



Project: Roosevelt Co., NM (NAD 83)
Site: Sec 27-6S-34E
Well: Tupelo Honey #5H
Wellbore: ST01 [233837]
Design: Final

HOBBS OCD

AUG 14 2017

RECEIVED CATHEDRAL



Azimuths to Grid North
True North: -0.49°
Magnetic North: 6.78°

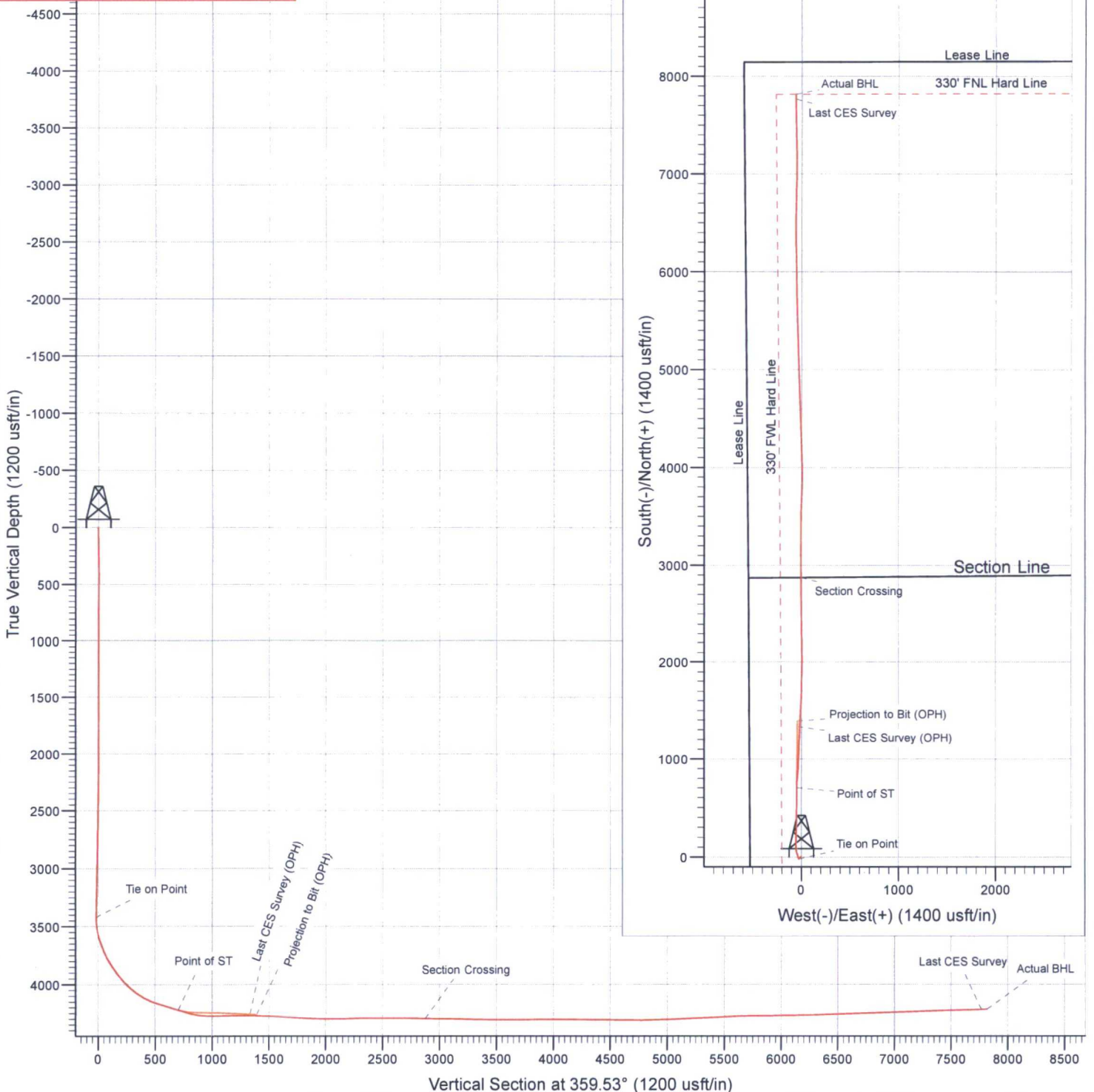
Magnetic Field
Strength: 48932.3snT
Dip Angle: 61.47°
Date: 5/18/2017
Model: HDGM

