

RECEIVED

DISTRICT I
1625 N. FRENCH DR., HOBBS, NM 88240
Phone: (505) 393-6161 Fax: (505) 393-0720

DISTRICT II
811 S. FIRST ST., ARTESIA, NM 88210
Phone: (505) 748-1283 Fax: (505) 748-9720

DISTRICT III
1000 RIO BRAZOS RD., AZTEC, NM 87410
Phone: (505) 334-6178 Fax: (505) 334-6170

DISTRICT IV
1220 S. ST. FRANCIS DR., SANTA FE, NM 87505
Phone: (505) 478-3460 Fax: (505) 478-3462

State of New Mexico
Energy, Minerals & Natural Resources Department
OIL CONSERVATION DIVISION
1220 SOUTH ST. FRANCIS DR.
Santa Fe, New Mexico 87505

Form C-102

Revised August 1, 2011

Submit one copy to appropriate

District Office

☒ AMENDED REPORT

As Drilled

WELL LOCATION AND ACREAGE DEDICATION PLAT

API Number 30-015-45832		Pool Code 98220	Pool Name Purple Sage; Wolfcamp (Gas)
Property Code 325315	Property Name HOWITZER FEDERAL COM		Well Number 603H
OGRID No. 229137	Operator Name COG OPERATING, LLC		Elevation 2974.4'

Surface Location

UL or lot No.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
A	12	24-S	28-E		1044	NORTH	620	EAST	EDDY

Bottom Hole Location If Different From Surface

UL or lot No.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
D	11	24-S	28-E		1205	NORTH	201	WEST	EDDY

Dedicated Acres	Joint or Infill	Consolidation Code	Order No.
640			

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED
OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION

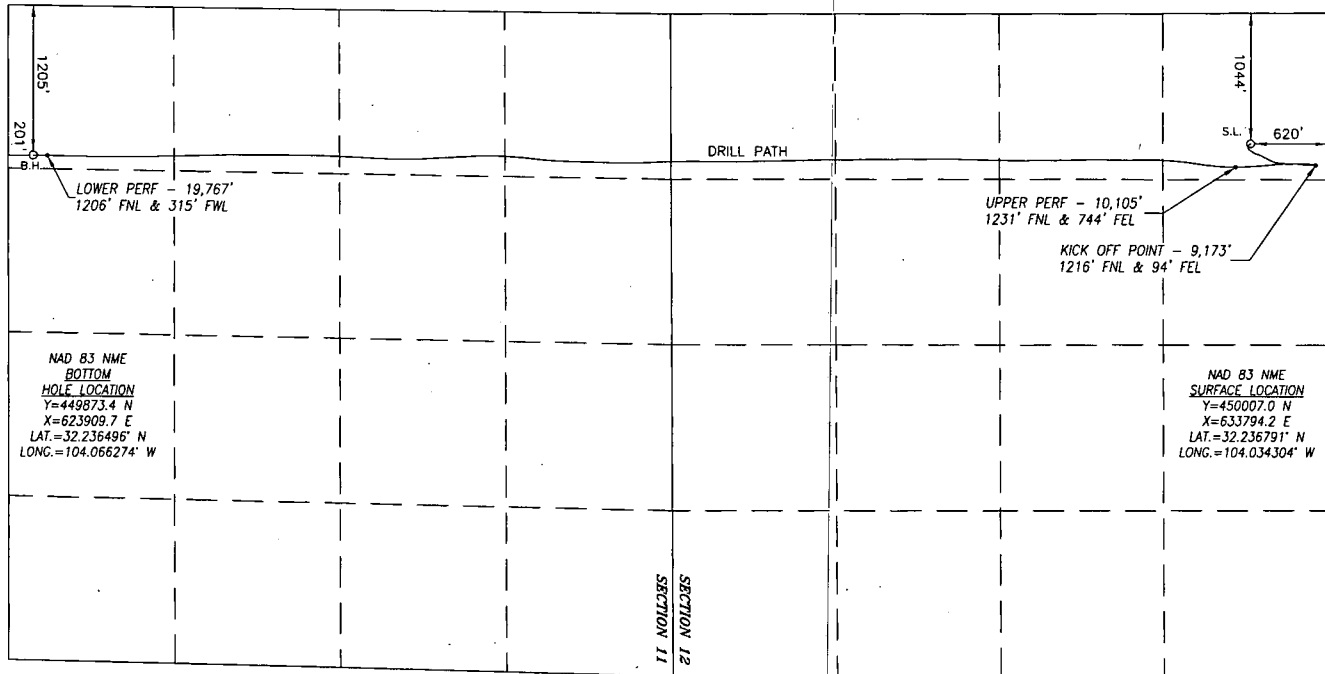
SEE PAGE 2

PAGE 1 OF 2

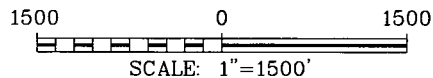
W.O. # 19-2313

DRAWN BY: WN

Property Code 325315	Property Name HOWITZER FEDERAL COM	Well Number 603H
OGRID No. 229137	Operator Name COG OPERATING, LLC	Elevation 2974.4'



SURFACE INFO AND BOREPATH SHOWN HEREON
IS BASED ON DIRECTIONAL SURVEY REPORT
PROVIDED BY COG OPERATING, LLC FOR THE
HOWITZER FEDERAL COM #603H SUPPLIED TO
HARCROW SURVEYING, LLC ON DECEMBER 11,
2019



OPERATOR CERTIFICATION

I hereby certify that the information herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Amanda Avery 1/8/2020
Signature Date

Amanda Avery
Printed Name

aaavery@concho.com
E-mail Address

SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

AUG. 28, 2018/JUNE 26, 2019

Date of Survey/Date of Geographic Survey

Signature & Seal of Professional Surveyor



Chad Harcrow 12/13/19
Certificate No. CHAD HARCROW 17777

RECEIVED

JAN 17 2020

EMNRD-OCD ARTESIA

Intent ☐ As Drilled ☒ X

API #
30-025-45832

Operator Name:
COG OPERATING, LLC

Property Name:
HOWITZER FEDERAL COM

Well Number
603H

Kick Off Point (KOP)

UL	Section	Township	Range	Lot	Feet	From N/S	Feet	From E/W	County
A	12	24S	28E		1216	NORTH	94	EAST	EDDY
Latitude 32.236321					Longitude -104.032603			NAD 83	

First Take Point (FTP)

UL	Section	Township	Range	Lot	Feet	From N/S	Feet	From E/W	County
A	12	24S	28E		1231	NORTH	744	EAST	EDDY
Latitude 32.236278					Longitude -104.034704			NAD 83	

Last Take Point (LTP)

UL	Section	Township	Range	Lot	Feet	From N/S	Feet	From E/W	County
D	11	24S	28E		1206	NORTH	315	WEST	EDDY
Latitude 32.236491					Longitude -104.065905			NAD 83	

15' RHP.
OK ~~315~~

Is this well the defining well for the Horizontal Spacing Unit?

No

Is this well an infill well?

Yes

If infill is yes please provide API if available, Operator Name and well number for Defining well for Horizontal Spacing Unit.

API #
30-015-45831

Operator Name:
COG Operating LLC

Property Name:
Howitzer Federal Com

Well Number
602H

KZ 06/29/2018

RECEIVED
JAN 17 2020
EMNRD-OCD ARTESIA

NORTHERN DELAWARE BASIN

EDDY COUNTY, NM

ATLAS

HOWITZER FEDERAL COM 603H

OWB

Design: AWP

A Certified Directional Survey
requested as required by NMOCD
Rule 19.15.16.14 NMAC

Standard Survey Report

26 August, 2019

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Project	EDDY 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	ATLAS		
Site Position:		Northing:	371,480.80 usft
From:	Map	Easting:	573,599.60 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 1' 15.933 N
		Longitude:	104° 5' 45.086 W
		Grid Convergence:	0.13 °

Well	HOWITZER FEDERAL COM 603H		
Well Position	+N/-S	0.0 usft	Northing: 449,948.10 usft
	+E/-W	0.0 usft	Easting: 592,610.60 usft
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	32° 14' 12.010 N
		Longitude:	104° 2' 1.727 W
		Ground Level:	2,974.4 usft

Wellbore	OWB		
Magnetics	Model Name	Sample Date	Declination (°)
	WMM2015	5/1/2019	7.00
		Dip Angle (°)	59.95
		Field Strength (nT)	47,690.49900027

