



Vanguard Natural Resources

Garfield County, CO

GGU 13-28

Federal GGU 24C-28-691

Wellbore #1

Design: Actual

End of Well Report

04 December, 2017





Payzone Directional End of Well Report



Company: Vanguard Natural Resources	Local Co-ordinate Reference: Well Federal GGU 24C-28-691
Project: Garfield County, CO	TVD Reference: Federal GGU 24C-28-691 @ 6147.6usft (Est KB)
Site: GGU 13-28	MD Reference: Federal GGU 24C-28-691 @ 6147.6usft (Est KB)
Well: Federal GGU 24C-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	Latitude: 39° 29' 40.232 N	
From: Lat/Long	Easting: 2,416,896.90 usft	Longitude: 107° 33' 59.065 W	
Position Uncertainty: 0.0 usft	Slot Radius: 13-3/16 "	Grid Convergence: -1.30 °	

Well Federal GGU 24C-28-691			
Well Position	+N/-S 0.0 usft	Northing: 1,611,616.23 usft	Latitude: 39° 29' 40.038 N
	+E/-W 0.0 usft	Easting: 2,416,889.12 usft	Longitude: 107° 33' 59.159 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	12/4/2017	9.46	65.65	51,529

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	93.08	

Survey Program Date 12/4/2017				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
136.0	7,635.0	Surface (Wellbore #1)	MWD	MWD v3:standard declination



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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	0.00
136.0	0.59	129.64	136.0	0.6	-0.4	0.5	0.43	0.43	0.00	
167.0	0.35	121.49	167.0	0.8	-0.6	0.7	0.80	-0.77	-26.29	
197.0	0.53	112.39	197.0	1.0	-0.7	0.9	0.64	0.60	-30.33	
227.0	0.53	107.78	227.0	1.3	-0.8	1.2	0.14	0.00	-15.37	
256.0	0.79	99.29	256.0	1.6	-0.9	1.5	0.96	0.90	-29.28	
286.0	0.53	119.47	286.0	1.9	-1.0	1.9	1.15	-0.87	67.27	
316.0	0.35	68.44	316.0	2.1	-1.0	2.1	1.37	-0.60	-170.10	
347.0	0.28	3.58	347.0	2.2	-0.9	2.2	1.11	-0.23	-209.23	
377.0	0.40	10.74	377.0	2.2	-0.7	2.2	0.42	0.40	23.87	
407.0	0.40	32.41	407.0	2.3	-0.5	2.3	0.50	0.00	72.23	
437.0	0.48	355.98	437.0	2.3	-0.3	2.3	0.95	0.27	-121.43	
467.0	0.48	355.58	467.0	2.3	-0.1	2.3	0.01	0.00	-1.33	
497.0	0.45	34.31	497.0	2.3	0.2	2.3	1.03	-0.10	129.10	
527.0	0.70	18.97	527.0	2.4	0.4	2.5	0.97	0.83	-51.13	
557.0	0.35	33.29	557.0	2.5	0.7	2.6	1.24	-1.17	47.73	
587.0	0.35	356.33	587.0	2.6	0.8	2.6	0.74	0.00	-123.20	
617.0	0.26	354.53	617.0	2.6	1.0	2.6	0.30	-0.30	-6.00	
648.0	0.48	328.73	648.0	2.5	1.2	2.5	0.87	0.71	-83.23	
678.0	0.26	324.65	678.0	2.4	1.4	2.4	0.74	-0.73	-13.60	
708.0	0.40	289.23	708.0	2.2	1.4	2.3	0.80	0.47	-118.07	
738.0	0.66	307.42	738.0	2.0	1.6	2.1	1.02	0.87	60.63	
768.0	0.62	311.86	768.0	1.7	1.8	1.8	0.21	-0.13	14.80	
785.0	0.77	302.34	785.0	1.5	1.9	1.6	1.11	0.88	-56.00	
Last PZD Surface Survey										
854.0	1.13	291.85	854.0	0.5	2.4	0.6	0.58	0.52	-15.20	
896.0	0.92	282.33	896.0	-0.2	2.6	-0.1	0.64	-0.50	-22.67	



