

# Noble Energy

Weld County, CO (NAD 83)

Sec. 30-T6N-R63W (Shadow PAD)

Shadow State A26-618

05-123-42921

Plan A

Design: Actual Surveys

## Sperry Drilling Services

### Final Survey Report

08 June, 2016

Surface UWI : 05-123-42921

Well Coordinates: 1,408,975.06 N, 3,285,021.62 E (40° 27' 05.47" N, 104° 28' 32.95" W)

Ground Level: 4,638.00 usft

Local Coordinate Origin:

Centered on Well Shadow State A26-618

Viewing Datum:

KB = 24' @ 4662.00usft (H&P 343)

TVDs to System:

N

North Reference:

Grid

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 81

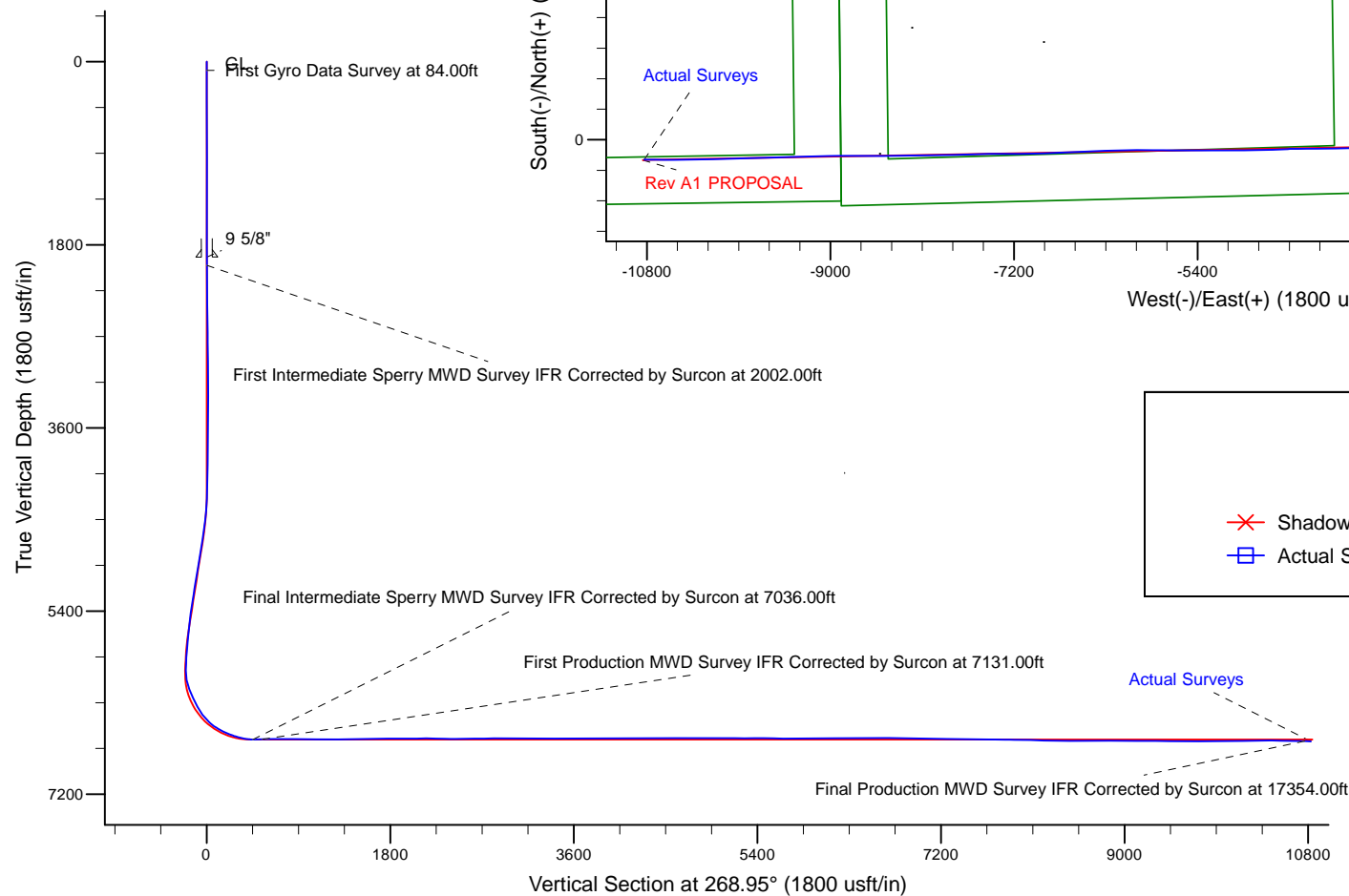
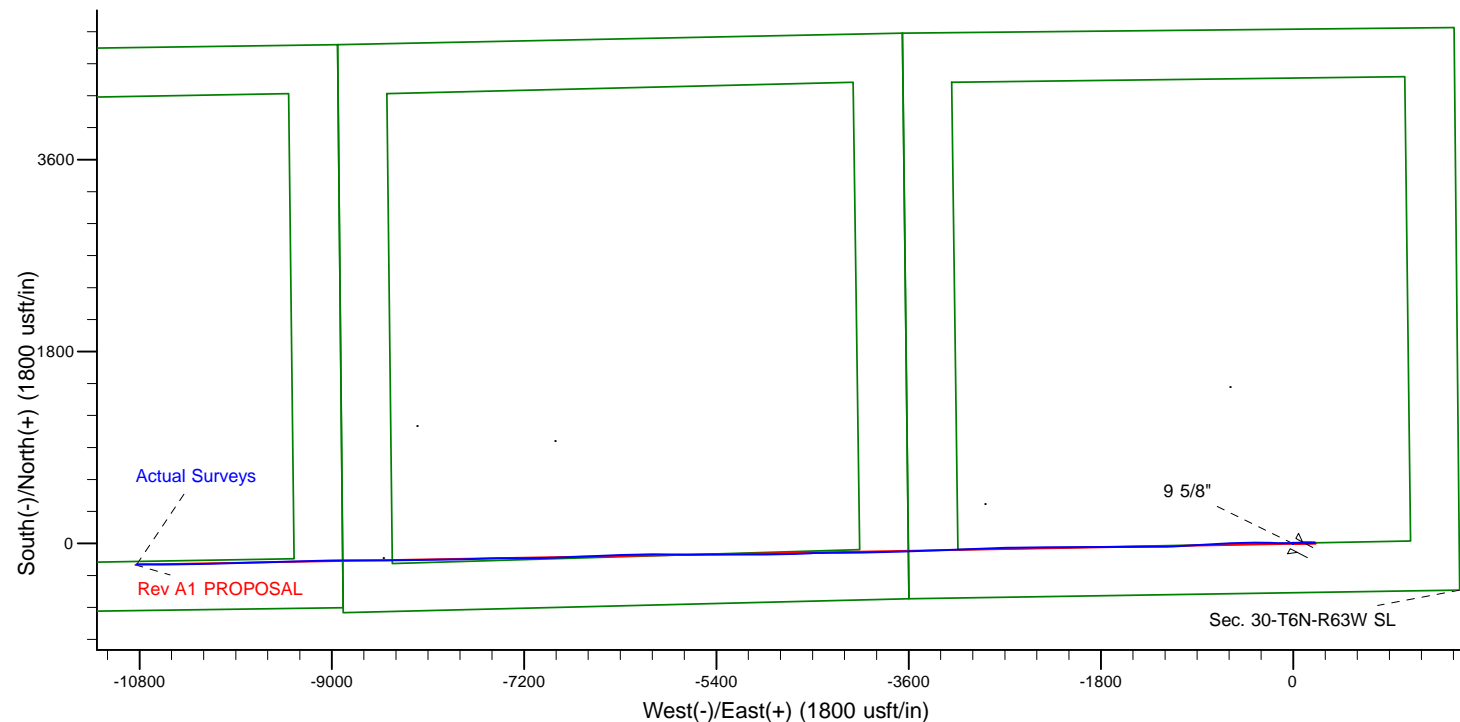
**HALLIBURTON**

