


LWD MEMORY LOG									
<div><div>BAKER HUGHES</div></div>			Gamma Ray						
Scale:			Company: Noble Energy						
1:1200 TVD			Well: Freedom Federal LC21-640						
Depth Reference:			Field: Wattenberg Field						
Driller's Depth			County: Weld Country: United States						
State: Colorado			Other Services:						
Status: Final Print			Surface Location: Latitude: Longitude:				Wellbore Surveys		
API No: 0512342804									
Job ID: 8597125			SEC: 22 TWN: 9N		RGE: 59W				
Permanent Datum (P.D.): Ground Level			Elevation: Above P.D.		4883.00 ft 30.00 ft		Elev. KB: 4913.00 ft Elev. DF: 4883.00 ft		
Log Measured From: Rig Floor									
Dates			Interval Logged			Magnetic Field Reference			
Date From: 2017-07-21			Top: (ft)		1929.00		Azi Reference North: Grid Dip Angle: (deg)		
Date To: 2017-07-23			Bottom: (ft)		11210.00		Total Magnetic Field Strength: (nT) 52606		
Spud Date: 2017-07-20			Mag to Reference North Correction: (deg) 6.71 E						
Borehole Record			Casing Record						
Hole Size (in)			From (ft)		To (ft)		Size (in) Weight (lb/ft) From (ft) To (ft)		
8.500			1941.00		11210.00		9.625 36.00 30.00 1931.00		

Steven Cano	2017-07-21	2017-07-23	Ty Jackson	2017-07-21	2017-07-23			
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Mud Properties Record

Date / Time	Run No.	Measured Depth (ft)	Mud Type	Density (ppg)	Viscosity (cP)	pH	Fluid Loss (cm3)	Oil / Water	Source	Total Chlorides (ppm)	K+ (%)
