

Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 18-T2N-R65W

Crowder 38N-19HZ

Plan C Rev 0

Design: Actual Field Surveys

Sperry Drilling Services Standard Report

01 April, 2013

Well Coordinates: 1,296,457.46 N, 3,223,550.51 E (40° 08' 39.85" N, 104° 42' 01.22" W)

Ground Level: 4,952.00 ft

Local Coordinate Origin:

Centered on Well Crowder 38N-19HZ

Viewing Datum:

RKB=25ft @ 4977.00ft (HP 308)

TVDs to System:

N

North Reference:

True

Unit System:

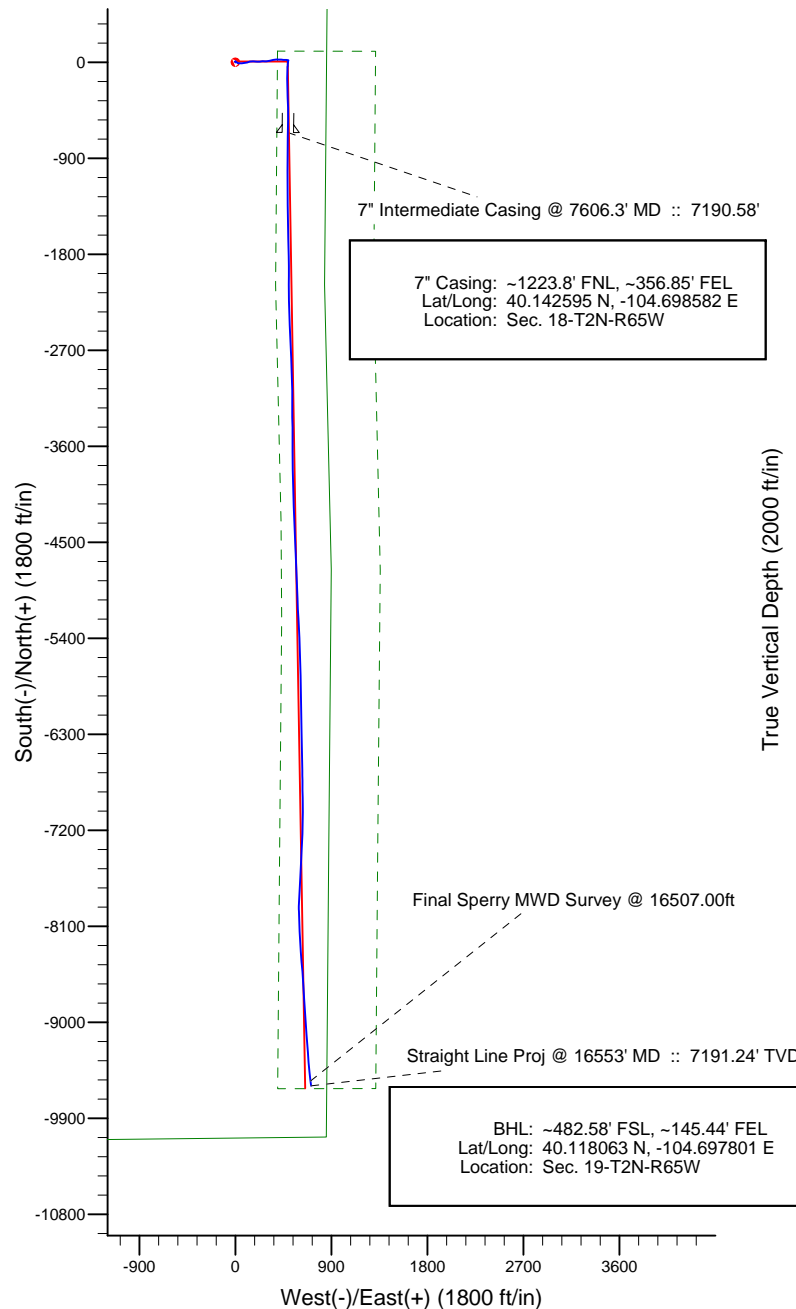
API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 2003.16 Build: 43I

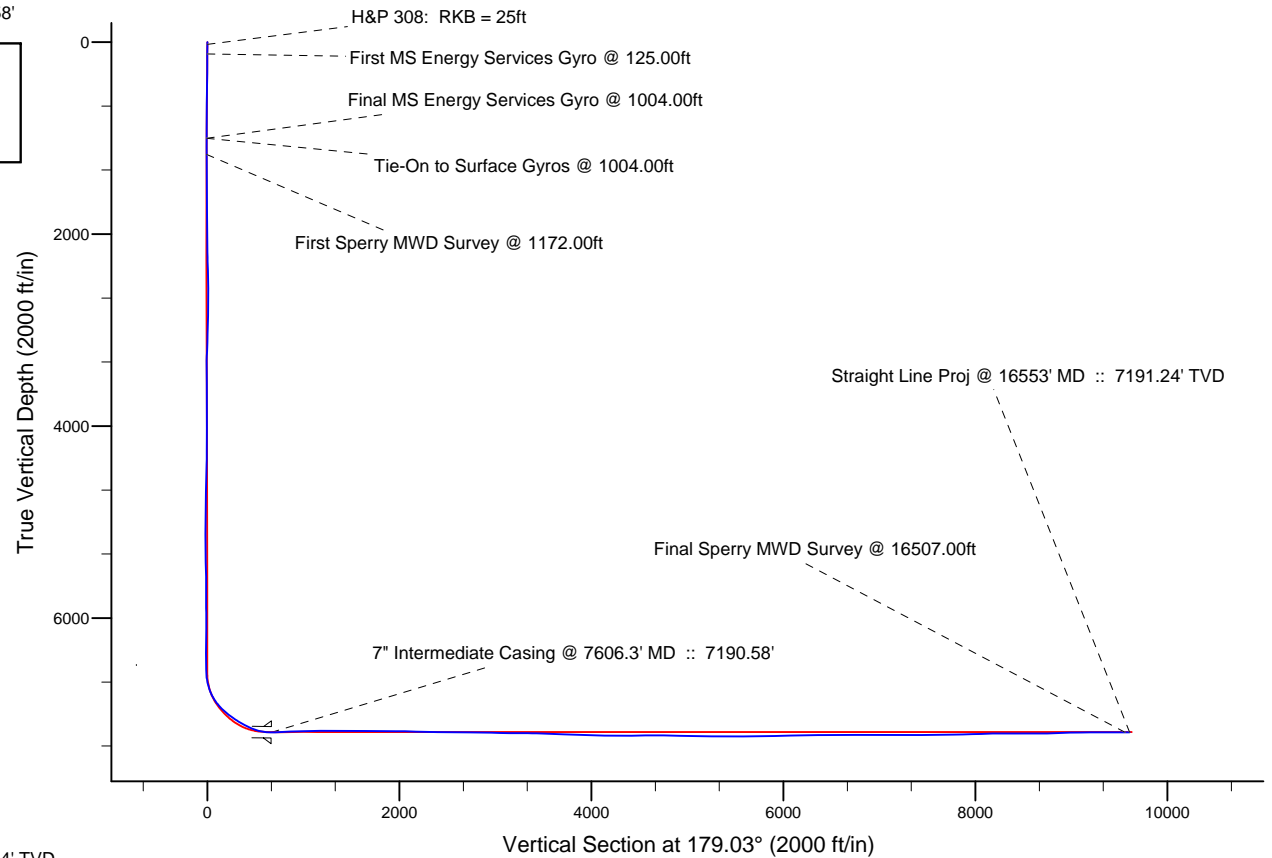
HALLIBURTON

Project: Weld County, CO (NAD 83)
 Site: Sec. 18-T2N-R65W
 Well: Crowder 38N-19HZ
 Wellbore: Plan C Rev 0
 Design: Actual Field Surveys



LEGEND

Crowder 38N-19HZ, Plan C Rev 0, Plan C Rev 0 Proposal VO
 Actual Field Surveys



WELL DETAILS: Crowder 38N-19HZ	
Ground Level:	4952.00
RKB=25ft @ 4977.00ft (HP 308)	
Design: Actual Field Surveys (Crowder 38N-19HZ/Plan C Rev 0)	
Created By: Fred Hartmann	Date: 04/01/2013
Reviewed: _____	Date: _____

