

PETROLEUM DEVELOPMENT CORP Weld County CO

Well Name: **Waste Management 2Q-321**

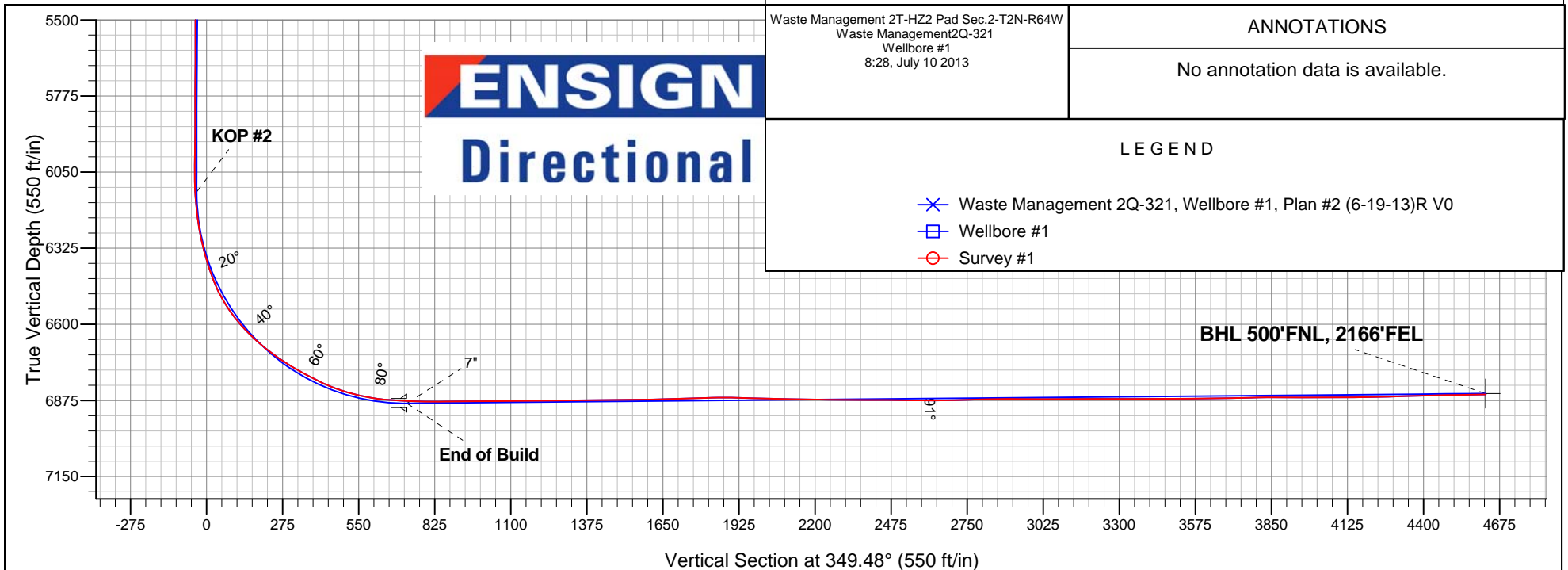
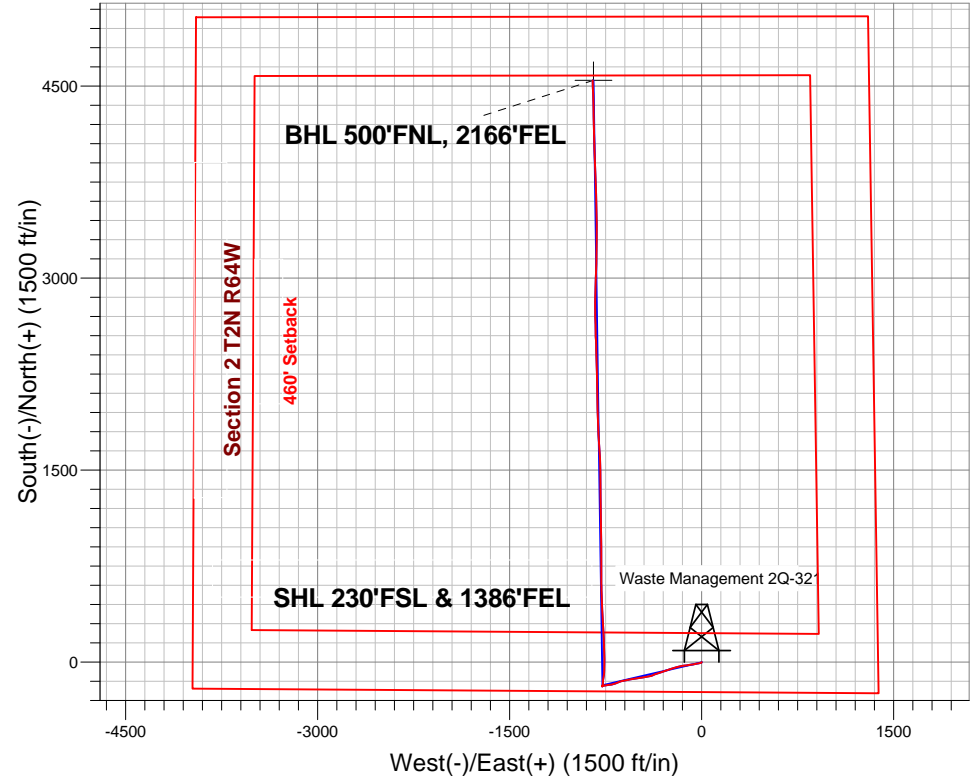
Surface Location: Waste Management 2T-HZ2 Pad Sec.2-T2N-R64W
North American Datum 1983 , US State Plane 1983 , Colorado Northern Zone
Ground Elevation: 4895.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1302950.81	3275552.12	40.160790	-104.514080	

