U.S. Army Garrison - Redstone
Huntsville, Madison County, Alabama
EPA I.D. Number AL 7 210 020 742

FACT SHEET

An emergency permit has been prepared for the Redstone Arsenal (RSA) facility, a hazardous waste facility located in Huntsville, Madison County, Alabama. This fact sheet has been prepared to briefly advise the public of the principal permitting, legal and policy issues of the permit.

I. PERMIT PROCESS

The purpose of the permitting process is to allow the State and the public to evaluate RSA's ability to comply with the hazardous waste management requirements of the Alabama Hazardous Waste Management and Minimization Act (AHWMMA), as amended. RSA must comply with hazardous waste management conditions set forth in the emergency permit during its effective period, which is ninety (90) days, from December 22, 2015 to March 21, 2016.

II. PROCEDURES FOR REACHING A FINAL DECISION

The Alabama Department of Environmental Management (ADEM or Department) has issued an emergency permit to allow for the storage of any munitions/explosives of concern (MEC), unexploded ordnance (UXO) or liquid filled items found in excavations made at the MSFC-003 site during underground utility line repairs. ADEM Admin. Code r. 335-14-8-.08(6)(b)1. requires that the public be given at least a 45-day comment period for each permit. The comment period will begin on January 6, 2016, which is the date of publication of the public notice in a major local newspaper of general circulation, and will end on February 22, 2016. The public notice will also be broadcast over local radio station(s).

Any person interested in commenting on the emergency permit application or emergency permit must do so within the 45-day comment period discussed above. All persons wishing to comment on any of the permit conditions or the permit application should submit their comments in writing to the Alabama Department of Environmental Management, Permits and Services Division, 1400 Coliseum Blvd. (zip 36110-2059), P.O. Box 301463 (zip 36130-1463) Montgomery, Alabama, ATTENTION: Mr. Russell A. Kelly.

ADEM will consider all written comments received during the comment period. After the comment period, notice will be given to the applicant and each person who has submitted written comments or requested information. All comments received within the 45-day period will be considered in the formulation of future permits of this type.

III. FACILITY DESCRIPTION

Redstone Arsenal (RSA) is a contiguous U. S. Army installation operated by the U. S. Army Aviation and Missile Command. RSA is located in Madison County, Alabama, at latitude N34º 37' 00" and longitude W86º 39' 00". RSA is bounded on the north by Interstate 565, on the east and northeast by the City of Huntsville, on the west and northwest by the City of Madison, and on the south by the Tennessee River. RSA is approximately 6 miles wide in an east to west direction and 10 miles long in a north to south direction. The installation occupies approximately 57.4 square miles or 37,910 acres.

RSA operates a hazardous waste facility that includes storage, the operation of Subpart X (Open Burning and Open Detonation Units or OB and OD) treatment facilities, and the implementation of investigation and corrective action for solid waste management units (SWMUs) and areas of concern (AOCs). These areas are permitted under the facility's AHWMMA Treatment, Storage and Disposal (TSD) permit. This fact sheet specifically addresses the emergency permit that has been developed to allow for temporary storage of any retrieved MEC, UXO or liquid filled items encountered in excavations made at MSFC-003 to repair the underground utility lines. Any retrieved MEC and UXO that is not taken immediately to RSA's open burning/open detonation (OB/OD) area will be stored at building 8208 and any retrieved liquid filled items will be stored at building 8211.

IV. SUMMARY OF PROPOSED PERMIT

This emergency permit allows RSA to store any MEC, UXO or liquid filled items found during underground utility line repair at MSFC-003 for 90 days.

V. TECHNICAL CONTACT

Jeanne M. Barnes
Governmental Hazardous Waste Branch, Land Division
Alabama Department of Environmental Management
1400 Coliseum Blvd (zip 36110-2059)
P.O. Box 301463 (zip 36130-1463)
Montgomery, Alabama
Phone: (334) 271-7752
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LANCE R. LEFLEUR
DIRECTOR

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Alabama Department of Environmental Management
adem.alabama.gov

1400 Coliseum Blvd. 36110-2400 ■ Post Office Box 301463
Montgomery, Alabama 36130-1463
(334) 271-7700 ■ FAX (334) 271-7950

December 22, 2015

CERTIFIED MAIL #

Mr. Terry Hazle, Director
Directorate of Environmental Management
DEPARTMENT OF THE ARMY
Installation Restoration Division
US Army Aviation and Missile Command
4488 Martin Road
Redstone Arsenal, AL 35898

RE: *Emergency Permit - Storage*
Redstone Arsenal (RSA) DSMOA Environmental Restoration Program
U.S. EPA I.D. No. AL 7 210 020 742

Dear Mr. Hazle:

The Alabama Department of Environmental Management (ADEM) has made a final determination to issue an Alabama Hazardous Waste Management and Minimization Act (AHWMMA) Emergency Permit to the U.S. Department of the Army, Redstone Arsenal. The permit is approved as of this date and a public comment period will be held from January 6, 2016 to February 22, 2016.

Enclosed is the issued emergency permit. If questions and comments arise concerning this matter, please contact Jeanne Barnes of the Governmental Hazardous Waste Branch at (334) 271-7752 or via email at jmbarnes@adem.state.al.us.

Sincerely,

Phillip D. Davis, Chief
Land Division

Attachment
cc: Director, RCRA Division, US EPA Region 4
Jason Wilson, ADEM
Ashley Mastin, ADEM

cc/via email: Robert Morris, US EPA Region 4
Kelley Hartley, ADEM

Birmingham Branch
110 Vulcan Road
Birmingham, AL 35209-4702
(205) 942-6168
(205) 941-1603 (FAX)

Decatur Branch
2715 Sandlin Road, S.W.
Decatur, AL 35603-1333
(256) 353-1713
(256) 340-9359 (FAX)

Mobile Branch
2204 Perimeter Road
Mobile, AL 36615-1131
(251) 450-3400
(251) 479-2593 (FAX)

Mobile-Coastal
3664 Dauphin Street, Suite B
Mobile, AL 36608
(251) 304-1176
(251) 304-1189 (FAX)

HAZARDOUS WASTE EMERGENCY PERMIT

STATEMENT OF BASIS

US EPA Identification Number:	**AL 7 210 020 742**
Facility Name:	**U.S. Army Garrison – Redstone U.S. Army Aviation and Missile Research Development and Engineering Center (AMRDEC)**
Location:	**Huntsville, Madison County**
Type of Hazardous Waste Management:	**Storage**
Permit Duration:	**Ninety (90) days**

The conditions in this permit are based on standards promulgated under Chapters 335-14-2, 335-14-3, 335-14-5, and Chapter 335-14-8 of the ADEM Administrative Code. The waste covered by this permit consists of munitions/explosives of concern (MEC), unexploded ordnance (UXO) and any liquid filled items removed from excavations made to repair underground utility lines at the surface site MSFC-003 within the U. S. Department of the Army, Redstone Arsenal (RSA). The current areas of repair include an industrial water leak (IWL) that has been detected at Site 1, between Buildings 4668 and 4669 (IWL4668/4669) and a potable water leak (PWL) at Site 2, near the northwest corner of Building 4667 (PWL4667).

This permit allows for the storage of any retrieved MEC and UXO at earth covered magazine (ECM) (igloo) 8208 and any retrieved liquid filled items at ECM/igloo 8211. These two igloos are included in a list of storage igloos being considered for addition to RSA's Alabama Hazardous Wastes Management and Minimization Act (AHWMMA) permit. These two storage areas are needed more quickly than the other proposed areas to allow storage of any munitions items encountered during excavations to access water lines and complete leak repairs.

The issuance of this permit will result in environmental and safety benefits. The conditions of this permit are designed to protect public health and the environment. The proper storage of recovered MEC, UXO and liquid filled items will reduce risks to the public. Storage of these items will continue until the retrieved items can be properly treated or disposed.

Issuance of an emergency permit under ADEM Administrative Code R. 335-14-8-.06(1) is warranted because there is an imminent and substantial danger to human health and the environment due to the potential instability of the excavated wastes and the current lack of available treatment alternatives.

ADEM
Alabama Department of Environmental Management

HAZARDOUS WASTE FACILITY PERMIT

ISSUED TO: United States Department of the Army, Redstone Arsenal

EPA ID/PERMIT NUMBER: AL7 210 020 742

LOCATION: Huntsville, Madison County, Alabama,
Latitude 34° 38' 53" and Longitude -86° 39' 35"

UNITS PERMITTED: Earth covered magazines (ECMs) 8208 and 8211

EFFECTIVE DATE: December 22, 2015

EXPIRATION DATE: March 21, 2016

This Permit is issued pursuant with the Code of Alabama 1975, §§ 22-30-1-et. seq., as amended, and regulations adopted thereunder and the Hazardous Waste Management and Minimization Act and in accordance with the plans and specifications and applications filed with the Department subject to the conditions appended hereto, all of which are considered a part of this Permit. This Permit shall be subject to all applicable laws of the State of Alabama, rules and regulations and orders of the Department of Environmental Management and shall be effective from the date of issuance.

Alabama Department of Environmental Management

US EPA Identification No./Permit No.	**AL7 210 020 742**
Name of Permittee/Operator:	**U.S. Department of the Army, Redstone Arsenal**
Operator:	**U.S. Department of the Army, Redstone Arsenal**
Facility Location:	**Madison County, Alabama 35898**
Effective Date:	**December 22, 2015**
Expiration Date:	**March 21, 2016**

In compliance with the provisions of the Alabama Hazardous Wastes Management and Minimization Act, as amended, the Permittee is authorized to conduct hazardous waste management activities including:

__*__Storage

_____Treatment

_____Disposal

at the facility location in accordance with the provisions and conditions attached to this permit. For the Alabama Department of Environmental Management;

Alabama Department of Environmental Management

12/22/15
Date

A. WASTE LIST

The following hazardous wastes may be stored at this facility

Waste Number	Common Name/Description	Total Quantity
D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D011, D018, D019, D022, D028, D030, D034, D039, D040, P036, P043, P095	Ignitable, Corrosive, Reactive/Energetic, Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver, Benzene, Carbon Tetrachloride, Chloroform, 1,2-Dichloroethane, 2,4-Dinitrotoluene, Hexachloroethane, Tetrachloroethylene, Trichloroethylene, Arsonous Dichloride, phenyl-Phosphorofluoridic acid, bis(1-methylethyl) ester, Phosgene	13,200 gallons (=240, 55-gal drums) at each ECM. 26,400 gallons total.

B. HAZARDOUS WASTE TREATMENT, STORAGE, DISPOSAL UNITS LIST

The following hazardous waste management units are covered by the permit: ECMs/Igloos 8208 and 8211.

1. Process Description

MEC or UXO retrieved from the excavations made to repair the water lines at MSFC-003 will be packaged, transported and stored at ECM/Igloo 8208. Any liquid-filled items retrieved from the excavations to repair the water lines at MSFC-003 will be packaged, transported and stored at ECM/Igloo 8211. Note that recovered conventional rounds may be transported to RSA's permitted open burning/open detonation (OB/OD) area for final disposition. No liquid-filled items shall be disposed or treated using OB/OD.

Design Capacity

Each ECM/igloo can store up to 240 55-gallon containers, or a total of 13,200 gallons.

2. Restrictions

(a) Management of the waste shall be in accordance with the approved MSFC-003 Construction Footprint Clearance Work Plan dated October 2015 that includes a chemical safety submission (CSS).

(b) Before storing, treating, or disposing of a hazardous waste, the Permittee shall obtain a detailed chemical and physical analysis of the waste.

(c) The storage of any waste not included above in Part A is prohibited.

(d) The Permittee shall not treat hazardous waste in containers at the storage facility.

3. Transportation Conditions

(a) MSFC-003 shall be secured and all nonessential personnel shall be evacuated from the immediate area during excavations to access the leaking water line(s).

(b) Road barricades shall be placed to prevent unauthorized entry to the excavation and storage areas.

(c) Any MEC, UXO or liquid filled items retrieved from the excavations shall be promptly and properly packaged. The packaged items shall be properly braced for transportation to ensure stability during movement to the storage area.

(d) The predetermined route of travel shall be directly from MSFC-003 to the storage ECM/igloo(s) or OB/OD. Two routes have been selected as shown on the MSFC-003 Hazardous Cargo Transportation Map, dated August 2015: Route Alpha and Route Bravo. Route Alpha is about 6.1 miles long and follows Dodd Road south through Test Area-1 to Buxton Road east to McAlpine Road and through the gate on Chinaberry Road to the ECMs. Route Bravo is about 9.7 miles long starting north on Dodd Road from MSFC-003 to east on Fowler Road and Mills Road to Patton Road then south to Buxton Road to McAlpine Road and through the gate on Chinaberry Road to ECMs/igloos 8208 and 8211. Note that if the retrieved items are to be demolished, they will be transported from Buxton Road south directly to the OB/OD area. All truck drivers hauling retrieved items shall have commercial driver's licenses.

(e) The route of travel between MSFC-003 and the storage area or the OB/OD area shall be secured by emergency personnel prior to transport, and shall be cleared of non-essential traffic during the transport procedures.

(f) Representatives of the chemical, biological, radiological, nuclear and high yield explosives (CBRNE) Analytical and Remediation Activity (CARA) and Huntsville Emergency Medical Services, Inc. (HEMSI) will escort transport trucks from MSFC-003 to the storage or the OB/OD area. If Route Bravo is followed, traffic along Mills, Buxton and Patton Roads will be blocked during transport. Either Directorate of Emergency Services (DES) or CARA personnel will block the roadways as needed.

(g) If recovered items that are not liquid filled are determined unsafe for moving, they will be handled by explosive ordnance disposal (EOD) personnel trained in munitions/propellant handling and OB/OD operations. Treatment will be accomplished using open detonation or open burning during daylight hours; commencing no sooner than one hour after sunrise and ending no later than one hour before sunset. The EOD Team will decide the treatment method in accordance with ADEM Admin. Code r. 335-14-7-.13(5), based on atmospheric and other conditions on the day of treatment.

4. Storage Conditions

(a) Incompatible wastes, or incompatible wastes and materials, must not be placed in the same container unless the Permittee is in compliance with ADEM Admin. Code R. 335-14-5-.02(8)(b).

(b) The Permittee shall not place hazardous waste in an unwashed container that previously held an incompatible waste or material.

(c) The Permittee must document compliance with Conditions 4(a) and 4(b) of this permit as required by ADEM Admin. Code R. 335-14-5-.05(4) and place this documentation in the operating record.

(d) The Permittee shall manage containers as required by ADEM Admin. Code R. 335-14-5-.09(4).

(e) A container holding hazardous waste must always be closed during storage, except when it is necessary to add, remove, sample or inspect the waste.

(f) A container holding hazardous waste must not be opened, handled, or stored in a manner which may rupture the container or cause it to leak.

(g) The Permittee must maintain aisle space at both ECMs/igloos of at least 14 feet to allow the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of facility operation in an emergency (ADEM Admin. Code R. 335-14-5-.03(6)).

(h) The Permittee shall assure that the ability of the container to contain the waste is not impaired, as required by ADEM Admin. Code R. 335-14-5-.09(3).

(i) Containers having a capacity greater than or equal to 30 gallons shall not be stacked over two containers high at any time.

(j) The Permittee shall maintain the containment systems of the container storage in accordance with the requirements of ADEM Admin. Code R. 335-14-5-.09(6)(b).

(k) The Permittee shall maintain an impervious coating that is free of cracks, gaps, or other deterioration on all containment system surfaces that may be exposed to hazardous wastes or hazardous constituents (or releases of hazardous wastes or hazardous constituents).

(l) Weekly, the Permittee shall inspect the ECMs to detect leaking containers and

deterioration of containers or containment systems and to ensure stacking is no more than two high as specified in Section 4(i) of this permit and as required by ADEM Admin. Code R. 335-14-5-.09(5). The Permittee shall note the number and capacity of hazardous waste containers present.

(m) The Permittee shall take precautions to prevent accidental ignition or reaction of ignitable or reactive waste and follow the procedures specified in ADEM Admin. Code R. 335-14-5-.02(8).

(n) If a container holding hazardous waste is not in good condition (e.g., severe rusting, apparent structural defects) or if it begins to leak, the Permittee shall immediately transfer the hazardous waste from such container to a container that is in good condition or otherwise manage the waste in compliance with the conditions of ADEM Admin. Code R. 335-14-5-.09(2).

C. GENERAL CONDITIONS

1. Duration of Permit (Rules 335-14-8-.05 and 335-14-8-.06(1))

   (a) This permit is issued for a period of ninety (90) days.

   (b) This permit may be terminated by the Department at any time without process if it is determined that termination is appropriate to protect human health and the environment.

   (c) In the event that more than 90 days of storage is needed, Redstone Arsenal may/shall apply for a one-time renewal of the permit.

2. Duty to Comply (Rule 335-14-8-.03(l)(a))

   The Permittee shall comply with all conditions of this permit. All words used in this permit shall have the meaning and definitions set forth in Chapter 335-14-1, 335-14-2, 335-14-5, and 335-14-8 of the ADEM Administrative Code. The operation of the facility shall be in accordance with the conditions agreed to with ADEM. The conditions have been incorporated as part of the permit. The filing of a request by the Permittee for a permit modification, revocation, re-issuance, termination, planned changes or anticipated noncompliance does not stay any condition of this permit. Any permit noncompliance constitutes a violation of the ADEM Administrative Code and is grounds for enforcement action, permit termination, permit revocation and re-issuance, permit modification or denial of a permit renewal application. In addition, criminal or civil actions may be brought in appropriate instances.

3. Imminent Hazard Action (Rule 335-14-5-.01(4)

Notwithstanding any other provision of these Rules, enforcement actions may be brought pursuant to Section 7003 of RCRA and AHWMMA.

4. Duty to Mitigate (Rule 335-14-8-.03(1)(d))

   The Permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.

5. Personnel Training (Rule 335-14-5-.02(7))

   Contact with the wastes will be limited to personnel adequately trained in the handling of reactive and flammable wastes.

6. Emergency Coordinator (Rule 335-14-5-.04(6))

   The Permittee will ensure that at all times there is at least one employee either on the premises or on call (i.e., available to respond to an emergency by reaching the facility within a short period of time) with the responsibility for coordinating all emergency response measures.

   The emergency coordinator must, in addition to carrying out the responsibilities specified in Rule 335-14-5-.04(7) of the ADEM Administrative Code, be thoroughly familiar with all operations and activities at the facility, and the location layout. In addition, this person must have the authority to commit the resources needed to carry out all emergency response measures.

7. Proper Operation and Maintenance (Rule 335-14-5-.03(2))

   The Permittee must maintain and operate the facility in a manner to minimize the possibility of any unplanned fire, explosion, or sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, and surface water, which could threaten human health or the environment.

8. Security (Rule 335-14-5-.02(5))

   The Permittee must prevent the unknowing entry and minimize the possibility for the unauthorized entry of persons or livestock onto the active portions of the facility by means of:

   (a) A surveillance system that continuously monitors and controls entry onto the active portion of the facility.

   (b) An artificial or natural barrier that completely surrounds the active portion of the facility and a means to control entry, at all times, through gates or other entrances to the active portion of the facility.

(c) In addition, the facility must post a sign with the legend "DANGER - UNAUTHORIZED PERSONNEL KEEP OUT", at each entrance to the active portion of the facility, and at other locations, in sufficient numbers to be seen from any approach to this active portion. This legend must be written in English and any other language predominant in the area surrounding the facility and must be legible from a distance of at least 25 feet. Existing signs with a legend other than "DANGER - UNAUTHORIZED PERSONNEL KEEP OUT" may be used if the wording on the sign indicates that only authorized personnel are allowed to enter the active portion and that entry onto the active portion can be dangerous.

