



# CATHEDRAL

## Resistivity and Gamma Ray

Job #: 165012 Well ID: 05-001-

Scale: 5 inch Type: MD

### Well Site Information

Oil Company	Ward Petroleum
Surface Location	Sec. 18-T1S-R66W
Well Name	Anderson 18-3-11HC
API	05-001-09941-00
Field	DJ Basin
State	Colorado
Country	USA

### Surface Coordinates

Well Type	Horizontal
Latitude	39° 57' 38 N
Longitude	104° 49' 26 E
N / S Coordinates	39.960436
E / W Coordinates	-104.823807
Azimuth Reference	True North
Grid Convergence	0.44°

### MWD Engineers

Lead Hand	Simon Jordan
Second Hand	Jared Nichols

Perm Datum	Ground	Elevation	5,005.00 ft		
Log depth measured from KB is	21.00 ft	above perm datum.	KB = 5,026.00 ft		
Total Depth	12600	Spud Date	Feb/18/2016	End Date	Feb/23/2016
(MD) Log Interval	Start Depth	1600.00 ft	End Depth	12598.00 ft	

### Bore Hole Record

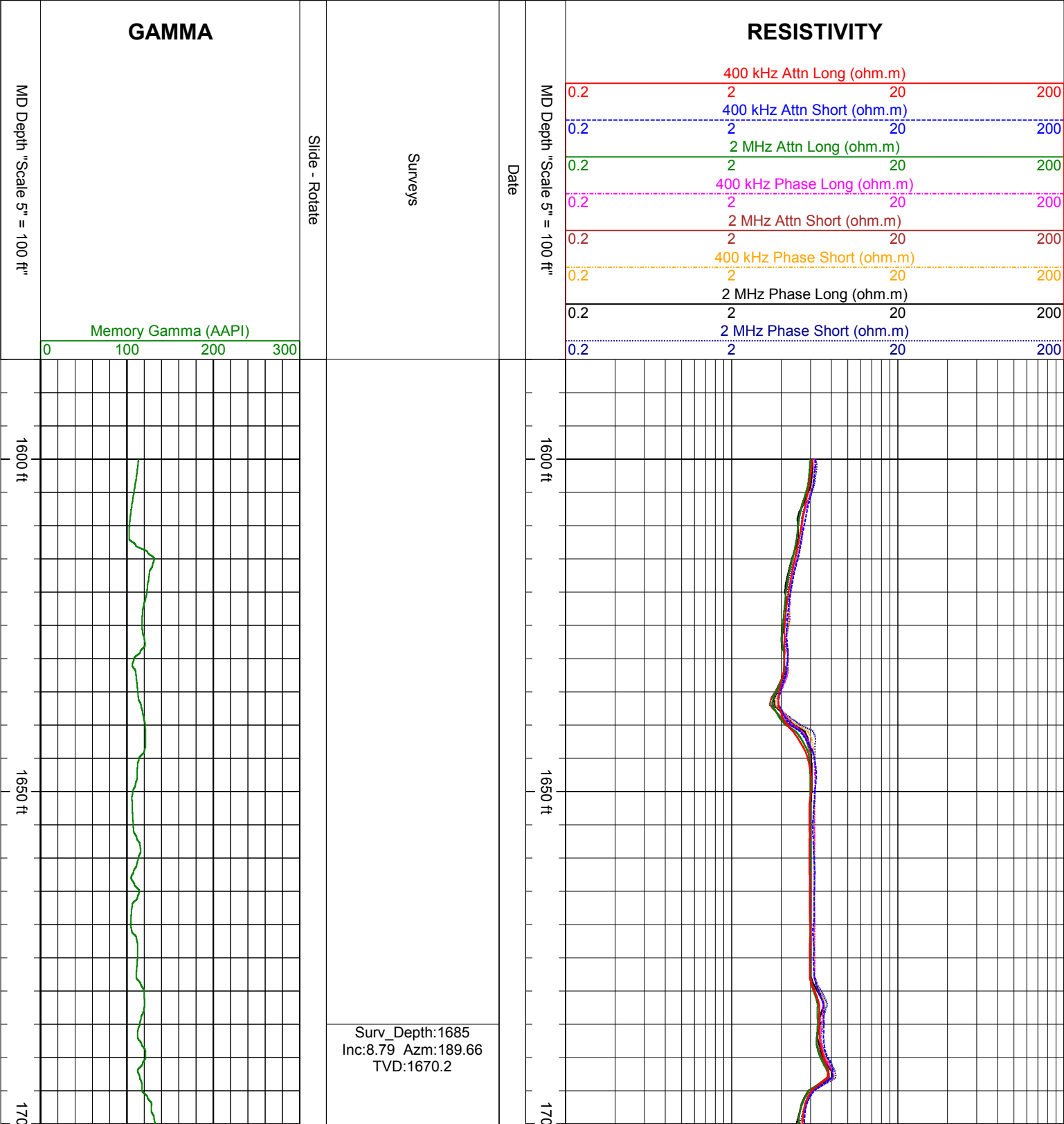
Hole Size	From	To
13.00"	0.00 ft	1,555.00 ft
8.75"	1,555.00 ft	12,600.00 ft

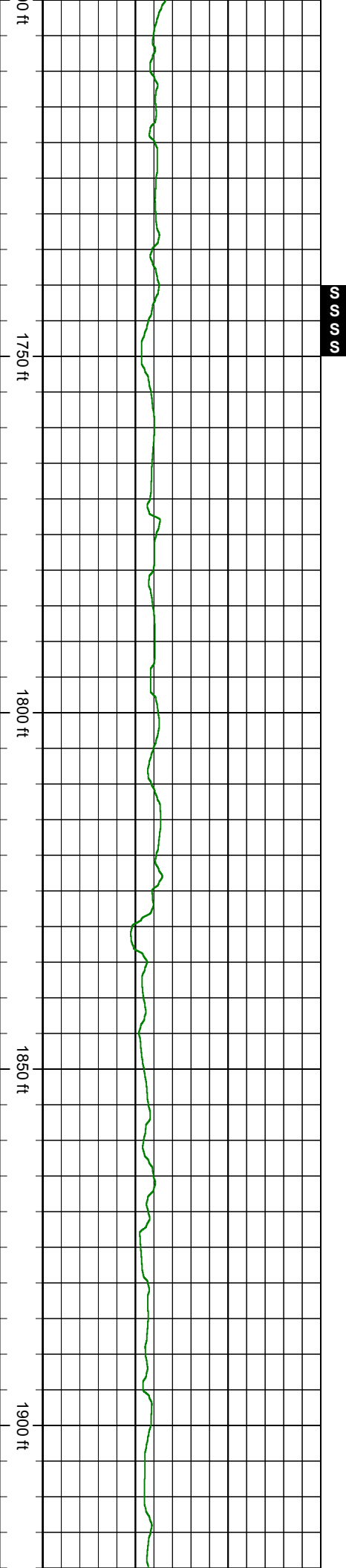
Casing Record				
Type	Size	WGT	From	To
Surface	9.625"	36.00 lb/ft	0.00 ft	1,519.00 ft
Production	5.500"	20.00 lb/ft	0.00 ft	12,553.00 ft

Run Data					
Bit Run Number	1	2			
Start Date & Time	Feb/16/2016 18:30:00	Feb/18/2016 16:00:00			
End Date & Time	Feb/17/2016 08:30:00	Feb/23/2016 18:30:00			
Run Hours	14	122.50 hr			
Depth In	90.00 ft	1,555.00 ft			
Depth Out	1,555.00 ft	12,600.00 ft			
Total Gamma Correction	N/A	5.00			
Gamma to Bit	N/A	51.00 ft			
Resistivity to Bit	N/A	61.96 ft			
Mud Type	Water Based	Oil Based			
Density	8.30 ppg	9.80 ppg			
Viscosity	28.00 sec/qt	52.00 sec/qt			
PH	N/A	N/A			
Fluid Loss	N/A	N/A			
K+ ppm	N/A	N/A			
CL- ppm	N/A	40,000.00			
Max Mud Temp	131.00 °F	221.00 °F			
Mud Report Depth	1,555.00 ft	10,658.00 ft			

Remarks

Interpretations of this data by Cathedral Energy Services will be of best judgment as to correctness. Cathedral Energy Services cannot and does not guarantee the accuracy or correctness of interpretations or any surveys derived therefrom. Cathedral Energy Services makes no warranties of performance, results, fitness or suitability for any particular purposes with respect to the goods being furnished under the terms and conditions. Cathedral Energy Services warrants that the equipment furnished will conform to Cathedral Energy Services published specifications in effect at the time and be in good working order.

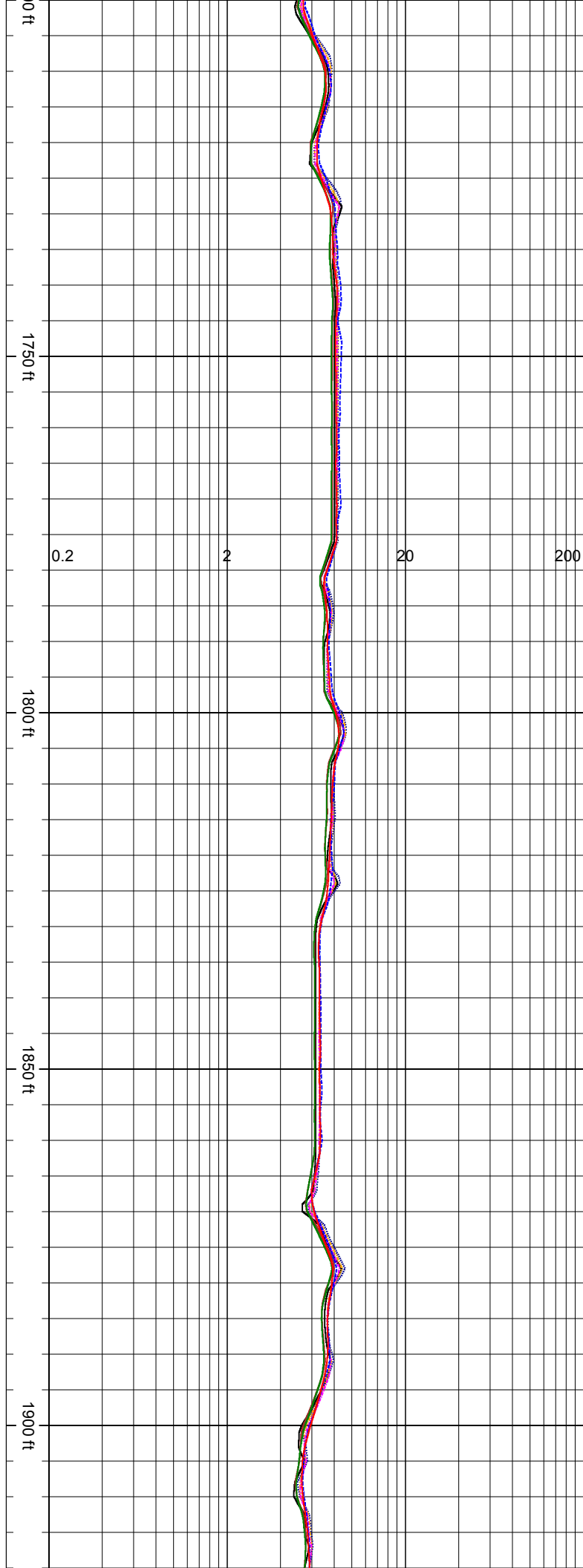




S  
S  
S  
S

Surv\_Depth:1780  
Inc:11.07 Azm:197.31  
TVD:1763.77

Surv\_Depth:1873  
Inc:11.73 Azm:200.3  
TVD:1854.93



Surv\_Depth:1966  
Inc:11.38 Azm:196.96  
TVD:1946.05

Surv\_Depth:2060  
Inc:11.21 Azm:197.4  
TVD:2038.23

1950 ft

0.2

2

20

200

2000 ft

2050 ft

2100 ft

1950 ft

2000 ft

2050 ft

2100 ft

Surv\_Depth:2155  
Inc:10.94 Azm:195.64  
TVD:2131.47

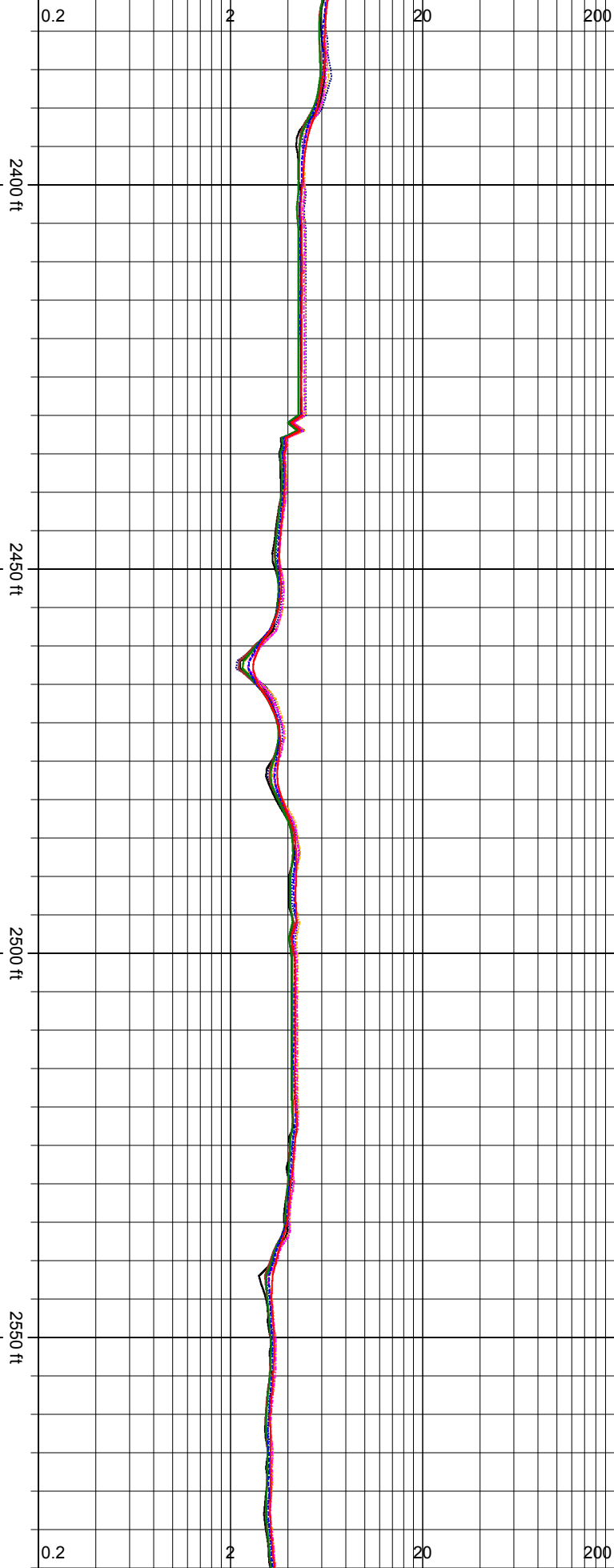
Surv\_Depth:2247  
Inc:10.55 Azm:193  
TVD:2221.87

Surv\_Depth:2341  
Inc:10.2 Azm:187.73  
TVD:2314.34

0.2 2 20 200

Surv\_Depth:2435  
Inc:10.11 Azm:189.05  
TVD:2406.87

Surv\_Depth:2529  
Inc:9.58 Azm:185.88  
TVD:2499.49



Surv\_Depth:2621  
Inc:9.05 Azm:184.74  
TVD:2590.26

Surv\_Depth:2713  
Inc:9.58 Azm:189.31  
TVD:2681.04

SSS

2600 ft

2650 ft

2700 ft

2750 ft

2800 ft

0.2

2

20

200

2600 ft

2650 ft

2700 ft

2750 ft

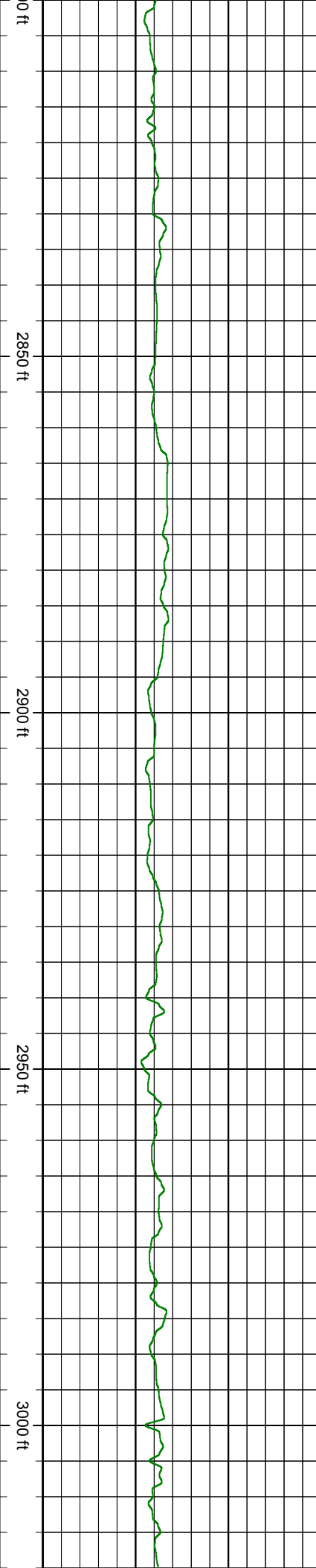
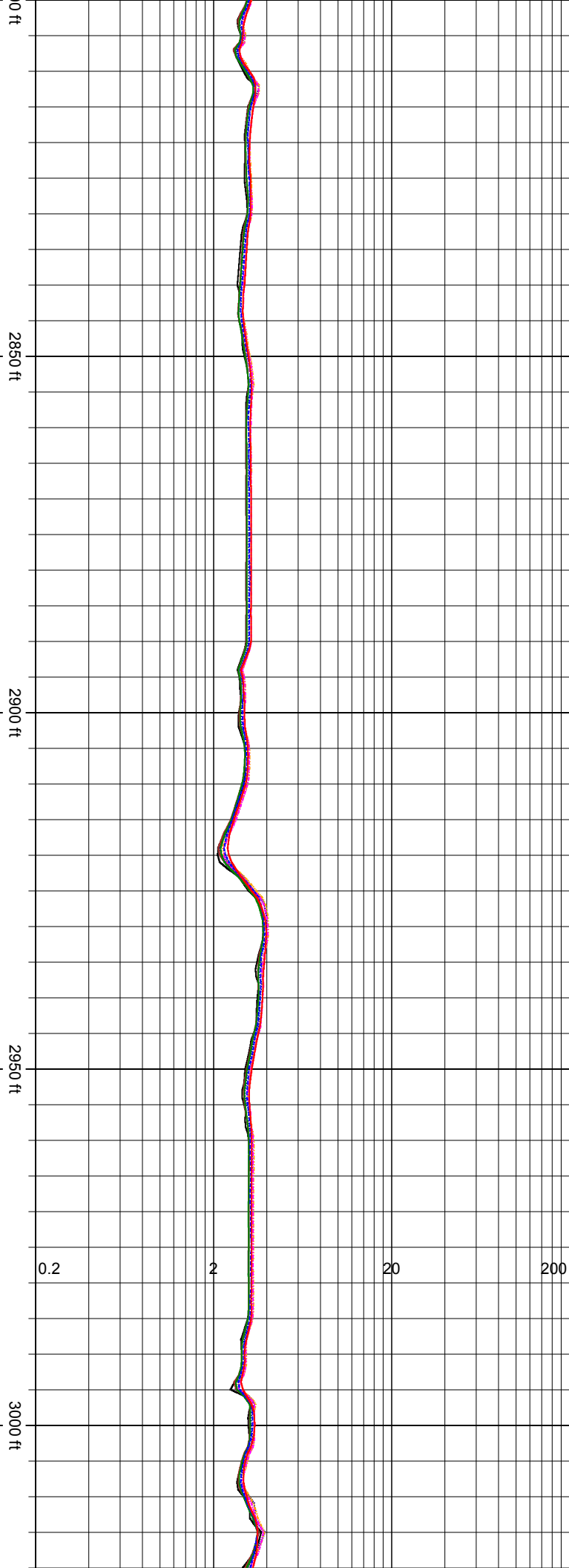
2800 ft

Surv\_Depth:2806  
Inc:9.8 Azm:191.68  
TVD:2772.71

Surv\_Depth:2899  
Inc:10.06 Azm:201.17  
TVD:2864.32

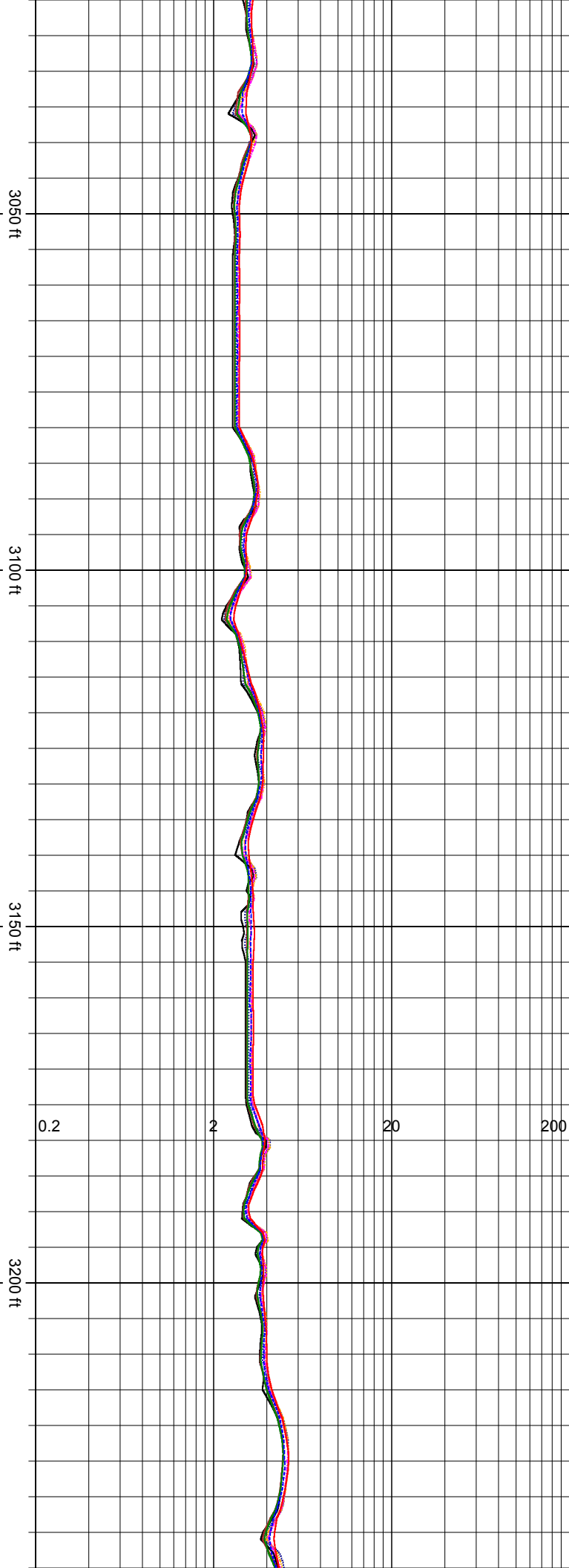
Surv\_Depth:2991  
Inc:9.27 Azm:201  
TVD:2955