Project: Weld County, CO (NAD 83)  
 Site: Sec. 30-T6N-R63W (Shadow PAD)  
 Well: Shadow State A26-618  
 Wellbore: Plan A  
 Design: Actual Surveys



Platted SHL: 462' FSL, 1553' FEL  
 Platted Lat/Long: 40.45152, -104.47582  
 Location: Sec. 30-T6N-R63W

Platted BHL: 450' FSL, 1940' FEL  
 Platted Lat/Long: 40.451317 N, -104.514505 W  
 State Planes - CO Northern: 1,408,778.95 N, 3,274,257.22 E  
 Location: Sec. 26-T6N-R64W



LEGEND

✕ Shadow State A26-618, Plan A, Rev A1 PROPOSAL V0

□ Actual Surveys

WELL DETAILS: Shadow State A26-618

Ground Level: 4638.00  
 KB = 24' @ 4662.00usft (H&P 343)

Created By: Tatiana Gomez  
 Created On: 6-8-2016

## Design Report for Shadow State A26-618 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Shadow State A26-618_Rev A0_SHL</b>							
84.00	0.33	230.24	84.00	-0.15	-0.19	0.19	0.39
<b>First Gyro Data Survey at 84.00ft</b>							
179.00	0.11	181.14	179.00	-0.42	-0.40	0.41	0.29
273.00	0.32	198.96	273.00	-0.76	-0.49	0.50	0.23
368.00	0.35	203.53	368.00	-1.28	-0.69	0.71	0.04
462.00	0.17	207.69	462.00	-1.66	-0.87	0.90	0.19
557.00	0.18	136.88	557.00	-1.90	-0.83	0.86	0.21
651.00	0.11	333.02	651.00	-1.92	-0.77	0.81	0.31
746.00	0.20	331.96	745.99	-1.70	-0.89	0.92	0.09
840.00	0.48	344.31	839.99	-1.17	-1.07	1.09	0.31
935.00	0.35	298.43	934.99	-0.65	-1.44	1.45	0.36
1,029.00	0.21	319.00	1,028.99	-0.38	-1.80	1.81	0.18
1,124.00	0.09	75.37	1,123.99	-0.23	-1.84	1.85	0.28
1,218.00	0.05	26.73	1,217.99	-0.18	-1.75	1.76	0.07
1,313.00	0.17	113.72	1,312.99	-0.20	-1.61	1.61	0.18
1,407.00	0.11	120.67	1,406.99	-0.30	-1.40	1.41	0.07
1,502.00	0.17	38.38	1,501.99	-0.24	-1.23	1.24	0.20
1,596.00	0.11	231.29	1,595.99	-0.18	-1.22	1.22	0.30
1,691.00	0.46	179.60	1,690.99	-0.62	-1.29	1.30	0.42
1,785.00	0.56	176.86	1,784.98	-1.46	-1.26	1.29	0.11
1,880.00	0.33	244.25	1,879.98	-2.04	-1.48	1.52	0.56
1,907.00	0.40	283.52	1,906.98	-2.05	-1.64	1.68	0.94
<b>Final Gyro Data Survey at 1907.00ft - Tie on to Gyro Data Survey at 1907.00ft</b>							
1,921.00	0.39	297.85	1,920.98	-2.02	-1.73	1.77	0.71
<b>9 5/8"</b>							
2,002.00	0.69	353.94	2,001.98	-1.41	-2.02	2.05	0.71
<b>First Intermediate Sperry MWD Survey IFR Corrected by Surcon at 2002.00ft</b>							
2,097.00	0.89	335.45	2,096.97	-0.17	-2.39	2.39	0.34
2,191.00	0.78	324.29	2,190.96	1.02	-3.07	3.05	0.21
2,286.00	0.87	313.90	2,285.95	2.04	-3.97	3.93	0.18
2,380.00	0.94	303.85	2,379.94	2.97	-5.12	5.06	0.18
2,475.00	0.82	289.45	2,474.93	3.63	-6.41	6.34	0.26
2,569.00	0.71	280.88	2,568.92	3.96	-7.61	7.54	0.17
2,664.00	0.61	272.60	2,663.91	4.10	-8.70	8.62	0.15
2,759.00	0.74	260.61	2,758.90	4.02	-9.81	9.73	0.20
2,853.00	0.87	253.23	2,852.90	3.71	-11.09	11.02	0.18
2,947.00	0.65	252.98	2,946.89	3.35	-12.28	12.22	0.23
3,042.00	0.74	248.02	3,041.88	2.96	-13.37	13.31	0.11
3,136.00	0.67	250.24	3,135.87	2.55	-14.45	14.40	0.08
3,231.00	0.34	234.92	3,230.87	2.20	-15.20	15.16	0.37
3,444.00	0.59	43.00	3,443.87	2.64	-14.97	14.92	0.43
3,633.00	0.74	58.67	3,632.85	3.99	-13.26	13.19	0.12
3,727.00	1.30	53.61	3,726.84	4.93	-11.89	11.79	0.60
3,822.00	1.18	55.25	3,821.82	6.13	-10.22	10.10	0.13
4,011.00	0.75	74.13	4,010.79	7.58	-7.43	7.29	0.28
4,106.00	0.63	73.79	4,105.78	7.89	-6.33	6.18	0.13
4,200.00	0.53	103.82	4,199.78	7.93	-5.41	5.26	0.34
4,295.00	3.11	100.23	4,294.72	7.37	-2.45	2.31	2.72

