



COG Operating LLC

Eddy County(NAD27)

Grave Digger

#3H

OH

30-015-39151



Plan: Design #1

Pathfinder X & Y Planning Report

04 April, 2011

PATHFINDER
A Schlumberger Company



Pathfinder
Pathfinder X & Y Planning Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #3H
Project:	Eddy County(NAD27)	TVD Reference:	RKB-18 5' @ 3471.50usft (Original Well Elev)
Site:	Grave Digger	MD Reference:	RKB-18 5' @ 3471.50usft (Original Well Elev)
Well:	#3H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Design #1	Database:	EDM 5000 1 Single User Db

Project	Eddy County(NAD27)
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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	Grave Digger
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Site Position:		Northing:	585,274 500 usft	Latitude:	32° 36' 32.284 N
From:	Map	Easting:	463,340 800 usft	Longitude:	104° 27' 8.584 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-0.06 °

Well	#3H
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Well Position	+N/-S	0 00 usft	Northing:	585,274 500 usft	Latitude:	32° 36' 32.284 N
	+E/-W	0 00 usft	Easting:	463,340 800 usft	Longitude:	104° 27' 8.584 W
Position Uncertainty		0 00 usft	Wellhead Elevation:	usft	Ground Level:	3,453 00 usft

Wellbore	OH
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	04/04/11	8.04	60.39	48,768

Design	Design #1
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Audit Notes:					
Version:	Phase:	PLAN	Tie On Depth:	0.00	
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0 00	0.00	180.14	

Survey Tool Program:	Date 04/04/11
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From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.00	7,208.93	Design #1 (OH)	MWD	MWD - Standard



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Project:	Eddy County(NAD27)	TVD Reference:	RKB-18.5' @ 3471 50usft (Original Well Elev)
Site:	Grave Digger	MD Reference:	RKB-18.5' @ 3471 50usft (Original Well Elev)
Well:	#3H	North Reference:	Gnd
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Design #1	Database:	EDM 5000.1 Single User Db

Planned Survey											
MD (usft)	Inc (°)	Azi (°)	TVD (usft)	TVDSS- (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
0 00	0 00	0 00	0 00	3,471.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
100 00	0 00	0 00	100.00	3,371.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
200 00	0 00	0 00	200 00	3,271.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
300 00	0 00	0 00	300 00	3,171.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
400.00	0 00	0 00	400.00	3,071.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
500 00	0 00	0 00	500.00	2,971.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
600 00	0 00	0 00	600.00	2,871.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
700 00	0 00	0 00	700.00	2,771.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
800 00	0 00	0 00	800.00	2,671.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
900.00	0 00	0 00	900.00	2,571.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
1,000.00	0 00	0 00	1,000.00	2,471.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
1,100.00	0 00	0 00	1,100.00	2,371.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
1,200.00	0 00	0 00	1,200.00	2,271.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
1,300.00	0 00	0 00	1,300.00	2,171.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
1,400.00	0 00	0 00	1,400.00	2,071.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
1,500 00	0 00	0 00	1,500 00	1,971.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
1,600 00	0 00	0 00	1,600 00	1,871.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
1,700 00	0 00	0 00	1,700 00	1,771.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
1,800.00	0 00	0 00	1,800.00	1,671.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
1,900 00	0 00	0 00	1,900 00	1,571.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
2,000 00	0 00	0 00	2,000.00	1,471.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
2,100 00	0 00	0 00	2,100.00	1,371.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
2,200 00	0 00	0 00	2,200.00	1,271.50	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
2,237 50	0 00	0 00	2,237.50	1,234.00	0 00	0 00	0 00	0 00	585,274.50	463,340.80	
KOP-2237.50°MD,0.00°INC,0.00°AZI,2237.50°TVD											
2,250 00	1 50	180 14	2,250.00	1,221.50	-0.16	0 00	0 16	12.00	585,274.34	463,340.80	
2,275 00	4 50	180 14	2,274.96	1,196.54	-1.47	0 00	1 47	12 00	585,273.03	463,340.80	



