



30-015-44319

COG Operating LLC

Eddy County, NM (NAD27 NME)

Copperhead 31 Fee

20H

RECEIVED

OH / Job #61925

MAY 24 2018

DISTRICT II-ARTESIA O.C.D.

Design: Surveys (Ensign 155)

Standard Survey Report

14 December, 2017





Phoenix Technology Services LP

Survey Report



Company: COG Operating LLC
Project: Eddy County, NM (NAD27 NME)
Site: Copperhead 31 Fee
Well: 20H
Wellbore: OH / Job #61925
Design: Surveys (Ensign 155)

Local Co-ordinate Reference: Well 20H
TVD Reference: GL+KB @ 2952.70usft (Ensign 155)
MD Reference: GL+KB @ 2952.70usft (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	Copperhead 31 Fee		
Site Position:		Northing:	364,508.90 usft
From:	Map	Easting:	593,815.60 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 0' 6.43506 N
		Longitude:	104° 1' 50.49092 W
		Grid Convergence:	0.16 °

Well	20H		
Well Position	+N/-S	0.00 usft	Northing:
	+E/-W	0.00 usft	Easting:
Position Uncertainty	0.00 usft	Wellhead Elevation:	0.00 usft
		Latitude:	32° 0' 6.43506 N
		Longitude:	104° 1' 50.49092 W
		Ground Level:	2,928.70 usft

Wellbore	OH / Job #61925				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	User Defined	10/13/2017	7.05	59.72	47,968

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	0.19	

Survey Program	Date 12/14/2017				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	9,748.41	Scientific Gyro Surveys (OH / Job #61925)	Scientific Gyro	Scientific Drilling Intl. Standard Wireline Keeper	
9,780.00	21,159.00	Phoenix MWD Surveys (OH / Job #61925)	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	0.57	3.95	100.00	0.50	0.03	0.50	0.57	0.57	0.00
125.00	0.81	12.21	125.00	0.79	0.08	0.79	1.04	0.96	33.04
150.00	1.09	22.66	149.99	1.19	0.21	1.19	1.31	1.12	41.80
175.00	1.41	28.40	174.99	1.68	0.45	1.68	1.37	1.28	22.96
200.00	1.60	28.94	199.98	2.25	0.76	2.25	0.76	0.76	2.16
225.00	1.65	27.63	224.97	2.88	1.10	2.88	0.25	0.20	-5.24
250.00	1.82	25.99	249.96	3.55	1.44	3.56	0.71	0.68	-6.56
275.00	1.60	25.49	274.95	4.22	1.76	4.23	0.88	-0.88	-2.00
300.00	1.66	24.76	299.94	4.87	2.07	4.87	0.25	0.24	-2.92



Phoenix Technology Services LP

Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 20H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Site:	Copperhead 31 Fee	MD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Well:	20H	North Reference:	Grid
Wellbore:	OH / Job #61925	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	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)
325.00	1.66	22.78	324.93	5.53	2.36	5.54	0.23	0.00	-7.92
350.00	1.31	17.81	349.92	6.14	2.58	6.14	1.49	-1.40	-19.88
375.00	1.16	12.14	374.91	6.66	2.73	6.66	0.77	-0.60	-22.68
400.00	1.11	11.23	399.91	7.14	2.83	7.15	0.21	-0.20	-3.64
425.00	1.10	9.67	424.90	7.61	2.91	7.62	0.13	-0.04	-6.24
450.00	1.12	8.48	449.90	8.09	2.99	8.10	0.12	0.08	-4.76
475.00	1.16	5.63	474.89	8.59	3.05	8.60	0.28	0.16	-11.40
500.00	1.07	2.82	499.89	9.07	3.09	9.08	0.42	-0.36	-11.24
525.00	0.97	0.88	524.88	9.52	3.10	9.53	0.42	-0.40	-7.76
550.00	0.95	359.70	549.88	9.93	3.10	9.94	0.11	-0.08	-4.72
575.00	1.19	2.28	574.88	10.40	3.11	10.41	0.98	0.96	10.32
600.00	1.19	2.78	599.87	10.92	3.14	10.93	0.04	0.00	2.00
625.00	1.19	358.03	624.86	11.44	3.14	11.45	0.39	0.00	-19.00
650.00	1.25	359.73	649.86	11.97	3.13	11.98	0.28	0.24	6.80
675.00	1.10	357.01	674.85	12.48	3.12	12.49	0.64	-0.60	-10.88
700.00	1.11	2.67	699.85	12.96	3.11	12.97	0.44	0.04	22.64
725.00	1.16	1.28	724.84	13.46	3.13	13.47	0.23	0.20	-5.56
750.00	1.13	359.39	749.84	13.96	3.13	13.97	0.19	-0.12	-7.56
775.00	1.14	358.51	774.83	14.45	3.12	14.46	0.08	0.04	-3.52
800.00	1.23	356.06	799.83	14.97	3.10	14.98	0.41	0.36	-9.80
825.00	1.12	357.76	824.82	15.48	3.07	15.49	0.46	-0.44	6.80
850.00	1.15	0.20	849.82	15.98	3.06	15.99	0.23	0.12	9.76
875.00	1.08	357.25	874.81	16.46	3.05	16.47	0.36	-0.28	-11.80
900.00	1.10	359.08	899.81	16.94	3.04	16.95	0.16	0.08	7.32
925.00	1.10	355.68	924.80	17.42	3.02	17.43	0.26	0.00	-13.60
950.00	1.25	359.06	949.80	17.93	2.99	17.94	0.66	0.60	13.52
975.00	1.18	357.01	974.79	18.46	2.98	18.47	0.33	-0.28	-8.20
1,000.00	1.14	359.26	999.79	18.97	2.96	18.97	0.24	-0.16	9.00
1,025.00	1.14	358.29	1,024.78	19.46	2.95	19.47	0.08	0.00	-3.88
1,050.00	1.15	357.62	1,049.78	19.96	2.93	19.97	0.07	0.04	-2.68
1,075.00	1.27	356.48	1,074.77	20.49	2.90	20.50	0.49	0.48	-4.56
1,100.00	1.25	355.30	1,099.77	21.04	2.86	21.05	0.13	-0.08	-4.72
1,125.00	1.24	355.63	1,124.76	21.58	2.82	21.59	0.05	-0.04	1.32
1,150.00	1.11	351.95	1,149.76	22.09	2.77	22.10	0.60	-0.52	-14.72
1,175.00	1.11	353.54	1,174.75	22.57	2.70	22.58	0.12	0.00	6.36
1,200.00	1.08	351.37	1,199.75	23.04	2.64	23.05	0.20	-0.12	-8.68
1,225.00	1.04	346.82	1,224.74	23.50	2.56	23.50	0.37	-0.16	-18.20
1,250.00	1.08	339.36	1,249.74	23.94	2.42	23.95	0.57	0.16	-29.84
1,275.00	1.00	330.31	1,274.73	24.35	2.23	24.35	0.73	-0.32	-36.20
1,300.00	1.04	321.70	1,299.73	24.71	1.98	24.72	0.63	0.16	-34.44
1,325.00	1.00	315.02	1,324.73	25.05	1.69	25.05	0.50	-0.16	-26.72
1,350.00	1.10	309.33	1,349.72	25.35	1.35	25.36	0.58	0.40	-22.76
1,375.00	1.22	304.16	1,374.72	25.65	0.94	25.66	0.64	0.48	-20.68