Design Report for Crowder 38N-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	0.21	313.88	125.00	0.13	-0.13	-0.13	0.21
First MS Energy Services Gyro @ 125.00ft							
225.00	0.43	352.46	225.00	0.63	-0.31	-0.63	0.30
325.00	0.54	339.47	324.99	1.44	-0.53	-1.45	0.15
425.00	0.48	332.75	424.99	2.25	-0.88	-2.27	0.08
525.00	0.32	352.08	524.99	2.90	-1.12	-2.92	0.21
625.00	0.51	353.46	624.99	3.62	-1.20	-3.64	0.19
725.00	0.33	3.08	724.98	4.35	-1.24	-4.37	0.19
825.00	0.53	0.91	824.98	5.10	-1.22	-5.12	0.20
925.00	0.64	14.74	924.97	6.10	-1.07	-6.12	0.18
1,004.00	0.48	10.72	1,003.97	6.85	-0.89	-6.87	0.21
Final MS Energy Services Gyro @ 1004.00ft - Tie-On to Surface Gyros @ 1004.00ft							
1,172.00	0.10	301.06	1,171.97	7.62	-0.89	-7.64	0.27
First Sperry MWD Survey @ 1172.00ft							
1,295.00	0.25	303.21	1,294.97	7.82	-1.20	-7.84	0.12
1,356.00	0.86	129.19	1,355.97	7.61	-0.96	-7.62	1.82
1,540.00	1.49	128.16	1,539.93	5.26	1.99	-5.22	0.34
1,724.00	1.34	125.48	1,723.87	2.53	5.62	-2.43	0.09
1,908.00	1.11	125.43	1,907.83	0.25	8.83	-0.10	0.13
2,002.00	0.98	108.20	2,001.81	-0.53	10.33	0.71	0.36
2,097.00	1.18	91.16	2,096.80	-0.80	12.08	1.01	0.40
2,191.00	1.50	121.82	2,190.77	-1.47	14.10	1.71	0.82
2,286.00	3.38	123.96	2,285.68	-3.69	17.48	3.99	1.98
2,380.00	4.71	101.34	2,379.45	-6.00	23.56	6.40	2.18
2,475.00	4.56	102.41	2,474.14	-7.58	31.07	8.10	0.18
2,570.00	5.67	93.14	2,568.76	-8.65	39.44	9.31	1.45
2,664.00	7.05	91.38	2,662.18	-9.04	49.85	9.88	1.48
2,759.00	8.88	83.28	2,756.26	-8.32	62.96	9.39	2.26
2,854.00	7.88	81.17	2,850.25	-6.46	76.68	7.76	1.10
2,949.00	9.44	81.34	2,944.16	-4.29	90.82	5.83	1.64
3,043.00	8.79	78.86	3,036.98	-1.74	105.48	3.53	0.81
3,138.00	8.18	74.47	3,130.94	1.47	119.12	0.55	0.94
3,233.00	7.48	71.46	3,225.05	5.24	131.49	-3.02	0.85
3,327.00	6.06	74.64	3,318.39	8.50	142.08	-6.10	1.56
3,422.00	7.09	86.40	3,412.77	10.20	152.77	-7.61	1.78
3,517.00	7.21	98.46	3,507.04	9.69	164.51	-6.91	1.58
3,611.00	6.63	92.66	3,600.35	8.57	175.77	-5.60	0.97
3,706.00	8.30	97.77	3,694.55	7.39	188.04	-4.21	1.89
3,801.00	7.69	92.60	3,788.62	6.18	201.19	-2.77	0.99
3,896.00	9.24	88.19	3,882.59	6.13	215.16	-2.48	1.77
3,990.00	8.41	81.05	3,975.48	7.44	229.49	-3.55	1.46
4,085.00	7.96	78.36	4,069.51	9.84	242.80	-5.73	0.62
4,179.00	9.62	92.49	4,162.41	10.82	257.02	-6.46	2.88
4,274.00	10.11	91.05	4,256.01	10.32	273.29	-5.69	0.58
4,369.00	9.66	86.96	4,349.60	10.59	289.59	-5.68	0.88
4,463.00	8.06	81.95	4,442.47	11.93	303.99	-6.78	1.89
4,558.00	8.54	77.36	4,536.48	14.41	317.47	-9.03	0.86

Design Report for Crowder 38N-19HZ - Actual Field Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
4,652.00	7.84	74.00	4,629.52	17.70	330.44	-12.10	0.90
4,747.00	8.87	78.29	4,723.51	20.97	343.84	-15.15	1.27
4,842.00	9.11	78.04	4,817.35	24.02	358.37	-17.95	0.26
4,936.00	9.31	88.57	4,910.14	25.75	373.25	-19.43	1.80
5,031.00	9.48	92.13	5,003.87	25.65	388.75	-19.07	0.64
5,125.00	8.27	89.94	5,096.74	25.37	403.25	-18.54	1.34
5,220.00	7.15	84.69	5,190.88	25.92	415.97	-18.88	1.39
5,314.00	6.85	102.65	5,284.19	25.24	427.26	-18.00	2.34
5,409.00	6.48	97.85	5,378.55	23.27	438.10	-15.85	0.70
5,503.00	6.75	94.09	5,471.92	22.15	448.87	-14.54	0.54
5,598.00	6.45	91.97	5,566.30	21.56	459.77	-13.78	0.41
5,693.00	5.97	88.42	5,660.74	21.52	470.04	-13.56	0.65
5,787.00	4.17	91.43	5,754.37	21.57	478.34	-13.47	1.94
5,882.00	3.41	100.90	5,849.16	20.95	484.57	-12.74	1.03
5,976.00	1.56	98.10	5,943.07	20.24	488.58	-11.96	1.97
6,071.00	0.87	75.02	6,038.04	20.24	490.56	-11.93	0.88
6,260.00	0.62	84.44	6,227.03	20.71	492.97	-12.36	0.15
6,449.00	0.54	80.64	6,416.02	20.96	494.86	-12.58	0.05
6,513.00	0.50	112.02	6,480.02	20.90	495.42	-12.51	0.44
6,544.00	0.47	129.15	6,511.02	20.77	495.64	-12.38	0.48
6,576.00	1.49	189.57	6,543.01	20.28	495.67	-11.88	4.13
6,607.00	3.73	192.33	6,573.98	18.89	495.39	-10.50	7.24
6,639.00	6.04	197.85	6,605.86	16.27	494.65	-7.90	7.36
6,670.00	8.98	192.05	6,636.59	12.35	493.65	-4.00	9.78
6,702.00	11.72	189.41	6,668.07	6.70	492.60	1.64	8.69
6,733.00	14.86	186.75	6,698.23	-0.35	491.61	8.67	10.32
6,765.00	18.23	185.79	6,728.90	-9.41	490.63	17.71	10.57
6,796.00	20.63	184.54	6,758.14	-19.68	489.70	27.97	7.86
6,828.00	23.87	184.09	6,787.75	-31.76	488.80	40.03	10.14
6,860.00	28.19	182.93	6,816.50	-45.77	487.95	54.03	13.59
6,891.00	32.38	182.83	6,843.26	-61.38	487.16	69.62	13.52
6,923.00	35.63	182.24	6,869.78	-79.26	486.38	87.48	10.21
6,954.00	38.33	181.19	6,894.55	-97.90	485.82	106.11	8.94
6,986.00	41.67	180.57	6,919.06	-118.46	485.51	126.66	10.51
7,017.00	44.46	180.13	6,941.70	-139.63	485.38	147.82	9.05
7,049.00	47.23	179.78	6,963.99	-162.58	485.40	170.78	8.69
7,080.00	49.72	179.15	6,984.54	-185.79	485.62	193.98	8.18
7,112.00	52.28	179.38	7,004.68	-210.65	485.94	218.85	8.02
7,143.00	53.89	178.73	7,023.30	-235.43	486.35	243.63	5.46
7,175.00	55.71	178.45	7,041.74	-261.57	487.00	269.78	5.73
7,206.00	56.90	178.80	7,058.94	-287.36	487.61	295.57	3.95
7,238.00	58.24	178.04	7,076.10	-314.35	488.36	322.58	4.64
7,269.00	59.45	177.77	7,092.14	-340.87	489.33	349.10	3.97
7,301.00	61.04	178.01	7,108.02	-368.63	490.35	376.87	5.01
7,332.00	62.35	178.09	7,122.72	-395.90	491.28	404.16	4.23
7,364.00	64.51	178.59	7,137.03	-424.51	492.11	432.78	6.89
7,395.00	66.80	179.46	7,149.81	-452.75	492.59	461.02	7.82
7,427.00	70.07	180.06	7,161.57	-482.50	492.71	490.77	10.37
7,459.00	73.35	180.46	7,171.61	-512.88	492.57	521.15	10.32
7,490.00	77.71	180.02	7,179.35	-542.89	492.45	551.15	14.13
7,522.00	82.08	180.42	7,184.97	-574.39	492.32	582.64	13.71