2017-07-21 12:07	1	1941.00	Oil Based Mud	9.2	9	N/A	N/A	75.7/24.3	Active Pit	25000	0.00
2017-07-23 16:11	1	4489.00	Oil Based Mud	9.1	11	N/A	N/A	74.6/25.4	Active Pit	26500	0.00
2017-07-23 16:16	1	9969.00	Oil Based Mud	9.2	9	N/A	N/A	75.6/24.4	Active Pit	26000	0.00

Equipment and Service Data

Run No.	Tool	Serial Number	Measurement	Sensor Offset (ft)	Bit Offset (ft)	Max O.D. (in)	Min I.D. (in)
1	ATC_SU	14236915	Near Bit Inclination	5.93	6.76	7.000	4.330
1	ATC_SU	14236915	Near Bit VSS	5.93	6.76	7.000	4.330
1	ATC_MWD	12154241	Gamma (single)	2.76	12.93	7.000	3.250
1	ATC_MWD	12154241	Directional (mag)	12.28	22.45	7.000	3.250

Service and Tool Mnemonics

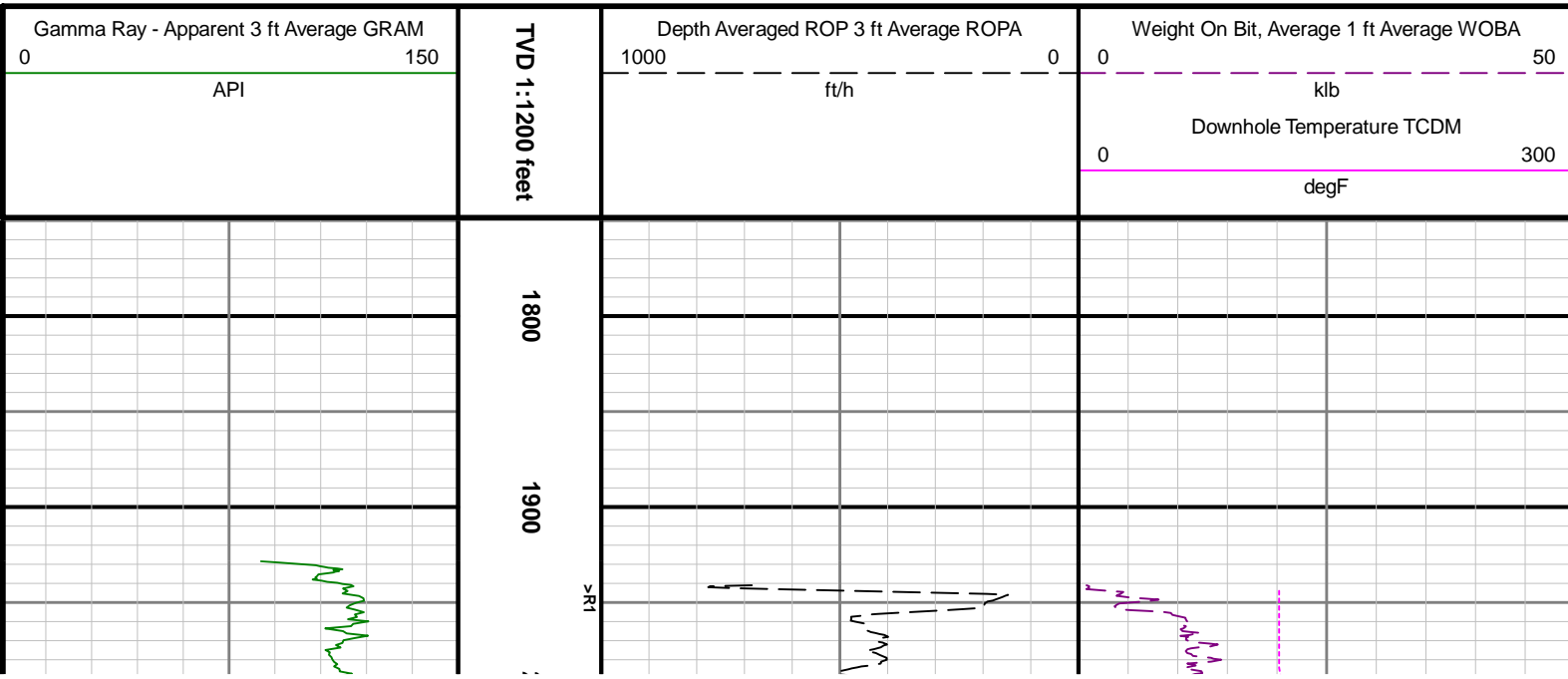
Mnemonic	Name	Description