## Design Report for Shadow State A26-618 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,389.00	4.31	94.15	4,388.52	6.66	3.59	-3.71	1.34
4,483.00	6.13	92.64	4,482.13	6.18	12.12	-12.24	1.94
4,578.00	8.14	93.32	4,576.39	5.55	23.91	-24.00	2.12
4,767.00	9.26	90.85	4,763.21	4.55	52.47	-52.55	0.62
4,862.00	8.49	89.66	4,857.07	4.48	67.13	-67.20	0.83
4,956.00	9.92	93.43	4,949.86	4.04	82.15	-82.21	1.65
5,146.00	8.53	89.82	5,137.40	3.10	112.58	-112.62	0.79
5,240.00	9.91	92.09	5,230.19	2.83	127.63	-127.66	1.52
5,335.00	8.54	90.69	5,323.95	2.45	142.86	-142.88	1.46
5,430.00	7.16	88.77	5,418.06	2.49	155.83	-155.85	1.48
5,619.00	6.25	84.08	5,605.77	3.80	177.84	-177.88	0.56
5,713.00	5.26	82.42	5,699.29	4.90	187.20	-187.26	1.07
5,808.00	4.38	79.46	5,793.96	6.14	195.08	-195.16	0.96
5,997.00	1.54	60.04	5,982.69	8.73	204.38	-204.51	1.57
6,091.00	9.88	272.28	6,076.27	9.68	197.39	-197.54	11.93
6,186.00	22.56	271.67	6,167.31	10.54	170.93	-171.09	13.35
6,281.00	24.64	271.10	6,254.36	11.45	132.91	-133.09	2.20
6,375.00	26.90	267.32	6,339.01	10.83	92.07	-92.25	2.97
6,470.00	38.03	264.01	6,419.04	6.76	41.33	-41.45	11.86
6,564.00	45.94	268.21	6,488.87	2.68	-21.34	21.28	8.93
6,659.00	58.62	270.68	6,546.88	2.09	-96.32	96.26	13.50
6,753.00	64.85	272.87	6,591.38	4.70	-179.02	178.90	6.94
6,848.00	72.11	270.66	6,626.21	7.38	-267.29	267.11	7.94
6,890.57	74.53	270.28	6,638.42	7.71	-308.06	307.87	5.74
<b>Shadow State A26-618_Rev A0_CSG PT</b>							
6,942.00	77.45	269.84	6,650.87	7.76	-357.96	357.76	5.74
7,036.00	90.49	268.97	6,660.73	6.79	-451.23	451.03	13.90
<b>Final Intermediate Sperry MWD Survey IFR Corrected by Surcon at 7036.00ft</b>							
7,131.00	91.81	267.53	6,658.82	3.89	-546.16	546.00	2.06
<b>First Production MWD Survey IFR Corrected by Surcon at 7131.00ft</b>							
7,225.00	89.78	266.83	6,657.52	-0.74	-640.03	639.94	2.28
7,320.00	89.31	266.77	6,658.27	-6.04	-734.88	734.87	0.50
7,414.00	90.33	267.05	6,658.57	-11.11	-828.74	828.81	1.13
7,508.00	89.19	265.93	6,658.96	-16.86	-922.56	922.72	1.70
7,603.00	90.33	267.45	6,659.36	-22.35	-1,017.40	1,017.64	2.00
7,698.00	89.22	266.53	6,659.73	-27.34	-1,112.27	1,112.58	1.52
7,792.00	89.75	269.79	6,660.58	-30.35	-1,206.20	1,206.56	3.51
7,887.00	90.05	269.43	6,660.74	-31.00	-1,301.20	1,301.55	0.49
7,981.00	91.10	269.72	6,659.80	-31.70	-1,395.19	1,395.54	1.16
8,076.00	91.99	270.10	6,657.24	-31.85	-1,490.15	1,490.49	1.02
8,170.00	90.39	269.61	6,655.29	-32.08	-1,584.13	1,584.45	1.78
8,265.00	91.59	269.39	6,653.64	-32.91	-1,679.11	1,679.43	1.28
8,360.00	89.68	270.14	6,652.59	-33.30	-1,774.10	1,774.41	2.16
8,454.00	90.08	269.84	6,652.79	-33.32	-1,868.10	1,868.40	0.53
8,549.00	90.61	269.50	6,652.22	-33.87	-1,963.09	1,963.39	0.66
8,644.00	90.36	269.60	6,651.41	-34.61	-2,058.09	2,058.38	0.28
8,738.00	89.71	269.67	6,651.36	-35.21	-2,152.09	2,152.37	0.70
8,833.00	88.97	269.62	6,652.45	-35.80	-2,247.08	2,247.36	0.78
8,928.00	88.82	269.42	6,654.28	-36.59	-2,342.06	2,342.33	0.26
9,022.00	89.90	269.48	6,655.33	-37.50	-2,436.04	2,436.32	1.15
9,117.00	91.16	269.63	6,654.45	-38.23	-2,531.04	2,531.31	1.34

## Design Report for Shadow State A26-618 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,211.00	90.73	269.15	6,652.90	-39.24	-2,625.02	2,625.29	0.69
9,306.00	90.73	268.08	6,651.69	-41.53	-2,719.98	2,720.28	1.13
9,400.00	90.02	268.25	6,651.08	-44.54	-2,813.93	2,814.27	0.78
9,495.00	88.95	267.39	6,651.93	-48.15	-2,908.85	2,909.25	1.44
9,590.00	90.24	267.97	6,652.60	-52.00	-3,003.77	3,004.22	1.49
9,684.00	91.10	267.95	6,651.50	-55.35	-3,097.70	3,098.20	0.92
9,779.00	89.56	267.70	6,650.96	-58.95	-3,192.63	3,193.18	1.64
9,968.00	90.42	267.42	6,650.99	-67.00	-3,381.46	3,382.12	0.48
10,063.00	90.09	268.40	6,650.57	-70.46	-3,476.39	3,477.10	1.09
10,157.00	88.97	267.98	6,651.34	-73.43	-3,570.34	3,571.09	1.27
10,252.00	89.93	268.48	6,652.25	-76.36	-3,665.29	3,666.07	1.14
10,441.00	90.27	268.68	6,651.92	-81.05	-3,854.23	3,855.07	0.21
10,535.00	89.65	268.28	6,651.98	-83.54	-3,948.20	3,949.07	0.78
10,630.00	90.73	268.45	6,651.67	-86.25	-4,043.16	4,044.06	1.15
10,724.00	90.45	269.56	6,650.70	-87.88	-4,137.14	4,138.05	1.22
10,819.00	90.30	269.81	6,650.08	-88.41	-4,232.13	4,233.04	0.31
10,914.00	90.18	269.62	6,649.68	-88.88	-4,327.13	4,328.03	0.24
11,008.00	91.97	269.76	6,647.92	-89.39	-4,421.11	4,422.01	1.91
11,103.00	89.28	268.29	6,646.88	-91.00	-4,516.08	4,516.99	3.23
11,198.00	89.75	268.33	6,647.69	-93.81	-4,611.03	4,611.98	0.50
11,292.00	89.65	267.45	6,648.18	-97.27	-4,704.97	4,705.96	0.94
11,387.00	89.62	267.10	6,648.78	-101.78	-4,799.86	4,800.92	0.37
11,482.00	90.52	269.93	6,648.67	-104.25	-4,894.82	4,895.90	3.13
11,576.00	90.83	270.27	6,647.56	-104.08	-4,988.81	4,989.88	0.49
11,671.00	89.38	270.11	6,647.39	-103.77	-5,083.81	5,084.85	1.54
11,766.00	89.10	269.56	6,648.65	-104.04	-5,178.80	5,179.83	0.65
11,860.00	89.53	269.53	6,649.77	-104.79	-5,272.79	5,273.82	0.46
11,955.00	90.70	269.88	6,649.58	-105.28	-5,367.78	5,368.81	1.29
12,049.00	89.81	270.63	6,649.16	-104.86	-5,461.78	5,462.78	1.24
12,144.00	88.82	270.16	6,650.30	-104.20	-5,556.77	5,557.75	1.15
12,238.00	89.38	270.23	6,651.77	-103.88	-5,650.76	5,651.71	0.60
12,332.00	90.05	270.15	6,652.24	-103.57	-5,744.75	5,745.69	0.72
12,427.00	91.35	270.28	6,651.08	-103.21	-5,839.74	5,840.65	1.38
12,521.00	89.38	269.87	6,650.48	-103.09	-5,933.74	5,934.63	2.14
12,616.00	89.53	269.28	6,651.39	-103.80	-6,028.73	6,029.62	0.64
12,710.00	90.76	269.71	6,651.15	-104.62	-6,122.72	6,123.61	1.39
12,805.00	91.01	269.13	6,649.68	-105.59	-6,217.71	6,218.60	0.66
12,899.00	89.96	267.50	6,648.88	-108.35	-6,311.66	6,312.58	2.06
12,994.00	90.02	267.46	6,648.90	-112.53	-6,406.57	6,407.55	0.08
13,088.00	91.16	267.59	6,647.93	-116.59	-6,500.47	6,501.52	1.22
13,183.00	90.15	267.76	6,646.85	-120.44	-6,595.39	6,596.49	1.08
13,277.00	89.04	267.10	6,647.51	-124.65	-6,689.29	6,690.45	1.37
13,372.00	89.19	266.84	6,648.98	-129.67	-6,784.14	6,785.38	0.32
13,466.00	88.88	268.53	6,650.56	-133.47	-6,878.05	6,879.34	1.83
13,561.00	88.91	268.86	6,652.39	-135.63	-6,973.01	6,974.32	0.35
13,655.00	89.62	268.95	6,653.60	-137.43	-7,066.98	7,068.31	0.76
13,750.00	89.26	269.87	6,654.53	-138.41	-7,161.97	7,163.31	1.04
13,844.00	88.88	269.96	6,656.05	-138.55	-7,255.96	7,257.28	0.42
13,939.00	90.12	269.75	6,656.88	-138.79	-7,350.95	7,352.26	1.32
14,033.00	89.16	269.46	6,657.47	-139.44	-7,444.95	7,446.25	1.07
14,128.00	88.64	268.73	6,659.30	-140.94	-7,539.92	7,541.23	0.94

