

HALLIBURTON

SPECTRAL DENSITY DUAL SPACED NEUTRON ARRAY COMPENSATED TRUE RESISTIVITY

COMPANY	NOBLE ENERGY
WELL	THOMPSON D20-31D
FIELD	WATTENBERG
COUNTY	WELD
STATE	CO
COMPANY	NOBLE ENERGY
WELL	THOMPSON D20-31D
FIELD	WATTENBERG
COUNTY	WELD
STATE	CO
API No.	05123313070000
Location	SURFACE HOLE LOCATION: 251' FSL & 269' FWL BOTTOM HOLE LOCATION: BHL: 1450' FEL & 150' FEL
Other Services:	RWCH CSNG BSAT
Secl.	17
Twp.	3N
Rge.	64W
Elev.	4763.0 ft
Elev. K.B.	4778.0 ft
D.F.	4777.0 ft
G.L.	4763.0 ft

Permanent Datum	GL	Elev. 4763.0 ft
Log measured from	KB	15.0 ft above perm. Datum
Drilling measured from	KB	G.L. 4763.0 ft

Date	11-Oct-10
Run No.	ONE
Depth - Driller	8025.00 ft
Depth - Logger	8020.0 ft
Bottom - Logged Interval	8018.0 ft
Top - Logged Interval	645.0 ft
Casing - Driller	8.625 in @ 645.0 ft
Casing - Logger	645.0 ft @ 645.0 ft
Bit Size	7.875 in @
Type Fluid in Hole	W/BM @
Density	9.3 ppg 51.00 spgr
PH	8.00 pH 12.0 cp/m
Source of Sample	MUD TANK
Rm @ Meas. Temperature	2.150 ohmm @ 60.70 degF @
Rmf @ Meas. Temperature	2.02 ohmm @ 61.30 degF @
Rmc @ Meas. Temperature	2.680 ohmm @ 68.20 degF @
Source Rmf	MEAS Rmc MEAS
Rm @ BHT	0.72 ohmm @ 196.0 degF @
Time Since Circulation	8.1 hr
Time on Bottom	11-Oct-10 05:37
Max. Rec. Temperature	196.0 degF @ 8020.0 ft @
Equipment	11170614 ROCK SPRING
Recorded By	D. CULVER
Witnessed By	B. HANSEN
	V. CREWS

Fold here

Service Ticket No.: 7678857 API Serial No.: 05123313070000 PGM Version: WL INSITE R3.0.7 (Build 3)

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.
Rmf @ Meas. Temp.	@	@		ONE	ACRT-	N/A	1.5" S.O.
Rmc @ Meas. Temp.	@	@			E104_S103		
Source Rmf	Rmc						
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.	11238317	Serial No.	10938796	Serial No.	11014271	Serial No.	11020488
Model No.	GTET	Model No.	BSAT	Model No.	SDLT-I	Model No.	DSNT-I
Diameter	3.625"	No. of Cent.	1	Diameter	4.5"	Diameter	3.625"
Detector Model No.	102-A	Spacing	0.5'	Log Type	GAM-GAM	Log Type	THERM-THERM
Type	SCINT			Source Type	Cs137	Source Type	Am241Be
Length	8"	LSA [Y/N]	N	Serial No.	5235GW	Serial No.	08-018
Distance to Source	18'	FWDA [Y/N]	N	Strength	1.5 Ci	Strength	15 Ci

LOGGING DATA

GENERAL GAMMA ACOUSTIC DENSITY NEUTRON

Run No.	Depth		Speed	Scale		Scale		Matrix	Scale		Matrix	Scale		Matrix
	From	To	ft/min	L	R	L	R		L	R		L	R	
	ONE	7024'	645'	REC	0	250	30%		-10%	55.5 usec/ft		20%	0%	
ONE	7295'	7024'	REC	0	250	30%	-10%	47.6 usec/ft	20%	0%	2.71 g/cc	20%	0%	LIME
ONE	7761'	7295'	REC	0	250	30%	-10%	55.5 usec/ft	20%	0%	2.68 g/cc	20%	0%	SAND
ONE	8020'	7761'	REC	0	250	30%	-10%	55.5 usec/ft	20%	0%	2.65 g/cc	20%	0%	SAND

DIRECTIONAL INFORMATION

Maximum Deviation @ KOP @

Remarks: RWCH-GTET-CSNG-DSNT-SDLT-FLEX-BSAT-ACRT RAN IN COMBINATION

ANNULAR HOLE VOLUME CALCULATED FOR 4.5 INCH PRODUCTION CASING

BOREHOLE RUGOSITY, TENSION PULLS AND WASHOUTS MAY EFFECT TOOL RESPONSE

LATITUDE: 40.21875

LONGITUDE: -104.58347

TODAY'S CREW: C. RINESS, K. TUELLER & A. SALDIVAR

RIG: ENSIGN 136

*** THANK YOU FOR CHOOSING HALLIBURTON ENERGY SERVICES, ROCK SPRINGS, WY (307) 352-8600 ***

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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PARAMETERS REPORT

Depth (ft)	Tool Name	Mnemonic	Description	Value	Units
TOP					
	DSNT	NLIT	Neutron Lithology	Sandstone	
	SDLT	DMA	Formation Density Matrix	2.680	g/cc
	BSAT	DTMT	Delta -T Matrix Type	Sandstone 55.5	
7024.00					
	DSNT	NLIT	Neutron Lithology	Limestone	
	SDLT	DMA	Formation Density Matrix	2.710	g/cc
	BSAT	DTMT	Delta -T Matrix Type	User define	
	BSAT	DTMA	Delta -T Matrix	47.60	uspf
7295.00					
	SDLT	DMA	Formation Density Matrix	2.680	g/cc
7761.00					
	SHARED	BS	Bit Size	7.875	in
	SHARED	UBS	Use Bit Size instead of Caliper for all applications.	No	
	SHARED	MDWT	Borehole Fluid Weight	9.300	ppg
	SHARED	OBM	Oil Based Mud System?	No	
	SHARED	RMUD	Mud Resistivity	2.150	ohmm
	SHARED	TRM	Temperature of Mud	60.2	degF
	SHARED	CSD	Logging Interval is Cased?	No	
	SHARED	ICOD	AHV Casing OD	4.500	in
	SHARED	ST	Surface Temperature	65.0	degF
	SHARED	TD	Total Well Depth	8020.00	ft
	SHARED	BHT	Bottom Hole Temperature	196.0	degF
	SHARED	SVTM	Navigation and Survey Master Tool	NONE	

SHARED	SVHM	Navigation and Survey Master Tool	NONE	
SHARED	AZTM	High Res Z Accelerometer Master Tool	GTET	
SHARED	TEMM	Temperature Master Tool	NONE	
SHARED	BHSM	Borehole Size Master Tool	NONE	
Rwa / CrossPlot	XPOK	Process Crossplot?	Yes	
Rwa / CrossPlot	FCHO	Select Source of F	Automatic	
Rwa / CrossPlot	AFAC	Archie A factor	0.6200	
Rwa / CrossPlot	MFAC	Archie M factor	2.1500	
Rwa / CrossPlot	RMFR	Rmf Reference	0.10	ohmm
Rwa / CrossPlot	TMFR	Rmf Ref Temp	75.00	degF
Rwa / CrossPlot	RWA	Resistivity of Formation Water	0.05	ohmm
Rwa / CrossPlot	ADP	Use Air Porosity to calculate CrossplotPhi	No	
GTET	GROK	Process Gamma Ray?	Yes	
GTET	GRSO	Gamma Tool Standoff	0.000	in
GTET	GEOK	Process Gamma Ray EVR?	No	
GTET	POTA	Potassium	0.00	%
GTET	MDTP	Mud Type	Natural	
GTET	TPOS	Tool Position	Standoff	
CSNG	CGOK	Process CSNG Data?	Yes	
CSNG	CENT	Is Tool Centralized?	No	
CSNG	MUDT	Mud Type?	Natural	
CSNG	KPCT	Percent K in Mud by Weight?	0.00	%
CSNG	GBOK	Gamma Enviromental Corrections?	Yes	
CSNG	BARF	Barite Correction Factor	1.00	
DSNT	DNOK	Process DSN?	Yes	
DSNT	DEOK	Process DSN EVR?	No	
DSNT	NLIT	Neutron Lithology	Sandstone	
DSNT	DNNO	DSN Standoff - 0.25 in (6.35 mm) Recommended	0.250	in
DSNT	DNTP	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	
SDLT	DNOK	Process Density?	Yes	
SDLT	DNOK	Process Density EVR?	No	
SDLT	AD	Is Hole Air Drilled?	No	
SDLT	CB	Logging Calibration Blocks?	No	
SDLT	SPVT	SDLT Pad Temperature Valid?	Yes	
SDLT	DTWN	Disable temperature warning	No	
SDLT	MDTP	Weighted Mud Correction Type?	None	
SDLT	DMA	Formation Density Matrix	2.650	g/cc
SDLT	DFL	Formation Density Fluid	1.000	g/cc
SDLT	CLOK	Process Caliper Outputs?	Yes	
SDLT	MLOK	Process MicroLog Outputs?	Yes	
BSAT	MBOK	Compute BCAS Results?	Yes	
BSAT	FLLO	Semblance Filter Low Pass Value?	5000	Hz
BSAT	FLHI	Semblance Filter High Pass Value?	27000	Hz
BSAT	DTFL	Delta -T Fluid	189.00	uspf
BSAT	DTMT	Delta -T Matrix Type	Sandstone 55.5	
BSAT	DTSH	Delta -T Shale	100.00	uspf
BSAT	SPEQ	Acoustic Porosity Equation	Wylie	
ACRt	RTOK	Process ACRt?	Yes	

ACRt	MNSO	Minimum Tool Standoff	1.50	in
ACRt	TCS1	Temperature Correction Source	FP Lwr & FP Up	
ACRt	TPOS	Tool Position	Free Hanging	
ACRt	RMOP	Rmud Source	Mud Cell	
ACRt	RMIN	Minimum Resistivity for MAP	0.20	ohmm
ACRt	RMIN	Maximum Resistivity for MAP	200.00	ohmm
ACRt	THQY	Threshold Quality	0.50	

