



COG Operating LLC

**Eddy County, NM (NAD27 NME)
Road Runner Federal Com
1H**

OH / Job #60726

Design: Surveys (Ensign 155)

Standard Survey Report

20 March, 2017

**NM OIL CONSERVATION
ARTESIA DISTRICT**

SEP 13 2017

RECEIVED





Phoenix Technology Services LP

Survey Report



Company: COG Operating LLC
Project: Eddy County, NM (NAD27 NME)
Site: Road Runner Federal Com
Well: 1H
Wellbore: OH / Job #60726
Design: Surveys (Ensign 155)

Local Co-ordinate Reference: Well 1H
TVD Reference: GL + KB @ 3274 40usft (Ensign 155)
MD Reference: GL + KB @ 3274 40usft (Ensign 155)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass 5000 GCR

Project	Eddy County, NM (NAD27 NME)		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site Road Runner Federal Com

Site Position: Northing: 397,906.10 usft Latitude: 32° 5' 38.12810 N
From: Map Easting: 529,306.00 usft Longitude: 104° 14' 19.31875 W
Position Uncertainty: 0.00 usft Slot Radius: 13-3/16 " Grid Convergence: 0.05 °

Well 1H

Well Position +N/-S 0.00 usft Northing: 397,906.10 usft Latitude: 32° 5' 38.12810 N
+E/-W 0.00 usft Easting: 529,306.00 usft Longitude: 104° 14' 19.31875 W
Position Uncertainty 0.00 usft Wellhead Elevation: 0.00 usft Ground Level: 3,250.40 usft

Wellbore OH / Job #60726

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	2/17/2017	7.48	59.83	48,039

Design Surveys (Ensign 155)

Audit Notes:

Version: 1.0 **Phase:** ACTUAL **Tie On Depth:** 0.00

Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	0.22

Survey Program Date 3/20/2017

From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.00	6,707.00	Gyro Surveys (OH / Job #60726)	NS-GYRO-MS	North sensing gyrocompassing m/s
6,707.00	17,475.00	Phoenix MWD Surveys (OH / Job #60726)	MWD+HDGM	OWSG Rev.2 MWD + HDGM

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	1.23	148.05	99.99	-0.91	0.57	-0.91	1.23	1.23	0.00
125.00	1.23	150.31	124.99	-1.37	0.84	-1.37	0.19	0.00	9.04
150.00	1.40	142.43	149.98	-1.85	1.16	-1.84	0.99	0.68	-31.52
175.00	1.19	155.48	174.97	-2.32	1.46	-2.32	1.44	-0.84	52.20
200.00	1.25	162.63	199.97	-2.82	1.65	-2.81	0.65	0.24	28.60
225.00	1.37	163.23	224.96	-3.37	1.81	-3.36	0.48	0.48	2.40
250.00	1.35	169.92	249.95	-3.94	1.95	-3.94	0.64	-0.08	26.76
275.00	1.54	156.43	274.95	-4.54	2.14	-4.53	1.55	0.76	-53.96
300.00	1.14	179.18	299.94	-5.10	2.27	-5.09	2.63	-1.60	91.00



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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
325.00	1.04	194.55	324.94	-5.57	2.22	-5.56	1.23	-0.40	61.48
350.00	1.12	208.92	349.93	-6.00	2.05	-5.99	1.13	0.32	57.48
375.00	1.15	199.11	374.93	-6.45	1.85	-6.44	0.79	0.12	-39.24
400.00	1.21	187.59	399.92	-6.95	1.73	-6.94	0.96	0.24	-46.08
425.00	1.32	220.85	424.92	-7.43	1.51	-7.42	2.93	0.44	133.04
450.00	1.19	194.07	449.91	-7.90	1.25	-7.89	2.38	-0.52	-107.12
475.00	1.13	198.13	474.90	-8.38	1.11	-8.38	0.41	-0.24	16.24
500.00	1.19	207.63	499.90	-8.85	0.92	-8.85	0.80	0.24	38.00
525.00	1.15	193.63	524.89	-9.32	0.74	-9.32	1.15	-0.16	-56.00
550.00	1.34	207.69	549.89	-9.83	0.54	-9.82	1.43	0.76	56.24
575.00	1.28	193.92	574.88	-10.36	0.34	-10.35	1.28	-0.24	-55.08
600.00	1.36	211.95	599.88	-10.88	0.12	-10.88	1.68	0.32	72.12
625.00	1.39	195.76	624.87	-11.42	-0.12	-11.42	1.55	0.12	-64.76
650.00	1.38	180.38	649.86	-12.01	-0.21	-12.02	1.48	-0.04	-61.52
675.00	1.44	212.37	674.85	-12.58	-0.38	-12.58	3.12	0.24	127.96
700.00	1.51	177.12	699.85	-13.18	-0.53	-13.18	3.58	0.28	-141.00
725.00	1.36	200.07	724.84	-13.78	-0.62	-13.79	2.36	-0.60	91.80
750.00	1.28	184.83	749.83	-14.34	-0.74	-14.34	1.44	-0.32	-60.96
775.00	1.28	187.77	774.83	-14.89	-0.80	-14.90	0.26	0.00	11.76
800.00	1.24	197.55	799.82	-15.43	-0.92	-15.43	0.87	-0.16	39.12
825.00	1.57	157.16	824.81	-16.00	-0.87	-16.01	4.07	1.32	-161.56
850.00	1.30	178.61	849.80	-16.60	-0.73	-16.60	2.39	-1.08	85.80
875.00	1.50	163.22	874.80	-17.20	-0.63	-17.20	1.70	0.80	-61.56
900.00	1.46	165.82	899.79	-17.82	-0.46	-17.82	0.31	-0.16	10.40
925.00	1.14	190.58	924.78	-18.37	-0.42	-18.38	2.56	-1.28	99.04
950.00	0.96	167.97	949.78	-18.82	-0.43	-18.82	1.79	-0.72	-90.44
975.00	1.10	249.14	974.78	-19.11	-0.61	-19.12	5.38	0.56	324.68
1,000.00	0.59	213.44	999.77	-19.31	-0.90	-19.31	2.84	-2.04	-142.80
1,025.00	0.78	237.58	1,024.77	-19.51	-1.12	-19.51	1.37	0.76	96.56
1,050.00	0.99	247.46	1,049.77	-19.68	-1.46	-19.68	1.04	0.84	39.52
1,075.00	0.64	185.13	1,074.77	-19.90	-1.67	-19.91	3.58	-1.40	-249.32
1,100.00	1.04	250.27	1,099.76	-20.12	-1.90	-20.12	3.86	1.60	260.56
1,125.00	1.13	255.81	1,124.76	-20.25	-2.35	-20.26	0.55	0.36	22.16
1,150.00	0.54	245.19	1,149.76	-20.36	-2.70	-20.37	2.43	-2.36	-42.48
1,175.00	0.54	279.66	1,174.76	-20.39	-2.92	-20.40	1.28	0.00	137.88
1,200.00	0.16	307.02	1,199.76	-20.35	-3.06	-20.36	1.62	-1.52	109.44
1,225.00	0.42	307.96	1,224.75	-20.28	-3.16	-20.29	1.04	1.04	3.76
1,250.00	0.28	56.23	1,249.75	-20.18	-3.18	-20.20	2.29	-0.56	433.08
1,275.00	0.33	35.62	1,274.75	-20.09	-3.09	-20.10	0.48	0.20	-82.44
1,300.00	0.79	82.10	1,299.75	-20.01	-2.88	-20.02	2.45	1.84	185.92
1,325.00	1.16	84.36	1,324.75	-19.96	-2.46	-19.97	1.49	1.48	9.04
1,350.00	1.08	77.87	1,349.74	-19.89	-1.97	-19.89	0.60	-0.32	-25.96
1,375.00	1.47	80.05	1,374.74	-19.78	-1.43	-19.79	1.57	1.56	8.72



