

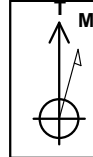


REFERENCE INFORMATION

Co-ordinate (N/E) Reference: Well Federal GGU 24C-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

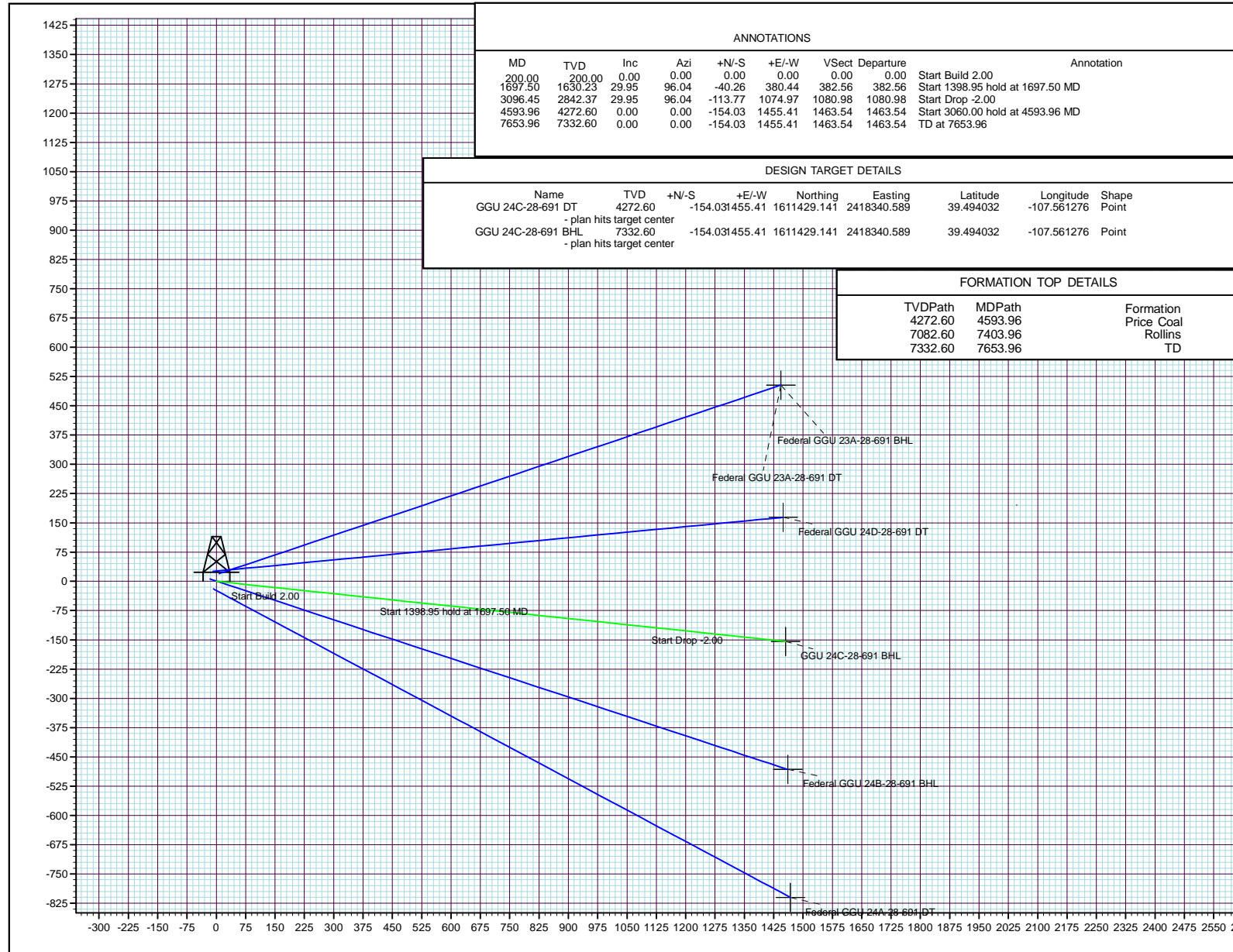


Project: GGU 13-28
 Site: GGU 13-28
 Well: Federal GGU 24C-28-691
 Wellbore: Federal GGU 24C-28-691
 Design: Design #1



