

3-4 EXPLOSIVE DESTRUCTION SYSTEM (EDS)

3-4a Process Description

The Explosive Destruction System (EDS) at Pueblo Chemical Depot (PCD) has five permitted Hazardous Waste Management Units; Container Storage Unit (CSU) H1102, CSU H1103, a roll-off container storage unit adjacent to H1103, and two EDS Treatment Units in Environmental Enclosures. CSU H1102 stores agent wastes prior to treatment in the EDS Units and CSU H1103 will be used to store wastes that have been treated in the EDS Units prior to off-site shipment to a permitted treatment, storage, and disposal facilities. The EDS units treat/destroy overpacked munitions, Department of Transportation (DOT) cylinders, and other miscellaneous items (ignition cartridges, propellant) currently stored at PCD that contain mustard agents (distilled sulfur mustard [HD]/mustard-T mixture [HT]), as well as treat/destroy any reject chemical agent munitions or contaminated energetics generated from the Pueblo Chemical Agent-Destruction Pilot Plant (PCAPP) operations.

The Treatment Process is as follows. Shaped charges are applied to the munitions and DOT cylinders and are then placed in the containment vessel of the EDS. Charges are then detonated to access chemical fill and deactivate the explosive components (if present). Liquid reagent is then added to treat the chemical fill and further deactivate explosives. When treatment has been determined to be complete, the liquid effluent is drained and solid material is manually removed from the EDS unit. The liquid and solid wastes are stored in CSU H1103 pending shipment to a permitted hazardous waste treatment, storage and disposal facility (TSDF). The EDS unit is then prepared for the next set of items for treatment.

Table 3-4-1 presents the EDS RCRA hazardous waste designation, the anticipated USEPA waste codes, the basis for designation, and the disposition of the waste material based on EDS waste characterization data and EDS profiles from recent EDS mustard agent operations.

3-4b Permitted Waste Identification

3-4b(1) Container Storage Unit (CSU) H1102

Container storage unit CSU H1102 is permitted to store overpacked munitions, DOT cylinders, miscellaneous items consisting of ignition cartridges, propellant, any reject chemical munitions, and contaminated energetics. These items will be stored in CSU H1102 prior to treatment in the EDS Units.

3-4b(2) Container Storage Unit H1103

CSU H1103 is permitted to store wastes produced from the EDS treatment units or treated in the Environmental Enclosures. These waste are as follows: neutralent and rinseates, used and unused decontamination solution and containment pans liquids, decontaminated metal parts and fragments, potentially agent-contaminated dunnage/packing material, spent carbon from the Environmental Enclosure Air Filtration System (AFS) and the CSU H1102 Igloo Containment System, spent prefilters and high efficiency particulate air (HEPA) filters from the Environmental Enclosure AFS, used personal protective equipment (PPE), miscellaneous solid and liquid wastes as a result of support, maintenance, and cleanup activities, laboratory liquid and solid wastes, Grayloc® Seal and O-rings, and boiler blow down solids that have been characterized as hazardous waste and do not possess container headspace concentrations greater than or equal to 1 VSL (vapor screening level).

3-4b(3) Roll-off Container Storage Unit adjacent to CSU H1103

The roll-off container storage unit adjacent to CSU H1103 is permitted to store metal (non-porous) parts and over-pack containers, pore-filters, HEPA filters, Grayloc Seal, and O-rings that have been cleared to less than the Vapor Screening Level (VSL or 0.003 mg/cubic meter) and PPE, wood pallets, or other porous waste materials that have never been contaminated or in contact with liquid agent.

3-4b(4) EDS Treatment Units

The two EDS treatment units are permitted to treat/destroy overpacked munitions, Department of Transportation (DOT) cylinders, and other miscellaneous items (ignition cartridges, propellant) currently stored at PCD that contain mustard agents (distilled sulfur mustard [HD]/mustard-T mixture [HT]).

3-4b(5) Container Treatment in Environmental Enclosure

When treating (decontaminating) contaminated overpack containers, packing material, PPE, and other miscellaneous items (buckets, sumps, step pans, catch trays, etc.) in containers inside the Environmental Enclosures, the permittee will follow procedures detailed in Annex I of the SOP for EDS Phase 2 Steam Series Units, Revision 1, December, 2014 (see **Attachment 9** of this Permit).

3-4c WASTE PRE-ACCEPTANCE REVIEW AND APPROVAL PROCESS

Review Prior to Storage in CSU H1102 of Items from the G-Block Igloos

Items for storage in CSU H1102 and subsequent treatment in the EDS have been previously stored in the PCD Hazardous Waste Permitted Storage Igloos, G203, G1009, G1107, G1109 and G1110. Munition type, condition, and presence of absence of liquids and energetic, as well as DOT cylinders and miscellaneous items, will have been verified and documented in the PCD Operating Record.

3-4d TREATMENT VERIFICATION SAMPLING AND ANALYSIS

Process sampling and analysis will be performed at the completion of each EDS treatment batch. Sampling and analysis will include 1) EDS neutralent waste analysis, 2) EDS interior vapor screening prior to opening the Containment Vessel door, and 3) rinse water sampling and analysis. **Table 3-4-3** identifies the sampling equipment methods.

