

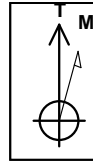


REFERENCE INFORMATION

Co-ordinate (N/E) Reference: Well Federal GGU 24A-28-691, True North
 Vertical (TVD) Reference: WELL @ 6130.60ft (Original Well Elev)
 Section (VS) Reference: Slot - (0.00N, 0.00E)
 Measured Depth Reference: WELL @ 6130.60ft (Original Well Elev)
 Calculation Method: Minimum Curvature

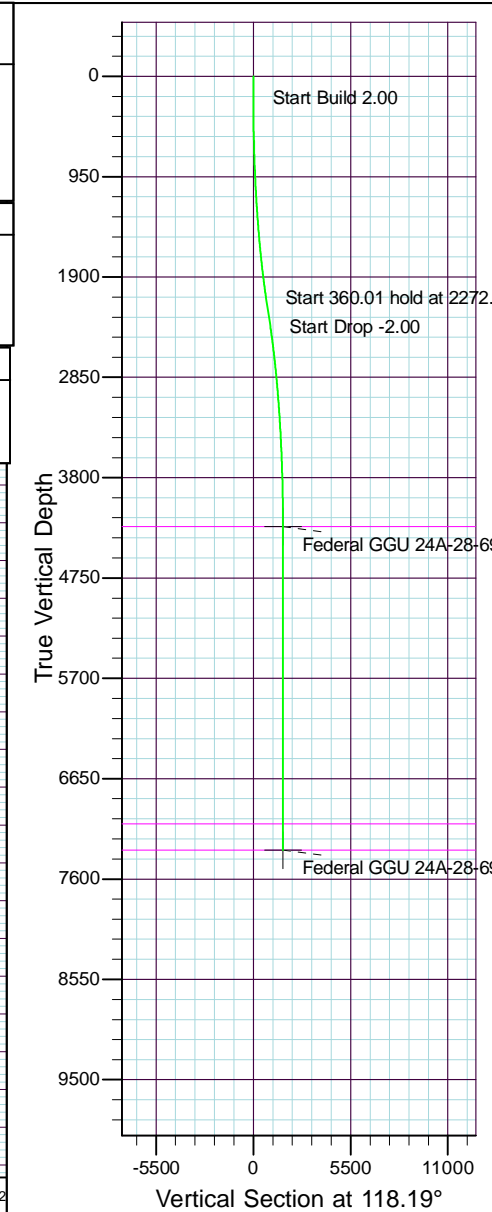
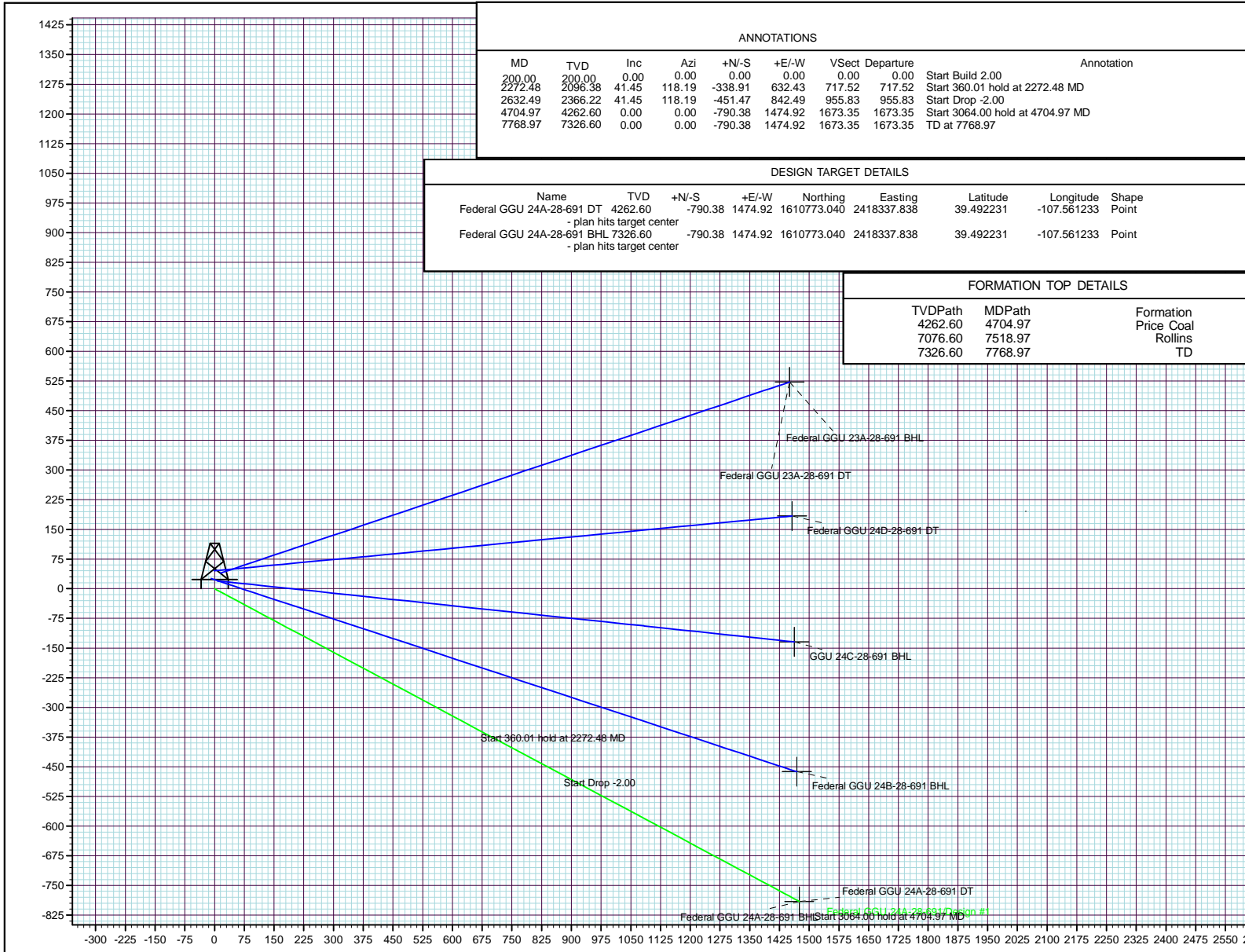


