

WELL INFORMATION					
MWD Run Number	100	200			
Date run completed	21-Sep-14	23-Sep-14			
Rig Bit Number	0100	0200			
Bit Size (in)	13.500	8.750			
Tool Nominal OD (in)	6.750	6.750			
Log Start Depth (MD, ft)	81.00	1,600.00			
Log End Depth (MD, ft)	1,600.00	6,165.00			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	20-Sep-14 22:00	21-Sep-14 23:00			
Drill/Wipe End Date and Time	21-Sep-14 04:07	22-Sep-14 21:00			
Min Inc (deg) @ Depth (MD, ft)	0.10 @ 911.00	1.19 @ 4,931.00			
Max Inc (deg) @ Depth (MD, ft)	9.32 @ 1,542.00	82.15 @ 6,112.00			
Bit TFA(in2) / Bit Type	1.05 / PDC	0.88 / PDC			
Flow Rate (gpm)	732.61	539.27			
Max AV (fpm) / CV (fpm) @ MWD	NA / NA	NA / NA			
Fluid Type	Native	Polymer			
Density (ppg) / Viscosity (spqt)	8.50 / 0.00	9.90 / 48.00			
Filtrate CL (ppm)	NA	2,000.00			
pH / Fluid Loss (mptm)	8.30 / 0	9.00 / 0			
PV (cP) / YP (lbf2)	NA / NA	15 / 21.00			
% Solids / % Sand	12 / 0.25	12 / 0.25			
% Oil / Oil:Water Ratio	NA / NA	NA / NA			
Rm @ Measured Temp (degF)	NA @ NA	NA @ NA			
Rmf @ Measured Temp (degF)	NA @ NA	NA @ NA			
Rmc @ Measured Temp (degF)	NA @ NA	NA @ NA			
Max Tool Temp (degF) @ Depth (MD, ft)	115.50 @ 911.00	122.00 @ 4,931.00			

Max Tool Temp (degF) / Source	115.56 / PCM	180.09 / PCM			
Rm @ Max Tool Temp (degF)	NA @ 115.56	NA @ 180.09			
Lead MWD Engineer	Scott Trowbridge	Scott Trowbridge			
Customer Representative	Kennith Wilkerson	Kennith Wilkerson			

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.93	5.93			
Sub Serial Number	11341342	11341342			
Insert Serial Number	11680789	11680744			
Date and Time Initialized	20-Sep-14 08:32	21-Sep-14 17:09			
Date and Time Read	21-Sep-14 09:17	23-Sep-14 07:35			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	56.22	51.24			
Software Version	6.21	6.21			
Sub Serial Number	11341342	11341342			
Sonde Serial Number	11638497	11478073			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	347.01	304.29			

### Gamma Ray Sensor Information

Tool Type		PCG			
Distance From Bit (ft)		46.14			
Recorded Sample Period (sec)		10			
Software Version		8.15			
Sub Serial Number		11341342			
Insert/Sonde Serial Number		11681054			

## REMARKS

1. All depths are true vertical bit depths, referenced to the Driller's pipe tally and are measured from the Drill Floor, unless otherwise specified.

2. No depth corrections have been made for pipe stretch or compression.

3. Critical annular velocities are calculated using the "Power Law" for water based fluids and the "Bingham Plastic" model for oil and synthetic based fluids.

4. All data is stored data unless otherwise specified.

5. The following smoothing parameters have been applied to the data:

PCG Gamma Ray BCorr (PGRC)  
Interval Resolution: .5  
Interval Distance: .6  
Gap Fill: 3

Average Rate of Penetration (ROPA)  
Interval Resolution: .5  
Interval Distance: 1.2  
Gap Fill: 3

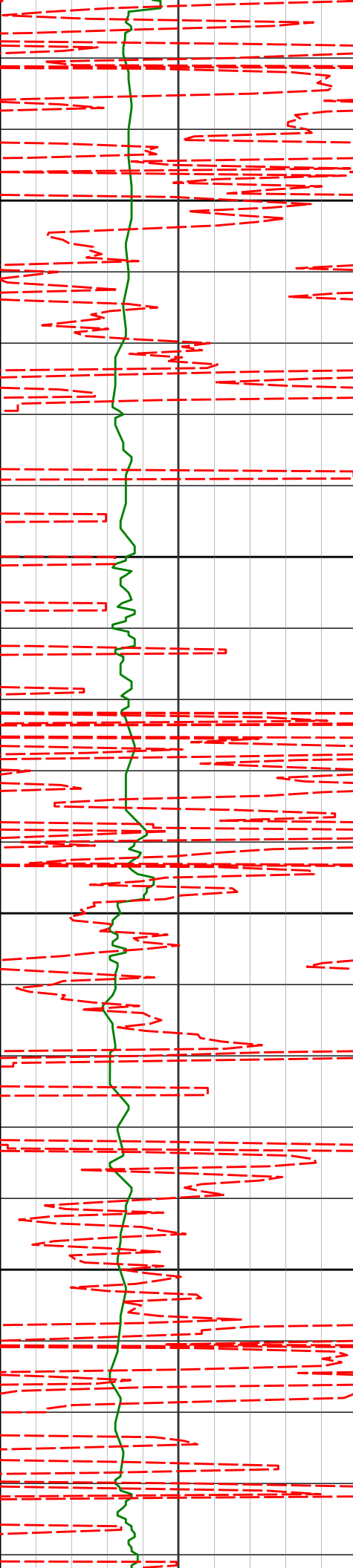
WARRANTY

HALLIBURTON WILL USE ITS BEST EFFORTS TO FURNISH CUSTOMERS WITH ACCURATE INFORMATION AND INTERPRETATIONS THAT ARE PART OF, AND INCIDENT TO, THE SERVICES PROVIDED. HOWEVER, HALLIBURTON CANNOT AND DOES NOT WARRANT THE ACCURACY OR CORRECTNESS OF SUCH INFORMATION AND INTERPRETATIONS. UNDER NO CIRCUMSTANCES SHOULD ANY SUCH INFORMATION OR INTERPRETATION BE RELIED UPON AS THE SOLE BASIS FOR ANY DRILLING, COMPLETION, PRODUCTION, OR FINANCIAL DECISION OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING VENTURE, DRILLING RIG OR ITS CREW OR ANY OTHER THIRD PARTY. THE CUSTOMER HAS FULL RESPONSIBILITY FOR ALL DRILLING, COMPLETION AND PRODUCTION OPERATION. HALLIBURTON MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THE SERVICES RENDERED. IN NO EVENT WILL HALLIBURTON BE LIABLE FOR FAILURE TO OBTAIN ANY PARTICULAR RESULTS OR FOR ANY DAMAGES, INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, RESULTING FROM THE USE OF ANY INFORMATION OR INTERPRETATION PROVIDED BY HALLIBURTON.

