

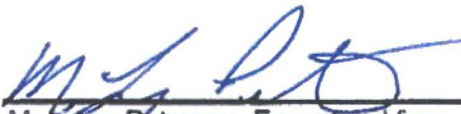
OPERATOR: COG Operating, LLC
WELL/LEASE: Mas Federal # 4 H
COUNTY: Lea County New Mexico
Section 34, T20S, R34E

PATRIOT DRILLING, LLC

**STATE OF NEW MEXICO
DEVIATION REPORT**

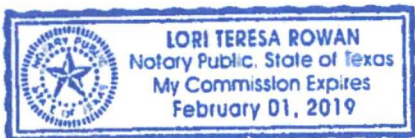
<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
276	3/4	2,822	2
774	1/2	3,199	2 1/2
1,215	1/2	3,955	1
1,684	1/4	4,295	3
1,971	1 1/2	4,729	3
2,346	2		

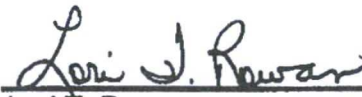
Patriot Drilling, LLC


M. Leroy Peterson, Executive Vice-
President

The foregoing instrument was acknowledged before me on this 27th day of
December, 2016 by M. Leroy Peterson, Executive Vice-President of Patriot Drilling,

My Commission Expires: 02/01/2019




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

December 22, 2016

Concho Resources, Inc.
One Concho Center
600 W. Illinois Avenue
Midland, Texas 79701

Attn: Kanicia Castillo

RE: Mas Federal No. 004H

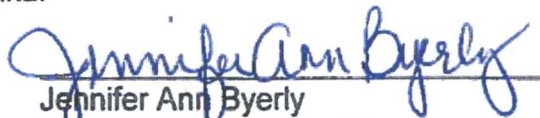
Please find enclosed a copy of the survey from 0' to 10,651' ran on the above referenced well.

Sincerely,

Keith Havelka
Operations

STATE OF TEXAS §
 §
COUNTY OF NUECES §

This instrument was acknowledged before me on the 22nd day of
December, A.D., 2016, by Keith Havelka.


Jennifer Ann Byerly
Notary Public, State of Texas



Company: COG Operating
Lease/Well: Mas Federal No./004H



Rig Name: Patriot 2
State/County: New Mexico/Lea
VS-Azi: 184.86 Degrees
Latitude: 32.35558, Longitude: -103.48178
Grid North = True North -0.46 degs (NAD 27)
Grid Correction Applied = -0.46 degs



Depth Reference : RBK = 20 Foot

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: gyro survey-de_01.ut
Minimum Curvature Method
Report Date/Time: 12/22/2016 / 15:34

VES Survey International
Midland Tx
(432) 563-5444
Surveyor: Gene Heiss
Mas Federal No. 004H / API 30-025-43482

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	----
100.00	0.78	38.60	100.00	0.53	0.43	-0.57	0.68	38.60	0.78
200.00	0.75	31.43	199.99	1.63	1.20	-1.72	2.02	36.28	0.10
300.00	0.84	28.26	299.98	2.83	1.88	-2.98	3.40	33.63	0.10
400.00	0.50	50.98	399.97	3.75	2.57	-3.95	4.54	34.41	0.42
500.00	0.11	172.90	499.97	3.93	2.92	-4.17	4.90	36.58	0.56
600.00	0.26	178.73	599.97	3.62	2.94	-3.85	4.66	39.05	0.15
700.00	0.28	174.28	699.97	3.16	2.96	-3.40	4.33	43.21	0.03
800.00	0.38	178.62	799.97	2.59	3.00	-2.83	3.96	49.18	0.10
900.00	0.20	193.20	899.97	2.09	2.96	-2.33	3.63	54.83	0.19
1000.00	0.33	197.40	999.96	1.64	2.84	-1.87	3.28	59.97	0.13
1100.00	0.26	164.94	1099.96	1.15	2.81	-1.38	3.03	67.80	0.18
1200.00	0.22	162.31	1199.96	0.75	2.92	-0.99	3.02	75.86	0.04
1300.00	0.15	173.26	1299.96	0.43	3.00	-0.68	3.03	81.80	0.07
1400.00	0.25	189.22	1399.96	0.09	2.98	-0.34	2.98	88.35	0.11
1500.00	0.17	187.47	1499.96	-0.27	2.93	0.02	2.94	95.31	0.08
1600.00	0.21	178.13	1599.96	-0.60	2.91	0.35	2.97	101.59	0.05

