

OPERATOR _____ COG _____
WELL/LEASE _____ Spruce Federal 3 _____
COUNTY _____ Eddy _____

STATE OF NEW MEXICO
DEVIATION REPORT

30-015-40197

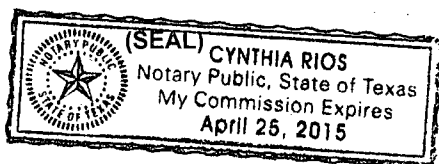
142	0.60
423	0.70
867	1.07
1049	0.86
1113	0.69
1175	0.31
1239	0.22
1302	0.70
1365	1.29
1428	1.76
1491	2.29
1555	2.99
1619	3.61
1682	4.75
1746	5.98
2188	7.58
2252	7.69
2347	8.09
2442	7.76
2538	7.66
2633	8.07
2824	7.30
2940	8.09
3015	7.39
3111	8.00
3205	7.65
3305	8.27
3491	7.58
3586	7.15
3681	7.57
3777	6.60
3873	7.47
4158	7.39
4252	6.86
4345	7.56
4535	7.56
4630	7.29
4677	7.30

SIGNED BY: _____

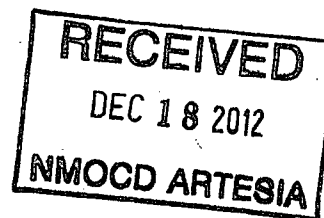
CHOYR GILBERT, OPERATIONS MANAGER

STATE OF TEXAS
COUNTY OF MIDLAND

ON THIS 7th DAY OF September, 2012, BEFORE ME, C RIOS, A NOTARY PUBLIC, PERSONALLY APPEARED CHOYR GILBERT, WHO ACKNOWLEDGED AND EXECUTED THIS DOCUMENT. WITNESS MY HAND AND OFFICIAL SEAL.



Cynthia Rios
NOTARY PUBLIC



COG Operating LLC

Eddy County, NM (NAD27 NME)

Spruce Federal

#3

OH - 32D08121054

Design: OH

SDI Standard Survey Report

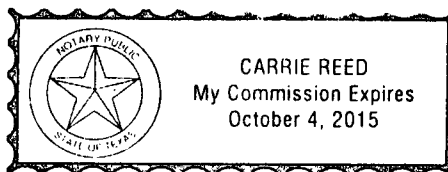
This survey is correct to the best of my knowledge and is supported by actual field data.

Richard

Notarized this date 8th of October, 2012.

Carrie Reed

Notary Signature
County of Midland
State of Texas





Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Spruce Federal
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RF @ 3608.00usft (Basic #35)
Site:	Spruce Federal	MD Reference:	RF @ 3608.00usft (Basic #35)
Well:	#3	North Reference:	Grid
Wellbore:	OH - 32D08121054	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM-Regulatory

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	Spruce Federal		
Site Position:		Northing:	656,406.10 usft
From:	Map	Easting:	530,230.20 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16"
		Latitude:	32° 48' 16.239 N
		Longitude:	104° 14' 5.806 W
		Grid Convergence:	0.05 °

Well	#3		
Well Position	+N/-S	-1,128.50 usft	Northing:
	+E/-W	-147.30 usft	Easting:
Position Uncertainty		0.00 usft	Wellhead Elevation:
			usft
			Latitude:
			Longitude:
			Ground Level:

Wellbore	OH - 32D08121054		
Magnetics	Model Name	Sample Date	Declination
			(°)
	IGRF2010	06/01/12	7.82
			Dip Angle
			(°)
			Field Strength
			(nT)
			48,792

Design	OH		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.00	-1,128.50	-147.30
			Direction
			(°)
			31.13

Survey Program	Date 10/05/12		
From	To	Survey (Wellbore)	Tool Name
(usft)	(usft)		
100.00	947.00	Gyro (OH - 32D08121054)	Keeper
1,049.00	4,727.00	MWD (OH - 32D08121054)	MWD
			Description
			Standard Wireline Keeper ver 1.0.2
			MWD - Standard

Survey			
Measured Depth	Inclination	Azimuth	True Vertical
(usft)	(°)	(°)	Depth
0.00	0.00	0.00	0.00
100.00	0.26	343.85	100.00
200.00	0.20	167.25	200.00
300.00	0.39	153.15	300.00
400.00	0.50	190.90	400.00
500.00	0.54	194.31	499.99
600.00	0.69	197.42	599.99
700.00	0.69	198.25	699.98
800.00	0.86	187.28	799.97
900.00	0.63	183.90	899.96
			North/South
			(usft)
			East/West
			(usft)
			Closure Azimuth
			(°)
			Closure Distance
			(usft)
			0.00
			0.23
			0.28
			0.23
			0.96
			1.83
			2.87
			4.06
			5.41
			6.70



