

Results of Directional Survey

DD

API number:	30-025-39913		
OGRID:		Operator:	COG OPERATING LLC
		Property:	BC FEDERAL # 65

surface	ULSTR:	A	20	T 17S	R 32E
				502 FNL	1121 FEL

BH Loc	ULSTR:	A	20	T 17S	R 32E
7045 MD		7021.9	TVD	979 FNL	979 FEL

Top Perf/OH	ULSTR:	A	20	T 17S	R 32E
5450 MD		5429.5	TVD	892 FNL	1008 FEL

Bot Perf/OH	ULSTR:	A	20	T 17S	R 32E
6820 MD		6797.2	TVD	966 FNL	982 FEL

	MD	N/S	E/W	VD
	5422	-388.00	112.30	5401.6
TOP PERFS/OH	5450	-389.67	112.90	5429.54
	5516	-393.60	114.30	5495.40
	6727	-459.10	137.90	6704.30
BOT PERFS/OH	6820	-464.10	139.50	6797.20
	6820	-464.10	139.50	6797.20

NEXT TO LAST	6913	-469.20	140.90	6890.00
LAST READING	7001	-474.20	141.90	6977.90
TD	7045	-476.70	142.40	7021.85

Surface Location	502 FN	1121 FE
Projected BHL	979 FN	979 FE
Location of		
Top Perfs/OH	892 FN	1008 FE
Bottom Perfs/OH	966 FN	982 FE

SUMMARY of Subsurface Locations

Surface Location	A-20-17S-32E	502 FN	1121 FE	Vert. Depth
Top Perfs/OH	A-20-17S-32E	892 FN	1008 FE	5429.54
Bottom Perfs/OH	A-20-17S-32E	966 FN	982 FE	6797.20
Projected TD	A-20-17S-32E	979 FN	979 FE	7021.85

AUG 31 2011



DRILLING INC. Oil Well Drilling Contractor

Post Office Box 160 Artesia, New Mexico 88211-0160 Office (575) 748-8704 Fax (575) 748-8719

HOBBS OCD

AUG 12 2011

RECEIVED

June 9, 2011

COG Operating, LLC
500 W. Texas, Suite 1300
Midland, Texas 79701

Re: BC Federal # 65
Sec. 20, T-17-S, R-32-E
Lea County, New Mexico

Attn: John Coffman

The following is a Deviation Survey on the referenced well in Lea County, New Mexico:

45' - 0.5°	602' - 3.25°
164' - 0.5°	772' - 5.5°
251' - 1.25°	873' - 5°
340' - 2°	1342' - 2.5°
428' - 2.25°	1839' - 2°
515' - 3°	

SUR: A-20-17s-32e. 5-2/N & 1121/E
BHL: A-20-17s-32e, 979/N & 979/E
API # 30-025-39913

Sincerely,

Gary W. Chappell
Contracts Manager

STATE OF NEW MEXICO)
COUNTY OF EDDY)

The foregoing was acknowledged before me this 9th day of June, 2011 by Gary W. Chappell.



OFFICIAL SEAL
Crisha Morgan
NOTARY PUBLIC-STATE OF NEW MEXICO

My commission expires: 10/28/2014

NOTARY PUBLIC



HOBBS OCD

AUG 12 2011

RECEIVED

COG OPERATING LLC

Lea County, NM (NAD27 NME)

BC Federal #65

BC Federal #65

OH - Job #32D0611517

SUR: A-20-17s-32e. 5-2/N & 1121/E
BHL: A-20-17s-32e, 979/N & 979/E
API # 30-025-39913

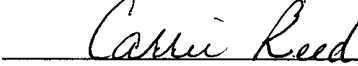
Survey: MWD Survey

SDI Standard Survey Report

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



Notarized this date 22nd of July, 2011.



Notary Signature
County of Midland
State of Texas



Scientific Drilling
Directional Drilling Operations



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well BC Federal #65
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4045.0usft (JW #4)
Site:	BC Federal #65	MD Reference:	KB Elev (13') @ 4045.0usft (JW #4)
Well:	BC Federal #65	North Reference:	Gnd
Wellbore:	OH - Job #32D0611517	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

Project	Lea 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	BC Federal #65		
Site Position:		Northing:	664,615.90 usft
From:	Map	Easting:	669,000.30 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"
		Latitude:	32° 49' 33.265 N
		Longitude:	103° 46' 59.437 W
		Grid Convergence:	0.30 °

Well	BC Federal #65		
Well Position	+N/-S	0.0 usft	Northing:
	+E/-W	0.0 usft	Easting:
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	32° 49' 33.265 N
		Longitude:	103° 46' 59.437 W
		Ground Level:	4,032.0 usft

