

12/28/2018



EJ May 150
Lincoln County, WV
Noah Horn 294 Rig

September 13, 2018

Survey Certification Report

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SEP 27 2018
WV Department of
Environmental Protection

12/28/2018



PRODIRECTIONAL

Survey Certification Letter

September 13, 2018

HG Energy

Operator Name: HG Energy
Well Name: EJ May 150
County/Parish: Lincoln County
State: WV
Rig Name: Noah Horn 294
Job Number: LWW3111718

This is to certify the surveys performed on the referenced well by Professional Directional Ent., Inc. are true and correct MWD Surveys, data provided as follows:

<u>Surveyor</u>	<u>Surveyed Depths</u>	<u>Projection to Bit</u>	<u>Dates Performed</u>	<u>Type of Survey</u>
ProDirectional	508'MD – 2,608'MD	2,677'MD	09/04/18 – 09/06/18	MWD-OWSG

Sincerely,

John Jordan
Well Planning Analyst
Professional Directional

850 Conroe Park West Drive | Conroe, TX 77303 | Phone: 936.441.7266

prodirectional.com

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Environmental Protection

HG Energy LLC

12/28/2018

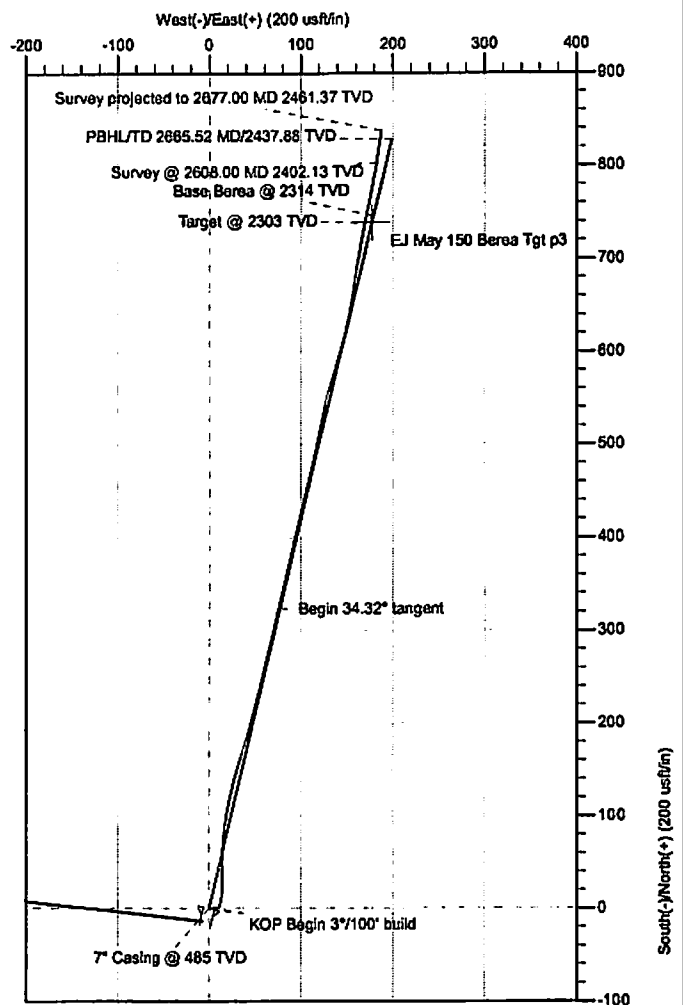
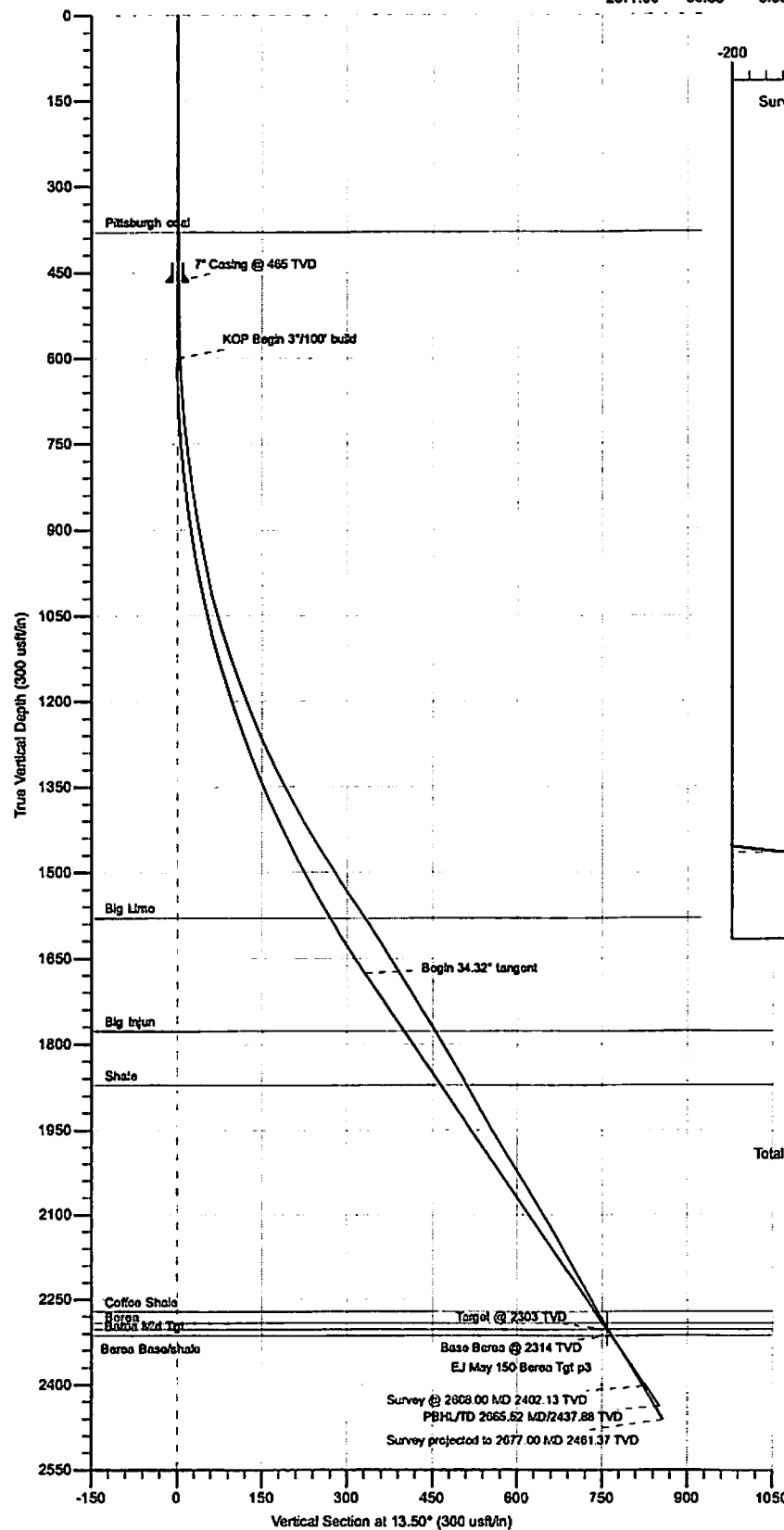
Section Details