Payzone Directional End of Well Report



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Site: GGU 13-28	MD Reference: Federal GGU 24C-28-691 @ 6147.6usft (Est KB)
Well: Federal GGU 24C-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	0.75	111.82	938.0	-0.3	2.6	-0.2	3.96	-0.40	-405.98	
982.0	2.29	100.61	981.9	0.8	2.3	1.0	3.55	3.50	-25.48	
1,024.0	3.87	94.81	1,023.9	3.1	2.1	3.2	3.83	3.76	-13.81	
1,066.0	5.63	95.51	1,065.7	6.6	1.8	6.7	4.19	4.19	1.67	
1,108.0	7.62	99.06	1,107.5	11.4	1.1	11.5	4.84	4.74	8.45	
1,151.0	9.27	101.80	1,150.0	17.6	0.0	17.7	3.95	3.84	6.37	
1,193.0	10.19	101.80	1,191.4	24.7	-1.5	24.6	2.19	2.19	0.00	
1,235.0	11.25	97.27	1,232.6	32.4	-2.8	32.3	3.22	2.52	-10.79	
1,277.0	12.52	93.63	1,273.7	41.1	-3.6	40.9	3.51	3.02	-8.67	
1,319.0	13.93	95.38	1,314.6	50.7	-4.3	50.5	3.49	3.36	4.17	
1,361.0	15.64	96.96	1,355.2	61.4	-5.5	61.2	4.18	4.07	3.76	
1,407.0	17.27	95.69	1,399.4	74.4	-6.9	74.1	3.63	3.54	-2.76	
1,449.0	18.46	94.24	1,439.3	87.2	-8.0	86.9	3.02	2.83	-3.45	
1,491.0	19.86	95.65	1,479.0	101.0	-9.2	100.7	3.51	3.33	3.36	
1,576.0	22.95	95.61	1,558.1	132.0	-12.3	131.5	3.64	3.64	-0.05	
1,660.0	24.89	92.72	1,634.9	166.0	-14.7	165.5	2.70	2.31	-3.44	
1,745.0	25.18	93.49	1,711.9	202.0	-16.7	201.4	0.51	0.34	0.91	
1,833.0	27.51	92.92	1,790.8	241.1	-18.8	240.4	2.66	2.65	-0.65	
1,917.0	27.77	92.83	1,865.2	280.0	-20.8	279.3	0.31	0.31	-0.11	
2,001.0	26.98	93.14	1,939.8	318.7	-22.8	317.9	0.96	-0.94	0.37	
2,086.0	26.54	93.01	2,015.7	356.9	-24.9	356.1	0.52	-0.52	-0.15	
2,170.0	26.19	93.23	2,090.9	394.2	-26.9	393.4	0.43	-0.42	0.26	
2,255.0	25.40	93.32	2,167.5	431.2	-29.0	430.3	0.93	-0.93	0.11	
2,343.0	27.07	94.42	2,246.4	470.1	-31.6	469.1	1.98	1.90	1.25	
2,425.0	26.94	94.42	2,319.5	507.3	-34.5	506.2	0.16	-0.16	0.00	
2,512.0	26.41	93.76	2,397.2	546.4	-37.3	545.2	0.70	-0.61	-0.76	
2,598.0	25.35	92.41	2,474.6	583.9	-39.3	582.7	1.41	-1.23	-1.57	