Wellbore	OH - Job #32D0611517				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	6/5/2011	7.73	60.71	48,954

Design	Actual			
Audit Notes:				
Version:	1.0	Phase:	ACTUAL	Tie On Depth:
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	163.23

Survey Program	Date 7/22/2011			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.0	2,074.0	Gyro Survey (OH - Job #32D0611517)	Keeper	Standard Wireline Keeper ver 1.0.2
2,173.0	7,045.0	MWD Survey (OH - Job #32D0611517)	MWD	MWD - Standard

Survey								
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)	
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.0	0.0
100.0	0.40	185.91	100.0	-0.3	0.0	185.91	0.3	
200.0	0.62	201.11	200.0	-1.2	-0.3	192.54	1.2	
300.0	1.50	200.23	300.0	-2.9	-0.9	197.32	3.1	
400.0	2.59	192.49	399.9	-6.4	-1.9	196.25	6.6	
500.0	3.37	191.51	499.8	-11.5	-2.9	194.35	11.8	
600.0	3.63	193.01	599.6	-17.4	-4.2	193.65	17.9	
700.0	3.68	184.33	699.4	-23.7	-5.2	192.34	24.3	
800.0	4.67	184.19	799.1	-31.0	-5.7	190.48	31.5	
900.0	4.16	186.01	898.8	-38.6	-6.4	189.41	39.2	
1,000.0	3.37	183.91	998.6	-45.2	-7.0	188.79	45.7	



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well BC Federal #65
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4045.0usft (JW #4)
Site:	BC Federal #65	MD Reference:	KB Elev (13') @ 4045.0usft (JW #4)
Well:	BC Federal #65	North Reference:	Grid
Wellbore:	OH - Job #32D0611517	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
1,100.0	3.04	183.97	1,098.5	-50.7	-7.4	188.26	51.3
1,200.0	2.94	185.91	1,198.3	-55.9	-7.8	187.95	56.5
1,300.0	2.63	190.19	1,298.2	-60.8	-8.5	187.95	61.3
1,400.0	2.41	190.16	1,398.1	-65.1	-9.3	188.10	65.7
1,500.0	1.79	191.04	1,498.0	-68.7	-9.9	188.23	69.4
1,600.0	1.00	194.88	1,598.0	-71.1	-10.5	188.37	71.8
1,700.0	0.51	185.13	1,698.0	-72.3	-10.7	188.43	73.1
1,800.0	0.16	154.91	1,798.0	-72.9	-10.7	188.35	73.7
1,900.0	0.31	160.73	1,898.0	-73.3	-10.5	188.19	74.1
2,000.0	0.26	168.61	1,998.0	-73.8	-10.4	188.04	74.5
2,074.0	0.36	170.55	2,072.0	-74.2	-10.3	187.94	74.9



Scientific Drilling International, Inc.
SDI Standard Survey Report



SUR: A-20-17s-32e, 5-2/N & 1121/E
BHL: A-20-17s-32e, 979/N & 979/E
API # 30-025-39913

Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well BC Federal #65
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4045.0usft (JW #4)
Site:	BC Federal #65	MD Reference:	KB Elev (13') @ 4045.0usft (JW #4)
Well:	BC Federal #65	North Reference:	Grid
Wellbore:	OH - Job #32D0611517	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

Project	Lea 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	BC Federal #65		
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Site Position:		Northing:	664,615.90 usft	Latitude:	32° 49' 33.265 N
From:	Map	Easting:	669,000.30 usft	Longitude:	103° 46' 59.437 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"	Grid Convergence:	0.30 °

Well	BC Federal #65					
Well Position	+N/-S	0.0 usft	Northing:	664,615.90 usft	Latitude:	32° 49' 33.265 N
	+E/-W	0.0 usft	Easting:	669,000.30 usft	Longitude:	103° 46' 59.437 W
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,032.0 usft	

Wellbore	OH - Job #32D0611517				
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	6/5/2011	7.73	60.71	48,954

Design	Actual				
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Audit Notes:				
Version:	1 0	Phase:	ACTUAL	Tie On Depth: 0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0 0	0 0	163.23

Survey Program		Date	7/22/2011		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	2,074.0	Gyro Survey (OH - Job #32D0611517)	Keeper	Standard Wireline Keeper ver 1.0.2	
2,173.0	7,045.0	MWD Survey (OH - Job #32D0611517)	MWD	MWD - Standard	

Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
2,074.0	0.36	170.55	2,072.0	-74.2	-10.3	187.94	74.9
Gyro Tie-in							
2,173.0	0.03	198.40	2,171.0	-74.5	-10.3	187.87	75.2
2,235.0	1.25	150.10	2,233.0	-75.1	-10.0	187.56	75.8
2,329.0	3.01	154.45	2,326.9	-78.2	-8.4	186.12	78.7
2,421.0	3.95	155.61	2,418.7	-83.3	-6.0	184.15	83.5
2,515.0	4.51	158.53	2,512.5	-89.7	-3.4	182.14	89.7
2,607.0	5.17	167.42	2,604.2	-97.1	-1.1	180.66	97.1
2,701.0	6.42	163.03	2,697.7	-106.2	1.3	179.28	106.3
2,794.0	5.52	163.84	2,790.2	-115.5	4.1	177.97	115.6
2,887.0	5.79	157.61	2,882.7	-124.1	7.1	176.72	124.3



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well BC Federal #65
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4045.0usft (JW #4)
Site:	BC Federal #65	MD Reference:	KB Elev (13') @ 4045.0usft (JW #4)
Well:	BC Federal #65	North Reference:	Grnd
Wellbore:	OH - Job #32D0611517	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
2,981.0	6.24	155.18	2,976.2	-133.2	11.1	175.25	133.6
3,075.0	6.73	158.36	3,069.6	-142.9	15.3	173.91	143.7
3,169.0	5.87	154.04	3,163.0	-152.4	19.4	172.75	153.6
3,262.0	7.20	154.51	3,255.4	-161.9	24.0	171.58	163.7
3,357.0	6.12	152.70	3,349.8	-171.8	28.9	170.46	174.2
3,450.0	7.33	157.51	3,442.1	-181.7	33.4	169.58	184.7
3,545.0	6.88	155.64	3,536.4	-192.4	38.1	168.81	196.2
3,638.0	6.57	155.09	3,628.8	-202.3	42.6	168.11	206.8
3,732.0	6.67	155.16	3,722.1	-212.2	47.2	167.47	217.4
3,825.0	6.61	154.62	3,814.5	-221.9	51.7	166.88	227.9
3,919.0	6.30	154.98	3,907.9	-231.5	56.2	166.35	238.2
4,013.0	6.29	153.92	4,001.4	-240.8	60.7	165.86	248.3
4,107.0	6.28	154.70	4,094.8	-250.0	65.1	165.40	258.4
4,200.0	6.47	152.21	4,187.2	-259.3	69.8	164.94	268.5
4,293.0	6.91	164.96	4,279.6	-269.3	73.6	164.71	279.2
4,386.0	6.83	163.59	4,371.9	-280.0	76.7	164.69	290.3
4,480.0	6.86	163.19	4,465.3	-290.8	79.9	164.64	301.5
4,572.0	6.79	162.33	4,556.6	-301.2	83.1	164.58	312.5
4,666.0	6.58	162.42	4,650.0	-311.6	86.4	164.50	323.4
4,759.0	6.41	162.54	4,742.4	-321.7	89.6	164.44	333.9
4,853.0	6.41	161.94	4,835.8	-331.7	92.8	164.37	344.4
4,946.0	6.15	159.10	4,928.2	-341.2	96.2	164.26	354.5
5,047.0	7.56	160.45	5,028.5	-352.6	100.3	164.12	366.6
5,141.0	6.78	159.74	5,121.8	-363.6	104.3	163.99	378.3
5,236.0	5.75	163.97	5,216.2	-373.4	107.6	163.93	388.6
5,329.0	4.75	161.64	5,308.8	-381.6	110.1	163.91	397.1
5,422.0	3.64	159.65	5,401.6	-388.0	112.3	163.86	403.9
5,516.0	3.62	161.69	5,495.4	-393.6	114.3	163.81	409.9
5,611.0	3.43	155.70	5,590.2	-399.0	116.4	163.74	415.7
5,705.0	3.60	151.95	5,684.0	-404.2	118.9	163.60	421.3
5,798.0	3.13	159.66	5,776.8	-409.2	121.2	163.50	426.7
5,891.0	3.38	161.84	5,869.7	-414.2	122.9	163.47	432.0
5,985.0	3.31	160.97	5,963.5	-419.3	124.7	163.44	437.5
6,078.0	3.32	161.16	6,056.4	-424.4	126.4	163.41	442.9
6,171.0	3.13	163.30	6,149.2	-429.4	128.0	163.40	448.1
6,265.0	3.13	164.54	6,243.1	-434.3	129.4	163.40	453.2
6,359.0	3.01	162.65	6,337.0	-439.2	130.9	163.41	458.3
6,445.0	3.36	160.54	6,422.8	-443.7	132.4	163.39	463.0
6,538.0	3.19	158.75	6,515.7	-448.7	134.2	163.35	468.3
6,632.0	3.45	161.22	6,609.5	-453.8	136.1	163.31	473.8
6,727.0	3.34	161.50	6,704.3	-459.1	137.9	163.28	479.4
6,820.0	3.14	162.51	6,797.2	-464.1	139.5	163.27	484.6
6,913.0	3.36	167.14	6,890.0	-469.2	140.9	163.29	489.9
7,001.0	3.26	169.53	6,977.9	-474.2	141.9	163.34	495.0
Last MWD Survey							



