**Company :** **NORTHEAST NATURAL ENERGY LLC**
**Well :** **BOGGESS 17H ST01**
**Field :** **MARCELLUS SHALE**

**Date :** **28-Jun-2019**
**Time :** **11:46**

GAMMA-RAY

# Schlumberger

2" = 100'
FEET MD

COMPANY : NORTHEAST NATURAL ENERGY LLC
WELL : BOGGESS 17H ST01
FIELD : MARCELLUS SHALE
COUNTY : MONONGALIA
STATE : WV
COUNTRY : USA
API No.: 47-061-01812

COMPANY : NORTHEAST NATURAL ENERGY LLC
WELL : BOGGESS 17H ST01
FIELD : MARCELLUS SHALE
COUNTY : MONONGALIA
STATE : WV
COUNTRY : USA
API No.: 47-061-01812

## WELL LOCATION

LAT:39°40'13"N LON:80°05'35"W
X:1,801,561' Y:426,810' NAD83

SEC: TWP: RANGE:

## OTHER SERVICES

DIRECTIONAL
ROP

DEPTH REF. : ROTARY TABLE
ELEVATION : 25.00 ft (ROTARY TABLE - GROUND LEVEL)
ALTITUDE : 1268.00 ft (GROUND LEVEL - MEAN SEA LEVEL)

## BOREHOLE RECORD

| HOLE SIZE in | FROM ft | TO ft |
|---|---|---|
| 8 1/2 | 5236 | 19055 |
| | | |
| | | |
| | | |
| | | |
| | | |

## CASING RECORD

| CASING SIZE in | FROM ft | TO ft |
|---|---|---|
| 9 5/8 | 25 | 2438 |
| | | |
| | | |
| | | |
| | | |
| | | |

## DEVIATION RECORD

| INCLINATION deg | FROM ft | TO ft |
|---|---|---|
| 00 - 00 | 25 | 5290 |
| 00 - 56 | 5290 | 6143 |
| 56 +/-1 | 6143 | 9081 |
| 56 - 87 | 9081 | 10408 |
| 87 +/-4 | 10408 | 19055 |
| | | |
| | | |
| | | |
| | | |

DRILLING Co.: PATTERSON
RIG : 334
LWD UNIT No.: TRAILER DISTRICT : NEB
SPUD DATE : 21-JUN-19
LWD START DATE : 21-JUN-19 DEPTH : 5213 ft
LWD END DATE : 29-JUN-19 DEPTH : 19032 ft
TOTAL DEPTH : 19055 ft

## RUN DATA

| RUN NUMBER | 1 |
|---|---|
| START DATE | 20-JUN-19 |
| START TIME | 22:00 |
| END DATE | 28-JUN-19 |
| END TIME | 09:00 |
| DEPTH IN ft | 5236 |
| DEPTH OUT ft | 19055 |
| LOG TOP ft | 5213 |
| LOG BOTTOM ft | 19032 |
| HOLE SIZE in | 8 1/2 |
| | |
| MUD DATA @ ft | 19055 |
| MUD TYPE | OIL BASED |
| DENSITY lb/gal | 12.00 |
| VISCOSITY s/qt | 67 |
| pH | |
| FLUID LOSS cm3/30 | 12.5 |
| SALINITY ppm | 34000 |
| Rm ohmm @ deg F | @ |
| Rmf ohmm @ deg F | @ |

| | | | | | | |
|---|---|---|---|---|---|---|
| MAX REC TEMP deg F | 231 | | | | | |
| Rm @ MAX TEMP ohmm | | | | | | |
| | | | | | | |
| LWD ENGINEER #1 | M.KHALIL | | | | | |
| LWD ENGINEER #2 | | | | | | |
| LWD ENGINEER #3 | | | | | | |

## REMARKS

NORTHEAST NATURAL ENERGY LLC, AFE#: 100430-603

SCHLUMBERGER JOB#: 19NEB1089

ALL LOGGING DATA IS MEMORY UNLESS STATED OTHERWISE.

ALL REFERENCES TO LOG TOP, LOG BOTTOM OR LOGGING TOOL DEPTH REFER TO THE GAMMA-RAY SENSO UNLESS STATED OTHERWISE.

ALL ANNOTATIONS IN THE DEPTH TRACK ARE REFERENCED TO BIT DEPTH.

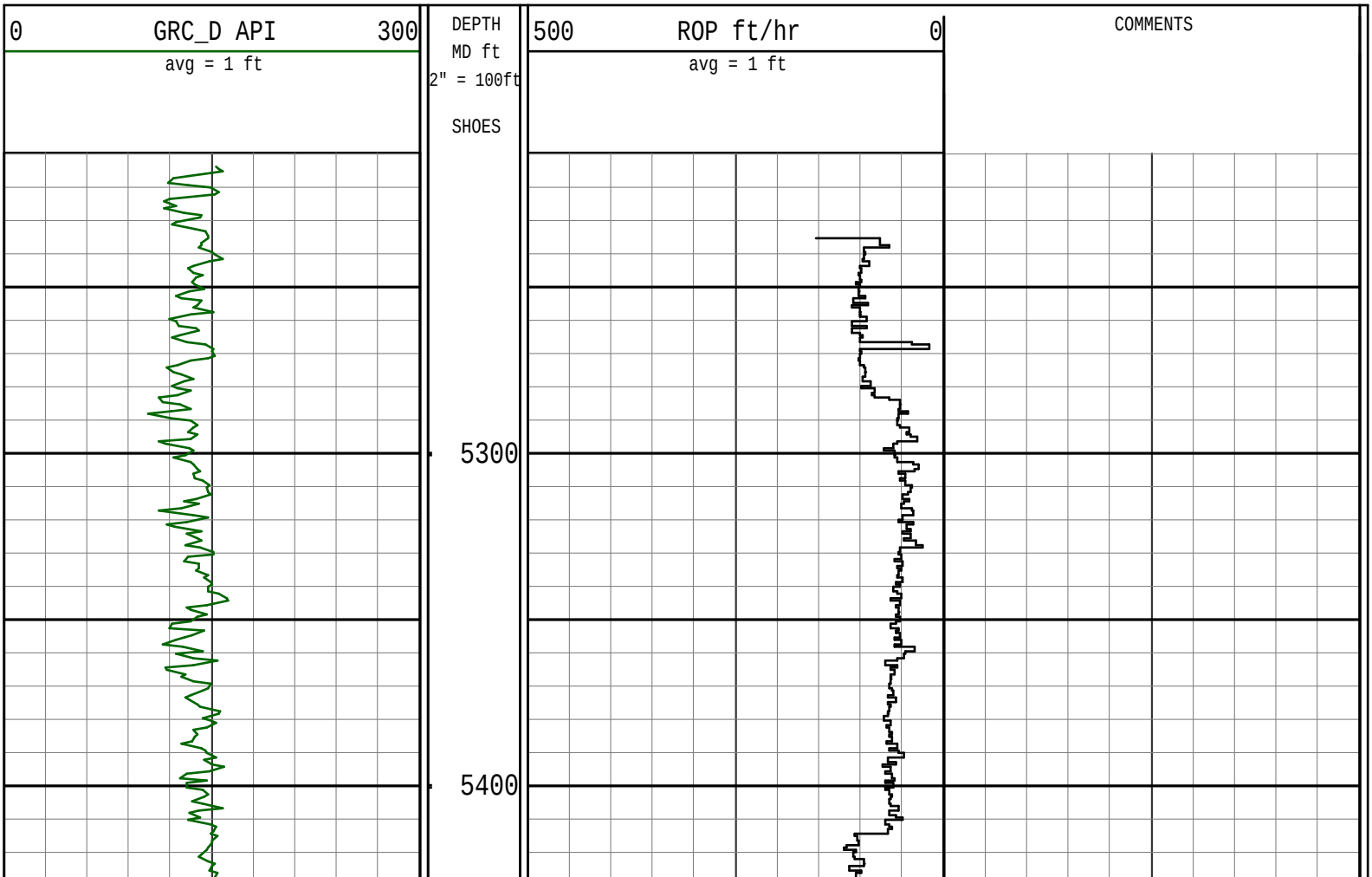
THIRD PARTY DEPTH TRACKING SERVICES PROVIDED BY PASON.

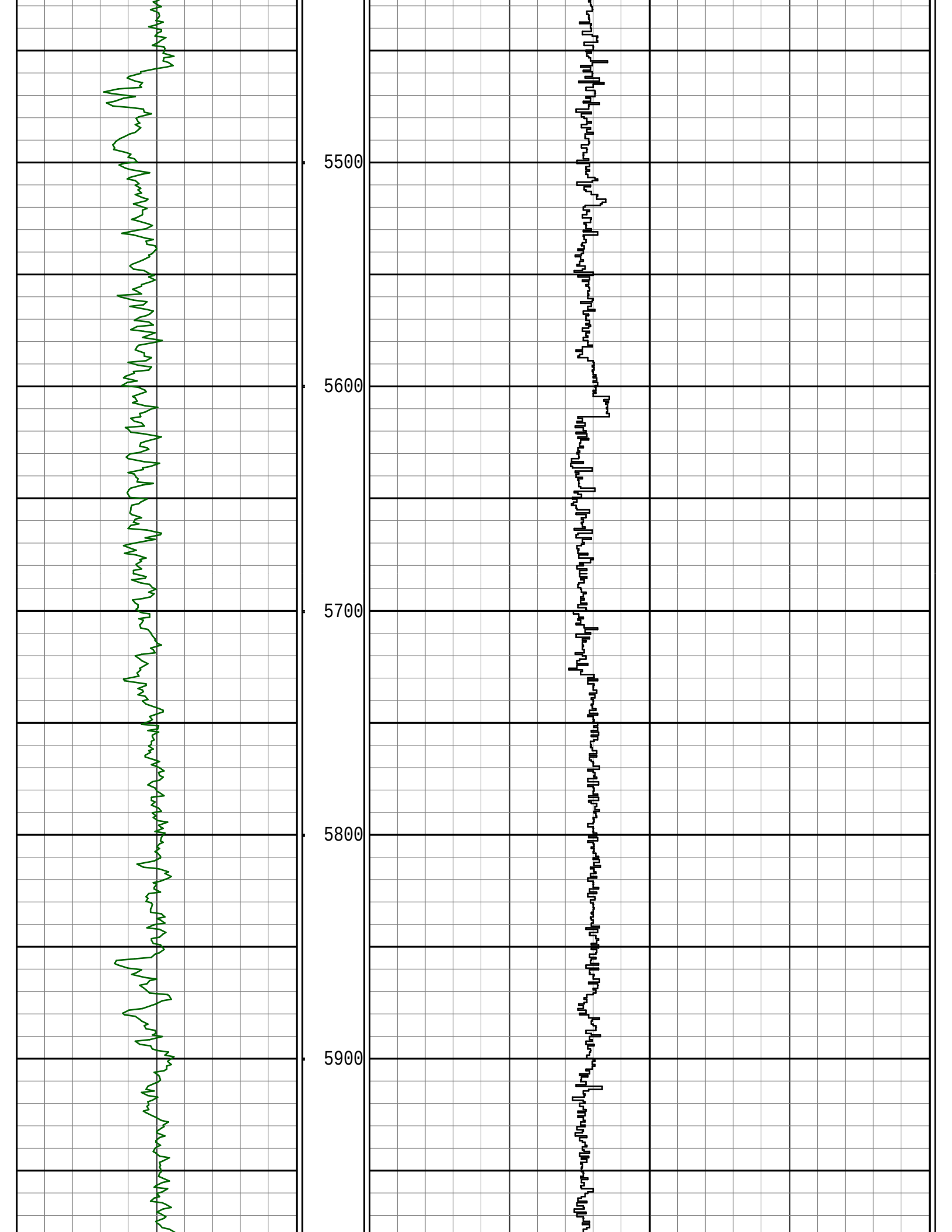
RUN #1: 6 3/4" XBOLT/AGR LOGGING RUN.



