

Results of Directional Survey

API number:	30-025-41888		
OGRID:		Operator:	CAZA OPERATING, LLC
		Property:	GRAMMA 27 STATE # 2H

surface	ULSTR:	A	27	T	21S	R	34E
				330	FNL	500	FEL

BH Loc	ULSTR:	P	27	T	21S	R	34E
14650	MD	10268.0	TVD	346	FSL	300	FEL
4934 FNL							

Top Perf/OH	ULSTR:	A	27	T	21S	R	34E
10575	MD	10302.6	TVD	867	FNL	506	FEL

Bot Perf/OH	ULSTR:	P	27	T	21S	R	34E
14572	MD	10276.1	TVD	423	FSL	308	FEL
4857 FNL							

	MD	N/S	E/W	VD
	10549	-511.70	-7.10	10297.7
TOP PERFS/OH	10575	-537.21	-6.13	10302.58
	10581	-543.10	-5.90	10303.70
	14546	-4501.50	189.70	10278.50
BOT PERFS/OH	14572	-4527.25	192.25	10276.05
	14597	-4552.00	194.70	10273.70

NEXT TO LAST	14597	-4552.00	194.70	10273.70
LAST READING	14650	-4604.40	200.10	10268.00
TD	14650	-4604.40	200.10	10268.00

Surface Location	330	FN	500	FE
Projected BHL	4934	FN	300	FE
Location of				
Top Perfs/OH	867	FN	506	FE
Bottom Perfs/OH	4857	FN	308	FE

SUMMARY of Subsurface Locations

Surface Location	A-27-21S-34E	330	FN	500	FE	Vert. Depth
Top Perfs/OH	A-27-21S-34E	867	FN	506	FE	10302.58
Bottom Perfs/OH	P-27-21S-34E	4857	FN	308	FE	10276.05
Projected TD	P-27-21S-34E	4934	FN	300	FE	10268.00

SEP 08 2014



Company: Caza Operating
Lease/Well: Gramma 27/#2H

HOBBS OGD
AUG 27 2014
RECEIVED

Rig Name: Patriot 1
State/County: New Mexico/Lea
Latitude: 32.46, Longitude: -103.45
GRID North is 0.47 Degrees East of True North
VS-Azi: 0.00 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

Depth Reference : RKB= 18.5 Feet

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: gyro survey.ut
Minimum Curvature Method
Report Date/Time: 6/28/2014 / 15:42

Vaughn Energy Services
West Texas
(432) 563-5444
Adam Gathright

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	0.11	213.17	100.00	-0.08	-0.05	-0.08	0.09	213.17	0.11
200.00	0.38	192.61	200.00	-0.48	-0.18	-0.48	0.51	199.99	0.28
300.00	0.55	177.97	300.00	-1.29	-0.23	-1.29	1.31	190.17	0.21
400.00	0.34	171.94	399.99	-2.06	-0.17	-2.06	2.07	184.80	0.22
500.00	0.56	167.50	499.99	-2.83	-0.03	-2.83	2.83	180.52	0.23
600.00	0.51	150.96	599.99	-3.70	0.29	-3.70	3.71	175.44	0.16
700.00	0.35	162.34	699.98	-4.37	0.60	-4.37	4.42	172.16	0.18
800.00	0.21	172.40	799.98	-4.85	0.72	-4.85	4.90	171.56	0.15
900.00	0.27	140.97	899.98	-5.22	0.89	-5.22	5.29	170.30	0.14
1000.00	0.42	120.17	999.98	-5.58	1.35	-5.58	5.74	166.38	0.19
1100.00	0.41	112.62	1099.98	-5.90	2.00	-5.90	6.23	161.30	0.05
1200.00	0.55	68.11	1199.97	-5.86	2.77	-5.86	6.48	154.68	0.38
1300.00	0.63	81.72	1299.97	-5.60	3.76	-5.60	6.75	146.12	0.16
1400.00	0.41	73.35	1399.96	-5.42	4.65	-5.42	7.14	139.36	0.24
1500.00	0.11	79.07	1499.96	-5.30	5.09	-5.30	7.35	136.17	0.30
1600.00	0.43	49.65	1599.96	-5.04	5.46	-5.04	7.43	132.70	0.34
1700.00	0.60	47.52	1699.96	-4.45	6.13	-4.45	7.58	125.94	0.18
1800.00	0.48	71.50	1799.95	-3.96	6.92	-3.96	7.97	119.79	0.26
1900.00	0.28	50.32	1899.95	-3.67	7.50	-3.67	8.35	116.10	0.24
2000.00	0.44	51.80	1999.95	-3.28	7.99	-3.28	8.63	112.33	0.16
2100.00	0.14	95.20	2099.95	-3.05	8.41	-3.05	8.95	109.96	0.35
2200.00	0.20	165.41	2199.95	-3.23	8.58	-3.23	9.17	110.66	0.20
2300.00	0.10	123.77	2299.95	-3.45	8.70	-3.45	9.36	111.65	0.14
2400.00	0.16	158.36	2399.95	-3.63	8.82	-3.63	9.54	112.38	0.10
2500.00	0.14	193.88	2499.95	-3.88	8.84	-3.88	9.66	113.70	0.09
2600.00	0.11	271.76	2599.95	-4.00	8.72	-4.00	9.59	114.65	0.16
2700.00	0.09	251.98	2699.95	-4.02	8.55	-4.02	9.45	115.18	0.04
2800.00	0.15	273.96	2799.95	-4.03	8.35	-4.03	9.27	115.79	0.08
2900.00	0.14	203.05	2899.94	-4.14	8.17	-4.14	9.16	116.87	0.17
3000.00	0.22	281.34	2999.94	-4.22	7.94	-4.22	8.99	117.99	0.23
3100.00	0.22	303.29	3099.94	-4.08	7.59	-4.08	8.62	118.23	0.08
3200.00	0.30	305.01	3199.94	-3.82	7.22	-3.82	8.16	117.89	0.08
3300.00	0.12	304.14	3299.94	-3.61	6.92	-3.61	7.80	117.57	0.18
3400.00	0.47	351.36	3399.94	-3.15	6.77	-3.15	7.47	114.93	0.40

