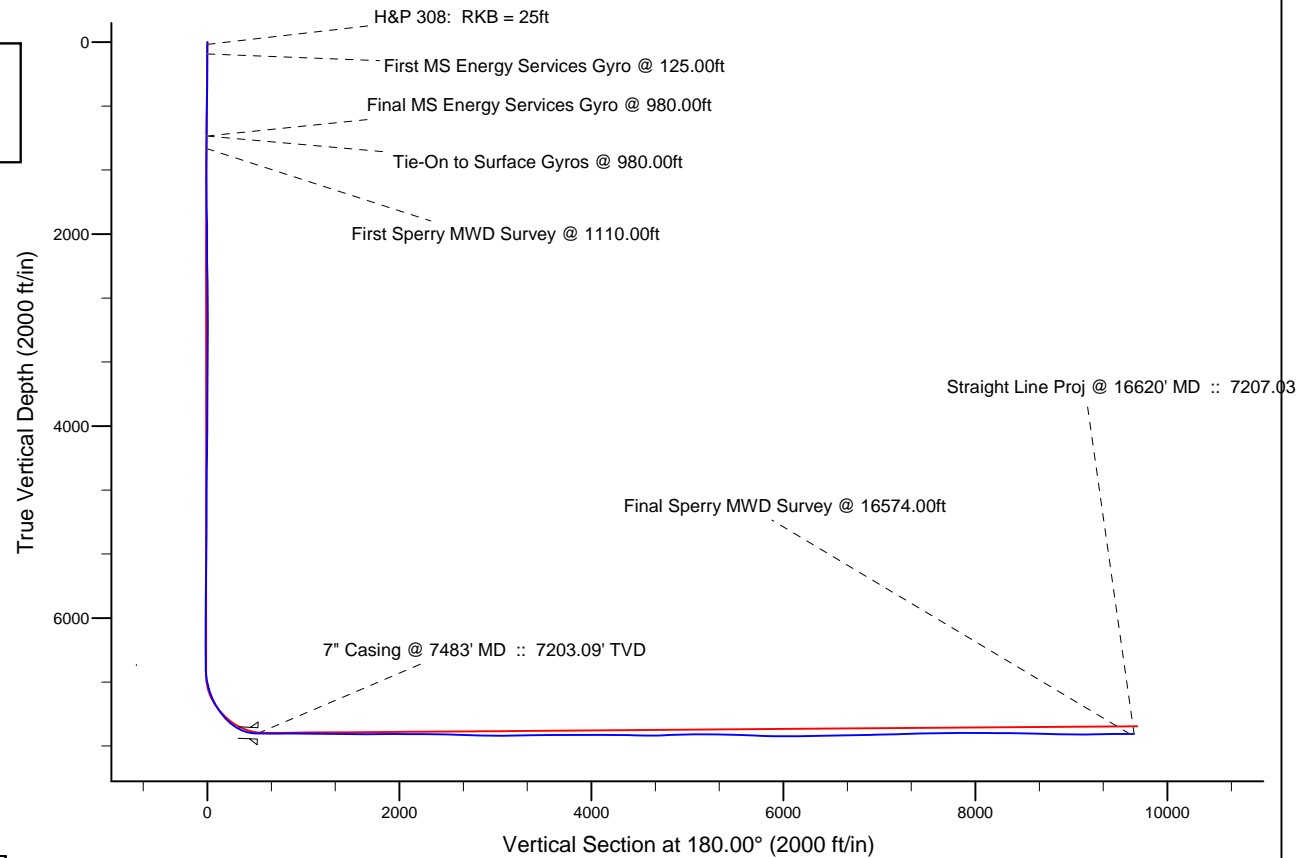
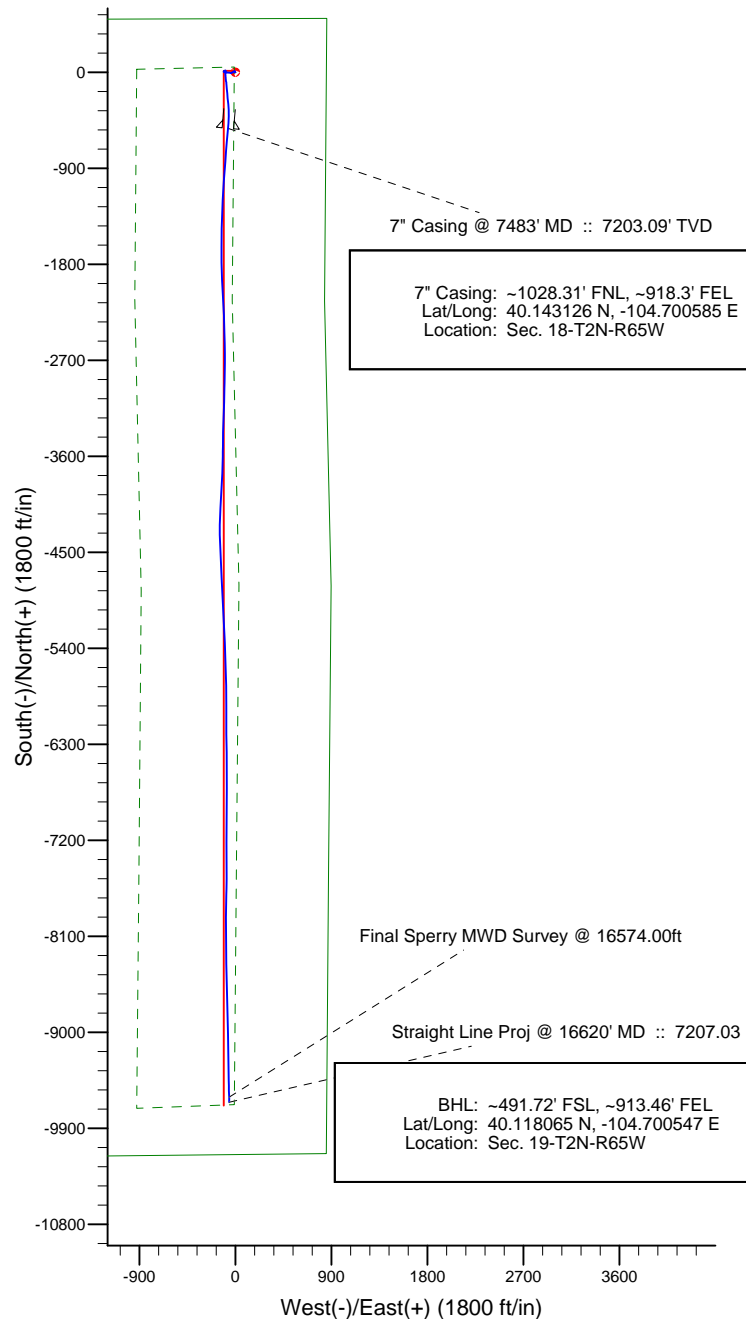


Project: Weld County, CO (NAD 83)
 Site: Sec. 18-T2N-R65W
 Well: Crowder 16N-19HZ
 Wellbore: Plan B Rev 0
 Design: Actual Field Surveys



LEGEND

--- Crowder 16N-19HZ, Plan B Rev 0, Plan B Rev 0 Proposal V0

--- Actual Field Surveys

WELL DETAILS: Crowder 16N-19HZ	
Ground Level:	4953.00
RKB=25ft @ 4978.00ft (HP 308)	
Design: Actual Field Surveys (Crowder 16N-19HZ/Plan B Rev 0)	
Created By: Fred Hartmann	Date: 04/08/2013
Reviewed: _____	Date: _____

Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 18-T2N-R65W

Crowder 16N-19HZ

Plan B Rev 0

Design: Actual Field Surveys

Sperry Drilling Services Standard Report

08 April, 2013

Well Coordinates: 1,296,517.22 N, 3,223,550.81 E (40° 08' 40.44" N, 104° 42' 01.21" W)