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Spruce Federal
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RF @ 3608.00usft (Basic #35)
Site:	Spruce Federal	MD Reference:	RF @ 3608.00usft (Basic #35)
Well:	#3	North Reference:	Grid
Wellbore:	OH - 32D08121054	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
947.00	0.76	181.28	946.96	-1,135.68	-148.43	188.94	7.27
Gyro Tie-in							
1,049.00	0.84	186.20	1,048.95	-1,137.10	-148.53	188.11	8.69
1,113.00	0.69	188.28	1,112.94	-1,137.95	-148.63	188.02	9.54
1,175.00	0.31	202.51	1,174.94	-1,138.47	-148.75	188.27	10.08
1,239.00	0.22	91.24	1,238.94	-1,138.64	-148.69	187.82	10.23
1,302.00	0.70	14.59	1,301.94	-1,138.27	-148.48	186.86	9.84
1,365.00	1.29	11.84	1,364.93	-1,137.20	-148.23	186.12	8.75
1,428.00	1.76	21.97	1,427.90	-1,135.61	-147.73	183.42	7.12
1,491.00	2.29	18.11	1,490.86	-1,133.51	-146.97	176.26	5.03
1,555.00	2.99	24.08	1,554.80	-1,130.78	-145.89	148.28	2.68
1,619.00	3.61	29.18	1,618.69	-1,127.49	-144.23	71.83	3.23
1,682.00	4.75	30.68	1,681.52	-1,123.52	-141.93	47.13	7.32
1,746.00	5.98	29.18	1,745.24	-1,118.33	-138.95	39.36	13.16
1,841.00	7.65	31.47	1,839.57	-1,108.61	-133.24	35.26	24.36
1,935.00	8.71	32.43	1,932.61	-1,097.27	-126.16	34.10	37.72
1,999.00	8.35	32.61	1,995.90	-1,089.26	-121.05	33.78	47.21
2,062.00	7.83	31.73	2,058.27	-1,081.76	-116.33	33.53	56.07
2,125.00	8.18	31.47	2,120.66	-1,074.29	-111.73	33.27	64.84
2,188.00	7.58	30.68	2,183.06	-1,066.89	-107.27	33.01	73.47
2,252.00	7.69	29.63	2,246.50	-1,059.54	-103.00	32.71	81.96
2,347.00	8.09	29.45	2,340.60	-1,048.19	-96.57	32.28	94.99
2,442.00	7.76	30.23	2,434.69	-1,036.83	-90.06	31.98	108.07
2,538.00	7.66	34.14	2,529.82	-1,025.94	-83.21	32.00	120.94
2,633.00	8.07	34.57	2,623.93	-1,015.20	-75.87	32.23	133.93
2,728.00	7.83	33.53	2,718.02	-1,004.32	-68.51	32.39	147.07
2,824.00	7.30	31.12	2,813.18	-993.65	-61.75	32.39	159.70
2,920.00	8.09	29.09	2,908.31	-982.52	-55.31	32.22	172.54
3,015.00	7.39	33.22	3,002.45	-971.57	-48.71	32.14	185.33
3,111.00	8.00	30.59	3,097.58	-960.65	-41.93	32.12	198.18
3,205.00	7.65	32.70	3,190.71	-949.76	-35.22	32.09	210.97
3,300.00	8.27	31.12	3,284.79	-938.59	-28.27	32.08	224.13
3,395.00	8.35	33.58	3,378.80	-926.99	-20.93	32.09	237.86
3,491.00	7.58	34.26	3,473.87	-915.95	-13.51	32.19	251.15
3,586.00	7.15	33.76	3,568.09	-905.86	-6.69	32.27	263.32
3,681.00	7.57	35.72	3,662.30	-895.86	0.24	32.38	275.48
3,777.00	6.60	35.42	3,757.57	-886.23	7.13	32.52	287.30
3,873.00	7.47	34.98	3,852.85	-876.62	13.91	32.62	299.05
3,968.00	7.30	33.49	3,947.06	-866.53	20.78	32.68	311.25
4,063.00	8.09	34.37	4,041.20	-855.98	27.88	32.73	323.97
4,158.00	7.39	30.29	4,135.34	-845.18	34.74	32.72	336.76
4,252.00	6.86	28.83	4,228.61	-835.05	40.49	32.62	348.40
4,345.00	7.56	26.63	4,320.87	-824.71	45.92	32.46	360.03
4,440.00	8.09	25.23	4,414.99	-813.08	51.57	32.23	372.88
4,535.00	7.56	26.81	4,509.10	-801.45	57.23	32.02	385.74



