

# **Sandridge Energy**

**Comanche County (KS27S)**

**Sec 23-T31S-R20W**

**VC 1-23H**

**Sidetrack #1**

**Survey: Sidetrack Surveys**

## **Standard Survey Report**

**04 January, 2012**

# Wolverine Directional, LLC

## Survey Report

<b>Company:</b> Sandridge Energy	<b>Local Co-ordinate Reference:</b> Well VC 1-23H
<b>Project:</b> Comanche County (KS27S)	<b>TVD Reference:</b> WELL @ 0.0ft (Original Well Elev)
<b>Site:</b> Sec 23-T31S-R20W	<b>MD Reference:</b> WELL @ 0.0ft (Original Well Elev)
<b>Well:</b> VC 1-23H	<b>North Reference:</b> Grid
<b>Wellbore:</b> Sidetrack #1	<b>Survey Calculation Method:</b> Minimum Curvature
<b>Design:</b> Sidetrack #1	<b>Database:</b> EDM 2003.21 Single User Db

<b>Design</b>	Sidetrack #1				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Direction (°)</b>	
	0.0	0.0	0.0	181.72	

<b>Survey Program</b>		<b>Date</b> 2012/01/04
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>
888.0	9,456.0	Sidetrack Surveys (Sidetrack #1)
		<b>Tool Name</b>
		MWD
		<b>Description</b>
		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)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
888.0	0.10	5.30	888.0	0.8	0.1	-0.8	0.01	0.01	0.00
1,041.0	0.30	252.10	1,041.0	0.8	-0.3	-0.8	0.23	0.13	-73.99
1,517.0	0.20	339.30	1,517.0	1.2	-1.8	-1.1	0.07	-0.02	18.32
1,993.0	0.50	292.50	1,993.0	2.7	-4.0	-2.6	0.08	0.06	-9.83
2,469.0	0.50	326.30	2,469.0	5.3	-7.1	-5.1	0.06	0.00	7.10
2,945.0	0.30	19.20	2,945.0	8.2	-7.8	-7.9	0.08	-0.04	11.11
3,421.0	0.30	63.20	3,421.0	9.9	-6.3	-9.7	0.05	0.00	9.24
3,898.0	0.30	146.90	3,897.9	9.4	-4.5	-9.3	0.08	0.00	17.55
3,993.0	0.50	154.90	3,992.9	8.8	-4.2	-8.7	0.22	0.21	8.42
4,064.0	0.40	149.80	4,063.9	8.4	-3.9	-8.2	0.15	-0.14	-7.18
4,089.0	0.50	169.80	4,088.9	8.2	-3.9	-8.0	0.74	0.40	80.00
4,121.0	1.50	181.10	4,120.9	7.6	-3.8	-7.5	3.17	3.13	35.31
4,152.0	3.10	173.70	4,151.9	6.4	-3.8	-6.3	5.24	5.16	-23.87
4,184.0	4.70	171.30	4,183.8	4.2	-3.5	-4.1	5.02	5.00	-7.50
4,216.0	6.60	173.90	4,215.7	1.1	-3.1	-1.0	5.99	5.94	8.13
4,248.0	8.00	175.20	4,247.4	-3.0	-2.7	3.0	4.41	4.38	4.06
4,279.0	9.70	177.40	4,278.1	-7.7	-2.4	7.8	5.59	5.48	7.10
4,311.0	11.80	180.20	4,309.5	-13.7	-2.3	13.7	6.76	6.56	8.75
4,343.0	14.20	182.30	4,340.7	-20.9	-2.4	20.9	7.64	7.50	6.56
4,375.0	16.90	181.80	4,371.5	-29.4	-2.7	29.5	8.45	8.44	-1.56
4,407.0	19.30	182.10	4,401.9	-39.4	-3.1	39.5	7.51	7.50	0.94
4,438.0	21.40	181.90	4,431.0	-50.2	-3.5	50.2	6.78	6.77	-0.65
4,468.0	23.30	181.00	4,458.7	-61.6	-3.7	61.6	6.44	6.33	-3.00
4,500.0	25.40	180.90	4,487.9	-74.7	-4.0	74.8	6.56	6.56	-0.31
4,532.0	26.90	180.80	4,516.6	-88.9	-4.2	88.9	4.69	4.69	-0.31
4,564.0	27.90	180.90	4,545.0	-103.6	-4.4	103.7	3.13	3.13	0.31
4,596.0	29.60	181.70	4,573.1	-119.0	-4.7	119.1	5.45	5.31	2.50
4,627.0	32.40	182.10	4,599.6	-134.9	-5.3	135.0	9.06	9.03	1.29
4,659.0	34.30	181.70	4,626.4	-152.5	-5.9	152.6	5.98	5.94	-1.25
4,691.0	36.30	181.90	4,652.5	-171.0	-6.4	171.1	6.26	6.25	0.63
4,723.0	38.10	181.20	4,678.0	-190.3	-7.0	190.4	5.78	5.63	-2.19
4,755.0	39.90	181.40	4,702.8	-210.5	-7.4	210.6	5.64	5.63	0.63
4,786.0	41.80	181.50	4,726.3	-230.7	-7.9	230.9	6.13	6.13	0.32
4,818.0	44.90	181.00	4,749.5	-252.7	-8.4	252.8	9.75	9.69	-1.56
4,850.0	47.00	181.70	4,771.8	-275.7	-9.0	275.8	6.75	6.56	2.19
4,882.0	48.50	182.30	4,793.3	-299.3	-9.8	299.5	4.89	4.69	1.88
4,914.0	48.50	182.60	4,814.5	-323.3	-10.8	323.5	0.70	0.00	0.94
4,945.0	49.90	182.70	4,834.8	-346.7	-11.9	346.9	4.52	4.52	0.32

