U.S. Army
Chemical Materials Agency
Program Manager for the Elimination of Chemical Weapons

Emergency Destruction Plan for a Recovered Chemical Agent Identification Set (CAIS) Item Using the Single CAIS Access and Neutralization System at Fort McClellan, Alabama

Final
Revision 1

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EXECUTIVE SUMMARY

This document describes the procedures and responsibilities for destruction of a chemical agent identification set (CAIS) ampule using the Single CAIS Access and Neutralization System (SCANS) at Fort McClellan, Alabama (FTMC).

An ampule from a K951 or K953 CAIS has been recovered at FTMC. Assessment of the ampule indicated it contained 2 milliliters (mL) of either distilled mustard agent (HD) or lewisite (L) dissolved in 38 mL of chloroform or 4 mL of nitrogen mustard (HN-1) dissolved in 36 mL chloroform. The ampule has been overpacked in a multiple round container and placed in the FTMC interim holding facility (IHF) for storage. SCANS will be deployed to FTMC to destroy the ampule and treat the chemical agent inside.

A maximum credible event (MCE) is an accidental breakage of the ampule before it is sealed inside the SCANS container. Such as accident would result in one of the following:

- The release of 2 mL of L and 38 mL of chloroform to the environment, resulting in a no deaths hazard distance of 1 meter and a no effects distance of 15 meters

- The release of 2 mL of HD and 38 mL of chloroform to the environment resulting in a no deaths hazard distance that is too small to model and a no effects distance of 5 meters

- The release of 4 mL of HN-1 and 36 mL of chloroform to the environment resulting in a no deaths hazard distance that is too small to model and a no effects distance of 10 meters.

This SCANS Emergency Destruction Plan describes the SCANS and how it will be employed for the safe and effective destruction of the CAIS ampule and treatment of the

chemical agent it contains. Wastes from the treatment process will be contained inside the SCANS and transported to a permitted treatment, storage, and disposal facility for further disposition.

A hazard assessment was prepared and is included as annex A. Hazards identified from the concept of operations and historical information were assigned risk assessment codes (RACs) based on the severity and probability of each hazard scenario. Nineteen hazards were identified; 17 were assigned a controlled RAC 3 and 2 were assigned a controlled RAC 4. All are acceptable with review.

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SECTION 1
INTRODUCTION

This document describes the procedures and responsibilities for destruction of a chemical agent identification set (CAIS) item using the Single CAIS Access and Neutralization System (SCANS) at the Fort McClellan, Alabama (FTMC).

1.1 Scope

The scope of this Plan begins with preparation of the SCANS for receipt of the CAIS item and covers all activities through management of wastes generated by the treatment process.

1.2 Objective

This Plan identifies responsibilities of the participating agencies and describes the procedures in sufficient detail that participating agencies will be able to identify permit requirements (none are anticipated), Standing Operating Procedures (SOPs), and other operational documentation that may be needed for each agency to carry out its responsibilities under this Plan.

1.3 Background

CAIS were used from the 1920s through the 1960s to train military personnel to identify and respond to chemical agent. In the past, CAIS items that were not used were often disposed of by burial. Consequently, intact CAIS items are occasionally found at former and present day military installations. When CAIS items are found, they are destroyed in a manner that ensures worker safety and protection of public health and the environment. The SCANS is a system specially designed to treat individual CAIS items. The ampule at FTMC was discovered while conducting work at a cleanup site on the

installation. The ampule has been placed inside a multiple round container and moved to the FTMC interim holding facility (IHF).

1.4 Environmental Considerations

The SCANS is a total containment CAIS item accessing and treatment system. Once sealed inside the SCANS container the CAIS item is isolated from the environment. Thus, there is very little risk of any neutralization wastes being released to the environment either as liquid or vapor. Waste products from the SCANS process consists of the SCANS container (with the neutralization products inside) and the system overpack used for shipping the wastes to a Resource Conservation and Recovery Act (RCRA)-permitted treatment, storage, and disposal facility (TSDF).

1.5 CAIS Items to be Destroyed

The current project is to destroy and treat a single CAIS ampule. The ampule is from a K951 or K953 CAIS and has been assessed to contain dilute chemical warfare agent. The ampule is a heat-sealed glass container 7.5 inches long and 1 inch in diameter. It contains 2 milliliters (mL) of either distilled mustard agent (HD) or lewisite (L) dissolved in 38 mL of chloroform or 4 mL of nitrogen mustard (HN-1) dissolved in 36 mL of chloroform. The chemicals of concern for the current project are HD, L, HN-1, and chloroform.

SECTION 2
ORGANIZATION

The participating agencies are identified in the following paragraphs. Their specific roles and responsibilities are described throughout this document and are summarized in section 10. Figure 2-1 shows the organization for this project.

The FTMC Site Manager is responsible for all activities conducted at FTMC and will approve location of the SCANS site. The Product Manager for Non-Stockpile Chemical Materiel (PMNSCM) is responsible for SCANS operations and will coordinate directly with FTMC to plan for the SCANS deployment. PMNSCM will coordinate directly with the Guardian Brigade (formerly Technical Escort Unit [TEU]) and FTMC to ensure that site safety concerns have been addressed before initiating SCANS operations. Duties of the Site Safety and Health Officer (SSHO) are described in the SCANS Health and Safety Plan (PM ECW, 2003).

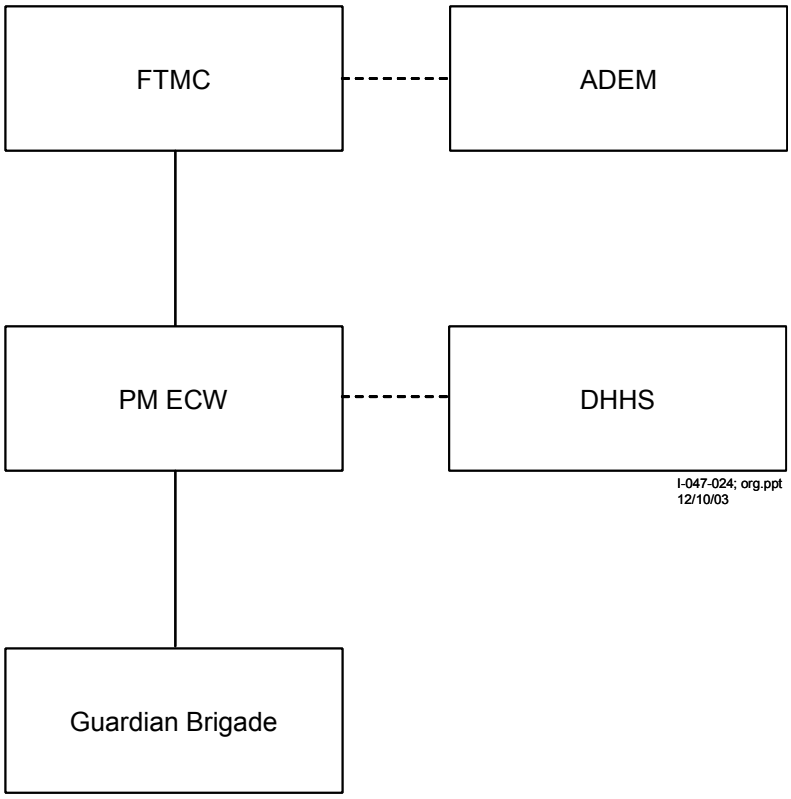
The following paragraphs describe the primary organizations participating in this project.

2.1 FTMC

The FTMC is the supported agency and responsible for all activities at the site.

2.2 PMNSCM

The PMNSCM provides funding and programmatic execution, and maintains overall operational control of the SCANS for the disposal of recovered CAIS. PMNSCM also provides the SCANS unit.



Legend

Direct Support

Coordination Lines

Figure 2-1. Organization for FTMC Emergency Destruction Plan

2.3 Guardian Brigade

The Guardian Brigade handles the recovered CAIS and operates the SCANS for PMNSCM.

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SECTION 3
SITE DESCRIPTION

The following paragraphs describe the location and layout of the SCANS site.

3.1 Site Location

The CAIS item to be destroyed is located in the IHF in Area T-38 (see the FTMC IHF Plan). Figure 3-1 shows the location of the IHF.

3.2 SCANS Location

The SCANS site will be located adjacent to the IHF in a convenient location that will not obstruct access to the IHF.

3.3 Site Layout

The SCANS site consists of the following features:

- Exclusion zone where the CAIS item will be unpacked from its overpack, loaded into the SCANS container, and treated.

