

PCDC - Pressure Case Directional  
PCGK - Pressure Case Gamma

1 : 240

Country : USA			
Field : Wattenberg			
Location :	Lat: 40° 42' 51.91" North		
	Long: 103° 49' 8.29" West		
Well : Cook State LD36-78HN			
Company : Noble Energy			
Rig : H&P 322			
LOCATION	Company : Noble Energy Rig : H&P 322 Well : Cook State LD36-78HN Field : Wattenberg Country : USA API Number : 05-123-36952		
Latitude : 40° 42' 51.91" North Longitude : 103° 49' 8.29" West		Other Services Directional Drilling	
UTM Easting = 3465985.020 ft UTM Northing = 1507523.960 ft			
Permanent Datum : Ground Level		Elevation : 4744.00 ft	Elev. KB N/A
Log Measured From : Drill Floor		24.00 ft Above Permanent Datum	DF 4768.00 ft GL 4744.00 ft WD N/A
Drilling Measured From :		TVD LOG	
Depth Logged : 640.00 ft To 6,116.00 ft		Unit No. : 11210425	
Date Logged : 06-May-13 To 10-May-13		Job No. : CA-XX-0900343458	
Total Depth MD : 6,116.00 ft TVD : 5,728.88 ft		Plot Type : Final	
Spud Date : 06-May-13		Plot Date : 10-May-13	
Run No.	Borehole Record (TVD)		Run No.
	Size From To	Size To	
2	8.750 in 640.00 ft	4,928.02 ft	Size Weight From To
	8.750 in 4,928.02 ft	5,728.88 ft	
3			Casing Record (TVD)
			SURFACE 630.00 ft

Max Tool Temp (degF) / Source	137.50 / PCM	154.30 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	Robert Ley	Robert Ley			
Customer Representative	Charles Colver	Charles Colver			

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.84	5.84			
Sub Serial Number	161211	161211			
Insert Serial Number	11680786	11680786			
Date and Time Initialized	07-May-13 15:50	07-May-13 15:50			
Date and Time Read	10-May-13 01:08	10-May-13 01:03			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	56.00	55.00			
Software Version	6.21	6.21			
Sub Serial Number	161211	161211			
Sonde Serial Number	10919505	10919505			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	49.85	118.08			

### Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	49.71	46.65			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	161211	161211			
Insert/Sonde Serial Number	11579845	11579845			

## REMARKS

1. All depths are measured depths and are calibrated to the driller' pipe tally and are measured from the drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
4. The Following smoothing parameters have been applied to the data"