HALLIBURTON  
Sperry Drilling Services  
TVD Main Log 1:240

Whiting Oil and Gas  
Razor #27J-3409A  
Frontier 26  
Sec. 27-T10N-R58W

PCG Gamma Ray BCorr PGRC 0 300 api						
Avg Rate of Penetration ROPA 500 0 feet per hr		TVD ft	Depth	Inc.	Azi.	TVD V.S.
		1600				
		Run 200				
		1636'	8.53°	331.24°	1632.11'	-64.58'
		1650				



1700

1750

1800

1850

1728'

9.16°

326.29°

1723.02'

-76.27'

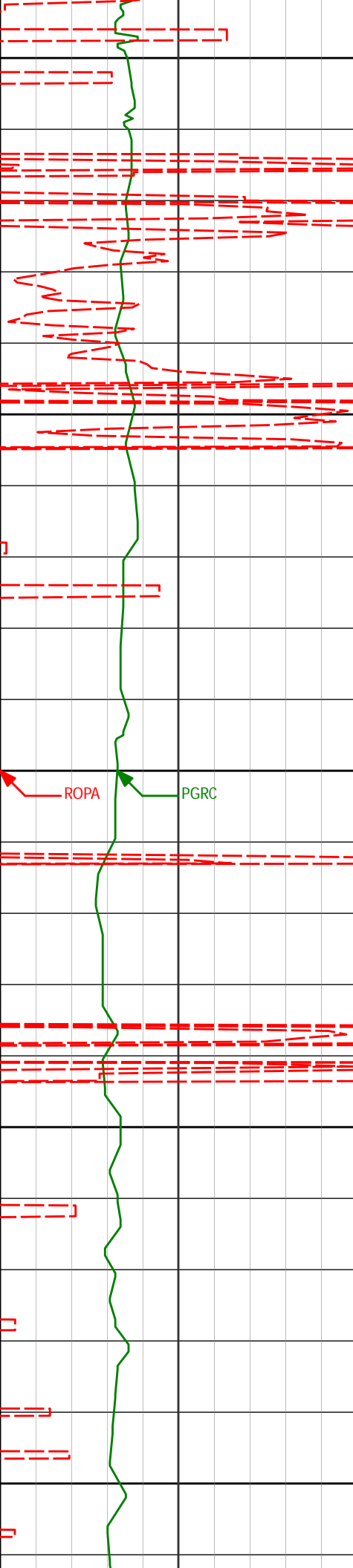
1819'

11.14°

321.89°

1812.59'

-88.73'



1900

1911'

14.16°

329.21°

1902.35' -104.81'

1950

2000

2002'

16.92°

329.09°

1990.02' -125.09'

2050

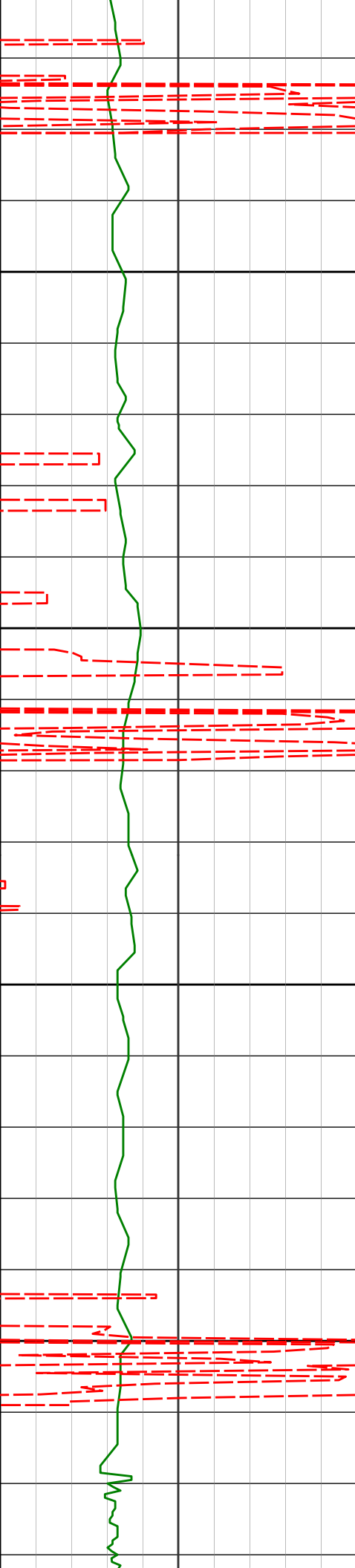
2094'

16.56°

328.31°

2078.12' -147.02'

2100



2150

2185'

15.63°

327.24°

2165.55' -167.67'

2200

2250

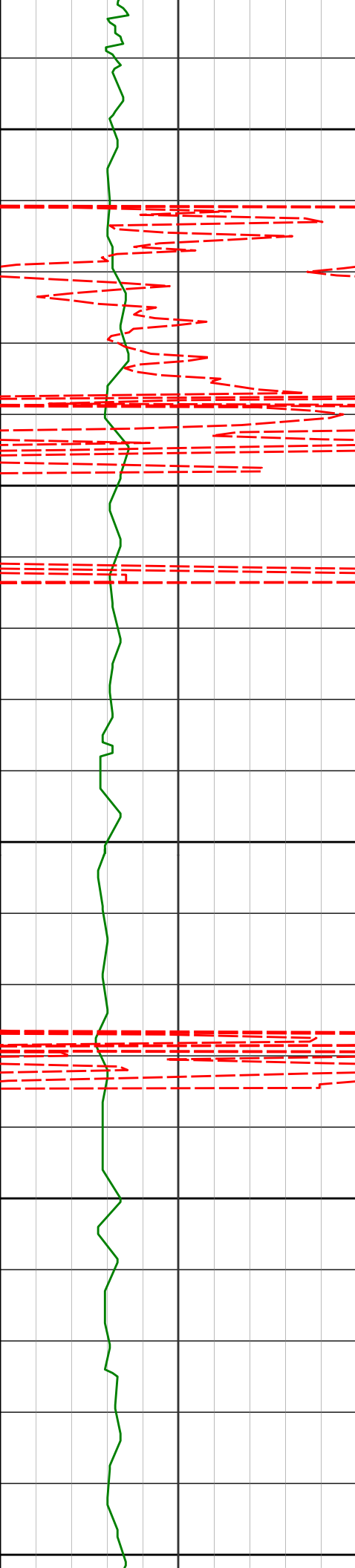
2277'

14.38°

325.32°

2254.41' -186.81'