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
7,566.00	86.94	180.95	7,189.18	-618.17	491.80	626.41	11.11
7,606.30	89.06	180.95	7,190.58	-658.44	491.13	666.66	5.27
7" Intermediate Casing @ 7606.3' MD :: 7190.58'							
7,647.00	91.21	180.95	7,190.48	-699.13	490.46	707.33	5.27
7,739.00	92.44	181.38	7,187.55	-791.06	488.59	799.22	1.42
7,831.00	92.56	179.63	7,183.54	-882.97	487.78	891.10	1.90
7,923.00	92.28	179.94	7,179.65	-974.88	488.12	983.01	0.45
8,015.00	91.60	179.80	7,176.54	-1,066.83	488.33	1,074.94	0.75
8,107.00	90.52	179.84	7,174.84	-1,158.81	488.62	1,166.92	1.17
8,199.00	89.85	179.95	7,174.54	-1,250.81	488.79	1,258.91	0.74
8,291.00	89.32	179.36	7,175.21	-1,342.81	489.34	1,350.90	0.86
8,386.00	89.94	179.50	7,175.82	-1,437.80	490.29	1,445.89	0.67
8,480.00	89.81	179.09	7,176.03	-1,531.79	491.45	1,539.89	0.46
8,575.00	89.69	178.07	7,176.44	-1,626.76	493.80	1,634.89	1.08
8,670.00	89.54	178.67	7,177.08	-1,721.72	496.50	1,729.88	0.65
8,764.00	89.63	179.11	7,177.76	-1,815.70	498.32	1,823.87	0.48
8,859.00	89.23	179.69	7,178.71	-1,910.69	499.32	1,918.87	0.74
8,953.00	90.34	180.40	7,179.06	-2,004.68	499.24	2,012.85	1.40
9,048.00	88.52	180.19	7,180.00	-2,099.67	498.75	2,107.82	1.93
9,143.00	88.03	178.88	7,182.86	-2,194.63	499.52	2,202.77	1.47
9,237.00	88.15	177.65	7,186.00	-2,288.53	502.37	2,296.71	1.31
9,332.00	88.27	177.68	7,188.96	-2,383.40	506.24	2,391.63	0.13
9,426.00	89.11	177.24	7,191.11	-2,477.29	510.40	2,485.57	1.01
9,521.00	91.08	178.12	7,190.95	-2,572.20	514.25	2,580.54	2.27
9,616.00	88.98	177.53	7,190.91	-2,667.13	517.85	2,675.51	2.30
9,710.00	90.43	178.27	7,191.39	-2,761.06	521.30	2,769.49	1.73
9,805.00	89.08	177.85	7,191.80	-2,856.00	524.51	2,864.47	1.49
9,899.00	88.21	178.32	7,194.02	-2,949.92	527.65	2,958.43	1.05
9,994.00	88.70	178.65	7,196.58	-3,044.85	530.16	3,053.39	0.62
10,088.00	89.54	178.43	7,198.02	-3,138.81	532.56	3,147.38	0.92
10,183.00	89.88	180.89	7,198.50	-3,233.80	533.12	3,242.36	2.61
10,277.00	89.20	179.09	7,199.26	-3,327.79	533.14	3,336.34	2.05
10,372.00	87.69	179.40	7,201.84	-3,422.75	534.39	3,431.30	1.62
10,466.00	88.05	179.96	7,205.33	-3,516.68	534.92	3,525.23	0.71
10,561.00	88.98	180.91	7,207.79	-3,611.64	534.19	3,620.17	1.40
10,655.00	87.41	178.71	7,210.75	-3,705.59	534.50	3,714.11	2.87
10,750.00	87.31	178.42	7,215.13	-3,800.46	536.88	3,809.00	0.32
10,845.00	87.41	178.69	7,219.51	-3,895.33	539.27	3,903.90	0.30
10,939.00	88.24	178.57	7,223.07	-3,989.23	541.52	3,997.83	0.89
11,033.00	88.83	178.60	7,225.48	-4,083.17	543.84	4,091.79	0.63
11,128.00	89.75	178.45	7,226.65	-4,178.13	546.29	4,186.78	0.98
11,222.00	91.05	178.14	7,226.00	-4,272.09	549.08	4,280.77	1.42
11,317.00	90.71	177.33	7,224.54	-4,367.00	552.84	4,375.73	0.92
11,412.00	89.94	177.27	7,224.00	-4,461.89	557.31	4,470.69	0.81
11,506.00	90.80	176.84	7,223.39	-4,555.76	562.14	4,564.63	1.02
11,601.00	90.03	177.69	7,222.70	-4,650.65	566.67	4,659.58	1.21
11,696.00	89.78	177.62	7,222.86	-4,745.57	570.56	4,754.55	0.27
11,790.00	89.14	178.33	7,223.75	-4,839.51	573.88	4,848.53	1.02
11,885.00	88.03	177.86	7,226.09	-4,934.43	577.04	4,943.49	1.27
11,980.00	88.18	177.69	7,229.23	-5,029.30	580.73	5,038.41	0.24
12,074.00	88.52	176.86	7,231.94	-5,123.16	585.19	5,132.33	0.95