## Design Report for Shadow State A26-618 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
14,222.00	89.44	268.51	6,660.87	-143.20	-7,633.88	7,635.22	0.88
14,317.00	89.10	267.90	6,662.08	-146.18	-7,728.82	7,730.20	0.74
14,411.00	89.90	267.74	6,662.90	-149.75	-7,822.75	7,824.18	0.87
14,506.00	88.73	268.72	6,664.04	-152.69	-7,917.69	7,919.16	1.61
14,662.00	88.96	269.38	6,667.18	-155.27	-8,073.64	8,075.13	0.45
14,757.00	88.16	269.68	6,669.57	-156.05	-8,168.61	8,170.09	0.90
14,851.00	88.43	269.56	6,672.37	-156.67	-8,262.56	8,264.05	0.31
14,946.00	88.83	269.60	6,674.64	-157.37	-8,357.53	8,359.01	0.42
15,041.00	89.42	269.74	6,676.09	-157.92	-8,452.52	8,453.99	0.64
15,135.00	90.22	269.70	6,676.38	-158.38	-8,546.52	8,547.98	0.85
15,230.00	90.87	270.15	6,675.48	-158.50	-8,641.51	8,642.97	0.83
15,324.00	90.37	269.97	6,674.46	-158.40	-8,735.51	8,736.94	0.57
15,419.00	90.86	269.62	6,673.44	-158.74	-8,830.50	8,831.93	0.63
15,513.00	89.60	269.58	6,673.07	-159.40	-8,924.49	8,925.92	1.34
15,608.00	89.38	269.23	6,673.91	-160.38	-9,019.49	9,020.91	0.44
15,702.00	89.47	268.75	6,674.86	-162.04	-9,113.47	9,114.90	0.52
15,797.00	89.60	268.62	6,675.63	-164.22	-9,208.44	9,209.90	0.19
15,891.00	89.87	268.37	6,676.06	-166.69	-9,302.40	9,303.90	0.39
15,986.00	89.51	268.05	6,676.58	-169.66	-9,397.36	9,398.89	0.51
16,081.00	89.13	267.89	6,677.70	-173.02	-9,492.29	9,493.87	0.43
16,270.00	89.69	268.43	6,679.65	-179.09	-9,681.18	9,682.84	0.41
16,364.00	90.21	268.88	6,679.73	-181.30	-9,775.15	9,776.83	0.73
16,458.00	90.71	268.74	6,678.98	-183.25	-9,869.13	9,870.83	0.55
16,553.00	91.20	268.29	6,677.39	-185.71	-9,964.08	9,965.81	0.70
16,648.00	90.46	268.87	6,676.02	-188.06	-10,059.04	10,060.80	0.99
16,742.00	90.79	268.45	6,674.99	-190.26	-10,153.01	10,154.79	0.57
16,837.00	91.07	268.48	6,673.45	-192.81	-10,247.97	10,249.78	0.30
16,932.00	91.44	268.72	6,671.37	-195.13	-10,342.91	10,344.75	0.46
17,026.00	89.04	269.57	6,670.97	-196.53	-10,436.90	10,438.74	2.71
17,121.00	88.33	269.50	6,673.15	-197.30	-10,531.87	10,533.71	0.75
17,215.00	88.45	270.42	6,675.79	-197.37	-10,625.83	10,627.66	0.99
17,310.00	89.26	270.56	6,677.69	-196.55	-10,720.81	10,722.61	0.87
17,354.00	89.44	270.56	6,678.19	-196.12	-10,764.80	10,766.59	0.41
Final Production MWD Survey IFR Corrected by Surcon at 17354.00ft							
17,415.00	89.44	270.56	6,678.79	-195.53	-10,825.79	10,827.56	0.00
Straight Line Projection to TD at 17415.00ft - Shadow State A26-618_Rev A0_BHL - Shadow State A26-618_Rev A 1_BHL							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
84.00	84.00	-0.15	-0.19	First Gyro Data Survey at 84.00ft
1,907.00	1,906.98	-2.05	-1.64	Final Gyro Data Survey at 1907.00ft
1,907.00	1,906.98	-2.05	-1.64	Tie on to Gyro Data Survey at 1907.00ft
2,002.00	2,001.98	-1.41	-2.02	First Intermediate Sperry MWD Survey IFR Corrected by Surcon at 2002.00ft
7,036.00	6,660.73	6.79	-451.23	Final Intermediate Sperry MWD Survey IFR Corrected by Surcon at 7036.00ft
7,131.00	6,658.82	3.89	-546.16	First Production MWD Survey IFR Corrected by Surcon at 7131.00ft
17,354.00	6,678.19	-196.12	-10,764.80	Final Production MWD Survey IFR Corrected by Surcon at 17354.00ft
17,415.00	6,678.79	-195.53	-10,825.79	Straight Line Projection to TD at 17415.00ft

## Design Report for Shadow State A26-618 - Actual Surveys

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/-S (usft)	Origin +E/-W (usft)	Start TVD (usft)
Target	Shadow State A26-618_Rev A 1_BHL	268.95	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
84.00	1,907.00	Gyro Data Surveys	NS-GYRO-MS
2,002.00	7,036.00	Intermediate Sperry MWD Surveys	MWD
7,131.00	17,415.00	Production Sperry MWD Surveys Corrected by Surcon	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,921.00	1,920.98	9 5/8"	9-5/8	13-3/4

Wellbore Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Shadow State A26-618 - actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	0.01	0.00	1,408,975.07	3,285,021.62	40.451520	-104.475820
Shadow State A26-618 - actual wellpath misses target center by 30.59usft at 6890.57usft MD (6638.42 TVD, 7.71 N, -308.06 E) - Point	0.00	0.00	6,661.02	-12.00	-302.00	1,408,963.06	3,284,719.64	40.451497	-104.476906
Shadow State A26-618 - actual wellpath misses target center by 21.44usft at 17415.00usft MD (6678.79 TVD, -195.53 N, -10825.79 E) - Point	0.00	0.00	6,662.00	-199.31	-10,838.59	1,408,775.76	3,274,183.44	40.451310	-104.514770
Shadow State A26-618 - actual wellpath misses target center by 21.44usft at 17415.00usft MD (6678.79 TVD, -195.53 N, -10825.79 E) - Point	0.00	0.00	6,662.00	-199.31	-10,838.59	1,408,775.76	3,274,183.44	40.451310	-104.514770
Shadow State A26-618 - actual wellpath misses target center by 21.44usft at 17415.00usft MD (6678.79 TVD, -195.53 N, -10825.79 E) - Point	0.00	0.00	6,662.00	-199.31	-10,838.59	1,408,775.76	3,274,183.44	40.451310	-104.514770

Directional Difficulty Index

Average Dogleg over Survey:	1.32 °/100usft	Maximum Dogleg over Survey:	13.90 °/100usft at 7,036.00 usft
Net Tortousity applicable to Plans:	0.70 °/100usft	Directional Difficulty Index:	6.829

