

HALLIBURTON

SPECTRAL DENSITY
DUAL SPACED NEUTRON
ARRAY COMPENSATED
TRUE RESISTIVITY
MICROLOG

COMPANY		EXPEDITION WATER SOLUTIONS COLORADO LLC	
WELL		EWS 4A	
FIELD/BLOCK		WATTENBERG	
COUNTY		WELD CO	
STATE		CO	
Permanent Datum		GL	
Log measured from		KB	
Drilling measured from		KB	
Date		04-Feb-17	
Run No.		ONE	
Depth - Driller		10119.0 ft	
Depth - Logger		10129.0 ft	
Bottom - Logged Interval		8502.0 ft	
Top - Logged Interval		10127.0 ft	
Casing - Driller		7.000 in @ 8499.0 ft	
Casing - Logger		8502.0 ft	
Bit Size		6.125 in	
Type Fluid in Hole		Water Based Mud	
Density		8.9 ppg	
Viscosity		53.00 s/qt	
PH		8.50 pH	
Source of Sample		MUD PIT	
Rm @ Meas. Temperature		1.33 ohmm @ 70.50 degF	
Rmf @ Meas. Temperature		0.75 ohmm @ 67.80 degF	
Rmc @ Meas. Temperature		1.45 ohmm @ 67.20 degF	
Source Rmf		MEASURED	
Rm @ BHT		0.39 ohmm @ 259.0 degF	
Time Since Circulation		08:37 hr	
Time on Bottom		04-Feb-17 20:37	
Max. Rec. Temperature		259.00 degF @	
Equipment		11170614 R.S.. WY	
Recorded By		T. CASADABAN	
Witnessed By		B. STONE	

COMPANY	EXPEDITION WATER SOLUTIONS COLORADO LLC
WELL	EWS 4A
FIELD/BLOCK	WATTENBERG
COUNTY	WELD
STATE	CO
API No.	05123440470000
Location	SURFACE HOLE LOCATION: 2232' FNL & 2037' FWL
Other Services:	RWCH
Sect.	17
Twp.	2N
Rge.	63W
Elev.	4843.0 ft
D.F.	4856.0 ft
G.L.	4843.0 ft

Fold here

Service Ticket No.: 903809497				API No.: 05123440470000				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		0.25 IN S.O.		N/A	
Rmc @ Meas. Temp.		@		@				I: 10967818							
Source Rmf		Rmc						S: 10961994							
Rm @ BHT		@		@											
Rmf @ BHT		@		@											
Rmc @ BHT		@		@											
EQUIPMENT DATA															
GAMMA				ACOUSTIC				DENSITY				NEUTRON			
Run No.		ONE		Run No.				Run No.		ONE		Run No.		ONE	
Serial No.		11259758		Serial No.				Serial No.		10808420		Serial No.		10860047	
Model No.		GTET		Model No.				Model No.		SDLT		Model No.		DSNT	
Diameter		3.625 IN		No. of Cent.				Diameter		5.0 IN		Diameter		3.625 IN	
Detector Model No.		GTET		Spacing				Log Type		GAMMA		Log Type		THERMAL	
Type		SCINT						Source Type		Cs-137		Source Type		Am241Be	
Length		8 IN		LSA [Y/N]				Serial No.		5116GW		Serial No.		08-018	
Distance to Source		10 FT		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	10129 ft	8502 ft	REC	0	150				0.3 decp	-0.1 decp	2.65 g/cc	0.3 decp	-0.1 decp	SAND	
DIRECTIONAL INFORMATION															
Maximum Deviation								@	KOP @						
Remarks: RWCH-GTET-DSNT-SDLT-ACRT RUN IN COMBINATION															
BOREHOLE RUGOSITY, TENSION PULLS, & WASHOUTS MAY EFFECT LOG QUALITY															
DSNT BOWSPRING DECENTRALIZER & ACRT STANDOFF REMOVED DUE TO HOLE SIZE															
ANNULAR HOLE VOLUME CALCULATED FOR 4.5-INCH CASING								SDLM S/N: 10695352							
LATITUDE: 40.139470															
LONGITUDE: -104.463560															
TODAY'S CREW: A. FULGHUM, D. PIEGER								RIG: ENSIGN 121							
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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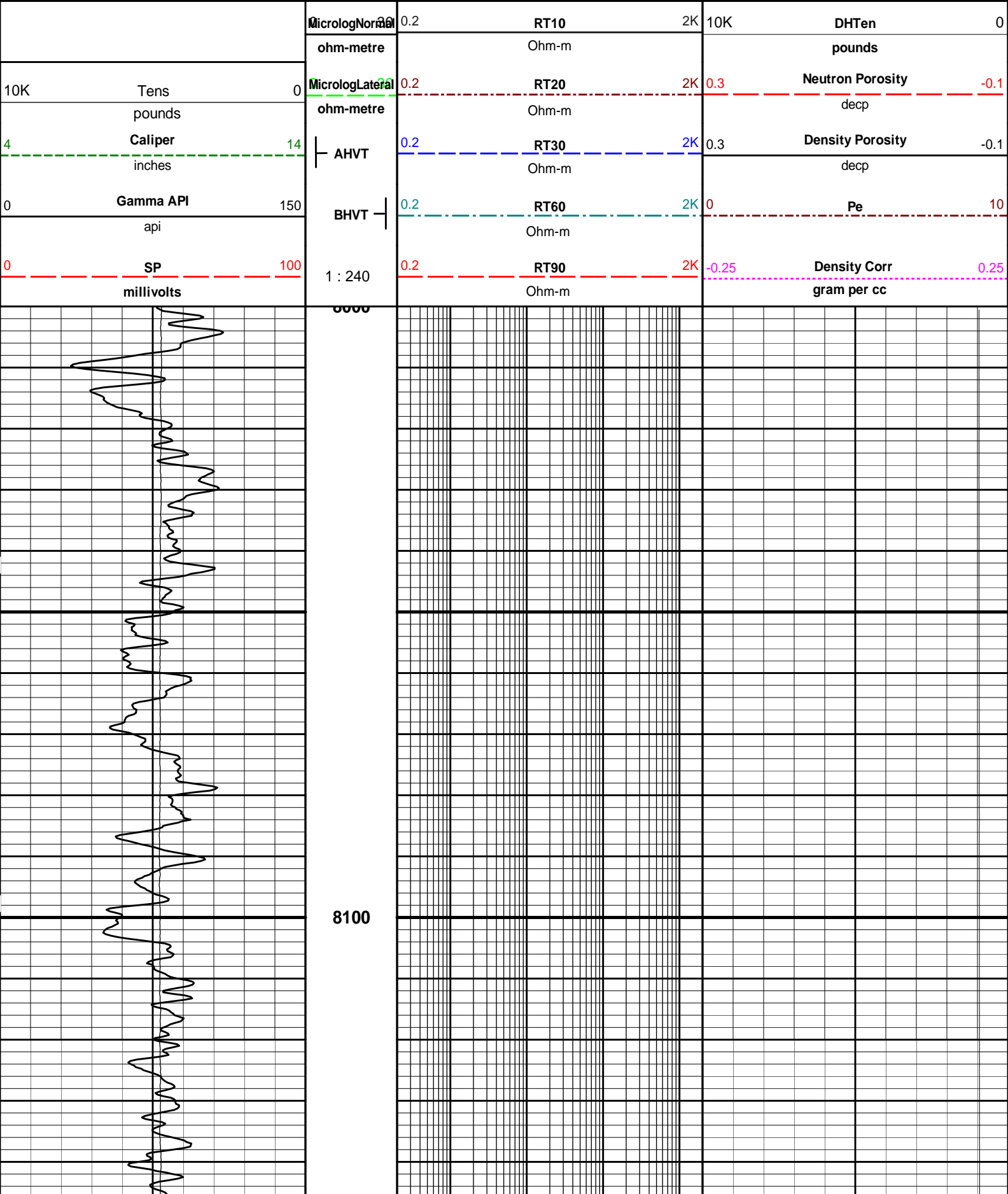
PARAMETERS REPORT

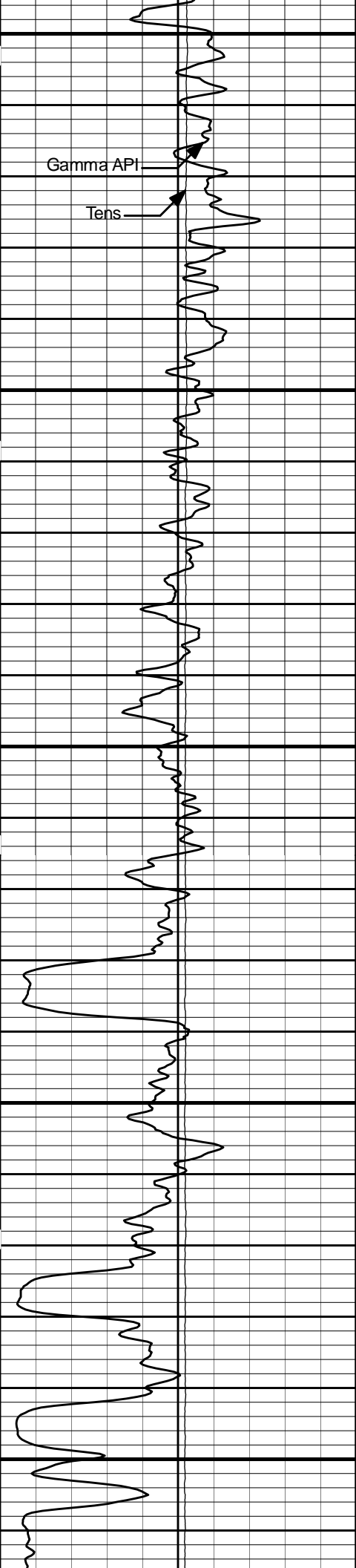
Depth (ft)	Tool Name	Mnemonic	Description	Value	Units
TOP					
	SHARED	BS	Bit Size	6.125	in
	SHARED	UBS	Use Bit Size instead of Caliper for all applications.	No	
	SHARED	MDBS	Mud Base	Water	
	SHARED	MDWT	Borehole Fluid Weight	8.900	ppg
	SHARED	WAGT	Weighting Agent	Natural	
	SHARED	BSAL	Borehole salinity	2700.00	ppm
	SHARED	FSAL	Formation Salinity NaCl	0.00	ppm
	SHARED	KPCT	Percent K in Mud by Weight?	0.00	%
	SHARED	RMUD	Mud Resistivity	1.330	ohmm
	SHARED	TRM	Temperature of Mud	70.5	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	40.0	degF
	SHARED	TD	Total Well Depth	10129.00	ft
	SHARED	BHT	Bottom Hole Temperature	259.0	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	