Sec	MD	Inc	Azi	TVD	+N-S	+E-W	Dleg	TFace	VSect	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	800.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	KOP Begin 3°/100' build
3	1744.03	34.32	13.50	1878.83	323.33	77.83	3.00	13.50	332.52	Begin 34.32° tangent
4	2502.20	34.32	13.50	2303.00	739.00	177.42	0.00	0.00	760.00	Target @ 2303 TVD
5	2515.52	34.32	13.50	2314.00	746.30	179.18	0.00	0.00	767.51	Base Berea @ 2314 TVD
6	2665.52	34.32	13.50	2437.88	828.54	198.92	0.00	0.00	852.08	PBHLTD 2665.52 MD/2437.88 TVD

ANNOTATIONS

MD	Inc	Azi	TVD	+N-S	+E-W	Vsect	Annotation
508.00	1.91	85.93	507.91	0.80	8.45	2.56	MWD surveys
2608.00	30.85	8.53	2402.13	803.20	182.48	823.60	Survey @ 2608.00 MD 2402.13 TVD
2677.00	30.85	8.53	2461.37	838.19	187.71	858.85	Survey projected to 2677.00 MD 2461.37 TVD

Well: E.J. May No. 150
 Site: E.J. May
 Project: Lincoln County, West Virginia UTM83
 Design: plan3
 Rig: Noah Horn 294



Geodetic System: Universal Transverse Mercator
 Datum: NAD83 West Virginia - HARN
 Ellipsoid: GRS 1980
 Zone: Zone 17N (84 W to 78 W)

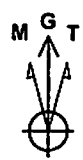
System Datum: Mean Sea Level
 Depth Reference: RKB=804+6 @ 810.00usft (Noah Horn 294)

Northing: 4232693.00
 Easting: 416089.00
 Latitude: 38° 14' 17.9765 N

Total Correction (M→T): To convert a Magnetic Direction to a True Direction, Subtract 8.35

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WV Department of Environmental Protection
 FORMATION TOP DETAILS



Azimuths to Grid North
 True North: 0.59°
 Magnetic North: -7.76°
 Magnetic Field
 Strength: 51473.8nT
 Dip Angle: 65.60°
 Date: 9/4/2018
 Model: HDGM

TVDPath	MDPath	Formation
380.00	380.00	Pittsburgh coal
1580.00	1629.08	Big Lino
1778.00	1866.53	Big Injun
1872.00	1980.34	Shale
2272.00	2484.67	Coffee Shale
2292.00	2488.88	Berea
2303.00	2502.20	Berea Mid Tgt
2314.00	2515.52	Berea Base/shale



PRODIRECTIONAL

Survey Report

Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 150
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=804+6 @ 810.00usft (Noah Horn 294)
Site:	E.J. May	MD Reference:	RKB=804+6 @ 810.00usft (Noah Horn 294)
Well:	E.J. May No. 150	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Project	Lincoln County, West Virginia UTM83		
Map System:	Universal Transverse Mercator	System Datum:	Mean Sea Level
Geo Datum:	NAD83 West Virginia - HARN		
Map Zone:	Zone 17N (84 W to 78 W)		

Site	E.J. May				
Site Position:		Northing:	4,232,693.00 m	Latitude:	38° 14' 17.9765 N
From:	Map	Easting:	416,089.00 m	Longitude:	81° 57' 31.8099 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-0.59 °

Well	E.J. May No. 150					
Well Position	+N/-S	0.00 usft	Northing:	4,232,693.00 m	Latitude:	38° 14' 17.9765 N
	+E/-W	0.00 usft	Easting:	416,089.00 m	Longitude:	81° 57' 31.8099 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	804.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	9/4/2018	-8.35	65.60	51,473.80000000

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	13.50	

Survey Program	Date	9/8/2018			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
508.00	2,608.00	MWD (Original Hole)	MWD	OWSG MWD - Standard	
2,677.00	2,677.00	Projection (Original Hole)	MWD	OWSG MWD - Standard	

Survey										
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)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
508.00	1.91	85.93	507.91	0.60	8.45	2.56	0.38	0.38	0.00	
MWD surveys										
538.00	1.79	93.20	537.89	0.61	9.41	2.79	0.88	-0.40	24.23	
568.00	1.84	59.99	567.88	0.82	10.30	3.21	3.46	0.17	-110.70	
598.00	2.48	33.97	597.86	1.60	11.08	4.15	3.85	2.13	-86.73	
628.00	3.17	16.61	627.82	2.94	11.68	5.58	3.64	2.30	-57.87	
658.00	4.33	9.78	657.75	4.85	12.11	7.54	4.14	3.87	-22.77	
688.00	5.20	13.90	687.65	7.28	12.62	10.03	3.11	2.90	13.73	
718.00	6.20	11.32	717.50	10.19	13.27	13.01	3.44	3.33	-8.60	

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Environmental Protection

Survey Report



Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 150
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=804+6 @ 810.00usft (Noah Horn 294)
Site:	E.J. May	MD Reference:	RKB=804+6 @ 810.00usft (Noah Horn 294)
Well:	E.J. May No. 150	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