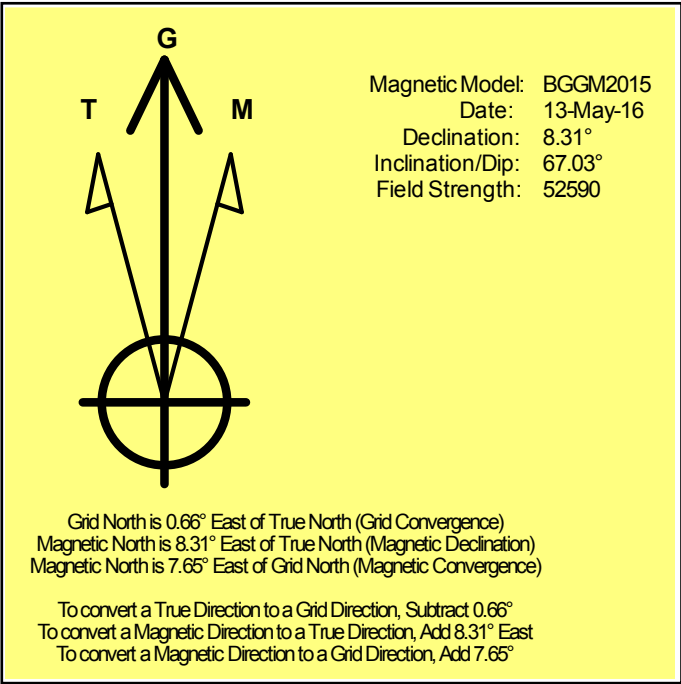
Audit Info

North Reference Sheet for Sec. 30-T6N-R63W (Shadow PAD) - Shadow State  
A26-618 - Plan A

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.  
Vertical Depths are relative to KB = 24' @ 4662.00usft (H&P 343). Northing and Easting are relative to Shadow State A26-618  
Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980  
Projection method is Lambert Conformal Conic (2 parallel)  
Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°  
False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996297

Grid Coordinates of Well: 1,408,975.06 usft N, 3,285,021.62 usft E  
Geographical Coordinates of Well: 40° 27' 05.47" N, 104° 28' 32.95" W  
Grid Convergence at Surface is: 0.66°

Based upon Minimum Curvature type calculations, at a Measured Depth of 17,415.00usft  
the Bottom Hole Displacement is 10,827.56usft in the Direction of 268.97° (Grid).  
Magnetic Convergence at surface is: -7.65° (13 May 2016, , BGGM2015)





# Noble Energy

Weld County, CO (NAD 83)

Sec. 30-T6N-R63W (Shadow PAD)

Shadow State A26-618

05-123-42921

Plan A

Design: Actual Surveys

## Sperry Drilling Services

### Geodetic Report

08 June, 2016

Well Coordinates: 1,408,975.06 N, 3,285,021.62 E (40° 27' 05.47" N, 104° 28' 32.95" W)

Ground Level: 4,638.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 81

Centered on Well Shadow State A26-618

KB = 24' @ 4662.00usft (H&P 343)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

## Design Report for Shadow State A26-618 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
0.00	0.00	0.00	0.00	0.00	0.00	40.451520	-104.475820	1,408,975.06	3,285,021.62
84.00	0.33	230.24	84.00	-0.15	-0.19	40.451520	-104.475821	1,408,974.91	3,285,021.44
179.00	0.11	181.14	179.00	-0.42	-0.40	40.451519	-104.475822	1,408,974.64	3,285,021.23
273.00	0.32	198.96	273.00	-0.76	-0.49	40.451518	-104.475822	1,408,974.30	3,285,021.14
368.00	0.35	203.53	368.00	-1.28	-0.69	40.451517	-104.475823	1,408,973.79	3,285,020.94
462.00	0.17	207.69	462.00	-1.66	-0.87	40.451516	-104.475823	1,408,973.40	3,285,020.76
557.00	0.18	136.88	557.00	-1.90	-0.83	40.451515	-104.475823	1,408,973.17	3,285,020.79
651.00	0.11	333.02	651.00	-1.92	-0.77	40.451515	-104.475823	1,408,973.14	3,285,020.85
746.00	0.20	331.96	745.99	-1.70	-0.89	40.451515	-104.475824	1,408,973.37	3,285,020.74
840.00	0.48	344.31	839.99	-1.17	-1.07	40.451517	-104.475824	1,408,973.89	3,285,020.55
935.00	0.35	298.43	934.99	-0.65	-1.44	40.451518	-104.475825	1,408,974.41	3,285,020.19
1,029.00	0.21	319.00	1,028.99	-0.38	-1.80	40.451519	-104.475827	1,408,974.68	3,285,019.82
1,124.00	0.09	75.37	1,123.99	-0.23	-1.84	40.451519	-104.475827	1,408,974.83	3,285,019.78
1,218.00	0.05	26.73	1,217.99	-0.18	-1.75	40.451520	-104.475827	1,408,974.88	3,285,019.87
1,313.00	0.17	113.72	1,312.99	-0.20	-1.61	40.451520	-104.475826	1,408,974.86	3,285,020.02
1,407.00	0.11	120.67	1,406.99	-0.30	-1.40	40.451519	-104.475825	1,408,974.76	3,285,020.22
1,502.00	0.17	38.38	1,501.99	-0.24	-1.23	40.451519	-104.475825	1,408,974.83	3,285,020.39
1,596.00	0.11	231.29	1,595.99	-0.18	-1.22	40.451520	-104.475825	1,408,974.88	3,285,020.41
1,691.00	0.46	179.60	1,690.99	-0.62	-1.29	40.451518	-104.475825	1,408,974.44	3,285,020.34
1,785.00	0.56	176.86	1,784.98	-1.46	-1.26	40.451516	-104.475825	1,408,973.60	3,285,020.37
1,880.00	0.33	244.25	1,879.98	-2.04	-1.48	40.451515	-104.475826	1,408,973.02	3,285,020.14
1,907.00	0.40	283.52	1,906.98	-2.05	-1.64	40.451514	-104.475826	1,408,973.01	3,285,019.98
1,921.00	0.39	297.85	1,920.98	-2.02	-1.73	40.451515	-104.475827	1,408,973.04	3,285,019.89
2,002.00	0.69	353.94	2,001.98	-1.41	-2.02	40.451516	-104.475828	1,408,973.66	3,285,019.60
2,097.00	0.89	335.45	2,096.97	-0.17	-2.39	40.451520	-104.475829	1,408,974.90	3,285,019.23
2,191.00	0.78	324.29	2,190.96	1.02	-3.07	40.451523	-104.475831	1,408,976.08	3,285,018.56
2,286.00	0.87	313.90	2,285.95	2.04	-3.97	40.451526	-104.475834	1,408,977.10	3,285,017.66
2,380.00	0.94	303.85	2,379.94	2.97	-5.12	40.451528	-104.475839	1,408,978.03	3,285,016.50
2,475.00	0.82	289.45	2,474.93	3.63	-6.41	40.451530	-104.475843	1,408,978.69	3,285,015.22
2,569.00	0.71	280.88	2,568.92	3.96	-7.61	40.451531	-104.475847	1,408,979.02	3,285,014.01
2,664.00	0.61	272.60	2,663.91	4.10	-8.70	40.451532	-104.475851	1,408,979.16	3,285,012.93
2,759.00	0.74	260.61	2,758.90	4.02	-9.81	40.451531	-104.475855	1,408,979.08	3,285,011.82
2,853.00	0.87	253.23	2,852.90	3.71	-11.09	40.451531	-104.475860	1,408,978.78	3,285,010.54
2,947.00	0.65	252.98	2,946.89	3.35	-12.28	40.451530	-104.475864	1,408,978.41	3,285,009.34
3,042.00	0.74	248.02	3,041.88	2.96	-13.37	40.451529	-104.475868	1,408,978.03	3,285,008.26
3,136.00	0.67	250.24	3,135.87	2.55	-14.45	40.451528	-104.475872	1,408,977.61	3,285,007.18
3,231.00	0.34	234.92	3,230.87	2.20	-15.20	40.451527	-104.475875	1,408,977.26	3,285,006.42
3,444.00	0.59	43.00	3,443.87	2.64	-14.97	40.451528	-104.475874	1,408,977.70	3,285,006.66
3,633.00	0.74	58.67	3,632.85	3.99	-13.26	40.451531	-104.475868	1,408,979.05	3,285,008.36
3,727.00	1.30	53.61	3,726.84	4.93	-11.89	40.451534	-104.475863	1,408,980.00	3,285,009.74
3,822.00	1.18	55.25	3,821.82	6.13	-10.22	40.451537	-104.475857	1,408,981.19	3,285,011.41
4,011.00	0.75	74.13	4,010.79	7.58	-7.43	40.451541	-104.475847	1,408,982.64	3,285,014.20

