HALLIBURTON

SPECTRAL DENSITY
DUAL SPACED NEUTRON
EVR LOG

COMPANY	CULBREATH OIL & GAS COMPANY INC
WELL	BREEDEN 1-30
FIELD/BLOCK	MORLAND-KANACO
COUNTY	SHERIDAN
STATE	KANSAS

COMPANY CULBREATH OIL & GAS COMPANY INC
WELL BREEDEN 1-30
FIELD/BLOCK MORLAND-KANACO
COUNTY SHERIDAN **STATE** KANSAS

API No. 15-179-21452-00-00
Location (SHL) 2310' FNL & 2310' FWL
SE SE NW
LAT: 39.241774997 N
LONG: 100.26699298 W

Sect. 30 Twp. 9S Rge. 26W

Other Services:
GTET
IDT
DSNT
SDLT
MICROLOG
BSAT
ACRT

Permanent Datum	GL	Elev. 2651.0 ft	Elev.: K.B.	2661.0 ft
Log measured from	KB	, 10.0 ft above perm. Datum	D.F.	2661.0 ft
Drilling measured from	KB		G.L.	2651.0 ft

Date		11-Aug-18					
Run No.		ONE					
Depth - Driller		4160.0 ft					
Depth - Logger		4160.0 ft					
Bottom - Logged Interval		4122.0 ft					
Top - Logged Interval		3500.0 ft					
Casing - Driller		8.625 in @ 265.0 ft		@		@	
Casing - Logger		263.0 ft					
Bit Size		7.875 in		@		@	
Type Fluid in Hole		Water Based Mud					
Density	Viscosity	9.20 g/cc	50.00 s/qt				
PH	Fluid Loss	9.50 pH	1.5 cptm				
Source of Sample		MUD PIT					
Rm @ Meas. Temperature		1.19 ohmm @ 75.00 degF		@		@	
Rmf @ Meas. Temperature		0.95 ohmm @ 75.00 degF		@		@	
Rmc @ Meas. Temperature		1.43 ohmm @ 75.00 degF		@		@	
Source Rmf	Rmc	MEAS	MEAS				
Rm @ BHT		0.84 ohmm @ 140.0 degF		@		@	
Time Since Circulation		06:44 hr					
Time on Bottom		11-Aug-18 04:14					
Max. Rec. Temperature		140.00 degF @ 4160.0 ft		@		@	
Equipment	Location	12156883	EL RENO, OK				
Recorded By		SEAN WOLTEMATH					
Witnessed By		LARRY NICHOLSON		HAROLD BELLERIVE			

Fold here

Service Ticket No.: 905062355	API No.: 15-179-21452-00-00	PGM Version: WL INSITE R5.6.3 (Build 4)

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								

				RESISTIVITY EQUIPMENT DATA				
Source of Sample								
Rm @ Meas. Temp		@	@	Run No.	Tool Type & No.	Pad Type	Tool Pos.	Other
Rmf @ Meas. Temp.		@	@	ONE	ACRT	N/A	ECEN	N/A
Rmc @ Meas. Temp.		@	@		I-11830684			
Source Rmf	Rmc				S-11830728			
Rm @ BHT		@	@					
Rmf @ BHT		@	@					
Rmc @ BHT		@	@					

EQUIPMENT DATA

GAMMA		ACOUSTIC		DENSITY		NEUTRON	
Run No.	ONE	Run No.	ONE	Run No.	ONE	Run No.	ONE
Serial No.	11013113	Serial No.	12173982	Serial No.	11213308	Serial No.	11019641
Model No.	GTET	Model No.	BSAT	Model No.	SDLT	Model No.	DSNT
Diameter	3.625"	No. of Cent.	N/A	Diameter	5.5"	Diameter	3.625"
Detector Model No.	GTET	Spacing	N/A	Log Type	GAM-GAM	Log Type	NEU-NEU
Type	SCINT			Source Type	Cs-137	Source Type	Am241Be
Length	8"	LSA [Y/N]		Serial No.	5475GW	Serial No.	DSN-436
Distance to Source	10'	FWDA [Y/N]		Strength	1.78 Ci	Strength	15.0 Ci

LOGGING DATA

GENERAL				GAMMA		ACOUSTIC			DENSITY			NEUTRON		
Run	Depth		Speed	Scale		Scale		Matrix	Scale		Matrix	Scale		Matrix
No.	From	To	ft/min	L	R	L	R		L	R		L	R	
ONE	TD	CSG	REC	0	150	30	-10	47.6 us/ft	30	-10	2.71 g/cc	30	-10	LIME

ONE	TD	CSG	REC	0	150	30	-10	47.6 us/ft	30	-10	2.71 g/cc	30	-10	LIME

DIRECTIONAL INFORMATION

Maximum Deviation	@	KOP	@

Remarks:

GTET-IDT-DSNT-SDLT-BSAT-ACRT RUN IN COMBINATION

ANNULAR HOLE VOLUME CALCULATED FOR 5.5 INCH CASING

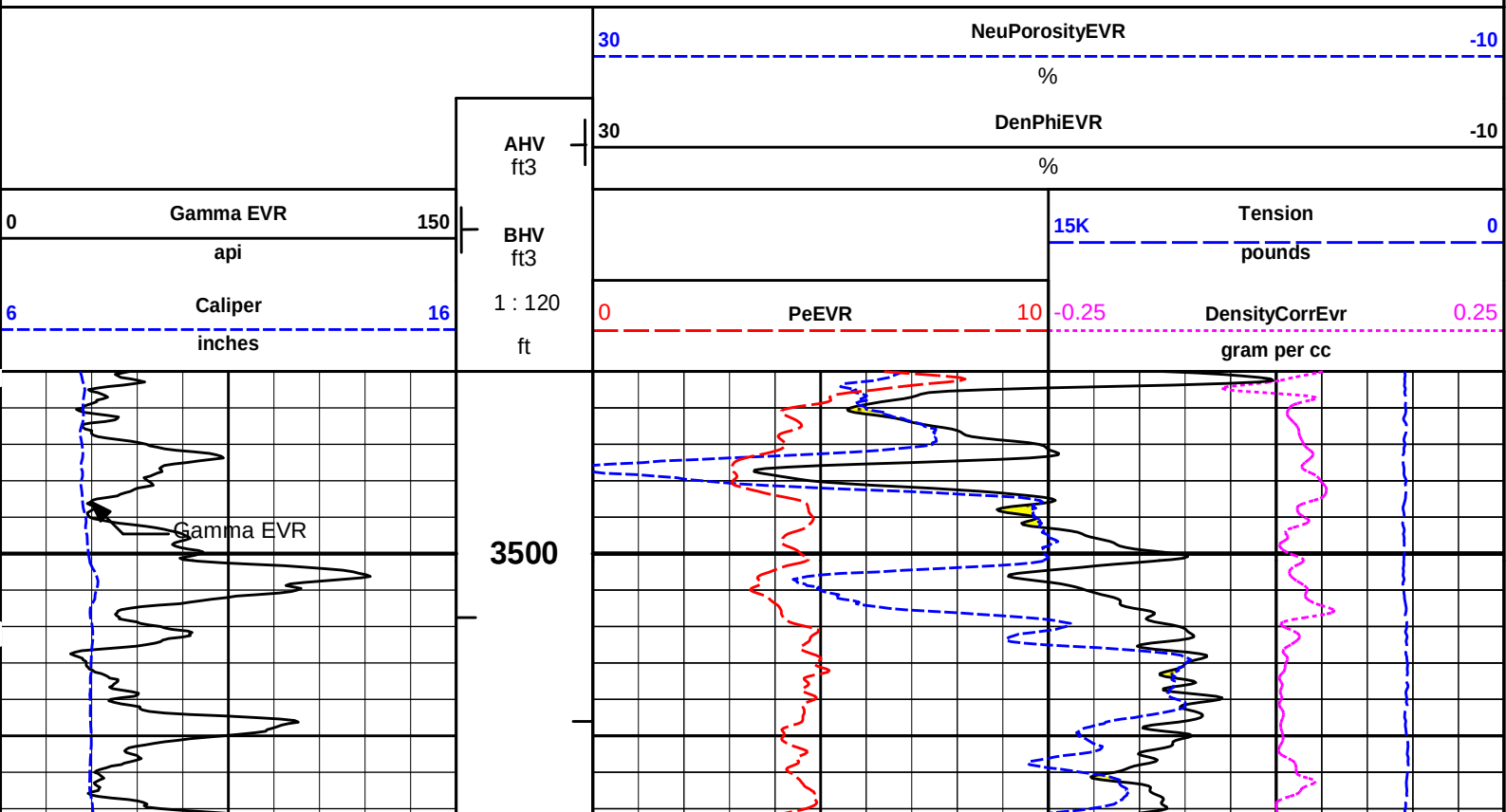
CHLORIDES REPORTED AT 2000 PPM

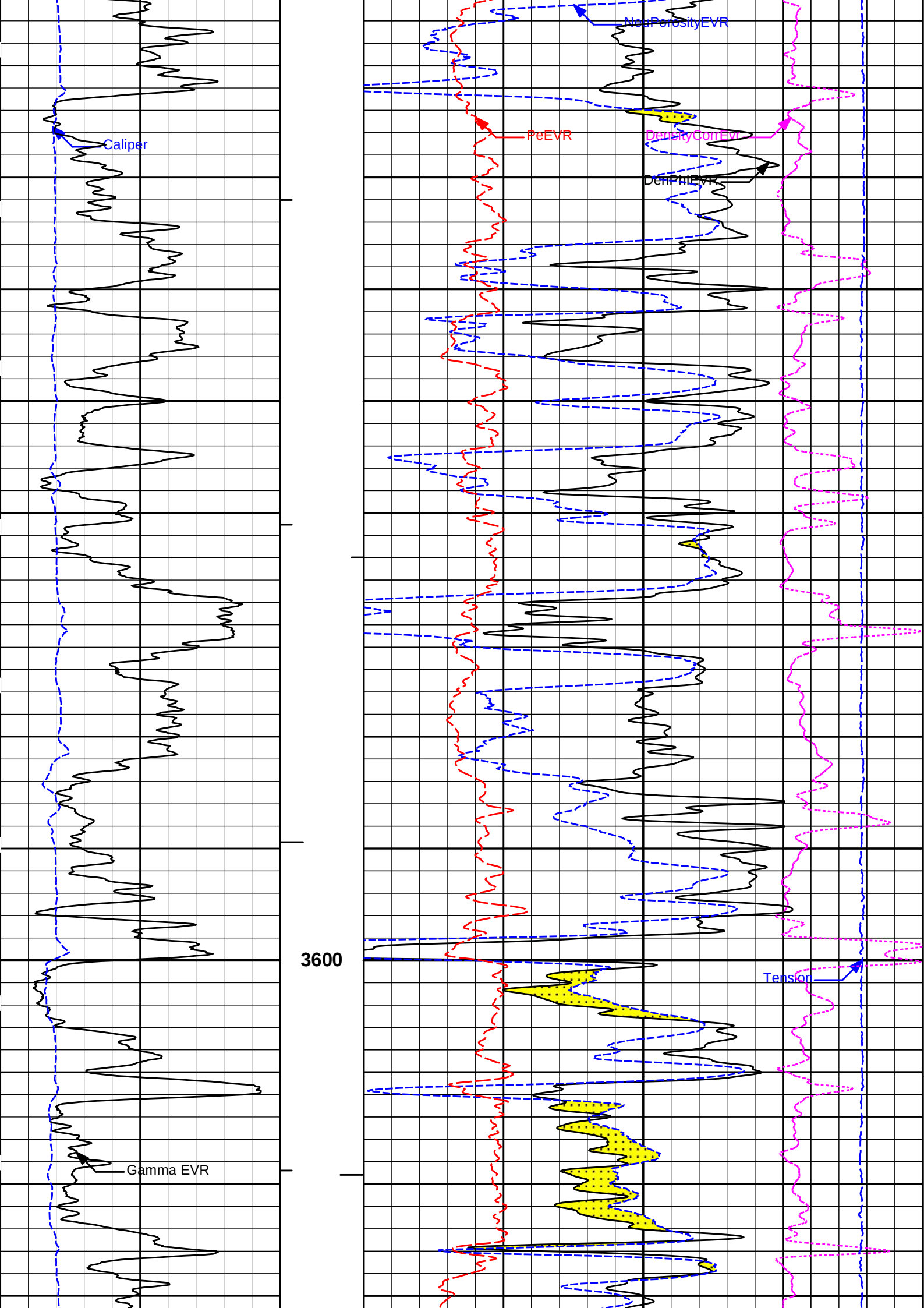
HALLIBURTON

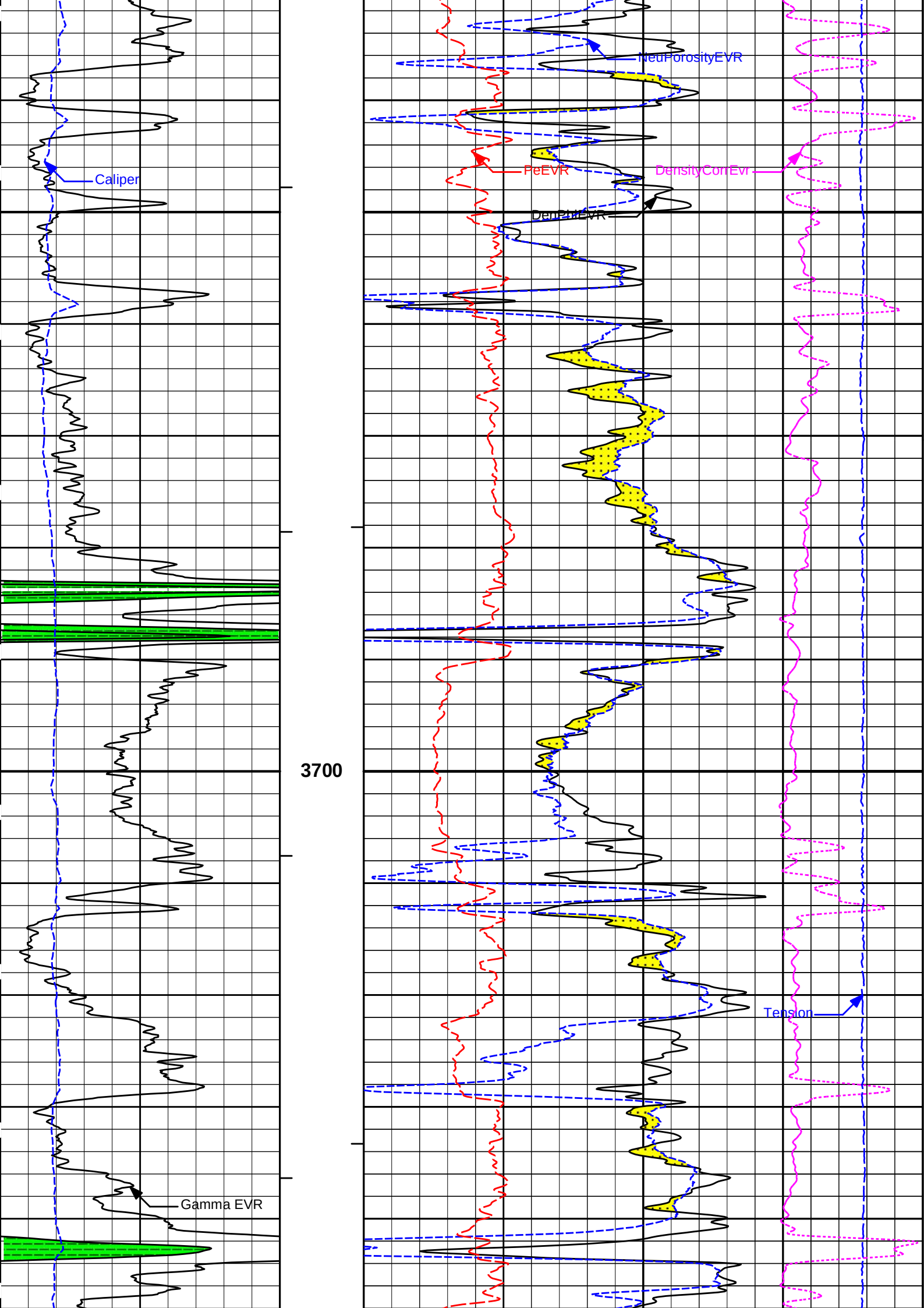
Plot Time: 11-Aug-18 05:36:30
Plot Range: 3490 ft to 4163.5 ft
Data: CULBRTH_BREEDEN\Well Based\DETAILS
Plot File: \\PORO_EVR\Poro_IQ_EVR_MAIN