SSS



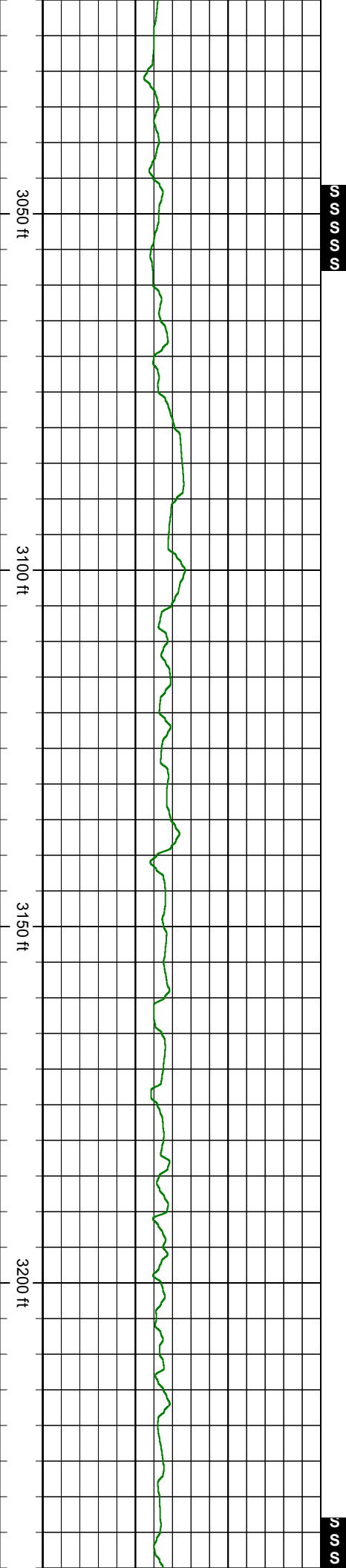


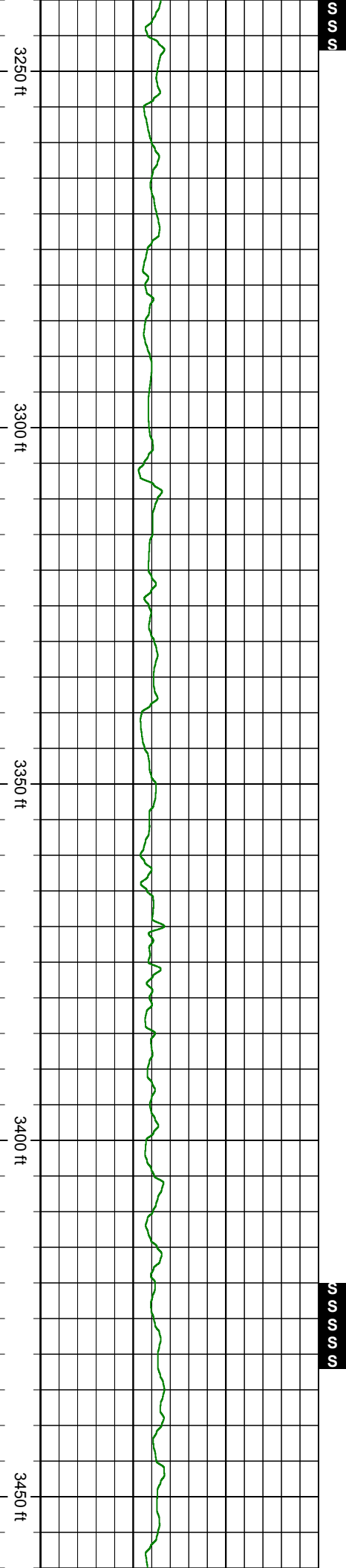
February 19, 2016



Surv\_Depth:3084  
Inc:10.2 Azm:208.56  
TVD:3046.66

Surv\_Depth:3178  
Inc:9.58 Azm:206.45  
TVD:3139.26



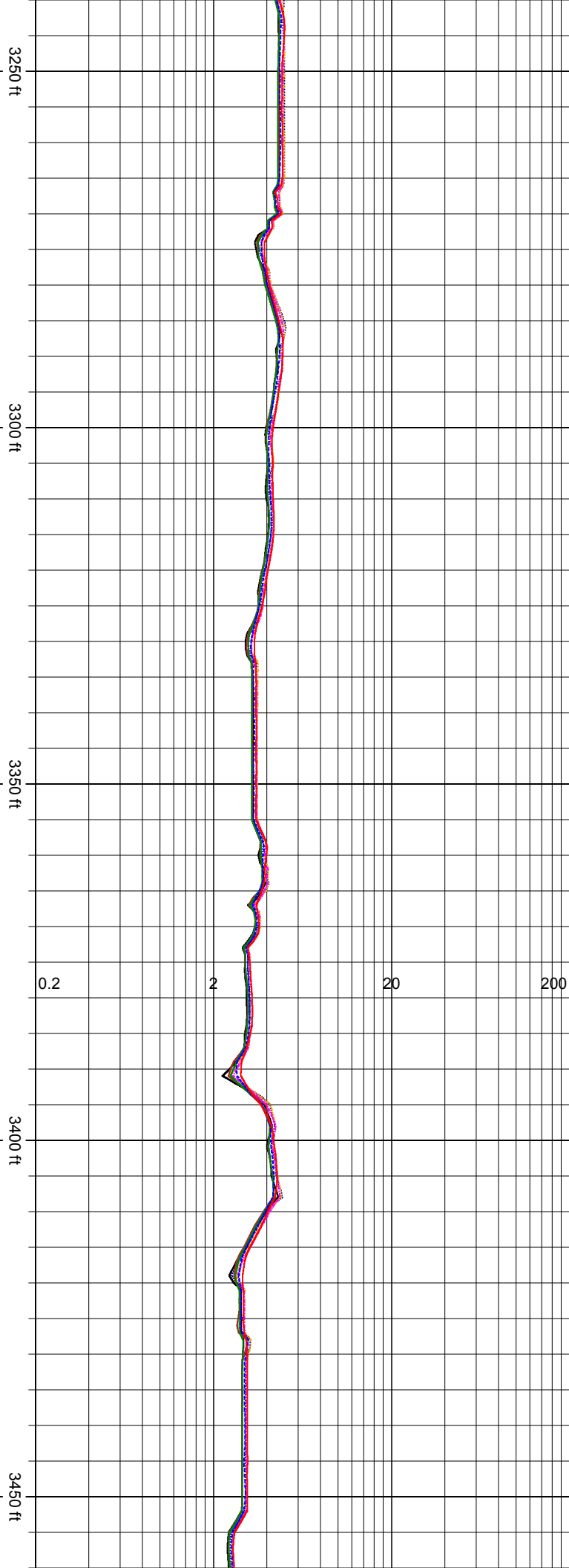


Surv\_Depth:3272  
Inc:11.38 Azm:207.15  
TVD:3231.69

Surv\_Depth:3365  
Inc:10.72 Azm:209.44  
TVD:3322.96

Surv\_Depth:3450

SSSSS

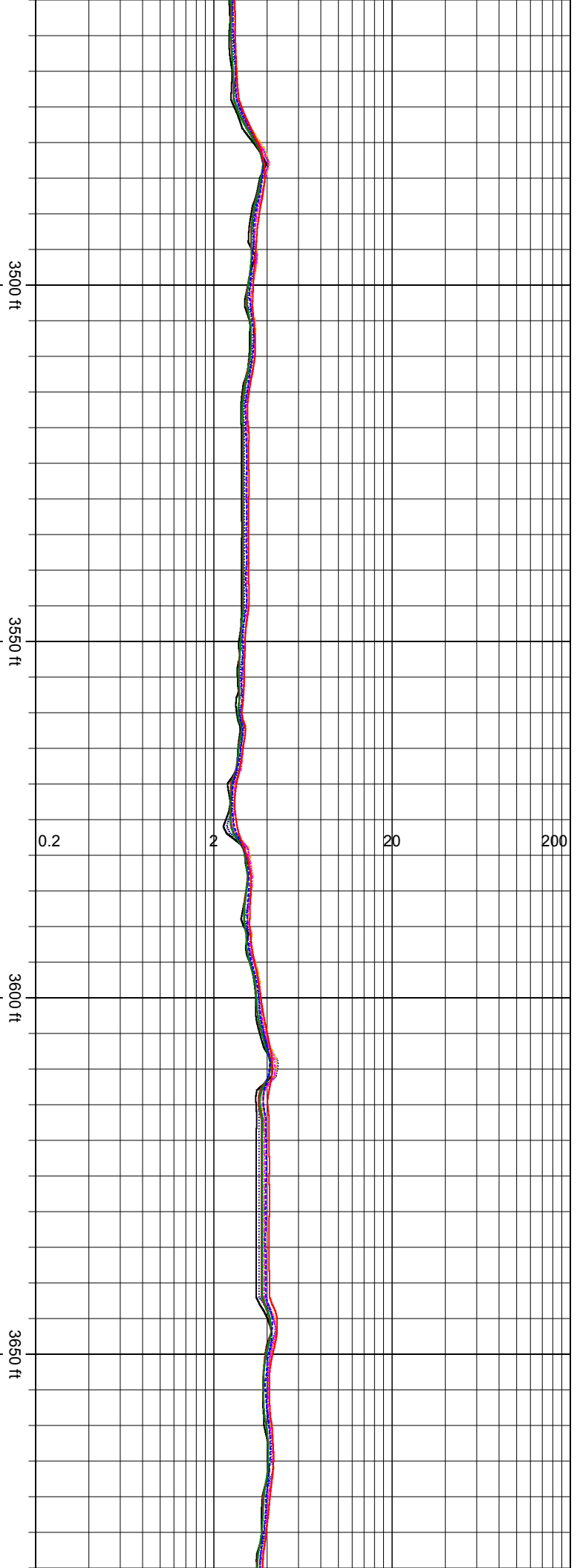


Surv\_Depth:3459  
Inc:11.12 Azm:201  
TVD:3415.27

Surv\_Depth:3551  
Inc:10.42 Azm:201.7  
TVD:3505.66

Surv\_Depth:3646  
Inc:10.77 Azm:191.59  
TVD:3599.04

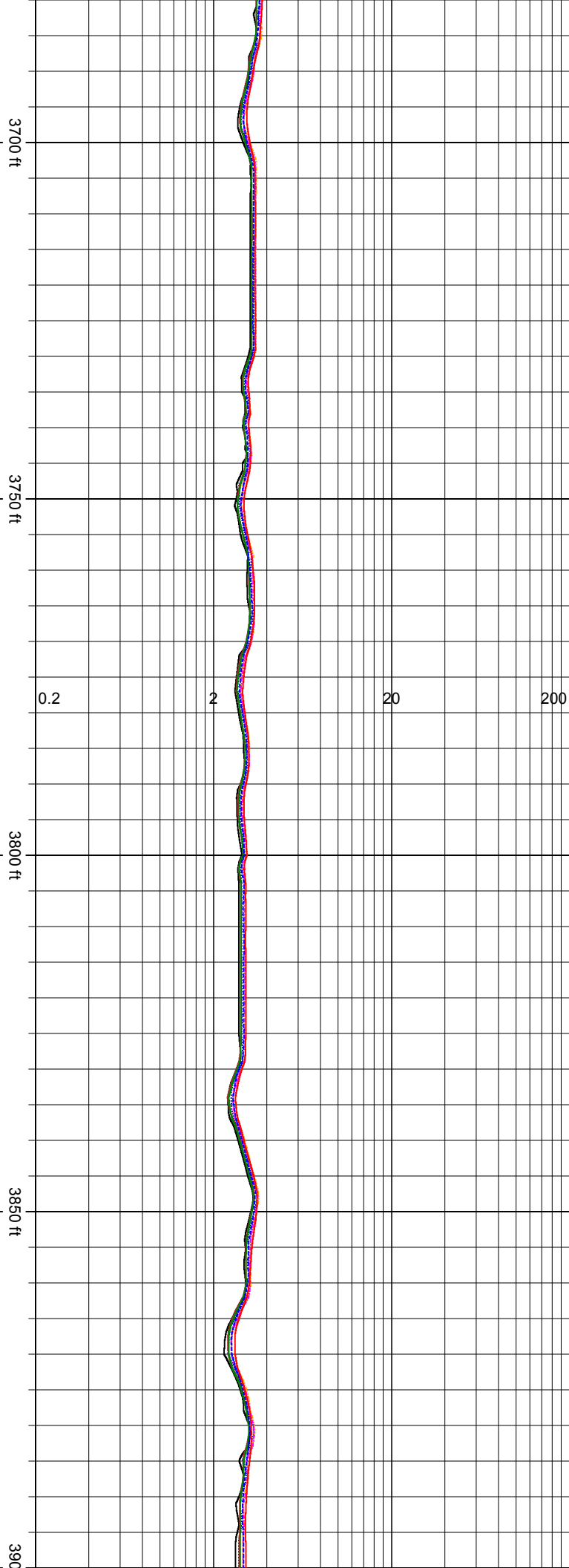
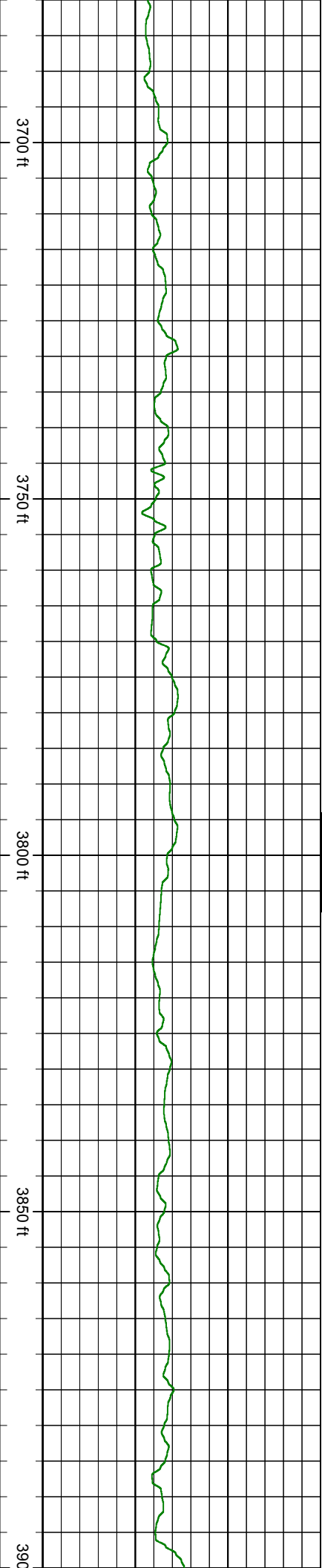
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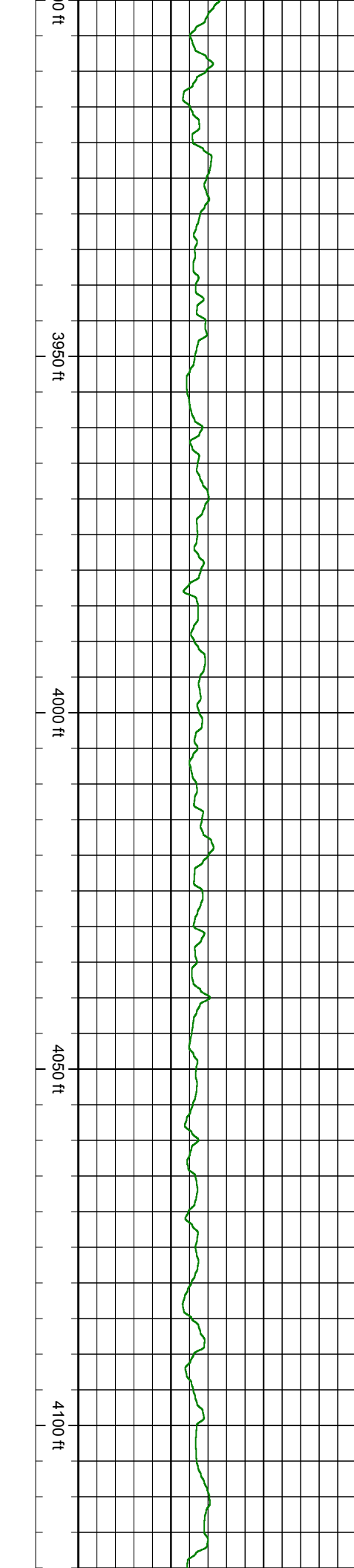


Surv\_Depth:3739  
Inc:9.93 Azm:193  
TVD:3690.53

Surv\_Depth:3833  
Inc:10.37 Azm:187.38  
TVD:3783.06

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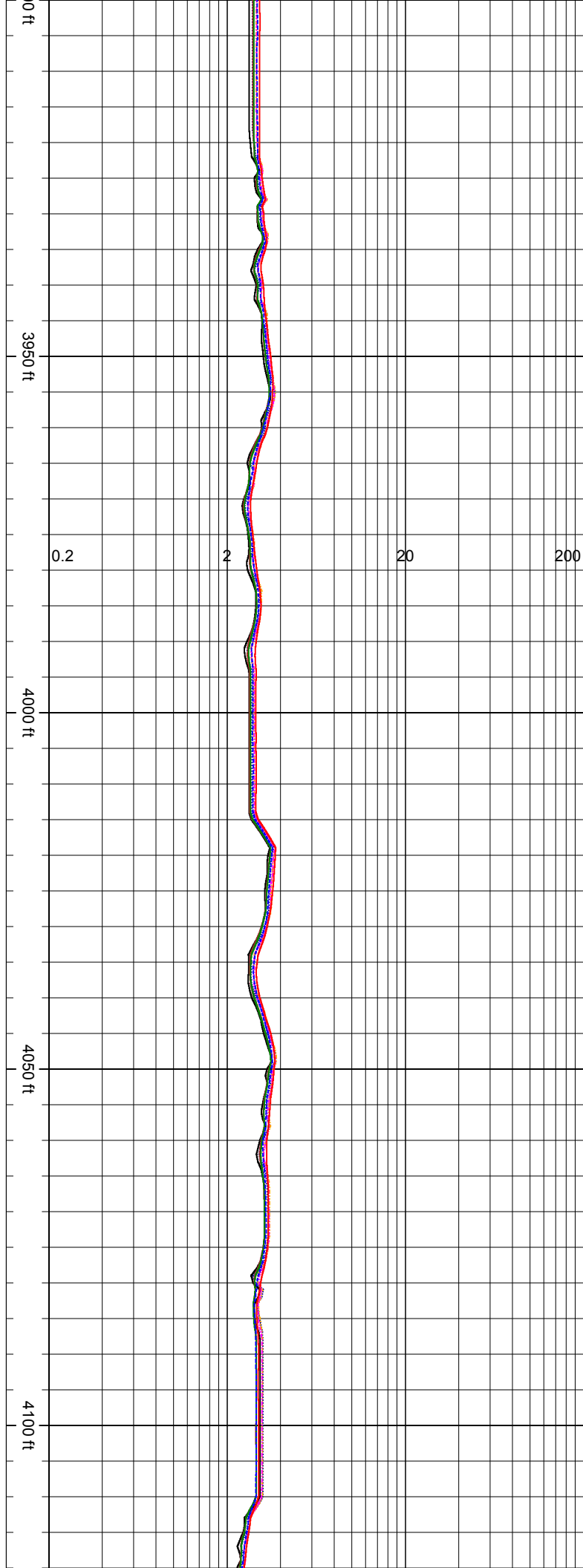


