

**Project:** Weld County, Colorado NAD27  
**Site:** Sec 16-T3N-R61W  
**Well:** State 16-3-61 1H  
**Wellbore:** Sidetrack 1  
**Final Surveys**  
**Rig:** SST 53

## SECTION DETAILS Rev1

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5761.48	0.00	0.00	5761.48	0.00	0.00	0.00	0.00	0.00	
6467.36	60.00	178.40	6345.24	-336.90	9.41	8.50	178.40	337.03	
6768.36	90.10	178.40	6422.00	-624.27	17.44	10.00	0.00	624.51	
10500.71	90.10	178.40	6415.40	-4355.16	121.54	0.00	51.46	4356.86	<b>PBHL</b>

**Surface Location:**  
**SHL 250' FNL & 660' FEL Sec 16-T3N-R61W**

US State Plane 1927 (Exact solution)  
 Colorado North 501

**Elevation:** 4652.55 GL + 22' KB @ 4674.55ft (SST 53)

**Northing** 329813.68 **Easting** 2360594.55 **Latitude** 40° 13' 53.554 N **Longitude** 104° 12' 30.559 W

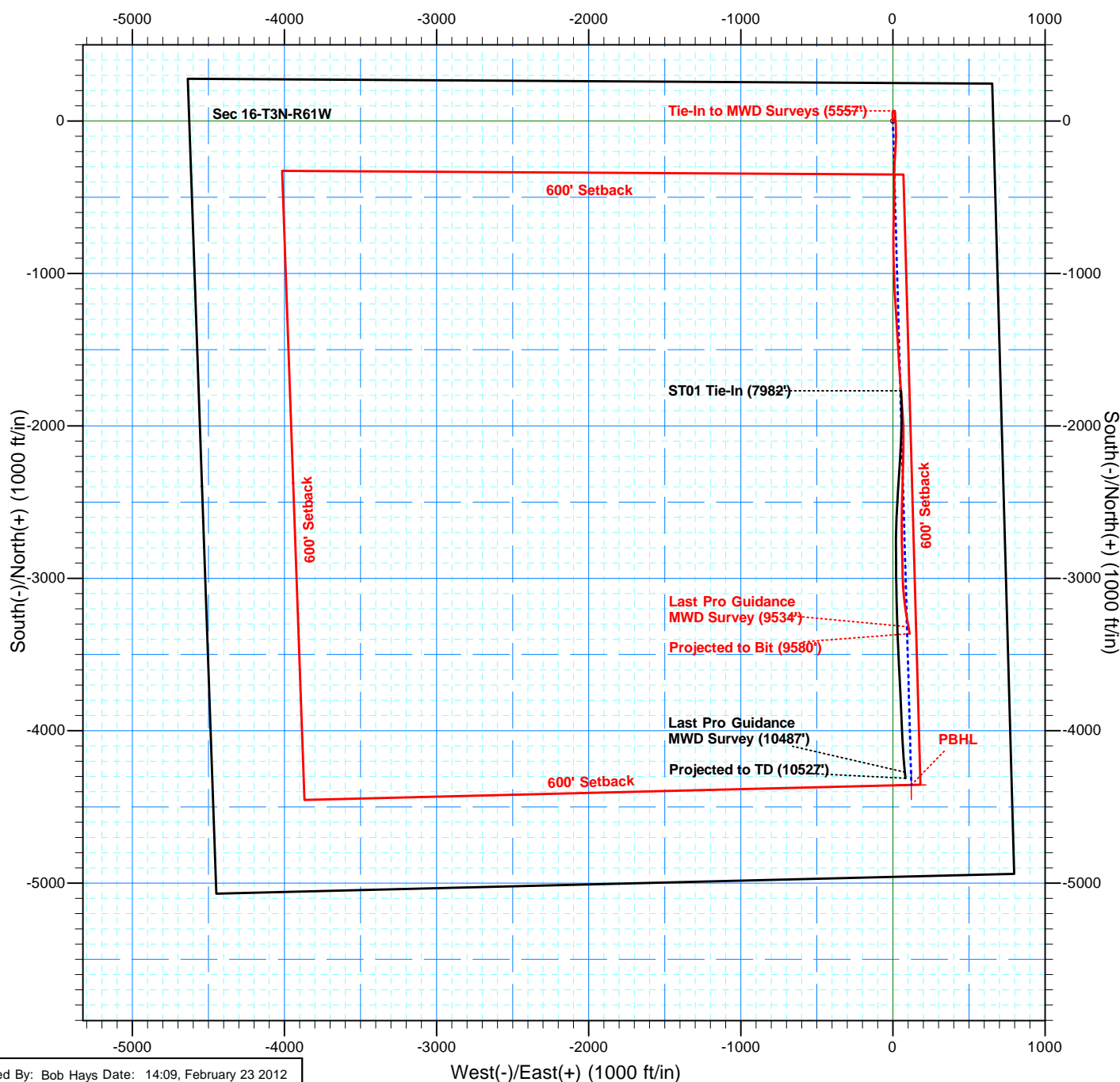
## WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
<b>PBHL</b>	6415.40	-4355.16	121.54	40° 13' 10.501 N	104° 12' 29.811 W



