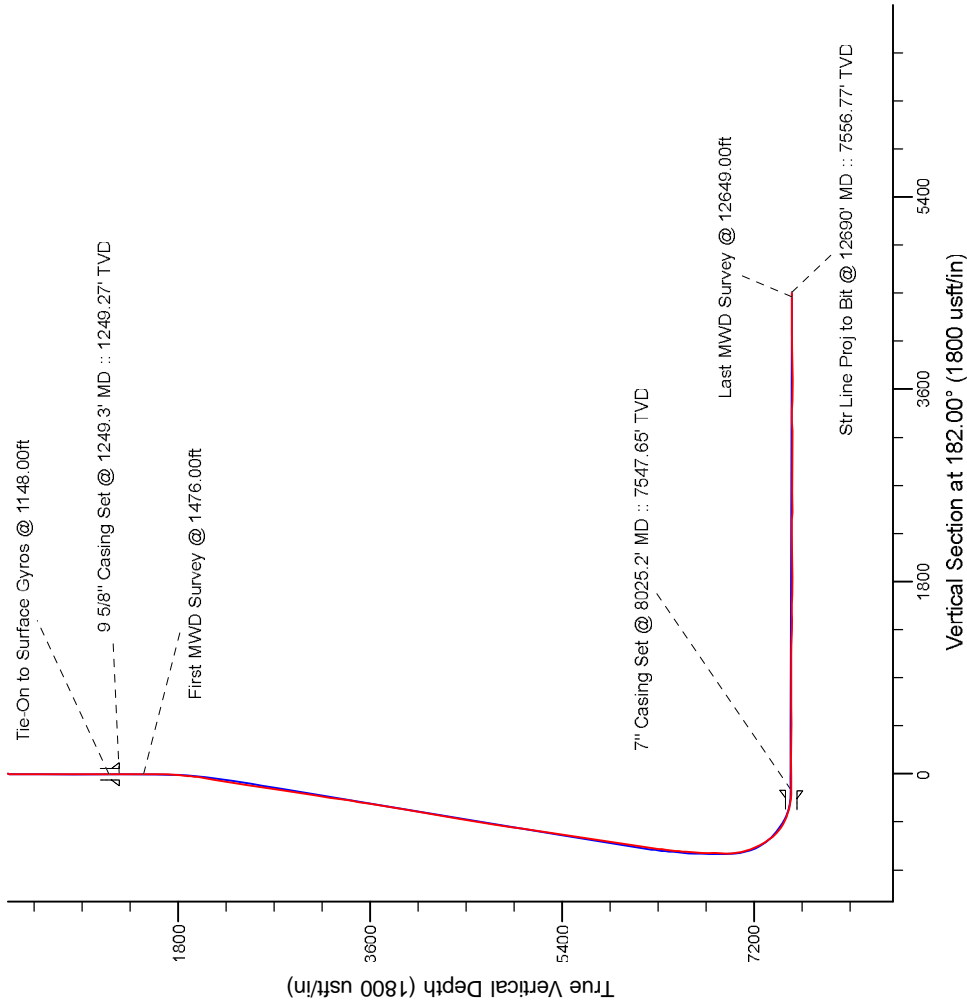
