

PCGC: Pressure Case Gamma
PCDC: Pressure Case Directional

[illegible]

WELL INFORMATION

MWD Run Number	100	200	300		
Date run completed	17-Jan-14	19-Jan-14	20-Jan-14		
Rig Bit Number	1	2	3		
Bit Size (in)	13.500	8.750	8.750		
Tool Nominal OD (in)	8.000	6.750	6.750		
Log Start Depth (TVD, ft)	124.00	1,998.72	5,947.15		
Log End Depth (TVD, ft)	1,998.72	5,947.15	6,655.52		
Drill or Wipe	Drill	Drill	Drill		
Drill/Wipe Start Date and Time	16-Jan-14 02:15	18-Jan-14 04:00	19-Jan-14 09:15		
Drill/Wipe End Date and Time	16-Jan-14 22:30	18-Jan-14 19:35	19-Jan-14 21:55		
Min Inc (deg) @ Depth (TVD, ft)	0.44 @ 323.99	0.32 @ 2,321.68	0.79 @ 5,977.15		
Max Inc (deg) @ Depth (TVD, ft)	1.45 @ 878.90	13.03 @ 3,819.77	86.00 @ 6,652.32		
Bit TFA(in2) / Bit Type	1.17 / PDC	0.77 / PDC	0.98 / PDC		
Flow Rate (gpm)	633.41	591.07	538.96		
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A	N/A / N/A		
Fluid Type	Native/Spud Mud	Polymer	Polymer		
Density (ppg) / Viscosity (spqt)	8.52 / 29.00	8.80 / 30.00	10.83 / 42.00		
Filtrate CL (ppm)	1,600.00	1,600.00	1,600.00		
pH / Fluid Loss (mptm)	8.80 / 0	9.80 / 0	9.10 / 7		
PV (cP) / YP (lbf2)	5 / 4.00	4 / 6.00	19 / 15.00		
% Solids / % Sand	2.3 / 0.35	2.3 / 0.25	5.5 / 0.25		
% Oil / Oil:Water Ratio	N/A / N/A	N/A / N/A	N/A / N/A		
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Max Tool Temp (deg F) @ Depth (ft)	62.51 / 80M	151.83 / 80M	127.87 / 80M		

Max Tool Temp (degF) / Source	98.51 / PCM	154.30 / PCM	167.97 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Lead MWD Engineer	Paul Kock	Paul Kock	Paul Kock		
Customer Representative	Martin Suarez	Martin Suarez	Martin Suarez		

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.84	5.84	5.84		
Sub Serial Number	11812718	11331933	11331933		
Insert Serial Number	11680783	11680783	11680783		
Date and Time Initialized	15-Jan-14 22:03	17-Jan-14 10:29	17-Jan-14 10:29		
Date and Time Read	17-Jan-14 02:10	20-Jan-14 14:17	20-Jan-14 14:28		
ECMB SW Version	N/A	N/A	N/A		

Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	56.26	53.41	52.04		
Software Version	6.21	6.21	6.21		
Sub Serial Number	11812718	11331933	11331933		
Sonde Serial Number	12177532	12177532	12177532		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	138.43	287.57	237.51		

Gamma Ray Sensor Information

Tool Type		PCG	PCG		
Distance From Bit (ft)		48.41	45.04		
Recorded Sample Period (sec)		10	10		
Software Version		8.15	8.15		
Sub Serial Number		11331933	11331933		
Insert/Sonde Serial Number		11681002	11681002		

REMARKS

1. All depths are calibrated to the driller's pipe tally and are measured from the Rig 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.
 - ROPA: Average Rate of Penetration is real time data.
 - PGRC: Smooth Pressure Case Gamma Ray Borehole corrected is recorded data.
4. The following smoothing parameters have been applied to the data:
 - All 2" (1:600) logs - 1 ft. interval, 3 ft. coercion distance.
 - All 5" (1:240) logs - .5 ft. interval, .6 ft. coercion distance.
5. INSITE version 8.0.0