3-4d(1) Neutralent Waste Sampling and Analysis

Upon completion of each treatment process batch, the neutralent will be collected and analyzed for treatment verification. A sample will be collected from the EDS sample valve assembly and placed into a sample container. The sample container will be packaged (double packed) into a larger container and the air inside the larger container monitored with low-level near real-time (NRT) monitors to verify the vapor concentration is below the VSL for mustard. Before the liquid neutralent sample is taken out of the Environmental Enclosure and transferred to the onsite Mobile Analytical Platform (MAP), the sample container is monitored to ensure it is not contaminated with chemical agent. The exterior of the container is monitored with the MINICAMS/heat-traced sample line at the sample table location in accordance with ECBC IOP MT-02 Attachment 10 of this permit.

3-4d(1)(a) Neutralent samples will be analyzed for mustard agent using **IOP MT-60**, Revision 1. Chemical agent analysis will be performed on every batch of neutralent generated. If the analytical results indicate agent concentration greater than 50 mg/L the waste will be re-processed through the EDS unit.

3-4d(1)(b) Neutralent samples will be analyzed for RCRA characterization. RCRA characterization will be performed for every tote of neutralent generated. An alternate frequency, based on a statistical analysis and consideration of all other hazardous constituents present in the munitions and/or materials

being treated and the analytical data for verification of characterization/treatment obtained, may be submitted as a Class II Permit Modification Request for review by the Department.

3-4d(2) Vapor Sampling and Analysis

Upon verification of treatment through neutralization analysis and rinsing of the EDS unit, vapor samples will be collected and analyzed, prior to opening the Containment Vessel. All vapor samples will be collected, in accordance with Procedure 14, using the vapor sample assembly located on the Vessel door. The vapor sample will be adsorbed onto a Depot Area Air Monitoring System (DAAMS) tube, which will then be desorbed and analyzed for chemical agent using **IOP MT-11** DAAMS Tubes Monitoring Procedures, **Attachment 10** of this Permit. Then the DAAMS tube is transferred to the onsite Mobile Analytical Platform (MAP) for analysis via **ECBC IOP MT13**, Analysis of CWM on DAAMS Tubes Using GCMSD Systems, **Attachment 10** of this Permit.

If the analytical results indicate headspace concentrations greater than or equal to 1 VSL, CDPHE will be notified via e-mail or verbal communication of an "Off-Normal Condition." (Off-Normal Condition is defined as a headspace result concentration of ≥ 1 VSL.) Notification will consist of the following information at a minimum: Date, Occurrence Time, Occurrence Number, Headspace Concentration, Detonation Number, Number and Type of wastes treated, Number of Shape Charges used, and any operating condition deviations (temp, press, reagent, treatment time, equipment failure or malfunction, etc). The Permittees may open the Containment Vessel door using PPE consistent with EDS operation SOPs after providing CDPHE notification.

3-4d(3) Rinsate Sampling and Analysis

Rinsate will be analyzed for RCRA characterization. RCRA characterization will be performed for every tote of rinsate generated. An alternate frequency, based on a statistical analysis and consideration of all other hazardous constituents present in the munitions and/or materials being treated and the analytical data for verification of characterization/treatment obtained, may be submitted as a Class II Permit Modification Request for review by the Department.

3-4d(4) Contaminated Energetics and Solidified Agent

Treatment effectiveness of any energetic and solidified agent will be determined by visual observation for unexploded components and solid-phase agent. Any observed unexploded components and munitions components with solidified agent will be removed, placed in appropriate containers, and transferred back to CSUH1102. Documentation of unexploded components and solidified agent observed and transported will be maintained in the Operating Record.

3-4d(5) Container Treatment in Environmental Enclosure

When treating (decontaminating) contaminated overpack containers, packing material, PPE, and other miscellaneous items in containers inside the Environmental Enclosures, the permittee will follow procedures detailed in Annex I of the SOP for EDS Phase 2 Steam Series Units, Revision No. 1, December 2014, Attachment 9 of this permit. If items/materials are submerged in a bleach solution and will remain submerged for disposal purposes, a liquid sample will be collected and analyzed to the clearance level for mustard agent in bleach solution.

Table 3-4-1. RCRA Hazardous Waste Designation, Rationale, and Disposition

Waste Material	Source	EPA Waste Codes ^{a,b}	Basis for Designation	Disposition of Waste Material
Munitions Removed from Overpacks	PCD	D001, D002, D003, D004-D011, D022, D028, D029, D030, D034, D039, D040, D043 K901, K902	<p>Mustard agent HD/HT carries EPA waste codes D002. Propellant carries D001.</p> <p>Munitions to be processed in the EDS may or may not contain energetic components (fuzes, bursters) and may or may not contain chemical agent mustard fill. Energetics are Class 1.1 explosives per 49 CFR 173.53; thus, are reactive (D003).</p> <p>Several TC organics have been identified as degradation compounds of mustard agents. These analytes and corresponding regulatory levels are:</p> <ul style="list-style-type: none"> • chloroform (D022) 6.0 ppm • 1,2-dichloroethane (D028) 0.5 ppm • 1,1-dichloroethylene (D029) 0.7 ppm • hexachloroethane (D034) 3.0 ppm • tetrachloroethylene (D039) 0.7 ppm • trichloroethylene (D040) 0.5 ppm • vinyl chloride (D043) 0.2 ppm <p>The State of Colorado lists waste chemical weapons as K901.</p> <p>The State of Colorado lists containers (such as overpacks) contaminated through contact with waste chemical weapons as K902. The chemical agent may also contain TC metals since some munitions are constructed of specialty alloys containing heavy metals and the chemical agent over time may leach metals from munition casings. Also, explosive components may contain lead (D008) from lead azide. Mercury (D009) may also be present in the mustard agents as a contaminant. 2,4-dinitrotoluene (D030) may be present from energetics at or above regulation level of 0.13 ppm.</p>	Munitions will be detonated in the EDS, accessing the chemical fill. The chemical fill will then be chemically treated.

