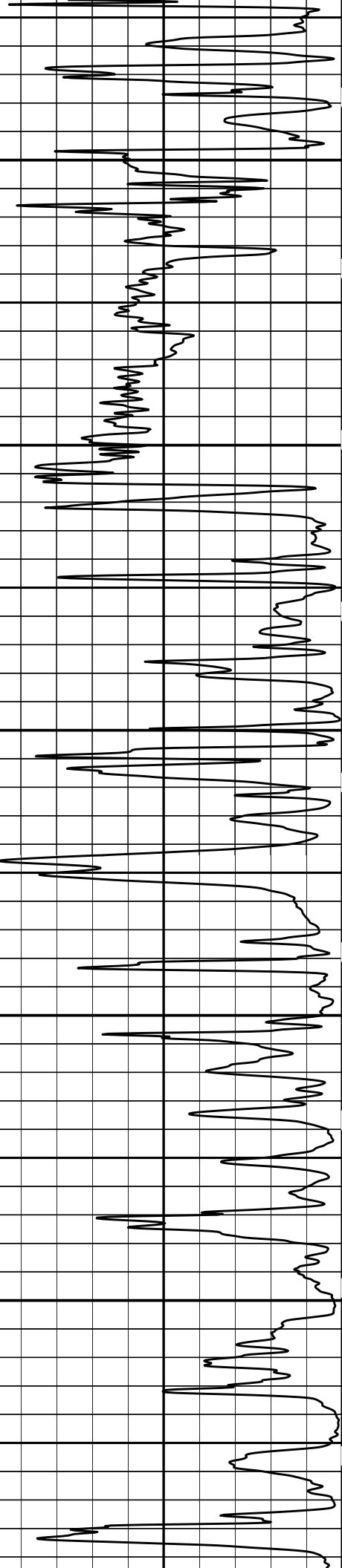
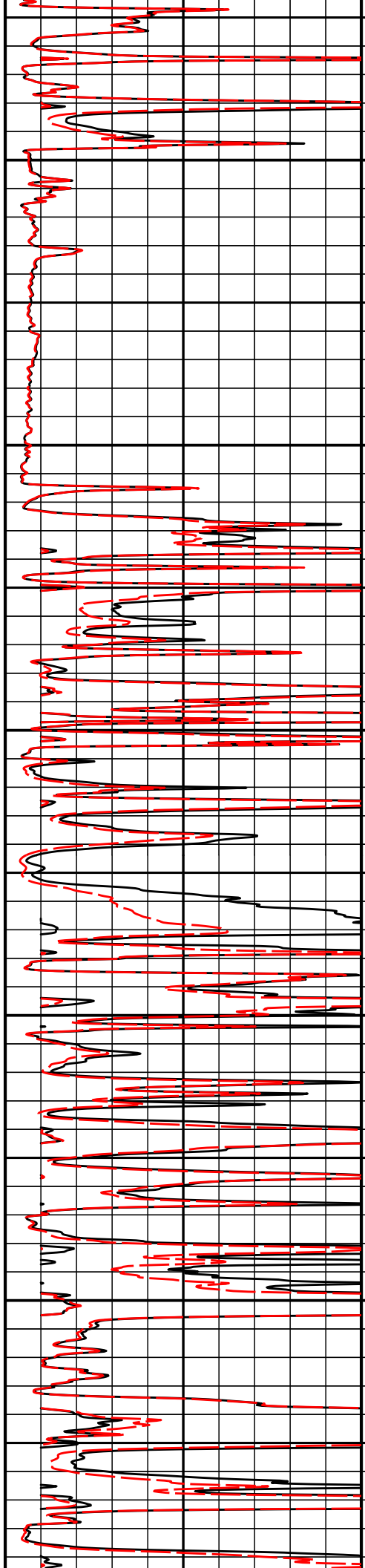
4100

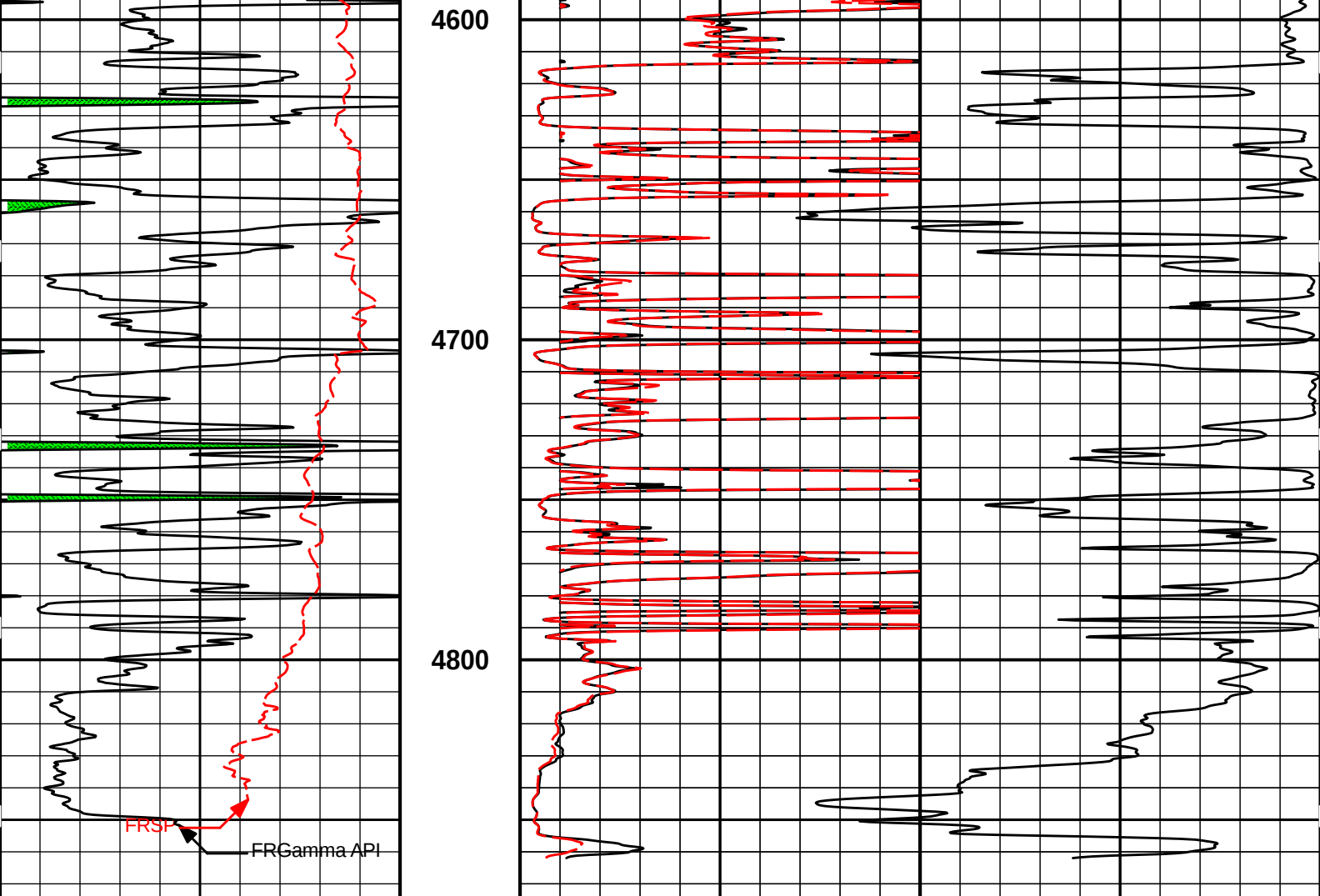
4200

4300

4400

4500





0	Gamma API	150	MD	0	20in Resistivity 2ft Res	50	
	api		1 : 600		ohm-metre		
	SP			0	90in Resistivity 2ft Res	50	
	-]20[+				ohm-metre		
				1000	90in Conductivity 2ft Res		0
					mmho per metre		