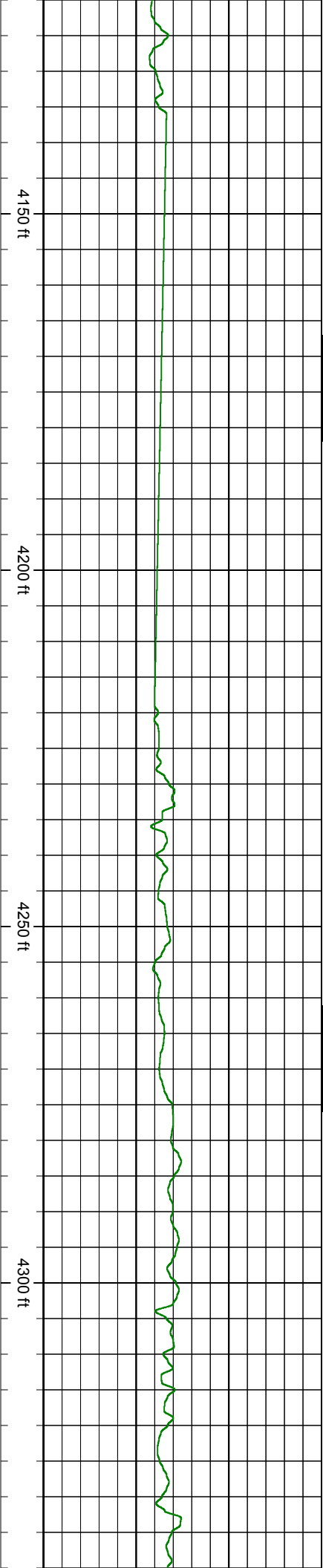


Surv\_Depth:3926  
Inc:9.23 Azm:188.43  
TVD:3874.7

Surv\_Depth:4019  
Inc:10.06 Azm:185.18  
TVD:3966.38

Surv\_Depth:4112  
Inc:8.17 Azm:182.72  
TVD:4058.2



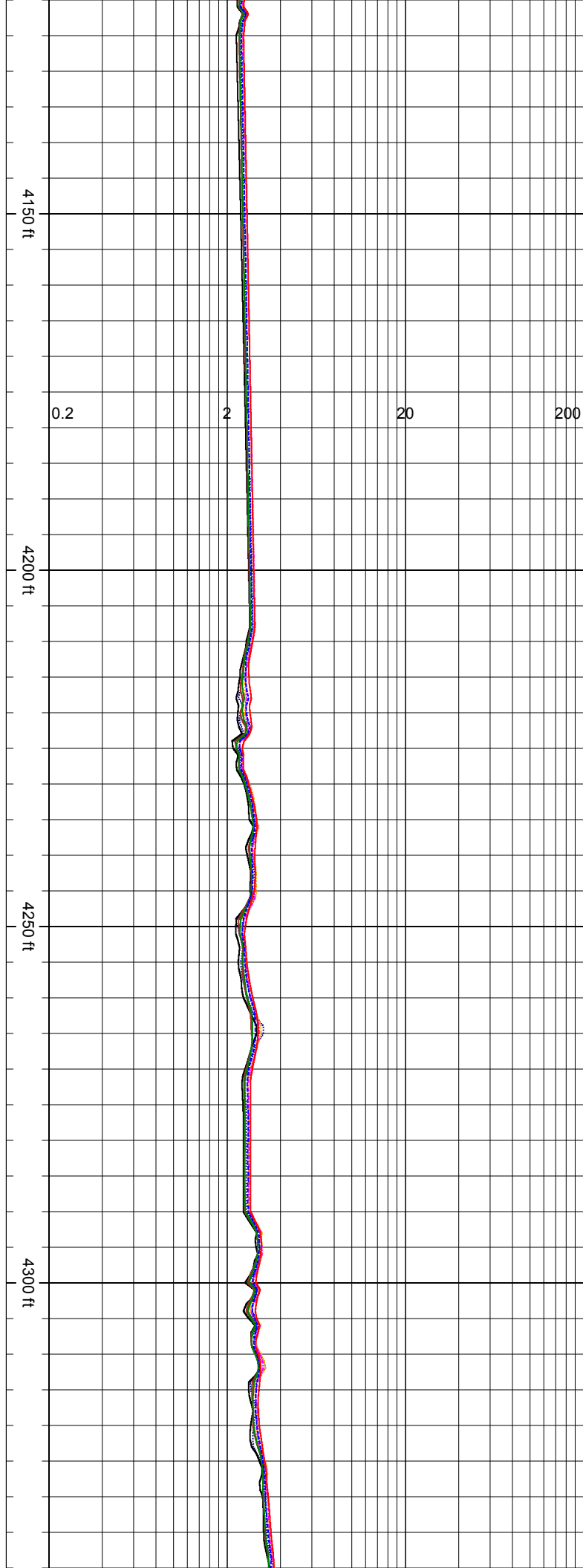


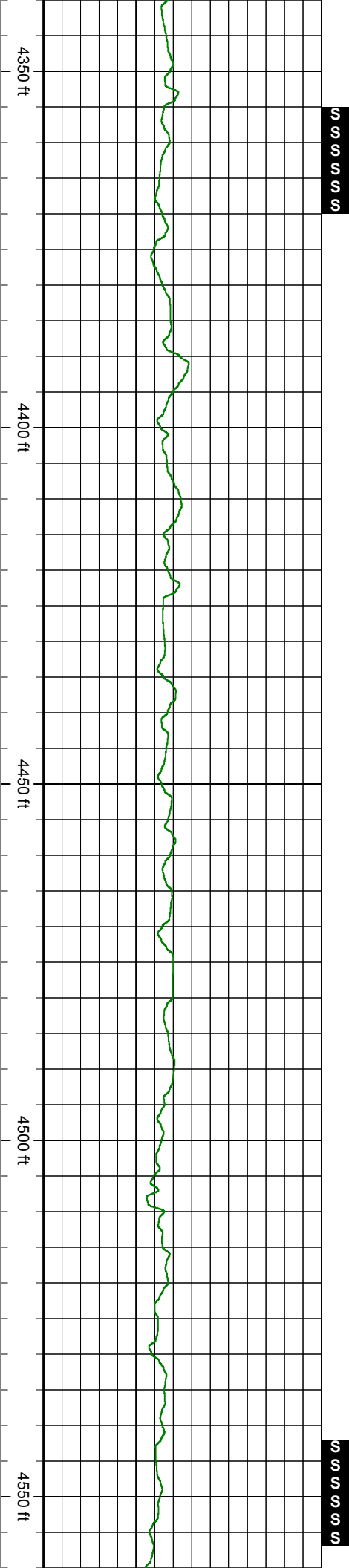
SSSSSS

SSSSSS

Surv\_Depth:4206  
Inc:8.92 Azm:186.94  
TVD:4151.15

Surv\_Depth:4300  
Inc:9.93 Azm:190.01  
TVD:4243.89



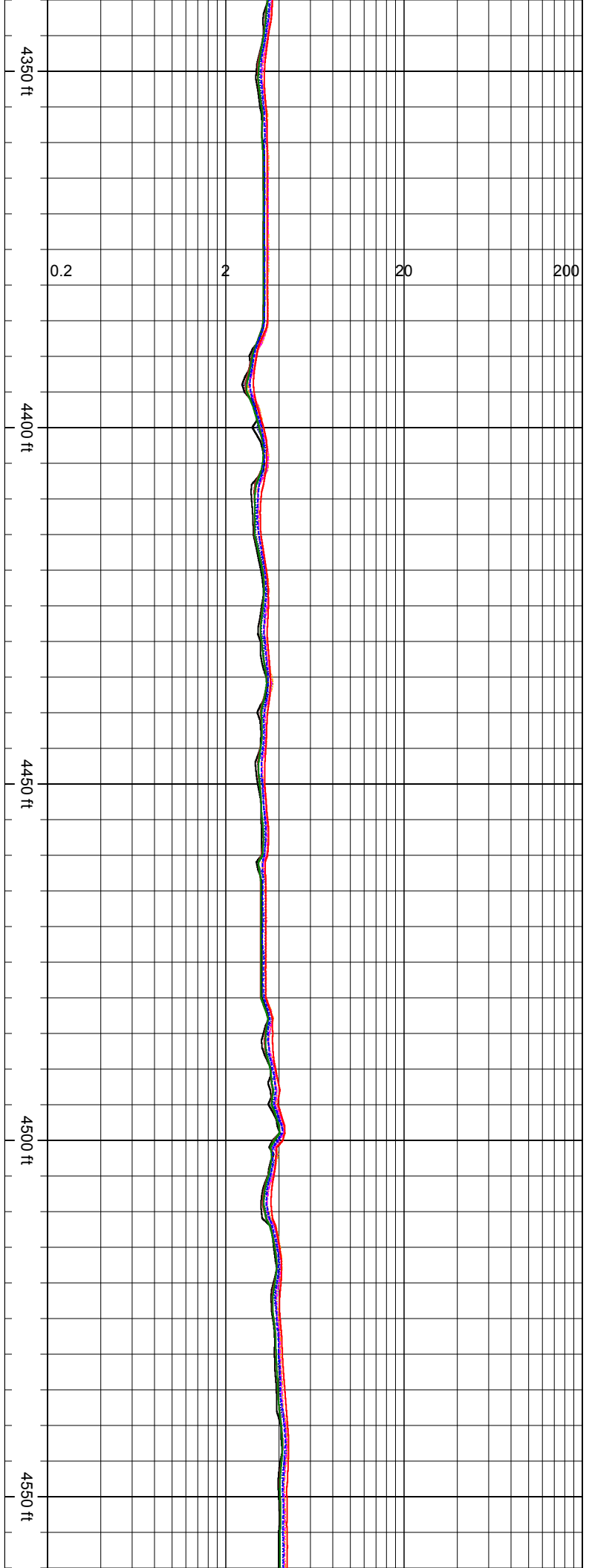


SSSSSS

Surv\_Depth:4394  
Inc:11.65 Azm:188.52  
TVD:4336.24

Surv\_Depth:4487  
Inc:10.2 Azm:187.99  
TVD:4427.56

SSSSSS



0.2 2 20 200

Surv\_Depth:4582  
Inc:10.46 Azm:186.5  
TVD:4521.01

Surv\_Depth:4676  
Inc:12 Azm:188.43  
TVD:4613.2

Surv\_Depth:4768  
Inc:10.5 Azm:184.56  
TVD:4703.43

SSSSSS

4600 ft

4650 ft

4700 ft

4750 ft

4600 ft

4650 ft

4700 ft

4750 ft

0.2

2

20

200

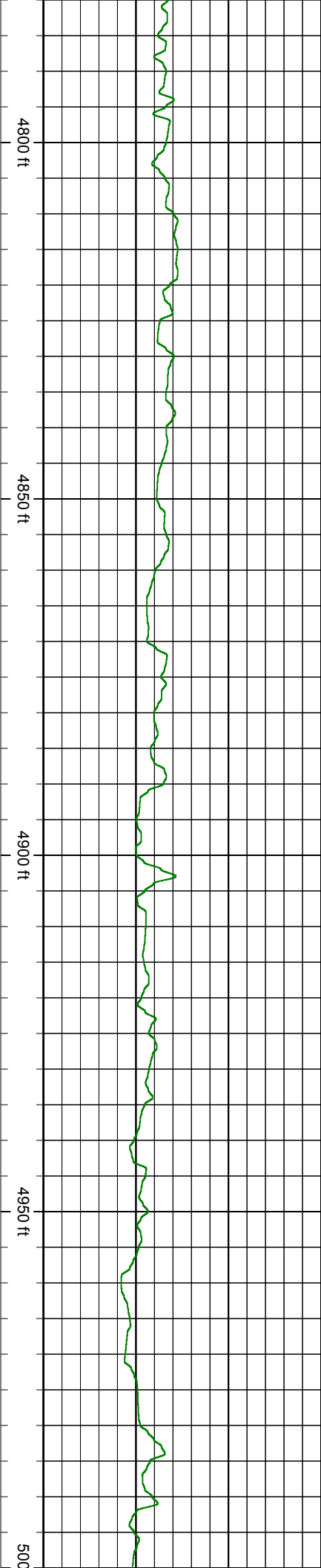
0.2

2

20

200



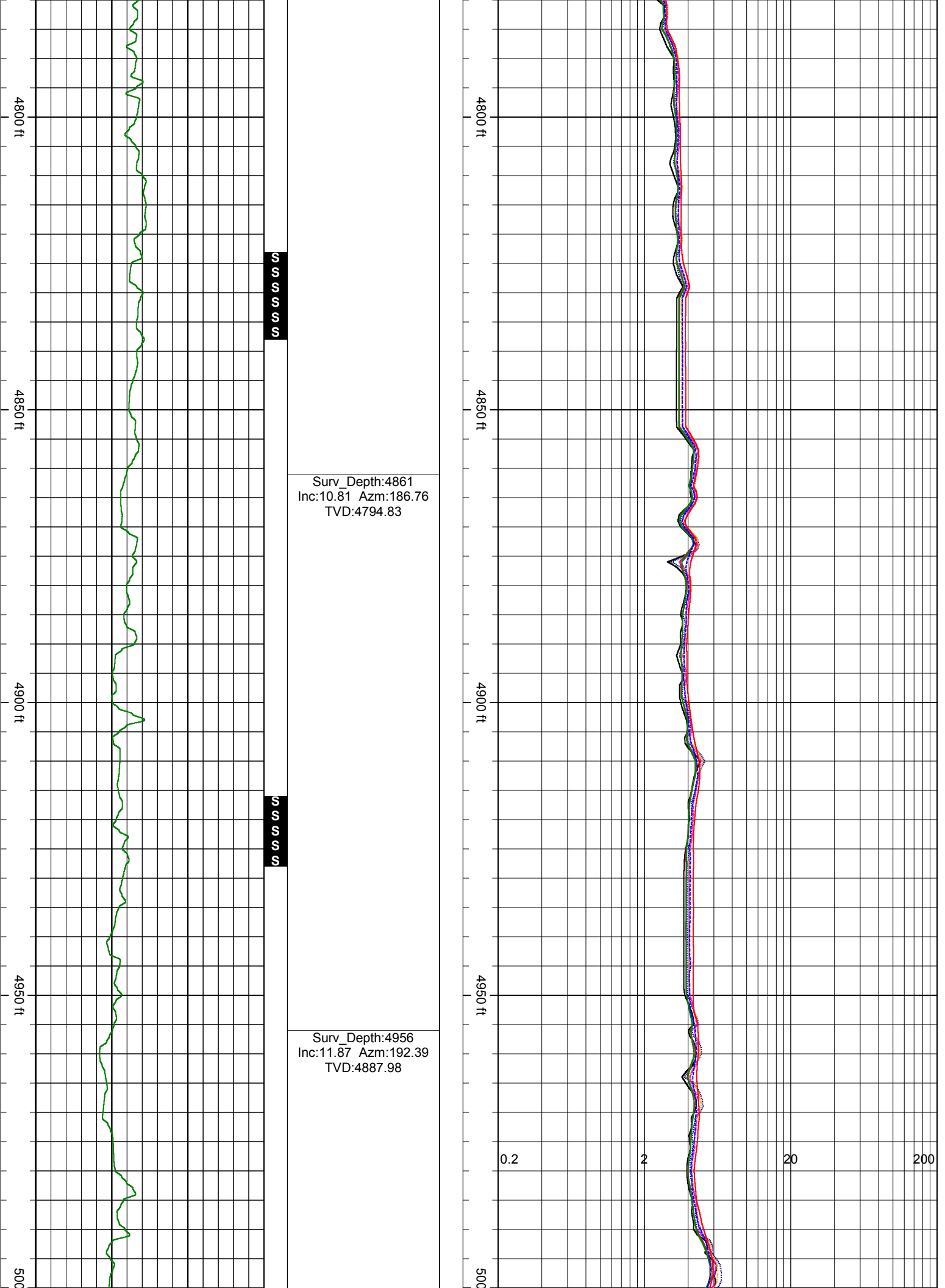


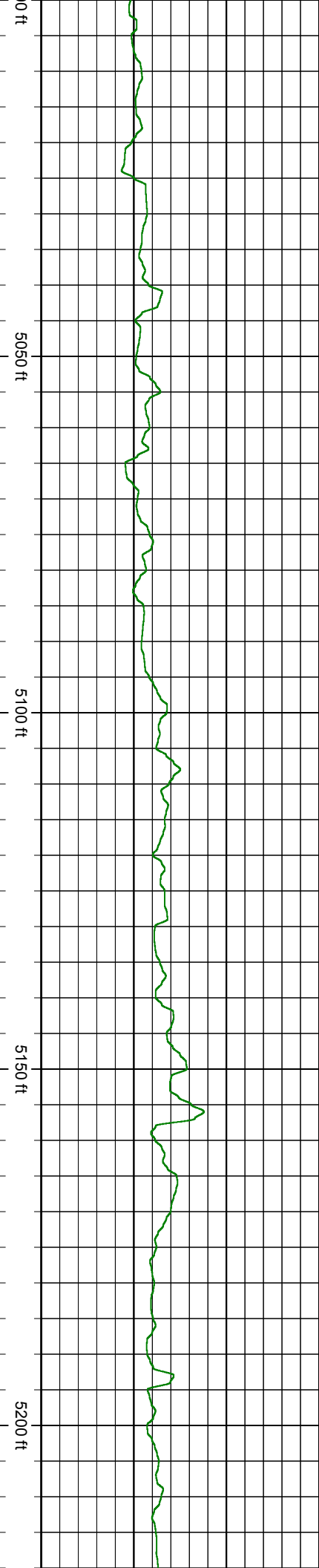
S S S S S S S

Surv\_Depth:4861  
Inc:10.81 Azm:186.76  
TVD:4794.83

S S S S S S S

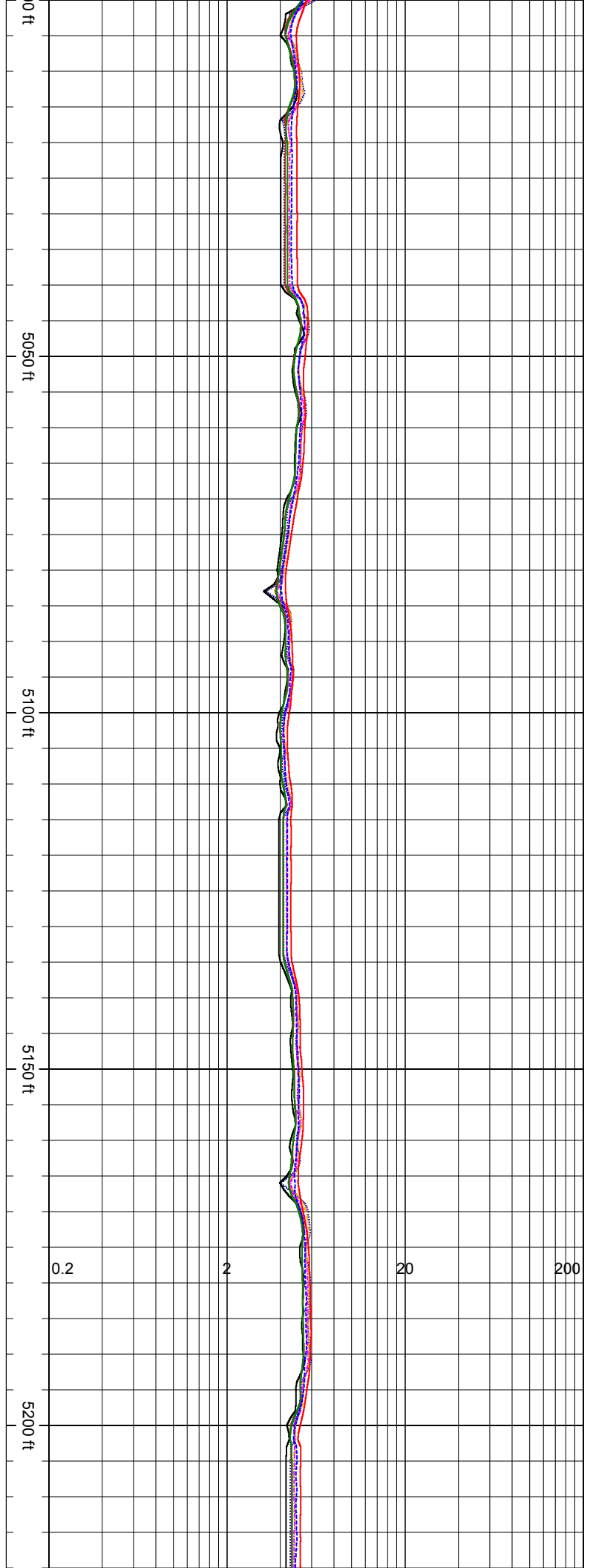
Surv\_Depth:4956  
Inc:11.87 Azm:192.39  
TVD:4887.98