Ground Level: 4,953.00 ft

Local Coordinate Origin:

Centered on Well Crowder 16N-19HZ

Viewing Datum:

RKB=25ft @ 4978.00ft (HP 308)

TVDs to System:

N

North Reference:

True

Unit System:

API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 2003.16 Build: 43I

HALLIBURTON

Design Report for Crowder 16N-19HZ - Actual Field Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00
H&P 308: RKB = 25ft							
125.00	0.68	271.45	125.00	0.02	-0.59	-0.02	0.68
First MS Energy Services Gyro @ 125.00ft							
225.00	0.72	290.62	224.99	0.25	-1.77	-0.25	0.24
325.00	1.17	282.57	324.98	0.69	-3.36	-0.69	0.47
425.00	1.38	303.75	424.95	1.59	-5.36	-1.59	0.51
525.00	0.72	315.03	524.94	2.70	-6.80	-2.70	0.69
625.00	0.50	300.96	624.93	3.37	-7.62	-3.37	0.26
725.00	0.70	344.27	724.92	4.18	-8.16	-4.18	0.48
825.00	0.99	7.92	824.91	5.62	-8.21	-5.62	0.45
925.00	0.67	33.20	924.90	6.97	-7.77	-6.97	0.48
980.00	1.05	18.63	979.90	7.72	-7.43	-7.72	0.79
Final MS Energy Services Gyro @ 980.00ft - Tie-On to Surface Gyros @ 980.00ft							
1,110.00	0.74	32.88	1,109.88	9.55	-6.59	-9.55	0.29
First Sperry MWD Survey @ 1110.00ft							
1,202.00	1.49	306.99	1,201.87	10.77	-7.23	-10.77	1.76
1,294.00	1.65	269.60	1,293.84	11.48	-9.51	-11.48	1.11
1,386.00	1.59	229.92	1,385.80	10.65	-11.81	-10.65	1.20
1,539.00	1.27	228.79	1,538.75	8.16	-14.71	-8.16	0.21
1,723.00	1.35	238.20	1,722.71	5.68	-18.08	-5.68	0.12
1,907.00	1.36	254.49	1,906.66	3.95	-22.03	-3.95	0.21
2,096.00	0.73	262.83	2,095.62	3.20	-25.39	-3.20	0.34
2,285.00	0.83	229.04	2,284.61	2.15	-27.61	-2.15	0.25
2,474.00	1.57	217.40	2,473.56	-0.80	-30.22	0.80	0.41
2,664.00	1.63	249.30	2,663.49	-3.82	-34.33	3.82	0.46
2,758.00	2.05	234.59	2,757.45	-5.27	-36.95	5.27	0.67
2,853.00	2.78	259.62	2,852.36	-6.67	-40.60	6.67	1.33
2,948.00	3.24	283.43	2,947.24	-6.46	-45.48	6.46	1.39
3,042.00	3.34	280.41	3,041.08	-5.35	-50.76	5.35	0.21
3,232.00	2.86	279.84	3,230.80	-3.54	-60.87	3.54	0.25
3,421.00	2.64	278.67	3,419.58	-2.08	-69.82	2.08	0.12
3,611.00	2.83	279.59	3,609.37	-0.64	-78.77	0.64	0.10
3,800.00	2.44	259.45	3,798.17	-0.59	-87.33	0.59	0.53
3,895.00	2.36	264.58	3,893.09	-1.15	-91.26	1.15	0.24
3,989.00	2.20	317.80	3,987.02	0.00	-94.40	0.00	2.18
4,084.00	1.18	294.68	4,081.98	1.76	-96.51	-1.76	1.27
4,178.00	1.24	282.08	4,175.96	2.38	-98.39	-2.38	0.29
4,273.00	1.27	288.41	4,270.94	2.93	-100.39	-2.93	0.15
4,462.00	1.25	292.35	4,459.89	4.37	-104.29	-4.37	0.05
4,651.00	1.32	316.34	4,648.85	6.73	-107.69	-6.73	0.28
4,746.00	0.80	307.56	4,743.83	7.93	-108.98	-7.93	0.57
4,841.00	0.59	133.17	4,838.83	8.00	-109.15	-8.00	1.46
5,030.00	0.68	80.11	5,027.82	7.52	-107.33	-7.52	0.30
5,219.00	1.38	38.48	5,216.79	9.50	-104.81	-9.50	0.52
5,408.00	1.03	44.76	5,405.75	12.49	-102.20	-12.49	0.20
5,597.00	1.03	65.37	5,594.72	14.40	-99.46	-14.40	0.19
5,786.00	0.25	92.94	5,783.70	15.09	-97.50	-15.09	0.43
5,975.00	0.66	67.03	5,972.70	15.49	-96.09	-15.49	0.24

Design Report for Crowder 16N-19HZ - Actual Field Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
6,070.00	0.51	11.54	6,067.69	16.12	-95.50	-16.12	0.59
6,165.00	0.17	83.92	6,162.69	16.55	-95.27	-16.55	0.51
6,354.00	0.35	85.83	6,351.69	16.62	-94.42	-16.62	0.10
6,492.00	0.31	160.40	6,489.69	16.30	-93.87	-16.30	0.29
6,543.00	1.32	170.84	6,540.68	15.59	-93.73	-15.59	1.99
6,575.00	4.56	180.35	6,572.64	13.95	-93.68	-13.95	10.20
6,606.00	6.87	183.14	6,603.48	10.87	-93.79	-10.87	7.50
6,638.00	9.20	183.66	6,635.16	6.40	-94.06	-6.40	7.28
6,669.00	11.51	187.27	6,665.66	0.86	-94.61	-0.86	7.74
6,701.00	13.38	181.26	6,696.90	-6.01	-95.10	6.01	7.10
6,732.00	15.21	179.74	6,726.94	-13.66	-95.16	13.66	6.03
6,764.00	17.24	178.68	6,757.67	-22.60	-95.03	22.60	6.41
6,795.00	19.59	173.57	6,787.08	-32.36	-94.34	32.36	9.19
6,827.00	22.54	174.74	6,816.94	-43.80	-93.18	43.80	9.31
6,858.00	25.23	173.51	6,845.28	-56.28	-91.88	56.28	8.82
6,890.00	27.39	172.61	6,873.96	-70.36	-90.17	70.36	6.86
6,921.00	29.61	172.81	6,901.21	-85.03	-88.29	85.03	7.17
6,953.00	31.29	174.34	6,928.79	-101.15	-86.48	101.15	5.78
6,984.00	33.79	173.92	6,954.92	-117.73	-84.77	117.73	8.10
7,016.00	35.75	173.94	6,981.21	-135.88	-82.84	135.88	6.13
7,047.00	38.22	174.99	7,005.97	-154.44	-81.05	154.44	8.22
7,079.00	40.82	175.82	7,030.65	-174.73	-79.42	174.73	8.29
7,111.00	43.85	174.69	7,054.30	-196.21	-77.64	196.21	9.76
7,142.00	47.34	174.69	7,075.99	-218.26	-75.59	218.26	11.26
7,174.00	50.23	174.48	7,097.08	-242.22	-73.31	242.22	9.04
7,205.00	53.39	174.38	7,116.24	-266.46	-70.95	266.46	10.20
7,237.00	56.63	174.54	7,134.59	-292.56	-68.42	292.56	10.13
7,268.00	60.91	175.06	7,150.66	-318.95	-66.02	318.95	13.88
7,300.00	65.43	177.06	7,165.10	-347.43	-64.07	347.43	15.19
7,331.00	70.36	179.29	7,176.76	-376.12	-63.16	376.12	17.24
7,363.00	75.12	180.50	7,186.25	-406.67	-63.11	406.67	15.31
7,396.00	78.21	182.08	7,193.86	-438.77	-63.84	438.77	10.46
7,438.00	84.77	184.28	7,200.07	-480.22	-66.15	480.22	16.45
7,483.00	87.54	184.93	7,203.09	-524.97	-69.75	524.97	6.31
7" Casing @ 7483' MD :: 7203.09' TVD							
7,513.00	89.38	185.36	7,203.90	-554.83	-72.44	554.83	6.31
7,608.00	89.94	184.75	7,204.46	-649.46	-80.81	649.46	0.87
7,702.00	90.43	184.25	7,204.16	-743.17	-88.19	743.17	0.74
7,797.00	90.00	184.21	7,203.80	-837.91	-95.19	837.91	0.45
7,891.00	89.94	184.57	7,203.85	-931.63	-102.39	931.63	0.39
7,986.00	89.01	183.87	7,204.72	-1,026.37	-109.38	1,026.37	1.23
8,080.00	89.44	183.62	7,206.00	-1,120.16	-115.52	1,120.16	0.53
8,175.00	90.06	183.16	7,206.41	-1,214.99	-121.13	1,214.99	0.81
8,269.00	89.07	181.67	7,207.12	-1,308.90	-125.10	1,308.90	1.90
8,364.00	88.76	180.95	7,208.92	-1,403.86	-127.27	1,403.86	0.83
8,458.00	90.00	181.66	7,209.94	-1,497.83	-129.41	1,497.83	1.52
8,553.00	90.43	181.00	7,209.58	-1,592.80	-131.61	1,592.80	0.83
8,648.00	89.81	179.73	7,209.38	-1,687.80	-132.22	1,687.80	1.49
8,743.00	90.37	178.89	7,209.24	-1,782.79	-131.07	1,782.79	1.06
8,837.00	90.99	178.47	7,208.12	-1,876.76	-128.91	1,876.76	0.80
8,932.00	89.81	176.84	7,207.46	-1,971.67	-125.02	1,971.67	2.12