## Design Report for Shadow State A26-618 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
4,106.00	0.63	73.79	4,105.78	7.89	-6.33	40.451542	-104.475843	1,408,982.96	3,285,015.30
4,200.00	0.53	103.82	4,199.78	7.93	-5.41	40.451542	-104.475839	1,408,983.00	3,285,016.22
4,295.00	3.11	100.23	4,294.72	7.37	-2.45	40.451540	-104.475829	1,408,982.43	3,285,019.18
4,389.00	4.31	94.15	4,388.52	6.66	3.59	40.451538	-104.475807	1,408,981.73	3,285,025.21
4,483.00	6.13	92.64	4,482.13	6.18	12.12	40.451537	-104.475776	1,408,981.24	3,285,033.75
4,578.00	8.14	93.32	4,576.39	5.55	23.91	40.451535	-104.475734	1,408,980.62	3,285,045.53
4,767.00	9.26	90.85	4,763.21	4.55	52.47	40.451531	-104.475632	1,408,979.62	3,285,074.09
4,862.00	8.49	89.66	4,857.07	4.48	67.13	40.451530	-104.475579	1,408,979.54	3,285,088.75
4,956.00	9.92	93.43	4,949.86	4.04	82.15	40.451529	-104.475525	1,408,979.10	3,285,103.77
5,146.00	8.53	89.82	5,137.40	3.10	112.58	40.451525	-104.475416	1,408,978.17	3,285,134.20
5,240.00	9.91	92.09	5,230.19	2.83	127.63	40.451524	-104.475362	1,408,977.89	3,285,149.25
5,335.00	8.54	90.69	5,323.95	2.45	142.86	40.451522	-104.475307	1,408,977.51	3,285,164.48
5,430.00	7.16	88.77	5,418.06	2.49	155.83	40.451522	-104.475260	1,408,977.55	3,285,177.45
5,619.00	6.25	84.08	5,605.77	3.80	177.84	40.451525	-104.475181	1,408,978.87	3,285,199.46
5,713.00	5.26	82.42	5,699.29	4.90	187.20	40.451528	-104.475147	1,408,979.96	3,285,208.82
5,808.00	4.38	79.46	5,793.96	6.14	195.08	40.451531	-104.475119	1,408,981.20	3,285,216.70
5,997.00	1.54	60.04	5,982.69	8.73	204.38	40.451538	-104.475086	1,408,983.79	3,285,226.00
6,091.00	9.88	272.28	6,076.27	9.68	197.39	40.451540	-104.475111	1,408,984.74	3,285,219.01
6,186.00	22.56	271.67	6,167.31	10.54	170.93	40.451544	-104.475206	1,408,985.60	3,285,192.54
6,281.00	24.64	271.10	6,254.36	11.45	132.91	40.451547	-104.475342	1,408,986.51	3,285,154.53
6,375.00	26.90	267.32	6,339.01	10.83	92.07	40.451547	-104.475489	1,408,985.89	3,285,113.69
6,470.00	38.03	264.01	6,419.04	6.76	41.33	40.451537	-104.475671	1,408,981.82	3,285,062.95
6,564.00	45.94	268.21	6,488.87	2.68	-21.34	40.451528	-104.475897	1,408,977.74	3,285,000.29
6,659.00	58.62	270.68	6,546.88	2.09	-96.32	40.451529	-104.476166	1,408,977.15	3,284,925.31
6,753.00	64.85	272.87	6,591.38	4.70	-179.02	40.451539	-104.476463	1,408,979.76	3,284,842.61
6,848.00	72.11	270.66	6,626.21	7.38	-267.29	40.451549	-104.476780	1,408,982.44	3,284,754.34
6,890.57	74.53	270.28	6,638.42	7.71	-308.06	40.451551	-104.476927	1,408,982.77	3,284,713.57
6,942.00	77.45	269.84	6,650.87	7.76	-357.96	40.451553	-104.477106	1,408,982.83	3,284,663.68
7,036.00	90.49	268.97	6,660.73	6.79	-451.23	40.451553	-104.477441	1,408,981.85	3,284,570.41
7,131.00	91.81	267.53	6,658.82	3.89	-546.16	40.451548	-104.477782	1,408,978.95	3,284,475.48
7,225.00	89.78	266.83	6,657.52	-0.74	-640.03	40.451538	-104.478120	1,408,974.32	3,284,381.61
7,320.00	89.31	266.77	6,658.27	-6.04	-734.88	40.451527	-104.478461	1,408,969.02	3,284,286.77
7,414.00	90.33	267.05	6,658.57	-11.11	-828.74	40.451516	-104.478798	1,408,963.96	3,284,192.91
7,508.00	89.19	265.93	6,658.96	-16.86	-922.56	40.451503	-104.479136	1,408,958.20	3,284,099.09
7,603.00	90.33	267.45	6,659.36	-22.35	-1,017.40	40.451491	-104.479477	1,408,952.72	3,284,004.26
7,698.00	89.22	266.53	6,659.73	-27.34	-1,112.27	40.451480	-104.479818	1,408,947.73	3,283,909.40
7,792.00	89.75	269.79	6,660.58	-30.35	-1,206.20	40.451475	-104.480155	1,408,944.71	3,283,815.47
7,887.00	90.05	269.43	6,660.74	-31.00	-1,301.20	40.451476	-104.480497	1,408,944.06	3,283,720.47
7,981.00	91.10	269.72	6,659.80	-31.70	-1,395.19	40.451477	-104.480834	1,408,943.37	3,283,626.49
8,076.00	91.99	270.10	6,657.24	-31.85	-1,490.15	40.451480	-104.481176	1,408,943.22	3,283,531.53
8,170.00	90.39	269.61	6,655.29	-32.08	-1,584.13	40.451482	-104.481513	1,408,942.98	3,283,437.55
8,265.00	91.59	269.39	6,653.64	-32.91	-1,679.11	40.451483	-104.481854	1,408,942.15	3,283,342.58