CrossPlot	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	Sandstone	
	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	
	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	2.650	g/cc
	SDLT Pad	DFL	Formation Density Fluid	1.000	g/cc
	SDLT Pad	BHSM	Borehole Size Source Tool	SDLT	
	Microlog Pad	MLOK	Process MicroLog Outputs?	Yes	
	ACRt Sonde	RTOK	Process ACRt?	Yes	
	ACRt Sonde	MNSO	Minimum Tool Standoff	0.25	in
	ACRt Sonde	TCS1	Temperature Correction Source	FP Lwr & FP Up	
	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: EXP_EWS-4A\0001 TRIPLE_MICROLOG\IDLE				Date: 04-Feb-17 21:49:11	

HALLIBURTON

Plot Time: 04-Feb-17 22:54:55
Plot Range: 8000 ft to 10141.3 ft
Data: EXP_EWS-4A\Well Based**
Plot File: \\COMPIVQ_BP_COMPOSITE_ACRt_5IN_DHT

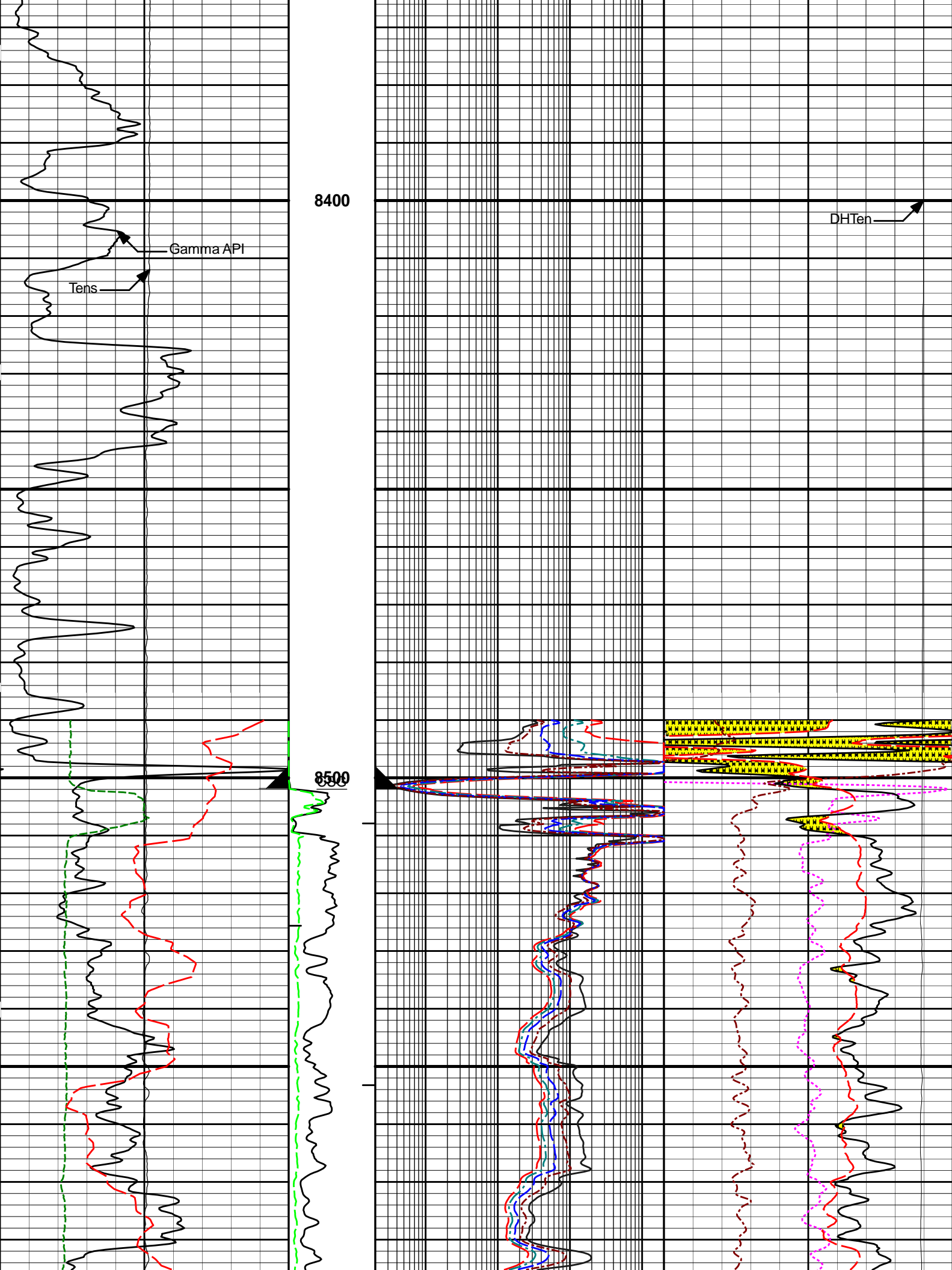