**To convert a Magnetic Direction to a Grid Direction, Add 7.63°**

Magnetic Model: IGRF2010 Date: 19-Jan-12  
**Azimuths & Coordinates to NAD27 Grid**



# Chesapeake Operating Inc.



Project: Weld County, Colorado NAD27  
 Site: Sec 16-T3N-R61W  
 Well: State 16-3-61 1H  
 Wellbore: Sidetrack 1  
 Final Surveys  
 Rig: SST 53



## SECTION DETAILS Rev1

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5761.48	0.00	0.00	5761.48	0.00	0.00	0.00	0.00	0.00	
6467.36	60.00	178.40	6345.24	-336.90	9.41	8.50	178.40	337.03	
6768.36	90.10	178.40	6422.00	-624.27	17.44	10.00	0.00	624.51	
10500.71	90.10	178.40	6415.40	-4355.16	121.54	0.00	51.46	4356.86	PBHL

Surface Location:  
 SHL 250' FNL & 660' FEL Sec 16-T3N-R61W

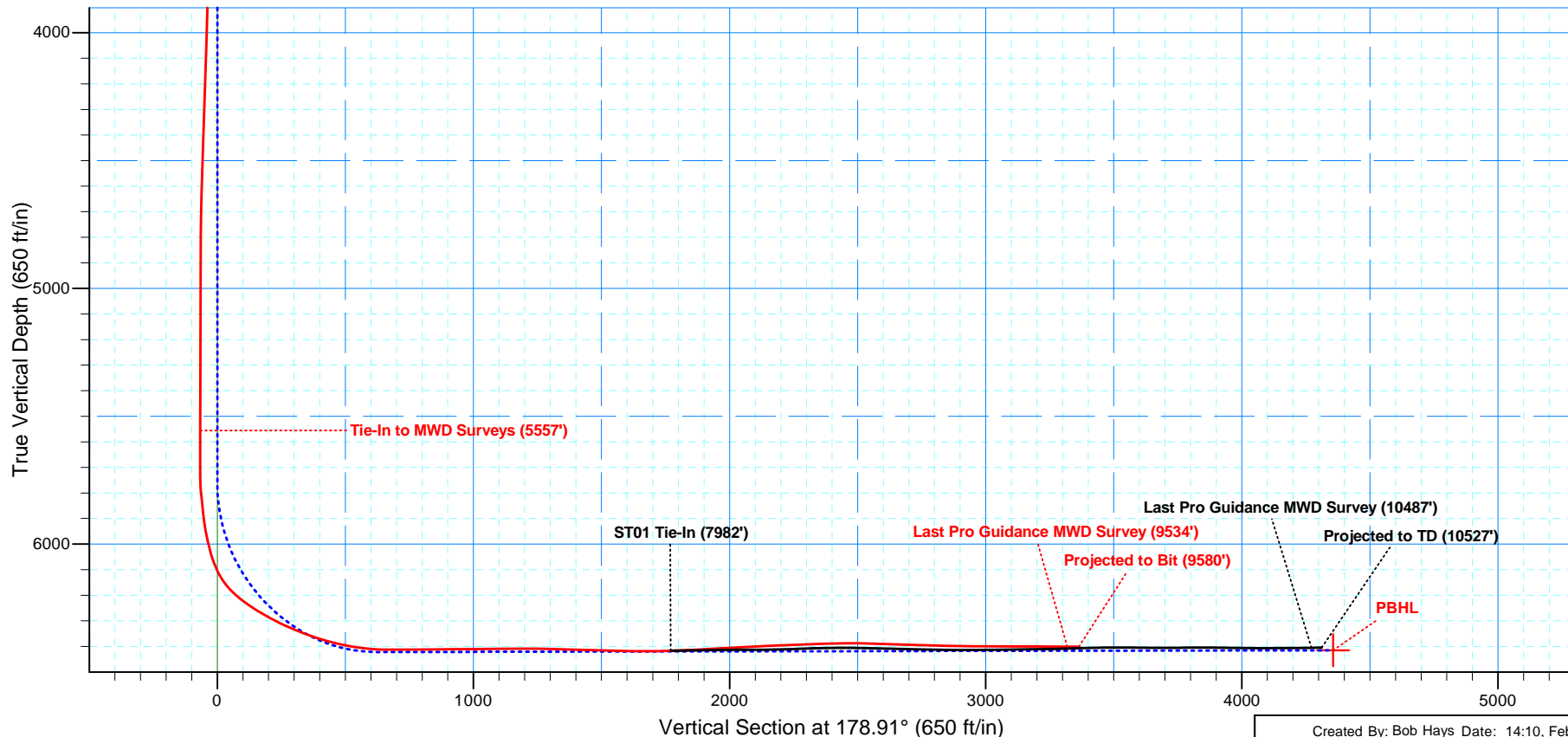
US State Plane 1927 (Exact solution)  
 Colorado North 501

Elevation: 4652.55 GL + 22' KB @ 4674.55ft (SST 53)

Northing	Easting	Latitude	Longitude
329813.68	2360594.55	40° 13' 53.554 N	104° 12' 30.559 W

## WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
PBHL	6415.40	-4355.16	121.54	40° 13' 10.501 N	104° 12' 29.811 W



Created By: Bob Hays Date: 14:10, February 23 2012



# **Chesapeake Operating Inc.**

**Weld County, Colorado NAD27**

**Sec 16-T3N-R61W**

**State 16-3-61 1H**

**Sidetrack 1**

**Design: Final Surveys**

## **Standard Survey Report**

**23 February, 2012**





# Professional Directional LTD

## Survey Report



<b>Company:</b>	Chesapeake Operating Inc.	<b>Local Co-ordinate Reference:</b>	Well State 16-3-61 1H
<b>Project:</b>	Weld County, Colorado NAD27	<b>TVD Reference:</b>	4652.55 GL + 22' KB @ 4674.55ft (SST 53)
<b>Site:</b>	Sec 16-T3N-R61W	<b>MD Reference:</b>	4652.55 GL + 22' KB @ 4674.55ft (SST 53)
<b>Well:</b>	State 16-3-61 1H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Sidetrack 1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Final Surveys	<b>Database:</b>	EDM 5000.1 Single User Db

<b>Project</b>	Weld County, Colorado NAD27		
<b>Map System:</b>	US State Plane 1927 (Exact solution)	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	NAD 1927 (NADCON CONUS)		
<b>Map Zone:</b>	Colorado North 501		