BOTTOM

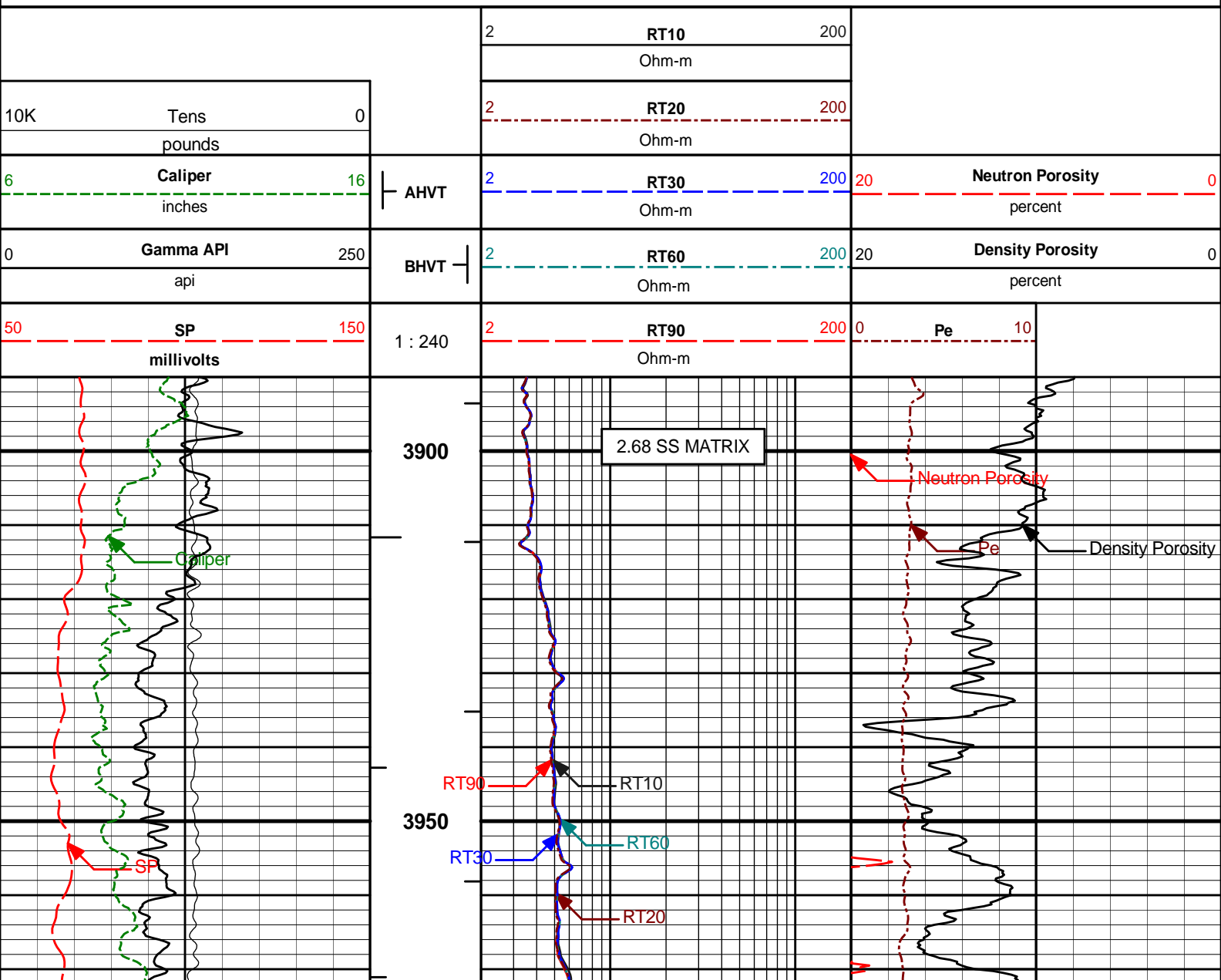
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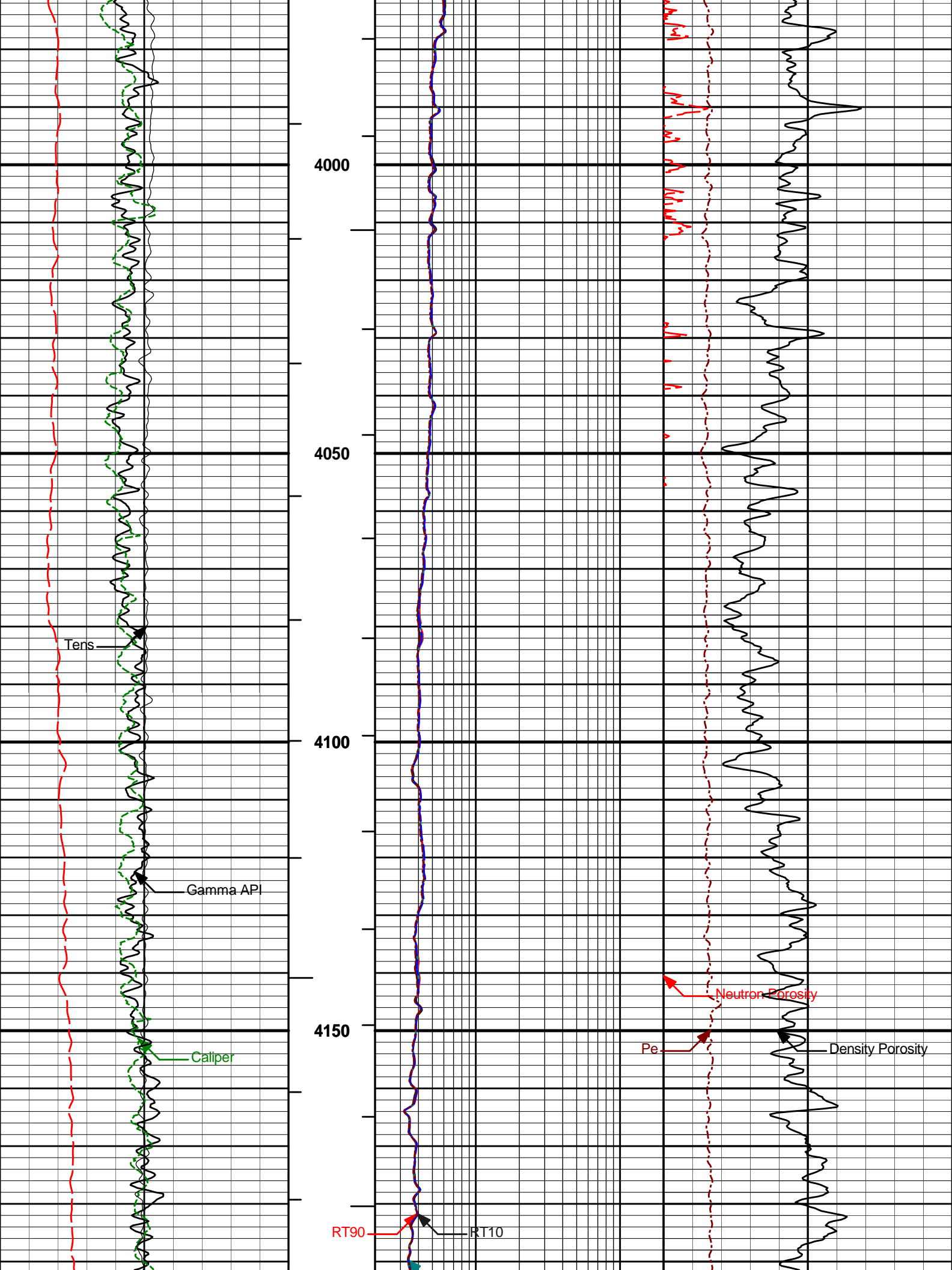
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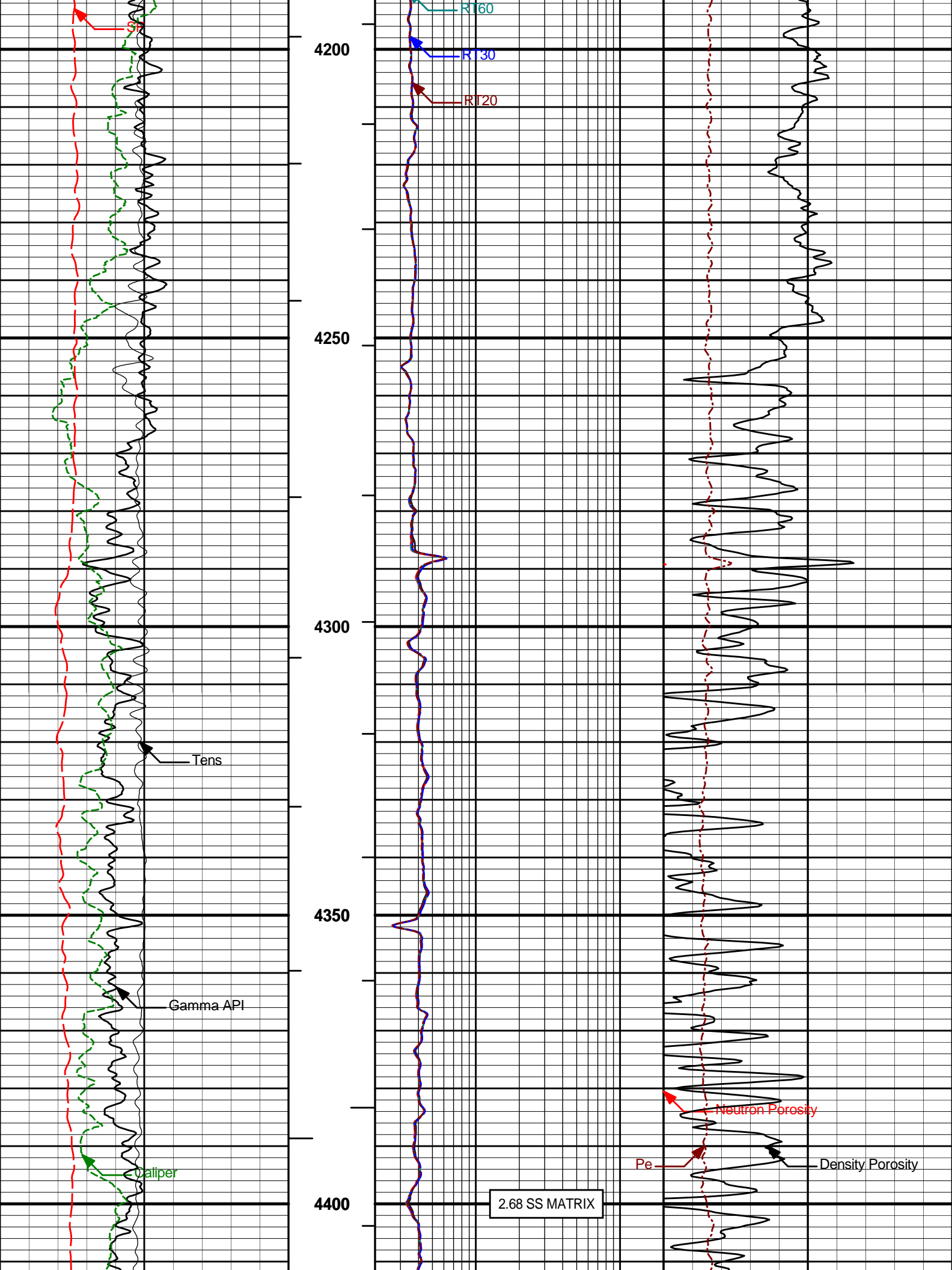
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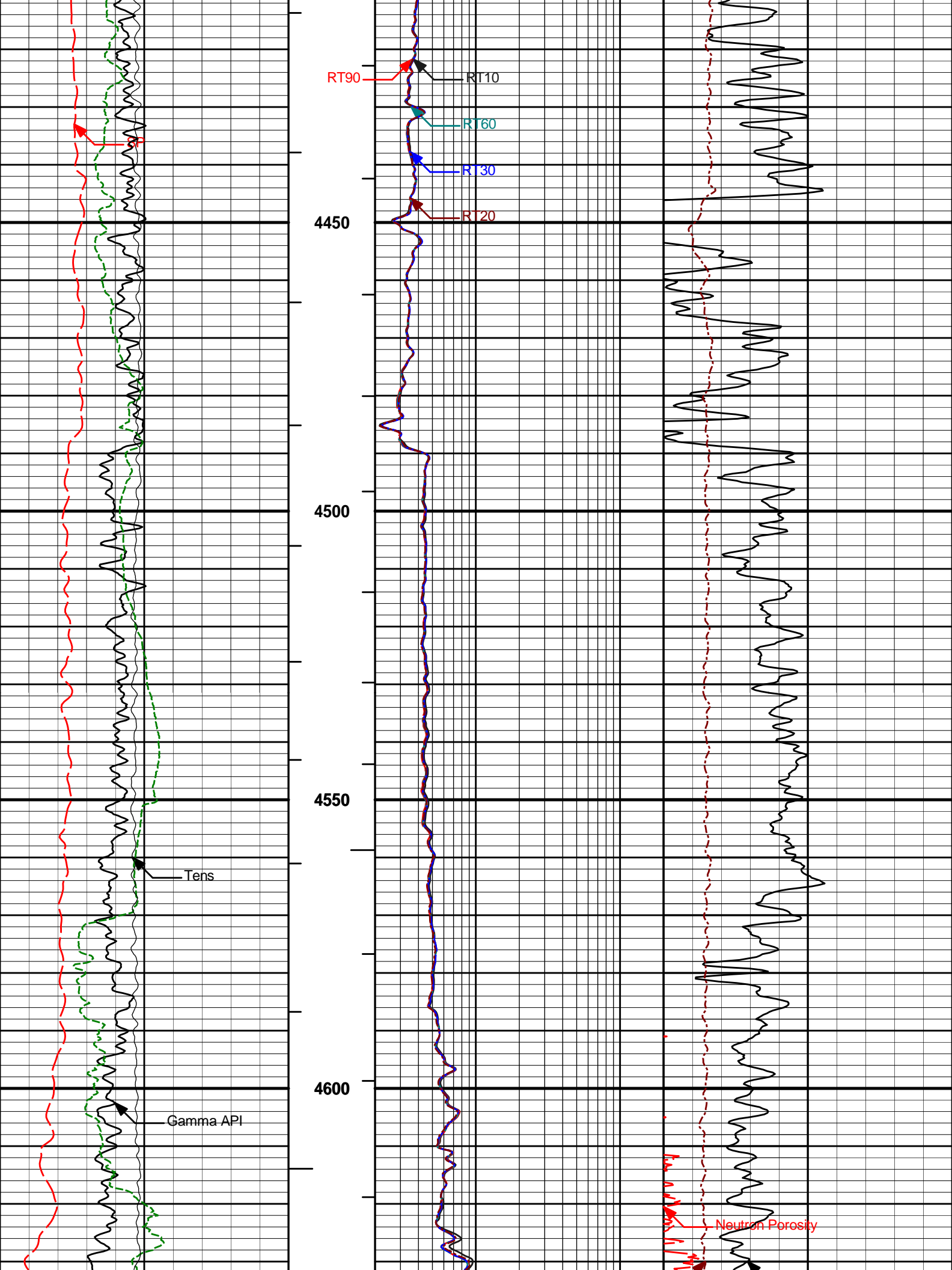
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 Plot Range: 3890 ft to 5290 ft
 Data: THOMPSON_D20_31\Well Based**
 Plot File: \COMP\NOBLE_PARK_SUS

