



Manzano LLC

Roosevelt Co., NM (NAD 83)

Sec 21-6S-34E

Domino 21-16 State #5H

HZ [315037]

Survey: CES MWD

Anticollision Report

25 November, 2017



Cathedral Energy Services

Anticollision Report

Company:	Manzano LLC	Local Co-ordinate Reference:	Well Domino 21-16 State #5H
Project:	Roosevelt Co., NM (NAD 83)	TVD Reference:	21' KB @ 4376.00usft (Silver Oak #7)
Reference Site:	Sec 21-6S-34E	MD Reference:	21' KB @ 4376.00usft (Silver Oak #7)
Site Error:	0.00usft	North Reference:	Grid
Reference Well:	Domino 21-16 State #5H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00usft	Output errors are at	2.00 sigma
Reference Wellbore	HZ [315037]	Database:	USA EDM 5000 Multi Users DB
Reference Design:	Survey: CES MWD	Offset TVD Reference:	Offset Datum

Reference	Survey: CES MWD		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	MD Interval 50.00usft	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 5,280.00usft	Error Surface:	Pedal Curve
Warning Levels Evaluated at:	2.00 Sigma		

Survey Program	Date 11/25/2017				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
84.00	1,954.10	Surface Gyros (HZ [315037])	GyroFlex		
1,954.10	11,332.00	CES MWD (HZ [315037])	MWD+HDGM	OWSG MWD + HDGM	

Summary						
Site Name	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
Sec 16-6S-34E						
Roosevelt 16 State #1 - VT [P&A Offset] - VT	7,004.52	4,055.01	232.91	78.92	1.513	CC, ES, SF



Cathedral Energy Services

Anticollision Report

Company: Manzano LLC
Project: Roosevelt Co., NM (NAD 83)
Reference Site: Sec 21-6S-34E
Site Error: 0.00usft
Reference Well: Domino 21-16 State #5H
Well Error: 0.00usft
Reference Wellbore: HZ [315037]
Reference Design: Survey: CES MWD

Local Co-ordinate Reference: Well Domino 21-16 State #5H
TVD Reference: 21' KB @ 4376.00usft (Silver Oak #7)
MD Reference: 21' KB @ 4376.00usft (Silver Oak #7)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: USA EDM 5000 Multi Users DB
Offset TVD Reference: Offset Datum

