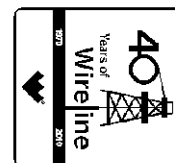




Weatherford

ARRAY INDUCTION
LOGS

COMPANY WEXPRO COMPANY
WELL MUSSER 31
FIELD POWDER WASH
PROVINCE/COUNTY MOFFAT
COUNTRY/STATE USA/COLORADO
LOCATION SHL: 348' FNL & 607' FEL



SEC TWP RGE Other Services
4 11N 97W MPD
API Number 0508107468 MDN
Permit Number

Permanent Datum G.L., Elevation 6601 feet
Log Measured From KB
Drilling Measured From KB

Elevations: feet
KB 6630.00
DF 6630.00
GL 6601.00

Date	07-DEC-2011	
Run Number	1	
Depth Driller	9095.00	feet
Depth Logger	6220.00	feet
First Reading	6217.00	feet
Last Reading	200.00	feet
Casing Driller	1539.00	feet
Casing Logger	1537.00	feet
Bit Size	7.875	inches
Hole Fluid Type	WBM	
Density / Viscosity	10.40 lb/USg	15.00 CP
PH / Fluid Loss	9.00	8.00 ml/30Min
Sample Source	FLOWLINE	
Rm @ Measured Temp	4.26 @ 76.4	ohm-m
Rmf @ Measured Temp	3.41 @ 76.4	ohm-m
Rmc @ Measured Temp	5.11 @ 76.4	ohm-m
Source Rmf / Rmc	CALC	CALC
Rm @ BHT	2.27 @ 146.0	ohm-m
Time Since Circulation	4 HOURS	
Max Recorded Temp	146.00	deg F
Equipment Name	COMPACT	
Equipment / Base	13144	RK SPR
Recorded By	J.PAULSON	J.LIU
Witnessed By	R.BUSH	

BOREHOLE RECORD

Last Edited: 07-DEC-2011 12:50

Bit Size inches	Depth From feet	Depth To feet
7.875	1539.00	9095.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	9.625	0.00	1537.00	36.00

REMARKS

SOFTWARE VERSION 12.02.4401

TOOLS RUN: SHA, MCG, MDN, MPD, MIS-D, SKJ, MFE, MAI RUN IN COMBINATION.

HARDWARE: MPD: 8" PROFILE PLATE USED.
MAI: TWO 1 INCH STANDOFFS USED.
MFE: ONE 1 INCH STANDOFF USED.
MDN: DUAL BOWSPRING USED.

2.65 G/CC DENSITY MATRIX USED TO CALCULATE POROSITY.

TIGHT PULLS, BOREHOLE SIZE AND RUGOSITY WILL AFFECT REPEATABILITY AND DATA QUALITY.

ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.

TOTAL HOLE VOLUME FROM TD TO SURFACE CASING =1731 CUBIC FEET

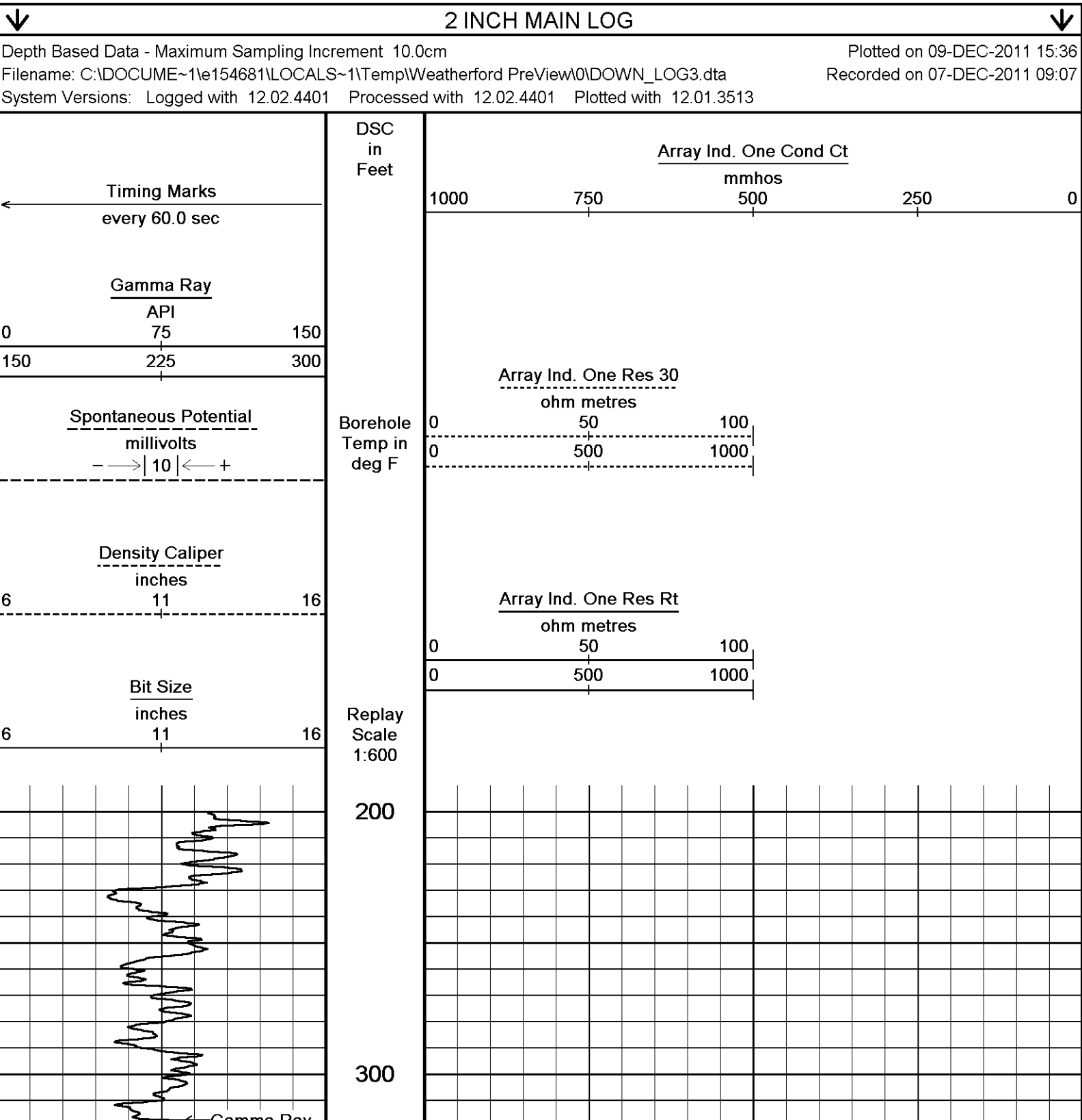
ANNUAL VOLUME WITH 4.5 INCH PRODUCTION CASING FROM TD TO SURFACE CASING = 1215 CUBIC FEET

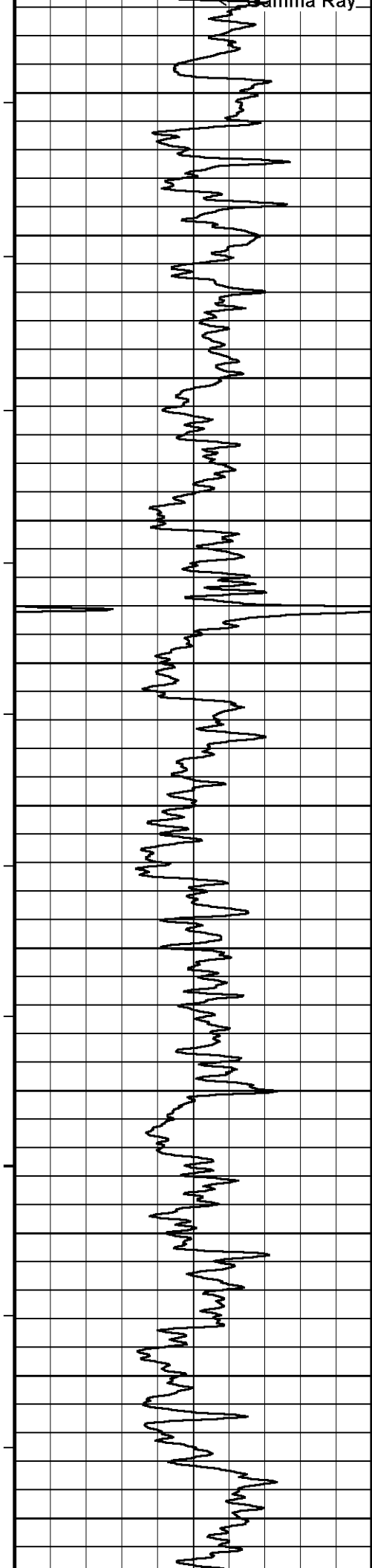
BRIDGED OFF AT 6220 AND LOGGED UP FROM THERE

SERVICE ORDER: #3526717
OPERATOR: D. SMITH
U. KIMBASSA

RIG: SST 88

All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions in our price schedule.