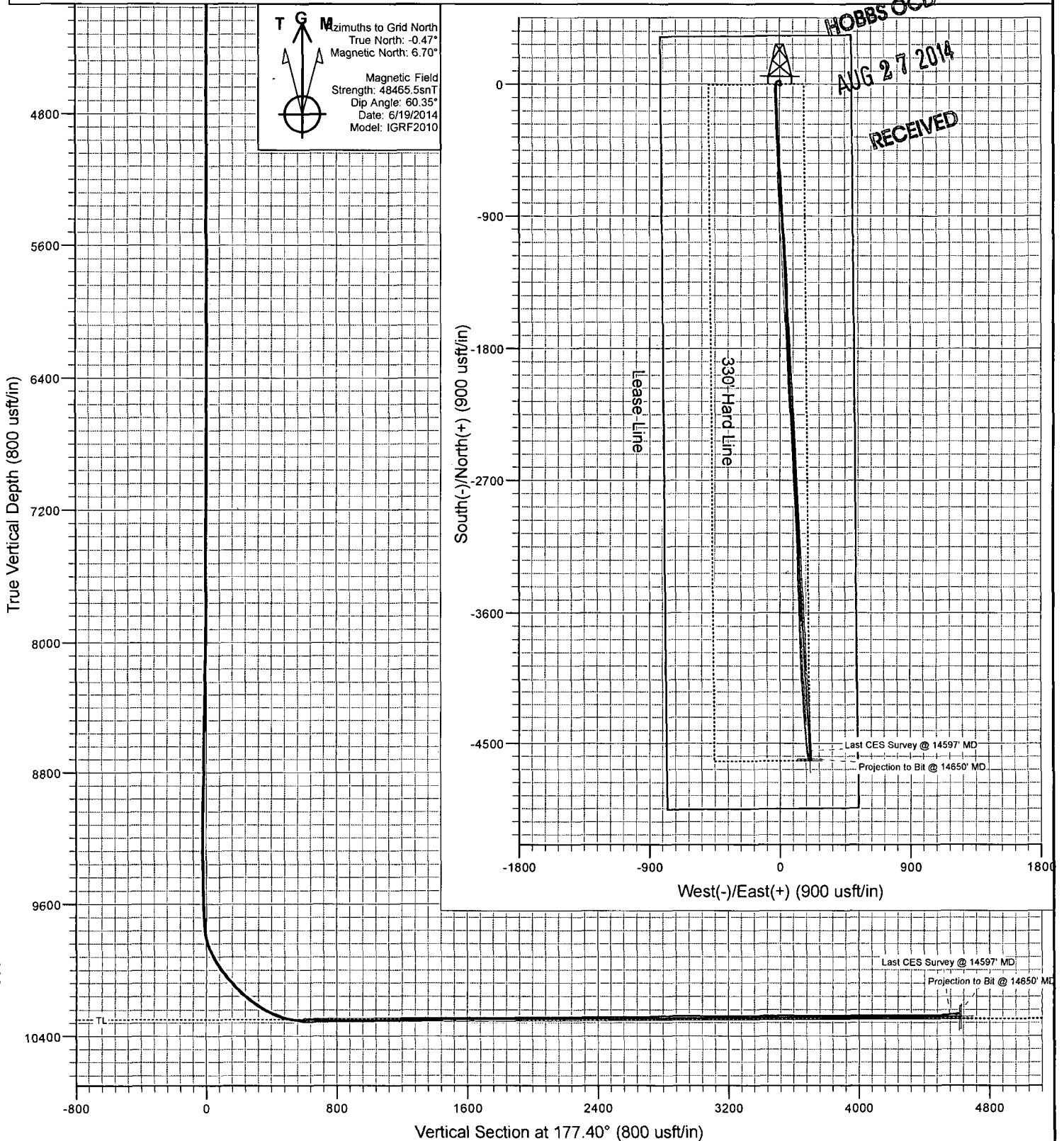
Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
3500.00	0.39	356.86	3499.94	-2.40	6.69	-2.40	7.11	109.74	0.09
3600.00	0.34	11.10	3599.94	-1.77	6.73	-1.77	6.96	104.77	0.10
3700.00	0.39	105.68	3699.93	-1.58	7.11	-1.58	7.28	102.51	0.53
3800.00	0.29	124.37	3799.93	-1.81	7.65	-1.81	7.86	103.34	0.14
3900.00	0.19	9.92	3899.93	-1.80	7.89	-1.80	8.09	102.84	0.41
4000.00	0.35	104.88	3999.93	-1.72	8.21	-1.72	8.39	101.81	0.41
4100.00	0.34	97.29	4099.93	-1.83	8.80	-1.83	8.99	101.77	0.05
4200.00	0.49	339.12	4199.93	-1.47	8.94	-1.47	9.06	99.33	0.72
4300.00	0.68	297.78	4299.92	-0.79	8.26	-0.79	8.30	95.47	0.45
4400.00	0.41	327.69	4399.92	-0.21	7.54	-0.21	7.55	91.59	0.38
4500.00	0.58	0.94	4499.92	0.61	7.36	0.61	7.38	85.29	0.33
4600.00	0.20	71.81	4599.91	1.17	7.53	1.17	7.63	81.16	0.55
4700.00	0.34	139.49	4699.91	1.00	7.90	1.00	7.96	82.79	0.32
4800.00	0.24	155.93	4799.91	0.58	8.17	0.58	8.20	85.92	0.13
4900.00	0.14	123.35	4899.91	0.33	8.36	0.33	8.37	87.76	0.14
5000.00	0.34	111.18	4999.91	0.15	8.74	0.15	8.74	89.00	0.21
5100.00	0.39	155.47	5099.91	-0.27	9.16	-0.27	9.17	91.68	0.28
5200.00	0.13	29.39	5199.91	-0.48	9.36	-0.48	9.37	92.93	0.48
5300.00	0.22	340.59	5299.91	-0.20	9.36	-0.20	9.36	91.20	0.17
5400.00	0.30	157.41	5399.91	-0.25	9.39	-0.25	9.39	91.55	0.52
5500.00	0.49	136.67	5499.90	-0.80	9.78	-0.80	9.82	94.69	0.24
5600.00	0.47	112.65	5599.90	-1.27	10.45	-1.27	10.53	96.93	0.20
5700.00	0.50	79.03	5699.90	-1.34	11.25	-1.34	11.33	96.81	0.28
5800.00	0.37	137.90	5799.89	-1.50	11.90	-1.50	11.99	97.19	0.44
5900.00	0.19	207.99	5899.89	-1.89	12.04	-1.89	12.18	98.94	0.36
6000.00	0.43	323.39	5999.89	-1.74	11.73	-1.74	11.86	98.44	0.54
6100.00	0.28	314.02	6099.89	-1.27	11.33	-1.27	11.40	96.39	0.16
6200.00	0.17	325.31	6199.89	-0.98	11.07	-0.98	11.12	95.05	0.12
6300.00	0.29	296.15	6299.89	-0.75	10.77	-0.75	10.79	93.97	0.16
6400.00	0.60	326.06	6399.89	-0.20	10.25	-0.20	10.25	91.13	0.38
6500.00	0.26	319.47	6499.88	0.40	9.81	0.40	9.82	87.64	0.35
6600.00	0.41	233.81	6599.88	0.36	9.38	0.36	9.38	87.78	0.47
6700.00	0.36	309.74	6699.88	0.35	8.85	0.35	8.85	87.71	0.48
6800.00	0.46	308.42	6799.88	0.80	8.29	0.80	8.33	84.47	0.10
6900.00	0.17	229.21	6899.88	0.95	7.87	0.95	7.93	83.09	0.46
7000.00	0.21	231.93	6999.88	0.74	7.61	0.74	7.65	84.43	0.04
7100.00	0.24	328.03	7099.88	0.80	7.35	0.80	7.40	83.77	0.33
7200.00	0.25	268.23	7199.87	0.97	7.03	0.97	7.10	82.14	0.24
7300.00	0.19	335.51	7299.87	1.12	6.75	1.12	6.84	80.60	0.25
7400.00	0.10	231.08	7399.87	1.21	6.61	1.21	6.72	79.61	0.24
7500.00	0.13	224.01	7499.87	1.07	6.45	1.07	6.54	80.58	0.03
7600.00	0.27	256.25	7599.87	0.93	6.15	0.93	6.22	81.38	0.17
7700.00	0.31	242.24	7699.87	0.75	5.68	0.75	5.73	82.46	0.08
7800.00	0.29	302.44	7799.87	0.76	5.23	0.76	5.29	81.71	0.30
7900.00	0.82	344.82	7899.87	1.59	4.84	1.59	5.09	71.83	0.64
8000.00	0.91	344.57	7999.85	3.04	4.44	3.04	5.38	55.58	0.09
8100.00	1.05	345.53	8099.84	4.70	4.00	4.70	6.17	40.39	0.15
8200.00	1.19	328.77	8199.82	6.48	3.23	6.48	7.24	26.50	0.35
8300.00	1.22	338.38	8299.80	8.35	2.30	8.35	8.66	15.39	0.20
8400.00	1.12	351.83	8399.78	10.30	1.77	10.30	10.45	9.74	0.29
8500.00	0.90	356.12	8499.76	12.05	1.58	12.05	12.15	7.46	0.23
8600.00	0.70	34.45	8599.75	13.34	1.87	13.34	13.47	7.98	0.56
8700.00	0.80	51.43	8699.75	14.28	2.76	14.28	14.55	10.95	0.24
8800.00	1.51	23.62	8799.73	15.92	3.84	15.92	16.38	13.55	0.88
8900.00	0.85	354.24	8899.70	17.86	4.29	17.86	18.37	13.50	0.87