Offset Design												Offset Site Error:	0.00 usft
Survey Program: 8350-Blind Drilling												Offset Well Error:	0.00 usft
Reference													
Offset				Semi Major Axis				Distance					
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Total Uncertainty Axis	Separation Factor	Warning
0.00	0.00	22.00	-22.00	0.00	0.58	1.21	3,159.93	66.96	3,160.64				
50.00	50.00	28.00	28.00	0.02	0.73	43.72	3,159.93	66.96	3,160.41	3,159.66	0.75	4,197.302	
100.00	99.99	77.99	77.99	0.07	2.04	46.39	3,159.93	66.96	3,159.77	3,157.68	2.10	1,505.947	
150.00	149.98	127.98	127.98	0.14	3.35	59.81	3,159.93	66.96	3,159.28	3,155.84	3.45	916.142	
200.00	199.98	177.98	177.98	0.22	4.66	89.36	3,159.93	66.96	3,159.12	3,154.32	4.80	658.312	
201.64	201.62	179.62	179.62	0.22	4.71	90.00	3,159.93	66.96	3,159.12	3,154.27	4.84	652.382	
250.00	249.98	227.98	227.98	0.27	5.97	114.20	3,159.93	66.96	3,159.19	3,153.06	6.13	515.370	
300.00	299.98	277.98	277.98	0.33	7.28	141.67	3,159.93	66.96	3,159.41	3,151.95	7.46	423.437	
350.00	349.98	327.98	327.98	0.38	8.59	150.89	3,159.93	66.96	3,159.70	3,150.89	8.81	358.696	
400.00	399.98	377.98	377.98	0.42	9.90	167.09	3,159.93	66.96	3,160.00	3,149.84	10.16	311.068	
450.00	449.98	427.98	427.98	0.43	11.21	-104.01	3,159.93	66.96	3,160.14	3,148.63	11.51	274.554	
500.00	499.98	477.98	477.98	0.45	12.52	-84.15	3,159.93	66.96	3,160.13	3,147.27	12.86	245.789	
513.02	513.00	491.00	491.00	0.46	12.86	-90.00	3,159.93	66.96	3,160.13	3,146.92	13.21	239.274	
550.00	549.98	527.98	527.98	0.47	13.83	106.32	3,159.93	66.96	3,160.14	3,145.94	14.20	222.528	
600.00	599.98	577.98	577.98	0.51	15.14	-175.44	3,159.93	66.96	3,160.20	3,144.65	15.55	203.201	
650.00	649.97	627.97	627.97	0.55	16.45	-128.49	3,159.93	66.96	3,160.33	3,143.42	16.91	186.938	
700.00	699.97	677.97	677.97	0.59	17.76	126.42	3,159.93	66.96	3,160.42	3,142.16	18.26	173.055	
750.00	749.97	727.97	727.97	0.62	19.07	-23.09	3,159.93	66.96	3,160.38	3,140.78	19.60	161.224	
800.00	799.97	777.97	777.97	0.65	20.38	-28.29	3,159.93	66.96	3,160.17	3,139.23	20.94	150.900	
850.00	849.97	827.97	827.97	0.66	21.69	-40.36	3,159.93	66.96	3,159.84	3,137.56	22.28	141.822	
900.00	899.97	877.97	877.97	0.67	23.00	-79.19	3,159.93	66.96	3,159.66	3,136.05	23.62	133.792	
921.04	921.02	899.02	899.02	0.67	23.55	-90.00	3,159.93	66.96	3,159.65	3,135.47	24.18	130.661	
950.00	949.97	927.97	927.97	0.68	24.31	-105.26	3,159.93	66.96	3,159.70	3,134.73	24.96	126.588	
1,000.00	999.97	977.97	977.97	0.70	25.62	-124.88	3,159.93	66.96	3,159.81	3,133.50	26.31	120.093	
1,050.00	1,049.97	1,027.97	1,027.97	0.74	26.93	-147.65	3,159.93	66.96	3,159.99	3,132.32	27.67	114.202	
1,100.00	1,099.97	1,077.97	1,077.97	0.79	28.24	-172.01	3,159.93	66.96	3,160.22	3,131.19	29.03	108.850	
1,150.00	1,149.97	1,127.97	1,127.97	0.85	29.55	169.66	3,159.93	66.96	3,160.48	3,130.08	30.40	103.963	
1,200.00	1,199.97	1,177.97	1,177.97	0.91	30.86	157.07	3,159.93	66.96	3,160.78	3,129.01	31.77	99.487	
1,250.00	1,249.97	1,227.97	1,227.97	0.97	32.17	136.11	3,159.93	66.96	3,161.05	3,127.92	33.13	95.405	
1,300.00	1,299.96	1,277.96	1,277.96	1.03	33.48	101.94	3,159.93	66.96	3,161.18	3,126.68	34.49	91.649	
1,350.00	1,349.96	1,327.96	1,327.96	1.06	34.79	-146.77	3,159.93	66.96	3,161.22	3,125.38	35.84	88.209	
1,400.00	1,399.96	1,377.96	1,377.96	1.10	36.10	-102.40	3,159.93	66.96	3,161.26	3,124.07	37.18	85.016	
1,450.00	1,449.96	1,427.96	1,427.96	1.14	37.41	142.73	3,159.93	66.96	3,161.36	3,122.82	38.54	82.036	
1,500.00	1,499.96	1,477.96	1,477.96	1.18	38.72	127.53	3,159.93	66.96	3,161.57	3,121.68	39.89	79.254	
1,550.00	1,549.96	1,527.96	1,527.96	1.24	40.03	160.36	3,159.93	66.96	3,161.78	3,120.52	41.26	76.634	
1,600.00	1,599.96	1,577.96	1,577.96	1.30	41.34	-146.25	3,159.93	66.96	3,161.95	3,119.33	42.63	74.179	
1,650.00	1,649.96	1,627.96	1,627.96	1.35	42.65	-137.26	3,159.93	66.96	3,162.21	3,118.22	44.00	71.875	
1,700.00	1,699.96	1,677.96	1,677.96	1.41	43.96	-139.29	3,159.93	66.96	3,162.58	3,117.22	45.37	69.713	
1,750.00	1,749.95	1,727.95	1,727.95	1.46	45.27	-146.14	3,159.93	66.96	3,163.04	3,116.30	46.74	67.679	
1,800.00	1,799.95	1,777.95	1,777.95	1.51	46.58	-129.11	3,159.93	66.96	3,163.48	3,115.38	48.09	65.780	
1,850.00	1,849.95	1,827.95	1,827.95	1.55	47.89	-79.98	3,159.93	66.96	3,163.58	3,114.14	49.44	63.987	
1,900.00	1,899.95	1,877.95	1,877.95	1.56	49.20	-54.95	3,159.93	66.96	3,163.40	3,112.64	50.76	62.315	
1,950.00	1,949.95	1,927.95	1,927.95	1.58	50.51	-38.45	3,159.93	66.96	3,163.07	3,110.99	52.08	60.733	
2,000.00	1,999.94	1,977.94	1,977.94	1.59	51.82	-36.44	3,159.93	66.96	3,162.46	3,109.06	53.40	59.220	
2,050.00	2,049.92	2,027.92	2,027.92	1.60	53.13	-36.15	3,159.93	66.96	3,161.41	3,106.68	54.72	57.771	
2,100.00	2,099.89	2,077.89	2,077.89	1.62	54.44	-36.03	3,159.93	66.96	3,159.90	3,103.85	56.04	56.383	
2,150.00	2,149.83	2,127.83	2,127.83	1.64	55.75	-35.19	3,159.93	66.96	3,157.95	3,100.58	57.38	55.039	
2,200.00	2,199.76	2,177.76	2,177.76	1.70	57.06	-32.72	3,159.93	66.96	3,155.76	3,097.02	58.74	53.724	
2,250.00	2,249.68	2,227.68	2,227.68	1.76	58.37	-31.81	3,159.93	66.96	3,153.40	3,093.29	60.12	52.455	
2,300.00	2,299.60	2,277.60	2,277.60	1.85	59.67	-32.64	3,159.93	66.96	3,151.01	3,089.50	61.51	51.228	
2,350.00	2,349.52	2,327.52	2,327.52	1.95	60.98	-33.15	3,159.93	66.96	3,148.62	3,085.70	62.91	50.046	
2,400.00	2,399.45	2,377.45	2,377.45	2.05	62.29	-33.44	3,159.93	66.96	3,146.38	3,082.05	64.33	48.910	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



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Reference Site:	Sec 21-6S-34E	MD Reference:	21' KB @ 4376.00usft (Silver Oak #7)
Site Error:	0.00usft	North Reference:	Grid
Reference Well:	Domino 21-16 State #5H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00usft	Output errors are at	2.00 sigma
Reference Wellbore	HZ [315037]	Database:	USA EDM 5000 Multi Users DB
Reference Design:	Survey: CES MWD	Offset TVD Reference:	Offset Datum