Design Report for Crowder 16N-19HZ - Actual Field Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
9,027.00	89.26	176.39	7,208.23	-2,066.50	-119.41	2,066.50	0.75
9,121.00	89.26	177.13	7,209.44	-2,160.34	-114.10	2,160.34	0.79
9,216.00	90.12	178.57	7,209.96	-2,255.27	-110.54	2,255.27	1.77
9,311.00	90.43	178.09	7,209.50	-2,350.23	-107.77	2,350.23	0.60
9,405.00	88.08	177.60	7,210.72	-2,444.15	-104.23	2,444.15	2.55
9,500.00	87.47	179.11	7,214.41	-2,539.03	-101.51	2,539.03	1.71
9,595.00	87.53	178.91	7,218.55	-2,633.93	-99.87	2,633.93	0.22
9,689.00	88.02	180.28	7,222.20	-2,727.85	-99.21	2,727.85	1.55
9,781.00	88.89	181.25	7,224.68	-2,819.81	-100.43	2,819.81	1.42
9,873.00	90.12	181.88	7,225.48	-2,911.77	-102.95	2,911.77	1.50
9,965.00	89.75	180.55	7,225.58	-3,003.75	-104.90	3,003.75	1.50
10,057.00	89.94	181.48	7,225.83	-3,095.73	-106.53	3,095.73	1.03
10,150.00	91.30	182.66	7,224.83	-3,188.66	-109.89	3,188.66	1.94
10,241.00	91.05	181.43	7,222.96	-3,279.58	-113.13	3,279.58	1.38
10,332.00	91.55	180.73	7,220.90	-3,370.54	-114.85	3,370.54	0.95
10,424.00	90.31	181.70	7,219.40	-3,462.51	-116.80	3,462.51	1.71
10,516.00	90.43	180.20	7,218.81	-3,554.49	-118.32	3,554.49	1.64
10,608.00	90.43	181.42	7,218.12	-3,646.47	-119.62	3,646.47	1.33
10,700.00	90.25	182.62	7,217.57	-3,738.41	-122.87	3,738.41	1.32
10,792.00	90.00	183.57	7,217.37	-3,830.28	-127.83	3,830.28	1.07
10,884.00	89.69	183.00	7,217.62	-3,922.13	-133.10	3,922.13	0.71
10,976.00	89.88	182.31	7,217.96	-4,014.03	-137.37	4,014.03	0.78
11,068.00	90.56	182.88	7,217.61	-4,105.93	-141.53	4,105.93	0.96
11,160.00	89.69	182.27	7,217.41	-4,197.84	-145.66	4,197.84	1.15
11,252.00	89.57	181.11	7,218.01	-4,289.79	-148.38	4,289.79	1.27
11,344.00	88.52	177.27	7,219.54	-4,381.75	-147.08	4,381.75	4.33
11,436.00	88.08	176.53	7,222.27	-4,473.58	-142.11	4,473.58	0.94
11,528.00	89.01	177.44	7,224.60	-4,565.42	-137.27	4,565.42	1.41
11,620.00	90.62	178.16	7,224.90	-4,657.35	-133.74	4,657.35	1.92
11,712.00	91.79	176.98	7,222.97	-4,749.24	-129.84	4,749.24	1.81
11,804.00	92.60	176.82	7,219.44	-4,841.04	-124.87	4,841.04	0.90
11,896.00	92.22	176.80	7,215.57	-4,932.81	-119.75	4,932.81	0.41
11,988.00	91.73	176.93	7,212.40	-5,024.62	-114.72	5,024.62	0.55
12,080.00	90.31	178.29	7,210.77	-5,116.52	-110.89	5,116.52	2.14
12,172.00	88.83	177.74	7,211.46	-5,208.46	-107.70	5,208.46	1.72
12,264.00	89.07	177.39	7,213.14	-5,300.36	-103.79	5,300.36	0.46
12,356.00	89.14	176.80	7,214.58	-5,392.23	-99.13	5,392.23	0.65
12,448.00	88.70	177.80	7,216.31	-5,484.11	-94.80	5,484.11	1.19
12,540.00	88.27	177.90	7,218.75	-5,576.01	-91.35	5,576.01	0.48
12,632.00	86.48	178.64	7,222.96	-5,667.87	-88.57	5,667.87	2.11
12,727.00	87.53	179.24	7,227.92	-5,762.72	-86.82	5,762.72	1.27
12,821.00	89.20	179.63	7,230.60	-5,856.68	-85.89	5,856.68	1.82
12,916.00	89.81	180.43	7,231.43	-5,951.67	-85.94	5,951.67	1.06
13,011.00	90.25	179.85	7,231.38	-6,046.67	-86.17	6,046.67	0.77
13,108.00	89.88	180.38	7,231.27	-6,143.67	-86.37	6,143.67	0.67
13,202.00	91.17	178.78	7,230.40	-6,237.66	-85.68	6,237.66	2.19
13,297.00	90.93	178.12	7,228.66	-6,332.61	-83.11	6,332.61	0.74
13,392.00	91.73	178.90	7,226.46	-6,427.55	-80.64	6,427.55	1.18
13,486.00	91.30	180.34	7,223.97	-6,521.51	-80.02	6,521.51	1.60
13,581.00	90.74	180.35	7,222.28	-6,616.49	-80.59	6,616.49	0.59
13,675.00	90.43	179.77	7,221.32	-6,710.49	-80.69	6,710.49	0.70