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

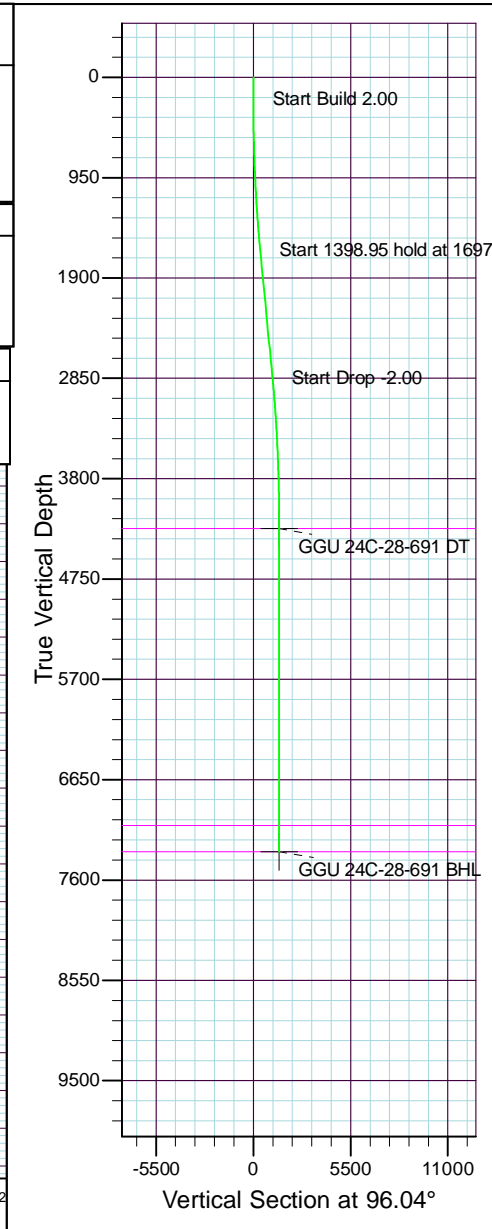
WELL DETAILS: Federal GGU 24C-28-691						
+N/-S	+E/-W	Northing	Ground Level: Easting	6130.60 Latitude	Longitude	
0.00	0.00	1611616.226	2416889.120	39.494455	-107.566433	



ANNOTATIONS									
MD	TVD	Inc	Azi	+N/-S	+E/-W	V Sect	Departure	Annotation	
200.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	Start Build 2.00	
1697.50	1630.23	29.95	96.04	-40.26	380.44	382.56	382.56	Start 1398.95 hold at 1697.50 MD	
3096.45	2842.37	29.95	96.04	-113.77	1074.97	1080.98	1080.98	Start Drop -2.00	
4593.96	4272.60	0.00	0.00	-154.03	1455.41	1463.54	1463.54	Start 3060.00 hold at 4593.96 MD	
7653.96	7332.60	0.00	0.00	-154.03	1455.41	1463.54	1463.54	TD at 7653.96	

DESIGN TARGET DETAILS									
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape	
GGU 24C-28-691 DT	4272.60	-154.031455.41	1611429.141	2418340.589	39.494032	-107.561276	Point		
- plan hits target center									
GGU 24C-28-691 BHL	7332.60	-154.031455.41	1611429.141	2418340.589	39.494032	-107.561276	Point		
- plan hits target center									

FORMATION TOP DETAILS			
TVDPath	MDPath	Formation	
4272.60	4593.96	Price Coal	
7082.60	7403.96	Rollins	
7332.60	7653.96	TD	





DIRECTIONAL DRILLING SPECIALISTS

Vanguard Natural Resources, LLC

GGU 13-28

GGU 13-28

Federal GGU 24C-28-691

Federal GGU 24C-28-691

Plan: Design #1

Standard Planning Report

07 February, 2017

Database:	Compass DB Connection	Local Co-ordinate Reference:	Well Federal GGU 24C-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 24C-28-691	Survey Calculation Method:	Minimum Curvature
Wellbore:	Federal GGU 24C-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 24C-28-691					
Well Position	+N/-S	-19.68 ft	Northing:	1,611,616.226 usft	Latitude:	39.494455
	+E/-W	-7.34 ft	Easting:	2,416,889.121 usft	Longitude:	-107.566433
Position Uncertainty		0.00 ft	Wellhead Elevation:	6,130.60 ft	Ground Level:	6,130.60 ft

Wellbore	Federal GGU 24C-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	96.04

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	
1,697.50	29.95	96.04	1,630.23	-40.26	380.44	2.00	2.00	0.00	96.04	
3,096.45	29.95	96.04	2,842.37	-113.77	1,074.97	0.00	0.00	0.00	0.00	
4,593.96	0.00	0.00	4,272.60	-154.03	1,455.41	2.00	-2.00	0.00	180.00	GGU 24C-28-691 DT
7,653.96	0.00	0.00	7,332.60	-154.03	1,455.41	0.00	0.00	0.00	0.00	GGU 24C-28-691 BH