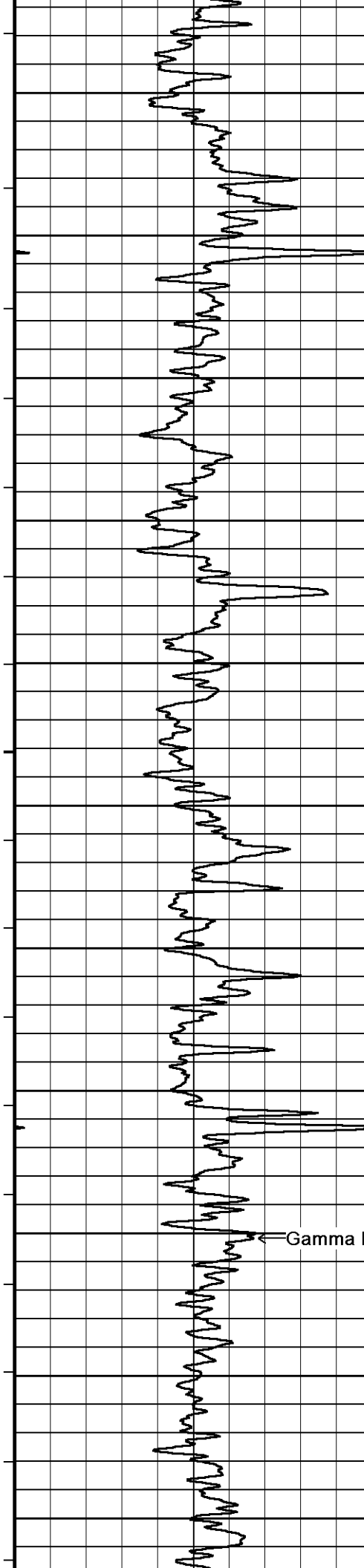
400

500

600

700

800



900

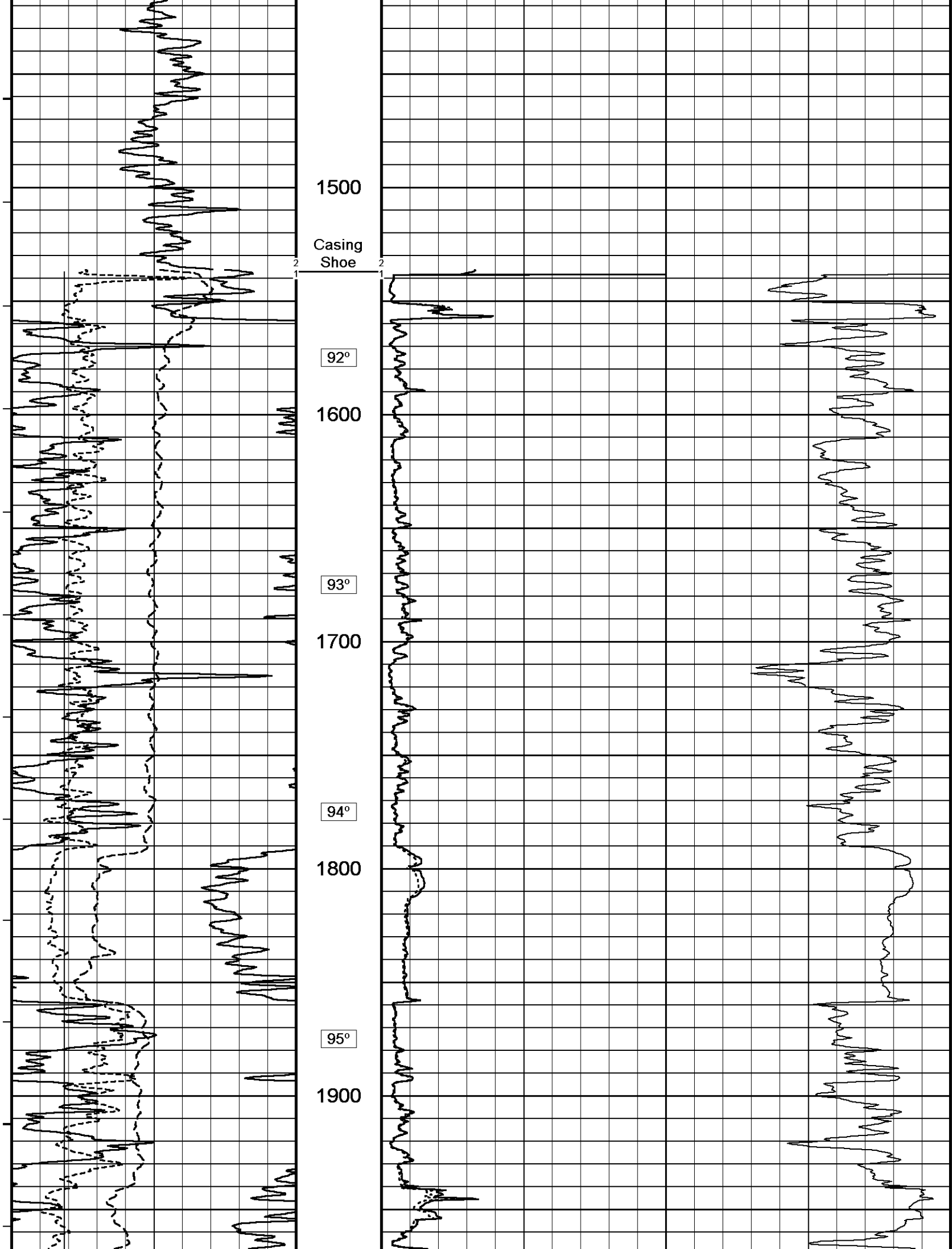
1000

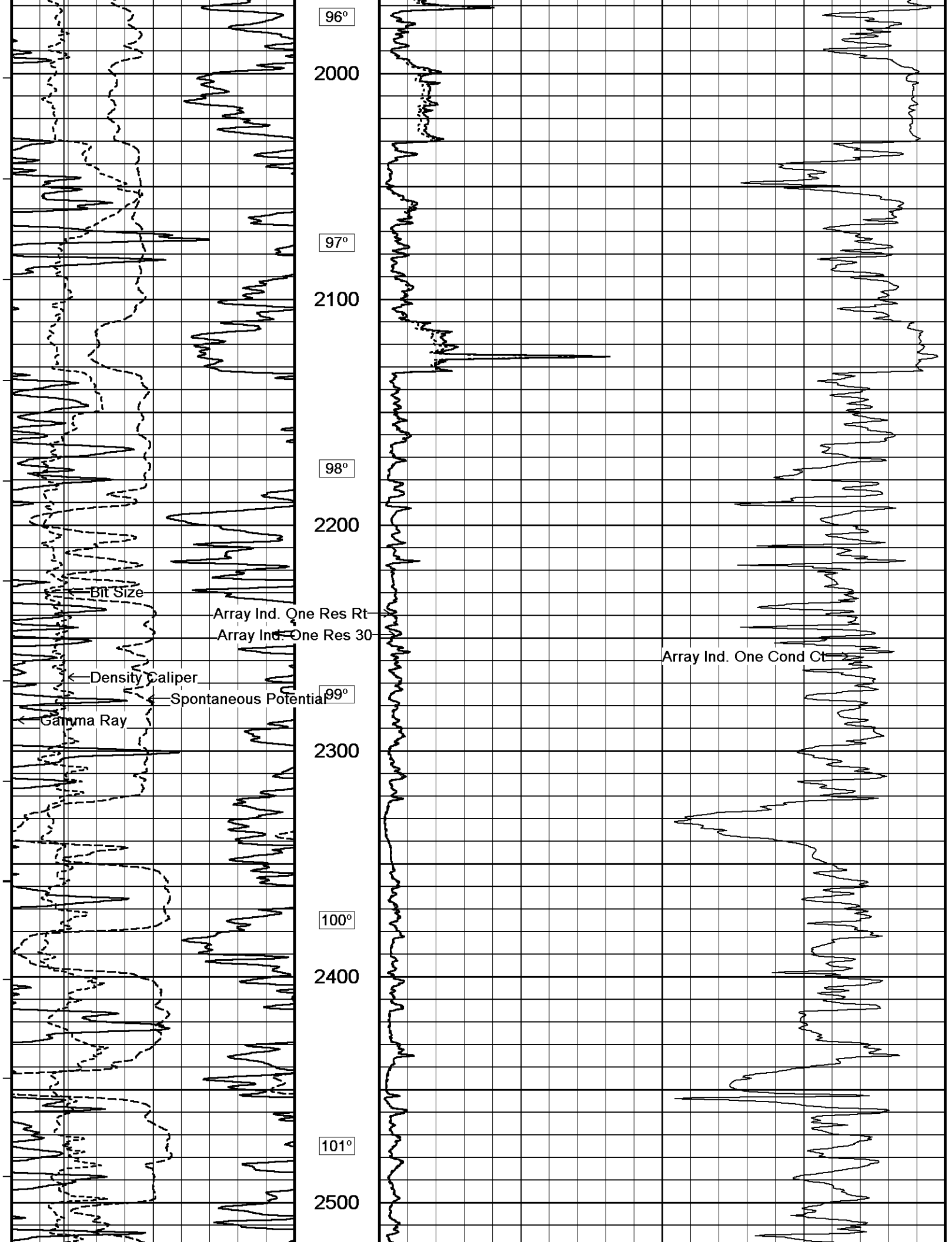
1100

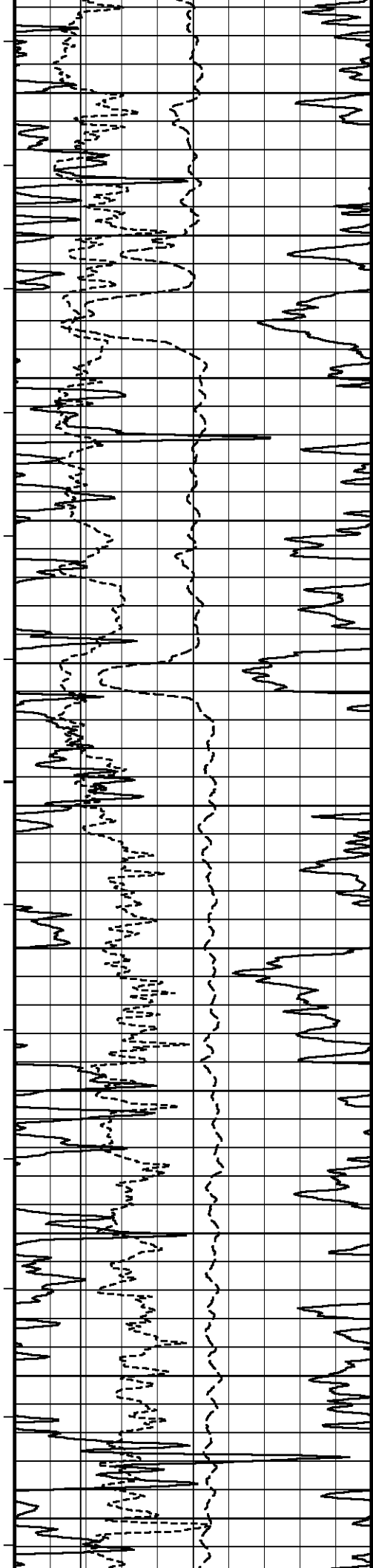
1200

← Gamma Ray 1300

1400







103°

2600

104°

2700

105°

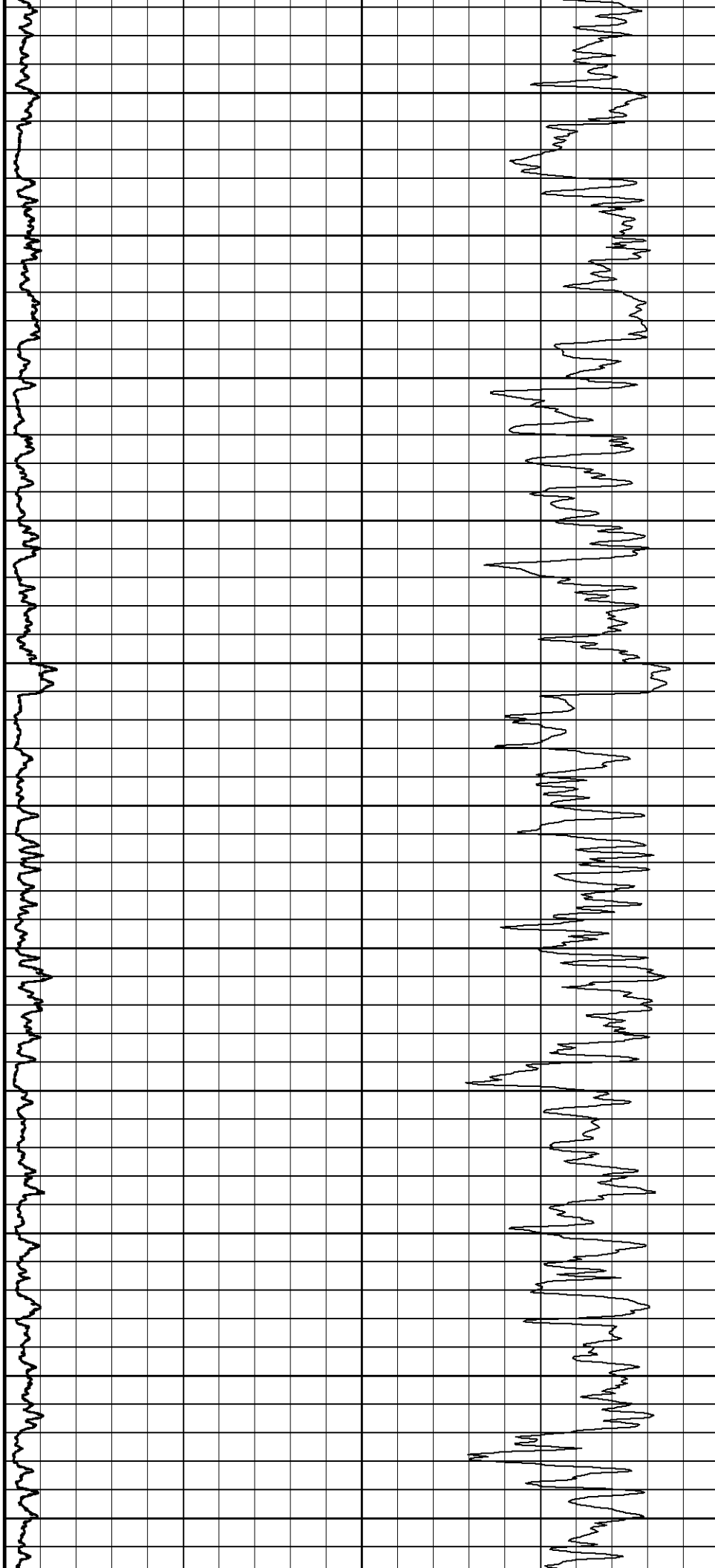
2800

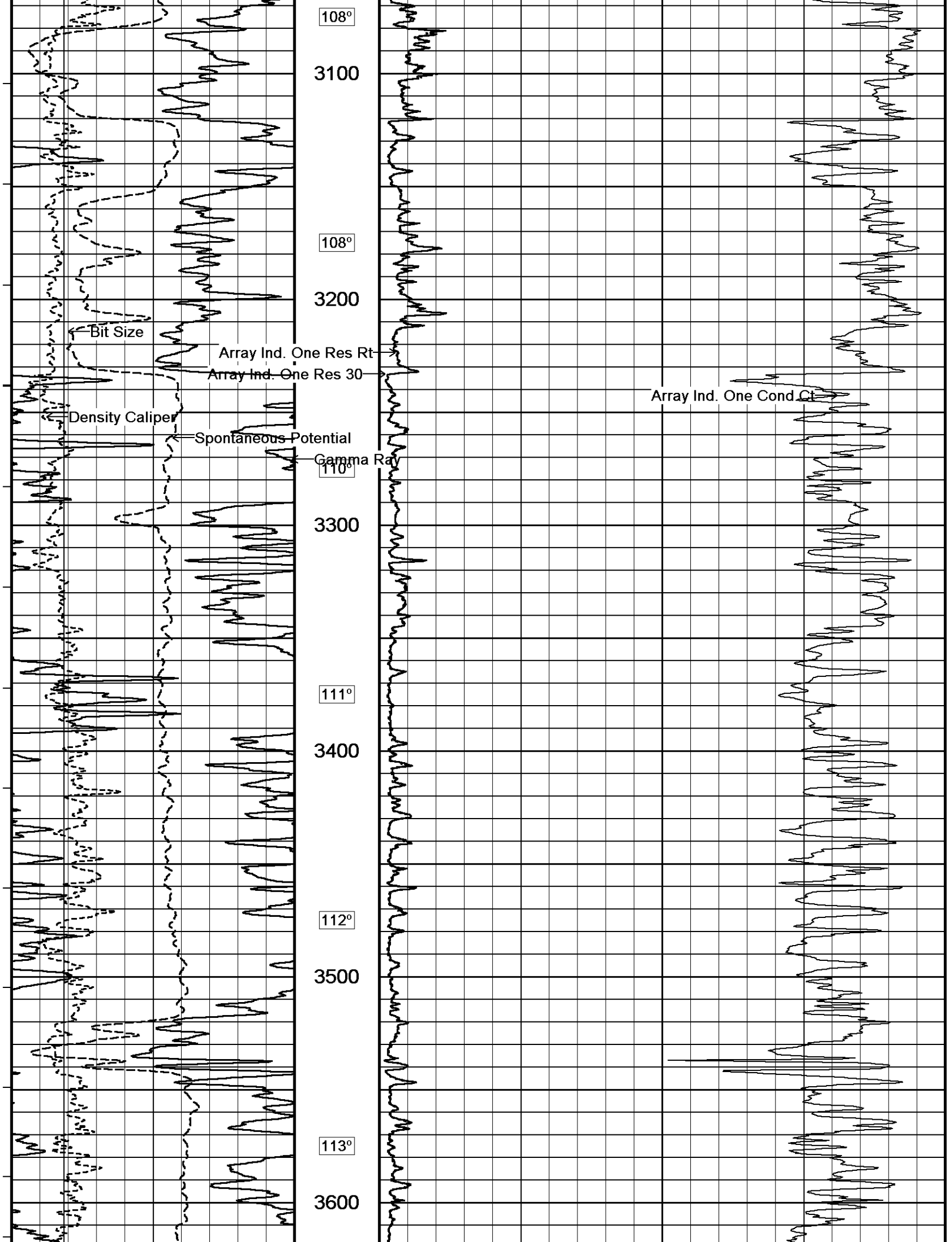
106°

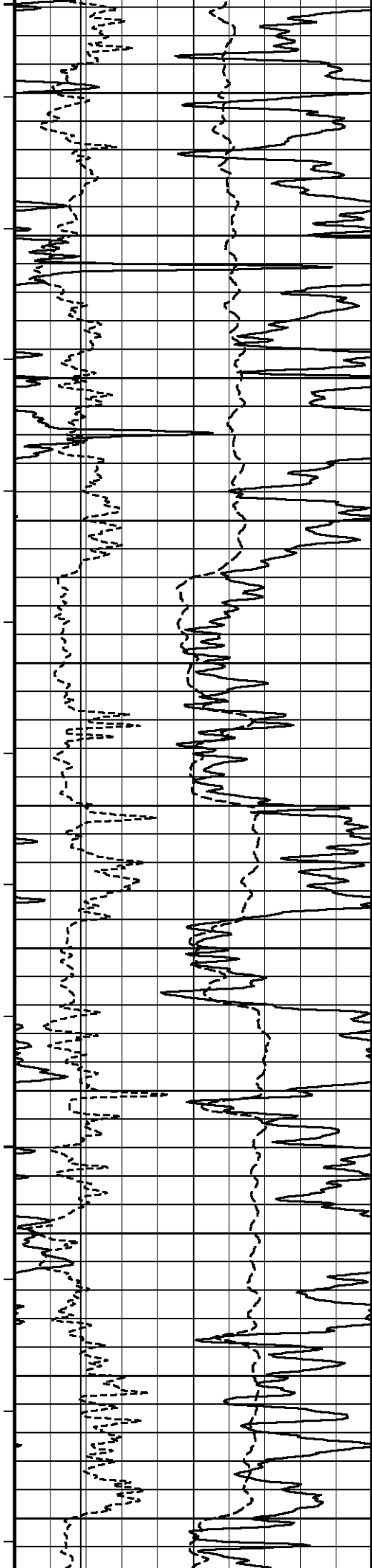
2900

107°

3000







115°

3700

116°

3800

117°

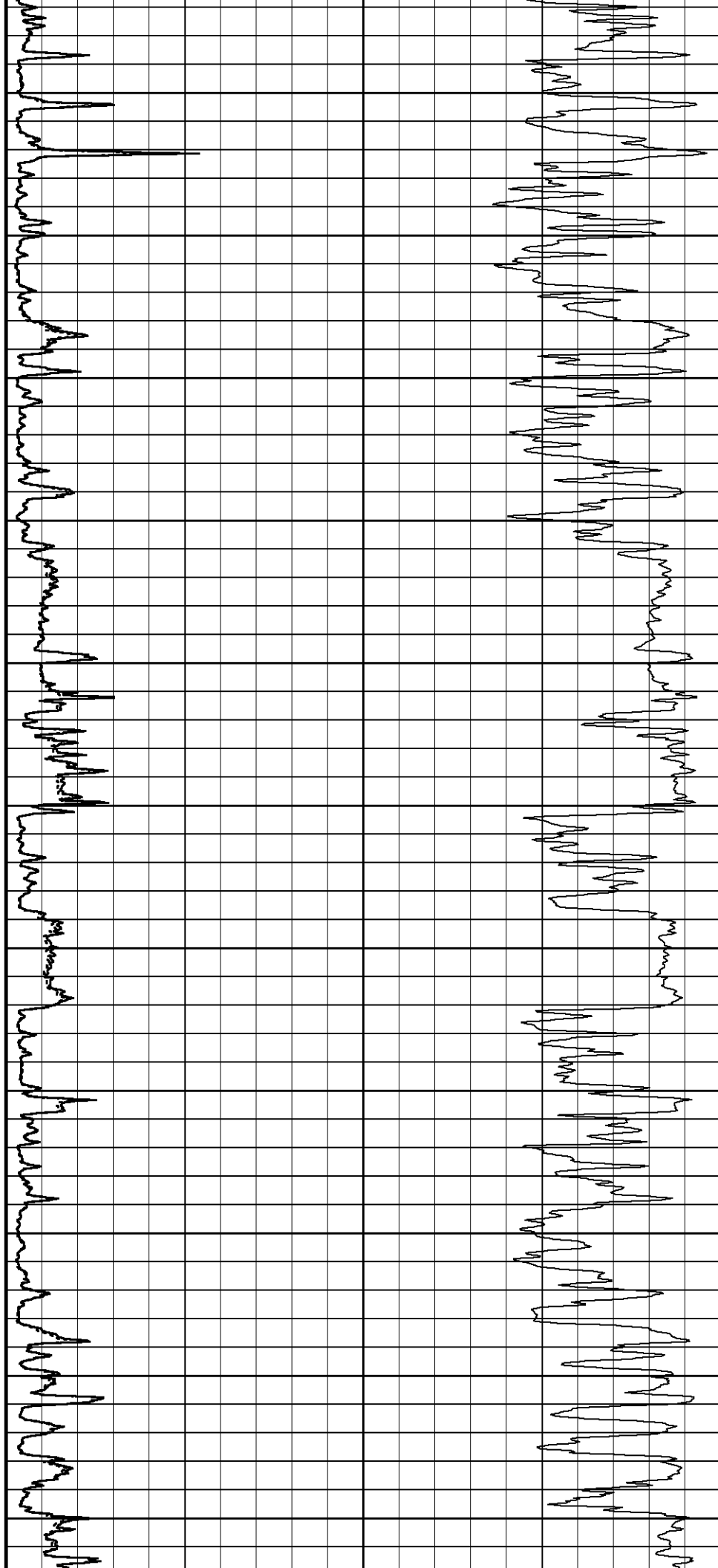
3900

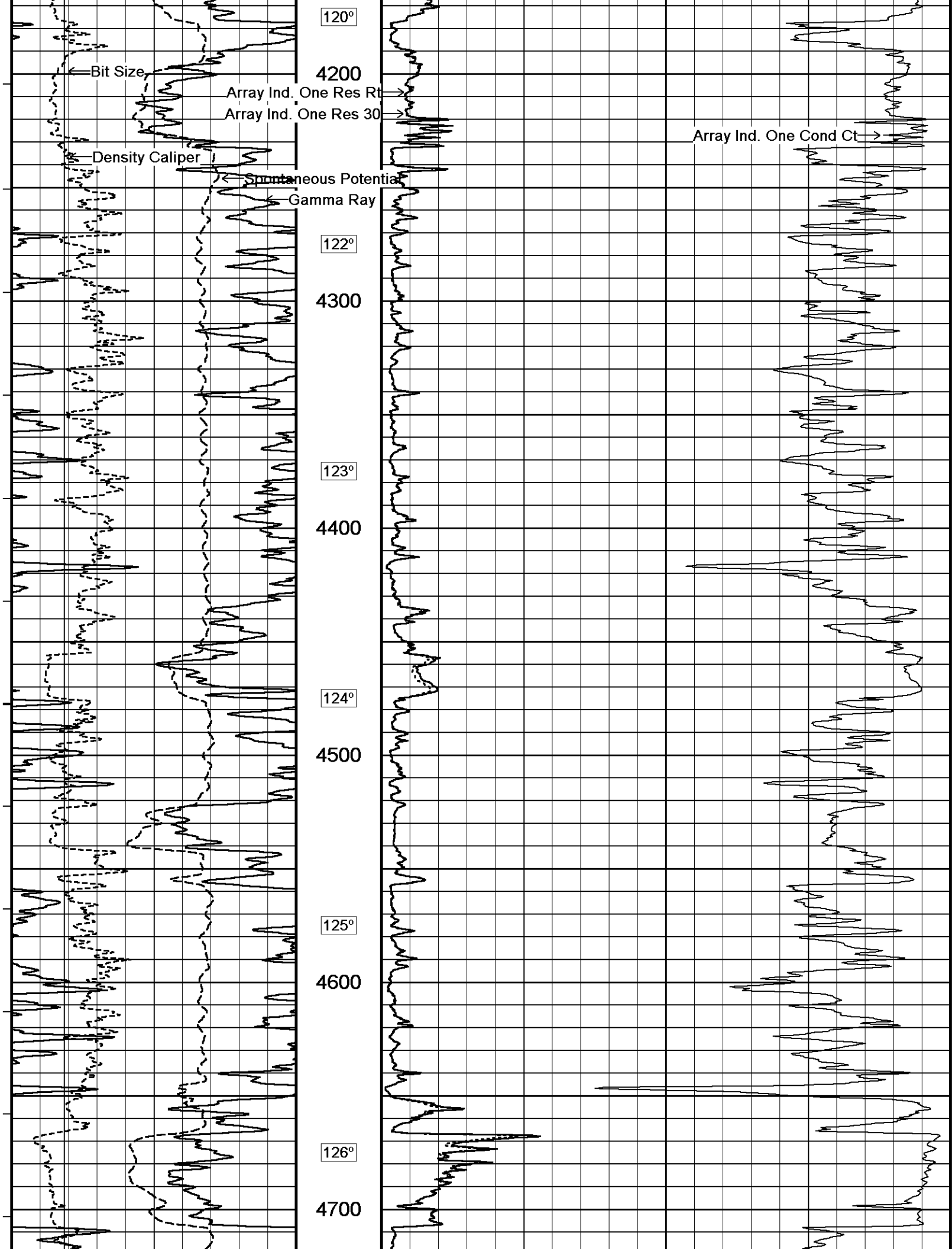
118°

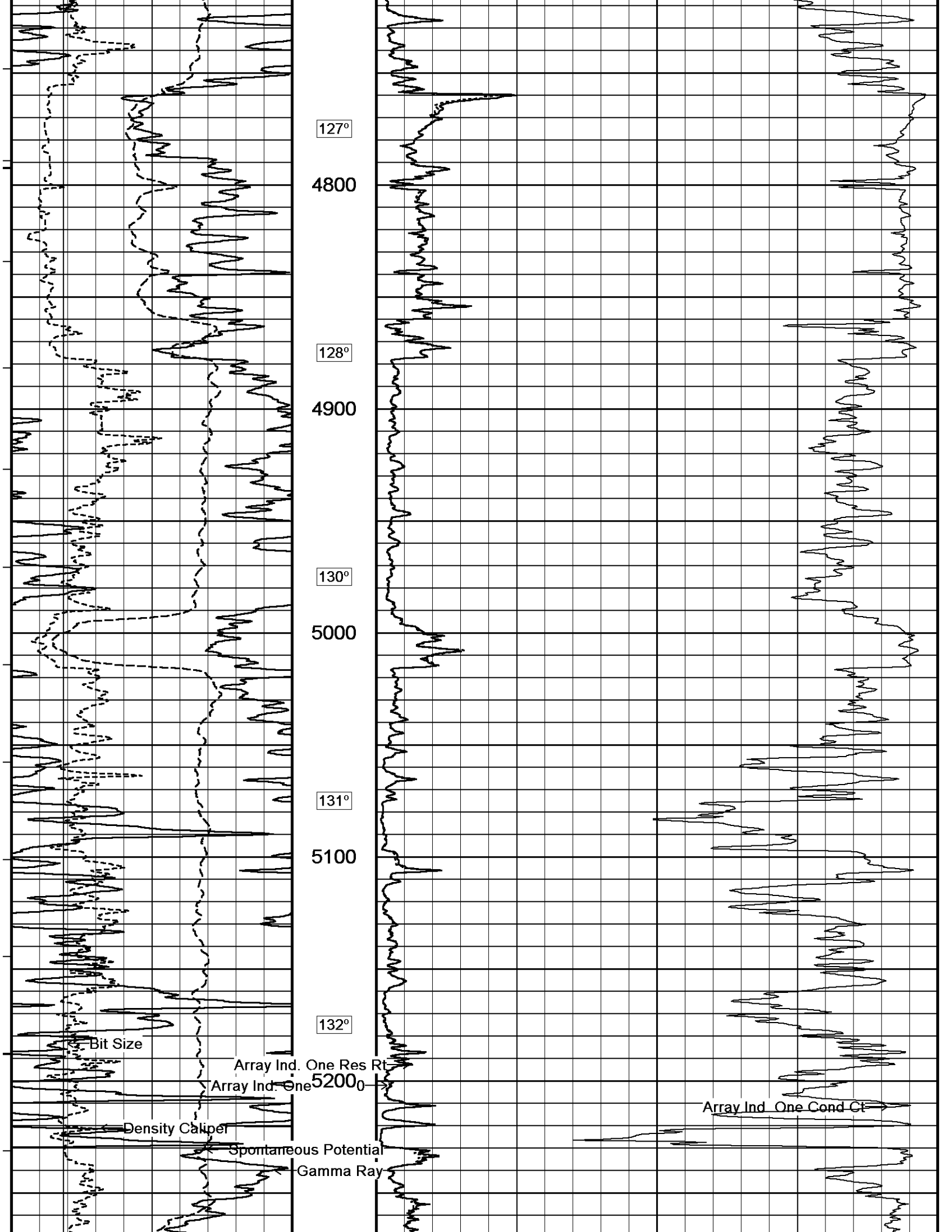
4000

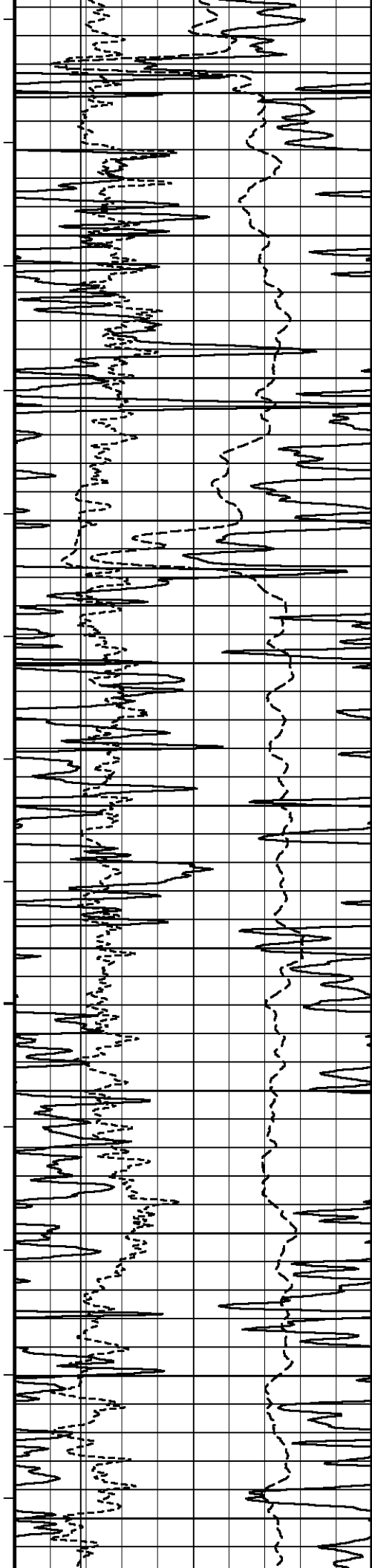
119°

4100









134°

5300

135°

5400

137°

5500

139°

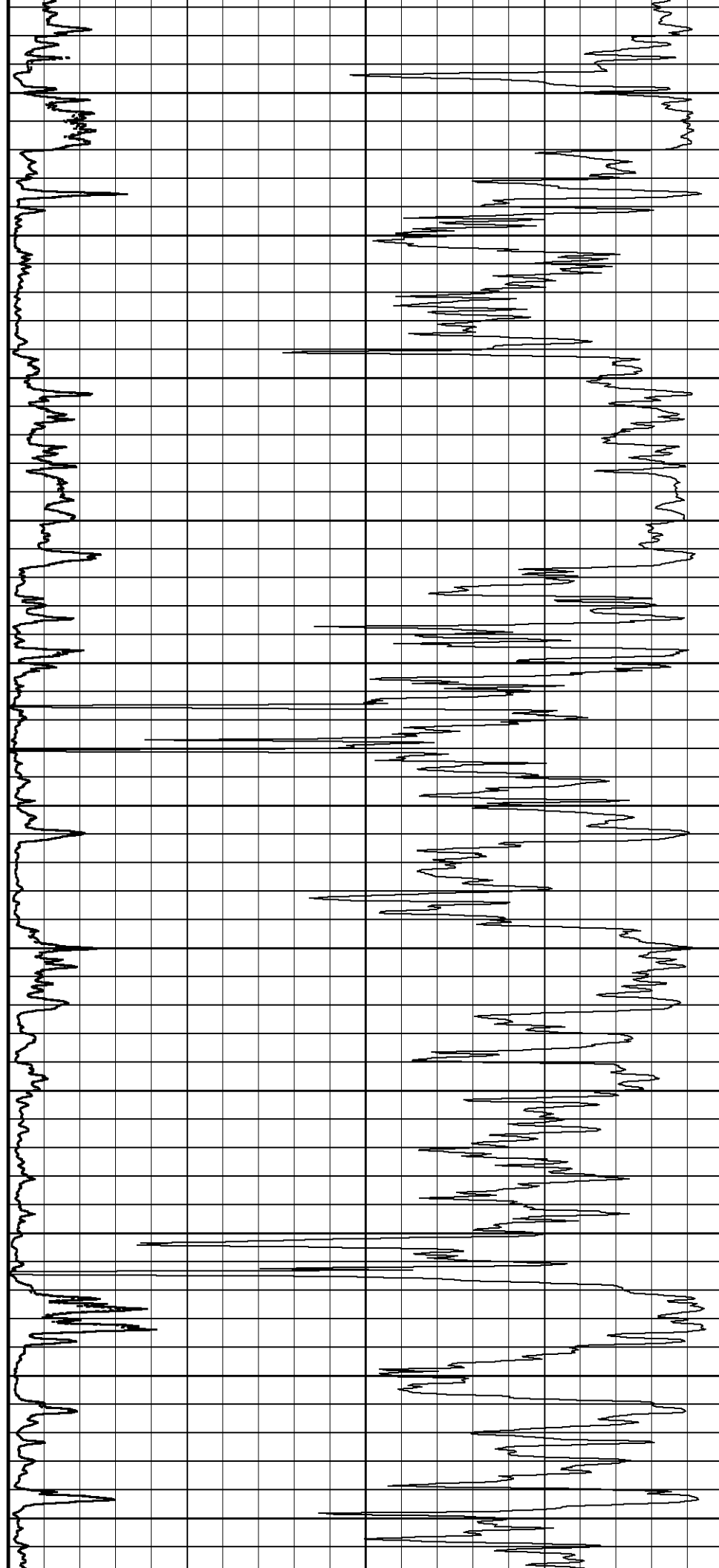
5600

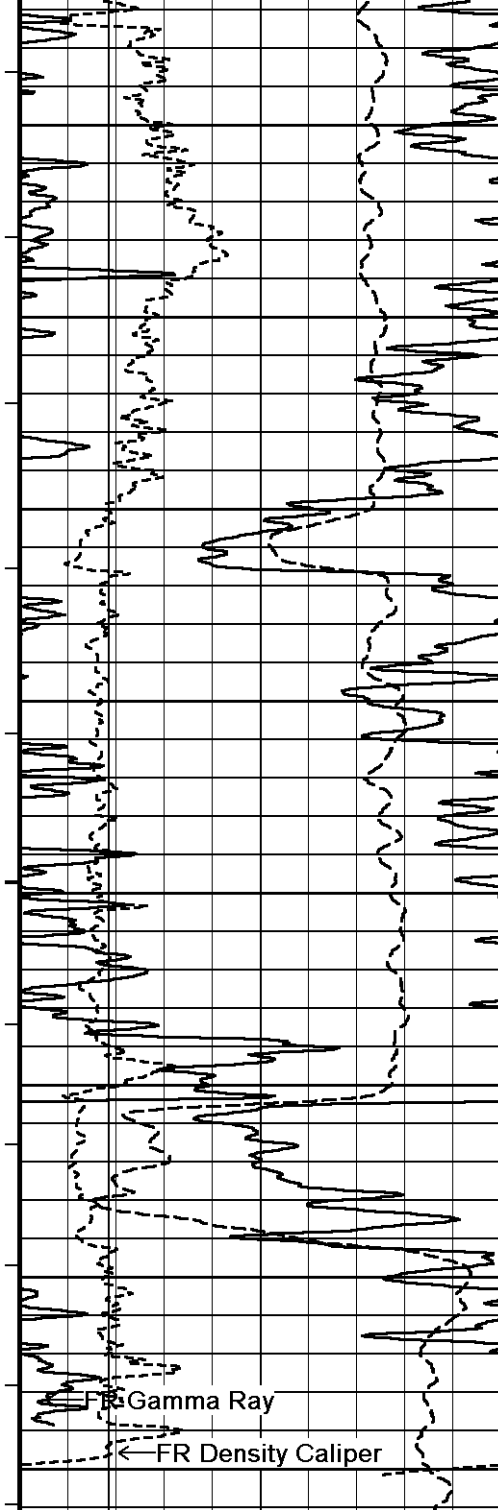
140°

5700

142°

5800





143°

5900

144°

6000

145°

6100

147°

6200

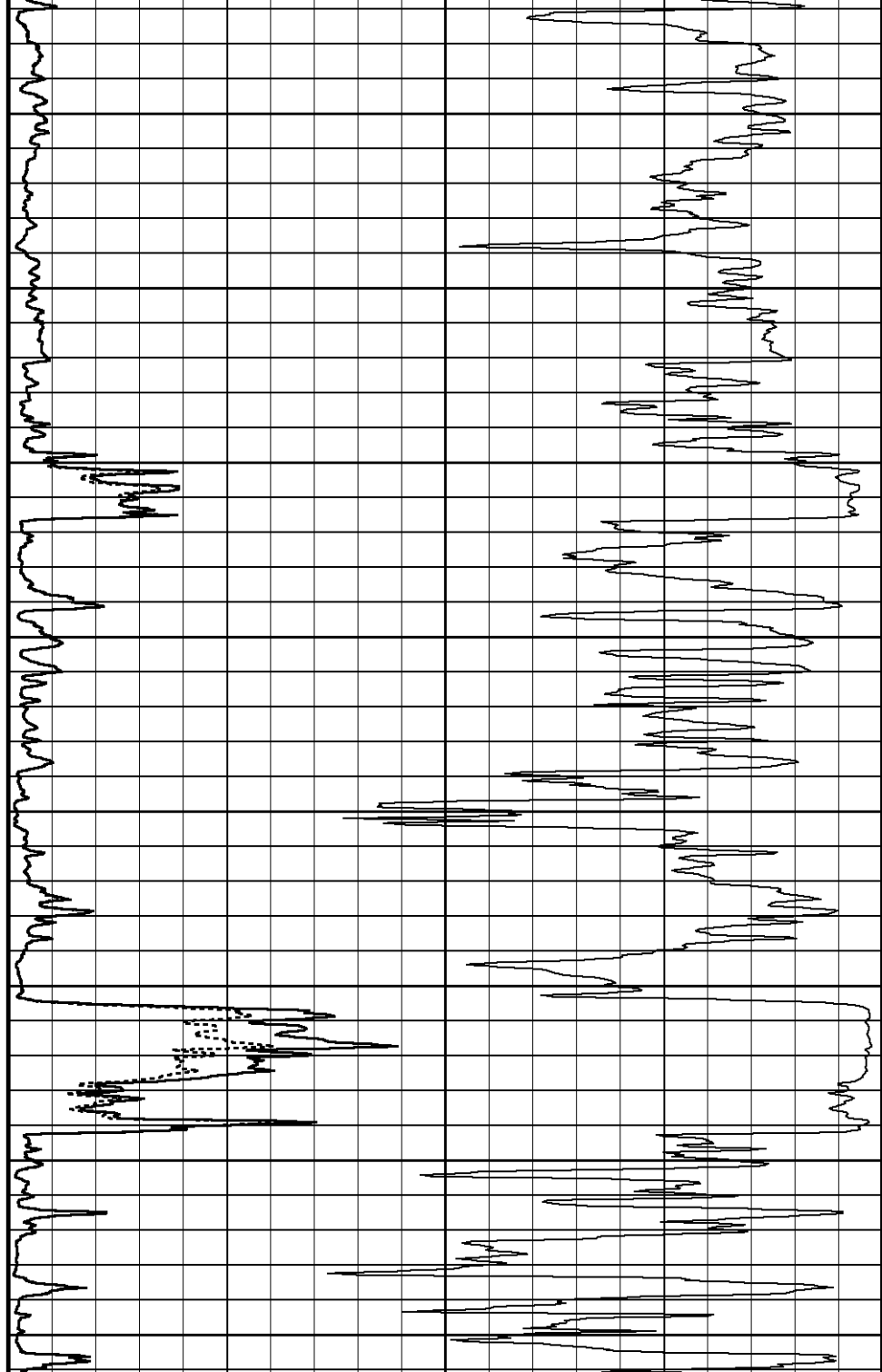
IFR Array Ind. One Cond Ct
IFR Spontaneous Potential