## Design Report for Shadow State A26-618 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
8,360.00	89.68	270.14	6,652.59	-33.30	-1,774.10	40.451485	-104.482196	1,408,941.76	3,283,247.59
8,454.00	90.08	269.84	6,652.79	-33.32	-1,868.10	40.451488	-104.482534	1,408,941.75	3,283,153.60
8,549.00	90.61	269.50	6,652.22	-33.87	-1,963.09	40.451489	-104.482875	1,408,941.20	3,283,058.60
8,644.00	90.36	269.60	6,651.41	-34.61	-2,058.09	40.451490	-104.483216	1,408,940.45	3,282,963.61
8,738.00	89.71	269.67	6,651.36	-35.21	-2,152.09	40.451491	-104.483554	1,408,939.85	3,282,869.62
8,833.00	88.97	269.62	6,652.45	-35.80	-2,247.08	40.451493	-104.483895	1,408,939.26	3,282,774.63
8,928.00	88.82	269.42	6,654.28	-36.59	-2,342.06	40.451494	-104.484237	1,408,938.47	3,282,679.66
9,022.00	89.90	269.48	6,655.33	-37.50	-2,436.04	40.451494	-104.484574	1,408,937.57	3,282,585.67
9,117.00	91.16	269.63	6,654.45	-38.23	-2,531.04	40.451495	-104.484916	1,408,936.83	3,282,490.68
9,211.00	90.73	269.15	6,652.90	-39.24	-2,625.02	40.451495	-104.485253	1,408,935.83	3,282,396.70
9,306.00	90.73	268.08	6,651.69	-41.53	-2,719.98	40.451492	-104.485595	1,408,933.53	3,282,301.75
9,400.00	90.02	268.25	6,651.08	-44.54	-2,813.93	40.451487	-104.485932	1,408,930.52	3,282,207.80
9,495.00	88.95	267.39	6,651.93	-48.15	-2,908.85	40.451480	-104.486273	1,408,926.91	3,282,112.88
9,590.00	90.24	267.97	6,652.60	-52.00	-3,003.77	40.451472	-104.486615	1,408,923.06	3,282,017.96
9,684.00	91.10	267.95	6,651.50	-55.35	-3,097.70	40.451466	-104.486952	1,408,919.72	3,281,924.03
9,779.00	89.56	267.70	6,650.96	-58.95	-3,192.63	40.451459	-104.487293	1,408,916.11	3,281,829.11
9,968.00	90.42	267.42	6,650.99	-67.00	-3,381.46	40.451443	-104.487972	1,408,908.07	3,281,640.29
10,063.00	90.09	268.40	6,650.57	-70.46	-3,476.39	40.451436	-104.488313	1,408,904.60	3,281,545.36
10,157.00	88.97	267.98	6,651.34	-73.43	-3,570.34	40.451431	-104.488651	1,408,901.63	3,281,451.42
10,252.00	89.93	268.48	6,652.25	-76.36	-3,665.29	40.451426	-104.488992	1,408,898.70	3,281,356.47
10,441.00	90.27	268.68	6,651.92	-81.05	-3,854.23	40.451419	-104.489671	1,408,894.02	3,281,167.54
10,535.00	89.65	268.28	6,651.98	-83.54	-3,948.20	40.451415	-104.490009	1,408,891.52	3,281,073.57
10,630.00	90.73	268.45	6,651.67	-86.25	-4,043.16	40.451411	-104.490350	1,408,888.81	3,280,978.62
10,724.00	90.45	269.56	6,650.70	-87.88	-4,137.14	40.451409	-104.490688	1,408,887.18	3,280,884.64
10,819.00	90.30	269.81	6,650.08	-88.41	-4,232.13	40.451411	-104.491029	1,408,886.66	3,280,789.65
10,914.00	90.18	269.62	6,649.68	-88.88	-4,327.13	40.451412	-104.491371	1,408,886.19	3,280,694.65
11,008.00	91.97	269.76	6,647.92	-89.39	-4,421.11	40.451414	-104.491709	1,408,885.68	3,280,600.68
11,103.00	89.28	268.29	6,646.88	-91.00	-4,516.08	40.451412	-104.492050	1,408,884.06	3,280,505.71
11,198.00	89.75	268.33	6,647.69	-93.81	-4,611.03	40.451408	-104.492391	1,408,881.26	3,280,410.76
11,292.00	89.65	267.45	6,648.18	-97.27	-4,704.97	40.451401	-104.492729	1,408,877.80	3,280,316.83
11,387.00	89.62	267.10	6,648.78	-101.78	-4,799.86	40.451392	-104.493070	1,408,873.28	3,280,221.94
11,482.00	90.52	269.93	6,648.67	-104.25	-4,894.82	40.451388	-104.493411	1,408,870.82	3,280,126.99
11,576.00	90.83	270.27	6,647.56	-104.08	-4,988.81	40.451391	-104.493749	1,408,870.99	3,280,033.00
11,671.00	89.38	270.11	6,647.39	-103.77	-5,083.81	40.451395	-104.494090	1,408,871.30	3,279,938.01
11,766.00	89.10	269.56	6,648.65	-104.04	-5,178.80	40.451397	-104.494431	1,408,871.03	3,279,843.02
11,860.00	89.53	269.53	6,649.77	-104.79	-5,272.79	40.451398	-104.494769	1,408,870.28	3,279,749.03
11,955.00	90.70	269.88	6,649.58	-105.28	-5,367.78	40.451400	-104.495110	1,408,869.79	3,279,654.04
12,049.00	89.81	270.63	6,649.16	-104.86	-5,461.78	40.451404	-104.495448	1,408,870.21	3,279,560.05
12,144.00	88.82	270.16	6,650.30	-104.20	-5,556.77	40.451409	-104.495789	1,408,870.86	3,279,465.06
12,238.00	89.38	270.23	6,651.77	-103.88	-5,650.76	40.451412	-104.496127	1,408,871.18	3,279,371.08
12,332.00	90.05	270.15	6,652.24	-103.57	-5,744.75	40.451416	-104.496465	1,408,871.50	3,279,277.08
12,427.00	91.35	270.28	6,651.08	-103.21	-5,839.74	40.451420	-104.496806	1,408,871.85	3,279,182.10