- Contamination reduction zone (personnel decontamination station [PDS]) where equipment and personnel will enter and leave the Exclusion Zone. After the CAIS item has been treated, the SCANS container will be brought from the Exclusion Zone into the PDS where it will be packaged inside Container 1. After Container 1 has been sealed and necessary data recorded, it will be removed to the Support Zone where it will be prepared for transportation to the TSDF.

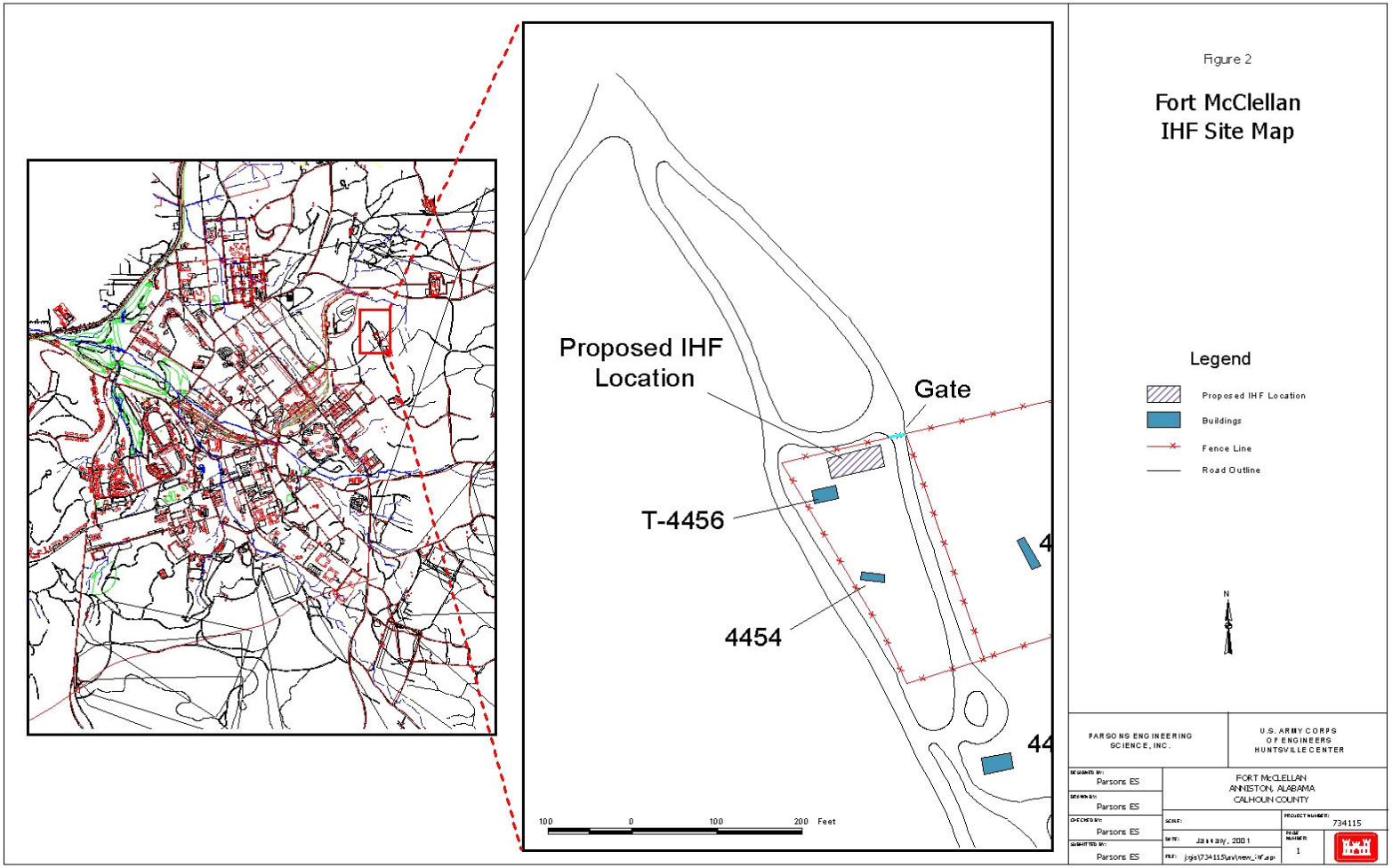

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Figure 3-1. Location of SCANS Site at FTMC

- Support Zone, where command and control personnel, supplies, and emergency responders will be located.

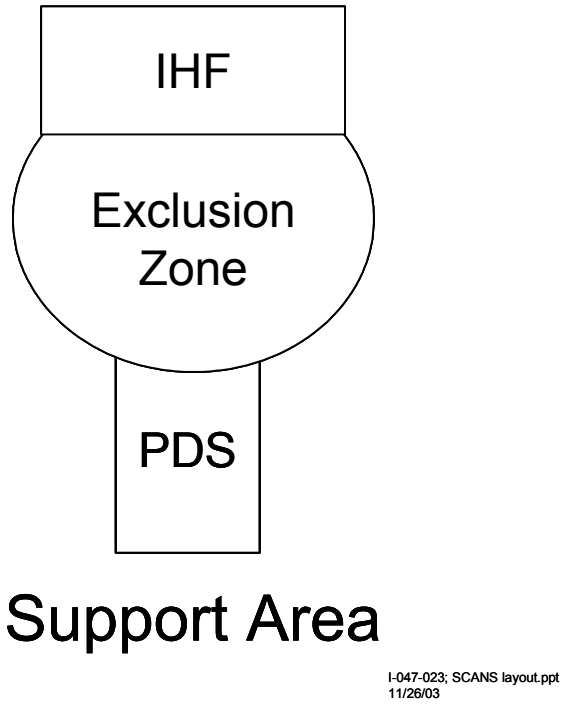

Figure 3-2. Layout of SCANS Site

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SECTION 4
SYSTEM DESCRIPTION

This section describes the components of the SCANS.

4.1 SCANS

The SCANS consists of the SCANS shipping container, SCANS container, and pre-measured reagent.

4.1.1 SCANS Shipping Container. The SCANS shipping container consists of two overpack containers: Container 1 and Container 2. Both containers are 20 gallons in size. Container 1 is the overpack for the SCANS container. Container 1 also contains the dry reagent (1,3-dichloro-5,5-dimethylhydantoin [DCDMH]). Container 2 contains two glass bottles for the Blue process. One bottle will be used during operations and the second bottle will be available as a spare. One of these bottles (depending on the type of CAIS to be treated) will be used and the other will be left in Container 2.

After the SCANS has been used, the SCANS cylinder with the neutralization products inside will be placed back inside Container 1 for transportation to the TSDF. Container 2 will be used as the overpack for other hazardous waste such as disposable personal protective equipment (PPE) and the unused reagent bottle. Container 2 will also be sent to a TSDF for disposition.

4.1.2 SCANS Container. The SCANS container is a cylindrical plastic (Kynar®) receptacle containing two specially designed cradles, one for an individual CAIS item, and the other for the reagent bottle. After placing the CAIS item and reagent bottle into their respective cradles, the container is sealed. The CAIS item and reagent bottle are broken using a metallic rod (the break pin) which slides through double O-ring seals of a fitting on the side of the SCANS container. After the CAIS item and reagent bottle have been broken, a screw cap with a third O-ring seal is secured over the break pin to

prevent slipping and to provide a positive pressure seal. The contents of the CAIS item and the reagent bottle are then mixed by a gentle manual shaking of the SCANS container. Chemical agent treatment takes place in the sealed SCANS container. The entire SCANS container is sent to the TSDF. It is never opened after the reagent and chemical agent bottles are broken and the contents mixed.

4.1.3 Blue Process Reagent. The Blue Process reagent is used for all CAIS items except agent-impregnated charcoal. The Blue Process reagent consists of the following chemicals:

- 1,304 mL chloroform
- 1,304 mL t-butanol
- 92 mL water
- 282 grams (g) DCDMH.

The liquid reagents are premixed and shipped to the SCANS site in a reagent bottle inside Container 2. The dry ingredient (DCDMH) comes to the SCANS site as a pre-measured amount in a plastic packet inside Container 1. Separation of the solid and liquid ingredients in separate shipping containers provides protection against premature mixing of the ingredients should the glass bottle containing the liquid reagent be broken during transportation to the SCANS site.

4.2 Security Requirements

Prior to treating the CAIS item, the SCANS itself has no special security requirements. Once the SCANS has been used to treat a CAIS item, it becomes hazardous waste and will be handled according to the chain-of-custody procedures prescribed by the U.S. Environmental Protection Agency (USEPA) for hazardous waste. Beyond that there are no additional security requirements.