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)
	0.0	0.0	0.0
			269.20

Survey Program	Date 7/23/2019		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name
94.8	8,950.0	GYRO-INTERMEDIATE (OWB)	Standard Keeper 104
9,108.0	19,881.0	MWD-CURVE/LATERAL (OWB)	MWD+IFR1+MS
			Description
			Standard Wireline Keeper ver 1.0.4
			OWSG MWD + IFR1 + Multi-Station 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	
94.8	0.29	82.95	94.8	0.0	0.2	-0.2	0.31	0.31	0.00	
100.0	0.30	81.71	100.0	0.0	0.3	-0.3	0.23	0.19	-23.75	
125.0	0.36	76.99	125.0	0.1	0.4	-0.4	0.26	0.24	-18.88	
150.0	0.30	68.16	150.0	0.1	0.5	-0.5	0.31	-0.24	-35.32	
175.0	0.20	114.35	175.0	0.1	0.6	-0.6	0.87	-0.40	184.76	
200.0	0.27	82.34	200.0	0.1	0.7	-0.7	0.58	0.28	-128.04	
225.0	0.15	119.95	225.0	0.1	0.8	-0.8	0.71	-0.48	150.44	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	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)	
250.0	0.22	221.06	250.0	0.0	0.8	-0.8	1.16	0.28	404.44	
275.0	0.65	232.29	275.0	-0.1	0.7	-0.7	1.75	1.72	44.92	
300.0	0.60	222.53	300.0	-0.3	0.5	-0.5	0.47	-0.20	-39.04	
325.0	0.83	226.28	325.0	-0.5	0.3	-0.3	0.94	0.92	15.00	
350.0	0.75	225.46	350.0	-0.7	0.0	0.0	0.32	-0.32	-3.28	
375.0	0.78	235.37	375.0	-0.9	-0.2	0.3	0.54	0.12	39.64	
400.0	0.91	235.44	400.0	-1.2	-0.5	0.6	0.52	0.52	0.28	
425.0	0.86	230.98	425.0	-1.4	-0.9	0.9	0.34	-0.20	-17.84	
450.0	0.82	229.82	450.0	-1.6	-1.1	1.2	0.17	-0.16	-4.64	
475.0	0.88	223.99	475.0	-1.9	-1.4	1.4	0.42	0.24	-23.32	
500.0	0.96	228.42	500.0	-2.1	-1.7	1.7	0.43	0.32	17.72	
525.0	0.71	236.95	525.0	-2.4	-2.0	2.0	1.11	-1.00	34.12	
550.0	0.75	235.60	550.0	-2.5	-2.2	2.3	0.17	0.16	-5.40	
575.0	0.83	235.57	575.0	-2.7	-2.5	2.6	0.32	0.32	-0.12	
600.0	0.87	235.82	600.0	-3.0	-2.8	2.9	0.16	0.16	1.00	
625.0	0.95	235.14	625.0	-3.2	-3.2	3.2	0.32	0.32	-2.72	
650.0	0.87	223.92	650.0	-3.4	-3.5	3.5	0.78	-0.32	-44.88	
675.0	0.84	230.34	675.0	-3.7	-3.7	3.8	0.40	-0.12	25.68	
700.0	0.77	230.57	700.0	-3.9	-4.0	4.1	0.28	-0.28	0.92	
725.0	0.74	232.67	725.0	-4.1	-4.3	4.3	0.16	-0.12	8.40	
750.0	0.83	236.68	749.9	-4.3	-4.5	4.6	0.42	0.36	16.04	
775.0	0.95	230.38	774.9	-4.5	-4.9	4.9	0.62	0.48	-25.20	
800.0	0.87	236.69	799.9	-4.8	-5.2	5.2	0.51	-0.32	25.24	
825.0	0.88	233.73	824.9	-5.0	-5.5	5.6	0.19	0.04	-11.84	
850.0	0.93	225.87	849.9	-5.3	-5.8	5.9	0.53	0.20	-31.44	
875.0	0.78	235.96	874.9	-5.5	-6.1	6.2	0.85	-0.60	40.36	
900.0	0.89	230.25	899.9	-5.7	-6.4	6.4	0.55	0.44	-22.84	
925.0	0.88	228.94	924.9	-6.0	-6.7	6.7	0.09	-0.04	-5.24	
950.0	0.79	228.65	949.9	-6.2	-6.9	7.0	0.36	-0.36	-1.16	
975.0	0.87	232.01	974.9	-6.4	-7.2	7.3	0.37	0.32	13.44	
1,000.0	1.36	215.64	999.9	-6.8	-7.5	7.6	2.32	1.96	-65.48	
1,025.0	0.84	221.32	1,024.9	-7.2	-7.8	7.9	2.12	-2.08	22.72	
1,050.0	0.88	232.47	1,049.9	-7.4	-8.1	8.2	0.69	0.16	44.60	
1,075.0	0.78	229.19	1,074.9	-7.6	-8.4	8.5	0.44	-0.40	-13.12	
1,100.0	0.75	242.35	1,099.9	-7.8	-8.7	8.8	0.71	-0.12	52.64	
1,125.0	1.07	240.82	1,124.9	-8.0	-9.0	9.1	1.28	1.28	-6.12	
1,150.0	1.03	240.34	1,149.9	-8.2	-9.4	9.5	0.16	-0.16	-1.92	
1,175.0	0.86	239.40	1,174.9	-8.5	-9.8	9.9	0.68	-0.68	-3.76	
1,200.0	0.86	237.03	1,199.9	-8.7	-10.1	10.2	0.14	0.00	-9.48	
1,225.0	0.99	229.20	1,224.9	-8.9	-10.4	10.5	0.72	0.52	-31.32	
1,250.0	1.15	222.39	1,249.9	-9.2	-10.7	10.9	0.82	0.64	-27.24	
1,275.0	0.91	227.44	1,274.9	-9.5	-11.1	11.2	1.03	-0.96	20.20	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	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)	
1,300.0	0.87	226.78	1,299.9	-9.8	-11.3	11.5	0.17	-0.16	-2.64	
1,325.0	0.91	228.29	1,324.9	-10.1	-11.6	11.8	0.19	0.16	6.04	
1,350.0	0.96	237.34	1,349.9	-10.3	-11.9	12.1	0.62	0.20	36.20	
1,375.0	1.20	228.68	1,374.9	-10.6	-12.3	12.5	1.16	0.96	-34.64	
1,400.0	1.02	229.37	1,399.9	-10.9	-12.7	12.8	0.72	-0.72	2.76	
1,425.0	1.06	225.78	1,424.9	-11.2	-13.0	13.2	0.31	0.16	-14.36	
1,450.0	0.82	237.32	1,449.9	-11.5	-13.3	13.5	1.22	-0.96	46.16	
1,475.0	1.30	221.43	1,474.9	-11.8	-13.7	13.8	2.23	1.92	-63.56	
1,500.0	1.01	217.36	1,499.8	-12.2	-14.0	14.2	1.20	-1.16	-16.28	
1,525.0	0.98	225.60	1,524.8	-12.5	-14.3	14.5	0.58	-0.12	32.96	
1,550.0	0.96	229.39	1,549.8	-12.8	-14.6	14.8	0.27	-0.08	15.16	
1,575.0	1.14	226.11	1,574.8	-13.1	-14.9	15.1	0.76	0.72	-13.12	
1,600.0	1.05	226.18	1,599.8	-13.4	-15.3	15.5	0.36	-0.36	0.28	
1,625.0	0.98	218.53	1,624.8	-13.8	-15.6	15.8	0.61	-0.28	-30.60	
1,650.0	1.00	223.76	1,649.8	-14.1	-15.9	16.1	0.37	0.08	20.92	
1,675.0	0.95	230.14	1,674.8	-14.4	-16.2	16.4	0.48	-0.20	25.52	
1,700.0	0.83	229.10	1,699.8	-14.6	-16.5	16.7	0.48	-0.48	-4.16	
1,725.0	1.08	237.45	1,724.8	-14.9	-16.8	17.0	1.14	1.00	33.40	
1,750.0	1.09	232.21	1,749.8	-15.1	-17.2	17.4	0.40	0.04	-20.96	
1,775.0	1.13	230.64	1,774.8	-15.4	-17.6	17.8	0.20	0.16	-6.28	
1,800.0	1.02	232.02	1,799.8	-15.7	-17.9	18.2	0.45	-0.44	5.52	
1,825.0	0.99	211.35	1,824.8	-16.1	-18.2	18.4	1.45	-0.12	-82.68	
1,850.0	0.87	232.40	1,849.8	-16.4	-18.5	18.7	1.44	-0.48	84.20	
1,875.0	0.98	231.42	1,874.8	-16.6	-18.8	19.0	0.44	0.44	-3.92	
1,900.0	1.05	231.80	1,899.8	-16.9	-19.1	19.4	0.28	0.28	1.52	
1,925.0	1.10	224.86	1,924.8	-17.2	-19.5	19.7	0.56	0.20	-27.76	
1,950.0	1.04	220.59	1,949.8	-17.5	-19.8	20.1	0.40	-0.24	-17.08	
1,975.0	1.12	208.27	1,974.8	-17.9	-20.1	20.3	0.98	0.32	-49.28	
2,000.0	1.15	213.88	1,999.8	-18.3	-20.3	20.6	0.46	0.12	22.44	
2,025.0	1.12	209.87	2,024.8	-18.8	-20.6	20.9	0.34	-0.12	-16.04	
2,050.0	0.98	200.75	2,049.8	-19.2	-20.8	21.1	0.87	-0.56	-36.48	
2,075.0	0.85	212.17	2,074.8	-19.5	-21.0	21.2	0.89	-0.52	45.68	
2,100.0	1.01	215.77	2,099.8	-19.9	-21.2	21.5	0.68	0.64	14.40	
2,125.0	1.11	207.96	2,124.7	-20.3	-21.4	21.7	0.70	0.40	-31.24	
2,150.0	1.19	211.40	2,149.7	-20.7	-21.7	22.0	0.42	0.32	13.76	
2,175.0	1.49	198.10	2,174.7	-21.2	-21.9	22.2	1.72	1.20	-53.20	
2,200.0	1.31	188.07	2,199.7	-21.8	-22.1	22.4	1.21	-0.72	-40.12	
2,225.0	1.19	192.04	2,224.7	-22.4	-22.2	22.5	0.59	-0.48	15.88	
2,250.0	1.14	198.47	2,249.7	-22.8	-22.3	22.6	0.56	-0.20	25.72	
2,275.0	1.22	197.48	2,274.7	-23.3	-22.4	22.8	0.33	0.32	-3.96	
2,300.0	1.53	192.88	2,299.7	-23.9	-22.6	22.9	1.32	1.24	-18.40	
2,325.0	1.66	192.10	2,324.7	-24.6	-22.8	23.1	0.53	0.52	-3.12	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	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)	
2,350.0	1.49	189.91	2,349.7	-25.3	-22.9	23.2	0.72	-0.68	-8.76	
2,375.0	1.44	185.97	2,374.7	-25.9	-23.0	23.3	0.45	-0.20	-15.76	
2,400.0	1.54	183.55	2,399.7	-26.5	-23.0	23.4	0.47	0.40	-9.68	
2,425.0	1.60	169.13	2,424.7	-27.2	-23.0	23.4	1.59	0.24	-57.68	
2,450.0	1.48	167.92	2,449.6	-27.9	-22.8	23.2	0.50	-0.48	-4.84	
2,475.0	1.58	174.20	2,474.6	-28.5	-22.7	23.1	0.78	0.40	25.12	
2,500.0	1.61	175.17	2,499.6	-29.2	-22.7	23.1	0.16	0.12	3.88	
2,525.0	1.47	167.77	2,524.6	-29.9	-22.6	23.0	0.97	-0.56	-29.60	
