

PathFinder Energy Services, Inc.

Survey Report

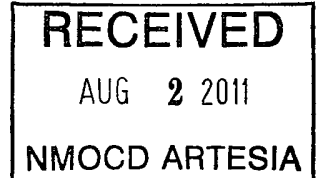
COG OPERATING, LLC
PHANTOM 18 STATE #2H
EDDY COUNTY, NM
Rig:MCVAY #7
PathFinder Office Supervisor: FRANCISCO SINISTERRA
PathFinder Field Engineers: JAMES CLOUD
JEFF CORBETT

30-015-38258

Survey Horiz. Reference:WELLHEAD
Ref Coordinates: LAT:32.39.16.5474 N LON:104.6.43.2953 W
GRID Reference:NAD83 new mexico east Transverse Mercator
Ref GRID Coord: X: 609448.1900 Y: 601944.1600
North Aligned To:GRID NORTH
Total Magnetic Correction: 7.81°EAST TO GRID
Vertical Section Plane: 0.11
Survey Vert. Reference: 18.00' Kelly Bushing To Ground
Altitude:3381.00' Ground To MSL

Survey Calculations by RX5 V6.03C using Minimum Curvature

Measured Depth (ft)	Incl (deg)	Drift Dir. (deg)	TVD (ft)	Course Length (ft)	Vertical Section (ft)	TOTAL Rectangular Offsets (ft) (ft)		Closure Dist (ft)	Dir (deg)	DLS (dg/100ft)
TIE IN TO SCIENTIFIC DRILLING GYRO SURVEY @ 8300' MD.										
8300.00	0.90	75.81	8296.42	0.00	57.55	57.69 N	75.05 W	94.66@	307.55	0.00
THE FOLLOWING ARE PATHFINDER MWD SURVEYS.										
8305.00	1.32	22.75	8301.42	5.00	57.61	57.75 N	74.99 W	94.65@	307.60	21.21
8309.00	1.58	11.50	8305.42	4.00	57.71	57.85 N	74.96 W	94.69@	307.66	9.61
8341.00	5.28	344.08	8337.36	32.00	59.55	59.70 N	75.28 W	96.08@	308.42	12.33
8373.00	9.41	346.89	8369.09	32.00	63.52	63.66 N	76.27 W	99.35@	309.85	12.95
8405.00	13.54	349.71	8400.44	32.00	69.75	69.90 N	77.54 W	104.39@	312.03	13.02
8437.00	17.76	352.34	8431.25	32.00	78.28	78.43 N	78.86 W	111.22@	314.84	13.37
8469.00	22.07	354.54	8461.33	32.00	89.10	89.25 N	80.08 W	119.91@	318.10	13.67
8500.00	26.82	357.70	8489.54	31.00	101.89	102.05 N	80.92 W	130.23@	321.59	15.89
8531.00	31.22	0.25	8516.64	31.00	116.92	117.08 N	81.16 W	142.46@	325.27	14.74
8563.00	35.09	0.69	8543.43	32.00	134.42	134.57 N	81.02 W	157.08@	328.95	12.12
8595.00	38.16	0.87	8569.11	32.00	153.50	153.66 N	80.75 W	173.59@	332.28	9.60
8627.00	41.33	1.13	8593.71	32.00	173.96	174.11 N	80.40 W	191.78@	335.22	9.92
8658.00	44.67	1.22	8616.38	31.00	195.09	195.25 N	79.96 W	210.99@	337.73	10.78
8690.00	48.28	1.57	8638.41	32.00	218.29	218.44 N	79.39 W	232.42@	340.03	11.31
8722.00	52.23	1.22	8658.87	32.00	242.88	243.03 N	78.80 W	255.49@	342.04	12.37
8754.00	55.57	0.43	8677.72	32.00	268.73	268.88 N	78.43 W	280.09@	343.74	10.63
8783.00	58.39	0.60	8693.52	29.00	293.04	293.19 N	78.21 W	303.45@	345.06	9.74
8815.00	61.29	1.39	8709.60	32.00	320.70	320.85 N	77.73 W	330.13@	346.38	9.31
8847.00	64.28	2.54	8724.23	32.00	349.14	349.29 N	76.75 W	357.62@	347.61	9.88
8879.00	67.62	2.27	8737.27	32.00	378.34	378.48 N	75.52 W	385.94@	348.72	10.47
8910.00	70.70	1.83	8748.30	31.00	407.29	407.43 N	74.49 W	414.19@	349.64	10.02
8942.00	72.98	1.92	8758.27	32.00	437.68	437.82 N	73.49 W	443.95@	350.47	7.13
8974.00	74.83	1.75	8767.14	32.00	468.41	468.55 N	72.51 W	474.13@	351.20	5.80