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Survey Calculation Method: Minimum Curvature
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Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,400.00	1.25	75.40	1,399.73	-19.66	-0.85	-19.66	0.98	-0.88	-18.60
1,425.00	1.12	51.58	1,424.73	-19.44	-0.39	-19.44	2.02	-0.52	-95.28
1,450.00	1.25	42.34	1,449.72	-19.08	-0.02	-19.08	0.92	0.52	-36.96
1,475.00	1.35	34.36	1,474.71	-18.64	0.33	-18.64	0.83	0.40	-31.92
1,500.00	1.56	42.68	1,499.71	-18.15	0.73	-18.14	1.19	0.84	33.28
1,525.00	1.62	37.16	1,524.70	-17.61	1.17	-17.61	0.66	0.24	-22.08
1,550.00	1.78	46.91	1,549.69	-17.07	1.67	-17.06	1.32	0.64	39.00
1,575.00	2.18	55.04	1,574.67	-16.53	2.34	-16.52	1.95	1.60	32.52
1,600.00	2.52	62.66	1,599.65	-16.00	3.22	-15.99	1.84	1.36	30.48
1,625.00	2.63	63.72	1,624.62	-15.50	4.22	-15.48	0.48	0.44	4.24
1,650.00	2.76	63.91	1,649.60	-14.98	5.28	-14.96	0.52	0.52	0.76
1,675.00	2.79	62.36	1,674.57	-14.43	6.36	-14.41	0.32	0.12	-6.20
1,700.00	2.20	54.10	1,699.54	-13.87	7.29	-13.84	2.76	-2.36	-33.04
1,725.00	1.94	49.28	1,724.53	-13.31	7.99	-13.28	1.25	-1.04	-19.28
1,750.00	1.35	35.95	1,749.52	-12.80	8.49	-12.76	2.80	-2.36	-53.32
1,775.00	0.77	339.31	1,774.51	-12.40	8.60	-12.37	4.51	-2.32	-226.56
1,800.00	1.29	284.67	1,799.51	-12.17	8.27	-12.14	4.21	2.08	-218.56
1,825.00	1.60	273.43	1,824.50	-12.08	7.65	-12.05	1.67	1.24	-44.96
1,850.00	1.78	272.01	1,849.49	-12.05	6.91	-12.02	0.74	0.72	-5.68
1,875.00	1.89	271.20	1,874.48	-12.02	6.11	-12.00	0.45	0.44	-3.24
1,900.00	1.78	269.74	1,899.47	-12.02	5.31	-12.00	0.48	-0.44	-5.84
1,925.00	1.66	267.99	1,924.45	-12.03	4.56	-12.01	0.52	-0.48	-7.00
1,950.00	1.22	272.78	1,949.45	-12.03	3.93	-12.02	1.82	-1.76	19.16
1,975.00	0.84	275.15	1,974.44	-12.00	3.49	-11.99	1.53	-1.52	9.48
2,000.00	0.64	290.73	1,999.44	-11.94	3.17	-11.92	1.13	-0.80	62.32
2,025.00	0.75	294.91	2,024.44	-11.82	2.89	-11.81	0.48	0.44	16.72
2,050.00	0.66	295.98	2,049.44	-11.69	2.62	-11.68	0.36	-0.36	4.28
2,075.00	0.64	293.23	2,074.43	-11.57	2.36	-11.56	0.15	-0.08	-11.00
2,100.00	0.69	292.72	2,099.43	-11.45	2.09	-11.45	0.20	0.20	-2.04
2,125.00	0.59	292.30	2,124.43	-11.35	1.83	-11.34	0.40	-0.40	-1.68
2,150.00	0.60	291.43	2,149.43	-11.25	1.59	-11.25	0.05	0.04	-3.48
2,175.00	0.60	292.78	2,174.43	-11.15	1.35	-11.15	0.06	0.00	5.40
2,200.00	0.68	292.41	2,199.43	-11.05	1.09	-11.04	0.32	0.32	-1.48
2,225.00	0.69	287.86	2,224.43	-10.94	0.81	-10.94	0.22	0.04	-18.20
2,250.00	0.78	284.61	2,249.42	-10.85	0.50	-10.85	0.40	0.36	-13.00
2,275.00	0.79	283.61	2,274.42	-10.77	0.17	-10.77	0.07	0.04	-4.00
2,300.00	0.85	285.98	2,299.42	-10.68	-0.17	-10.68	0.28	0.24	9.48
2,325.00	0.90	282.68	2,324.42	-10.58	-0.54	-10.59	0.28	0.20	-13.20
2,350.00	0.77	278.74	2,349.41	-10.52	-0.90	-10.52	0.57	-0.52	-15.76
2,375.00	0.72	282.57	2,374.41	-10.46	-1.22	-10.46	0.28	-0.20	15.32
2,400.00	0.77	280.35	2,399.41	-10.39	-1.54	-10.40	0.23	0.20	-8.88
2,425.00	0.62	278.78	2,424.41	-10.34	-1.84	-10.35	0.60	-0.60	-6.28
2,450.00	0.70	284.73	2,449.41	-10.28	-2.12	-10.29	0.42	0.32	23.80



