



Ryan Directional Services

Survey Report

RYAN DIRECTIONAL SERVICES, INC.

30-015-39633

Company: Chesapeake Operating, Inc. Date: 12/22/2011 Time: 18:02:01 Page: 1
Field: Eddy Co, NM NAD 83 Co-ordinate(NE) Reference: Site: PLU Big Sinks 23-24-30 USA 1H
Site: PLU Big Sinks 23-24-30 USA 1H Vertical (TVD) Reference: SITE 3453.0
Well: 23-24-30 USA 1H Section (VS) Reference: Well (0.00N,0.00E,179.95Azi)
Wellpath: OH Survey Calculation Method: Minimum Curvature Db: Sybase

Field: Eddy Co, NM NAD 83

USA

Map System: US State Plane Coordinate System 1983

Geo Datum: GRS 1980

Sys Datum: Mean Sea Level

Map Zone: New Mexico, Eastern Zone

Coordinate System: Site Centre

Geomagnetic Model: IGRF2010

Site: PLU Big Sinks 23-24-30 USA 1H

Eddy Co., TX

Site Position: Northing: 440597.78 ft Latitude: 32 12 37.265 N
From: Map Easting: 691016.66 ft Longitude: 103 50 57.759 W
Position Uncertainty: 0.00 ft North Reference: Grid
Ground Level: 3428.00 ft Grid Convergence: 0.26 deg

Well: 23-24-30 USA 1H

Slot Name:

Well Position: +N/-S 0.00 ft Northing: 440597.78 ft Latitude: 32 12 37.265 N
+E/-W 0.00 ft Easting: 691016.66 ft Longitude: 103 50 57.759 W
Position Uncertainty: 0.00 ft

Wellpath: OH

Current Datum: SITE Height 3453.00 ft Drilled From: Surface
Magnetic Data: 11/28/2011 Tie-on Depth: 0.00 ft
Field Strength: 48557 nT Above System Datum: Mean Sea Level
Vertical Section: Depth From (TVD) +N/-S +E/-W Declination: 7.66 deg
ft ft ft Mag Dip Angle: 60.11 deg
Direction
deg
0.00 0.00 0.00 179.95

Survey Program for Definitive Wellpath

Date: 12/22/2011 Validated: No Version: 0
Actual From To Survey Toolcode Tool Name
ft ft
205.00 12675.00 Survey #1 (205.00-12675.00) Ryan MWD Ryan MWD
12730.00 12730.00 Survey #2 (12730.00-12730.00) Projection Projection

Survey

MD ft	Incl deg	Azim deg	TVD ft	+N/-S ft	+E/-W ft	VS ft	DLS deg/100ft	Build deg/100ft	Turn deg/100ft	Tool/Comment
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	TIE LINE
205.00	1.20	66.30	204.99	0.86	1.97	-0.86	0.59	0.59	0.00	Ryan MWD
385.00	1.20	53.20	384.95	2.75	5.20	-2.74	0.15	0.00	-7.28	Ryan MWD
571.00	1.00	36.60	570.91	5.22	7.73	-5.21	0.20	-0.11	-8.92	Ryan MWD
768.00	1.20	17.70	767.88	8.56	9.38	-8.56	0.21	0.10	-9.59	Ryan MWD
958.00	1.10	35.90	957.84	11.94	11.05	-11.93	0.20	-0.05	9.58	Ryan MWD
1147.00	0.50	59.70	1146.82	13.82	12.83	-13.81	0.36	-0.32	12.59	Ryan MWD
1338.00	0.50	56.00	1337.81	14.71	14.24	-14.70	0.02	0.00	-1.94	Ryan MWD
1527.00	1.20	76.90	1526.79	15.62	16.85	-15.60	0.40	0.37	11.06	Ryan MWD
1718.00	2.00	82.60	1717.71	16.50	22.11	-16.48	0.43	0.42	2.98	Ryan MWD
1908.00	2.60	94.80	1907.56	16.57	29.69	-16.54	0.41	0.32	6.42	Ryan MWD
2098.00	3.10	103.60	2097.33	15.00	38.98	-14.97	0.35	0.26	4.63	Ryan MWD
2288.00	3.40	109.80	2287.02	11.88	49.27	-11.84	0.24	0.16	3.26	Ryan MWD
2478.00	2.50	120.70	2476.77	7.86	58.13	-7.81	0.56	-0.47	5.74	Ryan MWD
2668.00	1.90	120.90	2666.63	4.13	64.40	-4.07	0.32	-0.32	0.11	Ryan MWD
2859.00	1.90	92.70	2857.53	2.35	70.28	-2.29	0.48	0.00	-14.76	Ryan MWD
3049.00	1.20	96.30	3047.46	1.98	75.40	-1.92	0.37	-0.37	1.89	Ryan MWD
3240.00	1.30	59.50	3238.42	2.86	79.26	-2.79	0.42	0.05	-19.27	Ryan MWD
3430.00	2.60	90.50	3428.31	3.92	85.43	-3.85	0.86	0.68	16.32	Ryan MWD
3620.00	2.70	117.30	3618.11	1.83	93.71	-1.75	0.65	0.05	14.11	Ryan MWD
3810.00	4.40	138.90	3807.75	-5.72	102.48	5.81	1.12	0.89	11.37	Ryan MWD
4001.00	2.70	136.30	3998.37	-14.49	110.41	14.59	0.89	-0.89	-1.36	Ryan MWD



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Well: 23-24-30 USA 1H Section (VS) Reference: Well (0.00N,0.00E,179.95Azi)
Wellpath: OH Survey Calculation Method: Minimum Curvature Db: Sybase