Surv\_Depth:5049  
Inc:11.6 Azm:196.08  
TVD:4979.03

Surv\_Depth:5141  
Inc:11.56 Azm:193.35  
TVD:5069.15



Surv\_Depth:5233  
Inc:10.46 Azm:190.36  
TVD:5159.44

Surv\_Depth:5326  
Inc:8.75 Azm:195.64  
TVD:5251.14

Surv\_Depth:5418  
Inc:9.62 Azm:201.79  
TVD:5341.97

SSSSSS

5250 ft

5300 ft

5350 ft

5400 ft

5250 ft

5300 ft

5350 ft

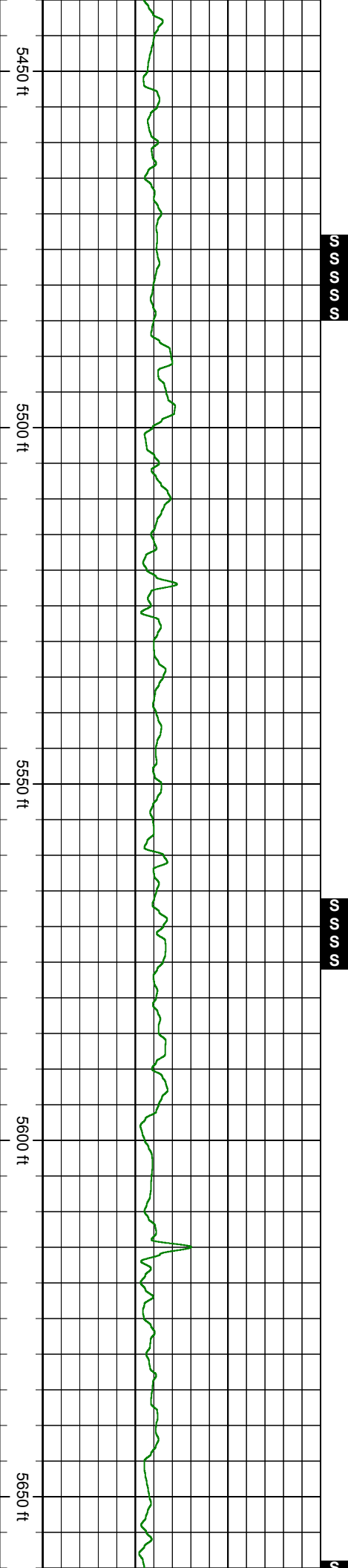
5400 ft

0.2

2

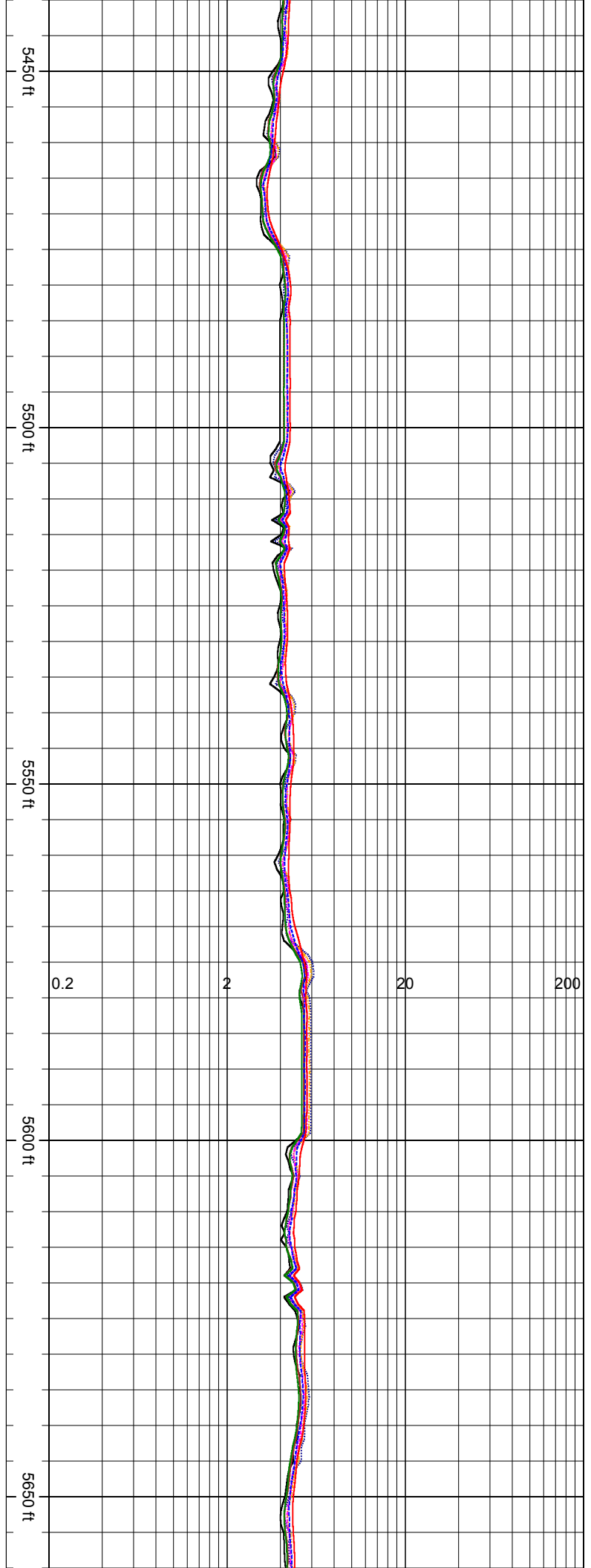
20

200



Surv\_Depth:5511  
Inc:10.11 Azm:205.66  
TVD:5433.6

Surv\_Depth:5604  
Inc:10.59 Azm:200.03  
TVD:5525.09



SSSSSS

Surv\_Depth:5697  
Inc:11.25 Azm:190.72  
TVD:5616.4

SSSSSS

Surv\_Depth:5790  
Inc:9.49 Azm:191.59  
TVD:5707.87

5700 ft

5750 ft

5800 ft

5850 ft

5700 ft

5750 ft

5800 ft

5850 ft

0.2

2

20

200

Surv\_Depth:5883  
Inc:8.88 Azm:185.97  
TVD:5799.68

Surv\_Depth:5976  
Inc:6.77 Azm:185.62  
TVD:5891.8

Surv\_Depth:6070  
Inc:8.04 Azm:183.51  
TVD:5985.01

SSSSSS

5900 ft

5950 ft

6000 ft

6050 ft

6100 ft

5900 ft

5950 ft

6000 ft

6050 ft

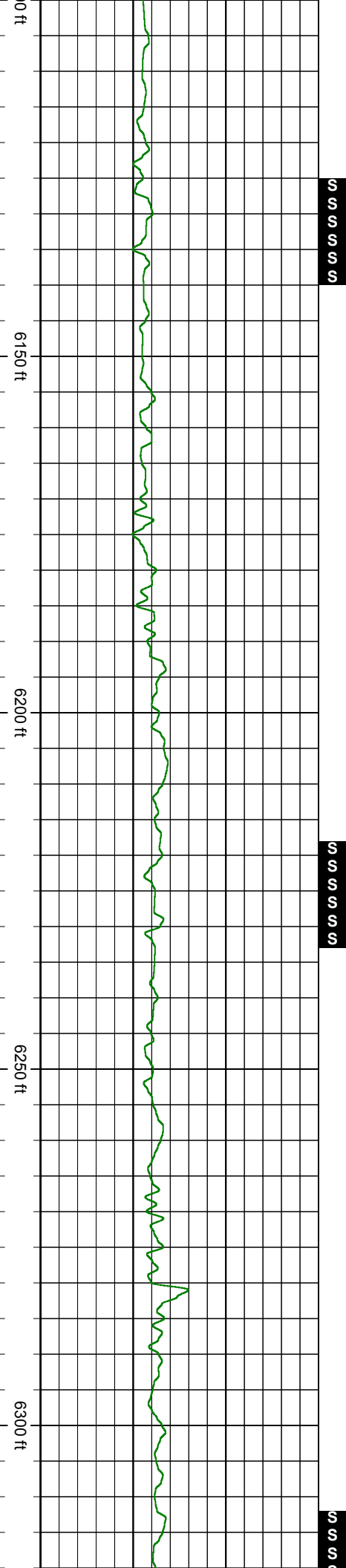
6100 ft

0.2

2

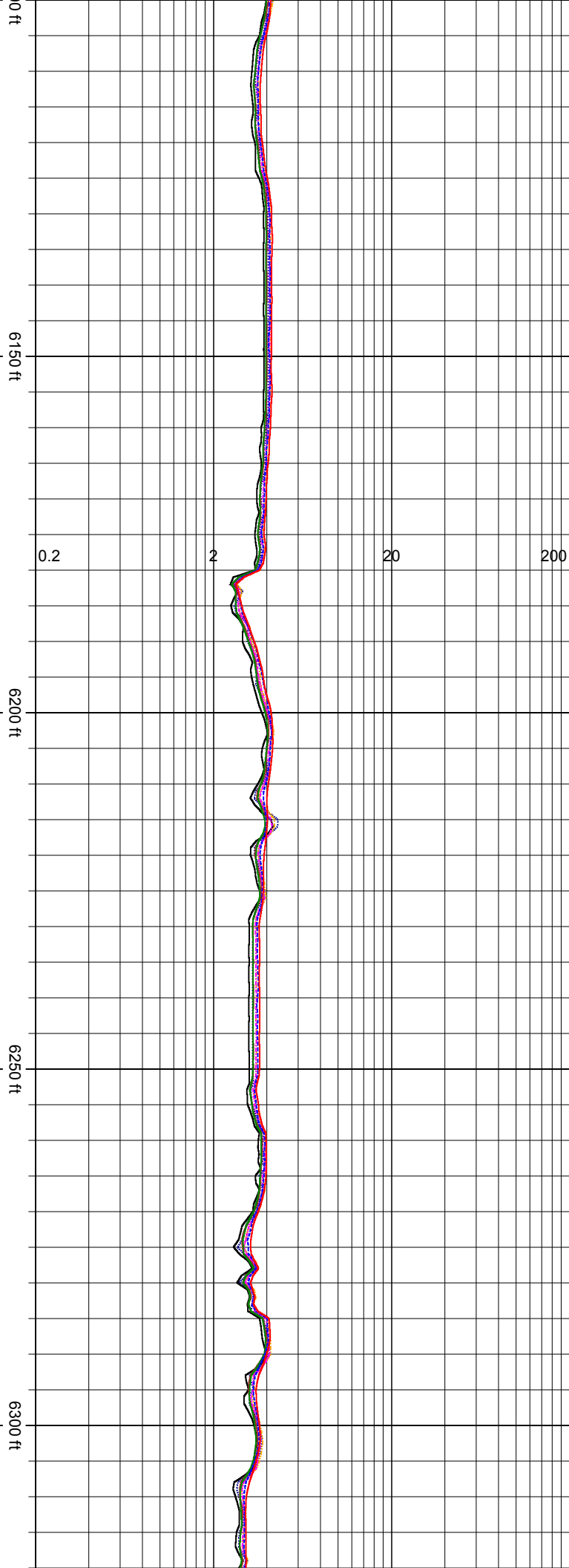
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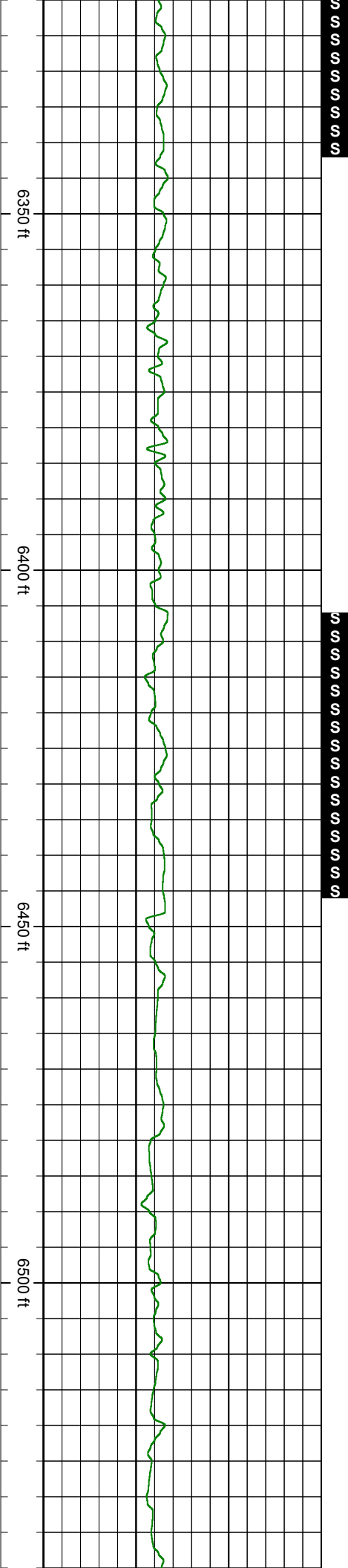
200



Surv\_Depth:6163  
Inc:8.13 Azm:185.18  
TVD:6077.1

Surv\_Depth:6257  
Inc:7.12 Azm:193  
TVD:6170.27

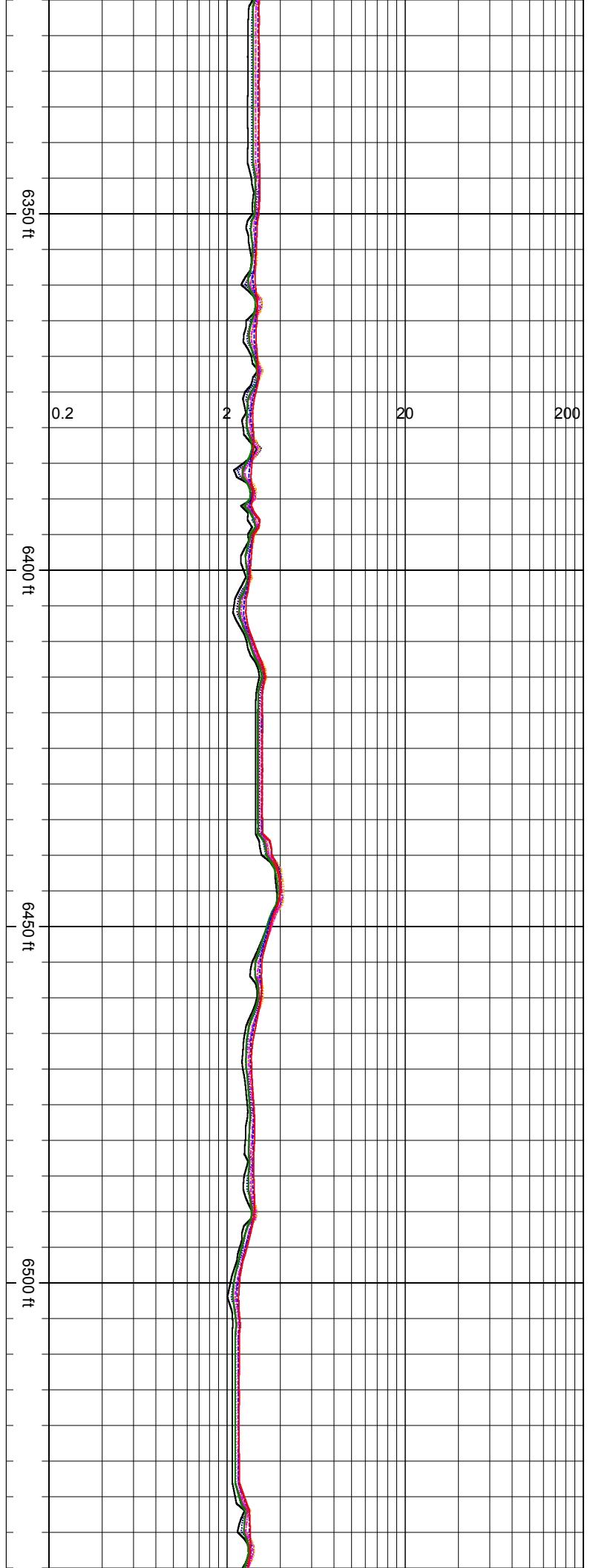




Surv\_Depth:6351  
Inc:7.43 Azm:192.21  
TVD:6263.52

Surv\_Depth:6443  
Inc:10.37 Azm:191.07  
TVD:6354.4

Surv\_Depth:6536  
Inc:8.22 Azm:193.53  
TVD:6465.92

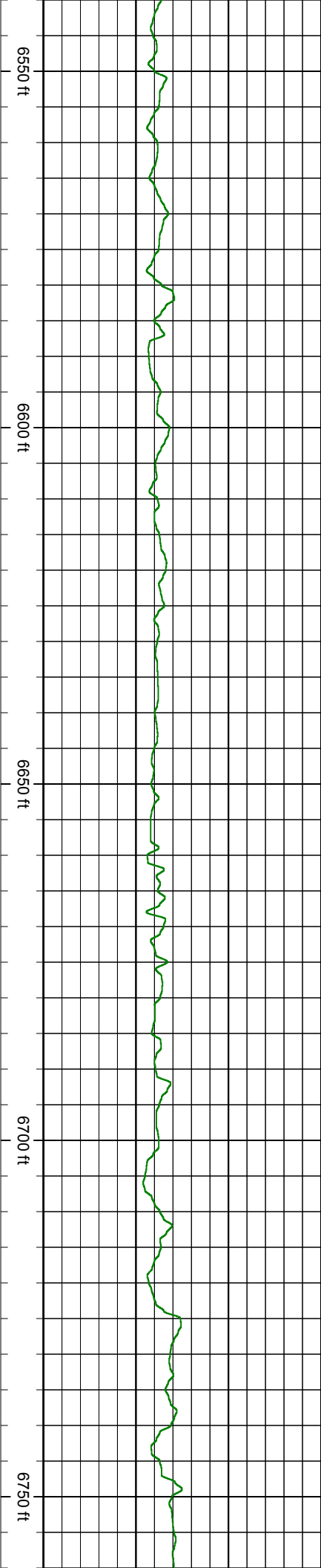




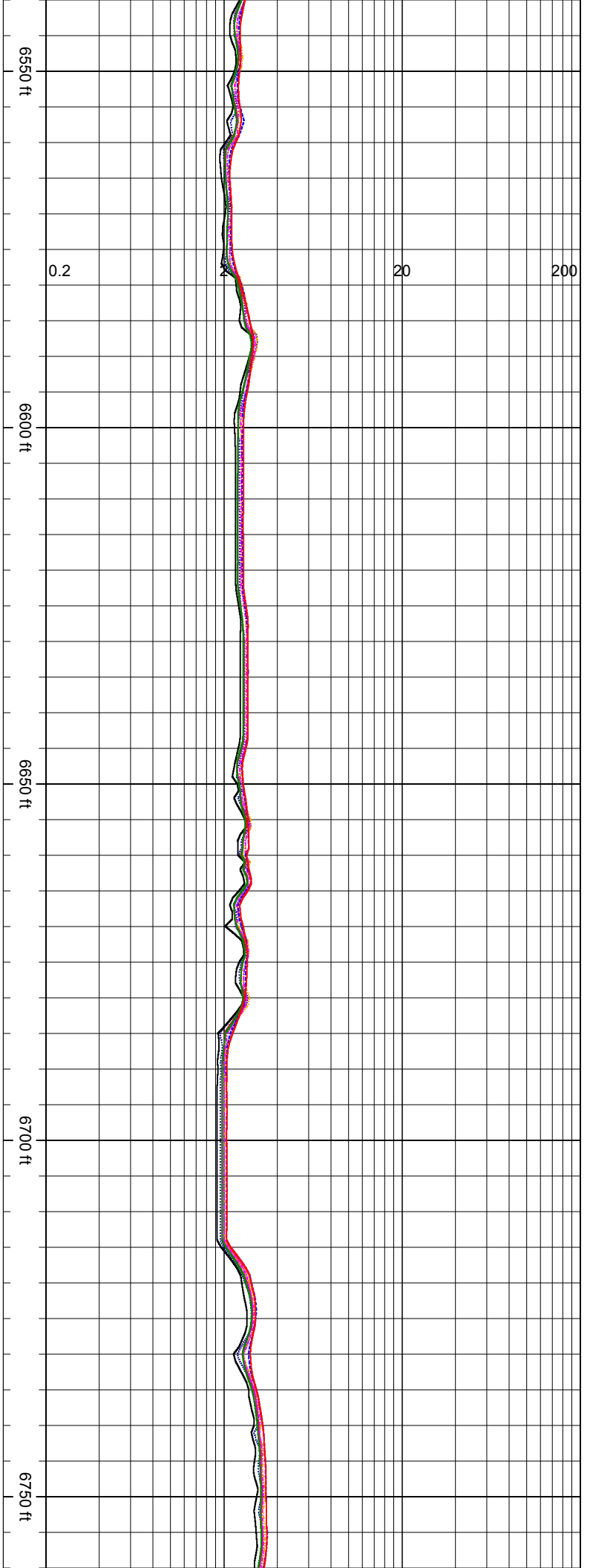
Inc:5.22 Azm:199.99  
TVD:6446.18

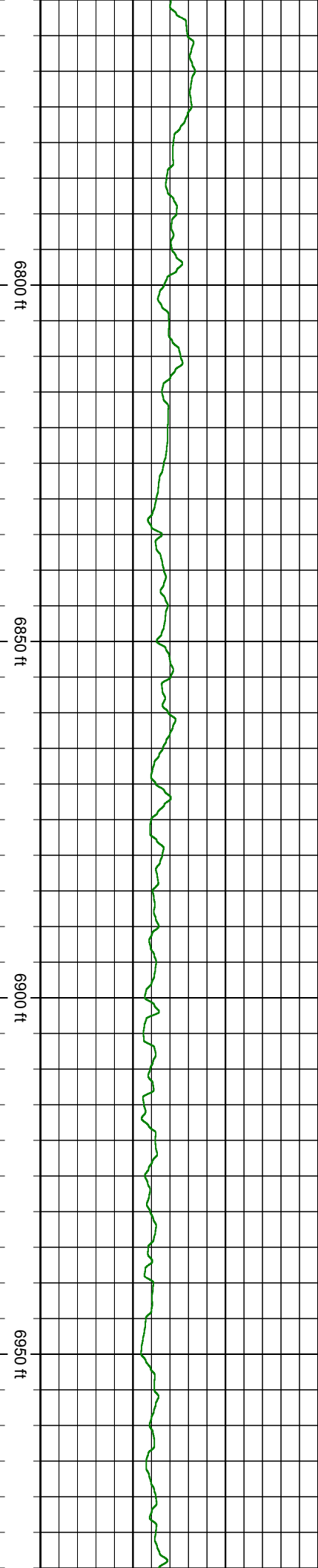
Surv\_Depth:6630  
Inc:5.76 Azm:190.98  
TVD:6539.47