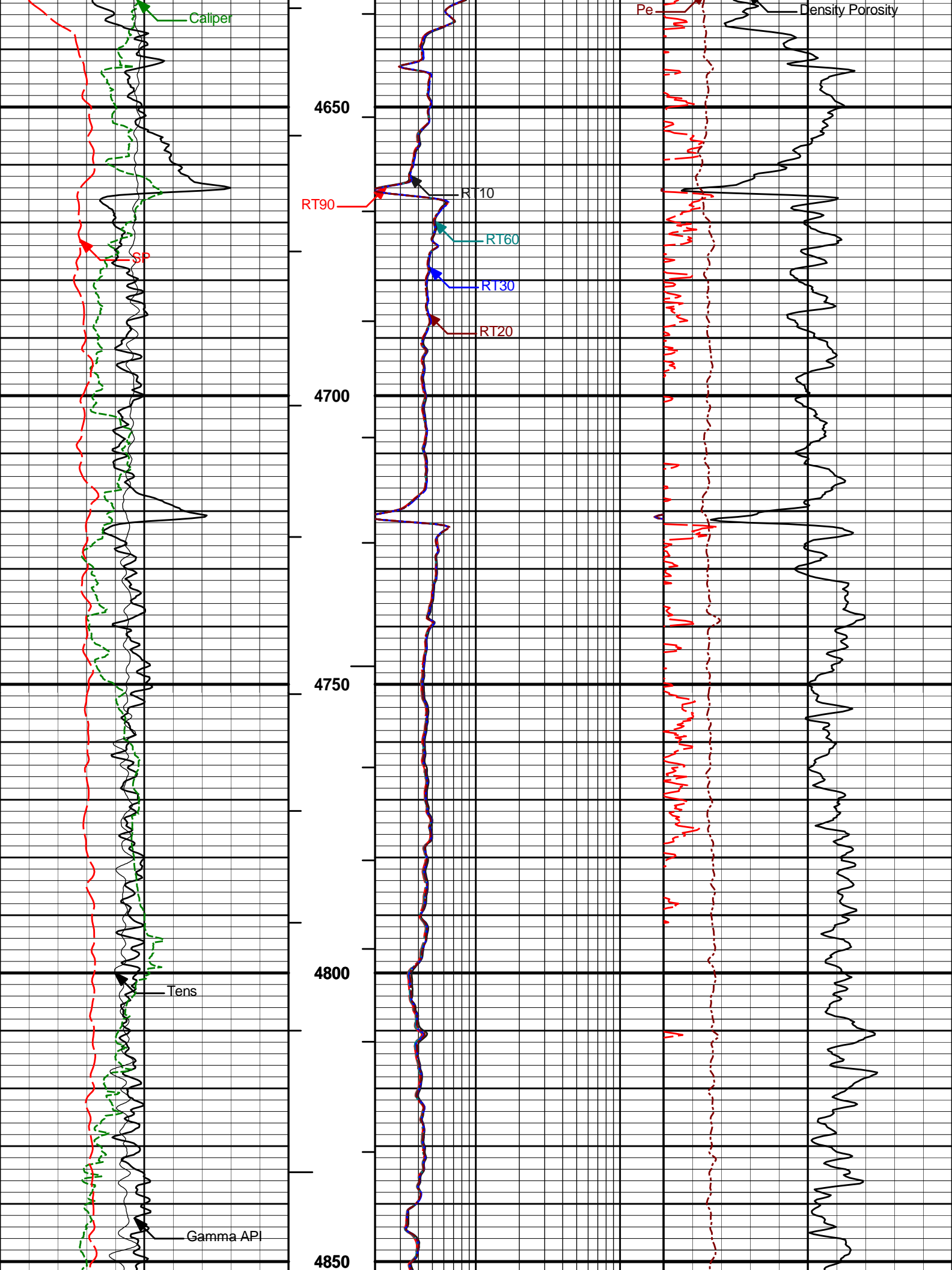
MAIN PASS 5" = 100'