9. Access to Communications or Alarm System (Rule 335-14-5-.03(5))

Whenever hazardous waste is being loaded, unloaded, or otherwise handled, the Permittee must ensure that all personnel involved in the operation will have immediate access to an internal alarm or emergency communication device, either directly or through visual or voice contact with another employee.

10. General Inspection Requirements (Rule 335-14-5-.02(6))

The Permittee must inspect the site prior to the unloading or managing any waste to ensure that only authorized personnel are present.

11. General Requirements for Ignitable, Reactive or Incompatible Waste (Rule 335-14-5-.02(8))

The Permittee must take precautions to prevent accidental ignition or reaction of ignitable or reactive waste.

12. Arrangements with Local Authorities (Rule 335-14-5-.03(8))

The Permittee must assure that the following arrangements have been made with the local authorities (unless otherwise specified):

(a) Arrangements made to familiarize police, fire departments, and emergency response teams with the layout of the facility, properties of hazardous waste handled at the facility and associated hazards, places where facility personnel will normally be working, entrances to and roads inside the facility, and possible evacuation routes;

(b) Agreements designating primary emergency authority to a specific police and a specific fire department, and agreements with any other to provide support to the primary emergency authority;

(c) Agreements with State emergency response teams, emergency response contractors, and equipment suppliers; and

(d) Arrangements to familiarize local hospitals with the properties of hazardous waste handled at the facility and the types of injuries or illnesses that could result from fire, explosions, or releases at the facility.

13. Identification Number (Rule 335-14-5-.02(2))

An EPA Identification Number has been assigned to the facility: AL 7 210 020 742

14. Closure (Rule 335-14-5-.07(2))

(a) The Permittee shall close the permitted hazardous waste management areas, as required by ADEM Admin. Code R. 335-14-5-.07(2), 335-14-5-.09(9), 335-14-5-.10(8).

(b) The Permittee shall decontaminate or dispose of all facility equipment as required by ADEM Admin. Code Rules 335-14-5-.07(5), 335-14-5-.09(9), 335-14-5-.10(8), 335-14-5-.11(9), and 335-14-5-.12(9).

(c) The Permittee shall certify that both ECMs included in this permit have been closed in accordance with ADEM Admin. Code R. 335-14-5-.07(6). The Permittee shall maintain copies of this closure certification in the facility operating record as required by ADEM Admin Code R. 335-14-5-.05(4).

15. Reporting (Rule 335-14-5-.05(8))

The Permittee shall submit to the Alabama Department of Environmental Management the following information at the conclusion of MSFC-003 utility repair:

(a) The EPA identification number.

(b) The actual storage dates.

(c) A description of and the quantity of each container of waste that is stored.

(d) Name of emergency coordinator:

(e) Copy of all analytical reports and a description of the sampling and analytical methods used.

(f) A certification that the emergency has been alleviated.

From: Watson, Jason N CIV USARMY IMCOM ATLANTIC (US) [jason.n.watson3.civ@mail.mil]
Sent: Friday, June 12, 2015 8:51 AM
To: Barnes, Jeanne M; Delapaz, Terry M CIV USARMY IMCOM ATLANTIC (US); Hazle, Terry W CIV (US)
Cc: Cobb, Steve; Stroud, Philip; Hodges, Barry A CIV (US); Barnwell, Bob; Davis, Jeffrey L CIV USARMY IMCOM AEC (US); Roeske, Ashley E HNC; Wilson, J Jason; Kiessling, Edward H. (MSFC-AS10); Keith, Amy G. (MSFC-AS10); Pommerenck, Derek A CIV USARMY CESAS (US); Gorman, Robert P CIV (US); Howard, J C (Clint) CIV USARMY USAG (US); Downey, Salee T CTR (US)
Subject: Emergency Hazardous Waste Storage Permit Request
Attachments: MSFC-003_Hazardous_Cargo_MapReducedSize.pdf; 8200BlockArea_r.pdf

Importance: High

Jeanne,

Redstone Arsenal requests an Emergency Hazardous Waste Storage Permit for Igloos 8208 and 8211 in support of the Voluntary Interim Measures (VIM) for the Utility Repairs to be conducted at MSFC-003-R-01 Inactive Old Bone Yard Disposal Site #1. On Wednesday, June 3, 2015 the Directorate of Public Works (DPW) received notification that a 72 inch industrial water line had ruptured in the West Test Stand Area of the Marshall Space Flight Center. As a result, the 96 inch industrial water line feeding the damaged 72 inch line has been shut off from service. These two lines are the main industrial water source for the MSFC West Test Stand Area and are essential to the operations conducted in the West Test Stand Area. Thus the Army is requesting the use of the two above referenced igloos for the VIM based on the premise that a Permit Modification Request for the area has already been submitted and is currently under review by ADEM. At the request of the Department, the Army is preparing a Voluntary Interim Measures Work Plan (VIMWP) for the VIM and will seek ADEM approval for the VIMWP. Additionally, the Army is preparing a Time Critical Removal Action (TCRA) Chemical Safety Submission (CSS) for the VIM and will obtain Department of Defense Explosive Safety Board (DDESB) approval for the submission. The Army will provide ADEM a copy of the DDESB Approval Memorandum for the referenced CSS once gained. All activities associated with the Utility Repair will be performed in accordance with the approved VIMWP and CSS. The intent of the VIM is to repair critical infrastructure in the West Test Stand Area of MSFC-003. The intent of the VIM is not to investigate the site or remove Munitions and Explosives of Concern (MEC) unless required in order to gain access to the damaged industrial water line. Only MEC, including unknown liquid filled items, will be packaged and transported to the approved storage location while awaiting further assessment and final disposition. All other material will be managed onsite while awaiting final disposition as part of the planned Interim Measures Phase IB Investigation for this site. Included is the MSFC-003 Hazardous Cargo Transportation figure, which provides the transportation routes that will be used in the event of an MEC transport from MSFC-003 to Igloos 8208 and 8211. Igloo 8208 will be used to store Unexploded Ordnance (UXO) and Igloo 8211 will be used for Unknown Liquid Filled Items. Included is the 8200 Block Area figure, which displays the above mentioned igloos and the surrounding 8200 Block Area. Feel free to contract me with any additional questions or concerns. Thank you in advance for your assistance in this matter. Jason

Jason Watson
Site Manager
Installation Restoration Branch
IMRE-PWE-R
Environmental Management Division
Directorate of Public Works
US Army Garrison - Redstone

Office: 256-842-1448
Fax: 256-876-0887
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MSFC-003 Hazardous Cargo Transportation Map
August 2014

Redstone Arsenal

Environmental Management Division
Directorate of Public Works
U.S. Army Garrison - Redstone
Redstone Arsenal, Alabama

Scale 1:42000

Map Projection - Transverse Mercator
Horizontal Datum - North American Datum 1983
Grid Coordinate System - State Plane Alabama East
Planar Distance Units - U.S. Survey Feet

0 0.25 0.5 1 Miles

Legend

- Gate Point
- COM Point
- Fence
- Stream
- Route Alpha
- Route Bravo
- Water Body
- Water Reservoir
- Existing Structure
- Redstone Airfield
- NASA
- USFWS
- Redstone Arsenal
- OB/OD and Igloo Area

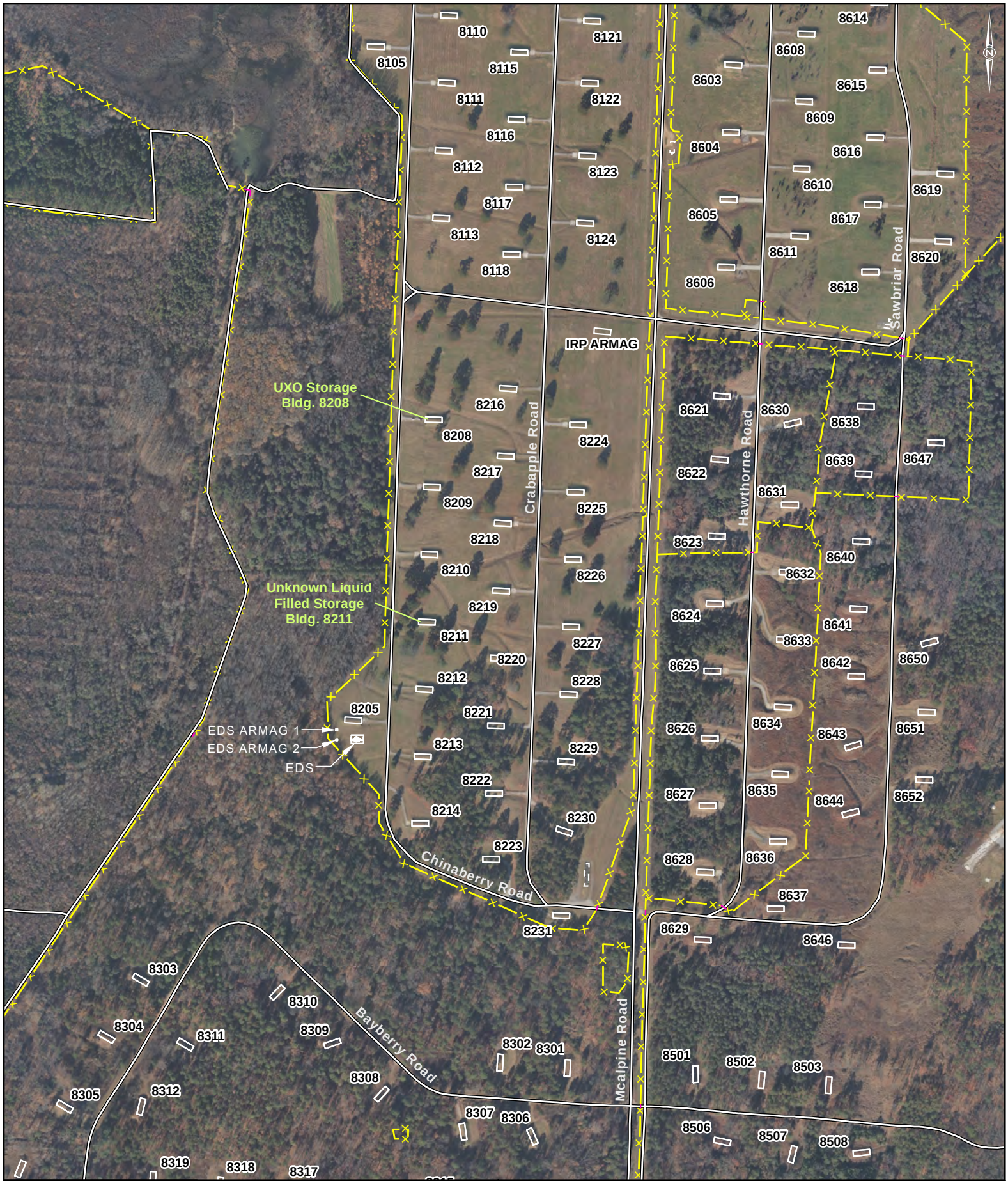
Road Type

- Primary
- Secondary
- Tertiary
- Other

Environmental Restoration Site

- MSFC-003
- Other Interim Measures Site

RSA-051
RSA-052
RSA-061
RSA-063
RSA-264
RSA-068
RSA-066
RSA-012 (OB)
RSA-131 (OD)
Igloo Block 8200
RSA-110
RSA-257
RSA-064
RSA-281
RSA-112
RSA-113
RSA-114
RSA-188
MSFC-035
MSFC-003
TA-1
TA-2
TA-3
TA-4
TA-5
TA-6
TA-10
Corkern Range
McKinley Range
Indian Creek
McDonald Creek
Huntsville Spring Branch
Tennessee River
Goss Road
Bennet Street
Overlook Road
Rideout Road
Homestead Road
Locust Road
Airfield Road
Anderson Road
Hale Road
Hackberry Road
Shelby Drive
Centerline Road
Martin Road
Centaur Street
Beacon Street
Neal Road
Marshall Drive
Toftoy Thruway
Pioneer Street
Digney Road
Mercury Road
Titan Street
Tiros Street
Apollo Road
Gemini Road
Thor Avenue
Morris Road
Dodd Road
Relay Avenue
Saturn Road
Surveyor Street
Raven Street
Ranger Street
Fowler Road
Patton Road
Mills Road
Hicks Road
Stewart Road
Refuge Road
Wood Road
Industrial Road
Lindner Road
Jungerman Road
Calibration Drive
Viper Road
Metrolab Drive
Von Braun Circle
Sparkman Circle
Burose Road
Almond Road
Martin Road
Aerobee Road
Redeye Road
Little John Drive
Hercules Road
Phoenix Road
Honest John Drive
Snooper Drive
Vincent Road
Nike Street
Stinger Road
LaCross Drive
Acton Drive
Mauler Road
Hof Circle
Bomford Drive
Ripley Drive
Skinner Drive
Hughes Drive
Jupiter Street
Holly Road
Gray Road
Kingfisher Road
Calun Drive
Ajax Road
Atacm Drive
Roland Road
Patriot Drive
Madkin Mountain Road
Hansen Road
Hipair Road
Corporal Road
Maintenance Row
Hawk Road
Redstone Road
Deerberry Road
Spicebush Road
Sweetleaf Road
Limeberry Road
Firethorne Road
Ninebark Road
Warehouse Road
West Line Road
East Line Road
Alabama Avenue
Towers Avenue
Mathews Road
Line Road
Thiokol Pond Road
Eagle Road
Sandpiper Road
Sparrow Road
Crane Road
Blue Jay Road
Pelican Road
Falcon Road
Blue Bird Road
Bat Road
Cardinal Road
Robin Road
Tern Road
Wren Road
Plover Road
Magazine Road
Creek Road
Patriot Road
Pentagon Place
Pentagon Road
Sheffield Road
Buxton Road
Buckeye Road
Hemlock Road
Sycamore Road
Honeysuckle Road
Raiford Road
Beech Road
Sweetgum Circle
Persimmon Road
Sourwood Road
Staghorne Road
Hawthorne Road
Moalphie Road
Chinaberry Road
Chapapple Road
Pershing Road
Bayberry Road
Blackberry Road
Blueberry Road
Raspberry Road
Mulberry Road
Corkwood Road
Aspen Road
Cottonwood Road
Beaver Dam Road
Sawbriar Road
Shields Road



8200 Block Area

Road
Gate
Fence

Building Footprint
Existing
Demolished

EDS Assessment and Storage Complex at the RSA 8200 Block

1:7,200

0 250 500 Feet

Dec. 2012 RGB Orthophotos - 3 Inch
Map Projection - Transverse Mercator
Horizontal Datum - North American Datum 1983
Grid Coordinate System - State Plane Alabama East
Planar Distance Units - U.S. Survey Feet

Munitions and Explosives of Concern/Chemical Warfare Materiel Construction Footprint Clearance Work Plan for MSFC-003-R-01, Inactive Old Bone Yard Disposal Site #1 U.S. Army Garrison – Redstone Madison County, Alabama U.S. EPA ID No. AL7 210 020 742

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OCTOBER 2015

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

List of Figures

List of Attachments

List of Appendices

Executive Summary

This site-specific work plan provides the details required to conduct a munitions and explosives of concern/chemical warfare materiel construction footprint clearance at Redstone Arsenal site MSFC-003-R-01, Inactive Old Bone Yard Disposal Site #1. As part of a separate effort, MSFC-003-R-01 is being investigated under the Resource Conservation and Recovery Act Corrective Action Program (U.S. Environmental Protection Agency ID#: AL7 210 020 742) in accordance with the Alabama Hazardous Wastes Management and Minimization Act Hazardous Storage Facility/Thermal Treatment/Solid Waste Management Unit Corrective Action Permit, issued on September 30, 2010. Any applicable data collected during the execution of work performed under this plan will be incorporated into the planned Resource Conservation and Recovery Act Facility Investigation and design of the Interim Measure of chemical warfare materiel and munitions and explosives of concern for this site.

The site is located within National Aeronautics and Space Administration's George C. Marshall Space Flight Center and lies inside the U.S. Army Garrison-Redstone in north-central Alabama. MSFC-003-R-01 consists of the following four historical area surface sites: MSFC-3 (including the Permanent Toxic Storage Area), MSFC-3E (also called RSA-002-R-01 in Redstone Arsenal's Military Munitions Response Program site inspection), MSFC-82, and MSFC-82S.

The overall objective of this project is to perform a munitions and explosives of concern/chemical warfare materiel clearance within the construction footprint located on MSFC-003-R-01 to allow for subsurface construction activities to be completed in a safe and expeditious manner in order to support National Aeronautics and Space Administration's mission.

The scope of work for the construction footprint clearance field activities at MSFC-003-R-01 is to implement all necessary contingencies for:

- Munitions and explosives of concern, material potentially presenting an explosive hazard, and explosives hazards;
- Chemical warfare materiel and chemical agent contaminated media;
- Perform mobilization and demobilization activities for these tasks; and
- Provide any information obtained during this effort to the project delivery team to incorporate into the planned Resource Conservation and Recovery Act Facilities Investigation and Interim Measures, as applicable.

1.0 Introduction

The 20th Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives (CBRNE) Analytical and Remediation Activity (CARA) is supporting the United States (U.S.) Army Engineering and Support Center, Huntsville (USAESCH) under scope of work (SOW) dated April 21, 2014 (Attachment A). This SOW requires CARA to provide Unexploded Ordnance (UXO) and chemical agent (CA) qualified and trained personnel and equipment to support removal of anomalies within the construction footprint at Redstone Arsenal (RSA) Marshall Space Flight Center (MSFC) environmental site MSFC-003-R-01. This project falls under the Resource Conservation and Recovery Act (RCRA); U.S. Department of Defense (DoD); U.S. Department of the Army (DA); U.S. Army Corps of Engineers (USACE); and RSA regulations and guidance, as applicable. The provisions of 29 Code of Federal Regulations (CFR) 1910.120, *Hazardous Waste Operations and Emergency Response*, will apply to all actions on the site.

This site-specific work plan provides the details required to conduct a munitions and explosives of concern (MEC)/chemical warfare materiel (CWM) construction footprint clearance at RSA site MSFC-003-R-01, Inactive Old Bone Yard Disposal Site #1. As part of a separate effort, MSFC-003-R-01 is being investigated under the RCRA Corrective Action Program (U.S. Environmental Protection Agency [EPA] ID#: AL7 210 020 742) in accordance with the Alabama Hazardous Wastes Management and Minimization Act (AHWMMA) Hazardous Storage Facility/Thermal Treatment/Solid Waste Management Unit (SWMU) Corrective Action Permit, issued on September 30, 2010 (hereinafter referred to as the RCRA Permit) (Alabama Department of Environmental Management [ADEM], 2015). Any applicable data collected during the execution of work performed under this plan will be incorporated into the planned RCRA Facility Investigation (RFI) and design of the Interim Measure (IM) of CWM and MEC for this site.

All field personnel will follow this work plan and abide by the Site-Specific Safety and Health Plan (SSHP) (Attachment 1 to Appendix D) and the Chemical Safety Submission (CSS) (Appendix K), as applicable.

1.1. Redstone Arsenal Location and Description

RSA is located in southern Madison County, Alabama, and bounded by the City of Huntsville to the north and east and the Tennessee River to the south (Figure 1-1). The towns of Madison and Triana are northwest and southwest of the facility, respectively. RSA encompasses approximately 38,300 acres, and the Department of the Army controls 36,459 acres of that total. Approximately 15,500 acres are woodlands, 5,360 acres are leased for agricultural use, and 12,000 acres are used for test ranges.