Design Report for Crowder 16N-19HZ - Actual Field Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
13,770.00	91.17	180.98	7,220.00	-6,805.48	-81.31	6,805.48	1.49
13,864.00	91.30	181.79	7,217.97	-6,899.43	-83.58	6,899.43	0.87
13,959.00	91.11	179.60	7,215.97	-6,994.39	-84.73	6,994.39	2.31
14,053.00	91.61	180.37	7,213.74	-7,088.36	-84.71	7,088.36	0.98
14,148.00	91.67	179.95	7,211.02	-7,183.32	-84.97	7,183.32	0.45
14,243.00	91.42	178.53	7,208.46	-7,278.28	-83.71	7,278.28	1.52
14,337.00	92.78	179.42	7,205.02	-7,372.20	-82.03	7,372.20	1.73
14,432.00	90.87	180.84	7,201.99	-7,467.14	-82.25	7,467.14	2.50
14,526.00	91.73	180.67	7,199.86	-7,561.11	-83.49	7,561.11	0.93
14,621.00	90.31	181.62	7,198.17	-7,656.07	-85.38	7,656.07	1.80
14,715.00	89.94	180.45	7,197.96	-7,750.05	-87.08	7,750.05	1.31
14,810.00	90.43	181.17	7,197.65	-7,845.04	-88.43	7,845.04	0.92
14,905.00	89.63	180.06	7,197.61	-7,940.04	-89.45	7,940.04	1.44
14,999.00	90.62	180.42	7,197.40	-8,034.03	-89.84	8,034.03	1.12
15,094.00	89.50	179.11	7,197.30	-8,129.03	-89.45	8,129.03	1.81
15,189.00	89.13	178.41	7,198.44	-8,224.00	-87.39	8,224.00	0.83
15,283.00	89.63	179.46	7,199.45	-8,317.98	-85.65	8,317.98	1.24
15,378.00	89.69	178.87	7,200.02	-8,412.96	-84.26	8,412.96	0.62
15,472.00	89.26	178.74	7,200.88	-8,506.94	-82.30	8,506.94	0.48
15,567.00	88.08	179.14	7,203.08	-8,601.90	-80.55	8,601.90	1.31
15,662.00	88.14	178.76	7,206.22	-8,696.83	-78.81	8,696.83	0.40
15,756.00	88.14	178.41	7,209.27	-8,790.75	-76.49	8,790.75	0.37
15,851.00	89.32	178.56	7,211.37	-8,885.69	-73.97	8,885.69	1.25
15,945.00	89.07	178.38	7,212.69	-8,979.65	-71.46	8,979.65	0.33
16,040.00	89.75	178.83	7,213.67	-9,074.61	-69.15	9,074.61	0.86
16,134.00	90.99	179.83	7,213.07	-9,168.60	-68.05	9,168.60	1.69
16,229.00	91.05	179.22	7,211.37	-9,263.58	-67.27	9,263.58	0.65
16,324.00	91.17	178.76	7,209.53	-9,358.55	-65.59	9,358.55	0.50
16,418.00	90.74	177.87	7,207.97	-9,452.50	-62.83	9,452.50	1.05
16,513.00	90.12	179.46	7,207.25	-9,547.46	-60.61	9,547.46	1.80
16,574.00	90.12	179.07	7,207.13	-9,608.46	-59.83	9,608.46	0.64
Final Sperry MWD Survey @ 16574.00ft							
16,620.00	90.12	179.07	7,207.03	-9,654.45	-59.09	9,654.45	0.00
Straight Line Proj @ 16620' MD :: 7207.03							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
25.00	25.00	0.00	0.00	H&P 308: RKB = 25ft
125.00	125.00	0.02	-0.59	First MS Energy Services Gyro @ 125.00ft
980.00	979.90	7.72	-7.43	Final MS Energy Services Gyro @ 980.00ft
980.00	979.90	7.72	-7.43	Tie-On to Surface Gyros @ 980.00ft
1,110.00	1,109.88	9.55	-6.59	First Sperry MWD Survey @ 1110.00ft
16,574.00	7,207.13	-9,608.46	-59.83	Final Sperry MWD Survey @ 16574.00ft
16,620.00	7,207.03	-9,654.45	-59.09	Straight Line Proj @ 16620' MD :: 7207.03

Design Report for Crowder 16N-19HZ - Actual Field Surveys

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/ S (ft)	+E/-W (ft)	
User	No Target (Freehand)	180.00	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
25.00	980.00	MS Energy Services - Surface Gyros	NS-GYRO-MS
1,110.00	7,438.00	Sperry MWD Surveys - Vert/Build	MWD+IFR1+SC
7,513.00	16,574.00	Sperry MWD Surveys - Lateral	MWD+IFR1+SC

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,483.00	7,203.09	7" Casing @ 7483' MD :: 7203.09' TVD	7	8-3/4

Design Report for Crowder 16N-19HZ - Actual Field Surveys**Targets**

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Crowder 16N-19HZ_ - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,296,517.22	3,223,550.81	40.144567	-104.700336
Point 1			-926.12	29.33		1,296,538.20	3,222,624.50		
Point 2			-944.11	-2,127.68		1,294,381.20	3,222,625.96		
Point 3			-883.37	-4,861.75		1,291,647.91	3,222,711.35		
Point 4			-905.78	-7,459.27		1,289,050.40	3,222,712.36		
Point 5			-925.06	-9,712.80		1,286,796.88	3,222,713.41		
Point 6			-10.66	-9,677.42		1,286,840.50	3,223,627.41		
Point 7			8.22	-7,467.51		1,289,050.40	3,223,626.36		
Point 8			31.20	-4,806.70		1,291,711.20	3,223,625.35		
Point 9			-30.11	-2,135.93		1,294,381.20	3,223,539.96		
Point 10			-11.86	49.22		1,296,566.33	3,223,538.50		
Point 11			-926.12	29.33		1,296,538.20	3,222,624.50		
Crowder 16N-19HZ_ - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,296,517.22	3,223,550.81	40.144567	-104.700336
Point 1			-4,359.82	-4,889.76		1,291,588.55	3,219,235.44		
Point 2			-1,840.21	-4,853.12		1,291,647.91	3,221,754.51		
Point 3			896.20	-4,814.50		1,291,711.20	3,224,490.35		
Crowder 16N-19HZ_ - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	1,296,517.22	3,223,550.81	40.144567	-104.700336
Crowder 16N-19HZ_ - actual wellpath misses target center by 100.53ft at 16620.00ft MD (7207.03 TVD, -9654.45 N, -59.09 E) - Point	0.00	0.00	7,127.00	-9,686.58	-110.75	1,286,830.43	3,223,527.41	40.117977	-104.700732
Crowder 16N-19HZ_ - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,296,517.22	3,223,550.81	40.144567	-104.700336
Point 1			-4,330.07	486.60		1,296,964.74	3,219,216.70		
Point 2			-4,359.75	-2,202.14		1,294,275.95	3,219,211.27		
Point 3			-4,359.82	-4,889.76		1,291,588.55	3,219,235.44		
Point 4			-4,348.33	-7,578.38		1,288,900.25	3,219,271.17		
Point 5			-4,337.15	-10,192.74		1,286,286.21	3,219,305.92		
Point 6			-1,788.24	-10,164.97		1,286,336.96	3,221,854.37		
Point 7			850.27	-10,136.13		1,286,389.59	3,224,492.41		
Point 8			873.22	-7,475.31		1,289,050.40	3,224,491.36		
Point 9			896.20	-4,814.50		1,291,711.20	3,224,490.35		
Point 10			834.89	-2,143.73		1,294,381.20	3,224,404.96		
Point 11			857.34	507.37		1,297,032.28	3,224,403.50		
Point 12			-1,788.58	497.20		1,296,998.25	3,221,757.89		
Point 13			-4,330.07	486.60		1,296,964.74	3,219,216.70		

North Reference Sheet for Sec. 18-T2N-R65W - Crowder 16N-19HZ - Plan B 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=25ft @ 4978.00ft (HP 308). Northing and Easting are relative to Crowder 16N-19HZ

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: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99995855