Table 3-4-1. RCRA Hazardous Waste Designation, Rationale, and Disposition

Waste Material	Source	EPA Waste Codes ^{a,b}	Basis for Designation	Disposition of Waste Material
DOT Cylinders Containing Mustard Agent (HD, HT)	DOT cylinders stored at PCD generated from drill and transfer operations	D002, D004-D011, D022, D028, D029, D034, D039, D040, D043 K901, K902	<p>Mustard agent HD/HT carries EPA waste codes D002</p> <p>Several TC organics have been identified as degradation compounds of mustard agents. These analytes and corresponding regulatory levels are:</p> <ul style="list-style-type: none"> • chloroform (D022) 6.0 ppm • 1,2-dichloroethane (D028) 0.5 ppm • 1,1-dichloroethylene (D029) 0.7 ppm • hexachloroethane (D034) 3.0 ppm • tetrachloroethylene (D039) 0.7 ppm • trichloroethylene (D040) 0.5 ppm • vinyl chloride (D043) 0.2 ppm <p>Waste Code K901 is applied because the DOT cylinders do not contain standard mustard agent.</p> <p>The State of Colorado lists containers (such as overpacks) contaminated through contact with waste chemical agent as K902.</p> <p>The chemical agent may also contain TC metals since some munitions are constructed of specialty alloys containing heavy metals and the chemical agent over time may leach metals from munition casings. Mercury (D009) may also be present in mustard agents as a contaminant</p>	DOT cylinders will be detonated in the EDS, accessing the chemical fill. The chemical fill then will be chemically treated.

Table 3-4-1. RCRA Hazardous Waste Designation, Rationale, and Disposition

Waste Material	Source	EPA Waste Codes ^{a,b}	Basis for Designation	Disposition of Waste Material
Agent-Contaminated Propellant	Miscellaneous items stored at PCD	D001, D003-D011, D022, D028, D029, D030, D034, D039, D040, D043 K901	<p>Propellant carries D001 and meets the definition of reactive under 6 CCR 1007-3 § 261.23(a)(8), and thus, carries reactive waste code D003.</p> <p>The State of Colorado lists chemical weapons as K901.</p> <p>Waste contaminated with chemical agent HD/HT may contain TC metals and TC organics associated with chemical agent HD/HT.</p>	Propellant will be placed into the EDS and detonated.
Agent-Contaminated Ignition Cartridges	Miscellaneous items stored at PCD	D001, D003-D011, D022, D028, D029, D030, D034, D039, D040, D043 K901	<p>Ignition cartridges to be processed in the EDS carry the characteristics of ignitability (D001) and may also contain energetic components (fuzes and bursters); energetics meet the definition of reactive under 6 CCR 1007-3 § 261.23(a)(8), and thus, carry reactive waste code D003.</p> <p>The primer in the ignition cartridge may contain barium nitrate (D005) and lead styphnate (D008).</p> <p>Waste contaminated with chemical agent HD/HT may contain TC metals and TC organics associated with chemical agent HD/HT.</p>	Ignition cartridges will be placed in the EDS and detonated.

Table 3-4-1. RCRA Hazardous Waste Designation, Rationale, and Disposition

Waste Material	Source	EPA Waste Codes ^{a,b}	Basis for Designation	Disposition of Waste Material
Potentially Agent-Contaminated Empty M2A1 Cans (Ammo cans)	Used to store waste propellant and ignition cartridges at PCD	D002, D004-D011, D022, D028, D029, D030, D034, D039, D040, D043 K902	The State of Colorado lists containers (such as M2A1 cans) contaminated through contact with waste chemical weapons as K902. Waste contaminated with chemical agent HD/HT may contain TC metals and TC organics associated with chemical agent HD/HT.	The M2A1 cans will be bagged, held at 70°F for 4 hours and then monitored to < 1 VSL using MINICAMS®. If monitoring results are < 1 VSL, the waste M2A1 cans will be placed in a roll-off container at CSU H1103. If > 1 VSL, the permittee will follow procedures detailed in Annex I of the SOP for EDS Phase 2 Steam Series Units, Attachment 9. If the wastes cannot be decontaminated to less than 1 VSL, the wastes will be containerized and placed into PCD permitted storage (for example, G1110) pending shipment to an offsite TSDF.
Potentially Agent-Contaminated Empty Metal Overpacks	Used to store leaking munitions	D002, D004-D011, D022, D028, D029, D030, D034, D039, D040, D043 K902	The State of Colorado lists containers contaminated through contact with waste chemical weapons as K902. Waste contaminated with chemical agent HD/HT may contain TC metals and TC organics associated with chemical agent HD/HT.	Will be placed in containers and monitored. If wastes are > 1 VSL, the solid wastes will be decontaminated following procedures in Annex I of SOP for EDS Phase 2 Steam Series Units, Attachment 9. Once cleared, the solid wastes will be placed in a roll-off container at CSU H1103.
Mustard Agent/MEA Neutralent	Generated from detonation of munition/DOT	D002, D004-D011, D018, D019, D022, D028, D029, D030,	Liquid neutralent waste may be corrosive (D002) and have a pH ≥12.5; may contain heavy metals from the munition casings and container components, thus, may contain TC	Liquid waste will be placed in containers and stored in permitted CSU H1103,

