Schlumberger

Company: **QUICKSILVER RESOURCES INC.**

Well: **K−Diamond 21−21**
Field: **Bell Rock**
County: **Moffat** State: **Colorado**

Company: QUICKSILVER RESOURCES IN
Well: K−Diamond 21−21
Location: SHL:NE 1/4,NW 1/4 S21, 2047'F
Field: Bell Rock
County: Moffat

Platform Express
Array Induction Tool
BHC

LOCATION

SHL:NE 1/4,NW 1/4 S21, 2047'FWL&651'FSL
BHL:NE 1/4,NW 1/4 S21, 2047'FWL&651'FSL

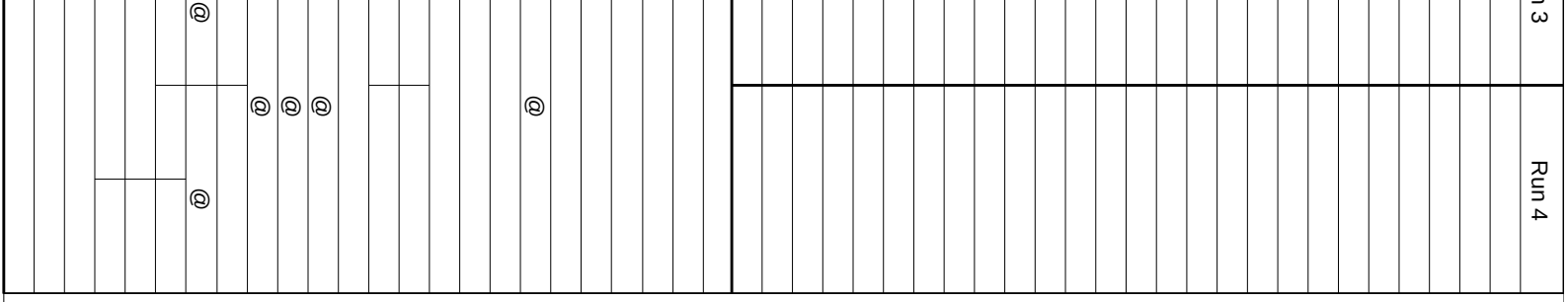
Elev.: K.B. 6319.00 ft
G.L. 6303.00 ft
D.F. 6319.00 ft

Permanent Datum: Ground Level Elev.: 6303.00 ft
Log Measured From: Kelly Bushing 16.00 ft above Perm. Datum
Drilling Measured From: Kelly Bushing

API Serial No.	Section	Township	Range
050810765600	21	6N	92W

	Run 1	Run 2	Run
Logging Date	11−Jul−2011		
Run Number	One		
Depth Driller	5185 ft		
Schlumberger Depth	5191 ft		
Bottom Log Interval	5183 ft		
Top Log Interval	1217 ft		
Casing Driller Size @ Depth	9.625 in @ 1217 ft	@	
Casing Schlumberger	1217 ft		
Bit Size	8.750 in		
Type Fluid In Hole	OBM		
MUD Density / Viscosity	8.35 lbm/gal / 47 s		
MUD Fluid Loss / PH	/		
MUD Source Of Sample	N/A		
RM @ Measured Temperature	@	@	
RMF @ Measured Temperature	@	@	
RMC @ Measured Temperature	@	@	
Source RMF / RMC	N/A / N/A		
RM @ MRT / RMF @ MRT	@ 125 / @ 125	@ / @	
Maximum Recorded Temperatures	125 degF		
Circulation Stopped / Time	11−Jul−2011 / 5:00		
Logger On Bottom / Time	11−Jul−2011 / 14:00		
Unit Number / Location	2267 / Rock Springs		
Recorded By	Arvin Shi		
Witnessed By	Chris Loftis		

	Run 1	Run 2	Run
Logging Date			
Run Number			
Depth Driller			
Schlumberger Depth			
Bottom Log Interval			
Top Log Interval			
Casing Driller Size @ Depth	@		
Casing Schlumberger			
Bit Size			
Type Fluid In Hole			
MUD Density / Viscosity	/		
MUD Fluid Loss / PH	/		
MUD Source Of Sample			
RM @ Measured Temperature	@		
RMF @ Measured Temperature	@		
RMC @ Measured Temperature	@		
Source RMF / RMC	/		
RM @ MRT / RMF @ MRT	@ / @		
Maximum Recorded Temperatures			
Circulation Stopped / Time	/		
Logger On Bottom / Time	/		
Unit Number / Location	/		
Recorded By			
Witnessed By			



DEPTH SUMMARY LISTING

Date Created: 11−JUL−2011 14:27:07

Depth System Equipment

Depth Measuring Device		Tension Device		Logging Cable	
Type:	IDW−B	Type:	CMTD−B/A	Type:	7−46P XS
Serial Number:	4711	Serial Number:	2697	Serial Number:	6363
Calibration Date:	8−Dec−2010	Calibration Date:	15−Jun−2011	Length:	23755 FT
Calibrator Serial Number:	33	Calibrator Serial Number:	88310		
Calibration Cable Type:	7−46P	Number of Calibration Points:	10	Conveyance Method:	Wireline
Wheel Correction 1:	−5	Calibration RMS:	8	Rig Type:	LAND
Wheel Correction 2:	−4	Calibration Peak Error:	20		

Depth Control Parameters

Log Sequence:	First Log In the Well
Rig Up Length At Surface:	0.00 FT
Rig Up Length At Bottom:	0.00 FT
Rig Up Length Correction:	0.00 FT
Stretch Correction:	3.00 FT
Tool Zero Check At Surface:	0.80 FT

Depth Control Remarks

1. All Schlumberger Depth Control Procedures Followed
2. IDW used as primary depth control device, Z−Chart used for secondary depth control
3. Rig up lengths not performed due to hole conditions
4. IDW put in service on 01−Mar−2011
5.
6.

OTHER SERVICES1	OTHER SERVICES2
OS1: None	OS1:
OS2:	OS2:
OS3:	OS3:
OS4:	OS4:
OS5:	OS5:

REMARKS: RUN NUMBER 1	REMARKS: RUN NUMBER 2
1. Tool ran as per tool sketch.	
2. Tool ran with 2*1" standoffs.	
3. Density compensated for bit size.	
4. Neutron compensated for hole size and stand−off.	
5. Tool ran with 2*centralizer to center DSLT.	
6. Max recorded temperature was 125 by HGNS sensor.	
7. TDL was 5191 ft recorded from tension pick up.	

8. Casing shoe detected is 1217 ft

Your Crew : Douglas Robinson & Eddie Jones

RUN 1		
SERVICE ORDER #:	BOAA−00027	
PROGRAM VERSION:	18C0−147	
FLUID LEVEL:		
LOGGED INTERVAL	START	STOP

RUN 2		
SERVICE ORDER #:		
PROGRAM VERSION:		
FLUID LEVEL:		
LOGGED INTERVAL	START	STOP

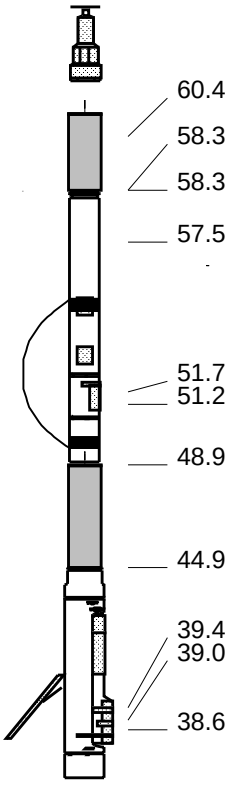
EQUIPMENT DESCRIPTION

RUN 1 RUN 2

SURFACE EQUIPMENT

GSR−J 5411
NCT−B
CNB−AB
NCS−VB
WITM (DTS)−A

DOWNHOLE EQUIPMENT

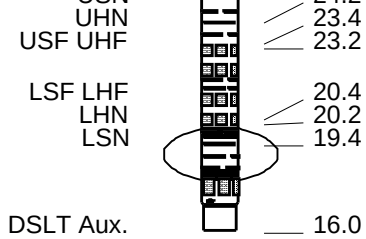


LEH−QT 64.2
LEH−QT 237

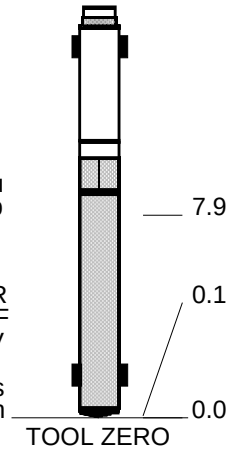
DTC−H 61.3
ECH−KC 10355
DTCH0−A 8699
CTEM 60.4
TelStatus
ToolStatu 58.3
HGNS HTEM
HMCA 58.3

HILTH−FTB 58.3
HGNSD−H 4828
HMCA−H
HGNH 3940
NLS−KL
NSR−F 5153
HACCZ−H 6300
HCNT−H
HGR
HRCC−H 4881
HRMS−H 4928
HRGD−H 4999
GLS−VJ 5411
MCFL Device−H
HILT Nucl. LS−H 43212
HILT Nucl. SS−H 42285
HILT Nucl. BS−H 41254
BOW−SPR
NPV−N
HGNS Gamm 57.5
HGNS Neut 51.7
HGNS Neut 51.2
HGNS sens 48.9
HRCC cart 44.9
MCFL 39.4
HILT cali 39.0
HRDD−LS
HRDD−SS
HRDD−BS 38.6

DSLT−FTB 36.6
DSLC−B
ECH−KH
SLS−W
USN 24.2



AIT−M
AMIS−A 1251
AMRM−A



16.0
1.0 IN
Standoff

1.0 IN
Standoff

MAXIMUM STRING DIAMETER 5.88 IN
MEASUREMENTS RELATIVE TO TOOL ZERO
ALL LENGTHS IN FEET

Client: QUICKSILVER RESOURCES INC.
Well: K−Diamond 21−21
Field: Bell Rock
State: Colorado
Country: USA

Drawing Date: 7/11/2011
API #:

Rig Name: DHS 6
Reference Datum: Ground Level
Elevation: 6303.0 ft

Production String	(in) OD	(in) ID	(ft) MD	Well Schematic	(ft) MD	(in) OD	(in) ID	Casing String
					0.0	9.625		Casing String, 36 lbm/ft
					1217.0	9.625		Casing Shoe
					1217.0	8.750		Borehole Segment

						5185.0	8.750	Borehole Segment Bottom

All Depth’s are Driller’s depth

Schlumberger

Main Pass

MAXIS Field Log

Company: QUICKSILVER RESOURCES INC. **Well: K−Diamond 21−21**

Input DLIS Files

	AIT_SONIC_TLD_MCFL_027PUP	FN:33		15−Aug−2011 15:44	5194.5 FT	1175.0 FT

Output DLIS Files

DEFAULT	AIT_SONIC_TLD_MCFL_004PUP	FN:3	PRODUCER	15−Aug−2011 16:21	5194.5 FT	1175.0 FT

Integrated Hole/Cement Volume Summary

Hole Volume = 1638.71 F3

Cement Volume = 586.92 F3 (assuming 7.00 IN casing O.D.)

Computed from 5152.0 FT to 1217.0 FT using data channel(s) HCAL

QP System Version: 17C0−154

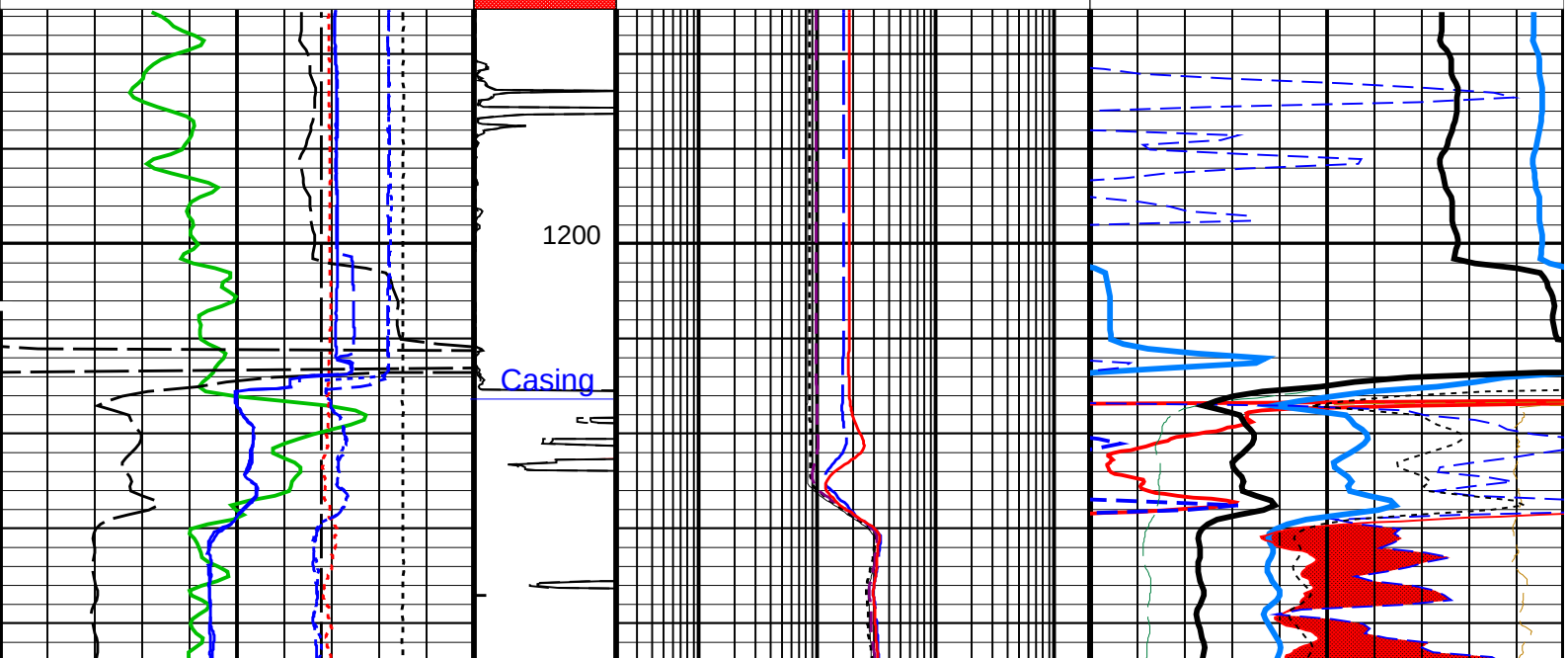
OP System Version: 17C0-154

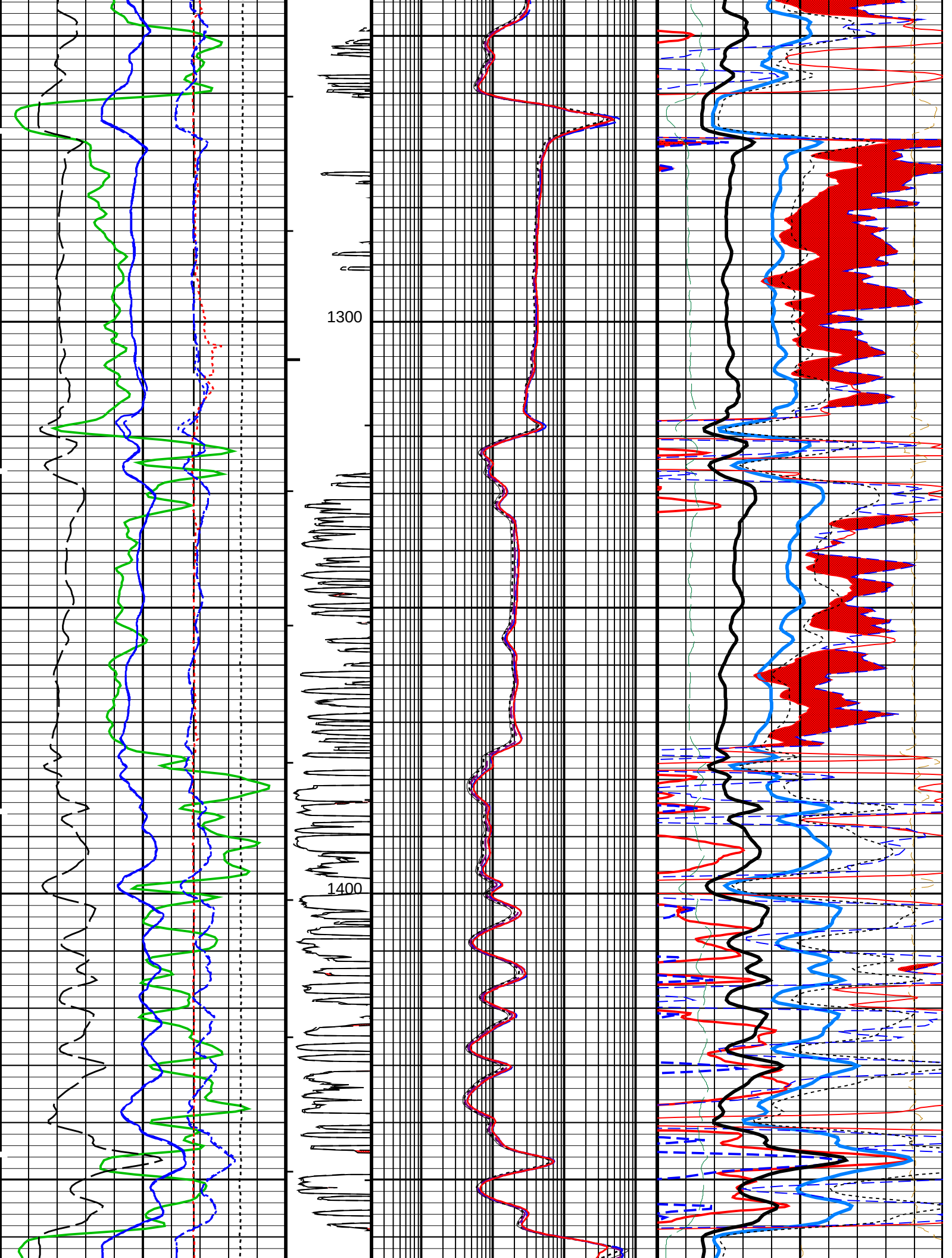
AIT-M	17C0-154	DSLT-FTB	17C0-154
HILTH-FTB	17C0-154	DTC-H	17C0-154

