

Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 21-T1N-R67W

Howard 4N-21HZ

Plan A Rev 0

Plan: Plan A Rev 0 Permit

Sperry Drilling Services

Proposal Report

28 December, 2012

Well Coordinates: 1,254,557.81 N, 3,168,142.33 E (40° 01' 50.11" N, 104° 53' 58.37" W)

Ground Level: 5,025.00 ft

Local Coordinate Origin:

Centered on Well Howard 4N-21HZ

Viewing Datum:

RKB=17 @ 5042.00ft (Drilling Rig)

TVDs to System:

N

North Reference:

True

Unit System:

API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 2003.16 Build: 43I

HALLIBURTON

Project: Weld County, CO (NAD 83)

Site: Sec. 21-T1N-R67W

Well: Howard 4N-21HZ

Wellbore: Plan A Rev 0

Design: Plan A Rev 0 Permit

Anadarko Petroleum Corp.

HALLIBURTON

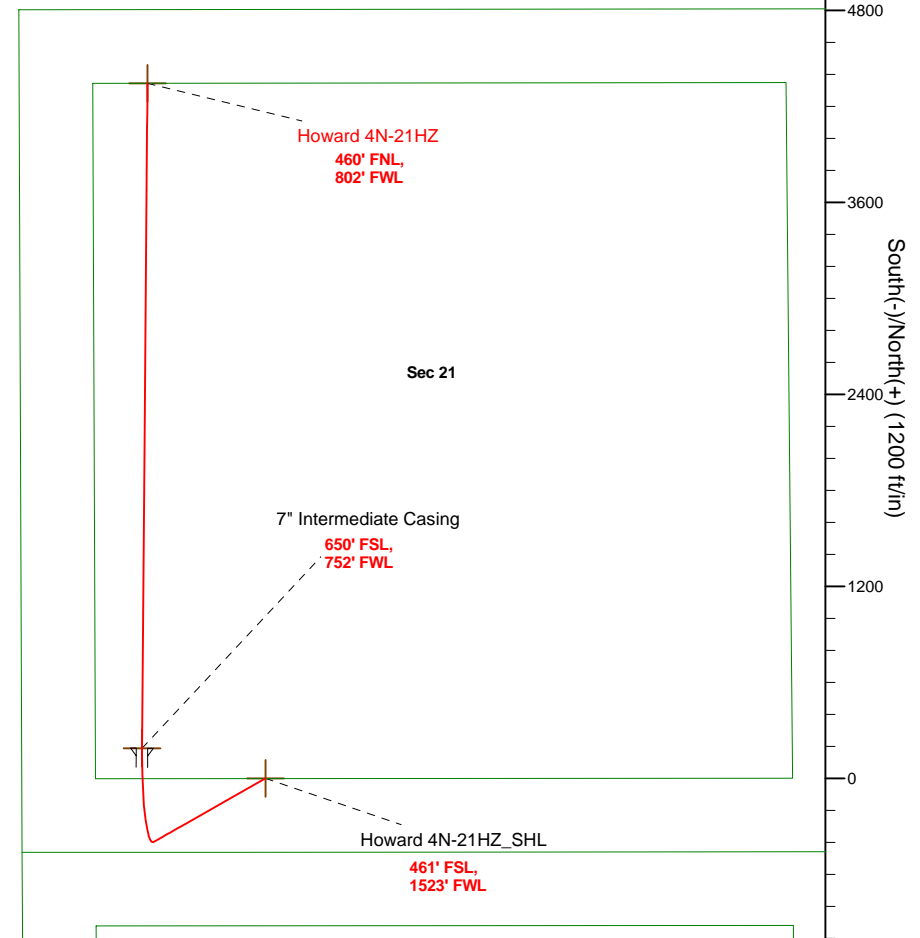
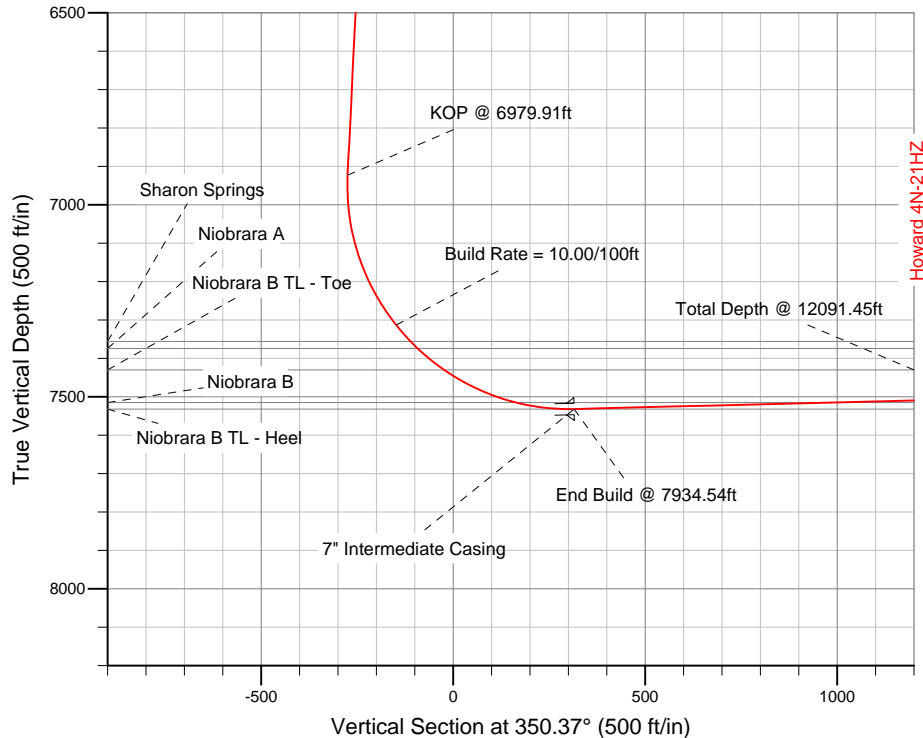
Sperry Drilling