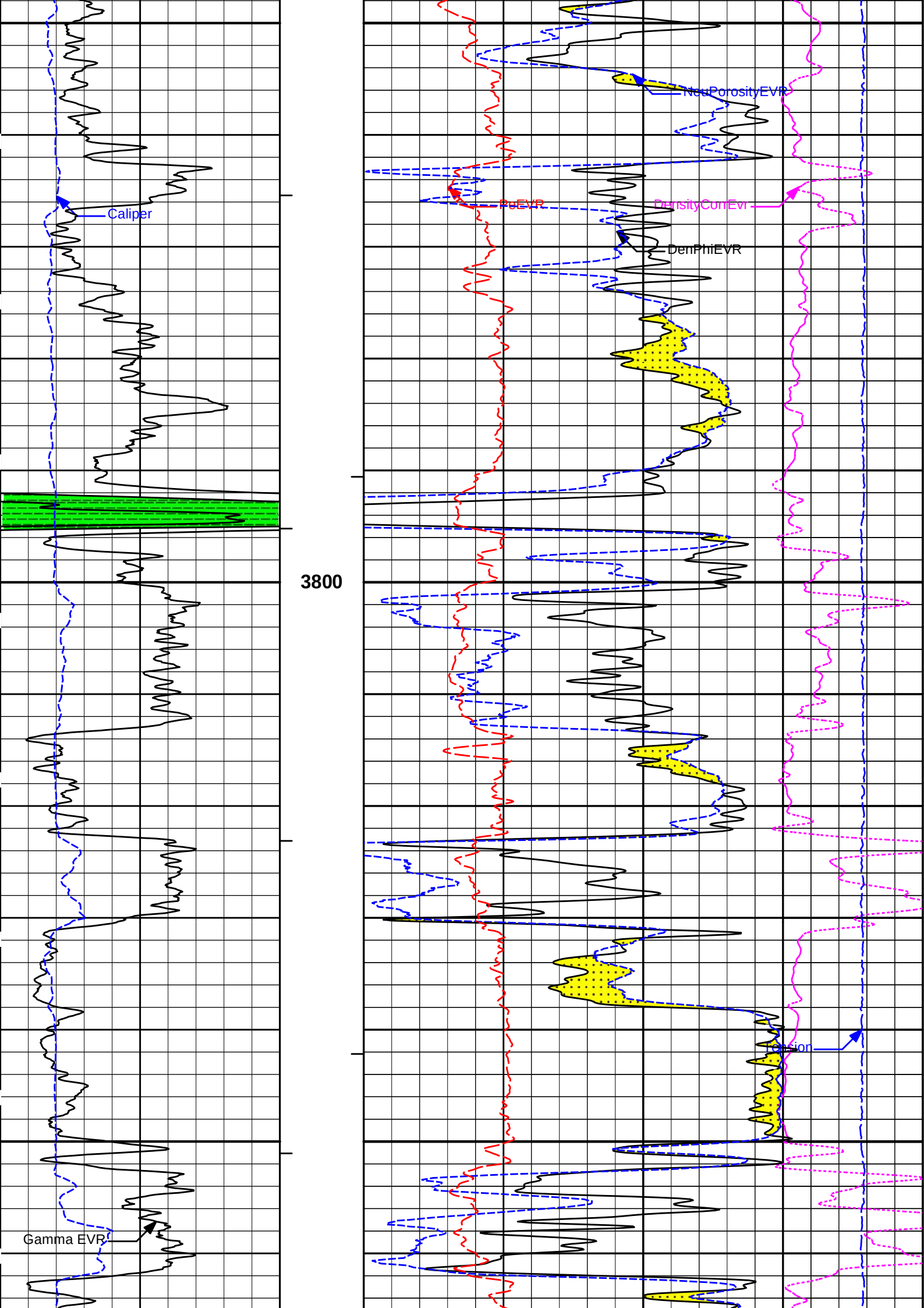
MAIN LOG

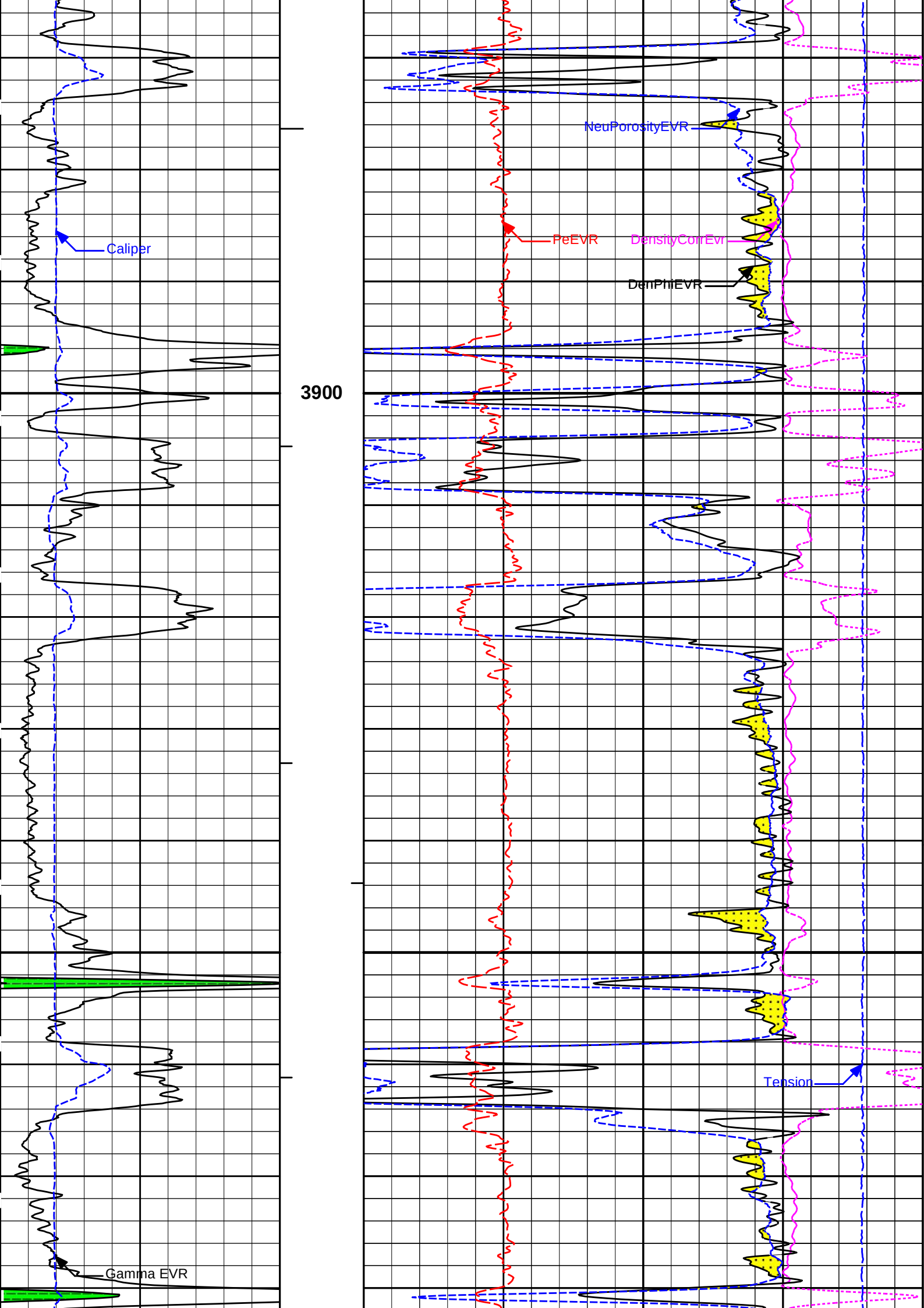
MAIN LOG
10" = 100'