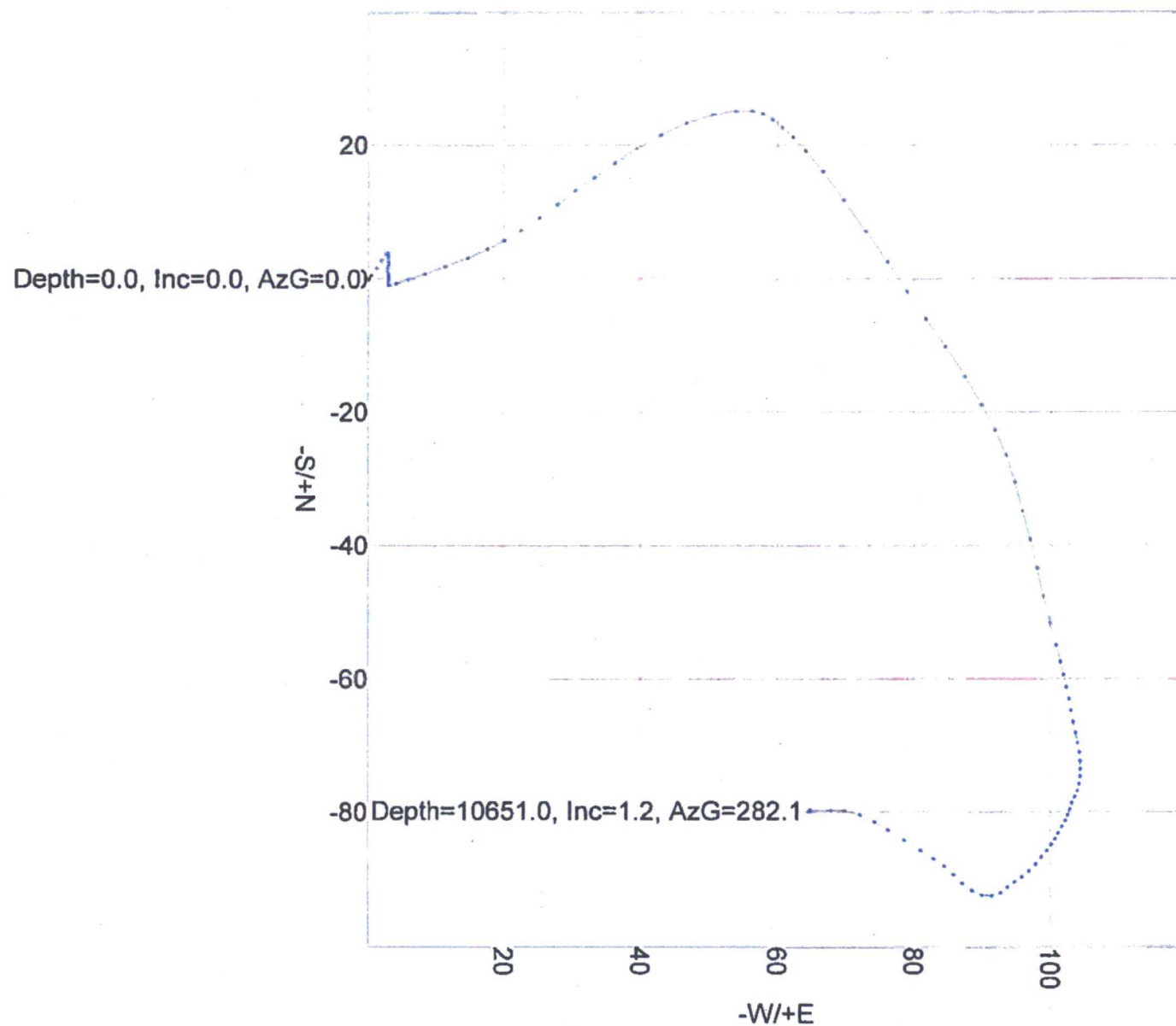
Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1700.00	0.19	187.08	1699.96	-0.94	2.90	0.69	3.05	108.00	0.03
1800.00	0.36	70.68	1799.96	-1.00	3.17	0.73	3.33	107.58	0.47
1900.00	0.79	70.61	1899.95	-0.67	4.11	0.32	4.17	99.31	0.43
2000.00	1.32	71.65	1999.94	-0.08	5.86	-0.41	5.86	90.80	0.54
2100.00	1.63	71.61	2099.90	0.73	8.30	-1.43	8.33	84.96	0.30
2200.00	2.17	69.02	2199.85	1.86	11.41	-2.82	11.56	80.74	0.55
2300.00	1.94	67.44	2299.78	3.19	14.74	-4.42	15.08	77.80	0.24
2400.00	1.67	63.58	2399.73	4.48	17.61	-5.96	18.17	75.72	0.30
2500.00	1.46	61.72	2499.70	5.73	20.03	-7.41	20.84	74.03	0.21
2600.00	1.85	55.70	2599.65	7.25	22.49	-9.13	23.63	72.14	0.42
2700.00	1.97	54.65	2699.60	9.15	25.23	-11.26	26.83	70.06	0.13
2800.00	1.86	49.63	2799.54	11.20	27.87	-13.52	30.03	68.10	0.20
2900.00	1.87	55.12	2899.49	13.18	30.44	-15.71	33.17	66.58	0.18
3000.00	2.09	54.72	2999.43	15.17	33.26	-17.93	36.56	65.49	0.22
3100.00	2.10	51.36	3099.36	17.36	36.18	-20.36	40.13	64.37	0.12
3200.00	2.36	60.23	3199.29	19.53	39.40	-22.79	43.97	63.64	0.43
3300.00	2.37	59.91	3299.20	21.58	42.97	-25.15	48.09	63.33	0.01
3400.00	2.34	69.45	3399.12	23.34	46.67	-27.21	52.18	63.43	0.39
3500.00	2.22	75.04	3499.04	24.56	50.46	-28.74	56.12	64.05	0.25
3600.00	1.80	86.35	3598.98	25.16	53.90	-29.63	59.48	64.98	0.58
3700.00	0.98	97.10	3698.95	25.15	56.32	-29.83	61.68	65.94	0.85
3800.00	0.87	117.52	3798.94	24.69	57.85	-29.50	62.90	66.88	0.35
3900.00	1.00	125.17	3898.92	23.84	59.24	-28.77	63.85	68.08	0.18
4000.00	1.10	129.28	3998.91	22.73	60.69	-27.79	64.81	69.47	0.12
4100.00	1.40	136.14	4098.88	21.24	62.28	-26.44	65.80	71.17	0.34
4200.00	1.83	140.07	4198.84	19.13	64.15	-24.50	66.95	73.39	0.44
4300.00	2.72	141.57	4298.76	16.05	66.65	-21.64	68.56	76.46	0.89
4400.00	3.27	147.52	4398.63	11.80	69.65	-17.65	70.64	80.39	0.63
4500.00	3.29	143.18	4498.46	7.10	72.90	-13.25	73.24	84.44	0.25
4600.00	3.11	146.26	4598.31	2.54	76.12	-8.99	76.17	88.09	0.24
4700.00	2.91	148.34	4698.17	-1.87	78.96	-4.83	78.99	91.36	0.23
4800.00	2.78	144.38	4798.05	-6.00	81.71	-0.94	81.93	94.20	0.23
4900.00	3.09	146.00	4897.91	-10.21	84.63	3.01	85.24	96.88	0.32
5000.00	2.99	149.07	4997.77	-14.69	87.48	7.22	88.70	99.53	0.19
5100.00	2.50	151.40	5097.66	-18.84	89.86	11.16	91.82	101.84	0.51
5200.00	2.31	152.96	5197.57	-22.65	91.82	14.69	94.55	103.80	0.20
5300.00	2.45	158.96	5297.48	-26.34	93.51	18.32	97.15	105.73	0.29
5400.00	2.52	166.49	5397.39	-30.47	94.79	22.33	99.57	107.82	0.33
5500.00	2.59	164.65	5497.29	-34.79	95.90	26.54	102.01	109.94	0.11