#### PGRC (Gamma Ray):

Interval Resolution: 0.5 feet  
Coercion Distance: 0.6 feet  
Gap Fill: 3.0 feet

#### ROPA (Rate of Penetration):

Interval Resolution: 0.5 feet  
Coercion Distance: 1.2 feet

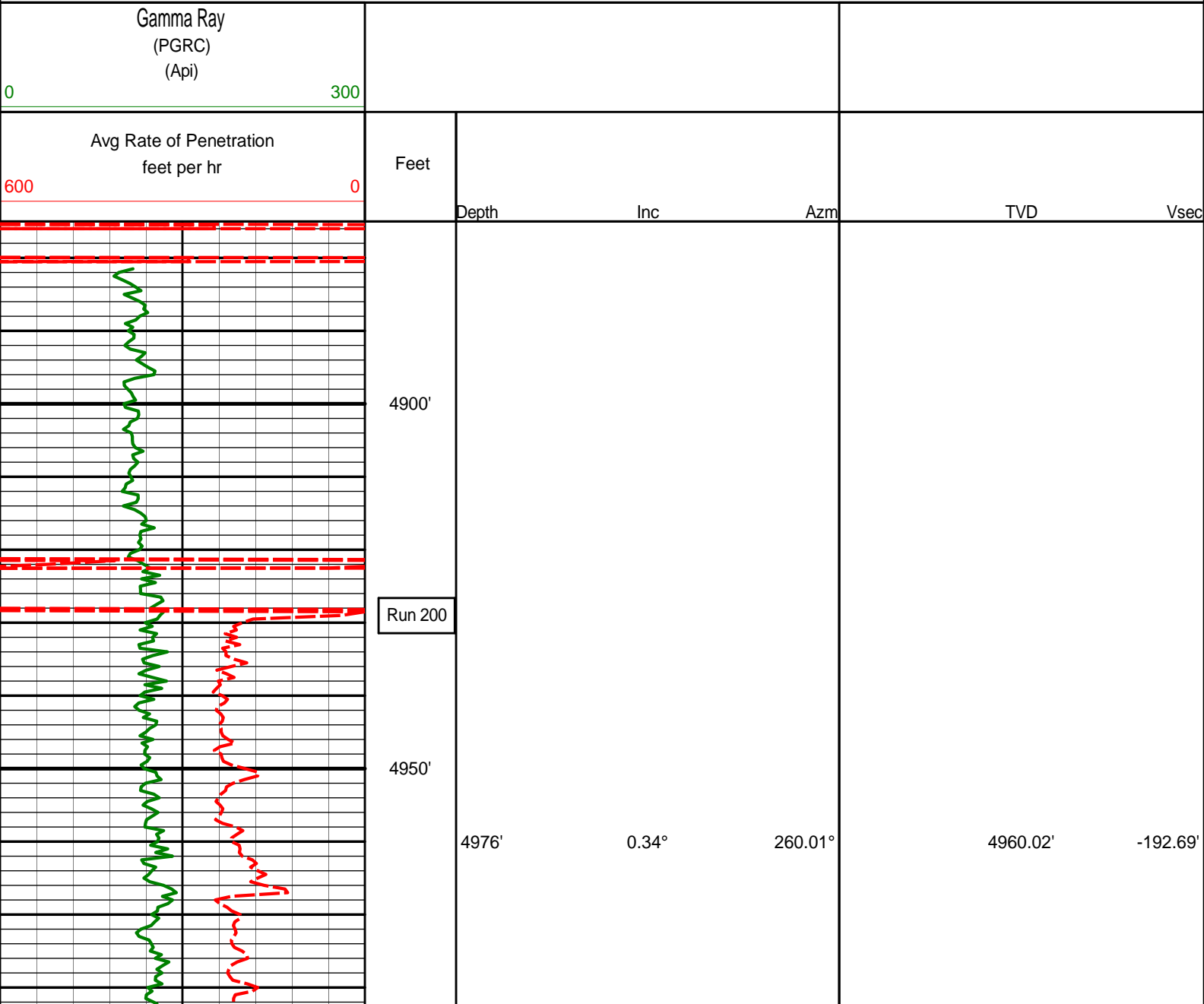
## WARRANTY

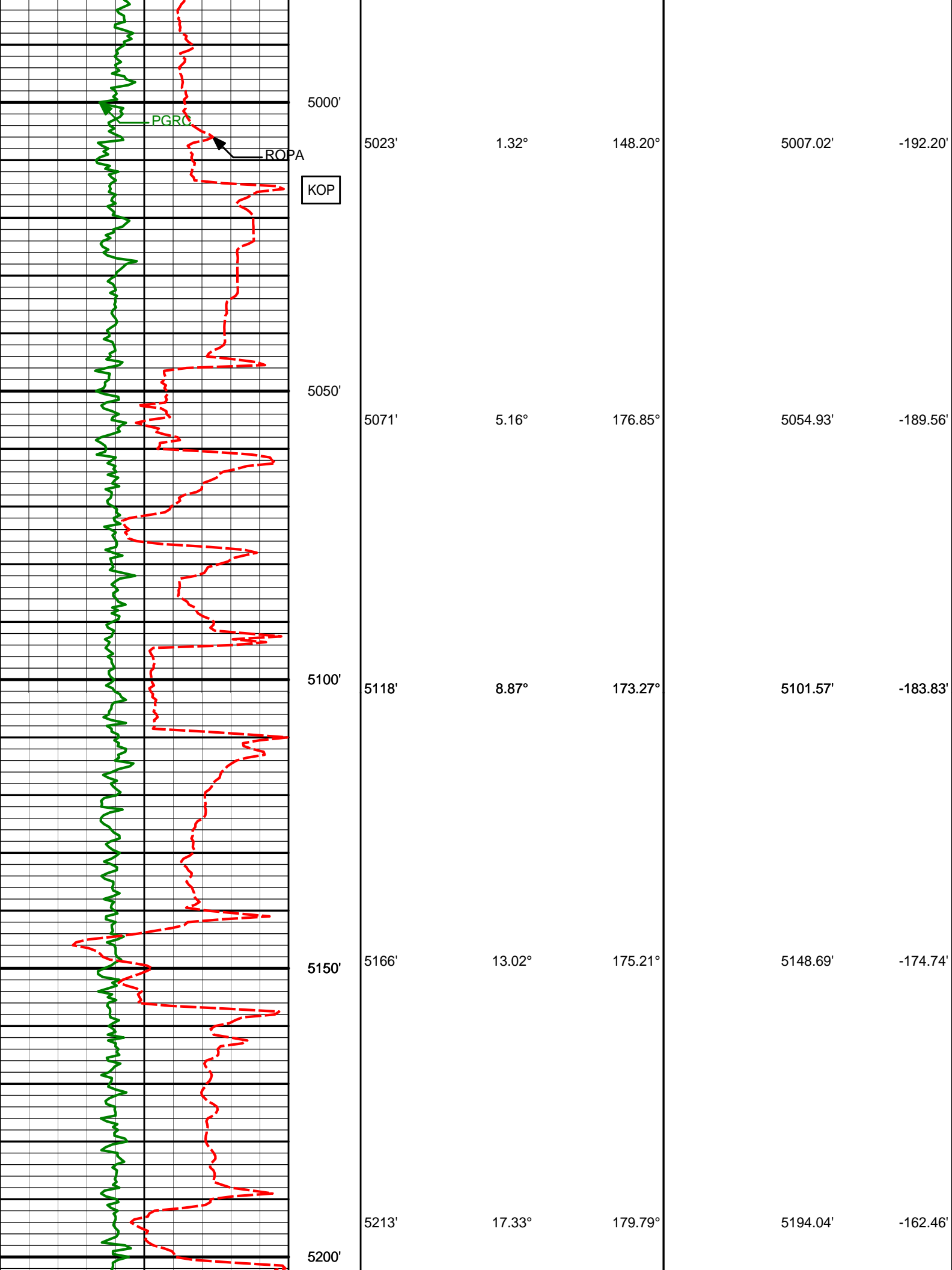
