# CALIPER LOG

| | |
|---|---|
| COMPANY | MID-CON ENERGY OPERATING, INC. |
| WELL | HRMU 14-1 |
| FIELD | HARKER RANCH MORROW UNIT |
| PROVINCE/COUNTY | CHEYENNE |
| COUNTRY/STATE | U.S.A. / COLORADO |
| LOCATION | 469' FSL & 1320' FWL OF SW/4 |

| SEC 1 | TWP 13S | RGE 43W | Other Services |
|---|---|---|---|
| Latitude | | | |
| Longitude | | | |
| API Number | 05-017-0714800 | | |

Permanent Datum GL, Elevation 4028.59 feet
Log Measured From KB
Drilling Measured From KB @ 16.6 feet

| Elevations: | feet |
|---|---|
| KB | 4045.19 |
| DF | 4043.19 |
| GL | 4028.59 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Date | 06-SEP-2014 | | | | | |
| Run Number | TWO | | | | | |
| Service Order | 7577-97212326 | | | | | |
| Depth Driller | 5350.00 | feet | | | | |
| Depth Logger | 5349.00 | feet | | | | |
| First Reading | 5327.98 | feet | | | | |
| Last Reading | 632.00 | feet | | | | |
| Casing Driller | 626.00 | feet | | | | |
| Casing Logger | 632.00 | feet | | | | |
| Bit Size | 7.875 | inches | | | | |
| Hole Fluid Type | CHEMICAL | | | | | |
| Density / Viscosity | 8.50 | lb/USg | 20.00 | CP | | |
| PH / Fluid Loss | 11.00 | | 8.80 | ml/30Min | | |
| Sample Source | MUD PIT | | | | | |
| Rm @ Measured Temp | 1.51 @ 96.0 | ohm-m | | | | |
| Rmf @ Measured Temp | 1.21 @ 96.0 | ohm-m | | | | |
| Rmc @ Measured Temp | 1.81 @ 96.0 | ohm-m | | | | |
| Source Rmf / Rmc | CALC | | CALC | | | |
| Rm @ BHT | 1.12 @131.0 | ohm-m | | | | |
| Time Since Circulation | 3.5 HOURS | | | | | |
| Max Recorded Temp | 131.00 | deg F | | | | |
| Equipment / Base | 13244 | | LIB | | | |
| Recorded By | JEFFREY RANDLE | | | | | |
| Witnessed By | CLINT ARNOLD | | | | | |
| JOB # | LB14-264 | | | | | |

## BOREHOLE RECORD

Last Edited: 06-SEP-2014 20:43

| Bit Size inches | Depth From feet | Depth To feet |
|---|---|---|
| 7.875 | 626.00 | 5350.00 |

## CASING RECORD

| Type | Size inches | Depth From feet | Shoe Depth feet | Weight pounds/ft |
|---|---|---|---|---|
| SURFACE | 8.625 | 0.00 | 626.00 | 24.00 |

## REMARKS

- SOFTWARE ISSUE: WLS 13.08.2113.
- RUN ONE: MCG, MDN, MPD, MFE, MAI RUN IN COMBINATION.
  - HARDWARE: DUAL BOWSPRING USED ON MDN.
  0.5 INCH STANDOFF USED ON MFE.
  0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY.
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
- TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 2327 CU.FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO 4349 FEET: 253 CU.FT.
- RIG: WILDCAT DRILLING #1

- RIG: WILDCAT DRILLING #1.

- ENGINEER: J. RANDLE.

- OPERATOR: J. LaPOINT, S. LARES.



## 5 INCH MAIN

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 07-SEP-2014 01:52

Filename: C:\Minimus 13.08.2113\Logs\Mid-Con HRMU 14-1\Mid-Con HRMU 14-1 Repeat.dta — Recorded on 06-SEP-2014 22:19