DSC
in
Feet

Timing Marks
every 60.0 sec

Gamma Ray

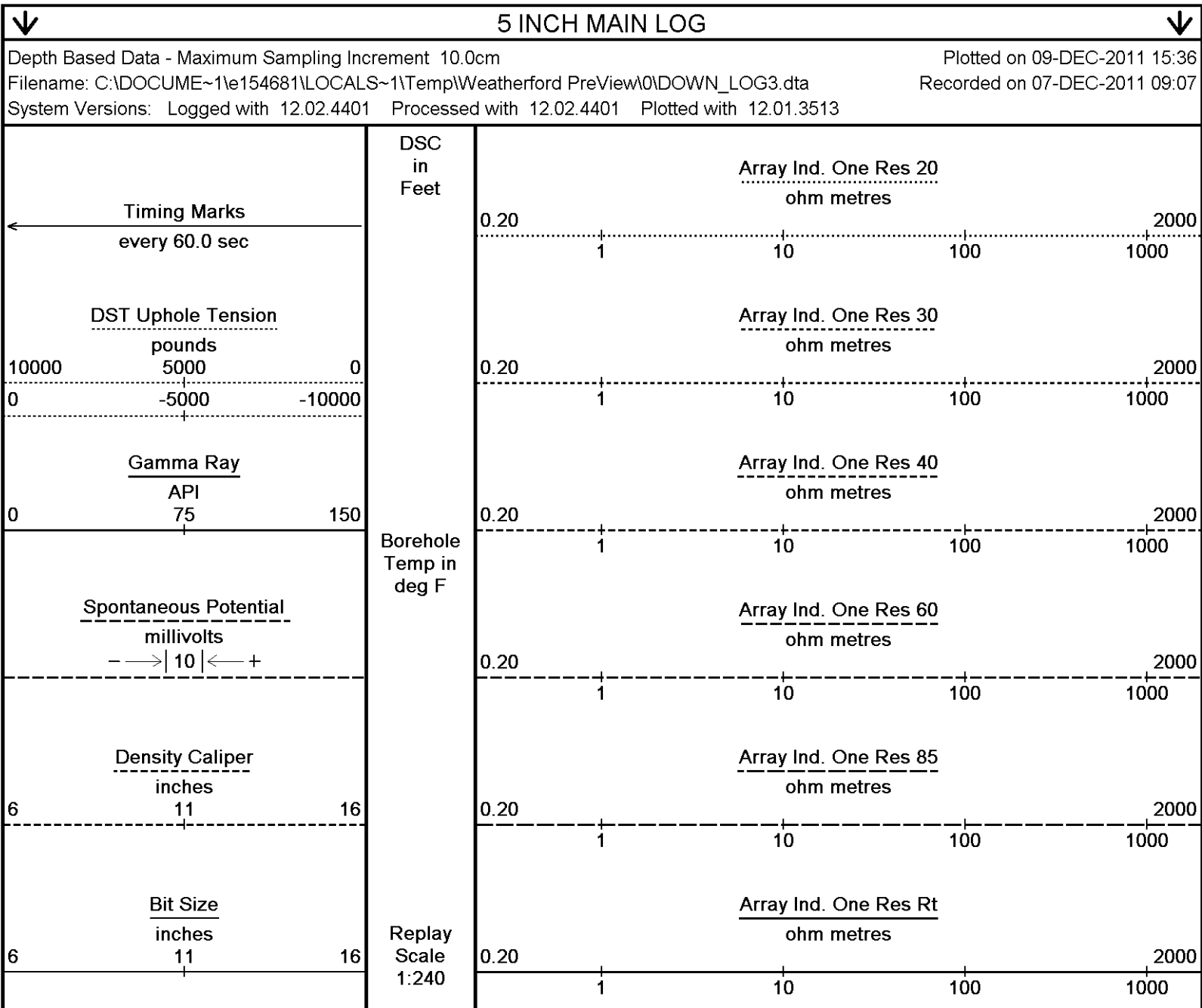
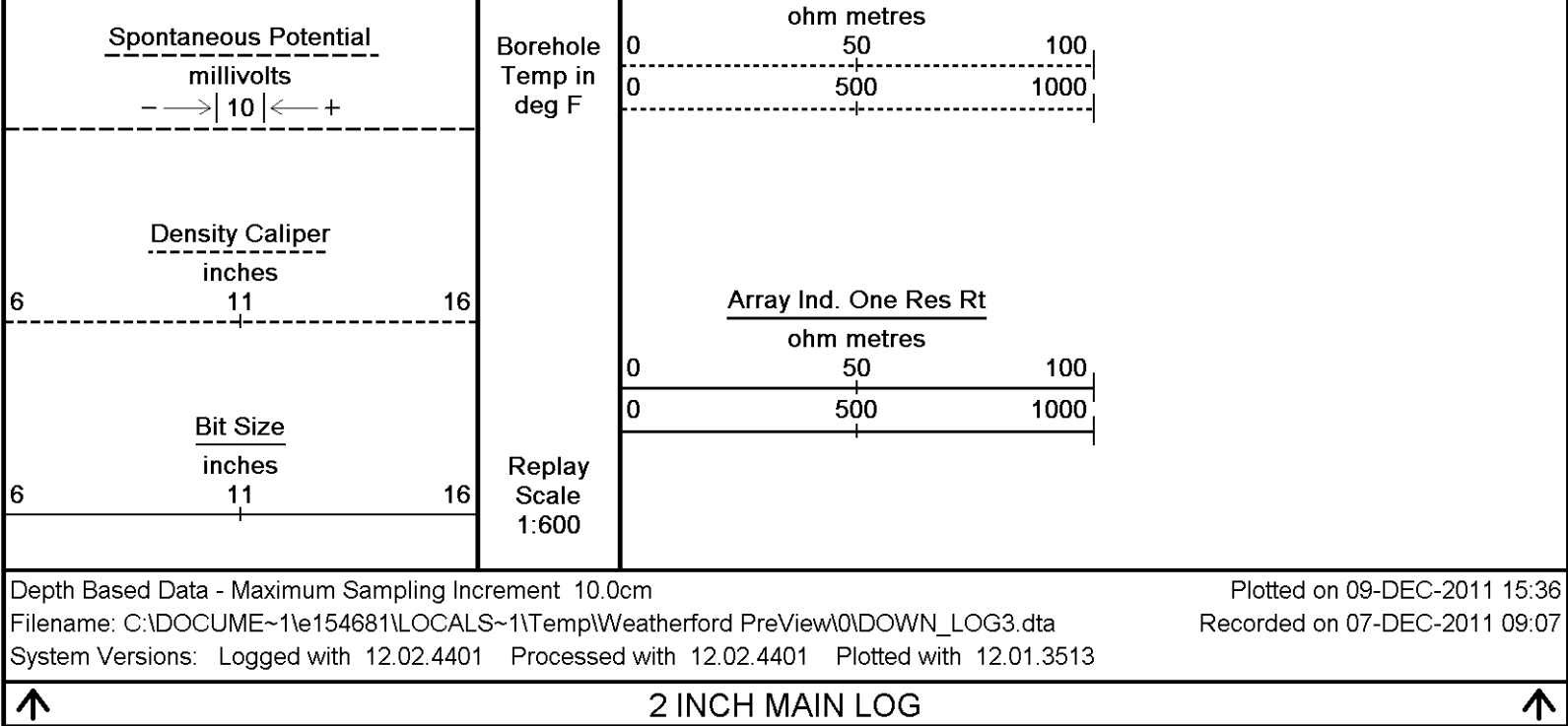
API		
0	75	150
150	225	300



Array Ind. One Cond Ct

1000 750 500 250 0

mmhos



1530
Casing
Shoe

1550

92°

1600

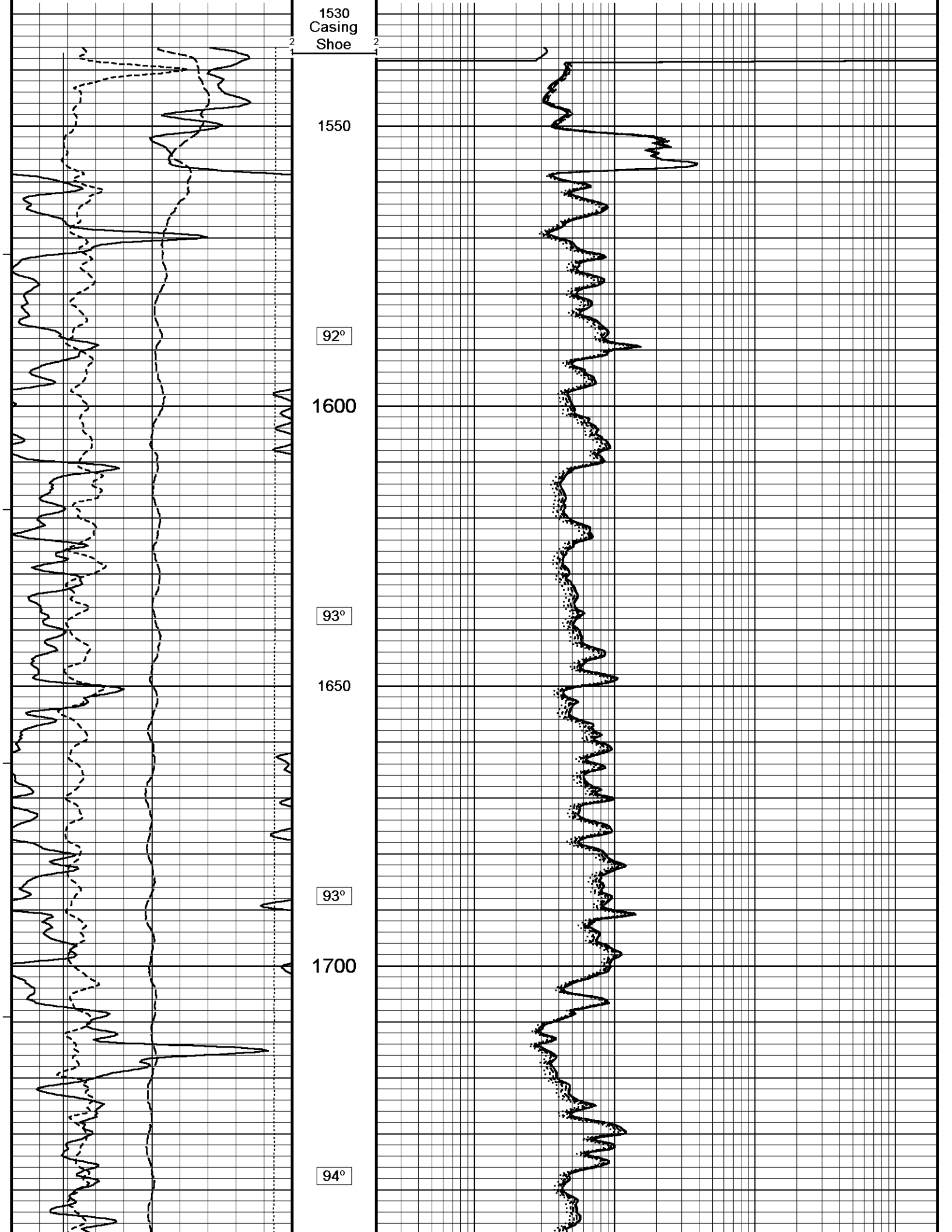
93°

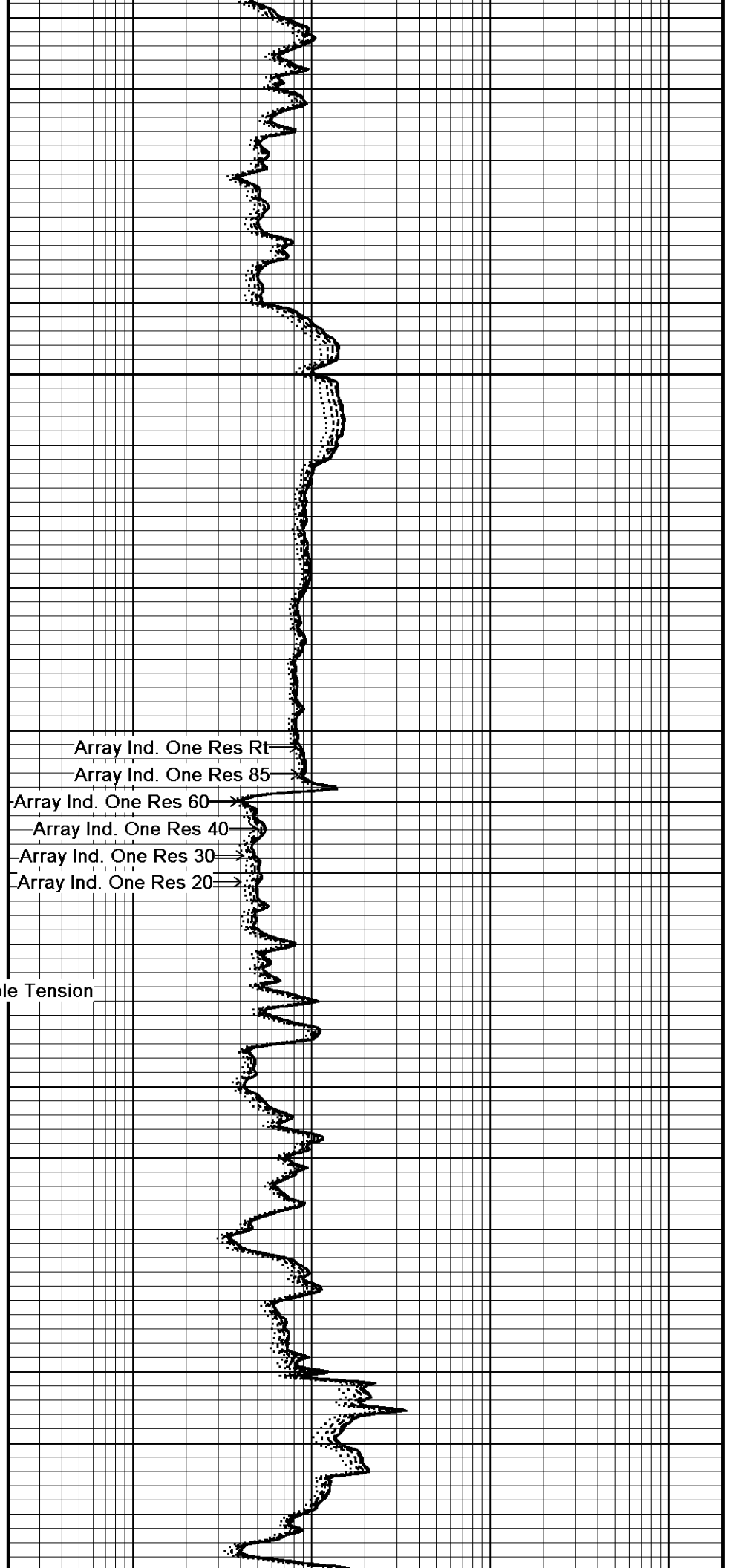
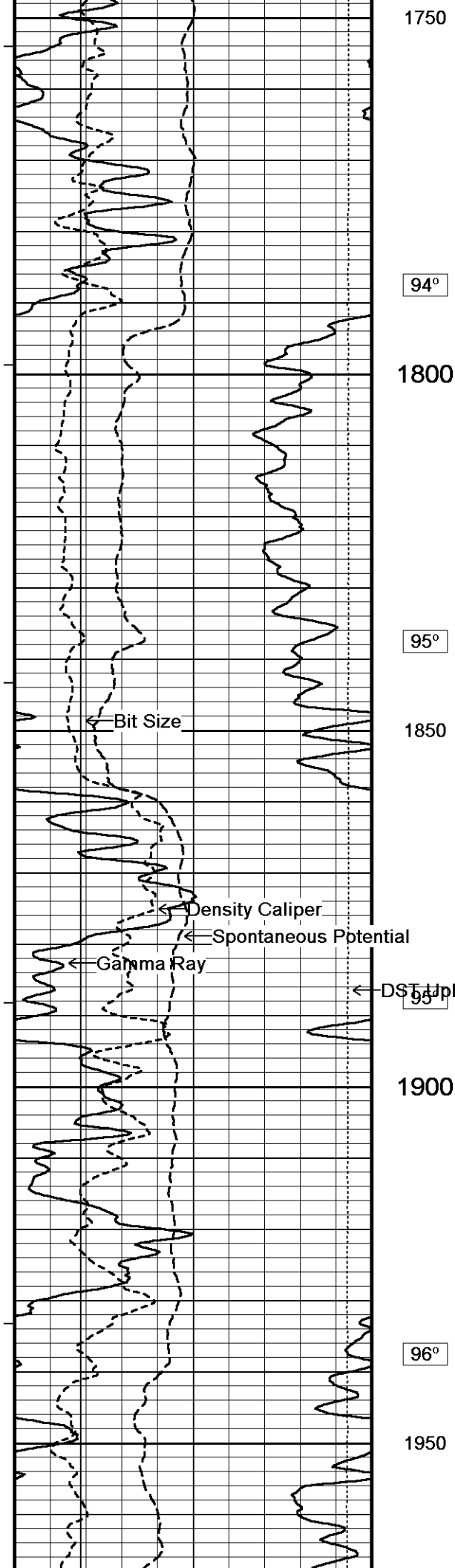
1650

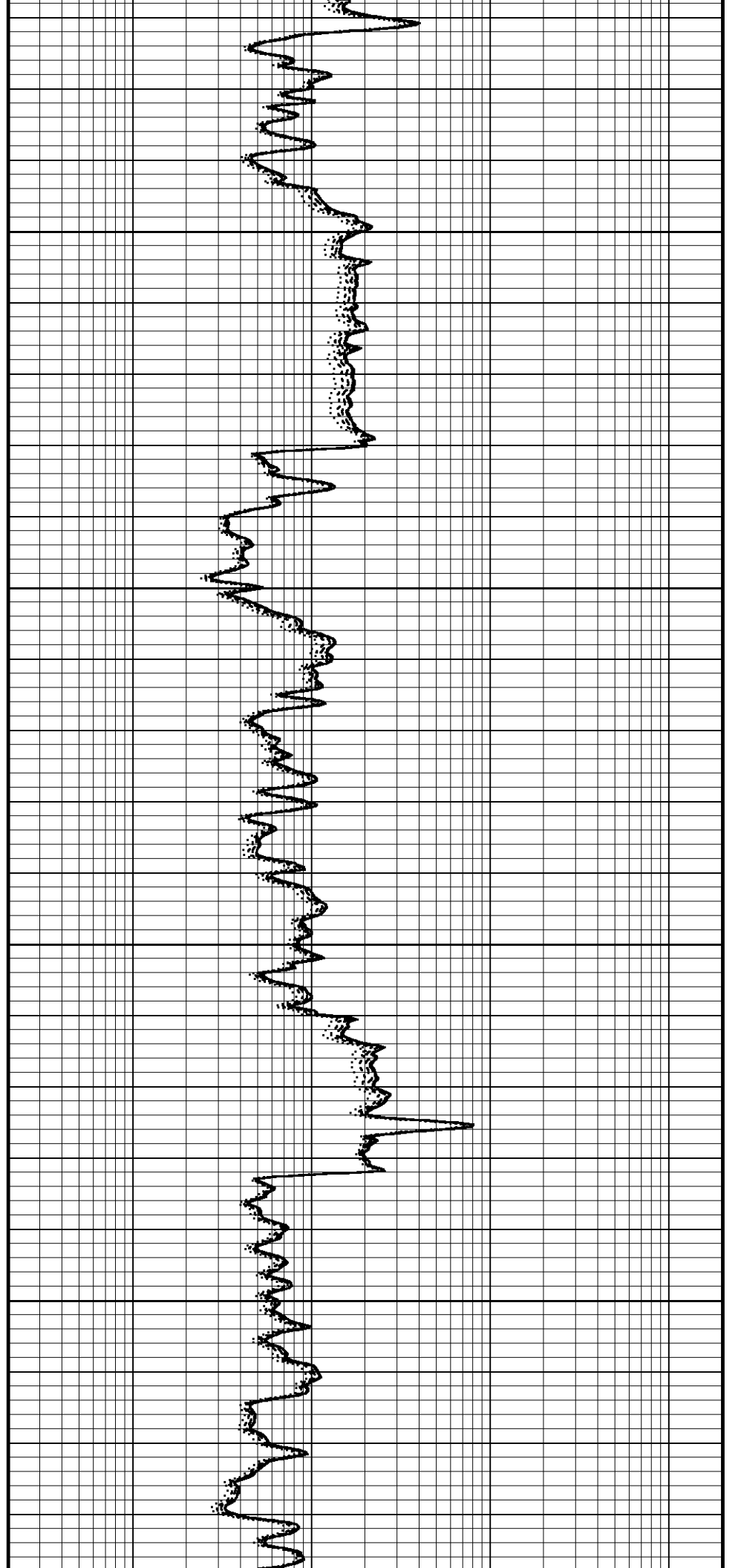
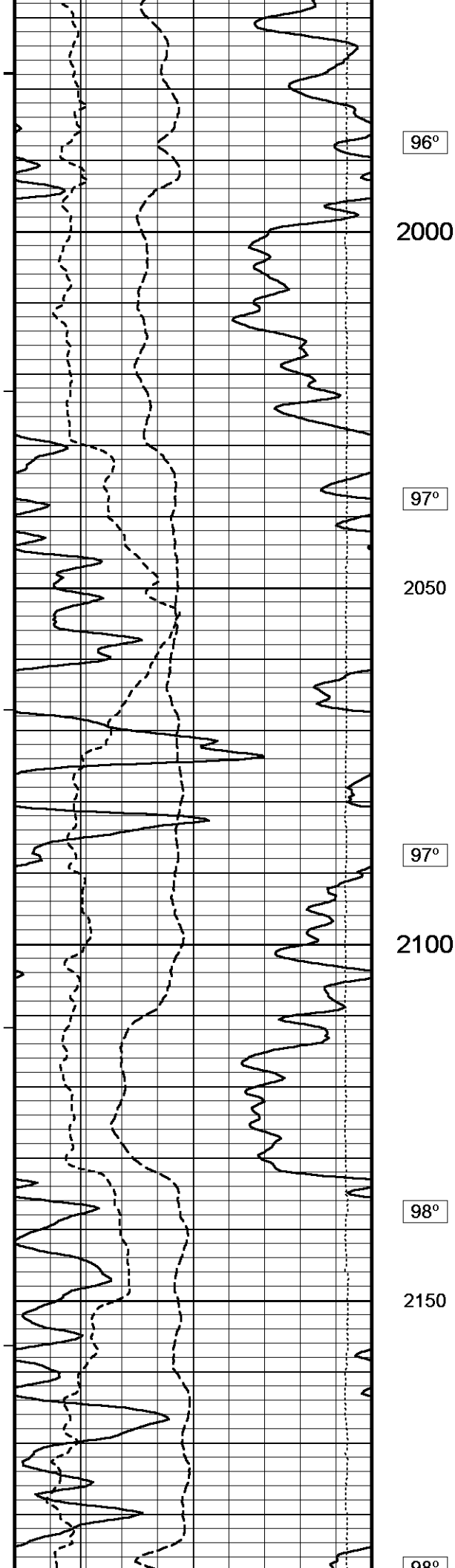
93°