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12,169.00	89.17	176.99	7,233.86	-5,218.00	590.29	5,227.24	0.70
12,275.00	89.66	176.94	7,234.94	-5,323.84	595.90	5,333.17	0.46
12,367.00	89.94	177.03	7,235.26	-5,415.72	600.74	5,425.11	0.32
12,458.00	90.99	178.42	7,234.52	-5,506.64	604.35	5,516.08	1.91
12,551.00	91.08	178.17	7,232.84	-5,599.58	607.12	5,609.06	0.29
12,643.00	90.80	179.14	7,231.33	-5,691.54	609.28	5,701.04	1.10
12,737.00	90.99	179.23	7,229.86	-5,785.52	610.61	5,795.03	0.22
12,832.00	91.02	178.99	7,228.20	-5,880.50	612.09	5,890.01	0.25
12,927.00	91.14	179.56	7,226.41	-5,975.47	613.29	5,985.00	0.61
13,021.00	91.08	178.99	7,224.59	-6,069.45	614.48	6,078.98	0.61
13,116.00	91.05	178.64	7,222.82	-6,164.41	616.44	6,173.96	0.37
13,211.00	90.96	178.66	7,221.15	-6,259.37	618.68	6,268.94	0.10
13,305.00	91.39	178.23	7,219.23	-6,353.31	621.23	6,362.92	0.65
13,400.00	90.09	179.15	7,218.00	-6,448.28	623.40	6,457.91	1.68
13,494.00	90.06	178.63	7,217.88	-6,542.26	625.22	6,551.91	0.55
13,589.00	90.25	179.89	7,217.62	-6,637.25	626.45	6,646.90	1.34
13,683.00	89.45	178.68	7,217.87	-6,731.24	627.62	6,740.90	1.54
13,778.00	90.12	180.13	7,218.22	-6,826.23	628.61	6,835.89	1.68
13,873.00	90.12	180.12	7,218.02	-6,921.23	628.40	6,930.88	0.01
13,967.00	89.85	179.17	7,218.05	-7,015.23	628.99	7,024.87	1.05
14,062.00	90.52	180.68	7,217.74	-7,110.22	629.11	7,119.85	1.74
14,156.00	90.12	180.60	7,217.22	-7,204.21	628.06	7,213.81	0.43
14,251.00	90.06	181.94	7,217.07	-7,299.19	625.95	7,308.74	1.41
14,345.00	90.09	183.10	7,216.94	-7,393.10	621.82	7,402.56	1.23
14,440.00	89.81	183.58	7,217.03	-7,487.93	616.29	7,497.29	0.58
14,535.00	89.97	183.64	7,217.21	-7,582.75	610.31	7,591.99	0.18
14,629.00	90.99	184.00	7,216.42	-7,676.53	604.04	7,685.66	1.15
14,724.00	91.20	182.16	7,214.61	-7,771.37	598.94	7,780.40	1.95
14,818.00	91.73	182.14	7,212.20	-7,865.28	595.41	7,874.23	0.56
14,913.00	91.57	178.46	7,209.47	-7,960.22	594.92	7,969.15	3.88
15,008.00	91.88	178.52	7,206.61	-8,055.14	597.42	8,064.10	0.33
15,102.00	90.77	177.15	7,204.43	-8,149.05	600.97	8,158.05	1.88
15,197.00	90.03	176.56	7,203.77	-8,243.90	606.18	8,252.98	1.00
15,291.00	90.31	176.01	7,203.49	-8,337.70	612.27	8,346.87	0.66
15,386.00	89.97	174.99	7,203.26	-8,432.41	619.73	8,441.69	1.13
15,480.00	89.44	175.80	7,203.74	-8,526.10	627.27	8,535.50	1.03
15,575.00	90.71	176.72	7,203.62	-8,620.90	633.47	8,630.39	1.65
15,670.00	91.02	176.22	7,202.18	-8,715.71	639.32	8,725.28	0.62
15,764.00	91.69	176.40	7,199.96	-8,809.48	645.37	8,819.15	0.74
15,859.00	92.06	176.07	7,196.85	-8,904.23	651.60	8,913.98	0.52
15,954.00	91.63	175.95	7,193.79	-8,998.95	658.21	9,008.80	0.47
16,048.00	90.43	176.65	7,192.10	-9,092.73	664.27	9,102.68	1.48
16,143.00	89.88	175.86	7,191.85	-9,187.53	670.48	9,197.56	1.01
16,237.00	90.25	175.54	7,191.74	-9,281.27	677.53	9,291.40	0.52
16,332.00	90.09	175.11	7,191.46	-9,375.95	685.27	9,386.21	0.48
16,426.00	89.82	174.13	7,191.53	-9,469.53	694.08	9,479.93	1.08
16,507.00	90.28	172.34	7,191.46	-9,549.97	703.62	9,560.51	2.28
Final Sperry MWD Survey @ 16507.00ft							
16,553.00	90.28	172.34	7,191.24	-9,595.55	709.75	9,606.19	0.00
Straight Line Proj @ 16553' MD :: 7191.24' TVD							

Design Report for Crowder 38N-19HZ - Actual Field Surveys

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	0.13	-0.13	First MS Energy Services Gyro @ 125.00ft
1,004.00	1,003.97	6.85	-0.89	Final MS Energy Services Gyro @ 1004.00ft
1,004.00	1,003.97	6.85	-0.89	Tie-On to Surface Gyros @ 1004.00ft
1,172.00	1,171.97	7.62	-0.89	First Sperry MWD Survey @ 1172.00ft
16,507.00	7,191.46	-9,549.97	703.62	Final Sperry MWD Survey @ 16507.00ft
16,553.00	7,191.24	-9,595.55	709.75	Straight Line Proj @ 16553' MD :: 7191.24' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/_S (ft)	+E/-W (ft)	
User	No Target (Freehand)	179.03	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
25.00	1,004.00	MS Energy Services - Surface Gyros	NS-GYRO-MS
1,172.00	7,566.00	Sperry MWD Surveys - Vert/Build	MWD+SC
7,647.00	16,507.00	Sperry MWD Surveys - Lateral	MWD+SC

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,606.30	7,190.58	7" Intermediate Casing @ 7606.3' MD :: 7190.58'	7	8-3/4

Design Report for Crowder 38N-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 38N-19HZ_ - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,296,457.46	3,223,550.51	40.144403	-104.700339
Point 1			-4,358.98	-4,830.00		1,291,588.55	3,219,235.44		
Point 2			-1,839.37	-4,793.36		1,291,647.91	3,221,754.51		
Point 3			897.04	-4,754.74		1,291,711.20	3,224,490.35		
Crowder 38N-19HZ_ - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,296,457.46	3,223,550.51	40.144403	-104.700339
Point 1			394.23	105.32		1,296,566.33	3,223,943.75		
Point 2			375.67	-2,089.14		1,294,371.88	3,223,944.98		
Point 3			426.44	-4,301.31		1,292,160.35	3,224,015.70		
Point 4			432.94	-5,221.34		1,291,240.45	3,224,030.49		
Point 5			413.94	-7,424.63		1,289,037.17	3,224,031.36		
Point 6			395.00	-9,621.31		1,286,840.50	3,224,032.23		
Point 7			1,315.26	-9,620.52		1,286,849.59	3,224,952.41		
Point 8			1,334.06	-7,419.70		1,289,050.40	3,224,951.36		
Point 9			1,357.04	-4,758.89		1,291,711.20	3,224,950.35		
Point 10			1,295.73	-2,088.12		1,294,381.20	3,224,864.96		
Point 11			1,314.03	102.98		1,296,572.28	3,224,863.50		
Point 12			394.23	105.32		1,296,566.33	3,223,943.75		
Crowder 38N-19HZ_ - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,296,457.46	3,223,550.51	40.144403	-104.700339
Point 1			-4,329.23	546.36		1,296,964.74	3,219,216.70		
Point 2			-4,358.91	-2,142.38		1,294,275.95	3,219,211.27		
Point 3			-4,358.98	-4,830.00		1,291,588.55	3,219,235.44		
Point 4			-4,347.49	-7,518.62		1,288,900.25	3,219,271.17		
Point 5			-4,336.31	-10,132.98		1,286,286.21	3,219,305.92		
Point 6			-1,787.41	-10,105.21		1,286,336.96	3,221,854.37		
Point 7			851.11	-10,076.37		1,286,389.59	3,224,492.41		
Point 8			874.06	-7,415.55		1,289,050.40	3,224,491.36		
Point 9			897.04	-4,754.74		1,291,711.20	3,224,490.35		
Point 10			835.73	-2,083.97		1,294,381.20	3,224,404.96		
Point 11			858.18	567.13		1,297,032.28	3,224,403.50		
Point 12			-1,787.74	556.96		1,296,998.25	3,221,757.89		
Point 13			-4,329.23	546.36		1,296,964.74	3,219,216.70		
Crowder 38N-19HZ_ - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	1,296,457.46	3,223,550.51	40.144403	-104.700339
Crowder 38N-19HZ_ - actual wellpath misses target center by 62.07ft at 16553.00ft MD (7191.24 TVD, -9595.55 N, 709.75 E) - Point	0.00	0.00	7,187.00	-9,618.45	652.21	1,286,845.68	3,224,289.40	40.118000	-104.698007

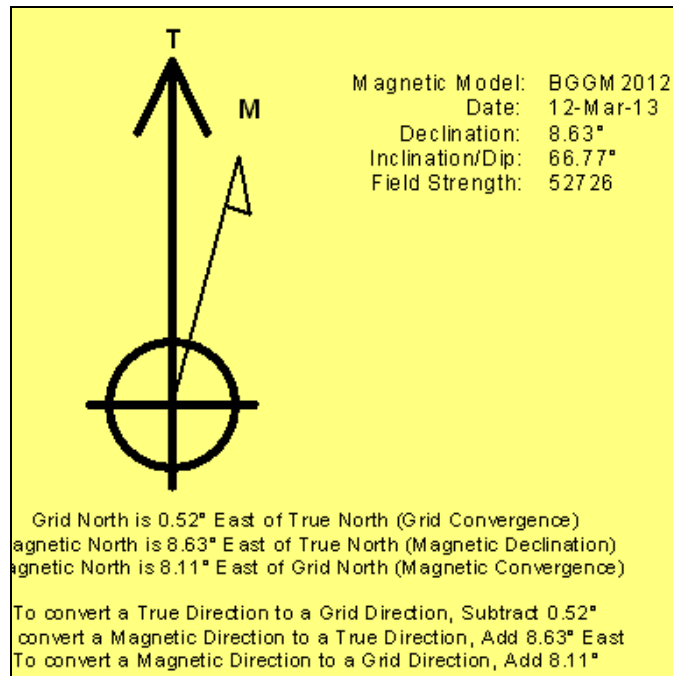
North Reference Sheet for Sec. 18-T2N-R65W - Crowder 38N-19HZ - Plan C Rev 0