Table 3-4-1. RCRA Hazardous Waste Designation, Rationale, and Disposition

Waste Material	Source	EPA Waste Codes ^{a,b}	Basis for Designation	Disposition of Waste Material
Mustard Agent/MEA Neutralent Contintued	cylinders and chemical neutralization of chemical fill	D034, D039, D040, D043 K901	metals; may contain TC organics known to be degradation and decomposition products of mustard agent. Lead may be present from lead azide. Based on data from previous EDS operations, other TC organics that may be present in the neutralent waste are benzene (D018) and carbon tetrachloride (D019). The State of Colorado lists Chemical Weapons as K901 as hazardous waste/	pending shipment offsite to a permitted TSDF.
Rinse water	Generated from rinsing the EDS Containment Vessel following treatment	D004-D011, D018, D019, D022, D028, D029, D030, D034, D039, D040, D043 K902	May contain TC organics and TC metals from residues in the EDS Containment Vessel following treatment. The State of Colorado lists residues resulting from treatment of chemical agent and any soil, water, debris, or containers contaminated through contact with K901-listed waste chemical weapons as K902. The State of Colorado lists K902 as any water contaminated through contact with K901-listed waste chemical weapons.	Liquid waste will be placed in containers and stored in permitted CSU H1103, pending shipment offsite to a permitted TSDF.
Used Decontamination Solutions and Containment Pan Liquids	Generated from the decontamination of the EDS Containment Vessel and/or components with a bleach/water solution	D002, D004-D011, D018, D019, D022, D028, D029, D030, D034, D039, D040, D043 K902	May be corrosive due to bleach. May contain TC organics from residues in the EDS Containment Vessel following treatment. The State of Colorado lists residues resulting from treatment of chemical agent and any soil, water, debris, or containers contaminated through contact with K901-listed waste chemical weapons as K902. The State of Colorado lists K902 as any water contaminated through contact with K901-listed waste chemical weapons.	Liquid waste will be placed in containers and stored in permitted CSU H1103, pending shipment offsite to a permitted TSDF.

Table 3-4-1. RCRA Hazardous Waste Designation, Rationale, and Disposition

Waste Material	Source	EPA Waste Codes ^{a,b}	Basis for Designation	Disposition of Waste Material
Decontaminated Metal Parts and Fragments	Generated from treatment of munitions/DOT cylinders in the EDS	D004-D011 K901	Munition casings, metal parts, and fragments are composed of metal alloys and may contain TC metals. The State of Colorado lists Chemical Weapons as K901 hazardous waste.	Will be placed in containers and stored in permitted CSU H1103 and/or the H1103 Roll-Off Container Storage Area, pending shipment offsite to a permitted TSDF.
Miscellaneous Solid Waste (Hoses, Valves, Absorbent Rags and Wipes)	Generated during EDS operations	D004-D011, D018, D019, D022, D028, D030, D034, D039, D040, D043 K902	TC organics and metals may be present as a result of chemical agent mustard contamination. The State of Colorado lists K902 as any debris or containers contaminated through contact with K901-listed waste chemical weapons.	Wastes will be placed in containers and air monitored. If wastes are > 1 VSL, the solid wastes will be decontaminated following procedures in Annex I of SOP for EDS Phase 2 Steam Series Units, Attachment 9. Once cleared, the solid wastes will be placed in a roll-off container at CSU H1103 or in containers for storage inside CSU H1103, as appropriate, pending shipment offsite to a permitted TSDF.
Potentially Agent Contaminated Dunnage/Packing Material and Secondary Containment Pallets	Generated from munition unpacking inside Environmental Enclosure for EDS Treatment;	D004-D011, D022, D028, D029, D030, D034, D039, D040, D043 K902	Waste contaminated with chemical agent HD/HT may contain TC metals and TC organics associated with chemical agent HD/HT. The State of Colorado lists K902 as any debris or containers contaminated through contact with K901-listed waste	If dunnage, packing material or secondary containment pallets are contaminated as verified by air monitoring results greater than 1 VSL, items will be decontaminated