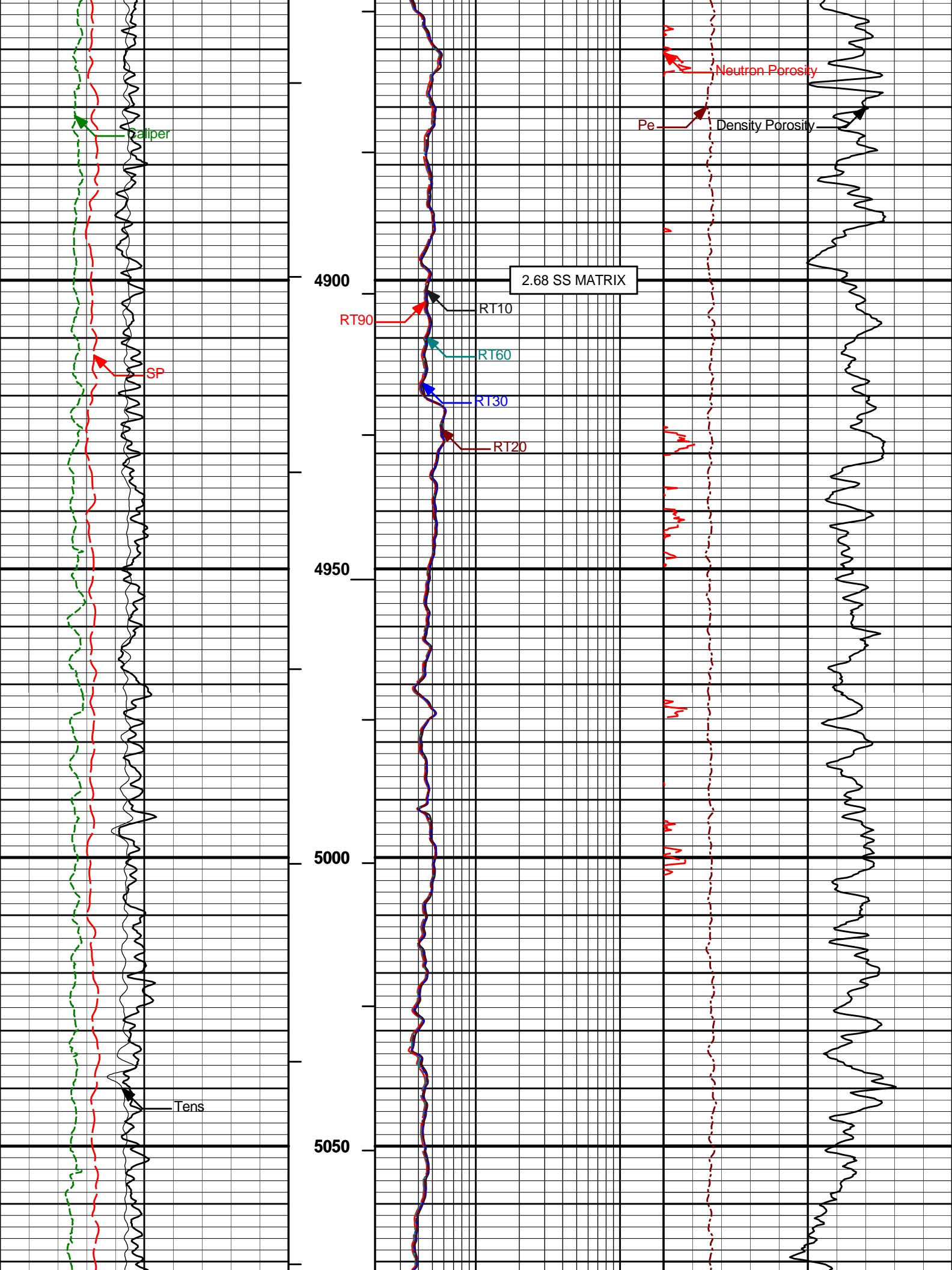


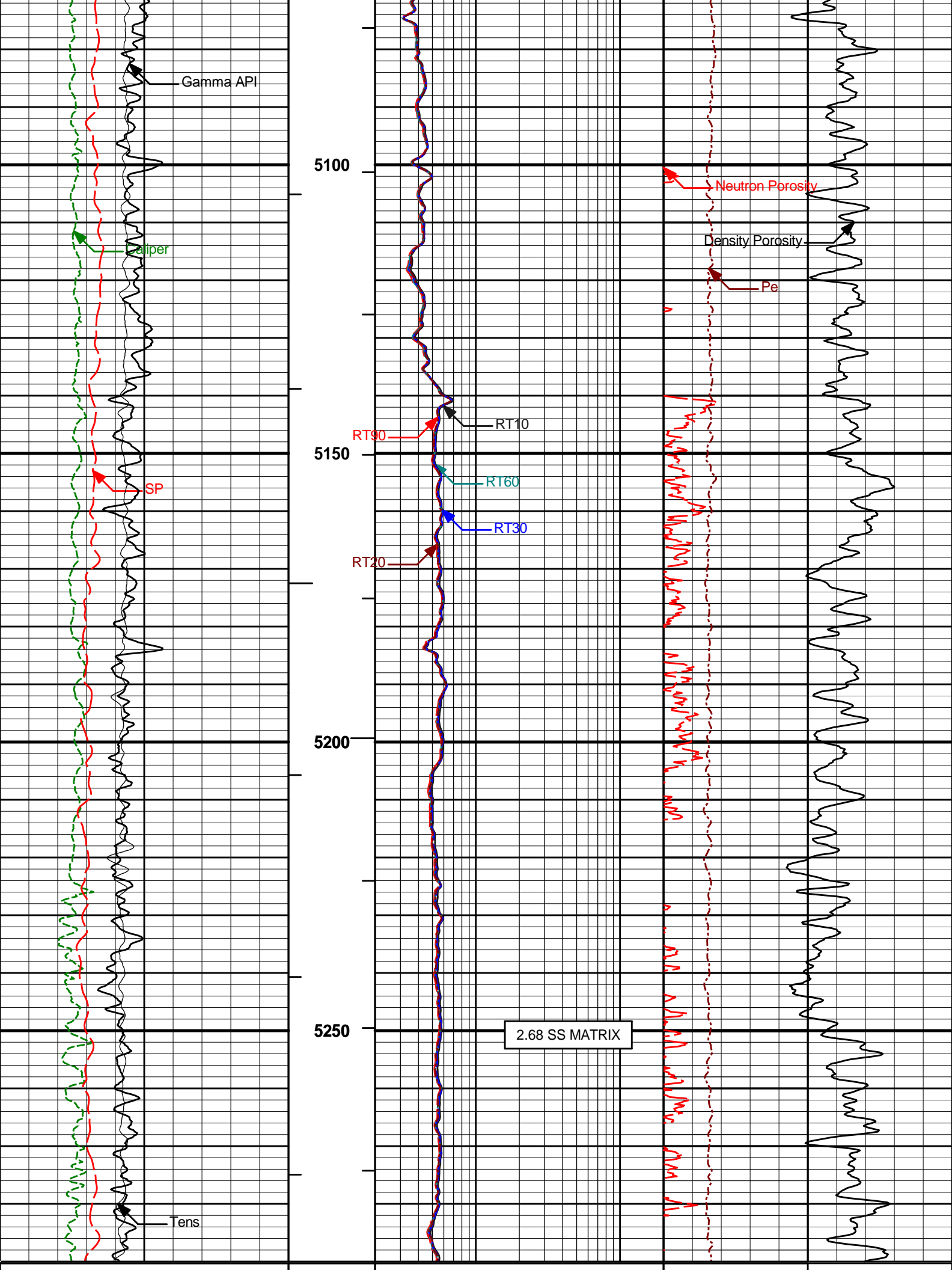












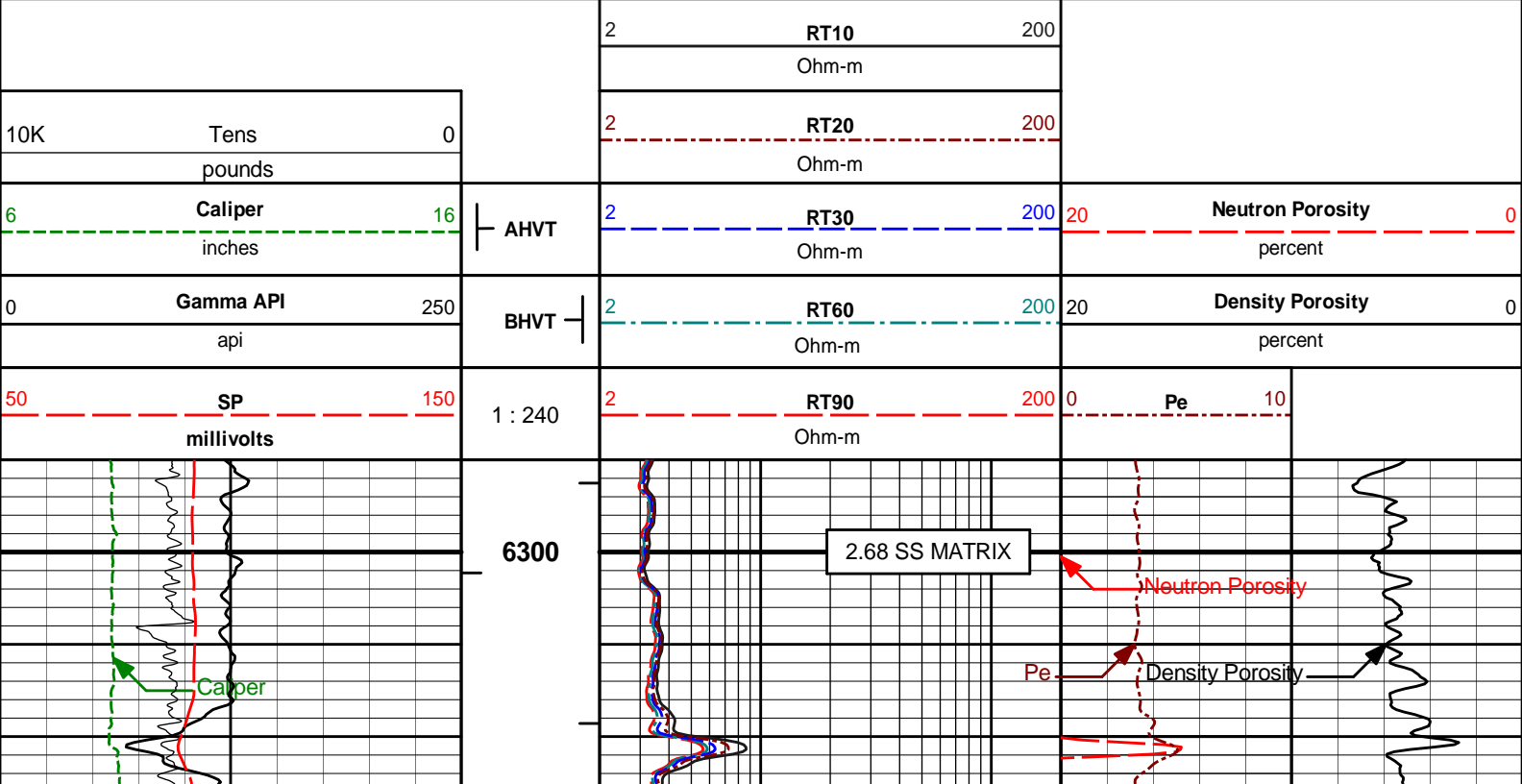
50	SP	150	1 : 240	2	RT90	200	0	Pe	10
	millivolts				Ohm-m				
0	Gamma API	250	BHVT	2	RT60	200	20	Density Porosity	0
	api				Ohm-m			percent	
6	Caliper	16	AHVT	2	RT30	200	20	Neutron Porosity	0
	inches				Ohm-m			percent	
10K	Tens	0		2	RT20	200			
	pounds				Ohm-m				
				2	RT10	200			
					Ohm-m				

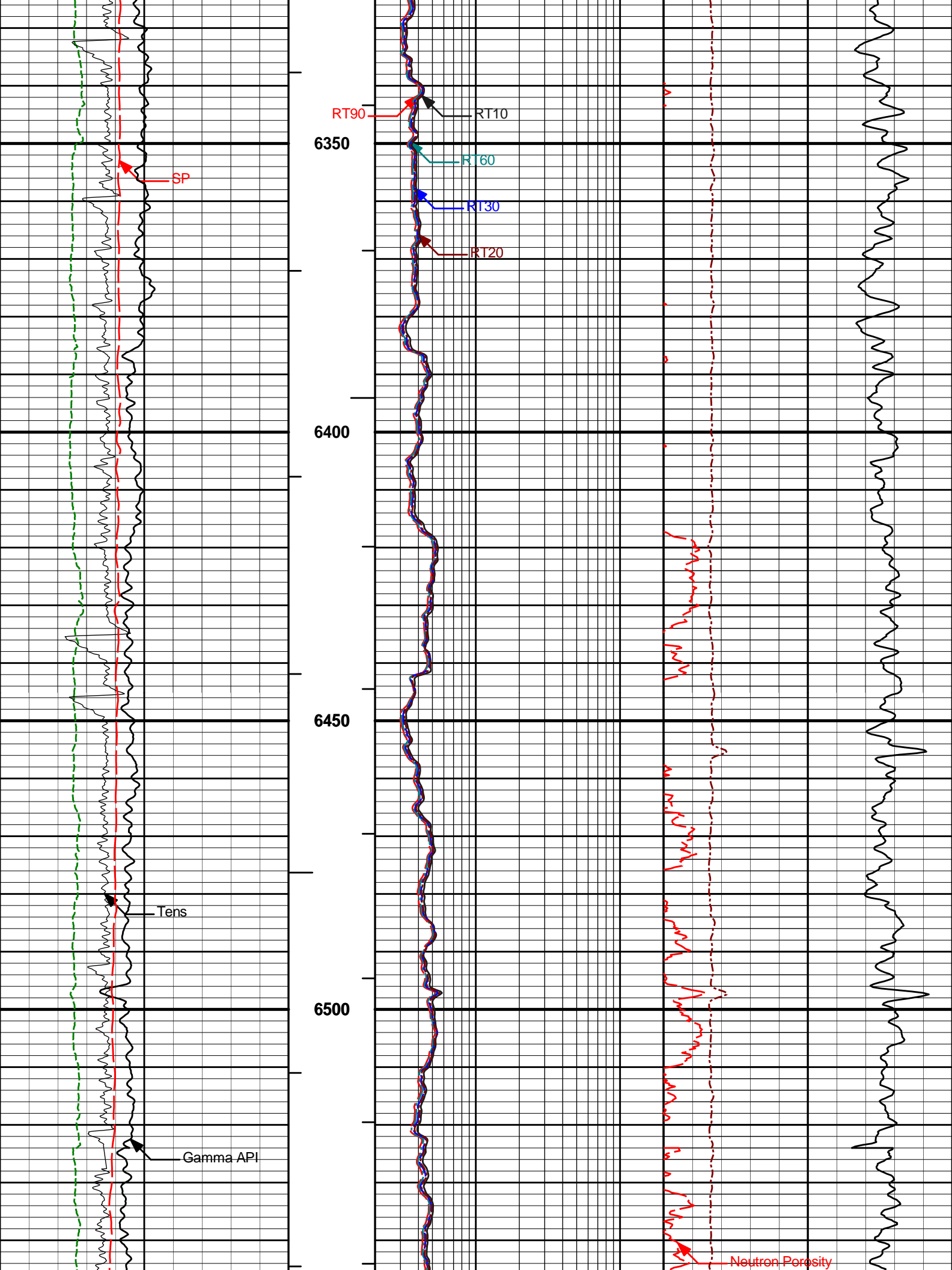
HALLIBURTON Plot Time: 11-Oct-10 10:55:58
 Plot Range: 3890 ft to 5290 ft
 Data: THOMPSON_D20_31\Well Based\1*
 Plot File: \COMP\NOBLE_PARK_SUS