The recovered CAIS item awaiting destruction is secured in an IHF where it can be protected from accidental damage or misappropriation following Army requirements for safeguarding this type of materiel in accordance with Army Regulation (AR) 190-11 Category II. The IHF is located in Area T-38. It is surrounded by a chain link fence that is 6 feet high and constructed of 2-inch mesh and 9 gauge diameter wire. When chemical warfare materiel (CWM) is in storage, U.S. Army Corps of Engineers, Mobile District (CESAM) will provide either a 24-hour armed guard or an intrusion detection system plus periodic surveillance, including checking the security of the IHF gate and locks.

4.3 Support Equipment

The SCANS is a man portable, manually operated device. Support equipment needed at the SCANS site is necessary for worker safety and contingency operations.

4.3.1 Electrical Power. The SCANS does not require electrical power. However, electrical power may be needed for lighting if the work area is inside a building. If the building does not have adequate lighting, a portable lighting system may be used.

4.3.2 Breathing Air Supply. The emergency response team will wear self-contained breathing apparatus (SCBA); therefore, a source of bottled air for breathing must be made available. The Guardian Brigade will either bring pre-filled SCBA to the site or will coordinate with a local provider to fill the SCBA bottles.

4.3.3 Command Post. A location will be provided for the SCANS team leader to prepare paperwork and conduct pre- and post-operation meetings with team members.

4.3.4 PDS. A PDS will be set up for personnel to remove PPE when leaving the Exclusion Zone. In the event of a MINICAMS® alarm in the Exclusion Zone, the PDS also will be used to monitor all equipment removed from the Exclusion Zone and to decontaminate personnel if they should become contaminated, either as the result of a

spill of chemical agent or exposure to other contamination present at the recovery site. The PDS is described in the Guardian Brigade operation orders.

4.3.5 Communication. The SCANS team leader will have the ability to communicate with local emergency response services in the event there is an emergency that requires response by medical, fire, or hazardous materials responders. If the SCANS site is remote and a cellular telephone will not work, then other arrangements must be made, such as a land line or radio.

4.4 Safety Equipment

The SCANS site will be provided with communication equipment, lighting, and spill response supplies for safe recovered CWM handling operations. In addition, the following equipment will be on hand in the work area or in a convenient nearby location as directed by the SSHO.

- A, B, C-rated fire extinguisher
- First aid supplies
- PDS.

In addition, all site personnel will be familiar with safety precautions described in this Plan and other pertinent plans such as the IHF Plan or the Chemical Safety Submission (CSS).

SECTION 5
SCANS OPERATIONS

The SCANS will be operated in accordance with established operating procedures. The following steps describe normal SCANS operations:

a. Obtain the assessments for the CAIS items to be destroyed (usually completed before the SCANS arrives at the site).

b. Arrive at the treatment location.

c. Conduct a pre-operational survey.

d. Unpack and inspect SCANS container and Blue Process reagent.

e. Move SCANS container, reagent, and other equipment into the work area.

f. Establish Exclusion Zone, Contamination Reduction Zone, Support Zone, and specific work areas as needed.

g. Unpack the CAIS item.

h. Place CAIS item into the SCANS container.

i. Prepare the reagent by pouring the DCDMH into the solvent bottle and shaking until the DCDMH is dissolved.

j. Place reagent bottle into SCANS container.

k. Seal the SCANS container.

l. Operate the break-pin mechanism to break open the CAIS item and reagent bottle so that the treatment reagent will have access to the chemical warfare agent.

m. Agitate the contents of the SCANS container for 10 minutes.

n. Place the SCANS container (with the treated CAIS item inside) inside a plastic bag and move it to the PDS. In the PDS, the container will be placed inside a second plastic bag inside Container 1 (the overpack). The overpack may then be sealed, moved to the support area, and prepared for transportation to the TSDF.

5.1 Pre-Operations

The SCANS site will be set up to include an Exclusion Zone (sufficient area around the CAIS item to allow workers to load and operate the SCANS), Contamination Reduction Zone (the PDS), and the Support Zone (everything outside the Exclusion Zone and the Contamination Reduction Zone).

Prior to toxic operations, a pre-operational survey is conducted. Chemical operations will not begin until all appropriate approvals have been obtained.

5.2 First Entry

Before the SCANS team enters the IHF, first entry monitoring will be performed (see paragraph 7.1 of this Plan). If chemical agent vapors are detected or if a spill or other unusual situation is discovered, the situation will be resolved to ensure a safe work environment before SCANS work will begin.

5.3 Unpacking the SCANS

The SCANS shipping container will be unpacked in the work zone. Container 2 will be opened enough to monitor the interior for chloroform. Assuming no leakage has occurred during transportation, the container will be opened all the way and the Blue Process reagent bottle removed. Container 1 will be opened and the SCANS container removed. The container will be opened and inspected for signs of damage during transportation. The open SCANS container, the reagent bottle, and necessary tools (wrench for tightening bolts, mallet for striking the break-pin, etc.) will be arranged on the catch trays.

5.4 Loading the SCANS

The CAIS, overpacked in a multiple round container, is retrieved from the IHF and brought outside the IHF to the SCANS work area. The multiple round container will be opened and the CAIS item will be removed and placed in the appropriate cradle inside the SCANS container. The DCDMH and reagent are mixed in the reagent bottle until the DCDMH has dissolved. The reagent bottle is then placed in its cradle in the SCANS container. The container will then be sealed and inspected.

5.5 Chemical Treatment

After the SCANS container is sealed, the break-pin is struck with a mallet so that the reagent bottle and CAIS item are broken, allowing the reagent to mix with the contents of the CAIS item. The break-pin is capped, then the SCANS container is manually agitated for 10 minutes. After 10 minutes agitation, the SCANS cylinder is placed inside a plastic bag and moved to the PDS.

In the PDS, the bagged SCANS container is placed inside a second plastic bag inside Container 1. After Container 1 has been sealed and inspected, it can be moved from the PDS to the support area and prepared for transport to the TSDF.

5.6 Closeout

Upon completion of operations, the SCANS site is closed out. Closeout activities include stowing all equipment and supplies and transferring hazardous waste to an approved TSDF (or arranging for its transfer).

5.7 Notifications

PMNSCM will notify the U.S. Department of Health and Human Services (DHHS) and FTMC will notify the Alabama Department of Environmental Management (ADEM) when the destruction is complete.

SECTION 6
WASTE MANAGEMENT

This section describes waste management and handling practices that will be used during SCANS operations.

6.1 Waste Descriptions

Potential waste streams generated from SCANS operations include:

- Process neutralent (the SCANS container with the treated CAIS item inside)
- Miscellaneous liquids (unused reagent, decontamination solutions from the PDS)
- Miscellaneous solids (PPE, PDS wastes, dunnage).

6.2 Process Neutralent

Process neutralent consists of the SCANS container with the neutralization products inside. Characterization of this waste will be based on generator knowledge of the material that was treated and the neutralization process used. During development of the process, samples of neutralization wastes generated from various kinds of CAIS items were analyzed for RCRA characterization (PMNSCM, 2003). Results of these analyses will serve as the basis for characterization of the treatment wastes.

6.3 Miscellaneous Liquids

6.3.1 Decontamination Wastes. The nature of the SCANS operation is such that there is very little likelihood of personnel or equipment becoming contaminated. However, a PDS will be established in the event an accident occurs resulting in contamination of personnel or equipment with chemical agent or reagent chemicals. Decontamination of PPE and equipment will only be performed if there is indication that the material has been exposed to a condition that might cause it to be contaminated. PPE and equipment will be monitored in the PDS to determine if contamination is present, as required.

If decontamination is necessary, decontamination wastes will be contained and managed as hazardous waste. Decontamination wastes will consist of water, decontamination solution (bleach and water), and small amounts of contamination such as chloroform and chemical agent (HD, L, or HN-1).

6.3.2 Unused Decontamination Solutions. Unused decontamination solutions will be kept for future operations or packaged for disposal as a hazardous waste. These items include bleach and water.

6.3.3 Unused Reagent. The SCANS comes with two Blue Process reagent bottles, one for use during operations and the second for use as a spare. Only one will be used to treat a single CAIS item and the other becomes waste. The waste reagent bottle (containing a chloroform, butanol, and water mixture) will be packaged inside Container 2 for disposal as hazardous waste.