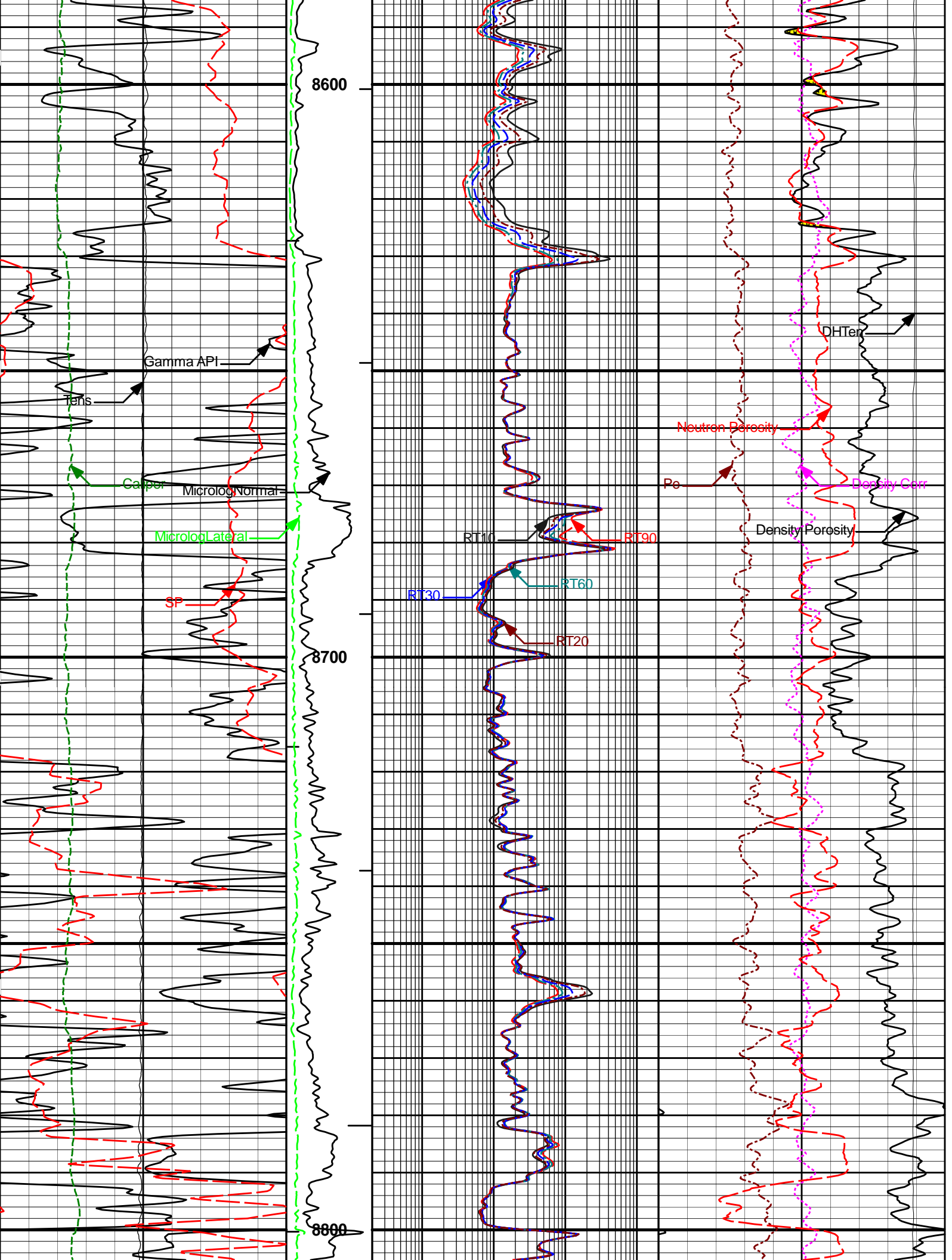


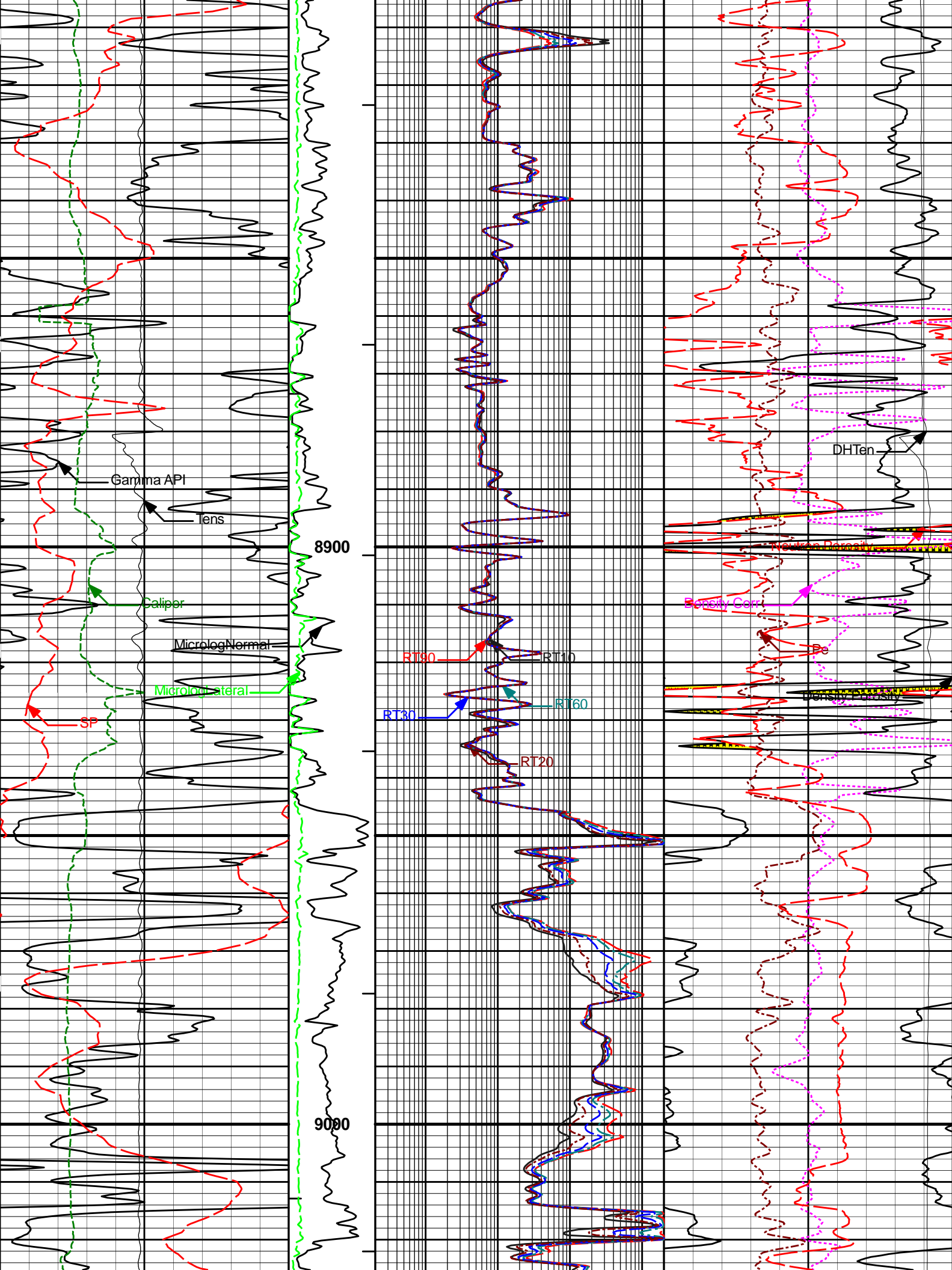
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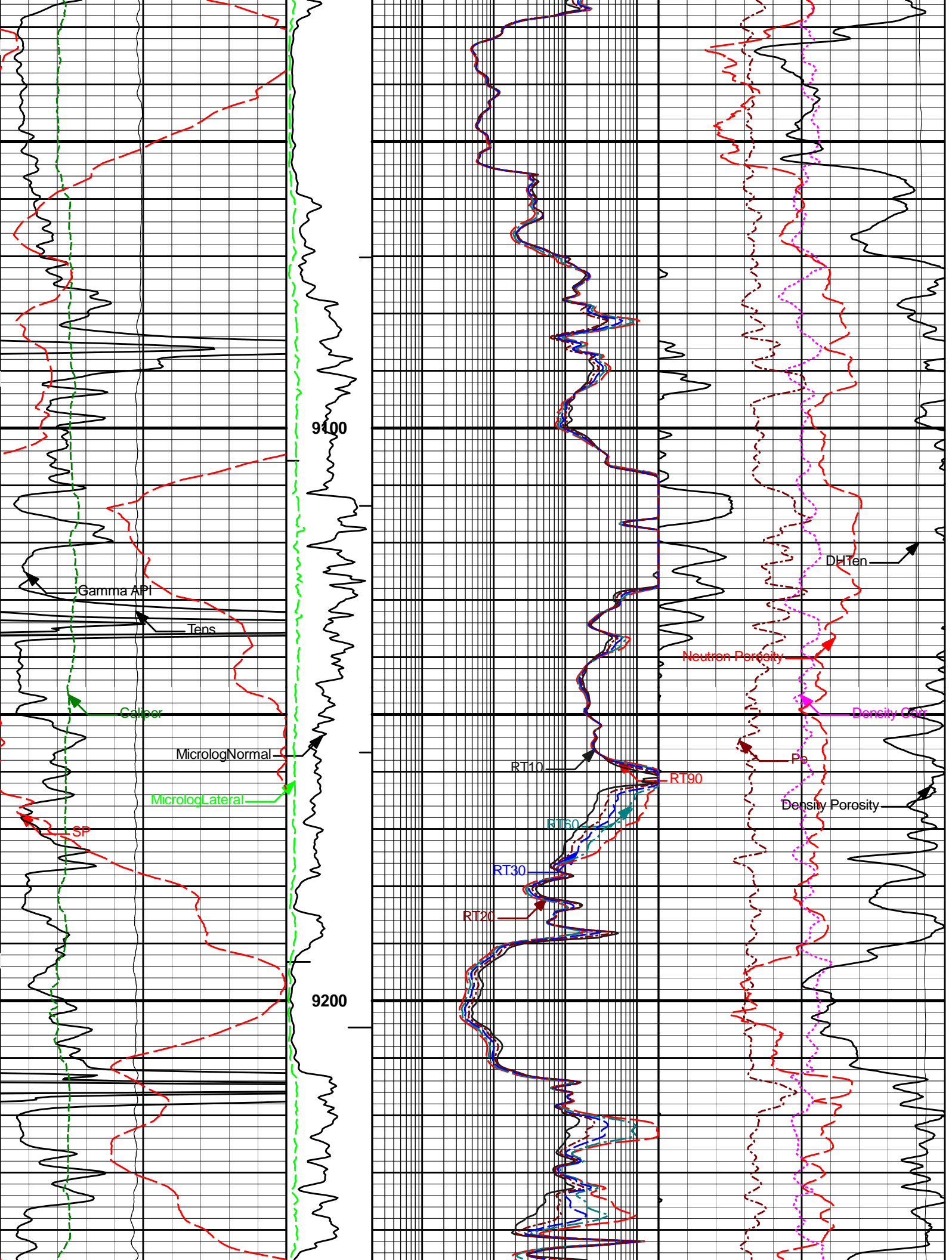
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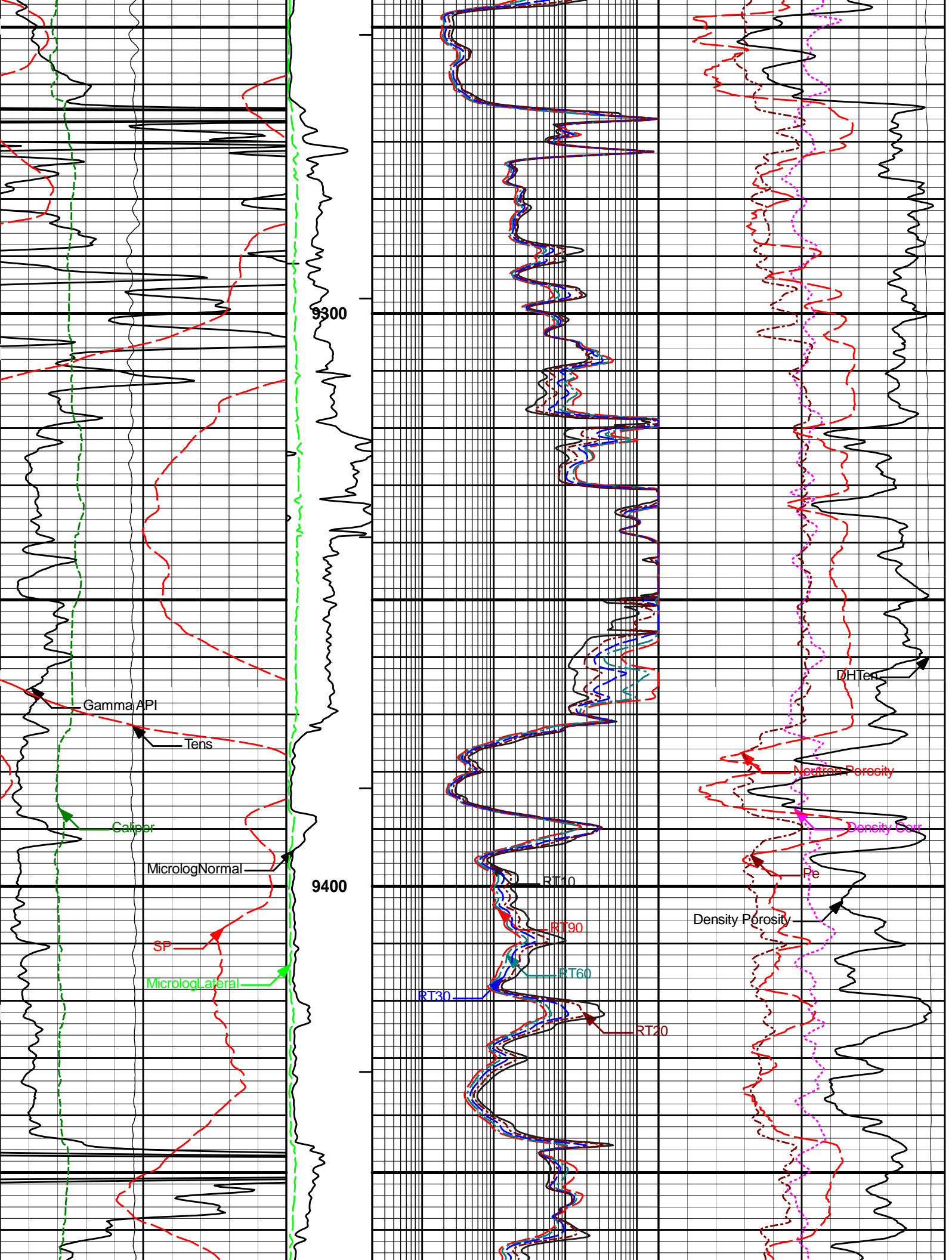
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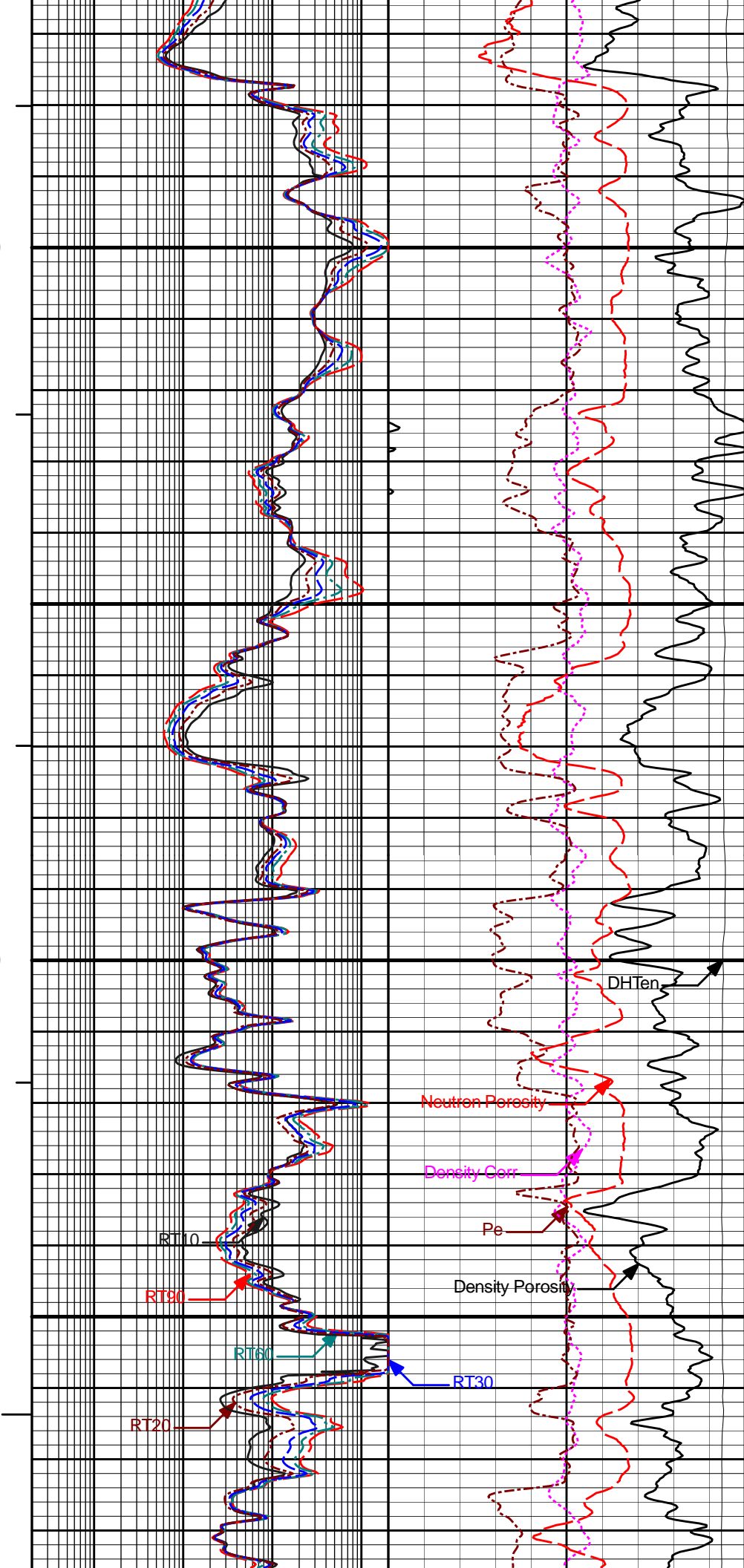
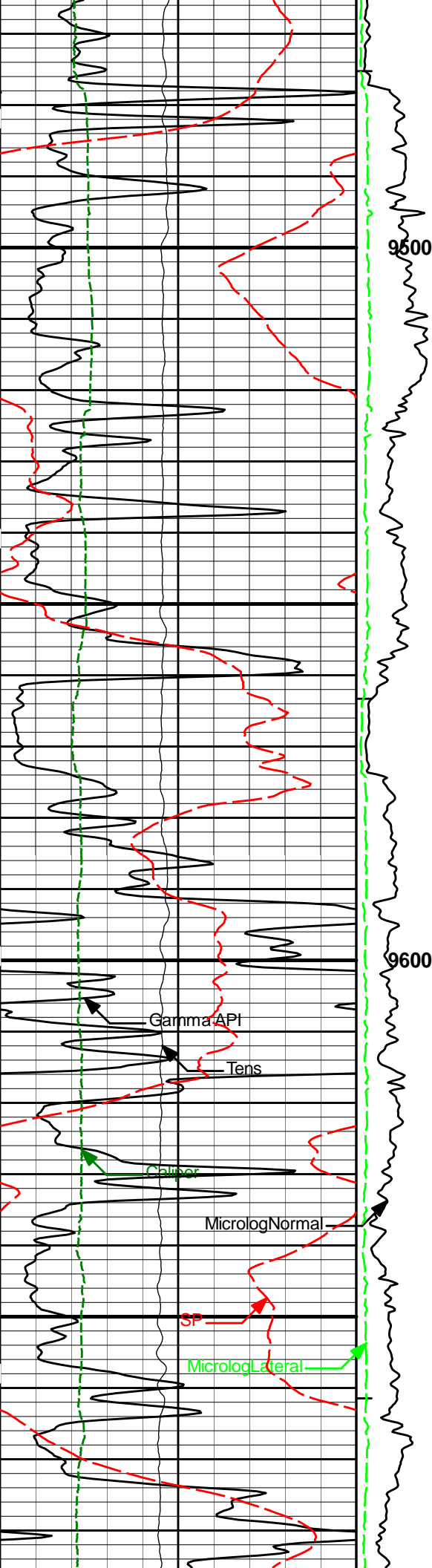