Offset Design													Sec 16-6S-34E - Roosevelt 16 State #1 - VT [P&A Offset] - VT		Offset Site Error:		0.00 usft
Survey Program: 8350-Blind Drilling														Offset Well Error:		0.00 usft	
Reference		Offset		Semi Major Axis			Distance										
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore +N/-S (usft)	Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Total Uncertainty Axis	Separation Factor	Warning				
2,450.00	2,449.40	2,427.40	2,427.40	2.17	63.60	-17.74	3,159.93	66.96	3,144.36	3,078.60	65.76	47.819					
2,500.00	2,499.37	2,477.37	2,477.37	2.29	64.91	21.83	3,159.93	66.96	3,142.73	3,075.54	67.19	46.776					
2,550.00	2,549.35	2,527.35	2,527.35	2.42	66.22	64.13	3,159.93	66.96	3,141.72	3,073.10	68.62	45.783					
2,572.11	2,571.46	2,549.46	2,549.46	2.47	66.80	90.00	3,159.93	66.96	3,141.61	3,072.36	69.26	45.361					
2,600.00	2,599.34	2,577.34	2,577.34	2.55	67.53	116.10	3,159.93	66.96	3,141.78	3,071.72	70.06	44.845					
2,650.00	2,649.32	2,627.32	2,627.32	2.68	68.84	120.30	3,159.93	66.96	3,142.43	3,070.93	71.50	43.948					
2,700.00	2,699.30	2,677.30	2,677.30	2.81	70.15	124.07	3,159.93	66.96	3,143.10	3,070.15	72.95	43.087					
2,750.00	2,749.29	2,727.29	2,727.29	2.95	71.46	133.56	3,159.93	66.96	3,143.84	3,069.44	74.40	42.257					
2,800.00	2,799.27	2,777.27	2,777.27	3.10	72.76	143.27	3,159.93	66.96	3,144.69	3,068.84	75.85	41.458					
2,850.00	2,849.26	2,827.26	2,827.26	3.25	74.07	151.97	3,159.93	66.96	3,145.61	3,068.30	77.31	40.688					
2,900.00	2,899.25	2,877.25	2,877.25	3.39	75.38	160.92	3,159.93	66.96	3,146.56	3,067.79	78.77	39.946					
2,950.00	2,949.25	2,927.25	2,927.25	3.55	76.69	174.62	3,159.93	66.96	3,147.32	3,067.09	80.23	39.228					
3,000.00	2,999.24	2,977.24	2,977.24	3.70	78.00	-169.69	3,159.93	66.96	3,147.88	3,066.18	81.70	38.531					
3,050.00	3,049.24	3,027.24	3,027.24	3.86	79.31	-164.16	3,159.93	66.96	3,148.43	3,065.27	83.16	37.858					
3,100.00	3,099.24	3,077.24	3,077.24	4.02	80.62	-157.56	3,159.93	66.96	3,148.99	3,064.36	84.63	37.208					
3,150.00	3,149.23	3,127.23	3,127.23	4.18	81.93	-148.80	3,159.93	66.96	3,149.49	3,063.39	86.10	36.578					
3,200.00	3,199.23	3,177.23	3,177.23	4.34	83.24	-156.27	3,159.93	66.96	3,149.91	3,062.34	87.57	35.968					
3,250.00	3,249.23	3,227.23	3,227.23	4.50	84.55	-176.43	3,159.93	66.96	3,150.29	3,061.24	89.05	35.378					
3,300.00	3,299.23	3,277.23	3,277.23	4.67	85.86	160.15	3,159.93	66.96	3,150.60	3,060.08	90.52	34.805					
3,350.00	3,349.23	3,327.23	3,327.23	4.83	87.17	128.90	3,159.93	66.96	3,150.81	3,058.82	92.00	34.249					
3,400.00	3,399.23	3,377.23	3,377.23	5.00	88.48	113.73	3,159.93	66.96	3,150.96	3,057.49	93.47	33.710					
3,450.00	3,449.23	3,427.23	3,427.23	5.16	89.79	36.93	3,159.93	66.96	3,150.95	3,056.00	94.95	33.186					
3,500.00	3,499.16	3,477.16	3,477.16	5.33	91.10	10.68	3,159.93	66.96	3,148.79	3,052.36	96.43	32.655					
3,550.00	3,548.77	3,526.77	3,526.77	5.50	92.40	4.58	3,159.93	66.96	3,142.70	3,044.80	97.90	32.101					
3,600.00	3,597.65	3,575.65	3,575.65	5.68	93.68	2.72	3,159.93	66.96	3,132.26	3,032.90	99.36	31.525					
3,650.00	3,645.63	3,623.63	3,623.63	5.86	94.94	4.43	3,159.93	66.96	3,118.25	3,017.46	100.79	30.938					
3,700.00	3,692.63	3,670.63	3,670.63	6.04	96.17	6.47	3,159.93	66.96	3,101.27	2,999.08	102.20	30.346					
3,750.00	3,738.61	3,716.61	3,716.61	6.21	97.38	6.61	3,159.93	66.96	3,081.75	2,978.18	103.57	29.755					
3,800.00	3,783.93	3,761.93	3,761.93	6.41	98.56	8.53	3,159.93	66.96	3,060.79	2,955.87	104.92	29.172					
3,850.00	3,828.10	3,806.10	3,806.10	6.64	99.72	10.14	3,159.93	66.96	3,037.62	2,931.37	106.25	28.589					
3,900.00	3,870.42	3,848.42	3,848.42	6.88	100.83	11.53	3,159.93	66.96	3,011.39	2,903.86	107.53	28.004					
3,950.00	3,911.07	3,889.07	3,889.07	7.15	101.89	10.15	3,159.93	66.96	2,982.65	2,873.89	108.77	27.423					
4,000.00	3,949.77	3,927.77	3,927.77	7.45	102.91	9.53	3,159.93	66.96	2,951.28	2,841.33	109.95	26.843					
4,050.00	3,984.57	3,962.57	3,962.57	7.78	103.82	10.50	3,159.93	66.96	2,915.69	2,804.66	111.03	26.260					
4,100.00	4,016.06	3,994.06	3,994.06	8.15	104.64	11.22	3,159.93	66.96	2,877.14	2,765.13	112.00	25.688					
4,150.00	4,044.98	4,022.98	4,022.98	8.55	105.40	10.86	3,159.93	66.96	2,836.64	2,723.74	112.90	25.126					
4,200.00	4,069.90	4,047.90	4,047.90	8.99	106.06	12.46	3,159.93	66.96	2,793.52	2,679.85	113.68	24.574					
4,250.00	4,090.91	4,068.91	4,068.91	9.46	106.61	16.75	3,159.93	66.96	2,748.44	2,634.10	114.34	24.038					
4,300.00	4,108.93	4,086.93	4,086.93	9.96	107.08	22.04	3,159.93	66.96	2,702.15	2,587.25	114.90	23.518					
4,350.00	4,122.17	4,100.17	4,100.17	10.50	107.42	33.39	3,159.93	66.96	2,654.40	2,539.08	115.33	23.016					
4,400.00	4,131.49	4,109.49	4,109.49	11.06	107.67	48.29	3,159.93	66.96	2,605.91	2,490.28	115.63	22.536					
4,450.00	4,137.43	4,115.43	4,115.43	11.65	107.82	63.60	3,159.93	66.96	2,556.99	2,441.15	115.84	22.074					
4,500.00	4,139.93	4,117.93	4,117.93	12.26	107.89	81.56	3,159.93	66.96	2,507.71	2,391.76	115.95	21.628					
4,550.00	4,140.75	4,118.75	4,118.75	12.88	107.91	86.37	3,159.93	66.96	2,458.31	2,342.30	116.01	21.191					
4,600.00	4,140.65	4,118.65	4,118.65	13.51	107.91	94.98	3,159.93	66.96	2,409.02	2,292.97	116.04	20.760					
4,650.00	4,140.08	4,118.08	4,118.08	14.16	107.89	92.56	3,159.93	66.96	2,359.78	2,243.71	116.07	20.330					
4,700.00	4,139.52	4,117.52	4,117.52	14.83	107.88	95.27	3,159.93	66.96	2,310.62	2,194.52	116.11	19.901					
4,750.00	4,138.34	4,116.34	4,116.34	15.51	107.85	98.99	3,159.93	66.96	2,261.51	2,145.37	116.13	19.473					
4,800.00	4,136.90	4,114.90	4,114.90	16.20	107.81	97.24	3,159.93	66.96	2,212.46	2,096.30	116.16	19.046					
4,850.00	4,135.78	4,113.78	4,113.78	16.89	107.78	95.12	3,159.93	66.96	2,163.52	2,047.31	116.20	18.618					
4,900.00	4,134.45	4,112.45	4,112.45	17.61	107.75	98.63	3,159.93	66.96	2,114.69	1,998.44	116.26	18.190					
4,950.00	4,132.39	4,110.39	4,110.39	18.32	107.69	101.54	3,159.93	66.96	2,065.98	1,949.69	116.30	17.765					

