

PCGK - Pressure Case Gamma

1 : 240

Company : Noble Energy									
Rig : H&P 322									
Well : Wells Ranch AE30-69HNB									
Field : Wattenburg									
Country : USA									
API Number : 05-123-38675									
LOCATION					Other Services Directional Drilling				
Latitude : 40° 27' 51.19" North Longitude : 104° 21' 21.49" West UTM Easting = 3,318,313.540 ft UTM Northing = 1,414,009.080 ft									
Country : USA									
Field : Wattenburg									
Well : Wells Ranch AE30-69HNB									
Rig : H&P 322									
Company : Noble Energy									
Permanent Datum : Ground Level					Elev. KB N/A				
Log Measured From : Drill Floor					DF 4800.00 ft				
Drilling Measured From : Drill Floor					GL 4776.00 ft				
TVD LOG					WD N/A				
Depth Logged : 627.00 ft To 6,864.00 ft					Unit No. : 11210425				
Date Logged : 29-Apr-14 To 30-Apr-14					Job No. : CA-XX-0901116552				
Total Depth MD : 6,864.00 ft TVD : 6,538.97 ft					Plot Type : Final				
Spud Date : 27-Apr-14					Plot Date : 02-May-14				
Borehole Record (TVD)									
Run No.	Size	From	To	Run No.	Size	From	To		
2	8.750 in	627.00 ft	5,846.47 ft						
3	8.750 in	5,846.47 ft	6538.97 ft						
Casing Record (TVD)									
	Size	Weight	From	To					

## WELL INFORMATION

<b>MWD Run Number</b>	100	200			
<b>Date run completed</b>	30-Apr-14	01-May-14			
<b>Rig Bit Number</b>	2	3			
<b>Bit Size (in)</b>	8.750	8.750			
<b>Tool Nominal OD (in)</b>	6.750	4.750			
<b>Log Start Depth (TVD, ft)</b>	627.00	5,846.47			
<b>Log End Depth (TVD, ft)</b>	5,846.47	6,538.97			
<b>Drill or Wipe</b>	Drill	Drill			
<b>Drill/Wipe Start Date and Time</b>	29-Apr-14 04:00	30-Apr-14 13:18			
<b>Drill/Wipe End Date and Time</b>	30-Apr-14 03:56	01-May-14 00:20			
<b>Min Inc (deg) @ Depth (TVD, ft)</b>	0.10 @ 235.00	2.92 @ 5,921.42			
<b>Max Inc (deg) @ Depth (TVD, ft)</b>	10.68 @ 2,985.18	81.53 @ 6,534.28			
<b>Bit TFA(in2) / Bit Type</b>	0.91 / PDC	0.98 / PDC			
<b>Flow Rate (gpm)</b>	574.00	585.00			
<b>Max AV (fpm) / CV (fpm) @ MWD</b>	462.9 / 462.9	462.9 / 462.9			
<b>Fluid Type</b>	Fresh Water Gel	Fresh Water Gel			
<b>Density (ppg) / Viscosity (spqt)</b>	8.53 / 27.00	9.18 / 34.00			
<b>Filtrate CL (ppm)</b>	1,900.00	1,900.00			
<b>pH / Fluid Loss (mptm)</b>	8.80 / N/A	9.40 / N/A			
<b>PV (cP) / YP (lbf2)</b>	1 / 3.00	9 / 4.00			
<b>% Solids / % Sand</b>	1.70 / 0.10	4.50 / 0.25			
<b>% Oil / Oil:Water Ratio</b>	N/A / N/A	N/A / N/A			
<b>Rm @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A			
<b>Rmf @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A			
<b>Rmc @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A			
<b>Max Tool Temp (deg F) / S</b>	127.50 / PDM	151.00 / PDM			

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	Osahon Igunbor	Osahon Igunbor			
Customer Representative	Jeremy Stolz	Jeremy Stolz			