# Wolverine Directional, LLC

## Survey Report

**Company:** Sandridge Energy  
**Project:** Comanche County (KS27S)  
**Site:** Sec 23-T31S-R20W  
**Well:** VC 1-23H  
**Wellbore:** Sidetrack #1  
**Design:** Sidetrack #1

**Local Co-ordinate Reference:** Well VC 1-23H  
**TVD Reference:** WELL @ 0.0ft (Original Well Elev)  
**MD Reference:** WELL @ 0.0ft (Original Well Elev)  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** EDM 2003.21 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)
4,977.0	50.60	182.30	4,855.2	-371.3	-13.0	371.5	2.39	2.19	-1.25
5,011.0	50.50	182.60	4,876.8	-397.5	-14.1	397.8	0.74	-0.29	0.88
5,043.0	50.50	182.00	4,897.2	-422.2	-15.1	422.5	1.45	0.00	-1.88
5,074.0	50.40	182.40	4,916.9	-446.1	-16.0	446.4	1.05	-0.32	1.29
5,106.0	52.90	182.10	4,936.8	-471.2	-17.0	471.5	7.85	7.81	-0.94
5,138.0	56.50	182.40	4,955.3	-497.3	-18.0	497.6	11.28	11.25	0.94
5,170.0	59.90	182.70	4,972.1	-524.4	-19.2	524.8	10.65	10.63	0.94
5,201.0	62.60	182.50	4,987.0	-551.6	-20.4	551.9	8.73	8.71	-0.65
5,233.0	64.90	181.80	5,001.2	-580.3	-21.5	580.6	7.45	7.19	-2.19
5,265.0	67.00	181.80	5,014.2	-609.5	-22.4	609.9	6.56	6.56	0.00
5,297.0	69.30	181.10	5,026.1	-639.1	-23.2	639.6	7.47	7.19	-2.19
5,328.0	71.30	181.10	5,036.6	-668.3	-23.8	668.7	6.45	6.45	0.00
5,360.0	75.00	180.30	5,045.9	-698.9	-24.1	699.4	11.81	11.56	-2.50
5,392.0	78.20	180.50	5,053.3	-730.1	-24.3	730.5	10.02	10.00	0.63
5,423.0	81.10	181.10	5,058.8	-760.6	-24.8	761.0	9.55	9.35	1.94
5,513.0	85.20	181.60	5,069.6	-849.9	-26.9	850.3	4.59	4.56	0.56
5,544.0	84.80	181.10	5,072.3	-880.7	-27.6	881.2	2.06	-1.29	-1.61
5,576.0	86.40	181.00	5,074.7	-912.6	-28.2	913.1	5.01	5.00	-0.31
5,608.0	89.10	181.20	5,076.0	-944.6	-28.8	945.0	8.46	8.44	0.63
5,640.0	89.20	181.10	5,076.5	-976.6	-29.4	977.0	0.44	0.31	-0.31
5,672.0	88.80	181.10	5,077.0	-1,008.6	-30.1	1,009.0	1.25	-1.25	0.00
5,704.0	89.70	181.00	5,077.4	-1,040.6	-30.6	1,041.0	2.83	2.81	-0.31
5,736.0	91.00	180.90	5,077.2	-1,072.6	-31.2	1,073.0	4.07	4.06	-0.31