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Survey Report



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Site:	Copperhead 31 Fee	MD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Well:	20H	North Reference:	Grid
Wellbore:	OH / Job #61925	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	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)
1,400.00	1.36	298.62	1,399.71	25.95	0.46	25.95	0.75	0.56	-22.16
1,425.00	1.44	297.28	1,424.70	26.23	-0.08	26.23	0.35	0.32	-5.36
1,450.00	1.63	287.75	1,449.69	26.49	-0.70	26.48	1.27	0.76	-38.12
1,475.00	1.65	282.54	1,474.68	26.67	-1.39	26.67	0.60	0.08	-20.84
1,500.00	1.77	282.65	1,499.67	26.83	-2.12	26.83	0.48	0.48	0.44
1,525.00	1.88	284.67	1,524.66	27.02	-2.89	27.01	0.51	0.44	8.08
1,550.00	1.96	285.13	1,549.65	27.24	-3.70	27.23	0.33	0.32	1.84
1,575.00	2.04	282.29	1,574.63	27.44	-4.55	27.43	0.51	0.32	-11.36
1,600.00	2.16	280.68	1,599.61	27.63	-5.44	27.61	0.53	0.48	-6.44
1,625.00	2.20	277.85	1,624.60	27.78	-6.38	27.76	0.46	0.16	-11.32
1,650.00	2.13	277.90	1,649.58	27.91	-7.32	27.88	0.28	-0.28	0.20
1,675.00	2.15	278.43	1,674.56	28.04	-8.24	28.01	0.11	0.08	2.12
1,700.00	2.16	280.17	1,699.54	28.19	-9.17	28.16	0.26	0.04	6.96
1,725.00	2.09	279.42	1,724.53	28.35	-10.08	28.32	0.30	-0.28	-3.00
1,750.00	1.87	272.17	1,749.51	28.44	-10.94	28.40	1.33	-0.88	-29.00
1,775.00	1.50	260.68	1,774.50	28.40	-11.67	28.36	2.00	-1.48	-45.96
1,800.00	1.41	249.13	1,799.49	28.24	-12.28	28.20	1.22	-0.36	-46.20
1,825.00	1.26	249.21	1,824.49	28.03	-12.83	27.99	0.60	-0.60	0.32
1,850.00	1.14	239.43	1,849.48	27.81	-13.30	27.77	0.95	-0.48	-39.12
1,875.00	1.19	238.31	1,874.47	27.55	-13.73	27.50	0.22	0.20	-4.48
1,900.00	1.25	238.75	1,899.47	27.27	-14.19	27.22	0.24	0.24	1.76
1,925.00	1.25	235.27	1,924.46	26.97	-14.64	26.92	0.30	0.00	-13.92
1,950.00	1.21	234.49	1,949.46	26.66	-15.08	26.61	0.17	-0.16	-3.12
1,975.00	0.96	226.96	1,974.45	26.37	-15.45	26.32	1.15	-1.00	-30.12
2,000.00	0.72	222.35	1,999.45	26.11	-15.71	26.06	1.00	-0.96	-18.44
2,025.00	0.75	211.77	2,024.45	25.85	-15.90	25.80	0.56	0.12	-42.32
2,050.00	0.62	198.60	2,049.45	25.59	-16.03	25.53	0.81	-0.52	-52.68
2,075.00	0.59	192.16	2,074.44	25.33	-16.10	25.28	0.30	-0.12	-25.76
2,100.00	0.52	177.81	2,099.44	25.09	-16.12	25.04	0.62	-0.28	-57.40
2,125.00	0.56	176.40	2,124.44	24.86	-16.11	24.80	0.17	0.16	-5.64
2,150.00	0.60	174.28	2,149.44	24.61	-16.09	24.55	0.18	0.16	-8.48
2,175.00	0.49	168.77	2,174.44	24.37	-16.06	24.32	0.49	-0.44	-22.04
2,200.00	0.48	182.13	2,199.44	24.16	-16.04	24.11	0.45	-0.04	53.44
2,225.00	0.48	175.91	2,224.44	23.95	-16.04	23.90	0.21	0.00	-24.88
2,250.00	0.60	161.99	2,249.44	23.72	-15.99	23.67	0.71	0.48	-55.68
2,275.00	0.72	146.38	2,274.44	23.47	-15.86	23.41	0.86	0.48	-62.44
2,300.00	0.91	132.17	2,299.43	23.20	-15.63	23.15	1.10	0.76	-56.84
2,325.00	1.16	116.70	2,324.43	22.96	-15.25	22.91	1.49	1.00	-61.88
2,350.00	1.30	113.83	2,349.42	22.73	-14.77	22.68	0.61	0.56	-11.48
2,375.00	1.44	113.51	2,374.42	22.49	-14.22	22.44	0.56	0.56	-1.28
2,400.00	1.50	114.05	2,399.41	22.23	-13.63	22.18	0.25	0.24	2.16
2,425.00	1.69	106.31	2,424.40	21.99	-12.98	21.95	1.15	0.76	-30.96
2,450.00	1.78	106.03	2,449.39	21.78	-12.25	21.74	0.36	0.36	-1.12



Phoenix Technology Services LP
Survey Report



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Site:	Copperhead 31 Fee	MD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Well:	20H	North Reference:	Grid
Wellbore:	OH / Job #61925	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	Compass 5000 GCR

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)
2,475.00	1.90	106.04	2,474.37	21.56	-11.48	21.52	0.48	0.48	0.04
2,500.00	1.91	106.64	2,499.36	21.33	-10.68	21.29	0.09	0.04	2.40
2,525.00	1.85	108.50	2,524.35	21.08	-9.90	21.05	0.34	-0.24	7.44
2,550.00	1.89	104.41	2,549.33	20.85	-9.12	20.82	0.56	0.16	-16.36
2,575.00	1.85	105.43	2,574.32	20.64	-8.33	20.61	0.21	-0.16	4.08
2,600.00	1.79	101.48	2,599.31	20.45	-7.56	20.43	0.56	-0.24	-15.80
2,625.00	1.72	101.55	2,624.30	20.30	-6.81	20.28	0.28	-0.28	0.28
2,650.00	1.66	105.92	2,649.28	20.13	-6.10	20.11	0.57	-0.24	17.48
2,675.00	1.72	102.77	2,674.27	19.94	-5.38	19.93	0.44	0.24	-12.60
2,700.00	1.72	101.55	2,699.26	19.79	-4.65	19.77	0.15	0.00	-4.88
2,725.00	1.73	100.68	2,724.25	19.64	-3.91	19.63	0.11	0.04	-3.48
2,750.00	1.75	98.78	2,749.24	19.51	-3.16	19.50	0.24	0.08	-7.60
2,775.00	1.75	102.64	2,774.23	19.37	-2.41	19.36	0.47	0.00	15.44
2,800.00	1.70	99.14	2,799.22	19.23	-1.67	19.22	0.47	-0.20	-14.00
2,825.00	1.69	98.41	2,824.21	19.12	-0.94	19.11	0.10	-0.04	-2.92
2,850.00	1.66	100.95	2,849.20	18.99	-0.22	18.99	0.32	-0.12	10.16
2,875.00	1.47	110.92	2,874.19	18.81	0.43	18.81	1.33	-0.76	39.88
2,900.00	1.26	151.18	2,899.18	18.45	0.87	18.46	3.84	-0.84	161.04
2,925.00	1.54	172.97	2,924.17	17.88	1.04	17.88	2.39	1.12	87.16
2,950.00	1.62	177.37	2,949.16	17.19	1.10	17.20	0.58	0.32	17.60
2,975.00	1.55	180.16	2,974.15	16.50	1.11	16.51	0.42	-0.28	11.16
3,000.00	1.58	181.40	2,999.14	15.82	1.10	15.82	0.18	0.12	4.96
3,025.00	1.64	178.81	3,024.13	15.12	1.10	15.12	0.38	0.24	-10.36
3,050.00	1.70	183.26	3,049.12	14.39	1.09	14.39	0.57	0.24	17.80
3,075.00	1.59	177.42	3,074.11	13.67	1.08	13.68	0.80	-0.44	-23.36
3,100.00	1.63	179.25	3,099.10	12.97	1.10	12.97	0.26	0.16	7.32
3,125.00	1.57	182.02	3,124.09	12.27	1.10	12.28	0.39	-0.24	11.08
3,150.00	1.57	179.94	3,149.08	11.59	1.08	11.59	0.23	0.00	-8.32
3,175.00	1.63	182.18	3,174.07	10.89	1.07	10.89	0.35	0.24	8.96
3,200.00	1.70	183.22	3,199.06	10.16	1.04	10.17	0.30	0.28	4.16
3,225.00	1.63	180.39	3,224.05	9.44	1.01	9.44	0.43	-0.28	-11.32
3,250.00	1.71	185.94	3,249.04	8.71	0.97	8.72	0.72	0.32	22.20
3,275.00	1.58	182.29	3,274.03	8.00	0.92	8.00	0.67	-0.52	-14.60
3,300.00	1.59	182.69	3,299.02	7.31	0.89	7.31	0.06	0.04	1.60
3,325.00	1.69	181.17	3,324.01	6.59	0.87	6.59	0.44	0.40	-6.08
3,350.00	1.65	181.04	3,349.00	5.86	0.85	5.87	0.16	-0.16	-0.52
3,375.00	1.68	179.62	3,373.99	5.14	0.85	5.14	0.20	0.12	-5.68
3,400.00	1.54	179.57	3,398.98	4.43	0.85	4.44	0.56	-0.56	-0.20
3,425.00	1.52	181.11	3,423.97	3.77	0.85	3.77	0.18	-0.08	6.16
3,450.00	1.08	178.52	3,448.97	3.20	0.85	3.20	1.78	-1.76	-10.36
3,475.00	0.69	180.01	3,473.96	2.81	0.85	2.82	1.56	-1.56	5.96
3,500.00	0.61	182.31	3,498.96	2.53	0.85	2.53	0.34	-0.32	9.20
3,525.00	0.56	176.71	3,523.96	2.27	0.85	2.28	0.30	-0.20	-22.40
3,550.00	0.43	176.63	3,548.96	2.06	0.86	2.06	0.52	-0.52	-0.32