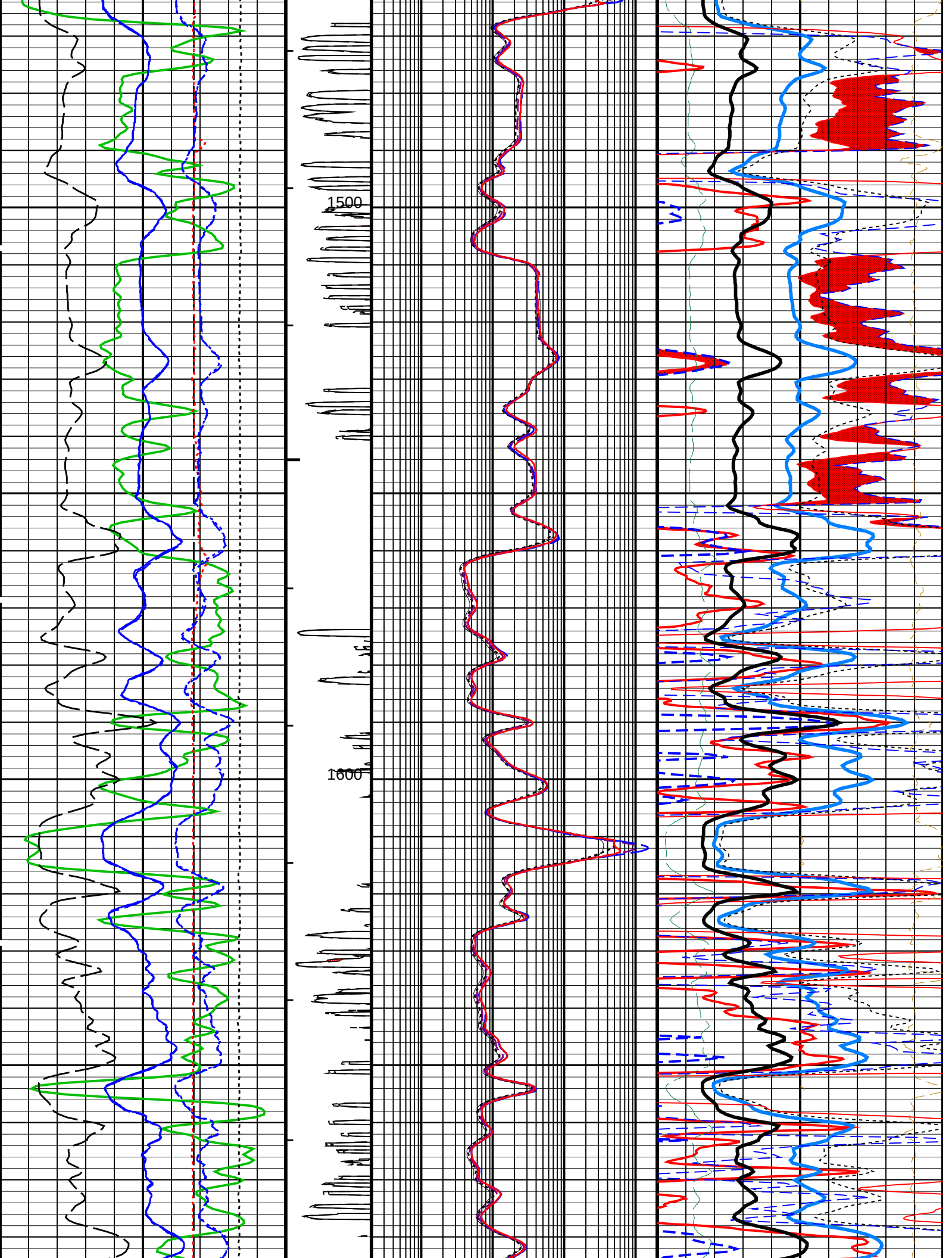
PIP SUMMARY

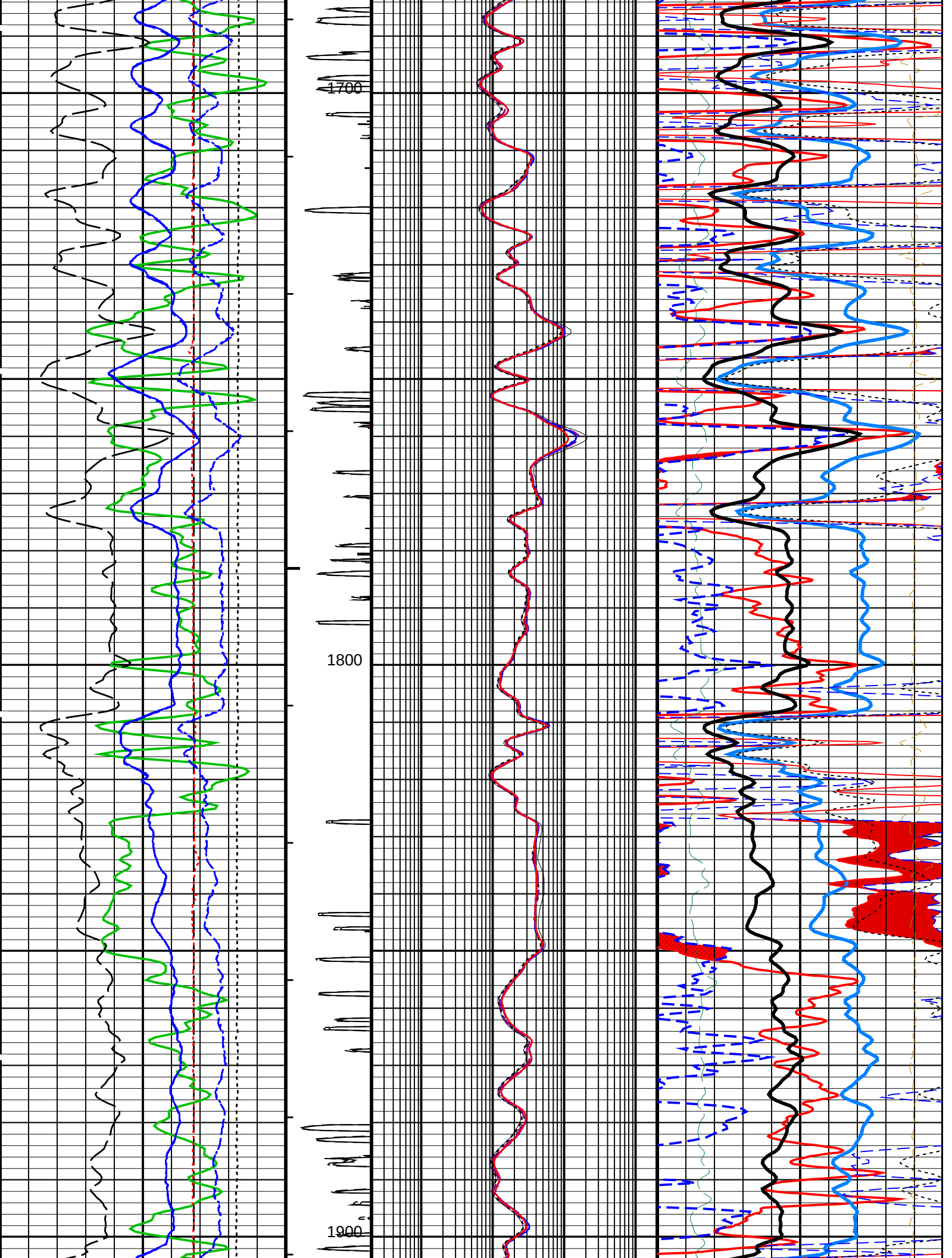
- Integrated Hole Volume Minor Pip Every 10 F3
- Integrated Hole Volume Major Pip Every 100 F3
- Integrated Cement Volume Minor Pip Every 10 F3
- Integrated Cement Volume Major Pip Every 100 F3
- Time Mark Every 60 S

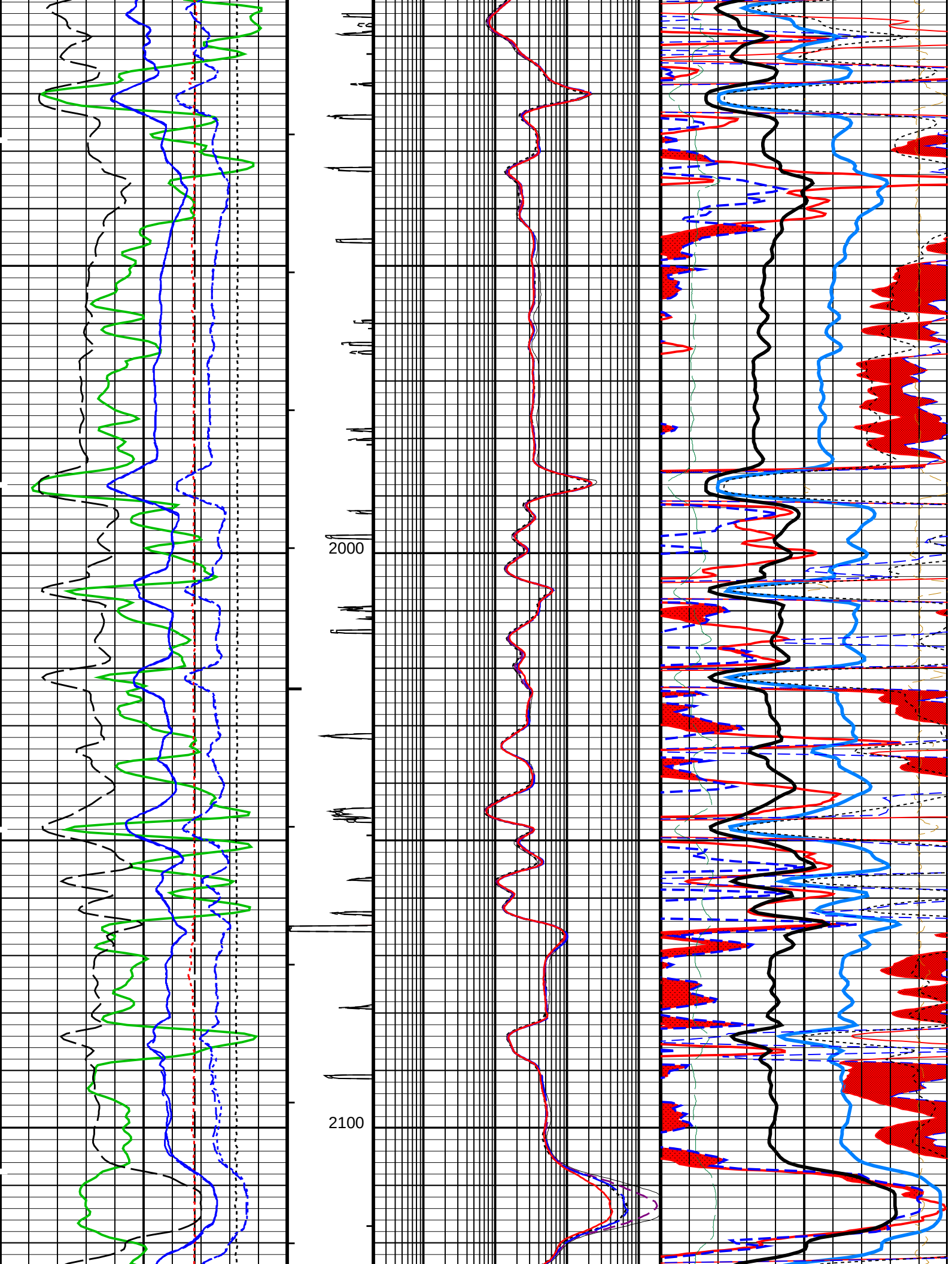
Gamma Ray (GR) 0 (GAPI) 150		Std. Res. Formation Pe (PEFZ) 0 (---- 10 / Density Correction (HDRA) −0.2 (G/C3) 0.05
Transit Time 3 (TT3) 1200 (US) 200		
Transit Time 2 (TT2) 1200 (US) 200		
Transit Time 1 (TT1) 1200 (US) 200		
Transit Time 4 (TT4) 1200 (US) 200	AIT 90 Inch Investigation (AF90) 0.2 (OHMM) 2000	Crossover From DPHZ to NPOR
Tension (TENS) 10000 (LBF) 0	AIT 60 Inch Investigation (AF60) 0.2 (OHMM) 2000	Sonic Porosity (SPHI) 0.45 (V/V) −0.15
Sonic Velocity (SVEL) 5000 (FT/S) 25000	Computed Micro Normal (HMNO) (OHMM) 0 40 / AIT 30 Inch Investigation (AF30) 0.2 (OHMM) 2000	Alpha Processed Neutron Porosity (NPOR) 0.2 (V/V) 0
HILT Caliper (HCAL) 2 (IN) 12	Computed Micro Inverse (HMIN) (OHMM) 0 40 / AIT 20 Inch Investigation (AF20) 0.2 (OHMM) 2000	Delta-T (DT) 150 (US/F) 50
Bit Size (BS) 2 (IN) 12	Area From HMIN to HMNO / AIT 10 Inch Investigation (AF10) 0.2 (OHMM) 2000	Std. Res. Density Porosity (DPHZ) 0.2 (V/V) 0