System Versions: Logged with 13.08.2113 Plotted with 13.08.2113

Timing Marks every 60.0 sec

Gamma Ray API 0 100 200 200 300 400

Density Caliper inches 6 11 16

Bit Size inches 6 11 16

DST Uphole Tension pounds 5000 0

Depth in Feet

Borehole Temp in deg F

HVI every 10 cu ft

Annular Integral every 10 cu ft

Replay Scale 1:240

620

Casing Shoe

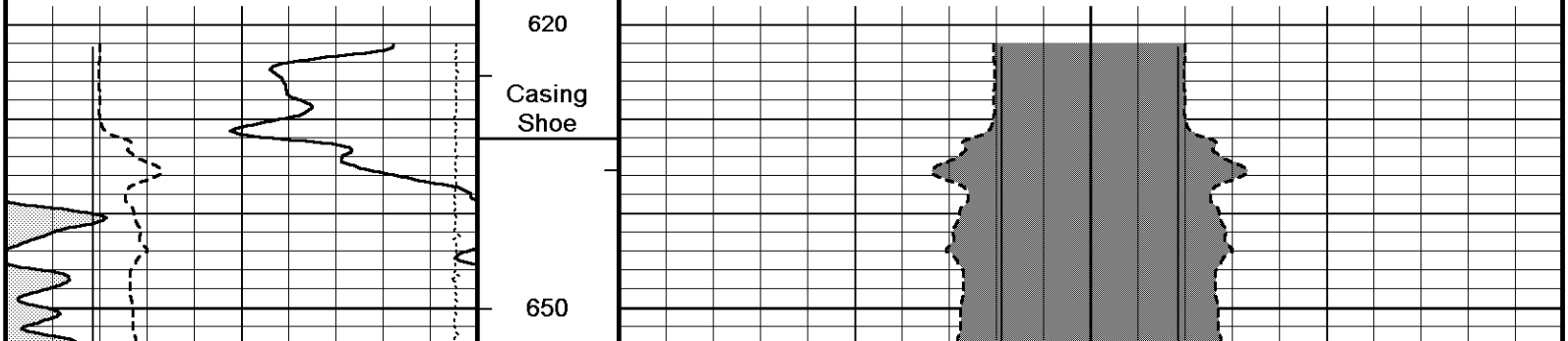
650

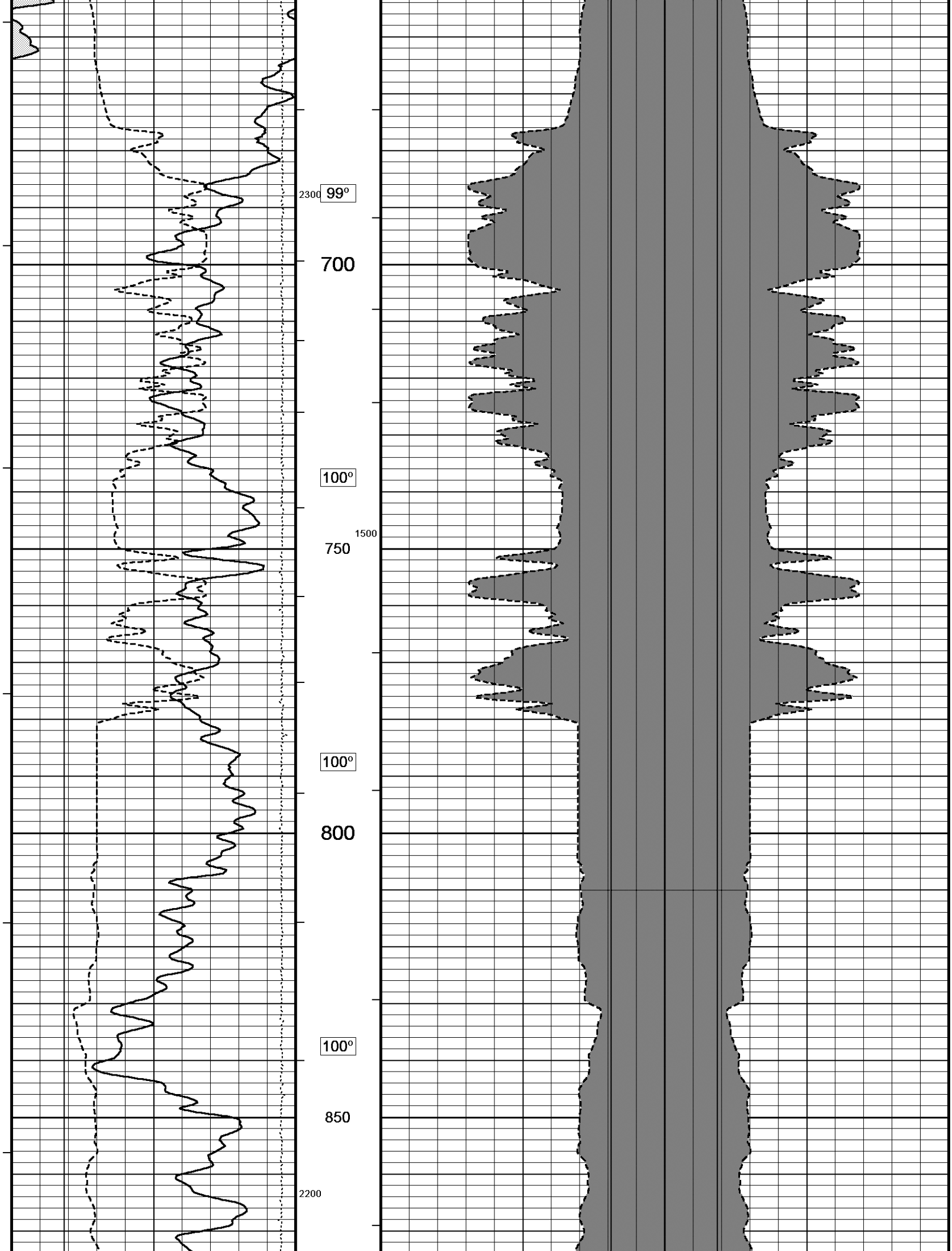
Density Caliper inches 16 11 6 6 11 16

Density Caliper inches 16 11 6 6 11 16

Bit Size inches 16 11 6 6 11 16

Bit Size inches 16 11 6 6 11 16

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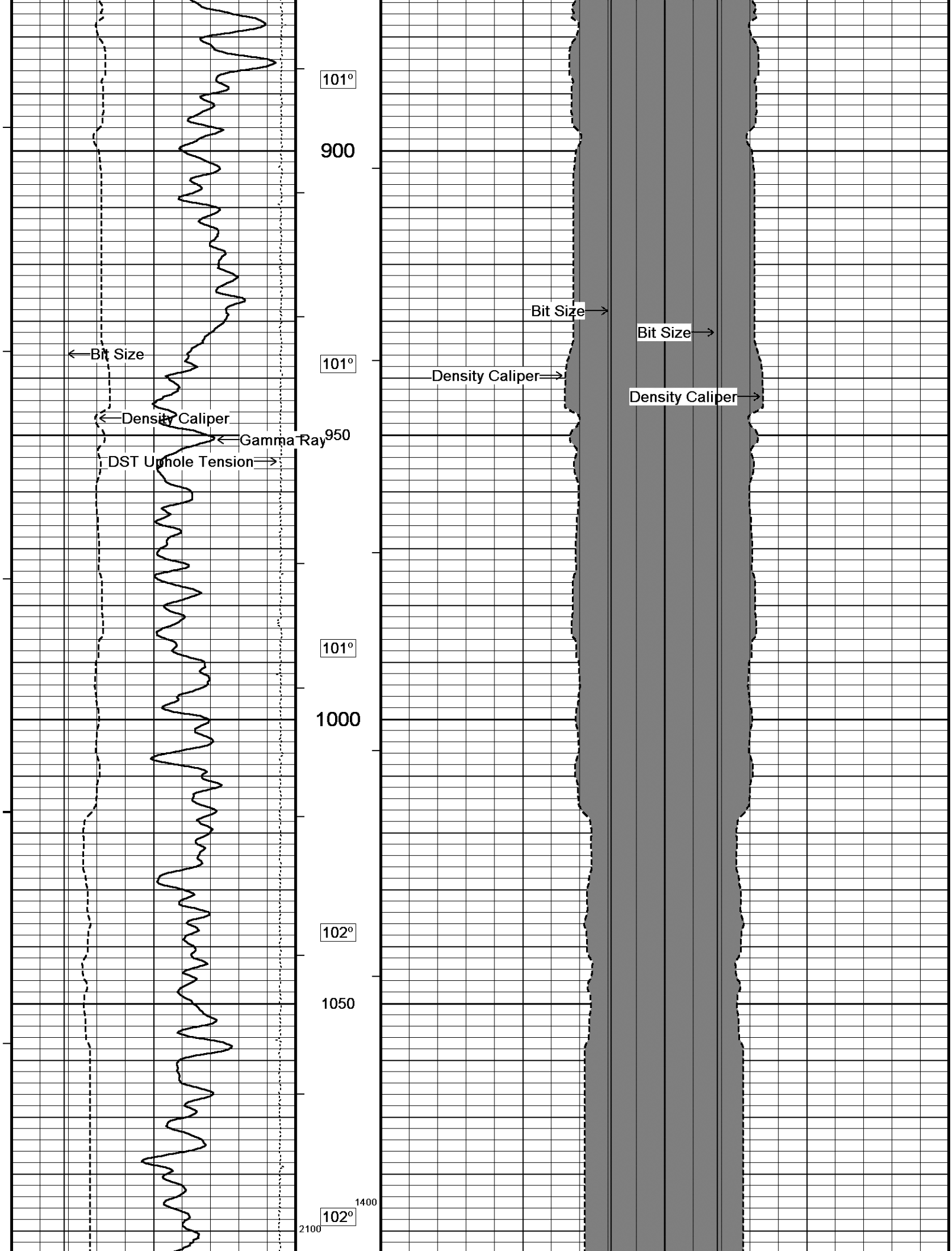
700
100°
1500
750
100°
800
100°
850
2200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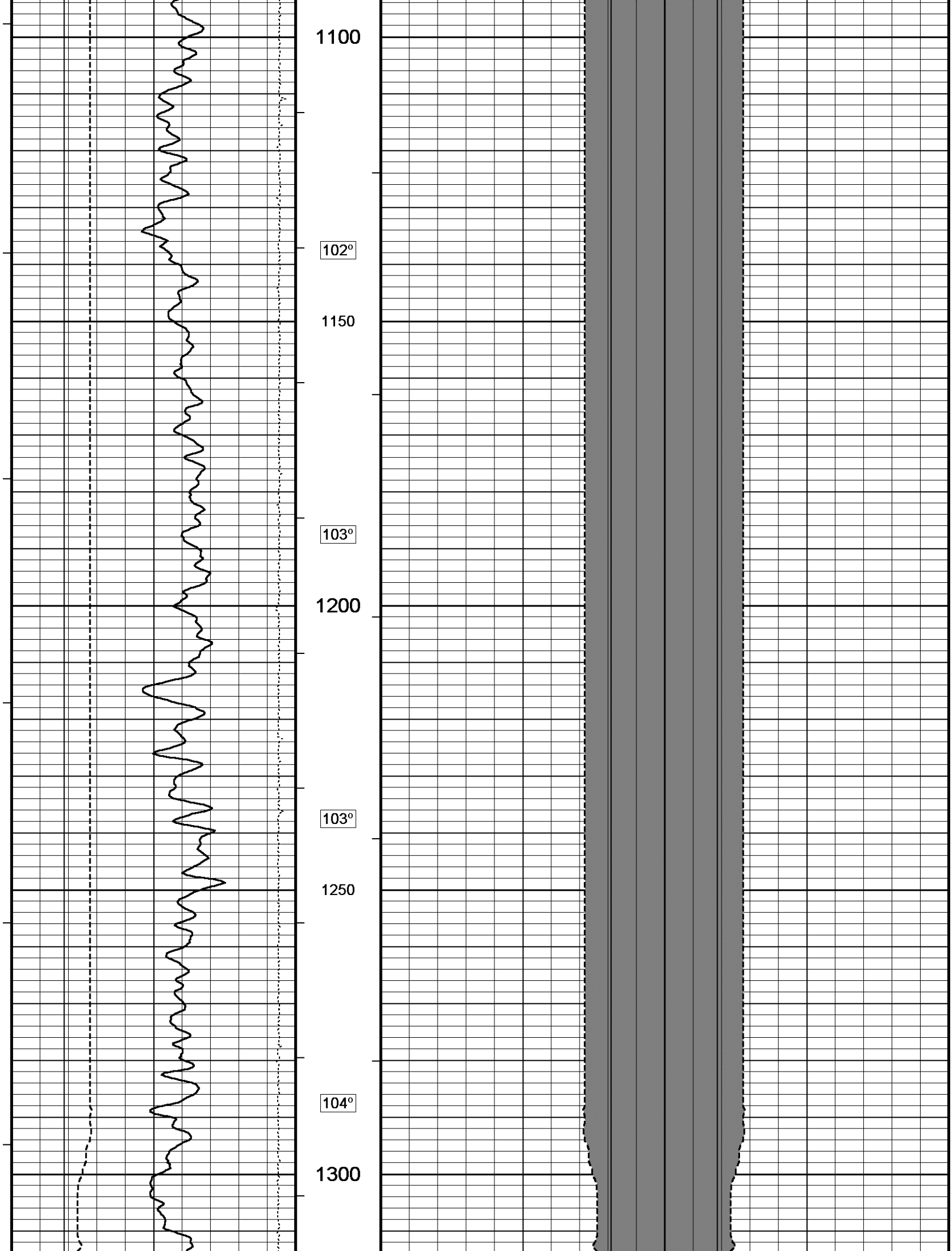
900
Bit Size
101°
Density Caliper
Gamma Ray
950
DST Uphole Tension
101°
1000
102°
1050
102°
1400
2100
Bit Size
Bit Size
Density Caliper
Density Caliper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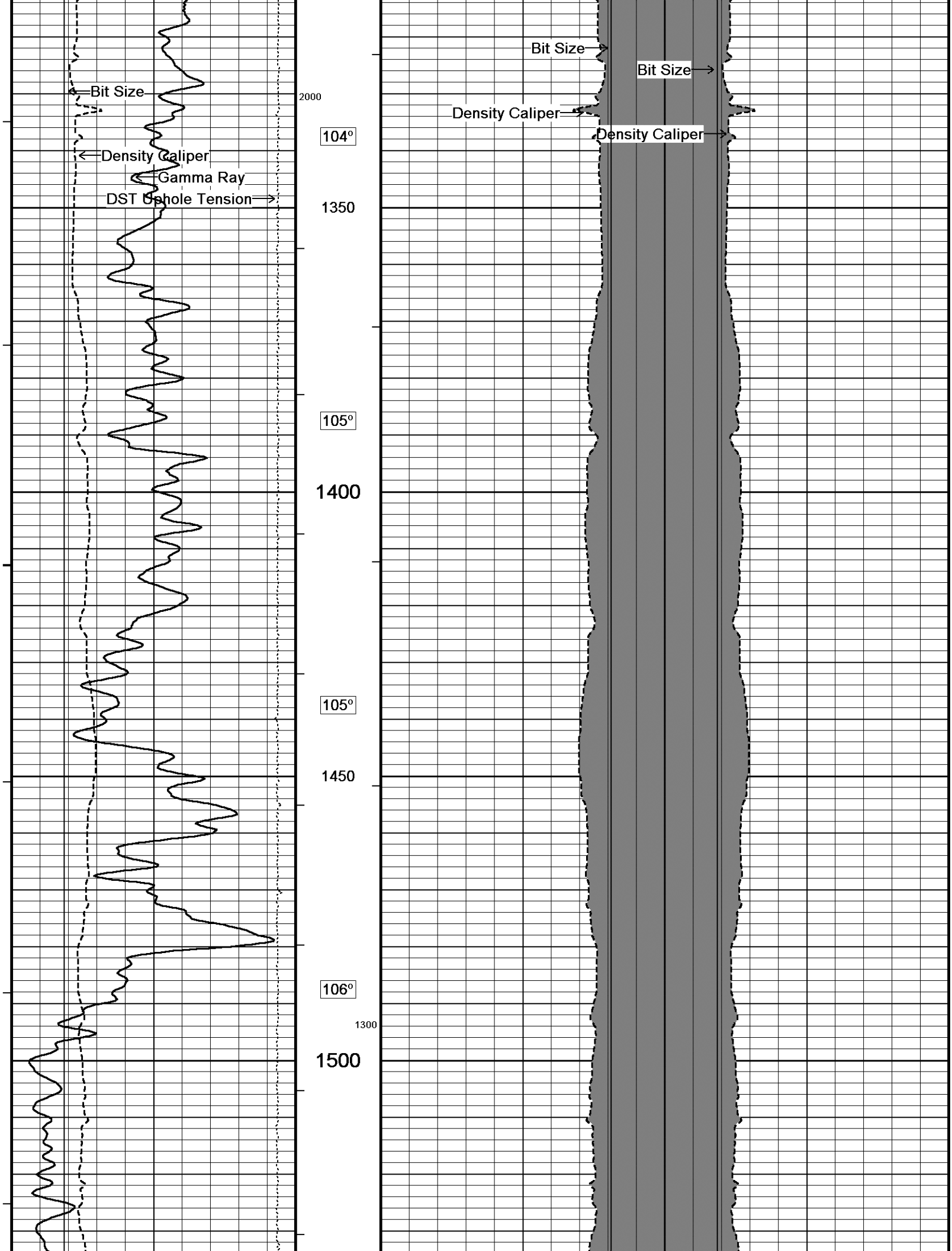
102°
1150
103°
1200
103°
1250
104°
1300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Density Caliper
Gamma Ray