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Cathedral Energy Services

Anticollision Report

Company: Manzano LLC
Project: Roosevelt Co., NM (NAD 83)
Reference Site: Sec 21-6S-34E
Site Error: 0.00usft
Reference Well: Domino 21-16 State #5H
Well Error: 0.00usft
Reference Wellbore: HZ [315037]
Reference Design: Survey: CES MWD

Local Co-ordinate Reference: Well Domino 21-16 State #5H
TVD Reference: 21' KB @ 4376.00usft (Silver Oak #7)
MD Reference: 21' KB @ 4376.00usft (Silver Oak #7)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: USA EDM 5000 Multi Users DB
Offset TVD Reference: Offset Datum

Offset Design												Offset Site Error:	0.00 usft
Survey Program: 8350-Blind Drilling												Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Distance							
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Total Uncertainty Axis	Separation Factor	Warning
5,000.00	4,130.09	4,108.09	4,108.09	19.03	107.63	102.17	3,159.93	66.96	2,017.20	1,900.86	116.34	17.339	
5,050.00	4,127.90	4,105.90	4,105.90	19.75	107.57	102.14	3,159.93	66.96	1,968.20	1,851.82	116.38	16.911	
5,100.00	4,126.21	4,104.21	4,104.21	20.45	107.53	98.94	3,159.93	66.96	1,919.02	1,802.58	116.44	16.481	
5,150.00	4,125.18	4,103.18	4,103.18	21.16	107.50	96.00	3,159.93	66.96	1,869.68	1,753.17	116.52	16.046	
5,200.00	4,124.35	4,102.35	4,102.35	21.87	107.48	95.18	3,159.93	66.96	1,820.41	1,703.80	116.61	15.611	
5,250.00	4,123.61	4,101.61	4,101.61	22.58	107.46	93.32	3,159.93	66.96	1,771.26	1,654.55	116.71	15.176	
5,300.00	4,123.33	4,101.33	4,101.33	23.30	107.46	89.97	3,159.93	66.96	1,722.15	1,605.30	116.85	14.739	
5,350.00	4,123.55	4,101.55	4,101.55	24.01	107.46	88.15	3,159.93	66.96	1,673.06	1,556.06	117.00	14.300	
5,400.00	4,123.91	4,101.91	4,101.91	24.73	107.47	87.58	3,159.93	66.96	1,623.96	1,506.79	117.17	13.860	
5,450.00	4,124.27	4,102.27	4,102.27	25.45	107.48	88.61	3,159.93	66.96	1,574.82	1,457.48	117.34	13.421	
5,500.00	4,124.33	4,102.33	4,102.33	26.16	107.48	90.69	3,159.93	66.96	1,525.58	1,408.07	117.51	12.982	
5,550.00	4,124.00	4,102.00	4,102.00	26.86	107.47	94.05	3,159.93	66.96	1,476.25	1,358.59	117.67	12.546	
5,600.00	4,123.18	4,101.18	4,101.18	27.56	107.45	97.95	3,159.93	66.96	1,426.88	1,309.07	117.81	12.111	
5,650.00	4,122.23	4,100.23	4,100.23	28.27	107.43	94.70	3,159.93	66.96	1,377.54	1,259.57	117.97	11.677	
5,700.00	4,121.75	4,099.75	4,099.75	28.98	107.41	91.64	3,159.93	66.96	1,328.39	1,210.22	118.17	11.242	
5,750.00	4,120.96	4,098.96	4,098.96	29.69	107.39	98.18	3,159.93	66.96	1,279.27	1,160.90	118.37	10.807	
5,800.00	4,119.15	4,097.15	4,097.15	30.39	107.35	104.40	3,159.93	66.96	1,230.04	1,111.49	118.55	10.376	
5,850.00	4,117.00	4,095.00	4,095.00	31.10	107.29	103.12	3,159.93	66.96	1,180.84	1,062.11	118.73	9.945	
5,900.00	4,114.92	4,092.92	4,092.92	31.80	107.23	101.11	3,159.93	66.96	1,131.76	1,012.81	118.95	9.515	
5,950.00	4,113.26	4,091.26	4,091.26	32.51	107.19	97.30	3,159.93	66.96	1,082.81	963.60	119.21	9.083	
6,000.00	4,112.18	4,090.18	4,090.18	33.23	107.16	93.87	3,159.93	66.96	1,034.02	914.48	119.54	8.650	
6,050.00	4,111.73	4,089.73	4,089.73	33.94	107.15	90.60	3,159.93	66.96	985.33	865.40	119.93	8.216	
6,100.00	4,111.75	4,089.75	4,089.75	34.66	107.15	90.92	3,159.93	66.96	936.73	816.36	120.37	7.782	
6,150.00	4,111.11	4,089.11	4,089.11	35.37	107.13	94.88	3,159.93	66.96	888.23	767.38	120.84	7.350	