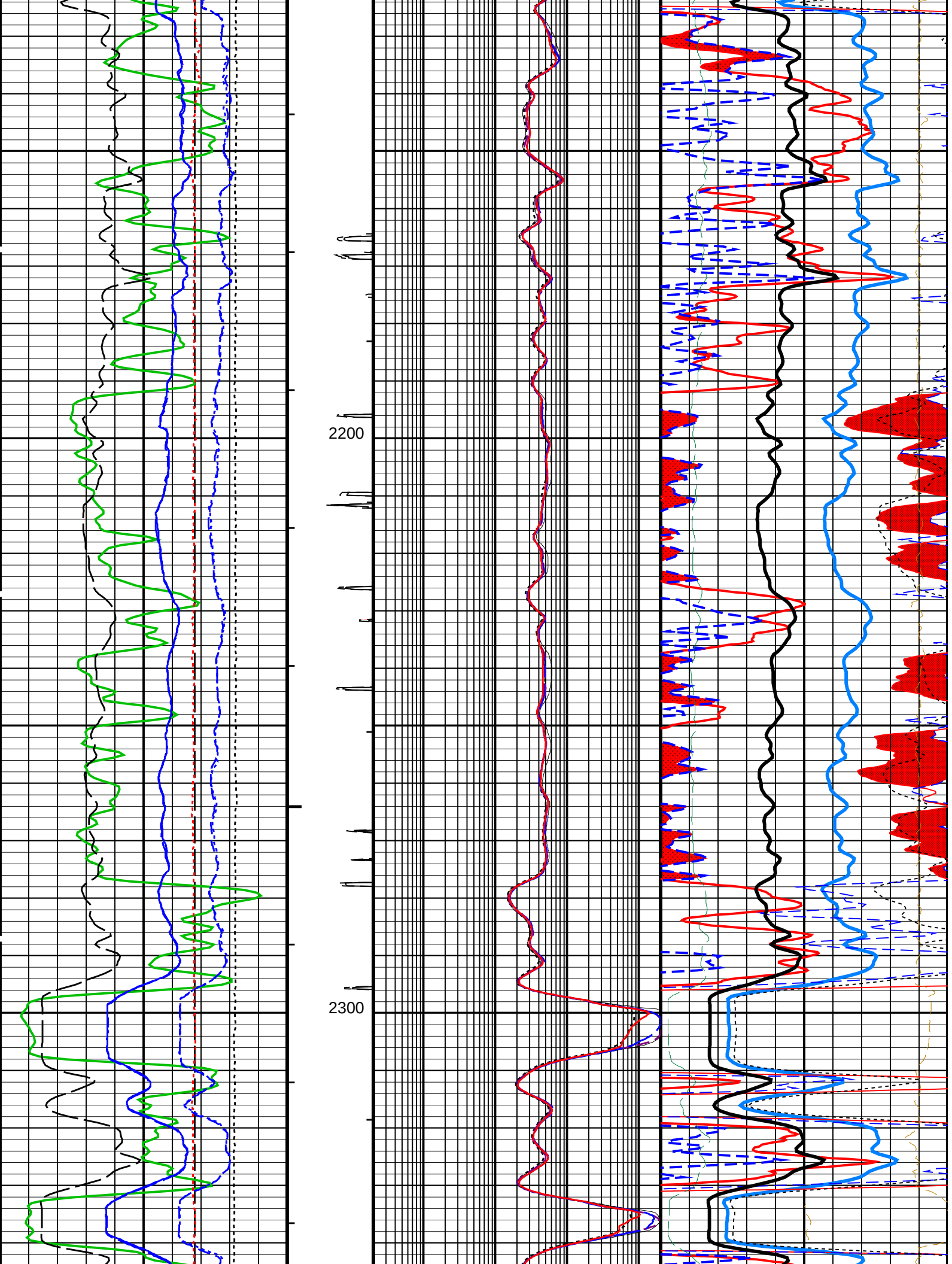


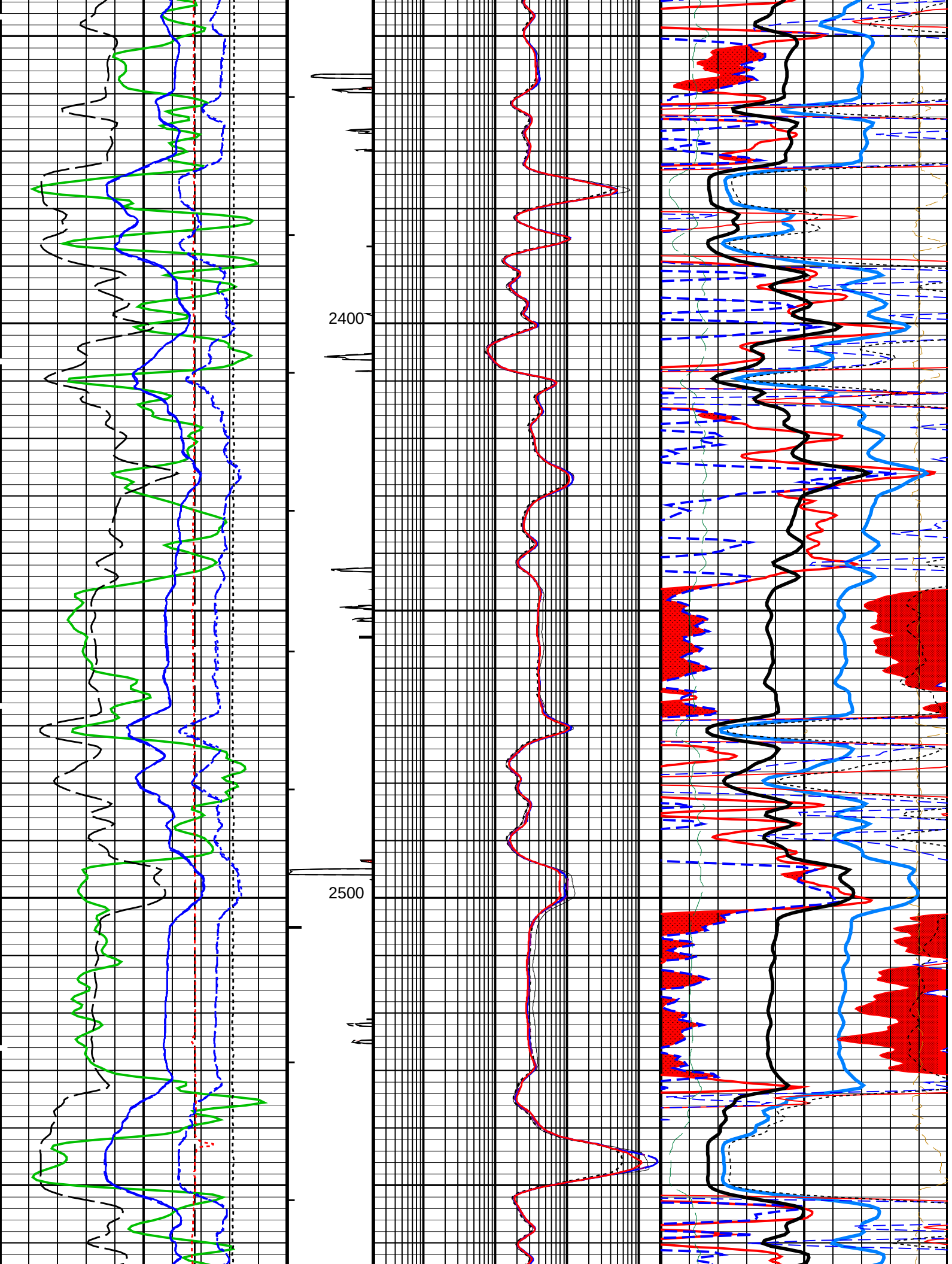

1300
1400

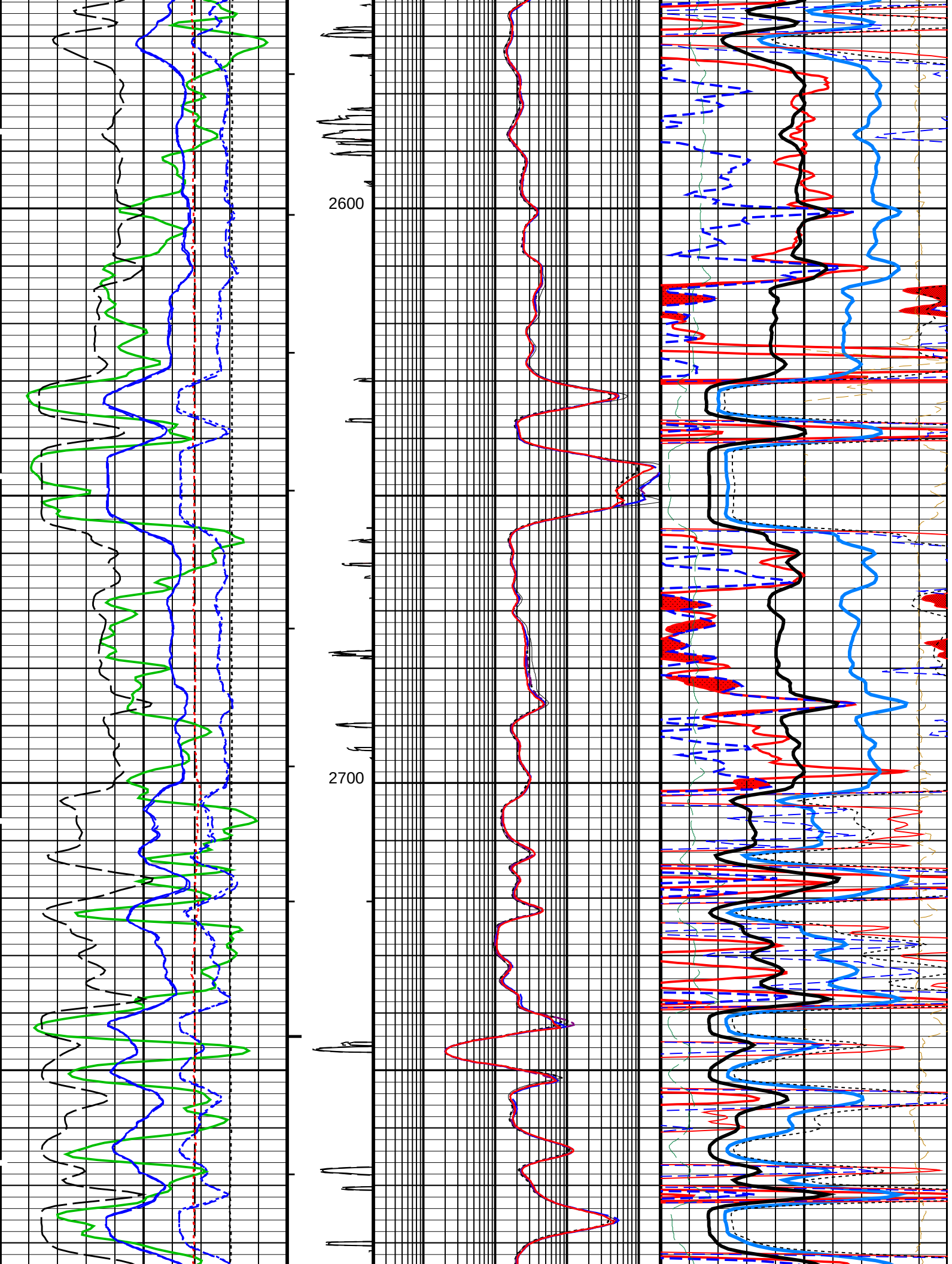

1500
1600

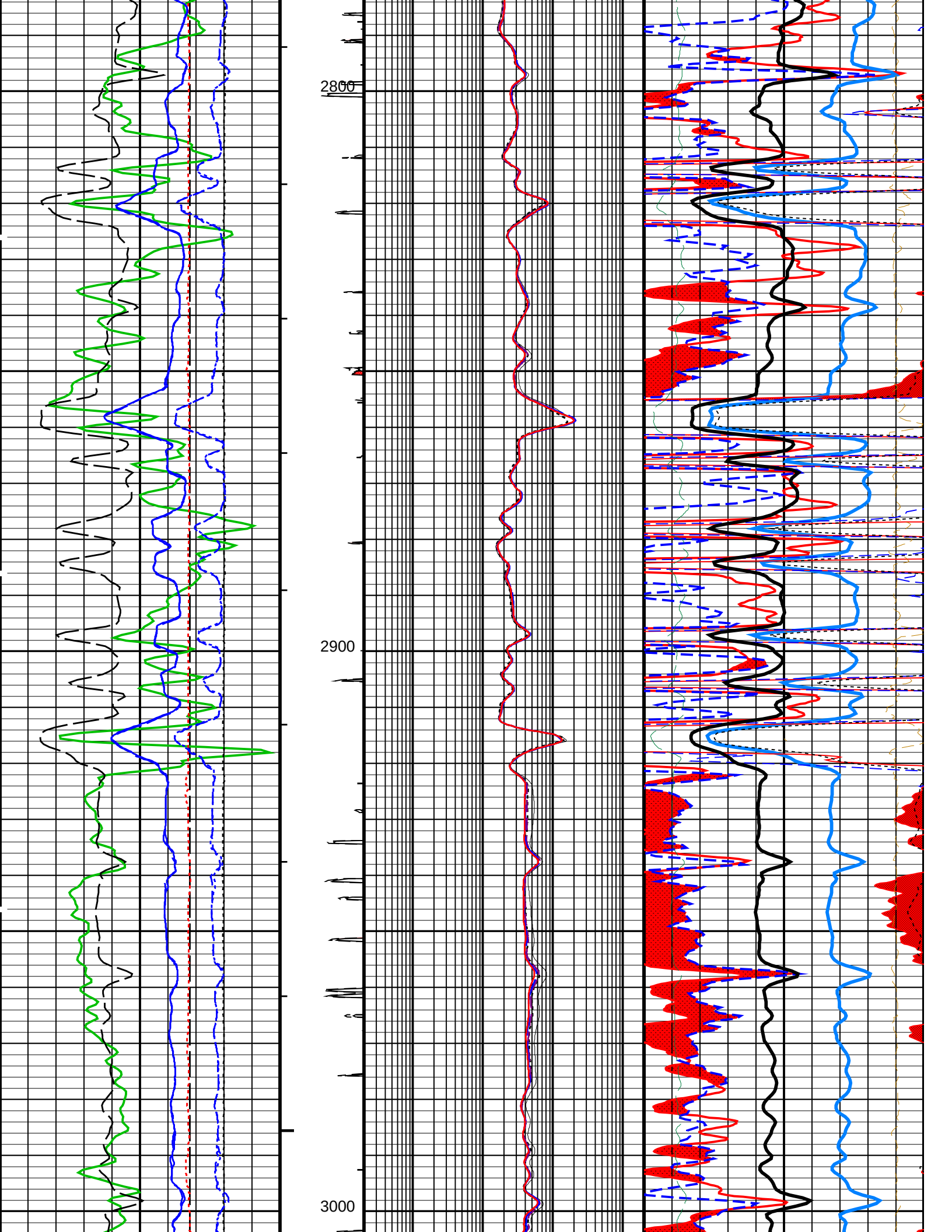

1700
1800
1900

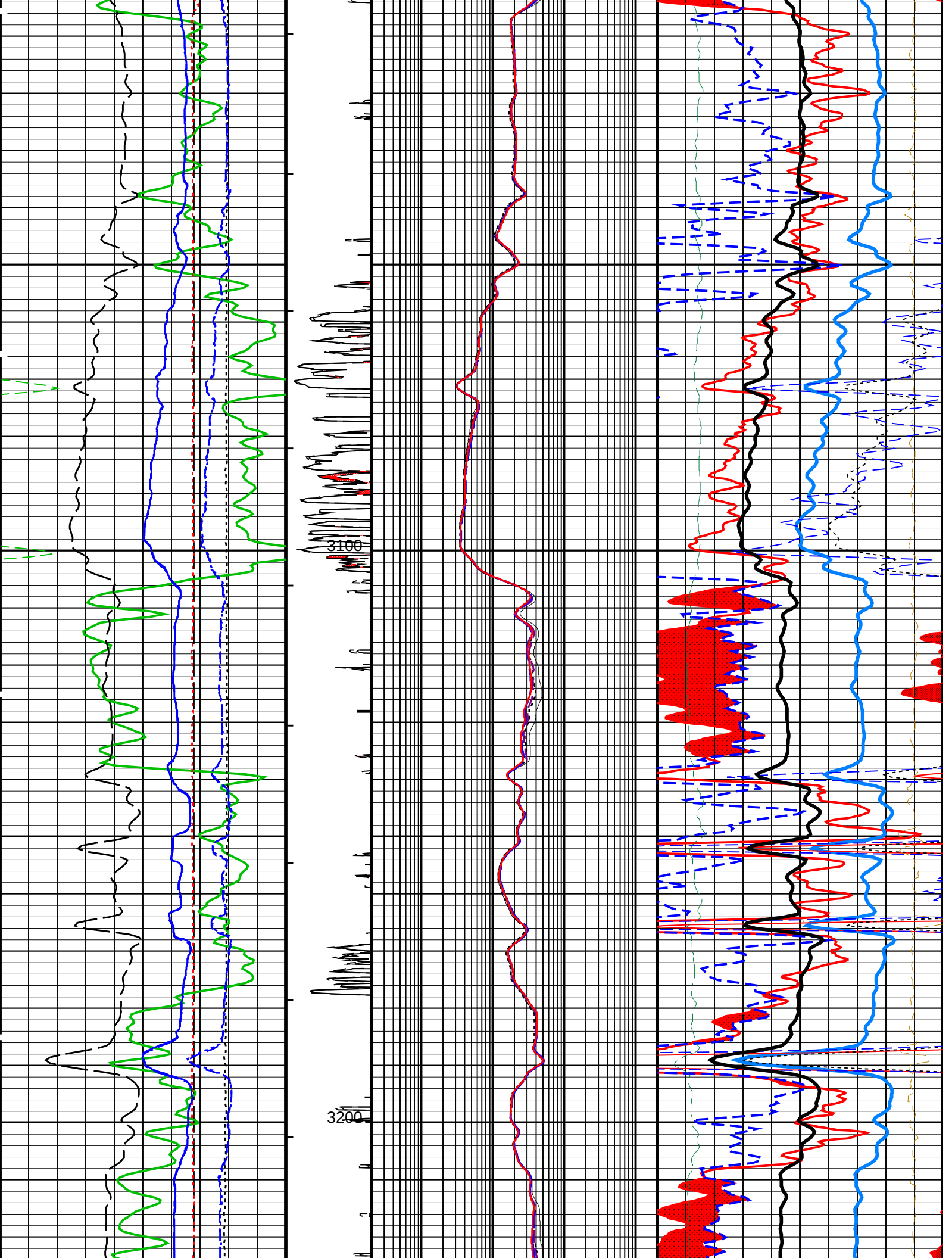

2000
2100

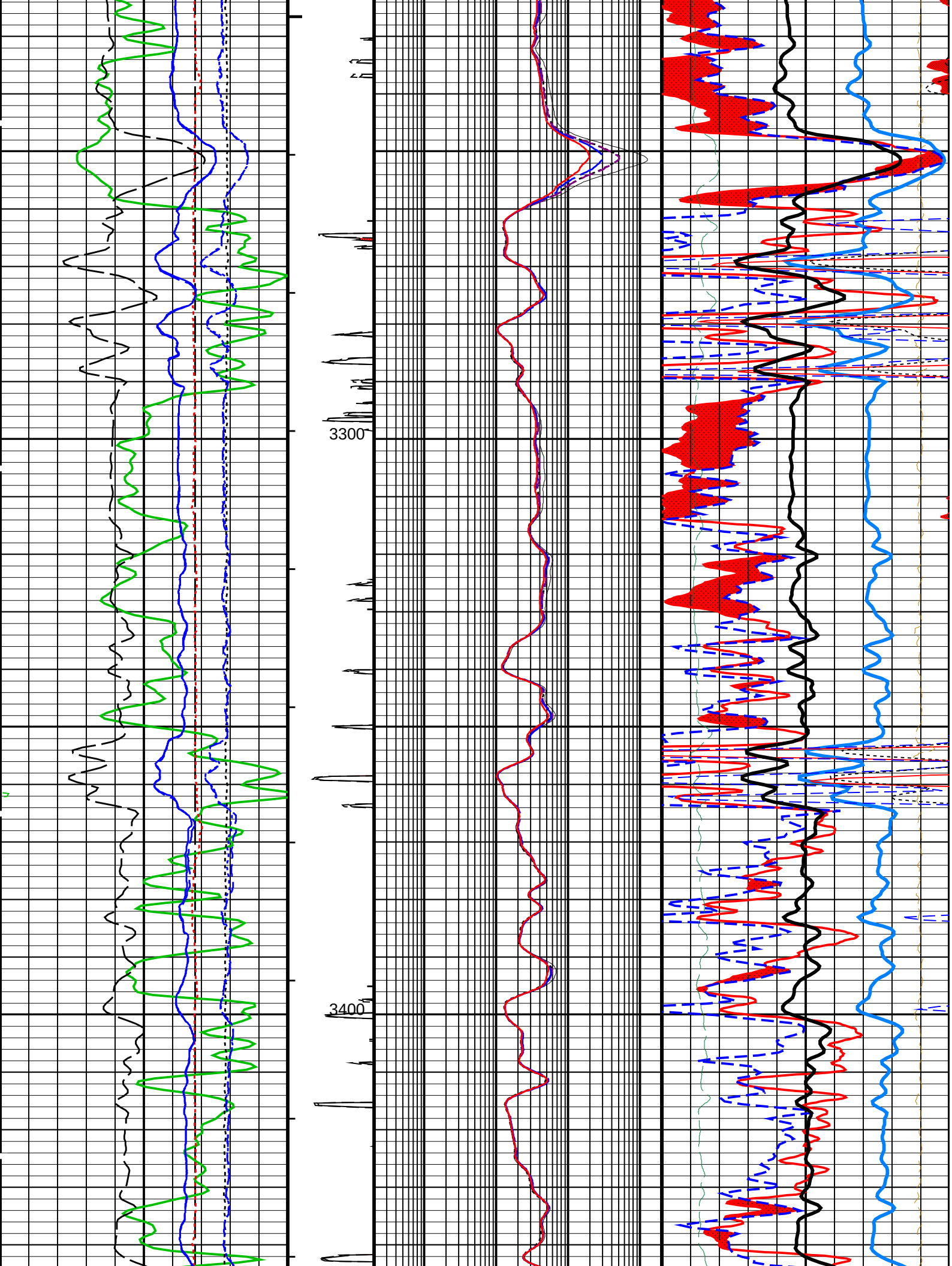

2200
2300

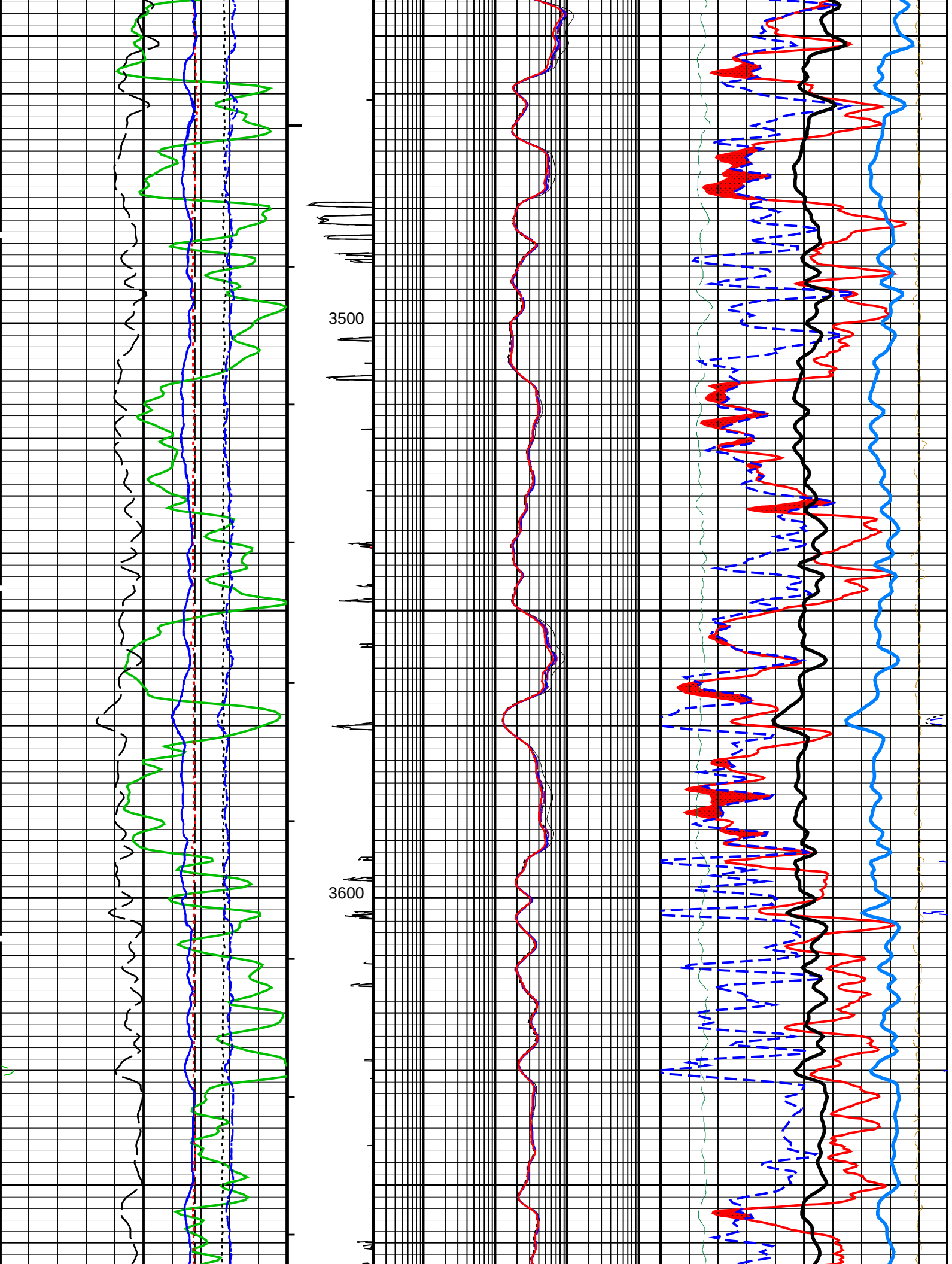

2400
2500

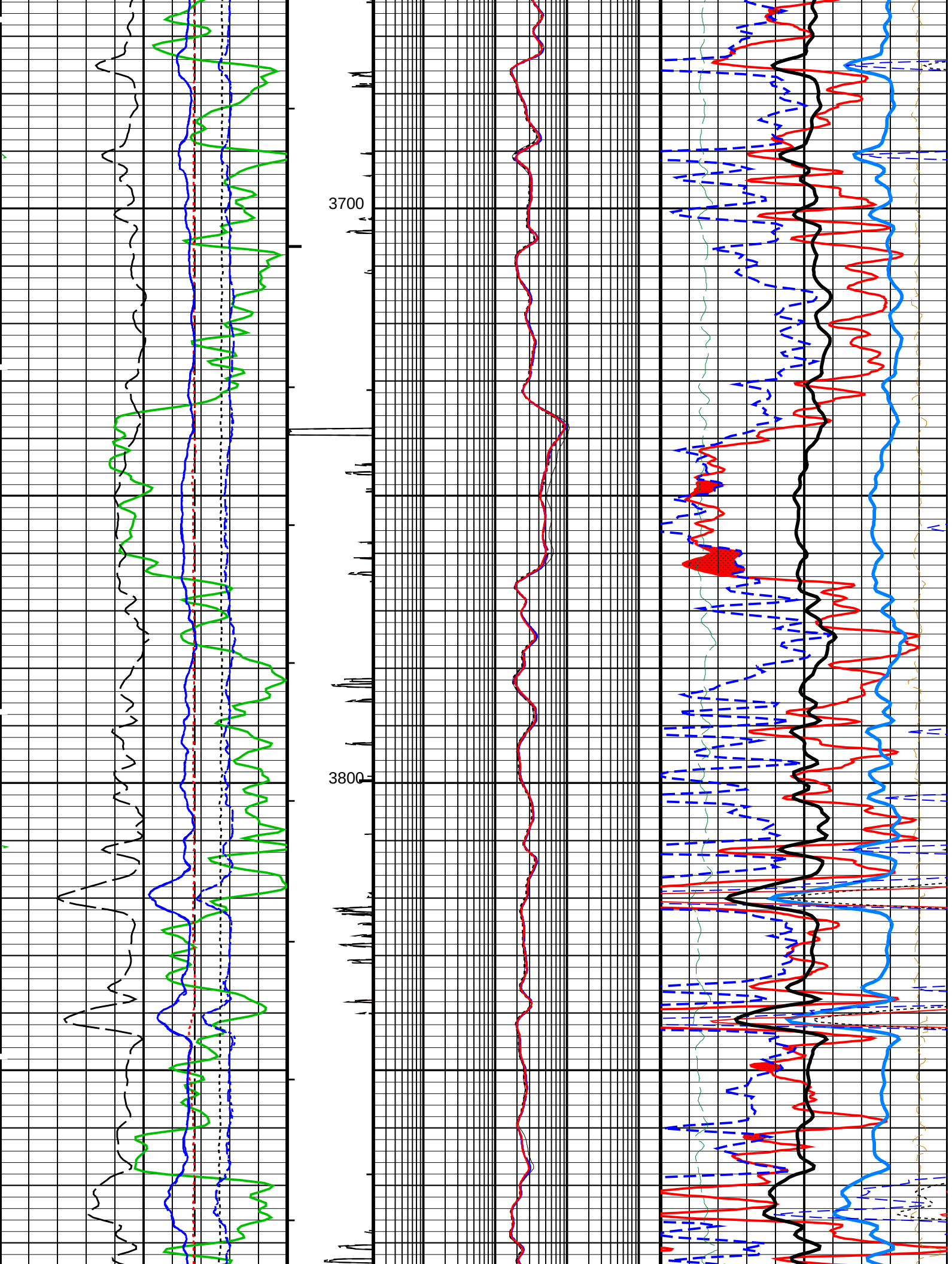

2600
2700

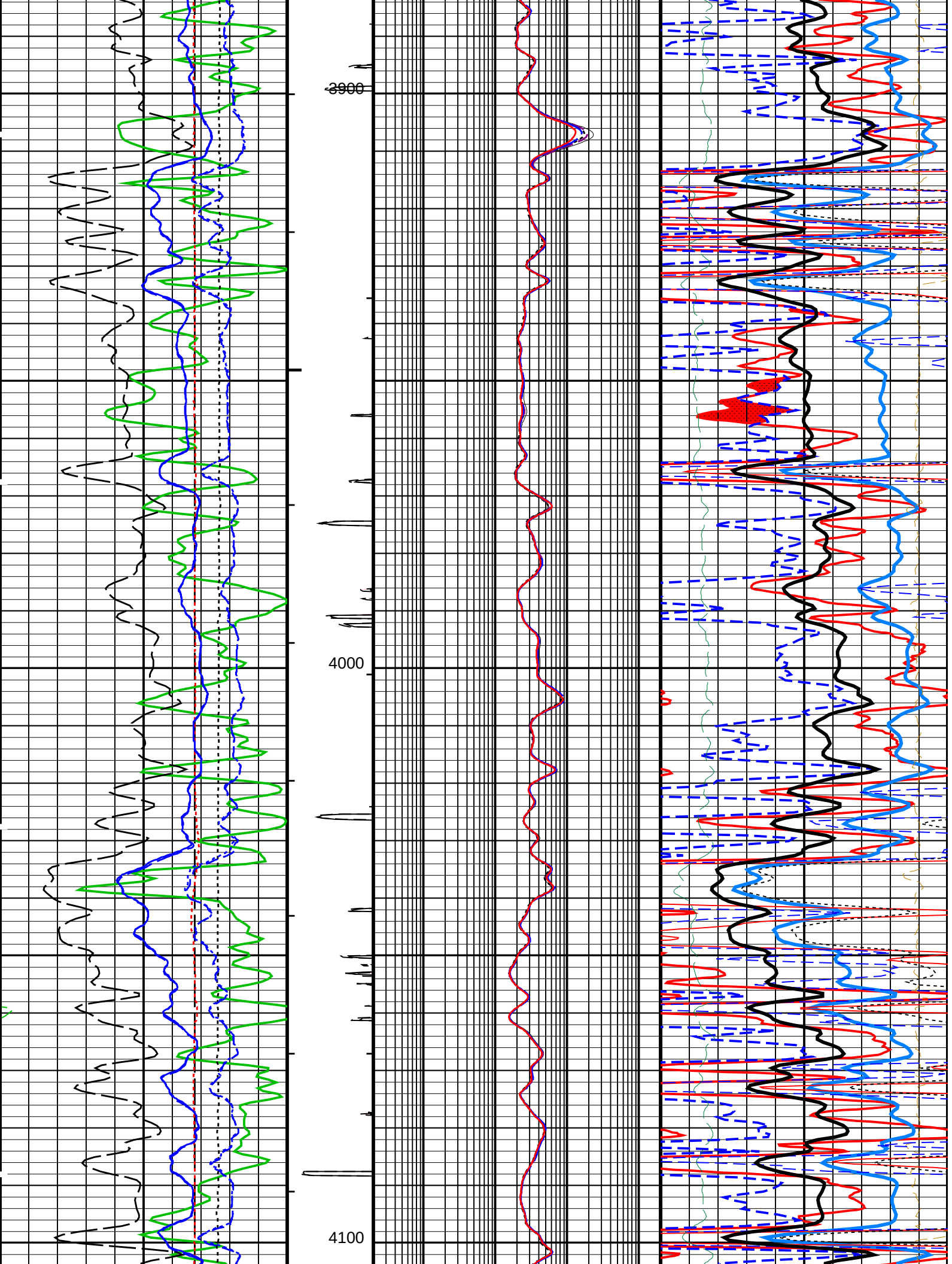

2800
2900
3000

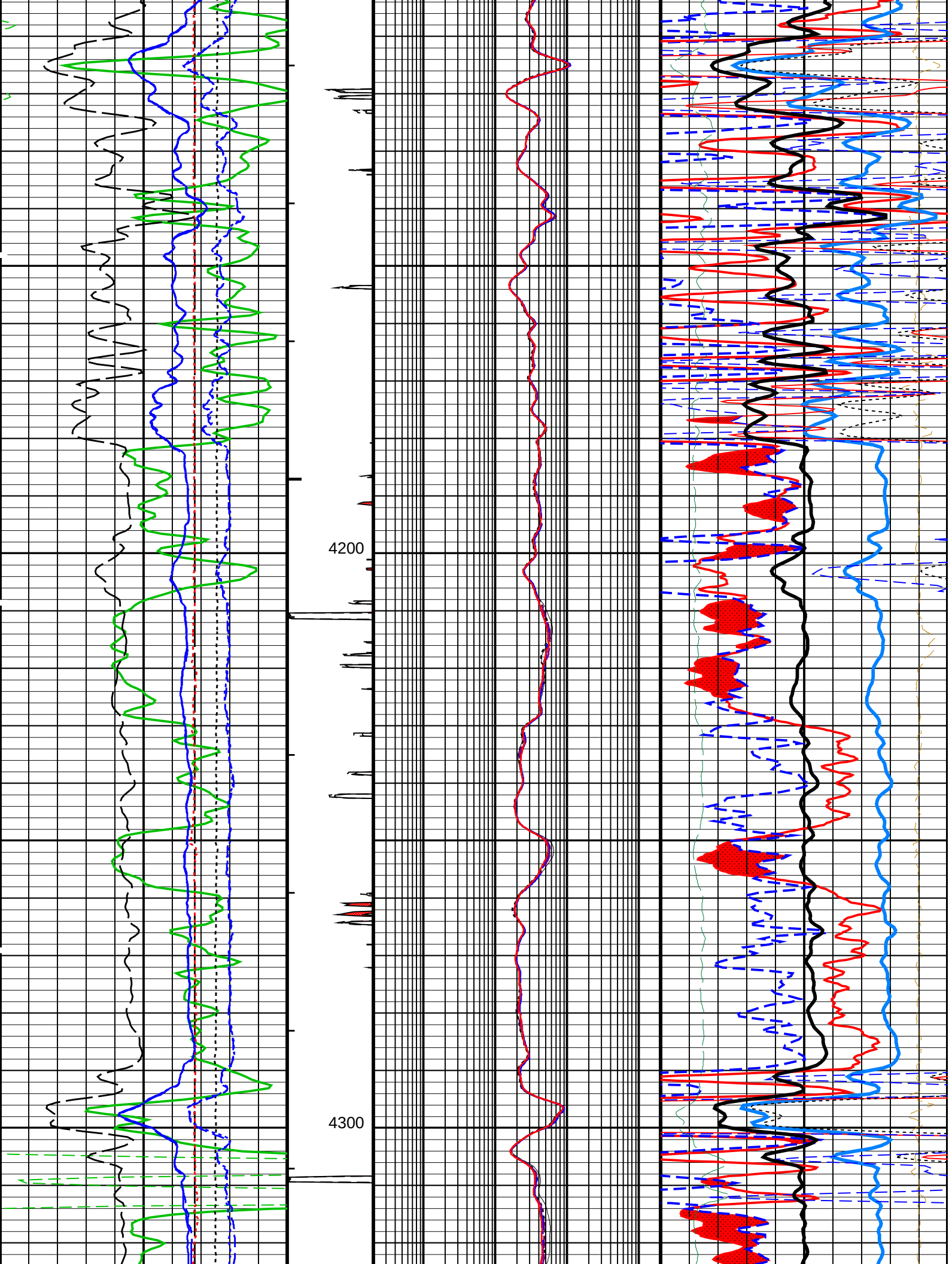

3100
3200

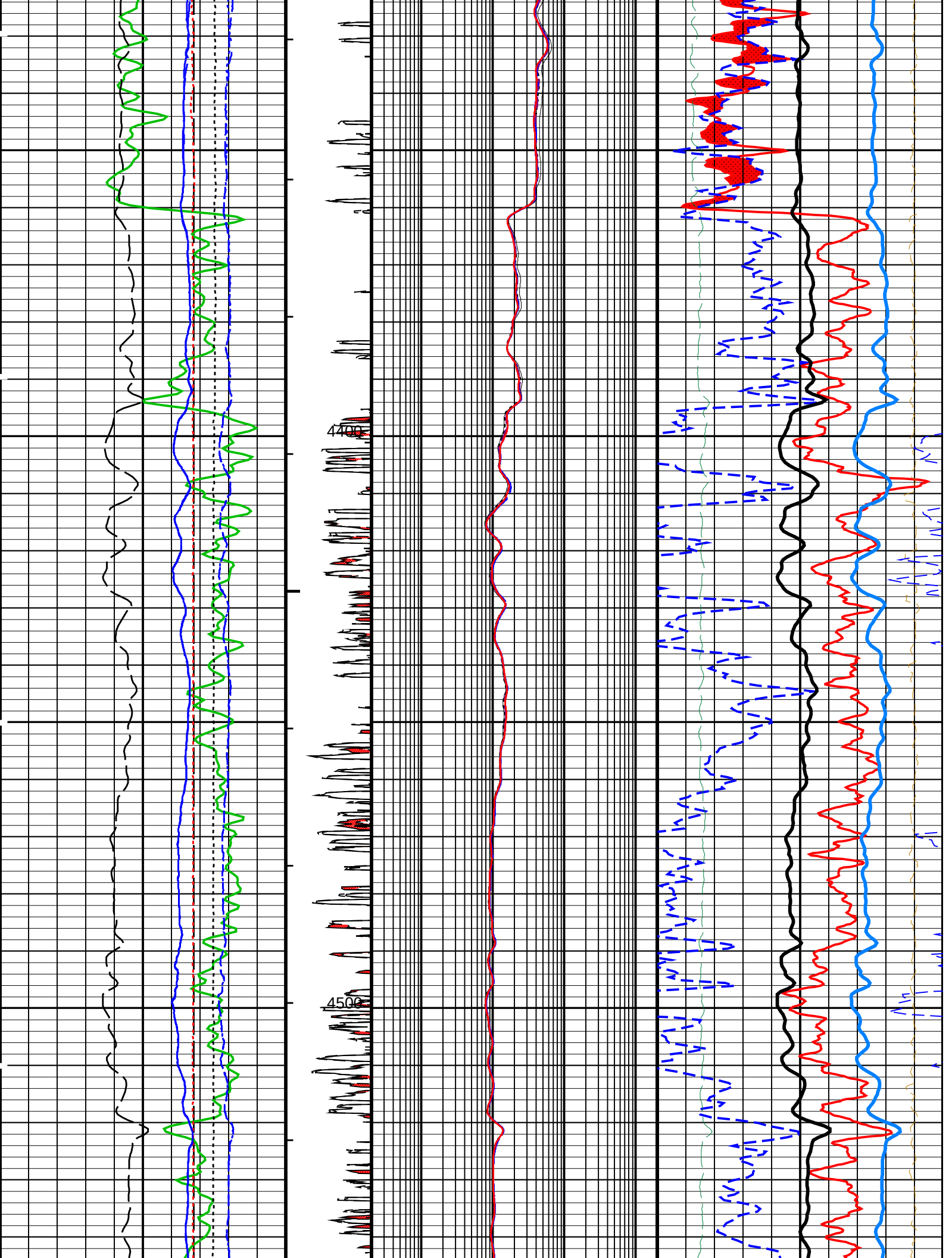

3300
3400

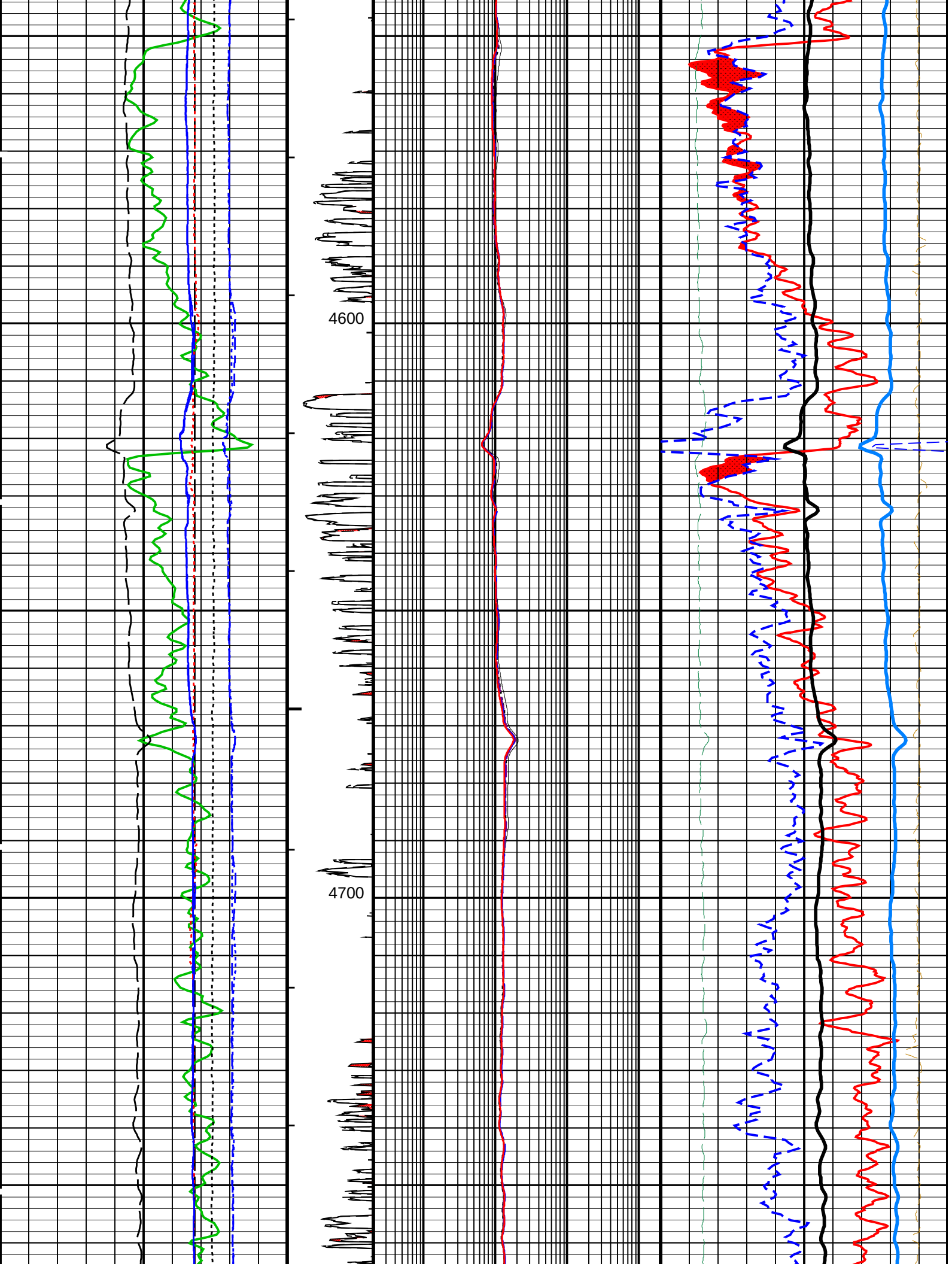

3500
3600

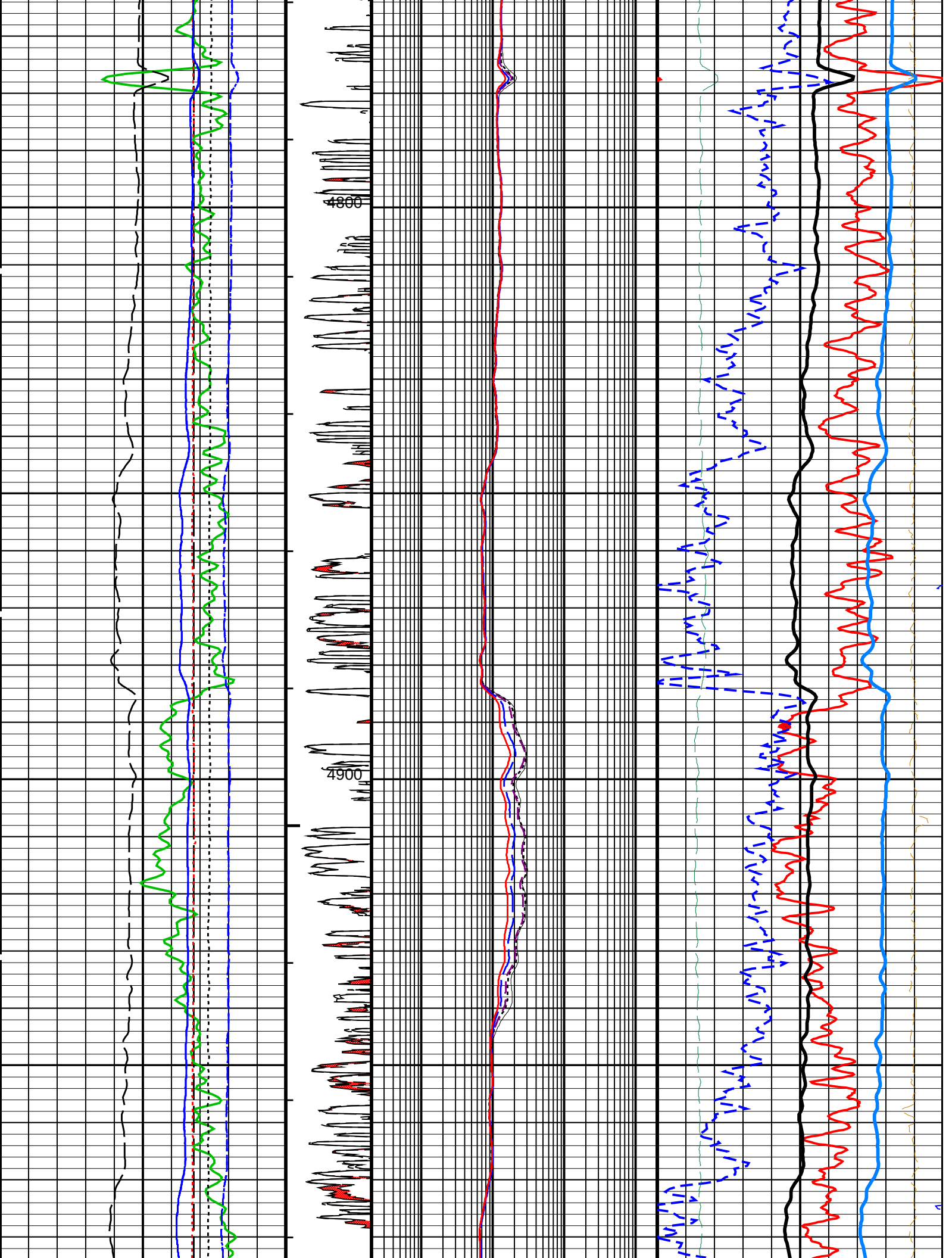

3700
3800

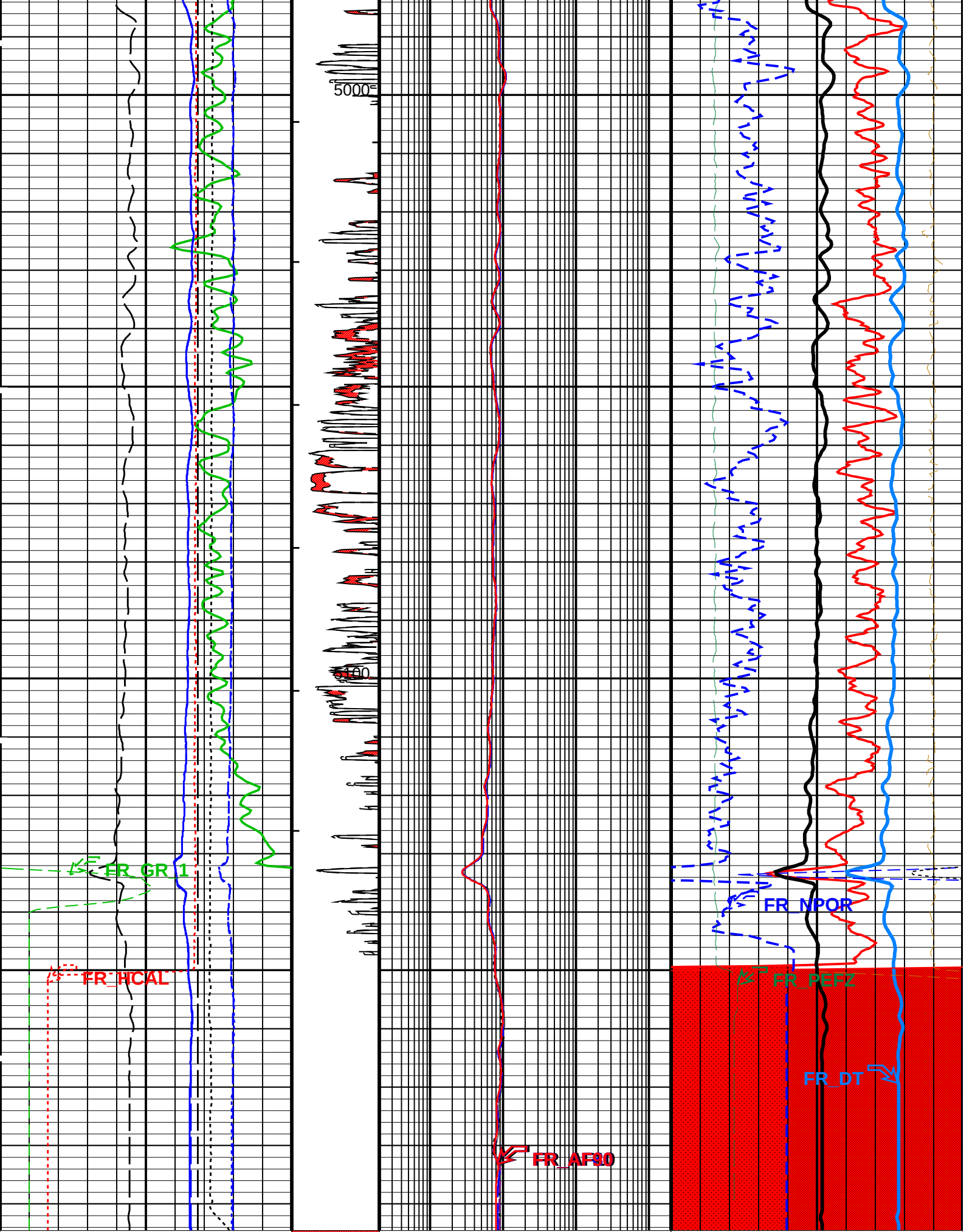

3900
4000
4100


4200
4300


4400
4500


4600
4700


4800
4900

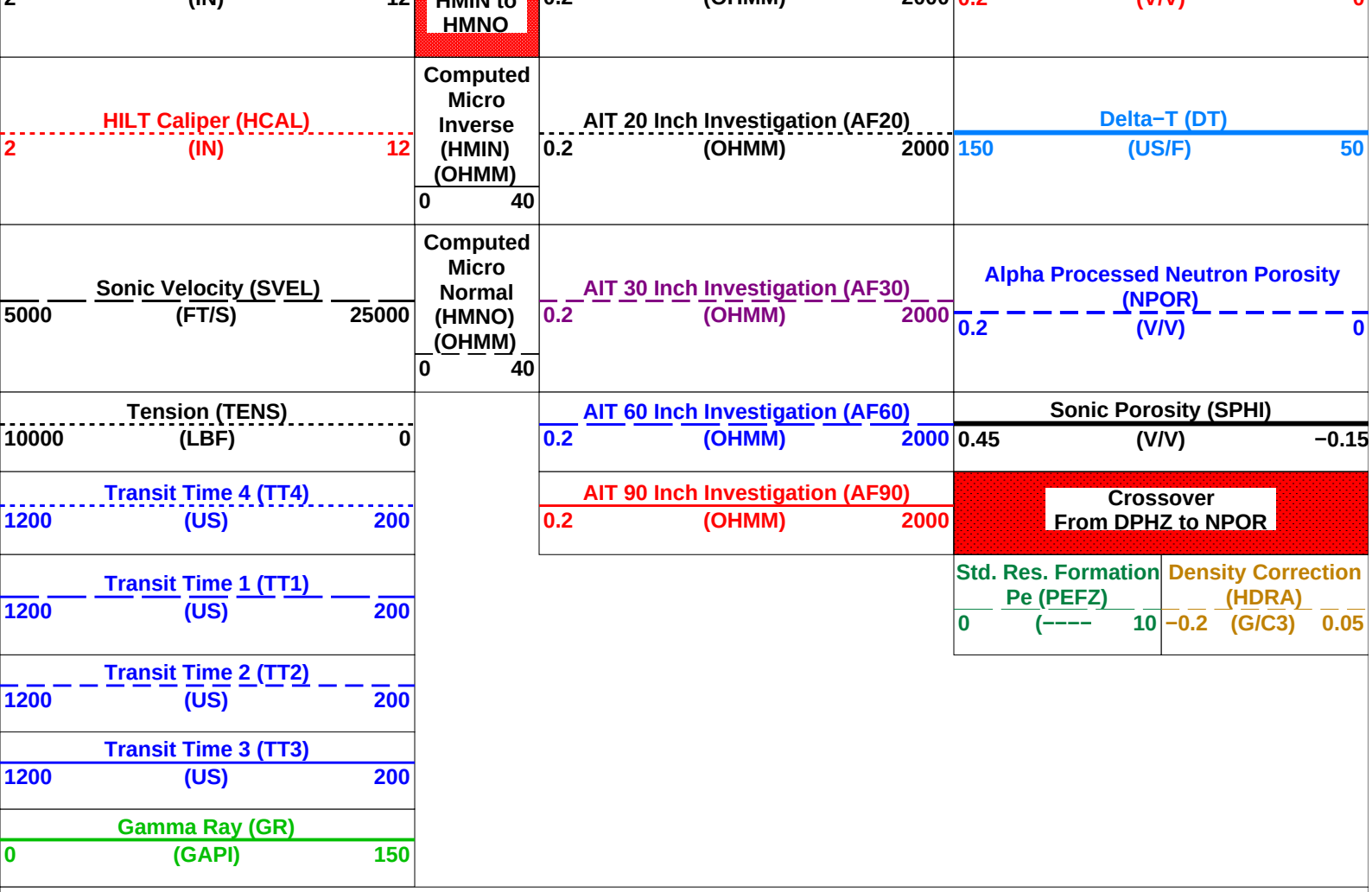


Bit Size (BS)
2 (IN) 12

Area From HMIN to

AIT 10 Inch Investigation (AF10)
0.2 (OHMM) 2000

Std. Res. Density Porosity (DPHZ)
0.2 (V/V) 0



PIP SUMMARY

- Integrated Hole Volume Minor Pip Every 10 F3
- Integrated Hole Volume Major Pip Every 100 F3
- Integrated Cement Volume Minor Pip Every 10 F3
- Integrated Cement Volume Major Pip Every 100 F3

Time Mark Every 60 S

AITM Answer Product Processing Summary. Data taken with sonde # 1251

***** Bhole Correction *****

Effective Mud Resistivity computed. Borehole diameter taken as input (see GCSE parameter)

Tool is run in ECCENTERED mode with a tool stand−off of 1.13 IN. Bit Size is 8.75 IN.

***** Input Selections to AITM Answer Product processing *****

Caliper (GCSE): HCAL Mud Resistivity (GRSE): GEN_9 Temperature (GTSE): HTEM Porosity (FPHI): DPHZ

***** Other parameters used by AITM Answer Product processing *****

Mud Sample Resistivity (RMS)	−50000.000 OHMM	Mud Sample Temperature (MST)	−50000.000 DEGF
Form Factor Exponent (FEXP)	2.000	Form Factor Numerator (FNUM)	1.000
Mud Filtrate Sample Resistivity (RMFS)	−50000.000 OHMM	Mud Filtrate Sample Temperature (MFST)	−50000.000 DEGF
Resitivity Connate Water (RW)	1.000 OHMM		