Phoenix Technology Services LP

Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 20H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Site:	Copperhead 31 Fee	MD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Well:	20H	North Reference:	Grid
Wellbore:	OH / Job #61925	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	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	0.38	180.26	3,573.96	1.88	0.87	1.89	0.22	-0.20	14.52
3,600.00	0.43	174.61	3,598.96	1.71	0.88	1.71	0.26	0.20	-22.60
3,625.00	0.46	177.49	3,623.96	1.51	0.89	1.52	0.15	0.12	11.52
3,650.00	0.43	177.84	3,648.96	1.32	0.90	1.32	0.12	-0.12	1.40
3,675.00	0.39	178.17	3,673.96	1.14	0.90	1.14	0.16	-0.16	1.32
3,700.00	0.43	183.45	3,698.96	0.96	0.90	0.96	0.22	0.16	21.12
3,725.00	0.35	170.47	3,723.95	0.79	0.91	0.80	0.47	-0.32	-51.92
3,750.00	0.42	176.02	3,748.95	0.63	0.93	0.63	0.32	0.28	22.20
3,775.00	0.55	176.73	3,773.95	0.41	0.94	0.42	0.52	0.52	2.84
3,800.00	0.41	174.34	3,798.95	0.21	0.96	0.21	0.57	-0.56	-9.56
3,825.00	0.46	179.75	3,823.95	0.02	0.96	0.02	0.26	0.20	21.64
3,850.00	0.38	164.81	3,848.95	-0.16	0.99	-0.16	0.54	-0.32	-59.76
3,875.00	0.42	173.63	3,873.95	-0.34	1.02	-0.33	0.29	0.16	35.28
3,900.00	0.41	175.35	3,898.95	-0.52	1.04	-0.51	0.06	-0.04	6.88
3,925.00	0.44	173.56	3,923.95	-0.70	1.05	-0.70	0.13	0.12	-7.16
3,950.00	0.39	178.90	3,948.95	-0.88	1.07	-0.88	0.25	-0.20	21.36
3,975.00	0.40	180.39	3,973.95	-1.05	1.07	-1.05	0.06	0.04	5.96
4,000.00	0.34	172.53	3,998.95	-1.21	1.08	-1.21	0.31	-0.24	-31.44
4,025.00	0.35	177.13	4,023.95	-1.36	1.09	-1.36	0.12	0.04	18.40
4,050.00	0.45	182.50	4,048.95	-1.54	1.09	-1.53	0.43	0.40	21.48
4,075.00	0.40	183.73	4,073.95	-1.72	1.08	-1.72	0.20	-0.20	4.92
4,100.00	0.47	190.58	4,098.94	-1.91	1.06	-1.91	0.35	0.28	27.40
4,125.00	0.32	171.22	4,123.94	-2.08	1.05	-2.08	0.80	-0.60	-77.44
4,150.00	0.39	186.83	4,148.94	-2.23	1.05	-2.23	0.48	0.28	62.44
4,175.00	0.46	182.73	4,173.94	-2.42	1.03	-2.42	0.31	0.28	-16.40
4,200.00	0.42	182.53	4,198.94	-2.61	1.02	-2.61	0.16	-0.16	-0.80
4,225.00	0.42	184.91	4,223.94	-2.79	1.01	-2.79	0.07	0.00	9.52
4,250.00	0.38	171.96	4,248.94	-2.97	1.02	-2.96	0.39	-0.16	-51.80
4,275.00	0.49	178.06	4,273.94	-3.16	1.03	-3.15	0.48	0.44	24.40
4,300.00	0.45	192.91	4,298.94	-3.36	1.01	-3.35	0.51	-0.16	59.40
4,325.00	0.48	180.22	4,323.94	-3.56	0.99	-3.56	0.43	0.12	-50.76
4,350.00	0.47	183.58	4,348.94	-3.77	0.98	-3.76	0.12	-0.04	13.44
4,375.00	0.41	188.79	4,373.94	-3.96	0.96	-3.95	0.29	-0.24	20.84
4,400.00	0.42	192.27	4,398.94	-4.13	0.93	-4.13	0.11	0.04	13.92
4,425.00	0.49	183.86	4,423.94	-4.33	0.90	-4.33	0.39	0.28	-33.64
4,450.00	0.40	184.46	4,448.93	-4.52	0.89	-4.52	0.36	-0.36	2.40
4,475.00	0.49	188.15	4,473.93	-4.72	0.87	-4.71	0.38	0.36	14.76
4,500.00	0.59	186.28	4,498.93	-4.95	0.84	-4.95	0.41	0.40	-7.48
4,525.00	0.51	193.01	4,523.93	-5.19	0.80	-5.18	0.41	-0.32	26.92
4,550.00	0.54	189.60	4,548.93	-5.41	0.75	-5.41	0.17	0.12	-13.64
4,575.00	0.49	193.73	4,573.93	-5.63	0.71	-5.63	0.25	-0.20	16.52
4,600.00	0.51	199.61	4,598.93	-5.84	0.65	-5.84	0.22	0.08	23.52
4,625.00	0.57	198.90	4,623.93	-6.06	0.57	-6.06	0.24	0.24	-2.84