6.4 Miscellaneous Solids

6.4.1 PPE. All contaminated PPE will be double bagged and monitored in accordance with Department of the Army (DA) Pamphlet (Pam) 385-61. Used PPE will be decontaminated (if needed), monitored, and containerized per the Guardian Brigade

procedures. Reusable items will be turned in to the agency that provided them for laundering and reissue. Disposable items will be managed as waste.

6.4.2 Dunnage. The CAIS item is currently overpacked inside a multiple round container and may have packing material around it to protect it from accidental breakage during storage and handling. When the CAIS item has been removed from its overpack, any packing material will become waste. If there is evidence that the packing material has become contaminated due to breakage or leaking of the CAIS item, then it will be decontaminated as appropriate and managed as hazardous waste. If there is not evidence of contamination, then the dunnage will not be decontaminated or treated in any manner other than to be packaged for disposal. The multiple round container is reusable and will be retained for future use.

6.5 Waste Characterization Parameters

CAIS items treated during SCANS operations will be characterized based upon process knowledge, analytical data, Raman spectroscopy analysis, and air monitoring. Thus, no additional characterization is required before treatment.

The SCANS Shipping Containers (Container 1 and Container 2 will be used as waste containers in accordance with Department of Transportation (DOT) and U.S. Environmental Protection Agency (USEPA) regulations. Each waste container will be labeled in accordance with the DOT and USEPA requirements. With the exception of recyclable material, wastes will be transported from the SCANS location to a RCRA-permitted TSDF for final disposition. If for some reason transportation cannot be effected before closeout of the SCANS site, the waste will be transferred to a temporary waste storage area (less than 90-day storage) pending transportation to the TSDF.

Table 6-1. Potential RCRA Hazardous Waste Codes and Basis for Classification

Description	Potential RCRA Waste Code	Basis for Classification	Disposition of Waste Material
Process Neutralent; generated from treatment of the CAIS item in the SCANS	D001, D002, D004-D011, D022, D028, D034, D039, D040, D043	The neutralent waste stream may be a RCRA ignitable waste; therefore, waste code D001 applies. The neutralent waste stream may be a RCRA corrosive waste; thus the waste code D002 applies. This waste stream may contain TC metals as a result of manufacturing impurities and TC organics as a result of degradation products from the chemical agents.	Liquid waste will be placed in containers and transported to a permitted TSDF. If for some reason transportation must be delayed, the waste may be stored in a less than 90-day container storage area pending shipment to a permitted TSDF.
Miscellaneous Liquids; includes unused reagent, rinse water, or other fluids.	D001, D002, D003, D004-D043	Liquid wastes may exhibit ignitability, corrosivity, and reactivity characteristics as well as contain TC metals, TC organics, and solvents due to their chemical composition and/or the presence of chemical agent.	Will be placed in containers and transported to a permitted TSDF. If for some reason transportation must be delayed, the waste may be stored appropriately in a less than 90-day storage area pending shipment to a permitted TSDF.
Miscellaneous Solids; includes used PPE (Gloves, Masks, and Other Protective Gear), and packing material	D001, D003, D004-D043, F001-F005	Solids may exhibit ignitability, corrosivity, and reactivity characteristics as well as contain TC metals, TC organics, and solvents due to their chemical composition and/or the presence of chemical agent.	Most PPE will be sent to the support laundry for reuse, and therefore, will not be designated a hazardous waste. If PPE cannot be sent to the laundry for reuse, it will be placed in containers and transported to a permitted TSDF. If for some reason transportation must be delayed, the waste may be stored in a less than 90-day storage area pending shipment to a permitted TSDF.

Notes:

CAIS = Chemical Agent Identification Set
PPE = personal protective equipment
RCRA = Resource Conservation and Recovery Act
SCANS = Single CAIS Access and Neutralization System
TSDF = treatment, storage, and disposal facility

SECTION 7
MONITORING PLAN

Monitoring will be conducted at the SCANS site for worker protection and to document any releases of hazardous materials to the environment.

7.1 First Entry Monitoring

The CAIS item is currently stored in an IHF. First entry monitoring of the IHF will be conducted in accordance with the IHF monitoring plan. The MINICAMS will be operated in accordance with Guardian Brigade MINICAMS SOP 3-1 and the Quality Control/Quality Assurance Plan for Chemical Agent Standard Reference Material. The IHF will be monitored for two consecutive cycles. Entry can proceed if both cycles indicate the airborne concentration of agent being monitored is below 1.0 time-weighted average (TWA).

7.2 Chloroform

It is possible that the reagent bottle containing chloroform could be broken or cracked during transportation to the SCANS site. To protect workers from exposure to potentially harmful levels of chloroform, a photoionization detector (PID) capable of detecting the total volatile organic compound concentration is recommended. The PID can provide a quick response and can detect 50 parts per million of chloroform in air.

7.3 Exclusion Area Monitoring

MINICAMS will be used to monitor the exclusion area during operations. The sample line will be located downwind in the immediate vicinity of workers to maximize the protection of workers, the public, and the environment. In the event of a MINICAMS alarm (readings greater than 0.75 TWA) confirmation Depot Area Air Monitoring System (DAAMS) samples will be collected at or near the MINICAMS sample line. If two

consecutive MINICAMS cycles indicate a concentration greater than or equal to the alarm level, the DAAMS tubes will be analyzed.

7.4 PDS Monitoring

In the event of a two consecutive MINICAMS alarms, MINICAMS will be used to monitor equipment and personnel at the PDS. Personnel monitoring will be conducted in accordance with DA guidance.

SECTION 8
CLOSEOUT PLAN

After the CAIS item has been destroyed, the SCANS site will be closed out. Wastes will be containerized, characterized, labeled, and transported to an appropriate disposal facility.

The goal of closeout is to return the SCANS site to the conditions that existed before chemical operations began. Specifically, all wastes that are generated will be removed from the site.

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SECTION 9
PUBLIC OUTREACH

The FTMC Site Manager will be responsible for public outreach at FTMC. Outreach functions are performed for FTMC by the CESAM Public Affairs Office (PAO). PMNSCM Public Outreach and Information Office (POIO) will provide support as needed.

Further questions should be directed to the individuals listed below. All information about this Emergency Destruction Plan will be distributed through PMNSCM. Telephone numbers and points of contact include:

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SECTION 10
ROLES AND RESPONSIBILITIES

The participating organizations include FTMC, PMNSCM, and the Guardian Brigade. To ensure successful project completion, each agency has both common and specific responsibilities they must perform. Common responsibilities include the following:

a. Coordinating with other organizations

b. Performing duties in accordance with accepted health, safety, and environmental procedures

c. Using established supply procedures and providing the supplies necessary to support their operations

d. Providing emergency response support

e. Developing training plans to ensure their employees are prepared to perform their assigned duties.

Specific responsibilities for each organization are presented in the following paragraphs.

10.1 FTMC

FTMC is the supported agency. FTMC responsibilities include the following:

a. Retain accountability for the recovered CAIS items until they have been destroyed.

b. Provide public outreach support.

c. Coordinate with the ADEM and, if appropriate, the USEPA for approval to implement this Plan.

d. Provide emergency response services for medical, fire, and hazardous materials.

e. Provide oversight of environmental compliance and health and safety.

f. Coordinate with the Guardian Brigade to ensure waste management is in compliance with RCRA requirements. A FTMC representative will sign hazardous waste manifests as the generator.

g. Provide physical security for the site.

h. Operate an Operations Center for emergency notifications, following established procedures.

i. Arrange for ambulance/Emergency Medical Technician (EMT) coverage at site.

10.2 PMNSCM

PMNSCM is responsible for developing and operating the SCANS and provides funding and programmatic direction and oversight. PMNSCM will:

a. Provide the SCANS unit.

b. Prepare a destruction plan for the item to be destroyed using SCANS.

c. Coordinate with DHHS for approval to implement this Plan.

d. Coordinate activities of the participating agencies. Has programmatic responsibility for ensuring that operations are accomplished according to this Plan and in a safe and environmentally acceptable manner.

e. Develop a hazard analysis (HA) that addresses the relative risk associated with recovered CAIS handling and SCANS operations.

f. Provide public outreach support to CESAM as requested.

g. Coordinate with PMNSCM and the Guardian Brigade to ensure appointment of an onsite SSHO (see paragraph 10.4 for responsibilities of the SSHO).