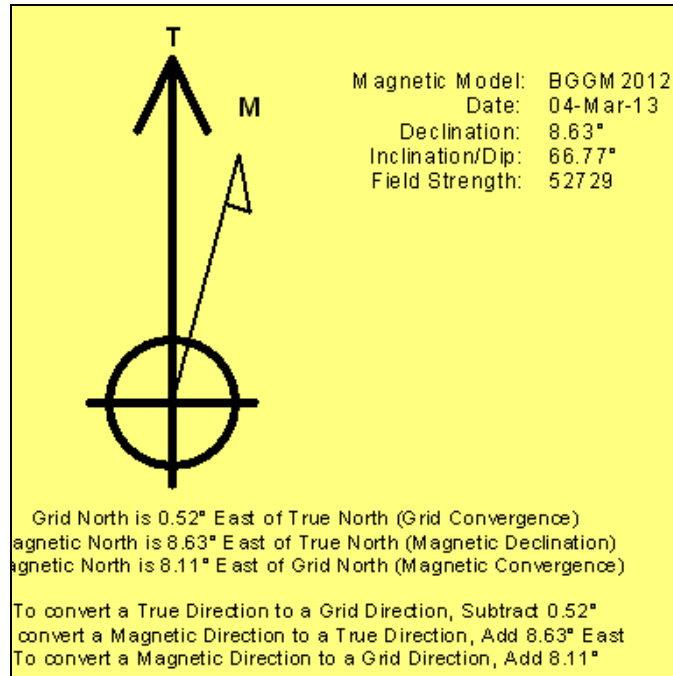
Grid Coordinates of Well: 1,296,517.22 ft N, 3,223,550.81 ft E

Geographical Coordinates of Well: 40° 08' 40.44" N, 104° 42' 01.21" W

Grid Convergence at Surface is: 0.52°

Based upon Minimum Curvature type calculations, at a Measured Depth of 16,620.00ft
the Bottom Hole Displacement is 9,654.63ft in the Direction of 180.35° (True).

Magnetic Convergence at surface is: -8.11° (4 March 2013, , BGGM2012)



Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 18-T2N-R65W

Crowder 16N-19HZ

Plan B Rev 0

Design: Actual Field Surveys

Sperry Drilling Services Geodetic Report

08 April, 2013

Well Coordinates: 1,296,517.22 N, 3,223,550.81 E (40° 08' 40.44" N, 104° 42' 01.21" W)

Ground Level: 4,953.00 ft

Local Coordinate Origin:	Centered on Well Crowder 16N-19HZ
Viewing Datum:	RKB=25ft @ 4978.00ft (HP 308)
TVDs to System:	N
North Reference:	True
Unit System:	API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 2003.16 Build: 431

HALLIBURTON

Design Report for Crowder 16N-19HZ - Actual Field Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (ft)	+E/-W (ft)	Latitude (ft)	Longitude (ft)	Northing (ft)	Easting (ft)
0.00	0.00	0.00	0.00	0.00	0.00	40.144567	-104.700336	1,296,517.22	3,223,550.81
25.00	0.00	0.00	25.00	0.00	0.00	40.144567	-104.700336	1,296,517.22	3,223,550.81
125.00	0.68	271.45	125.00	0.02	-0.59	40.144567	-104.700338	1,296,517.23	3,223,550.21
225.00	0.72	290.62	224.99	0.25	-1.77	40.144568	-104.700342	1,296,517.45	3,223,549.03
325.00	1.17	282.57	324.98	0.69	-3.36	40.144569	-104.700348	1,296,517.88	3,223,547.44
425.00	1.38	303.75	424.95	1.59	-5.36	40.144571	-104.700355	1,296,518.76	3,223,545.43
525.00	0.72	315.03	524.94	2.70	-6.80	40.144574	-104.700360	1,296,519.86	3,223,543.98
625.00	0.50	300.96	624.93	3.37	-7.62	40.144576	-104.700363	1,296,520.52	3,223,543.16
725.00	0.70	344.27	724.92	4.18	-8.16	40.144578	-104.700365	1,296,521.33	3,223,542.61
825.00	0.99	7.92	824.91	5.62	-8.21	40.144582	-104.700365	1,296,522.77	3,223,542.55
925.00	0.67	33.20	924.90	6.97	-7.77	40.144586	-104.700364	1,296,524.12	3,223,542.98
980.00	1.05	18.63	979.90	7.72	-7.43	40.144588	-104.700363	1,296,524.87	3,223,543.31
1,110.00	0.74	32.88	1,109.88	9.55	-6.59	40.144593	-104.700360	1,296,526.71	3,223,544.13
1,202.00	1.49	306.99	1,201.87	10.77	-7.23	40.144597	-104.700362	1,296,527.92	3,223,543.48
1,294.00	1.65	269.60	1,293.84	11.48	-9.51	40.144598	-104.700370	1,296,528.61	3,223,541.20
1,386.00	1.59	229.92	1,385.80	10.65	-11.81	40.144596	-104.700378	1,296,527.76	3,223,538.90
1,539.00	1.27	228.79	1,538.75	8.16	-14.71	40.144589	-104.700389	1,296,525.25	3,223,536.03
1,723.00	1.35	238.20	1,722.71	5.68	-18.08	40.144583	-104.700401	1,296,522.73	3,223,532.67
1,907.00	1.36	254.49	1,906.66	3.95	-22.03	40.144578	-104.700415	1,296,520.97	3,223,528.74
2,096.00	0.73	262.83	2,095.62	3.20	-25.39	40.144576	-104.700427	1,296,520.19	3,223,525.39
2,285.00	0.83	229.04	2,284.61	2.15	-27.61	40.144573	-104.700435	1,296,519.12	3,223,523.17
2,474.00	1.57	217.40	2,473.56	-0.80	-30.22	40.144565	-104.700444	1,296,516.15	3,223,520.59
2,664.00	1.63	249.30	2,663.49	-3.82	-34.33	40.144556	-104.700459	1,296,513.09	3,223,516.51
2,758.00	2.05	234.59	2,757.45	-5.27	-36.95	40.144553	-104.700468	1,296,511.62	3,223,513.91
2,853.00	2.78	259.62	2,852.36	-6.67	-40.60	40.144549	-104.700481	1,296,510.18	3,223,510.27
2,948.00	3.24	283.43	2,947.24	-6.46	-45.48	40.144549	-104.700499	1,296,510.35	3,223,505.39
3,042.00	3.34	280.41	3,041.08	-5.35	-50.76	40.144552	-104.700518	1,296,511.41	3,223,500.10
3,232.00	2.86	279.84	3,230.80	-3.54	-60.87	40.144557	-104.700554	1,296,513.13	3,223,489.97
3,421.00	2.64	278.67	3,419.58	-2.08	-69.82	40.144561	-104.700586	1,296,514.51	3,223,481.01
3,611.00	2.83	279.59	3,609.37	-0.64	-78.77	40.144565	-104.700618	1,296,515.87	3,223,472.05
3,800.00	2.44	259.45	3,798.17	-0.59	-87.33	40.144565	-104.700648	1,296,515.84	3,223,463.49
3,895.00	2.36	264.58	3,893.09	-1.15	-91.26	40.144564	-104.700662	1,296,515.25	3,223,459.56
3,989.00	2.20	317.80	3,987.02	0.00	-94.40	40.144567	-104.700674	1,296,516.37	3,223,456.41
4,084.00	1.18	294.68	4,081.98	1.76	-96.51	40.144572	-104.700681	1,296,518.11	3,223,454.28
4,178.00	1.24	282.08	4,175.96	2.38	-98.39	40.144573	-104.700688	1,296,518.71	3,223,452.40
4,273.00	1.27	288.41	4,270.94	2.93	-100.39	40.144575	-104.700695	1,296,519.24	3,223,450.40
4,462.00	1.25	292.35	4,459.89	4.37	-104.29	40.144579	-104.700709	1,296,520.65	3,223,446.49
4,651.00	1.32	316.34	4,648.85	6.73	-107.69	40.144585	-104.700721	1,296,522.98	3,223,443.06
4,746.00	0.80	307.56	4,743.83	7.93	-108.98	40.144589	-104.700726	1,296,524.16	3,223,441.77
4,841.00	0.59	133.17	4,838.83	8.00	-109.15	40.144589	-104.700726	1,296,524.23	3,223,441.60
5,030.00	0.68	80.11	5,027.82	7.52	-107.33	40.144588	-104.700720	1,296,523.78	3,223,443.42
5,219.00	1.38	38.48	5,216.79	9.50	-104.81	40.144593	-104.700711	1,296,525.77	3,223,445.92

