

Well Operator's Report of Well Work

Farm name: Russell Hervey BRK 8H Operator Well No.: 836179

LOCATION: Elevation: 1,160' Quadrangle: Stuebenville East

District: Buffalo County: Brooke
Latitude: 4,250' Feet South of 40 Deg. 17 Min. 30 Sec.
Longitude 12,250' Feet West of 80 Deg. 32 Min. 30 Sec.

Company: Chesapeake Appalachia, L.L.C.

Address:	Casing & Tubing	Used in drilling	Left in well	Cement fill up Cu. Ft.
<u>P.O. Box 18496</u> <u>Oklahoma City, OK 73154-0496</u>	<u>20"</u>	<u>138'</u>	<u>138'</u>	<u>244 Cu. Ft.</u>
Agent: <u>Eric Gillespie</u>	<u>13 3/8"</u>	<u>378'</u>	<u>378'</u>	<u>454 Cu. Ft.</u>
Inspector: <u>Gayne J. Knitowski</u>	<u>9 5/8"</u>	<u>1,716'</u>	<u>1,716'</u>	<u>791 Cu. Ft.</u>
Date Permit Issued: <u>8-29-2012</u>	<u>5 1/2"</u>	<u>11,176'</u>	<u>11,176'</u>	<u>1,090 Cu. Ft.</u>
Date Well Work Commenced: <u>12-23-2012</u>				
Date Well Work Completed: <u>6-30-2013</u>				
Verbal Plugging:				
Date Permission granted on:				
Rotary <input checked="" type="checkbox"/> Cable <input type="checkbox"/> Rig <input type="checkbox"/>				
Total Vertical Depth (ft): <u>5,959'</u>				
Total Measured Depth (ft): <u>11,177'</u>				
Fresh Water Depth (ft.): <u>48'</u>				
Salt Water Depth (ft.): <u>1100'</u>				
Is coal being mined in area (N/Y)? <u>N</u>				
Coal Depths (ft.): <u>245'</u>				
Void(s) encountered (N/Y) Depth(s) <u>N</u>				

OPEN FLOW DATA (If more than two producing formations please include additional data on separate sheet)

Producing formation Marcellus Pay zone depth (ft) 6,130-11,052
Gas: Initial open flow _____ MCF/d Oil: Initial open flow _____ Bbl/d
Final open flow 2,617* MCF/d Final open flow 199 Bbl/d
Time of open flow between initial and final tests 72 Hours *Calculated
Static rock Pressure 3,873* psig (surface pressure) after 72 Hours

Second producing formation _____ Pay zone depth (ft) _____
Gas: Initial open flow _____ MCF/d Oil: Initial open flow _____ Bbl/d
Final open flow _____ MCF/d Final open flow _____ Bbl/d
Time of open flow between initial and final tests _____ Hours
Static rock Pressure _____ psig (surface pressure) after _____ Hours

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I certify under penalty of law that I have personally examined and am familiar with the information submitted on this document and all the attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information I believe that the information is true, accurate, and complete.

Marlene Williams
Signature

2/26/15
Date
Department of Environmental Protection

9-00136

Were core samples taken? Yes _____ No N

Were cuttings caught during drilling? Yes Y No _____

Were Electrical, Mechanical or Geophysical logs recorded on this well? If yes, please list _____
LWD GR from 5305-11177' MD.

NOTE: IN THE AREA BELOW PUT THE FOLLOWING: 1). DETAILS OF PERFORATED INTERVALS, FRACTURING OR STIMULATING, PHYSICAL CHANGE, ETC. 2). THE WELL LOG WHICH IS A SYSTEMATIC DETAILED GEOLOGICAL RECORD OF THE TOPS AND BOTTOMS OF ALL FORMATIONS, INCLUDING COAL ENCOUNTERED BY THE WELLBORE FROM SURFACE TO TOTAL DEPTH.

Perforated Intervals, Fracturing, or Stimulating:

See attached

Plug Back Details Including Plug Type and Depth(s):

Formations Encountered:	Top Depth	/	Bottom Depth
Surface:			

See attached

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LATERAL WELLBORE (no vertical pilot hole associated with this well)

Maximum TVD of wellbore: 5959 ft TVD @ 11177 ft MD

Formation/Lithology	Top Depth, MD (ft)	Top Depth, TVD (ft)	Bottom Depth, MD (ft)	Bottom Depth, TVD (ft)
LS/SILT	0	0	272	272
PITTSBURG COAL	272	272	282	282
LS/SHALE/SILT	282	282	380	380
SS	380	380	440	440
SHALE	440	440	590	590
LS/SILT/SHALE	590	590	856	856
KITTANNING COAL	856	856	862	862
SS/SILT	862	862	1267	1267
BIG LIME	1267	1267	1315	1315
BIG INJUN (SS)	1315	1315	1612	1612
SHALE	1612	1612	5672	5648
GENESEO (SH)	5672	5648	5688	5661
TULLY (LS)	5688	5661	5748	5710
HAMILTON (SH)	5748	5710	6027	5849
MARCELLUS (SH)	6027	5849		
TD OF LATERAL			11177	5959