Version No : RX6 V7.02B Release 18Sep2017

Plot Time : 28-Jun-2019 11:45

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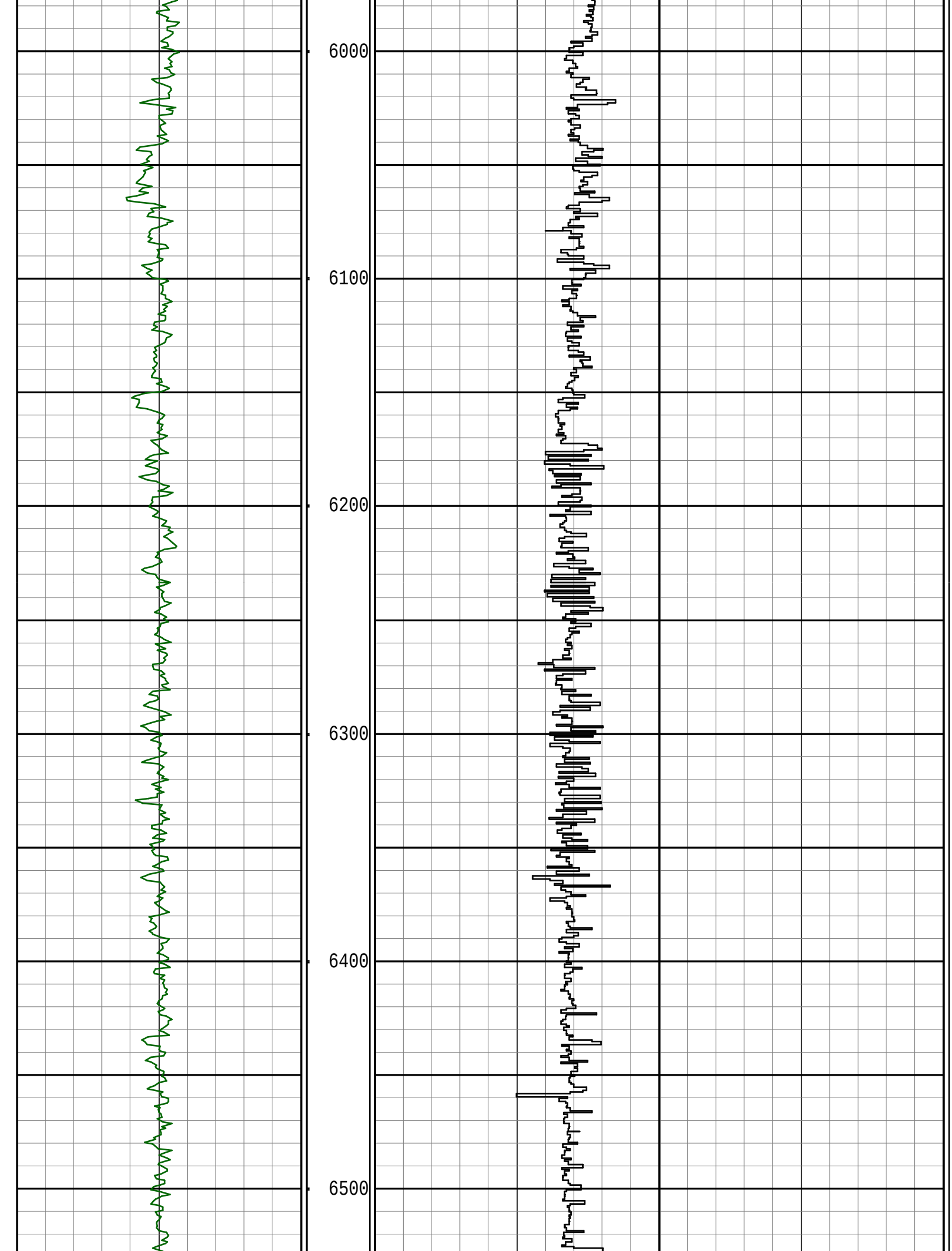
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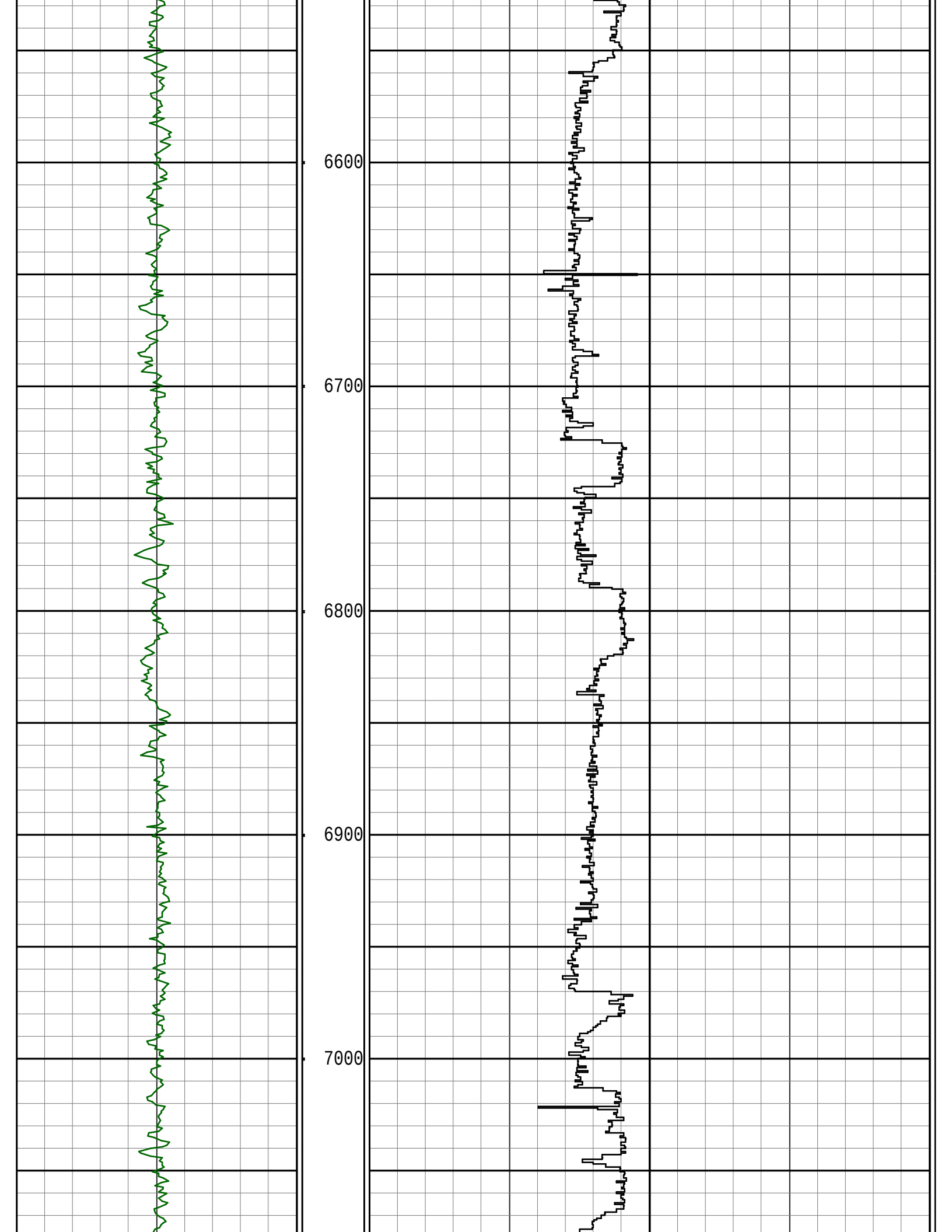
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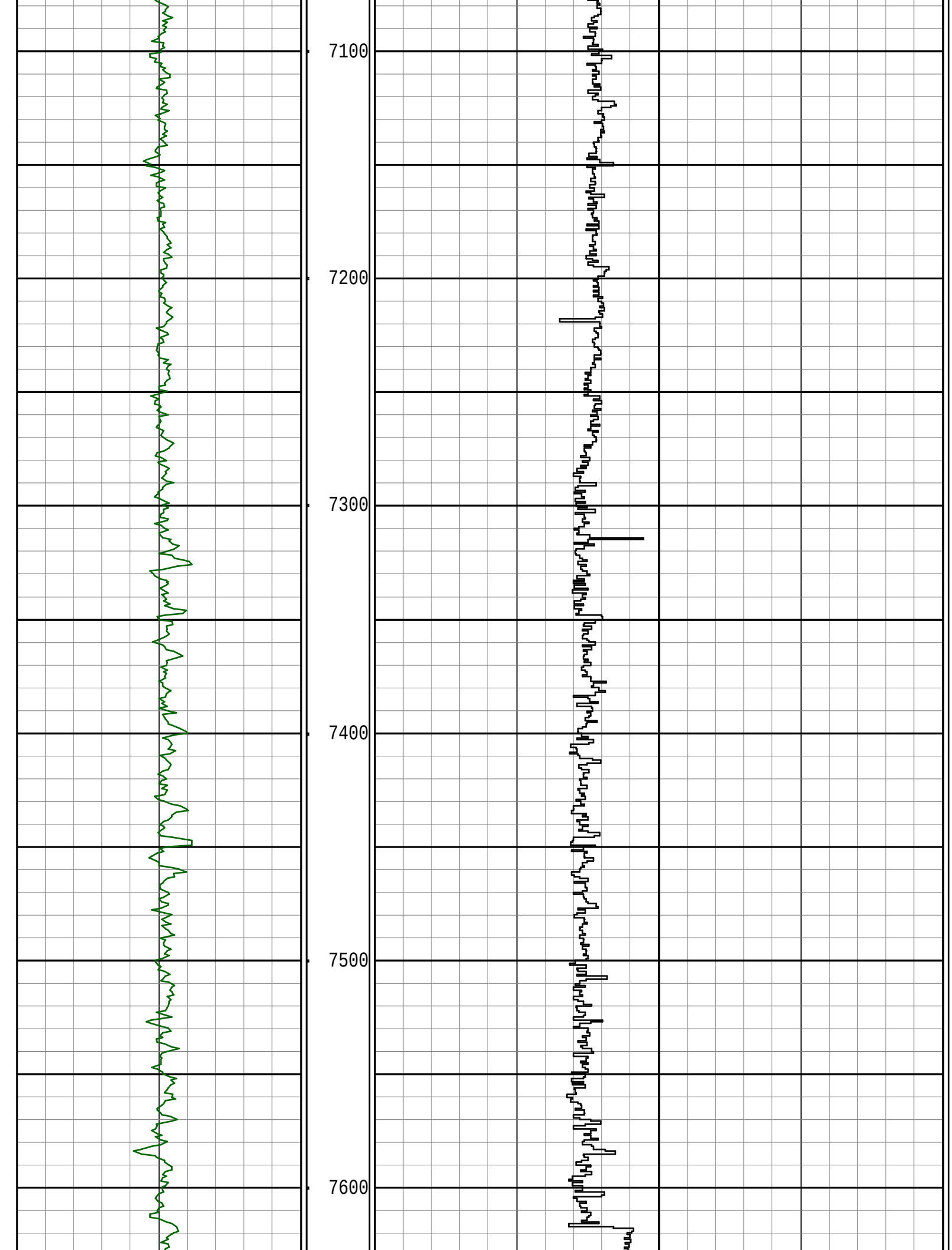
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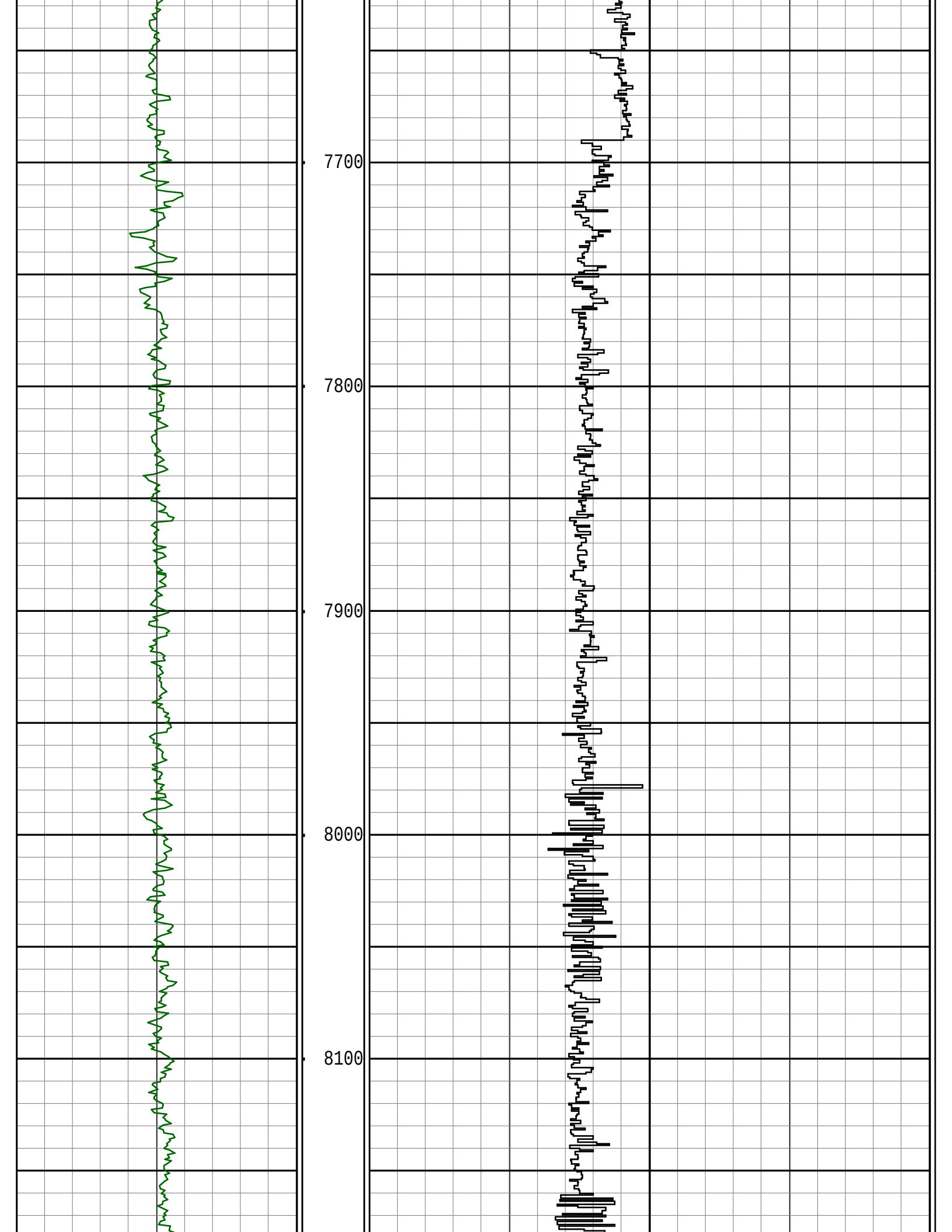