2300



2368'

13.41°

324.41°

2342.75' -204.04'

2350

2400

2459'

16.57°

324.27°

2430.64' -222.45'

2450

2500

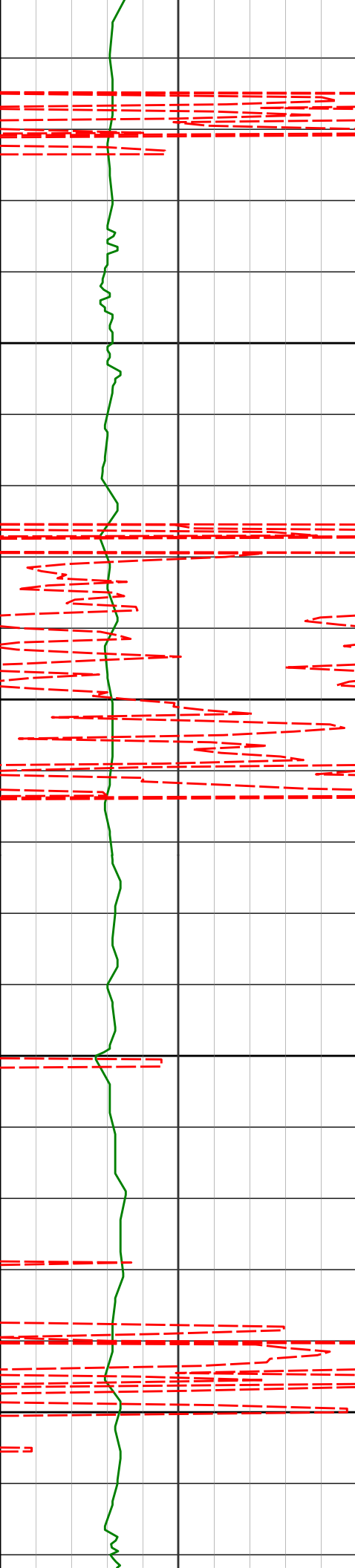
2551'

15.91°

321.99°

2518.97' -242.24'

2550



2600

2642'

15.38°

321.87°

2606.60' -260.79'

2650

2733'

17.24°

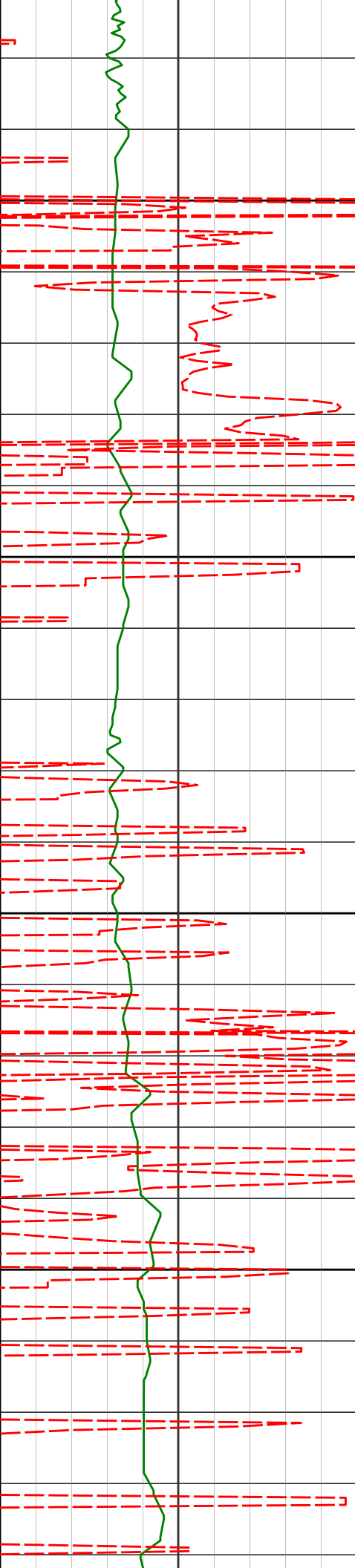
329.02°

2693.94' -281.10'

2700

2750





2825'

16.69°

327.79°

2781.94' -303.24'

2800

2850

2917'

14.23°

335.82°

2870.61' -324.13'

2900

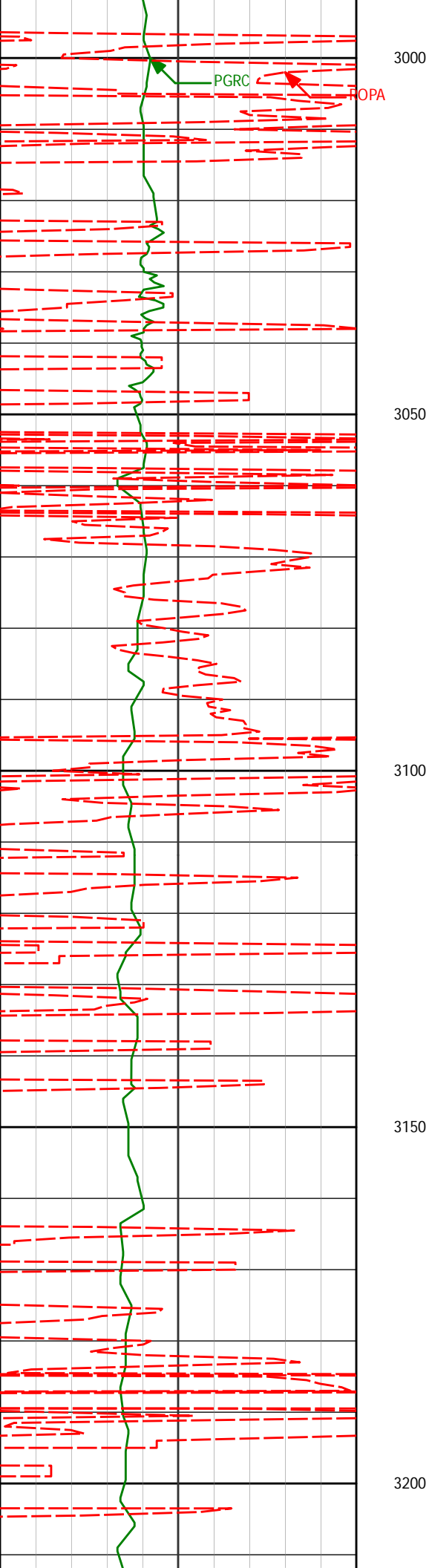
2950

3008'