Table 3-4-1. RCRA Hazardous Waste Designation, Rationale, and Disposition

Waste Material	Source	EPA Waste Codes ^{a,b}	Basis for Designation	Disposition of Waste Material
<p>Potentially Agent-Contaminated Dunnage/Packing Material and Secondary Containment Pallets Continued</p>	<p>pallets generated during storage activities</p>		<p>chemical weapons.</p>	<p>following procedures detailed in Annex I of the SOP for EDS Phase 2 Steam Series Units, Attachment 9. Once cleared, the solid wastes will be placed in a roll-off container at CSU H1103 or in containers for storage inside CSU H1103, as appropriate, pending shipment offsite to a permitted TSDF. If the wastes cannot be decontaminated to less than 1 VSL, the wastes will be containerized and placed into PCD permitted storage (for example, G1110) pending shipment to an offsite TSDF.</p>
<p>Unexploded or Untreated Energetic Components or Propellant Material following initial treatment in an EDS</p>	<p>Generated from incomplete detonation of munitions inside the EDS</p>	<p>D001, D003, D004-D011, D030 K901</p>	<p>Waste stream may be generated if incomplete detonation of munition energetics, propellant material, or donor charges occurs. Components may still be reactive and may contain heavy metals.</p> <p>The State of Colorado lists residues resulting from treatment of chemical agent as K901.</p> <p>Energetic components and propellant are components of a chemical munition.</p>	<p>Components will either be retreated in the EDS or returned to H1102 for future retreatment.</p>

Table 3-4-1. RCRA Hazardous Waste Designation, Rationale, and Disposition

Waste Material	Source	EPA Waste Codes ^{a,b}	Basis for Designation	Disposition of Waste Material
EDS Miscellaneous Liquid Wastes	Liquids such as chemical or supply spill, or other fluids, including waste oil and solvents from routine maintenance operations.	D001, D002, D004-D011, D018-D043, U080	Liquids may contain TC metals and/or TC organics. Routine maintenance operations may generate waste oils and solvents. Liquids may be ignitable and/or corrosive.	Will be placed in containers and stored in permitted CSU H1103, pending shipment offsite to a permitted TSDF.
Spent Carbon (from Environmental Enclosure Air Filtration System [AFS] and CSU Igloo Containment System)	Generated from changeout activities	D004-D011, D018, D019, D022, D028, D030, D034, D039, D040, D043 K902	May be contaminated with chemical agent; thus, may contain TC metals and TC organics associated with chemical agent mustard. The State of Colorado lists K902 as any debris or containers contaminated through contact with K901-listed waste chemical weapons.	Will be placed in containers and stored in permitted CSU H1103, pending shipment offsite to a permitted TSDF.
Spent Prefilters and HEPA Filters from the Environmental Enclosure (AFS)	Generated from changeout activities	D004-D011, D018, D019, D022, D028, D030, D034, D039, D040, D043 K902	May contain TC metals and TC organics associated with chemical agent mustard. The State of Colorado lists K902 as any debris or containers contaminated through contact with K901-listed waste chemical weapons.	Will be placed in containers and stored in permitted CSU H1103 or H1103 roll-off container, pending shipment offsite to a permitted TSDF.
Used PPE (Includes Gloves, Masks, and Other Protective Gear)	Generated from personnel use in providing worker protection from chemical agent	D004-D011, D018, D019, D022, D028, D030, D034, D039, D040, D043	The State of Colorado lists K902 as any debris or containers contaminated through contact with K901-listed waste chemical weapons.	Will be placed in containers and stored in permitted CSU H1103, pending shipment offsite to a permitted TSDF.

Table 3-4-1. RCRA Hazardous Waste Designation, Rationale, and Disposition

Waste Material	Source	EPA Waste Codes ^{a,b}	Basis for Designation	Disposition of Waste Material
		K902		
Grayloc [®] Seal and O-Rings	Generated from the EDS Metal Grayloc Door Rings	K902	The State of Colorado lists K902 as any debris or containers contaminated through contact with K901-listed waste chemical weapons.	Will be placed in containers and stored in permitted CSU H1103 or H1103 roll-off, pending shipment offsite to a permitted TSDF.
Solid Laboratory Waste	Generated from Mobile Analytical Platform operations	D004-D011, D018, D019, D022, D028, D030, D034, D039, D040, D043 K902	Solids such as decontaminated labware, vials, broken glassware, wipes, lab trash, and sampling equipment, may contain TC organics associated with mustard agent. The State of Colorado lists K902 as any debris or containers contaminated through contact with K901-listed waste chemical weapons.	Will be placed in containers and stored in permitted CSU H1103, pending shipment offsite to a permitted TSDF.
Liquid Laboratory Waste	Generated from Mobile Analytical Platform operations	D001, D002, F001-F009, U002, U080, U154	Liquids may consist of decontaminated mustard agent working standards in bleach (sodium hypochlorite; spent solvents [for example, 2-propanol and acetone and any used chemicals such as acetone, methylene chloride, and methanol.]	Will be placed in containers and stored in permitted CSU H1103, pending shipment offsite to a permitted TSDF.
Boiler Blowdown Solids	Generated from Boiler/Chiller Container Subsystem	D004-D011	May contain heavy metals	Will be placed in containers and stored in permitted CSU H1103, pending shipment offsite to a permitted TSDF.

Table 3-4-1. RCRA Hazardous Waste Designation, Rationale, and Disposition (Continued)

Notes:

- ^a Waste codes may change based on sampling and analysis results.
- ^b State waste codes K901 and K902 are based on CDPHE-approved Pueblo Chemical Depot Waste Analysis Plan, April 28, 2011.
- ^c All mustard-related secondary waste will carry the D003 (reactive) waste code if the waste is found to be above the 1.0 vapor screening level (VSL) from headspace monitoring.