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
9000.00	0.39	328.11	8999.70	18.89	4.03	18.89	19.31	12.05	0.53
9100.00	1.08	292.49	9099.69	19.54	2.98	19.54	19.77	8.67	0.80
9200.00	1.17	278.22	9199.67	20.05	1.09	20.05	20.08	3.11	0.29
9300.00	1.27	272.89	9299.65	20.25	-1.03	20.25	20.28	357.10	0.15
9400.00	2.40	260.18	9399.60	19.95	-4.19	19.95	20.39	348.14	1.20
9500.00	3.60	250.66	9499.46	18.55	-9.22	18.55	20.72	333.58	1.30
9600.00	3.68	235.10	9599.26	15.68	-14.82	15.68	21.57	316.62	0.99
9700.00	3.75	221.97	9699.05	11.41	-19.63	11.41	22.71	300.16	0.85
9800.00	3.42	224.20	9798.85	6.84	-23.90	6.84	24.86	285.98	0.36
9900.00	2.65	224.74	9898.71	3.06	-27.60	3.06	27.77	276.33	0.77
10000.00	2.66	208.67	9998.61	-0.62	-30.34	-0.62	30.35	268.84	0.74
10100.00	1.92	211.04	10098.53	-4.09	-32.32	-4.09	32.58	262.78	0.75
10200.00	2.29	226.96	10198.46	-6.89	-34.65	-6.89	35.33	258.75	0.69
10300.00	2.17	226.93	10298.38	-9.55	-37.49	-9.55	38.69	255.71	0.12