+N/-S	+E/-W	Northing	Ground Level: Easting	4334.00	Latitude	Longitude
0.00	0.00	1007336.40	806843.80		33.765909	-103.459684

ANNOTATIONS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Annotation
4585.00	74.60	0.30	4220.56	702.11	-46.70	702.47	Point of ST
6766.00	88.90	359.70	4296.41	2874.23	-2.16	2874.15	Section Crossing
11662.00	92.60	0.10	4217.50	7766.89	-57.22	7767.10	Last CES Survey
11712.00	92.60	0.10	4215.23	7816.84	-57.13	7817.04	Actual BHL

Actual Bottom Hole Location
330' FNL / 535' FWL
X:806786.67 Y:1015153.24





Cathedral Energy Services
Survey Report



Company:	Manzano LLC	Local Co-ordinate Reference:	Well Tupelo Honey #5H
Project:	Roosevelt Co., NM (NAD 83)	TVD Reference:	16' RKB @ 4350.00usft (Norton #6)
Site:	Sec 27-6S-34E	MD Reference:	16' RKB @ 4350.00usft (Norton #6)
Well:	Tupelo Honey #5H	North Reference:	Grid
Wellbore:	ST01 [233837]	Survey Calculation Method:	Minimum Curvature
Design:	Final	Database:	USA EDM 5000 Multi Users DB

Project	Roosevelt Co., NM (NAD 83)		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site	Sec 27-6S-34E		
Site Position:		Northing:	1,007,582.33 usft
From:	Map	Easting:	808,952.30 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16"
		Latitude:	33.766536
		Longitude:	-103.452740
		Grid Convergence:	0.49 °

Well	Tupelo Honey #5H		
Well Position	+N/-S	0.00 usft	Northing:
	+E/-W	0.00 usft	Easting:
Position Uncertainty	0.00 usft	Wellhead Elevation:	0.00 usft
		Latitude:	33.765909
		Longitude:	-103.459684
		Ground Level:	4,334.00 usft

Wellbore	ST01 [233837]		
Magnetics	Model Name	Sample Date	Declination (°)
	HDGM	5/18/2017	7.27
			Dip Angle (°)
			61.47
			Field Strength (nT)
			48,932.30000000

Design	Final		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	4,585.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.00	0.00	0.00
			Direction (°)
			359.53

Survey Program	Date 6/4/2017		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name
144.00	3,422.00	Gyro Surveys (Pilot Hole)	NS-GYRO-SS
3,443.00	4,585.00	CES MWD (OPH[233837])	MWD+HDGM
4,615.00	11,712.00	CES MWD (ST01 [233837])	MWD+HDGM
			Description
			NS Gyro single shots
			OWSG MWD + HDGM
			OWSG MWD + HDGM

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
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
144.00	1.00	11.00	143.99	1.23	0.24	1.23	0.69	0.69	
235.00	0.70	13.00	234.98	2.55	0.52	2.55	0.33	-0.33	
326.00	0.60	3.00	325.98	3.57	0.67	3.57	0.17	-0.11	
421.00	0.30	333.00	420.97	4.29	0.58	4.29	0.39	-0.32	
513.00	0.10	356.00	512.97	4.59	0.46	4.58	0.23	-0.22	
604.00	0.40	82.00	603.97	4.71	0.77	4.70	0.45	0.33	
695.00	0.60	128.00	694.97	4.46	1.46	4.45	0.47	0.22	
789.00	0.30	210.00	788.97	3.94	1.73	3.93	0.67	-0.32	
884.00	0.00	233.00	883.97	3.73	1.60	3.71	0.32	-0.32	
979.00	0.40	152.00	978.97	3.44	1.76	3.42	0.42	0.42	