ATC_SU	ATC_SU	Auto Trak Curve Steering Unit
ATC_MWD	ATC_MWD	Auto Trak Curve MWD
ATC_LCPM	ATC_LCPM	Auto Trak Curve LCPM

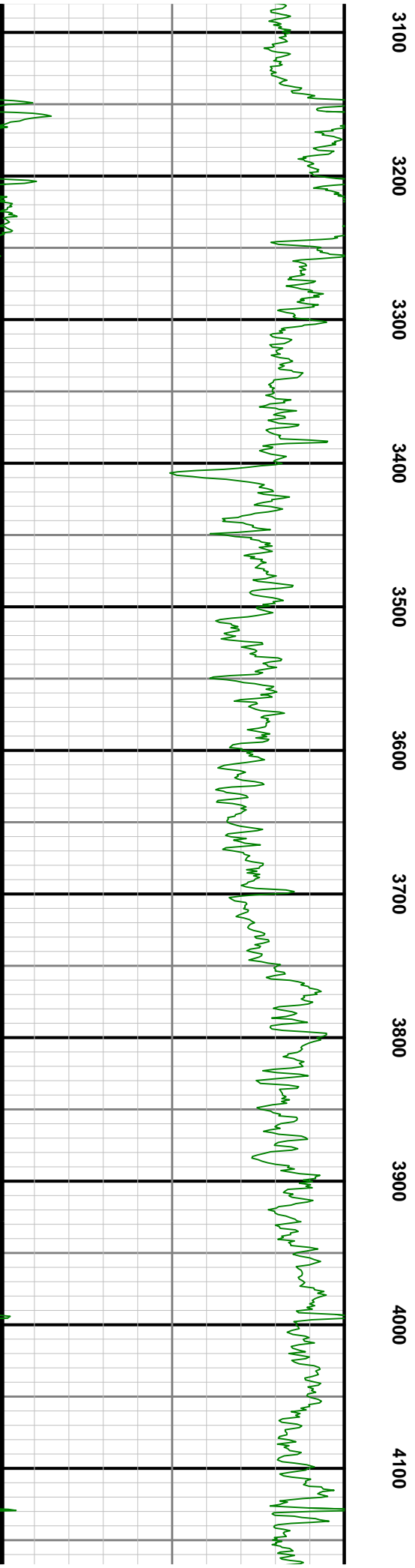
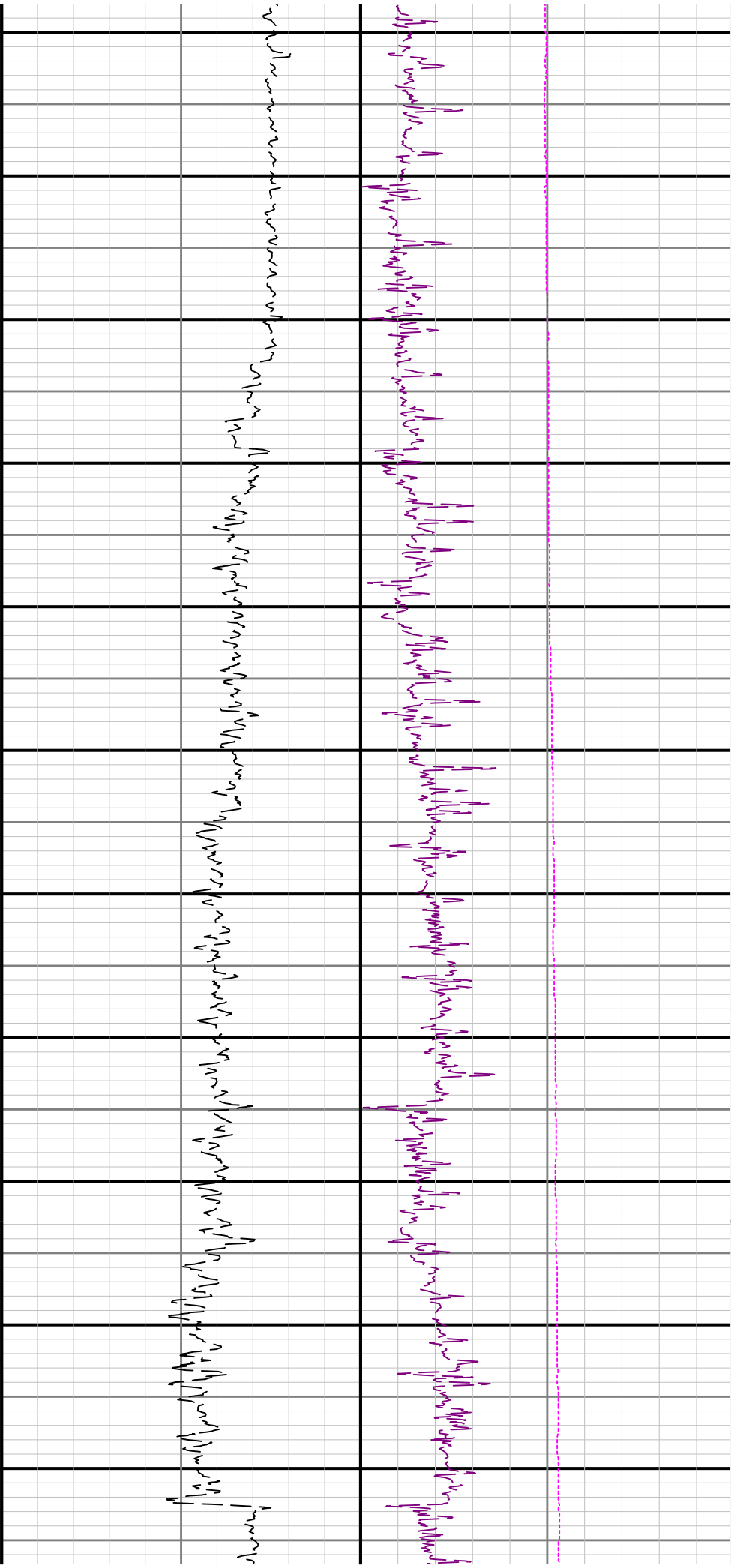
Comments

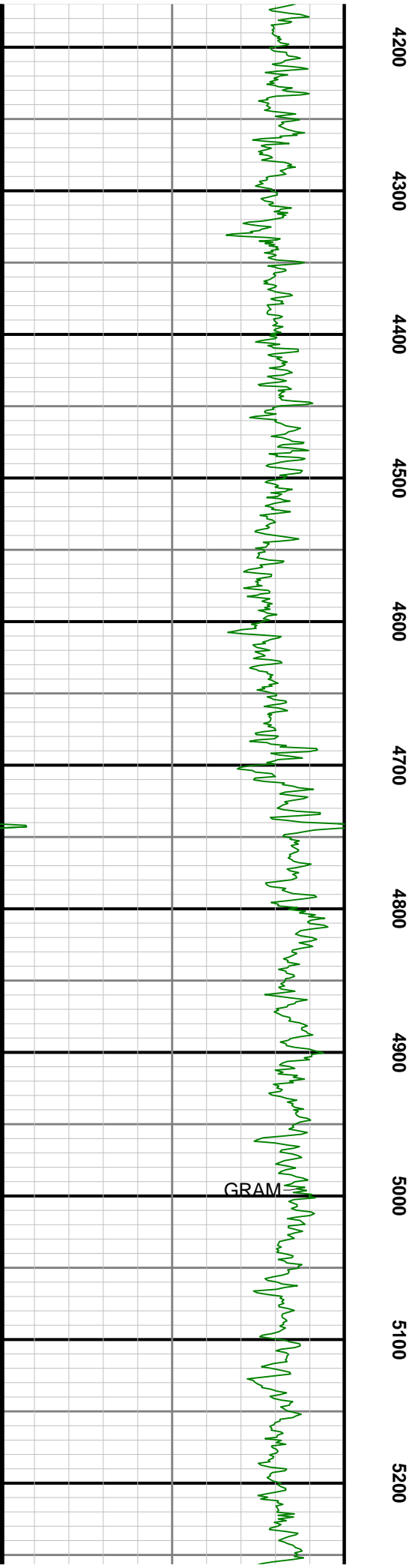
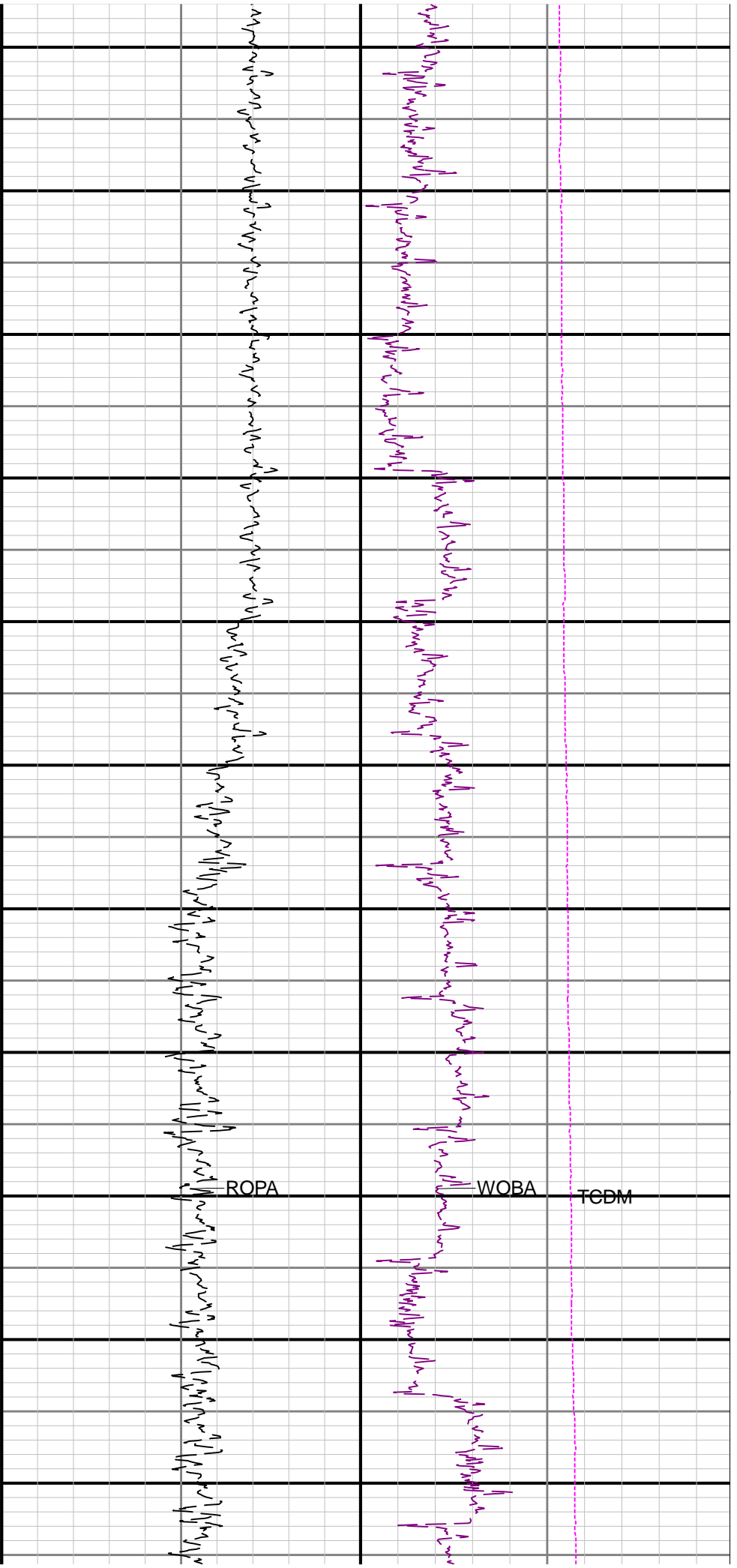
1	Depth measurements obtained from a depth control system not supplied or operated by Baker Hughes. Due to lack of control by Baker Hughes logging engineers, depth calibrations and measurements could not be independently verified
2	Baker Hughes LWD run 1 utilized a 6 3/4 inch Navigamma service (Gama Ray and Directional) behind a 8 1/2 inch bit and rotary steerable from 1941 to 11210 feet MD (1940 to 6057 feet TVD).