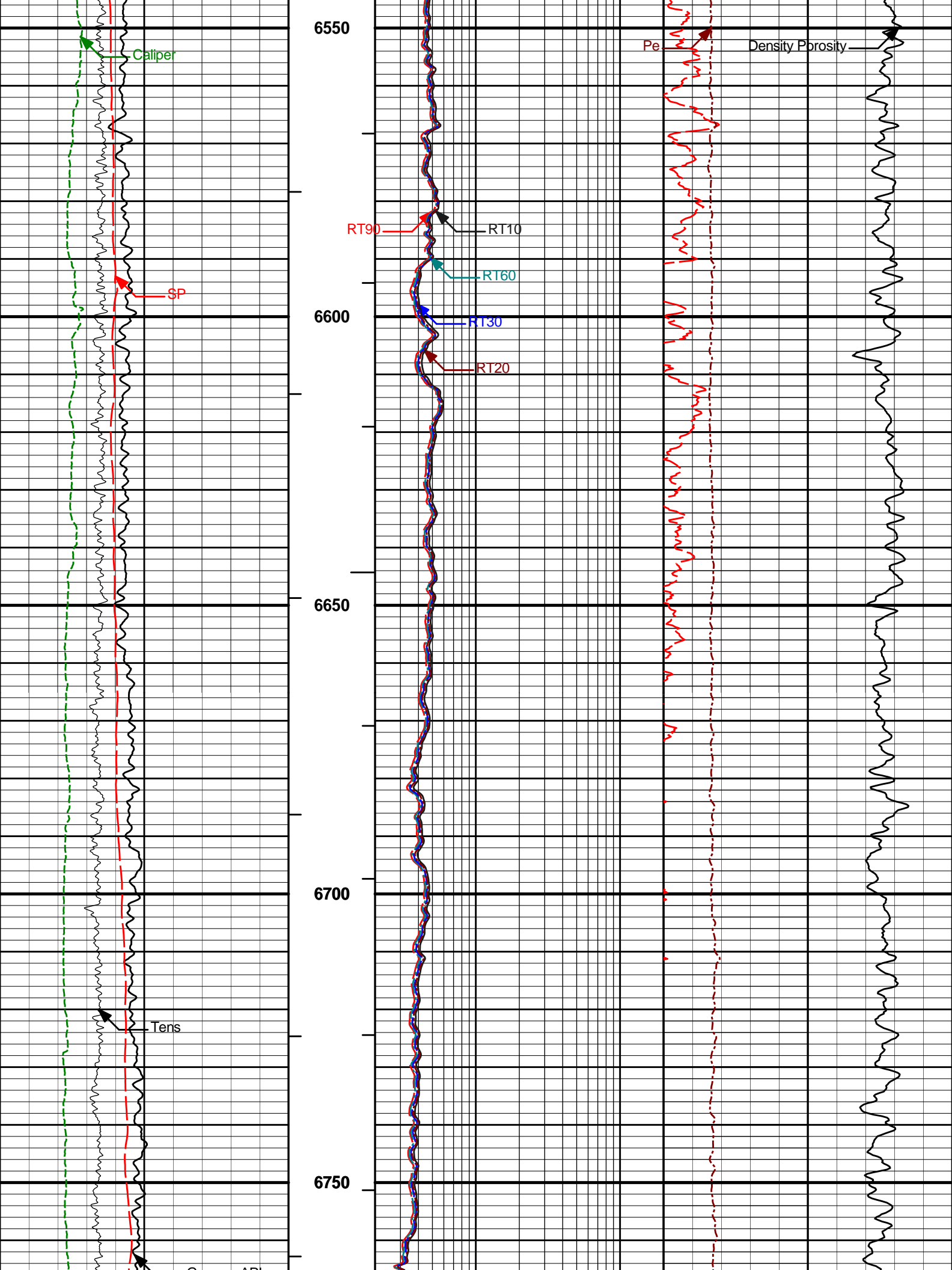
MAIN PASS 5" = 100'

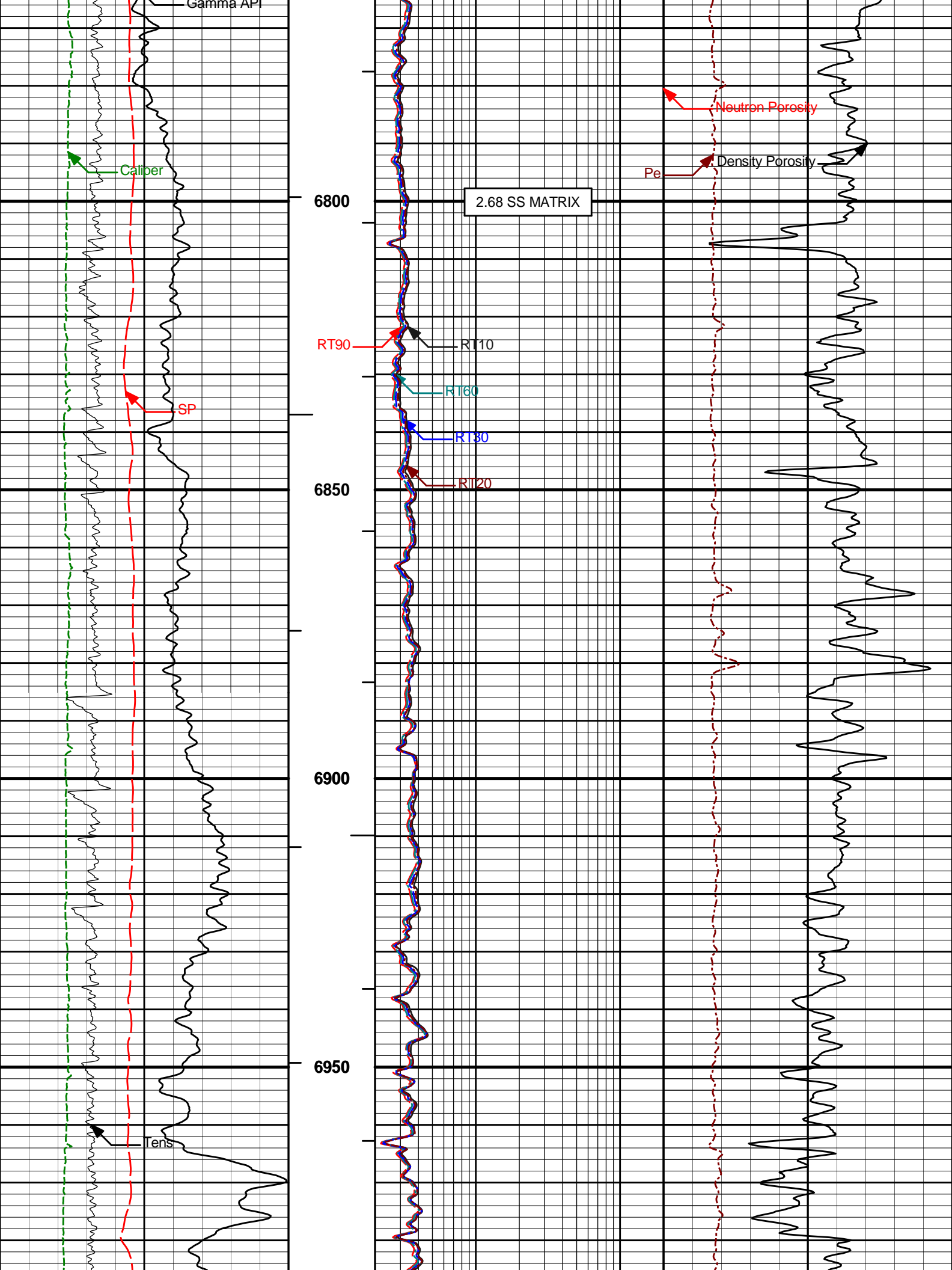
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 Plot Range: 6290 ft to 8035.92 ft
 Data: THOMPSON_D20_31\Well Based\1*
 Plot File: \COMP\NOBLE_NIO_COD

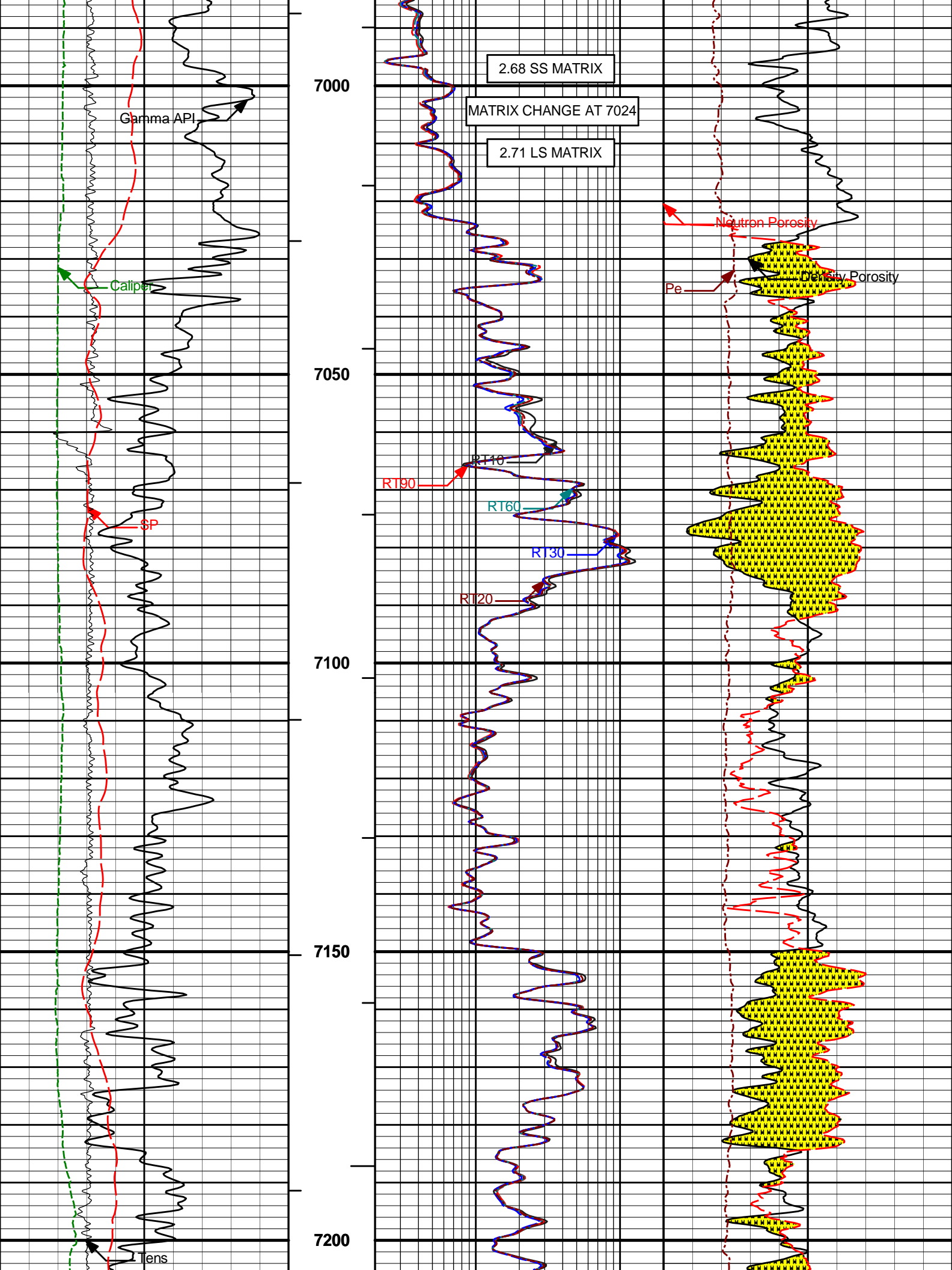
MAIN PASS 5" = 100'