6,200.00	4,109.63	4,087.63	4,087.63	36.08	107.10	97.29	3,159.93	66.96	839.87	718.52	121.35	6.921	
6,250.00	4,107.75	4,085.75	4,085.75	36.80	107.05	98.07	3,159.93	66.96	791.74	669.82	121.92	6.494	
6,300.00	4,105.57	4,083.57	4,083.57	37.51	106.99	98.28	3,159.93	66.96	743.88	621.31	122.57	6.069	
6,350.00	4,103.24	4,081.24	4,081.24	38.23	106.93	98.13	3,159.93	66.96	696.36	573.03	123.33	5.646	
6,400.00	4,100.77	4,078.77	4,078.77	38.95	106.86	97.94	3,159.93	66.96	649.23	525.01	124.22	5.226	
6,450.00	4,098.16	4,076.16	4,076.16	39.67	106.80	97.69	3,159.93	66.96	602.57	477.30	125.27	4.810	
6,500.00	4,095.45	4,073.45	4,073.45	40.39	106.72	97.07	3,159.93	66.96	556.47	429.97	126.50	4.399	
6,550.00	4,092.75	4,070.75	4,070.75	41.11	106.65	96.38	3,159.93	66.96	511.10	383.13	127.97	3.994	
6,600.00	4,090.25	4,068.25	4,068.25	41.84	106.59	94.70	3,159.93	66.96	466.78	337.03	129.75	3.598	
6,650.00	4,088.16	4,066.16	4,066.16	42.56	106.53	93.35	3,159.93	66.96	424.03	292.10	131.93	3.214	
6,700.00	4,086.29	4,064.29	4,064.29	43.29	106.48	92.74	3,159.93	66.96	383.16	248.60	134.56	2.848	
6,750.00	4,084.52	4,062.52	4,062.52	44.03	106.44	92.16	3,159.93	66.96	344.69	207.03	137.66	2.504	
6,800.00	4,082.88	4,060.88	4,060.88	44.76	106.40	91.60	3,159.93	66.96	309.55	168.31	141.24	2.192	
6,850.00	4,081.36	4,059.36	4,059.36	45.49	106.36	91.13	3,159.93	66.96	279.01	133.84	145.18	1.922	
6,900.00	4,079.88	4,057.88	4,057.88	46.23	106.32	90.75	3,159.93	66.96	254.88	105.78	149.10	1.709	
6,950.00	4,078.42	4,056.42	4,056.42	46.96	106.28	90.37	3,159.93	66.96	239.08	86.78	152.30	1.570	
7,000.00	4,077.11	4,055.11	4,055.11	47.70	106.24	90.03	3,159.93	66.96	232.96	79.02	153.94	1.513	
7,004.52	4,077.01	4,055.01	4,055.01	47.76	106.24	90.00	3,159.93	66.96	232.91	78.92	153.99	1.513 CC, ES, SF	
7,050.00	4,076.05	4,054.05	4,054.05	48.43	106.22	89.81	3,159.93	66.96	237.23	83.69	153.54	1.545	
7,100.00	4,075.42	4,053.42	4,053.42	49.16	106.20	89.82	3,159.93	66.96	251.43	100.08	151.34	1.661	
7,150.00	4,075.14	4,053.14	4,053.14	49.90	106.19	89.81	3,159.93	66.96	274.10	125.99	148.11	1.851	
7,200.00	4,074.87	4,052.87	4,052.87	50.63	106.19	89.75	3,159.93	66.96	303.56	158.98	144.59	2.100	
7,250.00	4,074.58	4,052.58	4,052.58	51.37	106.18	89.59	3,159.93	66.96	338.03	196.79	141.24	2.393	
7,300.00	4,074.20	4,052.20	4,052.20	52.10	106.17	89.36	3,159.93	66.96	376.08	237.83	138.25	2.720	
7,350.00	4,073.78	4,051.78	4,051.78	52.84	106.16	89.32	3,159.93	66.96	416.75	281.07	135.68	3.072	
7,400.00	4,073.41	4,051.41	4,051.41	53.58	106.15	89.27	3,159.93	66.96	459.33	325.83	133.50	3.441	
7,450.00	4,072.93	4,050.93	4,050.93	54.32	106.13	88.65	3,159.93	66.96	503.30	371.66	131.65	3.823	
7,500.00	4,072.23	4,050.23	4,050.23	55.06	106.12	88.30	3,159.93	66.96	548.30	418.24	130.06	4.216	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Cathedral Energy Services

Anticollision Report

Company: Manzano LLC
Project: Roosevelt Co., NM (NAD 83)
Reference Site: Sec 21-6S-34E
Site Error: 0.00usft
Reference Well: Domino 21-16 State #5H
Well Error: 0.00usft
Reference Wellbore: HZ [315037]
Reference Design: Survey: CES MWD

Local Co-ordinate Reference: Well Domino 21-16 State #5H
TVD Reference: 21' KB @ 4376.00usft (Silver Oak #7)
MD Reference: 21' KB @ 4376.00usft (Silver Oak #7)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: USA EDM 5000 Multi Users DB
Offset TVD Reference: Offset Datum

