

Results of Directional Survey

API number:	30-025-40302		
OGRID:		Operator:	COG OPERATING LLC
		Property:	LIGHTNING P-38 STATE # 2H

surface	ULSTR:	H	01	T 21S	R 33E
				1980 FNL	330 FEL

BH Loc	ULSTR:	E	01	T 21S	R 33E
16008 MD		11497.9	TVD	2071 FNL	366 FWL
					4914 FEL

Top Perf/OH	ULSTR:	H	01	T 21S	R 33E
11680 MD		11543.4	TVD	2029 FNL	592 FEL

Bot Perf/OH	ULSTR:	E	01	T 21S	R 33E
15970 MD		11499.5	TVD	2069 FNL	404 FWL
					4876 FEL

	MD	N/S	E/W	VD
	11655	-50.20	-238.20	11536.3
TOP PERFS/OH	11680	-49.11	-262.18	11543.41
	11687	-48.80	-268.90	11545.40
	15824	-84.70	-4400.40	11505.70
BOT PERFS/OH	15970	-89.46	-4546.16	11499.51
	16008	-90.70	-4584.10	11497.90

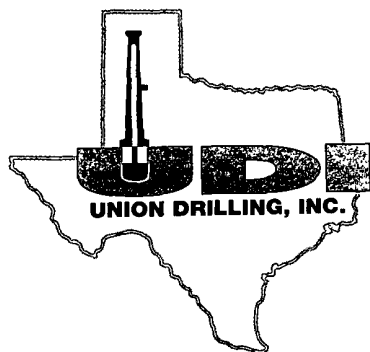
NEXT TO LAST	15824	-84.70	-4400.40	11505.70
LAST READING	16008	-90.70	-4584.10	11497.90
TD	16008	-90.70	-4584.10	11497.90

Surface Location	1980	FN	330	FE
Projected BHL	2071	FN	4914	FE
Location of				
Top Perfs/OH	2029	FN	592	FE
Bottom Perfs/OH	2069	FN	4876	FE

SUMMARY of Subsurface Locations

Surface Location	H-01-21S-33E	1980	FN	330	FE	Vert. Depth
Top Perfs/OH	H-01-21S-33E	2029	FN	592	FE	11543.41
Bottom Perfs/OH	E-01-21S-33E	2069	FN	4876	FE	11499.51
Projected TD	E-01-21S-33E	2071	FN	4914	FE	11497.90

JUN 07 2012



HOBBS OCD

MAY 21 2012

RECEIVED

COG OPERATING LLC
RECEIVED
 FEB 29 2012
 ARTESIA WEST

SUR: H-01-21s-33e, 1980/N & 330/E
 BHL: E-01-21s-33e, 2071/N & 4914/E
 API # 30-025-40302

Well Name & Number: Lightning P-38 State #2H

API Number: 30-025-40302

Location: 1980 FNL & 330 FEL, Lot A, Sec. 1, Township 21-S, Range 33-E, Lea County, New Mexico

Operator: COG Operating, LLC

Drilling Contractor: Union Drilling, Inc.

The undersigned hereby certifies that he is an authorized representative of the drilling Contractor who drilled the above described well and that deviation survey tests were conducted and he obtained the following results:

RECORD OF INCLINATION

*11 Measured Depth (feet)	12 Course Length (Hundreds of feet)	*13 Angle of Inclination (Degrees)	14 Displacement per Hundred Feet (Sine of Angle X100)	15 Course Displacement (feet)	16. Accumulative Displacement (feet)
346	346	.25	0.44	1.51	1.51
1032	686	.6	1.05	7.18	8.69
1940	908	.2	0.35	3.17	11.86
2901	961	.5	0.87	8.39	20.25
3877	976	1.6	2.79	27.25	47.50
4877	1000	1	1.75	17.45	64.96
5673	796	.2	0.35	2.78	67.74
6642	969	.9	1.57	15.22	82.96
7587	945	.6	1.05	9.90	92.85
8282	695	.5	0.87	6.06	98.92
9071	789	.5	0.87	6.89	105.80
9955	884	1.5	2.62	23.14	128.94
10955	1000	2.2	3.84	38.39	167.34
11181	226	5.45	9.51	21.49	188.83
DIRECTIONAL					
TOOK OVER					

Drilling Contractor: Union Drilling, Inc.

By: Jim Mayfield
Jim Mayfield
Title: Division Manager

Subscribed and sworn to before me this 23RD Day of February, 2012.

Laura Jo Young
Notary Public
My Commission Expires: July 29, 2014

COUNTY OF TAYLOR)
)
STATE OF TEXAS)



COG OPERATING

Berry
Lea County, NM
Lightning P-38 State #2H
VH - Job #32K0212109

HOBBS OCD

MAY 21 2012

RECEIVED

SUR: H-01-21s-33e, 1980/N & 330/E
BHL: E-01-21s-33e, 2071/N & 4914/E
API # 30-025-40302

Survey: Gyro

SDI Standard Survey Report

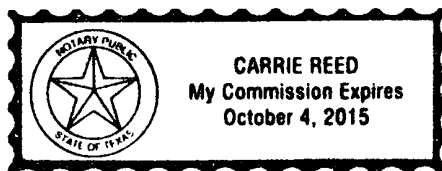
This survey is correct to the best of my knowledge and is supported by actual field data.

Robert

Notarized this date 14th of March, 2012.

Carrie Reed

Notary Signature
County of Midland
State of Texas



Scientific Drilling International, Inc.

SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Lightning P-38 State #2H
Project:	Berry	TVD Reference:	WELL @ 0 0usft (Original Well Elev)
Site:	Lea County, NM	MD Reference:	WELL @ 0 0usft (Original Well Elev)
Well:	Lightning P-38 State #2H	North Reference:	Grid
Wellbore:	VH - Job #32K0212109	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0212109	Database:	EDM-Regulatory

Project	Berry		
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	Lea County, NM		
Site Position:		Northing:	558,260 79 usft
From:	Lat/Long	Easting:	757,138 31 usft
Position Uncertainty:	0 0 usft	Slot Radius:	13-3/16"
		Latitude:	32° 31' 55 200 N
		Longitude:	103° 29' 56 400 W
		Grid Convergence:	0 45 °

Well	Lightning P-38 State #2H, Directional (Pathfinder)		
Well Position	+N/-S	0 0 usft	Northing: 552,394 61 usft
	+E/-W	0 0 usft	Easting: 751,326 95 usft
Position Uncertainty	0 0 usft	Wellhead Elevation:	usft
		Latitude:	32° 30' 57 600 N
		Longitude:	103° 31' 4 800 W
		Ground Level:	0 0 usft

Wellbore	VH - Job #32K0212109				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	1/28/2012	7 51	60 45	48,762

Design	VH - Job #32K0212109			
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	136 70

Survey Program	Date	3/13/2012		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100 0	11,557 0	Gyro (VH - Job #32K0212109)	Keeper	Keeper Gyro

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
100 0	0 32	205 31	100 0	-0 3	-0 1	205 31	0 3
200 0	0 30	207 78	200 0	-0 7	-0 4	206 10	0 8
300 0	0 34	195 06	300 0	-1 3	-0 6	204 05	1 4
400 0	0 41	191 79	400 0	-1 9	-0 7	200 58	2 0
500 0	0 71	198 53	500 0	-2 8	-1 0	199 11	3 0
600 0	0 81	201 17	600 0	-4 1	-1 4	199 36	4 3
700 0	0 74	203 54	700 0	-5 3	-1 9	200 06	5 7
800 0	0 79	198 86	800 0	-6 6	-2 4	200 26	7 0
900 0	0 78	206 11	900 0	-7 8	-2 9	200 62	8 4
1,000 0	0 93	215 08	999 9	-9 1	-3 7	202 18	9 8
1,100 0	1 02	227 20	1,099 9	-10 4	-4 8	204 97	11 4

Scientific Drilling International, Inc.

SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Lightning P-38 State #2H
Project:	Berry	TVD Reference:	WELL @ 0 0usft (Original Well Elev)
Site:	Lea County, NM	MD Reference:	WELL @ 0 0usft (Original Well Elev)
Well:	Lightning P-38 State #2H	North Reference:	Grid
Wellbore:	VH - Job #32K0212109	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0212109	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
1,200 0	1 01	228 88	1,199 9	-11 6	-6 2	208 01	13 1
1,300 0	1 08	238 30	1,299 9	-12 6	-7 6	211 08	14 8
1,400 0	1 16	249 80	1,399 9	-13 5	-9 4	214 79	16 4
1,500 0	1 11	249 49	1,499 9	-14 2	-11 2	218 38	18 1
1,600 0	1 21	251 39	1,599 8	-14 8	-13 1	221 49	19 8
1,700 0	1 21	257 74	1,699 8	-15 4	-15 2	224 54	21 6
1,800 0	1 09	262 02	1,799 8	-15 8	-17 1	227 39	23 3
1,900 0	0 24	294 62	1,899 8	-15 8	-18 3	229 13	24 2
2,000 0	0 24	303 55	1,999 8	-15 6	-18 6	230 06	24 3
2,100 0	0 29	300 84	2,099 8	-15 4	-19 0	231 09	24 5
2,200 0	0 18	298 26	2,199 8	-15 2	-19 4	231 98	24 6
2,300 0	0 27	291 10	2,299 8	-15 0	-19 7	232 78	24 8
2,400 0	0 19	298 74	2,399 8	-14 8	-20 1	233 58	25 0
2,500 0	0 10	319 56	2,499 8	-14 7	-20 3	234 13	25 1
2,600 0	0 28	27 07	2,599 8	-14 4	-20 3	234 58	24 9
2,700 0	0 37	35 80	2,699 8	-13 9	-20 0	235 09	24 3
2,800 0	0 39	46 48	2,799 8	-13 4	-19 5	235 47	23 7
2,900 0	0 87	53 41	2,899 8	-12 7	-18 7	235 68	22 6
3,000 0	1 43	57 12	2,999 8	-11 6	-17 0	235 68	20 6
3,100 0	2 44	69 14	3,099 7	-10 2	-14 0	233 93	17 3
3,200 0	2 68	70 58	3,199 6	-8 6	-9 8	228 52	13 0
3,300 0	2 58	71 29	3,299 5	-7 1	-5 4	217 29	9 0
3,400 0	2 12	68 72	3,399 4	-5 7	-1 6	195 39	6 0
3,500 0	2 10	64 12	3,499 3	-4 3	1 8	157 30	4 6
3,600 0	2 23	64 84	3,599 3	-2 7	5 2	117 01	5 8
3,700 0	2 04	60 62	3,699 2	-0 9	8 5	96 37	8 6
3,800 0	1 65	27 85	3,799 1	1 2	10 7	83 64	10 8
3,900 0	1 64	9 36	3,899 1	3 9	11 6	71 56	12 3
4,000 0	1 56	354 79	3,999 1	6 6	11 7	60 49	13 5
4,100 0	1 35	343 67	4,099 0	9 1	11 3	51 03	14 5
4,200 0	1 23	335 45	4,199 0	11 2	10 5	43 09	15 4
4,300 0	1 10	332 05	4,299 0	13 1	9 6	36 37	16 2
4,400 0	1 11	334 15	4,399 0	14 8	8 7	30 61	17 2
4,500 0	1 15	336 99	4,499 0	16 6	7 9	25 57	18 4
4,600 0	0 97	344 58	4,598 9	18 3	7 3	21 77	19 7
4,700 0	0 83	329 10	4,698 9	19 8	6 7	18 78	20 9
4,800 0	0 82	314 95	4,798 9	20 9	5 8	15 63	21 7
4,900 0	0 86	306 92	4,898 9	21 8	4 7	12 23	22 3
5,000 0	0 72	301 49	4,998 9	22 6	3 6	9 04	22 9
5,100 0	0 63	311 06	5,098 9	23 3	2 6	6 48	23 5
5,200 0	0 43	317 33	5,198 9	23 9	2 0	4 73	24 0
5,300 0	0 37	303 09	5,298 9	24 4	1 5	3 41	24 4
5,400 0	0 34	312 25	5,398 9	24 8	1 0	2 23	24 8
5,500 0	0 29	303 22	5,498 9	25 1	0 5	1 22	25 1

Scientific Drilling International, Inc.

SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Lightning P-38 State #2H
Project:	Berry	TVD Reference:	WELL @ 0 0usft (Original Well Elev)
Site:	Lea County, NM	MD Reference:	WELL @ 0 0usft (Original Well Elev)
Well:	Lightning P-38 State #2H	North Reference:	Grnd
Wellbore:	VH - Job #32K0212109	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0212109	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
5,600 0	0 15	148 04	5,598 9	25 1	0 4	0 89	25 1
5,700 0	0 15	109 37	5,698 9	25 0	0 6	1 34	25 0
5,800 0	0 17	100 09	5,798 9	24 9	0 9	1 96	24 9
5,900 0	0 24	73 75	5,898 9	24 9	1 2	2 76	25 0
6,000 0	0 41	42 93	5,998 9	25 3	1 6	3 73	25 3
6,100 0	0 49	42 77	6,098 9	25 8	2 2	4 82	25 9
6,200 0	0 55	56 98	6,198 9	26 4	2 9	6 20	26 6
6,300 0	0 83	69 88	6,298 9	26 9	4 0	8 35	27 2
6,400 0	0 85	74 16	6,398 8	27 4	5 3	11 05	27 9
6,500 0	0 80	72 64	6,498 8	27 8	6 7	13 61	28 6
6,600 0	0 76	79 38	6,598 8	28 1	8 0	15 97	29 3
6,700 0	0 78	83 37	6,698 8	28 3	9 4	18 31	29 8
6,800 0	0 63	92 51	6,798 8	28 4	10 6	20 48	30 3
6,900 0	0 60	97 66	6,898 8	28 3	11 7	22 42	30 6
7,000 0	0 63	105 87	6,998 8	28 1	12 7	24 37	30 8
7,100 0	0 76	112 06	7,098 8	27 7	13 9	26 61	30 9
7,200 0	0 70	119 68	7,198 8	27 1	15 0	28 96	31 0
7,300 0	0 77	134 84	7,298 8	26 3	16 0	31 30	30 8
7,400 0	0 74	134 14	7,398 8	25 4	17 0	33 70	30 5
7,500 0	0 74	142 60	7,498 8	24 5	17 8	36 06	30 2
7,600 0	0 76	143 59	7,598 7	23 4	18 6	38 46	29 9
7,700 0	0 60	145 35	7,698 7	22 4	19 3	40 67	29 6
7,800 0	0 67	145 12	7,798 7	21 5	19 9	42 77	29 3
7,900 0	0 64	145 31	7,898 7	20 6	20 6	44 97	29 1
8,000 0	0 63	147 12	7,998 7	19 7	21 2	47 12	28 9
8,100 0	0 64	151 35	8,098 7	18 7	21 8	49 28	28 7
8,200 0	0 65	149 09	8,198 7	17 7	22 3	51 51	28 5
8,300 0	0 60	151 52	8,298 7	16 8	22 9	53 68	28 4
8,400 0	0 64	148 77	8,398 7	15 9	23 4	55 86	28 3
8,500 0	0 57	152 96	8,498 7	14 9	23 9	58 00	28 2
8,600 0	0 56	165 11	8,598 7	14 0	24 3	59 97	28 0
8,700 0	0 39	180 56	8,698 7	13 2	24 4	61 55	27 7
8,800 0	0 37	189 29	8,798 7	12 6	24 3	62 71	27 4
8,900 0	0 50	203 55	8,898 7	11 8	24 1	63 85	26 8
9,000 0	0 41	211 21	8,998 7	11 1	23 7	64 89	26 2
9,100 0	0 49	242 15	9,098 7	10 6	23 2	65 38	25 5
9,200 0	0 79	250 01	9,198 7	10 2	22 1	65 31	24 4
9,300 0	0 34	200 67	9,298 7	9 7	21 4	65 68	23 5
9,400 0	0 22	148 66	9,398 7	9 2	21 4	66 66	23 3
9,500 0	0 30	89 82	9,498 7	9 1	21 8	67 37	23 6
9,600 0	0 20	53 27	9,598 7	9 2	22 2	67 51	24 0
9,700 0	0 63	126 19	9,698 7	9 0	22 7	68 51	24 4
9,800 0	1 17	143 37	9,798 6	7 8	23 8	71 83	25 0
9,900 0	1 42	151 64	9,898 6	5 9	25 0	76 72	25 7