***** AITM Answer Product processing control parameters *****

Playback Mode: RECOMPUTE

(AEBC): Yes (AEBL): Yes (AERP): Yes

(ABHM): 0_ComputeMudResistivity (ABLM): 6_One_Two_and_Four (ARPM): 6_One_Two_and_Four

Parameters

DLIS Name	Description	Value
	AIT−M: Array Induction Tool − M	
ABHM	Array Induction Borehole Correction Mode	0_ComputeMudResistivity
ABHV	Array Induction Borehole Correction Code Version Number	900
ABLM	Array Induction Basic Logs Mode	6_One_Two_and_Four
ABLV	Array Induction Basic Logs Code Version Number	223
AGDE	Array Induction Casing Detection Enable	Yes

ACDE	Array Induction Casing Detection Enable	Yes	
ACEN	Array Induction Tool Centering Flag (in Borehole)	Eccentered	
ACSED	Array Induction Casing Shoe Estimated Depth	−50000	FT
AETP	Array Induction Enable Sonde Error Temp&Pres Corr	Yes	
AFRSV	Array Induction Response Set Version for Four ft Resolution	41.70.24.20	
AIGS	Array Induction Select Akima Interpolation Gating	On	
AMRF	Array Induction Mud Resistivity Factor	1	
AORSV	Array Induction Response Set Version for One ft Resolution	41.70.24.20	
ARFV	Array Induction Radial Profiling Code Version Number	701	
ARPV	Array Induction Radial Parametrization Code Version Number	232	
ASTA	Array Induction Tool Standoff	1.125	IN
ATRSV	Array Induction Response Set Version for Two ft Resolution	41.70.24.20	
ATSE	Array Induction Temperature Selection(Sonde Error Correction)	Internal	
AULV	Array Induction User Level Control	Normal	
AZRSV	Array Induction Response Set Version for Z Resolution	00.10.25.00	
BHS	Borehole Status	OPEN	
BHT	Bottom Hole Temperature (used in calculations)	125	DEGF
FEXP	Form Factor Exponent	2	
FNUM	Form Factor Numerator	1	
GCSE	Generalized Caliper Selection	HCAL	
GDEV	Average Angular Deviation of Borehole from Normal	3.7	DEG
GGRD	Geothermal Gradient	0.01	DF/F
GRSE	Generalized Mud Resistivity Selection	CHART_GEN_9	
GTSE	Generalized Temperature Selection	HSTS_HTEM	
MATR	Rock Matrix for Neutron Porosity Corrections	LIMESTONE	
SHT	Surface Hole Temperature	68	DEGF
DSLT−FTB: Digitizing Sonic Logging Tool			
	Telemetry Mode	DSLC_FTB	
	DSLT Firing Mode	BHC	