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)
748.00	6.58	7.92	747.32	13.48	13.82	16.34	1.79	1.27	-11.33
778.00	7.14	5.11	777.10	17.04	14.23	19.89	2.18	1.87	-9.37
808.00	7.80	4.18	806.85	20.93	14.54	23.75	2.24	2.20	-3.10
838.00	8.78	0.06	836.53	25.25	14.69	27.98	3.82	3.27	-13.73
868.00	9.85	359.27	866.14	30.11	14.66	32.70	3.59	3.57	-2.63
898.00	10.04	357.61	895.69	35.28	14.52	37.70	1.15	0.63	-5.53
928.00	10.86	357.57	925.19	40.72	14.29	42.93	2.73	2.73	-0.13
958.00	12.05	359.06	954.59	46.68	14.12	48.68	4.09	3.97	4.97
988.00	12.88	3.29	983.88	53.15	14.26	55.01	4.11	2.77	14.10
1,018.00	13.94	5.42	1,013.07	60.08	14.79	61.87	3.90	3.53	7.10
1,048.00	16.21	5.24	1,042.03	67.85	15.52	69.60	7.57	7.57	-0.60
1,078.00	17.14	5.08	1,070.77	76.42	16.29	78.11	3.10	3.10	-0.53
1,108.00	18.50	6.19	1,099.33	85.56	17.20	87.21	4.67	4.53	3.70
1,138.00	19.08	8.21	1,127.73	95.14	18.41	96.81	2.91	1.93	6.73
1,168.00	20.00	10.06	1,156.00	105.05	20.01	106.82	3.70	3.07	6.17
1,198.00	20.45	11.19	1,184.15	115.24	21.92	117.17	1.99	1.50	3.77
1,228.00	21.39	12.23	1,212.18	125.73	24.10	127.88	3.37	3.13	3.47
1,258.00	22.91	15.06	1,239.96	136.72	26.77	139.19	6.19	5.07	9.43
1,288.00	24.25	16.96	1,267.46	148.25	30.09	151.17	5.13	4.47	6.33
1,318.00	25.23	17.13	1,294.70	160.25	33.77	163.71	3.28	3.27	0.57
1,348.00	26.40	17.05	1,321.71	172.74	37.61	176.74	3.90	3.90	-0.27
1,378.00	27.42	15.80	1,348.46	185.76	41.44	190.30	3.89	3.40	-4.17
1,408.00	28.19	15.04	1,375.00	199.25	45.16	204.29	2.83	2.57	-2.53
1,438.00	29.32	14.76	1,401.30	213.20	48.87	218.72	3.79	3.77	-0.93
1,468.00	30.62	14.12	1,427.28	227.71	52.61	233.70	4.46	4.33	-2.13
1,498.00	31.50	14.27	1,452.98	242.72	56.40	249.18	2.94	2.93	0.50
1,528.00	32.80	13.50	1,478.38	258.21	60.23	265.14	4.54	4.33	-2.57
1,558.00	33.18	13.33	1,503.54	274.10	64.02	281.47	1.30	1.27	-0.57
1,588.00	34.24	13.58	1,528.50	290.29	67.90	298.12	3.56	3.53	0.83
1,618.00	34.27	13.75	1,553.30	306.70	71.89	315.01	0.33	0.10	0.57
1,648.00	33.86	13.54	1,578.15	323.03	75.85	331.81	1.42	-1.37	-0.70
1,678.00	32.71	12.96	1,603.23	339.06	79.62	348.28	3.98	-3.83	-1.93
1,708.00	32.01	12.62	1,628.57	354.72	83.18	364.33	2.41	-2.33	-1.13
1,738.00	31.47	12.94	1,654.08	370.11	86.67	380.11	1.89	-1.80	1.07
1,768.00	31.54	12.99	1,679.66	385.38	90.19	395.79	0.25	0.23	0.17
1,798.00	31.88	14.71	1,705.18	400.69	93.96	411.56	3.22	1.13	5.73
1,828.00	31.55	14.29	1,730.70	415.96	97.91	427.33	1.32	-1.10	-1.40
1,858.00	31.35	14.27	1,756.29	431.13	101.77	442.98	0.67	-0.67	-0.07
1,888.00	31.16	14.56	1,781.94	446.21	105.65	458.54	0.81	-0.63	0.97
1,918.00	30.34	13.47	1,807.72	461.09	109.36	473.88	3.30	-2.73	-3.63
1,948.00	30.14	13.05	1,833.64	475.79	112.83	488.99	0.97	-0.67	-1.40
1,978.00	30.68	12.29	1,859.51	490.61	116.16	504.17	2.21	1.80	-2.53
2,008.00	30.49	12.12	1,885.34	505.53	119.39	519.43	0.70	-0.63	-0.57

Survey Report

Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 150
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=804+6 @ 810.00usft (Noah Horn 294)
Site:	E.J. May	MD Reference:	RKB=804+6 @ 810.00usft (Noah Horn 294)
Well:	E.J. May No. 150	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Survey										
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)	
2,038.00	29.84	11.37	1,911.28	520.29	122.46	534.50	2.50	-2.17	-2.50	
2,068.00	28.88	11.10	1,937.42	534.71	125.32	549.19	3.23	-3.20	-0.90	
2,098.00	30.36	13.68	1,963.50	549.19	128.51	564.02	6.51	4.93	8.60	
2,128.00	31.98	17.00	1,989.17	564.16	132.63	579.53	7.87	5.40	11.07	
2,158.00	32.48	18.55	2,014.55	579.39	137.51	595.48	3.22	1.67	5.17	
2,188.00	30.95	16.63	2,040.07	594.42	142.28	611.21	6.11	-5.10	-6.40	
2,218.00	30.85	13.85	2,065.81	609.28	146.33	626.61	4.77	-0.33	-9.27	
2,248.00	30.70	11.82	2,091.59	624.24	149.74	641.95	3.50	-0.50	-6.77	
2,278.00	30.08	10.44	2,117.47	639.13	152.67	657.12	3.11	-2.07	-4.60	
2,308.00	29.60	9.61	2,143.49	653.83	155.27	672.02	2.11	-1.60	-2.77	
2,338.00	28.82	8.94	2,169.68	668.28	157.63	686.62	2.82	-2.60	-2.23	
2,368.00	28.80	9.41	2,195.96	682.55	159.94	701.03	0.76	-0.07	1.57	
2,398.00	29.16	9.83	2,222.21	696.88	162.37	715.53	1.38	1.20	1.40	
2,428.00	29.34	10.21	2,248.38	711.32	164.92	730.17	0.86	0.60	1.27	
2,458.00	29.89	9.87	2,274.46	725.92	167.50	744.96	1.92	1.83	-1.13	
2,488.00	31.82	11.52	2,300.21	741.03	170.36	760.33	7.02	6.43	5.50	
2,518.00	32.47	11.77	2,325.62	756.67	173.59	776.28	2.21	2.17	0.83	
2,548.00	32.17	11.59	2,350.97	772.37	176.83	792.31	1.05	-1.00	-0.60	
2,578.00	31.47	10.61	2,376.46	787.89	179.88	808.12	2.90	-2.33	-3.27	
2,608.00	30.85	8.53	2,402.13	803.20	182.46	823.60	4.14	-2.07	-6.93	
Survey @ 2608.00 MD 2402.13 TVD										
2,677.00	30.85	8.53	2,461.37	838.19	187.71	858.85	0.00	0.00	0.00	
Survey projected to 2677.00 MD 2461.37 TVD										