Surv\_Depth:6722  
Inc:5.85 Azm:194.85  
TVD:6631



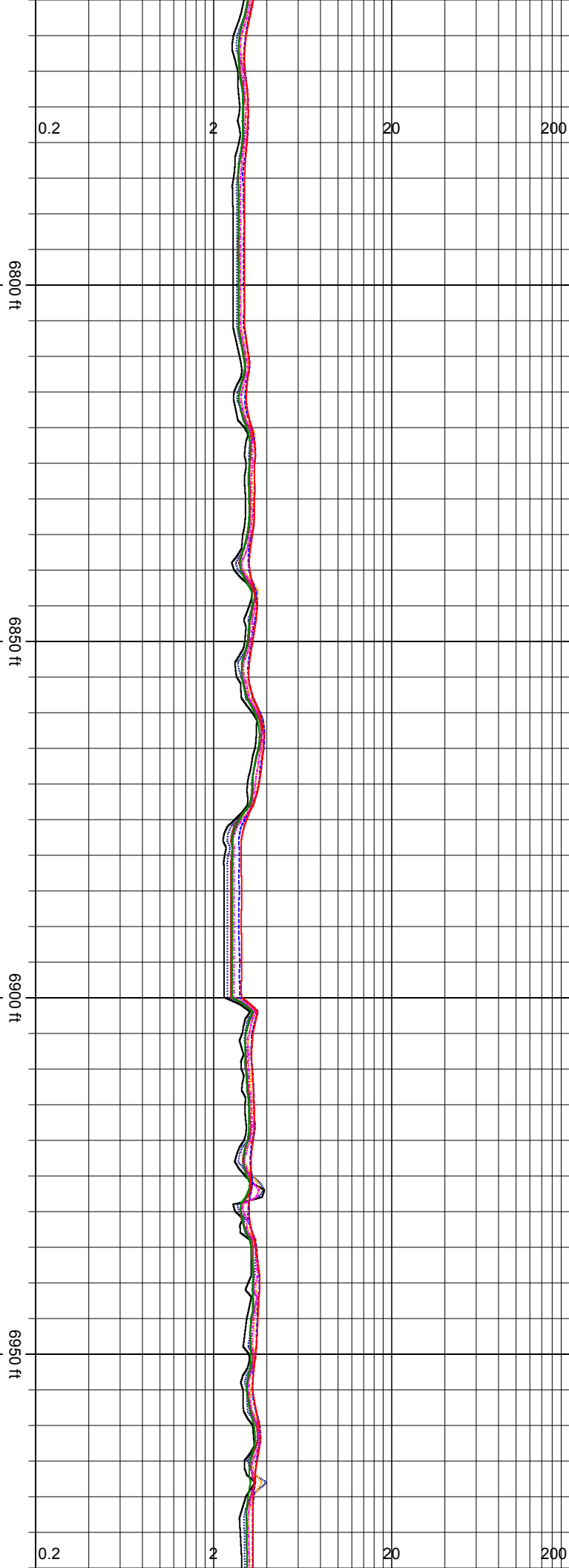
SSSSS

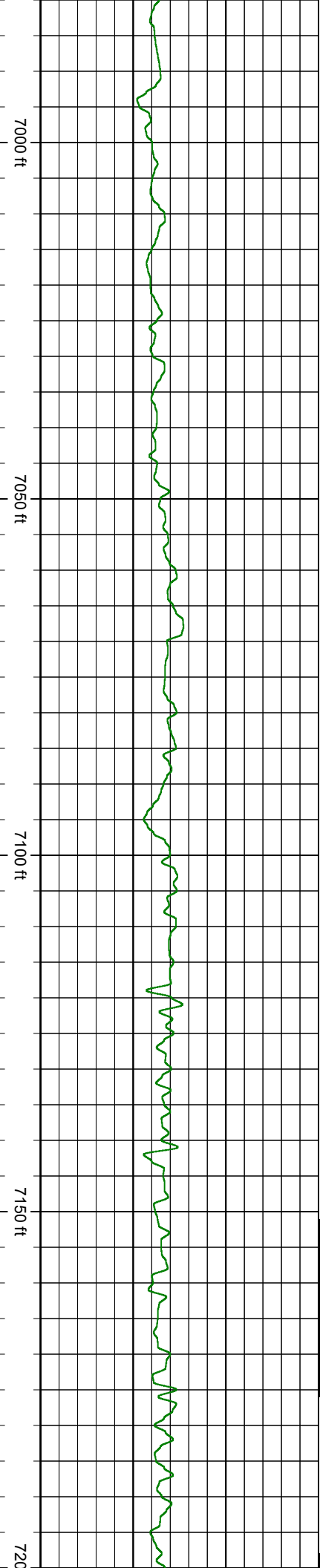




Surv\_Depth:6815  
Inc:4.79 Azm:195.02  
TVD:6723.6

Surv\_Depth:6909  
Inc:3.3 Azm:192.12  
TVD:6817.36



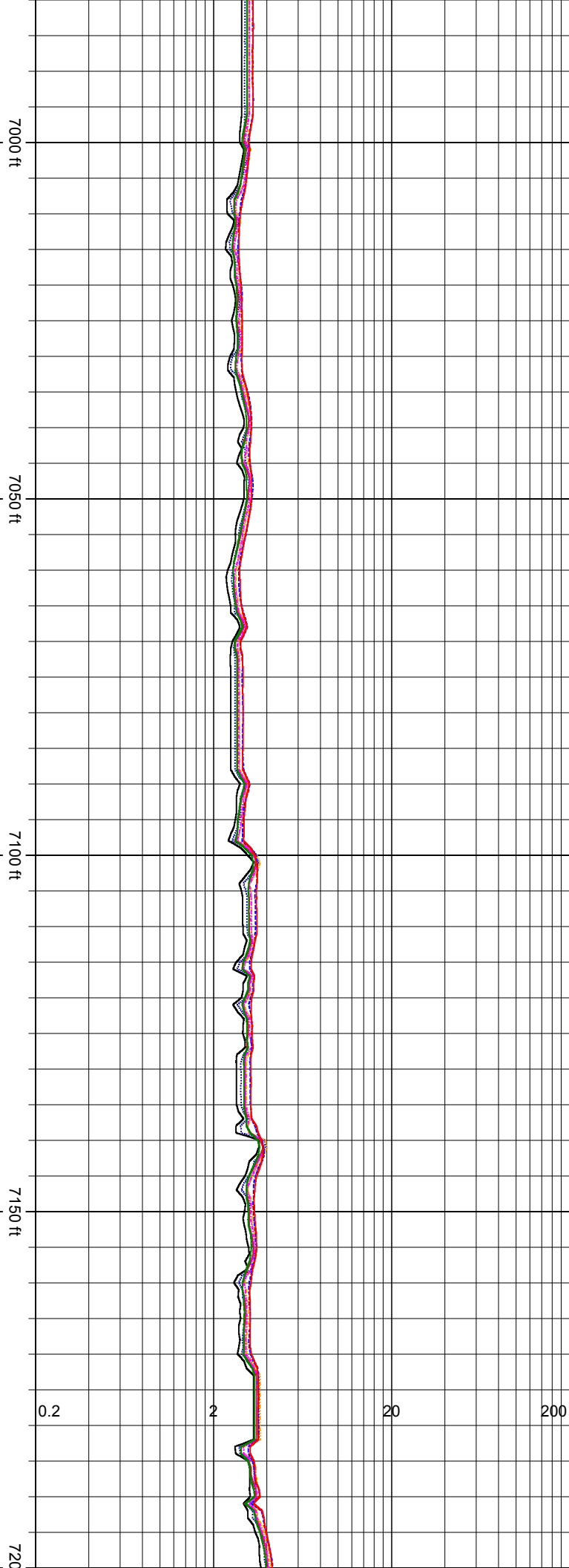


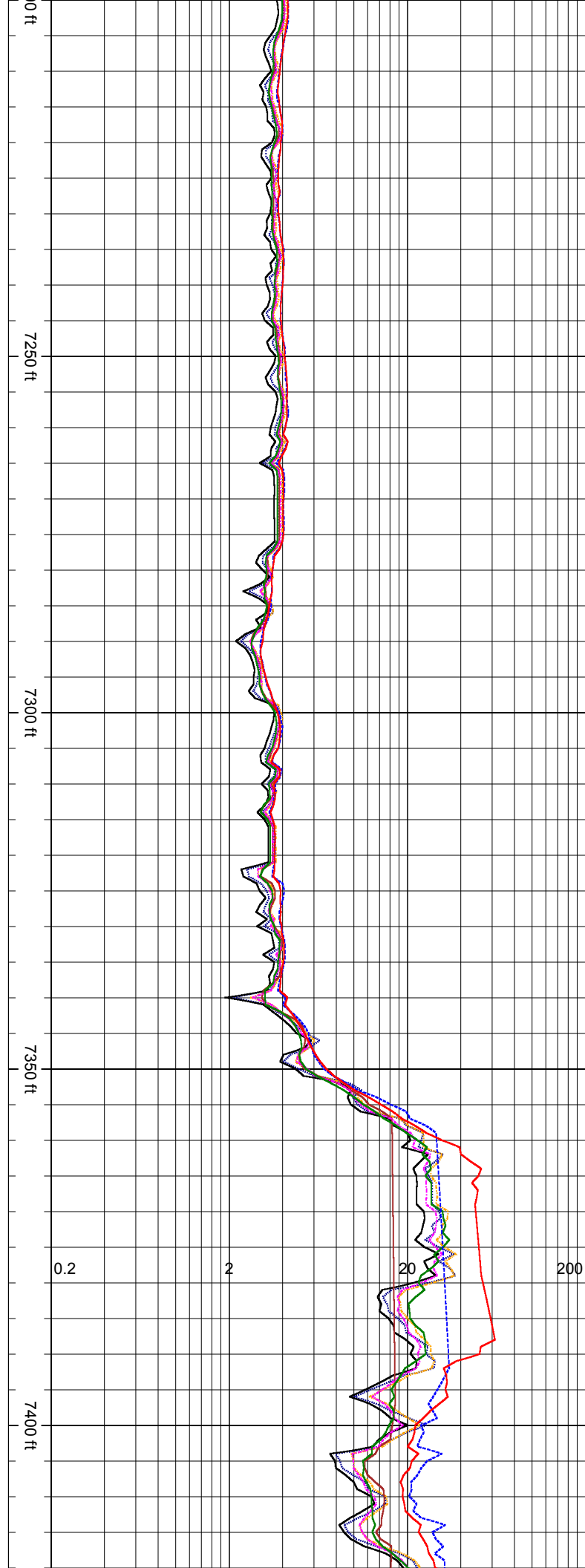
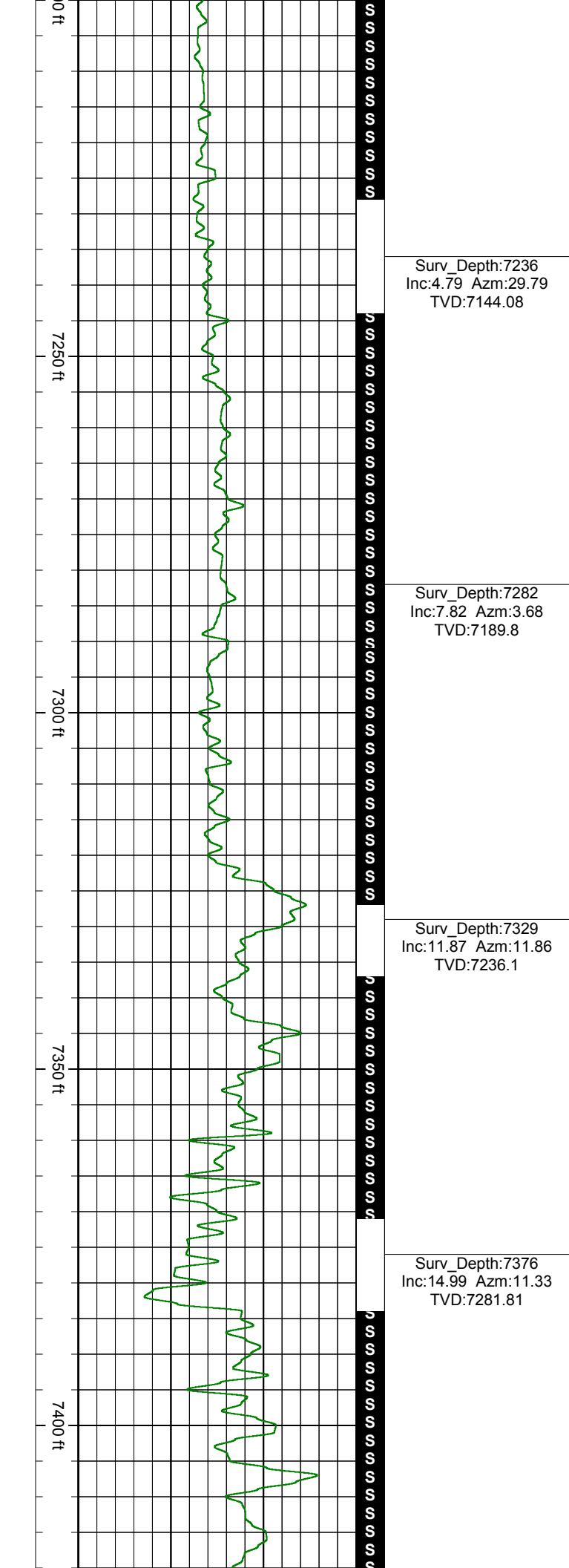
Surv\_Depth:7003  
Inc:2.29 Azm:181.31  
TVD:6911.25

Surv\_Depth:7096  
Inc:1.67 Azm:173.4  
TVD:7004.19

Surv\_Depth:7143  
Inc:1.36 Azm:164.7  
TVD:7051.18

Surv\_Depth:7189  
Inc:2.11 Azm:71.45  
TVD:7097.16





Surv\_Depth:7423  
Inc:19.25 Azm:10.89  
TVD:7326.72

Surv\_Depth:7470  
Inc:23.77 Azm:10.28  
TVD:7370.44

Surv\_Depth:7564  
Inc:34.37 Azm:8.25  
TVD:7452.46

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7450 ft

7500 ft

7550 ft

7600 ft

7450 ft

7500 ft

7550 ft

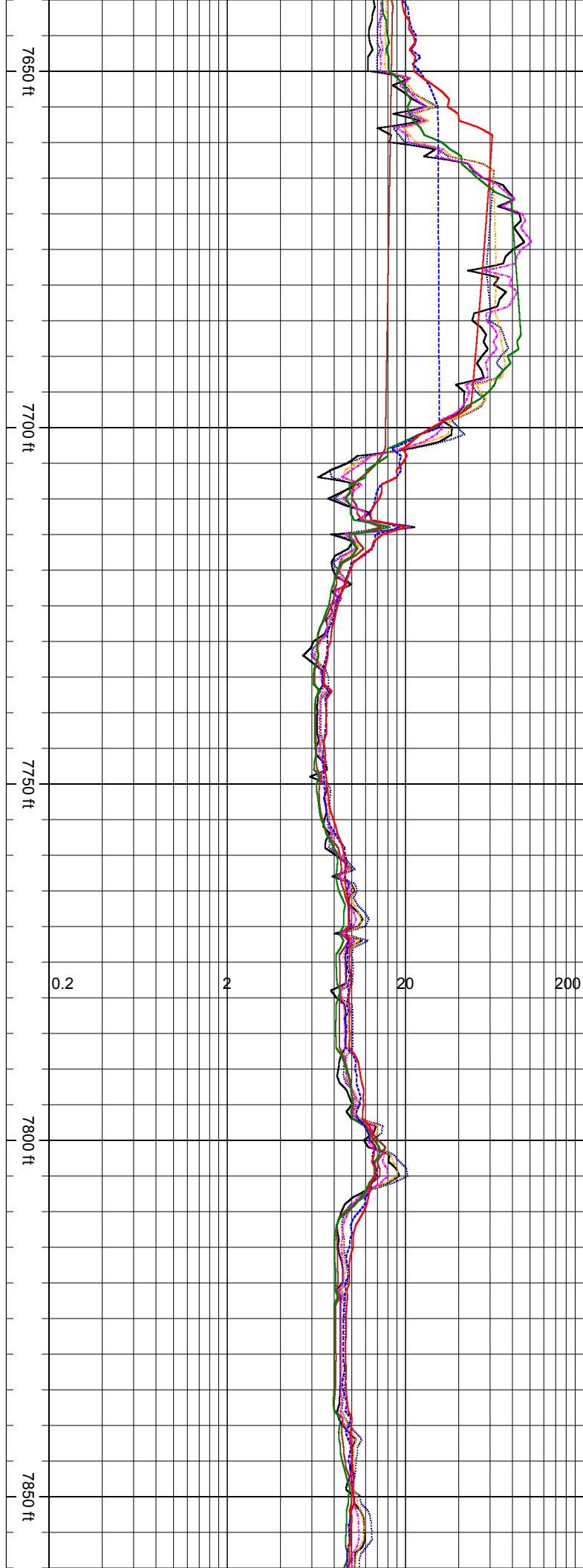
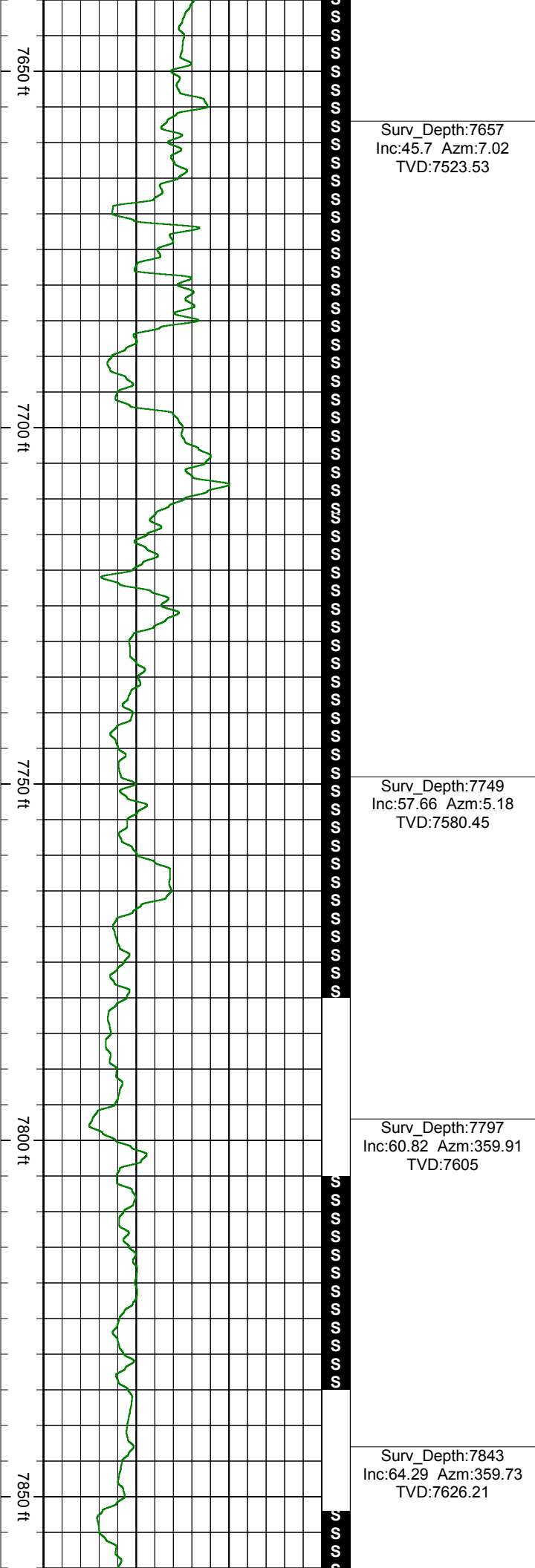
7600 ft

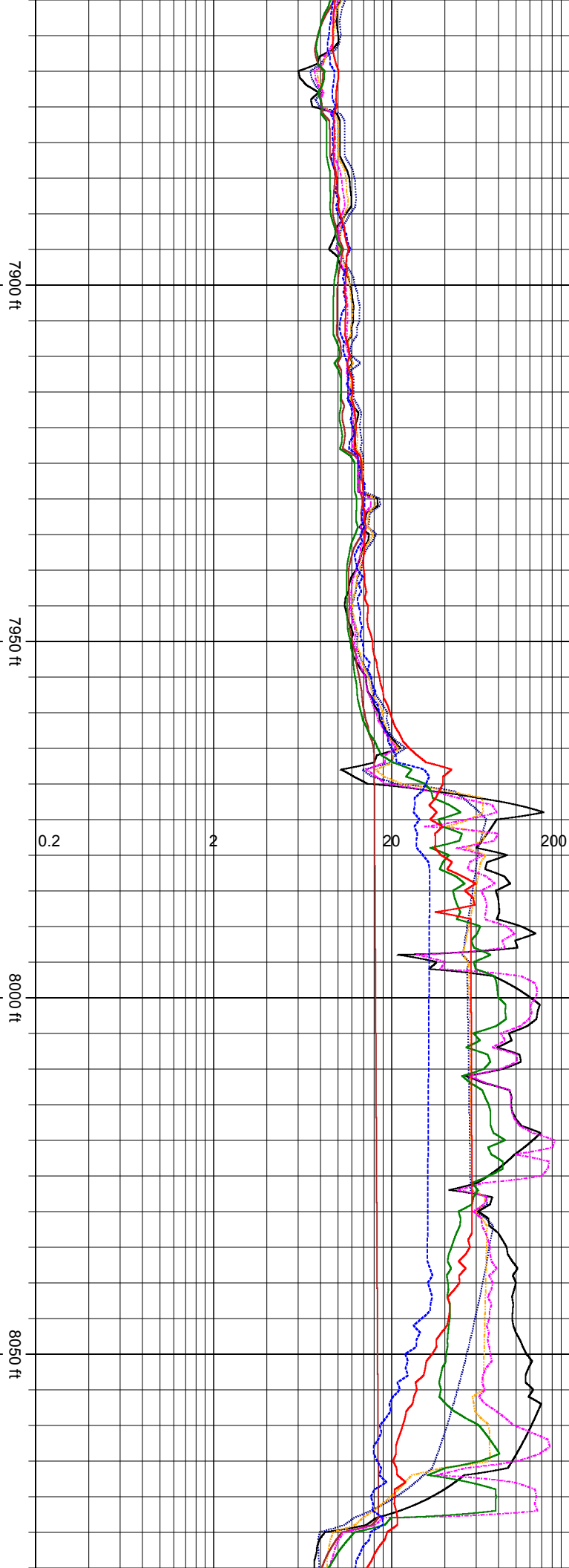
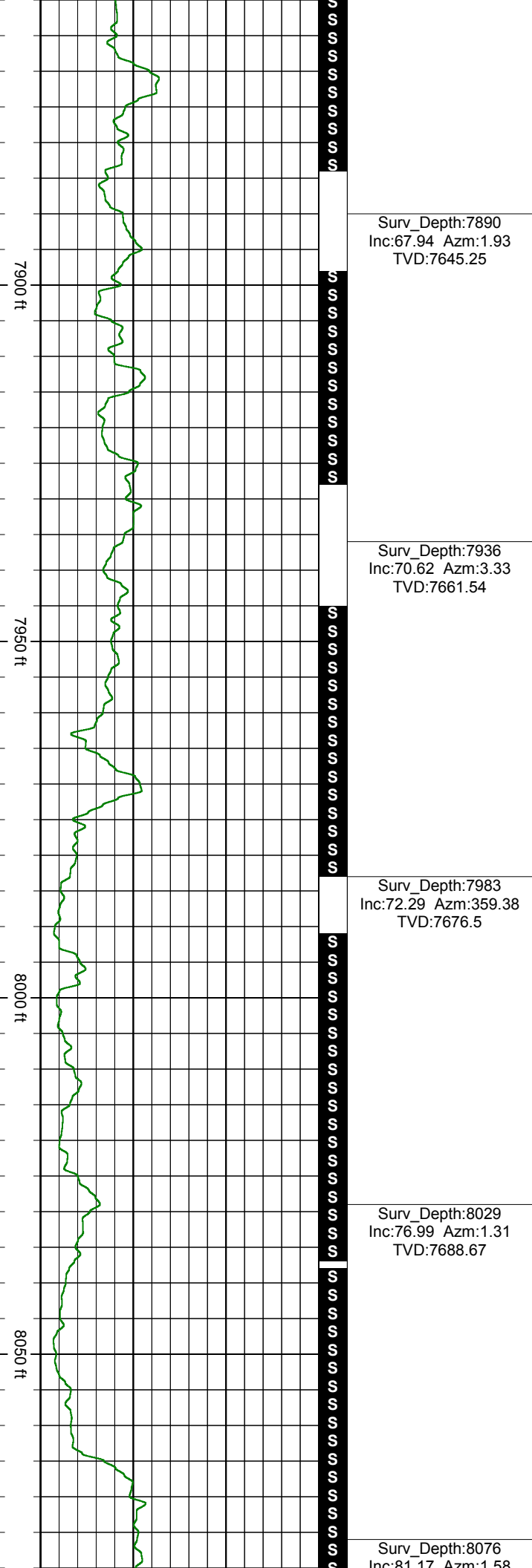
0.2