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2,475.00	0.69	288.22	2,474.40	-10.20	-2.41	-10.20	0.17	-0.04	13.96
2,500.00	0.64	286.98	2,499.40	-10.11	-2.69	-10.12	0.21	-0.20	-4.96
2,525.00	0.67	284.67	2,524.40	-10.03	-2.96	-10.04	0.16	0.12	-9.24
2,550.00	1.03	286.78	2,549.40	-9.93	-3.32	-9.94	1.45	1.44	8.44
2,575.00	1.01	284.30	2,574.39	-9.81	-3.75	-9.82	0.19	-0.08	-9.92
2,600.00	0.58	283.60	2,599.39	-9.72	-4.08	-9.74	1.72	-1.72	-2.80
2,625.00	0.91	284.59	2,624.39	-9.64	-4.40	-9.66	1.32	1.32	3.96
2,650.00	1.03	280.13	2,649.38	-9.56	-4.81	-9.57	0.57	0.48	-17.84
2,675.00	0.94	284.51	2,674.38	-9.46	-5.23	-9.48	0.47	-0.36	17.52
2,700.00	0.75	281.18	2,699.38	-9.38	-5.59	-9.40	0.78	-0.76	-13.32
2,725.00	0.75	279.72	2,724.38	-9.32	-5.91	-9.34	0.08	0.00	-5.84
2,750.00	0.64	277.03	2,749.37	-9.28	-6.21	-9.30	0.46	-0.44	-10.76
2,775.00	0.77	278.54	2,774.37	-9.24	-6.52	-9.26	0.53	0.52	6.04
2,800.00	0.76	276.62	2,799.37	-9.19	-6.85	-9.22	0.11	-0.04	-7.68
2,825.00	0.62	277.12	2,824.37	-9.16	-7.15	-9.18	0.56	-0.56	2.00
2,850.00	0.68	277.17	2,849.37	-9.12	-7.43	-9.15	0.24	0.24	0.20
2,875.00	0.69	280.95	2,874.37	-9.07	-7.72	-9.10	0.19	0.04	15.12
2,900.00	0.57	277.85	2,899.36	-9.03	-7.99	-9.06	0.50	-0.48	-12.40
2,925.00	0.65	282.49	2,924.36	-8.98	-8.26	-9.01	0.38	0.32	18.56
2,950.00	0.67	283.56	2,949.36	-8.91	-8.54	-8.95	0.09	0.08	4.28
2,975.00	0.63	282.37	2,974.36	-8.85	-8.81	-8.89	0.17	-0.16	-4.76
3,000.00	0.60	278.87	2,999.36	-8.80	-9.08	-8.84	0.19	-0.12	-14.00
3,025.00	0.56	278.48	3,024.36	-8.76	-9.33	-8.80	0.16	-0.16	-1.56
3,050.00	0.50	270.71	3,049.36	-8.74	-9.56	-8.78	0.37	-0.24	-31.08
3,075.00	0.43	274.70	3,074.35	-8.73	-9.76	-8.77	0.31	-0.28	15.96
3,100.00	0.55	282.29	3,099.35	-8.70	-9.97	-8.74	0.54	0.48	30.36
3,125.00	0.53	278.48	3,124.35	-8.66	-10.20	-8.70	0.16	-0.08	-15.24
3,150.00	0.47	272.78	3,149.35	-8.64	-10.42	-8.68	0.31	-0.24	-22.80
3,175.00	0.56	274.11	3,174.35	-8.62	-10.64	-8.66	0.36	0.36	5.32
3,200.00	0.56	279.13	3,199.35	-8.60	-10.88	-8.64	0.20	0.00	20.08
3,225.00	0.59	275.36	3,224.35	-8.56	-11.13	-8.61	0.19	0.12	-15.08
3,250.00	0.61	275.44	3,249.35	-8.54	-11.39	-8.58	0.08	0.08	0.32
3,275.00	0.66	271.19	3,274.35	-8.52	-11.67	-8.57	0.27	0.20	-17.00
3,300.00	0.59	264.92	3,299.34	-8.53	-11.94	-8.58	0.39	-0.28	-25.08
3,325.00	0.60	263.97	3,324.34	-8.56	-12.20	-8.60	0.06	0.04	-3.80
3,350.00	0.64	258.85	3,349.34	-8.60	-12.47	-8.65	0.27	0.16	-20.48
3,375.00	0.74	257.75	3,374.34	-8.66	-12.76	-8.71	0.40	0.40	-4.40
3,400.00	0.69	256.03	3,399.34	-8.73	-13.07	-8.78	0.22	-0.20	-6.88
3,425.00	0.60	254.34	3,424.34	-8.80	-13.34	-8.85	0.37	-0.36	-6.76
3,450.00	0.57	247.26	3,449.33	-8.88	-13.58	-8.94	0.31	-0.12	-28.32
3,475.00	0.72	260.97	3,474.33	-8.96	-13.85	-9.01	0.86	0.60	54.84
3,500.00	0.49	246.94	3,499.33	-9.02	-14.10	-9.08	1.09	-0.92	-56.12
3,525.00	0.39	225.94	3,524.33	-9.12	-14.26	-9.18	0.75	-0.40	-84.00
3,550.00	0.47	244.32	3,549.33	-9.23	-14.42	-9.28	0.63	0.32	73.52



Phoenix Technology Services LP Survey Report



Company: COG Operating LLC
Project: Eddy County, NM (NAD27 NME)
Site: Road Runner Federal Com
Well: 1H
Wellbore: OH / Job #60726
Design: Surveys (Ensign 155)

Local Co-ordinate Reference: Well 1H
TVD Reference: GL + KB @ 3274.40usft (Ensign 155)
MD Reference: GL + KB @ 3274.40usft (Ensign 155)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass 5000 GCR