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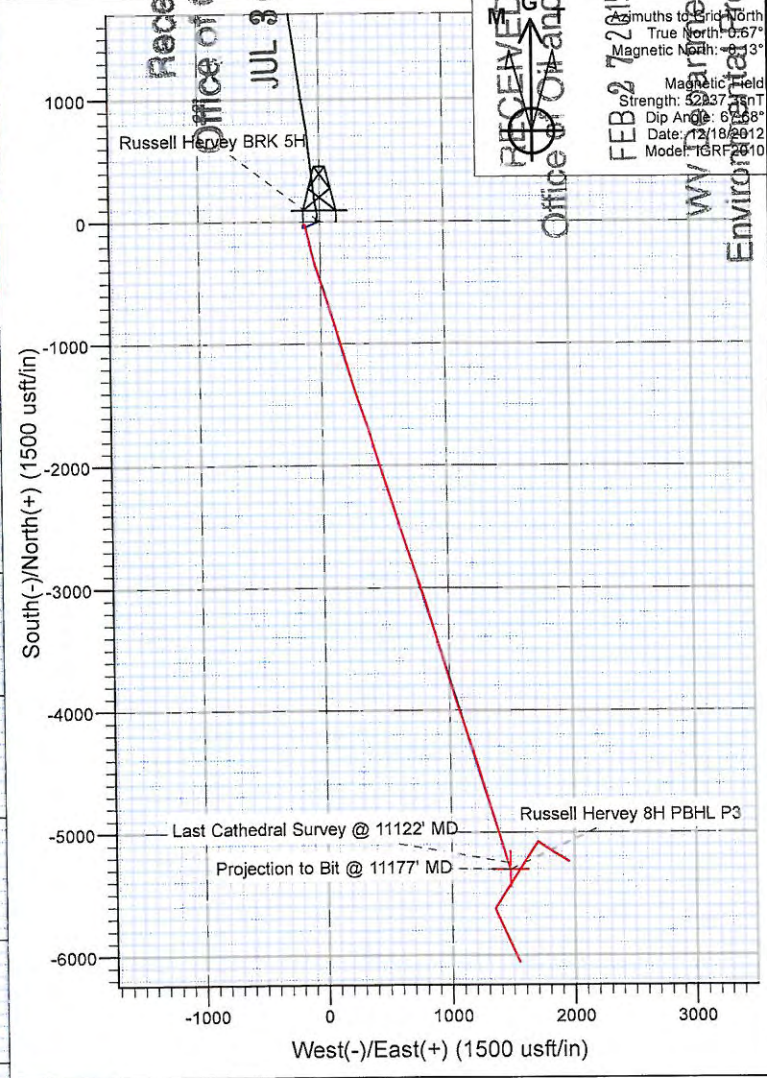
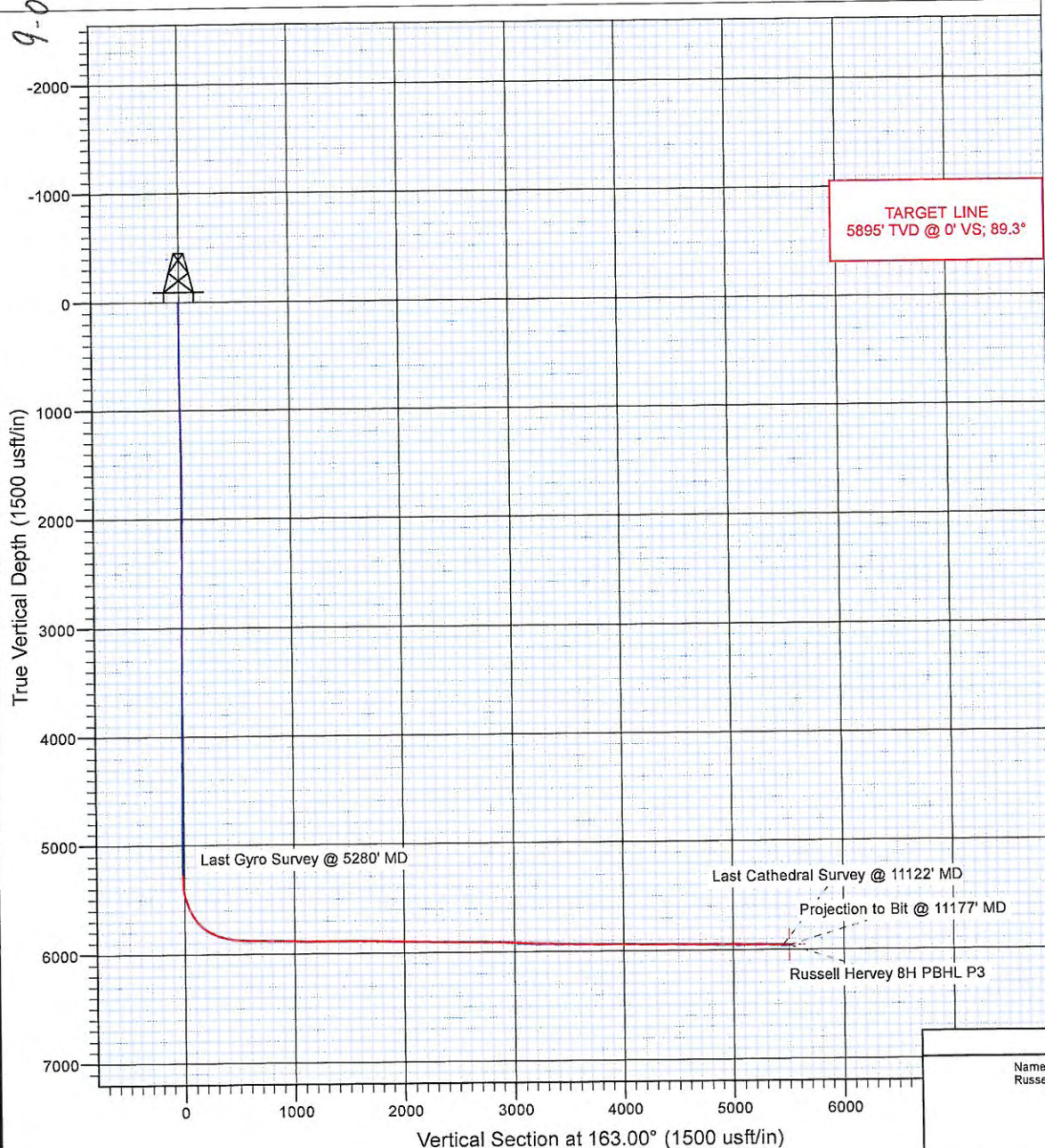
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9-00136