Cathedral Energy Services

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Well:	Tupelo Honey #5H	North Reference:	Grid
Wellbore:	ST01 [233837]	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 (°/100usf)	Build Rate (°/100u)	Formations / Comments
1,074.00	0.30	244.00	1,073.96	3.03	1.69	3.02	0.54	-0.11	
1,170.00	0.20	223.00	1,169.96	2.80	1.35	2.79	0.14	-0.10	
1,265.00	0.40	289.00	1,264.96	2.79	0.93	2.78	0.39	0.21	
1,359.00	0.40	296.00	1,358.96	3.04	0.32	3.04	0.05	0.00	
1,455.00	0.60	295.00	1,454.96	3.40	-0.44	3.40	0.21	0.21	
1,550.00	1.00	250.00	1,549.95	3.32	-1.67	3.34	0.75	0.42	
1,645.00	0.90	269.00	1,644.94	3.03	-3.19	3.05	0.35	-0.11	
1,835.00	0.70	249.00	1,834.92	2.59	-5.77	2.63	0.18	-0.11	
1,930.00	0.50	216.00	1,929.91	2.04	-6.55	2.10	0.41	-0.21	
2,025.00	0.40	229.00	2,024.91	1.49	-7.05	1.55	0.15	-0.11	
2,039.00	0.30	195.00	2,038.91	1.42	-7.09	1.48	1.61	-0.71	
2,089.00	0.50	108.00	2,088.91	1.23	-6.92	1.28	1.14	0.40	
2,185.00	0.40	141.00	2,184.91	0.84	-6.31	0.89	0.28	-0.10	
2,280.00	1.10	165.00	2,279.90	-0.30	-5.87	-0.25	0.79	0.74	
2,375.00	1.60	257.00	2,374.88	-1.48	-6.92	-1.42	2.08	0.53	
2,470.00	1.40	250.00	2,469.85	-2.18	-9.30	-2.10	0.29	-0.21	
2,566.00	1.60	242.00	2,565.81	-3.21	-11.59	-3.11	0.30	0.21	
2,661.00	1.10	238.00	2,660.79	-4.31	-13.53	-4.20	0.54	-0.53	
2,756.00	1.20	259.00	2,755.77	-4.98	-15.28	-4.86	0.45	0.11	
2,852.00	0.90	201.00	2,851.75	-5.88	-16.54	-5.74	1.10	-0.31	
2,947.00	1.40	181.00	2,946.74	-7.74	-16.83	-7.60	0.67	0.53	
3,042.00	1.30	206.00	3,041.71	-9.87	-17.32	-9.72	0.62	-0.11	
3,137.00	1.40	209.00	3,136.68	-11.85	-18.36	-11.70	0.13	0.11	
3,233.00	1.40	214.00	3,232.65	-13.85	-19.58	-13.69	0.13	0.00	
3,326.00	0.90	211.00	3,325.64	-15.42	-20.59	-15.25	0.54	-0.54	
3,422.00	1.80	233.00	3,421.61	-16.97	-22.18	-16.79	1.07	0.94	
3,443.00	1.90	275.80	3,442.60	-17.13	-22.79	-16.94	6.44	0.48	
3,474.00	5.00	322.40	3,473.54	-16.01	-24.13	-15.81	12.72	10.00	
3,506.00	8.90	337.90	3,505.30	-12.61	-25.91	-12.40	13.42	12.19	
3,538.00	13.00	341.00	3,536.72	-6.91	-28.02	-6.68	12.94	12.81	
3,570.00	16.70	343.60	3,567.64	0.91	-30.49	1.16	11.75	11.56	
3,602.00	19.40	345.00	3,598.06	10.45	-33.16	10.72	8.55	8.44	
3,634.00	21.10	342.60	3,628.09	21.08	-36.26	21.38	5.91	5.31	
3,666.00	21.60	338.00	3,657.89	32.04	-40.19	32.37	5.46	1.56	
3,697.00	21.80	340.00	3,686.70	42.74	-44.30	43.10	2.47	0.65	
3,730.00	23.20	347.00	3,717.19	54.84	-47.85	55.23	9.15	4.24	
3,761.00	25.80	353.80	3,745.40	67.50	-49.96	67.90	12.36	8.39	
3,793.00	29.40	356.20	3,773.75	82.26	-51.23	82.68	11.77	11.25	
3,824.00	31.90	355.30	3,800.42	98.02	-52.41	98.45	8.20	8.06	
3,856.00	33.40	356.40	3,827.36	115.24	-53.65	115.67	5.04	4.69	
3,888.00	34.20	358.80	3,853.96	133.02	-54.39	133.46	4.86	2.50	
3,920.00	34.90	2.00	3,880.32	151.16	-54.26	151.60	6.08	2.19	
3,951.00	37.10	3.30	3,905.39	169.36	-53.41	169.79	7.51	7.10	
3,983.00	39.20	3.30	3,930.56	189.10	-52.28	189.52	6.56	6.56	
4,015.00	41.30	2.70	3,954.98	209.74	-51.20	210.15	6.67	6.56	
4,047.00	42.10	1.60	3,978.87	231.01	-50.40	231.42	3.39	2.50	
4,078.00	44.30	0.60	4,001.47	252.23	-50.00	252.63	7.43	7.10	
4,110.00	47.50	359.80	4,023.74	275.20	-49.92	275.61	10.16	10.00	
4,142.00	51.10	0.00	4,044.60	299.46	-49.96	299.86	11.26	11.25	
4,174.00	53.20	0.90	4,064.23	324.73	-49.76	325.12	6.93	6.56	
4,205.00	56.50	1.90	4,082.08	350.06	-49.14	350.45	10.97	10.65	
4,237.00	59.40	2.00	4,099.06	377.17	-48.21	377.55	9.07	9.06	
4,269.00	61.70	1.80	4,114.79	405.01	-47.29	405.39	7.21	7.19	