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
5600.00	2.54	166.27	5597.19	-39.11	97.02	30.75	104.61	111.96	0.09
5700.00	2.46	167.63	5697.10	-43.36	98.01	34.90	107.17	113.87	0.09
5800.00	2.44	167.33	5797.00	-47.54	98.94	38.99	109.77	115.67	0.02
5900.00	2.31	165.11	5896.92	-51.57	99.92	42.91	112.44	117.30	0.17
6000.00	1.70	165.61	5996.86	-54.95	100.81	46.21	114.81	118.59	0.60
6100.00	1.21	165.29	6096.82	-57.41	101.44	48.61	116.56	119.51	0.49
6200.00	1.09	166.91	6196.80	-59.35	101.93	50.50	117.95	120.21	0.13
6300.00	1.13	168.85	6296.79	-61.25	102.33	52.36	119.26	120.90	0.06
6400.00	0.97	166.27	6396.77	-63.04	102.73	54.11	120.53	121.54	0.17
6500.00	0.99	173.04	6496.75	-64.73	103.03	55.77	121.68	122.14	0.12
6600.00	1.03	168.57	6596.74	-66.47	103.32	57.48	122.85	122.76	0.09
6700.00	0.92	168.26	6696.72	-68.15	103.66	59.12	124.05	123.32	0.11
6800.00	0.86	167.25	6796.71	-69.67	103.99	60.61	125.17	123.82	0.06
6900.00	0.76	171.70	6896.70	-71.07	104.25	61.98	126.17	124.28	0.12
7000.00	0.75	180.22	6996.69	-72.38	104.35	63.28	126.99	124.75	0.11
7100.00	0.66	178.82	7096.68	-73.60	104.35	64.50	127.70	125.20	0.09
7200.00	0.65	182.92	7196.68	-74.75	104.34	65.64	128.35	125.62	0.05
7300.00	0.62	187.06	7296.67	-75.85	104.24	66.75	128.92	126.04	0.06
7400.00	0.57	202.97	7396.67	-76.84	103.98	67.76	129.29	126.46	0.17
7500.00	0.60	205.54	7496.66	-77.77	103.56	68.72	129.51	126.90	0.04
7600.00	0.55	200.95	7596.66	-78.69	103.17	69.67	129.75	127.33	0.07
7700.00	0.58	196.99	7696.65	-79.62	102.85	70.62	130.06	127.74	0.05
7800.00	0.51	200.32	7796.65	-80.52	102.55	71.54	130.38	128.14	0.07
7900.00	0.53	207.90	7896.64	-81.35	102.17	72.40	130.60	128.52	0.07
8000.00	0.63	212.68	7996.64	-82.22	101.66	73.31	130.75	128.96	0.11
8100.00	0.67	203.49	8096.63	-83.22	101.13	74.36	130.97	129.45	0.11
8200.00	0.49	211.36	8196.63	-84.12	100.67	75.29	131.19	129.88	0.20
8300.00	0.67	212.74	8296.62	-84.98	100.13	76.19	131.33	130.32	0.18
8400.00	0.64	218.40	8396.61	-85.91	99.47	77.17	131.43	130.82	0.07
8500.00	0.81	219.83	8496.61	-86.89	98.67	78.22	131.48	131.37	0.17
8600.00	0.75	217.64	8596.60	-87.95	97.82	79.34	131.54	131.96	0.06
8700.00	0.87	231.20	8696.59	-88.94	96.83	80.42	131.48	132.57	0.22
8800.00	0.70	228.54	8796.58	-89.82	95.78	81.38	131.31	133.16	0.16
8900.00	0.70	239.56	8896.57	-90.54	94.79	82.18	131.08	133.69	0.14
9000.00	0.78	229.67	8996.56	-91.29	93.74	83.02	130.85	134.24	0.15
9100.00	0.72	232.84	9096.55	-92.11	92.72	83.92	130.70	134.81	0.07
9200.00	0.92	264.93	9196.54	-92.56	91.43	84.48	130.10	135.35	0.49
9300.00	0.82	287.28	9296.53	-92.42	89.95	84.47	128.97	135.78	0.35
9400.00	1.01	297.39	9396.52	-91.80	88.48	83.97	127.50	136.05	0.25

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
9500.00	1.02	313.94	9496.50	-90.78	87.06	83.08	125.78	136.20	0.29
9600.00	1.04	315.16	9596.49	-89.52	85.78	81.93	123.99	136.22	0.03
9700.00	1.08	311.72	9696.47	-88.26	84.44	80.78	122.15	136.26	0.08
9800.00	1.10	298.54	9796.45	-87.17	82.90	79.83	120.29	136.44	0.25
9900.00	1.50	307.69	9896.43	-85.91	81.02	78.74	118.09	136.68	0.45
10000.00	1.82	299.58	9996.39	-84.33	78.80	77.36	115.28	137.01	0.40
10100.00	1.38	306.69	10096.35	-82.82	76.25	76.06	112.58	137.37	0.48
10200.00	1.29	298.37	10196.32	-81.57	74.30	74.98	110.33	137.67	0.21
10300.00	1.49	293.39	10296.29	-80.52	72.11	74.12	108.09	138.15	0.23
10400.00	1.15	281.54	10396.26	-79.80	69.94	73.59	106.11	138.77	0.44
10500.00	1.21	258.04	10496.24	-79.82	67.92	73.78	104.81	139.60	0.49
10651.00	1.17	282.06	10647.21	-79.83	64.85	74.05	102.86	140.91	0.33



VES Survey International
Midland Tx
(432) 563-5444
Surveyor: Gene Heiss
Mas Federal No. 004H / API 30-025-43482



VES Survey Date: 12/15/2016



I Gene Heiss certify that I am employed by VES Survey International. That I did on the day(s) of 12/15/16 through 12/15/16 conduct or supervise the taking of a Rate Gyro survey from a depth of 0.00 feet to a depth of 10,651.00 feet; that the data is true, correct, complete and within the limitations of the tool as set forth by Vaughn Energy Services, that I am authorized and qualified to make this report; that this survey was conducted at the request of COG Operating for the Mas Federal Well # 4H API # 30-025-43482 in Lea County / Parish New Mexico; and that I have reviewed this report and find that it conforms to the principles and procedures as set forth by VES Survey International.

A handwritten signature in black ink, appearing to read "Gene Heiss", is written over a horizontal line.

Gene Heiss
Service Technician
VES Survey International



COG Operating L L C

Lea County, NM (NAD27 NME)

Sec. 34, T 20 S. , R 34 E

Mas Federal #4H

Wellbore #1

Design: Wellbore #1

Standard Survey Report

27 December, 2016





Integrity Directional Services, LLC

Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Mas Federal #4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3739.50ft (Patriot 2)
Site:	Sec. 34, T 20 S., R 34 E	MD Reference:	KB=20' @ 3739.50ft (Patriot 2)
Well:	Mas Federal #4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

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	Sec. 34, T 20 S., R 34 E		
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Site Position:		Northing:	559,673.4000 usft	Latitude:	32° 32' 10.320 N
From:	Map	Easting:	741,944.6000 usft	Longitude:	103° 32' 53.739 W
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.42 °

Well	Mas Federal #4H				
Well Position	+N/-S	0.00 ft	Northing:	559,673.4000 usft	Latitude: 32° 32' 10.320 N
	+E/-W	0.00 ft	Easting:	741,944.6000 usft	Longitude: 103° 32' 53.739 W
Position Uncertainty	0.00 ft		Wellhead Elevation:	0.00 ft	Ground Level: 3,719.50 ft

Wellbore	Wellbore #1				
-----------------	-------------	--	--	--	--

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	11/23/2016	7.03	60.36	48,182

Design	Wellbore #1				
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Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00

Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	184.86

Survey Program	Date 12/27/2016				
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
100.00	10,651.00	VES Gyros (Wellbore #1)	VESSI_GYROFLEX	VESSI Gyroflex Gyro	
10,777.00	15,972.00	IDS MWD Surveys (Wellbore #1)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
100.00	0.78	38.60	100.00	0.53	0.42	-0.57	0.78	0.78	0.00	
200.00	0.75	31.43	199.99	1.62	1.19	-1.72	0.10	-0.03	-7.17	
300.00	0.84	28.26	299.98	2.83	1.88	-2.98	0.10	0.09	-3.17	
400.00	0.50	50.98	399.97	3.75	2.56	-3.95	0.43	-0.34	22.72	
500.00	0.11	172.90	499.97	3.93	2.92	-4.16	0.57	-0.39	121.92	
600.00	0.26	178.73	599.97	3.60	2.93	-3.84	0.15	0.15	5.83	
700.00	0.28	174.28	699.97	3.13	2.96	-3.37	0.03	0.02	-4.45	
800.00	0.38	178.62	799.97	2.56	2.99	-2.80	0.10	0.10	4.34	
900.00	0.20	193.20	899.97	2.06	2.96	-2.30	0.19	-0.18	14.58	