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
508.00	507.91	0.60	8.45	MWD surveys	
2,608.00	2,402.13	803.20	182.46	Survey @ 2608.00 MD 2402.13 TVD	
2,677.00	2,461.37	838.19	187.71	Survey projected to 2677.00 MD 2461.37 TVD	

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Survey Report - Geographic

Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 150
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=804+6 @ 810.00usft (Noah Horn 294)
Site:	E.J. May	MD Reference:	RKB=804+6 @ 810.00usft (Noah Horn 294)
Well:	E.J. May No. 150	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Project	Lincoln County, West Virginia UTM83		
Map System:	Universal Transverse Mercator	System Datum:	Mean Sea Level
Geo Datum:	NAD83 West Virginia - HARN		
Map Zone:	Zone 17N (84 W to 78 W)		

Site	E.J. May				
Site Position:		Northing:	4,232,693.00 m	Latitude:	38° 14' 17.9765 N
From:	Map	Easting:	416,089.00 m	Longitude:	81° 57' 31.8099 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-0.59 °

Well	E.J. May No. 150					
Well Position	+N/-S	0.00 usft	Northing:	4,232,693.00 m	Latitude:	38° 14' 17.9765 N
	+E/-W	0.00 usft	Easting:	416,089.00 m	Longitude:	81° 57' 31.8099 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	804.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	9/4/2018	-8.35	65.60	51,473.80000000

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	13.50	

Survey Program	Date	9/8/2018			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
508.00	2,608.00	MWD (Original Hole)	MWD	OWSG MWD - Standard	RECEIVED Office of Oil and Gas
2,677.00	2,677.00	Projection (Original Hole)	MWD	OWSG MWD - Standard	

Survey	SEP 27 2018 WV Department of Environmental Protection									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (m)	Map Easting (m)	Latitude	Longitude	
0.00	0.00	0.00	0.00	0.00	0.00	4,232,693.00	416,089.00	38° 14' 17.9765 N	81° 57' 31.8099 W	
508.00	1.91	85.93	507.91	0.60	8.45	4,232,693.19	416,091.57	38° 14' 17.9833 N	81° 57' 31.7041 W	
MWD surveys										
538.00	1.79	93.20	537.89	0.61	9.41	4,232,693.19	416,091.87	38° 14' 17.9835 N	81° 57' 31.6919 W	
568.00	1.84	59.99	567.88	0.82	10.30	4,232,693.26	416,092.14	38° 14' 17.9857 N	81° 57' 31.6809 W	
598.00	2.48	33.97	597.86	1.60	11.08	4,232,693.49	416,092.38	38° 14' 17.9935 N	81° 57' 31.6712 W	
628.00	3.17	16.61	627.82	2.94	11.68	4,232,693.90	416,092.56	38° 14' 18.0067 N	81° 57' 31.6639 W	
658.00	4.33	9.78	657.75	4.85	12.11	4,232,694.48	416,092.69	38° 14' 18.0257 N	81° 57' 31.6587 W	
688.00	5.20	13.90	687.65	7.28	12.62	4,232,695.22	416,092.85	38° 14' 18.0498 N	81° 57' 31.6525 W	
718.00	6.20	11.32	717.50	10.19	13.27	4,232,696.11	416,093.04	38° 14' 18.0786 N	81° 57' 31.6448 W	
748.00	6.58	7.92	747.32	13.48	13.82	4,232,697.11	416,093.21	38° 14' 18.1112 N	81° 57' 31.6383 W	

Survey Report - Geographic

Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 150
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=804+6 @ 810.00usft (Noah Horn 294)
Site:	E.J. May	MD Reference:	RKB=804+6 @ 810.00usft (Noah Horn 294)
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Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_V14