Ensign #119 - RKB - 23' WELL @ 4918.0ft (Ensign #119 - RKB - 23')

FINAL SURVEY

Projected Bottom Hole Location
11347' MD 6853' TVD 4546' N & 850' W of SHL
91.2 degree Incl @ 358.4 degree AZM





PETROLEUM DEVELOPMENT CORP Weld County CO

SEC.2-T2N-R64W

Waste Management 2T-HZ2 Pad Sec.2-T2N-R64W

Waste Management 2Q-321

Wellbore #1

Survey: Survey #1

Standard Survey Report

10 July, 2013

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Waste Management 2Q-321
Project:	SEC.2-T2N-R64W	TVD Reference:	WELL @ 4918.0ft (Ensign #119 - RKB - 23')
Site:	Waste Management 2T-HZ2 Pad Sec.2-T2N-R64W	MD Reference:	WELL @ 4918.0ft (Ensign #119 - RKB - 23')
Well:	Waste Management 2Q-321	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Landmark

Project	SEC.2-T2N-R64W, Weld County, Colorado		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		Using Well Reference Point
Map Zone:	Colorado Northern Zone		Using geodetic scale factor

Site	Waste Management 2T-HZ2 Pad Sec.2-T2N-R64W				
Site Position:		Northing:	1,302,950.82 ft	Latitude:	40.160790
From:	Lat/Long	Easting:	3,275,552.12 ft	Longitude:	-104.514080
Position Uncertainty:	0.0 ft	Slot Radius:	"	Grid Convergence:	0.64 °

Well	Waste Management 2Q-321					
Well Position	+N-S	0.0 ft	Northing:	1,302,950.81 ft	Latitude:	40.160790
	+E-W	0.0 ft	Easting:	3,275,552.12 ft	Longitude:	-104.514080
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,895.0 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	6/19/2013	8.44	66.83	52,820

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N-S (ft)	+E-W (ft)	Direction (°)	
	0.0	0.0	0.0	349.48	

Survey Program	Date 7/1/2013			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
269.0	11,347.0	Survey #1 (Wellbore #1)	MWD	MWD - Standard