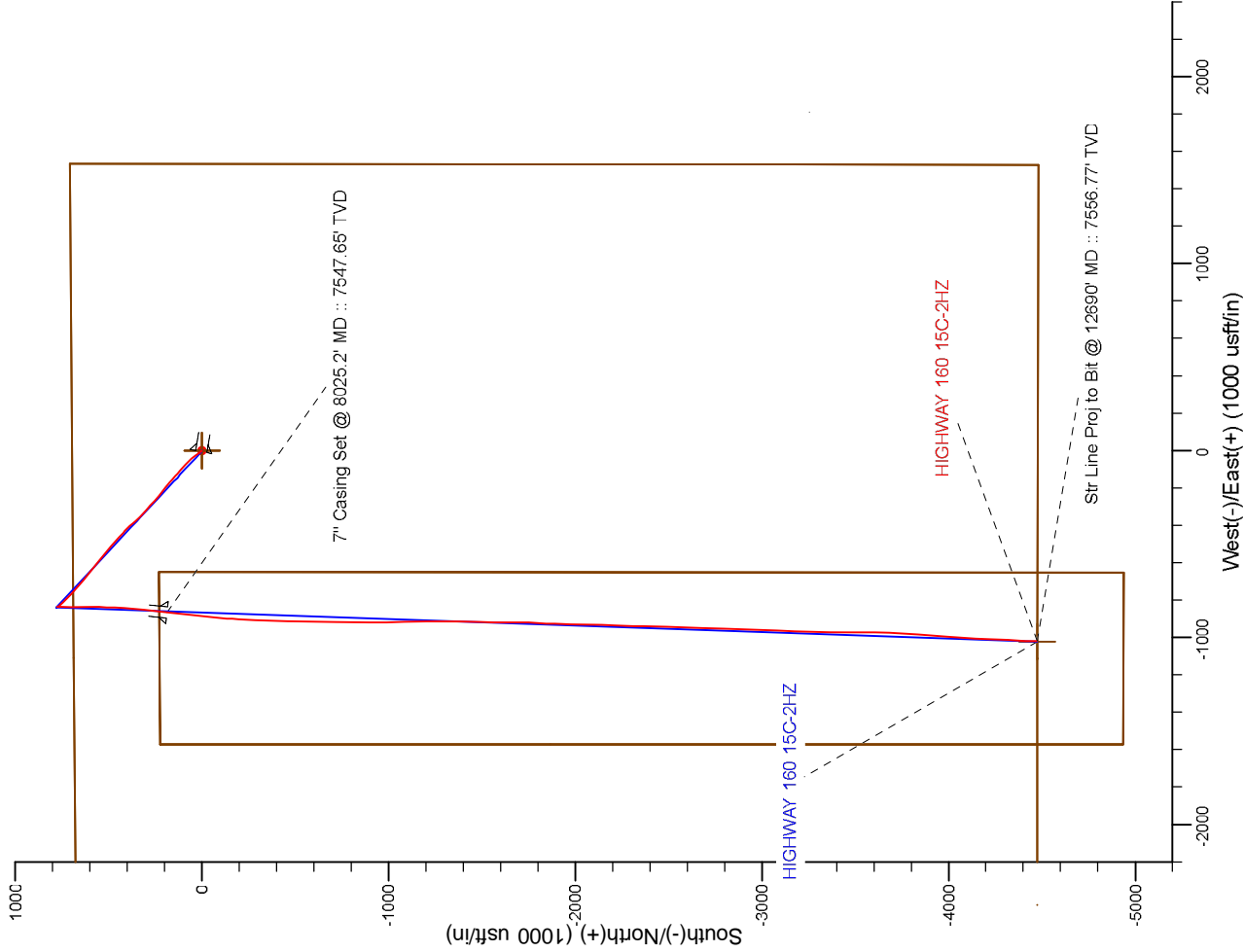