Database:	Compass DB Connection	Local Co-ordinate Reference:	Well Federal GGU 24C-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 24C-28-691	Survey Calculation Method:	Minimum Curvature
Wellbore:	Federal GGU 24C-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	96.04	299.98	-0.18	1.74	1.75	2.00	2.00	2.00	0.00
400.00	4.00	96.04	399.84	-0.73	6.94	6.98	2.00	2.00	2.00	0.00
500.00	6.00	96.04	499.45	-1.65	15.61	15.69	2.00	2.00	2.00	0.00
600.00	8.00	96.04	598.70	-2.93	27.73	27.88	2.00	2.00	2.00	0.00
700.00	10.00	96.04	697.47	-4.58	43.28	43.52	2.00	2.00	2.00	0.00
800.00	12.00	96.04	795.62	-6.59	62.25	62.60	2.00	2.00	2.00	0.00
900.00	14.00	96.04	893.06	-8.96	84.62	85.10	2.00	2.00	2.00	0.00
1,000.00	16.00	96.04	989.64	-11.68	110.36	110.98	2.00	2.00	2.00	0.00
1,100.00	18.00	96.04	1,085.27	-14.76	139.43	140.21	2.00	2.00	2.00	0.00
1,200.00	20.00	96.04	1,179.82	-18.18	171.81	172.77	2.00	2.00	2.00	0.00
1,300.00	22.00	96.04	1,273.17	-21.95	207.44	208.60	2.00	2.00	2.00	0.00
1,400.00	24.00	96.04	1,365.21	-26.07	246.30	247.67	2.00	2.00	2.00	0.00
1,500.00	26.00	96.04	1,455.84	-30.51	288.32	289.93	2.00	2.00	2.00	0.00
1,600.00	28.00	96.04	1,544.94	-35.29	333.47	335.33	2.00	2.00	2.00	0.00
1,697.50	29.95	96.04	1,630.23	-40.26	380.44	382.56	2.00	2.00	2.00	0.00
1,700.00	29.95	96.04	1,632.40	-40.39	381.68	383.81	0.00	0.00	0.00	0.00
1,800.00	29.95	96.04	1,719.04	-45.65	431.32	433.73	0.00	0.00	0.00	0.00
1,900.00	29.95	96.04	1,805.69	-50.90	480.97	483.66	0.00	0.00	0.00	0.00
2,000.00	29.95	96.04	1,892.33	-56.16	530.62	533.58	0.00	0.00	0.00	0.00
2,100.00	29.95	96.04	1,978.98	-61.41	580.26	583.50	0.00	0.00	0.00	0.00
2,200.00	29.95	96.04	2,065.63	-66.67	629.91	633.43	0.00	0.00	0.00	0.00
2,300.00	29.95	96.04	2,152.27	-71.92	679.56	683.35	0.00	0.00	0.00	0.00
2,400.00	29.95	96.04	2,238.92	-77.17	729.21	733.28	0.00	0.00	0.00	0.00
2,500.00	29.95	96.04	2,325.56	-82.43	778.85	783.20	0.00	0.00	0.00	0.00
2,600.00	29.95	96.04	2,412.21	-87.68	828.50	833.13	0.00	0.00	0.00	0.00
2,700.00	29.95	96.04	2,498.86	-92.94	878.15	883.05	0.00	0.00	0.00	0.00
2,800.00	29.95	96.04	2,585.50	-98.19	927.79	932.98	0.00	0.00	0.00	0.00
2,900.00	29.95	96.04	2,672.15	-103.45	977.44	982.90	0.00	0.00	0.00	0.00
3,000.00	29.95	96.04	2,758.80	-108.70	1,027.09	1,032.82	0.00	0.00	0.00	0.00
3,096.45	29.95	96.04	2,842.37	-113.77	1,074.97	1,080.98	0.00	0.00	0.00	0.00
3,100.00	29.88	96.04	2,845.44	-113.95	1,076.73	1,082.75	2.00	-2.00	0.00	0.00
3,200.00	27.88	96.04	2,933.00	-119.04	1,124.76	1,131.04	2.00	-2.00	0.00	0.00
3,300.00	25.88	96.04	3,022.19	-123.79	1,169.72	1,176.25	2.00	-2.00	0.00	0.00
3,400.00	23.88	96.04	3,112.91	-128.22	1,211.55	1,218.32	2.00	-2.00	0.00	0.00
3,500.00	21.88	96.04	3,205.04	-132.31	1,250.21	1,257.19	2.00	-2.00	0.00	0.00
3,600.00	19.88	96.04	3,298.47	-136.06	1,285.65	1,292.83	2.00	-2.00	0.00	0.00
3,700.00	17.88	96.04	3,393.08	-139.47	1,317.83	1,325.19	2.00	-2.00	0.00	0.00
3,800.00	15.88	96.04	3,488.77	-142.52	1,346.70	1,354.22	2.00	-2.00	0.00	0.00
3,900.00	13.88	96.04	3,585.41	-145.23	1,372.23	1,379.90	2.00	-2.00	0.00	0.00
4,000.00	11.88	96.04	3,682.89	-147.57	1,394.40	1,402.19	2.00	-2.00	0.00	0.00
4,100.00	9.88	96.04	3,781.09	-149.56	1,413.17	1,421.06	2.00	-2.00	0.00	0.00
4,200.00	7.88	96.04	3,879.88	-151.18	1,428.52	1,436.49	2.00	-2.00	0.00	0.00
4,300.00	5.88	96.04	3,979.16	-152.44	1,440.43	1,448.47	2.00	-2.00	0.00	0.00
4,400.00	3.88	96.04	4,078.79	-153.34	1,448.88	1,456.98	2.00	-2.00	0.00	0.00
4,500.00	1.88	96.04	4,178.66	-153.87	1,453.88	1,462.00	2.00	-2.00	0.00	0.00
4,593.96	0.00	0.00	4,272.60	-154.03	1,455.41	1,463.54	2.00	-2.00	0.00	0.00
4,600.00	0.00	0.00	4,278.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	0.00
4,700.00	0.00	0.00	4,378.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	0.00
4,800.00	0.00	0.00	4,478.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	0.00
4,900.00	0.00	0.00	4,578.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	0.00
5,000.00	0.00	0.00	4,678.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	0.00