Integrity Directional Services, LLC

Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Mas Federal #4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3739.50ft (Patriot 2)
Site:	Sec. 34, T 20 S., R 34 E	MD Reference:	KB=20' @ 3739.50ft (Patriot 2)
Well:	Mas Federal #4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,000.00	0.33	197.40	999.96	1.61	2.84	-1.85	0.13	0.13	4.20
1,100.00	0.26	164.94	1,099.96	1.12	2.81	-1.35	0.18	-0.07	-32.46
1,200.00	0.22	162.31	1,199.96	0.72	2.93	-0.96	0.04	-0.04	-2.63
1,300.00	0.15	173.26	1,299.96	0.40	3.00	-0.66	0.08	-0.07	10.95
1,400.00	0.25	189.22	1,399.96	0.06	2.98	-0.31	0.11	0.10	15.96
1,500.00	0.17	187.47	1,499.96	-0.30	2.93	0.05	0.08	-0.08	-1.75
1,600.00	0.21	178.13	1,599.96	-0.63	2.91	0.38	0.05	0.04	-9.34
1,700.00	0.19	187.08	1,699.96	-0.98	2.90	0.73	0.04	-0.02	8.95
1,800.00	0.36	70.68	1,799.96	-1.04	3.17	0.77	0.48	0.17	-116.40
1,900.00	0.79	70.61	1,899.95	-0.71	4.12	0.36	0.43	0.43	-0.07
2,000.00	1.32	71.65	1,999.94	-0.12	5.87	-0.38	0.53	0.53	1.04
2,100.00	1.63	71.51	2,099.90	0.70	8.31	-1.40	0.31	0.31	-0.14
2,200.00	2.17	69.02	2,199.85	1.83	11.42	-2.79	0.55	0.54	-2.49
2,300.00	1.94	67.44	2,299.78	3.15	14.75	-4.39	0.24	-0.23	-1.58
2,400.00	1.67	63.58	2,399.73	4.45	17.62	-5.93	0.30	-0.27	-3.86
2,500.00	1.46	61.72	2,499.70	5.70	20.05	-7.38	0.22	-0.21	-1.86
2,600.00	1.85	55.70	2,599.65	7.22	22.50	-9.10	0.43	0.39	-6.02
2,700.00	1.97	54.65	2,699.60	9.12	25.24	-11.22	0.12	0.12	-1.05
2,800.00	1.86	49.63	2,799.54	11.16	27.88	-13.49	0.20	-0.11	-5.02
2,900.00	1.87	55.12	2,899.49	13.15	30.45	-15.68	0.18	0.01	5.49
3,000.00	2.09	54.72	2,999.43	15.14	33.28	-17.90	0.22	0.22	-0.40
3,100.00	2.10	51.36	3,099.36	17.33	36.20	-20.34	0.12	0.01	-3.36
3,200.00	2.36	60.23	3,199.29	19.50	39.42	-22.77	0.43	0.26	8.87
3,300.00	2.37	59.91	3,299.20	21.56	42.99	-25.12	0.02	0.01	-0.32
3,400.00	2.34	69.45	3,399.12	23.31	46.70	-27.18	0.39	-0.03	9.54
3,500.00	2.22	75.04	3,499.04	24.53	50.48	-28.72	0.25	-0.12	5.59
3,600.00	1.80	86.35	3,598.98	25.13	53.92	-29.61	0.58	-0.42	11.31
3,700.00	0.98	97.10	3,698.95	25.12	56.33	-29.80	0.86	-0.82	10.75
3,800.00	0.87	117.52	3,798.94	24.67	57.85	-29.48	0.35	-0.11	20.42
3,900.00	1.00	125.17	3,898.92	23.81	59.24	-28.75	0.18	0.13	7.65
4,000.00	1.10	129.28	3,998.91	22.70	60.70	-27.76	0.13	0.10	4.11
4,100.00	1.40	136.14	4,098.88	21.21	62.29	-26.41	0.33	0.30	6.86
4,200.00	1.83	140.07	4,198.84	19.11	64.16	-24.47	0.44	0.43	3.93
4,300.00	2.72	141.57	4,298.76	16.02	66.66	-21.61	0.89	0.89	1.50
4,400.00	3.27	147.52	4,398.63	11.76	69.66	-17.62	0.63	0.55	5.95
4,500.00	3.29	143.18	4,498.46	7.06	72.92	-13.21	0.25	0.02	-4.34
4,600.00	3.11	146.26	4,598.31	2.50	76.14	-8.95	0.25	-0.18	3.08
4,700.00	2.91	148.34	4,698.17	-1.91	78.98	-4.79	0.23	-0.20	2.08
4,800.00	2.78	144.38	4,798.04	-6.04	81.73	-0.90	0.24	-0.13	-3.96
4,900.00	3.09	146.00	4,897.91	-10.25	84.65	3.04	0.32	0.31	1.62
5,000.00	2.99	149.07	4,997.77	-14.72	87.49	7.26	0.19	-0.10	3.07
5,100.00	2.50	151.40	5,097.66	-18.87	89.88	11.19	0.50	-0.49	2.33
5,200.00	2.31	152.96	5,197.57	-22.58	91.84	14.72	0.20	-0.19	1.56