HORIZONTAL DISPLACEMENT IS
38.69 FEET AT 255.71 DEGREES

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target	Annotation
1	10423.0	64.60	177.70	10257.6	-392.7	-12.9	0.00	0.00	391.7		Build 11.95°/100'
2	10638.0	90.28	176.96	10304.0	-600.6	-3.2	11.95	-1.70	599.8		EOB @ 10638' MD
3	14664.1	90.28	176.96	10284.0	-4620.9	210.1	0.00	0.00	4625.7	Gramma 27 PBHL P#1D	PBHL @ 14664.1' MD



Cathedral Energy Services

Survey Report

Company:	Caza Operating, LLC	Local Co-ordinate Reference:	Well Gramma 27 State 2H
Project:	Lea County, NM	TVD Reference:	HZ @ 3706.0usft
Site:	Gramma 27 State	MD Reference:	HZ @ 3706.0usft
Well:	Gramma 27 State 2H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Project	Lea County, NM		
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		Gramma 27 State			
Site Position:		Northing:	530,795.10 usft	Latitude:	32.456172
From:	Map	Easting:	772,365.40 usft	Longitude:	-103.450336
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"	Grid Convergence:	0.47 °

Well	Gramma 27 State 2H					
Well Position	+N/-S	0.0 usft	Northing:	530,795.10 usft	Latitude:	32.456172
	+E/-W	0.0 usft	Easting:	772,365.40 usft	Longitude:	-103.450336
Position Uncertainty	0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	3,688.0 usft	

Wellbore		HZ			
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	6/19/2014	7.17	60.35	48,465

Design		FINAL			
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	177.40

Survey Program		Date	7/10/2014		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	9,700.0	Survey #1 (HZ)	Gyro	Gyro	
9,727.0	14,650.0	MWD (HZ)	ISCWSA MWD	MWD - ISCWSA	

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u	Formations / Comments
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
100.0	0.11	213.17	100.0	-0.1	-0.1	0.1	0.11	0.11	
200.0	0.38	192.61	200.0	-0.5	-0.2	0.5	0.28	0.27	
300.0	0.55	177.97	300.0	-1.3	-0.2	1.3	0.21	0.17	
400.0	0.34	171.94	400.0	-2.1	-0.2	2.1	0.21	-0.21	
500.0	0.56	167.50	500.0	-2.8	0.0	2.8	0.22	0.22	
600.0	0.51	150.96	600.0	-3.7	0.3	3.7	0.16	-0.05	
700.0	0.35	162.34	700.0	-4.4	0.6	4.4	0.18	-0.16	
800.0	0.21	172.40	800.0	-4.9	0.7	4.9	0.15	-0.14	
900.0	0.27	140.97	900.0	-5.2	0.9	5.3	0.14	0.06	
1,000.0	0.42	120.17	1,000.0	-5.6	1.4	5.6	0.19	0.15	
1,100.0	0.41	112.62	1,100.0	-5.9	2.0	6.0	0.06	-0.01	