Survey

MD ft	Incl deg	Azim deg	TVD ft	+N/-S ft	+E/-W ft	VS ft	DLS deg/100ft	Build deg/100ft	Turn deg/100ft	Tool/Comment
4204.00	2.30	139.30	4201.18	-21.03	116.37	21.14	0.21	-0.20	1.48	Ryan MWD
4394.00	2.40	135.30	4391.02	-26.75	121.65	26.86	0.10	0.05	-2.11	Ryan MWD
4585.00	2.30	130.40	4581.86	-32.08	127.38	32.19	0.12	-0.05	-2.57	Ryan MWD
4775.00	2.40	127.10	4771.70	-36.95	133.46	37.07	0.09	0.05	-1.74	Ryan MWD
4965.00	2.00	125.00	4961.56	-41.25	139.35	41.37	0.21	-0.21	-1.11	Ryan MWD
5155.00	1.90	124.20	5151.45	-44.92	144.67	45.05	0.05	-0.05	-0.42	Ryan MWD
5346.00	1.90	111.90	5342.34	-47.88	150.22	48.02	0.21	0.00	-6.44	Ryan MWD
5535.00	1.60	113.60	5531.26	-50.11	155.55	50.24	0.16	-0.16	0.90	Ryan MWD
5725.00	1.50	114.50	5721.19	-52.20	160.24	52.34	0.05	-0.05	0.47	Ryan MWD
5915.00	1.30	115.10	5911.13	-54.15	164.46	54.29	0.11	-0.11	0.32	Ryan MWD
6105.00	1.50	126.40	6101.07	-56.54	168.41	56.68	0.18	0.11	5.95	Ryan MWD
6296.00	1.50	144.40	6292.01	-60.05	171.88	60.20	0.25	0.00	9.42	Ryan MWD
6486.00	1.30	152.60	6481.95	-63.99	174.32	64.14	0.15	-0.11	4.32	Ryan MWD
6676.00	1.60	174.70	6671.89	-68.54	175.55	68.70	0.33	0.16	11.63	Ryan MWD
6867.00	1.40	173.00	6862.83	-73.52	176.08	73.67	0.11	-0.10	-0.89	Ryan MWD
7057.00	1.40	176.40	7052.77	-78.14	176.51	78.29	0.04	0.00	1.79	Ryan MWD
7248.00	1.50	178.90	7243.71	-82.96	176.71	83.12	0.06	0.05	1.31	Ryan MWD
7439.00	1.50	169.80	7434.64	-87.92	177.20	88.08	0.12	0.00	-4.76	Ryan MWD
7629.00	1.20	158.70	7624.59	-92.22	178.36	92.38	0.21	-0.16	-5.84	Ryan MWD
7655.00	1.30	157.90	7650.59	-92.75	178.57	92.91	0.39	0.38	-3.08	Ryan MWD
7689.00	1.70	152.60	7684.57	-93.56	178.95	93.71	1.24	1.18	-15.59	Ryan MWD
7721.00	5.30	170.40	7716.51	-95.44	179.41	95.59	11.62	11.25	55.62	Ryan MWD
7752.00	9.60	177.80	7747.24	-99.43	179.75	99.59	14.18	13.87	23.87	Ryan MWD
7784.00	14.70	180.60	7778.51	-106.16	179.81	106.32	16.04	15.94	8.75	Ryan MWD
7816.00	20.30	180.90	7809.02	-115.78	179.68	115.94	17.50	17.50	0.94	Ryan MWD
7848.00	25.20	181.30	7838.52	-128.15	179.44	128.31	15.32	15.31	1.25	Ryan MWD
7879.00	29.30	181.60	7866.08	-142.34	179.08	142.49	13.23	13.23	0.97	Ryan MWD
7911.00	28.90	181.50	7894.04	-157.89	178.66	158.05	1.26	-1.25	-0.31	Ryan MWD
7943.00	29.90	181.30	7921.92	-173.60	178.27	173.75	3.14	3.12	-0.62	Ryan MWD
7975.00	32.30	182.80	7949.31	-190.11	177.68	190.27	7.88	7.50	4.69	Ryan MWD
8006.00	35.10	184.70	7975.10	-207.27	176.54	207.43	9.65	9.03	6.13	Ryan MWD
8038.00	37.40	187.40	8000.91	-226.08	174.53	226.23	8.75	7.19	8.44	Ryan MWD
8070.00	40.30	185.60	8025.83	-246.02	172.27	246.17	9.72	9.06	-5.62	Ryan MWD
8102.00	43.30	185.70	8049.68	-267.25	170.17	267.39	9.38	9.37	0.31	Ryan MWD
8133.00	45.90	185.20	8071.75	-288.91	168.11	289.06	8.46	8.39	-1.61	Ryan MWD
8165.00	48.30	185.40	8093.53	-312.25	165.94	312.40	7.51	7.50	0.62	Ryan MWD
8197.00	50.50	185.10	8114.36	-336.45	163.72	336.59	6.91	6.87	-0.94	Ryan MWD
8229.00	52.00	184.70	8134.39	-361.31	161.59	361.45	4.79	4.69	-1.25	Ryan MWD
8261.00	55.30	183.50	8153.35	-387.01	159.75	387.15	10.75	10.31	-3.75	Ryan MWD
8292.00	59.30	183.10	8170.10	-413.05	158.25	413.19	12.95	12.90	-1.29	Ryan MWD
8324.00	62.30	182.20	8185.71	-440.95	156.96	441.09	9.69	9.37	-2.81	Ryan MWD
8356.00	64.60	182.80	8200.01	-469.55	155.71	469.68	7.38	7.19	1.87	Ryan MWD
8387.00	63.60	181.30	8213.55	-497.41	154.72	497.55	5.42	-3.23	-4.84	Ryan MWD
8419.00	62.50	181.90	8228.05	-525.93	153.92	526.06	3.82	-3.44	1.87	Ryan MWD
8451.00	62.70	180.90	8242.78	-554.33	153.23	554.46	2.84	0.62	-3.12	Ryan MWD
8482.00	66.50	177.60	8256.08	-582.32	153.61	582.45	15.58	12.26	-10.65	Ryan MWD
8514.00	69.70	175.90	8268.01	-611.96	155.29	612.09	11.15	10.00	-5.31	Ryan MWD
8546.00	72.50	176.70	8278.38	-642.17	157.24	642.30	9.06	8.75	2.50	Ryan MWD
8578.00	74.50	177.80	8287.46	-672.81	158.72	672.95	7.07	6.25	3.44	Ryan MWD
8609.00	77.30	176.10	8295.02	-702.83	160.32	702.97	10.48	9.03	-5.48	Ryan MWD
8641.00	81.30	177.30	8300.96	-734.21	162.12	734.36	13.03	12.50	3.75	Ryan MWD
8673.00	84.50	176.00	8304.91	-765.91	163.98	766.05	10.78	10.00	-4.06	Ryan MWD
8704.00	87.90	178.10	8306.97	-796.79	165.57	796.94	12.88	10.97	6.77	Ryan MWD



