

Chesapeake

Brooke County, WV
Samuel Hubbard BRK
Samuel Hubbard BRK 8H

Original Hole

Design: Surveys

Standard Survey Report

16 July, 2012

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WV GEOLOGICAL SURVEY
MORGANTOWN, WV

Survey Report

Company:	Chesapeake	Local Co-ordinate Reference:	Well Samuel Hubbard BRK 8H
Project:	Brooke County, WV	TVD Reference:	KB ELEV. @ 1247.00ft (NOMAC 337)
Site:	Samuel Hubbard BRK	MD Reference:	KB ELEV. @ 1247.00ft (NOMAC 337)
Well:	Samuel Hubbard BRK 8H	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	North East R5000 Database

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

Site:	Samuel Hubbard BRK				
Site Position:		Northing:	652,698.67 usft	Latitude:	40.287271
From:	Lat/Long	Easting:	1,707,390.41 usft	Longitude:	-80.548823
Position Uncertainty:	0.00 ft	Slot Radius:	13.200 in	Grid Convergence:	-0.67 °

Well:	Samuel Hubbard BRK 8H					
Well Position	+N/-S	0.00 ft	Northing:	652,697.37 usft	Latitude:	40.287267
	+E/-W	0.00 ft	Easting:	1,707,376.45 usft	Longitude:	-80.548873
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,225.00 ft

Wellbore:	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	5/17/2012	-8.80	67.76	53,021

Design:	Surveys				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.00	0.00	0.00	326.36	

Survey Program	Date 7/14/2012				
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
100.00	5,123.00	CHK MWD (Original Hole)	MWD	MWD - Standard	
5,232.00	10,091.00	Crescent MWD (Original Hole)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.61	292.87	100.00	0.21	-0.49	0.44	0.61	0.61	0.00	0.00
200.00	0.55	242.67	199.99	0.19	-1.41	0.94	0.50	-0.06	-50.20	0.06
300.00	0.67	242.73	299.99	-0.29	-2.35	1.06	0.12	0.12	0.06	0.06
400.00	0.59	244.19	399.98	-0.79	-3.34	1.19	0.08	-0.08	1.46	1.46
500.00	0.24	182.13	499.98	-1.22	-3.81	1.09	0.52	-0.35	-62.06	-62.06
600.00	0.25	184.95	599.98	-1.65	-3.83	0.75	0.02	0.01	2.82	2.82
700.00	0.37	198.69	699.98	-2.17	-3.96	0.39	0.14	0.12	13.74	13.74
800.00	0.38	184.07	799.97	-2.81	-4.08	-0.07	0.10	0.01	-14.62	-14.62
900.00	0.30	179.77	899.97	-3.40	-4.11	-0.56	0.08	0.08	-4.30	-4.30

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Project:	Brooke County, WV	TVD Reference:	KB ELEV. @ 1247.00ft (NOMAC 337)
Site:	Samuel Hubbard BRK	MD Reference:	KB ELEV. @ 1247.00ft (NOMAC 337)
Well:	Samuel Hubbard BRK 8H	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	North East R5000 Database