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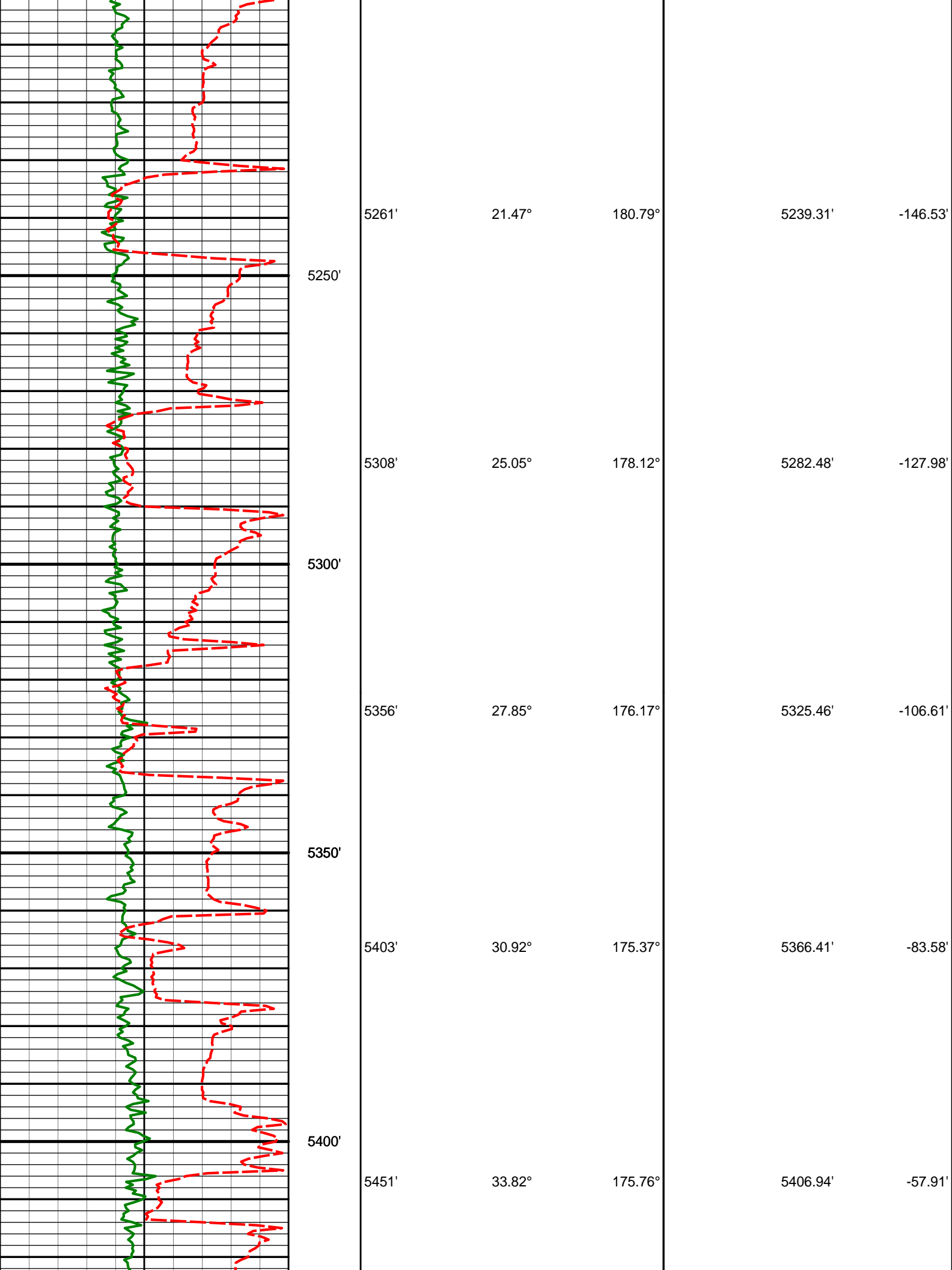
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