Cathedral Energy Services

Survey Report

Company:	Caza Operating, LLC	Local Co-ordinate Reference:	Well Gramma 27 State 2H
Project:	Lea County, NM	TVD Reference:	HZ @ 3706.0usft
Site:	Gramma 27 State	MD Reference:	HZ @ 3706.0usft
Well:	Gramma 27 State 2H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
1,200.0	0.55	68.11	1,200.0	-5.9	2.8	6.0	0.39	0.14	
1,300.0	0.63	81.72	1,300.0	-5.6	3.8	5.8	0.16	0.08	
1,400.0	0.41	73.35	1,400.0	-5.4	4.7	5.6	0.23	-0.22	
1,500.0	0.11	79.07	1,500.0	-5.3	5.1	5.5	0.30	-0.30	
1,600.0	0.43	49.65	1,600.0	-5.0	5.5	5.3	0.34	0.32	
1,700.0	0.60	47.52	1,700.0	-4.4	6.1	4.7	0.17	0.17	
1,800.0	0.48	71.50	1,799.9	-4.0	6.9	4.3	0.25	-0.12	
1,900.0	0.28	50.32	1,899.9	-3.7	7.5	4.0	0.24	-0.20	
2,000.0	0.44	51.80	1,999.9	-3.3	8.0	3.6	0.16	0.16	
2,100.0	0.14	95.20	2,099.9	-3.0	8.4	3.4	0.35	-0.30	
2,200.0	0.20	165.41	2,199.9	-3.2	8.6	3.6	0.20	0.06	
2,300.0	0.10	123.77	2,299.9	-3.4	8.7	3.8	0.14	-0.10	
2,400.0	0.16	158.36	2,399.9	-3.6	8.8	4.0	0.10	0.06	
2,500.0	0.14	193.88	2,499.9	-3.9	8.9	4.3	0.09	-0.02	
2,600.0	0.11	271.76	2,599.9	-4.0	8.7	4.4	0.16	-0.03	
2,700.0	0.09	251.98	2,699.9	-4.0	8.6	4.4	0.04	-0.02	
2,800.0	0.15	273.96	2,799.9	-4.0	8.4	4.4	0.07	0.06	
2,900.0	0.14	203.05	2,899.9	-4.1	8.2	4.5	0.17	-0.01	
3,000.0	0.22	281.34	2,999.9	-4.2	7.9	4.6	0.24	0.08	
3,100.0	0.22	303.29	3,099.9	-4.1	7.6	4.4	0.08	0.00	
3,200.0	0.30	305.01	3,199.9	-3.8	7.2	4.1	0.08	0.08	
3,300.0	0.12	304.14	3,299.9	-3.6	6.9	3.9	0.18	-0.18	
3,400.0	0.47	351.36	3,399.9	-3.1	6.8	3.4	0.40	0.35	
3,500.0	0.39	356.86	3,499.9	-2.4	6.7	2.7	0.09	-0.08	
3,600.0	0.34	11.10	3,599.9	-1.8	6.7	2.1	0.10	-0.05	
3,700.0	0.39	105.68	3,699.9	-1.6	7.1	1.9	0.54	0.05	
3,800.0	0.29	124.37	3,799.9	-1.8	7.6	2.1	0.15	-0.10	
3,900.0	0.19	9.92	3,899.9	-1.8	7.9	2.1	0.41	-0.10	
4,000.0	0.35	104.88	3,999.9	-1.7	8.2	2.1	0.41	0.16	
4,100.0	0.34	97.29	4,099.9	-1.8	8.8	2.2	0.05	-0.01	
4,200.0	0.49	339.12	4,199.9	-1.4	8.9	1.8	0.72	0.15	
4,300.0	0.68	297.78	4,299.9	-0.8	8.3	1.1	0.45	0.19	
4,400.0	0.41	327.69	4,399.9	-0.2	7.5	0.5	0.38	-0.27	
4,500.0	0.58	0.94	4,499.9	0.6	7.4	-0.3	0.33	0.17	
4,600.0	0.20	71.81	4,599.9	1.2	7.5	-0.8	0.55	-0.38	
4,700.0	0.34	139.49	4,699.9	1.0	7.9	-0.7	0.32	0.14	
4,800.0	0.24	155.93	4,799.9	0.6	8.2	-0.2	0.13	-0.10	
4,900.0	0.14	123.35	4,899.9	0.3	8.4	0.0	0.14	-0.10	
5,000.0	0.34	111.18	4,999.9	0.2	8.7	0.2	0.21	0.20	
5,100.0	0.39	155.47	5,099.9	-0.3	9.2	0.7	0.28	0.05	
5,200.0	0.13	29.39	5,199.9	-0.5	9.4	0.9	0.48	-0.26	
5,300.0	0.22	340.59	5,299.9	-0.2	9.3	0.6	0.17	0.09	
5,400.0	0.30	157.41	5,399.9	-0.2	9.4	0.7	0.52	0.08	
5,500.0	0.49	136.67	5,499.9	-0.8	9.8	1.2	0.23	0.19	
5,600.0	0.47	112.65	5,599.9	-1.3	10.5	1.7	0.20	-0.02	
5,700.0	0.50	79.03	5,699.9	-1.3	11.3	1.9	0.28	0.03	
5,800.0	0.37	137.90	5,799.9	-1.5	11.9	2.0	0.44	-0.13	
5,900.0	0.19	207.99	5,899.9	-1.9	12.0	2.4	0.35	-0.18	
6,000.0	0.43	323.39	5,999.9	-1.7	11.7	2.3	0.54	0.24	
6,100.0	0.28	314.02	6,099.9	-1.3	11.3	1.8	0.16	-0.15	
6,200.0	0.17	325.31	6,199.9	-1.0	11.1	1.5	0.12	-0.11	
6,300.0	0.29	296.15	6,299.9	-0.7	10.8	1.2	0.16	0.12	
6,400.0	0.60	326.06	6,399.9	-0.2	10.2	0.7	0.38	0.31	