## Design Report for Shadow State A26-618 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
12,521.00	89.38	269.87	6,650.48	-103.09	-5,933.74	40.451423	-104.497144	1,408,871.98	3,279,088.11
12,616.00	89.53	269.28	6,651.39	-103.80	-6,028.73	40.451424	-104.497485	1,408,871.27	3,278,993.12
12,710.00	90.76	269.71	6,651.15	-104.62	-6,122.72	40.451425	-104.497823	1,408,870.44	3,278,899.13
12,805.00	91.01	269.13	6,649.68	-105.59	-6,217.71	40.451425	-104.498164	1,408,869.48	3,278,804.15
12,899.00	89.96	267.50	6,648.88	-108.35	-6,311.66	40.451421	-104.498502	1,408,866.72	3,278,710.20
12,994.00	90.02	267.46	6,648.90	-112.53	-6,406.57	40.451412	-104.498843	1,408,862.54	3,278,615.29
13,088.00	91.16	267.59	6,647.93	-116.59	-6,500.47	40.451404	-104.499181	1,408,858.48	3,278,521.39
13,183.00	90.15	267.76	6,646.85	-120.44	-6,595.39	40.451396	-104.499522	1,408,854.63	3,278,426.48
13,277.00	89.04	267.10	6,647.51	-124.65	-6,689.29	40.451388	-104.499859	1,408,850.41	3,278,332.58
13,372.00	89.19	266.84	6,648.98	-129.67	-6,784.14	40.451377	-104.500200	1,408,845.39	3,278,237.73
13,466.00	88.88	268.53	6,650.56	-133.47	-6,878.05	40.451369	-104.500538	1,408,841.60	3,278,143.83
13,561.00	88.91	268.86	6,652.39	-135.63	-6,973.01	40.451366	-104.500879	1,408,839.43	3,278,048.87
13,655.00	89.62	268.95	6,653.60	-137.43	-7,066.98	40.451364	-104.501217	1,408,837.64	3,277,954.90
13,750.00	89.26	269.87	6,654.53	-138.41	-7,161.97	40.451364	-104.501558	1,408,836.66	3,277,859.92
13,844.00	88.88	269.96	6,656.05	-138.55	-7,255.96	40.451367	-104.501896	1,408,836.52	3,277,765.93
13,939.00	90.12	269.75	6,656.88	-138.79	-7,350.95	40.451369	-104.502237	1,408,836.28	3,277,670.94
14,033.00	89.16	269.46	6,657.47	-139.44	-7,444.95	40.451370	-104.502575	1,408,835.63	3,277,576.95
14,128.00	88.64	268.73	6,659.30	-140.94	-7,539.92	40.451369	-104.502916	1,408,834.13	3,277,481.99
14,222.00	89.44	268.51	6,660.87	-143.20	-7,633.88	40.451366	-104.503254	1,408,831.87	3,277,388.03
14,317.00	89.10	267.90	6,662.08	-146.18	-7,728.82	40.451361	-104.503595	1,408,828.89	3,277,293.09
14,411.00	89.90	267.74	6,662.90	-149.75	-7,822.75	40.451354	-104.503933	1,408,825.32	3,277,199.17
14,506.00	88.73	268.72	6,664.04	-152.69	-7,917.69	40.451349	-104.504274	1,408,822.38	3,277,104.22
14,662.00	88.96	269.38	6,667.18	-155.27	-8,073.64	40.451346	-104.504834	1,408,819.80	3,276,948.28
14,757.00	88.16	269.68	6,669.57	-156.05	-8,168.61	40.451347	-104.505176	1,408,819.02	3,276,853.32
14,851.00	88.43	269.56	6,672.37	-156.67	-8,262.56	40.451348	-104.505513	1,408,818.39	3,276,759.37
14,946.00	88.83	269.60	6,674.64	-157.37	-8,357.53	40.451349	-104.505854	1,408,817.70	3,276,664.40
15,041.00	89.42	269.74	6,676.09	-157.92	-8,452.52	40.451351	-104.506196	1,408,817.15	3,276,569.42
15,135.00	90.22	269.70	6,676.38	-158.38	-8,546.52	40.451352	-104.506533	1,408,816.69	3,276,475.42
15,230.00	90.87	270.15	6,675.48	-158.50	-8,641.51	40.451355	-104.506875	1,408,816.57	3,276,380.43
15,324.00	90.37	269.97	6,674.46	-158.40	-8,735.51	40.451358	-104.507212	1,408,816.67	3,276,286.44
15,419.00	90.86	269.62	6,673.44	-158.74	-8,830.50	40.451360	-104.507554	1,408,816.33	3,276,191.45
15,513.00	89.60	269.58	6,673.07	-159.40	-8,924.49	40.451361	-104.507892	1,408,815.67	3,276,097.46
15,608.00	89.38	269.23	6,673.91	-160.38	-9,019.49	40.451361	-104.508233	1,408,814.68	3,276,002.47
15,702.00	89.47	268.75	6,674.86	-162.04	-9,113.47	40.451360	-104.508571	1,408,813.03	3,275,908.50
15,797.00	89.60	268.62	6,675.63	-164.22	-9,208.44	40.451357	-104.508912	1,408,810.85	3,275,813.53
15,891.00	89.87	268.37	6,676.06	-166.69	-9,302.40	40.451353	-104.509250	1,408,808.38	3,275,719.57
15,986.00	89.51	268.05	6,676.58	-169.66	-9,397.36	40.451347	-104.509591	1,408,805.41	3,275,624.62
16,081.00	89.13	267.89	6,677.70	-173.02	-9,492.29	40.451341	-104.509932	1,408,802.05	3,275,529.69
16,270.00	89.69	268.43	6,679.65	-179.09	-9,681.18	40.451330	-104.510611	1,408,795.98	3,275,340.80
16,364.00	90.21	268.88	6,679.73	-181.30	-9,775.15	40.451327	-104.510949	1,408,793.77	3,275,246.83
16,458.00	90.71	268.74	6,678.98	-183.25	-9,869.13	40.451325	-104.511286	1,408,791.82	3,275,152.86
16,553.00	91.20	268.29	6,677.39	-185.71	-9,964.08	40.451321	-104.511628	1,408,789.36	3,275,057.91

## Design Report for Shadow State A26-618 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
16,648.00	90.46	268.87	6,676.02	-188.06	-10,059.04	40.451317	-104.511969	1,408,787.00	3,274,962.95
16,742.00	90.79	268.45	6,674.99	-190.26	-10,153.01	40.451314	-104.512307	1,408,784.81	3,274,868.99
16,837.00	91.07	268.48	6,673.45	-192.81	-10,247.97	40.451310	-104.512648	1,408,782.26	3,274,774.04
16,932.00	91.44	268.72	6,671.37	-195.13	-10,342.91	40.451306	-104.512989	1,408,779.94	3,274,679.09
17,026.00	89.04	269.57	6,670.97	-196.53	-10,436.90	40.451305	-104.513327	1,408,778.54	3,274,585.12
17,121.00	88.33	269.50	6,673.15	-197.30	-10,531.87	40.451306	-104.513668	1,408,777.77	3,274,490.15
17,215.00	88.45	270.42	6,675.79	-197.37	-10,625.83	40.451309	-104.514006	1,408,777.70	3,274,396.19
17,310.00	89.26	270.56	6,677.69	-196.55	-10,720.81	40.451314	-104.514347	1,408,778.52	3,274,301.22
17,354.00	89.44	270.56	6,678.19	-196.12	-10,764.80	40.451317	-104.514505	1,408,778.95	3,274,257.22
17,415.00	89.44	270.56	6,678.79	-195.53	-10,825.79	40.451320	-104.514724	1,408,779.54	3,274,196.23

### Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
84.00	84.00	-0.15	-0.19	First Gyro Data Survey at 84.00ft
1,907.00	1,906.98	-2.05	-1.64	Final Gyro Data Survey at 1907.00ft
1,907.00	1,906.98	-2.05	-1.64	Tie on to Gyro Data Survey at 1907.00ft
2,002.00	2,001.98	-1.41	-2.02	First Intermediate Sperry MWD Survey IFR Corrected by Surcon at 2002.00ft
7,036.00	6,660.73	6.79	-451.23	Final Intermediate Sperry MWD Survey IFR Corrected by Surcon at 7036.00ft
7,131.00	6,658.82	3.89	-546.16	First Production MWD Survey IFR Corrected by Surcon at 7131.00ft
17,354.00	6,678.19	-196.12	-10,764.80	Final Production MWD Survey IFR Corrected by Surcon at 17354.00ft
17,415.00	6,678.79	-195.53	-10,825.79	Straight Line Projection to TD at 17415.00ft

### Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	Shadow State A26-618_Rev A 1_BHL	268.95	Slot	0.00	0.00	0.00

### Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
84.00	1,907.00	Gyro Data Surveys	NS-GYRO-MS
2,002.00	7,036.00	Intermediate Sperry MWD Surveys	MWD
7,131.00	17,415.00	Production Sperry MWD Surveys Corrected by Surcon	MWD+IFR1+MS_WY

## Design Report for Shadow State A26-618 - Actual Surveys

### Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,921.00	1,920.98	9 5/8"	9-5/8	13-3/4

### Design Targets

Shape	Target Name	TVD ( )	Northing ( )	Easting ( )	+N/-S	+E/-W	Created	Updated
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### Directional Difficulty Index

Average Dogleg over Survey:	1.32 °/100usft	Maximum Dogleg over Survey:	13.90 °/100usft at 7,036.00 usft
Net Tortousity applicable to Plans:	0.70 °/100usft	Directional Difficulty Index:	6.829

### Audit Info

**North Reference Sheet for Sec. 30-T6N-R63W (Shadow PAD) - Shadow State A26-618 - Plan A**

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.

Vertical Depths are relative to KB = 24' @ 4662.00usft (H&P 343). Northing and Easting are relative to Shadow State A26-618

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996297

Grid Coordinates of Well: 1,408,975.06 usft N, 3,285,021.62 usft E

Geographical Coordinates of Well: 40° 27' 05.47" N, 104° 28' 32.95" W

Grid Convergence at Surface is: 0.66°

Based upon Minimum Curvature type calculations, at a Measured Depth of 17,415.00usft

the Bottom Hole Displacement is 10,827.56usft in the Direction of 268.97° (Grid).

Magnetic Convergence at surface is: -7.65° (13 May 2016, , BGGM2015)