AMSG	Auxiliary Minimum Sliding Gate	140	US
CBAF	CBL Adjustment Factor	1	
CBLG	CBL Gate Width	45	US
CDTS	C−Delta−T Shale	100	US/F
DDEL	Digitizing Delay	0	US
DIVL	DSLT Depth Sampling Interval	20	
DRCS	DSLT DLIS Recording Size	250	
DSIN	Digitizing Sample Interval	10	
DTF	Delta−T Fluid	220	US/F
DTFS	DSLC Telemetry Frame Size	536	
DTM	Delta−T Matrix	56	US/F
DWCO	Digitizing Word Count	250	
GAI	Manual Gain	40	
MAHTR	Manual High Threshold Reference	120	
MGAI	Maximum Gain	60	
MNHTR	Minimum High Threshold Reference	100	
NMSG	Near Minimum Sliding Gate	140	US
NMXG	Near Maximum Sliding Gate	1010	US
RATE	Firing Rate	R15	
SFAF	Sonic Formation Attenuation Factor	3	DB/F
SGCL	Sliding Gate Closing Delta−T	150	US/F
SGDT	Sliding Gate Delta−T	50	US/F
SGW	Sliding Gate Width	120	US
SLEV	Signal Level for AGC	5000	
SPFS	Sonic Porosity Formula	RAYMER_HUNT	
SPSO	Sonic Porosity Source	DT	
WAGC	Waveform AGC Allow/Disallow	OFF	
WMOD	Waveform Firing Mode	FULL	
HILTH−FTB: High resolution Integrated Logging Tool−DTS			
BHFL	Borehole Fluid Type	OIL	
BHFL_TLD	HILT Nuclear Mud Base	OIL	
BHS	Borehole Status	OPEN	
BHT	Bottom Hole Temperature (used in calculations)	125	DEGF
BSCO	Borehole Salinity Correction Option	NO	
CCCO	Casing & Cement Thickness Correction Option	NO	
DHC	Density Hole Correction	BS	
FD	Fluid Density	1	G/C3
FEXP	Form Factor Exponent	2	
FNUM	Form Factor Numerator	1	
FSAL	Formation Salinity	−50000	PPM
FSCO	Formation Salinity Correction Option	NO	
GCLF	Germany Coal−like Formation Option	NO	
GCSE	Generalized Caliper Selection	HCAL	
GDEV	Average Angular Deviation of Borehole from Normal	3.7	DEG
GGRD	Geothermal Gradient	0.01	DF/F
GRSE	Generalized Mud Resistivity Selection	CHART_GEN_9	
GTSE	Generalized Temperature Selection	HSTS_HTEM	
HSCO	Hole Size Correction Option	YES	
MATR	Rock Matrix for Neutron Porosity Corrections	LIMESTONE	
MCCO	Mud Cake Correction Option	NO	
MCOR	Mud Correction	NATU	
MDEN	Matrix Density	2.71	G/C3
MPOF	MCFL Processing Operation Mode	ON	
MWCO	Mud Weight Correction Option	NO	
NAAC	HRDD APS Activation Correction	OFF	
NMT	HILT Nuclear Mud Type	NOBARITE	