HALLIBURTON

Plot Time: 07-Apr-14 00:26:07
Plot Range: 595 ft to 4874.42 ft
Data: HEFT_#4-5\Well Based\ACRT CASING\
Plot File: \\-LOCAL-(not saved)\ACRT_2_lib

2 INCH MAIN LOG

HALLIBURTON

Plot Time: 07-Apr-14 00:26:07
Plot Range: 3895 ft to 4874.42 ft
Data: HEFT_#4-5\Well Based\ACRT DETAIL\
Plot File: \\-LOCAL-(not saved)\ACRT_5_main_lib

5 INCH MAIN LOG

	0.2	90in Resistivity 2ft Res	2000
		ohmm	
	0.2	60in Resistivity 2ft Res	2000
		ohmm	

SHALE

0 Gamma API 150

api

SP

-]20[+

MD
1 : 240
ft

3900

4000

0.2

30in Resistivity 2ft Res

2000

ohm-metre

0.2

20in Resistivity 2ft Res

2000

ohmm

0.2

10in Resistivity 2ft Res

2000

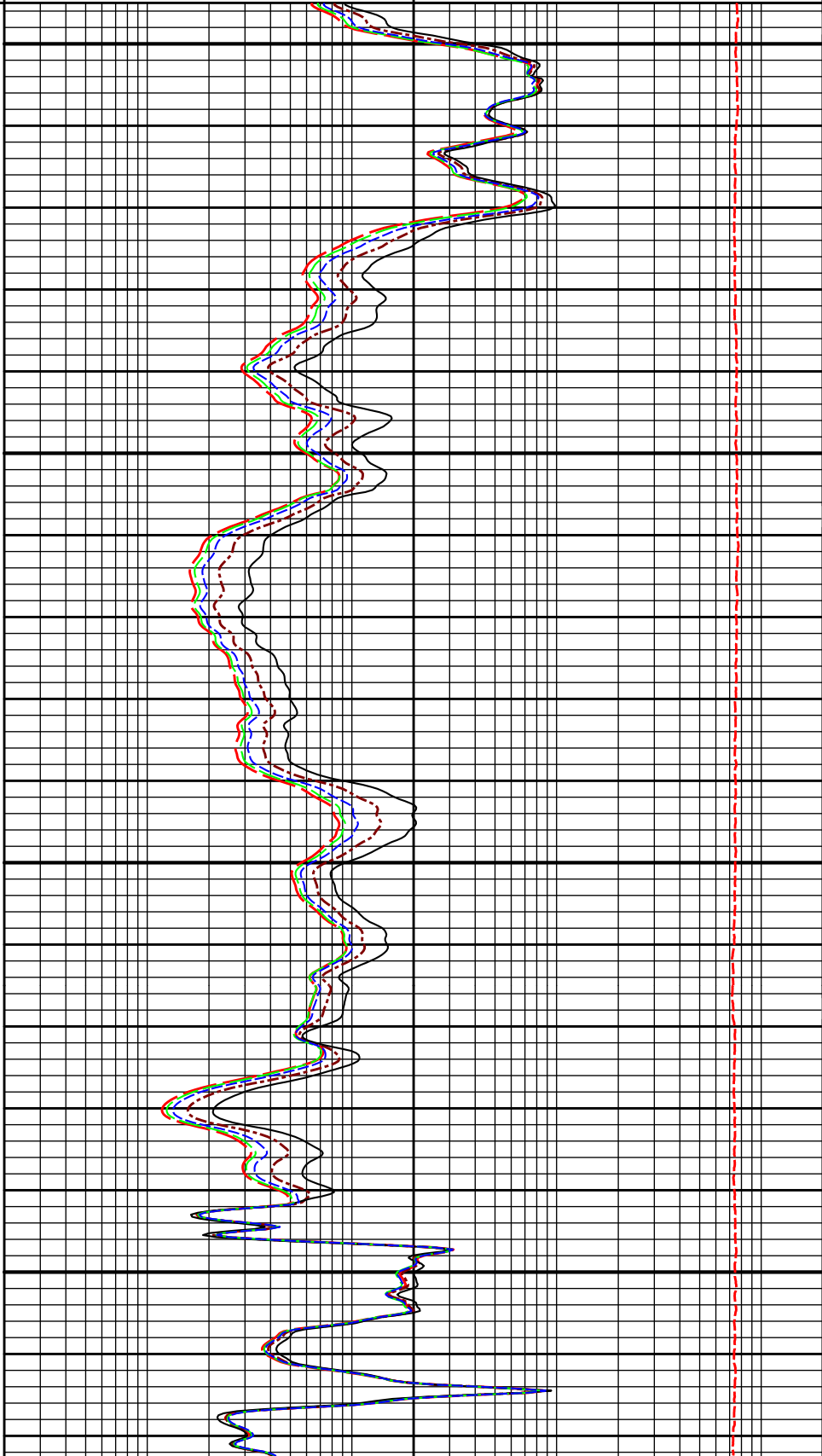
ohmm

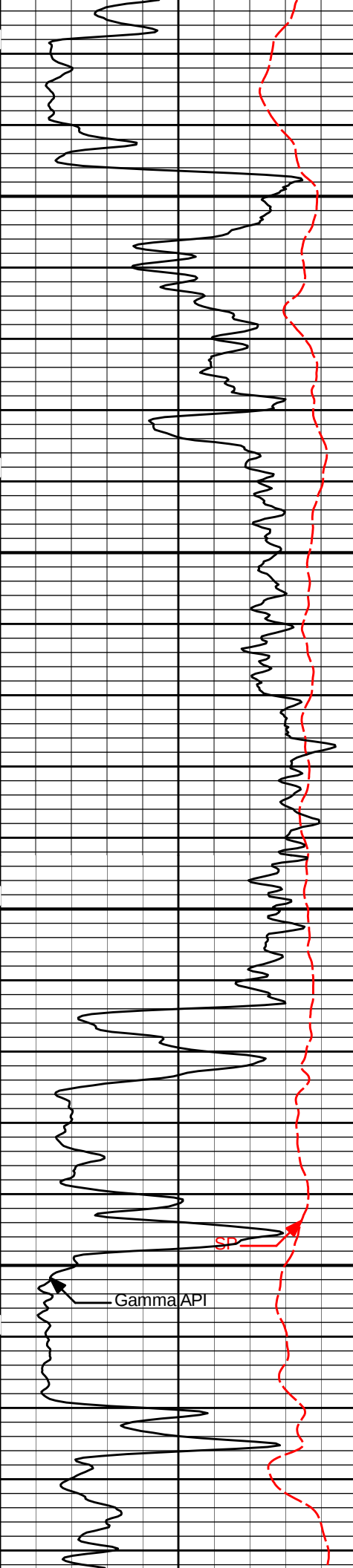