CFR	=	Code of Federal Regulations
CSU	=	Container Storage Unit
DOT	=	Department of Transportation
EDS	=	Explosive Destruction System
EPA	=	U.S. Environmental Protection Agency
HD	=	distilled sulfur mustard
HEPA	=	high efficiency particulate air
HT	=	mustard-T mixture
MEA	=	monoethanolamine
PCD	=	Pueblo Chemical Depot
PPE	=	personal protective equipment
ppm	=	parts per million
TC	=	Toxicity Characteristic
TSDF	=	treatment, storage, and disposal facility

3-4e TEST METHODS

3-4e(1) Process knowledge and sampling and analysis will be used as appropriate for characterizing waste. The Operating Record shall contain documentation of acceptable process knowledge that clearly demonstrates that the information relied upon for process knowledge is current and sufficient to identify the waste accurately and completely. **Table 3-4-2** lists the test methods that will be used for verifying treatment and characterizing wastes.

3-4e(2) Analytical methods used for waste characterization will be from: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, current edition; *Annual Book of ASTM Standards*, American Society for Testing and Materials, or other EPA recognized methods as referenced in the Colorado Hazardous Waste Regulations, 6 CCR 1007-3. Method Defined Parameters must use the method listed in Colorado Hazardous Waste Regulations, 6 CCR 1007-3; different revisions or alternative methods cannot be used.

3-4e(3) General laboratory quality assurance/quality control (QA/QC) procedures for chemical agent analysis will be conducted in accordance with the WAP - Appendix 3-2, U.S. Army's Edgewood Chemical Biological Center (ECBC), *Environmental Monitoring Laboratory, Laboratory and Monitoring Quality Control Plan for Chemical Materials Agency (CMA) and for Chemical Agent Standard Analytical Reference Material (CASARM)*, Revision 2.

3-4-e(4) Data produced and used for RCRA waste characterization must be reliable and of defined level of quality, scientifically valid, legally defensible, and of known and acceptable precision and accuracy, to make good environmental decisions.

A contract laboratory accredited in the National Environmental Laboratory Accreditation Program (NELAP) will be used for RCRA characterization sample analyses and that contract laboratory's quality assurance plan will be followed for those analyses. The Recovered Chemical Materiel Directorate (RCMD) will ensure the contract laboratory's QA/QC training program includes, at a minimum, sample custody procedures, an analyst training program, data review procedures, internal laboratory samples, and performance audits. The laboratory must have a data management system that allows them to meet analytical holding times and results reporting requirements. The laboratory must also achieve method detection limits sufficient to meet the established regulatory limits. The laboratory must also have

acceptable preparation, analytical, and cleanup methodologies. Documentation of the contract laboratory's QA/QC program, data management system, method detection limits, and methodologies must be documented in the Operating Record.

Table 3-4-2. Selected Parameters, Test Methods, and Rationale for EDS Process Wastes

Waste Stream	Parameter/Analysis	Test Methods ^{a,b,c}	Analysis Rationale
Mustard (HD/HT) Agent Neutralent	HD/HT ^d	IOP MT-60 Revision 1	Verify treatment level, of ≤ 50 ppm HD/HT, is met.
	TC Metals	Process knowledge or 1311 followed by 6010C; 7470A	Ensure safe handling, storage, and treatment; compliance with applicable regulations; ensure that all physical and chemical characteristics are known prior to disposition; determine further waste management needs.
	TC SVOCs	Process knowledge or 1311 followed by 8270D	
	TC VOCs	Process knowledge or 1311 followed by 5030B/ 8260B	
	pH	Process knowledge or 9040C	Process knowledge will be used for RCRA waste characterization where appropriate.
	Ignitability	Process knowledge or 1010A or 1020B	
Rinsewater	HD/HT	IOP MT-60 Revision 1	Ensure safe handling, storage, and treatment; compliance with applicable regulations; ensure that all physical and chemical characteristics are known prior to disposition; determine further waste management needs.
	TC Metals	Process knowledge or 1311 followed by 6010C; 7470A	
	TC SVOCs	Process knowledge or 1311 followed by 8270D	
	TC VOCs	Process knowledge or 1311 followed by 5030B/8260B	Process knowledge will be used for RCRA waste characterization where appropriate.
	pH	Process knowledge or 9040C	

Table 3-4-2. Selected Parameters, Test Methods, and Rationale for EDS Process Wastes

Waste Stream	Parameter/Analysis	Test Methods ^{a,b,c}	Analysis Rationale
Rinse water Continued	Ignitability	Process knowledge or 1010A or 1020B	

Used Decontamination Solution ^e	HD/HT ^d (as applicable)	IOP MT-60 Revision 1	<p>The completeness of decontamination is verified by testing the liquid and determining the concentration of HD/HT.</p> <p>Ensure safe handling, storage, and treatment; compliance with applicable regulations; ensure that all physical and chemical characteristics are known prior to disposition; determine further waste management needs.</p> <p>Process knowledge will be used for RCRA waste characterization where appropriate.</p>
	TC Metals	Process knowledge or 1311 followed by 6010C; 7470A	
	TC SVOCs	Process knowledge or 1311 followed by 8270D	
	TC VOCs	Process knowledge or 1311 followed by 5030B/8260B	
	pH	Process knowledge or 9040C or 9045D	
	Ignitability	Process knowledge or 1010A or 1020B	