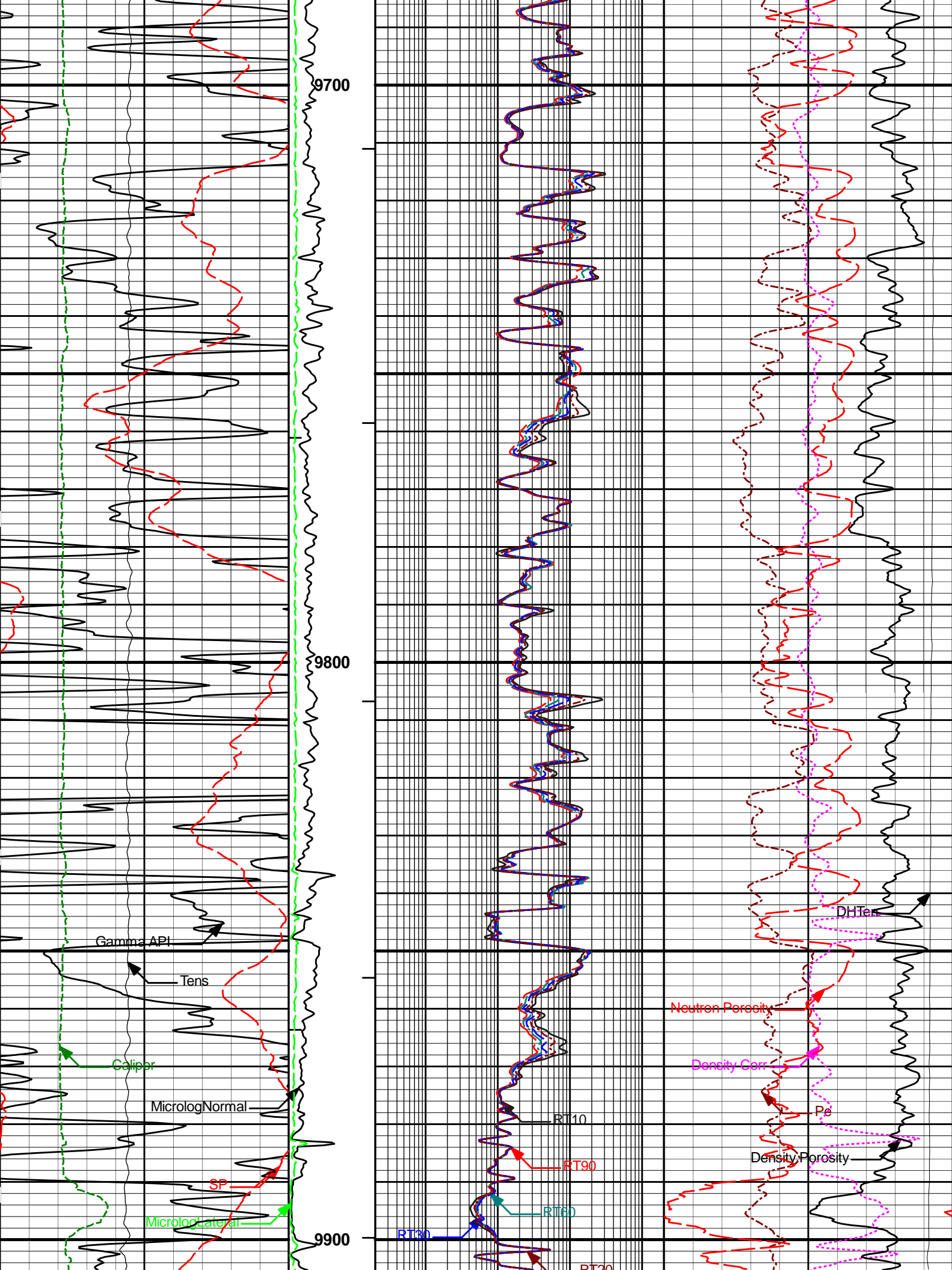


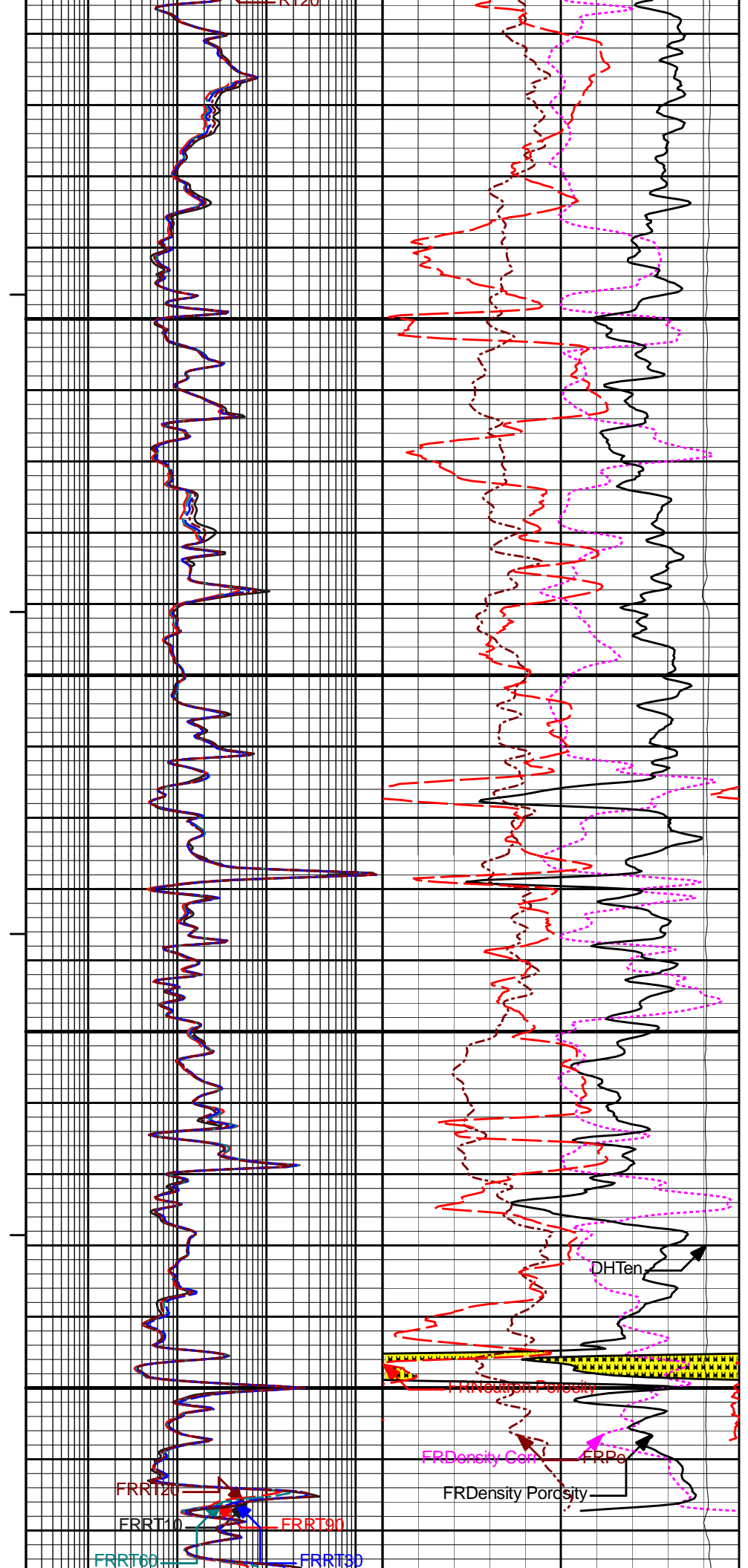
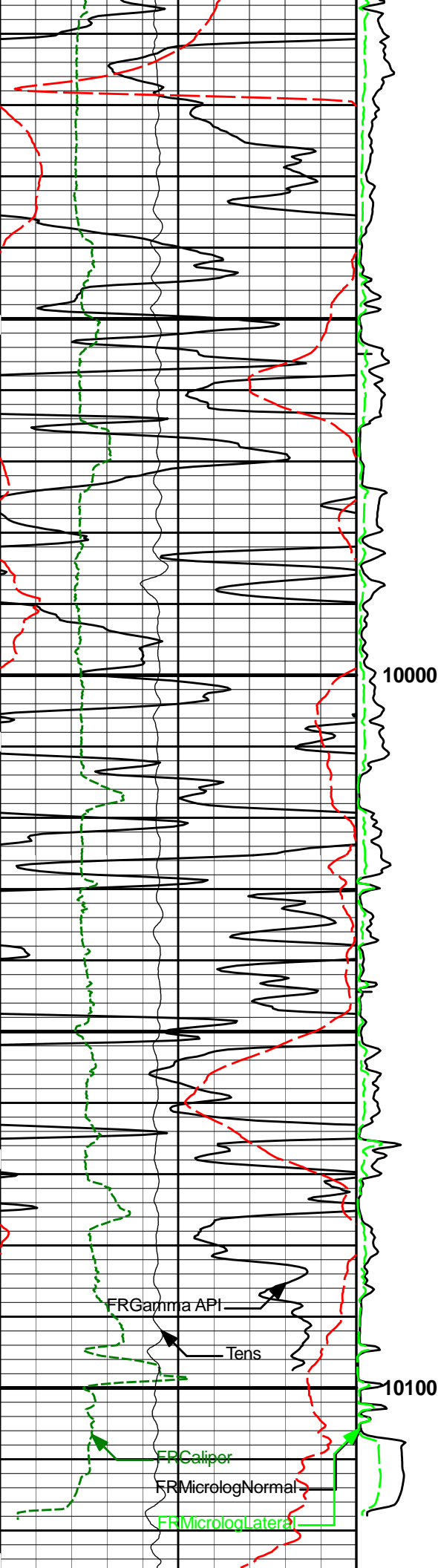