Cathedral Energy Services

Survey Report

Company:	Caza Operating, LLC	Local Co-ordinate Reference:	Well Gramma 27 State 2H
Project:	Lea County, NM	TVD Reference:	HZ @ 3706.0usft
Site:	Gramma 27 State	MD Reference:	HZ @ 3706.0usft
Well:	Gramma 27 State 2H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
6,500.0	0.26	319.47	6,499.9	0.4	9.8	0.0	0.34	-0.34	
6,600.0	0.41	233.81	6,599.9	0.4	9.4	0.0	0.47	0.15	
6,700.0	0.36	309.74	6,699.9	0.4	8.8	0.0	0.48	-0.05	
6,800.0	0.46	308.42	6,799.9	0.8	8.3	-0.4	0.10	0.10	
6,900.0	0.17	229.21	6,899.9	1.0	7.9	-0.6	0.46	-0.29	
7,000.0	0.21	231.93	6,999.9	0.8	7.6	-0.4	0.04	0.04	
7,100.0	0.24	328.03	7,099.9	0.8	7.3	-0.5	0.34	0.03	
7,200.0	0.25	268.23	7,199.9	1.0	7.0	-0.7	0.24	0.01	
7,300.0	0.19	335.51	7,299.9	1.1	6.7	-0.8	0.25	-0.06	
7,400.0	0.10	231.08	7,399.9	1.2	6.6	-0.9	0.24	-0.09	
7,500.0	0.13	224.01	7,499.9	1.1	6.4	-0.8	0.03	0.03	
7,600.0	0.27	256.25	7,599.9	1.0	6.1	-0.7	0.17	0.14	
7,700.0	0.31	242.24	7,699.9	0.8	5.7	-0.5	0.08	0.04	
7,800.0	0.29	302.44	7,799.9	0.8	5.2	-0.6	0.30	-0.02	
7,900.0	0.82	344.82	7,899.9	1.6	4.8	-1.4	0.64	0.53	
8,000.0	0.91	344.57	7,999.8	3.1	4.4	-2.9	0.09	0.09	
8,100.0	1.05	345.53	8,099.8	4.7	4.0	-4.5	0.14	0.14	
8,200.0	1.19	328.77	8,199.8	6.5	3.2	-6.4	0.35	0.14	
8,300.0	1.22	338.38	8,299.8	8.4	2.3	-8.3	0.20	0.03	
8,400.0	1.12	351.83	8,399.8	10.3	1.8	-10.2	0.29	-0.10	
8,500.0	0.90	356.12	8,499.7	12.1	1.6	-12.0	0.23	-0.22	
8,600.0	0.70	34.45	8,599.7	13.4	1.9	-13.3	0.56	-0.20	
8,700.0	0.80	51.43	8,699.7	14.3	2.7	-14.2	0.24	0.10	
8,800.0	1.51	23.62	8,799.7	16.0	3.8	-15.8	0.88	0.71	
8,900.0	0.85	354.24	8,899.7	17.9	4.3	-17.7	0.88	-0.66	
9,000.0	0.39	328.11	8,999.7	18.9	4.0	-18.7	0.53	-0.46	
9,100.0	1.08	292.49	9,099.7	19.6	3.0	-19.4	0.80	0.69	
9,200.0	1.17	278.22	9,199.7	20.1	1.1	-20.0	0.29	0.09	
9,300.0	1.27	272.89	9,299.6	20.3	-1.0	-20.3	0.15	0.10	
9,400.0	2.40	260.18	9,399.6	20.0	-4.2	-20.2	1.19	1.13	
9,500.0	3.60	250.66	9,499.4	18.6	-9.2	-19.0	1.30	1.20	
9,600.0	3.68	235.10	9,599.2	15.7	-14.8	-16.4	0.99	0.08	
9,700.0	3.75	221.97	9,699.0	11.4	-19.6	-12.3	0.85	0.07	
9,727.0	4.60	211.70	9,726.0	9.9	-20.8	-10.8	4.18	3.15	
9,756.0	6.90	198.10	9,754.8	7.2	-22.0	-8.2	9.17	7.93	
9,788.0	10.20	191.40	9,786.5	2.6	-23.1	-3.7	10.75	10.31	
9,819.0	14.70	188.80	9,816.7	-4.0	-24.3	2.9	14.62	14.52	
9,851.0	18.90	187.30	9,847.4	-13.1	-25.5	11.9	13.19	13.12	
9,883.0	22.90	185.20	9,877.3	-24.5	-26.8	23.2	12.72	12.50	
9,915.0	25.50	180.90	9,906.4	-37.6	-27.4	36.3	9.81	8.12	
9,947.0	29.20	178.40	9,934.9	-52.3	-27.3	51.0	12.10	11.56	
9,978.0	31.90	176.90	9,961.6	-68.0	-26.7	66.7	9.05	8.71	
10,010.0	34.80	175.40	9,988.3	-85.5	-25.5	84.3	9.42	9.06	
10,042.0	37.80	175.20	10,014.1	-104.4	-23.9	103.2	9.38	9.37	
10,070.0	39.90	175.70	10,035.9	-121.9	-22.5	120.8	7.58	7.50	
10,105.0	41.50	177.20	10,062.4	-144.7	-21.1	143.6	5.36	4.57	
10,147.0	43.40	177.40	10,093.4	-173.0	-19.8	171.9	4.54	4.52	
10,169.0	44.10	177.60	10,109.3	-188.2	-19.1	187.2	3.24	3.18	
10,201.0	46.40	177.60	10,131.8	-210.9	-18.2	209.9	7.19	7.19	
10,232.0	49.10	177.80	10,152.7	-233.9	-17.3	232.8	8.72	8.71	
10,264.0	51.30	178.40	10,173.1	-258.4	-16.4	257.4	7.02	6.87	
10,296.0	53.90	178.40	10,192.6	-283.8	-15.7	282.8	8.12	8.12	
10,327.0	56.60	178.70	10,210.2	-309.3	-15.1	308.3	8.75	8.71	