NPRM	HRDD Processing Mode	HiRes	
NSAR	HRDD Depth Sampling Rate	1	IN
PTCO	Pressure/Temperature Correction Option	NO	
SDAT	Standoff Data Source	SOCN	
SHT	Surface Hole Temperature	68	DEGF
SOCN	Standoff Distance	0.125	IN
SOCO	Standoff Correction Option	YES	
	HOLEV: Integrated Hole/Cement Volume		
BHS	Borehole Status	OPEN	
BHT	Bottom Hole Temperature (used in calculations)	125	DEGF
FCD	Future Casing (Outer) Diameter	7	IN
GCSE	Generalized Caliper Selection	HCAL	
GDEV	Average Angular Deviation of Borehole from Normal	3.7	DEG
GGRD	Geothermal Gradient	0.01	DF/F
GRSE	Generalized Mud Resistivity Selection	CHART_GEN_9	
GTSE	Generalized Temperature Selection	HSTS_HTEM	
HVCS	Integrated Hole Volume Caliper Selection	AUTOMATIC	
MATR	Rock Matrix for Neutron Porosity Corrections	LIMESTONE	
SHT	Surface Hole Temperature	68	DEGF
	STI: Stuck Tool Indicator		
LBFR	Trigger for MAXIS First Reading Label	TDL	
STKT	STI Stuck Threshold	5	FT
TDD	Total Depth − Driller	5185.00	FT
TDL	Total Depth − Logger	5191.00	FT
	System and Miscellaneous		
BS	Bit Size	8.750	IN
BSAL	Borehole Salinity	229220.00	PPM
CSIZ	Current Casing Size	9.625	IN
CWEI	Casing Weight	36.00	LB/F
DFD	Drilling Fluid Density	8.35	LB/G
DO	Depth Offset for Playback	0.0	FT
FLEV	Fluid Level	−50000.00	FT
MST	Mud Sample Temperature	−50000.00	DEGF
PP	Playback Processing	RECOMPUTE	
RMFS	Resistivity of Mud Filtrate Sample	−50000.0000	OHMM
TD	Total Depth	5152.4	FT

Format: 5Inch Vertical Scale: 5" per 100’ Graphics File Created: 15−Aug−2011 16:21

OP System Version: 17C0−154

AIT−M	17C0−154	DSLT−FTB	17C0−154
HILTH−FTB	17C0−154	DTC−H	17C0−154

Input DLIS Files

AIT_SONIC_TLD_MCFL_027PUP	FN:33	15−Aug−2011 15:44	5194.5 FT	1175.0 FT

Output DLIS Files

DEFAULT	AIT_SONIC_TLD_MCFL_004PUP	FN:3	PRODUCER	15−Aug−2011 16:21

Schlumberger

Repeat Pass

MAXIS Field Log

Company: QUICKSILVER RESOURCES INC. Well: K−Diamond 21−21

Input DLIS Files

AIT_SONIC_TLD_MCFL_025PUP	FN:31	15−Aug−2011 16:36	1600.5 FT	1075.0 FT
AIT_SONIC_TLD_MCFL_027PUP	FN:33	15−Aug−2011 15:44	5194.5 FT	1175.0 FT

Output DLIS Files

DEFAULT	AIT_SONIC_TLD_MCFL_009PUP	FN:8	PRODUCER	15−Aug−2011 16:58 1600.5 FT 1075.0 FT

DEFAULT AIT_SONIC_TED_MCFL_005.PDF PN:8 PRODUCER 15 Aug 2011 10:58 1600.5 FT 1075.0 FT

Integrated Hole/Cement Volume Summary

Hole Volume = 145.68 F3

Cement Volume = 43.06 F3 (assuming 7.00 IN casing O.D.)

Computed from 1600.5 FT to 1217.0 FT using data channel(s) HCAL

OP System Version: 17C0−154

AIT−M	17C0−154	DSLT−FTB	17C0−154
HILTH−FTB	17C0−154	DTC−H	17C0−154

PIP SUMMARY

Integrated Hole Volume Minor Pip Every 10 F3

Integrated Hole Volume Major Pip Every 100 F3

Integrated Cement Volume Minor Pip Every 10 F3

Integrated Cement Volume Major Pip Every 100 F3

Time Mark Every 60 S

TT3_REP Curve (TT3_REP)
1200 (US) 200

TT2_REP Curve (TT2_REP)
1200 (US) 200

TT1_REP Curve (TT1_REP)
1200 (US) 200

TT4_REP Curve (TT4_REP)
1200 (US) 200

TENS_REP Curve (TENS_REP)
10000 (LBF) 0

SVEL_REP Curve (SVEL_REP)
5000 (FT/S) 25000

HCAL_REP Curve (HCAL_REP)
2 (IN) 12

GR_1_REP Curve (GR_REP)
150 (GAPI) 300

GR_REP Curve (GR_REP)
0 (GAPI) 150

BS_REP Curve (BS_REP)
2 (IN) 12

HMNO_REP Curve (HMNO_REP) (OHMM)
0 40

HMIN_REP Curve (HMIN_REP) (OHMM)
0 40

AF90_REP Curve (AF90_REP)
0.2 (OHMM) 2000

AF60_REP Curve (AF60_REP)
0.2 (OHMM) 2000

AF30_REP Curve (AF30_REP)
0.2 (OHMM) 2000

AF20_REP Curve (AF20_REP)
0.2 (OHMM) 2000

AF10_REP Curve (AF10_REP)
0.2 (OHMM) 2000

SPHI_1_REP Curve (SPHI_REP)
0.4 (V/V) 0.2

SPHI_REP Curve (SPHI_REP)
0.45 (V/V) −0.15

PEFZ_REP Curve (PEFZ_REP)
0 (−−−− 10

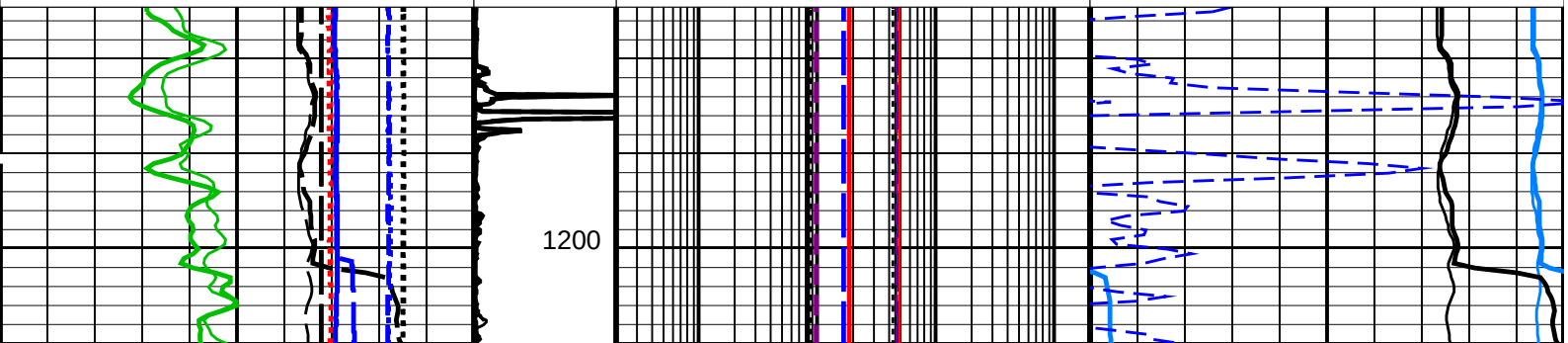
HDRA_REP Curve (HDRA_REP)
−0.2 (G/C3) 0.05

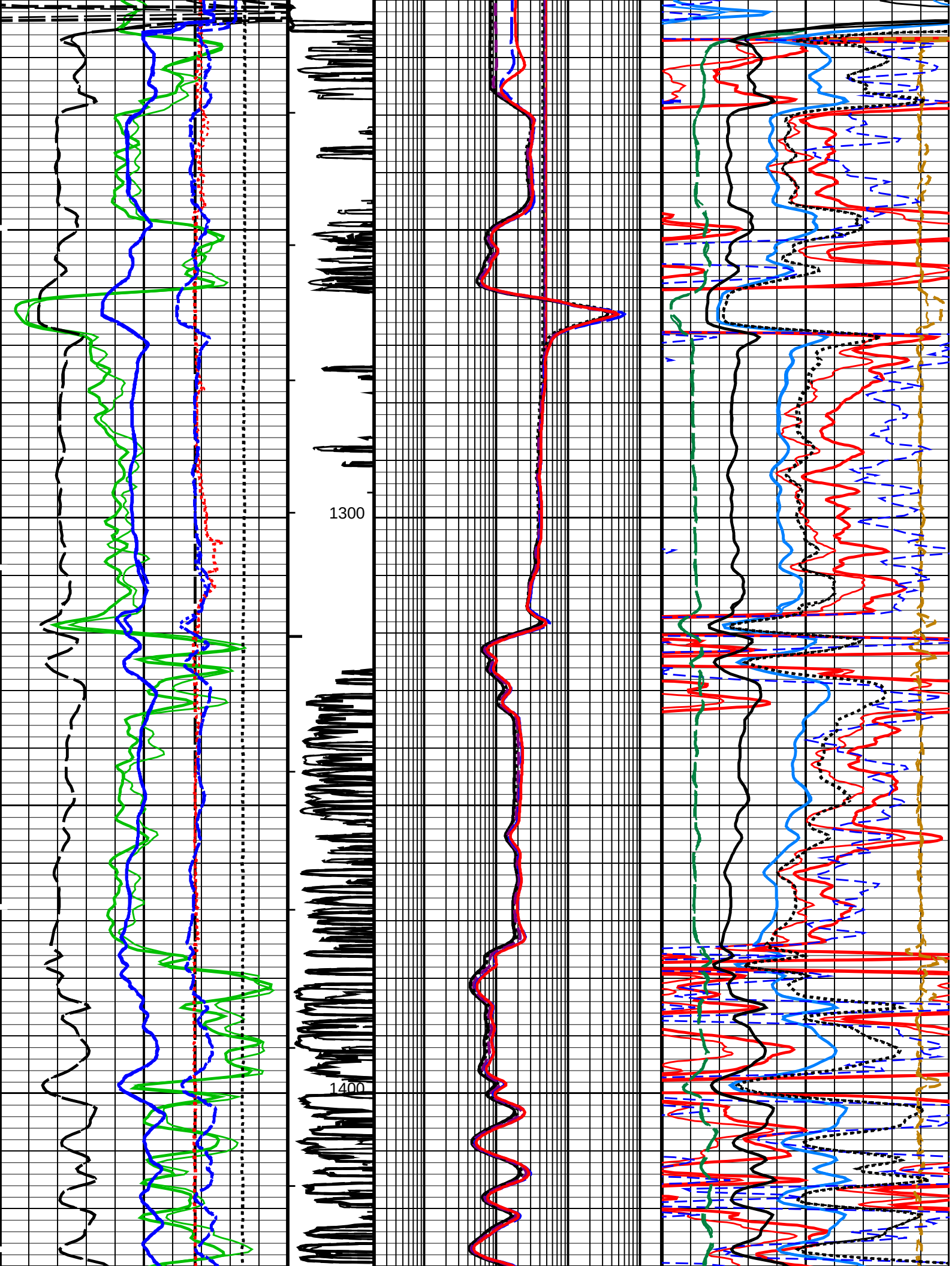
NPOR_REP Curve (NPOR_REP)
0.2 (V/V) 0

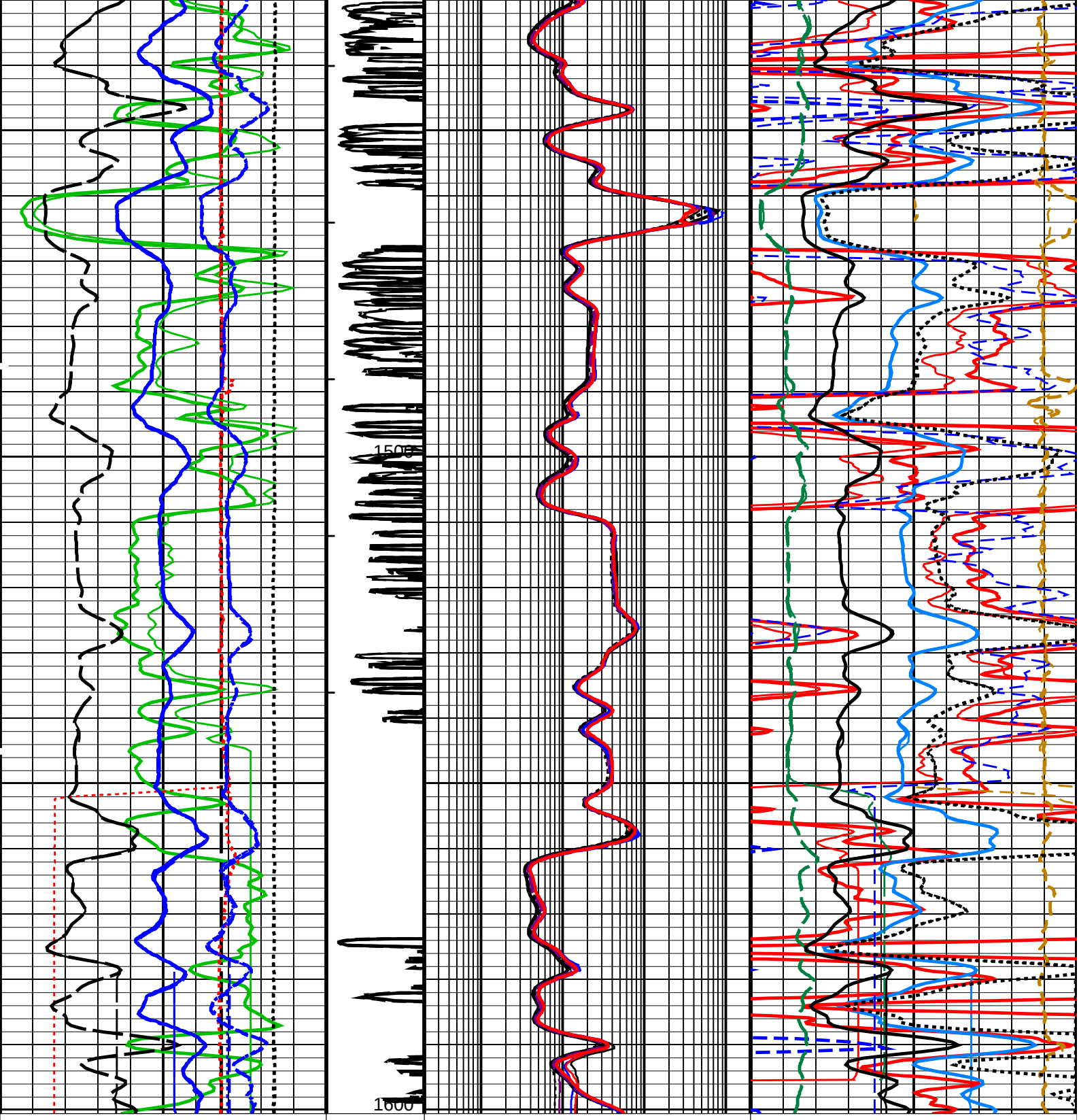
DPHZ_1_REP Curve (DPHZ_REP)
0.4 (V/V) 0.2

DT_REP Curve (DT_REP)
150 (US/F) 50

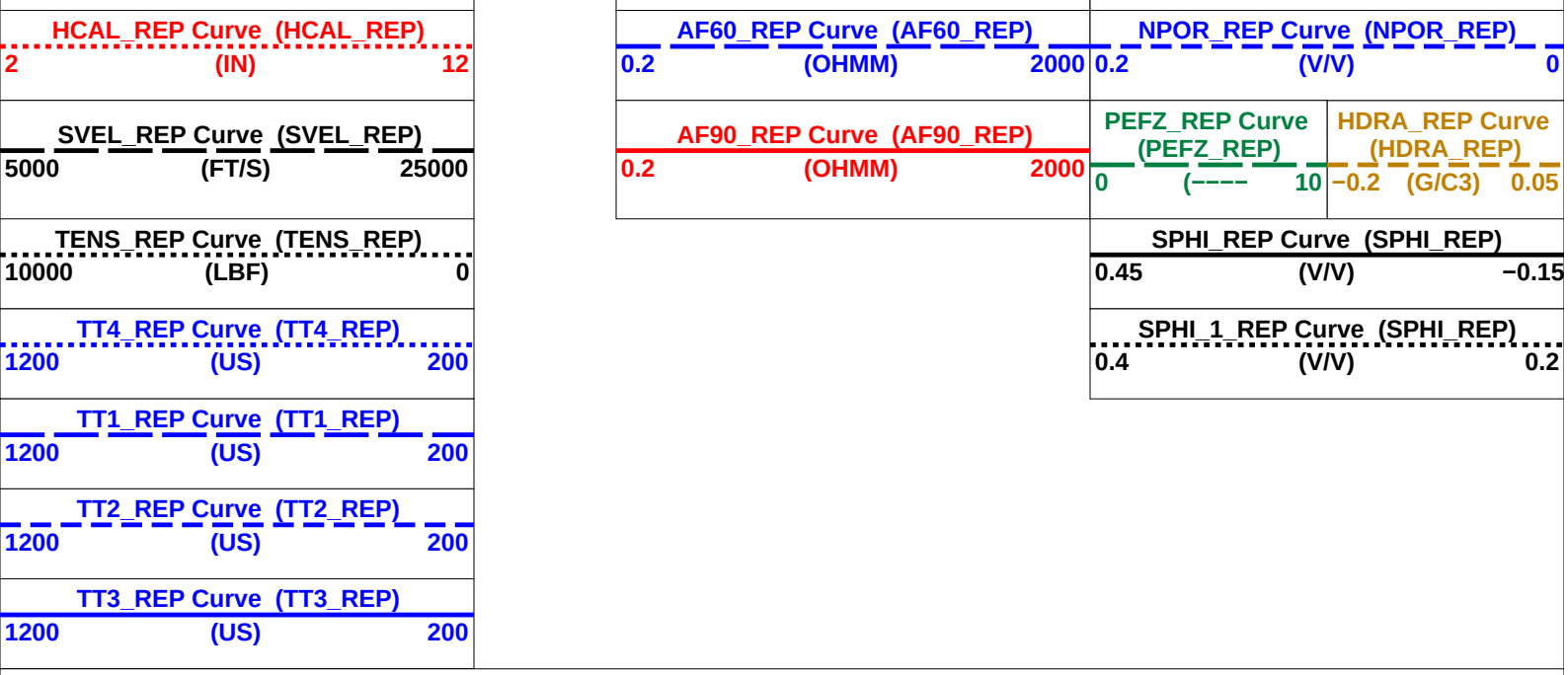
DPHZ_REP Curve (DPHZ_REP)
0.2 (V/V) 0




1300
1400



BS_REP Curve (BS_REP) 2 (IN) 12	HMIN_REP Curve (HMIN_REP) (OHMM) 0 40	AF10_REP Curve (AF10_REP) 0.2 (OHMM) 2000	DPHZ_REP Curve (DPHZ_REP) 0.2 (V/V) 0
GR_REP Curve (GR_REP) 0 (GAPI) 150	HMNO_REP Curve (HMNO_REP) (OHMM) 0 40	AF20_REP Curve (AF20_REP) 0.2 (OHMM) 2000	DT_REP Curve (DT_REP) 150 (US/F) 50
GR_1_REP Curve (GR_REP) 150 (GAPI) 300		AF30_REP Curve (AF30_REP) 0.2 (OHMM) 2000	DPHZ_1_REP Curve (DPHZ_REP) 0.4 (V/V) 0.2



PIP SUMMARY

Integrated Hole Volume Minor Pip Every 10 F3
Integrated Hole Volume Major Pip Every 100 F3
Integrated Cement Volume Minor Pip Every 10 F3
Integrated Cement Volume Major Pip Every 100 F3
Time Mark Every 60 S

AITM Answer Product Processing Summary. Data taken with sonde # 1251

***** Bhole Correction *****

Effective Mud Resistivity computed. Borehole diameter taken as input (see GCSE parameter)

Tool is run in ECCENTERED mode with a tool stand−off of 1.13 IN. Bit Size is 8.75 IN.