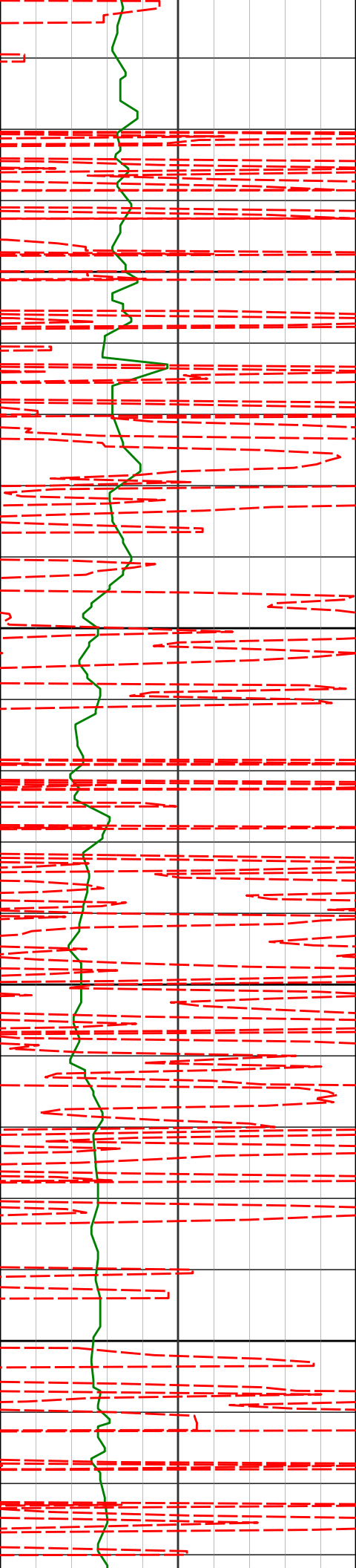
12.55°

334.40°

2959.14' -342.79'



3100'	10.52°	331.40°	3049.28'	-358.74'
3192'	11.88°	340.31°	3139.53'	-374.66'



3283'

11.76°

339.89°

3228.60' -391.85'

3250

3300

3375'

11.69°

340.55°

3318.68' -409.10'

3350

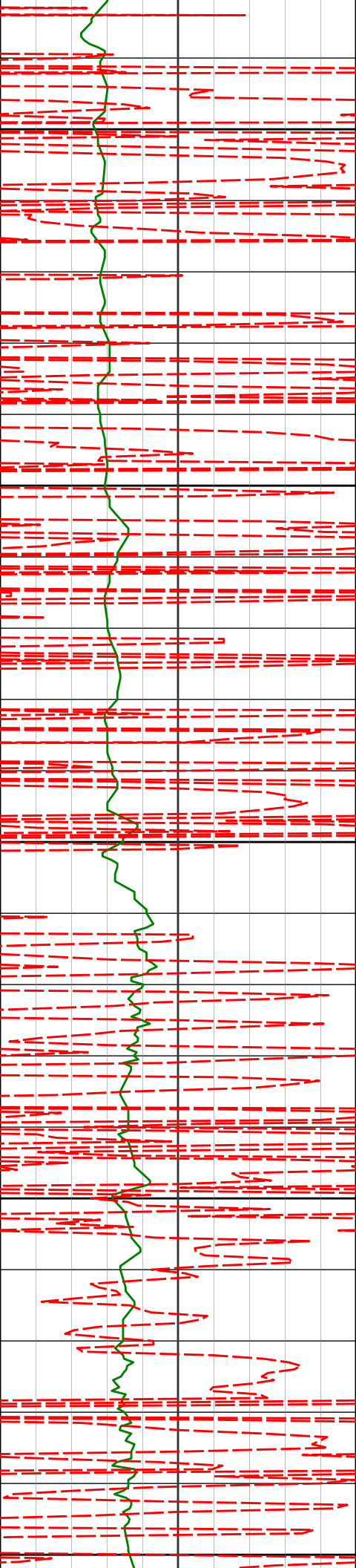
3400

3467'

11.77°

338.79°

3408.76' -426.29'



3450

3500

3550

3600

3650

3558'

12.03°

337.54°

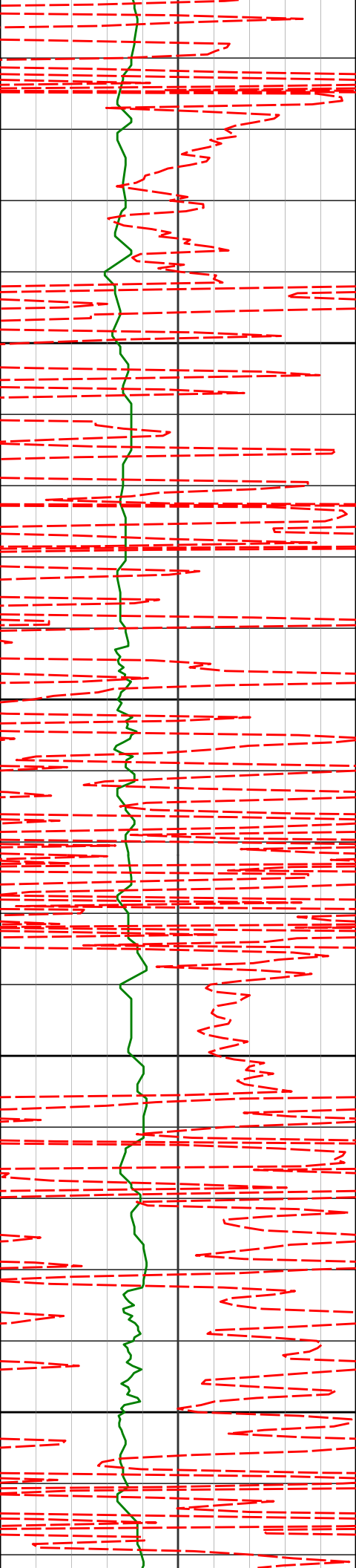
3497.80' -443.34'

3649'

11.92°

335.70°

3586.82' -460.28'



3741'

11.75°

335.01°

3676.87' -477.02'

3700

3750

3832'

11.40°

331.29°

3766.02' -492.87'