2,550.0	1.39	172.69	2,549.6	-30.5	-22.5	22.9	0.59	-0.32	19.68	
2,575.0	1.61	176.26	2,574.6	-31.2	-22.4	22.8	0.96	0.88	14.28	
2,600.0	1.61	177.60	2,599.6	-31.9	-22.4	22.8	0.15	0.00	5.36	
2,625.0	1.68	172.65	2,624.6	-32.6	-22.3	22.8	0.63	0.28	-19.80	
2,650.0	1.63	155.41	2,649.6	-33.3	-22.1	22.6	1.99	-0.20	-68.96	
2,675.0	1.51	165.85	2,674.6	-33.9	-21.9	22.4	1.24	-0.48	41.76	
2,700.0	1.51	171.53	2,699.6	-34.6	-21.8	22.2	0.60	0.00	22.72	
2,725.0	1.56	174.65	2,724.5	-35.2	-21.7	22.2	0.39	0.20	12.48	
2,750.0	1.59	173.94	2,749.5	-35.9	-21.6	22.1	0.14	0.12	-2.84	
2,775.0	1.87	171.83	2,774.5	-36.7	-21.5	22.0	1.15	1.12	-8.44	
2,800.0	1.59	167.85	2,799.5	-37.4	-21.4	21.9	1.22	-1.12	-15.92	
2,825.0	1.65	167.91	2,824.5	-38.1	-21.2	21.8	0.24	0.24	0.24	
2,850.0	1.81	168.16	2,849.5	-38.8	-21.1	21.6	0.64	0.64	1.00	
2,875.0	1.78	165.25	2,874.5	-39.6	-20.9	21.5	0.38	-0.12	-11.64	
2,900.0	1.90	162.24	2,899.5	-40.4	-20.7	21.2	0.62	0.48	-12.04	
2,925.0	2.18	157.46	2,924.5	-41.2	-20.4	20.9	1.31	1.12	-19.12	
2,950.0	2.77	143.63	2,949.4	-42.1	-19.8	20.4	3.34	2.36	-55.32	
2,975.0	3.19	137.94	2,974.4	-43.1	-19.0	19.6	2.05	1.68	-22.76	
3,000.0	3.47	136.50	2,999.4	-44.2	-18.0	18.6	1.17	1.12	-5.76	
3,025.0	4.10	135.77	3,024.3	-45.4	-16.9	17.5	2.53	2.52	-2.92	
3,050.0	4.39	129.60	3,049.2	-46.6	-15.5	16.2	2.16	1.16	-24.68	
3,075.0	4.45	127.79	3,074.2	-47.8	-14.0	14.7	0.61	0.24	-7.24	
3,100.0	4.68	126.12	3,099.1	-49.0	-12.4	13.1	1.06	0.92	-6.68	
3,125.0	4.78	123.66	3,124.0	-50.2	-10.7	11.4	0.90	0.40	-9.84	
3,150.0	4.64	122.73	3,148.9	-51.3	-9.0	9.7	0.64	-0.56	-3.72	
3,175.0	4.63	124.24	3,173.8	-52.4	-7.3	8.1	0.49	-0.04	6.04	
3,200.0	4.69	124.83	3,198.7	-53.6	-5.7	6.4	0.31	0.24	2.36	
3,225.0	4.67	124.17	3,223.7	-54.7	-4.0	4.7	0.23	-0.08	-2.64	
3,250.0	4.98	122.13	3,248.6	-55.9	-2.2	3.0	1.42	1.24	-8.16	
3,275.0	4.84	124.80	3,273.5	-57.1	-0.4	1.2	1.07	-0.56	10.68	
3,300.0	4.66	125.07	3,298.4	-58.3	1.3	-0.5	0.73	-0.72	1.08	
3,325.0	4.54	123.04	3,323.3	-59.4	2.9	-2.1	0.81	-0.48	-8.12	
3,350.0	4.59	122.04	3,348.2	-60.5	4.6	-3.8	0.38	0.20	-4.00	
3,375.0	4.54	125.82	3,373.2	-61.6	6.3	-5.4	1.22	-0.20	15.12	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	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)	
3,400.0	4.43	123.17	3,398.1	-62.7	7.9	-7.0	0.94	-0.44	-10.60	
3,425.0	4.45	122.13	3,423.0	-63.7	9.5	-8.6	0.33	0.08	-4.16	
3,450.0	4.49	122.28	3,447.9	-64.8	11.1	-10.2	0.17	0.16	0.60	
3,475.0	4.58	120.14	3,472.8	-65.8	12.8	-11.9	0.77	0.36	-8.56	
3,500.0	4.60	118.95	3,497.8	-66.8	14.6	-13.6	0.39	0.08	-4.76	
3,525.0	4.26	121.07	3,522.7	-67.7	16.2	-15.3	1.51	-1.36	8.48	
3,550.0	4.10	122.18	3,547.6	-68.7	17.8	-16.8	0.72	-0.64	4.44	
3,575.0	4.06	122.57	3,572.6	-69.6	19.3	-18.3	0.19	-0.16	1.56	
3,600.0	4.09	121.95	3,597.5	-70.6	20.8	-19.8	0.21	0.12	-2.48	
3,625.0	4.14	121.36	3,622.4	-71.5	22.3	-21.3	0.26	0.20	-2.36	
3,650.0	3.88	119.92	3,647.4	-72.4	23.8	-22.8	1.12	-1.04	-5.76	
3,675.0	3.74	119.71	3,672.3	-73.2	25.3	-24.3	0.56	-0.56	-0.84	
3,700.0	3.67	119.69	3,697.3	-74.0	26.7	-25.6	0.28	-0.28	-0.08	
3,725.0	3.70	120.63	3,722.2	-74.9	28.1	-27.0	0.27	0.12	3.76	
3,750.0	3.79	117.16	3,747.2	-75.6	29.5	-28.4	0.98	0.36	-13.88	
3,775.0	3.67	118.46	3,772.1	-76.4	30.9	-29.9	0.59	-0.48	5.20	
3,800.0	3.70	118.35	3,797.1	-77.2	32.4	-31.3	0.12	0.12	-0.44	
3,825.0	3.84	114.17	3,822.0	-77.9	33.8	-32.7	1.23	0.56	-16.72	
3,850.0	3.78	110.97	3,846.9	-78.5	35.4	-34.3	0.88	-0.24	-12.80	
3,875.0	3.82	110.96	3,871.9	-79.1	36.9	-35.8	0.16	0.16	-0.04	
3,900.0	3.86	110.95	3,896.8	-79.7	38.5	-37.4	0.16	0.16	-0.04	
3,925.0	4.04	108.64	3,921.8	-80.3	40.1	-39.0	0.96	0.72	-9.24	
3,950.0	4.25	106.00	3,946.7	-80.8	41.8	-40.7	1.13	0.84	-10.56	
3,975.0	4.48	104.79	3,971.6	-81.3	43.6	-42.5	0.99	0.92	-4.84	
4,000.0	4.29	108.13	3,996.6	-81.9	45.5	-44.3	1.27	-0.76	13.36	
4,025.0	4.54	105.44	4,021.5	-82.4	47.3	-46.2	1.30	1.00	-10.76	
4,050.0	4.37	103.50	4,046.4	-82.9	49.2	-48.0	0.91	-0.68	-7.76	
4,075.0	4.35	105.29	4,071.3	-83.4	51.0	-49.9	0.55	-0.08	7.16	
4,100.0	4.58	104.08	4,096.3	-83.9	52.9	-51.8	0.99	0.92	-4.84	
4,125.0	4.68	106.17	4,121.2	-84.4	54.9	-53.7	0.78	0.40	8.36	
4,150.0	4.78	109.48	4,146.1	-85.0	56.8	-55.6	1.16	0.40	13.24	
4,175.0	4.83	109.53	4,171.0	-85.7	58.8	-57.6	0.20	0.20	0.20	
4,200.0	5.04	108.60	4,195.9	-86.4	60.8	-59.6	0.90	0.84	-3.72	
4,225.0	5.10	112.47	4,220.8	-87.2	62.9	-61.7	1.39	0.24	15.48	
4,250.0	5.14	112.63	4,245.7	-88.1	65.0	-63.7	0.17	0.16	0.64	
4,275.0	5.22	113.25	4,270.6	-89.0	67.0	-65.8	0.39	0.32	2.48	
4,300.0	5.59	113.56	4,295.5	-89.9	69.2	-68.0	1.48	1.48	1.24	
4,325.0	5.88	113.18	4,320.4	-90.9	71.5	-70.2	1.17	1.16	-1.52	
4,350.0	6.06	113.92	4,345.3	-91.9	73.9	-72.6	0.78	0.72	2.96	
4,375.0	6.03	114.75	4,370.1	-93.0	76.3	-75.0	0.37	-0.12	3.32	
4,400.0	5.92	114.39	4,395.0	-94.1	78.7	-77.3	0.46	-0.44	-1.44	
4,425.0	6.10	115.36	4,419.8	-95.2	81.0	-79.7	0.83	0.72	3.88	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	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)	
4,450.0	6.22	113.51	4,444.7	-96.3	83.5	-82.1	0.93	0.48	-7.40	
4,475.0	6.30	113.45	4,469.5	-97.4	86.0	-84.6	0.32	0.32	-0.24	
4,500.0	6.30	114.42	4,494.4	-98.5	88.5	-87.1	0.43	0.00	3.88	
4,525.0	6.46	114.12	4,519.2	-99.6	91.0	-89.6	0.65	0.64	-1.20	
4,550.0	6.84	114.08	4,544.1	-100.8	93.7	-92.2	1.52	1.52	-0.16	
4,575.0	7.21	113.12	4,568.9	-102.0	96.5	-95.0	1.55	1.48	-3.84	
4,600.0	7.08	114.44	4,593.7	-103.3	99.3	-97.9	0.84	-0.52	5.28	
4,625.0	7.15	115.08	4,618.5	-104.6	102.1	-100.6	0.42	0.28	2.56	
4,650.0	7.05	116.29	4,643.3	-105.9	104.9	-103.4	0.72	-0.40	4.84	
4,675.0	7.32	113.25	4,668.1	-107.2	107.7	-106.2	1.86	1.08	-12.16	
4,700.0	7.28	113.57	4,692.9	-108.5	110.6	-109.1	0.23	-0.16	1.28	
4,725.0	7.13	114.68	4,717.7	-109.8	113.5	-112.0	0.82	-0.60	4.44	
4,750.0	7.32	115.64	4,742.5	-111.1	116.4	-114.8	0.90	0.76	3.84	
4,775.0	7.10	115.11	4,767.3	-112.5	119.2	-117.6	0.92	-0.88	-2.12	
4,800.0	7.01	115.88	4,792.1	-113.8	122.0	-120.4	0.52	-0.36	3.08	
4,825.0	6.89	115.23	4,816.9	-115.1	124.7	-123.1	0.57	-0.48	-2.60	
4,850.0	6.65	115.84	4,841.8	-116.4	127.4	-125.7	1.00	-0.96	2.44	
4,875.0	6.40	116.07	4,866.6	-117.6	129.9	-128.3	1.01	-1.00	0.92	
4,900.0	6.47	115.25	4,891.4	-118.8	132.4	-130.8	0.46	0.28	-3.28	
4,925.0	6.42	115.42	4,916.3	-120.0	135.0	-133.3	0.21	-0.20	0.68	
4,950.0	6.10	120.66	4,941.1	-121.3	137.4	-135.7	2.62	-1.28	20.96	
4,975.0	6.01	119.18	4,966.0	-122.6	139.7	-137.9	0.72	-0.36	-5.92	
5,000.0	5.97	117.90	4,990.9	-123.9	141.9	-140.2	0.56	-0.16	-5.12	
5,025.0	5.87	118.50	5,015.7	-125.1	144.2	-142.5	0.47	-0.40	2.40	
5,050.0	5.63	119.97	5,040.6	-126.3	146.4	-144.6	1.13	-0.96	5.88	
5,075.0	5.41	120.03	5,065.5	-127.5	148.5	-146.7	0.88	-0.88	0.24	
5,100.0	5.36	119.82	5,090.4	-128.7	150.5	-148.7	0.21	-0.20	-0.84	
5,125.0	5.33	118.83	5,115.3	-129.8	152.6	-150.7	0.39	-0.12	-3.96	
5,150.0	5.25	116.08	5,140.2	-130.9	154.6	-152.8	1.06	-0.32	-11.00	
5,175.0	4.85	117.26	5,165.1	-131.9	156.6	-154.7	1.65	-1.60	4.72	
5,200.0	4.95	119.11	5,190.0	-132.9	158.4	-156.6	0.75	0.40	7.40	
5,225.0	4.78	118.01	5,214.9	-133.9	160.3	-158.4	0.78	-0.68	-4.40	
5,250.0	4.51	117.20	5,239.8	-134.8	162.1	-160.2	1.11	-1.08	-3.24	
5,275.0	4.88	118.37	5,264.7	-135.8	163.9	-162.0	1.53	1.48	4.68	
5,300.0	4.63	118.45	5,289.6	-136.8	165.7	-163.8	1.00	-1.00	0.32	
5,325.0	4.53	117.72	5,314.6	-137.7	167.5	-165.6	0.46	-0.40	-2.92	
5,350.0	4.62	117.12	5,339.5	-138.6	169.3	-167.3	0.41	0.36	-2.40	
5,375.0	4.71	113.85	5,364.4	-139.5	171.1	-169.1	1.12	0.36	-13.08	
5,400.0	5.29	110.68	5,389.3	-140.3	173.1	-171.1	2.57	2.32	-12.68	
5,425.0	5.35	111.41	5,414.2	-141.2	175.3	-173.3	0.36	0.24	2.92	
5,450.0	5.56	110.12	5,439.1	-142.0	177.5	-175.5	0.97	0.84	-5.16	
5,475.0	5.58	109.21	5,464.0	-142.8	179.8	-177.8	0.36	0.08	-3.64	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	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)	
5,500.0	5.47	108.86	5,488.8	-143.6	182.1	-180.0	0.46	-0.44	-1.40	
5,525.0	5.66	109.60	5,513.7	-144.4	184.4	-182.3	0.81	0.76	2.96	
5,550.0	5.62	108.73	5,538.6	-145.2	186.7	-184.6	0.38	-0.16	-3.48	
5,575.0	5.72	109.13	5,563.5	-146.0	189.0	-187.0	0.43	0.40	1.60	
5,600.0	5.79	107.44	5,588.4	-146.8	191.4	-189.3	0.73	0.28	-6.76	
5,625.0	5.83	105.32	5,613.2	-147.5	193.8	-191.7	0.87	0.16	-8.48	
5,650.0	6.01	105.90	5,638.1	-148.2	196.3	-194.2	0.76	0.72	2.32	
5,675.0	6.19	102.56	5,662.9	-148.8	198.9	-196.8	1.59	0.72	-13.36	
5,700.0	6.20	101.33	5,687.8	-149.4	201.5	-199.4	0.53	0.04	-4.92	
5,725.0	6.54	99.46	5,712.6	-149.9	204.2	-202.1	1.59	1.36	-7.48	
5,750.0	6.95	98.12	5,737.5	-150.4	207.1	-205.0	1.76	1.64	-5.36	
5,775.0	7.01	98.15	5,762.3	-150.8	210.2	-208.0	0.24	0.24	0.12	
5,800.0	6.95	98.22	5,787.1	-151.2	213.2	-211.0	0.24	-0.24	0.28	
5,825.0	7.08	97.76	5,811.9	-151.6	216.2	-214.1	0.57	0.52	-1.84	
5,850.0	7.12	97.16	5,836.7	-152.0	219.2	-217.1	0.34	0.16	-2.40	
5,875.0	7.26	96.85	5,861.5	-152.4	222.4	-220.2	0.58	0.56	-1.24	
5,900.0	6.91	95.97	5,886.3	-152.8	225.4	-223.3	1.47	-1.40	-3.52	
5,925.0	6.89	96.02	5,911.2	-153.1	228.4	-226.3	0.08	-0.08	0.20	
5,950.0	6.98	96.05	5,936.0	-153.4	231.4	-229.2	0.36	0.36	0.12	
5,975.0	7.06	94.19	5,960.8	-153.7	234.4	-232.3	0.96	0.32	-7.44	
6,000.0	7.04	95.12	5,985.6	-153.9	237.5	-235.3	0.46	-0.08	3.72	
6,025.0	6.66	95.30	6,010.4	-154.2	240.5	-238.3	1.52	-1.52	0.72	
6,050.0	6.66	96.14	6,035.3	-154.5	243.4	-241.2	0.39	0.00	3.36	
6,075.0	6.61	95.13	6,060.1	-154.8	246.2	-244.1	0.51	-0.20	-4.04	
6,100.0	6.63	96.09	6,084.9	-155.0	249.1	-246.9	0.45	0.08	3.84	
6,125.0	6.55	95.21	6,109.8	-155.3	252.0	-249.8	0.52	-0.32	-3.52	
6,150.0	6.51	96.22	6,134.6	-155.6	254.8	-252.6	0.49	-0.16	4.04	
6,175.0	6.50	96.39	6,159.4	-155.9	257.6	-255.4	0.09	-0.04	0.68	
6,200.0	6.40	97.60	6,184.3	-156.3	260.4	-258.2	0.67	-0.40	4.84	
6,225.0	6.51	95.19	6,209.1	-156.6	263.2	-261.0	1.17	0.44	-9.64	
6,250.0	6.22	96.73	6,234.0	-156.9	265.9	-263.7	1.35	-1.16	6.16	
6,275.0	6.32	96.84	6,258.8	-157.2	268.7	-266.4	0.40	0.40	0.44	
6,300.0	6.34	96.92	6,283.7	-157.5	271.4	-269.2	0.09	0.08	0.32	
6,325.0	6.35	97.16	6,308.5	-157.9	274.1	-271.9	0.11	0.04	0.96	
6,350.0	6.27	96.59	6,333.4	-158.2	276.9	-274.6	0.41	-0.32	-2.28	
6,375.0	6.23	98.27	6,358.2	-158.5	279.6	-277.3	0.75	-0.16	6.72	
6,400.0	6.25	97.67	6,383.1	-158.9	282.2	-280.0	0.27	0.08	-2.40	
6,425.0	6.17	96.34	6,407.9	-159.2	284.9	-282.7	0.66	-0.32	-5.32	
6,450.0	6.00	99.87	6,432.8	-159.6	287.6	-285.3	1.64	-0.68	14.12	
6,475.0	6.05	98.26	6,457.6	-160.0	290.1	-287.9	0.70	0.20	-6.44	
6,500.0	5.94	97.83	6,482.5	-160.4	292.7	-290.5	0.48	-0.44	-1.72	
6,525.0	6.11	98.78	6,507.4	-160.8	295.3	-293.1	0.79	0.68	3.80	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	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)
6,550.0	6.23	98.25	6,532.2	-161.2	298.0	-295.7	0.53	0.48	-2.12
6,575.0	6.24	97.17	6,557.1	-161.5	300.7	-298.4	0.47	0.04	-4.32
6,600.0	6.22	98.82	6,581.9	-161.9	303.4	-301.1	0.72	-0.08	6.60
6,625.0	6.07	97.42	6,606.8	-162.3	306.0	-303.7	0.85	-0.60	-5.60
6,650.0	6.19	96.95	6,631.6	-162.6	308.7	-306.4	0.52	0.48	-1.88
6,675.0	6.40	96.13	6,656.5	-162.9	311.4	-309.1	0.91	0.84	-3.28
6,700.0	6.21	95.94	6,681.3	-163.2	314.1	-311.8	0.76	-0.76	-0.76
6,725.0	6.52	90.37	6,706.2	-163.4	316.9	-314.6	2.76	1.24	-22.28
6,750.0	6.49	86.78	6,731.0	-163.3	319.7	-317.4	1.63	-0.12	-14.36
6,775.0	6.66	84.97	6,755.8	-163.1	322.6	-320.3	1.07	0.68	-7.24
6,800.0	6.59	84.21	6,780.7	-162.8	325.4	-323.1	0.45	-0.28	-3.04
6,825.0	6.54	83.99	6,805.5	-162.5	328.3	-326.0	0.22	-0.20	-0.88
6,850.0	6.18	83.59	6,830.4	-162.2	331.0	-328.7	1.45	-1.44	-1.60
6,875.0	6.03	84.00	6,855.2	-161.9	333.7	-331.4	0.62	-0.60	1.64
6,900.0	6.07	82.96	6,880.1	-161.6	336.3	-334.0	0.47	0.16	-4.16
6,925.0	5.99	82.42	6,904.9	-161.3	338.9	-336.6	0.39	-0.32	-2.16
6,950.0	6.04	81.87	6,929.8	-161.0	341.5	-339.2	0.31	0.20	-2.20
6,975.0	6.19	82.80	6,954.7	-160.6	344.1	-341.9	0.72	0.60	3.72
7,000.0	6.51	83.46	6,979.5	-160.3	346.9	-344.6	1.31	1.28	2.64
7,025.0	6.45	82.79	7,004.3	-159.9	349.7	-347.4	0.39	-0.24	-2.68
7,050.0	6.69	82.34	7,029.2	-159.6	352.5	-350.3	0.98	0.96	-1.80
7,075.0	6.40	82.29	7,054.0	-159.2	355.3	-353.1	1.16	-1.16	-0.20
7,100.0	6.24	82.20	7,078.9	-158.8	358.1	-355.8	0.64	-0.64	-0.36
7,125.0	6.03	81.90	7,103.7	-158.4	360.7	-358.5	0.85	-0.84	-1.20
7,150.0	6.15	82.68	7,128.6	-158.1	363.3	-361.1	0.58	0.48	3.12
7,175.0	6.00	92.88	7,153.4	-158.0	366.0	-363.7	4.35	-0.60	40.80
7,200.0	5.88	99.02	7,178.3	-158.2	368.5	-366.3	2.59	-0.48	24.56
7,225.0	5.92	100.02	7,203.2	-158.7	371.1	-368.8	0.44	0.16	4.00
7,250.0	6.20	99.68	7,228.0	-159.1	373.7	-371.4	1.13	1.12	-1.36
7,275.0	6.00	99.76	7,252.9	-159.6	376.3	-374.0	0.80	-0.80	0.32
7,300.0	5.99	100.72	7,277.8	-160.0	378.9	-376.6	0.40	-0.04	3.84
7,325.0	6.01	99.64	7,302.6	-160.5	381.4	-379.2	0.46	0.08	-4.32
7,350.0	6.10	98.09	7,327.5	-160.9	384.0	-381.8	0.75	0.36	-6.20
7,375.0	6.25	97.97	7,352.3	-161.3	386.7	-384.4	0.60	0.60	-0.48
7,400.0	6.35	97.64	7,377.2	-161.6	389.4	-387.1	0.43	0.40	-1.32
7,425.0	6.46	97.70	7,402.0	-162.0	392.2	-389.9	0.44	0.44	0.24
7,450.0	6.36	96.01	7,426.9	-162.4	395.0	-392.7	0.85	-0.40	-6.76
7,475.0	6.46	96.19	7,451.7	-162.7	397.7	-395.4	0.41	0.40	0.72
7,500.0	6.75	95.68	7,476.6	-162.9	400.6	-398.3	1.18	1.16	-2.04
7,525.0	6.76	96.57	7,501.4	-163.3	403.5	-401.2	0.42	0.04	3.56
7,550.0	6.87	96.37	7,526.2	-163.6	406.5	-404.1	0.45	0.44	-0.80
7,575.0	6.93	98.13	7,551.0	-164.0	409.4	-407.1	0.88	0.24	7.04

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	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)
7,600.0	6.91	96.72	7,575.8	-164.4	412.4	-410.1	0.68	-0.08	-5.64
7,625.0	7.03	97.34	7,600.7	-164.7	415.4	-413.1	0.57	0.48	2.48
7,650.0	7.15	98.28	7,625.5	-165.2	418.5	-416.2	0.67	0.48	3.76
7,675.0	6.99	99.33	7,650.3	-165.6	421.5	-419.2	0.82	-0.64	4.20
7,700.0	6.70	99.91	7,675.1	-166.1	424.5	-422.1	1.19	-1.16	2.32
7,725.0	6.67	100.91	7,699.9	-166.7	427.3	-425.0	0.48	-0.12	4.00
7,750.0	6.57	100.76	7,724.8	-167.2	430.2	-427.8	0.41	-0.40	-0.60
7,775.0	6.43	100.59	7,749.6	-167.7	432.9	-430.6	0.57	-0.56	-0.68
7,800.0	6.26	100.80	7,774.4	-168.2	435.7	-433.3	0.69	-0.68	0.84
7,825.0	5.79	99.62	7,799.3	-168.7	438.2	-435.9	1.94	-1.88	-4.72
7,850.0	5.38	98.52	7,824.2	-169.1	440.6	-438.3	1.69	-1.64	-4.40
7,875.0	5.34	96.25	7,849.1	-169.4	443.0	-440.6	0.86	-0.16	-9.08
7,900.0	5.20	94.93	7,874.0	-169.6	445.2	-442.8	0.74	-0.56	-5.28
7,925.0	5.42	94.57	7,898.9	-169.8	447.6	-445.1	0.89	0.88	-1.44
7,950.0	6.13	92.27	7,923.7	-169.9	450.1	-447.7	2.99	2.84	-9.20
7,975.0	6.82	89.68	7,948.6	-170.0	452.9	-450.5	3.00	2.76	-10.36
8,000.0	6.94	90.67	7,973.4	-170.0	455.9	-453.5	0.67	0.48	3.96
8,025.0	7.11	89.94	7,998.2	-170.0	458.9	-456.5	0.77	0.68	-2.92
8,050.0	7.26	89.83	8,023.0	-170.0	462.1	-459.6	0.60	0.60	-0.44
8,075.0	6.85	88.63	8,047.8	-170.0	465.1	-462.7	1.74	-1.64	-4.80
8,100.0	6.35	88.21	8,072.7	-169.9	468.0	-465.6	2.01	-2.00	-1.68
8,125.0	6.14	84.94	8,097.5	-169.7	470.7	-468.3	1.65	-0.84	-13.08
8,150.0	5.84	83.28	8,122.4	-169.5	473.3	-470.9	1.39	-1.20	-6.64
8,175.0	5.44	82.37	8,147.3	-169.2	475.7	-473.3	1.64	-1.60	-3.64
8,200.0	5.06	81.81	8,172.2	-168.8	478.0	-475.6	1.53	-1.52	-2.24
8,225.0	4.70	80.64	8,197.1	-168.5	480.1	-477.7	1.49	-1.44	-4.68
8,250.0	4.51	80.60	8,222.0	-168.2	482.1	-479.7	0.76	-0.76	-0.16
8,275.0	4.32	80.96	8,246.9	-167.9	484.0	-481.6	0.77	-0.76	1.44
8,300.0	4.21	79.98	8,271.8	-167.6	485.8	-483.5	0.53	-0.44	-3.92
8,325.0	4.08	83.42	8,296.8	-167.3	487.6	-485.2	1.12	-0.52	13.76
8,350.0	4.38	84.96	8,321.7	-167.1	489.5	-487.1	1.28	1.20	6.16
8,375.0	4.39	82.12	8,346.6	-166.9	491.4	-489.0	0.87	0.04	-11.36
8,400.0	4.26	80.25	8,371.6	-166.6	493.2	-490.8	0.77	-0.52	-7.48
8,425.0	4.02	81.00	8,396.5	-166.3	495.0	-492.6	0.98	-0.96	3.00
8,450.0	4.25	83.62	8,421.4	-166.1	496.8	-494.4	1.19	0.92	10.48
8,475.0	4.37	81.62	8,446.4	-165.8	498.6	-496.3	0.77	0.48	-8.00
8,500.0	3.89	78.40	8,471.3	-165.5	500.4	-498.1	2.13	-1.92	-12.88
8,525.0	3.73	82.10	8,496.2	-165.3	502.1	-499.7	1.17	-0.64	14.80
8,550.0	3.93	82.41	8,521.2	-165.0	503.7	-501.4	0.80	0.80	1.24
8,575.0	3.92	80.61	8,546.1	-164.8	505.4	-503.1	0.49	-0.04	-7.20
8,600.0	3.77	77.93	8,571.1	-164.5	507.0	-504.7	0.94	-0.60	-10.72
8,625.0	3.56	80.52	8,596.0	-164.2	508.6	-506.3	1.07	-0.84	10.36

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	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)	
8,650.0	3.35	77.47	8,621.0	-163.9	510.1	-507.8	1.12	-0.84	-12.20	
8,675.0	2.91	76.83	8,645.9	-163.6	511.4	-509.1	1.77	-1.76	-2.56	
8,700.0	2.61	82.49	8,670.9	-163.4	512.6	-510.3	1.62	-1.20	22.64	
8,725.0	2.66	88.61	8,695.9	-163.3	513.8	-511.4	1.14	0.20	24.48	
8,750.0	2.74	88.08	8,720.8	-163.2	514.9	-512.6	0.34	0.32	-2.12	
8,775.0	2.40	88.55	8,745.8	-163.2	516.0	-513.7	1.36	-1.36	1.88	
8,800.0	2.16	98.53	8,770.8	-163.3	517.0	-514.7	1.85	-0.96	39.92	
8,825.0	2.33	115.52	8,795.8	-163.5	518.0	-515.6	2.74	0.68	67.96	
8,850.0	2.30	114.88	8,820.8	-164.0	518.9	-516.5	0.16	-0.12	-2.56	
8,875.0	2.18	119.88	8,845.7	-164.4	519.7	-517.4	0.92	-0.48	20.00	
8,900.0	1.96	123.11	8,870.7	-164.9	520.5	-518.2	1.00	-0.88	12.92	
8,925.0	1.94	130.35	8,895.7	-165.4	521.2	-518.8	0.99	-0.08	28.96	
8,950.0	2.15	135.65	8,920.7	-166.0	521.8	-519.5	1.13	0.84	21.20	
9,108.0	1.39	126.37	9,078.6	-169.3	525.5	-523.1	0.51	-0.48	-5.87	
First MWD Survey @ 9108'MD										
9,125.0	1.33	119.26	9,095.6	-169.5	525.8	-523.4	1.05	-0.35	-41.82	
9,157.0	1.12	106.45	9,127.6	-169.8	526.4	-524.0	1.07	-0.66	-40.03	
9,188.0	0.56	359.96	9,158.6	-169.7	526.7	-524.3	4.47	-1.81	-343.52	
9,220.0	4.71	285.86	9,190.6	-169.2	525.4	-523.0	14.34	12.97	-231.56	
9,252.0	10.33	281.14	9,222.3	-168.3	521.4	-519.0	17.65	17.56	-14.75	
9,283.0	15.83	282.87	9,252.5	-166.8	514.5	-512.1	17.78	17.74	5.58	
9,315.0	22.23	280.74	9,282.7	-164.7	504.3	-502.0	20.11	20.00	-6.66	
9,347.0	27.00	279.82	9,311.8	-162.3	491.2	-488.9	14.95	14.91	-2.88	
9,378.0	31.03	276.09	9,338.9	-160.3	476.3	-474.0	14.24	13.00	-12.03	
9,409.0	34.31	270.29	9,365.0	-159.4	459.6	-457.3	14.62	10.58	-18.71	
9,441.0	39.66	268.01	9,390.5	-159.7	440.4	-438.1	17.26	16.72	-7.13	
9,472.0	43.34	270.45	9,413.8	-159.9	419.8	-417.6	12.96	11.87	7.87	
9,504.0	47.96	272.35	9,436.1	-159.4	397.0	-394.7	15.05	14.44	5.94	
9,536.0	48.30	271.42	9,457.5	-158.6	373.2	-370.9	2.41	1.06	-2.91	
9,567.0	50.63	271.24	9,477.6	-158.0	349.6	-347.4	7.53	7.52	-0.58	
9,599.0	52.69	269.63	9,497.5	-157.8	324.5	-322.3	7.55	6.44	-5.03	
9,631.0	56.11	267.40	9,516.1	-158.5	298.5	-296.3	12.10	10.69	-6.97	
9,640.0	57.01	267.04	9,521.1	-158.9	291.0	-288.8	10.55	10.02	-3.97	
FTP @ 9640.2'MD / 9521.2'TVD										
9,662.0	59.22	266.20	9,532.7	-160.0	272.4	-270.1	10.55	10.04	-3.83	
9,694.0	60.42	265.97	9,548.8	-161.9	244.8	-242.5	3.80	3.75	-0.72	
9,725.0	60.49	265.25	9,564.1	-164.0	217.9	-215.6	2.03	0.23	-2.32	
9,757.0	61.32	265.26	9,579.6	-166.3	190.0	-187.7	2.59	2.59	0.03	
9,788.0	61.54	265.25	9,594.4	-168.5	162.9	-160.5	0.71	0.71	-0.03	
9,820.0	62.05	264.91	9,609.6	-170.9	134.8	-132.4	1.85	1.59	-1.06	
9,852.0	62.28	264.46	9,624.5	-173.6	106.6	-104.2	1.44	0.72	-1.41	
9,883.0	62.37	264.18	9,638.9	-176.3	79.3	-76.8	0.85	0.29	-0.90	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	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)
9,915.0	62.28	263.79	9,653.8	-179.2	51.1	-48.6	1.12	-0.28	-1.22
9,946.0	62.91	263.95	9,668.0	-182.2	23.7	-21.2	2.08	2.03	0.52
9,978.0	64.77	266.20	9,682.1	-184.6	-4.9	7.4	8.58	5.81	7.03
10,010.0	67.02	268.57	9,695.2	-186.0	-34.1	36.6	9.75	7.03	7.41
10,041.0	68.41	269.51	9,707.0	-186.5	-62.7	65.3	5.29	4.48	3.03
10,073.0	70.81	269.22	9,718.1	-186.8	-92.7	95.3	7.55	7.50	-0.91
10,105.0	72.69	269.63	9,728.1	-187.1	-123.1	125.7	6.00	5.88	1.28
10,136.0	75.95	270.61	9,736.5	-187.0	-153.0	155.5	10.95	10.52	3.16
10,168.0	78.05	271.99	9,743.7	-186.3	-184.1	186.7	7.79	6.56	4.31
10,200.0	81.27	273.41	9,749.5	-184.8	-215.6	218.1	10.97	10.06	4.44
10,231.0	84.74	274.52	9,753.2	-182.7	-246.3	248.8	11.74	11.19	3.58
10,263.0	87.02	275.83	9,755.5	-179.8	-278.0	280.5	8.21	7.13	4.09
10,294.0	87.74	276.13	9,757.0	-176.6	-308.8	311.3	2.52	2.32	0.97
10,326.0	88.25	275.87	9,758.1	-173.3	-340.6	343.0	1.79	1.59	-0.81
10,358.0	89.48	276.07	9,758.7	-169.9	-372.5	374.8	3.89	3.84	0.63
10,393.0	90.85	277.05	9,758.6	-165.9	-407.2	409.5	4.81	3.91	2.80
10,465.0	91.89	277.62	9,756.9	-156.7	-478.6	480.8	1.65	1.44	0.79
10,560.0	89.57	275.87	9,755.7	-145.6	-572.9	574.9	3.06	-2.44	-1.84
10,655.0	88.84	273.73	9,757.0	-137.6	-667.6	669.4	2.38	-0.77	-2.25
10,750.0	89.20	271.14	9,758.6	-133.6	-762.5	764.3	2.75	0.38	-2.73
10,845.0	88.81	268.80	9,760.3	-133.7	-857.5	859.2	2.50	-0.41	-2.46
10,940.0	92.45	269.17	9,759.2	-135.3	-952.4	954.2	3.85	3.83	0.39
11,035.0	94.22	270.04	9,753.7	-136.0	-1,047.3	1,049.1	2.08	1.86	0.92
11,130.0	94.19	269.81	9,746.7	-136.1	-1,142.0	1,143.8	0.24	-0.03	-0.24
11,224.0	93.86	269.46	9,740.1	-136.7	-1,235.8	1,237.6	0.51	-0.35	-0.37
11,319.0	93.63	269.27	9,733.9	-137.8	-1,330.6	1,332.4	0.31	-0.24	-0.20
11,414.0	94.02	269.48	9,727.6	-138.8	-1,425.3	1,427.1	0.47	0.41	0.22
11,509.0	92.73	269.38	9,722.0	-139.7	-1,520.2	1,522.0	1.36	-1.36	-0.11
11,604.0	92.20	269.35	9,717.9	-140.8	-1,615.1	1,616.9	0.56	-0.56	-0.03
11,654.0	92.37	269.06	9,715.9	-141.5	-1,665.0	1,666.8	0.67	0.34	-0.58
11,749.0	91.78	269.19	9,712.5	-142.9	-1,760.0	1,761.8	0.64	-0.62	0.14
11,844.0	90.74	268.80	9,710.4	-144.6	-1,854.9	1,856.8	1.17	-1.09	-0.41
11,939.0	89.65	270.58	9,710.1	-145.1	-1,949.9	1,951.7	2.20	-1.15	1.87
12,034.0	89.54	270.67	9,710.7	-144.1	-2,044.9	2,046.7	0.15	-0.12	0.09
12,129.0	88.16	271.37	9,712.6	-142.4	-2,139.9	2,141.6	1.63	-1.45	0.74
12,224.0	92.31	272.24	9,712.3	-139.4	-2,234.8	2,236.5	4.46	4.37	0.92
12,319.0	90.21	271.34	9,710.2	-136.4	-2,329.7	2,331.4	2.40	-2.21	-0.95
12,413.0	88.47	270.20	9,711.2	-135.2	-2,423.7	2,425.4	2.21	-1.85	-1.21
12,508.0	88.69	269.42	9,713.6	-135.5	-2,518.7	2,520.3	0.85	0.23	-0.82
12,603.0	90.27	269.71	9,714.5	-136.2	-2,613.7	2,615.3	1.69	1.66	0.31
12,698.0	87.99	268.74	9,715.9	-137.5	-2,708.6	2,710.3	2.61	-2.40	-1.02
12,793.0	89.79	269.15	9,717.7	-139.2	-2,803.6	2,805.3	1.94	1.89	0.43

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	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)
12,888.0	92.74	270.15	9,715.6	-139.8	-2,898.6	2,900.2	3.28	3.11	1.05
12,983.0	91.95	269.99	9,711.8	-139.7	-2,993.5	2,995.1	0.85	-0.83	-0.17
13,077.0	91.73	269.52	9,708.7	-140.1	-3,087.4	3,089.1	0.55	-0.23	-0.50
13,172.0	88.83	268.80	9,708.3	-141.5	-3,182.4	3,184.1	3.15	-3.05	-0.76
13,267.0	90.13	269.12	9,709.1	-143.2	-3,277.4	3,279.1	1.41	1.37	0.34
13,362.0	92.29	269.61	9,707.1	-144.3	-3,372.4	3,374.0	2.33	2.27	0.52
13,457.0	91.28	269.11	9,704.2	-145.3	-3,467.3	3,469.0	1.19	-1.06	-0.53
13,552.0	90.01	268.66	9,703.1	-147.2	-3,562.3	3,564.0	1.42	-1.34	-0.47
13,647.0	89.82	268.28	9,703.2	-149.7	-3,657.2	3,659.0	0.45	-0.20	-0.40
13,742.0	90.46	268.46	9,703.0	-152.4	-3,752.2	3,754.0	0.70	0.67	0.19
13,837.0	88.13	267.85	9,704.2	-155.5	-3,847.1	3,848.9	2.54	-2.45	-0.64
13,932.0	89.12	268.15	9,706.5	-158.8	-3,942.1	3,943.9	1.09	1.04	0.32
14,027.0	89.96	268.47	9,707.2	-161.6	-4,037.0	4,038.9	0.95	0.88	0.34
14,120.0	91.25	269.28	9,706.2	-163.4	-4,130.0	4,131.9	1.64	1.39	0.87
14,215.0	93.71	270.38	9,702.1	-163.7	-4,224.9	4,226.8	2.84	2.59	1.16
14,310.0	93.13	270.30	9,696.5	-163.1	-4,319.7	4,321.6	0.62	-0.61	-0.08
14,405.0	93.29	270.85	9,691.1	-162.2	-4,414.6	4,416.4	0.60	0.17	0.58
14,500.0	93.38	270.46	9,685.6	-161.1	-4,509.4	4,511.2	0.42	0.09	-0.41
14,595.0	91.44	269.98	9,681.6	-160.7	-4,604.3	4,606.1	2.10	-2.04	-0.51
14,690.0	90.80	267.18	9,679.8	-163.1	-4,699.2	4,701.1	3.02	-0.67	-2.95
14,785.0	90.77	266.48	9,678.5	-168.3	-4,794.1	4,796.0	0.74	-0.03	-0.74
14,880.0	92.56	267.93	9,675.7	-173.0	-4,888.9	4,890.9	2.42	1.88	1.53
14,974.0	92.23	269.67	9,671.8	-174.9	-4,982.8	4,984.8	1.88	-0.35	1.85
15,069.0	91.64	270.23	9,668.6	-175.0	-5,077.8	5,079.7	0.86	-0.62	0.59
15,163.0	91.58	270.59	9,665.9	-174.4	-5,171.7	5,173.7	0.39	-0.06	0.38
15,258.0	91.36	270.50	9,663.5	-173.4	-5,266.7	5,268.6	0.25	-0.23	-0.09
15,353.0	91.89	270.73	9,660.8	-172.4	-5,361.6	5,363.5	0.61	0.56	0.24
15,448.0	91.33	271.16	9,658.1	-170.9	-5,456.6	5,458.4	0.74	-0.59	0.45
15,543.0	91.53	272.13	9,655.8	-168.1	-5,551.5	5,553.3	1.04	0.21	1.02
15,638.0	91.61	273.51	9,653.2	-163.5	-5,646.4	5,648.1	1.45	0.08	1.45
15,733.0	92.82	276.22	9,649.5	-155.4	-5,741.0	5,742.6	3.12	1.27	2.85
15,828.0	92.03	277.14	9,645.5	-144.4	-5,835.2	5,836.7	1.28	-0.83	0.97
15,904.0	91.58	275.15	9,643.1	-136.2	-5,910.7	5,912.1	2.68	-0.59	-2.62
15,999.0	89.62	272.10	9,642.1	-130.2	-6,005.5	6,006.8	3.82	-2.06	-3.21
16,094.0	89.54	271.92	9,642.8	-126.9	-6,100.5	6,101.6	0.21	-0.08	-0.19
16,189.0	86.99	269.75	9,645.6	-125.5	-6,195.4	6,196.6	3.52	-2.68	-2.28
16,284.0	87.97	268.28	9,649.8	-127.2	-6,290.3	6,291.5	1.86	1.03	-1.55
16,379.0	90.66	267.11	9,651.0	-131.0	-6,385.2	6,386.4	3.09	2.83	-1.23
16,474.0	92.06	266.63	9,648.7	-136.2	-6,480.0	6,481.3	1.56	1.47	-0.51
16,569.0	91.22	266.21	9,646.0	-142.1	-6,574.8	6,576.1	0.99	-0.88	-0.44
16,664.0	91.58	267.11	9,643.7	-147.6	-6,669.6	6,671.0	1.02	0.38	0.95
16,759.0	93.26	268.44	9,639.7	-151.3	-6,764.5	6,765.9	2.25	1.77	1.40

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	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)
16,854.0	93.15	270.54	9,634.3	-152.2	-6,859.3	6,860.7	2.21	-0.12	2.21
16,949.0	93.26	271.09	9,629.0	-150.8	-6,954.1	6,955.6	0.59	0.12	0.58
17,044.0	93.09	270.71	9,623.8	-149.3	-7,049.0	7,050.4	0.44	-0.18	-0.40
17,139.0	91.95	273.30	9,619.6	-146.0	-7,143.8	7,145.2	2.98	-1.20	2.73
17,234.0	91.53	273.19	9,616.7	-140.6	-7,238.6	7,239.9	0.46	-0.44	-0.12
17,329.0	92.87	273.39	9,613.1	-135.2	-7,333.4	7,334.6	1.43	1.41	0.21
17,424.0	90.97	271.85	9,609.9	-130.8	-7,428.2	7,429.3	2.57	-2.00	-1.62
17,518.0	90.83	270.61	9,608.4	-128.8	-7,522.2	7,523.3	1.33	-0.15	-1.32
17,613.0	90.99	270.55	9,606.9	-127.9	-7,617.2	7,618.2	0.18	0.17	-0.06
17,708.0	90.99	270.54	9,605.3	-126.9	-7,712.2	7,713.2	0.01	0.00	-0.01
17,803.0	90.71	270.40	9,603.8	-126.2	-7,807.1	7,808.1	0.33	-0.29	-0.15
17,898.0	92.93	271.42	9,600.8	-124.7	-7,902.1	7,903.1	2.57	2.34	1.07
17,993.0	91.78	270.40	9,596.9	-123.2	-7,997.0	7,997.9	1.62	-1.21	-1.07
18,088.0	90.24	269.74	9,595.2	-123.0	-8,092.0	8,092.9	1.76	-1.62	-0.69
18,183.0	91.55	270.28	9,593.8	-123.0	-8,187.0	8,187.9	1.49	1.38	0.57
18,278.0	90.49	269.04	9,592.1	-123.6	-8,281.9	8,282.9	1.72	-1.12	-1.31
18,372.0	89.43	267.97	9,592.1	-126.0	-8,375.9	8,376.8	1.60	-1.13	-1.14
18,468.0	90.07	268.46	9,592.6	-129.0	-8,471.9	8,472.8	0.84	0.67	0.51
18,563.0	89.85	268.59	9,592.6	-131.5	-8,566.8	8,567.8	0.27	-0.23	0.14
18,658.0	89.90	268.31	9,592.8	-134.0	-8,661.8	8,662.8	0.30	0.05	-0.29
18,752.0	89.54	268.29	9,593.3	-136.8	-8,755.7	8,756.8	0.38	-0.38	-0.02
18,847.0	89.87	268.08	9,593.8	-139.8	-8,850.7	8,851.8	0.41	0.35	-0.22
18,942.0	90.49	268.61	9,593.5	-142.6	-8,945.7	8,946.8	0.86	0.65	0.56
19,037.0	92.59	270.25	9,590.9	-143.5	-9,040.6	9,041.7	2.80	2.21	1.73
19,131.0	90.97	270.43	9,588.0	-143.0	-9,134.6	9,135.7	1.73	-1.72	0.19
19,226.0	90.27	270.08	9,587.0	-142.5	-9,229.5	9,230.6	0.82	-0.74	-0.37
19,321.0	89.93	269.86	9,586.8	-142.6	-9,324.5	9,325.6	0.43	-0.36	-0.23
19,416.0	91.64	271.15	9,585.5	-141.8	-9,419.5	9,420.6	2.25	1.80	1.36
19,511.0	91.67	271.30	9,582.8	-139.7	-9,514.5	9,515.5	0.16	0.03	0.16
19,605.0	91.44	271.16	9,580.2	-137.7	-9,608.4	9,609.4	0.29	-0.24	-0.15
19,700.0	91.44	271.08	9,577.8	-135.9	-9,703.4	9,704.3	0.08	0.00	-0.08
19,751.8	91.21	270.88	9,576.6	-135.0	-9,755.1	9,756.1	0.59	-0.44	-0.39
LTP @ 19751.8'MD / 9576.6'TVD									
19,795.0	91.02	270.71	9,575.8	-134.4	-9,798.3	9,799.2	0.59	-0.44	-0.39
19,815.0	90.97	270.61	9,575.4	-134.1	-9,818.3	9,819.2	0.56	-0.25	-0.50
Last MWD Survey @ 19815'MD									
19,881.0	90.97	270.61	9,574.3	-133.4	-9,884.3	9,885.2	0.00	0.00	0.00
PTB @ 19881'MD									

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 603H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=26' IND 205 @ 3000.4usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 603H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
9,108.0	9,078.6	-169.3	525.5	First MWD Survey @ 9108'MD
9,640.0	9,521.1	-158.9	291.0	FTP @ 9640.2'MD / 9521.2'TVD
19,751.8	9,576.6	-135.0	-9,755.1	LTP @ 19751.8'MD / 9576.6'TVD
19,815.0	9,575.4	-134.1	-9,818.3	Last MWD Survey @ 19815'MD
19,881.0	9,574.3	-133.4	-9,884.3	PTB @ 19881'MD

Checked By: _____	Approved By: _____	Date: _____
-------------------	--------------------	-------------