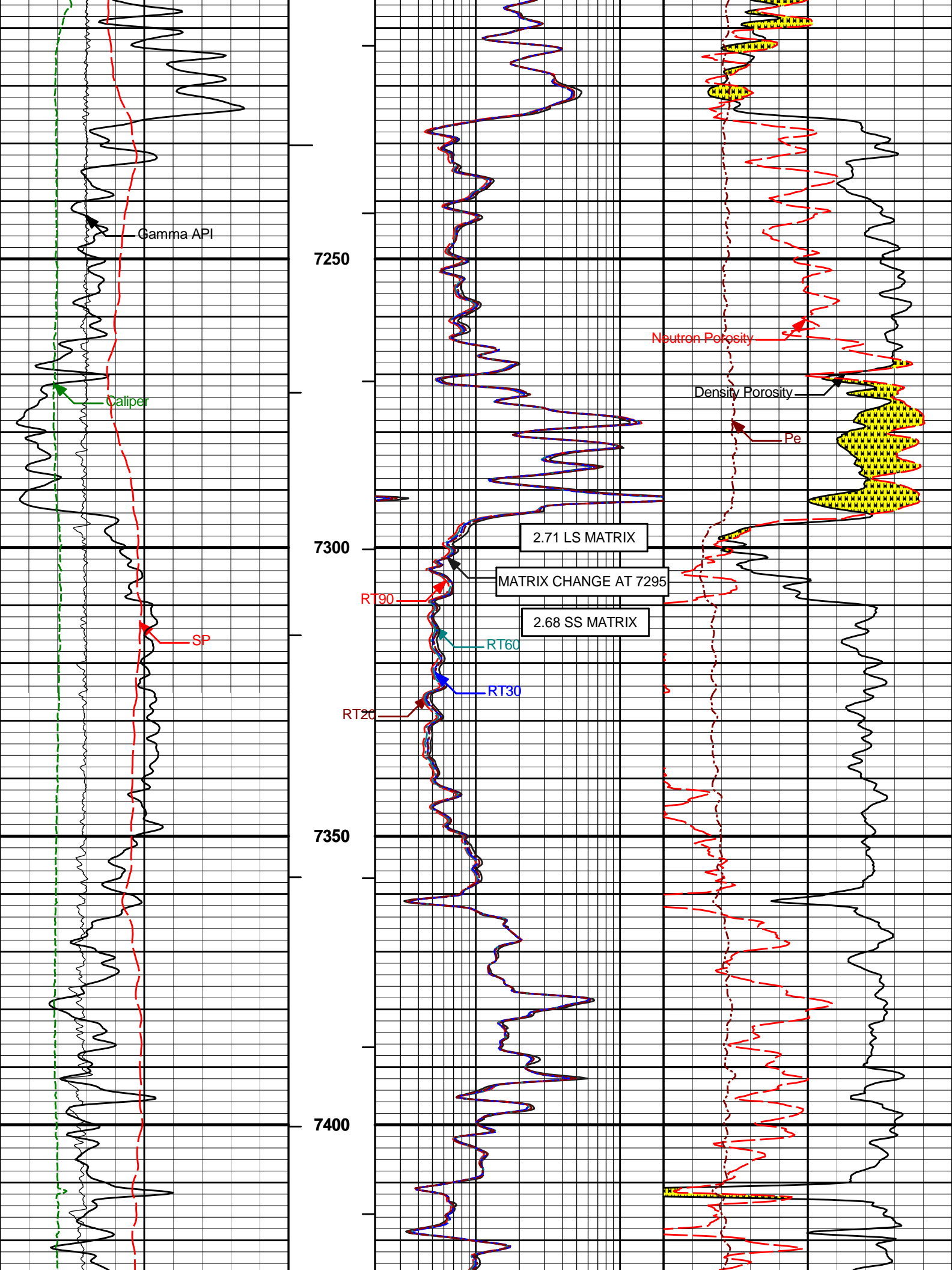


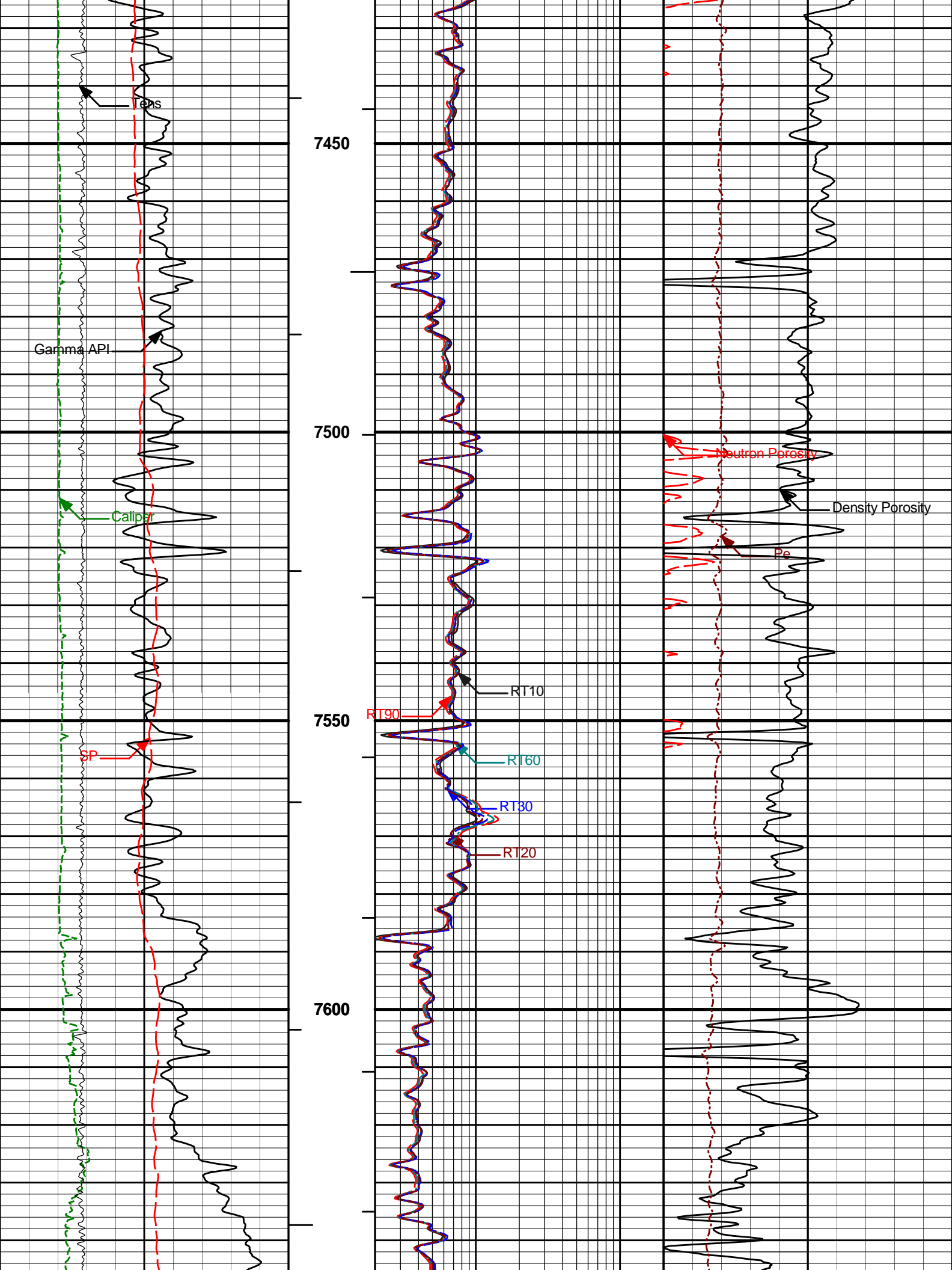


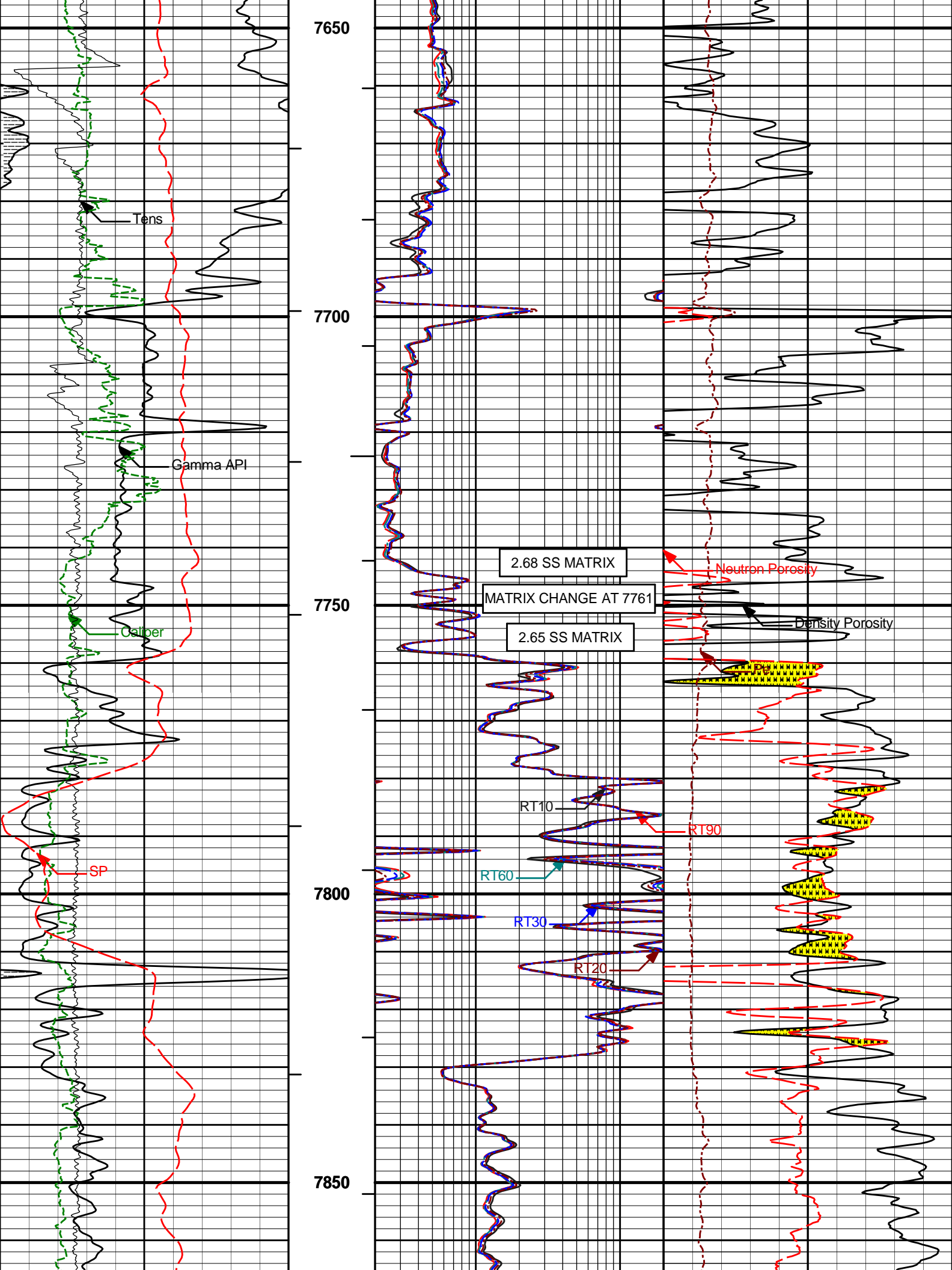


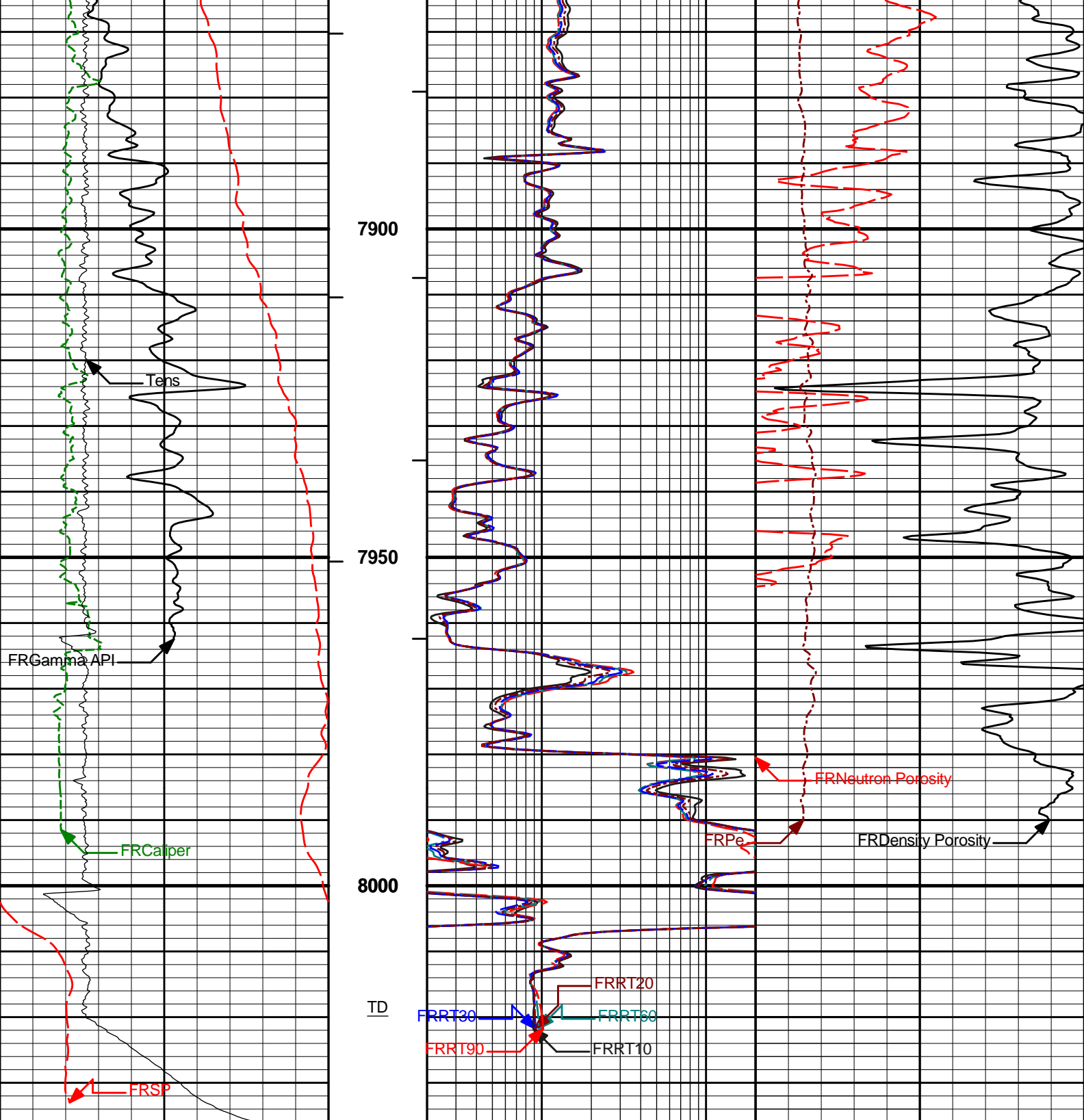












50	SP	150	1 : 240	2	RT90	200	0	Pe	10
	millivolts				Ohm-m				
0	Gamma API	250	BHVT	2	RT60	200	20	Density Porosity	0
	api				Ohm-m			percent	
6	Caliper	16	AHVT	2	RT30	200	20	Neutron Porosity	0
	inches				Ohm-m			percent	
10K	Tens	0		2	RT20	200			
	pounds				Ohm-m				
				2	RT10	200			
					Ohm-m				

MAIN PASS 5" = 100'

CALIBRATION REPORT**NATURAL GAMMA RAY TOOL SHOP CALIBRATION****Tool Name:** GTET - 11238317**Reference Calibration Date:** 19-Aug-10 18:41:08**Engineer:** D. CULVER**Calibration Date:** 15-Sep-10 14:46:35**Software Version:** WL INSITE R3.0.7 (Build 3)**Calibration Version:** 1

Calibrator Source S/N: TB-270

Calibrator API Reference:259.00 api

Measurement	Measured	Calibrated	Units
Background	46.9	47.8	api
Background + Calibrator	305.4	311.4	api
Calibrator	264.5	263.5	api

NATURAL GAMMA RAY TOOL FIELD CALIBRATION**Tool Name:** GTET - 11238317**Reference Calibration Date:** 15-Sep-10 14:46:35**Engineer:** D. CULVER**Calibration Date:** 11-Oct-10 03:00:26**Software Version:** WL INSITE R3.0.7 (Build 3)**Calibration Version:** 1

Calibrator Source S/N: TB-270

Calibrator API Reference:259.00 api

Field Verification	Shop	Field	Units
Background	47.8	41.6	api
Background + Calibrator	311.4	311.2	api
Calibrator	263.5	269.7	api

Shop	Field	Difference	Tolerance
263.5	269.7	-6.2	+/- 9.00

CSNG-FS SHOP CALIBRATION**Tool Name:** CSNG - 10965402**Reference Calibration Date:** 09-Oct-10 05:38:55**Engineer:** D. CULVER**Calibration Date:** 09-Oct-10 06:00:20**Software Version:** WL INSITE R3.0.7 (Build 3)**Calibration Version:** 1**Source SN:** TB-270

TITANIUM CASE	Measured	Calibrated	Units
60 KEV Peak Channel #	48.0	48.0	Channel #
239 KEV Peak Channel #	23.0	23.0	Channel #
583 KEV Peak Channel #	51.5	51.3	Channel #
2614 KEV Peak Channel #	211.0	211.0	Channel #
Calibrate Temperature	89.9	94.6	degF

Snow Block S/N: 11170614
 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:	0.959	0.961	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):	0.2104	0.2108	0.0004	+/- 0.0020
Calibrated Ratio:	9.71	9.72	0.012	+/- 0.050

VERIFIER		
Measurement	Value	Control Limit
Snow-Block Porosity (decp):	0.0697	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 - 11020488	Reference Calibration Date:	15-Sep-10 14:40:03
Engineer:	D. CULVER	Calibration Date:	11-Oct-10 03:02:03
Software Version:	WL INSITE R3.0.7 (Build 3)	Calibration Version:	1

Logging Source S/N: 08-018
 Snow Block S/N: 11170614

NEUTRON FIELD-CHECK SUMMARY				
	Shop	Field	Difference	Control Limit On Change
Snow-Block Porosity (decp):	0.0697	0.0727	0.0031	+/- 0.0150

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

SPECTRAL DENSITY SHOP CALIBRATION			
Tool Name:	SDLT - 11014271	Reference Calibration Date:	19-Aug-10 16:03:03
Engineer:	D. CULVER	Calibration Date:	16-Sep-10 15:48:30
Software Version:	WL INSITE R3.0.7 (Build 3)	Calibration Version:	1

Logging Source S/N: 5235GW
 Aluminum Block S/N: 63069
 Magnesium Block S/N: 63376

Density: 2.588g/cc Pe: 3.160
 Density: 1.687g/cc Pe: 2.594

DENSITY CALIBRATION SUMMARY			
Measurement	Previous Value	New Value	Control Limit
Near Bar Gain	1.0154	1.0246	0.90 - 1.10
Near Dens Gain	0.9843	0.9910	0.90 - 1.10
Near Peak Gain	0.9823	0.9842	0.90 - 1.10

Near Lith Gain	0.9618	0.9605	0.90 - 1.10
Far Bar Gain	1.0060	1.0035	0.90 - 1.10
Far Dens Gain	0.9938	0.9912	0.90 - 1.10
Far Peak Gain	0.9864	0.9880	0.90 - 1.10
Far Lith Gain	0.9683	0.9719	0.90 - 1.10
<hr/>			