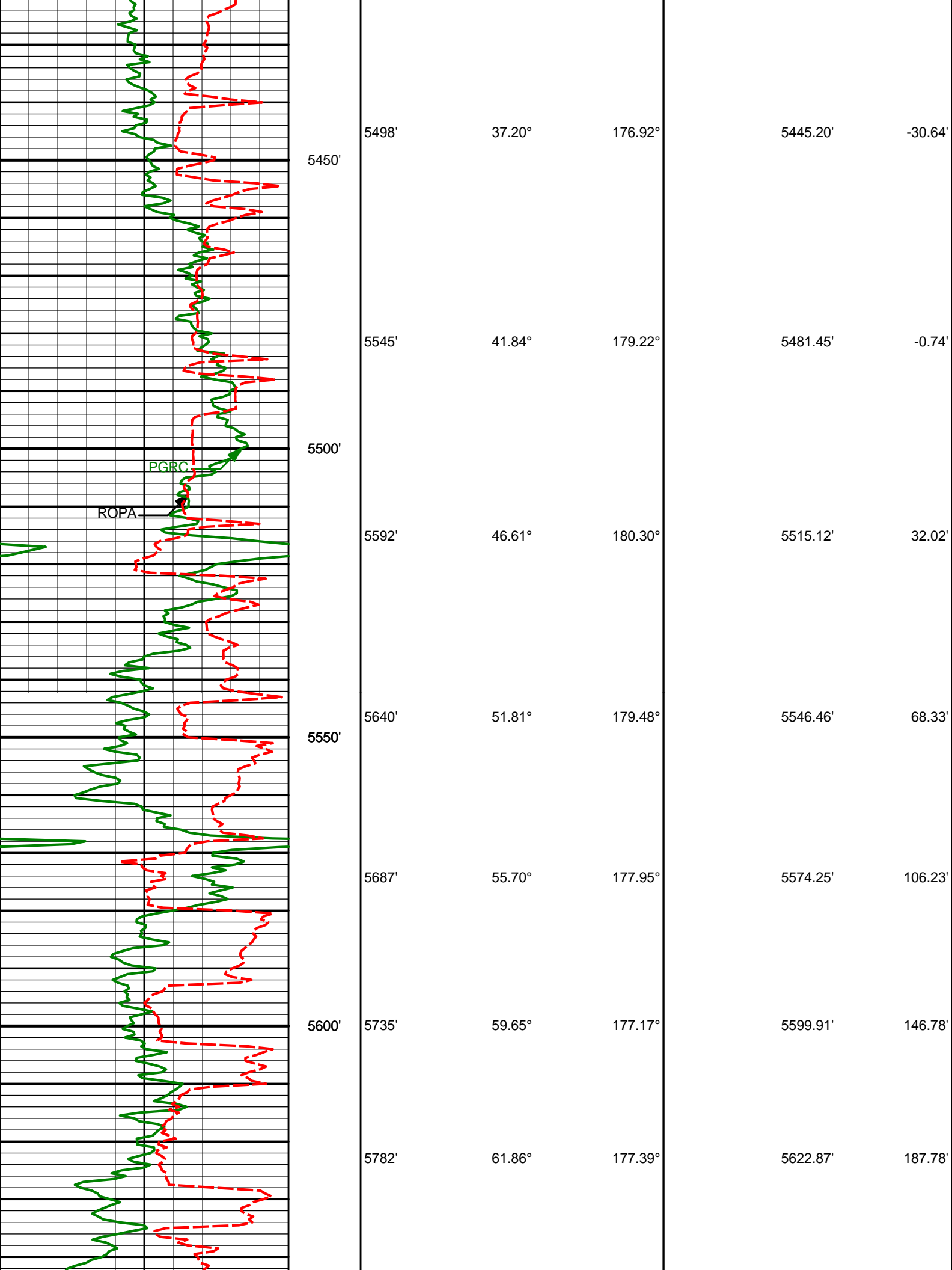
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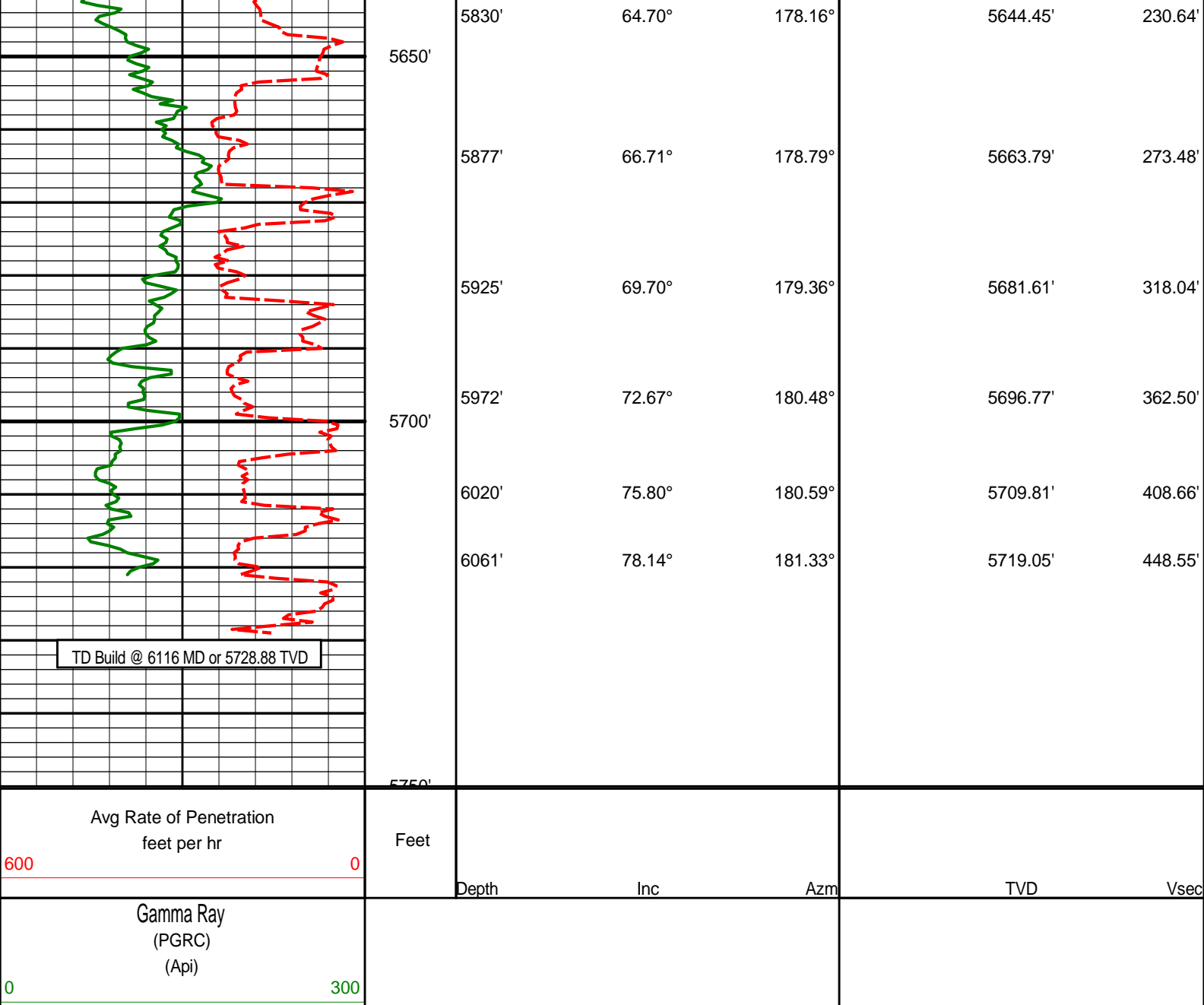
TVD Detail Log 1:240