***** Input Selections to AITM Answer Product processing *****

Caliper (GCSE): HCAL Mud Resistivity (GRSE): GEN_9 Temperature (GTSE): HTEM Porosity (FPHI): DPHZ

***** Other parameters used by AITM Answer Product processing *****

Mud Sample Resistivity (RMS)	−50000.000 OHMM	Mud Sample Temperature (MST)	−50000.000 DEGF
Form Factor Exponent (FEXP)	2.000	Form Factor Numerator (FNUM)	1.000
Mud Filtrate Sample Resistivity (RMFS)	−50000.000 OHMM	Mud Filtrate Sample Temperature (MFST)	−50000.000 DEGF
Resitivity Connate Water (RW)	1.000 OHMM		

***** AITM Answer Product processing control parameters *****

Playback Mode: RECOMPUTE

(AEBC): Yes (AEBL): Yes (AERP): Yes

(ABHM): 0_ComputeMudResistivity (ABLM): 6_One_Two_and_Four (ARPM): 6_One_Two_and_Four

Parameters

AIT−M: Array Induction Tool − M

DLIS Name	Description	Value	
ABHM	Array Induction Borehole Correction Mode	0_ComputeMudResistivity	
ABHV	Array Induction Borehole Correction Code Version Number	900	
ABLM	Array Induction Basic Logs Mode	6_One_Two_and_Four	
ABLV	Array Induction Basic Logs Code Version Number	223	
ACDE	Array Induction Casing Detection Enable	Yes	
ACEN	Array Induction Tool Centering Flag (in Borehole)	Eccentered	
ACSED	Array Induction Casing Shoe Estimated Depth	−50000	FT
AETP	Array Induction Enable Sonde Error Temp&Pres Corr	Yes	
AFRSV	Array Induction Response Set Version for Four ft Resolution	41.70.24.20	
AIGS	Array Induction Select Akima Interpolation Gating	On	
AMRF	Array Induction Mud Resistivity Factor	1	
AORSV	Array Induction Response Set Version for One ft Resolution	41.70.24.20	
ARFV	Array Induction Radial Profiling Code Version Number	701	
ARPV	Array Induction Radial Parametrization Code Version Number	232	
ASTA	Array Induction Tool Standoff	1.125	IN
ATRSV	Array Induction Response Set Version for Two ft Resolution	41.70.24.20	
ATSE	Array Induction Temperature Selection(Sonde Error Correction)	Internal	
AULV	Array Induction User Level Control	Normal	
AZRSV	Array Induction Response Set Version for Z Resolution	00.10.25.00	
BHS	Borehole Status	OPEN	
BHT	Bottom Hole Temperature (used in calculations)	125	DEGF
FEXP	Form Factor Exponent	2	
FNUM	Form Factor Numerator	1	
GCSE	Generalized Caliper Selection	HCAL	
GDEV	Average Angular Deviation of Borehole from Normal	3.7	DEG

GDEV	Average Angular Deviation of Borehole from Normal	3.7	DEG
GGRD	Geothermal Gradient	0.01	DF/F
GRSE	Generalized Mud Resistivity Selection	CHART_GEN_9	
GTSE	Generalized Temperature Selection	HSTS_HTEM	
MATR	Rock Matrix for Neutron Porosity Corrections	LIMESTONE	
SHT	Surface Hole Temperature	68	DEGF
DSLT−FTB: Digitizing Sonic Logging Tool			
	DSLT Firing Mode	BHC	
	Telemetry Mode	DSLC_FTB	
AMSG	Auxiliary Minimum Sliding Gate	140	US
CBAF	CBL Adjustment Factor	1	
CBLG	CBL Gate Width	45	US
CDTS	C−Delta−T Shale	100	US/F
DDEL	Digitizing Delay	0	US
DIVL	DSLT Depth Sampling Interval	20	
DRCS	DSLT DLIS Recording Size	250	
DSIN	Digitizing Sample Interval	10	
DTF	Delta−T Fluid	220	US/F
DTFS	DSLC Telemetry Frame Size	536	
DTM	Delta−T Matrix	56	US/F
DWCO	Digitizing Word Count	250	
GAI	Manual Gain	40	
MAHTR	Manual High Threshold Reference	120	
MGAI	Maximum Gain	60	
MNHTR	Minimum High Threshold Reference	100	
NMSG	Near Minimum Sliding Gate	140	US
NMXG	Near Maximum Sliding Gate	1010	US
RATE	Firing Rate	R15	
SFAF	Sonic Formation Attenuation Factor	3	DB/F
SGCL	Sliding Gate Closing Delta−T	150	US/F
SGDT	Sliding Gate Delta−T	50	US/F
SGW	Sliding Gate Width	120	US
SLEV	Signal Level for AGC	5000	
SPFS	Sonic Porosity Formula	RAYMER_HUNT	
SPSO	Sonic Porosity Source	DT	
WAGC	Waveform AGC Allow/Disallow	OFF	
WMOD	Waveform Firing Mode	FULL	
HILTH−FTB: High resolution Integrated Logging Tool−DTS			
BHFL	Borehole Fluid Type	OIL	
BHFL_TLD	HILT Nuclear Mud Base	OIL	
BHS	Borehole Status	OPEN	
BHT	Bottom Hole Temperature (used in calculations)	125	DEGF
BSCO	Borehole Salinity Correction Option	NO	
CCCO	Casing & Cement Thickness Correction Option	NO	
DHC	Density Hole Correction	BS	
FD	Fluid Density	1	G/C3
FEXP	Form Factor Exponent	2	
FNUM	Form Factor Numerator	1	
FSAL	Formation Salinity	−50000	PPM
FSCO	Formation Salinity Correction Option	NO	
GCLF	Germany Coal−like Formation Option	NO	
GCSE	Generalized Caliper Selection	HCAL	
GDEV	Average Angular Deviation of Borehole from Normal	3.7	DEG
GGRD	Geothermal Gradient	0.01	DF/F
GRSE	Generalized Mud Resistivity Selection	CHART_GEN_9	
GTSE	Generalized Temperature Selection	HSTS_HTEM	
HSCO	Hole Size Correction Option	YES	
MATR	Rock Matrix for Neutron Porosity Corrections	LIMESTONE	
MCCO	Mud Cake Correction Option	NO	
MCOR	Mud Correction	NATU	
MDEN	Matrix Density	2.71	G/C3
MPOF	MCFL Processing Operation Mode	ON	
MWCO	Mud Weight Correction Option	NO	
NAAC	HRDD APS Activation Correction	OFF	
NMT	HILT Nuclear Mud Type	NOBARITE	
NPRM	HRDD Processing Mode	HiRes	
NSAR	HRDD Depth Sampling Rate	1	IN
PTCO	Pressure/Temperature Correction Option	NO	
SDAT	Standoff Data Source	SOCN	
SHT	Surface Hole Temperature	68	DEGF
SOCN	Standoff Distance	0.125	IN
SOCO	Standoff Correction Option	YES	
HOLEV: Integrated Hole/Cement Volume			
BHS	Borehole Status	OPEN	
BHT	Bottom Hole Temperature (used in calculations)	125	DEGF
FCD	Future Casing (Outer) Diameter	7	IN
GCSE	Generalized Caliper Selection	HCAL	
GDEV	Average Angular Deviation of Borehole from Normal	3.7	DEG
GGRD	Geothermal Gradient	0.01	DF/F
GRSE	Generalized Mud Resistivity Selection	CHART_GEN_9	
GTSE	Generalized Temperature Selection	HSTS_HTEM	
HVCS	Integrated Hole Volume Caliper Selection	AUTOMATIC	
MATR	Rock Matrix for Neutron Porosity Corrections	LIMESTONE	
SHT	Surface Hole Temperature	68	DEGF
STI: Stuck Tool Indicator			

TDL	Total Depth − Logger	5191.00	FT
System and Miscellaneous			
BS	Bit Size	8.750	IN
BSAL	Borehole Salinity	229220.00	PPM
CSIZ	Current Casing Size	9.625	IN
CWEI	Casing Weight	36.00	LB/F
DFD	Drilling Fluid Density	8.35	LB/G
DO	Depth Offset for Playback	0.0	FT
DORL	Depth Offset for Repeat Analysis	0.0	FT
FLEV	Fluid Level	−50000.00	FT
MST	Mud Sample Temperature	−50000.00	DEGF
PP	Playback Processing	RECOMPUTE	
RMFS	Resistivity of Mud Filtrate Sample	−50000.0000	OHMM
TD	Total Depth	5152.4	FT

Format: 5Inch_REP_1 **Vertical Scale: 5" per 100'** **Graphics File Created: 15−Aug−2011 16:58**

OP System Version: 17C0−154

AIT−M	17C0−154	DSLT−FTB	17C0−154
HILTH−FTB	17C0−154	DTC−H	17C0−154

Input DLIS Files

AIT_SONIC_TLD_MCFL_025PUP	FN:31	15−Aug−2011 16:36	1600.5 FT	1075.0 FT
AIT_SONIC_TLD_MCFL_027PUP	FN:33	15−Aug−2011 15:44	5194.5 FT	1175.0 FT

Output DLIS Files

DEFAULT	AIT_SONIC_TLD_MCFL_009PUP	FN:8	PRODUCER	15−Aug−2011 16:58

Schlumberger

Calibrations

MAXIS Field Log

Calibration and Check Summary

Measurement	Nominal	Master	Before	After	Change	Limit	Units
Array Induction Tool − M Wellsite Calibration − Electronics Calibration Check − Thru Cal Mag. & Phase							
Master: 16−May−2011 17:07 Before: 10−Jul−2011 17:23							
Thru Cal Magnitude − 0	0	0.6194	0.6189	N/A	N/A	N/A	V
Thru Cal Magnitude − 1	0	1.268	1.267	N/A	N/A	N/A	V
Thru Cal Magnitude − 2	0	0.6293	0.6287	N/A	N/A	N/A	V
Thru Cal Magnitude − 3	0	0.7104	0.7098	N/A	N/A	N/A	V
Thru Cal Magnitude − 4	0	1.335	1.334	N/A	N/A	N/A	V
Thru Cal Magnitude − 5	0	1.946	1.945	N/A	N/A	N/A	V
Thru Cal Magnitude − 6	0	1.940	1.939	N/A	N/A	N/A	V
Thru Cal Magnitude − 7	0	1.394	1.393	N/A	N/A	N/A	V
Thru Cal Phase − 0	0	187.5	194.0	N/A	N/A	N/A	DEG
Thru Cal Phase − 1	0	186.4	193.0	N/A	N/A	N/A	DEG
Thru Cal Phase − 2	0	183.1	189.6	N/A	N/A	N/A	DEG
Thru Cal Phase − 3	0	182.4	188.9	N/A	N/A	N/A	DEG
Thru Cal Phase − 4	0	176.5	183.0	N/A	N/A	N/A	DEG
Thru Cal Phase − 5	0	174.9	181.4	N/A	N/A	N/A	DEG
Thru Cal Phase − 6	0	175.0	181.5	N/A	N/A	N/A	DEG
Thru Cal Phase − 7	0	174.1	180.6	N/A	N/A	N/A	DEG
Array Induction Tool − M Wellsite Calibration − Electronics Calibration Check − Auxiliary							
Master: 16−May−2011 17:07 Before: 10−Jul−2011 17:23							
Array Induction SPA Plus	991.0	985.3	985.7	N/A	N/A	N/A	MV
Array Induction SPA Zero	0	−0.09175	−0.06835	N/A	N/A	N/A	MV
Array Induction Temperature Pl	0.9170	0.9129	0.9132	N/A	N/A	N/A	V

Array Induction Temperature Ze	0	−0.00009237	−0.00006343	N/A	N/A	N/A	V

Array Induction Tool − M Wellsite Calibration − Test Loop Gain Correction
Master: 16−May−2011 17:07

Test Loop Gain Correctio − 0	0	1.013	N/A	N/A	N/A	N/A	V
Test Loop Gain Correctio − 1	0	1.011	N/A	N/A	N/A	N/A	V
Test Loop Gain Correctio − 2	0	1.023	N/A	N/A	N/A	N/A	V
Test Loop Gain Correctio − 3	0	1.019	N/A	N/A	N/A	N/A	V
Test Loop Gain Correctio − 4	0	1.000	N/A	N/A	N/A	N/A	V
Test Loop Gain Correctio − 5	0	0.9929	N/A	N/A	N/A	N/A	V
Test Loop Gain Correctio − 6	0	0.9970	N/A	N/A	N/A	N/A	V
Test Loop Gain Correctio − 7	0	1.010	N/A	N/A	N/A	N/A	V
Test Loop Gain Correctio − 0	0	−0.6338	N/A	N/A	N/A	N/A	DEG
Test Loop Gain Correctio − 1	0	0.5964	N/A	N/A	N/A	N/A	DEG
Test Loop Gain Correctio − 2	0	−0.03310	N/A	N/A	N/A	N/A	DEG
Test Loop Gain Correctio − 3	0	−0.1442	N/A	N/A	N/A	N/A	DEG
Test Loop Gain Correctio − 4	0	−0.07075	N/A	N/A	N/A	N/A	DEG
Test Loop Gain Correctio − 5	0	0.1788	N/A	N/A	N/A	N/A	DEG
Test Loop Gain Correctio − 6	0	0.3097	N/A	N/A	N/A	N/A	DEG
Test Loop Gain Correctio − 7	0	0.02847	N/A	N/A	N/A	N/A	DEG

Array Induction Tool − M Wellsite Calibration − Sonde Error Correction
Master: 16−May−2011 17:07

R Sonde Error Correction − 0	0	−76.36	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 1	0	164.9	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 2	0	116.1	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 3	0	72.05	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 4	0	26.31	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 5	0	14.06	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 6	0	9.643	N/A	N/A	N/A	N/A	MM/M
R Sonde Error Correction − 7	0	−1.560	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 0	0	587.8	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 1	0	−157.7	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 2	0	111.5	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 3	0	−93.77	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 4	0	0.9609	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 5	0	5.492	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 6	0	−6.527	N/A	N/A	N/A	N/A	MM/M
X Sonde Error Correction − 7	0	1.799	N/A	N/A	N/A	N/A	MM/M

Array Induction Tool − M Wellsite Calibration − Mud Gain Correction
Master: 16−May−2011 17:07

Coarse − Mag, Real, Imag − 0	0	1.075	N/A	N/A	N/A	N/A	
Coarse − Mag, Real, Imag − 1	0	1.075	N/A	N/A	N/A	N/A	
Coarse − Mag, Real, Imag − 2	0	1.075	N/A	N/A	N/A	N/A	
Fine − Mag, Real, Imag − 0	0	1.075	N/A	N/A	N/A	N/A	
Fine − Mag, Real, Imag − 1	0	1.075	N/A	N/A	N/A	N/A	
Fine − Mag, Real, Imag − 2	0	1.075	N/A	N/A	N/A	N/A	

High resolution Integrated Logging Tool−DTS Wellsite Calibration − Stab Measurement Summary
Before: 10−Jul−2011 17:32

BS Window Ratio	0.7420	N/A	0.7405	N/A	N/A	N/A	
BS Window Sum	26530	N/A	26520	N/A	N/A	N/A	CPS
SS Window Ratio	0.4822	N/A	0.4824	N/A	N/A	N/A	
SS Window Sum	12340	N/A	12320	N/A	N/A	N/A	CPS
LS Window Ratio	0.2989	N/A	0.2960	N/A	N/A	N/A	
LS Window Sum	1642	N/A	1635	N/A	N/A	N/A	CPS

High resolution Integrated Logging Tool−DTS Wellsite Calibration − Photo−multiplier High Voltages Calibrations
Before: 10−Jul−2011 17:32

BS PM High Voltage (Command)	1652	N/A	1709	N/A	N/A	N/A	V
SS PM High Voltage (Command)	1339	N/A	1343	N/A	N/A	N/A	V
LS PM High Voltage (Command)	1310	N/A	1312	N/A	N/A	N/A	V

High resolution Integrated Logging Tool−DTS Wellsite Calibration − Crystal Quality Resolutions Calibration
Before: 10−Jul−2011 17:32

BS Crystal Resolution	11.40	N/A	11.61	N/A	N/A	N/A	%
SS Crystal Resolution	9.539	N/A	9.366	N/A	N/A	N/A	%
LS Crystal Resolution	8.638	N/A	8.572	N/A	N/A	N/A	%

High resolution Integrated Logging Tool−DTS Wellsite Calibration − MCFL Calibration
Before: 10−Jul−2011 17:22

Raw B0 Resistivity	3875	N/A	3858	N/A	N/A	N/A	OHMM
Raw B1 Resistivity	3830	N/A	3863	N/A	N/A	N/A	OHMM
Raw B2 Resistivity	3830	N/A	3925	N/A	N/A	N/A	OHMM

High resolution Integrated Logging Tool−DTS Wellsite Calibration − HILT Caliper Calibration
Before: 10−Jul−2011 17:32

HILT Caliper Zero Measurement	6.000	N/A	6.711	N/A	N/A	N/A	IN
HILT Caliper Plus Measurement	8.000	N/A	8.840	N/A	N/A	N/A	IN

High resolution Integrated Logging Tool−DTS Wellsite Calibration − Detector Calibration
Before: 10−Jul−2011 17:22

Gamma Ray Background	30.00	N/A	39.89	N/A	N/A	N/A	GAPI
Gamma Ray (Jig − Bkgd)	165.0	N/A	177.7	N/A	N/A	15.00	GAPI

High resolution Integrated Logging Tool−DTS Wellsite Calibration − Zero Measurement
Master: 27−May−2011 14:53 Before: 10−Jul−2011 17:24

CNTC Background	25.57	25.57	24.51	N/A	N/A	3.836	CPS
CFTC Background	26.28	26.28	25.72	N/A	N/A	3.942	CPS

High resolution Integrated Logging Tool−DTS Wellsite Calibration − Ratio Measurement
Master: 27−May−2011 14:53

Thermal Near Corr. (Tank)	5800	5228	N/A	N/A	N/A	N/A	CPS
Thermal Far Corr. (Tank)	2400	2147	N/A	N/A	N/A	N/A	CPS
CNTC/CFTC (Tank)	2.159	2.435	N/A	N/A	N/A	N/A	

High resolution Integrated Logging Tool−DTS Wellsite Calibration − Accelerometer Calibration
Before: 11−Jul−2011 12:21

Z−Axis Acceleration	32.19	N/A	32.08	N/A	N/A	N/A	F/S2

High resolution Integrated Logging Tool−DTS Master Calibration − Inversion results
Master: 17−Jun−2011 12:23

Rho Aluminum	2.596	2.600	−−	−−	−−	−−	G/C3
Rho Magnesium	1.686	1.687	−−	−−	−−	−−	G/C3
Pe Aluminum	2.570	2.549	−−	−−	−−	−−	
Pe Magnesium	2.650	2.644	−−	−−	−−	−−	

High resolution Integrated Logging Tool−DTS Master Calibration − Deviation Summary
Master: 17−Jun−2011 12:23

BS Average Deviation	0	0.2624	−−	−−	−−	−−	%
BS Max Deviation	0	0.4926	−−	−−	−−	−−	%
SS Average Deviation	0	0.2979	−−	−−	−−	−−	%
SS Max Deviation	0	1.394	−−	−−	−−	−−	%
LS Average Deviation	0	0.4887	−−	−−	−−	−−	%
LS Max Deviation	0	1.411	−−	−−	−−	−−	%

Density Master Calibration is obsolete !