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
1,000.00	0.27	153.80	999.97	-3.87	-4.00	-1.01	0.13	-0.03	-25.97
1,100.00	0.30	148.83	1,099.97	-4.31	-3.76	-1.50	0.04	0.03	-4.97
1,200.00	0.23	249.49	1,199.97	-4.60	-3.81	-1.72	0.41	-0.07	100.66
1,300.00	0.37	237.58	1,299.97	-4.85	-4.27	-1.67	0.15	0.14	-11.91
1,400.00	0.29	232.63	1,399.97	-5.17	-4.75	-1.68	0.08	-0.08	-4.95
1,500.00	0.26	206.18	1,499.97	-5.53	-5.05	-1.81	0.13	-0.03	-26.45
1,600.00	0.25	242.18	1,599.97	-5.84	-5.34	-1.90	0.16	-0.01	36.00
1,700.00	0.32	236.62	1,699.96	-6.09	-5.77	-1.87	0.08	0.07	-5.56
1,800.00	0.36	228.36	1,799.96	-6.45	-6.24	-1.92	0.06	0.04	-8.26
1,900.00	0.14	251.08	1,899.96	-6.70	-6.59	-1.93	0.24	-0.22	22.72
2,000.00	0.17	344.37	1,999.96	-6.60	-6.74	-1.76	0.23	0.03	93.29
2,100.00	0.44	326.52	2,099.96	-6.13	-6.99	-1.23	0.28	0.27	-17.85
2,200.00	0.62	318.97	2,199.96	-5.41	-7.56	-0.31	0.19	0.18	-7.55
2,300.00	0.60	314.20	2,299.95	-4.63	-8.29	0.74	0.05	-0.02	-4.77
2,400.00	0.66	308.60	2,399.94	-3.91	-9.12	1.80	0.09	0.06	-5.60
2,600.00	0.26	338.94	2,599.94	-2.77	-10.18	3.34	0.23	-0.20	15.17
2,700.00	0.45	289.73	2,699.93	-2.42	-10.63	3.87	0.34	0.19	-49.21
2,800.00	0.26	317.48	2,799.93	-2.12	-11.15	4.41	0.25	-0.19	27.75
2,900.00	0.58	294.65	2,899.93	-1.74	-11.77	5.07	0.36	0.32	-22.83
3,000.00	0.67	326.68	2,999.92	-1.04	-12.55	6.08	0.36	0.09	32.03
3,100.00	0.94	316.93	3,099.91	0.04	-13.43	7.48	0.30	0.27	-9.75
3,200.00	0.68	314.60	3,199.90	1.06	-14.41	8.87	0.26	-0.26	-2.33
3,300.00	0.83	308.11	3,299.90	1.92	-15.41	10.14	0.17	0.15	-6.49
3,400.00	0.71	319.69	3,399.89	2.84	-16.38	11.44	0.20	-0.12	11.58
3,500.00	0.66	328.94	3,499.88	3.81	-17.07	12.63	0.12	-0.05	9.25
3,600.00	0.24	359.30	3,599.88	4.51	-17.37	13.38	0.47	-0.42	30.36
3,700.00	0.39	339.19	3,699.88	5.04	-17.50	13.89	0.18	0.15	-20.11
3,800.00	0.30	7.37	3,799.87	5.62	-17.59	14.42	0.19	-0.09	28.18
3,900.00	0.42	15.61	3,899.87	6.23	-17.45	14.85	0.13	0.12	8.24
4,000.00	0.27	357.48	3,999.87	6.82	-17.36	15.30	0.18	-0.15	-18.13
4,100.00	0.41	0.59	4,099.87	7.41	-17.37	15.79	0.14	0.14	3.11
4,200.00	0.07	345.28	4,199.87	7.83	-17.38	16.15	0.34	-0.34	-15.31
4,300.00	0.19	336.70	4,299.87	8.04	-17.46	16.37	0.12	0.12	-8.58
4,400.00	0.53	7.40	4,399.86	8.65	-17.47	16.88	0.38	0.34	30.70
4,500.00	0.65	358.32	4,499.86	9.67	-17.43	17.71	0.15	0.12	-9.08
4,600.00	0.56	6.69	4,599.85	10.73	-17.39	18.56	0.13	-0.09	8.37
4,700.00	0.17	251.76	4,699.85	11.17	-17.47	18.97	0.65	-0.39	-114.93
4,800.00	0.44	300.69	4,799.85	11.32	-17.94	19.36	0.35	0.27	48.93
4,900.00	0.47	351.44	4,899.85	11.92	-18.33	20.08	0.39	0.03	50.75
5,000.00	0.71	333.68	4,999.84	12.88	-18.67	21.06	0.30	0.24	-17.76
5,100.00	0.14	30.06	5,099.84	13.54	-18.88	21.73	0.64	-0.57	56.38
5,123.00	0.28	92.13	5,122.84	13.56	-18.81	21.71	1.08	0.61	269.87
5,232.00	0.40	121.30	5,231.84	13.35	-18.22	21.21	0.19	0.11	26.76

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Survey Report

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Company	Chesapeake	Local Co-ordinate Reference	Well Samuel Hubbard BRK
Project	Brooke County, WV	TVD Reference	KB ELEV. @ 1247.00ft (NOMAC 337)
Site	Samuel Hubbard BRK	MD Reference	KB ELEV. @ 1247.00ft (NOMAC 337)
Well	Samuel Hubbard BRK 8H	North Reference	Grid
Wellbore	Original Hole	Survey Calculation Method	Minimum Curvature
Design	Surveys	Database	North East R5000 Database