Project: GGU 13-28
 Site: GGU 13-28
 Well: Federal GGU 24A-28-691
 Wellbore: Federal GGU 24A-28-691
 Design: Design #1



Azimuths to True North
 Magnetic North: 9.43°
 Magnetic Field
 Strength: 51792.2nT
 Dip Angle: 65.60°
 Date: 12/31/2016
 Model: HDGM

WELL DETAILS: Federal GGU 24A-28-691					
+N/-S	+E/-W	Northing	Easting	Ground Level:	6130.60
0.00	0.00	1611596.729	2416881.338	Latitude	39.494401
				Longitude	-107.566459





DIRECTIONAL DRILLING SPECIALISTS

Vanguard Natural Resources, LLC

GGU 13-28

GGU 13-28

Federal GGU 24A-28-691

Federal GGU 24A-28-691

Plan: Design #1

Standard Planning Report

07 February, 2017

Database:	Compass DB Connection	Local Co-ordinate Reference:	Well Federal GGU 24A-28-691
Company:	Vanguard Natural Resources, LLC	TVD Reference:	WELL @ 6130.60ft (Original Well Elev)
Project:	GGU 13-28	MD Reference:	WELL @ 6130.60ft (Original Well Elev)
Site:	GGU 13-28	North Reference:	True
Well:	Federal GGU 24A-28-691	Survey Calculation Method:	Minimum Curvature
Wellbore:	Federal GGU 24A-28-691		
Design:	Design #1		