Scientific Drilling International, Inc.

SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Lightning P-38 State #2H
Project:	Berry	TVD Reference:	WELL @ 0 0usft (Original Well Elev)
Site:	Lea County, NM	MD Reference:	WELL @ 0 0usft (Original Well Elev)
Well:	Lightning P-38 State #2H	North Reference:	Grid
Wellbore:	VH - Job #32K0212109	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0212109	Database:	EDM-Regulatory

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
10,000 0	1 72	168 45	9,998 6	3 3	25 9	82 65	26 1
10,100 0	1 80	166 82	10,098 5	0 3	26 5	89 27	26 5
10,200 0	1 68	167 32	10,198 5	-2 6	27 2	95 50	27 3
10,300 0	1 77	166 16	10,298 4	-5 6	27 9	101 25	28 5
10,400 0	1 61	171 07	10,398 4	-8 4	28 5	106 50	29 7
10,500 0	1 36	167 55	10,498 4	-11 0	29 0	110 77	31 0
10,600 0	1 47	169 09	10,598 3	-13 4	29 5	114 46	32 4
10,700 0	1 86	162 14	10,698 3	-16 2	30 2	118 22	34 3
10,800 0	1 96	160 79	10,798 2	-19 4	31 3	121 77	36 8
10,900 0	2 01	152 35	10,898 2	-22 5	32 6	124 62	39 7
11,000 0	1 86	153 02	10,998 1	-25 5	34 2	126 75	42 7
11,100 0	1 78	152 76	11,098 1	-28 4	35 6	128 51	45 6
11,200 0	1 66	168 51	11,198 0	-31 2	36 6	130 38	48 1
11,300 0	1 72	167 08	11,298 0	-34 0	37 3	132 41	50 5
11,400 0	1 72	167 61	11,397 9	-37 0	37 9	134 27	53 0
11,500 0	1 63	167 30	11,497 9	-39 8	38 6	135 93	55 4
11,557 0	1 32	167 43	11,554 9	-41 3	38 9	136 70	56 7



Scientific Drilling
Directional Drilling Operations

Project: Berry
Lea County, NM
Well: Lightning P-38 State #2H
Wellbore: VH - Job #32K0212109
Design: VH - Job #32K0212109

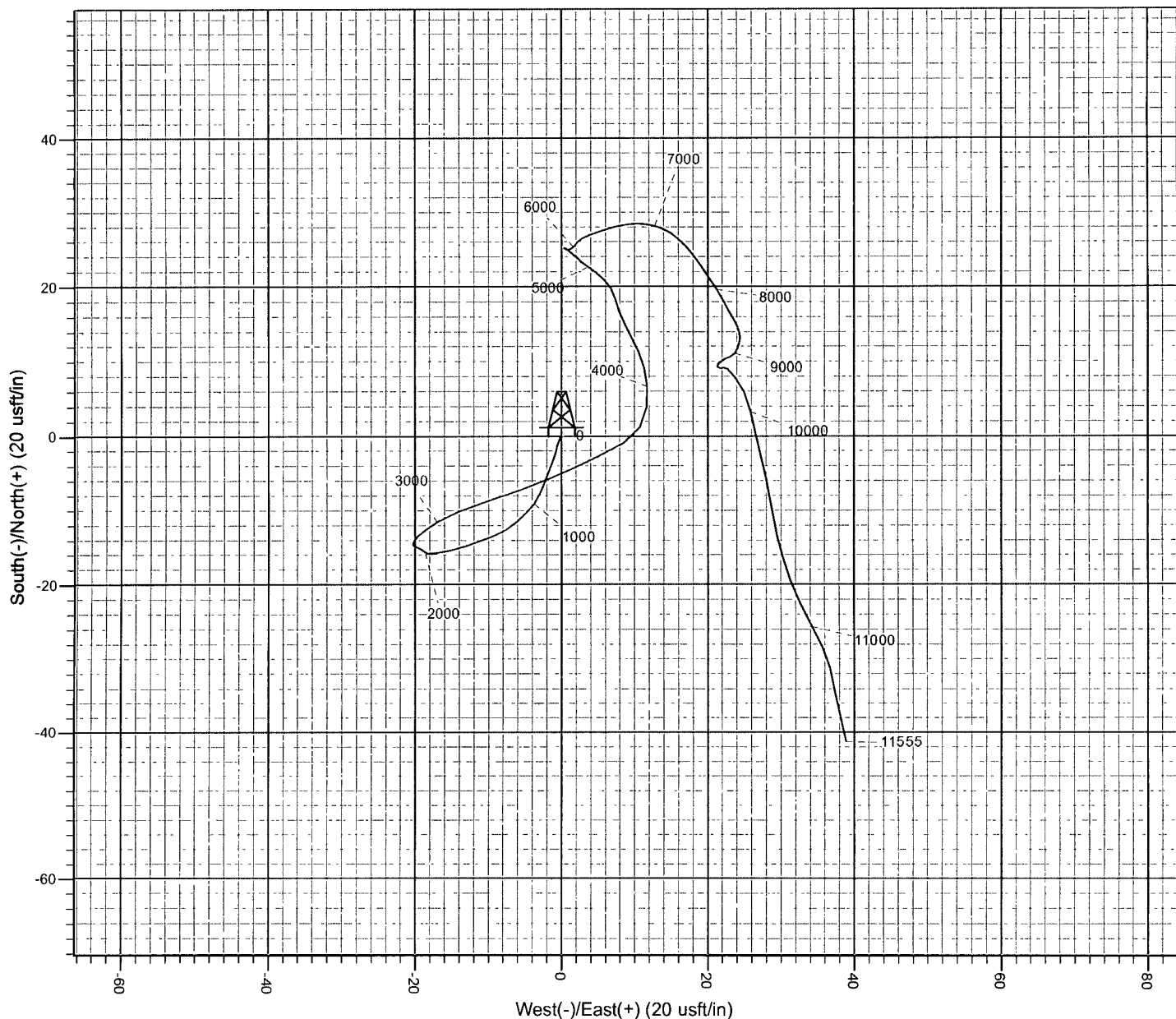


Azimuths to Grid North
True North -0 44°
Magnetic North 7 07°

Magnetic Field
Strength 48762 2snT
Dip Angle 60 45°
Date 1/28/2012
Model IGRF2010