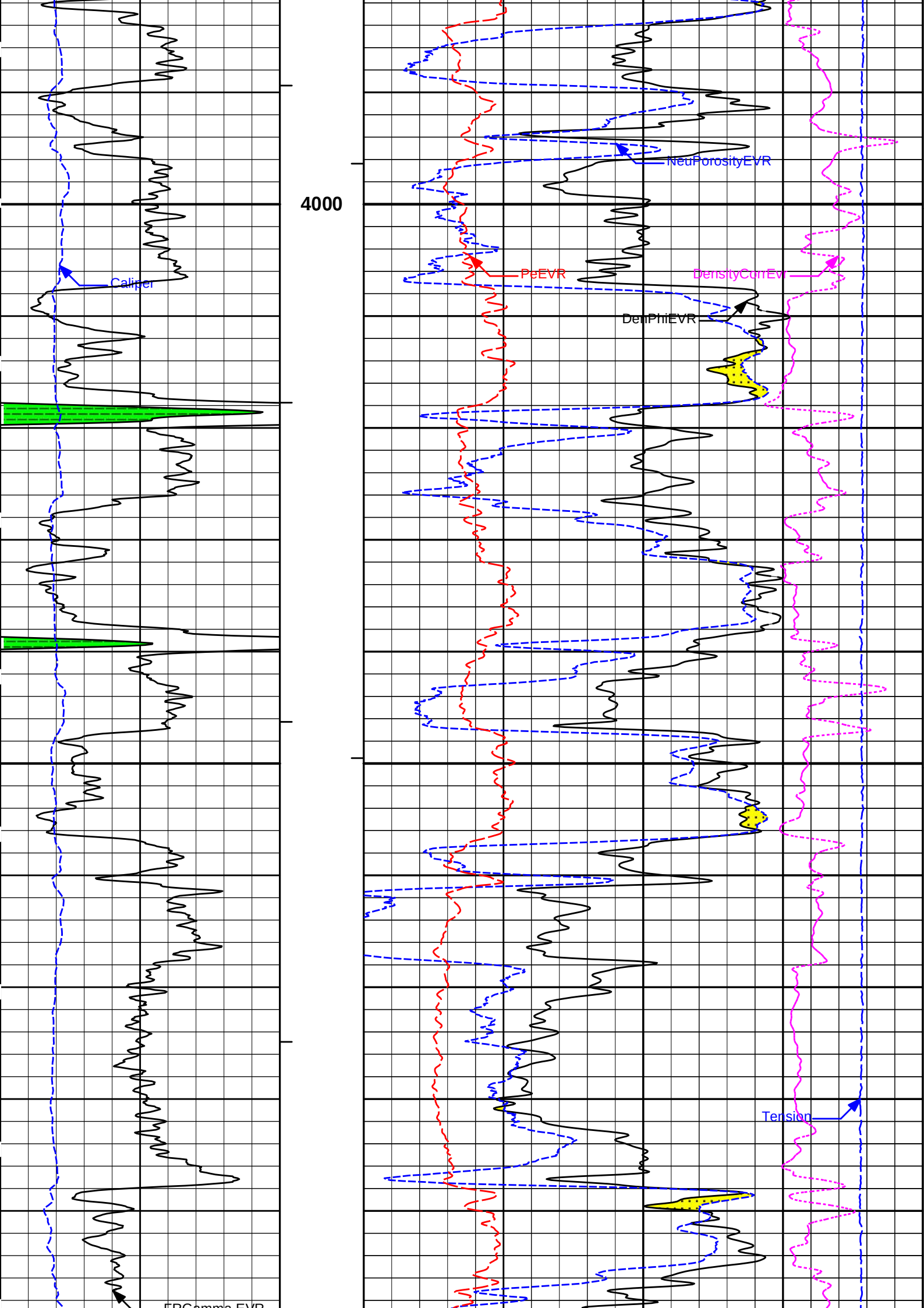


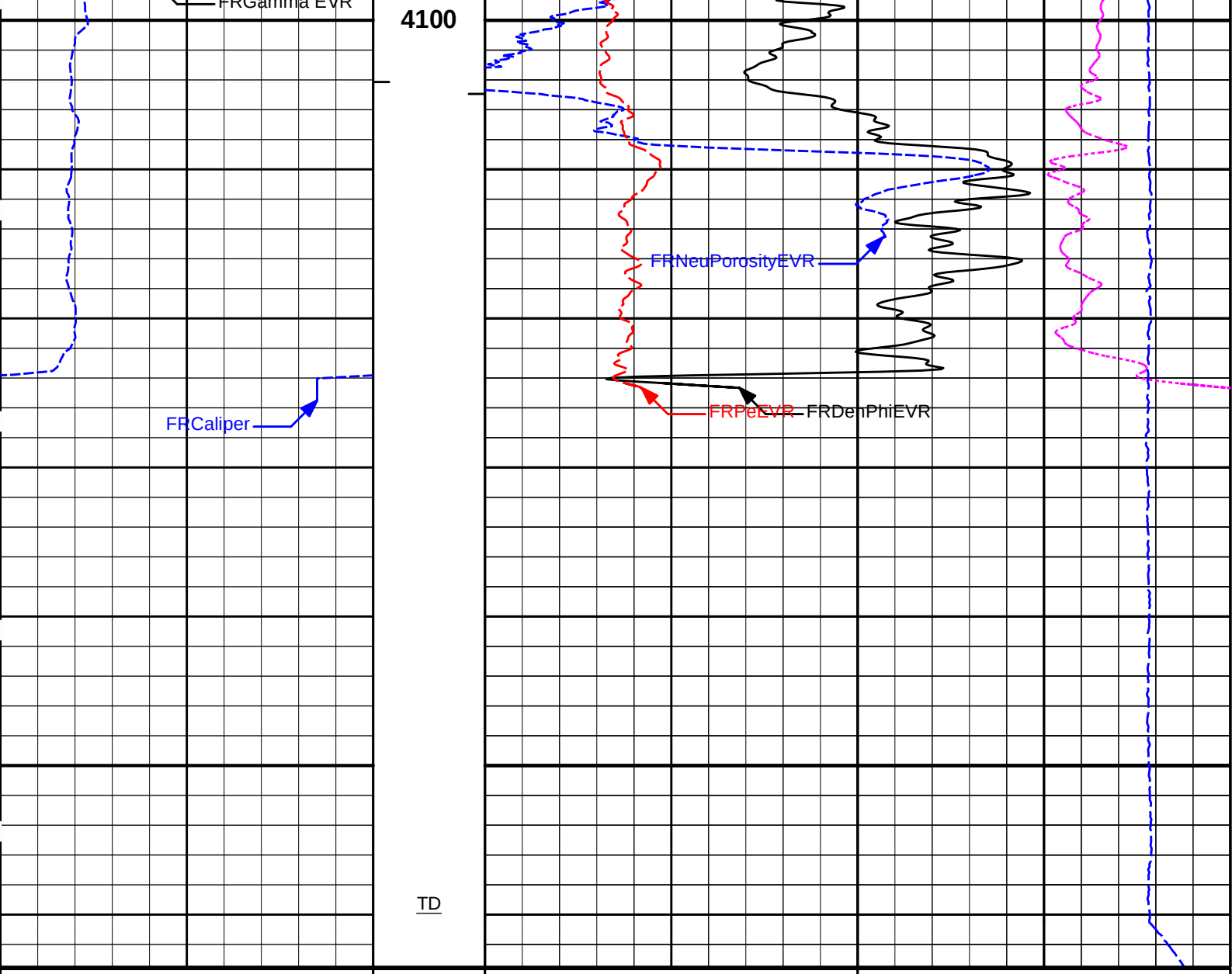

NeuPorosityEVR
PeEVR
DensityCorrEvr
DenPhiEVR
Caliper
3600
Tension
Gamma EVR


NeuPorosityEVR
PeEVR
DensityCorrEvr
DenPorEVR
Caliper
3700
Tension
Gamma EVR


Caliper
NeuPorosityEVR
PeEVR
DensityCorrEvr
DenPhiEVR
3800
Tension
Gamma EVR


NeuPorosityEVR
PeEVR
DensityCorrEvr
DenPhiEVR
Caliper
3900
Tension
Gamma EVR


4000
Caliper
NeuPorosityEVR
PeEVR
DensityCorrEvr
DenPhiEVR
Tension



HALLIBURTON

Plot Time: 11-Aug-18 05:36:33
Plot Range: 3490 ft to 4163.5 ft
Data: CULBRTH_BREEDEN\Well Based\DETAILS\
Plot File: \\PORO_EVR\Poro_IQ_EVR_MAIN

MAIN LOG

MAIN LOG
10" = 100'

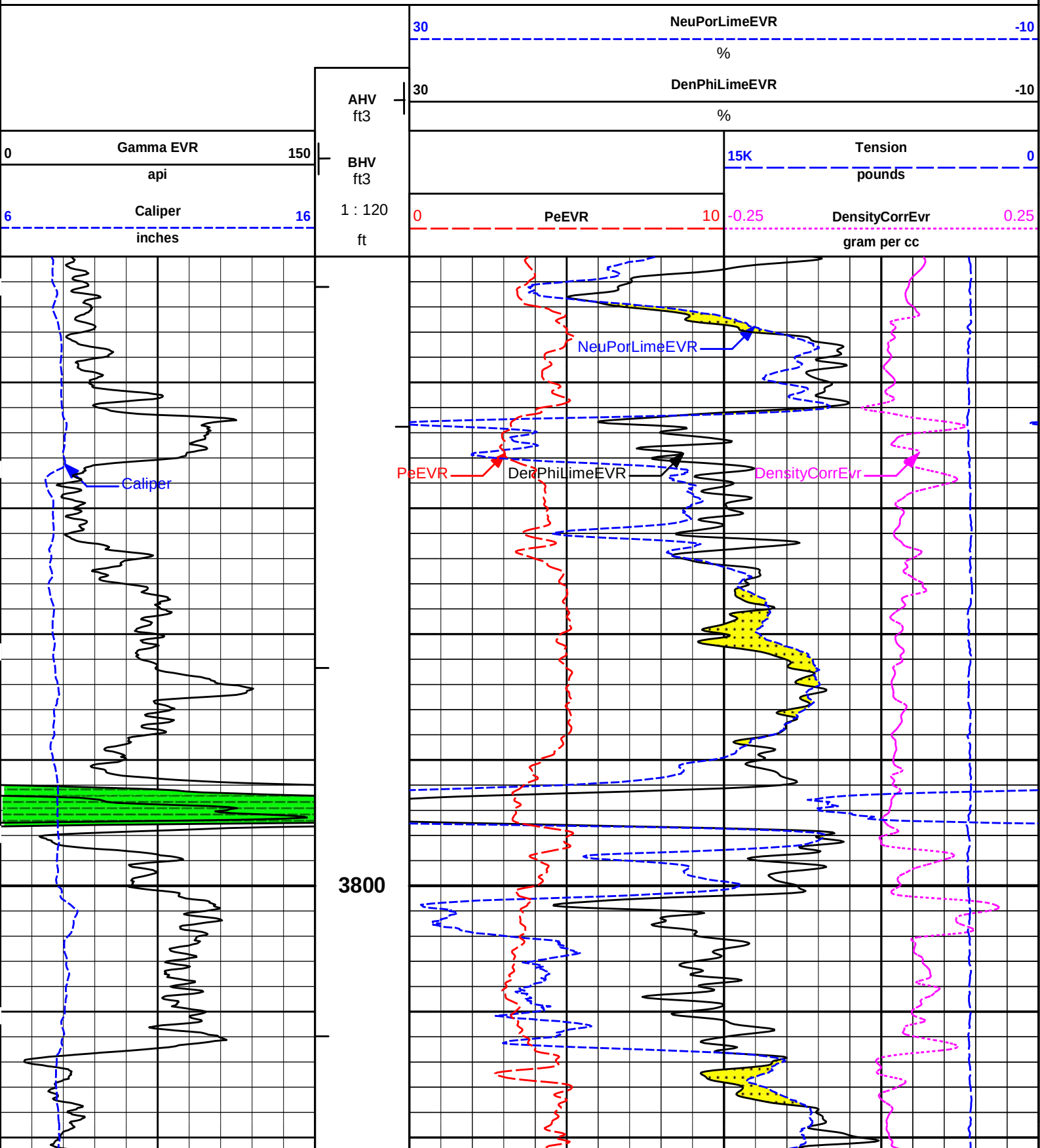
HALLIBURTON

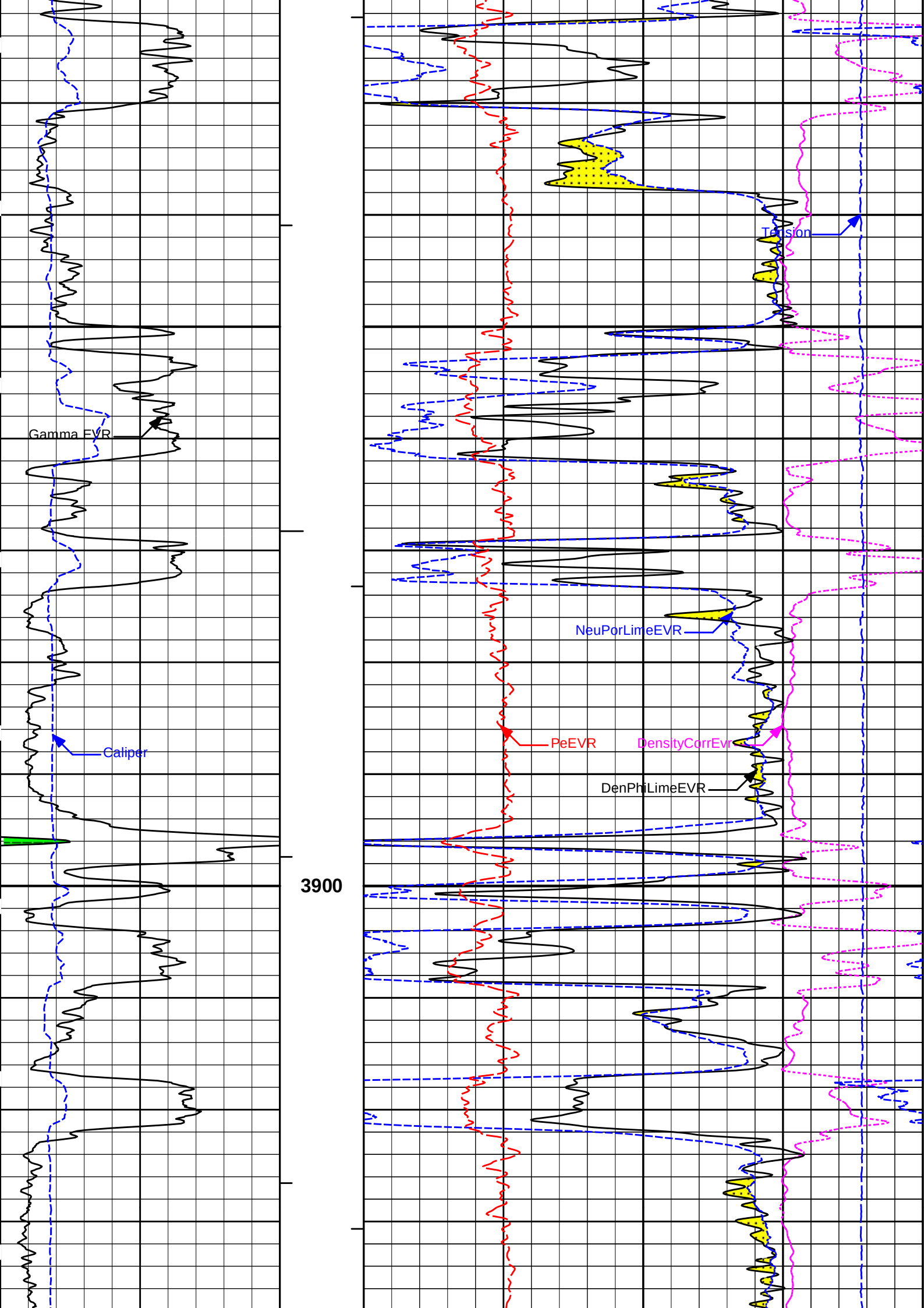
Plot Time: 11-Aug-18 05:36:33

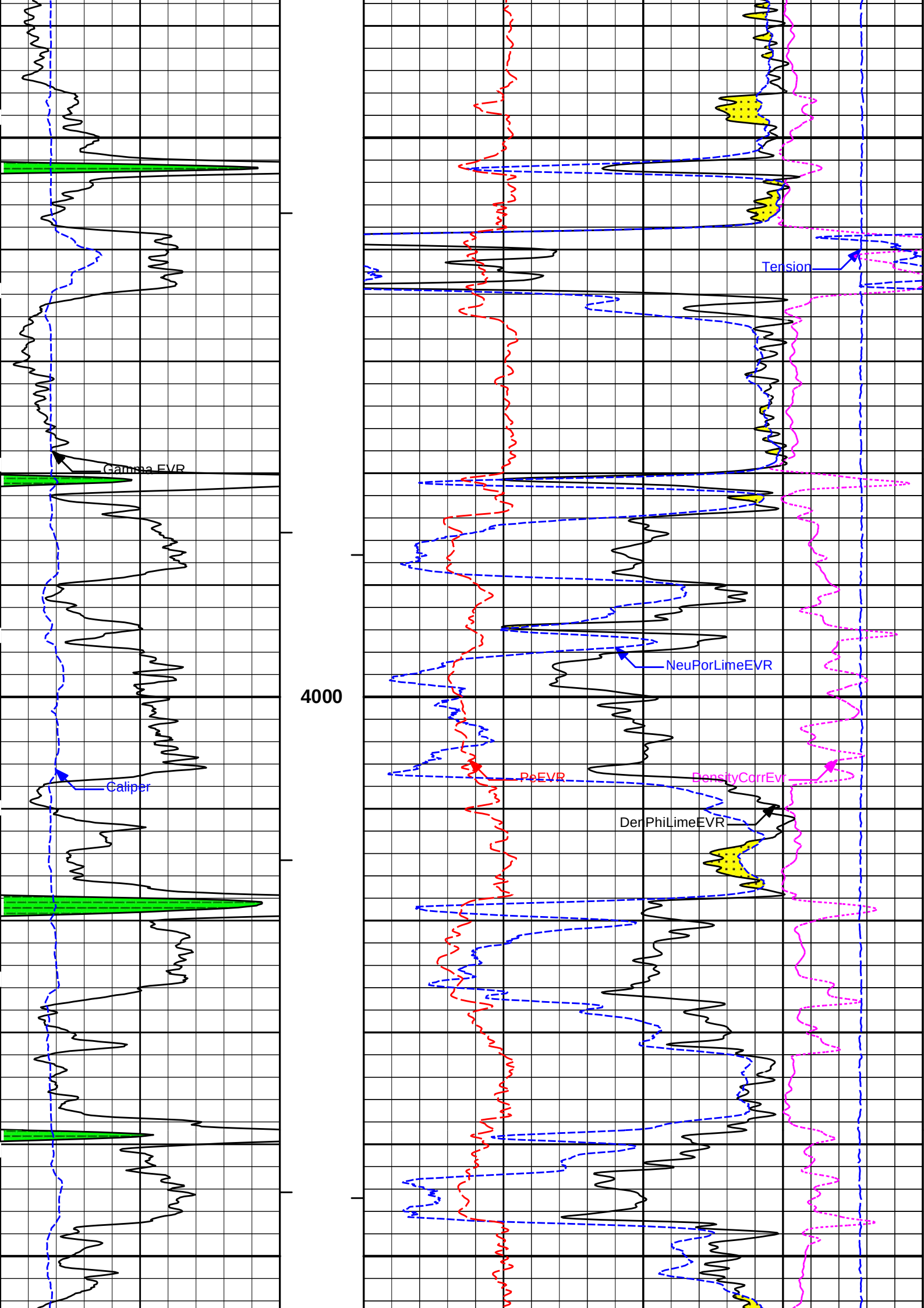
Plot Range: 3750 ft to 4164.83 ft
Data: CULBRTH_BREEDEN\Well Based\REPEAT\
Plot File: \\PORO_EVR\Poro_IQ_EVR_LIME_RPT

