

DISTRICT I
1625 N. FRENCH DR., HOBBS, NM 88240
Phone: (575) 393-6161 Fax: (575) 393-0720

DISTRICT II
811 S. FIRST ST., ARTESIA, NM 88210
Phone: (575) 748-1283 Fax: (575) 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) 476-3480 Fax: (505) 476-3482

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

RECEIVED

JAN 22 2010

Form C-102

Revised August 1, 2011

Submit one copy to appropriate

District Office

EMERD-OCD ARTESIA

☒ AMENDED REPORT

As Drilled

WELL LOCATION AND ACREAGE DEDICATION PLAT

API Number 30-015-45833	Pool Code 98220	Pool Name Purple Sage; Wolfcamp (Gas)
Property Code 325315	Property Name HOWITZER FEDERAL COM	Well Number 605H
OGRID No. 229137	Operator Name COG OPERATING, LLC	Elevation 2963.5'

Surface Location

UL or lot No.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
H	12	24-S	28-E		2125	NORTH	300	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
E	11	24-S	28-E		1767	NORTH	194	WEST	EDDY

Dedicated Acres 640	Joint or Infill	Consolidation Code	Order No.
------------------------	-----------------	--------------------	-----------

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

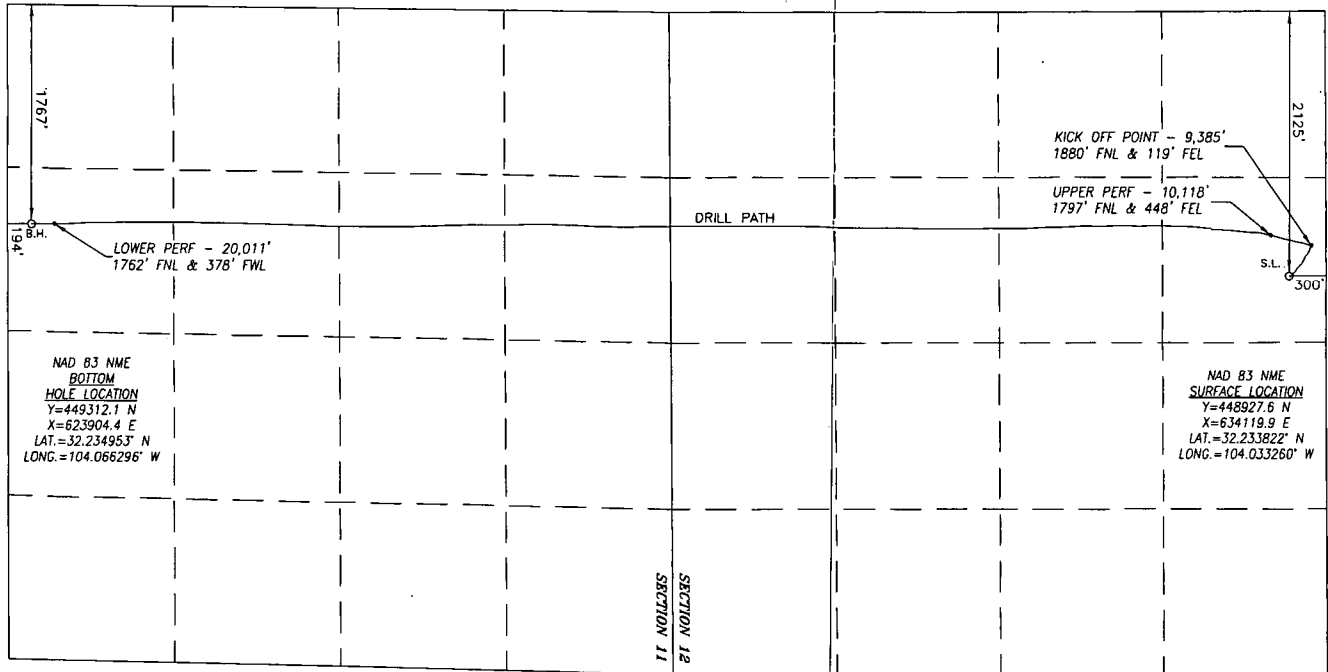
SEE PAGE 2

PAGE 1 OF 2

W.O. # 20-92

DRAWN BY: WN

Property Code 325315	Property Name HOWITZER FEDERAL COM	Well Number 605H
OGRID No. 229137	Operator Name COG OPERATING, LLC	Elevation 2963.5'



SURFACE INFO AND BOREPATH SHOWN HEREON
IS BASED ON DIRECTIONAL SURVEY REPORT
PROVIDED BY COG OPERATING, LLC FOR THE
HOWITZER FEDERAL COM #605H SUPPLIED TO
HARCROW SURVEYING, LLC ON JANUARY 20,
2020

1500 0 1500
SCALE: 1"=1500'

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 1/21/2020
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.

OCT. 20, 2018/AUG. 26, 2019
Date of Survey/Date of Geographic Survey

Signature & Seal of Professional Surveyor



Chad Harcrow 1/21/20
Certificate No. CHAD HARCROW 17777

RECEIVED

JAN 22 2020

Intent ☐ As Drilled ☒

EMNRD-OCD ARTESIA

API # 30-015-45833		Operator Name: COG OPERATING, LLC		Property Name: HOWITZER FEDERAL COM		Well Number 605H	
-----------------------	--	--------------------------------------	--	--	--	---------------------	--

Kick Off Point (KOP)

UL H	Section 12	Township 24S	Range 28E	Lot	Feet 1880	From N/S NORTH	Feet 119	From E/W EAST	County EDDY
Latitude 32.234497					Longitude -104.032678			NAD 83	

First Take Point (FTP)

UL H	Section 12	Township 24S	Range 28E	Lot	Feet 1797	From N/S NORTH	Feet 448	From E/W EAST	County EDDY
Latitude 32.234723					Longitude -104.033743			NAD 83	

Last Take Point (LTP)

UL E	Section 11	Township 24S	Range 28E	Lot	Feet 1762	From N/S NORTH	Feet 378	From E/W WEST	County EDDY
Latitude 32.234960					Longitude -104.065701			NAD 83	

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 22 2020

EMNRD-OCD ARTESIA

NORTHERN DELAWARE BASIN

EDDY COUNTY, NM

ATLAS

HOWITZER FEDERAL COM 605H

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 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	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	Latitude:	32° 1' 15.933 N
From:	Map	Easting:	573,599.60 usft	Longitude:	104° 5' 45.086 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.13 °

Well		HOWITZER FEDERAL COM 605H				
Well Position	+N/-S	0.0 usft	Northing:	448,868.70 usft	Latitude:	32° 14' 1.319 N
	+E/-W	0.0 usft	Easting:	592,936.30 usft	Longitude:	104° 1' 57.970 W
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft	Ground Level:	2,963.5 usft	

Wellbore		OWB			
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	5/23/2019	6.96	59.97	47,699.95388121

Design		AWP			
Audit Notes:					
Version:		1.0		Phase: ACTUAL	
				Tie On Depth: 0.0	
Vertical Section:		Depth From (TVD) (usft)		+N/-S (usft)	
		0.0		0.0	
				0.0	
				272.20	

Survey Program		Date	7/26/2019	
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.0	9,175.0	GYRO-SURF/INTERMEDIATE (OWB)	Standard Keeper	104 Standard Wireline Keeper ver 1.0.4
9,175.0	20,195.0	MWD-CURVE/LATERAL (OWB)	MWD+IFR1+MS	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
100.0	0.49	70.02	100.0	0.1	0.4	-0.4	0.49	0.49	0.00
125.0	0.62	74.93	125.0	0.2	0.6	-0.6	0.55	0.52	19.64
150.0	0.66	74.22	150.0	0.3	0.9	-0.9	0.16	0.16	-2.84
175.0	0.59	76.85	175.0	0.4	1.2	-1.2	0.30	-0.28	10.52
200.0	0.56	75.61	200.0	0.4	1.4	-1.4	0.13	-0.12	-4.96
225.0	0.54	75.86	225.0	0.5	1.6	-1.6	0.08	-0.08	1.00
250.0	0.49	72.67	250.0	0.5	1.9	-1.8	0.23	-0.20	-12.76

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	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)
275.0	0.42	69.54	275.0	0.6	2.0	-2.0	0.30	-0.28	-12.52
300.0	0.48	64.72	300.0	0.7	2.2	-2.2	0.28	0.24	-19.28
325.0	0.30	61.89	325.0	0.8	2.4	-2.3	0.72	-0.72	-11.32
350.0	0.13	67.62	350.0	0.8	2.5	-2.4	0.68	-0.68	22.92
375.0	0.17	67.96	375.0	0.8	2.5	-2.5	0.16	0.16	1.36
400.0	0.16	58.45	400.0	0.9	2.6	-2.6	0.12	-0.04	-38.04
425.0	0.17	84.87	425.0	0.9	2.7	-2.6	0.30	0.04	105.68
450.0	0.13	83.21	450.0	0.9	2.7	-2.7	0.16	-0.16	-6.64
475.0	0.12	148.82	475.0	0.9	2.8	-2.7	0.54	-0.04	262.44
500.0	0.13	148.47	500.0	0.8	2.8	-2.8	0.04	0.04	-1.40
525.0	0.13	191.11	525.0	0.8	2.8	-2.8	0.38	0.00	170.56
550.0	0.06	144.89	550.0	0.7	2.8	-2.8	0.39	-0.28	-184.88
575.0	0.03	152.95	575.0	0.7	2.8	-2.8	0.12	-0.12	32.24
600.0	0.05	271.99	600.0	0.7	2.8	-2.8	0.28	0.08	476.16
625.0	0.10	322.45	625.0	0.7	2.8	-2.8	0.31	0.20	201.84
650.0	0.16	321.13	650.0	0.8	2.7	-2.7	0.24	0.24	-5.28
675.0	0.19	326.25	675.0	0.8	2.7	-2.7	0.14	0.12	20.48
700.0	0.22	345.68	700.0	0.9	2.7	-2.6	0.30	0.12	77.72
725.0	0.27	339.31	725.0	1.0	2.6	-2.6	0.23	0.20	-25.48
750.0	0.26	347.26	750.0	1.1	2.6	-2.6	0.15	-0.04	31.80
775.0	0.31	348.55	775.0	1.2	2.6	-2.5	0.20	0.20	5.16
800.0	0.28	347.84	800.0	1.4	2.5	-2.5	0.12	-0.12	-2.84
825.0	0.31	13.85	825.0	1.5	2.5	-2.5	0.54	0.12	104.04
850.0	0.27	22.66	850.0	1.6	2.6	-2.5	0.24	-0.16	35.24
875.0	0.18	329.18	875.0	1.7	2.6	-2.5	0.87	-0.36	-213.92
900.0	0.15	329.34	900.0	1.8	2.6	-2.5	0.12	-0.12	0.64
925.0	0.19	351.57	925.0	1.8	2.5	-2.5	0.31	0.16	88.92
950.0	0.10	356.75	950.0	1.9	2.5	-2.4	0.36	-0.36	20.72
975.0	0.07	7.55	975.0	1.9	2.5	-2.4	0.14	-0.12	43.20
1,000.0	0.06	0.81	1,000.0	2.0	2.5	-2.5	0.05	-0.04	-26.96
1,025.0	0.05	99.17	1,025.0	2.0	2.5	-2.5	0.33	-0.04	393.44
1,050.0	0.05	224.00	1,050.0	2.0	2.5	-2.5	0.35	0.00	499.32
1,075.0	0.08	241.94	1,075.0	1.9	2.5	-2.4	0.14	0.12	71.76
1,100.0	0.06	299.23	1,100.0	1.9	2.5	-2.4	0.28	-0.08	229.16
1,125.0	0.03	303.42	1,125.0	2.0	2.5	-2.4	0.12	-0.12	16.76
1,150.0	0.08	6.31	1,150.0	2.0	2.5	-2.4	0.29	0.20	251.56
1,175.0	0.11	7.37	1,175.0	2.0	2.5	-2.4	0.12	0.12	4.24
1,200.0	0.03	27.77	1,200.0	2.0	2.5	-2.4	0.33	-0.32	81.60
1,225.0	0.14	337.11	1,225.0	2.1	2.5	-2.4	0.49	0.44	-202.64
1,250.0	0.08	299.30	1,250.0	2.1	2.4	-2.4	0.36	-0.24	-151.24
1,275.0	0.06	320.83	1,275.0	2.1	2.4	-2.3	0.13	-0.08	86.12
1,300.0	0.14	244.66	1,300.0	2.1	2.4	-2.3	0.55	0.32	-304.68

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	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)	
1,325.0	0.03	248.18	1,325.0	2.1	2.4	-2.3	0.44	-0.44	14.08	
1,350.0	0.07	262.98	1,350.0	2.1	2.3	-2.2	0.17	0.16	59.20	
1,375.0	0.00	75.58	1,375.0	2.1	2.3	-2.2	0.28	-0.28	0.00	
1,400.0	0.07	295.98	1,400.0	2.1	2.3	-2.2	0.28	0.28	0.00	
1,425.0	0.03	351.41	1,425.0	2.1	2.3	-2.2	0.23	-0.16	221.72	
1,450.0	0.20	257.21	1,450.0	2.1	2.2	-2.2	0.82	0.68	-376.80	
1,475.0	0.09	284.10	1,475.0	2.1	2.2	-2.1	0.51	-0.44	107.56	
1,500.0	0.09	260.59	1,500.0	2.1	2.1	-2.1	0.15	0.00	-94.04	
1,525.0	0.07	22.79	1,525.0	2.1	2.1	-2.0	0.56	-0.08	488.80	
1,550.0	0.01	345.99	1,550.0	2.2	2.1	-2.1	0.25	-0.24	-147.20	
1,575.0	0.16	80.60	1,575.0	2.2	2.2	-2.1	0.64	0.60	378.44	
1,600.0	0.14	89.41	1,600.0	2.2	2.2	-2.2	0.12	-0.08	35.24	
1,625.0	0.32	70.56	1,625.0	2.2	2.3	-2.2	0.77	0.72	-75.40	
1,650.0	0.27	51.70	1,650.0	2.2	2.4	-2.4	0.43	-0.20	-75.44	
1,675.0	0.35	49.19	1,675.0	2.3	2.5	-2.5	0.32	0.32	-10.04	
1,700.0	0.21	63.17	1,700.0	2.4	2.6	-2.6	0.62	-0.56	55.92	
1,725.0	0.28	62.90	1,725.0	2.5	2.7	-2.6	0.28	0.28	-1.08	
1,750.0	0.25	73.43	1,750.0	2.5	2.8	-2.8	0.23	-0.12	42.12	
1,775.0	0.24	63.38	1,775.0	2.5	2.9	-2.8	0.18	-0.04	-40.20	
1,800.0	0.23	72.21	1,800.0	2.6	3.0	-2.9	0.15	-0.04	35.32	
1,825.0	0.29	70.58	1,825.0	2.6	3.2	-3.0	0.24	0.24	-6.52	
1,850.0	0.35	54.27	1,850.0	2.7	3.3	-3.2	0.43	0.24	-65.24	
1,875.0	0.25	61.31	1,875.0	2.7	3.4	-3.3	0.43	-0.40	28.16	
1,900.0	0.26	69.98	1,900.0	2.8	3.5	-3.4	0.16	0.04	34.68	
1,925.0	0.25	75.90	1,925.0	2.8	3.6	-3.5	0.11	-0.04	23.68	
1,950.0	0.33	97.42	1,950.0	2.8	3.7	-3.6	0.54	0.32	86.08	
1,975.0	0.30	111.64	1,975.0	2.8	3.8	-3.7	0.33	-0.12	56.88	
2,000.0	0.23	103.59	2,000.0	2.8	4.0	-3.8	0.32	-0.28	-32.20	
2,025.0	0.27	108.82	2,025.0	2.7	4.1	-4.0	0.18	0.16	20.92	
2,050.0	0.33	126.31	2,050.0	2.7	4.2	-4.1	0.44	0.24	69.96	
2,075.0	0.35	135.43	2,075.0	2.6	4.3	-4.2	0.23	0.08	36.48	
2,100.0	0.41	134.78	2,100.0	2.5	4.4	-4.3	0.24	0.24	-2.60	
2,125.0	0.40	142.18	2,125.0	2.3	4.5	-4.4	0.21	-0.04	29.60	
2,150.0	0.50	135.75	2,150.0	2.2	4.6	-4.6	0.45	0.40	-25.72	
2,175.0	0.41	127.37	2,175.0	2.0	4.8	-4.7	0.45	-0.36	-33.52	
2,200.0	0.40	136.15	2,200.0	1.9	4.9	-4.8	0.25	-0.04	35.12	
2,225.0	0.42	136.40	2,225.0	1.8	5.1	-5.0	0.08	0.08	1.00	
2,250.0	0.40	137.15	2,250.0	1.7	5.2	-5.1	0.08	-0.08	3.00	
2,275.0	0.48	139.09	2,275.0	1.5	5.3	-5.2	0.33	0.32	7.76	
2,300.0	0.51	137.48	2,300.0	1.4	5.4	-5.4	0.13	0.12	-6.44	
2,325.0	0.43	134.99	2,325.0	1.2	5.6	-5.5	0.33	-0.32	-9.96	
2,350.0	0.42	129.71	2,350.0	1.1	5.7	-5.7	0.16	-0.04	-21.12	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	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)	
2,375.0	0.43	133.00	2,375.0	1.0	5.9	-5.8	0.11	0.04	13.16	
2,400.0	0.40	121.48	2,400.0	0.9	6.0	-6.0	0.35	-0.12	-46.08	
2,425.0	0.41	130.68	2,425.0	0.8	6.1	-6.1	0.26	0.04	36.80	
2,450.0	0.39	134.19	2,450.0	0.6	6.3	-6.2	0.13	-0.08	14.04	
2,475.0	0.37	145.90	2,475.0	0.5	6.4	-6.4	0.32	-0.08	46.84	
2,500.0	0.43	149.87	2,500.0	0.4	6.5	-6.5	0.26	0.24	15.88	
2,525.0	0.45	143.72	2,525.0	0.2	6.6	-6.6	0.21	0.08	-24.60	
2,550.0	0.42	139.53	2,550.0	0.1	6.7	-6.7	0.17	-0.12	-16.76	
2,575.0	0.49	140.20	2,575.0	-0.1	6.8	-6.8	0.28	0.28	2.68	
2,600.0	0.52	140.31	2,600.0	-0.3	7.0	-7.0	0.12	0.12	0.44	
2,625.0	0.47	132.64	2,625.0	-0.4	7.1	-7.1	0.33	-0.20	-30.68	
2,650.0	0.43	135.45	2,650.0	-0.6	7.3	-7.3	0.18	-0.16	11.24	
2,675.0	0.36	145.91	2,675.0	-0.7	7.4	-7.4	0.40	-0.28	41.84	
2,700.0	0.40	148.54	2,700.0	-0.8	7.5	-7.5	0.17	0.16	10.52	
2,725.0	0.27	142.74	2,725.0	-1.0	7.5	-7.6	0.54	-0.52	-23.20	
2,750.0	0.33	150.80	2,750.0	-1.1	7.6	-7.6	0.29	0.24	32.24	
2,775.0	0.41	165.78	2,775.0	-1.2	7.7	-7.7	0.50	0.32	59.92	
2,800.0	0.44	152.27	2,800.0	-1.4	7.7	-7.8	0.42	0.12	-54.04	
2,825.0	0.35	162.26	2,825.0	-1.5	7.8	-7.9	0.45	-0.36	39.96	
2,850.0	0.38	165.90	2,850.0	-1.7	7.8	-7.9	0.15	0.12	14.56	
2,875.0	0.42	161.35	2,875.0	-1.9	7.9	-8.0	0.20	0.16	-18.20	
2,900.0	0.34	159.67	2,900.0	-2.0	7.9	-8.0	0.32	-0.32	-6.72	
2,925.0	0.37	158.42	2,925.0	-2.2	8.0	-8.1	0.12	0.12	-5.00	
2,950.0	0.45	165.87	2,950.0	-2.3	8.1	-8.1	0.38	0.32	29.80	
2,975.0	0.50	169.98	2,975.0	-2.5	8.1	-8.2	0.24	0.20	16.44	
3,000.0	0.45	156.93	3,000.0	-2.7	8.2	-8.3	0.48	-0.20	-52.20	
3,025.0	0.47	171.04	3,025.0	-2.9	8.2	-8.3	0.46	0.08	56.44	
3,050.0	0.61	170.21	3,050.0	-3.2	8.2	-8.4	0.56	0.56	-3.32	
3,075.0	0.49	162.48	3,075.0	-3.4	8.3	-8.4	0.56	-0.48	-30.92	
3,100.0	0.59	170.91	3,100.0	-3.6	8.4	-8.5	0.51	0.40	33.72	
3,125.0	0.56	175.18	3,124.9	-3.9	8.4	-8.5	0.21	-0.12	17.08	
3,150.0	0.58	167.36	3,149.9	-4.1	8.4	-8.6	0.32	0.08	-31.28	
3,175.0	0.53	170.83	3,174.9	-4.4	8.5	-8.6	0.24	-0.20	13.88	
3,200.0	0.60	172.09	3,199.9	-4.6	8.5	-8.7	0.28	0.28	5.04	
3,225.0	0.63	172.91	3,224.9	-4.9	8.5	-8.7	0.13	0.12	3.28	
3,250.0	0.55	168.75	3,249.9	-5.1	8.6	-8.8	0.36	-0.32	-16.64	
3,275.0	0.56	174.02	3,274.9	-5.4	8.6	-8.8	0.21	0.04	21.08	
3,300.0	0.67	175.25	3,299.9	-5.6	8.6	-8.9	0.44	0.44	4.92	
3,325.0	0.61	176.33	3,324.9	-5.9	8.7	-8.9	0.24	-0.24	4.32	
3,350.0	0.71	170.38	3,349.9	-6.2	8.7	-8.9	0.48	0.40	-23.80	
3,375.0	0.72	174.85	3,374.9	-6.5	8.7	-9.0	0.23	0.04	17.88	
3,400.0	0.61	175.86	3,399.9	-6.8	8.8	-9.0	0.44	-0.44	4.04	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	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)
3,425.0	0.61	175.20	3,424.9	-7.1	8.8	-9.0	0.03	0.00	-2.64
3,450.0	0.64	173.09	3,449.9	-7.3	8.8	-9.1	0.15	0.12	-8.44
3,475.0	0.55	174.80	3,474.9	-7.6	8.8	-9.1	0.37	-0.36	6.84
3,500.0	0.37	148.28	3,499.9	-7.8	8.9	-9.2	1.10	-0.72	-106.08
3,525.0	0.65	70.71	3,524.9	-7.8	9.1	-9.4	2.70	1.12	-310.28
3,550.0	0.95	52.88	3,549.9	-7.6	9.4	-9.7	1.55	1.20	-71.32
3,575.0	1.01	48.34	3,574.9	-7.3	9.7	-10.0	0.39	0.24	-18.16
3,600.0	1.01	46.97	3,599.9	-7.0	10.0	-10.3	0.10	0.00	-5.48
3,625.0	1.03	49.70	3,624.9	-6.8	10.4	-10.6	0.21	0.08	10.92
3,650.0	1.12	51.04	3,649.9	-6.5	10.7	-11.0	0.37	0.36	5.36
3,675.0	0.98	47.97	3,674.9	-6.2	11.1	-11.3	0.60	-0.56	-12.28
3,700.0	0.99	49.58	3,699.9	-5.9	11.4	-11.6	0.12	0.04	6.44
3,725.0	1.10	48.23	3,724.9	-5.6	11.7	-11.9	0.45	0.44	-5.40
3,750.0	1.11	48.91	3,749.9	-5.3	12.1	-12.3	0.07	0.04	2.72
3,775.0	1.12	47.70	3,774.9	-4.9	12.5	-12.6	0.10	0.04	-4.84
3,800.0	1.11	50.12	3,799.9	-4.6	12.8	-13.0	0.19	-0.04	9.68
3,825.0	1.07	49.19	3,824.9	-4.3	13.2	-13.3	0.17	-0.16	-3.72
3,850.0	1.11	46.87	3,849.9	-4.0	13.5	-13.7	0.24	0.16	-9.28
3,875.0	1.09	48.69	3,874.9	-3.7	13.9	-14.0	0.16	-0.08	7.28
3,900.0	1.10	46.68	3,899.9	-3.3	14.2	-14.4	0.16	0.04	-8.04
3,925.0	1.11	50.97	3,924.9	-3.0	14.6	-14.7	0.33	0.04	17.16
3,950.0	1.09	49.56	3,949.9	-2.7	15.0	-15.1	0.13	-0.08	-5.64
3,975.0	1.14	48.48	3,974.9	-2.4	15.3	-15.4	0.22	0.20	-4.32
4,000.0	1.16	45.77	3,999.8	-2.1	15.7	-15.8	0.23	0.08	-10.84
4,025.0	1.12	50.04	4,024.8	-1.7	16.1	-16.1	0.38	-0.16	17.08
4,050.0	1.09	46.95	4,049.8	-1.4	16.4	-16.5	0.27	-0.12	-12.36
4,075.0	1.13	46.76	4,074.8	-1.1	16.8	-16.8	0.16	0.16	-0.76
4,100.0	1.02	46.35	4,099.8	-0.8	17.1	-17.2	0.44	-0.44	-1.64
4,125.0	1.08	50.63	4,124.8	-0.4	17.5	-17.5	0.39	0.24	17.12
4,150.0	1.38	42.10	4,149.8	-0.1	17.9	-17.9	1.40	1.20	-34.12
4,175.0	2.08	38.74	4,174.8	0.5	18.4	-18.3	2.83	2.80	-13.44
4,200.0	2.79	39.48	4,199.8	1.3	19.0	-19.0	2.84	2.84	2.96
4,225.0	2.91	38.50	4,224.8	2.3	19.8	-19.7	0.52	0.48	-3.92
4,250.0	2.78	39.19	4,249.7	3.3	20.6	-20.4	0.54	-0.52	2.76
4,275.0	2.85	38.80	4,274.7	4.2	21.4	-21.2	0.29	0.28	-1.56
4,300.0	2.84	38.35	4,299.7	5.2	22.1	-21.9	0.10	-0.04	-1.80
4,325.0	3.04	39.37	4,324.6	6.2	22.9	-22.7	0.83	0.80	4.08
4,350.0	3.02	39.51	4,349.6	7.2	23.8	-23.5	0.09	-0.08	0.56
4,375.0	2.87	39.69	4,374.6	8.2	24.6	-24.3	0.60	-0.60	0.72
4,400.0	2.96	39.98	4,399.5	9.2	25.4	-25.0	0.36	0.36	1.16
4,425.0	2.87	40.18	4,424.5	10.1	26.2	-25.8	0.36	-0.36	0.80
4,450.0	2.85	40.91	4,449.5	11.1	27.0	-26.6	0.17	-0.08	2.92

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	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)
4,475.0	2.97	39.78	4,474.4	12.1	27.9	-27.4	0.53	0.48	-4.52
4,500.0	2.94	39.98	4,499.4	13.0	28.7	-28.2	0.13	-0.12	0.80
4,525.0	3.00	39.10	4,524.4	14.0	29.5	-28.9	0.30	0.24	-3.52
4,550.0	3.00	39.72	4,549.3	15.1	30.3	-29.7	0.13	0.00	2.48
4,575.0	3.16	34.90	4,574.3	16.1	31.2	-30.5	1.22	0.64	-19.28
4,600.0	2.96	38.81	4,599.3	17.2	31.9	-31.3	1.16	-0.80	15.64
4,625.0	2.89	40.75	4,624.2	18.2	32.8	-32.0	0.48	-0.28	7.76
4,650.0	2.89	40.72	4,649.2	19.1	33.6	-32.8	0.01	0.00	-0.12
4,675.0	2.94	39.48	4,674.2	20.1	34.4	-33.6	0.32	0.20	-4.96
4,700.0	2.98	39.25	4,699.1	21.1	35.2	-34.4	0.17	0.16	-0.92
4,725.0	2.97	40.31	4,724.1	22.1	36.1	-35.2	0.22	-0.04	4.24
4,750.0	3.01	39.32	4,749.1	23.1	36.9	-36.0	0.26	0.16	-3.96
4,775.0	3.12	39.57	4,774.0	24.1	37.7	-36.8	0.44	0.44	1.00
4,800.0	3.02	40.50	4,799.0	25.2	38.6	-37.6	0.45	-0.40	3.72
4,825.0	3.04	38.51	4,824.0	26.2	39.4	-38.4	0.43	0.08	-7.96
4,850.0	3.00	38.27	4,848.9	27.2	40.3	-39.2	0.17	-0.16	-0.96
4,875.0	2.88	39.74	4,873.9	28.2	41.1	-40.0	0.57	-0.48	5.88
4,900.0	2.89	39.27	4,898.9	29.2	41.9	-40.7	0.10	0.04	-1.88
4,925.0	2.93	38.61	4,923.8	30.2	42.7	-41.5	0.21	0.16	-2.64
4,950.0	2.92	39.59	4,948.8	31.1	43.5	-42.2	0.20	-0.04	3.92
4,975.0	2.93	38.50	4,973.8	32.1	44.3	-43.0	0.23	0.04	-4.36
5,000.0	2.86	39.81	4,998.7	33.1	45.1	-43.8	0.39	-0.28	5.24
5,025.0	2.95	40.80	5,023.7	34.1	45.9	-44.5	0.41	0.36	3.96
5,050.0	2.93	39.84	5,048.7	35.1	46.7	-45.3	0.21	-0.08	-3.84
5,075.0	2.93	39.24	5,073.6	36.0	47.5	-46.1	0.12	0.00	-2.40
5,100.0	2.91	40.12	5,098.6	37.0	48.3	-46.9	0.20	-0.08	3.52
5,125.0	2.81	37.79	5,123.6	38.0	49.1	-47.6	0.61	-0.40	-9.32
5,150.0	2.90	39.21	5,148.5	39.0	49.9	-48.4	0.46	0.36	5.68
5,175.0	2.84	40.30	5,173.5	39.9	50.7	-49.1	0.32	-0.24	4.36
5,200.0	2.73	36.97	5,198.5	40.9	51.5	-49.9	0.78	-0.44	-13.32
5,225.0	2.74	37.77	5,223.4	41.8	52.2	-50.5	0.16	0.04	3.20
5,250.0	2.83	39.21	5,248.4	42.8	52.9	-51.3	0.46	0.36	5.76
5,275.0	2.66	39.41	5,273.4	43.7	53.7	-52.0	0.68	-0.68	0.80
5,300.0	2.68	38.78	5,298.4	44.6	54.4	-52.7	0.14	0.08	-2.52
5,325.0	2.62	38.19	5,323.3	45.5	55.2	-53.4	0.26	-0.24	-2.36
5,350.0	2.60	39.20	5,348.3	46.4	55.9	-54.0	0.20	-0.08	4.04
5,375.0	2.53	38.70	5,373.3	47.3	56.6	-54.7	0.29	-0.28	-2.00
5,400.0	2.52	37.64	5,398.3	48.1	57.3	-55.4	0.19	-0.04	-4.24
5,425.0	2.66	37.64	5,423.2	49.0	57.9	-56.0	0.56	0.56	0.00
5,450.0	2.58	39.33	5,448.2	49.9	58.7	-56.7	0.44	-0.32	6.76
5,475.0	2.63	38.25	5,473.2	50.8	59.4	-57.4	0.28	0.20	-4.32
5,500.0	2.66	38.52	5,498.2	51.7	60.1	-58.1	0.13	0.12	1.08

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	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)	
5,525.0	2.51	40.76	5,523.1	52.6	60.8	-58.7	0.72	-0.60	8.96	
5,550.0	2.66	40.93	5,548.1	53.4	61.5	-59.4	0.60	0.60	0.68	
5,575.0	2.65	41.05	5,573.1	54.3	62.3	-60.2	0.05	-0.04	0.48	
5,600.0	2.52	41.37	5,598.0	55.2	63.0	-60.9	0.52	-0.52	1.28	
5,625.0	2.61	41.32	5,623.0	56.0	63.8	-61.6	0.36	0.36	-0.20	
5,650.0	2.51	42.68	5,648.0	56.8	64.5	-62.3	0.47	-0.40	5.44	
5,675.0	2.65	43.53	5,673.0	57.7	65.3	-63.0	0.58	0.56	3.40	
5,700.0	2.65	43.26	5,697.9	58.5	66.1	-63.8	0.05	0.00	-1.08	
5,725.0	2.65	42.69	5,722.9	59.3	66.9	-64.6	0.11	0.00	-2.28	
5,750.0	2.82	42.18	5,747.9	60.2	67.7	-65.3	0.69	0.68	-2.04	
5,775.0	2.95	42.37	5,772.9	61.2	68.5	-66.1	0.52	0.52	0.76	
5,800.0	3.23	40.36	5,797.8	62.2	69.4	-67.0	1.20	1.12	-8.04	
5,825.0	3.02	41.44	5,822.8	63.2	70.3	-67.8	0.87	-0.84	4.32	
5,850.0	3.09	41.93	5,847.8	64.2	71.2	-68.7	0.30	0.28	1.96	
5,875.0	3.12	41.52	5,872.7	65.2	72.1	-69.5	0.15	0.12	-1.64	
5,900.0	3.22	41.12	5,897.7	66.2	73.0	-70.4	0.41	0.40	-1.60	
5,925.0	3.23	41.12	5,922.6	67.3	73.9	-71.3	0.04	0.04	0.00	
5,950.0	3.13	41.97	5,947.6	68.3	74.9	-72.2	0.44	-0.40	3.40	
5,975.0	3.22	41.49	5,972.6	69.4	75.8	-73.1	0.38	0.36	-1.92	
6,000.0	3.27	41.74	5,997.5	70.4	76.7	-74.0	0.21	0.20	1.00	
6,025.0	3.15	41.75	6,022.5	71.5	77.6	-74.8	0.48	-0.48	0.04	
6,050.0	3.16	41.84	6,047.4	72.5	78.6	-75.7	0.04	0.04	0.36	
6,075.0	3.21	42.40	6,072.4	73.5	79.5	-76.6	0.24	0.20	2.24	
6,100.0	3.08	41.69	6,097.4	74.5	80.4	-77.5	0.54	-0.52	-2.84	
6,125.0	3.02	41.20	6,122.3	75.5	81.3	-78.3	0.26	-0.24	-1.96	
6,150.0	3.15	41.67	6,147.3	76.6	82.2	-79.2	0.53	0.52	1.88	
6,175.0	3.00	42.11	6,172.3	77.5	83.1	-80.0	0.61	-0.60	1.76	
6,200.0	3.17	42.90	6,197.2	78.5	84.0	-80.9	0.70	0.68	3.16	
6,225.0	3.03	44.00	6,222.2	79.5	84.9	-81.8	0.61	-0.56	4.40	
6,250.0	3.06	42.81	6,247.2	80.5	85.8	-82.7	0.28	0.12	-4.76	
6,275.0	3.00	43.49	6,272.1	81.5	86.7	-83.5	0.28	-0.24	2.72	
6,300.0	3.06	44.10	6,297.1	82.4	87.7	-84.4	0.27	0.24	2.44	
6,325.0	2.98	43.81	6,322.0	83.4	88.6	-85.3	0.33	-0.32	-1.16	
6,350.0	2.95	44.52	6,347.0	84.3	89.5	-86.2	0.19	-0.12	2.84	
6,375.0	2.92	45.59	6,372.0	85.2	90.4	-87.0	0.25	-0.12	4.28	
6,400.0	2.90	41.27	6,396.9	86.1	91.2	-87.9	0.88	-0.08	-17.28	
6,425.0	2.97	45.41	6,421.9	87.0	92.1	-88.7	0.89	0.28	16.56	
6,450.0	3.08	44.45	6,446.9	88.0	93.1	-89.6	0.48	0.44	-3.84	
6,475.0	2.97	42.97	6,471.8	88.9	94.0	-90.5	0.54	-0.44	-5.92	
6,500.0	2.99	40.41	6,496.8	89.9	94.8	-91.3	0.54	0.08	-10.24	
6,525.0	3.25	37.91	6,521.8	90.9	95.7	-92.1	1.17	1.04	-10.00	
6,550.0	3.34	36.74	6,546.7	92.1	96.6	-93.0	0.45	0.36	-4.68	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	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)
6,575.0	3.29	35.30	6,571.7	93.3	97.4	-93.8	0.39	-0.20	-5.76
6,600.0	3.31	38.10	6,596.6	94.4	98.3	-94.6	0.65	0.08	11.20
6,625.0	3.38	37.42	6,621.6	95.6	99.2	-95.4	0.32	0.28	-2.72
6,650.0	3.32	36.31	6,646.6	96.7	100.0	-96.3	0.35	-0.24	-4.44
6,675.0	3.44	37.04	6,671.5	97.9	100.9	-97.1	0.51	0.48	2.92
6,700.0	3.43	37.18	6,696.5	99.1	101.8	-97.9	0.05	-0.04	0.56
6,725.0	3.71	36.92	6,721.4	100.4	102.8	-98.8	1.12	1.12	-1.04
6,750.0	3.73	38.05	6,746.4	101.6	103.7	-99.8	0.30	0.08	4.52
6,775.0	3.79	38.46	6,771.3	102.9	104.8	-100.7	0.26	0.24	1.64
6,800.0	3.84	37.48	6,796.3	104.2	105.8	-101.7	0.33	0.20	-3.92
6,825.0	3.78	35.61	6,821.2	105.6	106.8	-102.6	0.55	-0.24	-7.48
6,850.0	3.89	35.62	6,846.2	106.9	107.7	-103.6	0.44	0.44	0.04
6,875.0	3.96	30.99	6,871.1	108.4	108.7	-104.5	1.30	0.28	-18.52
6,900.0	4.03	30.48	6,896.0	109.9	109.6	-105.3	0.31	0.28	-2.04
6,925.0	4.12	30.49	6,921.0	111.4	110.5	-106.1	0.36	0.36	0.04
6,950.0	3.98	31.28	6,945.9	112.9	111.4	-107.0	0.60	-0.56	3.16
6,975.0	3.95	29.60	6,970.8	114.4	112.3	-107.8	0.48	-0.12	-6.72
7,000.0	3.94	28.60	6,995.8	115.9	113.1	-108.6	0.28	-0.04	-4.00
7,025.0	3.90	28.60	7,020.7	117.4	113.9	-109.3	0.16	-0.16	0.00
7,050.0	3.77	28.15	7,045.7	118.9	114.7	-110.1	0.53	-0.52	-1.80
7,075.0	3.72	26.59	7,070.6	120.3	115.5	-110.8	0.45	-0.20	-6.24
7,100.0	3.47	24.99	7,095.6	121.7	116.1	-111.4	1.08	-1.00	-6.40
7,125.0	3.48	26.30	7,120.5	123.1	116.8	-112.0	0.32	0.04	5.24
7,150.0	3.25	23.64	7,145.5	124.4	117.4	-112.6	1.11	-0.92	-10.64
7,175.0	3.04	23.75	7,170.4	125.7	118.0	-113.1	0.84	-0.84	0.44
7,200.0	3.00	22.86	7,195.4	126.9	118.5	-113.5	0.25	-0.16	-3.56
7,225.0	2.99	22.75	7,220.4	128.1	119.0	-114.0	0.05	-0.04	-0.44
7,250.0	3.05	21.72	7,245.3	129.3	119.5	-114.4	0.32	0.24	-4.12
7,275.0	2.98	22.99	7,270.3	130.5	120.0	-114.9	0.39	-0.28	5.08
7,300.0	3.19	21.44	7,295.3	131.8	120.5	-115.4	0.90	0.84	-6.20
7,325.0	3.33	22.70	7,320.2	133.1	121.0	-115.8	0.63	0.56	5.04
7,350.0	3.25	22.17	7,345.2	134.4	121.6	-116.3	0.34	-0.32	-2.12
7,375.0	3.86	25.31	7,370.1	135.8	122.2	-116.9	2.56	2.44	12.56
7,400.0	4.35	26.71	7,395.1	137.4	123.0	-117.6	2.00	1.96	5.60
7,425.0	4.38	27.19	7,420.0	139.1	123.9	-118.4	0.19	0.12	1.92
7,450.0	4.35	26.32	7,444.9	140.8	124.7	-119.2	0.29	-0.12	-3.48
7,475.0	4.38	26.77	7,469.9	142.5	125.6	-120.0	0.18	0.12	1.80
7,500.0	4.33	26.76	7,494.8	144.2	126.4	-120.8	0.20	-0.20	-0.04
7,525.0	4.24	26.35	7,519.7	145.9	127.3	-121.6	0.38	-0.36	-1.64
7,550.0	4.01	28.84	7,544.7	147.5	128.1	-122.3	1.17	-0.92	9.96
7,575.0	3.97	28.12	7,569.6	149.0	128.9	-123.1	0.26	-0.16	-2.88
7,600.0	3.94	28.75	7,594.5	150.5	129.7	-123.9	0.21	-0.12	2.52

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	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)	
7,625.0	3.93	27.70	7,619.5	152.1	130.6	-124.6	0.29	-0.04	-4.20	
7,650.0	3.91	28.56	7,644.4	153.6	131.4	-125.4	0.25	-0.08	3.44	
7,675.0	3.81	31.33	7,669.4	155.0	132.2	-126.2	0.85	-0.40	11.08	
7,700.0	3.97	33.40	7,694.3	156.5	133.1	-127.0	0.85	0.64	8.28	
7,725.0	3.88	36.20	7,719.2	157.9	134.1	-127.9	0.85	-0.36	11.20	
7,750.0	3.93	38.53	7,744.2	159.2	135.1	-128.9	0.67	0.20	9.32	
7,775.0	3.67	38.75	7,769.1	160.5	136.1	-129.9	1.04	-1.04	0.88	
7,800.0	3.76	41.23	7,794.1	161.8	137.2	-130.9	0.74	0.36	9.92	
7,825.0	3.76	39.92	7,819.0	163.0	138.3	-131.9	0.34	0.00	-5.24	
7,850.0	3.80	39.28	7,844.0	164.3	139.3	-132.9	0.23	0.16	-2.56	
7,875.0	4.16	39.86	7,868.9	165.6	140.4	-134.0	1.45	1.44	2.32	
7,900.0	4.54	41.63	7,893.8	167.0	141.7	-135.1	1.61	1.52	7.08	
7,925.0	4.70	41.31	7,918.8	168.5	143.0	-136.4	0.65	0.64	-1.28	
7,950.0	4.84	41.12	7,943.7	170.1	144.4	-137.7	0.56	0.56	-0.76	
7,975.0	4.84	40.23	7,968.6	171.7	145.7	-139.0	0.30	0.00	-3.56	
8,000.0	4.86	40.89	7,993.5	173.3	147.1	-140.3	0.24	0.08	2.64	
8,025.0	4.74	40.79	8,018.4	174.9	148.5	-141.7	0.48	-0.48	-0.40	
8,050.0	4.52	40.42	8,043.3	176.4	149.8	-142.9	0.89	-0.88	-1.48	
8,075.0	4.42	38.84	8,068.2	177.9	151.0	-144.1	0.63	-0.40	-6.32	
8,100.0	4.31	38.05	8,093.2	179.4	152.2	-145.2	0.50	-0.44	-3.16	
8,125.0	4.45	35.06	8,118.1	181.0	153.3	-146.3	1.07	0.56	-11.96	
8,150.0	4.51	32.30	8,143.0	182.6	154.4	-147.3	0.90	0.24	-11.04	
8,175.0	4.53	30.67	8,167.9	184.3	155.5	-148.3	0.52	0.08	-6.52	
8,200.0	4.54	29.56	8,192.9	186.0	156.5	-149.2	0.35	0.04	-4.44	
8,225.0	4.54	26.41	8,217.8	187.7	157.4	-150.1	1.00	0.00	-12.60	
8,250.0	4.68	24.76	8,242.7	189.5	158.2	-150.9	0.77	0.56	-6.60	
8,275.0	4.57	23.90	8,267.6	191.4	159.1	-151.6	0.52	-0.44	-3.44	
8,300.0	4.39	22.87	8,292.5	193.2	159.9	-152.3	0.79	-0.72	-4.12	
8,325.0	4.26	21.87	8,317.5	194.9	160.6	-153.0	0.60	-0.52	-4.00	
8,350.0	3.92	21.16	8,342.4	196.6	161.2	-153.6	1.37	-1.36	-2.84	
8,375.0	3.66	19.75	8,367.4	198.1	161.8	-154.1	1.10	-1.04	-5.64	
8,400.0	3.56	20.98	8,392.3	199.6	162.3	-154.6	0.51	-0.40	4.92	
8,425.0	3.43	22.60	8,417.3	201.0	162.9	-155.1	0.65	-0.52	6.48	
8,450.0	3.45	21.68	8,442.2	202.4	163.5	-155.6	0.23	0.08	-3.68	
8,475.0	3.54	21.27	8,467.2	203.8	164.0	-156.1	0.37	0.36	-1.64	
8,500.0	3.69	22.68	8,492.1	205.3	164.6	-156.6	0.70	0.60	5.64	
8,525.0	3.82	21.01	8,517.1	206.8	165.2	-157.2	0.68	0.52	-6.68	
8,550.0	3.82	22.21	8,542.0	208.3	165.9	-157.7	0.32	0.00	4.80	
8,575.0	3.94	21.88	8,567.0	209.9	166.5	-158.3	0.49	0.48	-1.32	
8,600.0	4.03	21.55	8,591.9	211.5	167.1	-158.9	0.37	0.36	-1.32	
8,625.0	4.18	21.65	8,616.8	213.2	167.8	-159.5	0.60	0.60	0.40	
8,650.0	4.23	21.92	8,641.8	214.9	168.5	-160.1	0.22	0.20	1.08	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	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)	
8,675.0	4.08	21.16	8,666.7	216.6	169.1	-160.7	0.64	-0.60	-3.04	
8,700.0	3.90	21.90	8,691.6	218.2	169.8	-161.3	0.75	-0.72	2.96	
8,725.0	3.48	19.03	8,716.6	219.7	170.3	-161.8	1.83	-1.68	-11.48	
8,750.0	3.13	20.86	8,741.5	221.0	170.8	-162.2	1.46	-1.40	7.32	
8,775.0	2.83	19.81	8,766.5	222.3	171.3	-162.6	1.22	-1.20	-4.20	
8,800.0	2.71	21.05	8,791.5	223.4	171.7	-163.0	0.54	-0.48	4.96	
8,825.0	2.57	18.87	8,816.5	224.5	172.1	-163.4	0.69	-0.56	-8.72	
8,850.0	2.58	19.42	8,841.4	225.5	172.5	-163.7	0.11	0.04	2.20	
8,875.0	2.71	19.37	8,866.4	226.6	172.8	-164.0	0.52	0.52	-0.20	
8,900.0	2.81	19.37	8,891.4	227.8	173.2	-164.4	0.40	0.40	0.00	
8,925.0	3.02	18.74	8,916.3	229.0	173.7	-164.7	0.85	0.84	-2.52	
8,950.0	2.87	17.46	8,941.3	230.2	174.1	-165.1	0.66	-0.60	-5.12	
8,975.0	3.10	18.93	8,966.3	231.4	174.5	-165.5	0.97	0.92	5.88	
9,000.0	3.12	19.36	8,991.2	232.7	174.9	-165.9	0.12	0.08	1.72	
9,025.0	2.96	18.85	9,016.2	234.0	175.3	-166.2	0.65	-0.64	-2.04	
9,050.0	2.78	17.85	9,041.2	235.1	175.7	-166.6	0.75	-0.72	-4.00	
9,075.0	2.58	17.68	9,066.1	236.3	176.1	-166.9	0.80	-0.80	-0.68	
9,100.0	2.54	17.32	9,091.1	237.3	176.4	-167.2	0.17	-0.16	-1.44	
9,125.0	2.54	16.70	9,116.1	238.4	176.8	-167.5	0.11	0.00	-2.48	
9,150.0	2.55	14.49	9,141.1	239.5	177.1	-167.7	0.39	0.04	-8.84	
9,175.0	2.60	16.12	9,166.0	240.5	177.3	-168.0	0.35	0.20	6.52	
TIE ONTO GYROS										
9,319.0	1.27	26.10	9,310.0	245.1	179.0	-169.4	0.95	-0.92	6.93	
FIRST MWD SVY @ 9319'MD										
9,355.0	1.03	22.66	9,346.0	245.8	179.3	-169.7	0.69	-0.67	-9.56	
9,386.0	0.60	342.02	9,376.9	246.2	179.3	-169.7	2.24	-1.39	-131.10	
9,418.0	2.35	294.90	9,408.9	246.6	178.7	-169.1	6.22	5.47	-147.25	
9,449.0	3.99	296.11	9,439.9	247.4	177.1	-167.5	5.29	5.29	3.90	
9,480.0	5.60	288.73	9,470.8	248.3	174.7	-165.1	5.55	5.19	-23.81	
9,511.0	7.17	282.19	9,501.6	249.2	171.4	-161.7	5.57	5.06	-21.10	
9,543.0	8.21	278.53	9,533.3	250.0	167.2	-157.5	3.59	3.25	-11.44	
9,574.0	9.89	277.81	9,563.9	250.7	162.4	-152.6	5.43	5.42	-2.32	
9,605.0	12.97	282.00	9,594.3	251.7	156.3	-146.5	10.28	9.94	13.52	
9,637.0	16.92	286.67	9,625.2	253.8	148.3	-138.5	12.90	12.34	14.59	
9,668.0	19.24	288.30	9,654.7	256.7	139.2	-129.2	7.66	7.48	5.26	
9,715.0	20.69	283.68	9,698.9	261.1	123.7	-113.6	4.56	3.09	-9.83	
9,758.0	25.34	281.67	9,738.4	264.8	107.3	-97.1	10.97	10.81	-4.67	
9,789.0	28.85	281.18	9,766.0	267.6	93.5	-83.2	11.35	11.32	-1.58	
9,826.0	32.09	280.66	9,797.9	271.1	75.1	-64.6	8.79	8.76	-1.41	
9,883.0	41.82	284.00	9,843.4	278.5	41.7	-31.0	17.42	17.07	5.86	
9,930.0	50.52	285.76	9,875.9	287.3	9.0	2.1	18.71	18.51	3.74	
9,977.0	56.21	284.28	9,904.0	297.0	-27.5	38.8	12.37	12.11	-3.15	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	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)
9,983.0	56.77	284.14	9,907.3	298.3	-32.3	43.7	9.58	9.37	-2.35
FTP @ 9983'MD / 9907.3'TVD									
10,024.0	60.62	283.22	9,928.6	306.5	-66.3	78.0	9.58	9.38	-2.24
10,071.0	66.70	284.31	9,949.4	316.6	-107.2	119.3	13.10	12.94	2.32
10,118.0	74.43	284.57	9,965.0	327.6	-150.1	162.6	16.46	16.45	0.55
10,165.0	76.74	280.94	9,976.7	337.6	-194.5	207.3	8.95	4.91	-7.72
10,212.0	80.00	276.07	9,986.2	344.4	-240.0	253.0	12.29	6.94	-10.36
10,259.0	86.83	275.18	9,991.6	349.0	-286.4	299.6	14.65	14.53	-1.89
10,352.0	88.80	275.79	9,995.1	357.9	-378.9	392.4	2.22	2.12	0.66
10,446.0	92.94	274.16	9,993.7	366.0	-472.6	486.2	4.73	4.40	-1.73
10,540.0	93.59	273.83	9,988.4	372.6	-566.2	580.1	0.78	0.69	-0.35
10,634.0	93.90	273.94	9,982.2	378.9	-659.8	673.8	0.35	0.33	0.12
10,728.0	92.77	273.49	9,976.8	385.0	-753.4	767.6	1.29	-1.20	-0.48
10,822.0	90.56	272.31	9,974.0	389.8	-847.2	861.6	2.66	-2.35	-1.26
10,916.0	90.62	272.37	9,973.1	393.6	-941.2	955.6	0.09	0.06	0.06
11,010.0	91.43	269.51	9,971.4	395.2	-1,035.1	1,049.5	3.16	0.86	-3.04
11,103.0	92.18	269.61	9,968.4	394.4	-1,128.1	1,142.4	0.81	0.81	0.11
11,198.0	92.66	270.04	9,964.4	394.1	-1,223.0	1,237.2	0.68	0.51	0.45
11,291.0	92.69	270.56	9,960.1	394.6	-1,315.9	1,330.0	0.56	0.03	0.56
11,385.0	89.05	269.38	9,958.7	394.6	-1,409.8	1,423.9	4.07	-3.87	-1.26
11,479.0	88.68	269.00	9,960.5	393.3	-1,503.8	1,517.8	0.56	-0.39	-0.40
11,573.0	88.71	268.85	9,962.7	391.5	-1,597.8	1,611.6	0.16	0.03	-0.16
11,666.0	89.69	268.57	9,964.0	389.4	-1,690.7	1,704.4	1.10	1.05	-0.30
11,760.0	89.94	268.17	9,964.3	386.7	-1,784.7	1,798.2	0.50	0.27	-0.43
11,854.0	90.67	268.17	9,963.8	383.7	-1,878.7	1,892.0	0.78	0.78	0.00
11,948.0	91.01	267.92	9,962.4	380.5	-1,972.6	1,985.7	0.45	0.36	-0.27
12,042.0	91.26	267.65	9,960.5	376.9	-2,066.5	2,079.4	0.39	0.27	-0.29
12,135.0	91.54	268.73	9,958.3	373.9	-2,159.4	2,172.2	1.20	0.30	1.16
12,229.0	92.27	269.18	9,955.1	372.2	-2,253.4	2,266.0	0.91	0.78	0.48
12,323.0	92.30	269.69	9,951.4	371.3	-2,347.3	2,359.8	0.54	0.03	0.54
12,417.0	92.69	269.20	9,947.3	370.4	-2,441.2	2,453.6	0.67	0.41	-0.52
12,511.0	92.63	268.87	9,942.9	368.8	-2,535.1	2,547.3	0.36	-0.06	-0.35
12,605.0	91.79	269.52	9,939.3	367.5	-2,629.0	2,641.1	1.13	-0.89	0.69
12,699.0	91.82	269.71	9,936.3	366.9	-2,722.9	2,735.0	0.20	0.03	0.20
12,792.0	91.65	270.00	9,933.5	366.6	-2,815.9	2,827.9	0.36	-0.18	0.31
12,886.0	90.42	270.79	9,931.8	367.3	-2,909.9	2,921.8	1.56	-1.31	0.84
12,980.0	90.98	270.69	9,930.7	368.5	-3,003.9	3,015.8	0.61	0.60	-0.11
13,074.0	92.55	271.08	9,927.8	369.9	-3,097.8	3,109.7	1.72	1.67	0.41
13,168.0	91.79	270.82	9,924.2	371.5	-3,191.7	3,203.6	0.85	-0.81	-0.28
13,261.0	89.55	269.26	9,923.1	371.6	-3,284.7	3,296.5	2.94	-2.41	-1.68
13,355.0	90.59	269.43	9,923.0	370.5	-3,378.7	3,390.4	1.12	1.11	0.18
13,449.0	92.05	270.68	9,920.9	370.6	-3,472.7	3,484.3	2.04	1.55	1.33

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	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)
13,543.0	90.56	269.84	9,918.7	371.0	-3,566.6	3,578.2	1.82	-1.59	-0.89
13,636.0	90.25	271.90	9,918.1	372.4	-3,659.6	3,671.2	2.24	-0.33	2.22
13,730.0	90.56	272.80	9,917.4	376.3	-3,753.5	3,765.2	1.01	0.33	0.96
13,824.0	90.17	272.11	9,916.8	380.3	-3,847.5	3,859.2	0.84	-0.41	-0.73
13,918.0	89.64	270.58	9,917.0	382.5	-3,941.4	3,953.2	1.72	-0.56	-1.63
14,012.0	90.92	270.16	9,916.5	383.1	-4,035.4	4,047.1	1.43	1.36	-0.45
14,106.0	91.90	270.34	9,914.2	383.5	-4,129.4	4,141.1	1.06	1.04	0.19
14,200.0	90.87	269.81	9,911.9	383.6	-4,223.4	4,235.0	1.23	-1.10	-0.56
14,294.0	90.67	269.22	9,910.7	382.9	-4,317.3	4,328.9	0.66	-0.21	-0.63
14,388.0	90.81	269.83	9,909.4	382.1	-4,411.3	4,422.7	0.67	0.15	0.65
14,482.0	90.36	270.12	9,908.5	382.0	-4,505.3	4,516.7	0.57	-0.48	0.31
14,575.0	90.39	269.81	9,907.9	382.0	-4,598.3	4,609.6	0.33	0.03	-0.33
14,669.0	89.75	269.52	9,907.8	381.4	-4,692.3	4,703.5	0.75	-0.68	-0.31
14,763.0	90.06	269.57	9,907.9	380.7	-4,786.3	4,797.4	0.33	0.33	0.05
14,857.0	90.92	269.92	9,907.1	380.3	-4,880.3	4,891.3	0.99	0.91	0.37
14,951.0	90.81	269.01	9,905.7	379.4	-4,974.3	4,985.2	0.98	-0.12	-0.97
15,045.0	91.71	269.15	9,903.6	377.9	-5,068.3	5,079.0	0.97	0.96	0.15
15,139.0	92.52	268.95	9,900.2	376.3	-5,162.2	5,172.8	0.89	0.86	-0.21
15,233.0	92.77	269.02	9,895.8	374.7	-5,256.1	5,266.6	0.28	0.27	0.07
15,327.0	90.84	269.41	9,892.9	373.4	-5,350.0	5,360.4	2.09	-2.05	0.41
15,420.0	92.86	270.23	9,889.9	373.1	-5,443.0	5,453.3	2.34	2.17	0.88
15,514.0	92.60	271.80	9,885.4	374.7	-5,536.8	5,547.1	1.69	-0.28	1.67
15,608.0	91.40	271.58	9,882.1	377.5	-5,630.7	5,641.1	1.30	-1.28	-0.23
15,702.0	91.82	272.33	9,879.5	380.7	-5,724.6	5,735.0	0.91	0.45	0.80
15,796.0	91.12	272.97	9,877.0	385.1	-5,818.5	5,829.0	1.01	-0.74	0.68
15,890.0	90.81	271.26	9,875.5	388.5	-5,912.4	5,923.0	1.85	-0.33	-1.82
15,984.0	90.87	271.48	9,874.1	390.8	-6,006.4	6,017.0	0.24	0.06	0.23
16,078.0	91.04	269.90	9,872.5	391.9	-6,100.4	6,110.9	1.69	0.18	-1.68
16,171.0	90.53	268.89	9,871.2	390.9	-6,193.4	6,203.8	1.22	-0.55	-1.09
16,265.0	90.92	269.11	9,870.0	389.3	-6,287.3	6,297.6	0.48	0.41	0.23
16,359.0	91.57	269.65	9,868.0	388.3	-6,381.3	6,391.5	0.90	0.69	0.57
16,453.0	91.26	269.70	9,865.7	387.7	-6,475.3	6,485.4	0.33	-0.33	0.05
16,547.0	92.21	269.73	9,862.8	387.3	-6,569.2	6,579.2	1.01	1.01	0.03
16,641.0	90.92	268.52	9,860.3	385.8	-6,663.2	6,673.1	1.88	-1.37	-1.29
16,735.0	90.56	267.87	9,859.1	382.9	-6,757.1	6,766.8	0.79	-0.38	-0.69
16,828.0	90.00	269.00	9,858.6	380.3	-6,850.1	6,859.6	1.36	-0.60	1.22
16,922.0	89.44	268.05	9,859.1	377.9	-6,944.0	6,953.4	1.17	-0.60	-1.01
17,016.0	89.44	268.98	9,860.0	375.5	-7,038.0	7,047.2	0.99	0.00	0.99
17,110.0	90.00	269.49	9,860.4	374.2	-7,132.0	7,141.1	0.81	0.60	0.54
17,204.0	89.97	269.56	9,860.5	373.4	-7,226.0	7,235.0	0.08	-0.03	0.07
17,298.0	89.61	270.12	9,860.8	373.2	-7,320.0	7,328.9	0.71	-0.38	0.60
17,392.0	91.34	268.90	9,860.0	372.4	-7,414.0	7,422.8	2.25	1.84	-1.30

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	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)	
17,486.0	92.47	270.50	9,856.9	371.9	-7,507.9	7,516.7	2.08	1.20	1.70	
17,579.0	90.28	269.06	9,854.7	371.5	-7,600.9	7,609.5	2.82	-2.35	-1.55	
17,673.0	90.14	270.69	9,854.3	371.3	-7,694.9	7,703.5	1.74	-0.15	1.73	
17,767.0	90.22	271.78	9,854.0	373.3	-7,788.9	7,797.5	1.16	0.09	1.16	
17,861.0	92.97	272.57	9,851.4	376.9	-7,882.7	7,891.4	3.04	2.93	0.84	
17,955.0	93.28	272.18	9,846.3	380.8	-7,976.5	7,985.3	0.53	0.33	-0.41	
18,049.0	92.41	271.25	9,841.6	383.6	-8,070.4	8,079.1	1.35	-0.93	-0.99	
18,143.0	92.18	271.33	9,837.9	385.7	-8,164.3	8,173.1	0.26	-0.24	0.09	
18,237.0	91.60	271.25	9,834.8	387.8	-8,258.2	8,267.0	0.62	-0.62	-0.09	
18,330.0	92.02	271.52	9,831.8	390.1	-8,351.1	8,359.9	0.54	0.45	0.29	
18,424.0	92.61	271.48	9,828.0	392.5	-8,445.0	8,453.9	0.63	0.63	-0.04	
18,518.0	92.30	271.53	9,824.0	395.0	-8,538.9	8,547.8	0.33	-0.33	0.05	
18,611.0	92.10	270.73	9,820.4	396.8	-8,631.8	8,640.7	0.89	-0.22	-0.86	
18,705.0	91.23	270.86	9,817.7	398.1	-8,725.8	8,734.6	0.94	-0.93	0.14	
18,798.0	90.14	270.58	9,816.6	399.3	-8,818.7	8,827.6	1.21	-1.17	-0.30	
18,892.0	89.38	270.21	9,817.0	400.0	-8,912.7	8,921.5	0.90	-0.81	-0.39	
18,986.0	89.22	270.02	9,818.1	400.2	-9,006.7	9,015.4	0.26	-0.17	-0.20	
19,079.0	89.92	270.43	9,818.8	400.5	-9,099.7	9,108.4	0.87	0.75	0.44	
19,173.0	90.39	270.43	9,818.6	401.2	-9,193.7	9,202.3	0.50	0.50	0.00	
19,267.0	90.81	269.75	9,817.6	401.4	-9,287.7	9,296.3	0.85	0.45	-0.72	
19,360.0	91.23	269.78	9,815.9	401.0	-9,380.7	9,389.2	0.45	0.45	0.03	
19,454.0	90.56	269.44	9,814.5	400.3	-9,474.7	9,483.1	0.80	-0.71	-0.36	
19,548.0	90.45	269.02	9,813.6	399.1	-9,568.7	9,576.9	0.46	-0.12	-0.45	
19,642.0	90.62	268.49	9,812.8	397.0	-9,662.6	9,670.8	0.59	0.18	-0.56	
19,735.0	90.70	268.27	9,811.7	394.4	-9,755.6	9,763.6	0.25	0.09	-0.24	
19,829.0	89.10	267.94	9,811.9	391.3	-9,849.5	9,857.3	1.74	-1.70	-0.35	
19,923.0	91.20	269.17	9,811.6	388.9	-9,943.5	9,951.1	2.59	2.23	1.31	
20,017.0	92.27	269.13	9,808.8	387.5	-10,037.5	10,044.9	1.14	1.14	-0.04	
20,057.8	92.01	269.15	9,807.2	386.9	-10,078.2	10,085.6	0.63	-0.63	0.04	
LTP @ 20057.8'MD / 9807.2'TVD										
20,111.0	91.68	269.17	9,805.5	386.1	-10,131.4	10,138.7	0.63	-0.63	0.04	
20,118.0	91.90	268.96	9,805.3	386.0	-10,138.4	10,145.7	4.34	3.14	-3.00	
FINAL MWD SVY @ 20118'MD										
20,195.0	91.90	268.96	9,802.8	384.6	-10,215.3	10,222.6	0.00	0.00	0.00	

Survey Report

Company:	NORTHERN DELAWARE BASIN	Local Co-ordinate Reference:	Well HOWITZER FEDERAL COM 605H
Project:	EDDY COUNTY, NM	TVD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Site:	ATLAS	MD Reference:	KB=27' Scan Free @ 2990.5usft (Original Well Elev)
Well:	HOWITZER FEDERAL COM 605H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	AWP	Database:	EDM_Users

Design Targets									
Target Name									
- hit/miss target	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- Shape	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(usft)		
PBHL - (HOWITZER F	1.07	90.15	9,799.0	391.8	-10,209.1	449,260.50	582,727.20	32° 14' 5.463 N	104° 3' 56.819 W
- actual wellpath misses target center by 8.1usft at 20188.8usft MD (9803.0 TVD, 384.8 N, -10209.1 E)									
- Rectangle (sides W100.0 H-10,407.1 D20.0)									
LTP - (HOWITZER FE	0.00	0.00	9,801.4	391.4	-10,079.1	449,260.10	582,857.20	32° 14' 5.456 N	104° 3' 55.305 W
- actual wellpath misses target center by 7.3usft at 20058.8usft MD (9807.2 TVD, 386.9 N, -10079.2 E)									
- Point									
FTP - (HOWITZER FE	0.00	0.00	9,869.0	364.8	-31.9	449,233.50	592,904.40	32° 14' 4.930 N	104° 1' 58.330 W
- actual wellpath misses target center by 76.4usft at 9973.7usft MD (9902.1 TVD, 296.3 N, -24.8 E)									
- Circle (radius 50.0)									

Design Annotations				
Measured Depth	Vertical Depth	Local Coordinates		Comment
(usft)	(usft)	+N/-S (usft)	+E/-W (usft)	
9,175.0	9,166.0	240.5	177.3	TIE ONTO GYROS
9,319.0	9,310.0	245.1	179.0	FIRST MWD SVY @ 9319'MD
9,983.0	9,907.3	298.3	-32.3	FTP @ 9983'MD / 9907.3'TVD
20,057.8	9,807.2	386.9	-10,078.2	LTP @ 20057.8'MD / 9807.2'TVD
20,118.0	9,805.3	386.0	-10,138.4	FINAL MWD SVY @ 20118'MD
20,195.0	9,802.8	384.6	-10,215.3	PTD @ 20195'MD

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