Integrity Directional Services, LLC
Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 34, T 20 S., R 34 E
Well: Mas Federal #4H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Mas Federal #4H
TVD Reference: KB=20' @ 3739.50ft (Patriot 2)
MD Reference: KB=20' @ 3739.50ft (Patriot 2)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
5,300.00	2.45	158.96	5,297.48	-26.37	93.52	18.36	0.29	0.14	6.00
5,400.00	2.52	166.49	5,397.39	-30.51	94.80	22.36	0.33	0.07	7.53
5,500.00	2.59	164.65	5,497.29	-34.82	95.91	26.57	0.11	0.07	-1.84
5,600.00	2.54	166.27	5,597.19	-39.15	97.04	30.79	0.09	-0.05	1.62
5,700.00	2.46	167.63	5,697.09	-43.40	98.02	34.94	0.10	-0.08	1.36
5,800.00	2.44	167.33	5,797.00	-47.58	98.95	39.02	0.02	-0.02	-0.30
5,900.00	2.31	165.11	5,896.92	-51.60	99.93	42.95	0.16	-0.13	-2.22
6,000.00	1.70	165.61	5,996.86	-54.98	100.82	46.25	0.61	-0.61	0.50
6,100.00	1.21	165.29	6,096.82	-57.44	101.46	48.64	0.49	-0.49	-0.32
6,200.00	1.09	166.91	6,196.80	-59.39	101.94	50.54	0.12	-0.12	1.62
6,300.00	1.13	168.85	6,296.78	-61.28	102.35	52.39	0.05	0.04	1.94
6,400.00	0.97	166.27	6,396.77	-63.07	102.74	54.14	0.17	-0.16	-2.58
6,500.00	0.99	173.04	6,496.75	-64.75	103.05	55.79	0.12	0.02	6.77
6,600.00	1.03	168.57	6,596.74	-66.49	103.33	57.50	0.09	0.04	-4.47
6,700.00	0.92	168.26	6,696.72	-68.16	103.67	59.13	0.11	-0.11	-0.31
6,800.00	0.86	167.25	6,796.71	-69.68	104.00	60.62	0.06	-0.06	-1.01
6,900.00	0.76	171.70	6,896.70	-71.07	104.26	61.98	0.12	-0.10	4.45
7,000.00	0.75	180.22	6,996.69	-72.38	104.35	63.27	0.11	-0.01	8.52
7,100.00	0.66	178.82	7,096.68	-73.61	104.36	64.50	0.09	-0.09	-1.40
7,200.00	0.65	182.92	7,196.68	-74.75	104.35	65.64	0.05	-0.01	4.10
7,300.00	0.62	187.06	7,296.67	-75.85	104.25	66.75	0.05	-0.03	4.14
7,400.00	0.57	202.97	7,396.67	-76.85	103.99	67.76	0.17	-0.05	15.91
7,500.00	0.60	205.54	7,496.66	-77.78	103.57	68.72	0.04	0.03	2.57
7,600.00	0.55	200.95	7,596.66	-78.70	103.17	69.67	0.07	-0.05	-4.59
7,700.00	0.58	196.99	7,696.65	-79.63	102.85	70.63	0.05	0.03	-3.96
7,800.00	0.51	200.32	7,796.65	-80.53	102.55	71.55	0.08	-0.07	3.33
7,900.00	0.53	207.90	7,896.64	-81.36	102.18	72.41	0.07	0.02	7.58
8,000.00	0.63	212.68	7,996.64	-82.23	101.67	73.32	0.11	0.10	4.78
8,100.00	0.67	203.49	8,096.63	-83.23	101.14	74.36	0.11	0.04	-9.19
8,200.00	0.49	211.36	8,196.63	-84.13	100.68	75.30	0.20	-0.18	7.87
8,300.00	0.67	212.74	8,296.62	-84.99	100.14	76.20	0.18	0.18	1.38
8,400.00	0.64	218.40	8,396.61	-85.92	99.48	77.18	0.07	-0.03	5.66
8,500.00	0.81	219.83	8,496.61	-86.90	98.68	78.22	0.17	0.17	1.43
8,600.00	0.75	217.64	8,596.60	-87.96	97.83	79.35	0.07	-0.06	-2.19
8,700.00	0.87	231.20	8,696.59	-88.95	96.84	80.43	0.23	0.12	13.56
8,800.00	0.70	228.54	8,796.58	-89.83	95.79	81.39	0.17	-0.17	-2.66
8,900.00	0.70	239.56	8,896.57	-90.55	94.80	82.19	0.13	0.00	11.02
9,000.00	0.78	229.67	8,996.56	-91.30	93.76	83.02	0.15	0.08	-9.89
9,100.00	0.72	232.84	9,096.55	-92.12	92.74	83.93	0.07	-0.06	3.17
9,200.00	0.92	264.93	9,196.54	-92.57	91.44	84.49	0.49	0.20	32.09
9,300.00	0.82	287.28	9,296.53	-92.42	89.95	84.47	0.35	-0.10	22.35
9,400.00	1.01	297.39	9,396.52	-91.81	88.49	83.98	0.25	0.19	10.11
9,500.00	1.02	313.94	9,496.50	-90.78	87.06	83.08	0.29	0.01	16.55



