

HALLIBURTON

DUAL SPACED NEUTRON
SPECTRAL DENSITY
MICRO LOG

RITCHIE EXPLORATION INC										COMPANY				RITCHIE EXPLORATION INC			
SEYMOUR-MORRILL 1										WELL				SEYMOUR-MORRILL 1			
EDDY NORTHWEST										FIELD/BLOCK				EDDY NORTHWEST			
PAWNEE										COUNTY				PAWNEE			
KANSAS										STATE				STATE KANSAS			
COMPANY										API No. 15-145-21826				Other Services: DSNT/SDLT MICRO BSAT ACRT			
WELL										Location E2 W2 E2 2570' FNL & 1805' FEL							
FIELD/BLOCK																	
COUNTY										PAWNEE							
EDDY NORTHWEST																	
SEYMOUR-MORRILL 1																	
EDDY NORTHWEST																	
COUNTY										PAWNEE							
STATE KANSAS																	
Permanent Datum										GL				Elev. 2041.0 ft			
Log measured from										KB				D.F. 2052.0 ft			
Drilling measured from										KB				G.L. 2041.0 ft			
Date										14-Sep-17							
Run No.										ONE							
Depth - Driller										4386.0 ft							
Depth - Logger										4385.0 ft							
Bottom - Logged Interval										4341.0 ft							
Top - Logged Interval										1113.0 ft							
Casing - Driller										8.625 in @ 1113.0 ft				@			
Casing - Logger										1113.0 ft				@			
Bit Size										7.875 in				@			
Type Fluid in Hole										Water Based Mud							
Density										9.3 ppg				50.00 s/qt			
Viscosity										10.50 pH				9.6 cpm			
Fluid Loss										MUD PIT							
Source of Sample																	
Rm @ Meas. Temperature										0.74 ohmm @ 75.00 degF				@			
Rmf @ Meas. Temperature										0.63 ohmm @ 75.00 degF				@			
Rmc @ Meas. Temperature										0.85 ohmm @ 75.00 degF				@			
Source Rmf										MEASURED							
Rm @ BHT										0.47 ohmm @ 121.0 degF				@			
Time Since Circulation										02:00 hr							
Time on Bottom										14-Sep-17 10:06							
Max. Rec. Temperature										121.00 degF @ 4385.0 ft				@			
Equipment										11230668				EL RENO, OK			
Recorded By										T. HYDE							
Witnessed By										J. GOLDSMITH							

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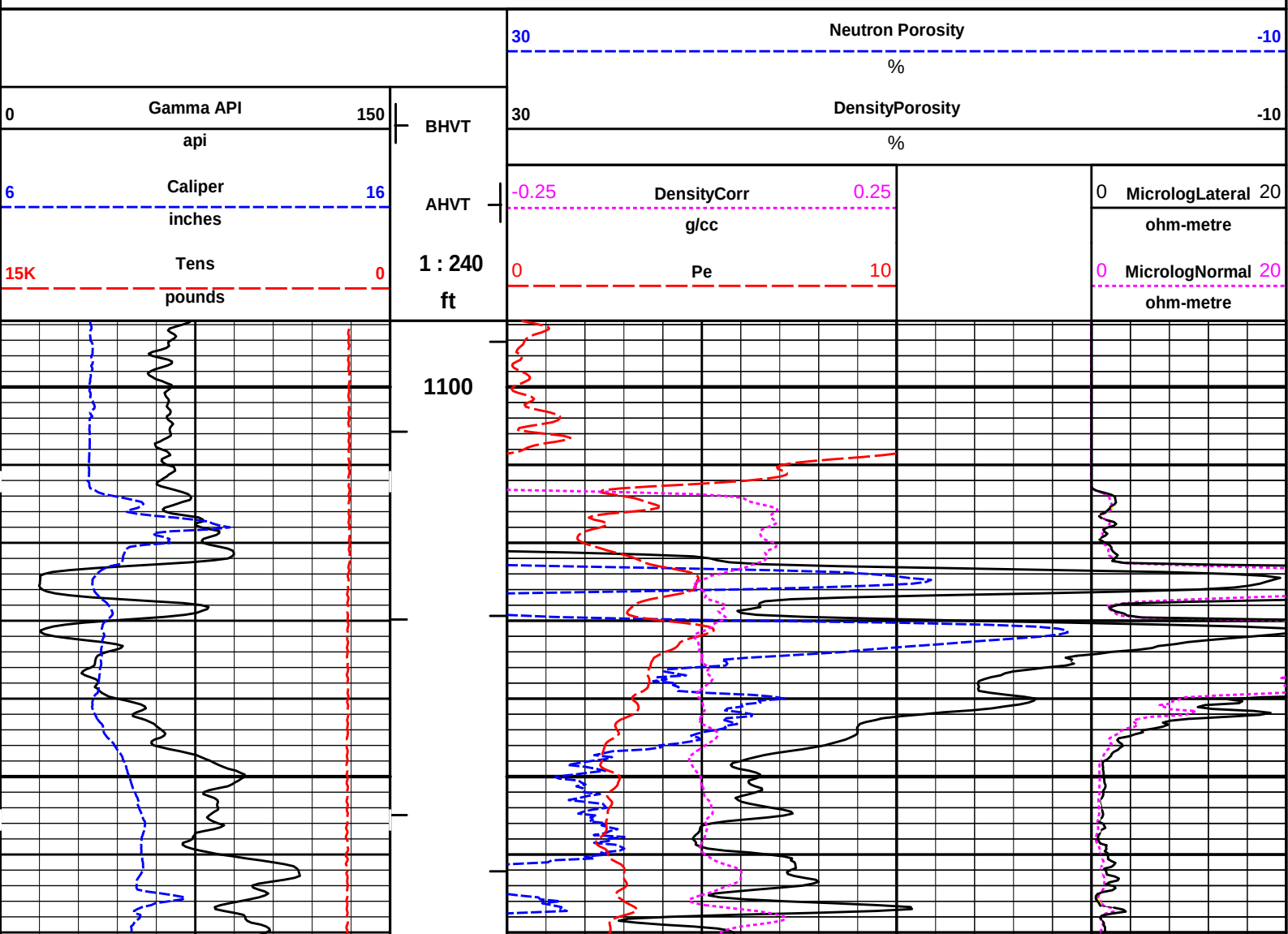
Service Ticket No.: 904302659						API No.: 15-145-21826						PGM Version: WL INSITE R5.0.5 (Build 8)					
CHANGE IN MUD TYPE OR ADDITIONAL SAMPLE								RESISTIVITY SCALE CHANGES									
Date	Sample No.					Type Log	Depth	Scale Up Hole		Scale Down Hole							
Depth-Driller																	
Type Fluid 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	CENT.		N/A						
Rmc @ Meas. Temp.		@		@			I-11026094										
Source Rmf	Rmc						S-11024142										
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.		10971172		Serial No.		10939050		Serial No.		12153520		Serial No.		11019643			
Model No.		GTET		Model No.		BSAT		Model No.		SDLT		Model No.		DSNT			
Diameter		3.625"		No. of Cent.		2		Diameter		5.5"		Diameter		3.625"			
Detector Model No.		T-102		Spacing		EVEN		Log Type		GAM-GAM		Log Type		NEU-NEU			
Type		SCINT						Source Type		Cs137		Source Type		Am241Be			
Length		8"		LSA [Y/N]				Serial No.		20791B		Serial No.		DSN-438			
Distance to Source		10'		FWDA [Y/N]				Strength		1.5 Ci		Strength		15 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 µsec/ft	30	-10	2.71 g/cc	30	-10	LIME			

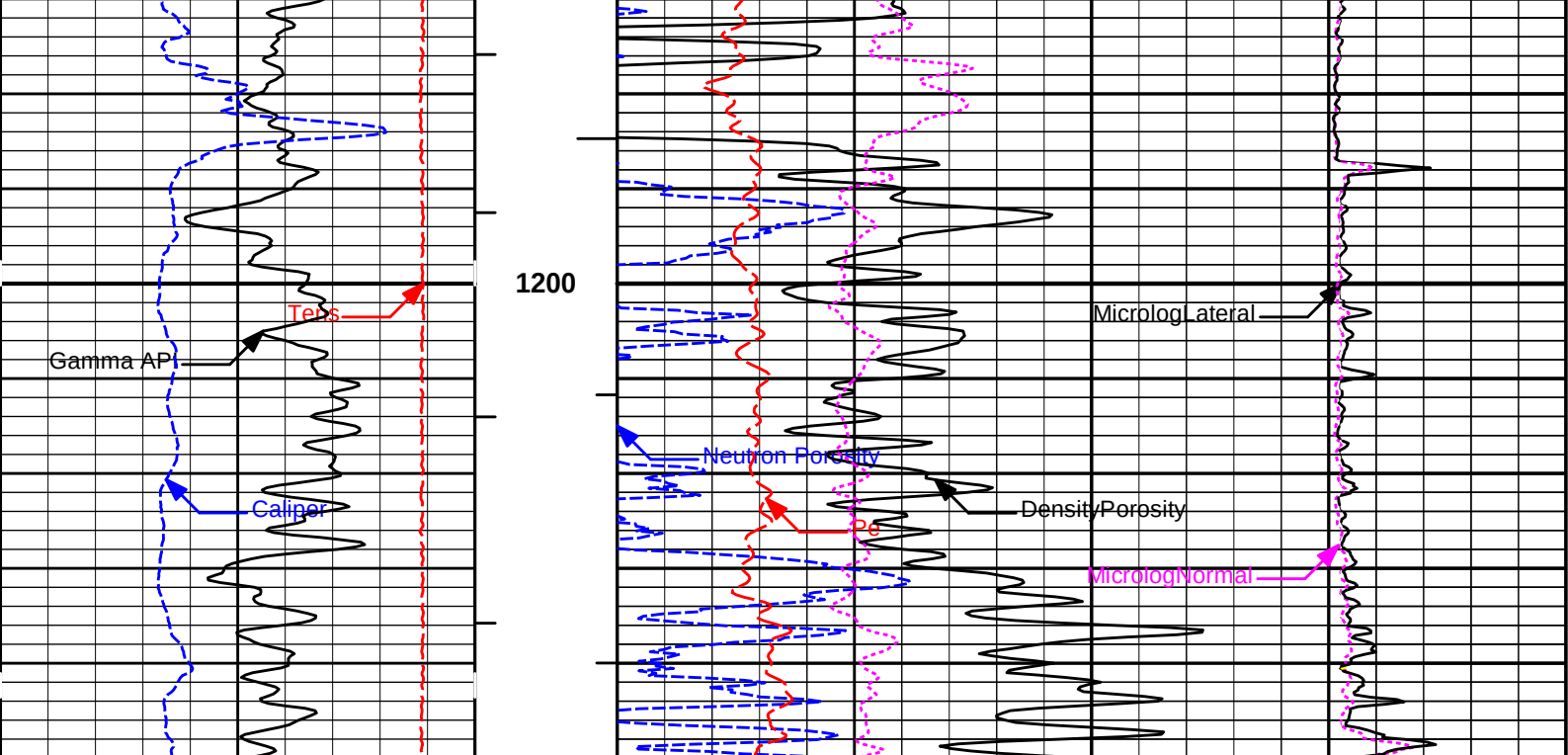
DIRECTIONAL INFORMATION															
Maximum Deviation @									KOP @						
Remarks: GTET-DSNT-SDLT-BSAT-ACRT RAN IN COMBINATION CHLORIDES REPORTED AT 4200 mg/l ANNULAR HOLE VOLUME CALCULATED FOR 4.5 INCH CASING															
HALLIBURTON DOES NOT GUARANTEE THE ACCURACY OF ANY INTERPRETATION OF THE LOG DATA, CONVERSION OF LOG DATA TO PHYSICAL ROCK PARAMETERS OR RECOMMENDATIONS WHICH MAY BE GIVEN BY HALLIBURTON PERSONNEL OR WHICH APPEAR ON THE LOG OR IN ANY OTHER FORM. ANY USER OF SUCH DATA, INTERPRETATIONS, CONVERSIONS, OR RECOMMENDATIONS AGREES THAT HALLIBURTON IS NOT RESPONSIBLE EXCEPT WHERE DUE TO GROSS NEGLIGENCE OR WILLFUL MISCONDUCT, FOR ANY LOSS, DAMAGES, OR EXPENSES RESULTING FROM THE USE THEREOF.															
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Plot Time: 14-Sep-17 13:45:58
Plot Range: 1091.5 ft to 1250 ft
Data: RITCHIE_SEYMOUR\Well Based\MAIN\
Plot File: \\PORO ML\PoroML 5 main IQ

5 INCH MAIN LOG





15K	Tens	0	1 : 240	0	Pe	10	0	MicrologNormal	20
	pounds		ft					ohm-metre	
6	Caliper	16	AHVT	-0.25	DensityCorr	0.25	0	MicrologLateral	20
	inches				g/cc			ohm-metre	
0	Gamma API	150	BHVT	30	DensityPorosity				-10
	api				%				
				30	Neutron Porosity				-10
					%				

HALLIBURTON

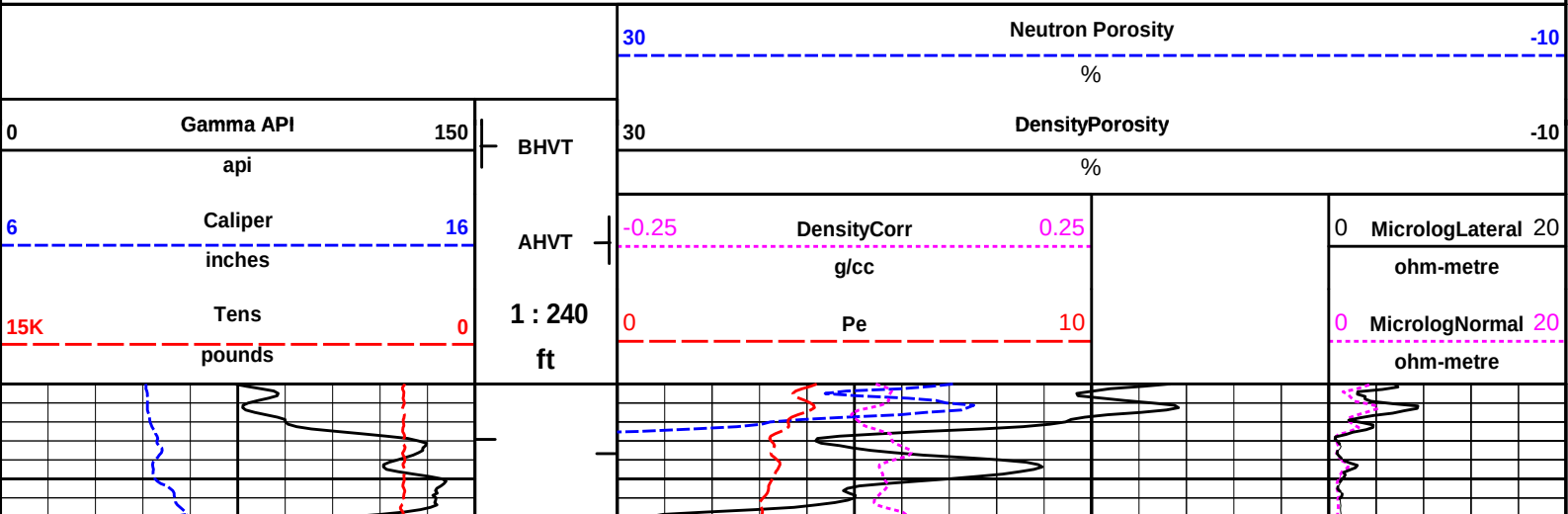
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Plot Range: 1091.5 ft to 1250 ft
Data: RITCHIE_SEYMOUR\Well Based\MAIN\
Plot File: \\IPORO_ML\PoromL_5_main_IQ