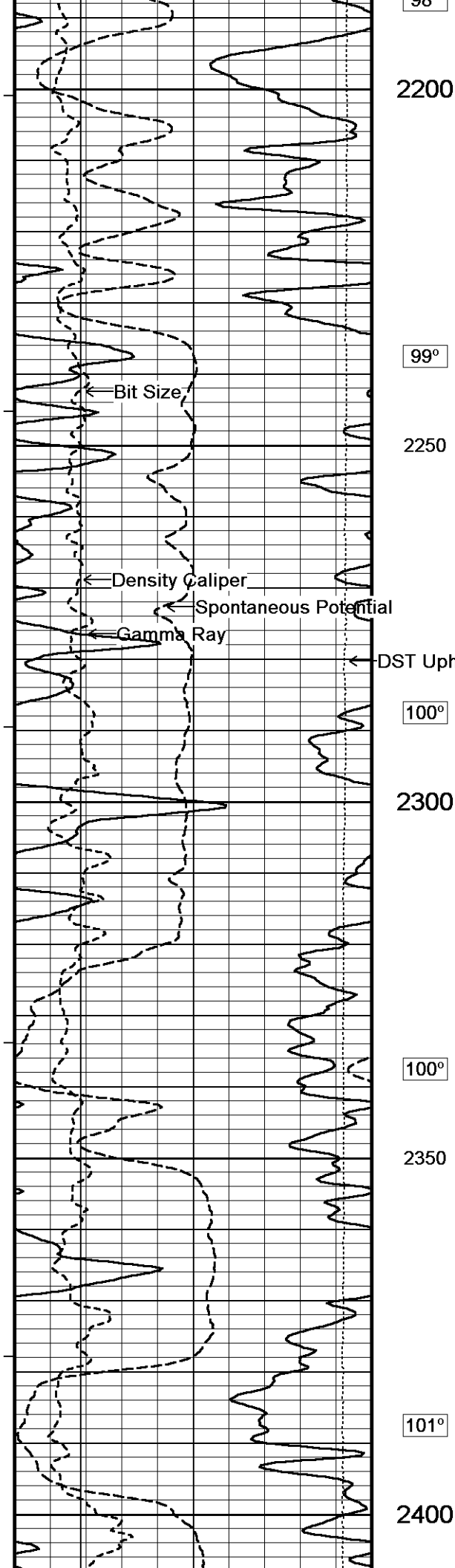
1700

94°









98°

2200

99°

2250

100°

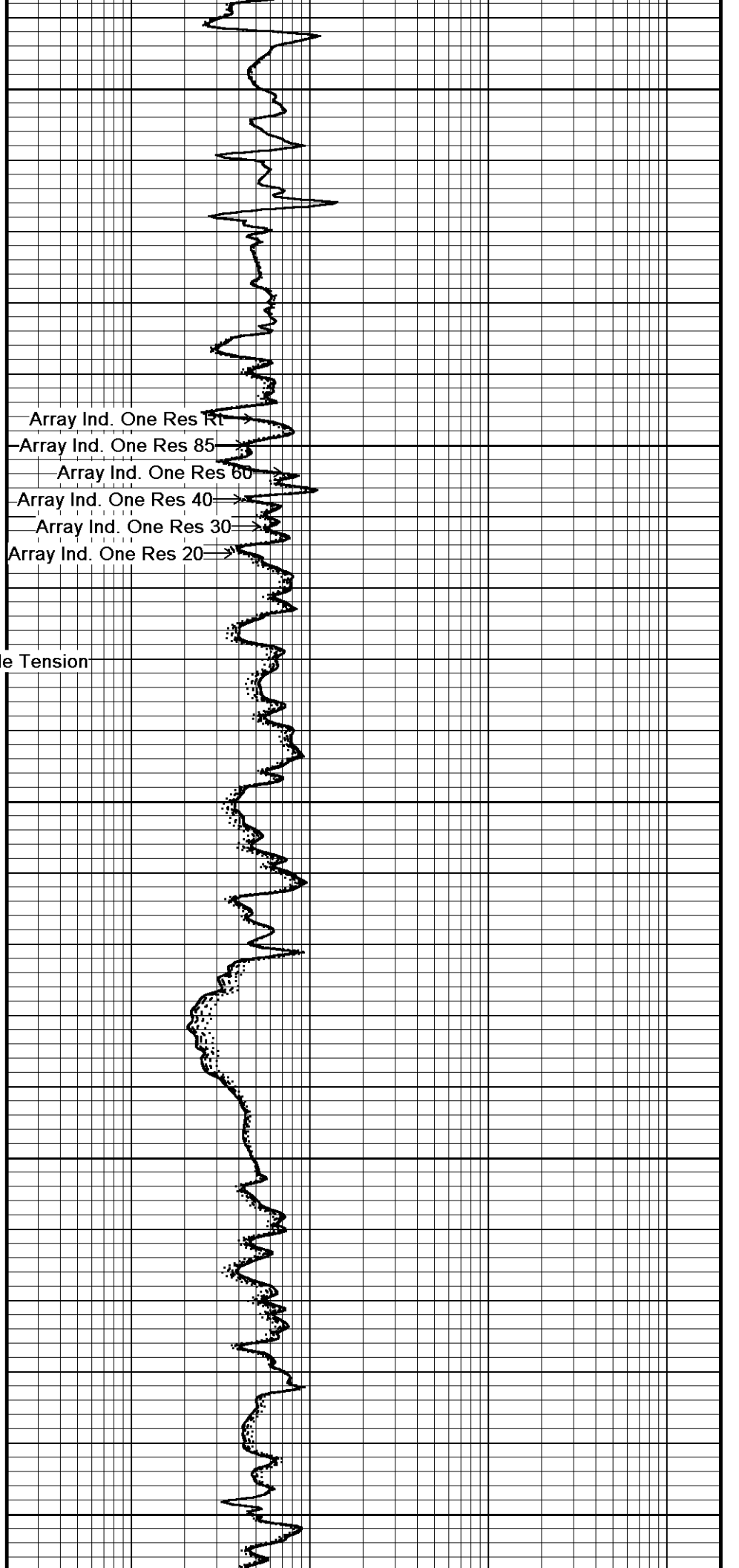
2300

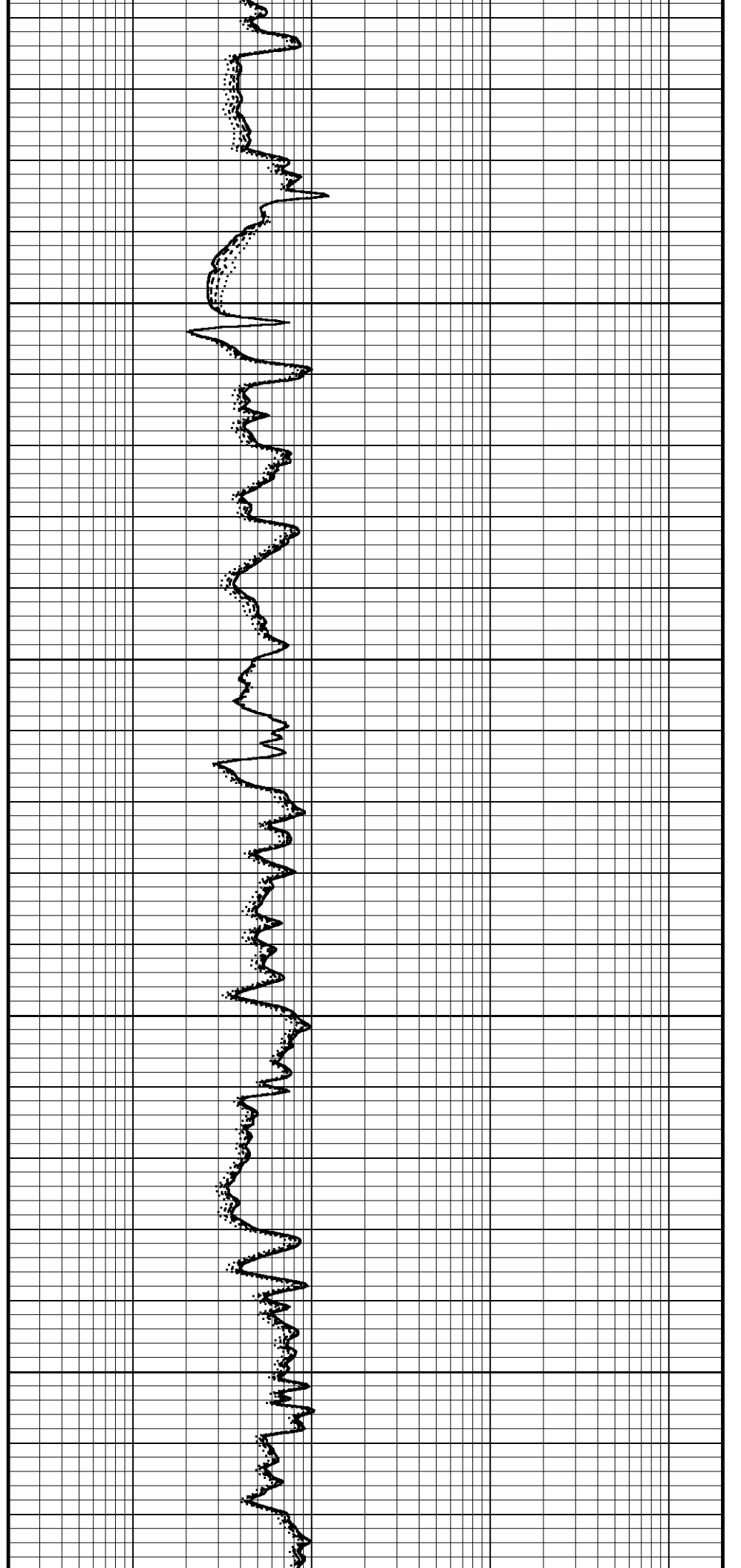
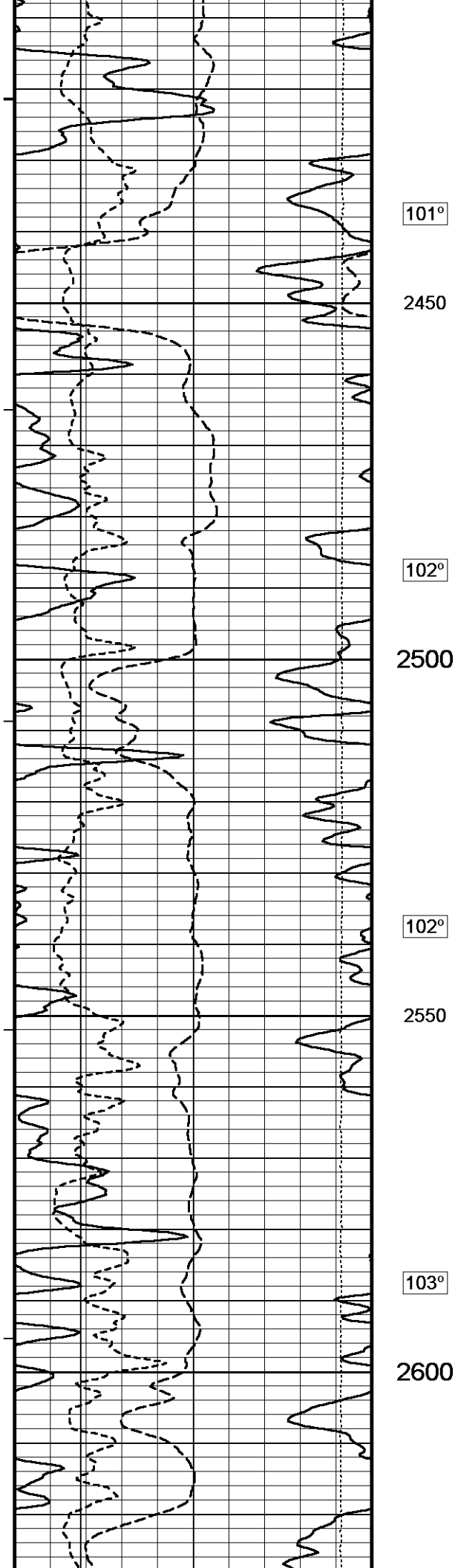
100°