Pathfinder
Pathfinder X & Y Planning Report



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Site:	Grave Digger	MD Reference:	RKB-18.5' @ 3471 50usft (Original Well Elev)
Well:	#3H	North Reference:	Gnd
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Design #1	Database:	EDM 5000.1 Single User Db

Planned Survey											
MD (usft)	Inc (°)	Azi (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
2,300.00	7.50	180.14	2,299.82	1,171.68	-4.08	-0.01	4.08	12.00	585,270.42	463,340.79	
2,325.00	10.50	180.14	2,324.51	1,146.99	-7.99	-0.02	7.99	12.00	585,266.51	463,340.78	
2,350.00	13.50	180.14	2,348.96	1,122.54	-13.19	-0.03	13.19	12.00	585,261.31	463,340.77	
2,375.00	16.50	180.14	2,373.11	1,098.39	-19.66	-0.05	19.66	12.00	585,254.84	463,340.75	
2,400.00	19.50	180.14	2,396.88	1,074.62	-27.38	-0.07	27.38	12.00	585,247.12	463,340.73	
2,425.00	22.50	180.14	2,420.22	1,051.28	-36.34	-0.09	36.34	12.00	585,238.16	463,340.71	
2,450.00	25.50	180.14	2,443.06	1,028.44	-46.51	-0.11	46.51	12.00	585,227.99	463,340.69	
2,475.00	28.50	180.14	2,465.33	1,006.17	-57.85	-0.14	57.85	12.00	585,216.65	463,340.66	
2,500.00	31.50	180.14	2,486.98	984.52	-70.35	-0.17	70.35	12.00	585,204.15	463,340.63	
2,525.00	34.50	180.14	2,507.94	963.56	-83.96	-0.21	83.96	12.00	585,190.54	463,340.59	
2,550.00	37.50	180.14	2,528.17	943.33	-98.66	-0.24	98.66	12.00	585,175.84	463,340.56	
2,575.00	40.50	180.14	2,547.59	923.91	-114.39	-0.28	114.39	12.00	585,160.11	463,340.52	
2,600.00	43.50	180.14	2,566.17	905.33	-131.11	-0.32	131.11	12.00	585,143.39	463,340.48	
2,625.00	46.49	180.14	2,583.85	887.65	-148.78	-0.36	148.79	12.00	585,125.72	463,340.44	
2,650.00	49.49	180.14	2,600.58	870.92	-167.36	-0.41	167.36	12.00	585,107.14	463,340.39	
2,675.00	52.49	180.14	2,616.31	855.19	-186.78	-0.46	186.79	12.00	585,087.72	463,340.34	
2,700.00	55.49	180.14	2,631.01	840.49	-207.01	-0.51	207.01	12.00	585,067.49	463,340.29	
2,725.00	58.49	180.14	2,644.62	826.88	-227.97	-0.56	227.97	12.00	585,046.53	463,340.24	
2,750.00	61.49	180.14	2,657.12	814.38	-249.62	-0.61	249.62	12.00	585,024.88	463,340.19	
2,775.00	64.49	180.14	2,668.47	803.03	-271.89	-0.66	271.89	12.00	585,002.61	463,340.14	
2,800.00	67.49	180.14	2,678.64	792.86	-294.72	-0.72	294.72	12.00	584,979.78	463,340.08	
2,825.00	70.49	180.14	2,687.61	783.89	-318.06	-0.78	318.06	12.00	584,956.44	463,340.02	
2,850.00	73.49	180.14	2,695.33	776.17	-341.83	-0.84	341.83	12.00	584,932.67	463,339.96	
2,875.00	76.49	180.14	2,701.81	769.69	-365.97	-0.89	365.98	12.00	584,908.53	463,339.91	
2,900.00	79.49	180.14	2,707.01	764.49	-390.42	-0.95	390.43	12.00	584,884.08	463,339.85	
2,925.00	82.49	180.14	2,710.92	760.58	-415.11	-1.01	415.11	12.00	584,859.39	463,339.79	
2,950.00	85.49	180.14	2,713.54	757.96	-439.97	-1.08	439.97	12.00	584,834.53	463,339.72	



