

Results of Directional Survey

API number:	30-025-39289		
OGRID:		Operator:	MARBOB ENERGY CORP
		Property:	PATTERSON B 52 FEDERAL # 4H

surface	ULSTR:	L	05	T 19S	R 32E
				2310 FSL	660 FWL

BH Loc	ULSTR:	M	05	T 19S	R 32E
11091	MD	9313.1	TVD	335 FSL	670 FWL

Top Perf/OH	ULSTR:	L	05	T 19S	R 32E
9500	MD	9305.6	TVD	1921 FSL	612 FWL

Bot Perf/OH	ULSTR:	M	05	T 19S	R 32E
11030	MD	9314.0	TVD	396 FSL	671 FWL

	MD	N/S	E/W	VD
	9476	-365.88	-50.46	9299.72
TOP PERFS/OH	9500	-388.95	-47.53	9305.63
	9508	-396.64	-46.55	9307.60
	10941	-1825.24	11.99	9315.21
BOT PERFS/OH	11030	-1914.22	10.61	9313.98
	11036	-1920.22	10.52	9313.90

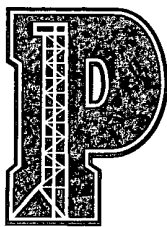
NEXT TO LAST	10941	-1825.24	11.99	9315.21
LAST READING	11036	-1920.22	10.52	9313.90
TD	11091	-1975.21	9.67	9313.14

Surface Location	2310 FS	660 FW
Projected BHL	335 FS	670 FW
Location of		
Top Perfs/OH	1921 FS	612 FW
Bottom Perfs/OH	396 FS	671 FW

SUMMARY of Subsurface Locations

Surface Location	L-05-19S-32E	2310 FS	660 FW	Vert. Depth
Top Perfs/OH	L-05-19S-32E	1921 FS	612 FW	9305.63
Bottom Perfs/OH	M-05-19S-32E	396 FS	671 FW	9313.98
Projected TD	M-05-19S-32E	335 FS	670 FW	9313.14

AUG 31 2011



HOBBS OCD

AUG 29 2011

PATRIOT DRILLING, LLC

RECEIVED

OPERATOR:
WELL/LEASE:
COUNTY:

30-025-39289
COG Operating, LLC.
Patterson B-52 Federal # 4H
Lea Co., New Mexico Unit L
Sec. 5, T19S, R32E

2310/S + 660/W

STATE OF NEW MEXICO
DEVIATION REPORT

<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
435	1/2	3,053	3/4
846	3/4	3,400	1/4
1,302	1	3,876	1/2
1,503	1/2	4,351	3/4
1,698	3/4	4,827	1 1/2
1,880	1	5,333	2
2,072	1/2	5,748	2
2,288	1 3/4	6,000	2 1/4
2,448	1 1/4	6,284	1 3/4
2,612	2 3/4	6,862	1 3/4
2,710	1	7,111	1 1/5
2,805	1 1/4	7,611	4
2,902	3/4		

SUR: L-5-19s-32e, 2310/S & 660/W
BHL: M-5-19s-32e, 335/S & 670/W
API # 30-025-39289

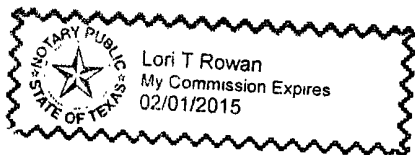
Patriot Drilling, LLC

M. Leroy Peterson, Executive Vice-President

The foregoing instrument was acknowledged before me on this 1st day of March, 2011 by M. Leroy Peterson, Executive Vice-President of Patriot Drilling, LLC.

My Commission Expires: 02/01/2015

Lori T. Rowan
Notary Public for Ector Co., Texas



HOBBS OCD

AUG 29 2011

RECEIVED

SUR: L-5-19s-32e, 2310/S & 660/W
BHL: M-5-19s-32e, 335/S & 670/W
API # 30-025-39289

COG OPERATING

Lusk

Lea County, NM

Patterson B-52 Federal #4

VH - Job #32K0211112

Survey: Actual

SDI Standard Survey Report

11 February, 2011

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

Richard

Notarized this date 11th of February, 2011.

Carrie Reed

Notary Signature
County of Midland
State of Texas



Scientific Drilling
Directional Drilling Operations

Scientific Drilling International, Inc.

SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Patterson B-52 Federal #4
Project:	Lusk	TVD Reference:	WELL @ 0.0usft (Original Well Elev)
Site:	Lea County, NM	MD Reference:	WELL @ 0.0usft (Original Well Elev)
Well:	Patterson B-52 Federal #4	North Reference:	Grid
Wellbore:	VH - Job #32K0211112	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0211112	Database:	EDM-Regulatory

Project:	Lusk	System Datum:	Mean Sea Level
Map System:	US State Plane 1927 (Exact solution)		
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site:	Lea County, NM		
Site Position:		Northing:	608,010 37 usft
From:	Lat/Long	Easting:	668,500 03 usft
Position Uncertainty:	0 0 usft	Slot Radius:	13-3/16"
		Grid Convergence:	0 30 °

Well:	Patterson B-52 Federal #4, Directional (Pathfinder)		
Well Position	+N/-S	0 0 usft	Northing: 614,601 60 usft
	+E/-W	0 0 usft	Easting: 665,808 67 usft
Position Uncertainty	0 0 usft	Wellhead Elevation:	usft
		Ground Level:	0 0 usft

Wellbore:	VH - Job #32K0211112		
Magnetics	Model Name	Sample Date	Declination
	BGGM2010	2/6/2011	7.82
			Dip Angle
			60.60
			Field Strength
			48,969

Design:	VH - Job #32K0211112		
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
			(°)
			180 00

Survey Program:	Date	2/11/2011		
From	To	Survey (Wellbore)	Tool Name	Description
(usft)	(usft)			
100 0	7,500.0	Actual (VH - Job #32K0211112)	Keeper	Keeper Gyro

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 29	10 49	100 0	0 2	0 0	10 49	0.3
200 0	0 32	1 67	200.0	0 8	0.1	7.36	0.8
300.0	0 11	170 33	300.0	1 0	0 1	7 38	1.0
400 0	0 16	225 37	400 0	0 8	0 0	3 08	0.8
500 0	0 21	175.50	500 0	0 5	0.0	354 88	0.5
600 0	0 24	213 62	600.0	0 1	-0 1	311 98	0.2
700 0	0 10	200 78	700 0	-0 1	-0 3	246 79	0.3
800 0	0 22	258 48	800 0	-0 2	-0 5	244 38	0.6
900 0	0 50	234 58	900 0	-0 5	-1 1	243 05	1.2
1,000 0	0 35	235 83	1,000 0	-1.0	-1 7	239 98	1.9
1,100.0	0.26	242 80	1,100 0	-1 2	-2 1	239 73	2.5