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Spruce Federal
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RF @ 3608.00usft (Basic #35)
Site:	Spruce Federal	MD Reference:	RF @ 3608.00usft (Basic #35)
Well:	#3	North Reference:	Grid
Wellbore:	OH - 32D08121054	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
4,630.00	7.30	27.42	4,603.31	-790.52	62.83	31.87	397.98
4,677.00	7.29	28.01	4,649.93	-785.24	65.61	31.81	403.93
Last MWD Survey							
4,724.18	7.29	28.01	4,696.72	-779.95	68.42	31.75	409.90
PBHL-Spruce #3							
4,727.00	7.29	28.01	4,699.52	-779.63	68.59	31.75	410.26
Projection to Bit							

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
4,677.00	4,649.93	-785.24	65.61	Last MWD Survey
4,727.00	4,699.52	-779.63	68.59	Projection to Bit

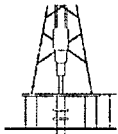


Spruce Federal #3
Eddy County, NM (NAN27 NME)
Northing (Y) 656406.10
Easting (X) 530230.20
Plan #4 vs Actual 7-7/8" Hole

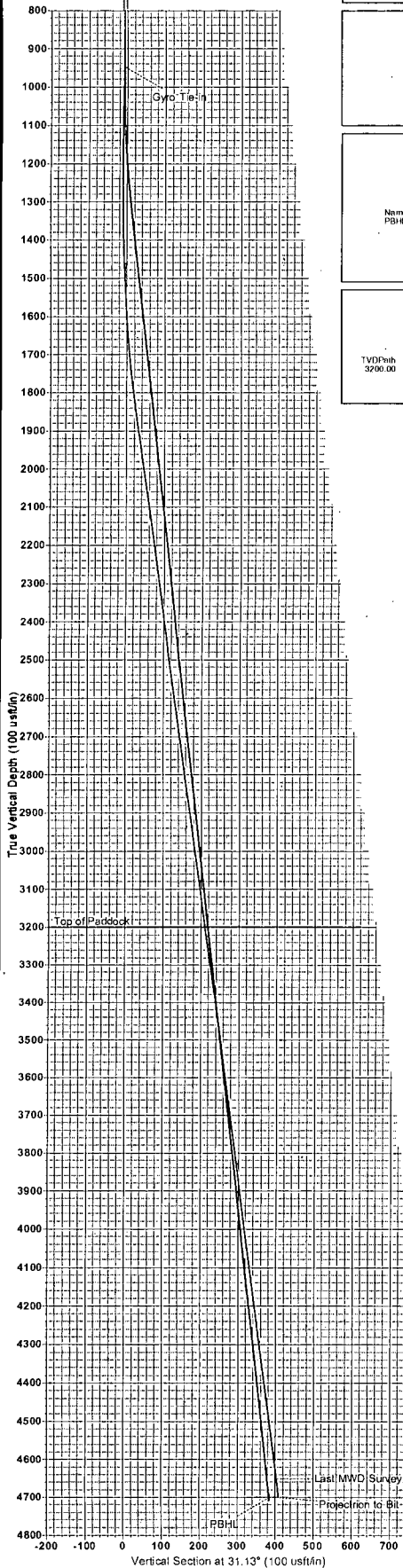


To convert Magnetic North to Grid, Add 7.78°
To convert True North to Grid, Subtract 0.05°

Azimuth to Grid North
True North: 0.05°
Magnetic North: 7.78°
Magnetic Field
Strength: 48792.1nT
Dip Angle: 60.58°
Date: 06/01/2012
Model: IGRF2010



RF @ 3808 00ush (Basic #35)
GI: 3500.00



WELL DETAILS: Spruce Federal

Ground Level	3500.00	Latitude	32° 46' 5.073 N	Longitude	104° 14' 7.544 W	Site
+N-S	0.00	+E-W	0.00	Northing	656277.60	

SITE DETAILS: Spruce Federal

See Centre Northing: 656406.10
Easting: 530230.20

Positional Uncertainty: 0.00
Convergence: 0.05
Local North: Grid

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N-S	+E-W	Dleg	TFace	VSecl	Target
1	947.00	0.78	181.28	946.98	-7.19	-1.13	0.00	0.00	-6.73	
2	850.00	0.78	181.28	849.96	-7.22	-1.13	0.00	0.00	-6.77	
3	1297.04	6.27	30.56	1296.37	-6.81	-8.46	2.00	-153.78	10.20	
4	4721.14	6.27	30.56	4700.00	328.73	186.52	0.00	0.00	384.02	PBHL