Near Bar Offset	-0.1328	-0.2167	NONE
Near Dens Offset	0.1641	0.1090	NONE
Near Peak Offset	0.1598	0.1528	NONE
Near Lith Offset	0.2986	0.3213	NONE
Far Bar Offset	-0.1328	-0.1090	NONE
Far Dens Offset	-0.0238	0.0017	NONE
Far Peak Offset	0.0357	0.0228	NONE
Far Lith Offset	0.1286	0.1005	NONE
<hr/>			
Near Bar Background	947.83	944.74	700 - 1450
Near Dens Background	313.64	312.43	230 - 480
Near Peak Background	136.57	137.80	100 - 210
Near Lith Background	165.23	164.78	125 - 260
Far Bar Background	536.17	535.02	450 - 900
Far Dens Background	213.86	212.22	175 - 345
Far Peak Background	82.11	80.69	70 - 140
Far Lith Background	86.78	86.97	75 - 145

CALIBRATION BLOCK SUMMARY				
Measurement	Current Reading (Previous Coef)	Calibrated (New Coef)	Change	Control Limit On Change
MAGNESIUM				
Density (g/cc)	1.682	1.687	0.005	+/- 0.015
Pe	2.659	2.593	-0.066	+/- 0.150
ALUMINUM				
Density (g/cc)	2.584	2.588	0.004	+/- 0.01500
Pe	3.234	3.159	-0.075	+/- 0.150

TOOL SUMMARY				
Measurement	Near Detector		Far Detector	
	Value	Control Limits	Value	Control Limits
QUALITY				
Background	-0.0010	+/- 0.0110	-0.0018	+/- 0.0140
Magnesium Block	-0.0006	+/- 0.0110	-0.0011	+/- 0.0140
Aluminum Block	0.0000	+/- 0.0110	-0.0006	+/- 0.0140
Resolution	9.03	6.00 - 11.50	9.75	6.00 - 11.50
Internal Verifier(B+D+P+L)	1560	1200 - 2700	915	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 - 11014271

Reference Calibration Date: 16-Sep-10 15:48:30

Engineer: D. CULVER

Calibration Date: 11-Oct-10 03:05:35

Software Version: WL INSITE R3.0.7 (Build 3)

Calibration Version: 1

Pad Temperature: 73.4 degF

DENSITY FIELD CALIBRATION SUMMARY

Measurement	Shop	Field	Change	Control Limit +/-
Near (B+D+P+L) cps	1559.748	1568.844	9.096	15.894
Far (B+D+P+L) cps	914.904	919.126	4.222	16.407
Near Resolution	9.03	8.97	-0.060	0.50
Far Resolution	9.75	9.74	-0.010	1.00

PASS/FAIL SUMMARY

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

DENSITY CALIPER SHOP CALIBRATION

Tool Name: SDLT - 11014271

Reference Calibration Date: 19-Aug-10 16:20:25

Engineer: D. CULVER

Calibration Date: 16-Sep-10 13:50:40

Software Version: WL INSITE R3.0.7 (Build 3)

Calibration Version: 1

CALIBRATION COEFFICIENTS

Measurement	Previous Value	New Value	Control Limit On New Value
Pad Offset	-1538.17	-1764.22	-7000.00 - -1000.00
Pad Gain	0.0003774	0.0003849	0.000200 - 0.000600
Arm Offset	-2091.15	-2286.95	-5000.00 - 3000.00
Arm Gain	0.0005547	0.0005590	0.000300 - 0.000700
Arm Power	-0.000004546	-0.000004658	-0.000010 - 0.000010

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)	2.05	2.00	-0.05	+/- 0.20
Medium Ring (in)	3.76	3.75	-0.01	+/- 0.20
RING DIAMETER:				
Small Ring (in)	6.68	6.50	-0.18	+/- 0.20
Medium Ring (in)	8.41	8.25	-0.16	+/- 0.20
Large Ring (in)	15.12	15.00	-0.12	+/- 0.20

PASS/FAIL SUMMARY

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

PASS/FAIL SUMMARY

Calibration-Coefficients Range Check:	Passed
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SDLT CALIPER FIELD CALIBRATION

Tool Name: SDLT - 11014271

Reference Calibration Date: 16-Sep-10 13:50:40

Engineer: D. CULVER

Calibration Date: 11-Oct-10 03:06:15

MEASURED CALIPER VALUES

Measurement	Shop	Field	Change	Control Limit On New Value
Pad Extension	3.75	3.67	-0.08	+/- 0.10
Ring Diameter	8.25	8.25	0.00	+/- 0.15

PASS/FAIL SUMMARY

Pad Extension Check:	Passed
Diameter Check:	Passed

ARRAY COMPENSATED TRUE RESISTIVITY SHOP CALIBRATION

Tool Name: ACRt - E104_S103

Reference Calibration Date: 07-Jul-10 10:19:28

Engineer: D. CULVER

Calibration Date: 30-Jul-10 15:26:14

Software Version: WL INSITE R3.0.7 (Build 3)