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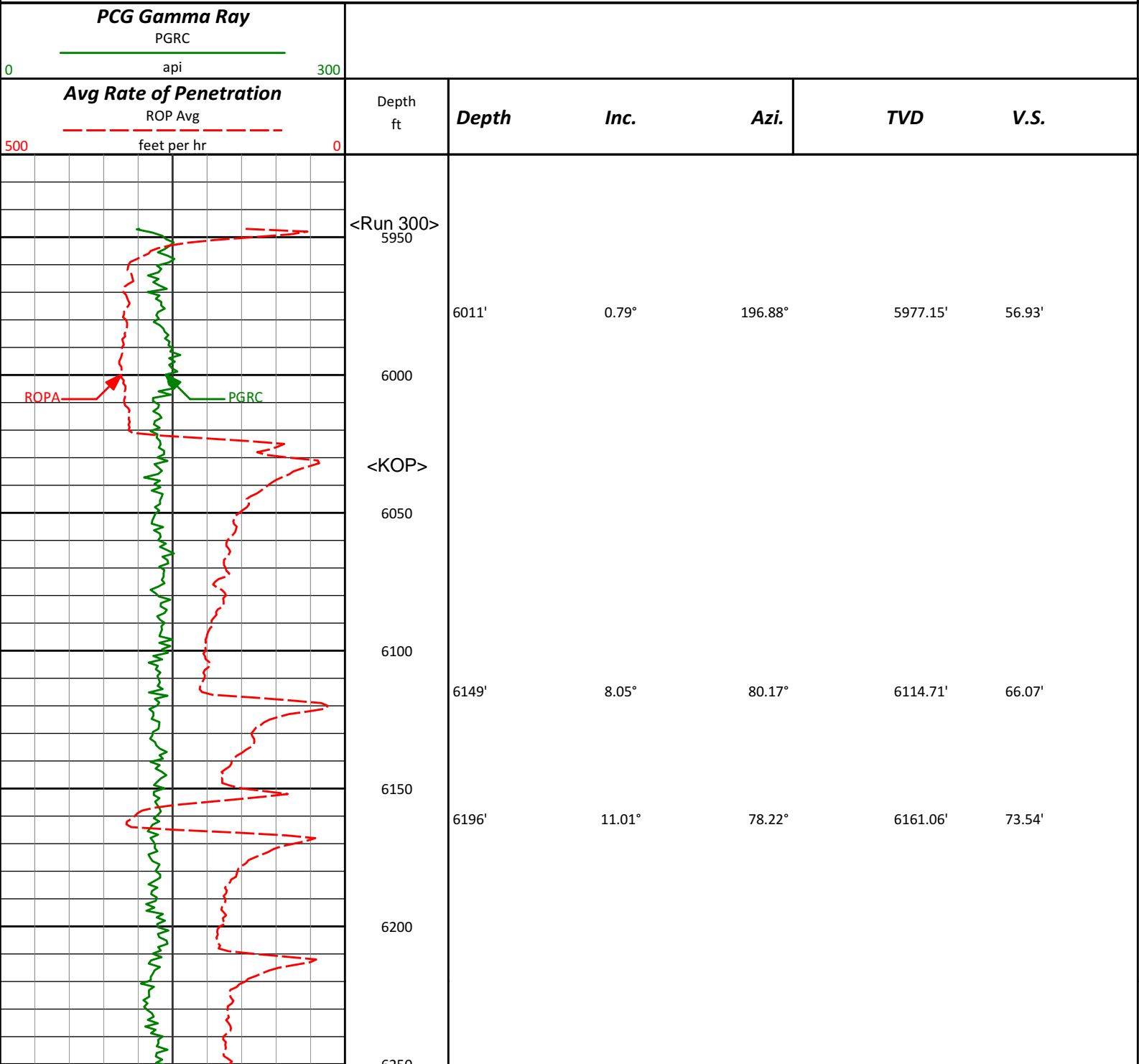
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