

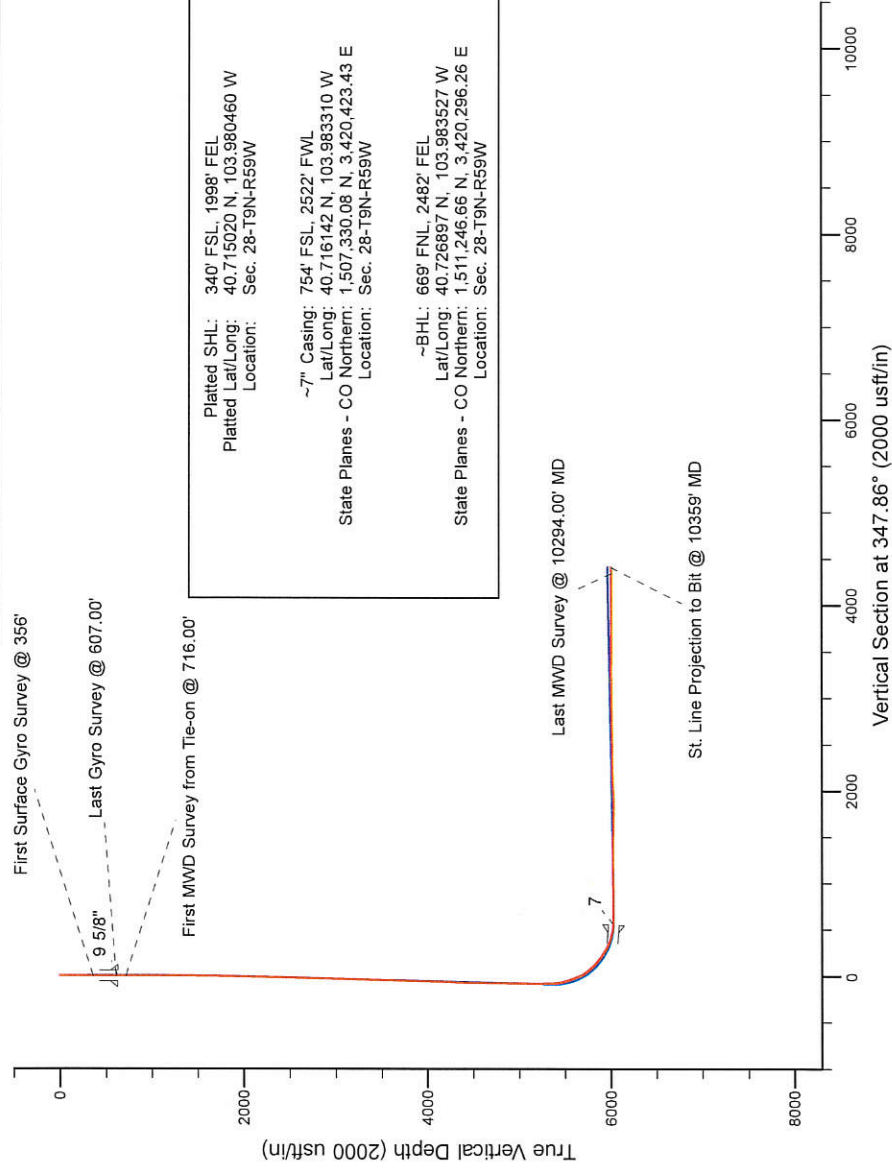
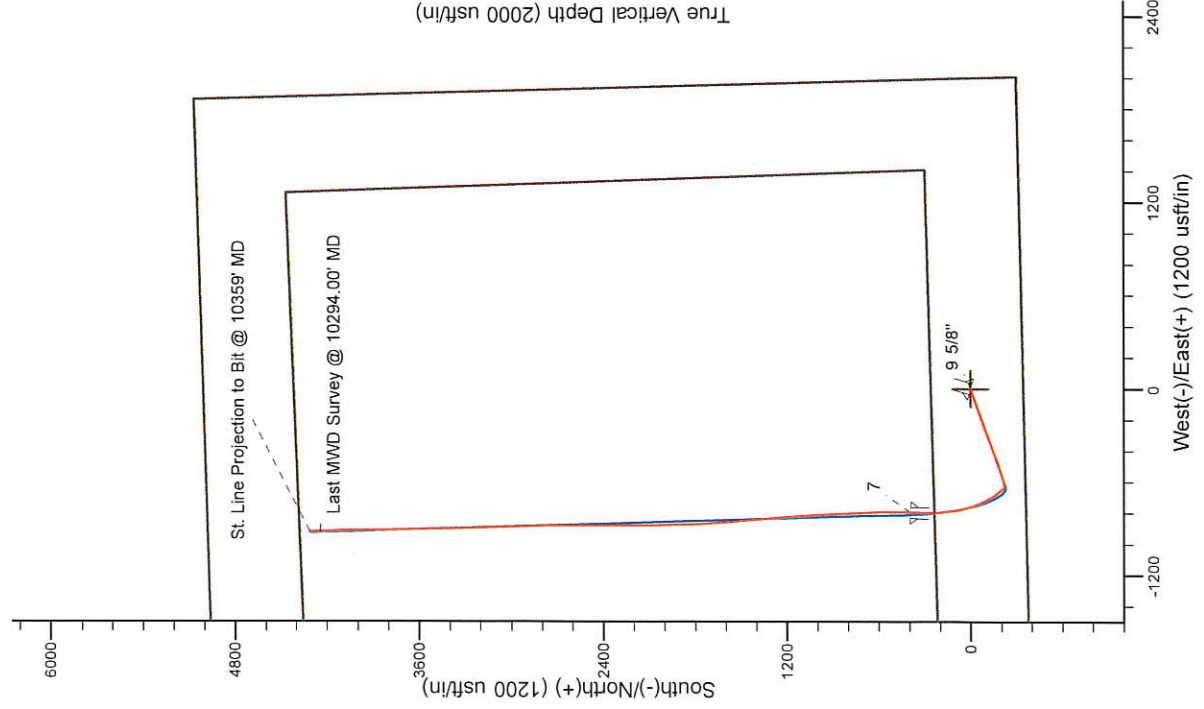
Project: Weld County, CO (NAD 83)  
Site: Sec. 28-T9N-R59W (LC28-15-A)  
Well: Rainbow LC28-76-1BHNA  
Wellbore: Plan C  
Design: Filed Surveys

# Noble Energy



## LEGEND

- Rainbow LC28-76-1BHNA, Plan C, Rev C0 - PROPOSAL V0
- Filed Surveys



Platted SHL: 340' FSL 1998' FEL  
Platted Lat/Long: 40.715020 N, 103.980460 W  
Location: Sec. 28-T9N-R59W

~7" Casing: 754' FSL 2522' FWL  
Lat/Long: 40.716142 N, 103.983310 W  
State Planes - CO Northern: 1,507,330.08 N, 3,420,423.43 E  
Location: Sec. 28-T9N-R59W

~BHL: 669' FNL 2482' FEL  
Lat/Long: 40.726897 N, 103.983527 W  
State Planes - CO Northern: 1,511,246.66 N, 3,420,296.26 E  
Location: Sec. 28-T9N-R59W

WELL DETAILS: Rainbow LC28-76-1BHNA

Ground Level: 4843.00  
RKB=24ft @ 4867.00usf (H&P 273)

Created By: Pari Amanlou  
Created On: 7-08-14

# Noble Energy

Weld County, CO (NAD 83)

Sec. 28-T9N-R59W (LC28-15-A)

Rainbow LC28-76-1BHNA

Job# 901400243:: API:05-123-38854

Plan C

Design: Filed Surveys

## Sperry Drilling Services

### Final Survey Report

15 July, 2014

Well Coordinates: 1,506,934.84 N, 3,421,220.38 E (40° 42' 54.07" N, 103° 58' 49.66" W)

Ground Level: 4,843.00 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 Rainbow LC28-76-1BHNA

RKB=24ft @ 4867.00usft (H&P 273)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

## Design Report for Rainbow LC28-76-1BHNA - Filed Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Toolface Azimuth (°)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
356.00	0.40	358.14	356.00	1.24	-0.04	1.22	0.11	0.11	0.00	358.14
<b>First Surface Gyro Survey @ %M%5'</b>										
607.00	0.40	181.04	607.00	1.24	-0.08	1.23	0.32	0.00	-70.56	-178.55
<b>Last Gyro Survey @ 607.00'</b>										
628.00	0.41	195.78	627.99	1.10	-0.11	1.09	0.50	0.06	70.17	90.91
<b>9 5/8"</b>										
716.00	0.67	235.30	715.99	0.50	-0.62	0.62	0.50	0.29	44.91	76.17
<b>First MWD Survey from Tie-on @ 716.00'</b>										
809.00	0.58	222.68	808.99	-0.16	-1.38	0.14	0.18	-0.10	-13.57	-129.38
1,088.00	0.38	242.02	1,087.98	-1.63	-3.16	-0.93	0.09	-0.07	6.93	150.39
1,274.00	0.22	244.38	1,273.97	-2.07	-4.02	-1.18	0.09	-0.09	1.27	176.76
1,367.00	3.28	262.44	1,366.92	-2.50	-6.82	-1.01	3.30	3.29	19.42	19.33
1,460.00	4.53	251.36	1,459.70	-4.02	-12.94	-1.21	1.56	1.34	-11.91	-36.72
1,553.00	5.53	252.35	1,552.34	-6.56	-20.69	-2.06	1.08	1.08	1.06	5.45
1,645.00	6.73	248.80	1,643.82	-9.85	-29.94	-3.33	1.37	1.30	-3.86	-19.30
1,737.00	8.11	248.62	1,735.04	-14.17	-41.01	-5.23	1.50	1.50	-0.20	-1.05
1,832.00	9.32	251.68	1,828.94	-19.03	-54.55	-7.13	1.36	1.27	3.22	22.48
1,927.00	10.13	249.02	1,922.58	-24.44	-69.66	-9.24	0.97	0.85	-2.80	-30.33
2,022.00	9.43	249.88	2,016.20	-30.10	-84.76	-11.61	0.75	-0.74	0.91	168.64
2,117.00	10.80	250.92	2,109.72	-35.69	-100.48	-13.76	1.45	1.44	1.09	8.11
2,212.00	11.10	250.58	2,202.99	-41.64	-117.52	-16.00	0.32	0.32	-0.36	-12.32
2,307.00	10.98	250.23	2,296.23	-47.74	-134.66	-18.36	0.14	-0.13	-0.37	-150.99
2,401.00	10.09	249.89	2,388.65	-53.60	-150.82	-20.69	0.95	-0.95	-0.36	-176.17
2,496.00	9.67	250.55	2,482.24	-59.12	-166.15	-22.86	0.46	-0.44	0.69	165.23
2,591.00	10.79	250.71	2,575.73	-64.71	-182.07	-24.98	1.18	1.18	0.17	1.53
2,686.00	11.19	250.85	2,668.98	-70.68	-199.17	-27.21	0.42	0.42	0.15	3.89
2,781.00	11.34	251.96	2,762.15	-76.59	-216.76	-29.30	0.28	0.16	1.17	55.87
2,875.00	10.27	250.17	2,854.49	-82.30	-233.43	-31.37	1.19	-1.14	-1.90	-163.47
2,970.00	9.69	249.96	2,948.05	-87.91	-248.91	-33.60	0.61	-0.61	-0.22	-176.51
3,065.00	9.15	249.03	3,041.77	-93.35	-263.47	-35.86	0.59	-0.57	-0.98	-164.72
3,160.00	8.81	247.54	3,135.60	-98.83	-277.25	-38.32	0.43	-0.36	-1.57	-146.36
3,255.00	9.84	248.71	3,229.34	-104.56	-291.54	-40.92	1.10	1.08	1.23	11.01
3,350.00	9.68	249.18	3,322.97	-110.35	-306.57	-43.41	0.19	-0.17	0.49	153.76
3,445.00	10.27	249.14	3,416.53	-116.20	-321.94	-45.90	0.62	0.62	-0.04	-0.69
3,540.00	11.16	247.55	3,509.88	-122.73	-338.36	-48.83	0.99	0.94	-1.67	-19.16
3,635.00	10.59	249.91	3,603.17	-129.24	-355.05	-51.69	0.76	-0.60	2.48	143.16
3,730.00	11.41	250.81	3,696.42	-135.33	-372.12	-54.05	0.88	0.86	0.95	12.27
3,825.00	10.11	253.27	3,789.75	-140.82	-388.99	-55.87	1.45	-1.37	2.59	161.75
3,920.00	9.86	248.53	3,883.31	-146.19	-404.54	-57.85	0.90	-0.26	-4.99	-109.24
4,014.00	8.39	245.63	3,976.12	-151.97	-418.28	-60.61	1.64	-1.56	-3.09	-164.05
4,109.00	7.32	250.49	4,070.23	-156.85	-430.30	-62.86	1.32	-1.13	5.12	150.56
4,204.00	8.02	246.14	4,164.38	-161.55	-442.06	-64.98	0.96	0.74	-4.58	-41.84
4,299.00	8.63	241.67	4,258.38	-167.61	-454.40	-68.31	0.94	0.64	-4.71	-48.92
4,394.00	9.98	242.67	4,352.13	-174.78	-467.98	-72.46	1.43	1.42	1.05	7.32
4,489.00	8.67	249.42	4,445.87	-181.07	-482.00	-75.67	1.79	-1.38	7.11	143.44
4,583.00	9.27	257.69	4,538.73	-185.18	-496.03	-76.73	1.51	0.64	8.80	69.17
4,678.00	9.78	257.75	4,632.42	-188.52	-511.39	-76.77	0.54	0.54	0.06	1.14
4,773.00	9.14	249.56	4,726.13	-192.87	-526.35	-77.87	1.57	-0.67	-8.62	-119.43
4,868.00	9.87	251.37	4,819.83	-198.11	-541.13	-79.88	0.83	0.77	1.91	23.16
4,963.00	10.04	252.06	4,913.40	-203.26	-556.73	-81.64	0.22	0.18	0.73	35.40
5,058.00	9.91	252.94	5,006.96	-208.21	-572.42	-83.18	0.21	-0.14	0.93	130.89
5,152.00	9.19	254.45	5,099.66	-212.59	-587.39	-84.32	0.81	-0.77	1.61	161.56
5,247.00	10.09	257.31	5,193.31	-216.45	-602.81	-84.85	1.07	0.95	3.01	29.43
5,315.00	9.75	257.64	5,260.30	-218.99	-614.25	-84.93	0.51	-0.50	0.49	170.67
5,385.00	8.99	257.68	5,329.36	-221.43	-625.38	-84.97	1.09	-1.09	0.06	179.53
5,430.01	8.81	272.10	5,373.84	-222.05	-632.27	-84.13	4.96	-0.39	32.03	101.59
<b>Rainbow LC28-76-1BHNA_KOP</b>										



## Design Report for Rainbow LC28-76-1BHNA - Filed Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Toolface Azimuth (°)
5,432.00	8.82	272.74	5,375.80	-222.04	-632.57	-84.05	4.96	0.26	32.31	87.34
5,480.00	10.55	308.73	5,423.16	-219.11	-639.68	-79.70	12.88	3.60	74.98	92.31
5,527.00	15.13	321.75	5,468.98	-211.60	-646.84	-70.84	11.47	9.74	27.70	38.75
5,575.00	18.35	324.40	5,514.94	-200.53	-655.12	-58.28	6.89	6.71	5.52	14.61
5,622.00	20.43	325.42	5,559.27	-187.76	-664.08	-43.91	4.48	4.43	2.17	9.73
5,670.00	22.16	323.34	5,604.00	-173.60	-674.24	-27.93	3.93	3.60	-4.33	-24.56
5,717.00	23.91	321.97	5,647.25	-158.99	-685.40	-11.30	3.89	3.72	-2.91	-17.66
5,765.00	31.11	324.83	5,689.79	-141.16	-698.56	8.89	15.25	15.00	5.96	11.68
5,811.00	36.97	330.30	5,727.90	-119.41	-712.27	33.04	14.36	12.74	11.89	29.89
5,859.00	40.74	334.24	5,765.28	-92.75	-726.24	62.04	9.39	7.85	8.21	34.80
5,906.00	45.34	337.40	5,799.63	-63.49	-739.33	93.40	10.81	9.79	6.72	26.29
5,911.01	45.59	337.59	5,803.14	-60.19	-740.70	96.92	5.68	4.97	3.84	28.91
Rainbow LC28-76-1BHNA_Lateral										
5,954.00	47.74	339.18	5,832.64	-31.12	-752.21	127.76	5.68	5.00	3.69	28.78
6,001.00	50.37	340.95	5,863.44	2.25	-764.30	162.93	6.28	5.60	3.77	27.53
6,049.00	53.00	344.86	5,893.21	38.24	-775.35	200.43	8.42	5.48	8.15	50.62
6,096.00	57.65	349.46	5,919.95	75.91	-783.89	239.05	12.75	9.89	9.79	40.46
6,144.00	61.74	352.03	5,944.17	116.80	-790.53	280.43	9.69	8.52	5.35	29.14
6,191.00	64.18	353.46	5,965.53	158.32	-795.81	322.13	5.86	5.19	3.04	27.89
6,239.00	66.65	355.10	5,985.50	201.75	-800.15	365.50	6.01	5.15	3.42	31.47
6,286.00	73.05	358.17	6,001.69	245.77	-802.72	409.08	14.93	13.62	6.53	24.79
6,334.00	78.52	2.39	6,013.48	292.27	-802.47	454.48	14.23	11.40	8.79	37.33
6,380.00	82.73	3.74	6,020.97	337.58	-800.04	498.27	9.60	9.15	2.93	17.67
6,438.00	86.69	2.38	6,026.32	395.24	-796.96	553.99	7.21	6.82	-2.35	-18.99
7										
6,492.00	90.37	1.12	6,027.70	449.18	-795.32	606.38	7.21	6.82	-2.33	-18.87
6,555.00	90.46	359.53	6,027.25	512.18	-794.96	667.90	2.53	0.14	-2.52	-86.75
6,650.00	90.77	358.41	6,026.23	607.16	-796.67	761.11	1.22	0.33	-1.18	-74.52
6,745.00	90.06	356.49	6,025.54	702.05	-800.89	854.77	2.15	-0.75	-2.02	-110.29
6,839.00	90.46	357.33	6,025.11	795.91	-805.96	947.60	0.99	0.43	0.89	64.53
6,934.00	91.08	357.38	6,023.84	890.80	-810.34	1,041.29	0.65	0.65	0.05	4.61
7,029.00	90.55	357.38	6,022.48	985.70	-814.68	1,134.97	0.56	-0.56	0.00	180.00
7,124.00	89.85	356.92	6,022.15	1,080.58	-819.41	1,228.73	0.88	-0.74	-0.48	-146.69
7,219.00	89.20	354.68	6,022.94	1,175.31	-826.36	1,322.81	2.46	-0.68	-2.36	-106.19
7,314.00	89.78	356.02	6,023.79	1,269.99	-834.07	1,416.99	1.54	0.61	1.41	66.60
7,409.00	88.55	353.99	6,025.17	1,364.61	-842.34	1,511.23	2.50	-1.29	-2.14	-121.23
7,503.00	90.12	356.07	6,026.26	1,458.25	-850.48	1,604.49	2.77	1.67	2.21	52.97
7,598.00	89.20	354.40	6,026.83	1,552.91	-858.37	1,698.69	2.01	-0.97	-1.76	-118.85
7,693.00	88.95	355.34	6,028.36	1,647.52	-866.86	1,792.97	1.02	-0.26	0.99	104.90
7,788.00	90.28	356.41	6,029.00	1,742.27	-873.70	1,887.04	1.80	1.40	1.13	38.82
7,883.00	91.91	358.96	6,027.18	1,837.16	-877.53	1,980.62	3.19	1.72	2.68	57.39
7,978.00	92.40	358.76	6,023.61	1,932.07	-879.42	2,073.80	0.56	0.52	-0.21	-22.19
8,073.00	92.04	359.47	6,019.93	2,026.99	-880.89	2,166.91	0.84	-0.38	0.75	116.89
8,168.00	90.22	358.80	6,018.06	2,121.96	-882.32	2,260.05	2.04	-1.92	-0.71	-159.79
8,263.00	89.57	359.20	6,018.23	2,216.94	-883.98	2,353.26	0.80	-0.68	0.42	148.39
8,357.00	91.32	0.48	6,017.50	2,310.93	-884.24	2,445.21	2.31	1.86	1.36	36.18
8,452.00	93.45	1.19	6,013.55	2,405.84	-882.86	2,537.69	2.36	2.24	0.75	18.41
8,546.00	91.94	0.61	6,009.13	2,499.72	-881.38	2,629.17	1.72	-1.61	-0.62	-158.99
8,641.00	90.22	359.41	6,007.34	2,594.69	-881.37	2,722.02	2.21	-1.81	-1.26	-145.09
8,736.00	91.11	0.33	6,006.23	2,689.69	-881.58	2,814.93	1.35	0.94	0.97	45.94
8,831.00	88.77	357.35	6,006.33	2,784.65	-883.51	2,908.17	3.99	-2.46	-3.14	-128.13
8,925.00	89.88	357.04	6,007.44	2,878.53	-888.11	3,000.92	1.23	1.18	-0.33	-15.61
9,020.00	91.11	358.59	6,006.62	2,973.45	-891.73	3,094.48	2.08	1.29	1.63	51.56
9,115.00	90.92	358.38	6,004.94	3,068.40	-894.24	3,187.84	0.30	-0.20	-0.22	-132.14
9,210.00	90.65	357.81	6,003.64	3,163.34	-897.40	3,281.32	0.66	-0.28	-0.60	-115.34
9,305.00	90.46	359.09	6,002.72	3,258.30	-899.97	3,374.69	1.36	-0.20	1.35	98.44
9,399.00	90.28	358.54	6,002.11	3,352.28	-901.91	3,466.98	0.62	-0.19	-0.59	-108.12
9,494.00	89.66	357.39	6,002.16	3,447.21	-905.28	3,560.50	1.38	-0.65	-1.21	-118.33
9,589.00	89.48	358.04	6,002.87	3,542.14	-909.07	3,654.10	0.71	-0.19	0.68	105.48

## Design Report for Rainbow LC28-76-1BHNA - Filed Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	Toolface Azimuth (°)
9,683.00	90.12	359.99	6,003.20	3,636.12	-910.69	3,746.32	2.18	0.68	2.07	71.83
9,778.00	89.72	359.80	6,003.33	3,731.12	-910.86	3,839.23	0.47	-0.42	-0.20	-154.59
9,873.00	89.94	359.72	6,003.61	3,826.11	-911.26	3,932.19	0.25	0.23	-0.08	-19.98
9,968.00	89.54	359.78	6,004.05	3,921.11	-911.67	4,025.15	0.43	-0.42	0.06	171.47
10,062.00	89.14	358.87	6,005.13	4,015.10	-912.78	4,117.27	1.06	-0.43	-0.97	-113.73
10,157.00	90.28	357.86	6,005.61	4,110.06	-915.49	4,210.67	1.60	1.20	-1.06	-41.54
10,252.00	90.74	357.24	6,004.76	4,204.96	-919.55	4,304.31	0.81	0.48	-0.65	-53.42
10,294.00	90.59	357.62	6,004.28	4,246.92	-921.44	4,345.72	0.97	-0.36	0.90	111.54
Last MWD Survey @ 10294.00' MD										
10,359.00	90.59	357.62	6,003.61	4,311.86	-924.13	4,409.78	0.00	0.00	0.00	0.00
St. Line Projection to Bit @ 10359' MD - Rainbow LC28-76-1BHNA_BHL										

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
356.00	356.00	1.24	-0.04	First Surface Gyro Survey @ %M%5'
607.00	607.00	1.24	-0.08	Last Gyro Survey @ 607.00'
716.00	715.99	0.50	-0.62	First MWD Survey from Tie-on @ 716.00'
10,294.00	6,004.28	4,246.92	-921.44	Last MWD Survey @ 10294.00' MD
10,359.00	6,003.61	4,311.86	-924.13	St. Line Projection to Bit @ 10359' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/-S (usft)	Origin +E/-W (usft)	Start TVD (usft)
Target	Rainbow LC28-76-1BHNA_BHL	347.86	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
356.00	607.00	Surface Gyro	Flexi-Shot
716.00	6,380.00	MWD Survey-Intermediate	MWD+SC
6,492.00	10,294.00	MWD Surveys- Production	MWD+SC

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
628.00	627.99	9 5/8"	9-5/8	13-3/4
6,438.00	6,026.32	7	7	8-3/4

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Design Report for Rainbow LC28-76-1BHNA - Filed Surveys

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*Targets associated with this wellbore*

Target Name	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Shape
Rainbow LC28-76-1BHNA_SHL	0.00	0.01	0.00	Point
Rainbow LC28-76-1BHNA_SL	0.00	0.01	0.00	Polygon
Rainbow LC28-76-1BHNA_600	0.00	0.01	0.00	Polygon
Rainbow LC28-76-1BHNA_KOP	5,373.54	-230.56	-633.47	Circle
Rainbow LC28-76-1BHNA_BHL	5,966.00	4,313.03	-927.73	Point
Rainbow LC28-76-1BHNA_Lateral	6,033.00	0.00	0.00	Polygon

*Directional Difficulty Index*

Average Dogleg over Survey:	1.91 °/100usft	Maximum Dogleg over Survey:	15.25 °/100usft at 5,765.00 usft
Net Tortousity applicable to Plans:	0.89 °/100usft	Directional Difficulty Index:	6.252

*Audit Info*



**North Reference Sheet for Sec. 28-T9N-R59W (LC28-15-A) - Rainbow  
LC28-76-1BHNA - Plan C**

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

Vertical Depths are relative to RKB=24ft @ 4867.00usft (H&P 273). Northing and Easting are relative to Rainbow LC28-76-1BHNA  
Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.50°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99998963

Grid Coordinates of Well: 1,506,934.84 usft N, 3,421,220.38 usft E

Geographical Coordinates of Well: 40° 42' 54.07" N, 103° 58' 49.66" W

Grid Convergence at Surface is: 0.98°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,359.00usft  
the Bottom Hole Displacement is 4,409.78usft in the Direction of 347.90° (Grid).

Magnetic Convergence at surface is: -7.15° (15 June 2014, , BGGM2014)