Offset Design													Sec 16-6S-34E - Roosevelt 16 State #1 - VT [P&A Offset] - VT		Offset Site Error: 0.00 usft	
Survey Program: 8350-Blind Drilling														Offset Well Error: 0.00 usft		
Reference		Offset		Semi Major Axis			Distance							Warning		
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft) +E/-W (usft)		Between Centres (usft)	Between Ellipses (usft)	Total Uncertainty Axis	Separation Factor				
7,550.00	4,071.80	4,049.80	4,049.80	55.80	106.10	89.53	3,159.93 66.96		594.06	465.35	128.71	4.616				
7,600.00	4,071.85	4,049.85	4,049.85	56.54	106.11	90.43	3,159.93 66.96		640.39	512.85	127.54	5.021				
7,650.00	4,071.95	4,049.95	4,049.95	57.28	106.11	90.16	3,159.93 66.96		687.24	560.70	126.54	5.431				
7,700.00	4,071.94	4,049.94	4,049.94	58.02	106.11	89.63	3,159.93 66.96		734.54	608.86	125.68	5.845				
7,750.00	4,071.71	4,049.71	4,049.71	58.76	106.10	88.73	3,159.93 66.96		782.18	657.26	124.92	6.262				
7,800.00	4,071.38	4,049.38	4,049.38	59.50	106.09	89.39	3,159.93 66.96		830.05	705.80	124.25	6.681				
7,850.00	4,071.45	4,049.45	4,049.45	60.23	106.10	91.18	3,159.93 66.96		877.96	754.34	123.63	7.102				
7,900.00	4,071.83	4,049.83	4,049.83	60.96	106.11	91.33	3,159.93 66.96		925.93	802.86	123.07	7.524				
7,950.00	4,072.10	4,050.10	4,050.10	61.69	106.11	90.80	3,159.93 66.96		974.04	851.48	122.56	7.948				
8,000.00	4,072.27	4,050.27	4,050.27	62.42	106.12	90.77	3,159.93 66.96		1,022.33	900.22	122.11	8.373				
8,050.00	4,072.45	4,050.45	4,050.45	63.15	106.12	90.83	3,159.93 66.96		1,070.83	949.11	121.71	8.798				
8,100.00	4,072.62	4,050.62	4,050.62	63.88	106.13	90.87	3,159.93 66.96		1,119.49	998.13	121.36	9.224				
8,150.00	4,072.80	4,050.80	4,050.80	64.61	106.13	90.92	3,159.93 66.96		1,168.29	1,047.24	121.06	9.651				
8,200.00	4,072.97	4,050.97	4,050.97	65.35	106.14	91.00	3,159.93 66.96		1,217.24	1,096.45	120.79	10.078				
8,250.00	4,073.14	4,051.14	4,051.14	66.08	106.14	90.84	3,159.93 66.96		1,266.33	1,145.77	120.56	10.504				
8,300.00	4,073.21	4,051.21	4,051.21	66.82	106.14	90.00	3,159.93 66.96		1,315.49	1,195.15	120.35	10.931				
8,350.00	4,073.28	4,051.28	4,051.28	67.56	106.14	90.95	3,159.93 66.96		1,364.72	1,244.56	120.16	11.358				
8,400.00	4,073.49	4,051.49	4,051.49	68.30	106.15	91.24	3,159.93 66.96		1,414.02	1,294.02	119.99	11.784				
8,450.00	4,073.41	4,051.41	4,051.41	69.04	106.15	87.44	3,159.93 66.96		1,463.40	1,343.55	119.84	12.211				
8,500.00	4,072.82	4,050.82	4,050.82	69.78	106.13	84.14	3,159.93 66.96		1,512.85	1,393.15	119.70	12.639				
8,550.00	4,072.01	4,050.01	4,050.01	70.52	106.11	82.87	3,159.93 66.96		1,562.34	1,442.78	119.56	13.067				
8,600.00	4,071.06	4,049.06	4,049.06	71.26	106.09	81.57	3,159.93 66.96		1,611.86	1,492.43	119.43	13.496				
8,650.00	4,069.97	4,047.97	4,047.97	72.00	106.06	80.27	3,159.93 66.96		1,661.38	1,542.08	119.30	13.926				
8,700.00	4,068.76	4,046.76	4,046.76	72.74	106.03	79.37	3,159.93 66.96		1,710.93	1,591.75	119.18	14.356				
8,750.00	4,067.53	4,045.53	4,045.53	73.49	105.99	78.75	3,159.93 66.96		1,760.52	1,641.45	119.07	14.786				
8,800.00	4,066.45	4,044.45	4,044.45	74.23	105.96	82.73	3,159.93 66.96		1,810.13	1,691.16	118.97	15.215				
8,850.00	4,065.95	4,043.95	4,043.95	74.97	105.95	88.33	3,159.93 66.96		1,859.71	1,740.82	118.89	15.643				
8,900.00	4,065.79	4,043.79	4,043.79	75.70	105.95	87.99	3,159.93 66.96		1,909.25	1,790.44	118.81	16.070				
8,950.00	4,065.46	4,043.46	4,043.46	76.44	105.94	86.41	3,159.93 66.96		1,958.79	1,840.06	118.73	16.497				
9,000.00	4,065.04	4,043.04	4,043.04	77.17	105.93	86.46	3,159.93 66.96		2,008.36	1,889.70	118.66	16.925				
9,050.00	4,064.67	4,042.67	4,042.67	77.91	105.92	86.65	3,159.93 66.96		2,057.99	1,939.38	118.61	17.352				
9,100.00	4,064.35	4,042.35	4,042.35	78.65	105.91	86.79	3,159.93 66.96		2,107.67	1,989.11	118.56	17.778				
9,150.00	4,064.08	4,042.08	4,042.08	79.39	105.90	87.31	3,159.93 66.96		2,157.41	2,038.89	118.52	18.203				
9,200.00	4,063.94	4,041.94	4,041.94	80.14	105.90	89.49	3,159.93 66.96		2,207.19	2,088.70	118.50	18.626				
9,250.00	4,063.96	4,041.96	4,041.96	80.88	105.90	89.21	3,159.93 66.96		2,257.00	2,138.51	118.48	19.049				
9,300.00	4,063.67	4,041.67	4,041.67	81.62	105.89	83.56	3,159.93 66.96		2,306.79	2,188.33	118.46	19.473				
9,350.00	4,062.92	4,040.92	4,040.92	82.37	105.87	78.85	3,159.93 66.96		2,356.56	2,238.14	118.42	19.899				
9,400.00	4,061.78	4,039.78	4,039.78	83.11	105.84	74.89	3,159.93 66.96		2,406.31	2,287.94	118.38	20.328				
9,450.00	4,060.34	4,038.34	4,038.34	83.85	105.80	73.05	3,159.93 66.96		2,456.05	2,337.73	118.32	20.757				
9,500.00	4,058.91	4,036.91	4,036.91	84.59	105.77	72.60	3,159.93 66.96		2,505.82	2,387.55	118.27	21.186				
9,550.00	4,057.43	4,035.43	4,035.43	85.33	105.73	69.94	3,159.93 66.96		2,555.60	2,437.37	118.23	21.616				
9,600.00	4,055.64	4,033.64	4,033.64	86.07	105.68	66.57	3,159.93 66.96		2,605.37	2,487.19	118.18	22.047				
9,650.00	4,053.64	4,031.64	4,031.64	86.82	105.63	64.50	3,159.93 66.96		2,655.14	2,537.02	118.12	22.479				
9,700.00	4,051.63	4,029.63	4,029.63	87.56	105.58	62.44	3,159.93 66.96		2,704.94	2,586.87	118.07	22.910				
9,750.00	4,049.97	4,027.97	4,027.97	88.30	105.53	71.99	3,159.93 66.96		2,754.76	2,636.73	118.03	23.340				
9,800.00	4,049.02	4,027.02	4,027.02	89.04	105.51	81.46	3,159.93 66.96		2,804.58	2,686.57	118.01	23.766				
9,850.00	4,048.63	4,026.63	4,026.63	89.78	105.50	88.04	3,159.93 66.96		2,854.39	2,736.39	118.00	24.190				
9,900.00	4,048.67	4,026.67	4,026.67	90.52	105.50	90.87	3,159.93 66.96		2,904.16	2,786.15	118.00	24.611				
9,950.00	4,048.58	4,026.58	4,026.58	91.25	105.50	87.17	3,159.93 66.96		2,953.90	2,835.90	118.00	25.033				
10,000.00	4,048.16	4,026.16	4,026.16	91.98	105.49	83.82	3,159.93 66.96		3,003.62	2,885.63	117.99	25.456				
10,050.00	4,047.40	4,025.40	4,025.40	92.71	105.47	80.75	3,159.93 66.96		3,053.31	2,935.34	117.97	25.882				
10,100.00	4,046.55	4,024.55	4,024.55	93.44	105.44	84.61	3,159.93 66.96		3,103.00	2,985.05	117.95	26.308				

