

Hadaway Consulting & Eng. LLC

Joint Resources Co. - LEA Cnty, NM (NAD 83)

Commander 4H

Commander 4H

Wellbore #1

Plan: Plan #1

Standard Planning Report

31 July, 2018



Planning Report

Database:	EDM 5000.14 Single User Db	Local Co-ordinate Reference:	Well Commander 4H
Company:	Hadaway Consulting & Eng. LLC	TVD Reference:	GL 3635' + 17' RKB @ 3652.00ft (Norton 2)
Project:	Joint Resources Co. - LEA Cnty, NM (NAD 83)	MD Reference:	GL 3635' + 17' RKB @ 3652.00ft (Norton 2)
Site:	Commander 4H	North Reference:	Grid
Well:	Commander 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1		

Project	Joint Resources Co. - LEA Cnty, NM (NAD 83), Lea County, NM		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site	Commander 4H			
Site Position:		Northing:	651,859.00 usft	Latitude: 32.786°N
From: Map		Easting:	923,751.80 usft	Longitude: 103.089°W
Position Uncertainty:	0.00 ft	Slot Radius:	13.200 in	Grid Convergence: 0.67 °

Well	Commander 4H			
Well Position	+N/-S	0.00 ft	Northing: 651,859.00 usft	Latitude: 32.786°N
	+E/-W	0.00 ft	Easting: 923,751.80 usft	Longitude: 103.089°W
Position Uncertainty		0.00 ft	Wellhead Elevation:	Ground Level: 3,635.00 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	7/31/2018	6.64	60.64	48,203.19448975

Design	Plan #1			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	179.35

Plan Sections										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4,741.30	0.00	0.00	4,741.30	0.00	0.00	0.00	0.00	0.00	0.00	
5,341.30	60.00	179.35	5,237.50	-286.46	3.25	10.00	10.00	0.00	179.35	
5,541.30	60.00	179.35	5,337.50	-459.65	5.21	0.00	0.00	0.00	0.00	
5,858.60	91.73	179.35	5,414.00	-763.41	8.66	10.00	10.00	0.00	0.00	
10,992.61	91.73	179.35	5,259.01	-5,894.75	66.88	0.00	0.00	0.00	0.00	Commander 4H PB



Planning Report

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Project:	Joint Resources Co. - LEA Cnty, NM (NAD 83)	MD Reference:	GL 3635' + 17' RKB @ 3652.00ft (Norton 2)
Site:	Commander 4H	North Reference:	Grid
Well:	Commander 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1		

Planned Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00
1,400.00	0.00	0.00	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00
1,500.00	0.00	0.00	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00
1,700.00	0.00	0.00	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00
1,800.00	0.00	0.00	1,800.00	0.00	0.00	0.00	0.00	0.00	0.00
1,900.00	0.00	0.00	1,900.00	0.00	0.00	0.00	0.00	0.00	0.00
2,000.00	0.00	0.00	2,000.00	0.00	0.00	0.00	0.00	0.00	0.00
2,100.00	0.00	0.00	2,100.00	0.00	0.00	0.00	0.00	0.00	0.00
2,200.00	0.00	0.00	2,200.00	0.00	0.00	0.00	0.00	0.00	0.00
2,300.00	0.00	0.00	2,300.00	0.00	0.00	0.00	0.00	0.00	0.00
2,400.00	0.00	0.00	2,400.00	0.00	0.00	0.00	0.00	0.00	0.00
2,500.00	0.00	0.00	2,500.00	0.00	0.00	0.00	0.00	0.00	0.00
2,600.00	0.00	0.00	2,600.00	0.00	0.00	0.00	0.00	0.00	0.00
2,700.00	0.00	0.00	2,700.00	0.00	0.00	0.00	0.00	0.00	0.00
2,800.00	0.00	0.00	2,800.00	0.00	0.00	0.00	0.00	0.00	0.00
2,900.00	0.00	0.00	2,900.00	0.00	0.00	0.00	0.00	0.00	0.00
3,000.00	0.00	0.00	3,000.00	0.00	0.00	0.00	0.00	0.00	0.00
3,100.00	0.00	0.00	3,100.00	0.00	0.00	0.00	0.00	0.00	0.00
3,200.00	0.00	0.00	3,200.00	0.00	0.00	0.00	0.00	0.00	0.00
3,300.00	0.00	0.00	3,300.00	0.00	0.00	0.00	0.00	0.00	0.00
3,400.00	0.00	0.00	3,400.00	0.00	0.00	0.00	0.00	0.00	0.00
3,500.00	0.00	0.00	3,500.00	0.00	0.00	0.00	0.00	0.00	0.00
3,600.00	0.00	0.00	3,600.00	0.00	0.00	0.00	0.00	0.00	0.00
3,700.00	0.00	0.00	3,700.00	0.00	0.00	0.00	0.00	0.00	0.00
3,800.00	0.00	0.00	3,800.00	0.00	0.00	0.00	0.00	0.00	0.00
3,900.00	0.00	0.00	3,900.00	0.00	0.00	0.00	0.00	0.00	0.00
4,000.00	0.00	0.00	4,000.00	0.00	0.00	0.00	0.00	0.00	0.00
4,100.00	0.00	0.00	4,100.00	0.00	0.00	0.00	0.00	0.00	0.00
4,200.00	0.00	0.00	4,200.00	0.00	0.00	0.00	0.00	0.00	0.00
4,300.00	0.00	0.00	4,300.00	0.00	0.00	0.00	0.00	0.00	0.00
4,400.00	0.00	0.00	4,400.00	0.00	0.00	0.00	0.00	0.00	0.00
4,500.00	0.00	0.00	4,500.00	0.00	0.00	0.00	0.00	0.00	0.00
4,600.00	0.00	0.00	4,600.00	0.00	0.00	0.00	0.00	0.00	0.00
4,700.00	0.00	0.00	4,700.00	0.00	0.00	0.00	0.00	0.00	0.00
4,741.30	0.00	0.00	4,741.30	0.00	0.00	0.00	0.00	0.00	0.00
4741'MD: KOP - Begin Build 10° DLS									
4,800.00	5.87	179.35	4,799.90	-3.00	0.03	3.00	10.00	10.00	0.00
4,900.00	15.87	179.35	4,897.98	-21.84	0.25	21.84	10.00	10.00	0.00
5,000.00	25.87	179.35	4,991.30	-57.41	0.65	57.42	10.00	10.00	0.00