Table 3-4-2. Selected Parameters, Test Methods, and Rationale for EDS Process Wastes

Waste Stream	Parameter/Analysis	Test Methods ^{a,b,c}	Analysis Rationale
Spent Carbon, Prefilters, and HEPA Filters (from the Environmental Enclosure Air Filtration Systems [AFSs] and CSU H1102)	HD/HT ^d	IOP MT-11 followed by IOP MT-13 or IOP MT-02 Section 9.0	Verify screening level of < 1 VSL is met.
	TC Metals ^f	Process knowledge	Ensure safe handling, storage, and treatment; compliance with applicable regulations; determine further waste management needs.
	TC Organics	Process knowledge	
Miscellaneous Liquids (Including Chemical or Supply Spill or Other Fluids Including Waste Oil and Solvents)	HD/HT ^d	IOP MT-60 Revision 1	Ensure safe handling, storage, and treatment; compliance with applicable regulations; ensure that all physical and chemical characteristics are known prior to disposition; determine further waste management needs.
	Total Metals	Process knowledge or 1311, 7470A, and 7471B, 6010C, 3010A as applicable	
	TC SVOC's TC VOC's	Process knowledge or 1311 8260B, 8270D	Process knowledge will be used for RCRA waste characterization where appropriate.
	pH	Process knowledge or 9040C	
	Ignitability	Process knowledge or 1010A or 1020B	

Table 3-4-2. Selected Parameters, Test Methods, and Rationale for EDS Process Wastes (Continued)

Waste Stream	Parameter/Analysis	Test Methods ^{a,b,c}	Analysis Rationale
Liquid Laboratory Waste	HD/HT ^d	IOP MT-60 Revision 1	Ensure safe handling, storage, and treatment; compliance with applicable regulations; ensure that all physical and chemical characteristics are known prior to disposition; determine further waste management needs. Process knowledge will be used for RCRA waste characterization where appropriate.
	TC Metals	Process knowledge or 1311, 7470A, and 7471B, 6010C, 3010A as applicable	
	TC Organics	Process knowledge or 1311 8260B, 8270D	
	pH	Process knowledge or 9040C	
	Ignitability	Process knowledge or 1010A or 1020B	
Solid Laboratory Waste (Including Labware, Sampling Equipment, Plastic Bags, Sample Bottle Assemblies, and Packing Material)	HD/HT ^d	IOP MT-11 followed by IOP MT-13 or IOP MT-02, Section 9.0	Verify screening level of <1 VSL is met. Ensure safe handling, storage, and treatment; compliance with applicable regulations; determine further waste management needs and container management practices. Process knowledge will be used for RCRA waste characterization where appropriate
	TC Metals	Process knowledge or 1311	
	TC Organics	Process knowledge or 1311	

Table 3-4-2. Selected Parameters, Test Methods, and Rationale for EDS Process Wastes (Continued)

Waste Stream	Parameter/Analysis	Test Methods ^{a,b,c}	Analysis Rationale
Miscellaneous Solids (Including Spill Cleanup, Debris, Decontaminated Metal Parts, Fragments, Grayloc [®] Seals and O-rings)	HD/HT ^d	IOP MT-11 followed by IOP MT-13 or IOP MT-02 see Section 9.0	Verify screening level of < 1VSL is met. Ensure safe handling, storage, and treatment; compliance with applicable regulations; ensure that all physical and chemical characteristics are known prior to disposition; determine further waste management needs.
	TC Metals ^f	Process knowledge	
	TC Organics	Process knowledge	
Potentially Contaminated PPE	HD/HT ^d	IOP MT-11 followed by IOP MT-13 or IOP MT-02 see Section 9.0	Verify screening level of < 1 VSL is met. Ensure safe handling, storage, and treatment; compliance with applicable regulations; determine further waste management needs and container management practices.
	TC Organics	Process knowledge	

Table 3-4-2. Selected Parameters, Test Methods, and Rationale for EDS Process Wastes (Continued)

Waste Stream	Parameter/Analysis	Test Methods ^{a,b,c}	Analysis Rationale
Potentially Contaminated Dunnage and Packing Material	HD/HT	IOP MT-11 followed by IOP MT-13 or IOP MT-02 see Section 9.0	Verify screening level of < 1VSL is met. Ensure safe handling, storage, and treatment; compliance with applicable regulations; determine further waste management needs and container management practices. Process knowledge will be used for RCRA waste characterization when appropriate.
	TC SVOCs	Process knowledge	
	TC VOCs	Process knowledge	
Unexploded Energetic (if generated) Components or Propellant Material	HD/HT ^d	IOP MT-11 followed by IOP MT-13 or IOP MT-02 see Section 9.0	Ensure safe handling, storage, and treatment; compliance with applicable regulations; determine further waste management needs and container management practices.
Boiler Blowdown Solids	Total Metals	3010A or 3020A/6010C or 6020A; 7470A	Ensure safe handling, storage, and treatment; compliance with applicable regulations; determine further waste management needs and container management practices.