10K

Tension

0

pounds

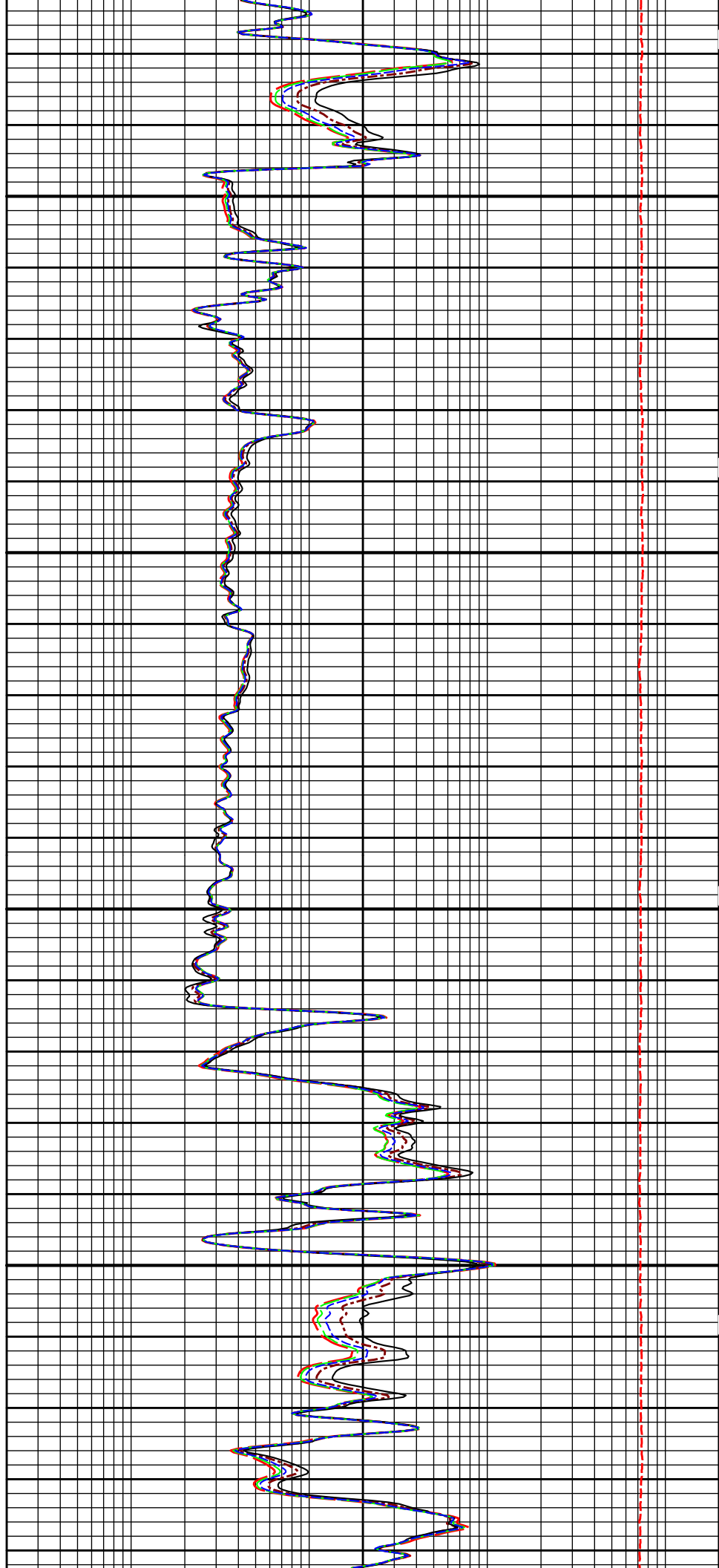


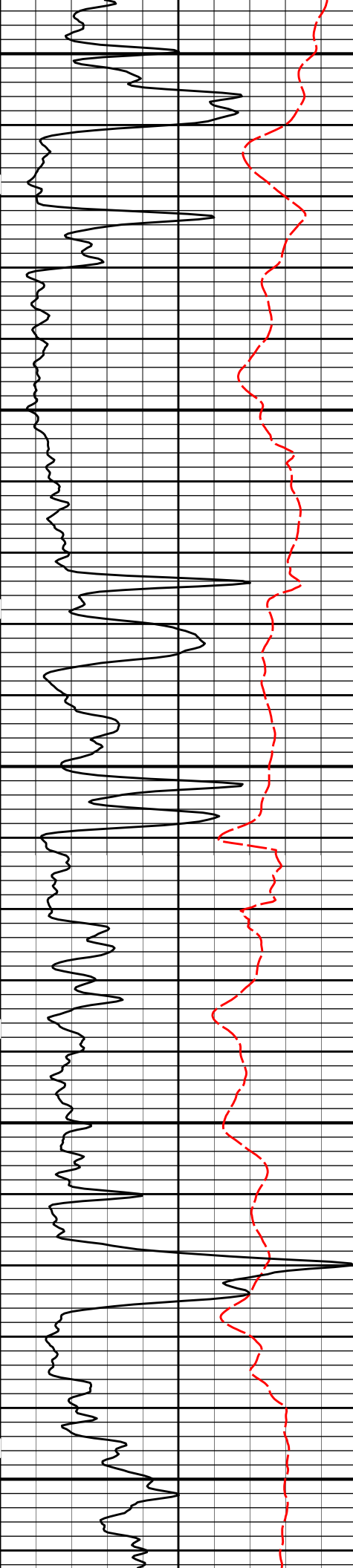


Gamma API

4100

4200

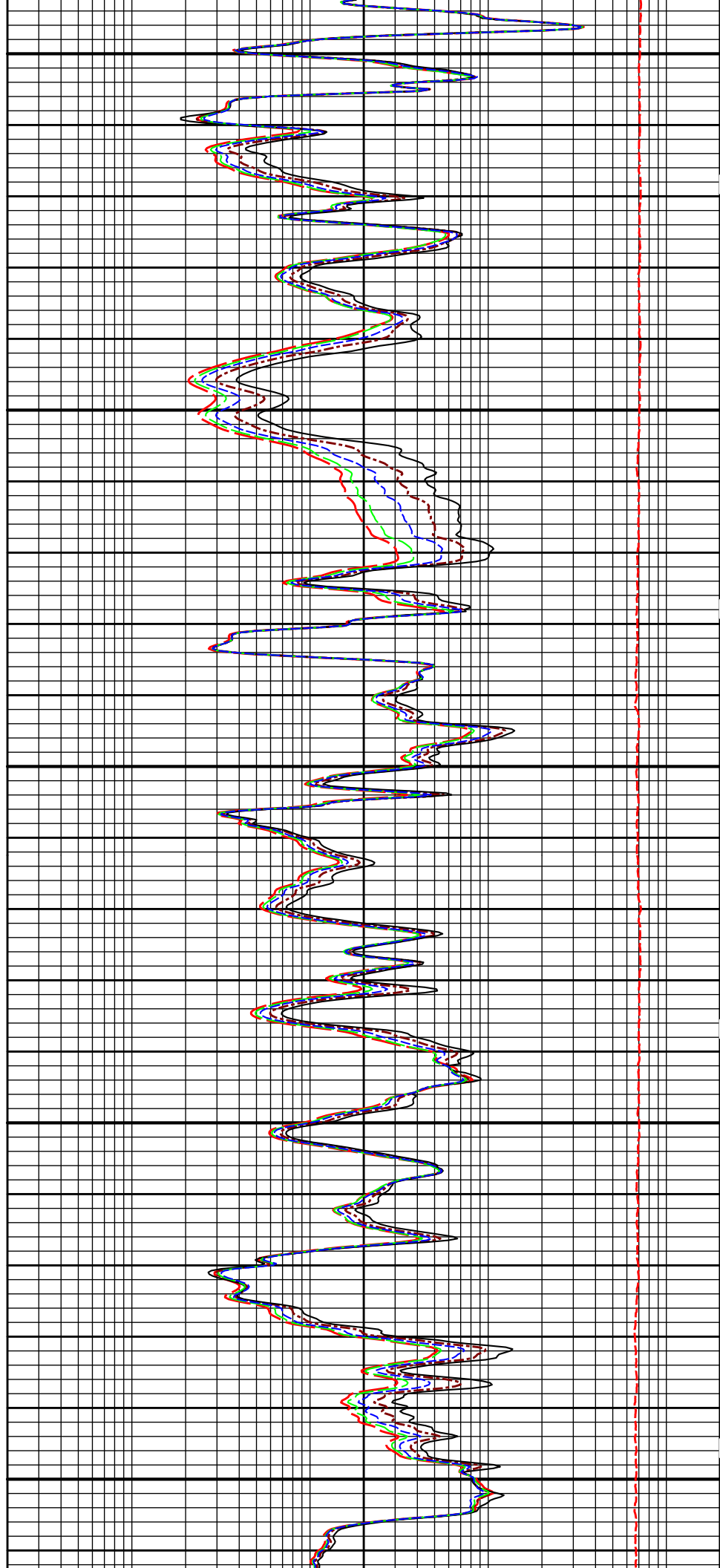


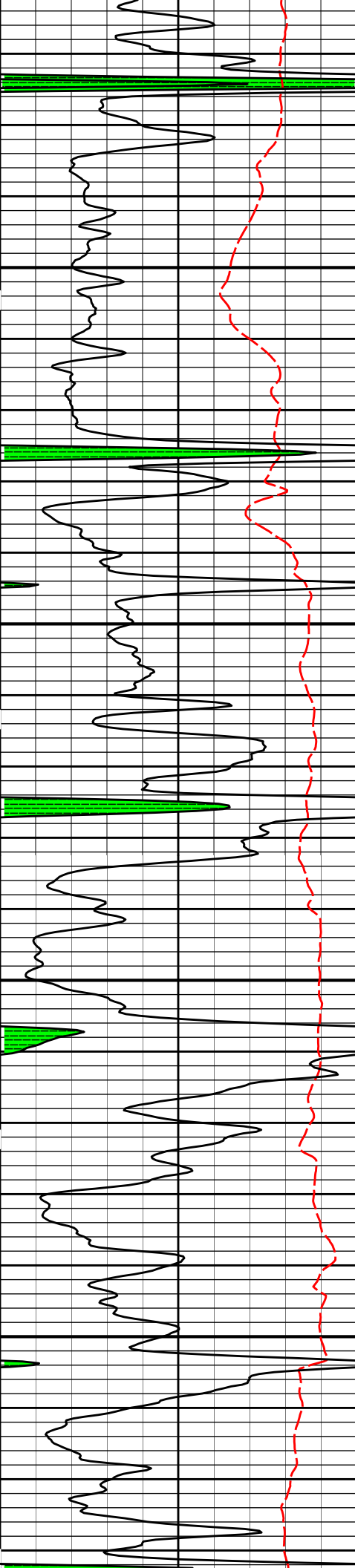


4300

4400

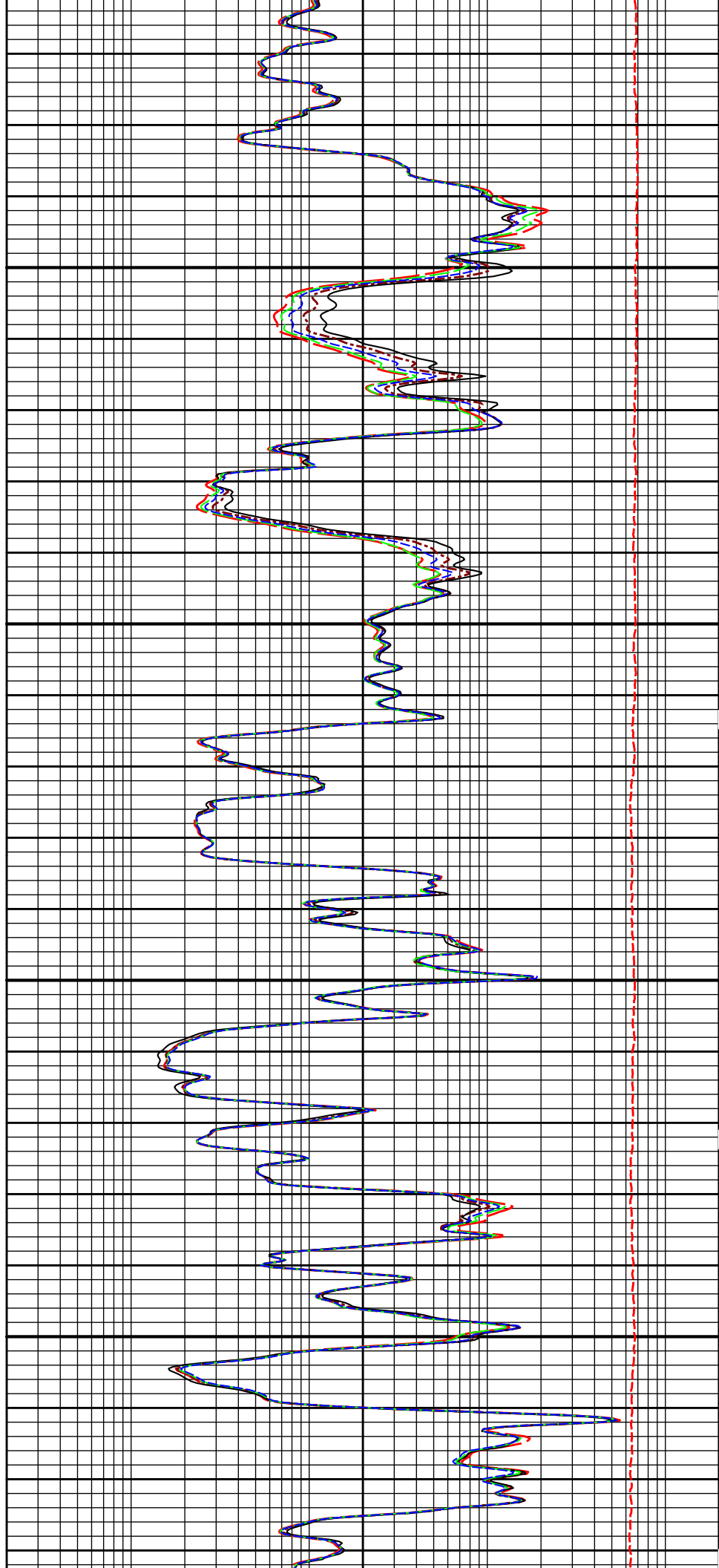
4500

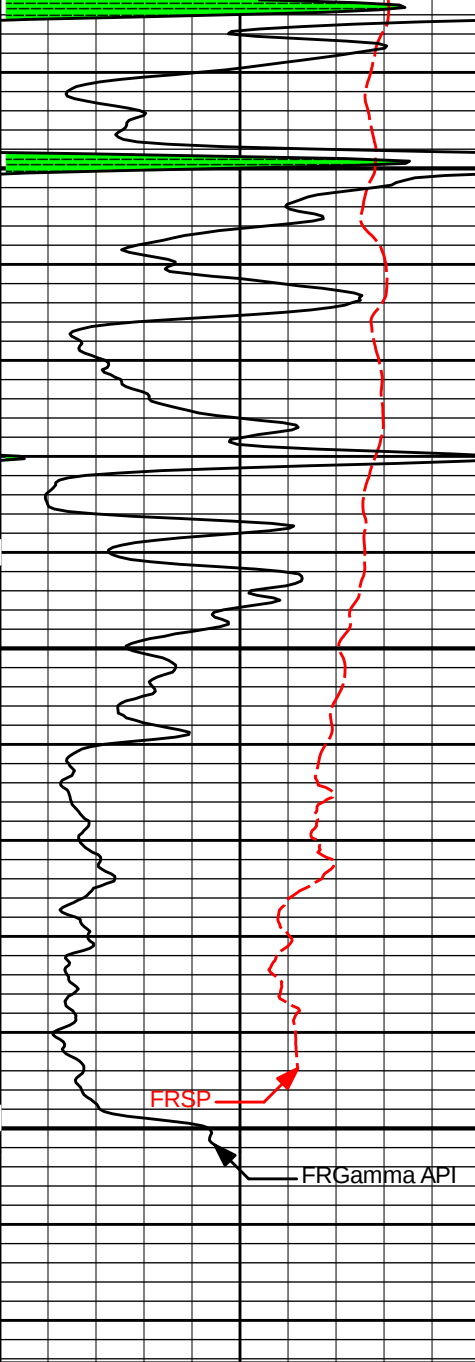