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Cathedral Energy Services

Anticollision Report

Company:	Manzano LLC	Local Co-ordinate Reference:	Well Domino 21-16 State #5H
Project:	Roosevelt Co., NM (NAD 83)	TVD Reference:	21' KB @ 4376.00usft (Silver Oak #7)
Reference Site:	Sec 21-6S-34E	MD Reference:	21' KB @ 4376.00usft (Silver Oak #7)
Site Error:	0.00usft	North Reference:	Grid
Reference Well:	Domino 21-16 State #5H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00usft	Output errors are at	2.00 sigma
Reference Wellbore	HZ [315037]	Database:	USA EDM 5000 Multi Users DB
Reference Design:	Survey: CES MWD	Offset TVD Reference:	Offset Datum

Offset Design													Sec 16-S-34E - Roosevelt 16 State #1 - VT [P&A Offset] - VT		Offset Site Error: 0.00 usft	
Survey Program: 8350-Blind Drilling														Offset Well Error: 0.00 usft		
Reference		Offset		Semi Major Axis			Distance							Warning		
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Total Uncertainty Axis	Separation Factor				
10,150.00	4,046.55	4,024.55	4,024.55	94.17	105.44	96.64	3,159.93	66.96	3,152.80	3,034.83	117.96	26.727				
10,200.00	4,047.19	4,025.19	4,025.19	94.91	105.46	99.40	3,159.93	66.96	3,202.65	3,084.65	118.00	27.142				
10,250.00	4,047.77	4,025.77	4,025.77	95.65	105.48	98.04	3,159.93	66.96	3,252.50	3,134.47	118.03	27.556				
10,300.00	4,048.32	4,026.32	4,026.32	96.39	105.49	98.85	3,159.93	66.96	3,302.36	3,184.29	118.07	27.970				
10,350.00	4,048.91	4,026.91	4,026.91	97.13	105.51	99.29	3,159.93	66.96	3,352.23	3,234.13	118.10	28.384				
10,400.00	4,049.18	4,027.18	4,027.18	97.87	105.51	89.45	3,159.93	66.96	3,402.10	3,283.96	118.13	28.799				
10,450.00	4,048.84	4,026.84	4,026.84	98.61	105.50	81.46	3,159.93	66.96	3,451.95	3,333.80	118.15	29.218				
10,500.00	4,048.08	4,026.08	4,026.08	99.34	105.48	76.92	3,159.93	66.96	3,501.79	3,383.64	118.15	29.640				
10,550.00	4,047.05	4,025.05	4,025.05	100.08	105.46	76.51	3,159.93	66.96	3,551.62	3,433.48	118.14	30.063				
10,600.00	4,046.36	4,024.36	4,024.36	100.82	105.44	83.59	3,159.93	66.96	3,601.46	3,483.32	118.14	30.484				
10,650.00	4,046.12	4,024.12	4,024.12	101.55	105.43	87.29	3,159.93	66.96	3,651.32	3,533.16	118.16	30.901				
10,700.00	4,045.95	4,023.95	4,023.95	102.29	105.43	87.10	3,159.93	66.96	3,701.19	3,583.01	118.18	31.318				
10,750.00	4,045.74	4,023.74	4,023.74	103.03	105.42	85.69	3,159.93	66.96	3,751.08	3,632.87	118.21	31.734				
10,800.00	4,045.41	4,023.41	4,023.41	103.76	105.41	83.83	3,159.93	66.96	3,800.94	3,682.72	118.22	32.151				
10,850.00	4,044.84	4,022.84	4,022.84	104.50	105.40	78.70	3,159.93	66.96	3,850.79	3,732.56	118.23	32.569				
10,900.00	4,043.81	4,021.81	4,021.81	105.23	105.37	73.38	3,159.93	66.96	3,900.61	3,782.38	118.23	32.991				
10,950.00	4,042.54	4,020.54	4,020.54	105.96	105.34	73.33	3,159.93	66.96	3,950.43	3,832.20	118.22	33.415				
11,000.00	4,041.36	4,019.36	4,019.36	106.70	105.31	74.06	3,159.93	66.96	4,000.25	3,882.03	118.22	33.838				
11,050.00	4,040.35	4,018.35	4,018.35	107.43	105.28	77.24	3,159.93	66.96	4,050.09	3,931.87	118.22	34.259				
11,100.00	4,039.58	4,017.58	4,017.58	108.16	105.26	80.53	3,159.93	66.96	4,099.92	3,981.70	118.23	34.679				
11,150.00	4,039.12	4,017.12	4,017.12	108.90	105.25	85.05	3,159.93	66.96	4,149.80	4,031.56	118.25	35.095				
11,200.00	4,039.03	4,017.03	4,017.03	109.64	105.25	91.24	3,159.93	66.96	4,199.73	4,081.45	118.28	35.507				
11,250.00	4,039.19	4,017.19	4,017.19	110.38	105.25	95.82	3,159.93	66.96	4,249.66	4,131.34	118.32	35.916				
11,300.00	4,039.51	4,017.51	4,017.51	111.12	105.26	98.25	3,159.93	66.96	4,299.60	4,181.24	118.37	36.324				
11,332.00	4,039.73	4,017.73	4,017.73	111.60	105.26	98.31	3,159.93	66.96	4,331.57	4,213.17	118.40	36.584				