Cathedral Energy Services

Survey Report

Company:	Caza Operating, LLC	Local Co-ordinate Reference:	Well Gramma 27 State 2H
Project:	Lea County, NM	TVD Reference:	HZ @ 3706.0usft
Site:	Gramma 27 State	MD Reference:	HZ @ 3706.0usft
Well:	Gramma 27 State 2H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
10,359.0	58.90	179.00	10,227.3	-336.3	-14.5	335.3	7.23	7.19	
10,391.0	61.70	178.40	10,243.2	-364.1	-13.9	363.1	8.90	8.75	
10,423.0	64.60	177.70	10,257.6	-392.7	-12.9	391.7	9.27	9.06	
10,454.0	67.90	177.30	10,270.1	-421.0	-11.7	420.0	10.71	10.65	
10,486.0	71.60	176.80	10,281.2	-451.0	-10.2	450.1	11.66	11.56	
10,517.0	74.90	177.00	10,290.1	-480.6	-8.6	479.7	10.66	10.65	
10,549.0	77.60	177.80	10,297.7	-511.7	-7.1	510.8	8.78	8.44	
10,581.0	80.80	177.60	10,303.7	-543.1	-5.9	542.2	10.02	10.00	
10,613.0	84.10	176.90	10,307.9	-574.8	-4.4	574.0	10.54	10.31	
10,644.0	87.40	176.30	10,310.2	-605.6	-2.5	604.9	10.82	10.65	
10,676.0	90.40	176.20	10,310.8	-637.5	-0.4	636.9	9.38	9.37	
10,708.0	91.20	176.20	10,310.4	-669.5	1.7	668.8	2.50	2.50	
10,740.0	91.90	175.70	10,309.5	-701.4	3.9	700.8	2.69	2.19	
10,835.0	91.00	176.00	10,307.1	-796.1	10.8	795.8	1.00	-0.95	
10,930.0	89.30	175.90	10,306.9	-890.8	17.5	890.7	1.79	-1.79	
11,025.0	90.50	176.10	10,307.0	-985.6	24.2	985.7	1.28	1.26	
11,120.0	90.60	177.10	10,306.1	-1,080.4	29.8	1,080.7	1.06	0.11	
11,215.0	92.60	176.10	10,303.5	-1,175.2	35.4	1,175.6	2.35	2.11	
11,310.0	91.30	176.40	10,300.2	-1,270.0	41.6	1,270.5	1.40	-1.37	
11,405.0	91.10	177.20	10,298.2	-1,364.8	46.9	1,365.5	0.87	-0.21	
11,500.0	90.40	179.10	10,297.0	-1,459.7	50.0	1,460.5	2.13	-0.74	
11,595.0	90.30	180.00	10,296.4	-1,554.7	50.7	1,555.4	0.95	-0.11	
11,690.0	90.40	179.60	10,295.8	-1,649.7	51.1	1,650.3	0.43	0.11	
11,786.0	90.00	177.80	10,295.5	-1,745.7	53.3	1,746.3	1.92	-0.42	
11,881.0	91.40	176.80	10,294.3	-1,840.6	57.7	1,841.3	1.81	1.47	
11,976.0	90.00	177.60	10,293.2	-1,935.5	62.4	1,936.3	1.70	-1.47	
12,071.0	90.90	177.60	10,292.4	-2,030.4	66.3	2,031.3	0.95	0.95	
12,166.0	90.20	176.80	10,291.5	-2,125.3	71.0	2,126.3	1.12	-0.74	
12,261.0	89.60	176.50	10,291.7	-2,220.1	76.5	2,221.3	0.71	-0.63	
12,356.0	91.30	175.80	10,290.9	-2,314.9	82.9	2,316.2	1.94	1.79	
12,452.0	90.50	175.40	10,289.4	-2,410.6	90.3	2,412.2	0.93	-0.83	
12,547.0	89.90	175.90	10,289.1	-2,505.3	97.5	2,507.1	0.82	-0.63	
12,641.0	90.50	176.40	10,288.8	-2,599.1	103.8	2,601.1	0.83	0.64	
12,737.0	90.20	177.10	10,288.2	-2,694.9	109.2	2,697.1	0.79	-0.31	
12,832.0	92.20	176.90	10,286.2	-2,789.8	114.2	2,792.1	2.12	2.11	
12,927.0	90.20	177.60	10,284.2	-2,884.6	118.8	2,887.1	2.23	-2.11	
13,022.0	89.50	178.20	10,284.5	-2,979.6	122.2	2,982.0	0.97	-0.74	
13,118.0	89.30	177.60	10,285.5	-3,075.5	125.8	3,078.0	0.66	-0.21	
13,213.0	89.50	178.50	10,286.5	-3,170.4	129.0	3,173.0	0.97	0.21	
13,308.0	91.20	179.00	10,285.9	-3,265.4	131.1	3,268.0	1.87	1.79	
13,403.0	91.00	178.50	10,284.1	-3,360.4	133.1	3,363.0	0.57	-0.21	
13,499.0	90.50	178.00	10,282.8	-3,456.3	136.1	3,458.9	0.74	-0.52	
13,594.0	90.10	177.60	10,282.3	-3,551.2	139.7	3,553.9	0.60	-0.42	
13,689.0	88.80	178.30	10,283.2	-3,646.2	143.1	3,648.9	1.55	-1.37	
13,784.0	88.10	178.50	10,285.8	-3,741.1	145.8	3,743.8	0.77	-0.74	
13,879.0	89.70	177.30	10,287.6	-3,836.0	149.2	3,838.8	2.11	1.68	
13,974.0	89.70	176.90	10,288.1	-3,930.9	154.1	3,933.8	0.42	0.00	
14,069.0	90.40	177.60	10,288.0	-4,025.8	158.6	4,028.8	1.04	0.74	
14,165.0	90.00	177.20	10,287.7	-4,121.7	163.0	4,124.8	0.59	-0.42	
14,260.0	90.50	176.90	10,287.3	-4,216.5	167.9	4,219.8	0.61	0.53	
14,355.0	90.70	175.90	10,286.3	-4,311.3	173.8	4,314.8	1.07	0.21	
14,451.0	92.10	175.20	10,283.9	-4,407.0	181.3	4,410.7	1.63	1.46	
14,546.0	94.50	174.60	10,278.5	-4,501.5	189.7	4,505.4	2.60	2.53	

