

# HALLIBURTON

## BOREHOLE SONIC ARRAY LOG

COMPANY **NEW GULF OPERATING, LLC**  
 WELL **HORTON #1**  
 FIELD **LANGDON**  
 COUNTY **RENO**  
 STATE **KANSAS**

COMPANY **NEW GULF OPERATING, LLC**  
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API No. 15-155-21574  
 Location 964' FNL & 670' FWL

Other Services:  
 SDL / DSN / ML  
 ACRT

Sec. 32 Twp. 24S Rge. 9W  
 ELEV. 1707.0 ft  
 GROUND LEVEL  
 KELLY BUSHING  
 KELLY BUSHING  
 10.0 ft above perm. Datum  
 ELEV.: K.B. 1717.0 ft  
 D.F. 1716.0 ft  
 G.L. 1707.0 ft

Date	23-Jun-11
Run No.	ONE
Depth - Driller	4320.00 ft
Depth - Logger	4300.0 ft
Bottom - Logged Interval	4273.0 ft
Top - Logged Interval	222.0 ft
Casing - Driller	8.625 in @ 226.0 ft
Casing - Logger	222.0 ft
Bit Size	7.875 in @
Type Fluid in Hole	WATER BASED MUD
Density	9.0 ppg 48.00 sg/qt
PH	11.50 pH 8.0 cp/m
Source of Sample	FLOW LINE
Rm @ Meas. Temperature	0.320 ohmm @ 74.00 degF
Rmf @ Meas. Temperature	0.27 ohmm @ 73.00 degF
Rmc @ Meas. Temperature	0.380 ohmm @ 73.00 degF
Source Rmf	MEASURED MEASURED
Rm @ BHT	0.16 ohmm @ 120.0 degF
Time Since Circulation	3.3 hr
Time on Bottom	23-Jun-11 21:59
Max. Rec. Temperature	120.0 degF @ 4300.0 ft
Equipment	10549592 LIBERAL
Recorded By	S. JUNG
Witnessed By	R. RODRIGUEZ

Fold here

Service Ticket No.: 8264517      API Serial No.: 15-155-21574      PGM Version: WL INSITE R3.2.5 (Build 2)

CHANGE IN MUD TYPE OR ADDITIONAL SAMPLE				RESISTIVITY SCALE CHANGES				
Date	Sample No.			Type Log	Depth	Scale Up Hole	Scale Down Hole	
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.	@	@						
Rmc @ Meas. Temp.	@	@						
Source Rmf	Rmc							
Rm @ BHT	@	@						
Rmf @ BHT	@	@						
Rmc @ BHT	@	@						

EQUIPMENT DATA							
GAMMA		ACOUSTIC		DENSITY		NEUTRON	
Run No.	ONE	Run No.	ONE	Run No.		Run No.	
Serial No.	10811258	Serial No.	10747683	Serial No.		Serial No.	
Model No.	GTET	Model No.	BSAT	Model No.		Model No.	
Diameter	3.625"	No. of Cent.	TWO	Diameter		Diameter	
Detector Model No.	T-102	Spacing	0.5'	Log Type		Log Type	
Type	SCINT			Source Type		Source Type	
Length	8"	LSA [Y/N]	Y	Serial No.		Serial No.	
Distance to Source	10'	FWDA [Y/N]	N	Strength		Strength	

LOGGING DATA

GENERAL      GAMMA      ACOUSTIC      DENSITY      NEUTRON

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

**DIRECTIONAL INFORMATION**

Maximum Deviation @ KOP @

Remarks: ANNULAR HOLE VOLUME CALCULATED FOR 5.5-INCH CASING

GPS COORDINATES: LAT: 37.77 N & LONG: 98.51 W

CHLORIDES REPORTED AT 12,000 PPM LCM REPORTED AT 2 PPB

POST TOOL SURVEY NOT PERFORMED ON LOCATION PER CUSTOMER REQUEST

RUBBER STANDOFFS USED INSTEAD OF CENTRALIZERS

TODAY'S CREW: F. VILLA, P. COBLE

THANK YOU FOR CHOOSING HALLIBURTON ENERGY SERVICES - LIBERAL, KS (620-624-8123)

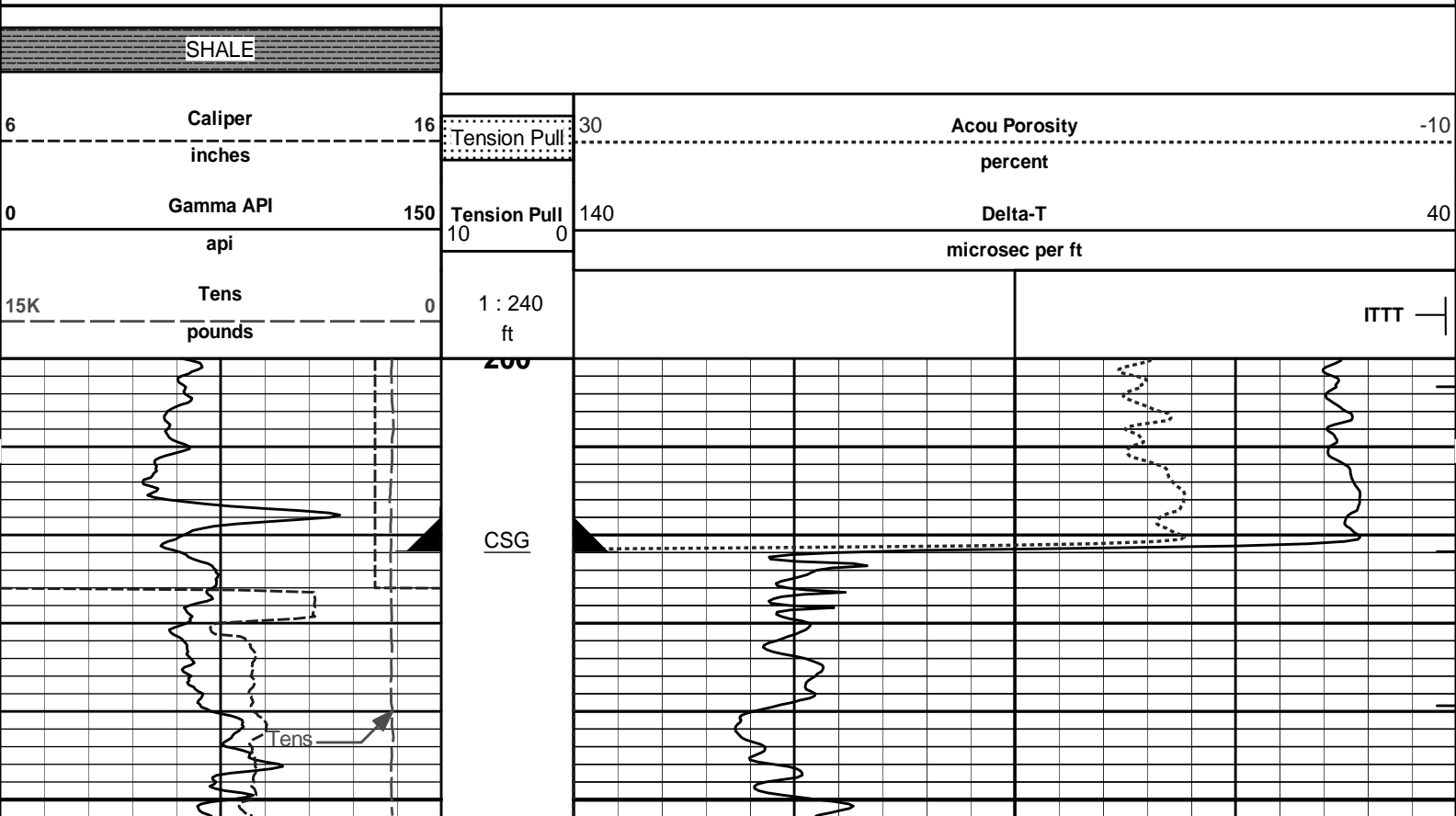
HALLIBURTON DOES NOT GUARANTEE THE ACCURACY OF ANY INTERPRETATION OF THE LOG DATA, CONVERSION OF LOG DATA TO PHYSICAL ROCK PARAMETERS OR RECOMMENDATIONS WHICH MAY BE GIVEN BY HALLIBURTON PERSONNEL OR WHICH APPEAR ON THE LOG OR IN ANY OTHER FORM. ANY USER OF SUCH DATA, INTERPRETATIONS, CONVERSIONS, OR 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.

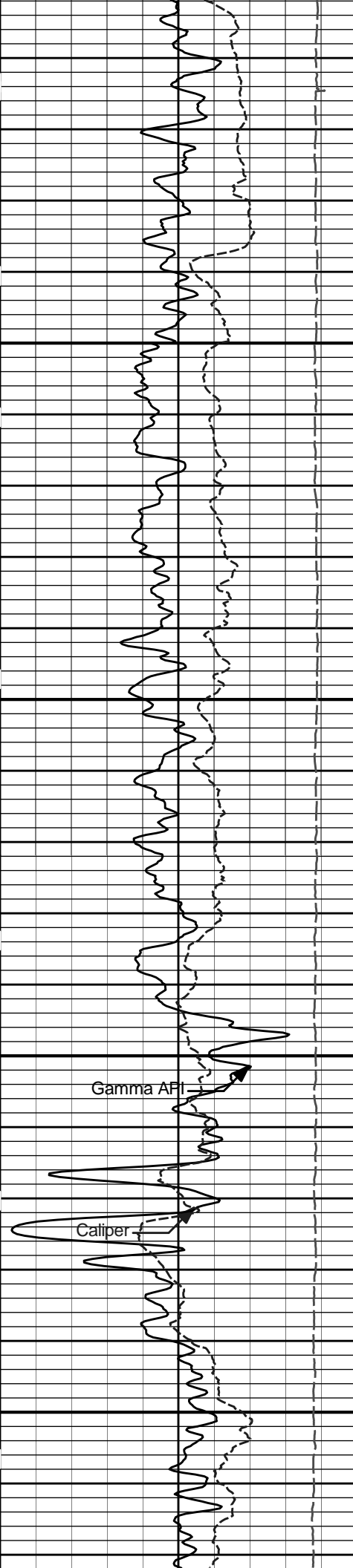
HALLIBURTON



Plot Time: 24-Jun-11 00:43:50  
 Plot Range: 200 ft to 4304 ft  
 Data: HORTON\_1\Well Based\DAQ-0001-CSG\  
 Plot File: \BSAT\BSAT\_5\_MAIN\_LIB