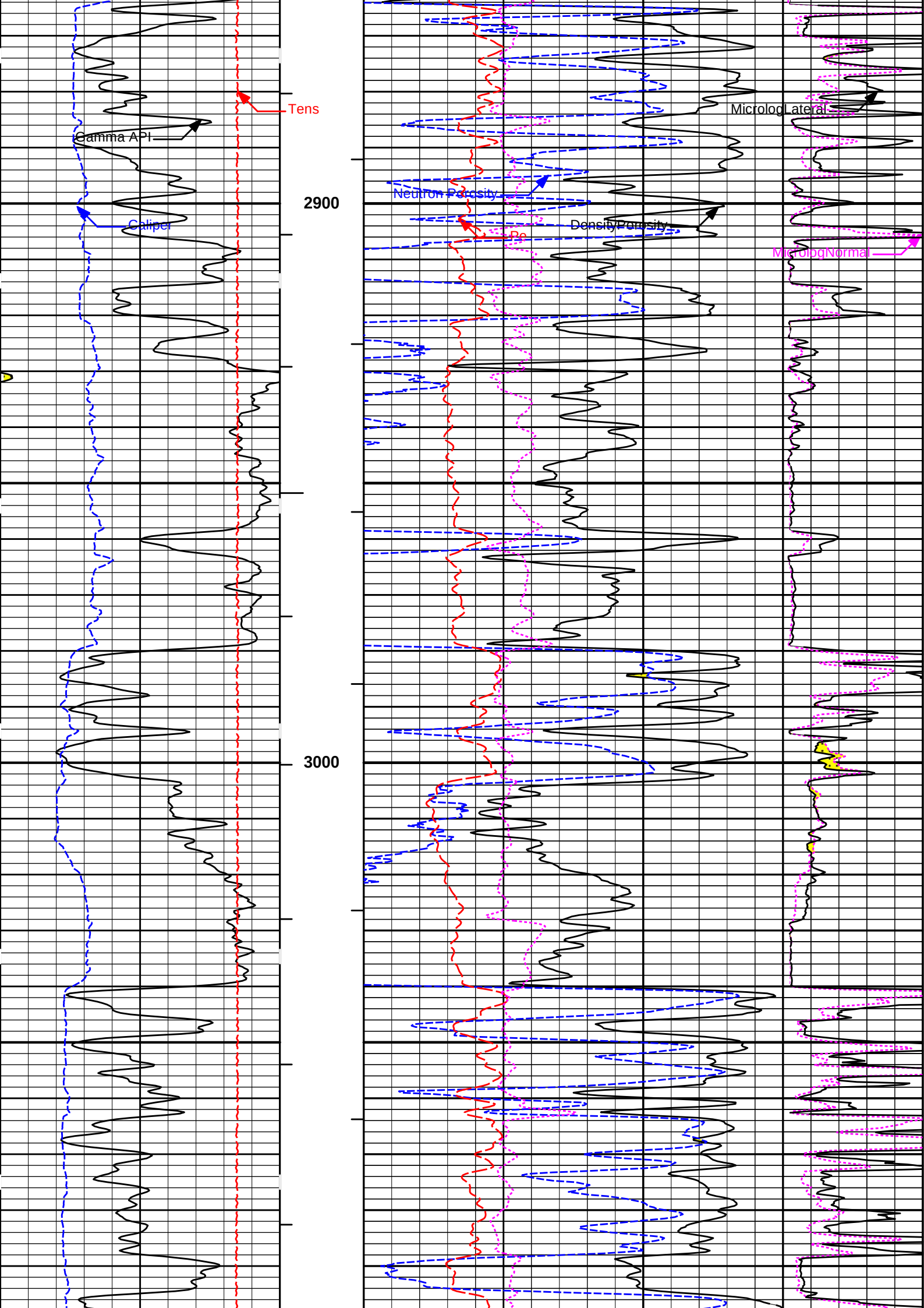
5 INCH MAIN LOG

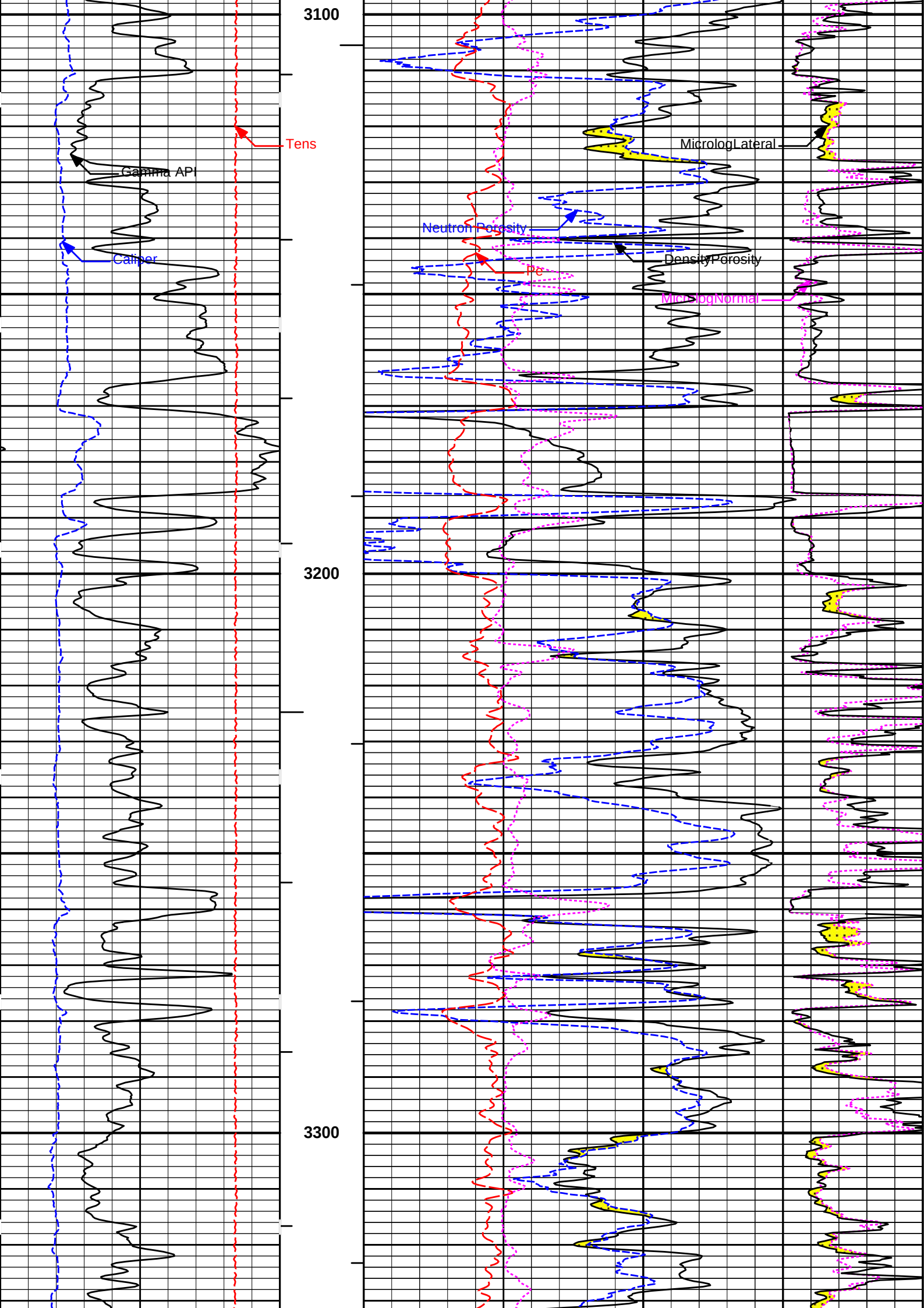
HALLIBURTON

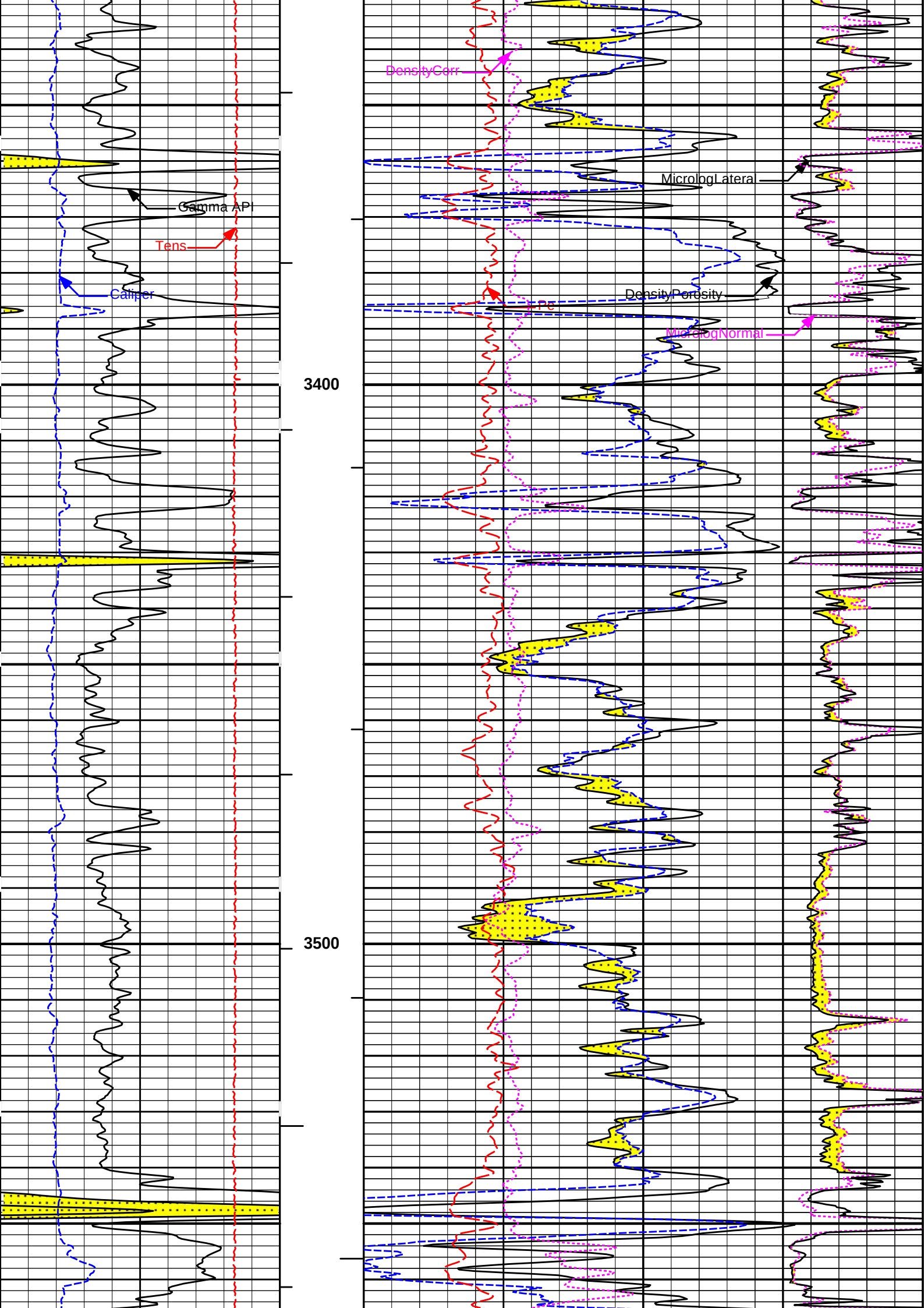
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Plot Range: 2850 ft to 4390 ft
Data: RITCHIE_SEYMOUR\Well Based\MAIN\
Plot File: \\IPORO_ML\PoromL_5_main_IQ