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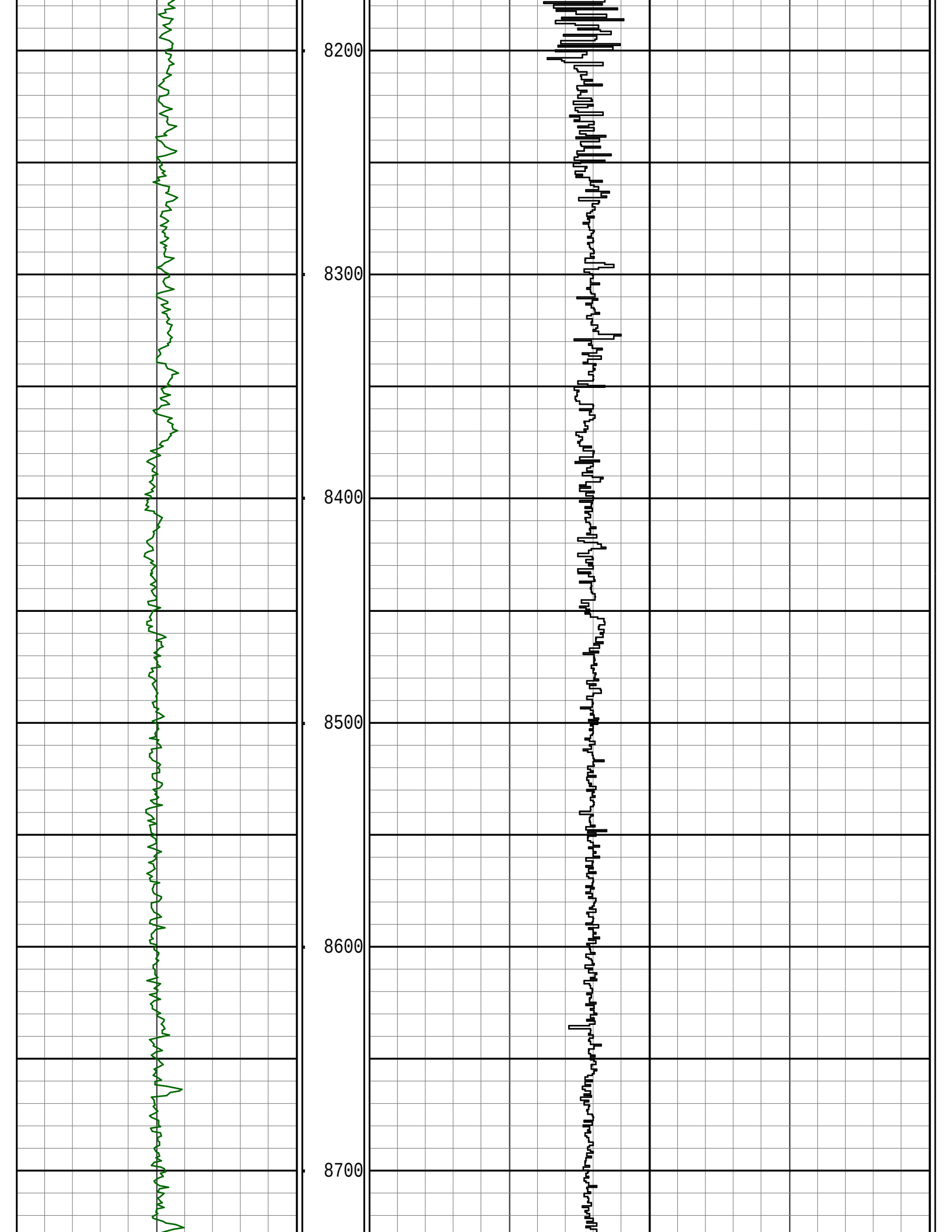
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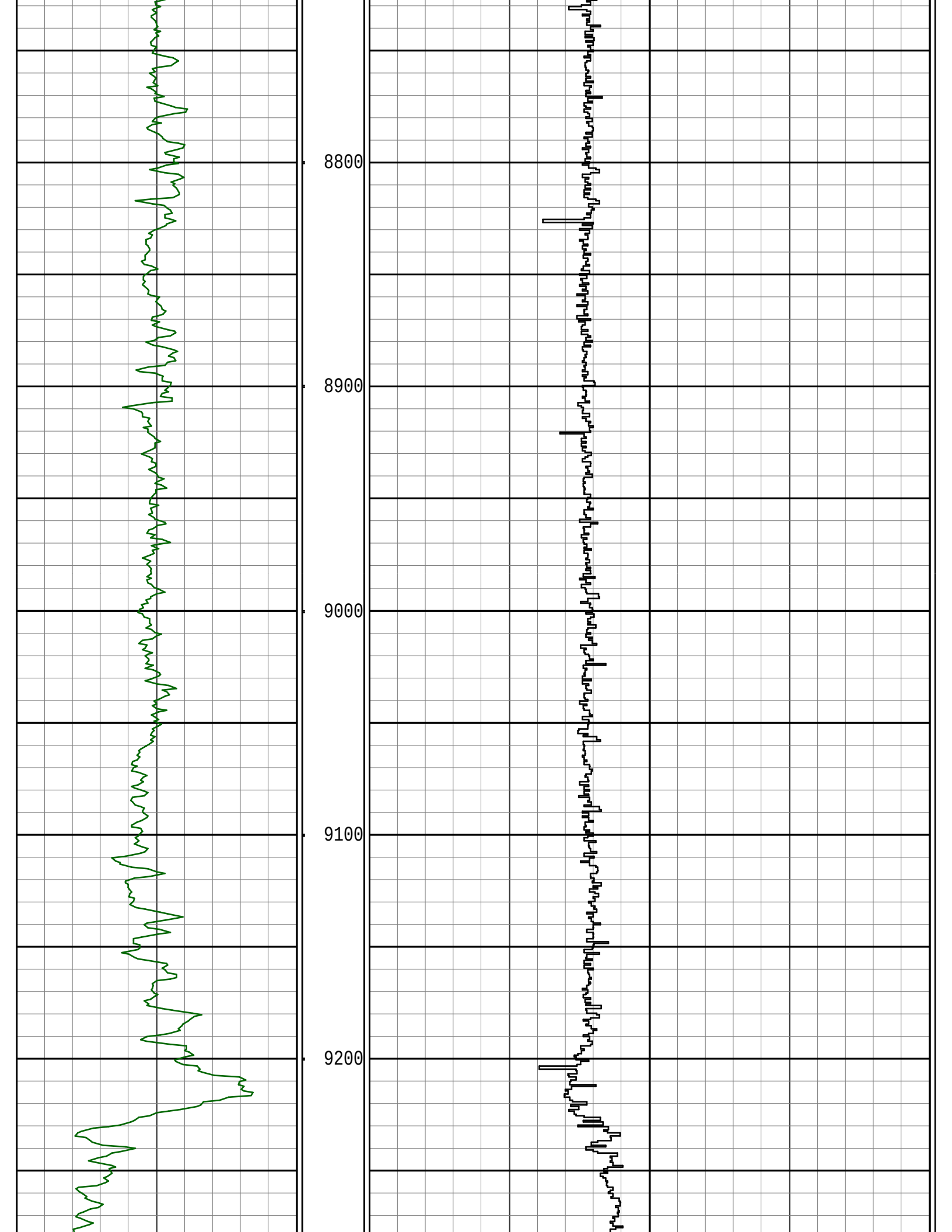
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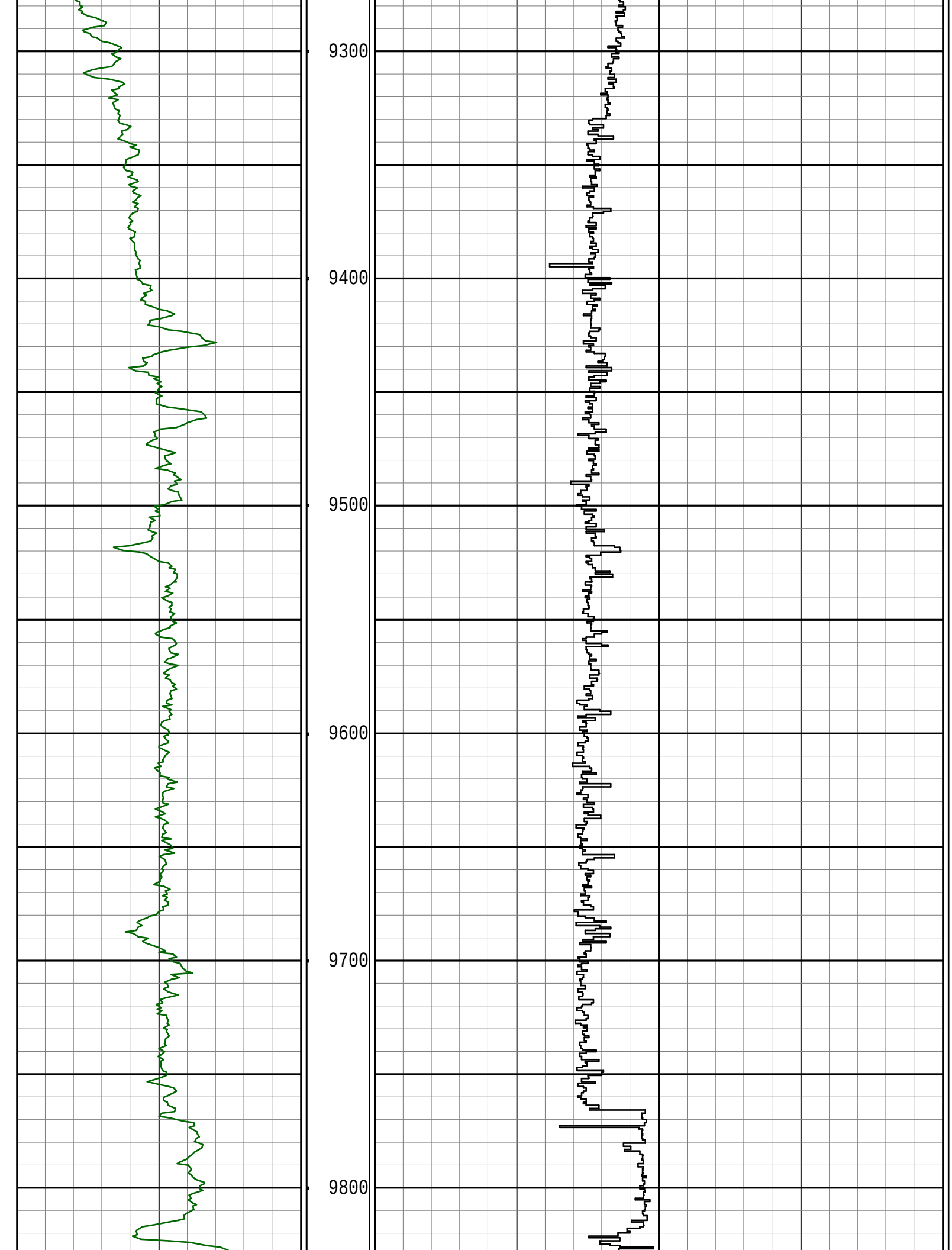
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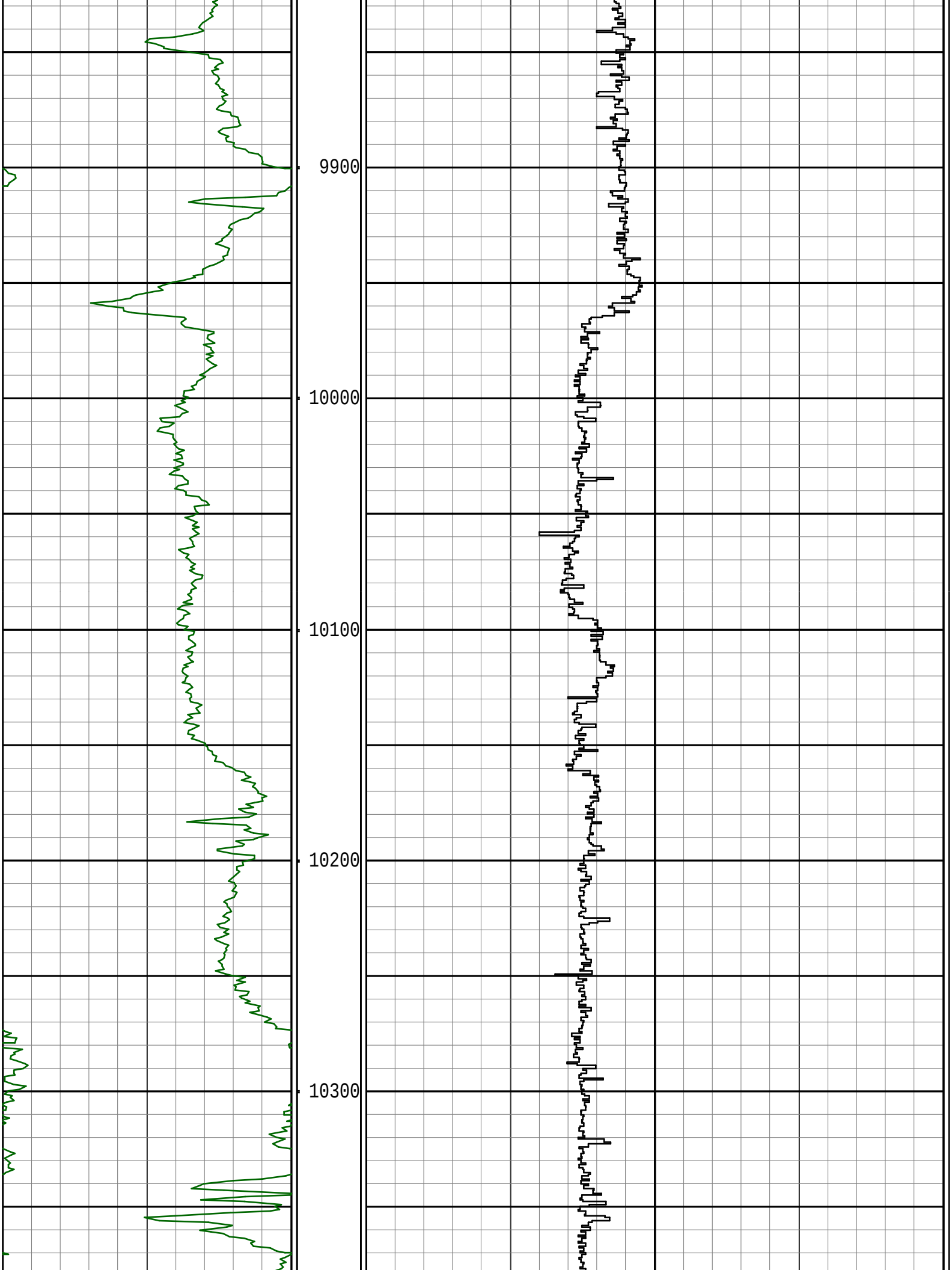
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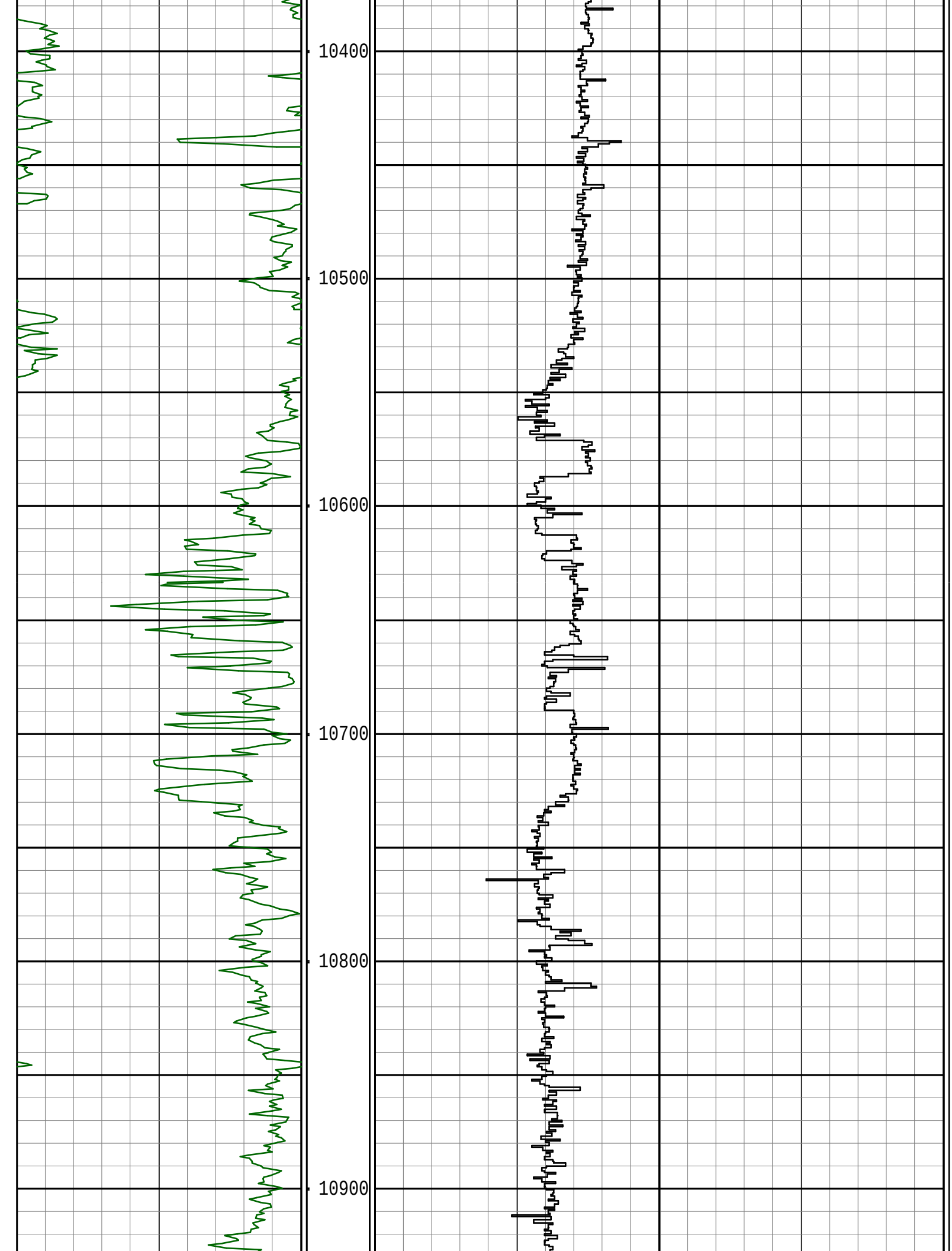