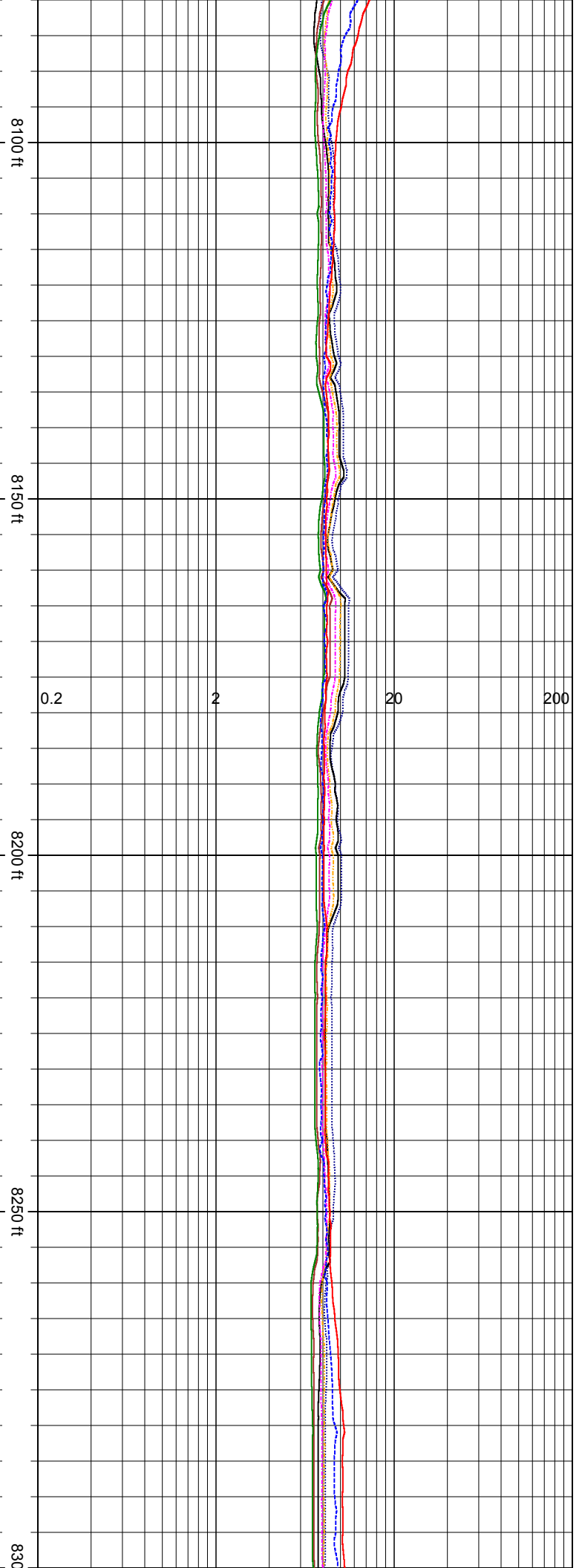
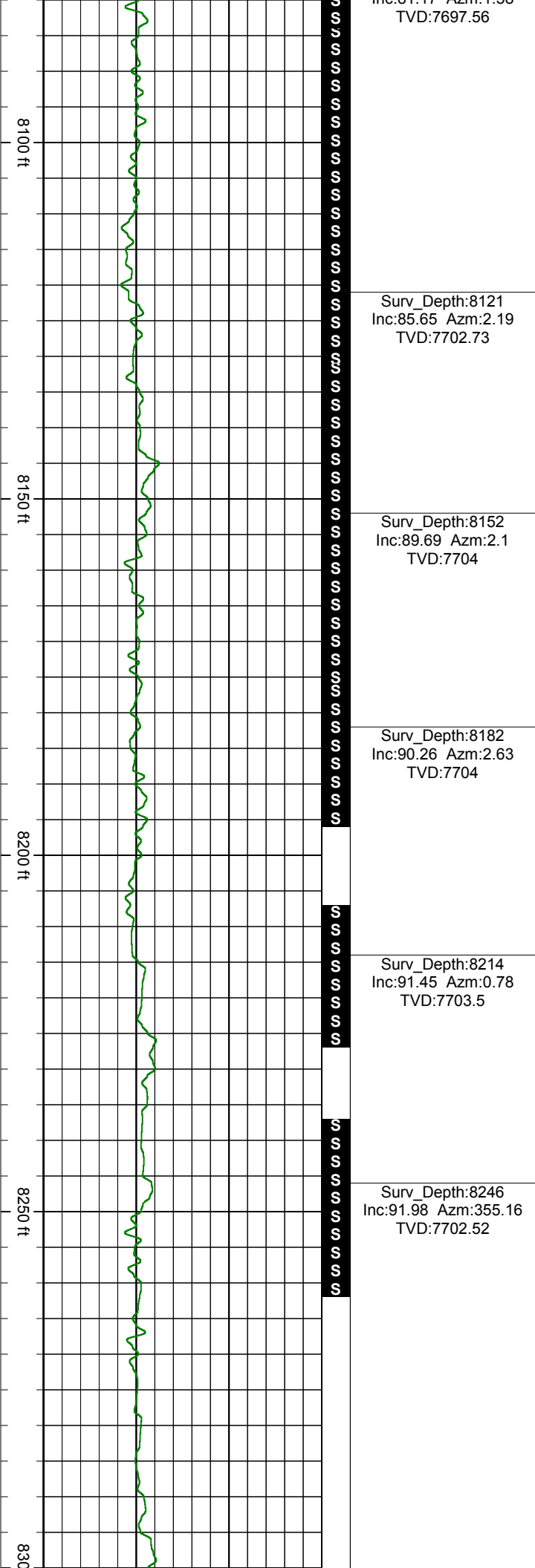
2

20

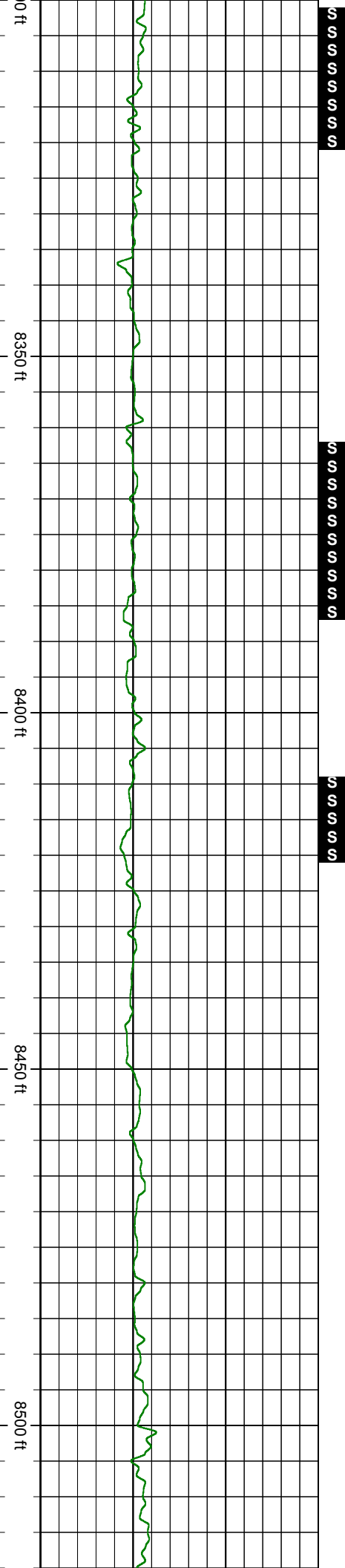
200









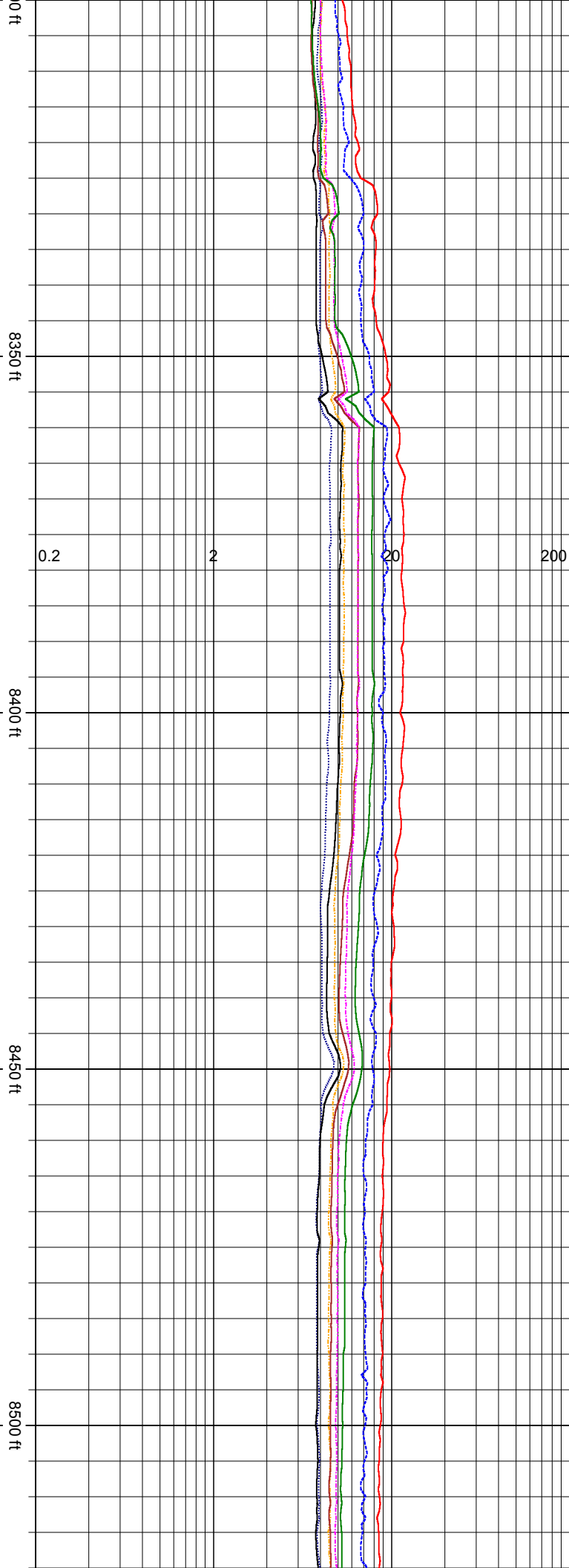


Surv\_Depth:8307  
Inc:93.47 Azm:355.6  
TVD:7699.59

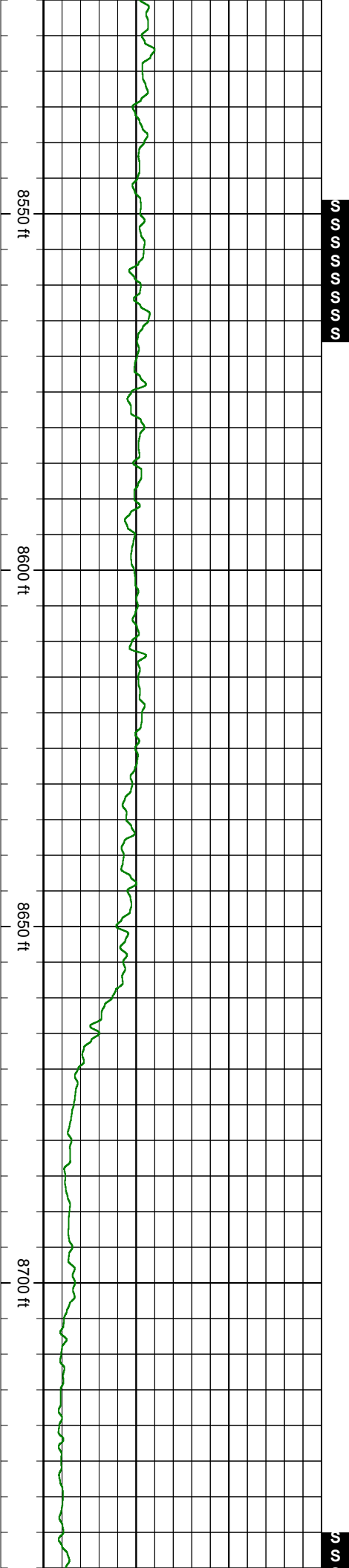
Surv\_Depth:8354  
Inc:92.64 Azm:353.31  
TVD:7697.09

Surv\_Depth:8400  
Inc:90.35 Azm:352.87  
TVD:7695.89

Surv\_Depth:8493  
Inc:89.87 Azm:351.64  
TVD:7695.65

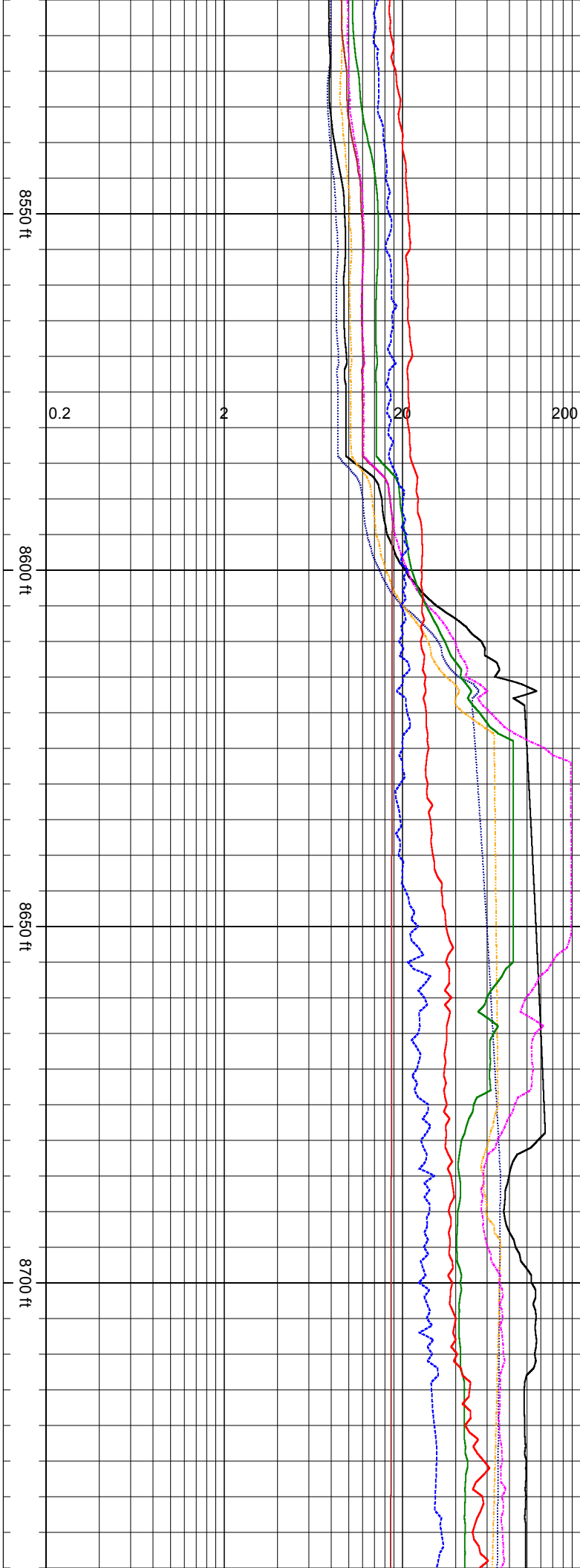


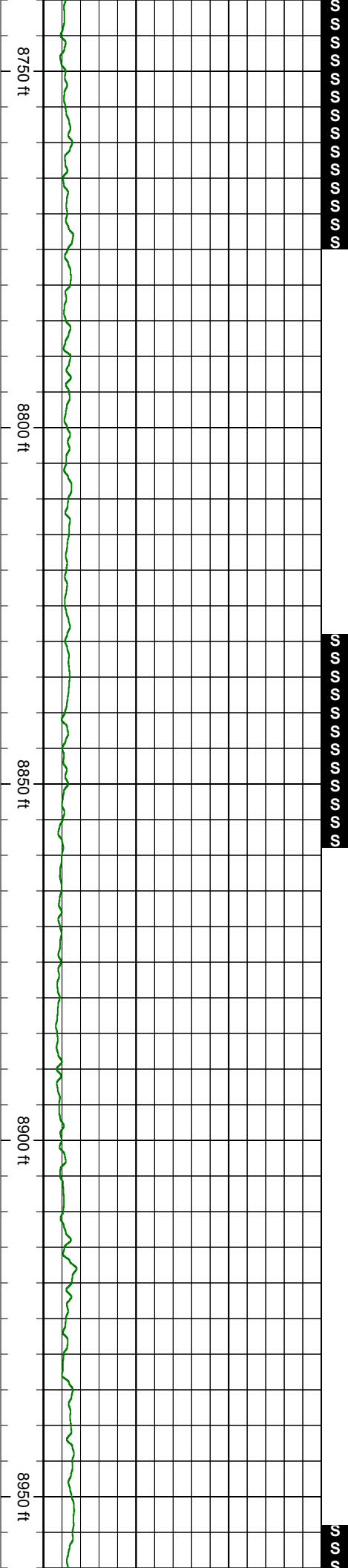
0.2 2 20 200



Surv\_Depth:8587  
Inc:91.06 Azm:354.37  
TVD:7694.83

Surv\_Depth:8680  
Inc:92.2 Azm:352.52  
TVD:7692.15



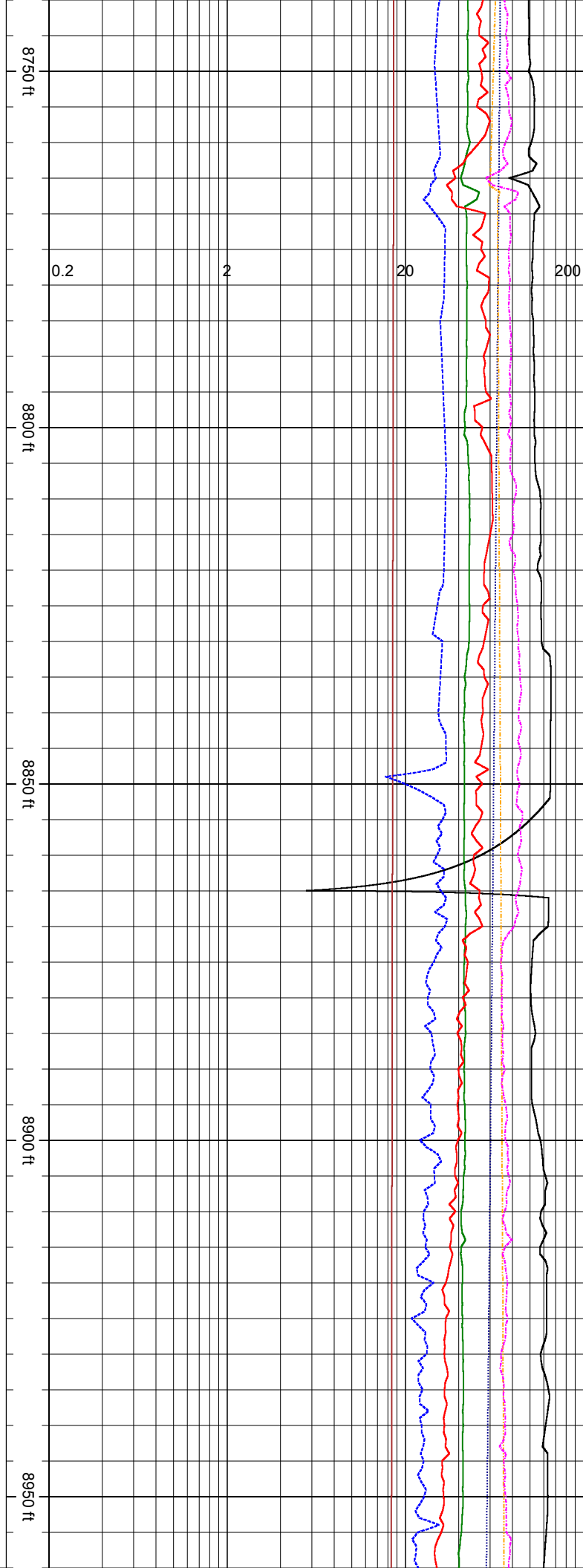


Surv\_Depth:8774  
Inc:89.87 Azm:354.02  
TVD:7690.42

Surv\_Depth:8868  
Inc:87.67 Azm:358.06  
TVD:7692.39

Surv\_Depth:8899  
Inc:88.11 Azm:356.65  
TVD:7693.53

Surv\_Depth:8935  
Inc:88.86 Azm:359.11  
TVD:7694.47

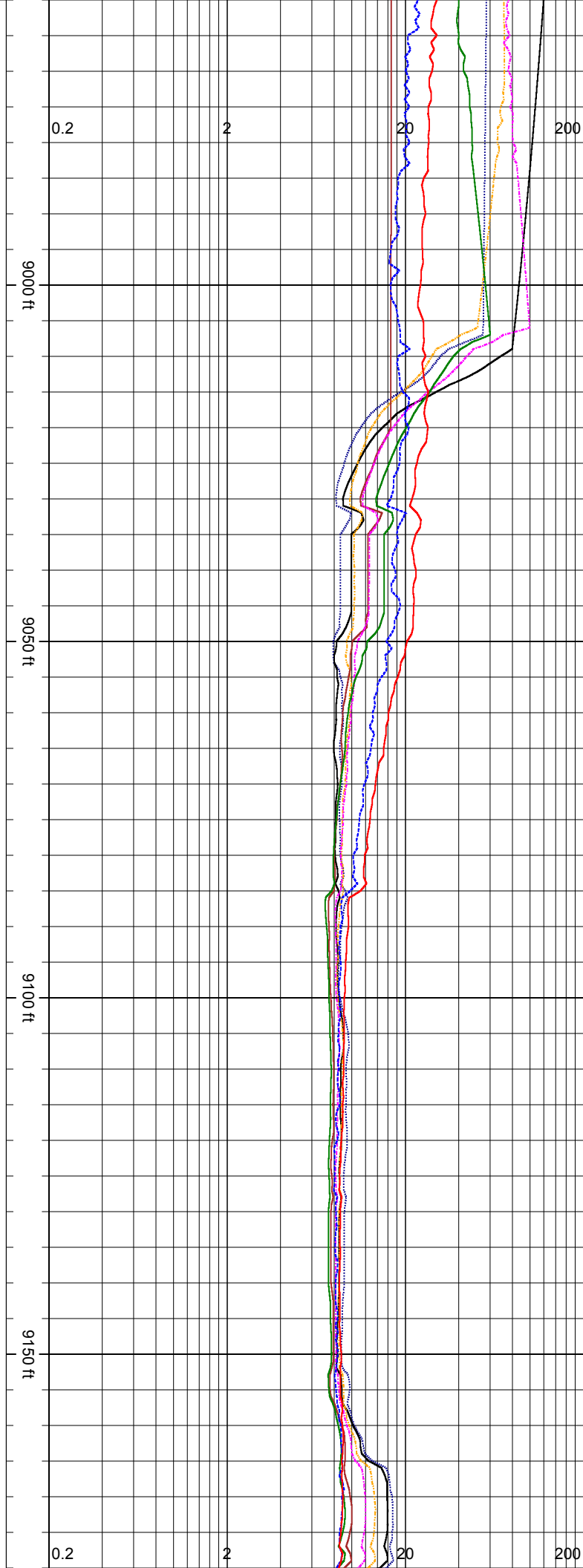
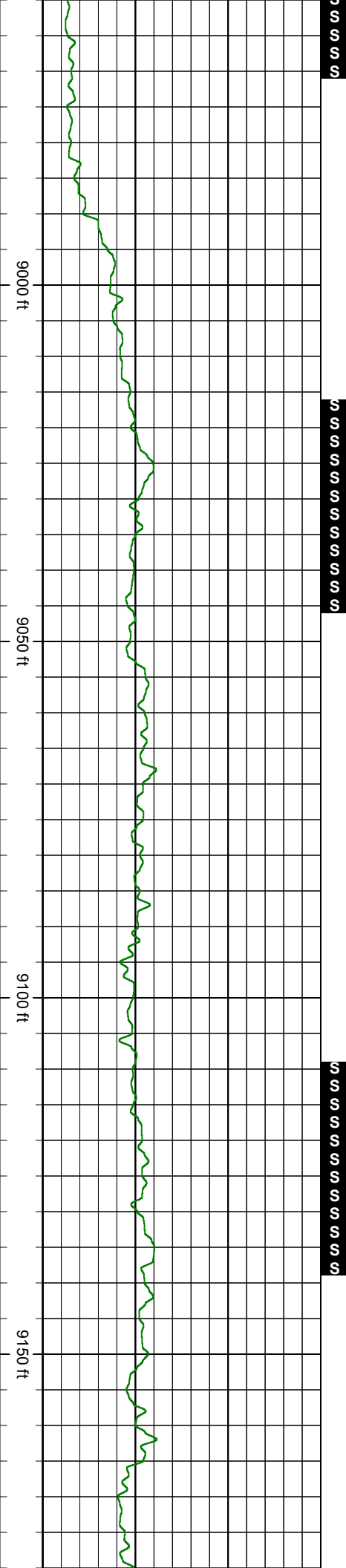