10.3 Guardian Brigade

The Guardian Brigade will:

a. Operate the SCANS.

b. Provide a SCANS Crew and be responsible for site setup, operations, and logistics.

c. Ensure management of wastes generated at the SCANS site is in compliance with applicable federal and state requirements.

d. Coordinate with PMNSCM to ensure appointment of an onsite SSHO (see paragraph 10.4 for responsibilities of the SSHO).

e. Provide PPE for Guardian Brigade personnel as needed for the work they will perform.

f. Notify the FTMC Operations Center of any accidents or releases of chemical agent.

10.4 SSHO

The responsibility for providing a government onsite SSHO is shared between the Program Manager for the Elimination of Chemical Weapons (PM ECW) (PMNSCM) and the Guardian Brigade. Each organization will provide qualified personnel who will serve in the capacity of an SSHO on a rotational basis. The SSHO will report directly to the safety manager or commander of his parent organization. Responsibilities of the SSHO include the following:

a. Conduct initial and daily (if the operation lasts more than one day) safety briefings.

b. Conduct inspections of the work areas to identify safety hazards and to monitor compliance with safe practices. Safe practices are identified throughout this Plan and in SOPs written for specific activities. Additional guidance may also be found in ARs and Pams (especially AR 385-10, AR and DA Pam 385-61, and AR and DA Pam 385-64), and in Occupational Safety and Health Administration (OSHA) regulations (especially 29 CFR 1910).

c. Advise the SCANS Team Leader and the PMNSCM/Guardian Brigade safety offices concerning safety implications of conditions at the SCANS site.

d. Initiate investigation of accidents and occupational illnesses.

e. Coordinate correction of any observed safety hazards.

f. Coordinate with FTMC, PMNSCM, Guardian Brigade, and DA safety offices, apprising them of hazards and unsafe practices and corrective actions taken.

Responsibilities of the SSHO are further described in the SCANS Health and Safety Plan (HASP) (PM ECW 2003).

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SECTION 11
RESULTS OF HAZARD ANALYSIS

The following paragraphs provide a summary of the information contained in the PMNSCM HA (annex A).

11.1 PMNSCM HA

Procedures described in this Emergency Destruction Plan were evaluated in accordance with the Non-Stockpile Chemical Materiel Product (NSCMP) *System Safety Management Plan* (SSMP) (PMCD, 2001). The assessment concluded that the items slated for destruction in the SCANS could be destroyed safely.

The MCE for this operation was determined to be the accidental release of the contents from one CAIS ampule as the consequence of the ampule breaking while it was being loaded into the SCANS. Such as accident would result in one of the following:

- The release of 2 mL of L and 38 mL of chloroform to the environment resulting in a no deaths hazard distance of 1 meter and a no effects distance of 15 meters

- The release of 2 mL of HD and 38 mL of chloroform to the environment resulting in a no deaths hazard distance that is too small to model and a no effects distance of 5 meters

- The release of 4 mL of HN-1 and 36 mL of chloroform to the environment resulting in a no deaths hazard distance that is too small to model and a no effects distance of 10 meters.

The HA identified 19 hazards. Seventeen hazards were assigned a controlled risk assessment code (RAC) 3 and two were assigned a controlled RAC 4. All are acceptable upon review by the System Safety Program Manager.

ANNEX A

EMERGENCY DESTRUCTION PLAN HAZARD ANALYSIS

ANNEX A
EMERGENCY DESTRUCTION PLAN HAZARD ANALYSIS

1. INTRODUCTION

This hazard analysis (HA) was developed to support the Emergency Destruction Plan for a recovered chemical agent identification set (CAIS) item using the Single CAIS Access and Neutralization System (SCANS) at Fort McClellan (FTMC), Alabama. It is an analysis of hazards associated with handling and destruction of recovered CAIS and is performed in accordance with the System Safety Management Plan (SSMP) for the Non Stockpile Chemical Materiel Product (NSCMP) (PMCD, 2001). In the HA, potential incidents that could occur during the destruction process are discussed qualitatively. To assign relative values to potential risk, risk assessment codes (RACs) are identified for each hazard or hazardous condition. This risk assessment encompasses the risks associated with handling, destruction, and treatment of recovered CAIS containing distilled mustard agent (HD), lewisite (L), or nitrogen mustard (HN-1). Recommended controls for reduction of risks are included in attachment A 1 to this annex.

2. CONCEPT OF OPERATIONS

The recovered CAIS item will be stored in the interim holding facility (IHF) on federal property at FTMC. The item will be destroyed using the SCANS. This HA addresses the hazards associated with the destruction of these items.

- The scope of this HA covers siting the SCANS, moving the items from the IHF to the SCANS, and activities associated with destruction and treatment of the items in the SCANS. A system-specific HA describing hazards associated with all aspects of SCANS operations—setup, operation, and redeployment—has been developed in separate documents for the SCANS (Hazard Tracking Log for SCANS, November 2002).

2.1 Assumptions

The following assumptions have been applied to this plan:

- The SCANS will be sited on federally controlled property immediately outside the IHF.

- This Emergency Destruction Plan includes: movement of items from the IHF to the SCANS; removal of CAIS from the multiple round container (MRC); destruction by the SCANS; and preparation of waste for transport away from the site by the waste hauling contractor.

2.2 Facility Description

The SCANS site will be centrally located within a radius of 49.5 feet (no effects distance for L). For additional detail of the facility description, refer to section 3 of the FTMC Emergency Destruction Plan.

2.3 Facility Location

The SCANS site will be located immediately outside of the FTMC IHF. The IHF location is approximately 7,300 feet from the nearest installation boundary; 2,330 feet from the nearest occupied building; and 1,300 feet from the nearest public road.

2.4 Chemical Warfare Materiel (CWM) Characterization

The recovered CAIS that will be destroyed at the SCAN site includes one single CAIS item filled with 2 milliliters (mL) of L or HD in 38 mL of chloroform, or 4 mL of HN-1 in 36 mL of chloroform. Table A-1 summarizes information about the agent fill that will be processed.

Table A-1. Amount of Agent by CAIS Type

Item	Agent	Amount per Item (milliliter)
CAIS Vial	HD or L	2.0
CAIS Vial	HN-1	4.0

Source: U.S. Army Program Manager for Chemical Demilitarization, Chemical Agent Identification Sets (CAIS) Information Package, November 1995.

2.5 Containment Equipment

The CAIS item is overpacked in a MRC. MRCs are specially designed for overpacking recovered CAIS and have been leak tested to demonstrate they will not leak due to rough handling.

3. HAZARD ANALYSIS

To aid in evaluating identified hazards, potential incident and accident scenarios have been defined and RACs have been assigned in accordance with the NSCMP SSMP. The RACs are based on combinations of hazard severity categories and hazard probability (or frequency of occurrence) categories. The definitions of the hazard severities and hazard probabilities are listed in tables A-2 and A-3, respectively, and the RAC matrix is provided in table A-4.

A summary of the hazards identified, along with the RACs assigned, is given in attachment A-1. Hazards assigned RAC 1 require corrective action prior to acceptance of the plan. Hazards assigned RAC 2 also require corrective action, but are of lower priority than RAC 1 hazards. If resolutions do not lower the RAC to 3 or 4, the RAC 1 and RAC 2 hazards must be formally accepted by the designated authorities in accordance with the SSMP.

Table A-2. Hazard Severity Categories

Description	Category	Mishap Definition
Catastrophic	I	May cause death, system loss, or severe environmental damage.
Critical	II	May cause severe injury, severe occupational illness, or major system or environmental damage.
Marginal	III	May cause minor injury, minor occupational illness, or minor system or environmental damage.
Negligible	IV	May cause less than minor injury, occupational illness, or less than minor system or environmental damage.

Source: Program Manager for Chemical Demilitarization, *System Safety Management Plan for the Non-Stockpile Chemical Materiel Product*, August 2001

Table A-3. Hazard Probability Categories

Frequency of Occurrence	Level	Description
Frequent	A	Will be continuously experienced.
Probable	B	Will occur frequently in the life of the system.
Occasional	C	Will occur several times in the life of the system.
Remote	D	Unlikely, but can reasonably be expected to occur in the life of the system.
Improbable	E	Unlikely, but possible to occur in the life of the system.