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
269.0	0.90	193.50	269.0	-2.1	-0.5	-1.9	0.33	0.33	0.00
361.0	0.80	240.80	361.0	-3.1	-1.2	-2.8	0.75	-0.11	51.41
452.0	1.80	245.60	452.0	-4.0	-3.1	-3.3	1.10	1.10	5.27
544.0	2.80	253.10	543.9	-5.2	-6.5	-3.9	1.13	1.09	8.15
635.0	4.00	254.00	634.7	-6.7	-11.7	-4.5	1.32	1.32	0.99
727.0	5.40	265.30	726.4	-8.0	-19.1	-4.4	1.82	1.52	12.28
818.0	7.10	260.30	816.9	-9.3	-28.9	-3.8	1.96	1.87	-5.49
890.0	8.20	258.40	888.2	-11.1	-38.3	-3.9	1.57	1.53	-2.64
1,001.0	8.60	260.00	998.0	-14.1	-54.3	-4.0	0.42	0.36	1.44
1,089.0	9.20	258.80	1,085.0	-16.6	-67.7	-4.0	0.71	0.68	-1.36

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Site:	Waste Management 2T-HZ2 Pad Sec.2-T2N-R64W	MD Reference:	WELL @ 4918.0ft (Ensign #119 - RKB - 23')
Well:	Waste Management 2Q-321	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Landmark