DST Uphole Tension
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1350
105°
1400
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1450
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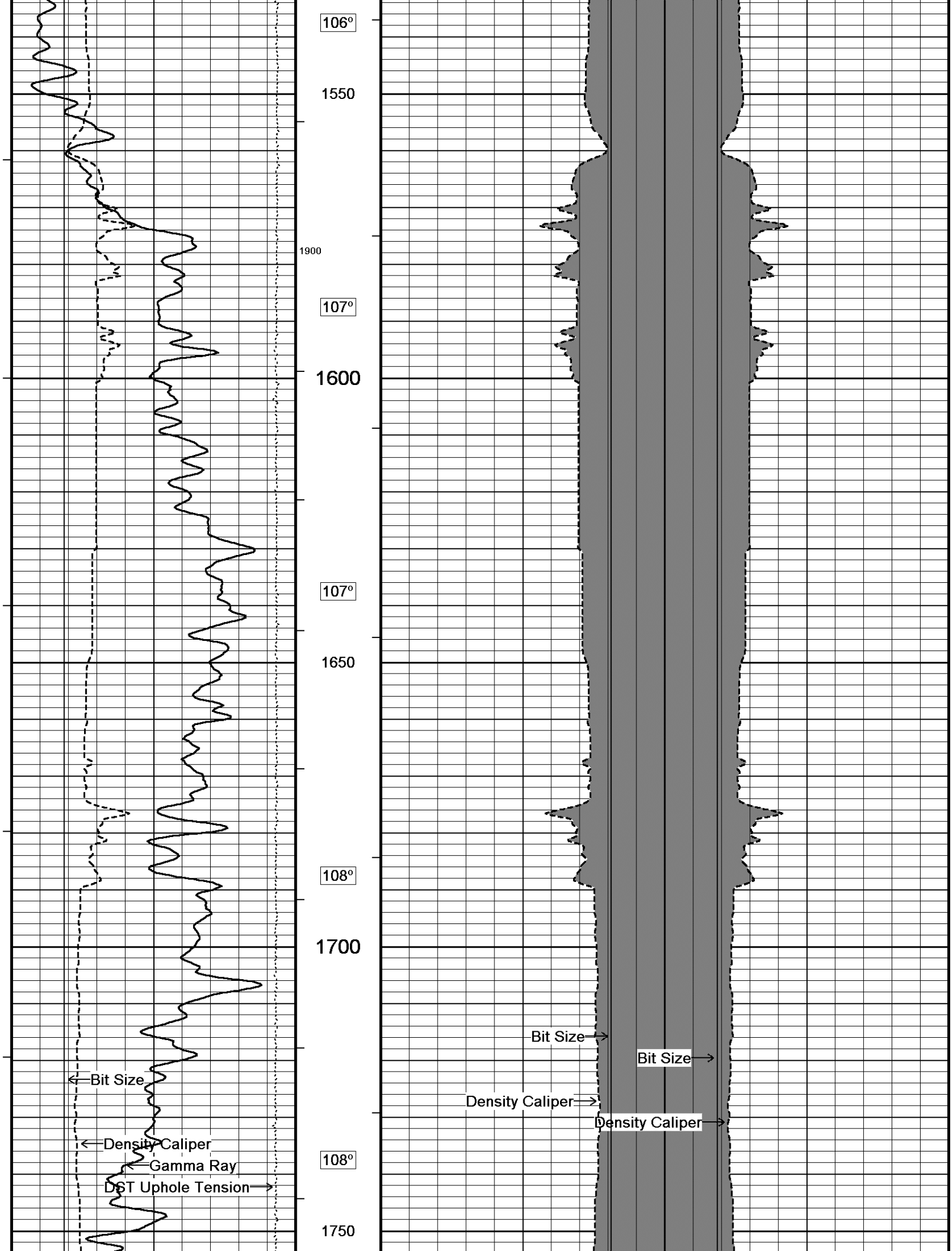
1500
Bit Size
Bit Size
Density Caliper
Density Caliper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1550
1900
107°
1600
107°
1650
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1700
108°
1750
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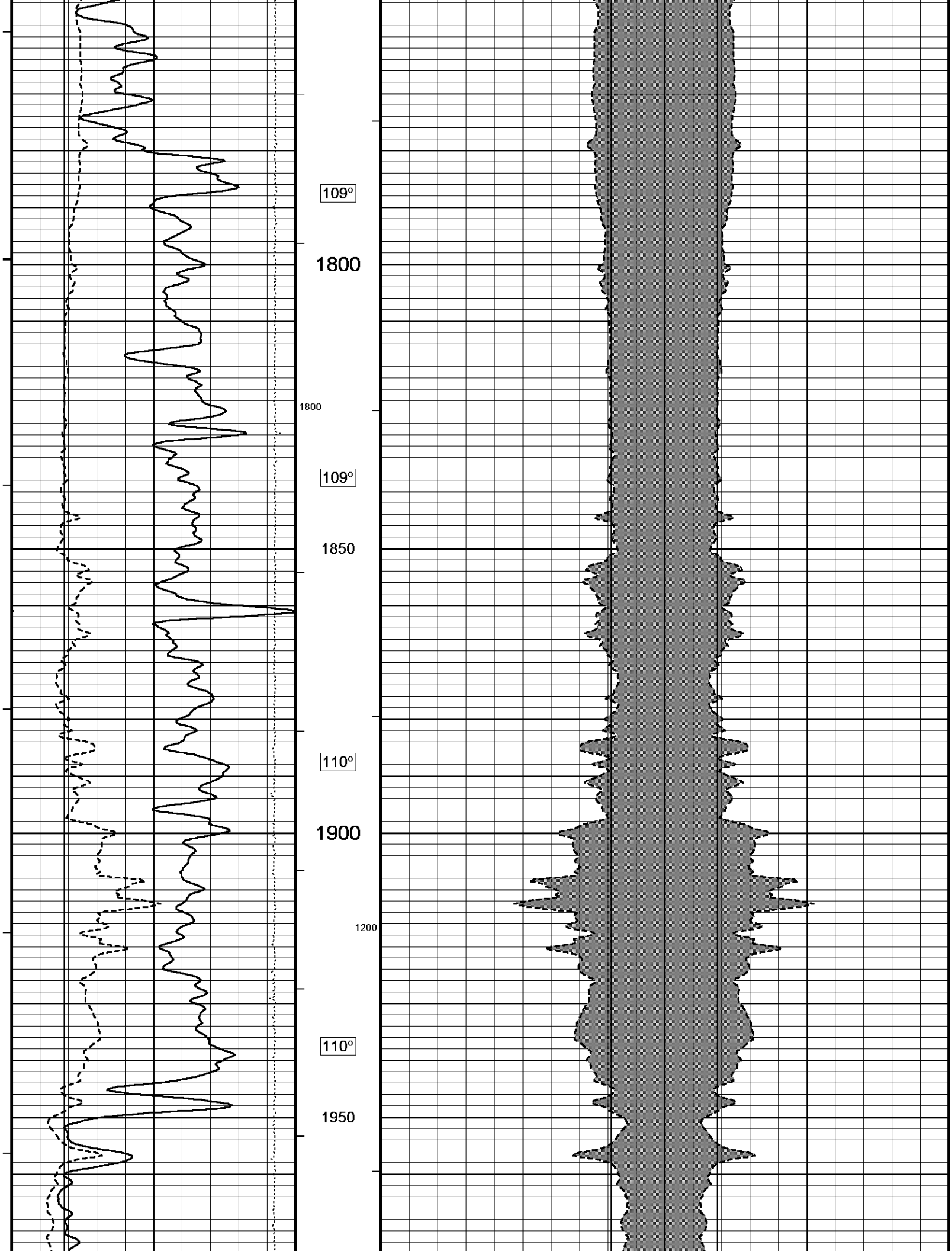
Gamma Ray
DST Uphole Tension
Bit Size
Bit Size
Density Caliper
Density Caliper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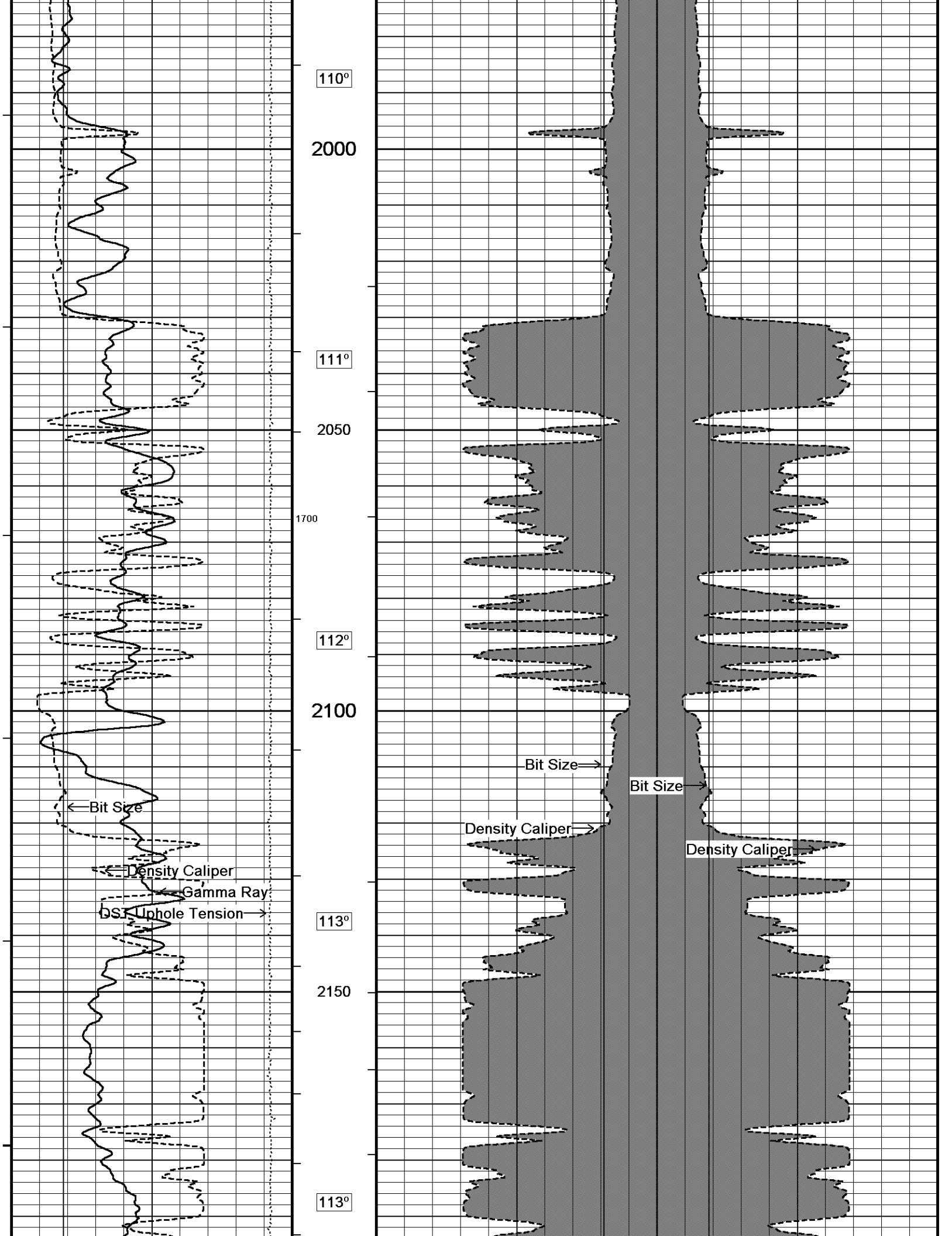
1800
1800
109°
1850
110°
1900
1200
110°
1950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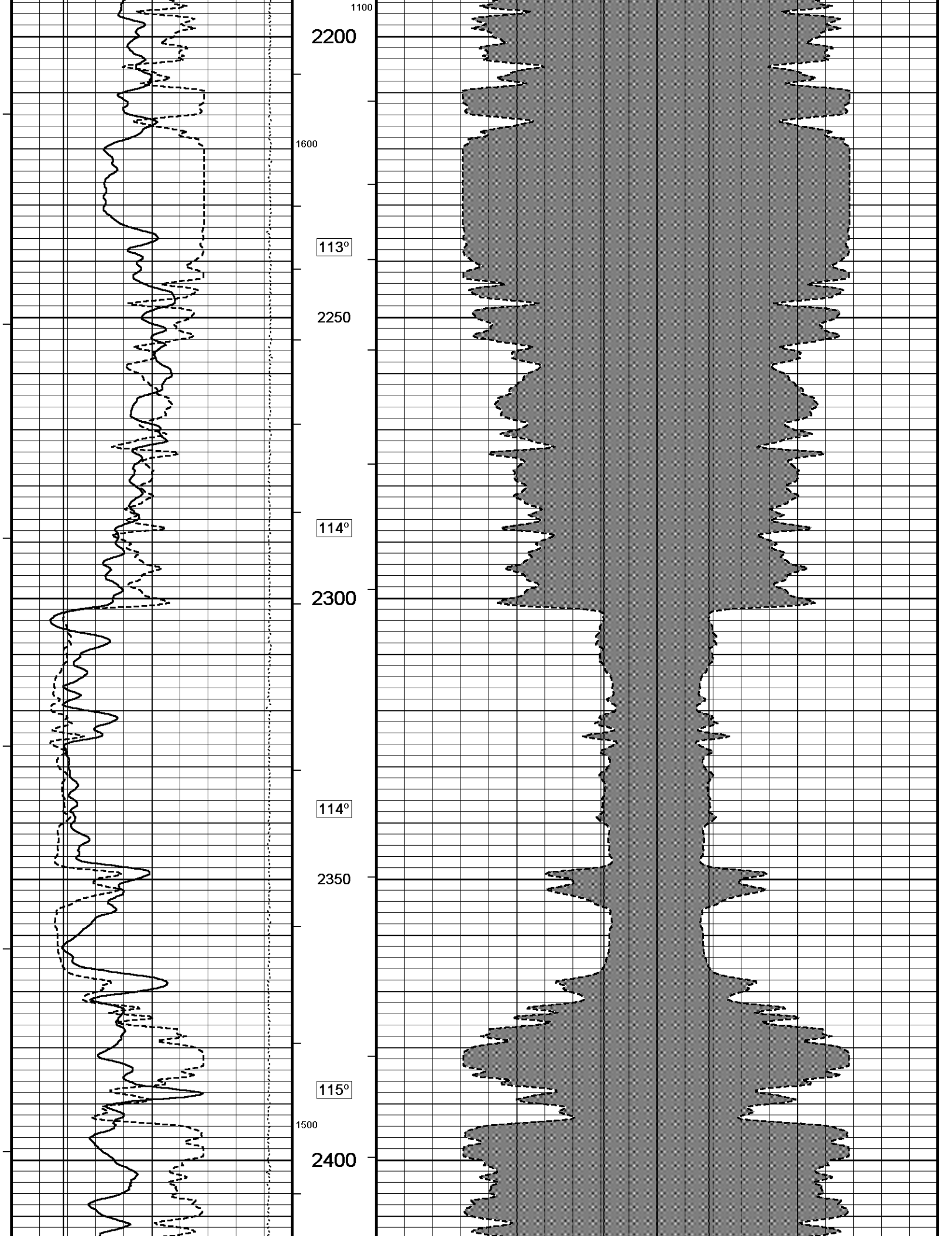
111°
2050
1700
112°
2100
113°
2150
113°
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
Bit Size
Bit Size
Density Caliper
Density Caliper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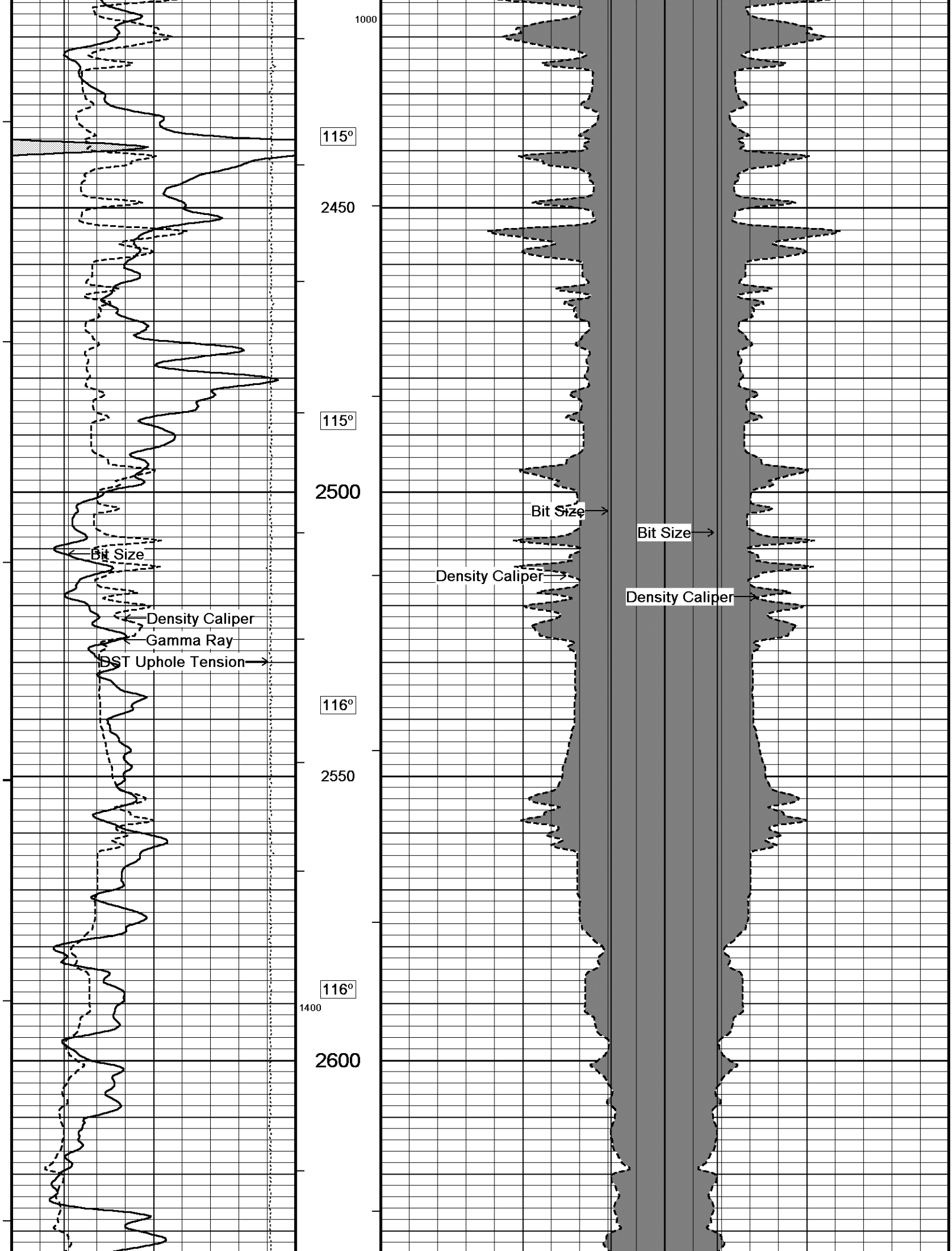
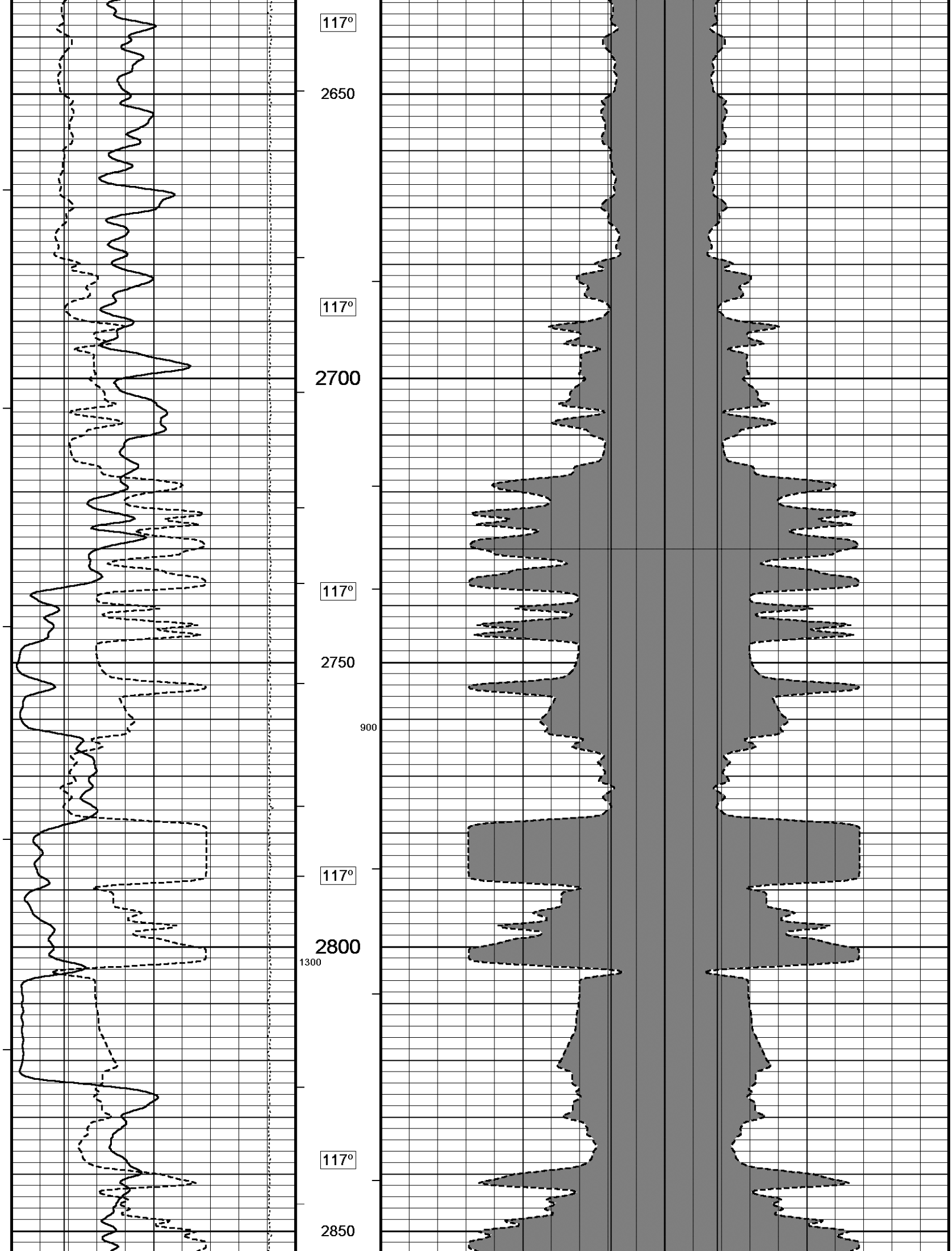
1600
113°
2250
114°
2300
114°
2350
115°
1500
2400