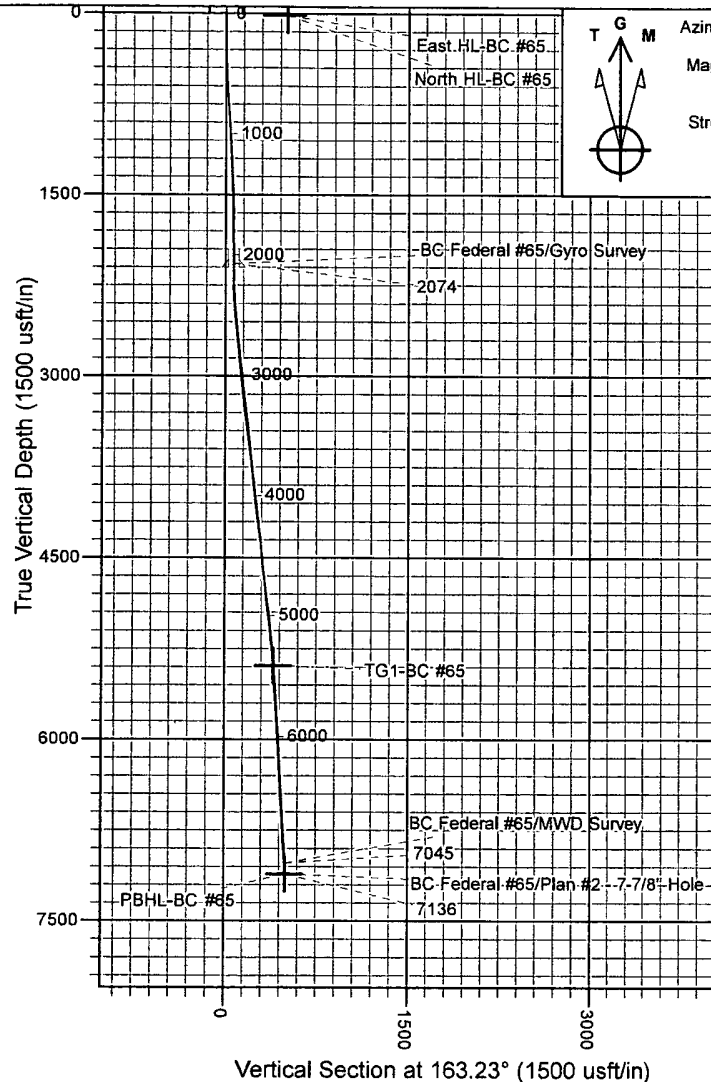
Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well BC Federal #65
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4045 0usft (JW #4)
Site:	BC Federal #65	MD Reference:	KB Elev (13') @ 4045 0usft (JW #4)
Well:	BC Federal #65	North Reference:	Grid
Wellbore:	OH - Job #32D0611517	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
7,045.0	3.26	169.53	7,021.8	-476.7	142.4	163.37	497.5
Projection to Bit							

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,074.0	2,072.0	-74.2	-10.3	Gyro Tie-in
7,001.0	6,977.9	-474.2	141.9	Last MWD Survey
7,045.0	7,021.8	-476.7	142.4	Projection to Bit



Project: Lea County, NM (NAD27 NME)
 Site: BC Federal #65
 Well: BC Federal #65
 Wellbore: OH - Job #32D0611517
 Design: Plan #2 - 7-7/8" Hole



Azimuths to Grid North
 True North: -0.30°
 Magnetic North 7.43°
 Magnetic Field
 Strength: 48954.2snT
 Dip Angle: 60.71°
 Date: 6/5/2011