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 @ 4977.00ft (HP 308). Northing and Easting are relative to Crowder 38N-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: 0.99995856

Grid Coordinates of Well: 1,296,457.46 ft N, 3,223,550.51 ft E
 Geographical Coordinates of Well: 40° 08' 39.85" N, 104° 42' 01.22" W
 Grid Convergence at Surface is: 0.52°

Based upon Minimum Curvature type calculations, at a Measured Depth of 16,553.00ft
 the Bottom Hole Displacement is 9,621.77ft in the Direction of 175.77° (True).

Magnetic Convergence at surface is: -8.11° (12 March 2013, , BGGM2012)



Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 18-T2N-R65W

Crowder 38N-19HZ

Plan C Rev 0

Design: Actual Field Surveys

Sperry Drilling Services Geodetic Report

01 April, 2013

Well Coordinates: 1,296,457.46 N, 3,223,550.51 E (40° 08' 39.85" N, 104° 42' 01.22" W)

Ground Level: 4,952.00 ft

Local Coordinate Origin:	Centered on Well Crowder 38N-19HZ
Viewing Datum:	RKB=25ft @ 4977.00ft (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 38N-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	40.144403	-104.700339	1,296,457.46	3,223,550.51
25.00	0.00	0.00	25.00	0.00	0.00	40.144403	-104.700339	1,296,457.46	3,223,550.51
125.00	0.21	313.88	125.00	0.13	-0.13	40.144403	-104.700339	1,296,457.59	3,223,550.37
225.00	0.43	352.46	225.00	0.63	-0.31	40.144405	-104.700340	1,296,458.08	3,223,550.19
325.00	0.54	339.47	324.99	1.44	-0.53	40.144407	-104.700341	1,296,458.89	3,223,549.96
425.00	0.48	332.75	424.99	2.25	-0.88	40.144409	-104.700342	1,296,459.70	3,223,549.60
525.00	0.32	352.08	524.99	2.90	-1.12	40.144411	-104.700343	1,296,460.35	3,223,549.36
625.00	0.51	353.46	624.99	3.62	-1.20	40.144413	-104.700343	1,296,461.07	3,223,549.27
725.00	0.33	3.08	724.98	4.35	-1.24	40.144415	-104.700343	1,296,461.80	3,223,549.23
825.00	0.53	0.91	824.98	5.10	-1.22	40.144417	-104.700343	1,296,462.55	3,223,549.24
925.00	0.64	14.74	924.97	6.10	-1.07	40.144420	-104.700343	1,296,463.55	3,223,549.38
1,004.00	0.48	10.72	1,003.97	6.85	-0.89	40.144422	-104.700342	1,296,464.31	3,223,549.55
1,172.00	0.10	301.06	1,171.97	7.62	-0.89	40.144424	-104.700342	1,296,465.07	3,223,549.55
1,295.00	0.25	303.21	1,294.97	7.82	-1.20	40.144424	-104.700343	1,296,465.27	3,223,549.23
1,356.00	0.86	129.19	1,355.97	7.61	-0.96	40.144424	-104.700342	1,296,465.06	3,223,549.48
1,540.00	1.49	128.16	1,539.93	5.26	1.99	40.144417	-104.700332	1,296,462.73	3,223,552.45
1,724.00	1.34	125.48	1,723.87	2.53	5.62	40.144410	-104.700319	1,296,460.04	3,223,556.11
1,908.00	1.11	125.43	1,907.83	0.25	8.83	40.144404	-104.700307	1,296,457.79	3,223,559.33
2,002.00	0.98	108.20	2,001.81	-0.53	10.33	40.144401	-104.700302	1,296,457.02	3,223,560.84
2,097.00	1.18	91.16	2,096.80	-0.80	12.08	40.144401	-104.700296	1,296,456.76	3,223,562.59
2,191.00	1.50	121.82	2,190.77	-1.47	14.10	40.144399	-104.700289	1,296,456.11	3,223,564.61
2,286.00	3.38	123.96	2,285.68	-3.69	17.48	40.144393	-104.700276	1,296,453.93	3,223,568.01
2,380.00	4.71	101.34	2,379.45	-6.00	23.56	40.144386	-104.700255	1,296,451.67	3,223,574.12
2,475.00	4.56	102.41	2,474.14	-7.58	31.07	40.144382	-104.700228	1,296,450.16	3,223,581.64
2,570.00	5.67	93.14	2,568.76	-8.65	39.44	40.144379	-104.700198	1,296,449.17	3,223,590.03
2,664.00	7.05	91.38	2,662.18	-9.04	49.85	40.144378	-104.700161	1,296,448.87	3,223,600.43
2,759.00	8.88	83.28	2,756.26	-8.32	62.96	40.144380	-104.700114	1,296,449.71	3,223,613.54
2,854.00	7.88	81.17	2,850.25	-6.46	76.68	40.144385	-104.700065	1,296,451.69	3,223,627.24
2,949.00	9.44	81.34	2,944.16	-4.29	90.82	40.144391	-104.700014	1,296,453.99	3,223,641.35
3,043.00	8.79	78.86	3,036.98	-1.74	105.48	40.144398	-104.699962	1,296,456.67	3,223,656.00
3,138.00	8.18	74.47	3,130.94	1.47	119.12	40.144407	-104.699913	1,296,460.00	3,223,669.60
3,233.00	7.48	71.46	3,225.05	5.24	131.49	40.144417	-104.699869	1,296,463.89	3,223,681.94
3,327.00	6.06	74.64	3,318.39	8.50	142.08	40.144426	-104.699831	1,296,467.24	3,223,692.50
3,422.00	7.09	86.40	3,412.77	10.20	152.77	40.144431	-104.699793	1,296,469.04	3,223,703.17
3,517.00	7.21	98.46	3,507.04	9.69	164.51	40.144430	-104.699751	1,296,468.63	3,223,714.92
3,611.00	6.63	92.66	3,600.35	8.57	175.77	40.144426	-104.699710	1,296,467.62	3,223,726.18
3,706.00	8.30	97.77	3,694.55	7.39	188.04	40.144423	-104.699666	1,296,466.55	3,223,738.47
3,801.00	7.69	92.60	3,788.62	6.18	201.19	40.144420	-104.699619	1,296,465.45	3,223,751.62
3,896.00	9.24	88.19	3,882.59	6.13	215.16	40.144420	-104.699569	1,296,465.53	3,223,765.59
3,990.00	8.41	81.05	3,975.48	7.44	229.49	40.144423	-104.699518	1,296,466.96	3,223,779.91
4,085.00	7.96	78.36	4,069.51	9.84	242.80	40.144430	-104.699471	1,296,469.49	3,223,793.20
4,179.00	9.62	92.49	4,162.41	10.82	257.02	40.144433	-104.699420	1,296,470.59	3,223,807.41