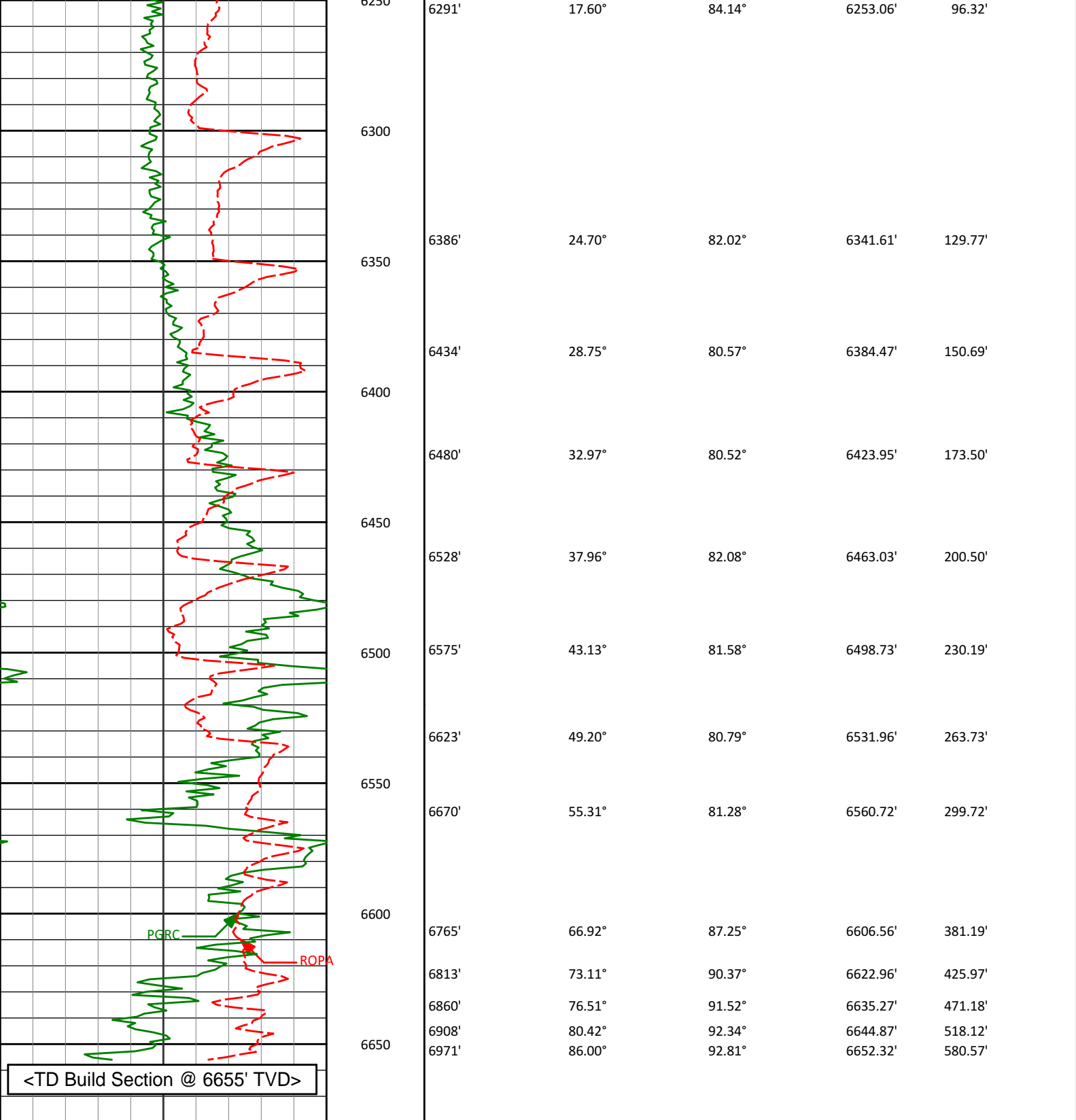
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Sperry Drilling Services