<b>Site</b>	Sec 16-T3N-R61W		
<b>Site Position:</b>		<b>Northing:</b>	329,813.68 ft
<b>From:</b>	Map	<b>Easting:</b>	2,360,594.55 ft
<b>Position Uncertainty:</b>	0.00 ft	<b>Slot Radius:</b>	1.10000 ft
		<b>Latitude:</b>	40° 13' 53.554 N
		<b>Longitude:</b>	104° 12' 30.559 W
		<b>Grid Convergence:</b>	0.83 °

<b>Well</b>	State 16-3-61 1H		
<b>Well Position</b>	<b>+N/-S</b>	0.00 ft	<b>Northing:</b>
	<b>+E/-W</b>	0.00 ft	<b>Easting:</b>
<b>Position Uncertainty</b>	0.00 ft	<b>Wellhead Elevation:</b>	ft
		<b>Latitude:</b>	40° 13' 53.554 N
		<b>Longitude:</b>	104° 12' 30.559 W
		<b>Ground Level:</b>	4,652.55 ft

<b>Wellbore</b>	Sidetrack 1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	01/19/12	8.47	66.98	53,040

<b>Survey Program</b>	<b>Date</b>	02/23/12			
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
800.00	5,557.00	MWD Surveys (Original Hole)	MWD	MWD	
5,730.00	7,982.00	Pro Guidance MWD Surveys (Original Hol	MWD	MWD	
8,031.00	10,487.00	Pro Guidance MWD Surveys (Sidetrack 1)	MWD	MWD	
10,527.00	10,527.00	Projected to TD (Sidetrack 1)	Projection	Projection	

<b>Survey</b>										
<b>Measured Depth (ft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Vertical Section (ft)</b>	<b>Dogleg Rate (°/100ft)</b>	<b>Build Rate (°/100ft)</b>	<b>Turn Rate (°/100ft)</b>	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
800.00	0.00	359.20	800.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,031.00	0.10	73.60	1,031.00	0.06	0.19	-0.05	0.04	0.04	0.00	
1,252.00	0.10	264.60	1,252.00	0.09	0.19	-0.09	0.09	0.00	-76.47	
1,442.00	0.10	251.60	1,442.00	0.03	-0.14	-0.03	0.01	0.00	-6.84	
1,727.00	0.10	256.60	1,727.00	-0.11	-0.61	0.10	0.00	0.00	1.75	
1,981.00	0.20	38.60	1,981.00	0.18	-0.55	-0.19	0.11	0.04	55.91	
2,647.00	1.40	3.60	2,646.92	9.21	0.68	-9.20	0.19	0.18	-5.26	
2,930.00	1.30	349.60	2,929.85	15.82	0.32	-15.81	0.12	-0.04	-4.95	
3,217.00	1.30	350.60	3,216.77	22.23	-0.80	-22.25	0.01	0.00	0.35	
3,501.00	1.20	0.60	3,500.70	28.39	-1.29	-28.41	0.08	-0.04	3.52	
3,787.00	1.60	346.60	3,786.62	35.27	-2.19	-35.30	0.18	0.14	-4.90	
4,040.00	1.70	1.60	4,039.52	42.45	-2.90	-42.50	0.17	0.04	5.93	
4,418.00	2.20	10.60	4,417.30	55.19	-1.41	-55.21	0.15	0.13	2.38	
4,640.00	1.40	7.60	4,639.18	62.07	-0.27	-62.06	0.36	-0.36	-1.35	



# Professional Directional LTD

## Survey Report



<b>Company:</b>	Chesapeake Operating Inc.	<b>Local Co-ordinate Reference:</b>	Well State 16-3-61 1H
<b>Project:</b>	Weld County, Colorado NAD27	<b>TVD Reference:</b>	4652.55 GL + 22' KB @ 4674.55ft (SST 53)
<b>Site:</b>	Sec 16-T3N-R61W	<b>MD Reference:</b>	4652.55 GL + 22' KB @ 4674.55ft (SST 53)
<b>Well:</b>	State 16-3-61 1H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Sidetrack 1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Final Surveys	<b>Database:</b>	EDM 5000.1 Single User Db