Integrity Directional Services, LLC

Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 34, T 20 S., R 34 E
Well: Mas Federal #4H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Mas Federal #4H
TVD Reference: KB=20' @ 3739.50ft (Patriot 2)
MD Reference: KB=20' @ 3739.50ft (Patriot 2)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,600.00	1.04	315.16	9,596.49	-89.52	85.78	81.93	0.03	0.02	1.22
9,700.00	1.08	311.72	9,696.47	-88.25	84.44	80.78	0.08	0.04	-3.44
9,800.00	1.10	298.54	9,796.45	-87.17	82.89	79.83	0.25	0.02	-13.18
9,900.00	1.50	307.69	9,896.43	-85.91	81.01	78.73	0.45	0.40	9.15
10,000.00	1.82	299.58	9,996.39	-84.32	78.60	77.36	0.40	0.32	-8.11
10,100.00	1.38	306.69	10,096.35	-82.82	76.25	76.06	0.48	-0.44	7.11
10,200.00	1.29	298.37	10,196.32	-81.57	74.29	74.98	0.21	-0.09	-8.32
10,300.00	1.49	293.39	10,296.29	-80.51	72.11	74.12	0.23	0.20	-4.98
10,400.00	1.15	281.54	10,396.26	-79.80	69.93	73.59	0.43	-0.34	-11.85
10,500.00	1.21	258.04	10,496.24	-79.82	67.92	73.77	0.48	0.06	-23.50
10,651.00	1.17	282.06	10,647.21	-79.82	64.85	74.04	0.33	-0.03	15.91
10,777.00	1.10	299.20	10,773.19	-78.96	62.54	73.38	0.27	-0.06	13.60
First IDS MWD Survey									
10,808.00	2.30	228.80	10,804.18	-79.23	61.81	73.71	7.07	3.87	-227.10
10,840.00	6.50	211.10	10,836.07	-81.20	60.39	75.80	13.64	13.13	-55.31
10,871.00	10.50	206.70	10,866.73	-85.23	58.21	79.99	13.06	12.90	-14.19
10,902.00	14.90	203.80	10,896.96	-91.40	55.33	86.39	14.34	14.19	-9.35
10,934.00	19.70	203.70	10,927.51	-100.11	51.50	95.39	15.00	15.00	-0.31
10,965.00	24.00	201.70	10,956.27	-110.76	47.07	106.37	14.08	13.87	-6.45
10,997.00	27.00	200.30	10,985.15	-123.62	42.14	119.61	9.56	9.38	-4.38
11,028.00	28.50	198.80	11,012.59	-137.22	37.32	133.57	5.34	4.84	-4.84
11,060.00	28.60	202.60	11,040.70	-151.52	31.91	148.28	5.68	0.31	11.88
11,091.00	31.60	201.70	11,067.51	-165.92	26.06	163.12	9.79	9.68	-2.90
11,123.00	35.90	202.60	11,094.12	-182.38	19.35	180.09	13.53	13.44	2.81
11,154.00	40.70	204.30	11,118.44	-200.00	11.69	198.29	15.85	15.48	5.48
11,186.00	45.00	207.00	11,141.89	-219.60	2.26	218.62	14.61	13.44	8.44
11,217.00	48.60	208.20	11,163.11	-239.62	-8.22	239.45	11.95	11.61	3.87
11,248.00	52.30	209.40	11,182.85	-260.55	-19.74	261.29	12.30	11.94	3.87
11,280.00	56.30	210.00	11,201.52	-283.12	-32.61	284.87	12.59	12.50	1.88
11,311.00	58.70	210.50	11,218.17	-305.70	-45.78	308.48	7.86	7.74	1.61
11,343.00	61.50	211.20	11,234.12	-329.52	-60.01	333.42	8.95	8.75	2.19
11,374.00	64.20	211.70	11,248.27	-353.04	-74.40	358.08	8.83	8.71	1.61
11,405.00	67.80	211.70	11,260.87	-377.14	-89.28	383.34	11.61	11.61	0.00
11,437.00	72.00	211.40	11,271.87	-402.74	-105.00	410.19	13.15	13.13	-0.94
11,468.00	76.20	211.00	11,280.36	-428.24	-120.44	436.90	13.61	13.55	-1.29
11,500.00	79.20	211.40	11,287.18	-454.98	-136.63	464.92	9.45	9.38	1.25
11,531.00	82.10	212.50	11,292.21	-480.93	-152.82	492.14	9.99	9.35	3.55
11,563.00	85.50	213.00	11,295.67	-507.68	-170.03	520.26	10.74	10.63	1.56
11,594.00	86.90	212.70	11,297.72	-533.66	-186.81	547.57	4.62	4.52	-0.97
11,626.00	88.20	212.30	11,299.09	-560.63	-203.98	575.89	4.25	4.06	-1.25
11,657.00	89.80	211.50	11,299.63	-586.94	-220.36	603.50	5.77	5.16	-2.58
11,689.00	91.50	210.10	11,299.27	-614.42	-236.74	632.27	6.88	5.31	-4.38
11,720.00	92.40	208.40	11,298.21	-641.45	-251.88	660.49	6.20	2.90	-5.48
11,751.00	92.30	205.80	11,296.94	-669.02	-265.99	689.15	8.39	-0.32	-8.39