Design Report for Crowder 38N-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)
4,274.00	10.11	91.05	4,256.01	10.32	273.29	40.144431	-104.699361	1,296,470.24	3,223,823.68
4,369.00	9.66	86.96	4,349.60	10.59	289.59	40.144432	-104.699303	1,296,470.66	3,223,839.97
4,463.00	8.06	81.95	4,442.47	11.93	303.99	40.144436	-104.699252	1,296,472.13	3,223,854.36
4,558.00	8.54	77.36	4,536.48	14.41	317.47	40.144442	-104.699203	1,296,474.73	3,223,867.82
4,652.00	7.84	74.00	4,629.52	17.70	330.44	40.144452	-104.699157	1,296,478.14	3,223,880.76
4,747.00	8.87	78.29	4,723.51	20.97	343.84	40.144460	-104.699109	1,296,481.53	3,223,894.13
4,842.00	9.11	78.04	4,817.35	24.02	358.37	40.144469	-104.699057	1,296,484.71	3,223,908.63
4,936.00	9.31	88.57	4,910.14	25.75	373.25	40.144474	-104.699004	1,296,486.57	3,223,923.49
5,031.00	9.48	92.13	5,003.87	25.65	388.75	40.144473	-104.698948	1,296,486.61	3,223,938.99
5,125.00	8.27	89.94	5,096.74	25.37	403.25	40.144473	-104.698897	1,296,486.46	3,223,953.49
5,220.00	7.15	84.69	5,190.88	25.92	415.97	40.144474	-104.698851	1,296,487.13	3,223,966.21
5,314.00	6.85	102.65	5,284.19	25.24	427.26	40.144472	-104.698811	1,296,486.55	3,223,977.51
5,409.00	6.48	97.85	5,378.55	23.27	438.10	40.144467	-104.698772	1,296,484.67	3,223,988.36
5,503.00	6.75	94.09	5,471.92	22.15	448.87	40.144464	-104.698733	1,296,483.65	3,223,999.14
5,598.00	6.45	91.97	5,566.30	21.56	459.77	40.144462	-104.698694	1,296,483.17	3,224,010.04
5,693.00	5.97	88.42	5,660.74	21.52	470.04	40.144462	-104.698658	1,296,483.21	3,224,020.31
5,787.00	4.17	91.43	5,754.37	21.57	478.34	40.144462	-104.698628	1,296,483.34	3,224,028.62
5,882.00	3.41	100.90	5,849.16	20.95	484.57	40.144460	-104.698606	1,296,482.77	3,224,034.85
5,976.00	1.56	98.10	5,943.07	20.24	488.58	40.144458	-104.698591	1,296,482.10	3,224,038.87
6,071.00	0.87	75.02	6,038.04	20.24	490.56	40.144458	-104.698584	1,296,482.12	3,224,040.84
6,260.00	0.62	84.44	6,227.03	20.71	492.97	40.144460	-104.698576	1,296,482.62	3,224,043.24
6,449.00	0.54	80.64	6,416.02	20.96	494.86	40.144460	-104.698569	1,296,482.88	3,224,045.14
6,513.00	0.50	112.02	6,480.02	20.90	495.42	40.144460	-104.698567	1,296,482.83	3,224,045.69
6,544.00	0.47	129.15	6,511.02	20.77	495.64	40.144460	-104.698566	1,296,482.70	3,224,045.92
6,576.00	1.49	189.57	6,543.01	20.28	495.67	40.144459	-104.698566	1,296,482.20	3,224,045.96
6,607.00	3.73	192.33	6,573.98	18.89	495.39	40.144455	-104.698567	1,296,480.82	3,224,045.69
6,639.00	6.04	197.85	6,605.86	16.27	494.65	40.144448	-104.698570	1,296,478.19	3,224,044.97
6,670.00	8.98	192.05	6,636.59	12.35	493.65	40.144437	-104.698573	1,296,474.26	3,224,044.00
6,702.00	11.72	189.41	6,668.07	6.70	492.60	40.144421	-104.698577	1,296,468.61	3,224,043.00
6,733.00	14.86	186.75	6,698.23	-0.35	491.61	40.144402	-104.698581	1,296,461.54	3,224,042.08
6,765.00	18.23	185.79	6,728.90	-9.41	490.63	40.144377	-104.698584	1,296,452.48	3,224,041.18
6,796.00	20.63	184.54	6,758.14	-19.68	489.70	40.144349	-104.698587	1,296,442.20	3,224,040.35
6,828.00	23.87	184.09	6,787.75	-31.76	488.80	40.144316	-104.698591	1,296,430.11	3,224,039.55
6,860.00	28.19	182.93	6,816.50	-45.77	487.95	40.144277	-104.698594	1,296,416.09	3,224,038.83
6,891.00	32.38	182.83	6,843.26	-61.38	487.16	40.144234	-104.698596	1,296,400.48	3,224,038.18
6,923.00	35.63	182.24	6,869.78	-79.26	486.38	40.144185	-104.698599	1,296,382.59	3,224,037.56
6,954.00	38.33	181.19	6,894.55	-97.90	485.82	40.144134	-104.698601	1,296,363.95	3,224,037.17
6,986.00	41.67	180.57	6,919.06	-118.46	485.51	40.144078	-104.698602	1,296,343.39	3,224,037.04
7,017.00	44.46	180.13	6,941.70	-139.63	485.38	40.144020	-104.698603	1,296,322.22	3,224,037.11
7,049.00	47.23	179.78	6,963.99	-162.58	485.40	40.143957	-104.698603	1,296,299.27	3,224,037.34
7,080.00	49.72	179.15	6,984.54	-185.79	485.62	40.143893	-104.698602	1,296,276.07	3,224,037.76
7,112.00	52.28	179.38	7,004.68	-210.65	485.94	40.143825	-104.698601	1,296,251.21	3,224,038.31