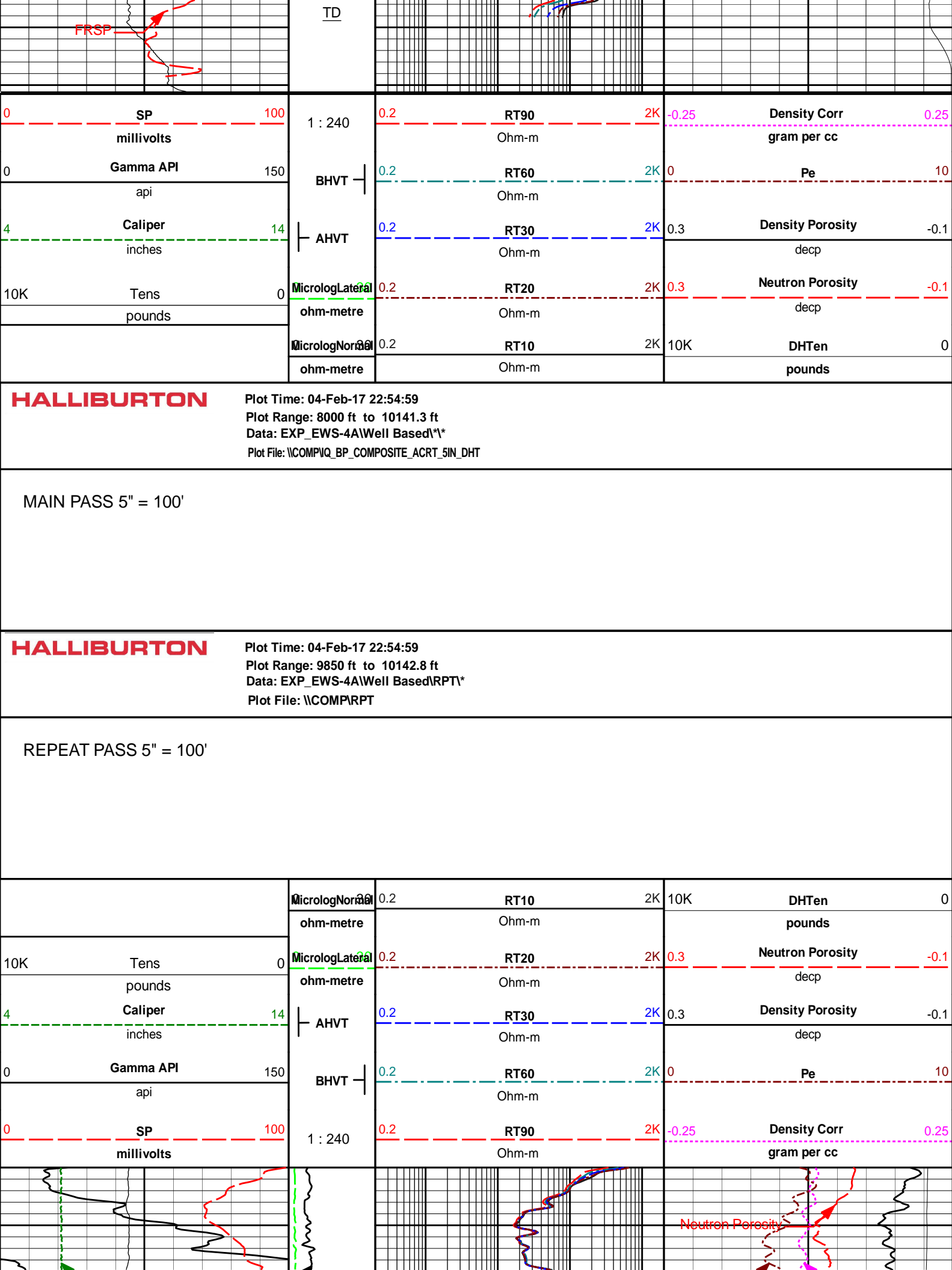


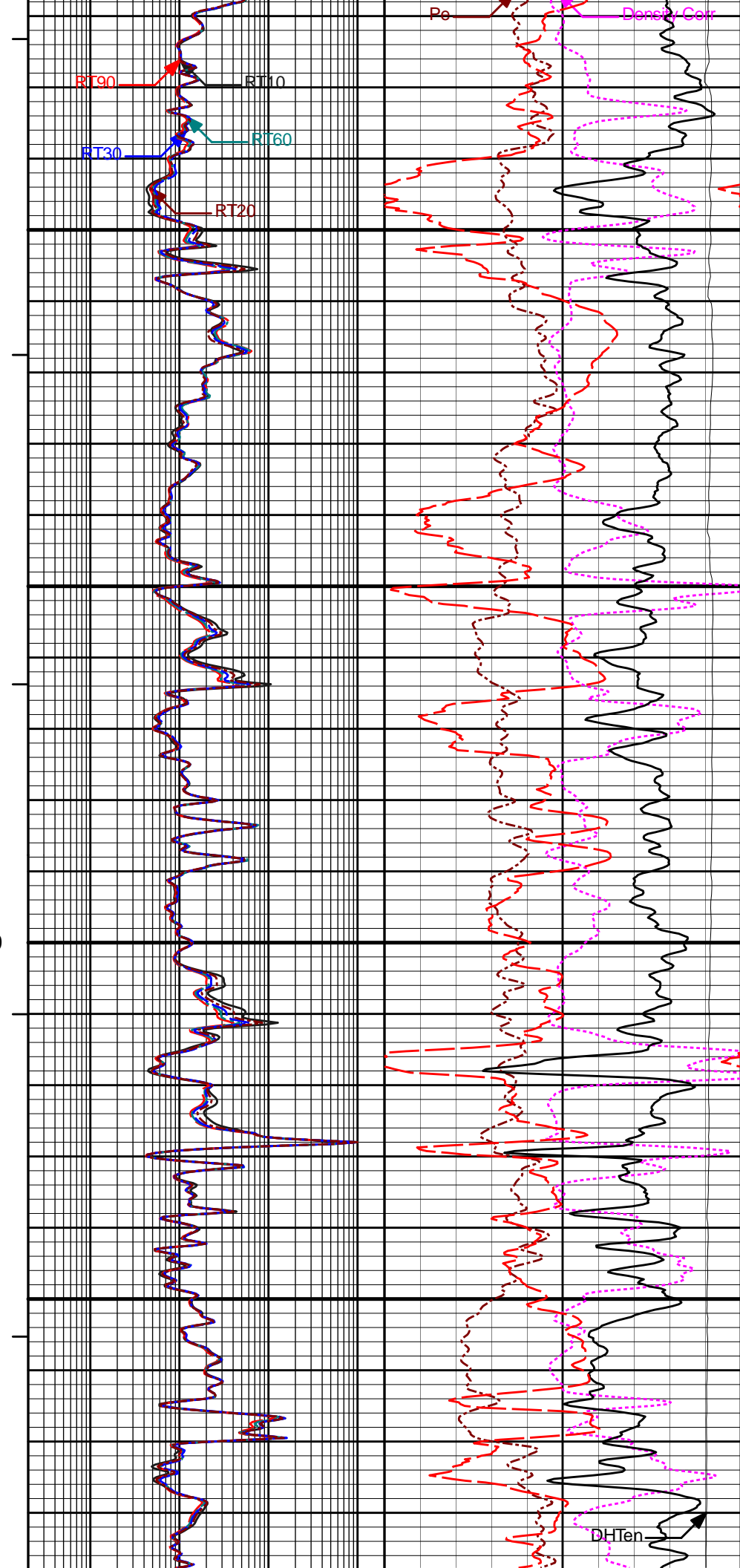
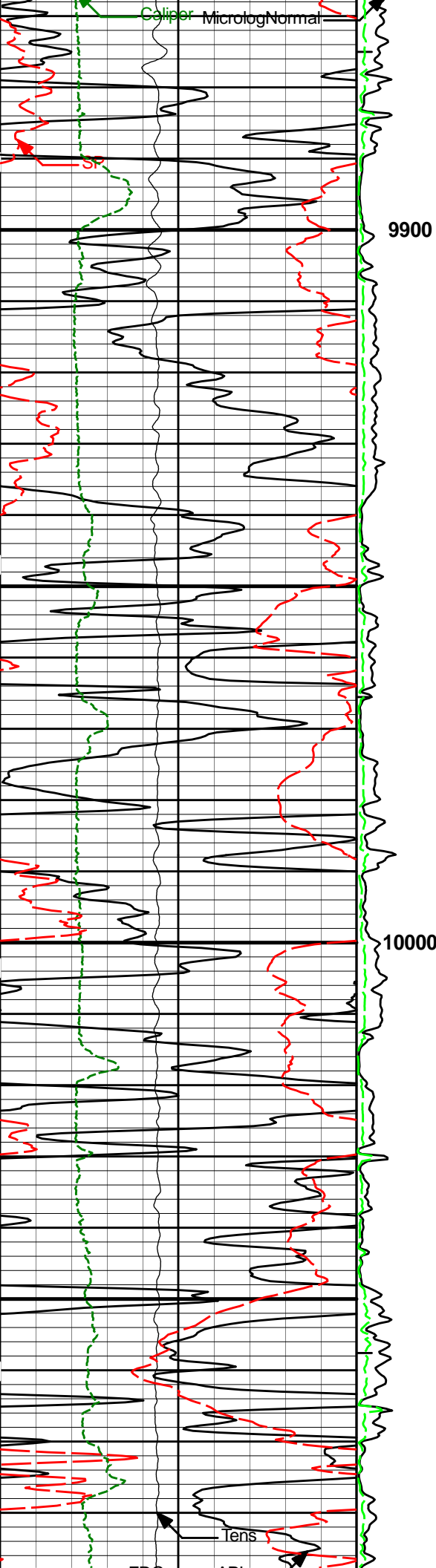


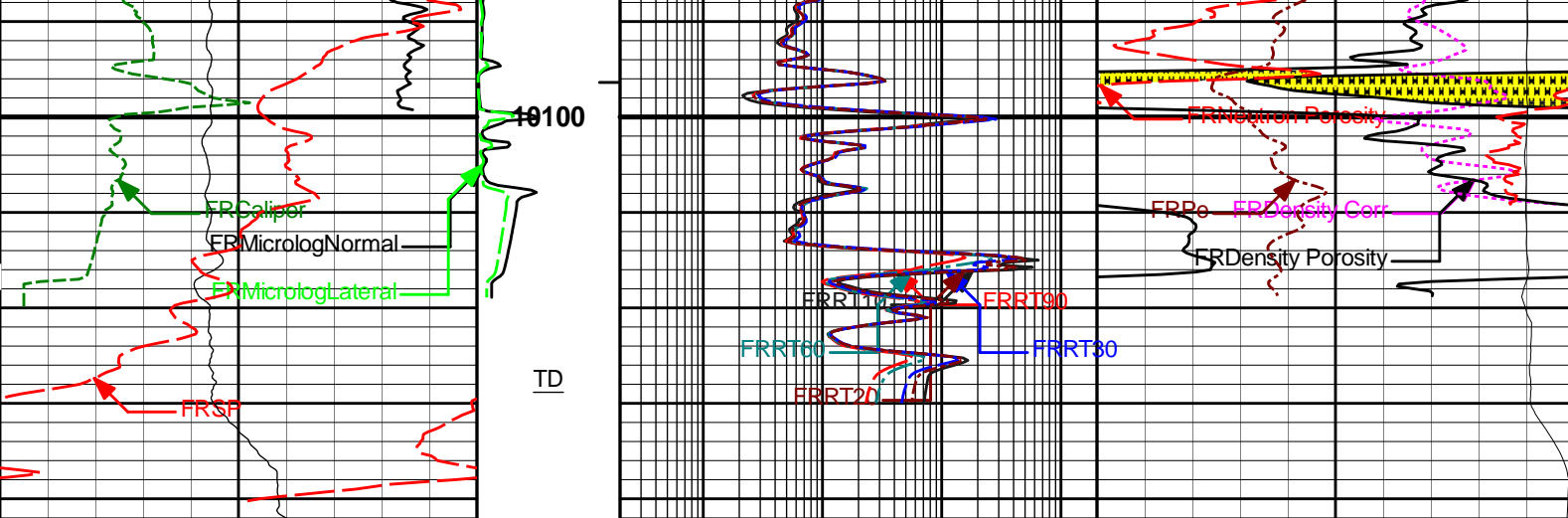












0	SP	100	1 : 240	0.2	RT90	2K	-0.25	Density Corr	0.25
	millivolts				Ohm-m			gram per cc	
0	Gamma API	150	BHVT	0.2	RT60	2K	0	Pe	10
	api				Ohm-m				
4	Caliper	14	AHVT	0.2	RT30	2K	0.3	Density Porosity	-0.1
	inches				Ohm-m			dec	
10K	Tens	0	Microlog Lateral	0.2	RT20	2K	0.3	Neutron Porosity	-0.1
	pounds		ohm-metre		Ohm-m			dec	
			Microlog Normal	0.2	RT10	2K	10K	DHTen	0
			ohm-metre		Ohm-m			pounds	

HALLIBURTON Plot Time: 04-Feb-17 22:55:01
Plot Range: 9850 ft to 10142.8 ft
Data: EXP_EWS-4A\Well Based\RPRT*
Plot File: \COMPRPT

REPEAT PASS 5" = 100'

HALLIBURTON

CALIBRATION REPORT

NATURAL GAMMA RAY TOOL SHOP CALIBRATION			
Tool Name:	GTET - 11259758	Reference Calibration Date:	19-Jan-17 10:48:42
Engineer:	B. ERICKSON	Calibration Date:	19-Jan-17 10:53:12
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1

Calibrator Source S/N: TB-270
Calibrator API Reference: 259.00 api
Equivalent Calibrator API Reference: 263.5 api

Measurement	Measured	Calibrated	Units
Background	61.8	61.0	api
Background + Calibrator	329.1	324.5	api
Calibrator	267.2	263.5	api

NATURAL GAMMA RAY TOOL FIELD CALIBRATION

Tool Name:	GTET - 11259758	Reference Calibration Date:	19-Jan-17 10:53:12
Engineer:	P. DIMPFL	Calibration Date:	03-Feb-17 16:29:29
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1

Calibrator Source S/N: TB-270
Calibrator API Reference:259.00 api
Equivalent Calibrator API Reference:263.5 api

Field Verification	Shop	Field	Units
Background	61.0	35.8	api
Background + Calibrator	324.5	304.5	api
Calibrator	263.5	268.7	api