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RYAN DIRECTIONAL SERVICES, INC.

Company: Chesapeake Operating, Inc.
Field: Eddy Co, NM NAD 83
Site: PLU Big Sinks 23-24-30 USA 1H
Well: 23-24-30 USA 1H
Wellpath: OH

Date: 12/22/2011 Time: 18:02:01 Page: 3
Co-ordinate(N/E) Reference: Site: PLU Big Sinks 23-24-30 USA 1H
Vertical (TVD) Reference: SITE 3453.0
Section (VS) Reference: Well (0.00N,0.00E,179.95Azi)
Survey Calculation Method: Minimum Curvature Db: Sybase

Survey

MD ft	Incl deg	Azim deg	TVD ft	+N/-S ft	+E/-W ft	VS ft	DLS deg/100ft	Build deg/100ft	Turn deg/100ft	Tool/Comment
8736.00	90.90	179.40	8307.30	-828.78	166.27	828.93	10.22	9.37	4.06	Ryan MWD
8768.00	91.40	180.40	8306.66	-860.77	166.33	860.92	3.49	1.56	3.12	Ryan MWD
8799.00	91.50	180.30	8305.87	-891.76	166.14	891.91	0.46	0.32	-0.32	Ryan MWD
8831.00	91.10	180.30	8305.15	-923.75	165.97	923.90	1.25	-1.25	0.00	Ryan MWD
8863.00	92.00	181.70	8304.28	-955.74	165.41	955.88	5.20	2.81	4.37	Ryan MWD
8894.00	92.20	182.40	8303.15	-986.70	164.30	986.84	2.35	0.65	2.26	Ryan MWD
8990.00	93.20	181.74	8298.62	-1082.52	160.84	1082.66	1.25	1.04	-0.69	Ryan MWD
9085.00	92.40	185.80	8293.98	-1177.19	154.60	1177.32	4.35	-0.84	4.27	Ryan MWD
9180.00	90.40	186.80	8291.66	-1271.58	144.18	1271.70	2.35	-2.11	1.05	Ryan MWD
9276.00	90.50	187.80	8290.91	-1366.79	131.98	1366.91	1.05	0.10	1.04	Ryan MWD
9371.00	87.30	188.00	8292.73	-1460.86	118.93	1460.97	3.37	-3.37	0.21	Ryan MWD
9466.00	86.70	189.30	8297.70	-1554.65	104.66	1554.74	1.51	-0.63	1.37	Ryan MWD
9561.00	87.10	186.30	8302.84	-1648.62	91.79	1648.70	3.18	0.42	-3.16	Ryan MWD
9657.00	86.20	186.20	8308.45	-1743.89	81.35	1743.96	0.94	-0.94	-0.10	Ryan MWD
9752.00	86.90	183.80	8314.17	-1838.35	73.09	1838.41	2.63	0.74	-2.53	Ryan MWD
9847.00	89.80	181.90	8316.90	-1933.18	68.37	1933.24	3.65	3.05	-2.00	Ryan MWD
9942.00	89.90	182.60	8317.15	-2028.10	64.64	2028.16	0.74	0.11	0.74	Ryan MWD
10038.00	89.40	181.90	8317.74	-2124.03	60.87	2124.08	0.90	-0.52	-0.73	Ryan MWD
10133.00	90.60	181.10	8317.74	-2218.99	58.39	2219.04	1.52	1.26	-0.84	Ryan MWD
10228.00	90.60	179.80	8316.74	-2313.98	57.64	2314.03	1.37	0.00	-1.37	Ryan MWD
10323.00	90.50	180.30	8315.83	-2408.98	57.56	2409.03	0.54	-0.11	0.53	Ryan MWD
10419.00	90.40	180.30	8315.08	-2504.97	57.05	2505.02	0.10	-0.10	0.00	Ryan MWD
10514.00	90.60	180.10	8314.25	-2599.97	56.72	2600.02	0.30	0.21	-0.21	Ryan MWD
10609.00	90.70	181.40	8313.17	-2694.95	55.48	2695.00	1.37	0.11	1.37	Ryan MWD
10704.00	89.80	178.30	8312.76	-2789.94	55.73	2789.99	3.40	-0.95	-3.26	Ryan MWD
10799.00	90.20	179.50	8312.76	-2884.92	57.55	2884.97	1.33	0.42	1.26	Ryan MWD
10895.00	91.30	182.30	8311.50	-2980.89	56.05	2980.94	3.13	1.15	2.92	Ryan MWD
10990.00	90.90	181.40	8309.68	-3075.82	52.98	3075.86	1.04	-0.42	-0.95	Ryan MWD
11085.00	90.20	180.20	8308.76	-3170.80	51.65	3170.85	1.46	-0.74	-1.26	Ryan MWD
11180.00	89.10	177.80	8309.34	-3265.78	53.31	3265.82	2.78	-1.16	-2.53	Ryan MWD
11276.00	86.20	176.10	8313.28	-3361.55	58.41	3361.60	3.50	-3.02	-1.77	Ryan MWD
11371.00	86.10	176.10	8319.66	-3456.11	64.86	3456.17	0.11	-0.11	0.00	Ryan MWD
11466.00	88.90	176.20	8323.80	-3550.80	71.23	3550.86	2.95	2.95	0.11	Ryan MWD
11561.00	89.50	177.50	8325.13	-3645.65	76.45	3645.71	1.51	0.63	1.37	Ryan MWD
11657.00	91.90	178.90	8323.96	-3741.58	79.47	3741.65	2.89	2.50	1.46	Ryan MWD
11752.00	89.40	177.90	8322.88	-3836.53	82.12	3836.60	2.83	-2.63	-1.05	Ryan MWD
11847.00	91.70	178.30	8321.97	-3931.47	85.27	3931.54	2.46	2.42	0.42	Ryan MWD
11942.00	91.70	180.40	8319.15	-4026.41	86.34	4026.49	2.21	0.00	2.21	Ryan MWD
12037.00	92.00	180.10	8316.08	-4121.36	85.93	4121.44	0.45	0.32	-0.32	Ryan MWD
12133.00	88.40	181.70	8315.75	-4217.33	84.42	4217.40	4.10	-3.75	1.67	Ryan MWD
12228.00	90.80	181.70	8316.41	-4312.28	81.60	4312.35	2.53	2.53	0.00	Ryan MWD
12323.00	92.80	183.90	8313.42	-4407.11	76.97	4407.17	3.13	2.11	2.32	Ryan MWD
12419.00	92.80	182.80	8308.74	-4502.83	71.36	4502.89	1.14	0.00	-1.15	Ryan MWD
12513.00	92.90	182.60	8304.06	-4596.61	66.94	4596.67	0.24	0.11	-0.21	Ryan MWD
12609.00	93.60	182.50	8298.62	-4692.36	62.68	4692.41	0.74	0.73	-0.10	Ryan MWD
12675.00	93.50	182.20	8294.53	-4758.18	59.98	4758.23	0.48	-0.15	-0.45	Ryan MWD
12730.00	93.50	182.20	8291.17	-4813.03	57.87	4813.08	0.00	0.00	0.00	PROJECTED to TD