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (m)	Map Easting (m)	Latitude	Longitude	
778.00	7.14	5.11	777.10	17.04	14.23	4,232,698.20	416,093.34	38° 14' 18.1465 N	81° 57' 31.6337 W	
808.00	7.80	4.18	806.85	20.93	14.54	4,232,699.38	416,093.43	38° 14' 18.1850 N	81° 57' 31.6303 W	
838.00	8.78	0.06	836.53	25.25	14.69	4,232,700.70	416,093.48	38° 14' 18.2277 N	81° 57' 31.6289 W	
868.00	9.85	359.27	866.14	30.11	14.66	4,232,702.18	416,093.47	38° 14' 18.2757 N	81° 57' 31.6299 W	
898.00	10.04	357.61	895.69	35.28	14.52	4,232,703.76	416,093.43	38° 14' 18.3269 N	81° 57' 31.6324 W	
928.00	10.86	357.57	925.19	40.72	14.29	4,232,705.42	416,093.36	38° 14' 18.3806 N	81° 57' 31.6360 W	
958.00	12.05	359.06	954.59	46.68	14.12	4,232,707.23	416,093.30	38° 14' 18.4395 N	81° 57' 31.6389 W	
988.00	12.88	3.29	983.88	53.15	14.26	4,232,709.20	416,093.35	38° 14' 18.5035 N	81° 57' 31.6380 W	
1,018.00	13.94	5.42	1,013.07	60.08	14.79	4,232,711.32	416,093.51	38° 14' 18.5721 N	81° 57' 31.6322 W	
1,048.00	16.21	5.24	1,042.03	67.85	15.52	4,232,713.69	416,093.73	38° 14' 18.6490 N	81° 57' 31.6241 W	
1,078.00	17.14	5.08	1,070.77	76.42	16.29	4,232,716.30	416,093.96	38° 14' 18.7338 N	81° 57' 31.6155 W	
1,108.00	18.50	6.19	1,099.33	85.56	17.20	4,232,719.08	416,094.24	38° 14' 18.8243 N	81° 57' 31.6054 W	
1,138.00	19.08	8.21	1,127.73	95.14	18.41	4,232,722.00	416,094.61	38° 14' 18.9192 N	81° 57' 31.5914 W	
1,168.00	20.00	10.06	1,156.00	105.05	20.01	4,232,725.02	416,095.10	38° 14' 19.0173 N	81° 57' 31.5727 W	
1,198.00	20.45	11.19	1,184.15	115.24	21.92	4,232,728.13	416,095.68	38° 14' 19.1182 N	81° 57' 31.5500 W	
1,228.00	21.39	12.23	1,212.18	125.73	24.10	4,232,731.33	416,096.34	38° 14' 19.2222 N	81° 57' 31.5241 W	
1,258.00	22.91	15.06	1,239.96	136.72	26.77	4,232,734.68	416,097.16	38° 14' 19.3311 N	81° 57' 31.4920 W	
1,288.00	24.25	16.96	1,267.46	148.25	30.09	4,232,738.19	416,098.17	38° 14' 19.4454 N	81° 57' 31.4519 W	
1,318.00	25.23	17.13	1,294.70	160.25	33.77	4,232,741.85	416,099.29	38° 14' 19.5645 N	81° 57' 31.4073 W	
1,348.00	26.40	17.05	1,321.71	172.74	37.61	4,232,745.66	416,100.46	38° 14' 19.6884 N	81° 57' 31.3608 W	
1,378.00	27.42	15.80	1,348.46	185.76	41.44	4,232,749.62	416,101.63	38° 14' 19.8175 N	81° 57' 31.3144 W	
1,408.00	28.19	15.04	1,375.00	199.25	45.16	4,232,753.74	416,102.76	38° 14' 19.9513 N	81° 57' 31.2695 W	
1,438.00	29.32	14.76	1,401.30	213.20	48.87	4,232,757.99	416,103.90	38° 14' 20.0896 N	81° 57' 31.2248 W	
1,468.00	30.62	14.12	1,427.28	227.71	52.61	4,232,762.41	416,105.03	38° 14' 20.2335 N	81° 57' 31.1799 W	
1,498.00	31.50	14.27	1,452.98	242.72	56.40	4,232,766.98	416,106.19	38° 14' 20.3822 N	81° 57' 31.1343 W	
1,528.00	32.80	13.50	1,478.38	258.21	60.23	4,232,771.71	416,107.36	38° 14' 20.5359 N	81° 57' 31.0883 W	
1,558.00	33.18	13.33	1,503.54	274.10	64.02	4,232,776.55	416,108.51	38° 14' 20.6934 N	81° 57' 31.0428 W	
1,588.00	34.24	13.58	1,528.50	290.29	67.90	4,232,781.49	416,109.69	38° 14' 20.8539 N	81° 57' 30.9963 W	
1,618.00	34.27	13.75	1,553.30	306.70	71.89	4,232,786.49	416,110.91	38° 14' 21.0165 N	81° 57' 30.9485 W	
1,648.00	33.86	13.54	1,578.15	323.03	75.85	4,232,791.47	416,112.12	38° 14' 21.1784 N	81° 57' 30.9009 W	
1,678.00	32.71	12.96	1,603.23	339.06	79.62	4,232,796.35	416,113.27	38° 14' 21.3372 N	81° 57' 30.8556 W	
1,708.00	32.01	12.62	1,628.57	354.72	83.18	4,232,801.12	416,114.35	38° 14' 21.4924 N	81° 57' 30.8131 W	
1,738.00	31.47	12.94	1,654.08	370.11	86.67	4,232,805.81	416,115.42	38° 14' 21.6450 N	81° 57' 30.7713 W	
1,768.00	31.54	12.99	1,679.66	385.38	90.19	4,232,810.47	416,116.49	38° 14' 21.7964 N	81° 57' 30.7292 W	
1,798.00	31.88	14.71	1,705.18	400.69	93.96	4,232,815.14	416,117.64	38° 14' 21.9481 N	81° 57' 30.6839 W	
1,828.00	31.55	14.29	1,730.70	415.96	97.91	4,232,819.79	416,118.84	38° 14' 22.0995 N	81° 57' 30.6363 W	
1,858.00	31.35	14.27	1,756.29	431.13	101.77	4,232,824.41	416,120.02	38° 14' 22.2499 N	81° 57' 30.5899 W	
1,888.00	31.16	14.56	1,781.94	446.21	105.65	4,232,829.01	416,121.20	38° 14' 22.3994 N	81° 57' 30.5433 W	
1,918.00	30.34	13.47	1,807.72	461.09	109.36	4,232,833.54	416,122.33	38° 14' 22.5469 N	81° 57' 30.4986 W	
1,948.00	30.14	13.05	1,833.64	475.79	112.83	4,232,838.03	416,123.39	38° 14' 22.6927 N	81° 57' 30.4571 W	
1,978.00	30.68	12.29	1,859.51	490.61	116.16	4,232,842.54	416,124.40	38° 14' 22.8395 N	81° 57' 30.4173 W	
2,008.00	30.49	12.12	1,885.34	505.53	119.39	4,232,847.09	416,125.39	38° 14' 22.9873 N	81° 57' 30.3787 W	
2,038.00	29.84	11.37	1,911.28	520.29	122.46	4,232,851.59	416,126.32	38° 14' 23.1336 N	81° 57' 30.3422 W	
2,068.00	28.88	11.10	1,937.42	534.71	125.32	4,232,855.99	416,127.20	38° 14' 23.2765 N	81° 57' 30.3081 W	
2,098.00	30.36	13.68	1,963.50	549.19	128.51	4,232,860.40	416,128.17	38° 14' 23.4200 N	81° 57' 30.2700 W	
2,128.00	31.98	17.00	1,989.17	564.16	132.63	4,232,864.96	416,129.42	38° 14' 23.5684 N	81° 57' 30.2204 W	
2,158.00	32.48	18.55	2,014.55	579.39	137.51	4,232,869.60	416,130.91	38° 14' 23.7195 N	81° 57' 30.1611 W	
2,188.00	30.95	16.63	2,040.07	594.42	142.28	4,232,874.18	416,132.37	38° 14' 23.8686 N	81° 57' 30.1032 W	
2,218.00	30.85	13.85	2,065.81	609.28	146.33	4,232,878.71	416,133.60	38° 14' 24.0160 N	81° 57' 30.0544 W	
2,248.00	30.70	11.82	2,091.59	624.24	149.74	4,232,883.27	416,134.64	38° 14' 24.1643 N	81° 57' 30.0136 W	
2,278.00	30.08	10.44	2,117.47	639.13	152.67	4,232,887.81	416,135.53	38° 14' 24.3118 N	81° 57' 29.9788 W	
2,308.00	29.60	9.61	2,143.49	653.83	155.27	4,232,892.29	416,136.33	38° 14' 24.4574 N	81° 57' 29.9481 W	
2,338.00	28.82	8.94	2,169.68	668.28	157.63	4,232,896.70	416,137.05	38° 14' 24.6008 N	81° 57' 29.9204 W	
2,368.00	28.80	9.41	2,195.96	682.55	159.94	4,232,901.05	416,137.75	38° 14' 24.7419 N	81° 57' 29.8933 W	
2,398.00	29.16	9.83	2,222.21	696.88	162.37	4,232,905.42	416,138.45	38° 14' 24.8839 N	81° 57' 29.8647 W	