Cathedral Energy Services

Anticollision Report

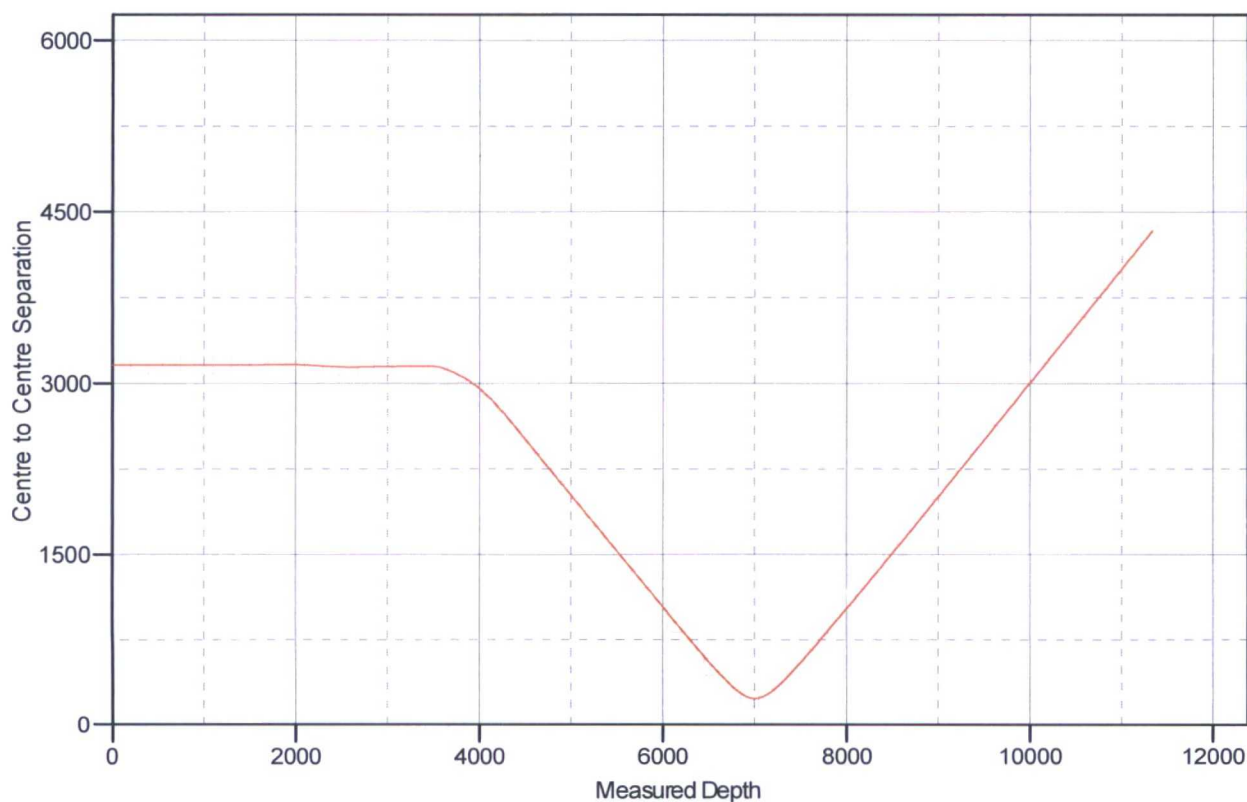
Company: Manzano LLC
Project: Roosevelt Co., NM (NAD 83)
Reference Site: Sec 21-6S-34E
Site Error: 0.00usft
Reference Well: Domino 21-16 State #5H
Well Error: 0.00usft
Reference Wellbore: HZ [315037]
Reference Design: Survey: CES MWD

Local Co-ordinate Reference: Well Domino 21-16 State #5H
TVD Reference: 21' KB @ 4376.00usft (Silver Oak #7)
MD Reference: 21' KB @ 4376.00usft (Silver Oak #7)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: USA EDM 5000 Multi Users DB
Offset TVD Reference: Offset Datum

Reference Depths are relative to 21' KB @ 4376.00usft (Silver Oak #7)
Offset Depths are relative to Offset Datum
Central Meridian is -104.333333 °

Coordinates are relative to: Domino 21-16 State #5H
Coordinate System is US State Plane 1983, New Mexico Eastern Zone
Grid Convergence at Surface is: 0.48°

Ladder Plot



LEGEND

— Roosevelt 16 State #1, VT[P&A Offset], VT V0