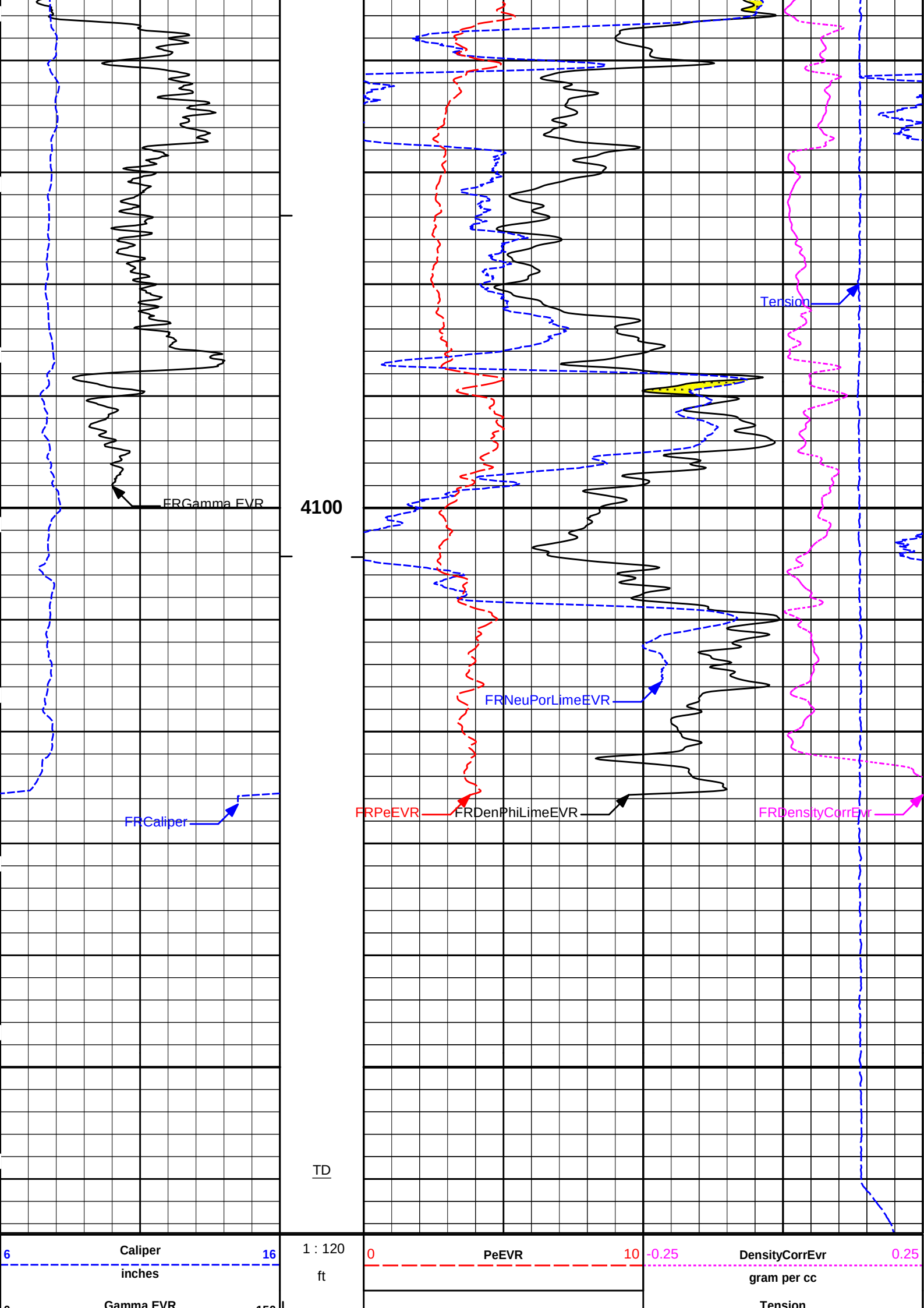
REPEAT SECTION

REPEAT SECTION
10" = 100'




Tension
Gamma_EVR
NeuPorLimeEVR
Caliper
PeEVR
DensityCorrEvr
DenPhiLimeEVR
3900


Tension
Gamma EVR
4000
NeuPorLimeEVR
PeEVR
DensityCorrEvr
Caliper
DenPhiLimeEVR


Tension
FRGamma EVR
4100
FRNeuPorLimeEVR
FRCaliper
FRPeEVR
FRDenPhiLimeEVR
FRDensityCorrEvr
TD
6
Caliper
16
inches
Gamma EVR
1 : 120
ft
0
PeEVR
10
-0.25
DensityCorrEvr
0.25
gram per cc
Tension

0 Gamma EVR 150
api

BHV
ft3

AHV
ft3

15K Tension 0
pounds

30 DenPhiLimeEVR -10
%

30 NeuPorLimeEVR -10
%

HALLIBURTON

Plot Time: 11-Aug-18 05:36:35
Plot Range: 3750 ft to 4164.83 ft
Data: CULBRTH_BREEDEN\Well Based\REPEAT\
Plot File: \\PORO_EVR\Poro_IQ_EVR_LIME_RPT

REPEAT SECTION

REPEAT SECTION
10" = 100'

HALLIBURTON

Plot Time: 11-Aug-18 05:36:35
Plot Range: 3490 ft to 4163.5 ft
Data: CULBRTH_BREEDEN\Well Based\DETAILS\
Plot File: \\-LOCAL-\CULBRTH_BREEDEN\Well Based\PORO_EVR\BULKD_5_IQ_EVR_MAIN

MAIN LOG

MAIN LOG
10" = 100'