The National Aeronautics and Space Administration (NASA) was granted 1,841 acres in the central part of RSA for the George C. MSFC in 1960. Prior to this land grant, the area occupied by MSFC was used by the Army. A portion of the southeastern part of RSA was previously used to develop solid rocket propellants as a government-owned, contractor-operated facility. This area is now referred to as the Redstone Arsenal Rocket Engine facility. International Specialty Products produces iron carbonyl on approximately 10 acres of leased land in the central portion of the facility. Approximately 2,900 acres owned by the Tennessee Valley Authority and 4,100 acres of the Wheeler National Wildlife Refuge are located within the boundaries of RSA.

1.2. MSFC-003-R-01 Site Description and History

The MSFC-003-R-01 site encompasses approximately 51 acres and lies in the approximate center of the NASA property in a partially controlled and developed area. Figure 1-2 presents the location of MSFC-003-R-01 at RSA.

MSFC-003-R-01 consists of the following four historical area surface sites and overlies two separate groundwater units (RSA-148 and RSA-149):

- MSFC-3 (including the Permanent Toxic Storage Area) (approximately 24 acres);
- MSFC-3E (also called RSA-002-R-01 in RSA's Military Munitions Response Program site inspection) (approximately 6 acres);
- MSFC-82 (approximately 17 acres); and
- MSFC-82S (approximately 4 acres).

MSFC-3 and MSFC-82 are referred to as the "Boneyard" and reference was made in 1957 that it was used by various laboratories and construction contractors to dispose of scrap material that would normally be disposed at the sanitary landfill or turned into salvage. Additionally, historical area MSFC-82 was reported to be contaminated with mustard (H), arsenic, white phosphorus (WP) and Lewisite (L) and may contain burn pits where chemical artillery shells (i.e., 4.2-inch chemical mortars) were demilitarized and likely buried.

Based on historical documents, the "Boneyard" (MSFC-3 and MSFC-82) was decontaminated in two separate phases in 1957 and 1960. Decontamination activities included subsurface exploration, clearing and burning vegetation, screening, removal of all metal debris, and disking the top 4 to 6 inches of soil with bleach.

In 1961, the rail line area located between MSFC-3 and MSFC-82 was decontaminated. In May 1963, a 4-foot (ft)-wide by 8-ft-deep trench was decontaminated in an area across the center of MSFC-3 and a north-south trench beginning at the east-west trench and terminating at the north site boundary. The trench was for installation of a 42-inch industrial waste line. No details on the findings from either of these actions have been located.

NASA rocket test stands were constructed between 1964 and 1966 in the area surrounding MSFC-003-R-01. This construction included installation of large-diameter test stand deluge pipes below grade across MSFC-003-R-01. During an interview, Mr. Davis at the MSFC Environmental Office stated "pick-up truck loads" of munitions were removed from the site during the deluge pipe installations. No records of the types of munitions removed or ultimate disposition were located.

During October 1999, a MEC item was discovered when excavating a ditch in MSFC-003-R-01. The item was believed to be a 4.2-inch mortar. Then in 2000, 52 empty chemically configured 4.2-inch mortars were unearthed during the repair of one of the test stand deluge pipes. CA was not detected.

MSFC-3E, formerly named RSA-002-R-01, is located east of MSFC-3. Records indicate that all of the miscellaneous debris within the footprint of the water reservoirs created for the Saturn Test Stand in MSFC-3 were relocated to MSFC-3E. Debris is known to be present at depths of one to four ft below ground surface. Records also indicate that prior to the NASA MSFC construction activities, surface debris and materials were removed from throughout the site. This was recently substantiated in January 2012 when unauthorized trenching activities uncovered an unknown quantity of red phosphorus burster tubes, 75 millimeter (mm) M89 hexachloroethane (HC) smoke projectiles, small crushed steel drums, and other unknown wastes.

MSFC-82S and the southern two-thirds of MSFC-82 are located within the boundary of historical Area 11, 1 of 17 contaminated grounds documented as accepting reject chemical munitions from the deactivation of the Huntsville Arsenal. These areas were noted as burning and destruction grounds contaminated with mustard, arsenic, WP, and L. The boundary of historical Area 11 also includes RSA-052. Historical aerial photograph review did not indicate that disposal trenches are present in MSFC-82S. Review of 1956 and 1959 aerial photographs of MSFC-82 indicated several trench features are present, but this time period coincides with the decontamination activities described above. In addition, previous geophysical surveys at MSFC-82 did not indicate burial features, so it is unlikely that Area 11 activities took place in this area.

The 2012 *Historical Review of Documents for Burial Sites at Redstone Arsenal, Alabama* (U.S. Army Chemical Materials Activity [CMA], 2012) provides detailed information on the lethal, incendiary, and non-lethal chemical munitions and containers that may be found in MSFC-003-R-01.

1.3. Previous Investigations

The previous environmental investigations performed within the MSFC-003-R-01 site boundary are summarized below:

- 1989, Preliminary Assessment
- 1991, Visual Site Inspection
- 1996, Geophysical Investigation and Limited Sampling
- 1998, Site Investigation
- 2008, Site Inspection
- 2009, Basewide Groundwater Sampling
- 2013, Geophysical Investigation

1.4. Conceptual Site Model

A conceptual site model will be prepared during the planned RFI and IM for this site.

1.5. Work Plan Objectives

The overall objectives of this project is to perform a MEC/CWM clearance within the construction footprint at MSFC-003-R-01 to allow for subsurface construction activities to be completed in a safe and expeditious manner in order to support NASA's mission.

Currently there are two areas requiring construction footprint clearance within the MSFC-003-R-01 site boundary (Figure 1-3):

- Site 1 – Industrial Water Leak (IWL) in between Buildings 4668 and 4669 (hereinafter referred to as Site 1 (IWL4668/4669))
- Site 2 – Potable Water Leak (PWL) at the northwest corner of Building 4667 (hereinafter referred to as Site 2 (PWL4667))

The underground utilities at MSFC-003-R-01 are in a deteriorated state due to their age, and will continue to deteriorate, thus allowing for the need to perform additional construction footprint clearances. These additional areas will be incorporated into this plan through a Work Plan Variance and will be submitted to the Army and to the ADEM for review and approval prior to fieldwork.

2.0 Technical Management

The purpose of this Section is to provide the approach and procedures that will be used to manage the tasks required to meet the project objectives. Detailed descriptions of the field procedures for this project are included in subsequent Sections of this work plan.

2.1. Project Organizations

This Section describes the organizations involved, along with their project roles for the MSFC-003-R-01 construction footprint clearance.

2.1.1. U.S. Army Environmental Command (AEC)

This site is an AEC site, and as such, AEC will provide project management oversight for execution of this project, and serves as the Program Manager for DA. AEC's responsibilities include document reviews and providing funding

2.1.2. U.S. Army Engineering and Support Center, Huntsville (USAESCH)

The USAESCH has prepared this work plan and as the Army's executing agency for this project, provides technical expertise for MEC/CWM and munitions constituents activities, and serves as the Project Manager for conducting this project. USAESCH responsibilities include procurement and direction of supporting agencies (e.g., CARA) and the coordination of document reviews and approvals. USAESCH will provide an onsite USAESCH Ordnance and Explosives (OE) Safety Specialist (OESS) who will maintain command and control of the site during all intrusive fieldwork. The USAESCH will also coordinate pre-operational surveys (USAESCH Survey and DA Pre-Operational Survey) and tabletop exercises to provide an assessment of the intrusive team's capabilities prior to the commencement of intrusive activities.

2.1.3. U.S. Army Garrison-Redstone's Installation Restoration Branch (IRB)

RSA's Installation Restoration Branch's (IRB) responsibilities include providing a Site Manager to coordinate the review of project plans and documents, with tenants and organizations within the work area, working with news media and the public, and coordinating with federal, state, and local stakeholders on issues pertaining to implementation of this project and protection of ecological and cultural resources. Other responsibilities include providing proper notifications to state and local regulators, notifying the National Response Center and state officials in the event of a release or spill, Chemical Event Reporting in accordance with the Interim Guidance (Army Regulation (AR) 385-XX), *Chemical Warfare Materiel Responses and Related Activities,* (DA, 2009), and signing the hazardous waste manifest as generator of any hazardous waste.

RSA's Directorate of Public Works (DPW) will provide construction contractor personnel and equipment necessary to perform Army related activities within the construction footprint.

2.1.4. CBRNE Analytical and Remediation Activity (CARA)

CARA will provide UXO and CA qualified and trained personnel and equipment, to perform a construction footprint clearance at MSFC-003-R-01 in accordance with the CSS and Work Plans. CARA will provide the staff for the Senior UXO Supervisor (SUXOS) and UXO Safety Officer (UXOSO) (the UXOSO is the same role as the Site Safety and Health Officer [SSHO]), as well as the down range UXO Teams. CARA's Air Monitoring Team will provide personnel and equipment necessary for the monitoring of airborne concentrations from CA and industrial

chemicals in accordance with the approved Air Monitoring Plan (Appendix J). CARA will also provide personnel and equipment necessary for assessment, packaging, and transportation of items with an unknown liquid fill to storage. CARA provides a worldwide capability to conduct chemical, biological, radiological, and industrial hazards operations in support of the DoD, local, state and Federal agencies. In accordance with current ARs, at least two persons (officer, noncommissioned officer, or civilian) are required to conduct operations with the exact number depending on the mission. Current ARs also require that CARA conduct detailed assessment of items with unknown filler. CARA will prepare a report of the circumstances of discovery and results of assessment including photographs, x-rays, and monitoring data in accordance with the Interim Guidance (AR 385-XX) (DA, 2009). CARA is also responsible for escorting the transportation of RCWM over public highways, as applicable. The CARA teams will report directly to the USAESCH OESS who, in turn, will keep site management informed about decisions made regarding site activities.

2.1.5. National Aeronautics and Space Administration (NASA)

This site is within NASA's MSFC boundary, and as such, NASA shall provide necessary construction equipment and personnel to perform NASA related activities within the construction footprint. NASA shall also participate in document reviews and approvals and coordination with appropriate NASA personnel.

2.1.6. Alabama Department of Environmental Management (ADEM)

ADEM's mission is to protect, conserve, and manage Alabama's natural resources and enforce the State's environmental laws. The RSA Site Manager will be responsible for coordination ADEM throughout the project. ADEM personnel will review and approve work plans developed for this project, as applicable.

2.1.7. Supporting Agencies for CWM Contingency

2.1.7.1. U.S. Army Garrison-Redstone Safety Office

The U.S. Army Garrison-Redstone Safety Office will review and approve the CSS prior to forwarding to the Army Aviation and Missile Life Cycle Management Command (AMCOM) Safety Office.

2.1.7.2. Aviation and Missile Command (AMCOM) Safety Office

The AMCOM Safety Office will review and approve the CSS prior to forwarding to the U.S. Army Technical Center for Explosives Safety (USATCES).

2.1.7.3. U.S. Army Technical Center for Explosives Safety (USATCES)

USATCES provides Army approval of the CSS and performs as the Army member of the Major Command (MACOM) pre-operational survey team.

2.1.7.4. Department of Defense Explosives Safety Board (DDESB)

DDESB provides DoD approval of the CSS.

2.1.7.5. Recovered Chemical Materiel Directorate (RCMD)

RCMD provides support to USAESCH for planning and implementation of storage and final disposition of recovered CWM (RCWM), including destruction. RCMD will also provide the equipment needed for detailed non-intrusive assessment and for RCWM destruction.

2.1.8. Local Agencies

Government representatives from RSA and NASA will be informed of the schedule, significant project findings, and project progress throughout the construction footprint clearance. Emergency Management Agencies from both organizations will be asked to participate in the Tabletop Exercises conducted prior to intrusive operations and will be consulted for contingency planning by the Project Delivery Team (PDT). They will also be informed of planned operations and the schedule on a regular basis during intrusive operations.

Representatives from Huntsville Hospital will also be invited to participate in the Tabletop Exercises. The Huntsville Hospital will accommodate personnel with injuries from chemical exposures while conducting operations at the MSFC-003-R-01 site. Medical professionals at Huntsville Hospital will be provided CA-specific training prior to operations.

2.2. Communications and Reporting

The following communications will be documented in a chronological communications log maintained by the SUXOS and the SSHO/UXOSO:

- Each occasion that MEC or suspected CWM is encountered;
- When and why work is stopped for safety reasons;
- Health and Safety violations;
- Personnel changes and reason for changes; and
- Any deviations from the approved work plan that occur in the field.

When field operations are being conducted, a daily progress report will be completed by the Site Supervisor or the SUXOS. The report will be submitted to the USAESCH Project Manager, RSA Site Manager, and NASA Site Manager and will include the following:

- Discussion of work progress;
- Personnel on site, including site visitors;
- Problems encountered;
- Agents monitored;
- Agent alarms, if any;
- Headspaced items, if any; and
- Discussion of work completed versus project schedule.

Prior to the start of operations each day, the Site Supervisor or the SUXOS will prepare and submit a daily Common Operating Picture (COP) Report (Appendix F). The report will be submitted to the USAESCH Project Manager, RSA Site Manager, NASA Site Manager, and the Installation's Emergency Operations Center (IEOC). This report will include the following:

- Personnel onsite;
- Work schedule;
- Intrusive location;
- EZs; and
- Planned activities for the day.

2.2.1. Deliverables

Project deliverables will meet the schedule requirements of the project and will be prepared in accordance with the applicable format referenced in the SOW. Deliverables will undergo internal Army review prior to submittal to other organizations. The primary project deliverables are:

- CSS
- Work Plan
- Daily Reports, during intrusive operations
- After Action Report

2.3. Schedule

A project schedule has been prepared for work planning purposes (Figure 1-4). This schedule will be updated, when necessary, and submitted to the Army with the associated progress report. The included schedule is based on the anticipated time needed for document reviews and approvals.

2.4. Public Relations Support

RSA is responsible for all public relations in accordance with established policies and procedures.

2.5. Field Operations Management

The Site Supervisor and/or the SUXOS will oversee all aspects of the field operations. There will be daily communication between field staff (including the construction contractor) and the Site Supervisor. The Site Supervisor and/or SUXOS will address any unexpected issues or concerns that arise during field operations. Thus, the Site Supervisor and/or SUXOS will be involved in issue resolution and will be aware of any changes in site conditions or planned modifications to field procedures. The Site Supervisor will involve the USAESCH Project Manager and RSA Site Manager as necessary, but at a minimum will inform them of any changes in site conditions or planned modifications to field procedures for consideration and concurrence.

3.0 Field Activities

This Section describes the field activities that will be completed to perform a construction footprint clearance within the MSFC-003-R-01 site boundary and meet the purpose, scope, and objectives presented in Section 1.0. All intrusive activities completed at locations with the occasional CWM and medium/high UXO probabilities will require near real-time air monitoring and UXO support. The field program consists of location and removal of anomalies and headspacing of potentially CA contaminated media from locations within MSFC-003-R-01. Figure 1-3 depicts the current locations requiring a construction footprint clearance.

The underground utilities at MSFC-003-R-01 are in a deteriorated state due to their age, and will continue to deteriorate, thus allowing for the need to perform additional construction footprint clearances. These additional areas will be incorporated into this plan through a Work Plan Variance and will be submitted to the Army and to ADEM for review and approval prior to fieldwork.

Environmental sampling is not planned as part of this effort. Any work associated with evaluating the environmental impacts associated with munitions constituents (MC)/hazardous and toxic waste (HTW) will be performed as part of the planned RFI and IM.

For the purposes of this effort, items suspected of being CWM will be defined as follows:

a) Chemical munitions. Such munitions, which included projectiles, rockets, mines, and bombs, and may have been manufactured by the U.S. or foreign countries.
b) Bulk CA containers. Such containers include, but are not limited to, 55-gallon drums and 1-ton containers.
c) Miscellaneous containers (e.g., laboratory bottles) that based on location may contain CA.
d) Munitions with unknown liquid fills.

3.1. Initial Summary of Risk from MEC, CWM, and CA

MEC, CWM, and/or CA, where present, is a safety hazard and constitutes an imminent and substantial danger to the general public, site personnel, and the environment. The complete conceptual site model for MSFC-003-R-01 will be provided as part of the planned RFI and IM and is not required as part of this effort. MSFC-003-R-01 is expected to contain the following based on the activities described in Section 1.2:

- Areas noted as burning and destruction grounds contaminated with H, arsenic, WP, and L.
- Areas used by various laboratories and construction contractors to dispose of scrap material that would normally be disposed at the sanitary fill or turned into salvage.
- Areas of several waste/burn pits.
- Areas of relocated waste where red-phosphorous burster tubes, 75-mm shot canister, small crushed steel drums, and other unknown wastes were recently uncovered.

Given the site history, there is a possibility that MC from the conventional MEC or CWM will be present at the site. Sample collection and analysis for MC is not planned for this project. Any required MC sample collection and analysis will be performed as part of the planned RFI and IM.

3.2. Follow-On Activities

Upon completion of the construction footprint clearance, the construction contractor will perform necessary utility repairs/replacement within the cleared footprint.

The data generated from this project will be presented in an After Action Report and provided to the PDT for incorporation into the planned RFI and IM, as applicable.

3.3. MEC Anomaly Avoidance

MEC anomaly avoidance procedures as described in Section 3.4 of Attachment 1, Appendix 1 in the Installation-Wide (IW) Accident Prevention Plan (APP) (Shaw, 2013a) and Engineering Manual (EM) 385-1-97, *Explosives Safety and Health Requirements Manual* (USACE, 2013a), will be practiced for some of the site preparation activities described in Section 3.4. If an item (MEC/material potentially presenting an explosive hazard [MPPEH]) is identified during these activities, the notification procedures specified in RSA Explosives Safety Management Program (current version) and the requirements specified in EM 385-1-97 (USACE, 2013a) will be followed.

NOTE: MEC anomaly avoidance procedures do not apply to the construction footprint clearance. All clearance operations will be conducted in accordance with the CSS, as applicable.

3.4. Mobilization/Demobilization

This Section details the activities necessary to mobilize personnel and equipment for site work, as well as those activities necessary to shut down the site at the conclusion of the field work. As part of mobilization, the following general activities are required for the project to proceed:

- Site preparations;
- Establishment of command post;
- Equipment mobilization;
- Training and briefing;
- Communications; and
- Work zone preparations.

Demobilization will consist of the performance of the same activities (or their undoing) in reverse order. In general, staging areas will be demobilized last, so that they can be used as a staging area for the demobilization efforts.

Preparations for mobilization will not commence until receipt of the DDESB approval of the CSS and ADEM approval of this work plan. Upon receipt of the above referenced approvals, the field team will be notified, travel and lodging arrangements made, and the requisite copies of the applicable documents assembled.

3.4.1. Site Preparations

3.4.1.1. Civil Survey

A civil survey is not planned for the construction footprint clearance.

3.4.1.2. Vegetation Clearance

If required, vegetation clearance/removal may be performed by the NASA or RSA contractor in accordance with their approved plans and procedures.

MEC anomaly avoidance and notification procedures as described in the above Section 3.3 will be followed.

3.4.1.3. Utility Clearance

If required, utilities may be marked prior to beginning the construction footprint clearance at MSFC-003-R-01 and will be performed as described in Section 5.4.3 of Standard Operating Procedure (SOP) No. 27.0 (Attachment 3 to Appendix D).

MEC anomaly avoidance and notification procedures as described in the above Section 3.3 will be followed.

3.4.2. Establishment of Command Post

A Command Post (CP) will be established which may consist of an office facility and equipment storage facility. The CP will serve as the primary location for management of site operations.

3.4.3. Equipment Mobilization

Equipment and materials will be transported to the site by the CARA field team, or obtained locally. Equipment will include but is not limited to analog metal detectors (i.e., Schonstedt or similar instrument), air monitoring equipment, intrusive operation equipment, documents, first aid kits, fire extinguishers, global positioning systems (GPS), digital cameras, field radios, etc. Site vehicles will be rented or Government owned and in most cases will be fourwheel drive sport utility vehicles or pickup trucks that will accommodate site personnel and equipment. Excavation equipment, or mechanical brush cutting equipment, if required, will be provided by the construction contractor.

3.4.4. Training and Briefing

3.4.4.1. Site-Specific Training

As part of the mobilization process, CARA will perform site-specific training for personnel assigned to this project. The purpose of this training is to ensure that all personnel fully understand the procedures and methods to be used to perform operations at the site, their individual roles and responsibilities, and any and all safety and environmental practices/procedures associated with operations. Personnel will be trained prior to and as they arrive on site. All project personnel will complete the Occupational Safety and Health Administration (OSHA) 40-hour in accordance with 29 CFR 1910.120, and 8-hour refresher (as required), training course for hazardous waste site workers as required by the specific task. Additional site specific training, in accordance with EM 385-1-97 (USACE, 2013a), and this work plan will be provided to all personnel upon their initial mobilization. A medical surveillance program will be in place for each member of the field team, with the most recent exam for each member having occurred within the last 12 months.

Topics covered during the site-specific training include:

- Activities to be performed;

- Archaeological and historical resources awareness;
- Threatened and endangered species habitat awareness;
- MEC known and suspected to be present at the site;
- Action to take upon encountering MEC;
- Signs and symptoms exposure to CA and any other chemicals of concern known and suspected to be present at the site;
- Environmental and medical monitoring procedures and purposes;
- Site workers' responsibilities in health protection programs, including instruction in first aid, self aid, and buddy aid techniques;
- Actions to be taken in the event of a CA mishap;
- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area;
- The physical and health hazards of chemicals in the work area;
- Measures employees can take to protect themselves from these hazards;
- The procedures and personal protective equipment (PPE) to be used to protect employess from exposure to hazardous chemicals;
- Details of the Hazard Communication (HAZCOM) program;
- Emergency and spill response training; and
- Safe work practices.

NOTE: The required RSA UXO Awareness Training requirements will be covered through the completion of this site-specific training.

3.4.5. Communications

Communication equipment will be used to ensure effective communication between site members. Communication equipment will be checked each day after the morning safety briefing. Each field team will remain together throughout the field activities.

3.4.6. Demobilization

Several demobilizations or partial demobilizations may be required as part of this project. In general, personnel and rental equipment, unless otherwise needed for the demobilization effort, will be demobilized as early as possible upon completion of use for its intended purpose. Site restoration will be coordinated through RSA and NASA.

3.5. Construction Footprint Clearance

3.5.1. General Methodology

Intrusive operations will be performed in accordance with procedures outlined in the Interim Guidance (AR 385-XX) (DA, 2009), Engineering Pamphlet (EP) 75-1-3, *Recovered Chemical Warfare Materiel (RCWM) Response Process* (USACE, 2004); and the OSHA requirements for

excavations in 29 CFR 1926 Subpart P. Conventional MEC disposal operations will be performed in accordance with EM 385-1-97 (USACE, 2013a) and Technical Manual (TM) 60A-1-1-31, *EOD Disposal Procedures*. The SSHP developed for this site (Attachment 1 of Appendix D) will be followed at all times, as will procedures outlined in DoD Manual (DoDM) 6055.09-M, *DoD Ammunition and Explosives Safety Standards* (DoD, 2010).

3.5.2. Pre-Operational Surveys and Tabletop Exercises

Pre-operational surveys (both USAESCH and DA) and Tabletop Exercises will be conducted prior to intrusive operations. USAESCH will prepare the Pre-operational Survey Plan, assemble the Pre-operational survey team, and conduct the MACOM Pre-operational survey (delegated by USACE Headquarters) for the startup of chemical operations. Local emergency responders and stakeholders will be invited to the Tabletop Exercises, which will evaluate the responses to various emergency scenarios in a meeting room environment. More information regarding the pre-operational surveys can be found in Section 15.5.2 of the SSHP (Attachment 1 of Appendix D). Information regarding the Tabletop Exercise can be found in Section 15.5.3 of the SSHP (Attachment 1 of Appendix D).

3.5.3. Team Composition

3.5.3.1. Command Post Team

The command post (CP) Team is responsible for communications and directing all other field activities and resides outside the exclusion zone (EZ) in the support zone (SZ). The CP Team will consist of the Site Supervisor, SUXOS, SSHO/UXOSO/UXO Quality Control Specialist (UXOQCS), and the USAESCH OESS. The CP Operator, is designated as CP Team's radio 'voice' and is responsible for communicating with the other field teams, recording downrange activities, and conducting communications checks.

3.5.3.2. Down Range Teams

The Down Range Teams are comprised of members of CARA and the construction contractor and are responsible for work within the EZ. Each Down Range Team will consist of a Team Leader who acts as the safety observer and is responsible for the overall direction of the team and for radio communications. The number of team members will vary depending on the work being performed and equipment being used. If excavation equipment or other heavy equipment is required, one or two members of the Construction Team will be the equipment operators, while other workers conduct the air monitoring and act as ground guides. The downrange personnel may be categorized into more than one team—the use of multiple teams allows one team to be resting while one or more teams are working, providing for continuous productivity.

3.5.3.3. Air Monitoring Team

The Air Monitoring Team is comprised of members of CARA who will perform air monitoring for CA and other industrial chemicals during intrusive operations, and will be sufficiently staffed in a manner that allows them to fulfill the obligations set forth in the Air Monitoring Plan (Appendix J).

3.5.3.4. Rescue Team

The Rescue Team is comprised of members of CARA and will consist of a minimum of two people and a dedicated vehicle. This team will remain on standby during the investigation of anomalies

down range, and will position themselves near the personnel decontamination station (PDS). The Rescue Team will remain on standby until they are notified by the Site Supervisor and/or SUXOS that the down range team needs assistance—either emergency or logistical. The Rescue Team will remain ready to don Level B PPE in an expedient manner—typically by being "half-dressed." PPE requirements are identified in Section 9 of the APP (Appendix D).

3.5.3.5. Personnel Decontamination Station (PDS) Team

The PDS Team is comprised of members of CARA and operates the PDS and is responsible for decontaminating potentially contaminated personnel and also for verifying that decontamination has been completed. The PDS will be staffed when excavation activities are being conducted down range. The PDS will be staffed by one PDS Supervisor and a minimum of two PDS attendants. PDS operations are described in the SSHP (Attachment 1 of Appendix D).

3.5.3.6. Other Workers

Other workers may be present at the site including escorted visitors, surveyors, and other subcontractors. This work must all occur outside the EZ when the Down Range Team is active.

3.5.3.7. Construction Team

The Construction Team is comprised of NASA and/or Installation contractors and will be responsible for excavation and repairs of underground utilities. The Construction Team will consist of a Site Supervisor or Team Leader who will provide all documentation of competent person qualifications to the UXOSO prior to the start of work.

3.5.4. Personnel Qualifications

The field operations will be conducted by personnel divided into teams. Each team will have assigned duties. In some instances, individuals may be considered a member of more than one team. As an example, in some circumstances, a member of an air monitoring team may participate in the PDS team or the rescue team, as long as they are medically cleared to do so.

All UXO personnel will meet the requirements set forth in DDESB Technical Paper (TP) 18, *Minimum Qualifications for Unexploded Ordnance Technicians and Personnel*, and will be approved by the USAESCH for the position being performed.

The following Sections detail individual UXO personnel qualifications for this project.

3.5.4.1. SUXOS

As the most senior UXO qualified individual onsite, the SUXOS directly supervises all daily MEC activities. This individual is responsible for the successful performance of field teams, early detection and identification of potential problem areas, and instituting corrective measures, including the planning, coordination, and supervision of all explosives operations performed on site. The SUXOS will execute instructions from the Site Supervisor; document site conditions; photographically document operations; and prepare project reports.

3.5.4.2. SSHO/UXOSO

The SSHO/UXOSO will have the specific training (as a minimum must have completed the 30-hour OSHA construction safety course), knowledge and experience necessary to implement the

APP/SSHP and verify compliance with applicable safety and health requirements. In addition, the SSHO/UXOSO will have the following skills/knowledge:

- The ability to develop and implement approved explosives and UXO health and safety programs on site in compliance with applicable DoD policy and federal, state, and local health and safety statutes, regulations, and codes;
- The ability to conduct, document, and report the results of safety inspections to ensure compliance with all applicable explosives safety policies, standards, regulations, and codes;
- The ability to identify fuzing, necessary precautions, and fuze condition; i.e., armed, unarmed, or functioned; how this condition can or will affect the munitions payload should other forces be applied;
- The ability to recognize munitions/ordnance types and to determine the hazards and make risk assessments. This includes identifying potential fillers, including those in extremely deteriorated condition; e.g., high explosives, fragmentation, white phosphorus, and potential CWM. Must also be able to determine if munitions can be moved before destroying or if the munitions must be blown-in-place (BIP); fragmentation radius; and, in the case of suspected CWM the potential down-wind hazard along with the engineering controls to mitigate risk;
- The ability to enforce personnel limits and safety EZs for explosives related operations; and
- The ability to ensure all protective works and equipment used with the EZs are operated in compliance with DoD policy, DDESB approvals, and Federal, state, and local health and safety statutes, regulations, and codes.

3.5.4.3. UXOQCS

The UXOQCS and the UXOSO may be dual-hatted for this project, upon approval by the USAESCH. The UXOQCS will have experience in UXO/MEC clearance operations and supervising personnel. The UXOQCS will have the required quality control training, including at least 2 years experience providing QC on similar projects. In addition, the UXOQCS will have the following skills/knowledge:

- The ability to implement the MEC-specific Sections of the QC plan for all explosives related operations;
- The ability to conduct and document QC audits of all explosives operations for compliance with established procedures;
- The ability to identify, document, report, and ensure completion of all corrective actions to ensure all explosive operations comply with requirements.

3.5.4.4. UXO Technician III

This individual supervises a UXO team. This individual will have experience in MEC clearance and disposal operations and supervising personnel.

3.5.4.5. UXO Technician II

This individual will serve as a member of a UXO team.

3.5.4.6. UXO Technician I

This individual will serve as a member of a UXO team. The UXO Technician I will not perform UXO procedures without the direct supervision of a fully qualified UXO Technician II (or above).

3.5.5. Daily Operations and Project Work Flow

Weekend work is anticipated on this project and additional coordination for access outside of normal hours is also anticipated. Field operations may be conducted during night-time hours and all lighting requirements (SSHP, Attachment 1 of Appendix D) will be followed. All UXO personnel involved in MEC-related activities will work no more than 40 hours of UXO-related work and not exceed four 12-hour days, with 48 hours rest between workweeks.

The schedule of daily operations, which governs all activities necessary to complete the intrusive excavation, is presented below. This provides a quick reference summary of procedures to be followed each day. Many of these activities are described in detail in the applicable Sections of this Work Plan.

1. Workers and support staff arrive at the CP or other designated meeting point and receive a daily safety briefing by the SSHO/UXOSO.
2. All team leaders receive a daily operations schedule. COP is sent out to recipients.
3. Air Monitoring Team performs equipment checks and set-up.
4. Work force sets up the equipment and mitigation supplies at the site. The PDS and Emergency PDS (EPDS) are set up (if not left in place from prior day).
5. Once all air monitoring equipment are operational and the site is ready for the day, the SSHO/UXOSO will give a short, specific safety briefing to the Down Range Teams. The USAESCH OESS will be notified, and work will commence, pending approval of the USAESCH OESS.
6. During the workday, there will be some QC checks, as well as operational challenges of the equipment being used on-site.
7. During intrusive operations, Down Range Teams will undergo medical monitoring following each rotation down range to determine appropriate work cycles and rest times.
8. During intrusive operations, a down range operations log will be kept and appropriate entries will be made indicating the findings.
9. If MEC item or suspect CWM is encountered, operations will be conducted in accordance with Section 3.5.12 of this Work Plan.
10. The Air Monitoring Team will gather all Depot Area Agent Monitoring Systems (DAAMS) for subsequent processing.
11. The work force will conduct any necessary cleanup or shutdown of the work site before the day's work ends.
12. The Site Supervisor/SUXOS may or may not conduct a daily debrief for the day's operations.

13. All wastes generated during the day will be handled in accordance with applicable regulations and guidance and until final disposal can be arranged.

3.5.6. Intrusive Procedures

The Down Range Team, consisting of UXO qualified personnel, will use magnetometers to locate anomalies within the construction footprint, to the maximum extent practicable.

A combination of one or more of the following detection technologies may be used, as applicable:

- Analog Detection Using Flux Gate Magnetometers: The Schonstedt GA-52Cx, or equivalent, may be used. The GA-52Cx is a hand-held locator that detects the magnetic field of surface and subsurface ferrous metal objects and energized power lines. The locator provides audio detection signals that peak in frequency when the locator's tip is held directly over the target. Prior to daily field activities, UXO Technicians will ensure proper detector function by checking for appropriate battery levels or by passing the detectors over a test strip.

- Analog Detection Using Electromagnetic Induction: The White's Spectrum XLT E-Series, or equivalent, may be used. The White's Spectrum XLT E-Series All-Metals Detector is a hand-held, all-metals detector with a 9.5-inch search coil that detects surface and subsurface ferrous and non-ferrous metal items. The output signal is an audible tone or visual display. The XLT locator can be configured to operate in different soil types and to accommodate external magnetic fields such as those associated with iron-rich magnetic soil and overhead or buried power lines. The XLT also has software programs to remove noise associated with power lines. The interference programs will remove 50 hertz power line noise or 60 hertz power line noise. Prior to daily field activities, UXO Technicians will ensure proper detector function by checking for appropriate battery levels or by passing the detectors over a test strip.

During anomaly excavation, the equipment operator will excavate the overburden, but not more than 12 inches at a time, and deposit the soil onto plastic sheeting on the ground. After each 12 inch lift, the CARA UXO Personnel will inspect the area using analog detection equipment and if any anomalies are identified, will continue the excavation using hand tools. Observers, positioned upwind, will watch for signs for MEC, munitions debris (MD), suspect CWM or intact containers with the excavation and removed spoils. Using hand signals, the observers will halt the excavation if any type of media is uncovered. Media locations will be recorded and spoils separated to prevent possible cross contamination of soils.

Once the item is exposed for inspection, the UXO team will evaluate the source of the anomaly to determine whether it is suspected CWM or conventional MEC. If the source of the anomaly is suspected to be CWM or a munition that has an unknown filler, the UXO team will follow the guidelines in Section 3.5.12.2 of this Work Plan. Conventional MEC will be handled in accordance with Section 3.5.12.3. If the item is determined to be MD, it will be removed and the area will be rechecked with the handheld magnetometer to ensure that a hazardous item is not hidden beneath it.

Removal will be performed to the depth of detection or to the depth required within the construction footprint to perform necessary operations. Once all anomalies are identified and any necessary MEC operations (e.g., assessment, x-ray, packaging) are completed, the construction contractor will perform necessary utility repairs/replacements, the excavation will be filled in with appropriate fill material and the site restored as close to its original condition as possible. All trash will be removed from the site and any investigation-derived waste (IDW) will be handled in accordance with Section 3.7 of this Work Plan.

3.5.7. Air Monitoring

Air monitoring must be conducted to protect site workers whenever intrusive operations are underway (areas which meet the definition of "unlikely" or "seldom" for encountering CWM or CA as determined in a Determination of Applicability or other approved assessment are exempt). Air monitoring for chemical and industrial agents of concern will be conducted in accordance with the approved Air Monitoring Plan (Appendix J) by the Air Monitoring Team. Air Monitoring for dust will be conducted by the SSHO/UXOSO, or designated team member. Section 3.5.12.1 provides guidelines for when there is a detection of CA.

When working at an excavation and there is confirmation of CA, but no source has been identified, a Down Range Team may re-enter the EZ with the appropriate PPE level (see Section 9.0 of the APP, Appendix D) and continue excavation to identify a source. The Down Range Team will also perform mitigation activities once the source is confirmed. Mitigation procedures may include containerizing or covering the surrounding soil or materials. If CA is confirmed, a Chemical Event Report will be initiated by the Garrison Safety Office in accordance with Interim Guidance (AR 385-XX) (DA, 2009).

3.5.8. Layout Plan and Site Work Zones

The establishment of the work zones will help ensure that personnel are properly protected against the hazards present where they are working, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in an emergency. The work zones allow the use of multiple teams or portions of teams conducting excavations simultaneously. The APP (Appendix D) provides information regarding a generalized set up of work zones (i.e., EZ, contamination-reduction zone, or CRZ, SZ). The following Sections outline the requirements for the EZ, CRZ, and the SZ.

3.5.8.1. Exclusion Zone (EZ)

The EZ is an area used to protect the public and non-essential personnel from inadvertent chemical releases or detonations. The EZ is based on the area of interest related to either the munitions with the greatest fragmentation distance (MGFD) or the type or amount of CA involved (maximum credible event, or MCE). Since most areas of the site have the potential of having both munitions and CA threats, the larger of the two will be used. Discussions regarding the formation of the EZ are presented below and in the CSS (Appendix K).

3.5.8.1.1. Maximum Credible Event (MCE)

The MCE is the worst case release of a CA or industrial chemical from a munition, bulk container, or process that could reasonably be expected to occur as a result of an unintended, unplanned, or accidental release.

The MCE was derived after a comprehensive review of the available historical documentation and munitions finds during previous intrusive activities, and it was determined that the 4.2-inch M2/M2A1 chemical mortar filled with 6.2 pounds of mustard (H or HD) was the munition that produces the largest CA or industrial chemical EZ, and proves to be most likely and hazardous munition which might be encountered during the construction footprint clearance. The MCE may be revised or supplemented if unforeseen hazards are encountered. Additional information is provided in the CSS (Appendix K).

3.5.8.1.2. 1% Lethality Distance

The 1% lethality distance is calculated based on the MCE and meteorological conditions and is established as the distance at which specific dosages would occur, e.g., the 1% lethality distance for HD is the distance at which 150 mg-min/m^3 occurs.

A computer model (D2PC) was used to predict the 1% lethality distance based on dispersion modeling of the release using meteorological data, and the characteristics of the chemical potentially present. The default distance of 171 feet was computed using worst-case daytime weather conditions and the D2PC dispersion model. The CSS (Appendix K) presents the data that was input into the D2PC program. The actual 1% lethality distance may instead be calculated and adjusted in the field based on current atmospheric conditions using the D2PC computer model. When used, model input parameters will include data collected with an on-site weather station. A log of these D2PC daily calculations will be maintained in the CP. Additional information is provided in the CSS (Appendix K).

3.5.8.1.3. Public Access Exclusion Distance (PAED)

Under normal operations, the PAED is the greater distance of either the 1% lethality distance associated with a MCE or the inhabited building distance (IBD) or hazard fragmentation distance (HFD) associated with the MGFD. Since the 1% lethality is larger than the MGFD, CARA will maintain the 1% lethality distance as the EZ for the public. Additional information is provided in the CSS (Appendix K).

3.5.8.1.4. Munitions with the Greatest Fragmentation Distance (MGFD)

Based on the available historical documentation, the MGFD for the construction footprint clearance at MSFC-003-R-01 is the 4.2-inch M2/M2A1 chemical mortar.