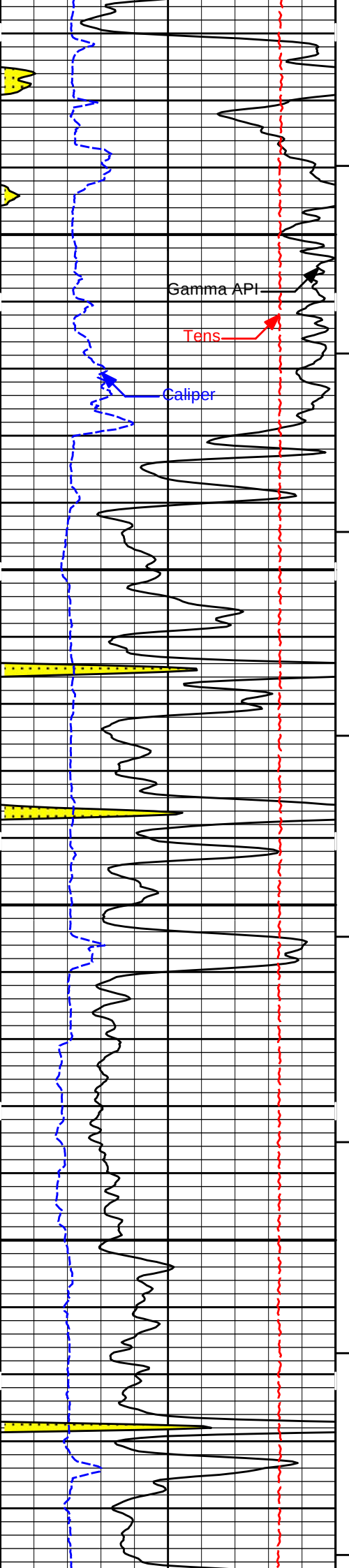
5 INCH MAIN LOG





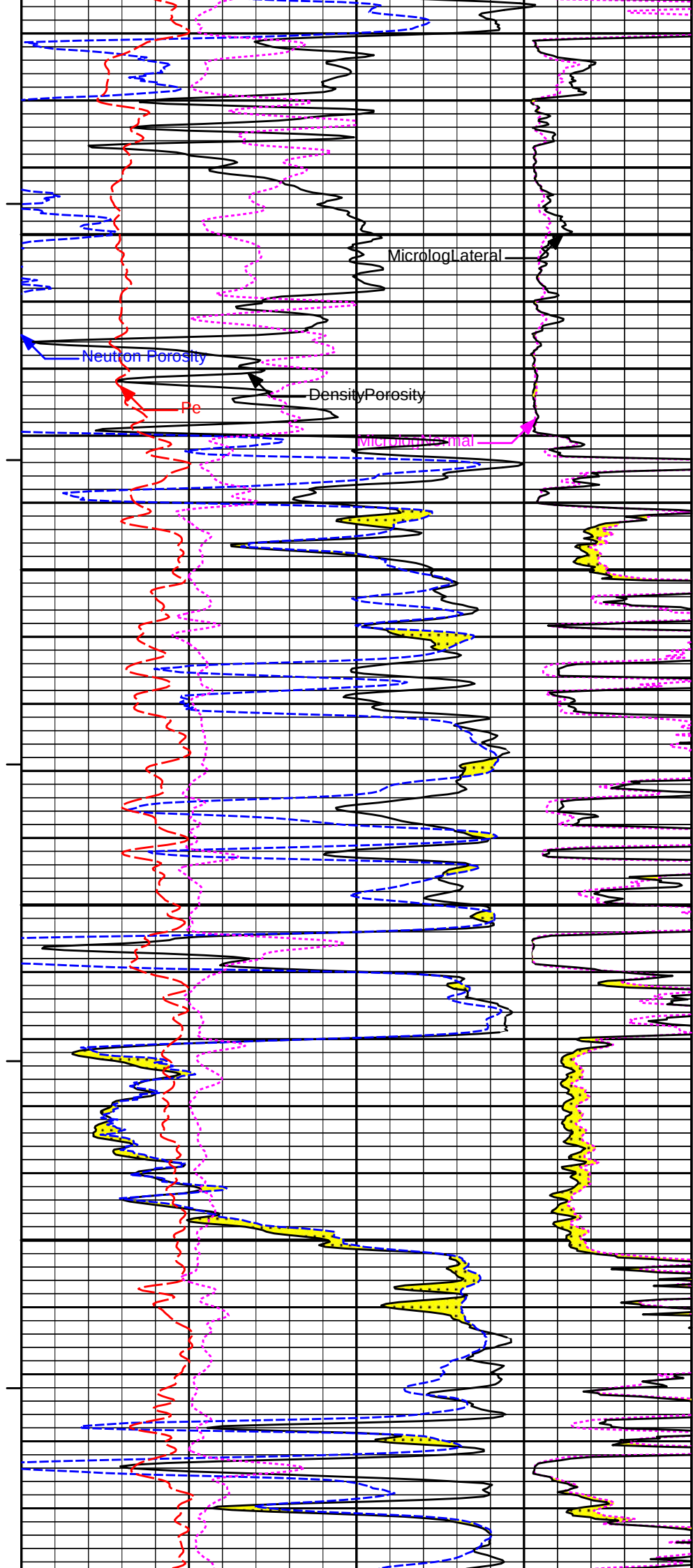


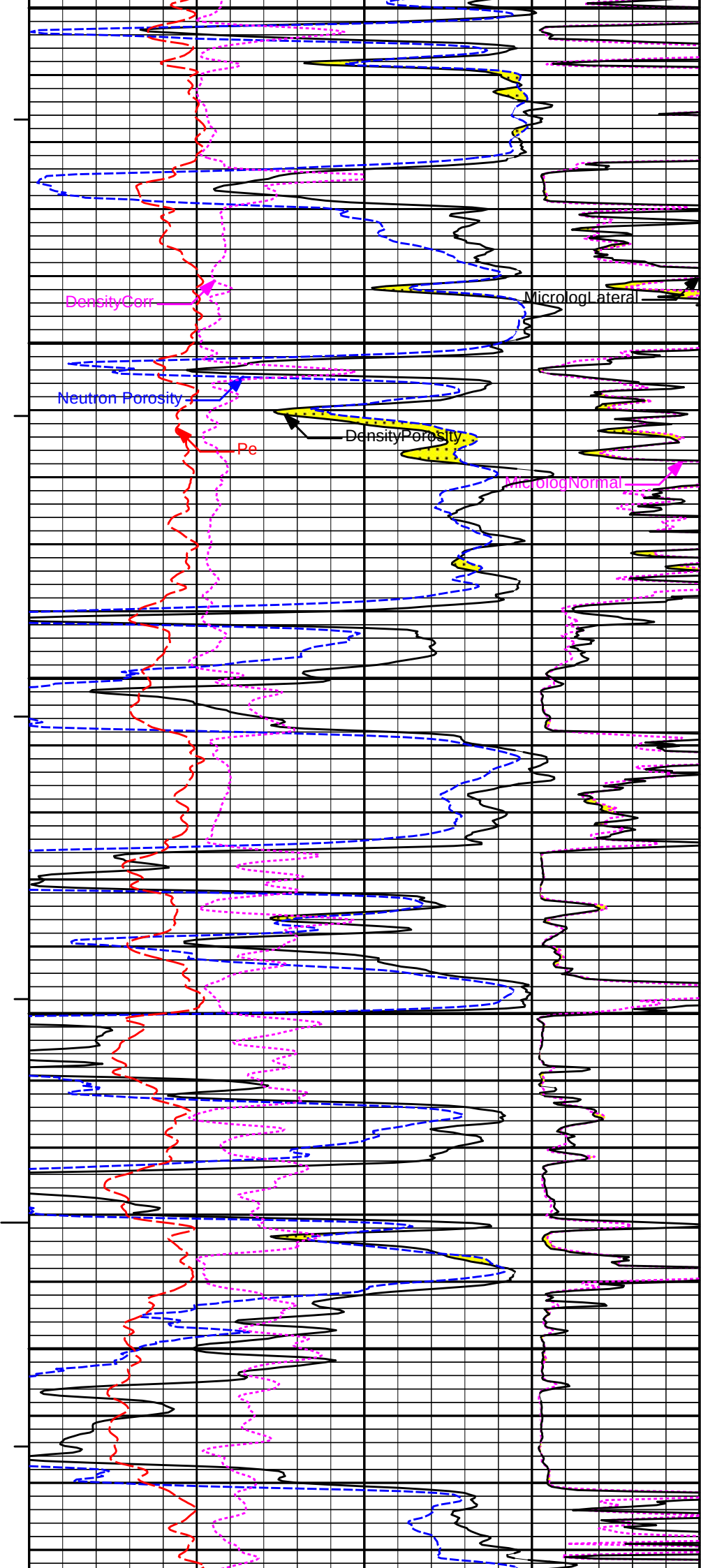
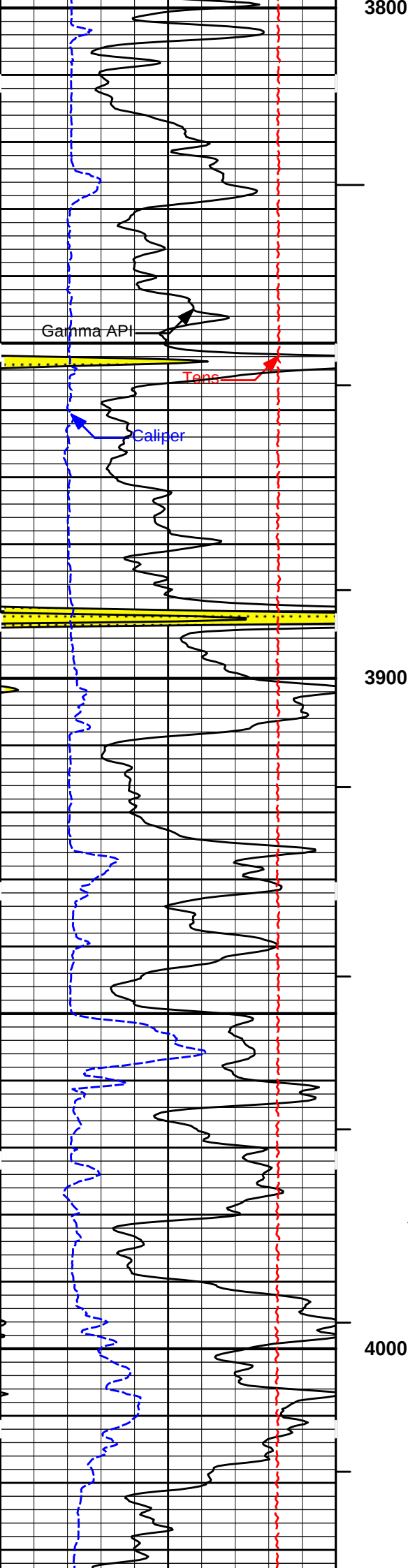


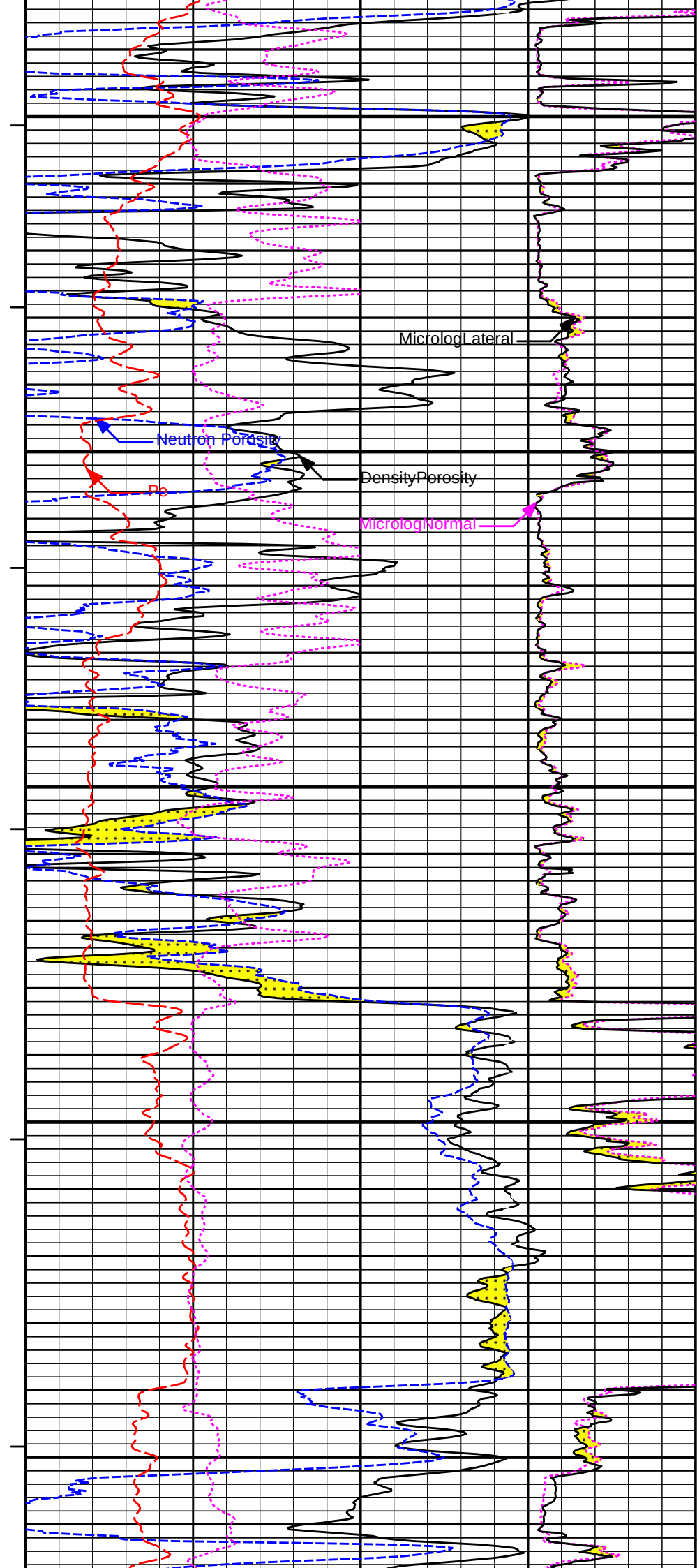
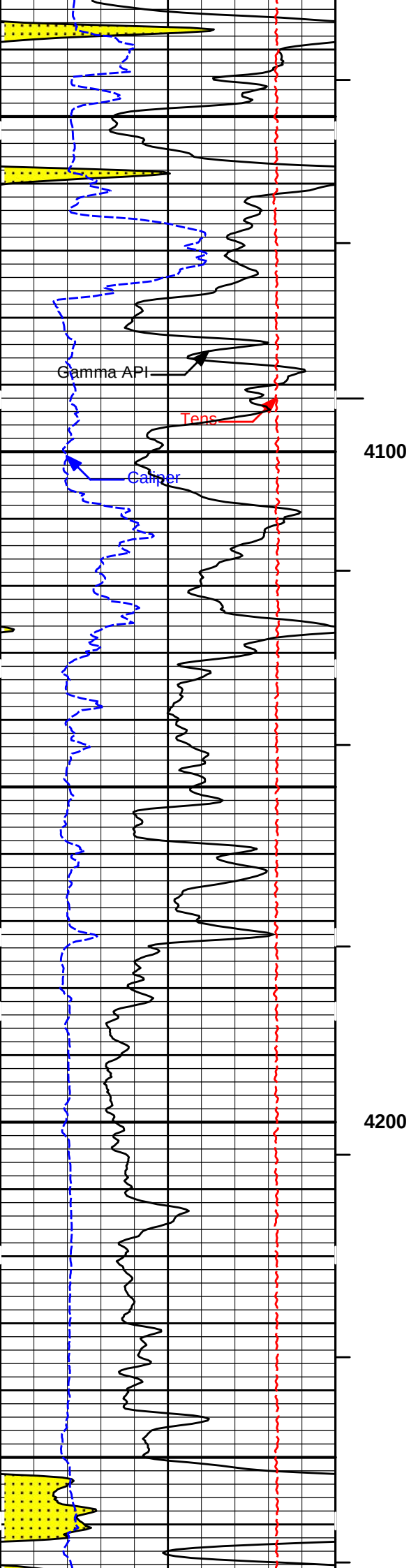


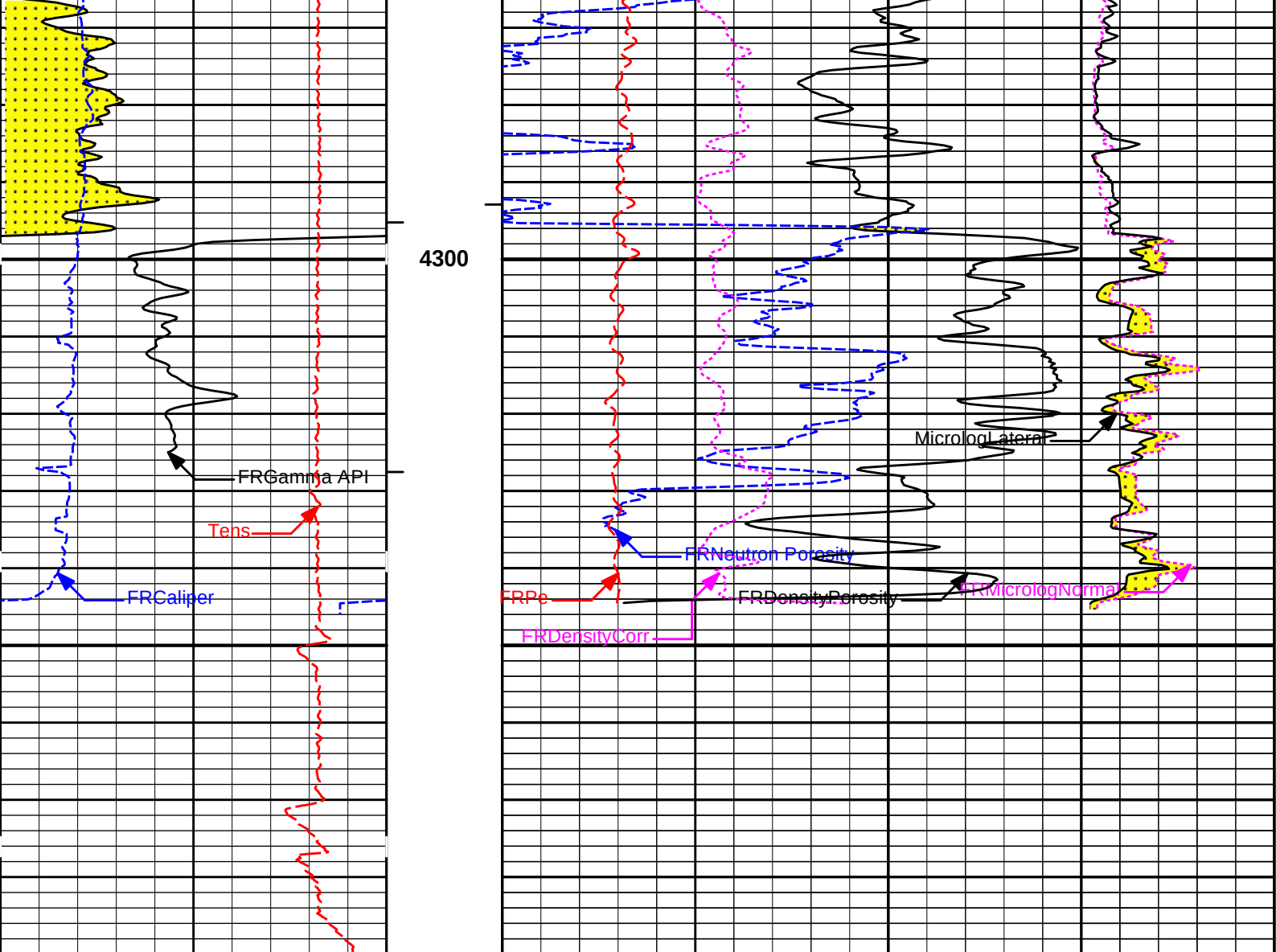
3600

3700









15K	Tens	0	1 : 240	0	Pe	10	0	MicrologNormal	20
	pounds		ft					ohm-metre	
6	Caliper	16	AHVT	-0.25	DensityCorr	0.25	0	MicrologLateral	20
	inches				g/cc			ohm-metre	
0	Gamma API	150	BHVT	30	DensityPorosity				-10
	api				%				
				30	Neutron Porosity				-10
					%				

HALLIBURTON

Plot Time: 14-Sep-17 13:46:04
 Plot Range: 2850 ft to 4390 ft
 Data: RITCHIE_SEYMOUR\Well Based\MAIN\
 Plot File: \\PORO_ML\PoromL_5_main_IQ

