

OCD – HOBBS
04/16/2020
RECEIVED

NORTHERN DELAWARE BASIN

LEA COUNTY, NM

BULLDOG

BROT HELM FED COM #601H

OWB

Design: AWP

Standard Survey Report

04 November, 2019

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well BROTH HELM FED COM #601H
Project:	LEA COUNTY, NM	TVD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Site:	BULLDOG	MD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Well:	BROTH HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

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	BULLDOG		
Site Position:		Northing:	398,637.10 usft
From:	Map	Easting:	741,887.40 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 5' 36.820 N
		Longitude:	103° 33' 8.116 W
		Grid Convergence:	0.42 °

Well	BROTH HELM FED COM #601H		
Well Position	+N/-S	0.0 usft	Northing: 430,528.11 usft
	+E/-W	0.0 usft	Easting: 778,529.20 usft
Position Uncertainty	3.0 usft	Wellhead Elevation:	usft
		Latitude:	32° 10' 49.566 N
		Longitude:	103° 25' 59.107 W
		Ground Level:	3,420.2 usft

Wellbore	OWB				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	WMM2015	9/17/2018	6.78	60.01	47,783.01425383

Design	AWP				
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	179.05	

Survey Program	Date	11/4/2019		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.0	11,891.0	GYRO-SURF/INTER (OWB)	Standard Keeper 104	Standard Wireline Keeper ver 1.0.4
11,891.0	22,913.0	MWD-CURVE/LATERAL (OWB)	MWD+IFR1+FDIR	OWSG MWD + IFR1 + FDIR Correction

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
100.0	0.77	163.41	100.0	-0.6	0.2	0.6	0.77	0.77	0.00
125.0	0.74	182.47	125.0	-1.0	0.2	1.0	1.01	-0.12	76.24
150.0	0.78	178.64	150.0	-1.3	0.2	1.3	0.26	0.16	-15.32
175.0	0.80	176.74	175.0	-1.6	0.2	1.6	0.13	0.08	-7.60
200.0	0.77	175.26	200.0	-2.0	0.3	2.0	0.14	-0.12	-5.92
225.0	0.68	167.70	225.0	-2.3	0.3	2.3	0.52	-0.36	-30.24
250.0	0.71	178.27	250.0	-2.6	0.3	2.6	0.53	0.12	42.28
275.0	0.62	175.07	275.0	-2.9	0.4	2.9	0.39	-0.36	-12.80
300.0	0.62	164.68	300.0	-3.2	0.4	3.2	0.45	0.00	-41.56

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Well:	BROTH HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
325.0	0.66	155.39	325.0	-3.4	0.5	3.4	0.44	0.16	-37.16
350.0	0.65	151.14	350.0	-3.7	0.6	3.7	0.20	-0.04	-17.00
375.0	0.68	138.40	375.0	-3.9	0.8	3.9	0.60	0.12	-50.96
400.0	0.72	138.97	400.0	-4.1	1.0	4.1	0.16	0.16	2.28
425.0	0.74	137.33	425.0	-4.4	1.2	4.4	0.12	0.08	-6.56
450.0	0.78	132.87	450.0	-4.6	1.5	4.6	0.29	0.16	-17.84
475.0	0.78	134.67	475.0	-4.8	1.7	4.9	0.10	0.00	7.20
500.0	0.74	136.20	500.0	-5.1	1.9	5.1	0.18	-0.16	6.12
525.0	0.69	127.93	525.0	-5.3	2.2	5.3	0.46	-0.20	-33.08
550.0	0.61	130.83	550.0	-5.5	2.4	5.5	0.35	-0.32	11.60
575.0	0.67	128.91	575.0	-5.6	2.6	5.7	0.25	0.24	-7.68
600.0	0.75	135.58	600.0	-5.9	2.8	5.9	0.46	0.32	26.68
625.0	0.76	134.45	625.0	-6.1	3.1	6.1	0.07	0.04	-4.52
650.0	0.71	133.67	650.0	-6.3	3.3	6.4	0.20	-0.20	-3.12
675.0	0.77	129.99	675.0	-6.5	3.5	6.6	0.31	0.24	-14.72
700.0	0.76	132.26	699.9	-6.7	3.8	6.8	0.13	-0.04	9.08
725.0	0.71	131.71	724.9	-7.0	4.0	7.0	0.20	-0.20	-2.20
750.0	0.60	129.78	749.9	-7.1	4.2	7.2	0.45	-0.44	-7.72
775.0	0.58	128.92	774.9	-7.3	4.4	7.4	0.09	-0.08	-3.44
800.0	0.56	122.61	799.9	-7.5	4.6	7.5	0.26	-0.08	-25.24
825.0	0.47	116.95	824.9	-7.6	4.8	7.6	0.41	-0.36	-22.64
850.0	0.56	127.97	849.9	-7.7	5.0	7.8	0.53	0.36	44.08
875.0	0.50	126.92	874.9	-7.8	5.2	7.9	0.24	-0.24	-4.20
900.0	0.51	133.13	899.9	-8.0	5.4	8.1	0.22	0.04	24.84
925.0	0.46	129.22	924.9	-8.1	5.5	8.2	0.24	-0.20	-15.64
950.0	0.47	131.79	949.9	-8.2	5.7	8.3	0.09	0.04	10.28
975.0	0.54	135.68	974.9	-8.4	5.8	8.5	0.31	0.28	15.56
1,000.0	0.58	137.10	999.9	-8.6	6.0	8.7	0.17	0.16	5.68
1,025.0	0.51	133.53	1,024.9	-8.7	6.2	8.8	0.31	-0.28	-14.28
1,050.0	0.59	136.98	1,049.9	-8.9	6.3	9.0	0.35	0.32	13.80
1,075.0	0.56	133.91	1,074.9	-9.1	6.5	9.2	0.17	-0.12	-12.28
1,100.0	0.50	132.66	1,099.9	-9.2	6.7	9.4	0.24	-0.24	-5.00
1,125.0	0.54	128.23	1,124.9	-9.4	6.9	9.5	0.23	0.16	-17.72
1,150.0	0.64	123.58	1,149.9	-9.5	7.1	9.7	0.44	0.40	-18.60
1,175.0	0.65	119.47	1,174.9	-9.7	7.3	9.8	0.19	0.04	-16.44
1,200.0	1.23	106.64	1,199.9	-9.8	7.7	10.0	2.45	2.32	-51.32
1,225.0	1.46	110.80	1,224.9	-10.0	8.2	10.2	1.00	0.92	16.64
1,250.0	1.63	107.62	1,249.9	-10.2	8.9	10.4	0.76	0.68	-12.72
1,275.0	1.71	106.35	1,274.9	-10.5	9.6	10.6	0.35	0.32	-5.08
1,300.0	1.72	107.85	1,299.9	-10.7	10.3	10.8	0.18	0.04	6.00
1,325.0	1.63	108.81	1,324.9	-10.9	11.0	11.1	0.38	-0.36	3.84
1,350.0	1.74	108.09	1,349.9	-11.1	11.7	11.3	0.45	0.44	-2.88
1,375.0	1.79	107.51	1,374.9	-11.4	12.4	11.6	0.21	0.20	-2.32

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Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
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Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
1,400.0	1.86	108.88	1,399.8	-11.6	13.2	11.8	0.33	0.28	5.48	
1,425.0	1.80	107.25	1,424.8	-11.9	13.9	12.1	0.32	-0.24	-6.52	
1,450.0	1.76	106.53	1,449.8	-12.1	14.7	12.3	0.18	-0.16	-2.88	
1,475.0	1.80	107.40	1,474.8	-12.3	15.4	12.6	0.19	0.16	3.48	
1,500.0	1.83	106.50	1,499.8	-12.6	16.2	12.8	0.17	0.12	-3.60	
1,525.0	1.87	108.49	1,524.8	-12.8	16.9	13.1	0.30	0.16	7.96	
1,550.0	1.84	110.86	1,549.8	-13.1	17.7	13.4	0.33	-0.12	9.48	
1,575.0	1.93	108.76	1,574.8	-13.4	18.5	13.7	0.45	0.36	-8.40	
1,600.0	1.93	107.29	1,599.7	-13.6	19.3	13.9	0.20	0.00	-5.88	
1,625.0	1.91	107.70	1,624.7	-13.9	20.1	14.2	0.10	-0.08	1.64	
1,650.0	1.85	105.14	1,649.7	-14.1	20.9	14.4	0.41	-0.24	-10.24	
1,675.0	1.87	105.30	1,674.7	-14.3	21.6	14.7	0.08	0.08	0.64	
1,700.0	1.89	103.39	1,699.7	-14.5	22.4	14.9	0.26	0.08	-7.64	
1,725.0	1.90	102.44	1,724.7	-14.7	23.2	15.1	0.13	0.04	-3.80	
1,750.0	1.80	102.75	1,749.7	-14.9	24.0	15.3	0.40	-0.40	1.24	
1,775.0	1.80	105.58	1,774.6	-15.1	24.8	15.5	0.36	0.00	11.32	
1,800.0	1.80	107.46	1,799.6	-15.3	25.6	15.7	0.24	0.00	7.52	
1,825.0	1.86	104.32	1,824.6	-15.5	26.3	15.9	0.47	0.24	-12.56	
1,850.0	1.81	104.59	1,849.6	-15.7	27.1	16.2	0.20	-0.20	1.08	
1,875.0	1.88	106.54	1,874.6	-15.9	27.9	16.4	0.38	0.28	7.80	
1,900.0	1.85	108.35	1,899.6	-16.2	28.6	16.6	0.26	-0.12	7.24	
1,925.0	1.77	106.14	1,924.6	-16.4	29.4	16.9	0.42	-0.32	-8.84	
1,950.0	1.93	110.20	1,949.6	-16.7	30.2	17.1	0.83	0.64	16.24	
1,975.0	1.91	107.95	1,974.5	-16.9	31.0	17.4	0.31	-0.08	-9.00	
2,000.0	1.87	106.93	1,999.5	-17.2	31.7	17.7	0.21	-0.16	-4.08	
2,025.0	1.85	109.94	2,024.5	-17.4	32.5	18.0	0.40	-0.08	12.04	
2,050.0	1.40	112.97	2,049.5	-17.7	33.2	18.2	1.83	-1.80	12.12	
2,075.0	1.21	113.31	2,074.5	-17.9	33.7	18.5	0.76	-0.76	1.36	
2,100.0	1.08	115.23	2,099.5	-18.1	34.2	18.7	0.54	-0.52	7.68	
2,125.0	1.16	115.00	2,124.5	-18.3	34.6	18.9	0.32	0.32	-0.92	
2,150.0	1.06	115.51	2,149.5	-18.5	35.0	19.1	0.40	-0.40	2.04	
2,175.0	1.06	113.89	2,174.5	-18.7	35.5	19.3	0.12	0.00	-6.48	
2,200.0	1.06	116.20	2,199.5	-18.9	35.9	19.5	0.17	0.00	9.24	
2,225.0	1.03	116.59	2,224.5	-19.1	36.3	19.7	0.12	-0.12	1.56	
2,250.0	0.86	111.52	2,249.5	-19.3	36.7	19.9	0.76	-0.68	-20.28	
2,275.0	0.32	23.85	2,274.5	-19.3	36.9	19.9	3.62	-2.16	-350.68	
2,300.0	0.80	345.71	2,299.5	-19.1	36.8	19.7	2.33	1.92	-152.56	
2,325.0	1.07	345.96	2,324.5	-18.7	36.7	19.3	1.08	1.08	1.00	
2,350.0	1.12	347.07	2,349.5	-18.2	36.6	18.8	0.22	0.20	4.44	
2,375.0	1.08	344.91	2,374.5	-17.7	36.5	18.3	0.23	-0.16	-8.64	
2,400.0	1.15	345.12	2,399.4	-17.3	36.4	17.9	0.28	0.28	0.84	
2,425.0	1.18	344.78	2,424.4	-16.8	36.3	17.4	0.12	0.12	-1.36	
2,450.0	1.20	348.86	2,449.4	-16.3	36.1	16.9	0.35	0.08	16.32	

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Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
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Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
2,475.0	1.17	346.96	2,474.4	-15.8	36.0	16.4	0.20	-0.12	-7.60
2,500.0	1.20	346.61	2,499.4	-15.3	35.9	15.9	0.12	0.12	-1.40
2,525.0	1.19	347.85	2,524.4	-14.8	35.8	15.3	0.11	-0.04	4.96
2,550.0	1.19	349.25	2,549.4	-14.2	35.7	14.8	0.12	0.00	5.60
2,575.0	1.14	345.88	2,574.4	-13.7	35.6	14.3	0.34	-0.20	-13.48
2,600.0	1.12	348.30	2,599.4	-13.3	35.5	13.9	0.21	-0.08	9.68
2,625.0	1.21	346.75	2,624.4	-12.8	35.4	13.4	0.38	0.36	-6.20
2,650.0	1.13	348.99	2,649.4	-12.3	35.3	12.9	0.37	-0.32	8.96
2,675.0	1.16	347.18	2,674.4	-11.8	35.2	12.4	0.19	0.12	-7.24
2,700.0	1.23	348.12	2,699.4	-11.3	35.0	11.9	0.29	0.28	3.76
2,725.0	1.17	350.40	2,724.4	-10.8	34.9	11.3	0.31	-0.24	9.12
2,750.0	1.20	353.32	2,749.4	-10.2	34.9	10.8	0.27	0.12	11.68
2,775.0	1.22	355.55	2,774.4	-9.7	34.8	10.3	0.20	0.08	8.92
2,800.0	1.22	2.74	2,799.4	-9.2	34.8	9.8	0.61	0.00	28.76
2,825.0	1.23	3.49	2,824.4	-8.7	34.8	9.2	0.08	0.04	3.00
2,850.0	1.22	4.84	2,849.3	-8.1	34.9	8.7	0.12	-0.04	5.40
2,875.0	1.27	7.89	2,874.3	-7.6	34.9	8.2	0.33	0.20	12.20
2,900.0	1.18	13.79	2,899.3	-7.1	35.0	7.6	0.62	-0.36	23.60
2,925.0	1.18	15.33	2,924.3	-6.6	35.2	7.1	0.13	0.00	6.16
2,950.0	1.26	15.20	2,949.3	-6.0	35.3	6.6	0.32	0.32	-0.52
2,975.0	1.25	17.07	2,974.3	-5.5	35.5	6.1	0.17	-0.04	7.48
3,000.0	1.22	19.21	2,999.3	-5.0	35.6	5.6	0.22	-0.12	8.56
3,025.0	1.17	22.85	3,024.3	-4.5	35.8	5.1	0.36	-0.20	14.56
3,050.0	1.21	26.85	3,049.3	-4.1	36.0	4.7	0.37	0.16	16.00
3,075.0	1.26	28.60	3,074.3	-3.6	36.3	4.2	0.25	0.20	7.00
3,100.0	1.19	33.64	3,099.3	-3.1	36.6	3.7	0.51	-0.28	20.16
3,125.0	1.24	34.84	3,124.3	-2.7	36.9	3.3	0.22	0.20	4.80
3,150.0	1.20	37.97	3,149.3	-2.3	37.2	2.9	0.31	-0.16	12.52
3,175.0	1.32	40.53	3,174.3	-1.8	37.5	2.4	0.53	0.48	10.24
3,200.0	1.35	43.15	3,199.3	-1.4	37.9	2.0	0.27	0.12	10.48
3,225.0	1.47	48.02	3,224.3	-1.0	38.4	1.6	0.68	0.48	19.48
3,250.0	1.48	47.56	3,249.3	-0.5	38.8	1.2	0.06	0.04	-1.84
3,275.0	1.55	47.94	3,274.2	-0.1	39.3	0.7	0.28	0.28	1.52
3,300.0	1.62	49.32	3,299.2	0.4	39.8	0.3	0.32	0.28	5.52
3,325.0	1.67	48.29	3,324.2	0.8	40.4	-0.2	0.23	0.20	-4.12
3,350.0	1.63	49.93	3,349.2	1.3	40.9	-0.6	0.25	-0.16	6.56
3,375.0	1.67	49.53	3,374.2	1.8	41.5	-1.1	0.17	0.16	-1.60
3,400.0	1.63	50.09	3,399.2	2.2	42.0	-1.5	0.17	-0.16	2.24
3,425.0	1.73	52.50	3,424.2	2.7	42.6	-2.0	0.49	0.40	9.64
3,450.0	1.62	49.27	3,449.2	3.2	43.2	-2.4	0.58	-0.44	-12.92
3,475.0	1.47	24.23	3,474.2	3.7	43.6	-3.0	2.74	-0.60	-100.16
3,500.0	1.74	10.57	3,499.2	4.3	43.8	-3.6	1.87	1.08	-54.64
3,525.0	1.63	2.55	3,524.1	5.1	43.8	-4.3	1.04	-0.44	-32.08
3,550.0	1.59	9.27	3,549.1	5.8	43.9	-5.0	0.77	-0.16	26.88

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well BROTH HELM FED COM #601H
Project:	LEA COUNTY, NM	TVD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Site:	BULLDOG	MD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Well:	BROTH HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
3,575.0	1.57	15.42	3,574.1	6.4	44.1	-5.7	0.68	-0.08	24.60
3,600.0	1.58	17.45	3,599.1	7.1	44.3	-6.4	0.23	0.04	8.12
3,625.0	1.72	21.19	3,624.1	7.8	44.5	-7.0	0.71	0.56	14.96
3,650.0	1.67	21.65	3,649.1	8.5	44.8	-7.7	0.21	-0.20	1.84
3,675.0	1.72	21.04	3,674.1	9.2	45.0	-8.4	0.21	0.20	-2.44
3,700.0	1.83	25.44	3,699.1	9.9	45.3	-9.1	0.70	0.44	17.60
3,725.0	1.89	25.14	3,724.1	10.6	45.7	-9.8	0.24	0.24	-1.20
3,750.0	1.96	28.68	3,749.0	11.4	46.1	-10.6	0.55	0.28	14.16
3,775.0	2.00	30.33	3,774.0	12.1	46.5	-11.3	0.28	0.16	6.60
3,800.0	2.02	30.24	3,799.0	12.9	46.9	-12.1	0.08	0.08	-0.36
3,825.0	2.04	26.81	3,824.0	13.6	47.4	-12.9	0.49	0.08	-13.72
3,850.0	2.32	31.57	3,849.0	14.5	47.8	-13.7	1.33	1.12	19.04
3,875.0	2.43	31.43	3,874.0	15.4	48.4	-14.5	0.44	0.44	-0.56
3,900.0	2.54	31.61	3,898.9	16.3	48.9	-15.5	0.44	0.44	0.72
3,925.0	2.59	31.25	3,923.9	17.2	49.5	-16.4	0.21	0.20	-1.44
3,950.0	2.65	32.49	3,948.9	18.2	50.1	-17.4	0.33	0.24	4.96
3,975.0	2.64	31.36	3,973.9	19.2	50.7	-18.3	0.21	-0.04	-4.52
4,000.0	2.67	32.63	3,998.8	20.2	51.3	-19.3	0.26	0.12	5.08
4,025.0	2.73	31.15	4,023.8	21.2	52.0	-20.3	0.37	0.24	-5.92
4,050.0	2.71	31.38	4,048.8	22.2	52.6	-21.3	0.09	-0.08	0.92
4,075.0	2.72	31.70	4,073.7	23.2	53.2	-22.3	0.07	0.04	1.28
4,100.0	2.74	31.63	4,098.7	24.2	53.8	-23.3	0.08	0.08	-0.28
4,125.0	2.34	29.53	4,123.7	25.2	54.4	-24.2	1.64	-1.60	-8.40
4,150.0	1.65	24.03	4,148.7	25.9	54.8	-25.0	2.86	-2.76	-22.00
4,175.0	1.11	9.13	4,173.7	26.5	55.0	-25.6	2.58	-2.16	-59.60
4,200.0	1.10	7.48	4,198.7	27.0	55.0	-26.1	0.13	-0.04	-6.60
4,225.0	1.06	2.61	4,223.7	27.4	55.1	-26.5	0.40	-0.16	-19.48
4,250.0	1.19	352.54	4,248.7	27.9	55.1	-27.0	0.94	0.52	-40.28
4,275.0	1.37	350.70	4,273.6	28.5	55.0	-27.6	0.74	0.72	-7.36
4,300.0	1.48	351.38	4,298.6	29.1	54.9	-28.2	0.45	0.44	2.72
4,325.0	1.51	350.64	4,323.6	29.7	54.8	-28.8	0.14	0.12	-2.96
4,350.0	1.46	349.67	4,348.6	30.4	54.7	-29.5	0.22	-0.20	-3.88
4,375.0	1.49	350.96	4,373.6	31.0	54.6	-30.1	0.18	0.12	5.16
4,400.0	1.56	355.10	4,398.6	31.7	54.5	-30.8	0.52	0.28	16.56
4,425.0	1.57	354.65	4,423.6	32.4	54.4	-31.4	0.06	0.04	-1.80
4,450.0	1.56	353.64	4,448.6	33.0	54.4	-32.1	0.12	-0.04	-4.04
4,475.0	1.61	356.09	4,473.6	33.7	54.3	-32.8	0.34	0.20	9.80
4,500.0	1.57	359.22	4,498.6	34.4	54.3	-33.5	0.38	-0.16	12.52
4,525.0	1.67	359.95	4,523.6	35.1	54.3	-34.2	0.41	0.40	2.92
4,550.0	1.81	2.84	4,548.5	35.9	54.3	-35.0	0.66	0.56	11.56
4,575.0	1.87	11.95	4,573.5	36.7	54.4	-35.8	1.19	0.24	36.44
4,600.0	2.06	20.22	4,598.5	37.5	54.6	-36.6	1.36	0.76	33.08
4,625.0	2.08	28.20	4,623.5	38.3	55.0	-37.4	1.15	0.08	31.92

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well BROTH HELM FED COM #601H
Project:	LEA COUNTY, NM	TVD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Site:	BULLDOG	MD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Well:	BROT HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
4,650.0	2.31	32.81	4,648.5	39.1	55.5	-38.2	1.16	0.92	18.44	
4,675.0	2.28	39.71	4,673.5	39.9	56.1	-39.0	1.11	-0.12	27.60	
4,700.0	2.20	44.43	4,698.4	40.7	56.7	-39.7	0.80	-0.32	18.88	
4,725.0	1.80	69.58	4,723.4	41.1	57.4	-40.2	3.82	-1.60	100.60	
4,750.0	1.81	82.38	4,748.4	41.3	58.2	-40.4	1.61	0.04	51.20	
4,775.0	1.95	88.85	4,773.4	41.4	59.0	-40.4	1.02	0.56	25.88	
4,800.0	2.02	88.54	4,798.4	41.4	59.9	-40.4	0.28	0.28	-1.24	
4,825.0	1.96	87.38	4,823.4	41.4	60.7	-40.4	0.29	-0.24	-4.64	
4,850.0	1.90	88.36	4,848.4	41.5	61.6	-40.5	0.27	-0.24	3.92	
4,875.0	1.85	90.74	4,873.3	41.5	62.4	-40.4	0.37	-0.20	9.52	
4,900.0	1.50	93.90	4,898.3	41.5	63.1	-40.4	1.45	-1.40	12.64	
4,925.0	0.69	131.75	4,923.3	41.3	63.6	-40.3	4.18	-3.24	151.40	
4,950.0	0.68	139.87	4,948.3	41.1	63.8	-40.1	0.39	-0.04	32.48	
4,975.0	0.67	138.15	4,973.3	40.9	64.0	-39.8	0.09	-0.04	-6.88	
5,000.0	1.18	131.26	4,998.3	40.6	64.3	-39.5	2.08	2.04	-27.56	
5,025.0	1.42	119.74	5,023.3	40.3	64.7	-39.2	1.41	0.96	-46.08	
5,050.0	1.56	117.18	5,048.3	40.0	65.3	-38.9	0.62	0.56	-10.24	
5,075.0	1.64	118.46	5,073.3	39.7	65.9	-38.6	0.35	0.32	5.12	
5,100.0	1.67	116.69	5,098.3	39.3	66.5	-38.2	0.24	0.12	-7.08	
5,125.0	1.16	134.84	5,123.3	39.0	67.1	-37.9	2.69	-2.04	72.60	
5,150.0	0.99	192.09	5,148.3	38.6	67.2	-37.5	4.16	-0.68	229.00	
5,175.0	1.22	211.52	5,173.3	38.2	67.0	-37.0	1.75	0.92	77.72	
5,200.0	1.35	209.27	5,198.3	37.7	66.7	-36.6	0.56	0.52	-9.00	
5,225.0	1.55	207.39	5,223.3	37.1	66.4	-36.0	0.82	0.80	-7.52	
5,250.0	1.58	204.26	5,248.3	36.5	66.1	-35.4	0.36	0.12	-12.52	
5,275.0	1.55	202.60	5,273.2	35.9	65.9	-34.8	0.22	-0.12	-6.64	
5,300.0	1.57	199.28	5,298.2	35.2	65.6	-34.1	0.37	0.08	-13.28	
5,325.0	1.60	196.88	5,323.2	34.6	65.4	-33.5	0.29	0.12	-9.60	
5,350.0	1.58	199.09	5,348.2	33.9	65.2	-32.8	0.26	-0.08	8.84	
5,375.0	1.64	198.84	5,373.2	33.3	65.0	-32.2	0.24	0.24	-1.00	
5,400.0	1.54	198.50	5,398.2	32.6	64.7	-31.5	0.40	-0.40	-1.36	
5,425.0	1.56	199.85	5,423.2	32.0	64.5	-30.9	0.17	0.08	5.40	
5,450.0	1.34	213.39	5,448.2	31.4	64.2	-30.3	1.62	-0.88	54.16	
5,475.0	1.38	244.37	5,473.2	31.0	63.8	-30.0	2.91	0.16	123.92	
5,500.0	1.49	258.98	5,498.2	30.8	63.2	-29.8	1.52	0.44	58.44	
5,525.0	1.57	259.88	5,523.2	30.7	62.6	-29.7	0.33	0.32	3.60	
5,550.0	1.55	259.23	5,548.1	30.6	61.9	-29.6	0.11	-0.08	-2.60	
5,575.0	1.51	259.39	5,573.1	30.5	61.2	-29.4	0.16	-0.16	0.64	
5,600.0	1.60	258.01	5,598.1	30.3	60.6	-29.3	0.39	0.36	-5.52	
5,625.0	1.62	259.19	5,623.1	30.2	59.9	-29.2	0.15	0.08	4.72	
5,650.0	1.56	258.96	5,648.1	30.1	59.2	-29.1	0.24	-0.24	-0.92	
5,675.0	1.53	257.86	5,673.1	29.9	58.5	-29.0	0.17	-0.12	-4.40	
5,700.0	1.47	260.34	5,698.1	29.8	57.9	-28.8	0.35	-0.24	9.92	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well BROTH HELM FED COM #601H
Project:	LEA COUNTY, NM	TVD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Site:	BULLDOG	MD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Well:	BROTH HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
5,725.0	1.52	257.87	5,723.1	29.7	57.2	-28.7	0.33	0.20	-9.88
5,750.0	1.60	258.32	5,748.1	29.5	56.6	-28.6	0.32	0.32	1.80
5,775.0	1.64	258.63	5,773.1	29.4	55.9	-28.5	0.16	0.16	1.24
5,800.0	1.57	259.30	5,798.1	29.3	55.2	-28.3	0.29	-0.28	2.68
5,825.0	1.60	257.61	5,823.0	29.1	54.5	-28.2	0.22	0.12	-6.76
5,850.0	1.61	264.23	5,848.0	29.0	53.8	-28.1	0.74	0.04	26.48
5,875.0	1.60	271.44	5,873.0	29.0	53.1	-28.1	0.81	-0.04	28.84
5,900.0	1.74	275.73	5,898.0	29.0	52.4	-28.2	0.75	0.56	17.16
5,925.0	1.77	275.69	5,923.0	29.1	51.6	-28.2	0.12	0.12	-0.16
5,950.0	1.74	275.50	5,948.0	29.2	50.9	-28.3	0.12	-0.12	-0.76
5,975.0	1.89	276.95	5,973.0	29.3	50.1	-28.4	0.63	0.60	5.80
6,000.0	1.81	275.22	5,998.0	29.4	49.3	-28.5	0.39	-0.32	-6.92
6,025.0	1.78	277.53	6,023.0	29.4	48.5	-28.6	0.31	-0.12	9.24
6,050.0	1.73	277.20	6,047.9	29.5	47.8	-28.7	0.20	-0.20	-1.32
6,075.0	1.51	284.51	6,072.9	29.7	47.1	-28.9	1.21	-0.88	29.24
6,100.0	1.35	287.48	6,097.9	29.8	46.5	-29.1	0.71	-0.64	11.88
6,125.0	1.28	291.16	6,122.9	30.0	45.9	-29.3	0.44	-0.28	14.72
6,150.0	1.31	292.42	6,147.9	30.2	45.4	-29.5	0.17	0.12	5.04
6,175.0	1.33	292.48	6,172.9	30.5	44.9	-29.7	0.08	0.08	0.24
6,200.0	1.35	294.74	6,197.9	30.7	44.3	-30.0	0.23	0.08	9.04
6,225.0	1.39	292.80	6,222.9	30.9	43.8	-30.2	0.24	0.16	-7.76
6,250.0	1.31	289.78	6,247.9	31.2	43.2	-30.4	0.43	-0.32	-12.08
6,275.0	1.41	294.15	6,272.9	31.4	42.7	-30.7	0.58	0.40	17.48
6,300.0	1.43	292.59	6,297.9	31.6	42.1	-30.9	0.17	0.08	-6.24
6,325.0	1.40	295.10	6,322.9	31.9	41.6	-31.2	0.28	-0.12	10.04
6,350.0	1.69	313.74	6,347.8	32.3	41.0	-31.6	2.31	1.16	74.56
6,375.0	2.49	327.78	6,372.8	33.0	40.5	-32.3	3.78	3.20	56.16
6,400.0	2.73	331.71	6,397.8	34.0	39.9	-33.3	1.20	0.96	15.72
6,425.0	2.71	332.78	6,422.8	35.0	39.3	-34.3	0.22	-0.08	4.28
6,450.0	2.68	332.52	6,447.8	36.0	38.8	-35.4	0.13	-0.12	-1.04
6,475.0	2.78	331.52	6,472.7	37.1	38.2	-36.5	0.44	0.40	-4.00
6,500.0	2.67	332.95	6,497.7	38.1	37.7	-37.5	0.52	-0.44	5.72
6,525.0	2.69	330.96	6,522.7	39.2	37.1	-38.6	0.38	0.08	-7.96
6,550.0	2.71	330.55	6,547.6	40.2	36.6	-39.6	0.11	0.08	-1.64
6,575.0	2.68	330.58	6,572.6	41.2	36.0	-40.6	0.12	-0.12	0.12
6,600.0	2.69	330.46	6,597.6	42.3	35.4	-41.7	0.05	0.04	-0.48
6,625.0	2.71	330.83	6,622.6	43.3	34.8	-42.7	0.11	0.08	1.48
6,650.0	2.75	331.12	6,647.5	44.3	34.2	-43.7	0.17	0.16	1.16
6,675.0	2.82	330.94	6,672.5	45.4	33.7	-44.8	0.28	0.28	-0.72
6,700.0	2.83	329.53	6,697.5	46.5	33.0	-45.9	0.28	0.04	-5.64
6,725.0	2.76	330.87	6,722.4	47.5	32.4	-47.0	0.38	-0.28	5.36
6,750.0	2.74	330.96	6,747.4	48.6	31.9	-48.0	0.08	-0.08	0.36
6,775.0	2.80	330.66	6,772.4	49.6	31.3	-49.1	0.25	0.24	-1.20
6,800.0	2.92	336.53	6,797.3	50.7	30.7	-50.2	1.27	0.48	23.48

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well BROTH HELM FED COM #601H
Project:	LEA COUNTY, NM	TVD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Site:	BULLDOG	MD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Well:	BROT HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
6,825.0	3.14	340.93	6,822.3	52.0	30.2	-51.4	1.28	0.88	17.60
6,850.0	3.22	342.14	6,847.3	53.3	29.8	-52.8	0.42	0.32	4.84
6,875.0	3.17	343.73	6,872.2	54.6	29.4	-54.1	0.41	-0.20	6.36
6,900.0	3.20	342.61	6,897.2	55.9	29.0	-55.4	0.28	0.12	-4.48
6,925.0	3.24	342.31	6,922.2	57.3	28.6	-56.8	0.17	0.16	-1.20
6,950.0	3.28	343.06	6,947.1	58.6	28.1	-58.2	0.23	0.16	3.00
6,975.0	3.13	345.21	6,972.1	60.0	27.8	-59.5	0.77	-0.60	8.60
7,000.0	3.01	348.40	6,997.0	61.3	27.5	-60.8	0.83	-0.48	12.76
7,025.0	2.96	351.14	7,022.0	62.6	27.2	-62.1	0.60	-0.20	10.96
7,050.0	2.88	353.50	7,047.0	63.8	27.0	-63.4	0.58	-0.32	9.44
7,075.0	3.10	359.87	7,071.9	65.1	27.0	-64.7	1.59	0.88	25.48
7,100.0	3.21	1.69	7,096.9	66.5	27.0	-66.0	0.60	0.44	7.28
7,125.0	3.18	1.90	7,121.9	67.9	27.0	-67.4	0.13	-0.12	0.84
7,150.0	3.17	3.20	7,146.8	69.3	27.1	-68.8	0.29	-0.04	5.20
7,175.0	3.24	1.58	7,171.8	70.7	27.2	-70.2	0.46	0.28	-6.48
7,200.0	3.22	2.02	7,196.7	72.1	27.2	-71.6	0.13	-0.08	1.76
7,225.0	3.18	2.67	7,221.7	73.5	27.3	-73.0	0.22	-0.16	2.60
7,250.0	3.21	1.44	7,246.7	74.9	27.3	-74.4	0.30	0.12	-4.92
7,275.0	3.14	1.62	7,271.6	76.2	27.3	-75.8	0.28	-0.28	0.72
7,300.0	3.17	0.61	7,296.6	77.6	27.4	-77.2	0.25	0.12	-4.04
7,325.0	3.01	0.15	7,321.6	79.0	27.4	-78.5	0.65	-0.64	-1.84
7,350.0	3.13	2.98	7,346.5	80.3	27.4	-79.8	0.77	0.48	11.32
7,375.0	3.11	0.67	7,371.5	81.7	27.5	-81.2	0.51	-0.08	-9.24
7,400.0	2.96	2.87	7,396.5	83.0	27.5	-82.5	0.76	-0.60	8.80
7,425.0	3.23	3.71	7,421.4	84.3	27.6	-83.9	1.10	1.08	3.36
7,450.0	3.68	8.47	7,446.4	85.8	27.7	-85.4	2.13	1.80	19.04
7,475.0	3.96	11.06	7,471.3	87.5	28.0	-87.0	1.32	1.12	10.36
7,500.0	3.99	11.33	7,496.3	89.2	28.4	-88.7	0.14	0.12	1.08
7,525.0	4.20	13.35	7,521.2	90.9	28.7	-90.4	1.02	0.84	8.08
7,550.0	4.24	13.71	7,546.1	92.7	29.2	-92.2	0.19	0.16	1.44
7,575.0	4.27	11.11	7,571.1	94.5	29.6	-94.0	0.78	0.12	-10.40
7,600.0	4.21	11.16	7,596.0	96.3	29.9	-95.8	0.24	-0.24	0.20
7,625.0	4.19	10.77	7,620.9	98.1	30.3	-97.6	0.14	-0.08	-1.56
7,650.0	4.17	11.20	7,645.9	99.9	30.6	-99.4	0.15	-0.08	1.72
7,675.0	4.18	11.50	7,670.8	101.7	31.0	-101.2	0.10	0.04	1.20
7,700.0	4.27	10.59	7,695.7	103.5	31.3	-103.0	0.45	0.36	-3.64
7,725.0	4.11	10.02	7,720.6	105.3	31.7	-104.8	0.66	-0.64	-2.28
7,750.0	4.07	10.34	7,745.6	107.1	32.0	-106.5	0.18	-0.16	1.28
7,775.0	4.10	10.51	7,770.5	108.8	32.3	-108.3	0.13	0.12	0.68
7,800.0	4.07	9.48	7,795.5	110.6	32.6	-110.0	0.32	-0.12	-4.12
7,825.0	4.12	8.99	7,820.4	112.3	32.9	-111.8	0.24	0.20	-1.96
7,850.0	4.14	9.73	7,845.3	114.1	33.2	-113.5	0.23	0.08	2.96
7,875.0	4.02	9.07	7,870.3	115.9	33.5	-115.3	0.52	-0.48	-2.64

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well BROTH HELM FED COM #601H
Project:	LEA COUNTY, NM	TVD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Site:	BULLDOG	MD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Well:	BROT HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
7,900.0	4.01	8.64	7,895.2	117.6	33.8	-117.0	0.13	-0.04	-1.72	
7,925.0	3.96	8.29	7,920.1	119.3	34.0	-118.7	0.22	-0.20	-1.40	
7,950.0	3.90	8.52	7,945.1	121.0	34.3	-120.4	0.25	-0.24	0.92	
7,975.0	3.79	7.94	7,970.0	122.7	34.5	-122.1	0.47	-0.44	-2.32	
8,000.0	3.70	7.47	7,995.0	124.3	34.7	-123.7	0.38	-0.36	-1.88	
8,025.0	3.61	7.67	8,019.9	125.9	34.9	-125.3	0.36	-0.36	0.80	
8,050.0	3.60	5.74	8,044.9	127.4	35.1	-126.8	0.49	-0.04	-7.72	
8,075.0	3.63	5.49	8,069.8	129.0	35.3	-128.4	0.14	0.12	-1.00	
8,100.0	3.63	5.28	8,094.8	130.6	35.4	-130.0	0.05	0.00	-0.84	
8,125.0	3.47	3.29	8,119.7	132.1	35.5	-131.5	0.81	-0.64	-7.96	
8,150.0	3.44	3.97	8,144.7	133.6	35.6	-133.0	0.20	-0.12	2.72	
8,175.0	3.40	2.80	8,169.6	135.1	35.7	-134.5	0.32	-0.16	-4.68	
8,200.0	3.33	2.46	8,194.6	136.6	35.8	-136.0	0.29	-0.28	-1.36	
8,225.0	3.12	358.81	8,219.6	138.0	35.8	-137.4	1.17	-0.84	-14.60	
8,250.0	3.18	358.43	8,244.5	139.3	35.8	-138.7	0.25	0.24	-1.52	
8,275.0	3.12	358.70	8,269.5	140.7	35.7	-140.1	0.25	-0.24	1.08	
8,300.0	3.16	357.80	8,294.4	142.1	35.7	-141.5	0.25	0.16	-3.60	
8,325.0	3.10	357.69	8,319.4	143.5	35.6	-142.8	0.24	-0.24	-0.44	
8,350.0	3.00	358.00	8,344.4	144.8	35.6	-144.2	0.41	-0.40	1.24	
8,375.0	2.88	357.67	8,369.3	146.1	35.5	-145.5	0.48	-0.48	-1.32	
8,400.0	2.92	354.97	8,394.3	147.3	35.5	-146.7	0.57	0.16	-10.80	
8,425.0	2.86	356.33	8,419.3	148.6	35.4	-148.0	0.36	-0.24	5.44	
8,450.0	2.83	356.88	8,444.2	149.8	35.3	-149.2	0.16	-0.12	2.20	
8,475.0	2.73	355.81	8,469.2	151.0	35.2	-150.4	0.45	-0.40	-4.28	
8,500.0	2.72	357.14	8,494.2	152.2	35.1	-151.6	0.26	-0.04	5.32	
8,525.0	2.63	353.90	8,519.2	153.4	35.0	-152.8	0.70	-0.36	-12.96	
8,550.0	2.78	354.49	8,544.1	154.6	34.9	-154.0	0.61	0.60	2.36	
8,575.0	2.71	354.81	8,569.1	155.7	34.8	-155.1	0.29	-0.28	1.28	
8,600.0	2.67	356.15	8,594.1	156.9	34.7	-156.3	0.30	-0.16	5.36	
8,625.0	2.80	353.72	8,619.0	158.1	34.6	-157.5	0.70	0.52	-9.72	
8,650.0	2.83	356.01	8,644.0	159.3	34.5	-158.7	0.47	0.12	9.16	
8,675.0	3.08	359.62	8,669.0	160.6	34.5	-160.0	1.25	1.00	14.44	
8,700.0	3.12	0.26	8,693.9	162.0	34.5	-161.4	0.21	0.16	2.56	
8,725.0	3.24	0.29	8,718.9	163.4	34.5	-162.8	0.48	0.48	0.12	
8,750.0	3.26	358.94	8,743.9	164.8	34.5	-164.2	0.32	0.08	-5.40	
8,775.0	3.21	359.16	8,768.8	166.2	34.4	-165.6	0.21	-0.20	0.88	
8,800.0	3.20	357.52	8,793.8	167.6	34.4	-167.0	0.37	-0.04	-6.56	
8,825.0	3.15	355.51	8,818.7	169.0	34.3	-168.4	0.49	-0.20	-8.04	
8,850.0	3.29	354.18	8,843.7	170.4	34.2	-169.8	0.63	0.56	-5.32	
8,875.0	3.23	354.33	8,868.7	171.8	34.0	-171.2	0.24	-0.24	0.60	
8,900.0	3.29	353.26	8,893.6	173.2	33.9	-172.6	0.34	0.24	-4.28	
8,925.0	3.38	352.33	8,918.6	174.6	33.7	-174.0	0.42	0.36	-3.72	
8,950.0	3.39	351.55	8,943.5	176.1	33.5	-175.5	0.19	0.04	-3.12	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well BROTH HELM FED COM #601H
Project:	LEA COUNTY, NM	TVD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Site:	BULLDOG	MD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Well:	BROT HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
8,975.0	3.34	351.04	8,968.5	177.5	33.3	-177.0	0.23	-0.20	-2.04	
9,000.0	3.32	351.82	8,993.5	179.0	33.1	-178.4	0.20	-0.08	3.12	
9,025.0	3.20	354.63	9,018.4	180.4	32.9	-179.8	0.80	-0.48	11.24	
9,050.0	3.12	0.44	9,043.4	181.8	32.8	-181.2	1.32	-0.32	23.24	
9,075.0	2.94	4.33	9,068.3	183.1	32.9	-182.5	1.09	-0.72	15.56	
9,100.0	3.03	3.74	9,093.3	184.4	33.0	-183.8	0.38	0.36	-2.36	
9,125.0	2.97	5.39	9,118.3	185.7	33.1	-185.1	0.42	-0.24	6.60	
9,150.0	2.95	8.55	9,143.2	187.0	33.2	-186.4	0.66	-0.08	12.64	
9,175.0	2.78	8.23	9,168.2	188.2	33.4	-187.6	0.68	-0.68	-1.28	
9,200.0	2.74	8.84	9,193.2	189.4	33.6	-188.8	0.20	-0.16	2.44	
9,225.0	2.72	8.26	9,218.2	190.6	33.8	-190.0	0.14	-0.08	-2.32	
9,250.0	2.68	6.19	9,243.1	191.7	33.9	-191.1	0.42	-0.16	-8.28	
9,275.0	2.70	4.95	9,268.1	192.9	34.0	-192.3	0.25	0.08	-4.96	
9,300.0	2.70	4.03	9,293.1	194.1	34.1	-193.5	0.17	0.00	-3.68	
9,325.0	2.52	6.49	9,318.0	195.2	34.2	-194.6	0.85	-0.72	9.84	
9,350.0	2.33	5.46	9,343.0	196.3	34.3	-195.7	0.78	-0.76	-4.12	
9,375.0	2.25	6.91	9,368.0	197.3	34.4	-196.7	0.40	-0.32	5.80	
9,400.0	2.36	7.02	9,393.0	198.3	34.6	-197.7	0.44	0.44	0.44	
9,425.0	2.24	3.93	9,418.0	199.3	34.7	-198.7	0.69	-0.48	-12.36	
9,450.0	2.31	356.57	9,442.9	200.2	34.7	-199.6	1.20	0.28	-29.44	
9,475.0	2.39	353.72	9,467.9	201.3	34.6	-200.7	0.57	0.32	-11.40	
9,500.0	2.40	351.80	9,492.9	202.3	34.4	-201.7	0.32	0.04	-7.68	
9,525.0	2.38	349.62	9,517.9	203.3	34.3	-202.7	0.37	-0.08	-8.72	
9,550.0	2.40	349.94	9,542.9	204.4	34.1	-203.8	0.10	0.08	1.28	
9,575.0	2.46	349.67	9,567.8	205.4	33.9	-204.8	0.24	0.24	-1.08	
9,600.0	2.44	350.38	9,592.8	206.5	33.7	-205.9	0.15	-0.08	2.84	
9,625.0	1.98	1.11	9,617.8	207.4	33.6	-206.8	2.47	-1.84	42.92	
9,650.0	1.69	21.64	9,642.8	208.2	33.8	-207.6	2.85	-1.16	82.12	
9,675.0	1.57	24.58	9,667.8	208.8	34.1	-208.2	0.58	-0.48	11.76	
9,700.0	1.60	26.93	9,692.8	209.5	34.4	-208.9	0.29	0.12	9.40	
9,725.0	1.47	23.41	9,717.8	210.1	34.7	-209.5	0.64	-0.52	-14.08	
9,750.0	1.47	19.78	9,742.7	210.7	34.9	-210.1	0.37	0.00	-14.52	
9,775.0	1.51	13.80	9,767.7	211.3	35.1	-210.7	0.64	0.16	-23.92	
9,800.0	1.58	9.21	9,792.7	211.9	35.2	-211.3	0.57	0.28	-18.36	
9,825.0	1.57	5.55	9,817.7	212.6	35.3	-212.0	0.40	-0.04	-14.64	
9,850.0	1.62	358.19	9,842.7	213.3	35.3	-212.7	0.84	0.20	-29.44	
9,875.0	1.64	357.52	9,867.7	214.0	35.3	-213.4	0.11	0.08	-2.68	
9,900.0	1.67	359.70	9,892.7	214.8	35.3	-214.1	0.28	0.12	8.72	
9,925.0	1.69	354.05	9,917.7	215.5	35.2	-214.9	0.67	0.08	-22.60	
9,950.0	1.63	352.02	9,942.7	216.2	35.1	-215.6	0.34	-0.24	-8.12	
9,975.0	1.63	347.16	9,967.7	216.9	35.0	-216.3	0.55	0.00	-19.44	
10,000.0	1.60	343.13	9,992.6	217.6	34.8	-217.0	0.47	-0.12	-16.12	
10,025.0	1.59	341.52	10,017.6	218.2	34.6	-217.6	0.18	-0.04	-6.44	
10,050.0	1.71	333.37	10,042.6	218.9	34.4	-218.3	1.05	0.48	-32.60	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well BROTH HELM FED COM #601H
Project:	LEA COUNTY, NM	TVD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Site:	BULLDOG	MD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Well:	BROTH HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
10,075.0	1.77	326.85	10,067.6	219.6	34.0	-219.0	0.83	0.24	-26.08
10,100.0	1.74	330.02	10,092.6	220.2	33.6	-219.6	0.41	-0.12	12.68
10,125.0	1.79	328.11	10,117.6	220.9	33.2	-220.3	0.31	0.20	-7.64
10,150.0	1.84	324.18	10,142.6	221.5	32.7	-221.0	0.54	0.20	-15.72
10,175.0	1.74	320.78	10,167.6	222.2	32.3	-221.6	0.58	-0.40	-13.60
10,200.0	1.77	323.70	10,192.6	222.8	31.8	-222.2	0.38	0.12	11.68
10,225.0	1.72	322.96	10,217.5	223.4	31.3	-222.8	0.22	-0.20	-2.96
10,250.0	1.78	324.08	10,242.5	224.0	30.9	-223.4	0.28	0.24	4.48
10,275.0	1.74	322.01	10,267.5	224.6	30.4	-224.1	0.30	-0.16	-8.28
10,300.0	1.83	323.29	10,292.5	225.2	29.9	-224.7	0.39	0.36	5.12
10,325.0	1.80	319.96	10,317.5	225.8	29.5	-225.3	0.44	-0.12	-13.32
10,350.0	1.90	318.79	10,342.5	226.4	28.9	-225.9	0.43	0.40	-4.68
10,375.0	1.91	318.00	10,367.5	227.1	28.4	-226.6	0.11	0.04	-3.16
10,400.0	2.02	316.55	10,392.5	227.7	27.8	-227.2	0.48	0.44	-5.80
10,425.0	2.08	314.45	10,417.4	228.3	27.2	-227.9	0.38	0.24	-8.40
10,450.0	2.04	313.51	10,442.4	229.0	26.5	-228.5	0.21	-0.16	-3.76
10,475.0	2.03	309.96	10,467.4	229.6	25.9	-229.1	0.51	-0.04	-14.20
10,500.0	2.24	308.78	10,492.4	230.1	25.1	-229.7	0.86	0.84	-4.72
10,525.0	2.16	307.63	10,517.4	230.7	24.4	-230.3	0.37	-0.32	-4.60
10,550.0	2.06	309.39	10,542.4	231.3	23.7	-230.9	0.48	-0.40	7.04
10,575.0	0.86	304.12	10,567.3	231.7	23.2	-231.3	4.82	-4.80	-21.08
10,600.0	0.43	142.46	10,592.3	231.7	23.1	-231.3	5.10	-1.72	-646.64
10,625.0	0.91	126.98	10,617.3	231.5	23.3	-231.1	2.03	1.92	-61.92
10,650.0	0.88	123.45	10,642.3	231.3	23.6	-230.9	0.25	-0.12	-14.12
10,675.0	0.94	127.57	10,667.3	231.1	23.9	-230.6	0.35	0.24	16.48
10,700.0	0.68	135.82	10,692.3	230.8	24.2	-230.4	1.14	-1.04	33.00
10,725.0	0.54	143.81	10,717.3	230.6	24.4	-230.2	0.65	-0.56	31.96
10,750.0	0.56	153.97	10,742.3	230.4	24.5	-230.0	0.40	0.08	40.64
10,775.0	0.47	142.93	10,767.3	230.2	24.6	-229.8	0.53	-0.36	-44.16
10,800.0	0.42	157.96	10,792.3	230.1	24.7	-229.6	0.51	-0.20	60.12
10,825.0	0.42	161.72	10,817.3	229.9	24.8	-229.5	0.11	0.00	15.04
10,850.0	0.32	179.94	10,842.3	229.8	24.8	-229.3	0.61	-0.40	72.88
10,875.0	0.47	200.72	10,867.3	229.6	24.8	-229.1	0.82	0.60	83.12
10,900.0	0.49	214.15	10,892.3	229.4	24.7	-229.0	0.46	0.08	53.72
10,925.0	0.52	226.96	10,917.3	229.2	24.5	-228.8	0.47	0.12	51.24
10,950.0	0.56	241.45	10,942.3	229.1	24.3	-228.7	0.57	0.16	57.96
10,975.0	0.74	251.10	10,967.3	229.0	24.1	-228.6	0.84	0.72	38.60
11,000.0	0.93	243.79	10,992.3	228.8	23.7	-228.4	0.87	0.76	-29.24
11,025.0	1.10	248.03	11,017.3	228.7	23.3	-228.3	0.74	0.68	16.96
11,050.0	1.36	246.42	11,042.3	228.5	22.8	-228.1	1.05	1.04	-6.44
11,075.0	1.75	247.37	11,067.3	228.2	22.2	-227.8	1.56	1.56	3.80
11,100.0	1.99	250.61	11,092.3	227.9	21.4	-227.5	1.05	0.96	12.96
11,125.0	2.12	250.97	11,117.3	227.6	20.6	-227.2	0.52	0.52	1.44

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well BROTH HELM FED COM #601H
Project:	LEA COUNTY, NM	TVD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Site:	BULLDOG	MD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Well:	BROTH HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
11,150.0	2.13	252.47	11,142.3	227.3	19.7	-227.0	0.23	0.04	6.00	
11,175.0	2.12	251.32	11,167.2	227.0	18.8	-226.7	0.18	-0.04	-4.60	
11,200.0	1.80	250.03	11,192.2	226.7	18.0	-226.4	1.29	-1.28	-5.16	
11,225.0	0.71	217.55	11,217.2	226.5	17.6	-226.2	5.04	-4.36	-129.92	
11,250.0	1.01	142.67	11,242.2	226.2	17.6	-225.9	4.29	1.20	-299.52	
11,275.0	1.36	136.43	11,267.2	225.8	17.9	-225.5	1.49	1.40	-24.96	
11,300.0	1.31	141.33	11,292.2	225.4	18.3	-225.0	0.50	-0.20	19.60	
11,325.0	1.15	153.49	11,317.2	224.9	18.6	-224.6	1.22	-0.64	48.64	
11,350.0	0.93	171.85	11,342.2	224.5	18.8	-224.2	1.59	-0.88	73.44	
11,375.0	0.82	202.45	11,367.2	224.1	18.7	-223.8	1.90	-0.44	122.40	
11,400.0	0.92	211.56	11,392.2	223.8	18.5	-223.5	0.68	0.40	36.44	
11,425.0	1.01	210.12	11,417.2	223.4	18.3	-223.1	0.37	0.36	-5.76	
11,450.0	1.02	202.72	11,442.2	223.0	18.1	-222.7	0.53	0.04	-29.60	
11,475.0	1.10	182.81	11,467.2	222.6	18.0	-222.3	1.50	0.32	-79.64	
11,500.0	0.96	163.51	11,492.2	222.1	18.1	-221.8	1.49	-0.56	-77.20	
11,525.0	1.58	112.61	11,517.2	221.8	18.5	-221.5	4.91	2.48	-203.60	
11,550.0	2.97	95.91	11,542.1	221.6	19.4	-221.3	6.10	5.56	-66.80	
11,575.0	3.75	93.02	11,567.1	221.5	20.9	-221.1	3.19	3.12	-11.56	
11,600.0	3.89	92.72	11,592.0	221.4	22.5	-221.0	0.57	0.56	-1.20	
11,625.0	3.64	98.81	11,617.0	221.3	24.2	-220.8	1.89	-1.00	24.36	
11,650.0	3.48	96.23	11,641.9	221.1	25.7	-220.6	0.91	-0.64	-10.32	
11,675.0	3.22	98.84	11,666.9	220.9	27.2	-220.4	1.21	-1.04	10.44	
11,700.0	3.17	100.67	11,691.9	220.6	28.5	-220.1	0.45	-0.20	7.32	
11,725.0	3.03	101.51	11,716.8	220.4	29.9	-219.8	0.59	-0.56	3.36	
11,750.0	2.88	103.81	11,741.8	220.1	31.1	-219.5	0.76	-0.60	9.20	
11,775.0	2.85	106.57	11,766.8	219.8	32.3	-219.2	0.56	-0.12	11.04	
11,800.0	2.83	108.26	11,791.7	219.4	33.5	-218.8	0.34	-0.08	6.76	
11,825.0	2.79	109.63	11,816.7	219.0	34.7	-218.4	0.31	-0.16	5.48	
11,850.0	2.68	107.99	11,841.7	218.6	35.8	-218.0	0.54	-0.44	-6.56	
11,875.0	2.52	97.96	11,866.6	218.4	36.9	-217.7	1.93	-0.64	-40.12	
11,891.0	2.66	106.44	11,882.6	218.2	37.6	-217.5	2.55	0.88	53.00	
12,015.0	2.22	102.48	12,006.5	216.9	42.7	-216.1	0.38	-0.35	-3.19	
12,047.0	2.03	98.57	12,038.5	216.6	43.9	-215.9	0.75	-0.59	-12.22	
12,079.0	3.03	101.35	12,070.5	216.4	45.3	-215.6	3.15	3.13	8.69	
12,110.0	4.36	103.03	12,101.4	216.0	47.2	-215.2	4.30	4.29	5.42	
12,142.0	6.23	109.82	12,133.3	215.1	50.0	-214.2	6.15	5.84	21.22	
12,174.0	10.21	116.59	12,164.9	213.2	54.2	-212.3	12.78	12.44	21.16	
12,205.0	13.54	122.51	12,195.3	210.1	59.7	-209.0	11.42	10.74	19.10	
12,237.0	17.28	129.96	12,226.1	205.0	66.5	-203.9	13.20	11.69	23.28	
12,268.0	20.03	138.53	12,255.5	198.1	73.6	-196.8	12.50	8.87	27.65	
12,300.0	23.46	144.92	12,285.2	188.7	80.9	-187.4	13.01	10.72	19.97	
12,332.0	26.57	151.80	12,314.2	177.2	87.9	-175.7	13.29	9.72	21.50	
12,363.0	28.68	155.50	12,341.7	164.3	94.3	-162.7	8.77	6.81	11.94	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well BROTH HELM FED COM #601H
Project:	LEA COUNTY, NM	TVD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Site:	BULLDOG	MD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Well:	BROT HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
12,394.5	31.05	160.08	12,369.0	149.8	100.2	-148.1	10.44	7.53	14.55
FTP @ 12394.5'MD									
12,395.0	31.09	160.15	12,369.4	149.6	100.3	-147.9	10.44	7.77	13.51
12,416.3	33.73	163.68	12,387.4	138.7	103.8	-137.0	15.28	12.42	16.60
FTP (BROT HELM FED COM #601H)									
12,427.0	35.10	165.28	12,396.2	132.9	105.4	-131.1	15.28	12.74	14.91
12,458.0	38.15	169.25	12,421.1	114.9	109.5	-113.0	12.45	9.84	12.81
12,490.0	41.59	173.17	12,445.7	94.6	112.6	-92.7	13.31	10.75	12.25
12,521.0	45.82	175.45	12,468.1	73.3	114.7	-71.4	14.56	13.65	7.35
12,553.0	50.43	175.87	12,489.4	49.5	116.5	-47.6	14.44	14.41	1.31
12,585.0	54.11	179.13	12,509.0	24.3	117.6	-22.3	14.04	11.50	10.19
12,616.0	56.92	183.52	12,526.6	-1.3	117.0	3.2	14.78	9.06	14.16
12,648.0	59.29	186.25	12,543.5	-28.3	114.6	30.2	10.36	7.41	8.53
12,679.0	62.33	186.95	12,558.6	-55.2	111.5	57.1	10.00	9.81	2.26
12,711.0	66.12	187.44	12,572.5	-83.8	107.9	85.6	11.92	11.84	1.53
12,743.0	70.52	185.99	12,584.3	-113.3	104.4	115.0	14.38	13.75	-4.53
12,775.0	74.82	184.85	12,593.9	-143.7	101.6	145.4	13.86	13.44	-3.56
12,811.0	81.05	183.42	12,601.4	-178.8	99.0	180.4	17.74	17.31	-3.97
12,872.0	87.00	180.46	12,607.7	-239.4	97.0	241.0	10.88	9.75	-4.85
12,968.0	85.97	179.17	12,613.6	-335.2	97.3	336.8	1.72	-1.07	-1.34
13,063.0	86.54	180.38	12,619.8	-430.0	97.7	431.6	1.41	0.60	1.27
13,158.0	87.06	180.37	12,625.1	-524.9	97.0	526.4	0.55	0.55	-0.01
13,254.0	86.89	180.46	12,630.2	-620.8	96.4	622.3	0.20	-0.18	0.09
13,349.0	89.62	180.46	12,633.1	-715.7	95.6	717.2	2.87	2.87	0.00
13,443.0	91.09	180.25	12,632.5	-809.7	95.0	811.2	1.58	1.56	-0.22
13,538.0	90.11	179.20	12,631.5	-904.7	95.5	906.1	1.51	-1.03	-1.11
13,633.0	90.71	178.03	12,630.8	-999.6	97.8	1,001.1	1.38	0.63	-1.23
13,728.0	91.81	179.93	12,628.7	-1,094.6	99.5	1,096.1	2.31	1.16	2.00
13,823.0	88.44	178.35	12,628.5	-1,189.6	100.9	1,191.1	3.92	-3.55	-1.66
13,917.0	87.95	182.12	12,631.5	-1,283.5	100.5	1,285.0	4.04	-0.52	4.01
14,012.0	87.09	186.37	12,635.6	-1,378.1	93.5	1,379.5	4.56	-0.91	4.47
14,107.0	86.17	184.53	12,641.2	-1,472.5	84.5	1,473.7	2.16	-0.97	-1.94
14,202.0	91.60	183.39	12,643.0	-1,567.3	77.9	1,568.3	5.84	5.72	-1.20
14,297.0	93.27	183.48	12,639.0	-1,662.0	72.2	1,663.0	1.76	1.76	0.09
14,393.0	94.25	183.12	12,632.7	-1,757.6	66.7	1,758.5	1.09	1.02	-0.38
14,488.0	92.21	180.51	12,627.3	-1,852.4	63.7	1,853.2	3.48	-2.15	-2.75
14,583.0	89.82	180.52	12,625.7	-1,947.4	62.8	1,948.2	2.52	-2.52	0.01
14,678.0	86.52	179.33	12,628.7	-2,042.3	63.0	2,043.1	3.69	-3.47	-1.25
14,773.0	90.45	181.02	12,631.2	-2,137.3	62.7	2,138.0	4.50	4.14	1.78
14,868.0	88.59	180.15	12,632.0	-2,232.3	61.7	2,233.0	2.16	-1.96	-0.92
14,962.0	87.46	179.91	12,635.2	-2,326.2	61.7	2,326.9	1.23	-1.20	-0.26
15,057.0	85.48	180.45	12,641.1	-2,421.0	61.4	2,421.7	2.16	-2.08	0.57
15,152.0	86.97	179.04	12,647.3	-2,515.8	61.8	2,516.5	2.16	1.57	-1.48
15,247.0	87.58	178.22	12,651.9	-2,610.7	64.1	2,611.4	1.08	0.64	-0.86

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well BROTH HELM FED COM #601H
Project:	LEA COUNTY, NM	TVD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Site:	BULLDOG	MD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Well:	BROT HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
15,343.0	88.73	178.02	12,655.0	-2,706.6	67.2	2,707.3	1.22	1.20	-0.21
15,437.0	89.45	179.17	12,656.4	-2,800.5	69.5	2,801.3	1.44	0.77	1.22
15,532.0	89.25	178.40	12,657.5	-2,895.5	71.5	2,896.3	0.84	-0.21	-0.81
15,628.0	86.08	177.72	12,661.4	-2,991.4	74.8	2,992.2	3.38	-3.30	-0.71
15,723.0	85.07	177.28	12,668.8	-3,086.0	78.9	3,086.9	1.16	-1.06	-0.46
15,818.0	84.58	176.83	12,677.3	-3,180.5	83.8	3,181.4	0.70	-0.52	-0.47
15,913.0	86.11	177.09	12,685.0	-3,275.0	88.8	3,276.0	1.63	1.61	0.27
16,008.0	85.59	177.52	12,691.9	-3,369.7	93.2	3,370.7	0.71	-0.55	0.45
16,104.0	87.38	174.95	12,697.8	-3,465.3	99.5	3,466.4	3.26	1.86	-2.68
16,198.0	91.69	175.75	12,698.6	-3,558.9	107.1	3,560.2	4.66	4.59	0.85
16,293.0	91.84	178.28	12,695.6	-3,653.7	112.1	3,655.1	2.67	0.16	2.66
16,387.0	89.85	178.02	12,694.3	-3,747.7	115.1	3,749.1	2.14	-2.12	-0.28
16,482.0	89.48	177.49	12,694.8	-3,842.6	118.8	3,844.0	0.68	-0.39	-0.56
16,577.0	87.38	176.23	12,697.4	-3,937.4	124.0	3,938.9	2.58	-2.21	-1.33
16,671.0	87.52	176.33	12,701.6	-4,031.1	130.1	4,032.7	0.18	0.15	0.11
16,765.0	88.38	176.95	12,705.0	-4,124.9	135.6	4,126.6	1.13	0.91	0.66
16,859.0	90.48	180.63	12,705.9	-4,218.9	137.6	4,220.6	4.51	2.23	3.91
16,953.0	88.07	184.28	12,707.1	-4,312.7	133.6	4,314.4	4.65	-2.56	3.88
17,048.0	88.41	180.14	12,710.0	-4,407.6	129.9	4,409.2	4.37	0.36	-4.36
17,142.0	88.15	180.70	12,712.8	-4,501.6	129.3	4,503.1	0.66	-0.28	0.60
17,236.0	90.51	180.68	12,713.9	-4,595.5	128.1	4,597.0	2.51	2.51	-0.02
17,329.0	89.85	180.97	12,713.6	-4,688.5	126.8	4,690.0	0.78	-0.71	0.31
17,424.0	90.77	180.84	12,713.1	-4,783.5	125.3	4,784.9	0.98	0.97	-0.14
17,518.0	91.00	181.01	12,711.7	-4,877.5	123.8	4,878.9	0.30	0.24	0.18
17,613.0	90.48	180.28	12,710.4	-4,972.5	122.7	4,973.8	0.94	-0.55	-0.77
17,707.0	92.84	181.29	12,707.7	-5,066.4	121.4	5,067.7	2.73	2.51	1.07
17,801.0	91.72	181.86	12,704.0	-5,160.3	118.8	5,161.6	1.34	-1.19	0.61
17,896.0	87.09	181.38	12,705.0	-5,255.2	116.1	5,256.4	4.90	-4.87	-0.51
17,991.0	85.65	179.59	12,711.0	-5,350.0	115.3	5,351.2	2.42	-1.52	-1.88
18,085.0	89.99	182.03	12,714.5	-5,443.9	114.0	5,445.1	5.30	4.62	2.60
18,179.0	92.76	189.02	12,712.3	-5,537.4	105.0	5,538.4	8.00	2.95	7.44
18,275.0	91.37	187.01	12,708.8	-5,632.4	91.6	5,633.1	2.54	-1.45	-2.09
18,369.0	90.02	183.08	12,707.7	-5,726.0	83.3	5,726.6	4.42	-1.44	-4.18
18,413.0	89.71	180.71	12,707.8	-5,770.0	81.9	5,770.5	5.43	-0.70	-5.39
18,467.0	88.25	177.92	12,708.8	-5,824.0	82.5	5,824.5	5.83	-2.70	-5.17
18,562.0	87.02	176.85	12,712.7	-5,918.8	86.9	5,919.4	1.72	-1.29	-1.13
18,657.0	84.22	176.41	12,719.9	-6,013.3	92.4	6,014.0	2.98	-2.95	-0.46
18,779.0	87.91	177.17	12,728.3	-6,134.8	99.2	6,135.6	3.09	3.02	0.62
18,874.0	94.24	176.13	12,726.5	-6,229.6	104.8	6,230.5	6.75	6.66	-1.09
18,968.0	95.13	176.08	12,718.8	-6,323.1	111.1	6,324.0	0.95	0.95	-0.05
19,062.0	95.51	177.60	12,710.1	-6,416.5	116.3	6,417.6	1.66	0.40	1.62
19,156.0	90.35	178.54	12,705.3	-6,510.3	119.5	6,511.4	5.58	-5.49	1.00
19,251.0	89.29	178.63	12,705.6	-6,605.3	121.8	6,606.4	1.12	-1.12	0.09

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well BROTH HELM FED COM #601H
Project:	LEA COUNTY, NM	TVD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Site:	BULLDOG	MD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Well:	BROT HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
19,347.0	88.40	178.99	12,707.6	-6,701.2	123.8	6,702.4	1.00	-0.93	0.38
19,442.0	88.25	178.43	12,710.3	-6,796.2	125.9	6,797.3	0.61	-0.16	-0.59
19,536.0	86.67	177.70	12,714.5	-6,890.0	129.1	6,891.2	1.85	-1.68	-0.78
19,630.0	88.22	178.43	12,718.7	-6,983.9	132.3	6,985.1	1.82	1.65	0.78
19,725.0	87.59	177.16	12,722.2	-7,078.7	135.9	7,080.0	1.49	-0.66	-1.34
19,820.0	90.58	177.04	12,723.7	-7,173.6	140.7	7,174.9	3.15	3.15	-0.13
19,916.0	90.01	175.95	12,723.2	-7,269.4	146.6	7,270.8	1.28	-0.59	-1.14
20,009.0	91.27	178.01	12,722.1	-7,362.3	151.5	7,363.8	2.60	1.35	2.22
20,104.0	91.93	177.51	12,719.5	-7,457.2	155.2	7,458.7	0.87	0.69	-0.53
20,199.0	96.20	185.21	12,712.8	-7,551.8	153.0	7,553.3	9.25	4.49	8.11
20,294.0	91.76	187.42	12,706.2	-7,646.0	142.6	7,647.3	5.22	-4.67	2.33
20,389.0	88.25	183.94	12,706.2	-7,740.5	133.2	7,741.6	5.20	-3.69	-3.66
20,484.0	88.66	181.47	12,708.7	-7,835.3	128.7	7,836.4	2.63	0.43	-2.60
20,578.0	86.55	179.05	12,712.6	-7,929.2	128.3	7,930.3	3.41	-2.24	-2.57
20,673.0	87.59	178.97	12,717.5	-8,024.1	129.9	8,025.1	1.10	1.09	-0.08
20,767.0	88.17	178.14	12,721.0	-8,118.0	132.3	8,119.1	1.08	0.62	-0.88
20,862.0	88.00	177.41	12,724.1	-8,212.9	135.9	8,214.0	0.79	-0.18	-0.77
20,957.0	87.02	175.93	12,728.3	-8,307.6	141.5	8,308.8	1.87	-1.03	-1.56
21,051.0	88.02	175.82	12,732.3	-8,401.3	148.2	8,402.6	1.07	1.06	-0.12
21,146.0	85.00	174.14	12,738.1	-8,495.7	156.5	8,497.1	3.64	-3.18	-1.77
21,241.0	88.71	176.52	12,743.3	-8,590.2	164.2	8,591.8	4.64	3.91	2.51
21,334.0	89.66	176.57	12,744.7	-8,683.1	169.8	8,684.7	1.02	1.02	0.05
21,429.0	90.64	177.30	12,744.4	-8,777.9	174.9	8,779.6	1.29	1.03	0.77
21,524.0	91.82	177.33	12,742.4	-8,872.8	179.4	8,874.5	1.24	1.24	0.03
21,619.0	92.56	178.24	12,738.7	-8,967.7	183.0	8,969.5	1.23	0.78	0.96
21,713.0	92.74	177.69	12,734.4	-9,061.5	186.4	9,063.3	0.62	0.19	-0.59
21,793.0	98.37	182.42	12,726.7	-9,141.1	186.3	9,142.9	9.17	7.04	5.91
21,835.0	99.83	184.81	12,720.0	-9,182.4	183.7	9,184.2	6.61	3.48	5.69
21,930.0	95.51	182.86	12,707.3	-9,276.4	177.4	9,278.0	4.98	-4.55	-2.05
22,025.0	91.11	181.13	12,701.8	-9,371.1	174.1	9,372.7	4.98	-4.63	-1.82
22,119.0	89.10	180.34	12,701.7	-9,465.1	172.9	9,466.7	2.30	-2.14	-0.84
22,214.0	87.03	179.48	12,704.9	-9,560.0	173.0	9,561.6	2.36	-2.18	-0.91
22,309.0	86.28	178.43	12,710.4	-9,654.9	174.8	9,656.4	1.36	-0.79	-1.11
22,403.0	86.45	178.02	12,716.4	-9,748.6	177.7	9,750.2	0.47	0.18	-0.44
22,498.0	85.82	177.24	12,722.8	-9,843.3	181.6	9,845.0	1.05	-0.66	-0.82
22,592.0	84.69	176.13	12,730.6	-9,936.8	187.0	9,938.6	1.68	-1.20	-1.18
22,686.0	83.25	174.89	12,740.4	-10,030.0	194.3	10,031.9	2.02	-1.53	-1.32
22,781.0	82.58	173.99	12,752.2	-10,123.9	203.5	10,125.8	1.18	-0.71	-0.95
22,815.9	83.13	173.63	12,756.5	-10,158.3	207.2	10,160.4	1.88	1.58	-1.02
LTP (BROT HELM FED COM #601H)									
22,863.3	83.88	173.15	12,761.9	-10,205.1	212.6	10,207.2	1.88	1.58	-1.02
LTP @ 22863.3'MD									
22,867.0	83.94	173.11	12,762.2	-10,208.7	213.1	10,210.9	1.88	1.58	-1.02
FINAL MWD SVY @ 22867'MD									

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well BROT HELM FED COM #601H
Project:	LEA COUNTY, NM	TVD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Site:	BULLDOG	MD Reference:	RKB= 3421' + 27' @ 3447.2usft (Nabor 893)
Well:	BROT HELM FED COM #601H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
22,900.1	83.94	173.11	12,765.7	-10,241.4	217.0	10,243.5	0.00	0.00	0.00
PBHL (BROT HELM FED COM #601H)									
22,913.0	83.94	173.11	12,767.1	-10,254.1	218.6	10,256.4	0.00	0.00	0.00
PTD @ 22913'MD									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
12,394.5	12,369.0	149.8	100.2	FTP @ 12394.5'MD
22,863.3	12,761.9	-10,205.1	212.6	LTP @ 22863.3'MD
22,867.0	12,762.2	-10,208.7	213.1	FINAL MWD SVY @ 22867'MD
22,913.0	12,767.1	-10,254.1	218.6	PTD @ 22913'MD

Checked By: _____ Approved By: _____ Date: _____