0 Gamma EVR 150
api

18 FarQuality -2

-18 NearQuality 2

6 Caliper 16
inches

AHV
ft3

BHV
ft3

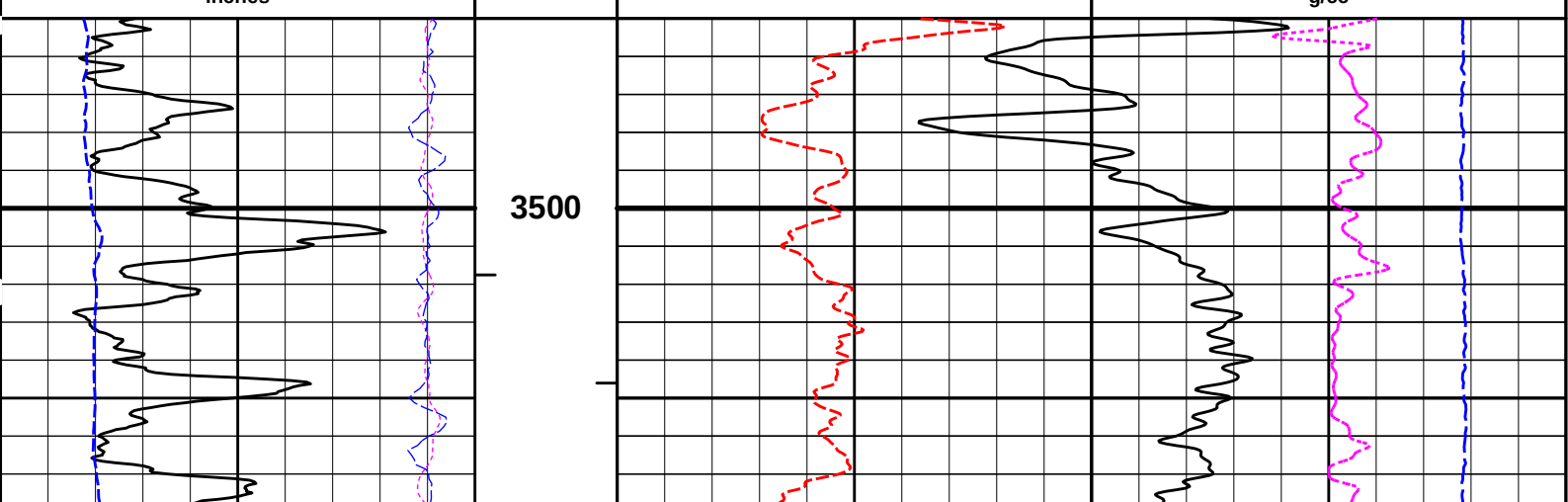
1 : 120
ft

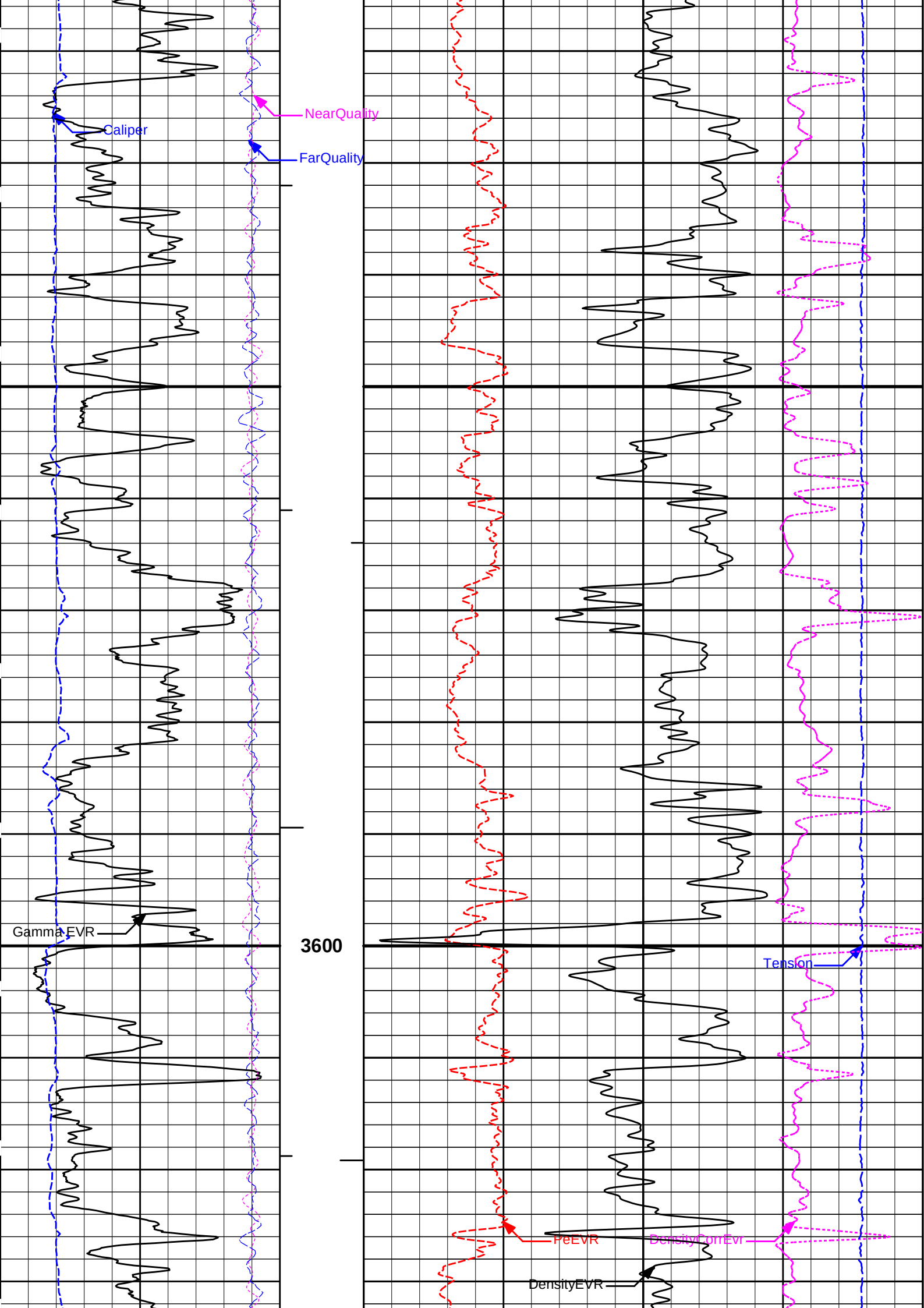
2 DensityEVR 3
g/cc

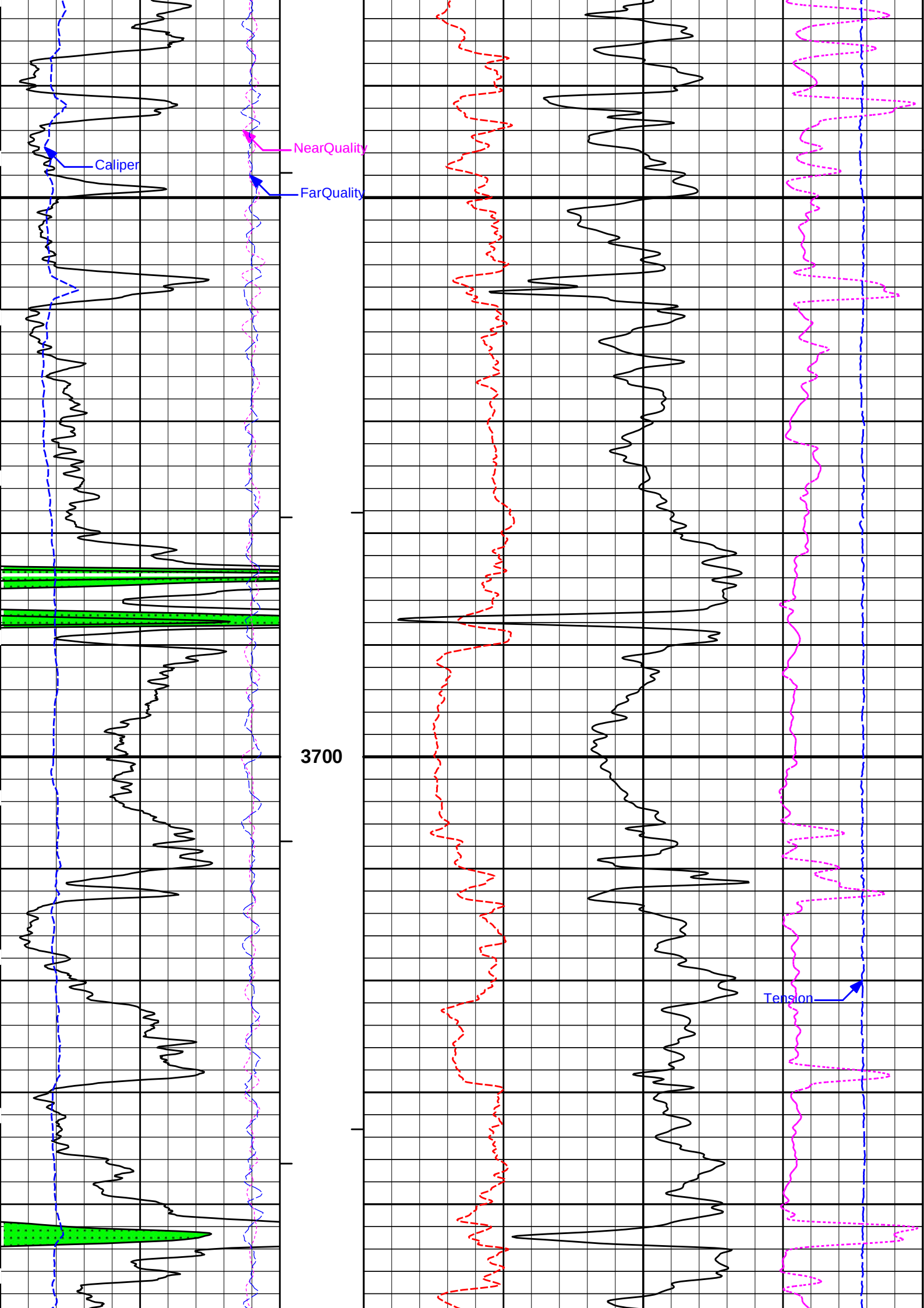
15K Tension 0
pounds

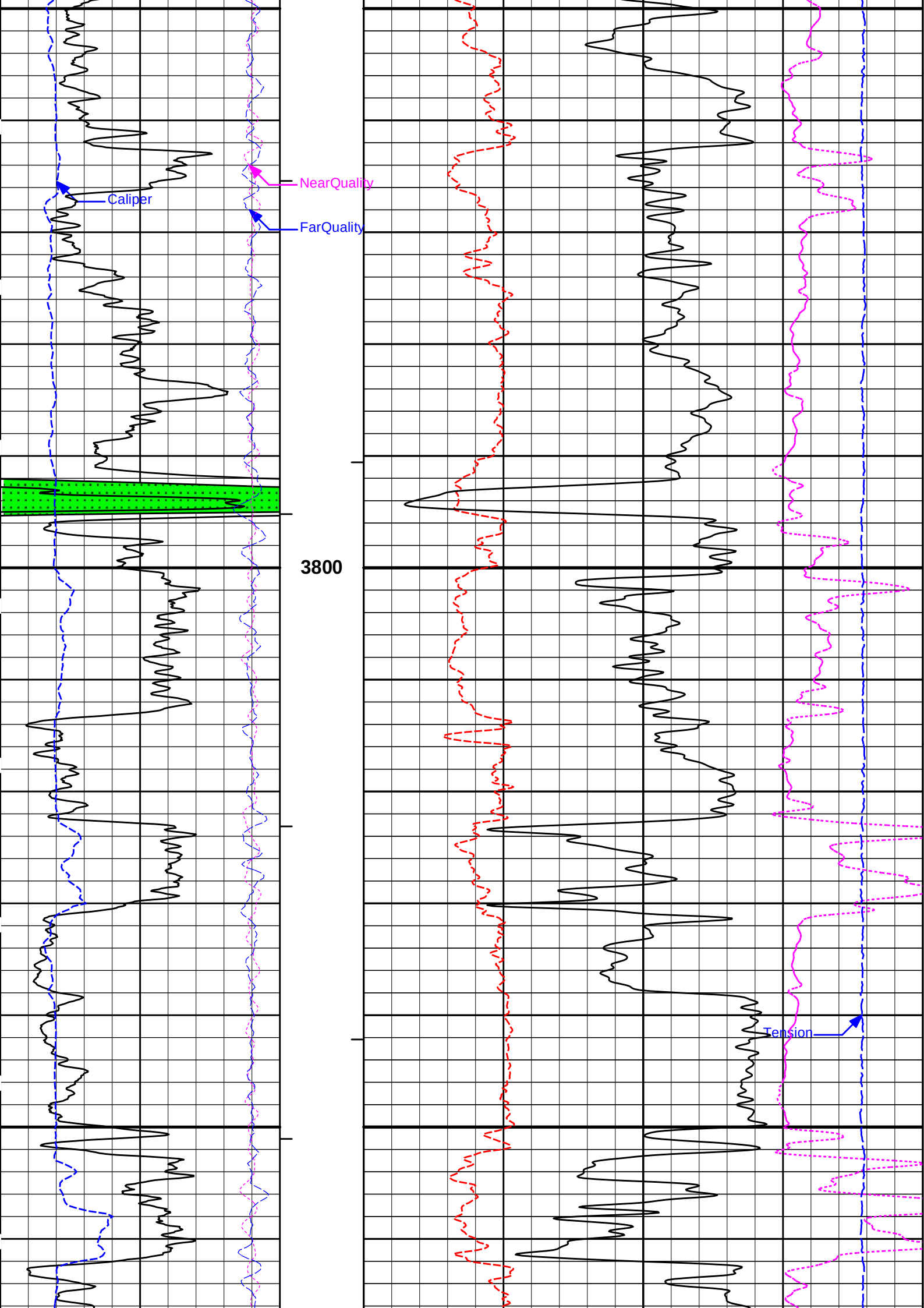
0 PeEVR 10

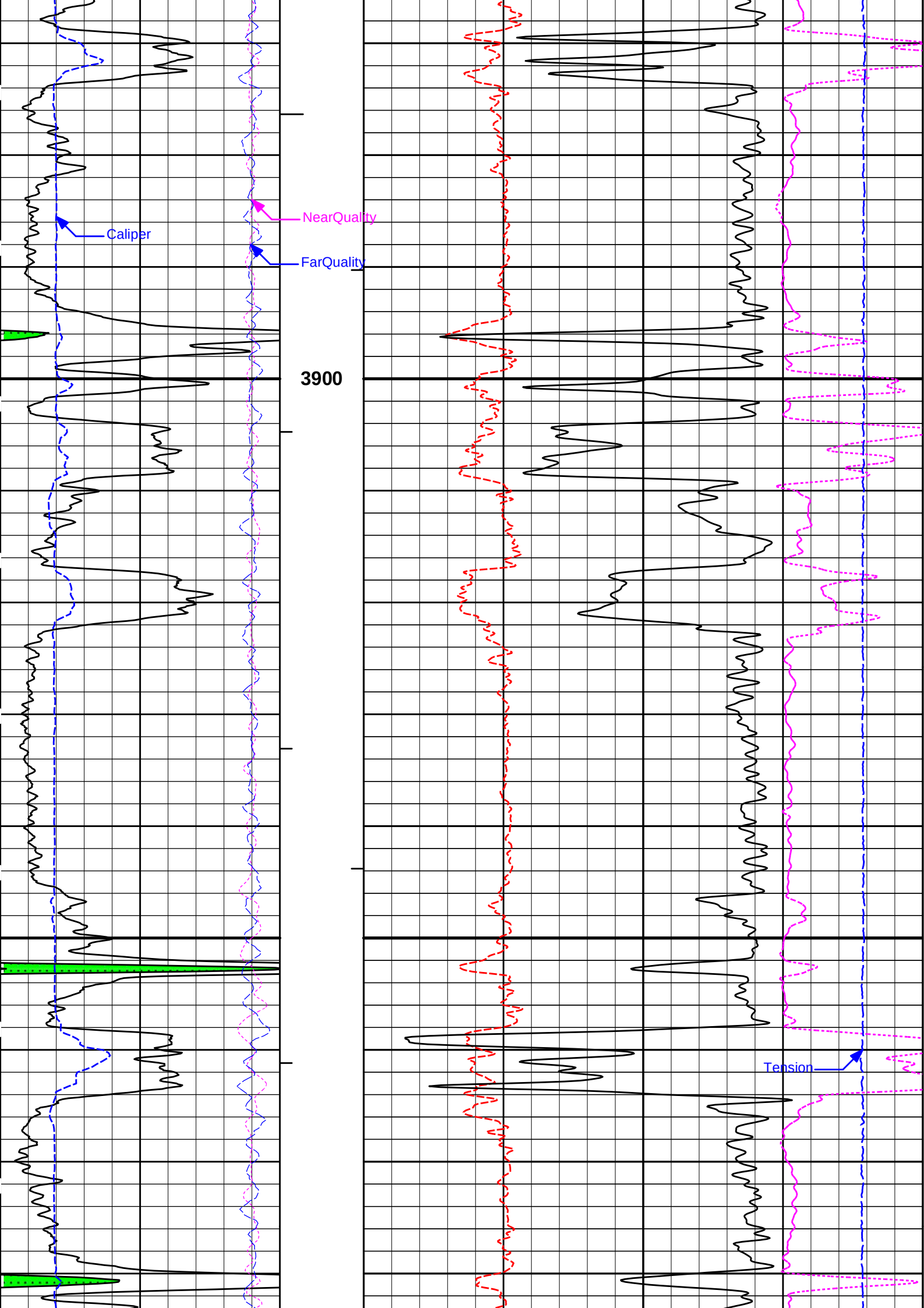
-0.25 DensityCorrEvr 0.25
g/cc

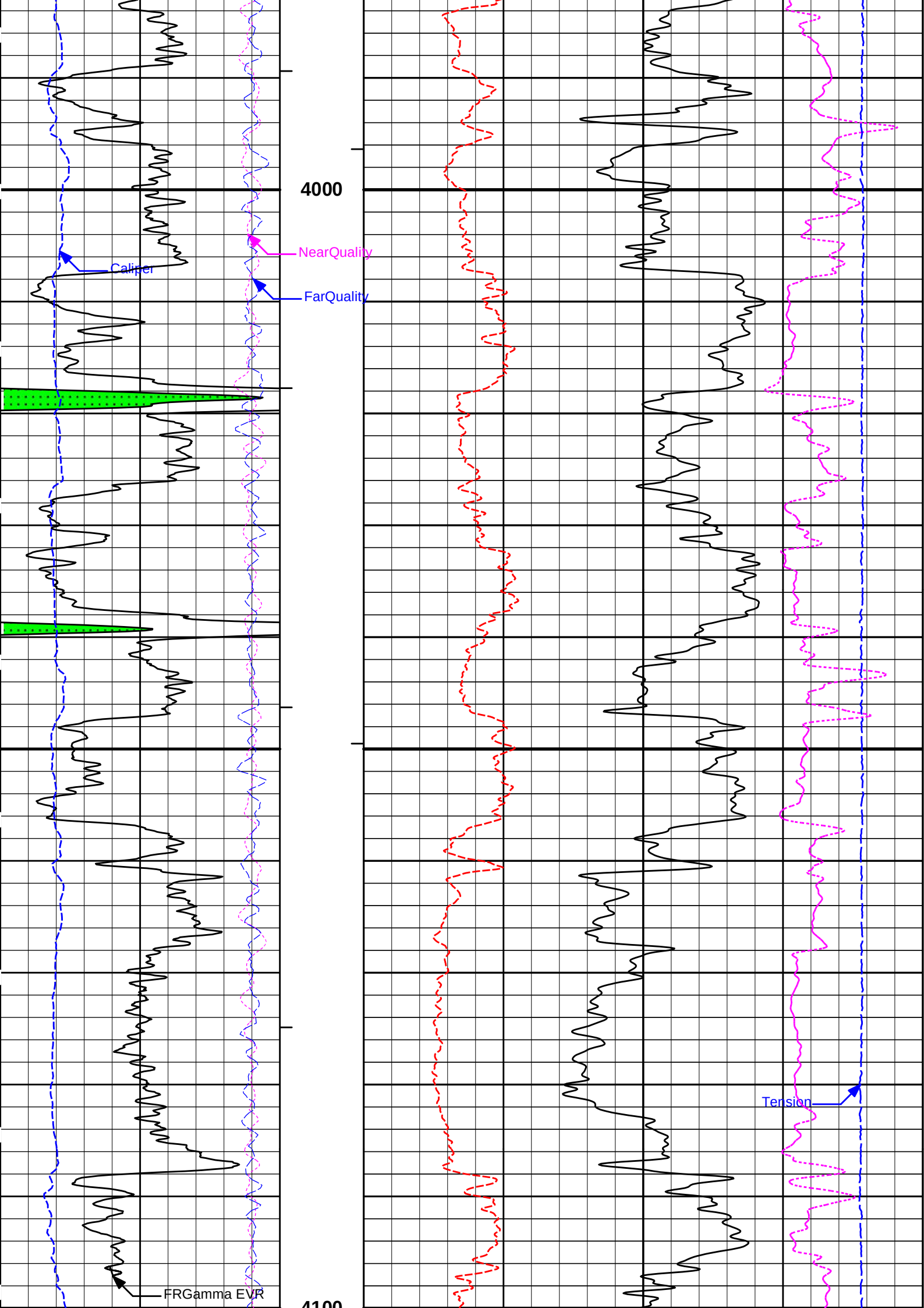


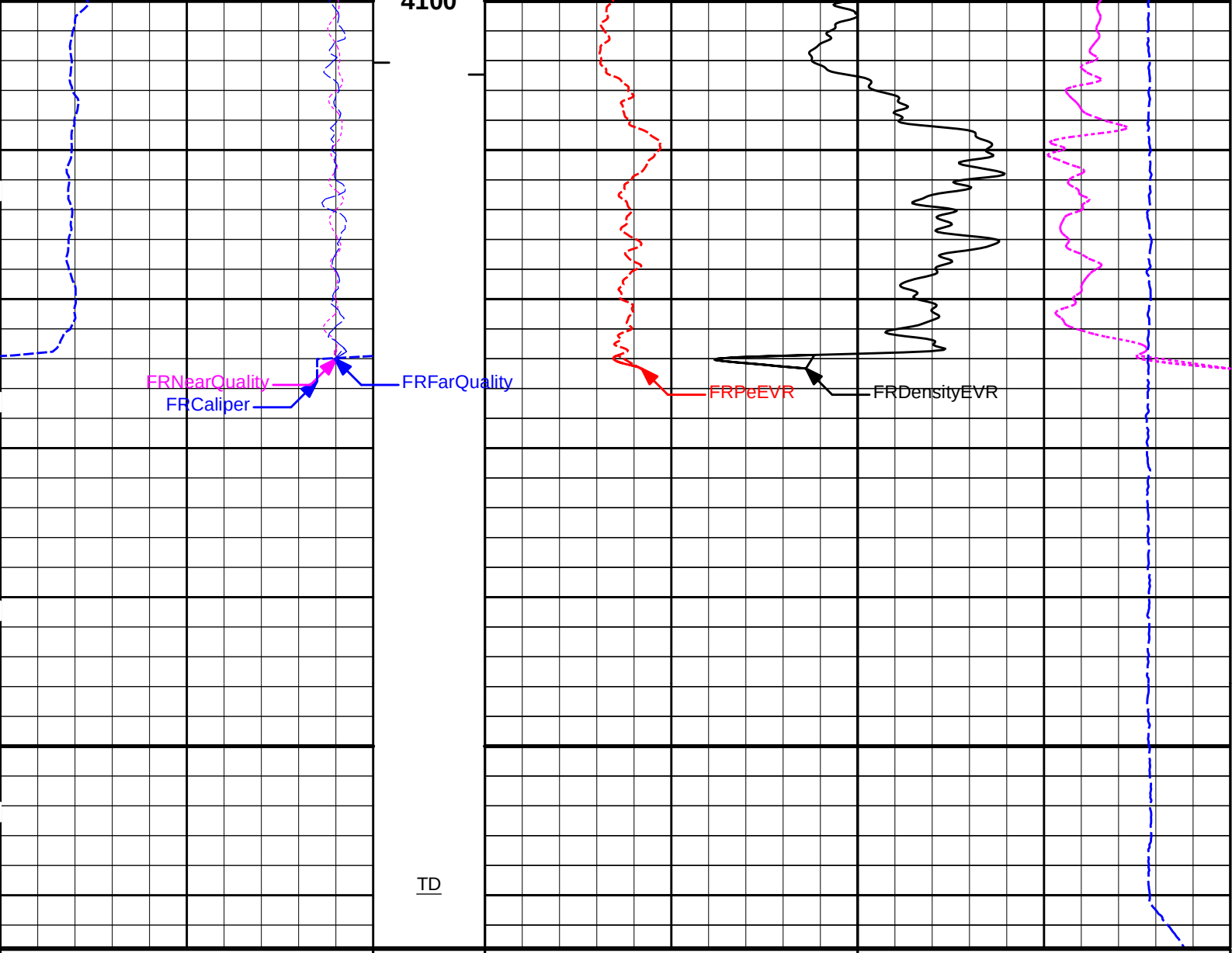

NearQuality
Caliper
FarQuality
Gamma EVR
3600
Tension
PeEVR
DensityCorrEvr
DensityEVR


NearQuality
Caliper
FarQuality
3700
Tension


NearQuality
Caliper
FarQuality
3800
Tension


NearQuality
Caliper
FarQuality
3900
Tension


4000
Caliper
NearQuality
FarQuality
Tension
FRGamma EVR
4100



6	Caliper	16	1 : 120 ft	0 PeEVR 10	-0.25 DensityCorrEvr 0.25
	inches				g/cc
-18	NearQuality	2	BHV ft3		15K Tension 0
					pounds
18	FarQuality	-2	AHV ft3	2 DensityEVR 3	
				g/cc	
0	Gamma EVR	150			
	api				