3800

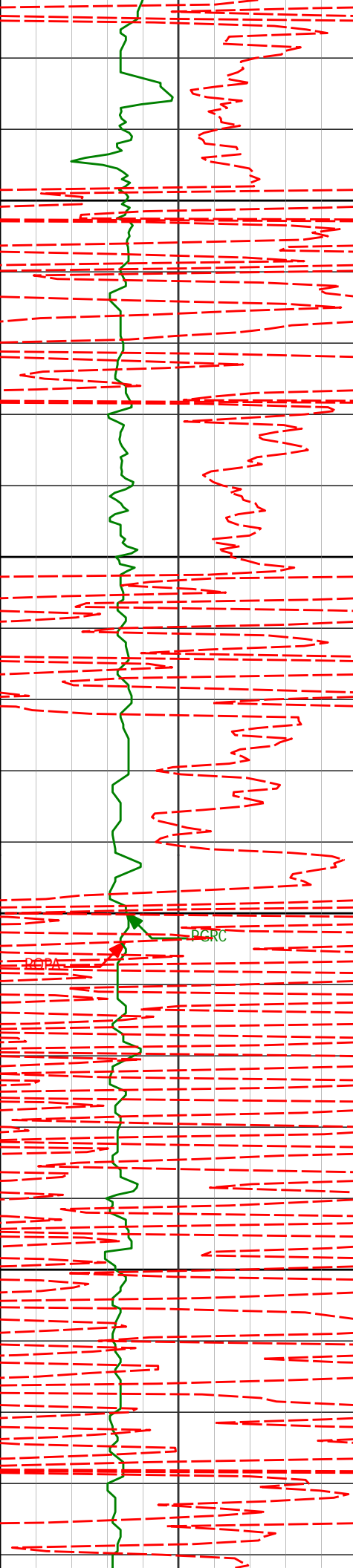
3850

3924'

11.48°

331.06°

3856.19' -508.40'



3900

3950

4000

4050

4015'

14.51°

343.33°

3944.87' -526.85'

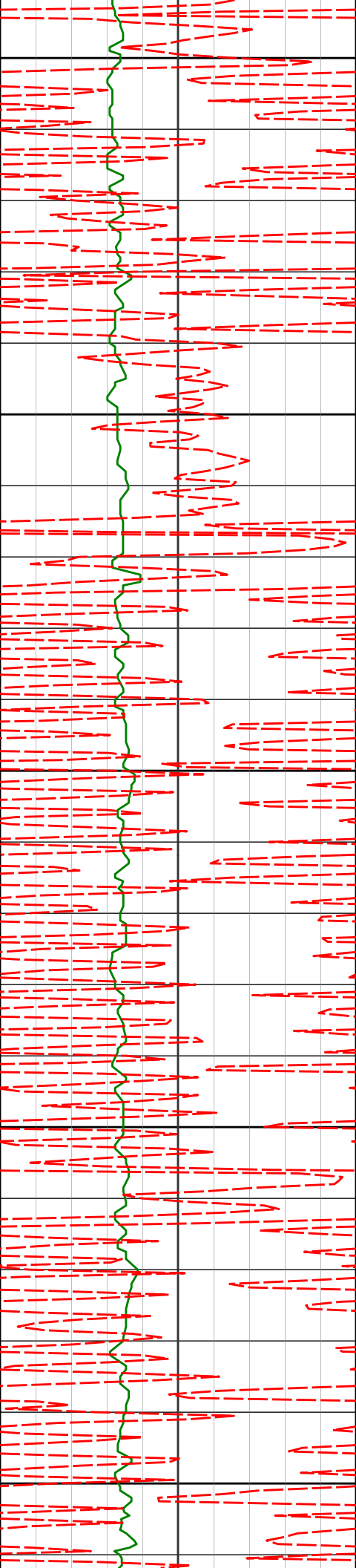
4106'

16.48°

344.57°

4032.55' -549.85'

PCRC



4100

4197'

15.58°

343.52°

4120.02' -573.64'

4150

4200

4289'

14.72°

344.03°

4208.82' -596.36'

4250

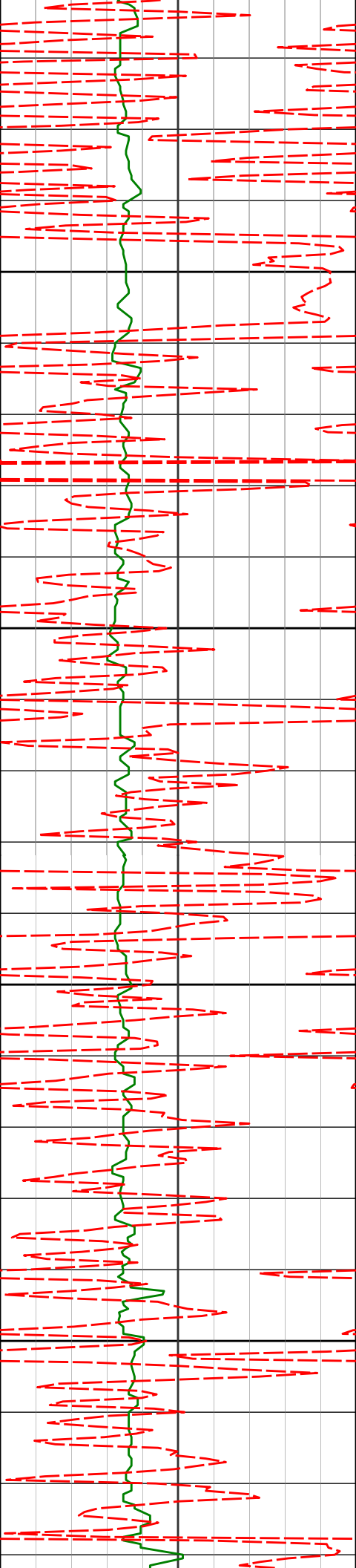
4300

4380'

13.16°

342.01°

4297.13' -616.99'



4350

4473'

10.91°

341.37°

4388.08' -635.08'

4400

4450

4563'

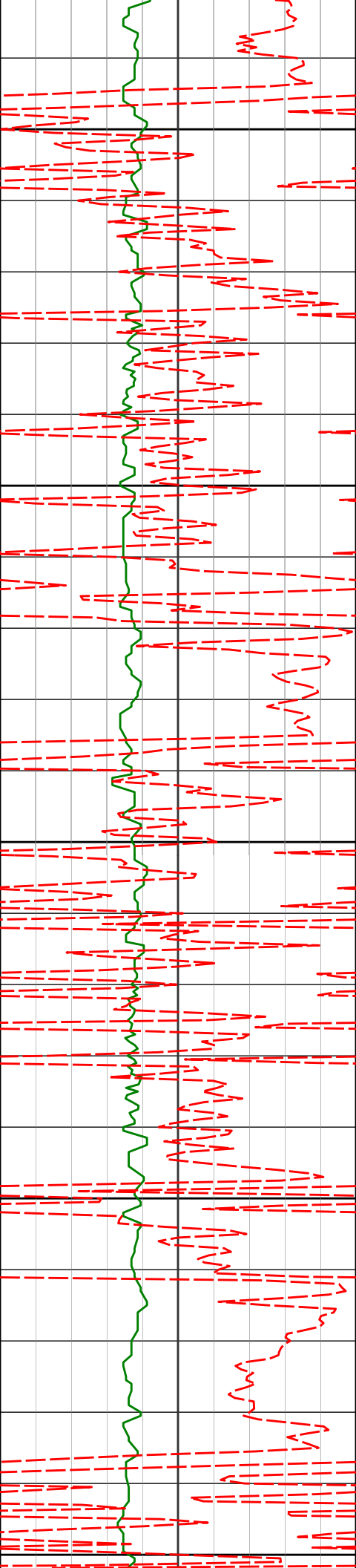
9.69°

342.92°

4476.63' -650.12'