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
3,575.00	0.55	253.12	3,574.33	-9.31	-14.62	-9.36	0.45	0.32	35.20
3,600.00	0.42	249.21	3,599.33	-9.38	-14.82	-9.43	0.54	-0.52	-15.64
3,625.00	0.44	247.90	3,624.33	-9.44	-15.00	-9.50	0.09	0.08	-5.24
3,650.00	0.30	233.22	3,649.33	-9.52	-15.14	-9.58	0.67	-0.56	-58.72
3,675.00	0.69	271.92	3,674.33	-9.55	-15.34	-9.61	1.97	1.56	154.80
3,700.00	0.49	259.70	3,699.32	-9.57	-15.60	-9.63	0.94	-0.80	-48.88
3,725.00	0.46	276.10	3,724.32	-9.58	-15.80	-9.64	0.55	-0.12	65.60
3,750.00	0.20	334.09	3,749.32	-9.53	-15.92	-9.59	1.57	-1.04	231.96
3,775.00	0.13	40.46	3,774.32	-9.47	-15.92	-9.53	0.76	-0.28	265.48
3,800.00	0.13	316.70	3,799.32	-9.42	-15.92	-9.48	0.69	0.00	-335.04
3,825.00	0.18	313.54	3,824.32	-9.38	-15.97	-9.44	0.20	0.20	-12.64
3,850.00	0.16	336.27	3,849.32	-9.32	-16.01	-9.38	0.28	-0.08	90.92
3,875.00	0.10	25.74	3,874.32	-9.26	-16.02	-9.33	0.49	-0.24	197.88
3,900.00	0.14	70.99	3,899.32	-9.23	-15.98	-9.30	0.40	0.16	181.00
3,925.00	0.12	2.69	3,924.32	-9.20	-15.95	-9.26	0.59	-0.08	-273.20
3,950.00	0.24	319.87	3,949.32	-9.13	-15.98	-9.19	0.69	0.48	-171.28
3,975.00	0.12	311.72	3,974.32	-9.08	-16.04	-9.14	0.49	-0.48	-32.60
4,000.00	0.25	311.58	3,999.32	-9.02	-16.10	-9.08	0.52	0.52	-0.56
4,025.00	0.22	293.41	4,024.32	-8.97	-16.18	-9.03	0.32	-0.12	-72.68
4,050.00	0.19	302.19	4,049.32	-8.93	-16.26	-8.99	0.17	-0.12	35.12
4,075.00	0.35	298.45	4,074.32	-8.87	-16.36	-8.93	0.64	0.64	-14.96
4,100.00	0.13	287.33	4,099.32	-8.82	-16.46	-8.89	0.90	-0.88	-44.48
4,125.00	0.28	291.66	4,124.32	-8.79	-16.54	-8.85	0.60	0.60	17.32
4,150.00	0.30	287.17	4,149.32	-8.75	-16.66	-8.81	0.12	0.08	-17.96
4,175.00	0.07	271.36	4,174.32	-8.73	-16.74	-8.79	0.93	-0.92	-63.24
4,200.00	0.17	262.93	4,199.32	-8.73	-16.79	-8.80	0.41	0.40	-33.72
4,225.00	0.07	94.19	4,224.32	-8.74	-16.81	-8.80	0.96	-0.40	-674.96
4,250.00	0.11	274.14	4,249.32	-8.74	-16.82	-8.80	0.72	0.16	719.80
4,275.00	0.01	15.76	4,274.32	-8.73	-16.84	-8.80	0.45	-0.40	406.48
4,300.00	0.08	27.20	4,299.32	-8.72	-16.83	-8.78	0.28	0.28	45.76
4,325.00	0.18	300.02	4,324.32	-8.68	-16.86	-8.75	0.77	0.40	-348.72
4,350.00	0.07	208.43	4,349.32	-8.68	-16.90	-8.74	0.78	-0.44	-366.36
4,375.00	0.13	268.24	4,374.32	-8.69	-16.94	-8.76	0.45	0.24	239.24
4,400.00	0.10	154.08	4,399.32	-8.71	-16.96	-8.78	0.78	-0.12	-456.64
4,425.00	0.26	147.00	4,424.32	-8.78	-16.92	-8.84	0.64	0.64	-28.32
4,450.00	0.17	203.51	4,449.32	-8.86	-16.90	-8.92	0.87	-0.36	226.04
4,475.00	0.21	186.17	4,474.32	-8.94	-16.92	-9.00	0.28	0.16	-69.36
4,500.00	0.28	166.47	4,499.32	-9.04	-16.91	-9.11	0.43	0.28	-78.80
4,525.00	0.31	169.93	4,524.32	-9.17	-16.88	-9.24	0.14	0.12	13.84
4,550.00	0.31	180.95	4,549.32	-9.30	-16.87	-9.37	0.24	0.00	44.08
4,575.00	0.22	185.84	4,574.32	-9.42	-16.88	-9.48	0.37	-0.36	19.56
4,600.00	0.32	150.54	4,599.32	-9.53	-16.85	-9.59	0.76	0.40	-141.20
4,625.00	0.18	189.95	4,624.32	-9.63	-16.82	-9.69	0.86	-0.56	157.64



Phoenix Technology Services LP

Survey Report



Company: COG Operating LLC
Project: Eddy County, NM (NAD27 NME)
Site: Road Runner Federal Com
Well: 1H
Wellbore: OH / Job #60726
Design: Surveys (Ensign 155)

Local Co-ordinate Reference: Well 1H
TVD Reference: GL + KB @ 3274 40usft (Ensign 155)
MD Reference: GL + KB @ 3274 40usft (Ensign 155)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass 5000 GCR