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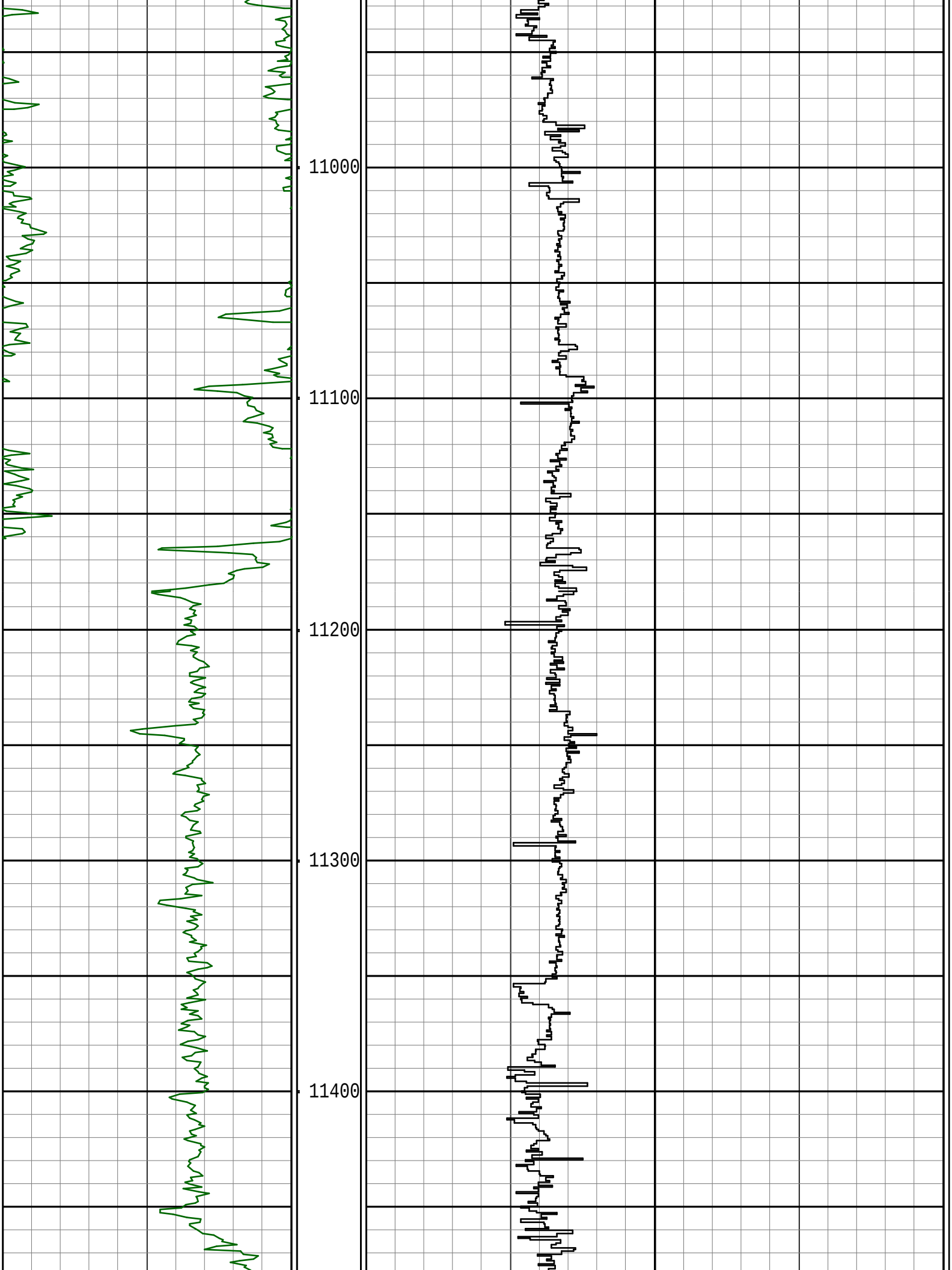
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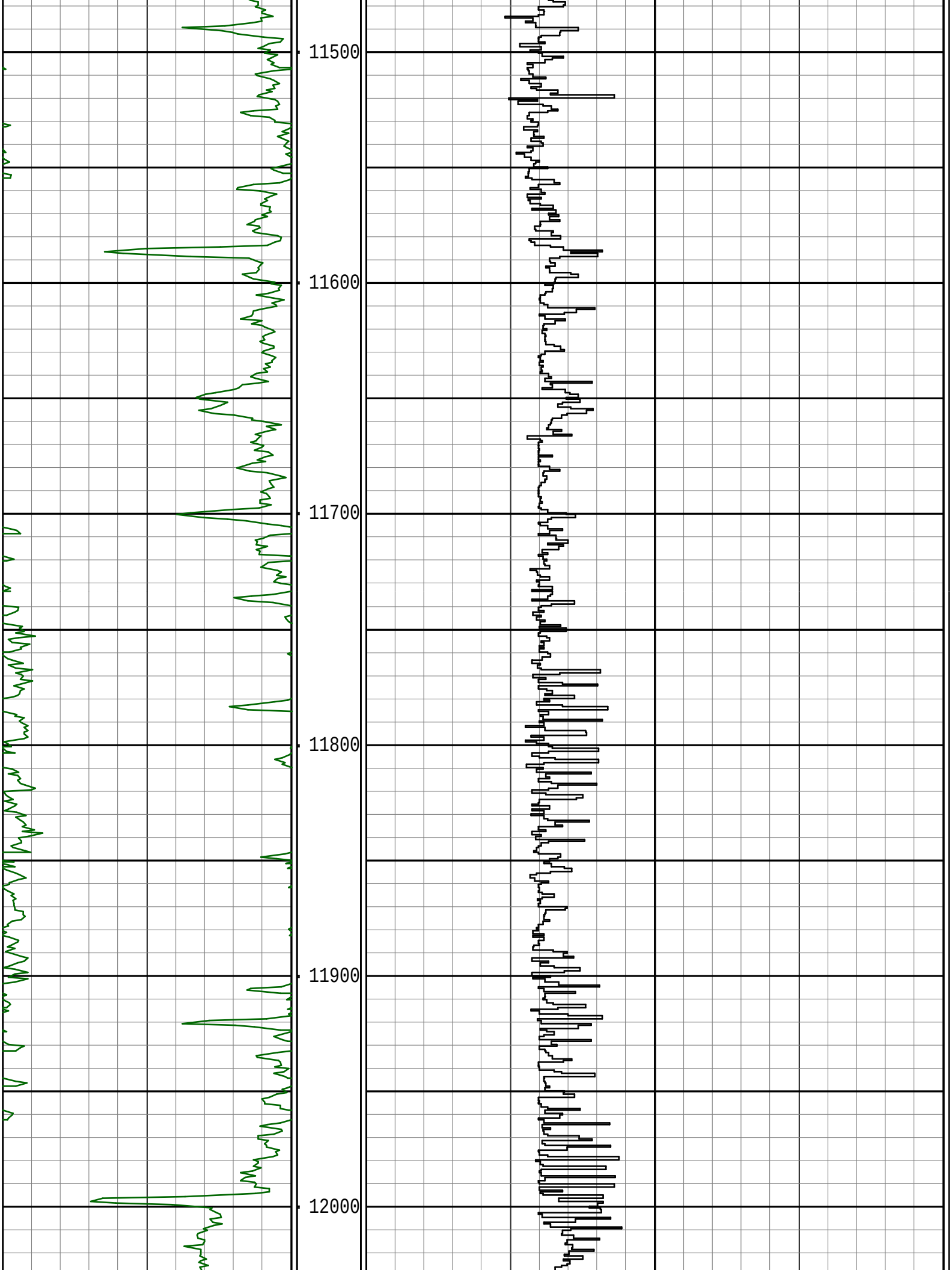
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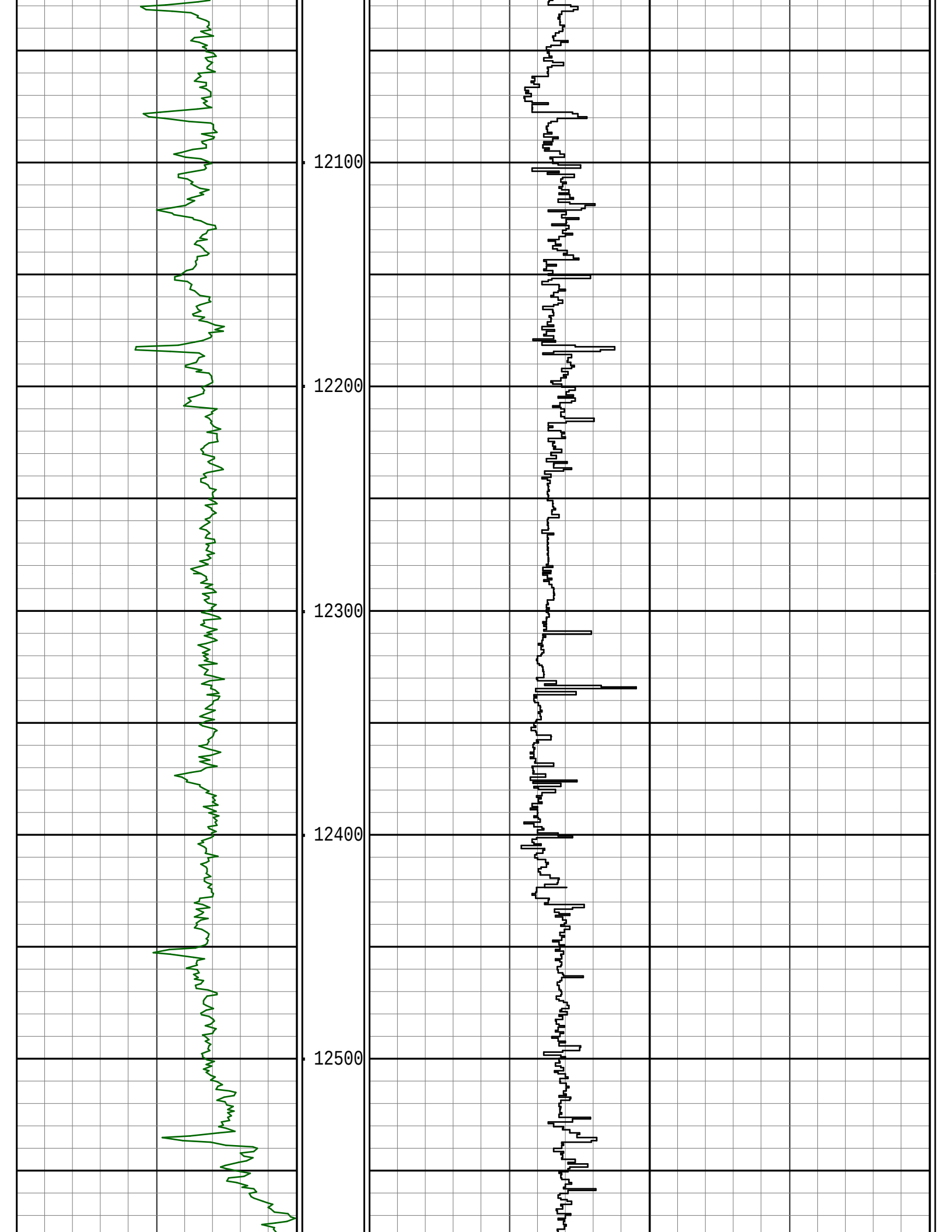
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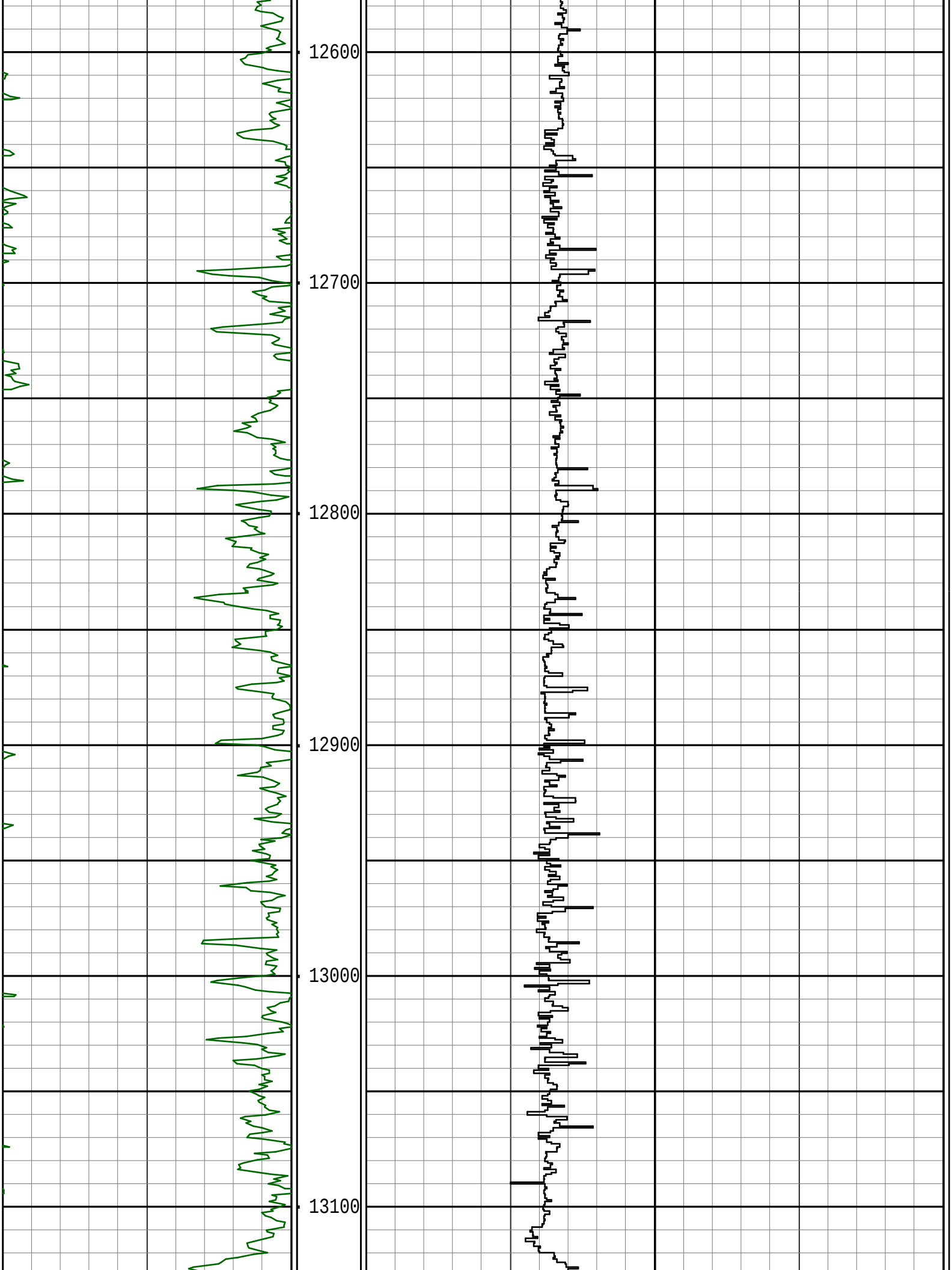
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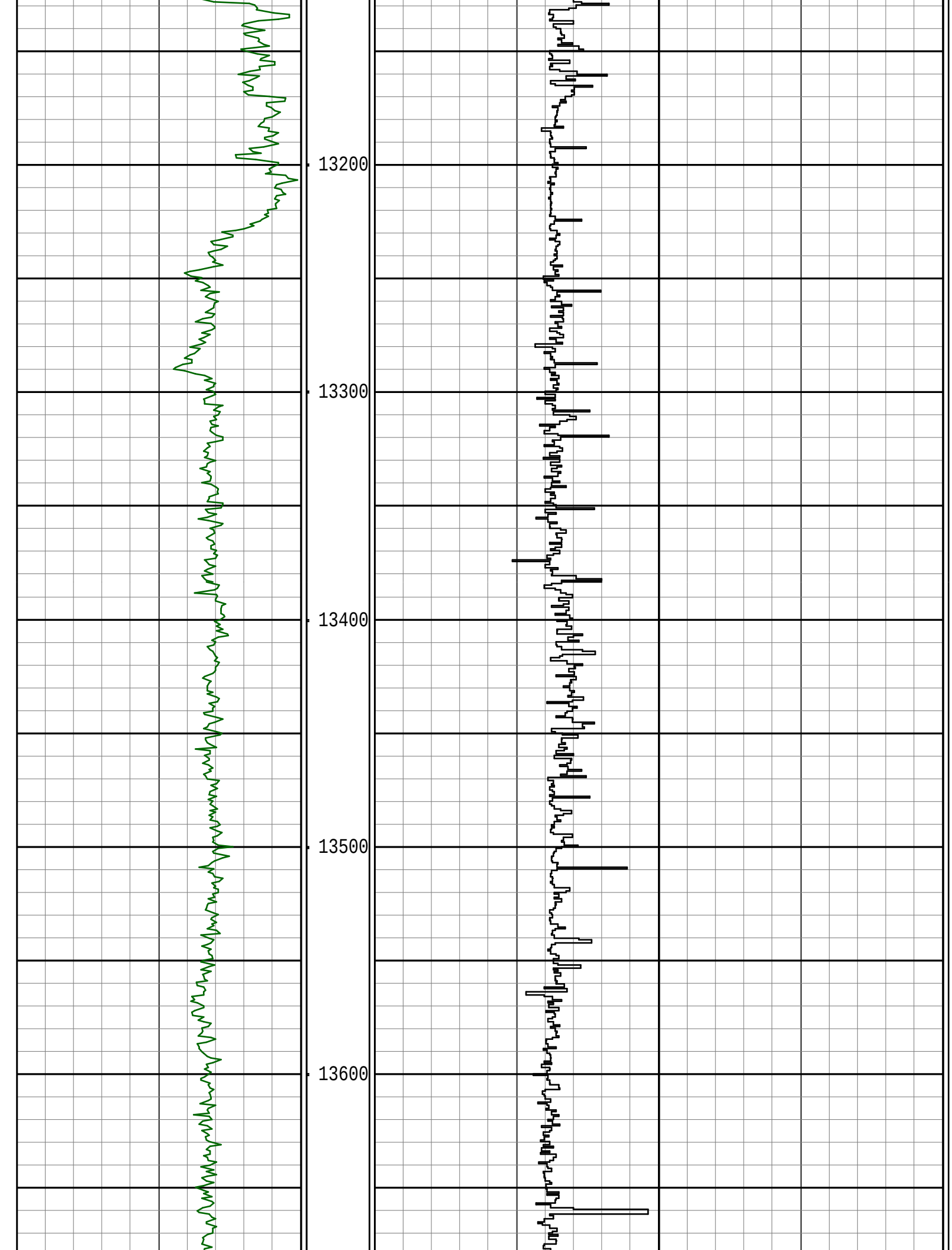