Notes:

- ^a Methods are from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, current edition, as referenced in the Colorado Hazardous Waste Regulations (6 CCR 1007-3) unless otherwise specified. The analytical methods listed may have been updated since this permit modification was developed. The most current methods will be used during EDS operations.
- ^b U.S. Army Test Methods will be used for mustard agent analysis.
- ^c Process knowledge will be used for RCRA waste characterization after an initial waste profile has been established per waste stream. The Army will perform additional analysis if process knowledge is determined to be insufficient or if abnormalities in process occur.
- ^d HD/HT will be analyzed as H.
- ^e If decontamination solutions were used for decontaminating chemical agent, then analyze for potential agent contaminants listed.
- ^f TC metals consist of arsenic (D004), barium (D005), cadmium (D006), chromium (D007), lead (D008), mercury (D009), selenium (D010), and silver (D011).

CSU	=	Container Storage Unit
HD	=	distilled sulfur mustard
HEPA	=	high efficiency particulate air
HT	=	mustard-T mixture
PPE	=	personal protective equipment
RCRA	=	Resource Conservation and Recovery Act
SVOC	=	semivolatile organic compound
TC	=	toxicity characteristic
VOC	=	volatile organic compound

Table 3-4-3. Sampling Equipment Methods and Frequency

Media and Waste Stream	Sample Type	Method and Equipment ^a	Frequency
<u>Vapor</u>			
Headspace Monitoring for HD/HT	Grab	Once chemical treatment is complete and the vessel has been drained and rinsed, a sample of the vapor headspace is collected and analyzed prior to opening the door. The sample is collected, in accordance with EDS SOP Attachment 9, into a sample bag and adsorbed onto a DAAMS tube before being transferred to the MAP.”	Each chemical agent treatment operation.
Headspace Monitoring of Solids: Metal Parts, Fragments, Dunnage, Spent Filters (pre-, HEPA, and carbon), Laboratory Waste, Personal Protective Equipment, Grayloc [®] Seals and O-rings Miscellaneous Solid Waste (hoses, valves, absorbent rags, wipes, etc.)	Grab	Waste material will be bagged inside a waste container and held at or above 70°F for 4 hours, then bagged contents will be monitored using MINICAMS or DAAMS tubes.	Every container of solid waste generated from an EDS chemical agent treatment process.

Table 3-4-3. Sampling Equipment Methods and Frequency

Media and Waste Stream	Sample Type	Method and Equipment ^a	Frequency
<u>Liquid</u>			
Neutralent (for Agent Analysis, Process Monitoring, and RCRA Waste Characterization)	Grab	For chemical agent samples, collect liquid sample from EDS Containment Vessel sample valve assembly per EDS SOP. For RCRA waste characterization sampling, collect sample from waste container using a COLIWASA or drum thief per EDS SOP or ASTM D5495-03.	For chemical agent analysis, each batch of neutralent generated. For RCRA waste characterization, perform sampling and analysis on the each batch of neutralent wastes generated from each campaign.
Rinsewater	Grab	For RCRA waste characterization sampling, collect sample from waste container using a COLIWASA, or drum thief per EDS SOP or ASTM D5495-03.	For RCRA waste characterization, perform sampling and analysis on the each tote container of rinsewater wastes generated from each campaign.
Used Decontamination Solutions	Grab	Collect liquid samples from waste container using a COLIWASA per EDS SOP or ASTM D5495-03.	Each container generated.

Notes:

^a As applicable, equipment used to sample waste materials will be disposable or designed for easy decontamination. Contaminated disposable equipment will be managed as hazardous waste, as appropriate. Cleanable equipment will be thoroughly decontaminated prior to reuse. Used decontamination solutions will be managed as hazardous waste.

ASTM = American Society for Testing and Materials
COLIWASA = composite liquid waste sampler
DAAMS = Depot Area Air Monitoring System
EDS = Explosive Destruction System
HD = distilled sulfur mustard
HEPA = high efficiency particulate air
HT = mustard-T mixture
MAP = Mobile Analytical Platform
RCRA = Resource Conservation and Recovery Act
SOP = Standing Operating Procedure

List of Appendices to WAP

Appendix 3-1 – PCD SOP and Plan:

The PCD Plans listed below and referenced in the Waste Analysis Plan are attached as Appendix 3-1. Hard copies of these documents are available for review by contacting Jeannine Natterman, Public Involvement Officer, Hazardous Materials and Waste Management Division at 303-692-3303.

1. **PCD Site Specific Monitoring Plan (SSMP)** - February, 2013
2. **PCD Site Specific Laboratory Quality Control Plan (LQCP)** – April, 2013
3. **PU-0000-W-465**, Toxic Chemical Laboratory Analytical Operating Procedures, Revision 13 Change 1, March 2014
4. **PU-0000-R-468**, Propellant Sampling for Stability Testing, Change 4, December 2013
5. **PU-0000-R-491**, Near Real Time (NRT) Monitoring Systems, Revision 16, December 2014

Appendix 3-2 – U.S. Army’s Edgewood Chemical Biological Center (ECBC), *Environmental Monitoring Laboratory, Laboratory and Monitoring Quality Control Plan for Chemical Materials Agency and for Chemical Agent Standard Analytical Reference Material*, Revision 2, Changes a., b., and c.

Appendix 3-3 – Pueblo Chemical Agent-Destruction Pilot Plant Explosive Destruction System at PCD – Site Specific Monitoring Plan

Appendix 3-4 – Pueblo Chemical Agent-Destruction Pilot Plant Explosive Destruction System at PCD – Chemical Agent Worker Population Limit Exceedance Plan