Project: Brooke County, WV
 Site: Russell Hervey
 Well: Russell Hervey BRK 8H
 Wellbore: HZ
 Design: HZ



		Ground Level: 1160.0			
+N-S	+E-W	Northing	Easting	Latitude	Longitude
0.0	0.0	642077.30	1705016.88	40° 15' 28.947 N	80° 33' 24.775 W

DESIGN TARGET DETAILS

Name	TVD	+N-S	+E-W	Northing	Easting	Latitude	Longitude	Shape
Russell Hervey 8H PBHL P3	5895.5	5302.2	1479.0	636775.11	1706495.91	40° 14' 36.728 N	80° 33' 4.900 W	Point
- survey misses target center by 2.7usft at 11176.9usft MD (5959.5 TVD, -5302.3 N, 1478.7 E)								

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 Magnetic North
 True North: 0.67°
 Magnetic North: 0.3°
 Magnetic Field
 Strength: 52.37 uT
 Dip Angle: 6.68°
 Date: 12/16/2012
 Model: IGRF10

WV Department of Environmental Protection

Cathedral Energy Services

Survey Report

9-00136

Company:	Chesapeake Energy Corp	Local Co-ordinate Reference:	Well Russell Hervey BRK 8H
Project:	Brooke County, WV	TVD Reference:	WELL @ 1178.0usft (Nomac 37)
Site:	Russell Hervey	MD Reference:	WELL @ 1178.0usft (Nomac 37)
Well:	Russell Hervey BRK 8H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	HZ	Database:	USA EDM 5000 Multi Users DB

Project	Brooke County, WV		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		Using geodetic scale factor
Map Zone:	West Virginia North 4701		

Site	Russell Hervey		
Site Position:		Northing:	642,082.72 usft
From:	Lat/Long	Easting:	1,705,007.27 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"
		Latitude:	40° 15' 29.000 N
		Longitude:	80° 33' 24.900 W
		Grid Convergence:	-0.67 °

Well	Russell Hervey BRK 8H		
Well Position	+N/-S	0.0 usft	Northing: 642,077.30 usft
	+E/-W	0.0 usft	Easting: 1,705,016.88 usft
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	40° 15' 28.947 N
		Longitude:	80° 33' 24.775 W
		Ground Level:	1,160.0 usft

Wellbore	HZ				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	12/18/2012	-8.80	67.68	52,937

Design	HZ				
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	163.00	

Survey Program	Date	1/3/2013			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	5,280.0	Gyro (HZ)	Gyro	Gyro	
5,324.0	11,177.0	Survey #3 (HZ)	MWD	Geolink MWD	

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
100.0	0.80	312.31	100.0	0.5	-0.5	-0.6	0.80	0.80	
200.0	0.59	302.19	200.0	1.2	-1.5	-1.6	0.24	-0.21	
300.0	0.59	288.81	300.0	1.7	-2.4	-2.3	0.14	0.00	
400.0	0.42	266.07	400.0	1.8	-3.2	-2.7	0.26	-0.17	
500.0	1.44	238.66	500.0	1.1	-4.7	-2.4	1.08	1.02	
600.0	2.76	240.73	599.9	-0.7	-7.9	-1.6	1.32	1.32	
700.0	4.85	250.27	699.7	-3.3	-13.9	-0.9	2.18	2.09	
800.0	6.69	245.75	799.2	-7.1	-23.2	0.0	1.89	1.84	
900.0	7.81	245.09	898.4	-12.4	-34.7	1.7	1.12	1.12	
1,000.0	8.09	243.40	997.4	-18.4	-47.2	3.8	0.36	0.28	
1,100.0	8.10	251.11	1,096.4	-23.8	-60.1	5.2	1.08	0.01	