Shop	Field	Difference	Tolerance
263.5	268.7	-5.2	+/- 9.00

DUAL SPACED NEUTRON SHOP CALIBRATION			
Tool Name:	DSNT - 10860047	Reference Calibration Date:	19-Jan-17 15:17:08
Engineer:	B. ERICKSON	Calibration Date:	19-Jan-17 15:29:27
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1

Logging Source S/N: 08-018
Tank Serial Number: ROCK SPRINGS
Reference value assigned to Tank: 49.230
Snow Block S/N: 11392047
Calibration Tank Water Temperature: 61 degF
Min. Tool Housing Outside Diameter: 3.625 in

CALIBRATION CONSTANTS			
Measurement	Prev. Value	New Value	Control Limit On New Value
Gain:	0.94855	0.94722	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):	0.1978	0.1974	0.0004	+/- 0.0020
Calibrated Ratio:	9.2792	9.2663	0.013	+/- 0.050

VERIFIER		
Measurement	Value	Control Limit
Snow-Block Porosity (decp):	0.0543	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 - 10860047	Reference Calibration Date:	19-Jan-17 15:29:27
Engineer:	P. DIMPFL	Calibration Date:	03-Feb-17 16:38:17
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1

Logging Source S/N: 08-018
Snow Block S/N: 11392047

NEUTRON FIELD CHECK SUMMARY			
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NEUTRON FIELD CHECK SUMMARY				
	Shop	Field	Difference	Control Limit On Change
Snow-Block Porosity (decp):	0.0543	0.0486	-0.0057	+/- 0.0150

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

DENSITY CALIPER SHOP CALIBRATION

Tool Name:	SDLT - 10695352	Reference Calibration Date:	02-Feb-17 09:19:57
Engineer:	T. CASADABAN	Calibration Date:	02-Feb-17 09:25:21
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1
Host Tool Name:	DSNT - 10860047		

CALIBRATION COEFFICIENTS			
Measurement	Previous Value	New Value	Control Limit On New Value
Pad Offset	-2621.14	-2263.97	-7000.00 - -1000.00
Pad Gain	0.0003984	0.0003838	0.0002000 - 0.0006000
Arm Offset	-1676.59	-2189.91	-5000.00 - 3000.00
Arm Gain	0.0004797	0.0004935	0.000300 - 0.000700
Arm Power	-0.000003208	-0.000004062	-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)	1.93	2.00	0.07	+/- 0.20
Medium Ring (in)	3.75	3.75	0.00	+/- 0.20
RING DIAMETER:				
Small Ring (in)	6.56	6.50	-0.06	+/- 0.20
Medium Ring (in)	8.27	8.25	-0.02	+/- 0.20
Large Ring (in)	15.01	15.00	-0.01	+/- 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 - 10695352	Reference Calibration Date:	02-Feb-17 09:25:21
Engineer:	P. DIMPFL	Calibration Date:	03-Feb-17 16:30:57
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	3.76	0.01	+/- 0.10
Ring Diameter	8.25	8.23	-0.02	+/- 0.15

PASS/FAIL SUMMARY	
Pad Extension Check:	Passed

SPECTRAL DENSITY SHOP CALIBRATION

Tool Name:SDLT Pad - 10808420

Reference Calibration Date:19-Jan-17 13:44:22

Engineer:B. ERICKSON

Calibration Date:19-Jan-17 14:08:38

Software Version:WL INSITE R5.0.5 (Build 8)

Calibration Version:1

Logging Source S/N: 5116 GW

Aluminum Block S/N: ROCK SPRINGS

Density: 2.602g/cc

Pe: 3.110

Magnesium Block S/N: ROCK SPRINGS

Density: 1.690g/cc

Pe: 2.610

DENSITY CALIBRATION SUMMARY			
Measurement	Previous Value	New Value	Control Limit
Near Bar Gain	1.0661	1.0574	0.90 - 1.10
Near Dens Gain	1.0260	1.0221	0.90 - 1.10
Near Peak Gain	1.0353	1.0674	0.90 - 1.10
Near Lith Gain	1.0543	1.0668	0.90 - 1.10
Far Bar Gain	1.0147	1.0150	0.90 - 1.10
Far Dens Gain	1.0027	1.0028	0.90 - 1.10
Far Peak Gain	1.0019	0.9994	0.90 - 1.10
Far Lith Gain	0.9796	0.9760	0.90 - 1.10
Near Bar Offset	-0.2689	-0.1885	NONE
Near Dens Offset	0.0848	0.1179	NONE
Near Peak Offset	0.0522	-0.2106	NONE
Near Lith Offset	-0.0611	-0.1664	NONE
Far Bar Offset	0.1025	0.1010	NONE
Far Dens Offset	0.1810	0.1793	NONE
Far Peak Offset	0.1740	0.1945	NONE
Far Lith Offset	0.3168	0.3430	NONE
Near Bar Background	752.04	750.14	700 - 1450
Near Dens Background	248.80	249.21	230 - 480
Near Peak Background	108.89	108.11	100 - 210
Near Lith Background	133.77	132.84	125 - 260
Far Bar Background	481.51	481.87	450 - 900
Far Dens Background	186.60	186.94	175 - 345
Far Peak Background	74.31	73.29	70 - 140
Far Lith Background	77.22	78.15	75 - 145

CALIBRATION BLOCK SUMMARY				
Measurement	Current Reading (Previous Coef)	Calibrated (New Coef)	Change	Control Limit On Change
MAGNESIUM				
Density (g/cc)	1.689	1.690	0.001	+/- 0.015
Pe	2.546	2.565	0.019	+/- 0.150
ALUMINUM				
Density (g/cc)	2.602	2.602	-0.000	+/- 0.01500
Pe	3.018	3.070	0.052	+/- 0.150

TOOL SUMMARY				
Measurement	Near Detector		Far Detector	
	Value	Control Limits	Value	Control Limits
QUALITY				

Background	0.0012	+/- 0.0110	0.0012	+/- 0.0140
Magnesium Block	-0.0006	+/- 0.0110	-0.0015	+/- 0.0140
Aluminum Block	-0.0011	+/- 0.0110	-0.0015	+/- 0.0140
Resolution	8.95	6.00 - 11.50	9.63	6.00 - 11.50
Internal Verifier(B+D+P+L)	1240	1200 - 2700	820	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 - 10808420	Reference Calibration Date:	19-Jan-17 14:08:38
Engineer:	P. DIMPFL	Calibration Date:	03-Feb-17 16:28:59
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1

Pad Temperature: 61.1 degF

DENSITY FIELD CALIBRATION SUMMARY				
Measurement	Shop	Field	Change	Control Limit +/-
Near (B+D+P+L) cps	1240.297	1234.897	-5.400	14.281
Far (B+D+P+L) cps	820.256	818.542	-1.714	15.801
Near Resolution	8.95	8.85	-0.100	0.50
Far Resolution	9.63	9.67	0.040	1.00

PASS/FAIL SUMMARY	
Bkg Quality Check:	Passed
Bkg Resolution Check:	Passed
Bkg Verification Check:	Passed

MICRO LOG SHOP CALIBRATION

Tool Name:	Microlog Pad - 10695352	Reference Calibration Date:	02-Feb-17 09:30:36
Engineer:	T. CASADABAN	Calibration Date:	02-Feb-17 09:33:43
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1
Host Tool Name:	DSNT - 10860047		

CALIBRATION COEFFICIENT SUMMARY					
Measurement	Micro Log Normal		Micro Log Lateral		Units
	Measured	Calibrated	Measured	Calibrated	
Tool Zero	-0.11	-0.11	-0.01	-0.01	ohmm
Calibration Point #1	0.00	0.00	0.00	0.00	ohmm
Calibration Point #2	20.01	20.00	20.01	20.00	ohmm
Internal Reference	20.05	20.04	20.13	20.13	ohmm

Measurement	Micro Log Normal Tool Value	Micro Log Lateral Tool Value	Units
Tool Zero	-14.52	-1.22	V
Calibration Point #1	15.31	3.08	V
Calibration Point #2	5282.31	6785.41	V

Internal Reference			5293.82		6828.65		V		
MICRO LOG FIELD CHECK									
Tool Name: Microlog Pad - 10695352			Reference Calibration Date: 02-Feb-17 09:33:43						
Engineer: P. DIMPFL			Calibration Date: 03-Feb-17 16:33:20						
Software Version: WL INSITE R5.0.5 (Build 8)			Calibration Version: 1						
	Measurement		Micro Log Normal		Micro Log Lateral				
			Shop	Field	Shop	Field	Units		
	Tool Zero		-0.11	-0.12	-0.01	-0.01	ohmm		
	Internal Reference		20.04	20.02	20.13	20.10	ohmm		
	Summary								
	Signal		Shop	Field	Difference		Tolerance		
	Microlog Normal		20.04	20.02	0.02		+/- 0.80		
Microlog Lateral		20.13	20.10	0.03		+/- 0.80			
ARRAY COMPENSATED TRUE RESISTIVITY SHOP CALIBRATION									
Tool Name: ACRt Sonde - 10967818			Reference Calibration Date: 20-Jan-17 11:09:57						
Engineer: B. ERICKSON			Calibration Date: 20-Jan-17 11:20:00						
Software Version: WL INSITE R5.0.5 (Build 8)			Calibration Version: 1						
Host Tool Name: ACRt Instrument - 10961994									
TYPICAL GAIN RANGE									
Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper
A1 (80")	0.95	1.0127	1.05	0.95	1.0121	1.05	0.95	1.0043	1.05
A2 (50")	0.95	1.0233	1.05	0.95	1.0233	1.05	0.95	1.0167	1.05
A3 (29")	0.95	1.0236	1.05	0.95	1.0238	1.05	0.95	1.0211	1.05
A4 (17")	0.95	1.0119	1.05	0.95	1.0098	1.05	0.95	1.0090	1.05
A5 (10")	N/A	N/A	N/A	0.95	1.0119	1.05	0.95	1.0101	1.05
A6 (6")	N/A	N/A	N/A	0.95	0.9942	1.05	0.95	0.9918	1.05
SONDE OFFSET									
Subarray	R12KHz			R36KHz			R72KHz		
	(mmho/m)			(mmho/m)			(mmho/m)		
A1 (80")	-1.067			-3.923			-4.799		
A2 (50")	-1.938			-3.755			-3.933		
A3 (29")	-10.463			-3.318			-3.071		
A4 (17")	-96.639			-30.422			-24.484		
A5 (10")	N/A			-109.025			-57.250		
A6 (6")	N/A			291.522			149.193		
TRANSMITTER CURRENT GAIN					R-MUD VERIFICATION				
Signal	Lower	R		Upper	Signal	Lower (ohm-m)	Measured (ohm-m)	Upper (ohm-m)	
12K	0.6	0.91		1.3	Mud Cell	0.95	0.99	1.05	
36K	1.0	1.28		2.0					
72K	1.0	1.52		2.0					
PASS/FAIL SUMMARY									
GAIN RANGE CHK					PASS				
SONDE OFFSET CHK					PASS				