Surv\_Depth:8961  
Inc:88.64 Azm:357.53  
TVD:7695.04

February 21, 2016

Surv\_Depth:9054  
Inc:85.61 Azm:358.85  
TVD:7699.74

Surv\_Depth:9146  
Inc:87.32 Azm:2.89  
TVD:7705.44



Surv\_Depth:9239  
Inc:89.74 Azm:5.27  
TVD:7707.88

Surv\_Depth:9332  
Inc:91.27 Azm:6.5  
TVD:7707.07

9200 ft

9250 ft

9300 ft

9350 ft

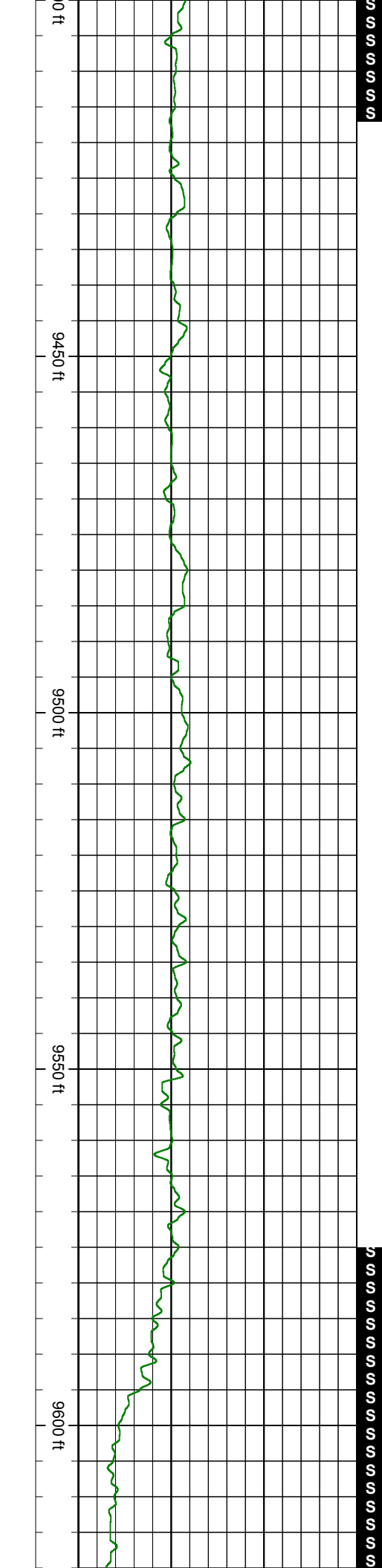
9400 ft

0.2

2

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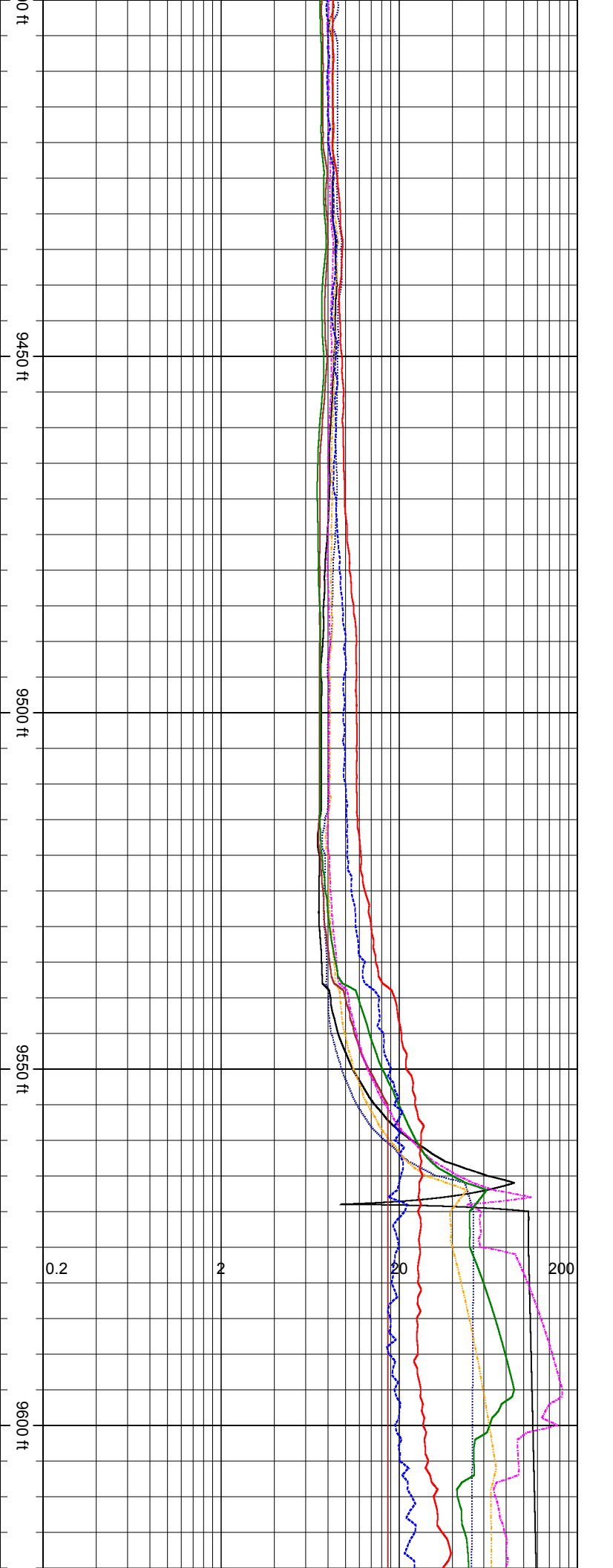
200



Surv\_Depth:9427  
Inc:91.06 Azm:3.42  
TVD:7705.08

Surv\_Depth:9520  
Inc:92.9 Azm:0.78  
TVD:7701.83

Surv\_Depth:9614  
Inc:91.8 Azm:3.07  
TVD:7707.08



TVD:7697.98

Surv\_Depth:9706  
Inc:89.43 Azm:4.3  
TVD:7697.01

Surv\_Depth:9799  
Inc:89.39 Azm:2.89  
TVD:7697.99

9650 ft

9700 ft

9750 ft

9800 ft

9650 ft

9700 ft

9750 ft

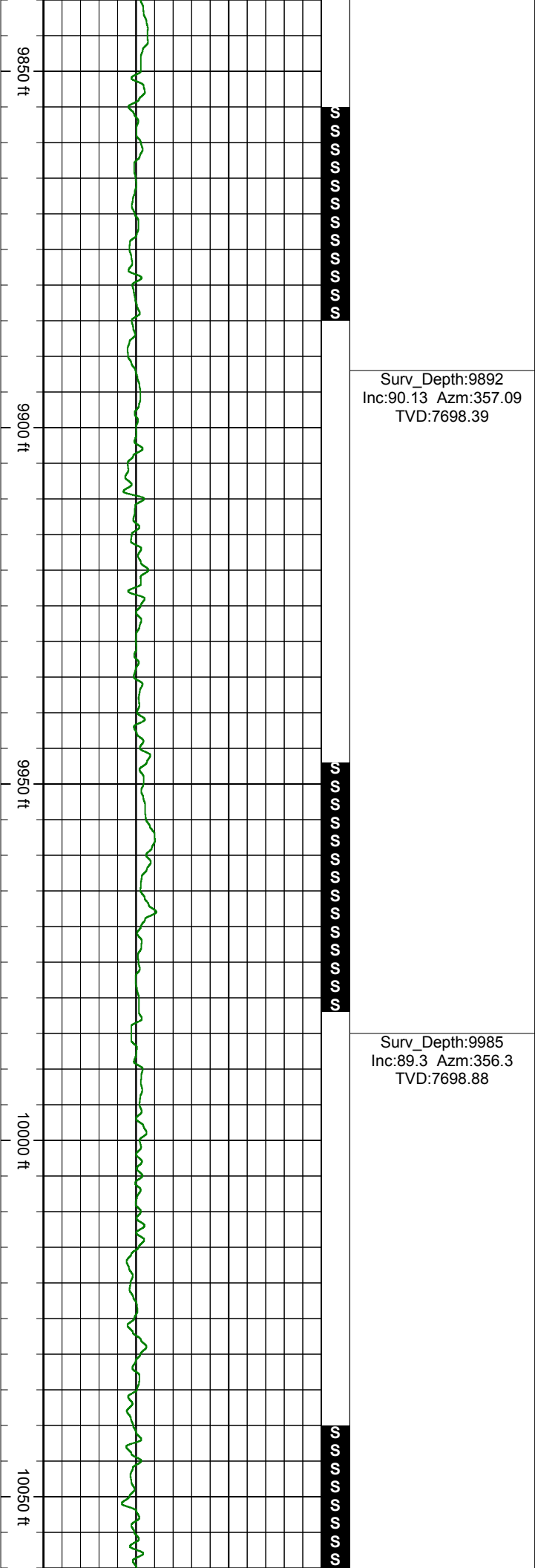
9800 ft

0.2

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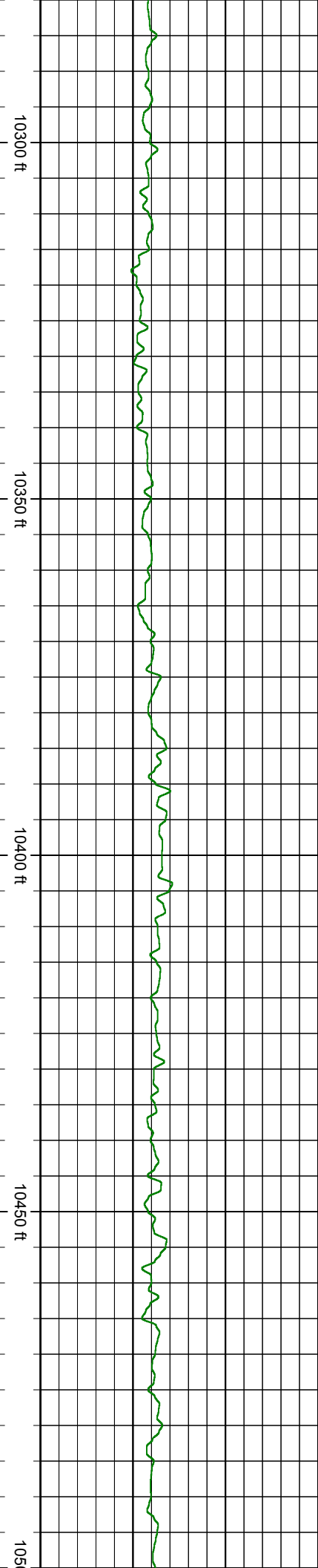
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200









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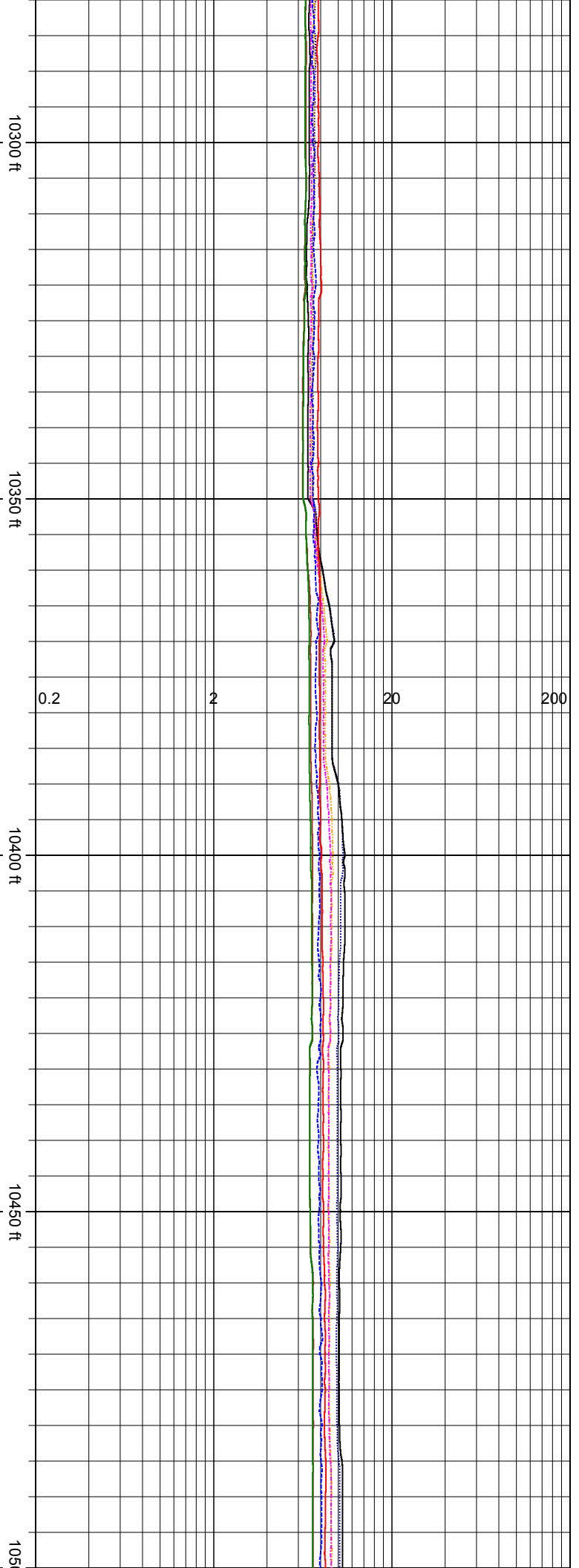
Surv\_Depth:10310  
Inc:89.25 Azm:353.58  
TVD:7711.53

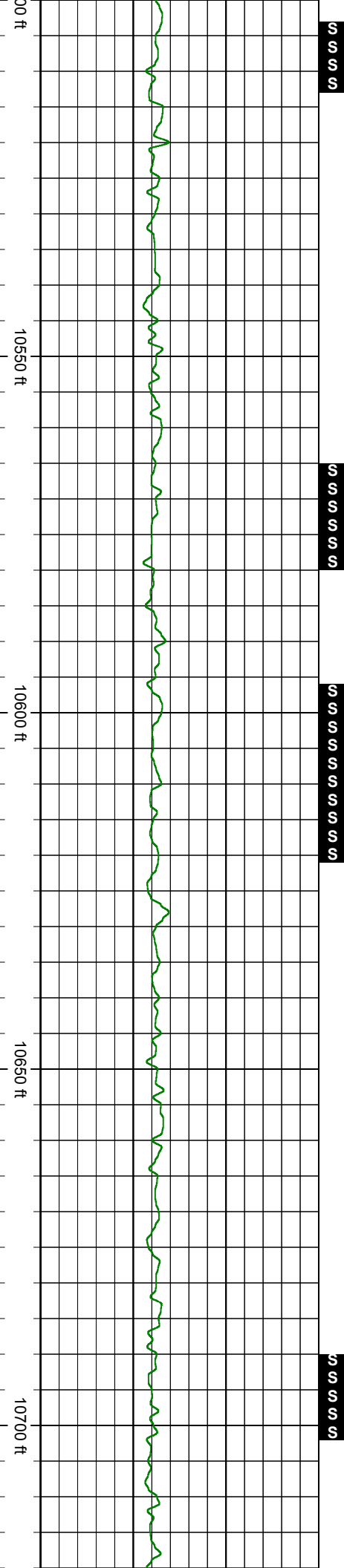
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Surv\_Depth:10356  
Inc:88.55 Azm:357.53  
TVD:7712.37

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Surv\_Depth:10448  
Inc:87.63 Azm:357.09  
TVD:7715.42



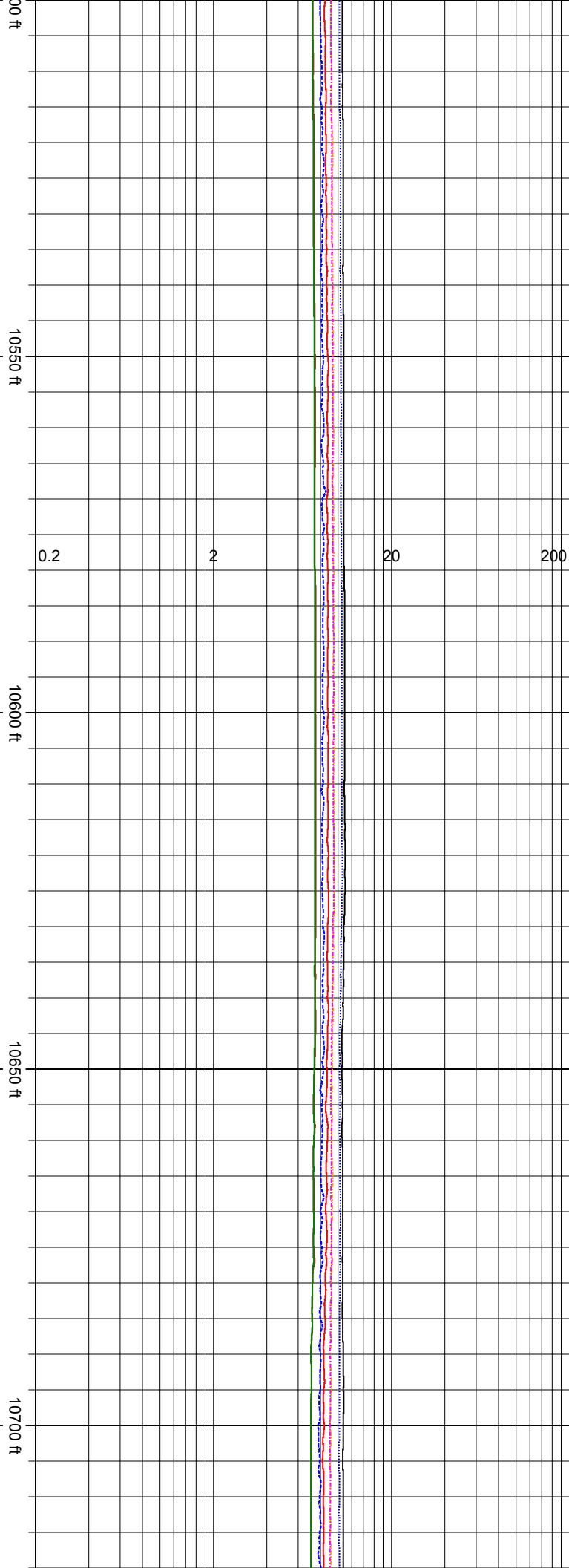


Surv\_Depth:10510  
Inc:88.95 Azm:358.94  
TVD:7717.31

Surv\_Depth:10541  
Inc:89.56 Azm:0.43  
TVD:7717.72

Surv\_Depth:10635  
Inc:91.71 Azm:0.26  
TVD:7716.65

Surv\_Depth:10682  
Inc:92.33 Azm:0.52  
TVD:7715.01



Surv\_Depth:10728  
Inc:91.93 Azm:2.19  
TVD:7713.33

Surv\_Depth:10821  
Inc:91.58 Azm:4.65  
TVD:7710.49

Surv\_Depth:10853  
Inc:92.2 Azm:4.91  
TVD:7709.42

Surv\_Depth:10915  
Inc:89.6 Azm:3.16  
TVD:7708.45

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10750 ft

0.2

2

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200

10800 ft

10850 ft

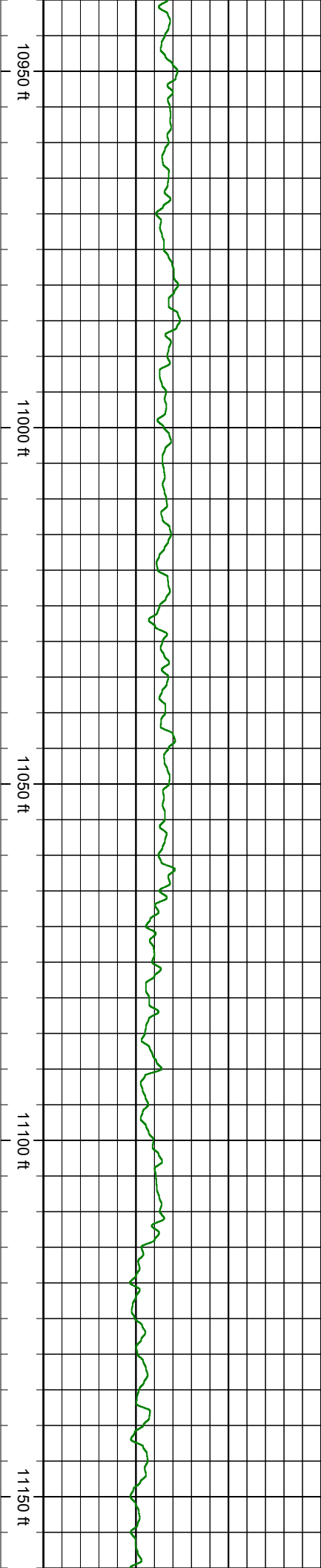
10900 ft

10750 ft

10800 ft

10850 ft

10900 ft

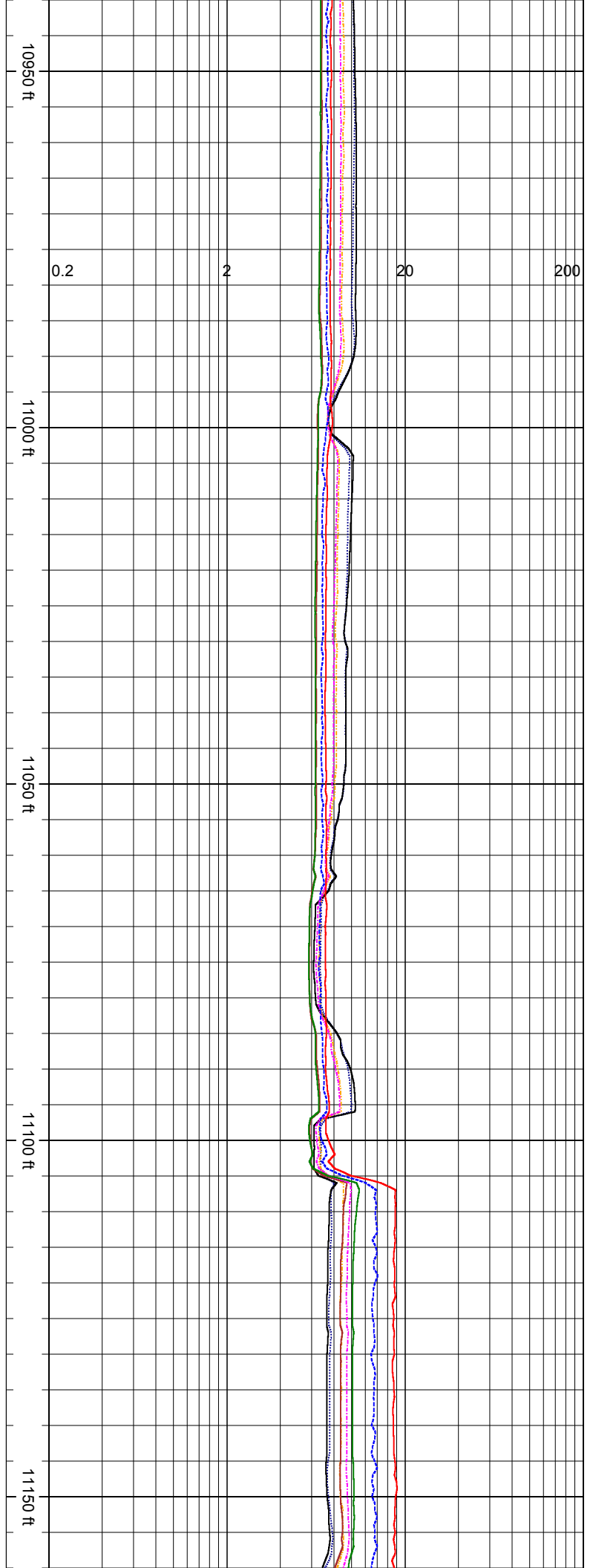


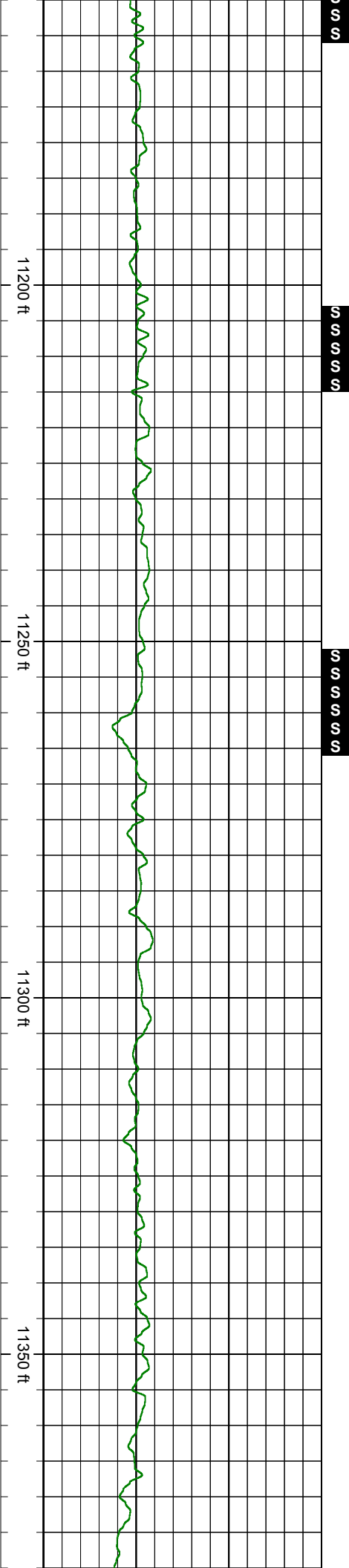
Surv\_Depth:11009  
Inc:90.18 Azm:3.33  
TVD:7708.62