## HALLIBURTON

### DIRECTIONAL SURVEY REPORT

Noble Energy  
Cook State LD36-78HN  
Wattenberg  
Weld Colorado  
USA  
CA-XX-0900343458

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
338.00	0.10	12.60	338.00	0.29 N	0.06 E	-0.29	0.03
620.00	0.10	33.20	620.00	0.73 N	0.25 E	-0.73	0.01
728.00	0.26	321.12	728.00	1.00 N	0.15 E	-1.00	0.23
821.00	0.44	292.30	821.00	1.31 N	0.31 W	-1.31	0.27
914.00	0.61	330.06	913.99	1.87 N	0.89 W	-1.89	0.40
1007.00	0.51	325.04	1006.99	2.63 N	1.37 W	-2.67	0.11
1193.00	0.46	348.09	1192.98	4.04 N	2.00 W	-4.10	0.11
1379.00	0.45	12.03	1378.98	5.48 N	2.00 W	-5.54	0.10
1472.00	0.35	354.73	1471.97	6.12 N	1.95 W	-6.17	0.17

1567.00	0.36	38.04	1566.97	6.64 N	1.80 W	-6.69	0.28
1662.00	0.56	79.70	1661.97	6.96 N	1.16 W	-6.99	0.39
1757.00	0.50	86.62	1756.97	7.07 N	0.29 W	-7.07	0.09
1852.00	0.86	76.56	1851.96	7.26 N	0.83 E	-7.23	0.40
1946.00	0.31	14.04	1945.95	7.67 N	1.58 E	-7.62	0.82
2041.00	0.26	315.09	2040.95	8.08 N	1.49 E	-8.03	0.30
2136.00	0.43	253.19	2135.95	8.13 N	0.99 E	-8.10	0.41
2231.00	0.89	236.48	2230.95	7.62 N	0.03 E	-7.61	0.52
2326.00	0.71	223.94	2325.94	6.78 N	1.00 W	-6.81	0.26
2421.00	0.48	190.81	2420.93	5.97 N	1.48 W	-6.01	0.43
2516.00	1.78	21.84	2515.92	6.94 N	1.01 W	-6.97	2.37
2611.00	3.57	359.21	2610.81	11.27 N	0.50 W	-11.28	2.16
2706.00	5.11	354.14	2705.54	18.44 N	0.97 W	-18.46	1.67
2801.00	7.58	355.80	2799.95	28.89 N	1.87 W	-28.93	2.60
2896.00	7.61	356.07	2894.12	41.41 N	2.75 W	-41.48	0.05
2990.00	9.56	3.58	2987.06	55.42 N	2.69 W	-55.47	2.39
3085.00	11.08	0.40	3080.52	72.42 N	2.14 W	-72.45	1.70
3180.00	12.36	3.74	3173.54	91.69 N	1.41 W	-91.69	1.52
3275.00	13.15	6.19	3266.20	112.57 N	0.42 E	-112.51	1.01
3370.00	12.67	7.85	3358.80	133.63 N	3.01 E	-133.49	0.64
3465.00	11.26	6.10	3451.73	153.18 N	5.42 E	-152.95	1.53
3560.00	8.90	349.87	3545.28	169.64 N	5.11 E	-169.41	3.86
3655.00	5.01	340.70	3639.56	180.80 N	2.45 E	-180.64	4.25
3750.00	2.97	326.59	3734.33	186.77 N	0.28 W	-186.69	2.37
3844.00	2.72	318.57	3828.22	190.47 N	3.09 W	-190.48	0.50
3939.00	1.54	317.19	3923.15	193.09 N	5.45 W	-193.17	1.24
4034.00	0.99	39.64	4018.13	194.66 N	5.79 W	-194.75	1.81
4129.00	0.80	61.30	4113.12	195.61 N	4.69 W	-195.67	0.41
4224.00	0.94	73.95	4208.11	196.15 N	3.36 W	-196.16	0.25