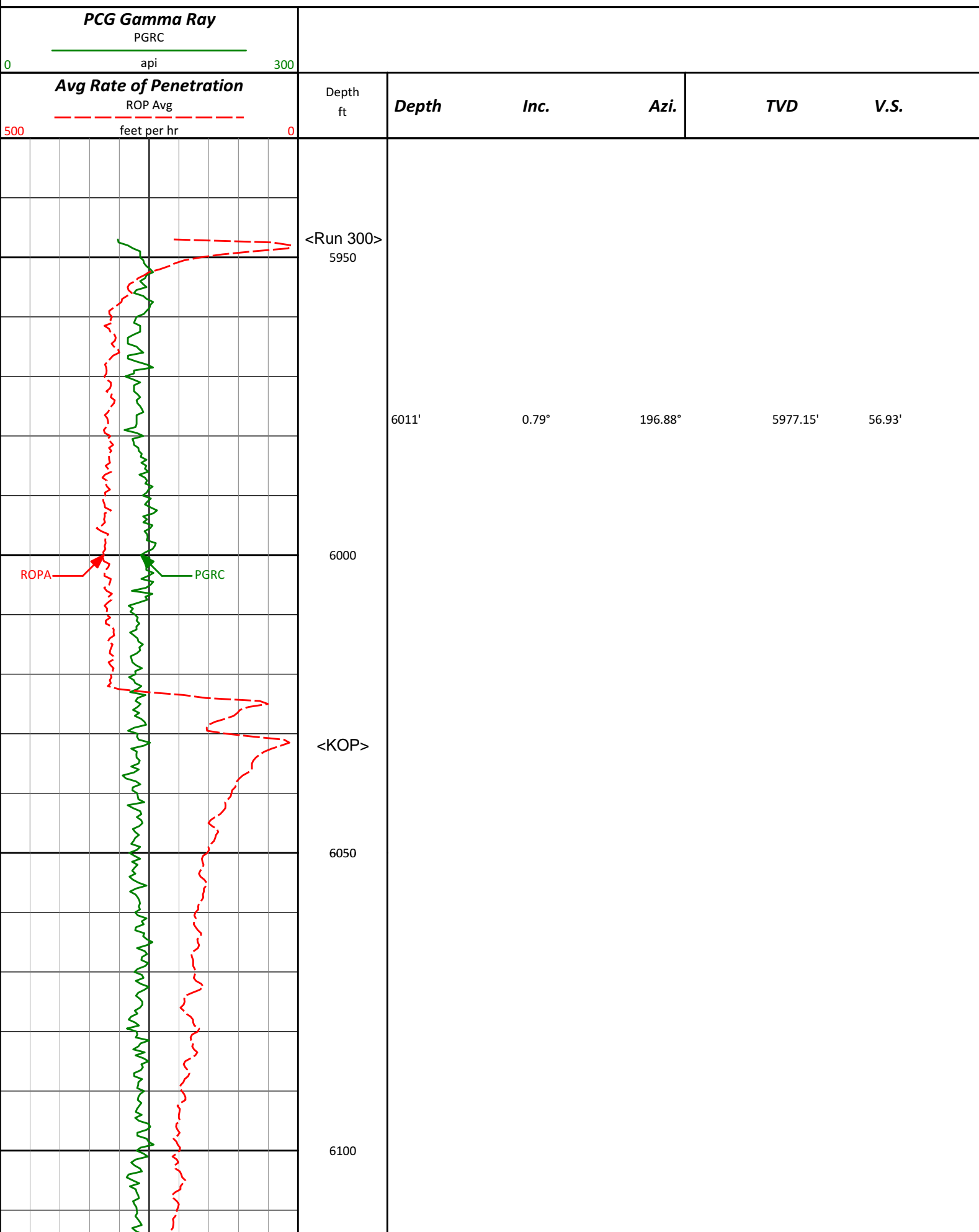
TVD Detail Log 1:600

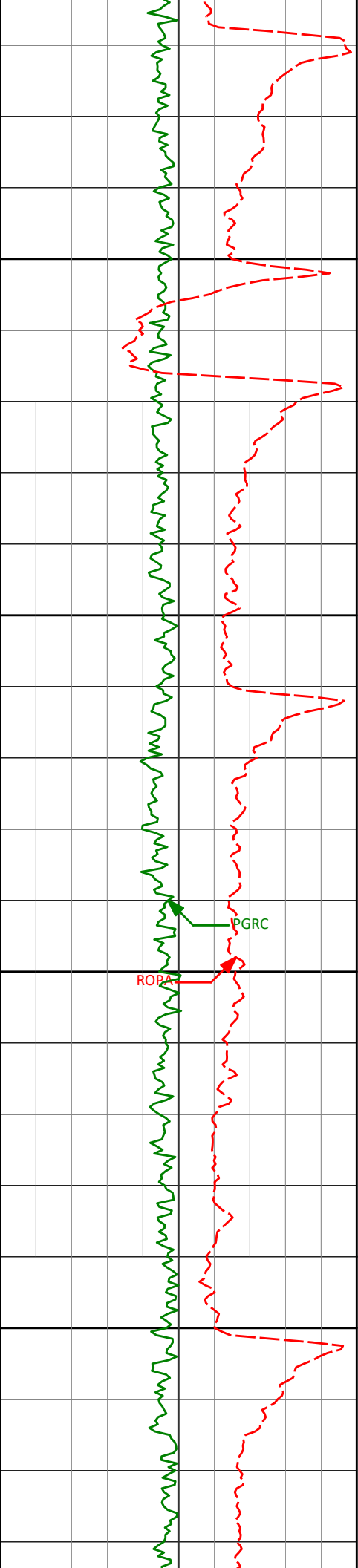
Noble Energy, Inc
Cougar B02-68-1HN
H&P 315
T5N R64W





<div>Avg Rate of Penetration</div> <div>ROP Avg</div> <div>5000</div> <div>feet per hr</div>		Depth ft	Depth	Inc.	Azi.	TVD	V.S.