HALLIBURTON

Plot Time: 11-Aug-18 05:36:38
Plot Range: 3490 ft to 4163.5 ft
Data: CULBRTH_BREEDEN\Well Based\DETAILS\
Plot File: \\-LOCAL-\CULBRTH_BREEDEN\Well Based\PORO_EVR\BULKD_5_IQ_EVR_MAIN

MAIN LOG

MAIN LOG
10" = 100'

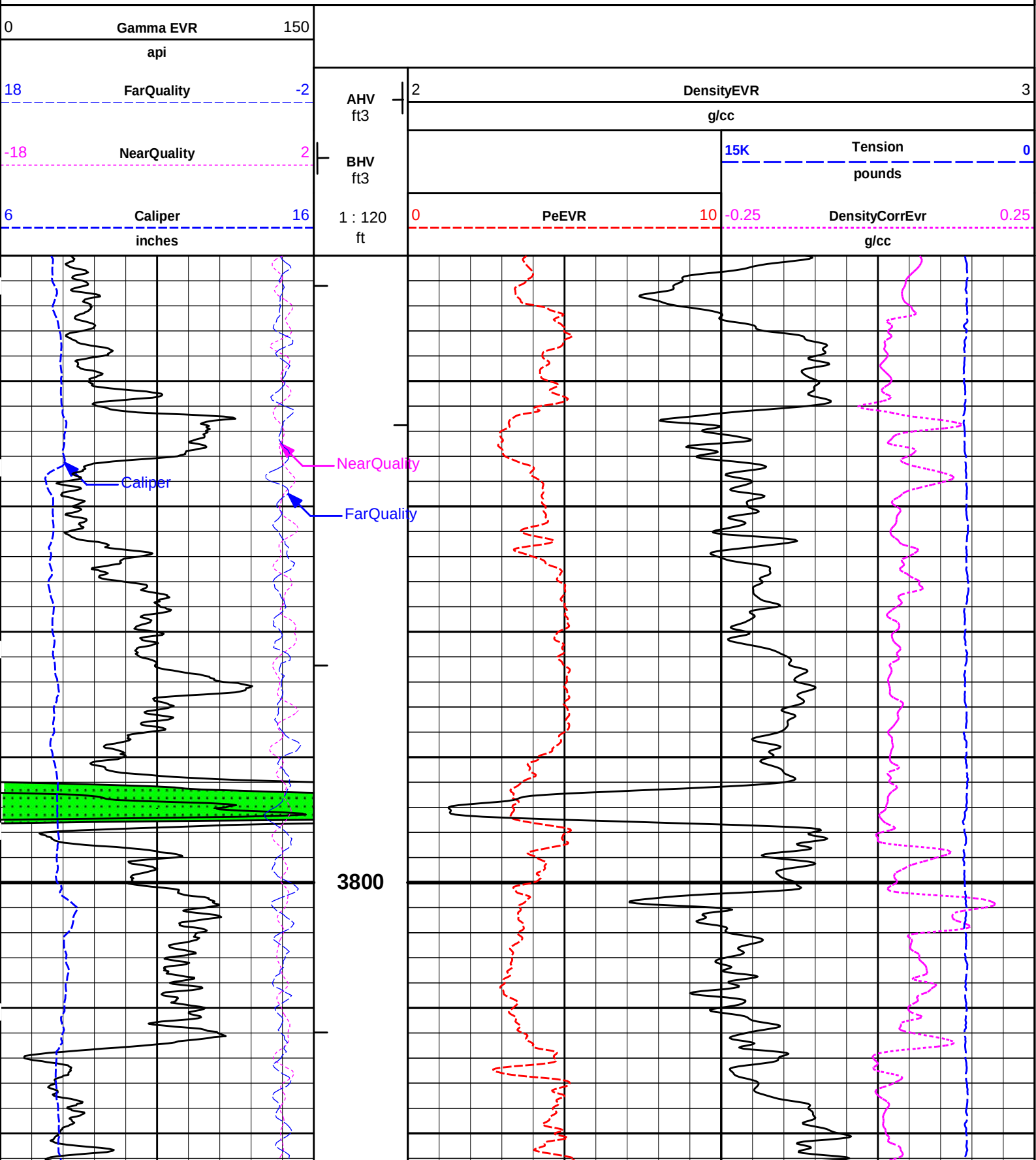
HALLIBURTON

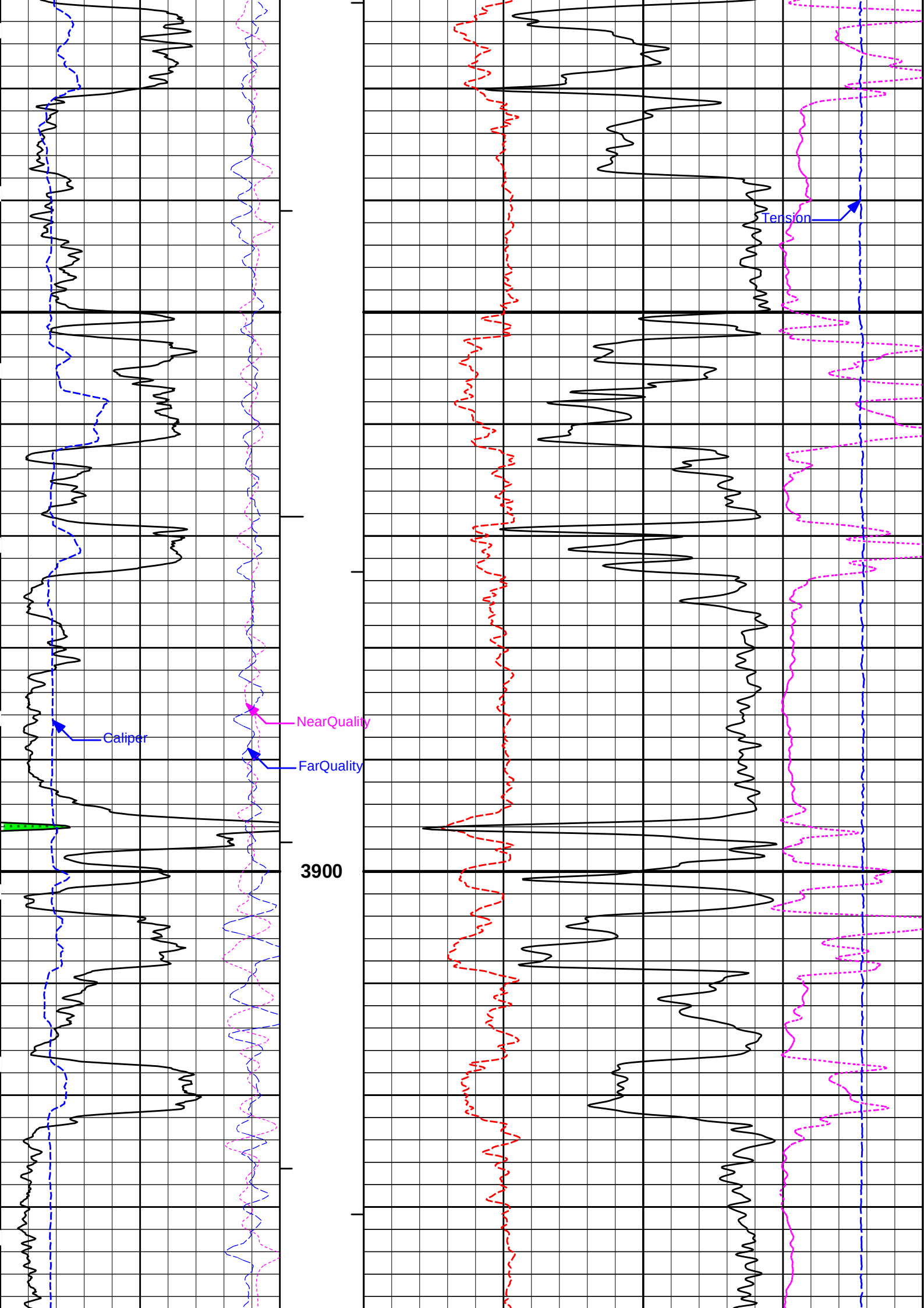
Plot Time: 11-Aug-18 05:36:38
Plot Range: 3750 ft to 4164.83 ft

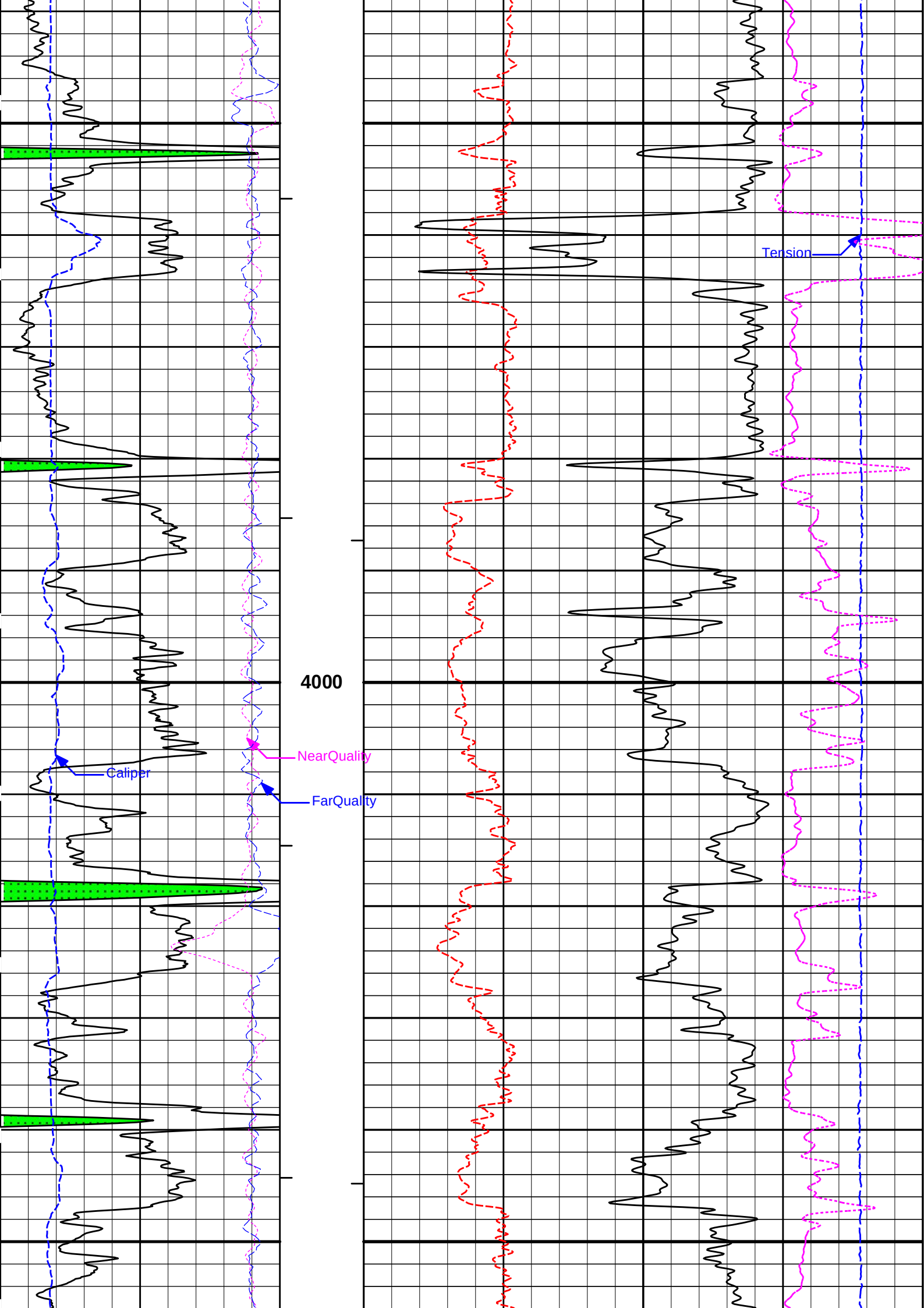
Data: CULBRTH_BREEDEN\Well Based\REPEAT\
Plot File: \\-LOCAL-\CULBRTH_BREEDEN\Well Based\PORO_EVR\BULKD_5_IQ_EVR_RPT

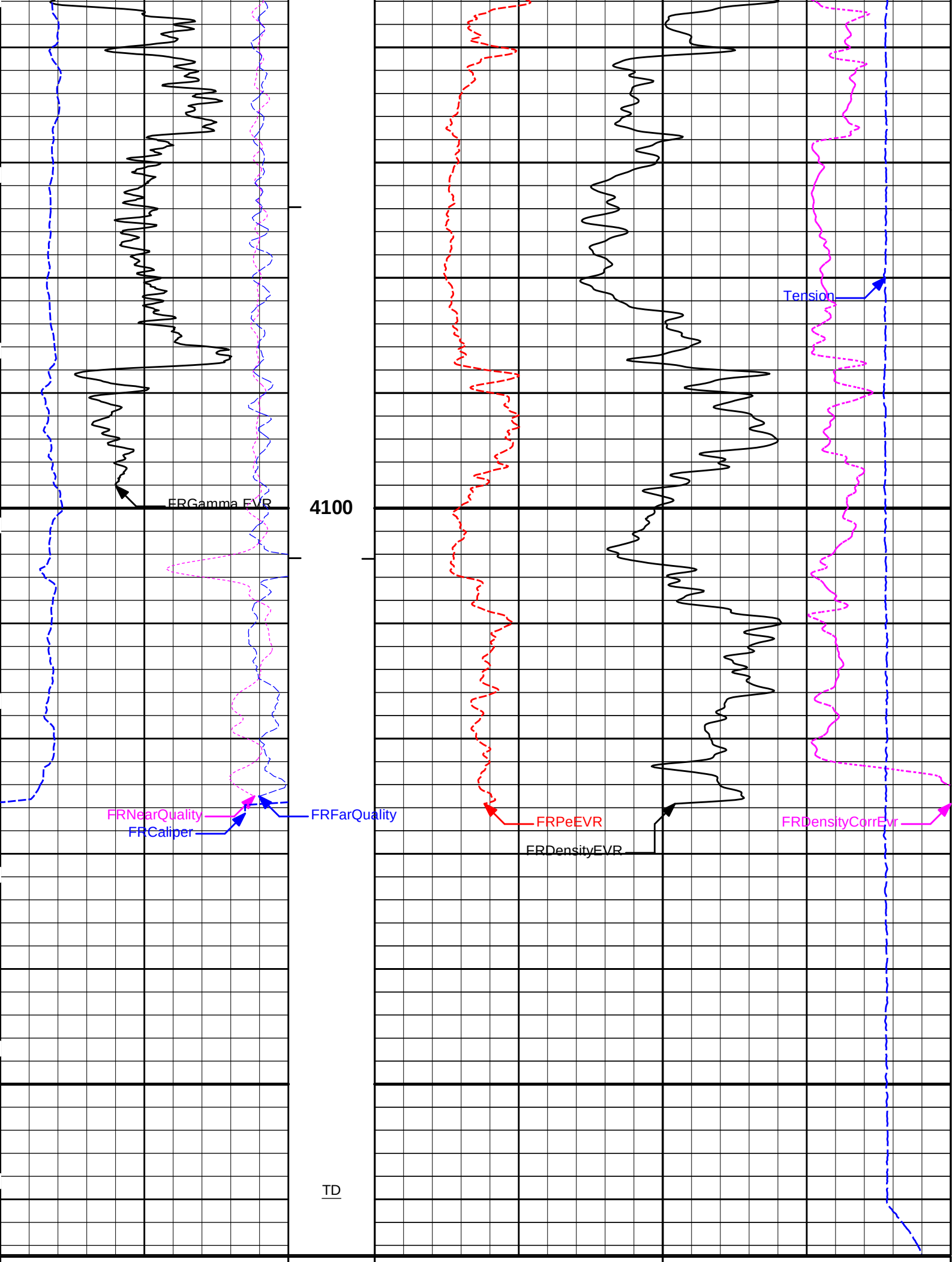
REPEAT SECTION

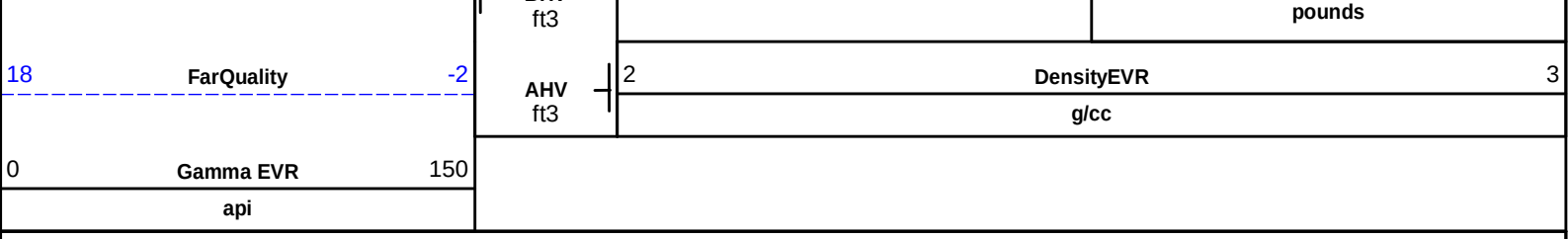
REPEAT SECTION
10" = 100'