Survey

Measured Depth (usft)	Inclination (")	Azimuth (")	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate ("/100usft)	Build Rate ("/100usft)	Turn Rate ("/100usft)
4,650.00	0.25	154.78	4,649.32	-9.72	-16.81	-9.78	0.58	0.28	-140.68
4,675.00	0.37	129.51	4,674.32	-9.82	-16.72	-9.88	0.72	0.48	-101.08
4,700.00	0.19	172.57	4,699.32	-9.91	-16.65	-9.97	1.06	-0.72	172.24
4,725.00	0.27	149.23	4,724.32	-10.00	-16.62	-10.06	0.49	0.32	-93.36
4,750.00	0.19	170.25	4,749.32	-10.09	-16.58	-10.16	0.46	-0.32	84.08
4,775.00	0.25	159.18	4,774.32	-10.18	-16.55	-10.25	0.29	0.24	-44.28
4,800.00	0.37	146.46	4,799.32	-10.30	-16.49	-10.37	0.55	0.48	-50.88
4,825.00	0.17	202.10	4,824.32	-10.40	-16.46	-10.47	1.23	-0.80	222.56
4,850.00	0.32	149.98	4,849.32	-10.50	-16.44	-10.56	1.02	0.60	-208.48
4,875.00	0.35	164.29	4,874.32	-10.63	-16.38	-10.70	0.35	0.12	57.24
4,900.00	0.29	183.40	4,899.32	-10.77	-16.37	-10.83	0.49	-0.24	76.44
4,925.00	0.50	151.63	4,924.31	-10.93	-16.32	-10.99	1.18	0.84	-127.08
4,950.00	0.40	163.26	4,949.31	-11.11	-16.24	-11.17	0.54	-0.40	46.52
4,975.00	0.51	150.82	4,974.31	-11.29	-16.16	-11.35	0.59	0.44	-49.76
5,000.00	0.61	144.48	4,999.31	-11.49	-16.03	-11.56	0.47	0.40	-25.36
5,025.00	0.54	150.12	5,024.31	-11.70	-15.89	-11.77	0.36	-0.28	22.56
5,050.00	0.54	154.97	5,049.31	-11.91	-15.79	-11.97	0.18	0.00	19.40
5,075.00	0.55	147.00	5,074.31	-12.12	-15.67	-12.18	0.31	0.04	-31.88
5,100.00	0.55	154.68	5,099.31	-12.33	-15.55	-12.39	0.29	0.00	30.72
5,125.00	0.66	147.90	5,124.31	-12.56	-15.43	-12.62	0.52	0.44	-27.12
5,150.00	0.65	152.09	5,149.30	-12.81	-15.28	-12.87	0.20	-0.04	16.76
5,175.00	0.75	151.57	5,174.30	-13.08	-15.14	-13.14	0.40	0.40	-2.08
5,200.00	0.71	156.81	5,199.30	-13.36	-15.00	-13.42	0.31	-0.16	20.96
5,225.00	0.83	158.89	5,224.30	-13.67	-14.87	-13.73	0.49	0.48	8.32
5,250.00	0.86	150.91	5,249.30	-14.01	-14.72	-14.06	0.49	0.12	-31.92
5,275.00	0.74	157.07	5,274.29	-14.32	-14.56	-14.38	0.59	-0.48	24.64
5,300.00	1.00	154.94	5,299.29	-14.67	-14.41	-14.72	1.05	1.04	-8.52
5,325.00	1.08	162.71	5,324.29	-15.09	-14.24	-15.14	0.65	0.32	31.08
5,350.00	1.06	162.77	5,349.28	-15.53	-14.11	-15.59	0.08	-0.08	0.24
5,375.00	1.07	163.69	5,374.28	-15.98	-13.97	-16.03	0.08	0.04	3.68
5,400.00	0.91	167.13	5,399.27	-16.40	-13.86	-16.45	0.68	-0.64	13.76
5,425.00	0.45	177.18	5,424.27	-16.69	-13.81	-16.74	1.89	-1.84	40.20
5,450.00	0.16	187.81	5,449.27	-16.82	-13.81	-16.87	1.18	-1.16	42.52
5,475.00	0.07	266.53	5,474.27	-16.86	-13.83	-16.91	0.65	-0.36	314.88
5,500.00	0.11	332.76	5,499.27	-16.84	-13.86	-16.89	0.42	0.16	264.92
5,525.00	0.18	6.85	5,524.27	-16.78	-13.87	-16.83	0.43	0.28	136.36
5,550.00	0.18	17.32	5,549.27	-16.70	-13.85	-16.75	0.13	0.00	41.88
5,575.00	0.16	341.44	5,574.27	-16.63	-13.85	-16.68	0.43	-0.08	-143.52
5,600.00	0.41	284.21	5,599.27	-16.57	-13.95	-16.63	1.40	1.00	-228.92
5,625.00	0.62	266.22	5,624.27	-16.56	-14.17	-16.62	1.05	0.84	-71.96
5,650.00	0.76	256.14	5,649.27	-16.61	-14.46	-16.67	0.74	0.56	-40.32
5,675.00	0.81	258.51	5,674.27	-16.68	-14.80	-16.74	0.24	0.20	9.48
5,700.00	0.78	248.66	5,699.26	-16.78	-15.13	-16.84	0.56	-0.12	-39.40



Phoenix Technology Services LP

Survey Report



Company: COG Operating LLC
Project: Eddy County, NM (NAD27 NME)
Site: Road Runner Federal Com
Well: 1H
Wellbore: OH / Job #60726
Design: Surveys (Ensign 155)

Local Co-ordinate Reference: Well 1H
TVD Reference: GL + KB @ 3274 40usft (Ensign 155)
MD Reference: GL + KB @ 3274 40usft (Ensign 155)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass 5000 GCR

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
5,725.00	0.76	240.98	5,724.26	-16.92	-15.43	-16.98	0.42	-0.08	-30.72
5,750.00	0.68	237.75	5,749.26	-17.08	-15.70	-17.14	0.36	-0.32	-12.92
5,775.00	0.59	241.19	5,774.26	-17.22	-15.94	-17.29	0.39	-0.36	13.76
5,800.00	0.54	250.50	5,799.26	-17.33	-16.17	-17.39	0.42	-0.20	37.24
5,825.00	0.54	255.09	5,824.26	-17.40	-16.39	-17.46	0.17	0.00	18.36
5,850.00	0.57	254.65	5,849.25	-17.46	-16.62	-17.52	0.12	0.12	-1.76
5,875.00	0.52	256.21	5,874.25	-17.52	-16.86	-17.58	0.21	-0.20	6.24
5,900.00	0.56	253.64	5,899.25	-17.58	-17.08	-17.65	0.19	0.16	-10.28
5,925.00	0.68	265.82	5,924.25	-17.63	-17.35	-17.69	0.71	0.48	48.72
5,950.00	0.66	271.88	5,949.25	-17.63	-17.64	-17.70	0.29	-0.08	24.24
5,975.00	0.51	268.62	5,974.25	-17.63	-17.89	-17.70	0.61	-0.60	-13.04
6,000.00	0.26	314.18	5,999.25	-17.59	-18.05	-17.66	1.51	-1.00	182.24
6,025.00	0.31	34.34	6,024.25	-17.50	-18.05	-17.57	1.48	0.20	320.64
6,050.00	0.64	53.26	6,049.25	-17.36	-17.90	-17.43	1.44	1.32	75.68
6,075.00	0.90	58.12	6,074.24	-17.17	-17.62	-17.24	1.07	1.04	19.44
6,100.00	1.21	59.92	6,099.24	-16.93	-17.23	-17.00	1.25	1.24	7.20
6,125.00	1.32	59.97	6,124.23	-16.66	-16.75	-16.72	0.44	0.44	0.20
6,150.00	1.25	67.72	6,149.23	-16.41	-16.25	-16.47	0.75	-0.28	31.00
6,175.00	1.25	65.38	6,174.22	-16.19	-15.75	-16.25	0.20	0.00	-9.36
6,200.00	1.39	78.58	6,199.21	-16.02	-15.20	-16.08	1.34	0.56	52.80
6,225.00	1.01	78.42	6,224.21	-15.92	-14.69	-15.97	1.52	-1.52	-0.64
6,250.00	1.03	95.50	6,249.20	-15.89	-14.25	-15.95	1.21	0.08	68.32
6,275.00	1.04	106.55	6,274.20	-15.98	-13.81	-16.03	0.80	0.04	44.20
6,300.00	1.14	111.41	6,299.20	-16.13	-13.36	-16.19	0.54	0.40	19.44
6,325.00	1.20	108.78	6,324.19	-16.31	-12.88	-16.36	0.32	0.24	-10.52
6,350.00	1.11	114.55	6,349.19	-16.49	-12.41	-16.54	0.59	-0.36	23.08
6,375.00	0.92	123.94	6,374.18	-16.71	-12.02	-16.75	1.01	-0.76	37.56
6,400.00	0.82	129.70	6,399.18	-16.93	-11.72	-16.98	0.53	-0.40	23.04
6,425.00	0.80	141.59	6,424.18	-17.18	-11.47	-17.23	0.68	-0.08	47.56
6,450.00	0.93	137.52	6,449.17	-17.47	-11.23	-17.51	0.57	0.52	-16.28
6,475.00	0.98	140.45	6,474.17	-17.79	-10.95	-17.83	0.28	0.20	11.72
6,500.00	1.04	138.45	6,499.17	-18.12	-10.67	-18.16	0.28	0.24	-8.00
6,525.00	0.97	135.14	6,524.16	-18.44	-10.37	-18.48	0.36	-0.28	-13.24
6,550.00	0.86	122.82	6,549.16	-18.69	-10.06	-18.73	0.90	-0.44	-49.28
6,575.00	0.46	96.99	6,574.16	-18.81	-9.80	-18.84	1.96	-1.60	-103.32
6,600.00	0.55	86.28	6,599.16	-18.81	-9.58	-18.85	0.52	0.36	-42.84
6,625.00	0.39	69.96	6,624.16	-18.77	-9.39	-18.81	0.83	-0.64	-65.28
6,650.00	0.51	71.18	6,649.16	-18.71	-9.20	-18.74	0.48	0.48	4.88
6,675.00	0.58	76.11	6,674.15	-18.64	-8.97	-18.68	0.34	0.28	19.72
6,700.00	0.46	50.63	6,699.15	-18.55	-8.77	-18.58	1.03	-0.48	-101.92
6,707.00	0.46	61.98	6,706.15	-18.52	-8.72	-18.55	1.30	0.00	162.14
Tie In									
6,816.00	0.45	353.05	6,815.15	-17.89	-8.39	-17.92	0.47	-0.01	-63.24
First Phoenix MWD Survey									