## 5 INCH MAIN LOG



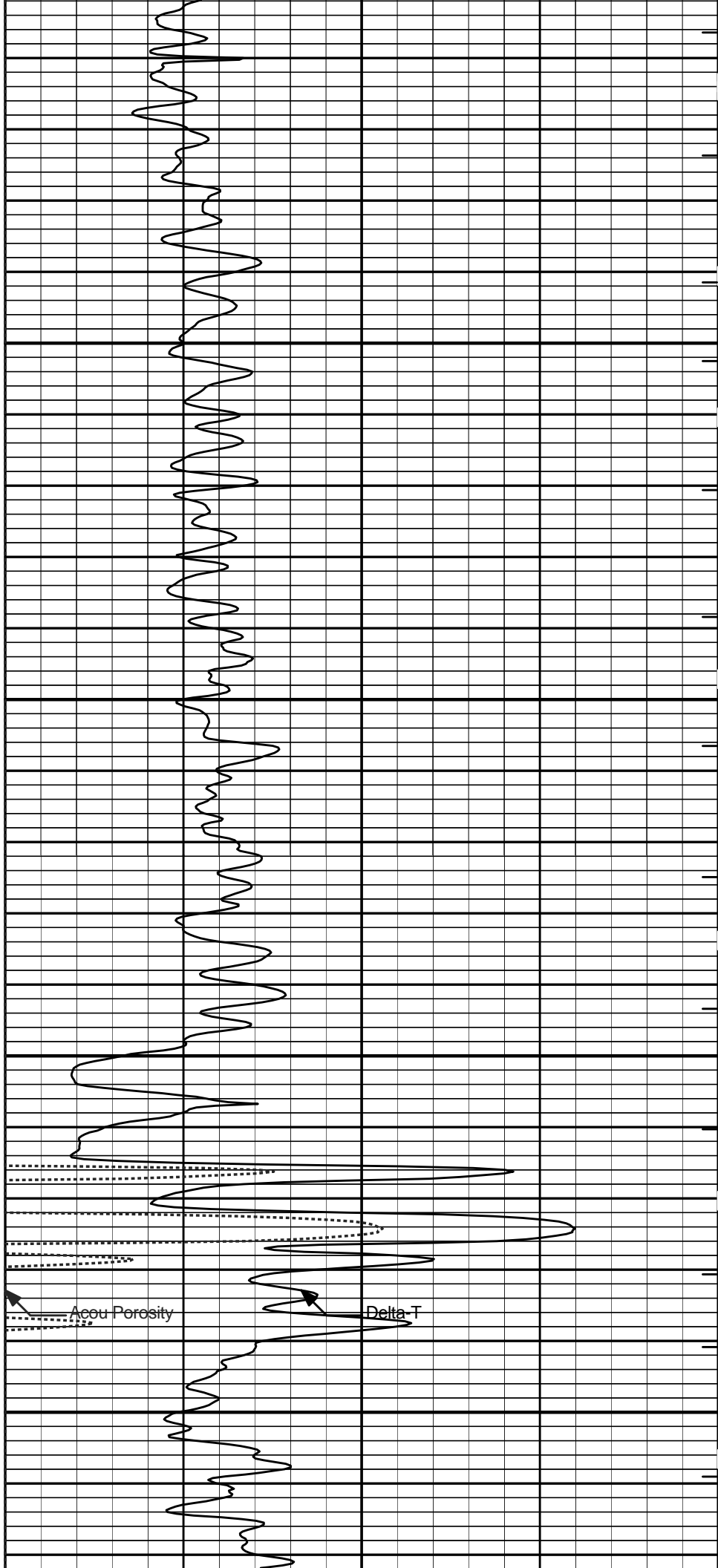


300

400

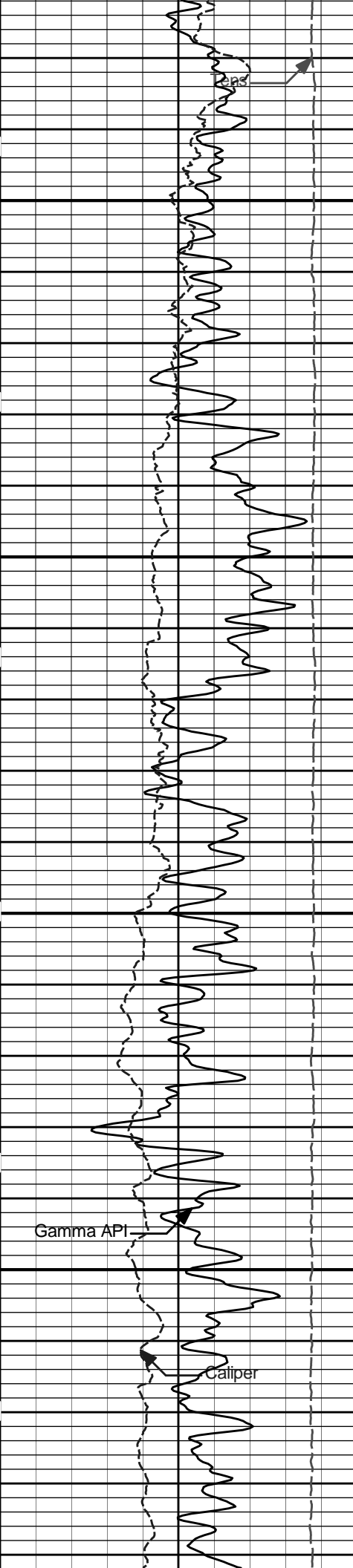
Gamma API

Caliper



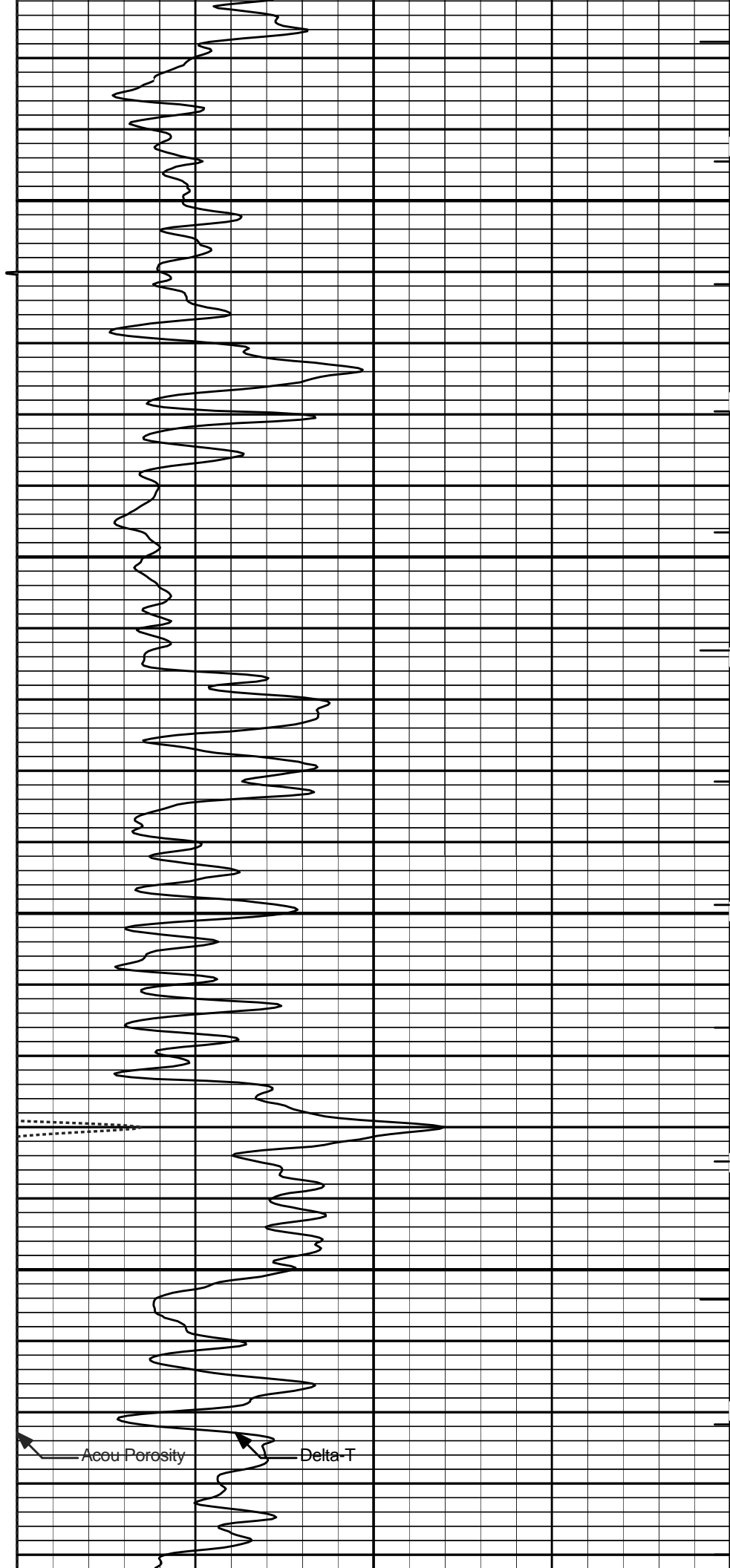
Acou Porosity

Delta T



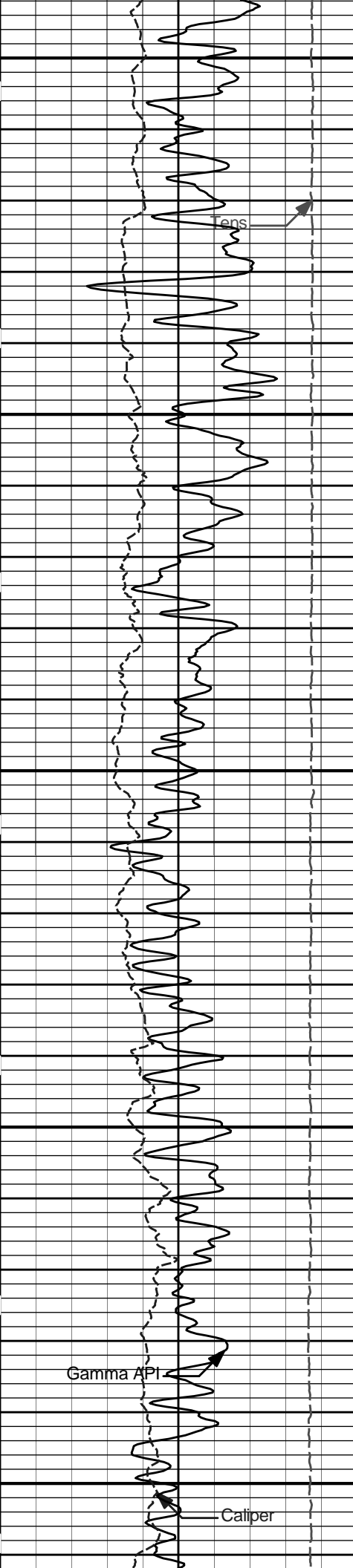
500

600



Acou Porosity

Delta-T



700

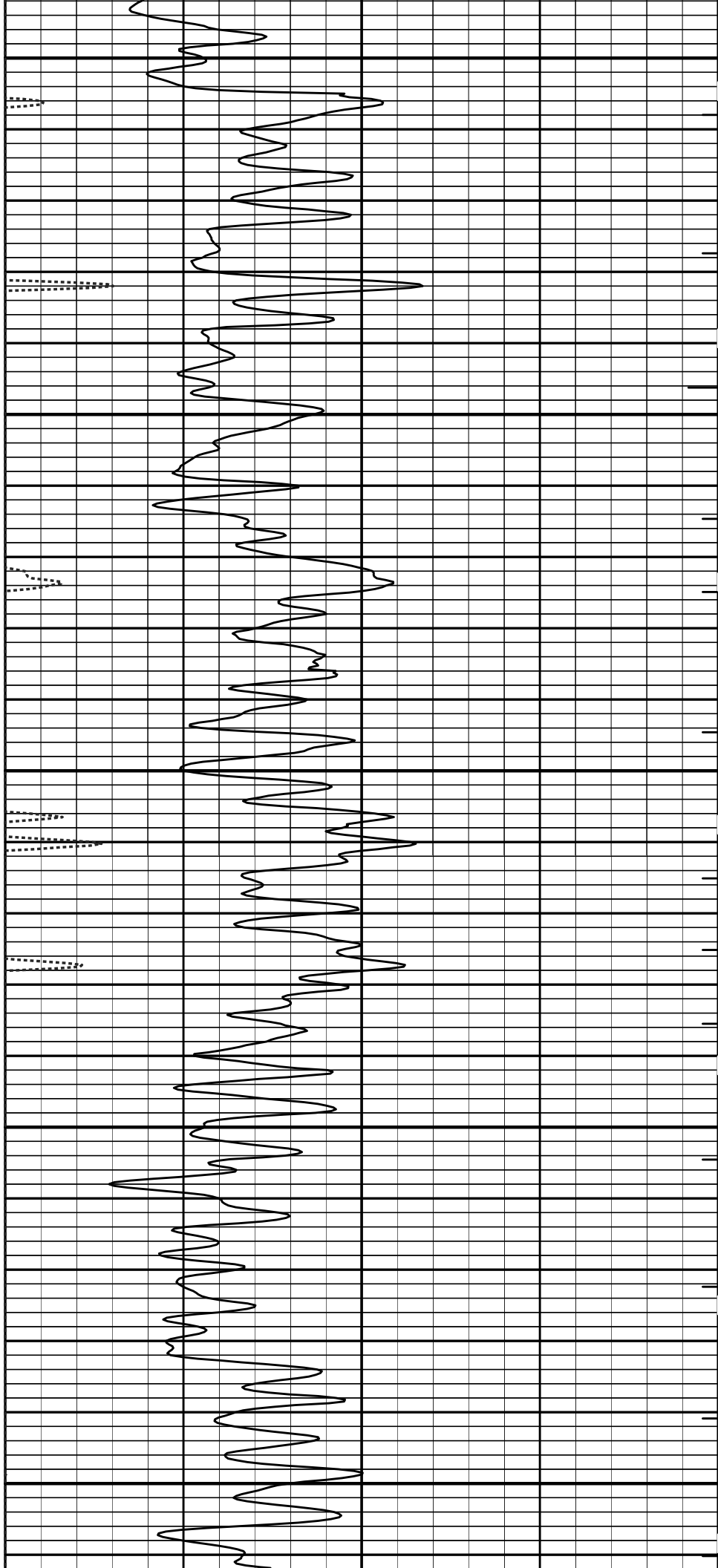
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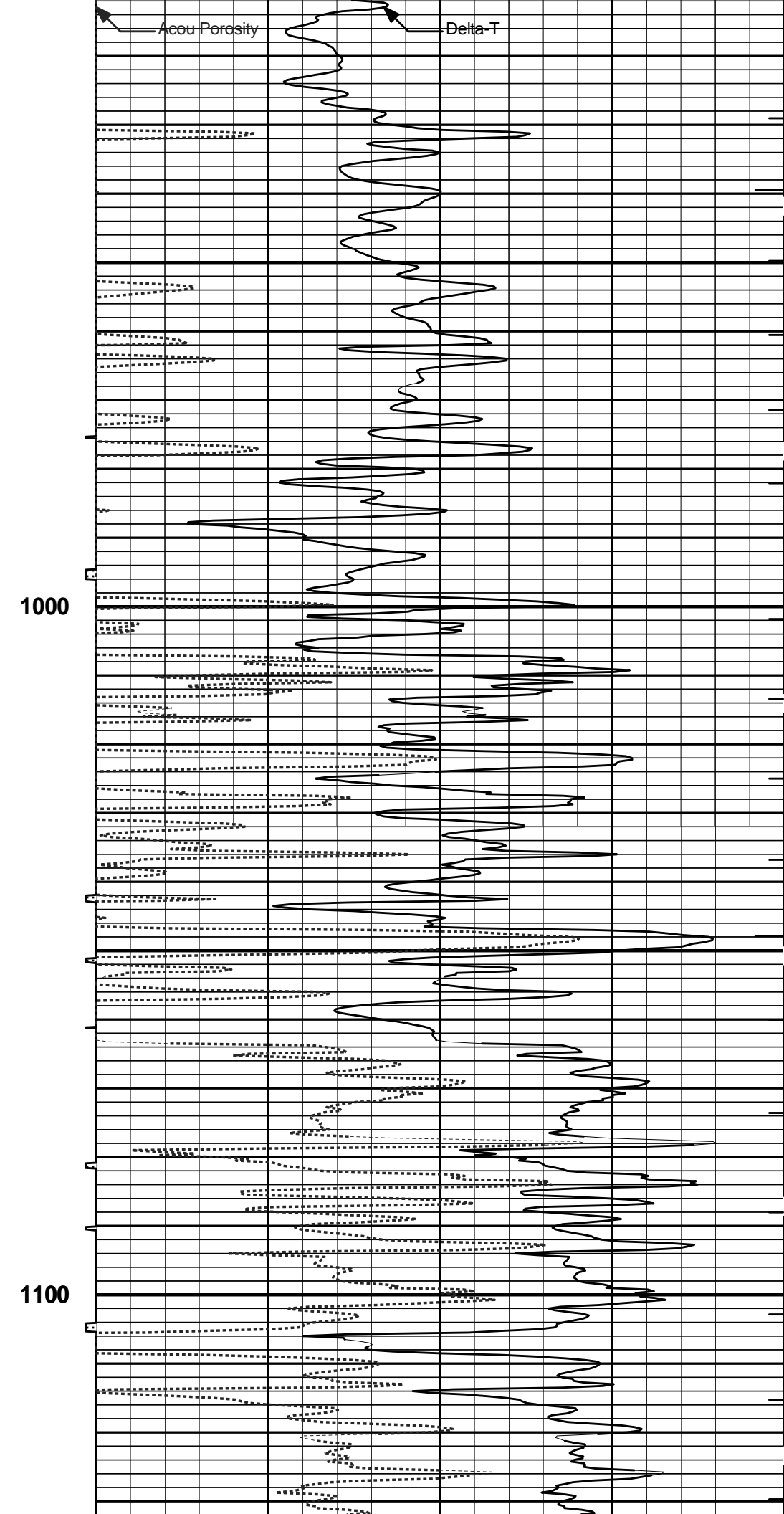
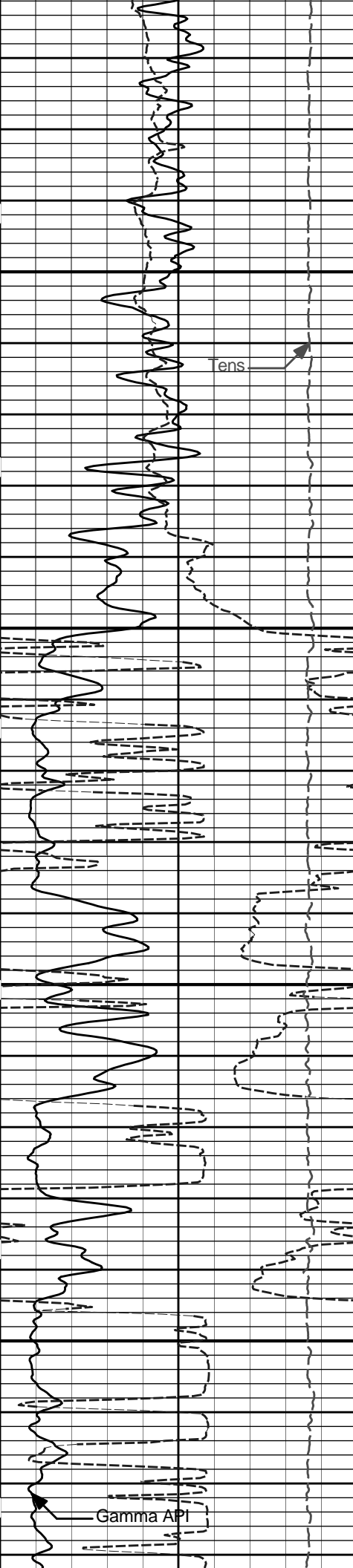
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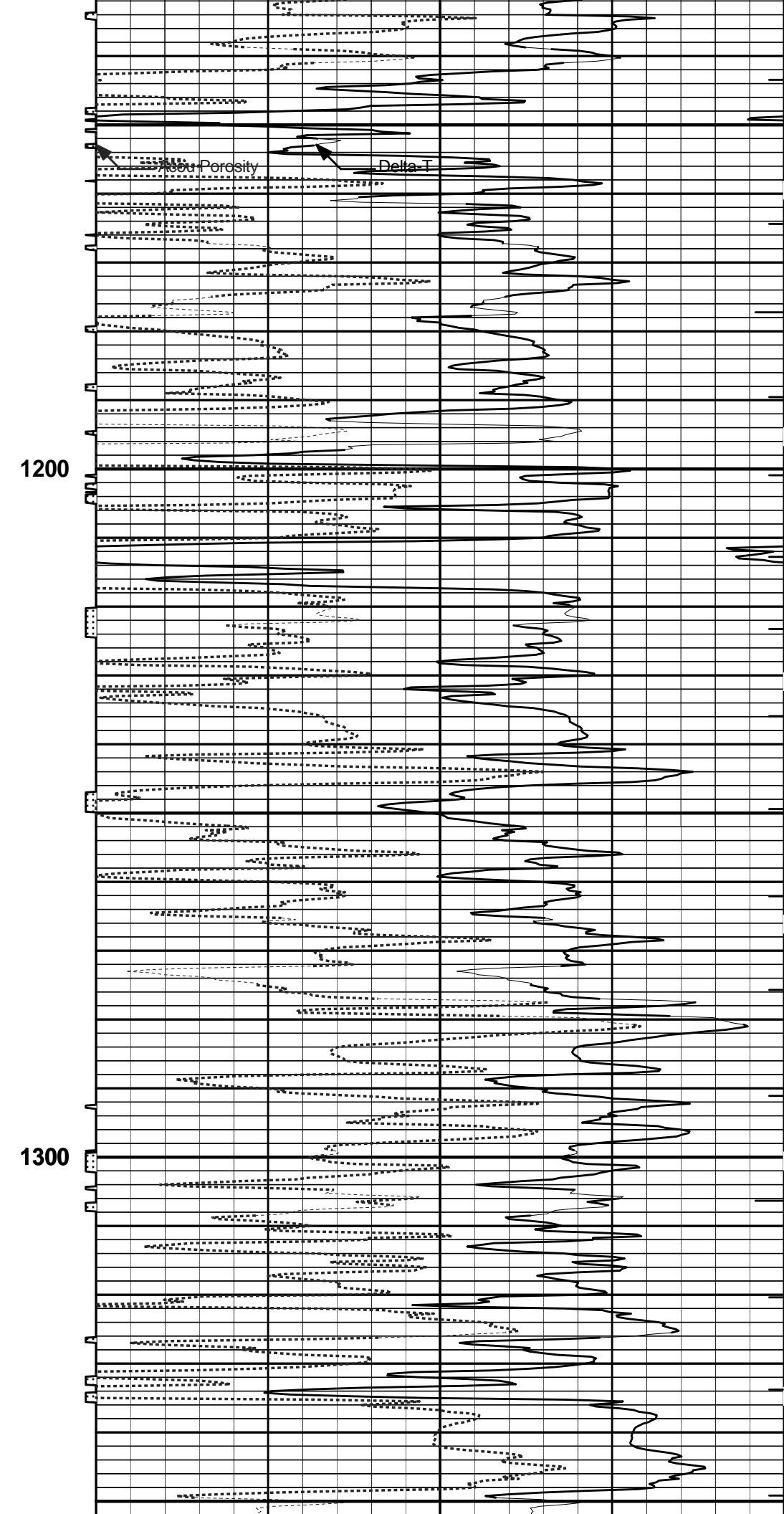
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Gamma API