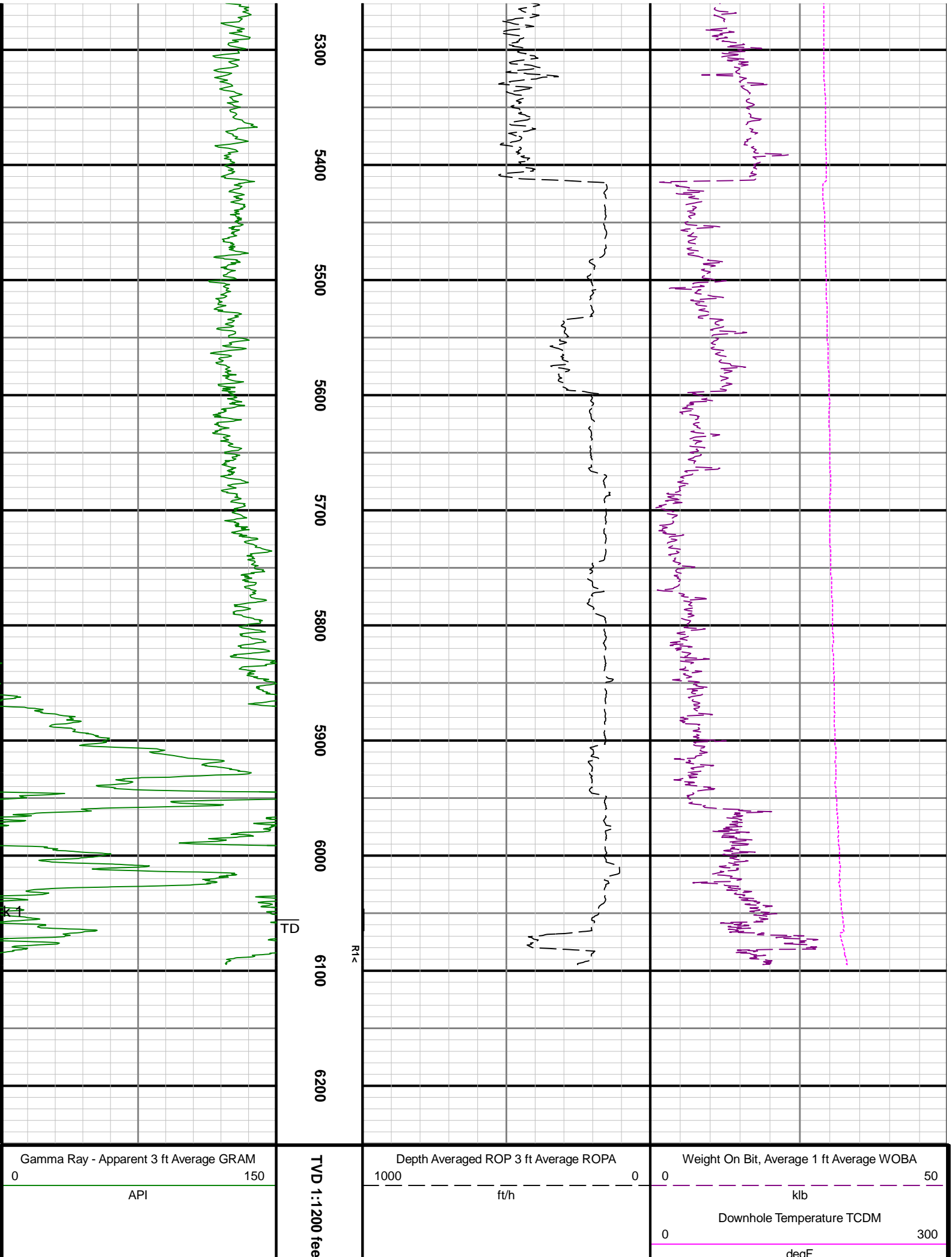
Remarks

Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	11198.00	8.500	1	The interval from 11198 to 11210 feet MD (6057 feet TVD) was not logged due to sensor offset at well TD.









Geographic Coordinates					Wellbore Orientation					Survey Parameters		
Latitude: 40° 15' 30" N					Longitude: 105° 45' 00" W					Depth: 1000 ft		
North Reference: Grid					Drill Depth Zero: Rig Floor					Vertical Section: 0.00 ft		
Vertical Datum is: Ground Level					Vertical Datum to DDZ: (ft) 30.00					Vertical Section East: (m) 0.00		
Vertical Section North: (m) 0.00					Vertical Section East: (m) 0.00					Magnetic Declination: (deg) 7.70		
Vertical Section Azimuth: (deg) 277.40					Magnetic Declination: (deg) 7.70					TVD Calculation Method: Minimum Curvature		
Grid Convergence: (deg) -0.99					TVD Calculation Method: Minimum Curvature					Local Magnetic Field: (nT) 52606		
Total Correction: (deg) 6.71					Local Magnetic Field: (nT) 52606					Local Gravity Field: (m/s2) 9.801		
Magnetic Correction: Off					Local Gravity Field: (m/s2) 9.801							
Local Magnetic Dip Angle: (deg) 67.08												
Tie-In / Projection	Measured Depth (ft)	Inclination (deg)	Azimuth (deg)	Temperature (degF)	North (ft)	East (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Course Length (ft)	Dog Leg Severity (deg/100ft)	Build Rate (deg/100ft)	Turn Rate (deg/100ft)
Tie-In	0.00	0.00	0.00	N/A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	78.00	0.17	285.96	N/A	0.03	-0.11	78.00	0.11	78.00	0.22	0.22	-94.92
	175.00	0.17	304.81	N/A	0.15	-0.37	175.00	0.38	97.00	0.06	0.00	19.43
	267.00	0.42	40.25	N/A	0.49	-0.26	267.00	0.32	92.00	0.51	0.27	103.74
	362.00	0.37	43.83	N/A	0.98	0.18	362.00	-0.05	95.00	0.06	-0.05	3.77
	456.00	0.19	270.56	N/A	1.20	0.23	456.00	-0.07	94.00	0.55	-0.19	-141.78
	551.00	0.57	170.81	N/A	0.73	0.15	550.99	-0.05	95.00	0.66	0.40	-105.00
	645.00	0.26	155.66	N/A	0.08	0.31	644.99	-0.30	94.00	0.35	-0.33	-16.12
	740.00	0.05	284.80	N/A	-0.11	0.36	739.99	-0.37	95.00	0.31	-0.22	135.94
	834.00	0.18	324.40	N/A	0.02	0.23	833.99	-0.23	94.00	0.15	0.14	42.13
	929.00	0.30	152.86	N/A	-0.08	0.26	928.99	-0.27	95.00	0.50	0.13	-180.57
	1023.00	0.42	223.26	N/A	-0.55	0.14	1022.99	-0.21	94.00	0.45	0.13	74.89
	1118.00	0.14	191.83	N/A	-0.92	-0.13	1117.99	0.01	95.00	0.33	-0.29	-33.08
	1213.00	0.13	320.05	N/A	-0.95	-0.22	1212.99	0.10	95.00	0.26	-0.01	134.97
	1307.00	0.19	146.01	N/A	-1.00	-0.20	1306.99	0.07	94.00	0.34	0.06	-185.15
	1402.00	0.09	336.64	N/A	-1.06	-0.14	1401.99	0.00	95.00	0.29	-0.11	-178.28
	1497.00	0.26	335.70	N/A	-0.79	-0.26	1496.99	0.16	95.00	0.18	0.18	-0.99