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Site:	Lea County, NM	MD Reference:	WELL @ 0.0usft (Original Well Elev)
Well:	Patterson B-52 Federal #4	North Reference:	Grid
Wellbore:	VH - Job #32K0211112	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0211112	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	0.19	354.14	1,200.0	-1.2	-2.3	243.30	2.6
1,300.0	0.40	45.40	1,300.0	-0.8	-2.1	250.03	2.2
1,400.0	0.33	13.02	1,400.0	-0.2	-1.8	262.40	1.8
1,500.0	0.37	32.43	1,500.0	0.3	-1.6	281.42	1.6
1,600.0	0.64	47.10	1,600.0	1.0	-1.0	314.87	1.4
1,700.0	0.79	42.25	1,700.0	1.9	-0.1	356.96	1.9
1,800.0	1.08	59.90	1,800.0	2.8	1.2	22.57	3.1
1,900.0	1.13	64.56	1,899.9	3.7	2.9	37.69	4.7
2,000.0	1.00	64.73	1,999.9	4.5	4.6	45.21	6.4
2,100.0	1.20	70.67	2,099.9	5.3	6.3	50.38	8.2
2,200.0	1.17	66.27	2,199.9	6.0	8.3	53.98	10.2
2,300.0	1.62	75.04	2,299.9	6.8	10.6	57.29	12.6
2,400.0	1.63	68.72	2,399.8	7.7	13.3	59.96	15.3
2,500.0	1.77	73.80	2,499.8	8.6	16.1	61.80	18.2
2,600.0	1.78	69.57	2,599.7	9.6	19.0	63.23	21.3
2,700.0	1.28	63.94	2,699.7	10.6	21.5	63.68	23.9
2,800.0	0.97	67.34	2,799.7	11.4	23.2	63.81	25.9
2,900.0	0.52	46.89	2,899.7	12.1	24.4	63.64	27.2
3,000.0	0.30	8.27	2,999.7	12.6	24.7	62.92	27.8
3,100.0	0.35	13.20	3,099.7	13.2	24.8	62.01	28.1
3,200.0	0.19	331.51	3,199.7	13.6	24.8	61.21	28.3
3,300.0	0.17	200.99	3,299.7	13.6	24.7	61.07	28.2
3,400.0	0.06	236.61	3,399.7	13.5	24.6	61.28	28.0
3,500.0	0.22	228.14	3,499.7	13.3	24.4	61.37	27.8
3,600.0	0.28	249.87	3,599.7	13.1	24.0	61.39	27.4
3,700.0	0.34	219.47	3,699.6	12.8	23.6	61.55	26.9
3,800.0	0.31	245.13	3,799.6	12.5	23.2	61.76	26.3
3,900.0	0.38	244.38	3,899.6	12.2	22.6	61.69	25.7
4,000.0	0.35	262.12	3,999.6	12.0	22.0	61.41	25.1
4,100.0	0.33	239.86	4,099.6	11.8	21.5	61.17	24.5
4,200.0	0.44	241.97	4,199.6	11.5	20.9	61.18	23.9
4,300.0	0.68	260.92	4,299.6	11.2	20.0	60.66	22.9
4,400.0	0.78	254.07	4,399.6	10.9	18.7	59.70	21.7
4,500.0	1.00	267.90	4,499.6	10.7	17.2	58.06	20.3
4,600.0	0.97	260.63	4,599.6	10.6	15.5	55.74	18.8
4,700.0	1.14	266.00	4,699.6	10.4	13.7	52.87	17.1
4,800.0	1.34	277.34	4,799.6	10.4	11.5	47.84	15.5
4,900.0	1.74	286.79	4,899.5	11.0	8.9	38.96	14.2
5,000.0	1.76	290.93	4,999.5	12.0	6.0	26.63	13.4
5,100.0	1.87	285.97	5,099.4	13.0	3.0	13.07	13.3
5,200.0	1.95	286.72	5,199.4	13.9	-0.2	359.26	13.9
5,300.0	1.84	284.95	5,299.3	14.8	-3.4	347.24	15.2
5,400.0	1.85	282.38	5,399.3	15.6	-6.5	337.42	16.9
5,500.0	1.89	282.26	5,499.2	16.3	-9.7	329.31	19.0

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Well:	Patterson B-52 Federal #4	North Reference:	Grid
Wellbore:	VH - Job #32K0211112	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0211112	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	2.12	284.46	5,599.2	17.1	-13.1	322.61	21.5
5,700.0	2.04	285.45	5,699.1	18.0	-16.6	317.42	24.5
5,800.0	1.83	286.48	5,799.0	19.0	-19.8	313.74	27.4
5,900.0	2.00	286.62	5,899.0	19.9	-23.0	310.86	30.5
6,000.0	1.82	289.08	5,998.9	20.9	-26.2	308.63	33.6
6,100.0	1.75	294.28	6,098.9	22.1	-29.1	307.21	36.5
6,200.0	1.59	296.05	6,198.8	23.3	-31.7	306.32	39.4
6,300.0	1.49	293.55	6,298.8	24.5	-34.2	305.59	42.0
6,400.0	1.44	290.01	6,398.8	25.4	-36.5	304.81	44.5
6,500.0	1.50	284.55	6,498.7	26.2	-39.0	303.86	47.0
6,600.0	1.45	286.78	6,598.7	26.9	-41.5	302.93	49.4
6,700.0	1.48	282.80	6,698.7	27.5	-43.9	302.05	51.8
6,800.0	1.60	275.94	6,798.6	27.9	-46.6	300.95	54.3
6,900.0	1.83	274.25	6,898.6	28.2	-49.6	299.64	57.0
7,000.0	2.11	272.38	6,998.5	28.4	-53.0	298.18	60.1
7,100.0	1.61	262.37	7,098.5	28.3	-56.2	296.71	63.0
7,200.0	1.73	253.94	7,198.4	27.7	-59.1	295.11	65.2
7,300.0	1.75	257.53	7,298.4	26.9	-62.0	293.48	67.6
7,400.0	2.19	263.55	7,398.3	26.4	-65.4	291.98	70.5
7,500.0	2.96	258.05	7,498.2	25.6	-69.8	290.17	74.4