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.84	5.84			
Sub Serial Number	11341333	11341333			
Insert Serial Number	11680106	11680106			
Date and Time Initialized	28-Apr-14 09:47	28-Apr-14 09:47			
Date and Time Read	01-May-14 06:58	01-May-14 06:43			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	60.00	59.00			
Software Version	6.21	6.21			
Sub Serial Number	11341333	11341333			
Sonde Serial Number	11478090	11478090			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	267.38	7.91			

### Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	53.08	51.49			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11341333	11341333			
Insert/Sonde Serial Number	12071281	12071281			

## REMARKS

1. All depths are true vertical 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"

PGXR (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

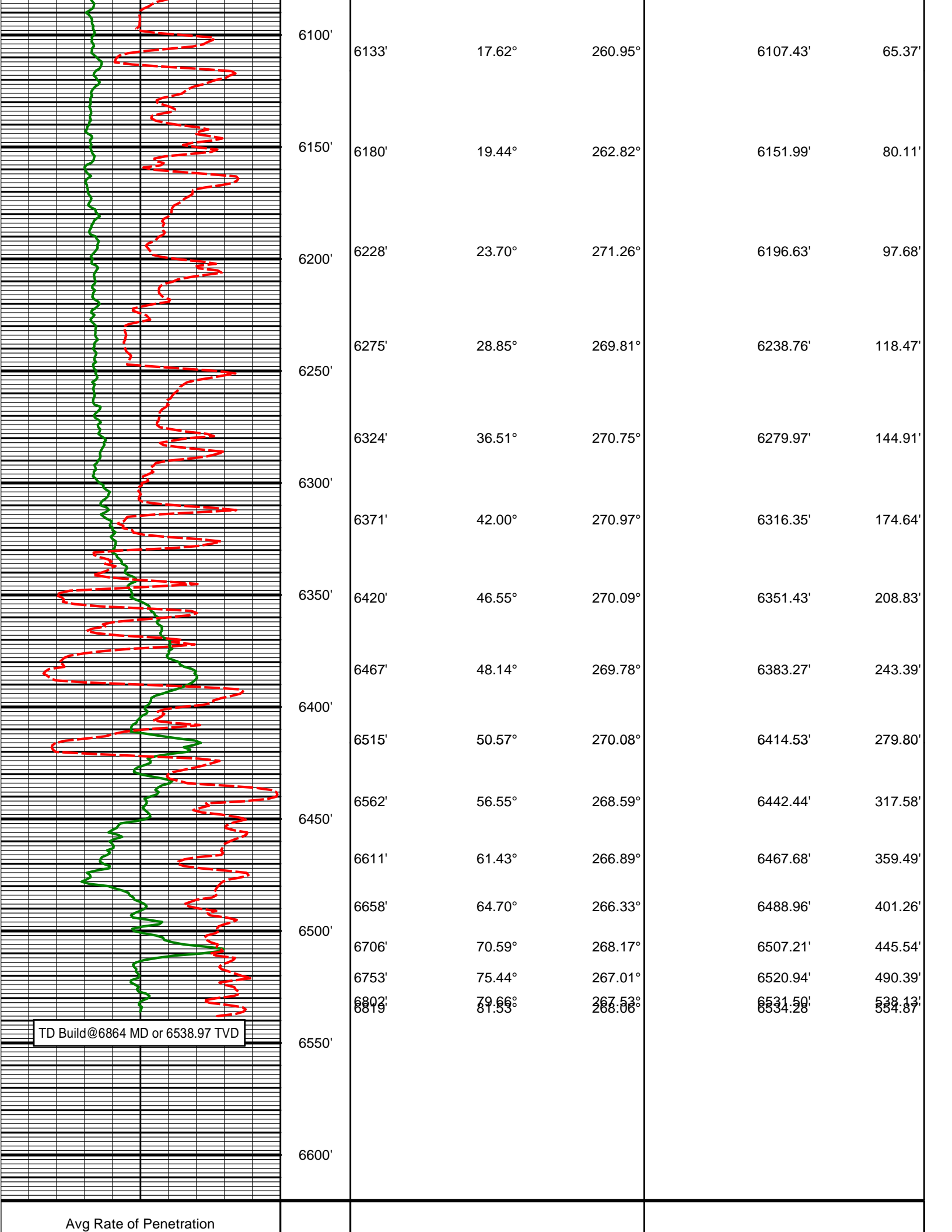