Caliper

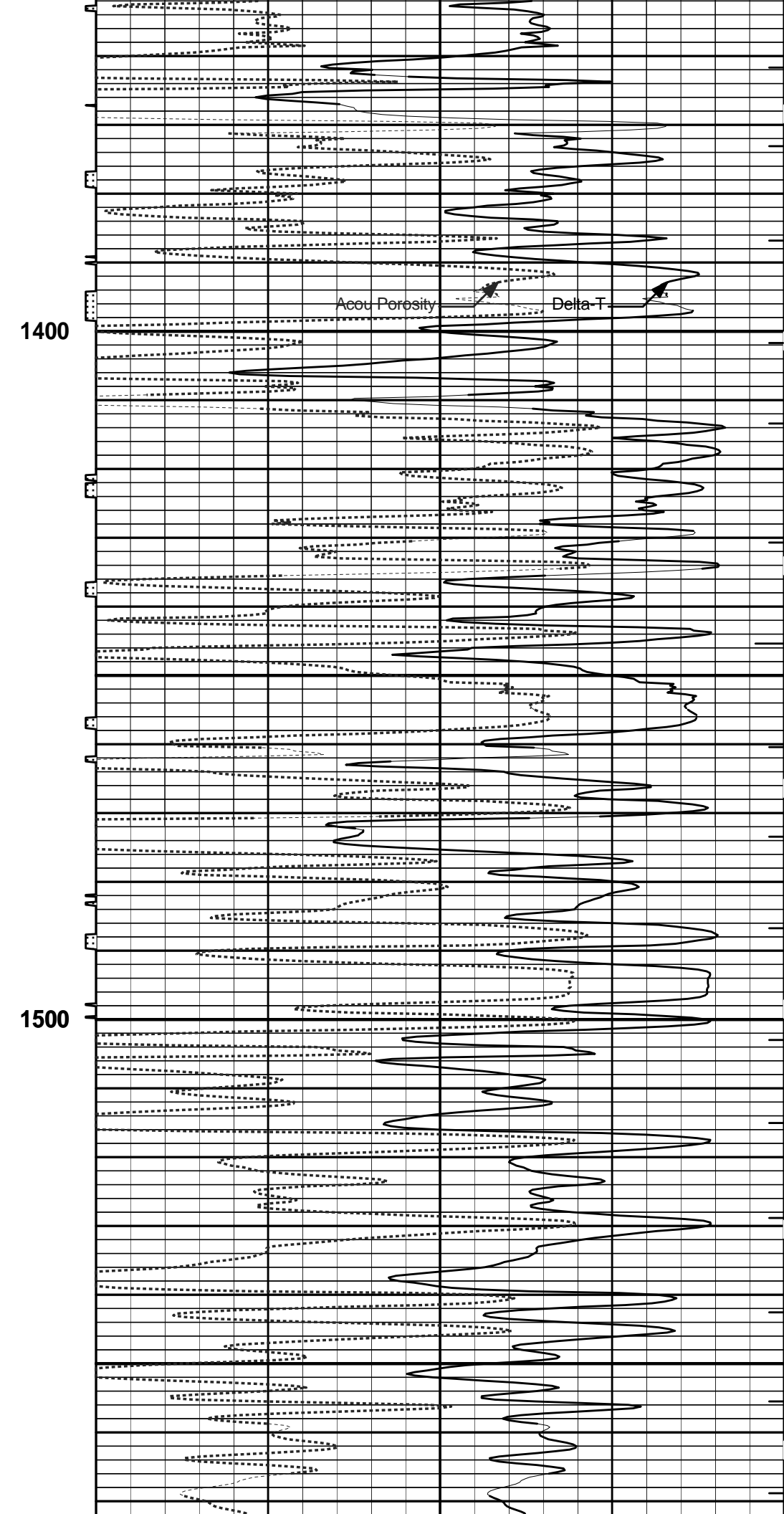
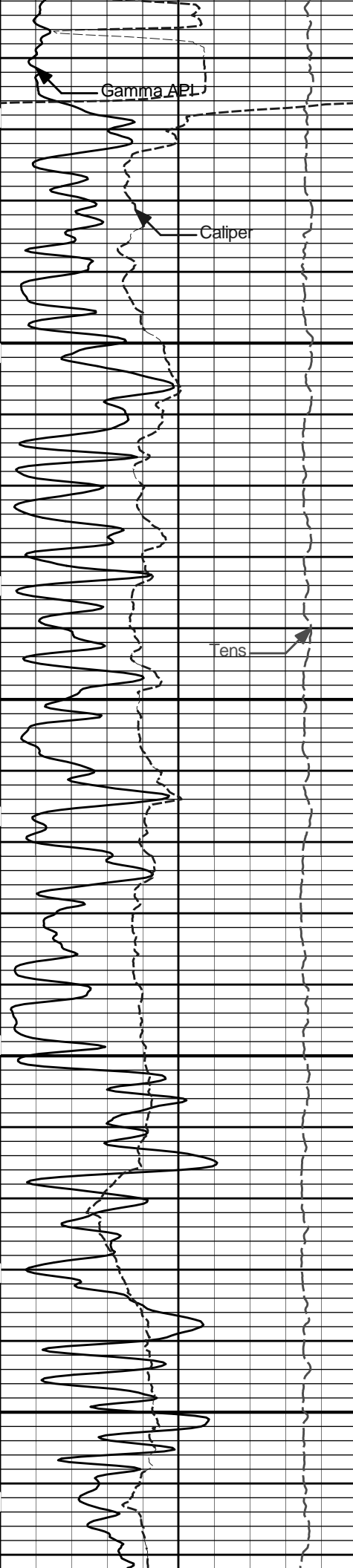


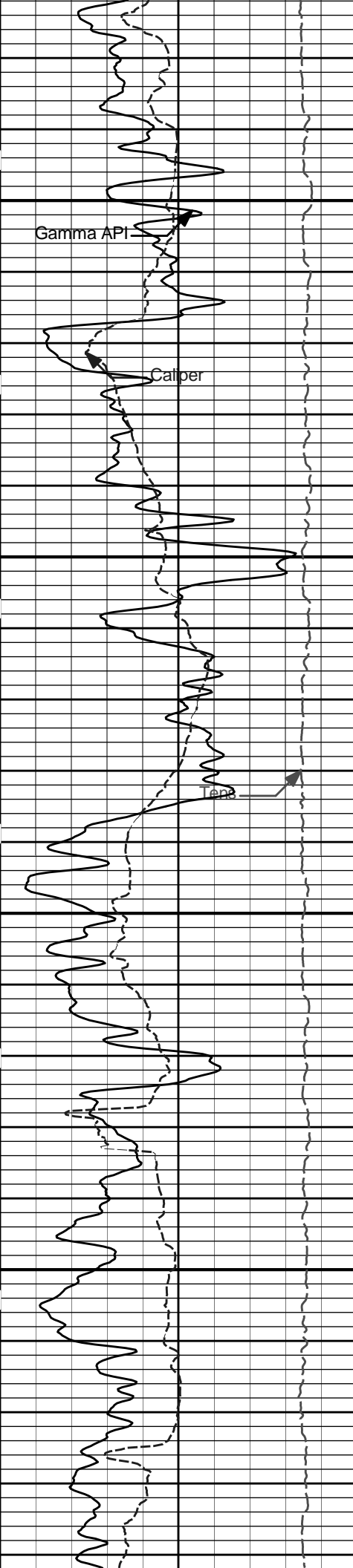




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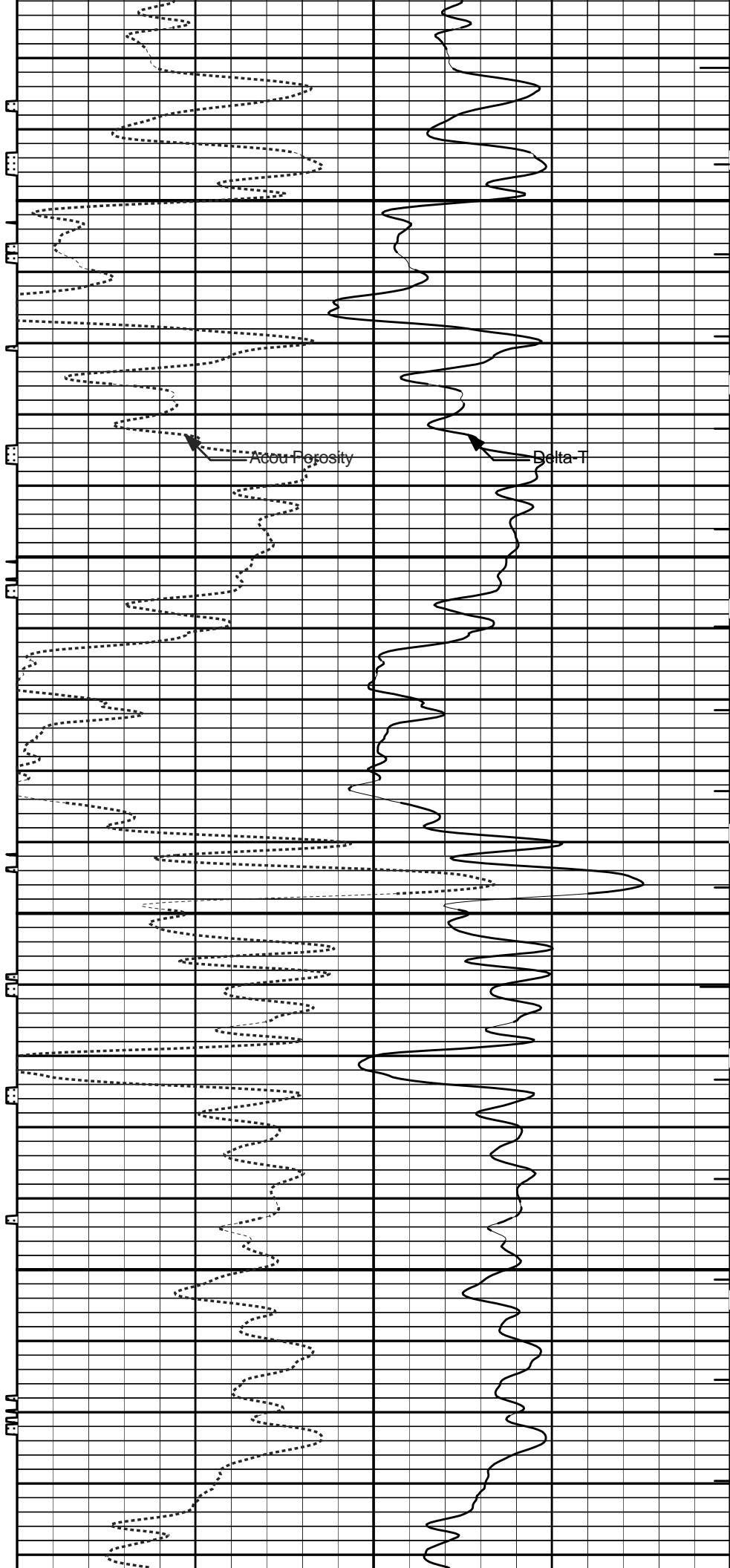
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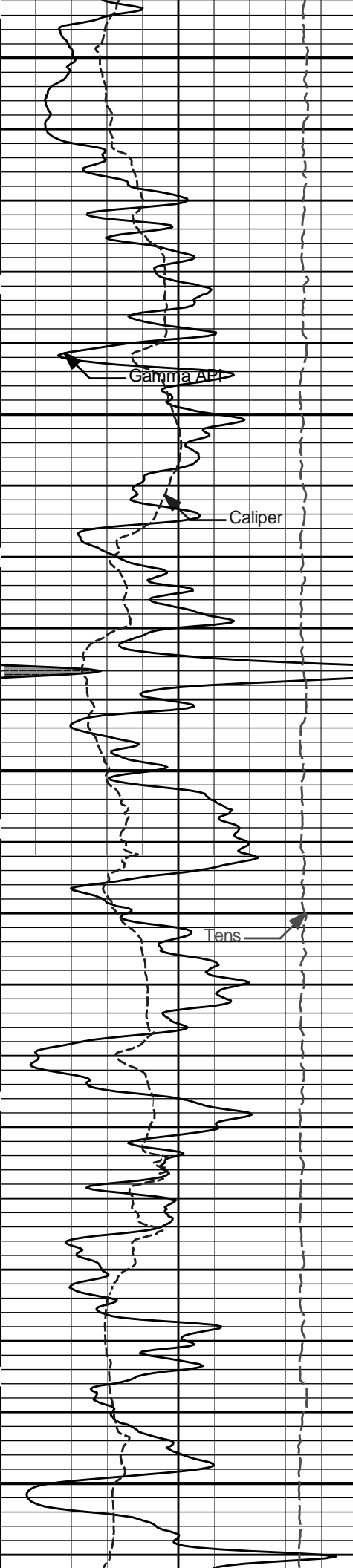