Phoenix Technology Services LP Survey Report



Company: COG Operating LLC
Project: Eddy County, NM (NAD27 NME)
Site: Road Runner Federal Com
Well: 1H
Wellbore: OH / Job #60726
Design: Surveys (Ensign 155)

Local Co-ordinate Reference: Well 1H
TVD Reference: GL + KB @ 3274.40usft (Ensign 155)
MD Reference: GL + KB @ 3274.40usft (Ensign 155)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass 5000 GCR

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
6,911.00	9.75	6.83	6,909.67	-9.51	-7.48	-9.54	9.80	9.79	14.51
6,957.00	16.44	5.87	6,954.45	0.84	-6.35	0.82	14.55	14.54	-2.09
7,006.00	21.83	7.04	7,000.73	16.79	-4.52	16.78	11.03	11.00	2.39
7,052.00	27.67	4.15	7,042.48	35.95	-2.70	35.94	12.96	12.70	-6.28
7,100.00	31.91	1.98	7,084.13	59.76	-1.45	59.75	9.11	8.83	-4.52
7,146.00	36.57	359.98	7,122.15	85.63	-1.04	85.62	10.42	10.13	-4.35
7,193.00	41.54	0.40	7,158.64	115.23	-0.93	115.23	10.59	10.57	0.89
7,229.00	45.06	0.63	7,184.83	139.92	-0.71	139.91	9.80	9.79	0.63
FTP									
7,240.00	46.14	0.69	7,192.53	147.78	-0.62	147.77	9.80	9.79	0.58
7,287.00	50.13	0.39	7,223.89	182.77	-0.29	182.77	8.50	8.49	-0.64
7,334.00	52.77	0.36	7,253.18	219.52	-0.05	219.52	5.62	5.62	-0.06
7,381.00	56.80	0.20	7,280.27	257.91	0.13	257.91	8.58	8.57	-0.34
7,427.00	58.85	0.34	7,304.77	296.84	0.32	296.84	4.46	4.46	0.30
7,476.00	63.45	0.67	7,328.40	339.75	0.70	339.75	9.41	9.39	0.67
7,522.00	66.14	1.35	7,347.99	381.36	1.44	381.36	6.00	5.85	1.48
7,569.00	71.27	1.08	7,365.05	425.13	2.36	425.13	10.93	10.91	-0.57
7,616.00	76.14	359.86	7,378.24	470.22	2.73	470.23	10.66	10.36	-2.60
7,663.00	81.41	359.29	7,387.38	516.31	2.38	516.31	11.28	11.21	-1.21
7,710.00	86.08	359.10	7,392.50	563.01	1.73	563.01	9.94	9.94	-0.40
7,786.00	90.75	359.90	7,394.61	638.95	1.06	638.95	6.23	6.14	1.05
7,880.00	90.92	359.76	7,393.24	732.94	0.78	732.94	0.23	0.18	-0.15
7,974.00	91.29	0.29	7,391.42	826.93	0.83	826.92	0.69	0.39	0.56
8,067.00	91.73	0.09	7,388.97	919.89	1.13	919.89	0.52	0.47	-0.22
8,161.00	92.32	0.27	7,385.65	1,013.83	1.43	1,013.83	0.66	0.63	0.19
8,255.00	90.78	0.09	7,383.11	1,107.80	1.72	1,107.79	1.65	-1.64	-0.19
8,349.00	90.92	0.06	7,381.71	1,201.79	1.85	1,201.78	0.15	0.15	-0.03
8,443.00	91.06	359.64	7,380.09	1,295.77	1.60	1,295.77	0.47	0.15	-0.45
8,537.00	90.98	359.32	7,378.42	1,389.75	0.75	1,389.74	0.35	-0.09	-0.34
8,631.00	91.15	359.16	7,376.67	1,483.73	-0.50	1,483.71	0.25	0.18	-0.17
8,726.00	90.92	359.07	7,374.95	1,578.70	-1.97	1,578.68	0.26	-0.24	-0.09
8,820.00	91.03	359.24	7,373.35	1,672.68	-3.35	1,672.65	0.22	0.12	0.18
8,914.00	91.34	359.19	7,371.41	1,766.65	-4.64	1,766.62	0.33	0.33	-0.05
9,009.00	89.55	0.15	7,370.67	1,861.64	-5.19	1,861.60	2.14	-1.88	1.01
9,103.00	89.61	359.86	7,371.36	1,955.64	-5.18	1,955.60	0.32	0.06	-0.31
9,197.00	89.30	1.89	7,372.25	2,049.61	-3.74	2,049.59	2.18	-0.33	2.16
9,291.00	89.44	1.76	7,373.29	2,143.56	-0.75	2,143.54	0.20	0.15	-0.14
9,386.00	89.58	2.10	7,374.10	2,238.50	2.45	2,238.50	0.39	0.15	0.36
9,480.00	89.50	2.02	7,374.86	2,332.44	5.83	2,332.45	0.12	-0.09	-0.09
9,574.00	89.39	1.52	7,375.77	2,426.39	8.73	2,426.41	0.54	-0.12	-0.53
9,668.00	89.78	2.09	7,376.45	2,520.34	11.69	2,520.37	0.73	0.41	0.61
9,762.00	90.56	1.66	7,376.17	2,614.29	14.77	2,614.33	0.95	0.83	-0.46
9,856.00	90.84	1.25	7,375.02	2,708.25	17.16	2,708.30	0.53	0.30	-0.44