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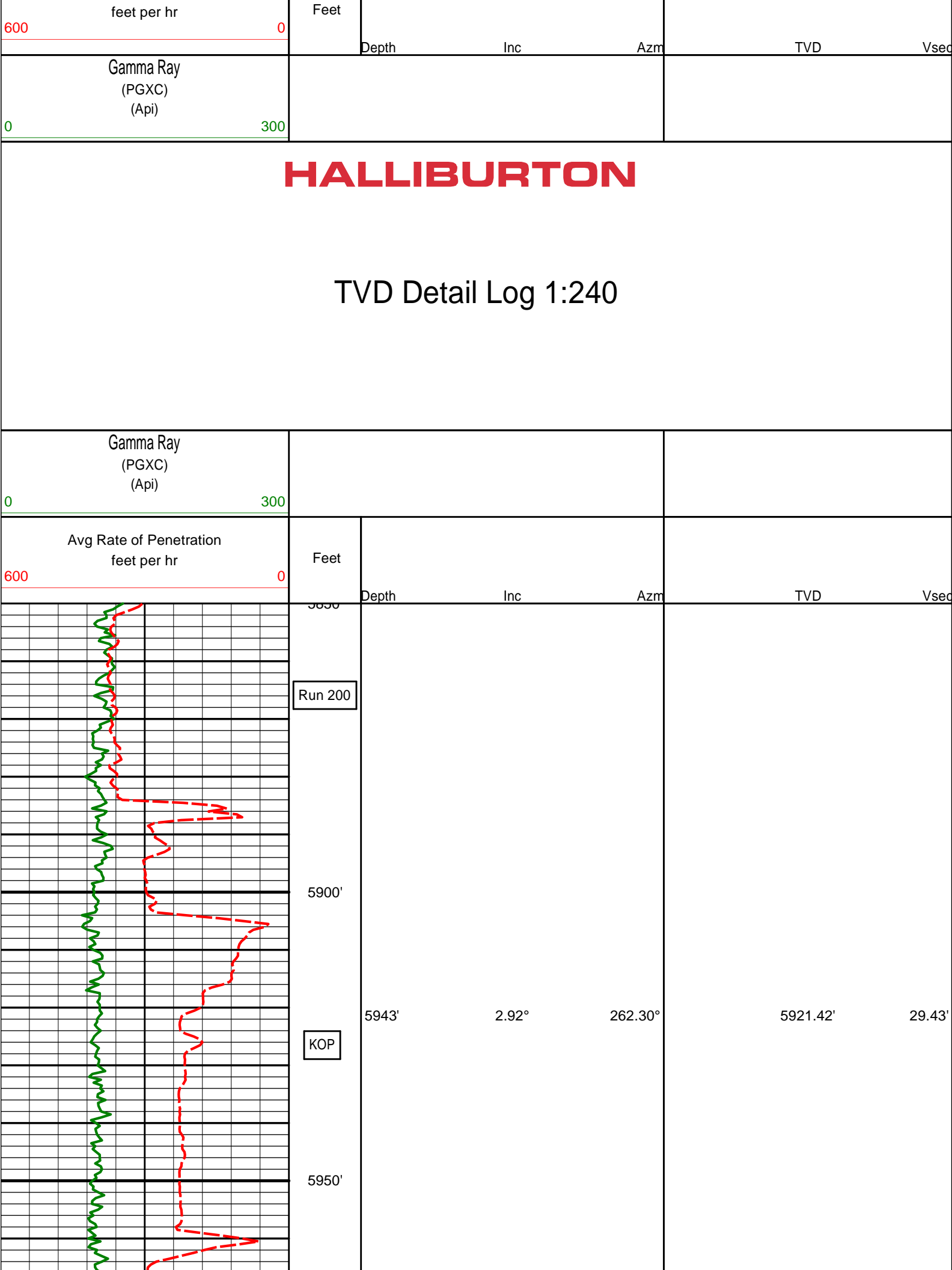
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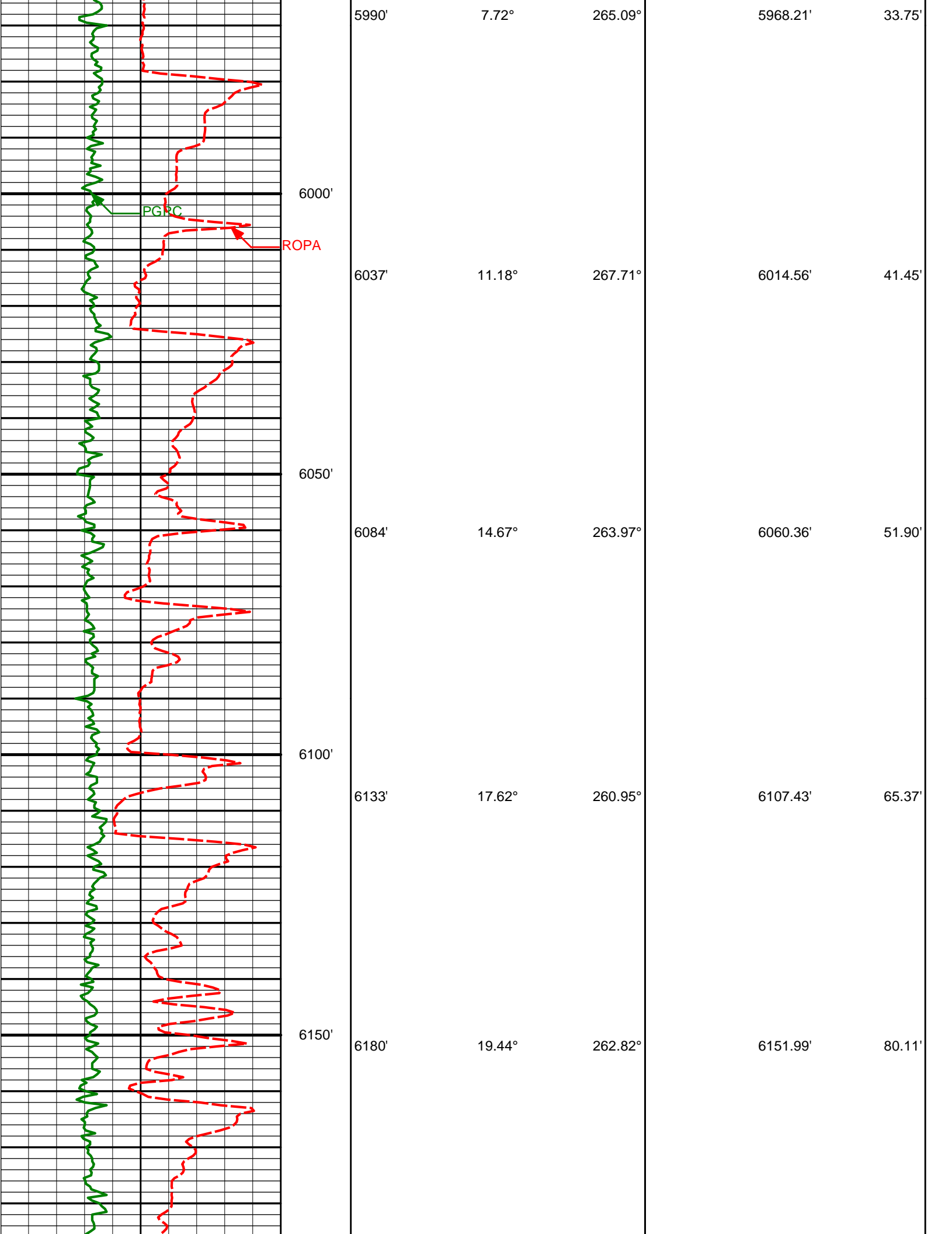
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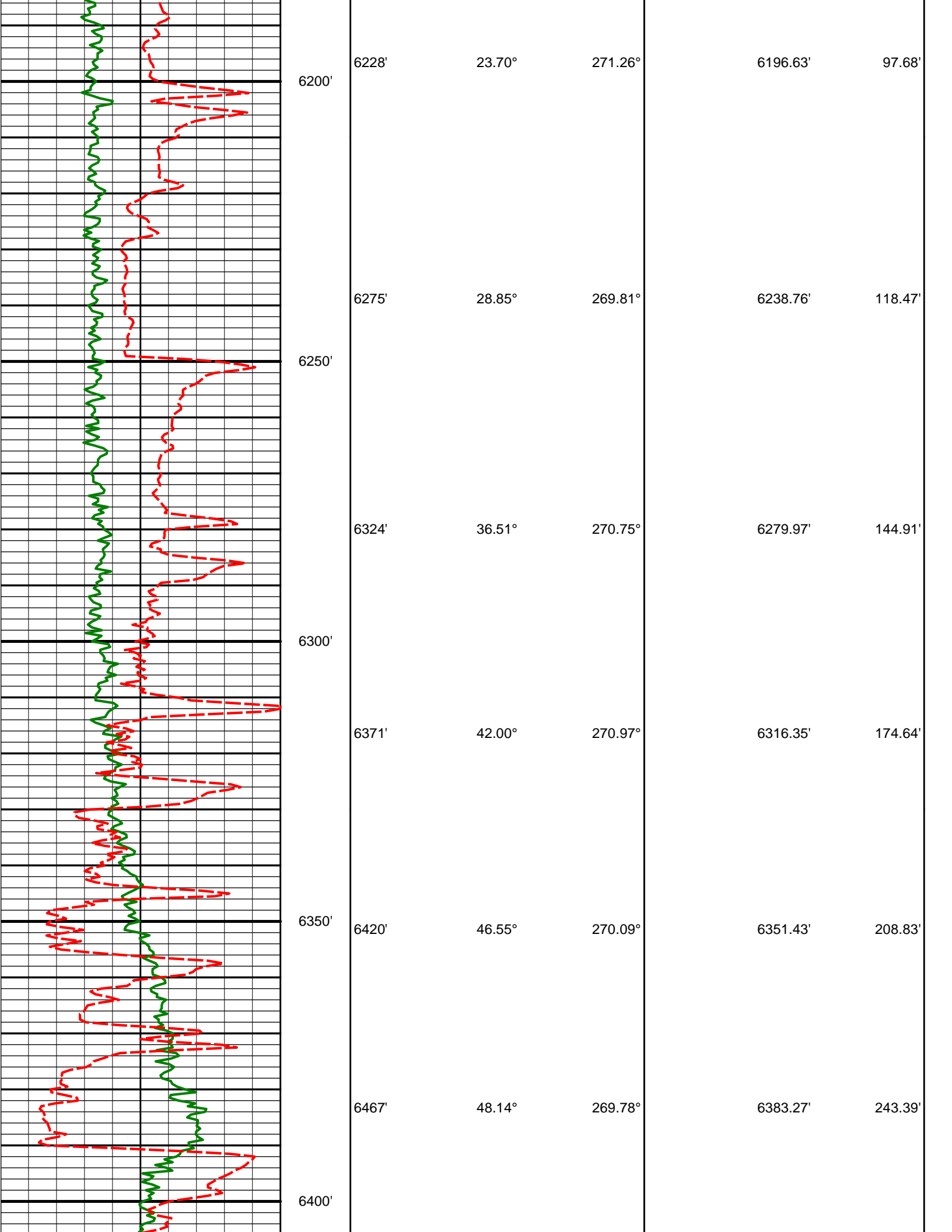
## TVD Detail Log 1:600