The HFD is a protective distance based on the maximum blast effect and the distance a piece (i.e., fragment) can travel at a velocity which could render damage to equipment or injury to individuals. An HFD of 129 feet has been established in the event of an unintentional detonation for non-essential personnel. The calculated HFD and associated safety criteria are provided in the CSS (Appendix K).

During disposal operations (i.e., intentional detonations) of conventional munitions, the maximum fragmentation distance (MFD) of the actual item being destroyed will be used unless approved engineering controls are incorporated to reduce this distance.

3.5.8.1.5. No Significant Effects (NOSE) Distance

The NOSE is the distance at which the general population (to include more susceptible subpopulations) would not experience any significant effects from exposure to CA. There will not be any occupied buildings within the EZ, therefore the NOSE distance does not apply for these operations.

3.5.8.1.6. Conclusion

The EZ used during the intrusive activities at the MSFC-003-R-01 site will be related to either the MGFD or the MCE and their respective HFD or 1% Lethality Distance. If the area of intrusive operations has the potential of having both a MGFD and a threat of encountering CA, the larger of the HFD or 1% Lethality Distance will be used. For the intentional detonation of conventional MEC, the MFD will be used unless approved engineering controls are incorporated to reduce this distance.

3.5.8.2. Contamination Reduction Zone (CRZ)

The CRZ is the transition area between the contaminated area and the clean area. This zone provides an area to prevent or reduce the transfer of hazardous materials that may have been picked up by personnel or equipment leaving the EZ.

A PDS will be established in the CRZ to facilitate decontamination in the event of a chemical of concern or an item with an unknown liquid fill being encountered and to prevent EZ personnel from transferring contamination to the SZ. This PDS will be established during all intrusive anomaly operations. At a minimum, personnel within the EZ will proceed through the PDS and complete a gross decontamination of boots and hands. All personnel entering or exiting the EZ during down range set-up and intrusive operations will be required to report to the PDS. To minimize the setup and takedown of the PDS, whenever possible, the PDS will be setup at location that can serve more than one grid where intrusive operations will be conducted. For more details regarding PDS set-up, procedures and decontamination see the APP (Appendix D).

3.5.8.3. Support Zone (SZ)

The SZ is considered a clean area and will be located at a sufficient distance from the intrusive activity to ensure the safety of the SZ personnel. The SZ is separated from the CRZ by the contamination control line. Public access beyond the contamination control line will be prevented during intrusive operations. The SZ contains the command post and other support supplies.

3.5.9. Evacuation and Shelter-in-Place

No occupied buildings or ongoing operations are present inside the EZs. Public access during intrusive operations is restricted to outside the HFD/PAED.

In the event an emergency condition occurs (e.g., release of CA outside of engineering controls) RSA will be responsible for coordination of supporting agencies to safely notify the endangered public.

3.5.10. Security and Medical Support

Security will only be required during non-working hours when either equipment has been left on-site or when there is a potential risk (e.g., munition left on site or conventional UXO or item with

an unknown liquid fill has been placed in storage) to the public or workers. Further information on security is provided in Section 7.0.

NASA will provide an ambulance staffed with at least one state or National Registry of Emergency Medical Technicians (NREMT) who are certified in advanced life support measures (i.e., paramedics) and will remain onsite during the intrusive operations and transportation activities. The paramedics will be equipped with a U.S. Department of Transportation (DOT)-approved ambulance with supplies necessary to treat those personnel who become injured or exposed to the agents of concern. The ambulance will provide transportation for the medical evacuation of personnel to Huntsville Hospital if it is determined that air evacuation is not needed. On site medical support will be provided during training, surveys, and exercises leading up to the intrusive work as well as during intrusive operations.

Prior to site activities, Non-stockpile Chemical Medical Training will be conducted for the Huntsville Hospital Emergency Care Center staff and the contracted on site paramedics. The USAESCH will provide instructors who will familiarize the medical team with the hazards and chemicals potentially encountered during this operation. Representatives from the medical facility and the paramedics will also be invited to participate in the tabletop exercise conducted prior to the start of intrusive work.

3.5.11. Emergency Conditions

In the event of an emergency condition (e.g., release of CA outside of engineering controls), the USAESCH OESS, with assistance of the Site Supervisor and/or SUXOS, will make initial notifications to the following:

- USAESCH Project Manager – Ashley Roeske, (256)895-1429
- RSA Site Manager – Jason Watson, (256)842-1448
- RSA Garrison Safety Chief – Mike Moore, (256)313-3297
- IEOC – (256)842-2218
- NASA Emergency Operations Center – (256)544-5793
- NASA Safety Office – (256)544-0974

During emergency operations, the excavation team will be instituting emergency procedures in an attempt to locate and control the source of the CA release. Emergency procedures include covering the excavation or open containers with plastic, containerizing soil in drums, and securing the lids of any open drums.

The Garrison Safety Office will initiate a Chemical Event Report and additional notifications will be made by the Garrison Safety Office in accordance with the Interim Guidance (AR 385-XX) (DA, 2009) and RSA regulations and guidance. The media shall be referred to the RSA Public Affairs Office.

3.5.12. Contingency Plans

The purpose of this Section is to summarize the response procedures to be used to ensure the safety and the protection of the public and site workers when MEC or suspected CWM items are encountered during intrusive operations.

3.5.12.1. Detection of CA in Air

If a miniature chemical agent monitoring system (MINICAMS) alarm occurs, the following sequence of events will be employed:

1. After the first alarm, the down range team will don respirators (if in Modified Level D PPE) and proceed upwind of the excavation or outside the 1% lethality distance. They will remain outside of the 1% lethality distance awaiting an additional cycle from the MINICAMS. At this point, the PDS personnel will begin to don the required PPE in order to support the down range team processing through the PDS.
2. If two additional cycles are clear, the down range team will remove their respirators and return downrange to continue operations.
3. If one additional cycles indicate the possible presence of CA at levels above their current PPE approval ratings, the down range team will be processed through the PDS.
4. If the alarm detection level equals below 1 x the short term exposure limit (STEL) for CA and there is not a splash hazard for CA, a team of two personnel will don their Level C PPE ensemble to mitigate the source of the alarm. The team will also remove and/or replace the DAAMS tubes for confirmation of the presence of CA.
5. If the alarm detection level equals to or above 1 x STEL (but below 10 x STEL) for CA and there is not a splash hazard, a team of two personnel will don their Level B PPE ensemble to mitigate the source of the alarm. The team will also remove and/or replace the DAAMS tubes for confirmation of the presence of CA.
6. If the alarm detection levels equals 10 x STEL and/or there is a splash hazard, a team of two personnel will don their Level A PPE ensemble and will mitigate the source of the alarm. The team will also remove and/or replace the DAAMS tubes for confirmation of the presence of CA.

The Down Range Team (once the appropriate PPE level has been verified by the UXOSO) will also perform mitigation activities once the source is confirmed. Mitigation procedures may include containerizing the surrounding soil or materials and covering the excavation. At this point, a Chemical Event Report will be initiated in accordance with Interim Guidance (AR 385-XX) (DA, 2009) and Appendix B of EP 75-1-3 (USACE, 2004) by the Garrison Safety Office.

If analysis of the DAAMS confirms the detection of CA and an item is encountered that suspected of being CWM, excavation will halt and the procedures in the following Section shall be followed.

3.5.12.2. Discovery of an Unknown Liquid-Filled Item

The following procedures shall be followed when such an “unknown” is encountered and is suspected to be CWM.

1. The Down Range Team, consisting of UXO-qualified personnel, will perform a preliminary visual assessment of the unknown item. If the item is suspected of containing an unknown liquid fill, further assessment by CARA will be performed. CARA will:
    a) Determine using organic x-ray equipment whether the item contains a liquid line.
    b) Determine whether the condition of the item allows for it to be safely packaged, transported, and stored pending its assessment and final disposition.
    c) Depending on the condition of the item:
        i. Safely package the item and place in a suitable container and transport to storage while awaiting further assessment and final disposition; or
        ii. Secure the item in place and mitigate vapor hazards, if safe to do so; and
    d) Establish a chain of custody by completing a Department of Defense (DD) Form 1911 (Material Courier Receipt).
    e) Perform further assessment using non-destructive testing (e.g., by x-ray, by use of a portable isotopic neutron spectrometry [PINS]), with the assessment provided to the Munitions Assessment Review Board (MARB). The MARB will analyze the assessment data to verify the fill, identify the most likely CA by type, and recommend final disposition (e.g., Explosive Destruction System [EDS]). Where a positive determination of fill cannot be made, the most hazardous potential CA for the type of the item involved will be used. Items may not be immediately assessed further. In this case, the items will remain in storage until such time that further assessment can be arranged.
2. Custody of the item will be maintained until such time as the fill is determined and final disposition is made. RCMD will be responsible for accountability of any items, as determined by the MARB to be RCWM, pending its final disposition. The Installation will be responsible for accountability of any items, as determined by the MARB to not be RCWM, pending its final disposition.
3. Where the above assessment activities determine that the item is not RCWM, is not explosively configured, and is not suspected of being a WP/incendiary munition, it will be handled in accordance with Section 3.5.12.3.

Final assessments will be conducted when sufficient munitions (as determined by the PDT) are in storage to warrant mobilization of the Mobile Munitions Assessment System (MMAS) or PINS. After final determination of the filler by the MARB has been completed, RCMD will determine the disposition of the CA-filled rounds and conventional MEC will be disposed of locally using a method determined most reasonable and safe by the PDT and stakeholders.

If an item consistent with the above is discovered, is impeding planned construction activities, and is unacceptable to move, then appropriate actions, notifications, and requests for Explosive Ordnance Disposal (EOD) support will be made in accordance with the Interim Guidance (AR 385-XX) (DA, 2009) and RSA regulations and guidance.

3.5.12.3. Discovery of MEC

If an item is encountered that appears to be a munition or an item that could be explosively configured, excavation will halt. The UXOSO will be notified and the Down Range Team will

begin a preliminary assessment. These assessment procedures will determine if the item is explosively configured in accordance with EM 385-1-97 (USACE, 2013a). If the item is suspected of being CWM then the procedures in Section 3.5.12.2, shall be followed.

If the SUXOS and UXOSO have determined the item is acceptable to move, it may be moved to a collection point for destruction using consolidated shots; however the collection point will be an area that has been previously cleared for both MPPEH and CWM.

MEC which are unacceptable to move will be BIP the same day unless it is not practical to do so due to weather, etc. Similarly, MEC which are acceptable to move will be consolidated and destroyed the same day if practical. In the event that MEC cannot be destroyed the same day, positive control of the item will be maintained (e.g., guarded) until the time that they are destroyed. The SUXOS and UXOSO will follow the procedures in the approved CSS (Appendix K) and this work plan for evacuation and site control, fragmentation distance, BIP procedures, and operations in populated/sensitive areas when destroying UXO in place. When this technique is employed, engineering controls may be used to minimize the blast and fragmentation effects.

Prior to preparing MEC for detonation, non-essential personnel will be evacuated from the EZ and will remain outside the EZ until MEC operations are completed. While preparing MEC for detonation, the UXOSO will ensure that the number of personnel on site is kept to the minimum required to safely accomplish the disposal mission. Authority to initiate demolition operations will rest solely with the SUXOS. The UXOSO will be responsible for ensuring all personnel have been accounted for and that the area is secure prior to authorizing the detonation of explosive charges. The SUXOS will ensure that the Management Team is notified of an impending demolition shot.

If determined by the SUXOS, UXOSO, and the USAESCH OESS, that a consolidated shot within the boundary of MSFC-003-R-01 is not practicable, the conventional MEC, determined acceptable to move, may be either transported to earth covered magazine (ECM) 8208 while awaiting final disposition, or transported to the Installation's approved and sited open burn/ open detonation (OB/OD) site for final disposition. Pre-approved procedures will be executed to load the items onto the transport vehicle. Tiedowns and bracing will be inspected to ensure items are adequately secured. Utilization of approved transportation routes which are least disruptive to Installation operations will be closed to the public during movement. Transportation and custody documentation will be completed by CARA Personnel.

3.5.12.4. Discovery of Intact Containers

If a container is discovered that is known not to be a munition, it will be assessed as if it were suspected CWM. The Down Range Team will perform a preliminary visual assessment of the unknown item. If the item is suspected to contain CA, the Down Range Team will perform further assessment to determine if the container contains an unknown liquid filler.

If the item has been confirmed to contain an unknown liquid fill, it will be packaged and transported to ECM 8211 in accordance with the CSS (Appendix K).
If the item is determined not contain a liquid fill, the item will be handled as IDW and disposed of properly.

3.5.13. Accountability and Records Management for MEC and Suspect CWM

A Trimble GEO XH handheld GPS, or equivalent, will be used to record specific data. Data collection will account for all MEC and suspected CWM encountered during the construction footprint clearance. These data entries will be made indicating amount, identification, condition, depth, and disposition, as applicable. An entry will be made for MD and MPPEH, indicating the general types of materials encountered but a full accounting will not be maintained.

An account of all recovered MEC and suspected CWM will be maintained by CARA in the project file. Each piece of ordnance recovered will be given a unique database identification number, and the item will be tracked from discovery to final disposition listing location, dates, and disposition. Pictures will be taken of each MEC and suspected CWM item discovered. A white board, or similar method, should be used to record the anomaly number, depth, and other pertinent information in the photograph. The UXOSO/UXOQCS is responsible for tracking, maintenance, and photographic records of all MEC and suspected CWM recovered during the project.

3.6. MC Sampling

Environmental sampling is not planned as part of this effort. Any work associated with evaluating the environmental impacts associated with MC/HTW will be performed as part of the planned RFI and IM.

3.7. Investigation-Derived Waste (IDW) Plan

This Section presents the disposal procedures for non-RCWM items. Soil and debris contaminated with CA is not considered RCWM. Waste streams requiring disposal could potentially include cultural debris, soil, decontamination water, PPE/solid waste, or other hazardous wastes; all are considered IDW. NOTE: For the purposes of IDW, “Investigation” implies “operational” derived waste.

3.7.1. General

During intrusive activities, containers of unknown liquids or solids (e.g., bottles or cans that have no labels, identifiable markings, or distinguishable physical characteristics) may be encountered. When such an “unknown” is encountered, the unknown will be assessed in accordance with Section 3.5.12.2.

3.7.2. Waste Soil

Due to the potential of encountering CWM or CA-contaminated soil, spoils will be placed on plastic sheeting or geo-textile cloth during intrusive excavations.

If the source of the anomaly is not suspected to be an item with an unknown liquid fill, the excavated soil may be returned to the excavation hole.

If the excavated anomaly is an item suspected to contain an unknown liquid fill, the excavated soil will undergo headspace screening by CARA in accordance with the Air Monitoring Plan (Appendix J).

- If headspace results show that CA is absent, the soil will be returned to the excavation site and any further waste characterization analysis will be performed as part of the planned RFI and IM for this site.

- If headspace results show that CA is present in detectable concentrations, the soil will be decontaminated in accordance with DA Pamphlet (PAM) 385-61, *Toxic Chemical Agent Safety Standards* (DA, 2012) until its headspace results are below the STEL. The decontaminated soil will be containerized and stored on site or in a permitted facility in accordance with applicable laws and regulations until final characterization and disposition.

3.7.3. Waste Water

Gray water will be produced through equipment and personnel decontamination. Equipment and personnel decontamination waters from the PDS will be collected daily in holding tanks or drums. The dates the waters are collected will be marked on the side of the container, and notated on an electronic drum log (maintained by the UXOQCS).

The decontamination solutions will be segregated into two categories:

1. Decontamination solutions used during operations when air monitoring detections of CA or other hazardous constituents have occurred or when suspected CWM is encountered.
    a. The decontamination solution will be containerized and stored on site or in a permitted facility in accordance with applicable laws and regulations until final transportation for offsite disposal as hazardous waste. Bleach may need to be added to reduce CA levels to allow disposal – depending on waste contractor requirements.
2. Decontamination solutions used when no suspected CWM has been encountered and there have been no air monitoring detections of CA or other hazardous constituents.
    a. The solution will be disposed offsite as nonhazardous waste.

NOTE: The collection and analysis of aqueous samples is not planned for this site.

3.7.4. Metallic Debris and Other Cultural Materials

During operations, teams may encounter metallic debris and other debris. Debris material will be classified as either being a CA hazard or a non-CA hazard. If a MINICAMS alarm occurs and is confirmed by DAAMS, or if other obvious signs of CA contamination are observed during the operations at that site, the debris will be containerized and undergo headspace monitoring by the Air Monitoring Team in accordance with the Air Monitoring Plan (Appendix J).

Items assessed in the field to be chemical warfare training related debris will be placed in containers (e.g., drums) or wrapped in plastic capable of being sealed and heated. The containers will be heated in accordance with the procedures outlined in the Air Monitoring Plan (Appendix J) and the ambient air in the container will be monitored for CA by the Air Monitoring Team. If monitoring reveals the presence of agent vapor above the STEL, the items must be decontaminated. Metallic items will be removed from the drum after decontamination and allowed to dry. After the metallic items have dried, they will be headspaced again for agent vapor above the STEL. Once the metallic items have been decontaminated to a level below the STEL, they will be processed as 3X scrap. Porous debris that has been decontaminated will remain in the drum, the drum will be sealed, and the exterior of the drum will be washed with a decontaminating 5%

solution of bleach and rinsed. Decontamination solution and rinse water will be handled in accordance with Section 3.7.3.

Non-CWM debris material (cultural debris) will be staged on site in appropriate containers. Non-CWM debris material consists of debris that has no visual CA contamination, was not located in discolored soil, and was negative for CA during air monitoring activities conducted during excavation. Metal bins, wood bins, or poly drums will be used to store cultural debris as required. Non-metallic debris that is not suspect CWM will be containerized and stored in a dumpster located in the staging area, or picked up by a local solid waste facility.

3.7.5. PPE

Wastes from disposal of PPE will be created daily during intrusive activities. These wastes may include boots, fabric, tape, disposable outer garments, and plastic sheeting. If there are no detections of CA during air monitoring conducted or suspect CWM encountered during intrusive operations, the PPE waste can be packaged in plastic bags, labeled as "used, not contaminated" and disposed of as solid waste (trash) in a dumpster or other similar container.

If agent is detected during that day's activities, the PPE wastes will be sealed within a drum and labeled as to its contents. The drum will be subjected to headspace monitoring and, if CA is detected above the STEL, the contents will be decontaminated and stored on site or in a permitted facility while awaiting off-site transportation and disposal. If agent is detected below the STEL, the material will be handled as described but without decontamination.

3.7.6. Laboratory Waste

The onsite laboratory associated with the Air Monitoring Team is expected to generate small quantities of several types of waste. These wastes include: spent isopropyl alcohol, spent acetone, spent bleach, sharps (i.e., needles, syringes), spent decontamination water, and used mass selective detector pump oil. These wastes are not expected to be CA-contaminated. Waste profiles will be developed based on generator knowledge and wastes will be packaged and staged for disposition in accordance with applicable regulations and guidance.

3.7.7. MPPEH and MD

Items found to present an explosives hazard will be handled as stated for MEC in the Section 3.5.12.3.

For items handled onsite by CARA, the SUXOS will designate a team leader (UXO Technician III) who will perform a 100% re-inspection of all recovered items to determine if free of explosives hazards or other dangerous fillers. This team leader will supervise the demolition of items found to contain explosive hazards, and will also supervise the consolidation of MPPEH, MD, and range-related debris segregation. Inert munitions debris, range-related debris, and MPPEH may be stored in the same general area, but will be stored in separate containers. All known MPPEH will be stored in locked containers to prevent materials from being added that may not have been through the inspection process.