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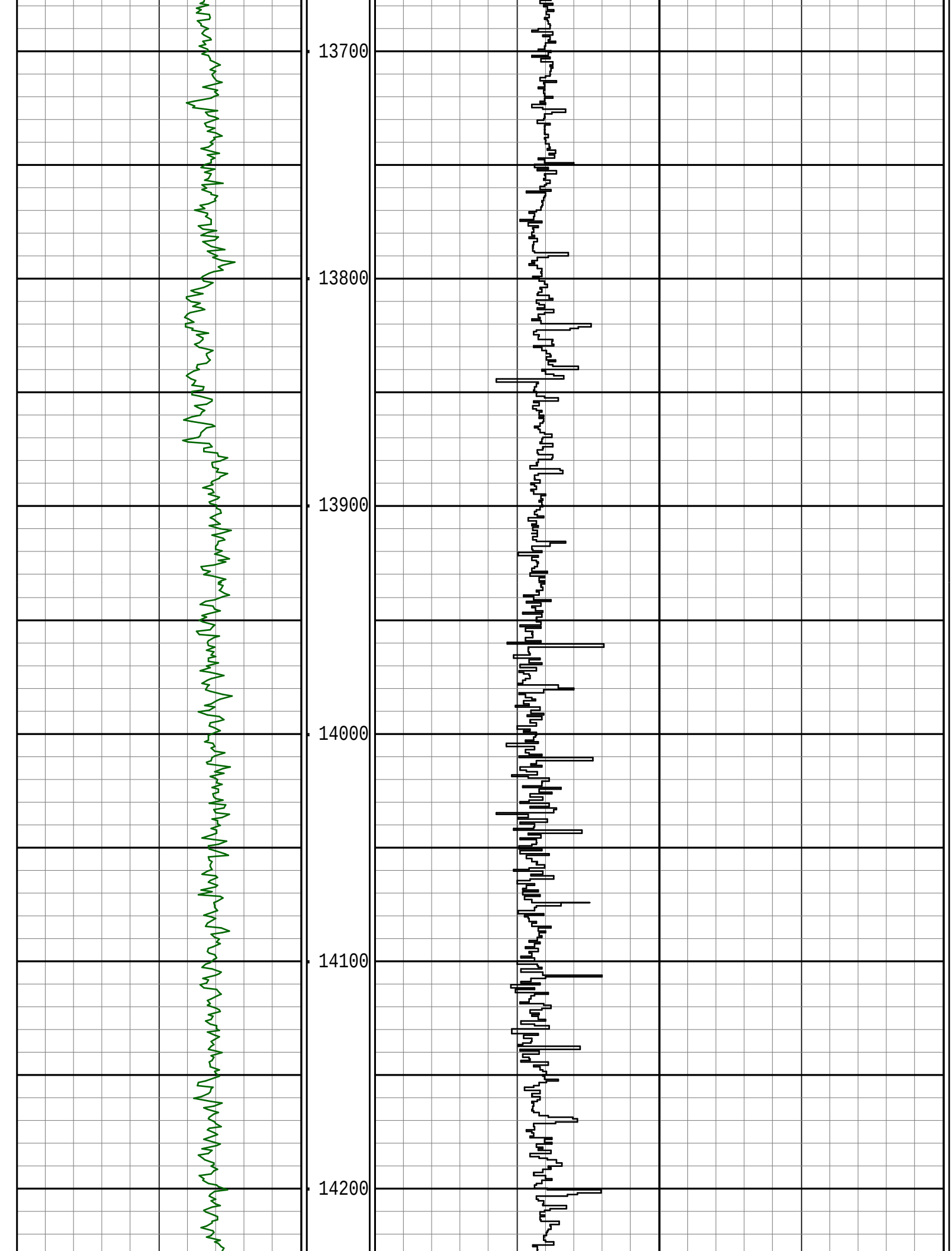
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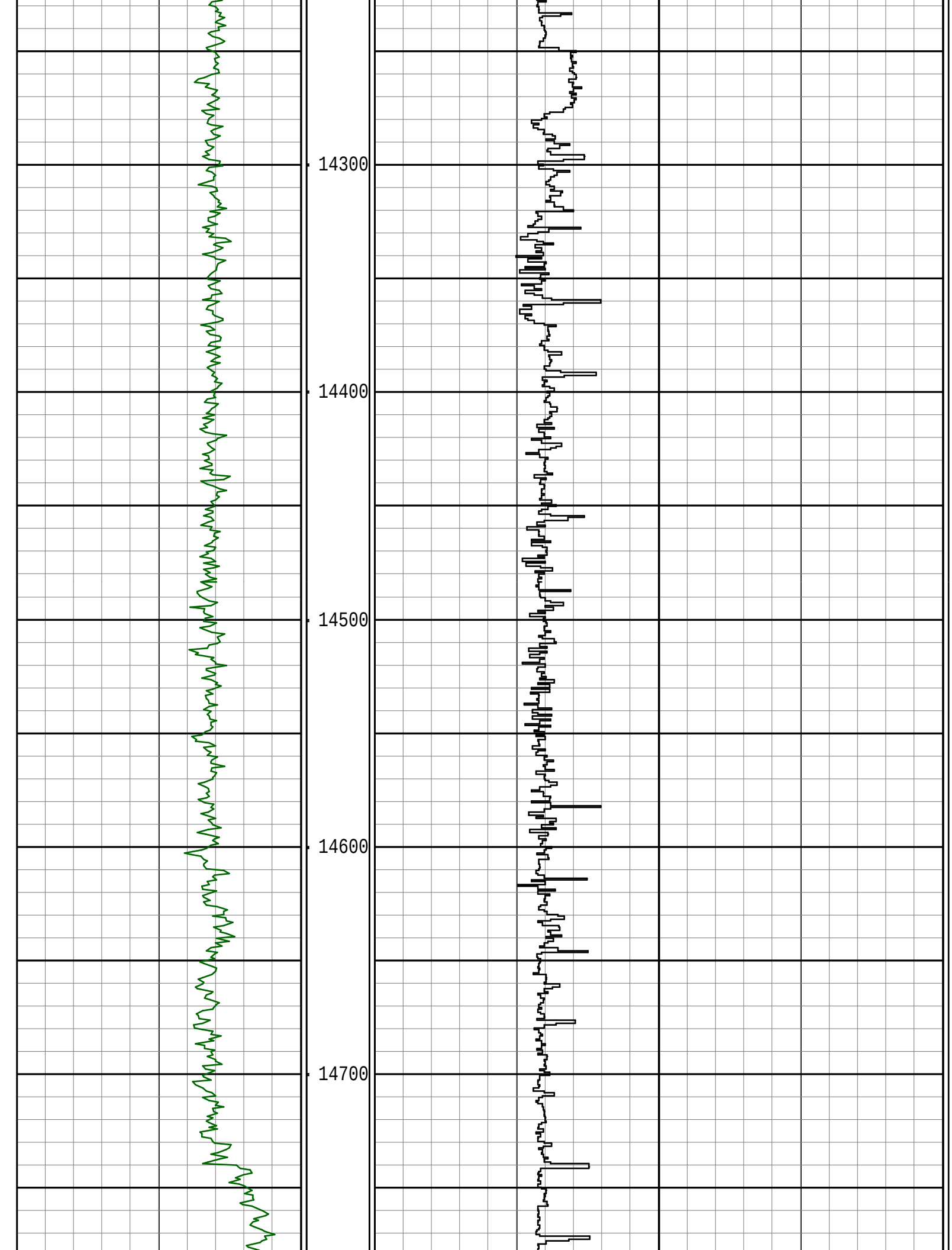
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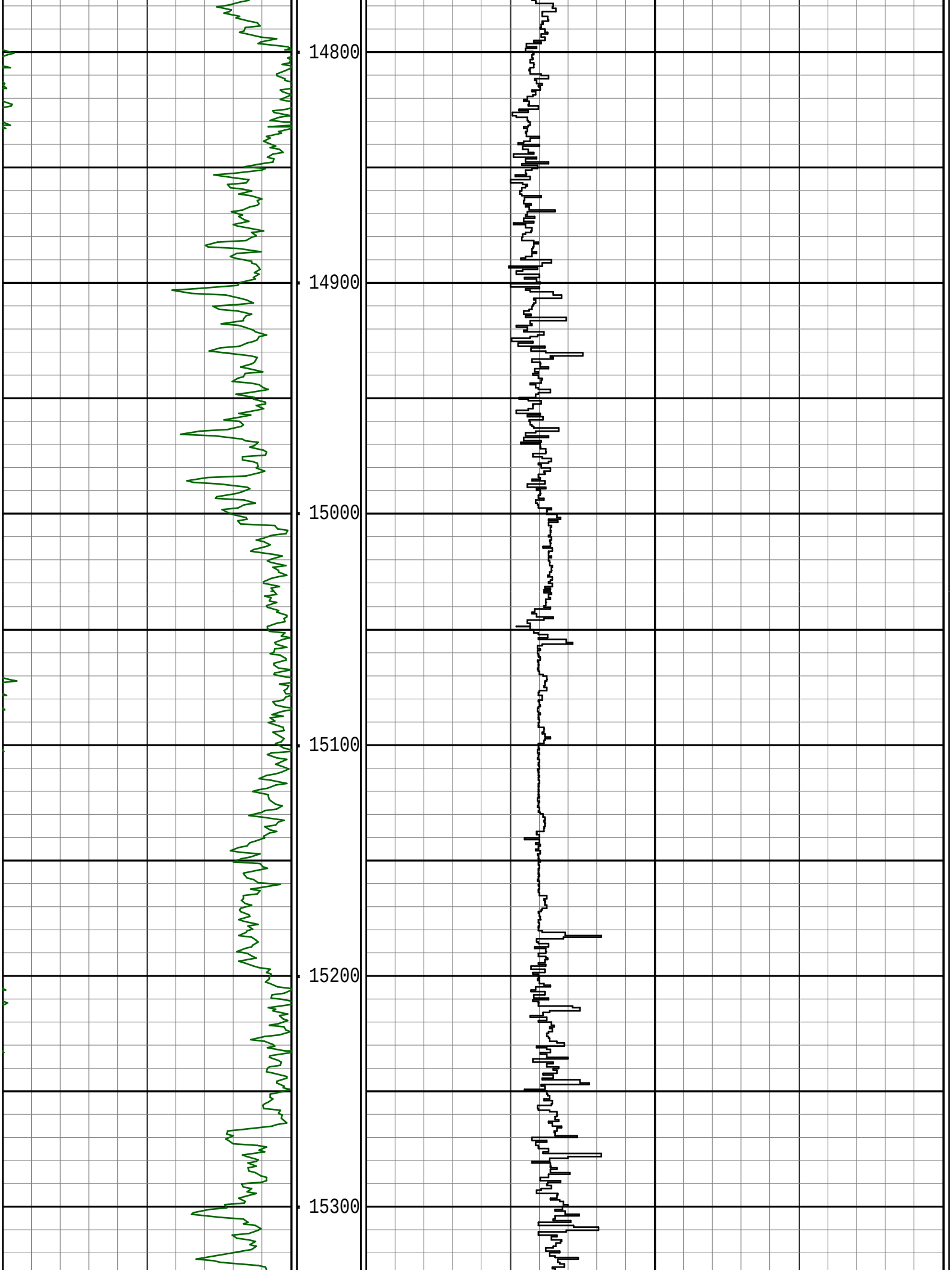
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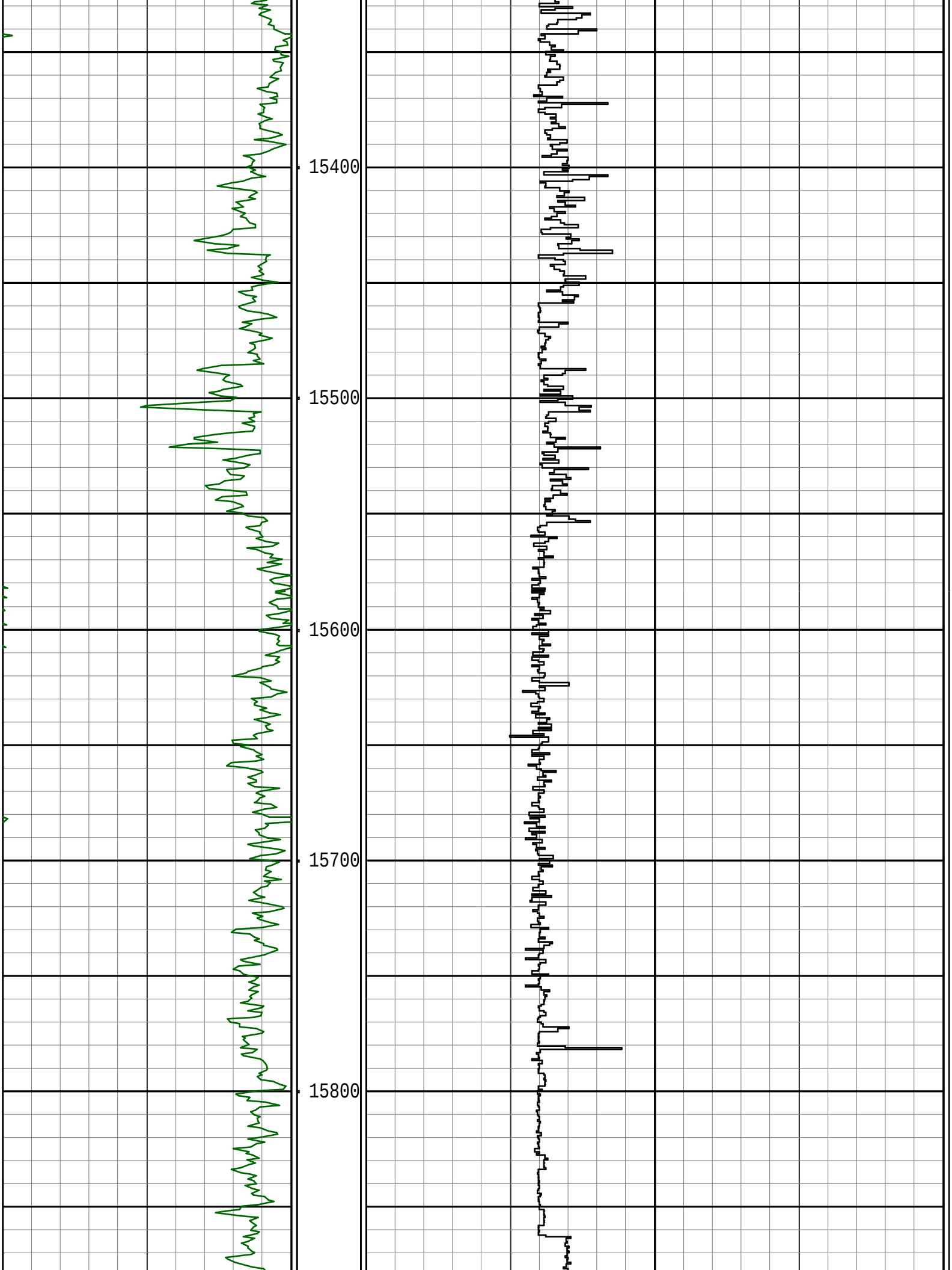
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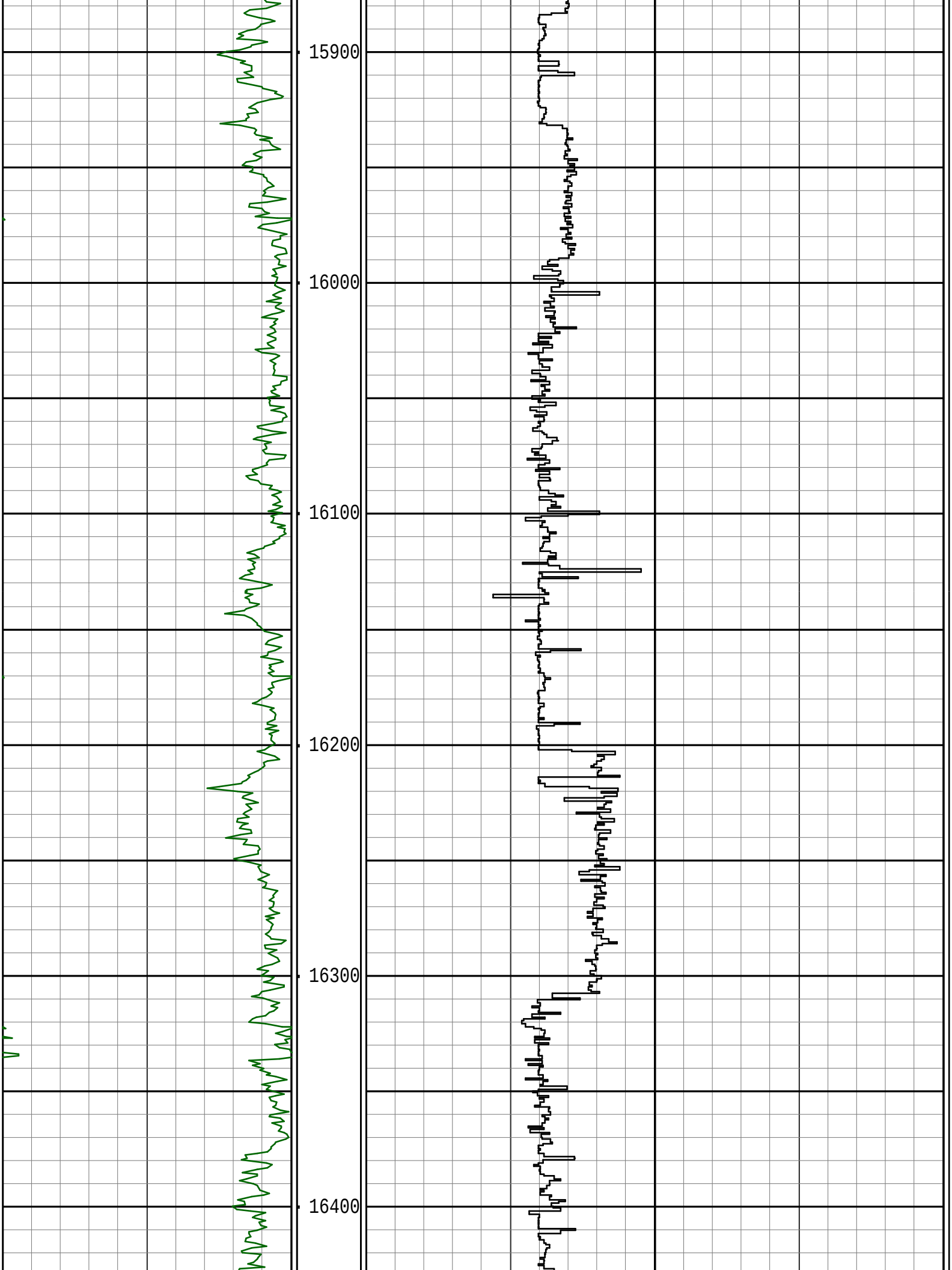