Company: Chesapeake OperatingField: Bone SpringsCty/Blk/Par: Eddy County, NMWell Name: Big Sinks 23-24-30 USA 1-HRig: Patterson 62Job Number: 5184Magnetic Decl.: 7.40Grid Corr.: Total Survey Corr.: Target Info:

Calculation Method

Minimum Curvature

Proposed Azimuth

179.95

Depth Reference

Driller

Tie Into: Ryan Surveys

No.	Tool Type	Survey Depth (ft)	Incl (°)	Azimuth (°)	Course Lgth (ft)	TVD (ft)	VS (ft)	Coordinates		Closure		DLS (°/100')	Bld Rate (°/100')
								N/S (ft)	E/W (ft)	Dist (ft)	Ang (°)		
0	TIE-IN	0	0	0	0	0.00	0.00	0.00	0.00	0	0.00	0	0
1	MWD	205	1.2	66.3	205	204.99	-0.86	0.86 N	1.97 E	2.15	66.30	0.59	0.6
2	MWD	385	1.2	53.2	180	384.95	-2.74	2.75 N	5.20 E	5.88	62.14	0.15	0.0
3	MWD	571	1	36.6	186	570.91	-5.21	5.22 N	7.73 E	9.33	55.97	0.20	-0.1
4	MWD	768	1.2	17.7	197	767.88	-8.56	8.56 N	9.38 E	12.70	47.60	0.21	0.1
5	MWD	958	1.1	35.9	190	957.84	-11.93	11.94 N	11.05 E	16.27	42.80	0.20	-0.1
6	MWD	1147	0.5	59.7	189	1146.82	-13.81	13.82 N	12.83 E	18.86	42.87	0.36	-0.3
7	MWD	1338	0.5	56	191	1337.81	-14.70	14.71 N	14.24 E	20.47	44.07	0.02	0.0
8	MWD	1527	1.2	76.9	189	1526.79	-15.60	15.62 N	16.85 E	22.98	47.17	0.40	0.4
9	MWD	1718	2	82.6	191	1717.71	-16.48	16.50 N	22.11 E	27.59	53.26	0.43	0.4
10	MWD	1908	2.6	94.8	190	1907.56	-16.54	16.57 N	29.69 E	34.00	60.83	0.41	0.3
11	MWD	2098	3.1	103.6	190	2097.33	-14.97	15.00 N	38.98 E	41.76	68.95	0.35	0.3
12	MWD	2288	3.4	109.8	190	2287.02	-11.84	11.88 N	49.27 E	50.68	76.44	0.24	0.2
13	MWD	2478	2.5	120.7	190	2476.77	-7.81	7.86 N	58.13 E	58.66	82.30	0.56	-0.5
14	MWD	2668	1.9	120.9	190	2666.63	-4.07	4.13 N	64.40 E	64.53	86.33	0.32	-0.3
15	MWD	2859	1.9	92.7	191	2857.53	-2.29	2.35 N	70.28 E	70.32	88.08	0.48	0.0
16	MWD	3049	1.2	96.3	190	3047.46	-1.92	1.98 N	75.40 E	75.43	88.49	0.37	-0.4
17	MWD	3240	1.3	59.5	191	3238.42	-2.79	2.86 N	79.26 E	79.31	87.93	0.42	0.1
18	MWD	3430	2.6	90.5	190	3428.31	-3.85	3.92 N	85.43 E	85.52	87.37	0.86	0.7
19	MWD	3620	2.7	117.3	190	3618.11	-1.75	1.83 N	93.71 E	93.73	88.88	0.65	0.1
20	MWD	3810	4.4	138.9	190	3807.75	5.81	5.72 S	102.48 E	102.64	93.19	1.12	0.9
21	MWD	4001	2.7	136.3	191	3998.37	14.59	14.49 S	110.41 E	111.35	97.48	0.89	-0.9
22	MWD	4204	2.3	139.3	203	4201.18	21.14	21.03 S	116.37 E	118.25	100.25	0.21	-0.2
23	MWD	4394	2.4	135.3	190	4391.02	26.86	26.75 S	121.65 E	124.56	102.40	0.10	0.1
24	MWD	4585	2.3	130.4	191	4581.86	32.19	32.08 S	127.38 E	131.36	104.14	0.12	-0.1
25	MWD	4775	2.4	127.1	190	4771.70	37.07	36.95 S	133.46 E	138.48	105.48	0.09	0.1
26	MWD	4965	2	125	190	4961.56	41.37	41.25 S	139.35 E	145.32	106.49	0.21	-0.2
27	MWD	5155	1.9	124.2	190	5151.45	45.05	44.92 S	144.67 E	151.48	107.25	0.05	-0.1