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Cathedral Energy Services

9-00136

Survey Report

Company:	Chesapeake Energy Corp	Local Co-ordinate Reference:	Well Russell Hervey BRK 8H
Project:	Brooke County, WV	TVD Reference:	WELL @ 1178 0usft (Nomac 37)
Site:	Russell Hervey	MD Reference:	WELL @ 1178 0usft (Nomac 37)
Well:	Russell Hervey BRK 8H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	HZ	Database:	USA EDM 5000 Multi Users DB

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
1,200.0	8.29	249.34	1,195.4	-28.7	-73.5	5.9	0.32	0.19	
1,300.0	7.39	247.72	1,294.4	-33.6	-86.2	7.0	0.93	-0.90	
1,400.0	6.89	236.30	1,393.7	-39.4	-97.2	9.3	1.50	-0.50	
1,500.0	5.92	240.59	1,493.1	-45.3	-106.6	12.1	1.08	-0.97	
1,600.0	3.46	246.44	1,592.7	-49.0	-113.9	13.6	2.50	-2.46	
1,700.0	2.87	254.92	1,692.6	-50.9	-119.1	13.8	0.75	-0.59	
1,800.0	2.58	270.27	1,792.4	-51.5	-123.8	13.1	0.78	-0.29	
1,900.0	2.03	268.34	1,892.4	-51.5	-127.8	11.9	0.56	-0.55	
2,000.0	1.53	280.06	1,992.3	-51.4	-130.9	10.9	0.62	-0.50	
2,100.0	1.31	284.48	2,092.3	-50.8	-133.3	9.7	0.25	-0.22	
2,200.0	0.84	294.71	2,192.3	-50.3	-135.1	8.6	0.51	-0.47	
2,300.0	0.73	286.73	2,292.3	-49.8	-136.3	7.7	0.15	-0.11	
2,400.0	0.79	299.04	2,392.3	-49.2	-137.5	6.9	0.17	0.06	
2,500.0	0.63	323.64	2,492.2	-48.5	-138.5	5.9	0.34	-0.16	
2,600.0	0.67	315.96	2,592.2	-47.6	-139.2	4.8	0.10	0.04	
2,700.0	0.51	325.14	2,692.2	-46.8	-139.9	3.9	0.19	-0.16	
2,800.0	0.40	337.58	2,792.2	-46.1	-140.3	3.1	0.15	-0.11	
2,900.0	0.67	340.98	2,892.2	-45.3	-140.6	2.2	0.27	0.27	
3,000.0	0.45	299.87	2,992.2	-44.5	-141.1	1.3	0.44	-0.22	
3,100.0	0.59	2.09	3,092.2	-43.8	-141.4	0.5	0.55	0.14	
3,200.0	0.33	318.42	3,192.2	-43.1	-141.6	-0.2	0.42	-0.26	
3,300.0	0.53	348.53	3,292.2	-42.4	-141.9	-0.9	0.30	0.20	
3,400.0	0.43	53.25	3,392.2	-41.7	-141.7	-1.5	0.52	-0.10	
3,500.0	0.10	4.65	3,492.2	-41.4	-141.4	-1.7	0.37	-0.33	
3,600.0	0.53	39.57	3,592.2	-41.0	-141.1	-2.1	0.45	0.43	
3,700.0	0.67	24.31	3,692.2	-40.1	-140.5	-2.8	0.21	0.14	
3,800.0	0.81	47.33	3,792.2	-39.1	-139.8	-3.5	0.33	0.14	
3,900.0	0.91	45.49	3,892.2	-38.0	-138.7	-4.2	0.10	0.10	
4,000.0	0.87	51.29	3,992.2	-37.0	-137.5	-4.8	0.10	-0.04	
4,100.0	0.68	24.85	4,092.2	-36.0	-136.7	-5.5	0.40	-0.19	
4,200.0	0.81	26.74	4,192.2	-34.8	-136.1	-6.5	0.13	0.13	
4,300.0	0.80	22.24	4,292.1	-33.5	-135.5	-7.6	0.06	-0.01	
4,400.0	0.83	29.03	4,392.1	-32.3	-134.9	-8.6	0.10	0.03	
4,500.0	0.90	33.68	4,492.1	-31.0	-134.1	-9.6	0.10	0.07	
4,600.0	0.61	33.66	4,592.1	-29.9	-133.4	-10.4	0.29	-0.29	
4,700.0	0.58	27.19	4,692.1	-29.0	-132.9	-11.1	0.07	-0.03	
4,800.0	0.73	63.32	4,792.1	-28.2	-132.1	-11.6	0.43	0.15	
4,900.0	0.81	59.80	4,892.1	-27.6	-130.9	-11.9	0.09	0.08	
5,000.0	0.89	54.18	4,992.1	-26.8	-129.7	-12.3	0.12	0.08	
5,100.0	0.88	70.00	5,092.1	-26.1	-128.3	-12.6	0.24	-0.01	
5,200.0	0.93	83.86	5,192.1	-25.7	-126.8	-12.5	0.22	0.05	
5,280.0	1.08	133.02	5,272.0	-26.2	-125.6	-11.7	1.06	0.19	
5,324.0	0.90	147.20	5,316.0	-26.7	-125.1	-11.0	0.69	-0.41	
5,356.0	1.90	155.90	5,348.0	-27.4	-124.7	-10.2	3.19	3.13	
5,388.0	4.30	159.00	5,380.0	-29.0	-124.1	-8.5	7.52	7.50	
5,419.0	7.70	159.60	5,410.8	-32.1	-122.9	-5.3	10.97	10.97	
5,451.0	10.90	164.00	5,442.4	-37.0	-121.4	-0.1	10.24	10.00	
5,482.0	13.90	167.20	5,472.6	-43.4	-119.7	6.5	9.92	9.68	
5,514.0	16.70	166.30	5,503.5	-51.7	-117.8	15.0	8.78	8.75	
5,545.0	19.50	165.70	5,533.0	-61.0	-115.5	24.6	9.05	9.03	
5,577.0	21.50	163.90	5,562.9	-71.8	-112.5	35.8	6.55	6.25	
5,608.0	25.10	163.60	5,591.4	-83.6	-109.1	48.0	11.62	11.61	
5,639.0	27.70	164.80	5,619.2	-96.9	-105.3	61.8	8.56	8.39	