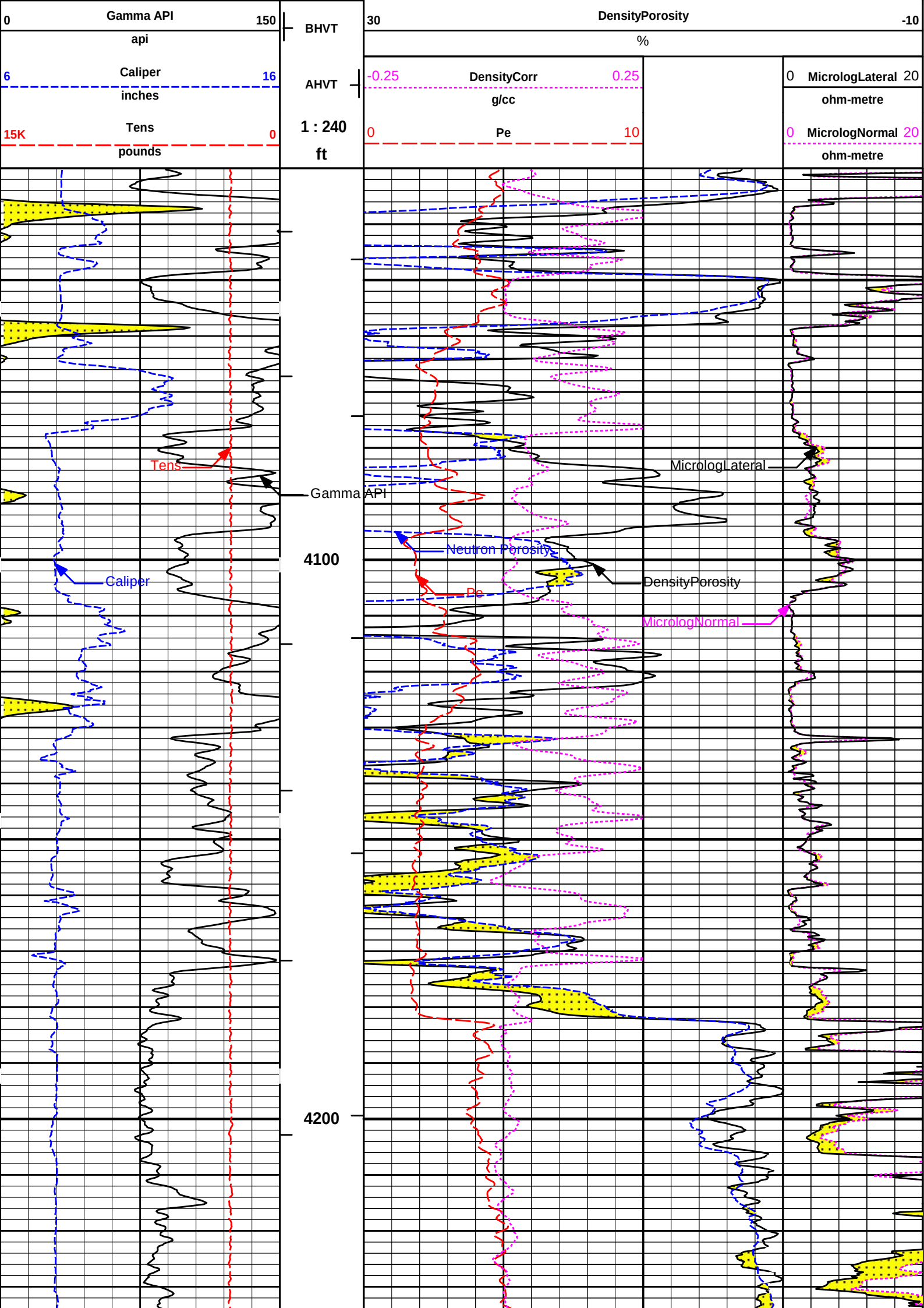
5 INCH MAIN LOG

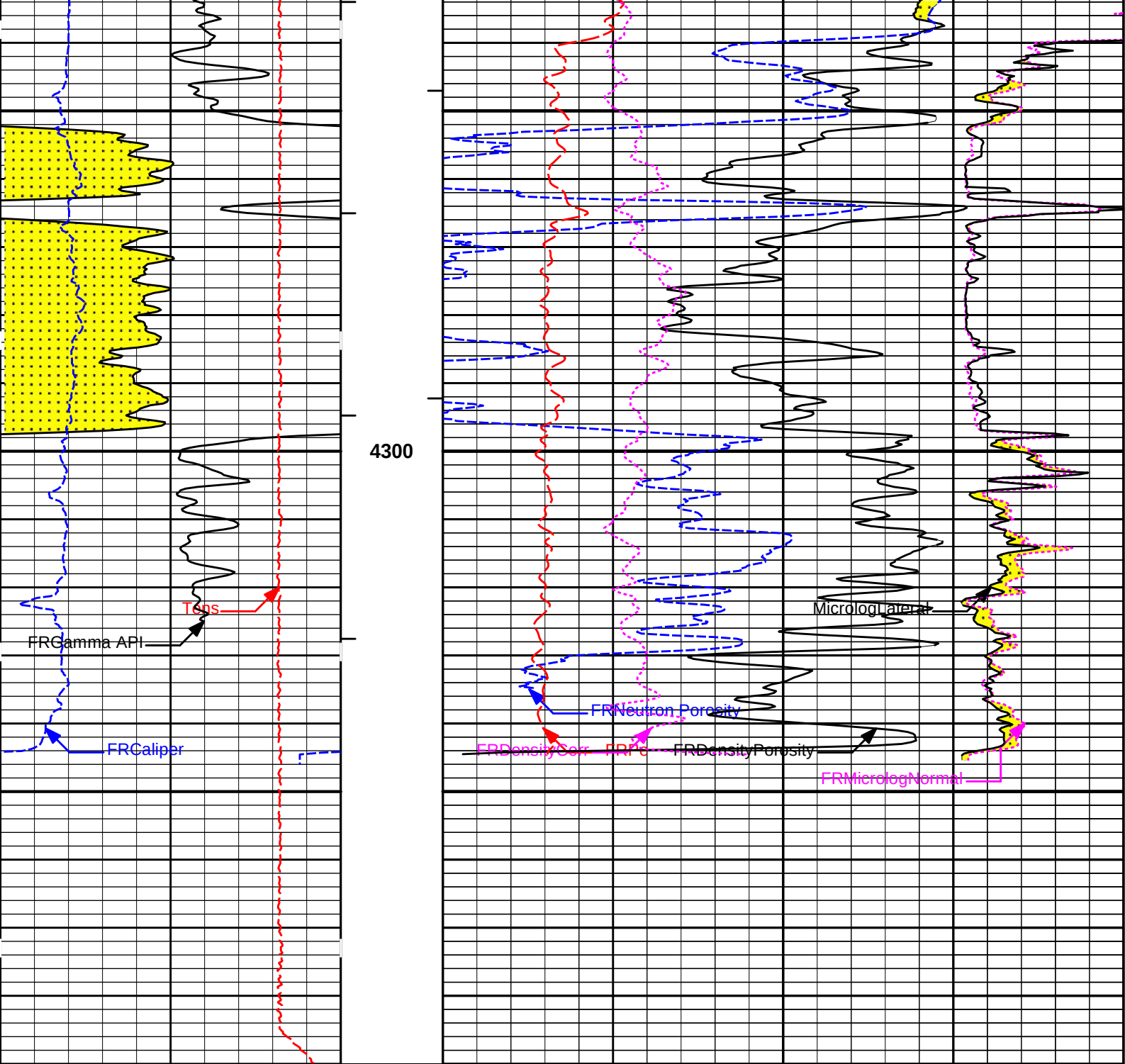
HALLIBURTON

Plot Time: 14-Sep-17 13:46:05
 Plot Range: 4030 ft to 4390.08 ft
 Data: RITCHIE_SEYMOUR\Well Based\RP1\
 Plot File: \\PORO_ML\PoromL_5_main_IQ

5 INCH REPEAT LOG

30	Neutron Porosity	-10
	%	





15K	Tens	0	1 : 240	0	Pe	10	0	MicrologNormal	20
	pounds		ft					ohm-metre	
6	Caliper	16	AHVT	-0.25	DensityCorr	0.25	0	MicrologLateral	20
	inches				g/cc			ohm-metre	
0	Gamma API	150	BHVT	30	DensityPorosity				
	api				%				
				30	Neutron Porosity				
					%				

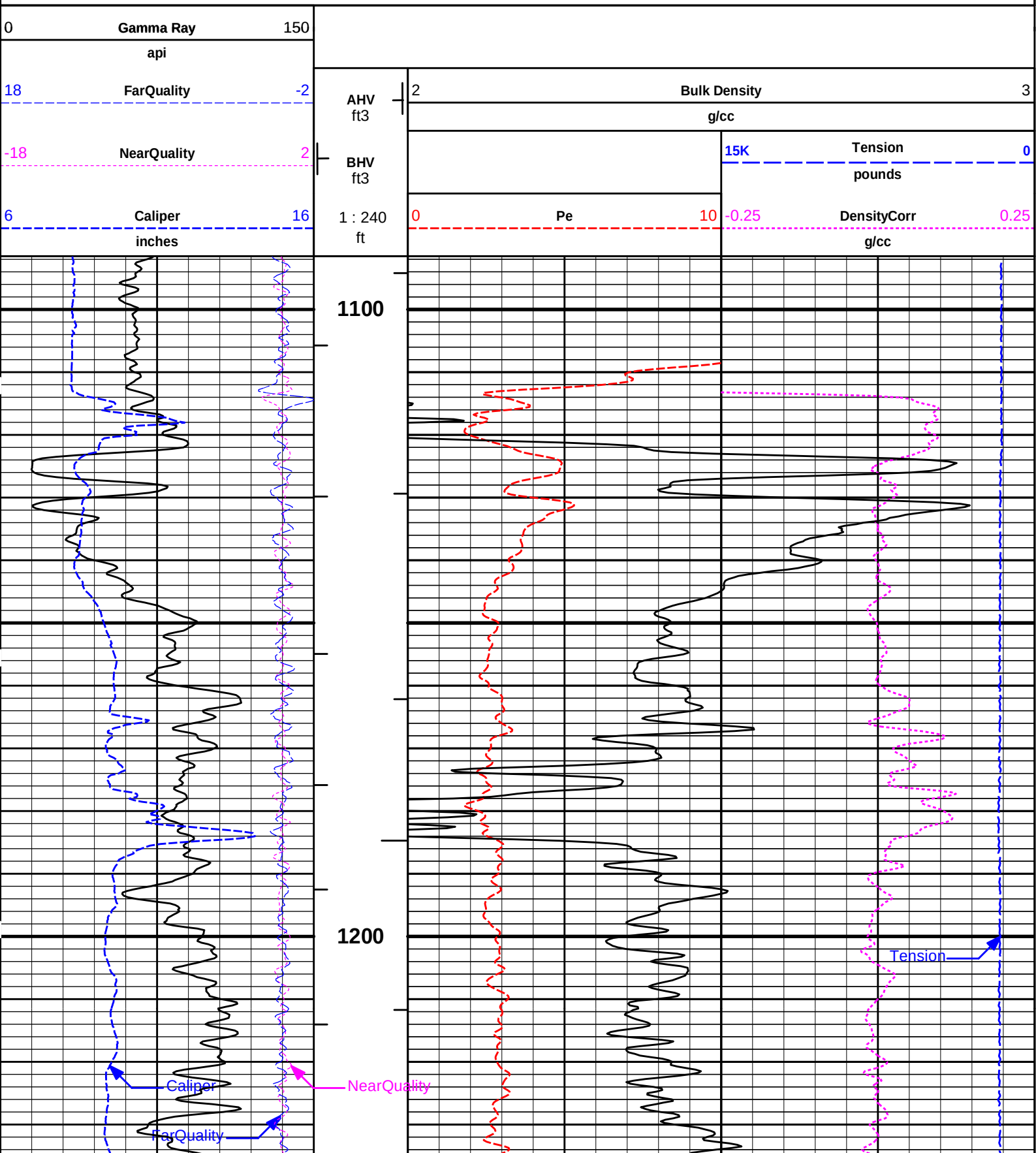
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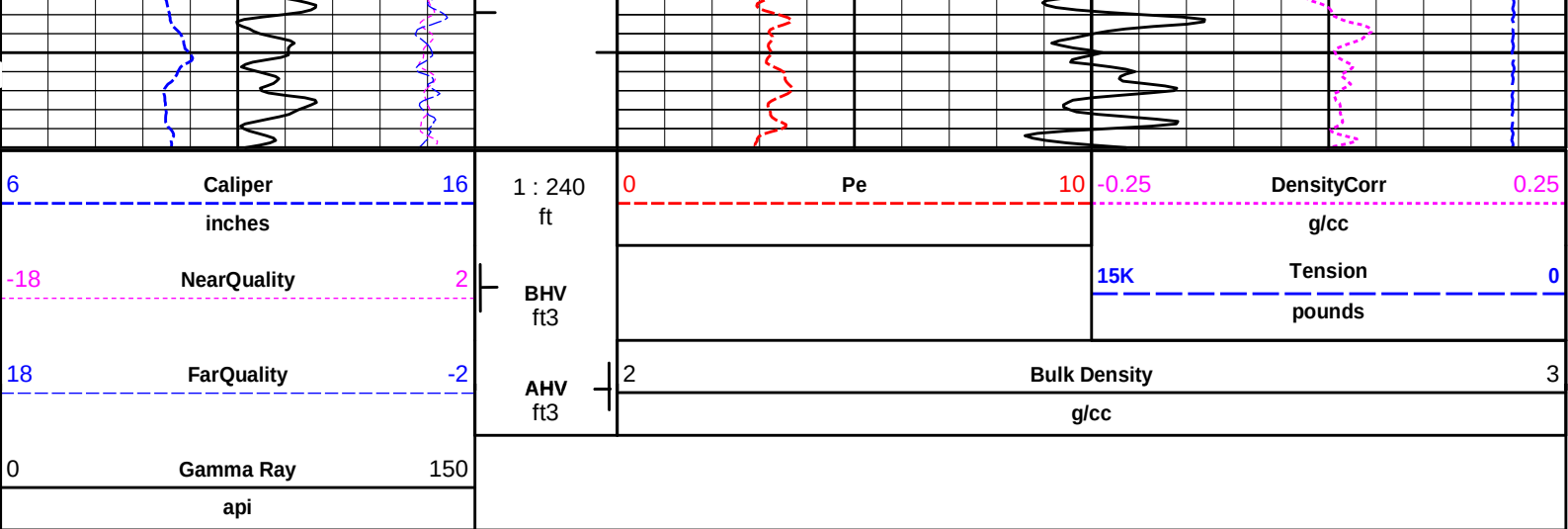
Plot Time: 14-Sep-17 13:46:07
Plot Range: 4030 ft to 4390.08 ft
Data: RITCHIE_SEYMOUR\Well Based\RP1\
Plot File: \\PORO_ML\PoromL_5_main_IQ

5 INCH REPEAT LOG

5 INCH MAIN LOG

MAIN SECTION 5" PER 100'





HALLIBURTON

Plot Time: 14-Sep-17 13:46:09
Plot Range: 1091.5 ft to 1250 ft
Data: RITCHIE_SEYMOUR\Well Based\MAIN\
Plot File: \\-LOCAL-\\RITCHIE_SEYMOUR\0001 GTET-DSNT-SDLT-BSAT-ACRTIPORO_ML\BULKD_5_MAIN_IQ

5 INCH MAIN LOG

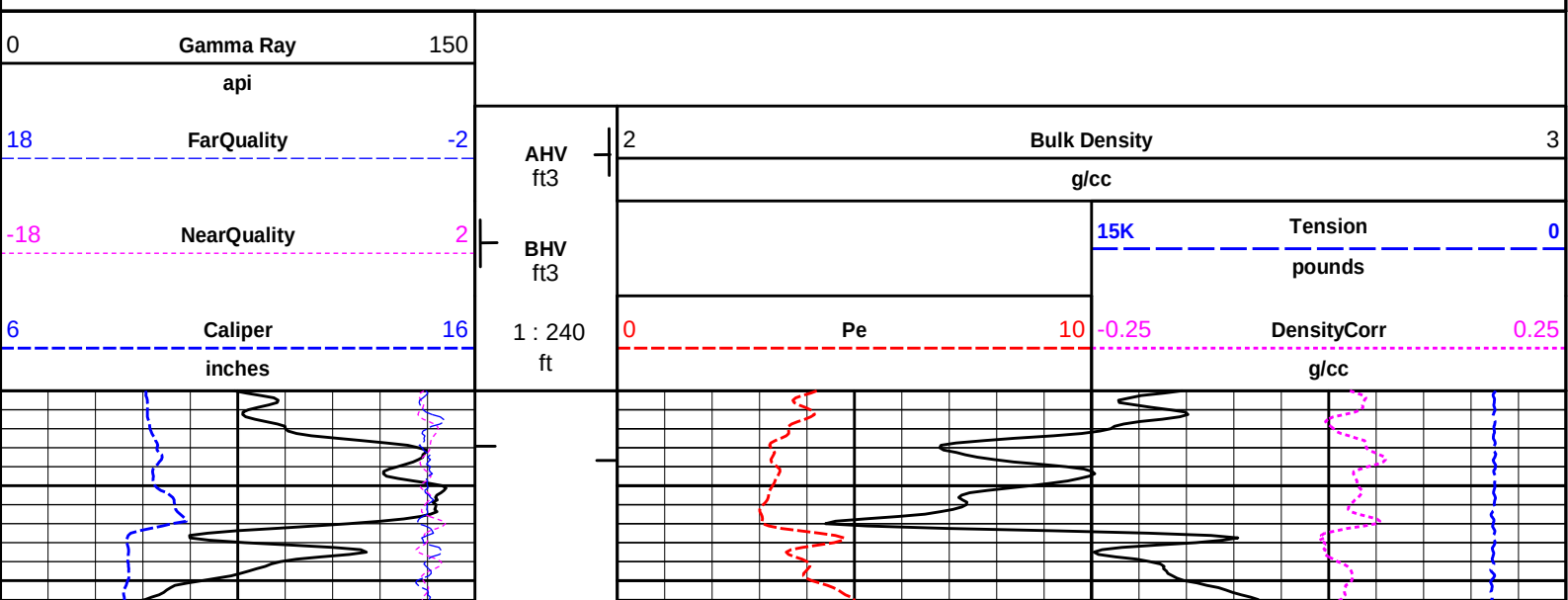
MAIN SECTION 5" PER 100'

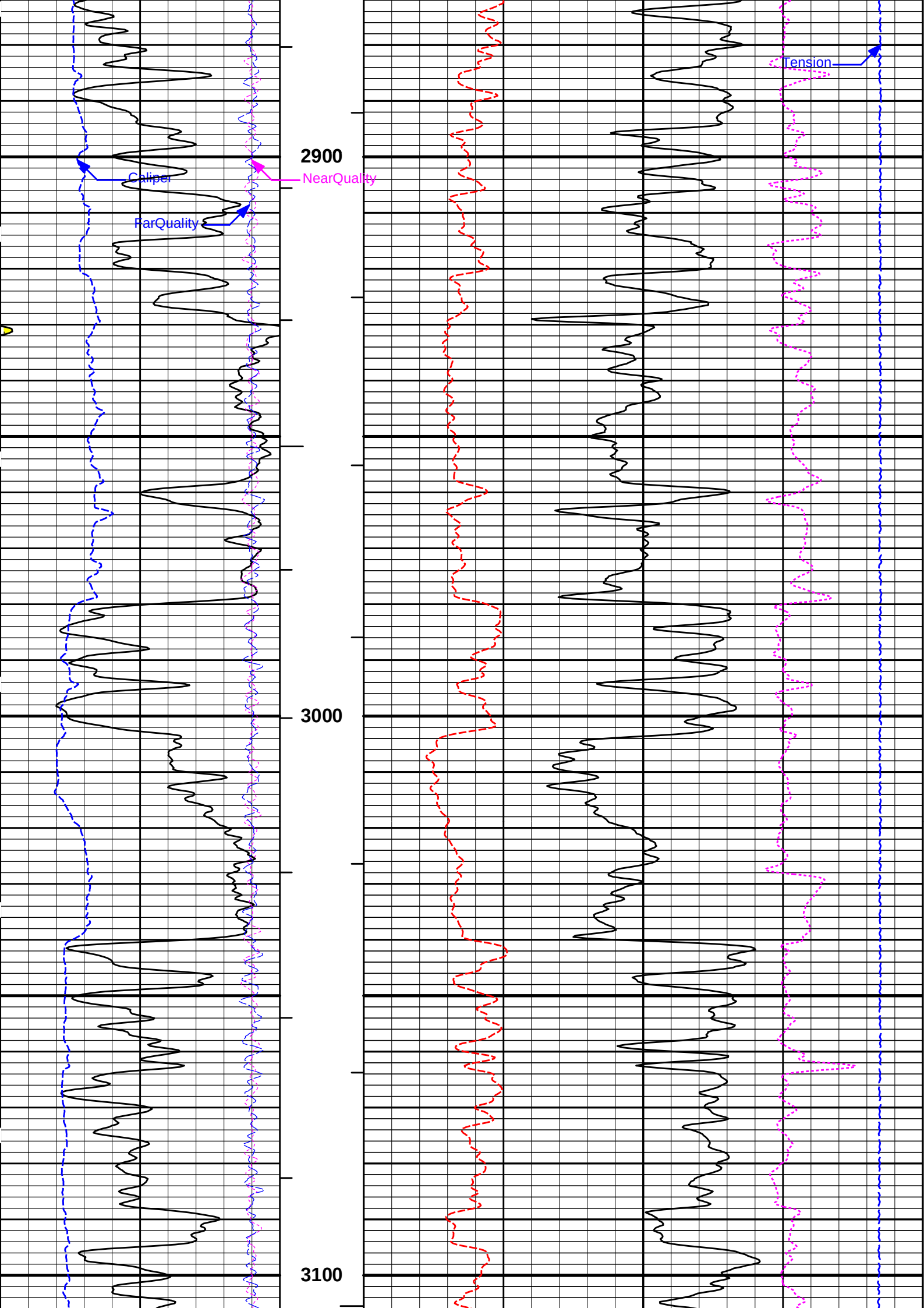
HALLIBURTON

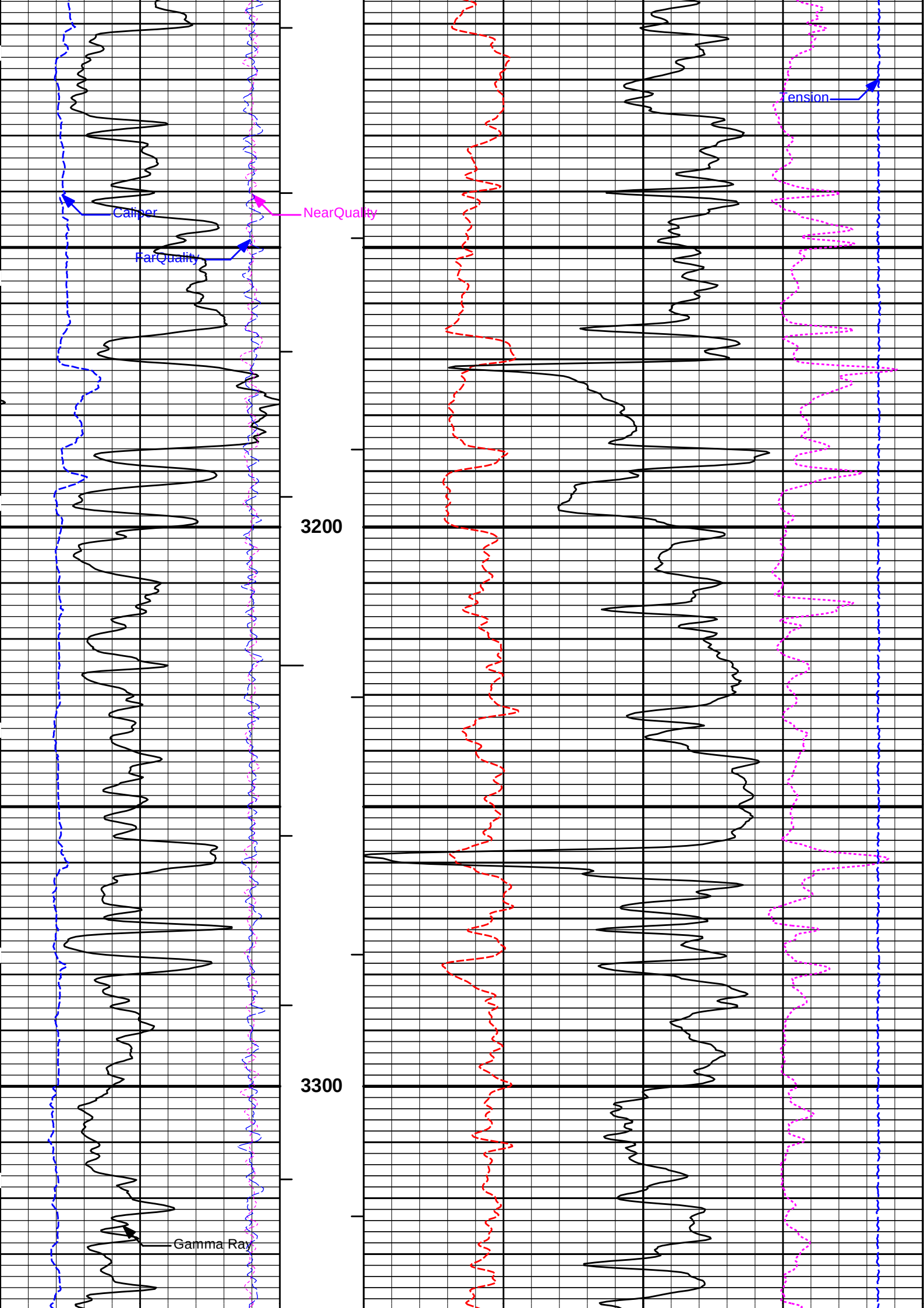
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Plot Range: 2850 ft to 4390 ft
Data: RITCHIE_SEYMOUR\Well Based\MAIN\
Plot File: \\-LOCAL-\\RITCHIE_SEYMOUR\0001 GTET-DSNT-SDLT-BSAT-ACRTIPORO_ML\BULKD_5_MAIN_IQ

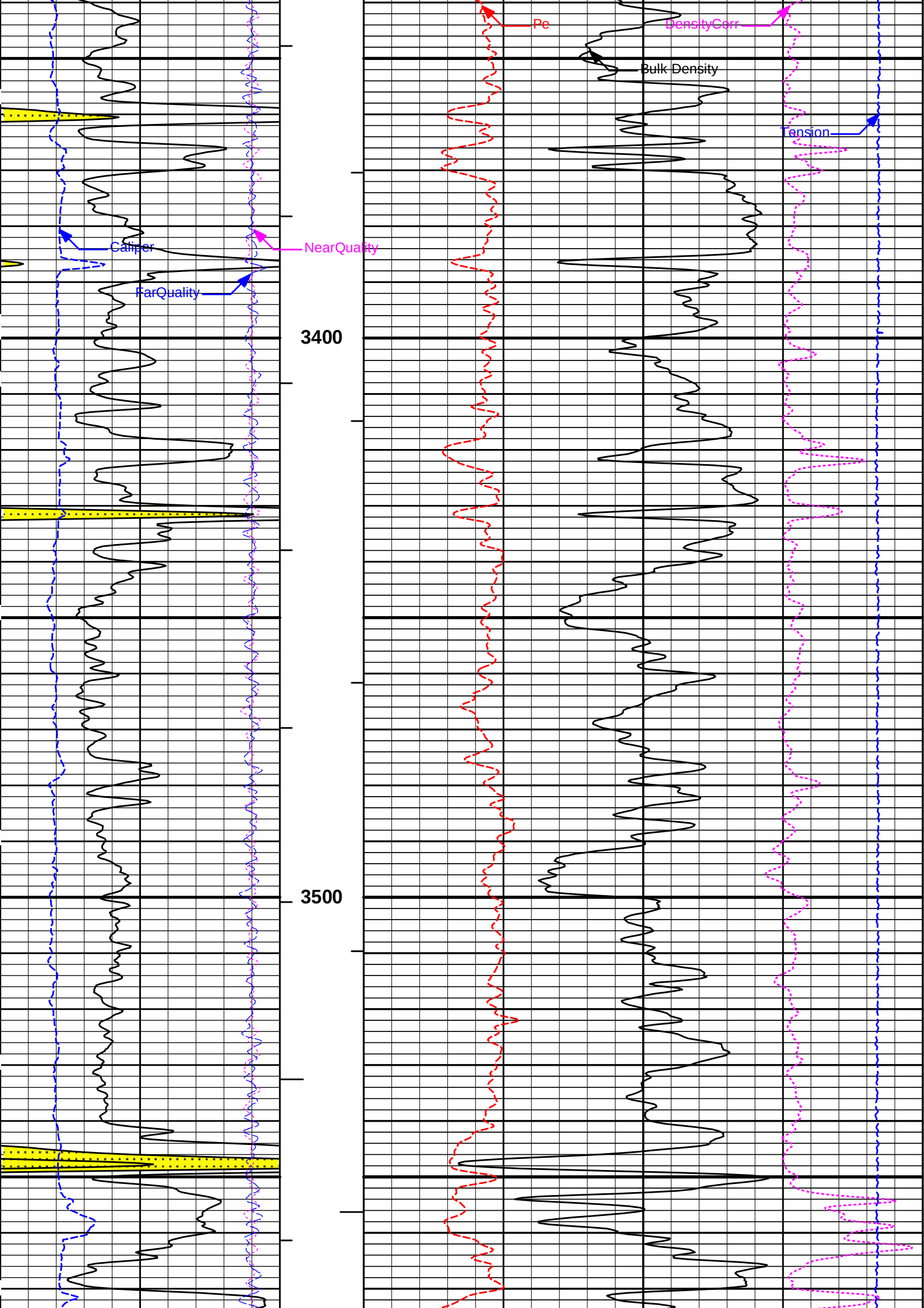
5 INCH MAIN LOG

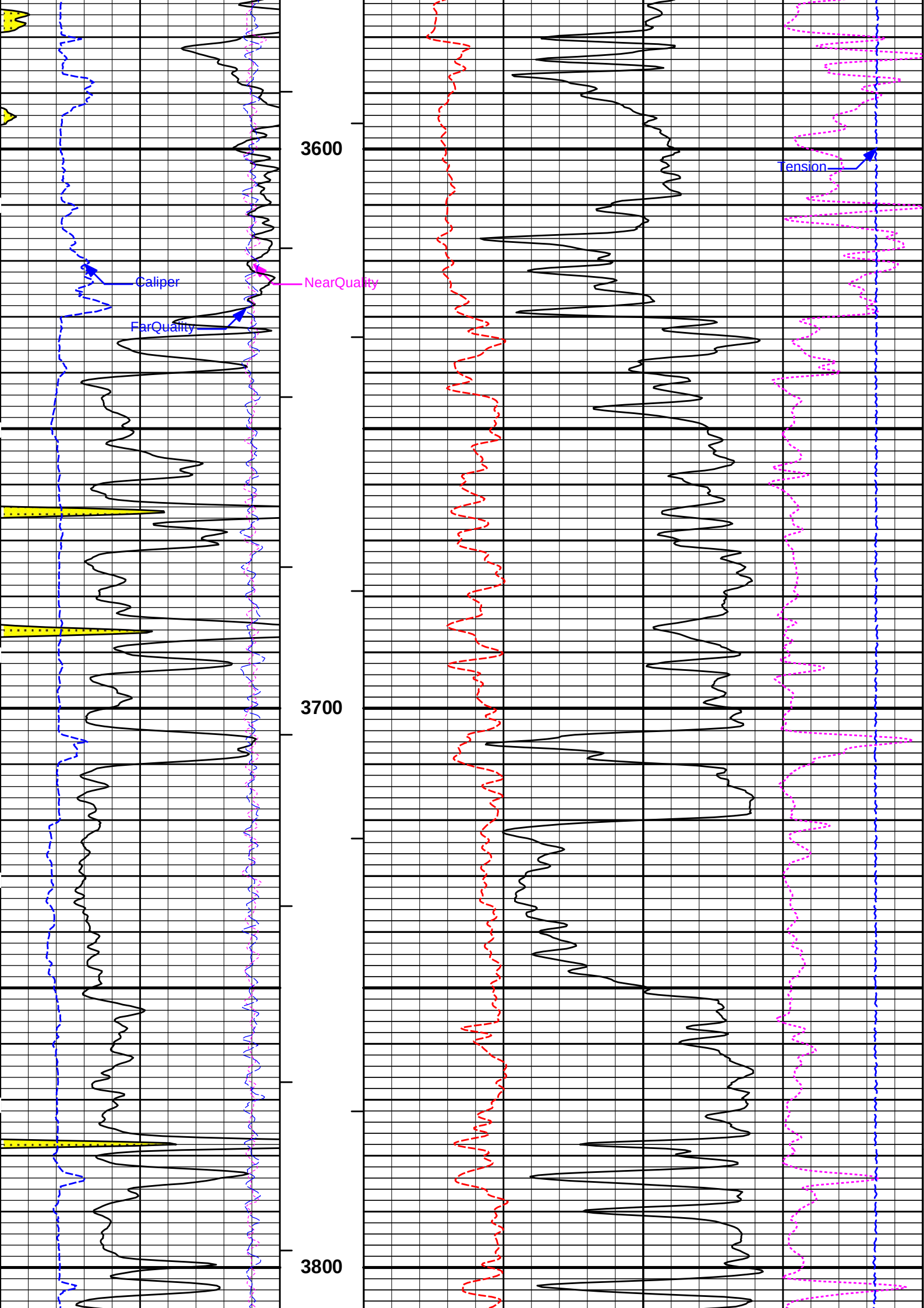
MAIN SECTION 5" PER 100'