WELL DETAILS: Lightning P-38 State #2H
WELL @ 0.0usft (Original Well Elev)
Ground Level: 0.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0 0	552394 61	751326.95	32° 30' 57.600 N	103° 31' 4.800 W	



PROJECT DETAILS: Berry
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: Lea County, NM
Site Centre Latitude: 32° 31' 55.200 N
Longitude: 103° 29' 56.400 W
Positional Uncertainty: 0.0
Convergence 0.45
Local North: Grid



COG Operating LLC

Lea County(NAD83)

Lightning P-38 State

#2H

OH

Design: OH

Pathfinder X & Y Report

21 February, 2012

SUR: H-01-21s-33e, 1980/N & 330/E
BHL: E-01-21s-33e, 2071/N & 4914/E
API # 30-025-40302

PATHFINDER®

A Schlumberger Company



Pathfinder
Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County(NAD83)	TVD Reference:	KB = 19' @ 3808 6usft (Original Well Elev)
Site:	Lightning P-38 State	MD Reference:	KB = 19' @ 3808 6usft (Original Well Elev)
Well:	#2H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000 1 Single User Db

Project	Lea County(NAD83)		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site	Lightning P-38 State		
Site Position:		Northing:	552,736 340 usft
From:	Map	Easting:	792,467 160 usft
Position Uncertainty:	0 0 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 31' 0 816 N
		Longitude:	103° 31' 7 012 W
		Grid Convergence:	0.44 °

Well	#2H		
Well Position	+N/-S	0 0 usft	Northing:
	+E/-W	0 0 usft	Easting:
Position Uncertainty		0 0 usft	Wellhead Elevation:
			Latitude:
			Longitude:
			Ground Level:

Wellbore	OH		
Magnetics	Model Name	Sample Date	Declination
	IGRF200510	1/29/2012	(°)
			Dip Angle
			(°)
			Field Strength
			(nT)

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



Pathfinder
Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Lea County(NAD83)
Site: Lightning P-38 State
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 19' @ 3808.6usft (Original Well Elev)
MD Reference: KB = 19' @ 3808.6usft (Original Well Elev)
North Reference: Gnd
Survey Calculation Method: Minimum Curvature
Database: EDM 5000 1 Single User Db

Survey Program		Date	2/21/2012		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100 0	11,000.0	Gyro #1 (OH)	NS-GYRO-MS	North sensing gyrocompassing m/s	
11,057.0	16,008 0	MWD #2 (OH)	MWD	MWD - Standard	

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)
0.0	0.00	0 00	0 0	-3,808 6	0.0	0 0	0.0	0 00	552,736 34	792,467 16
100 0	0 32	205 31	100 0	-3,708 6	-0.3	-0.1	0 1	0 32	552,736 09	792,467 04
200 0	0 30	207.78	200.0	-3,608.6	-0.7	-0.4	0 4	0.02	552,735.60	792,466 80
300.0	0 34	195 06	300.0	-3,508.6	-1.3	-0.6	0 6	0 08	552,735.09	792,466.60
400 0	0 41	191 79	400 0	-3,408 6	-1.9	-0.7	0.7	0 07	552,734 45	792,466 45
500 0	0 71	198 53	500 0	-3,308.6	-2.8	-1.0	1 0	0 31	552,733 51	792,466 18
600 0	0 81	201 17	600.0	-3,208.6	-4 1	-1.4	1 5	0 11	552,732 26	792,465 73
700 0	0 74	203 54	700 0	-3,108 6	-5.3	-1.9	2 0	0.08	552,731 01	792,465.21
800 0	0 79	198.86	800 0	-3,008 6	-6 6	-2.4	2 5	0.08	552,729 77	792,464 73
900.0	0 78	206 11	900 0	-2,908.6	-7 8	-2.9	3 0	0 10	552,728 51	792,464 21
1,000.0	0 93	215 08	999 9	-2,808.7	-9 1	-3.7	3 8	0 20	552,727 23	792,463.45
1,100 0	1 02	227 20	1,099.9	-2,708.7	-10 4	-4.8	4 9	0 22	552,725 96	792,462 33
1,200.0	1 01	228 88	1,199 9	-2,608 7	-11 6	-6.2	6 2	0 03	552,724.78	792,461 01
1,300.0	1.08	238 30	1,299.9	-2,508 7	-12 6	-7.6	7 7	0 19	552,723 70	792,459 54
1,400 0	1 16	249 80	1,399 9	-2,408 7	-13 5	-9.4	9.5	0 24	552,722 86	792,457 79
1,500.0	1 11	249 49	1,499 9	-2,308 7	-14.2	-11.2	11.3	0 05	552,722 17	792,455 93
1,600.0	1 21	251.39	1,599.8	-2,208.8	-14 8	-13.1	13 2	0 11	552,721 49	792,454 03
1,700 0	1.21	257 74	1,699 8	-2,108 8	-15 4	-15.2	15 3	0.13	552,720 93	792,451 99
1,800 0	1 09	262 02	1,799 8	-2,008 8	-15 8	-17.1	17.3	0 15	552,720 57	792,450 02
1,900 0	0 24	294 62	1,899 8	-1,908 8	-15 8	-18.3	18 4	0 90	552,720.53	792,448 89
2,000 0	0.24	303.55	1,999 8	-1,808 8	-15 6	-18 6	18 8	0 04	552,720 73	792,448 52