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Site:	Commander 4H	North Reference:	Grid
Well:	Commander 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
5,100.00	35.87	179.35	5,077.02	-108.66	1.23	108.66	10.00	10.00	0.00
5,200.00	45.87	179.35	5,152.55	-174.00	1.97	174.01	10.00	10.00	0.00
5,300.00	55.87	179.35	5,215.58	-251.47	2.85	251.49	10.00	10.00	0.00
5,341.30	60.00	179.35	5,237.50	-286.46	3.25	286.48	10.00	10.00	0.00
5341'MD: 60° Incl. - Hold 200' MD Tangent									
5,400.00	60.00	179.35	5,266.85	-337.29	3.83	337.31	0.00	0.00	0.00
5,500.00	60.00	179.35	5,316.85	-423.89	4.81	423.92	0.00	0.00	0.00
5,541.30	60.00	179.35	5,337.50	-459.65	5.21	459.68	0.00	0.00	0.00
5541'MD: Resume Build 10° DLS									
5,600.00	65.87	179.35	5,364.19	-511.90	5.81	511.93	10.00	10.00	0.00
5,700.00	75.87	179.35	5,396.92	-606.25	6.88	606.29	10.00	10.00	0.00
5,800.00	85.87	179.35	5,412.77	-704.85	8.00	704.90	10.00	10.00	0.00
5,858.60	91.73	179.35	5,414.00	-763.41	8.66	763.46	10.00	10.00	0.00
5859'MD: Hold 91.73° Incl. on Azm. 179.35									
5,895.01	91.73	179.35	5,412.90	-799.81	9.07	799.86	0.00	0.00	0.00
5895'MD: FTP - Commander 4H FTP									
5,900.00	91.73	179.35	5,412.75	-804.79	9.13	804.84	0.00	0.00	0.00
6,000.00	91.73	179.35	5,409.73	-904.74	10.26	904.80	0.00	0.00	0.00
6,100.00	91.73	179.35	5,406.71	-1,004.69	11.40	1,004.75	0.00	0.00	0.00
6,200.00	91.73	179.35	5,403.69	-1,104.63	12.53	1,104.70	0.00	0.00	0.00
6,300.00	91.73	179.35	5,400.67	-1,204.58	13.67	1,204.66	0.00	0.00	0.00
6,400.00	91.73	179.35	5,397.65	-1,304.53	14.80	1,304.61	0.00	0.00	0.00
6,500.00	91.73	179.35	5,394.63	-1,404.48	15.93	1,404.57	0.00	0.00	0.00
6,600.00	91.73	179.35	5,391.62	-1,504.43	17.07	1,504.52	0.00	0.00	0.00
6,700.00	91.73	179.35	5,388.60	-1,604.37	18.20	1,604.48	0.00	0.00	0.00
6,800.00	91.73	179.35	5,385.58	-1,704.32	19.34	1,704.43	0.00	0.00	0.00
6,900.00	91.73	179.35	5,382.56	-1,804.27	20.47	1,804.39	0.00	0.00	0.00
7,000.00	91.73	179.35	5,379.54	-1,904.22	21.60	1,904.34	0.00	0.00	0.00
7,100.00	91.73	179.35	5,376.52	-2,004.17	22.74	2,004.29	0.00	0.00	0.00
7,200.00	91.73	179.35	5,373.50	-2,104.11	23.87	2,104.25	0.00	0.00	0.00
7,300.00	91.73	179.35	5,370.48	-2,204.06	25.01	2,204.20	0.00	0.00	0.00
7,400.00	91.73	179.35	5,367.47	-2,304.01	26.14	2,304.16	0.00	0.00	0.00
7,500.00	91.73	179.35	5,364.45	-2,403.96	27.27	2,404.11	0.00	0.00	0.00
7,600.00	91.73	179.35	5,361.43	-2,503.91	28.41	2,504.07	0.00	0.00	0.00
7,700.00	91.73	179.35	5,358.41	-2,603.85	29.54	2,604.02	0.00	0.00	0.00
7,800.00	91.73	179.35	5,355.39	-2,703.80	30.67	2,703.98	0.00	0.00	0.00
7,900.00	91.73	179.35	5,352.37	-2,803.75	31.81	2,803.93	0.00	0.00	0.00
8,000.00	91.73	179.35	5,349.35	-2,903.70	32.94	2,903.88	0.00	0.00	0.00
8,100.00	91.73	179.35	5,346.33	-3,003.65	34.08	3,003.84	0.00	0.00	0.00
8,200.00	91.73	179.35	5,343.31	-3,103.59	35.21	3,103.79	0.00	0.00	0.00
8,300.00	91.73	179.35	5,340.30	-3,203.54	36.34	3,203.75	0.00	0.00	0.00
8,400.00	91.73	179.35	5,337.28	-3,303.49	37.48	3,303.70	0.00	0.00	0.00
8,500.00	91.73	179.35	5,334.26	-3,403.44	38.61	3,403.66	0.00	0.00	0.00
8,600.00	91.73	179.35	5,331.24	-3,503.39	39.75	3,503.61	0.00	0.00	0.00
8,700.00	91.73	179.35	5,328.22	-3,603.33	40.88	3,603.57	0.00	0.00	0.00
8,800.00	91.73	179.35	5,325.20	-3,703.28	42.01	3,703.52	0.00	0.00	0.00
8,900.00	91.73	179.35	5,322.18	-3,803.23	43.15	3,803.47	0.00	0.00	0.00
9,000.00	91.73	179.35	5,319.16	-3,903.18	44.28	3,903.43	0.00	0.00	0.00
9,100.00	91.73	179.35	5,316.15	-4,003.13	45.42	4,003.38	0.00	0.00	0.00
9,200.00	91.73	179.35	5,313.13	-4,103.07	46.55	4,103.34	0.00	0.00	0.00
9,300.00	91.73	179.35	5,310.11	-4,203.02	47.68	4,203.29	0.00	0.00	0.00
9,400.00	91.73	179.35	5,307.09	-4,302.97	48.82	4,303.25	0.00	0.00	0.00



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Site:	Commander 4H	North Reference:	Grid
Well:	Commander 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1		

Planned Survey

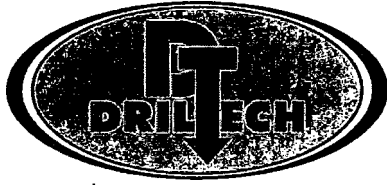
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
9,500.00	91.73	179.35	5,304.07	-4,402.92	49.95	4,403.20	0.00	0.00	0.00
9,600.00	91.73	179.35	5,301.05	-4,502.87	51.09	4,503.16	0.00	0.00	0.00
9,700.00	91.73	179.35	5,298.03	-4,602.81	52.22	4,603.11	0.00	0.00	0.00
9,800.00	91.73	179.35	5,295.01	-4,702.76	53.35	4,703.06	0.00	0.00	0.00
9,900.00	91.73	179.35	5,292.00	-4,802.71	54.49	4,803.02	0.00	0.00	0.00
10,000.00	91.73	179.35	5,288.98	-4,902.66	55.62	4,902.97	0.00	0.00	0.00
10,100.00	91.73	179.35	5,285.96	-5,002.61	56.76	5,002.93	0.00	0.00	0.00
10,200.00	91.73	179.35	5,282.94	-5,102.55	57.89	5,102.88	0.00	0.00	0.00
10,300.00	91.73	179.35	5,279.92	-5,202.50	59.02	5,202.84	0.00	0.00	0.00
10,400.00	91.73	179.35	5,276.90	-5,302.45	60.16	5,302.79	0.00	0.00	0.00
10,500.00	91.73	179.35	5,273.88	-5,402.40	61.29	5,402.75	0.00	0.00	0.00
10,600.00	91.73	179.35	5,270.86	-5,502.35	62.42	5,502.70	0.00	0.00	0.00
10,700.00	91.73	179.35	5,267.85	-5,602.29	63.56	5,602.65	0.00	0.00	0.00
10,800.00	91.73	179.35	5,264.83	-5,702.24	64.69	5,702.61	0.00	0.00	0.00
10,900.00	91.73	179.35	5,261.81	-5,802.19	65.83	5,802.56	0.00	0.00	0.00
10,992.61	91.73	179.35	5,259.01	-5,894.75	66.88	5,895.13	0.00	0.00	0.00
10993'MD: LTP/PBHL - Commander 4H PBHL									

Design Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
Commander 4H PBHL	0.00	0.01	5,259.00	-5,894.71	70.60	645,964.30	923,822.40	32.770°N	103.089°W
- plan misses target center by 3.72ft at 10992.61ft MD (5259.01 TVD, -5894.75 N, 66.88 E)									
- Point									
Commander 4H FTP	0.00	0.01	5,414.00	-799.80	12.40	651,059.20	923,764.20	32.784°N	103.089°W
- plan misses target center by 3.50ft at 5895.01ft MD (5412.90 TVD, -799.81 N, 9.07 E)									
- Point									

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
4,741.30	4,741.30	0.00	0.00	4741'MD: KOP - Begin Build 10° DLS
5,341.30	5,237.50	-286.46	3.25	5341'MD: 60° Incl. - Hold 200' MD Tangent
5,541.30	5,337.50	-459.65	5.21	5541'MD: Resume Build 10° DLS
5,858.60	5,414.00	-763.41	8.66	5859'MD: Hold 91.73° Incl. on Azm. 179.35
5,895.01	5,412.90	-799.80	9.07	5895'MD: FTP
10,992.61	5,259.01	-5,894.75	66.88	10993'MD: LTP/PBHL



Hadaway Consulting & Eng. LLC

Joint Resources Co. - LEA Cnty, NM (NAD 83)

Commander 4H

Commander 4H

Wellbore #1

Plan: Plan #1

Standard Planning Report - Geographic

31 July, 2018



Planning Report - Geographic

Database:	EDM 5000.14 Single User Db	Local Co-ordinate Reference:	Well Commander 4H
Company:	Hadaway Consulting & Eng. LLC	TVD Reference:	GL 3635' + 17' RKB @ 3652.00ft (Norton 2)
Project:	Joint Resources Co. - LEA Cnty, NM (NAD 83)	MD Reference:	GL 3635' + 17' RKB @ 3652.00ft (Norton 2)
Site:	Commander 4H	North Reference:	Grid
Well:	Commander 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1		

Project	Joint Resources Co. - LEA Cnty, NM (NAD 83), Lea County, NM		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site	Commander 4H			
Site Position:		Northing:	651,859.00 usft	Latitude: 32.786°N
From: Map		Easting:	923,751.80 usft	Longitude: 103.089°W
Position Uncertainty:	0.00 ft	Slot Radius:	13.200 in	Grid Convergence: 0.67 °

Well	Commander 4H			
Well Position	+N/-S	0.00 ft	Northing: 651,859.00 usft	Latitude: 32.786°N
	+E/-W	0.00 ft	Easting: 923,751.80 usft	Longitude: 103.089°W
Position Uncertainty	0.00 ft	Wellhead Elevation:		Ground Level: 3,635.00 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	7/31/2018	6.64	60.64	48,203.19448975

Design	Plan #1			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	179.35

Plan Sections										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4,741.30	0.00	0.00	4,741.30	0.00	0.00	0.00	0.00	0.00	0.00	
5,341.30	60.00	179.35	5,237.50	-286.46	3.25	10.00	10.00	0.00	179.35	
5,541.30	60.00	179.35	5,337.50	-459.65	5.21	0.00	0.00	0.00	0.00	
5,858.60	91.73	179.35	5,414.00	-763.41	8.66	10.00	10.00	0.00	0.00	
10,992.61	91.73	179.35	5,259.01	-5,894.75	66.88	0.00	0.00	0.00	0.00	Commander 4H PB



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Project:	Joint Resources Co. - LEA Cnty, NM (NAD 83)	MD Reference:	GL 3635' + 17' RKB @ 3652.00ft (Norton 2)
Site:	Commander 4H	North Reference:	Grid
Well:	Commander 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1		

Planned Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.00	0.00	0.00	0.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
100.00	0.00	0.00	100.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
200.00	0.00	0.00	200.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
300.00	0.00	0.00	300.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
400.00	0.00	0.00	400.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
500.00	0.00	0.00	500.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
600.00	0.00	0.00	600.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
700.00	0.00	0.00	700.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
800.00	0.00	0.00	800.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
900.00	0.00	0.00	900.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
1,000.00	0.00	0.00	1,000.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
1,100.00	0.00	0.00	1,100.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
1,200.00	0.00	0.00	1,200.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
1,300.00	0.00	0.00	1,300.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
1,400.00	0.00	0.00	1,400.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
1,500.00	0.00	0.00	1,500.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
1,600.00	0.00	0.00	1,600.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
1,700.00	0.00	0.00	1,700.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
1,800.00	0.00	0.00	1,800.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
1,900.00	0.00	0.00	1,900.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
2,000.00	0.00	0.00	2,000.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
2,100.00	0.00	0.00	2,100.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
2,200.00	0.00	0.00	2,200.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
2,300.00	0.00	0.00	2,300.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
2,400.00	0.00	0.00	2,400.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
2,500.00	0.00	0.00	2,500.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
2,600.00	0.00	0.00	2,600.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
2,700.00	0.00	0.00	2,700.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
2,800.00	0.00	0.00	2,800.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
2,900.00	0.00	0.00	2,900.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
3,000.00	0.00	0.00	3,000.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
3,100.00	0.00	0.00	3,100.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
3,200.00	0.00	0.00	3,200.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
3,300.00	0.00	0.00	3,300.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
3,400.00	0.00	0.00	3,400.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
3,500.00	0.00	0.00	3,500.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
3,600.00	0.00	0.00	3,600.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
3,700.00	0.00	0.00	3,700.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
3,800.00	0.00	0.00	3,800.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
3,900.00	0.00	0.00	3,900.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
4,000.00	0.00	0.00	4,000.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
4,100.00	0.00	0.00	4,100.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
4,200.00	0.00	0.00	4,200.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
4,300.00	0.00	0.00	4,300.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
4,400.00	0.00	0.00	4,400.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
4,500.00	0.00	0.00	4,500.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
4,600.00	0.00	0.00	4,600.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
4,700.00	0.00	0.00	4,700.00	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
4,741.30	0.00	0.00	4,741.30	0.00	0.00	651,859.00	923,751.80	32.786°N	103.089°W
4741°MD: KOP - Begin Build 10° DLS									
4,800.00	5.87	179.35	4,799.90	-3.00	0.03	651,856.00	923,751.83	32.786°N	103.089°W
4,900.00	15.87	179.35	4,897.98	-21.84	0.25	651,837.17	923,752.05	32.786°N	103.089°W
5,000.00	25.87	179.35	4,991.30	-57.41	0.65	651,801.59	923,752.45	32.786°N	103.089°W
5,100.00	35.87	179.35	5,077.02	-108.66	1.23	651,750.35	923,753.03	32.786°N	103.089°W



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Project:	Joint Resources Co. - LEA Cnty, NM (NAD 83)	MD Reference:	GL 3635' + 17' RKB @ 3652.00ft (Norton 2)
Site:	Commander 4H	North Reference:	Grid
Well:	Commander 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,200.00	45.87	179.35	5,152.55	-174.00	1.97	651,685.00	923,753.77	32.785°N	103.089°W
5,300.00	55.87	179.35	5,215.58	-251.47	2.85	651,607.53	923,754.65	32.785°N	103.089°W
5,341.30	60.00	179.35	5,237.50	-286.46	3.25	651,572.54	923,755.05	32.785°N	103.089°W
5341'MD: 60° Incl. - Hold 200' MD Tangent									
5,400.00	60.00	179.35	5,266.85	-337.29	3.83	651,521.71	923,755.63	32.785°N	103.089°W
5,500.00	60.00	179.35	5,316.85	-423.89	4.81	651,435.12	923,756.61	32.785°N	103.089°W
5,541.30	60.00	179.35	5,337.50	-459.65	5.21	651,399.35	923,757.02	32.785°N	103.089°W
5541'MD: Resume Build 10° DLS									
5,600.00	65.87	179.35	5,364.19	-511.90	5.81	651,347.11	923,757.61	32.784°N	103.089°W
5,700.00	75.87	179.35	5,396.92	-606.25	6.88	651,252.75	923,758.68	32.784°N	103.089°W
5,800.00	85.87	179.35	5,412.77	-704.85	8.00	651,154.15	923,759.80	32.784°N	103.089°W
5,858.60	91.73	179.35	5,414.00	-763.41	8.66	651,095.60	923,760.46	32.784°N	103.089°W
5859'MD: Hold 91.73° Incl. on Azm. 179.35									
5,895.01	91.73	179.35	5,412.90	-799.81	9.07	651,059.20	923,760.87	32.784°N	103.089°W
5895'MD: FTP - Commander 4H FTP									
5,900.00	91.73	179.35	5,412.75	-804.79	9.13	651,054.22	923,760.93	32.784°N	103.089°W
6,000.00	91.73	179.35	5,409.73	-904.74	10.26	650,954.27	923,762.06	32.783°N	103.089°W
6,100.00	91.73	179.35	5,406.71	-1,004.69	11.40	650,854.32	923,763.20	32.783°N	103.089°W
6,200.00	91.73	179.35	5,403.69	-1,104.63	12.53	650,754.37	923,764.33	32.783°N	103.089°W
6,300.00	91.73	179.35	5,400.67	-1,204.58	13.67	650,654.43	923,765.47	32.782°N	103.089°W
6,400.00	91.73	179.35	5,397.65	-1,304.53	14.80	650,554.48	923,766.60	32.782°N	103.089°W
6,500.00	91.73	179.35	5,394.63	-1,404.48	15.93	650,454.53	923,767.73	32.782°N	103.089°W
6,600.00	91.73	179.35	5,391.62	-1,504.43	17.07	650,354.58	923,768.87	32.782°N	103.089°W
6,700.00	91.73	179.35	5,388.60	-1,604.37	18.20	650,254.63	923,770.00	32.781°N	103.089°W
6,800.00	91.73	179.35	5,385.58	-1,704.32	19.34	650,154.69	923,771.14	32.781°N	103.089°W
6,900.00	91.73	179.35	5,382.56	-1,804.27	20.47	650,054.74	923,772.27	32.781°N	103.089°W
7,000.00	91.73	179.35	5,379.54	-1,904.22	21.60	649,954.79	923,773.40	32.781°N	103.089°W
7,100.00	91.73	179.35	5,376.52	-2,004.17	22.74	649,854.84	923,774.54	32.780°N	103.089°W
7,200.00	91.73	179.35	5,373.50	-2,104.11	23.87	649,754.90	923,775.67	32.780°N	103.089°W
7,300.00	91.73	179.35	5,370.48	-2,204.06	25.01	649,654.95	923,776.81	32.780°N	103.089°W
7,400.00	91.73	179.35	5,367.47	-2,304.01	26.14	649,555.00	923,777.94	32.779°N	103.089°W
7,500.00	91.73	179.35	5,364.45	-2,403.96	27.27	649,455.05	923,779.07	32.779°N	103.089°W
7,600.00	91.73	179.35	5,361.43	-2,503.91	28.41	649,355.10	923,780.21	32.779°N	103.089°W
7,700.00	91.73	179.35	5,358.41	-2,603.85	29.54	649,255.16	923,781.34	32.779°N	103.089°W
7,800.00	91.73	179.35	5,355.39	-2,703.80	30.67	649,155.21	923,782.48	32.778°N	103.089°W
7,900.00	91.73	179.35	5,352.37	-2,803.75	31.81	649,055.26	923,783.61	32.778°N	103.089°W
8,000.00	91.73	179.35	5,349.35	-2,903.70	32.94	648,955.31	923,784.74	32.778°N	103.089°W
8,100.00	91.73	179.35	5,346.33	-3,003.65	34.08	648,855.37	923,785.88	32.778°N	103.089°W
8,200.00	91.73	179.35	5,343.31	-3,103.59	35.21	648,755.42	923,787.01	32.777°N	103.089°W
8,300.00	91.73	179.35	5,340.30	-3,203.54	36.34	648,655.47	923,788.15	32.777°N	103.089°W
8,400.00	91.73	179.35	5,337.28	-3,303.49	37.48	648,555.52	923,789.28	32.777°N	103.089°W
8,500.00	91.73	179.35	5,334.26	-3,403.44	38.61	648,455.57	923,790.41	32.776°N	103.089°W
8,600.00	91.73	179.35	5,331.24	-3,503.39	39.75	648,355.63	923,791.55	32.776°N	103.089°W
8,700.00	91.73	179.35	5,328.22	-3,603.33	40.88	648,255.68	923,792.68	32.776°N	103.089°W
8,800.00	91.73	179.35	5,325.20	-3,703.28	42.01	648,155.73	923,793.81	32.776°N	103.089°W
8,900.00	91.73	179.35	5,322.18	-3,803.23	43.15	648,055.78	923,794.95	32.775°N	103.089°W
9,000.00	91.73	179.35	5,319.16	-3,903.18	44.28	647,955.83	923,796.08	32.775°N	103.089°W
9,100.00	91.73	179.35	5,316.15	-4,003.13	45.42	647,855.89	923,797.22	32.775°N	103.089°W
9,200.00	91.73	179.35	5,313.13	-4,103.07	46.55	647,755.94	923,798.35	32.775°N	103.089°W
9,300.00	91.73	179.35	5,310.11	-4,203.02	47.68	647,655.99	923,799.48	32.774°N	103.089°W
9,400.00	91.73	179.35	5,307.09	-4,302.97	48.82	647,556.04	923,800.62	32.774°N	103.089°W
9,500.00	91.73	179.35	5,304.07	-4,402.92	49.95	647,456.10	923,801.75	32.774°N	103.089°W
9,600.00	91.73	179.35	5,301.05	-4,502.87	51.09	647,356.15	923,802.89	32.773°N	103.089°W



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Well:	Commander 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1		

Planned Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
9,700.00	91.73	179.35	5,298.03	-4,602.81	52.22	647,256.20	923,804.02	32.773°N	103.089°W
9,800.00	91.73	179.35	5,295.01	-4,702.76	53.35	647,156.25	923,805.15	32.773°N	103.089°W
9,900.00	91.73	179.35	5,292.00	-4,802.71	54.49	647,056.30	923,806.29	32.773°N	103.089°W
10,000.00	91.73	179.35	5,288.98	-4,902.66	55.62	646,956.36	923,807.42	32.772°N	103.089°W
10,100.00	91.73	179.35	5,285.96	-5,002.61	56.76	646,856.41	923,808.56	32.772°N	103.089°W
10,200.00	91.73	179.35	5,282.94	-5,102.55	57.89	646,756.46	923,809.69	32.772°N	103.089°W
10,300.00	91.73	179.35	5,279.92	-5,202.50	59.02	646,656.51	923,810.82	32.772°N	103.089°W
10,400.00	91.73	179.35	5,276.90	-5,302.45	60.16	646,556.57	923,811.96	32.771°N	103.089°W
10,500.00	91.73	179.35	5,273.88	-5,402.40	61.29	646,456.62	923,813.09	32.771°N	103.089°W
10,600.00	91.73	179.35	5,270.86	-5,502.35	62.42	646,356.67	923,814.23	32.771°N	103.089°W
10,700.00	91.73	179.35	5,267.85	-5,602.29	63.56	646,256.72	923,815.36	32.770°N	103.089°W
10,800.00	91.73	179.35	5,264.83	-5,702.24	64.69	646,156.77	923,816.49	32.770°N	103.089°W
10,900.00	91.73	179.35	5,261.81	-5,802.19	65.83	646,056.83	923,817.63	32.770°N	103.089°W
10,992.61	91.73	179.35	5,259.01	-5,894.75	66.88	645,964.26	923,818.68	32.770°N	103.089°W
10993'MD: LTP/PBHL - Commander 4H PBHL									

Design Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
Commander 4H PBHL	0.00	0.01	5,259.00	-5,894.71	70.60	645,964.30	923,822.40	32.770°N	103.089°W
- plan misses target center by 3.72ft at 10992.61ft MD (5259.01 TVD, -5894.75 N, 66.88 E)									
- Point									
Commander 4H FTP	0.00	0.01	5,414.00	-799.80	12.40	651,059.20	923,764.20	32.784°N	103.089°W
- plan misses target center by 3.50ft at 5895.01ft MD (5412.90 TVD, -799.81 N, 9.07 E)									
- Point									

Plan Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
4,741.30	4,741.30	0.00	0.00	4741'MD: KOP - Begin Build 10° DLS
5,341.30	5,237.50	-286.46	3.25	5341'MD: 60° Incl. - Hold 200' MD Tangent
5,541.30	5,337.50	-459.65	5.21	5541'MD: Resume Build 10° DLS
5,858.60	5,414.00	-763.41	8.66	5859'MD: Hold 91.73° Incl. on Azm. 179.35
5,895.01	5,412.90	-799.80	9.07	5895'MD: FTP
10,992.61	5,259.01	-5,894.75	66.88	10993'MD: LTP/PBHL

Joint Resources

DrilTech L.L.C.

Hadaway Consulting & Eng. LLC
Site: Joint Resources Co. - LEA Cnty, NM (NAD 83)
Well: Commander 4H
Wellbore: Wellbore #1
Plan: Plan #1
Norton 2

SURFACE LOCATION

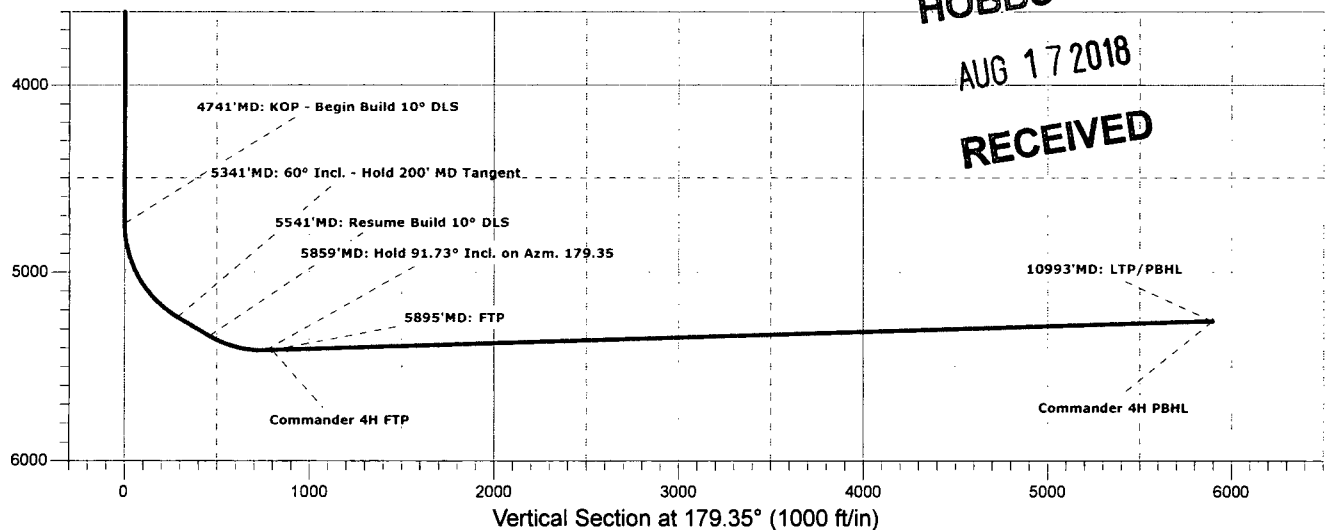
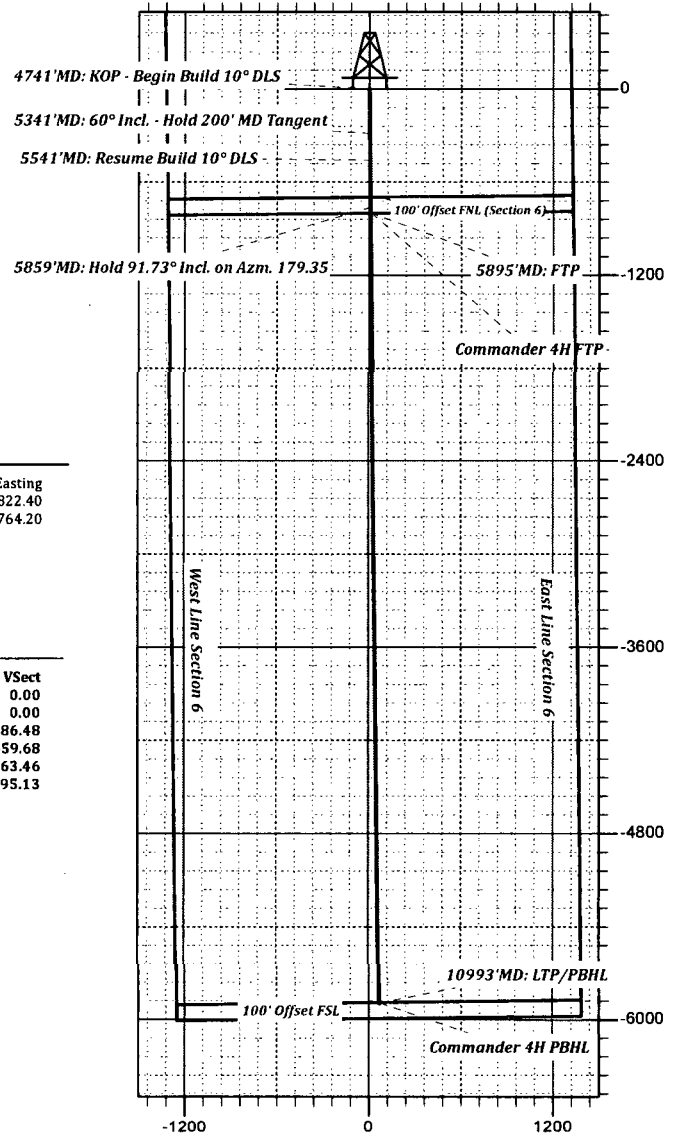
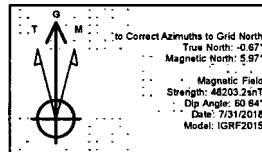
US State Plane 1983
 New Mexico Eastern Zone
 Elevation: GL 3635' ± 17' RKB @ 3652.00ft (Norton 2).
 Commander 4H
 Latitude 32.786°N
 Longitude 103.089°W
 Northing 651859.00
 Easting 923751.80

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting
Commander 4H PBHL	5259.00	-5894.71	70.60	645964.30	923822.40
Commander 4H FTP	5414.00	-799.80	12.40	651059.20	923764.20

SECTION DETAILS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4741.30	0.00	0.00	4741.30	0.00	0.00	0.00	0.00	0.00
5341.30	60.00	179.35	5237.50	-286.46	3.25	10.00	179.35	286.48
5541.30	60.00	179.35	5337.50	-459.65	5.21	0.00	0.00	459.68
5858.60	91.73	179.35	5414.00	-763.41	8.66	10.00	0.00	763.46
10992.61	91.73	179.35	5259.01	-5894.75	66.88	0.00	0.00	5895.13



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