5,831.0	90.30	181.30	5,076.2	-1,167.6	-33.0	1,168.0	0.85	-0.74	0.42
5,927.0	90.20	180.90	5,075.7	-1,263.5	-34.8	1,264.0	0.43	-0.10	-0.42
6,023.0	89.00	181.80	5,076.4	-1,359.5	-37.1	1,360.0	1.56	-1.25	0.94
6,118.0	90.10	182.50	5,077.2	-1,454.4	-40.7	1,455.0	1.37	1.16	0.74
6,214.0	89.10	181.80	5,077.8	-1,550.4	-44.3	1,551.0	1.27	-1.04	-0.73
6,310.0	90.60	183.30	5,078.1	-1,646.3	-48.5	1,647.0	2.21	1.56	1.56
<b>Last OH Survey</b>									
6,382.0	86.80	181.90	5,079.7	-1,718.1	-51.8	1,718.9	5.62	-5.28	-1.94
<b>First ST#1 Survey</b>									
6,405.0	85.20	181.90	5,081.3	-1,741.1	-52.6	1,741.9	6.96	-6.96	0.00
6,436.0	85.40	180.80	5,083.9	-1,772.0	-53.3	1,772.8	3.59	0.65	-3.55
6,467.0	86.30	178.70	5,086.1	-1,802.9	-53.2	1,803.7	7.35	2.90	-6.77
6,498.0	88.00	177.90	5,087.6	-1,833.8	-52.2	1,834.6	6.06	5.48	-2.58
6,529.0	89.30	177.40	5,088.4	-1,864.8	-51.0	1,865.5	4.49	4.19	-1.61
6,560.0	88.60	178.00	5,088.9	-1,895.8	-49.7	1,896.4	2.97	-2.26	1.94
6,592.0	89.70	178.60	5,089.4	-1,927.7	-48.8	1,928.3	3.92	3.44	1.88
6,624.0	90.80	178.10	5,089.3	-1,959.7	-47.9	1,960.3	3.78	3.44	-1.56
6,655.0	92.20	178.10	5,088.5	-1,990.7	-46.8	1,991.2	4.52	4.52	0.00
6,686.0	91.40	178.40	5,087.5	-2,021.7	-45.9	2,022.1	2.76	-2.58	0.97
6,718.0	91.50	178.60	5,086.7	-2,053.7	-45.0	2,054.1	0.70	0.31	0.63
6,749.0	92.40	178.70	5,085.6	-2,084.6	-44.3	2,085.0	2.92	2.90	0.32
6,781.0	91.90	178.90	5,084.4	-2,116.6	-43.6	2,116.9	1.68	-1.56	0.63
6,813.0	92.40	178.90	5,083.2	-2,148.6	-43.0	2,148.9	1.56	1.56	0.00
6,845.0	92.80	178.90	5,081.8	-2,180.5	-42.4	2,180.8	1.25	1.25	0.00
6,877.0	90.90	179.70	5,080.7	-2,212.5	-42.0	2,212.8	6.44	-5.94	2.50
6,909.0	90.80	179.40	5,080.3	-2,244.5	-41.8	2,244.7	0.99	-0.31	-0.94
6,941.0	90.30	179.10	5,080.0	-2,276.5	-41.4	2,276.7	1.82	-1.56	-0.94
6,973.0	89.10	179.90	5,080.1	-2,308.5	-41.1	2,308.7	4.51	-3.75	2.50
7,005.0	89.20	178.70	5,080.6	-2,340.5	-40.7	2,340.7	3.76	0.31	-3.75
7,036.0	88.70	179.40	5,081.2	-2,371.5	-40.2	2,371.6	2.77	-1.61	2.26
7,068.0	88.10	180.90	5,082.1	-2,403.5	-40.3	2,403.6	5.05	-1.88	4.69