The UXOQCS will conduct daily audits of the procedures used by the UXO teams and individuals for processing MPPEH, and will perform random sampling (by pieces, volume, or area) of all

MPPEH collected from various teams to ensure no items with explosive hazards are identified as MD or range-related debris.

MPPEH inspection, certification, verification and disposition will be performed in accordance with the procedures outlined in Interim Guidance Document (IGD) 14-01 (EM 200-1-15), *Technical Guidance for Military Munitions Response Actions* (USACE, 2013b). The UXOQCS and SUXOS will perform an inspection of MD and/or range-related debris to verify and certify that it is free from explosive material. The inspected debris will be secured in a closed, labeled, and sealed container which will carry a unique identification number. The container must be sealed in a manner in which the seal must be broken in order for the container to be opened. The seal number must be recorded and maintained in the site documents as presented in Section 4.2.

A DD Form 1348-1A will be filled out by the SUXOS and used as certification/verification documentation. This form must show the typed or printed names of the SUXOS and UXOQCS, organization, signature, and home office and field office phone number(s) of the persons certifying and verifying the debris as free of explosive hazards. The form must also clearly state the basic material content, estimated weight, container and seal numbers, site location. The form will also contain the following statement:

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

The MD will be sent to either the Installation's Defense Logistics Agency's Disposition Services (formerly DRMO) or to a designated demilitarization subcontractor who will certify (on company letterhead) that the material has been received, agrees with the provided documentation that the sealed containers contained no explosive hazards when received, and would not be sold, traded, or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content. This documentation must be returned to the RSA Site Manager and will be incorporated into the After Action Report.

When items are transported to OB/OD for final disposition, the SUXOS will ensure that all items are identified on a DD Form 1911 and will provide this along with a Waste Profile Sheet to the OB/OD. Upon receipt of the items, the OB/OD will sign the DD Form 1911 and will be responsible for all further handling and final disposition. A completed DD Form 1348-1A will be filled out by the OB/OD and provided to the RSA Site Manager to document final disposition. This documentation will be incorporated into the After Action Report. A copy of the DD Form 1911, DD Form 1348-1A, and the Waste Profile Sheet are available in Appendix F.

3.8. Risk Characterization and Analysis

Environmental samples will not be collected during this project. Risk characterization and analysis will be performed during the planned RFI and IM.

4.0 Quality Control Plan

It is CARA's policy to apply sound and cost-effective quality principles to all of its activities. The quality policies are established within the applicable Work Plan and its procedures are applicable to all participating project personnel and subcontractors. The plan is applicable to all site activities affecting quality including, intrusive operations, handling of hazardous materials, and data management. CARA is solely responsible for the control of quality and for providing services and deliverables that conform to the requirements outlined in their scope of work.

4.1. Quality Control (QC) Process and Procedures

Listed below are QC processes and procedures associated with personnel, data collection/analysis, other equipment, deliverables, and for measuring the effectiveness of the construction footprint clearance. CARA's QC process provide for:

1. All equipment used on-site will be calibrated, if calibration is applicable to that instrument, and used and maintained in accordance with manufacturer's specifications. Records of any repairs performed on equipment will be included in the final report with an explanation of problem diagnosis and repair.
    a. Each instrument will be noted according to make, model, and serial number in the field logbooks and/or in the digital data logger for the respective instruments.
    b. Functional instrument tests for the system will be recorded.
    c. All instruments and equipment that require field calibration will be checked prior to the start of each workday.
    d. Batteries will be replaced as needed, and the instruments will be checked against a known source.
2. QC procedures will be implemented to ensure data acquisition, data processing, and interpretation methods are monitored at a sufficient level to meet the overall program objectives. Random audits of procedures will be performed by the USAESCH OESS.
3. Monitoring/measuring the effectiveness of work performed:
    a. The UXOQCS is responsible for ensuring that personnel accomplish all QC checks and that the appropriate log entries are made. The UXOQCS performs random, unscheduled checks to ensure that personnel accomplish all work specified in the work plan and submits a report of their findings to the SUXOS.
    b. Project deliverables, such as the work plan and After Action Report documents, will be prepared and reviewed internally by the Army prior to submittal to ADEM.
    c. Daily QC reports, completed by the UXOQCS, will be submitted to the Site Supervisor and/or SUXOS which include descriptions of the areas checked and the results of the QC checks. Records of these inspections will be submitted at the end of the project.
4. Inspecting the maintenance and accuracy of site records
5. Determining compliance with site safety, environmental, and operational plans
6. Ensuring the accuracy, timeliness, and completeness of data deliverables.

The UXOQCS will document whether clearance processes need to be modified, if corrective actions are necessary, or if the processes are being performed to their optimal capabilities. If it is found that the interpretation processes need modifying or corrective actions are identified, all data processed previously will be re-evaluated under these new guidelines.

4.2. Data Management

All CARA and USAESCH field records generated during the construction footprint clearance activities will be checked for completeness by the USAESCH and RSA. The results of these activities will be compiled and presented in the After Action Report.

5.0 Explosives Management Plan

This Section provides details for the management of explosives during this project where detonations on MSFC-003-R-01 are planned to occur (i.e., BIP or consolidated shots). This work plan was developed in accordance with Federal Acquisition Regulation (FAR) 52.245-2, *Government Property (Fixed Price Contracts)*; state and local laws and regulations; Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) P 5400.7, *Federal Explosives Laws and Regulations* (ATF, 2012); DoDM 6055.09-M (DoD, 2010); DOT regulations; and AR 190-11, *Physical Security of Arms, Ammunition, and Explosives* (DA, 2013). All detonations planned to occur on the OB/OD will follow established and DDESB approved safety and siting plans.

Any MEC, MPPEH, and/or CWM identified during the intrusive operations will be handled in accordance with the CSS (Appendix K).

5.1. Licenses/Permits

Explosives will be obtained, as needed, from an on-call vendor/supplier. The necessary licenses or permits will be acquired authorizing the purchase, transportation and usage of explosives on RSA and copies will be available for local, state and federal authorizes upon request.

5.2. Acquisition

If required, commercial explosives will be acquired by authorized individuals from a local ATF-licensed vendor or vendors who will supply and deliver materials to the location. A copy of the user permit will be maintained at the CP, and upon request, will be made available to any local, state, or federal authority.

Typically, the following explosives will be used for disposal of MEC/MPPEH or venting of inert munitions:

- Jet perforators and/or cast boosters
- Detonating cord
- Electric or nonelectric initiators.

Maximum anticipated quantities of explosives that will be ordered and delivered to MSFC-003-R-01 will depend on the number of items encountered.

5.3. Initial Receipt

The licensed explosives vendor will deliver the explosives to a designated location at MSFC-003-R-01. The actual type and quantity of explosives received will be noted on the shipping documentation with the signatures of both the delivery driver and the individual authorized to receive such explosives.

5.4. Storage

Storage of conventional MEC will be performed in accordance with the CSS (Appendix K). Storage of donor explosives is not required. Donor explosives to be used for MEC/MPPEH demolition will be delivered to the site on an as-needed basis. Donor explosives will either be consumed on the same day they are delivered or picked up at the end of the day by the explosives vendor.

5.4.1. Smoking and Open Flames
Smoking, matches, open flames, and spark-producing devices are only permitted at areas designated by the Site Supervisor and not within 50 feet of any explosives.

5.4.2. Quantity and Storage Restrictions
As discussed in Section 5.4, donor explosives will not be stored on site and will be delivered to RSA on an as-needed basis. The team will attempt to limit the number of deliveries of donor explosives by consolidating demolition activities when possible.

5.4.3. Explosives Storage Within a Magazine
Storage of any conventional MEC will be performed in accordance with the CSS (Appendix K).

5.4.4. Housekeeping
The explosive storage magazine(s) will be kept clean, dry, and free of grit, paper, empty packages and containers, and rubbish. The area surrounding the magazine(s) is to be kept clear of rubbish, brush, dry grass, and trees (except live trees more than 10 feet tall) for not less than 25 feet in all directions. Volatile materials are to be kept a distance of not less than 50 feet from the magazine(s).

5.5. Transportation
Transportation will be performed in accordance with the CSS (Appendix K).

5.6. Receipt Procedures
Receipt of explosives will be performed in accordance with the CSS (Appendix K). Individuals who are authorized to receive, issue, transport and use explosives will be accountable by signing receipt documents, as necessary. The individuals held accountable will obtain and return receipts for all explosives purchased and delivered, and certify in writing that the explosives were used for their intended purposes. Individuals authorized to receive, issue, transport, and use explosives will be identified by name in writing.

5.7. Inventory of Stored MEC
An accurate running inventory of all identified MEC stored in the magazines will be maintained. A minimum of two copies of the inventory shall be retained at the facility. One copy will be at the location of the magazine and the other will be maintained by the SUXOS in the field office. CARA will provide a weekly update of the inventory to the USAESCH PM and RSA PM.

5.8. *Lost or Stolen Explosives and Unauthorized Use of Explosives*
If explosives are discovered to be lost, stolen, or used without authorization, the incident will be immediately reported to the SUXOS and the Site Supervisor, who in turn, will inform the USAESCH OESS, USAESCH Project Manager, and RSA Site Manager. If the inventory is not correct upon delivery, the recipient will either reject the delivery or have the discrepancy corrected by the vendor.

The federal licensee is required by 27 CFR 55.30, *Reporting Theft or Loss of Explosive Materials*, to report the theft or loss of explosives to the ATF within 24 hours. In the event of such an occurrence, the following procedures will be followed:

- Appropriate notifications will be made in accordance with 27 CFR 55.30. These will include calling the ATF (800-461-8841 or 888-283-2662) and the local law enforcement authorities.

- Complete and forward ATF Form 5400.5 (Appendix F). A copy of this form will be provided to the Site Supervisor, USAESCH Project Manager, and RSA Site Manager.

6.0 Storage Facility Siting Plan

A CSS for the MSFC-003-R-01 MEC/CWM construction footprint clearance, which details the storage facility siting requirements, has been prepared by USAESCH as a separate document and will be placed in Appendix K upon final DDESB approval.

7.0 Physical Security Plan for RCWM Project Sites

A Physical Security Plan is required by Interim Guidance (AR 385-XX) (DA, 2009) for suspect CWM project sites. The Physical Security Plan describes the security criteria to be employed during the construction footprint clearance including the storage of suspected CWM within an ECM.

7.1. Mission

The purpose of the project is to perform a MEC/CWM construction footprint clearance within the MSFC-003-R-01 site boundary and properly handle all MEC, MPPEH, explosives hazards, suspect CWM, and CA-contaminated media.

7.2. Purpose

This plan defines the areas of security interest related to the MSFC-003-R-01 site boundary, and specifies the equipment, forces, and devices used to protect suspected CWM and provide an effective security posture.

7.3. Objective

The objectives of physical security are:

- Prevent unauthorized access to suspected CWM;
- Prevent damage from sabotage, espionage, or unauthorized use of suspected CWM;
- Prevent theft or diversion of suspected CWM or government equipment and supplies.

7.4. Threat Analysis

The current Force Protection Level for RSA is "Bravo" which indicates an increased and predictable threat of terrorism. This is primarily due to the growing concern of a jihadist threat in the U.S. However, the most likely threat to MSFC-003-R-01 and unauthorized access to suspected CWM comes from trespassers accessing the site boundary and the location of the ECM.

7.5. Vulnerabilities

The following security areas are considered the most vulnerable because of their locations and uses:

- The ECM is located at the 8200 Block – south end of the Installation – on Government controlled property. The ECM is where suspected CWM will be stored. The ECM will be equipped with an approved intrusion detection system (IDS) and surrounded by a fence meeting the minimum requirements as specified in AR 190-11 (DA, 2013). In addition to the IDS, the ECM will be patrolled by the Installation approved security forces.
- Periodic surveillance will be provided during intrusive operations or any time equipment is left on site.

7.6. Priorities

The priority of physical security is:

- First, to any suspected CWM identified at the site, during transportation of the item to the ECM, and in storage at the ECM.
- Second, to the security of equipment and supplies at the intrusive location due to the sensitive nature of the work and the properties.

- Third, to the security of equipment and supplies at the CP.

7.7. Limited and Exclusion Areas

Access to the project work areas will be controlled by the project staff and the Installation approved security force, as applicable. Only those essential personnel will be allowed on the site without an escort. The ECM will also be a limited access area. Only essential personnel from USAESCH and CARA will be allowed access inside of the ECM area once suspected CWM has been placed in the facility.

7.8. Equipment and Devices to Detect or Delay Intrusion

7.8.1. Site Office Area

The Site Office Area includes the site office and the equipment storage area. The site office will consist of either an office trailer facility or a conex with office facilities. Equipment may be stored in either conex boxes or on site. Both offices and equipment conexes will be properly secured to prevent the entry of non-authorized personnel.

7.8.2. IDW Storage Area and ECM

These areas should be secured in the following manners:

1) Perimeter boundary: The ECM storing suspect CWM and RCWM will be surrounded by a fence meeting the minimum requirements of AR 190-11 (DA, 2013). A separate fence will be installed around the IDW storage area to prevent unauthorized access. A fence surrounding ECMs storing conventional MEC is not required per AR 190-11 (DA, 2013). However, all ECMs will be within the secured, access controlled, 8200 block.
2) Clear zones: The IDW storage area and the ECMs will have a clear view around all sides.
3) Gates: All gates will be locked to the compounds during the non-operational hours and monitored during operational periods at times when no suspected CWM is stored. All gates to the ECM will be locked and key-control will be maintained whenever items are being stored.
4) Signs: metallic “Restricted Area” signs will be used on the suspect CWM ECM fence, one per side, meeting the requirements of AR 190-13, *The Army Physical Security Program* (DA, 2011).
5) Inspections and maintenance: The security patrol will monitor security of the ECM. If no items are in storage, the security will periodically check the area as part of the 8200 block check.
    a. When suspected CWM is stored in the ECM:
        i. An IDS is installed and functional:
            1. The security patrol will check the facility every 24 hours to observe integrity of the fence, including the gate and lock, and observe the condition of the ECM and surrounding area.
        ii. An IDS is not installed, or the IDS is not working properly:
            1. The security patrol will provide a 24-hour armed guard posted at a location to maintain constant, unobstructed observation of the ECM, prevent any unauthorized access to the structure, and make known any unauthorized access to the structure

until the IDS is operational. The security patrol will also check the facility every 2 hours, in addition to the 24-hour armed guard.

iii. If there are signs of an unauthorized activity or if any out-of-the-ordinary circumstances are noticed:

1. Site management personnel will be called by the security guard in the following order: USAESCH OESS, Site Supervisor, SUXOS, then the UXOSO/UXOQCS – until one is contacted. Thereafter, site management personnel will notify the USAESCH Project Manager, RSA Site Manager, Air Monitoring Team, and the IEOC.

2. **The security guard will not enter the ECM under any circumstances**.

3. If there is reason to suspect that the integrity of the ECM has been compromised, the Air Monitoring Team will conduct first entry monitoring and the CARA UXO Team will inventory and inspect stored items.

b. When conventional MEC is stored in the ECM:

iv. An IDS is installed and functional:

1. The security patrol will check the facility every 72 hours to observe integrity and condition of the lock and ECM and surrounding area.

v. An IDS is not installed, or the IDS is not working properly:

1. The security patrol will check the facility every 48 hours to observe integrity and condition of the lock and ECM and surrounding area until the IDS is operational.

vi. If there are signs of an unauthorized activity or if any out-of-the-ordinary circumstances are noticed:

1. Site management personnel will be called by the security guard in the following order: USAESCH OESS, Site Supervisor, SUXOS, then the UXOSO/UXOQCS – until one is contacted. Thereafter, site management personnel will notify the USAESCH Project Manager, RSA Site Manager, and the IEOC.

2. **The security guard will not enter the ECM under any circumstances**.

3. If there is reason to suspect that the integrity of the ECM has been compromised, the CARA UXO Team will inventory and inspect stored items.

7.9. Security Lighting

Security lighting will allow security personnel to maintain visual-assessment capability during darkness.

7.9.1. Intrusive Area Lighting

Night work in MSFC-003-R-01 may be required if the intrusive work impacts tenants that have daytime schedules that are mission critical. A kick-off meeting will be held prior to initiating site work with tenant organizations, the RSA Garrison Safety Office, and the IEOC to outline contingency plans and determine the final work schedule.

These work activities will require artificial lighting to illuminate specific work areas as required to maintain safe working conditions. EM 385-1-1, *Safety and Health Requirements Manual* (USACE, 2014) will be referenced for specific performance standards. Minimum Lighting

Requirements, for the construction, general outdoor and work areas will be used as initial performance criteria for the night operations plan. The lighting and monitoring requirements for lighting during night operations are presented in the APP (Appendix D).

The UXOSO will conduct prescribed light surveys to verify employees working on specific site work areas have adequate lighting in accordance with EM 385-1-1 (USACE, 2014)

7.9.2. Site Office and ECM Area Lighting

- Lighting will be provided on the outside of the ECM and at the Site Office. The lights will either have photoelectric cells to turn on automatically at dusk and off at dawn, or will be run by a generator which is turned on at dusk and off at dawn.
- Use control and standards: Where electricity is provided, lighting will be switched on (to operate automatically) at all times when suspected CWM is placed in the ECM. The control switch for the lighting will be locked to prevent unauthorized access. If lighting is run off of a generator, the security force will be charged with starting the lighting prior to darkness and ensuring the lighting runs through the night.
- Inspection and maintenance: The security force will check the security lighting and the fences of the ECM compound at the site every 2 hours when suspected CWM is stored.
- Emergency actions for power failure: If a power failure occurs due to a power outage or equipment failure, security forces may be enlarged until the situation is corrected.

7.10. Communication Systems

The security force will be equipped with two forms of communication equipment which has been demonstrated to work in the area. A cell phone will also be maintained (even if it is not one of the required forms of equipment) to ensure contact with off-site personnel.

7.11. Locks and Keys

Locks and keys to the ECM gates are controlled by the USAESCH, and the ECM doors are controlled by the Site Supervisor, or SUXOS, once suspected CWM is stored within the ECM. Locks and keys for collateral areas and equipment will be maintained by the Site Supervisor, or SUXOS.

7.12. Measures to Control Personnel, Vehicles, and Material

- Personnel Access Controls: Only essential personnel and authorized visitors will be permitted entry into the site and only essential personnel will be permitted entry into the ECM. Control procedures will assure positive identification of all personnel prior to entry. Authorized visitors and maintenance personnel will be escorted at all times. Entry into the site will be at the discretion of the USAESCH OESS and Site Supervisor.
- Escort Requirements: Escorts will keep visitors under constant observation at all times.
- Non-Operational Hours Access Procedures: the Site Supervisor or SUXOS must approve non-duty hour access. All pertinent facts concerning the access will be recorded and reviewed by the operations officer.

7.13. Personnel Identification System
Security personnel will check photo identification against the access roster prior to admittance to the ECM.

7.14. Vehicle Control
Only authorized vehicles are allowed at the intrusive site. Only authorized transportation vehicles are allowed in the ECM compound.

7.15. Material Control
The CARA Team will log all suspected CWM being transported from the areas of interest to the ECM. Suspected CWM, which has been determined safe to move, will be transported by the CARA Team. Suspected CWM, which has been determined unsafe to move, will be handled by the responding EOD unit. All movement will be logged using DD Form 1911.