Pathfinder
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Site:	Grave Digger	MD Reference:	RKB-18.5' @ 3471 50usft (Original Well Elev)
Well:	#3H	North Reference:	Gnd
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Design #1	Database:	EDM 5000 1 Single User Db

Planned Survey										
MD (usft)	Inc (°)	Azi (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)
2,975.00	88.49	180.14	2,714.85	756.65	-464.94	-1.14	464.94	12.00	584,809.56	463,339.66
2,983.58	89.52	180.14	2,715.00	756.50	-473.51	-1.16	473.52	12.00	584,800.99	463,339.64
EOC-2983.58°MD,89.52°INC,180.14°AZI,2715.00°TVD										
3,000.00	89.52	180.14	2,715.14	756.36	-489.93	-1.20	489.93	0.00	584,784.57	463,339.60
3,100.00	89.52	180.14	2,715.98	755.52	-589.93	-1.44	589.93	0.00	584,684.57	463,339.36
3,200.00	89.52	180.14	2,716.81	754.69	-689.93	-1.69	689.93	0.00	584,584.57	463,339.11
3,300.00	89.52	180.14	2,717.65	753.85	-789.92	-1.93	789.92	0.00	584,484.58	463,338.87
3,400.00	89.52	180.14	2,718.49	753.01	-889.92	-2.17	889.92	0.00	584,384.58	463,338.63
3,500.00	89.52	180.14	2,719.33	752.17	-989.91	-2.42	989.92	0.00	584,284.59	463,338.38
3,600.00	89.52	180.14	2,720.16	751.34	-1,089.91	-2.66	1,089.91	0.00	584,184.59	463,338.14
3,700.00	89.52	180.14	2,721.00	750.50	-1,189.91	-2.91	1,189.91	0.00	584,084.59	463,337.89
3,800.00	89.52	180.14	2,721.84	749.66	-1,289.90	-3.15	1,289.91	0.00	583,984.60	463,337.65
3,900.00	89.52	180.14	2,722.68	748.82	-1,389.90	-3.40	1,389.90	0.00	583,884.60	463,337.40
4,000.00	89.52	180.14	2,723.52	747.98	-1,489.90	-3.64	1,489.90	0.00	583,784.60	463,337.16
4,100.00	89.52	180.14	2,724.35	747.15	-1,589.89	-3.88	1,589.90	0.00	583,684.61	463,336.92
4,200.00	89.52	180.14	2,725.19	746.31	-1,689.89	-4.13	1,689.89	0.00	583,584.61	463,336.67
4,300.00	89.52	180.14	2,726.03	745.47	-1,789.88	-4.37	1,789.89	0.00	583,484.62	463,336.43
4,400.00	89.52	180.14	2,726.87	744.63	-1,889.88	-4.62	1,889.89	0.00	583,384.62	463,336.18
4,500.00	89.52	180.14	2,727.70	743.80	-1,989.88	-4.86	1,989.88	0.00	583,284.62	463,335.94
4,600.00	89.52	180.14	2,728.54	742.96	-2,089.87	-5.11	2,089.88	0.00	583,184.63	463,335.69
4,700.00	89.52	180.14	2,729.38	742.12	-2,189.87	-5.35	2,189.88	0.00	583,084.63	463,335.45
4,800.00	89.52	180.14	2,730.22	741.28	-2,289.86	-5.60	2,289.87	0.00	582,984.64	463,335.20
4,900.00	89.52	180.14	2,731.05	740.45	-2,389.86	-5.84	2,389.87	0.00	582,884.64	463,334.96
5,000.00	89.52	180.14	2,731.89	739.61	-2,489.86	-6.08	2,489.86	0.00	582,784.64	463,334.72
5,100.00	89.52	180.14	2,732.73	738.77	-2,589.85	-6.33	2,589.86	0.00	582,684.65	463,334.47
5,200.00	89.52	180.14	2,733.57	737.93	-2,689.85	-6.57	2,689.86	0.00	582,584.65	463,334.23
5,300.00	89.52	180.14	2,734.41	737.09	-2,789.85	-6.82	2,789.85	0.00	582,484.65	463,333.98