Phoenix Technology Services LP Survey Report



Company: COG Operating LLC
Project: Eddy County, NM (NAD27 NME)
Site: Road Runner Federal Com
Well: 1H
Wellbore: OH / Job #60726
Design: Surveys (Ensign 155)

Local Co-ordinate Reference: Well 1H
TVD Reference: GL + KB @ 3274.40usft (Ensign 155)
MD Reference: GL + KB @ 3274.40usft (Ensign 155)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass 5000 GCR

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,950.00	91.37	0.93	7,373.21	2,802.22	18.94	2,802.27	0.66	0.56	-0.34
10,044.00	91.68	0.73	7,370.71	2,896.17	20.30	2,896.23	0.39	0.33	-0.21
10,138.00	92.80	1.35	7,367.03	2,990.08	22.01	2,990.15	1.36	1.19	0.66
10,232.00	90.59	0.01	7,364.25	3,084.03	23.12	3,084.09	2.75	-2.35	-1.43
10,326.00	90.59	359.95	7,363.28	3,178.02	23.09	3,178.09	0.06	0.00	-0.06
10,420.00	90.34	359.89	7,362.52	3,272.02	22.96	3,272.08	0.27	-0.27	-0.06
10,513.00	90.45	0.21	7,361.88	3,365.02	23.04	3,365.08	0.36	0.12	0.34
10,607.00	90.95	0.36	7,360.73	3,459.01	23.51	3,459.07	0.56	0.53	0.16
10,701.00	90.74	0.40	7,359.34	3,553.00	24.13	3,553.06	0.23	-0.22	0.04
10,795.00	90.59	0.67	7,358.25	3,646.99	25.01	3,647.06	0.33	-0.16	0.29
10,889.00	90.31	0.83	7,357.51	3,740.98	26.24	3,741.05	0.34	-0.30	0.17
10,983.00	90.03	0.66	7,357.24	3,834.97	27.46	3,835.04	0.35	-0.30	-0.18
11,077.00	89.97	0.91	7,357.24	3,928.96	28.75	3,929.04	0.27	-0.06	0.27
11,168.00	90.45	0.80	7,356.90	4,019.95	30.11	4,020.03	0.54	0.53	-0.12
11,258.00	90.75	0.96	7,355.96	4,109.93	31.49	4,110.02	0.38	0.33	0.18
11,351.00	91.17	1.08	7,354.40	4,202.90	33.14	4,203.00	0.47	0.45	0.13
11,443.00	90.08	359.72	7,353.40	4,294.89	33.79	4,294.99	1.89	-1.18	-1.48
11,532.00	89.97	359.74	7,353.36	4,383.89	33.37	4,383.99	0.13	-0.12	0.02
11,623.00	90.00	359.65	7,353.38	4,474.89	32.88	4,474.98	0.10	0.03	-0.10
11,713.00	90.03	0.01	7,353.36	4,564.89	32.62	4,564.98	0.40	0.03	0.40
11,804.00	90.36	0.11	7,353.05	4,655.89	32.71	4,655.98	0.38	0.36	0.11
11,895.00	90.81	0.08	7,352.12	4,746.88	32.86	4,746.98	0.50	0.49	-0.03
11,987.00	91.17	0.79	7,350.53	4,838.87	33.56	4,838.96	0.87	0.39	0.77
12,080.00	91.18	1.20	7,348.62	4,931.83	35.18	4,931.93	0.44	0.01	0.44
12,174.00	90.39	1.02	7,347.34	5,025.81	37.00	5,025.91	0.86	-0.84	-0.19
12,268.00	91.54	0.02	7,345.75	5,119.79	37.85	5,119.89	1.62	1.22	-1.06
12,362.00	91.48	359.28	7,343.28	5,213.75	37.27	5,213.86	0.79	-0.06	-0.79
12,457.00	92.01	359.69	7,340.38	5,308.70	36.42	5,308.80	0.71	0.56	0.43
12,550.00	89.44	357.86	7,339.21	5,401.66	34.43	5,401.75	3.39	-2.76	-1.97
12,644.00	88.88	357.71	7,340.58	5,495.58	30.80	5,495.66	0.62	-0.60	-0.16
12,738.00	88.85	357.65	7,342.45	5,589.49	27.00	5,589.55	0.07	-0.03	-0.06
12,832.00	88.38	357.72	7,344.72	5,683.38	23.20	5,683.43	0.51	-0.50	0.07
12,926.00	88.94	358.19	7,346.92	5,777.29	19.85	5,777.33	0.78	0.60	0.50
13,020.00	89.44	358.46	7,348.25	5,871.24	17.10	5,871.27	0.60	0.53	0.29
13,115.00	89.08	358.85	7,349.47	5,966.21	14.87	5,966.22	0.56	-0.38	0.41
13,209.00	90.67	359.84	7,349.68	6,060.20	13.80	6,060.21	1.99	1.69	1.05
13,304.00	89.75	0.46	7,349.33	6,155.20	14.04	6,155.21	1.17	-0.97	0.65
13,398.00	91.23	0.65	7,348.53	6,249.19	14.95	6,249.20	1.59	1.57	0.20
13,492.00	91.43	0.84	7,346.34	6,343.15	16.18	6,343.17	0.29	0.21	0.20
13,586.00	92.71	0.66	7,342.95	6,437.08	17.41	6,437.10	1.38	1.36	-0.19
13,680.00	91.65	1.34	7,339.37	6,531.00	19.05	6,531.02	1.34	-1.13	0.72
13,775.00	92.27	1.50	7,336.12	6,625.91	21.40	6,625.95	0.67	0.65	0.17
13,869.00	90.31	0.60	7,334.01	6,719.87	23.12	6,719.91	2.29	-2.09	-0.96
13,963.00	90.06	0.38	7,333.70	6,813.86	23.92	6,813.90	0.35	-0.27	-0.23