Calibration Version: 1

TYPICAL GAIN RANGE

Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper
A1 (80")	0.95	1.0008	1.05	0.95	1.0062	1.05	0.95	1.0037	1.05
A2 (50")	0.95	1.0050	1.05	0.95	1.0107	1.05	0.95	1.0100	1.05
A3 (29")	0.95	1.0050	1.05	0.95	1.0105	1.05	0.95	1.0071	1.05
A4 (17")	0.95	1.0027	1.05	0.95	1.0052	1.05	0.95	1.0058	1.05
A5 (10")	N/A	N/A	N/A	0.95	0.9961	1.05	0.95	0.9947	1.05
A6 (6")	N/A	N/A	N/A	0.95	0.9846	1.05	0.95	0.9829	1.05

TYPICAL SONDE OFFSET RANGE

Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper
A1 (80")	-5	0.072	2	-6	-3.582	-2	-8	-4.667	-2
A2 (50")	-7	-2.086	-1	-6	-3.562	-2	-7	-4.390	-2
A3 (29")	-27	-10.558	-9	-9	-3.309	-3	-7	-2.796	-1
A4 (17")	-180	-97.801	-60	-45	-32.623	-15	-39	-26.599	-13
A5 (10")	N/A	N/A	N/A	-150	-75.232	-50	-80	-37.849	-10
A6 (6")	N/A	N/A	N/A	175	272.705	525	90	140.084	270

TRANSMITTER CURRENT GAIN

Signal	Lower	R	Upper
12K	0.6	0.9255	1.3
36K	1.0	1.8997	2.0
72K	1.0	1.1647	2.0

R-MUD VERIFICATION

Signal	Lower (ohm-m)	Measured (ohm-m)	Upper (ohm-m)
Mud Cell	0.95	0.997	1.05

CALIBRATION SUMMARY

Sensor	Shop	Field	Post	Difference	Tolerance	Units
GTET-11238317						
Gamma Ray Calibrator	263.5	269.7	-----	-6.2	+/- 9.00	api
CSNG-10965402						
60 KEV Peak Channel #	48.0	48.0	-----	0.0	-----	Channel #
239 KEV Peak Channel #	23.0	23.0	-----	0.0	-----	Channel #
583 KEV Peak Channel #	51.3	51.6	-----	-0.3	-----	Channel #
2614 KEV Peak Channel #	211.0	211.4	-----	-0.4	-----	Channel #

Snow-Block Porosity	0.0697	0.0727	-----	-0.0030	+/- 0.0150	decp
SDLT-11014271						
Near(B+D+P+L)	1559.748	1568.844	-----	-9.096	+/-15.894	cps
Far(B+D+P+L)	914.904	919.126	-----	-4.222	+/-16.407	cps
Pad Extension	3.75	3.67	-----	0.08	+/-0.10	in
Ring Diameter	8.25	8.25	-----	0.000	+/-0.15	in
ACRt-E104_S103						
Mud Cell	0.997	-----	-----	0.000	-----	ohm-m

Data: THOMPSON_D20_31\0003 CSNG-GTET\IDLE Date: 11-Oct-10 09:53:32

HALLIBURTON

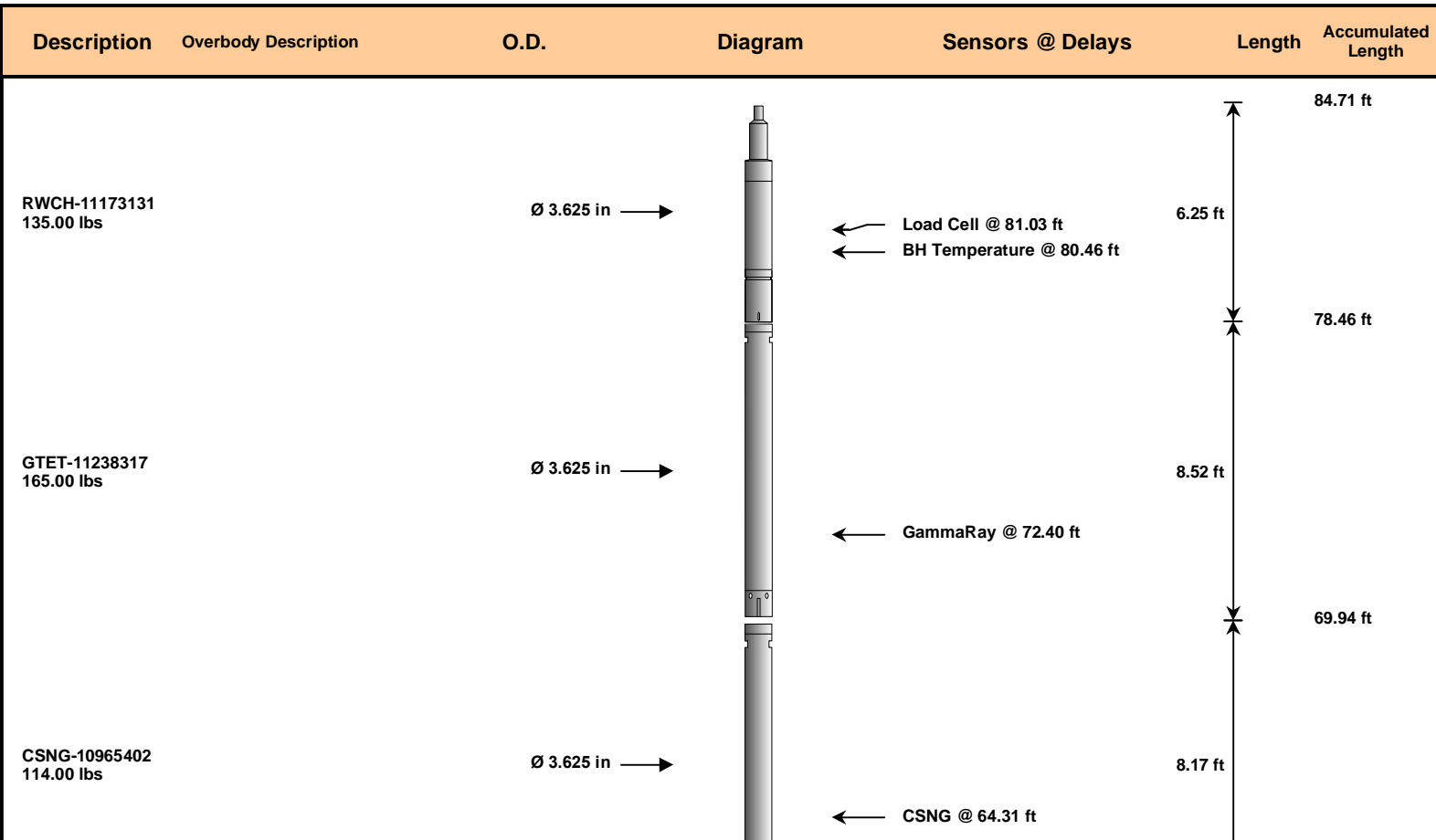
CUSTOMER EVENT LOG

Event Type	Time & Date	Depth (ft)	Event Description
	11-Oct-10 04:23:46	11.50	Logging 001 11-Oct-10 04:23 Dn @11.5f
	11-Oct-10 04:35:45	764.89	Halting 001 11-Oct-10 04:23 Dn @11.5f
	11-Oct-10 04:36:29	799.75	Logging 002 11-Oct-10 04:36 Up @799.8f
	11-Oct-10 04:40:38	572.56	Halting 002 11-Oct-10 04:36 Up @799.8f
	11-Oct-10 04:41:06	474.50	Logging 003 11-Oct-10 04:41 Dn @474.5f
	11-Oct-10 05:32:56	7788.08	Halting 003 11-Oct-10 04:41 Dn @474.5f
	11-Oct-10 05:37:44	8036.50	Logging 004 11-Oct-10 05:37 Up @8036.5f
	11-Oct-10 07:21:18	7810.38	Halting 004 11-Oct-10 05:37 Up @8036.5f

Data: THOMPSON_D20_31\0001 CSNG-GTET\HW11182 Date: 11-Oct-10 08:11:49

HALLIBURTON

TOOL STRING DIAGRAM REPORT



DSNT-11020488
174.00 lbs

DSN Decentralizer-
11020488
6.60 lbs

Ø 3.625 in* →
Ø 3.625 in →

9.69 ft

← DSN Far @ 54.84 ft
← DSN Near @ 54.09 ft

61.77 ft

SDLT-11014271
360.00 lbs

Ø 4.500 in →
Ø 4.750 in →

10.81 ft

SDL Microlog @ 44.27 ft
SDL Caliper @ 44.09 ft
SDL @ 44.08 ft

52.09 ft

Flex Joint-
10847054
140.00 lbs

Ø 3.625 in →

5.67 ft

41.27 ft

Centralizer 29-CENT1
12.00 lbs

Ø 4.000 in* →

35.60 ft

BSAT-10938796
300.00 lbs

Ø 3.625 in →

15.77 ft

← Sonic Receivers @ 27.09 ft

19.83 ft

Regal Standoff 6_75-
StandOff
20.00 lbs

Ø 6.750 in* →

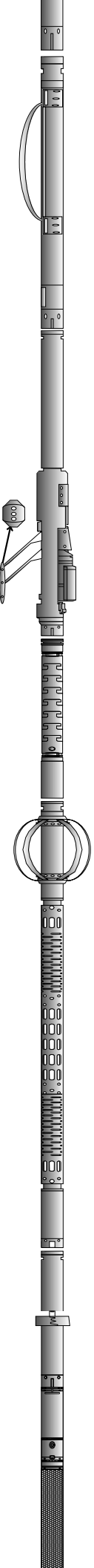
← Mud Resistivity @ 13.44 ft

ACRt-E104_S103
250.00 lbs

Ø 3.625 in →

← ACRt @ 9.46 ft

19.25 ft



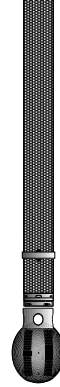
SP Ring-1
0.00 lbs

Ø 3.625 in* →

← SP @ 1.86 ft

Cabbage Head-
CABBAGEHEAD
10.00 lbs

Ø 3.625 in
Ø 6.000 in →



0.58 ft
0.58 ft
0.00 ft

Mnemonic	Tool Name	Serial Number	Weight (lbs)	Length (ft)	Accumulated Length (ft)	Max.Log. Speed (fpm)
RWCH	Releasable Wireline Cable Head	11173131	135.00	6.25	78.46	300.00
GTET	Gamma Telemetry Tool	11238317	165.00	8.52	69.94	60.00
CSNG	Compensated Spectral Natural Gamma	10965402	114.00	8.17	61.77	15.00
DSNT	Dual Spaced Neutron	11020488	174.00	9.69	52.09	60.00
DCNT	DSN Decentralizer	11020488	6.60	5.13	* 55.42	300.00
SDLT	Spectral Density Tool	11014271	360.00	10.81	41.27	60.00
FLEX	Flex Joint	10847054	140.00	5.67	35.60	300.00
BCAS	Borehole Sonic Array Tool	10938796	300.00	15.77	19.83	60.00
OBCEN	Centralizer - 29 in.Overbody	CENT1	12.00	2.42	* 32.67	300.00
ACRt	Array Compensated True Resistivity	E104_S103	250.00	19.25	0.58	300.00
SP	SP Ring	1	0.00	0.25	* 1.86	300.00
RSOF	Regal Standoff 6.75"	StandOff	20.00	0.52	* 17.16	300.00
CBHD	Cabbage Head	CABBAGEHEAD	10.00	0.58	0.00	300.00
Total			1,686.60	84.71		

* Not included in Total Length and Length Accumulation.

Data: THOMPSON_D20_31\0001 CSNG-GTETIDLE Date: 11-Oct-10 04:04:28

COMPANY	NOBLE ENERGY		
WELL	THOMPSON D20-31D		
FIELD	WATTENBERG		
COUNTY	WELD	STATE	CO
HALLIBURTON		SPECTRAL DENSITY DUAL SPACED NEUTRON ARRAY COMPENSATED TRUE RESISTIVITY	