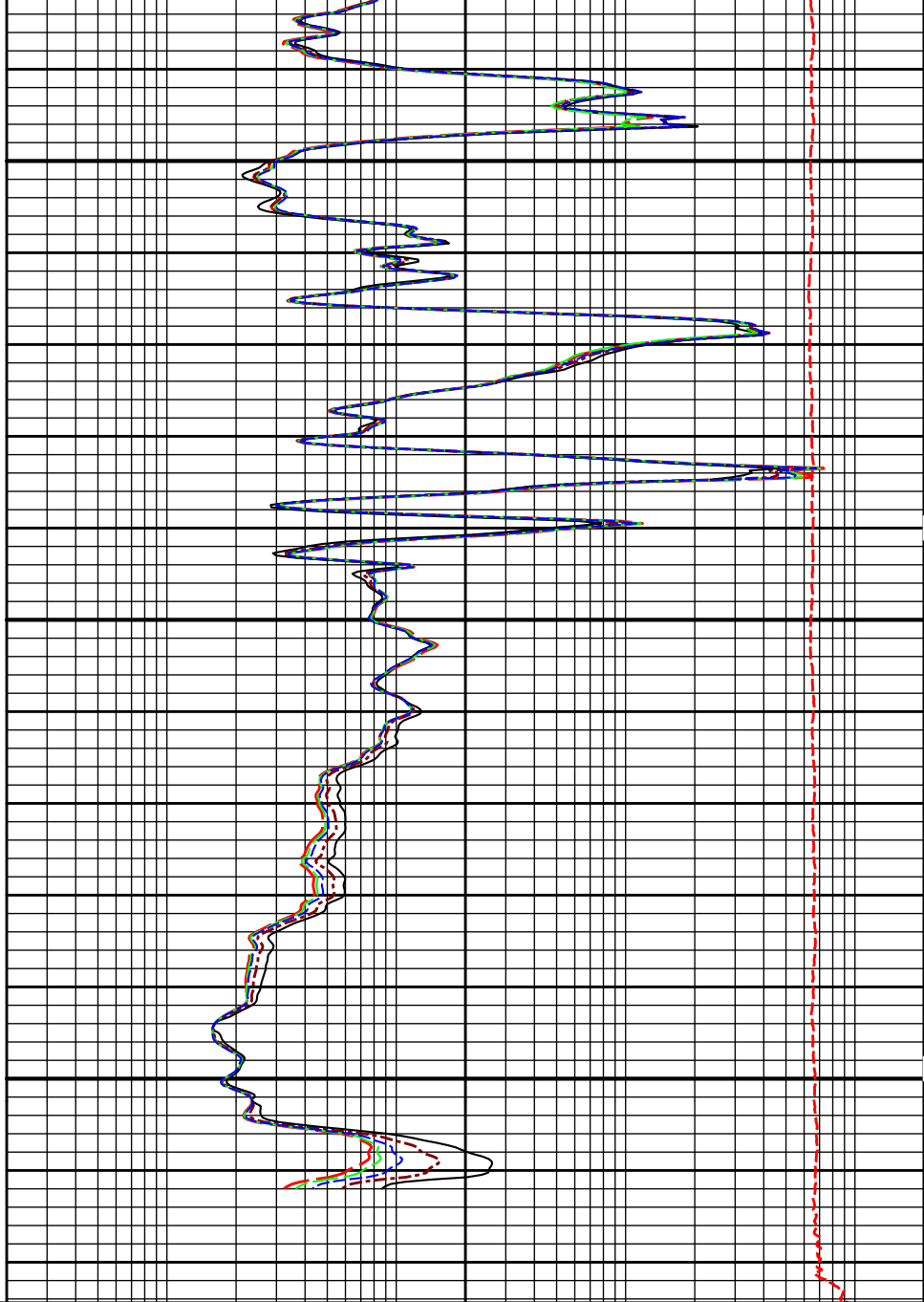
4600

4700





4800



SP		
-]20[+		
0	Gamma API	150
api		
SHALE		

MD
1 : 240
ft

	10K	Tension	0
		pounds	
0.2	10in Resistivity 2ft Res		2000
	ohmm		
0.2	20in Resistivity 2ft Res		2000
	ohmm		
0.2	30in Resistivity 2ft Res		2000
	ohm-metre		
0.2	60in Resistivity 2ft Res		2000
	ohmm		
0.2	90in Resistivity 2ft Res		2000
	ohmm		