7.16. Security Forces
Security forces for the ECM consist of:

1) Type and composition: The ECM will be equipped with an IDS. In addition to the IDS, the facility will be patrolled periodically by the security personnel.
2) Authority and Jurisdiction: The Installation's Directorate of Emergency Services (DES) will provide standard local security procedures to the security personnel.
3) Weapons, Ammunition, and Equipment: When items are stored in the ECM, security personnel will be armed and equipped in accordance with standard local procedures.
4) Rules of Engagement and Use of Deadly Force: These are commensurate with the rules employed by the local security forces.
5) Training: This is the responsibility of DES. Instructions to the security guards will be provided by the CARA Site Manager or SUXOS. The SSHO/UXOSO will provide safety and health training.
6) Actions to be taken under adverse weather and limited visibility conditions: Patrols will be maintained during these conditions to ensure security integrity.
7) Posts: security posting will be designated by the CARA Site Manager or SUXOS, in cooperation with the USAESCH OESS.
8) Working dogs: may be used if available and deemed necessary.
9) Response Force: the armed guard on duty will call for the appropriate response force from the police, emergency responder, or other designated authority depending on his assessment of the situation. Response times will be 10 to 15 minutes.

7.17. Emergency Actions of General Nature
Actions pertaining to emergency situations will be in accordance with the APP (Appendix D).

7.18. RCWM Movement
RCMD will be responsible for any off-site movement of RCWM.

7.19. Coordination

This plan will be coordinated with all members of the intrusive team, to include DES, IEOC, NASA Security, the CARA Team, USAESCH, RSA IRB and construction personnel.

7.20. Key and Lock Control and Instructions for Security Force

A Key Control Register and Inventory form and written instructions for the security force are provided in Appendix F of this Work Plan.

8.0 References

27 Code of Federal Regulations (CFR) 55.30, ***Reporting Theft or Loss of Explosive Materials.***

29 Code of Federal Regulations (CFR) 1910.120, ***Hazardous Waste Operations and Emergency Response***.

29 Code of Federal Regulations (CFR) 1926, Subpart P, ***Excavations***.

Alabama Department of Environmental Management (ADEM), 2015, ***Redstone Arsenal's Alabama Hazardous Waste Management and Minimization Act Hazardous Waste Storage Facility, Thermal Treatment, Solid Waste Management Unit Corrective Action Permit, Modification No. 5,*** May.

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FIGURES

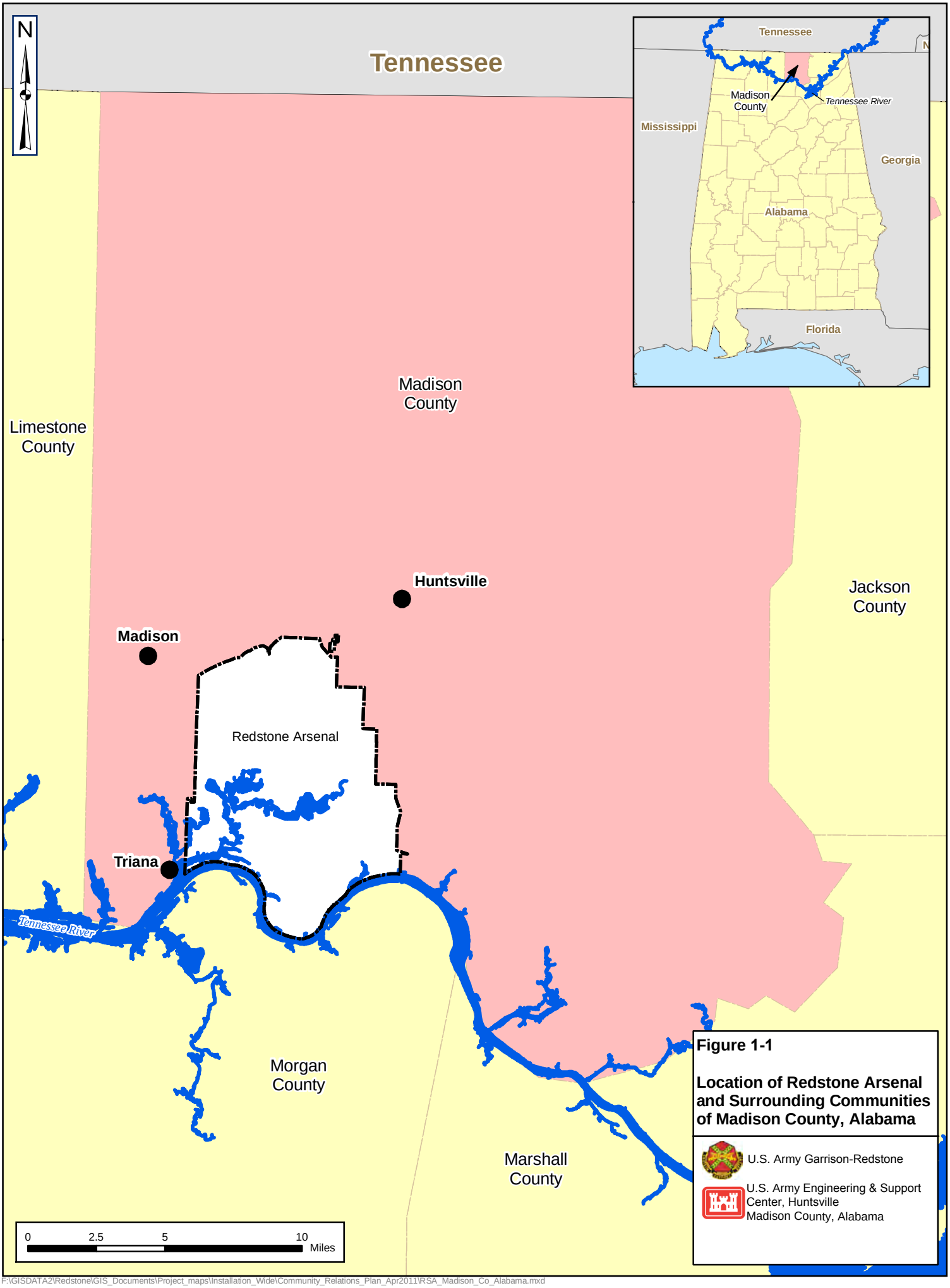


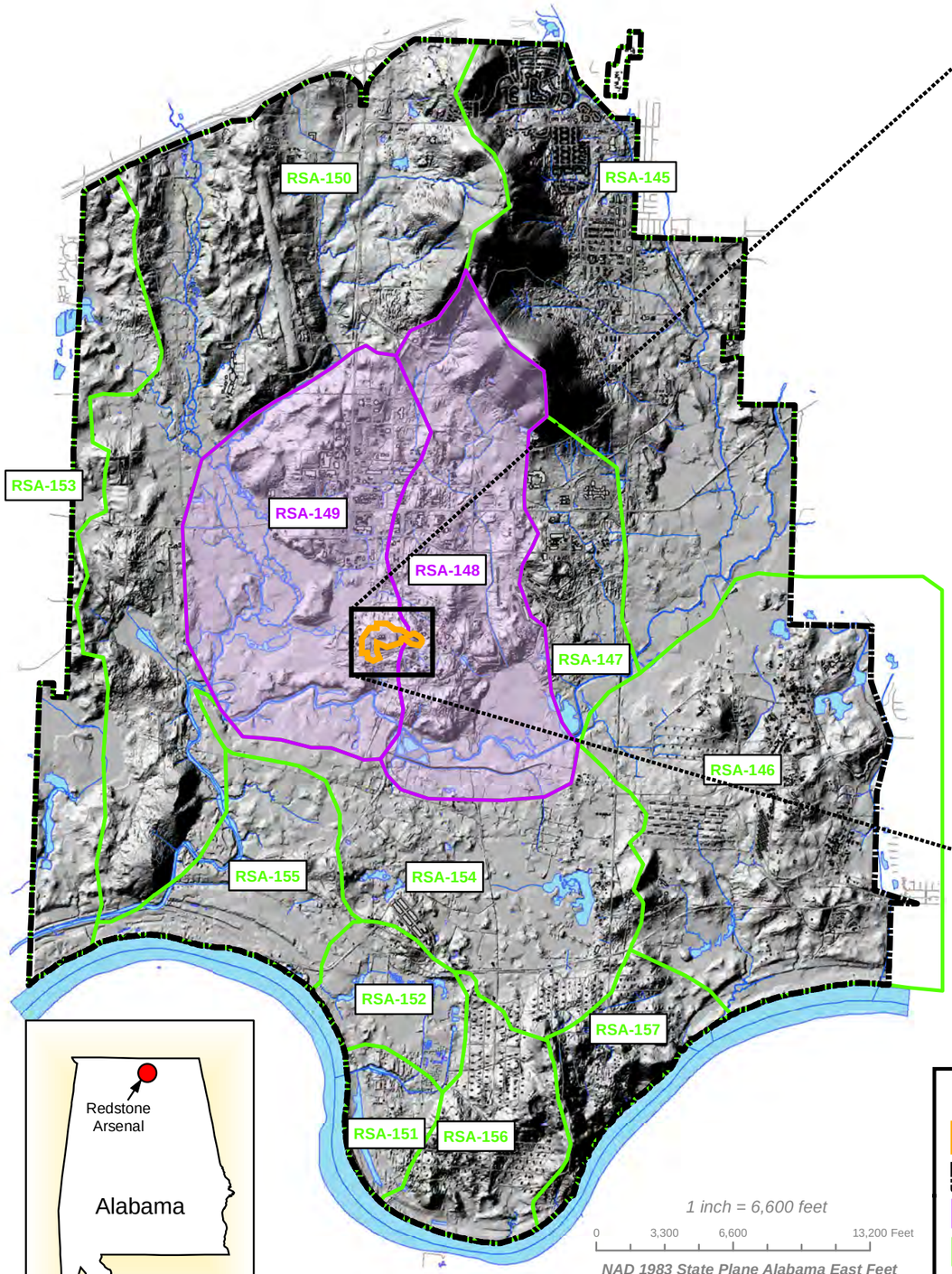
Figure 1-1

Location of Redstone Arsenal and Surrounding Communities of Madison County, Alabama

U.S. Army Garrison-Redstone

U.S. Army Engineering & Support Center, Huntsville
Madison County, Alabama

F:\GISDATA2\Redstone\GIS_Documents\Project_maps\Installation_Wide\Community_Relations_Plan_Apr2011\RSA_Madison_Co_Alabama.mxd



Legend

- MSFC-003-R-01 Site Boundary
- RSA Installation Boundary
- RSA-149, RSA-148 Site Boundary
- Groundwater Site Boundaries
- Buildings
- Removed Structures
- Roads
- Surface Drainage Features (Some Ephemeral)
- Water Bodies

Figure 1-2

MSFC-003-R-01
Regional Location Map
Redstone Arsenal
Madison County, Alabama

1 inch = 500 feet

N

0 250 500 1,000 Feet

NAD 1983 State Plane Alabama East Feet

U.S. Army Engineering & Support Center, Huntsville
Madison County, Alabama

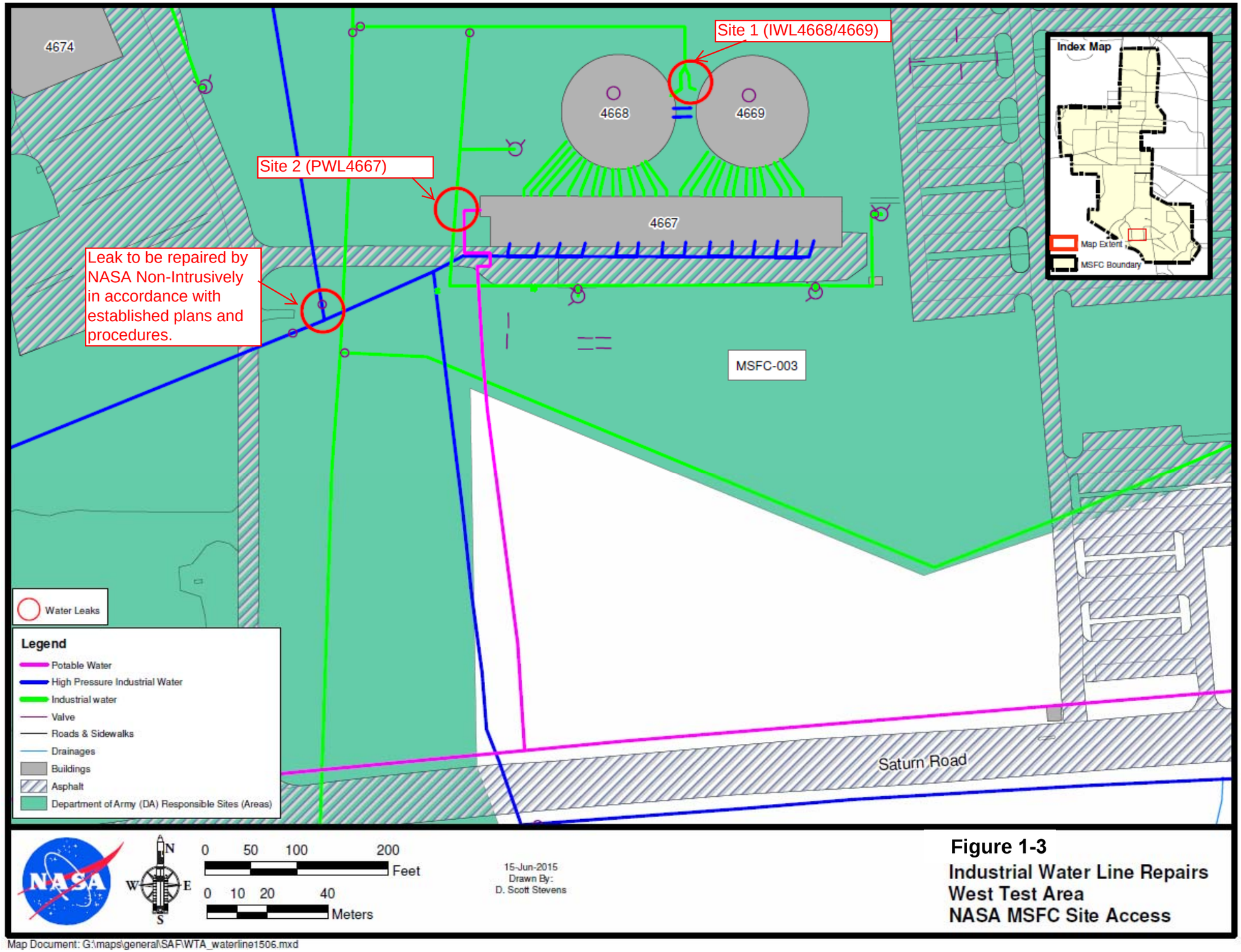


Figure 1-3
Industrial Water Line Repairs
West Test Area
NASA MSFC Site Access

Map Document: G:\maps\general\SAF\WTA_waterline1506.mxd

ID	Task Name	Duration	Start	Finish	Notes
1	**MSFC-003-R-01 Utility Upgrades**	**145 days**	**Mon 6/8/15**	**Fri 2/5/16**	**REVISED 10/26/15**
2	**Deliverables**	**145 days**	**Mon 6/8/15**	**Fri 2/5/16**	
3	**Chemical Safety Submission (CSS)**	**145 days**	**Mon 6/8/15**	**Fri 2/5/16**	
4	Development	20 days	Mon 6/8/15	Fri 7/3/15	Completed
5	Internal Review	12 days	Mon 7/6/15	Tue 7/21/15	Completed
6	MM-CX Concurrence	1 day	Wed 7/22/15	Wed 7/22/15	Completed
7	Submit to AMCOM & Garrison Safety Offices	1 day	Wed 7/22/15	Wed 7/22/15	Completed
8	AMCOM & Garrison Safety Office Review	5 days	Wed 7/22/15	Tue 7/28/15	Completed
9	AMCOM & Garrison Safety Office - Onboard Review	1 day	Wed 7/29/15	Wed 7/29/15	Completed
10	Garrison Safety Office Concurrence	1 day	Mon 8/17/15	Mon 8/17/15	Completed
11	AMCOM Safety Office Concurrence and submittal to USATCES	50 days	Tue 8/18/15	Tue 10/27/15	**Currently behind schedule.**
12	USATCES Review	21 days	Wed 10/28/15	Tue 12/1/15	**Must expedite to meet field schedule**
13	USATCES Acceptance and submittal to DDESB	1 day	Wed 12/2/15	Wed 12/2/15	
14	DDESB Review	21 days	Thu 12/3/15	Thu 2/4/16	**Must expedite to meet field schedule**
15	DDESB Approval	1 day	Fri 2/5/16	Fri 2/5/16	
16	**Work Plan**	**114 days**	**Mon 6/8/15**	**Mon 11/16/15**	
17	Development	50 days	Mon 6/8/15	Fri 8/14/15	Completed
18	Internal Review	10 days	Mon 8/24/15	Fri 9/4/15	Completed
19	Army Concurrence and submittal to ADEM & NASA	1 day	Mon 9/21/15	Mon 9/21/15	Completed
20	ADEM Review	15 days	Tue 9/22/15	Tue 10/13/15	Completed
21	ADEM Onboard Comment Resolution	1 day	Fri 10/23/15	Fri 10/23/15	Completed
22	Revise Deliverable	5 days	Mon 10/26/15	Fri 10/30/15	
23	ADEM Backcheck and Concurrence	10 days	Mon 11/2/15	Mon 11/16/15	
24	**Emergency Permit - Approval**	**1 day**	**Mon 11/16/15**	**Mon 11/16/15**	**Anticipate approval at/around Work Plan Approval.**
25	Medical Support Training for HEMSI and Huntsville Hospital	1 day	Tue 9/22/15	Tue 9/22/15	Completed
26	**Mobilization & Site Preparations**	**1 day**	**Fri 10/30/15**	**Fri 10/30/15**	
27	CARA Personnel & Equipment Mobilization & Site Setup	1 day	Fri 10/30/15	Fri 10/30/15	
28	**Training**	**21.5 days**	**Tue 11/17/15**	**Mon 1/25/16**	**All site personnel must participate.**
29	Site-Specific Training	4 days	Tue 11/17/15	Fri 11/20/15	
30	Huntsville Survey	2 days	Mon 11/30/15	Tue 12/1/15	
31	Tabletop Exercise	0.5 days	Wed 12/2/15	Wed 12/2/15	
32	MACOM Pre-Operational Survey	2.5 days	Wed 1/20/16	Fri 1/22/16	
33	Approval to start work	1 day	Fri 1/22/16	Mon 1/25/16	
34	**Field Work**	**5 days**	**Mon 1/25/16**	**Mon 2/1/16**	
35	Fieldwork	5 days	Mon 1/25/16	Mon 2/1/16	
36	Use-or-Lose Leave for Army Personnel	1 day	Mon 12/7/15	Mon 1/11/16	