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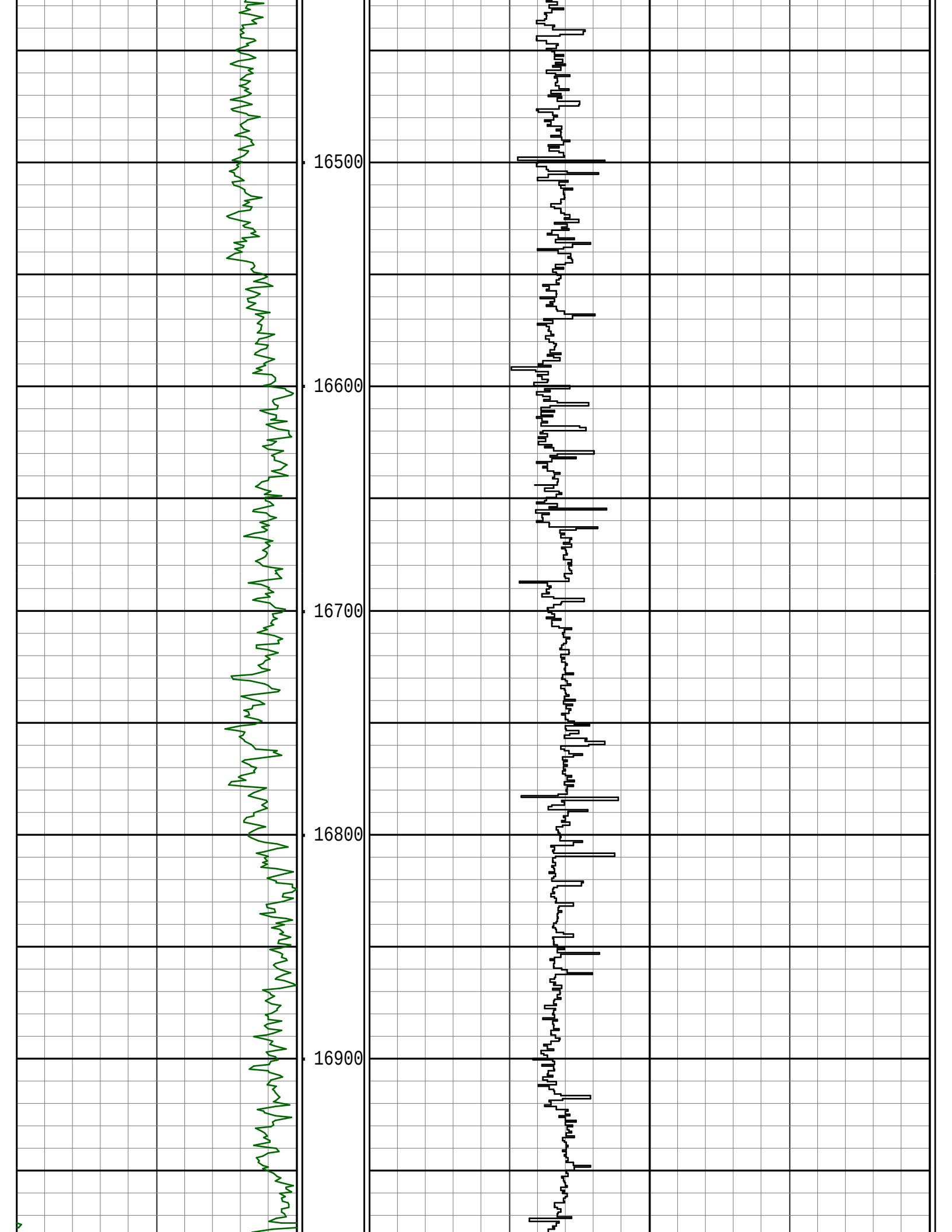
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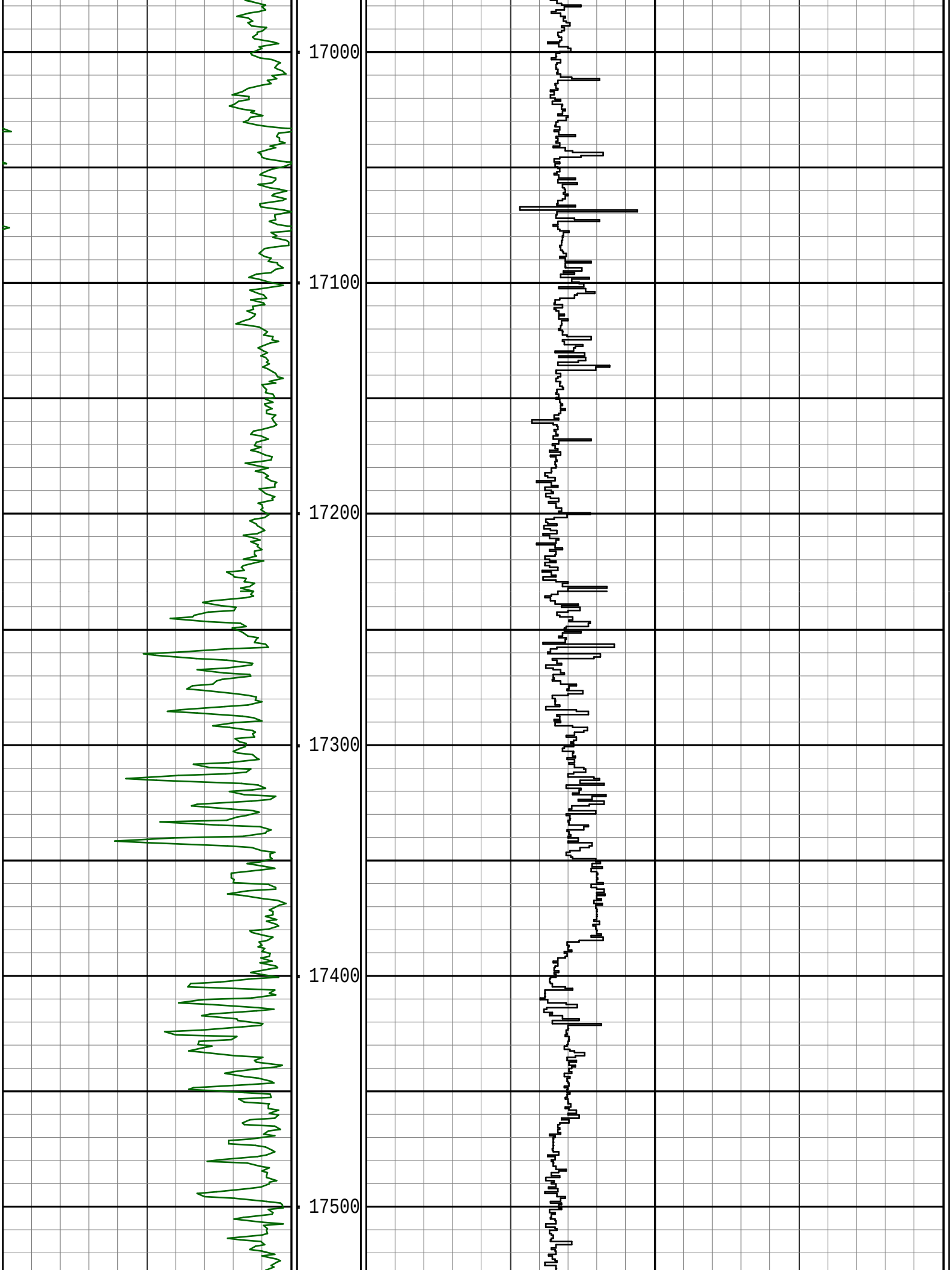
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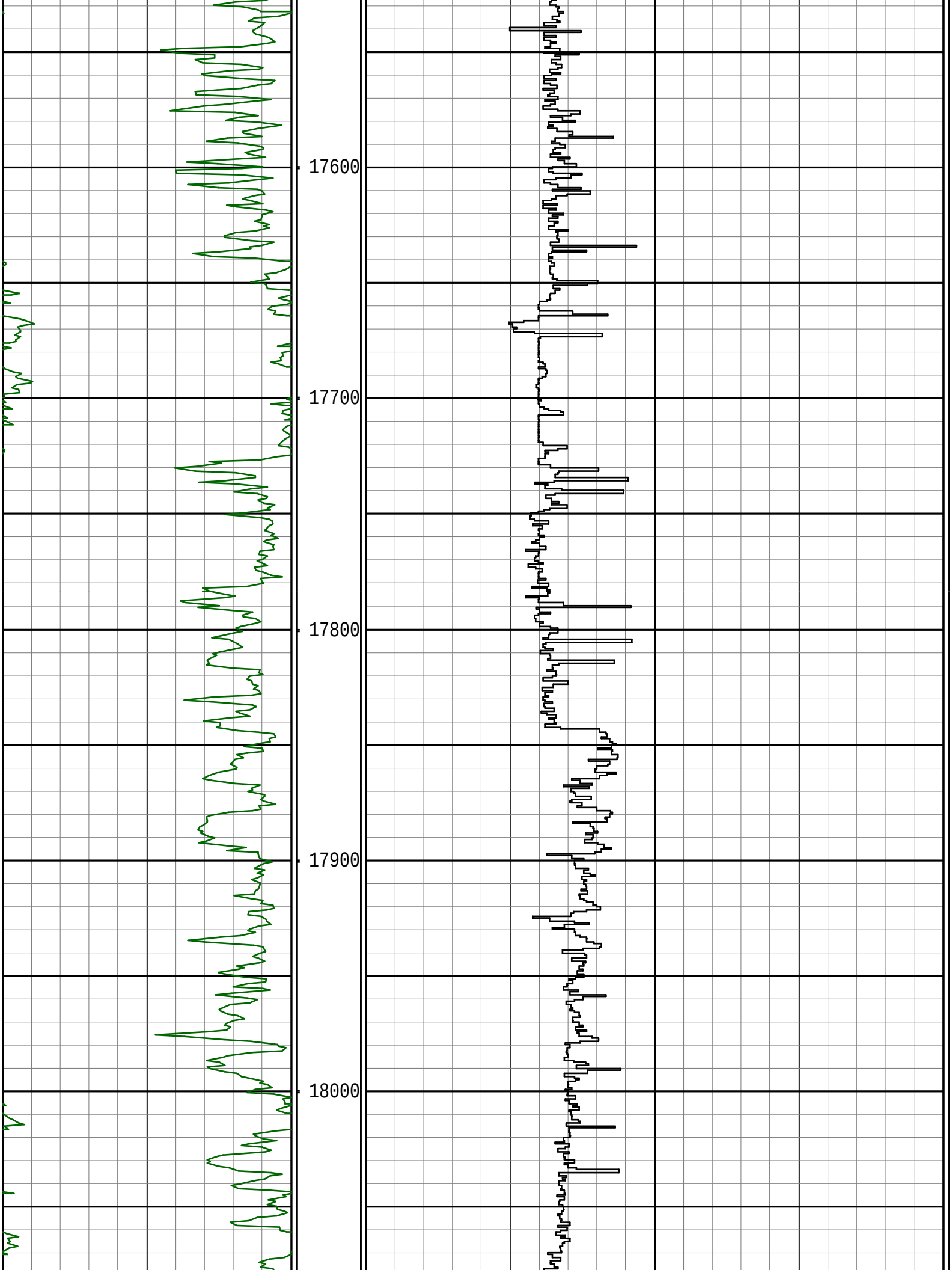
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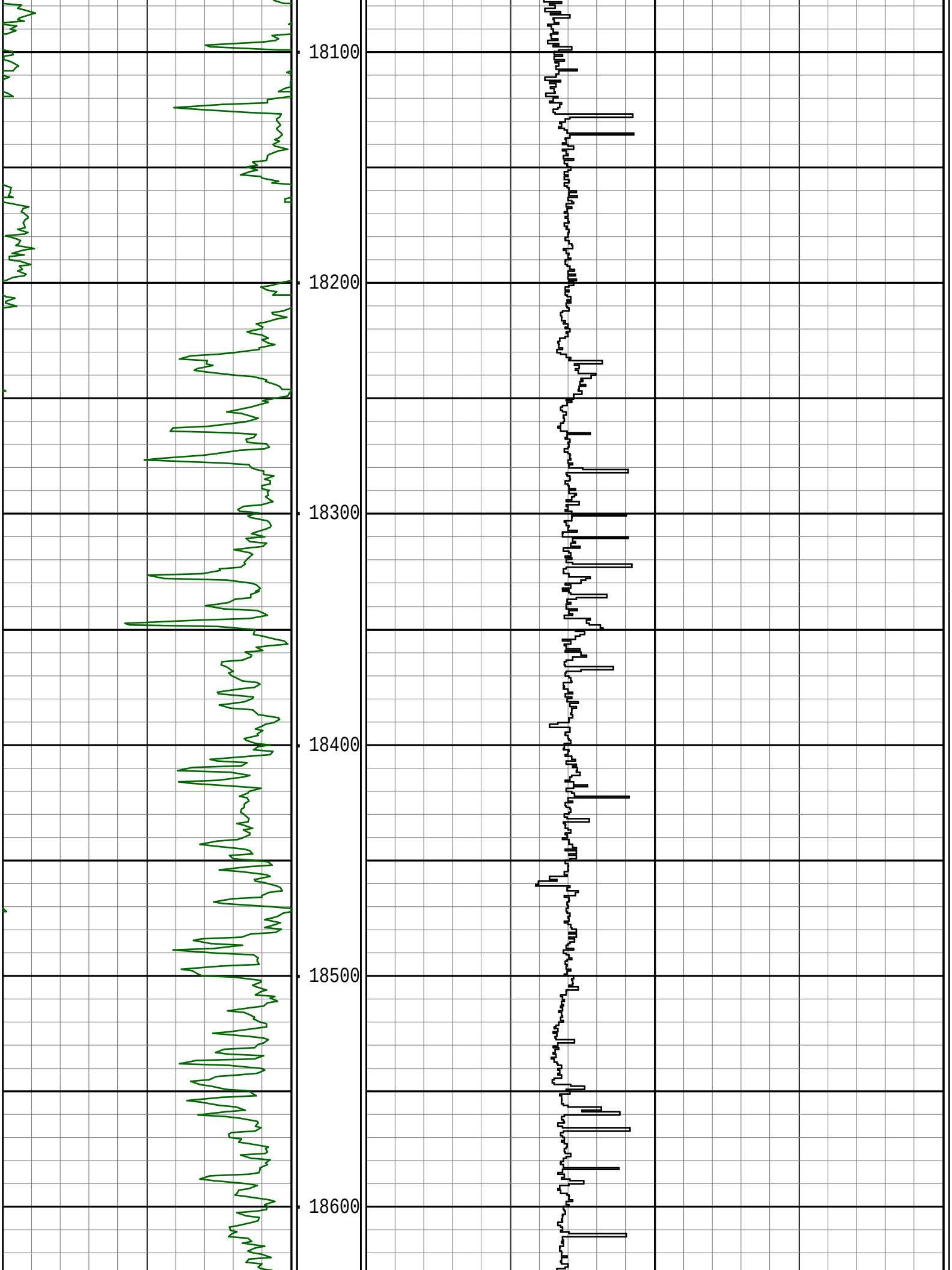
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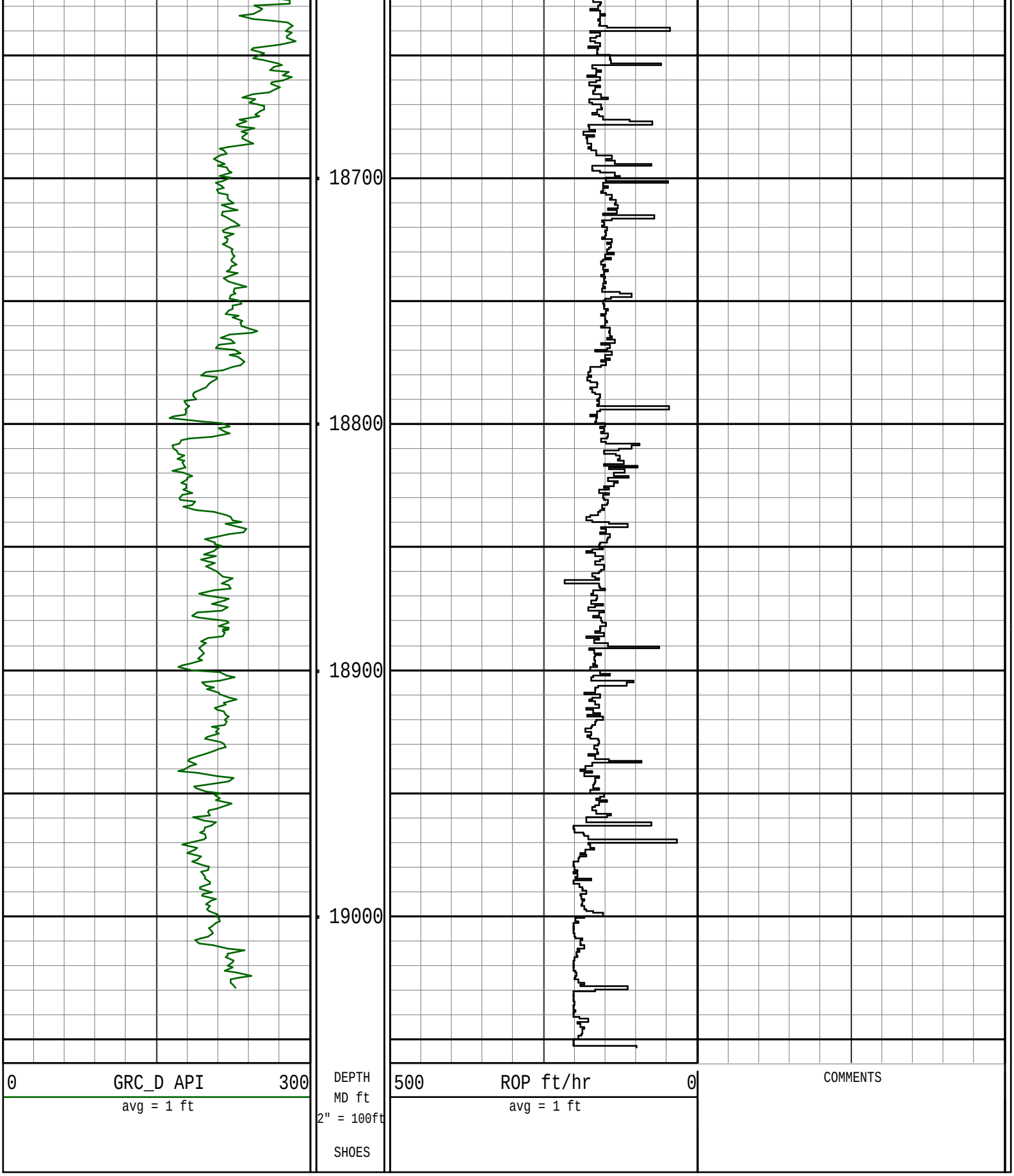