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4,301.00	63.30	1.40	4,129.57	433.39	-46.50	433.75	5.12	5.00	
4,333.00	67.20	0.10	4,142.96	462.44	-46.12	462.80	12.73	12.19	
4,365.00	70.70	0.20	4,154.45	492.30	-46.05	492.66	10.94	10.94	
4,396.00	72.50	0.30	4,164.24	521.71	-45.92	522.07	5.81	5.81	
4,428.00	72.30	359.90	4,173.91	552.21	-45.86	552.57	1.35	-0.62	
4,460.00	72.50	0.00	4,183.59	582.72	-45.89	583.07	0.69	0.62	
4,490.00	72.50	359.60	4,192.61	611.33	-45.99	611.68	1.27	0.00	
4,522.00	72.30	359.30	4,202.29	641.83	-46.28	642.19	1.09	-0.62	
4,553.00	72.80	359.40	4,211.58	671.40	-46.62	671.76	1.64	1.61	
4,585.00	74.60	0.30	4,220.56	702.11	-46.70	702.47	6.24	5.62	Point of ST
4,615.00	72.70	2.60	4,229.01	730.88	-45.97	731.24	9.71	-6.33	
4,647.00	73.00	5.10	4,238.45	761.39	-43.92	761.72	7.52	0.94	
4,679.00	74.50	6.60	4,247.40	791.95	-40.79	792.26	6.50	4.69	
4,710.00	76.40	6.10	4,255.19	821.77	-37.47	822.05	6.32	6.13	
4,742.00	79.00	4.70	4,262.01	852.89	-34.53	853.15	9.18	8.12	
4,774.00	82.00	3.50	4,267.29	884.37	-32.27	884.60	10.08	9.37	
4,805.00	85.00	2.30	4,270.80	915.13	-30.72	915.35	10.41	9.68	
4,837.00	87.10	1.70	4,273.00	947.03	-29.60	947.24	6.82	6.56	
4,869.00	89.10	2.10	4,274.06	978.99	-28.54	979.19	6.37	6.25	
4,901.00	91.10	2.20	4,274.00	1,010.97	-27.34	1,011.16	6.26	6.25	
4,995.00	91.60	1.80	4,271.79	1,104.88	-24.06	1,105.04	0.68	0.53	
5,058.00	91.30	1.80	4,270.20	1,167.83	-22.08	1,167.97	0.48	-0.48	
5,148.00	90.40	2.50	4,268.86	1,257.76	-18.71	1,257.87	1.27	-1.00	
5,242.00	89.00	3.20	4,269.35	1,351.64	-14.03	1,351.71	1.67	-1.49	
5,337.00	87.70	3.30	4,272.09	1,446.44	-8.65	1,446.47	1.37	-1.37	
5,433.00	87.20	2.60	4,276.36	1,542.22	-3.71	1,542.20	0.90	-0.52	
5,528.00	87.00	2.50	4,281.17	1,637.00	0.51	1,636.95	0.24	-0.21	