Design Report for Crowder 16N-19HZ - Actual Field Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (ft)	+E/-W (ft)	Latitude (ft)	Longitude (ft)	Northing (ft)	Easting (ft)
5,408.00	1.03	44.76	5,405.75	12.49	-102.20	40.144601	-104.700702	1,296,528.78	3,223,448.50
5,597.00	1.03	65.37	5,594.72	14.40	-99.46	40.144606	-104.700692	1,296,530.72	3,223,451.23
5,786.00	0.25	92.94	5,783.70	15.09	-97.50	40.144608	-104.700685	1,296,531.43	3,223,453.18
5,975.00	0.66	67.03	5,972.70	15.49	-96.09	40.144609	-104.700680	1,296,531.84	3,223,454.59
6,070.00	0.51	11.54	6,067.69	16.12	-95.50	40.144611	-104.700678	1,296,532.48	3,223,455.17
6,165.00	0.17	83.92	6,162.69	16.55	-95.27	40.144612	-104.700677	1,296,532.91	3,223,455.39
6,354.00	0.35	85.83	6,351.69	16.62	-94.42	40.144613	-104.700674	1,296,532.99	3,223,456.24
6,492.00	0.31	160.40	6,489.69	16.30	-93.87	40.144612	-104.700672	1,296,532.67	3,223,456.79
6,543.00	1.32	170.84	6,540.68	15.59	-93.73	40.144610	-104.700671	1,296,531.96	3,223,456.94
6,575.00	4.56	180.35	6,572.64	13.95	-93.68	40.144605	-104.700671	1,296,530.33	3,223,457.00
6,606.00	6.87	183.14	6,603.48	10.87	-93.79	40.144597	-104.700671	1,296,527.24	3,223,456.92
6,638.00	9.20	183.66	6,635.16	6.40	-94.06	40.144585	-104.700672	1,296,522.77	3,223,456.70
6,669.00	11.51	187.27	6,665.66	0.86	-94.61	40.144569	-104.700674	1,296,517.23	3,223,456.20
6,701.00	13.38	181.26	6,696.90	-6.01	-95.10	40.144550	-104.700676	1,296,510.35	3,223,455.77
6,732.00	15.21	179.74	6,726.94	-13.66	-95.16	40.144529	-104.700676	1,296,502.70	3,223,455.78
6,764.00	17.24	178.68	6,757.67	-22.60	-95.03	40.144505	-104.700676	1,296,493.76	3,223,455.99
6,795.00	19.59	173.57	6,787.08	-32.36	-94.34	40.144478	-104.700673	1,296,484.01	3,223,456.77
6,827.00	22.54	174.74	6,816.94	-43.80	-93.18	40.144447	-104.700669	1,296,472.58	3,223,458.03
6,858.00	25.23	173.51	6,845.28	-56.28	-91.88	40.144412	-104.700665	1,296,460.11	3,223,459.44
6,890.00	27.39	172.61	6,873.96	-70.36	-90.17	40.144374	-104.700659	1,296,446.05	3,223,461.28
6,921.00	29.61	172.81	6,901.21	-85.03	-88.29	40.144334	-104.700652	1,296,431.40	3,223,463.29
6,953.00	31.29	174.34	6,928.79	-101.15	-86.48	40.144289	-104.700645	1,296,415.30	3,223,465.24
6,984.00	33.79	173.92	6,954.92	-117.73	-84.77	40.144244	-104.700639	1,296,398.73	3,223,467.10
7,016.00	35.75	173.94	6,981.21	-135.88	-82.84	40.144194	-104.700632	1,296,380.61	3,223,469.19
7,047.00	38.22	174.99	7,005.97	-154.44	-81.05	40.144143	-104.700626	1,296,362.06	3,223,471.15
7,079.00	40.82	175.82	7,030.65	-174.73	-79.42	40.144087	-104.700620	1,296,341.78	3,223,472.96
7,111.00	43.85	174.69	7,054.30	-196.21	-77.64	40.144028	-104.700614	1,296,320.33	3,223,474.95
7,142.00	47.34	174.69	7,075.99	-218.26	-75.59	40.143968	-104.700606	1,296,298.30	3,223,477.19
7,174.00	50.23	174.48	7,097.08	-242.22	-73.31	40.143902	-104.700598	1,296,274.36	3,223,479.68
7,205.00	53.39	174.38	7,116.24	-266.46	-70.95	40.143836	-104.700590	1,296,250.14	3,223,482.27
7,237.00	56.63	174.54	7,134.59	-292.56	-68.42	40.143764	-104.700581	1,296,224.07	3,223,485.03
7,268.00	60.91	175.06	7,150.66	-318.95	-66.02	40.143691	-104.700572	1,296,197.70	3,223,487.67
7,300.00	65.43	177.06	7,165.10	-347.43	-64.07	40.143613	-104.700565	1,296,169.24	3,223,489.88
7,331.00	70.36	179.29	7,176.76	-376.12	-63.16	40.143534	-104.700562	1,296,140.56	3,223,491.04
7,363.00	75.12	180.50	7,186.25	-406.67	-63.11	40.143451	-104.700562	1,296,110.01	3,223,491.37
7,396.00	78.21	182.08	7,193.86	-438.77	-63.84	40.143363	-104.700564	1,296,077.91	3,223,490.93
7,438.00	84.77	184.28	7,200.07	-480.22	-66.15	40.143249	-104.700573	1,296,036.45	3,223,488.99
7,483.00	87.54	184.93	7,203.09	-524.97	-69.75	40.143126	-104.700585	1,295,991.67	3,223,485.79
7,513.00	89.38	185.36	7,203.90	-554.83	-72.44	40.143044	-104.700595	1,295,961.78	3,223,483.37
7,608.00	89.94	184.75	7,204.46	-649.46	-80.81	40.142784	-104.700625	1,295,867.08	3,223,475.86
7,702.00	90.43	184.25	7,204.16	-743.17	-88.19	40.142527	-104.700651	1,295,773.31	3,223,469.33
7,797.00	90.00	184.21	7,203.80	-837.91	-95.19	40.142267	-104.700676	1,295,678.52	3,223,463.18