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Last Gyro Survey @ 5280' MD
JUL 30 2015

04/08/2016

Cathedral Energy Services
Survey Report

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Company:	Chesapeake Energy Corp	Local Co-ordinate Reference:	Well Russell Hervey BRK 8H
Project:	Brooke County, WV	TVD Reference:	WELL @ 1178.0usft (Nomac 37)
Site:	Russell Hervey	MD Reference:	WELL @ 1178.0usft (Nomac 37)
Well:	Russell Hervey BRK 8H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	HZ	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
5,675.0	31.30	166.30	5,650.5	-114.0	-100.9	79.5	10.21	10.00	
5,706.0	33.70	167.10	5,676.6	-130.2	-97.1	96.1	7.86	7.74	
5,738.0	38.00	169.20	5,702.6	-148.6	-93.3	114.8	13.97	13.44	
5,769.0	43.40	169.40	5,726.1	-168.4	-89.5	134.9	17.42	17.42	
5,800.0	48.80	170.30	5,747.6	-190.4	-85.6	157.1	17.54	17.42	
5,832.0	54.20	170.40	5,767.5	-215.1	-81.4	181.9	16.88	16.88	
5,863.0	57.90	167.00	5,784.8	-240.3	-76.3	207.5	15.01	11.94	
5,895.0	61.30	164.30	5,801.0	-267.0	-69.5	235.0	12.88	10.63	
5,927.0	64.20	164.00	5,815.6	-294.4	-61.7	263.5	9.10	9.06	
5,959.0	67.60	165.20	5,828.7	-322.5	-54.0	292.7	11.16	10.63	
5,991.0	71.90	164.10	5,839.8	-351.5	-46.0	322.7	13.82	13.44	
6,022.0	75.20	163.00	5,848.5	-380.0	-37.6	352.4	11.18	10.65	
6,054.0	76.50	161.80	5,856.4	-409.6	-28.2	383.4	5.45	4.06	
6,085.0	78.00	161.40	5,863.2	-438.3	-18.7	413.6	5.00	4.84	
6,117.0	81.00	160.50	5,869.0	-468.0	-8.4	445.1	9.77	9.38	
6,148.0	83.90	161.80	5,873.1	-497.1	1.5	475.8	10.24	9.35	
6,179.0	85.50	161.90	5,876.0	-526.4	11.1	506.7	5.17	5.16	
6,211.0	87.10	162.60	5,878.0	-556.8	20.9	538.6	5.46	5.00	
6,242.0	88.60	162.60	5,879.2	-586.4	30.1	569.6	4.84	4.84	
6,305.0	89.00	162.80	5,880.5	-646.5	48.9	632.5	0.71	0.63	
6,363.0	89.30	162.60	5,881.4	-701.9	66.1	690.5	0.62	0.52	
6,427.0	89.40	163.20	5,882.1	-763.0	84.9	754.5	0.95	0.16	
6,489.0	88.90	162.60	5,883.0	-822.3	103.2	816.5	1.26	-0.81	
6,549.0	88.80	162.80	5,884.2	-879.6	121.0	876.5	0.37	-0.17	
6,613.0	88.40	163.30	5,885.8	-940.8	139.6	940.5	1.00	-0.63	
6,676.0	88.50	163.60	5,887.5	-1,001.1	157.6	1,003.5	0.50	0.16	
6,739.0	88.20	163.50	5,889.3	-1,061.5	175.4	1,066.4	0.50	-0.48	
6,803.0	89.20	164.40	5,890.8	-1,123.0	193.1	1,130.4	2.10	1.56	
6,866.0	90.30	164.60	5,891.0	-1,183.7	209.9	1,193.4	1.77	1.75	
6,927.0	91.20	163.20	5,890.2	-1,242.3	226.9	1,254.4	2.73	1.48	
6,990.0	90.30	162.20	5,889.4	-1,302.5	245.6	1,317.4	2.14	-1.43	
7,052.0	90.20	162.30	5,889.1	-1,361.5	264.5	1,379.4	0.23	-0.16	
7,116.0	90.30	162.60	5,888.9	-1,422.5	283.8	1,443.4	0.49	0.16	
7,178.0	89.50	161.80	5,889.0	-1,481.6	302.7	1,505.3	1.82	-1.29	
7,240.0	88.30	161.30	5,890.2	-1,540.4	322.4	1,567.3	2.10	-1.94	
7,303.0	88.60	161.60	5,891.9	-1,600.1	342.4	1,630.3	0.67	0.48	
7,365.0	89.00	162.60	5,893.2	-1,659.1	361.4	1,692.2	1.74	0.65	
7,429.0	89.30	163.30	5,894.1	-1,720.2	380.2	1,756.2	1.19	0.47	
7,492.0	88.80	163.90	5,895.2	-1,780.7	398.0	1,819.2	1.24	-0.79	
7,555.0	89.20	164.50	5,896.3	-1,841.3	415.1	1,882.2	1.14	0.63	
7,619.0	88.40	163.90	5,897.6	-1,902.8	432.6	1,946.2	1.56	-1.25	
7,681.0	88.00	162.00	5,899.6	-1,962.1	450.7	2,008.1	3.13	-0.65	
7,743.0	88.20	161.80	5,901.6	-2,021.0	470.0	2,070.1	0.46	0.32	
7,807.0	88.50	162.50	5,903.4	-2,081.9	489.6	2,134.1	1.19	0.47	
7,870.0	88.50	163.20	5,905.1	-2,142.1	508.2	2,197.0	1.11	0.00	
7,932.0	88.70	163.90	5,906.6	-2,201.5	525.7	2,259.0	1.17	0.32	
7,995.0	89.50	162.90	5,907.6	-2,261.9	543.7	2,322.0	2.03	1.27	
8,058.0	88.70	162.50	5,908.6	-2,322.0	562.4	2,385.0	1.42	-1.27	
8,120.0	89.00	162.80	5,909.8	-2,381.2	580.9	2,447.0	0.68	0.48	
8,184.0	89.30	162.70	5,910.8	-2,442.3	599.9	2,511.0	0.49	0.47	
8,247.0	89.30	163.30	5,911.6	-2,502.5	618.3	2,574.0	0.95	0.00	
8,310.0	89.60	164.10	5,912.2	-2,563.0	636.0	2,637.0	1.36	0.48	
8,373.0	89.30	162.00	5,912.8	-2,623.3	654.4	2,700.0	3.37	-0.48	

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Cathedral Energy Services
Survey Report

9-00136

Company:	Chesapeake Energy Corp	Local Co-ordinate Reference:	Well Russell Hervey BRK 8H
Project:	Brooke County, WV	TVD Reference:	WELL @ 1178 0usft (Nomac 37)
Site:	Russell Hervey	MD Reference:	WELL @ 1178 0usft (Nomac 37)
Well:	Russell Hervey BRK 8H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	HZ	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
8,436.0	89.30	162.20	5,913.5	-2,683.2	673.7	2,762.9	0.32	0.00	
8,499.0	89.30	162.30	5,914.3	-2,743.2	692.9	2,825.9	0.16	0.00	
8,562.0	87.90	161.70	5,915.8	-2,803.1	712.4	2,888.9	2.42	-2.22	
8,626.0	88.00	161.60	5,918.1	-2,863.8	732.5	2,952.8	0.22	0.16	
8,690.0	87.00	161.90	5,920.9	-2,924.5	752.6	3,016.8	1.63	-1.56	
8,753.0	87.00	162.20	5,924.2	-2,984.4	771.9	3,079.7	0.48	0.00	
8,816.0	87.10	162.30	5,927.5	-3,044.3	791.1	3,142.6	0.22	0.16	
8,880.0	87.20	162.30	5,930.6	-3,105.2	810.6	3,206.5	0.16	0.16	
8,943.0	88.00	163.40	5,933.3	-3,165.3	829.1	3,269.4	2.16	1.27	
9,005.0	89.30	164.10	5,934.7	-3,224.8	846.5	3,331.4	2.38	2.10	
9,069.0	89.30	163.20	5,935.5	-3,286.2	864.5	3,395.4	1.41	0.00	
9,132.0	89.30	163.60	5,936.3	-3,346.6	882.5	3,458.4	0.63	0.00	
9,196.0	89.40	163.50	5,937.0	-3,408.0	900.6	3,522.4	0.22	0.16	
9,258.0	89.60	163.80	5,937.6	-3,467.5	918.1	3,584.4	0.58	0.32	
9,321.0	89.70	164.70	5,937.9	-3,528.1	935.2	3,647.4	1.44	0.16	
9,385.0	88.80	163.00	5,938.8	-3,589.6	953.0	3,711.4	3.01	-1.41	
9,449.0	88.70	163.10	5,940.2	-3,650.8	971.6	3,775.3	0.22	-0.16	
9,511.0	88.70	163.60	5,941.6	-3,710.2	989.4	3,837.3	0.81	0.00	
9,573.0	88.90	163.90	5,942.9	-3,769.7	1,006.7	3,899.3	0.58	0.32	
9,634.0	89.30	163.60	5,943.8	-3,828.2	1,023.8	3,960.3	0.82	0.66	
9,697.0	89.00	162.50	5,944.8	-3,888.5	1,042.1	4,023.3	1.81	-0.48	
9,758.0	89.00	162.10	5,945.8	-3,946.6	1,060.7	4,084.3	0.66	0.00	
9,819.0	89.90	161.90	5,946.4	-4,004.6	1,079.5	4,145.2	1.51	1.48	
9,881.0	89.80	160.50	5,946.6	-4,063.3	1,099.5	4,207.2	2.26	-0.16	
9,944.0	89.80	162.80	5,946.8	-4,123.1	1,119.3	4,270.2	3.65	0.00	
10,007.0	90.00	162.70	5,946.9	-4,183.3	1,138.0	4,333.2	0.35	0.32	
10,070.0	90.10	162.70	5,946.9	-4,243.4	1,156.8	4,396.2	0.16	0.16	
10,133.0	89.80	161.20	5,946.9	-4,303.3	1,176.3	4,459.2	2.43	-0.48	
10,195.0	90.20	163.10	5,946.9	-4,362.3	1,195.3	4,521.2	3.13	0.65	
10,258.0	90.50	163.20	5,946.5	-4,422.6	1,213.6	4,584.2	0.50	0.48	
10,322.0	89.00	163.60	5,946.8	-4,483.9	1,231.8	4,648.2	2.43	-2.34	
10,385.0	89.40	163.10	5,947.7	-4,544.3	1,249.9	4,711.2	1.02	0.63	
10,449.0	88.10	163.20	5,949.1	-4,605.5	1,268.4	4,775.1	2.04	-2.03	
10,512.0	88.20	163.30	5,951.1	-4,665.8	1,286.6	4,838.1	0.22	0.16	
10,573.0	88.80	163.30	5,952.7	-4,724.2	1,304.1	4,899.1	0.98	0.98	