Pathfinder
Pathfinder X & Y Planning Report

PATHFINDER
A Schlumberger Company

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Project:	Eddy County(NAD27)	TVD Reference:	RKB-18 5' @ 3471 50usft (Original Well Elev)
Site:	Grave Digger	MD Reference:	RKB-18 5' @ 3471 50usft (Original Well Elev)
Well:	#3H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Design #1	Database:	EDM 5000 1 Single User Db

Planned Survey:										
MD (usft)	Inc (°)	Azi (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)
5,400.00	89.52	180.14	2,735.24	736.26	-2,889.84	-7.06	2,889.85	0.00	582,384.66	463,333.74
5,500.00	89.52	180.14	2,736.08	735.42	-2,989.84	-7.31	2,989.85	0.00	582,284.66	463,333.49
5,600.00	89.52	180.14	2,736.92	734.58	-3,089.83	-7.55	3,089.84	0.00	582,184.67	463,333.25
5,700.00	89.52	180.14	2,737.76	733.74	-3,189.83	-7.79	3,189.84	0.00	582,084.67	463,333.01
5,800.00	89.52	180.14	2,738.59	732.91	-3,289.83	-8.04	3,289.84	0.00	581,984.67	463,332.76
5,900.00	89.52	180.14	2,739.43	732.07	-3,389.82	-8.28	3,389.83	0.00	581,884.68	463,332.52
6,000.00	89.52	180.14	2,740.27	731.23	-3,489.82	-8.53	3,489.83	0.00	581,784.68	463,332.27
6,100.00	89.52	180.14	2,741.11	730.39	-3,589.82	-8.77	3,589.83	0.00	581,684.68	463,332.03
6,200.00	89.52	180.14	2,741.95	729.55	-3,689.81	-9.02	3,689.82	0.00	581,584.69	463,331.78
6,300.00	89.52	180.14	2,742.78	728.72	-3,789.81	-9.26	3,789.82	0.00	581,484.69	463,331.54
6,400.00	89.52	180.14	2,743.62	727.88	-3,889.80	-9.50	3,889.82	0.00	581,384.70	463,331.30
6,500.00	89.52	180.14	2,744.46	727.04	-3,989.80	-9.75	3,989.81	0.00	581,284.70	463,331.05
6,600.00	89.52	180.14	2,745.30	726.20	-4,089.80	-9.99	4,089.81	0.00	581,184.70	463,330.81
6,700.00	89.52	180.14	2,746.13	725.37	-4,189.79	-10.24	4,189.80	0.00	581,084.71	463,330.56
6,800.00	89.52	180.14	2,746.97	724.53	-4,289.79	-10.48	4,289.80	0.00	580,984.71	463,330.32
6,900.00	89.52	180.14	2,747.81	723.69	-4,389.78	-10.73	4,389.80	0.00	580,884.72	463,330.07
7,000.00	89.52	180.14	2,748.65	722.85	-4,489.78	-10.97	4,489.79	0.00	580,784.72	463,329.83
7,100.00	89.52	180.14	2,749.49	722.01	-4,589.78	-11.21	4,589.79	0.00	580,684.72	463,329.59
7,209.03	89.52	180.14	2,750.40	721.10	-4,698.80	-11.48	4,698.81	0.00	580,575.70	463,329.32
TD at 7209.03										



Pathfinder
Pathfinder X & Y Planning Report



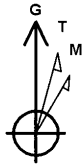
Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #3H
Project:	Eddy County(NAD27)	TVD Reference:	RKB-18.5' @ 3471.50usft (Original Well Elev)
Site:	Grave Digger	MD Reference:	RKB-18.5' @ 3471.50usft (Original Well Elev)
Well:	#3H	North Reference:	Gnd
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Design #1	Database:	EDM 5000 1 Single User Db