Database:	Compass DB Connection	Local Co-ordinate Reference:	Well Federal GGU 24C-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 24C-28-691	Survey Calculation Method:	Minimum Curvature
Wellbore:	Federal GGU 24C-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	4,778.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
5,200.00	0.00	0.00	4,878.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
5,300.00	0.00	0.00	4,978.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
5,400.00	0.00	0.00	5,078.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
5,500.00	0.00	0.00	5,178.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
5,600.00	0.00	0.00	5,278.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
5,700.00	0.00	0.00	5,378.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
5,800.00	0.00	0.00	5,478.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
5,900.00	0.00	0.00	5,578.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
6,000.00	0.00	0.00	5,678.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
6,100.00	0.00	0.00	5,778.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
6,200.00	0.00	0.00	5,878.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
6,300.00	0.00	0.00	5,978.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
6,400.00	0.00	0.00	6,078.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
6,500.00	0.00	0.00	6,178.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
6,600.00	0.00	0.00	6,278.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
6,700.00	0.00	0.00	6,378.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
6,800.00	0.00	0.00	6,478.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
6,900.00	0.00	0.00	6,578.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
7,000.00	0.00	0.00	6,678.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
7,100.00	0.00	0.00	6,778.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
7,200.00	0.00	0.00	6,878.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
7,300.00	0.00	0.00	6,978.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
7,400.00	0.00	0.00	7,078.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
7,500.00	0.00	0.00	7,178.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
7,600.00	0.00	0.00	7,278.64	-154.03	1,455.41	1,463.54	0.00	0.00	0.00	
7,653.96	0.00	0.00	7,332.60	-154.03	1,455.41	1,463.54	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
GGU 24C-28-691 DT - hit/miss target - Shape - Point	0.00	0.00	4,272.60	-154.03	1,455.41	1,611,429.142	2,418,340.589	39.494032	-107.561276
GGU 24C-28-691 BHL - plan hits target center - Point	0.00	0.00	7,332.60	-154.03	1,455.41	1,611,429.142	2,418,340.589	39.494032	-107.561276

Formations						
Measured Depth (ft)	Vertical Depth (ft)	Name	Lithology	Dip (°)	Dip Direction (°)	
4,593.96	4,272.60	Price Coal		0.00		
7,403.96	7,082.60	Rollins		0.00		
7,653.96	7,332.60	TD		0.00		

Database:	Compass DB Connection	Local Co-ordinate Reference:	Well Federal GGU 24C-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 24C-28-691	Survey Calculation Method:	Minimum Curvature
Wellbore:	Federal GGU 24C-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
1,697.50	1,630.23	-40.26	380.44	Start 1398.95 hold at 1697.50 MD
3,096.45	2,842.37	-113.77	1,074.97	Start Drop -2.00
4,593.96	4,272.60	-154.03	1,455.41	Start 3060.00 hold at 4593.96 MD
7,653.96	7,332.60	-154.03	1,455.41	TD at 7653.96