Project: Lusk
 Lea County, NM
 Well: Patterson B-52 Federal #4
 Wellbore: VH - Job #32K0211112
 Design: VH - Job #32K0211112



Azimuths to Grid North
 True North: -0.29°
 Magnetic North: 7.53°

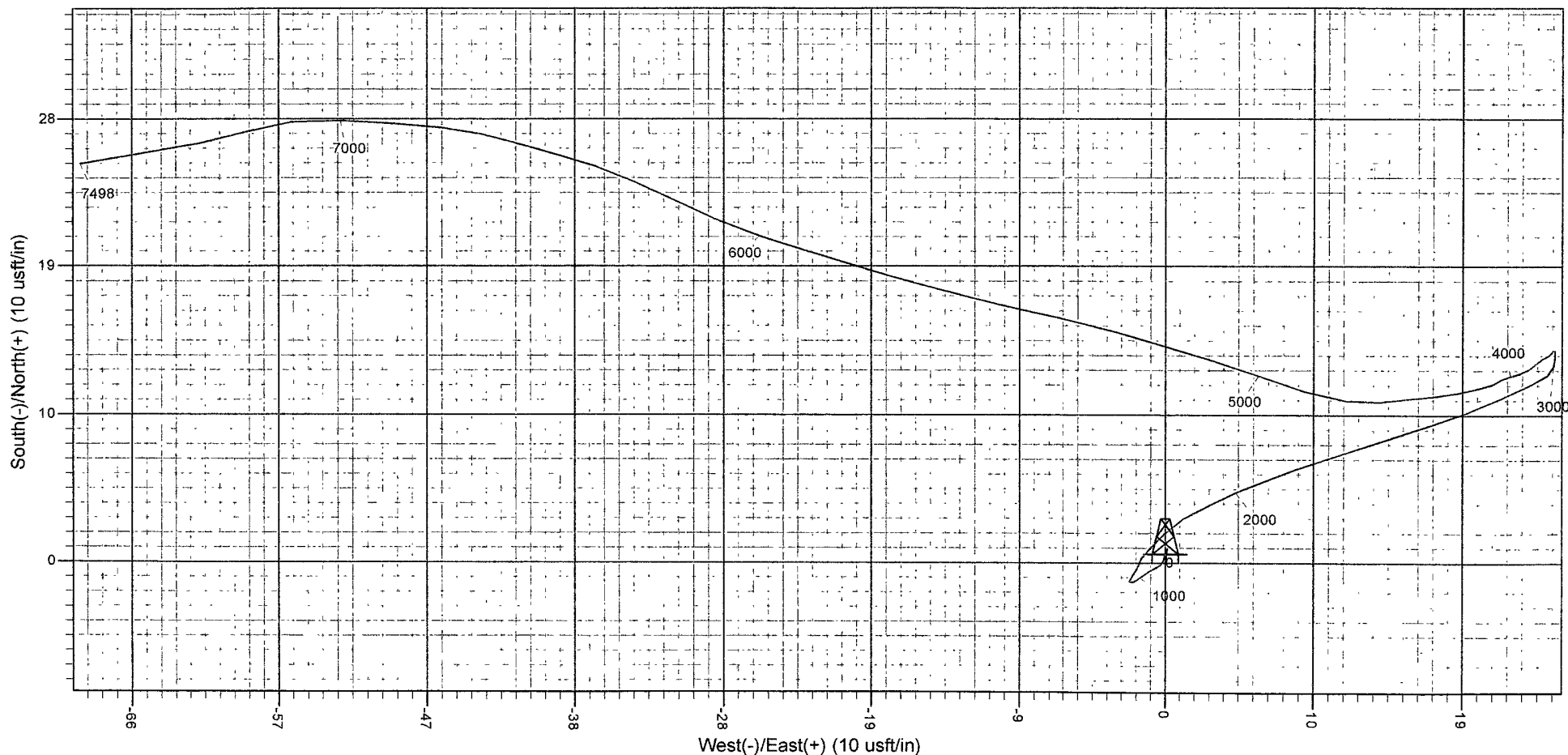
Magnetic Field
 Strength: 48969 2snT
 Dip Angle: 60.60°
 Date: 2/6/2011
 Model: BGGM2010