Project	GGU 13-28		
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:	1,611,635.732 usft	Latitude:	39.494509
From:	Lat/Long	Easting:	2,416,896.904 usft	Longitude:	-107.566407
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	-1.30 °

Well	Federal GGU 24A-28-691					
Well Position	+N/-S	-39.35 ft	Northing:	1,611,596.729 usft	Latitude:	39.494401
	+E/-W	-14.68 ft	Easting:	2,416,881.338 usft	Longitude:	-107.566459
Position Uncertainty		0.00 ft	Wellhead Elevation:	6,130.60 ft	Ground Level:	6,130.60 ft

Wellbore	Federal GGU 24A-28-691				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	12/31/2016	9.43	65.60	51,792

Design	Design #1			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	118.19

Plan Sections										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	
2,272.48	41.45	118.19	2,096.38	-338.91	632.43	2.00	2.00	0.00	118.19	
2,632.49	41.45	118.19	2,366.22	-451.47	842.49	0.00	0.00	0.00	0.00	
4,704.97	0.00	0.00	4,262.60	-790.38	1,474.92	2.00	-2.00	0.00	180.00	Federal GGU 24A-28-
7,768.97	0.00	0.00	7,326.60	-790.38	1,474.92	0.00	0.00	0.00	0.00	Federal GGU 24A-28-

Database:	Compass DB Connection	Local Co-ordinate Reference:	Well Federal GGU 24A-28-691
Company:	Vanguard Natural Resources, LLC	TVD Reference:	WELL @ 6130.60ft (Original Well Elev)
Project:	GGU 13-28	MD Reference:	WELL @ 6130.60ft (Original Well Elev)
Site:	GGU 13-28	North Reference:	True
Well:	Federal GGU 24A-28-691	Survey Calculation Method:	Minimum Curvature
Wellbore:	Federal GGU 24A-28-691		
Design:	Design #1		