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Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 150
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=804+6 @ 810.00usft (Noah Horn 294)
Site:	E.J. May	MD Reference:	RKB=804+6 @ 810.00usft (Noah Horn 294)
Well:	E.J. May No. 150	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (m)	Map Easting (m)	Latitude	Longitude	
2,428.00	29.34	10.21	2,248.38	711.32	164.92	4,232,909.82	416,139.27	38° 14' 25.0269 N	81° 57' 29.8346 W	
2,458.00	29.89	9.87	2,274.46	725.92	167.50	4,232,914.26	416,140.05	38° 14' 25.1715 N	81° 57' 29.8041 W	
2,488.00	31.82	11.52	2,300.21	741.03	170.36	4,232,918.87	416,140.93	38° 14' 25.3212 N	81° 57' 29.7702 W	
2,518.00	32.47	11.77	2,325.62	756.67	173.59	4,232,923.64	416,141.91	38° 14' 25.4761 N	81° 57' 29.7319 W	
2,548.00	32.17	11.59	2,350.97	772.37	176.83	4,232,928.42	416,142.90	38° 14' 25.6318 N	81° 57' 29.6932 W	
2,578.00	31.47	10.61	2,376.46	787.89	179.88	4,232,933.16	416,143.83	38° 14' 25.7856 N	81° 57' 29.6570 W	
2,608.00	30.85	8.53	2,402.13	803.20	182.46	4,232,937.82	416,144.61	38° 14' 25.9371 N	81° 57' 29.6266 W	
Survey @ 2608.00 MD 2402.13 TVD										
2,677.00	30.85	8.53	2,461.37	838.19	187.71	4,232,948.49	416,146.21	38° 14' 26.2837 N	81° 57' 29.5653 W	
Survey projected to 2677.00 MD 2461.37 TVD										

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
508.00	507.91	0.60	8.45	MWD surveys	
2,608.00	2,402.13	803.20	182.46	Survey @ 2608.00 MD 2402.13 TVD	
2,677.00	2,461.37	838.19	187.71	Survey projected to 2677.00 MD 2461.37 TVD	

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Completion Report



Company: HG Energy LLC	Local Co-ordinate Reference: Well E.J. May No. 150
Project: Lincoln County, West Virginia UTM83	TVD Reference: RKB=804+6 @ 810.00usft (Noah Horn 294)
Site: E.J. May	MD Reference: RKB=804+6 @ 810.00usft (Noah Horn 294)
Well: E.J. May No. 150	North Reference: Grid
Wellbore: Oriignal Hole	Survey Calculation Method: Minimum Curvature
Design: Surveys Oriignal Hole	Database: DB_Jul2216dt_v14

Project Lincoln County, West Virginia UTM83	
Map System: Universal Transverse Mercator	System Datum: Mean Sea Level
Geo Datum: NAD83 West Virginia - HARN	
Map Zone: Zone 17N (84 W to 78 W)	

Site E.J. May		
Site Position:	Northing: 4,232,693.00 m	Latitude: 38° 14' 17.9765 N
From: Map	Easting: 416,089.00 m	Longitude: 81° 57' 31.8099 W
Position Uncertainty: 0.00 usft	Slot Radius: 13-3/16 "	Grid Convergence: -0.59 °

Well E.J. May No. 150		
Well Position +N-S 0.00 usft	Northing: 4,232,693.00 m	Latitude: 38° 14' 17.9765 N
+E-W 0.00 usft	Easting: 416,089.00 m	Longitude: 81° 57' 31.8099 W
Position Uncertainty 0.00 usft	Wellhead Elevation: usft	Ground Level: 804.00 usft

Wellbore Oriignal Hole					
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	9/4/2018	-8.35	65.60	51,473.80000000

Design Surveys Oriignal Hole				
Audit Notes:				
Version: 1.0	Phase: ACTUAL	Tie On Depth: 0.00		
Vertical Section:	Depth From (TVD) (usft)	+N-S (usft)	+E-W (usft)	Direction (°)
	0.00	0.00	0.00	13.50

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Completion Report



Company: HG Energy LLC	Local Co-ordinate Reference: Well E.J. May No. 150
Project: Lincoln County, West Virginia UTM83	TVD Reference: RKB=804+6 @ 810.00usft (Noah Horn 294)
Site: E.J. May	MD Reference: RKB=804+6 @ 810.00usft (Noah Horn 294)
Well: E.J. May No. 150	North Reference: Grid
Wellbore: Oriignal Hole	Survey Calculation Method: Minimum Curvature
Design: Surveys Oriignal Hole	Database: DB_Jul2216dt_v14

