

Deviation Approval and Risk Acceptance Document (DARAD)

for

PARCEL 3

**Fort Wingate Depot Activity (FWDA)
McKinley County, New Mexico**

**Contract No: W912DY-10-D-0025
Task Order Number: DS02**

Prepared for:

**U.S. Army Corps of Engineers
Tulsa and Fort Worth Districts**

Prepared by:



**PIKA-Pirnie Joint Venture, LLC
12723 Capricorn Drive, Suite 500
Stafford, TX**

Version 3.0, July 23, 2015

**Executive Summary for Parcel 3
Fort Wingate Depot Activity (FWDA)**

The purpose of this Deviation Approval and Risk Acceptance Document (DARAD) is listed below:

1. This DARAD is to accept the risk caused from Improved Conventional Munitions (ICM)/Submunitions involved with the clearance of waste military munitions or waste munitions scrap being conducted within Parcel 3 at the FWDA, pursuant to FWDA RCRA Permit No. NM6213820947, Sections IV.B, IV.C and IV.F. Parcel 3 is a previous and known ICM area that has Bomb Live Unit (BLU)-3 and BLU-4 identified. Parcel 3 (Kickout Area [KOA], Solid Waste Management Units (SWMU) 14, SWMU 15, SWMU 33, SWMU 74, Area of Concern (AOC) 89, AOC 90, and AOC 91 [excluding the KOA Inner Fence Area]) has the M107 (Comp B Filled), M107 (TNT Filled) and the M795, 155mm, High Explosive (HE) Projectiles as its Munition with the Greatest Fragmentation Distance (MGFD), which has the Maximum Fragmentation Distance – Horizontal (MFD-H) of 2,894 feet. Parcel 3 (KOA Inner Fence Area and AOC 92) has the AN-M66A2 2,000-lb HE Bomb as its MGFD, which has the MFD-H of 3,593 feet. All non-essential personnel will be evacuated and FWDA installation roads will be blocked with controlled access to the Exclusion Zone (or Minimum Separation Distance (MSD) arcs) required for the clearance operations per the Explosives Safety Submission (ESS) and this DARAD. The permanent risk mitigation focuses on Parcel 3 clearance operations being the only known and approved method to mitigate and reduce the ICM/Submunition hazards associated with the FWDA Parcel 3. The interim risk mitigation addresses the use of experienced personnel in accordance with DA and USACE guidance to provide the most effective control of the ICM/Submunition hazards.
2. The information on the Potential Explosion Site (PES) within the DARAD form (blocks 29 – 35) applies to the evaluation of the ICM/Submunition explosive hazards that require the submission and approval of this DARAD. As no deviations or waivers are required for the MGFD and other conventional MEC hazards associated with this site due to their compliance with all regulations and rules, the PES ICM/Submunition hazard being evaluated is that of the most hazardous ICM expected to date (BLU-3 and BLU-4).
3. This DARAD is being submitted per the requirements of DA PAM 385-63, Section 2-12 and DA PAM 385-64, Section 19-8 to consider the Hazard Severity and Hazard Probability (fuzing, density of submunitions in the area, type of activity to be conducted, and vegetation) prior to the conduct of clearance activities at the FWDA Parcel 3.
4. DA PAM 385-30, "Risk Management", provides a mechanism to properly evaluate the risks involved with clearance operations in ICM/Submunition areas.

5. This DARAD addresses the JMAC-EST Memorandum for policy of ICM Clean-Up Operations, dated 25 July 2013, Paragraph 7, requiring a signed DARAD approving the use of non-Unexploded Ordnance (UXO) qualified personnel.
 - a. The option to use either qualified UXO personnel or the use of non-UXO qualified personnel as Earth Moving Machinery (EMM) operators to operate the hardened/shielded or remote-controlled (R/C) excavators and dump trucks utilized for excavation and transportation of excavated soils to the Sorting/Inspection Area (SIA), and to transport segregated metal from the SIA to the designated inspection area.
 - b. The use of non-UXO qualified personnel for Digital Geophysical Mapping (DGM) and Location Survey personnel/teams, construction contractors/local vendors supporting clearance activities (vegetation removal, fence repair and road repair, sift plant maintenance) escorted by qualified UXO personnel.
 - c. Qualified UXO personnel escorting Unexploded Ordnance Technician I (UXOTI) and other assigned project personnel (i.e., Project Manager (PM), Corporate Safety and Health Manager (CSHM), etc.) across and through the Parcel 3 ICM area as required for project needs and assignments (i.e., transport of UXOTI using roadways, across the Parcel 3 ICM area, to their daily assigned work area elsewhere at FWDA).
6. Per Block 28 of the DA Form 7632 for DARAD attachments, the ESS with its associated figures for all FWDA Parcels in its Appendix A, are attached to this DARAD.

Summary for UXO Qualified or Non-UXO Qualified Personnel for EMM Operations:

This DARAD along with necessary sections of the site approved work plan(s) will provide the necessary steps and operations to implement the option of using either qualified UXO personnel or non-UXO qualified personnel as EMM operators at the Parcel 3, which is an ICM site. The following sections will be included at a minimum:

1. Procedures for escorted access of non-UXO personnel by UXO-qualified personnel, both in and out of Parcel 3, to get them to their applicative piece of EMM.
2. Procedures for UXO qualified personnel to properly mark a clear pathway for the dump truck driver to use in order to move to and stay within the hardened/shielded position during excavation and loading of the dump truck, and to use to return to the dump truck when ready to transport to the SIA, during ingress or egress movement of the dump truck driver, and the temporary stoppage of excavation and loading operations.
3. All non-UXO qualified personnel will be properly trained for their position in accordance with the approved work plan (WP).

Summary for DGM, Survey Team, and Construction Contractors Supporting Clearance Activities/Operations:

This DARAD along with necessary sections of the site approved work plan(s) will provide the necessary approval for using non-UXO qualified personnel as DGM and Survey personnel/ teams, construction contractor/local vendor support (e.g. vegetation removal, fence repairs or road repairs, sift plant maintenance) at the FWDA Parcel 3, which is an ICM site.

1. All DGM operators/teams, surveyors/survey teams/support contractor personnel will be escorted by qualified UXO personnel.
2. All DGM operators/teams, surveyors/survey teams/support contractor personnel will receive site familiarization briefing, and be properly trained for their duties in accordance with the WP.

Summary for Escort of UXOTI and Other Assigned Project Personnel:

When UXOTI(s) need escort across the Parcel 3 ICM area to get to their FWDA work site, they will be escorted by UXO-qualified personnel. UXO-qualified personnel will also escort other assigned project personnel (i.e., PM, CSHM, etc.) when on site to conduct project business, site checks, etc.).

DEVIATION APPROVAL AND RISK ACCEPTANCE DOCUMENT (DARAD)

For use of this form, see DA PAM 385-30; the proponent agency is DAS.

SITE INFORMATION

1a. Country: United States	1b. State: New Mexico	2. Service: A - Army	3a. Installation Type: DEPOT
3b. Installation Name: Fort Wingate Depot Activity (FWDA)		3c. Type of Site: Parcel 3	

DEVIATION INFORMATION

4. Deviation #: CESWF-W-20151001-A	5a. Effective Date: 2015-10-01 <small>(Will auto populate from block 16)</small>	5b. Expiration Date: 2020-10-01	6. Deviation From: Ammunition/Explosive (AE) Safety Standards
7. Type of Deviation: W - Waiver		8a. Number/Title and Paragraph of Requirement: DA PAM 385-63, Range Safety, Section 2-1.g and Section 2-12.	
8b. What we need to do that deviates from 8a: (Synopsis of block 24) Allow non-UXO-Qualified and UXO-Qualified personnel access into Parcel 3, a known Improved Conventional Munitions (ICM) area to remove the explosive ICM/MEC hazards associated with Parcel 3.			
8c. Operational, Strategic or Compelling Reason for Violation: Reduction of ICM/MEC hazards associated with the Parcel 3 will allow for a safer environment for future access and allow the U.S. Army to comply with the RCRA Permit and future land usages.			
9. Potential Consequences of Deviation from Approved Standards:		9a. # Fatalities: 0	9b. # Injuries: 0
		9c. Equip/Fac Loss \$: \$ 0.00	10. Date Deviation Initiated: 20151001
11. Residual Severity: 4 - Negligible	12. Residual Probability: E - Unlikely	13. Residual Level of Risk: L - Low - RAC 4	14a. Safety Professional/ Analyst (POC Info): Dennis Myers OE Safety Specialist, CESWF
14b. Analyst Signature: MYERS.DENNIS J.101087330	14c. Submitter (POC Info): Shawn M. Corcoran, UXO Program Manager PIKA-PIRNIE Joint Venture <small>(If different from 14a.)</small>		14d. Submitter Signature: Shawn Corcoran <small>(if different from 14a.)</small>

14 e. REVIEWED BY:

DATE	CONCUR (YES/NO)	ORGANIZATION	PRINTED NAME/TITLE	Attachment	SIGNATURE
20151001	YES	U.S. Army Corps of Engineers, Fort Worth	Jackie Smith, CESWF Lead OESS	Attachment? <input type="checkbox"/>	SMITH.JACKIE.G. 1121737430
				Attachment? <input type="checkbox"/>	
				Attachment? <input type="checkbox"/>	
				Attachment? <input type="checkbox"/>	
				Attachment? <input type="checkbox"/>	
				Attachment? <input type="checkbox"/>	

DEVIATION APPROVAL/RISK ACCEPTANCE

I have reviewed the risk assessment and understand the hazard and potential consequences. I am approving this deviation and accepting the additional potential consequences and residual risk based on current operational necessity.

15. Army HQ: USACE	15b. Unit/Comm: CESWF	16a. DATE: 2015-10-01	16b. Expiration Date: 2020-10-01	17. RANK/TITLE: GS-15/Chief Industrial and Medical Branch
17a. PRINTED NAME: William J. O'Donnell II		17b. SIGNATURE: O'DONNELL.WILLIAM.J.II.1180145105		
17c. Comment:				Attachment? <input type="checkbox"/>

Digitally signed by O'DONNELL.WILLIAM.J.II.1180145105
DN: cn=US, o=4US Government, ou=DoD, ou=PKI, ou=USA, cn=O'DONNELL.WILLIAM.J.II.1180145105
Date: 2015.07.30 14:32:56 -0400

RISK ASSESSMENT WORKSHEET

Deviation #: CESWF-W-20151001-A	Effective Date: 2015-10-01	Expiration Date: 2020-10-01	
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RISK ANALYSIS INFORMATION

18. Current Situation: "Provide a description of the situation that necessitates this deviation." The explosive ICM/MEC hazards associated with Parcel 3 need to be remediated of waste military munitions or waste munitions scrap pursuant to FWDA RCRA Permit No. NM6213820947, Sections IV.B, IV.C and IV.F. This DARAD is being submitted per the requirements of DA PAM 385-63, Section 2-12 and DA PAM 385-64, Section 19-8.						Attachment? <input type="checkbox"/>
19. Hazard Category: Explosion		20. Specific Hazard: The Parcel 3 specific hazards outside the parameters of the approved ESS and covered in this DARAD are the ICM's Bomb Live Unit (BLU)-3 and BLU-4 and other less hazardous ICMs				
21. Duration of Deviation (Choose one of the following)	21a. 1 month or less: (select the duration (in days))	0	21b. 1 month to 1 year: (select the duration (in months))	0	21c. 1 year to 5 years: (select the duration (in years))	5
					21d. Permanent or greater than 5 years: (enter number of years or PERMANENT)	0
22. Deviation Approval Authority: (or Equivalent) Brigade CO, Responsible O6, Responsible GM-16/GS-15 or equivalent						
23. Mission Impact of Not Accepting Risk: Failure to receive a signed DARAD would result in the Army being non-compliant of FWDA RCRA Permit No. NM6213820947. If an accidental detonation occurred that injured essential personnel or destroyed/damaged surrounding equipment, Parcel 3 could remain non-remediated.					Attachment? <input type="checkbox"/>	
24. What we need to do that violates 8a: (Provide a detailed description of the action that deviates from the standards.) Allow non-UXO qualified personnel and UXO qualified personnel to accept the risk caused from known ICM/submunitions in order to remediate Parcel 3, a known ICM area. Permit the option to use either qualified UXO personnel or the use of non-UXO qualified personnel as: Earth Moving Machinery (EMM) operators to operate the hardened/shielded or remote-controlled (R/C) excavators and dump trucks utilized for excavation and transportation of excavated soils from the MRS to the Sorting/Inspection Area (SIA), and to transport segregated metal from the SIA to the designated inspection area: Digital Geophysical Mapping (DGM) and Survey personnel/teams, construction contractors/local vendors supporting clearance activities (e.g., vegetation removal, fence/ road repair, SIA maintenance); Supervisory access by designated assigned project personnel (e.g. Project Manager (PM), Corporate Safety and Health Manager (CSHM), as well as UXOTI) while escorted by UXO qualified personnel.					Attachment? <input type="checkbox"/>	
25. Control Measures: "Measures taken, or will take, to reduce hazards of risk being accepted." All non-essential personnel will be evacuated and FWDA installation roads will be blocked with controlled access to the Exclusion Zone (or Minimum Separation Distance (MSD) arcs) required for the clearance operations per the Explosives Safety Submission (ESS) and this DARAD. All non-UXO qualified personnel will be escorted by UXO qualified personnel after receiving a site familiarization briefing, and having been properly trained for their duties as per the WP. DA PAM 385-30, "Risk Management," provides the mechanism to properly evaluate the risks involved with clearance operations in ICM/ Submunitions areas.					Attachment? <input type="checkbox"/>	
26. Permanent Corrective Actions (with Milestones): Include estimated cost, military construction project number, etc. There is no known permanent risk mitigation (corrective action) beyond an actual MEC/MPPEH clearance of the ICM/Submunitions contaminated area (i.e. FWDA Parcel 3) in order to reduce/remove all hazards identified.					Attachment? <input type="checkbox"/>	
27. Alternatives Considered: "Things considered doing but didn't, and why." Alternative 1: Not completing a MEC/MPPEH clearance of the ICM/Submunition area. This option was not considered as a viable option as it results in non-compliance with the FWDA RCRA Permit No. NM6213820947, Sections IV.B, IV.C and IV.F, and will prohibit the eventual transfer of lands from the U.S. Army.					Attachment? <input type="checkbox"/>	
Alternative 2:					Other	
Alternative 3:						
28. Attach any supporting documents (i.e. Photos, MOU, ASAP-X, ESS, etc.)					Attachment? <input checked="" type="checkbox"/>	

AMMUNITION AND EXPLOSIVES WORKSHEET

Deviation #: CESWF-W-20151001-A

Effective Date: 2015-10-01

Expiration Date: 2020-10-01

INFORMATION ON THE POTENTIAL EXPLOSION SITE (PES)

29a. PES Name/#: Parcel 3	29b. PES Function: Inactive; formerly contained OB/OD units, burning grounds, and burial areas containing ICMs	30. PES # People: 50
31. PES Equip/Fac (Value) \$: \$1,500,000.00	32. Required Blast Distance: 264	33. Required Fragment Distance: 592
34a. Hazard Division: <u>1.1</u> : NEW: 0.36	34b. Hazard Division: <u>1.2.1</u> : NEW:	34c. Hazard Division: <u>1.2.2</u> : NEW:
34d. Hazard Division: <u>1.2.3</u> : NEW:	34e. Hazard Division: <u>1.3</u> : NEW:	34f. Hazard Division: <u>1.4</u> : NEW/MEQ:

35a. QD arcs exceed the installation boundary? YES NO Are other Services affected? YES NO Was coordination made? YES NO Provide other coordination documentation, as necessary.

Why coordination was/was not made: Coordination was conducted through the DDESB approval process for the ESS for all Parcel 3 explosive operations. Additional specific explosive hazards from the ICM/Submunitions at Parcel 3 are covered within this DARAD.

Coordination paperwork attached?

35b. Is this deviation associated with a hybrid or risk-base safety submission? NO

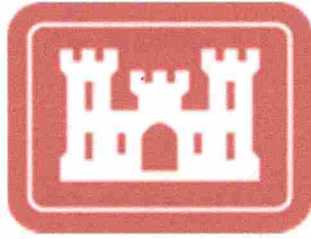
35c. If YES, provide site plan #:

INFORMATION ON THE EXPOSED SITES (ES)

FACILITY	DISTANCE, Feet		# PEOPLE	EQUIP/FAC (VALUE) \$	EXPOSURE TYPE	ON/OFF INSTALLATION	At Required Distance			At Requested Distances			(Attachment?) <input type="checkbox"/>
	REQUIRED	ACTUAL					FATALITIES	INJURIES	EQUIP/FAC (LOSS) \$	FATALITIES	INJURIES	EQUIP/FAC (LOSS) \$	VIOLATION?
None	0	0				ON							NO
	0	0				ON							NO
	0	0				ON							NO
	0	0				ON							NO
	0	0				ON							NO
	0	0				ON							NO
	0	0				ON							NO
	0	0				ON							NO
	0	0				ON							NO
	0	0				ON							NO
	0	0				ON							NO
	0	0				ON							NO

EXPECTED POTENTIAL CONSEQUENCES

37. Potential Explosion Site:	a. Fatalities: 50	b. Injuries:	c. Equip/Fac \$: \$ 1,500,000.00
38. Potential Losses for Exposed Sites (ES) Meeting Criteria:	a. Fatalities:	b. Injuries:	c. Equip/Fac \$:
39. Potential Loss Being Accepted for Deviating from Approved Standards:	a. Fatalities: 0	b. Injuries: 0	c. Equip/Fac \$: \$ 0.00
40. Total Potential Loss (#/\$):	a. Fatalities: 50	b. Injuries: 0	c. Equip/Fac \$: \$ 1,500,000.00



EXPLOSIVES SAFETY SUBMISSION

MUNITIONS AND EXPLOSIVES OF CONCERN

NON-TIME CRITICAL REMOVAL ACTION

KICKOUT AREA, SWMU 1, SWMU 10, SWMU 14, SWMU 15, SWMU 33, SWMU 74,
AOC, 76, AOC 89, AOC 90, AOC 91, and AOC 92 IN PARCELS 1, 2, 3, 11, 20 and 21

FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

February 13, 2015

Prepared by:
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Prepared for:
UNITED STATES ARMY CORPS OF ENGINEERS
TULSA AND FORT WORTH DISTRICTS

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Table 3-1	Minimum Separation Distances (MSD)s
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APPENDICES

Appendix A: Figures/Maps

- Figure 1 – Regional Map of FWDA
- Figure 2 – MRS Site Map of KOA, AOC(s), and SWMU(s)
- Figure 3 – ESQD Map of KOA, AOC(s), and SWMU(s)
- Figure 4 – ESQD Map of SWMU 1
- Figure 5 – ESQD Map of SWMU 10
- Figure 6 – ESQD Map of CAMU
- Figure 7 – ESQD Map of ECM(s)

Appendix B Fragmentation Data Review Sheets

- AN-M66A2, 2000-lb HE Bomb
- BLU-3B (Composition A5 filled)
- 155 mm M795
- 155 mm M107 (TNT filled)
- 155 mm M107 (Comp B filled)
- 105mm M1 Projectile (Composition B filled)
- 105mm M1 Projectile (TNT filled)
- 20 mm M56A4 Projectile
- 20 mm M97 HEI Projectile
- 20 mm Mk I HEI Projectile
- M18A1 AP Mine

LIST OF ACRONYMS

AOC	Area of Concern
ASR	Archive Search Report
BEM	Buried Explosion Module
Bgs	below ground surface
BIP	Blow-in-place
BLU	Bomb Live Unit
BRAC	Base Realignment and Closure
CAMU	Corrective Action Management Unit
CBRNE	Chemical, Biological, Radiological, Nuclear and Enhanced Conventional Weapons
CE	Conditional Exemption
CEHNC-EM-CX	Corps of Engineers, Huntsville Center, Environmental and Munitions, Center of Expertise
CESWF	US Army Corps of Engineers – Fort Worth District
CESWT	US Army Corps of Engineers – Tulsa District
CRMP	Community Relations Management Plan
CWM	Chemical Warfare Material
CWM-DC	Chemical Warfare Design Center
CY	Cubic Yard
DARAD	Deviation Approval and Risk Acceptance Document
DD	Defense Department
DDESB	Department of Defense Explosives Safety Board
DoD	Department of Defense
DoDI	Department of Defense Instruction
DOI	Department of Interior
DOT	Department of Transportation
ECM	Earth Covered Magazine
EM	Engineering Manual
EMM	Earth Moving Machinery
EOC	Emergency Operations Center
EOD	Explosive Ordnance Disposal
EPP	Environmental Protection Plan
ESQD	Explosives Safety Quantity Distance
ESS	Explosives Safety Submission
EX	Explosives
EZ	Exclusion Zone
FWDA	Fort Wingate Depot Activity
GPS	Global Positioning System
HC	Hazard Class
HFD	Hazardous Fragment Distance

HWMU	Hazardous Waste Management Unit
ICM	Improved Conventional Munitions
JV	Joint Venture
KOA	Kickout Area
Lbs	Pounds
LUC	Land Use Controls
LLC	Limited Liability Company
MCE	Maximum Credible Event
MDAS	Material Documented as Safe
MDEH	Material Documented as an Explosive Hazard
MEC	Munitions and Explosives of Concern
MFD-H	Maximum Fragment Distance Horizontal
MGFD	Munition with the Greatest Fragmentation Distance
MMRP	Military Munitions Response Program
MPPEH	Material Potentially Presenting an Explosive Hazard
MR	Munitions Response
MRS	Munitions Response Sites
MSD	Minimum Separation Distance
NEW	Net Explosive Weight
NTCR	Non-Time Critical Removal Action
OB	Open Burning
OD	Open Detonation
OE	Ordnance and Explosives
OESS	Ordnance and Explosive Safety Specialist
POC	Point of Contact
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Plan
Q-D	Quantity Distance
R/C	Remote Control
RCRA	Resource Conservation Recovery Act
RCWM	Recovered Chemical Warfare Material
SIA	Sorting and Inspection Area
SOP	Standard Operating Procedure
SUXOS	Senior UXO Supervisor
SWMU	Solid Waste Management Unit
TM	Technical Manual
TP	Technical Paper
TSD	Team Separation Distance
USACE	US Army Corps of Engineers
USAESCH	US Army Engineering Support, Huntsville
USATCES	US Army Technical Center for Explosives Safety
USEPA	United States Environmental Protection Agency

UXO	Unexploded Ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer
WMM	Waste Military Munitions
WP	Work Plan

1.0 BACKGROUND

This Explosives Safety Submission (ESS) for Military Munitions Response Program (MMRP) Non-Time Critical Removal Action (NTCRA) is being submitted by PIKA-Pirnie JV, LLC. to U.S. Army Corps of Engineers (USACE) to perform the munitions and explosives of concern (MEC) surface and subsurface removal action activities associated with Fort Wingate Depot Activity (FWDA), McKinley County, New Mexico. Munitions Response Sites (MRS)s include:

- Kickout Area (KOA)
- Solid Waste Management Unit (SWMU) 1
- SWMU 10
- SWMU 14 (also identified as SWMU 16 in the Resource Conservation Recovery Act (RCRA) Permit)
- SWMU 15 (also identified as SWMU 17 in the RCRA Permit)
- SWMU 33 (also identified as SWMU 35 in the RCRA Permit)
- SWMU 74
- Area of Concern (AOC) 76
- AOC 89
- AOC 90
- AOC 91
- AOC 92.

The FWDA is a Base Realignment and Closure (BRAC) installation located 8 miles east of Gallup, south of Red Rock State Park, next to the reservations of the Navajo Nation and the Zuni Pueblo Tribe (see Figure 1 for site location). This response action is being completed as part of the closure process for the site as stipulated in the Resource Conservation Recovery Act (RCRA) Permit for the FWDA.

1.1 SITE LOCATION

The KOA, SWMU 1, SWMU 10, SWMU 14, SWMU 15, SWMU 33, SWMU 74, AOC 76, AOC 89, AOC 90, AOC 91, and AOC 92 are located on FWDA in Parcels 1, 2, 3, 11, 20, and 21. FWDA property is currently retained by the Department of the Army (Figure 2).

1.2 SITE DESCRIPTION

FWDA is an inactive U.S. Army Depot whose active mission was to store, ship, and receive material and dispose of obsolete or deteriorated explosives and military munitions. The depot operated from the 1918 to 1993, at which time the active mission ceased and the installation closed.

- The KOA is located within Parcels 1, 2, 3 and 20 at FWDA and is the area surrounding the site OB/OD areas.
- SWMU 1 consists of three TNT leaching beds.

- SWMU 10 in Parcel 11 consists of the Sewage Treatment Plant.
- SWMU 14 consists of the old burning ground and demolition landfill area.
- SWMU 15 consists of the old demolition area.
- SWMU 33 consists of the waste munitions debris pile KP1.
- SWMU 74 consists of Area/Site 16 that is the proposed burning ground.
- AOC 76 in Parcel 2 is feature 19 on the 1973 aerial photo API-5 in the 1995 Archive Search Report (ASR).
- AOC 89 in Parcel 3 is feature 30 and feature 34 on the 1973 aerial photo API-5 in the 1995 ASR.
- AOC 90 in Parcel 3 is feature 36 on the 1973 aerial photo API-5 in the 1995 ASR.
- AOC 91 in Parcel 3 is feature 41 in the 1973 aerial photo API-5 and feature 27 on the 1978 aerial photo API-7 in the 1995 ASR.
- AOC 92 consists of the demolition grounds adjacent to the Hazardous Waste Management Unit (HWMU).

Demilitarization of unserviceable, obsolete, or waste explosives, propellants, munitions, and munitions components was accomplished at these sites. Propellants, small arms, and bulk explosives were burned as a means of disposal. Explosively filled munitions were disposed of by detonation. Disposals by detonation were conducted within detonation craters that may have been tamped with an earthen cover to minimize fragmentation dispersal. After OB/OD operations were completed within the detonation craters, residual material and wastes were placed around the HWMU, SWMU 14 and SWMU 15, typically pushed onto or over the arroyo banks.

TABLE 1-1: MRS(S), AOC(S) AND SWMU(S)

MRS / Operational Areas	Acres	Munitions Response Action	Institutional Controls
KOA (Outer Area) Parcels 1, 2, 3, 20	~2844	<ul style="list-style-type: none"> • Manual Analog Magnetometer Assisted MEC Surface and Subsurface Removal Action 	6-foot chain link fence with three-strand barbed wire at the top located around the installation. Portions of the site fall onto tribal lands and have no institutional controls. Installation's outer-fence has appropriate signage.
KOA (Inner Fence) Parcel 3	~300	<ul style="list-style-type: none"> • Manual Analog Magnetometer Assisted MEC Surface Removal Action 	
SWMU 1	~3	<ul style="list-style-type: none"> • Soil Blending and Removal 	6-foot chain link fence with three-strand barbed wire at the top located around the installation. Fence has appropriate signage.
SWMU 10	~7.5	<ul style="list-style-type: none"> • Reacquisition and Intrusive Investigation of 100% of Anomalies 	Installation's outer-fence has appropriate signage and no other controls are noted.

SWMU 14 (to include adjacent west arroyo)	~16	<ul style="list-style-type: none"> • Manual Analog Magnetometer Assisted MEC Surface and Subsurface Removal Action • Hardened/Shielded or Remote-Controlled Excavation and Mechanical/Magnetic Screening of MEC 	6-foot chain link fence with three-strand barbed wire at the top located around the installation. Installation's outer-fence has appropriate signage.
SWMU 15 (to include adjacent west arroyo)	~7	<ul style="list-style-type: none"> • Manual Analog Magnetometer Assisted MEC Surface and Subsurface Removal Action • Hardened/Shielded or Remote-Controlled Excavation and Mechanical/Magnetic Screening of MEC 	6-foot chain link fence with three-strand barbed wire at the top located around the installation. Portions of the site fall on to tribal lands and have no institutional controls. Installation's outer-fence has appropriate signage.
SWMU 33 (to include adjacent west arroyo)	~0.04	<ul style="list-style-type: none"> • Manual Analog Magnetometer Assisted MEC Surface and Subsurface Removal Action • Hardened/Shielded or Remote-Controlled Excavation and Mechanical/Magnetic Screening of MEC 	6-foot chain link fence with three-strand barbed wire at the top located around the installation. Installation's outer-fence has appropriate signage.
SWMU 74	~1.42	<ul style="list-style-type: none"> • Manual Analog Magnetometer Assisted MEC Surface and Subsurface Removal Action 	6-foot chain link fence with three-strand barbed wire at the top located around the installation. Portions of the site fall onto tribal lands and have no institutional controls. Installation's outer-fence has appropriate signage.
AOC 76	~1.33	<ul style="list-style-type: none"> • Manual Analog Magnetometer Assisted MEC Surface and Subsurface Removal Action 	Installation's outer-fence has appropriate signage and no other controls are noted.
AOC 89	~2.91	<ul style="list-style-type: none"> • Manual Analog Magnetometer Assisted MEC Surface and Subsurface Removal Action 	6-foot chain link fence with three-strand barbed wire at the top located around the installation. Installation's outer-fence has appropriate signage.
AOC 90	~1.69	<ul style="list-style-type: none"> • Manual Analog Magnetometer Assisted MEC Surface and Subsurface Removal Action 	6-foot chain link fence with three-strand barbed wire at the top located around the installation. Portions of the site fall onto tribal lands and have no institutional controls. Installation's outer-fence has appropriate signage.

AOC 91	~18.3	<ul style="list-style-type: none"> • Manual Analog Magnetometer Assisted MEC Surface and Subsurface Removal Action 	6-foot chain link fence with three-strand barbed wire at the top located around the installation. Installation's outer-fence has appropriate signage.
AOC 92	~20	<ul style="list-style-type: none"> • MEC Surface and Subsurface Removal Action • Soil Removal 	6-foot chain link fence with three-strand barbed wire at the top located around Parcel 3 and Installation's outer fence. Both fences have appropriate signage.

1.2.1 Terrain and Vegetation

Vegetation includes plants that are indicative of a grassland and sagebrush community, surrounded by Pinion Pine/Juniper woodland communities. The terrain and vegetation is not expected to hinder MEC removal actions.

1.2.2 Soil Conditions

Previous MRs at FWDA indicates a high iron content in soils therefore both magnetometers and all metals detectors will be used.

1.3 SITE HISTORY

FWDA currently occupies approximately 24 square miles (15,273 acres) of land with facilities formerly used to operate a reserve storage facility providing for the care, preservation, and minor maintenance of assigned commodities-primarily conventional military munitions. From 1918 to 1993, FWDA stored, conducted functional testing of, and demilitarized munitions. Open burning, detonation, incineration, and bomb washout were the principal demilitarization methods used.

The Kickout Area MRS, located in Parcels 1, 2, 3 and 20 at FWDA consists of the combined area of land adjacent to the OB/OD Unit, SWMUs 14, 15 and 33 to which waste military munitions (WMM) were released during the operation of the OB/OD unit and to which solid wastes were released during the operation of SWMU 14, 15 and 33.

The SWMU 1 TNT leaching beds, located in Parcel 21 at FWDA, was used as overflow areas from the TNT washout process at the TNT Washout Plant. Prior to 1962, pink water from the TNT washout process was drained into settling tanks located on the northern and eastern sides of Building 503. The overflow from the settling tanks drained into the unlined triangle-shaped leaching bed. In 1962, two additional unlined leaching beds were created on the north side of Arterial Road No.4 and were used until 1967.

The SWMU 10, located in Parcel 11 at FWDA, is the former Sewage Treatment Plant (including Buildings/Structures 22, T-37, 63, 69, 70, 71, 72, 73, 74a, 74b, 74c, 74d, 82 and 83, document

incinerator, Structure 745, drainage ditch, and septic and sewage systems) that were associated and used for processing FWDA sewage and outflows.

The SWMU 14, located within Parcel 3 at FWDA, is the Old Burning Ground and Demolition Landfill Area that was used from 1948 until the late 1950s. It was used to dispose of explosives contaminated waste from the TNT Washout Plant and old equipment from the TNT drying and flaking operations. The area was permitted by the Army to open burn up to 30,000 pounds of explosives at a time. The Demolition Landfill Area reportedly contained 75MM projectiles, fuzes/fuze components, shell casings, pipes (ranging in various sizes and lengths), metal strapping material and other metal materials.

The SWMU 15, located within Parcel 3 at FWDA, is the Old Demolition Area that was used from 1948 to 1955. The area was used to dispose of military munitions. Material was periodically bulldozed from this area towards the arroyo that bisects the SWMU 15. As a result, MEC is on the surface and in the subsurface at the SWMU 15.

The SWMU 33, located within Parcel 3 and south of SWMU 15 at FWDA, is a munitions debris pile KPI consisting of large projectiles that were eroded out of the back of a small side arroyo. Numerous projectiles were observed in the area in during a site walk and subsurface survey in November 1999 (*Final Open Burn/Open Detonation Area RCRA Interim Status Closure Plan Phase 1A - Characterization and assessment of Site Conditions for the Soils/solid Matrix, Nov 99*).

The SWMU 74, located on the border of both Parcel 1 and 3 at FWDA, contains area 16/site 16, a proposed burning ground in the 1958 map, per the 1995 ASR.

The AOC 76, located in Parcel 2 at FWDA, contains feature 19 as reported in the 1995 ASR, and has no further history available.

The AOC 89, located in Parcel 3 at FWDA, contains feature 30 as reported in the 1995 ASR, which consists of three U-shaped revetments. It includes four temporary storage areas used for staging military munitions prior to treatment at the OB/OD. It also contains a small pile of soil and metal debris created during UXO efforts from 1992/1993. Feature 34 is a rectangular cleared area with shallow trenches along two sides.

The AOC 90, located in Parcel 3 at FWDA, contains feature 36 as reported in the 1995 ASR, which consists of two dry ponds, dammed downstream. It is near the western boundary of the closed OB/OD.

The AOC 91, located in Parcel 3 at FWDA, contains feature 41 and feature 27 in the 1995 ASR. Feature 41 is a disturbed area, within the firebreak, east and south of the known demolition area. Feature 27 is a disturbed area with many roads and paths.

The AOC 92, located within Parcel 3 and adjacent to the HWMU at FWDA, is a part of the inactive OB/OD unit that was operated from 1955 until 1993. AOC 92 was used to dispose of military munitions. MEC is on the surface and in the subsurface at AOC 92.

1.4 CURRENT AND FUTURE LAND USE

The current land use at FWDA Parcel 3 consists of another contractor specifically working at the Corrective Action Management Unit (CAMU) and HWMU with their activities covered under a separate ESS (Explosives Safety Submission, Non-Time Critical Removal Action and Abandonment of Monitoring Wells CMW07, CMW14, CMW 17, CMW 18, CMW 06, CMW20 and FW38 HWMU, Parcel 3, Fort Wingate Depot Activity, McKinley County, New Mexico) written specific to those areas only. The current work scheduled under this ESS covers all other areas of Parcel 3 with exception of the HWMU and CAMU. Any activities required to be completed within the CAMU will be conducted under the Explosives Safety Submission, Non-

Time Critical Removal Action and Abandonment of Monitoring Wells CMW07, CMW14, CMW 17, CMW 18, CMW 06, CMW20 and FW38 HWMU, Parcel 3, Fort Wingate Depot Activity, McKinley County, New Mexico ESS. It is located on US Army owned property that is undeveloped and vacant. The Parcel 3, which contains the KOA, SWMU(s) 14, 15, 33 and part of SWMU 74, AOC(s) 89, 90, 91 and 92, are encompassed by a 6 foot (ft) chain link fence with three strand barbed wire at the top. Access to the property is limited to foot traffic and light vehicle traffic through locked gates. Most of the FWDA (to include SWMU 1 in Parcel 21, SWMU 10 in Parcel 11, AOC 76 in Parcel 2 and the part of SWMU 74 in Parcel 1 under this ESS) will be transferred to the Department of the Interior (DOI), for future ownership by the Navajo and Zuni Native American tribes; however, the Army intends to maintain ownership of most of Parcel 3 indefinitely.

1.5 PROJECT AREA

This ESS will be utilized for the removal of MEC and explosive contaminated soils within the identified KOA, AOC(s), and SWMU(s) listed in Table 1-1.

1.5.1 General

A description of the MRS(s), AOC(s), and SWMU(s) covered by this ESS is given in Section 1.2 and Table 1-1 above. This ESS covers the munitions response processes and procedures (e.g., MEC and soil removal) for these sites. The munitions response processes and procedures for the remaining FWDA areas will be addressed in future amendments to this ESS or future ESS(s).

1.5.2 Historical and Characterization Data Analysis

Copious site work has been completed at FWDA and can be accessed at the BRAC historical website: www.ftwingate.org.

1.5.3 Selected Munitions Response Actions

Table 1-1 summarizes the munitions response actions for the KOA, AOC(s), and SWMU(s) at FWDA.

1.5.3.1 Land Use Controls

For the KOA, AOC(s), and SWMU(s), those Land Use Controls selected as likely to be effective and feasible, are described in paragraph 10 of this ESS.

1.6 REASON FOR MEC

The site history in Section 1.3 and Table 1-2 below provides the reason for MEC on the property.

1.7 TYPE OF MEC

The results of the previous site work available through the FWDA historical website listed in paragraph 1.5.2 above and the MEC items summarized in Table 1-2 below establish the types of MEC expected. Parcel 3 is confirmed to contain Improved Conventional Munitions (ICM) Bomb Live Unit (BLU)-3 and BLU-4.

TABLE 1-2: TYPE AND DEPTH OF MEC REMOVED

MRS/AOC/SWMU	MEC Recovered	Maximum Depth of MEC Recovered During Previous Site Investigations	Maximum Geophysical Detection Depth Below Ground Surface (bgs)
KOA [includes SWMU(s) 14, 15, 33, and 74, and AOC(s) 76, 89, 90, 91, and 92][excluding the KOA Inner Fence Area]	20mm, 37/40mm, 50mm, 57mm, 60mm, 75/76mm, 81mm, 90mm, 102mm, 105mm, 120mm, 155mm, 3.5", M83, Fuses, bomb live unit (BLU) 3 & 4, 5-inch rockets, 2.75-inch rockets and 3-inch rockets	~ < 2 feet bgs	~ < 4 feet
KOA Inner Fence Area	20mm, 37/40mm, 50mm, 57mm, 60mm, 75/76mm, 81mm, 90mm, 102mm, 105mm, 120mm, 155mm, 3.5", M83, Fuses, bomb live unit (BLU) 3 & 4, 5-inch rockets, 2.75-inch rockets and 3-inch rockets and AN-M66A2, 2000-lb HE Bombs	~ < 2 feet bgs	~ < 4 feet
SWMU 10	20mm	Surface	~ 1 foot
SWMU 1	Small pieces of TNT	~ < 1 feet bgs	N/A

2.0 MAPS

2.1 REGIONAL, SITE, AND QUANTITY DISTANCE MAPS

All Figures listed here are located in Appendix A. Figure 1 of this ESS contains the FWDA Regional Map and Figure 2 is the MRS(s) AOC(s), and SWMU(s) Site Map, that shows all areas to be addressed under this ESS. Figure 3 contains the Explosives Safety Quantity-Distance (ESQD) Map of the MRS(s), AOC(s) and SWMU(s) within the KOA. Figure 4 shows the ESQD Map of SWMU 1 in Parcel 21. Figure 5 shows the ESQD Map of SWMU 10 in Parcel 11. Figure 6 shows the ESQD Map of the Corrective Action Management Unit (CAMU) and Figure 7 shows the ESQD Map of the Earth Covered Magazines (ECM)s to be used for MPPEH/MEC and donor explosives storage.

3.0 EXPLOSIVES SAFETY QUANTITY-DISTANCE (ESQD)

3.1 MUNITION WITH GREATEST FRAGMENTATION DISTANCE (MGFD)

As a result of actual findings presented in Table 1-2, the munition with the greatest fragmentation distance (MGFD) is shown in Table 3-1. If, during the course of the removal action, MEC with a greater fragmentation distance is encountered, the minimum separation distance (MSD) will be adjusted in accordance with DDESB Technical Paper (TP) 16, operations will continue, and amendment to this ESS will be submitted for approval (a copy of this document will be available on-site). Q-D arcs will be adjusted accordingly.

TABLE 3-1: MINIMUM SEPARATION DISTANCES

MRS	MGFD	MSD (Feet) ⁽¹⁾					
		For Unintentional Detonations ⁽²⁾			For Intentional Detonations ⁽²⁾		
		Hazardous Fragment Distance (HFD)	Team Separation Distance (TSD) HFD/K40	Essential Personnel Separation Distance K24/K18	Without Engineering Controls Maximum Fragment Distance – Horizontal (MFD-H)	With Engineering Controls (Sandbag Mitigation)	With Engineering Controls (Water Mitigation)
KOA, SWMU 14, SWMU 15, SWMU 33, SWMU 74, AOC 76, AOC 89, AOC 90, and AOC 91 [excluding the KOA Inner Fence Area]	155 mm Series Projectiles	450 ⁽³⁾	TSD – 123 ⁽⁴⁾ TSD – 450 ⁽⁵⁾	K24 – 74 ⁽¹⁸⁾ K18 – 55 ⁽¹⁸⁾	2894 ⁽⁶⁾	Not Permitted ⁽¹⁷⁾	Not Permitted ⁽¹⁷⁾

MRS	MGFD	MSD (Feet) ⁽¹⁾					
		For Unintentional Detonations ⁽²⁾			For Intentional Detonations ⁽²⁾		
		Hazardous Fragment Distance (HFD)	Team Separation Distance (TSD) HFD/K40	Essential Personnel Separation Distance K24/K18	Without Engineering Controls Maximum Fragment Distance – Horizontal (MFD-H)	With Engineering Controls (Sandbag Mitigation)	With Engineering Controls (Water Mitigation)
KOA Inner Fence Area and AOC 92	AN-M66A2, 2000-lb HE Bomb	910	TSD – 440 ⁽⁷⁾ TSD – 910 ⁽⁸⁾	K24 – 264 ⁽¹⁹⁾ K18 – 198 ⁽¹⁹⁾	3593	Not Permitted	Not Permitted
SWMU 14 Sorting and Inspection Area (SIA)	M1 105 mm HE Projectile and BLU-3B ⁽⁹⁾	592 ⁽¹⁰⁾	TSD – 592 ⁽¹¹⁾	K24 – 43 ⁽¹²⁾ K18 – 32 ⁽¹²⁾	2,111 ⁽¹³⁾	220 ⁽¹³⁾	275 ⁽¹³⁾
SWMU 10	20 mm Series Projectile	73 ⁽¹⁴⁾	TSD – 14 ⁽¹⁵⁾	Not Applicable	651 ⁽¹⁶⁾	25 ⁽¹⁶⁾	200 ⁽¹⁶⁾

Notes:

- (1) See Appendix B for fragmentation database review sheet.
- (2) Mechanized MEC Operations in SWMU 14, SWMU 15, and SWMU 33 are considered “high input” (all inside of Parcel 3 (ICM Area)); see Section 3.7.
- (3) Based on the 155 mm M107 (Comp B filled projectile).
- (4) TSD for manual MEC/MPPEH Clearance is the K40 Distance per DoD 6055.09-M, Section V7.E3.7.2.2.1 based on the 155 mm M795 projectile.
- (5) TSD for essential personnel site teams that are not shielded/barricaded during “high input” Mechanized MEC Operations is the HFD for 155 mm M107 (Comp B filled projectile) – at SWMU 14, SWMU 15, and SWMU 33.
- (6) Based on the 155 mm M107 (TNT filled).
- (7) TSD for manual MEC/MPPEH Clearance is the K40 Distance per DoD 6055.09-M, Section V7.E3.7.2.2.1 based on the AN-M66A2, 2000-lb HE Bomb.
- (8) TSD for essential personnel site teams that are not shielded/barricaded during “high input” Mechanized MEC Operations is the HFD for the AN-M66A2, 2000-lb HE Bomb.
- (9) Based on the MGFD reduction described in Section 3.7.
- (10) Based on the MFD-H for the BLU-3B (Composition A5 filled).
- (11) TSD for essential personnel site teams that are not shielded/barricaded during “high input” Mechanized MEC Operations is the MFD-H for the BLU-3B (Composition A5 filled).

- (12) Essential personnel protected by shields/barricades during Mechanized MEC SIA Operations; based on the 105 mm M1 Projectile (Composition B filled).
- (13) Based on the 105mm M1 Projectile (TNT filled).
- (14) Based on the 20 mm Mk 1 HEI Projectile.
- (15) TSD for manual MEC/MPPEH Clearance is the K40 Distance per DoD 6055.09-M, Section V7.E3.7.2.2.1 based on the 20 mm M56A4 Projectile.
- (16) Based on the 20 mm M97 HEI Projectile.
- (17) Sandbag and Water mitigation is only authorized specifically for the 155mm, M107 (Composition B filled) HE Projectile. If positive stamped in nomenclature is verified to this specific round, then sandbag and/or water mitigation can be utilized per the Fragmentation Data Review Form (see Appendix B) and the HNC engineering controls publications for each.
- (18) Essential personnel protected by shields/barricades during Mechanized MEC Excavation Operations; based on the 155 mm M795 projectile.
- (19) Essential personnel protected by shields/barricades during Mechanized MEC Excavation Operations; based on the AN-M66A2, 2000-lb HE Bomb.

TABLE 3-2 MSD TABLE FOR MAXIMUM CREDIBLE EVENT (MCE)

Explosive Operation	Location where Operation will be Conducted	MCE (lbs.) ⁽²⁾⁽³⁾	MSD (ft) ⁽¹⁾	
			For Unintentional Detonations ⁽⁴⁾	For Intentional Detonations
Manual and Mechanized Wet Blending of Explosive Soils	SWMU 1	2	HFD – 346 K40 – 50 K24 – 30 K18 – 23	N/A ⁽⁵⁾

Notes:

- (1) The MSD to non-essential personnel is the greater of K40 or the HFD based on Table V3.E3.T2
- (2) MCE is in lbs of HD 1.1, TNT (worst case suspect explosive for SWMU 1)
- (3) MCE is calculated per Section 3.6 definition below.
- (4) K40/K24/K18 calculations are based on the formula $D = K \times (MCE)^{1/3}$.
- (5) The wet blending procedure will consist of taking the top 18 inches of soil off mechanically and blending it with clean berm soils. If any large visible bulk explosives are found, operations will halt, a qualified UXO Technician team will remove the bulk explosives and store them in the CE explosives storage bunker until disposal can be scheduled and accomplished.

3.2 MEC AREA(S)

The MSD restrictions from Tables 3-1 and 3-2 above for personnel will be applied during all MEC operations/activities conducted at MRS(s), AOC(s), and SWWU(s) under this ESS.

3.3 DEMOLITION EXPLOSIVES

3.3.1 Delivery on an As-Needed Basis

Donor explosives will be provided by a local vendor on an as-needed basis or stored in the ECMs identified in Section 3.3.2 below.

3.3.2 Explosives Storage Magazines

Donor explosives will be stored in DDESB sited ECMs at the Explosives Storage Block B (see Figure 7 in Appendix A). These ECMs operate under a Conditional Exemption (CE) in accordance with DoD 6055.09-M-V7. The ECM magazines have been previously sited and DDESB approved for CE storage per DDESB Approval Memorandum, *DDESB-PE, 30 May 2008, Subject: DDESB approval of request for a Time Critical Removal Action (TCRA), Explosives Safety Submission (ESS) for Fort Wingate Depot Activity (FWDA) McKinley County, New Mexico*, and will require no change to the previously approved Limits.

A total of eight (8) ECMs in Explosive Storage Block B (see Figure 7 in Appendix A), have each been sited for a storage limit of 20,000 lbs. NEW for Hazard Division (HD) 1.1, and have been designated for CE Storage of recovered MPPEH/MEC and demolition/donor explosives. All of the qualifying conditions of the CE, which include the type of munitions that can be stored, how the munitions are stored, the notification requirements, as well as stringent recordkeeping and documentation requirements, will be met in accordance with the ECM SOP.

All stored explosives will be compatible in accordance with DoD 6055.09-M, BATFE Publication 5400.7 and DA Pamphlet (PAM) 385-64. All magazines will be properly grounded, lightning protected, set-up and secured in accordance with National Fire Protection Agency (NFPA) 780, USACE EM 385-1-97, Change 1 and DA PAM 385-64. The ECMs are located inside a secure perimeter fence with approved access only. All commercial donor explosives are assigned a Hazard Class (HC) and Department of Transportation (DOT) Explosives (EX) number per EM 385-1-97, Table I.9-1 *Storage and Handling of Commercial Explosives*.

3.4 PLANNED OR ESTABLISHED DEMOLITION AREAS

All MEC items that are unacceptable to move will be BIP and MEC items, other than an UXO, deemed acceptable to move by the SUXOS and UXOSO will be transported to the ECMs in the Explosives Storage Block B or the 10-day CAMU permitted temporary storage area, for later destruction at the CAMU in accordance with the previously approved ESS as amended, *Explosives Safety Submission, Non-Time Critical Removal Action and Abandonment of Monitoring Wells CMW07, CMW14, CMW 17, CMW 18, CMW 06, CMW20 and FW38 HWMU, Parcel 3, Fort Wingate Depot Activity, McKinley County, New Mexico*. Discovered and confirmed UXO items will be marked and guarded, if necessary, until disposal can be planned and accomplished.

3.5 FOOTPRINT AREAS

3.5.1 Blow-in Place

BIP operations are expected at the FWDA KOA, AOC(s), and SWMU(s). MSD for intentional detonation when conducting disposal operations is identified in Table 3-1 for both with and without engineering controls and is depicted in Figure 3 and Figure 5 of Appendix A. Procedures for engineering controls for demolition are described in Section 7.3 below.

3.5.2 Collection Points

Collection points are those areas used to temporarily accumulate MEC determined acceptable to move by the SUXOS and UXOSO. Acceptable to move MEC for this project will be secured in the southwest corner of each grid until transported to the ECMs or the CAMU for a demolition event to be scheduled at the earliest opportunity. MEC items at the CAMU will be laid out as shown in USAESCH publication "*Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives (OE) Sites*", dated August 1998 with terminology update dated March 2000 for the project. The maximum NEW at a collection point will be limited such that the K40 overpressure distance for the total NEW does not exceed the Hazardous Fragmentation Distance for the area.

3.5.3 In-Grid Consolidated Shots

Consolidating multiple MEC will be conducted at the CAMU however no in-grid consolidated shots will take place during this project. United States Army Engineering and Support Center, Huntsville (USAESCH) publication "*Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives (OE) Sites*", dated August 1998 with terminology update March 2000 will be used and a copy of this report will be available on-site. The maximum NEW for a consolidated shot will be limited such that the K328 overpressure distance for the total NEW (including donor charges) does not exceed the MSD for the intentional detonation.

3.6 MAXIMUM CREDIBLE EVENT (MCE)

The MCE that will be used for SWMU 1 during manual and mechanized soil wet blending operations was calculated using historical and site visit findings. The nature of TNT contamination in the soils at SWMU 1 consists of small granular and/or nugget sized pieces of TNT within the soil. This granular/nugget contamination of bulk TNT within the soil was equated to a level of a maximum of 2 lbs. of TNT contamination within a 2.5 CY excavator bucket. Thus, the maximum MCE would be the excavator bucket load of soil, which would be 2 lbs. NEW of TNT.

See Table 3-2 above for the MCE established for SWMU 1 for both manual and mechanized wet blending of explosives contamination within the soils will occur.

3.7 MECHANIZED MEC PROCESSING OPERATIONS

3.7.1 Mechanized MEC Processing Operations in Parcel 3 at SWMU 14, 15 and 33

Due to the hazards posed by the ICM(s) (BLU-3/BLU-4 Bomblets) submunitions in Parcel 3 (SWMU 14, SWMU 15, SWMU 33 and the adjacent arroyo) at the FWDA, when the mechanized MEC processing operations are to be conducted under this ESS, they will be considered "high-input" in accordance with DoD 6055.09-M, V7.E4.5.8.3.5 and all non-essential and essential personnel will be provided the proper MSD(s) as listed within the MSD Table 3-1 above. All specific information concerning Earth Moving Machinery (EMM) (e.g., excavator) shielded/hardened or remote-controlled (R/C) and specific information concerning the SIA operations (screening) is located in Section 6.0 below.

The mechanized MEC operations (i.e. excavation) will be performed using a long-boom hardened/shielded EMM. The MSD for non-essential personnel during the excavation operations at these SWMU(s) (all located outside of the KOA Inner Fence Area) will be the Maximum Fragmentation Distance – Horizontal (MFD-H) for intentional detonations of 2,894 feet per DoD 6055.09-M, V7.E4.5.8.3.5.2.1.1. Essential personnel (i.e., hardened EMM operator) will be separated from the operation at greater than 55 feet based on K18 of the MGF, 155mm, M795 HE Projectile (see Appendix B for the Fragmentation Data Review Form). Plexiglas shielding protection from fragments will be rounded up from 5.69" to 5.75" based on the hazardous fragmentation from the MGF, 155 mm, M107 (TNT filled) HE Projectile (see Appendix B for the Fragmentation Data Review Form). The operator will also be provided added hearing protection that will afford the > 9 db attenuation in accordance with USACE EM 385-1-97, Change 1. The mechanized MEC operations TSD is the HFD as shown in Table 3-1 above.

If the required K18/K24 separation distances cannot be achieved for essential personnel (i.e., hardened EMM operator) from the excavation or soil stockpiling/truck loading point, then the EMM will be operated by remote controlled (R/C) excavation. During R/C excavation, the MSD for non-essential personnel will be the MFD-H for intentional detonations of 2,894 feet per DoD 6055.09-M, V7.E4.5.8.3.5.2.1.1. The R/C EMM will be operated remotely from a hardened/shielded frontal and overhead protected location that provides greater than 74 feet based on K24 of the MGF. If no frontal/overhead protection is provided, the R/C operator will be stationed at the HFD as shown in Table 3-1 above.

The mechanized MEC processing (i.e. screening) at the SIA will also be performed using hardened/shielded protection. The MSD is based upon MGF reduction approach as follows:

- a. Large MEC items (105mm and greater) are capable of being seen visually by the UXOTIII supervising the excavation operation and/or their observance through camera projection of the excavator bucket. This allows them to stop the excavation and remove the large MEC items at the excavation point before it gets transported to the SIA location

resulting in a lower MGF D for the SIA. The use of a small capacity bucket prevents items larger than a 105mm from fitting into the bucket, which either prevents its entry in entirety or only allows such items in, but forces a portion of them to protrude from the bucket with clear visibility of such item and allowing its removal.

- b. The excavator will also cascade the excavated material (spoils) onto the cleared ground for the UXOTIII observing the operation to provide a quality control observance of the spoils through either camera projection or visually to assure no large MEC items greater than a 105mm are transported to the SIA.
- c. There are three visual chances to observe large MEC items during the soil removal at the actual excavation point (1st at the excavation scoop of soils, 2nd as the excavation scoop is being cascaded onto the ground, and 3rd during the UXOTIII QC observation check).

Based on the above logic the MSD for non-essential personnel during screening operations at the SIA will be the MFD-H for intentional detonations of 2,111 feet per DoD 6055.09-M, V7.E4.5.8.3.5.2.1.1. The essential personnel, hardened EMM operator, used to load the SIA hopper will be separated from the operation at greater than 32 feet based on K18 of the MGF D and with 4.27" Plexiglas shielding protection from fragments based on the hazardous fragmentation from the MGF D, 105mm, M1 (TNT Filled) HE Projectile (see Appendix B for the Fragmentation Data Review Form). The operator will also be provided added hearing protection that will afford the > 9 db attenuation in accordance with USACE EM 385-1-97, Change 1. The essential personnel, UXO team, operating the SIA will be separated from the screening operation by the K24 distance listed in Table 3-1, and protected from fragmentation utilizing the MIL-Standard HESCO barrier meeting the requirements of DDESB TP-15.

3.7.2 Mechanized MEC Processing Operations in Parcel 21 at SWMU 1

When manual soil blending methods are not used, mechanized MEC operations (i.e. mechanized soil blending) will be performed using a hardened/shielded EMM. MCE is calculated per Section 3.6 and shown in Table 3-2 above. The MSD for non-essential personnel during the excavation operations at SWMU 1 will be the HFD for unintentional detonations of 346 feet per DoD 6055.09-M, Table V3.E3.T2, footnote "c" for NEW <100 lbs. Essential personnel (i.e., hardened EMM operator) will be separated from the operation at greater than 23 feet based on the K18 of the MCE as shown in Table 3-2 above. A conservative munitions analog with equivalent TNT explosive weight of 2.0 lbs NEW, which is the M18A1 AP Mine (see Appendix B for the Fragmentation Data Review Form) will be used for application of hardening/shielding, which will be 1.13" of Plexiglas to provide protection from fragments. The operator will also be provided added hearing protection that will afford the > 9 db attenuation in accordance with USACE EM 385-1-97, Change 1. The mechanized MEC operations TSD is the HFD as shown in Table 3-2 above.

4.0 START DATE

The anticipated start date for the operations under this ESS is April 1, 2015.

5.0 MEC MIGRATION

Both frost heave and seasonal flooding are sources of MEC migration for the FWDA. The frost depth for Gallup, NM is approximately 18 inches. Therefore, frost-related migration of MEC is considered a relevant migration pathway for FWDA. Erosion due to wind and rain may result in the migration of subsurface MEC to the surface, particularly within the arroyo channel during flash flooding. Arroyo sweeps are periodically performed under a separate project and ESS.

6.0 DETECTION EQUIPMENT AND RESPONSE TECHNIQUES

The MEC removal at the KOA, AOC(s), and SWMU(s) will be conducted using procedures as outlined below:

6.1 REMOVAL DEPTH

MEC removal will be performed to depth of detection as shown in Table 1-2.

6.2 DETECTION EQUIPMENT

A combination of one or more of the following detection technologies will be used at this site.

6.2.1 Analog Mag and Flag Using Flux-Gate Magnetic Gradiometers

Detectors selected for this project are the Schonstedt 52-CX and Sub-Surface Instruments or equivalents. These instruments have similar detection characteristics.

6.2.2 Analog Mag and Flag Using Electromagnetic Induction

Detectors selected for this project are the White XLT, Vallon, Fisher, Garrett, and MINELAB or equivalents. All of these instruments have similar detection characteristics.

6.2.3 Digital Geophysical Mapping Using Time-Domain Electromagnetic Induction

Equipment selected for this project is the EM-61 MK2 high-resolution time-domain electromagnetic metal detector and the RTK Global Positioning System (GPS).

6.3 SWEEP PROCEDURES

A qualified UXO team will perform a manual surface and subsurface “mag” and “dig” MEC/MPPEH removal of the KOA, AOC(s), and SWMU(s) at the FWDA. Equipment/Detectors selected for use and the assigned personnel operating that detector/equipment will be checked for

proper operation and proficiency respectively in accordance with the approved work plan. The site will be divided into grids/lanes for clearance control. Search lanes will be used that are suitable for the equipment and terrain. In SWMU 10 reacquisition and intrusive investigation of 100% of previously mapped anomalies (by others) will be performed using the EM-61 MK 2.

6.4 EXCLUSION ZONE CONTROL

Physical control of the on-site operations will be maintained to ensure that there is no unauthorized access by non-essential personnel during operations. Physical control will be accomplished by blocking access roads to the site at the point of the MSD as described in Table 3-1 and Table 3-2. The Q-D arcs for the KOA, AOC(s), SWMU(s), CAMU and ECM(s) are shown on Figures 3, 4, 5, 6 and 7 in Appendix A.

6.5 INTRUSIVE INVESTIGATION

Only UXO-qualified personnel meeting the USACE requirements of being an UXO Technician II (UXOTII) or higher level per DDESB TP 18 and meeting the requirements of DA PAM 385-63 will be allowed inside the designated ICM areas (inside Parcel 3). All other UXO Technicians working outside the designated ICM area will meet the requirements for position in accordance with DDESB TP 18 and will perform clearance and investigation of MEC/MPPEH/Anomalies for the FWDA KOA, AOC(s), and SWMU(s). UXO personnel will locate, identify and record the location of all discovered MEC/MPPEH for subsequent destruction. Deeper anomalies may be excavated using mechanical augmentation to manual methods, as needed. All EMM used to remove soil overburden will be conducted in accordance with EM 385-1-97, Section I.2.U.03.01.

6.5.1 MECHANIZED MEC PROCESSING OPERATIONS

All mechanized MEC operations will be accomplished per Section 3.7 above and the following paragraphs.

EMM (e.g., excavator) will be shielded/hardened per the requirements of Section 3.7 above in accordance with DoD 6055.09-M and the DDESB Fragmentation Database for the MGF. The shielded/hardened EMM will excavate the grids working from cleared grounds. The excavated material (spoils) will be cascaded onto clear ground and visually (either through camera projection or manually, with all operations shut-down) QC inspected by the excavation-observing UXOTIII assuring no large MEC items greater than a 105mm projectile remain or are removed at the cascaded excavation point. Once cleared by the UXOTIII, the excavator will re-scoop the cleared soils and load them into an unmanned shielded/hardened dump truck positioned on clear ground. Once the truck is loaded, all site excavation/loading operations will stop, the driver will ingress the truck and transport the soils to the SIA. Once the truck is at the appropriate MSD away from the grid being worked, the shielded/hardened EMM can return to excavation of the soils of that grid. Any discovered MEC/MPPEH, other than an UXO will be BIP if deemed unacceptable to move or if acceptable to move, be transported to the ECM or the

10-day CAMU permitted temporary storage until the next scheduled demolition event per the FWDA RCRA Permit. The excavations will continue until the bottom and sidewalls contain no visual evidence of contamination or waste material.

When the applicative MGF D causes the required hardening to be too great or the K24/K18 safety distance cannot be achieved for the EMM operator, then the optional R/C EMM excavation procedures will be used. The R/C EMM MEC/MPPEH excavation will be conducted in the same manner as the hardened/shielded approach as described in Section 3.7 above. The operator will use real-time wireless video cameras to monitor and control the EMM.

The SIA process utilizes a combination of various soil separation equipment, primarily hoppers, conveyors, trommel/screen, soil processors (when required), ferrous magnets, and non-ferrous separators (as needed) to screen out any MEC/MPPEH/MD from the soils removed from the SWMUs 14, 15 and 33, and the adjacent west arroyo. To enhance safety, SIA personnel operating the conveyor lines and the Supervising UXO Technician will have access to an emergency shut-off switch for positive control of all activities at the SIA (i.e., when a MEC item is stuck on the conveyor belt). This switch will be used to immediately shut-down all conveyors and metal separators in the event that the conveyor lines need to be evacuated due to MEC. All conveyor personnel will be made aware of the switch's location. When MEC items determined to be unacceptable to move are discovered within the SIA, the emergency stop will be activated and the SIA evacuated of personnel to the required MSD. Then two UXO qualified Technicians will restart the SIA from behind a hardened position that is K24/K18 distance away, allowing the item to roll off the conveyor. If the MEC item is lodged, a line will be attached to the item allowing it to be pulled off the conveyor from a hardened location at K24/K18 distance. Once the MEC item is on the ground, the hardened EMM will pick the MEC item up and move it to a disposal location for immediate disposal.

All operations at the SIA will temporarily stop when a soil containing dump truck from the excavation area arrives at the SIA. Operations at the SIA will remain stopped until the truck is in the approved dumping position. The driver will leave the truck and travel via the designated cleared pathway to a hardened position where they will remotely dump the contents of the truck. Once the soils are dumped, the driver will return to the truck and drive back to the excavation location. Once the truck is outside the required MSD, SIA operations may resume.

A generalized overview of each element of the SIA process is presented below:

- The staged dumped soils delivered from the excavation area will be loaded using a hardened EMM (excavator) into a feed hopper or trommel allowing the separation of >4-inch oversized material that will be sent down a side chute for manual inspection and certification by UXO Technicians. The remaining soils will be fed onto a conveyor that will transport the material to a ferrous metal separator. Soils may be blended with a

drying agent like quicklime to reduce the moisture content, downsize the feed material (e.g. soil clods), and increase the effectiveness of the screening operation.

- At the ferrous metal separator, ferrous items will be magnetically removed from the conveyor using an overhead suspended magnet and sent down a side conveyor into an unmanned dump truck for later inspection and certification by UXO Technicians.
- Material not removed by the ferrous separator will be sent into a soils processor and conveyed to a screen where the fines will be separated and sent down a side conveyor and under a second overhead suspended magnet. Any ferrous items remaining in the fines will be magnetically removed from the conveyor and down a chute captured in a bin to be inspected later by UXO Technicians. The remaining fines will be conveyed into an unmanned dump truck. The UXOQCS will conduct QC checks of the screened fines. Screened fines will be staged on site until confirmation sampling is completed.
- The remaining oversize material will be fed onto a conveyor to a non-ferrous metal separator that will remove non-ferrous metal from the remaining material. Non-ferrous metal will be conveyed away at a 90-degree angle from the primary conveyor to a bin at the end of that belt. This material will be periodically removed and stockpiled for later inspection and classification by UXO Technicians.
- Materials that pass through the non-ferrous separator will pass through a 43-inch Mil-Standard HESCO barrier blast wall meeting the requirements of DDESB TP 15 to an inspection station where UXO Technicians will remove any metal objects not previously captured and/or any MEC/MPPEH items that may still remain in the material. MEC/MPPEH items removed from the SIA line by UXO Technicians will be inspected and certified as either MDEH or MDAS.
- The remaining soils or debris will then be conveyed to a pile that will be staged onsite until confirmation sampling is conducted, as needed.
- When the ferrous material capturing dump trucks and the non-ferrous material capturing metal bins are determined to be full by the SIA operators, the SIA will halt operations so that the trucks/bins can be moved to the designated inspection area (see Figures 2 and 3 of Appendix A) and remotely dumped. Once the load is dumped, the driver will leave his hardened position and enter the truck to drive it back and stage it at the SIA. When the truck is back in position at the SIA and the driver is back in his hardened location, the SIA will resume operations. A hardened EMM will be used to spread the dumped pile of ferrous/non-ferrous material at the inspection area, without commingling, to a depth of approximately less than one (1)-foot thick for safe visual inspection. The material will be inspected and certified as either MEC/MDEH requiring explosive demolition, or as MDAS requiring offsite recycling.

6.5.2 SWMU 1 Soil Blending

Soil blending is required for the TNT leaching beds in SWMU 1 in order to address the explosive hazards and remove/dispose the granular/nugget TNT contamination within the dark soil areas that have been previously sampled and delineated at SWMU 1. Approximately 5 CY of soils from a total of 5,873 CY (< 0.085%) have been determined to contain explosives concentrations of 10.6% secondary explosives by weight. Clean borrow soil will be transported to the area of stained soils for wet blending and mixing to 1-foot depth in order to reduce the overall secondary explosive concentration to below 10%.

When manual methods (i.e., non-sparking shovels) are used for blending and homogenizing soils, qualified unexploded ordnance (UXO) personnel will conduct the soil blending procedures. If mechanized soil blending is conducted, then either qualified UXO personnel or non-UXO personnel (EMM operators) will operate the hardened/shielded EMM to blend and homogenize the soils. Soil blending and homogenization will be conducted at the dark stained soil areas containing the granular/nugget TNT contamination and then the soils will be sampled (by multi-incremental sampling). If the concentration of the samples confirms those areas to be below 10% secondary explosives by weight, then no further blending operations will be required. If the concentration is still above 10% secondary explosives by weight, the soils will continue to be blended as described above until the concentration is below 10%. Once the remaining soils are below 10% secondary explosives by weight, any remaining removal operations will no longer be an explosive operation and can continue under the USACE approved procedures of the SWMU 1 specific Work Plan. Waste characterization samples will be collected and soils will be transported to an offsite disposal facility upon verification that the soils are below the 10% secondary explosives threshold.

6.6 QUALITY CONTROL AND QUALITY ASSURANCE

Quality control (QC) activities will be implemented to ensure that the clearance surveys are being performed according to the standards for the project. A sample population of the removal grids as defined in the WP for the MRS(s), AOC(s), and SWMU(s) will be re-swept by the UXO Quality Control Specialist (UXOQCS). If any seed item, MEC item recovered, or a metallic debris item larger than one and one-half (1.5) inch by three (3) inch in size, is found then the entire grid will require a second investigation by the UXO team. The quality control plan (QCP) will include criteria for product acceptance and non-acceptance.

Quality Assurance (QA) activities will be conducted by a USACE Ordnance and Explosives Safety Specialist (OESS) in accordance with USACE EM 385-1-97, Change 1, Section I.3.D. The USACE OESS will perform periodic checks to ensure compliance with the established procedures, applicable guidance documents and the work plans.

7.0 DISPOSITION TECHNIQUES

7.1 DEMOLITION OPERATIONS

The Senior UXO Supervisor (SUXOS) will ensure that coordination through FWDA point of contacts (POC)s is completed to ensure that all pertinent parties have been notified of an on-site demolition schedule and evacuated per the MSD distances from Tables 3-1 and 3-2 above. Scheduled demolition operations will be coordinated with all stakeholders to limit conflict with the operations at FWDA. Explosive operations will be conducted in accordance with the procedures outlined in U.S. Army Technical Manual (TM) 60A-1-1-31, USACE EM 385-1-97, Change 1 and the approved site WP and Contractor Standard Operation Procedures (SOP)s. Demolition (of cased explosives as referenced in RCRA Permit) and open burn (for uncased explosives as referenced in the RCRA Permit) operations conducted at the CAMU will also be completed per the previously approved ESS as amended, *Explosives Safety Submission, Non-Time Critical Removal Action and Abandonment of Monitoring Wells CMW07, CMW14, CMW 17, CMW 18, CMW 06, CMW20 and FW38 HWMU, Parcel 3, Fort Wingate Depot Activity, McKinley County, New Mexico.*

7.2 EXPLOSIVE STORAGE, ACCOUNTABILITY, AND TRANSPORTATION

Donor explosives will be stored at the magazines listed per paragraph 3.3.2 above, or explosives will be delivered on an as needed basis. Total control of explosives will be maintained while the explosives are on site. All vehicles transporting explosives will be properly inspected, equipped, and placarded prior to the loading of explosives on the vehicle, and Defense Department (DD) Form 626 "Motor Vehicle Inspection" completed.

7.3 ENGINEERING CONTROLS

Sandbag or water mitigation may be used as engineering controls to reduce the intentional detonation MSD on MEC items authorized for the sandbag mitigation procedure. These controls will be used in accordance with HNC-ED-CS-98-7, Amendment 2 dated November 2014, HNC Safety Advisory dated 7 November 2011, and DDESB Memo dated 22 May 2014. Water mitigation will be used in accordance with HNC-ED-CS-S-00-3 *Use of Water for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions*, dated September 2000. Tamping (single or multiple items) may be used in accordance with DDESB Technical Paper 16 and the Buried Explosion Module (BEM) most current version (Version 6.3.2. or newer). These documents will be available on site for mitigation methods used.

7.4 MPPEH PROCEDURES

7.4.1 Inspection and Certification

MPPEH procedures will be in accordance with DoDI 4140.62 and USACE EM 385-1-97, Change 1, Chapter 1, Section 11. All MPPEH will be assessed and its explosives safety status determined and documented prior to transfer within the DoD or release from DoD control. Prior to release to the public, MPPEH will be documented by authorized and technically qualified personnel as MDAS after a 100-percent inspection and an independent 100-percent re-inspection to determine that it is safe from an explosives safety perspective, for certification as MDAS as approved by the DDESB. All certified MDAS material will be segregated to prevent comingling and maintain an intact chain of custody and be secured in locked storage containers until released from DoD control and/or final disposition.

7.4.2 DD Form 1348-1A

Upon completion of all removal activities, the SUXOS will complete a DD Form 1348-1A in accordance with USACE EM 1110-1-4009, Chapter 14 to include the following statement.

"This certifies and verifies that the material listed has been 100 percent inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related material."

7.5 ALTERNATIVE DISPOSAL TECHNIQUES

No off-site destruction or disposal of MEC/MPPEH items is anticipated for the operations under this ESS. All MEC disposal operations will occur within the KOA, AOC(s), and SWMU(s), or at the CAMU.

8.0 ENVIRONMENTAL, ECOLOGICAL OR CULTURAL CONSIDERATIONS

There are currently no environmental, ecological or cultural considerations that will be impacted by the scope of this ESS. A Cultural Resources Management Plan (CRMP) and Environment Protection Plan (EPP) will identify any cultural or environmental resources that may apply to this ESS.

9.0 TECHNICAL SUPPORT

9.1 MILITARY SUPPORT

No chemical warfare materiel (CWM) is suspected at this site. However, if a munition with unknown filler is found, or if a MEC item cannot be positively identified, the on-site USACE project team will notify the local POC as designated in the WP. The local POC will contact and facilitate Explosive Ordnance Disposal (EOD) response. If the local POC is not the local law

enforcement agent, they will notify the local enforcement agency of the discovery, which will contact EOD. If the item is Recovered CWM (RCWM) or has an unknown liquid filler, the on-site USACE project team will notify the 20th Chemical, Biological, Radiological, Nuclear and Enhanced Conventional Weapons (CBRNE) Emergency Operations Center (EOC) at 410-436-6200 for any EOD support.

9.2 CONTRACTOR SUPPORT

All on-site contractor UXO personnel will meet the training and minimum experience requirements required by DDESB TP 18, *Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel* and DA PAM 385-63 *Range Safety* (for designated ICM areas).

10.0 RESIDUAL RISK MANAGEMENT

10.1 LAND USE CONTROLS

The Army intends to maintain possession of Parcel 3 indefinitely. Future land use is undetermined. The site is surrounded by a 6-ft chain link fence with three-strand barbed wire at the top. Access is through locked gates. Following MEC surface and subsurface removal actions, the MRS may undergo further investigation. Land use controls (LUCs) may be implemented following remedial actions.

10.2 LONG-TERM MANAGEMENT

The need for and the appropriate form of any required LUCs will be evaluated after all response activities have been completed. Because future land use at this site is undetermined, 5- year reviews may be required to determine if the munitions response actions continue to be protective of human health, safety and the environment. The review will evaluate specific factors that may impact the continued effectiveness of the response. These factors may include such things as changes in physical conditions at Parcel 3 or changes in land use and public accessibility.

11.0 SAFETY EDUCATION PROGRAM

In accordance with the FWDA RCRA Permit, FWDA has developed a Community Relation Plan. The Community Relations Plan outlines the community relations program for FWDA. The purpose of the Community Relations Plan is to outline how the public will be informed of investigation and cleanup activities at FWDA as well as inform the public of safety issues concerning waste military munitions released at the Facility.

As part of the Community Relations Plan, a Public Safety Program has been established to prevent the unknowing or unauthorized entry of persons or livestock onto portions of the Facility where waste military munitions are known or suspected to be present. FWDA has involved and

consulted with the tribes, particularly the Zuni of Pueblo and the Navajo Nation regarding all investigation and cleanup efforts conducted at FWDA.

12.0 STAKEHOLDER INVOLVEMENT

Stakeholders include the New Mexico Environment Department (NMED), United States Environmental Protection Agency (USEPA) Region VI, USACE Tulsa and Fort Worth Districts, Pueblo of Zuni, and the Navajo Nation. Meetings will be held among stakeholders during the project planning and Work Plan development process through preparation of the final report.

13.0 CONTINGENCES

There are no contingencies identified at this time.

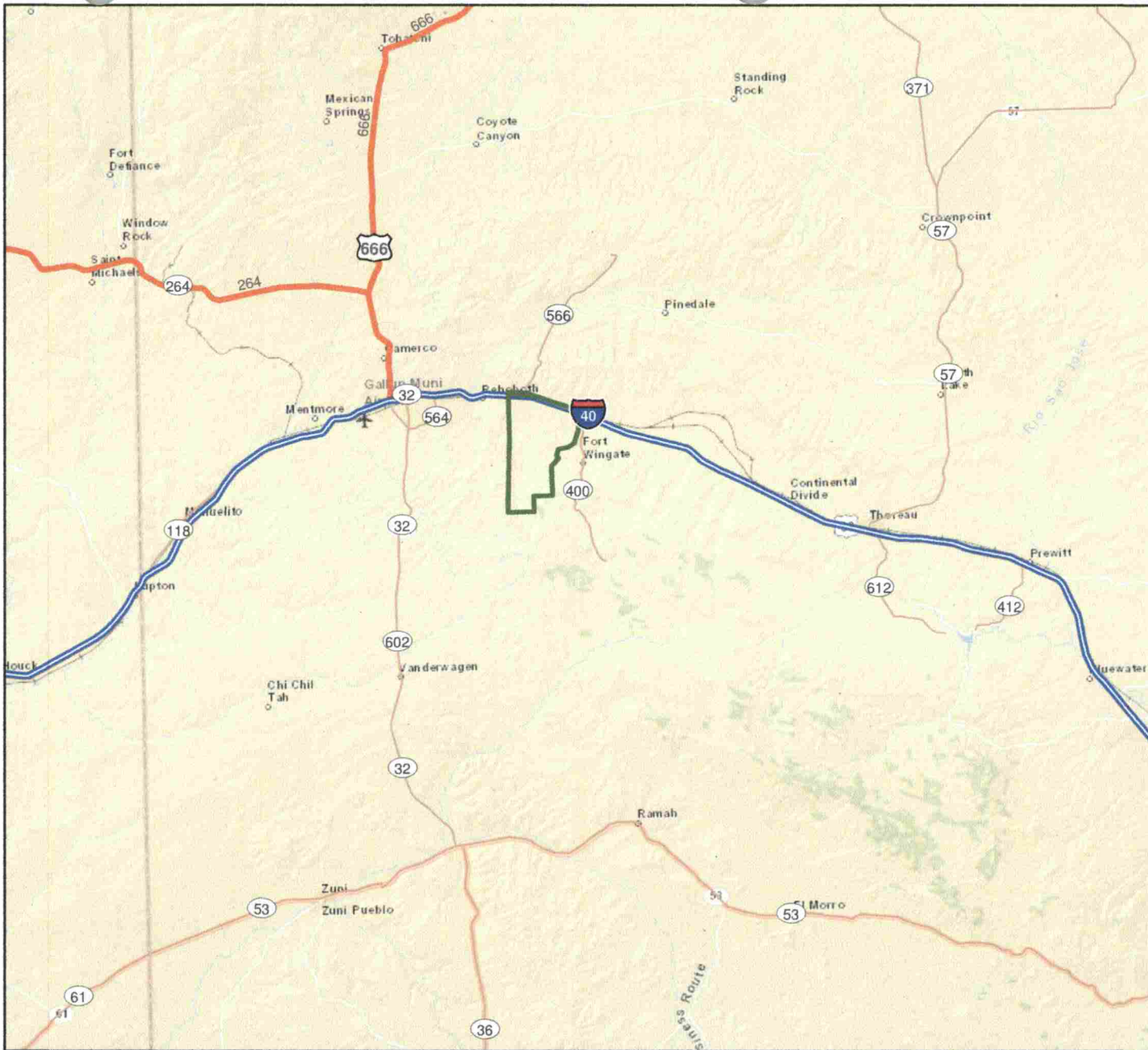
APPENDIX A

FIGURE/MAPS

- Figure 1 – Regional Map of FWDA
- Figure 2 – MRS Site Map of KOA, AOC(s), and SWMU(s)
- Figure 3 – ESQD Map of KOA, AOC(s), and SWMU(s)
- Figure 4 – ESQD Map of SWMU 1
- Figure 5 – ESQD Map of SWMU 10
- Figure 6 – ESQD Map of CAMU
- Figure 7 – ESQD Map of ECM(s)

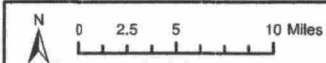
Fort Wingate Depot Activity
McKirley County, New Mexico

Figure 1
Regional Area Map



Legend

 Installation Boundary

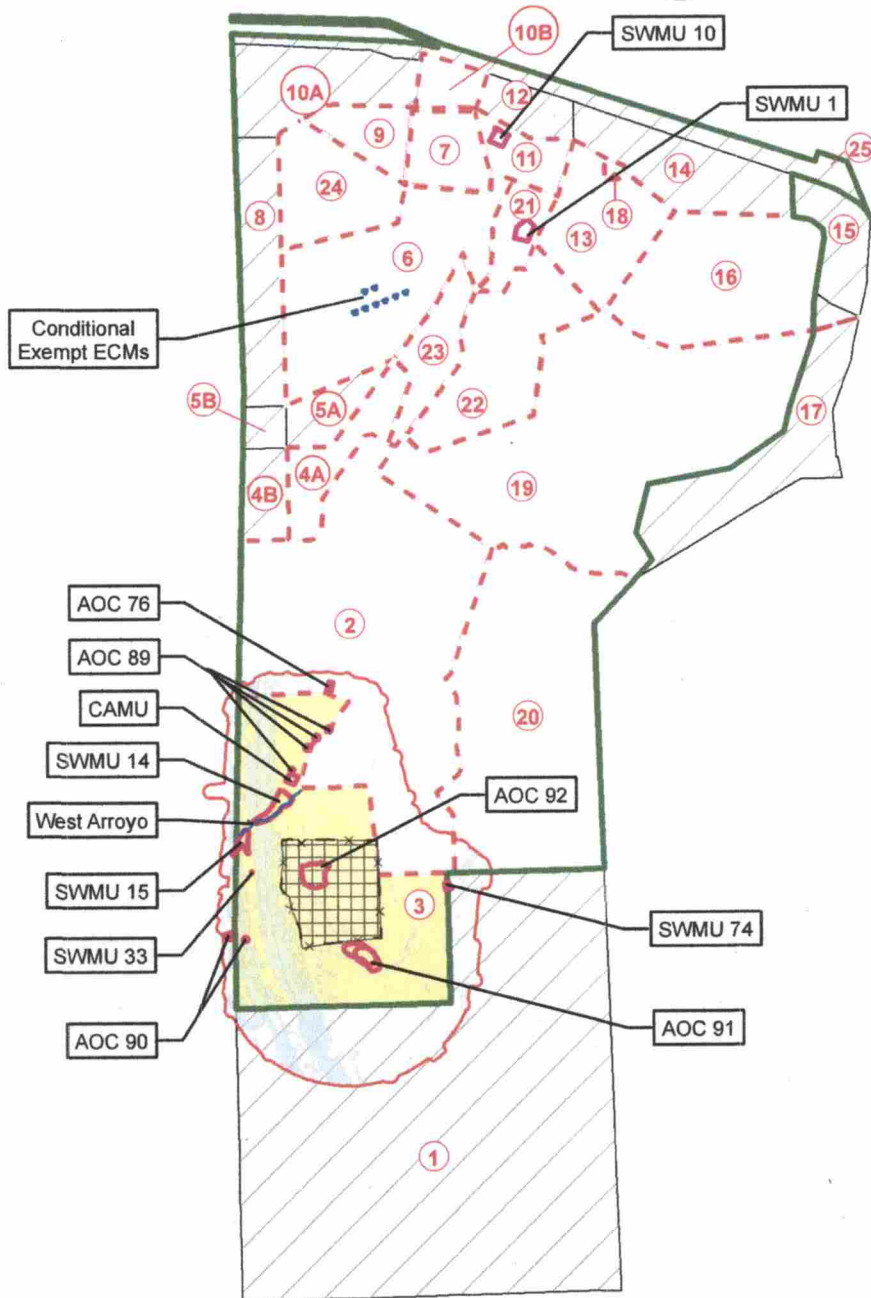


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Fort Wingate Depot Activity
McKinley County, New Mexico

Figure 2
Parcel Overview

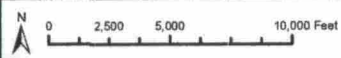
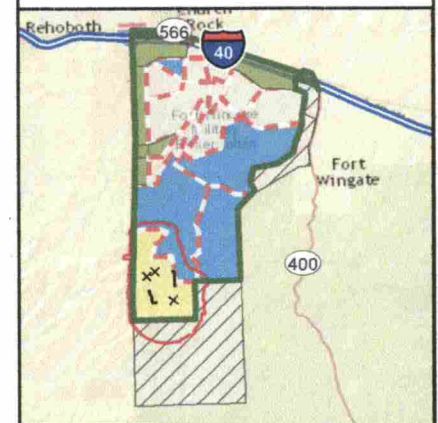


Legend

- FWDA Boundary
- Kickout Area (KOA)
- KOA Inner Fence (Army Retain)
- AOCs & SWMUs
- Conditional Exempt Earth Covered Magazines (ECMs)
- Inaccessible Area
- West Arroyo
- Parcel Number

Parcel Status

- Army Parcel Boundary
- Parcel 3, Army Retained
- Army, Leased to MDA
- Army, Pending Transfer
- Tribal Lands



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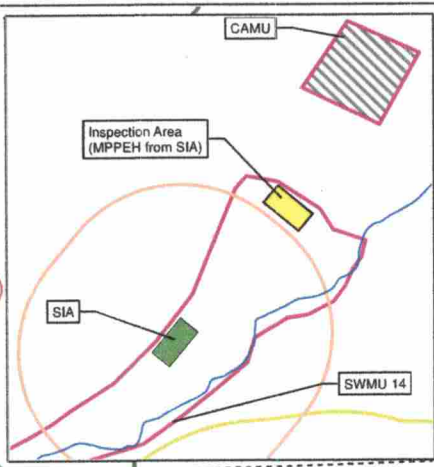
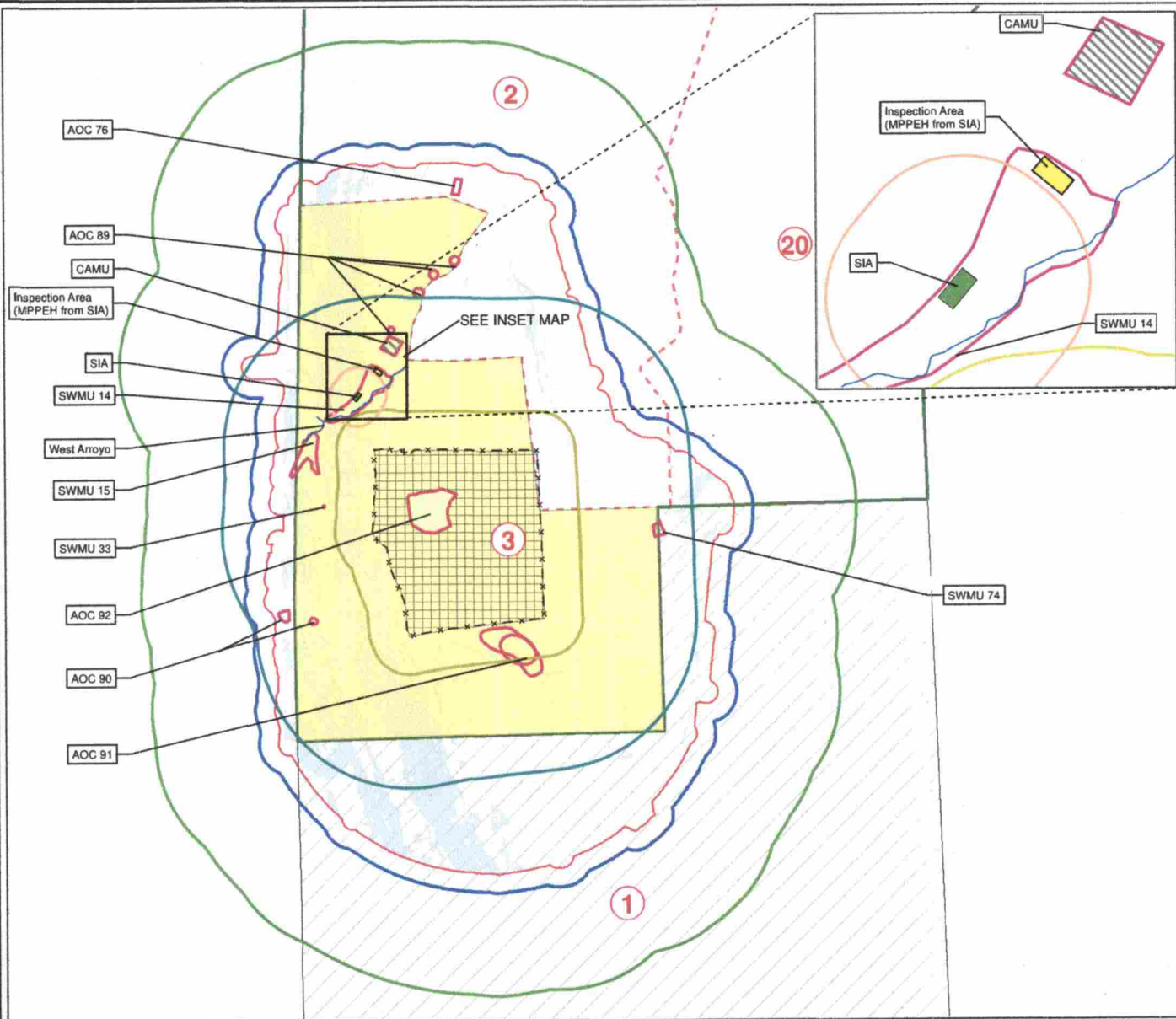
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Fort Wingate Depot Activity
 McKinley County, New Mexico
Figure 3
 ESQD Map for KOA



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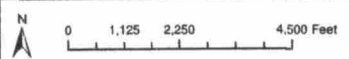
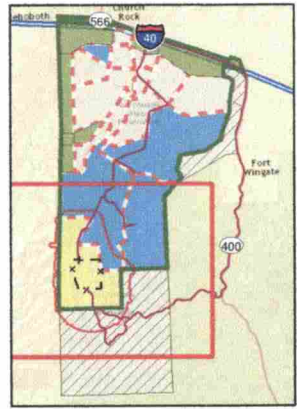
- FWDA Boundary
- West Arroyo
- Inaccessible Area
- KOA Inner Fence (Army Retain)
- Kickout Area (KOA)
- AOCs & SWMUs
- Corrective Action Management Unit (CAMU)
- Sorting & Inspection Area (SIA)
- Inspection Area (MPPEH from SIA)

ESQD

- Hazardous Fragment Distance (HFD) - 450 feet based on the 155mm M107 (Comp B filled) projectile
- Maximum Fragment Distance Horizontal (MFD-H) 2894 feet based on the 155mm M107 (TNT filled) projectile
- SIA Hazardous Fragment Distance (HFD), 592 feet, based on the BLU-3B (Composition A5 Filled) Submunition
- SIA Maximum Fragment Distance Horizontal (MFD-H) 2,111 feet based on the 105mm M1 (TNT filled) projectile
- Hazardous Fragment Distance (HFD) 910 feet based on the AN-M66A2, 2000-lb HE Bomb (KOA Inner Fence Only)
- Maximum Fragment Distance - Horizontal (MFD-H), 3593 feet based on the AN-M66A2, 2000-lb HE Bomb (KOA Inner Fence Only)

Parcel Status

- Army Parcel Boundary
- Parcel 3, Army Retained
- Army, Leased to MDA
- Army, Pending Transfer
- Tribal Lands
- Evacuation Route

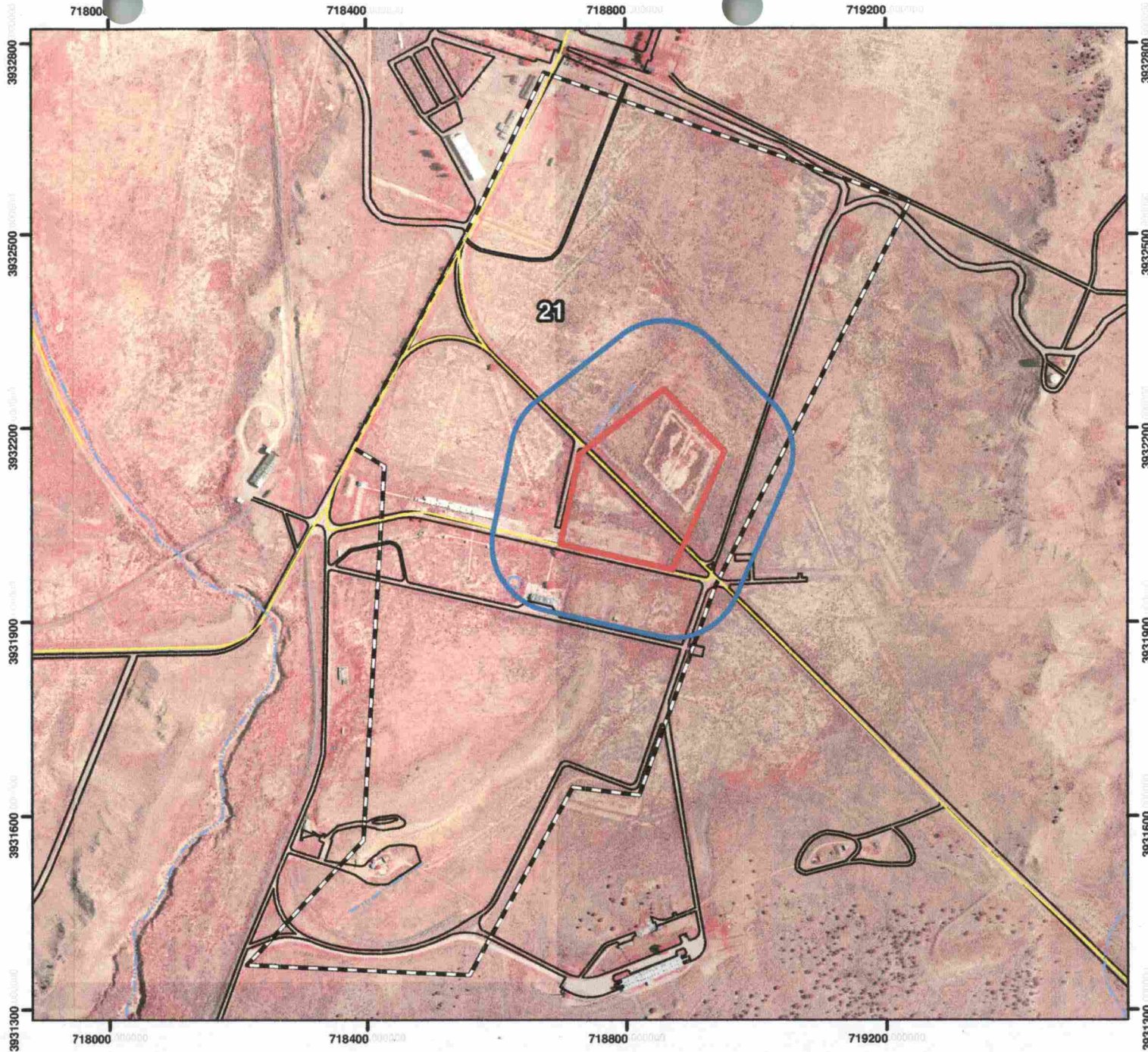


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Fort Wingate Depot Activity
McKinley County, New Mexico

Figure 4
ESQD Map for SWMU 1

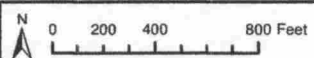
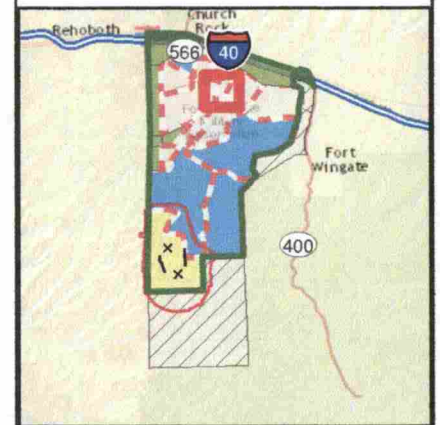


Legend

- FWDA Boundary
- FWDA Parcel 21
- SWMU 1
- Hazardous Fragment Distance (HFD) 346 feet
- Roads
- Access Route
- Arroyo

Parcel Status

- Army Parcel Boundary
- Parcel 3, Army Retained
- Army, Leased to MDA
- Army, Pending Transfer
- Tribal Lands



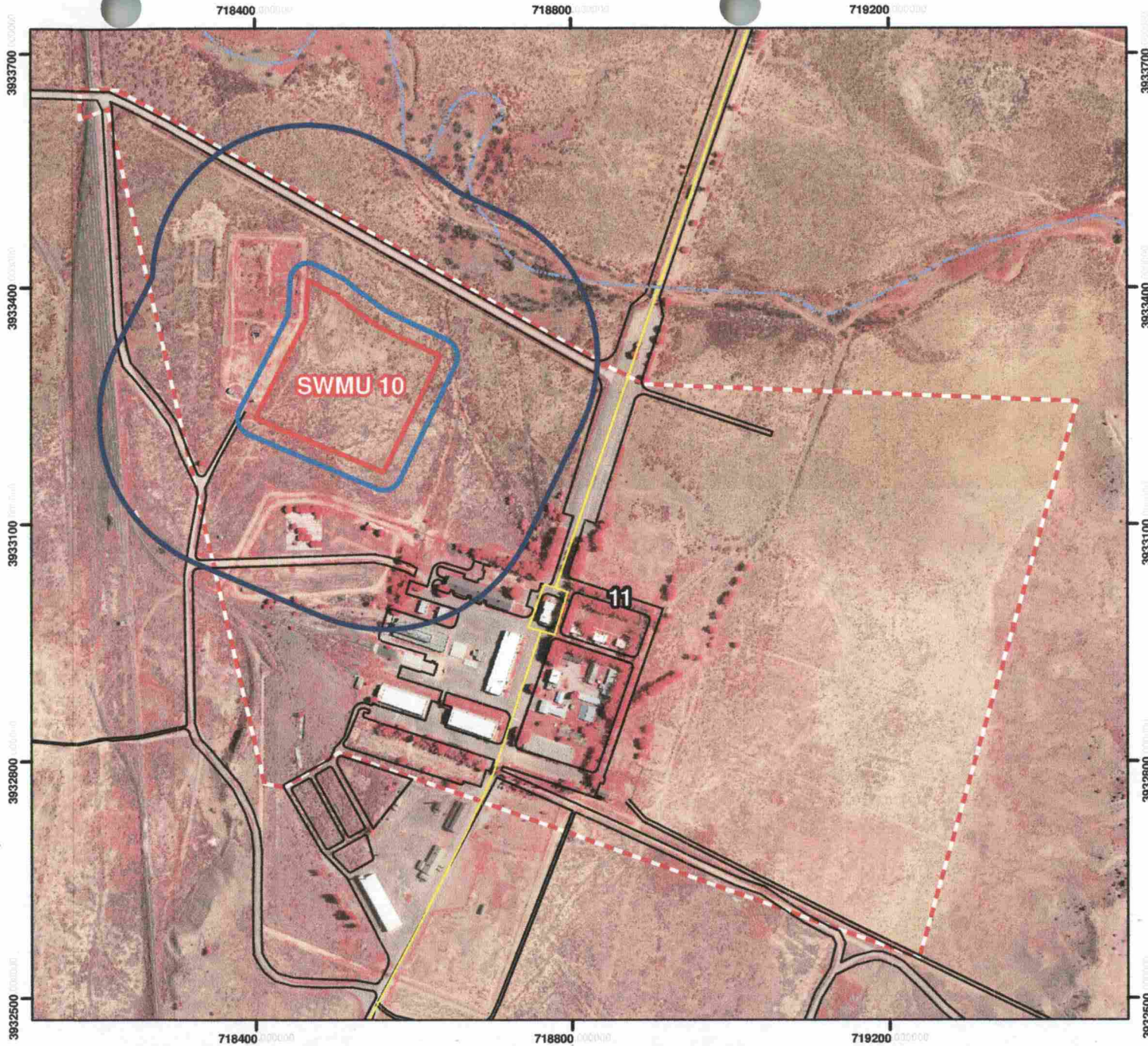
Drawn By: NW	Date: 12/30/2014	Job Code: 14-41-137	MXD: A:\Working\Ft_Wingate_1441137\MXD\ESS\30 Dec 2014\Figure_4.mxd
Datum: WGS 84	CS: UTM 12N	PDF: A:\Working\Ft_Wingate_1441137\Products\PDFs	



Fort Wingate Depot Activity
McKinley County, New Mexico

Figure 5

ESQD Map for SWMU 10

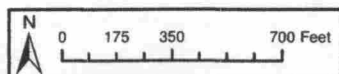
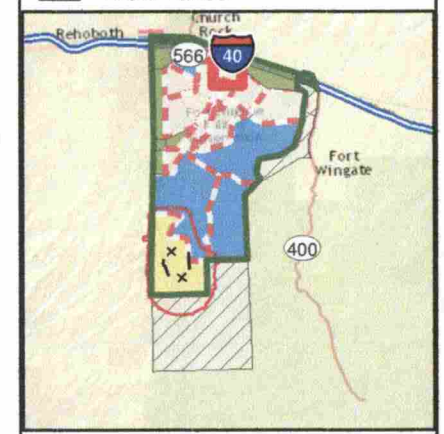


Legend

- FWDA Boundary
- FWDA Parcel 11
- SWMU 10
- Hazardous Fragment Distance (HFD) - 73 feet
- Maximum Fragment Distance Horizontal (MFD-H) - 651 feet
- Access Route
- Roads
- Arroyo

Parcel Status

- Army Parcel Boundary
- Parcel 3, Army Retained
- Army, Leased to MDA
- Army, Pending Transfer
- Tribal Lands







Drawn By: NW	Date: 12/30/2014	Job Code: 14-41-137	MXD: A:\Working\Ft_Wingate_1441137\MXD\ESS\30 Dec 2014\Figure_5.mxd
Datum: WGS 84	CS: UTM 12N	PDF: A:\Working\Ft_Wingate_1441137\Products\PDFs	




Fort Wingate Spot Activity
 McKinley County, New Mexico
Figure 6
 ESQD Map for CAMU







Legend

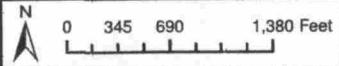
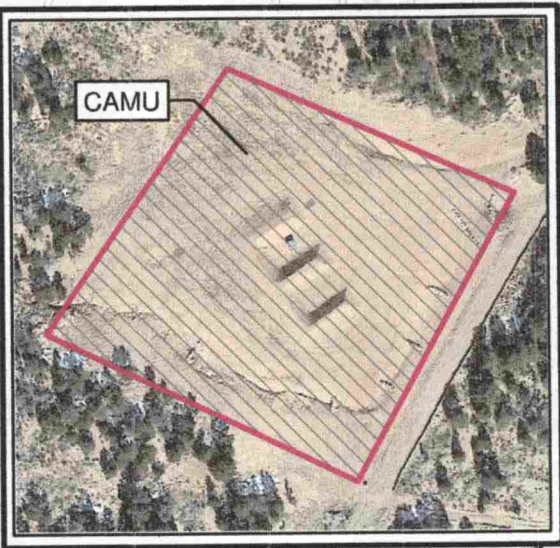
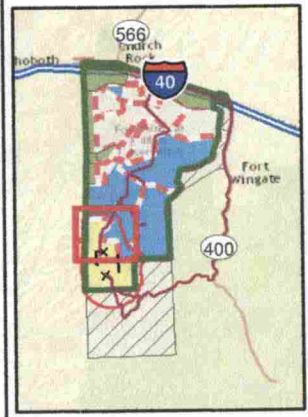
-  FWDA Installation Boundary
-  Roads
-  Corrective Action Management Unit (CAMU)
-  KOA Inner Fence (Army Retain)

Explosive Safety Quantity Distance (ESQD)

-  Maximum Fragment Distance Horizontal (MFD-H)
 2894 Feet based on the 155mm, M107 (TNT Filled) HE Projectile

Parcel Status

-  Army Parcel Boundary
-  Parcel 3, Army Retained
-  Army, Leased to MDA
-  Army, Pending Transfer
-  Removed from Permit
-  Evacuation Route



Drawn By: NW	Date: 1/9/2015	Job Code: 14-41-137	MXD: A:\Working\Ft_Wingate_1441137\MXD\ESS\8 Jan 2015\Figure_6.mxd
Datum: WGS 84	CS: UTM 12N	Imagery: 2009 Color Infrared	PDF: A:\Working\Ft_Wingate_1441137\Products\PDFs\Appendix_B

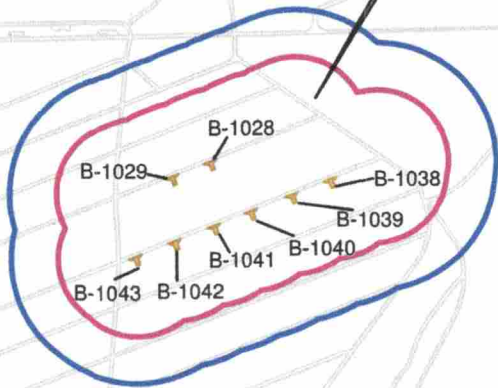


Fort Wingate Depot Activity
McKinley County, New Mexico

Figure 7

ESQD Map for
Conditional Exempt ECMs

Conditional Exempt ECMs



Legend

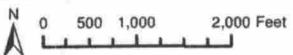
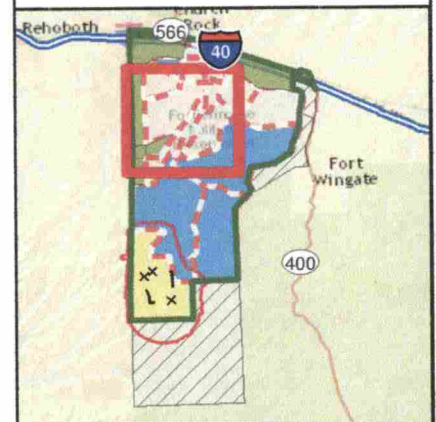
- FWDA Boundary
- Explosives Storage Block B Igloos
- Roads

ESQD

- Inhabited Building Distance - 1250 feet
- Public Traffic Route Distance - 750 feet

Parcel Status

- Army Parcel Boundary
- Parcel 3, Army Retained
- Army, Leased to MDA
- Army, Pending Transfer
- Tribal Lands



Drawn By: MI

Date: 12/30/2014

Job Code: 14-41-137

MXD: A:\Working\FL_Wingate_1441137\MXD\ESS\30 Dec 2014\Figura_7.mxd

Datum: WGS 84

CS: UTM 12N

PDF: A:\Working\FL_Wingate_1441137\Products\PDFs



PIKA
ARCADIS MALCOLM PIRNIE

APPENDIX B

FRAGMENTATION DATA REVIEW SHEETS

AN-M66A2, 2000-lb HE Bomb
BLU-3B (Composition A5 filled)
155 mm M795
155 mm M107 (TNT filled)
155 mm M107 (Comp B filled)
105mm M1 Projectile (Composition B filled)
105mm M1 Projectile (TNT filled)
20 mm M56A4 Projectile
20 mm M97 HEI Projectile
20 mm Mk I HEI Projectile
M18A1 AP Mine

Fragmentation Data Review Form



Database Revision Date 8/21/2014

Category:

Munition:

Case Material:

Fragmentation Method:

Secondary Database Category:

Munition Case Classification:

DODIC:

Date Record Created:

Record Created By:

Last Date Record Updated:

Individual Last Updated Record:

Date Record Retired:

Munition Information and Fragmentation Characteristics

Explosive Type:

Explosive Weight (lb):

Diameter (in):

Cylindrical Case Weight (lb):

Maximum Fragment Weight (Intentional) (lb):

Design Fragment Weight (95%) (Unintentional) (lb):

Critical Fragment Velocity (fps):

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):

MFD-H [Maximum Fragment Distance, Horizontal] (ft):

MFD-V [Maximum Fragment Distance, Vertical] (ft):

Overpressure Distances

TNT Equivalent (Pressure):

TNT Equivalent Weight - Pressure (lbs):

Unbarricaded Intraline Distance (3.5 psi), K18 Distance:

Public Traffic Route Distance (2.3 psi); K24 Distance:

Inhabited Building Distance (1.2 psi), K40 Distance:

Intentional MSD (0.0655 psi), K328 Distance:

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):

TNT Equivalent Weight - Impulse (lbs):

Kinetic Energy 10^6 (lb-ft²/s²):

Single Sandbag Mitigation

Required Wall & Roof Thickness (in):

Expected Max. Throw Distance (ft):

Minimum Separation Distance (ft):

Double Sandbag Mitigation

Required Wall & Roof Thickness (in):

Expected Max. Throw Distance (ft):

Minimum Separation Distance (ft):

Water Mitigation

Minimum Separation Distance (ft):

Water Containment System:

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	54.66	19.16
Mild Steel:	7.69	2.89
Hard Steel:	6.31	2.37
Aluminum:	14.71	5.87
LEXAN:	18.37	10.05
Plexi-glass:	19.25	8.65
Bullet Resist Glass:	18.32	7.53

Item Notes

Fragmentation Data Review Form



Database Revision Date 8/21/2014

Category: Miscellaneous

Munition: BLU-3/B (Composition A-5 filled)

Case Material: Aluminum Matrix with Steel Sphere Fragments

Fragmentation Method: Pre-formed Fragmenting

Secondary Database Category: Submunition

Munition Case Classification: Robust

DODIC: E269

Date Record Created: 6/6/2007

Record Created By: MC

Last Date Record Updated: 6/4/2014

Individual Last Updated Record: SDH

Date Record Retired:

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	127
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	592
MFD-V [Maximum Fragment Distance, Vertical] (ft):	482

Overpressure Distances

TNT Equivalent (Pressure):	1.46
TNT Equivalent Weight - Pressure (lbs):	0.521
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	14
Public Traffic Route Distance (2.3 psi); K24 Distance:	19
Inhabited Building Distance (1.2 psi), K40 Distance:	32
Intentional MSD (0.0655 psi), K328 Distance:	264

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	3.51	3.51
Mild Steel:	0.62	0.62
Hard Steel:	0.51	0.51
Aluminum:	1.37	1.37
LEXAN:	3.98	3.98
Plexi-glass:	2.53	2.53
Bullet Resist Glass:	1.94	1.94

Item Notes

Munition Information and Fragmentation Characteristics

Explosive Type: Composition A-5

Explosive Weight (lb): 0.35714285714

Diameter (in): 2.6400

Cylindrical Case Weight (lb): 1.08801

Maximum Fragment Weight (Intentional) (lb): 0.0024

Design Fragment Weight (95%) (Unintentional) (lb): 0.0024

Critical Fragment Velocity (fps): 8318

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse): 1.3

TNT Equivalent Weight - Impulse (lbs): 0.464

Kinetic Energy 10⁶ (lb-ft²/s²): 0.0823

Single Sandbag Mitigation

Required Wall & Roof Thickness (in): 12

Expected Max. Throw Distance (ft): 25

Minimum Separation Distance (ft): 25

Double Sandbag Mitigation

Required Wall & Roof Thickness (in): 24

Expected Max. Throw Distance (ft): 10

Minimum Separation Distance (ft): 12.5

Water Mitigation

Minimum Separation Distance (ft): 200/200

Water Containment System: 5 gal carboys/ inflatable pool

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Fragmentation Data Review Form



Database Revision Date 8/21/2014

Category: Surface-Launched HE Rounds
 Munition: 155 mm M795
 Case Material: Steel, Mild
 Fragmentation Method: Naturally Fragmenting
 Secondary Database Category: Projectile
 Munition Case Classification: Robust

DODIC: D529
 Date Record Created: 9/21/2004
 Record Created By: MC
 Last Date Record Updated: 2/4/2010
 Individual Last Updated Record: SDH
 Date Record Retired:

Munition Information and Fragmentation Characteristics

Explosive Type: TNT
 Explosive Weight (lb): 28.814
 Diameter (in): 6.0430
 Cylindrical Case Weight (lb): 61.96831
 Maximum Fragment Weight (Intentional) (lb): 0.6139
 Design Fragment Weight (95%) (Unintentional) (lb): 0.1116
 Critical Fragment Velocity (fps): 4434

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse): 1
 TNT Equivalent Weight - Impulse (lbs): 28.814
 Kinetic Energy 10⁶ (lb-ft²/s²): 6.0352

Single Sandbag Mitigation

Required Wall & Roof Thickness (in): Not Permitted
 Expected Max. Throw Distance (ft): Not Permitted
 Minimum Separation Distance (ft): Not Permitted

Double Sandbag Mitigation

Required Wall & Roof Thickness (in): Not Permitted
 Expected Max. Throw Distance (ft): Not Permitted
 Minimum Separation Distance (ft): Not Permitted

Water Mitigation

Minimum Separation Distance (ft): Not Permitted
 Water Containment System: Not Permitted

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft): 443
 MFD-H [Maximum Fragment Distance, Horizontal] (ft): 2739
 MFD-V [Maximum Fragment Distance, Vertical] (ft): 2111

Overpressure Distances

TNT Equivalent (Pressure): 1
 TNT Equivalent Weight - Pressure (lbs): 28.814
 Unbarricaded Intraline Distance (3.5 psi), K18 Distance: 55
 Public Traffic Route Distance (2.3 psi); K24 Distance: 74
 Inhabited Building Distance (1.2 psi), K40 Distance: 123
 Intentional MSD (0.0655 psi), K328 Distance: 1006

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	15.11	7.34
Mild Steel:	2.79	1.42
Hard Steel:	2.29	1.16
Aluminum:	5.44	2.85
LEXAN:	10.90	7.19
Plexi-glass:	9.67	5.57
Bullet Resist Glass:	8.86	4.79

Item Notes

Fragmentation Data Review Form



Database Revision Date 8/21/2014

Category:

Munition:

Case Material:

Fragmentation Method:

Secondary Database Category:

Munition Case Classification:

DODIC:

Date Record Created:

Record Created By:

Last Date Record Updated:

Individual Last Updated Record:

Date Record Retired:

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):

MFD-H [Maximum Fragment Distance, Horizontal] (ft):

MFD-V [Maximum Fragment Distance, Vertical] (ft):

Overpressure Distances

TNT Equivalent (Pressure):

TNT Equivalent Weight - Pressure (lbs):

Unbarricaded Intraline Distance (3.5 psi), K18 Distance:

Public Traffic Route Distance (2.3 psi); K24 Distance:

Inhabited Building Distance (1.2 psi), K40 Distance:

Intentional MSD (0.0655 psi), K328 Distance:

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	14.62	7.33
Mild Steel:	2.82	1.43
Hard Steel:	2.31	1.17
Aluminum:	5.39	2.85
LEXAN:	11.10	7.30
Plexi-glass:	9.91	5.69
Bullet Resist Glass:	9.14	4.99

Item Notes

Munition Information and Fragmentation Characteristics

Explosive Type:

Explosive Weight (lb):

Diameter (in):

Cylindrical Case Weight (lb):

Maximum Fragment Weight (Intentional) (lb):

Design Fragment Weight (95% Unintentional) (lb):

Critical Fragment Velocity (fps):

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):

TNT Equivalent Weight - Impulse (lbs):

Kinetic Energy 10⁶ (lb-ft²/s²):

Single Sandbag Mitigation

Required Wall & Roof Thickness (in):

Expected Max. Throw Distance (ft):

Minimum Separation Distance (ft):

Double Sandbag Mitigation

Required Wall & Roof Thickness (in):

Expected Max. Throw Distance (ft):

Minimum Separation Distance (ft):

Water Mitigation

Minimum Separation Distance (ft):

Water Containment System:

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Fragmentation Data Review Form



Database Revision Date 8/21/2014

Category: Surface-Launched HE Rounds

Munition: 155 mm M107 (Composition B filled)

Case Material: Steel, Mild

Fragmentation Method: Naturally Fragmenting

Secondary Database Category: Projectile

Munition Case Classification: Robust

DODIC: D571

Date Record Created: 9/21/2004

Record Created By: MC

Last Date Record Updated:

Individual Last Updated Record: SDH

Date Record Retired:

Munition Information and Fragmentation Characteristics

Explosive Type: Composition B

Explosive Weight (lb): 15.448

Diameter (in): 6.1024

Cylindrical Case Weight (lb): 73.50184

Maximum Fragment Weight (Intentional) (lb): 0.6641

Design Fragment Weight (95%) (Unintentional) (lb): 0.1372

Critical Fragment Velocity (fps): 3584

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft): 450

MFD-H [Maximum Fragment Distance, Horizontal] (ft): 2630

MFD-V [Maximum Fragment Distance, Vertical] (ft): 2022

Overpressure Distances

TNT Equivalent (Pressure): 1.16

TNT Equivalent Weight - Pressure (lbs): 17.920

Unbarricaded Intraline Distance (3.5 psi), K18 Distance: 47

Public Traffic Route Distance (2.3 psi); K24 Distance: 63

Inhabited Building Distance (1.2 psi), K40 Distance: 105

Intentional MSD (0.0655 psi), K328 Distance: 858

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse): 1.14

TNT Equivalent Weight - Impulse (lbs): 17.611

Kinetic Energy 10⁶ (lb-ft²/s²): 5.4935

Single Sandbag Mitigation

Required Wall & Roof Thickness (in): 36

Expected Max. Throw Distance (ft): 220

Minimum Separation Distance (ft): 220

Double Sandbag Mitigation

Required Wall & Roof Thickness (in): Not Permitted

Expected Max. Throw Distance (ft): Not Permitted

Minimum Separation Distance (ft): Not Permitted

Water Mitigation

Minimum Separation Distance (ft): 275

Water Containment System: 1100 gal tank

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	14.45	6.68
Mild Steel:	2.74	1.29
Hard Steel:	2.25	1.06
Aluminum:	5.30	2.61
LEXAN:	10.69	6.73
Plexi-glass:	9.43	5.10
Bullet Resist Glass:	8.58	4.39

Item Notes

Empty box for item notes.

Fragmentation Data Review Form



Database Revision Date 8/21/2014

Category: Surface-Launched HE Rounds

Munition: 105 mm M1 (Composition B filled)

Case Material: Steel, Mild

Fragmentation Method: Naturally Fragmenting

Secondary Database Category: Projectile

Munition Case Classification: Robust

DODIC: C445

Date Record Created: 9/21/2004

Record Created By: MC

Last Date Record Updated: 2/26/2010

Individual Last Updated Record: SDH

Date Record Retired:

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft): 335

MFD-H [Maximum Fragment Distance, Horizontal] (ft): 1886

MFD-V [Maximum Fragment Distance, Vertical] (ft): 1475

Overpressure Distances

TNT Equivalent (Pressure): 1.16

TNT Equivalent Weight - Pressure (lbs): 5.881

Unbarricaded Intraline Distance (3.5 psi), K18 Distance: 32

Public Traffic Route Distance (2.3 psi); K24 Distance: 43

Inhabited Building Distance (1.2 psi), K40 Distance: 72

Intentional MSD (0.0655 psi), K328 Distance: 592

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Munition Information and Fragmentation Characteristics

Explosive Type: Composition B

Explosive Weight (lb): 5.07

Diameter (in): 4.1339

Cylindrical Case Weight (lb): 18.15827

Maximum Fragment Weight (Intentional) (lb): 0.1701

Design Fragment Weight (95%) (Unintentional) (lb): 0.0414

Critical Fragment Velocity (fps): 5058

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse): 1.14

TNT Equivalent Weight - Impulse (lbs): 5.780

Kinetic Energy 10^6 (lb-ft²/s²): 1.9864

Single Sandbag Mitigation

Required Wall & Roof Thickness (in): 24

Expected Max. Throw Distance (ft): 135

Minimum Separation Distance (ft): 135

Double Sandbag Mitigation

Required Wall & Roof Thickness (in): Not Permitted

Expected Max. Throw Distance (ft): Not Permitted

Minimum Separation Distance (ft): Not Permitted

Water Mitigation

Minimum Separation Distance (ft): 200

Water Containment System: 1100 gal tank

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	9.88	4.54
Mild Steel:	1.87	0.89
Hard Steel:	1.54	0.73
Aluminum:	3.73	1.82
LEXAN:	8.38	5.43
Plexi-glass:	6.82	3.83
Bullet Resist Glass:	5.97	3.18

Item Notes

Empty box for item notes.

Fragmentation Data Review Form



Database Revision Date 8/21/2014

Category:

Munition:

Case Material:

Fragmentation Method:

Secondary Database Category:

Munition Case Classification:

DODIC:

Date Record Created:

Record Created By:

Last Date Record Updated:

Individual Last Updated Record:

Date Record Retired:

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):

MFD-H [Maximum Fragment Distance, Horizontal] (ft):

MFD-V [Maximum Fragment Distance, Vertical] (ft):

Overpressure Distances

TNT Equivalent (Pressure):

TNT Equivalent Weight - Pressure (lbs):

Unbarricaded Intraline Distance (3.5 psi), K18 Distance:

Public Traffic Route Distance (2.3 psi); K24 Distance:

Inhabited Building Distance (1.2 psi), K40 Distance:

Intentional MSD (0.0655 psi), K328 Distance:

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	10.01	5.05
Mild Steel:	1.93	0.98
Hard Steel:	1.58	0.80
Aluminum:	3.80	1.98
LEXAN:	8.71	5.89
Plexi-glass:	7.18	4.27
Bullet Resist Glass:	6.37	3.61

Item Notes

Munition Information and Fragmentation Characteristics

Explosive Type:

Explosive Weight (lb):

Diameter (in):

Cylindrical Case Weight (lb):

Maximum Fragment Weight (Intentional) (lb):

Design Fragment Weight (95%) (Unintentional) (lb):

Critical Fragment Velocity (fps):

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):

TNT Equivalent Weight - Impulse (lbs):

Kinetic Energy 10⁶ (lb-ft²/s²):

Single Sandbag Mitigation

Required Wall & Roof Thickness (in):

Expected Max. Throw Distance (ft):

Minimum Separation Distance (ft):

Double Sandbag Mitigation

Required Wall & Roof Thickness (in):

Expected Max. Throw Distance (ft):

Minimum Separation Distance (ft):

Water Mitigation

Minimum Separation Distance (ft):

Water Containment System:

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Fragmentation Data Review Form



Database Revision Date 8/21/2014

Category: Surface-Launched HE Rounds
 Munition: 20 mm M56A4
 Case Material: Steel, Mild
 Fragmentation Method: Naturally Fragmenting
 Secondary Database Category: Projectile
 Munition Case Classification: Robust

DODIC: A890
 Date Record Created: 11/9/2006
 Record Created By: MC
 Last Date Record Updated: 9/14/2011
 Individual Last Updated Record: SDH
 Date Record Retired:

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft): 65
 MFD-H [Maximum Fragment Distance, Horizontal] (ft): 535
 MFD-V [Maximum Fragment Distance, Vertical] (ft): 427

Overpressure Distances

TNT Equivalent (Pressure): 1.46
 TNT Equivalent Weight - Pressure (lbs): 0.039
 Unbarricaded Intraline Distance (3.5 psi), K18 Distance: 6
 Public Traffic Route Distance (2.3 psi); K24 Distance: 8
 Inhabited Building Distance (1.2 psi), K40 Distance: 14
 Intentional MSD (0.0655 psi), K328 Distance: 111

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	1.86	1.00
Mild Steel:	0.36	0.20
Hard Steel:	0.30	0.16
Aluminum:	0.80	0.45
LEXAN:	3.04	2.11
Plexi-glass:	1.77	1.10
Bullet Resist Glass:	1.33	0.80

Item Notes

Munition Information and Fragmentation Characteristics

Explosive Type: H-764 (RDX)
 Explosive Weight (lb): 0.0264
 Diameter (in): 0.7874
 Cylindrical Case Weight (lb): 0.10516
 Maximum Fragment Weight (Intentional) (lb): 0.0034
 Design Fragment Weight (95%) (Unintentional) (lb): 0.0017
 Critical Fragment Velocity (fps): 3064

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse): 1.3
 TNT Equivalent Weight - Impulse (lbs): 0.034
 Kinetic Energy 10⁶ (lb-ft²/s²): 0.0307

Single Sandbag Mitigation

Required Wall & Roof Thickness (in): 12
 Expected Max. Throw Distance (ft): 25
 Minimum Separation Distance (ft): 25

Double Sandbag Mitigation

Required Wall & Roof Thickness (in): 24
 Expected Max. Throw Distance (ft): 10
 Minimum Separation Distance (ft): 12.5

Water Mitigation

Minimum Separation Distance (ft): 200/200
 Water Containment System: 5 gal carboys/ inflatable pool

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Fragmentation Data Review Form



Database Revision Date 8/21/2014

Category:

Munition:

Case Material:

Fragmentation Method:

Secondary Database Category:

Munition Case Classification:

DODIC:

Date Record Created:

Record Created By:

Last Date Record Updated:

Individual Last Updated Record:

Date Record Retired:

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	66
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	651
MFD-V [Maximum Fragment Distance, Vertical] (ft):	476

Munition Information and Fragmentation Characteristics

Explosive Type:

Explosive Weight (lb):

Diameter (in):

Cylindrical Case Weight (lb):

Maximum Fragment Weight (Intentional) (lb):

Design Fragment Weight (95%) (Unintentional) (lb):

Critical Fragment Velocity (fps):

Overpressure Distances

TNT Equivalent (Pressure):	1.07
TNT Equivalent Weight - Pressure (lbs):	0.018
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	5
Public Traffic Route Distance (2.3 psi); K24 Distance:	6
Inhabited Building Distance (1.2 psi), K40 Distance:	11
Intentional MSD (0.0655 psi), K328 Distance:	86

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):

TNT Equivalent Weight - Impulse (lbs):

Kinetic Energy 10⁶ (lb-ft²/s²):

Single Sandbag Mitigation

Required Wall & Roof Thickness (in):

Expected Max. Throw Distance (ft):

Minimum Separation Distance (ft):

Double Sandbag Mitigation

Required Wall & Roof Thickness (in):

Expected Max. Throw Distance (ft):

Minimum Separation Distance (ft):

Water Mitigation

Minimum Separation Distance (ft):

Water Containment System:

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	1.55	1.12
Mild Steel:	0.29	0.19
Hard Steel:	0.24	0.16
Aluminum:	0.64	0.43
LEXAN:	2.82	2.19
Plexi-glass:	1.61	1.15
Bullet Resist Glass:	1.22	0.83

Item Notes

Fragmentation Data Review Form



Database Revision Date 8/21/2014

Category: Surface-Launched HE Rounds
 Munition: 20 mm Mk I HEI
 Case Material: Steel, Mild
 Fragmentation Method: Naturally Fragmenting
 Secondary Database Category: Projectile
 Munition Case Classification: Robust

DODIC:
 Date Record Created: 6/10/2010
 Record Created By: SDH
 Last Date Record Updated: 1/12/2012
 Individual Last Updated Record: SDH
 Date Record Retired:

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft): 73
 MFD-H [Maximum Fragment Distance, Horizontal] (ft): 645
 MFD-V [Maximum Fragment Distance, Vertical] (ft): 491

Overpressure Distances

TNT Equivalent (Pressure): 1.07
 TNT Equivalent Weight - Pressure (lbs): 0.027
 Unbarricaded Intraline Distance (3.5 psi), K18 Distance: 5
 Public Traffic Route Distance (2.3 psi); K24 Distance: 7
 Inhabited Building Distance (1.2 psi), K40 Distance: 12
 Intentional MSD (0.0655 psi), K328 Distance: 98

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	1.69	1.08
Mild Steel:	0.33	0.20
Hard Steel:	0.27	0.16
Aluminum:	0.72	0.44
LEXAN:	2.96	2.21
Plexi-glass:	1.72	1.16
Bullet Resist Glass:	1.30	0.85

Munition Information and Fragmentation Characteristics

Explosive Type: Tetryl and Incenciary Mix
 Explosive Weight (lb): 0.025
 Diameter (in): 0.7934
 Cylindrical Case Weight (lb): 0.19546
 Maximum Fragment Weight (Intentional) (lb): 0.0076
 Design Fragment Weight (95%) (Unintentional) (lb): 0.0027
 Critical Fragment Velocity (fps): 2644

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse): 1.07
 TNT Equivalent Weight - Impulse (lbs): 0.027
 Kinetic Energy 10⁶ (lb-ft²/s²): 0.0298

Single Sandbag Mitigation

Required Wall & Roof Thickness (in): 12
 Expected Max. Throw Distance (ft): 25
 Minimum Separation Distance (ft): 25

Double Sandbag Mitigation

Required Wall & Roof Thickness (in): 24
 Expected Max. Throw Distance (ft): 10
 Minimum Separation Distance (ft): 12.5

Water Mitigation

Minimum Separation Distance (ft): 200/200
 Water Containment System: 5 gal carboys/ inflatable pool

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Item Notes

Fragmentation Data Review Form



Database Revision Date 8/21/2014

Category: Grenades & Mines
 Munition: M18A1 AP Mine (Claymore)
 Case Material: Steel, Mild
 Fragmentation Method: Pre-formed Fragmenting
 Secondary Database Category: Mine
 Munition Case Classification: Robust

DODIC: K143
 Date Record Created: 1/29/2008
 Record Created By: MC
 Last Date Record Updated: 3/29/2010
 Individual Last Updated Record: SDH
 Date Record Retired:

Munition Information and Fragmentation Characteristics

Explosive Type: Composition C-4
 Explosive Weight (lb): 1.5
 Diameter (in): 4.0000
 Cylindrical Case Weight (lb): 3.00000
 Maximum Fragment Weight (Intentional) (lb): 0.0016
 Design Fragment Weight (95%) (Unintentional) (lb): 0.0016
 Critical Fragment Velocity (fps): 3995

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse): 1.19
 TNT Equivalent Weight - Impulse (lbs): 1.785
 Kinetic Energy 10^6 (lb-ft²/s²): 0.0128

Single Sandbag Mitigation

Required Wall & Roof Thickness (in): 20
 Expected Max. Throw Distance (ft): 125
 Minimum Separation Distance (ft): 125

Double Sandbag Mitigation

Required Wall & Roof Thickness (in): Not Permitted
 Expected Max. Throw Distance (ft): Not Permitted
 Minimum Separation Distance (ft): Not Permitted

Water Mitigation

Minimum Separation Distance (ft): 264/200
 Water Containment System: 5 gal carboys/ inflatable pool

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft): 195
 MFD-H [Maximum Fragment Distance, Horizontal] (ft): 456
 MFD-V [Maximum Fragment Distance, Vertical] (ft): 362

Overpressure Distances

TNT Equivalent (Pressure): 1.37
 TNT Equivalent Weight - Pressure (lbs): 2.055
 Unbarricaded Intraline Distance (3.5 psi), K18 Distance: 23
 Public Traffic Route Distance (2.3 psi); K24 Distance: 31
 Inhabited Building Distance (1.2 psi), K40 Distance: 51
 Intentional MSD (0.0655 psi), K328 Distance: 417

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	1.22	1.22
Mild Steel:	0.20	0.20
Hard Steel:	0.17	0.17
Aluminum:	0.45	0.45
LEXAN:	2.08	2.08
Plexi-glass:	1.13	1.13
Bullet Resist Glass:	0.83	0.83

Item Notes

The diameter listed for this round is listed for modeling purposes only. This mine does not actually have a diameter but is approximately 4 inches tall by 8.5 inches wide by 1.5 inches thick.