QUALITY CHECK SHOP CALIBRATION

Tool Name:	ACRt Sonde - 10967818	Reference Calibration Date:	20-Jan-17 11:11:24
Engineer:	B. ERICKSON	Calibration Date:	20-Jan-17 11:21:32
Software Version:	WL INSITE R5.0.5 (Build 8)	Calibration Version:	1
Host Tool Name:	ACRt Instrument - 10961994		

STANDARD DEVIATIONS

	R12KHz			R36KHz			R72KHz		
	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail
A1 (80")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A2 (50")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A3 (29")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A4 (17")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A5 (10")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A6 (6")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass

AVERAGES

	R12KHz			R36KHz			R72KHz		
	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail
A1 (80")	0.000	< 0.500	Pass	-0.001	> -0.500	Pass	-0.005	> -0.500	Pass
A2 (50")	0.000	< 0.500	Pass	-0.001	> -0.500	Pass	-0.004	> -0.500	Pass
A3 (29")	-0.000	< 0.500	Pass	-0.001	> -0.500	Pass	-0.003	> -0.500	Pass
A4 (17")	-0.002	> -0.500	Pass	-0.007	> -0.500	Pass	-0.023	> -0.500	Pass
A5 (10")	-0.012	> -0.500	Pass	-0.025	> -0.500	Pass	-0.053	> -0.500	Pass
A6 (6")	0.014	< 0.500	Pass	0.065	< 0.500	Pass	0.141	< 0.500	Pass

GAIN TOLERANCE

R12KHz

	Measured (mmho/m)	Last Month (mmho/m)	Difference (mmho/m)	Tolerance (mmho/m)	Pass/Fail
A1 (80")	-179182432.000	-179092384.000	90048.000	8954619.200	Pass
A2 (50")	-173978544.000	-173884304.000	94240.000	8694215.200	Pass
A3 (29")	-171180368.000	-171085552.000	94816.000	8554277.600	Pass
A4 (17")	-169473488.000	-169422528.000	50960.000	8471126.400	Pass
A5 (10")	-176881680.000	-176810080.000	71600.000	8840504.000	Pass
A6 (6")	-171115152.000	-171053728.000	61424.000	8552686.400	Pass

R36KHz

	Measured (mmho/m)	Last Month (mmho/m)	Difference (mmho/m)	Tolerance (mmho/m)	Pass/Fail
A1 (80")	-43280176.000	-43437612.000	157436.000	2171880.600	Pass
A2 (50")	-50765772.000	-50918432.000	152660.000	2545921.600	Pass
A3 (29")	-59507816.000	-59656412.000	148596.000	2982820.600	Pass
A4 (17")	-61352352.000	-61493064.000	140712.000	3074653.200	Pass
A5 (10")	-54335288.000	-54486060.000	150772.000	2724303.000	Pass
A6 (6")	-59162912.000	-59310504.000	147592.000	2965525.200	Pass

R72KHz

	Measured (mmho/m)	Last Month (mmho/m)	Difference (mmho/m)	Tolerance (mmho/m)	Pass/Fail
A1 (80")	-66770016.000	-66660640.000	109376.000	3333032.000	Pass


A2 (50")	-56371968.000	-56263204.000	108764.000	2813160.200	Pass
A3 (29")	-53260988.000	-53147188.000	113800.000	2657359.400	Pass
A4 (17")	-50529720.000	-50429672.000	100048.000	2521483.600	Pass
A5 (10")	-52095852.000	-51983752.000	112100.000	2599187.600	Pass
A6 (6")	-52334800.000	-52228144.000	106656.000	2611407.200	Pass
PASS/FAIL SUMMARY					
Std Deviation Verification			Pass		
Average Verification			Pass		
Gain Tolerance Verification			Pass		

CALIBRATION SUMMARY						
Sensor	Shop	Field	Post	Difference	Tolerance	Units
GTET-11259758						
Gamma Ray Calibrator	263.5	268.7	-----	-5.2	+/- 9.00	api
DSNT-10860047						
Snow-Block Porosity	0.0543	0.0486	-----	0.0057	+/- 0.0150	decp
SDLT-10695352						
Pad Extension	3.75	3.76	-----	-0.01	+/-0.10	in
Ring Diameter	8.25	8.23	-----	0.02	+/-0.15	in
SDLT Pad-10808420						
Near(B+D+P+L)	1240.297	1234.897	-----	5.400	+/-14.281	cps
Far(B+D+P+L)	820.256	818.542	-----	1.714	+/-15.801	cps
Microlog Pad-10695352						
MicroLog Normal	20.04	20.02	-----	0.02	+/-0.80	ohmm
MicroLog Lateral	20.13	20.10	-----	0.03	+/-0.80	ohmm
ACRt Sonde-10967818						
Mud Cell	0.99	-----	-----	0	-----	ohm-m
Data: EXP_EWS-4A\0001 TRIPLE_MICROLOG\004 04-Feb-17 20:37 Up 10149.3f						
						Date: 04-Feb-17 20:42:41

HALLIBURTON			
CUSTOMER EVENT LOG			
Event Type	Time & Date	Depth (ft)	Event Description
	04-Feb-17 20:08:48.881	8713.75	Logging 001 04-Feb-17 20:08 Up @8713.8f
	04-Feb-17 20:14:38.113	8435.97	Halting 001 04-Feb-17 20:08 Up @8713.8f
	04-Feb-17 20:14:56.819	8374.00	Logging 002 04-Feb-17 20:14 Dn @8374.0f
	04-Feb-17 20:23:57.701	10051.12	Halting 002 04-Feb-17 20:14 Dn @8374.0f
	04-Feb-17 20:26:25.921	10151.00	Logging 003 04-Feb-17 20:26 Up 10151.0f
	04-Feb-17 20:33:40.225	9771.89	Halting 003 04-Feb-17 20:26 Up 10151.0f
	04-Feb-17 20:37:11.090	10149.25	Logging 004 04-Feb-17 20:37 Up 10149.3f
	04-Feb-17 20:56:54.276	9060.39	Halting 004 04-Feb-17 20:37 Up 10149.3f
	04-Feb-17 21:00:43.550	9250.25	Logging 005 04-Feb-17 21:00 Up @9250.3f
	04-Feb-17 21:23:47.820	7991.13	Halting 005 04-Feb-17 21:00 Up @9250.3f
Data: EXP_EWS-4A\0001 TRIPLE_MICROLOG\HW11384			Date: 04-Feb-17 21:50:01

HALLIBURTON	
TOOL STRING DIAGRAM REPORT	

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
				Fishing Neck @ 53.97 ft		54.85 ft
RWCH-11103904 135.00 lbs		Ø 2.310 in → Ø 3.625 in →		Load Cell @ 51.17 ft BH Temperature @ 50.60 ft	6.25 ft	
				Z-Accelerometer @ 48.15 ft		48.60 ft
GTET-11259758 165.00 lbs		Ø 3.625 in →		GammaRay @ 42.54 ft	8.52 ft	
						40.08 ft
DSNT-10860047 174.00 lbs		Ø 3.625 in →		DSN Far @ 33.14 ft DSN Near @ 32.39 ft	9.69 ft	
						30.39 ft
SDLT-10695352 360.00 lbs	SDLT Pad-10808420 65.00 lbs Microlog Pad-10695352 8.00 lbs	Ø 4.500 in → Ø 4.500 in* → Ø 4.750 in* →		Microlog @ 22.58 ft SDL Caliper @ 22.40 ft SDL @ 22.39 ft	10.81 ft	
						19.58 ft
ACRt Instrument- 10961994 50.00 lbs		Ø 3.625 in →		Mud Resistivity @ 13.19 ft	5.03 ft	
						14.55 ft
ACRt Sonde- 10967818 200.00 lbs		Ø 3.625 in →		ACRt @ 9.21 ft	14.22 ft	

SP Ring-10988480 0.00 lbs		Ø 3.625 in*	→		←	SP @ 1.61 ft		
Bull Nose-12345678 50.00 lbs		Ø 2.750 in	→				0.33 ft	0.33 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			11103904	135.00	6.25	48.60	300.00
GTET	Gamma Telemetry Tool			11259758	165.00	8.52	40.08	60.00
DSNT	Dual Spaced Neutron			10860047	174.00	9.69	30.39	60.00
SDLT	Spectral Density Tool			10695352	360.00	10.81	19.58	60.00
SDLP	Density Insite Pad			10808420	65.00	2.55	*	21.79
MICP	Microlog Pad			10695352	8.00	1.00	*	22.08
ACRt	Array Compensated True Resistivity Instrument Section			10961994	50.00	5.03	14.55	120.00
ACRt	Array Compensated True Resistivity Sonde Section			10967818	200.00	14.22	0.33	120.00
SP	SP Ring			10988480	0.00	0.25	*	1.61
BLNS	ROLLER BOGIE			12345678	50.00	0.33	0.00	300.00
Total					1,207.00	54.85		
* Not included in Total Length and Length Accumulation.								
Data: EXP_EWS-4A\0001 TRIPLE_MICROLOG\004 04-Feb-17 20:37 Up 10149.3f								
Date: 04-Feb-17 20:40:29								

COMPANY	EXPEDITION WATER SOLUTIONS COLORADO LLC		
WELL	EWS 4A		
FIELD	WATTENBERG		
COUNTY	WELD	STATE	CO
HALLIBURTON		SPECTRAL DENSITY DUAL SPACED NEUTRON ARRAY COMPENSATED TRUE RESISTIVITY MICROLOG	