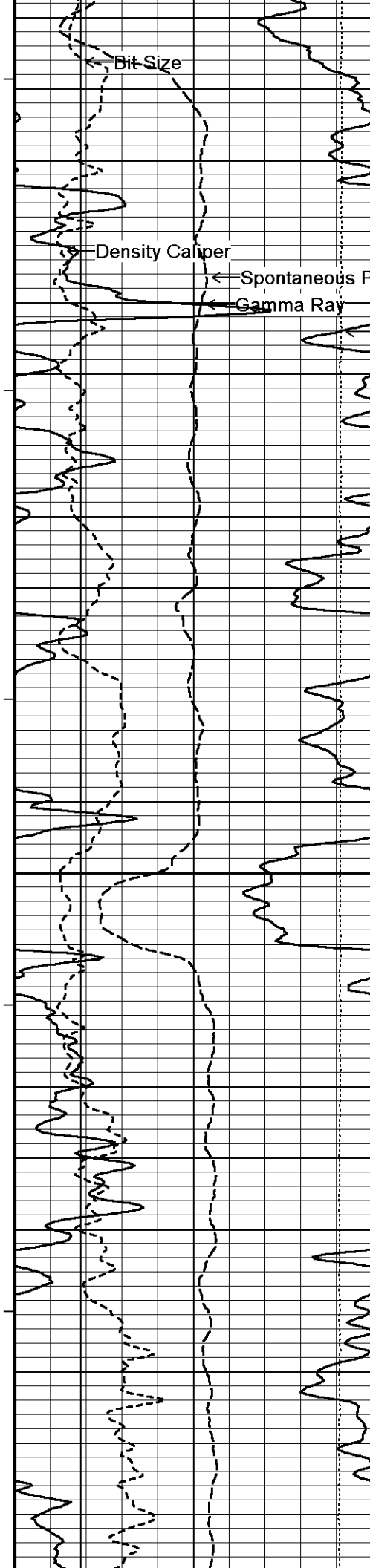
2350

101°

2400







103°

2650

104°

2700

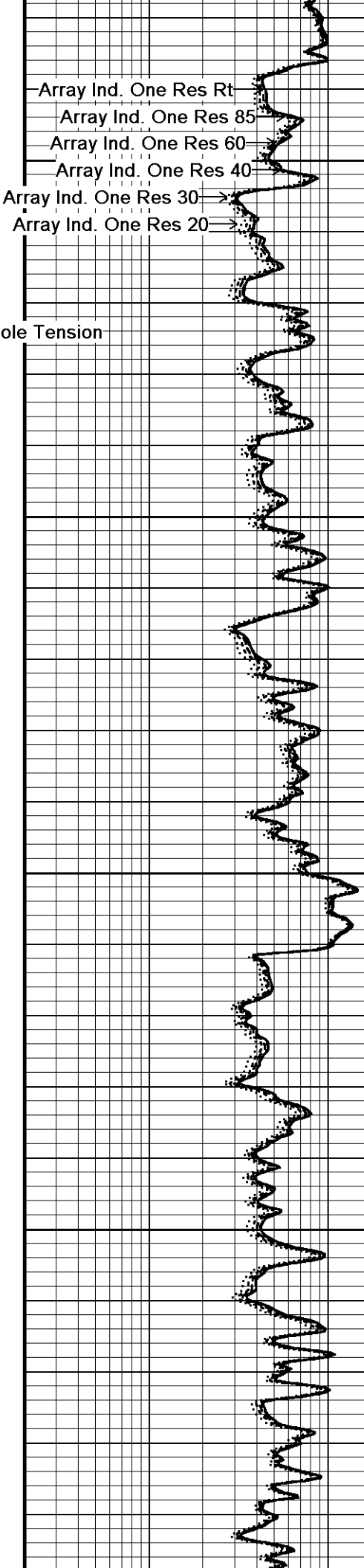
104°

2750

105°

2800

105°



Array Ind. One Res Rt

Array Ind. One Res 85

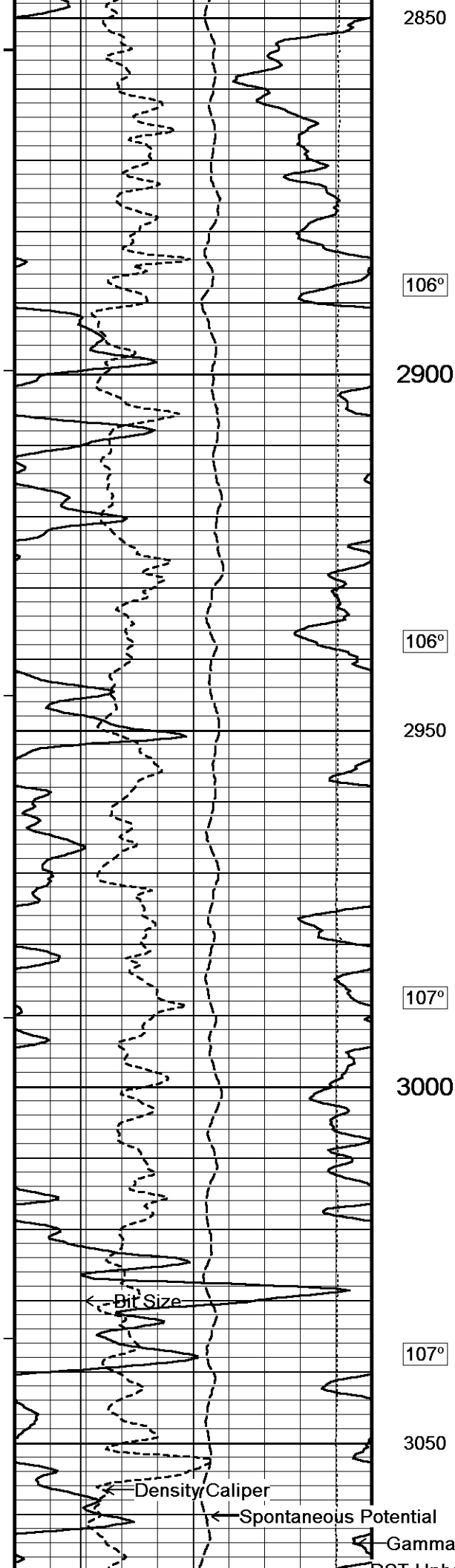
Array Ind. One Res 60

Array Ind. One Res 40

Array Ind. One Res 30

Array Ind. One Res 20

DST Uphole Tension



2850

106°

2900

106°

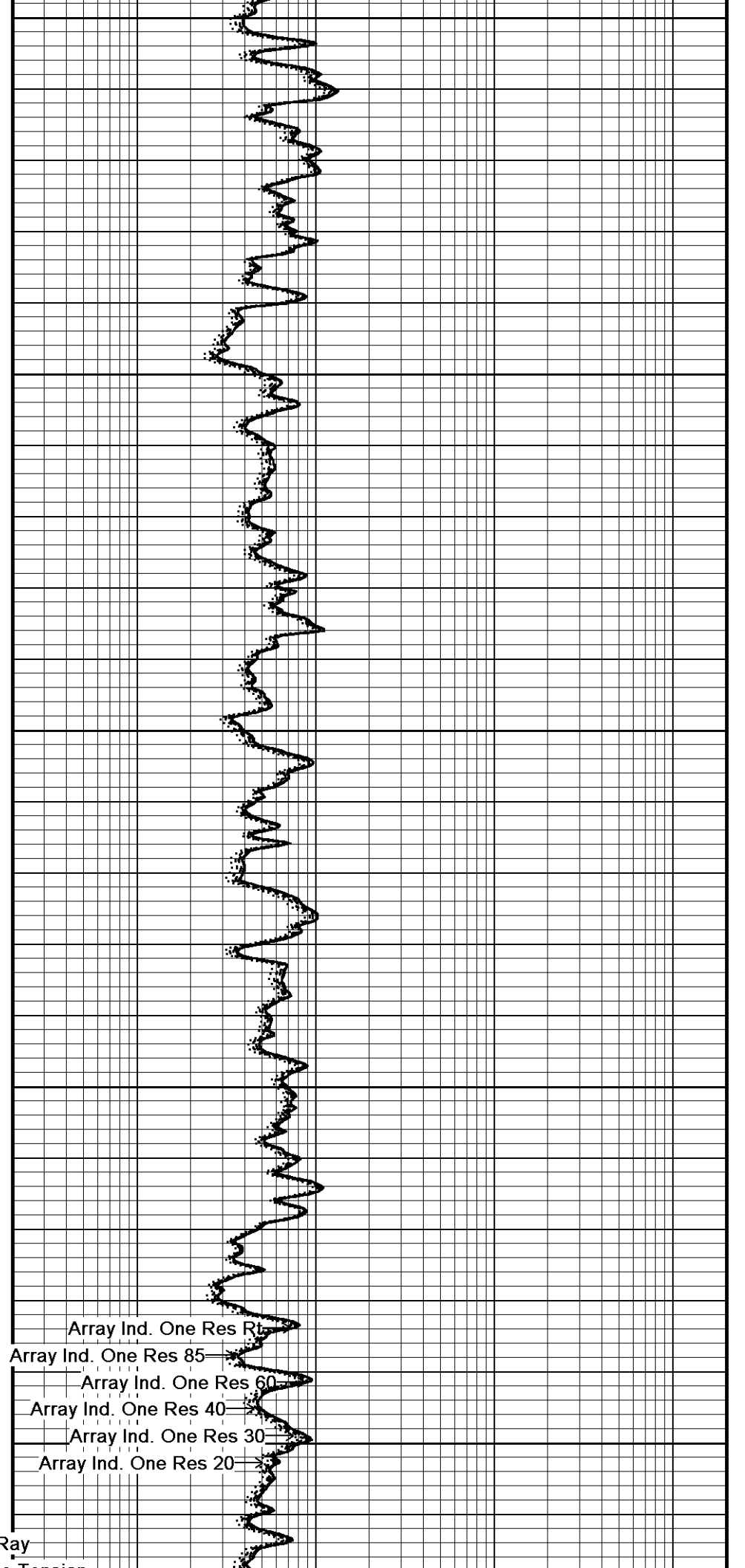
2950

107°

3000

107°

3050



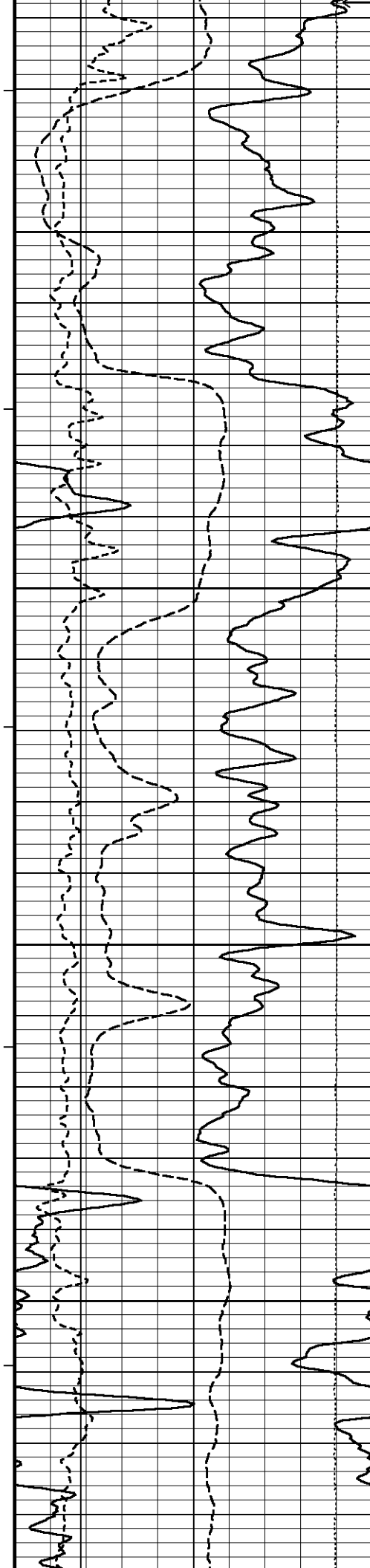
Array Ind. One Res 85

Array Ind. One Res 60

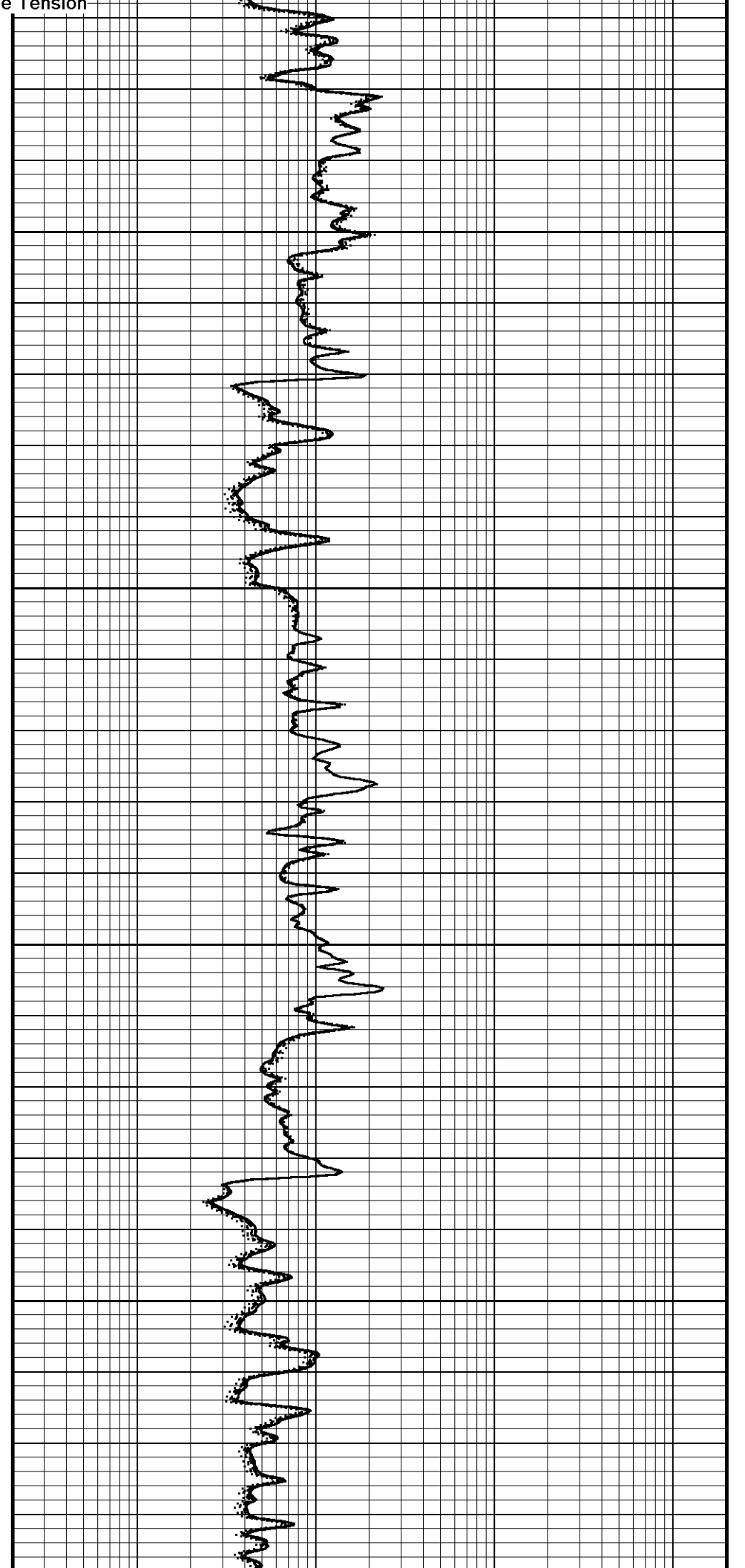
Array Ind. One Res 40

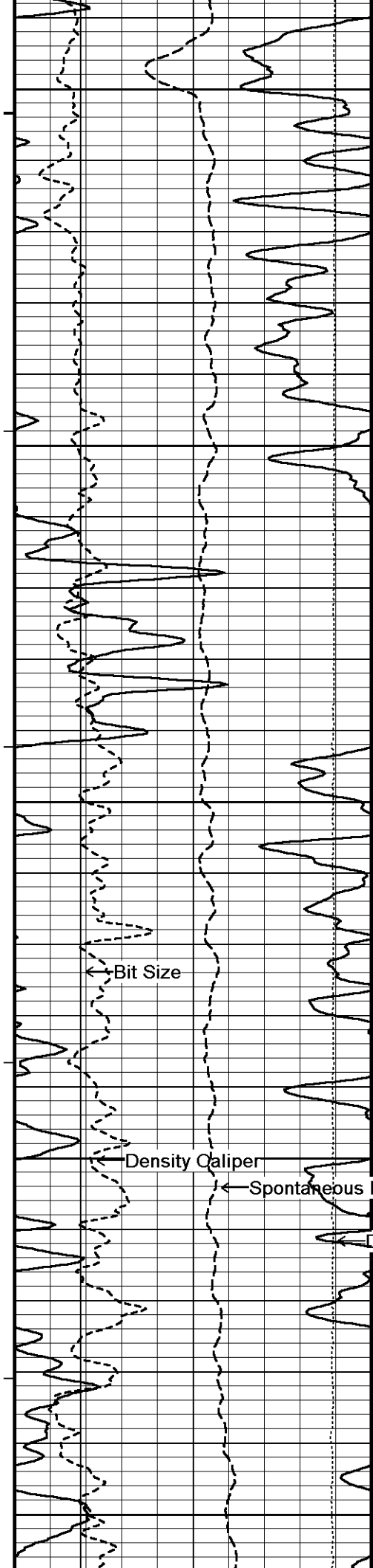
Array Ind. One Res 30

Array Ind. One Res 20



108°
108°
109°
109°
110°





110
3300

111°
3350

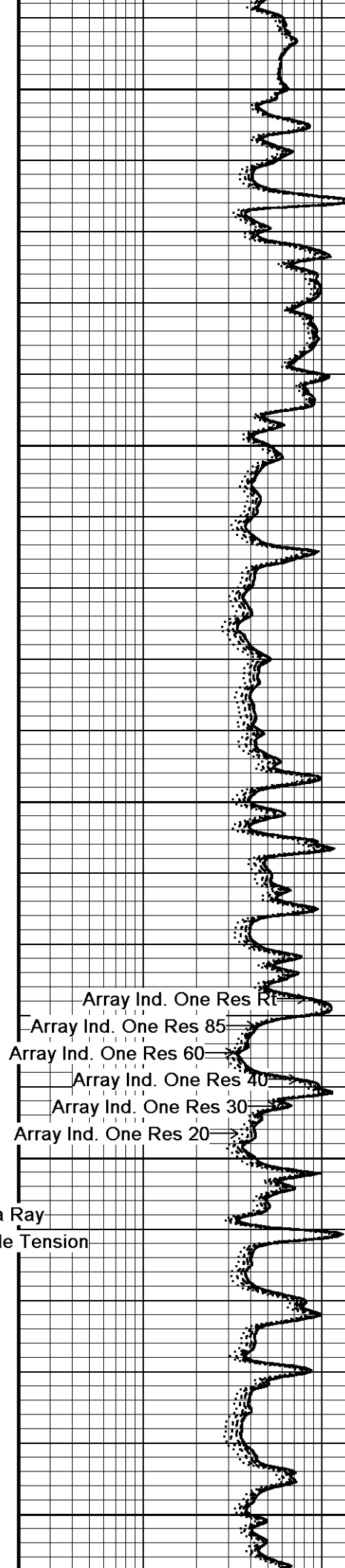
111°
3400

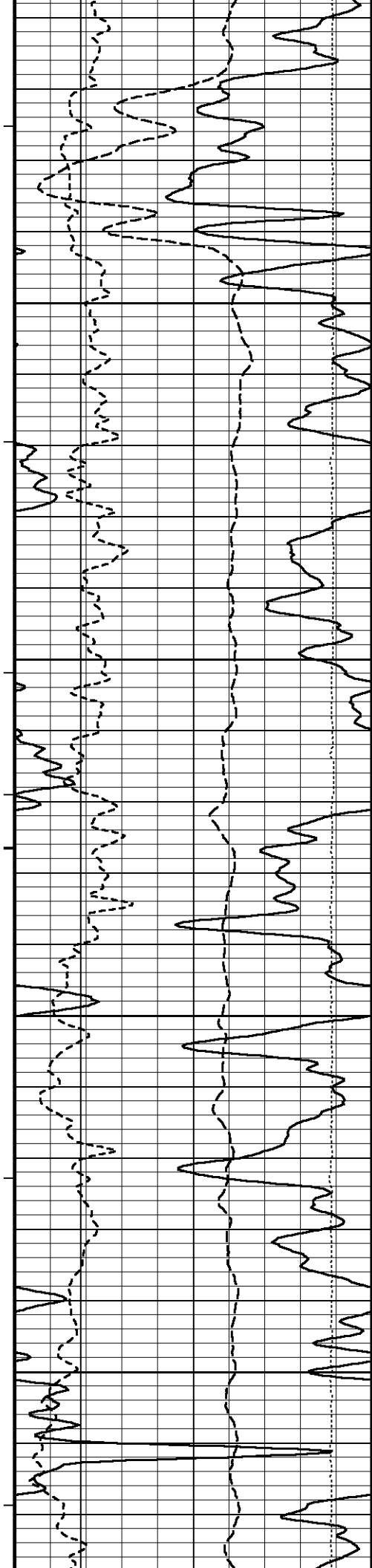
112°
3450

112°
3500

Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40
Array Ind. One Res 30
Array Ind. One Res 20

Spontaneous Potential
Gamma Ray
DST Uphole Tension





113°

3550

114°

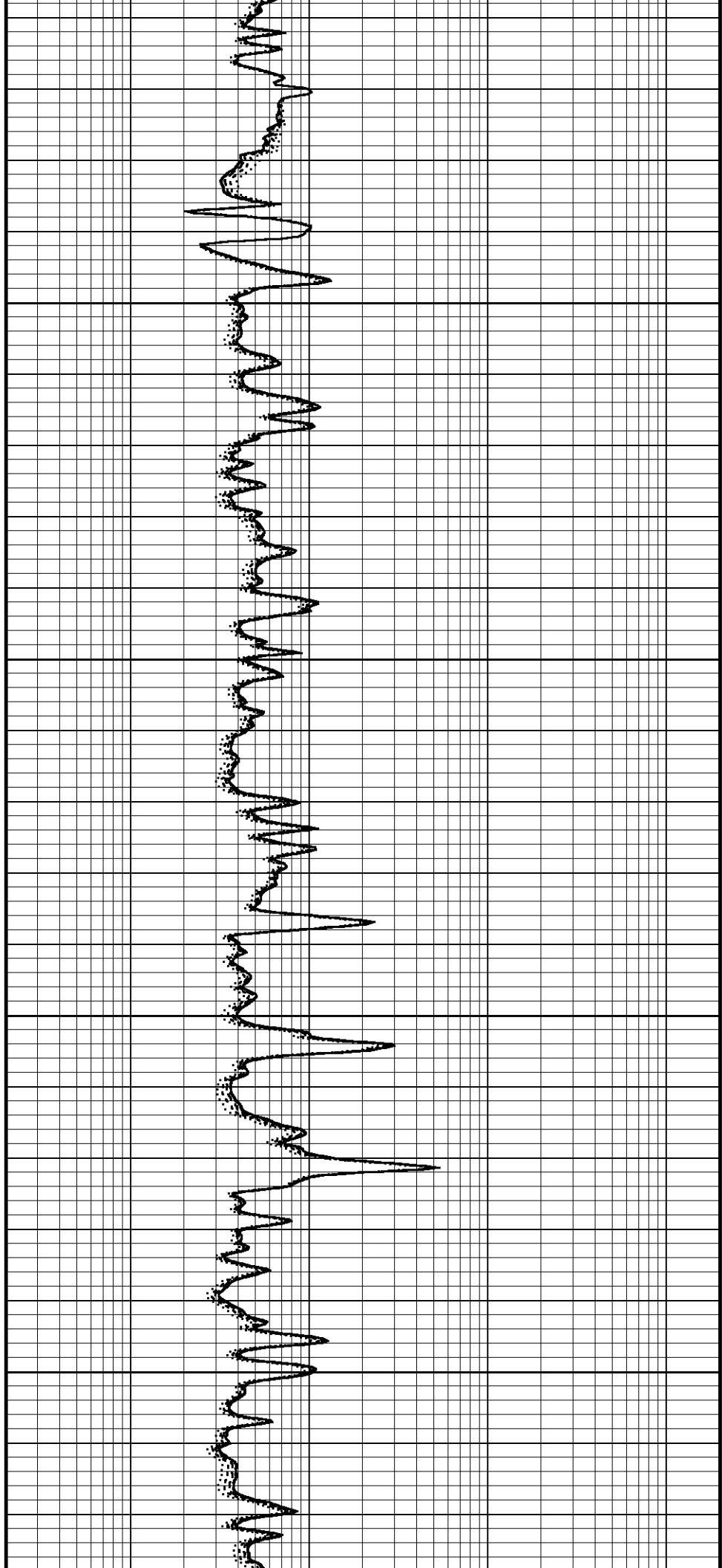
3600

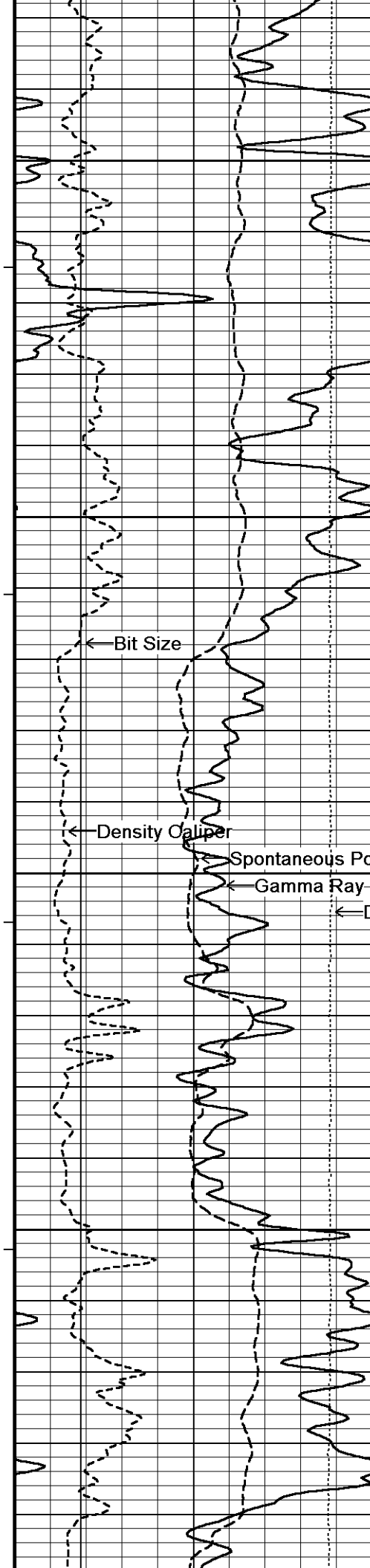
114°

3650

115°

3700





115°

3750

116°

3800

116°

3850

117°

3900

118°

← Bit Size

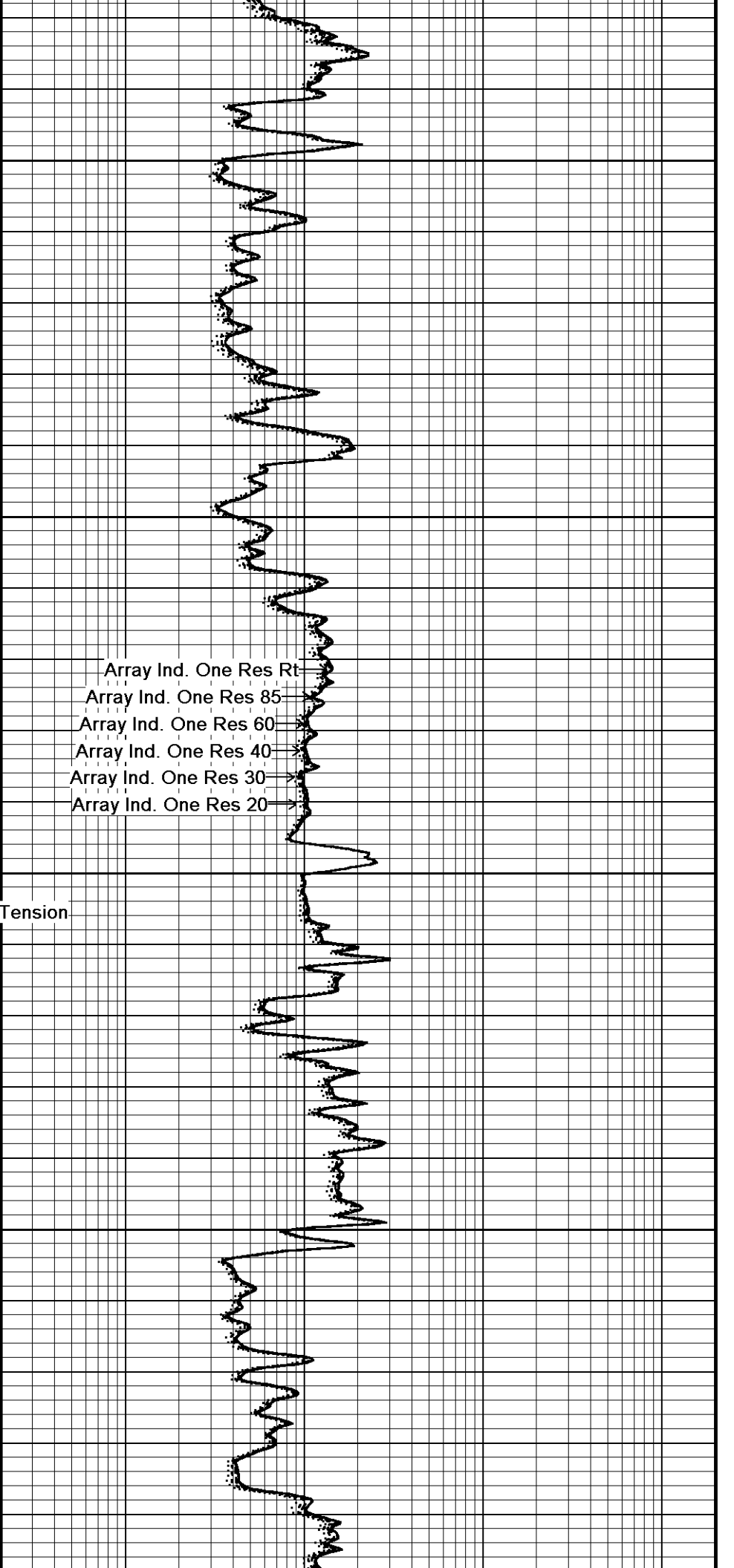
← Density Caliper

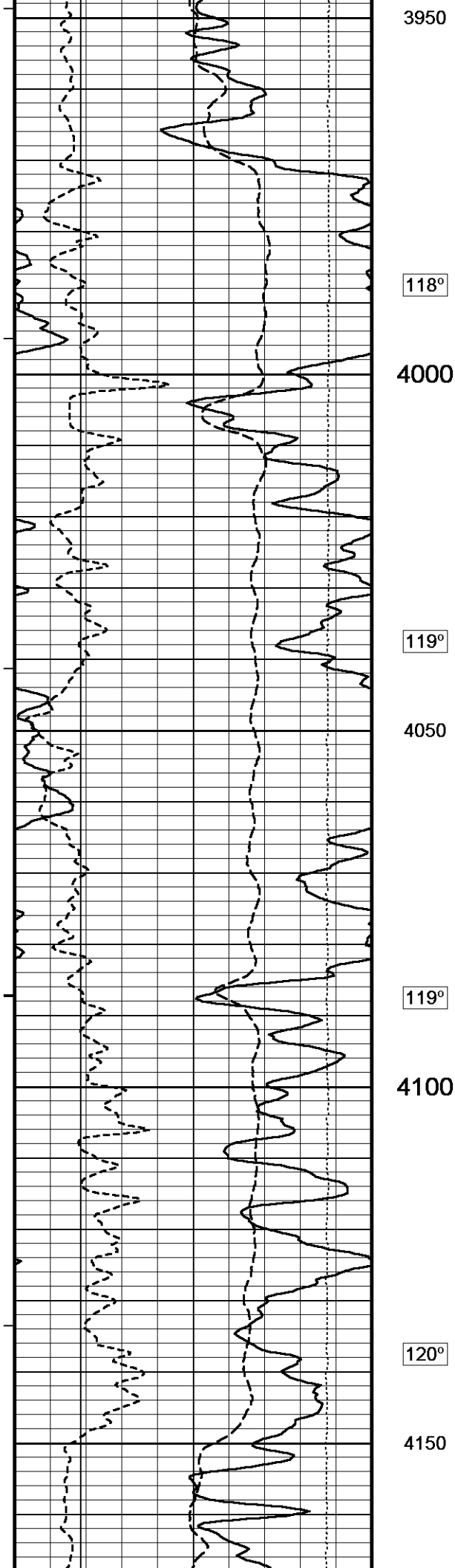
← Spontaneous Potential

← Gamma Ray

← DST Uphole Tension

Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40
Array Ind. One Res 30
Array Ind. One Res 20