WELL DETAILS: Patterson B-52 Federal #4

WELL @ 0 0usft (Original Well Elev)

Ground Level: 0.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	614601.60	665808.67	32° 41' 18.532 N	103° 47' 39.822 W	



PROJECT DETAILS: Lusk
 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° 40' 13.174 N
 Longitude: 103° 47' 8.729 W
 Positional Uncertainty: 0.0
 Convergence: 0.30
 Local North: Grid



Job Number: 700001547
 Company: COG Operating
 Lease/Well: Patterson B-52 Federal #4H
 Location: Maljammar
 Rig Name: Patriot Rig #6
 RKB:
 G.L. or M.S.L.:

State/Country: New Mexico, USA
 Declination: 7.76
 Grid: .29
 File name: F:\PATTB52.SVY
 Date/Time: 15-Feb-11 / 19:16
 Curve Name: WORKING CURVE

Pathfinder Energy Services

SUR: L-5-19s-32e, 2310/S & 660/W
 BHL: M-5-19s-32e, 335/S & 670/W
 API # 30-025-39289

WINSERVE SURVEY CALCULATIONS
 Minimum Curvature Method
 Vertical Section Plane 180.00
 Vertical Section Referenced to Wellhead
 Rectangular Coordinates Referenced to Wellhead

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	CLOSURE		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
SDI GYRO TIE IN									
7500.00	2.96	258.05	7498.22	25.61	-69.85	-25.61	74.40	290.14	.00
7695.00	3.87	258.94	7692.87	23.31	-81.23	-23.31	84.51	286.01	.47
7759.00	3.08	253.22	7756.75	22.39	-85.00	-22.39	87.90	284.76	1.35
7854.00	2.73	231.16	7851.63	20.24	-89.21	-20.24	91.47	282.78	1.22
7950.00	.97	166.39	7947.59	18.01	-90.80	-18.01	92.57	281.22	2.58
8045.00	1.23	238.28	8042.57	16.70	-91.47	-16.70	92.99	280.34	1.38
8141.00	1.32	200.75	8138.55	15.12	-92.74	-15.12	93.97	279.26	.86
8236.00	1.85	232.74	8233.52	13.17	-94.35	-13.17	95.26	277.95	1.06
8330.00	1.32	205.76	8327.48	11.28	-96.03	-11.28	96.69	276.70	.96
8425.00	1.67	206.03	8422.45	9.05	-97.11	-9.05	97.53	275.32	.37
8521.00	2.29	213.85	8518.39	6.20	-98.79	-6.20	98.99	273.59	.70
8578.00	1.58	217.54	8575.36	4.63	-99.91	-4.63	100.01	272.65	1.26