5,623.00	86.00	1.20	4,286.97	1,731.77	3.57	1,731.69	1.72	-1.05	
5,719.00	86.90	0.30	4,292.91	1,827.58	4.82	1,827.48	1.32	0.94	
5,814.00	87.60	1.00	4,297.47	1,922.46	5.90	1,922.35	1.04	0.74	
5,909.00	89.40	0.00	4,299.95	2,017.42	6.73	2,017.30	2.17	1.89	
6,004.00	90.90	359.50	4,299.71	2,112.42	6.31	2,112.30	1.66	1.58	
6,099.00	92.30	359.30	4,297.05	2,207.37	5.32	2,207.26	1.49	1.47	
6,194.00	91.50	359.00	4,293.90	2,302.31	3.91	2,302.20	0.90	-0.84	
6,289.00	89.70	359.50	4,292.91	2,397.29	2.67	2,397.19	1.97	-1.89	
6,385.00	89.80	359.20	4,293.33	2,493.29	1.58	2,493.19	0.33	0.10	
6,480.00	90.10	358.90	4,293.41	2,588.27	0.00	2,588.18	0.45	0.32	
6,575.00	89.90	359.50	4,293.41	2,683.26	-1.32	2,683.18	0.67	-0.21	
6,670.00	88.80	359.90	4,294.49	2,778.25	-1.82	2,778.17	1.23	-1.16	
6,765.00	88.90	359.70	4,296.40	2,873.23	-2.15	2,873.15	0.24	0.11	
6,766.00	88.90	359.70	4,296.41	2,874.23	-2.16	2,874.15	0.00	0.00	Section Crossing
6,860.00	89.10	359.60	4,298.05	2,968.22	-2.73	2,968.14	0.24	0.21	
6,956.00	89.60	0.10	4,299.14	3,064.21	-2.98	3,064.13	0.74	0.52	
7,051.00	88.20	0.10	4,300.97	3,159.19	-2.82	3,159.11	1.47	-1.47	
7,146.00	89.70	0.30	4,302.71	3,254.17	-2.49	3,254.08	1.59	1.58	
7,241.00	88.40	359.90	4,304.28	3,349.16	-2.32	3,349.06	1.43	-1.37	
7,337.00	88.70	0.50	4,306.71	3,445.12	-1.99	3,445.02	0.70	0.31	
7,432.00	89.90	1.00	4,307.87	3,540.11	-0.74	3,539.99	1.37	1.26	
7,527.00	90.80	1.80	4,307.29	3,635.07	1.58	3,634.94	1.27	0.95	
7,622.00	90.90	2.40	4,305.88	3,730.00	5.06	3,729.83	0.64	0.11	
7,717.00	90.10	2.00	4,305.05	3,824.93	8.71	3,824.72	0.94	-0.84	
7,812.00	89.10	359.30	4,305.72	3,919.91	9.78	3,919.69	3.03	-1.05	
7,907.00	90.20	358.30	4,306.30	4,014.88	7.79	4,014.68	1.56	1.16	