1000
115°
2450
115°
2500
Bit Size
Bit Size
Density Caliper
Density Caliper
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
116°
2550
116°
1400
2600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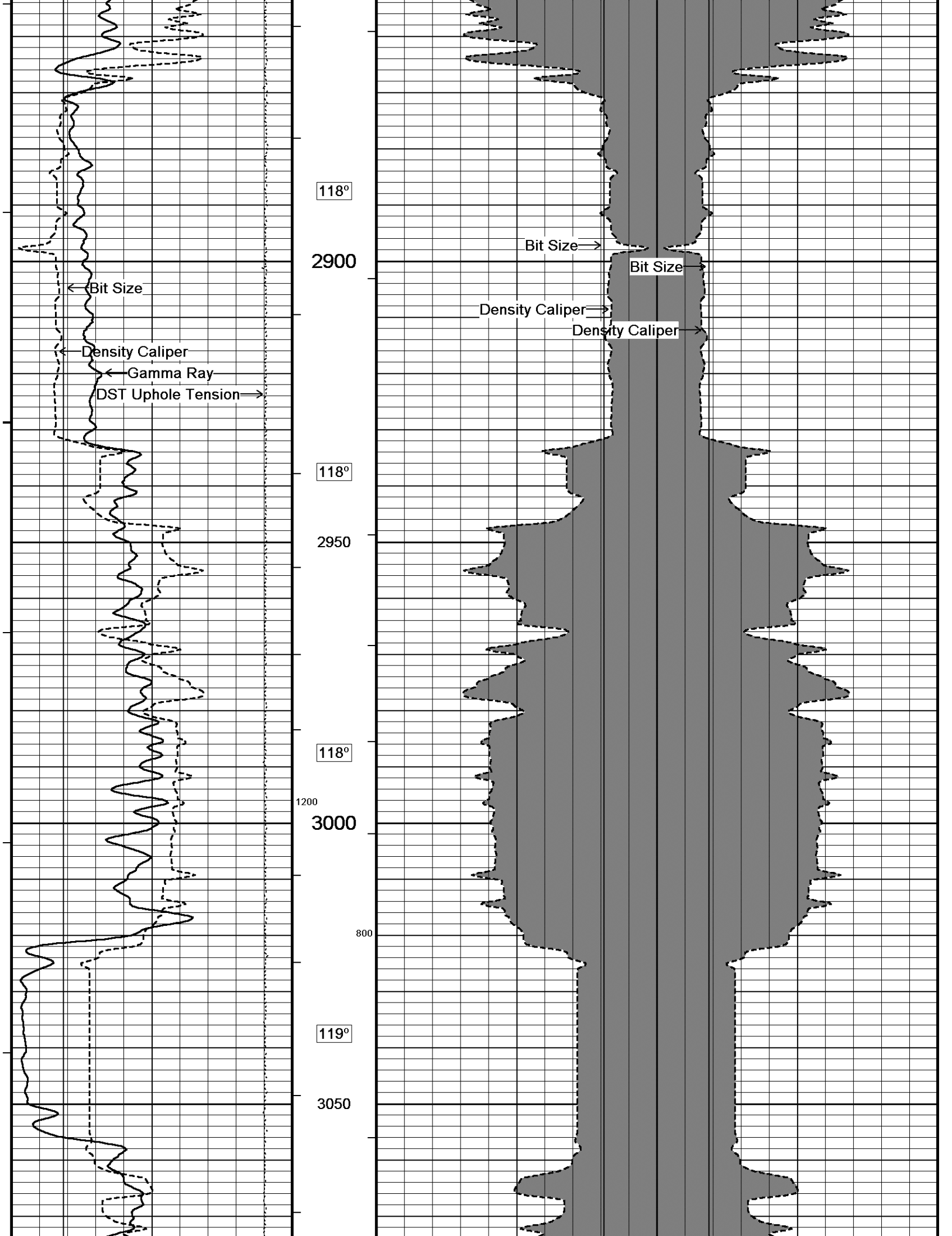
117°
2700
117°
2750
900
117°
2800
1300
117°
2850


118°
2900
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
Bit Size
Bit Size
Density Caliper
Density Caliper
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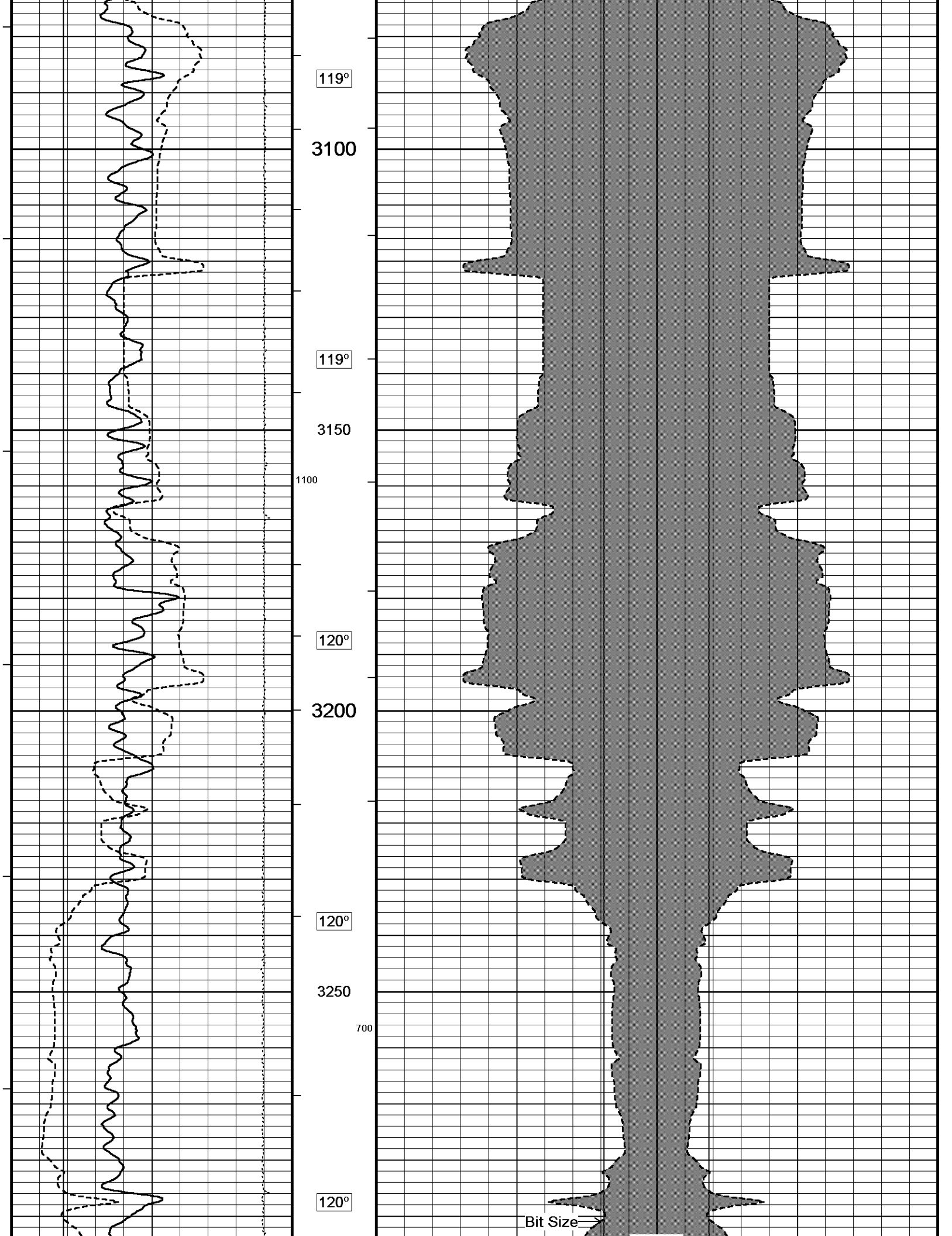
2950
118°
1200
3000
800
119°
3050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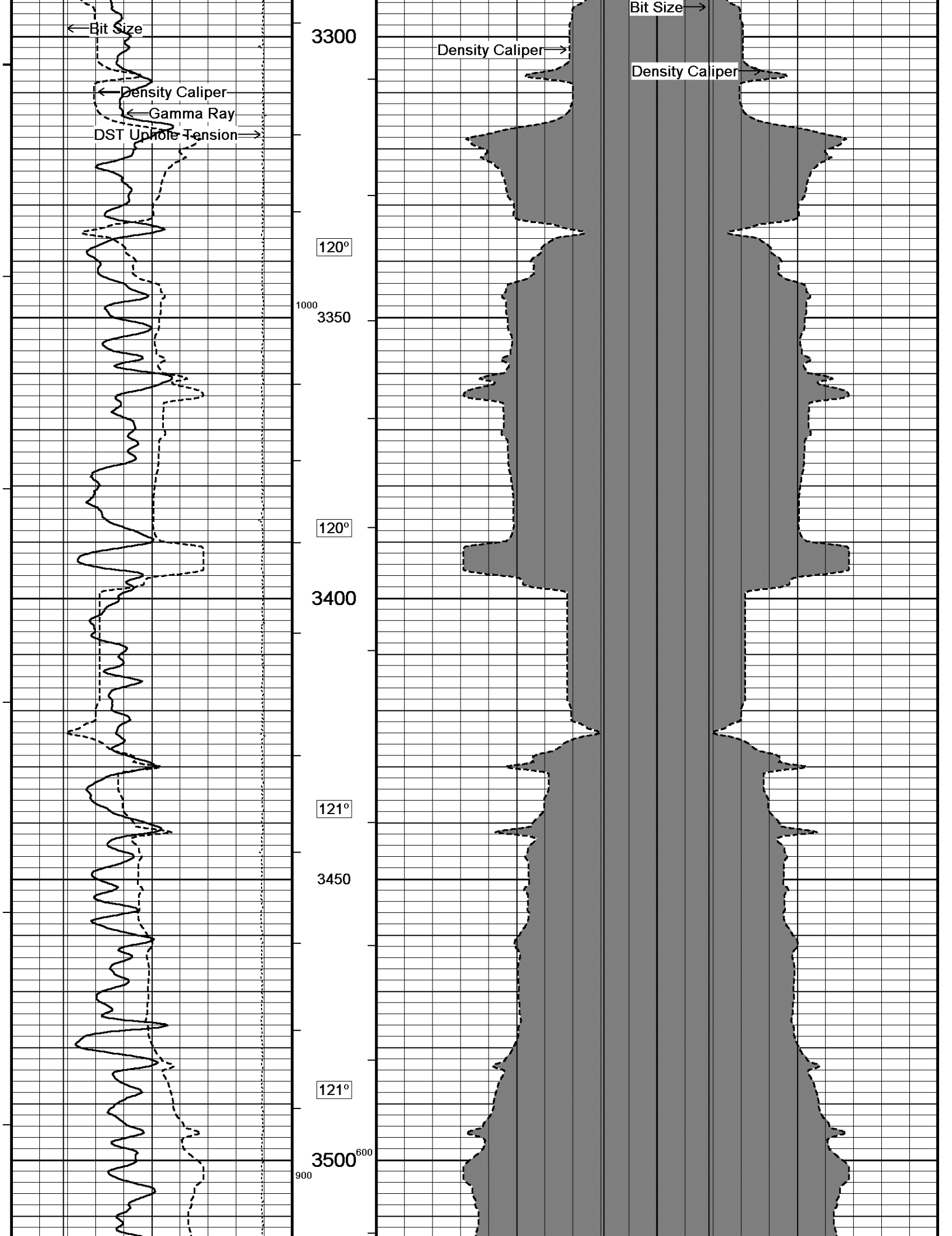
3150
1100
120°
3200
120°
3250
700
120°
Bit Size


Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
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3350
120°
3400
121°
3450
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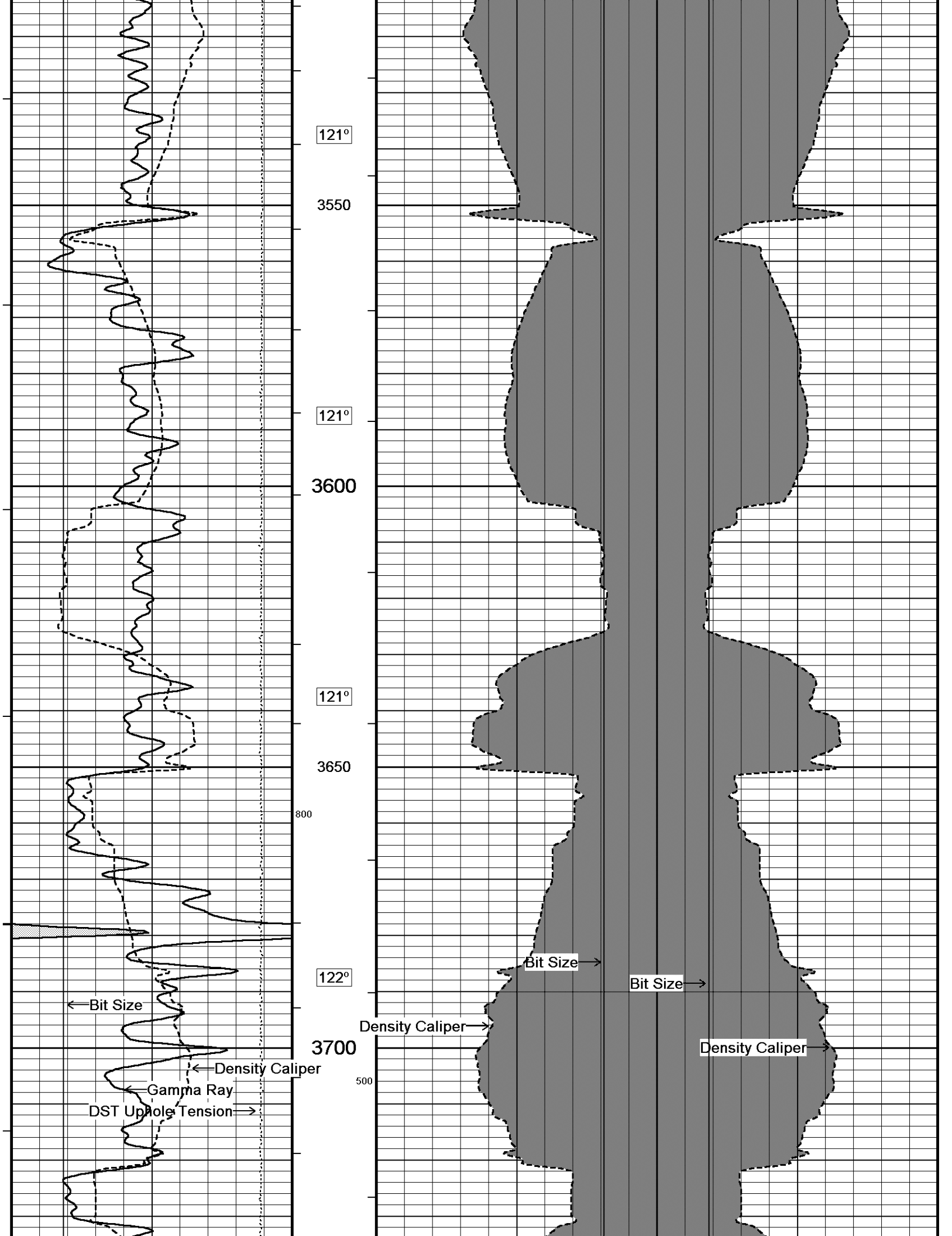
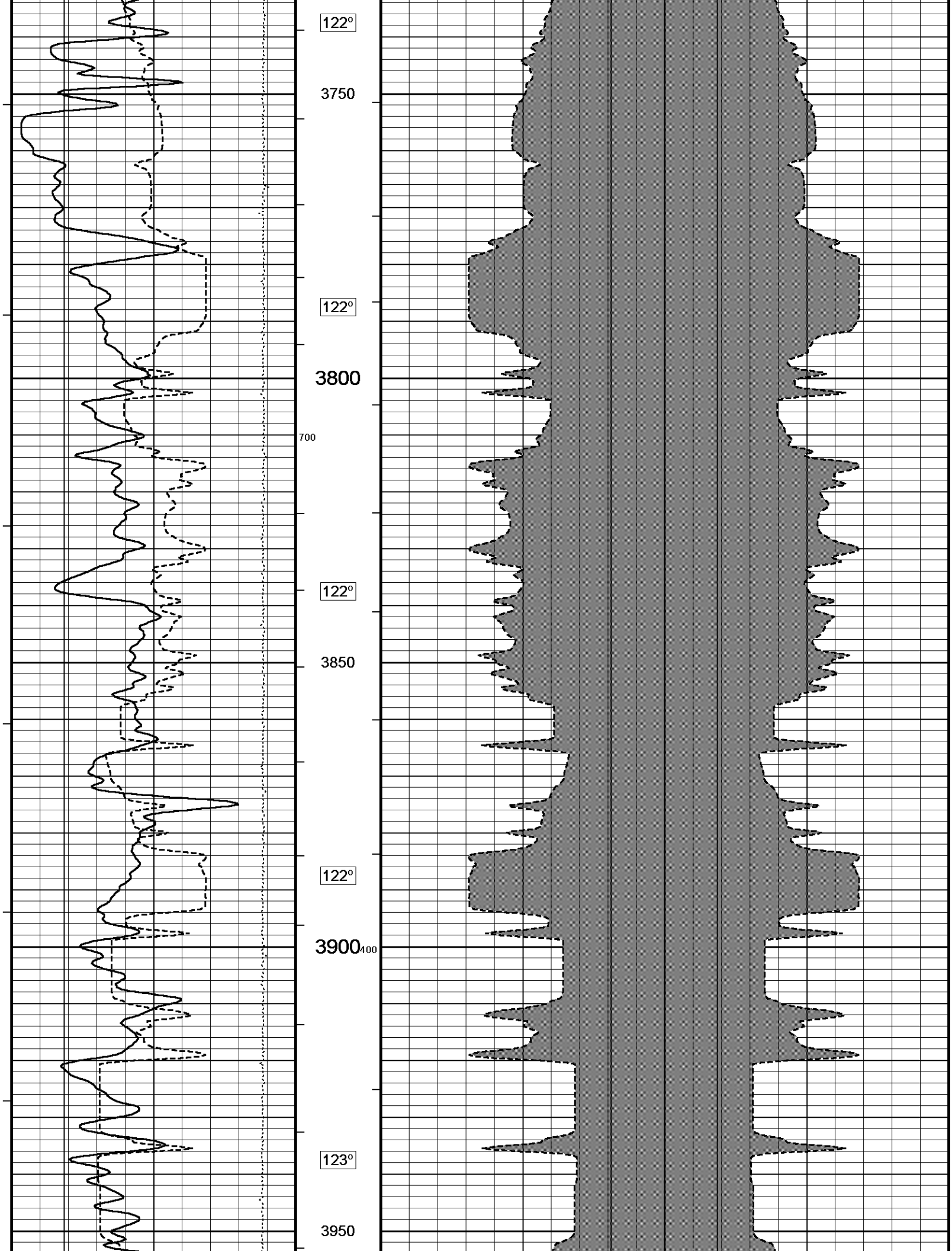
3500
600
900
Bit Size
Density Caliper
Density Caliper


121°
3550
121°
3600
121°
3650
800
122°
Bit Size
3700
Density Caliper
Gamma Ray
DST Uphole Tension
500
Bit Size
Bit Size
Density Caliper
Density Caliper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122°
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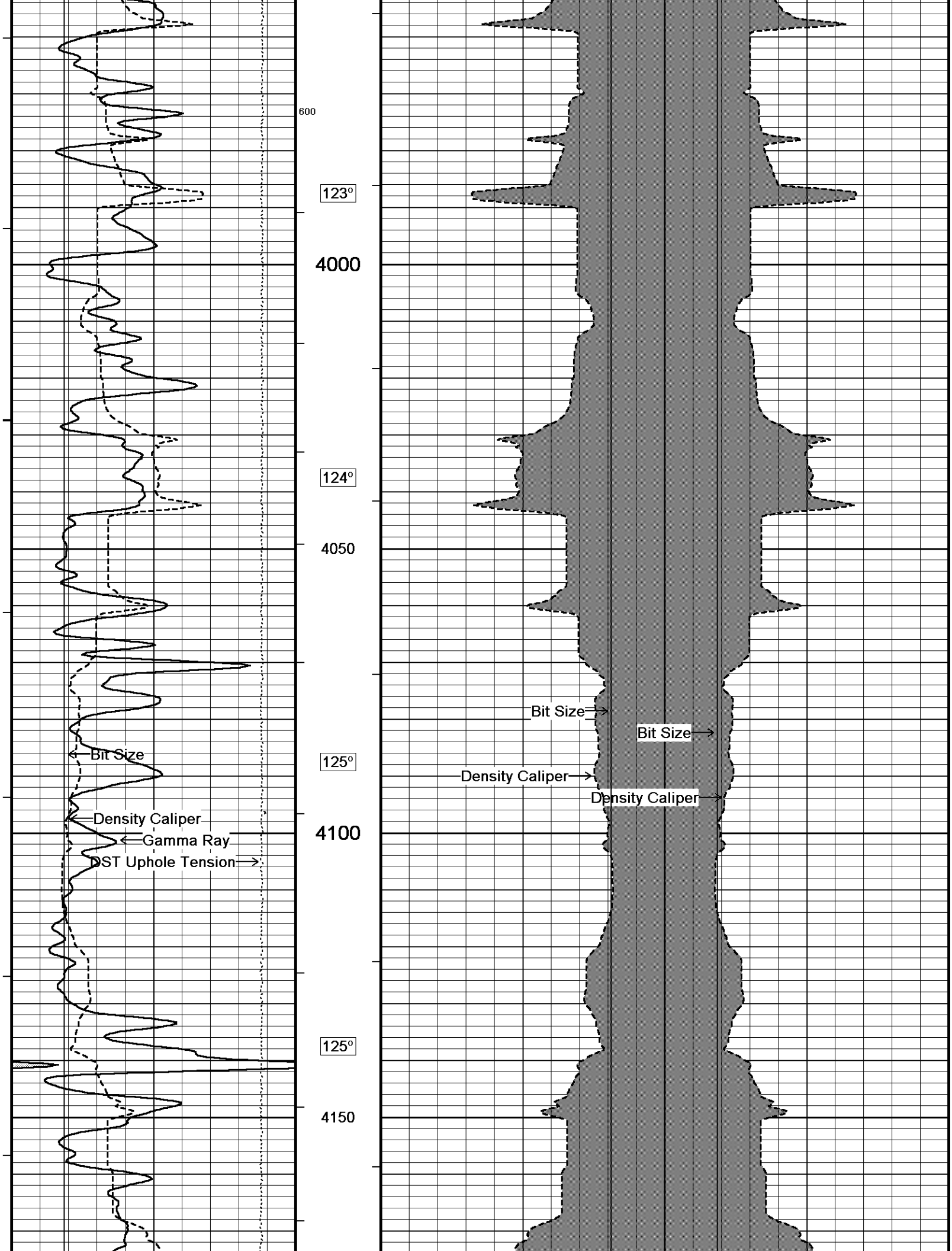
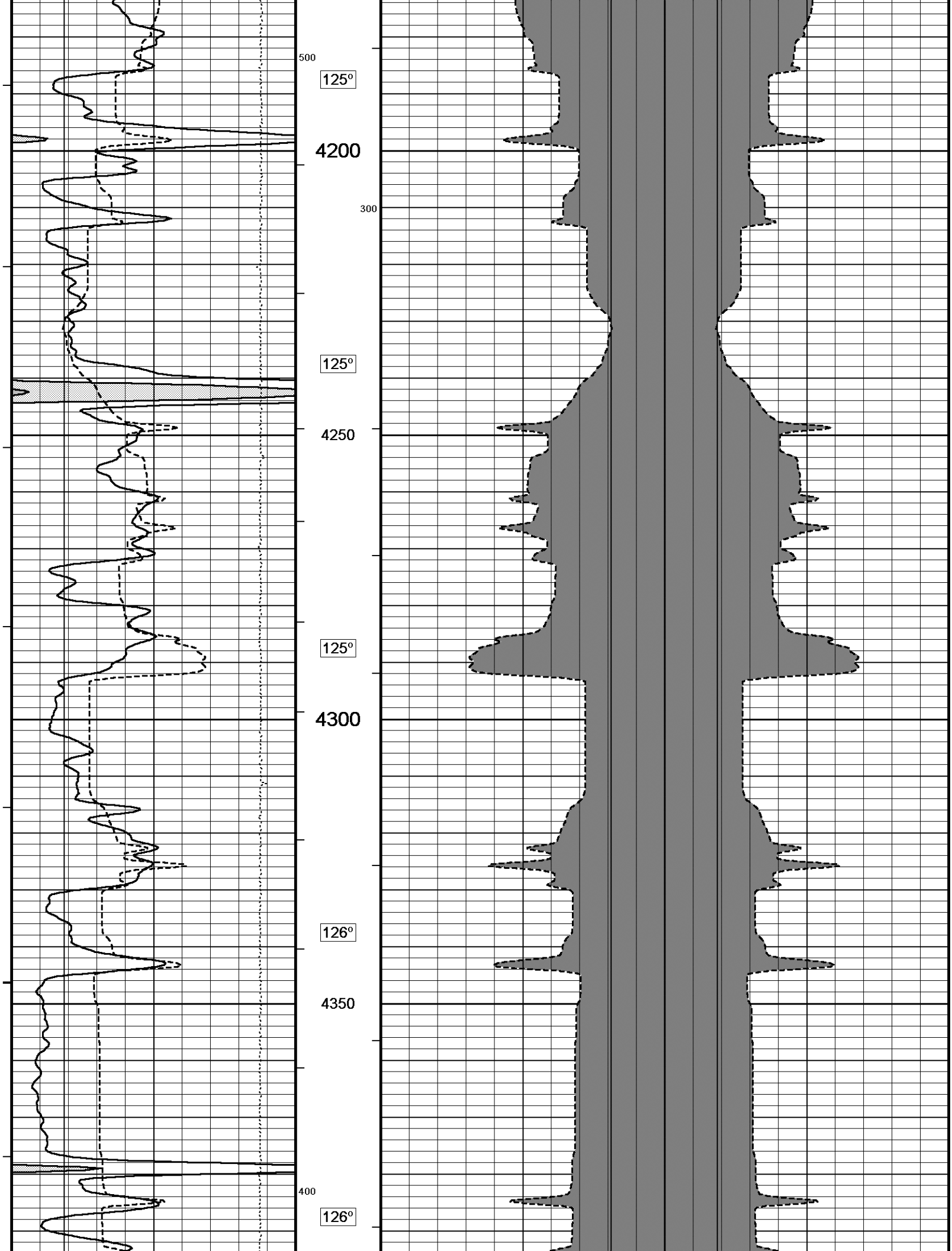
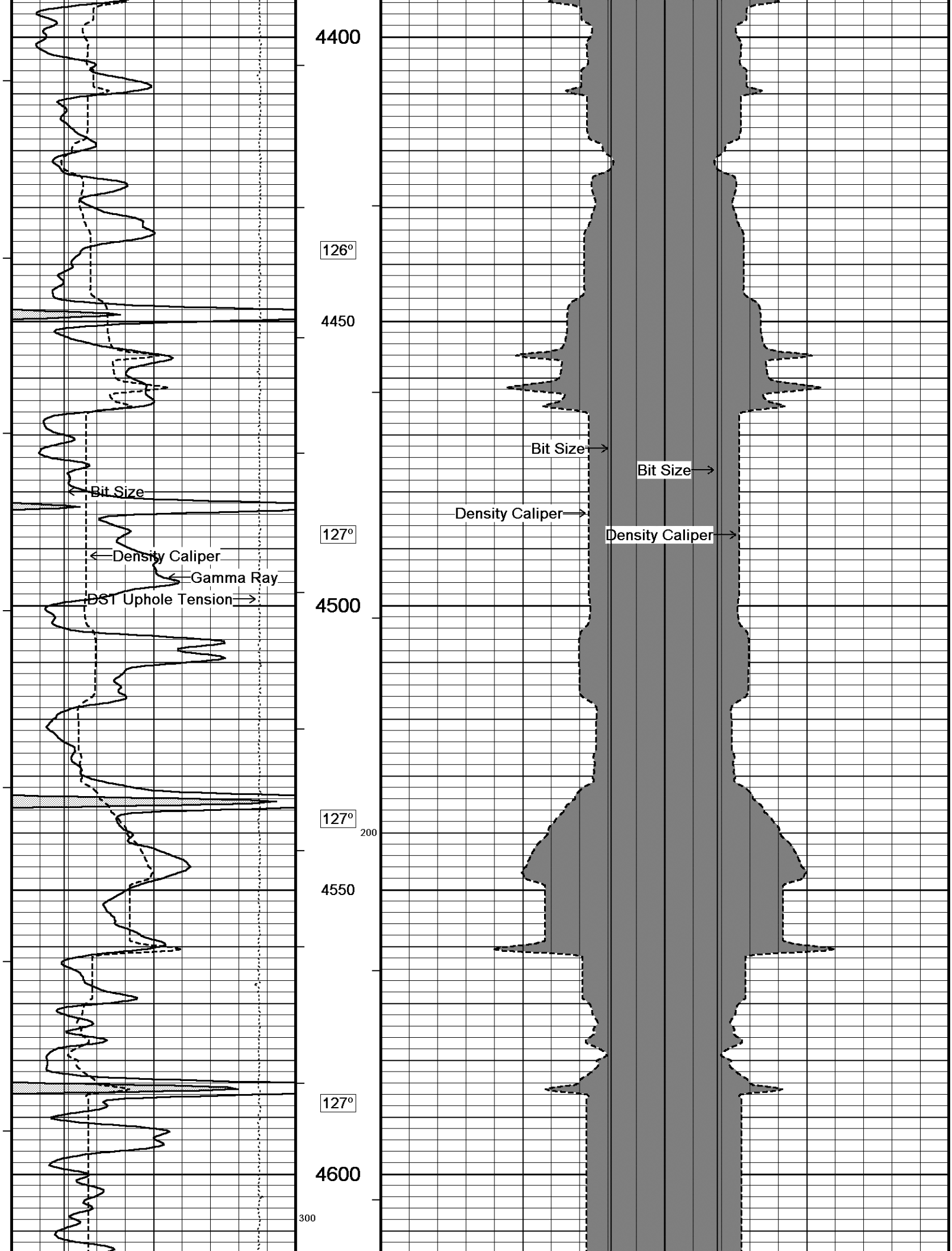
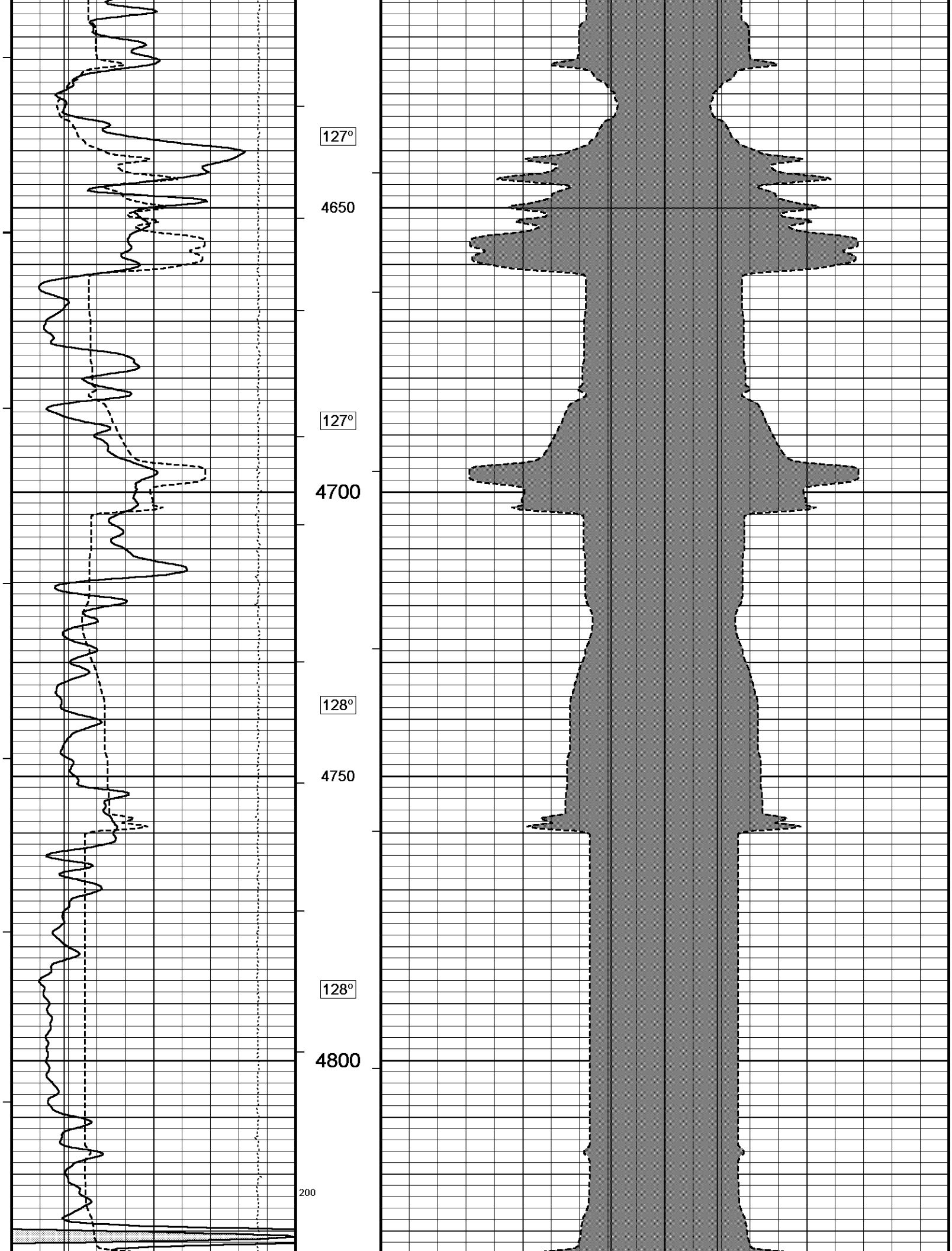
700
122°
3850
122°
3900
400
123°
3950


600
123°
4000
124°
4050
125°
4100
125°
4150
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
Bit Size
Bit Size
Density Caliper
Density Caliper


500
125°
4200
300
125°
4250
125°
4300
126°
4350
400
126°


4400
126°
4450
Bit Size
127°
Density Caliper
Gamma Ray
DST Uphole Tension
4500
127°
200
4550
127°
4600
300
Bit Size
Bit Size
Density Caliper
Density Caliper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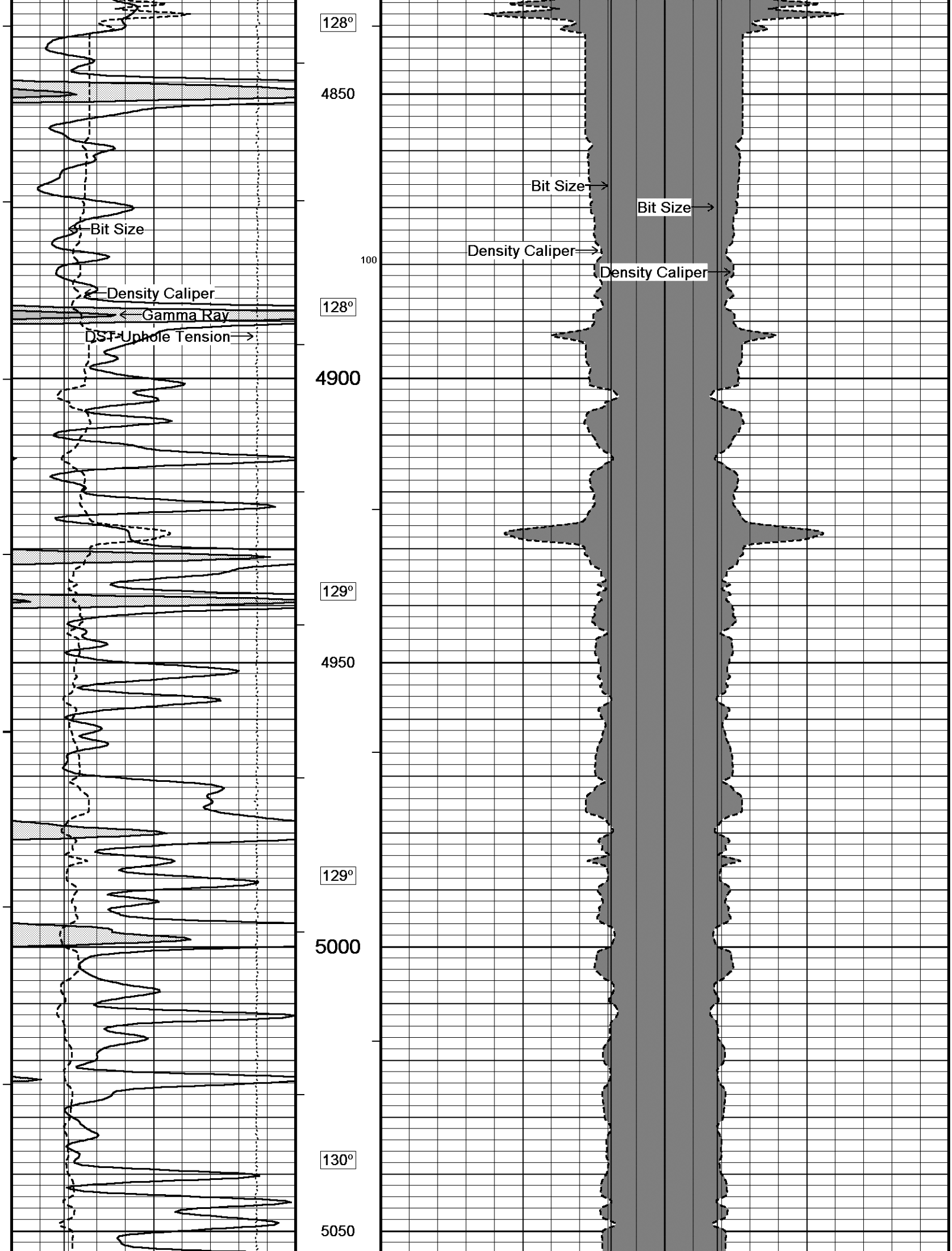
127°
4700
128°
4750
128°
4800
200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4850
Bit Size
Density Caliper
Gamma Ray
DST-Uphole Tension
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129°
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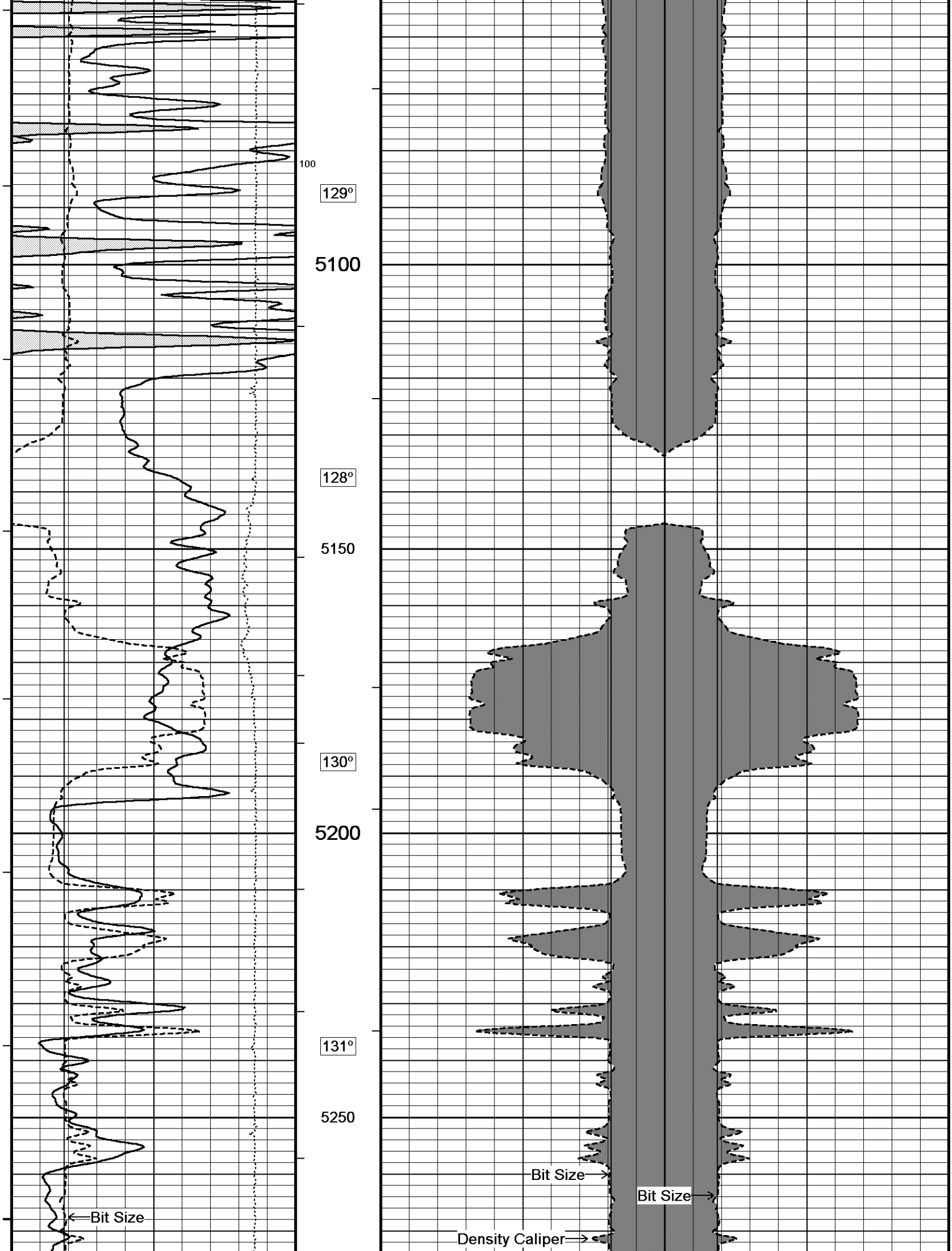
129°
5000
130°
5050
Bit Size
Bit Size
100
Density Caliper
Density Caliper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129°
5100
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130°
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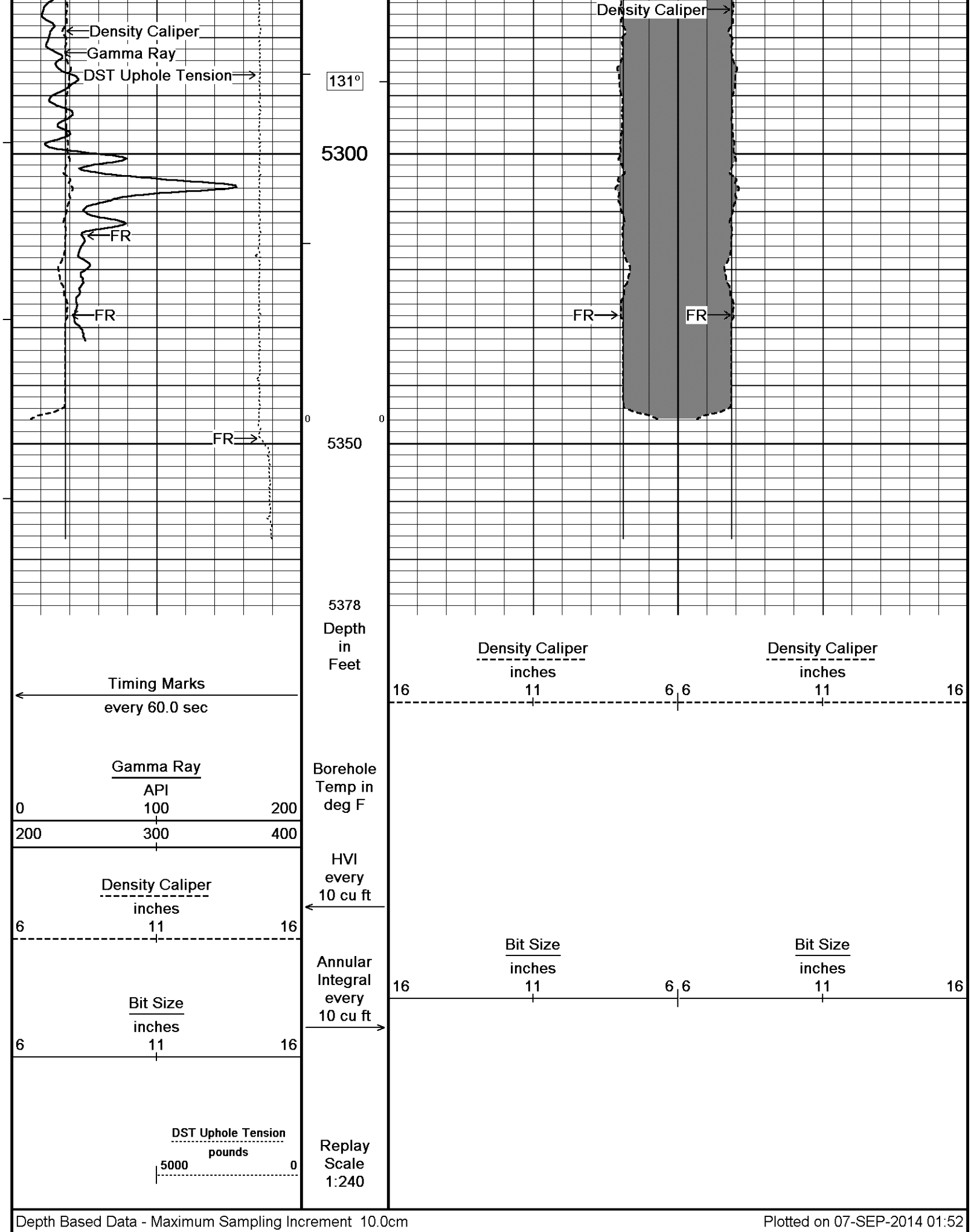
Bit Size
Bit Size
Bit Size
Density Caliper




Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 07-SEP-2014 01:52
Filename: C:\Minimus 13.08.2113\Logs\Mid-Con HRMU 14-1\Mid-Con HRMU 14-1 Repeat.dta
Recorded on 06-SEP-2014 22:19
System Versions: Logged with 13.08.2113 Plotted with 13.08.2113

# BEFORE SURVEY CALIBRATION

C:\Minimus 13.08.2113\Logs\Mid-Con HRMU 14-1\Mid-Con HRMU 14-1 Repeat.dta

## General Constants All 000

Last Edited on 06-SEP-2014,20:43

| | | |
|---|---|---|
| **General Parameters** | | |
| Mud Resistivity | 1.510 | ohm-metres |
| Mud Resistivity Temperature | 96.000 | degrees F |
| Water Level | 0.000 | feet |
| Borehole Fluid 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 | 5.500 | inches |
| Caliper for Differential Caliper | None | |
| **Rwa Parameters** | | |
| Porosity used | Crossplot Porosity | |
| Resistivity used | Array Ind. One Res Rt | |
| RWA Constant A | 0.610 | |
| RWA Constant M | 2.150 | |
| SW/APOR Tool Source | 0.000 | |

## Down-hole Tension Calibration SMS 0

Field Calibration on 06-SEP-2014 21:23

| Reading No | Measured | Calibrated (lbs) |
|---|---|---|
| 1 | 15737.84 | 0.00 |
| 2 | 16034.73 | 326.30 |

## SP Calibration MCG-C 208

Field Calibration on 05-SEP-2014 13:40

| | Measured | Calibrated (mV) |
|---|---|---|
| Reference 1 | 99.8 | 98.7 |
| Reference 2 | -97.8 | -98.9 |

## High Resolution Temperature Calibration MCG-C 208

Field Calibration on 23-JAN-2014,17:11

| | Measured | Calibrated(Deg F) |
|---|---|---|
| Lower | 50.00 | 50.00 |
| Upper | 75.00 | 75.00 |

## High Resolution Temperature Constants MCG-C 208

Last Edited on 23-JAN-2014,17:11

| | |
|---|---|
| Pre-filter Length | 11 |

## Gamma Calibration MCG-C 208

Field Calibration on 05-SEP-2014 13:53

| | Measured | Calibrated (API) |
|---|---|---|
| Background | 66 | 45 |
| Calibrator (Gross) | 1122 | 770 |
| Calibrator (Net) | 1056 | 725 |

## Gamma Constants MCG-C 208

Last Edited on 06-SEP-2014,20:43

| | | |
|---|---|---|
| Gamma Calibrator Number | GRC038 | |
| Mud Density | 1.02 | gm/cc |
| Caliper Source for Processing | Density Caliper | |
| Tool Position | Eccentred | |
| Concentration of KCl | | kppm |
| K Mud Type | Chloride | |
| K Mud Concentration | 0.00 | % |

## Neutron Calibration MDN-B.J 387

Base Calibration on 31-JUL-2014 11:36
Field Check on 05-SEP-2014 13:58

Base Calibration

| | Measured | | Calibrated (cps) | |
|---|---|---|---|---|
| | Near | Far | Near | Far |
| | 2985 | 92 | 3714 | 110 |

| | | | |
|---|---|---|---|
| Ratio | 32.470 | 33.764 | |

| Field Calibrator at Base | Calibrated (cps) | |
|---|---|---|
| | 1675 | 2460 |
| Ratio | 0.681 | |

| Field Check | Calibrated (cps) | |
|---|---|---|
| | 1683 | 2443 |
| Ratio | 0.689 | |

## Neutron Constants MDN-B.J 387

Last Edited on 06-SEP-2014,20:42

| | | |
|---|---|---|
| Neutron Source Id | P58125B | |
| Neutron Jig Number | 5824NE | |
| Epithermal Neutron | | |
| Caliper Source for Processing | Density Caliper | |
| Stand-off | 0.00 | inches |
| Mud Density | 1.00 | gm/cc |
| Limestone Sigma | 7.10 | cu |
| Sandstone Sigma | 4.26 | cu |
| Dolomite Sigma | 4.70 | cu |
| Formation Pressure Source | None | |
| Formation Pressure | N/A | kpsi |
| Temperature Source | Constant Value | |
| Temperature | 68.00 | degrees F |
| Mud Salinity | 0.00 | kppm |
| Salinity Correction | Not Applied | |
| Formation Fluid Salinity Source | None | |
| Formation Fluid Salinity | N/A | kppm |
| Barite Mud Correction | Not Applied | |

## FE Calibration MFE-A.A 55

Base Calibration on 05-SEP-2014 14:08
Field Check on 05-SEP-2014 14:12

Base Calibration

| | Measured | Calibrated (ohm-m) |
|---|---|---|
| Reference 1 | 0.0 | 0.0 |
| Reference 2 | 951.0 | 126.8 |
| Base Check | | 281.6 |
| Field Check | | 281.6 |

## FE Constants MFE-A.A 55

Last Edited on 06-SEP-2014,20:42

| | | |
|---|---|---|
| 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 | 0.5 | inches |

## Induction Calibration MAI-A.A 5

Base Calibration on 21-JAN-2014,09:50
Field Check on 05-SEP-2014 13:23

Base Calibration

Test Loop Calibration

| Channel | Measured Low | Measured High | Calibrated (mmho/m) Low | Calibrated (mmho/m) High |
|---|---|---|---|---|
| 1 | 16.3 | 470.8 | 9.3 | 966.2 |
| 2 | 5.6 | 376.1 | 7.6 | 821.4 |
| 3 | 2.6 | 266.1 | 5.2 | 566.0 |
| 4 | 1.6 | 130.0 | 2.6 | 279.2 |

Array Temperature 71.1 Deg F

| Channel | Base Check (mmho/m) Low | Base Check (mmho/m) High | Field Check (mmho/m) Low | Field Check (mmho/m) High |
|---|---|---|---|---|
| 1 | 0.0 | 0.0 | 15.2 | 3862.7 |
| 2 | 0.0 | 0.0 | 31.8 | 3591.0 |
| 3 | 0.0 | 0.0 | 29.8 | 2971.7 |
| 4 | 0.0 | 0.0 | 20.8 | 2126.4 |
| Deep | | | 18.5 | 1912.4 |

| | | | |
|---|---|---|---|
| Medium | | 43.1 | 3861.6 |
| Shallow | | 47.4 | 5372.8 |
| Array Temperature | 0.0 | | 73.9 Deg F |

## Induction Constants MAI-A.A 5

Last Edited on 06-SEP-2014,20:42

| | | |
|---|---|---|
| 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 | 0.50 | inches |
| Number of Fins on Stand-off | 8.0000 | |
| Stand-off Fin Angle | 45.00 | 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

| | | |
|---|---|---|
| Archie Constant (A) | 1.00 | |
| 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 | |

## High Resolution Temperature Calibration MAI-A.A 5

Field Calibration on 21-JAN-2014,15:43

| | Measured | Calibrated(Deg F) |
|---|---|---|
| Lower | 50.00 | 50.00 |
| Upper | 75.00 | 75.00 |

## High Resolution Temperature Constants MAI-A.A 5

Last Edited on 27-JUN-2014,14:12

| | |
|---|---|
| Pre-filter Length | 11 |

## Caliper Calibration MPD-D.A 481

Base Calibration on 23-AUG-2014 13:39
Field Calibration on 05-SEP-2014 13:28

Base Calibration

| Reading No | Measured | Calibrator Size (in) |
|---|---|---|
| 1 | 17257 | 3.99 |
| 2 | 27352 | 5.98 |
| 3 | 37398 | 7.97 |
| 4 | 47224 | 9.86 |
| 5 | 58327 | 11.92 |
| 6 | N/A | N/A |

Field Calibration

| Measured Caliper (in) | Actual Caliper (in) |
|---|---|
| 7.95 | 7.97 |

## Photo Density Calibration MPD-D.A 481

Base Calibration on 23-AUG-2014 14:06
Field Check on 05-SEP-2014 13:32

Density Calibration

| Base Calibration | Measured Near | Measured Far | Calibrated (sdu) Near | Calibrated (sdu) Far |
|---|---|---|---|---|
| Background | 1216 | 1426 | | |
| Reference 1 | 55706 | 26385 | 59556 | 30836 |
| Reference 2 | 22306 | 2607 | 24941 | 2541 |
| Field Check at Base | 1215.9 | 1425.6 | | |
| Field Check | 1213.8 | 1423.6 | | |

PE Calibration

| Base Calibration | WS | WH | Ratio | Calibrated Ratio |
|---|---|---|---|---|
| Background | 232 | 1087 | | |
| Reference 1 | 24125 | 55503 | 0.439 | 0.371 |
| Reference 2 | 6847 | 22166 | 0.314 | 0.272 |
| Field Check at Base | 232.2 | 1087.0 | | |
| Field Check | 230.3 | 1084.6 | | |

## Density Constants MPD-D.A 481

Last Edited on 06-SEP-2014,20:42

| | | |
|---|---|---|
| Density Source Id | P50557B | |
| Nylon Calibrator Number | DNCE695 | |
| Aluminium Calibrator Number | DACD698 | |
| Density Shoe Profile | 8 inch | |
| Caliper Source for Processing | Density Caliper | |
| PE Correction to Density | Not Applied | |
| Mud Density | 1.02 | 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) |
|---|---|
| 2.71 | 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

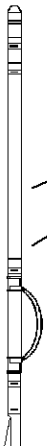
C:\Minimus 13.08.2113\Logs\Mid-Con HRMU 14-1\Mid-Con HRMU 14-1 Repeat.dta

CBH-C, Cablehead, 11 pin
CBH-C 265 LG: 2.40 ft WT: 24.3 lb OD: 2.240 in

Compact Comms Gamma
MCG-C 208 LG: 8.70 ft WT: 63.9 lb OD: 2.240 in

Compact Neutron
MDN-B.J 387 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper
MPD-D.A 481 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

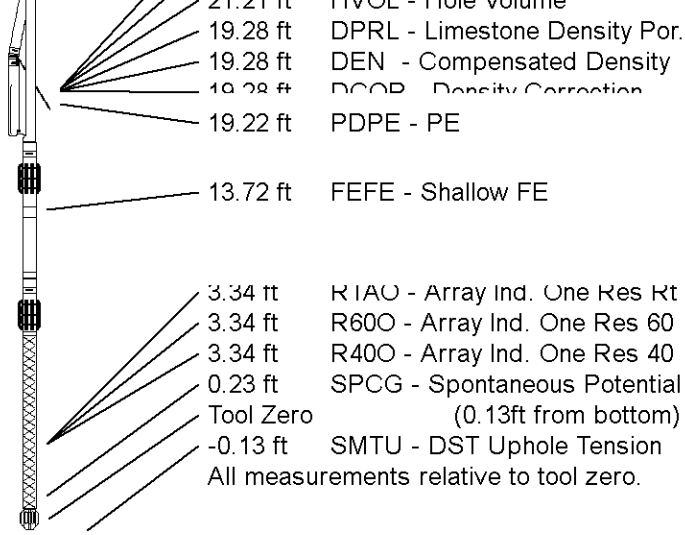


34.90 ft GRGC - Gamma Ray
32.00 ft CGXT - MCG External Temperature
28.45 ft NPRL - Limestone Neutron Por.
21.21 ft CLDC - Density Caliper
21.21 ft AVOL - Annular Volume

Compact Focussed Electric
MFE-A.A 55  LG: 6.05 ft  WT: 48.5 lb  OD: 2.244 in

Compact Induction
MAI-A.A 5  LG: 10.81 ft  WT: 48.5 lb  OD: 2.244 in

Total  Length: 42.59 ft  Weight: 326.3 lb




| | |
|---|---|
| COMPANY | MID-CON ENERGY OPERATING, INC. |
| WELL | HRMU 14-1 |
| FIELD | HARKER RANCH MORROW UNIT |
| PROVINCE/COUNTY | CHEYENNE |
| COUNTRY/STATE | U.S.A. / COLORADO |

| | | | | | |
|---|---|---|---|---|---|
| Elevation Kelly Bushing | 4045.19 | feet | First Reading | 5327.98 | feet |
| Elevation Drill Floor | 4043.19 | feet | Depth Driller | 5350.00 | feet |
| Elevation Ground Level | 4028.59 | feet | Depth Logger | 5349.00 | feet |

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