1600

1700





1800

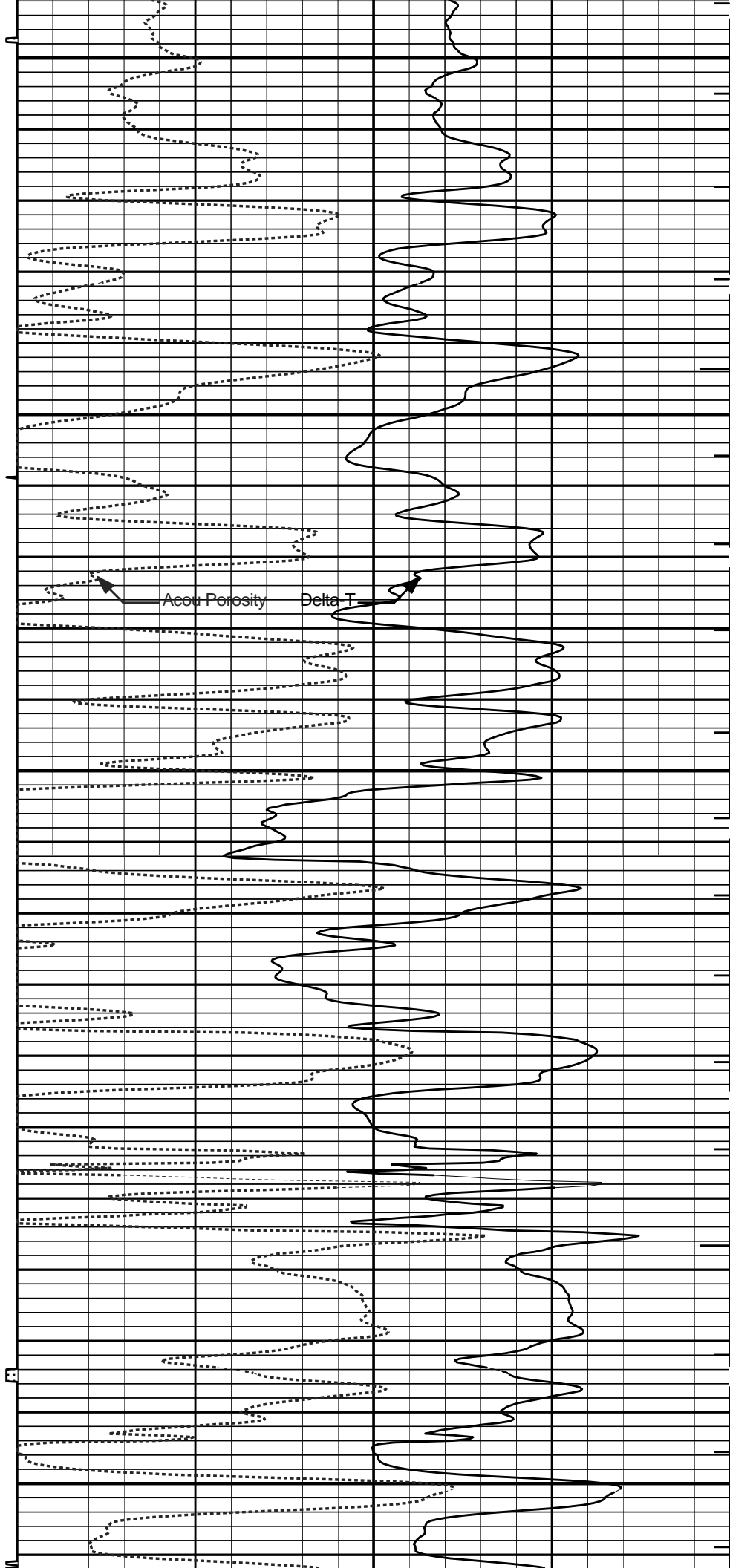
Gamma API

Caliper

Tens

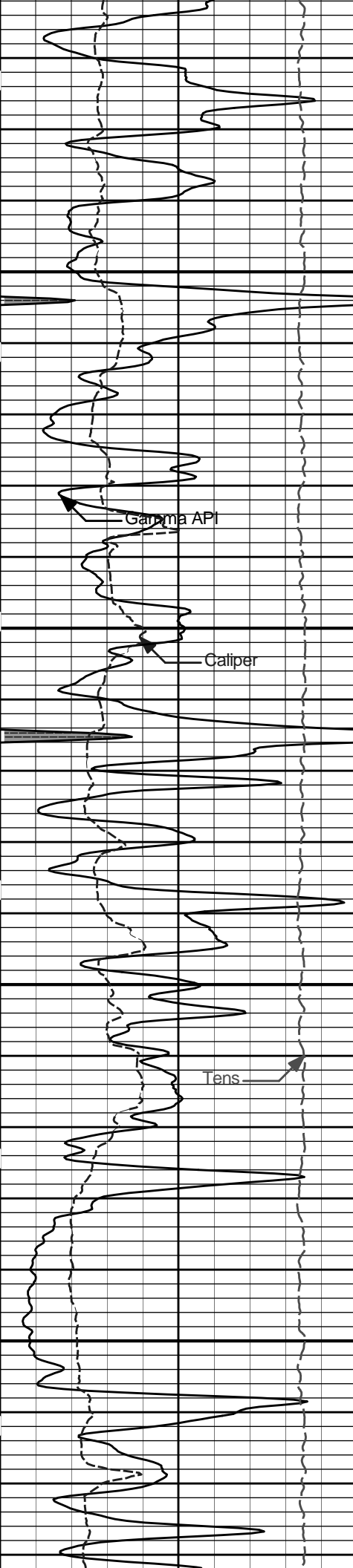
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2000



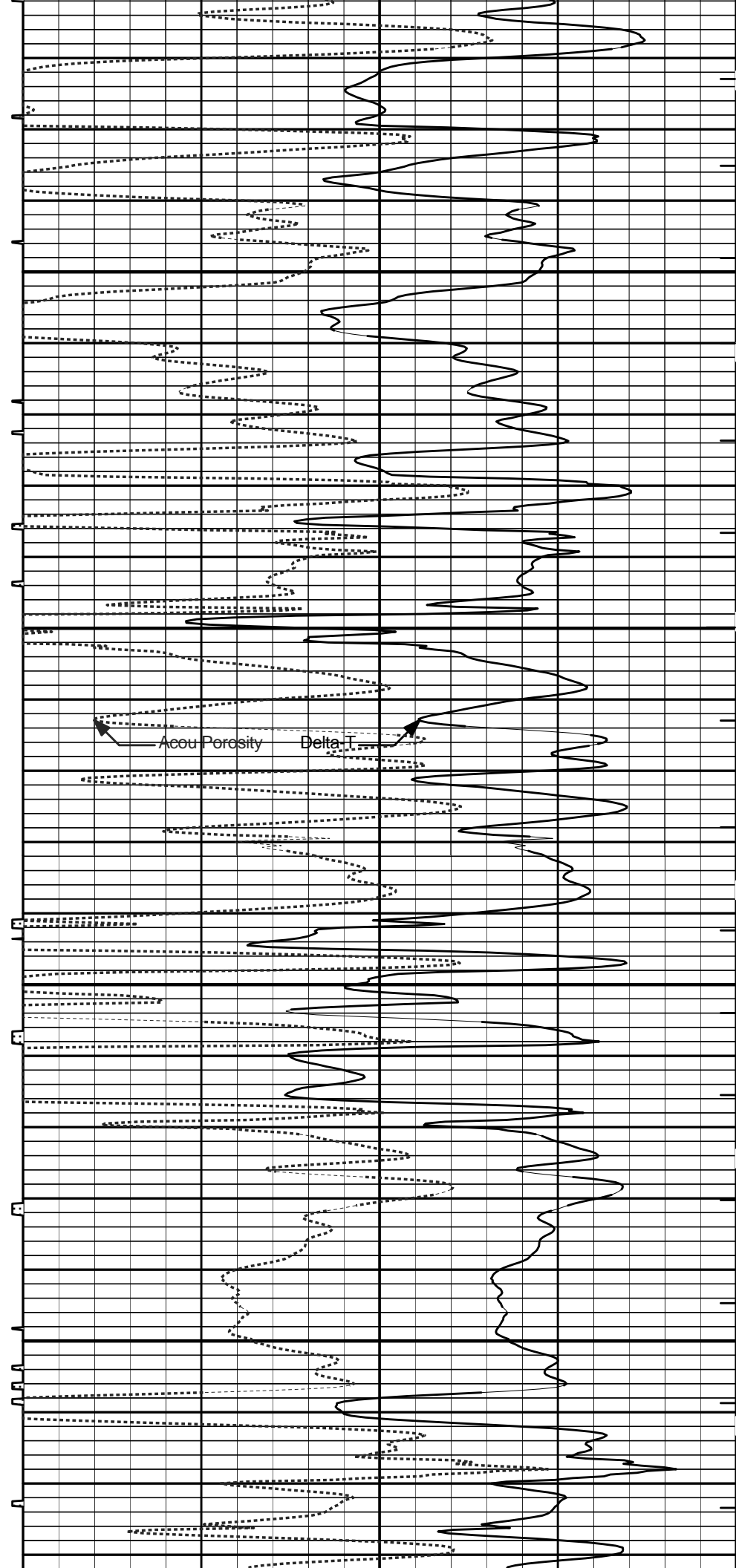
Acou Porosity

Delta-T

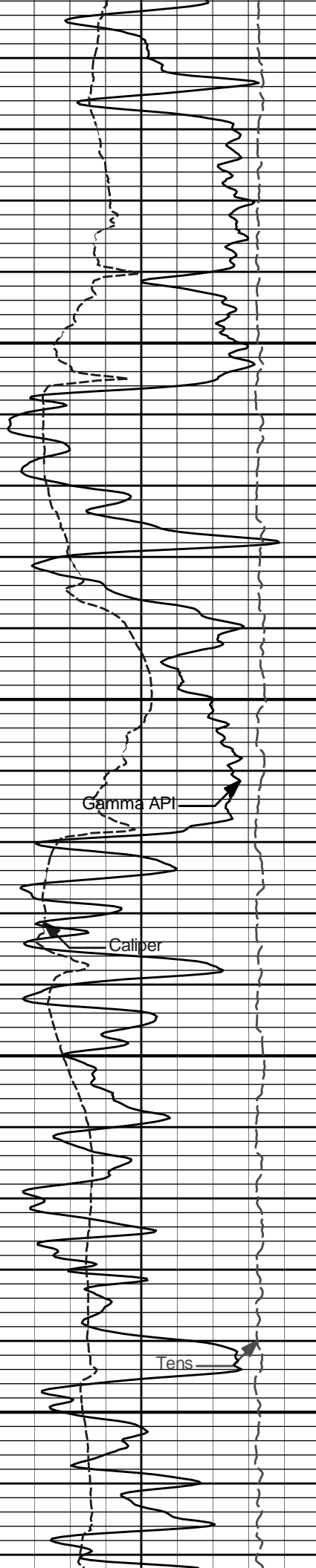


2100

2200

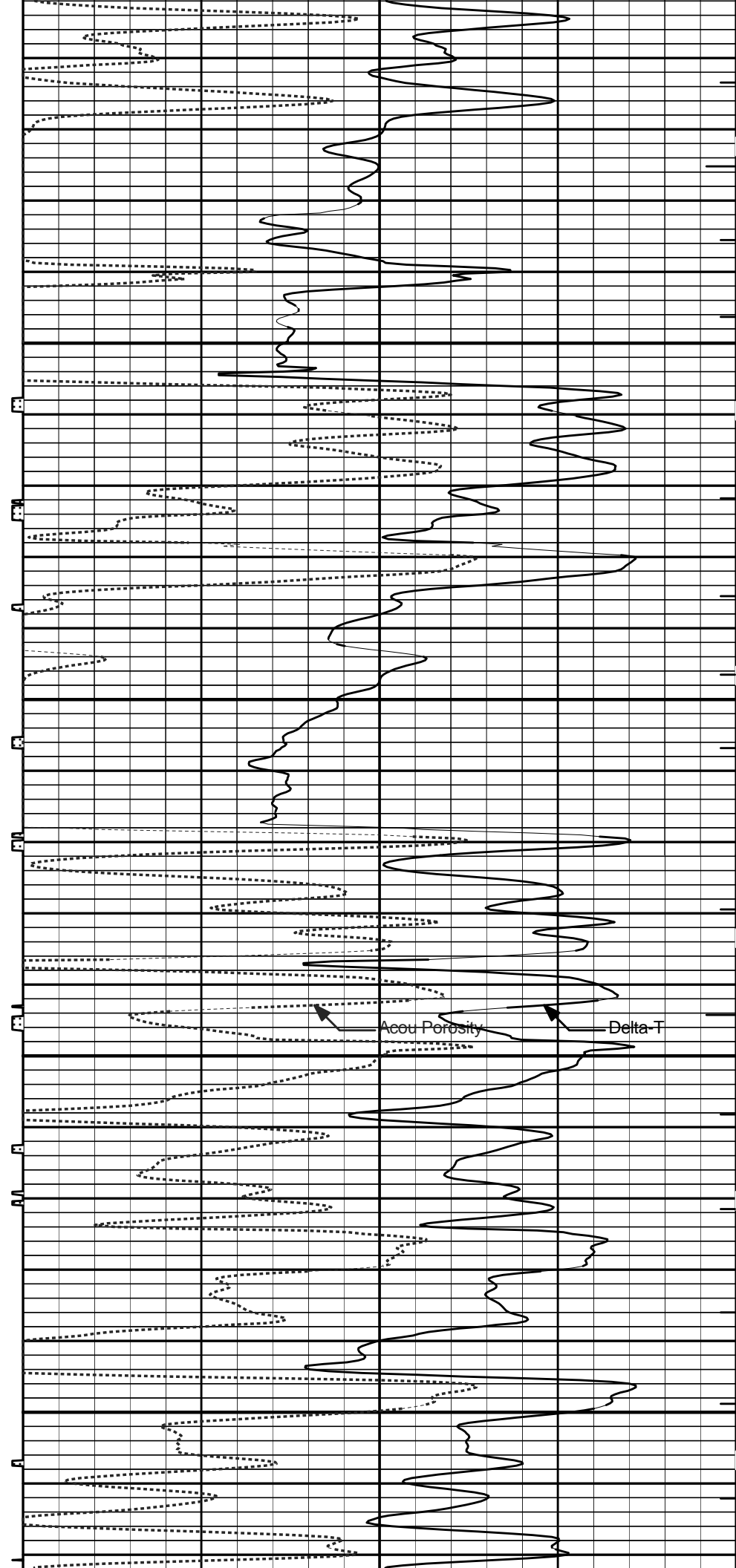






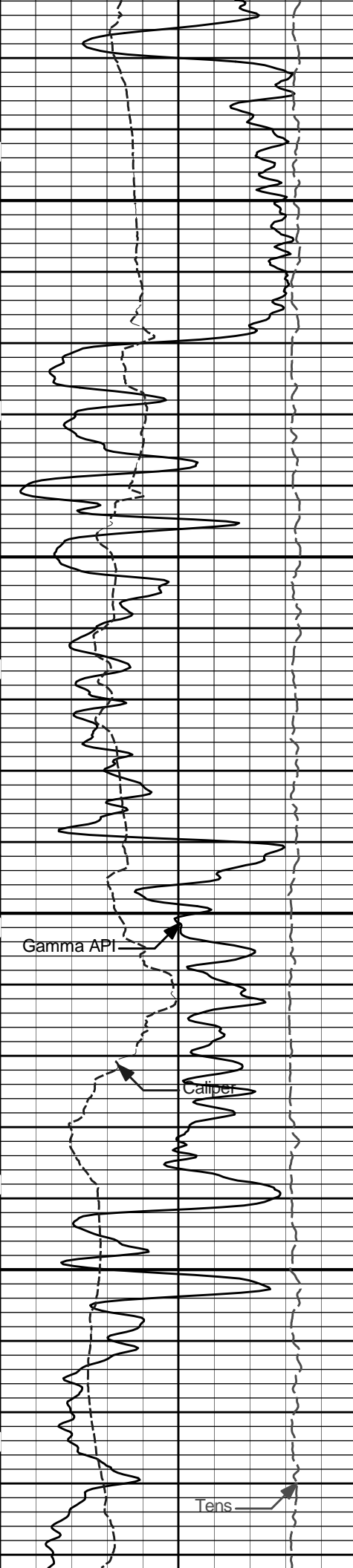
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2600