LEGEND

- △— HIGHWAY 160 15C-2HZ, Plan C, Rev C2 V0
- Actual Field Surveys



7" Casing: ~503.55' FNL, ~2397.54' FEL  
Lat/Long: 40.085960 N, -104.743406 E  
State Planes - CO Northern: 1,275,063.03' N, 3,211,692.92' E  
Location: Sec. 2-T1N-R66W

BHL: ~2.28' FSL, ~2548.28' FEL  
Lat/Long: 40.073169 N, -104.743959 E  
State Planes - CO Northern: 1,270,402.24' N, 3,211,577.97' E  
Location: Sec. 2-T1N-R66W

WELL DETAILS: HIGHWAY 160 15C-2HZ

Ground Level: 5102.00  
RKB = 13' @ 5115.00usft (Ensign 132)

Design: Actual Field Surveys (HIGHWAY 160 15C-2HZ/Plan C)  
Created By: Clint Eshelman Date: 1/6/2013  
Reviewed: \_\_\_\_\_

# Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 2-T1N-R66W

HIGHWAY 160 15C-2HZ

Plan C

Design: Actual Field Surveys

## Sperry Drilling Services

### Standard Report

06 January, 2014

Well Coordinates: 1,274,884.32 N, 3,212,560.05 E (40° 05' 07.62" N, 104° 44' 25.12" W)

Ground Level: 5,102.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well HIGHWAY 160 15C-2HZ

RKB = 13' @ 5115.00usft (Ensign 132)

N

True

API - US Survey Feet - Custom

## HALLIBURTON

**Design Report for HIGHWAY 160 15C-2HZ - Actual Field Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.00	0.00	0.00	13.00	0.00	0.00	0.00	0.00
113.00	0.57	347.71	113.00	0.49	-0.11	-0.48	0.57
213.00	0.55	329.08	212.99	1.38	-0.46	-1.37	0.18
313.00	0.46	343.17	312.99	2.18	-0.82	-2.15	0.15
413.00	0.31	355.46	412.99	2.83	-0.96	-2.80	0.17
513.00	0.31	312.34	512.99	3.29	-1.18	-3.24	0.23
613.00	0.28	287.21	612.98	3.54	-1.61	-3.48	0.13
713.00	0.43	293.53	712.98	3.76	-2.19	-3.68	0.15
813.00	0.44	304.61	812.98	4.13	-2.85	-4.03	0.08
913.00	0.25	312.55	912.98	4.50	-3.33	-4.38	0.20
1,013.00	0.32	290.99	1,012.98	4.74	-3.75	-4.61	0.13
1,113.00	0.29	284.13	1,112.98	4.91	-4.26	-4.75	0.05
1,148.00	0.25	267.43	1,147.98	4.92	-4.42	-4.77	0.25
<b>Tie-On to Surface Gyros @ 1148.00ft</b>							
1,249.30	0.16	280.57	1,249.27	4.94	-4.78	-4.77	0.10