4500





4550

4655'

7.13°

343.00°

4567.64' -662.78'

4600

4650

4747'

5.82°

342.93°

4659.05' -672.53'

4700

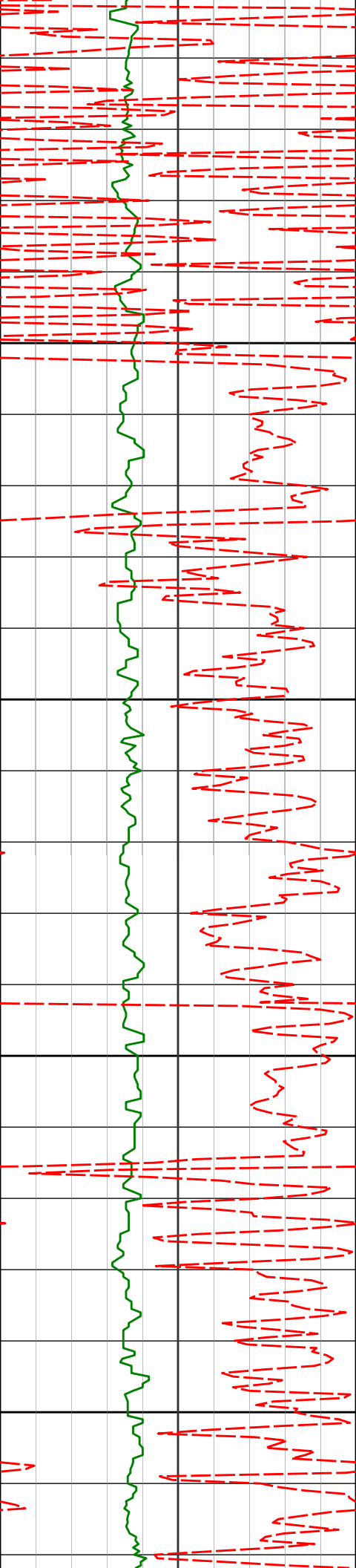
4750

4839'

2.37°

320.44°

4750.80' -678.32'



4800

4850

4900

4950

4931'

1.19°

163.49°

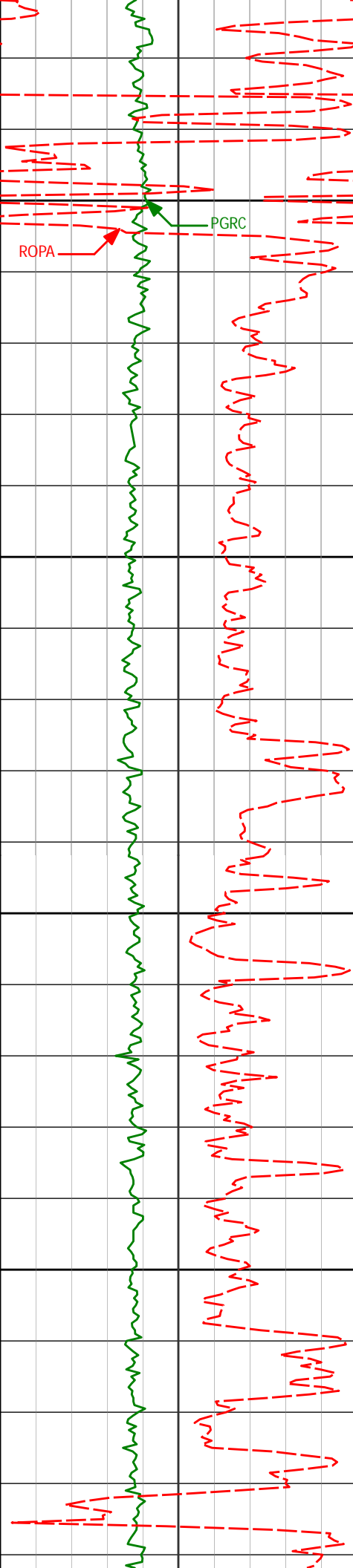
4842.78' -678.83'

5023'

2.52°

165.43°

4934.73' -676.00'



KOP 5096' MD

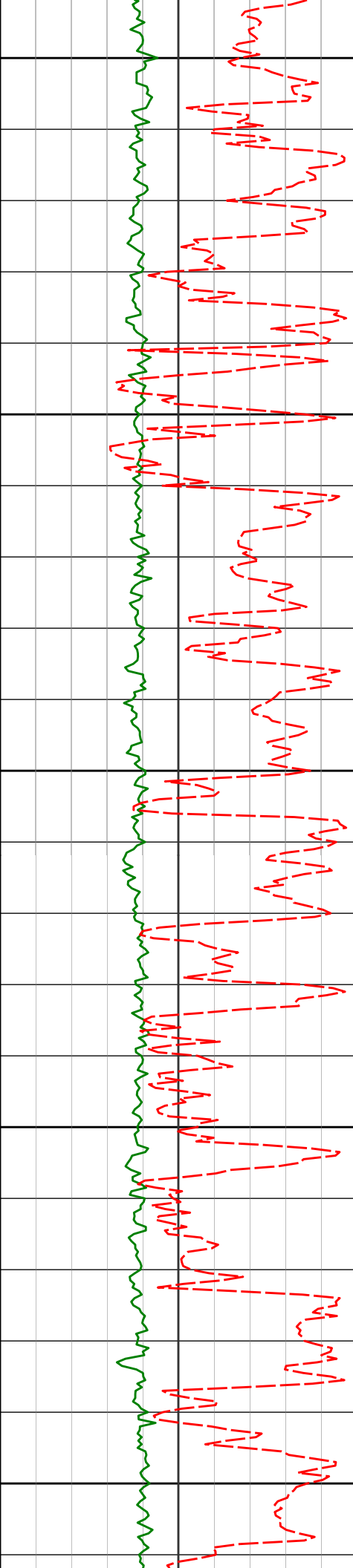
5000

5050

5100

5150

5115'	4.80°	170.42°	5026.54'	-670.31'
5146'	11.37°	184.06°	5057.22'	-665.98'
5176'	15.50°	181.08°	5086.39'	-659.01'
5206'	20.34°	181.79°	5114.93'	-649.79'
5238'	27.58°	184.28°	5144.15'	-636.80'
5268'	32.37°	185.06°	5170.13'	-621.83'