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)
4,801.00	0.40	19.60	4,800.16	64.54	0.18	-64.53	0.63	-0.62	7.45
5,557.00	1.10	89.60	5,556.10	67.08	8.32	-66.91	0.14	0.09	9.26
5,730.00	1.20	87.20	5,729.07	67.18	11.79	-66.94	0.06	0.06	-1.39
5,762.00	2.10	151.60	5,761.06	66.68	12.41	-66.43	5.99	2.81	201.25
5,793.00	4.90	168.60	5,792.00	64.88	12.94	-64.63	9.54	9.03	54.84
5,825.00	7.60	177.00	5,823.81	61.43	13.32	-61.17	8.89	8.44	26.25
5,857.00	5.70	175.60	5,855.59	57.73	13.55	-57.46	5.96	-5.94	-4.38
5,889.00	5.80	174.60	5,887.43	54.54	13.83	-54.27	0.44	0.31	-3.13
5,920.00	8.30	175.40	5,918.19	50.75	14.15	-50.47	8.07	8.06	2.58
5,952.00	10.40	176.80	5,949.76	45.56	14.50	-45.28	6.60	6.56	4.38
5,983.00	12.20	177.90	5,980.16	39.49	14.78	-39.21	5.85	5.81	3.55
6,015.00	13.90	178.30	6,011.33	32.27	15.01	-31.98	5.32	5.31	1.25
6,047.00	16.00	177.90	6,042.25	24.02	15.29	-23.73	6.57	6.56	-1.25
6,079.00	20.50	177.20	6,072.63	14.01	15.72	-13.71	14.08	14.06	-2.19
6,111.00	25.50	172.90	6,102.08	1.57	16.85	-1.25	16.47	15.63	-13.44
6,143.00	31.50	174.60	6,130.19	-13.60	18.49	13.95	18.92	18.75	5.31
6,174.00	37.20	178.80	6,155.78	-31.05	19.45	31.41	19.90	18.39	13.55
6,206.00	43.60	179.30	6,180.13	-51.77	19.79	52.14	20.03	20.00	1.56
6,237.00	49.00	177.90	6,201.54	-74.17	20.35	74.54	17.72	17.42	-4.52
6,269.00	53.00	179.40	6,221.68	-99.03	20.92	99.41	13.02	12.50	4.69
6,301.00	56.30	181.40	6,240.19	-125.12	20.73	125.49	11.50	10.31	6.25
6,332.00	57.90	184.00	6,257.03	-151.11	19.50	151.46	8.73	5.16	8.39
6,364.00	59.40	185.10	6,273.68	-178.35	17.33	178.65	5.53	4.69	3.44
6,396.00	61.60	184.80	6,289.44	-206.10	14.93	206.35	6.92	6.88	-0.94
6,427.00	63.70	184.00	6,303.68	-233.55	12.82	233.75	7.15	6.77	-2.58
6,459.00	65.70	182.60	6,317.35	-262.43	11.16	262.60	7.40	6.25	-4.38
6,491.00	67.30	181.00	6,330.11	-291.76	10.24	291.90	6.78	5.00	-5.00
6,523.00	68.70	180.90	6,342.10	-321.43	9.74	321.55	4.38	4.38	-0.31
6,554.00	69.10	180.60	6,353.26	-350.35	9.37	350.46	1.57	1.29	-0.97
6,586.00	70.90	180.20	6,364.21	-380.41	9.16	380.52	5.75	5.63	-1.25
6,618.00	73.10	179.60	6,374.09	-410.85	9.21	410.95	7.10	6.88	-1.88
6,649.00	75.70	179.90	6,382.43	-440.70	9.34	440.80	8.44	8.39	0.97
6,681.00	77.40	180.00	6,389.87	-471.82	9.37	471.92	5.32	5.31	0.31
6,713.00	78.80	180.50	6,396.47	-503.13	9.23	503.22	4.63	4.38	1.56
6,744.00	80.90	181.00	6,401.93	-533.64	8.83	533.72	6.96	6.77	1.61
6,776.00	82.90	182.30	6,406.44	-565.31	7.92	565.36	7.43	6.25	4.06
6,808.00	85.10	182.20	6,409.79	-597.11	6.67	597.13	6.88	6.88	-0.31
6,840.00	87.70	181.60	6,411.80	-629.02	5.61	629.02	8.34	8.13	-1.88
6,871.00	89.50	181.10	6,412.55	-660.00	4.88	659.98	6.03	5.81	-1.61
6,935.00	90.20	180.50	6,412.72	-724.00	3.99	723.94	1.44	1.09	-0.94
7,030.00	90.80	180.20	6,411.89	-818.99	3.41	818.91	0.71	0.63	-0.32
7,125.00	90.10	178.70	6,411.15	-913.98	4.32	913.90	1.74	-0.74	-1.58
7,221.00	90.40	178.00	6,410.73	-1,009.94	7.08	1,009.89	0.79	0.31	-0.73