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
1,181.0	10.20	260.30	1,175.7	-19.4	-82.9	-3.9	1.12	1.09	1.63
1,273.0	10.90	261.20	1,266.1	-22.1	-99.5	-3.6	0.78	0.76	0.98
1,365.0	11.30	262.60	1,356.4	-24.6	-117.1	-2.8	0.52	0.43	1.52
1,457.0	11.70	263.30	1,446.5	-26.8	-135.3	-1.7	0.46	0.43	0.76
1,549.0	12.40	262.10	1,536.5	-29.3	-154.3	-0.6	0.81	0.76	-1.30
1,640.0	12.50	256.00	1,625.4	-33.0	-173.5	-0.8	1.45	0.11	-6.70
1,733.0	13.30	254.50	1,716.0	-38.3	-193.6	-2.3	0.93	0.86	-1.61
1,825.0	13.90	255.40	1,805.4	-43.9	-214.5	-4.0	0.69	0.65	0.98
1,917.0	13.10	250.80	1,894.9	-50.1	-235.1	-6.4	1.45	-0.87	-5.00
2,008.0	13.90	249.60	1,983.4	-57.3	-255.0	-9.8	0.93	0.88	-1.32
2,103.0	12.90	249.60	2,075.8	-65.0	-275.7	-13.6	1.05	-1.05	0.00
2,198.0	11.70	252.80	2,168.6	-71.6	-294.8	-16.6	1.45	-1.26	3.37
2,294.0	10.00	253.00	2,262.9	-76.9	-312.1	-18.6	1.77	-1.77	0.21
2,389.0	10.00	253.00	2,356.5	-81.7	-327.9	-20.5	0.00	0.00	0.00
2,484.0	8.40	250.70	2,450.2	-86.4	-342.3	-22.5	1.73	-1.68	-2.42
2,579.0	8.10	249.10	2,544.2	-91.1	-355.1	-24.7	0.40	-0.32	-1.68
2,674.0	7.80	247.50	2,638.3	-95.9	-367.3	-27.3	0.39	-0.32	-1.68
2,769.0	7.80	248.60	2,732.5	-100.8	-379.3	-29.8	0.16	0.00	1.16
2,865.0	7.70	247.50	2,827.6	-105.6	-391.3	-32.4	0.19	-0.10	-1.15
2,960.0	8.60	259.30	2,921.6	-109.4	-404.1	-33.8	1.99	0.95	12.42
3,055.0	8.80	260.90	3,015.5	-111.8	-418.3	-33.6	0.33	0.21	1.68
3,150.0	8.60	260.30	3,109.4	-114.2	-432.5	-33.3	0.23	-0.21	-0.63
3,245.0	9.00	259.30	3,203.3	-116.7	-446.8	-33.2	0.45	0.42	-1.05
3,341.0	9.40	260.50	3,298.1	-119.4	-461.9	-33.1	0.46	0.42	1.25
3,436.0	8.90	261.90	3,391.9	-121.7	-476.8	-32.7	0.58	-0.53	1.47
3,531.0	8.20	263.10	3,485.8	-123.6	-490.8	-31.9	0.76	-0.74	1.26
3,626.0	7.60	261.70	3,579.9	-125.3	-503.8	-31.3	0.66	-0.63	-1.47
3,722.0	7.50	260.70	3,675.1	-127.2	-516.2	-30.9	0.17	-0.10	-1.04
3,817.0	7.30	259.60	3,769.3	-129.3	-528.3	-30.8	0.26	-0.21	-1.16
3,912.0	7.00	261.20	3,863.6	-131.3	-539.9	-30.6	0.38	-0.32	1.68
4,007.0	7.20	258.40	3,957.8	-133.4	-551.5	-30.5	0.42	0.21	-2.95
4,103.0	8.00	258.40	4,053.0	-136.0	-563.9	-30.7	0.83	0.83	0.00
4,198.0	8.40	258.80	4,147.0	-138.6	-577.2	-31.0	0.43	0.42	0.42
4,293.0	8.40	260.30	4,241.0	-141.1	-590.8	-30.9	0.23	0.00	1.58
4,388.0	8.50	259.80	4,335.0	-143.6	-604.6	-30.8	0.13	0.11	-0.53
4,483.0	7.70	255.80	4,429.0	-146.4	-617.7	-31.2	1.03	-0.84	-4.21
4,578.0	7.90	251.90	4,523.1	-150.0	-630.1	-32.4	0.60	0.21	-4.11
4,674.0	8.50	249.40	4,618.2	-154.5	-643.0	-34.6	0.73	0.63	-2.60
4,769.0	8.50	247.70	4,712.1	-159.6	-656.0	-37.2	0.26	0.00	-1.79
4,864.0	7.80	250.10	4,806.2	-164.5	-668.6	-39.7	0.82	-0.74	2.53
4,959.0	7.10	255.10	4,900.3	-168.2	-680.3	-41.2	1.00	-0.74	5.26
5,054.0	7.30	255.80	4,994.6	-171.2	-691.8	-42.0	0.23	0.21	0.74
5,150.0	8.20	258.00	5,089.7	-174.1	-704.5	-42.6	0.99	0.94	2.29
5,245.0	8.20	262.40	5,183.8	-176.4	-717.8	-42.4	0.66	0.00	4.63
5,340.0	6.90	262.10	5,277.9	-178.1	-730.2	-41.8	1.37	-1.37	-0.32
5,435.0	6.40	262.80	5,372.3	-179.5	-741.1	-41.3	0.53	-0.53	0.74
5,531.0	5.40	261.74	5,467.8	-180.9	-750.9	-40.8	1.05	-1.04	-1.10
5,626.0	4.40	260.30	5,562.4	-182.1	-758.9	-40.6	1.06	-1.05	-1.52
5,721.0	3.40	257.00	5,657.2	-183.4	-765.2	-40.6	1.08	-1.05	-3.47
5,816.0	2.60	255.80	5,752.1	-184.5	-770.0	-40.9	0.84	-0.84	-1.26
5,912.0	2.10	262.10	5,848.0	-185.3	-773.9	-40.9	0.59	-0.52	6.56
6,006.0	1.00	170.90	5,942.0	-186.3	-775.5	-41.7	2.49	-1.17	-97.02
6,053.0	1.10	150.30	5,989.0	-187.1	-775.2	-42.5	0.83	0.21	-43.83

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Well:	Waste Management 2Q-321	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Landmark