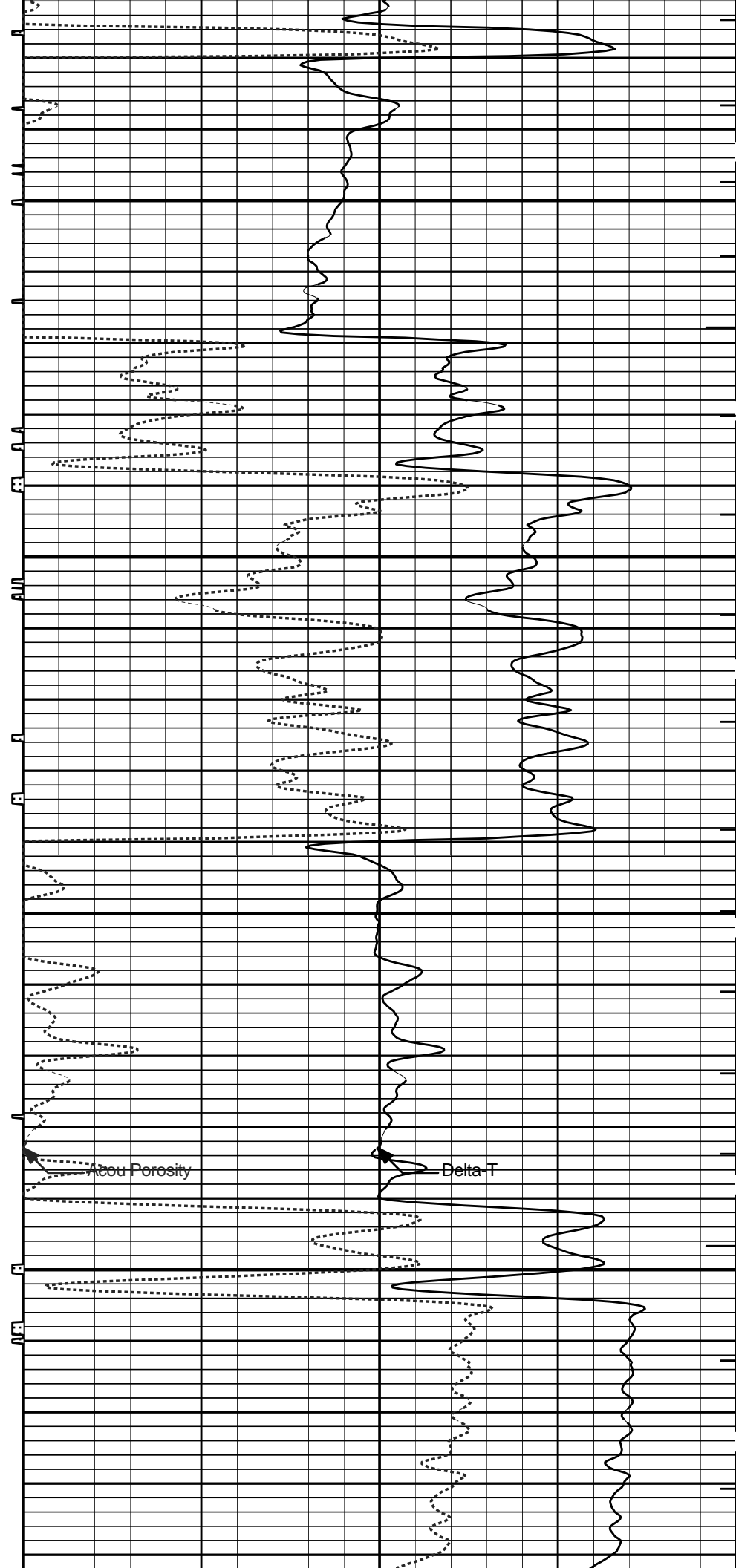
Acou Porosity

Delta-T



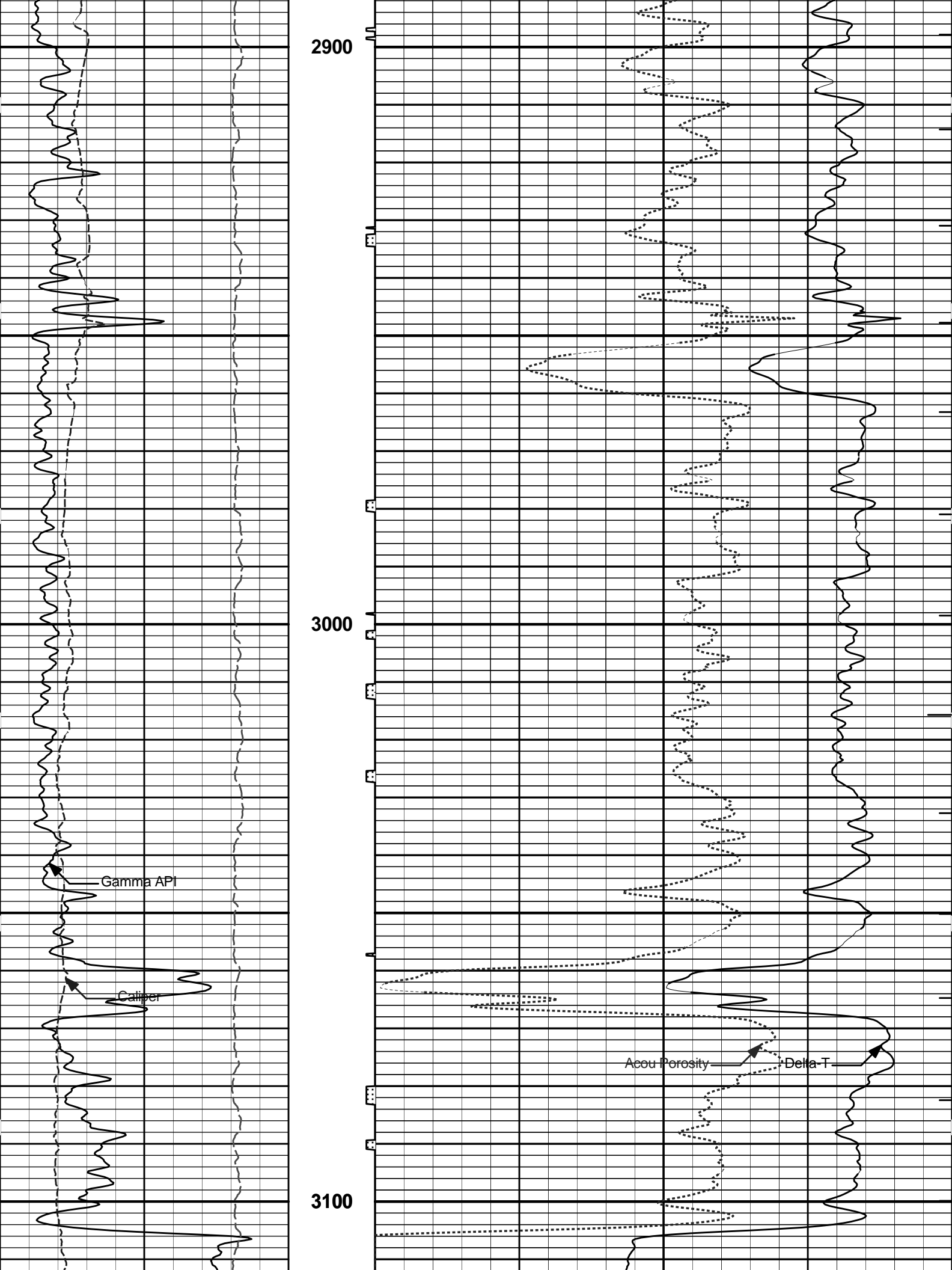
2700

2800



Abou Porosity

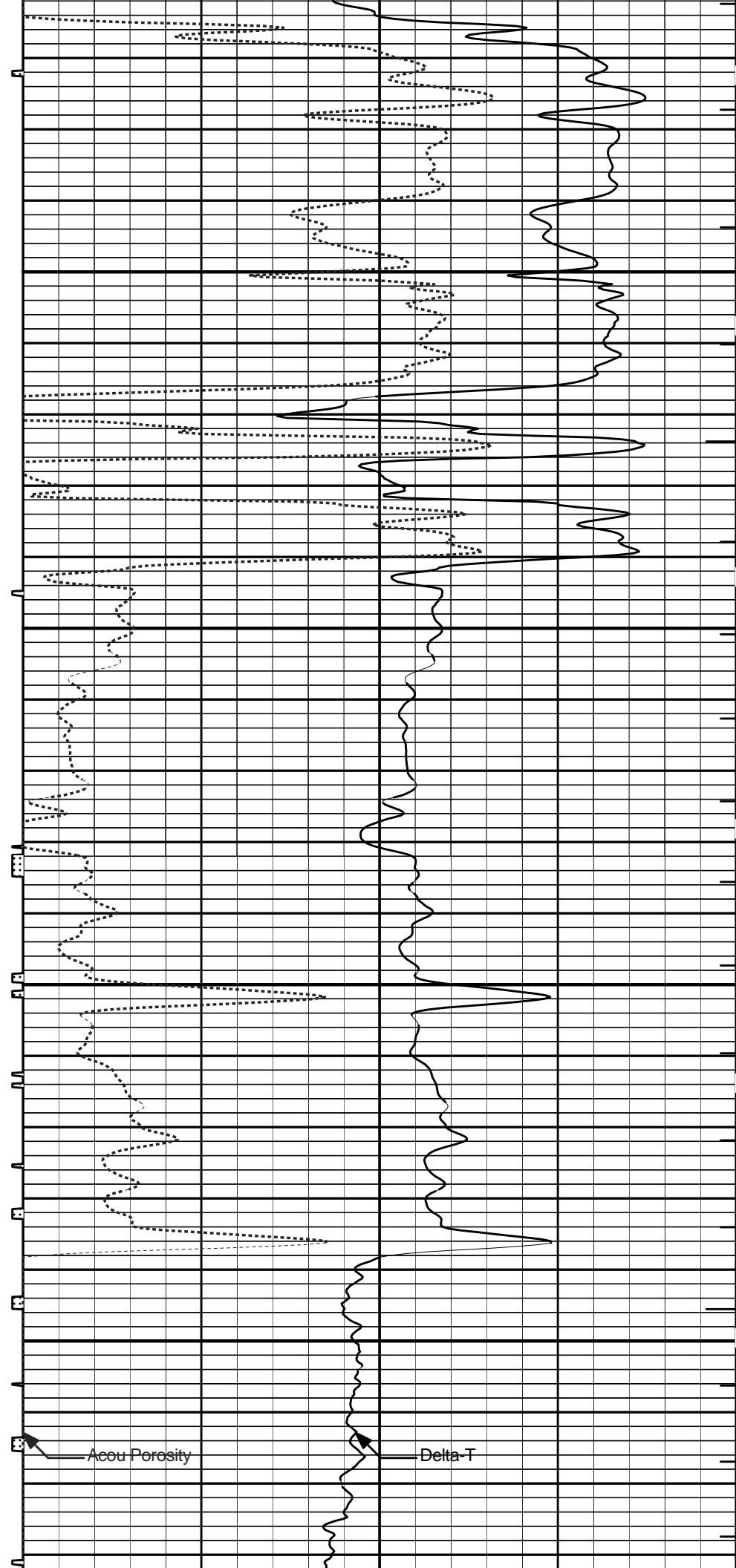
Delta-T

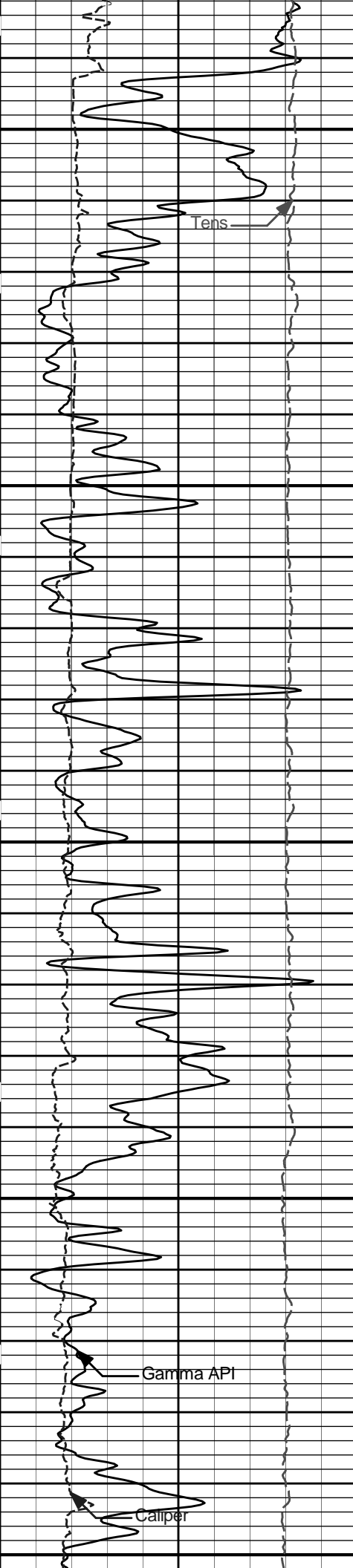




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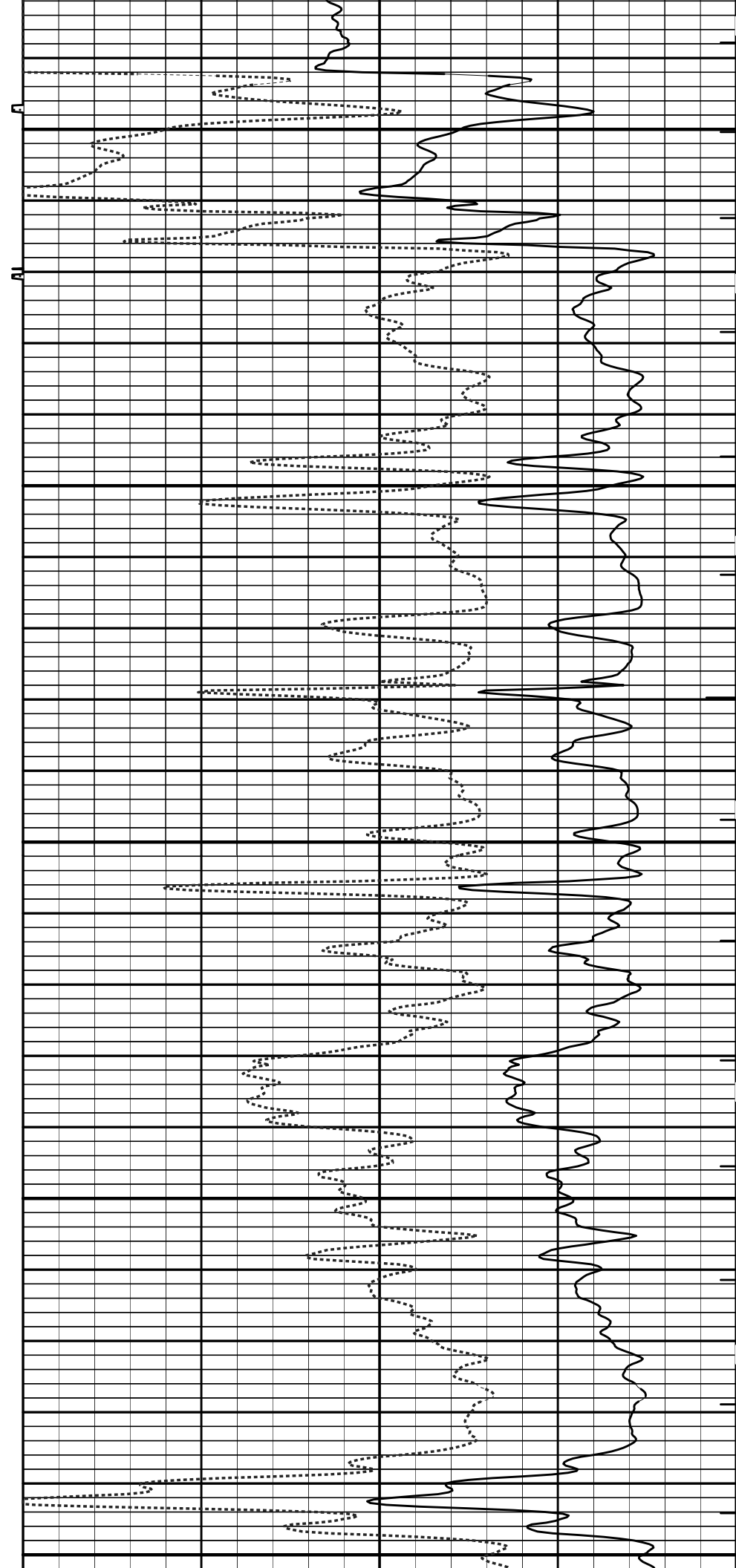
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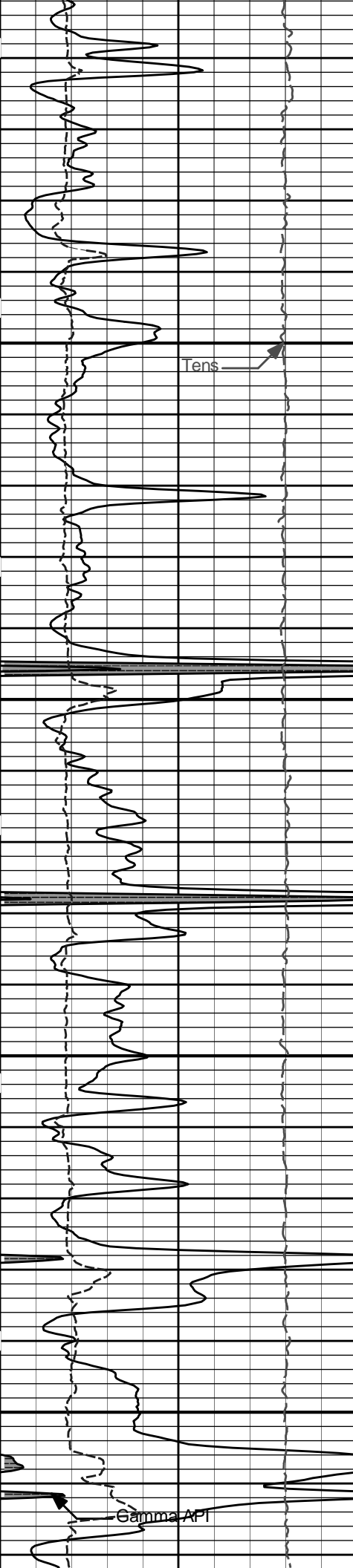