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	C L O S U R E		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
8681.00	1.06	222.46	8678.33	2.80	-101.42	-2.80	101.45	271.58	.52
8776.00	.62	219.21	8773.32	1.75	-102.33	-1.75	102.35	270.98	.47
8808.00	.97	191.43	8805.32	1.35	-102.50	-1.35	102.51	270.76	1.60
8840.00	2.81	171.40	8837.30	.31	-102.43	-.31	102.43	270.17	6.02
8871.00	6.16	165.77	8868.20	-2.05	-101.91	2.05	101.93	268.85	10.89
8903.00	10.02	164.19	8899.88	-6.40	-100.73	6.40	100.93	266.37	12.08
8935.00	13.37	164.10	8931.21	-12.64	-98.96	12.64	99.76	262.72	10.47
8967.00	16.09	162.26	8962.15	-20.42	-96.59	20.42	98.73	258.06	8.62
8999.00	19.43	162.87	8992.62	-29.73	-93.67	29.73	98.28	252.39	10.45
9030.00	22.60	165.07	9021.56	-40.42	-90.62	40.42	99.22	245.96	10.54
9062.00	26.20	168.14	9050.70	-53.28	-87.58	53.28	102.51	238.69	11.92
9094.00	30.25	170.43	9078.89	-68.14	-84.79	68.14	108.78	231.21	13.10
9126.00	34.29	172.63	9105.94	-85.04	-82.29	85.04	118.34	224.06	13.15
9158.00	38.08	174.38	9131.76	-103.81	-80.17	103.81	131.16	217.68	12.27
9190.00	42.12	175.18	9156.24	-124.33	-78.30	124.33	146.93	212.20	12.73
9221.00	46.52	175.44	9178.41	-145.91	-76.53	145.91	164.76	207.68	14.21
9253.00	50.83	175.53	9199.53	-169.86	-74.64	169.86	185.54	203.72	13.47
9285.00	55.05	175.00	9218.82	-195.31	-72.53	195.31	208.34	200.37	13.25
9317.00	58.21	173.59	9236.42	-221.89	-69.87	221.89	232.63	197.48	10.54
9348.00	61.64	172.10	9251.95	-248.50	-66.52	248.50	257.25	194.99	11.82
9380.00	64.98	171.48	9266.32	-276.80	-62.43	276.80	283.75	192.71	10.58
9412.00	67.97	171.92	9279.09	-305.83	-58.20	305.83	311.32	190.77	9.43
9444.00	71.23	172.80	9290.24	-335.55	-54.22	335.55	339.90	189.18	10.51
9476.00	74.30	173.07	9299.72	-365.88	-50.46	365.88	369.34	187.85	9.63
9508.00	77.21	172.45	9307.60	-396.64	-46.55	396.64	399.36	186.69	9.29
9539.00	80.81	171.66	9313.51	-426.78	-42.34	426.78	428.87	185.67	11.88
9574.00	85.21	171.57	9317.77	-461.14	-37.28	461.14	462.64	184.62	12.57
9605.00	87.85	171.22	9319.64	-491.73	-32.65	491.73	492.81	183.80	8.59
9637.00	89.34	171.13	9320.43	-523.34	-27.74	523.34	524.07	183.03	4.66
9669.00	90.31	171.40	9320.52	-554.97	-22.88	554.97	555.44	182.36	3.15
9733.00	90.84	172.36	9319.88	-618.32	-13.84	618.32	618.48	181.28	1.71
9796.00	90.04	173.77	9319.40	-680.86	-6.23	680.86	680.88	180.52	2.57
9860.00	89.60	175.88	9319.60	-744.59	-.46	744.59	744.59	180.04	3.37
9923.00	89.60	176.93	9320.04	-807.46	3.49	807.46	807.47	179.75	1.67

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	C L O S U R E		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
9987.00	89.60	178.25	9320.49	-871.41	6.18	871.41	871.43	179.59	2.06
10051.00	89.34	178.16	9321.08	-935.37	8.18	935.37	935.41	179.50	.43
10114.00	89.78	178.43	9321.56	-998.34	10.06	998.34	998.39	179.42	.82
10178.00	90.57	179.66	9321.37	-1062.33	11.12	1062.33	1062.39	179.40	2.28
10273.00	90.57	180.10	9320.42	-1157.33	11.32	1157.33	1157.38	179.44	.46
10369.00	90.31	179.57	9319.68	-1253.32	11.60	1253.32	1253.38	179.47	.61
10464.00	90.13	179.39	9319.32	-1348.32	12.46	1348.32	1348.37	179.47	.27
10559.00	89.78	178.87	9319.39	-1443.31	13.90	1443.31	1443.37	179.45	.66
10655.00	90.75	180.01	9318.95	-1539.30	14.84	1539.30	1539.37	179.45	1.56
10750.00	90.75	179.75	9317.71	-1634.29	15.04	1634.29	1634.36	179.47	.27
10845.00	90.66	181.24	9316.54	-1729.28	14.22	1729.28	1729.33	179.53	1.57
10941.00	90.92	181.42	9315.21	-1825.24	11.99	1825.24	1825.28	179.62	.33
11036.00	90.66	180.36	9313.90	-1920.22	10.52	1920.22	1920.25	179.69	1.15
Projection to TD									
11091.00	90.66	180.36	9313.27	-1975.21	10.17	1975.21	1975.24	179.70	.00

Company: COG Operating
Lease/Well: Patterson B-52 Federal #4H
Rig Name: Patriot Rig #6
State/Country: New Mexico, USA

PATHFINDER

