



Vanguard Natural Resources

Garfield County, CO

GGU 13-28

Federal GGU 24D-28-691

Wellbore #1

Design: Actual

End of Well Report

19 December, 2017





Payzone Directional

End of Well Report



Company:	Vanguard Natural Resources	Local Co-ordinate Reference:	Well Federal GGU 24D-28-691
Project:	Garfield County, CO	TVD Reference:	Federal GGU 24D-28-691 @ 6147.6usft (Est KB)
Site:	GGU 13-28	MD Reference:	Federal GGU 24D-28-691 @ 6147.6usft (Est KB)
Well:	Federal GGU 24D-28-691	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM 5000.1 Single User Db

Project	Garfield County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Central Zone		Using geodetic scale factor

Site	GGU 13-28		
Site Position:		Northing:	1,611,635.73 usft
From:	Lat/Long	Easting:	2,416,896.90 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	39° 29' 40.232 N
		Longitude:	107° 33' 59.065 W
		Grid Convergence:	-1.30 °

Well		Federal GGU 24D-28-691				
Well Position	+N/-S	0.0 usft	Northing:	1,611,641.91 usft	Latitude:	39° 29' 40.290 N
	+E/-W	0.0 usft	Easting:	2,416,881.24 usft	Longitude:	107° 33' 59.267 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	6,147.6 usft	Ground Level:	6,130.6 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	12/19/2017	9.45	65.65	51,524

Design	Actual			
Audit Notes:				
Version:	1.0	Phase:	ACTUAL	Tie On Depth: 0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	81.88

Survey Program	Date	12/19/2017		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
137.0	7,650.0	Actual (Wellbore #1)	MWD	MWD v3:standard declination



Payzone Directional End of Well Report



Company:	Vanguard Natural Resources	Local Co-ordinate Reference:	Well Federal GGU 24D-28-691
Project:	Garfield County, CO	TVD Reference:	Federal GGU 24D-28-691 @ 6147.6usft (Est KB)
Site:	GGU 13-28	MD Reference:	Federal GGU 24D-28-691 @ 6147.6usft (Est KB)
Well:	Federal GGU 24D-28-691	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM 5000.1 Single User Db

Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)	Build (°/100usft)	Turn (°/100usft)	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
137.0	0.71	308.70	137.0	-0.6	0.5	-0.7	0.52	0.52	0.00	
167.0	0.83	291.77	167.0	-0.9	0.7	-1.0	0.85	0.40	-56.43	
197.0	0.92	310.58	197.0	-1.2	1.0	-1.4	1.00	0.30	62.70	
227.0	0.75	326.49	227.0	-1.5	1.3	-1.7	0.95	-0.57	53.03	
257.0	0.79	324.16	257.0	-1.7	1.6	-1.9	0.17	0.13	-7.77	
286.0	0.48	346.88	286.0	-1.8	1.9	-2.1	1.36	-1.07	78.34	
316.0	0.63	22.79	316.0	-1.7	2.2	-2.0	1.24	0.50	119.70	
346.0	0.70	52.89	346.0	-1.5	2.4	-1.8	1.17	0.23	100.33	
376.0	0.70	49.77	376.0	-1.1	2.7	-1.5	0.13	0.00	-10.40	
407.0	0.92	83.96	407.0	-0.7	2.8	-1.1	1.68	0.71	110.29	
438.0	1.08	103.94	438.0	-0.2	2.8	-0.6	1.23	0.52	64.45	
468.0	1.19	118.23	468.0	0.3	2.6	-0.1	1.01	0.37	47.63	
498.0	1.19	111.69	498.0	0.8	2.3	0.5	0.45	0.00	-21.80	
527.0	1.14	117.36	527.0	1.3	2.0	1.0	0.43	-0.17	19.55	
558.0	1.27	130.89	557.9	1.8	1.7	1.6	1.01	0.42	43.65	
587.0	0.97	117.05	586.9	2.2	1.4	2.0	1.39	-1.03	-47.72	
618.0	0.75	116.78	617.9	2.6	1.1	2.5	0.71	-0.71	-0.87	
647.0	0.40	121.57	646.9	2.8	1.0	2.7	1.22	-1.21	16.52	
678.0	0.18	126.58	677.9	2.9	0.9	2.8	0.71	-0.71	16.16	
708.0	0.31	315.77	707.9	2.9	1.0	2.8	1.63	0.43	-569.37	
738.0	0.22	297.40	737.9	2.8	1.0	2.7	0.41	-0.30	-61.23	
768.0	0.57	293.05	767.9	2.7	1.1	2.5	1.17	1.17	-14.50	
785.0	0.62	298.72	784.9	2.5	1.2	2.4	0.45	0.29	33.35	
Last PZD Surface Survey										
854.0	0.74	305.25	853.9	1.9	1.6	1.7	0.21	0.17	9.46	
896.0	0.40	312.02	895.9	1.6	1.9	1.3	0.82	-0.81	16.12	