Source: Program Manager for Chemical Demilitarization, *System Safety Management Plan for the Non-Stockpile Chemical Materiel Product*, August 2001

Table A-4. Risk Assessment Codes

Frequency of Occurrence	Consequence Category			
	I Catastrophic	II Critical	III Marginal	IV Negligible
A - Frequent	1	1	1	3
B - Probable	1	1	2	3
C - Occasional	1	2	3	4
D - Remote	2	2	3	4
E - Improbable	3	3	3	4

Hazard Risk Index	Risk Assessment Code	Action Required
IA, IB, IC, IIA, IIB, IIIA	1	Unacceptable - immediate corrective action required. Asst. Sec. Army Decision.
ID, IIC, IID, IIIB	2	Undesirable - reduced priority, corrective action required. Product Manager for Non-Stockpile Chemical Materiel decision.
IE, IIE, IIIC, IIID, IIIE, IVA, IVB	3	Acceptable - low priority for corrective action (may not warrant action). System Safety Program Manager decision.
IVC, IVD, IVE	4	Acceptable - no corrective action required.

Source: Program Manager for Chemical Demilitarization, *System Safety Management Plan for the Non-Stockpile Chemical Materiel Product*, August 2001

4. MAXIMUM CREDIBLE EVENT

The maximum credible event (MCE) for destruction and treatment of the HD-, L-, or HN-1-filled CAIS vial currently in storage at FTMC was determined to be one of the following:

- The evaporative release of 2 mL of L and 38 mL of chloroform to the environment resulting in a no effects distance of 15 meters

- The evaporative release of 2 mL of HD and 38 mL of chloroform to the environment resulting in a no effects distance of 5 meters

- The evaporative release of 4 mL of HN-1 and 36 mL of chloroform to the environment resulting in a no effects distance of 10 meters.

The accident would occur outside engineering controls. Workers handling the CAIS would be protected by personal protective equipment (PPE). D2PC models can be found in attachment A-2. Table A-5 summarizes the hazard distances for maximum agent releases.

5. MITIGATION OF HAZARDS

Table A-6 contains a summary of the handling, movement, and SCANS operational events; possible incidents; and hazards associated with the incidents. In addition, the

Table A-5. Hazard Distances for Maximum Agent Releases[a]

Agent	Amount (mL)	No Deaths (m)	No Effects (m)
HD (CAIS vial)	2.0	Not available[b]	5
L (CAIS vial)	2.0	1	15
HN-1 (CAIS Vial)	4.0	Not available[b]	10

Notes:

[a] Attachment A-3 contains printouts of all D2PC input and output parameters.
[b] The no deaths distance was too small to model.

Summary of D2PC Input Parameters:

Height to the mixing layer	=	1,500 m
Location	=	not defined
Atmospheric pressure	=	760 millimeters of mercury
Release type	=	evaporative
Surface type	=	concrete
Evaporation time	=	60 minutes
Temperature	=	30°C
Wind speed	=	1 meter per second
Atmospheric stability	=	category D

HD = mustard agent
HN-1 = nitrogen mustard
L = lewisite
m = meters
mL = milliliters

Table A-6. Summary of Identified Hazards and Risk Assessment Codes

Item	Hazard	Uncontrolled RAC	Controlled RAC
001	CAIS improperly labeled	3	3
002	CAIS improperly labeled	3	3
003	Reagents leak in shipping container	3	3
004	Lifting the reactor from the shipping container	3	3
005	Adding DCDMH to the co-solvent bottle and material is splashed out of container	2	3
006	Inserting reagent bottle or agent bottle into the SCANS and container is dropped	2	3
007	Reactor not properly tightened	2	3
008	Reactor flange surfaces not uniform	2	3
009	Work area at elevated temperature	3	3
010	Flammable liquids handled in open air	3	3
011	Unexpected reaction during treatment	2	3
012	Heat stress from PPE	2	3
013	Moving drums and/or equipment cases by hand	3	3
014	Striking rod to break bottles and contact is off center	4	4
015	Awkward body position when breaking bottles in the SCANS	3	3
016	Work surface not even	3	3
017	Contaminated PPE	3	3
018	Breaker rod penetration damaged	4	4
019	SCANS must be mixed by hand	2	3

Notes:

CAIS = chemical agent identification set
DCDMH = 1,3-dichloro-5,5-dimethylhydantoin
MRC = multiple round container
PPE = personal protective equipment
RAC = risk assessment code
SCANS = Single CAIS Access and Neutralization System

following paragraphs provide more specific information on how to mitigate hazards associated with handling, moving, storing, destroying, and neutralizing recovered CAIS.

The location of the SCANS site allows separation from public areas should an accident occur. The location is served by roads that allow emergency response personnel access to the site.

Two-way radio and cellular telephone communications are available in the event of an accident.

Guardian Brigade (formerly Technical Escort Unit [TEU]) personnel will conduct first entry monitoring of the IHF. The inspection and monitoring will reduce the probability of leaks occurring and will preclude workers from entering an immediately dangerous to life and health contaminated area unknowingly.

Recovered CAIS handling and processing will be conducted by Guardian Brigade personnel. Guardian Brigade personnel are trained in spill response procedures for the chemical agents involved. The use of PPE will protect Guardian Brigade workers from hazards resulting from release of agent.

Implementation of these mitigators can reduce both the severity and probability of hazards that can occur.

6. SUMMARY

An HA that encompasses the risk potential of handling, moving, and destroying CAIS has been performed for the Emergency Destruction Plan. The proposed site for the SCANS operations is acceptable. Hazards were identified from the concept of operations and from historical information, and RACs were assigned based on consequence severity and frequency of occurrence. There were 19 hazards identified, 17 of which were assigned a controlled RAC 3 and 2 that were assigned a controlled

RAC 4; all are acceptable with review. A summary of the hazards identified, along with the RACs assigned, is given in table A-6.

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ATTACHMENT A-1
HAZARD CONTROL LOG WORKSHEETS

Table A-1-1. Assessment Plan Hazards

Item	Hazardous Condition	Cause	Effect	RAC	Recommendation	Resolution	Controlled RAC	Remarks
Hazards During Handling								
001	CAIS improperly labeled	Raman data not interpreted properly	Unreacted agent sent to TSDF for disposal; possible permit violation	3 (IIID)	Only trained Raman operators should be making the determination of type of agent from the Raman analysis and there should be a second person independently verifying the results.	CAIS items will be identified prior to setting up SCANS operations and each item will be given a unique identifying number. SCANS operators will verify the item number before the CAIS item is inserted into the SCANS reactor and log this information into the operator log.	3 (IIIE)	
002	CAIS improperly labeled	Operator error	Wrong treatment process used. Unreacted agent sent to TSDF for disposal; possible permit violation	3 (IIID)	Only trained Raman operators should be making the determination of type of agent from the Raman analysis and there should be a second person independently verifying the results.	CAIS items will be identified prior to setting up SCANS operations and each item will be given a unique identifying number. SCANS operators will verify the item number before the CAIS item is inserted into the SCANS reactor and log this information into the operator log.	3 (IIIE)	

Table A-1-1. Assessment Plan Hazards (Continued)

Item	Hazardous Condition	Cause	Effect	RAC	Recommendation	Resolution	Controlled RAC	Remarks
003	Reagents leak in shipping container	Container lid not tight; overpack mishandled	Any leaking solvent will be absorbed into the packing material. Cleanup will be required.	3 (IIID)			3 (IIID)	
005	Lifting the reactor from the shipping container	Awkward configuration for one man lift	Personal injury during lifting	3 (IIIC)	Use two operators for SCANS operation and minimize the weight.	SCANS is a two-man operation.	3 (IIID)	
006	Adding DCDMH to the co-solvent bottle and material is splashed out of container	Powder being added to liquid and mixing by hand	Potential exposure to chloroform	2 (IIC)	Wear appropriate PPE to prevent injury. Evaluate adding the DCDMH in a plastic bag that will dissolve in the chloroform.	Operators will wear Level C PPE and chloroform exposure will be monitored.	3 (IIIC)	*Single Chemical Agent Identification Set Access and Neutralization System Chloroform Exposure Study Report* (June 2003) cites that Level C is warranted due to exposures below the NIOSH recommended exposure level.