3950

118°

4000

119°

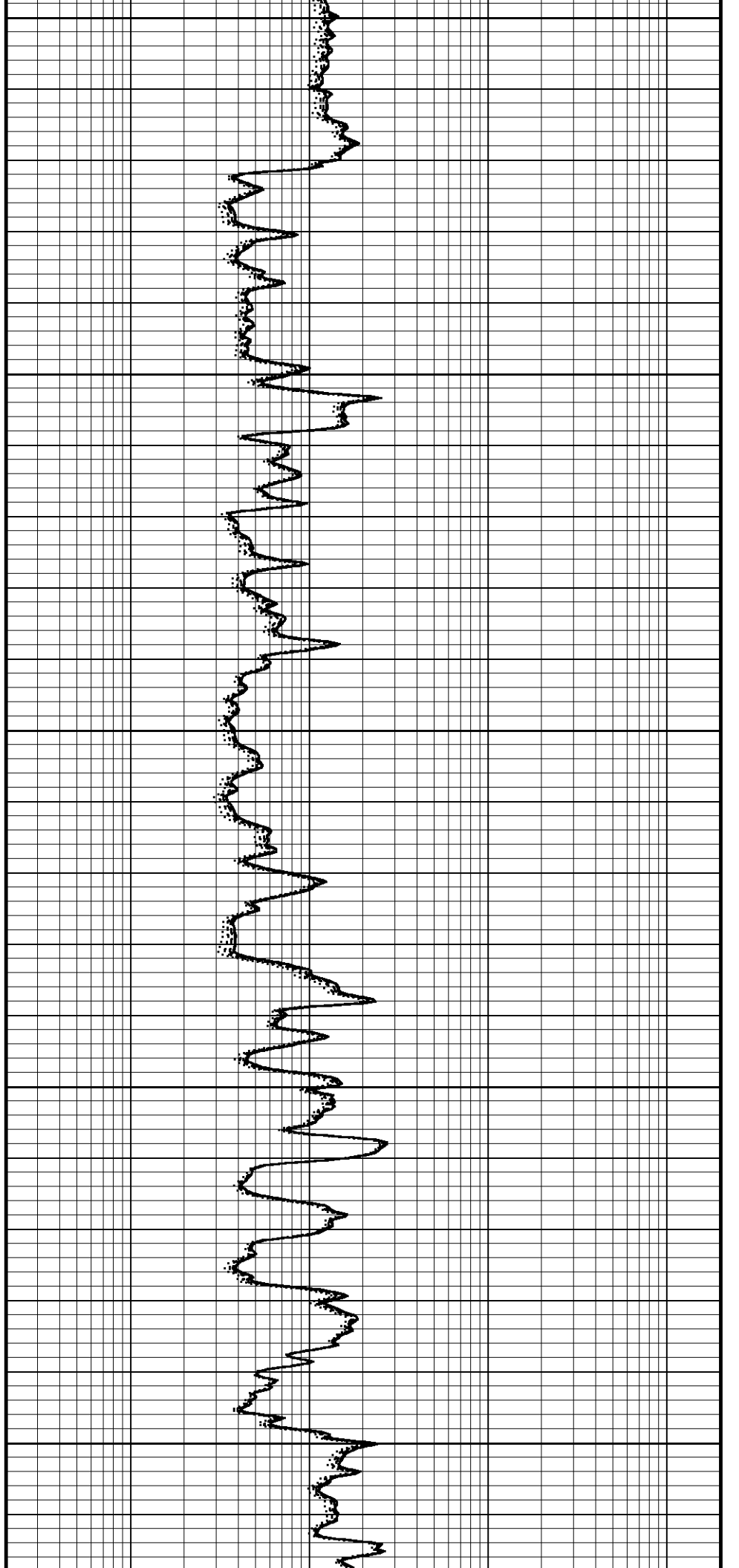
4050

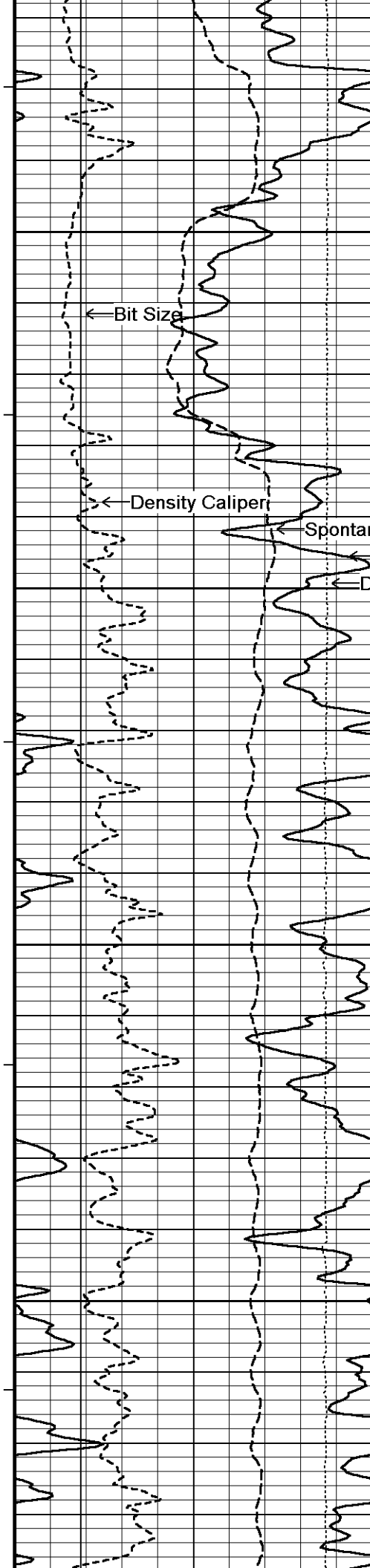
119°

4100

120°

4150





120°

4200

Bit Size

Density Caliper

Spontaneous Potential

Gamma Ray

DST 4250 psi Tension

121°

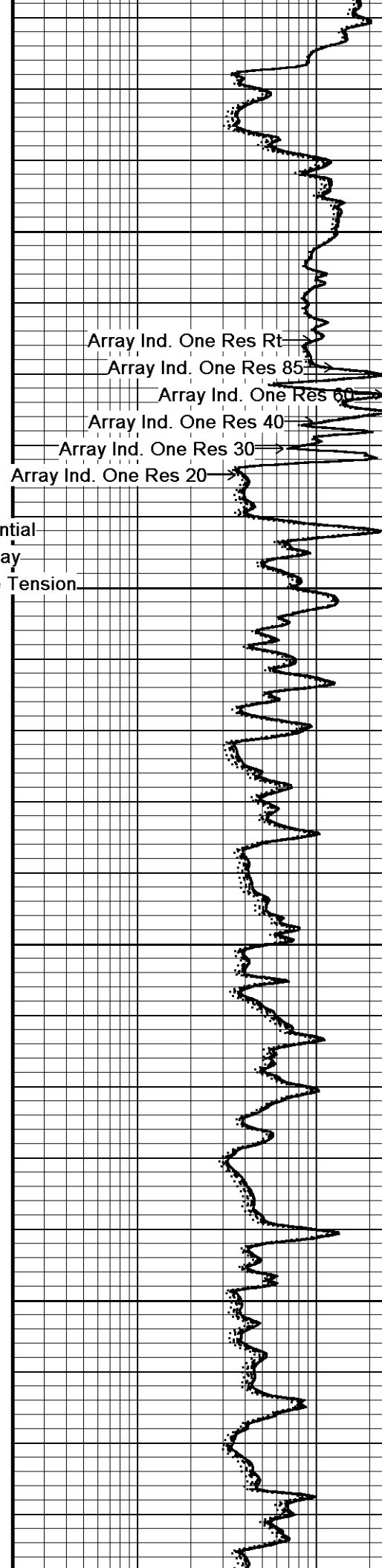
122°

4300

122°

4350

123°



Array Ind. One Res Rt

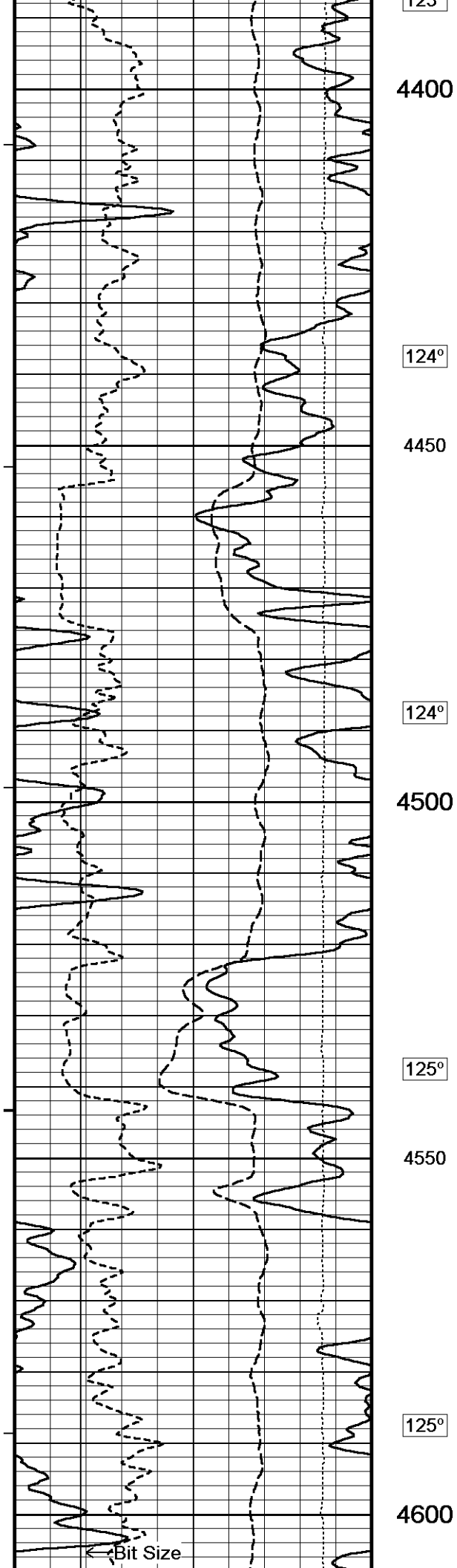
Array Ind. One Res 85

Array Ind. One Res 60

Array Ind. One Res 40

Array Ind. One Res 30

Array Ind. One Res 20



123

4400

124°

4450

124°

4500

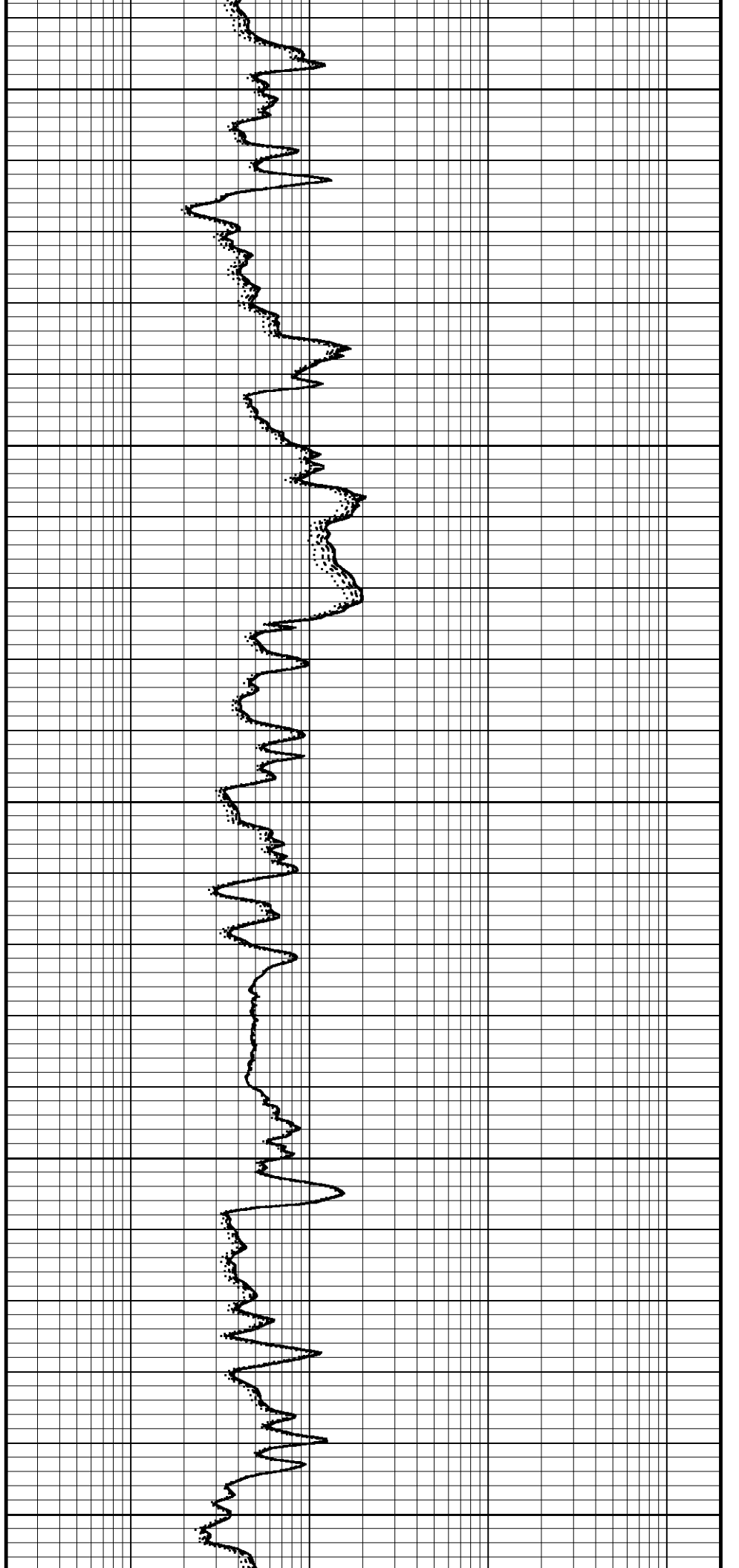
125°

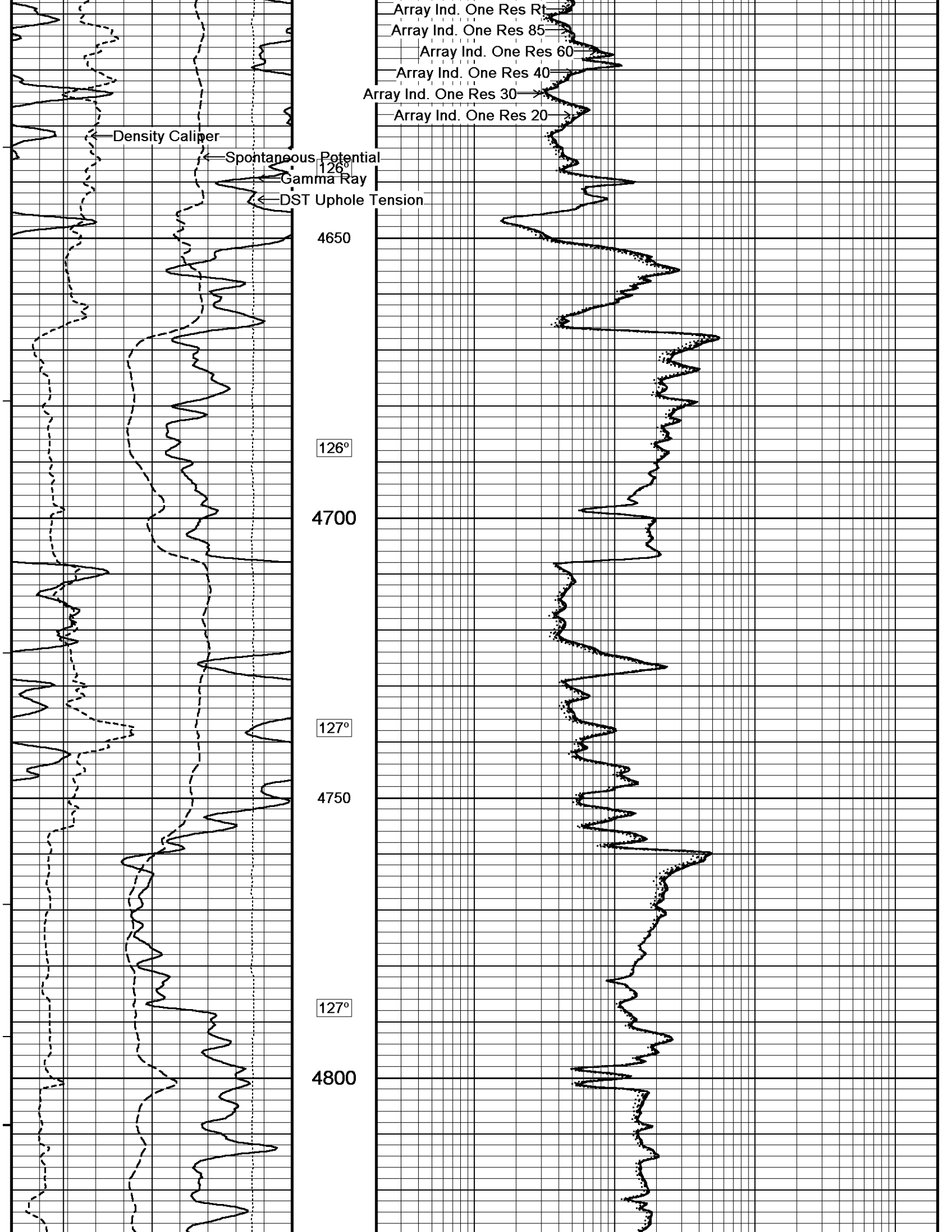
4550

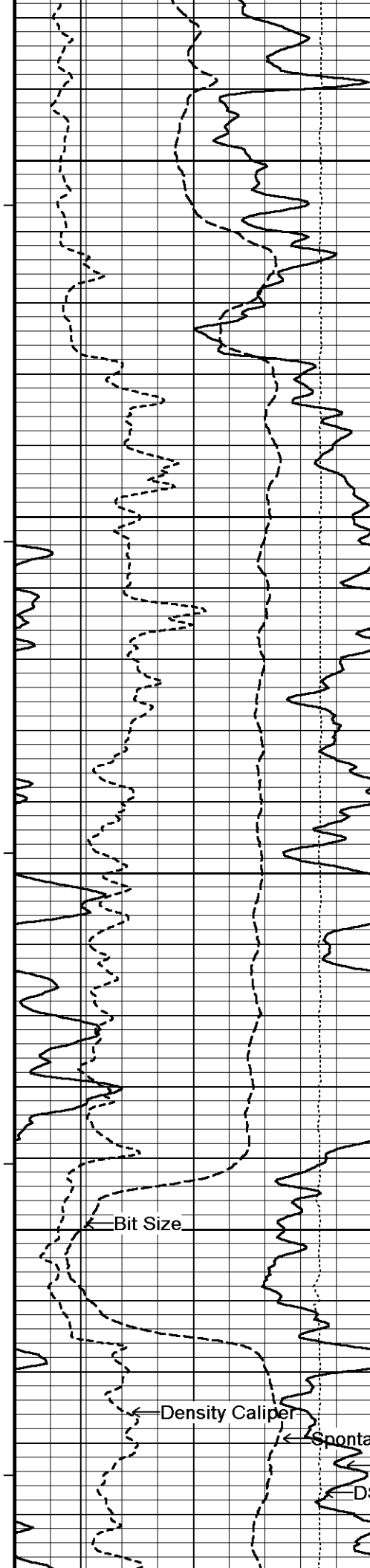
125°

4600

Bit Size







128°

4850

129°

4900

129°

4950

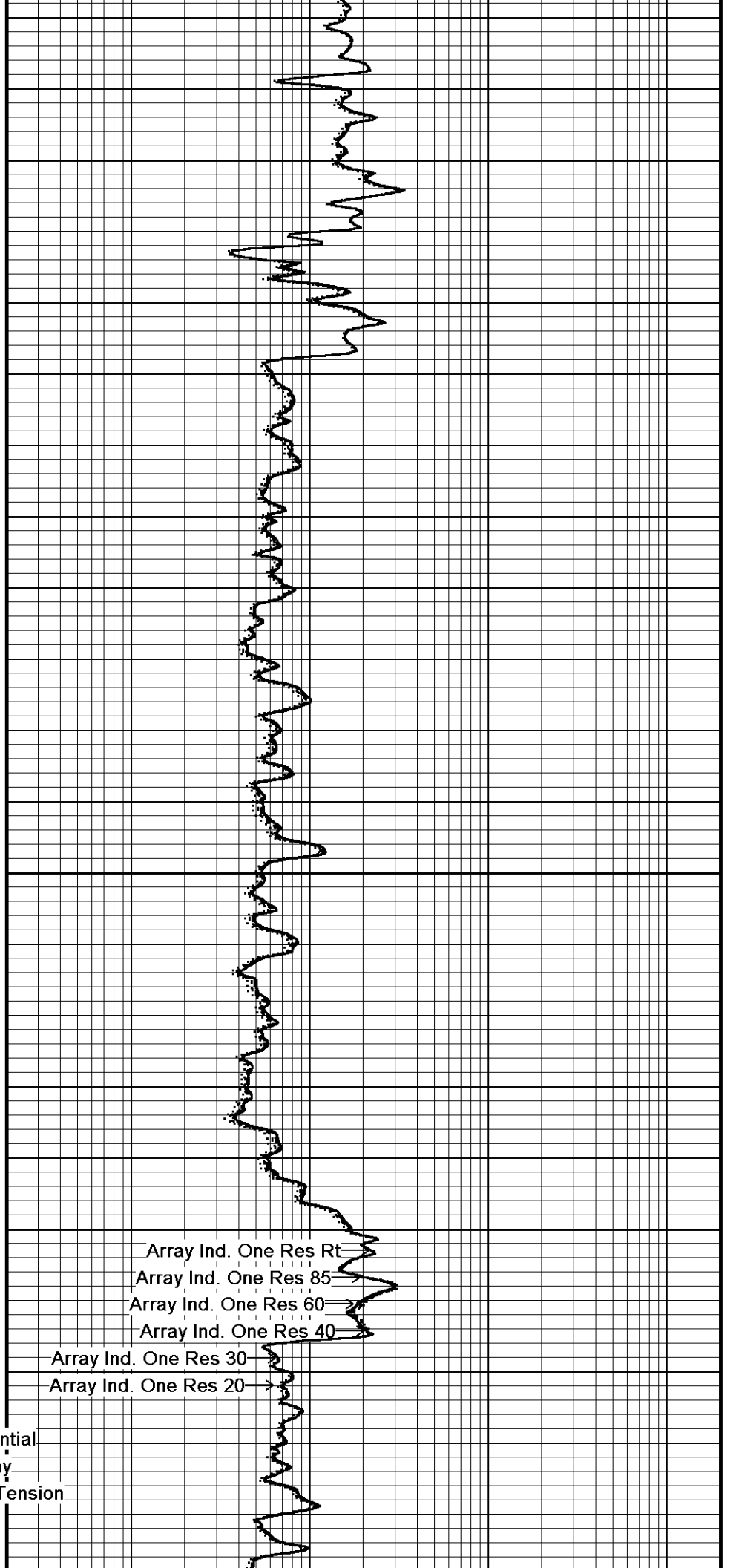
130°

5000

130°

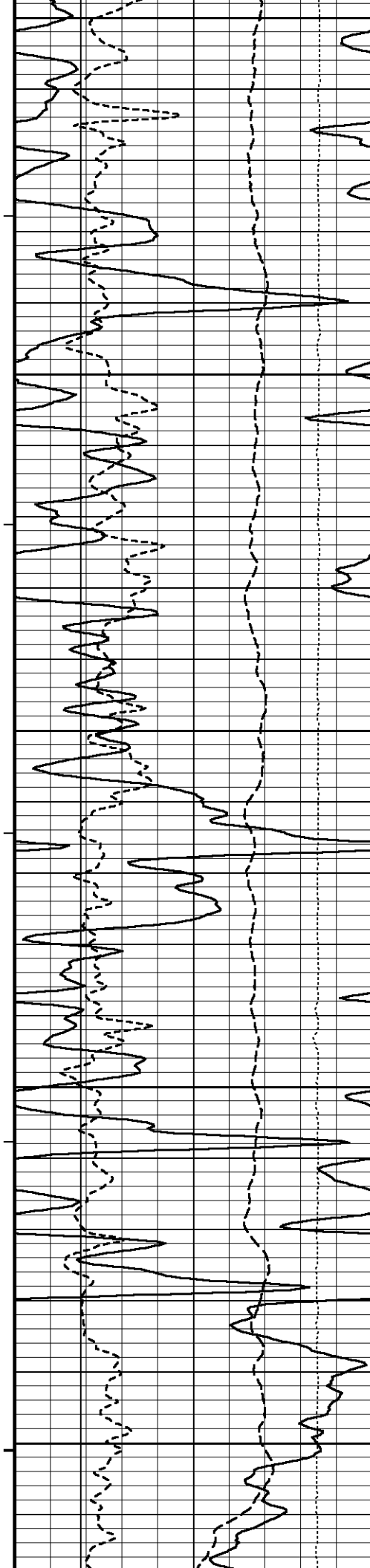
5050

Spontaneous Potential
Gamma Ray
DST Up/Down Tension

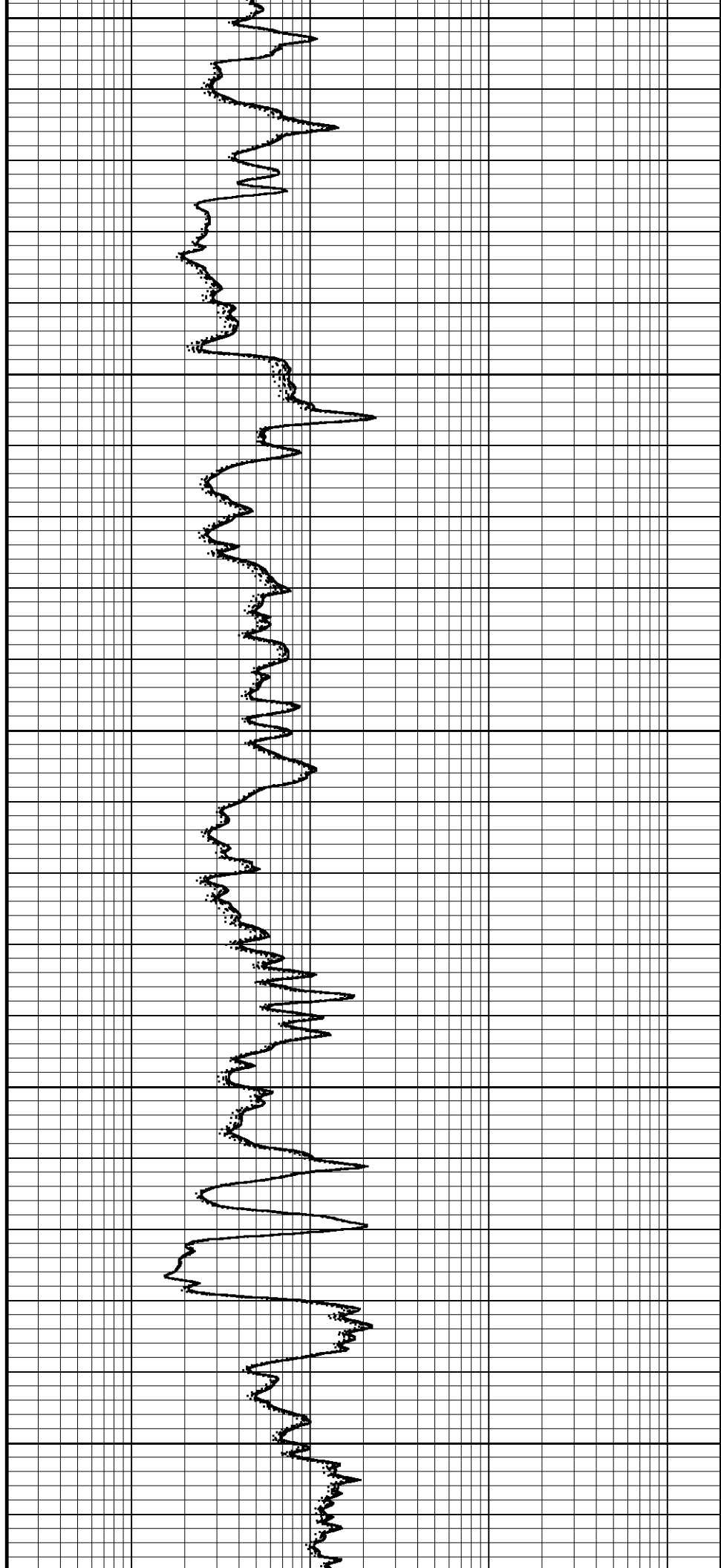


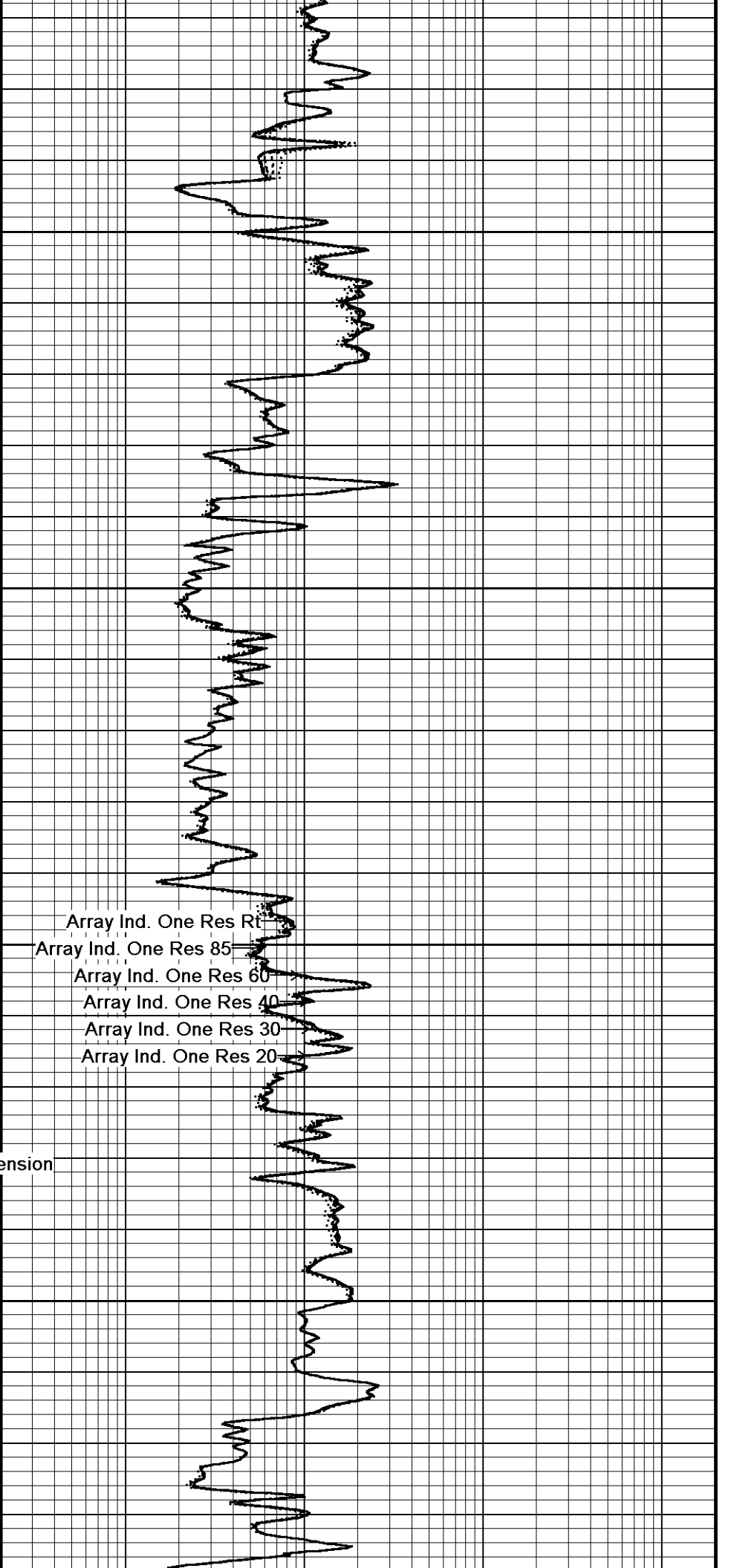
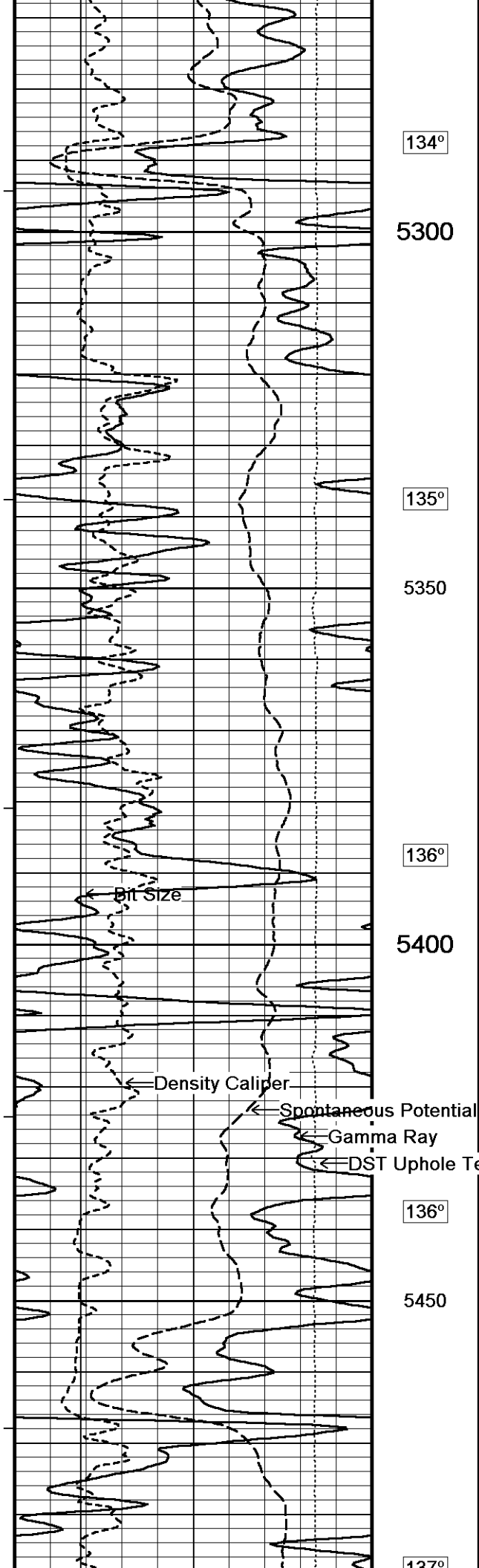
Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40