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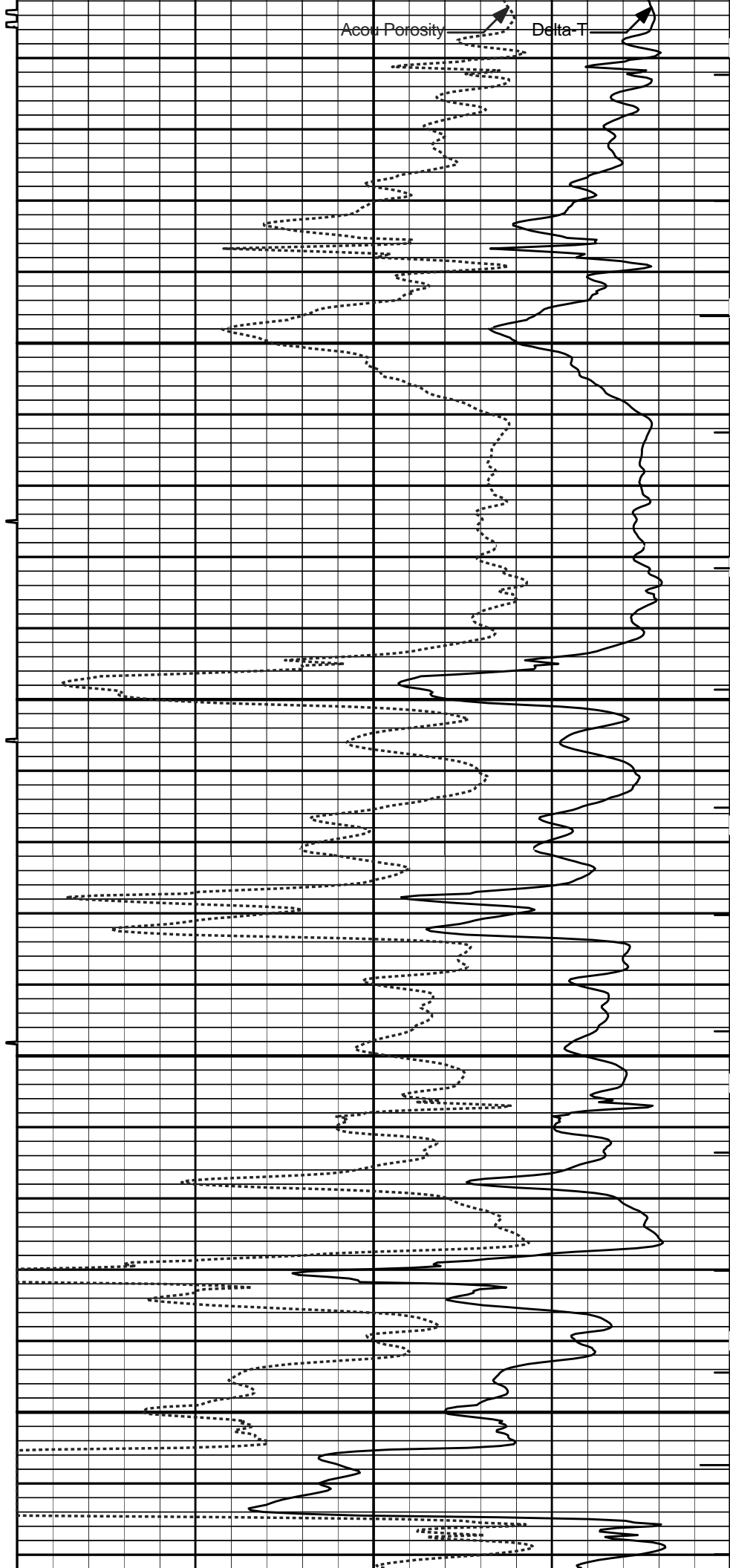
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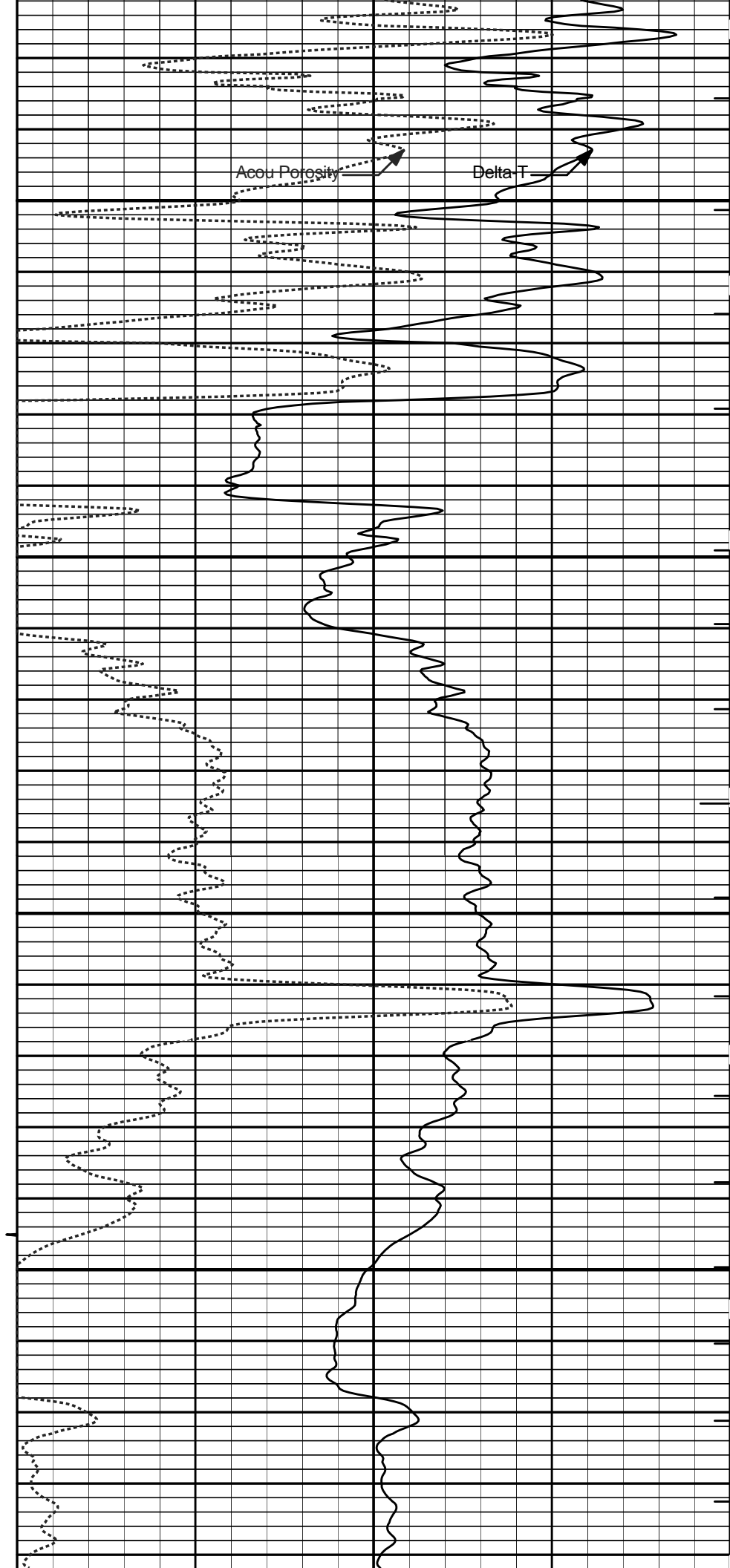
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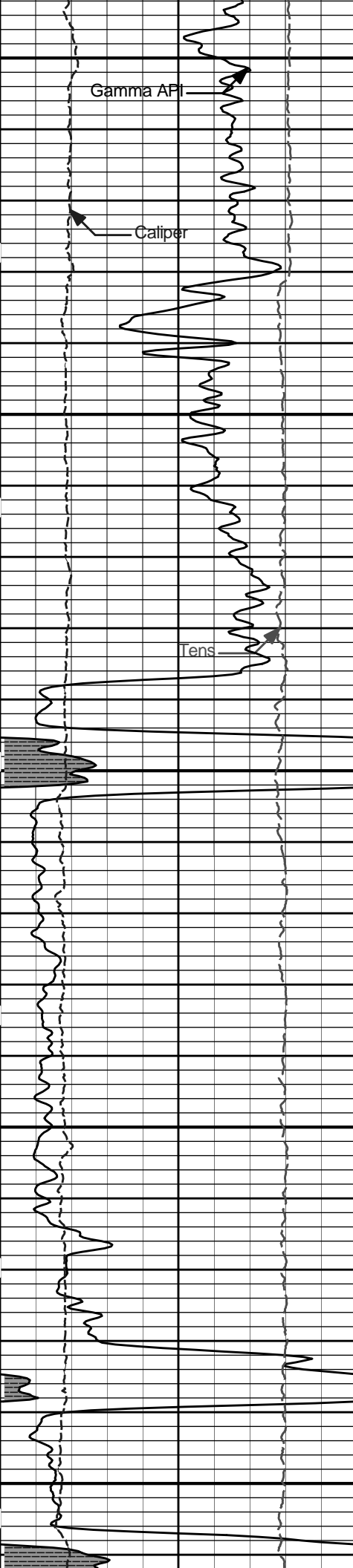
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3900



Acou Porosity

Delta T



4000

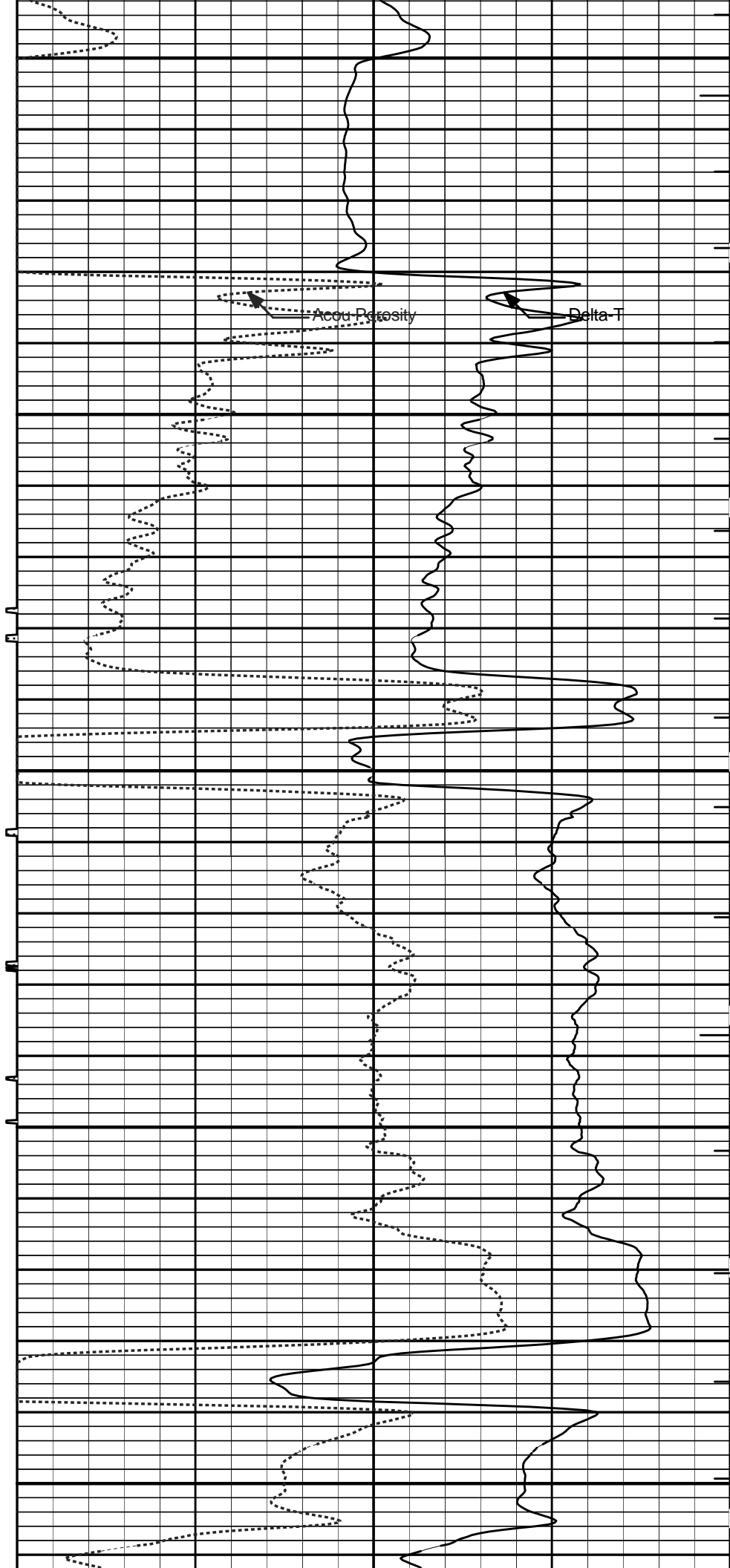
Gamma API

Caliper

Tens

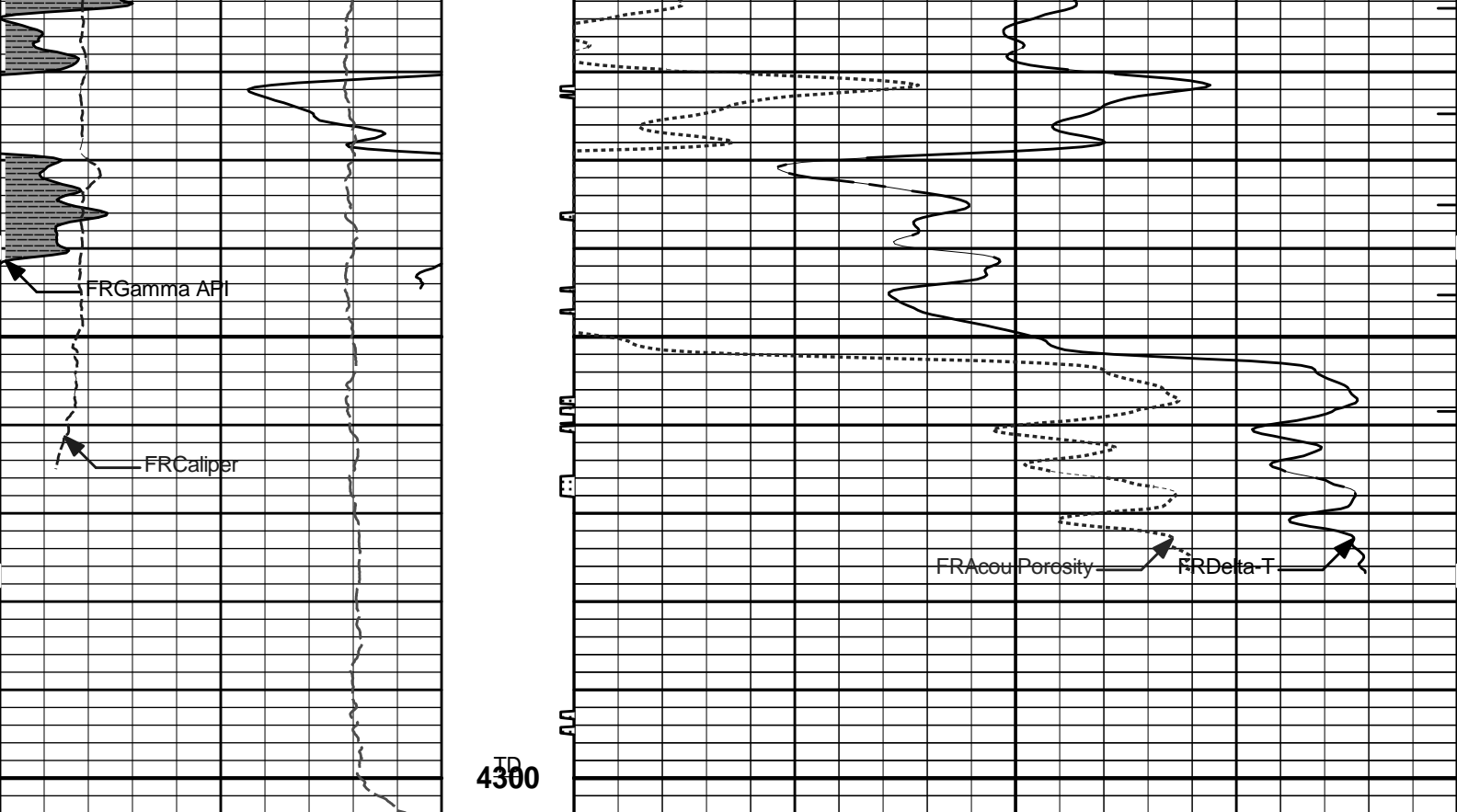
4100

4200



Accu Porosity

Delta T



15K	Tens	0	1 : 240		ITTT
	pounds		ft		
0	Gamma API	150	Tension Pull	140	Delta-T
	api		10 0		microsec per ft
6	Caliper	16	Tension Pull	30	Acou Porosity
	inches				percent
SHALE					