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
6,101.0	0.40	93.00	6,037.0	-187.6	-774.8	-43.0	1.97	-1.46	-119.38
6,148.0	1.40	16.70	6,084.0	-187.0	-774.5	-42.5	2.90	2.13	-162.34
6,196.0	4.00	19.00	6,131.9	-184.9	-773.7	-40.5	5.42	5.42	4.79
6,243.0	6.20	8.80	6,178.7	-180.8	-772.8	-36.7	5.04	4.68	-21.70
6,292.0	8.30	9.30	6,227.3	-174.7	-771.8	-30.9	4.29	4.29	1.02
6,339.0	11.30	4.90	6,273.6	-166.8	-770.9	-23.3	6.57	6.38	-9.36
6,387.0	14.40	2.10	6,320.4	-156.1	-770.3	-12.9	6.59	6.46	-5.83
6,434.0	17.10	5.60	6,365.6	-143.4	-769.4	-0.6	6.09	5.74	7.45
6,482.0	20.10	9.00	6,411.1	-128.2	-767.4	14.0	6.64	6.25	7.08
6,529.0	23.90	8.80	6,454.7	-110.8	-764.7	30.6	8.09	8.09	-0.43
6,578.0	29.50	6.50	6,498.5	-89.0	-761.8	51.5	11.62	11.43	-4.69
6,625.0	34.10	2.60	6,538.4	-64.3	-759.9	75.4	10.72	9.79	-8.30
6,673.0	38.30	359.10	6,577.1	-36.0	-759.5	103.2	9.75	8.75	-7.29
6,720.0	43.10	0.00	6,612.8	-5.4	-759.8	133.4	10.29	10.21	1.91
6,768.0	47.30	0.00	6,646.6	28.7	-759.8	166.9	8.75	8.75	0.00
6,815.0	51.10	0.20	6,677.3	64.3	-759.7	201.8	8.09	8.09	0.43
6,863.0	53.70	359.80	6,706.6	102.3	-759.7	239.2	5.46	5.42	-0.83
6,910.0	56.90	357.00	6,733.3	140.9	-760.8	277.4	8.39	6.81	-5.96
6,958.0	59.80	356.10	6,758.5	181.7	-763.2	317.9	6.25	6.04	-1.88
7,005.0	62.30	356.30	6,781.2	222.7	-766.0	358.8	5.33	5.32	0.43
7,054.0	63.80	357.00	6,803.5	266.3	-768.5	402.1	3.32	3.06	1.43
7,101.0	67.60	356.80	6,822.8	309.1	-770.8	444.6	8.09	8.09	-0.43
7,149.0	71.90	357.50	6,839.4	354.0	-773.1	489.2	9.06	8.96	1.46
7,196.0	76.10	358.10	6,852.4	399.2	-774.8	533.9	9.02	8.94	1.28
7,244.0	79.20	357.90	6,862.6	446.0	-776.4	580.3	6.47	6.46	-0.42
7,305.0	84.70	357.40	6,871.2	506.4	-778.9	640.0	9.05	9.02	-0.82
7,389.0	87.20	358.80	6,877.1	590.1	-781.7	722.9	3.41	2.98	1.67
7,437.0	88.70	359.80	6,878.8	638.1	-782.3	770.1	3.76	3.13	2.08
7,532.0	90.80	0.20	6,879.2	733.1	-782.3	863.5	2.25	2.21	0.42
7,627.0	90.60	359.50	6,878.1	828.0	-782.5	957.0	0.77	-0.21	-0.74
7,723.0	90.30	359.30	6,877.3	924.0	-783.5	1,051.5	0.38	-0.31	-0.21
7,818.0	90.60	359.10	6,876.6	1,019.0	-784.9	1,145.2	0.38	0.32	-0.21
7,913.0	90.30	358.90	6,875.8	1,114.0	-786.5	1,238.8	0.38	-0.32	-0.21
8,008.0	91.10	359.50	6,874.7	1,209.0	-787.8	1,332.5	1.05	0.84	0.63
8,103.0	90.00	0.20	6,873.7	1,304.0	-788.1	1,425.9	1.37	-1.16	0.74
8,199.0	90.60	359.50	6,873.2	1,400.0	-788.3	1,520.3	0.96	0.63	-0.73
8,294.0	91.50	358.20	6,871.5	1,494.9	-790.3	1,614.1	1.66	0.95	-1.37
8,389.0	91.60	357.40	6,868.9	1,589.8	-793.9	1,708.0	0.85	0.11	-0.84
8,484.0	92.10	357.00	6,865.9	1,684.7	-798.5	1,802.1	0.67	0.53	-0.42
8,580.0	89.00	357.00	6,864.9	1,780.5	-803.6	1,897.3	3.23	-3.23	0.00
8,675.0	88.50	357.20	6,867.0	1,875.4	-808.4	1,991.4	0.57	-0.53	0.21
8,770.0	88.20	358.10	6,869.8	1,970.3	-812.3	2,085.4	1.00	-0.32	0.95
8,865.0	89.30	359.30	6,871.8	2,065.2	-814.4	2,179.2	1.71	1.16	1.26
8,961.0	89.70	358.60	6,872.7	2,161.2	-816.2	2,273.9	0.84	0.42	-0.73
9,056.0	89.90	359.70	6,873.0	2,256.2	-817.6	2,367.5	1.18	0.21	1.16
9,151.0	89.60	358.40	6,873.4	2,351.2	-819.2	2,461.2	1.40	-0.32	-1.37
9,246.0	89.00	357.40	6,874.6	2,446.1	-822.6	2,555.1	1.23	-0.63	-1.05
9,341.0	90.70	358.60	6,874.8	2,541.0	-826.0	2,649.1	2.19	1.79	1.26
9,437.0	91.70	359.50	6,872.8	2,637.0	-827.5	2,743.7	1.40	1.04	0.94
9,532.0	91.50	358.90	6,870.2	2,731.9	-828.9	2,837.3	0.67	-0.21	-0.63
9,627.0	89.20	359.10	6,869.6	2,826.9	-830.5	2,931.0	2.43	-2.42	0.21
9,722.0	90.00	2.10	6,870.2	2,921.9	-829.5	3,024.2	3.27	0.84	3.16