<div>PCG Gamma Ray</div> <div>PGRC</div> <div>0300</div> <div>api</div>							





6150

6200

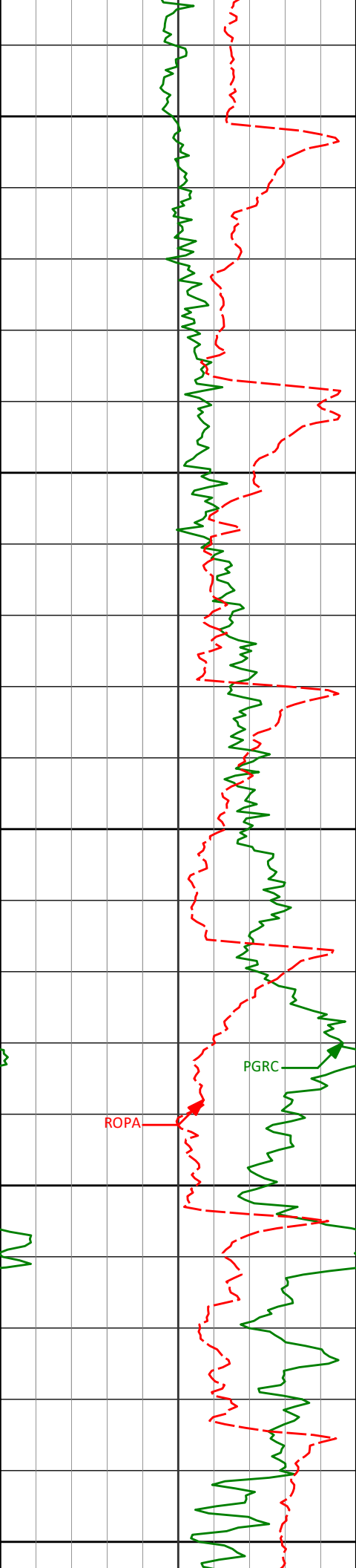
6250

6300

ROPA

PGRC

6149'	8.05°	80.17°	6114.71'	66.07'
6196'	11.01°	78.22°	6161.06'	73.54'
6291'	17.60°	84.14°	6253.06'	96.32'