<b>9 5/8" Casing Set @ 1249.3' MD :: 1249.27' TVD</b>							
1,476.00	0.13	22.48	1,475.97	5.23	-4.99	-5.06	0.10
<b>First MWD Survey @ 1476.00ft</b>							
1,572.00	0.19	136.94	1,571.97	5.22	-4.84	-5.05	0.28
1,666.00	2.33	319.37	1,665.95	6.56	-5.98	-6.34	2.68
1,760.00	3.71	319.39	1,759.82	10.31	-9.20	-9.99	1.47
1,855.00	7.01	324.18	1,854.39	17.35	-14.60	-16.83	3.50
1,949.00	8.97	327.57	1,947.47	28.19	-21.88	-27.41	2.14
2,043.00	11.33	325.84	2,040.00	42.02	-31.00	-40.91	2.53
2,135.00	12.81	321.33	2,129.96	57.46	-42.45	-55.94	1.91
2,230.00	14.24	313.78	2,222.33	73.77	-57.47	-71.72	2.39
2,324.00	14.99	310.91	2,313.29	89.73	-75.00	-87.06	1.11
2,418.00	13.16	310.80	2,404.46	104.68	-92.29	-101.40	1.95
2,512.00	12.58	311.22	2,496.10	118.42	-108.09	-114.58	0.62
2,606.00	11.84	311.27	2,587.98	131.53	-123.04	-127.15	0.79
2,700.00	13.76	311.85	2,679.64	145.35	-138.62	-140.42	2.05
2,794.00	13.05	310.35	2,771.07	159.68	-155.03	-154.17	0.84
2,888.00	14.01	310.86	2,862.46	173.99	-171.73	-167.89	1.03
2,982.00	13.15	308.96	2,953.84	188.16	-188.65	-181.46	1.03
3,076.00	14.56	309.55	3,045.10	202.41	-206.07	-195.09	1.51
3,171.00	14.32	308.98	3,137.10	217.40	-224.41	-209.44	0.29
3,265.00	14.16	308.69	3,228.21	231.90	-242.42	-223.30	0.19
3,359.00	13.83	307.49	3,319.42	245.93	-260.31	-236.69	0.47
3,454.00	14.21	314.12	3,411.59	260.96	-277.69	-251.11	1.74
3,549.00	13.54	313.33	3,503.82	276.70	-294.15	-266.27	0.73
3,644.00	14.27	312.63	3,596.04	292.27	-310.86	-281.24	0.79
3,739.00	13.35	310.13	3,688.29	307.26	-327.86	-295.63	1.15
3,835.00	13.82	317.44	3,781.61	322.85	-344.09	-310.65	1.85
3,930.00	12.96	315.31	3,874.03	338.79	-359.25	-326.04	1.04
4,025.00	13.82	317.46	3,966.45	354.72	-374.42	-341.44	1.05
4,120.00	12.83	317.54	4,058.89	370.86	-389.21	-357.05	1.04
4,215.00	14.48	317.34	4,151.20	387.38	-404.38	-373.03	1.74
4,311.00	13.34	317.68	4,244.38	404.39	-419.97	-389.49	1.19
4,419.00	14.66	313.02	4,349.18	422.93	-438.35	-407.38	1.61