From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
508.00	2,608.00	MWD (Oriignal Hole)	MWD	OWSG MWD - Standard
2,677.00	2,677.00	Projection (Oriignal Hole)	MWD	OWSG MWD - Standard

MD (usft)	Inc (")	Azi (azimuth) (")	TVD (usft)	DLeg ("/100usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (")	Northing (m)	Easting (m)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,232,693.00	416,089.00
508.00	1.91	85.93	507.91	0.38	0.60	8.45	8.47	85.93	4,232,693.18	416,091.57
MWD surveys										
538.00	1.79	93.20	537.89	0.88	0.61	9.41	9.43	86.29	4,232,693.19	416,091.87
568.00	1.84	59.99	567.88	3.46	0.82	10.30	10.33	85.42	4,232,693.25	416,092.14
598.00	2.48	33.97	597.86	3.85	1.60	11.08	11.19	81.76	4,232,693.49	416,092.38
628.00	3.17	16.61	627.82	3.64	2.94	11.68	12.04	75.88	4,232,693.90	416,092.56
658.00	4.33	9.78	657.75	4.14	4.85	12.11	13.04	68.17	4,232,694.48	416,092.69
688.00	5.20	13.90	687.65	3.11	7.28	12.62	14.58	60.02	4,232,695.22	416,092.85
718.00	6.20	11.32	717.50	3.44	10.19	13.27	16.73	52.47	4,232,696.11	416,093.04
748.00	6.58	7.92	747.32	1.79	13.48	13.82	19.31	45.71	4,232,697.11	416,093.21
778.00	7.14	5.11	777.10	2.18	17.04	14.23	22.20	39.85	4,232,698.19	416,093.34
808.00	7.80	4.18	806.85	2.24	20.93	14.54	25.49	34.79	4,232,699.38	416,093.43
838.00	8.78	0.06	836.53	3.82	25.25	14.69	29.21	30.19	4,232,700.70	416,093.48
868.00	9.85	359.27	866.14	3.59	30.11	14.66	33.49	25.97	4,232,702.18	416,093.47
898.00	10.04	357.61	895.69	1.15	35.28	14.52	38.16	22.37	4,232,703.75	416,093.43
928.00	10.86	357.57	925.19	2.73	40.72	14.29	43.16	19.34	4,232,705.41	416,093.36
958.00	12.05	359.06	954.59	4.09	46.68	14.12	48.76	16.83	4,232,707.23	416,093.30
988.00	12.88	3.29	983.88	4.11	53.15	14.26	55.03	15.02	4,232,709.20	416,093.35
1,018.00	13.94	5.42	1,013.07	3.90	60.08	14.79	61.88	13.83	4,232,711.31	416,093.51
1,048.00	16.21	5.24	1,042.03	7.57	67.85	15.52	69.60	12.88	4,232,713.68	416,093.73

WV Department of Environmental Protection

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Completion Report



Company: HG Energy LLC	Local Co-ordinate Reference: Well E.J. May No. 150
Project: Lincoln County, West Virginia UTM83	TVD Reference: RKB=804+6 @ 810.00usft (Noah Horn 294)
Site: E.J. May	MD Reference: RKB=804+6 @ 810.00usft (Noah Horn 294)
Well: E.J. May No. 150	North Reference: Grid
Wellbore: Original Hole	Survey Calculation Method: Minimum Curvature
Design: Surveys Original Hole	Database: DB_Jul2216dt_v14

Survey												
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	DLeg (°/100usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (m)	Easting (m)		
1,078.00	17.14	5.08	1,070.77	3.10	76.42	16.29	78.14	12.03	4,232,716.29	416,093.97		
1,108.00	18.50	6.19	1,099.33	4.67	85.56	17.20	87.27	11.36	4,232,719.08	416,094.24		
1,138.00	19.08	8.21	1,127.73	2.91	95.14	18.41	96.91	10.95	4,232,722.00	416,094.61		
1,168.00	20.00	10.06	1,156.00	3.70	105.05	20.01	106.94	10.78	4,232,725.02	416,095.10		
1,198.00	20.45	11.19	1,184.15	1.99	115.24	21.92	117.31	10.77	4,232,728.13	416,095.68		
1,228.00	21.39	12.23	1,212.17	3.37	125.73	24.10	128.02	10.85	4,232,731.32	416,096.34		
1,258.00	22.91	15.06	1,239.96	6.19	136.72	26.77	139.31	11.08	4,232,734.67	416,097.16		
1,288.00	24.25	16.96	1,267.46	5.13	148.25	30.09	151.27	11.47	4,232,738.19	416,098.17		
1,318.00	25.23	17.13	1,294.70	3.28	160.25	33.77	163.77	11.90	4,232,741.84	416,099.29		
1,348.00	26.40	17.05	1,321.71	3.90	172.74	37.81	176.78	12.28	4,232,745.65	416,100.46		
1,378.00	27.42	15.80	1,348.46	3.89	185.78	41.44	190.33	12.58	4,232,749.62	416,101.63		
1,408.00	28.19	15.04	1,375.00	2.83	199.25	45.16	204.31	12.77	4,232,753.73	416,102.77		
1,438.00	29.32	14.76	1,401.30	3.79	213.20	48.87	218.73	12.91	4,232,757.98	416,103.90		
1,468.00	30.62	14.12	1,427.28	4.46	227.71	52.61	233.71	13.01	4,232,762.41	416,105.03		
1,498.00	31.50	14.27	1,452.98	2.94	242.72	56.40	249.18	13.08	4,232,766.98	416,106.19		
1,528.00	32.80	13.50	1,478.38	4.54	258.21	60.23	265.15	13.13	4,232,771.70	416,107.36		
1,558.00	33.18	13.33	1,503.54	1.30	274.10	64.02	281.48	13.15	4,232,776.55	416,108.51		
1,588.00	34.24	13.58	1,528.50	3.56	290.29	67.90	298.13	13.16	4,232,781.48	416,109.69		
1,618.00	34.27	13.75	1,553.30	0.33	306.70	71.89	315.01	13.19	4,232,786.48	416,110.91		
1,648.00	33.86	13.54	1,578.15	1.42	323.03	75.85	331.82	13.21	4,232,791.46	416,112.12		
1,678.00	32.71	12.96	1,603.23	3.98	339.06	79.62	348.28	13.22	4,232,796.35	416,113.27		
1,708.00	32.01	12.62	1,628.57	2.41	354.72	83.16	364.34	13.20	4,232,801.12	416,114.35		
1,738.00	31.47	12.94	1,654.08	1.89	370.11	86.67	380.12	13.18	4,232,805.81	416,115.42		
1,768.00	31.54	12.99	1,679.66	0.25	385.38	90.19	395.80	13.17	4,232,810.47	416,116.49		
1,798.00	31.88	14.71	1,705.18	3.22	400.69	93.96	411.56	13.20	4,232,815.13	416,117.64		
1,828.00	31.55	14.29	1,730.70	1.32	415.96	97.91	427.33	13.25	4,232,819.79	416,118.84		
1,858.00	31.35	14.27	1,756.29	0.67	431.13	101.77	442.98	13.28	4,232,824.41	416,120.02		