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Well:	Federal GGU 24C-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)	
2,682.0	24.74	92.39	2,550.7	619.5	-40.8	618.2	0.73	-0.73	-0.02	
2,767.0	24.51	91.30	2,628.0	654.9	-41.9	653.6	0.60	-0.27	-1.28	
2,851.0	24.52	93.49	2,704.4	689.7	-43.4	688.4	1.08	0.01	2.61	
2,935.0	24.26	93.84	2,780.9	724.4	-45.6	723.0	0.35	-0.31	0.42	
3,021.0	24.13	92.48	2,859.3	759.7	-47.6	758.2	0.67	-0.15	-1.58	
3,106.0	25.53	95.34	2,936.5	795.3	-50.0	793.8	2.17	1.65	3.36	
3,190.0	25.40	95.03	3,012.3	831.4	-53.3	829.8	0.22	-0.15	-0.37	
3,277.0	24.86	93.87	3,091.1	868.4	-56.2	866.6	0.84	-0.62	-1.33	
3,363.0	24.43	93.58	3,169.2	904.2	-58.5	902.4	0.52	-0.50	-0.34	
3,451.0	23.91	93.27	3,249.5	940.3	-60.6	938.4	0.61	-0.59	-0.35	
3,536.0	23.23	93.56	3,327.4	974.2	-62.7	972.3	0.81	-0.80	0.34	
3,620.0	23.42	92.75	3,404.6	1,007.5	-64.5	1,005.5	0.44	0.23	-0.96	
3,706.0	22.32	91.65	3,483.8	1,040.9	-65.8	1,038.9	1.37	-1.28	-1.28	
3,791.0	22.41	90.81	3,562.4	1,073.2	-66.5	1,071.2	0.39	0.11	-0.99	
3,875.0	22.54	94.94	3,640.0	1,105.3	-68.1	1,103.3	1.89	0.15	4.92	
3,960.0	22.68	94.06	3,718.5	1,138.0	-70.7	1,135.9	0.43	0.16	-1.04	
4,046.0	23.55	93.84	3,797.6	1,171.8	-73.0	1,169.5	1.02	1.01	-0.26	
4,134.0	22.83	92.62	3,878.5	1,206.4	-74.9	1,204.1	0.98	-0.82	-1.39	
4,218.0	21.40	91.91	3,956.3	1,238.0	-76.2	1,235.7	1.73	-1.70	-0.85	
4,303.0	20.13	94.02	4,035.8	1,268.2	-77.7	1,265.8	1.73	-1.49	2.48	
4,388.0	17.97	93.58	4,116.1	1,295.9	-79.6	1,293.5	2.55	-2.54	-0.52	
4,472.0	16.84	92.05	4,196.3	1,321.0	-80.8	1,318.6	1.45	-1.35	-1.82	
4,556.0	15.95	92.46	4,276.9	1,344.7	-81.8	1,342.3	1.07	-1.06	0.49	
4,641.0	14.60	91.78	4,358.9	1,367.1	-82.6	1,364.7	1.60	-1.59	-0.80	
4,725.0	11.95	92.66	4,440.6	1,386.4	-83.3	1,383.9	3.16	-3.15	1.05	
4,809.0	9.49	88.07	4,523.1	1,402.0	-83.5	1,399.5	3.10	-2.93	-5.46	
4,894.0	6.55	93.93	4,607.3	1,413.8	-83.6	1,411.4	3.59	-3.46	6.89	



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Well:	Federal GGU 24C-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)	
4,978.0	5.63	93.67	4,690.8	1,422.7	-84.2	1,420.3	1.10	-1.10	-0.31	
5,062.0	5.27	92.83	4,774.4	1,430.7	-84.6	1,428.2	0.44	-0.43	-1.00	
GGU 24C-28-691 TGT										
5,146.0	4.97	93.84	4,858.1	1,438.2	-85.1	1,435.7	0.37	-0.36	1.20	
5,233.0	4.88	90.77	4,944.8	1,445.7	-85.4	1,443.2	0.32	-0.10	-3.53	
5,319.0	4.44	87.91	5,030.5	1,452.7	-85.3	1,450.2	0.58	-0.51	-3.33	
5,403.0	4.04	89.41	5,114.3	1,458.8	-85.1	1,456.4	0.49	-0.48	1.79	
5,488.0	1.57	70.38	5,199.2	1,462.9	-84.7	1,460.5	3.07	-2.91	-22.39	
5,572.0	1.36	78.02	5,283.1	1,464.9	-84.1	1,462.5	0.34	-0.25	9.10	
5,656.0	1.14	79.78	5,367.1	1,466.7	-83.8	1,464.3	0.27	-0.26	2.10	
5,741.0	0.62	72.75	5,452.1	1,468.0	-83.5	1,465.6	0.62	-0.61	-8.27	
5,825.0	0.40	61.19	5,536.1	1,468.6	-83.2	1,466.3	0.29	-0.26	-13.76	
5,909.0	0.26	28.89	5,620.1	1,469.0	-82.9	1,466.6	0.27	-0.17	-38.45	
5,995.0	0.50	71.84	5,706.1	1,469.4	-82.6	1,467.1	0.41	0.28	49.94	
6,082.0	0.44	96.44	5,793.1	1,470.1	-82.5	1,467.8	0.24	-0.07	28.28	
6,166.0	0.66	99.00	5,877.1	1,470.9	-82.7	1,468.6	0.26	0.26	3.05	
6,250.0	0.18	145.92	5,961.1	1,471.5	-82.8	1,469.1	0.66	-0.57	55.86	
6,335.0	0.22	230.65	6,046.1	1,471.4	-83.0	1,469.1	0.32	0.05	99.68	
6,419.0	0.48	236.76	6,130.1	1,471.0	-83.3	1,468.7	0.31	0.31	7.27	
6,503.0	0.79	217.29	6,214.1	1,470.4	-84.0	1,468.0	0.44	0.37	-23.18	
6,588.0	1.05	229.59	6,299.1	1,469.5	-85.0	1,467.1	0.38	0.31	14.47	
6,672.0	0.76	213.10	6,383.1	1,468.7	-85.9	1,466.2	0.46	-0.35	-19.63	
6,758.0	1.37	347.39	6,469.1	1,468.1	-85.4	1,465.6	2.30	0.71	156.15	
6,843.0	1.26	345.11	6,554.0	1,467.5	-83.5	1,465.2	0.14	-0.13	-2.68	
6,927.0	1.54	327.41	6,638.0	1,466.6	-81.7	1,464.3	0.61	0.33	-21.07	
7,011.0	1.41	335.68	6,722.0	1,465.5	-79.8	1,463.3	0.30	-0.15	9.85	
7,098.0	0.92	335.19	6,809.0	1,464.7	-78.2	1,462.6	0.56	-0.56	-0.56	



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7,183.0	1.27	346.49	6,894.0	1,464.1	-76.6	1,462.1	0.48	0.41	13.29
7,269.0	1.50	341.58	6,979.9	1,463.4	-74.6	1,461.5	0.30	0.27	-5.71
7,352.0	0.79	214.65	7,062.9	1,462.7	-74.1	1,460.8	2.50	-0.86	-152.93
7,436.0	1.60	231.14	7,146.9	1,461.5	-75.3	1,459.6	1.04	0.96	19.63
7,523.0	1.67	232.98	7,233.9	1,459.6	-76.8	1,457.6	0.10	0.08	2.11
7,580.0	1.58	242.64	7,290.8	1,458.3	-77.7	1,456.3	0.51	-0.16	16.95
Last PZD Survey									
7,621.9	1.58	242.64	7,332.8	1,457.3	-78.2	1,455.2	0.00	0.00	0.00
GGU 24C-28-691 BHL									
7,635.0	1.58	242.64	7,345.8	1,457.0	-78.4	1,454.9	0.00	0.00	0.00
Straightline Projection to TD									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
785.0	785.0	1.9	1.6	Last PZD Surface Survey
7,580.0	7,290.8	-77.7	1,456.3	Last PZD Survey
7,635.0	7,345.8	-78.4	1,454.9	Straightline Projection to TD