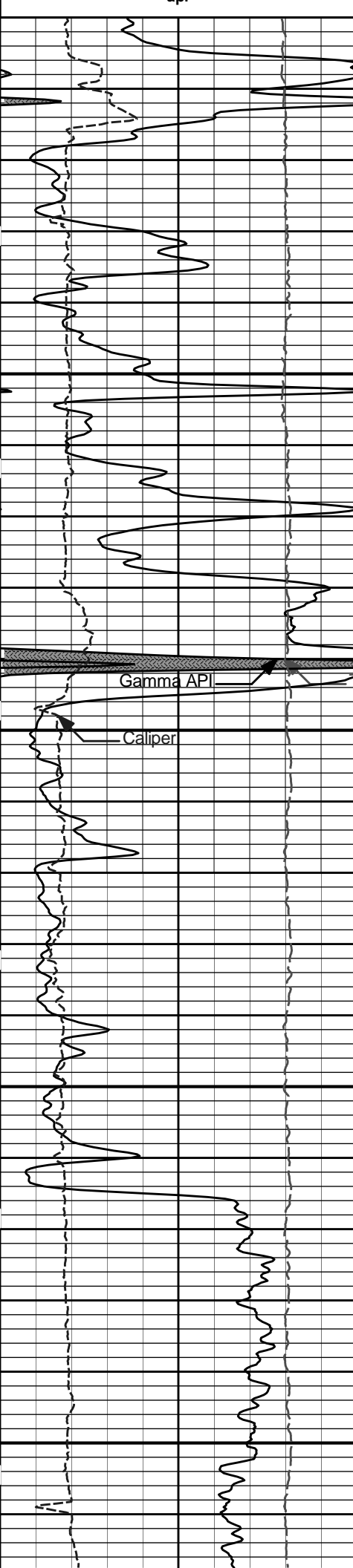
**HALLIBURTON** Plot Time: 24-Jun-11 00:44:04  
 Plot Range: 200 ft to 4304 ft  
 Data: HORTON\_1\Well Based\DAQ-0001-CSG\  
 Plot File: \\BSAT\BSAT\_5\_MAIN\_LIB

## 5 INCH MAIN LOG

**HALLIBURTON** Plot Time: 24-Jun-11 00:44:05  
 Plot Range: 3750 ft to 4303.92 ft  
 Data: HORTON\_1\Well Based\DAQ-0001-REPEAT\  
 Plot File: \\BSAT\BSAT\_5\_REP\_LIB

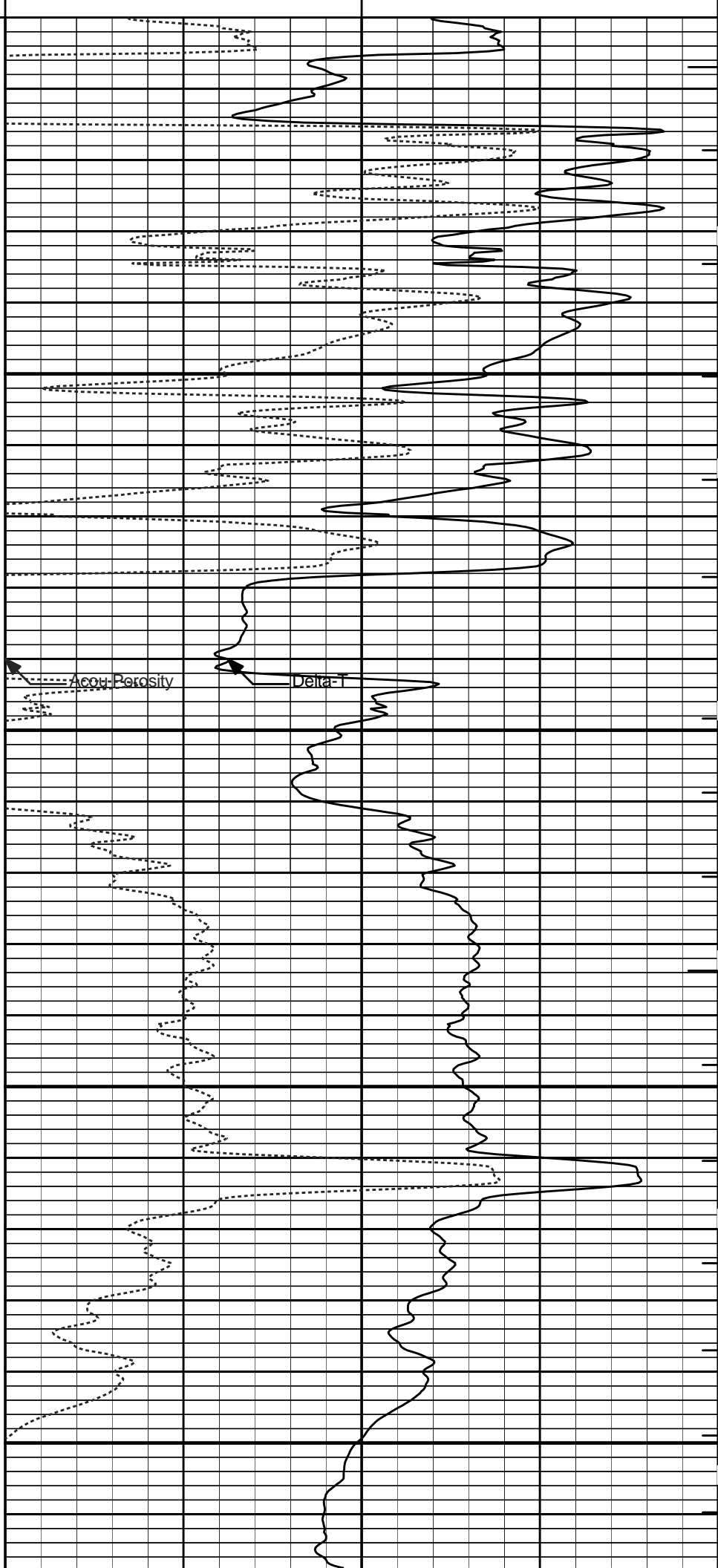
## REPEAT SECTION

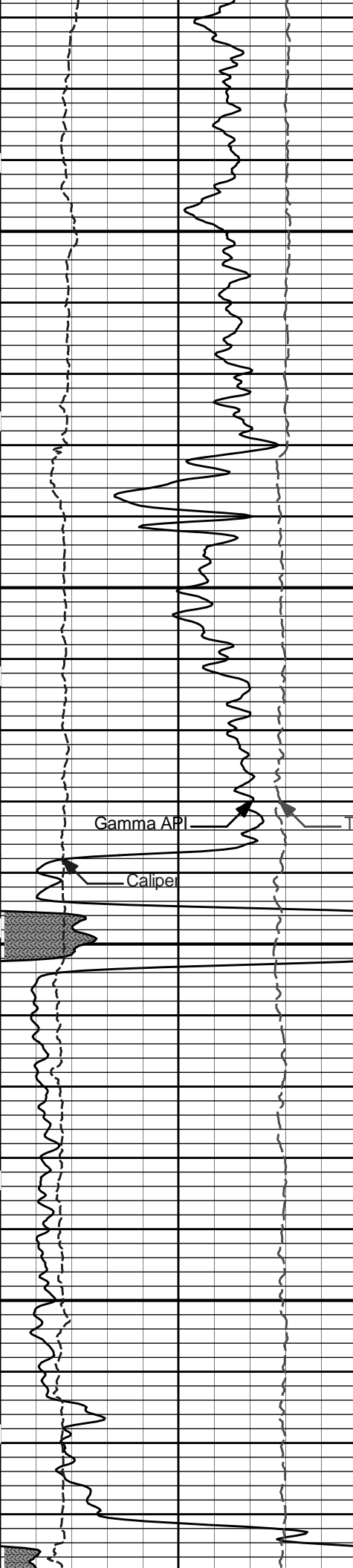
6	Caliper	16	30	Acou Porosity	-10
	inches			percent	
15K	Tension	0	140	Delta-T	40
	pounds			microsec per ft	
0	Gamma API	150	1 : 240		ITTT
	api		ft		



3800

3900





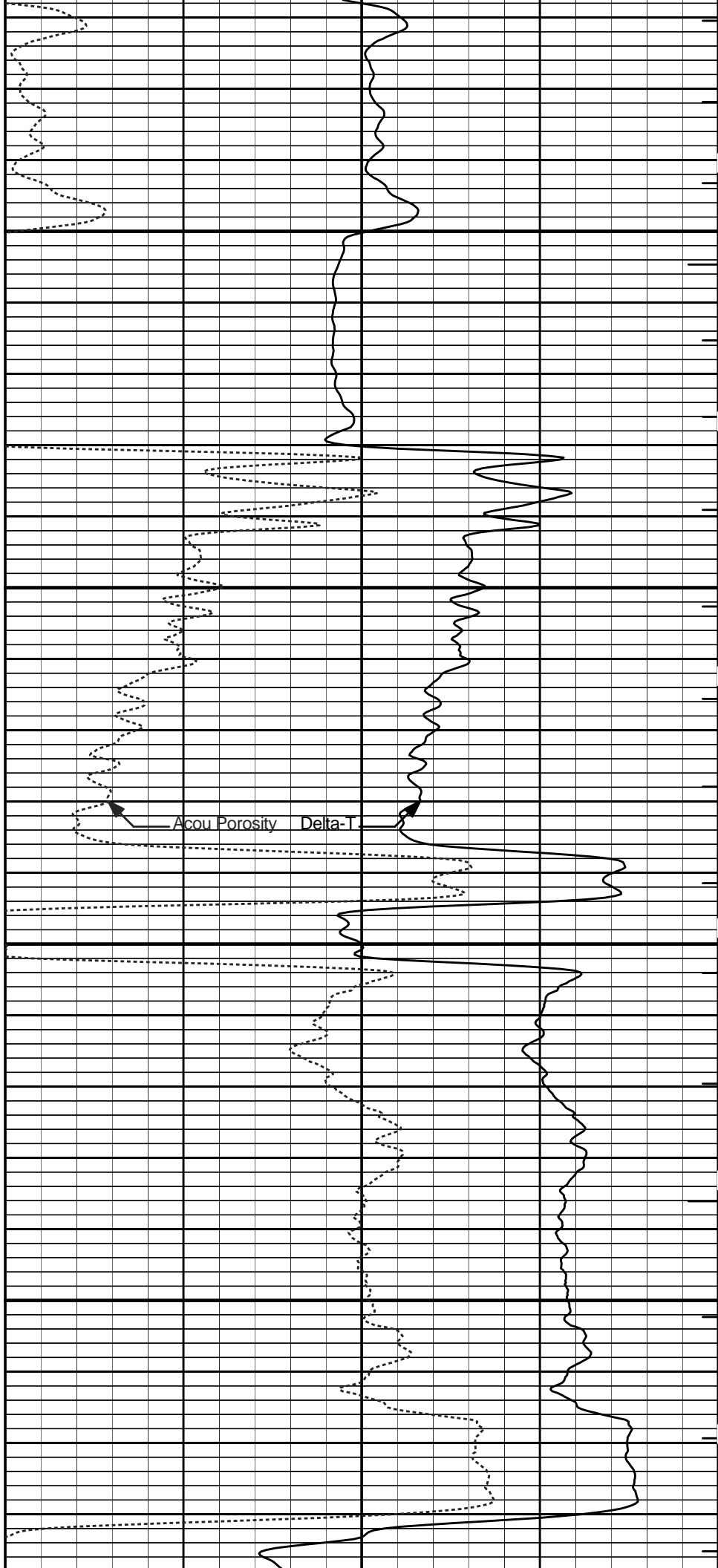
4000

Gamma API

Tension

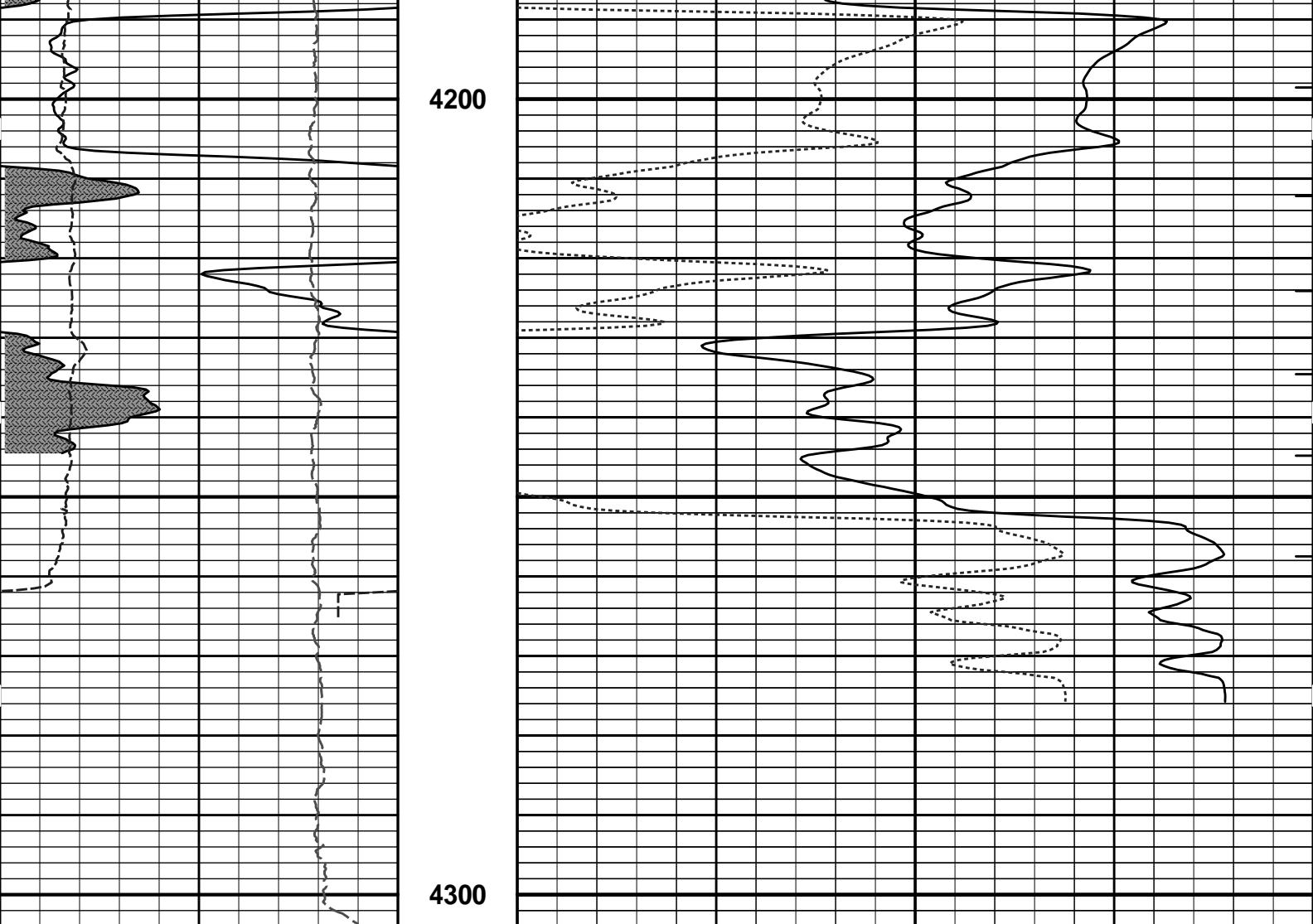
Caliper

4100



Acou Porosity

Delta-T



0	Gamma API	150	1 : 240 ft		ITTT	
	api					
15K	Tension	0	30	140	Delta-T	40
	pounds				microsec per ft	
6	Caliper	16			Acou Porosity	-10
	inches				percent	