**Design Report for HIGHWAY 160 15C-2HZ - Actual Field Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,501.00	14.71	313.24	4,428.50	437.14	-453.52	-421.05	0.09
4,596.00	13.55	312.68	4,520.62	452.95	-470.49	-436.25	1.23
4,691.00	14.24	309.51	4,612.84	467.93	-487.69	-450.62	1.08
4,786.00	13.69	309.16	4,705.03	482.46	-505.42	-464.53	0.59
4,881.00	14.59	309.66	4,797.16	497.20	-523.35	-478.63	0.96
4,976.00	13.16	311.75	4,889.38	512.04	-540.63	-492.86	1.59
5,071.00	14.65	310.80	4,981.59	527.09	-557.79	-507.30	1.59
5,167.00	13.32	309.26	5,074.75	542.02	-575.55	-521.60	1.44
5,262.00	13.74	308.40	5,167.11	555.95	-592.86	-534.92	0.49
5,357.00	14.23	309.16	5,259.29	570.33	-610.76	-548.67	0.55
5,452.00	12.93	308.08	5,351.64	584.26	-628.18	-561.98	1.39
5,547.00	13.98	308.35	5,444.03	597.94	-645.54	-575.05	1.11
5,642.00	14.65	309.79	5,536.08	612.75	-663.77	-589.21	0.80
5,738.00	12.22	308.10	5,629.44	626.79	-681.10	-602.64	2.56
5,833.00	13.29	305.44	5,722.10	639.32	-697.91	-614.58	1.28
5,928.00	13.19	311.21	5,814.58	652.80	-714.96	-627.45	1.39
6,022.00	13.53	312.78	5,906.04	667.33	-731.10	-641.41	0.53
6,117.00	13.27	312.65	5,998.45	682.27	-747.27	-655.77	0.28
6,212.00	14.04	314.21	6,090.76	697.69	-763.55	-670.62	0.90
6,307.00	12.16	311.57	6,183.29	712.36	-779.30	-684.73	2.08
6,402.00	12.40	316.53	6,276.12	726.41	-793.80	-698.26	1.14
6,497.00	10.32	315.60	6,369.25	739.89	-806.78	-711.28	2.20
6,592.00	8.70	315.55	6,462.94	751.10	-817.76	-722.10	1.71
6,687.00	6.63	316.57	6,557.09	760.21	-826.56	-730.90	2.18
6,782.00	4.25	325.59	6,651.65	767.10	-832.32	-737.58	2.65
6,878.00	2.22	342.74	6,747.50	771.81	-834.89	-742.20	2.32
6,973.00	0.59	51.94	6,842.47	773.87	-835.05	-744.26	2.19
7,068.00	0.37	15.71	6,937.47	774.47	-834.58	-744.87	0.38
7,116.00	3.00	195.80	6,985.45	773.41	-834.88	-743.80	7.02
7,163.00	6.94	185.90	7,032.26	769.40	-835.51	-739.77	8.55
7,211.00	11.30	183.62	7,079.65	761.82	-836.10	-732.17	9.11
7,258.00	16.34	179.37	7,125.27	750.60	-836.32	-720.96	10.93
7,306.00	20.68	181.53	7,170.78	735.37	-836.47	-705.73	9.15
7,353.00	24.45	181.41	7,214.17	717.34	-836.93	-687.70	8.02
7,401.00	27.52	180.78	7,257.31	696.32	-837.33	-666.67	6.42
7,448.00	30.79	179.39	7,298.35	673.43	-837.35	-643.79	7.10
7,496.00	34.13	179.30	7,338.85	647.67	-837.05	-618.06	6.96
7,543.00	39.57	178.82	7,376.45	619.50	-836.58	-589.92	11.59
7,591.00	46.94	180.73	7,411.38	586.63	-836.49	-557.08	15.59
7,638.00	53.77	182.56	7,441.35	550.48	-837.56	-520.92	14.84
7,686.00	59.75	182.49	7,467.65	510.39	-839.33	-480.79	12.46
7,733.00	65.35	181.44	7,489.31	468.73	-840.75	-439.10	12.08
7,781.00	69.14	183.53	7,507.87	424.51	-842.68	-394.85	8.86
7,829.00	73.76	184.62	7,523.14	379.14	-845.91	-349.38	9.86
7,877.00	79.00	185.21	7,534.44	332.68	-849.91	-302.81	10.98
7,924.00	82.81	186.26	7,541.87	286.51	-854.55	-256.51	8.40
7,955.00	85.53	186.26	7,545.02	255.85	-857.91	-225.76	8.77
7,987.00	88.00	186.31	7,546.82	224.10	-861.41	-193.90	7.72
8,025.20	89.51	186.30	7,547.65	186.14	-865.61	-155.82	3.96
<b>7" Casing Set @ 8025.2' MD :: 7547.65' TVD</b>							
8,060.00	90.89	186.30	7,547.53	151.55	-869.43	-121.12	3.96

**Design Report for HIGHWAY 160 15C-2HZ - Actual Field Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
8,155.00	90.49	186.17	7,546.39	57.12	-879.74	-26.38	0.44
8,250.00	90.34	185.65	7,545.70	-37.37	-889.53	68.39	0.57
8,345.00	90.00	184.86	7,545.42	-131.97	-898.23	163.24	0.91
8,440.00	88.74	182.67	7,546.46	-226.75	-904.46	258.18	2.66
8,536.00	88.86	181.94	7,548.47	-322.65	-908.32	354.16	0.77
8,631.00	89.17	181.59	7,550.10	-417.59	-911.25	449.14	0.49
8,726.00	89.32	180.85	7,551.36	-512.56	-913.27	544.12	0.79
8,821.00	90.18	181.60	7,551.77	-607.54	-915.30	639.11	1.20
8,916.00	90.28	181.00	7,551.39	-702.51	-917.46	734.10	0.64
9,011.00	90.25	180.92	7,550.95	-797.50	-919.05	829.09	0.09
9,106.00	89.69	180.09	7,551.00	-892.49	-919.89	924.05	1.05
9,202.00	90.06	179.42	7,551.21	-988.49	-919.48	1,019.98	0.80
9,297.00	88.83	177.89	7,552.13	-1,083.46	-917.25	1,114.81	2.07
9,392.00	90.12	178.86	7,553.00	-1,178.41	-914.55	1,209.61	1.70
9,487.00	88.71	180.20	7,553.97	-1,273.40	-913.77	1,304.51	2.05
9,583.00	88.46	180.63	7,556.34	-1,369.37	-914.47	1,400.45	0.52
9,678.00	90.22	181.98	7,557.43	-1,464.33	-916.63	1,495.43	2.33
9,773.00	89.20	180.41	7,557.91	-1,559.30	-918.61	1,590.41	1.97
9,868.00	88.21	180.11	7,560.06	-1,654.28	-919.04	1,685.34	1.09
9,963.00	90.28	182.11	7,561.31	-1,749.24	-920.88	1,780.31	3.03
10,058.00	92.53	182.77	7,558.98	-1,844.12	-924.93	1,875.28	2.47
10,153.00	90.89	181.69	7,556.15	-1,939.00	-928.62	1,970.23	2.07
10,280.00	88.95	180.54	7,556.33	-2,065.97	-931.09	2,097.20	1.78
10,375.00	90.65	181.66	7,556.66	-2,160.94	-932.92	2,192.19	2.14
10,439.00	90.55	182.64	7,555.99	-2,224.90	-935.32	2,256.18	1.54
10,566.00	88.43	180.55	7,557.12	-2,351.83	-938.85	2,383.16	2.34
10,629.00	89.11	181.03	7,558.47	-2,414.81	-939.72	2,446.13	1.32
10,724.00	91.14	182.10	7,558.26	-2,509.76	-942.32	2,541.12	2.42
10,819.00	90.49	181.72	7,556.91	-2,604.70	-945.48	2,636.11	0.79
10,915.00	90.06	182.27	7,556.45	-2,700.64	-948.82	2,732.11	0.73
11,010.00	89.54	182.38	7,556.78	-2,795.56	-952.68	2,827.11	0.56
11,105.00	88.98	182.34	7,558.01	-2,890.47	-956.59	2,922.10	0.59
11,200.00	89.78	182.09	7,559.04	-2,985.40	-960.26	3,017.09	0.88
11,295.00	89.26	181.02	7,559.83	-3,080.36	-962.84	3,112.08	1.25
11,390.00	91.02	182.11	7,559.60	-3,175.31	-965.43	3,207.07	2.18
11,486.00	91.05	181.95	7,557.87	-3,271.24	-968.83	3,303.06	0.17
11,581.00	89.05	180.50	7,557.79	-3,366.21	-970.86	3,398.04	2.60
11,676.00	88.12	180.74	7,560.13	-3,461.17	-971.89	3,492.98	1.01
11,771.00	89.01	180.34	7,562.51	-3,556.14	-972.79	3,587.92	1.03
11,866.00	90.28	181.70	7,563.10	-3,651.12	-974.48	3,682.90	1.96
11,961.00	91.05	183.36	7,562.00	-3,746.01	-978.67	3,777.89	1.93
12,056.00	91.79	183.86	7,559.64	-3,840.80	-984.65	3,872.82	0.94
12,151.00	91.42	184.32	7,556.98	-3,935.52	-991.42	3,967.72	0.62
12,246.00	90.74	183.80	7,555.19	-4,030.26	-998.15	4,062.64	0.90
12,341.00	89.78	183.00	7,554.76	-4,125.09	-1,003.78	4,157.61	1.32
12,437.00	89.63	183.17	7,555.25	-4,220.95	-1,008.95	4,253.59	0.24
12,532.00	89.94	182.65	7,555.61	-4,315.83	-1,013.77	4,348.58	0.64
12,627.00	89.57	182.36	7,556.02	-4,410.73	-1,017.92	4,443.57	0.49
12,649.00	89.26	182.32	7,556.24	-4,432.71	-1,018.82	4,465.57	1.42
<b>Last MWD Survey @ 12649.00ft</b>							
12,690.00	89.26	182.32	7,556.77	-4,473.68	-1,020.48	4,506.57	0.00