<b>Company:</b>	Chesapeake Operating Inc.	<b>Local Co-ordinate Reference:</b>	Well State 16-3-61 1H
<b>Project:</b>	Weld County, Colorado NAD27	<b>TVD Reference:</b>	4652.55 GL + 22' KB @ 4674.55ft (SST 53)
<b>Site:</b>	Sec 16-T3N-R61W	<b>MD Reference:</b>	4652.55 GL + 22' KB @ 4674.55ft (SST 53)
<b>Well:</b>	State 16-3-61 1H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Sidetrack 1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Final Surveys	<b>Database:</b>	EDM 5000.1 Single User Db

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)
7,316.00	91.20	176.50	6,409.40	-1,104.82	11.64	1,104.84	1.79	0.84	-1.58
7,411.00	89.90	176.80	6,408.49	-1,199.65	17.19	1,199.76	1.40	-1.37	0.32
7,507.00	88.10	176.90	6,410.16	-1,295.48	22.46	1,295.68	1.88	-1.88	0.10
7,602.00	88.90	175.90	6,412.65	-1,390.26	28.43	1,390.55	1.35	0.84	-1.05
7,697.00	88.30	176.80	6,414.97	-1,485.04	34.47	1,485.43	1.14	-0.63	0.95
7,792.00	88.30	176.90	6,417.79	-1,579.86	39.69	1,580.32	0.11	0.00	0.11
7,887.00	90.40	175.90	6,418.87	-1,674.66	45.66	1,675.22	2.45	2.21	-1.05
7,982.00	91.60	175.10	6,417.21	-1,769.35	53.11	1,770.04	1.52	1.26	-0.84
<b>ST01 Tie-In (7982')</b>									
8,031.00	90.60	178.40	6,416.27	-1,818.25	55.89	1,818.98	7.04	-2.04	6.73
8,062.00	90.60	180.10	6,415.94	-1,849.24	56.29	1,849.98	5.48	0.00	5.48
8,158.00	91.20	179.30	6,414.44	-1,945.23	56.79	1,945.96	1.04	0.63	-0.83
8,253.00	90.20	181.10	6,413.28	-2,040.22	56.46	2,040.92	2.17	-1.05	1.89
8,348.00	89.80	183.60	6,413.28	-2,135.13	52.57	2,135.74	2.67	-0.42	2.63
8,443.00	92.30	184.00	6,411.54	-2,229.90	46.27	2,230.37	2.67	2.63	0.42
8,539.00	92.30	183.60	6,407.68	-2,325.61	39.92	2,325.95	0.42	0.00	-0.42
8,634.00	90.30	183.40	6,405.53	-2,420.40	34.12	2,420.61	2.12	-2.11	-0.21
8,729.00	88.70	183.40	6,406.36	-2,515.23	28.48	2,515.31	1.68	-1.68	0.00
8,824.00	88.80	182.60	6,408.43	-2,610.08	23.51	2,610.05	0.85	0.11	-0.84
8,919.00	88.60	180.80	6,410.58	-2,705.00	20.70	2,704.91	1.91	-0.21	-1.89
9,014.00	88.60	179.70	6,412.91	-2,799.97	20.28	2,799.85	1.16	0.00	-1.16
9,110.00	89.60	179.30	6,414.41	-2,895.96	21.12	2,895.83	1.12	1.04	-0.42