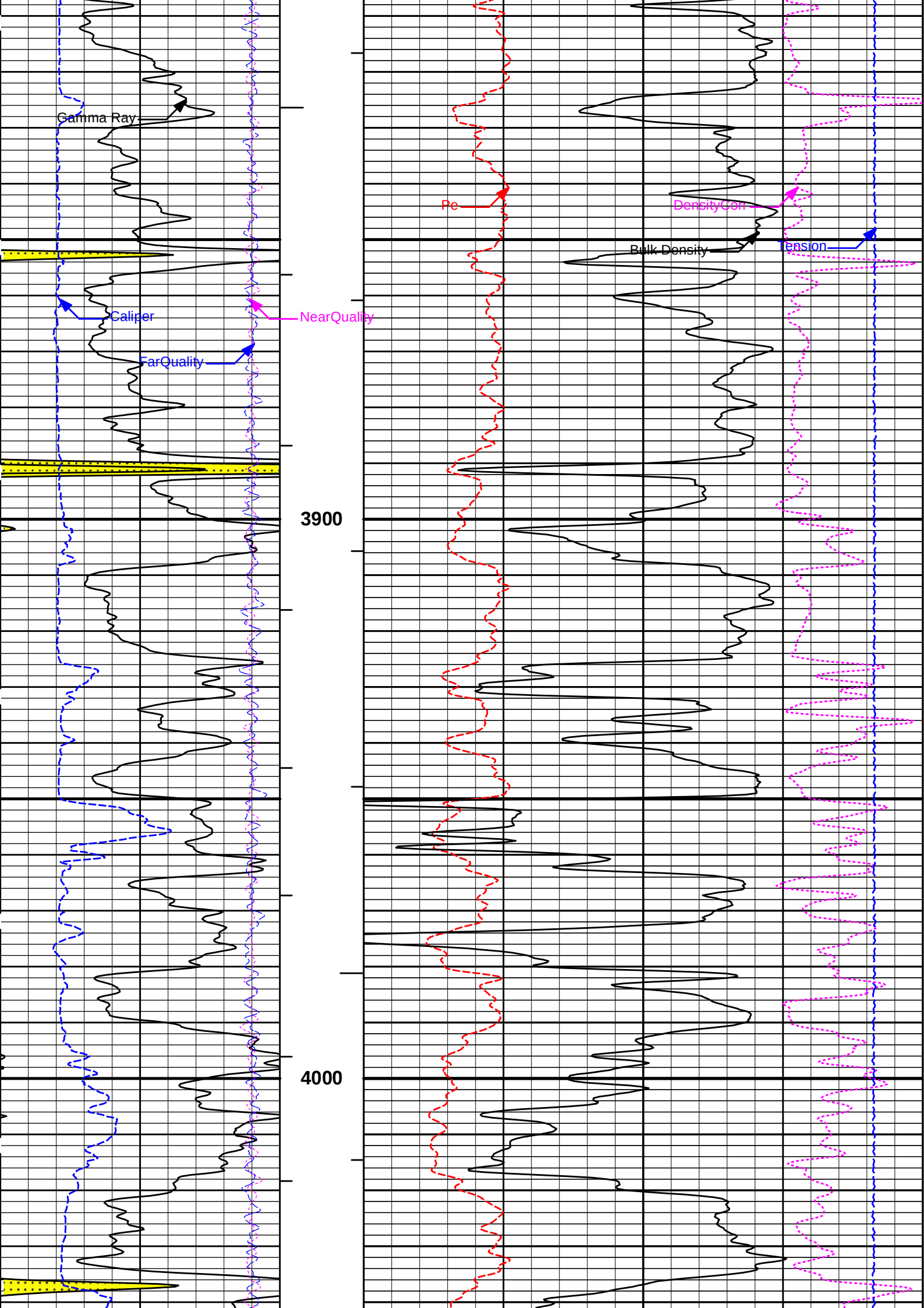


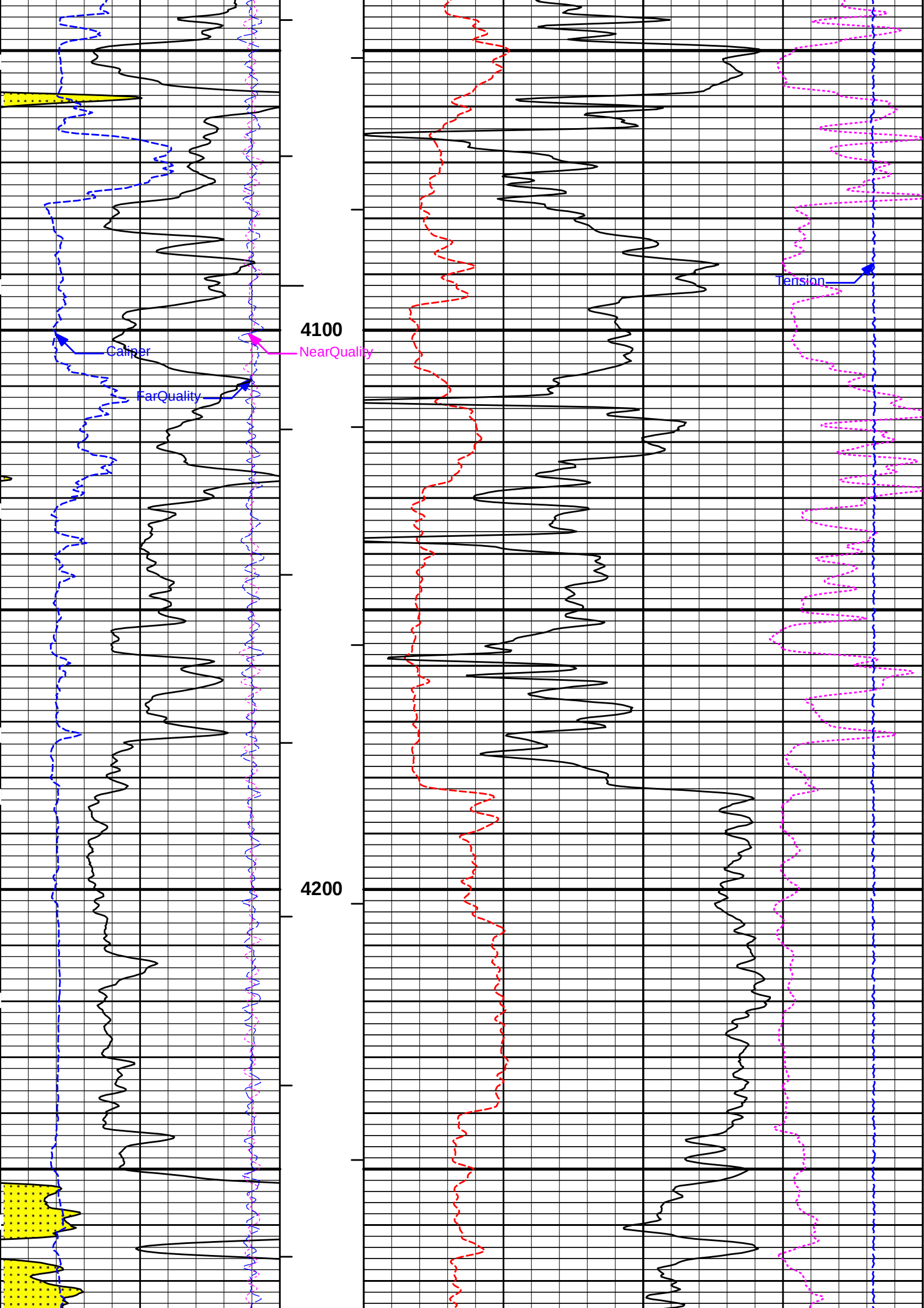


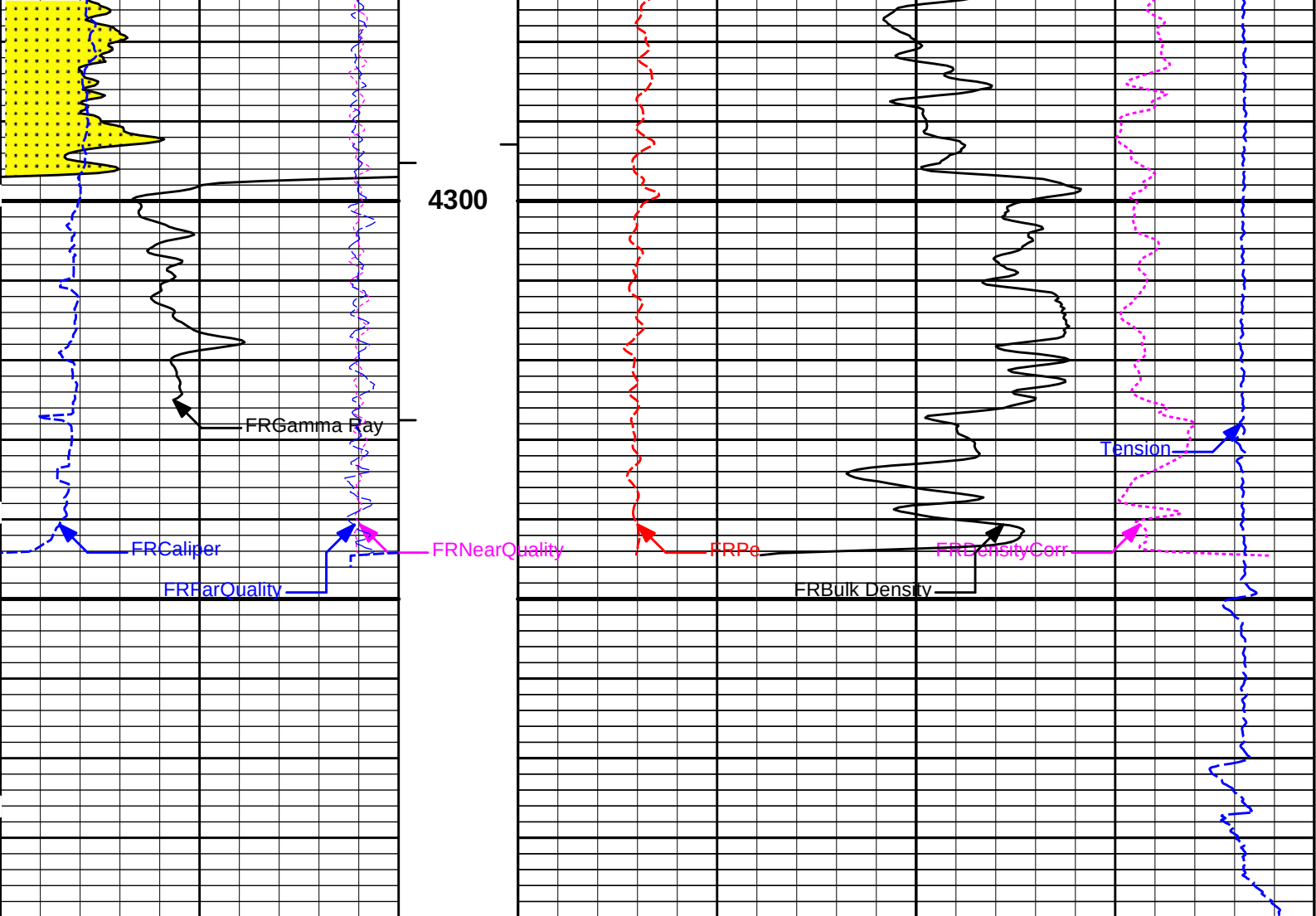












6	Caliper	16	1 : 240	0	Pe	10	-0.25	DensityCorr	0.25
	inches		ft					g/cc	
-18	NearQuality	2	BHV				15K	Tension	0
			ft3					pounds	
18	FarQuality	-2	AHV	2	Bulk Density				3
			ft3		g/cc				
0	Gamma Ray	150							
	api								

HALLIBURTON

Plot Time: 14-Sep-17 13:46:12
 Plot Range: 2850 ft to 4390 ft
 Data: RITCHIE_SEYMOUR\Well Based\MAIN\
 Plot File: \\LOCAL-1\RITCHIE_SEYMOUR\0001 GTET-DSNT-SDLT-BSAT-ACRT\IPORO_ML\BULKD_5_MAIN_IQ

5 INCH MAIN LOG

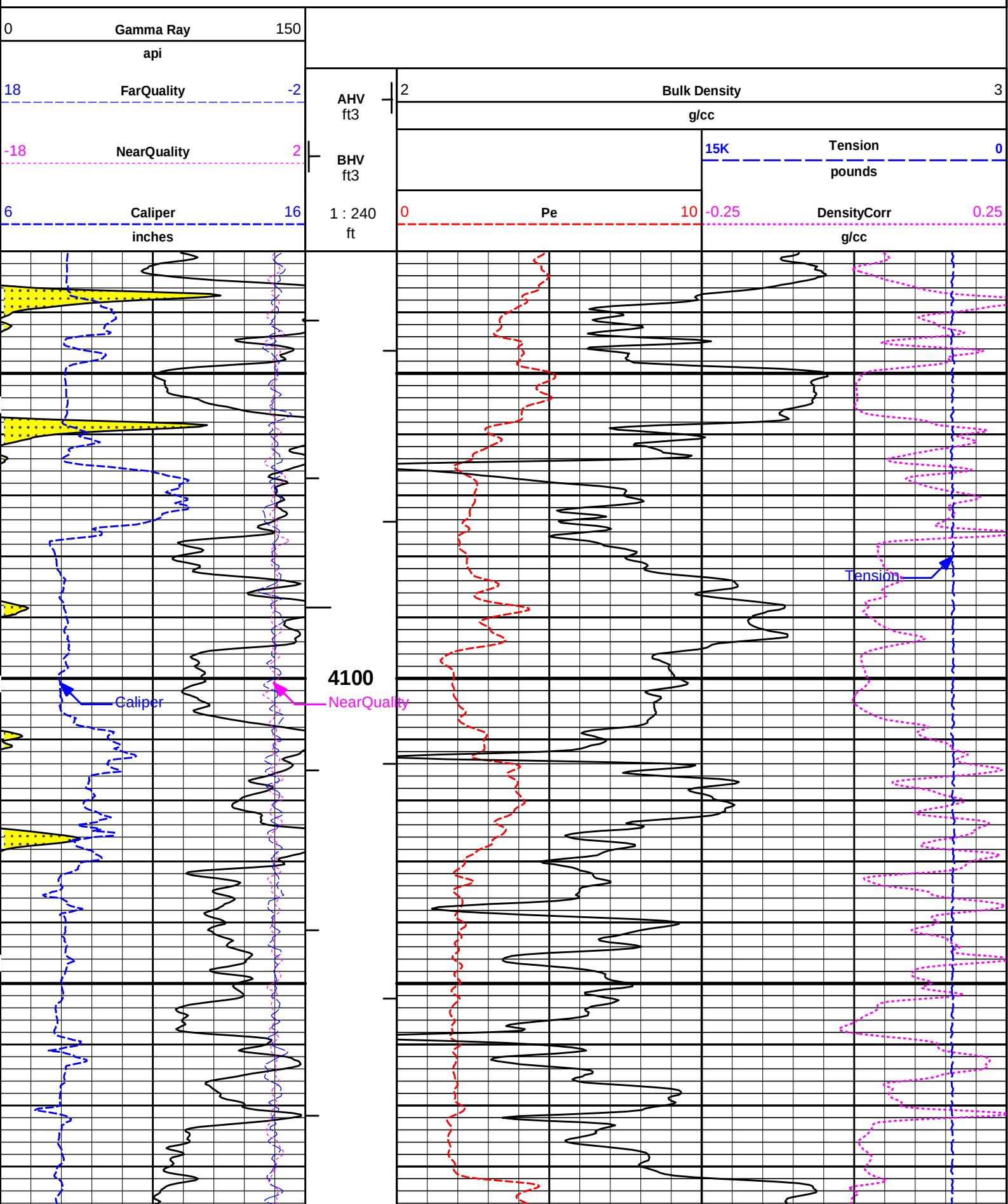
MAIN SECTION 5" PER 100'

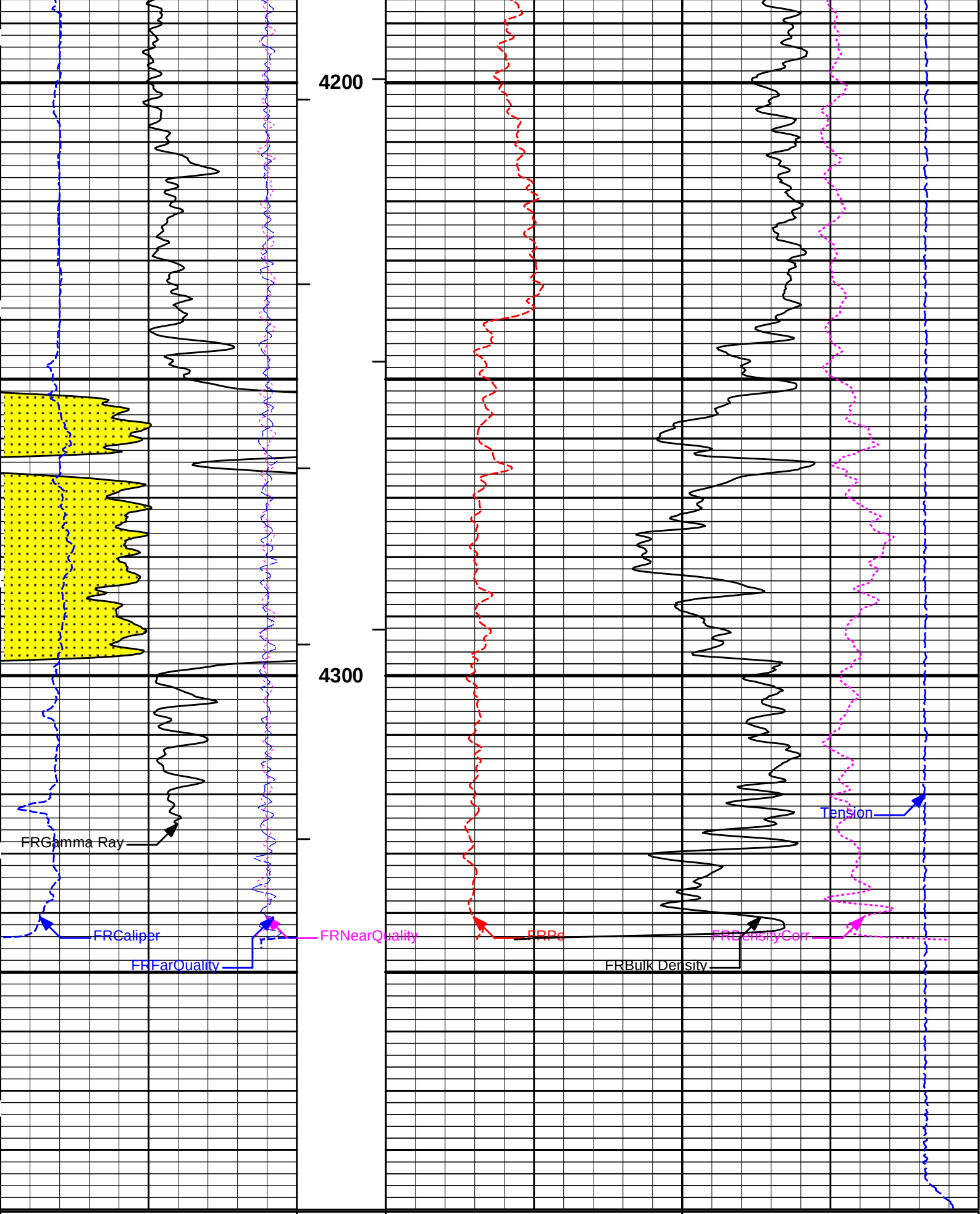
HALLIBURTON

Plot Time: 14-Sep-17 13:46:13
 Plot Range: 4030 ft to 4390.08 ft
 Data: RITCHIE_SEYMOUR\Well Based\IPT\
 Plot File: \\LOCAL-1\RITCHIE_SEYMOUR\0001 GTET-DSNT-SDLT-BSAT-ACRT\IPORO_ML\BULKD_5_MAIN_IQ

5 INCH REPEAT LOG

REPEAT SECTION 5" PER 100'





6	Caliper	16	1 : 240	0	Pe	10	-0.25	DensityCorr	0.25
	inches		ft					g/cc	
-18	NearQuality	2	BHV				15K	Tension	0
			ft3					pounds	
18	FarQuality	-2	AHV	2	Bulk Density				3
			ft3		g/cc				

0	Gamma Ray	150		
	api			
HALLIBURTON		Plot Time: 14-Sep-17 13:46:14 Plot Range: 4030 ft to 4390.08 ft Data: RITCHIE_SEYMOUR\Well Based\IPT\ Plot File: \\LOCAL-IRITCHIE_SEYMOUR\0001 GTET-DSNT-SDLT-BSAT-ACRT\IPORO_ML\BULKD_5_MAIN_IQ		
5 INCH REPEAT LOG				
REPEAT SECTION 5" PER 100'				
HALLIBURTON				
CALIBRATION REPORT				
NATURAL GAMMA RAY TOOL SHOP CALIBRATION				
Tool Name:	GTET - 10971172	Reference Calibration Date:	14-Jul-17 15:53:59	
Engineer:	WHITLOCK	Calibration Date:	04-Sep-17 09:33:42	
Software Version:	WL INSITE R5.0.5 (Build 8)	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	25.3	25.1	api
	Background + Calibrator	259.0	257.1	api
	Calibrator	233.7	232.0	api
NATURAL GAMMA RAY TOOL FIELD CALIBRATION				
Tool Name:	GTET - 10971172	Reference Calibration Date:	04-Sep-17 09:33:42	
Engineer:	WHITLOCK	Calibration Date:	04-Sep-17 09:38:31	
Software Version:	WL INSITE R5.0.5 (Build 8)	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	25.1	24.1	api
	Background + Calibrator	257.1	255.9	api
	Calibrator	232.0	231.7	api
	Shop	Field	Difference	Tolerance
	232.0	231.7	0.3	+/- 9.00
DUAL SPACED NEUTRON SHOP CALIBRATION				
Tool Name:	DSNT - 11019643	Reference Calibration Date:	03-Jul-17 11:40:27	
Engineer:	T. HYDE	Calibration Date:	03-Jul-17 11:55:03	
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1	
Logging Source S/N: DSN-438 Tank Serial Number: 10730320 Reference value assigned to Tank: 56.100 Spray Block S/N: 668				