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Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
8,002.00	90.60	359.20	4,305.63	4,109.86	5.72	4,109.67	1.04	0.42	
8,097.00	89.70	357.50	4,305.38	4,204.81	2.99	4,204.65	2.02	-0.95	
8,192.00	89.70	357.90	4,305.88	4,299.73	-0.83	4,299.60	0.42	0.00	
8,288.00	89.80	358.20	4,306.30	4,395.68	-4.09	4,395.56	0.33	0.10	
8,383.00	89.30	358.20	4,307.05	4,490.63	-7.08	4,490.53	0.53	-0.53	
8,478.00	88.40	358.00	4,308.95	4,585.55	-10.23	4,585.48	0.97	-0.95	
8,573.00	89.50	357.70	4,310.69	4,680.47	-13.79	4,680.43	1.20	1.16	
8,668.00	91.70	358.10	4,309.70	4,775.39	-17.27	4,775.38	2.35	2.32	
8,753.00	91.40	357.80	4,307.40	4,860.31	-20.31	4,860.31	0.50	-0.35	
8,849.00	90.90	357.50	4,305.47	4,956.21	-24.25	4,956.24	0.61	-0.52	
8,944.00	92.50	358.80	4,302.66	5,051.11	-27.31	5,051.17	2.17	1.68	
9,039.00	92.60	358.70	4,298.43	5,146.00	-29.38	5,146.06	0.15	0.11	
9,134.00	92.40	358.30	4,294.29	5,240.87	-31.87	5,240.96	0.47	-0.21	
9,228.00	92.40	357.90	4,290.35	5,334.74	-34.98	5,334.85	0.43	0.00	
9,323.00	92.60	357.10	4,286.20	5,429.56	-39.12	5,429.69	0.87	0.21	
9,418.00	93.70	359.20	4,280.98	5,524.36	-42.18	5,524.52	2.49	1.16	
9,513.00	92.10	358.40	4,276.18	5,619.21	-44.17	5,619.38	1.88	-1.68	
9,609.00	90.00	359.60	4,274.42	5,715.17	-45.84	5,715.36	2.52	-2.19	
9,704.00	89.60	358.60	4,274.75	5,810.16	-47.34	5,810.35	1.13	-0.42	
9,799.00	91.80	359.50	4,273.59	5,905.13	-48.91	5,905.33	2.50	2.32	
9,894.00	91.50	359.10	4,270.85	6,000.08	-50.07	6,000.29	0.53	-0.32	
9,989.00	90.90	358.50	4,268.86	6,095.04	-52.06	6,095.26	0.89	-0.63	
10,084.00	90.70	358.60	4,267.54	6,190.00	-54.46	6,190.24	0.24	-0.21	
10,179.00	91.70	359.00	4,265.55	6,284.96	-56.45	6,285.21	1.13	1.05	
10,274.00	92.20	358.80	4,262.32	6,379.89	-58.28	6,380.15	0.57	0.53	
10,369.00	91.20	0.60	4,259.50	6,474.84	-58.77	6,475.10	2.17	-1.05	
10,464.00	92.40	1.20	4,256.51	6,569.78	-57.28	6,570.03	1.41	1.26	
10,559.00	92.10	1.30	4,252.78	6,664.68	-55.21	6,664.91	0.33	-0.32	
10,654.00	91.80	1.20	4,249.55	6,759.60	-53.14	6,759.81	0.33	-0.32	
10,749.00	91.80	1.40	4,246.57	6,854.53	-50.99	6,854.72	0.21	0.00	
10,844.00	91.30	1.60	4,244.00	6,949.46	-48.50	6,949.63	0.57	-0.53	
10,940.00	91.80	0.30	4,241.40	7,045.41	-46.91	7,045.56	1.45	0.52	
11,035.00	92.30	359.40	4,238.00	7,140.35	-47.16	7,140.50	1.08	0.53	
11,130.00	92.40	358.80	4,234.11	7,235.26	-48.65	7,235.42	0.64	0.11	
11,225.00	92.30	358.80	4,230.21	7,330.16	-50.64	7,330.33	0.11	-0.11	
11,320.00	91.50	358.50	4,227.06	7,425.08	-52.87	7,425.26	0.90	-0.84	
11,415.00	91.40	359.50	4,224.66	7,520.03	-54.53	7,520.23	1.06	-0.11	
11,510.00	90.60	359.00	4,223.00	7,615.01	-55.77	7,615.21	0.99	-0.84	
11,605.00	92.80	359.50	4,220.18	7,709.95	-57.02	7,710.16	2.37	2.32	
11,662.00	92.60	0.10	4,217.50	7,766.89	-57.22	7,767.10	1.11	-0.35	Last CES Survey
11,712.00	92.60	0.10	4,215.23	7,816.84	-57.13	7,817.04	0.00	0.00	Actual BHL