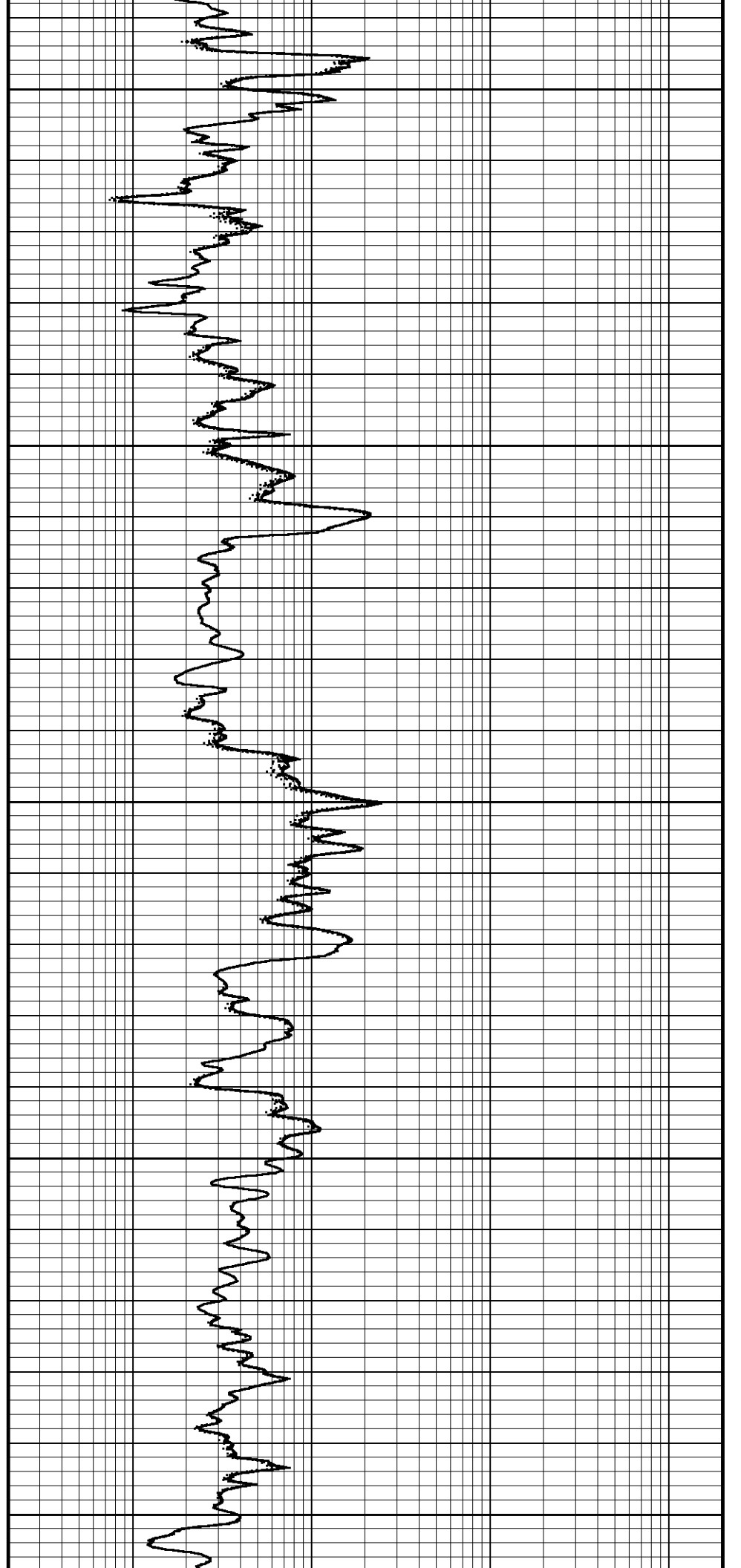
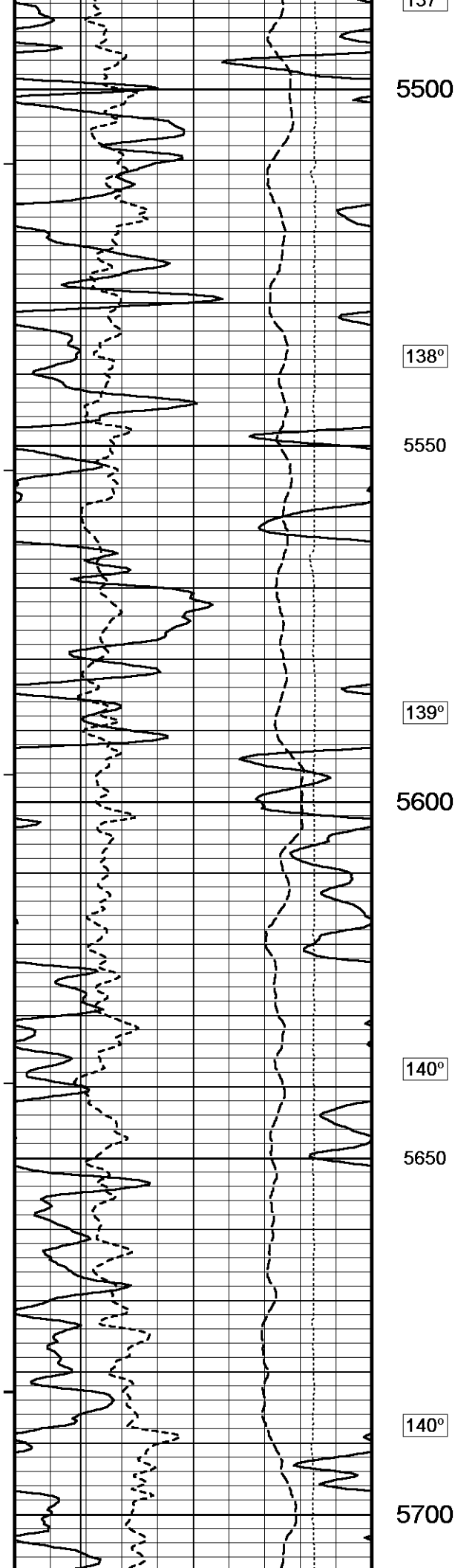
Array Ind. One Res 30
Array Ind. One Res 20