Design Report for Crowder 38N-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)
7,143.00	53.89	178.73	7,023.30	-235.43	486.35	40.143757	-104.698599	1,296,226.43	3,224,038.94
7,175.00	55.71	178.45	7,041.74	-261.57	487.00	40.143685	-104.698597	1,296,200.30	3,224,039.82
7,206.00	56.90	178.80	7,058.94	-287.36	487.61	40.143614	-104.698595	1,296,174.52	3,224,040.67
7,238.00	58.24	178.04	7,076.10	-314.35	488.36	40.143540	-104.698592	1,296,147.53	3,224,041.66
7,269.00	59.45	177.77	7,092.14	-340.87	489.33	40.143467	-104.698589	1,296,121.04	3,224,042.87
7,301.00	61.04	178.01	7,108.02	-368.63	490.35	40.143391	-104.698585	1,296,093.29	3,224,044.14
7,332.00	62.35	178.09	7,122.72	-395.90	491.28	40.143316	-104.698582	1,296,066.02	3,224,045.32
7,364.00	64.51	178.59	7,137.03	-424.51	492.11	40.143238	-104.698579	1,296,037.42	3,224,046.40
7,395.00	66.80	179.46	7,149.81	-452.75	492.59	40.143160	-104.698577	1,296,009.19	3,224,047.13
7,427.00	70.07	180.06	7,161.57	-482.50	492.71	40.143078	-104.698577	1,295,979.44	3,224,047.53
7,459.00	73.35	180.46	7,171.61	-512.88	492.57	40.142995	-104.698577	1,295,949.06	3,224,047.66
7,490.00	77.71	180.02	7,179.35	-542.89	492.45	40.142913	-104.698578	1,295,919.05	3,224,047.81
7,522.00	82.08	180.42	7,184.97	-574.39	492.32	40.142826	-104.698578	1,295,887.56	3,224,047.97
7,566.00	86.94	180.95	7,189.18	-618.17	491.80	40.142706	-104.698580	1,295,843.78	3,224,047.84
7,606.30	89.06	180.95	7,190.58	-658.44	491.13	40.142595	-104.698582	1,295,803.51	3,224,047.54
7,647.00	91.21	180.95	7,190.48	-699.13	490.46	40.142484	-104.698585	1,295,762.81	3,224,047.23
7,739.00	92.44	181.38	7,187.55	-791.06	488.59	40.142231	-104.698591	1,295,670.87	3,224,046.19
7,831.00	92.56	179.63	7,183.54	-882.97	487.78	40.141979	-104.698594	1,295,578.97	3,224,046.21
7,923.00	92.28	179.94	7,179.65	-974.88	488.12	40.141727	-104.698593	1,295,487.06	3,224,047.38
8,015.00	91.60	179.80	7,176.54	-1,066.83	488.33	40.141474	-104.698592	1,295,395.12	3,224,048.42
8,107.00	90.52	179.84	7,174.84	-1,158.81	488.62	40.141222	-104.698591	1,295,303.15	3,224,049.54
8,199.00	89.85	179.95	7,174.54	-1,250.81	488.79	40.140969	-104.698591	1,295,211.16	3,224,050.53
8,291.00	89.32	179.36	7,175.21	-1,342.81	489.34	40.140717	-104.698589	1,295,119.18	3,224,051.92
8,386.00	89.94	179.50	7,175.82	-1,437.80	490.29	40.140456	-104.698585	1,295,027.20	3,224,053.72
8,480.00	89.81	179.09	7,176.03	-1,531.79	491.45	40.140198	-104.698581	1,294,930.23	3,224,055.72
8,575.00	89.69	178.07	7,176.44	-1,626.76	493.80	40.139937	-104.698573	1,294,835.29	3,224,058.93
8,670.00	89.54	178.67	7,177.08	-1,721.72	496.50	40.139677	-104.698563	1,294,740.36	3,224,062.49
8,764.00	89.63	179.11	7,177.76	-1,815.70	498.32	40.139419	-104.698557	1,294,646.40	3,224,065.16
8,859.00	89.23	179.69	7,178.71	-1,910.69	499.32	40.139158	-104.698553	1,294,551.43	3,224,067.01
8,953.00	90.34	180.40	7,179.06	-2,004.68	499.24	40.138900	-104.698553	1,294,457.44	3,224,067.78
9,048.00	88.52	180.19	7,180.00	-2,099.67	498.75	40.138639	-104.698555	1,294,362.46	3,224,068.15
9,143.00	88.03	178.88	7,182.86	-2,194.63	499.52	40.138379	-104.698552	1,294,267.52	3,224,069.78
9,237.00	88.15	177.65	7,186.00	-2,288.53	502.37	40.138121	-104.698542	1,294,173.65	3,224,073.47
9,332.00	88.27	177.68	7,188.96	-2,383.40	506.24	40.137860	-104.698528	1,294,078.82	3,224,078.19
9,426.00	89.11	177.24	7,191.11	-2,477.29	510.40	40.137603	-104.698514	1,293,984.98	3,224,083.20
9,521.00	91.08	178.12	7,190.95	-2,572.20	514.25	40.137342	-104.698500	1,293,890.11	3,224,087.91
9,616.00	88.98	177.53	7,190.91	-2,667.13	517.85	40.137082	-104.698487	1,293,795.22	3,224,092.37
9,710.00	90.43	178.27	7,191.39	-2,761.06	521.30	40.136824	-104.698475	1,293,701.33	3,224,096.66
9,805.00	89.08	177.85	7,191.80	-2,856.00	524.51	40.136563	-104.698463	1,293,606.42	3,224,100.73
9,899.00	88.21	178.32	7,194.02	-2,949.92	527.65	40.136305	-104.698452	1,293,512.54	3,224,104.72
9,994.00	88.70	178.65	7,196.58	-3,044.85	530.16	40.136045	-104.698443	1,293,417.64	3,224,108.08
10,088.00	89.54	178.43	7,198.02	-3,138.81	532.56	40.135787	-104.698434	1,293,323.71	3,224,111.32

Design Report for Crowder 38N-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)
10,183.00	89.88	180.89	7,198.50	-3,233.80	533.12	40.135526	-104.698432	1,293,228.73	3,224,112.75
10,277.00	89.20	179.09	7,199.26	-3,327.79	533.14	40.135268	-104.698432	1,293,134.75	3,224,113.61
10,372.00	87.69	179.40	7,201.84	-3,422.75	534.39	40.135007	-104.698428	1,293,039.81	3,224,115.72
10,466.00	88.05	179.96	7,205.33	-3,516.68	534.92	40.134750	-104.698426	1,292,945.89	3,224,117.09
10,561.00	88.98	180.91	7,207.79	-3,611.64	534.19	40.134489	-104.698429	1,292,850.93	3,224,117.22
10,655.00	87.41	178.71	7,210.75	-3,705.59	534.50	40.134231	-104.698427	1,292,757.00	3,224,118.38
10,750.00	87.31	178.42	7,215.13	-3,800.46	536.88	40.133971	-104.698419	1,292,662.16	3,224,121.61
10,845.00	87.41	178.69	7,219.51	-3,895.33	539.27	40.133710	-104.698410	1,292,567.32	3,224,124.86
10,939.00	88.24	178.57	7,223.07	-3,989.23	541.52	40.133452	-104.698402	1,292,473.44	3,224,127.95
11,033.00	88.83	178.60	7,225.48	-4,083.17	543.84	40.133194	-104.698394	1,292,379.53	3,224,131.12
11,128.00	89.75	178.45	7,226.65	-4,178.13	546.29	40.132934	-104.698385	1,292,284.60	3,224,134.42
11,222.00	91.05	178.14	7,226.00	-4,272.09	549.08	40.132676	-104.698375	1,292,190.68	3,224,138.07
11,317.00	90.71	177.33	7,224.54	-4,367.00	552.84	40.132415	-104.698362	1,292,095.80	3,224,142.68
11,412.00	89.94	177.27	7,224.00	-4,461.89	557.31	40.132155	-104.698346	1,292,000.96	3,224,148.01
11,506.00	90.80	176.84	7,223.39	-4,555.76	562.14	40.131897	-104.698329	1,291,907.14	3,224,153.68
11,601.00	90.03	177.69	7,222.70	-4,650.65	566.67	40.131637	-104.698312	1,291,812.30	3,224,159.07
11,696.00	89.78	177.62	7,222.86	-4,745.57	570.56	40.131376	-104.698299	1,291,717.42	3,224,163.81
11,790.00	89.14	178.33	7,223.75	-4,839.51	573.88	40.131118	-104.698287	1,291,623.52	3,224,167.98
11,885.00	88.03	177.86	7,226.09	-4,934.43	577.04	40.130858	-104.698275	1,291,528.64	3,224,171.99
11,980.00	88.18	177.69	7,229.23	-5,029.30	580.73	40.130597	-104.698262	1,291,433.81	3,224,176.53
12,074.00	88.52	176.86	7,231.94	-5,123.16	585.19	40.130340	-104.698246	1,291,340.00	3,224,181.85
12,169.00	89.17	176.99	7,233.86	-5,218.00	590.29	40.130079	-104.698228	1,291,245.21	3,224,187.80
12,275.00	89.66	176.94	7,234.94	-5,323.84	595.90	40.129789	-104.698208	1,291,139.43	3,224,194.36
12,367.00	89.94	177.03	7,235.26	-5,415.72	600.74	40.129537	-104.698191	1,291,047.61	3,224,200.03
12,458.00	90.99	178.42	7,234.52	-5,506.64	604.35	40.129287	-104.698178	1,290,956.72	3,224,204.46
12,551.00	91.08	178.17	7,232.84	-5,599.58	607.12	40.129032	-104.698168	1,290,863.81	3,224,208.07
12,643.00	90.80	179.14	7,231.33	-5,691.54	609.28	40.128779	-104.698160	1,290,771.88	3,224,211.05
12,737.00	90.99	179.23	7,229.86	-5,785.52	610.61	40.128521	-104.698155	1,290,677.92	3,224,213.24
12,832.00	91.02	178.99	7,228.20	-5,880.50	612.09	40.128261	-104.698150	1,290,582.97	3,224,215.57
12,927.00	91.14	179.56	7,226.41	-5,975.47	613.29	40.128000	-104.698146	1,290,488.01	3,224,217.63
13,021.00	91.08	178.99	7,224.59	-6,069.45	614.48	40.127742	-104.698142	1,290,394.05	3,224,219.67
13,116.00	91.05	178.64	7,222.82	-6,164.41	616.44	40.127481	-104.698135	1,290,299.12	3,224,222.49
13,211.00	90.96	178.66	7,221.15	-6,259.37	618.68	40.127221	-104.698127	1,290,204.19	3,224,225.58
13,305.00	91.39	178.23	7,219.23	-6,353.31	621.23	40.126963	-104.698117	1,290,110.27	3,224,228.98
13,400.00	90.09	179.15	7,218.00	-6,448.28	623.40	40.126702	-104.698110	1,290,015.33	3,224,232.00
13,494.00	90.06	178.63	7,217.88	-6,542.26	625.22	40.126444	-104.698103	1,289,921.38	3,224,234.67
13,589.00	90.25	179.89	7,217.62	-6,637.25	626.45	40.126183	-104.698099	1,289,826.41	3,224,236.76
13,683.00	89.45	178.68	7,217.87	-6,731.24	627.62	40.125925	-104.698095	1,289,732.43	3,224,238.78
13,778.00	90.12	180.13	7,218.22	-6,826.23	628.61	40.125665	-104.698091	1,289,637.46	3,224,240.62
13,873.00	90.12	180.12	7,218.02	-6,921.23	628.40	40.125404	-104.698092	1,289,542.47	3,224,241.27
13,967.00	89.85	179.17	7,218.05	-7,015.23	628.99	40.125146	-104.698090	1,289,448.48	3,224,242.70
14,062.00	90.52	180.68	7,217.74	-7,110.22	629.11	40.124885	-104.698089	1,289,353.49	3,224,243.68