HALLIBURTON

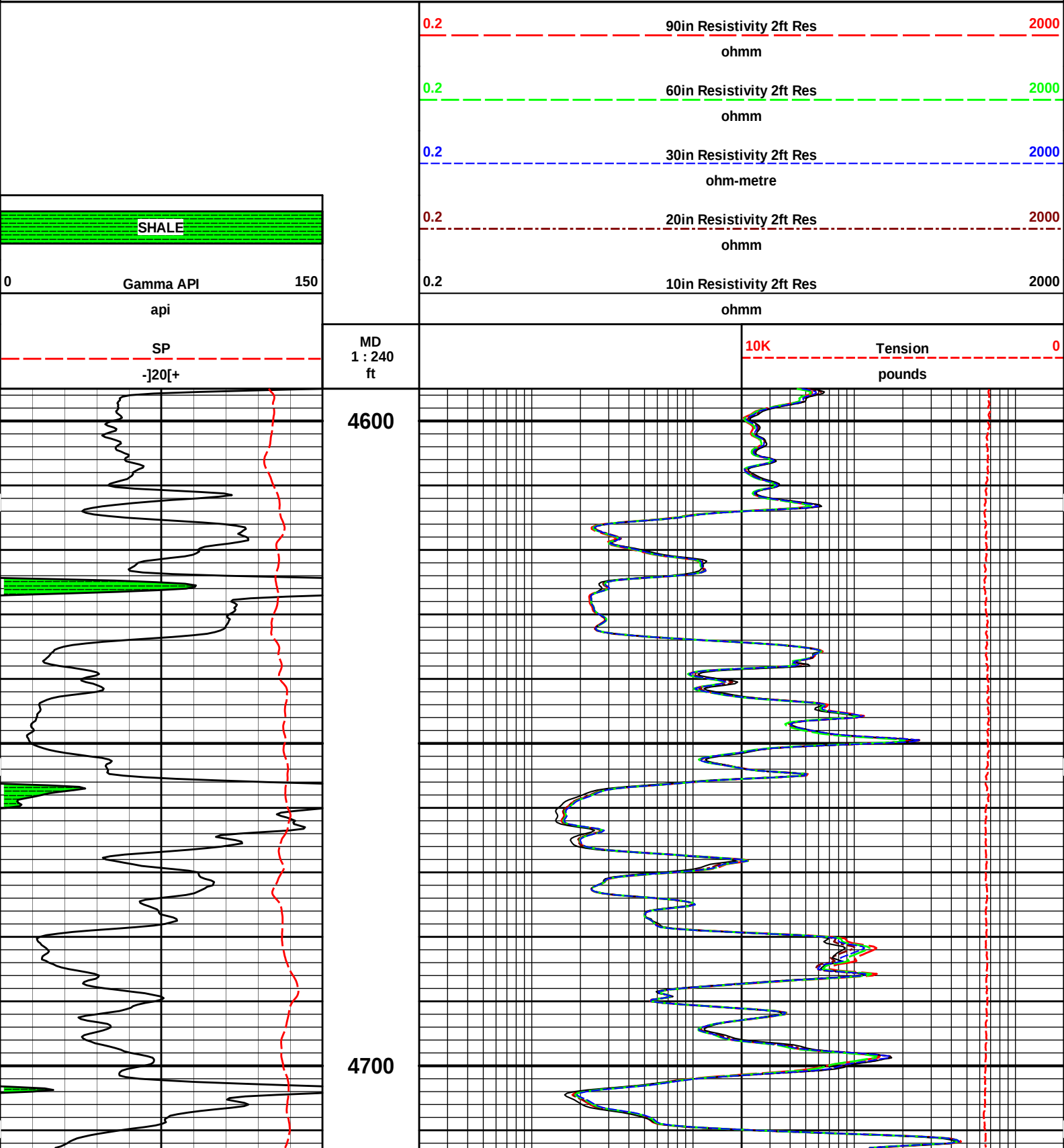
Plot Time: 07-Apr-14 00:26:09
Plot Range: 3895 ft to 4874.42 ft
Data: HEFT_#4-5\Well Based\ACRT DETAIL\
Plot File: \\-LOCAL-(not saved)\ACRT_5_main_lib