Table A-1-1. Assessment Plan Hazards (Continued)

Item	Hazardous Condition	Cause	Effect	RAC	Recommendation	Resolution	Controlled RAC	Remarks
007	Inserting reagent bottle or agent bottle into the SCANS and container is dropped	Handling with impervious gloves	Agent or chloroform spill with operator exposure	2 (IIC)	Wear appropriate PPE.	Level C PPE will be used. Handling will take place on spill pans and with absorbent pads.	3 (IIIC)	
008	Reactor not properly tightened	Operator error	Reactor leaks during treatment with possible operator exposure and injury	2 (IID)	Operators wear appropriate PPE. Provide special instructions for tightening the flange bolts.	Tightening sequence for flange bolts specified in the SOP. SOPs specify inspection requirements.	3 (IIIE)	
009	Reactor flange surfaces not uniform	Damaged during handling	Flange leaks during reaction with possible operator exposure and injury	2 (IID)	Inspect flanges before use. Wear appropriate PPE.	SOPs specify inspection requirements. Operators wear PPE.	3 (IIIE)	
010	Work area at elevated temperature	Temperature not controlled adequately	Possibility of heat stress injury	3 (IIIC)	Control work time based on temperature.	Control work time based on temperature.	3 (IIID)	
011	Flammable liquids handled in open air	By design, quantities are limited	Minimal	3 (IVA)	Limit handling time.	Co-solvents are premixed before shipping to site. Chloroform will be monitored.	3 (IVA)	

Table A-1-1. Assessment Plan Hazards (Continued)

Item	Hazardous Condition	Cause	Effect	RAC	Recommendation	Resolution	Controlled RAC	Remarks
012	Unexpected reaction during treatment	Wrong reagents used	Hotter than normal reaction with a proportionate increase in pressure could result in a seal leak and possible operator exposure.	2 (IID)	Wear appropriate PPE. Require two independent checks on reagent selection.	HASP requires use of PPE, and two operators will verify materials loaded into the SCANS.	3 (IIE)	
013	Heat stress from PPE	High level of PPE	Heat stress injury	2 (IID)	Limit work time in PPE.	Limit work time in PPE.	3 (IIE)	
014	Moving drums and/or equipment cases by hand	Weight exceeding safe lifting limits	Personal injury	3 (IIID)	Use material handling equipment or make it a two-man lift.	SCANS activity is specified in the SOPs as a two-man operation.	3 (IIID)	
015	Striking rod to break bottles and contact is off center	Operator miss-hits the striking rod	Reactor slides when hit and bottles may not be broken on the first hit	4 (IVC)	None.	Procedures cover miss and hits.	4 (IVC)	
016	Awkward body position when breaking bottles in the SCANS	SCANS location relative to the operator not ideal	Minor strain	3 (IIID)	None.	Setup dictated by available site.	3 (IIID)	
017	Work surface not even	Selection of work site limited by availability of work area	Operator could incur a strain	3 (IIID)	None.	Select the best site possible.	3 (IIID)	

Table A-1-1. Assessment Plan Hazards (Continued)

Item	Hazardous Condition	Cause	Effect	RAC	Recommendation	Resolution	Controlled RAC	Remarks
018	Contaminated PPE	Manual handling of reagents and catalyst	Chemical exposure and possible injury	3 (IIID)	None.	Operators trained in contamination control. A PDS will be set up.	3 (IIID)	
019	Breaker rod penetration damaged	Miss-hit during processing	Minimal	4 (IVD)	None.	After bottles are broken, a cap is installed over the break-pin fitting.	4 (IVD)	
020	SCANS must be mixed by hand	Design	Operator strain	2 (IIIB)	Use two operators to mix the reactor.	SOPs require two operators to mix the reactor.	3 (IIIC)	

Notes:

CAIS = chemical agent identification set
DCDMH = 1,3-dichloro-5,5-dimethylhydantoin
HASP = Health and Safety Plan
PDS = Personnel Decontamination Station
PPE = personal protective equipment
RAC = risk assessment code
SCANS = Single CAIS Access and Neutralization System
SOP = Standing Operating Procedure
TSDF = treatment, storage, and disposal facility

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ATTACHMENT A-2
D2PC CALCULATION

```
          --------------------------------
          | DOWNWIND HAZARD PROGRAM D2PC |
          -------------------------------  2
   TYPE ? FOR DEFINITIONS

 1. YOUR NOVICE LEVEL: 3,2,1 OR 0 NOV
 INPUT:1

 2. LOCATION                    LOC
      AAD,DPG,EWA,JHI,LBG,NAP,PBA,PAD,RMA,UAD,EUR,NDF
 INPUT:NDF

 4. HEIGHT OF MIXING LAYER        HML
 INPUT:1500

 5. MUNITION TYPE                 MUN
      105,155,8IN,500,750,M55,525,139,M23,4.2,TON,TMU,NON
 INPUT:NON

 6. AGENT TYPE                    AGN
      GA,GB,GD,GF,VX,BZ,HY,UD,HD,H1,H3,HT,LL,AC,
      CG,CK,DM,EG,QL,DF,DC,TC,PR,IP,ZS,KB,NA
 INPUT:HD

 8. RELEASE TYPE                  REL
      INS,EVP,SEM,VAR,STK,STJ,FLS,FIR,IGL,EVS
 INPUT:EVP

 9. STABILITY TYPE                STB
      A,B,C,D,E,F,U,S,W
 INPUT:D

10. WINDSPEED (M/SEC)             WND
 INPUT:1
BRT=25. DI=     2.0   100.0   150.0

 7. SPILL OR AIRBORNE SOURCE (MG) QQQ
 INPUT:ML 2
   ML TO MG    .254E+04

   SURFACE
12. TEMPERATURE (DEG C)           TMP
 INPUT:30
```

16. ATMOSPHERIC PRESSURE (MM HG) PMM
INPUT:760

17. SURFACE CODE SUR
GRA,CON,NDF
INPUT:CON

18. TIME OF EVAPORATION (MIN) TEV
INPUT:60
CON EVR=4.935E+02(MG/MIN-SQ M) AREA=3.069E-03(SQ M) VPR=1.607E-01
Q=2.536E+03(MG) Q'=9.086E+01(MG) TEV=6.000E+01(MIN)
ALL OTHER INPUT
ALL

1 MUN:NON AGN:HD REL:EVP WND= 1.0(M/S) TMP=30.0(C) NDF- STB:D

Q(MG)	TS(MIN)	HTS(M)	HML(M)	SXS(M)	SYS(M)	SZS(M)	
9.086E+01	6.00E+01	.00E+00	1.50E+03	1.85E-02	1.85E-02	1.00E-01	D

5. (M) IS DISTANCE TO NO EFFECTS

ALL OTHER INPUT

```
          --------------------------------
          | DOWNWIND HAZARD PROGRAM D2PC |
          -------------------------------  2
   TYPE ? FOR DEFINITIONS

 1. YOUR NOVICE LEVEL: 3,2,1 OR 0 NOV
 INPUT:1

 2. LOCATION                    LOC
      AAD,DPG,EWA,JHI,LBG,NAP,PBA,PAD,RMA,UAD,EUR,NDF
 INPUT:NDF

 4. HEIGHT OF MIXING LAYER        HML
 INPUT:1500

 5. MUNITION TYPE                 MUN
      105,155,8IN,500,750,M55,525,139,M23,4.2,TON,TMU,NON
 INPUT:NON

 6. AGENT TYPE                    AGN
      GA,GB,GD,GF,VX,BZ,HY,UD,HD,H1,H3,HT,LL,AC,
      CG,CK,DM,EG,QL,DF,DC,TC,PR,IP,ZS,KB,NA
 INPUT:LL

 8. RELEASE TYPE                  REL
      INS,EVP,SEM,VAR,STK,STJ,FLS,FIR,IGL,EVS
 INPUT:EVP

 9. STABILITY TYPE                STB
      A,B,C,D,E,F,U,S,W
 INPUT:D

10. WINDSPEED (M/SEC)             WND
 INPUT:1
BRT=25. DI=     2.0   100.0   150.0

 7. SPILL OR AIRBORNE SOURCE (MG) QQQ
 INPUT:ML 2
   ML TO MG    .378E+04

   SURFACE
12. TEMPERATURE (DEG C)           TMP
 INPUT:30
```

16. ATMOSPHERIC PRESSURE (MM HG) PMM
INPUT:760

17. SURFACE CODE SUR
GRA,CON,NDF
INPUT:CON

18. TIME OF EVAPORATION (MIN) TEV
INPUT:60
CON EVR=1.972E+03(MG/MIN-SQ M) AREA=4.574E-03(SQ M) VPR=5.298E-01
Q=3.780E+03(MG) Q'=5.412E+02(MG) TEV=6.000E+01(MIN)
ALL OTHER INPUT
ALL