DESIGN TARGET DETAILS

Name	TVD	+N-S	+E-W	Northing	Easting	Latitude	Longitude	Shape
PBHL-Spruce #3	4700.00	328.73	186.52	656609.30	530281.40	32° 48' 8.324 N	104° 14' 5.215 W	Circle (Radius: 50.00)

- pin has target center

FORMATION TOP DETAILS

TVDFeet	MDFeet	Formation	DipAngle	DipDir
3200.00	3212.12	Top of Paddock	0.00	

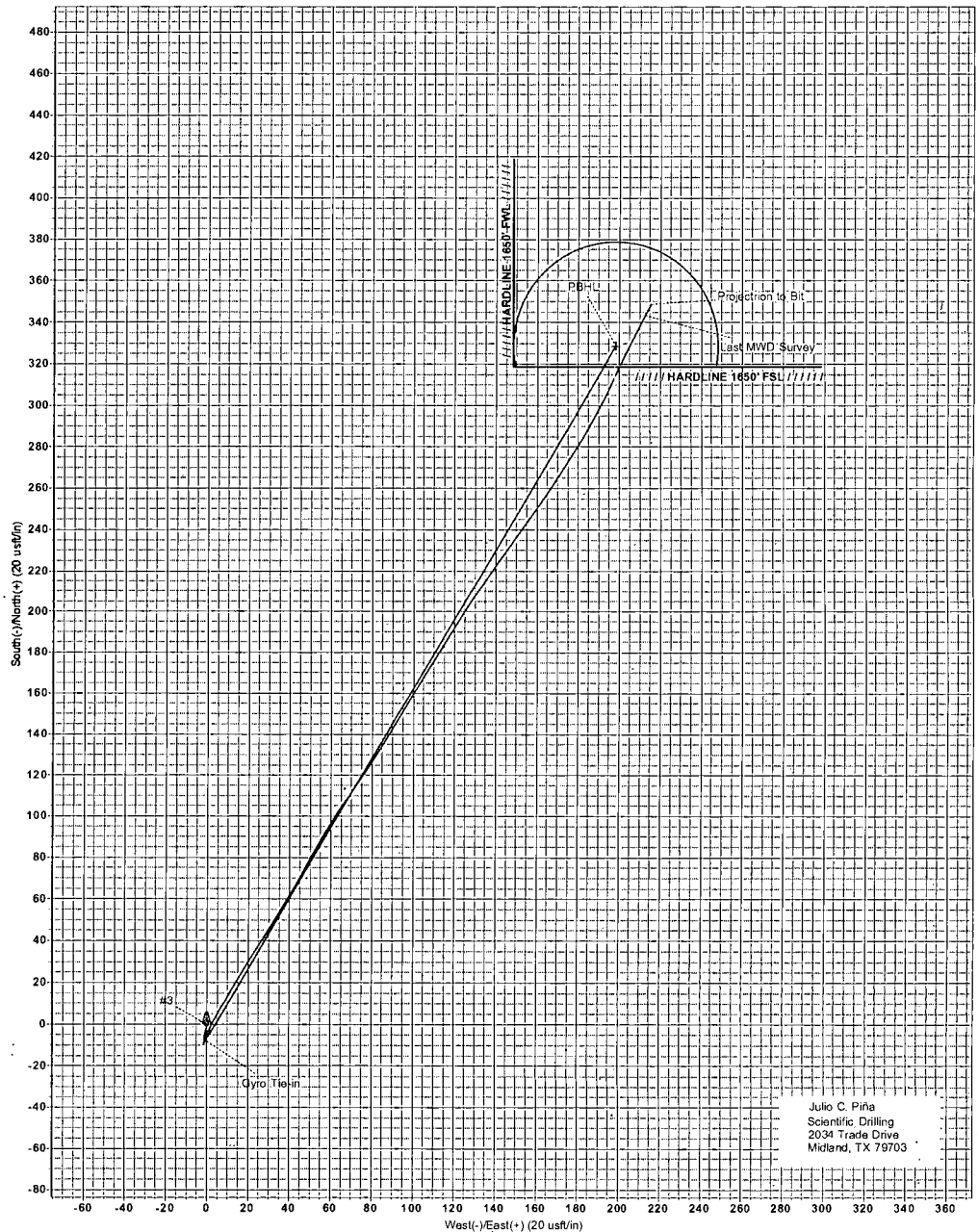
CASING DETAILS

TVD	MD	Name	Size
850.00		8-5/8" Casing	8-5/8"

PROJECT DETAILS: Eddy County, NM (NAN27 NME)

Geographic System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico First 3001

System Datum: Mean Sea Level



Julio C. Pina
Scientific Drilling
2034 Trade Drive
Midland, TX 79703