Integrity Directional Services, LLC
Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Mas Federal #4H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3739.50ft (Patriot 2)
Site:	Sec. 34, T 20 S., R 34 E	MD Reference:	KB=20' @ 3739.50ft (Patriot 2)
Well:	Mas Federal #4H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
11,783.00	91.10	203.00	11,295.99	-698.15	-279.20	719.29	9.52	-3.75	-8.75
11,814.00	90.70	201.60	11,295.51	-726.83	-290.96	748.86	4.70	-1.29	-4.52
11,846.00	91.00	200.60	11,295.03	-756.68	-302.48	779.58	3.26	0.94	-3.13
11,877.00	90.10	199.30	11,294.73	-785.82	-313.06	809.51	5.10	-2.90	-4.19
11,909.00	90.40	198.30	11,294.59	-816.11	-323.37	840.57	3.26	0.94	-3.13
11,940.00	89.90	196.80	11,294.51	-845.66	-332.72	870.81	5.10	-1.61	-4.84
11,959.00	89.10	196.10	11,294.68	-863.88	-338.10	889.42	5.59	-4.21	-3.68
11,991.00	88.20	194.70	11,295.43	-894.73	-346.59	920.87	5.20	-2.81	-4.38
12,022.00	87.70	193.60	11,296.54	-924.77	-354.17	951.45	3.90	-1.61	-3.55
12,054.00	87.90	192.30	11,297.77	-955.93	-361.33	983.10	4.11	0.63	-4.06
12,085.00	88.40	191.00	11,298.77	-986.27	-367.59	1,013.87	4.49	1.61	-4.19
12,117.00	88.70	189.50	11,299.58	-1,017.75	-373.28	1,045.72	4.78	0.94	-4.69
12,148.00	89.10	188.30	11,300.18	-1,048.37	-378.08	1,076.63	4.08	1.29	-3.87
12,179.00	89.50	186.90	11,300.55	-1,079.10	-382.18	1,107.60	4.70	1.29	-4.52
12,211.00	88.70	185.10	11,301.06	-1,110.92	-385.52	1,139.58	6.15	-2.50	-5.63
12,242.00	88.00	183.60	11,301.95	-1,141.81	-387.87	1,170.57	5.34	-2.26	-4.84
12,274.00	87.80	182.10	11,303.12	-1,173.75	-389.46	1,202.53	4.73	-0.63	-4.69
12,358.00	89.10	182.00	11,305.66	-1,267.65	-392.82	1,296.38	1.39	1.38	-0.11
12,463.00	88.10	181.40	11,307.99	-1,362.58	-395.64	1,391.20	1.23	-1.05	-0.63
12,557.00	87.40	180.80	11,311.68	-1,456.49	-397.44	1,484.93	0.98	-0.74	-0.64
12,652.00	88.10	181.20	11,315.41	-1,551.40	-399.10	1,579.64	0.85	0.74	0.42
12,746.00	89.30	181.90	11,317.54	-1,645.34	-401.64	1,673.45	1.48	1.28	0.74
12,841.00	88.50	182.60	11,319.36	-1,740.25	-405.37	1,768.34	1.12	-0.84	0.74
12,936.00	89.10	181.70	11,321.35	-1,835.16	-408.93	1,863.21	1.14	0.63	-0.95
13,030.00	89.00	180.70	11,322.91	-1,929.13	-410.90	1,957.00	1.07	-0.11	-1.06
13,125.00	87.70	180.60	11,325.65	-2,024.08	-411.98	2,051.70	1.37	-1.37	-0.11
13,219.00	88.40	181.00	11,328.84	-2,118.01	-413.29	2,145.41	0.86	0.74	0.43
13,314.00	88.40	181.50	11,331.50	-2,212.95	-415.36	2,240.19	0.53	0.00	0.53
13,408.00	88.40	182.00	11,334.12	-2,306.87	-418.23	2,334.01	0.53	0.00	0.53
13,503.00	88.90	181.80	11,336.36	-2,401.79	-421.38	2,428.86	0.57	0.53	-0.21
13,597.00	89.50	182.10	11,337.67	-2,495.73	-424.58	2,522.73	0.71	0.64	0.32
13,692.00	88.60	181.40	11,339.25	-2,590.67	-427.48	2,617.57	1.20	-0.95	-0.74
13,786.00	87.90	181.40	11,342.12	-2,684.60	-429.78	2,711.36	0.74	-0.74	0.00
13,880.00	88.70	181.40	11,344.91	-2,778.53	-432.07	2,805.14	0.85	0.85	0.00
13,975.00	87.90	181.40	11,347.72	-2,873.46	-434.39	2,899.93	0.84	-0.84	0.00
14,069.00	88.50	181.30	11,350.68	-2,967.38	-436.60	2,993.71	0.65	0.64	-0.11
14,163.00	89.70	181.70	11,352.15	-3,061.34	-439.06	3,087.53	1.35	1.28	0.43
14,258.00	90.50	182.00	11,351.99	-3,156.29	-442.13	3,182.40	0.90	0.84	0.32
14,352.00	89.80	181.40	11,351.74	-3,250.25	-444.92	3,276.25	0.98	-0.74	-0.64
14,447.00	90.20	181.10	11,351.74	-3,345.22	-446.99	3,371.07	0.53	0.42	-0.32
14,541.00	90.20	179.80	11,351.41	-3,439.22	-447.73	3,464.78	1.38	0.00	-1.38
14,650.00	90.30	179.80	11,350.94	-3,548.22	-447.35	3,573.36	0.09	0.09	0.00
14,744.00	88.30	178.50	11,352.09	-3,642.19	-445.96	3,666.88	2.54	-2.13	-1.38



Integrity Directional Services, LLC
Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 34, T 20 S., R 34 E
Well: Mas Federal #4H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Mas Federal #4H
TVD Reference: KB=20' @ 3739.50ft (Patriot 2)
MD Reference: KB=20' @ 3739.50ft (Patriot 2)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
14,838.00	88.70	178.90	11,354.55	-3,736.13	-443.82	3,760.30	0.60	0.43	0.43
14,932.00	89.10	179.60	11,356.35	-3,830.11	-442.59	3,853.84	0.86	0.43	0.74
15,027.00	89.00	180.10	11,357.93	-3,925.09	-442.35	3,948.46	0.54	-0.11	0.53
15,121.00	89.90	180.70	11,358.83	-4,019.09	-443.00	4,042.17	1.15	0.96	0.64
15,216.00	88.40	180.10	11,360.24	-4,114.07	-443.67	4,136.87	1.70	-1.58	-0.63
15,310.00	88.80	180.50	11,362.54	-4,208.04	-444.16	4,230.54	0.60	0.43	0.43
15,405.00	89.70	180.50	11,363.78	-4,303.03	-444.99	4,325.26	0.95	0.95	0.00
15,499.00	88.70	180.20	11,365.09	-4,397.02	-445.56	4,418.96	1.11	-1.06	-0.32
15,594.00	89.10	180.20	11,366.91	-4,492.00	-445.89	4,513.62	0.42	0.42	0.00
15,688.00	89.20	180.10	11,368.31	-4,585.99	-446.14	4,607.30	0.15	0.11	-0.11
15,783.00	89.40	180.20	11,369.47	-4,680.98	-446.39	4,701.97	0.24	0.21	0.11
15,877.00	89.70	180.20	11,370.21	-4,774.98	-446.71	4,795.66	0.32	0.32	0.00
15,915.00	89.70	180.20	11,370.41	-4,812.98	-446.85	4,833.53	0.00	0.00	0.00
Final IDS MWD Suvey									
15,972.00	89.70	180.20	11,370.71	-4,869.97	-447.05	4,890.34	0.00	0.00	0.00
Projection to TD									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
10,777.00	10,773.19	-78.96	62.54	First IDS MWD Survey
15,915.00	11,370.41	-4,812.98	-446.85	Final IDS MWD Suvey
15,972.00	11,370.71	-4,869.97	-447.05	Projection to TD

Checked By: _____ Approved By: _____ Date: _____