Company: Chesapeake OperatingField: Bone SpringsCty/Blk/Par: Eddy County, NMWell Name: Big Sinks 23-24-30 USA 1-HRig: Patterson 62Job Number: 5184Magnetic Decl.: 7.40Grid Corr.: Total Survey Corr.: Target Info:

Calculation Method

Minimum Curvature

Proposed Azimuth

179.95

Depth Reference

Driller

Tie Into: Ryan Surveys

No.	Tool Type	Survey Depth (ft)	Incl (°)	Azimuth (°)	Course Lgth (ft)	TVD (ft)	VS (ft)	Coordinates		Closure		DLS (°/100')	Bld Rate (°/100')
								N/S (ft)	E/W (ft)	Dist (ft)	Ang (°)		
28	MWD	5346	1.9	111.9	191	5342.34	48.02	47.88 S	150.22 E	157.67	107.68	0.21	0.0
29	MWD	5535	1.6	113.6	189	5531.26	50.24	50.11 S	155.55 E	163.42	107.86	0.16	-0.2
30	MWD	5725	1.5	114.5	190	5721.19	52.34	52.20 S	160.24 E	168.53	108.04	0.05	-0.1
31	MWD	5915	1.3	115.1	190	5911.13	54.29	54.15 S	164.46 E	173.14	108.22	0.11	-0.1
32	MWD	6105	1.5	126.4	190	6101.07	56.68	56.54 S	168.41 E	177.65	108.56	0.18	0.1
33	MWD	6296	1.5	144.4	191	6292.01	60.20	60.05 S	171.88 E	182.07	109.26	0.25	0.0
34	MWD	6486	1.3	152.6	190	6481.95	64.14	63.99 S	174.32 E	185.69	110.16	0.15	-0.1
35	MWD	6676	1.6	174.7	190	6671.89	68.70	68.54 S	175.55 E	188.46	111.33	0.33	0.2
36	MWD	6867	1.4	173	191	6862.83	73.67	73.52 S	176.08 E	190.82	112.66	0.11	-0.1
37	MWD	7057	1.4	176.9	190	7052.77	78.29	78.14 S	176.49 E	193.02	113.88	0.05	0.0
38	MWD	7248	1.5	178.9	191	7243.71	83.12	82.97 S	176.67 E	195.18	115.16	0.06	0.1
39	MWD	7439	1.5	169.8	191	7434.64	88.08	87.93 S	177.16 E	197.78	116.40	0.12	0.0
40	MWD	7629	1.2	158.7	190	7624.59	92.38	92.23 S	178.32 E	200.76	117.35	0.21	-0.2
41	MWD	7655	1.3	157.9	26	7650.58	92.91	92.75 S	178.53 E	201.19	117.45	0.39	0.4
42	MWD	7689	1.7	152.6	34	7684.57	93.72	93.56 S	178.91 E	201.89	117.61	1.24	1.2
43	MWD	7721	5.3	170.4	32	7716.51	95.60	95.44 S	179.37 E	203.18	118.02	11.62	11.3
44	MWD	7752	9.6	177.8	31	7747.24	99.59	99.44 S	179.71 E	205.39	118.96	14.18	13.9
45	MWD	7784	14.7	180.6	32	7778.51	106.32	106.17 S	179.77 E	208.78	120.56	16.04	15.9
46	MWD	7816	20.3	180.9	32	7809.02	115.94	115.78 S	179.64 E	213.72	122.80	17.50	17.5
47	MWD	7848	25.2	181.3	32	7838.52	128.31	128.15 S	179.40 E	220.47	125.54	15.32	15.3
48	MWD	7879	29.3	181.6	31	7866.08	142.49	142.34 S	179.04 E	228.72	128.49	13.23	13.2
49	MWD	7911	28.9	181.5	32	7894.04	158.05	157.90 S	178.62 E	238.40	131.48	1.26	-1.3
50	MWD	7943	29.9	181.3	32	7921.91	173.76	173.60 S	178.23 E	248.81	134.25	3.14	3.1
51	MWD	7975	32.3	182.8	32	7949.31	190.27	190.12 S	177.64 E	260.19	136.94	7.88	7.5
52	MWD	8006	35.1	184.7	31	7975.10	207.43	207.27 S	176.50 E	272.24	139.58	9.65	9.0
53	MWD	8038	37.4	187.4	32	8000.91	226.24	226.08 S	174.49 E	285.59	142.34	8.75	7.2
54	MWD	8070	40.3	185.6	32	8025.83	246.18	246.03 S	172.23 E	300.32	145.01	9.72	9.1
55	MWD	8102	43.3	185.7	32	8049.68	267.40	267.25 S	170.13 E	316.81	147.52	9.38	9.4



Company: Chesapeake Operating
Field: Bone Springs
Cty/Blk/Par: Eddy County, NM
Well Name: Big Sinks 23-24-30 USA 1-H
Rig: Patterson 62