10,636.0	89.30	163.90	5,953.8	-4,784.7	1,321.9	4,962.1	1.24	0.79	
10,697.0	89.70	164.30	5,954.3	-4,843.3	1,338.6	5,023.1	0.93	0.66	
10,758.0	89.10	163.20	5,954.9	-4,901.9	1,355.7	5,084.0	2.05	-0.98	
10,820.0	89.00	163.10	5,956.0	-4,961.2	1,373.6	5,146.0	0.23	-0.16	
10,884.0	89.40	163.30	5,956.9	-5,022.5	1,392.1	5,210.0	0.70	0.63	
10,946.0	89.70	162.80	5,957.3	-5,081.8	1,410.2	5,272.0	0.94	0.48	
11,009.0	89.30	162.60	5,957.9	-5,141.9	1,428.9	5,335.0	0.71	-0.63	
11,072.0	89.30	162.70	5,958.7	-5,202.1	1,447.7	5,398.0	0.16	0.00	
11,122.0	89.60	162.90	5,959.1	-5,249.8	1,462.5	5,448.0	0.72	0.60	Last Cathedral Survey @ 11122' MD
11,177.0	89.60	162.90	5,959.5	-5,302.4	1,478.7	5,503.0	0.00	0.00	Projection to Bit @ 11177' MD

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Cathedral Energy Services
Survey Report

9-00136

Company:	Chesapeake Energy Corp	Local Co-ordinate Reference:	Well Russell Hervey BRK 8H
Project:	Brooke County, WV	TVD Reference:	WELL @ 1178.0usft (Nomac 37)
Site:	Russell Hervey	MD Reference:	WELL @ 1178.0usft (Nomac 37)
Well:	Russell Hervey BRK 8H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	HZ	Database:	USA EDM 5000 Multi Users DB

Targets									
Target Name	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- hit/miss target	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(usft)		
- Shape									
Russell Hervey 8H PBHI	0.00	360.00	5,962.2	-5,302.2	1,479.0	636,775.11	1,706,495.91	40° 14' 36.726 N	80° 33' 4.900 W
- actual wellpath misses target center by 2.7usft at 11176.9usft MD (5959.5 TVD, -5302.3 N, 1478.7 E)									
- Point									
Russell Hervey 8H PBHI	0.00	360.00	5,947.2	-5,302.2	1,479.0	636,775.11	1,706,495.91	40° 14' 36.726 N	80° 33' 4.900 W
- actual wellpath misses target center by 12.3usft at 11176.8usft MD (5959.5 TVD, -5302.2 N, 1478.6 E)									
- Point									

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
5,280.0	5,272.0	-26.2	-125.6	Last Gyro Survey @ 5280' MD	
11,122.0	5,959.1	-5,249.8	1,462.5	Last Cathedral Survey @ 11122' MD	
11,177.0	5,959.5	-5,302.4	1,478.7	Projection to Bit @ 11177' MD	

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Hydraulic Fracturing Fluid Product Component Information Disclosure

9-00136	Fracture Date:	4/8/2013
	State:	WEST VIRGINIA
	County:	BROOKE
	API Number:	4700900136
	Operator Name:	CHESAPEAKE APPALACHIA LLC
	Well Name and Number:	RUSSELL HERVEY BRK 8H
	Longitude:	-80.556882
	Latitude:	40.258041
	Long/Lat Projection:	NAD27
	Production Type:	GAS
True Vertical Depth (TVD):	5,960	
Total Water Volume (gal)*:	5,066,880	

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Hydraulic Fracturing Fluid Composition:

Trade Name	Supplier	Purpose	Ingredients	Chemical Abstract Service Number (CAS #)	Maximum Ingredient Concentration in Additive (% by Mass)**	Maximum Ingredient Concentration in HF Fluid (% by Mass)**	Comments
Fresh Water	CHESAPEAKE ENERGY	Carrier/Base Fluid	Water	007732-18-5	100.00%	82.00829%	
Recycled Produced Water	CHESAPEAKE ENERGY	Carrier/Base Fluid	Water	007732-18-5	100.00%	4.84718%	
Northern White Sand	FTS INTERNATIONAL	Proppant - Natural	Crystalline Silica (Quartz Sand, Silicon Dioxide)	014808-60-7	100.00%	7.91897%	
100 Mesh Sand	FTS INTERNATIONAL	Proppant - Natural	Crystalline Silica (Quartz Sand, Silicon Dioxide)	014808-60-7	100.00%	3.69595%	
10.1 - 15 HCL	FTS INTERNATIONAL	Acid	Hydrochloric Acid	007647-01-0	15.00%	0.20240%	
			Water	007732-18-5	85.00%	1.14695%	
FRW-200	FTS INTERNATIONAL	Friction Reducer	Petroleum Distillate Hydrotreated Light	064742-47-8	26.00%	0.01298%	
FE-100L	FTS INTERNATIONAL	Iron Control Agent	Citric Acid	000077-92-9	55.00%	0.00819%	
FRW-600	FTS INTERNATIONAL	Friction Reducer	Petroleum Distillate Hydrotreated Light	064742-47-8	30.00%	0.00608%	

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HVG01 (TURQUOISE-1 BULK)	FTS INTERNATIONAL	Gelling Agent	Crystalline Silica (Quartz Sand, Silicon Dioxide)	014808-60-7	2.00%	0.00085%
			Guar Gum	009000-30-0	50.00%	0.02132%
			Petroleum Distillate Hydrotreated Light	064742-47-8	55.00%	0.02345%
			Surfactant	068439-51-0	2.00%	0.00085%
B10 (HIGH PH BUFFER)	FTS INTERNATIONAL	pH Adjusting Agent	Potassium Carbonate	000584-08-7	48.00%	0.00068%
			Potassium Hydroxide	001310-58-3	20.00%	0.00028%
APB01 (AMMONIUM PERSUFATE BREAKER)	FTS INTERNATIONAL	Breaker	Ammonium Persulfate	007727-54-0	100.00%	0.00059%
BXL02 Borate XL	FTS INTERNATIONAL	Cross Linker	Boric Acid	010043-35-3	15.00%	0.00043%
			Potassium Hydroxide	001310-58-3	12.00%	0.00034%
			Sodium Metaborate Tetrahydrate	010555-76-7	25.00%	0.00071%
CI-150	FTS INTERNATIONAL	Corrosion Inhibitor	Dimethyl Formamide	000068-12-2	10.00%	0.00017%
			Isopropanol (Isopropyl Alcohol, Propan-2-ol)	000067-63-0	60.00%	0.00104%
			Proprietary Aromatic Aldehyde	TRADE SECRET	10.00%	0.00017%
			Proprietary Organic Amine Resin Salt	TRADE SECRET	30.00%	0.00052%
			Proprietary Quaternary Ammonium Compound	TRADE SECRET	10.00%	0.00017%
SC30	X CHEM	Scale Inhibitor	Sodium Polyacrylate	009003-04-7	100.00%	0.00913%
B84	X CHEM	Anti-Bacterial Agent	Didecyl Dimethyl Ammonium Chloride	007173-51-5	8.00%	0.00295%
			Ethanol	000064-17-5	4.00%	0.00147%
			Glutaraldehyde (Pentanediol)	000111-30-8	27.00%	0.00994%
			Quaternary Ammonium Compound	068424-85-1	6.00%	0.00203%

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Additional Ingredients Not Listed on MSDS

APB01 (AMMONIUM PERSUFATE BREAKER), B10 (HIGH PH BUFFER), BXL02 Borate XL, CI-150, FE-100L, FRW- 200, FRW-600	FTS INTERNATIONAL	Breaker, Corrosion Inhibitor, Cross Linker, Friction Reducer, Iron Control Agent, pH Adjusting Agent	Proprietary Breaker (APB01) Additive	TRADE SECRET	0.00003%
			Proprietary Corrosion Inhibitor Additive (CI-150)	TRADE SECRET	0.00089%
			Proprietary Friction Reducer Additive (FRW-200 and FRW- 200W)	TRADE SECRET	0.04654%
			Proprietary Friction Reducer Additive (FRW-600)	TRADE SECRET	0.02064%
			Water	007732-18-5	0.02099%
B84, SC30	X CHEM	Anti-Bacterial Agent, Scale Inhibitor	Water	007732-18-5	0.05200%

Environmental Protection

- * Total Water Volume sources may include fresh water, produced water, and/or recycled water
- ** Information is based on the maximum potential for concentration and thus the total may be over 100%

"Additional Ingredients Not Listed on MSDS" component information were obtained directly from the supplier. As such, the Operator is not responsible for inaccurate and/or incomplete information. Any questions regarding the content of this information should be directed to the supplier who provided it.

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