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Completion Report



Company: HG Energy LLC	Local Co-ordinate Reference: Well E.J. May No. 150
Project: Lincoln County, West Virginia UTM83	TVD Reference: RKB=804+6 @ 810.00usft (Noah Horn 294)
Site: E.J. May	MD Reference: RKB=804+6 @ 810.00usft (Noah Horn 294)
Well: E.J. May No. 150	North Reference: Grid
Wellbore: Original Hole	Survey Calculation Method: Minimum Curvature
Design: Surveys Original Hole	Database: DB_Jul2216dt_v14

Survey												
MD (usft)	Inc (")	Azi (azimuth) (")	TVD (usft)	DLeg ("/100usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (")	Northing (m)	Easting (m)		
1,888.00	31.16	14.56	1,781.94	0.81	448.21	105.65	458.54	13.32	4,232,829.00	416,121.20		
1,918.00	30.34	13.47	1,807.72	3.30	461.09	109.36	473.88	13.34	4,232,833.54	416,122.33		
1,948.00	30.14	13.05	1,833.64	0.97	475.79	112.83	488.99	13.34	4,232,838.02	416,123.39		
1,978.00	30.68	12.29	1,859.51	2.21	490.61	116.16	504.17	13.32	4,232,842.54	416,124.41		
2,008.00	30.49	12.12	1,885.34	0.70	505.53	119.39	519.43	13.29	4,232,847.09	416,125.39		
2,038.00	29.84	11.37	1,911.28	2.50	520.29	122.46	534.50	13.24	4,232,851.58	416,126.32		
2,068.00	28.88	11.10	1,937.42	3.23	534.71	125.32	549.20	13.19	4,232,855.98	416,127.20		
2,098.00	30.36	13.68	1,963.50	6.51	549.19	128.51	564.03	13.17	4,232,860.39	416,128.17		
2,128.00	31.98	17.00	1,989.17	7.87	564.16	132.63	579.54	13.23	4,232,864.96	416,129.42		
2,158.00	32.48	18.55	2,014.55	3.22	579.39	137.51	595.48	13.35	4,232,869.60	416,130.91		
2,188.00	30.95	16.63	2,040.07	6.11	594.42	142.28	611.21	13.46	4,232,874.18	416,132.37		
2,218.00	30.85	13.85	2,065.81	4.77	609.28	146.33	626.61	13.51	4,232,878.71	416,133.60		
2,248.00	30.70	11.82	2,091.59	3.50	624.24	149.74	641.95	13.49	4,232,883.27	416,134.64		
2,278.00	30.08	10.44	2,117.47	3.11	639.13	152.67	657.12	13.43	4,232,887.81	416,135.53		
2,308.00	29.60	9.61	2,143.49	2.11	653.83	155.27	672.02	13.36	4,232,892.29	416,136.33		
2,338.00	28.82	8.94	2,169.68	2.82	668.28	157.63	686.62	13.27	4,232,896.69	416,137.05		
2,368.00	28.80	9.41	2,195.96	0.76	682.55	159.94	701.04	13.19	4,232,901.04	416,137.75		
2,398.00	29.16	9.83	2,222.21	1.38	696.88	182.37	715.55	13.12	4,232,905.41	416,138.49		
2,428.00	29.34	10.21	2,248.38	0.86	711.32	164.92	730.19	13.05	4,232,909.81	416,139.27		
2,458.00	29.89	9.87	2,274.46	1.92	725.92	167.50	744.99	12.99	4,232,914.26	416,140.05		
2,488.00	31.82	11.52	2,300.21	7.02	741.03	170.36	760.36	12.95	4,232,918.87	416,140.93		
2,518.00	32.47	11.77	2,325.62	2.21	756.67	173.59	776.32	12.92	4,232,923.63	416,141.91		
2,548.00	32.17	11.59	2,350.97	1.05	772.37	176.83	792.36	12.90	4,232,928.42	416,142.90		
2,578.00	31.47	10.61	2,376.46	2.90	787.89	179.88	808.17	12.86	4,232,933.15	416,143.83		
2,608.00	30.85	8.53	2,402.13	4.14	803.20	182.46	823.66	12.80	4,232,937.82	416,144.61		

Survey @ 2608.00 MD 2402.13 TVD

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Site: E.J. May	MD Reference:	RKB=804+6 @ 810.00usft (Noah Horn 294)
Well: E.J. May No. 150	North Reference:	Grid
Wellbore: Original Hole	Survey Calculation Method:	Minimum Curvature
Design: Surveys Original Hole	Database:	DB_Jul2216dt_v14

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	DLeg (°/100usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (m)	Easting (m)
2,677.00	30.85	8.53	2,461.37	0.00	838.19	187.71	858.95	12.62	4,232,948.48	416,146.21
Survey projected to 2677.00 MD 2461.37 TVD										

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N-S (usft)	+E-W (usft)	
508.00	507.91	0.60	8.45	MWD surveys
2,608.00	2,402.13	803.20	182.46	Survey @ 2608.00 MD 2402.13 TVD
2,677.00	2,461.37	838.19	187.71	Survey projected to 2677.00 MD 2461.37 TVD

Checked By: _____ Approved By: _____ Date: _____

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