Planned Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	2.00	118.19	299.98	-0.82	1.54	1.75	2.00	2.00	2.00	0.00
400.00	4.00	118.19	399.84	-3.30	6.15	6.98	2.00	2.00	2.00	0.00
500.00	6.00	118.19	499.45	-7.41	13.83	15.69	2.00	2.00	2.00	0.00
600.00	8.00	118.19	598.70	-13.17	24.57	27.88	2.00	2.00	2.00	0.00
700.00	10.00	118.19	697.47	-20.56	38.36	43.52	2.00	2.00	2.00	0.00
800.00	12.00	118.19	795.62	-29.57	55.18	62.60	2.00	2.00	2.00	0.00
900.00	14.00	118.19	893.06	-40.19	75.01	85.10	2.00	2.00	2.00	0.00
1,000.00	16.00	118.19	989.64	-52.42	97.82	110.98	2.00	2.00	2.00	0.00
1,100.00	18.00	118.19	1,085.27	-66.23	123.59	140.21	2.00	2.00	2.00	0.00
1,200.00	20.00	118.19	1,179.82	-81.60	152.28	172.77	2.00	2.00	2.00	0.00
1,300.00	22.00	118.19	1,273.17	-98.53	183.87	208.60	2.00	2.00	2.00	0.00
1,400.00	24.00	118.19	1,365.21	-116.98	218.30	247.67	2.00	2.00	2.00	0.00
1,500.00	26.00	118.19	1,455.84	-136.95	255.55	289.93	2.00	2.00	2.00	0.00
1,600.00	28.00	118.19	1,544.94	-158.39	295.57	335.33	2.00	2.00	2.00	0.00
1,700.00	30.00	118.19	1,632.39	-181.29	338.30	383.81	2.00	2.00	2.00	0.00
1,800.00	32.00	118.19	1,718.11	-205.61	383.69	435.31	2.00	2.00	2.00	0.00
1,900.00	34.00	118.19	1,801.97	-231.34	431.69	489.77	2.00	2.00	2.00	0.00
2,000.00	36.00	118.19	1,883.88	-258.43	482.25	547.12	2.00	2.00	2.00	0.00
2,100.00	38.00	118.19	1,963.74	-286.85	535.29	607.30	2.00	2.00	2.00	0.00
2,200.00	40.00	118.19	2,041.45	-316.57	590.76	670.23	2.00	2.00	2.00	0.00
2,272.48	41.45	118.19	2,096.38	-338.91	632.43	717.52	2.00	2.00	2.00	0.00
2,300.00	41.45	118.19	2,117.01	-347.51	648.49	735.74	0.00	0.00	0.00	0.00
2,400.00	41.45	118.19	2,191.96	-378.78	706.84	801.93	0.00	0.00	0.00	0.00
2,500.00	41.45	118.19	2,266.91	-410.05	765.18	868.13	0.00	0.00	0.00	0.00
2,600.00	41.45	118.19	2,341.87	-441.31	823.53	934.32	0.00	0.00	0.00	0.00
2,632.49	41.45	118.19	2,366.22	-451.47	842.49	955.83	0.00	0.00	0.00	0.00
2,700.00	40.10	118.19	2,417.34	-472.30	881.35	999.92	2.00	-2.00	-2.00	0.00
2,800.00	38.10	118.19	2,494.95	-502.08	936.93	1,062.98	2.00	-2.00	-2.00	0.00
2,900.00	36.10	118.19	2,574.70	-530.57	990.10	1,123.30	2.00	-2.00	-2.00	0.00
3,000.00	34.10	118.19	2,656.51	-557.73	1,040.78	1,180.80	2.00	-2.00	-2.00	0.00
3,100.00	32.10	118.19	2,740.28	-583.52	1,088.91	1,235.40	2.00	-2.00	-2.00	0.00
3,200.00	30.10	118.19	2,825.90	-607.92	1,134.43	1,287.05	2.00	-2.00	-2.00	0.00
3,300.00	28.10	118.19	2,913.28	-630.89	1,177.30	1,335.68	2.00	-2.00	-2.00	0.00
3,400.00	26.10	118.19	3,002.29	-652.41	1,217.45	1,381.23	2.00	-2.00	-2.00	0.00
3,500.00	24.10	118.19	3,092.85	-672.44	1,254.83	1,423.65	2.00	-2.00	-2.00	0.00
3,600.00	22.10	118.19	3,184.82	-690.97	1,289.41	1,462.88	2.00	-2.00	-2.00	0.00
3,700.00	20.10	118.19	3,278.12	-707.97	1,321.14	1,498.88	2.00	-2.00	-2.00	0.00
3,800.00	18.10	118.19	3,372.61	-723.43	1,349.98	1,531.60	2.00	-2.00	-2.00	0.00
3,900.00	16.10	118.19	3,468.18	-737.31	1,375.89	1,561.00	2.00	-2.00	-2.00	0.00
4,000.00	14.10	118.19	3,564.72	-749.62	1,398.85	1,587.05	2.00	-2.00	-2.00	0.00
4,100.00	12.10	118.19	3,662.12	-760.32	1,418.83	1,609.71	2.00	-2.00	-2.00	0.00
4,200.00	10.10	118.19	3,760.24	-769.42	1,435.80	1,628.96	2.00	-2.00	-2.00	0.00
4,300.00	8.10	118.19	3,858.98	-776.88	1,449.73	1,644.77	2.00	-2.00	-2.00	0.00
4,400.00	6.10	118.19	3,958.21	-782.72	1,460.63	1,657.13	2.00	-2.00	-2.00	0.00
4,500.00	4.10	118.19	4,057.81	-786.92	1,468.46	1,666.02	2.00	-2.00	-2.00	0.00
4,600.00	2.10	118.19	4,157.65	-789.47	1,473.23	1,671.43	2.00	-2.00	-2.00	0.00
4,700.00	0.10	118.19	4,257.63	-790.38	1,474.92	1,673.34	2.00	-2.00	-2.00	0.00
4,704.97	0.00	0.00	4,262.60	-790.38	1,474.92	1,673.35	2.00	-2.00	-2.00	0.00
4,800.00	0.00	0.00	4,357.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	0.00
4,900.00	0.00	0.00	4,457.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	0.00
5,000.00	0.00	0.00	4,557.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	0.00

Database:	Compass DB Connection	Local Co-ordinate Reference:	Well Federal GGU 24A-28-691
Company:	Vanguard Natural Resources, LLC	TVD Reference:	WELL @ 6130.60ft (Original Well Elev)
Project:	GGU 13-28	MD Reference:	WELL @ 6130.60ft (Original Well Elev)
Site:	GGU 13-28	North Reference:	True
Well:	Federal GGU 24A-28-691	Survey Calculation Method:	Minimum Curvature
Wellbore:	Federal GGU 24A-28-691		
Design:	Design #1		

Planned Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
5,100.00	0.00	0.00	4,657.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
5,200.00	0.00	0.00	4,757.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
5,300.00	0.00	0.00	4,857.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
5,400.00	0.00	0.00	4,957.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
5,500.00	0.00	0.00	5,057.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
5,600.00	0.00	0.00	5,157.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
5,700.00	0.00	0.00	5,257.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
5,800.00	0.00	0.00	5,357.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
5,900.00	0.00	0.00	5,457.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
6,000.00	0.00	0.00	5,557.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
6,100.00	0.00	0.00	5,657.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
6,200.00	0.00	0.00	5,757.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
6,300.00	0.00	0.00	5,857.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
6,400.00	0.00	0.00	5,957.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
6,500.00	0.00	0.00	6,057.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
6,600.00	0.00	0.00	6,157.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
6,700.00	0.00	0.00	6,257.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
6,800.00	0.00	0.00	6,357.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
6,900.00	0.00	0.00	6,457.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
7,000.00	0.00	0.00	6,557.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
7,100.00	0.00	0.00	6,657.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
7,200.00	0.00	0.00	6,757.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
7,300.00	0.00	0.00	6,857.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
7,400.00	0.00	0.00	6,957.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
7,500.00	0.00	0.00	7,057.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
7,600.00	0.00	0.00	7,157.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
7,700.00	0.00	0.00	7,257.63	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	
7,768.97	0.00	0.00	7,326.60	-790.38	1,474.92	1,673.35	0.00	0.00	0.00	

Design Targets										
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude	
Federal GGU 24A-28-69 - hit/miss target - Shape - Point	0.00	0.00	4,262.60	-790.38	1,474.92	1,610,773.040	2,418,337.838	39.492231	-107.561233	
Federal GGU 24A-28-69 - plan hits target center - Point	0.00	0.00	7,326.60	-790.38	1,474.92	1,610,773.040	2,418,337.838	39.492231	-107.561233	

Formations						
Measured Depth (ft)	Vertical Depth (ft)	Name	Lithology	Dip (°)	Dip Direction (°)	
4,704.97	4,262.60	Price Coal		0.00		
7,518.97	7,076.60	Rollins		0.00		
7,768.97	7,326.60	TD		0.00		

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Project:	GGU 13-28	MD Reference:	WELL @ 6130.60ft (Original Well Elev)
Site:	GGU 13-28	North Reference:	True
Well:	Federal GGU 24A-28-691	Survey Calculation Method:	Minimum Curvature
Wellbore:	Federal GGU 24A-28-691		
Design:	Design #1		

Plan Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment	
		+N/-S (ft)	+E/-W (ft)		
200.00	200.00	0.00	0.00	Start Build 2.00	
2,272.48	2,096.38	-338.91	632.43	Start 360.01 hold at 2272.48 MD	
2,632.49	2,366.22	-451.47	842.49	Start Drop -2.00	
4,704.97	4,262.60	-790.38	1,474.92	Start 3064.00 hold at 4704.97 MD	
7,768.97	7,326.60	-790.38	1,474.92	TD at 7768.97	