	1591.00	0.02	257.75	N/A	-0.60	-0.36	1590.99	0.28	94.00	0.27	-0.26	-82.93
	1685.00	0.19	200.80	N/A	-0.75	-0.44	1684.99	0.34	94.00	0.19	0.18	-60.59
	1780.00	0.18	275.59	N/A	-0.88	-0.64	1779.99	0.52	95.00	0.24	-0.01	78.73
	1875.00	0.44	99.11	N/A	-0.93	-0.43	1874.99	0.31	95.00	0.65	0.27	-185.77
	1902.00	0.46	107.14	N/A	-0.98	-0.22	1901.98	0.09	27.00	0.24	0.07	29.74
	1979.00	0.98	159.08	N/A	-1.68	0.31	1978.98	-0.52	77.00	1.02	0.68	67.45
	2073.00	0.89	86.82	N/A	-2.39	1.32	2072.97	-1.62	94.00	1.18	-0.10	-76.87
	2167.00	2.53	23.67	N/A	-0.45	2.89	2166.93	-2.92	94.00	2.42	1.74	-67.18
	2262.00	4.86	25.32	N/A	5.11	5.45	2261.73	-4.75	95.00	2.45	2.45	1.74
	2357.00	7.20	4.37	N/A	14.68	7.62	2356.21	-5.67	95.00	3.34	2.46	-22.05
	2451.00	8.95	350.75	N/A	27.78	6.90	2449.28	-3.26	94.00	2.75	1.86	-14.49
	2546.00	10.06	357.58	N/A	43.36	5.36	2542.98	0.27	95.00	1.66	1.17	7.19
	2640.00	10.53	5.74	N/A	60.11	5.87	2635.47	1.92	94.00	1.63	0.50	8.68
	2735.00	13.02	16.73	N/A	79.00	9.82	2728.47	0.43	95.00	3.52	2.62	11.57
	2829.00	13.82	12.63	N/A	100.10	15.33	2819.91	-2.31	94.00	1.32	0.85	-4.36
	2924.00	14.72	351.83	N/A	123.13	16.09	2912.04	-0.10	95.00	5.45	0.95	-21.89
	3018.00	15.03	325.84	N/A	145.06	7.54	3002.99	11.21	94.00	7.05	0.33	-27.65
	3112.00	13.75	318.48	N/A	163.52	-6.71	3094.04	27.71	94.00	2.37	-1.36	-7.83
	3207.00	13.75	325.53	N/A	181.28	-20.58	3186.33	43.76	95.00	1.76	0.00	7.42
	3302.00	14.61	335.51	N/A	201.49	-31.94	3278.45	57.63	95.00	2.72	0.91	10.51
	3396.00	14.94	342.79	N/A	223.86	-40.44	3369.35	68.94	94.00	2.00	0.35	7.74
	3491.00	14.76	345.83	N/A	247.29	-47.03	3461.17	78.49	95.00	0.84	-0.19	3.20
	3585.00	14.94	352.19	N/A	270.91	-51.61	3552.04	86.07	94.00	1.74	0.19	6.77
	3680.00	14.78	359.01	N/A	295.16	-53.48	3643.87	91.05	95.00	1.85	-0.17	7.18
	3775.00	14.83	7.34	N/A	319.33	-52.14	3735.73	92.83	95.00	2.24	0.05	8.77
	3869.00	13.80	9.14	N/A	342.33	-48.82	3826.81	92.50	94.00	1.19	-1.10	1.91
	3964.00	13.16	7.08	N/A	364.25	-45.69	3919.19	92.22	95.00	0.84	-0.67	-2.17
	4058.00	11.58	11.49	N/A	384.12	-42.49	4011.01	91.61	94.00	1.96	-1.68	4.69
	4153.00	12.70	24.68	N/A	402.95	-36.23	4103.90	87.82	95.00	3.14	1.18	13.88
	4248.00	12.80	20.78	N/A	422.28	-28.13	4196.56	82.29	95.00	0.91	0.11	-4.11
	4342.00	13.41	15.20	N/A	442.54	-21.58	4288.11	78.40	94.00	1.49	0.65	-5.94
	4437.00	13.77	9.51	N/A	464.32	-16.82	4380.46	76.49	95.00	1.46	0.38	-5.99
	4531.00	13.79	5.08	N/A	486.51	-13.98	4471.75	76.53	94.00	1.12	0.02	-4.71
	4626.00	13.76	0.40	N/A	509.09	-12.90	4564.03	78.36	95.00	1.17	-0.03	-4.93
	4720.00	13.78	355.13	N/A	531.42	-13.77	4655.33	82.10	94.00	1.33	0.02	-5.61
	4815.00	13.78	351.49	N/A	553.89	-16.41	4747.59	87.61	95.00	0.91	0.00	-3.83