Tension
NearQuality
Caliper
FarQuality
3900


Tension
4000
NearQuality
Caliper
FarQuality


FRGamma EVR
4100
Tension
FRNearQuality
FRFarQuality
FRCaliper
FRPeEVR
FRDensityEVR
FRDensityCorrEvr
TD
6
Caliper
16
inches
-18
NearQuality
2
1 : 120
ft
0
PeEVR
10
-0.25
DensityCorrEvr
0.25
g/cc
15K
Tension
0
BHV



HALLIBURTON

Plot Time: 11-Aug-18 05:36:41
Plot Range: 3750 ft to 4164.83 ft
Data: CULBRTH_BREEDEN\Well Based\REPEAT
Plot File: \\-LOCAL-\CULBRTH_BREEDEN\Well Based\PORO_EVR\BULKD_5_IQ_EVR_RPT

REPEAT SECTION

REPEAT SECTION
10" = 100'

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	9.200	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	2.000	ohmm
	SHARED	TRM	Temperature of Mud	75.0	degF
	SHARED	CSD	Logging Interval is Cased?	No	
	SHARED	ICOD	AHV Casing OD	5.500	in
	SHARED	CSTR	Compressive Strength	1000.00	psia
	SHARED	ST	Surface Temperature	75.0	degF
	SHARED	TD	Total Well Depth	4160.00	ft
	SHARED	BHT	Bottom Hole Temperature	120.0	degF
	SHARED	SVTM	Navigation and Survey Master Tool	IDT	
	SHARED	AZTM	High Res Z Accelerometer Master Tool	IDT	
	SHARED	TEMM	CBM Temperature Master Tool	GTET	
	SHARED	SOCI	Source of Casing Information	Parameters	
	SHARED	MSAL	Water-base mud filtrate salinity	0.00	ppm
	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	SDLT	
Rwa / CrossPlot	ROIN	Input for RO Calculation	Rwa	
GTET	GROK	Process Gamma Ray?	Yes	
GTET	GEOK	Process Gamma Ray EVR?	Yes	
GTET	TPOS	Tool Position for Gamma Ray Tools.	Eccentered	
GTET	BHSM	Borehole Size Source Tool	SDLT	
IDT	WRTI	Survey Writing Interval	30	ft
IDT	SOPT	Smoothing Option	None	
DSNT	DNOK	Process DSN?	Yes	
DSNT	DEOK	Process DSN EVR?	Yes	
DSNT	NLIT	Neutron Lithology	Limestone	
DSNT	DNSO	DSN Standoff - 0.25 in (6.35 mm) Recommended	0.250	in
DSNT	DNTT	Temperature Correction Type	None	
DSNT	DPRS	DSN Pressure Correction Type	None	
DSNT	SHCO	View More Correction Options	No	
DSNT	UTVD	Use TVD for Gradient Corrections?	No	
DSNT	LHWT	Logging Horizontal Water Tank?	No	
DSNT	UCLA	Classic Neutron Parameter utilized?	No	
DSNT	BHSM	Borehole Size Source Tool	SDLT	
SDLT	CLOK	Process Caliper Outputs?	Yes	
Microlog Pad	MLOK	Process MicroLog Outputs?	Yes	
SDLT Pad	DNOK	Process Density?	Yes	
SDLT Pad	DNOK	Process Density EVR?	Yes	
SDLT Pad	CB	Logging Calibration Blocks?	No	
SDLT Pad	SPVT	SDLT Pad Temperature Valid?	Yes	
SDLT Pad	DTWN	Disable temperature warning	No	
SDLT Pad	DMA	Formation Density Matrix	2.710	g/cc
SDLT Pad	DFL	Formation Density Fluid	1.000	g/cc
SDLT Pad	BHSM	Borehole Size Source Tool	SDLT	
BSAT	MBOK	Compute BCAS Results?	Yes	
BSAT	FLLO	Frequency Filter Low Pass Value?	5000	Hz
BSAT	FLHI	Frequency Filter High Pass Value?	27000	Hz
BSAT	DTFL	Delta -T Pore Fluid	189.00	uspf
BSAT	DTMT	Delta -T Matrix Type	Limestone 47.6	
BSAT	DTSH	Delta -T Shale	100.00	uspf
BSAT	SPEQ	Acoustic Porosity Equation	Wylie	
ACRt Sonde	RTOK	Process ACRt?	Yes	
ACRt Sonde	MNSO	Minimum Tool Standoff	1.50	in
ACRt Sonde	TCS1	Temperature Correction Source	FP Lwr & FP Upr	
ACRt Sonde	TPOS	Tool Position	Eccentered	
ACRt Sonde	RMOP	Rmud Source	Mud Cell	
ACRt Sonde	RMIN	Minimum Resistivity for MAP	0.20	ohmm
ACRt Sonde	RMAX	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	SDLT	
ACRt Sonde	MBFL	Apply Corkscrew Effect?	No	

BOTTOM

Data: CULBRTH_BREEDEN\0001 GTET-IDT-DSNT-SDLT-BSAT-ACRT\004 11-Aug-18 04:14 Up @4164.3f **Date: 11-Aug-18 05:22:38**

HALLIBURTON

CALIBRATION REPORT

NATURAL GAMMA RAY TOOL SHOP CALIBRATION

Tool Name:	**GTET - 11013113**	**Reference Calibration Date:**	**02-May-18 11:20:36**
Engineer:	**WHITLOCK**	**Calibration Date:**	**05-Aug-18 09:58:00**
Software Version:	**WL INSITE R5.6.3 (Build 4)**	**Calibration Version:**	**1**

Calibrator Source S/N: TB-79
Calibrator API Reference:222.00 api
Equivalent Calibrator API Reference:225.9 api

Measurement	Measured	Calibrated	Units
Background	26.4	26.2	api
Background + Calibrator	253.6	252.1	api
Calibrator	227.2	225.9	api

NATURAL GAMMA RAY TOOL FIELD CALIBRATION

Tool Name:	**GTET - 11013113**	**Reference Calibration Date:**	**05-Aug-18 09:58:00**
Engineer:	**WHITLOCK**	**Calibration Date:**	**05-Aug-18 10:00:58**
Software Version:	**WL INSITE R5.6.3 (Build 4)**	**Calibration Version:**	**1**

Calibrator Source S/N: TB-79
Calibrator API Reference:222.00 api
Equivalent Calibrator API Reference:225.9 api

Field Verification	Shop	Field	Units
Background	26.2	26.1	api
Background + Calibrator	252.1	251.2	api
Calibrator	225.9	225.0	api

Shop	Field	Difference	Tolerance
225.9	225.0	0.9	+/- 9.00

DUAL SPACED NEUTRON SHOP CALIBRATION

Tool Name:	**DSNT - 11019641**	**Reference Calibration Date:**	**04-Aug-18 12:03:14**
Engineer:	**SCHLIEM**	**Calibration Date:**	**04-Aug-18 12:26:27**
Software Version:	**WL INSITE R5.6.3 (Build 4)**	**Calibration Version:**	**1**

Logging Source S/N: DSN-436
Tank Serial Number: EL RENO HWT
Reference value assigned to Tank: 56.100
Snow Block S/N: 12156883
Calibration Tank Water Temperature: 89 degF
Min. Tool Housing Outside Diameter: 3.625 in

CALIBRATION CONSTANTS

Measurement	Prev. Value	New Value	Control Limit On New Value
Gain:	0.97922	0.97742	0.900 - 1.100

WATER TANK SUMMARY (Horizontal Water Tank)

Measurement	Current Reading (Previous Coef.)	Calibrated (New Coef.)	Change	Control Limit On Change
Porosity (decp):	0.2364	0.2358	0.0006	+/- 0.0020
Calibrated Ratio:	10.5794	10.5599	0.019	+/- 0.050

VERIFIER

Measurement	Value	Control Limit
Snow-Block Porosity (decp):	0.0667	0.02000 - 0.09000

PASS/FAIL SUMMARY

Background Check:	Passed

Background Check:	Passed
Gain-Range Check:	Passed
Snow-Block Check:	Passed

DUAL SPACED NEUTRON FIELD CALIBRATION

Tool Name:	**DSNT - 11019641**	**Reference Calibration Date:**	**04-Aug-18 12:26:27**
Engineer:	**WHITLOCK**	**Calibration Date:**	**05-Aug-18 09:45:13**
Software Version:	**WL INSITE R5.6.3 (Build 4)**	**Calibration Version:**	**1**

Logging Source S/N: DSN-436

Snow Block S/N: 12156883

NEUTRON FIELD-CHECK SUMMARY

	Shop	Field	Difference	Control Limit On Change
Snow-Block Porosity (decp):	0.0667	0.0665	-0.0002	+/- 0.0150

PASS/FAIL SUMMARY

Block Change Check:	Passed
Snow Block Stat Check:	Passed
Temperature Check:	Passed

DENSITY CALIPER SHOP CALIBRATION

Tool Name:	**SDLT - 10960494**	**Reference Calibration Date:**	**01-Jan-70 00:00:00**
Engineer:	**WHITLOCK**	**Calibration Date:**	**08-Jun-18 16:19:27**
Software Version:	**WL INSITE R5.6.3 (Build 4)**	**Calibration Version:**	**1**
Host Tool Name:	**DSNT - 11019641**		

CALIBRATION COEFFICIENTS

Measurement	Previous Value	New Value	Control Limit On New Value
Pad Offset	-3977.11	-3977.11	-7000.00 - -1000.00
Pad Gain	0.0003897	0.0003897	0.0002000 - 0.0006000
Arm Offset	-3073.13	-3073.13	-5000.00 - 3000.00
Arm Gain	0.0005210	0.0005210	0.000300 - 0.000700
Arm Power	-0.000005094	-0.000005094	-0.000010000 - 0.000010000

The ring diameter is computed from: DIAMETER = PAD EXTENSION + ARM EXTENSION + TOOL DIAMETER

Tool Diameter: 4.50 in

CALIBRATION RINGS

Measurement	Current Reading (Previous Coeff.)	Calibrated (New Coeff.)	Change	Control Limit On New Value
PAD EXTENSION:				
Small Ring (in)	2.00	2.00	0.00	+/- 0.20
Medium Ring (in)	3.75	3.75	0.00	+/- 0.20
RING DIAMETER:				
Small Ring (in)	6.50	6.50	0.00	+/- 0.20
Medium Ring (in)	8.25	8.25	0.00	+/- 0.20
Large Ring (in)	15.00	15.00	0.00	+/- 0.20

PASS/FAIL SUMMARY

Calibration-Coefficients Range Check:	Passed
Ring-Measurement Check:	Passed

PASS/FAIL SUMMARY

Calibration-Coefficients Range Check:	Passed

SDLT CALIPER FIELD CALIBRATION

Tool Name:	**SDLT - 10960494**	**Reference Calibration Date:**	**08-Jun-18 16:19:27**
Engineer:	**WHITLOCK**	**Calibration Date:**	**05-Aug-18 09:46:30**
Software Version:	**WL INSITE R5.6.3 (Build 4)**	**Calibration Version:**	**1**

MEASURED CALIPER VALUES				
Measurement	Shop	Field	Change	Control Limit On New Value
Pad Extension	3.75	3.79	0.04	+/- 0.10
Ring Diameter	8.25	8.25	-0.00	+/- 0.15

PASS/FAIL SUMMARY	
Pad Extension Check:	Passed
Diameter Check:	Passed

MICRO LOG SHOP CALIBRATION

Tool Name: Microlog Pad - 10960494 **Reference Calibration Date:** 01-Jan-70 00:00:00

Engineer: WHITLOCK **Calibration Date:** 08-Jun-18 16:08:54

Software Version: WL INSITE R5.6.3 (Build 4) **Calibration Version:** 1

Host Tool Name: DSNT - 11019641

CALIBRATION COEFFICIENT SUMMARY					
Measurement	Micro Log Normal		Micro Log Lateral		
	Measured	Calibrated	Measured	Calibrated	Units
Tool Zero	-0.07	-0.07	-0.01	-0.01	ohmm
Calibration Point #1	0.00	0.00	0.00	0.00	ohmm
Calibration Point #2	20.00	20.00	20.00	20.00	ohmm
Internal Reference	19.92	19.92	19.98	19.98	ohmm

Measurement	Micro Log Normal Tool Value	Micro Log Lateral Tool Value	Units
Tool Zero	-0.11	0.18	V
Calibration Point #1	18.42	2.03	V
Calibration Point #2	5354.08	6974.83	V
Internal Reference	5331.77	6967.38	V

MICRO LOG FIELD CHECK

Tool Name: Microlog Pad - 10960494 **Reference Calibration Date:** 08-Jun-18 16:08:54

Engineer: WHITLOCK **Calibration Date:** 05-Aug-18 09:54:07

Software Version: WL INSITE R5.6.3 (Build 4) **Calibration Version:** 1

Measurement	Micro Log Normal		Micro Log Lateral		
	Shop	Field	Shop	Field	Units
Tool Zero	-0.07	-0.07	-0.01	-0.00	ohmm
Internal Reference	19.92	19.89	19.98	19.95	ohmm