**Design Report for HIGHWAY 160 15C-2HZ - Actual Field Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
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Str Line Proj to Bit @ 12690' MD :: 7556.77' TVD

**Design Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,148.00	1,147.98	4.92	-4.42	Tie-On to Surface Gyros @ 1148.00ft
1,476.00	1,475.97	5.23	-4.99	First MWD Survey @ 1476.00ft
12,649.00	7,556.24	-4,432.71	-1,018.82	Last MWD Survey @ 12649.00ft
12,690.00	7,556.77	-4,473.68	-1,020.48	Str Line Proj to Bit @ 12690' MD :: 7556.77' TVD

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	182.00	Slot	0.00	0.00	0.00

**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool
13.00	1,148.00	MS Energy Gyros	NS-GYRO-MS
1,476.00	8,155.00	MWD Vertical/Build Surveys	MWD+IFR1+SC
8,250.00	12,690.00	MWD Lateral Surveys	MWD+IFR1+SC

**Casing Details**

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,249.30	1,249.27	9 5/8" Casing Set @ 1249.3' MD :: 1249.27' TVD	9-5/8	13-1/2
8,025.20	7,547.65	7" Casing Set @ 8025.2' MD :: 7547.65' TVD	7	8-3/4

**Design Report for HIGHWAY 160 15C-2H - Actual Field Surveys****Wellbore Targets**

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
HIGHWAY 160 15C-2H - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	1,274,884.32	3,212,560.05	40° 5' 7.616 N	104° 44' 25.123 W
HIGHWAY 160 15C-2H - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,274,884.32	3,212,560.05	40° 5' 7.616 N	104° 44' 25.123 W
Point 1				0.00	224.11	-1,570.94	1,275,094.96	3,210,987.31	
Point 2				0.00	231.38	-650.91	1,275,110.11	3,211,907.21	
Point 3				0.00	-3,170.71	-651.04	1,271,708.27	3,211,936.22	
Point 4				0.00	-4,936.76	-652.94	1,269,942.34	3,211,949.45	
Point 5				0.00	-4,934.94	-1,572.98	1,269,936.28	3,211,029.47	
Point 6				0.00	-1,864.78	-1,570.83	1,273,006.23	3,211,005.32	
Point 7				0.00	224.11	-1,570.94	1,275,094.96	3,210,987.31	
HIGHWAY 160 15C-2H - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,274,884.32	3,212,560.05	40° 5' 7.616 N	104° 44' 25.123 W
Point 1				0.00	666.85	-3,754.18	1,275,518.96	3,208,800.44	
Point 2				0.00	687.78	-1,110.95	1,275,562.53	3,211,443.29	
Point 3				0.00	708.64	1,532.11	1,275,606.03	3,214,085.98	
Point 4				0.00	-1,863.50	1,531.72	1,273,034.08	3,214,107.62	
Point 5				0.00	-3,172.50	1,529.94	1,271,725.17	3,214,117.05	
Point 6				0.00	-4,480.89	1,527.89	1,270,416.86	3,214,126.21	
Point 7				0.00	-4,478.54	208.25	1,270,407.90	3,212,806.65	
Point 8				0.00	-4,475.79	-1,111.19	1,270,399.35	3,211,487.29	
Point 9				0.00	-4,473.32	-2,430.65	1,270,390.52	3,210,167.91	
Point 10				0.00	-4,470.73	-3,750.00	1,270,381.80	3,208,848.64	
Point 11				0.00	-1,865.50	-3,734.70	1,272,986.97	3,208,841.62	
Point 12				0.00	666.85	-3,754.18	1,275,518.96	3,208,800.44	
HIGHWAY 160 15C-2H - actual wellpath misses target center by 2.86usft at 12690.00usft MD (7556.77 TVD, -4473.68 N, -1020.48 E) - Point	0.00	0.00	7,555.00	-4,474.92	-1,022.34	1,270,400.98	3,211,576.12	40° 4' 23.394 N	104° 44' 38.274 W

**Directional Difficulty Index**

Average Dogleg over Survey:	1.82 °/100usft	Maximum Dogleg over Survey:	15.59 °/100usft at 7,591.00 usft
Net Tortousity applicable to Plans:	0.87 °/100usft	Directional Difficulty Index:	6,393

**Audit Info**

**North Reference Sheet for Sec. 2-T1N-R66W - HIGHWAY 160 15C-2HZ - Plan C**

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

Vertical Depths are relative to RKB = 13' @ 5115.00usft (Ensign 132). Northing and Easting are relative to HIGHWAY 160 15C-2HZ

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° 30' 0.000 W°, Longitude Origin: 0° 0' 0.000 E°, Latitude Origin: 40° 47' 0.000 N°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996099

Grid Coordinates of Well: 1,274,884.32 usft N, 3,212,560.05 usft E

Geographical Coordinates of Well: 40° 05' 07.62" N, 104° 44' 25.12" W

Grid Convergence at Surface is: 0.49°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,690.00usft

the Bottom Hole Displacement is 4,588.59usft in the Direction of 192.85° ( True).

Magnetic Convergence at surface is: -8.05° (14 October 2013, , BGGM2013)