6350

6400

6450

6500

6550

6386'

24.70°

82.02°

6341.61'

129.77'

6434'

28.75°

80.57°

6384.47'

150.69'

6480'

32.97°

80.52°

6423.95'

173.50'

6528'

37.96°

82.08°

6463.03'

200.50'

6575'

43.13°

81.58°

6498.73'

230.19'

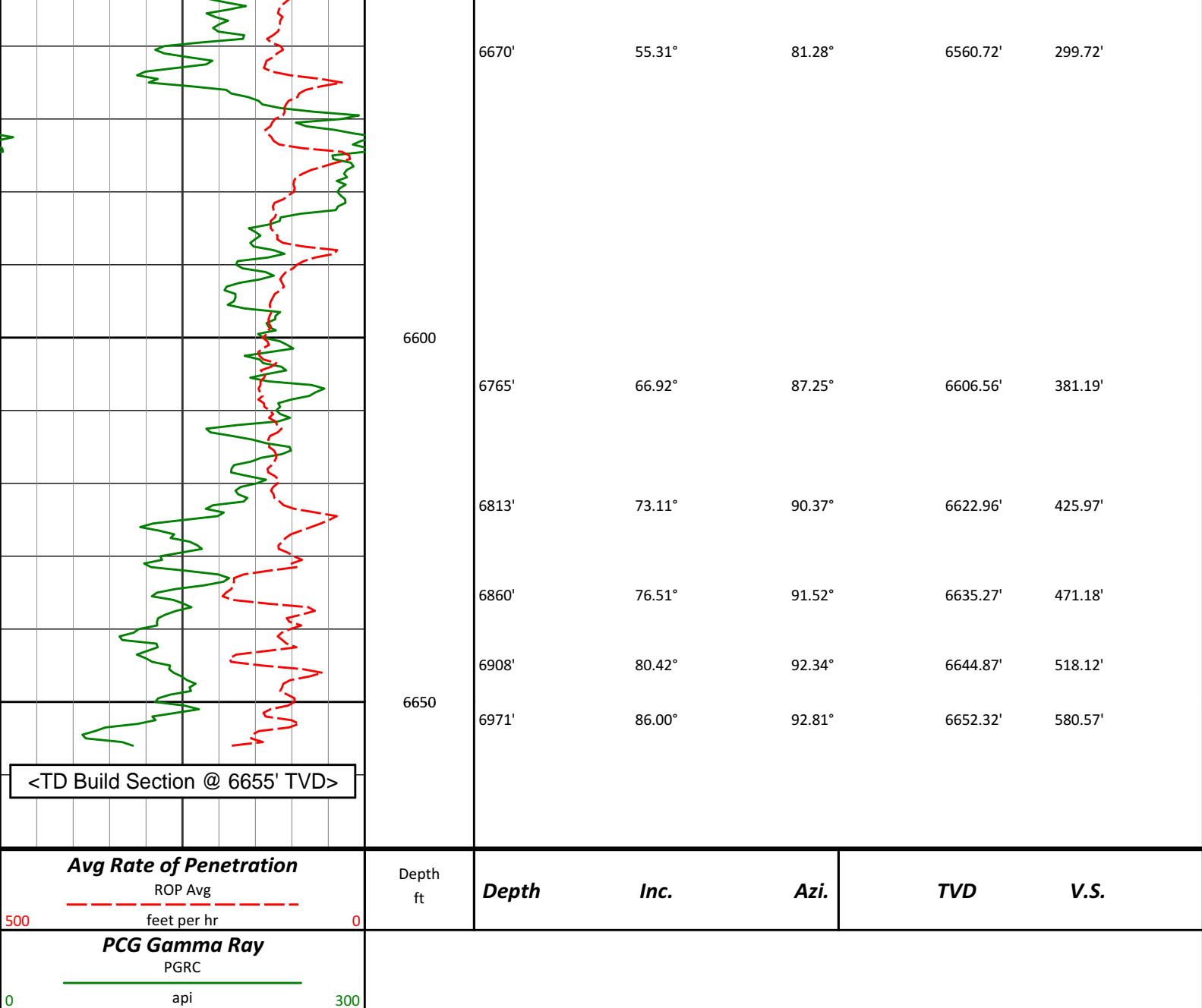
6623'