Pathfinder
Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County(NAD83)	TVD Reference:	KB = 19' @ 3808.6usft (Original Well Elev)
Site:	Lightning P-38 State	MD Reference:	KB = 19' @ 3808.6usft (Original Well Elev)
Well:	#2H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
2,100.0	0.29	300.84	2,099.8	-1,708.8	-15.4	-19.0	19.1	0.05	552,720.98	792,448.13	
2,200.0	0.18	298.26	2,199.8	-1,608.8	-15.2	-19.4	19.5	0.11	552,721.18	792,447.78	
2,300.0	0.27	291.10	2,299.8	-1,508.8	-15.0	-19.7	19.9	0.09	552,721.34	792,447.42	
2,400.0	0.19	298.74	2,399.8	-1,408.8	-14.8	-20.1	20.2	0.09	552,721.51	792,447.05	
2,500.0	0.10	319.56	2,499.8	-1,308.8	-14.7	-20.3	20.4	0.10	552,721.65	792,446.85	
2,600.0	0.28	27.07	2,599.8	-1,208.8	-14.4	-20.3	20.4	0.26	552,721.94	792,446.90	
2,700.0	0.37	35.80	2,699.8	-1,108.8	-13.9	-20.0	20.1	0.10	552,722.42	792,447.20	
2,800.0	0.39	46.48	2,799.8	-1,008.8	-13.4	-19.5	19.6	0.07	552,722.91	792,447.64	
2,900.0	0.87	53.41	2,899.8	-908.8	-12.7	-18.7	18.8	0.49	552,723.60	792,448.50	
3,000.0	1.43	57.12	2,999.8	-808.8	-11.6	-17.0	17.1	0.56	552,724.73	792,450.15	
3,100.0	2.44	69.14	3,099.7	-708.9	-10.2	-14.0	14.0	1.08	552,726.16	792,453.19	
3,200.0	2.68	70.58	3,199.6	-609.0	-8.6	-9.8	9.8	0.25	552,727.70	792,457.39	
3,300.0	2.58	71.29	3,299.5	-509.1	-7.1	-5.4	5.5	0.11	552,729.20	792,461.72	
3,400.0	2.12	68.72	3,399.4	-409.2	-5.7	-1.6	1.6	0.47	552,730.59	792,465.58	
3,500.0	2.10	64.12	3,499.3	-309.3	-4.3	1.8	-1.8	0.17	552,732.06	792,468.95	
3,600.0	2.23	64.84	3,599.3	-209.3	-2.7	5.2	-5.2	0.13	552,733.69	792,472.36	
3,700.0	2.04	60.62	3,699.2	-109.4	-0.9	8.5	-8.5	0.25	552,735.39	792,475.67	
3,800.0	1.65	27.85	3,799.1	-9.5	1.2	10.7	-10.7	1.11	552,737.54	792,477.89	
3,900.0	1.64	9.36	3,899.1	90.5	3.9	11.6	-11.7	0.53	552,740.22	792,478.80	
4,000.0	1.56	354.79	3,999.1	190.5	6.6	11.7	-11.8	0.41	552,742.99	792,478.91	
4,100.0	1.35	343.67	4,099.0	290.4	9.1	11.3	-11.4	0.35	552,745.47	792,478.45	
4,200.0	1.23	335.45	4,199.0	390.4	11.2	10.5	-10.6	0.22	552,747.58	792,477.68	
4,300.0	1.10	332.05	4,299.0	490.4	13.1	9.6	-9.7	0.15	552,749.41	792,476.78	
4,400.0	1.11	334.15	4,399.0	590.4	14.8	8.7	-8.9	0.04	552,751.13	792,475.91	
4,500.0	1.15	336.99	4,499.0	690.4	16.6	7.9	-8.1	0.07	552,752.92	792,475.09	
4,600.0	0.97	344.58	4,598.9	790.3	18.3	7.3	-7.4	0.23	552,754.66	792,474.48	
4,700.0	0.83	329.10	4,698.9	890.3	19.8	6.7	-6.9	0.28	552,756.10	792,473.88	



Pathfinder
Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County(NAD83)	TVD Reference:	KB = 19' @ 3808.6usft (Original Well Elev)
Site:	Lightning P-38 State	MD Reference:	KB = 19' @ 3808.6usft (Original Well Elev)
Well:	#2H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
4,800.0	0.82	314.95	4,798.9	990.3	20.9	5.8	-6.0	0.20	552,757.22	792,473.00	
4,900.0	0.86	306.92	4,898.9	1,090.3	21.8	4.7	-4.9	0.12	552,758.18	792,471.89	
5,000.0	0.72	301.49	4,998.9	1,190.3	22.6	3.6	-3.8	0.16	552,758.96	792,470.76	
5,100.0	0.63	311.06	5,098.9	1,290.3	23.3	2.6	-2.8	0.14	552,759.65	792,469.81	
5,200.0	0.43	317.33	5,198.9	1,390.3	23.9	2.0	-2.2	0.21	552,760.29	792,469.14	
5,300.0	0.37	303.09	5,298.9	1,490.3	24.4	1.5	-1.6	0.12	552,760.74	792,468.62	
5,400.0	0.34	312.25	5,398.9	1,590.3	24.8	1.0	-1.1	0.06	552,761.11	792,468.13	
5,500.0	0.29	303.22	5,498.9	1,690.3	25.1	0.5	-0.7	0.07	552,761.45	792,467.69	
5,600.0	0.15	148.04	5,598.9	1,790.3	25.1	0.4	-0.6	0.43	552,761.48	792,467.55	
5,700.0	0.15	109.37	5,698.9	1,890.3	25.0	0.6	-0.8	0.10	552,761.33	792,467.74	
5,800.0	0.17	100.09	5,798.9	1,990.3	24.9	0.9	-1.0	0.03	552,761.26	792,468.01	
5,900.0	0.24	73.75	5,898.9	2,090.3	24.9	1.2	-1.4	0.12	552,761.29	792,468.36	
6,000.0	0.41	42.93	5,998.9	2,190.3	25.3	1.6	-1.8	0.24	552,761.61	792,468.81	
6,100.0	0.49	42.77	6,098.9	2,290.3	25.8	2.2	-2.4	0.08	552,762.19	792,469.34	
6,200.0	0.55	56.98	6,198.9	2,390.3	26.4	2.9	-3.1	0.14	552,762.76	792,470.03	
6,300.0	0.83	69.88	6,298.9	2,490.3	26.9	4.0	-4.2	0.32	552,763.27	792,471.11	
6,400.0	0.85	74.16	6,398.8	2,590.2	27.4	5.3	-5.5	0.07	552,763.72	792,472.51	
6,500.0	0.80	72.64	6,498.8	2,690.2	27.8	6.7	-6.9	0.05	552,764.13	792,473.89	
6,600.0	0.76	79.38	6,598.8	2,790.2	28.1	8.0	-8.3	0.10	552,764.46	792,475.21	
6,700.0	0.78	83.37	6,698.8	2,890.2	28.3	9.4	-9.6	0.06	552,764.67	792,476.53	
6,800.0	0.63	92.51	6,798.8	2,990.2	28.4	10.6	-10.8	0.19	552,764.72	792,477.76	
6,900.0	0.60	97.66	6,898.8	3,090.2	28.3	11.7	-11.9	0.06	552,764.63	792,478.83	
7,000.0	0.63	105.87	6,998.8	3,190.2	28.1	12.7	-12.9	0.09	552,764.41	792,479.88	
7,100.0	0.76	112.06	7,098.8	3,290.2	27.7	13.9	-14.1	0.15	552,764.01	792,481.02	
7,200.0	0.70	119.68	7,198.8	3,390.2	27.1	15.0	-15.2	0.11	552,763.45	792,482.16	
7,300.0	0.77	134.84	7,298.8	3,490.2	26.3	16.0	-16.2	0.21	552,762.68	792,483.17	
7,400.0	0.74	134.14	7,398.8	3,590.2	25.4	17.0	-17.1	0.03	552,761.75	792,484.11	