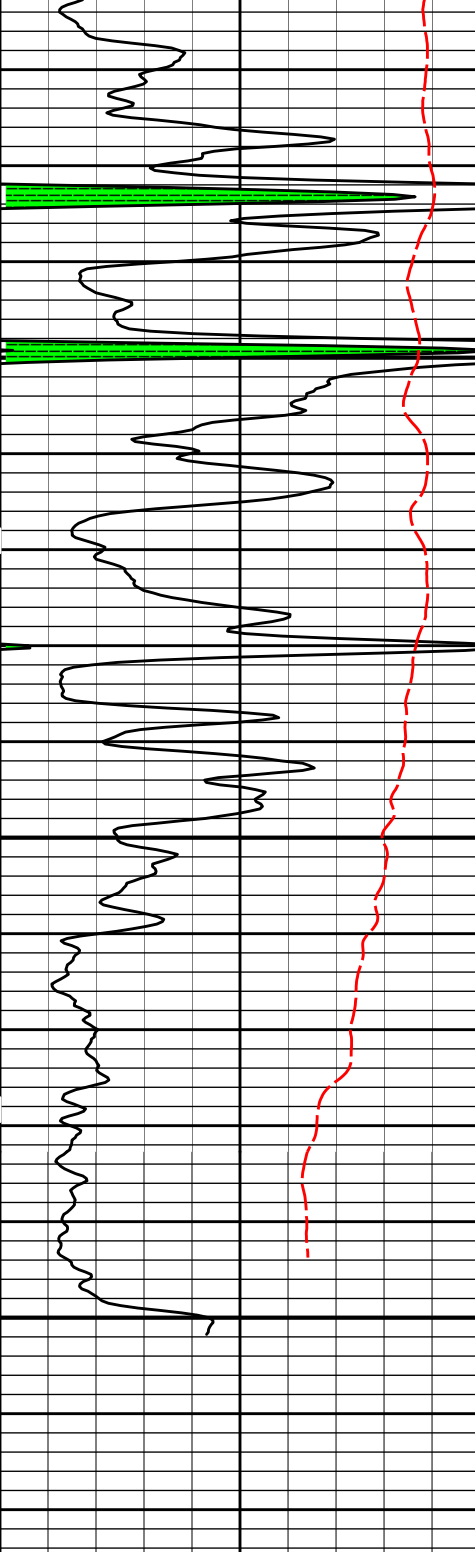
5 INCH MAIN LOG

HALLIBURTON

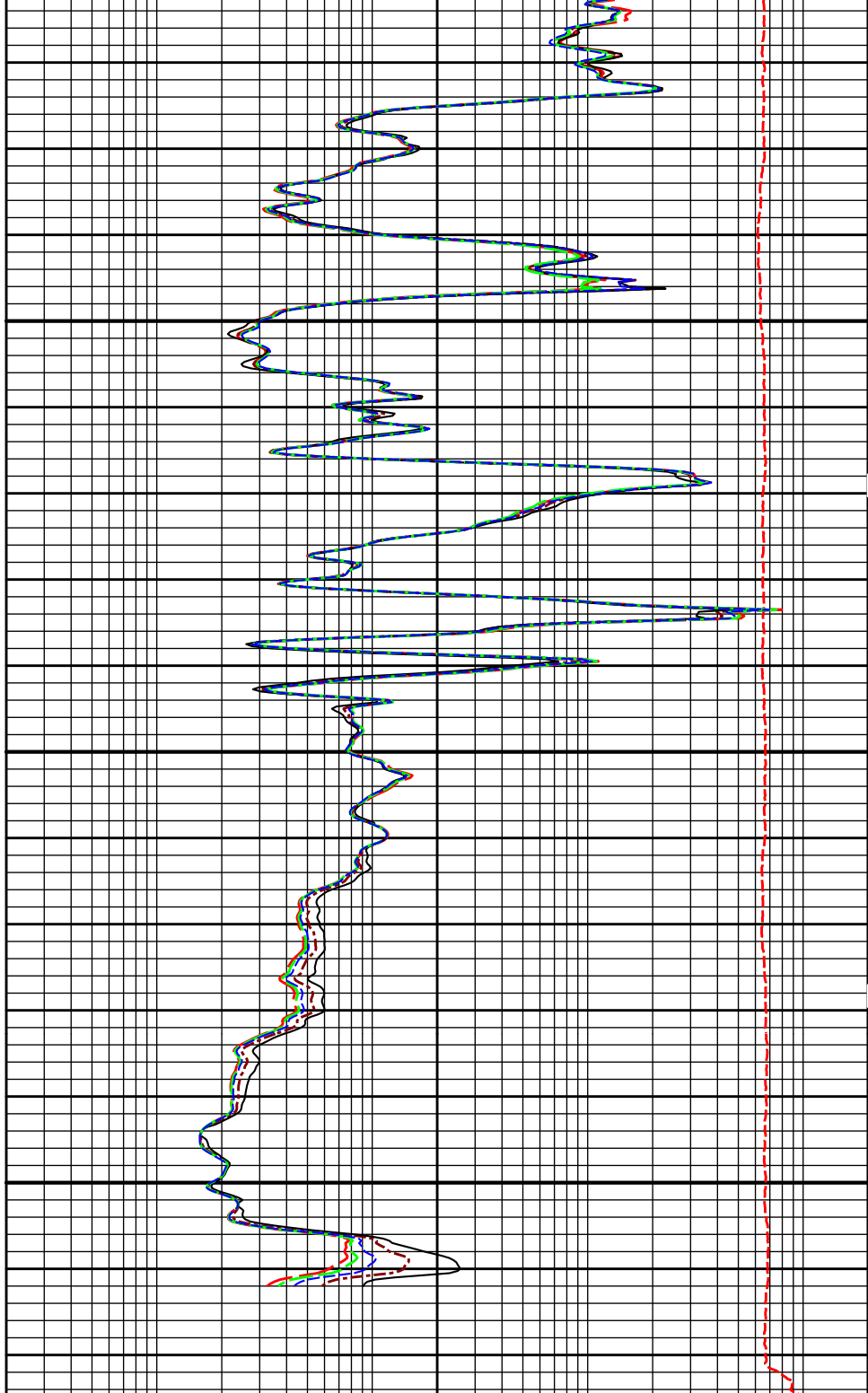
Plot Time: 07-Apr-14 00:26:09
Plot Range: 4595 ft to 4874.83 ft
Data: HEFT_#4-5\Well Based\ACRT REPEAT\
Plot File: \\-LOCAL-(not saved)\ACRT_5_repeat_lib

REPEAT SECTION





4800



SP		
-]20[+		
0	Gamma API	150
api		
SHALE		

MD
1 : 240
ft

		10K	Tension	0
		pounds		
0.2	10in Resistivity 2ft Res	2000		
		ohmm		
0.2	20in Resistivity 2ft Res	2000		
		ohmm		
0.2	30in Resistivity 2ft Res	2000		
		ohm-metre		
0.2	60in Resistivity 2ft Res	2000		
		ohmm		
0.2	90in Resistivity 2ft Res	2000		
		ohmm		

REPEAT SECTION

TOOL STRING DIAGRAM REPORT

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length	
Cable Head- 12345678 30.00 lbs		Ø 3.625 in →			1.92 ft	33.76 ft	
SP Sub-12345678 60.00 lbs		Ø 3.625 in →		← SP @ 30.06 ft	3.74 ft	31.84 ft	
						28.10 ft	
GTET-11039640 165.00 lbs		Ø 3.625 in →		← GammaRay @ 22.04 ft	8.52 ft		
						19.58 ft	
ACRt Instrument- 10929776 50.00 lbs		Ø 3.625 in →			5.03 ft		
Regal Standoff 6_75- 00000001 20.00 lbs		Ø 6.750 in* →				14.55 ft	
				← Mud Resistivity @ 13.19 ft			
ACRt Sonde- 10929775 200.00 lbs		Ø 3.625 in →		← ACRt @ 9.21 ft	14.22 ft		
						0.33 ft	
Bull Nose-00000668 5.00 lbs		Ø 2.750 in →			0.33 ft	0.00 ft	
Mnemonic	Tool Name		Serial Number	Weight (lbs)	Length (ft)	Accumulated Length (ft)	Max.Log. Speed (fpm)
CH	Standard OH Cable Head		12345678	30.00	1.92	31.84	300.00
SP	SP Sub		12345678	60.00	3.74	28.10	300.00