Snow Block S/N: 668
Calibration Tank Water Temperature: 75 degF
Min. Tool Housing Outside Diameter: 3.625 in

CALIBRATION CONSTANTS			
Measurement	Prev. Value	New Value	Control Limit On New Value
Gain:	1.02375	1.02291	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):	0.2360	0.2358	0.0003	+/- 0.0020
Calibrated Ratio:	10.5683	10.5597	0.009	+/- 0.050

VERIFIER		
Measurement	Value	Control Limit
Snow-Block Porosity (decp):	0.0690	0.02000 - 0.09000

PASS/FAIL SUMMARY	
Background Check:	Passed
Gain-Range Check:	Passed
Snow-Block Check:	Passed

DUAL SPACED NEUTRON FIELD CALIBRATION

Tool Name:	DSNT - 11019643	Reference Calibration Date:	03-Jul-17 11:55:03
Engineer:	WHITLOCK	Calibration Date:	04-Sep-17 10:28:09
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1

Logging Source S/N: DSN-438
Snow Block S/N: 668

NEUTRON FIELD-CHECK SUMMARY				
	Shop	Field	Difference	Control Limit On Change
Snow-Block Porosity (decp):	0.0690	0.0741	0.0051	+/- 0.0150

PASS/FAIL SUMMARY	
Block Change Check:	Passed
Snow Block Stat Check:	Passed
Temperature Check:	Passed

DENSITY CALIPER SHOP CALIBRATION

Tool Name:	SDLT - 12153520	Reference Calibration Date:	16-Jul-17 09:04:46
Engineer:	T. HYDE	Calibration Date:	16-Jul-17 09:15:37
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1
Host Tool Name:	DSNT - 11019643		

CALIBRATION COEFFICIENTS			
Measurement	Previous Value	New Value	Control Limit On New Value
Pad Offset	-4999.24	-4827.59	-7000.00 - -1000.00
Pad Gain	0.0003776	0.0003732	0.0002000 - 0.0006000
Arm Offset	-3298.36	-3861.19	-5000.00 - 3000.00
Arm Gain	0.0004826	0.0005319	0.000300 - 0.000700
Arm Power	-0.000003416	-0.000006577	-0.000010000 - 0.000010000

The ring diameter is computed from: DIAMETER = PAD EXTENSION + ARM EXTENSION + TOOL DIAMETER
Tool Diameter: 4.50 in

CALIBRATION RINGS	
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Measurement	Current Reading (Previous Coeff.)	Calibrated (New Coeff.)	Change	Control Limit On New Value
PAD EXTENSION:				
Small Ring (in)	1.96	2.00	0.04	+/- 0.20
Medium Ring (in)	3.73	3.75	0.02	+/- 0.20
RING DIAMETER:				
Small Ring (in)	6.55	6.50	-0.05	+/- 0.20
Medium Ring (in)	8.19	8.25	0.06	+/- 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 - 12153520		Reference Calibration Date:	16-Jul-17 09:15:37
Engineer:	WHITLOCK		Calibration Date:	04-Sep-17 09:21:44
Software Version:	WL INSITE R5.0.5 (Build 8)		Calibration Version:	1

MEASURED CALIPER VALUES				
Measurement	Shop	Field	Change	Control Limit On New Value
Pad Extension	3.75	3.75	0.00	+/- 0.10
Ring Diameter	8.25	8.35	0.10	+/- 0.15
PASS/FAIL SUMMARY				
Pad Extension Check:			Passed	
Diameter Check:			Passed	

MICRO LOG SHOP CALIBRATION				
Tool Name:	Microlog Pad - 12153520		Reference Calibration Date:	01-Jan-70 00:00:00
Engineer:	T. HYDE		Calibration Date:	03-Jul-17 10:53:37
Software Version:	WL INSITE R5.0.5 (Build 8)		Calibration Version:	1
Host Tool Name:	DSNT - 11019643			

CALIBRATION COEFFICIENT SUMMARY					
Measurement	Micro Log Normal		Micro Log Lateral		Units
	Measured	Calibrated	Measured	Calibrated	
Tool Zero	-0.13	-0.13	-0.00	-0.00	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	19.85	19.85	19.96	19.96	ohmm
Measurement	Micro Log Normal Tool Value		Micro Log Lateral Tool Value		Units
Tool Zero	0.10		0.07		V
Calibration Point #1	34.01		1.14		V
Calibration Point #2	5331.93		6960.54		V
Internal Reference	5293.44		6948.13		V

MICRO LOG FIELD CHECK				
Tool Name:	Microlog Pad - 12153520		Reference Calibration Date:	03-Jul-17 10:53:37
Engineer:	WHITLOCK		Calibration Date:	04-Sep-17 10:35:42
Software Version:	WL INSITE R5.0.5 (Build 8)		Calibration Version:	1

Measurement	Micro Log Normal		Micro Log Lateral		Units
	Shop	Field	Shop	Field	

Tool Zero	-0.13	-0.13	-0.00	-0.00	ohmm
Internal Reference	19.85	19.85	19.96	19.95	ohmm
Summary					
Signal	Shop	Field	Difference	Tolerance	
Microlog Normal	19.85	19.85	0.00	+/- 0.80	
Microlog Lateral	19.96	19.95	0.01	+/- 0.80	

SPECTRAL DENSITY SHOP CALIBRATION

Tool Name:	SDLT Pad - 10865884	Reference Calibration Date:	24-Aug-17 11:23:24
Engineer:	T. HYDE	Calibration Date:	24-Aug-17 11:42:16
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1

Logging Source S/N: 20791B		
Aluminum Block S/N: EL RENO ALUMINUM	Density: 2.581g/cc	Pe: 3.170
Magnesium Block S/N: EL RENO MAGNESIUM	Density: 1.687g/cc	Pe: 2.594

Density Calibration Summary			
Measurement	Previous Value	New Value	Control Limit
Near Bar Gain	0.9954	0.9902	0.90 - 1.10
Near Dens Gain	1.0009	1.0022	0.90 - 1.10
Near Peak Gain	1.0204	1.0067	0.90 - 1.10
Near Lith Gain	1.0177	0.9798	0.90 - 1.10
Far Bar Gain	1.0074	1.0105	0.90 - 1.10
Far Dens Gain	0.9955	0.9954	0.90 - 1.10
Far Peak Gain	0.9934	0.9941	0.90 - 1.10
Far Lith Gain	0.9729	0.9715	0.90 - 1.10
Near Bar Offset	0.3329	0.3796	NONE
Near Dens Offset	0.2570	0.2455	NONE
Near Peak Offset	0.0842	0.1932	NONE
Near Lith Offset	0.0696	0.3811	NONE
Far Bar Offset	0.1940	0.1702	NONE
Far Dens Offset	0.2685	0.2711	NONE
Far Peak Offset	0.2758	0.2703	NONE
Far Lith Offset	0.3932	0.4038	NONE
Near Bar Background	746.92	745.40	700 - 1450
Near Dens Background	248.02	247.88	230 - 480
Near Peak Background	108.57	110.03	100 - 210
Near Lith Background	133.69	133.02	125 - 260
Far Bar Background	588.08	589.53	450 - 900
Far Dens Background	230.50	230.28	175 - 345
Far Peak Background	91.05	89.65	70 - 140
Far Lith Background	94.33	94.00	75 - 145

Calibration Block Summary				
Measurement	Current Reading (Previous Coef)	Calibrated (New Coef)	Change	Control Limit On Change
MAGNESIUM				
Density (g/cc)	1.691	1.687	-0.004	+/- 0.015
Pe	2.525	2.559	0.034	+/- 0.150
ALUMINUM				
Density (g/cc)	2.581	2.581	0.000	+/- 0.01500
Pe	3.149	3.132	-0.017	+/- 0.150

Tool Summary		
Measurement	Near Detector	Far Detector

	Value	Control Limits	Value	Control Limits
QUALITY				
Background	-0.0003	+/- 0.0110	0.0019	+/- 0.0140
Magnesium Block	0.0002	+/- 0.0110	-0.0019	+/- 0.0140
Aluminum Block	-0.0010	+/- 0.0110	-0.0000	+/- 0.0140
Resolution	8.39	6.00 - 11.50	8.91	6.00 - 11.50
Internal Verifier(B+D+P+L)	1236	1200 - 2700	1003	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 - 10865884	Reference Calibration Date:	24-Aug-17 11:42:16
Engineer:	WHITLOCK	Calibration Date:	04-Sep-17 10:39:19
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1

Pad Temperature: 85.8 degF

DENSITY FIELD CALIBRATION SUMMARY				
Measurement	Shop	Field	Change	Control Limit +/-
Near (B+D+P+L) cps	1236.342	1238.398	2.056	14.260
Far (B+D+P+L) cps	1003.465	1005.370	1.905	16.946
Near Resolution	8.39	8.49	0.100	0.50
Far Resolution	8.91	8.90	-0.010	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 - 11024142	Reference Calibration Date:	10-Mar-17 17:11:10
Engineer:	HARRIS	Calibration Date:	08-May-17 12:03:48
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1
Host Tool Name:	ACRt Instrument - 11026094		

TYPICAL GAIN RANGE

Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper
A1 (80")	0.95	1.0326	1.05	0.95	1.0155	1.05	0.95	1.0115	1.05
A2 (50")	0.95	1.0417	1.05	0.95	1.0258	1.05	0.95	1.0241	1.05
A3 (29")	0.95	1.0399	1.05	0.95	1.0226	1.05	0.95	1.0189	1.05
A4 (17")	0.95	1.0419	1.05	0.95	1.0219	1.05	0.95	1.0203	1.05
A5 (10")	N/A	N/A	N/A	0.95	1.0108	1.05	0.95	1.0082	1.05
A6 (6")	N/A	N/A	N/A	0.95	1.0024	1.05	0.95	0.9986	1.05

SONDE OFFSET

Subarray	R12KHz			R36KHz			R72KHz		
	(mmho/m)			(mmho/m)			(mmho/m)		

A1 (80")	1.163		-4.063		-6.054	
A2 (50")	-0.275		-3.847		-5.115	
A3 (29")	-13.268		-4.151		-4.011	
A4 (17")	-108.350		-33.982		-26.717	
A5 (10")	N/A		-106.088		-50.170	
A6 (6")	N/A		238.519		131.886	
TRANSMITTER CURRENT GAIN				R-MUD VERIFICATION		
Signal	Lower	R	Upper	Signal	Lower (ohm-m) Measured (ohm-m) Upper (ohm-m)	
12K	0.6	0.87	1.3	Mud Cell	0.95 1.00 1.05	
36K	1.0	1.84	2.0			
72K	1.0	1.12	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-10971172						
Gamma Ray Calibrator	232.0	231.7	-----	0.3	+/- 9.00	api
DSNT-11019643						
Snow-Block Porosity	0.0690	0.0741	-----	-0.0051	+/- 0.0150	decp
SDLT-12153520						
Pad Extension	3.75	3.75	-----	0.00	+/-0.10	in
Ring Diameter	8.25	8.35	-----	-0.10	+/-0.15	in
Microlog Pad-12153520						
MicroLog Normal	19.85	19.85	-----	0.00	+/-0.80	ohmm
MicroLog Lateral	19.96	19.95	-----	0.01	+/-0.80	ohmm
SDLT Pad-10865884						
Near(B+D+P+L)	1236.342	1238.398	-----	-2.056	+/-14.260	cps
Far(B+D+P+L)	1003.465	1005.370	-----	-1.905	+/-16.946	cps
ACRt Sonde-11024142						
Mud Cell	1.00	-----	-----	0	-----	ohm-m
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	9.300	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	0.740	ohmm	
	SHARED	TRM	Temperature of Mud	75.0	degF	
	SHARED	CSD	Logging Interval is Cased?	No		
	SHARED	ICOD	AHV Casing OD	4.500	in	

	SHARED	CSTR	Compressive Strength	1000.00	psia
	SHARED	ST	Surface Temperature	75.0	degF
	SHARED	TD	Total Well Depth	4386.00	ft
	SHARED	BHT	Bottom Hole Temperature	121.0	degF
	SHARED	SVTM	Navigation and Survey Master Tool	NONE	
	SHARED	AZTM	High Res Z Accelerometer Master Tool	GTET	
	SHARED	TEMM	CBM Temperature Master Tool	GTET	
	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?	No	
	GTET	TPOS	Tool Position for Gamma Ray Tools.	Eccentered	
	GTET	BHSM	Borehole Size Source Tool	SDLT	
	DSNT	DNOK	Process DSN?	Yes	
	DSNT	DEOK	Process DSN EVR?	No	
	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	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?	No	
	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	User define	
	BSAT	DTMA	Delta -T Matrix	47.60	uspf
	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	1.19	in
	ACRt Sonde	TCS1	Temperature Correction Source	FP Lwr & FP Upr	
	ACRt Sonde	TPOS	Tool Position	Centered	
	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	

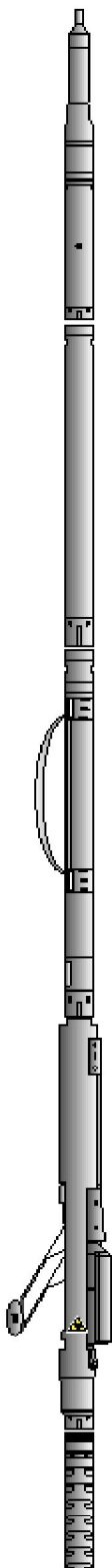
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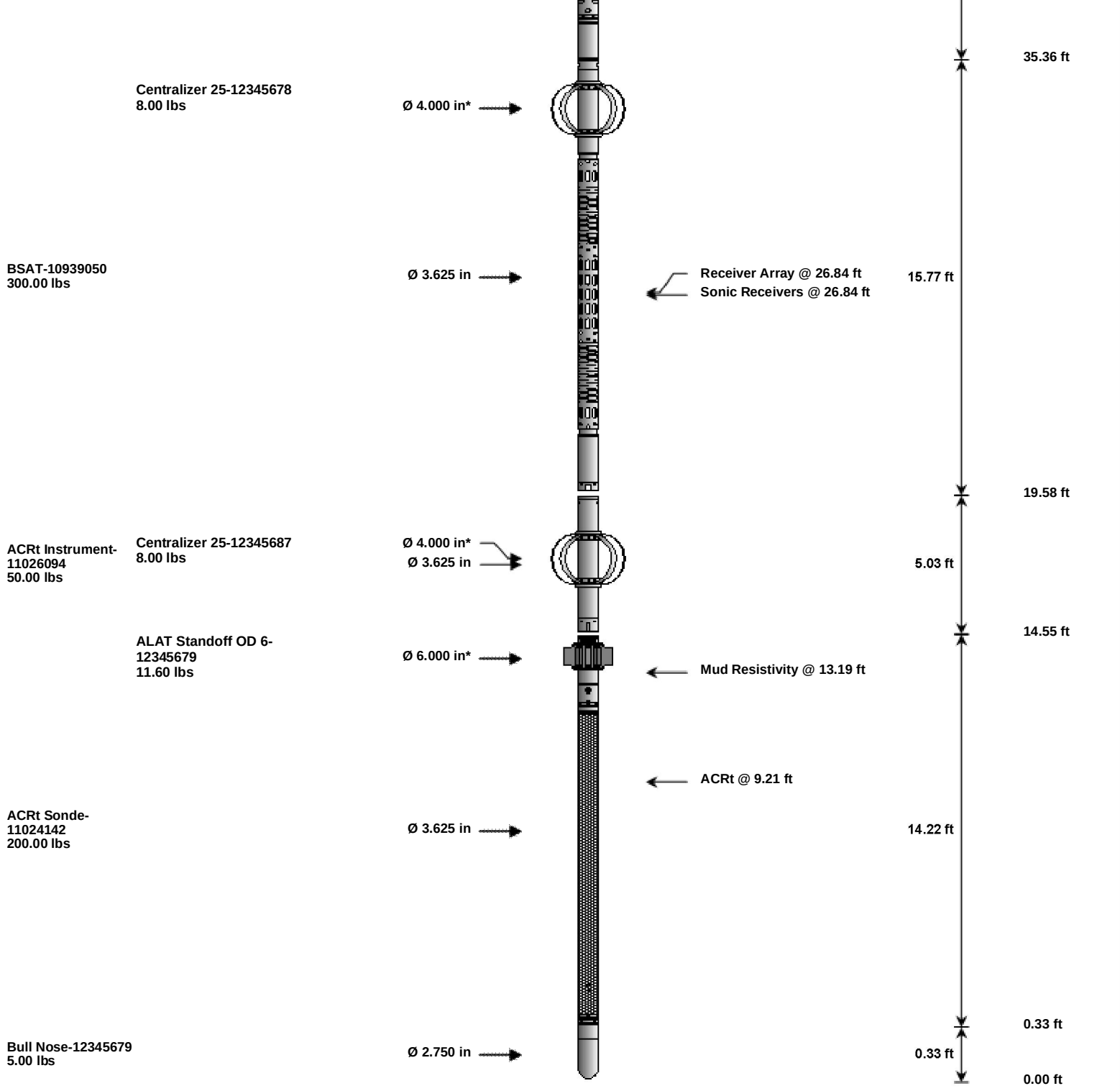
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Date: 14-Sep-17 11:46:30