Phoenix Technology Services LP
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 20H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Site:	Copperhead 31 Fee	MD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Well:	20H	North Reference:	Grid
Wellbore:	OH / Job #61925	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	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	0.53	196.54	4,648.93	-6.29	0.50	-6.29	0.18	-0.16	-9.44
4,675.00	0.54	199.64	4,673.93	-6.51	0.42	-6.51	0.12	0.04	12.40
4,700.00	0.60	199.20	4,698.92	-6.75	0.34	-6.75	0.24	0.24	-1.76
4,725.00	0.64	192.39	4,723.92	-7.01	0.27	-7.01	0.34	0.16	-27.24
4,750.00	0.64	196.64	4,748.92	-7.28	0.20	-7.28	0.19	0.00	17.00
4,775.00	0.60	202.60	4,773.92	-7.53	0.11	-7.53	0.30	-0.16	23.84
4,800.00	0.68	200.31	4,798.92	-7.79	0.01	-7.79	0.34	0.32	-9.16
4,825.00	0.72	203.66	4,823.92	-8.08	-0.11	-8.08	0.23	0.16	13.40
4,850.00	0.75	203.89	4,848.91	-8.37	-0.24	-8.37	0.12	0.12	0.92
4,875.00	0.80	207.08	4,873.91	-8.67	-0.38	-8.67	0.26	0.20	12.76
4,900.00	0.74	207.58	4,898.91	-8.97	-0.54	-8.97	0.24	-0.24	2.00
4,925.00	0.78	211.34	4,923.91	-9.26	-0.70	-9.26	0.26	0.16	15.04
4,950.00	0.61	209.99	4,948.91	-9.52	-0.86	-9.52	0.68	-0.68	-5.40
4,975.00	0.55	216.33	4,973.90	-9.73	-0.99	-9.74	0.35	-0.24	25.36
5,000.00	0.75	205.64	4,998.90	-9.98	-1.14	-9.98	0.93	-0.80	-42.76
5,025.00	0.80	206.67	5,023.90	-10.28	-1.28	-10.28	0.21	0.20	4.12
5,050.00	0.84	212.82	5,048.90	-10.59	-1.46	-10.60	0.39	0.16	24.60
5,075.00	0.63	201.34	5,073.90	-10.87	-1.61	-10.88	1.02	-0.84	-45.92
5,100.00	0.53	201.46	5,098.89	-11.11	-1.70	-11.11	0.40	-0.40	0.48
5,125.00	0.62	212.60	5,123.89	-11.33	-1.82	-11.34	0.57	0.36	44.56
5,150.00	0.69	212.77	5,148.89	-11.57	-1.97	-11.58	0.28	0.28	0.68
5,175.00	0.69	216.42	5,173.89	-11.82	-2.14	-11.83	0.18	0.00	14.60
5,200.00	0.76	218.74	5,198.89	-12.07	-2.34	-12.08	0.30	0.28	9.28
5,225.00	0.69	212.08	5,223.89	-12.33	-2.52	-12.33	0.44	-0.28	-26.64
5,250.00	0.65	208.77	5,248.88	-12.58	-2.67	-12.59	0.22	-0.16	-13.24
5,275.00	0.63	210.63	5,273.88	-12.82	-2.81	-12.83	0.12	-0.08	7.44
5,300.00	0.63	208.03	5,298.88	-13.06	-2.94	-13.07	0.11	0.00	-10.40
5,325.00	0.70	210.71	5,323.88	-13.31	-3.08	-13.32	0.31	0.28	10.72
5,350.00	0.75	214.94	5,348.88	-13.58	-3.26	-13.59	0.29	0.20	16.92
5,375.00	0.75	217.58	5,373.88	-13.84	-3.45	-13.85	0.14	0.00	10.56
5,400.00	0.69	214.99	5,398.87	-14.09	-3.64	-14.11	0.27	-0.24	-10.36
5,425.00	0.69	209.96	5,423.87	-14.35	-3.80	-14.36	0.24	0.00	-20.12
5,450.00	0.77	212.53	5,448.87	-14.62	-3.96	-14.63	0.35	0.32	10.28
5,475.00	0.78	210.86	5,473.87	-14.91	-4.14	-14.92	0.10	0.04	-6.68
5,500.00	0.74	210.55	5,498.86	-15.19	-4.31	-15.21	0.16	-0.16	-1.24
5,525.00	0.79	216.32	5,523.86	-15.47	-4.49	-15.49	0.37	0.20	23.08
5,550.00	0.77	207.58	5,548.86	-15.76	-4.67	-15.77	0.48	-0.08	-34.96
5,575.00	0.73	205.93	5,573.86	-16.05	-4.82	-16.07	0.18	-0.16	-6.60
5,600.00	0.78	203.57	5,598.86	-16.35	-4.96	-16.37	0.24	0.20	-9.44
5,625.00	0.85	195.84	5,623.85	-16.68	-5.08	-16.70	0.52	0.28	-30.92
5,650.00	0.86	195.11	5,648.85	-17.04	-5.18	-17.06	0.06	0.04	-2.92
5,675.00	0.93	189.41	5,673.85	-17.43	-5.26	-17.44	0.45	0.28	-22.80
5,700.00	1.05	179.57	5,698.84	-17.85	-5.29	-17.87	0.83	0.48	-39.36



Phoenix Technology Services LP
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 20H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Site:	Copperhead 31 Fee	MD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Well:	20H	North Reference:	Grid
Wellbore:	OH / Job #61925	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	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	1.20	185.00	5,723.84	-18.34	-5.31	-18.36	0.74	0.60	21.72
5,750.00	1.33	181.40	5,748.83	-18.89	-5.34	-18.91	0.61	0.52	-14.40
5,775.00	1.41	184.47	5,773.83	-19.49	-5.37	-19.51	0.43	0.32	12.28
5,800.00	1.45	183.46	5,798.82	-20.11	-5.42	-20.13	0.19	0.16	-4.04
5,825.00	1.42	182.66	5,823.81	-20.74	-5.45	-20.76	0.14	-0.12	-3.20
5,850.00	1.59	187.78	5,848.80	-21.39	-5.51	-21.41	0.87	0.68	20.48
5,875.00	1.64	184.55	5,873.79	-22.09	-5.59	-22.11	0.42	0.20	-12.92
5,900.00	1.81	189.37	5,898.78	-22.84	-5.68	-22.86	0.89	0.68	19.28
5,925.00	1.93	193.01	5,923.77	-23.64	-5.84	-23.66	0.68	0.48	14.56
5,950.00	1.97	193.42	5,948.75	-24.47	-6.03	-24.49	0.17	0.16	1.64
5,975.00	2.10	193.06	5,973.74	-25.33	-6.24	-25.35	0.52	0.52	-1.44
6,000.00	2.34	194.51	5,998.72	-26.27	-6.47	-26.29	0.99	0.96	5.80
6,025.00	2.49	195.91	6,023.70	-27.29	-6.74	-27.31	0.64	0.60	5.60
6,050.00	2.59	197.48	6,048.67	-28.35	-7.06	-28.37	0.49	0.40	6.28
6,075.00	2.59	197.93	6,073.65	-29.42	-7.41	-29.45	0.08	0.00	1.80
6,100.00	2.65	198.71	6,098.62	-30.51	-7.77	-30.53	0.28	0.24	3.12
6,125.00	2.56	195.14	6,123.59	-31.60	-8.10	-31.62	0.74	-0.36	-14.28
6,150.00	2.57	194.99	6,148.57	-32.68	-8.39	-32.70	0.05	0.04	-0.60
6,175.00	2.63	196.12	6,173.54	-33.77	-8.69	-33.80	0.32	0.24	4.52
6,200.00	2.65	197.63	6,198.52	-34.87	-9.03	-34.90	0.29	0.08	6.04
6,225.00	2.65	196.69	6,223.49	-35.97	-9.37	-36.01	0.17	0.00	-3.76
6,250.00	2.72	196.36	6,248.46	-37.10	-9.70	-37.13	0.29	0.28	-1.32
6,275.00	2.77	197.31	6,273.43	-38.24	-10.05	-38.28	0.27	0.20	3.80
6,300.00	2.79	196.81	6,298.40	-39.40	-10.40	-39.44	0.13	0.08	-2.00
6,325.00	2.85	194.76	6,323.37	-40.59	-10.74	-40.62	0.47	0.24	-8.20
6,350.00	2.99	194.78	6,348.34	-41.82	-11.06	-41.85	0.56	0.56	0.08
6,375.00	3.07	197.74	6,373.31	-43.09	-11.43	-43.12	0.70	0.32	11.84
6,400.00	3.06	196.12	6,398.27	-44.36	-11.82	-44.40	0.35	-0.04	-6.48
6,425.00	3.19	196.46	6,423.23	-45.67	-12.20	-45.71	0.53	0.52	1.36
6,450.00	3.15	195.69	6,448.20	-47.00	-12.59	-47.04	0.23	-0.16	-3.08
6,475.00	3.17	195.26	6,473.16	-48.33	-12.95	-48.37	0.12	0.08	-1.72
6,500.00	3.17	195.81	6,498.12	-49.66	-13.32	-49.70	0.12	0.00	2.20
6,525.00	3.12	195.54	6,523.08	-50.98	-13.69	-51.03	0.21	-0.20	-1.08
6,550.00	3.23	195.95	6,548.04	-52.31	-14.07	-52.36	0.45	0.44	1.64
6,575.00	3.24	195.28	6,573.00	-53.67	-14.45	-53.72	0.16	0.04	-2.68
6,600.00	3.16	195.78	6,597.96	-55.02	-14.82	-55.07	0.34	-0.32	2.00
6,625.00	3.16	197.14	6,622.93	-56.34	-15.21	-56.39	0.30	0.00	5.44
6,650.00	3.19	196.48	6,647.89	-57.66	-15.61	-57.72	0.19	0.12	-2.64
6,675.00	3.22	197.88	6,672.85	-59.00	-16.03	-59.05	0.34	0.12	5.60
6,700.00	3.09	196.99	6,697.81	-60.31	-16.44	-60.37	0.56	-0.52	-3.56
6,725.00	3.04	194.73	6,722.78	-61.60	-16.81	-61.65	0.52	-0.20	-9.04
6,750.00	3.09	196.74	6,747.74	-62.88	-17.17	-62.94	0.47	0.20	8.04
6,775.00	3.10	196.38	6,772.70	-64.18	-17.55	-64.24	0.09	0.04	-1.44
6,800.00	3.02	196.47	6,797.67	-65.46	-17.93	-65.52	0.32	-0.32	0.36