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	DLeg	TFace	VSec	Target
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	1100.00	0.00	0.00	1100.00	0.00	0.00	0.00	0.00	0.00	
3	1506.86	8.14	240.39	1505.49	-14.25	-25.07	2.00	240.39	-9.86	
4	6979.91	8.14	240.39	6923.44	-397.07	-698.55	0.00	0.00	-274.61	
5	7934.54	91.41	0.47	7532.00	189.00	-771.00	10.00	119.66	315.32	Howard 4N-21HZ_CP
6	12091.45	91.41	0.47	7430.00	4344.52	-737.21	0.00	0.00	4406.62	Howard 4N-21HZ_BHL

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude	Shape
Howard 4N-21HZ_SHL	0.00	0.00	0.00	40.030586	-104.899547	Point
Howard 4N-21HZ_BHL	7430.00	4344.52	-737.21	40.042512	-104.902180	Point
Howard 4N-21HZ_CP	7532.00	189.00	-771.00	40.031105	-104.902300	Point



*Footages are calculated from SHL and assume section lines parallel N/S and E/W.

WELL DETAILS: Howard 4N-21HZ

Ground Level: 5025.00 RKB=17 @ 5042.00ft (Drilling Rig)

Plan: Plan A Rev 0 Permit (Howard 4N-21HZ/Plan A Rev 0)

Created By: Fred Hartmann Date: 12/28/2012
Reviewed: _____ Date: _____

Plan Report for Howard 4N-21HZ - Plan A Rev 0 Permit

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)	Toolface Azimuth (°)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Begin Nudge @ 1100.00ft										
1,200.00	2.00	240.39	1,199.98	-0.86	-1.52	-0.60	2.00	2.00	0.00	240.39
1,300.00	4.00	240.39	1,299.84	-3.45	-6.07	-2.38	2.00	2.00	0.00	0.00
1,400.00	6.00	240.39	1,399.45	-7.76	-13.64	-5.36	2.00	2.00	0.00	0.00
1,500.00	8.00	240.39	1,498.70	-13.78	-24.24	-9.53	2.00	2.00	0.00	0.00
1,506.86	8.14	240.39	1,505.49	-14.25	-25.07	-9.86	2.00	2.00	0.00	0.00
End Nudge @ 1506.86ft										
1,600.00	8.14	240.39	1,597.70	-20.77	-36.54	-14.36	0.00	0.00	0.00	0.00
1,700.00	8.14	240.39	1,696.69	-27.76	-48.84	-19.20	0.00	0.00	0.00	0.00
1,800.00	8.14	240.39	1,795.68	-34.76	-61.15	-24.04	0.00	0.00	0.00	0.00
1,900.00	8.14	240.39	1,894.68	-41.75	-73.45	-28.88	0.00	0.00	0.00	0.00
2,000.00	8.14	240.39	1,993.67	-48.75	-85.76	-33.71	0.00	0.00	0.00	0.00
2,100.00	8.14	240.39	2,092.66	-55.74	-98.06	-38.55	0.00	0.00	0.00	0.00
2,200.00	8.14	240.39	2,191.66	-62.74	-110.37	-43.39	0.00	0.00	0.00	0.00
2,300.00	8.14	240.39	2,290.65	-69.73	-122.67	-48.22	0.00	0.00	0.00	0.00
2,400.00	8.14	240.39	2,389.64	-76.72	-134.98	-53.06	0.00	0.00	0.00	0.00
2,500.00	8.14	240.39	2,488.63	-83.72	-147.28	-57.90	0.00	0.00	0.00	0.00
2,600.00	8.14	240.39	2,587.63	-90.71	-159.59	-62.74	0.00	0.00	0.00	0.00
2,700.00	8.14	240.39	2,686.62	-97.71	-171.90	-67.57	0.00	0.00	0.00	0.00
2,800.00	8.14	240.39	2,785.61	-104.70	-184.20	-72.41	0.00	0.00	0.00	0.00
2,900.00	8.14	240.39	2,884.61	-111.70	-196.51	-77.25	0.00	0.00	0.00	0.00
3,000.00	8.14	240.39	2,983.60	-118.69	-208.81	-82.09	0.00	0.00	0.00	0.00
3,100.00	8.14	240.39	3,082.59	-125.69	-221.12	-86.92	0.00	0.00	0.00	0.00
3,200.00	8.14	240.39	3,181.59	-132.68	-233.42	-91.76	0.00	0.00	0.00	0.00
3,300.00	8.14	240.39	3,280.58	-139.68	-245.73	-96.60	0.00	0.00	0.00	0.00
3,400.00	8.14	240.39	3,379.57	-146.67	-258.03	-101.44	0.00	0.00	0.00	0.00
3,500.00	8.14	240.39	3,478.57	-153.67	-270.34	-106.27	0.00	0.00	0.00	0.00
3,600.00	8.14	240.39	3,577.56	-160.66	-282.64	-111.11	0.00	0.00	0.00	0.00
3,700.00	8.14	240.39	3,676.55	-167.65	-294.95	-115.95	0.00	0.00	0.00	0.00
3,800.00	8.14	240.39	3,775.55	-174.65	-307.25	-120.79	0.00	0.00	0.00	0.00
3,900.00	8.14	240.39	3,874.54	-181.64	-319.56	-125.62	0.00	0.00	0.00	0.00
4,000.00	8.14	240.39	3,973.53	-188.64	-331.87	-130.46	0.00	0.00	0.00	0.00
4,100.00	8.14	240.39	4,072.53	-195.63	-344.17	-135.30	0.00	0.00	0.00	0.00
4,200.00	8.14	240.39	4,171.52	-202.63	-356.48	-140.14	0.00	0.00	0.00	0.00
4,300.00	8.14	240.39	4,270.51	-209.62	-368.78	-144.97	0.00	0.00	0.00	0.00
4,400.00	8.14	240.39	4,369.51	-216.62	-381.09	-149.81	0.00	0.00	0.00	0.00
4,500.00	8.14	240.39	4,468.50	-223.61	-393.39	-154.65	0.00	0.00	0.00	0.00
4,600.00	8.14	240.39	4,567.49	-230.61	-405.70	-159.48	0.00	0.00	0.00	0.00
4,700.00	8.14	240.39	4,666.49	-237.60	-418.00	-164.32	0.00	0.00	0.00	0.00
4,776.28	8.14	240.39	4,742.00	-242.94	-427.39	-168.01	0.00	0.00	0.00	0.00
Sussex										
4,800.00	8.14	240.39	4,765.48	-244.60	-430.31	-169.16	0.00	0.00	0.00	0.00
4,900.00	8.14	240.39	4,864.47	-251.59	-442.61	-174.00	0.00	0.00	0.00	0.00
5,000.00	8.14	240.39	4,963.46	-258.58	-454.92	-178.83	0.00	0.00	0.00	0.00
5,100.00	8.14	240.39	5,062.46	-265.58	-467.22	-183.67	0.00	0.00	0.00	0.00
5,200.00	8.14	240.39	5,161.45	-272.57	-479.53	-188.51	0.00	0.00	0.00	0.00

Plan Report for Howard 4N-21HZ - Plan A Rev 0 Permit

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)	Toolface Azimuth (°)
5,300.00	8.14	240.39	5,260.44	-279.57	-491.83	-193.35	0.00	0.00	0.00	0.00
5,400.00	8.14	240.39	5,359.44	-286.56	-504.14	-198.18	0.00	0.00	0.00	0.00
5,500.00	8.14	240.39	5,458.43	-293.56	-516.45	-203.02	0.00	0.00	0.00	0.00
5,600.00	8.14	240.39	5,557.42	-300.55	-528.75	-207.86	0.00	0.00	0.00	0.00
5,700.00	8.14	240.39	5,656.42	-307.55	-541.06	-212.70	0.00	0.00	0.00	0.00
5,800.00	8.14	240.39	5,755.41	-314.54	-553.36	-217.53	0.00	0.00	0.00	0.00
5,900.00	8.14	240.39	5,854.40	-321.54	-565.67	-222.37	0.00	0.00	0.00	0.00
6,000.00	8.14	240.39	5,953.40	-328.53	-577.97	-227.21	0.00	0.00	0.00	0.00
6,100.00	8.14	240.39	6,052.39	-335.53	-590.28	-232.05	0.00	0.00	0.00	0.00
6,200.00	8.14	240.39	6,151.38	-342.52	-602.58	-236.88	0.00	0.00	0.00	0.00
6,300.00	8.14	240.39	6,250.38	-349.52	-614.89	-241.72	0.00	0.00	0.00	0.00
6,400.00	8.14	240.39	6,349.37	-356.51	-627.19	-246.56	0.00	0.00	0.00	0.00
6,500.00	8.14	240.39	6,448.36	-363.50	-639.50	-251.40	0.00	0.00	0.00	0.00
6,600.00	8.14	240.39	6,547.36	-370.50	-651.80	-256.23	0.00	0.00	0.00	0.00
6,700.00	8.14	240.39	6,646.35	-377.49	-664.11	-261.07	0.00	0.00	0.00	0.00
6,800.00	8.14	240.39	6,745.34	-384.49	-676.42	-265.91	0.00	0.00	0.00	0.00
6,900.00	8.14	240.39	6,844.34	-391.48	-688.72	-270.75	0.00	0.00	0.00	0.00
6,979.91	8.14	240.39	6,923.44	-397.07	-698.55	-274.61	0.00	0.00	0.00	0.00
KOP @ 6979.91ft										
7,000.00	7.35	254.16	6,943.35	-398.13	-701.03	-275.24	10.00	-3.91	68.56	119.66
7,100.00	10.63	318.96	7,042.33	-392.90	-713.27	-268.04	10.00	3.28	64.80	106.01
7,200.00	19.26	339.51	7,138.92	-370.44	-725.13	-243.91	10.00	8.63	20.55	41.82
7,300.00	28.77	347.25	7,230.18	-331.42	-736.24	-203.58	10.00	9.51	7.73	21.90
7,400.00	38.52	351.33	7,313.34	-277.03	-746.27	-148.27	10.00	9.75	4.09	14.81
Build Rate = 10.00/100ft										
7,456.81	44.10	352.94	7,356.00	-239.89	-751.37	-110.81	10.00	9.82	2.83	11.39
Sharon Springs										
7,482.43	46.62	353.57	7,374.00	-221.79	-753.51	-92.61	10.00	9.85	2.43	10.18
Niobrara A										
7,500.00	48.35	353.96	7,385.87	-208.92	-754.91	-79.68	10.00	9.86	2.26	9.74
7,600.00	58.23	355.89	7,445.57	-129.16	-761.91	0.13	10.00	9.88	1.93	9.47
7,700.00	68.14	357.44	7,490.63	-40.17	-767.04	88.72	10.00	9.90	1.55	8.32
7,779.20	75.99	358.52	7,515.00	35.07	-769.68	163.34	10.00	9.92	1.36	7.62
Niobrara B										
7,800.00	78.06	358.79	7,519.67	55.33	-770.15	183.40	10.00	9.92	1.30	7.28
7,900.00	87.98	0.04	7,531.81	154.46	-771.15	281.30	10.00	9.92	1.25	7.22
7,934.54	91.41	0.47	7,532.00	189.00	-771.00	315.32	10.00	9.92	1.23	7.07
End Build @ 7934.54ft - Niobrara B TL - Heel - 7" Intermediate Casing - Howard 4N-21HZ_CP										
8,000.00	91.41	0.47	7,530.39	254.43	-770.47	379.74	0.00	0.00	0.00	7.07
8,100.00	91.41	0.47	7,527.94	354.40	-769.66	478.17	0.00	0.00	0.00	0.00
8,200.00	91.41	0.47	7,525.49	454.37	-768.84	576.59	0.00	0.00	0.00	0.00
8,300.00	91.41	0.47	7,523.03	554.33	-768.03	675.01	0.00	0.00	0.00	0.00
8,400.00	91.41	0.47	7,520.58	654.30	-767.22	773.43	0.00	0.00	0.00	0.00
8,500.00	91.41	0.47	7,518.13	754.27	-766.40	871.85	0.00	0.00	0.00	0.00
8,600.00	91.41	0.47	7,515.67	854.23	-765.59	970.27	0.00	0.00	0.00	0.00
8,700.00	91.41	0.47	7,513.22	954.20	-764.78	1,068.70	0.00	0.00	0.00	0.00
8,800.00	91.41	0.47	7,510.76	1,054.17	-763.97	1,167.12	0.00	0.00	0.00	0.00
8,900.00	91.41	0.47	7,508.31	1,154.13	-763.15	1,265.54	0.00	0.00	0.00	0.00
9,000.00	91.41	0.47	7,505.86	1,254.10	-762.34	1,363.96	0.00	0.00	0.00	0.00
9,100.00	91.41	0.47	7,503.40	1,354.07	-761.53	1,462.38	0.00	0.00	0.00	0.00
9,200.00	91.41	0.47	7,500.95	1,454.03	-760.71	1,560.80	0.00	0.00	0.00	0.00
9,300.00	91.41	0.47	7,498.50	1,554.00	-759.90	1,659.23	0.00	0.00	0.00	0.00
9,400.00	91.41	0.47	7,496.04	1,653.97	-759.09	1,757.65	0.00	0.00	0.00	0.00
9,500.00	91.41	0.47	7,493.59	1,753.93	-758.28	1,856.07	0.00	0.00	0.00	0.00
9,600.00	91.41	0.47	7,491.13	1,853.90	-757.46	1,954.49	0.00	0.00	0.00	0.00
9,700.00	91.41	0.47	7,488.68	1,953.87	-756.65	2,052.91	0.00	0.00	0.00	0.00
9,800.00	91.41	0.47	7,486.23	2,053.83	-755.84	2,151.34	0.00	0.00	0.00	0.00
9,900.00	91.41	0.47	7,483.77	2,153.80	-755.02	2,249.76	0.00	0.00	0.00	0.00
10,000.00	91.41	0.47	7,481.32	2,253.77	-754.21	2,348.18	0.00	0.00	0.00	0.00

Plan Report for Howard 4N-21HZ - Plan A Rev 0 Permit

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)	Toolface Azimuth (°)
10,100.00	91.41	0.47	7,478.87	2,353.73	-753.40	2,446.60	0.00	0.00	0.00	0.00
10,200.00	91.41	0.47	7,476.41	2,453.70	-752.59	2,545.02	0.00	0.00	0.00	0.00
10,300.00	91.41	0.47	7,473.96	2,553.66	-751.77	2,643.44	0.00	0.00	0.00	0.00
10,400.00	91.41	0.47	7,471.50	2,653.63	-750.96	2,741.87	0.00	0.00	0.00	0.00
10,500.00	91.41	0.47	7,469.05	2,753.60	-750.15	2,840.29	0.00	0.00	0.00	0.00
10,600.00	91.41	0.47	7,466.60	2,853.56	-749.33	2,938.71	0.00	0.00	0.00	0.00
10,700.00	91.41	0.47	7,464.14	2,953.53	-748.52	3,037.13	0.00	0.00	0.00	0.00
10,800.00	91.41	0.47	7,461.69	3,053.50	-747.71	3,135.55	0.00	0.00	0.00	0.00
10,900.00	91.41	0.47	7,459.24	3,153.46	-746.90	3,233.97	0.00	0.00	0.00	0.00
11,000.00	91.41	0.47	7,456.78	3,253.43	-746.08	3,332.40	0.00	0.00	0.00	0.00
11,100.00	91.41	0.47	7,454.33	3,353.40	-745.27	3,430.82	0.00	0.00	0.00	0.00
11,200.00	91.41	0.47	7,451.87	3,453.36	-744.46	3,529.24	0.00	0.00	0.00	0.00
11,300.00	91.41	0.47	7,449.42	3,553.33	-743.64	3,627.66	0.00	0.00	0.00	0.00
11,400.00	91.41	0.47	7,446.97	3,653.30	-742.83	3,726.08	0.00	0.00	0.00	0.00
11,500.00	91.41	0.47	7,444.51	3,753.26	-742.02	3,824.50	0.00	0.00	0.00	0.00
11,600.00	91.41	0.47	7,442.06	3,853.23	-741.21	3,922.93	0.00	0.00	0.00	0.00
11,700.00	91.41	0.47	7,439.61	3,953.20	-740.39	4,021.35	0.00	0.00	0.00	0.00
11,800.00	91.41	0.47	7,437.15	4,053.16	-739.58	4,119.77	0.00	0.00	0.00	0.00
11,900.00	91.41	0.47	7,434.70	4,153.13	-738.77	4,218.19	0.00	0.00	0.00	0.00
12,000.00	91.41	0.47	7,432.24	4,253.10	-737.95	4,316.61	0.00	0.00	0.00	0.00
12,091.44	91.41	0.47	7,430.00	4,344.51	-737.21	4,406.61	0.00	0.00	0.00	0.00
Niobrara B TL - Toe										
12,091.45	91.41	0.47	7,430.00	4,344.52	-737.21	4,406.62	0.00	0.00	0.00	0.00
Total Depth @ 12091.45ft - Howard 4N-21HZ_BHL										

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
1,100.00	1,100.00	0.00	0.00	Begin Nudge @ 1100.00ft
1,506.86	1,505.49	-14.25	-25.07	End Nudge @ 1506.86ft
6,979.91	6,923.44	-397.07	-698.55	KOP @ 6979.91ft
7,400.00	7,313.34	-277.03	-746.27	Build Rate = 10.00/100ft
7,934.54	7,532.00	189.00	-771.00	End Build @ 7934.54ft
12,091.45	7,430.00	4,344.52	-737.21	Total Depth @ 12091.45ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	Howard 4N-21HZ_BHL	350.37	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
0.00	7,934.54	Plan A Rev 0 Permit	MWD
7,934.54	12,091.45	Plan A Rev 0 Permit	MWD

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,934.54	7,532.00	7" Intermediate Casing	7	8-3/4

Plan Report for Howard 4N-21HZ - Plan A Rev 0 Permit**Formation Details**

Measured Depth (ft)	Vertical Depth (ft)	Name	Lithology	Dip (°)	Dip Direction (°)
4,776.28	4,742.00	Sussex		0.00	
7,456.81	7,356.00	Sharon Springs		0.00	
7,482.43	7,374.00	Niobrara A		0.00	
7,779.20	7,515.00	Niobrara B		0.00	
7,934.54	7,532.00	Niobrara B TL - Heel		0.00	
12,091.44	7,430.00	Niobrara B TL - Toe		0.00	

Targets associated with this wellbore

Target Name	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Shape
Howard 4N-21HZ_CP	7,532.00	189.00	-771.00	Point
Howard 4N-21HZ_BHL	7,430.00	4,344.52	-737.21	Point
Howard 4N-21HZ_SHL	0.00	0.00	0.00	Point

North Reference Sheet for Sec. 21-T1N-R67W - Howard 4N-21HZ - Plan A Rev 0

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.
 Vertical Depths are relative to RKB=17 @ 5042.00ft (Drilling Rig). Northing and Easting are relative to Howard 4N-21HZ
 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 -105.50°, Longitude Origin:0.000000°, Latitude Origin:40.783333°
 False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99996419
 Grid Coordinates of Well: 1,254,557.81 ft N, 3,168,142.33 ft E
 Geographical Coordinates of Well: 40° 01' 50.11" N, 104° 53' 58.37" W
 Grid Convergence at Surface is: 0.39°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,091.45ft
 the Bottom Hole Displacement is 4,406.62ft in the Direction of 350.37° (True).
 Magnetic Convergence at surface is: -8.36° (27 December 2012, , BGGM2012)