Surv\_Depth:11056  
Inc:90.92 Azm:5.97  
TVD:7708.16

Surv\_Depth:11101  
Inc:91.63 Azm:4.91  
TVD:7707.18

Surv\_Depth:11148  
Inc:91.14 Azm:3.77  
TVD:7706.07





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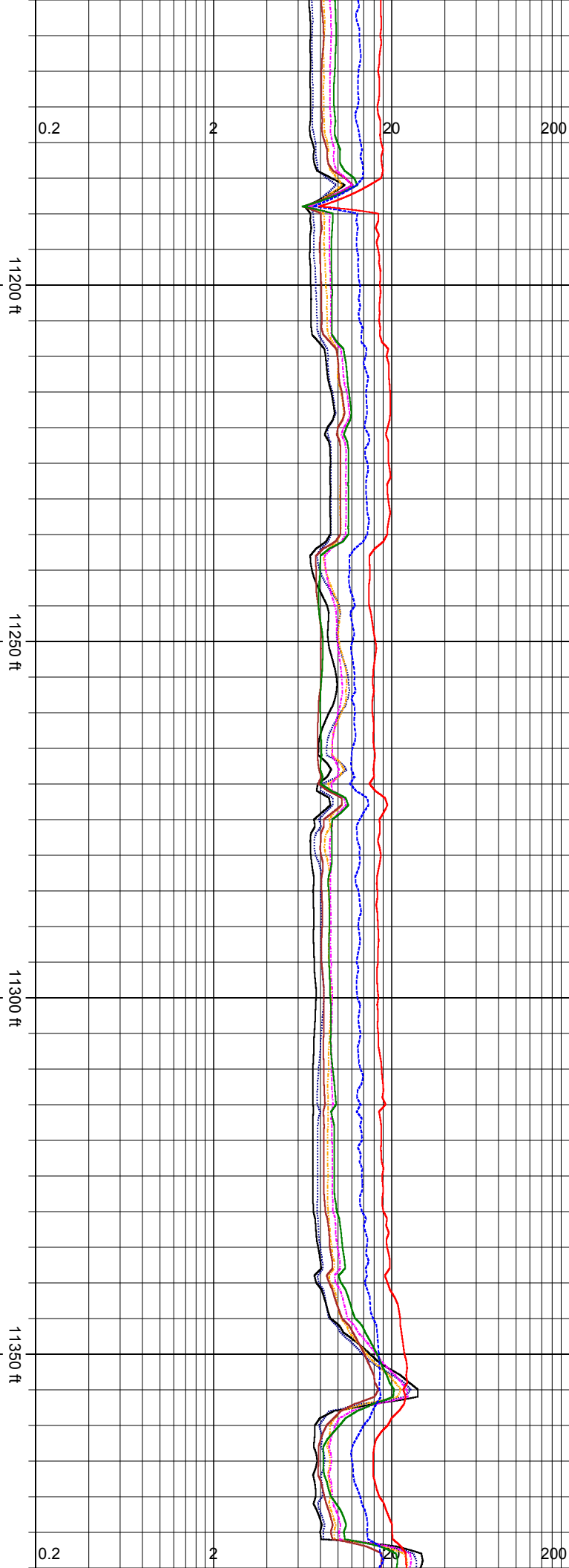
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Surv\_Depth:11196  
Inc:90.97 Azm:4.83  
TVD:7705.2

Surv\_Depth:11243  
Inc:89.82 Azm:0.34  
TVD:7704.87

Surv\_Depth:11289  
Inc:89.91 Azm:358.5  
TVD:7704.99

Surv\_Depth:11336  
Inc:90.57 Azm:358.24  
TVD:7704.78



Surv\_Depth:11382  
Inc:91.32 Azm:359.03  
TVD:7704.02

Surv\_Depth:11429  
Inc:90.48 Azm:0.43  
TVD:7703.28

Surv\_Depth:11476  
Inc:89.87 Azm:0.87  
TVD:7703.12

Surv\_Depth:11523  
Inc:89.43 Azm:358.94  
TVD:7703.4

Surv\_Depth:11569  
Inc:88.2 Azm:358.59  
TVD:7704.37

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11400 ft

11450 ft

11500 ft

11550 ft

11600 ft

11400 ft

11450 ft

11500 ft

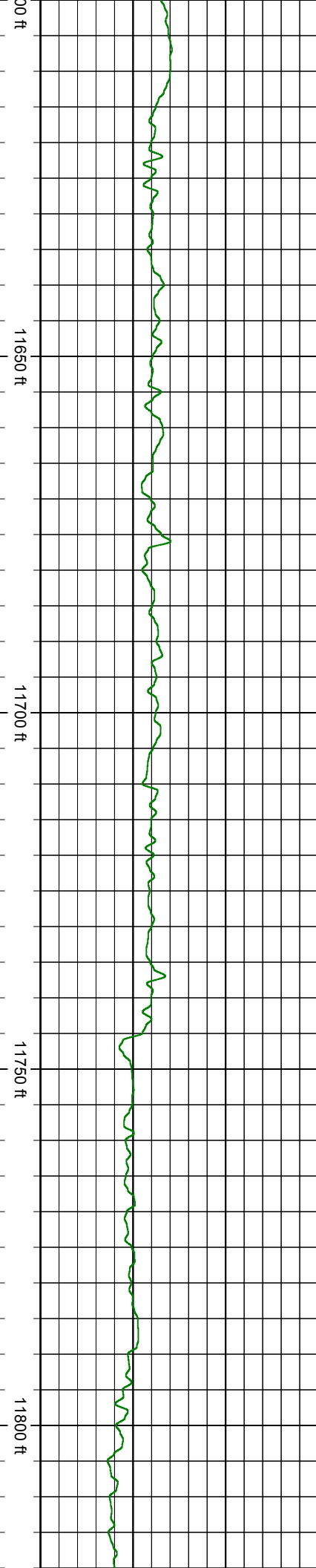
11550 ft

11600 ft

0.2

2

200



Surv\_Depth:11616  
Inc:87.88 Azm:358.76  
TVD:7705.97

Surv\_Depth:11661  
Inc:88.46 Azm:358.59  
TVD:7707.38

Surv\_Depth:11708  
Inc:90.18 Azm:358.94  
TVD:7707.91

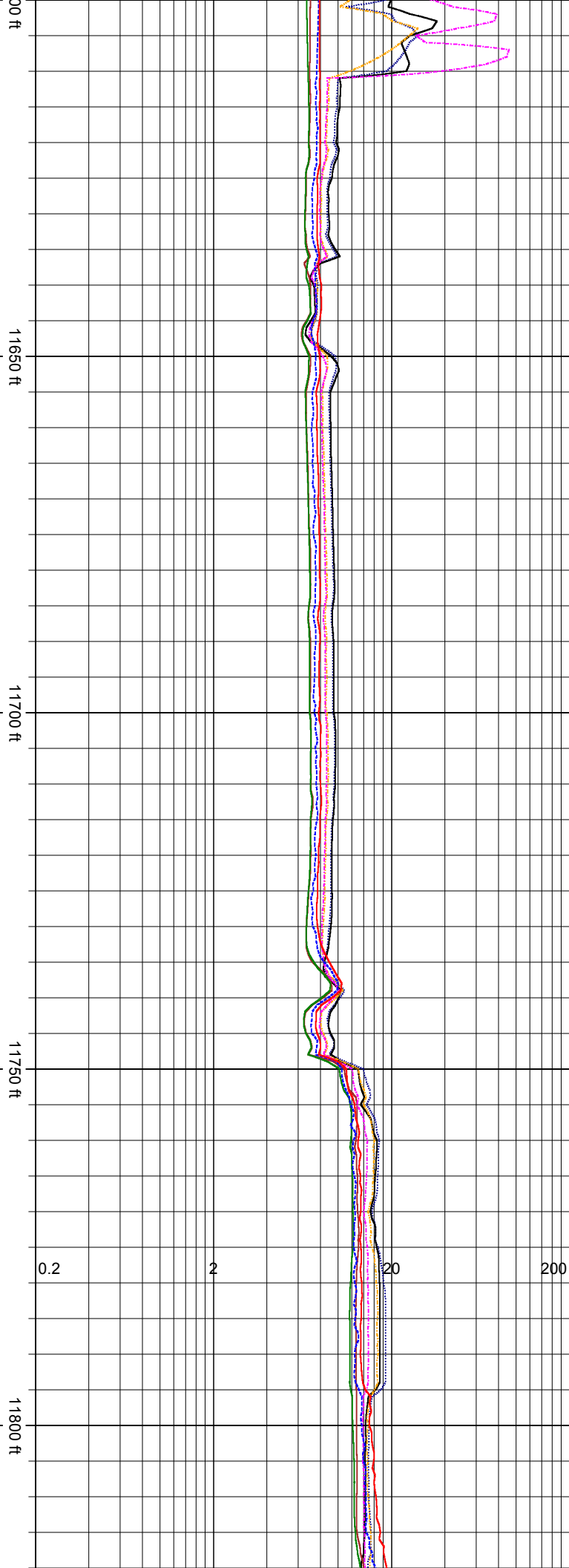
Surv\_Depth:11756  
Inc:91.01 Azm:358.59  
TVD:7707.41

Surv\_Depth:11803  
Inc:90.13 Azm:0.17  
TVD:7706.96

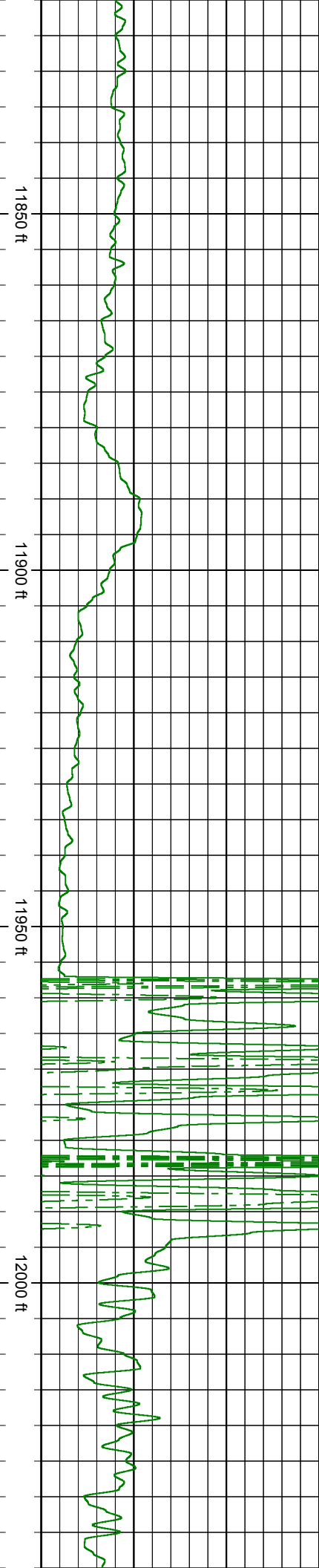
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Surv\_Depth:11848  
Inc:89.87 Azm:0.34  
TVD:7706.96

Surv\_Depth:11895  
Inc:90.35 Azm:0.78  
TVD:7706.84

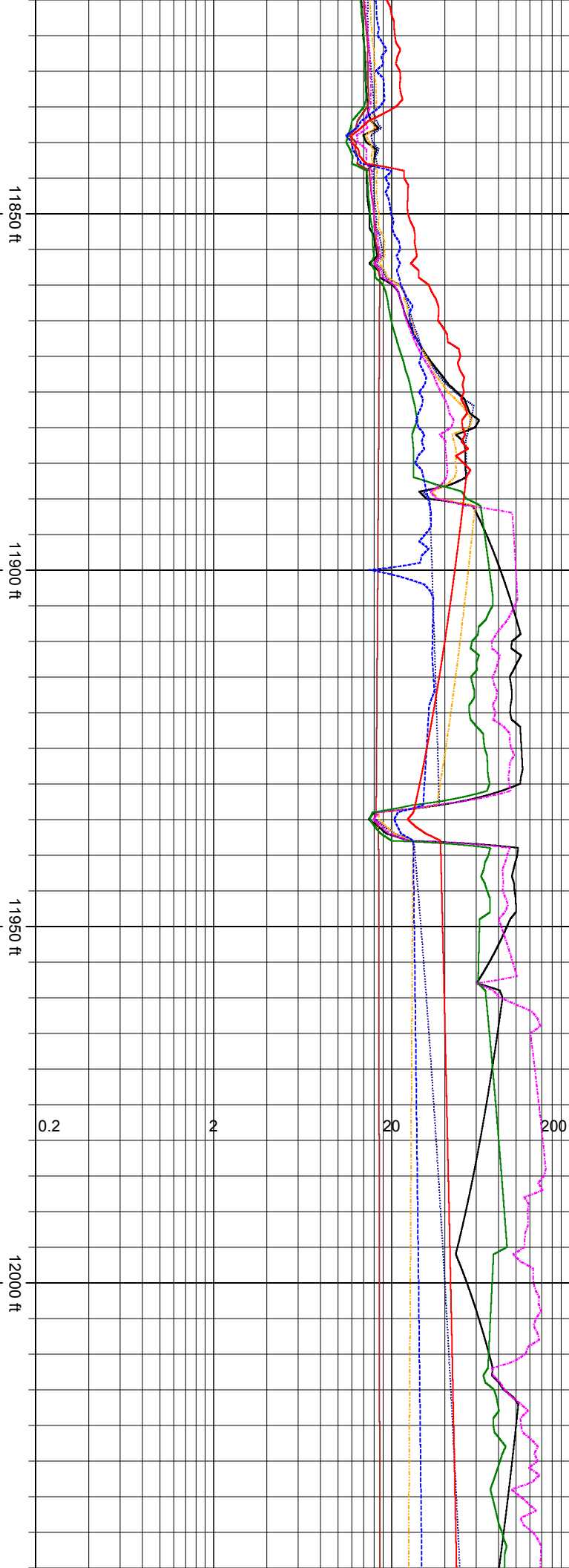
Surv\_Depth:11943  
Inc:89.39 Azm:1.05  
TVD:7706.92

Surv\_Depth:11990  
Inc:90 Azm:1.49  
TVD:7707.17

Surv\_Depth:12034  
Inc:90.31 Azm:3.24  
TVD:7707.05

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SS



TVD:7707.05

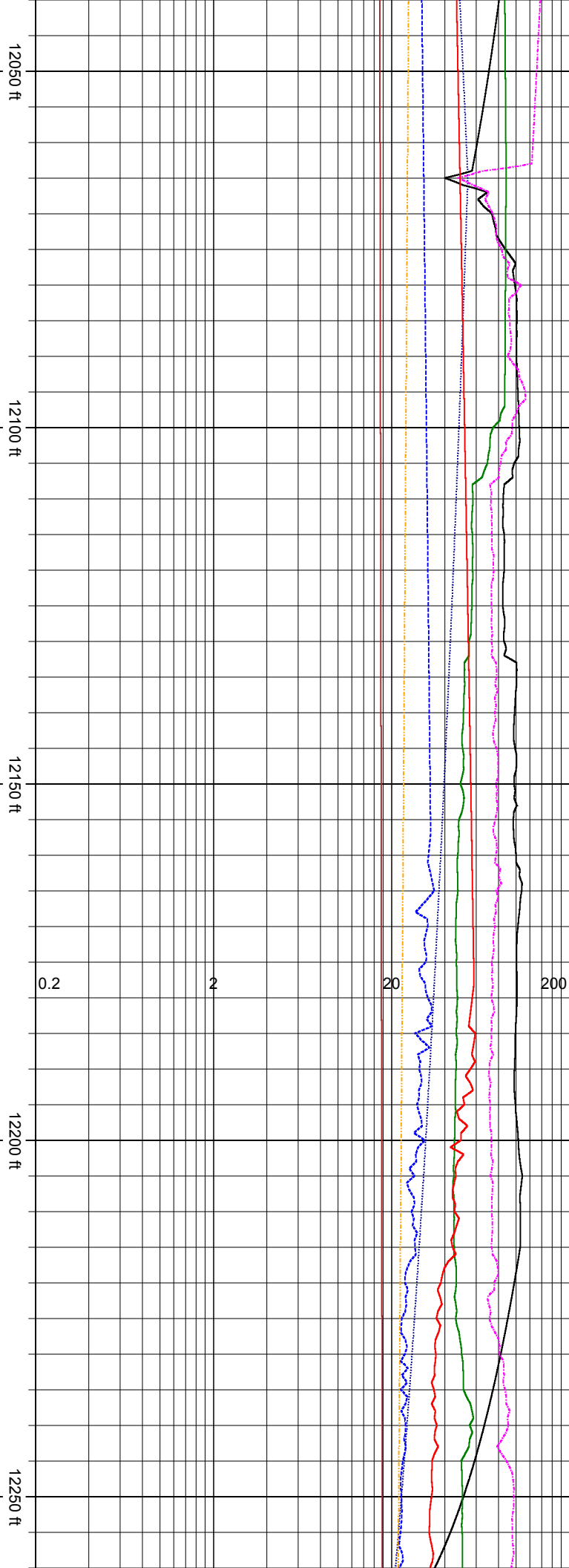
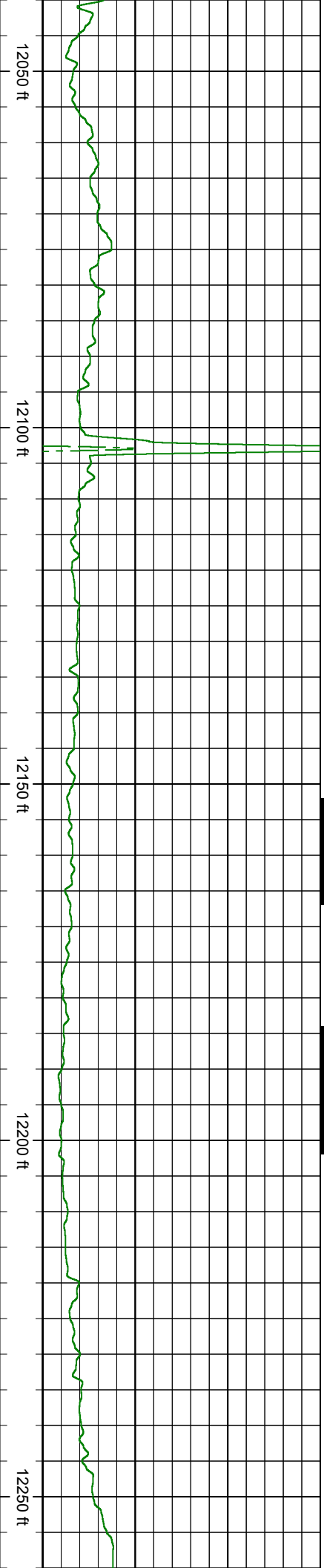
Surv\_Depth:12097  
Inc:91.41 Azm:0.96  
TVD:7706.12

Surv\_Depth:12129  
Inc:91.98 Azm:3.6  
TVD:7705.17

Surv\_Depth:12222  
Inc:89.78 Azm:1.49  
TVD:7703.71

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SSSSSS



Surv\_Depth:12269  
Inc:89.87 Azm:0.87  
TVD:7703.83

Surv\_Depth:12316  
Inc:90.88 Azm:1.75  
TVD:7703.5

Surv\_Depth:12410  
Inc:92.55 Azm:358.76  
TVD:7700.71

SSSS

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12300 ft

12350 ft

12400 ft

12450 ft

0.2

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200