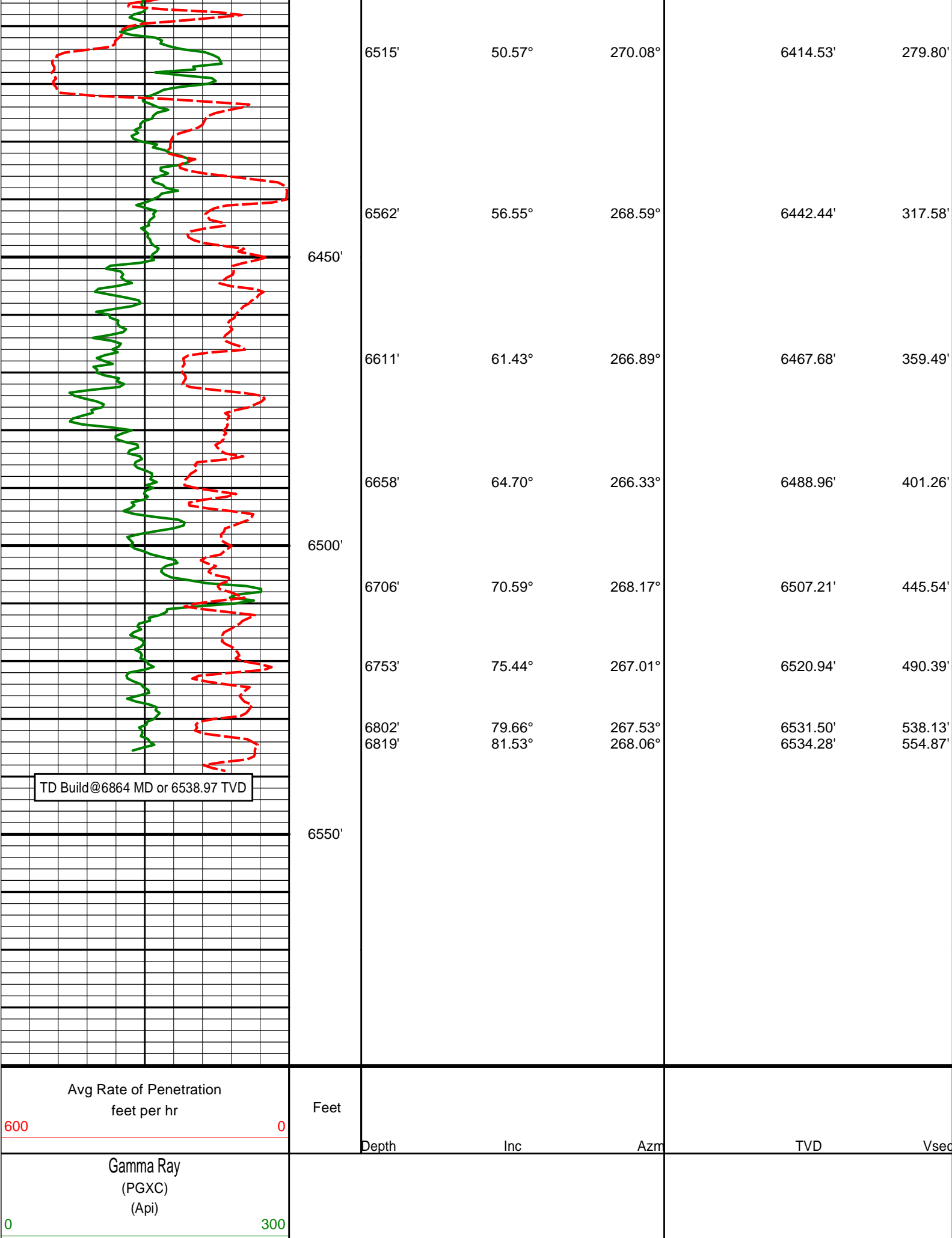
Gamma Ray (PGXC) (Api)					
0300					
Avg Rate of Penetration feet per hr	Feet				
6000					
	Depth	Inc	Azm	TVD	Vsec
	Run 200 5850'				
	KOP				
	5943'	2.92°	262.30°	5921.42'	29.43'
	5950'				
	5990'	7.72°	265.09°	5968.21'	33.75'
	6000'				
	6037'	11.18°	267.71°	6014.56'	41.45'
	6050'				
	6084'	14.67°	263.97°	6060.36'	51.90'