# Wolverine Directional, LLC

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### Survey

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7,100.0	89.30	181.80	5,082.8	-2,435.4	-41.0	2,435.6	4.69	3.75	2.81
7,132.0	90.60	182.30	5,082.8	-2,467.4	-42.2	2,467.6	4.35	4.06	1.56
7,164.0	90.50	182.50	5,082.5	-2,499.4	-43.5	2,499.6	0.70	-0.31	0.63
7,196.0	90.60	182.70	5,082.2	-2,531.4	-44.9	2,531.6	0.70	0.31	0.63
7,222.0	90.50	182.60	5,082.0	-2,557.3	-46.1	2,557.6	0.54	-0.38	-0.38
7,254.0	90.60	182.40	5,081.6	-2,589.3	-47.5	2,589.6	0.70	0.31	-0.63
7,286.0	90.40	182.40	5,081.4	-2,621.3	-48.9	2,621.6	0.63	-0.63	0.00
7,381.0	90.20	182.00	5,080.9	-2,716.2	-52.5	2,716.6	0.47	-0.21	-0.42
7,477.0	90.20	182.20	5,080.5	-2,812.1	-56.0	2,812.5	0.21	0.00	0.21
7,572.0	90.10	181.80	5,080.3	-2,907.1	-59.4	2,907.5	0.43	-0.11	-0.42
7,668.0	90.10	181.00	5,080.1	-3,003.0	-61.7	3,003.5	0.83	0.00	-0.83
7,763.0	89.90	180.50	5,080.1	-3,098.0	-62.9	3,098.5	0.57	-0.21	-0.53
7,859.0	88.60	180.70	5,081.4	-3,194.0	-64.0	3,194.5	1.37	-1.35	0.21
7,955.0	90.20	181.40	5,082.4	-3,290.0	-65.7	3,290.5	1.82	1.67	0.73
8,050.0	89.00	181.40	5,083.0	-3,385.0	-68.0	3,385.5	1.26	-1.26	0.00
8,145.0	89.90	182.10	5,084.0	-3,479.9	-70.9	3,480.5	1.20	0.95	0.74
8,241.0	91.00	181.10	5,083.2	-3,575.9	-73.6	3,576.5	1.55	1.15	-1.04
8,337.0	89.70	180.80	5,082.6	-3,671.9	-75.2	3,672.5	1.39	-1.35	-0.31
8,432.0	91.10	182.50	5,082.0	-3,766.8	-77.9	3,767.4	2.32	1.47	1.79
8,528.0	89.20	181.80	5,081.7	-3,862.7	-81.5	3,863.4	2.11	-1.98	-0.73
8,624.0	91.20	182.80	5,081.4	-3,958.6	-85.4	3,959.4	2.33	2.08	1.04
8,719.0	91.50	181.90	5,079.1	-4,053.5	-89.3	4,054.4	1.00	0.32	-0.95
8,815.0	92.80	182.40	5,075.5	-4,149.4	-92.9	4,150.3	1.45	1.35	0.52
8,908.0	89.80	180.70	5,073.4	-4,242.3	-95.4	4,243.3	3.71	-3.23	-1.83
9,004.0	88.90	180.50	5,074.5	-4,338.3	-96.4	4,339.3	0.96	-0.94	-0.21
9,099.0	89.10	180.30	5,076.2	-4,433.3	-97.1	4,434.2	0.30	0.21	-0.21
9,195.0	88.60	179.50	5,078.1	-4,529.3	-96.9	4,530.1	0.98	-0.52	-0.83
9,291.0	89.00	179.60	5,080.1	-4,625.3	-96.1	4,626.1	0.43	0.42	0.10
9,386.0	88.20	179.80	5,082.4	-4,720.2	-95.7	4,721.0	0.87	-0.84	0.21
<b>Last ST#1 Survey</b>									
9,456.0	88.20	179.80	5,084.6	-4,790.2	-95.4	4,790.9	0.00	0.00	0.00
<b>Proj to TD - VC 1-23H PBHL</b>									

### Survey Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
6,310.0	5,078.1	-1,646.3	-48.5	Last OH Survey
6,382.0	5,079.7	-1,718.1	-51.8	First ST#1 Survey
9,386.0	5,082.4	-4,720.2	-95.7	Last ST#1 Survey
9,456.0	5,084.6	-4,790.2	-95.4	Proj to TD

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_