Design Report for Crowder 16N-19HZ - Actual Field Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (ft)	+E/-W (ft)	Latitude (ft)	Longitude (ft)	Northing (ft)	Easting (ft)
7,891.00	89.94	184.57	7,203.85	-931.63	-102.39	40.142010	-104.700702	1,295,584.74	3,223,456.83
7,986.00	89.01	183.87	7,204.72	-1,026.37	-109.38	40.141750	-104.700727	1,295,489.95	3,223,450.69
8,080.00	89.44	183.62	7,206.00	-1,120.16	-115.52	40.141492	-104.700749	1,295,396.11	3,223,445.40
8,175.00	90.06	183.16	7,206.41	-1,214.99	-121.13	40.141232	-104.700769	1,295,301.23	3,223,440.64
8,269.00	89.07	181.67	7,207.12	-1,308.90	-125.10	40.140974	-104.700783	1,295,207.29	3,223,437.52
8,364.00	88.76	180.95	7,208.92	-1,403.86	-127.27	40.140713	-104.700791	1,295,112.33	3,223,436.21
8,458.00	90.00	181.66	7,209.94	-1,497.83	-129.41	40.140455	-104.700799	1,295,018.35	3,223,434.91
8,553.00	90.43	181.00	7,209.58	-1,592.80	-131.61	40.140195	-104.700807	1,294,923.36	3,223,433.57
8,648.00	89.81	179.73	7,209.38	-1,687.80	-132.22	40.139934	-104.700809	1,294,828.37	3,223,433.82
8,743.00	90.37	178.89	7,209.24	-1,782.79	-131.07	40.139673	-104.700805	1,294,733.39	3,223,435.82
8,837.00	90.99	178.47	7,208.12	-1,876.76	-128.91	40.139415	-104.700797	1,294,639.45	3,223,438.83
8,932.00	89.81	176.84	7,207.46	-1,971.67	-125.02	40.139155	-104.700783	1,294,544.58	3,223,443.57
9,027.00	89.26	176.39	7,208.23	-2,066.50	-119.41	40.138894	-104.700763	1,294,449.81	3,223,450.04
9,121.00	89.26	177.13	7,209.44	-2,160.34	-114.10	40.138637	-104.700744	1,294,356.03	3,223,456.19
9,216.00	90.12	178.57	7,209.96	-2,255.27	-110.54	40.138376	-104.700731	1,294,261.14	3,223,460.61
9,311.00	90.43	178.09	7,209.50	-2,350.23	-107.77	40.138116	-104.700721	1,294,166.21	3,223,464.24
9,405.00	88.08	177.60	7,210.72	-2,444.15	-104.23	40.137858	-104.700709	1,294,072.33	3,223,468.62
9,500.00	87.47	179.11	7,214.41	-2,539.03	-101.51	40.137597	-104.700699	1,293,977.48	3,223,472.20
9,595.00	87.53	178.91	7,218.55	-2,633.93	-99.87	40.137337	-104.700693	1,293,882.61	3,223,474.70
9,689.00	88.02	180.28	7,222.20	-2,727.85	-99.21	40.137079	-104.700691	1,293,788.70	3,223,476.21
9,781.00	88.89	181.25	7,224.68	-2,819.81	-100.43	40.136827	-104.700695	1,293,696.74	3,223,475.81
9,873.00	90.12	181.88	7,225.48	-2,911.77	-102.95	40.136574	-104.700704	1,293,604.76	3,223,474.12
9,965.00	89.75	180.55	7,225.58	-3,003.75	-104.90	40.136322	-104.700711	1,293,512.77	3,223,473.00
10,057.00	89.94	181.48	7,225.83	-3,095.73	-106.53	40.136069	-104.700717	1,293,420.78	3,223,472.20
10,150.00	91.30	182.66	7,224.83	-3,188.66	-109.89	40.135814	-104.700729	1,293,327.83	3,223,469.68
10,241.00	91.05	181.43	7,222.96	-3,279.58	-113.13	40.135564	-104.700741	1,293,236.89	3,223,467.26
10,332.00	91.55	180.73	7,220.90	-3,370.54	-114.85	40.135315	-104.700747	1,293,145.92	3,223,466.36
10,424.00	90.31	181.70	7,219.40	-3,462.51	-116.80	40.135062	-104.700754	1,293,053.94	3,223,465.24
10,516.00	90.43	180.20	7,218.81	-3,554.49	-118.32	40.134810	-104.700759	1,292,961.96	3,223,464.55
10,608.00	90.43	181.42	7,218.12	-3,646.47	-119.62	40.134557	-104.700764	1,292,869.96	3,223,464.07
10,700.00	90.25	182.62	7,217.57	-3,738.41	-122.87	40.134305	-104.700775	1,292,778.00	3,223,461.66
10,792.00	90.00	183.57	7,217.37	-3,830.28	-127.83	40.134053	-104.700793	1,292,686.10	3,223,457.52
10,884.00	89.69	183.00	7,217.62	-3,922.13	-133.10	40.133801	-104.700812	1,292,594.21	3,223,453.08
10,976.00	89.88	182.31	7,217.96	-4,014.03	-137.37	40.133548	-104.700827	1,292,502.28	3,223,449.65
11,068.00	90.56	182.88	7,217.61	-4,105.93	-141.53	40.133296	-104.700842	1,292,410.35	3,223,446.31
11,160.00	89.69	182.27	7,217.41	-4,197.84	-145.66	40.133044	-104.700857	1,292,318.41	3,223,443.01
11,252.00	89.57	181.11	7,218.01	-4,289.79	-148.38	40.132791	-104.700867	1,292,226.44	3,223,441.12
11,344.00	88.52	177.27	7,219.54	-4,381.75	-147.08	40.132539	-104.700862	1,292,134.50	3,223,443.25
11,436.00	88.08	176.53	7,222.27	-4,473.58	-142.11	40.132287	-104.700844	1,292,042.73	3,223,449.05
11,528.00	89.01	177.44	7,224.60	-4,565.42	-137.27	40.132035	-104.700827	1,291,950.94	3,223,454.72
11,620.00	90.62	178.16	7,224.90	-4,657.35	-133.74	40.131782	-104.700814	1,291,859.05	3,223,459.08
11,712.00	91.79	176.98	7,222.97	-4,749.24	-129.84	40.131530	-104.700800	1,291,767.20	3,223,463.80

Design Report for Crowder 16N-19HZ - Actual Field Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (ft)	+E/-W (ft)	Latitude (ft)	Longitude (ft)	Northing (ft)	Easting (ft)
11,804.00	92.60	176.82	7,219.44	-4,841.04	-124.87	40.131278	-104.700783	1,291,675.45	3,223,469.60
11,896.00	92.22	176.80	7,215.57	-4,932.81	-119.75	40.131026	-104.700764	1,291,583.73	3,223,475.55
11,988.00	91.73	176.93	7,212.40	-5,024.62	-114.72	40.130774	-104.700746	1,291,491.98	3,223,481.40
12,080.00	90.31	178.29	7,210.77	-5,116.52	-110.89	40.130522	-104.700733	1,291,400.12	3,223,486.07
12,172.00	88.83	177.74	7,211.46	-5,208.46	-107.70	40.130270	-104.700721	1,291,308.22	3,223,490.08
12,264.00	89.07	177.39	7,213.14	-5,300.36	-103.79	40.130017	-104.700707	1,291,216.36	3,223,494.82
12,356.00	89.14	176.80	7,214.58	-5,392.23	-99.13	40.129765	-104.700691	1,291,124.54	3,223,500.31
12,448.00	88.70	177.80	7,216.31	-5,484.11	-94.80	40.129513	-104.700675	1,291,032.70	3,223,505.47
12,540.00	88.27	177.90	7,218.75	-5,576.01	-91.35	40.129261	-104.700663	1,290,940.84	3,223,509.75
12,632.00	86.48	178.64	7,222.96	-5,667.87	-88.57	40.129008	-104.700653	1,290,849.01	3,223,513.35
12,727.00	87.53	179.24	7,227.92	-5,762.72	-86.82	40.128748	-104.700646	1,290,754.19	3,223,515.96
12,821.00	89.20	179.63	7,230.60	-5,856.68	-85.89	40.128490	-104.700643	1,290,660.25	3,223,517.73
12,916.00	89.81	180.43	7,231.43	-5,951.67	-85.94	40.128229	-104.700643	1,290,565.26	3,223,518.54
13,011.00	90.25	179.85	7,231.38	-6,046.67	-86.17	40.127969	-104.700644	1,290,470.27	3,223,519.17
13,108.00	89.88	180.38	7,231.27	-6,143.67	-86.37	40.127702	-104.700645	1,290,373.27	3,223,519.85
13,202.00	91.17	178.78	7,230.40	-6,237.66	-85.68	40.127444	-104.700642	1,290,279.30	3,223,521.38
13,297.00	90.93	178.12	7,228.66	-6,332.61	-83.11	40.127184	-104.700633	1,290,184.38	3,223,524.81
13,392.00	91.73	178.90	7,226.46	-6,427.55	-80.64	40.126923	-104.700624	1,290,089.47	3,223,528.13
13,486.00	91.30	180.34	7,223.97	-6,521.51	-80.02	40.126665	-104.700622	1,289,995.52	3,223,529.60
13,581.00	90.74	180.35	7,222.28	-6,616.49	-80.59	40.126404	-104.700624	1,289,900.54	3,223,529.89
13,675.00	90.43	179.77	7,221.32	-6,710.49	-80.69	40.126146	-104.700625	1,289,806.55	3,223,530.64
13,770.00	91.17	180.98	7,220.00	-6,805.48	-81.31	40.125886	-104.700627	1,289,711.57	3,223,530.87
13,864.00	91.30	181.79	7,217.97	-6,899.43	-83.58	40.125628	-104.700635	1,289,617.61	3,223,529.45
13,959.00	91.11	179.60	7,215.97	-6,994.39	-84.73	40.125367	-104.700639	1,289,522.64	3,223,529.15
14,053.00	91.61	180.37	7,213.74	-7,088.36	-84.71	40.125109	-104.700639	1,289,428.67	3,223,530.02
14,148.00	91.67	179.95	7,211.02	-7,183.32	-84.97	40.124849	-104.700640	1,289,333.72	3,223,530.61
14,243.00	91.42	178.53	7,208.46	-7,278.28	-83.71	40.124588	-104.700635	1,289,238.78	3,223,532.73
14,337.00	92.78	179.42	7,205.02	-7,372.20	-82.03	40.124330	-104.700629	1,289,144.89	3,223,535.26
14,432.00	90.87	180.84	7,201.99	-7,467.14	-82.25	40.124069	-104.700630	1,289,049.95	3,223,535.90
14,526.00	91.73	180.67	7,199.86	-7,561.11	-83.49	40.123811	-104.700635	1,288,955.98	3,223,535.51
14,621.00	90.31	181.62	7,198.17	-7,656.07	-85.38	40.123551	-104.700641	1,288,861.01	3,223,534.47
14,715.00	89.94	180.45	7,197.96	-7,750.05	-87.08	40.123293	-104.700647	1,288,767.02	3,223,533.62
14,810.00	90.43	181.17	7,197.65	-7,845.04	-88.43	40.123032	-104.700652	1,288,672.02	3,223,533.13
14,905.00	89.63	180.06	7,197.61	-7,940.04	-89.45	40.122771	-104.700656	1,288,577.03	3,223,532.97
14,999.00	90.62	180.42	7,197.40	-8,034.03	-89.84	40.122513	-104.700657	1,288,483.04	3,223,533.42
15,094.00	89.50	179.11	7,197.30	-8,129.03	-89.45	40.122253	-104.700656	1,288,388.05	3,223,534.67
15,189.00	89.13	178.41	7,198.44	-8,224.00	-87.39	40.121992	-104.700648	1,288,293.11	3,223,537.58
15,283.00	89.63	179.46	7,199.45	-8,317.98	-85.65	40.121734	-104.700642	1,288,199.15	3,223,540.17
15,378.00	89.69	178.87	7,200.02	-8,412.96	-84.26	40.121473	-104.700637	1,288,104.19	3,223,542.41
15,472.00	89.26	178.74	7,200.88	-8,506.94	-82.30	40.121215	-104.700630	1,288,010.24	3,223,545.22
15,567.00	88.08	179.14	7,203.08	-8,601.90	-80.55	40.120954	-104.700624	1,287,915.30	3,223,547.83
15,662.00	88.14	178.76	7,206.22	-8,696.83	-78.81	40.120694	-104.700618	1,287,820.40	3,223,550.43