5200

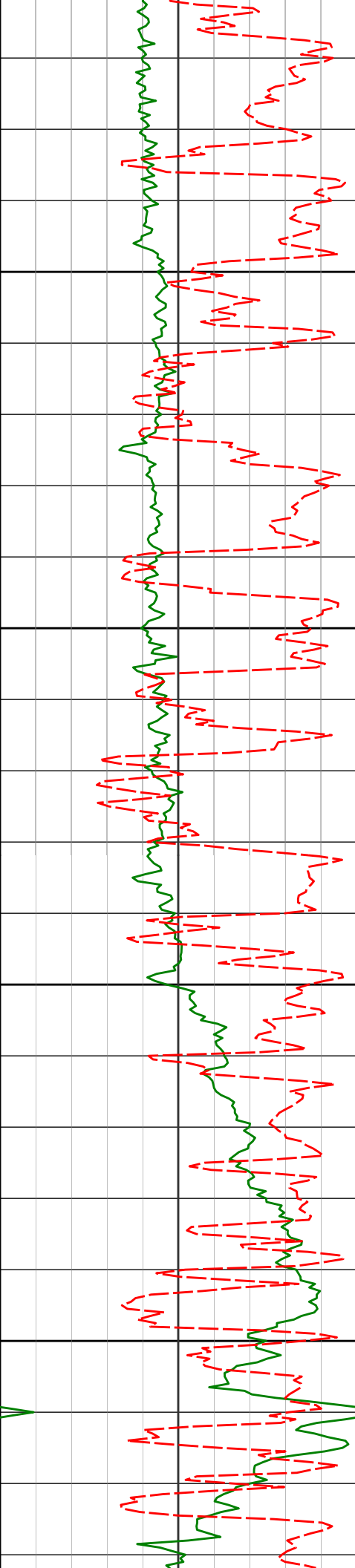
5250

5300

5350

5400

5299'	35.04°	184.67°	5195.92'	-604.64'
5329'	37.42°	184.03°	5220.11'	-586.91'
5359'	37.51°	182.89°	5243.93'	-568.67'
5389'	38.60°	183.23°	5267.55'	-550.18'
5420'	40.37°	185.24°	5291.47'	-530.47'
5451'	42.39°	184.65°	5314.73'	-509.99'
5482'	43.37°	184.12°	5337.45'	-488.91'
5513'	43.38°	184.45°	5359.98'	-467.63'
5543'	43.98°	182.59°	5381.68'	-446.91'
5573'	45.73°	181.91°	5402.95'	-425.75'



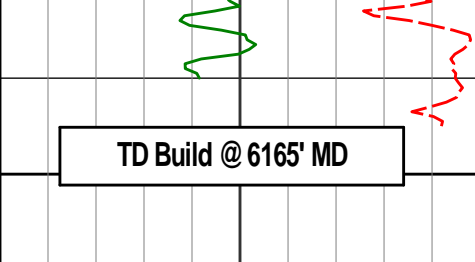
5450

5500

5550

5600

5605'	48.16°	180.00°	5424.79'	-402.39'
5637'	50.53°	178.87°	5445.64'	-378.16'
5669'	51.03°	178.32°	5465.87'	-353.43'
5700'	53.56°	178.85°	5484.83'	-328.98'
5732'	55.55°	178.85°	5503.39'	-302.97'
5764'	56.17°	178.58°	5521.35'	-276.56'
5795'	57.93°	179.48°	5538.21'	-250.60'
5827'	61.30°	180.05°	5554.39'	-223.04'
5858'	64.85°	181.41°	5568.43'	-195.43'
5890'	68.68°	181.55°	5581.05'	-166.04'
5921'	69.69°	181.60°	5592.06'	-137.07'
5953'	71.07°	181.34°	5602.81'	-106.93'
5984'	74.36°	180.86°	5612.02'	-77.35'
6016'	75.29°	181.31°	5620.39'	-46.48'
6047'	77.57°	180.49°	5627.67'	-16.37'

		5650					
			6079'	81.05°	179.77°	5633.60'	15.04'
			6112'	82.15°	179.43°	5638.42'	47.63'

## HALLIBURTON

### DIRECTIONAL SURVEY REPORT

Whiting Oil and Gas  
 Razor 27J-3409A  
 Redtail  
 Weld Colorado  
 USA  
 CA-XX-0901619872  
 Surveys are Sag, IFR and MS corrected.

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
177.00	0.11	322.84	177.00	0.14 N	0.10 W	-0.13	0.06
268.00	0.56	357.90	268.00	0.65 N	0.17 W	-0.64	0.52
359.00	0.62	351.97	358.99	1.58 N	0.26 W	-1.57	0.09
451.00	0.66	336.12	450.99	2.56 N	0.54 W	-2.53	0.20
544.00	0.69	339.90	543.98	3.57 N	0.95 W	-3.52	0.06
635.00	0.36	311.79	634.98	4.28 N	1.35 W	-4.21	0.45
727.00	0.15	293.42	726.98	4.52 N	1.68 W	-4.43	0.24
819.00	0.33	241.09	818.98	4.44 N	2.02 W	-4.33	0.29
911.00	0.10	241.87	910.97	4.27 N	2.32 W	-4.15	0.25
993.00	1.00	334.75	992.97	4.89 N	2.69 W	-4.75	1.23
1087.00	2.41	348.80	1086.93	7.57 N	3.42 W	-7.39	1.55
1176.00	4.05	356.77	1175.78	12.54 N	3.97 W	-12.33	1.91
1268.00	5.14	351.43	1267.49	19.86 N	4.76 W	-19.60	1.27
1360.00	6.50	346.79	1359.01	29.01 N	6.57 W	-28.64	1.56
1451.00	7.97	341.48	1449.28	40.00 N	9.75 W	-39.47	1.77
1542.00	9.32	335.41	1539.25	52.69 N	14.82 W	-51.88	1.79
1636.00	8.53	331.24	1632.11	65.72 N	21.34 W	-64.58	1.09
1728.00	9.16	326.29	1723.02	77.79 N	28.69 W	-76.27	1.07
1819.00	11.14	321.89	1812.59	90.74 N	38.13 W	-88.73	2.34
1911.00	14.16	329.21	1902.35	107.40 N	49.38 W	-104.81	3.71
2002.00	16.92	329.09	1990.02	128.33 N	61.89 W	-125.09	3.03
2094.00	16.56	328.31	2078.12	150.97 N	75.65 W	-147.02	0.46
2185.00	15.63	327.24	2165.55	172.32 N	89.10 W	-167.67	1.07
2277.00	14.38	325.32	2254.41	192.13 N	102.30 W	-186.81	1.46
2368.00	13.41	324.41	2342.75	210.01 N	114.87 W	-204.04	1.09
2459.00	16.57	324.27	2430.64	229.13 N	128.60 W	-222.45	3.47
2551.00	15.91	321.99	2518.97	249.71 N	144.02 W	-242.24	1.00
2642.00	15.38	321.87	2606.60	269.03 N	159.16 W	-260.79	0.58
2733.00	17.24	329.02	2693.94	290.09 N	173.55 W	-281.10	3.00
2825.00	16.69	327.79	2781.94	312.96 N	187.61 W	-303.24	0.71
2917.00	14.23	335.82	2870.61	334.45 N	199.29 W	-324.13	3.54
3008.00	12.55	334.40	2959.14	353.58 N	208.14 W	-342.79	1.88
3100.00	10.52	331.40	3049.28	369.97 N	216.48 W	-358.74	2.30
3192.00	11.88	340.31	3139.53	386.26 N	223.69 W	-374.66	2.39
3283.00	11.76	339.89	3228.60	403.78 N	230.04 W	-391.85	0.16
3375.00	11.69	340.55	3318.68	421.38 N	236.36 W	-409.10	0.16
3467.00	11.77	338.79	3408.76	438.91 N	242.86 W	-426.29	0.40