# DIRECTIONAL SURVEY REPORT

Noble Energy  
Wells Ranch AE30-69HNB  
Wattenburg  
Weld Colorado  
USA  
CA-XX-0901116552

<i>Measured Depth (feet)</i>	<i>Inclination (degrees)</i>	<i>Direction (degrees)</i>	<i>Vertical Depth (feet)</i>	<i>Latitude (feet)</i>	<i>Departure (feet)</i>	<i>Vertical Section (feet)</i>	<i>Dogleg (deg/100ft)</i>
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
235.00	0.10	64.04	235.00	0.09 N	0.18 E	-0.18	0.04
485.00	0.20	240.84	485.00	0.03 S	0.00 W	0.00	0.12
585.00	0.40	249.04	585.00	0.24 S	0.48 W	0.47	0.20
735.00	0.30	160.15	735.00	0.79 S	0.83 W	0.82	0.33
828.00	0.21	168.78	828.00	1.19 S	0.72 W	0.70	0.10
921.00	0.19	204.87	920.99	1.50 S	0.75 W	0.72	0.13
1014.00	0.31	214.40	1013.99	1.84 S	0.96 W	0.92	0.14
1107.00	0.24	254.55	1106.99	2.10 S	1.29 W	1.25	0.21
1294.00	0.44	253.93	1293.99	2.41 S	2.35 W	2.31	0.11
1480.00	0.34	248.13	1479.99	2.81 S	3.55 W	3.50	0.06
1575.00	0.20	247.79	1574.98	2.98 S	3.97 W	3.91	0.15
1669.00	0.36	208.83	1668.98	3.30 S	4.26 W	4.20	0.26
1764.00	0.62	306.19	1763.98	3.26 S	4.82 W	4.76	0.80
1859.00	0.94	264.81	1858.97	3.02 S	6.01 W	5.96	0.66
1954.00	2.84	330.30	1953.92	1.05 S	7.95 W	7.93	2.73
2049.00	5.06	347.69	2048.70	5.09 N	10.01 W	10.10	2.63
2144.00	6.44	356.88	2143.22	14.50 N	11.20 W	11.45	1.74
2239.00	7.42	358.53	2237.52	25.95 N	11.64 W	12.10	1.05
2333.00	8.04	358.54	2330.67	38.59 N	11.97 W	12.65	0.66
2428.00	8.26	356.34	2424.71	52.05 N	12.57 W	13.50	0.40
2523.00	9.74	356.01	2518.54	66.87 N	13.57 W	14.76	1.56
2618.00	10.61	353.32	2612.04	83.58 N	15.14 W	16.63	1.04
2712.00	10.00	352.61	2704.52	100.27 N	17.20 W	18.98	0.66
2807.00	10.26	357.94	2798.05	116.90 N	18.57 W	20.64	1.02
2902.00	9.46	356.92	2891.64	133.15 N	19.29 W	21.66	0.86
2997.00	10.68	1.48	2985.18	149.75 N	19.48 W	22.14	1.53
3092.00	9.55	357.98	3078.70	166.42 N	19.53 W	22.49	1.35
3187.00	9.51	349.93	3172.39	182.03 N	21.18 W	24.42	1.40
3282.00	6.59	338.12	3266.45	194.82 N	24.59 W	28.05	3.52
3377.00	6.92	340.25	3360.79	205.26 N	28.55 W	32.20	0.44
3471.00	6.40	356.00	3454.17	215.82 N	30.83 W	34.67	2.01
3566.00	7.73	358.33	3548.44	227.49 N	31.39 W	35.43	1.43
3661.00	8.80	352.51	3642.46	241.08 N	32.52 W	36.81	1.43
3756.00	8.66	0.99	3736.36	255.44 N	33.34 W	37.89	1.36
3851.00	7.95	17.24	3830.38	268.86 N	31.27 W	36.05	2.57
3946.00	4.37	19.14	3924.81	278.56 N	28.14 W	33.09	3.77
4041.00	2.73	24.43	4019.63	284.04 N	26.02 W	31.07	1.76
4137.00	1.24	78.14	4115.58	286.34 N	24.05 W	29.15	2.33
4232.00	0.73	185.51	4210.57	285.94 N	23.11 W	28.19	1.70
4328.00	0.81	184.64	4306.56	284.66 N	23.22 W	28.28	0.08
4423.00	0.53	215.94	4401.55	283.64 N	23.53 W	28.58	0.48
4518.00	0.85	201.65	4496.54	282.63 N	24.05 W	29.07	0.38
4614.00	0.56	238.53	4592.54	281.72 N	24.71 W	29.72	0.54
4710.00	0.34	216.96	4688.53	281.25 N	25.28 W	30.29	0.29
4805.00	1.17	136.20	4783.53	280.32 N	24.78 W	29.77	1.23
4900.00	0.68	158.62	4878.51	279.10 N	23.91 W	28.87	0.63
4996.00	0.62	156.29	4974.51	278.09 N	23.49 W	28.44	0.07
5092.00	0.46	184.72	5070.50	277.23 N	23.31 W	28.24	0.32
5187.00	0.25	227.52	5165.50	276.70 N	23.50 W	28.42	0.35
5283.00	0.64	238.35	5261.50	276.28 N	24.10 W	29.02	0.41
5379.00	0.89	178.91	5357.49	275.26 N	24.54 W	29.44	0.82
5474.00	0.35	125.08	5452.49	274.35 N	24.29 W	29.17	0.78
5666.00	0.68	118.84	5644.48	273.46 N	22.81 W	27.68	0.17
5761.00	0.50	140.70	5739.47	272.87 N	22.06 W	26.91	0.30
5808.00	0.49	107.06	5786.47	272.65 N	21.73 W	26.58	0.61
5943.00	2.92	262.30	5921.42	272.02 N	24.59 W	29.43	2.50
5990.00	7.72	265.09	5968.21	271.59 N	28.92 W	33.75	10.22
6037.00	14.42	267.74	6014.52	271.14 N	28.92 W	34.45	7.42