4319.00	1.09	65.14	4303.09	196.74 N	1.79 W	-196.71	0.23
4414.00	1.49	61.91	4398.07	197.70 N	0.11 E	-197.61	0.43
4508.00	1.13	176.43	4492.06	197.35 N	1.25 E	-197.22	2.35
4603.00	1.05	190.54	4587.04	195.56 N	1.15 E	-195.44	0.30
4698.00	0.74	221.98	4682.03	194.25 N	0.58 E	-194.15	0.60
4793.00	0.25	203.18	4777.03	193.60 N	0.09 E	-193.51	0.53
4888.00	0.60	229.76	4872.02	193.09 N	0.38 W	-193.01	0.41
4976.00	0.34	260.01	4960.02	192.74 N	0.99 W	-192.69	0.39
5023.00	1.32	148.20	5007.02	192.26 N	0.84 W	-192.20	3.15
5071.00	5.16	176.85	5054.93	189.63 N	0.43 W	-189.56	8.45
5118.00	8.87	173.27	5101.57	183.92 N	0.11 E	-183.83	7.94
5166.00	13.02	175.21	5148.69	174.85 N	0.99 E	-174.74	8.67
5213.00	17.33	179.79	5194.04	162.57 N	1.46 E	-162.46	9.51
5261.00	21.47	180.79	5239.31	146.64 N	1.37 E	-146.53	8.65
5308.00	25.05	178.12	5282.48	128.09 N	1.58 E	-127.98	7.95
5356.00	27.85	176.17	5325.46	106.74 N	2.66 E	-106.61	6.10
5403.00	30.92	175.37	5366.41	83.75 N	4.37 E	-83.58	6.59
5451.00	33.82	175.76	5406.94	58.13 N	6.35 E	-57.91	6.07
5498.00	37.20	176.92	5445.20	30.89 N	8.08 E	-30.64	7.33
5545.00	41.84	179.22	5481.45	1.01 N	9.06 E	-0.74	10.35
5592.00	46.61	180.30	5515.12	31.76 S	9.18 E	32.02	10.28
5640.00	51.81	179.48	5546.46	68.09 S	9.26 E	68.33	10.91
5687.00	55.70	177.95	5574.25	105.97 S	10.13 E	106.23	8.67
5735.00	59.65	177.17	5599.91	146.49 S	11.86 E	146.78	8.35
5782.00	61.86	177.39	5622.87	187.45 S	13.80 E	187.78	4.71
5830.00	64.70	178.16	5644.45	230.29 S	15.46 E	230.64	6.08
5877.00	66.71	178.79	5663.79	273.10 S	16.60 E	273.48	4.45
5925.00	69.70	179.36	5681.61	317.66 S	17.32 E	318.04	6.33
5972.00	72.67	180.48	5696.77	362.15 S	17.38 E	362.50	6.71
6020.00	75.80	180.59	5709.81	408.33 S	16.95 E	408.66	6.52
6061.00	78.14	181.33	5719.05	448.27 S	16.27 E	448.55	5.97

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 178.29 DEGREES (GRID)

A TOTAL CORRECTION OF 7.09 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.

HORIZONTAL DISPLACEMENT(CLOSURE) AT 6061.00 FEET

IS 448.56 FEET ALONG 177.92 DEGREES (GRID)



Surveys at 338 ft and 620 ft were taken and provided by HP 322 while they were drilling the surface hole.

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