	4910.00	13.69	351.32	N/A	576.19	-19.78	4839.88	93.83	95.00	0.10	-0.09	-0.18
	5004.00	13.83	352.05	N/A	598.31	-23.01	4931.18	99.88	94.00	0.24	0.15	0.78
	5098.00	13.81	351.14	N/A	620.53	-26.29	5022.46	106.00	94.00	0.23	-0.02	-0.97
	5193.00	13.43	347.09	N/A	642.48	-30.51	5114.79	113.00	95.00	1.08	-0.40	-4.26

	5288.00	12.40	338.85	N/A	662.75	-36.65	5207.39	121.71	95.00	2.22	-1.08	-8.67
	5382.00	11.77	356.15	N/A	681.74	-40.94	5299.34	128.40	94.00	3.90	-0.67	18.40
	5477.00	12.85	0.73	N/A	701.97	-41.45	5392.16	131.52	95.00	1.53	1.14	4.82
	5572.00	15.51	336.26	N/A	724.18	-46.44	5484.34	139.32	95.00	6.84	2.80	-25.76
	5666.00	18.86	311.91	N/A	745.87	-62.83	5574.24	158.37	94.00	8.36	3.56	-25.90
	5761.00	21.92	290.54	N/A	762.37	-90.91	5663.40	188.34	95.00	8.42	3.22	-22.49
	5855.00	28.63	279.96	N/A	772.44	-129.58	5748.40	227.99	94.00	8.58	7.14	-11.26
	5949.00	36.52	278.70	N/A	780.58	-179.49	5827.55	278.53	94.00	8.42	8.39	-1.34
	6044.00	45.92	278.20	N/A	789.74	-241.35	5898.93	341.05	95.00	9.90	9.89	-0.53
	6138.00	52.62	282.45	N/A	802.63	-311.33	5960.24	412.11	94.00	7.91	7.13	4.52
	6233.00	61.89	278.95	N/A	817.32	-389.76	6011.58	491.78	95.00	10.24	9.76	-3.68
	6328.00	70.44	273.88	N/A	826.89	-476.01	6049.96	578.55	95.00	10.24	9.00	-5.34
	6422.00	77.14	273.19	N/A	832.44	-566.05	6076.19	668.55	94.00	7.16	7.13	-0.73
	6517.00	84.20	272.82	N/A	837.35	-659.61	6091.58	761.96	95.00	7.44	7.43	-0.39
	6611.00	91.85	271.93	N/A	841.24	-753.40	6094.81	855.48	94.00	8.19	8.14	-0.95
	6706.00	90.68	270.12	N/A	842.94	-848.36	6092.72	949.86	95.00	2.27	-1.23	-1.91
	6801.00	90.40	266.98	N/A	840.53	-943.31	6091.82	1043.71	95.00	3.32	-0.29	-3.31
	6895.00	90.55	265.74	N/A	834.57	-1037.12	6091.04	1135.97	94.00	1.33	0.16	-1.32
	6990.00	90.12	264.33	N/A	826.34	-1131.76	6090.49	1228.76	95.00	1.55	-0.45	-1.48
	7084.00	90.55	266.13	N/A	818.53	-1225.43	6089.94	1320.64	94.00	1.97	0.46	1.91
	7179.00	90.52	267.44	N/A	813.20	-1320.27	6089.05	1414.01	95.00	1.38	-0.03	1.38
	7273.00	90.65	269.90	N/A	811.02	-1414.23	6088.09	1506.91	94.00	2.62	0.14	2.62
	7368.00	90.68	271.32	N/A	812.03	-1509.22	6086.99	1601.23	95.00	1.49	0.03	1.49
	7462.00	90.49	270.73	N/A	813.71	-1603.20	6086.03	1694.65	94.00	0.66	-0.20	-0.63
	7557.00	90.28	270.39	N/A	814.64	-1698.19	6085.39	1788.97	95.00	0.42	-0.22	-0.36
	7651.00	90.28	269.90	N/A	814.88	-1792.19	6084.93	1882.21	94.00	0.52	0.00	-0.52
	7746.00	90.34	268.53	N/A	813.58	-1887.18	6084.42	1976.24	95.00	1.44	0.06	-1.44
	7841.00	90.37	267.16	N/A	810.00	-1982.10	6083.83	2069.92	95.00	1.44	0.03	-1.44
	7935.00	90.37	266.43	N/A	804.75	-2075.96	6083.22	2162.31	94.00	0.78	0.00	-0.78
	8030.00	90.37	264.84	N/A	797.52	-2170.67	6082.61	2255.31	95.00	1.67	0.00	-1.67