**HALLIBURTON**

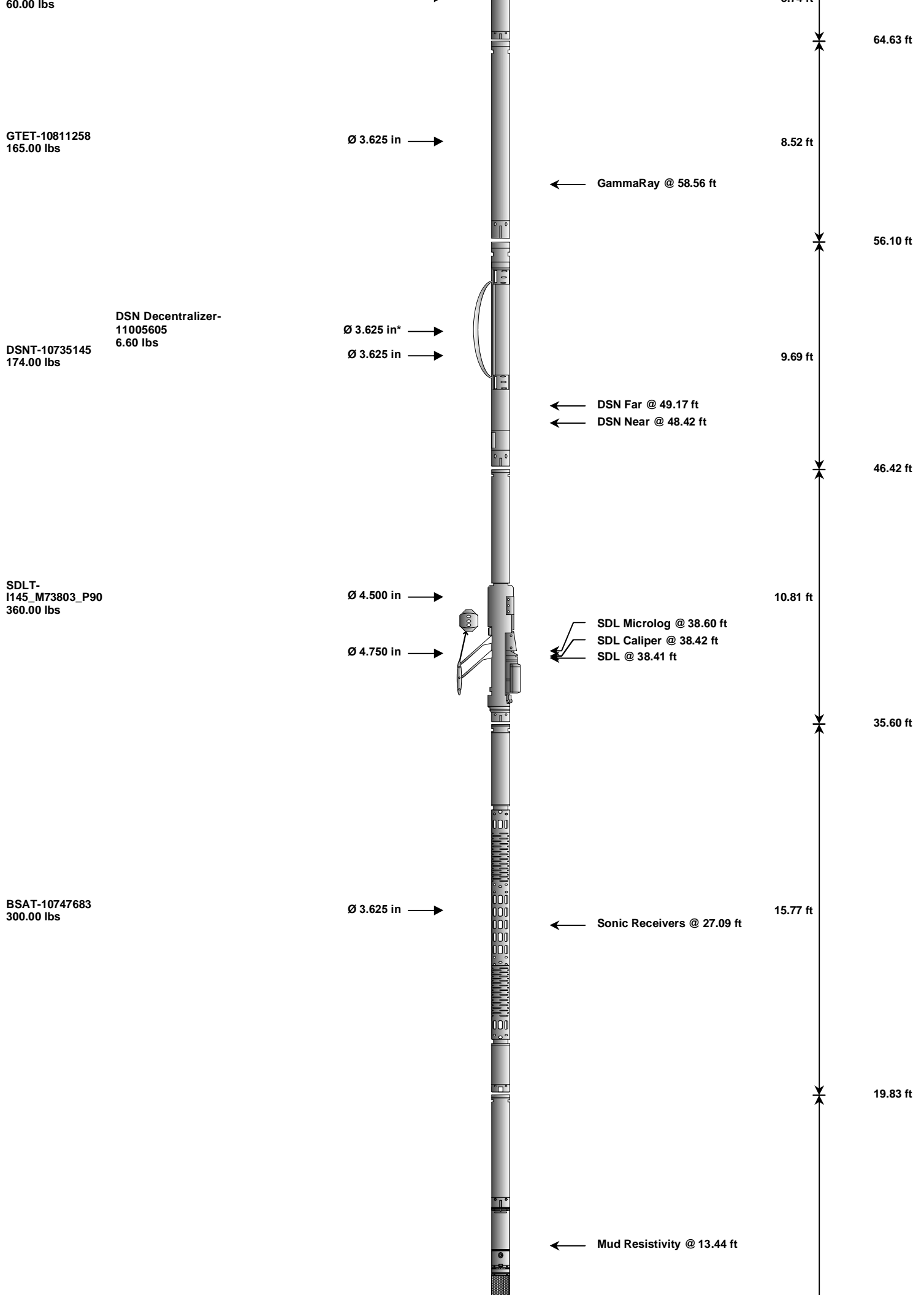
Plot Time: 24-Jun-11 00:44:09  
 Plot Range: 3750 ft to 4303.92 ft  
 Data: HORTON\_1\Well Based\DAQ-0001-REPEAT\  
 Plot File: \BSAT\BSAT\_5\_REP\_LIB

## REPEAT SECTION

**HALLIBURTON**

## TOOL STRING DIAGRAM REPORT

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
Cable Head Tension-001 30.00 lbs		Ø 3.625 in →		← Load Cell @ 69.36 ft	2.00 ft	70.36 ft
SP Sub-TRK954		Ø 3.625 in →		← SP @ 66.59 ft	3.74 ft	68.36 ft



ACRt-11256\_S0784  
250.00 lbs

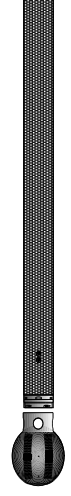
Ø 3.625 in →

← ACRt @ 9.46 ft

19.25 ft

Cabbage Head-  
TRK954  
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)
CHT	Cable Head with Load Cell	001	30.00	2.00	68.36	300.00
SP	SP Sub	TRK954	60.00	3.74	64.63	300.00
GTET	Gamma Telemetry Tool	10811258	165.00	8.52	56.10	60.00
DSNT	Dual Spaced Neutron	10735145	174.00	9.69	46.42	60.00
DCNT	DSN Decentralizer	11005605	6.60	5.13 *	49.75	300.00
SDLT	Spectral Density Tool	1145_M73803_P90	360.00	10.81	35.60	60.00
BSAT	Borehole Sonic Array Tool	10747683	300.00	15.77	19.83	60.00
ACRt	Array Compensated True Resistivity	11256_S0784	250.00	19.25	0.58	300.00
CBHD	Cabbage Head	TRK954	10.00	0.58	0.00	300.00
<b>Total</b>			<b>1,355.60</b>	<b>70.36</b>		

\* Not included in Total Length and Length Accumulation.

Data: HORTON\_1\0001 QUAD\_COMBOIDLE Date: 23-Jun-11 22:15:02

# 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	9.000	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	0.320	ohmm
	SHARED	TRM	Temperature of Mud	74.0	degF
	SHARED	CSD	Logging Interval is Cased?	No	
	SHARED	ICOD	AHV Casing OD	5.500	in
	SHARED	ST	Surface Temperature	75.0	degF
	SHARED	TD	Total Well Depth	4320.00	ft
	SHARED	BHT	Bottom Hole Temperature	120.0	degF
	SHARED	SVTM	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 /	YPOK	Resistivity Compensation	Y	

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		0.27	ohmm
Rwa / CrossPlot	TMFR	Rmf Ref Temp		73.00	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	TPOS	Tool Position		Centered	
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	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	CB	Logging Calibration Blocks?		No	
SDLT	SPVT	SDLT Pad Temperature Valid?		Yes	
SDLT	DTWN	Disable temperature warning		No	
SDLT	DMA	Formation Density Matrix		2.710	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	Frequency Filter Low Pass Value?		5000	Hz
BSAT	FLHI	Frequency Filter High Pass Value?		27000	Hz
BSAT	DTFL	Delta -T 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	RTOK	Process ACRt?		Yes	
ACRt	MNSO	Minimum Tool Standoff		1.50	in
ACRt	TCS1	Temperature Correction Source		FP Lwr & FP Upr	
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

# INPUTS, DELAYS AND FILTERS TABLE

Mnemonic	Input Description	Delay (ft)	Filter Type	Filter Length (ft)
<b>Depth Panel</b>				
TENS	Tension	0.00	NO	
<b>Cable Head Tension</b>				
DHTN	Downhole Tension	0.00	BLK	0.000
<b>SP Sub</b>				
PLTC	Plot Control Mask	66.58	NO	
SP	Spontaneous Potential	66.58	BLK	1.250
SPR	Raw Spontaneous Potential	66.58	NO	
SPO	Spontaneous Potential Offset	66.58	NO	
<b>GTET</b>				
TPUL	Tension Pull	58.56	NO	
GR	Natural Gamma Ray API	58.56	TRI	1.750
GRU	Unfiltered Natural Gamma Ray API	58.56	NO	
EGR	Natural Gamma Ray API with Enhanced Vertical Resolution	58.56	W	1.416 , 0.750
ACCZ	Accelerometer Z	0.00	BLK	0.083
DEVI	Inclination	0.00	NO	
<b>DSNT</b>				
TPUL	Tension Pull	48.32	NO	
RNDS	Near Detector Telemetry Counts	48.42	BLK	1.417
RFDS	Far Detector Telemetry Counts	49.17	TRI	0.583
DNTT	DSN Tool Temperature	48.42	NO	
DSNS	DSN Tool Status	48.32	NO	
ERND	Near Detector Telemetry Counts EVR	48.42	BLK	0.000
ERFD	Far Detector Telemetry Counts EVR	49.17	BLK	0.000
ENTM	DSN Tool Temperature EVR	48.42	NO	
<b>SDLT</b>				
TPUL	Tension Pull	38.41	NO	
NAB	Near Above	38.24	BLK	0.920
NHI	Near Cesium High	38.24	BLK	0.920
NLO	Near Cesium Low	38.24	BLK	0.920
NVA	Near Valley	38.24	BLK	0.920
NBA	Near Barite	38.24	BLK	0.920
NDE	Near Density	38.24	BLK	0.920
NPK	Near Peak	38.24	BLK	0.920
NLI	Near Lithology	38.24	BLK	0.920
NBAU	Near Barite Unfiltered	38.24	BLK	0.250
NLIU	Near Lithology Unfiltered	38.24	BLK	0.250
FAB	Far Above	38.58	BLK	0.250
FHI	Far Cesium High	38.58	BLK	0.250
FLO	Far Cesium Low	38.58	BLK	0.250
FVA	Far Valley	38.58	BLK	0.250
FBA	Far Barite	38.58	BLK	0.250
FDE	Far Density	38.58	BLK	0.250
FPK	Far Peak	38.58	BLK	0.250
FLI	Far Lithology	38.58	BLK	0.250
PTMP	Pad Temperature	38.42	BLK	0.920
NHV	Near Detector High Voltage	35.60	NO	

FHV	Far Detector High Voltage	35.60	NO	
ITMP	Instrument Temperature	35.60	NO	
DDHV	Detector High Voltage	35.60	NO	
TPUL	Tension Pull	38.42	NO	
PCAL	Pad Caliper	38.42	TRI	0.250
ACAL	Arm Caliper	38.42	TRI	0.250
TPUL	Tension Pull	38.60	NO	
MINV	Microlog Lateral	38.60	BLK	0.750
MNOR	Microlog Normal	38.60	BLK	0.750
<b>BSAT</b>				
TPUL	Tension Pull	27.09	NO	
STAT	Status	27.09	NO	
DLYT	Delay Time	27.09	NO	
SI	Sample Interval	27.09	NO	
TXRX	Raw Telemetry 10 Receivers	27.09	NO	
FRMC	Tool Frame Count	27.09	NO	
<b>ACRt</b>				
TPUL	Tension Pull	2.97	NO	
F1R1	ACRT 12KHz - 80in R value	9.22	BLK	0.000
F1X1	ACRT 12KHz - 80in X value	9.22	BLK	0.000
F1R2	ACRT 12KHz - 50in R value	6.72	BLK	0.000
F1X2	ACRT 12KHz - 50in X value	6.72	BLK	0.000
F1R3	ACRT 12KHz - 29in R value	5.22	BLK	0.000
F1X3	ACRT 12KHz - 29in X value	5.22	BLK	0.000
F1R4	ACRT 12KHz - 17in R value	4.22	BLK	0.000
F1X4	ACRT 12KHz - 17in X value	4.22	BLK	0.000
F1R5	ACRT 12KHz - 10in R value	3.72	BLK	0.000
F1X5	ACRT 12KHz - 10in X value	3.72	BLK	0.000
F1R6	ACRT 12KHz - 6in R value	3.47	BLK	0.000
F1X6	ACRT 12KHz - 6in X value	3.47	BLK	0.000
F2R1	ACRT 36KHz - 80in R value	9.22	BLK	0.000
F2X1	ACRT 36KHz - 80in X value	9.22	BLK	0.000
F2R2	ACRT 36KHz - 50in R value	6.72	BLK	0.000
F2X2	ACRT 36KHz - 50in X value	6.72	BLK	0.000
F2R3	ACRT 36KHz - 29in R value	5.22	BLK	0.000
F2X3	ACRT 36KHz - 29in X value	5.22	BLK	0.000
F2R4	ACRT 36KHz - 17in R value	4.22	BLK	0.000
F2X4	ACRT 36KHz - 17in X value	4.22	BLK	0.000
F2R5	ACRT 36KHz - 10in R value	3.72	BLK	0.000
F2X5	ACRT 36KHz - 10in X value	3.72	BLK	0.000
F2R6	ACRT 36KHz - 6in R value	3.47	BLK	0.000
F2X6	ACRT 36KHz - 6in X value	3.47	BLK	0.000
F3R1	ACRT 72KHz - 80in R value	9.22	BLK	0.000
F3X1	ACRT 72KHz - 80in X value	9.22	BLK	0.000
F3R2	ACRT 72KHz - 50in R value	6.72	BLK	0.000
F3X2	ACRT 72KHz - 50in X value	6.72	BLK	0.000
F3R3	ACRT 72KHz - 29in R value	5.22	BLK	0.000
F3X3	ACRT 72KHz - 29in X value	5.22	BLK	0.000
F3R4	ACRT 72KHz - 17in R value	4.22	BLK	0.000
F3X4	ACRT 72KHz - 17in X value	4.22	BLK	0.000
F3R5	ACRT 72KHz - 10in R value	3.72	BLK	0.000
F3X5	ACRT 72KHz - 10in X value	3.72	BLK	0.000
F3R6	ACRT 72KHz - 6in R value	3.47	BLK	0.000
F3X6	ACRT 72KHz - 6in X value	3.47	BLK	0.000

RMUD	Mud Resistivity	12.76	BLK	0.000
F1RT	Transmitter Reference 12 KHz Real Signal	2.97	BLK	0.000
F1XT	Transmitter Reference 12 KHz Imaginary Signal	2.97	BLK	0.000
F2RT	Transmitter Reference 36 KHz Real Signal	2.97	BLK	0.000
F2XT	Transmitter Reference 36 KHz Imaginary Signal	2.97	BLK	0.000
F3RT	Transmitter Reference 72 KHz Real Signal	2.97	BLK	0.000
F3XT	Transmitter Reference 72 KHz Imaginary Signal	2.97	BLK	0.000
TFPU	Upper Feedpipe Temperature Calculated	2.97	BLK	0.000
TFPL	Lower Feedpipe Temperature Calculated	2.97	BLK	0.000
ITMP	Instrument Temperature	2.97	BLK	0.000
TCVA	Temperature Correction Values Loop Off	2.97	NO	
TIDV	Instrument Temperature Derivative	2.97	NO	
TUDV	Upper Temperature Derivative	2.97	NO	
TLDV	Lower Temperature Derivative	2.97	NO	
TRBD	Receiver Board Temperature	2.97	NO	

Data: HORTON\_110001 QUAD\_COMBOWDLE

Date: 23-Jun-11 22:15:57

COMPANY	NEW GULF OPERATING, LLC		
WELL	HORTON #1		
FIELD	LANGDON		
COUNTY	RENO	STATE	KANSAS
<b>HALLIBURTON</b>		<b>BOREHOLE SONIC ARRAY LOG</b>	