Payzone Directional End of Well Report



Company:	Vanguard Natural Resources	Local Co-ordinate Reference:	Well Federal GGU 24D-28-691
Project:	Garfield County, CO	TVD Reference:	Federal GGU 24D-28-691 @ 6147.6usft (Est KB)
Site:	GGU 13-28	MD Reference:	Federal GGU 24D-28-691 @ 6147.6usft (Est KB)
Well:	Federal GGU 24D-28-691	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM 5000.1 Single User Db

Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)	Build (°/100usft)	Turn (°/100usft)	
938.0	1.41	68.74	937.9	2.0	2.2	1.7	3.88	2.40	277.90	
980.0	2.94	70.94	979.9	3.6	2.7	3.2	3.65	3.64	5.24	
1,023.0	4.53	75.73	1,022.8	6.3	3.5	5.9	3.77	3.70	11.14	
1,065.0	6.10	78.77	1,064.6	10.2	4.3	9.7	3.80	3.74	7.24	
1,107.0	7.91	81.09	1,106.3	15.3	5.2	14.7	4.36	4.31	5.52	
1,149.0	9.18	79.03	1,147.8	21.6	6.3	20.9	3.11	3.02	-4.90	
1,194.0	10.46	80.65	1,192.2	29.2	7.7	28.4	2.91	2.84	3.60	
1,237.0	11.38	81.09	1,234.4	37.4	8.9	36.5	2.15	2.14	1.02	
1,281.0	12.92	78.89	1,277.4	46.6	10.6	45.6	3.65	3.50	-5.00	
1,323.0	14.46	81.79	1,318.2	56.6	12.2	55.4	4.01	3.67	6.90	
1,365.0	16.17	84.91	1,358.7	67.7	13.5	66.4	4.52	4.07	7.43	
1,407.0	17.49	85.71	1,398.9	79.8	14.5	78.5	3.19	3.14	1.90	
1,449.0	18.85	85.71	1,438.8	92.9	15.5	91.6	3.24	3.24	0.00	
1,491.0	20.55	84.73	1,478.4	107.0	16.6	105.7	4.12	4.05	-2.33	
1,534.0	22.24	84.70	1,518.4	122.7	18.1	121.3	3.93	3.93	-0.07	
1,578.0	23.77	82.67	1,558.9	139.8	20.0	138.4	3.92	3.48	-4.61	
1,664.0	26.41	81.53	1,636.8	176.3	25.0	174.5	3.12	3.07	-1.33	
1,749.0	26.59	81.40	1,712.8	214.2	30.6	212.0	0.22	0.21	-0.15	
1,833.0	26.19	82.06	1,788.1	251.6	36.0	249.0	0.59	-0.48	0.79	
1,919.0	25.93	82.32	1,865.4	289.4	41.1	286.4	0.33	-0.30	0.30	
2,005.0	25.97	82.19	1,942.7	327.0	46.2	323.7	0.08	0.05	-0.15	
2,089.0	25.36	81.62	2,018.4	363.4	51.3	359.7	0.78	-0.73	-0.68	
2,174.0	24.96	81.40	2,095.3	399.5	56.7	395.5	0.48	-0.47	-0.26	
2,258.0	26.02	82.10	2,171.2	435.6	61.9	431.2	1.31	1.26	0.83	
2,342.0	25.53	82.19	2,246.8	472.2	66.9	467.4	0.59	-0.58	0.11	
2,431.0	24.96	82.15	2,327.3	510.1	72.0	505.0	0.64	-0.64	-0.04	
2,515.0	25.84	82.23	2,403.2	546.2	76.9	540.7	1.05	1.05	0.10	



Payzone Directional End of Well Report



Company:	Vanguard Natural Resources	Local Co-ordinate Reference:	Well Federal GGU 24D-28-691
Project:	Garfield County, CO	TVD Reference:	Federal GGU 24D-28-691 @ 6147.6usft (Est KB)
Site:	GGU 13-28	MD Reference:	Federal GGU 24D-28-691 @ 6147.6usft (Est KB)
Well:	Federal GGU 24D-28-691	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM 5000.1 Single User Db

Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)	Build (°/100usft)	Turn (°/100usft)	
2,599.0	25.14	81.97	2,479.0	582.3	81.9	576.5	0.84	-0.83	-0.31	
2,683.0	24.52	81.71	2,555.2	617.6	86.9	611.4	0.75	-0.74	-0.31	
2,770.0	25.22	81.75	2,634.2	654.2	92.2	647.6	0.80	0.80	0.05	
2,854.0	25.93	82.19	2,709.9	690.4	97.2	683.6	0.87	0.85	0.52	
2,939.0	25.49	82.76	2,786.5	727.3	102.0	720.1	0.59	-0.52	0.67	
3,023.0	24.70	83.07	2,862.6	762.9	106.4	755.5	0.95	-0.94	0.37	
3,107.0	26.19	82.85	2,938.4	799.0	110.9	791.3	1.78	1.77	-0.26	
3,193.0	26.32	82.76	3,015.6	837.0	115.6	829.0	0.16	0.15	-0.10	
3,280.0	26.15	84.65	3,093.6	875.5	119.9	867.2	0.98	-0.20	2.17	
3,364.0	26.10	81.31	3,169.0	912.4	124.4	903.9	1.75	-0.06	-3.98	
3,450.0	25.27	80.17	3,246.5	949.7	130.4	940.7	1.12	-0.97	-1.33	
3,534.0	24.30	80.21	3,322.8	984.9	136.4	975.4	1.15	-1.15	0.05	
3,619.0	25.00	80.17	3,400.0	1,020.3	142.4	1,010.4	0.82	0.82	-0.05	
3,705.0	24.70	83.02	3,478.1	1,056.5	147.7	1,046.1	1.44	-0.35	3.31	
3,791.0	25.67	83.58	3,555.9	1,093.1	152.0	1,082.5	1.16	1.13	0.65	
3,876.0	24.70	80.92	3,632.8	1,129.2	156.8	1,118.3	1.75	-1.14	-3.13	
3,960.0	23.55	82.59	3,709.5	1,163.6	161.8	1,152.3	1.59	-1.37	1.99	
4,044.0	22.50	81.93	3,786.8	1,196.4	166.2	1,184.8	1.29	-1.25	-0.79	
4,131.0	21.93	80.56	3,867.3	1,229.3	171.2	1,217.3	0.89	-0.66	-1.57	
4,217.0	20.74	81.62	3,947.4	1,260.6	176.0	1,248.2	1.45	-1.38	1.23	
4,303.0	19.20	84.61	4,028.3	1,289.9	179.6	1,277.4	2.15	-1.79	3.48	
4,388.0	16.17	84.12	4,109.2	1,315.7	182.1	1,303.1	3.57	-3.56	-0.58	
4,472.0	14.41	82.98	4,190.3	1,337.9	184.6	1,325.1	2.13	-2.10	-1.36	
4,557.0	13.93	82.41	4,272.7	1,358.7	187.2	1,345.7	0.59	-0.56	-0.67	
4,641.0	11.69	81.62	4,354.6	1,377.3	189.8	1,364.2	2.67	-2.67	-0.94	
4,725.0	10.42	80.08	4,437.0	1,393.4	192.3	1,380.1	1.55	-1.51	-1.83	
4,809.0	9.45	78.59	4,519.8	1,407.9	195.0	1,394.3	1.19	-1.15	-1.77	



Payzone Directional End of Well Report



Company:	Vanguard Natural Resources	Local Co-ordinate Reference:	Well Federal GGU 24D-28-691
Project:	Garfield County, CO	TVD Reference:	Federal GGU 24D-28-691 @ 6147.6usft (Est KB)
Site:	GGU 13-28	MD Reference:	Federal GGU 24D-28-691 @ 6147.6usft (Est KB)
Well:	Federal GGU 24D-28-691	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM 5000.1 Single User Db

Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)	Build (°/100usft)	Turn (°/100usft)	
4,894.0	8.17	84.08	4,603.8	1,420.9	197.0	1,407.2	1.80	-1.51	6.46	
4,978.0	6.68	87.51	4,687.1	1,431.7	197.8	1,418.0	1.85	-1.77	4.08	
5,053.9	6.32	86.48	4,762.4	1,440.3	198.3	1,426.6	0.50	-0.48	-1.36	
GGU 24D-28-691 TGT										
5,062.0	6.28	86.36	4,770.5	1,441.1	198.4	1,427.4	0.50	-0.47	-1.45	
5,147.0	6.02	86.50	4,855.0	1,450.2	198.9	1,436.5	0.31	-0.31	0.16	
5,231.0	4.35	76.08	4,938.7	1,457.8	200.0	1,444.0	2.27	-1.99	-12.40	
5,315.0	4.09	73.75	5,022.5	1,463.9	201.6	1,450.0	0.37	-0.31	-2.77	
5,399.0	3.38	72.43	5,106.3	1,469.3	203.1	1,455.2	0.85	-0.85	-1.57	
5,484.0	3.12	68.13	5,191.1	1,474.0	204.8	1,459.8	0.42	-0.31	-5.06	
5,568.0	3.03	67.34	5,275.0	1,478.4	206.5	1,463.9	0.12	-0.11	-0.94	
5,654.0	2.50	63.07	5,360.9	1,482.4	208.2	1,467.7	0.66	-0.62	-4.97	
5,740.0	2.24	62.19	5,446.9	1,485.8	209.8	1,470.9	0.31	-0.30	-1.02	
5,825.0	2.20	52.22	5,531.8	1,488.7	211.6	1,473.6	0.46	-0.05	-11.73	
5,909.0	2.15	53.49	5,615.7	1,491.5	213.5	1,476.2	0.08	-0.06	1.51	
5,995.0	1.89	49.63	5,701.7	1,494.1	215.4	1,478.5	0.34	-0.30	-4.49	
6,081.0	0.57	68.04	5,787.7	1,495.8	216.5	1,480.0	1.58	-1.53	21.41	
6,166.0	0.79	89.35	5,872.6	1,496.7	216.7	1,481.0	0.39	0.26	25.07	
6,250.0	0.79	91.46	5,956.6	1,497.9	216.6	1,482.1	0.03	0.00	2.51	
6,334.0	0.88	91.20	6,040.6	1,499.1	216.6	1,483.4	0.11	0.11	-0.31	
6,418.0	0.53	74.53	6,124.6	1,500.1	216.7	1,484.4	0.48	-0.42	-19.85	
6,503.0	0.26	316.37	6,209.6	1,500.4	216.9	1,484.6	0.81	-0.32	-139.01	
6,587.0	0.26	289.13	6,293.6	1,500.1	217.2	1,484.3	0.15	0.00	-32.43	
6,671.0	0.44	347.36	6,377.6	1,499.9	217.5	1,484.1	0.45	0.21	69.32	
6,756.0	0.92	9.94	6,462.6	1,500.1	218.5	1,484.1	0.64	0.56	26.56	
6,840.0	0.48	302.88	6,546.6	1,500.1	219.4	1,483.9	1.02	-0.52	-79.83	
6,926.0	1.32	240.66	6,632.6	1,498.9	219.1	1,482.8	1.37	0.98	-72.35	



Payzone Directional End of Well Report



Company:	Vanguard Natural Resources	Local Co-ordinate Reference:	Well Federal GGU 24D-28-691
Project:	Garfield County, CO	TVD Reference:	Federal GGU 24D-28-691 @ 6147.6usft (Est KB)
Site:	GGU 13-28	MD Reference:	Federal GGU 24D-28-691 @ 6147.6usft (Est KB)
Well:	Federal GGU 24D-28-691	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM 5000.1 Single User Db