Summary				
Signal	Shop	Field	Difference	Tolerence
Microlog Normal	19.92	19.89	0.03	+/- 0.80
Microlog Lateral	19.98	19.95	0.03	+/- 0.80

SPECTRAL DENSITY SHOP CALIBRATION

Tool Name: SDLT Pad - 11213308 **Reference Calibration Date:** 08-Jun-18 10:39:59

Engineer: WHITLOCK **Calibration Date:** 08-Jun-18 11:01:29

Software Version: WL INSITE R5.6.3 (Build 4) **Calibration Version:** 1

Logging Source S/N: 5475GW

Aluminum Block S/N: EL RENO Density: 2.581g/cc Pe: 3.170

Magnesium Block S/N: EL RENO Density: 1.687g/cc Pe: 2.594

DENSITY CALIBRATION SUMMARY			
Measurement	Previous Value	New Value	Control Limit
Near Bar Gain	1.0041	1.0112	0.90 - 1.10
Near Dens Gain	0.9869	0.9828	0.90 - 1.10

Near Dens Gain	0.9869	0.9898	0.90 - 1.10
Near Peak Gain	0.9943	0.9998	0.90 - 1.10
Near Lith Gain	1.0181	1.0093	0.90 - 1.10
Far Bar Gain	1.0040	1.0066	0.90 - 1.10
Far Dens Gain	0.9932	0.9944	0.90 - 1.10
Far Peak Gain	0.9916	0.9923	0.90 - 1.10
Far Lith Gain	0.9744	0.9710	0.90 - 1.10
Near Bar Offset	0.0934	0.0300	NONE
Near Dens Offset	0.2485	0.2218	NONE
Near Peak Offset	0.1593	0.1112	NONE
Near Lith Offset	-0.0690	0.0007	NONE
Far Bar Offset	0.0165	-0.0022	NONE
Far Dens Offset	0.1281	0.1192	NONE
Far Peak Offset	0.1238	0.1182	NONE
Far Lith Offset	0.2190	0.2467	NONE
Near Bar Background	955.07	955.02	700 - 1450
Near Dens Background	316.53	316.75	230 - 480
Near Peak Background	138.87	138.74	100 - 210
Near Lith Background	168.67	169.41	125 - 260
Far Bar Background	482.41	482.24	450 - 900
Far Dens Background	194.46	191.91	175 - 345
Far Peak Background	77.48	77.25	70 - 140
Far Lith Background	79.35	80.04	75 - 145

CALIBRATION BLOCK SUMMARY

Measurement	Current Reading (Previous Coef)	Calibrated (New Coef)	Change	Control Limit On Change
MAGNESIUM				
Density (g/cc)	1.688	1.687	-0.001	+/- 0.015
Pe	2.517	2.559	0.042	+/- 0.150
ALUMINUM				
Density (g/cc)	2.582	2.581	-0.001	+/- 0.01500
Pe	3.106	3.132	0.026	+/- 0.150

TOOL SUMMARY

Measurement	Near Detector		Far Detector	
	Value	Control Limits	Value	Control Limits
QUALITY				
Background	0.0017	+/- 0.0110	0.0006	+/- 0.0140
Magnesium Block	-0.0008	+/- 0.0110	-0.0008	+/- 0.0140
Aluminum Block	-0.0005	+/- 0.0110	-0.0001	+/- 0.0140
Resolution	9.21	6.00 - 11.50	9.21	6.00 - 11.50
Internal Verifier(B+D+P+L)	1580	1200 - 2700	831	800 - 1700

PASS/FAIL SUMMARY

Background Quality Check:	Passed
Background Range Check:	Passed
Background Resolution Check:	Passed
Background Verification Check:	Passed
Magnesium Quality Check:	Passed
Aluminum Quality Check:	Passed
Gains Check:	Passed
Changes in Calibration Blocks:	Passed

SPECTRAL DENSITY FIELD CHECK

Tool Name:	**SDLT Pad - 11213308**	**Reference Calibration Date:**	**08-Jun-18 11:01:29**
Engineer:	**WHITLOCK**	**Calibration Date:**	**05-Aug-18 09:57:45**
Software Version:	**WL INSITE R5.6.3 (Build 4)**	**Calibration Version:**	**1**

Pad Temperature: 89.3 degF

DENSITY FIELD CALIBRATION SUMMARY

Measurement	Shop	Field	Change	Control Limit +/-
Near (B+D+P+L) cps	1579.927	1575.636	-4.291	15.990
Far (B+D+P+L) cps	831.441	827.695	-3.746	15.874
Near Resolution	9.21	9.13	-0.080	0.50
Far Resolution	9.21	9.31	0.100	1.00

PASS/FAIL SUMMARY

Bkg Quality Check:	Passed
Bkg Resolution Check:	Passed
Bkg Verification Check:	Passed

ARRAY COMPENSATED TRUE RESISTIVITY SHOP CALIBRATION

Tool Name:	**ACRt Sonde - 11830728**	**Reference Calibration Date:**	**23-Feb-18 10:15:37**
Engineer:	**WHITLOCK**	**Calibration Date:**	**06-Jun-18 13:24:46**
Software Version:	**WL INSITE R5.6.3 (Build 4)**	**Calibration Version:**	**1**
Host Tool Name:	**ACRt Instrument - 11830684**		

TYPICAL GAIN RANGE

Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper
A1 (80")	0.95	1.0279	1.05	0.95	1.0076	1.05	0.95	0.9997	1.05
A2 (50")	0.95	1.0334	1.05	0.95	1.0139	1.05	0.95	1.0097	1.05
A3 (29")	0.95	1.0346	1.05	0.95	1.0146	1.05	0.95	1.0081	1.05
A4 (17")	0.95	1.0279	1.05	0.95	1.0063	1.05	0.95	1.0018	1.05
A5 (10")	N/A	N/A	N/A	0.95	1.0001	1.05	0.95	0.9950	1.05
A6 (6")	N/A	N/A	N/A	0.95	0.9869	1.05	0.95	0.9818	1.05

SONDE OFFSET

Subarray	R12KHz	R36KHz	R72KHz
	(mmho/m)	(mmho/m)	(mmho/m)
A1 (80")	0.315	-4.964	-5.711
A2 (50")	0.409	-3.450	-5.485
A3 (29")	-11.648	-3.720	-3.783
A4 (17")	-90.980	-28.724	-23.707
A5 (10")	N/A	-76.200	-37.537
A6 (6")	N/A	280.488	149.005

TRANSMITTER CURRENT GAIN

Signal	Lower	R	Upper
12K	0.6	0.82	1.3
36K	1.0	1.80	2.0
72K	1.0	1.05	2.0

R-MUD VERIFICATION

Signal	Lower (ohm-m)	Measured (ohm-m)	Upper (ohm-m)
Mud Cell	0.95	0.99	1.05

PASS/FAIL SUMMARY

GAIN RANGE CHK	PASS
SONDE OFFSET CHK	PASS

TOOL OK TO LOG

CALIBRATION SUMMARY

CALIBRATION SUMMARY

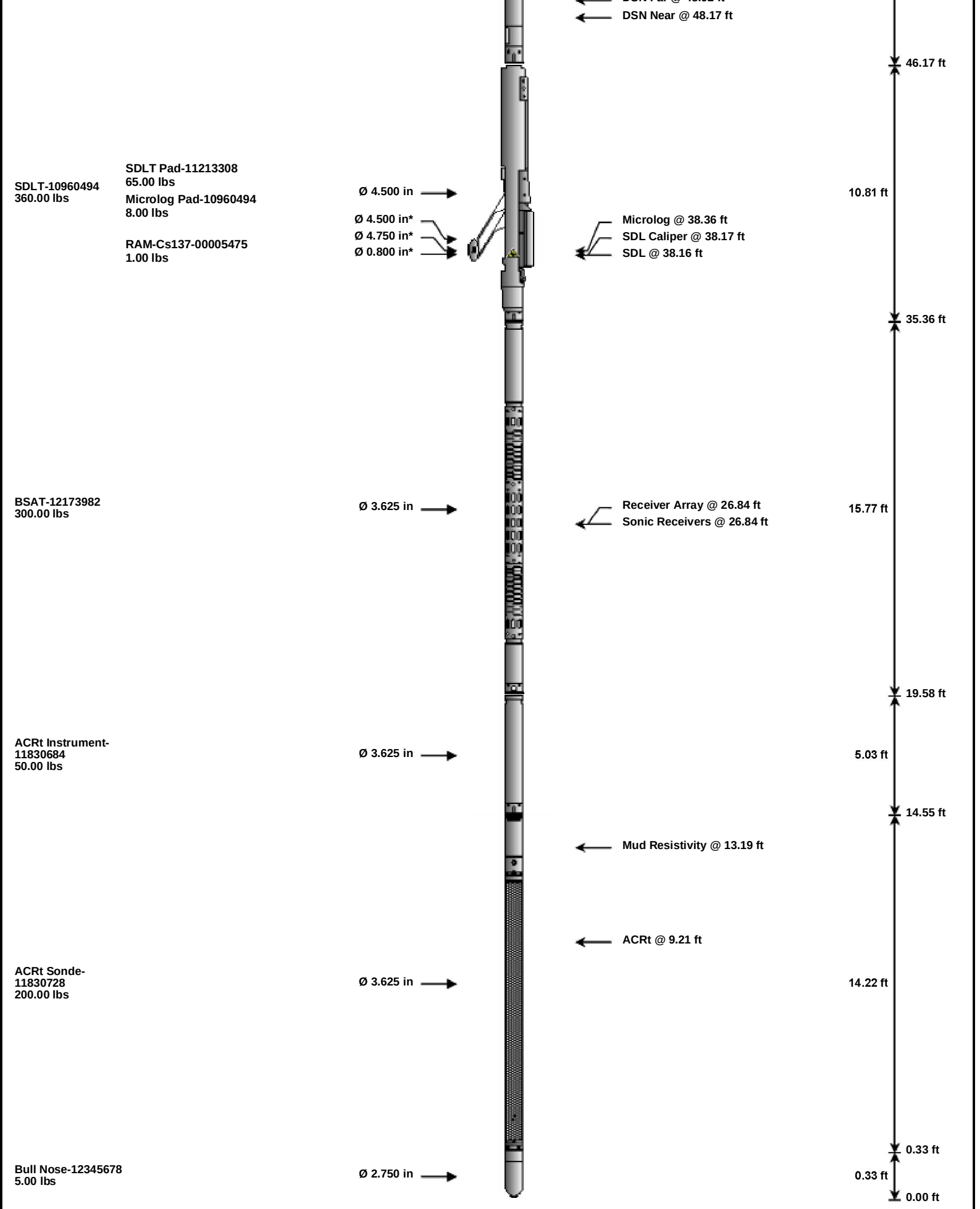
Sensor	Shop	Field	Post	Difference	Tolerance	Units
GTET-11013113						
Gamma Ray Calibrator	225.9	225.0	----------	0.9	+/- 9.00	api
DSNT-11019641						
Snow-Block Porosity	0.0667	0.0665	----------	0.0002	+/- 0.0150	decp
SDLT-10960494						
Pad Extension	3.75	3.79	----------	-0.04	+/-0.10	in
Ring Diameter	8.25	8.25	----------	0.00	+/-0.15	in
Microlog Pad-10960494						
MicroLog Normal	19.92	19.89	----------	0.03	+/-0.80	ohmm
MicroLog Lateral	19.98	19.95	----------	0.03	+/-0.80	ohmm
SDLT Pad-11213308						
Near(B+D+P+L)	1579.927	1575.636	----------	4.291	+/-15.990	cps
Far(B+D+P+L)	831.441	827.695	----------	3.746	+/-15.874	cps
ACRt Sonde-11830728						
Mud Cell	0.99	----------	----------	0	----------	ohm-m

Data: CULBRTH_BREEDEN\0001 GTET-IDT-DSNT-SDLT-BSAT-ACRT\IDLE **Date: 11-Aug-18 05:25:57**

HALLIBURTON

TOOL STRING DIAGRAM REPORT

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
						79.68 ft
CH_HOS_I 37.50 lbs	Weak Point 7000 lbs- CH_HOS_I 0.01 lbs	Ø 2.750 in Ø 0.010 in*		Temperature @ 78.65 ft	3.03 ft	76.65 ft
XOHD-12345678 20.00 lbs		Ø 2.750 in Ø 3.625 in			0.95 ft	75.70 ft
SP Sub-11812437 60.00 lbs		Ø 3.625 in		SP @ 73.92 ft	3.74 ft	71.96 ft
				Z-Accelerometer @ 71.51 ft		
GTET-11013113 165.00 lbs		Ø 3.625 in			8.52 ft	
				GammaRay @ 65.90 ft		63.44 ft
IDT-10886210 150.00 lbs		Ø 3.625 in			7.58 ft	
						55.86 ft
DSNT-11019641 174.00 lbs	DSN Decentralizer- 11019641 6.60 lbs	Ø 5.000 in* Ø 3.625 in			9.69 ft	
				DSN Far @ 48.92 ft		



Mnemonic	Tool Name	Serial Number	Weight (lbs)	Length (ft)		Accumulated Length (ft)	Max.Log. Speed (fpm)
CH_HOS	Hostile Cable Head with Load Cell	CH_HOS_I	37.50	3.03		76.65	300.00
WP7K	Weak Point 7000 lbs	CH_HOS_I	0.01	0.01	*	77.45	300.00
XOHD	Hostile to Dits Cross Over	12345678	20.00	0.95		75.70	300.00
SP	SP Sub	11812437	60.00	3.74		71.96	300.00
GTET	Gamma Telemetry Tool	11013113	165.00	8.52		63.44	60.00
IDT	Insite Directional Tool	10886210	150.00	7.58		55.86	60.00

DSNT	Dual Spaced Neutron	11019641	174.00	9.69		46.17	60.00
DCNT	DSN Decentralizer	11019641	6.60	5.13	*	49.50	300.00
SDLT	Spectral Density Tool	10960494	360.00	10.81		35.36	60.00
SDLP	Density Insite Pad	11213308	65.00	2.55	*	37.57	60.00
Cs137	Logging Source, SDLT-I, 1.78 Ci - Cs137	00005475	1.00	0.80	*	37.80	300.00
MICP	Microlog Pad	10960494	8.00	1.00	*	37.86	60.00
BSAT	Borehole Sonic Array Tool	12173982	300.00	15.77		19.58	60.00
ACRt	Array Compensated True Resistivity Instrument Section	11830684	50.00	5.03		14.55	120.00
ACRt	Array Compensated True Resistivity Sonde Section	11830728	200.00	14.22		0.33	120.00
BLNS	Bull Nose	12345678	5.00	0.33		0.00	300.00
Total			**1,602.11**	**79.68**			

* Not included in Total Length and Length Accumulation.

Data: CULBRTH_BREEDEN\0001 GTET-IDT-DSNT-SDLT-BSAT-ACRT\004 11-Aug-18 04:14 Up @4164.3f **Date: 11-Aug-18 05:13:28**

COMPANY	**CULBREATH OIL & GAS COMPANY INC**		
WELL	**BREEDEN 1-30**		
FIELD	**MORLAND-KANACO**		
COUNTY	**SHERIDAN**	STATE	**KANSAS**

HALLIBURTON

SPECTRAL DENSITY
DUAL SPACED NEUTRON
EVR LOG