The GLS−VJ source activity is acceptable.

The HGNS Neutron Master Calibration was done with the following parameters :

NCT−B Water Temperature 68.4 DEGF.
Thermal Housing Size 3.377 IN.
NSR−F serial number 5153

Array Induction Tool − M / Equipment Identification

Primary Equipment:

Rm/SP Bottom Nose	AMRM − A	
Array Induction Sonde	AMIS − A	1251

Auxiliary Equipment:

Array Induction Tool − M Wellsite Calibration
Electronics Calibration Check − Thru Cal Mag. & Phase

Idx	Phase	Value	Thru Cal Magnitude V	Nominal	Value	Thru Cal Phase DEG	Nominal
0	Master	0.6194		0.6100	187.5		197.0
	Before	0.6189			194.0		
1	Master	1.268		1.270	186.4		196.0
	Before	1.267			193.0		
2	Master	0.6293		0.6200	183.1		192.0
	Before	0.6287			189.6		
3	Master	0.7104		0.7000	182.4		191.0
	Before	0.7098			188.9		
4	Master	1.335		1.340	176.5		185.0
	Before	1.334			183.0		

	Before	1.334		183.0	
5	Master	1.946	1.960	174.9	182.0
	Before	1.945		181.4	
6	Master	1.940	1.960	175.0	181.0
	Before	1.939		181.5	
7	Master	1.394	1.410	174.1	175.0
	Before	1.393		180.6	
		60.00 % (Minimum) (Nominal)	140.0 % (Maximum)	Nom −60.00 (Minimum) (Nominal)	Nom + 60.00 (Maximum)

Master: 16−May−2011 17:07 Before: 10−Jul−2011 17:23

Array Induction Tool − M Wellsite Calibration

Electronics Calibration Check − Auxiliary

Phase	Array Induction SPA Plus MV	Value
Master		985.3
Before		985.7
	941.0 (Minimum) 991.0 (Nominal) 1040 (Maximum)	

Phase	Array Induction SPA Zero MV	Value
Master		−0.09175
Before		−0.06835
	−50.00 (Minimum) 0 (Nominal) 50.00 (Maximum)	

Phase	Array Induction Temperature Plus V	Value
Master		0.9129
Before		0.9132
	0.8710 (Minimum) 0.9170 (Nominal) 0.9630 (Maximum)	

Phase	Array Induction Temperature Zero V	Value
Master		−9.237E−00
Before		−6.343E−00
	−0.05000 (Minimum) 0 (Nominal) 0.05000 (Maximum)	

Master: 16−May−2011 17:07 Before: 10−Jul−2011 17:23

Array Induction Tool − M Wellsite Calibration

Test Loop Gain Correction

Idx	Value	Test Loop Gain Correction Magnitude V	Value	Test Loop Gain Correction Phase DEG
0	1.013	0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)	−0.6338	−3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
1	1.011	0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)	0.5964	−3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
2	1.023	0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)	−0.03310	−3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
3	1.019	0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)	−0.1442	−3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
4	1.000	0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)	−0.07075	−3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
5	0.9929	0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)	0.1788	−3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
6	0.9970	0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)	0.3097	−3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)
7	1.010	0.9500 (Minimum) 1.000 (Nominal) 1.050 (Maximum)	0.02847	−3.000 (Minimum) 0 (Nominal) 3.000 (Maximum)

Master: 16−May−2011 17:07

Array Induction Tool − M Wellsite Calibration

Sonde Error Correction

Idx	Value	R Sonde Error Correction MM/M	Value	X Sonde Error Correction MM/M
0	−76.36	−231.0 (Minimum) −56.00 (Nominal) 119.0 (Maximum)	587.8	−2250 (Minimum) 0 (Nominal) 2250 (Maximum)
1	164.9		−157.7	

		114.0 (Minimum)	159.0 (Nominal)	204.0 (Maximum)		−625.0 (Minimum)	0 (Nominal)	625.0 (Maximum)	
2	116.1				111.5				
		66.00 (Minimum)	111.0 (Nominal)	156.0 (Maximum)		−350.0 (Minimum)	0 (Nominal)	350.0 (Maximum)	
3	72.05				−93.77				
		39.00 (Minimum)	64.00 (Nominal)	89.30 (Maximum)		−250.0 (Minimum)	0 (Nominal)	250.0 (Maximum)	
4	26.31				0.9609				
		15.00 (Minimum)	25.00 (Nominal)	35.00 (Maximum)		−63.00 (Minimum)	0 (Nominal)	63.00 (Maximum)	
5	14.06				5.492				
		4.000 (Minimum)	14.00 (Nominal)	24.00 (Maximum)		−50.00 (Minimum)	0 (Nominal)	50.00 (Maximum)	
6	9.643				−6.527				
		5.000 (Minimum)	10.00 (Nominal)	15.00 (Maximum)		−30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)	
7	−1.560				1.799				
		−5.000 (Minimum)	0 (Nominal)	5.000 (Maximum)		−30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)	

Master: 16−May−2011 17:07

Array Induction Tool − M Wellsite Calibration

Mud Gain Correction

Idx	Value	Coarse − Mag, Real, Imag			Value	Fine − Mag, Real, Imag		
0	1.075				1.075			
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)
1	1.075				1.075			
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)
2	1.075				1.075			
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)

Master: 16−May−2011 17:07

Array Induction Tool − M Master Calibration

Electronics Calibration Check − Thru Cal Mag. & Phase

Idx	Phase	Value	Thru Cal Magnitude V	Nominal	Value	Thru Cal Phase DEG	Nominal
0	Master	0.6194		0.6100	187.5		197.0
1	Master	1.268		1.270	186.4		196.0
2	Master	0.6293		0.6200	183.1		192.0
3	Master	0.7104		0.7000	182.4		191.0
4	Master	1.335		1.340	176.5		185.0
5	Master	1.946		1.960	174.9		182.0
6	Master	1.940		1.960	175.0		181.0
7	Master	1.394		1.410	174.1		175.0
		60.00 % (Minimum)	(Nominal)	140.0 % (Maximum)		Nom −60.00 (Minimum)	(Nominal)	Nom + 60.00 (Maximum)

Master: 16−May−2011 17:07

Array Induction Tool − M Master Calibration

Electronics Calibration Check − Auxiliary

Phase	Array Induction SPA Plus MV	Value	Phase	Array Induction SPA Zero MV	Value
Master		985.3	Master		−0.09175
	941.0 (Minimum) 991.0 (Nominal) 1040 (Maximum)			−50.00 (Minimum) 0 (Nominal) 50.00 (Maximum)	
Phase	Array Induction Temperature Plus V	Value	Phase	Array Induction Temperature Zero V	Value
Master		0.9129	Master		−9.237E−00
	0.8710 (Minimum) 0.9170 (Nominal) 0.9630 (Maximum)			−0.05000 (Minimum) 0 (Nominal) 0.05000 (Maximum)	

Master: 16−May−2011 17:07

Array Induction Tool − M Master Calibration

Test Loop Gain Correction

Idx	Value	Test Loop Gain Correction Magnitude V			Value	Test Loop Gain Correction Phase DEG		
0	1.013				−0.6338			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
1	1.011				0.5964			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
2	1.023				−0.03310			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
3	1.019				−0.1442			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
4	1.000				−0.07075			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
5	0.9929				0.1788			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
6	0.9970				0.3097			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)
7	1.010				0.02847			
		0.9500 (Minimum)	1.000 (Nominal)	1.050 (Maximum)		−3.000 (Minimum)	0 (Nominal)	3.000 (Maximum)

Master: 16−May−2011 17:07

Array Induction Tool − M Master Calibration

Sonde Error Correction

Idx	Value	R Sonde Error Correction MM/M			Value	X Sonde Error Correction MM/M		
0	−76.36				587.8			
		−231.0 (Minimum)	−56.00 (Nominal)	119.0 (Maximum)		−2250 (Minimum)	0 (Nominal)	2250 (Maximum)
1	164.9				−157.7			
		114.0 (Minimum)	159.0 (Nominal)	204.0 (Maximum)		−625.0 (Minimum)	0 (Nominal)	625.0 (Maximum)
2	116.1				111.5			
		66.00 (Minimum)	111.0 (Nominal)	156.0 (Maximum)		−350.0 (Minimum)	0 (Nominal)	350.0 (Maximum)
3	72.05				−93.77			
		39.00 (Minimum)	64.00 (Nominal)	89.30 (Maximum)		−250.0 (Minimum)	0 (Nominal)	250.0 (Maximum)
4	26.31				0.9609			
		15.00 (Minimum)	25.00 (Nominal)	35.00 (Maximum)		−63.00 (Minimum)	0 (Nominal)	63.00 (Maximum)
5	14.06				5.492			
		4.000 (Minimum)	14.00 (Nominal)	24.00 (Maximum)		−50.00 (Minimum)	0 (Nominal)	50.00 (Maximum)
6	9.643				−6.527			
		5.000 (Minimum)	10.00 (Nominal)	15.00 (Maximum)		−30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)
7	−1.560				1.799			
		−5.000 (Minimum)	0 (Nominal)	5.000 (Maximum)		−30.00 (Minimum)	0 (Nominal)	30.00 (Maximum)

Master: 16−May−2011 17:07

Array Induction Tool − M Master Calibration

Mud Gain Correction

Idx	Value	Coarse − Mag, Real, Imag			Value	Fine − Mag, Real, Imag		
0	1.075				1.075			
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)
1	1.075				1.075			

		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)
2	1.075				1.075			
		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)		0.8000 (Minimum)	1.000 (Nominal)	1.200 (Maximum)

Master: 16−May−2011 17:07

High resolution Integrated Logging Tool−DTS / Equipment Identification

Primary Equipment:		
HILT high−Resolution Mechanical Sonde	HRMS − H	4928
HILT Rxo Gamma−ray Device	HRGD − H	4999
HILT Micro Cylindrically Focused Log Dev	MCFL − H	
GR Logging Source	GLS − VJ	5411
HILT High Res. Control Cartridge	HRCC − H	4881
HILT Gamma−Ray Neutron Sonde−DTS	HGNS − H	4828
HGNS Gamma−Ray Device	HGR −	
HGNS Neutron Detector with Alpha Source	HCNT − H	
Auxiliary Equipment:		
Neutron Calibration Tank	NCT − B	
Gamma Source Radioactive	GSR − J	5411
HGNS Housing	HGNH −	3940

High resolution Integrated Logging Tool−DTS Wellsite Calibration
Stab Measurement Summary

Phase	BS Window Ratio	Value	Phase	SS Window Ratio	Value	Phase	LS Window Ratio	Value
Before		0.7405	Before		0.4824	Before		0.2960
	0.7049 (Minimum) 0.7420 (Nominal) 0.7791 (Maximum)			0.4580 (Minimum) 0.4822 (Nominal) 0.5063 (Maximum)			0.2839 (Minimum) 0.2989 (Nominal) 0.3138 (Maximum)	
Phase	BS Window Sum CPS	Value	Phase	SS Window Sum CPS	Value	Phase	LS Window Sum CPS	Value
Before		26520	Before		12320	Before		1635
	25200 (Minimum) 26530 (Nominal) 27860 (Maximum)			11720 (Minimum) 12340 (Nominal) 12950 (Maximum)			1559 (Minimum) 1642 (Nominal) 1724 (Maximum)	

Before: 10−Jul−2011 17:32

High resolution Integrated Logging Tool−DTS Wellsite Calibration
Photo−multiplier High Voltages Calibrations

Phase	BS PM High Voltage (Command) V	Value	Phase	SS PM High Voltage (Command) V	Value	Phase	LS PM High Voltage (Command) V	Value
Before		1709	Before		1343	Before		1312
	1552 (Minimum) 1652 (Nominal) 1752 (Maximum)			1239 (Minimum) 1339 (Nominal) 1439 (Maximum)			1210 (Minimum) 1310 (Nominal) 1410 (Maximum)	

Before: 10−Jul−2011 17:32

High resolution Integrated Logging Tool−DTS Wellsite Calibration
Crystal Quality Resolutions Calibration

Phase	BS Crystal Resolution %	Value	Phase	SS Crystal Resolution %	Value	Phase	LS Crystal Resolution %	Value
Before		11.61	Before		9.366	Before		8.572
	10.40 (Minimum) 11.40 (Nominal) 12.40 (Maximum)			8.539 (Minimum) 9.539 (Nominal) 10.54 (Maximum)			7.638 (Minimum) 8.638 (Nominal) 9.638 (Maximum)	

Before: 10−Jul−2011 17:32

High resolution Integrated Logging Tool−DTS Wellsite Calibration
MCFL Calibration

Phase	Raw B0 Resistivity OHMM	Value	Phase	Raw B1 Resistivity OHMM	Value	Phase	Raw B2 Resistivity OHMM	Value
Before		3858	Before		3863	Before		3925
	3565 (Minimum) 3875 (Nominal) 4185 (Maximum)			3524 (Minimum) 3830 (Nominal) 4136 (Maximum)			3524 (Minimum) 3830 (Nominal) 4136 (Maximum)	

Before: 10−Jul−2011 17:22

High resolution Integrated Logging Tool−DTS Wellsite Calibration
HILT Caliper Calibration

Phase	HILT Caliper Zero Measurement IN	Value	Phase	HILT Caliper Plus Measurement IN	Value
Before		6.711	Before		8.840
	4.500 (Minimum) 6.000 (Nominal) 7.500 (Maximum)			6.000 (Minimum) 8.000 (Nominal) 10.00 (Maximum)	

Before: 10−Jul−2011 17:32

High resolution Integrated Logging Tool−DTS Wellsite Calibration

Detector Calibration

Phase	Gamma Ray Background GAPI	Value	Phase	Gamma Ray (Jig − Bkgd) GAPI	Value
Before		39.89	Before		177.7
	0 (Minimum) 30.00 (Nominal) 120.0 (Maximum)			157.1 (Minimum) 165.0 (Nominal) 206.3 (Maximum)	

Before: 10−Jul−2011 17:22

High resolution Integrated Logging Tool−DTS Wellsite Calibration

Zero Measurement

Phase	CNTC Background CPS	Value	Phase	CFTC Background CPS	Value
Master		25.57	Master		26.28
Before		24.51	Before		25.72
	5.000 (Minimum) 25.57 (Nominal) 40.00 (Maximum)			5.000 (Minimum) 26.28 (Nominal) 40.00 (Maximum)	

Master: 27−May−2011 14:53 Before: 10−Jul−2011 17:24

High resolution Integrated Logging Tool−DTS Wellsite Calibration

Ratio Measurement

Phase	Thermal Near Corr. (Tank) CPS	Value	Phase	Thermal Far Corr. (Tank) CPS	Value	Phase	CNTC/CFTC (Tank)	Value
Master		5228	Master		2147	Master		2.435
	4700 (Minimum) 5800 (Nominal) 6900 (Maximum)			1900 (Minimum) 2400 (Nominal) 2900 (Maximum)			2.120 (Minimum) 2.159 (Nominal) 2.540 (Maximum)	

Master: 27−May−2011 14:53

High resolution Integrated Logging Tool−DTS Wellsite Calibration

Accelerometer Calibration

Phase	Z−Axis Acceleration F/S2	Value
Before		32.08
	31.53 (Minimum) 32.19 (Nominal) 32.84 (Maximum)	

Before: 11−Jul−2011 12:21

High resolution Integrated Logging Tool−DTS Master Calibration

Inversion results

Phase	Rho Aluminum G/C3	Value	Phase	Rho Magnesium G/C3	Value
Master		2.600	Master		1.687
	2.586 (Minimum) 2.596 (Nominal) 2.606 (Maximum)			1.676 (Minimum) 1.686 (Nominal) 1.696 (Maximum)	
Phase	Pe Aluminum	Value	Phase	Pe Magnesium	Value
Master		2.549	Master		2.644
	2.470 (Minimum) 2.570 (Nominal) 2.670 (Maximum)			2.550 (Minimum) 2.650 (Nominal) 2.750 (Maximum)	

Master: 17−Jun−2011 12:23

High resolution Integrated Logging Tool−DTS Master Calibration

Deviation Summary

Phase	BS Average Deviation %	Value	Phase	SS Average Deviation %	Value	Phase	LS Average Deviation %	Value
Master		0.2624	Master		0.2979	Master		0.4887
	−0.6000 (Minimum) 0 (Nominal) 0.6000 (Maximum)			−1.000 (Minimum) 0 (Nominal) 1.000 (Maximum)			−1.500 (Minimum) 0 (Nominal) 1.500 (Maximum)	
Phase	BS Max Deviation %	Value	Phase	SS Max Deviation %	Value	Phase	LS Max Deviation %	Value
Master		0.4926	Master		1.394	Master		1.411
	−1.600 (Minimum) 0 (Nominal) 1.600 (Maximum)			−2.500 (Minimum) 0 (Nominal) 2.500 (Maximum)			−3.500 (Minimum) 0 (Nominal) 3.500 (Maximum)	

Master: 17−Jun−2011 12:23

High resolution Integrated Logging Tool−DTS Master Calibration

Zero Measurement

Phase	CNTC Background CPS	Value	Phase	CFTC Background CPS	Value
Master		25.57	Master		26.28
	5.000 25.57 40.00			5.000 26.28 40.00	

	(Minimum)	(Nominal)	(Maximum)		(Minimum)	(Nominal)	(Maximum)	

Master: 27−May−2011 14:53

High resolution Integrated Logging Tool−DTS Master Calibration

Tank Measurement

Phase	Thermal Near Corr. (Tank) CPS			Value	Phase	Thermal Far Corr. (Tank) CPS			Value	Phase	CNTC/CFTC (Tank)			Value
Master				5228	Master				2147	Master				2.435
	4700 (Minimum)	5800 (Nominal)	6900 (Maximum)			1900 (Minimum)	2400 (Nominal)	2900 (Maximum)			2.120 (Minimum)	2.159 (Nominal)	2.540 (Maximum)	

Master: 27−May−2011 14:53

DTS Telemetry Tool / Equipment Identification

Primary Equipment:		
DTC−H Auxiliary Cartridge	DTCH − A	
DTC−H Telemetry Cartridge	DTCH − A	8699
Auxiliary Equipment:		
DTCH Telemetry Cartridge Housing	ECH − KC	10355

Company: **QUICKSILVER RESOURCES INC.**

Schlumberger

Well: **K−Diamond 21−21**
Field: **Bell Rock**
County: **Moffat**
State: **Colorado**

Platform Express
Array Induction Tool
BHC