Job Number: 5184
Magnetic Decl.: 7.40
Grid Corr.:
Total Survey Corr.:
Target Info:

Calculation Method Minimum Curvature
Proposed Azimuth 179.95
Depth Reference Driller
Tie Into: Ryan Surveys

No.	Tool Type	Survey Depth (ft)	Incl (°)	Azimuth (°)	Course Lgth (ft)	TVD (ft)	VS (ft)	Coordinates		Closure		DLS (°/100')	Bld Rate (°/100')
								N/S (ft)	E/W (ft)	Dist (ft)	Ang (°)		
56	MWD	8133	45.9	185.2	31	8071.75	289.06	288.92 S	168.07 E	334.24	149.81	8.46	8.4
57	MWD	8165	48.3	185.4	32	8093.53	312.40	312.25 S	165.90 E	353.59	152.02	7.51	7.5
58	MWD	8197	50.5	185.1	32	8114.36	336.59	336.45 S	163.68 E	374.15	154.06	6.91	6.9
59	MWD	8229	52	184.7	32	8134.39	361.45	361.31 S	161.55 E	395.78	155.91	4.79	4.7
60	MWD	8261	55.3	183.5	32	8153.35	387.15	387.02 S	159.71 E	418.68	157.58	10.75	10.3
61	MWD	8292	59.3	183.1	31	8170.09	413.19	413.05 S	158.21 E	442.32	159.04	12.95	12.9
62	MWD	8324	62.3	182.2	32	8185.70	441.09	440.95 S	156.92 E	468.04	160.41	9.69	9.4
63	MWD	8356	64.6	182.8	32	8200.01	469.69	469.55 S	155.67 E	494.68	161.66	7.38	7.2
64	MWD	8387	63.6	181.3	31	8213.55	497.55	497.42 S	154.67 E	520.91	162.73	5.42	-3.2
65	MWD	8419	62.5	181.9	32	8228.05	526.06	525.93 S	153.88 E	547.98	163.69	3.82	-3.4
66	MWD	8451	62.7	180.9	32	8242.78	554.46	554.33 S	153.19 E	575.11	164.55	2.84	0.6
67	MWD	8482	66.5	177.6	31	8256.07	582.46	582.32 S	153.56 E	602.23	165.23	15.58	12.3
68	MWD	8514	69.7	175.9	32	8268.01	612.09	611.96 S	155.25 E	631.35	165.76	11.15	10.0
69	MWD	8546	72.5	176.7	32	8278.37	642.30	642.17 S	157.20 E	661.13	166.24	9.06	8.7
70	MWD	8578	74.5	177.8	32	8287.46	672.95	672.81 S	158.67 E	691.27	166.73	7.07	6.3
71	MWD	8609	77.3	176.1	31	8295.01	702.97	702.83 S	160.28 E	720.88	167.15	10.48	9.0
72	MWD	8641	81.3	177.3	32	8300.95	734.36	734.22 S	162.08 E	751.89	167.55	13.03	12.5
73	MWD	8673	84.5	176	32	8304.91	766.05	765.91 S	163.94 E	783.26	167.92	10.78	10.0
74	MWD	8704	87.9	178.1	31	8306.96	796.94	796.80 S	165.53 E	813.81	168.26	12.88	11.0
75	MWD	8736	90.9	179.4	32	8307.30	828.93	828.78 S	166.23 E	845.29	168.66	10.22	9.4
76	MWD	8768	91.4	180.4	32	8306.66	860.92	860.78 S	166.28 E	876.69	169.07	3.49	1.6
77	MWD	8799	91.5	180.3	31	8305.87	891.91	891.77 S	166.10 E	907.10	169.45	0.46	0.3
78	MWD	8831	91.1	180.3	32	8305.15	923.90	923.76 S	165.93 E	938.54	169.82	1.25	-1.3
79	MWD	8863	92	181.7	32	8304.28	955.88	955.74 S	165.37 E	969.94	170.18	5.20	2.8
80	MWD	8894	92.2	182.4	31	8303.14	986.84	986.70 S	164.26 E	1000.28	170.55	2.35	0.6
81	MWD	8990	93.2	181.7	96	8298.62	1082.67	1082.53 S	160.83 E	1094.41	171.55	1.27	1.0
82	MWD	9085	92.4	185.8	95	8293.98	1177.32	1177.19 S	154.63 E	1187.30	172.52	4.39	-0.8

Company: Chesapeake OperatingField: Bone SpringsCty/Blk/Par: Eddy County, NMWell Name: Big Sinks 23-24-30 USA 1-HRig: Patterson 62Job Number: 5184Magnetic Decl.: 7.40Grid Corr.: Total Survey Corr.: Target Info:

Calculation Method

Minimum Curvature

Proposed Azimuth

179.95

Depth Reference

Driller

Tie Into: Ryan Surveys

No.	Tool Type	Survey Depth (ft)	Incl (°)	Azimuth (°)	Course Lgth (ft)	TVD (ft)	VS (ft)	Coordinates		Closure		DLS (°/100')	Bld Rate (°/100')
								N/S (ft)	E/W (ft)	Dist (ft)	Ang (°)		
83	MWD	9180	90.4	186.8	95	8291.66	1271.71	1271.58 S	144.20 E	1279.73	173.53	2.35	-2.1
84	MWD	9276	90.5	187.8	96	8290.90	1366.91	1366.80 S	132.01 E	1373.16	174.48	1.05	0.1
85	MWD	9371	87.3	188	95	8292.73	1460.97	1460.87 S	118.95 E	1465.70	175.34	3.37	-3.4
86	MWD	9466	86.7	189.3	95	8297.70	1554.75	1554.66 S	104.69 E	1558.18	176.15	1.51	-0.6
87	MWD	9561	87.1	186.3	95	8302.84	1648.71	1648.63 S	91.81 E	1651.18	176.81	3.18	0.4
88	MWD	9657	86.2	186.2	96	8308.45	1743.97	1743.89 S	81.38 E	1745.79	177.33	0.94	-0.9
89	MWD	9752	86.9	183.8	95	8314.17	1838.42	1838.35 S	73.12 E	1839.81	177.72	2.63	0.7
90	MWD	9847	89.8	181.9	95	8316.90	1933.24	1933.18 S	68.40 E	1934.39	177.97	3.65	3.1
91	MWD	9942	89.9	182.6	95	8317.15	2028.16	2028.11 S	64.67 E	2029.14	178.17	0.74	0.1
92	MWD	10038	89.4	181.9	96	8317.74	2124.08	2124.03 S	60.90 E	2124.91	178.36	0.90	-0.5
93	MWD	10133	90.6	181.1	95	8317.74	2219.05	2219.00 S	58.41 E	2219.77	178.49	1.52	1.3
94	MWD	10228	90.6	179.8	95	8316.74	2314.04	2313.99 S	57.67 E	2314.71	178.57	1.37	0.0
95	MWD	10323	90.5	180.3	95	8315.83	2409.03	2408.98 S	57.58 E	2409.67	178.63	0.54	-0.1
96	MWD	10419	90.4	180.3	96	8315.08	2505.03	2504.98 S	57.08 E	2505.63	178.69	0.10	-0.1
97	MWD	10514	90.6	180.1	95	8314.25	2600.02	2599.97 S	56.75 E	2600.59	178.75	0.30	0.2
98	MWD	10609	90.7	181.4	95	8313.17	2695.00	2694.96 S	55.51 E	2695.53	178.82	1.37	0.1
99	MWD	10704	89.8	178.3	95	8312.75	2789.99	2789.94 S	55.75 E	2790.50	178.86	3.40	-0.9
100	MWD	10799	90.2	179.5	95	8312.75	2884.97	2884.92 S	57.58 E	2885.50	178.86	1.33	0.4
101	MWD	10895	91.3	182.3	96	8311.50	2980.94	2980.89 S	56.07 E	2981.42	178.92	3.13	1.1
102	MWD	10990	90.9	181.4	95	8309.67	3075.87	3075.82 S	53.00 E	3076.28	179.01	1.04	-0.4
103	MWD	11085	90.2	180.2	95	8308.76	3170.85	3170.81 S	51.68 E	3171.23	179.07	1.46	-0.7
104	MWD	11180	89.1	177.8	95	8309.34	3265.83	3265.78 S	53.34 E	3266.22	179.06	2.78	-1.2
105	MWD	11276	86.2	176.1	96	8313.28	3361.60	3361.55 S	58.44 E	3362.06	179.00	3.50	-3.0
106	MWD	11371	86.1	176.1	95	8319.66	3456.18	3456.12 S	64.88 E	3456.73	178.92	0.11	-0.1
107	MWD	11466	88.9	176.2	95	8323.80	3550.87	3550.81 S	71.26 E	3551.52	178.85	2.95	2.9
108	MWD	11561	89.5	177.5	95	8325.13	3645.72	3645.65 S	76.48 E	3646.45	178.80	1.51	0.6
109	MWD	11657	91.9	178.9	96	8323.95	3741.65	3741.59 S	79.49 E	3742.43	178.78	2.89	2.5
110	MWD	11752	89.4	177.9	95	8322.88	3836.61	3836.53 S	82.14 E	3837.41	178.77	2.83	-2.6



Company: Chesapeake Operating
Field: Bone Springs
Cty/Blk/Par: Eddy County, NM
Well Name: Big Sinks 23-24-30 USA 1-H
Rig: Patterson 62

Job Number: 5184
Magnetic Decl.: 7.40
Grid Corr.:
Total Survey Corr.:
Target Info:

Calculation Method: Minimum Curvature
Proposed Azimuth: 179.95
Depth Reference: Driller
Tie Into: Ryan Surveys

No.	Tool Type	Survey Depth (ft)	Incl (°)	Azimuth (°)	Course Lgth (ft)	TVD (ft)	VS (ft)	Coordinates		Closure		DLS (°/100')	Bld Rate (°/100')
								N/S (ft)	E/W (ft)	Dist (ft)	Ang (°)		
111	MWD	11847	91.7	178.3	95	8321.96	3931.54	3931.47 S	85.29 E	3932.40	178.76	2.46	2.4
112	MWD	11942	91.7	180.4	95	8319.15	4026.49	4026.42 S	86.37 E	4027.34	178.77	2.21	0.0
113	MWD	12037	92	180.1	95	8316.08	4121.44	4121.37 S	85.96 E	4122.26	178.81	0.45	0.3
114	MWD	12133	88.4	181.7	96	8315.74	4217.41	4217.34 S	84.45 E	4218.18	178.85	4.10	-3.7
115	MWD	12228	90.8	181.7	95	8316.41	4312.36	4312.29 S	81.63 E	4313.06	178.92	2.53	2.5
116	MWD	12323	92.8	183.9	95	8313.42	4407.18	4407.11 S	76.99 E	4407.79	179.00	3.13	2.1
117	MWD	12419	92.8	182.8	96	8308.73	4502.90	4502.83 S	71.39 E	4503.40	179.09	1.14	0.0
118	MWD	12513	92.9	182.6	94	8304.06	4596.67	4596.61 S	66.97 E	4597.10	179.17	0.24	0.1
119	MWD	12609	93.6	182.5	96	8298.62	4692.42	4692.36 S	62.70 E	4692.78	179.23	0.74	0.7
120	MWD	12675	93.5	182.2	66	8294.53	4758.23	4758.18 S	60.00 E	4758.56	179.28	0.48	-0.2
121	MWD												
122	MWD												
123	MWD												
124	MWD												
125	MWD												
126	MWD												
127	MWD												
128	MWD												
129	MWD												
130	MWD												
131	MWD												
132	MWD												
133	MWD												
134	MWD												
135	MWD												
136	MWD												
137	MWD												