Design Report for Crowder 38N-19HZ - Actual Field Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	+E/-W (ft)	Geographic Coordinates Latitude (ft)	Longitude (ft)	UTM Coordinates Northing (ft)	Easting (ft)
14,156.00	90.12	180.60	7,217.22	-7,204.21	628.06	40.124627	-104.698093	1,289,259.50	3,224,243.48
14,251.00	90.06	181.94	7,217.07	-7,299.19	625.95	40.124366	-104.698101	1,289,164.51	3,224,242.23
14,345.00	90.09	183.10	7,216.94	-7,393.10	621.82	40.124109	-104.698115	1,289,070.58	3,224,238.94
14,440.00	89.81	183.58	7,217.03	-7,487.93	616.29	40.123848	-104.698135	1,288,975.70	3,224,234.26
14,535.00	89.97	183.64	7,217.21	-7,582.75	610.31	40.123588	-104.698157	1,288,880.84	3,224,229.14
14,629.00	90.99	184.00	7,216.42	-7,676.53	604.04	40.123331	-104.698179	1,288,787.00	3,224,223.72
14,724.00	91.20	182.16	7,214.61	-7,771.37	598.94	40.123070	-104.698197	1,288,692.12	3,224,219.47
14,818.00	91.73	182.14	7,212.20	-7,865.28	595.41	40.122812	-104.698210	1,288,598.20	3,224,216.80
14,913.00	91.57	178.46	7,209.47	-7,960.22	594.92	40.122552	-104.698212	1,288,503.26	3,224,217.15
15,008.00	91.88	178.52	7,206.61	-8,055.14	597.42	40.122291	-104.698203	1,288,408.36	3,224,220.51
15,102.00	90.77	177.15	7,204.43	-8,149.05	600.97	40.122034	-104.698190	1,288,314.50	3,224,224.91
15,197.00	90.03	176.56	7,203.77	-8,243.90	606.18	40.121773	-104.698171	1,288,219.70	3,224,230.98
15,291.00	90.31	176.01	7,203.49	-8,337.70	612.27	40.121516	-104.698150	1,288,125.96	3,224,237.91
15,386.00	89.97	174.99	7,203.26	-8,432.41	619.73	40.121256	-104.698123	1,288,031.33	3,224,246.22
15,480.00	89.44	175.80	7,203.74	-8,526.10	627.27	40.120998	-104.698096	1,287,937.71	3,224,254.61
15,575.00	90.71	176.72	7,203.62	-8,620.90	633.47	40.120738	-104.698074	1,287,842.98	3,224,261.66
15,670.00	91.02	176.22	7,202.18	-8,715.71	639.32	40.120478	-104.698053	1,287,748.23	3,224,268.36
15,764.00	91.69	176.40	7,199.96	-8,809.48	645.37	40.120221	-104.698031	1,287,654.52	3,224,275.26
15,859.00	92.06	176.07	7,196.85	-8,904.23	651.60	40.119961	-104.698009	1,287,559.84	3,224,282.35
15,954.00	91.63	175.95	7,193.79	-8,998.95	658.21	40.119701	-104.697986	1,287,465.19	3,224,289.81
16,048.00	90.43	176.65	7,192.10	-9,092.73	664.27	40.119443	-104.697964	1,287,371.46	3,224,296.72
16,143.00	89.88	175.86	7,191.85	-9,187.53	670.48	40.119183	-104.697942	1,287,276.73	3,224,303.78
16,237.00	90.25	175.54	7,191.74	-9,281.27	677.53	40.118926	-104.697916	1,287,183.07	3,224,311.67
16,332.00	90.09	175.11	7,191.46	-9,375.95	685.27	40.118666	-104.697889	1,287,088.46	3,224,320.26
16,426.00	89.82	174.13	7,191.53	-9,469.53	694.08	40.118409	-104.697857	1,286,994.96	3,224,329.92
16,507.00	90.28	172.34	7,191.46	-9,549.97	703.62	40.118188	-104.697823	1,286,914.62	3,224,340.19
16,553.00	90.28	172.34	7,191.24	-9,595.55	709.75	40.118063	-104.697801	1,286,869.09	3,224,346.73

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	+E/-W (ft)	Comment
25.00	25.00	0.00	0.00	H&P 308: RKB = 25ft
125.00	125.00	0.13	-0.13	First MS Energy Services Gyro @ 125.00ft
1,004.00	1,003.97	6.85	-0.89	Final MS Energy Services Gyro @ 1004.00ft
1,004.00	1,003.97	6.85	-0.89	Tie-On to Surface Gyros @ 1004.00ft
1,172.00	1,171.97	7.62	-0.89	First Sperry MWD Survey @ 1172.00ft
16,507.00	7,191.46	-9,549.97	703.62	Final Sperry MWD Survey @ 16507.00ft
16,553.00	7,191.24	-9,595.55	709.75	Straight Line Proj @ 16553' MD :: 7191.24' TVD

Design Report for Crowder 38N-19HZ - Actual Field Surveys

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (ft)	Origin +E/-W (ft)	Start TVD (ft)
User	No Target (Freehand)	179.03	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
25.00	1,004.00	MS Energy Services - Surface Gyros	NS-GYRO-MS
1,172.00	7,566.00	Sperry MWD Surveys - Vert/Build	MWD+SC
7,647.00	16,507.00	Sperry MWD Surveys - Lateral	MWD+SC

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,606.30	7,190.58	7" Intermediate Casing @ 7606.3' MD :: 7190.58'	7	8-3/4

Targets for Plan C Rev 0

Shape	Target Name	TVD (ft)	Northing (ft)	Easting (ft)	+N/-S ft	+E/-W ft	Created	Updated
Polygon	Crowder 38N-19HZ_18/19	0.00	1,296,457.46	3,223,550.51	0.00	0.00	07-24-2012	02-13-2013
Polygon	Crowder 38N-19HZ_LD	0.00	1,296,457.46	3,223,550.51	0.00	0.00	07-24-2012	02-13-2013
Polygon	Crowder 38N-19HZ_Sec	0.00	1,296,457.46	3,223,550.51	0.00	0.00	07-24-2012	02-13-2013
Point	Crowder 38N-19HZ_SHL	0.00	1,296,457.46	3,223,550.51	0.00	0.00	07-24-2012	02-13-2013
Point	Crowder 38N-19HZ_BHL	7,187.00	1,286,845.68	3,224,289.40	-9,618.45	652.21	07-24-2012	02-27-2013

North Reference Sheet for Sec. 18-T2N-R65W - Crowder 38N-19HZ - Plan C 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 @ 4977.00ft (HP 308). Northing and Easting are relative to Crowder 38N-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: 0.99995856

Grid Coordinates of Well: 1,296,457.46 ft N, 3,223,550.51 ft E

Geographical Coordinates of Well: 40° 08' 39.85" N, 104° 42' 01.22" W

Grid Convergence at Surface is: 0.52°

Based upon Minimum Curvature type calculations, at a Measured Depth of 16,553.00ft

the Bottom Hole Displacement is 9,621.77ft in the Direction of 175.77° (True).

Magnetic Convergence at surface is: -8.11° (12 March 2013, , BGGM2012)