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
5,261.00	1.50	140.20	5,260.83	13.01	-17.89	20.74	3.89	3.79	65.17
5,293.00	3.30	135.50	5,292.80	12.03	-16.98	19.42	5.65	5.63	-14.69
5,324.00	5.10	141.30	5,323.72	10.32	-15.49	17.17	5.96	5.81	18.71
5,356.00	7.30	144.70	5,355.53	7.55	-13.43	13.72	6.97	6.88	10.63
5,387.00	9.60	144.00	5,386.19	3.85	-10.77	9.17	7.43	7.42	-2.26
5,418.00	12.20	146.40	5,416.63	-0.97	-7.44	3.31	8.51	8.39	7.74
5,450.00	15.00	146.40	5,447.73	-7.24	-3.27	-4.21	8.75	8.75	0.00
5,482.00	17.50	148.10	5,478.45	-14.77	1.56	-13.16	7.95	7.81	5.31
5,513.00	20.20	147.70	5,507.78	-23.25	6.89	-23.17	8.72	8.71	-1.29
5,545.00	23.40	146.60	5,537.49	-33.23	13.34	-35.06	10.08	10.00	-3.44
5,576.00	27.00	146.50	5,565.54	-44.24	20.61	-48.25	11.61	11.61	-0.32
5,608.00	30.80	148.00	5,593.55	-57.25	28.97	-63.71	12.09	11.88	4.69
5,640.00	34.30	149.80	5,620.52	-72.00	37.85	-80.91	11.35	10.94	5.63
5,671.00	38.10	151.50	5,645.53	-87.96	46.81	-99.16	12.68	12.26	5.48
5,703.00	41.90	153.90	5,670.04	-106.24	56.22	-119.59	12.81	11.88	7.50
5,734.00	45.30	157.10	5,692.49	-125.69	65.07	-140.69	13.07	10.97	10.32
5,765.00	49.30	159.60	5,713.51	-146.86	73.46	-162.96	14.20	12.90	8.06
5,797.00	53.60	162.90	5,733.45	-170.56	81.48	-187.13	15.67	13.44	10.31
5,829.00	57.00	163.90	5,751.66	-195.77	88.99	-212.28	10.93	10.63	3.13
5,860.00	59.90	163.60	5,767.88	-221.13	96.38	-237.48	9.39	9.35	-0.97
5,891.00	62.30	162.60	5,782.86	-247.09	104.27	-263.47	8.24	7.74	-3.23
5,923.00	65.10	161.70	5,797.04	-274.39	113.07	-291.07	9.11	8.75	-2.81
5,954.00	67.40	161.10	5,809.53	-301.28	122.12	-318.48	7.63	7.42	-1.94
5,986.00	69.00	160.50	5,821.41	-329.34	131.89	-347.25	5.29	5.00	-1.88
6,017.00	71.00	159.70	5,832.01	-356.73	141.80	-375.54	6.89	6.45	-2.58
6,049.00	73.30	159.30	5,841.82	-385.26	152.47	-405.20	7.29	7.19	-1.25
6,080.00	76.30	159.70	5,849.95	-413.28	162.95	-434.33	9.76	9.68	1.29
6,112.00	80.40	159.70	5,856.41	-442.66	173.82	-464.82	12.81	12.81	0.00
6,143.00	83.20	160.50	5,860.83	-471.51	184.26	-494.62	9.39	9.03	2.58
6,175.00	85.00	160.20	5,864.12	-501.49	194.96	-525.51	5.70	5.63	-0.94
6,270.00	91.60	159.50	5,866.93	-590.58	227.66	-617.79	6.99	6.95	-0.74
6,365.00	92.80	160.20	5,863.29	-679.70	260.36	-710.10	1.46	1.26	0.74
6,458.00	88.10	160.20	5,862.56	-767.18	291.85	-800.37	5.05	-5.05	0.00
6,551.00	85.60	160.90	5,867.67	-854.73	322.77	-890.39	2.79	-2.69	0.75
6,646.00	85.60	160.70	5,874.96	-944.18	353.92	-982.11	0.21	0.00	-0.21
6,739.00	88.40	161.80	5,879.82	-1,032.11	383.77	-1,071.86	3.23	3.01	1.18
6,834.00	88.00	161.60	5,882.81	-1,122.26	413.58	-1,163.43	0.47	-0.42	-0.21
6,928.00	88.90	163.80	5,885.35	-1,211.97	441.52	-1,253.59	2.53	0.96	2.34
7,023.00	88.40	162.40	5,887.59	-1,302.84	469.13	-1,344.53	1.56	-0.53	-1.47
7,118.00	88.20	163.00	5,890.41	-1,393.50	497.37	-1,435.65	0.67	-0.21	0.63
7,211.00	88.10	163.10	5,893.41	-1,482.42	524.47	-1,524.69	0.15	-0.11	0.11
7,306.00	90.10	163.00	5,894.90	-1,573.28	552.16	-1,615.67	2.11	2.11	-0.11
7,400.00	90.10	163.20	5,894.74	-1,663.22	579.48	-1,705.69	0.21	0.00	0.21