3558.00	12.03	337.54	3497.80	456.33 N	249.84 W	-443.34	0.40
3649.00	11.92	335.70	3586.82	473.66 N	257.33 W	-460.28	0.44
3741.00	11.75	335.01	3676.87	490.81 N	265.20 W	-477.02	0.24
3832.00	11.40	331.29	3766.02	507.09 N	273.44 W	-492.87	0.91
3924.00	11.48	331.06	3856.19	523.08 N	282.23 W	-508.40	0.10
4015.00	14.51	343.33	3944.87	541.94 N	289.89 W	-526.85	4.49
4106.00	16.48	344.57	4032.55	565.30 N	296.59 W	-549.85	2.20
4197.00	15.58	343.52	4120.02	589.46 N	303.49 W	-573.64	1.04
4289.00	14.72	344.03	4208.82	612.55 N	310.22 W	-596.36	0.95
4380.00	13.16	342.01	4297.13	633.52 N	316.60 W	-616.99	1.80
4473.00	10.91	341.37	4388.08	651.93 N	322.68 W	-635.08	2.42
4563.00	9.69	342.92	4476.63	667.24 N	327.62 W	-650.12	1.39
4655.00	7.13	343.00	4567.64	680.10 N	331.57 W	-662.78	2.78
4747.00	5.82	342.93	4659.05	690.02 N	334.61 W	-672.53	1.42
4839.00	2.37	320.44	4750.80	695.95 N	337.19 W	-678.32	4.07
4931.00	1.19	163.49	4842.78	696.50 N	338.13 W	-678.83	3.80
5023.00	2.52	165.43	4934.73	693.63 N	337.35 W	-676.00	1.45
5115.00	4.80	170.42	5026.54	687.87 N	336.20 W	-670.31	2.50
5146.00	11.37	184.06	5057.22	683.54 N	336.20 W	-665.98	21.93
5176.00	15.50	181.08	5086.39	676.58 N	336.48 W	-659.01	13.95
5206.00	20.34	181.79	5114.93	667.36 N	336.72 W	-649.79	16.15
5238.00	27.58	184.28	5144.15	654.39 N	337.45 W	-636.80	22.84
5268.00	32.37	185.06	5170.13	639.46 N	338.68 W	-621.83	16.02
5299.00	35.04	184.67	5195.92	622.32 N	340.13 W	-604.64	8.64
5329.00	37.42	184.03	5220.11	604.64 N	341.48 W	-586.91	8.03
5359.00	37.51	182.89	5243.93	586.43 N	342.58 W	-568.67	2.33
5389.00	38.60	183.23	5267.55	567.96 N	343.57 W	-550.18	3.70
5420.00	40.37	185.24	5291.47	548.31 N	345.03 W	-530.47	7.04
5451.00	42.39	184.65	5314.73	527.89 N	346.79 W	-509.99	6.64
5482.00	43.37	184.12	5337.45	506.86 N	348.40 W	-488.91	3.37
5513.00	43.38	184.45	5359.98	485.63 N	349.99 W	-467.63	0.73
5543.00	43.98	182.59	5381.68	464.95 N	351.26 W	-446.91	4.73
5573.00	45.73	181.91	5402.95	443.81 N	352.09 W	-425.75	6.05
5605.00	48.16	180.00	5424.79	420.43 N	352.47 W	-402.39	8.76
5637.00	50.53	178.87	5445.64	396.16 N	352.23 W	-378.16	7.88
5669.00	51.03	178.32	5465.87	371.38 N	351.62 W	-353.43	2.05
5700.00	53.56	178.85	5484.83	346.86 N	351.02 W	-328.98	8.27
5732.00	55.55	178.85	5503.39	320.80 N	350.50 W	-302.97	6.22
5764.00	56.17	178.58	5521.35	294.32 N	349.90 W	-276.56	2.06
5795.00	57.93	179.48	5538.21	268.31 N	349.46 W	-250.60	6.18
5827.00	61.30	180.05	5554.39	240.71 N	349.35 W	-223.04	10.64
5858.00	64.85	181.41	5568.43	213.08 N	349.71 W	-195.43	12.10
5890.00	68.68	181.55	5581.05	183.69 N	350.47 W	-166.04	11.98
5921.00	69.69	181.60	5592.06	154.72 N	351.27 W	-137.07	3.26
5953.00	71.07	181.34	5602.81	124.59 N	352.04 W	-106.93	4.38
5984.00	74.36	180.86	5612.02	95.00 N	352.61 W	-77.35	10.72
6016.00	75.29	181.31	5620.39	64.12 N	353.19 W	-46.48	3.21
6047.00	77.57	180.49	5627.67	33.99 N	353.66 W	-16.37	7.79
6079.00	81.05	179.77	5633.60	2.55 N	353.73 W	15.04	11.10
6112.00	82.15	179.43	5638.42	30.09 S	353.51 W	47.63	3.49

# CALCULATION BASED ON MINIMUM CURVATURE METHOD

SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT  
TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT

VERTICAL SECTION RELATIVE TO WELL HEAD  
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 182.85 DEGREES (TRUE)  
A TOTAL CORRECTION OF 7.52 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 6112.00 FEET  
IS 354.78 FEET ALONG 265.13 DEGREES (TRUE)

Tie onto surface at 0' MD