+N/-S
 0.0

+E/-W
 0.0

Northing
 664615.90

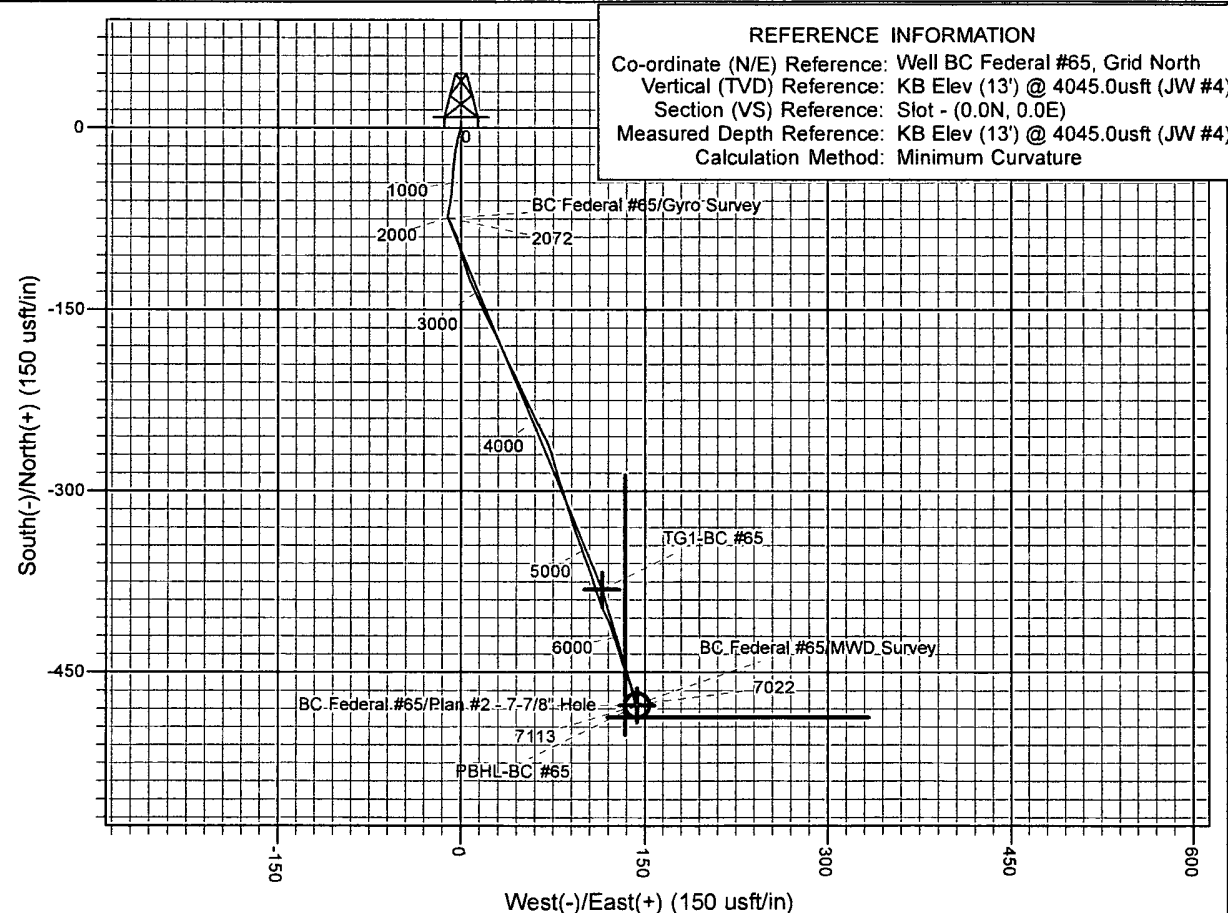
WELL DETAILS: BC Federal #65
 KB Elev (13') @ 4045.0usft (JW #4)
 Ground Level: 4032.0

Easting
 669000.30

Latitude
 32° 49' 33.265 N

Longitude
 103° 46' 59.437 W

Slo



REFERENCE INFORMATION
 Co-ordinate (N/E) Reference: Well BC Federal #65, Grid North
 Vertical (TVD) Reference: KB Elev (13') @ 4045.0usft (JW #4)
 Section (VS) Reference: Slot - (0.0N, 0.0E)
 Measured Depth Reference: KB Elev (13') @ 4045.0usft (JW #4)
 Calculation Method: Minimum Curvature

COMPANY DETAILS: COG OPERATING LLC
 223032

Calculation Method: Minimum Curvature
 Error System: ISCWSA
 Scan Method: Closest Approach 3D
 Error Surface: Elliptical Conic
 Warning Method: Error Ratio

PROJECT DETAILS: Lea County, NM (NAD27 NME)
 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

SITE DETAILS: BC Federal #65
 Site Centre Latitude: 32° 49' 33.265 N
 Longitude: 103° 46' 59.437 W
 Positional Uncertainty: 0.0
 Convergence: 0.30
 Local North: Grid