Design Report for Crowder 16N-19HZ - Actual Field Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (ft)	+E/-W (ft)	Latitude (ft)	Longitude (ft)	Northing (ft)	Easting (ft)
15,756.00	88.14	178.41	7,209.27	-8,790.75	-76.49	40.120436	-104.700609	1,287,726.50	3,223,553.60
15,851.00	89.32	178.56	7,211.37	-8,885.69	-73.97	40.120175	-104.700601	1,287,631.59	3,223,556.96
15,945.00	89.07	178.38	7,212.69	-8,979.65	-71.46	40.119918	-104.700592	1,287,537.66	3,223,560.32
16,040.00	89.75	178.83	7,213.67	-9,074.61	-69.15	40.119657	-104.700583	1,287,442.73	3,223,563.49
16,134.00	90.99	179.83	7,213.07	-9,168.60	-68.05	40.119399	-104.700579	1,287,348.76	3,223,565.44
16,229.00	91.05	179.22	7,211.37	-9,263.58	-67.27	40.119138	-104.700577	1,287,253.79	3,223,567.08
16,324.00	91.17	178.76	7,209.53	-9,358.55	-65.59	40.118877	-104.700571	1,287,158.85	3,223,569.61
16,418.00	90.74	177.87	7,207.97	-9,452.50	-62.83	40.118620	-104.700561	1,287,064.93	3,223,573.22
16,513.00	90.12	179.46	7,207.25	-9,547.46	-60.61	40.118359	-104.700553	1,286,969.99	3,223,576.29
16,574.00	90.12	179.07	7,207.13	-9,608.46	-59.83	40.118191	-104.700550	1,286,909.01	3,223,577.62
16,620.00	90.12	179.07	7,207.03	-9,654.45	-59.09	40.118065	-104.700547	1,286,863.03	3,223,578.78

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
25.00	25.00	0.00	0.00	H&P 308: RKB = 25ft
125.00	125.00	0.02	-0.59	First MS Energy Services Gyro @ 125.00ft
980.00	979.90	7.72	-7.43	Final MS Energy Services Gyro @ 980.00ft
980.00	979.90	7.72	-7.43	Tie-On to Surface Gyros @ 980.00ft
1,110.00	1,109.88	9.55	-6.59	First Sperry MWD Survey @ 1110.00ft
16,574.00	7,207.13	-9,608.46	-59.83	Final Sperry MWD Survey @ 16574.00ft
16,620.00	7,207.03	-9,654.45	-59.09	Straight Line Proj @ 16620' MD :: 7207.03

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
User	No Target (Freehand)	180.00	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
25.00	980.00	MS Energy Services - Surface Gyros	NS-GYRO-MS
1,110.00	7,438.00	Sperry MWD Surveys - Vert/Build	MWD+IFR1+SC
7,513.00	16,574.00	Sperry MWD Surveys - Lateral	MWD+IFR1+SC

Design Report for Crowder 16N-19HZ - Actual Field Surveys

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,483.00	7,203.09	7" Casing @ 7483' MD :: 7203.09' TVD	7	8-3/4

Targets for Plan B Rev 0

Shape	Target Name	TVD (ft)	Northing (ft)	Easting (ft)	+N/-S ft	+E/-W ft	Created	Updated
Polygon	Crowder 16N-19HZ_LD	0.00	1,296,517.22	3,223,550.81	0.00	0.00	07-24-2012	02-13-2013
Polygon	Crowder 16N-19HZ_18/19	0.00	1,296,517.22	3,223,550.81	0.00	0.00	07-24-2012	02-13-2013
Point	Crowder 16N-19HZ_SHL	0.00	1,296,517.22	3,223,550.81	0.00	0.00	07-24-2012	02-13-2013
Point	Crowder 16N-19HZ_BHL	7,127.00	1,286,830.43	3,223,527.41	-9,686.58	-110.75	07-24-2012	02-27-2013
Polygon	Crowder 16N-19HZ_Sec	0.00	1,296,517.22	3,223,550.81	0.00	0.00	07-24-2012	02-13-2013

North Reference Sheet for Sec. 18-T2N-R65W - Crowder 16N-19HZ - Plan B 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=25ft @ 4978.00ft (HP 308). Northing and Easting are relative to Crowder 16N-19HZ

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: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99995855

Grid Coordinates of Well: 1,296,517.22 ft N, 3,223,550.81 ft E

Geographical Coordinates of Well: 40° 08' 40.44" N, 104° 42' 01.21" W

Grid Convergence at Surface is: 0.52°

Based upon Minimum Curvature type calculations, at a Measured Depth of 16,620.00ft

the Bottom Hole Displacement is 9,654.63ft in the Direction of 180.35° (True).

Magnetic Convergence at surface is: -8.11° (4 March 2013, , BGGM2012)