Phoenix Technology Services LP
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 20H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Site:	Copperhead 31 Fee	MD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Well:	20H	North Reference:	Grid
Wellbore:	OH / Job #61925	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	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)
6,825.00	3.06	196.02	6,822.63	-66.73	-18.30	-66.79	0.19	0.16	-1.80
6,850.00	3.00	193.85	6,847.60	-68.01	-18.64	-68.07	0.52	-0.24	-8.68
6,875.00	3.00	194.18	6,872.56	-69.28	-18.96	-69.34	0.07	0.00	1.32
6,900.00	3.05	195.32	6,897.53	-70.55	-19.29	-70.62	0.31	0.20	4.56
6,925.00	3.06	194.66	6,922.49	-71.84	-19.64	-71.90	0.15	0.04	-2.64
6,950.00	3.04	193.37	6,947.46	-73.13	-19.96	-73.20	0.29	-0.08	-5.16
6,975.00	3.05	193.36	6,972.42	-74.42	-20.27	-74.49	0.04	0.04	-0.04
7,000.00	3.18	194.51	6,997.38	-75.74	-20.60	-75.81	0.58	0.52	4.60
7,025.00	3.16	195.02	7,022.35	-77.08	-20.95	-77.15	0.14	-0.08	2.04
7,050.00	3.19	195.26	7,047.31	-78.41	-21.31	-78.48	0.13	0.12	0.96
7,075.00	3.32	194.66	7,072.27	-79.79	-21.68	-79.86	0.54	0.52	-2.40
7,100.00	3.39	194.75	7,097.22	-81.20	-22.05	-81.27	0.28	0.28	0.36
7,125.00	3.42	195.68	7,122.18	-82.63	-22.44	-82.71	0.25	0.12	3.72
7,150.00	3.39	197.20	7,147.14	-84.06	-22.86	-84.13	0.38	-0.12	6.08
7,175.00	3.47	197.53	7,172.09	-85.48	-23.30	-85.56	0.33	0.32	1.32
7,200.00	3.46	196.73	7,197.05	-86.93	-23.75	-87.01	0.20	-0.04	-3.20
7,225.00	3.21	196.33	7,222.00	-88.32	-24.16	-88.40	1.00	-1.00	-1.60
7,250.00	3.06	198.61	7,246.97	-89.63	-24.57	-89.71	0.78	-0.60	9.12
7,275.00	2.93	197.14	7,271.93	-90.87	-24.97	-90.95	0.60	-0.52	-5.88
7,300.00	2.90	194.43	7,296.90	-92.09	-25.32	-92.18	0.56	-0.12	-10.84
7,325.00	2.73	187.92	7,321.87	-93.29	-25.56	-93.38	1.45	-0.68	-26.04
7,350.00	2.70	184.55	7,346.84	-94.47	-25.69	-94.56	0.65	-0.12	-13.48
7,375.00	2.76	183.94	7,371.81	-95.66	-25.78	-95.74	0.27	0.24	-2.44
7,400.00	2.66	181.59	7,396.79	-96.84	-25.83	-96.92	0.60	-0.40	-9.40
7,425.00	2.68	179.85	7,421.76	-98.00	-25.85	-98.09	0.33	0.08	-6.96
7,450.00	2.69	181.30	7,446.73	-99.17	-25.86	-99.26	0.27	0.04	5.80
7,475.00	2.70	181.04	7,471.70	-100.35	-25.88	-100.44	0.06	0.04	-1.04
7,500.00	2.61	181.08	7,496.68	-101.51	-25.90	-101.59	0.36	-0.36	0.16
7,525.00	2.57	179.24	7,521.65	-102.64	-25.91	-102.72	0.37	-0.16	-7.36
7,550.00	2.47	177.27	7,546.63	-103.74	-25.88	-103.82	0.53	-0.40	-7.88
7,575.00	2.35	177.71	7,571.60	-104.79	-25.83	-104.87	0.49	-0.48	1.76
7,600.00	2.22	178.61	7,596.58	-105.78	-25.80	-105.87	0.54	-0.52	3.60
7,625.00	2.11	177.84	7,621.57	-106.73	-25.77	-106.81	0.46	-0.44	-3.08
7,650.00	1.98	178.90	7,646.55	-107.62	-25.74	-107.70	0.54	-0.52	4.24
7,675.00	1.94	178.62	7,671.54	-108.47	-25.72	-108.56	0.16	-0.16	-1.12
7,700.00	1.88	178.95	7,696.52	-109.31	-25.71	-109.39	0.24	-0.24	1.32
7,725.00	1.91	176.50	7,721.51	-110.13	-25.67	-110.22	0.35	0.12	-9.80
7,750.00	1.87	178.55	7,746.50	-110.96	-25.64	-111.04	0.31	-0.16	8.20
7,775.00	1.87	180.57	7,771.48	-111.77	-25.63	-111.86	0.26	0.00	8.08
7,800.00	1.91	179.32	7,796.47	-112.60	-25.63	-112.68	0.23	0.16	-5.00
7,825.00	1.94	181.52	7,821.45	-113.44	-25.64	-113.52	0.32	0.12	8.80
7,850.00	1.96	183.46	7,846.44	-114.28	-25.67	-114.37	0.28	0.08	7.76
7,875.00	2.20	185.51	7,871.42	-115.19	-25.75	-115.27	1.00	0.96	8.20



Phoenix Technology Services LP

Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 20H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Site:	Copperhead 31 Fee	MD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Well:	20H	North Reference:	Grid
Wellbore:	OH / Job #61925	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	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)
7,900.00	2.43	184.63	7,896.40	-116.20	-25.83	-116.28	0.93	0.92	-3.52
7,925.00	2.62	185.68	7,921.38	-117.29	-25.93	-117.38	0.78	0.76	4.20
7,950.00	2.67	185.22	7,946.35	-118.44	-26.04	-118.53	0.22	0.20	-1.84
7,975.00	2.74	185.27	7,971.32	-119.62	-26.15	-119.70	0.28	0.28	0.20
8,000.00	2.73	183.35	7,996.30	-120.80	-26.24	-120.89	0.37	-0.04	-7.68
8,025.00	2.72	181.65	8,021.27	-121.99	-26.29	-122.08	0.33	-0.04	-6.80
8,050.00	2.76	179.03	8,046.24	-123.19	-26.30	-123.27	0.53	0.16	-10.48
8,075.00	2.75	181.10	8,071.21	-124.39	-26.30	-124.47	0.40	-0.04	8.28
8,100.00	2.75	180.54	8,096.18	-125.59	-26.32	-125.67	0.11	0.00	-2.24
8,125.00	2.76	178.62	8,121.15	-126.79	-26.31	-126.88	0.37	0.04	-7.68
8,150.00	2.64	180.40	8,146.12	-127.97	-26.30	-128.05	0.59	-0.48	7.12
8,175.00	2.70	179.51	8,171.10	-129.13	-26.30	-129.22	0.29	0.24	-3.56
8,200.00	2.62	179.06	8,196.07	-130.29	-26.28	-130.38	0.33	-0.32	-1.80
8,225.00	2.58	182.23	8,221.04	-131.42	-26.30	-131.51	0.60	-0.16	12.68
8,250.00	2.60	179.34	8,246.02	-132.55	-26.31	-132.64	0.53	0.08	-11.56
8,275.00	2.62	179.77	8,270.99	-133.69	-26.30	-133.78	0.11	0.08	1.72
8,300.00	2.50	178.98	8,295.97	-134.81	-26.29	-134.90	0.50	-0.48	-3.16
8,325.00	2.57	179.90	8,320.94	-135.91	-26.28	-136.00	0.32	0.28	3.68
8,350.00	2.68	178.84	8,345.92	-137.06	-26.27	-137.15	0.48	0.44	-4.24
8,375.00	2.66	180.13	8,370.89	-138.22	-26.26	-138.31	0.25	-0.08	5.16
8,400.00	2.58	178.25	8,395.86	-139.37	-26.24	-139.45	0.47	-0.32	-7.52
8,425.00	2.49	181.02	8,420.84	-140.47	-26.23	-140.56	0.61	-0.36	11.08
8,450.00	2.34	181.19	8,445.82	-141.53	-26.25	-141.61	0.60	-0.60	0.68
8,475.00	2.30	183.38	8,470.80	-142.54	-26.29	-142.62	0.39	-0.16	8.76
8,500.00	2.44	186.70	8,495.78	-143.57	-26.38	-143.65	0.78	0.56	13.28
8,525.00	2.36	185.60	8,520.75	-144.61	-26.50	-144.69	0.37	-0.32	-4.40
8,550.00	2.42	185.66	8,545.73	-145.64	-26.60	-145.73	0.24	0.24	0.24
8,575.00	2.48	185.04	8,570.71	-146.71	-26.70	-146.80	0.26	0.24	-2.48
8,600.00	2.69	186.11	8,595.68	-147.83	-26.81	-147.92	0.86	0.84	4.28
8,625.00	2.79	185.27	8,620.66	-149.02	-26.93	-149.11	0.43	0.40	-3.36
8,650.00	2.77	187.04	8,645.63	-150.22	-27.06	-150.31	0.35	-0.08	7.08
8,675.00	2.73	187.36	8,670.60	-151.41	-27.21	-151.50	0.17	-0.16	1.28
8,700.00	2.64	186.23	8,695.57	-152.58	-27.35	-152.67	0.42	-0.36	-4.52
8,725.00	2.57	187.28	8,720.54	-153.71	-27.48	-153.80	0.34	-0.28	4.20
8,750.00	2.61	187.87	8,745.52	-154.83	-27.63	-154.92	0.19	0.16	2.36
8,775.00	2.51	189.25	8,770.49	-155.93	-27.79	-156.02	0.47	-0.40	5.52
8,800.00	2.49	189.43	8,795.47	-157.01	-27.97	-157.10	0.09	-0.08	0.72
8,825.00	2.41	188.96	8,820.45	-158.06	-28.14	-158.15	0.33	-0.32	-1.88
8,850.00	2.54	188.39	8,845.42	-159.13	-28.31	-159.22	0.53	0.52	-2.28
8,875.00	2.44	189.16	8,870.40	-160.20	-28.47	-160.29	0.42	-0.40	3.08
8,900.00	2.42	192.09	8,895.38	-161.24	-28.67	-161.34	0.50	-0.08	11.72
8,925.00	2.41	193.67	8,920.35	-162.27	-28.90	-162.36	0.27	-0.04	6.32
8,950.00	2.30	193.42	8,945.33	-163.27	-29.14	-163.36	0.44	-0.44	-1.00