HALLIBURTON

TOOL STRING DIAGRAM REPORT

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
CH_HOS-11459024 37.50 lbs	Weak Point 7000 lbs- 12345678 0.01 lbs	Ø 2.750 in Ø 0.010 in*		← Temperature @ 76.74 ft	2.50 ft	77.24 ft
XOHD-11569312 20.00 lbs		Ø 2.750 in Ø 3.625 in			0.95 ft	74.74 ft
SP Sub-11441709 60.00 lbs		Ø 3.625 in		← SP @ 72.01 ft	3.74 ft	73.79 ft
				← Z-Accelerometer @ 69.60 ft		70.05 ft
GTET-10971172 165.00 lbs		Ø 3.625 in		← GammaRay @ 63.99 ft	8.52 ft	
						61.53 ft
DSNT-11019643 174.00 lbs	DSN Decentralizer- 11019643 6.60 lbs	Ø 5.000 in* Ø 3.625 in		← DSN Far @ 54.59 ft ← DSN Near @ 53.84 ft	9.69 ft	
						51.84 ft
SDLT-12153520 360.00 lbs	SDLT Pad-10865884 65.00 lbs Microlog Pad-12153520 8.00 lbs RAM-Cs137-00005155 1.00 lbs	Ø 4.500 in Ø 4.500 in* Ø 4.750 in* Ø 0.800 in*		Microlog @ 44.03 ft SDL Caliper @ 43.84 ft SDL @ 43.83 ft	10.81 ft	
						41.03 ft
Flex Joint-11005585 140.00 lbs		Ø 3.625 in			5.67 ft	

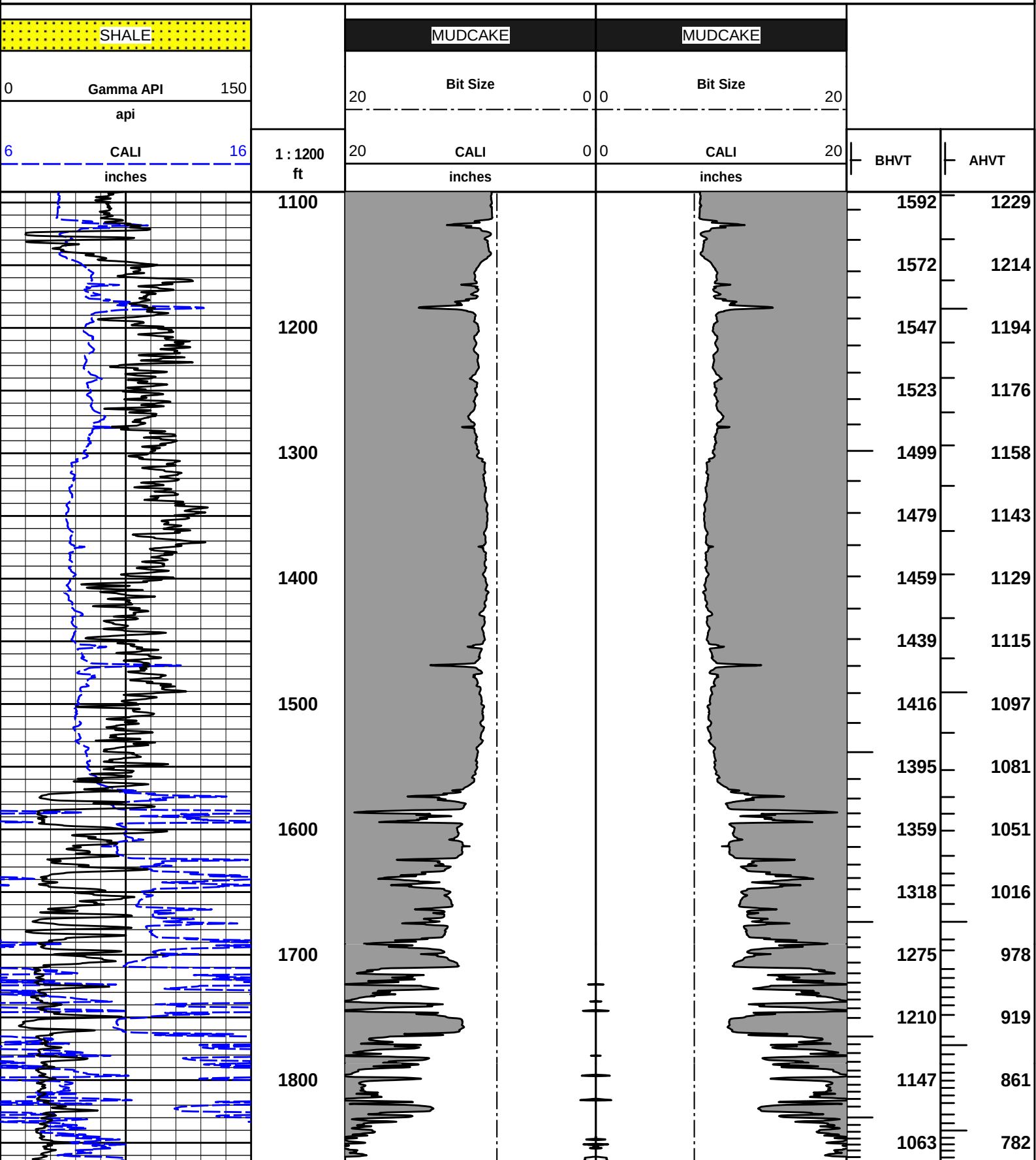


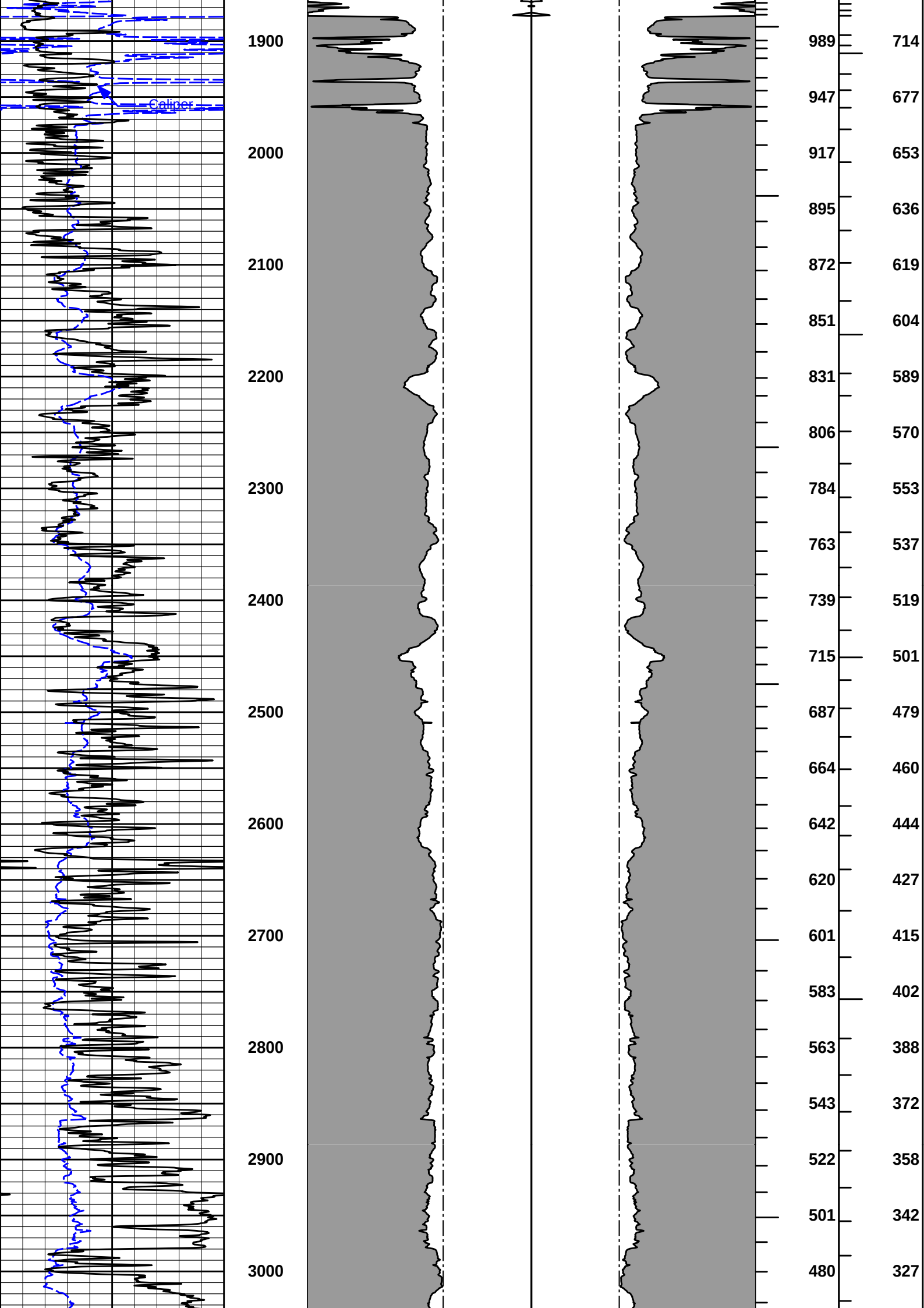
Mnemonic	Tool Name	Serial Number	Weight (lbs)	Length (ft)	Accumulated Length (ft)	Max.Log. Speed (fpm)
CH_HOS	Hostile Cable Head with Load Cell	11459024	37.50	2.50	74.74	300.00
WP7K	Weak Point 7000 lbs	12345678	0.01	0.01	* 75.54	300.00
XOHD	Hostile to Dits Cross Over	11569312	20.00	0.95	73.79	300.00
SP	SP Sub	11441709	60.00	3.74	70.05	300.00
GTET	Gamma Telemetry Tool	10971172	165.00	8.52	61.53	60.00
DSNT	Dual Spaced Neutron	11019643	174.00	9.69	51.84	60.00
DCNT	DSN Decentralizer	11019643	6.60	5.13	* 55.17	300.00
SDLT	Spectral Density Tool	12153520	360.00	10.81	41.03	60.00
SDLP	Density Insite Pad	10865884	65.00	2.55	* 43.24	60.00
Cs137	Logging Source, SDLT-I, 1.78 Ci - Cs137	00005155	1.00	0.80	* 43.47	300.00
MICP	Microlog Pad	12153520	8.00	1.00	* 43.53	60.00
FLEX	Flex Joint	11005585	140.00	5.67	35.36	300.00
BSAT	Borehole Sonic Array Tool	10939050	300.00	15.77	19.58	60.00
OBCEN	Centralizer - 25 in. Overbody	12345678	8.00	2.08	* 32.54	300.00
ACRt	Array Compensated True Resistivity Instrument Section	11026094	50.00	5.03	14.55	120.00
OBCEN	Centralizer - 25 in. Overbody	12345687	8.00	2.08	* 16.17	300.00
ACRt	Array Compensated True Resistivity Sonde Section	11024142	200.00	14.22	0.33	120.00
ALATS	Array Laterolog Tool OD 6 Standoff	12345679	11.60	1.00	* 13.19	60.00
BLNS	Bull Nose	12345679	5.00	0.33	0.00	300.00

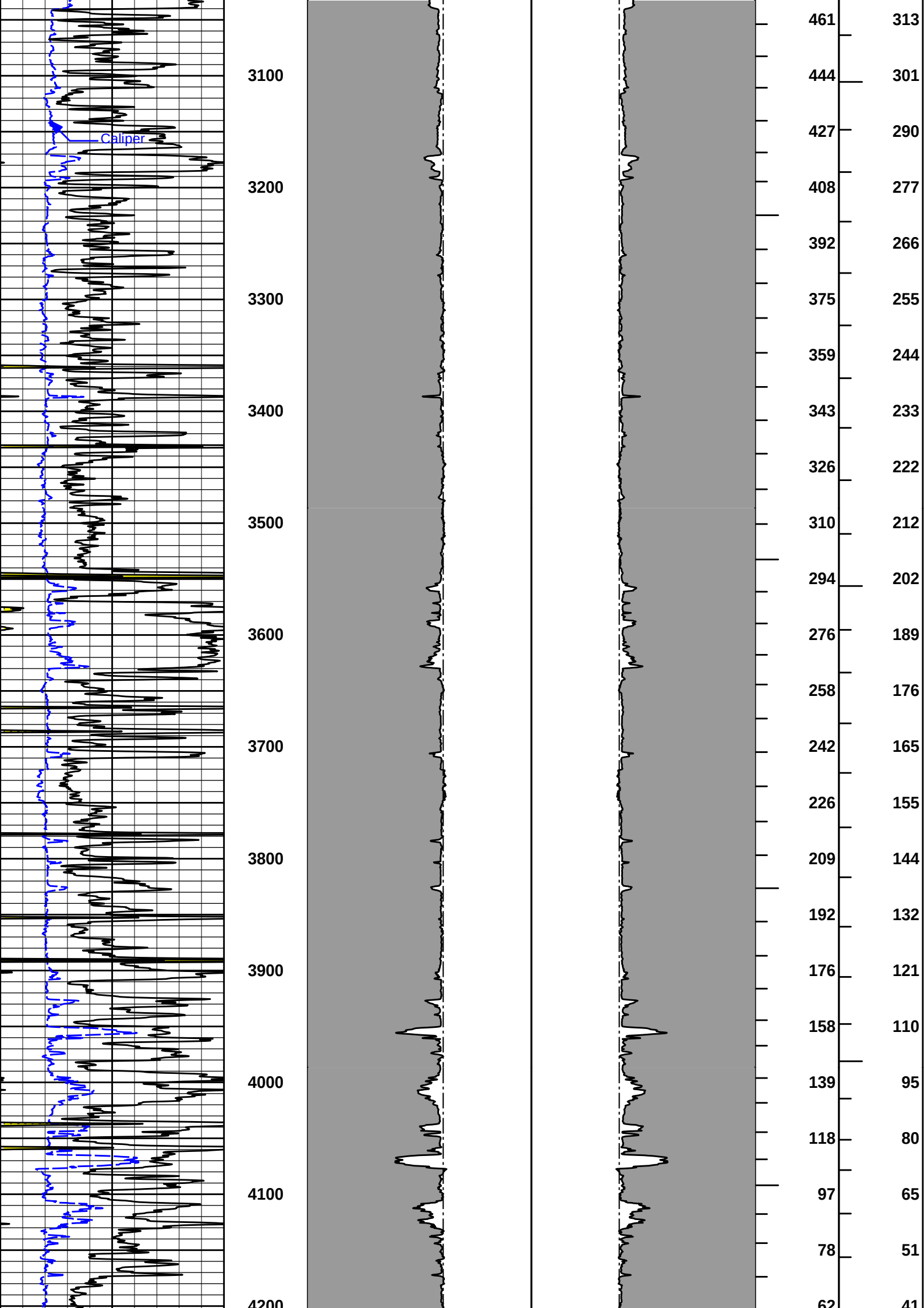
HALLIBURTON

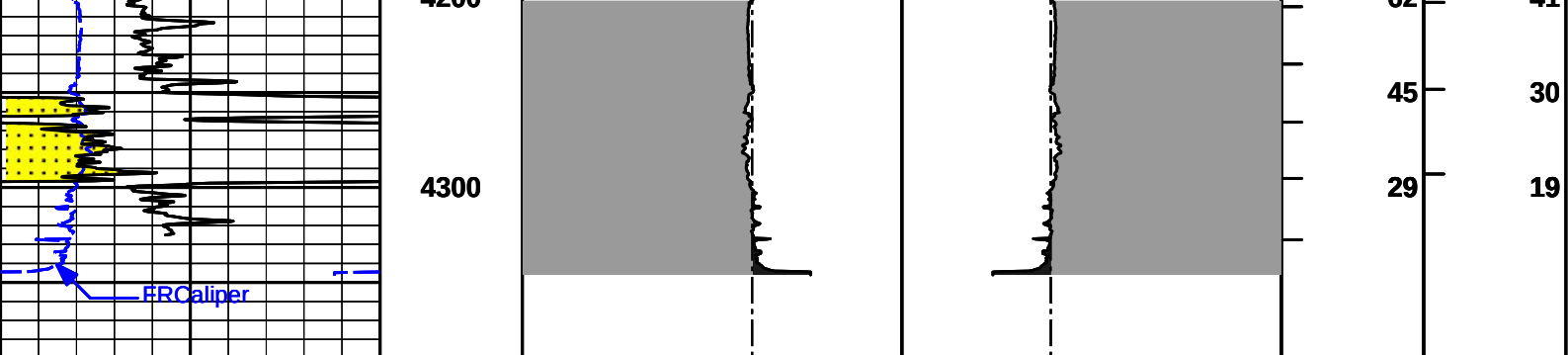
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ANNULAR HOLE VOLUME PLOT









6	CALI	16	1 : 1200 ft	20	CALI	0 0	20	CALI	20	BHVT	AHVT
	inches				inches			inches			
0	Gamma API	150		20	Bit Size	0 0	20	Bit Size	20		
	api										
	SHALE				MUDCAKE			MUDCAKE			

HALLIBURTON

Plot Time: 14-Sep-17 13:46:25

Plot Range: 1091.5 ft to 4390 ft

Data: RITCHIE_SEYMOUR\Well Based\MAIN

Plot File: \\LOCAL\RITCHIE_SEYMOUR\0001 GTET-DSNT-SDLT-BSAT-ACRT\PORO_ML\AHV Plot_INSITE_IQ

ANNULAR HOLE VOLUME PLOT

COMPANY	RITCHIE EXPLORATION INC		
WELL	SEYMOUR-MORRILL 1		
FIELD	EDDY NORTHWEST		
COUNTY	PAWNEE	STATE	KANSAS
HALLIBURTON		DUAL SPACED NEUTRON SPECTRAL DENSITY MICRO LOG	