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9006.00	77.82	1.66	8774.71	32.00	499.49	499.63 N	71.58 W	504.73@	351.85	9.35
9038.00	80.55	1.83	8780.71	32.00	530.90	531.04 N	70.63 W	535.72@	352.42	8.55
9069.00	82.66	1.57	8785.23	31.00	561.56	561.69 N	69.72 W	566.00@	352.92	6.86
9101.00	85.38	2.27	8788.57	32.00	593.36	593.50 N	68.65 W	597.45@	353.40	8.77
9125.00	87.32	2.01	8790.10	24.00	617.30	617.43 N	67.76 W	621.14@	353.74	8.16
9217.00	90.31	1.92	8792.00	92.00	709.22	709.35 N	64.60 W	712.28@	354.80	3.25
9311.00	91.01	1.83	8790.92	94.00	803.17	803.29 N	61.53 W	805.64@	355.62	0.75
9405.00	91.36	1.22	8788.97	94.00	897.12	897.23 N	59.03 W	899.17@	356.24	0.75
9498.00	88.99	0.08	8788.69	93.00	990.11	990.22 N	57.97 W	991.92@	356.65	2.83
9590.00	89.16	359.72	8790.17	92.00	1082.09	1082.21 N	58.13 W	1083.77@	356.93	0.43
9682.00	89.52	358.85	8791.23	92.00	1174.08	1174.19 N	59.28 W	1175.69@	357.11	1.02
9775.00	89.34	359.11	8792.16	93.00	1267.05	1267.17 N	60.93 W	1268.64@	357.25	0.34
9867.00	90.31	359.90	8792.44	92.00	1359.05	1359.17 N	61.73 W	1360.57@	357.40	1.36
9960.00	90.40	0.78	8791.86	93.00	1452.04	1452.16 N	61.18 W	1453.45@	357.59	0.95
10052.00	90.75	0.16	8790.94	92.00	1544.04	1544.16 N	60.42 W	1545.34@	357.76	0.77
10145.00	90.66	0.96	8789.79	93.00	1637.03	1637.14 N	59.51 W	1638.22@	357.92	0.87
10237.00	89.96	0.16	8789.30	92.00	1729.02	1729.14 N	58.62 W	1730.13@	358.06	1.16
10330.00	89.34	0.25	8789.87	93.00	1822.02	1822.13 N	58.28 W	1823.07@	358.17	0.67
10422.00	89.43	1.04	8790.85	92.00	1914.01	1914.12 N	57.25 W	1914.98@	358.29	0.86
10515.00	89.96	2.80	8791.35	93.00	2006.96	2007.06 N	54.13 W	2007.79@	358.46	1.98
10607.00	91.10	2.98	8790.50	92.00	2098.84	2098.94 N	49.49 W	2099.53@	358.65	1.25
10700.00	88.37	2.10	8790.93	93.00	2191.75	2191.84 N	45.37 W	2192.31@	358.81	3.08
10793.00	88.99	1.75	8793.07	93.00	2284.68	2284.76 N	42.25 W	2285.15@	358.94	0.76
10885.00	89.60	2.27	8794.20	92.00	2376.62	2376.70 N	39.02 W	2377.02@	359.06	0.87
10978.00	89.43	1.92	8794.99	93.00	2469.56	2469.63 N	35.62 W	2469.89@	359.17	0.42
11070.00	89.96	1.39	8795.48	92.00	2561.52	2561.59 N	32.97 W	2561.80@	359.26	0.82
11163.00	90.40	0.78	8795.19	93.00	2654.51	2654.57 N	31.20 W	2654.76@	359.33	0.81
11255.00	91.89	358.93	8793.35	92.00	2746.48	2746.55 N	31.44 W	2746.73@	359.34	2.58

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11350.00	90.84	358.93	8791.09	95.00	2841.43	2841.50 N	33.21 W	2841.70@	359.33	1.11
11442.00	89.78	0.96	8790.59	92.00	2933.43	2933.50 N	33.30 W	2933.68@	359.35	2.49
11535.00	90.13	1.48	8790.66	93.00	3026.41	3026.47 N	31.32 W	3026.64@	359.41	0.67
11628.00	90.57	1.22	8790.09	93.00	3119.38	3119.45 N	29.13 W	3119.58@	359.47	0.55
11690.00	91.63	1.04	8788.90	62.00	3181.36	3181.42 N	27.90 W	3181.54@	359.50	1.73
11751.00	91.71	1.13	8787.12	61.00	3242.33	3242.39 N	26.75 W	3242.50@	359.53	0.20
11814.00	91.10	1.04	8785.58	63.00	3305.30	3305.35 N	25.56 W	3305.45@	359.56	0.98
11875.00	88.55	1.22	8785.77	61.00	3366.28	3366.34 N	24.35 W	3366.43@	359.59	4.19
11937.00	87.85	0.69	8787.71	62.00	3428.25	3428.30 N	23.32 W	3428.38@	359.61	1.42
11998.00	87.85	1.31	8790.00	61.00	3489.20	3489.25 N	22.26 W	3489.32@	359.63	1.02
12060.00	87.67	1.39	8792.43	62.00	3551.13	3551.18 N	20.80 W	3551.24@	359.66	0.32
12123.00	88.20	1.92	8794.70	63.00	3614.07	3614.11 N	18.98 W	3614.16@	359.70	1.19
12185.00	89.34	2.71	8796.03	62.00	3676.01	3676.05 N	16.48 W	3676.08@	359.74	2.24
12249.00	87.93	2.62	8797.55	64.00	3739.92	3739.96 N	13.50 W	3739.98@	359.79	2.21
12313.00	88.20	2.45	8799.71	64.00	3803.83	3803.86 N	10.67 W	3803.87@	359.84	0.50
12376.00	88.11	2.54	8801.74	63.00	3866.74	3866.77 N	7.93 W	3866.77@	359.88	0.20
12439.00	88.72	2.27	8803.48	63.00	3929.67	3929.69 N	5.29 W	3929.69@	359.92	1.06
12503.00	90.40	1.92	8803.97	64.00	3993.63	3993.64 N	2.95 W	3993.64@	359.96	2.68
12566.00	90.92	1.57	8803.25	63.00	4056.60	4056.61 N	1.03 W	4056.61@	359.99	1.00
12629.00	91.45	1.92	8801.95	63.00	4119.56	4119.56 N	0.89 E	4119.56@	0.01	1.01
12693.00	89.96	1.39	8801.16	64.00	4183.53	4183.53 N	2.74 E	4183.53@	0.04	2.47
12756.00	90.92	1.13	8800.67	63.00	4246.51	4246.51 N	4.12 E	4246.51@	0.06	1.58
12819.00	91.98	0.96	8799.08	63.00	4309.48	4309.48 N	5.27 E	4309.48@	0.07	1.70
12882.00	91.36	0.51	8797.24	63.00	4372.45	4372.45 N	6.08 E	4372.45@	0.08	1.22
12946.00	92.51	0.96	8795.08	64.00	4436.41	4436.40 N	6.90 E	4436.41@	0.09	1.93
13009.00	93.56	1.04	8791.75	63.00	4499.31	4499.30 N	8.00 E	4499.31@	0.10	1.67
13056.00	93.56	0.78	8788.83	47.00	4546.22	4546.21 N	8.74 E	4546.22@	0.11	0.55
STRAIGHT LINE PROJECTION TO BIT @ 13110' MD.										
13110.00	93.56	0.78	8785.48	54.00	4600.11	4600.10 N	9.47 E	4600.11@	0.12	0.00