Phoenix Technology Services LP

Survey Report



Company: COG Operating LLC
Project: Eddy County, NM (NAD27 NME)
Site: Copperhead 31 Fee
Well: 20H
Wellbore: OH / Job #61925
Design: Surveys (Ensign 155)

Local Co-ordinate Reference: Well 20H
TVD Reference: GL+KB @ 2952.70usft (Ensign 155)
MD Reference: GL+KB @ 2952.70usft (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)
8,975.00	2.34	194.83	8,970.31	-164.25	-29.39	-164.35	0.28	0.16	5.64
9,000.00	2.32	197.88	8,995.29	-165.22	-29.67	-165.32	0.50	-0.08	12.20
9,025.00	2.37	198.34	9,020.27	-166.20	-29.99	-166.30	0.21	0.20	1.84
9,050.00	2.31	197.87	9,045.25	-167.17	-30.31	-167.27	0.25	-0.24	-1.88
9,075.00	2.31	198.09	9,070.23	-168.13	-30.62	-168.23	0.04	0.00	0.88
9,100.00	2.23	197.75	9,095.21	-169.07	-30.93	-169.17	0.32	-0.32	-1.36
9,125.00	2.19	197.96	9,120.19	-169.99	-31.22	-170.09	0.16	-0.16	0.84
9,150.00	2.24	199.80	9,145.17	-170.90	-31.53	-171.00	0.35	0.20	7.36
9,175.00	2.14	198.64	9,170.16	-171.80	-31.85	-171.91	0.44	-0.40	-4.64
9,200.00	2.32	200.64	9,195.14	-172.72	-32.18	-172.82	0.78	0.72	8.00
9,225.00	2.40	198.42	9,220.12	-173.69	-32.52	-173.79	0.49	0.32	-8.88
9,250.00	2.47	198.51	9,245.09	-174.69	-32.86	-174.80	0.28	0.28	0.36
9,275.00	2.58	201.59	9,270.07	-175.73	-33.23	-175.84	0.70	0.44	12.32
9,300.00	2.68	204.11	9,295.04	-176.79	-33.68	-176.90	0.61	0.40	10.08
9,325.00	2.57	199.95	9,320.02	-177.85	-34.11	-177.96	0.88	-0.44	-16.64
9,350.00	2.56	198.80	9,344.99	-178.90	-34.48	-179.01	0.21	-0.04	-4.60
9,375.00	2.53	199.56	9,369.97	-179.95	-34.85	-180.06	0.18	-0.12	3.04
9,400.00	2.58	196.69	9,394.94	-181.01	-35.19	-181.12	0.55	0.20	-11.48
9,425.00	2.55	195.18	9,419.92	-182.08	-35.50	-182.20	0.30	-0.12	-6.04
9,450.00	2.65	195.59	9,444.89	-183.18	-35.80	-183.30	0.41	0.40	1.64
9,475.00	2.57	195.01	9,469.86	-184.28	-36.10	-184.39	0.34	-0.32	-2.32
9,500.00	2.60	195.80	9,494.84	-185.36	-36.40	-185.48	0.19	0.12	3.16
9,525.00	2.76	194.65	9,519.81	-186.49	-36.71	-186.61	0.68	0.64	-4.60
9,550.00	2.56	190.24	9,544.78	-187.62	-36.96	-187.74	1.14	-0.80	-17.64
9,575.00	2.61	189.10	9,569.76	-188.73	-37.15	-188.86	0.29	0.20	-4.56
9,600.00	2.50	188.64	9,594.73	-189.83	-37.32	-189.96	0.45	-0.44	-1.84
9,625.00	2.60	185.96	9,619.71	-190.94	-37.46	-191.06	0.62	0.40	-10.72
9,650.00	2.88	188.96	9,644.68	-192.12	-37.62	-192.25	1.26	1.12	12.00
9,675.00	2.76	186.12	9,669.65	-193.34	-37.78	-193.47	0.74	-0.48	-11.36
9,700.00	2.82	185.44	9,694.62	-194.55	-37.90	-194.68	0.27	0.24	-2.72
9,725.00	2.75	181.20	9,719.59	-195.76	-37.97	-195.89	0.87	-0.28	-16.96
9,748.41	2.74	187.05	9,742.98	-196.88	-38.05	-197.01	1.20	-0.04	24.99
Tie In									
9,868.00	2.51	188.60	9,862.44	-202.31	-38.80	-202.43	0.20	-0.19	1.30
First Phoenix MWD Survey									
9,963.00	2.44	189.28	9,957.35	-206.36	-39.43	-206.49	0.08	-0.07	0.72
10,057.00	1.12	180.83	10,051.30	-209.25	-39.77	-209.38	1.43	-1.40	-8.99
10,088.00	1.74	45.47	10,082.30	-209.23	-39.44	-209.35	8.57	2.00	-436.65
10,119.00	4.10	36.48	10,113.26	-208.00	-38.44	-208.13	7.73	7.61	-29.00
10,150.00	5.89	30.84	10,144.14	-205.75	-36.97	-205.87	5.98	5.77	-18.19
10,181.00	8.04	23.31	10,174.91	-202.39	-35.29	-202.51	7.52	6.94	-24.29
10,213.00	10.72	18.19	10,206.48	-197.51	-33.48	-197.62	8.76	8.38	-16.00
10,244.00	13.65	14.34	10,236.78	-191.22	-31.67	-191.33	9.80	9.45	-12.42
10,276.00	16.81	9.30	10,267.65	-182.99	-29.99	-183.09	10.70	9.88	-15.75