Cathedral Energy Services
Survey Report



Company:	Manzano LLC	Local Co-ordinate Reference:	Well Tupelo Honey #5H
Project:	Roosevelt Co., NM (NAD 83)	TVD Reference:	16' RKB @ 4350.00usft (Norton #6)
Site:	Sec 27-6S-34E	MD Reference:	16' RKB @ 4350.00usft (Norton #6)
Well:	Tupelo Honey #5H	North Reference:	Grid
Wellbore:	ST01 [233837]	Survey Calculation Method:	Minimum Curvature
Design:	Final	Database:	USA EDM 5000 Multi Users DB

Targets

Target Name	- hit/miss target	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- Shape		(°)	(°)	(usft)	(usft)	(usft)	(usft)	(usft)		
TH #5H - P5 PBHL		0.00	0.00	4,125.00	7,818.90	-64.80	1,015,155.30	806,779.00	33.787396	-103.459679
	- actual wellpath misses target center by 90.58usft at 11712.00usft MD (4215.23 TVD, 7816.84 N, -57.13 E)									
	- Point									
TH #5H - P6 PBHL		0.00	0.00	4,189.00	7,818.90	-64.80	1,015,155.30	806,779.00	33.787396	-103.459679
	- actual wellpath misses target center by 27.41usft at 11712.00usft MD (4215.23 TVD, 7816.84 N, -57.13 E)									
	- Point									
TH #5H - P6b PBHL		0.00	0.00	4,210.00	7,818.90	-64.80	1,015,155.30	806,779.00	33.787396	-103.459679
	- actual wellpath misses target center by 9.51usft at 11712.00usft MD (4215.23 TVD, 7816.84 N, -57.13 E)									
	- Point									

Design Annotations

Measured Depth	Vertical Depth	Local Coordinates		Comment
(usft)	(usft)	+N/-S	+E/-W	
		(usft)	(usft)	
4,585.00	4,220.56	702.11	-46.70	Point of ST
6,766.00	4,296.41	2,874.23	-2.16	Section Crossing
11,662.00	4,217.50	7,766.89	-57.22	Last CES Survey
11,712.00	4,215.23	7,816.84	-57.13	Actual BHL

Checked By: _____ Approved By: _____ Date: _____