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Well:	Waste Management 2Q-321	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Landmark

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
9,818.0	90.50	3.20	6,869.8	3,017.8	-825.1	3,117.7	1.26	0.52	1.15	
9,913.0	89.90	1.10	6,869.5	3,112.7	-821.5	3,210.4	2.30	-0.63	-2.21	
10,008.0	90.00	0.70	6,869.6	3,207.7	-820.0	3,303.5	0.43	0.11	-0.42	
10,103.0	90.50	0.20	6,869.2	3,302.7	-819.3	3,396.8	0.74	0.53	-0.53	
10,198.0	90.30	359.70	6,868.5	3,397.7	-819.4	3,490.2	0.57	-0.21	-0.53	
10,294.0	90.20	359.30	6,868.1	3,493.7	-820.2	3,584.7	0.43	-0.10	-0.42	
10,389.0	90.60	358.60	6,867.4	3,588.7	-822.0	3,678.4	0.85	0.42	-0.74	
10,484.0	92.00	358.60	6,865.3	3,683.6	-824.3	3,772.2	1.47	1.47	0.00	
10,579.0	90.00	357.90	6,863.6	3,778.6	-827.2	3,866.1	2.23	-2.11	-0.74	
10,674.0	89.90	357.20	6,863.7	3,873.5	-831.2	3,960.1	0.74	-0.11	-0.74	
10,770.0	89.50	357.70	6,864.2	3,969.4	-835.5	4,055.2	0.67	-0.42	0.52	
10,865.0	91.30	359.10	6,863.5	4,064.3	-838.2	4,149.0	2.40	1.89	1.47	
10,960.0	91.40	358.40	6,861.3	4,159.3	-840.2	4,242.8	0.74	0.11	-0.74	
11,055.0	91.10	358.80	6,859.2	4,254.2	-842.6	4,336.5	0.53	-0.32	0.42	
11,151.0	91.70	358.40	6,856.9	4,350.2	-844.9	4,431.3	0.75	0.63	-0.42	
11,246.0	90.60	358.40	6,855.0	4,445.1	-847.6	4,525.1	1.16	-1.16	0.00	
11,287.0	91.20	358.40	6,854.3	4,486.1	-848.7	4,565.6	1.46	1.46	0.00	
11,347.0	91.20	358.40	6,853.1	4,546.1	-850.4	4,624.9	0.00	0.00	0.00	
BHL 500'FNL, 2160'FEL										

Design Targets										
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude		Longitude
- hit/miss target										
- Shape										
BHL 500'FNL, 2160'FI	0.00	0.00	6,850.0	4,546.5	-844.0	1,307,487.40	3,274,657.72	40.173270		-104.517100
- survey misses target center by 7.1ft at 11347.0ft MD (6853.1 TVD, 4546.1 N, -850.4 E)										
- Point										

Checked By: _____	Approved By: _____	Date: _____
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