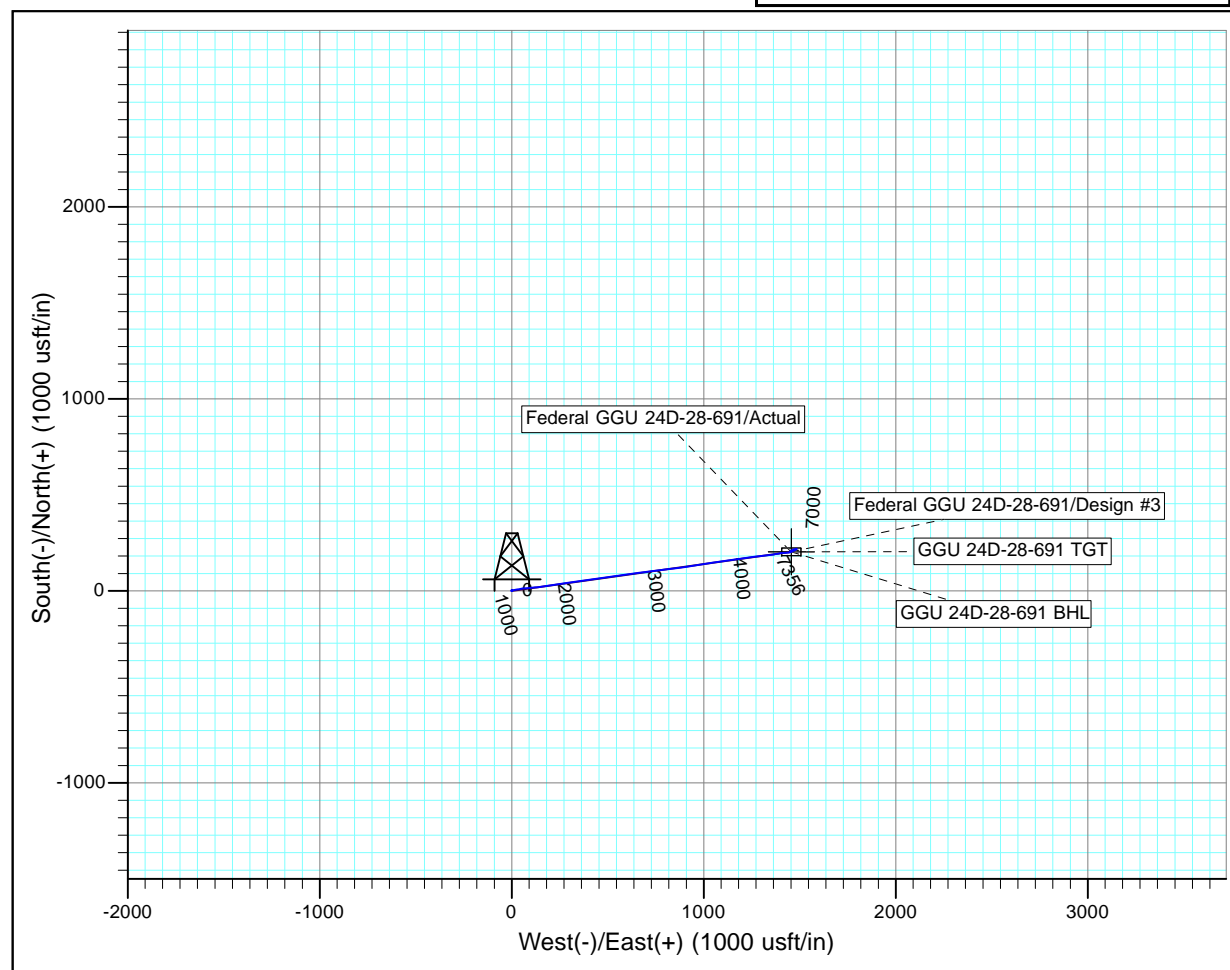
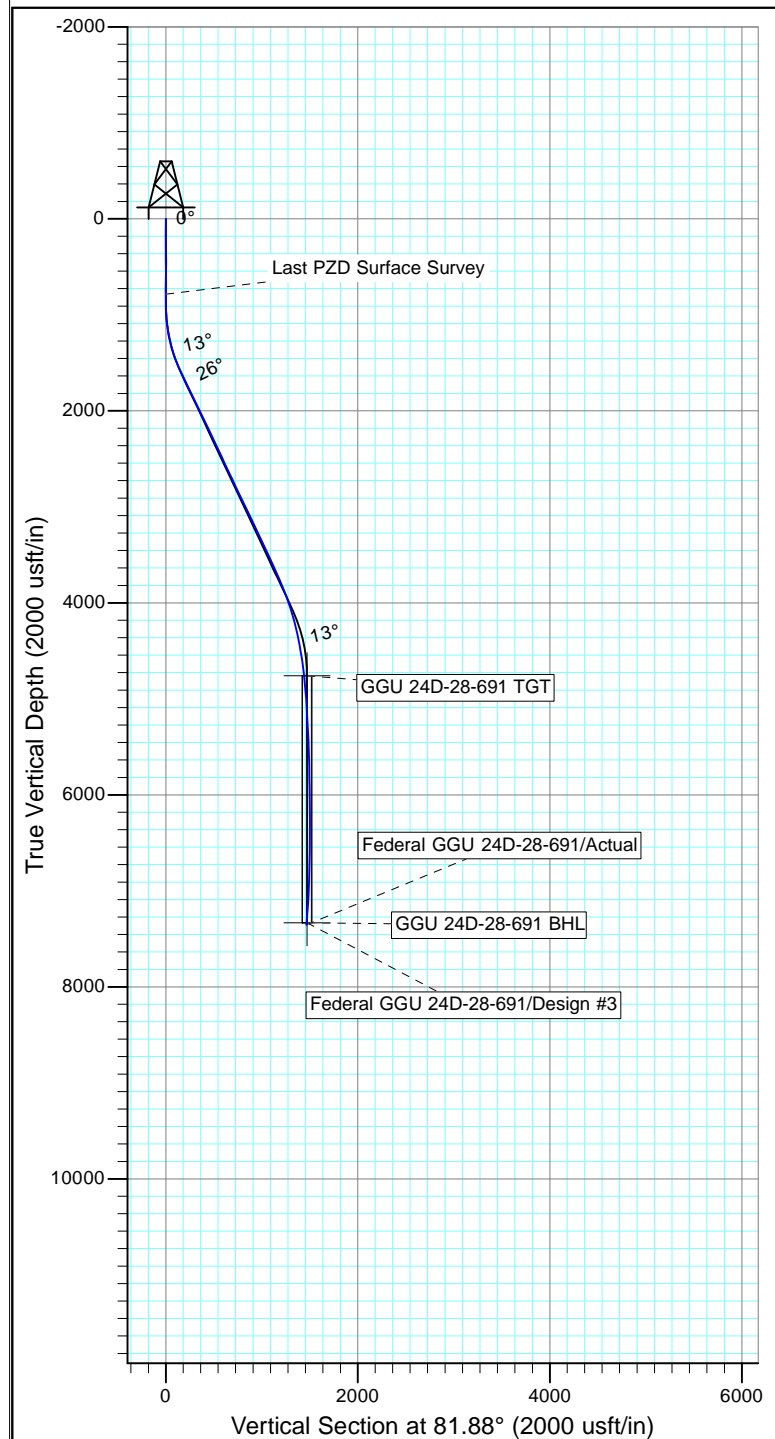
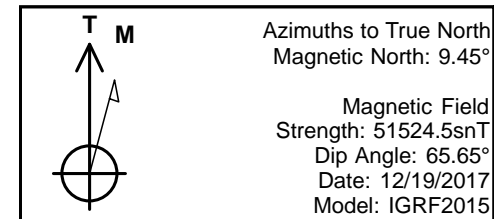
Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)	Build (°/100usft)	Turn (°/100usft)	
7,013.0	1.77	242.84	6,719.6	1,496.7	218.0	1,480.7	0.52	0.52	2.51	
7,099.0	1.80	251.34	6,805.5	1,494.1	216.9	1,478.2	0.31	0.03	9.88	
7,185.0	1.36	268.61	6,891.5	1,491.7	216.5	1,475.9	0.75	-0.51	20.08	
7,269.0	1.43	294.35	6,975.5	1,489.9	216.9	1,474.0	0.74	0.08	30.64	
7,356.0	3.25	248.61	7,062.4	1,486.5	216.4	1,470.7	2.84	2.09	-52.57	
7,440.0	4.64	246.87	7,146.2	1,480.9	214.2	1,465.4	1.66	1.65	-2.07	
7,525.0	4.57	244.48	7,230.9	1,474.4	211.4	1,459.2	0.24	-0.08	-2.81	
7,567.0	4.44	242.84	7,272.8	1,471.3	210.0	1,456.2	0.44	-0.31	-3.90	
Last PZD Survey										
7,627.8	4.44	242.84	7,333.5	1,466.8	207.8	1,452.0	0.00	0.00	0.00	
GGU 24D-28-691 BHL										
7,650.0	4.44	242.84	7,355.5	1,465.2	207.0	1,450.5	0.00	0.00	0.00	
Straightline Projection to TD										

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
785.0	784.9	1.2	2.4	Last PZD Surface Survey
7,567.0	7,272.8	210.0	1,456.2	Last PZD Survey
7,650.0	7,355.5	207.0	1,450.5	Straightline Projection to TD

Checked By: _____ Approved By: _____ Date: _____



Project: Garfield County, CO
 Site: GGU 13-28
 Well: Federal GGU 24D-28-691
 Wellbore: Wellbore #1
 Design: Actual



Design: Actual (Federal GGU 24D-28-691/Wellbore #1)

Created By: Derek Stephens Date: 10:21, December 19 2017

THIS SURVEY IS CORRECT TO THE BEST OF
 MY KNOWLEDGE AND IS SUPPORTED
 BY ACTUAL FIELD DATA