Chesapeake Operating, Inc.
Field: Eddy Co, NM NAD 83
Site: PLU Big Sinks 23-24-30 USA 1H
Well: 23-24-30 USA 1H
Wellpath: OH



Azimuths to Grid North
 True North -0.26°
 Magnetic North 7.40°
 Magnetic Field
 Strength 48557nT
 Dip Angle 60.11°
 Date 11/29/2011
 Model IGRF2010

WELLPATH DETAILS

OH
 Rig Ref Datum Patterson 62 SITE 3453 00ft
 V Section Angle 179.95°
 Origin +N/-S 0.00
 Origin +E/-W 0.00
 Starting From TVD 0.00

FIELD DETAILS

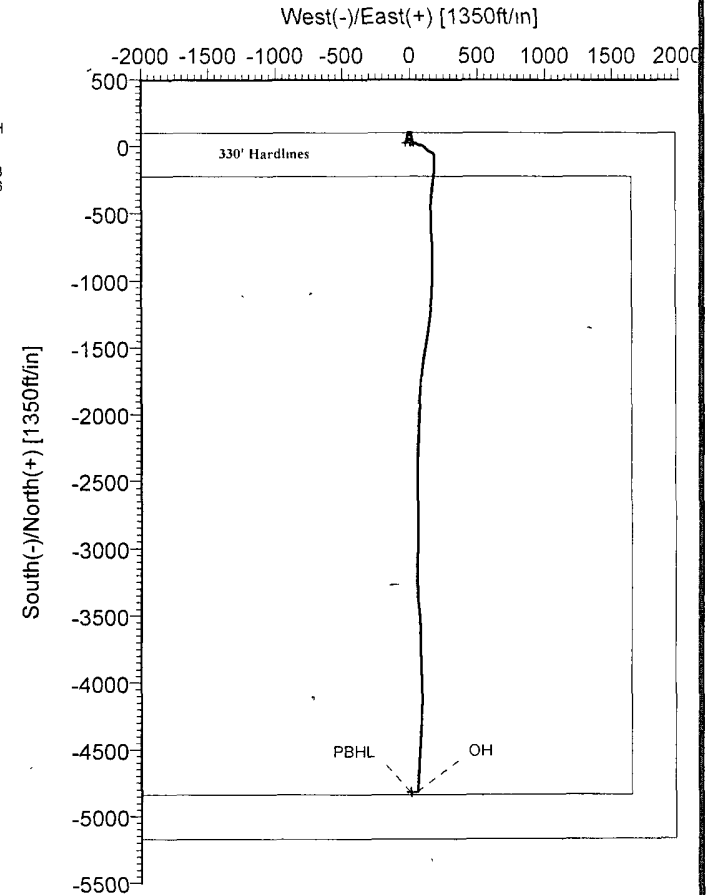
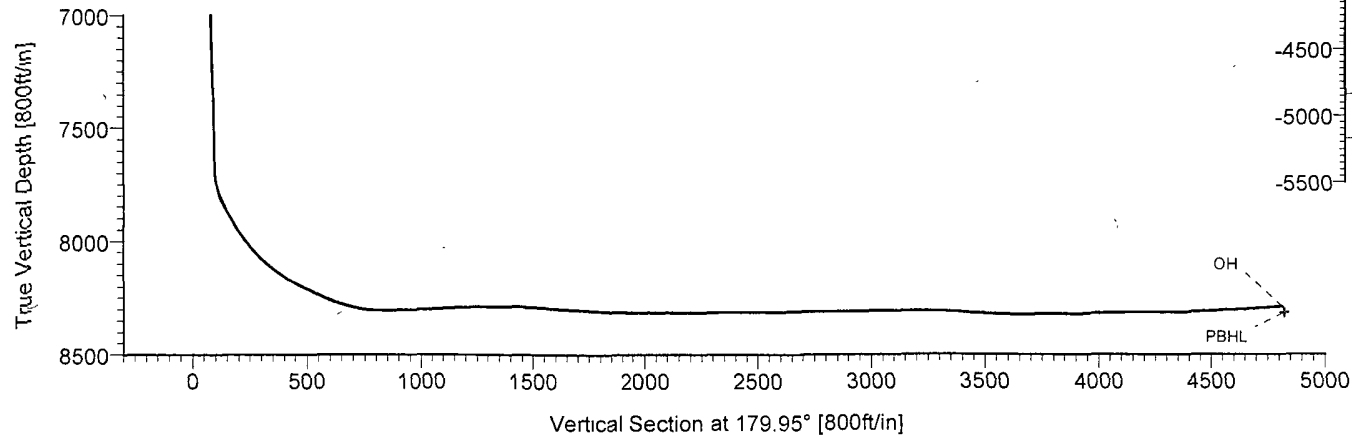
Eddy Co, NM NAD 83 USA
 Geodetic System US State Plane Coordinate System 1983
 Ellipsoid GRS 1980
 Zone New Mexico, Eastern Zone
 Magnetic Model IGRF2010
 System Datum Mean Sea Level
 Local North Grid North

SITE DETAILS

PLU Big Sinks 23-24-30 USA 1H
 Eddy Co, TX
 Site Centre Northing 440597.78
 Easting 691016.66
 Ground Level 3428.00
 Positional Uncertainty 0.00
 Convergence 0.26

TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
PBHL	8318.65	-4819.92	4.56	435777.87	691021.22	32°11'49.569N	103°50'57.959W	Point



Ryan Directional Services
 19510 Oil Center Blvd
 Houston, TX 77073
 Ph 281-443-1414
 Fx 281-443-1676



RYAN DIRECTIONAL SERVICES, INC.

A NABORS COMPANY

Wellpath: (23-24-30 USA 1H)OH

Created By Erik De La Fe Date 12/29/2011
 Checked _____ Date _____
 Reviewed _____ Date _____
 Approved _____ Date _____