Phoenix Technology Services LP Survey Report



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Site: Road Runner Federal Com
Well: 1H
Wellbore: OH / Job #60726
Design: Surveys (Ensign 155)

Local Co-ordinate Reference: Well 1H
TVD Reference: GL + KB @ 3274.40usft (Ensign 155)
MD Reference: GL + KB @ 3274.40usft (Ensign 155)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass 5000 GCR

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
14,057.00	90.25	0 52	7,333.45	6,907.86	24.66	6,907.90	0.25	0 20	0 15
14,151.00	89.97	0 92	7,333.27	7,001.85	25.84	7,001.90	0.52	-0 30	0 43
14,245.00	90.22	0 99	7,333.11	7,095.84	27.41	7,095.89	0.28	0 27	0 07
14,339.00	90.73	1 03	7,332.33	7,189.82	29.07	7,189.88	0.54	0 54	0 04
14,434.00	90.81	0 22	7,331.06	7,284.81	30.10	7,284.87	0.86	0 08	-0 85
14,528.00	90.98	0 32	7,329.59	7,378.79	30.55	7,378.86	0.21	0 18	0 11
14,621.00	91.51	0 75	7,327.57	7,471.77	31.41	7,471.83	0.73	0 57	0 46
14,715.00	91.96	0 94	7,324.72	7,565.71	32.80	7,565.78	0.52	0 48	0 20
14,809.00	89.75	0 26	7,323.32	7,659.69	33.78	7,659.76	2.46	-2 35	-0 72
14,903.00	89.61	0 17	7,323.84	7,753.69	34.14	7,753.76	0.18	-0 15	-0 10
14,997.00	89.52	0 36	7,324.56	7,847.68	34 57	7,847.76	0.22	-0 10	0 20
15,091.00	89.52	0 31	7,325.35	7 941.68	35.12	7,941.76	0.05	0 00	-0 05
15,186.00	89.50	0 52	7,326.16	8,036.67	35.81	8,036.75	0.22	-0 02	0 22
15,280.00	89.24	0 71	7,327.19	8,130.66	36 82	8,130.74	0.34	-0 28	0 20
15,373.00	89.36	0 66	7,328.33	8,223.65	37.93	8,223.73	0.14	0 13	-0 05
15,467.00	89.50	0 71	7,329.26	8,317.64	39.05	8,317.73	0.16	0 15	0 05
15,561.00	89.97	1.11	7,329.70	8,411.62	40.55	8,411.72	0.66	0 50	0.43
15,655.00	89.89	2.04	7,329.81	8,505.59	43 13	8,505.69	0.99	-0.09	0.99
15,749.00	91.06	2.46	7,329.03	8,599.51	46 82	8,599.63	1.32	1.24	0.45
15,843.00	91.40	2.15	7,327.02	8,693.41	50 60	8,693.54	0.49	0.36	-0.33
15,938.00	91.26	359.19	7,324.81	8,788.37	51.71	8,788.50	3.12	-0.15	-3.12
16,032.00	91.99	358.70	7,322.14	8,882.32	49.98	8,882.44	0.94	0.78	-0.52
16,126.00	90.75	358.86	7,319.90	8,976.27	47.98	8,976.38	1.33	-1.32	0.17
16,220.00	91.68	358.71	7,317.90	9,070.22	45.99	9,070.33	1.00	0.99	-0.16
16,315.00	92.46	358.39	7,314.47	9,165.13	43.58	9,165.23	0.89	0.82	-0.34
16,409.00	90.50	359.16	7,312.04	9,259.07	41.58	9,259.16	2.24	-2.09	0.82
16,502.00	91.34	359.28	7,310.55	9,352.05	40.31	9,352.13	0.91	0.90	0.13
16,596.00	89.78	359.22	7,309.63	9,446.03	39.08	9,446.11	1.66	-1.66	-0.06
16,690.00	90.64	358.75	7,309.29	9,540.02	37.41	9,540.09	1.04	0.91	-0.50
16,784.00	91.73	358.75	7,307.34	9,633.97	35.36	9,634.04	1.16	1.16	0.00
16,878.00	89.41	359.04	7,306.41	9,727.94	33.55	9,728.00	2.49	-2.47	0.31
16,972.00	89.02	358.99	7,307.70	9,821.92	31.94	9,821.97	0.42	-0.41	-0.05
17,067.00	89.80	359.07	7,308.68	9,916.90	30.33	9,916.95	0.83	0.82	0.08
17,161.00	90.78	359.20	7,308.20	10,010.89	28 91	10,010.93	1.05	1.04	0.14
17,215.00	90.64	358.92	7,307.53	10,064.88	28.02	10,064.91	0.59	-0.26	-0.53
LTP									
17,256.00	90.53	358.70	7,307.11	10,105.87	27.17	10,105.90	0.59	-0.26	-0.53
17,349.00	90.45	358.96	7,306.32	10,198.84	25.27	10,198.86	0.29	-0.09	0.28
17,414.00	90.36	359.27	7,305.86	10,263.83	24.27	10,263.85	0.50	-0.14	0.48
Final Phoenix MWD Survey									
17,475.00	90.36	359.27	7,305.48	10,324.83	23.49	10,324.84	0.00	0.00	0.00
Projection to TD									



Phoenix Technology Services LP
Survey Report



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Design: Surveys (Ensign 155)

Local Co-ordinate Reference: Well 1H
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MD Reference: GL + KB @ 3274.40usft (Ensign 155)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass 5000 GCR

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
6,707.00	6,706.15	-18.52	-8.72	Tie In
6,816.00	6,815.15	-17.89	-8.39	First Phoenix MWD Survey
7,229.00	7,184.83	139.92	-0.71	FTP
17,215.00	7,307.53	10,064.88	28.02	LTP
17,414.00	7,305.86	10,263.83	24.27	Final Phoenix MWD Survey
17,475.00	7,305.48	10,324.83	23.49	Projection to TD