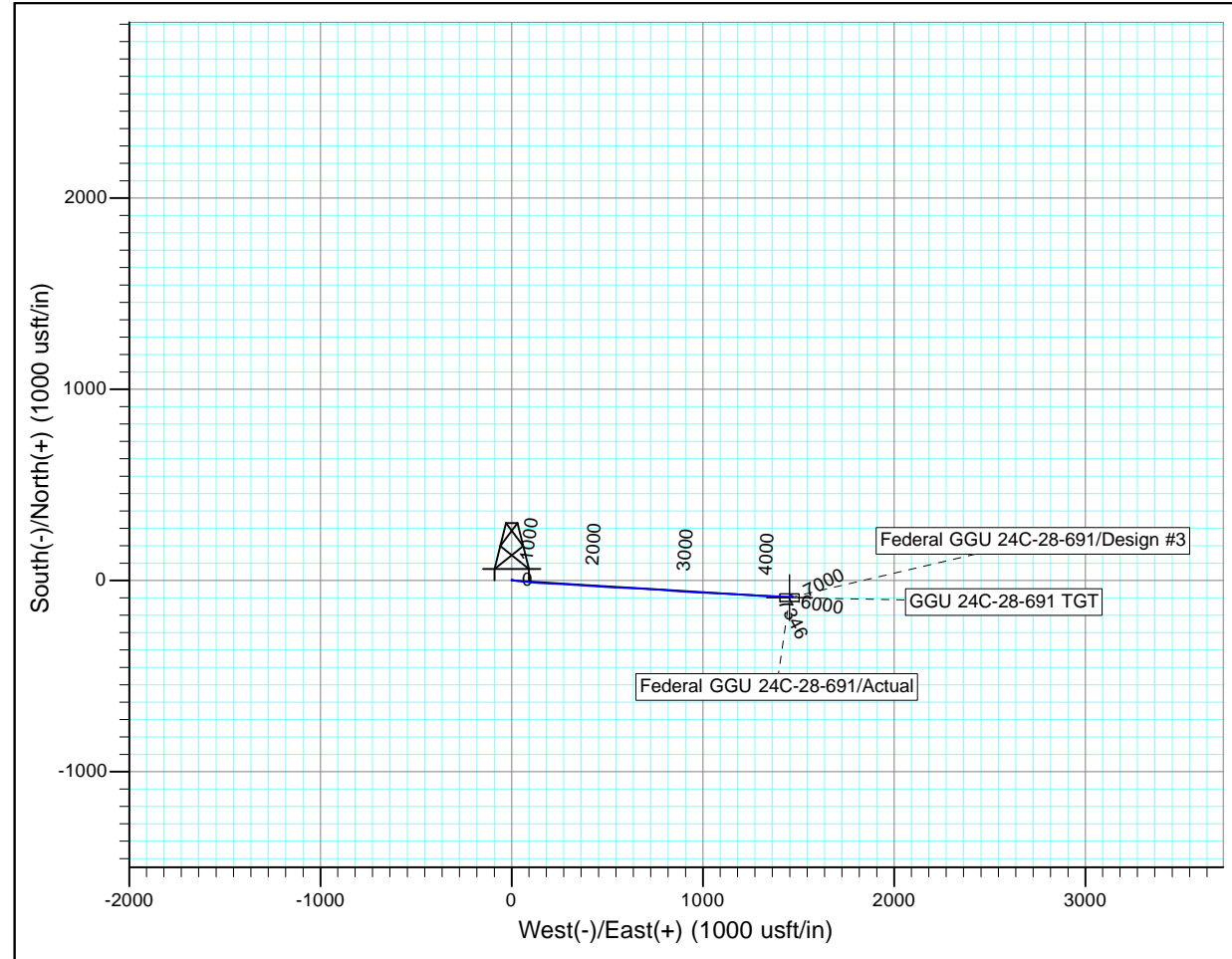
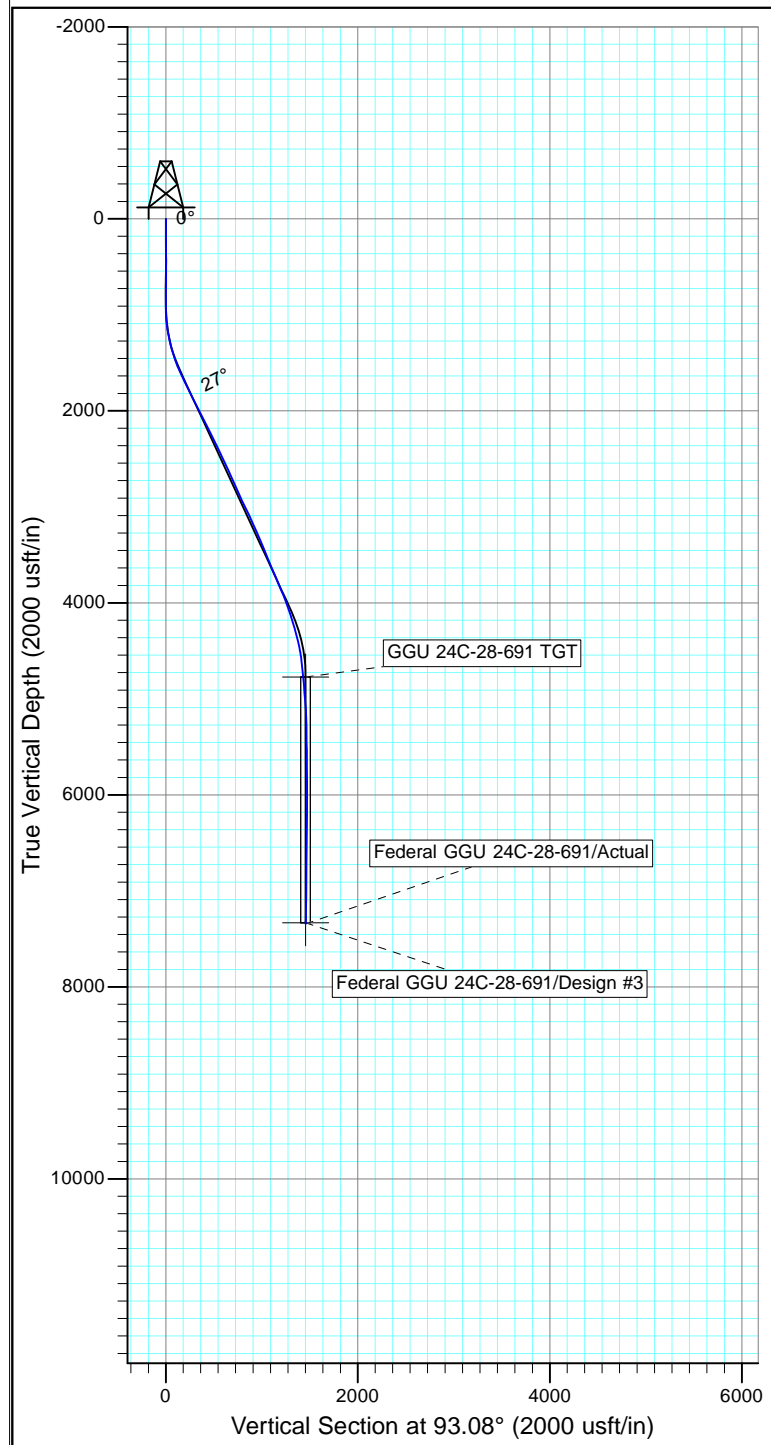
Checked By: _____ Approved By: _____ Date: _____



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

Azimuths to True North
 Magnetic North: 9.46°

Magnetic Field
 Strength: 51529.0snT
 Dip Angle: 65.65°
 Date: 12/4/2017
 Model: IGRF2015



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

Created By: Derek Stephens Date: 8:45, December 04 2017

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