6037.00	11.18	267.71	6014.56	271.14 N	36.62 W	41.45	7.42
6084.00	14.67	263.97	6060.36	270.33 N	47.10 W	51.90	7.63
6133.00	17.62	260.95	6107.43	268.51 N	60.60 W	65.37	6.26
6180.00	19.44	262.82	6151.99	266.41 N	75.38 W	80.11	4.07
6228.00	23.70	271.26	6196.63	265.63 N	92.96 W	97.68	10.96
6275.00	28.85	269.81	6238.76	265.80 N	113.76 W	118.47	11.04
6324.00	36.51	270.75	6279.97	265.95 N	140.20 W	144.91	15.67
6371.00	42.00	270.97	6316.35	266.40 N	169.92 W	174.64	11.68
6420.00	46.55	270.09	6351.43	266.71 N	204.12 W	208.83	9.37
6467.00	48.14	269.78	6383.27	266.66 N	238.68 W	243.39	3.42
6515.00	50.57	270.08	6414.53	266.62 N	275.10 W	279.80	5.08
6562.00	56.55	268.59	6442.44	266.16 N	312.89 W	317.58	12.98
6611.00	61.43	266.89	6467.68	264.49 N	354.84 W	359.49	10.39
6658.00	64.70	266.33	6488.96	262.01 N	396.66 W	401.26	7.04
6706.00	70.59	268.17	6507.21	259.90 N	440.98 W	445.54	12.77
6753.00	75.44	267.01	6520.94	258.00 N	485.88 W	490.39	10.59
6802.00	79.66	267.53	6531.50	255.73 N	533.66 W	538.13	8.67
6819.00	81.53	268.06	6534.28	255.08 N	550.42 W	554.87	11.42

**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 271.02 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.44 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 6819.00 FEET  
IS 606.65 FEET ALONG 294.86 DEGREES (GRID)**

**Tie-In @ Surface**

**Surveys at 235 ft, 485 ft and 585 ft were taken and provided by HP 322 while they were drilling the surface hole and have been converted from magnetic north to grid north.**