Cathedral Energy Services

Survey Report

Company:	Caza Operating, LLC	Local Co-ordinate Reference:	Well Gramma 27 State 2H
Project:	Lea County, NM	TVD Reference:	HZ @ 3706.0usft
Site:	Gramma 27 State	MD Reference:	HZ @ 3706.0usft
Well:	Gramma 27 State 2H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
14,597.0	96.20	174.10	10,273.7	-4,552.0	194.7	4,556.2	3.47	3.33	Last CES Survey @ 14597' MD
14,650.0	96.20	174.10	10,268.0	-4,604.4	200.1	4,608.8	0.00	0.00	Projection to Bit @ 14650' MD - Gramma 27 Stat

Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
Gramma 2H PBHL P#1A	0.00	0.00	10,290.0	-4,620.9	210.1	526,174.20	772,575.50	32.443466	-103.449778
- actual wellpath misses target center by 29.3usft at 14650.0usft MD (10268.0 TVD, -4604.4 N, 200.1 E)									
- Point									
Gramma 27 State 2H HZ	0.00	0.00	10,295.0	-4,610.9	209.6	526,184.19	772,575.05	32.443494	-103.449780
- actual wellpath misses target center by 29.4usft at 14650.0usft MD (10268.0 TVD, -4604.4 N, 200.1 E)									
- Point									
Gramma 27 PBHL P#1D	89.72	176.96	10,284.0	-4,620.9	210.1	526,174.20	772,575.50	32.443466	-103.449778
- actual wellpath misses target center by 25.1usft at 14650.0usft MD (10268.0 TVD, -4604.4 N, 200.1 E)									
- Rectangle (sides W24.0 H24.0 D4,026.1)									

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
14,597.0	10,273.7	-4,552.0	194.7	Last CES Survey @ 14597' MD	
14,650.0	10,268.0	-4,604.4	200.1	Projection to Bit @ 14650' MD	

Checked By: _____ Approved By: _____ Date: _____