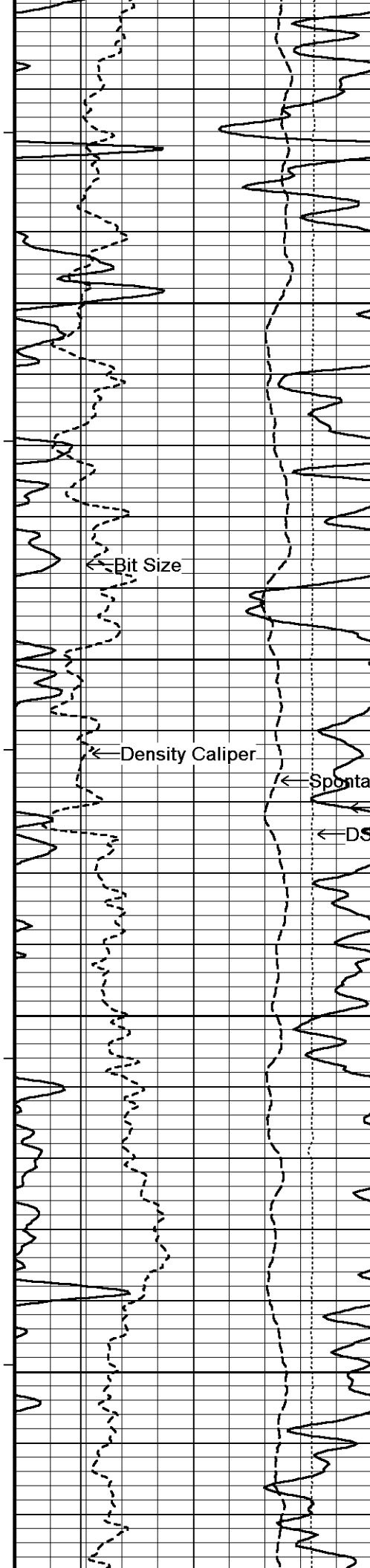


5050
131°
5100
132°
5150
132°
5200
133°
5250









141°

5750

142°

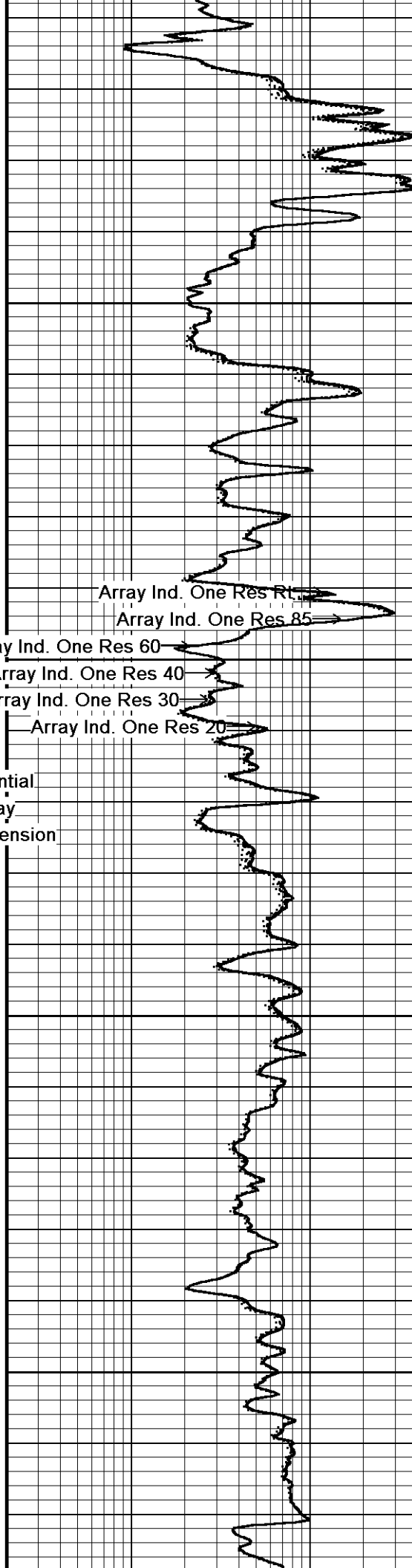
5800

142°

5850

143°

5900



Array Ind. One Res Rt

Array Ind. One Res 85

Array Ind. One Res 60

Array Ind. One Res 40

Array Ind. One Res 30

Array Ind. One Res 20

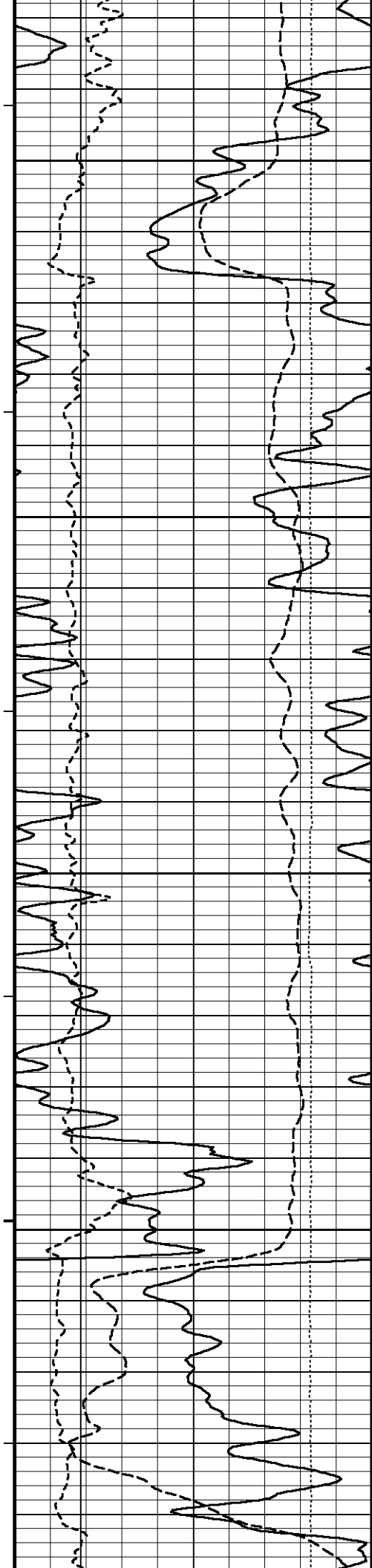
Spontaneous Potential

Gamma Ray

DST Uphole Tension

Bit Size

Density Caliper



143°

5950

144°

6000

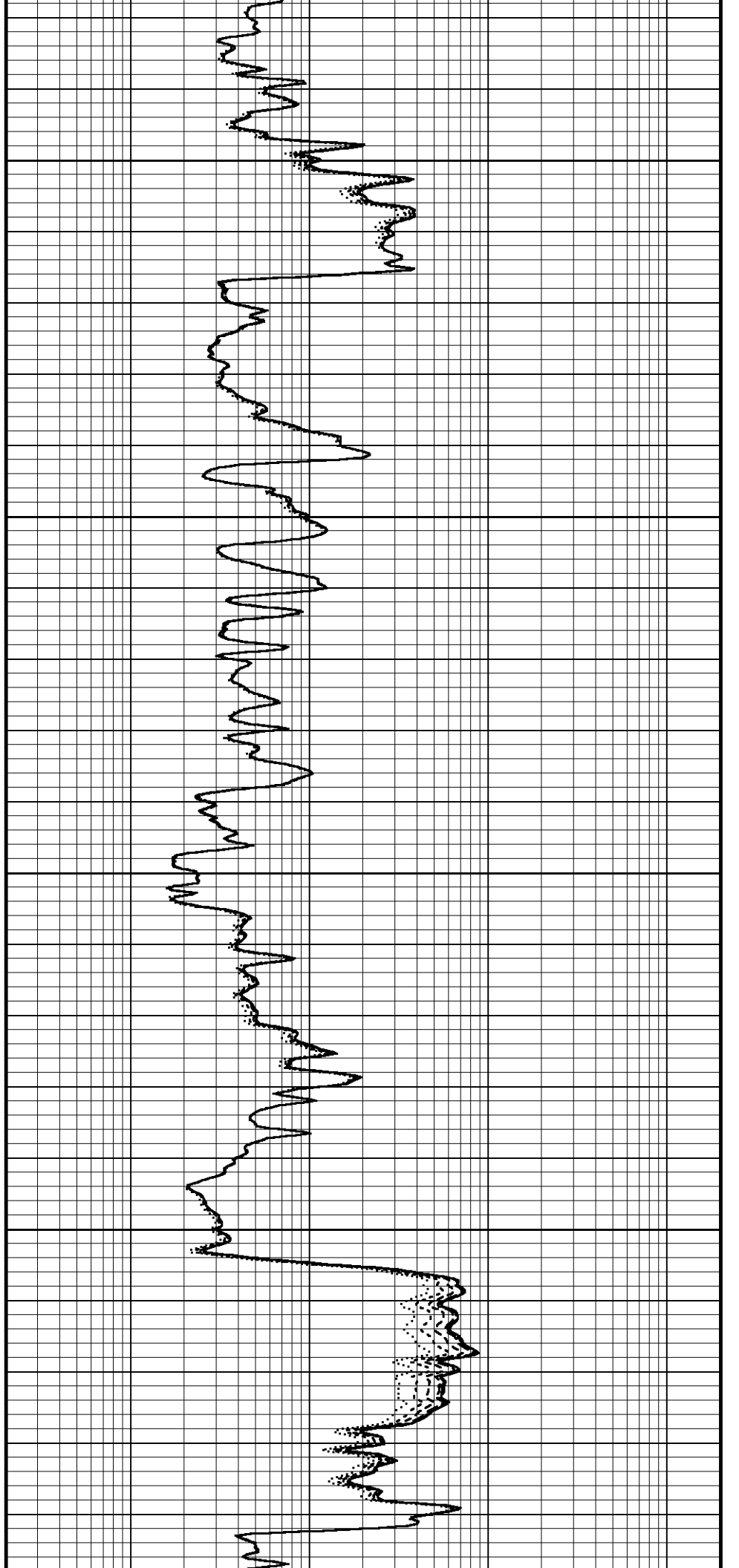
144°

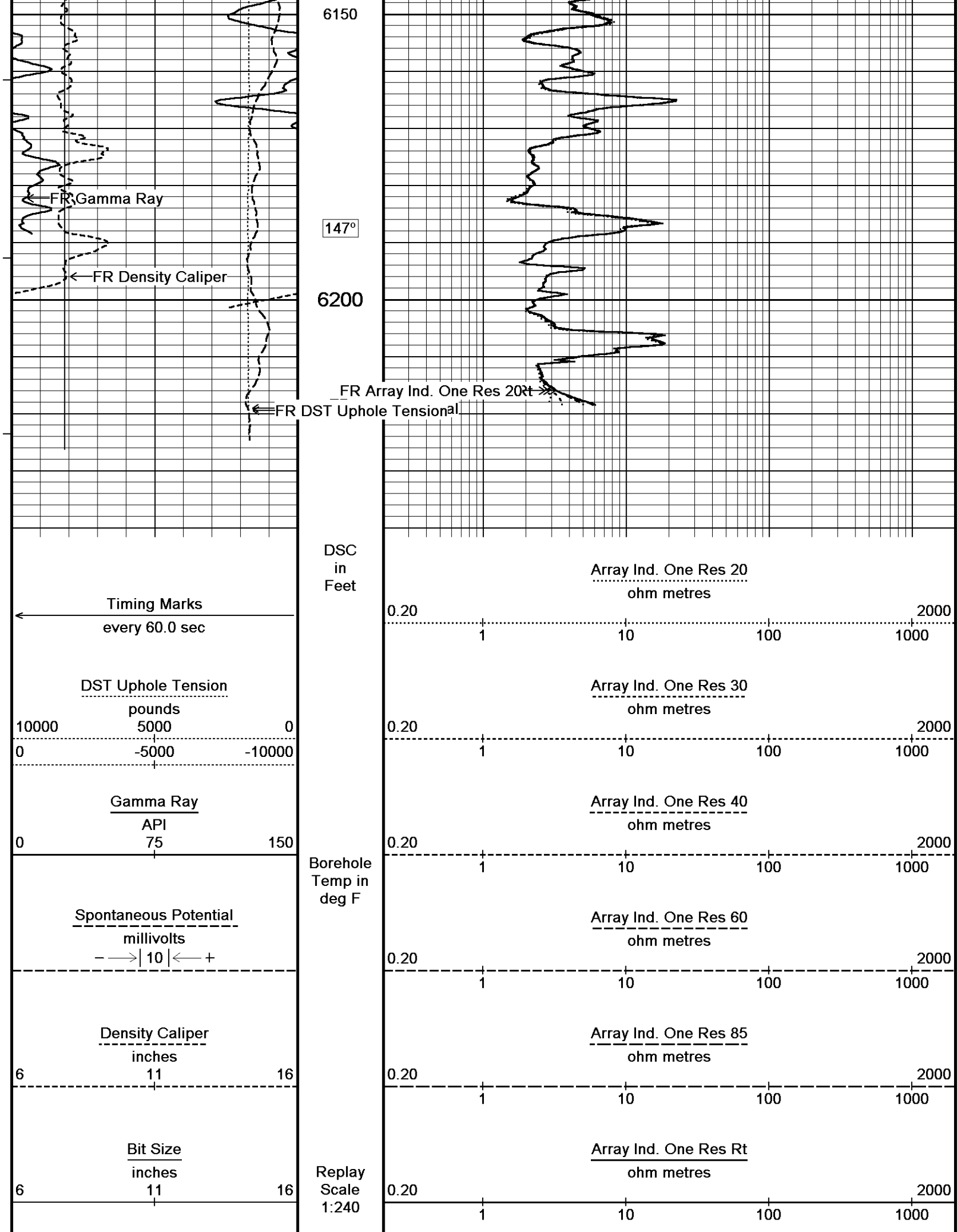
6050

145°

6100

146°





↑

5 INCH MAIN LOG

↑

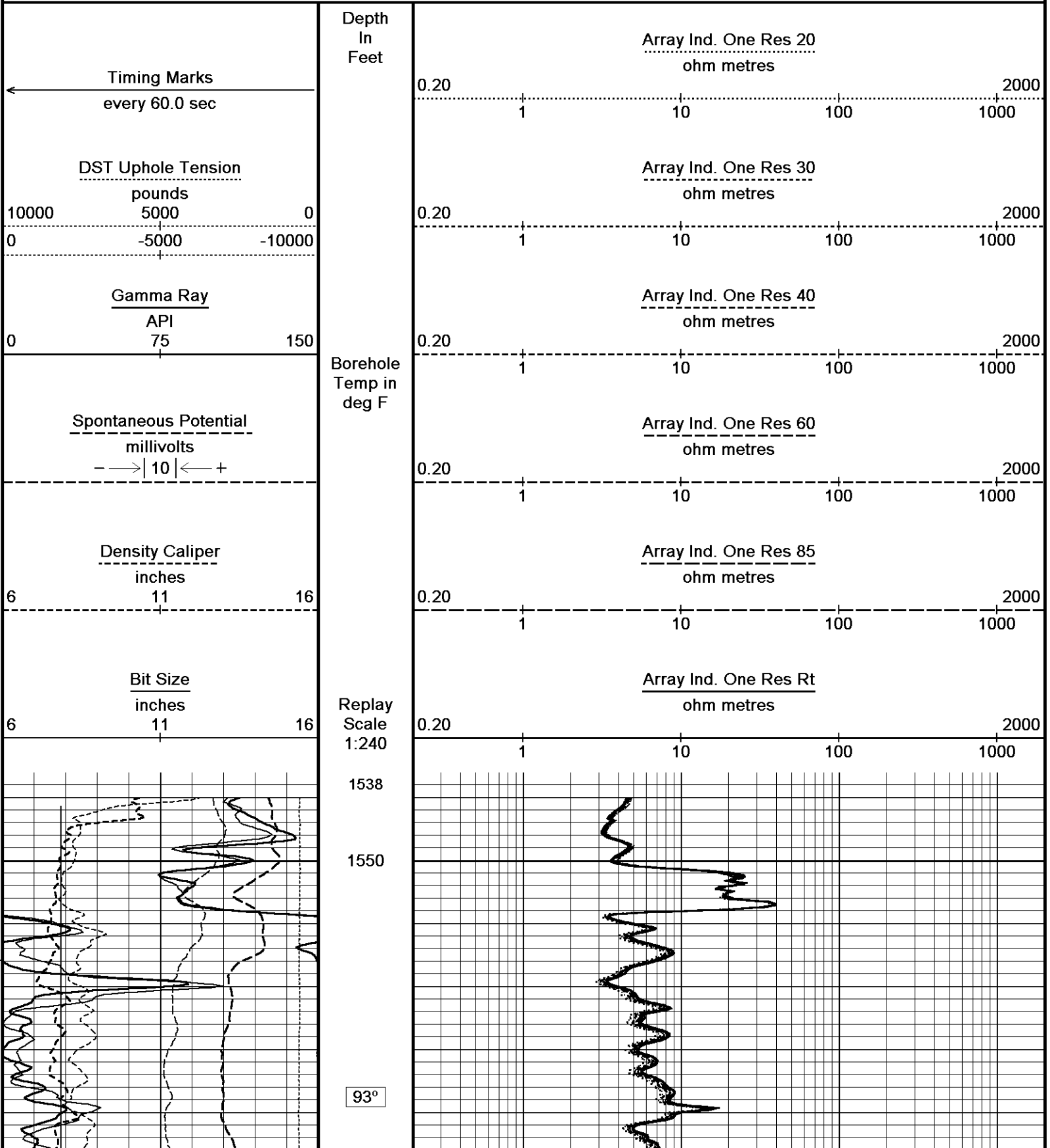
↓

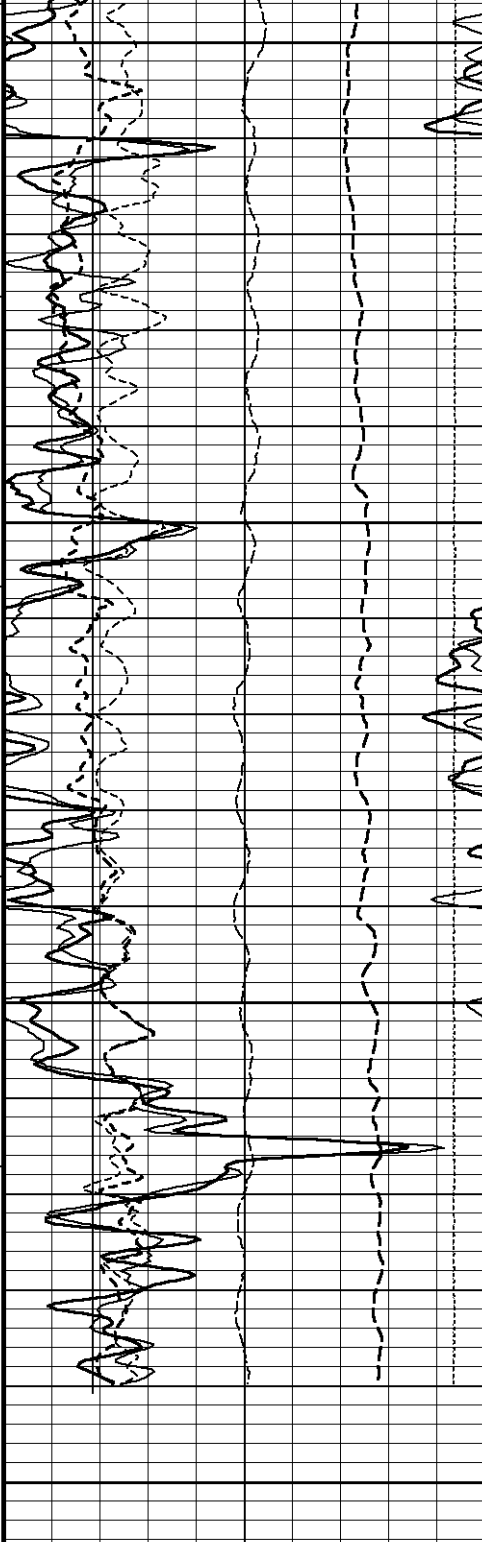
UPPER REPEAT SECTION OVERLAY DSC

↓

Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: C:\DOCUME~1\154681\LOCALS~1\Temp\Weatherford PreView\0\Casing.dta
Filename: C:\DOCUME~1\154681\LOCALS~1\Temp\Weatherford PreView\0\DOWN_LOG3.dta
System Versions: Logged with 12.02.4401 Processed with 12.02.4401 Plotted with 12.01.3513

Plotted on 09-DEC-2011 15:36
Recorded on 07-DEC-2011 07:11
Recorded on 07-DEC-2011 09:07





1600

94°

1650

94°

1700

94°

1750

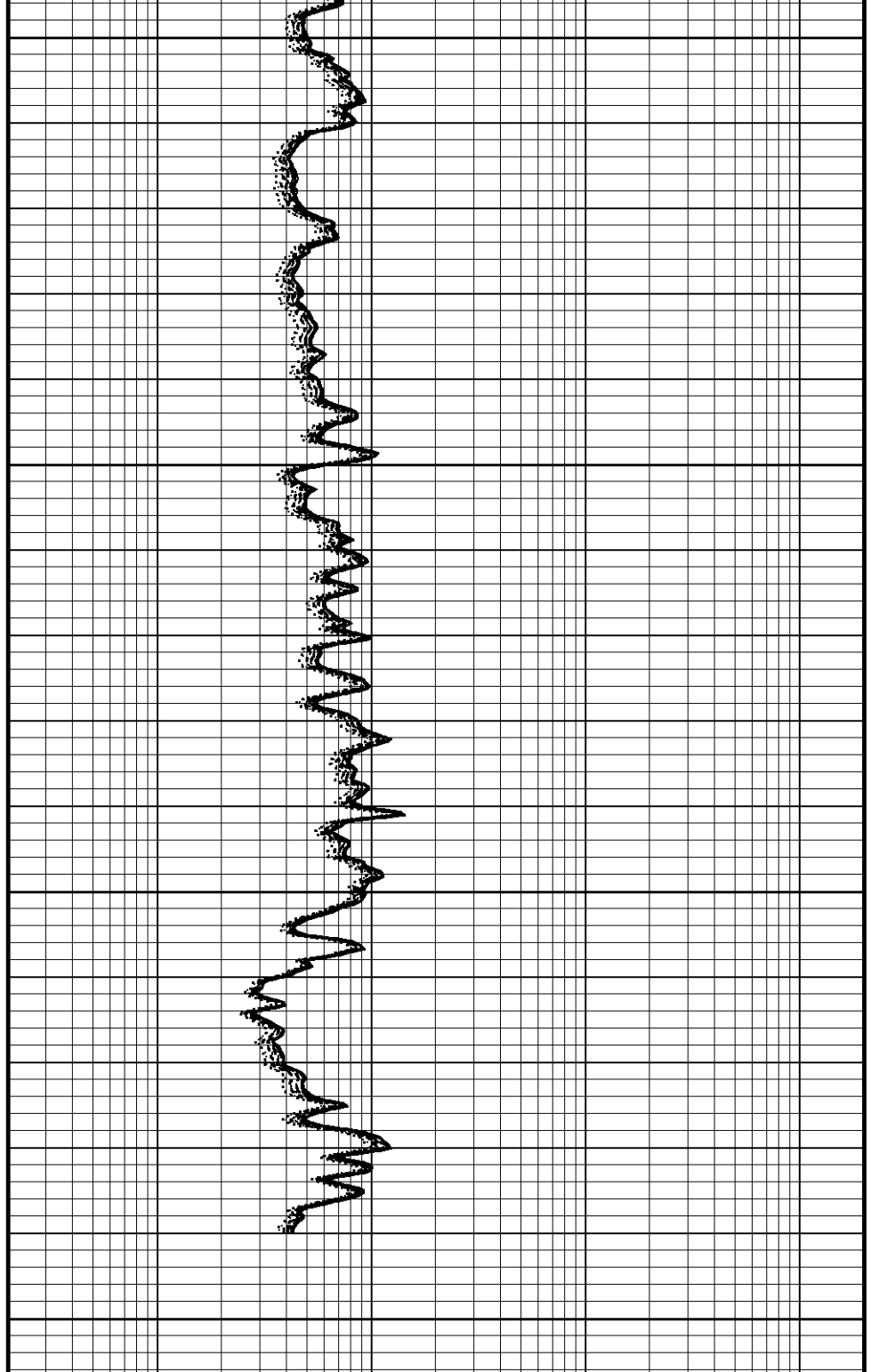
Depth
In
Feet

← Timing Marks
every 60.0 sec

DST Uphole Tension
pounds
10000 5000 0
0 -5000 -10000

Gamma Ray
API
0 75 150

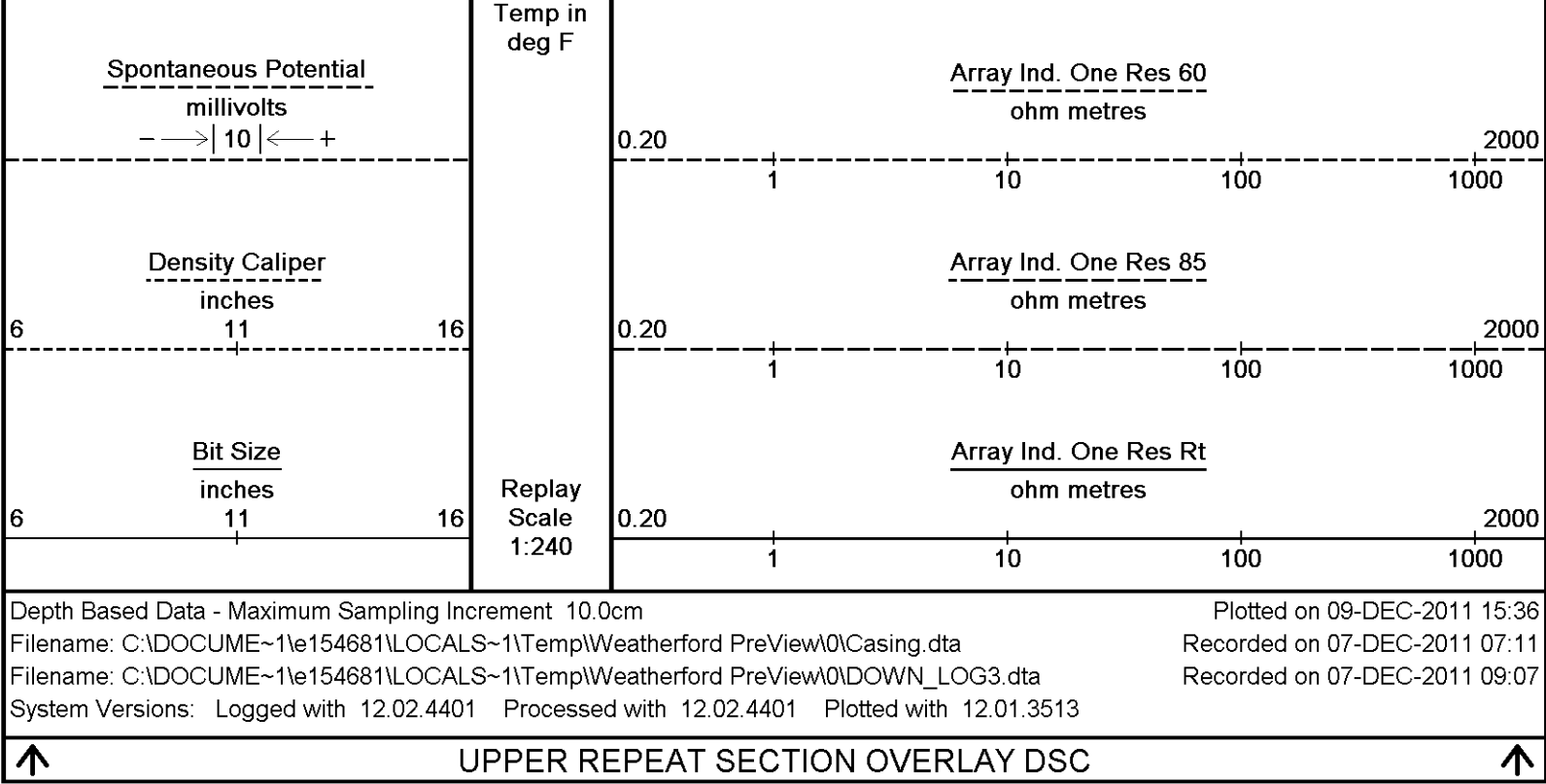
Borehole



0.20 1 10 100 1000 2000

0.20 1 10 100 1000 2000

0.20 1 10 100 1000 2000



BEFORE SURVEY CALIBRATION				C:\DOCUME~1\154681\LOCALS~1\Temp\Weatherford PreView\0\DOWN_LOG3.dta
General Constants All 000			Last Edited on 07-DEC-2011 05:31	
General Parameters				
Mud Resistivity	4.260	ohm-metres		
Mud Resistivity Temperature	76.400	degrees F		
Water Level	0.000	feet		
Density/Neutron Processing	Wet Hole			
Hole/Annular Volume and Differential Caliper Parameters				
HVOL Method	Single Caliper			
HVOL Caliper 1	Density Caliper			
HVOL Caliper 2	N/A			
Annular Volume Diameter	4.500	inches		
Caliper for Differential Caliper	Density Caliper			
Rwa Parameters				
Porosity used	Base Density Porosity			
Resistivity used	Array Ind. One Res Rt			
RWA Constant A	0.610			
RWA Constant M	2.150			
Down-hole Tension Calibration All 000			Field Calibration on 24-OCT-2010 04:34	
Reading No	Measured	Calibrated (lbs)		
1	15659.85	0.00		
2	15734.68	370.00		
Down-hole Tension Calibration SMS 0			Field Calibration on 07-DEC-2011 06:41	
Reading No	Measured	Calibrated (lbs)		
1	17182.45	0.00		
2	17346.58	300.00		
High Resolution Temperature Calibration MCG-C 115			Field Calibration on 01-JUL-2011 11:21	
	Measured	Calibrated(Deg F)		
Lower	50.00	50.00		
Upper	75.00	75.00		
High Resolution Temperature Constants MCG-C 115			Last Edited on	

Pre-filter Length		11	
SP Calibration MCG-C 115			
	Measured	Calibrated (mV)	Field Calibration on 28-NOV-2011 15:19
Reference 1	103.4	100.2	
Reference 2	-97.4	-100.2	

Gamma Calibration MCG-C 115		
	Measured	Calibrated (API)
Background	76	51
Calibrator (Gross)	853	570
Calibrator (Net)	777	519
Field Calibration on 06-DEC-2011 14:39		

Gamma Constants MCG-C 115		
Last Edited on 07-DEC-2011 07:03		
Gamma Calibrator Number	GRCC-119	
Mud Density	1.00	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl	0.00	kppm

Neutron Calibration MDN-B.J 372		
Base Calibration on 07-NOV-2011 14:49		
Field Check on 06-DEC-2011 14:55		
Base Calibration		
	Measured	Calibrated (cps)
	Near Far	Near Far
	2901 89	3714 110
Ratio	32.694	33.764
Field Calibrator at Base		
		Calibrated (cps)
		2354 3415
Ratio		0.689
Field Check		
		Calibrated (cps)
		2315 3427
Ratio		0.676

Neutron Constants MDN-B.J 372		
Last Edited on 07-DEC-2011 07:03		
Neutron Source Id	P31115B	
Neutron Jig Number	NJ5299	
Epithermal Neutron	No	
Caliper Source for Processing	Density Caliper	
Stand-off	0.00	inches
Mud Density	1.00	gm/cc
Limestone Sigma	7.10	cu
Sandstone Sigma	7.00	cu
Dolomite Sigma	4.70	cu
Formation Pressure Source	None	
Formation Pressure	N/A	kpsi
Temperature Source	None	
Temperature	N/A	degrees F
Mud Salinity	0.00	kppm
Formation Fluid Salinity Source	None	
Formation Fluid Salinity	N/A	kppm
Barite Mud Correction	Not Applied	

FE Calibration MFE-A.A 102		
Base Calibration on 07-NOV-2011 11:17		
Field Check on 06-DEC-2011 14:45		
Base Calibration		
	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	978.7	126.8
Base Check		
		280.0
Field Check		
		280.0

FE Constants MFE-A.A 102		
Last Edited on 07-DEC-2011 05:29		
Running Mode	No Slows	

Running Mode	No Sleeve	
MFE K Factor	0.1268	
Caliper Source for FE correction	Density Caliper	
Caliper Value for FE correction	N/A	inches
Rm Source for FE correction	Temperature Corr	
Temp. for Rm Corr.	MCG External Temperature	
Stand-off	1.0	inches

High Resolution Temperature Calibration MAI-B.A 268			Field Calibration on 10-OCT-2011 15:43
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	75.00	75.00	

High Resolution Temperature Constants MAI-B.A 268		Last Edited on
Pre-filter Length	11	

Induction Calibration MAI-B.A 268				Base Calibration on 07-NOV-2011 13:33	
				Field Check on 06-DEC-2011 14:33	
Base Calibration					
Test Loop Calibration		Measured		Calibrated (mmho/m)	
Channel	Low	High		Low	High
1	17.2	459.3		9.3	966.2
2	6.5	375.4		7.6	821.4
3	3.7	255.1		5.2	566.0
4	2.2	131.8		2.6	279.2
Array Temperature		74.3	Deg F		
Channel	Base Check (mmho/m)		Field Check (mmho/m)		
	Low	High	Low	High	
1	0.0	0.0	10.8	3926.0	
2	0.0	0.0	28.5	3565.8	
3	0.0	0.0	27.7	3080.5	
4	0.0	0.0	18.7	2084.4	
Deep	0.0	0.0	17.0	2012.9	
Medium	0.0	0.0	40.9	4058.0	
Shallow	0.0	0.0	42.2	5266.3	
Array Temperature		0.0	47.9	Deg F	

Induction Constants MAI-B.A 268			Last Edited on 07-DEC-2011 06:55
Induction Model		RtAP-WBM	
Caliper for Borehole Corr.	Density Caliper		
Hole Size for Borehole Correction	N/A		inches
Tool Centred	No		
Stand-off Type	Fins		
Stand-off	1.00		inches
Number of Fins on Stand-off	6.0000		
Stand-off Fin Angle	60.00		degrees
Stand-off Fin Width	0.5000		inches
Borehole Corr. Rm Source	Temperature Corr		
Temp. for Rm Corr.	MCG External Temperature		
Squasher Start	0.0020		mhos/metre
Squasher Offset	N/A		mhos/metre
Borehole Normalisation			
DRM1	0.0000	DRC1	0.0000
DRM2	0.0000	DRC2	0.0000
MRM1	0.0000	MRC1	0.0000
MRM2	0.0000	MRC2	0.0000
SRM1	0.0000	SRC1	0.0000
SRM2	0.0000	SRC2	0.0000
Calibration Site Corrections			
Channel 1	0.00		mmhos/metre
Channel 2	0.00		mmhos/metre
Channel 3	0.00		mmhos/metre
Channel 4	0.00		mmhos/metre
Apparent Porosity and Water Saturation Constants			

Apparent Porosity and Water Saturation Constants	1.00	
Archie Constant (A)	2.00	
Cementation Exponent (M)	2.00	
Saturation Exponent (N)	2.00	
Saturation of Water for Apor	100.00	percent
Resistivity of Water for Apor and Sw	0.05	ohm-m
Resistivity of Mud Filtrate for Sw	0.00	ohm-m
Source for Rt	0.00	
Source for Rxo	0.00	

Caliper Calibration MPD-B 104

Base Calibration on 06-DEC-2011 11:01
Field Calibration on 06-DEC-2011 11:05

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	11778	3.99
2	20380	5.97
3	29068	7.96
4	37241	9.86
5	46400	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.95	7.96

Photo Density Calibration MPD-B 104

Base Calibration on 06-DEC-2011 10:30
Field Check on 06-DEC-2011 10:42

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Reference 1	36975	12896	52994	19128
Reference 2	17425	2405	25185	2558

Field Check at Base

1270.5 1474.5

Field Check

1271.6 1479.2

PE Calibration

Base Calibration	WS	Measured		Calibrated Ratio
		WH	Ratio	
Background	236	1146		
Reference 1	12925	36819	0.356	0.309
Reference 2	5134	17296	0.303	0.274

Field Check at Base

235.8 1145.9

Field Check

238.5 1148.4

Density Constants MPD-B 104

Last Edited on 07-DEC-2011 05:30

Density Source Id	P15771B	
Nylon Calibrator Number	DNC -D 527	
Aluminium Calibrator Number	DAC-D 527	
Density Shoe Profile	8 inch	
Caliper Source for Processing	Density Caliper	
PE Correction to Density	Not Applied	
Mud Density	1.25	gm/cc
Mud Density Z/A Multiplier	1.11	
Mud Filtrate Density	1.00	gm/cc
Dry Hole Mud Filtrate Density	1.00	gm/cc
DNCT	0.00	gm/cc
CRCT	0.00	gm/cc
Density Z/A Correction	Hybrid	
Matrix Density (gm/cc)	Depth (ft)	
2.68		
0.00	0.00	
0.00	0.00	
0.00	0.00	

0.00
0.00
0.00
0.00
0.00

0.00
0.00
0.00
0.00
0.00

DOWNHOLE EQUIPMENT

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3/8" Triple Cone Cable Head (MCB C A)

MCB-C.A 5 LG: 1.58 ft WT: 15.4 lb OD: 2.24 in

SHA-F Compact Swivel Head Adaptor

SHA-F 67 LG: 2.74 ft WT: 26.5 lb OD: 2.24 in

Compact Comms Gamma

MCG-C 115 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Neutron

MDN-B.J 372 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper

MPD-B 104 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

SKJ-D Compact Knuckle Joint

SKJ-D 34 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in

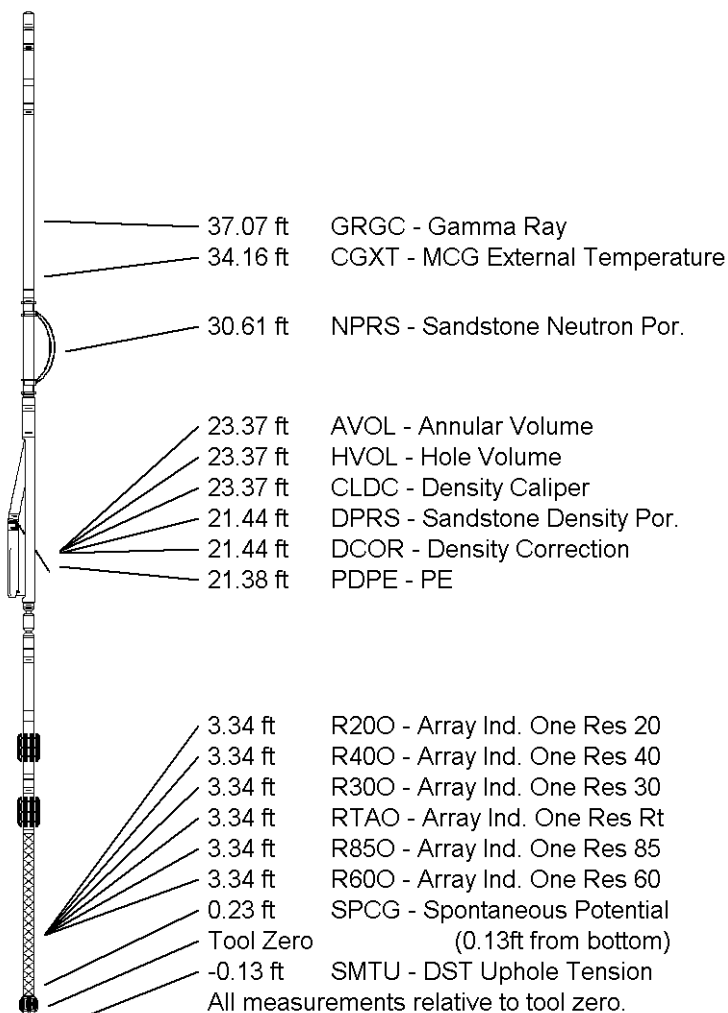
Compact Focussed Electric

MFE-A.A 102 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction

MAI-B.A 268 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 46.67 ft Weight: 368.2 lb



COMPANY

WEXPRO COMPANY

WELL

MUSSER 31

FIELD

POWDER WASH

PROVINCE/COUNTY

MOFFAT

COUNTRY/STATE

USA/COLORADO

Elevation Kelly Bushing 6630.00 feet

Elevation Drill Floor 6630.00 feet

Elevation Ground Level 6601.00 feet

First Reading 6217.00 feet

Depth Driller 9095.00 feet

Depth Logger 6220.00 feet



Weatherford®

ARRAY INDUCTION
LOGS