49.20°

80.79°

6531.96'

263.73'



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DIRECTIONAL SURVEY REPORT

Noble Energy
Cougar B02-68-1HN
Wattenberg
Weld Colorado
USA
CA-XX-0900918631

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
232.00	0.48	186.29	232.00	0.97 S	0.11 W	-0.01	0.21
324.00	0.44	160.70	323.99	1.69 S	0.03 W	0.13	0.23
417.00	0.64	156.17	416.99	2.50 S	0.30 E	0.53	0.21
509.00	0.87	181.28	508.98	3.67 S	0.49 E	0.83	0.43
601.00	0.93	179.37	600.97	5.11 S	0.48 E	0.96	0.08
694.00	1.20	177.13	693.95	6.84 S	0.54 E	1.18	0.29
786.00	1.43	162.89	785.93	8.91 S	0.92 E	1.76	0.43
879.00	1.45	175.95	878.90	11.19 S	1.35 E	2.40	0.35

972.00	0.69	173.88	971.88	12.92 S	1.49 E	2.70	0.82
1064.00	0.55	155.28	1063.88	13.87 S	1.73 E	3.03	0.27
1157.00	0.77	142.65	1156.87	14.77 S	2.30 E	3.68	0.29
1251.00	1.06	172.36	1250.86	16.13 S	2.80 E	4.31	0.58
1344.00	1.00	172.42	1343.85	17.79 S	3.02 E	4.68	0.06
1436.00	1.43	183.32	1435.83	19.74 S	3.06 E	4.91	0.53
1529.00	0.94	194.69	1528.81	21.64 S	2.80 E	4.82	0.58
1623.00	1.03	201.80	1622.79	23.17 S	2.29 E	4.46	0.16
1718.00	1.20	194.44	1717.77	24.93 S	1.72 E	4.07	0.24
1813.00	0.91	203.78	1812.76	26.58 S	1.17 E	3.67	0.36
1908.00	1.13	212.73	1907.74	28.07 S	0.36 E	3.00	0.29
1941.00	1.38	199.23	1940.73	28.72 S	0.05 E	2.76	1.17
2037.00	1.05	213.98	2036.71	30.54 S	0.82 W	2.06	0.48
2132.00	0.99	205.38	2131.70	32.00 S	1.66 W	1.37	0.17
2227.00	0.80	200.27	2226.69	33.36 S	2.24 W	0.92	0.21
2322.00	0.32	225.22	2321.68	34.17 S	2.66 W	0.57	0.56
2417.00	0.68	222.37	2416.68	34.78 S	3.23 W	0.06	0.38
2512.00	2.90	185.56	2511.63	37.59 S	3.84 W	-0.28	2.52
2607.00	4.24	160.46	2606.45	43.30 S	2.90 W	1.19	2.14
2702.00	6.38	177.07	2701.04	51.89 S	1.46 W	3.44	2.75
2796.00	7.57	173.85	2794.34	63.27 S	0.52 W	5.44	1.33
2891.00	8.70	178.29	2888.38	76.67 S	0.36 E	7.59	1.36
2986.00	9.74	177.14	2982.15	91.88 S	0.98 E	9.64	1.11
3081.00	10.45	178.86	3075.68	108.52 S	1.55 E	11.77	0.81
3176.00	11.64	179.95	3168.92	126.72 S	1.73 E	13.67	1.27
3271.00	11.41	176.88	3262.01	145.68 S	2.25 E	15.97	0.69
3366.00	12.46	177.54	3354.95	165.30 S	3.20 E	18.77	1.12
3461.00	10.94	174.51	3447.98	184.52 S	4.50 E	21.88	1.73
3555.00	10.46	174.64	3540.34	201.89 S	6.16 E	25.16	0.50
3650.00	10.74	162.41	3633.73	218.92 S	9.64 E	30.24	2.38
3745.00	11.54	168.09	3726.94	236.67 S	14.28 E	36.53	1.43
3840.00	13.03	175.60	3819.77	256.65 S	17.06 E	41.18	2.30
3935.00	12.21	183.51	3912.48	277.36 S	17.27 E	43.34	2.01
4029.00	11.13	183.24	4004.54	296.34 S	16.15 E	44.02	1.16
4124.00	9.82	182.04	4097.95	313.59 S	15.34 E	44.84	1.40
4219.00	10.36	180.87	4191.48	330.22 S	14.92 E	45.99	0.61
4314.00	8.88	179.17	4285.14	346.10 S	14.90 E	47.47	1.59
4409.00	9.71	185.48	4378.90	361.41 S	14.24 E	48.25	1.38
4504.00	8.33	186.06	4472.72	376.24 S	12.75 E	48.17	1.46
4599.00	7.13	187.15	4566.85	388.93 S	11.29 E	47.91	1.28
4694.00	6.38	174.51	4661.20	400.03 S	11.06 E	48.73	1.75
4789.00	5.59	175.85	4755.68	409.91 S	11.90 E	50.49	0.85
4884.00	3.80	162.87	4850.36	417.53 S	13.16 E	52.47	2.18
4979.00	1.79	171.81	4945.24	422.00 S	14.30 E	54.02	2.16
5073.00	1.89	162.27	5039.20	424.93 S	14.98 E	54.98	0.34
5168.00	0.46	279.36	5134.18	426.36 S	15.08 E	55.22	2.25
5453.00	0.62	60.20	5419.17	425.42 S	15.29 E	55.33	0.36
5738.00	0.62	157.97	5704.16	426.08 S	17.20 E	57.29	0.33
5926.00	0.58	216.93	5892.15	427.78 S	17.01 E	57.27	0.31
6011.00	0.79	196.88	5977.15	428.68 S	16.58 E	56.93	0.37
6149.00	8.05	80.17	6114.71	427.94 S	25.84 E	66.07	6.11
6196.00	11.01	78.22	6161.06	426.46 S	33.48 E	73.54	6.35
6291.00	17.60	84.14	6253.06	423.14 S	56.68 E	96.32	7.10
6386.00	24.70	82.02	6341.61	418.91 S	90.67 E	129.77	7.51
6434.00	28.75	80.57	6384.47	415.63 S	112.01 E	150.69	8.55
6480.00	32.97	80.52	6423.95	411.75 S	135.28 E	173.50	9.17
6528.00	37.96	82.08	6463.03	407.56 S	162.80 E	200.50	10.57
6575.00	43.13	81.58	6498.73	403.22 S	193.03 E	230.19	11.01
6623.00	49.20	80.79	6531.96	397.90 S	227.23 E	263.73	12.70
6670.00	55.31	81.28	6560.72	392.12 S	263.93 E	299.72	13.04
6765.00	66.92	87.25	6606.56	384.06 S	346.52 E	381.19	13.39
6813.00	73.11	90.37	6622.96	383.15 S	391.59 E	425.97	14.27
6860.00	76.51	91.52	6635.27	383.90 S	436.93 E	471.18	7.62
6908.00	80.42	92.34	6644.87	385.49 S	483.93 E	518.12	8.30
6971.00	86.00	92.81	6652.32	388.30 S	546.40 E	580.57	8.89
7025.00	87.20	92.80	6655.52	390.94 S	600.24 E	634.42	2.23

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 95.41 DEGREES (GRID)
A TOTAL CORRECTION OF 7.79 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7025.00 FEET
IS 716.32 FEET ALONG 123.08 DEGREES (GRID)

Last survey is a projection from 6971 ft MD to TD at 7025 ft MD.

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