Pathfinder
Pathfinder X & Y Report

PATHFINDER
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Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County(NAD83)	TVD Reference:	KB = 19' @ 3808.6usft (Original Well Elev)
Site:	Lightning P-38 State	MD Reference:	KB = 19' @ 3808.6usft (Original Well Elev)
Well:	#2H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000 1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
7,500.0	0.74	142.60	7,498.8	3,690.2	24.5	17.8	-18.0	0.11	552,760.79	792,484.97	
7,600.0	0.76	143.59	7,598.7	3,790.1	23.4	18.6	-18.8	0.02	552,759.75	792,485.75	
7,700.0	0.60	145.35	7,698.7	3,890.1	22.4	19.3	-19.4	0.16	552,758.78	792,486.44	
7,800.0	0.67	145.12	7,798.7	3,990.1	21.5	19.9	-20.1	0.07	552,757.87	792,487.08	
7,900.0	0.64	145.31	7,898.7	4,090.1	20.6	20.6	-20.7	0.03	552,756.93	792,487.73	
8,000.0	0.63	147.12	7,998.7	4,190.1	19.7	21.2	-21.3	0.02	552,756.01	792,488.35	
8,100.0	0.64	151.35	8,098.7	4,290.1	18.7	21.8	-21.9	0.05	552,755.06	792,488.91	
8,200.0	0.65	149.09	8,198.7	4,390.1	17.7	22.3	-22.4	0.03	552,754.08	792,489.47	
8,300.0	0.60	151.52	8,298.7	4,490.1	16.8	22.9	-23.0	0.06	552,753.14	792,490.01	
8,400.0	0.64	148.77	8,398.7	4,590.1	15.9	23.4	-23.5	0.05	552,752.20	792,490.55	
8,500.0	0.57	152.96	8,498.7	4,690.1	14.9	23.9	-24.0	0.08	552,751.28	792,491.07	
8,600.0	0.56	165.11	8,598.7	4,790.1	14.0	24.3	-24.4	0.12	552,750.36	792,491.42	
8,700.0	0.39	180.56	8,698.7	4,890.1	13.2	24.4	-24.5	0.21	552,749.55	792,491.54	
8,800.0	0.37	189.29	8,798.7	4,990.1	12.6	24.3	-24.4	0.06	552,748.89	792,491.48	
8,900.0	0.50	203.55	8,898.7	5,090.1	11.8	24.1	-24.2	0.17	552,748.17	792,491.26	
9,000.0	0.41	211.21	8,998.7	5,190.1	11.1	23.7	-23.8	0.11	552,747.47	792,490.90	
9,100.0	0.49	242.15	9,098.7	5,290.1	10.6	23.2	-23.3	0.25	552,746.96	792,490.34	
9,200.0	0.79	250.01	9,198.7	5,390.1	10.2	22.1	-22.2	0.31	552,746.52	792,489.31	
9,300.0	0.34	200.67	9,298.7	5,490.1	9.7	21.4	-21.5	0.62	552,746.01	792,488.56	
9,400.0	0.22	148.66	9,398.7	5,590.1	9.2	21.4	-21.5	0.27	552,745.57	792,488.55	
9,500.0	0.30	89.82	9,498.7	5,690.1	9.1	21.8	-21.8	0.26	552,745.41	792,488.91	
9,600.0	0.20	53.27	9,598.7	5,790.1	9.2	22.2	-22.2	0.18	552,745.51	792,489.32	
9,700.0	0.63	126.19	9,698.7	5,890.1	9.0	22.7	-22.8	0.60	552,745.29	792,489.90	
9,800.0	1.17	143.37	9,798.6	5,990.0	7.8	23.8	-23.8	0.60	552,744.15	792,490.95	
9,900.0	1.42	151.64	9,898.6	6,090.0	5.9	25.0	-25.0	0.31	552,742.24	792,492.15	
10,000.0	1.72	168.45	9,998.6	6,190.0	3.3	25.9	-25.9	0.55	552,739.68	792,493.04	
10,100.0	1.80	166.82	10,098.5	6,289.9	0.3	26.5	-26.5	0.09	552,736.68	792,493.70	



Pathfinder
Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County(NAD83)	TVD Reference:	KB = 19' @ 3808 6usft (Original Well Elev)
Site:	Lightning P-38 State	MD Reference:	KB = 19' @ 3808 6usft (Original Well Elev)
Well:	#2H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000 1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
10,200 0	1 68	167.32	10,198 5	6,389.9	-2 6	27 2	-27 2	0 12	552,733 72	792,494 38	
10,300 0	1 77	166.16	10,298 4	6,489 8	-5.6	27 9	-27.9	0.10	552,730 79	792,495 07	
10,400 0	1 61	171 07	10,398 4	6,589 8	-8 4	28.5	-28 4	0.22	552,727 90	792,495.66	
10,500 0	1 36	167 55	10,498.4	6,689 8	-11 0	29 0	-28 9	0 27	552,725.35	792,496 13	
10,600 0	1.47	169.09	10,598 3	6,789.7	-13 4	29 5	-29 4	0 12	552,722 94	792,496 63	
10,700.0	1 86	162 14	10,698 3	6,889 7	-16 2	30 2	-30.1	0 44	552,720 13	792,497.37	
10,800 0	1 96	160 79	10,798 2	6,989 6	-19 4	31.3	-31.1	0 11	552,716 97	792,498 43	
10,900 0	2 01	152.35	10,898 2	7,089.6	-22 5	32 6	-32 5	0.30	552,713.80	792,499.81	
11,000 0	1 86	153 02	10,998 1	7,189 5	-25 5	34 2	-34 0	0.15	552,710.80	792,501.36	
11,087.0	1.67	153 01	11,085 1	7,276 5	-27 9	35 4	-35 2	0.22	552,708 42	792,502 57	
11,118 0	1 67	172 52	11,116 1	7,307 5	-28 8	35 7	-35 5	1 83	552,707 57	792,502.84	
11,150 0	2.20	214 87	11,148.0	7,339.4	-29 7	35 4	-35.2	4 63	552,706 60	792,502.54	
11,181.0	5.45	247 17	11,179 0	7,370 4	-30.8	33 7	-33.5	12.19	552,705 54	792,500 85	
11,213.0	9 94	256.70	11,210.7	7,402 1	-32 0	29 6	-29 4	14.54	552,704.31	792,496.76	
11,245.0	14 77	259.11	11,241 9	7,433 3	-33 4	22 9	-22 7	15 18	552,702 91	792,490 06	
11,276 0	18 99	257 79	11,271 6	7,463 0	-35.2	14.1	-13.8	13 67	552,701 09	792,481.25	
11,308 0	23 21	258 91	11,301.4	7,492 8	-37.6	2.8	-2.5	13 25	552,698 78	792,469 96	
11,339 0	27 44	261 00	11,329 5	7,520.9	-39 9	-10.3	10 5	13 94	552,696 49	792,456 91	
11,371.0	31 30	263 01	11,357.3	7,548 7	-42.0	-25 8	26 1	12 45	552,694 32	792,441.37	
11,402 0	34 65	264.05	11,383 3	7,574 7	-43 9	-42 6	42 9	10 96	552,692 43	792,424 61	
11,434 0	38.08	264 00	11,409 1	7,600.5	-45 9	-61 4	61.8	10 72	552,690 45	792,405 74	
11,466.0	42 74	264 93	11,433.5	7,624 9	-47.9	-82 1	82 4	14 68	552,688.46	792,385 10	
11,497.0	47 22	266 75	11,455 4	7,646 8	-49.5	-103 9	104 3	15.03	552,686.88	792,363 25	
11,529 0	51 88	267 96	11,476 1	7,667 5	-50 6	-128 2	128 6	14 84	552,685 77	792,338.93	
11,560 0	56 37	268 42	11,494.3	7,685 7	-51 4	-153 3	153 7	14 53	552,684 98	792,313.83	
11,592 0	61.29	270 18	11,510 9	7,702 3	-51 7	-180.7	181 1	16 08	552,684 65	792,286 46	
11,623 0	66 21	271 58	11,524 6	7,716 0	-51 3	-208 5	208 9	16 38	552,685 09	792,258 67	



Pathfinder
Pathfinder X & Y Report

PATHFINDER
A Schlumberger Company

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County(NAD83)	TVD Reference:	KB = 19' @ 3808.6usft (Original Well Elev)
Site:	Lightning P-38 State	MD Reference:	KB = 19' @ 3808.6usft (Original Well Elev)
Well:	#2H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000 1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
11,655.0	70.87	272.46	11,536.3	7,727.7	-50.2	-238.2	238.6	14.79	552,686.14	792,228.92	
11,687.0	75.89	272.82	11,545.4	7,736.8	-48.8	-268.9	269.2	15.72	552,687.55	792,198.30	
11,718.0	81.25	273.10	11,551.6	7,743.0	-47.2	-299.2	299.5	17.31	552,689.12	792,167.96	
11,778.0	90.48	272.05	11,555.9	7,747.3	-44.5	-358.9	359.2	15.48	552,691.81	792,108.24	
11,841.0	91.36	272.10	11,554.9	7,746.3	-42.3	-421.9	422.2	1.40	552,694.09	792,045.29	
11,936.0	92.33	273.12	11,551.8	7,743.2	-37.9	-516.7	517.0	1.48	552,698.41	791,950.44	
12,030.0	90.84	271.70	11,549.2	7,740.6	-34.0	-610.6	610.8	2.19	552,702.36	791,856.57	
12,125.0	89.69	271.33	11,548.8	7,740.2	-31.5	-705.6	705.8	1.27	552,704.87	791,761.60	
12,220.0	91.89	271.81	11,547.5	7,738.9	-28.9	-800.5	800.7	2.37	552,707.47	791,666.66	
12,314.0	91.71	271.62	11,544.5	7,735.9	-26.1	-894.4	894.6	0.28	552,710.29	791,572.74	
12,408.0	92.68	272.09	11,540.9	7,732.3	-23.0	-988.3	988.4	1.15	552,713.33	791,478.86	
12,503.0	91.45	271.98	11,537.5	7,728.9	-19.6	-1,083.2	1,083.3	1.30	552,716.70	791,383.99	
12,598.0	91.28	271.64	11,535.2	7,726.6	-16.6	-1,178.1	1,178.2	0.40	552,719.70	791,289.06	
12,693.0	91.54	271.46	11,532.9	7,724.3	-14.1	-1,273.0	1,273.1	0.33	552,722.27	791,194.13	
12,787.0	91.63	272.27	11,530.3	7,721.7	-11.0	-1,366.9	1,367.0	0.87	552,725.32	791,100.21	
12,882.0	89.16	271.75	11,529.6	7,721.0	-7.7	-1,461.9	1,461.9	2.66	552,728.66	791,005.28	
13,008.0	89.43	271.31	11,531.2	7,722.6	-4.3	-1,587.8	1,587.8	0.41	552,732.02	790,879.33	
13,103.0	90.92	272.02	11,530.9	7,722.3	-1.6	-1,682.8	1,682.7	1.74	552,734.78	790,784.38	
13,198.0	91.10	271.76	11,529.2	7,720.6	1.6	-1,777.7	1,777.7	0.33	552,737.91	790,689.45	
13,293.0	92.33	272.53	11,526.4	7,717.8	5.1	-1,872.6	1,872.5	1.53	552,741.47	790,594.56	
13,393.0	91.10	271.14	11,523.4	7,714.8	8.3	-1,972.5	1,972.4	1.86	552,744.67	790,494.66	
13,488.0	89.69	270.49	11,522.7	7,714.1	9.7	-2,067.5	2,067.4	1.63	552,746.02	790,399.67	
13,582.0	89.25	270.31	11,523.6	7,715.0	10.3	-2,161.5	2,161.3	0.51	552,746.67	790,305.68	
13,677.0	88.20	270.09	11,525.7	7,717.1	10.7	-2,256.5	2,256.3	1.13	552,747.01	790,210.70	
13,772.0	88.46	269.15	11,528.5	7,719.9	10.0	-2,351.4	2,351.3	1.03	552,746.38	790,115.75	
13,867.0	88.81	268.21	11,530.7	7,722.1	7.8	-2,446.4	2,446.2	1.06	552,744.19	790,020.80	
13,961.0	89.16	267.62	11,532.4	7,723.8	4.4	-2,540.3	2,540.2	0.73	552,740.77	789,926.88	



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Site:	Lightning P-38 State	MD Reference:	KB = 19' @ 3808.6usft (Original Well Elev)
Well:	#2H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
14,056.0	91 19	268 43	11,532 1	7,723 5	1 2	-2,635.2	2,635 1	2 30	552,737 50	789,831.94	
14,151 0	91 10	268 00	11,530 2	7,721.6	-1.8	-2,730 2	2,730.1	0 46	552,734 54	789,737 01	
14,246 0	90 66	267.66	11,528.8	7,720 2	-5 4	-2,825 1	2,825 0	0 59	552,730.94	789,642 09	
14,340.0	90 57	267 26	11,527 8	7,719 2	-9 6	-2,919 0	2,919 0	0 44	552,726 77	789,548 18	
14,467 0	90 13	266 65	11,527.0	7,718 4	-16.3	-3,045.8	3,045 8	0 59	552,720 03	789,421 37	
14,561 0	92 33	269.11	11,525 0	7,716 4	-19.8	-3,139 7	3,139.8	3 51	552,716 55	789,327 47	
14,656 0	91 19	269 02	11,522 0	7,713 4	-21 3	-3,234 6	3,234 7	1 20	552,715 00	789,232 52	
14,751.0	91 28	268 51	11,520 0	7,711 4	-23 4	-3,329 6	3,329 7	0 55	552,712 95	789,137 57	
14,846.0	89 78	267 07	11,519 1	7,710 5	-27 0	-3,424 5	3,424 6	2 19	552,709 29	789,042 65	
14,940 0	88 99	265 85	11,520 1	7,711 5	-32.9	-3,518 3	3,518 5	1 55	552,703 49	788,948 84	
15,035 0	90 13	266 51	11,520 9	7,712 3	-39 2	-3,613 1	3,613 3	1 39	552,697 16	788,854 05	
15,161 0	89 08	265 85	11,521 7	7,713 1	-47.6	-3,738 8	3,739 1	0 98	552,688.77	788,728 34	
15,256 0	90.04	266 67	11,522.5	7,713 9	-53.8	-3,833.6	3,833 9	1.33	552,682 57	788,633 54	
15,351 0	89 34	265 75	11,523 0	7,714 4	-60 1	-3,928 4	3,928 7	1.22	552,676.29	788,538 76	
15,446 0	92 07	267 63	11,521.8	7,713.2	-65 5	-4,023.2	4,023 6	3 49	552,670 81	788,443 93	
15,540 0	92 15	266 46	11,518 3	7,709 7	-70.4	-4,117.0	4,117 4	1 25	552,665.96	788,350.12	
15,635 0	92 59	266 88	11,514 4	7,705 8	-75 9	-4,211 8	4,212.2	0 64	552,660 45	788,255.37	
15,730.0	92 77	267 12	11,510 0	7,701 4	-80 9	-4,306 6	4,307 0	0 32	552,655 48	788,160 60	
15,824.0	92 42	268 13	11,505 7	7,697 1	-84.7	-4,400 4	4,400 9	1.14	552,651 59	788,066 78	
16,008 0	92 42	268 13	11,497 9	7,689 3	-90 7	-4,584 1	4,584 7	0 00	552,645.59	787,883 04	



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Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County(NAD83)	TVD Reference:	KB = 19' @ 3808.6usft (Original Well Elev)
Site:	Lightning P-38 State	MD Reference:	KB = 19' @ 3808.6usft (Original Well Elev)
Well:	#2H	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000 1 Single User Db

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
11,150.0	11,148.0	-29.7	35.4	KOP - 11150.0 'MD, 11148.0 'TVD, 214.87 'AZI, 2.20 'INC, -29.7 'N, 35.4 'E
11,778.0	11,555.9	-44.5	-358.9	LP - 11778.0 'MD, 11555.9 'TVD, 272.05 'AZI, 90.48 'INC, -44.5 'N, -358.9 'E
16,008.0	11,497.9	-90.7	-4,584.1	BHL - 16008.0 'MD, 11497.9 'TVD, 268.13 'AZI, 92.42 'INC, -90.7 'N, -4584.1 'E