	8124.00	90.28	263.24	N/A	787.76	-2264.16	6082.07	2346.76	94.00	1.70	-0.10	-1.70
	8219.00	90.37	263.04	N/A	776.41	-2358.48	6081.53	2438.84	95.00	0.23	0.09	-0.21
	8313.00	90.34	262.75	N/A	764.79	-2451.76	6080.95	2529.84	94.00	0.31	-0.03	-0.31
	8408.00	90.28	263.74	N/A	753.61	-2546.09	6080.44	2621.95	95.00	1.04	-0.06	1.04
	8502.00	90.18	266.48	N/A	745.60	-2639.74	6080.06	2713.79	94.00	2.92	-0.11	2.91
	8597.00	90.28	270.42	N/A	743.03	-2734.69	6079.68	2807.61	95.00	4.15	0.11	4.15
	8692.00	90.37	270.72	N/A	743.98	-2829.68	6079.14	2901.94	95.00	0.33	0.09	0.32
	8786.00	90.34	269.43	N/A	744.10	-2923.68	6078.56	2995.16	94.00	1.37	-0.03	-1.37
	8881.00	90.28	270.74	N/A	744.24	-3018.67	6078.04	3089.39	95.00	1.38	-0.06	1.38
	8975.00	90.28	271.38	N/A	745.98	-3112.66	6077.58	3182.81	94.00	0.68	0.00	0.68
	9070.00	90.43	270.39	N/A	747.45	-3207.64	6077.00	3277.19	95.00	1.05	0.16	-1.04
	9164.00	90.46	267.66	N/A	745.85	-3301.62	6076.27	3370.18	94.00	2.90	0.03	-2.90
	9259.00	90.25	266.17	N/A	740.73	-3396.48	6075.68	3463.59	95.00	1.58	-0.22	-1.57
	9353.00	90.65	266.57	N/A	734.78	-3490.28	6074.94	3555.85	94.00	0.60	0.43	0.43
	9447.00	90.31	266.99	N/A	729.50	-3584.13	6074.15	3648.24	94.00	0.57	-0.36	0.45
	9542.00	90.25	268.52	N/A	725.78	-3679.05	6073.69	3741.89	95.00	1.61	-0.06	1.61
	9637.00	90.25	269.48	N/A	724.12	-3774.04	6073.27	3835.87	95.00	1.01	0.00	1.01
	9731.00	89.75	271.59	N/A	725.00	-3868.03	6073.27	3929.19	94.00	2.31	-0.53	2.24
	9826.00	90.43	273.59	N/A	729.29	-3962.93	6073.12	4023.85	95.00	2.22	0.72	2.11
	9920.00	90.52	274.05	N/A	735.56	-4056.71	6072.34	4117.66	94.00	0.50	0.10	0.49
	10015.00	90.34	274.25	N/A	742.43	-4151.46	6071.63	4212.51	95.00	0.28	-0.19	0.21
	10110.00	90.46	273.75	N/A	749.06	-4246.23	6070.97	4307.34	95.00	0.54	0.13	-0.53
	10204.00	90.40	271.46	N/A	753.33	-4340.12	6070.26	4401.00	94.00	2.44	-0.06	-2.44
	10299.00	90.43	267.69	N/A	752.63	-4435.10	6069.57	4495.09	95.00	3.97	0.03	-3.97
	10393.00	90.52	263.16	N/A	745.13	-4528.77	6068.79	4587.02	94.00	4.82	0.10	-4.82
	10487.00	90.43	263.50	N/A	734.21	-4622.13	6068.01	4678.20	94.00	0.37	-0.10	0.36
	10582.00	90.52	264.46	N/A	724.25	-4716.60	6067.23	4770.60	95.00	1.01	0.09	1.01
	10677.00	90.55	266.24	N/A	716.55	-4811.28	6066.34	4863.50	95.00	1.87	0.03	1.87
	10771.00	90.43	266.09	N/A	710.26	-4905.07	6065.54	4955.69	94.00	0.20	-0.13	-0.16
	10866.00	90.55	267.04	N/A	704.57	-4999.89	6064.72	5049.00	95.00	1.01	0.13	1.00
	11055.00	91.88	263.73	N/A	689.37	-5188.21	6060.72	5233.78	189.00	1.89	0.70	-1.75
	11150.00	90.77	261.64	N/A	677.28	-5282.40	6058.52	5325.64	95.00	2.49	-1.17	-2.20
Projection	11210.00	90.77	261.64	N/A	668.56	-5341.76	6057.71	5383.38	60.00	0.00	0.00	0.00