Phoenix Technology Services LP
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 20H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Site:	Copperhead 31 Fee	MD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Well:	20H	North Reference:	Grid
Wellbore:	OH / Job #61925	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	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)
10,307.00	19.98	8.41	10,297.06	-173.33	-28.49	-173.42	10.27	10.23	-2.87
10,338.00	22.66	8.54	10,325.94	-162.18	-26.83	-162.27	8.65	8.65	0.42
10,370.00	25.18	7.21	10,355.19	-149.33	-25.06	-149.41	8.05	7.88	-4.16
10,401.00	27.17	5.37	10,383.01	-135.74	-23.57	-135.82	6.93	6.42	-5.94
10,433.00	28.28	8.29	10,411.33	-120.96	-21.79	-121.04	5.48	3.47	9.13
10,464.00	30.54	9.50	10,438.34	-105.93	-19.43	-105.99	7.54	7.29	3.90
10,495.00	36.39	7.97	10,464.19	-89.04	-16.86	-89.09	19.06	18.87	-4.94
10,526.00	41.47	6.86	10,488.30	-69.73	-14.35	-69.77	16.54	16.39	-3.58
10,558.00	46.96	5.58	10,511.22	-47.55	-11.95	-47.59	17.38	17.16	-4.00
10,589.00	52.70	3.22	10,531.21	-23.94	-10.15	-23.98	19.41	18.52	-7.61
10,620.00	58.57	2.96	10,548.70	1.60	-8.78	1.57	18.95	18.94	-0.84
10,652.00	64.69	3.58	10,563.90	29.70	-7.17	29.67	19.20	19.13	1.94
10,683.00	70.63	3.42	10,575.68	58.30	-5.42	58.28	19.17	19.16	-0.52
10,712.00	77.41	2.97	10,583.66	86.12	-3.87	86.11	23.43	23.38	-1.55
10,743.00	80.77	2.46	10,589.53	116.52	-2.43	116.51	10.96	10.84	-1.65
10,774.00	81.82	2.55	10,594.22	147.14	-1.09	147.13	3.40	3.39	0.29
10,805.00	82.98	1.77	10,598.32	177.84	0.07	177.84	4.50	3.74	-2.52
10,837.00	86.13	359.59	10,601.35	209.69	0.45	209.69	11.95	9.84	-6.81
10,868.00	88.10	358.49	10,602.91	240.64	-0.07	240.64	7.28	6.35	-3.55
10,900.00	89.13	358.34	10,603.69	272.62	-0.96	272.62	3.25	3.22	-0.47
10,962.00	89.36	358.99	10,604.50	334.60	-2.40	334.59	1.11	0.37	1.05
11,055.00	88.60	359.58	10,606.16	427.58	-3.56	427.56	1.03	-0.82	0.63
11,149.00	87.71	1.84	10,609.19	521.51	-2.40	521.50	2.58	-0.95	2.40
11,243.00	88.29	2.93	10,612.47	615.37	1.51	615.37	1.31	0.62	1.16
11,336.00	87.96	1.13	10,615.51	708.26	4.81	708.27	1.97	-0.35	-1.94
11,427.00	88.07	0.83	10,618.66	799.19	6.36	799.21	0.35	0.12	-0.33
11,517.00	88.54	0.52	10,621.32	889.15	7.42	889.17	0.63	0.52	-0.34
11,607.00	87.50	358.39	10,624.43	979.08	6.57	979.10	2.63	-1.16	-2.37
11,696.00	89.89	359.55	10,626.46	1,068.04	4.97	1,068.05	2.98	2.69	1.30
11,786.00	91.59	1.47	10,625.30	1,158.02	5.77	1,158.03	2.85	1.89	2.13
11,876.00	92.50	1.04	10,622.09	1,247.94	7.74	1,247.96	1.12	1.01	-0.48
11,966.00	90.20	0.53	10,619.97	1,337.90	8.97	1,337.92	2.62	-2.56	-0.57
12,058.00	90.56	1.50	10,619.36	1,429.88	10.60	1,429.91	1.12	0.39	1.05
12,147.00	87.34	0.60	10,620.99	1,518.84	12.23	1,518.87	3.76	-3.62	-1.01
12,239.00	86.41	359.77	10,626.00	1,610.70	12.53	1,610.73	1.35	-1.01	-0.90
12,333.00	90.92	359.00	10,628.19	1,704.64	11.52	1,704.67	4.87	4.80	-0.82
12,427.00	91.26	358.88	10,626.40	1,798.61	9.78	1,798.63	0.38	0.36	-0.13
12,521.00	85.63	358.85	10,628.95	1,892.52	7.92	1,892.53	5.99	-5.99	-0.03
12,615.00	89.86	359.76	10,632.65	1,986.42	6.78	1,986.43	4.60	4.50	0.97
12,709.00	89.21	358.77	10,633.41	2,080.40	5.58	2,080.41	1.26	-0.69	-1.05
12,802.00	88.49	359.18	10,635.28	2,173.37	3.91	2,173.37	0.89	-0.77	0.44
12,896.00	90.45	358.82	10,636.15	2,267.35	2.27	2,267.34	2.12	2.09	-0.38
12,990.00	89.41	355.45	10,636.27	2,361.21	-2.43	2,361.19	3.75	-1.11	-3.59



Phoenix Technology Services LP

Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 20H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Site:	Copperhead 31 Fee	MD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Well:	20H	North Reference:	Grid
Wellbore:	OH / Job #61925	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	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)
13,084.00	89.91	357.49	10,636.82	2,455.03	-8.21	2,454.99	2.23	0.53	2.17
13,178.00	89.89	358.06	10,636.99	2,548.96	-11.86	2,548.90	0.61	-0.02	0.61
13,272.00	86.33	357.62	10,640.09	2,642.82	-15.40	2,642.76	3.82	-3.79	-0.47
13,366.00	89.83	1.18	10,643.24	2,736.74	-16.38	2,736.67	5.31	3.72	3.79
13,460.00	91.88	1.22	10,641.83	2,830.70	-14.41	2,830.64	2.18	2.18	0.04
13,554.00	87.93	359.87	10,641.99	2,924.68	-13.52	2,924.61	4.44	-4.20	-1.44
13,648.00	90.06	0.26	10,643.64	3,018.66	-13.41	3,018.59	2.30	2.27	0.41
13,740.00	90.28	0.87	10,643.37	3,110.65	-12.51	3,110.59	0.70	0.24	0.66
13,834.00	88.10	359.74	10,644.69	3,204.63	-12.01	3,204.57	2.61	-2.32	-1.20
13,928.00	88.35	359.13	10,647.61	3,298.58	-12.93	3,298.52	0.70	0.27	-0.65
14,021.00	91.20	0.00	10,647.97	3,391.57	-13.64	3,391.50	3.20	3.06	0.94
14,114.00	90.59	359.11	10,646.52	3,484.55	-14.36	3,484.49	1.16	-0.66	-0.96
14,208.00	93.25	1.36	10,643.37	3,578.48	-13.98	3,578.42	3.71	2.83	2.39
14,303.00	91.43	2.08	10,639.49	3,673.36	-11.13	3,673.30	2.06	-1.92	0.76
14,397.00	90.61	2.24	10,637.82	3,767.28	-7.59	3,767.23	0.89	-0.87	0.17
14,491.00	92.38	2.54	10,635.37	3,861.16	-3.67	3,861.12	1.91	1.88	0.32
14,585.00	91.18	1.41	10,632.45	3,955.05	-0.43	3,955.03	1.75	-1.28	-1.20
14,679.00	88.60	0.16	10,632.63	4,049.03	0.86	4,049.02	3.05	-2.74	-1.33
14,773.00	87.79	0.35	10,635.59	4,142.99	1.28	4,142.97	0.89	-0.86	0.20
14,867.00	86.89	0.43	10,639.95	4,236.88	1.92	4,236.86	0.96	-0.96	0.09
14,962.00	86.36	0.66	10,645.54	4,331.71	2.82	4,331.70	0.61	-0.56	0.24
15,056.00	87.45	0.46	10,650.62	4,425.57	3.73	4,425.56	1.18	1.16	-0.21
15,150.00	84.93	359.41	10,656.86	4,519.35	3.63	4,519.34	2.90	-2.68	-1.12
15,244.00	94.06	0.32	10,657.69	4,613.25	3.41	4,613.23	9.76	9.71	0.97
15,338.00	91.77	0.39	10,652.91	4,707.12	3.99	4,707.11	2.44	-2.44	0.07
15,430.00	89.50	0.48	10,651.89	4,799.10	4.69	4,799.09	2.47	-2.47	0.10
15,524.00	90.73	1.13	10,651.70	4,893.09	6.01	4,893.09	1.48	1.31	0.69
15,618.00	90.42	1.66	10,650.76	4,987.06	8.30	4,987.06	0.65	-0.33	0.56
15,712.00	87.65	1.48	10,652.34	5,081.00	10.87	5,081.01	2.95	-2.95	-0.19
15,806.00	88.15	2.99	10,655.79	5,174.86	14.54	5,174.88	1.69	0.53	1.61
15,900.00	90.50	5.60	10,656.89	5,268.58	21.57	5,268.62	3.74	2.50	2.78
15,993.00	89.05	3.36	10,657.26	5,361.29	28.84	5,361.35	2.87	-1.56	-2.41
16,087.00	88.41	0.76	10,659.34	5,455.19	32.22	5,455.27	2.85	-0.68	-2.77
16,180.00	87.53	0.59	10,662.64	5,548.13	33.31	5,548.21	0.96	-0.95	-0.18
16,274.00	87.20	0.87	10,666.96	5,642.02	34.51	5,642.10	0.46	-0.35	0.30
16,368.00	87.76	359.99	10,671.09	5,735.93	35.21	5,736.01	1.11	0.60	-0.94
16,462.00	88.35	0.94	10,674.28	5,829.87	35.97	5,829.95	1.19	0.63	1.01
16,556.00	88.54	1.40	10,676.83	5,923.81	37.89	5,923.91	0.53	0.20	0.49
16,650.00	88.01	0.23	10,679.66	6,017.76	39.23	6,017.85	1.37	-0.56	-1.24
16,744.00	89.52	0.15	10,681.69	6,111.73	39.54	6,111.83	1.61	1.61	-0.09
16,838.00	90.06	358.72	10,682.03	6,205.72	38.61	6,205.82	1.63	0.57	-1.52
16,932.00	90.89	358.88	10,681.25	6,299.70	36.65	6,299.79	0.90	0.88	0.17
17,026.00	91.18	358.79	10,679.56	6,393.67	34.74	6,393.75	0.32	0.31	-0.10
17,120.00	91.01	358.83	10,677.76	6,487.63	32.78	6,487.70	0.19	-0.18	0.04