Checked By: _____ Approved By: _____ Date: _____



Project: Lea County(NAD83)
 Site: Lightning P-38 State
 Well: #2H
 Wellbore: OH
 Design: OH (#2H/OH)



Azimuths to Grid North
 True North: -0.44°
 Magnetic North: 7.06°
 Magnetic Field
 Strength: 48771.5snT
 Dip Angle: 60.48°
 Date: 1/29/2012
 Model: IGRF200510

PATHFINDER®
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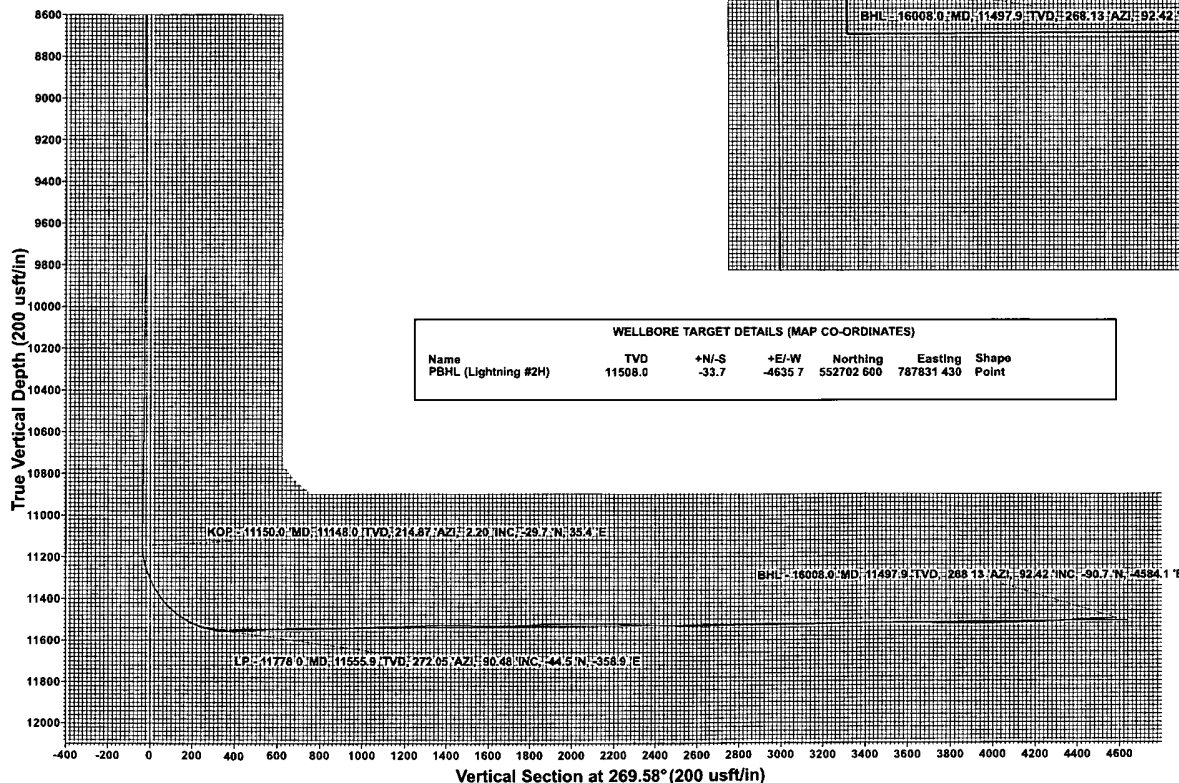
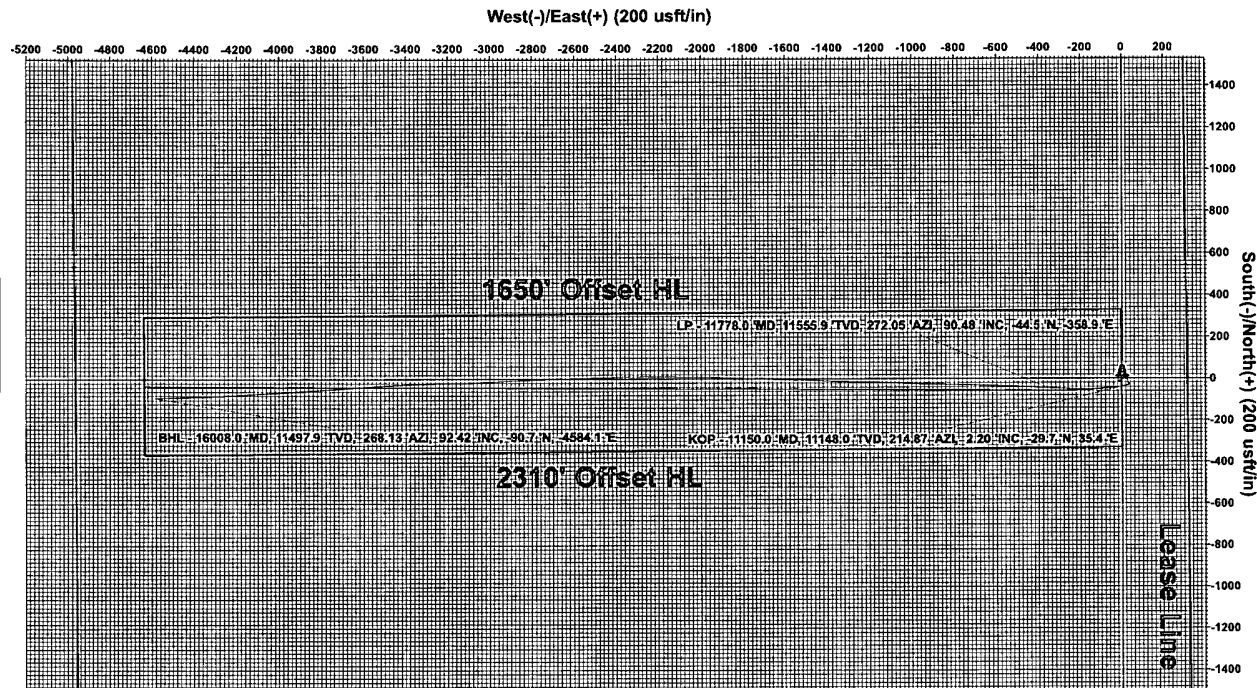
WELL DETAILS: #2H

Ground Elevation 3789.6
 RKB Elevation KB = 19' @ 3808.6usft (Original Well Elev)
 Rig Name Original Well Elev

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	552736.340	792467.160	32°31'08.16 N	103°31'7.012 W	

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target
1	11472.0	43.60	265.31	11437.8	-48.2	-86.2	0.00	0.00	86.5	
2	11766.9	90.56	270.30	11549.6	-56.2	-350.0	15.99	6.82	350.4	
3	16052.9	90.56	270.30	11508.0	-33.7	-4635.7	0.00	0.00	4635.9	PBHL (Lightning #2H)



WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
PBHL (Lightning #2H)	11508.0	-33.7	-4635.7	552702.600	787831.430	Point

EOW

PROJECT DETAILS: Lea County(NAD83)
 Geodetic System: US State Plane 1983
 Datum: North American Datum 1983
 Ellipsoid: GRS 1980
 Zone: New Mexico Eastern Zone
 System Datum: Mean Sea Level
 Local North: Grid

Design: OH (#2H/OH)

Created By: Michael Trout Date: 14.06, February 21 2012
 Checked: _____ Date: _____