## Survey Report

| | |
|---|---|
| Vertical Section Plane: 329.66° | Total Correction: 9.27° West to True |
| Calculation Method: Minimum Curvature | Survey Reference: Wellhead |
| North Aligned to: True North | Well: BOGGESS 17H ST01 |
| RT: 25' ROTARY TABLE TO GROUND LEVEL | FIELD: MARCELLUS SHALE |

| Measured Depth (ft) | Inclination (deg) | Azimuth (deg) | TVD (ft) | Course Length (ft) | Vertical Section (ft) | Rect Co-ord North (ft) | Rect Co-ord East (ft) | Closure Distance (ft) | Closure Direction (deg) | Dog-leg Severity (dg/hft) | Temp (deg F) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ORIGIN OF WELL AT SURFACE | | | | | | | | | | | |
| 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 | 0.00 N | 0.00 E | 0.00 | 0.00 | | |
| THE FOLLOWING ARE MULTISHOT SURVEYS | | | | | | | | | | | |
| 110.00 | 0.16 | 266.21 | 110.00 | 110.00 | 0.07 | 0.01 S | 0.15 W | 0.15 | 266.21 | 0.14 | |
| 210.00 | 0.15 | 259.79 | 210.00 | 100.00 | 0.18 | 0.04 S | 0.42 W | 0.42 | 264.23 | 0.02 | |
| 310.00 | 0.16 | 259.84 | 310.00 | 100.00 | 0.27 | 0.09 S | 0.69 W | 0.69 | 262.51 | 0.01 | |
| 410.00 | 0.17 | 250.98 | 410.00 | 100.00 | 0.35 | 0.16 S | 0.97 W | 0.98 | 260.39 | 0.03 | |
| 510.00 | 0.16 | 258.86 | 510.00 | 100.00 | 0.42 | 0.24 S | 1.24 W | 1.27 | 259.13 | 0.02 | |
| 610.00 | 0.15 | 93.36 | 610.00 | 100.00 | 0.39 | 0.27 S | 1.25 W | 1.28 | 257.65 | 0.31 | |
| 710.00 | 0.19 | 77.78 | 710.00 | 100.00 | 0.27 | 0.25 S | 0.96 W | 0.99 | 255.58 | 0.06 | |
| 810.00 | 0.16 | 77.09 | 810.00 | 100.00 | 0.18 | 0.18 S | 0.66 W | 0.68 | 254.73 | 0.03 | |
| 910.00 | 0.12 | 56.80 | 910.00 | 100.00 | 0.14 | 0.09 S | 0.43 W | 0.44 | 258.15 | 0.06 | |
| 1010.00 | 0.22 | 319.13 | 1010.00 | 100.00 | 0.33 | 0.11 N | 0.47 W | 0.49 | 283.26 | 0.26 | |
| 1110.00 | 0.22 | 324.63 | 1110.00 | 100.00 | 0.71 | 0.41 N | 0.71 W | 0.82 | 300.22 | 0.02 | |
| 1210.00 | 0.17 | 74.03 | 1210.00 | 100.00 | 0.87 | 0.61 N | 0.68 W | 0.91 | 312.01 | 0.32 | |
| 1310.00 | 0.36 | 91.78 | 1309.99 | 100.00 | 0.67 | 0.64 N | 0.22 W | 0.68 | 340.98 | 0.20 | |
| 1410.00 | 0.36 | 98.88 | 1409.99 | 100.00 | 0.30 | 0.58 N | 0.40 E | 0.71 | 34.66 | 0.05 | |
| 1510.00 | 0.38 | 103.44 | 1509.99 | 100.00 | -0.13 | 0.46 N | 1.04 E | 1.13 | 66.16 | 0.03 | |
| 1610.00 | 0.43 | 111.91 | 1609.99 | 100.00 | -0.65 | 0.24 N | 1.71 E | 1.72 | 81.97 | 0.08 | |
| 1710.00 | 0.47 | 117.31 | 1709.98 | 100.00 | -1.30 | 0.09 S | 2.42 E | 2.42 | 92.07 | 0.06 | |
| 1810.00 | 0.48 | 119.63 | 1809.98 | 100.00 | -2.01 | 0.48 S | 3.15 E | 3.18 | 98.72 | 0.02 | |
| 1910.00 | 0.58 | 128.60 | 1909.98 | 100.00 | -2.84 | 1.01 S | 3.91 E | 4.03 | 104.43 | 0.13 | |
| 2010.00 | 0.58 | 136.87 | 2009.97 | 100.00 | -3.81 | 1.69 S | 4.65 E | 4.95 | 109.99 | 0.08 | |
| 2110.00 | 0.57 | 134.85 | 2109.97 | 100.00 | -4.78 | 2.41 S | 5.35 E | 5.87 | 114.27 | 0.02 | |
| 2210.00 | 0.59 | 134.53 | 2209.96 | 100.00 | -5.76 | 3.12 S | 6.07 E | 6.82 | 117.23 | 0.02 | |
| 2310.00 | 0.56 | 139.11 | 2309.96 | 100.00 | -6.74 | 3.85 S | 6.75 E | 7.78 | 119.70 | 0.05 | |
| 2410.00 | 0.46 | 140.69 | 2409.95 | 100.00 | -7.61 | 4.53 S | 7.33 E | 8.62 | 121.74 | 0.10 | |
| 2510.00 | 0.47 | 137.61 | 2509.95 | 100.00 | -8.41 | 5.15 S | 7.86 E | 9.39 | 123.22 | 0.03 | |
| 2610.00 | 0.49 | 139.22 | 2609.95 | 100.00 | -9.23 | 5.77 S | 8.42 E | 10.21 | 124.45 | 0.02 | |
| 2710.00 | 0.54 | 135.94 | 2709.94 | 100.00 | -10.11 | 6.44 S | 9.02 E | 11.08 | 125.50 | 0.06 | |
| 2810.00 | 0.57 | 134.87 | 2809.94 | 100.00 | -11.05 | 7.13 S | 9.70 E | 12.04 | 126.29 | 0.03 | |
| 2910.00 | 0.57 | 139.68 | 2909.93 | 100.00 | -12.02 | 7.86 S | 10.38 E | 13.02 | 127.13 | 0.05 | |
| 3010.00 | 0.56 | 141.26 | 3009.93 | 100.00 | -12.99 | 8.62 S | 11.00 E | 13.98 | 128.06 | 0.02 | |
| 3110.00 | 0.52 | 146.54 | 3109.92 | 100.00 | -13.93 | 9.38 S | 11.56 E | 14.88 | 129.04 | 0.06 | |
| 3210.00 | 0.52 | 145.87 | 3209.92 | 100.00 | -14.84 | 10.13 S | 12.07 E | 15.75 | 130.02 | 0.01 | |
| 3310.00 | 0.55 | 134.35 | 3309.91 | 100.00 | -15.75 | 10.84 S | 12.66 E | 16.67 | 130.57 | 0.11 | |
| 3410.00 | 0.67 | 125.51 | 3409.91 | 100.00 | -16.75 | 11.52 S | 13.48 E | 17.73 | 130.50 | 0.15 | |
| 3510.00 | 0.66 | 125.35 | 3509.90 | 100.00 | -17.81 | 12.19 S | 14.43 E | 18.89 | 130.19 | 0.01 | |
| 3610.00 | 0.62 | 122.70 | 3609.90 | 100.00 | -18.81 | 12.81 S | 15.35 E | 20.00 | 129.85 | 0.05 | |
| 3710.00 | 0.54 | 116.16 | 3709.89 | 100.00 | -19.69 | 13.31 S | 16.23 E | 20.99 | 129.36 | 0.10 | |
| 3810.00 | 0.50 | 115.15 | 3809.89 | 100.00 | -20.44 | 13.71 S | 17.05 E | 21.88 | 128.80 | 0.04 | |
| 3910.00 | 0.51 | 119.11 | 3909.88 | 100.00 | -21.19 | 14.11 S | 17.83 E | 22.74 | 128.35 | 0.04 | |
| 4010.00 | 0.49 | 138.77 | 4009.88 | 100.00 | -21.99 | 14.65 S | 18.50 E | 23.60 | 128.37 | 0.17 | |
| 4110.00 | 0.46 | 141.40 | 4109.88 | 100.00 | -22.81 | 15.28 S | 19.04 E | 24.41 | 128.76 | 0.04 | |
| 4210.00 | 0.45 | 138.38 | 4209.87 | 100.00 | -23.59 | 15.89 S | 19.55 E | 25.19 | 129.11 | 0.03 | |
| 4310.00 | 0.44 | 145.10 | 4309.87 | 100.00 | -24.36 | 16.50 S | 20.03 E | 25.95 | 129.48 | 0.05 | |
| 4410.00 | 0.43 | 144.34 | 4409.87 | 100.00 | -25.11 | 17.12 S | 20.47 E | 26.68 | 129.91 | 0.01 | |
| 4510.00 | 0.38 | 173.10 | 4509.86 | 100.00 | -25.79 | 17.75 S | 20.72 E | 27.29 | 130.58 | 0.21 | |
| 4610.00 | 0.41 | 173.21 | 4609.86 | 100.00 | -26.42 | 18.44 S | 20.81 E | 27.80 | 131.54 | 0.03 | |
| 4710.00 | 0.66 | 213.04 | 4709.86 | 100.00 | -27.01 | 19.28 S | 20.54 E | 28.16 | 133.19 | 0.43 | |
| 4810.00 | 0.71 | 229.84 | 4809.85 | 100.00 | -27.37 | 20.16 S | 19.75 E | 28.22 | 135.59 | 0.21 | |
| 4910.00 | 0.73 | 240.96 | 4909.84 | 100.00 | -27.46 | 20.87 S | 18.72 E | 28.03 | 138.11 | 0.14 | |
| 5010.00 | 0.64 | 245.75 | 5009.84 | 100.00 | -27.39 | 21.41 S | 17.65 E | 27.74 | 140.49 | 0.11 | |
| 5110.00 | 0.49 | 247.03 | 5109.83 | 100.00 | -27.28 | 21.80 S | 16.75 E | 27.49 | 142.47 | 0.15 | |
| THE FOLLOWING ARE SCHLUMBERGER MWD SURVEYS | | | | | | | | | | | |
| 5290.00 | 0.90 | 295.10 | 5289.82 | 180.00 | -26.01 | 21.50 S | 14.76 E | 26.08 | 145.53 | 0.38 | 129.94 |
| 5385.00 | 12.48 | 0.89 | 5384.04 | 95.00 | -16.59 | 10.88 S | 14.24 E | 17.92 | 127.39 | 12.78 | 140.78 |
| 5480.00 | 16.24 | 36.18 | 5476.23 | 95.00 | -2.48 | 10.15 N | 22.26 E | 24.46 | 65.49 | 9.83 | 140.78 |
| 5575.00 | 22.89 | 44.32 | 5565.71 | 95.00 | 7.71 | 34.12 N | 43.04 E | 54.92 | 51.59 | 7.55 | 144.39 |
| 5670.00 | 29.26 | 33.04 | 5651.05 | 95.00 | 23.02 | 66.86 N | 68.65 E | 95.82 | 45.76 | 8.47 | 144.39 |
| 5764.00 | 36.99 | 28.56 | 5729.73 | 94.00 | 47.97 | 111.03 N | 94.73 E | 145.95 | 40.47 | 8.62 | 144.39 |
| 5859.00 | 46.17 | 29.29 | 5800.71 | 95.00 | 80.12 | 166.13 N | 125.23 E | 208.04 | 37.01 | 9.68 | 148.01 |
| 5953.00 | 54.05 | 32.58 | 5860.96 | 94.00 | 114.65 | 227.87 N | 162.37 E | 279.80 | 35.47 | 8.80 | 148.01 |
| 6048.00 | 55.69 | 33.95 | 5915.62 | 95.00 | 149.17 | 292.82 N | 204.99 E | 357.45 | 34.99 | 2.09 | 151.62 |
| 6143.00 | 56.44 | 35.90 | 5968.66 | 95.00 | 182.15 | 357.44 N | 250.11 E | 436.26 | 34.98 | 1.88 | 151.62 |
| 6238.00 | 56.44 | 38.30 | 6021.18 | 95.00 | 212.51 | 420.57 N | 297.86 E | 515.37 | 35.31 | 2.10 | 151.62 |
| 6333.00 | 56.44 | 38.42 | 6073.70 | 95.00 | 241.27 | 482.65 N | 346.99 E | 594.43 | 35.71 | 0.10 | 155.24 |
| 6428.00 | 56.31 | 38.37 | 6126.31 | 95.00 | 269.96 | 544.65 N | 396.12 E | 673.46 | 36.03 | 0.14 | 155.24 |
| 6523.00 | 56.46 | 38.12 | 6178.90 | 95.00 | 298.85 | 606.78 N | 445.09 E | 752.52 | 36.26 | 0.27 | 155.24 |
| 6618.00 | 56.49 | 40.42 | 6231.37 | 95.00 | 326.44 | 668.08 N | 495.22 E | 831.61 | 36.55 | 2.02 | 158.85 |
| 6712.00 | 56.54 | 40.33 | 6283.24 | 94.00 | 352.33 | 727.81 N | 546.00 E | 909.85 | 36.88 | 0.10 | 155.24 |

# Survey Report

| | |
|---|---|
| Vertical Section Plane: 329.66° | Total Correction: 9.27° West to True |
| Calculation Method: Minimum Curvature | Survey Reference: Wellhead |
| North Aligned to: True North | Well: BOGGESS 17H ST01 |
| RT: 25' ROTARY TABLE TO GROUND LEVEL | FIELD: MARCELLUS SHALE |


| Measured Depth (ft) | Inclination (deg) | Azimuth (deg) | TVD (ft) | Course Length (ft) | Vertical Section (ft) | Rect Co-ord North (ft) | Rect Co-ord East (ft) | Closure Distance (ft) | Closure Direction (deg) | Dog-leg Severity (dg/hft) | Temp (deg F) |
|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6806.00 | 55.85 | 40.46 | 6335.53 | 94.00 | 378.10 | 787.30 N | 596.62 E | 987.82 | 37.16 | 0.74 | 158.85 |
| 6902.00 | 55.89 | 40.94 | 6389.40 | 96.00 | 403.92 | 847.54 N | 648.44 E | 1067.15 | 37.42 | 0.42 | 158.85 |
| 6996.00 | 56.36 | 40.73 | 6441.79 | 94.00 | 429.10 | 906.59 N | 699.47 E | 1145.06 | 37.65 | 0.53 | 158.85 |
| 7091.00 | 56.44 | 40.77 | 6494.36 | 95.00 | 454.75 | 966.53 N | 751.12 E | 1224.08 | 37.85 | 0.09 | 158.85 |
| 7187.00 | 56.53 | 39.01 | 6547.37 | 96.00 | 481.82 | 1027.94 N | 802.45 E | 1304.07 | 37.98 | 1.53 | 158.85 |
| 7282.00 | 56.60 | 37.64 | 6599.72 | 95.00 | 510.66 | 1090.13 N | 851.61 E | 1383.34 | 38.00 | 1.20 | 162.46 |
| 7376.00 | 56.44 | 38.27 | 6651.57 | 94.00 | 539.66 | 1151.95 N | 899.83 E | 1461.74 | 37.99 | 0.59 | 162.46 |
| 7471.00 | 56.47 | 38.44 | 6704.07 | 95.00 | 568.42 | 1214.04 N | 948.96 E | 1540.92 | 38.01 | 0.15 | 162.46 |
| 7566.00 | 56.48 | 38.17 | 6756.54 | 95.00 | 597.26 | 1276.19 N | 998.05 E | 1620.11 | 38.03 | 0.24 | 162.46 |
| 7660.00 | 55.36 | 38.11 | 6809.21 | 94.00 | 625.82 | 1337.42 N | 1046.13 E | 1697.97 | 38.03 | 1.19 | 162.46 |
| 7755.00 | 55.29 | 40.94 | 6863.27 | 95.00 | 652.71 | 1397.68 N | 1095.85 E | 1776.06 | 38.10 | 2.45 | 166.08 |
| 7849.00 | 55.44 | 40.80 | 6916.69 | 94.00 | 677.62 | 1456.16 N | 1146.46 E | 1853.31 | 38.21 | 0.20 | 166.08 |
| 7944.00 | 55.85 | 41.03 | 6970.30 | 95.00 | 702.83 | 1515.43 N | 1197.82 E | 1931.66 | 38.32 | 0.48 | 166.08 |
| 8039.00 | 56.47 | 40.56 | 7023.20 | 95.00 | 728.34 | 1575.17 N | 1249.37 E | 2010.49 | 38.42 | 0.77 | 166.08 |
| 8134.00 | 56.48 | 40.63 | 7075.67 | 95.00 | 754.21 | 1635.30 N | 1300.91 E | 2089.63 | 38.50 | 0.06 | 169.69 |
| 8229.00 | 56.31 | 38.55 | 7128.25 | 95.00 | 781.36 | 1696.27 N | 1351.33 E | 2168.74 | 38.54 | 1.83 | 166.08 |
| 8324.00 | 56.43 | 38.16 | 7180.87 | 95.00 | 810.10 | 1758.30 N | 1400.41 E | 2247.84 | 38.54 | 0.36 | 169.69 |
| 8418.00 | 56.36 | 38.42 | 7232.90 | 94.00 | 838.63 | 1819.75 N | 1448.92 E | 2326.13 | 38.53 | 0.24 | 169.69 |
| 8513.00 | 56.56 | 38.25 | 7285.38 | 95.00 | 867.42 | 1881.86 N | 1498.04 E | 2405.31 | 38.52 | 0.26 | 169.69 |
| 8608.00 | 56.53 | 38.13 | 7337.76 | 95.00 | 896.43 | 1944.15 N | 1547.04 E | 2484.57 | 38.51 | 0.11 | 169.69 |
| 8703.00 | 56.54 | 38.24 | 7390.14 | 95.00 | 925.45 | 2006.45 N | 1596.03 E | 2563.82 | 38.50 | 0.10 | 173.31 |
| 8798.00 | 56.37 | 38.06 | 7442.64 | 95.00 | 954.48 | 2068.71 N | 1644.94 E | 2642.99 | 38.49 | 0.24 | 169.69 |
| 8891.00 | 56.51 | 38.25 | 7494.05 | 93.00 | 982.89 | 2129.65 N | 1692.82 E | 2720.49 | 38.48 | 0.23 | 173.31 |
| 8986.00 | 56.47 | 37.85 | 7546.50 | 95.00 | 1012.06 | 2192.03 N | 1741.64 E | 2799.70 | 38.47 | 0.35 | 173.31 |
| 9081.00 | 56.48 | 38.04 | 7598.97 | 95.00 | 1041.36 | 2254.48 N | 1790.34 E | 2878.89 | 38.45 | 0.17 | 176.92 |
| 9176.00 | 58.33 | 28.34 | 7650.23 | 95.00 | 1077.03 | 2321.37 N | 1834.01 E | 2958.44 | 38.31 | 8.82 | 176.92 |
| 9270.00 | 61.39 | 20.30 | 7697.48 | 94.00 | 1124.06 | 2395.38 N | 1867.36 E | 3037.25 | 37.94 | 8.08 | 180.54 |
| 9365.00 | 65.00 | 12.59 | 7740.36 | 95.00 | 1182.11 | 2476.63 N | 1891.25 E | 3116.17 | 37.37 | 8.18 | 184.15 |
| 9460.00 | 68.76 | 6.27 | 7777.69 | 95.00 | 1249.26 | 2562.76 N | 1905.49 E | 3193.53 | 36.63 | 7.29 | 180.54 |
| 9554.00 | 71.65 | 1.46 | 7809.54 | 94.00 | 1322.39 | 2650.97 N | 1911.41 E | 3268.20 | 35.79 | 5.71 | 180.54 |
| 9649.00 | 74.18 | 356.53 | 7837.46 | 95.00 | 1401.53 | 2741.72 N | 1909.79 E | 3341.31 | 34.86 | 5.63 | 184.15 |
| 9743.00 | 74.87 | 350.89 | 7862.56 | 94.00 | 1484.22 | 2831.72 N | 1899.87 E | 3410.01 | 33.86 | 5.83 | 184.15 |
| 9839.00 | 75.23 | 344.94 | 7887.35 | 96.00 | 1572.26 | 2922.37 N | 1880.45 E | 3475.11 | 32.76 | 6.00 | 184.15 |
| 9933.00 | 77.76 | 341.04 | 7909.30 | 94.00 | 1661.18 | 3009.74 N | 1853.71 E | 3534.80 | 31.63 | 4.85 | 184.15 |
| 10028.00 | 79.70 | 339.41 | 7927.87 | 95.00 | 1752.76 | 3097.41 N | 1822.18 E | 3593.65 | 30.47 | 2.65 | 187.76 |
| 10123.00 | 83.44 | 336.56 | 7941.80 | 95.00 | 1845.72 | 3184.50 N | 1786.96 E | 3651.61 | 29.30 | 4.93 | 187.76 |
| 10218.00 | 85.35 | 332.55 | 7951.08 | 95.00 | 1939.89 | 3269.85 N | 1746.34 E | 3706.97 | 28.11 | 4.66 | 187.76 |
| 10313.00 | 85.69 | 331.11 | 7958.50 | 95.00 | 2034.53 | 3353.34 N | 1701.63 E | 3760.38 | 26.91 | 1.55 | 187.76 |
| 10408.00 | 87.03 | 330.30 | 7964.53 | 95.00 | 2129.32 | 3436.02 N | 1655.24 E | 3813.93 | 25.72 | 1.65 | 187.76 |
| 10502.00 | 88.71 | 330.26 | 7968.03 | 94.00 | 2223.25 | 3517.60 N | 1608.68 E | 3867.99 | 24.58 | 1.79 | 191.38 |
| 10597.00 | 88.15 | 328.07 | 7970.63 | 95.00 | 2318.20 | 3599.13 N | 1560.00 E | 3922.67 | 23.43 | 2.38 | 194.99 |
| 10692.00 | 87.48 | 329.46 | 7974.25 | 95.00 | 2413.12 | 3680.30 N | 1510.78 E | 3978.32 | 22.32 | 1.62 | 198.61 |
| 10787.00 | 87.65 | 329.38 | 7978.29 | 95.00 | 2508.03 | 3762.01 N | 1462.49 E | 4036.29 | 21.24 | 0.20 | 198.61 |
| 10881.00 | 87.54 | 329.64 | 7982.23 | 94.00 | 2601.95 | 3842.94 N | 1414.84 E | 4095.12 | 20.21 | 0.30 | 198.61 |
| 10976.00 | 87.59 | 328.94 | 7986.27 | 95.00 | 2696.86 | 3924.55 N | 1366.37 E | 4155.60 | 19.20 | 0.74 | 202.22 |
| 11071.00 | 87.65 | 328.83 | 7990.21 | 95.00 | 2791.77 | 4005.81 N | 1317.32 E | 4216.85 | 18.20 | 0.13 | 202.22 |
| 11165.00 | 87.65 | 329.30 | 7994.07 | 94.00 | 2885.69 | 4086.37 N | 1269.04 E | 4278.89 | 17.25 | 0.50 | 198.61 |
| 11259.00 | 87.76 | 327.70 | 7997.83 | 94.00 | 2979.59 | 4166.45 N | 1219.96 E | 4341.38 | 16.32 | 1.70 | 202.22 |
| 11354.00 | 88.32 | 328.64 | 8001.08 | 95.00 | 3074.50 | 4247.12 N | 1169.89 E | 4405.30 | 15.40 | 1.15 | 198.61 |
| 11449.00 | 88.43 | 329.55 | 8003.78 | 95.00 | 3169.46 | 4328.59 N | 1121.12 E | 4471.42 | 14.52 | 0.96 | 202.22 |
| 11544.00 | 88.66 | 329.68 | 8006.19 | 95.00 | 3264.42 | 4410.52 N | 1073.08 E | 4539.18 | 13.67 | 0.28 | 202.22 |
| 11639.00 | 89.10 | 330.97 | 8008.05 | 95.00 | 3359.40 | 4493.04 N | 1026.06 E | 4608.71 | 12.86 | 1.43 | 202.22 |
| 11734.00 | 88.71 | 328.25 | 8009.86 | 95.00 | 3454.37 | 4574.97 N | 978.01 E | 4678.34 | 12.07 | 2.89 | 202.22 |
| 11828.00 | 88.77 | 330.18 | 8011.93 | 94.00 | 3548.34 | 4655.70 N | 929.91 E | 4747.66 | 11.30 | 2.05 | 205.83 |
| 11922.00 | 88.21 | 328.90 | 8014.41 | 94.00 | 3642.31 | 4736.69 N | 882.28 E | 4818.16 | 10.55 | 1.49 | 205.83 |
| 12017.00 | 87.82 | 330.32 | 8017.70 | 95.00 | 3737.25 | 4818.59 N | 834.25 E | 4890.27 | 9.82 | 1.55 | 205.83 |
| 12112.00 | 88.99 | 329.25 | 8020.34 | 95.00 | 3832.21 | 4900.65 N | 786.46 E | 4963.35 | 9.12 | 1.67 | 205.83 |
| 12206.00 | 89.50 | 331.21 | 8021.58 | 94.00 | 3926.19 | 4982.23 N | 739.80 E | 5036.86 | 8.45 | 2.16 | 205.83 |
| 12301.00 | 89.10 | 327.58 | 8022.74 | 95.00 | 4021.16 | 5063.98 N | 691.44 E | 5110.97 | 7.78 | 3.84 | 209.45 |
| 12396.00 | 89.50 | 329.49 | 8023.90 | 95.00 | 4116.13 | 5145.00 N | 641.86 E | 5184.88 | 7.11 | 2.05 | 209.45 |
| 12491.00 | 89.55 | 329.58 | 8024.69 | 95.00 | 4211.13 | 5226.88 N | 593.70 E | 5260.49 | 6.48 | 0.11 | 205.83 |
| 12586.00 | 89.78 | 329.37 | 8025.24 | 95.00 | 4306.13 | 5308.71 N | 545.45 E | 5336.66 | 5.87 | 0.33 | 205.83 |
| 12681.00 | 89.16 | 328.95 | 8026.12 | 95.00 | 4401.12 | 5390.28 N | 496.75 E | 5413.12 | 5.27 | 0.79 | 205.83 |
| 12776.00 | 89.10 | 330.63 | 8027.57 | 95.00 | 4496.11 | 5472.36 N | 448.95 E | 5490.75 | 4.69 | 1.77 | 205.83 |
| 12870.00 | 89.66 | 331.31 | 8028.58 | 94.00 | 4590.07 | 5554.55 N | 403.34 E | 5569.17 | 4.15 | 0.94 | 205.83 |
| 12964.00 | 89.83 | 330.65 | 8029.00 | 94.00 | 4684.05 | 5636.74 N | 357.74 E | 5648.08 | 3.63 | 0.72 | 209.45 |
| 13059.00 | 89.61 | 330.44 | 8029.46 | 95.00 | 4779.04 | 5719.46 N | 311.03 E | 5727.91 | 3.11 | 0.32 | 209.45 |
| 13154.00 | 89.44 | 330.30 | 8030.25 | 95.00 | 4874.03 | 5802.04 N | 264.06 E | 5808.04 | 2.61 | 0.23 | 209.45 |
| 13248.00 | 89.78 | 328.65 | 8030.89 | 94.00 | 4968.02 | 5883.00 N | 216.32 E | 5886.98 | 2.11 | 1.79 | 213.06 |
| 13342.00 | 89.66 | 329.71 | 8031.35 | 94.00 | 5062.01 | 5963.73 N | 168.16 E | 5966.10 | 1.62 | 1.14 | 213.06 |
| 13437.00 | 90.28 | 330.15 | 8031.40 | 95.00 | 5157.01 | 6045.94 N | 120.56 E | 6047.14 | 1.14 | 0.80 | 213.06 |

## Survey Report

| | |
|---|---|
| Vertical Section Plane: 329.66° | Total Correction: 9.27° West to True |
| Calculation Method: Minimum Curvature | Survey Reference: Wellhead |
| North Aligned to: True North | Well: BOGGESS 17H ST01 |
| RT: 25' ROTARY TABLE TO GROUND LEVEL | FIELD: MARCELLUS SHALE |

| Measured Depth (ft) | Inclination (deg) | Azimuth (deg) | TVD (ft) | Course Length (ft) | Vertical Section (ft) | Rect Co-ord North (ft) | Rect Co-ord East (ft) | Closure Distance (ft) | Closure Direction (deg) | Dog-leg Severity (dg/hft) | Temp (deg F) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13532.00 | 89.89 | 330.27 | 8031.26 | 95.00 | 5252.01 | 6128.39 N | 73.36 E | 6128.83 | 0.69 | 0.43 | 213.06 |
| 13627.00 | 90.00 | 329.02 | 8031.35 | 95.00 | 5347.01 | 6210.36 N | 25.35 E | 6210.41 | 0.23 | 1.32 | 216.68 |
| 13722.00 | 89.94 | 328.71 | 8031.40 | 95.00 | 5442.00 | 6291.68 N | 23.77 W | 6291.72 | 359.78 | 0.33 | 216.68 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13722.00 | 89.94 | 328.71 | 8031.40 | 95.00 | 5442.00 | 6291.66 N | 23.77 W | 6291.72 | 359.78 | 0.33 | 216.68 |
| 13817.00 | 90.22 | 330.17 | 8031.27 | 95.00 | 5536.99 | 6373.48 N | 72.07 W | 6373.89 | 359.35 | 1.56 | 216.68 |
| 13911.00 | 90.39 | 330.83 | 8030.77 | 94.00 | 5630.98 | 6455.29 N | 118.35 W | 6456.38 | 358.95 | 0.72 | 216.68 |
| 14007.00 | 90.45 | 329.21 | 8030.06 | 96.00 | 5726.97 | 6538.44 N | 166.32 W | 6540.56 | 358.54 | 1.69 | 216.68 |
| 14102.00 | 90.11 | 330.42 | 8029.60 | 95.00 | 5821.97 | 6620.56 N | 214.09 W | 6624.02 | 358.15 | 1.32 | 216.68 |
| 14197.00 | 89.89 | 328.44 | 8029.60 | 95.00 | 5916.96 | 6702.35 N | 262.40 W | 6707.48 | 357.76 | 2.10 | 220.29 |
| 14292.00 | 90.11 | 329.73 | 8029.60 | 95.00 | 6011.96 | 6783.85 N | 311.21 W | 6790.99 | 357.37 | 1.38 | 220.29 |
| 14386.00 | 89.55 | 327.31 | 8029.88 | 94.00 | 6105.93 | 6864.01 N | 360.29 W | 6873.46 | 357.00 | 2.64 | 202.22 |
| 14481.00 | 90.00 | 329.15 | 8030.25 | 95.00 | 6200.90 | 6944.77 N | 410.30 W | 6956.88 | 356.62 | 1.99 | 209.45 |
| 14576.00 | 90.11 | 329.44 | 8030.16 | 95.00 | 6295.89 | 7026.45 N | 458.81 W | 7041.42 | 356.26 | 0.33 | 213.06 |
| 14671.00 | 90.67 | 329.31 | 8029.51 | 95.00 | 6390.89 | 7108.20 N | 507.21 W | 7126.27 | 355.92 | 0.61 | 216.68 |
| 14765.00 | 91.29 | 331.64 | 8027.91 | 94.00 | 6484.86 | 7189.98 N | 553.52 W | 7211.25 | 355.60 | 2.57 | 216.68 |
| 14860.00 | 90.62 | 328.52 | 8026.32 | 95.00 | 6579.83 | 7272.29 N | 600.89 W | 7297.07 | 355.28 | 3.36 | 216.68 |
| 14955.00 | 90.28 | 329.69 | 8025.58 | 95.00 | 6674.82 | 7353.81 N | 649.67 W | 7382.45 | 354.95 | 1.28 | 216.68 |
| 15050.00 | 89.78 | 329.16 | 8025.53 | 95.00 | 6769.82 | 7435.60 N | 697.99 W | 7468.29 | 354.64 | 0.77 | 216.68 |
| 15144.00 | 89.83 | 331.13 | 8025.85 | 94.00 | 6863.81 | 7517.12 N | 744.78 W | 7553.93 | 354.34 | 2.10 | 216.68 |
| 15239.00 | 90.56 | 328.98 | 8025.52 | 95.00 | 6958.80 | 7599.43 N | 792.20 W | 7640.61 | 354.05 | 2.39 | 220.29 |
| 15334.00 | 90.06 | 329.91 | 8025.01 | 95.00 | 7053.80 | 7681.24 N | 840.49 W | 7727.09 | 353.76 | 1.11 | 220.29 |
| 15429.00 | 90.00 | 330.39 | 8024.96 | 95.00 | 7148.80 | 7763.63 N | 887.78 W | 7814.23 | 353.48 | 0.51 | 220.29 |
| 15524.00 | 89.66 | 328.81 | 8025.24 | 95.00 | 7243.79 | 7845.57 N | 935.85 W | 7901.19 | 353.20 | 1.70 | 220.29 |
| 15618.00 | 89.94 | 330.48 | 8025.57 | 94.00 | 7337.79 | 7926.68 N | 983.35 W | 7987.44 | 352.93 | 1.80 | 220.29 |
| 15713.00 | 90.45 | 330.70 | 8025.25 | 95.00 | 7432.78 | 8009.44 N | 1030.00 W | 8075.39 | 352.67 | 0.59 | 220.29 |
| 15807.00 | 90.50 | 331.56 | 8024.47 | 94.00 | 7526.74 | 8091.75 N | 1075.39 W | 8162.90 | 352.43 | 0.92 | 220.29 |
| 15903.00 | 90.95 | 333.77 | 8023.25 | 96.00 | 7622.60 | 8177.02 N | 1119.46 W | 8253.29 | 352.20 | 2.35 | 220.29 |
| 15998.00 | 90.56 | 329.36 | 8022.00 | 95.00 | 7717.51 | 8260.53 N | 1164.68 W | 8342.23 | 351.97 | 4.66 | 220.29 |
| 16092.00 | 90.06 | 329.42 | 8021.49 | 94.00 | 7811.51 | 8341.43 N | 1212.55 W | 8429.10 | 351.73 | 0.54 | 220.29 |
| 16186.00 | 90.00 | 329.40 | 8021.44 | 94.00 | 7905.51 | 8422.35 N | 1260.38 W | 8516.13 | 351.49 | 0.07 | 220.29 |
| 16280.00 | 89.66 | 328.92 | 8021.72 | 94.00 | 7999.50 | 8503.06 N | 1308.57 W | 8603.16 | 351.25 | 0.63 | 220.29 |
| 16374.00 | 89.89 | 328.81 | 8022.09 | 94.00 | 8093.49 | 8583.51 N | 1357.17 W | 8690.14 | 351.02 | 0.27 | 223.91 |
| 16469.00 | 90.56 | 331.15 | 8021.72 | 95.00 | 8188.48 | 8665.76 N | 1404.70 W | 8778.87 | 350.79 | 2.56 | 223.91 |
| 16563.00 | 91.06 | 331.47 | 8020.39 | 94.00 | 8282.43 | 8748.21 N | 1449.82 W | 8867.54 | 350.59 | 0.63 | 223.91 |
| 16658.00 | 89.94 | 328.61 | 8019.56 | 95.00 | 8377.42 | 8830.51 N | 1497.25 W | 8956.54 | 350.38 | 3.23 | 223.91 |
| 16753.00 | 90.34 | 331.09 | 8019.33 | 95.00 | 8472.41 | 8912.65 N | 1544.96 W | 9045.56 | 350.17 | 2.64 | 223.91 |
| 16849.00 | 90.22 | 328.70 | 8018.86 | 96.00 | 8568.40 | 8995.69 N | 1593.11 W | 9135.67 | 349.96 | 2.49 | 223.91 |
| 16942.00 | 90.22 | 329.73 | 8018.50 | 93.00 | 8661.39 | 9075.58 N | 1640.71 W | 9222.70 | 349.75 | 1.11 | 223.91 |
| 17037.00 | 90.00 | 329.69 | 8018.32 | 95.00 | 8756.39 | 9157.62 N | 1688.63 W | 9312.00 | 349.55 | 0.24 | 227.52 |
| 17132.00 | 89.78 | 328.72 | 8018.50 | 95.00 | 8851.39 | 9239.22 N | 1737.26 W | 9401.13 | 349.35 | 1.05 | 223.91 |
| 17226.00 | 89.89 | 329.14 | 8018.77 | 94.00 | 8945.38 | 9319.73 N | 1785.77 W | 9489.28 | 349.15 | 0.46 | 227.52 |
| 17321.00 | 89.78 | 327.53 | 8019.04 | 95.00 | 9040.35 | 9400.59 N | 1835.64 W | 9578.13 | 348.95 | 1.70 | 227.52 |
| 17416.00 | 89.16 | 329.01 | 8019.92 | 95.00 | 9135.32 | 9481.38 N | 1885.60 W | 9667.06 | 348.75 | 1.69 | 33.80 |
| 17512.00 | 89.33 | 328.33 | 8021.19 | 96.00 | 9231.30 | 9563.38 N | 1935.51 W | 9757.27 | 348.56 | 0.73 | 227.52 |
| 17606.00 | 89.50 | 329.28 | 8022.15 | 94.00 | 9325.28 | 9643.78 N | 1984.20 W | 9845.79 | 348.37 | 1.03 | 223.91 |
| 17700.00 | 88.99 | 328.30 | 8023.39 | 94.00 | 9419.26 | 9724.17 N | 2032.90 W | 9934.39 | 348.19 | 1.18 | 223.91 |
| 17795.00 | 89.05 | 329.00 | 8025.01 | 95.00 | 9514.23 | 9805.29 N | 2082.32 W | 10023.96 | 348.01 | 0.74 | 227.52 |
| 17890.00 | 89.38 | 328.45 | 8026.31 | 95.00 | 9609.21 | 9886.47 N | 2131.63 W | 10113.66 | 347.83 | 0.68 | 227.52 |
| 17985.00 | 89.38 | 328.97 | 8027.34 | 95.00 | 9704.19 | 9967.65 N | 2180.97 W | 10203.46 | 347.66 | 0.55 | 227.52 |
| 18080.00 | 89.50 | 329.05 | 8028.27 | 95.00 | 9799.18 | 10049.09 N | 2229.88 W | 10293.52 | 347.49 | 0.15 | 227.52 |
| 18174.00 | 89.22 | 328.58 | 8029.32 | 94.00 | 9893.16 | 10129.50 N | 2278.55 W | 10382.61 | 347.32 | 0.58 | 227.52 |
| 18269.00 | 89.10 | 328.73 | 8030.71 | 95.00 | 9988.14 | 10210.62 N | 2327.97 W | 10472.64 | 347.16 | 0.20 | 231.13 |
| 18364.00 | 89.22 | 330.25 | 8032.11 | 95.00 | 10083.12 | 10292.46 N | 2376.19 W | 10563.19 | 347.00 | 1.60 | 227.52 |
| 18459.00 | 89.66 | 330.86 | 8033.03 | 95.00 | 10178.11 | 10375.18 N | 2422.89 W | 10654.33 | 346.86 | 0.79 | 231.13 |
| 18553.00 | 89.94 | 328.84 | 8033.36 | 94.00 | 10272.10 | 10456.46 N | 2470.10 W | 10744.25 | 346.71 | 2.17 | 231.13 |
| 18647.00 | 89.38 | 329.95 | 8033.92 | 94.00 | 10366.09 | 10537.36 N | 2517.95 W | 10834.03 | 346.56 | 1.32 | 231.13 |
| 18741.00 | 89.22 | 329.60 | 8035.07 | 94.00 | 10460.09 | 10618.58 N | 2565.27 W | 10924.05 | 346.42 | 0.41 | 223.91 |
| 18836.00 | 90.39 | 332.07 | 8035.39 | 95.00 | 10555.06 | 10701.53 N | 2611.56 W | 11015.58 | 346.29 | 2.88 | 227.52 |
| 18931.00 | 90.00 | 328.88 | 8035.07 | 95.00 | 10650.04 | 10784.18 N | 2658.37 W | 11107.00 | 346.15 | 3.38 | 227.52 |
| 19026.00 | 89.44 | 328.06 | 8035.53 | 95.00 | 10745.01 | 10865.15 N | 2708.05 W | 11197.55 | 346.00 | 1.05 | 231.13 |
| STRAIGHT LINE PROJECTION TO BIT DEPTH AT 19055'MD | | | | | | | | | | | |
| 19055.00 | 89.44 | 328.06 | 8035.82 | 29.00 | 10774.00 | 10889.76 N | 2723.39 W | 11225.14 | 345.96 | 0.00 | |

## BOTTOM HOLE ASSEMBLY RECORD

| RUN #1 | ft | | | | | | |
|---|---|---|---|---|---|---|---|
| 8 1/2" PDC BIT | 1.33 | | | | | | |
| PD COPIBANA | 12.32 | | | | | | |
| NM HHOP SUB | 5.84 | | | | | | |
| XBOLT DIR/GR | 23.23 | | | | | | |
| NM X/O SUB | 3.57 | | | | | | |
| FRAC ID SUB | 2.64 | | | | | | |
| NM FLEX DC | 15.14 | | | | | | |
| 0° MUD MOTOR | 38.62 | | | | | | |
| DIFFUSER SUB | 7.33 | | | | | | |
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| TOTAL BHA: | 110.02 | | | | | | |
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| | | | | | | | |
| SENSOR OFFSETS: | | | | | | | |
| GAMMA-RAY | 23.16 | | | | | | |
| DIRECTIONAL | 26.47 | | | | | | |

GAMMA-RAY

Schlumberger

2" = 100'
FEET MD