Plan Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,237.50	2,237.50	0.00	0.00	KOP-2237.50'MD,0.00°INC,0.00°AZI,2237.50'TVD
2,983.58	2,715.00	-473.51	-1.16	EOC-2983.58'MD,89.52°INC,180.14°AZI,2715.00'TVD
7,209.03	2,750.40	-4,698.80	-11.48	TD at 7209.03

Checked By: _____	Approved By: _____	Date: _____
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Project: Eddy County(NAD27)
Site: Grave Digger
Well: #3H
Wellbore: OH
Plan: Design #1 (#3H/OH)



Azimuths to Grid North
True North: 0.06°
Magnetic North: 8.11°

Magnetic Field
Strength: 48767.7snT
Dip Angle: 60.39°
Date: 04/04/2011
Model: IGRF2010

PATHFINDER
A Schlumberger Company

PROJECT DETAILS: Eddy County(NAD27)
Geodetic System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level
Local North: Grid

SECTION DETAILS									
MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2237.50	0.00	0.00	2237.50	0.00	0.00	0.00	0.00	0.00	
2983.58	89.52	180.14	2715.00	-473.51	-1.16	12.00	180.14	473.52	
47209.03	89.52	180.14	2750.40	-4698.80	-11.48	0.00	0.00	4698.81	BHL (GraveDigger#3H)

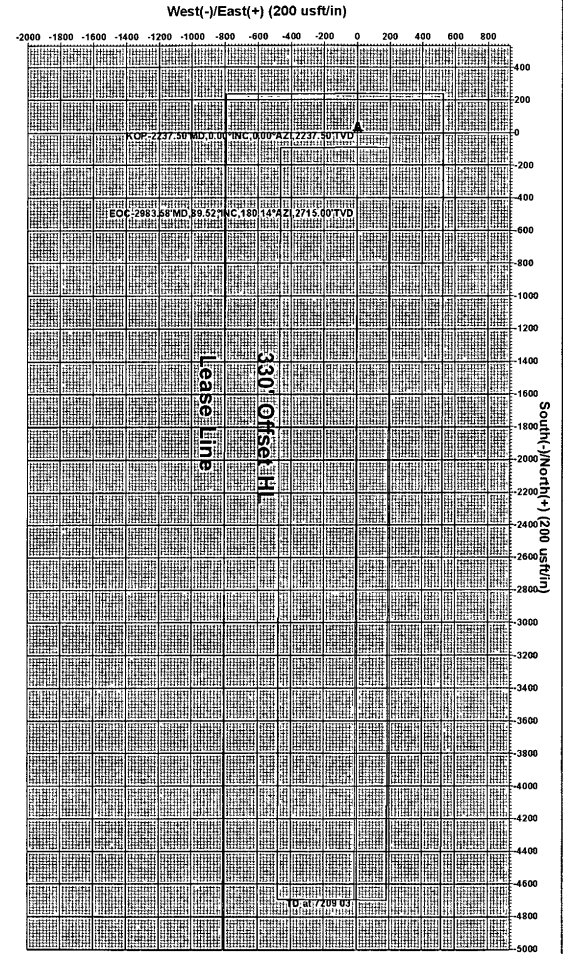
WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
BHL (GraveDigger#3H)	2750.40	-4698.80	-11.70	580575.700	463328.100	Point

WELL DETAILS #3H

Ground Elevation		3453.00				
RKB Elevation		RKB-18.5' @ 3471.50usft (Original Well Elev)				
Rig Name		Original Well Elev				
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Spot
0 00	0 00	585274.500	463340.800	32° 36' 32.284 N	104° 27' 8.584 W	

Vertical Section at 180.14° (200 usft/in)



Plan Design #1 (#3H/OH)
Created By: Nate Blighen Date: 14 Apr, April 04 2011
Checked: Date: