ORDNANCE SYSTEMS INC.
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Kingsport, Tennessee 37660-9982
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In Reply Reference 5974RO
Federal Express Tracking Number: 7797 1859 1116

July 24, 2017

Ms. Michelle Walker Owenby, Program Administrator
Tennessee Department of Environment and Conservation
Division of Air Pollution Control
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, TN 37243

Reference: BAE Systems Ordnance Systems Inc's. (OSI's), operating contractor for Holston Army Ammunition Plant (HSAAP) in Kingsport, response to the Tennessee Department of Environment and Conservation Division of Air Pollution Control (APC) letter received 27 JUNE 2017

Dear Ms. Owenby:

BAE Systems Ordnance Systems Inc. (OSI), operating contractor for Holston Army Ammunition Plant (HSAAP) in Kingsport, respectfully submits this response as requested by the letter received from Tennessee Department of Environment and Conservation (TDEC), Division of Air Pollution Control (DAPC) on 27 June 2017. The request requires certification that there are no safe alternatives to open burning HSAAP materials as well as information necessary to support the claim in order to retain the protection of the application shield provisions of TAPC Rule 1200-03-09-.02(11)(f)2.

OSI certifies that open burning continues to be the only approved, safe method of decontamination for explosives and explosives contaminated materials at HSAAP. Currently, there are no proven safe alternatives to open burning of HSAAP explosives and explosives contaminated material. Please find enclosed supplemental information that supports this certification claim.

As detailed in the enclosed "Milan Army Ammunition Plant (MLAAP) calendar year 2016 annual report" a thorough evaluation is outlined in Table 4 summarizing the results, applicability, and maturity of multiple potential technologies. As documented in the report there are limited mature technologies suited for further evaluation by MLAAP. The report concludes there are limited technologies identified and they are not suitable for highly variable waste streams. HSAAP agrees with this conclusion and concurs that these technologies are not suitable for similar HSAAP generated waste streams. HSAAP is planning a detailed evaluation of alternative, mature technologies, specific to HSAAP explosive contaminated waste. Additional support for the certification statement above can be found in the 4 November 2016 Department of Army Memorandum for Armaments Research

Development and Engineering Center (ARDEC) Legal Office, which identifies the need for further open burn alternative evaluation.

To the best of my knowledge, and based on information and belief formed after reasonable inquiry, the statements and information contained in this letter are true, accurate, and complete.

Mr. James Ogle serves as BAE Systems OSI's primary contact for air program issues and may be reached at (423) 578-6231 or by email at james.ogle@baesystems.com. Please do not hesitate to contact Mr. Ogle should questions arise or additional information be needed.

Sincerely,

BAE SYSTEMS Ordnance Systems Inc.

Robert E. Winstead
Director EHSS

Enclosures: - Milan Army Ammunition Plant (MLAAP) calendar year 2016 annual report
-4 November 2016 Department of Army Memorandum for Armaments Research Development and Engineering Center (ARDEC) Legal Office
-August 2015 Department of Defense Instruction 4140.62: MPPEH guidance
-21 JUNE 2017 TDEC letter

cc HSAAP/Vestal
Jimmy Johnston, TDEC Deputy Director APC
Moe Baghernejad, Environmental Protection Specialist, TDEC APC
Ben Kacher, OSI Legal Counsel
Michael Stagg, Partner Waller Lansden Dortch & Davis, LLP
Environmental Affairs Files 1305/2017

DEPARTMENT OF THE ARMY
MILAN ARMY AMMUNITION PLANT
2280 HIGHWAY 104 WEST, SUITE 1
MILAN, TENNESSEE 38358-3176

REPLY TO
ATTENTION OF

March 29, 2017

Environmental Office

SUBJECT: Annual Reports Required by Conditions 20 and 44 (AA1) of the Milan Army Ammunition Plant (MLAAP) Conditional Major Air Permit #467630

Jackson Environmental Field Office
Air Pollution Control Division
1625 Hollywood Drive
Jackson, TN 38305

To Mr. Brad Garrett:

Enclosed is the annual report for calendar year 2016 required by the MLAAP Operating Permit No. 467630. The annual report includes the written statement and records required by Condition No. 20. Section six of the annual report includes the annual review of all available DoD research related to alternatives to open burning of explosive and explosive contaminated and or potentially explosives contaminated combustibles that is required by Condition No. 44.

If you have any questions or comments in regards to this matter, the point of contact is Mr. William R. Corrigan, 731-686-6911.

Sincerely,

Britt Locke
Commander's Representative

Enclosures

1) CY16 Actual Emissions Report for MLAAP

2016 ACTUAL EMISSIONS REPORT

Conditional Major Permit No. 467630
Emission Source Reference No. 27-0010

EnSafe Project Number:
0888819784, PH03

Prepared for:

American Ordnance LLC
Milan Army Ammunition Plant
2280 Tennessee Highway 104 West, Suite 1
Milan, Tennessee 38358

Prepared by:

ENSAFE

EnSafe Inc.
5724 Summer Trees Drive
Memphis, Tennessee 38134
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March 23, 2017

Table of Contents
2016 Actual Emissions Report

Responsible Official Certification .... Section 1

2016 Actual Emissions Summary .... Section 2

Monthly Fuel Usage and Operating Hours .... Section 3

Monthly Paint and Solvent Usage and LAP Production .... Section 4

Monthly Woodworking Operations and Emissions .... Section 5

Department of Defense Research on Alternative Methods for Open Burning .... Section 6

Responsible Official Certification

Milan Army Ammunition Plant
Operating Permit (Conditional Major) No. 467630

Milan Army Ammunition Plant is submitting the facility's Calendar Year 2016 actual emissions as required by Condition 20 of the above referenced permit. The amounts and information given regarding Milan Army Ammunition Plant's CY2016 actual emissions is accurate to the best of my knowledge.

The facility was in compliance with the following specific permit conditions:

Condition No. 3 – Single HAP emissions shall not exceed 9.9 tons during all intervals of 12 consecutive months; Combination of HAPS shall not exceed 24.9 tons during all intervals of consecutive months

Condition No. 7 – Nitrogen Oxides plantwide shall not exceed 77 tons during any interval of 12 consecutive months

Condition No. 9 – Sulfur Dioxide plantwide shall not exceed 98 tons during any interval of 12 consecutive months

Condition No. 10 – Particulate Matter plantwide shall not exceed 98 tons during any interval of 12 consecutive months

Britton. G. Locke
Commander's Representative
Milan Army Ammunition Plant

29 Mar 17
Date:

2016 Actual Emissions Summary

Milan Army Ammunition Plant

Conditional Major

Permit No. 467630

Actual Emissions Summary [1,2,3]

		Permit Limit (tons)	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16
NO_x (condition 7)	Boilers Emissions (Tons/month)		0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03
	Boilers Emissions (Tons/12 consecutive months)	60	0.04	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.12
	Open burning/detonation (Tons/12 consecutive months)		1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
	Emergency Engine (Tons/12 consecutive months)		13.78	13.78	13.78	13.78	13.78	13.78	13.78	13.78	13.78	13.78	13.78	13.78
	TOTAL NO_x Emissions (12 consecutive months)	77	15.15	15.18	15.19	15.19	15.19	15.19	15.19	15.19	15.19	15.19	15.20	15.23
CO (condition 8)	Boilers Emissions (Tons/month)		0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	Boilers Emissions (Tons/12 consecutive months)		0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03
	Open burning/detonation (Tons/12 consecutive months)		3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24
	Emergency Engine (Tons/12 consecutive months)		2.97	2.97	2.97	2.97	2.97	2.97	2.97	2.97	2.97	2.97	2.97	2.97
	TOTAL CO Emissions (12 consecutive months)	22	6.22	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.23	6.24
SO_2 (condition 9)	Boilers Emissions (Tons/month)		0.14	0.10	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.11
	Boilers Emissions (Tons/12 consecutive months)	96.6	0.14	0.24	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.32	0.43
	Open burning/detonation (Tons/12 consecutive months)		0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
	Emergency Engine (Tons/12 consecutive months)		0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
	TOTAL SO_2 Emissions (12 consecutive months)	98	1.45	1.55	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.63	1.74
PM_{10} (conditions 10 and 30)	Boilers Emissions (Tons/month)		0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	Boilers Emissions (Tons/12 consecutive months)	6.0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	Open burning/detonation (Tons/12 consecutive months)		85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00
	Emergency Engine (Tons/12 consecutive months)		0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
	LAP Emissions (Tons/12 consecutive months)	5.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Woodworking (Tons/month)		0.00E+00	2.00E-03	0.00E+00	2.00E-03	0.00E+00	0.00E+00	3.00E-03	0.00E+00	9.00E-03	0.00E+00	0.00E+00	0.00E+00
	Woodworking (Tons/12 consecutive months)	0.03	0.00E+00	2.00E-03	0.00E+00	2.00E-03	0.00E+00	0.00E+00	3.00E-03	0.00E+00	9.00E-03	0.00E+00	0.00E+00	0.00E+00
	Surface Coating (Tons/12 consecutive months)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL PM_{10} Emissions (12 consecutive months)	98	85.99	85.99	85.99	86.00	85.99	85.99	86.00	85.99	86.00	85.99	85.99	86.00
VOC (conditions 6 and 11)	Boilers Emissions (Tons/month)		5.06E-04	3.63E-04	1.13E-04	2.77E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-04	3.87E-04
	Boilers Emissions (Tons/12 consecutive months)		5.06E-04	8.69E-04	9.81E-04	1.01E-03	1.01E-03	1.01E-03	1.01E-03	1.01E-03	1.01E-03	1.01E-03	1.13E-03	1.51E-03
	LAP Emissions (Tons/12 consecutive months)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Surface Coating (Tons/12 consecutive months)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL VOC Emissions (12 consecutive months)	50	5.06E-04	8.69E-04	9.81E-04	1.01E-03	1.01E-03	1.01E-03	1.01E-03	1.01E-03	1.01E-03	1.01E-03	1.13E-03	1.51E-03
HAP (conditions 3 and 11)	Boilers, Single Largest HAP (Tons/12 consecutive months)		6.62E-05	1.14E-04	1.29E-04	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.47E-04	1.98E-04
	LAP, Single Largest HAP (Tons/12 consecutive months)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Surface Coating, Single Largest HAP (Tons/12 consecutive months)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total Single Largest HAP (Tons/12 consecutive months)	9.9	6.62E-05	1.14E-04	1.29E-04	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.47E-04	1.98E-04
	Boilers, Total HAP (Tons/12 consecutive months)		8.88E-05	1.53E-04	1.72E-04	1.77E-04	1.77E-04	1.77E-04	1.77E-04	1.77E-04	1.77E-04	1.77E-04	1.98E-04	2.66E-04
	LAP, Total HAP (Tons/12 consecutive months)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Surface Coating, Total HAP (Tons/12 consecutive months)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total HAP (Tons/12 consecutive months)	24.9	8.88E-05	1.53E-04	1.72E-04	1.77E-04	1.77E-04	1.77E-04	1.77E-04	1.77E-04	1.77E-04	1.77E-04	1.98E-04	2.66E-04

Notes:

(1) The new conditional major permit was issued on October 18, 2016.

(2) Based on the issuance of the new permit, the first true emissions on a tons per 12 consecutive month basis is December 2016.

(3) The permit requires boiler emissions to be listed in tons/year as well as tons per 12 consecutive month. The December 2016 emissions represent tons/year, as well as tons per 12 consecutive month.

Monthly Fuel Usage and Operating Hours

Milan Army Ammunition Plant
Conditional Major
Permit No. 467630

Fuel Usage Tracking — Fuel Oil Usage (gal / mo.)

	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16
A115L-1	0	0	0	0	0	0	0	0	0	0	0	0
A115L-2	0	0	0	0	0	0	0	0	0	0	0	0
I3A-1	0	0	0	0	0	0	0	0	0	0	0	0
I4-A1	2247	1797	535	201	0	0	0	0	0	0	373	1874
I5A-1	0	0	0	0	0	0	0	0	0	0	0	0
V1L-1	0	0	0	0	0	0	0	0	0	0	0	0
B21L-1	0	0	0	0	0	0	0	0	0	0	0	0
B21L-2	0	0	0	0	0	0	0	0	0	0	0	0
J107A-1	0	0	0	0	0	0	0	0	0	0	0	0
J107A-2	0	0	0	0	0	0	0	0	0	0	0	0
T116A-1	1767	1082	360	19	0	0	0	0	0	0	557	1196
D88L-1	0	0	0	0	0	0	0	0	0	0	0	0
D88L-2	0	0	0	0	0	0	0	0	0	0	0	0

Operating Hours Tracking (hr / mo.)

	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16
A115L-1	0	0	0	0	0	0	0	0	0	0	0	0
A115L-2	0	0	0	0	0	0	0	0	0	0	0	0
I3A-1	0	0	0	0	0	0	0	0	0	0	0	0
I4-A1	235	188	56	21	0	0	0	0	0	0	39	196
I5A-1	0	0	0	0	0	0	0	0	0	0	0	0
V1L-1	0	0	0	0	0	0	0	0	0	0	0	0
B21L-1	0	0	0	0	0	0	0	0	0	0	0	0
B21L-2	0	0	0	0	0	0	0	0	0	0	0	0
J107A-1	0	0	0	0	0	0	0	0	0	0	0	0
J107A-2	0	0	0	0	0	0	0	0	0	0	0	0
T116A-1	177	154	38	3	0	0	0	0	0	0	84	144
D88L-1	0	0	0	0	0	0	0	0	0	0	0	0
D88L-2	0	0	0	0	0	0	0	0	0	0	0	0

Monthly Paint and Solvent Usage and LAP Production

Milan Army Ammunition Plant
Conditional Major
Permit No. 467630

Surface Coating Operations - Paint and Solvent Usage (Condition No. 11)

	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16
Paint Usage	0	0	0	0	0	0	0	0	0	0	0	0
Solvent Usage	0	0	0	0	0	0	0	0	0	0	0	0

LAP Production (Condition No. 30)

	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16
Production	0	0	0	0	0	0	0	0	0	0	0	0

Production and Paint Usage provided by American Ordnance. Since there was no usage during 2016, the emissions are 0.

Monthly Woodworking Operations and Emissions

Milan Army Ammunition Plant
Conditional Major
Permit No. 467630

Woodworking Operations (J-5)
Condition No. 30

	hours of operation (hours/month)	Loading Rate (lbs/hour)	PM Emissions (lb/hour)	PM Emissions (tons/month)
Jan-16	0	40	2	0.00E+00
Feb-16	2			2.00E-03
Mar-16	0			0.00E+00
Apr-16	2			2.00E-03
May-16	0			0.00E+00
Jun-16	0			0.00E+00
Jul-16	3			3.00E-03
Aug-16	0			0.00E+00
Sep-16	9			9.00E-03
Oct-16	0			0.00E+00
Nov-16	0			0.00E+00
Dec-16	0			0.00E+00

Department of Defense Research on Alternative Methods for Open Burning

CY2016

Evaluation of Alternative Technologies to Open Burning and Open Detonation of Explosive and Explosive Contaminated or Potentially Explosive Contaminated Waste

Milan Army Ammunition Plant

Purpose

The purpose of this document is to meet Condition No. 44 (AA1) of the Milan Army Ammunition Plant (MLAAP) Conditional Major Air Permit No. 467630 issued October 18, 2016. Condition No. 44(AA1) states that MLAAP will conduct a review of all available DoD research related to alternatives to open burning of explosives and explosive-contaminated and or potentially explosive contaminated combustibles annually. In the event a safe alternative is discovered, the report shall include a plan to implement the new method of disposal or a technical explanation of why such method is not technically feasible at the installation.

Approach

An evaluation was made of the feasibility and safety of technologies other than OB and OD for treating the energetic wastes generated by MLAAP using the below six-step approach.

Step 1. Identify and describe the energetic waste stream.

Step 2. Identify safety issues.

Step 3. Identify and categorize alternative technologies to OB and OD

Step 4. Screen the technologies for general applicability to the energetic waste stream and technology maturity.

Step 5. Provide more information about the technologies that pass the initial screening.

Step 6. Evaluate the technologies for specific application to the waste stream and compare them with the current treatment methods.

This approach was also used by Naval Air Weapons Station, China Lake, California (which we will refer to as China Lake for brevity) to support their Resource Conservation and Recovery Act (RCRA) OD permit application. China Lake completed a thorough evaluation of alternative technologies to OD to support their permit, and they continue to monitor technological developments. MLAAP was able to leverage much of China Lake's research efforts to complete an evaluation of alternative technologies.

Historical Background

The MLAAP covers approximately 22,351 acres in Gibson and Carroll Counties of western Tennessee (Figure 1). MLAAP is located 5 miles east of Milan, Tennessee (Gibson County) and 28 miles north of Jackson, Tennessee. Lavinia, a small town on the eastern side of the installation, is located in Carroll County. Main access to the site is provided by Tennessee Highway 104 West, on which the MLAAP headquarters is located.

The MLAAP opened in 1942 and is an active Army Special Installation. Until late 2012 early 2013, when production ceased, MLAAP's mission provided for the load, assembly and pack (LAP) of medium-to-large-caliber ammunition and storage of military munitions. MLAAP is a government-owned, contractor-operated military industrial installation operated by American Ordnance LLC. MLAAP's current mission is to maintain the capability to LAP medium-to-large caliber ammunition as well as munitions storage and demolition and to transition to a commercial distribution site. MLAAP is currently inactive in the LAP areas.

Figure 1. Location of Milan Army Ammunition Plant

Sources of Explosive Wastes

MLAAP energetic waste streams, that are RCRA hazardous wastes, have historically been generated from production operations and from its storage mission as military munitions that are unstable are removed from storage for treatment or as military munitions are deemed as waste by the Designated Ammunition Authority at higher headquarters. Thus MLAAP's mission generates a diverse energetic waste stream. MLAAP has a RCRA permit for the Open Burning/Open Detonation of Department of Defense military munitions.

Hazardous wastes generated at MLAAP that are treated by OB/OD primarily include bulk propellants, explosives and pyrotechnics (PEP) and munitions and munition components, explosive sludges, and explosives contaminated carbon from the treatment of pinkwater that fail a reactivity test.

In addition to the RCRA explosive hazardous wastes mentioned above, MLAAP generates explosive contaminated wastes that are not classified as RCRA hazardous wastes. These explosive contaminated wastes pose significant safety hazard and are treated by "flashing" at the treatment area.

Waste Reduction and Minimization

Periodic reviews for waste minimization are essential for tracking progress and compliance to meet and satisfy the State of Tennessee Hazardous Waste Reduction Act of 1990 and the requirements of the Resource Conservation and Recovery Act (RCRA). A hazardous waste reduction assessment is conducted annually as the annual hazardous waste summary is generated. Assessment of hazardous waste generation at MLAAP is ongoing as aspects and impacts are reviewed in conformance to the ISO 14001 Environmental Management System. The purpose of this assessment is three-fold:

- To determine conformance and compliance with Federal, State and internal hazardous waste regulations
- To identify opportunities for reducing wastes of all types (solid, liquid, gaseous, hazardous, non-hazardous) at MLAAP and
- To provide information on alternative methods of capturing those opportunities for use by MLAAP in deciding which, if any, options may be implemented.

STEP 1. IDENTIFY AND DESCRIBE THE ENERGETIC WASTE STREAM

MLAAP waste streams may be broadly classified into the following categories as listed in Table 1. These categories were used in the MLAAP RCRA Subpart X permit application in 2011.

The MLAAP military munitions waste stream (Category A in Table 1) has been divided into thirteen distinct munitions categories, using treatment data from 2006 as a base year. Calendar year 2006 was used in the Human Health and Ecological Risk Assessment for the Subpart X RCRA permit application because that year represented a broad range of typical categories of military munitions that have been treated at MLAAP. These categories were chosen based on MLAAP's mission and applicability for evaluating alternative technologies. Total breakdown of all materials in a category is complicated by the extreme variety of items in the category. Although there are a wide variety of items in each category, the general composition is expected to include the components of commonly used explosives and explosive mixtures. In 2016 there were no explosives open burned at MLAAP. The main treatment categories treated by OD in CY2016 included fuzes, single base propellant and composition B munitions components. Table 2 depicts the quantity treated by OD by total NEW.

Table 1 includes a brief description of the "explosive contaminated" and "potentially explosive contaminated" waste streams. The "potentially contaminated" explosive waste stream has been discontinued. The "explosive contaminated" waste stream remains active. The explosive contaminated waste stream is highly variable. The weight treated includes the weight of metal that was recycled and dunnage used to build the fire.

Table 1 Milan AAP Waste Stream Categories			
Waste Stream Categories	**Waste Stream Description**	**Treatment Method**	**Amount Treated CY2016**
A. Military Munitions	1. Military Munitions 20mm through 155 mm, components and subassemblies 2. Composition B based explosives 3. Countermeasure Flares 4. Single Base propellants 5. Double Base propellants 6. Triple Base propellants 7. Ammonium Perchlorate Based propellants 8. RDX based explosives 9. Fuzes 10. Illumination flares and pyrotechnics compositions 11. Black Powder 12. Insensitive munitions 13. TNT	Explosives Waste that are Open Detonated or Open Burned	4,882 NEW Pounds treated by Open Detonation. 0 Pounds treated by Open Burning.
B.1.Explosive Contaminated Waste	1. Comprised of equipment and packaging known to be contaminated with explosives 2. Material Potentially Presenting an Explosive Hazard (e.g., munitions containers, munitions debris remaining after munitions use, range related debris) 3. Explosives contaminated equipment from explosives processing	Open Burning	*204,527 Pounds 379,840 pounds of metal were recovered for recycling
B.2.Potentially Contaminated Explosive Waste	1. Comprised of packaging from production areas likely contaminated with explosives	Open Burning	41,640 Pounds
* This quantity primarily includes the weight of the combustibles used to build the fire to "flash" the explosive contaminated equipment.			

Table 2
MLAAP Explosive (Military Munitions) Waste Stream Treated by OD 2016

Waste Stream Category	Total NEW (lbs.)	Percent of Waste Stream by NEW
M223 FUZE	544.4613	11.15192
M169 CTG. CASE ASSY.	0.0101	0.000207
M118 CTG. CASE, 40MM	0.0016	3.28E-05
M550 FUZE WO/SPITBACK	0.0015	3.07E-05
COMP A-5 VACUUM SCRAP	30	0.614475
COMP A-5	4	0.08193
BLACK POWDER	2402	49.19895
M767A1 FUZE	0.4021	0.008236
M74 GRENADE W/M219A2 FUZE	1401.385	28.70386
COMP B, GR. A. CLEAN RISER SCRAP	4	0.08193
M55 STAB DETONATOR	283.82	5.813341
EXPULSION CHARGE 155MM	181.0565	3.708489
EXPULSION CHG. ASSY.	31.08	0.636596
TOTAL	4882.2	100%

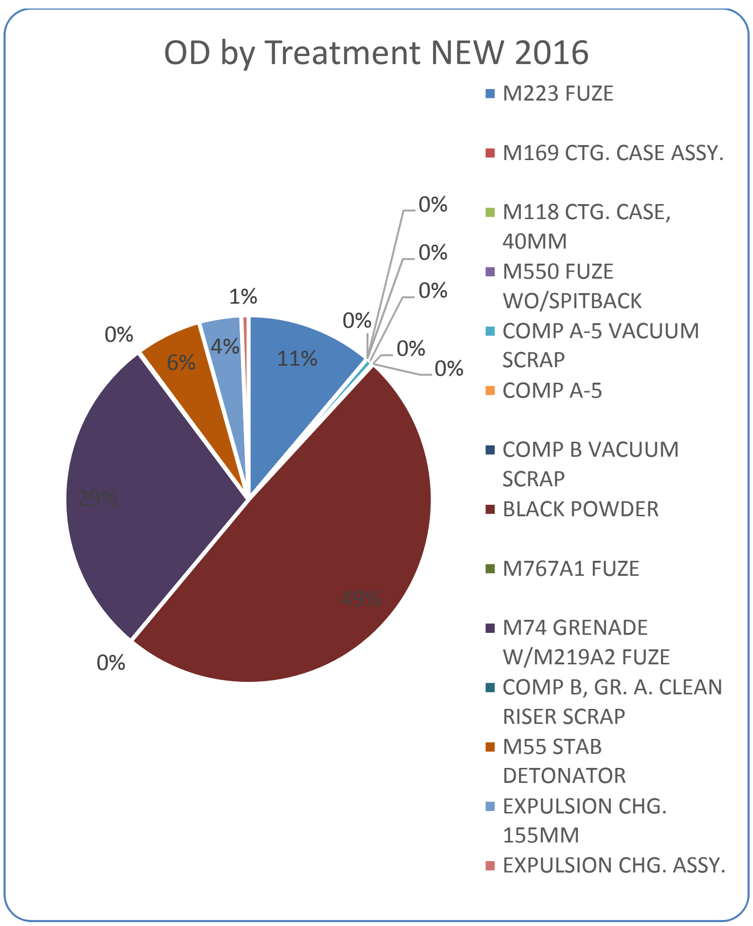

Figure 2. Breakdown of Military Munitions Treated by OB/OD from 2016

Explosive contaminated wastes (Category B.1 in Table 1) are solid wastes that are segregated from non-explosive contaminated wastes due to their contact with explosives. The explosive contaminated waste stream includes material potentially presenting an explosive hazard (MPPEH). MPPEH broadly contains such items as ventilation ducts, piping, holding tanks, range debris, etc. MPPEH items potentially contain a high enough concentration of explosives that the material presents an explosive hazard. The size of MPPEH may range from a 40MM casing that can fit in the palm of a hand, to a 155MM casing weighing 75 pounds or equipment weighing many tons that has to be handled with heavy equipment. Explosive contaminated wastes also include such items as packaging, personal protective clothing from explosive handling areas.

One example of MPPEH includes vacuum piping. In particular explosives operations, explosives are vacuumed from the operation to a remote location from the operation. The contaminated piping at some locations was removed in 2016 and sent to the Burning Ground for flashing. Contaminated piping is a particular risk as it is unsafe to cut and unsafe to decontaminate by any means other than open burning because the internal cavities of the pipe are not accessible for inspection.

Potentially contaminated explosive wastes (Category B.2 in Table 1) are wastes that have historically been generated on production lines that have a potential to have come into contact with explosives. These wastes include such items as packaging and containers and floor sweepings from locations that do not utilize bulk explosives or propellant. Since production lines are shut down, the potentially explosive contaminated waste stream has been discontinued. Testing and/or process knowledge will determine if the waste warrants treatment as explosive contaminated.

When evaluating the applicability of alternative technologies, it is important to note that MLAAP's waste stream changes with time as munitions developed change or as DoD mission requirements at MLAAP are determined, hence it is never homogenous. Because MLAAP's LAP mission is currently inactive but subject to change, future waste streams may not correlate well with past waste stream items. Hence, accurate prediction of wastes to be expected in the upcoming years is unlikely.

STEP 2. IDENTIFICATION OF SAFETY ISSUES

Safety issues present the most significant constraints when evaluating alternative treatment methods for energetic wastes. Once a propellant or explosive is initiated, the energy reactions are extremely rapid and violent. Therefore, safety is of prime importance when working with propellants, explosives, and ordnance containing energetic materials. One of the fundamentals of safety is to minimize the exposure of people and equipment to energetics. Methods for destruction are based upon the quantity and nature of the materials to be destroyed.

Treatment at the OD unit occurs both aboveground and in subsurface configurations. Aboveground thermal treatment by OD may be required in the case of machine-damaged, dropped, and other dangerous rounds. Aboveground OD is only used on munitions items that are too dangerous to manage via standard subsurface treatment. Subsurface thermal treatment at the OD unit is for bulk military high explosives, completed military ammunition, and munitions components. Treatment at the OB unit takes place in elevated burn pans on concrete pads. At MLAAP, explosives are stored in special explosive storage igloos located on the MLAAP facility. The proximity of explosives and explosives contaminated wastes to the MLAAP OB/OD site minimizes the handling, transportation and subsequent exposure of personnel and transients to potential explosive mishaps.

MLAAP places great emphasis on the safety and health of its employees, especially those performing potentially dangerous operations such as working with propellants and explosives and explosive contaminated wastes. The Plant Safety Committee which is comprised of subject matter experts in occupational health, environmental regulations, industrial hygiene and explosive safety, meets on a monthly basis to detail all of the potential hazards associated with explosive operations.

The Department of Defense Explosives Safety Board (DDESB) established explosives safety standards (DoD 6055.09-STD, DoD Ammunition and Explosives Safety Standards, February 2008), policy, and guidance applicable to military munitions, including demilitarization and disposal. All explosives safety procedures at MLAAP follow the DoD requirement set forth in DoD Directive 6055.9E, to "expose the minimum number of people for the minimum time to the minimum amount of explosives…". The OB and OD of energetic wastes at MLAAP are within acceptable risk limits, *provided excessive unpacking or manipulation of energetic wastes is avoided*. Each explosive operation being conducted must ensure the exposure time that personnel physically interact with explosives is minimized as much as possible to mitigate the likelihood of an explosive Accident or Incident (A/I).

Department of Transportation and DoD regulations prohibit many of the energetic wastes generated by MLAAP from being transported on public roadways, either because they are materials that have not been fully classified for transportation, or because they have been damaged or otherwise altered through production activities causing them to have unpredictable stability and sensitivity.

Additionally, alternative treatment methods that involve pretreatment such as cutting, grinding, or other significant manipulation of the energetic material such as repackaging and transportation, would involve unacceptable risk because of the variety and unpredictable explosive hazards associated with energetic waste. These pretreatment operations would also result in greatly increased manipulation requirements for the energetic wastes, increasing the exposure time of people to explosives and therefore increasing the probability of an accidental injury or death incident.

STEP 3. IDENTIFICATION AND CATEGORIZATION OF ALTERNATIVE TECHNOLOGIES

Numerous sources were used to identify and obtain information about alternative technologies. Of special note are:

1. Evaluation of Alternative Technologies to Open Detonation for Treatment of Energetic Wastes at the Naval Air Weapons Station, China Lake, California, January 2004.
2. Status of Alternative Technologies to OB/OD Events, Naval Air Weapons Station, China Lake, California, July 2010.
3. Status of Alternative Technologies to OB/OD Events, Naval Air Weapons Station, China Lake, California, July 2012.
4. Status of Alternative Technologies to OB/OD Events, Naval Air Weapons Station, China Lake, California, July 2014.
5. OB/OD Alternatives Meeting. Joint Ordnance Commanders Group, Environmental Subgroup, February 2015
6. Review of International Technologies for Destruction of Recovered Chemical Warfare Materiel, National Academy of Sciences. 2006.
7. Human Health and Ecological Risk Assessment Report for the Open Burn/Open Detonation Unit, Naval Surface Warfare Center Dahlgren, April 2005.
8. Review and Evaluation of Alternative Technologies for Demilitarization of Assembled Chemical Weapons, National Academy of Sciences, 1999.
9. CDC (Centers for Disease Control and Prevention). 2006. M55 Rocket Fire/Explosion Concerns, March 1. Aberdeen Proving Ground, Md.: U.S. Army Chemical Materials Agency.
10. Investigation Report: Donaldson Enterprises Inc., Fireworks Disposal Explosion and Fire, US Chemical Safety and Hazard Investigation Board, April 8, 2011.
11. Pollutant Emission Factors for a Transportable Detonation System for Destroying UXO. UXO Countermine Forum, New Orleans, LA 2001.
12. Disposal Options for the Rocket Motors from Nerve Agent Rockets Stored at Blue Grass Army Depot, National Academies Press. 2012.
13. Santoleri, J.J., Theodore, L. and Reynolds, J. 2000. Introduction of Hazardous Waste Incineration, 2nd Edition. Wiley-Interscience, New York.
14. Human Health and Ecological Risk Assessment – Subpart X Permit Application, Milan Army Ammunition Plant, November 2011

The technologies identified as potential alternatives to OB and OD are grouped into two categories: destruction technologies, and recovery and reuse technologies. In addition, pretreatment technologies that facilitate either the removal of energetic material from the casing or the disassembly of munitions are listed (Figure 3). Table 3 is a comprehensive list of the technologies identified by category, with a brief description of each. All identified technologies are included in Table 3, regardless of their level of maturity or their applicability to MLAAP's energetic waste stream.

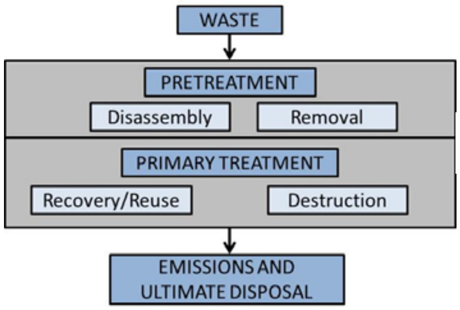

Figure 3. Technology Categories

Table 3.
Identified Technologies With Description Summaries.

Technology	Description
Pretreatment: Disassembly	
Flexible Workcell/Robotic Disassembly	Robotics unpack, handle, repack, and help in the disassembly process.
Laser Cutting of Munitions	Ultra-short laser pulses ablate the energetic as an alternative to conventional explosive machining.
Pretreatment: Removal Technologies	
Washout, High-Pressure Waterjet	A high-pressure washout nozzle directs streams of water against the energetic. The energetic is eroded, removed and collected.
Washout, Steam	Steam removes TNT-based explosives
Washout, Carbon Dioxide	A carbon dioxide pellet blaster removes press-loaded explosives
Washout, Liquid Nitrogen	High-pressure liquid nitrogen erodes and thermally spalls propellant from a rotating rocket motor.
Meltout, Microwave	Microwaves melt out TNT-based explosives.
Dry Machining	Energetics are removed from their casings by machining.
Cryofracturing, Cryocycling	Liquid nitrogen freezes energetics or munitions and then fractures them for size reduction or to disassemble small cased munitions.
Ultrasonic Removal	Focused ultrasonic energy fragments the cast-loaded energetics and enables removal. Recovery/reuse would follow.

Primary Treatment: Destructive Technologies	
Open Burn	Described in permit (Most of which is similar to "Contained Burn #2" without treatment of combustion gases.)
Open Detonation	Described in permit
Contained Detonation	Energetics are detonated in a steel chamber, constructed to dampen the blast. After-burning reactions are suppressed to protect the integrity of the chamber. Particulates are filtered from the detonation gases.
Contained Burn #1, Solid Rocket Motors	Rocket motors are burned in a confined chamber. The combustion gases are contained, treated, and released.
Contained Burn #2, Confined Burn Facility	Energetic wastes are burned in a blast-reinforced chamber. The combustion gases are contained, treated, and released.
Incineration, Rotary Kiln	Enclosed incineration. Rotary kiln slowly moves waste from one end to the other. Waste detonates or combusts. Emissions are treated. Uniform waste streams are treated most efficiently. Small explosive items (< 40 grams energetics) with casings are acceptable in some units.
Incineration, Plasma Arc	Molten slag (soil with iron fluxing agent) destroys organic compounds and traps inorganic compounds. Emissions are treated. Enclosed alternative to incineration.
Incineration, Fluidized Bed	Waste is injected into a turbulent bed of hot sand, created by forced air. Emissions are treated. Limited to liquids, slurries and powders with low organic content. Enclosed incinerator.
Oxidation, Base Hydrolysis	Waste is heated to mild temperatures (90 to 150^{0}C) and usually elevated pressures (200 psig) with a strong base (pH >12). Energetic waste is converted to water-soluble, non-energetic products. Resulting solution is still hazardous and must be treated.
Oxidation, Supercritical Water (Hydrothermal Oxidation)	Organic waste, water, and an oxidant (e.g., air or oxygen are subjected to high temperature and pressure (>374^{0}C, >3,000 psig). Organics are decomposed. Very severe operating requirements and usually reserved for the more difficult to treat wastes
Oxidation, Molten Salt	Air and water are injected into a molten salt bed. The product gases are forced to pass through the molten salt before exiting, which results in good retention of metals and acidic gases. Operating temperatures are typically from 850 to 1,000^{0}C.
Oxidation, Electrochemical	An electrochemical cell is used to destroy organic waste. Organic liquids are oxidized either directly by metal ions, or

	by other oxidizing compounds produced from reaction involving the metal ions. This technology is being considered for primary explosives such as azides and styphnates, but has not been developed for this application yet.
Oxidation, Wet Air	Aqueous phase oxidation is used to treat organic and inorganic wastes at elevated temperatures (150 to 320^{o}C) and pressures (300 to 3,000 psig). Similar to supercritical water oxidation (SCWO), but with slightly lower temperatures and pressures. Limited to slurries and liquids.
Oxidation, Peroxydisulfate	An aqueous process that uses sodium or ammonium-peroxydisulfate to destroy organic liquids or solids.
Oxidation, Adams Sulfur	Organic wastes are reacted in an atmosphere of elemental sulfur vapor at low temperatures. Products are carbon-sulfur residue, hydrogen sulfide gas, and sulfides. Emission must be treated.
Molten Metal	A molten metal medium destroys energetic wastes.
Hypergolic Non-Detonative Neutralization	Bulk energetic wastes are reacted with a hypergolic chemical (the combination would instantly ignite), which neutralizes the energetic waste in a controlled exothermic reaction.
Charged Particle Beam	Energetic electron beams detect and detonate high explosives. Applicable for clearance of unexploded ordnance from military ranges.
Primary Treatment: Recovery and Reuse	
Liquid Ammonia Extraction	Propellant and explosive fuel and oxidizer ingredients are extracted, separated, and recovered using liquid ammonia.
Reuse Solid Propellant for Commercial Mining/Quarry Applications	Reformulation of reclaimed explosives and propellants into commercial blasting explosives for use in mining application.
Commercial Resale	Sale of obsolete U.S. munitions
Commercial Conversion	Chemical conversion of recovered explosives and propellants to form other products
Co-Firing in Boilers	Energetics are desensitized so that they can be co-fired with traditional fuels in commercial boilers for heat.
Actodemil Oxidation	Explosive waste slurry or granular solids are fed into the unit. Oxidation occurs at moderate temperatures (70°C to 90°C) and atmospheric pressure with a potassium hydroxide/humic acid reagent over a period of two to four hours. After hydrolysis, the waste stream is neutralized using hydrogen peroxide. (Actodemil is a patented process of Arctech Inc. based in Chantilly, Virginia.)

STEP 4. TECHNOLOGY SCREENS

Two initial screening criteria were applied to the identified technologies: 1) basic applicability of the technology to MLAAP's waste stream, and 2) maturity of the technology.

Basic Applicability Screen

Most of the alternatives to OB and OD identified are being developed to treat the growing stockpile of homogenous unusable munitions at production or demilitarization facilities. As a result, technology development is focused on treating a large volume of homogenous munitions. MLAAP is not a typical demilitarization facility that handles large volumes of homogenous wastes nor an active ammunition plant with low variety of products and wastes. The energetic waste stream at MLAAP is variable and is currently being generated by wastes coming out of the storage area as determined by the DoD Designated Disposition Authority (DDA). If MLAAP was active and generating a high volume of specific wastes, then specific demil capabilities could be emphasized to a greater extent.

Disassembly

Manual disassembly of the compromised munitions of MLAAP's waste stream poses an unacceptable risk to the workforce. Disassembly technologies typically involve assembly line operations, with preprogrammed machinery that can repeat the same task for multiple iterations. Programmable assembly line operations work well for large quantities of homogenous items which are in good to near pristine condition.

The energetic waste stream at MLAAP currently exhibits a complete lack of uniformity regarding geometry, explosive type, fuzing cavity spaces, degree of corrosion/degradation and country of origin. Items are frequently misshapen from environmental stressors such as heat, cold, humidity, age or other safety and stress tests. Thus, reprogramming would be impractical if not impossible to adjust for the unique configurations of each item. MLAAP is unaware of assembly line systems for disassembling compromised munitions from conventional weapons.

Additionally, Sandia National Labs is attempting to create a prototype system at McAlester Army Ammunition Plant in Oklahoma to disassemble 40mm fixed round munitions. Testing has found that although the munitions were thought to be identical, nose closure threads on the pitch of the projectile varied resulting in the inability of the disassembly machines to unscrew the nose closures. Thus even small differences in the configuration of unstressed munitions prove to be challenging to automated disassembly processes.

It is important to note that the explosive contaminated waste stream composed of MPPEH is completely non-homogenous.

Removal

Technologies in the "removal" category are considered ancillary treatments. These technologies must be coupled with a primary treatment technology as a pretreatment of the wastes. Removal technologies are applicable to a wide variety of munitions and munitions components with minor changes to the procedure. Washout by water jet, steam, carbon dioxide, or liquid nitrogen can be done to different munitions by changes to cutting nozzles, pressures and locations of the cuts. However, these technologies increase risks to ordnance workers since the munitions are unstable or misshapen after testing. Each individual item would have to be assessed on a case-by-case basis to determine, if possible, where to make efficient cuts and how much pressure is required to safely cut open the munition without causing a reaction. The additional handling and exposure required for each munition item poses unacceptable risks to the workforce. The other disadvantage to abrasive water jet cutting is that an additional waste stream is created because the water used in the cutting becomes contaminated with explosives, metal particles, and grit.

Likewise, dry machining evokes serious safety concerns. Dry machining involves the mechanical shearing, sawing or punching of test items to remove fuzes or detonators or to expose explosive fillers. Explosive hazards and safety concerns of an ordnance worker mutilating unstable munitions are the obvious risks. In addition, most of the equipment developed for this application is utilized for a specific munition or specific family of munitions and would not be appropriate for the diverse and evolving waste stream of MLAAP.

Microwave meltout involves a process that melts and erodes the explosive. Through unique fixturing, the condensate/explosive mixture is collected and processed by separating/melt kettles and the explosive cast into bricks or flaked. Insensitive munitions composed of polymer bonded explosives present a particularly difficult challenge because they cannot be removed from the munition by autoclave techniques.This method produces large quantities of pink water that would add a hazardous waste stream and require treatment prior to discharge. Additionally microwave meltout is labor intensive and hazardous to the health of operators.

Cryofracture involves the cooling of the munitions in a liquid nitrogen bath, followed by fracture of the embrittled item(s) in a hydraulic press and the subsequent thermal treatment of the fractured munition debris in order to destroy the explosives and decontaminate any residual metal parts (which may be recovered for scrap value). Cryofracture itself is not an alternative to OB/OD, but is a component of a larger process to destroy munitions items which are then treated to neutralize or drive off the energetic hazard. Cryofracture has been implemented at large demilitarization facilities such as Fort McAlester, Oklahoma. This technology requires a large infrastructure investment. Cryofracture has been demonstrated for industrial-scale, and very specific, applications. Cryofracture has not been demonstrated or tested on heterogeneous, small-scale waste streams resembling what MLAAP generates; furthermore, there are additional, safety concerns regarding the unintentional detonation of these munitions as they are crushed, if the liquid nitrogen has not completely inundated the explosive materials. This problem is significantly magnified when attempting to treat non-homogenous items that have undergone destructive testing, environmental stressors, and/or are experimental explosives developed through various R&D initiatives.

Recycle and Reuse

Propellant or explosive removal is the first step in implementing recycle and reuse processes for solid rocket motors and munitions. Subsequent steps include size reduction and preparation of the material for recycle and reuse. Once it is suitably prepared, the processed propellants and explosives can be introduced into the feed streams of the commercial explosives industry for direct reuse. Alternatively, the high value constituents of these materials can be chemically extracted for reuse.

Once the energetics have been recovered, they may be used as a supplemental fuel in boilers (co-firing) to provide energy or converted into other commercial products for resale such as explosives used in mining. Quarry and mining explosives are generally "ANFO like" materials (ammonium nitrate and fuel oil) and the use of a nonconventional blast explosive (e.g., an explosive removed from a waste munition) would need to be approved by the state's Fire Marshal. Approval is only given in cases where there is a continuous source of a material, the product is ensured to be safe for the environment and there are industries willing to use the product. MLAAP does not process enough material for commercial interests. Thus such a program for commercial recovery is not viable.

Some technologies (liquid ammonia extraction and Actodemil oxidation) use explosives that have been removed from disassembled munitions as a feedstock for the production of propellants or, after neutralization, use as a fertilizer. Documented cases of fires that occurred during the cutting of rocket motors (Ref 9) and the removal of black powder from fireworks (Ref 10) have proven that the sensitivity of the explosives is often a significant safety issue for munition items that must undergo disassembly prior to any type of treatment. Due to these safety concerns, the technologies which require disassembly or removal of the energetic prior to treatment are not appropriate for the MLAAP waste stream.

Maturity Screen

The alternative technologies listed in Table 3 are at varying stages of development – ranging from conceptual ideas to commercially available. Technologies in very early stages of development, including those that are in the conceptual idea, feasibility study, or bench-scale stage, have been eliminated from the current evaluation because their degree of success and the potential for implementation cannot be reasonably predicted. Additionally, unproven or immature technologies pose unacceptable safety risks. If any of the technologies eliminated exhibit promising results for development, they can be evaluated in the future.

<u>Unproven or immature technologies</u>

Electrochemical Oxidation

An electrochemical cell is used to destroy organic waste. Organic liquids are oxidized either directly by metal ions or by other oxidizing compounds produced from a reaction involving the metal ions. This process has been proposed as a possible alternative for treating chemical warfare agents but is not applicable to metal parts, energetics, or dunnage. A substantial research and development program for the application of this technology to energetic compounds would be required. No lab-scale or pilot plant demonstration data have been published or are available for evaluating applicability of this technology to the MLAAP waste stream. The application of this technology on MLAAP's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Wet Air Oxidation
Organic materials in a dilute aqueous mixture are oxidized at elevated temperatures and pressures, detoxifying and converting residual organics to carbon dioxide. Despite long residence times, refractory organic compounds remain. Application of this process to the treatment of energetics will require additional research and pilot plant studies. The application of this technology on MLAAP's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Peroxydisulfate Oxidation
Peroxydisulfate salts can be used to oxidize organic compounds to CO_2. This technology has been proposed as a potential treatment method for wastes generated during chemical agent detoxification. However, this process has not been shown to be applicable to contaminated metal parts or energetics and is not considered appropriate for the MLAAP's waste stream. The application of this technology on MLAAP's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Adams Sulfur Oxidation
This process used a patented method that relies on the reactivity of elemental sulfur vapor to destroy organic materials at temperatures of 500 to 600 °C. Liquid (chemical) agent and sulfur vapor are fed to a reactor that is maintained at a constant temperature. The gas leaving the reactor contains nitrogen and unreacted sulfur vapor along with products of the reaction such as carbon disulfide, hydrogen sulfide, carbonyl sulfide, disulfur dichloride, thiophosgene, and hydrochloric acid. The application of this technology on MLAAP's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Molten Metal
Metals such as copper, iron, or cobalt are used at high temperatures (3,000°F) to thermally decompose organic compounds such as chemical agents. Inorganics are dissolved to form a slag that is insoluble in the liquid metal and rises to the top of the vessel where it can be removed (skimmed off the top). Gasses from the furnace would be very dirty, containing soot from the metal pyrolysis and possible form slag particulate matter. A separate purifier unit would be needed to clean the gas before it is released. The molten metal furnace and catalytic extraction process are essentially developed technologies as they are very similar to those used in steel production. However, the use of these technologies in the destruction of munitions or propellants has not been

tested or evaluated. The application of this technology on MLAAP's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Hypergolic Non-Detonative Neutralization

Amine compounds are reacted with bulk TNT, RDX, and Comp B, leading to spontaneous burning of the explosive materials supposedly without detonation, deflagration, or uncontrolled cook-off. The high costs of degrading explosives by this method have discouraged further research and development of this technology. MLAAP is unaware of any pilot plant demonstration data that have been published or are available for evaluating applicability of this technology to the MLAAP waste stream. The application of this technology on MLAAP's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Charged Particle Beam

Energetically-charged (electron and proton) particle beams can penetrate significant distances into dense media and deposit significant fractions of their energy in the form of secondary electrons, gamma rays, x-rays, and neutrons. Such energy deposition can lead to heating, melting, material dispersal and thermal shock of energetic materials. It has been shown experimentally that under proper conditions both sensitive and insensitive high explosives can be detonated by electronic beams. However, the technology to efficiently deliver electron beams of sufficient energy and current in the field has not been demonstrated. Research is ongoing at Lawrence Livermore National Laboratory (NAWCWD TP 8559). No lab-scale or pilot plant demonstration data have been published or are available for evaluating applicability of this technology to the MLAAP waste stream. The application of this technology on MLAAP's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Base Hydrolysis Oxidation

Energetic wastes are mixed with a strong base and heated to 90-150°C, causing the waste to be decomposed into a water soluble product. Since all influent waste material must be separated from any non-energetic material, reduced in size so the energetic material can fit through a 1" x 1" mesh, and treated within a slurry, this technology is appropriate only for bulk high explosives and propellants. The base used for the reaction must be periodically replaced and the resulting secondary waste, which is highly toxic and corrosive, must be subjected to additional treatment and disposed of in a secure landfill.

This technology requires the energetic material to be removed from munitions and, due to the safety concerns outlined above, would not be applicable to cased munitions. However, this technology may be applicable to bulk high explosives and bulk propellants. The processes require further testing and development to ensure explosives safety of hydrolysis reaction (NAWCWD TP 8559). No lab-scale or pilot plant demonstration data have been published or are available for evaluating applicability of this technology to the MLAAP waste stream. The application of this technology on MLAAP's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Molten Salt Oxidation

A bed of molten salt, usually sodium carbonate, oxidizes organic material at 900 – 1000°C. Volatile organic compounds in the waste feed material are broken up into their constituents; chlorine, sulfur, and phosphorous, are converted into inorganic salts and retained within the salt bed. Inorganic compounds and heavy metals sink into the melt and accumulate at the bottom where they remain in-situ. This accumulation allows for the possibility of recovering and recycling certain metals from the melt during melt disposal. This technology has not been fully developed for technology transition. The units were tested on small scale and met with explosives safety concerns with product limitations in waste preparation for treatment, reactive residue formation and runaway reactions and environmental concerns with the volumes of hazardous waste generated verses open burning an open detonation. Operational concerns include the need for expertise by users, a slow feed stream process, and significant handling of explosive waste prior to treatment. MLAAP is unaware of any applications of this technology on waste streams similar to MLAAP's. The application of this technology on MLAAP's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Supercritical Water Oxidation

The waste feed stream is mixed with an oxidant (air, oxygen, or hydrogen peroxide) in water at pressures and temperatures above the critical points (374°C and 22.13MPa). At this point, the property of water as a polar solvent is diminished and its solubility behavior is reversed allowing for a single-phase reaction between an aqueous waste material and a dissolved oxidizer. The reactions are enclosed within a pressure vessel maintained at 400-650°C and occur relatively quickly from only a few seconds to several minutes. This technology is still very much in the early stages of development and bench-scale reactors must be lined with gold to prevent corrosion. Solid feed waste must be pre-treated by either dissolving or atomizing into a water solution mixed with an oxidizer such as hydrogen peroxide. Salts within influent waste will precipitate within the oxidation reactor. The unit requires an off-gas treatment facility. Most supercritical fluid technology has been confined to the laboratory since it is expensive and usable only on a small scale. MLAAP is unaware of any applications of this technology on waste streams similar to MLAAP's. The application of this technology on MLAAP's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Fluidized Bed Incineration

A fluid bed is a dense, uniform suspension of solids (usually sand) maintained in a turbulent motion by upward moving air, behaving as a fluid. When fluidized, all particles are suspended and fully exposed to the gas stream, increasing the surface area available for reaction. Combustible solids are dispersed rapidly and are held for a long enough time to achieve high combustion efficiencies.

Influent solid waste requires significant size reduction (shredding) and the removal of alkali metals. Solid waste feed particles in a bubbling fluidized bed combustor and a rotating fluidized bed combustor must be <10mm and <30mm respectively. Off-gases can be treated; however, effluent products can contain high amounts of mercury salts. The process requires a long start-up time to bring the bed to the required temperature and the bed material must be regularly replenished. This technology requires pretreatment processes which may cause accidental detonation of the feed stream, introducing safety hazards and risks to personnel or equipment. MLAAP is unaware of any applications of this technology on waste streams similar to MLAAP's. The application of this technology on MLAAP's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Plasma Arc Incineration

Electric current heats gasses to 5,000 – 15,000°C, dissociating waste into atomic elements which can re-combine into environmentally safe products. This concept has been proven for municipal waste where organic waste is heated and converted into a gas which is fed into a plasma arc for refining to be used for electricity generation. Remaining solid waste is fed into another plasma arc to be melted and cooled into an inert slag. This process has the potential to create volatile metals which must be sent to appropriate air scrubbers for off-gas treatment.

There were two plasma arc units tested by the Army, one at Hawthorne Army Depot and one at NSWC Crane. The Hawthorne unit was called the Plasma Ordnance Demilitarization System (PODS). MSE Technology Applications, Incorporated designed and constructed the PODS for Hawthorne Army Depot to treat small caliber, and hand-emplaced pyrotechnics, smokes, and flares, canisters removed from 155mm projectiles, and munition components containing small quantities of high explosives. The system at Hawthorne was unsuccessful and is currently inactive. NSWC Crane tested a Mobile Plasma Treatment System (MPTS). The MPTS was a smaller system that was designed to be moved from installation to installation. The MPTS was never proven out, nor was it ever used for production demilitarization operations. The MPTS at Crane has been dismantled. The application of this technology on MLAAP's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Ultrasonic Fragmentation and Laser Cutting

Ultrasonic fragmentation and laser cutting are immature and unproven technologies and will not be explored further.

Table 4. Summary of the Results of the Applicability and Maturity Screens.

Technology	Determination
Pretreatment: Disassembly	
Flexible Workcell/Robotic Disassembly	Not appropriate for MLAAP
Laser Cutting of Munitions	Not appropriate for MLAAP; immature technology
Pretreatment: Removal Technologies	
Washout, High-Pressure Waterjet	Not appropriate for MLAAP
Washout, Steam	Not appropriate for MLAAP
Washout, Carbon Dioxide	Not appropriate for MLAAP
Washout, Liquid Nitrogen	Not appropriate for MLAAP
Meltout, Microwave	Not appropriate for MLAAP
Dry Machining	Not appropriate for MLAAP
Cryofracturing, Cryocycling	Not appropriate for MLAAP
Ultrasonic Removal	Not appropriate for MLAAP; immature technology
Primary Treatment: Recovery and Reuse	
Liquid Ammonia Extraction	Not appropriate for MLAAP
Reuse Solid Propellant for Commercial	Not appropriate for MLAAP
Commercial Resale	Not appropriate for MLAAP
Commercial Conversion	Not appropriate for MLAAP
Co-Firing in Boilers	Not appropriate for MLAAP
Actodemil Oxidation	Not appropriate for MLAAP; immature technology
Primary Treatment: Destructive Technologies	
Oxidation, Electrochemical	Immature technology
Oxidation, Wet Air	Immature technology
Oxidation, Peroxydisulfate	Immature technology
Oxidation, Adams Sulfur	Immature technology
Molten Metal	Immature technology
Hypergolic Non-Detonative Neutralization	Immature technology
Charged Particle Beam	Immature technology
Oxidation, Base Hydrolysis	Immature technology
Oxidation, Molten Salt	Immature technology
Oxidation, Supercritical Water	Immature technology
Incineration, Fluidized Bed	Immature technology
Incineration, Plasma Arc	Immature technology
Contained Detonation	Candidate for evaluation
Contained Burn #2, Confined Burn Facility	Candidate for evaluation
Incineration, Rotary Kiln	Candidate for evaluation

STEP 5. REVIEW OF REMAINING ALTERNATIVE TECHNOLOGIES

This section provides information on current OB/OD operations followed by the technologies listed in Table 4 that were found to be suitable candidates for further evaluation. The intent of these descriptions is to provide an overview of the technology, its developmental status, and a general understanding of how the technology fits into the treatment of energetic wastes. Detailed qualitative and quantitative data are typically not provided because consistent data do not exist for the technologies. Available data vary significantly with the composition of the waste feed streams, throughput, operating conditions, and the use of scrubbing and filtration systems. Inclusion of these inconsistent data could mislead the reader into assuming that a qualitative and quantitative comparison of technologies exists, when in fact it does not. An in-depth analysis, evaluation, and comparison of existing data for specific technologies would be required before a final decision to implement an alternative technology.

Each technology description consists of the following outline:

Summary: Describes how the technology works

Current status: Describes current reported status of development or implementation of the technology

Applicability to MLAAP energetic wastes: Provides analysis of waste that could theoretically be treated by the technology if all considerations of mission impacts, space, costs, etc. could be successfully mitigated.

Impact to MLAAP's mission: Describes the considerations of locating another explosive operation or facility at the MLAAP.

Environmental Releases: Describes environmental emissions and secondary waste streams.

Safety: Describes the safety risks posed to the MLAAP workforce.

OPEN DETONATION AND OPEN BURNING

Summary: The methods for conducting OB and OD are described in depth within the MLAAP RCRA permit. Treatment at the OB unit takes place in elevated burn pans. Treatment at the OD unit occurs both aboveground and in subsurface configurations. Subsurface thermal treatment is for bulk military high explosives, completed medium to large caliber military ammunition, and munitions components. Aboveground thermal treatment associated with the OD Unit is for treatment of machine-damaged, dropped, and other dangerous rounds. Aboveground OD is only used on munitions items that are too dangerous to manage via standard subsurface treatment.

Current status: OB and OD are mature technologies and are the current methods of treatment for MLAAP energetic wastes at MLAAP.

Applicability to MLAAP energetic wastes: 100% of MLAAP's energetic waste stream is currently treated using OB and OD. The MLAAP OB and OD sites are located at strategic safe distances from the general pubic, other mission essential explosive storage igloos, and inhabited areas on MLAAP.

Impact to MLAAP's mission: The area is already secured with qualified, experienced and certified personnel on-hand so the handling, movement and overall exposure to explosive hazards are minimized to the greatest degree possible.

Environmental Releases: Environmental releases from MLAAP's OB/OD activities were evaluated in the 2011 Human Health and Ecological Risk Assessment (HHERA) Report for the Subpart X Application, Milan Army Ammunition Plant (Ref. 14). For the dispersion modeling of OB/OD ordnance, the USEPA model, OB/OD Dispersion Model (OBODM) was used as recommended by the TDEC and USEPA Region 4. This model was developed by the U.S. Army for use in evaluating the potential air quality and depositional impacts of the OB/OD of obsolete munitions and solid propellants.

OBODM contains emission factors for approximately 40 different classes of ordnances. The list of contaminants used at MLAAP for identification as contaminants of potential concern (COPC) and evaluated in the human health and ecological risk assessment is provided in Appendix C. At MLAAP, 13 of the OBODM classes were used reflective of a typical disposal inventory. In order to accurately depict a worse-case hourly quantity to use in the modeling for MLAAP, the maximum amount was derived for each disposal type.

For OB, a total of 11 burn pans can be used in an hour: nine pans with a maximum capacity of 333.33 pounds each and two pans with a maximum capacity of 500 pounds each. Due to safety reasons, the burn pans are not typically filled to capacity; therefore, in the modeling, a burn amount of 300 pounds was used for each of the nine burn pans and 500 pounds was used for the remaining two pans. The resulting maximum amount burned per hour 3,700 pounds. The lesser of the maximum per hour and the annual inventory quantity was used in the modeling.

In total, 380 individual OBODM model runs were made to reflect all combinations of ordnance, chemical, receptor grid, concentration, and deposition modeling.

For the human health risk assessment, risk screening was conservative and was performed in accordance with the Risk Assessment Guidance for Superfund (RAGS). Specific characterization was not warranted because no air or soil contaminants of potential concern (COPCs) were identified.

The ecological risk assessment summary indicated that ecological threats are almost, or entirely, absent and therefore no further work is warranted based on ecological risk and the estimated concentrations used to develop the screening level ecological risk calculations in this SLERA (USEPA, 1997).

Generally, OB/OD generates air emissions and, on rare occasions, OB generates ash that must be managed as a potentially hazardous secondary waste stream. Metal fragments are recovered certified and verified to be free of explosive materials, and recycled.

Emissions from the OB/OD of a wide variety of energetic materials and ordnance items have been measured using various air sampling systems such as the BangBox, the Nevada Test Site X-Tunnel, the Hypervelocity Lab Chamber, the Fixed-Wing Aircraft mounted sampler, an airborne "Flyer", a raised scissor-lift equipped with air emissions sampling devices, and Micro-Pulse LIDAR. Although not every test used the same sampling methods and/or included the complete list of target analytes, the combined test results account for all constituent types (e.g., gases, metals, particulates) and can be considered representative of OB/OD emissions at MLAAP. The sampling equipment and analytical methods used during the various testing programs are listed in Appendix B.

The initial detonation products are: carbon (C) (soot), carbon monoxide (CO), hydrogen (H_2), methane (CH_4), ethane (C_2H_6), formaldehyde, nitrogen (N), carbon dioxide (CO_2), water vapor (H_2O), small hydrocarbons and small CxHy fragments. The initial stage of the typical detonation process is over in less than 10 microseconds and is followed by a 2 to 5 second duration fireball (after burn). In this second stage of the process, combustible detonation reaction products (e.g., CO, CH_4, C_2H_6, formaldehyde, H_2 and the CxHy fragments) are spontaneously oxidized (combusted) to CO_2 and H_2O.

Test data have shown that unconfined detonations, lightly-confined detonations, and burns yield similar emission products but the mix of products is different. The emission products from the energetic materials are carbon dioxide, water, and nitrogen, along with small quantities of NOx and light hydrocarbons. Consistent with detonation theory, test data have also shown that molecules larger than the starting molecules are not formed, even when the detonation is partially confined. Emission products from most energetic materials destroyed by OB and OD processes are adequately represented by carbon dioxide, carbon monoxide, nitrogen oxide, nitrogen dioxide, total saturated hydrocarbons (ethane, propane, and butane), acetylene, ethylene, propene, benzene, toluene, and particulate. Compared to an unconfined detonation of the same material, detonating an energetic material under a soil cover (buried detonation) or other conditions which inhibit the formation of a fireball will cause a decrease in CO_2 and an increase in soot (free carbon), carbon monoxide, light saturated hydrocarbons, acetylene, ethylene, propene, benzene, and toluene.

Emission data generated from these tests represent emissions from uncontained treatment of explosives and are often used to conduct risk assessments to evaluate releases from the OB/OD units. Emission factors based on these tests have been published, typically on a pound of compound per pound of net explosive weight (NEW) basis, and can be used to predict the types and quantities of pollutants released during open burning.

Safety: The MLAAP has in place standard operating procedures (SOPS) for OB and OD activities in an effort to mitigate risks/hazards to acceptable levels to prevent a mishap from occurring. See Step 2 of this report.

CONTAINED DETONATION

Summary: Contained detonation of munitions can be performed in detonation chambers. Usually the munition to be destroyed is bundled with donor charges and carried by hand into a detonation chamber where it is placed in a preconfigured location and arranged for detonation. The detonation is initiated with electric blasting caps. The chamber is designed to withstand the detonation pressure and fragmentation. Expanding gasses are vented and cooled within an expansion tank before being filtered through an air pollution control unit for discharge to the atmosphere. Airborne particulates are collected on filters in the final stage. Filters create a secondary waste stream and must be removed as hazardous wastes. The systems can be transportable or fixed.

Emissions generated during the detonation are vented to an expansion chamber to reduce pressure and then to a baghouse system to filter out particulates. The remaining emissions are vented to the air. Noise, overpressure, particulates, and thermal and debris hazards are significantly reduced. The water used to prepare the munition quenches the after-burning, which leads to an increase in products of incomplete combustion that may not be captured by the particulate filters.

Current status: This technology has been used by some DoD organizations. For example, NSWC Crane procured a D-200 model contained detonation chamber (CDC) over 10 years ago (2004). Crane conducted a stress test on the chamber prior to conducting treatment but, due to failures of the door and walls, the CDC has never been used for treatment at Crane. The structure is currently being utilized as an explosive staging site to support demolition operations as well has a holding cell for the temporary storage of material potentially presenting an explosive hazard (MPPEH).

MLAAP has had two Donovan Blast Chamber (DBC's) that were RCRA constructed in 1997 and used in 1997-98. They were RCRA closed in 2008. The DBC's were specifically constructed to treat M42/M46 grenades downloaded from the 155MM DDICM round. Each DBC was 12 feet by 16 feet by 18 feet, totally enclosed, and constructed of approximately two feet thick steel walls that are filled with sand. Each had a front entrance hydraulic door, a hydraulic exhaust door in the rear and a venting system for overpressure control. The overpressure was directed from each chamber through a venting system to expansion chambers. The expansion chambers were fabricated from low carbon steel. Each expansion chamber was approximately ten feet in diameter and twenty-five feet long.

The chambers were large enough to accommodate munitions of different types. The blast chambers were located inside a metal fabricated building. Each chamber contained an eleven thousand pound, open top, fragmentation containment unit (FCU) that was partially filled with gravel.

An explosive munition was placed in the FCU with an appropriate explosive donor charge. A detonator was inserted into the energetic material. The hydraulic doors were sealed shut and the detonator was connected to a firing unit outside the chamber. The chamber was at ambient pressure and temperature before and after the detonation. A large voltage was delivered from the firing unit to the detonator. Upon detonation the overpressure was directed from the chamber through a venting system to a partitioned cylinder expansion chamber approximately ten feet in height by sixty feet in length. The expansion chamber was partitioned to ten feet in height by thirty feet in length for each blast chamber with an approximate inside area greater than 2,350 square feet per partition. From the expansion chamber, the decomposition gases and particulate were vented to an air pollution control unit (APCU). Each APCU was a Torit filter cartridge system dust collector, Downflo II Model No. DTF3-36. Collected contaminants were deposited into 55 gallon drums. Both APCU stacks were tested by Ramcon Environmental Corporation, Memphis TN October 20-22, 1998 for particulate, multi-metals, chlorine, explosives and nitrogen oxide.

Provided below are typical restrictions for use of a contained detonation:

a) The unit would not be used for propellants which are generally considered inappropriate for detonation because donor charges required to detonate them exceed the weight of the waste propellant, often by a ratio of 3:1. Excessive amounts of donor charges would be counter to the waste minimization goals of RCRA. Propellant by definition, produced large amounts of gas that would overwhelm the capacity of the DBC expansion chamber. Gun propellants are most efficiently treated in a burn pan;
b) Except when small items could readily be formed into a bundle, the unit would not be able to treat items less than 0.5 lbs. NEW (which require more donor charge than waste). Multiple manipulation to configure the bundle would be a safety hazard.

c) The unit would not be able to treat explosive contaminated equipment because of differing geometries, sizes or range residue since these items have unknown quantities (NEW) of energetic contamination and require a large donor charge to ensure that the suspect residue is completely eliminated in the OD reaction.
d) Munitions that are large in size or contain a large amount of energetic material must be reduced in size and/or net explosive weight before loading into blast chamber.
e) The munitions must also be stable enough for loading into the CDC. Explosive waste generated at MLAAP may not safely be cut or dismantled due to the need to minimize handling.
f) Munitions with a significant amount of casing metal would fragment during detonation and accelerate wear and tear on replaceable armor plates that are suspended on the inside of the chamber.

Applicability to MLAAP energetic wastes:

The upper explosive limit for one blast chamber was 25 pounds NEW, including donor charges. The total explosive involved in one treatment operation for a “stack” of grenades was approximately 9.7 pounds per shot. 2.8 pounds NEW initiator was used per shot, leaving 6.9 pounds NEW waste treated. The production rate objective was 110 shots per day for a total of 759 pounds NEW treated per day.

The treatment log for open burn and open detonation at MLAAP’s permitted treatment units was analyzed for year 2016 to determine items that would have been appropriate for treatment in a CDC. Specifications for the non-operations DBC at MLAAP were used for this analysis.

The MLAAP CDC had an explosive limit of 25 pounds net explosive weight (NEW) including donor charges. The MLAAP treatment log was filtered to eliminate the following sets of items:

- NEW greater than 20 +/-5 lbs.—with donor charge these items would exceed the explosive capacity of the CDC;
- Propellants—these items are generally considered inappropriate for detonation because donor charges required to detonate them will exceed the weight of the waste propellant. They are most efficiently treated in a burn pan;
- Small items less than 0.5 lb. NEW—require more donor charge than waste, therefore these items are more efficiently treated by other methods;

Applying exclusion filters to individual items rather than sets and allowing for smaller items to be bundled for detonation were not considered here as these adjustments would impose more hazards on the explosive workers due to more priming operations, and increase the risk of incomplete detonation and hazardous recovery of live small items from pea gravel and corners and crevices within the chamber.

Impact of a Permanently Sited Confined Detonation Chamber to MLAAP's mission: Operation of a permanent DBC has occurred at MLAAP. If the DBC was repaired, permitted, and placed back into service, the facility would take several years to add to the RCRA permit and CAA permit. Additionally the DBC would have to be tested and proven out for specific energetic items. Another complicating design factor is the lack of homogeneity of existing materials that could potentially be considered for disposal. The portion of the MLAAP CY2016 waste stream suitable for treatment in the detonation chamber would only be items that were suitable for detonation and not open burning.

Environmental Releases: Contained detonation chambers have the potential to reduce the emissions of metals and particulates (Ref. 11). Long-term chamber stability necessary for continuous use as RCRA permitted hazardous waste treatment unit has not been confirmed.

Secondary waste streams include the filters and wastes from cleaning the inside of the detonation chamber or exhaust handling components.

Safety: Significantly more handling would be required to treat MLAAP's waste stream if contained detonation was adopted. Increased handling and safety risks include factors such as:

- The limited capacity of contained detonation chambers requires multiple trips to the chamber from the magazine where items are stored and the magazine where donor charge is stored vs. one trip to each magazine for OB/OD. This inherently increases risk to all involved, plus the public, when items for treatment come from storage igloos.
- When considering operating a permanent or portable detonation chamber, existing technologies (e.g. Donovan Chamber) do not have the explosive capacity to meet or match the current 500 lb. limit at the MLAAP OD site. The maximum NEW that existing detonation chambers are able to safely handle at one time is 25 lbs. NEW. This is only 5% of the current limit for OD at MLAAP. The small capacity of a detonation chamber would require multiple detonation chamber operations to match a single OD explosive operation. For example, if the grenades from ten (10) 155MM projectiles needed to be thermally treated in the Detonation Chamber, it would require ten separate detonations versus one at the current OD site. This translates to multiple explosive movements to the Detonation Chamber site, versus a single movement of all demolition materials to an OD site for a single demolition operation. It quickly becomes apparent that use of a detonation chamber poses an increased in risk to human health for MLAAP workers.
- The contained detonation chamber limits on net explosive weight would require that contained detonations be conducted in smaller batches than current OD practices. An increased number of operations would increase the number of entries and exits from explosive storage igloos, travel along public-use routes, and iterations for set-up, to include placement of detonators, initiators, squibs, blasting caps or other initiating devices. The placement of such detonators is inherently dangerous, significantly increasing the risk to human health and safety.

CONTAINED BURN #2, CONFINED BURN FACILITY

Summary: This technology involves burning waste propellants and small explosive munitions in a chamber. The chamber is designed to contain an unintentional detonation. Emissions are contained, treated using conventional pollution control equipment, and released to the environment.

Current status: A pilot-scale contained burn facility unit was attempted at Naval Surface Warfare Center Indian Head Division on a 10-pound scale; however, the oxygen supply design for complete combustion and gas temperature control were never completed. Since small munitions are likely to detonate rather than burn, the design of the contained burn system must consider the chamber damage that could occur from the fragmentation of metal casings and high burn temperatures required for the smokeless powders/propellants. Research, development, and on-site demonstration of a full-scale treatment unit have not yet been completed. A contained burn facility is being used at Camp Minden, LA to treat over 15 million pounds of M6 propellant and approximately 320,000 pounds of Clean Burning Igniter that will test the concept of full-scale treatment of uniform waste streams.

Applicability to MLAAP energetic wastes: When and if this technology becomes available, it may be appropriate for uncased propellants and small explosive munitions. Based on the CY2016 data for MLAAP, this technology would not be appropriate for MLAAP.

Impact to MLAAP's mission: Siting of a permanent facility would have negligible impact on MLAAP operations.

Environmental Emissions: Gaseous and particulate emissions from the combustion process are stored in a holding tank for later processing before release into the environment. Handling is minimized, but gas storage capacity can be a limiting factor (Ref. 12). Secondary hazardous waste streams include the filters and wastes from cleaning the inside of the chamber.

Safety: Increased handling and safety risks would be similar to those for the CDC.

ROTARY KILN INCINERATION

Summary: The waste is fed into the rotary kiln through either a continuous or positive feed system. The kiln rotates, slowly moving the waste from one end to the other. The waste detonates or combusts, becomes part of the flue gas that leaves the kiln, and goes to the secondary combustion chamber. From the secondary combustion chamber, the flue gas is quenched, then scrubbed and filtered through a bag house before it is discharged. Another type of rotary kiln is the "Deact" furnace, a modified Ammunition Peculiar Equipment (APE) Model 1236 furnace designed to handle grenades, fuzes, and cut up hardware from pyrotechnics, white phosphorous, riot control devices, colored smoke munitions, and small explosive items. The APE 1236 can also be used to deactivate bulk energetics, small arms, rocket motors and other munitions which can be cut into pieces shorter than 10 inches to allow them to pass through the feed chute. The M1 version of the APE-1236 has been upgraded with a state-of-the-art bag house, afterburner, modern control circuitry, fugitive emission control, and an automatic feed system. Disadvantages include high capital and operating costs, highly trained personnel to ensure proper operation, frequent replacement of the refractory lining if very abrasive or corrosive conditions exist in the kiln, and the generation of fine particulates (which become entrained in the exhaust gases) due to the cascading action of the burning (Ref. 13).

Current Status: This technology is considered to be mature for small arms ammunition, small munitions, and bulk energetics. It is capable of processing up to ~40 grams of confined explosives per item. Several Army bases operate rotary kiln incinerators for small munitions.

Figure 4. APE1236 Deactivation Furnace at Tooele Army Depot, Tooele, Utah

Applicability to MLAAP energetic wastes: Rotary kiln furnaces, such as the APE, are configured to specific munitions and configurations. The feedrate and other settings must be retooled for each munition type. This technology is appropriate for large volumes of homogeneous waste. Since none of MLAAP's waste stream is homogeneous or continuous, MLAAP's waste is not appropriate for a rotary kiln incinerator.

Impact to MLAAP's mission: Siting of a permanent facility would have negligible impact on MLAAP operations.

Environmental Emissions. Incinerator off-gas requires treatment by an air pollution-control system to remove particulates and neutralize and remove acid gases (HCl, NO_x, and SO_x). Baghouses, venturi scrubbers, and wet electrostatic precipitators remove particulates; packed-bed scrubbers and spray driers must be installed to remove acid gases. The furnace is equipped with conveyors and feed systems, and most are also equipped with air pollution control equipment to limit gaseous pollutant emissions by removing particulates and hazardous gaseous wastes such as HCl, NOx and SOx. Rotary kiln designs incorporate high-temperature seals between the stationary end plates and rotating section. The seals are inherently prone to leaks, which creates the potential to release unburned wastes. The kilns are almost always operated at a negative pressure to circumvent this problem; however, difficulties often still arise when batches of waste are fed semi-continuously. This phenomenon is known as "puffing" and poses a major problem if toxic or otherwise hazardous materials are being burned (Ref. 11). Few atmospheric filtration devices are capable of handling the extreme changes in pressure and flow rate that occur during a large detonation event (Ref. 10). Also, unstable and inconsistent waste stream increases chances of "puffing." Secondary waste streams would include fly ash and filters.

Safety: This technology requires pretreatment processes which may cause accidental detonation of the feed stream, introducing safety hazards and risks to personnel/equipment, and has therefore been dismissed from further evaluation by MLAAP since this technology is not appropriate for any portion of MLAAP's waste stream.

STEP 6. EVALUATION OF ALTERNATIVE TECHNOLOGIES.

OB and OD are currently the only treatment methods that can safely and effectively treat all of MLAAP's energetic waste. Of the reviewed alternatives, only the contained detonation chamber and a confined burn facility have the potential to treat any portion of MLAAP's energetic wastes.

Additionally, contained detonation chambers have a poor performance history, and contained burn technology is still being developed for broader applications. Rotary kiln incinerator technology is not appropriate for any portion of MLAAP's waste stream. A summary table of the evaluated technologies is provided in Table 5.

Table 5. Summary of Evaluated Technologies

Technology	Maturity	Environmental releases	Safety
OB	Mature	Contaminants of potential concern listed in Appendix C. Negligible human health and ecological risk.	Risk hazards mitigated
OD	Mature	Contaminants of potential concern listed in Appendix C. Negligible human health and ecological risk.	Risk hazards mitigated
Contained Detonation	Limited use within DoD; Useful for small regular waste streams. High maintenance costs.	Contaminants of potential concern are the same as for open detonation. Some particulate releases can be controlled by APC Equipment.	Increased safety and handling risks over OD
Contained Burn	This technology has been evaluated with respect to the types and quantities of explosive waste currently being treated by OB at NSWCDD. Useful for consistent high volume waste streams. High capital and maintenance costs.	Contaminants of potential concern are the same as for open burning. Some emissions can be controlled by APC Equipment.	Increased safety and handling risks over OB
Rotary Kiln Incinerator	Several Army bases operate rotary kiln incinerators for demilitarization. Not usable for large or irregular shaped items. High capital and maintenance costs.	Contaminants of potential concern are the same as for open burning or open detonation; Some emissions can be controlled by APC Equipment.	This technology requires pretreatment processes which may cause accidental detonation of the feed stream, introducing safety hazards and risks to personnel/equipment, and has therefore been dismissed from further evaluation.

CONCLUSION

None of the identified alternative technologies are suited to address MLAAP's energetic waste streams. OB and OD remain the safest, most flexible, simplest, and most effective method for treating MLAAP's energetic hazardous waste stream and that is approved by DDESB. Although contained detonation and contained burning units may be suitable for treating a small portion of the MLAAP waste stream, they are not suitable for highly variable waste streams. Neither contained detonation, contained burn units nor the rotary kiln incinerator are suitable for explosive contaminated waste that is variable in size and configurations.

FUTURE EFFORTS

Although this effort was unable to identify any feasible alternatives to the OB or OD of energetic wastes at MLAAP, technology development is far from stagnant. Alternatives to OB and OD are continuously being evaluated at the DoD level for applicability to the military's energetic waste streams. As appropriate alternatives are identified at the DoD level, MLAAP will evaluate each for applicability to the MLAAP explosive and explosive contaminated waste streams. The MLAAP energetic waste stream will continue to be monitored for changes to the energetic waste stream mix that could make alternatives more applicable.

APPENDIX A – Munitions Definitions & Terminology

I. Robust Munitions - For purposes of determining Sensitivity Group, Robust Munitions are those hazard Class/Division (C/D) 1.1 (mass detonating) and C/D 1.2 (fragment producing) military munitions that meet two of the following criteria:
1) Have a ratio of the explosive weight to empty case weight less than 1;
2) Have a nominal wall thickness of at least 0.4 inches;
3) Have a case thickness/NEW $^{1/3}$ > 0.05 inches/pound $^{1/3}$...... (NOTE: As depicted 1/3 represents the cubed root & "NEW" is the Net Explosive Weight)
-Examples of Robust Munitions include 20 mm, 25 mm, and 30 mm cartridges, General Purpose (GP) bombs, artillery projectiles, and penetrator warheads.
-For purposes of determining case fragment distances for intentional detonations, Robust Munitions are those that meet the definition above, or meet the definition of Fragmenting Military Munitions.

II. Fragmenting Military Munitions - These military munitions have cases that are designed to fragment (for example, naturally fragmenting warheads, continuous rod warheads, items with scored cases and military munitions that contain pre-formed fragments). See also Sensitivity Group.

III. Extremely Heavy Case Munitions - These military munitions are defined as having a cylindrical section case weight to explosive weight ratio greater than 9.
-Examples of Extremely Heavy Case Munitions are 16-inch Projectiles and most armor piercing (AP) projectiles. (The Fragmentation Data Base is located on the Department of Defense Explosives Safety Board (DDESB) secure web page to determine if a specific item is extremely heavy case munition.)
-For purposes of determining Sensitivity Group, Extremely Heavy Case Munitions are considered Robust Munitions.

III. Non-Robust Munitions - For purposes of determining Sensitivity Group, Non-Robust Munitions are those hazard Class/Division 1.1 and 1.2 military munitions that are not categorized as SG 1, SG 3, SG 4, or SG 5.
-Examples of such munitions include torpedoes and underwater mines. See also Sensitivity Group.
-For purposes of determining case fragment distances for intentional detonations, Non-Robust Munitions are those military munitions that do not meet the definition of Robust Munitions. See Robust Munitions.

IV. Sensitivity Group (SG) - A category used to describe the susceptibility of hazard Class/Division 1.1 and 1.2 military munitions to sympathetic detonation for the purpose of

storage within a high performance magazine (HPM), or where ARMCO, Inc. revetments or substantial dividing walls are used to reduce the maximum credible event. Each hazard Class/Division 1.1 and 1.2 military munition is designated, based on its physical attributes, into one of five sensitivity groups, which are listed in the Joint Hazard Classification System (JHCS). The sensitivity groups are:
a. SG 1 - Robust Military Munitions.
b. SG 2 - Non-Robust Military Munitions.
c. SG 3 - Fragmenting Military Munitions.
d. SG 4 - Cluster Bomb/Dispenser Unit Military Munitions.
e. SG 5 - Sympathetic Detonation Sensitive Military Munitions.

V. Sympathetic Detonation - The detonation of a munition or an explosive charge induced by the detonation of another munition or explosive charge.

VI. Sympathetic Detonation Sensitive Military Munitions - Munitions for which high performance magazine (HPM) non-propagation walls are not effective. Military munitions are assigned to SG 5 when either very sensitive to propagation or the sensitivity has not been determined.

VII. Non-Fragmenting Explosive Material - Self-explanatory, as there is no casing material that can produce fragmentation, or the explosives are actually bare. In either event the detonation of such material only produces blast-overpressure.

APPENDIX B. Target Analytes and Sampling Methods Used to Develop Emissions Data

Target Analyte	Sampling Equipment/Method
Particulates (0.01 – 0.5µm diameter)	TSI differential mobility particle sizer
	TSI aerodynamic particle sizer
	PMS active scattering aerosol spectrometer probe
Particulates (2 – 47 µm diameter)	PMS Forward Scattering Spectrometer Probe
Particulates/Metals	Teflon filter for gravimetric analysis
Particulates	Nuclepore for characterization by scanning electron microscope
	High-volume Sampler with quartz fiber filter
Particulate concentration	Nephelometer
PM-2.5	40 CFR Part 50
PM-10	EPA Method 201A
	40 CFR Part 50
PM-10 real-time analysis	TEOM Series 1400A
Total Suspended Particulate	EPA Reference Method for Determination of Suspended Particulate Matter in the Atmosphere (High-Volume Method)
Hydrocarbons	6-Liter SUMMA Canister
Total hydrocarbons	Detector
Sulfur Dioxide (SO_2)	Pulsed Fluorescence SO_2 Analyzer
SO2 real-time analysis	TECO Model 43
Ozone (O_3)	UV Photometric O3 Analyzer
O_3	TECO Model 49
Carbon monoxide (CO)	Gas Filter Correlation CO Analyzer
	EPA Method 10
	SUMMA canister analyzed using EPA Method 25C
CO real-time analysis	TECO Model 48
Carbon dioxide (CO2)	Gas Filter Correlation CO2 Analyzer
	EPA Method 3A
	Non-dispersive infrared (NDIR) continuous emissions monitor (CEM)
	SUMMA canister analyzed using EPA Method 25C
CO2 real-time analysis	TECO Model 41H
Oxides of Nitrogen (NOx)	Chemiluminescent Nitrogen Oxides Analyzer
	EPA Method 7E
NOx real-time analysis	TECO Model 42
Hydrogen Cyanide (HCN)	Bubbler
HCN	MDA Scientific Model 7100
	SW-846 Method 9012
Hydrogen Chloride (HCl)	Bubbler
	MDA Scientific Model 7100
	Dual-train Midget Impingers analyzed using EPA Method 26
	ISO Method 21438-2 and NIOSH Method 7903
Ammonia (NH3)	Bubbler

Target Analyte	Sampling Equipment/Method
Semivolatile Organics (SVOCs)	EPA Method TO-13
	High-volume Sampler with quartz fiber filter, analyzed using supercritical fluid chromatography (SFC)/mass spectrometry (MS) and gas chromatography (GC)/MS Method 8270
	Quartz fiber filters, modified resin cartridge train
	SUMMA canister analyzed using EPA Method TO-13A
Volatile Organics	SUMMA canister analyzed using EPA Method TO-14, EPA Method TO-12, and EPA Method TO-15
Metals	High-volume Sampler with quartz fiber filter, analyzed using inductively coupled plasma (ICP), cold vapor atomic absorption (CVAA), and flame atomic absorption (AA)
Dioxins and Furans	PS-1 samplers analyzed using Method 8290
Chlorine	Dual-train Midget Impingers analyzed using EPA Method 26
Residues	EPA Method 8330 (energetics), EPA Method 8270 (SVOCs), Method 1311 (TCLP metals), EPA Method 6010 (metals), EPA Method 7470 (mercury)
Benzene	SUMMA canister (Method TO-15) analyzed using GC/low resolution mass spectrometry (LRMS)
Naphthalene	Method TO-13 analyzed using GC/LRMS
Lead	Filter analyzed using compendium method IO-3.3, energy dispersive X-ray fluorescence
Chlorate (ClO_3^-)	ISO Method 21438-2 and NIOSH Method 7903
Perchlorate (ClO_4^-)	ISO Method 21438-2 and NIOSH Method 7903

TECO = Thermo-Electron Corporation

APPENDIX C. Contaminants of Potential Concern

Table 7
Human Health Risk Screening — Air

Chemical	Exploded Annually (µg/m³)	Burned Annually (µg/m³)	Totals (µg/m³)	Resident Air RSL (µg/m³)	key	Industrial Air RSL (µg/m³)	key	Resident COPC	Industrial COPC
1,3-Butadiene	3.97E-05	5.49E-08	3.98E-05	0.081	c*	0.41	c*	—	—
1-Hexane	2.27E-09	7.88E-08	8.11E-08	730	n	3100	n	—	—
1-Hexene	7.89E-09	1.23E-07	1.30E-07	NA		NA		—	—
2,4-Dinitrotoluene	—	1.71E-10	1.71E-10	0.027	c	0.14	c	—	—
Allyl Chloride	5.68E-09	3.45E-07	3.50E-07	0.41	c**	2	c**	—	—
Aluminum	1.13E-04	6.58E-04	7.72E-04	5.2	n	22	n	—	—
Antimony	1.64E-07	—	1.64E-07	NA		NA		—	—
Barium	1.01E-05	1.05E-05	2.06E-05	0.52	n	2.2	n	—	—
Benzene	5.30E-07	2.72E-06	3.25E-06	0.31	c	1.6	c*	—	—
Cadmium	1.99E-06	1.52E-06	3.51E-06	$1.4e^{-3}$	c*	$6.8e^{-3}$	c*	—	—
Carbon Tetrachloride	6.44E-09	8.63E-08	9.27E-08	0.41	c	2	c	—	—
Chloroform	1.34E-10	—	1.34E-10	0.11	c	0.53	c	—	—
Chromium	6.72E-07	6.93E-06	7.60E-06	$1.1e^{-5}$	c	$1.5e^{-4}$	c	—	—
CL2	—	1.43E-05	1.43E-05	NA		NA		—	—
Copper	6.48E-05	6.43E-06	7.12E-05	NA		NA		—	—
Diethyl Phthalate	2.84E-07	1.57E-11	2.84E-07	NA		NA		—	—
Ethylbenzene	6.33E-09	4.15E-08	4.79E-08	0.97	c	4.9	c	—	—
HCL	—	8.04E-04	8.04E-04	NA		NA		—	—
Lead	3.56E-06	3.38E-07	3.90E-06	0.2	c	1	c	—	—
Methyl Chloride	1.13E-09	7.71E-08	7.82E-08	NA		NA		—	—
Methyl Chloroform	3.16E-09	—	3.16E-09	NA		NA		—	—
Methylcyclohexane	9.01E-09	5.74E-09	1.47E-08	NA		NA		—	—
Methylene Chloride	1.36E-06	6.94E-06	8.30E-06	$3.9e^{-4}$	c	$1.9e^{-3}$	c	—	—
Naphthalene	—	2.70E-09	2.70E-09	0.072	c*	0.36	c*	—	—
n-Hexane	3.20E-08	1.33E-08	4.53E-08	730	n	3100	n	—	—
Phenol	—	4.88E-10	4.88E-10	210	n	880	n	—	—
RDX	7.02E-06	1.44E-06	8.46E-06	NA		NA		—	—
Styrene	1.14E-06	3.06E-07	1.44E-06	1000	n	4400	n	—	—

Table 7
Human Health Risk Screening — Air

Chemical	Exploded Annually (µg/m^3)	Burned Annually (µg/m^3)	Totals (µg/m^3)	Resident Air RSL (µg/m^3)	key	Industrial Air RSL (µg/m^3)	key	Resident COPC	Industrial COPC
Toluene	3.71E-06	5.41E-07	4.25E-06	0.1	n	0.44	n	—	—
Vinyl Chloride	3.41E-10	3.05E-08	3.09E-08	0.16	c	2.8	c	—	—
Zinc	4.74E-05	1.39E-06	4.88E-05	NA		NA		—	—

Notes:

HHRA	=	Human Health Risk Assessment
µg/m3	=	Micrograms per cubic meter
COPC	=	Chemical of potential concern
C	=	Cancer
c*	=	Where: n SL < 100X c SL
c**	=	Where n SL < 10X c SL; n = noncancer
n	=	Noncancer
NA	=	Indicates Not Applicable/Not Available
Chromium	=	Total chromium data were screened using hexavalent chromium RSLs
—	=	Indicates the chemical is not a COPC
RSL	=	USEPA Regional Screening Level; downloaded from: http://www.epa.gov/region9/superfund/prg/
Residential Air RSL	=	USEPA June 2011 Regional Air Screening Levels for residential land use
Industrial Air RSL	=	USEPA June 2011 Regional Air Screening Levels for industrial land use

DEPARTMENT OF THE ARMY
PROJECT DIRECTOR JOINT SERVICES
1 BUFFINGTON ROAD
PICATINNY ARSENAL NJ 07806-5000

REPLY TO
ATTENTION OF

SFAE-AMO-JS 4 November 2016

MEMORANDUM FOR Armaments Research Development and Engineering Center (ARDEC) Legal Office, (RDAR-DGC/Mr. Larry Brady)

SUBJECT: Release of the March 2012 Engineer Research and Development Center (ERDC) Report "Alternative Treatment Options for Open Burning of Explosive Waste at Holston Army Ammunition Plant (HSAAP), March 2012"

1. This memorandum is to accompany and supplement the release of the March 2012 ERDC Report "Alternative Treatment Options for Open Burning of Explosive Waste at HSAAP," sponsored by the Office of the Project Director Joint Services. The distribution for this report is currently authorized to U.S. Government agencies only, thus prompting this action to release it to the Tennessee Department of Environment and Conservation, which is not a U.S. Government agency.

2. The objective of the above cited 2012 report was to review the status of alternative explosive hazardous waste disposal technologies as an aid in monitoring the progress of the ongoing development of safe alternatives to open burning of explosive hazardous waste at HSAAP. The report assessed these five different technologies: Alkaline Hydrolysis, Static Detonation Chamber, Incineration, Gas Phase Reduction, and Supercritical Water Oxidation with the primary focus of treating open burning waste.

3. The report discussed the application, general safety and engineering controls, waste stream, and capital and operating costs for each option. The report estimated wastes generated onsite and burned in open pans from the years 2000 to 2009. The ERDC report was completed prior to changes in the Department of Defense Explosives Safety Board (DDESB) guidance and prior to Title V Permit Renewal Application (applied for in Dec. 2013) which resulted in more stringent emissions regulations.

4. The report, subsequently finalized in 2012, provided a limited survey of technologies available in 2010. The conclusions in the report were based on generalities and did not consider the specific and detailed compositions of the waste streams at HSAAP. In addition, the report did not provide a full explosive safety analysis for processing, handling, treatment and post operation cleanup for the explosive hazardous waste generated at HSAAP.

5. The full objective of this study has not yet been met. There is still a need for a detailed waste stream analysis as well as documentation for technology specific explosive safety requirements before selection of a safe and appropriate treatment technology, that meets both HSAAP needs and the Resource Conservation and Recovery Act permitting requirements, can be made. In addition none of the technologies were reviewed for application at HSAAP by the US Army Technical Center for Explosives Safety (USATCES), the primary Army agency for explosives safety. As a result, the Army is continuing towards the initial study objective and will supplement the 2012 findings with additional waste classification analysis and technologies assessments. The results of this ongoing study will provide a comprehensive approach, realistically incorporating the waste stream and safe handling specifics to match the correct technology with the correct waste stream. At the conclusion, a decision will be made regarding the best alternative treatment options for open burning of explosive waste at HSAAP.

6. This office concurs with the appropriate release of the Report "Alternative Treatment Options for Open Burning of Explosive Waste at Holston Army Ammunition Plant (HSAAP)," March 2012, except for Appendix A: Vendor White Papers, which contains proprietary vendor information. The Project Director Joint Services point of contact is Dr. Gabriela Dory, SFAE-AMO-JS, 973.724.5746, gabriela.a.dory.civ@mail.mil.

Matthew T. Zimmerman
Deputy Project Director Joint Services

DoD Instruction 4140.62

Material Potentially Presenting an Explosive Hazard (MPPEH)

Originating Component: Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics

Effective: August 20, 2015

Releasability: Cleared for public release. Available on the Internet from the DoD Issuances Website at http://www.dtic.mil/whs/directives.

Reissues and cancels: DoD Instruction 4140.62, "Material Potentially Presenting an Explosive Hazard," November 25, 2008, as amended

Approved by: Frank Kendall, Under Secretary of Defense for Acquisition, Technology, and Logistics

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Purpose: In accordance with the authority in DoD Directive (DoDD) 5134.01 and DoD Instruction (DoDI) 4140.01, this issuance:

- Establishes policy and assigns responsibilities for the management and disposition of MPPEH, material documented as an explosive hazard (MDEH), and material documented as safe (MDAS).

- Authorizes other publications related to and supporting the management and disposition of MPPEH, MDEH, and MDAS.

TABLE OF CONTENTS

SECTION 1: GENERAL ISSUANCE INFORMATION 3
1.1. Applicability. 3
1.2. Policy. 3
1.3. Information Collections. 4
SECTION 2: RESPONSIBILITIES 5
2.1. Assistant Secretary of Defense for Energy, Installations, and Environment (ASD(EI&E)). 5
2.2. ASD(L&MR). 5
2.3. Assistant Secretary of Defense for Research and Engineering (ASD(R&E)). 6
2.4. Director, Defense Logistics Agency (DLA). 6
2.5. DoD Component Heads. 6
2.6. Secretary of the Army 7
SECTION 3: PROCEDURES 8
3.1. Military Munitions Acquisition Programs. 8
3.2. MPPEH Management and Disposition. 8
3.3. Implementing Guidance. 12
3.4. Demilitarization Requirements. 14
GLOSSARY 15
G.1. Acronyms. 15
G.2. Definitions. 15
REFERENCES 18

SECTION 1: GENERAL ISSUANCE INFORMATION

1.1. APPLICABILITY. This issuance:

a. Applies to:

(1) OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the DoD (referred to collectively in this issuance as the "DoD Components").

(2) MPPEH, MDEH, and MDAS that are under DoD control or under the control of DoD contractors to the extent provided in the contract.

b. Does not apply to:

(1) Military munitions (also referred to as ammunition and explosives) and munitions-related materials, including wholly inert components (e.g., fins, launch tubes, containers, packaging material), that are used or reused for their intended purpose and are within a DoD Component's established munitions management system.

(2) Non-munitions-related material (e.g., horseshoes, rebar, other solid objects) and munitions debris that are solid metal fragments that do not realistically present an explosive hazard.

(3) Other items (e.g., gasoline cans, compressed gas cylinders) that are not munitions or munitions-related material but may present an explosion hazard.

(4) Persons outside the DoD other than DoD contractors as provided in contracts.

(5) Subsurface material.

1.2. POLICY. It is DoD policy that:

a. The management and disposition of MPPEH, MDEH, and MDAS will be conducted in a manner that supports operational readiness and mission requirements:

(1) In accordance with:

(a) Operational range sustainability requirements found in DoDD 3200.15 and DoDI 3200.16.

(b) The supply chain materiel management policies found in DoDI 4140.01.

(c) The explosives safety standards found in DoD 6055.09-M.

(d) The environmental requirements found in DoDD 4715.1E, DoDI 4715.4, and DoDI 4715.06.

(2) Pursuant to Subpart M of Part 266 of Title 40, Code of Federal Regulations (CFR), to the extent applicable.

b. DoD contractors who manage or are responsible for the disposition of MPPEH, MDEH, or MDAS must comply with this issuance and DoD 4145.26-M through contractual provisions.

c. As part of the MPPEH management and disposition process:

(1) MDEH must not be commingled with MPPEH or MDAS or misidentified or improperly documented as MDAS once the explosive hazards it presents have been determined.

(2) MDAS must not be commingled with MPPEH or MDEH or misidentified or improperly documented as MDEH once the explosive hazards it presents have been determined.

1.3. INFORMATION COLLECTIONS. The incident reports, referenced in Paragraph 3.3.f., do not require licensing with a report control symbol in accordance with Paragraph 1.b.(5) of Enclosure 3 of Volume 1 of DoD Manual (DoDM) 8910.01.

SECTION 2: RESPONSIBILITIES

2.1. ASSISTANT SECRETARY OF DEFENSE FOR ENERGY, INSTALLATIONS, AND ENVIRONMENT (ASD(EI&E)). Under the authority, direction, and control of the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), the ASD(EI&E):

a. Has overall responsibility for and oversight of environmental, safety (including explosives safety), and occupational health matters related to the implementation of this issuance.

b. In coordination with the Assistant Secretary of Defense for Logistics and Materiel Readiness (ASD(L&MR)), develops:

(1) Guidance for the management and disposition of MPPEH, MDEH, and MDAS.

(2) Qualification standards for DoD personnel and DoD contractors involved in:

(a) Managing and disposing of MPPEH, MDEH, and MDAS.

(b) Determining whether MDEH is safe for transport over public traffic routes.

c. Monitors compliance with this issuance.

d. Issues supplementing guidance when necessary.

e. Through the DoD Explosives Safety Board (DDESB), develops and recommends explosives safety standards for MPPEH, MDEH, and MDAS for submission to the USD(AT&L) for approval.

2.2. ASD(L&MR). Under the authority, direction, and control of the USD(AT&L), the ASD(L&MR):

a. Oversees uniform implementation of this issuance and applicable related DoD issuances.

b. Monitors the effectiveness and efficiency of logistics systems related to the implementation of this issuance.

c. Confirms that Volume 6 of DoD 4100.39-M provides cataloging data and turn-in requirements for used or demilitarized military munitions.

d. Establishes procedures for maintaining accountability and disposition of DoD materiel in Volume 11 of DoDM 4140.01 and DoD 4160.21-M.

e. Implements the DoD Demilitarization Program as outlined in Volume 3 of DoD4160.28-M.

2.3. ASSISTANT SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (ASD(R&E)). Under the authority, direction, and control of the USD(AT&L), the ASD(R&E) acts as the OSD proponent for technologies required to:

a. Detect the presence of explosives on material, including MPPEH, MDEH, and MDAS.

b. Determine the composition of such explosives to determine whether the explosives present on an individual item or a quantity of items poses an explosive hazard.

c. Improve the management and disposition of MPPEH, MDEH, and MDAS.

2.4. DIRECTOR, DEFENSE LOGISTICS AGENCY (DLA). Under the authority, direction, and control of the ASD(L&MR) and in addition to the responsibilities in Paragraph 2.5., the Director, DLA, in coordination with the U.S. Army as the Single Manager for Conventional Ammunition (SMCA) and the other Military Services and pursuant to DoDD 5160.65, maintains a DoD Demilitarization Program Office. The DoD Demilitarization Program Office provides guidelines for demilitarization requirements for DoD materiel in accordance with DoDI 4160.28.

2.5. DoD COMPONENT HEADS. The DoD Component heads:

a. Comply with the requirements of this issuance and subsequent implementing guidance by providing the necessary policies, guidance, procedures, and funds required.

b. Require that:

(1) Management and disposition of MPPEH, MDEH, and MDAS are handled in accordance with supply chain materiel management policies and procedures in DoDI 4140.01, disposition procedures in DoD 4160.21-M, demilitarization procedures in Volume 3 of DoD 4160.28-M, explosives safety standards in DoD 6055.09-M, and environmental requirements in DoDD 4715.1E, DoDI 4715.4, DoDI 4715.06, and Title 40, CFR.

(2) MPPEH and MDEH are controlled and managed to prevent their unauthorized use, transfer, or release. MPPEH and MDEH holding areas are included in local facility threat assessments.

(3) Commanders or authorized officials certify that DoD Component personnel who have responsibilities associated with MPPEH, MDEH, and MDAS meet the qualifications and requirements established in Paragraph 3.2.

(4) Contracting officers reference or incorporate within the contract mandatory ammunition and explosives (military munitions) safety clauses in accordance with Subpart 223.3 and Sections 252.223-7002 and 252.223-7003 of the Defense Federal Acquisition Regulation Supplement for applicable work done by contractors, whether facilities are DoD or contractor-owned. For contractual work performed on DoD-owned facilities, the DoD Components may also include their own ammunition and explosives and other safety standards and procedures to

DoD contracts provided that, at a minimum, they are as stringent as the requirements of DoD 4145.26-M.

(5) The management and disposition of MPPEH, MDEH, and MDAS comply with DoD 6055.09-M. The transportation of MDEH and MDAS complies with Parts 100-185 of Title 49, CFR.

c. Establish criteria for:

(1) Determining when MDAS that contains small arms ammunition (SAA) that presents an explosive hazard can no longer be considered MDAS and must be reprocessed as MPPEH.

(2) Applying expert knowledge as an alternative approved means to determine that the release or transfer of material does not present an unknown explosive hazard to the receiver.

d. Coordinate with the Director, DLA, to establish approved demilitarization requirements in accordance with DoDI 4160.28.

2.6. SECRETARY OF THE ARMY In addition to the responsibilities in Paragraph 2.5. and in his or her capacity as the SMCA, the Secretary of the Army:

a. Demilitarizes and disposes of military munitions within DoD Component-established munitions management systems in accordance with DoDI 4160.28 and DoDI 5160.68.

b. Provides procedures to demilitarize unused SMCA-managed military munitions (Class V items) while complying with:

(1) Applicable policies for demilitarization and disposal.

(2) Trade security controls (TSC) in accordance with DoDI 2030.08.

SECTION 3: PROCEDURES

3.1. MILITARY MUNITIONS ACQUISITION PROGRAMS. Program managers for military munitions acquisition programs confirm that military munitions acquisition program planning, design, and implementation include requirements to:

a. Eliminate or reduce, to the extent practical, potential explosive and environmental hazards remaining on or in used or demilitarized military munitions and associated material.

b. Document the expected level of explosive residue and other munitions' constituents that remain on used or demilitarized military munitions (e.g., cartridge casings, discarding sabots).

c. Define specific procedures that comply with applicable DoD explosives safety standards, TSC, and demilitarization requirements.

d. Seek continuous improvement in technologies and procedures used in the management and disposition of MPPEH, MDEH, and MDAS.

3.2. MPPEH MANAGEMENT AND DISPOSITION. By implementing MPPEH management and disposition procedures, the DoD Components will:

a. Implement one of the processes in Paragraphs 3.2.a.(1)-(3) to confirm that unknown explosive hazards are not present when transferring MDEH or MDAS within DoD and when releasing MDEH to a qualified receiver or MDAS to the public.

(1) Visual inspections may be used to determine that material is safe; however, they are not always sufficient to determine that material does not pose an explosive hazard. Visual inspections may be appropriate provided internal cavities are vented to allow a visual inspection of the surfaces of each vented cavity to confirm there are no explosive hazards present. Further details on when venting is applicable or may be waived are provided in Paragraph 3.3.i.

(2) A DDESB-approved means (e.g., thermal treatment) with an appropriate post-processing inspection may be used.

(3) The application of DoD Component-established expert knowledge criteria may be used.

b. Determine the explosives safety status of MPPEH. However, the explosives safety status does not need to be determined before allowing qualified DoD contractors to perform range clearance activities or munitions responses.

c. Ensure contracts for such activities or responses require contractors to meet applicable DoD and DoD Component explosives safety criteria and implement the provisions of this issuance.

d. Require that demilitarization procedures established by DLA and, when applicable, the other DoD Components (including the Secretary of the Army as the SMCA) address:

(1) When the use of visual inspections is appropriate.

(2) The procedures that will be used to inspect or process MPPEH.

e. Include documentation requirements for inspections or processes conducted on MPPEH.

f. Consider the use of a closed-circuit process for the management of MPPEH that is either munitions debris or range-related debris. This process should be managed by a single entity that maintains a chain of custody from collection of the material as MPPEH through its final disposition (e.g., melting).

g. Require the explosives safety status of material to be transferred within or released from DoD control be determined and documented in accordance with Paragraph 3.2.a.

h. Require personnel who determine and document the explosives safety status of material as MDEH or MDAS:

(1) Are trained, as appropriate, for tasks they will perform regarding the:

(a) Recognition, safe handling, and processing of unused and used or demilitarized military munitions and other MPPEH or MDEH. When appropriate, such personnel will be qualified in accordance with DDESB Technical Paper 18 or trained in accordance with the DoD Component's policy and guidance for training and qualifying personnel who handle military munitions.

(b) Demilitarization, TSC, and procedures that apply to MDEH and MDAS that will be released from DoD control.

(c) Management and disposition of MPPEH, MDEH, and MDAS, in accordance with applicable federal or State hazardous material and hazardous waste regulations, including applicable regulations for transportation, for the known or suspected hazards present given the type of material involved.

(2) Can demonstrate or provide proof of adequate training or experience in the duties described in Paragraph 3.2.h.(1).

(3) Are assigned to a technically qualified position or designated, in writing, by the commander or authorized official directly responsible for controlling the transfer or release of MPPEH, MDEH, or MDAS as technically qualified to perform the duties assigned in accordance with this issuance, related DoD issuances, and DoD Component policy and procedures. Contractor personnel will be designated as technically qualified and approved as provided in the governing contract.

i. Confirm MDEH is transferred or released only to qualified receivers that have provided documentation or upon verification of:

(1) The licenses, permits, and site approvals, as appropriate, required to manage and dispose of the materials being received;

(2) The facilities, capacity, and technical expertise required to safely manage the explosive hazards associated with the MDEH being received;

(3) Procedures in place for the management and disposition of MDEH in accordance with this issuance and DoDD 5134.01, DoD 4160.21-M, and DoDI 4160.28; and

(4) Personnel who meet or exceed the criteria specified in Paragraph 3.2.h.

j. Require the commander or authorized official directly responsible for transferring MDEH within or releasing it from DoD control to approve an explosives safety risk evaluation that documents the adequacy of a qualified receiver's management controls, personnel, and operations before allowing the material to be transferred or released. Such documentation is not required when the receiver is a DoD activity or installation assigned a military munitions-related mission (e.g., a military munitions depot) that is capable of the management and disposition of the material (i.e., MDEH) it is to receive.

k. Ensure that only MDAS is released to the public.

l. Establish and maintain a chain of custody through release from DoD control by ensuring that MPPEH awaiting documentation of its explosives safety status, MDEH, and MDAS are segregated and secured to prevent commingling with one another. Where applicable, MDEH that both poses a different explosive hazard than other MDEH and will be released to a different qualified receiver must also be segregated and secured from other MDEH.

m. Ensure that containers and holding areas for material being processed are secured and clearly marked with:

(1) The hazards, if any, that may be present.

(2) The material's explosives safety status.

n. Require explosives safety siting approval for locations used for MPPEH or MDEH processing operations (e.g., consolidation, inspection, sorting, storage, transfer, release) in accordance with DoD 6055.09-M and the DoD Component's implementing regulations or, where applicable, with permits or licenses.

o. Minimize the quantity and time MPPEH, MDEH, and MDAS is accumulated and retained at any location. Under some circumstances the accumulation of MPPEH, including speculative accumulation or its movement from either an operational range or the site of use, could require its management as waste military munitions under applicable federal or State requirements.

p. Confirm a legible copy of the documentation of the material's explosives safety status accompanies the material when it is transferred or released. This documentation will be maintained by the generating DoD Component for a period of at least 3 years thereafter, or longer when required by the DoD Component's regulations. MDEH and MDAS are no longer considered to be MPPEH as long as the chain of custody remains intact and the required documentation is provided.

(1) Documentation of the material's explosives safety status must state that the material:

(a) Does not present an explosive hazard and is consequently safe from an explosives safety perspective for transfer within or release from DoD control; or

(b) Contains explosive hazards and, if applicable, cavities that remain unvented with the known or suspected explosive hazards stated. Such material is only transferable or releasable to a qualified receiver.

(2) The documentation of material as safe requires two independent signatures by designated personnel.

(a) The first signatory may be either a DoD employee or a DoD contractor. This signatory must have performed or witnessed the initial 100-percent visual inspection or the use of a DDESB-approved means for processing the material, or have applied expert knowledge criteria to determine that the material is in the condition expected.

(b) The second signatory must be a U.S. citizen who may be either a DoD employee or a DoD contractor. If the first signatory performed or witnessed a visual inspection, the second signatory must have performed or witnessed the second independent 100-percent visual inspection. If the first signatory used a DDESB-approved means for processing the material, the second signatory must have witnessed or performed the specified post-process inspection by sampling or other methodology as specified in DDESB-approved means. If the first signatory applied expert knowledge, the second signatory must have independently applied expert knowledge criteria to verify the material is in the condition expected.

(c) Each signatory must confirm the chain of custody was maintained before signing the explosives safety documentation.

(3) When a single visual inspection is sufficient to determine the explosive hazards known or suspected to be present documentation of the MDEH, determination only requires one signature. In such cases, the signatory must be a U.S. citizen who may be either a DoD employee or a DoD contractor.

q. Require that a database be maintained to record all relevant reports pertaining to each incident where:

(1) An unauthorized transfer or release of MPPEH occurred;

(2) MDEH was transferred within or released from DoD control to an unqualified receiver or presented an unintentional explosive hazard to a qualified receiver; or

(3) MDAS was transferred within or released from DoD and was subsequently found to contain an explosive hazard.

3.3. IMPLEMENTING GUIDANCE. By implementing guidance developed in accordance with Section 2, the DoD Components will:

a. Establish, as appropriate, DoD Component-level points of contact for addressing issues related to the management and disposition of MPPEH, MDEH, or MDAS.

b. Provide DoD Component-level oversight of programs established to implement this issuance.

c. Establish, if required, criteria for:

(1) The application of expert knowledge to determine, by MPPEH type, that specific material does or does not pose an explosive hazard.

(2) The modified inspection of expended small arms cartridge casings.

d. Develop procedures for management and disposition of DoD Component-specific MPPEH based on DoD policy.

e. Establish procedures to ensure that the integrity of processes for management and disposition of MPPEH, MDEH, and MDAS (e.g., inspection, re-inspection, documentation) are continuously maintained through the time of release from DoD control. If a DoD Component or one of its contractors breaks the chain of custody at any time before the subject material's release from DoD control, the subject material becomes MPPEH and its explosives safety status must be re-established in accordance with the procedures of this issuance identified in Paragraph 3.2.p.(2) or 3.2.p.(3).

f. Ensure material transferred within or released from DoD control that is subsequently found to present an unintentional explosive hazard is investigated and reported.

(1) Such releases or transfers will be investigated and reported:

(a) Through the releaser's chain of command or the contracting officer's representative to the contracting officer;

(b) To the appropriate DoD Component's explosives safety office or center; and

(c) In accordance with DoDM 5100.76 and applicable DoD Component-established reporting requirements.

(2) Mishaps involving such material will also be reported in accordance with DoDI 6055.07 and applicable DoD Component regulations.

(3) Should SAA be found mixed with MDAS, the SAA must be removed and undergo proper disposition. Given the low risk posed by SAA generally, both military and commercial, such a discovery does not constitute an explosives or munitions emergency and will not necessarily negate the MDAS determination. However, the DoD Component criteria established in Paragraph 2.5.c.(1) must be followed to decide if the MDAS determination remains valid.

g. Ensure, when possible, MPPEH, MDEH, and MDAS are managed and processed (e.g., sorted, vented, inspected, segregated, secured) on the operational range or at the point of use to minimize handling and transport before processing and to facilitate disposition. In certain circumstances, the movement of some material from either the operational range or the site of use could require its management as waste military munitions under applicable federal or State requirements.

h. Prevent, to the extent practical, a release of munitions constituents (e.g., explosive residues, heavy metals) from MPPEH, MDEH, or MDAS into the environment during its management and processing.

i. Ensure the use of DDESB-approved or DoD Component-approved procedures to vent internal cavities of MPPEH, MDEH, and MDAS to allow a visual inspection of the surfaces of each vented cavity to confirm there are no explosive hazards present before transfer or release as part of the disposition process. This requirement is waived when:

(1) The qualified receiver meets the requirements of Paragraphs 3.2.i. and 3.2.j.; or

(2) Expert knowledge is applied to determine that the subject material is in the condition expected. In this event, MPPEH can be documented as MDEH or MDAS without the venting of cavities. When internal cavities are not vented and expert knowledge does not apply, the qualified receiver must be notified in writing of the cavities' existence and the potential explosive hazards.

j. Establish procedures to both determine the salvage value of MPPEH, MDEH, and MDAS, if any, and ensure this value will be recovered to the extent required by the DoD and applicable laws and regulations. Funds realized from the sale of recyclable materials must be credited to the appropriate accounts pursuant to Sections 2577 or 4690 of Title 10, United States Code.

k. Ensure that shipments of MDEH and MDAS over public traffic routes comply with DoD 6055.09-M; Title 49, CFR; and applicable federal or State hazardous material and hazardous waste transportation regulations. Transportation of MDEH must also comply with Joint Technical Bulletin 700-2/Naval Sea Systems Command Instruction 8020.8C/Air Force Technical Order 11A-1-47. MPPEH will not be transported over public traffic routes until certified personnel determine its explosives safety status (e.g., it is documented as MDEH).

l. For MDEH or MDAS transferred within or released from DoD control, ensure:

(1) Determination is made regarding whether the subject material constitutes a hazardous waste or is otherwise regulated as a hazardous material.

(2) Subsequent management of this material within DoD complies with all applicable federal or State requirements.

3.4. DEMILITARIZATION REQUIREMENTS. The DoD Components will ensure the implementation of demilitarization requirements of DoDI 4160.28 and DoDI 2030.08 and the DoD Component-developed procedures to address:

a. Used military munitions and associated material.

b. Containers and packaging materials for military munitions.

c. Equipment used to manufacture, maintain, renovate, demilitarize, or dispose of military munitions. When appropriate, the DoD Components should consult with manufacturers to determine if they have recommended disposal procedures to help ensure the safety of human health and the environment.

GLOSSARY

G.1. ACRONYMS.

ASD(EI&E)	Assistant Secretary of Defense for Energy, Installations, and Environment
ASD(L&MR)	Assistant Secretary of Defense for Logistics and Materiel Readiness
ASD(R&E)	Assistant Secretary of Defense for Research and Engineering
CFR	Code of Federal Regulations
DDESB	Department of Defense Explosives Safety Board
DLA	Defense Logistics Agency
DoDD	DoD directive
DoDI	DoD instruction
DoDM	DoD manual
MDAS	material documented as safe
MDEH	material documented as an explosive hazard
MPPEH	material potentially presenting an explosive hazard
SAA	small arms ammunition
SMCA	Single Manager for Conventional Ammunition
TSC	trade security controls
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics

G.2. DEFINITIONS.

Unless otherwise noted, these terms and their definitions are for the purpose of this issuance.

Class V. Defined in Volume 10 of DoDM 4140.01.

expended small arms cartridge casings. Spent cartridge cases from SAA used in live-fire training or testing and collected after use. Also referred to as "fired cartridge cases."

explosive hazard. Defined in Volume 8 of DoD 6055.09-M.

explosives or munitions emergency. Defined in Section 260.10 of Title 40, CFR.

management and disposition of MPPEH, MDEH, and MDAS. Includes the identification; recovery; collection; inspection; determination of the material's explosives safety status; marking; storage, including segregating by the explosives safety status; security; demilitarization; the accountability, when appropriate; and the transfer or release, including sale.

MDAS. MPPEH that has been assessed and documented as not presenting an explosive hazard and for which the chain of custody has been established and maintained. This material is no longer considered to be MPPEH.

MDEH. MPPEH that cannot be documented as MDAS, that has been assessed and documented as to the maximum explosive hazards the material is known or suspected to present, and for which the chain of custody has been established and maintained. This material is no longer considered to be MPPEH.

MPPEH. Material owned or controlled by the DoD that, before determination of its explosives safety status, potentially contains explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (e.g., equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations). Excluded from MPPEH are:

Military munitions and military munitions-related materials, including wholly inert components (e.g., fins, launch tubes, containers, packaging material), that are to be used or reused for their intended purpose and are within a DoD Component-established munitions management system.

Non-munitions-related material (e.g., horseshoes, rebar, other solid objects) and munitions debris that are solid metal fragments that do not realistically present an explosive hazard

Other items (e.g., gasoline cans, compressed gas cylinders) that are not munitions or munitions-related material but may present an explosion hazard.

munitions response. Defined in Volume 8 of DoD 6055.09-M.

qualified receiver. DoD and commercial entities (i.e., activities, units, businesses) that have personnel who are trained and experienced in the safe handling of the MDEH they are authorized, licensed, or otherwise permitted to receive, manage, and conduct disposition and are capable of attaining a DoD-approved site plan.

range clearance. Defined in Volume 8 of DoD 6055.09-M.

SAA. Defined in Volume 8 of DoD 6055.09-M.

sabot. A device that allows a projectile of a smaller caliber to be fired from a weapon of a larger caliber by filling the weapon's bore and keeping the projectile centered. The sabot normally separates and falls away from the projectile a short distance from the muzzle.

transferred within or released from DoD control. A receiver has acknowledged receipt of MDEH or MDAS by signed documentation (e.g., DD Form 1348-1A, "Issue Release/Receipt Document," available at http://www.dtic.mil/whs/directives//forms/eforms/dd13481a.pdf, or an equivalent document) and has taken physical custody of the MDEH or MDAS.

REFERENCES

Code of Federal Regulations, Title 40

Code of Federal Regulations, Title 49

Defense Federal Acquisition Regulation Supplement, Subpart 223.3, and Sections 252.223-7002 and 252.223-7003, current edition

DoD 4100.39-M, Volume 6, "Federal Logistics Information System (FLIS) Procedures Manual: Supply Management," May 2010

DoD 4145.26-M, "DoD Contractors' Safety Manual for Ammunition and Explosives," March 13, 2008

DoD 4160.21-M, "Defense Materiel Disposition Manual," August 18, 1997

DoD 4160.28-M, Volume 3, "Defense Demilitarization: Procedural Guidance," June 7, 2011

DoD 6055.09-M, "DoD Ammunition and Explosives Safety Standards," February 29, 2008, as amended

DoD Directive 3200.15, "Sustaining Access to the Live Training and Test Domain," December 18, 2013

DoD Directive 4715.1E, "Environment, Safety, and Occupational Health (ESOH)," March 19, 2005

DoD Directive 5134.01, "Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L))," December 9, 2005, as amended

DoD Directive 5160.65, "Single Manager for Conventional Ammunition (SMCA)," August 1, 2008

DoD Explosives Safety Board Technical Paper 18, "Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel," December 20, 2004

DoD Instruction 2030.08, "Implementation of Trade Security Controls (TSC) for Transfers of DoD Personal Property to Parties Outside DoD Control," February 19, 2015

DoD Instruction 3200.16, Operational Range Clearance (ORC), April 21, 2015

DoD Instruction 4140.01, "DoD Supply Chain Materiel Management Policy," December 14, 2011

DoD Instruction 4160.28, "DoD Demilitarization (DEMIL) Program," April 7, 2011

DoD Instruction 4715.06, "Environmental Compliance in the United States," May 4, 2015

DoD Instruction 4715.4, "Pollution Prevention," June 18, 1996, as amended

DoD Instruction 5160.68, "Single Manager for Conventional Ammunition (SMCA): Responsibilities of the SMCA, the Military Services, and United States Special Operations Command (USSOCOM)," December 29, 2008

DoD Instruction 6055.07, "Mishap Notification, Investigation, Reporting, and Record Keeping," June 6, 2011

DoD Manual 4140.01, "DoD Supply Chain Materiel Management Procedures," February 10, 2014, as amended

DoD Manual 5100.76, "Physical Security of Sensitive Conventional Arms, Ammunition, and Explosives (AA&E)," April 17, 2012

DoD Manual 8910.01, Volume 1, "DoD Information Collections Manual: Procedures for DoD Internal Information Collections," June 30, 2014

Joint Technical Bulletin 700-2/Naval Sea Systems Command Instruction 8020.8C/Air Force Technical Order 11A-1-47, "Department of Defense Ammunition and Explosives Hazard Classification Procedures," July 30, 2012

United States Code, Title 10

Received 27JUN17 [signature]

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL
William R. Snodgrass Tennessee Tower, 15th Floor
312 Rosa L. Parks Avenue
Nashville, TN 37243
(615) 532-0554 Voice or (615) 532-0614 FAX

Certified Article Number
9414 7266 9904 2058 5341 98
SENDERS RECORD

June 21, 2017

Mr. Robert E. Winstead
Director of Environmental, Health, Safety and Security
BAE SYSTEMS Ordnance Systems Inc.
Holston Army Ammunition Plant
4509 West Stone Drive
Kingsport, TN 37660

RE: Open Burning Sources
BAE SYSTEMS Ordnance Systems Inc. / Holston Army Ammunition Plant
4509 West Stone Drive, Kingsport
37-0028 / 568188

Dear Mr. Winstead:

The open burning of non-radioactive, explosive, shock sensitive, chemically unstable, or highly reactive wastes, packaging, or contaminated or potentially contaminated combustible materials at Holston Army Ammunition Plant (HSAAP) is currently allowed at your facility pursuant to the open burning prohibition exception found at TAPCR1200-03-04-.04(k).

> *(k) Fires consisting solely of non-radioactive, explosive, shock sensitive, chemically unstable, or highly reactive wastes, packaging, or contaminated or potentially contaminated combustible materials. Priming materials used to facilitate such burning shall be limited to #1 or #2 grade fuel oils, and wood waste. The provisions of Rule 1200-3-4-.03(4) as it pertains solely to "other rubber products" and "other plastics" are waived for this exception. <u>Open burning conducted under this exception is only allowed where no other safe means of disposal exists.</u>*

The open burning of these materials as a means of treatment and disposal has drawn the attention of citizens' groups around the country, and the Division received numerous comments during the public comment period for renewal of your Title V permit. The Division of Air Pollution Control (DAPC) acknowledges that the U.S. Department of the Army is reviewing safe alternatives to minimize the open burning of these materials. Based on the above rule, you are asked to submit a statement signed by the Responsible Official certifying that there are no safe alternatives to open burning these materials within thirty days of receipt of this letter. The certification shall include information necessary supporting this claim. You are permitted to operate under the authority of your most recent permit(s) consistent with the application shield provisions of Tennessee Air Pollution Control Regulations (TAPCR) part 1200-03-09-.02(11)(f)2. This protection shall cease to apply if you fail to submit any additional information identified as being needed to process the application by the deadline specified in writing by the Technical Secretary.

If you have any questions concerning this correspondence, please contact Moe Baghernejad at (615) 532-0594 or via email at moe.baghernejad@tn.gov.

Sincerely,

James P. Johnston, P.E.
Deputy Director
Permitting and Regulatory Development