GTET	Gamma Telemetry Tool	11039640	165.00	8.52	19.58	60.00
ACRt	Array Compensated True Resistivity Instrument Section	10929776	50.00	5.03	14.55	120.00
RSOF	Regal Standoff 6.75in	00000001	20.00	0.52 *	14.75	300.00
ACRt	Array Compensated True Resistivity Sonde Section	10929775	200.00	14.22	0.33	120.00
BLNS	Bull Nose	00000668	5.00	0.33	0.00	300.00
Total			530.00	33.76		
* Not included in Total Length and Length Accumulation.						
Data: HEFT_#4-5\0002 GTET_ACRT\IDLE						
Date: 06-Apr-14 21:45:46						

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	9.400	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	0.515	ohmm	
	SHARED	TRM	Temperature of Mud	72.0	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	4872.00	ft	
	SHARED	BHT	Bottom Hole Temperature	111.0	degF	
	SHARED	SVTM	Navigation and Survey Master Tool	NONE		
	SHARED	AZTM	High Res Z Accelerometer Master Tool	GTET		
	SHARED	TEMM	Temperature 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		
	Rwa / CrossPlot	BHSM	Borehole Size Source Tool	Depth Panel		
	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		
	GTET	BHSM	Borehole Size Source Tool	Depth Panel		
	ACRt Sonde	RTOK	Process ACRt?	Yes		
	ACRt Sonde	MNSO	Minimum Tool Standoff	1.50	in	

ACRt Sonde	TCS1	Temperature Correction Source	FP Lwr & FP Up	
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
ACRt Sonde	BHSM	Borehole Size Source Tool	Depth Panel	
BOTTOM				
Data: HEFT_#4-5\0002 GTET_ACRT\006 06-Apr-14 23:01 Up @4875.0f				Date: 07-Apr-14 00:20:32

HALLIBURTON

CALIBRATION REPORT

NATURAL GAMMA RAY TOOL SHOP CALIBRATION									
Tool Name:		GTET - 11039640				Reference Calibration Date:		02-Apr-14 11:18:23	
Engineer:		SHELDON INGERSOLL				Calibration Date:		02-Apr-14 11:22:33	
Software Version:		WL INSITE R4.2.0 (Build 2)				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		47.4		47.6		api	
		Background + Calibrator		278.1		279.6		api	
		Calibrator		230.7		232.0		api	

NATURAL GAMMA RAY TOOL FIELD CALIBRATION									
Tool Name:		GTET - 11039640				Reference Calibration Date:		02-Apr-14 11:22:33	
Engineer:		SHELDON INGERSOLL				Calibration Date:		06-Apr-14 16:41:36	
Software Version:		WL INSITE R4.2.0 (Build 2)				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		47.6		43.8		api	
		Background + Calibrator		279.6		276.8		api	
		Calibrator		232.0		233.0		api	
		Shop		Field		Difference		Tolerance	
		232.0		233.0		-1.0		+/- 9.00	

ARRAY COMPENSATED TRUE RESISTIVITY SHOP CALIBRATION									
Tool Name:		ACRt Sonde - 10929775				Reference Calibration Date:		19-Feb-14 09:38:10	
Engineer:		THOMAS K HYDE				Calibration Date:		19-Mar-14 12:09:45	
Software Version:		WL INSITE R4.2.0 (Build 2)				Calibration Version:		1	
Host Tool Name:		ACRt Instrument - 10929776							

TYPICAL GAIN RANGE									
Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper

A1 (80")	0.95	1.0263	1.05	0.95	1.0215	1.05	0.95	1.0134	1.05
A2 (50")	0.95	1.0255	1.05	0.95	1.0200	1.05	0.95	1.0139	1.05
A3 (29")	0.95	1.0203	1.05	0.95	1.0138	1.05	0.95	1.0074	1.05
A4 (17")	0.95	1.0214	1.05	0.95	1.0109	1.05	0.95	1.0062	1.05
A5 (10")	N/A	N/A	N/A	0.95	1.0112	1.05	0.95	1.0071	1.05
A6 (6")	N/A	N/A	N/A	0.95	1.0205	1.05	0.95	1.0176	1.05

SONDE OFFSET									
Subarray	R12KHz			R36KHz			R72KHz		
	(mmho/m)			(mmho/m)			(mmho/m)		
A1 (80")	-1.574			-4.651			-4.858		
A2 (50")	-2.610			-4.430			-4.683		
A3 (29")	-14.818			-4.760			-2.984		
A4 (17")	-104.629			-32.400			-25.186		
A5 (10")	N/A			-118.666			-54.048		
A6 (6")	N/A			280.838			141.655		

TRANSMITTER CURRENT GAIN				R-MUD VERIFICATION			
Signal	Lower	R	Upper	Signal	Lower (ohm-m)	Measured (ohm-m)	Upper (ohm-m)
12K	0.6	0.84	1.3	Mud Cell	0.95	0.99	1.05
36K	1.0	1.17	2.0				
72K	1.0	1.46	2.0				
PASS/FAIL SUMMARY							
GAIN RANGE CHK					PASS		
SONDE OFFSET CHK					PASS		
TOOL OK TO LOG							

CALIBRATION SUMMARY						
Sensor	Shop	Field	Post	Difference	Tolerance	Units
GTET-11039640						
Gamma Ray Calibrator	232.0	233.0	-----	-1.0	+/- 9.00	api
ACRt Sonde-10929775						
Mud Cell	0.99	-----	-----	0.00	-----	ohm-m
Data: HEFT_#4-5\0002 GTET_ACRT\006 06-Apr-14 23:01 Up @4875.0f					Date: 07-Apr-14 00:20:52	

HALLIBURTON				
INPUTS, DELAYS AND FILTERS TABLE				
Mnemonic	Input Description			Filter Length (ft)
		Delay (ft)	Filter Type	
Depth Panel				
TENS	Tension	0.00	NO	
Rwa / CrossPlot				
TPUL	Tension Pull	33.76	NO	
BS	Bit Size	33.76	NO	
HDIA	Measured Hole Diameter	0.00	NO	
SP Sub				

SP Sub

PLTC	Plot Control Mask	30.06	NO	
SP	Spontaneous Potential	30.06	BLK	1.250
SPR	Raw Spontaneous Potential	30.06	NO	
SPO	Spontaneous Potential Offset	30.06	NO	
GTET				
TPUL	Tension Pull	22.04	NO	
GR	Natural Gamma Ray API	22.04	TRI	1.750
GRU	Unfiltered Natural Gamma Ray API	22.04	NO	
EGR	Natural Gamma Ray API with Enhanced Vertical Resolution	22.04	W	1.416 , 0.750
HDIA	Measured Hole Diameter	0.00	NO	
ACCZ	Accelerometer Z	0.00	BLK	0.083
DEVI	Inclination	0.00	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 Reference 12 KHz Real Signal	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	
HDIA	Measured Hole Diameter	0.00	NO	
Data: HEFT_#4-5\0002 GTET_ACRT\IDLE			Date: 07-Apr-14 00:20:11	

COMPANY	HERMAN L. LOEB, LLC.		
WELL	HEFT #4-5		
FIELD	EINSEL		
COUNTY	KIOWA	STATE	KANSAS
HALLIBURTON		ARRAY COMPENSATED TRUE RESISTIVITY LOG	