1 MUN:NON AGN:LL REL:EVP WND= 1.0(M/S) TMP=30.0(C) NDF- STB:D

Q(MG)	TS(MIN)	HTS(M)	HML(M)	SXS(M)	SYS(M)	SZS(M)	
5.412E+02	6.00E+01	.00E+00	1.50E+03	2.25E-02	2.25E-02	1.00E-01	D

1. (M) IS DISTANCE TO NO DEATHS

15. (M) IS DISTANCE TO NO EFFECTS

ALL OTHER INPUT

```
          --------------------------------
          | DOWNWIND HAZARD PROGRAM D2PC |
          -------------------------------  2
   TYPE ? FOR DEFINITIONS

 1. YOUR NOVICE LEVEL: 3,2,1 OR 0 NOV
 INPUT:1

 2. LOCATION                    LOC
      AAD,DPG,EWA,JHI,LBG,NAP,PBA,PAD,RMA,UAD,EUR,NDF
 INPUT:NDF

 4. HEIGHT OF MIXING LAYER        HML
 INPUT:1500

 5. MUNITION TYPE                 MUN
      105,155,8IN,500,750,M55,525,139,M23,4.2,TON,TMU,NON
 INPUT:NON

 6. AGENT TYPE                    AGN
      GA,GB,GD,GF,VX,BZ,HY,UD,HD,H1,H3,HT,LL,AC,
      CG,CK,DM,EG,QL,DF,DC,TC,PR,IP,ZS,KB,NA
 INPUT:H1

 8. RELEASE TYPE                  REL
      INS,EVP,SEM,VAR,STK,STJ,FLS,FIR,IGL,EVS
 INPUT:EVP

 9. STABILITY TYPE                STB
      A,B,C,D,E,F,U,S,W
 INPUT:D

10. WINDSPEED (M/SEC)             WND
 INPUT:1
BRT=25. DI=     2.0   100.0   150.0

 7. SPILL OR AIRBORNE SOURCE (MG) QQQ
 INPUT:ML 4
   ML TO MG    .436E+04

   SURFACE
12. TEMPERATURE (DEG C)           TMP
 INPUT:30

16. ATMOSPHERIC PRESSURE (MM HG)  PMM
 INPUT:760
```

17. SURFACE CODE SUR
GRA,CON,NDF
INPUT:CON

18. TIME OF EVAPORATION (MIN) TEV
INPUT:60
CON EVR=9.155E+02(MG/MIN-SQ M) AREA=5.276E-03(SQ M) VPR=3.398E-01
Q=4.360E+03(MG) Q'=2.898E+02(MG) TEV=6.000E+01(MIN)
ALL OTHER INPUT
ALL

1 MUN:NON AGN:H1 REL:EVP WND= 1.0(M/S) TMP=30.0(C) NDF- STB:D

Q(MG)	TS(MIN)	HTS(M)	HML(M)	SXS(M)	SYS(M)	SZS(M)	
2.898E+02	6.00E+01	.00E+00	1.50E+03	2.42E-02	2.42E-02	1.00E-01	D

10. (M) IS DISTANCE TO NO EFFECTS

ALL OTHER INPUT

ANNEX B
CHEMICAL TABLE

Table B-1. Chemical and Physical Properties of Recovered Chemical Munitions Fill Materiel

Chemical Name	Mustard (H, HD)	Lewisite (L) Dichloro (2-chlorovinyl) arsine	Chloroform	Nitrogen Mustard (HN-1) 2,2'-dichlorotriethyl amine
Chemical Formula	C4H8Cl2S	$C_2H_2AsCl_3$	$CHCl_3$	$C_6H_{13}Cl_2N$
Molecular Weight	159.08	207.32	119.4	170.08
Physical State	Pale yellow oily liquid	Colorless to brownish liquid	Colorless liquid	Pale amber to yellow oily liquid
Vapor Density (Relative to Air)	5.5	7.2	4.13	5.9
Liquid Density	1.27 g/mL at 25°C	1.89 g/mL at 20°C	1.47 g/mL at 20°C	1.09 g/mL at 25°C
Solid Density	N/A	N/A	N/A	N/A
Normal Freezing Point	8°C	-18°C ± at 0.1°C	-63.5°C	-34°C
Boiling Point	Decomposes at about 180°C	190°C	61.2°C	66°C at 3 torr 88.5°C at 12 torr 194°C at 760 torr Decomposes before boiling at 760 torr
Vapor Pressure	0.11 mm Hg at 25°C impurities tend to lower vapor pressure	0.394 mm Hg at 20°C	159 mm Hg at 20°C	0.25 mm Hg at 25°C
Volatility	Approximately 920 mg/m^3 at 25°C	4,480 mg/m^3 at 20°C	100% at 20°C	2,290 mg/m^3 at 25°C
Viscosity	3.95 centistokes at 25°C	2.05 centipoise at 77°F	N/A	N/A
Solubility	0.092 g/100 g water; completely soluble in acetone, chloroform, carbon tetrachloride, and ether	Insoluble in water and dilute mineral acids. Soluble in organic solvents and oils. Miscibile with other chemical warfare agents.	0.79 g/100 g H_2O at 20°C. Miscible with alcohol, benzene, ether, carbon tetrachloride, carbon disulfide, and oils.	Very slightly soluble in water. Freely soluble in acetone and other organic solvents.
Heat of Combustion	4,500 cal/g	N/A	N/A	N/A

Table B-1. Chemical and Physical Properties of Recovered Chemical Munitions Fill Materiel (Continued)

Chemical Name	Mustard (H, HD)	Lewisite (L) Dichloro (2-chlorovinyl) arsine	Chloroform	Nitrogen Mustard (HN-1) 2,2'-dichlorotriethyl amine
Latent Heat of Vaporization		58 cal/g	N/A	N/A
Latent Heat of Fusion	26.5 cal/g	Unknown	N/A	N/A
Special Properties			Pure chloroform is light sensitive and is usually stabilized with 0.75% ethanol.	Polymerizes slowly. Hydrolyzes slowly in water.
Flash Point	105°C	Does not flash	Nonflammable	High enough not to interfere with military use
DOT Classification	Poison A	Poison A	Poison A	Poison A
Corrosivity	Brass rapidly corroded. Cast iron poor	None if dry	Chemically active with metals such as aluminum or magnesium powder, sodium, and potassium.	Corrosive to ferrous alloys beginning at 65°C
Decontaminants	Bleaching powder, sodium hypochlorite	Bleach powder, sodium hypochlorite, fire, caustic soda	Sand, diatomaceous earth, and kitty litter are used as absorbent material.	Bleach, fire
Stabilizers Commonly Used	Can be stabilized with acridine or naphthoquinoline			N/A

Notes:

cal/g = calories per gram
DOT = Department of Transportation
g = gram
g/mL = grams per milliliter
mg/m^3 = milligrams per cubic meter
mm Hg = millimeters of mercury
N/A = not available

ANNEX C
ACRONYMS/ABBREVIATIONS

ANNEX C
ACRONYMS/ABBREVIATIONS

ADEM	Alabama Department of Environmental Management
AR	Army Regulation
CAIS	chemical agent identification set
CESAM	U.S. Army Corps of Engineers, Mobile District
CFR	Code of Federal Regulations
CSS	Chemical Safety Submission
CWM	chemical warfare materiel
D2PC	chemical hazard prediction model
DA	Department of the Army
DAAMS	Depot Area Air Monitoring System
DCDMH	1,3-dichloro-5,5-dimethylhydantoin
DHHS	Department of Health and Human Services
EMT	Emergency Medical Technician
FM	Field Manual
FTMC	Fort McClellan
g	gram
HA	hazard analysis
HASP	Health and Safety Plan
HD	distilled mustard
HN-1	nitrogen mustard
IHF	interim holding facility

L	lewisite
MCE	maximum credible event
mL	milliliter
MRC	multiple round container
NFPA	National Fire Protection Association
NSCMP	Non-Stockpile Chemical Materiel Product
OSHA	Occupational Safety and Health Administration
Pam	pamphlet
PAO	Public Affairs Office
PDS	personnel decontamination station
PID	photoionization detector
PM ECW	Program Manager for the Elimination of Chemical Weapons (formerly PMCD)
PMCD	Program Manager for Chemical Demilitarization
PMNSCM	Product Manager for Non-Stockpile Chemical Materiel
POIO	Public Outreach and Information Office
PPE	personal protective equipment
RAC	risk assessment code
RCRA	Resource Conservation and Recovery Act
SCANS	Single CAIS Access and Neutralization System
SCBA	self-contained breathing apparatus
SOP	Standing Operating Procedure
SSHO	Site Safety and Health Officer
SSMP	System Safety Management Plan

TEU	U.S. Army Technical Escort Unit (now known as Guardian Brigade)
TSDF	treatment, storage, and disposal facility
TWA	time-weighted average
USEPA	U.S. Environmental Protection Agency

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ANNEX D
REFERENCES

ANNEX D
REFERENCES

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