Survey Report

Company:	Chesapeake	Local Co-ordinate Reference:	Well Samuel Hubbard BRK 8H
Project:	Brooke County, WV	TVD Reference:	KB ELEV. @ 1247.00ft (NOMAC 337)
Site:	Samuel Hubbard BRK	MD Reference:	KB ELEV. @ 1247.00ft (NOMAC 337)
Well:	Samuel Hubbard BRK 8H	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	North East R5000 Database

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
7,495.00	88.90	164.00	5,895.56	-1,754.34	606.30	-1,796.41	1.52	-1.26	0.84	
7,587.00	88.90	164.40	5,897.33	-1,842.85	631.35	-1,883.97	0.43	0.00	0.43	
7,681.00	87.80	163.90	5,900.04	-1,933.24	657.01	-1,973.43	1.29	-1.17	-0.53	
7,775.00	87.60	164.00	5,903.81	-2,023.50	682.98	-2,062.97	0.24	-0.21	0.11	
7,869.00	87.90	160.70	5,907.50	-2,113.00	711.45	-2,153.25	3.52	0.32	-3.51	
7,964.00	90.30	160.40	5,908.99	-2,202.56	743.08	-2,245.33	2.55	2.53	-0.32	
8,059.00	90.90	161.10	5,908.00	-2,292.24	774.40	-2,337.34	0.97	0.63	0.74	
8,153.00	90.90	161.10	5,906.52	-2,381.16	804.85	-2,428.23	0.00	0.00	0.00	
8,248.00	89.00	162.00	5,906.61	-2,471.27	834.91	-2,519.91	2.21	-2.00	0.95	
8,342.00	88.70	162.60	5,908.49	-2,560.80	863.48	-2,610.28	0.71	-0.32	0.64	
8,435.00	88.60	163.40	5,910.68	-2,649.71	890.66	-2,699.35	0.87	-0.11	0.86	
8,530.00	88.40	163.60	5,913.17	-2,740.77	917.64	-2,790.10	0.30	-0.21	0.21	
8,625.00	87.80	163.80	5,916.32	-2,831.90	944.29	-2,880.73	0.67	-0.63	0.21	
8,719.00	87.70	163.70	5,920.01	-2,922.08	970.57	-2,970.37	0.15	-0.11	-0.11	
8,815.00	88.40	163.40	5,923.28	-3,014.09	997.74	-3,062.02	0.79	0.73	-0.31	
8,909.00	88.10	161.90	5,926.15	-3,103.77	1,025.76	-3,152.20	1.63	-0.32	-1.60	
9,002.00	88.40	161.90	5,928.99	-3,192.13	1,054.64	-3,241.76	0.32	0.32	0.00	
9,095.00	88.40	162.90	5,931.58	-3,280.74	1,082.74	-3,331.10	1.07	0.00	1.08	
9,189.00	88.60	163.30	5,934.04	-3,370.65	1,110.06	-3,421.09	0.48	0.21	0.43	
9,283.00	88.00	162.50	5,936.83	-3,460.45	1,137.69	-3,511.16	1.06	-0.64	-0.85	
9,378.00	89.80	161.50	5,938.66	-3,550.78	1,167.04	-3,602.62	2.17	1.89	-1.05	
9,473.00	89.80	161.70	5,938.99	-3,640.92	1,197.02	-3,694.27	0.21	0.00	0.21	
9,567.00	90.40	161.90	5,938.82	-3,730.22	1,226.38	-3,784.88	0.67	0.64	0.21	
9,662.00	90.70	161.40	5,937.91	-3,820.39	1,256.29	-3,876.51	0.61	0.32	-0.53	
9,757.00	90.20	161.20	5,937.17	-3,910.37	1,286.75	-3,968.30	0.57	-0.53	-0.21	
9,851.00	89.80	161.60	5,937.17	-3,999.46	1,316.73	-4,059.07	0.60	-0.43	0.43	
9,946.00	89.10	160.90	5,938.08	-4,089.41	1,347.26	-4,150.88	1.04	-0.74	-0.74	
10,036.00	88.80	160.40	5,939.73	-4,174.31	1,377.08	-4,238.08	0.65	-0.33	-0.56	
10,091.00	88.80	160.40	5,940.88	-4,226.11	1,395.53	-4,291.42	0.00	0.00	0.00	

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment	
		+N/-S (ft)	+E/-W (ft)		
10,091.00	5,940.88	-4,226.11	1,395.53	PTB: [10091.00' MD][88.80° Inc][160.40° Azi]	

Checked By: _____ Approved By: _____ Date: _____

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