9,205.00	90.80	179.70	6,414.08	-2,990.95	21.95	2,990.83	1.33	1.26	0.42
9,300.00	91.00	178.60	6,412.59	-3,085.93	23.36	3,085.81	1.18	0.21	-1.16
9,395.00	90.70	179.00	6,411.18	-3,180.90	25.35	3,180.80	0.53	-0.32	0.42
9,490.00	91.10	178.20	6,409.69	-3,275.85	27.67	3,275.79	0.94	0.42	-0.84
9,585.00	92.10	177.50	6,407.04	-3,370.75	31.23	3,370.73	1.28	1.05	-0.74
9,680.00	90.90	177.20	6,404.55	-3,465.61	35.62	3,465.66	1.30	-1.26	-0.32
9,775.00	89.10	177.60	6,404.55	-3,560.51	39.93	3,560.63	1.94	-1.89	0.42
9,871.00	89.50	177.00	6,405.72	-3,656.40	44.45	3,656.58	0.75	0.42	-0.63
9,965.00	90.70	177.70	6,405.56	-3,750.29	48.80	3,750.54	1.48	1.28	0.74
10,061.00	90.30	177.20	6,404.72	-3,846.19	53.07	3,846.51	0.67	-0.42	-0.52
10,156.00	89.00	177.60	6,405.30	-3,941.09	57.38	3,941.47	1.43	-1.37	0.42
10,251.00	89.60	177.00	6,406.46	-4,035.98	61.85	4,036.43	0.89	0.63	-0.63
10,346.00	90.00	176.30	6,406.79	-4,130.82	67.40	4,131.35	0.85	0.42	-0.74
10,441.00	90.70	175.20	6,406.21	-4,225.55	74.44	4,226.20	1.37	0.74	-1.16
10,487.00	91.10	174.70	6,405.49	-4,271.37	78.49	4,272.09	1.39	0.87	-1.09
<b>Last Pro Guidance MWD Survey (10487')</b>									
10,527.00	91.10	174.70	6,404.72	-4,311.19	82.19	4,311.97	0.00	0.00	0.00
<b>Projected to TD (10527')</b>									



Professional Directional LTD  
Survey Report



<b>Company:</b>	Chesapeake Operating Inc.	<b>Local Co-ordinate Reference:</b>	Well State 16-3-61 1H
<b>Project:</b>	Weld County, Colorado NAD27	<b>TVD Reference:</b>	4652.55 GL + 22' KB @ 4674.55ft (SST 53)
<b>Site:</b>	Sec 16-T3N-R61W	<b>MD Reference:</b>	4652.55 GL + 22' KB @ 4674.55ft (SST 53)
<b>Well:</b>	State 16-3-61 1H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Sidetrack 1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Final Surveys	<b>Database:</b>	EDM 5000.1 Single User Db

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment	
		+N/-S (ft)	+E/-W (ft)		
7,982.00	6,417.21	-1,769.35	53.11	ST01 Tie-In (7982')	
10,487.00	6,405.49	-4,271.37	78.49	Last Pro Guidance MWD Survey (10487')	
10,527.00	6,404.72	-4,311.19	82.19	Projected to TD (10527')	