Phoenix Technology Services LP

Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 20H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Site:	Copperhead 31 Fee	MD Reference:	GL+KB @ 2952.70usft (Ensign 155)
Well:	20H	North Reference:	Grid
Wellbore:	OH / Job #61925	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	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)
17,213.00	89.11	358.74	10,677.66	6,580.60	30.81	6,580.67	2.05	-2.04	-0.10
17,308.00	90.73	359.79	10,677.79	6,675.59	29.59	6,675.65	2.03	1.71	1.11
17,402.00	91.04	359.53	10,676.34	6,769.58	29.04	6,769.64	0.43	0.33	-0.28
17,496.00	88.71	356.99	10,676.55	6,863.52	26.18	6,863.57	3.67	-2.48	-2.70
17,590.00	87.28	356.01	10,679.84	6,957.28	20.45	6,957.31	1.84	-1.52	-1.04
17,683.00	93.84	359.39	10,678.93	7,050.14	16.72	7,050.16	7.93	7.05	3.63
17,777.00	92.80	359.63	10,673.48	7,143.98	15.91	7,143.99	1.14	-1.11	0.26
17,872.00	91.43	359.75	10,669.98	7,238.91	15.40	7,238.92	1.45	-1.44	0.13
17,965.00	88.82	358.87	10,669.78	7,331.89	14.28	7,331.90	2.96	-2.81	-0.95
18,060.00	88.80	0.22	10,671.75	7,426.87	13.53	7,426.87	1.42	-0.02	1.42
18,154.00	89.75	1.27	10,672.94	7,520.85	14.75	7,520.86	1.51	1.01	1.12
18,248.00	91.23	1.35	10,672.13	7,614.82	16.90	7,614.83	1.58	1.57	0.09
18,341.00	90.67	1.02	10,670.59	7,707.79	18.82	7,707.81	0.70	-0.60	-0.35
18,436.00	89.19	0.56	10,670.71	7,802.77	20.13	7,802.80	1.63	-1.56	-0.48
18,530.00	90.64	1.83	10,670.85	7,896.75	22.09	7,896.78	2.05	1.54	1.35
18,623.00	89.47	1.32	10,670.76	7,989.71	24.65	7,989.75	1.37	-1.26	-0.55
18,717.00	89.41	1.59	10,671.68	8,083.68	27.03	8,083.72	0.29	-0.06	0.29
18,811.00	89.21	2.43	10,672.81	8,177.61	30.33	8,177.67	0.92	-0.21	0.89
18,905.00	89.94	4.53	10,673.51	8,271.43	36.04	8,271.50	2.37	0.78	2.23
18,999.00	90.11	4.58	10,673.47	8,365.13	43.50	8,365.23	0.19	0.18	0.05
19,093.00	89.27	3.74	10,673.97	8,458.88	50.32	8,459.00	1.26	-0.89	-0.89
19,187.00	88.82	1.79	10,675.54	8,552.75	54.85	8,552.89	2.13	-0.48	-2.07
19,281.00	89.19	1.32	10,677.17	8,646.70	57.40	8,646.85	0.64	0.39	-0.50
19,376.00	87.53	0.50	10,679.89	8,741.65	58.91	8,741.80	1.95	-1.75	-0.86
19,470.00	87.48	358.08	10,683.98	8,835.55	57.75	8,835.69	2.57	-0.05	-2.57
19,564.00	87.03	356.48	10,688.49	8,929.33	53.29	8,929.46	1.77	-0.48	-1.70
19,658.00	87.96	357.33	10,692.60	9,023.10	48.22	9,023.21	1.34	0.99	0.90
19,752.00	89.05	357.85	10,695.05	9,116.98	44.27	9,117.08	1.28	1.16	0.55
19,846.00	91.77	359.51	10,694.38	9,210.94	42.11	9,211.03	3.39	2.89	1.77
19,939.00	90.09	359.71	10,692.87	9,303.93	41.47	9,304.01	1.82	-1.81	0.22
20,034.00	87.56	357.42	10,694.81	9,398.86	39.10	9,398.94	3.59	-2.66	-2.41
20,128.00	87.71	357.63	10,698.69	9,492.70	35.04	9,492.76	0.27	0.16	0.22
20,222.00	89.66	358.45	10,700.85	9,586.61	31.83	9,586.66	2.25	2.07	0.87
20,316.00	90.31	358.76	10,700.87	9,680.58	29.54	9,680.63	0.77	0.69	0.33
20,411.00	89.97	358.00	10,700.64	9,775.54	26.85	9,775.58	0.88	-0.36	-0.80
20,505.00	90.45	358.06	10,700.30	9,869.49	23.62	9,869.51	0.51	0.51	0.06
20,599.00	89.66	359.43	10,700.21	9,963.46	21.56	9,963.48	1.68	-0.84	1.46
20,693.00	89.55	0.01	10,700.86	10,057.46	21.10	10,057.47	0.63	-0.12	0.62
20,787.00	89.58	0.02	10,701.57	10,151.45	21.13	10,151.47	0.03	0.03	0.01
20,881.00	88.49	359.66	10,703.15	10,245.44	20.87	10,245.45	1.22	-1.16	-0.38
20,975.00	89.72	1.10	10,704.62	10,339.42	21.49	10,339.44	2.01	1.31	1.53
21,070.00	88.91	1.11	10,705.76	10,434.40	23.32	10,434.42	0.85	-0.85	0.01
21,099.00	88.74	0.82	10,706.35	10,463.39	23.81	10,463.41	1.16	-0.59	-1.00



Phoenix Technology Services LP

Survey Report



Company: COG Operating LLC
Project: Eddy County, NM (NAD27 NME)
Site: Copperhead 31 Fee
Well: 20H
Wellbore: OH / Job #61925
Design: Surveys (Ensign 155)

Local Co-ordinate Reference: Well 20H
TVD Reference: GL+KB @ 2952.70usft (Ensign 155)
MD Reference: GL+KB @ 2952.70usft (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)
Final Phoenix MWD Survey									
21,159.00	88.74	0.82	10,707.67	10,523.36	24.67	10,523.39	0.00	0.00	0.00
Projection to TD									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
9,748.41	9,742.98	-196.88	-38.05	Tie In
9,868.00	9,862.44	-202.31	-38.80	First Phoenix MWD Survey
21,099.00	10,706.35	10,463.39	23.81	Final Phoenix MWD Survey
21,159.00	10,707.67	10,523.36	24.67	Projection to TD