Figure 1-4, MSFC-003-R-01
NASA Utility Repairs Schedule
Date: Mon 10/26/15

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

ATTACHMENT 1
LIST OF ABBREVIATIONS AND ACRONYMS

LIST OF ABBREVIATIONS AND ACRONYMS

AC	hydrogen cyanide
ACGIH	American Conference of Governmental Industrial Hygienists
ADEM	Alabama Department of Environmental Management
AEC	U.S. Army Environmental Command
AEL	airborne exposure limit
AHA	activity hazard analysis
AHWMMA	Alabama Hazardous Wastes Management and Minimization Act
ALS	advanced life support
AMCOM	U.S. Army Materiel Command
AOC	agent of concern
APP	Accident Prevention Plan
APR	air purifying respirator
AR	Army Regulation
As	Arsenic
ATF	Bureau of Alcohol, Tobacco, Firearms and Explosives
ATV	all-terrain vehicle
BEI	Biological Exposure Indices
BIP	blow-in-place
BRAC	Base Realignment and Closure
^{o}C	degrees Celsius
CA	chemical agent
CACM	chemical agent contaminated media
CARA	20th CBRNE Command's Analytical and Remediation Activity
CASARM	Chemical Agent Standard Analytical Reference Material
CASHPAC	Chemical Agent Safety and Health Policy Action Committee
CBRNE	Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives
CDC	Centers for Disease Control and Prevention
CET	chemical engineering technician
CFR	Code of Federal Regulations
CG	phosgene
$CHCl_3$	chloroform
CK	cyanogen chloride
cm	centimeter
CMA	Chemical Materials Activity
CN	chloroacetophenone
COP	common operating picture
CP	command post
CPR	cardiopulmonary resuscitation
CPU	chemical protective undergarment
CRZ	contamination reduction zone
CSS	Chemical Safety Submission
CVAA	2-chlorovinyl arsenous acid
CVAO	2-chlorovinyl arsenous oxide
CWA	chemical warfare agent
CWM	chemical warfare materiel

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

DA	Department of the Army
DAAMS	Depot Area Agent Monitoring System
DD	Department of Defense
DDESB	Department of Defense Explosives Safety Board
DDT	dichlorodiphenyltrichloroethane
DID	data item description
DM	adamsite
DMM	discarded military munitions
DNT	2,4-dinitrotoluene
DoD	Department of Defense
DoDM	Department of Defense-Manual
DOT	Department of Transportation
DP	Diphosgene
DPW	Directorate of Public Works
DQO	data quality objective
ECBC	Edgewood Chemical Biological Center
ECM	earth covered magazine
EDS	Explosives Destruction System
ELAP	Environmental Laboratory Accreditation Program
EM	Engineering Manual
EMT	Emergency Medical Technician
EOD	Explosives Ordnance Disposal
EP	Engineering Pamphlet
EPA	Environmental Protection Agency
EPDS	emergency personnel decontamination station
ERCP	Emergency Response Contingency Plan
ESRI	Environmental Systems Research Institute
eV	electron volts
EZ	exclusion zone
^{o}F	degrees Fahrenheit
F-B	flash-to-bang
FAR	Federal Acquisition Regulation
FY	fiscal year
ft	feet
GA	Tabun
GCD	Gulf Chemical Depot
GC/MS	gas chromatograph/mass spectrometry
GIS	geospatial information system
GPS	global positioning system

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

H	mustard
HAZCOM	hazardous communication
HAZWOPER	hazardous waste operations
HBESL	health-based environmental screening level
HC	
HD	sulfar mustard
HFD	hazardous fragmentation distance
HL	mustard Lewisite mixture
HN-3	nitrogen mustard
HQ	mustard sesqui mustard mixture
HS	sulfar mustard
HT	mustard T mixture
HTRW	hazardous, toxic, radioactive waste
HTW	hazardous and toxic waste
HVA	Huntsville Arsenal
HVAC	heating, ventilation, and air conditioning
IAP	Installation Action Plan
IAW	in accordance with
IBD	inhabited building distance
IDLH	immediately dangerous to life and health
IDS	intrusion detection system
IEOC	Installation's Emergency Operations Center
IGD	Interim Guidance Document
IP	ionization potential
IRB	Installation Restoration Branch
IM	Interim Measures
IW	Installation Wide
IWL	industrial water line
JOR	job order request
L	Lewisite
LMQAP	Laboratory and Monitoring Quality Assurance Plan
MACOM	Major Command
MARB	Munitions Assessment Review Board
MC	munitions constituents
MCE	maximum credible event
MCP	Monitoring Concept Plan
MD	munitions debris
MEC	munitions and explosives of concern
MFD	maximum fragmentation distance
MGFD	munition with the greatest fragmentation distance
mg/m^3	milligrams per meter cubed
MINICAMS	miniature chemical agent monitoring system
mm	millimeter
MMAS	Mobile Munitions Assessment System
MPPEH	material potentially presenting an explosive hazard

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

MSDS	material safety datasheet
MSFC	Marshall Space Flight Center
N/A	not applicable
NASA	National Aeronautics and Space Administration
NELAC	National Laboratory Accreditation
NELAP	National Laboratory Accreditation Program
NIOSH	National Institute for Occupational Safety and Health
NLT	no later than
NOSE	no significant effects
NREMT	National Registry of Emergency Medical Technicians
NRT	near-real time
OB/OD	open burn/open detonation
OE	ordnance and explosives
OESS	Ordnance and Explosives Safety Specialist
OSHA	Occupational Safety and Health Administration
PAED	public access exclusion distance
PAM	pamphlet
Pb	lead
PD	phenyldichloroarsine
PDS	personnel decontamination station
PDT	Project Delivery Team
PEL	permissible exposure limit
PID	photoionization detector
PINS	portable isotopic neutron spectrometry
PM	Project Manager
PMC	Project Management Contract
POC	point of contact
PPE	personal protective equipment
PS	chloropicrin
PWL	potable water line
QA	quality assurance
QAPP	Quality Assurance Program Plan
QASAS	Quality Assurance Specialist (Ammunition Surveillance)
QC	quality control
QSM	Quality System Management
RAC	risk assessment code
RCMD	Recovered Chemical Materiels Directorate
RCRA	Resource Conservation and Recovery Act
RCWM	recovered chemical warfare materiel
RDX	cyclonite
REL	recommended exposure limit
RFI	RCRA Facility Investigation
RSA	Redstone Arsenal

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

SCBA	self-contained breathing apparatus
SDS	safety data sheet
SOP	standard operating procedure
SOW	scope of work
SSFR	Site-Specific Final Report
SSHO	Site-Safety and Health Officer
SSHP	Site-Safety and Health Plan
STEL	short-term exposure limit
SUXOS	Senior UXO Supervisor
SWMU	solid waste management unit
SZ	support zone
TBD	to be determined
TC	thionyl chloride
TEA	triethanolamine
TEEL	temporary emergency exposure limit
TLV	threshold limit value
TLV-C	TLV-ceiling
TM	Technical Manual
TNT	2,3,6-trinitrotoluene
TP	Technical Paper
TWA	time-weighted average
U.S.	United States
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USATCES	U.S. Army Technical Center for Explosives Safety
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer
VOC	volatile organic compound
VSL	vapor screening level
WBGT	wet bulb globe thermometer
WERS	Worldwide Environmental Remediation Services
WNV	West Nile Virus
WP	white phosphorous
WPL	worker protection limit
WWII	World War II

APPENDIX A
CARA SCOPE OF WORK

FINAL
20th CBRNE Command
CBRNE Analytical & Remediation Activity (CARA)
Scope of Work (SOW)
Redstone Arsenal
Huntsville, Alabama
21 April 2014
Revision: 0
Revision Date: NA

1.0 INTRODUCTION

1.1. OBJECTIVE

The objective of this scope of work (SOW) is for the Chemical, Biological, Radiological, Nuclear and High-Yield Explosives (CBRNE) Analytical and Remediation Activity (CARA) to provide all personnel and equipment necessary to perform munitions and explosives of concern (MEC), including chemical warfare materiel (CWM), related support located at Redstone Arsenal (RSA), Madison County, Alabama.

Specifically, CARA shall provide the three types of support identified below. Refer to Attachment A for site-specific information.

1.1.1. Support to Suspect CWM Sites requiring an Interim Measure (IM)

These sites, hereinafter referred to as the "IM Sites", are listed below:

- MSFC-003-R-01, Inactive Old Bone Yard Disposal Site #1
- MSFC-035, Inactive Sump/Tiled Drain Field – East TA
- RSA-051, Inactive Munitions Demil & Disposal, Area I
- RSA-052, Inactive Munitions Demil & Disposal, Area N
- RSA-061, Inactive Munitions Demil/Disposal Area P
- RSA-063, Inactive Chemical Munitions Disposal Area M
- RSA-064, Inactive Munitions Demil/Disposal Area BB
- RSA-066, Inactive Ash Disposal Site, Area X-1
- RSA-068, Inactive Chemical Disposal, Area Z
- RSA-110, Former Drum Storage/Construction Debris, Area Y
- RSA-112, Suspected Former Demil/Disposal, Area W
- RSA-113, Inactive Disposal Trenches/Burn Pits, Area W
- RSA-114, Inactive Madkin Mountain Rock Quarry
- RSA-188, Northern Burial Area/Burning Ground #3
- RSA-257, Rock Pond
- RSA-264, RR Spring
- RSA-281, Disposal Trenches at RSA-046 Range

Refer to Tasks 1 and 2 for specific requirements.

1.1.2. Support to Suspect MEC/CWM Sites

These sites, hereinafter referred to as the "MEC/CWM Sites", are listed below:

- MSFC-003-R-01, Inactive Old Bone Yard Disposal Site #1
- MSFC-034, Former Chemical Production & Filling Area
- RSA-238, Former Huntsville Arsenal Plant No. 2 Mustard Lines 5 & 6

Refer to Tasks 3 and 4 for specific requirements.

1.1.3. Support to the Garrison

This support, hereinafter referred to as "Garrison Support", includes the following:

- Initial Responses Upon Discovery of Suspected MEC/CWM
- On-Site Unexploded Ordnance (UXO)/Air Monitoring Support
- On-Call UXO/Air Monitoring Support

Refer to Task 5 for specific requirements.

1.2. RSA FACILITY LOCATION AND DESCRIPTION

RSA is an Army facility that encompasses approximately 38,300 acres of land in southwestern Madison County, Alabama. The City of Huntsville and Madison County bound RSA to the north, east, and west. The City of Madison is adjacent to a very small portion of the northwest corner of RSA. RSA is bounded to the south by the Tennessee River and Morgan County lies to the south across the River (RSA Installation Action Plan (IAP), November 2009).

Wheeler National Wildlife Refuge comprises a large portion of RSA. The Department of Interior owns approximately 4,100 acres and the Tennessee Valley Authority owns approximately 2,900 acres. The George C. Marshall Space Flight Center (MSFC) of the National Aeronautics and Space Administration (NASA) comprises approximately 1,841 acres in the central portion of RSA. Industrial areas are located in the southeast portion of RSA, and family housing, commercial, recreational, and medical centers are located in the northern portion. Missile/rocket testing and munitions storage, along with the associated range fans, test area safety fans, and explosive safety-quantity distance arcs have been reserved for the southern portion of RSA.

RSA is the current headquarters of the U.S. Army Aviation and Missile Command, which is the U.S. Army Materiel Command's major subordinate command that manages the Army's missile and rocket program. The primary mission of RSA is the development, acquisition, testing, fielding, and sustainment of aviation and missile weapon systems. RSA is home to over 60 different tenant organizations, most of which support the aviation and missile weapon system effort. RSA is also home to such diverse activities as training for handling explosives and ordnance devices, Defense Intelligence Agency activities, and the production of iron carbonyl (RSA IAP, November 2009).

Facilities at RSA include administrative buildings, laboratories, flight test ranges, and other specialized buildings and equipment. In addition, RSA is a "gaining facility" under the Army's Base Realignment and Closure (BRAC), targeted for completion by the end of government fiscal

year (FY) 2011. As a gaining facility under BRAC, RSA will experience additional building structure changes, expansion of missions, expansion of the current work force, and civilian and military growth.

1.3. RSA OPERATIONAL HISTORY

RSA was formerly comprised of three separate military facilities originally established in 1941: the Redstone Ordnance Plant, the Huntsville Arsenal (HVA), and the Gulf Chemical Warfare Depot (GCD). These three facilities worked together from 1942 to 1945 to produce conventional and chemical munitions for use during World War II (WWII).

Munitions casings were filled (chemically configured) at the HVA. The HVA covered the largest area and was composed of three production plants (Plants No. 1, No. 2, and No. 3).

The three plants produced a variety of CWM. Both Plants No. 1 and Plant No. 2 produced chemical warfare agents (CWA) [mustard agent (H) and lewisite (L)], chlorine, phosgene (CG), and white phosphorus (WP). Later, vomiting agent (Adamsite [DM]) was produced in a plant south of the original Plant No. 3 boundary and thionyl chloride (TC) in a plant northwest of the Plant No. 2 chlorine facility. Plant No. 3 produced smoke munitions and gel-type incendiaries. The HVA area also included support facilities, including an airfield and associated bomb and other test ranges for aerial bombing, mortar and other munitions testing and administrative/support areas. Over eight million pounds of munitions were dropped or fired on these test ranges.

Once munitions were filled with CWM at one of the three HVA facilities, they were then transported by rail to the Redstone Ordnance Plant for final assembly, including installation of any fusing, burster tube, or other explosive configuration. The Redstone Ordnance Plant also produced other explosive items.

Once assembly was complete, munitions were then transported to the GCD for storage in bunkers, igloos, and other structures. The GCD stored and shipped the munitions as well as bulk chemical and equipment associated with decontamination. Numerous chemical manufacturing plants were operated at the three facilities to produce raw material for toxic agents, as well as to manufacture the agents themselves.

Following WWII the chemical manufacturing facilities used to produce bulk chemicals for the war effort were leased for the production of commercial chemicals and pesticides, including dichlorodiphenyltrichloroethane (DDT). Average production of pesticides was approximately 12,500 tons per year. Other former chemical production operations produced chlorine and caustic chemical products.

In 1949, the mission of RSA was changed to the research and development of rocketry and guided missile systems. In 1950, the three facilities (HVA, Redstone Ordnance Plant, and GCD) were combined into one facility under the name Redstone Arsenal. The Chief of Ordnance designated RSA as the site of the Ordnance Rocket Center and in 1960 the MSFC was established in the center of RSA within the former HVA plants area. The MSFC commands all Spacelab operations during space shuttle missions and tests and manufactures space vehicles and components. In 1962, the U.S. Army Missile Command was established at RSA and was responsible for the integrated commodity management of free rockets, guided missiles, ballistic missiles, target missiles and associated equipment.

1.4. SITE-SPECIFIC INFORMATION

Available site-specific information is provided in Attachment A for CARA review and use. Any additional site-specific information will be provided as an addendum to this SOW.

1.5. ANTICIPATED PHYSICAL AND CHEMICAL SITE HAZARDS

The following sections describe the chemical and some physical hazards that may be encountered during execution of fieldwork at RSA.

1.5.1. CWM and Recovered CWM (RCWM)

CWM consists of items configured as munitions containing a chemical substance that is intended to kill, seriously injure, or incapacitate a person through its physiological effects. RCWM is defined as CWM items that are recovered from range-clearing operations, chemical weapons burial sites, and other locations. Common chemical fills include nerve agents, blister agents, and various industrial chemicals. (Shaw, 2013)

Available information on AOCs are provided in Attachment A.

1.5.2. MEC

Munitions and explosive of concern (MEC) distinguish the following specific categories of military munitions that may pose unique explosives safety risks:

- Unexploded ordnance (UXO) includes military munitions that have been primed, fuzed, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and remain unexploded either by malfunction, design, or any other cause.

- Discarded military munitions (DMM) are military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include UXO, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations.

- Munitions constituents (for example, 2,4,6-trinitrotoluene (TNT), cyclonite) present in high enough concentrations to pose an explosion hazard, which is sometimes referred to as explosive soil. Explosive soil refers to mixtures of explosives in soil, sand, clay, or other solid media at concentrations such that the mixture itself is explosive as further defined in the following paragraphs:

    (1) The concentration of a particular explosive in soil necessary to present an explosion hazard depends on whether the particular explosive is classified as “primary” or “secondary.” Guidance on whether an explosive is classified as “primary” or “secondary” can be obtained from the Environmental and Munitions Center of Expertise or Chapters 7 and 8 of Technical Manual (TM) 9-1300-214, Military Explosives (U.S. Army 1984).

(2) Primary explosives are those extremely sensitive explosives (or mixtures thereof) that are used in primers, detonators, and blasting caps. They are easily detonated by heat, sparks, impact, or friction. Examples of primary explosives include lead azide, lead styphnate, and mercury fulminate.

(3) Secondary explosives are bursting and booster explosives (that is, they are used as the main bursting charge or as the booster that sets off the main bursting charge). Secondary explosives are much less sensitive than primary explosives. They are less likely to detonate if struck or when exposed to friction or to electrical sparks. Examples of secondary explosives include TNT, Composition B, and Ammonium Picrate (Explosive D).

(4) Soil containing 10 percent or more by weight of any secondary explosive or mixture of secondary explosives is considered "explosive soil." This determination was based on information provided by the U.S. Army Environmental Command as a result of studies conducted.

(5) Soil containing propellants (as opposed to primary or secondary high explosives) may also present explosion hazards. (Shaw, 2013)

Available MEC information is provided in Attachment A.

1.5.3. Industrial Chemicals

As result of historical operations conducted throughout the history of RSA, numerous chemicals were used, manufactured, or disposed, resulting in legacy contamination being addressed by the Army. DDT production, for example, resulted in contamination to areas of RSA, as well as the chemicals required to manufacture DDT, such as chlorobenzene. Former Redstone Arsenal Rocket Engine operations have contributed to chlorinated solvent environmental issues, primarily trichloroethene. Metals, semivolatile organics, and petroleum aromatic hydrocarbons are also present in areas of RSA that could pose human health or ecological hazards. (Shaw, 2013)

Due to the number of sites identified at RSA requiring further environmental assessment, investigation, or remediation, additional industrial chemical hazards will be discussed in subsequent addendums to this SOW.

2.0 CARA SUPPORT TO RSA

CARA shall provide all personnel, supplies, and equipment necessary to successfully meet the requirements of this SOW.

CARA and Explosive Ordnance Disposal (EOD) personnel are under the operational control of the US Army Engineering and Support Center, Huntsville's (USAESCH) CWM Design Center. All CARA and EOD personnel will use only approved operational procedures as they support USAESCH. The CARA Supervisor shall report any problems immediately to the USAESCH CWM Design Center and/or the USAESCH Ordnance and Explosives Safety Specialist (OESS), if onsite. Any problems shall be resolved by the USAESCH, RSA, and the 20th CBRNE Command.

2.1. TASK 1, IM SITES

The following tasks are required to support the IM Sites as a whole.

2.1.1. Task 1.1, IM Sites: Annual Support

The objective of this task is for CARA to provide annual support to the IM Sites. This includes, but is not limited to the following:

2.1.1.1. CARA Supervisor

Provide a CARA Supervisor, physically located at RSA, to serve as the primary point of contact (POC) for this project and coordinate directly with the USAESCH Project Manager (PM) identified in Section 4.1. The CARA Supervisor shall be separate from Site Supervisors and shall perform annual project and program management support. This support includes, but is not limited to, participating in meetings and project discussions with USAESCH and RSA, plan development and reviews, equipment and facility maintenance coordination, and perform reporting requirements. Specifically, the CARA Supervisor will be required to obtain access to the RSA computer network. Appropriate forms and training requirements shall be provided to the designated CARA Supervisor. This computer access will primarily be used to submit necessary job order requests (JORs) related to CARA operations.

Meetings include, but are not limited to, the following:

a) Project Kick-Off Meetings (assume 1 per month; 4 hours each)
Initial planning meetings to meet members of the RSA project delivery teams (PDTs), discuss project schedules and project specifics, and identify roles and responsibilities.

b) Scoping Meetings (assume 1 per month; 2 hours each)
These meetings ensure that the approaches pursued by CARA and/or the Prime Contractor are acceptable to all stakeholders and protect the legal and program obligations of the Army. It allows for collective input from all parties so that a wider range of alternatives can be considered and expedites decision making and problem resolution.

c) Progress Meetings (assume 2 per month; 2 hours each)
These meetings will be used to review the past months' efforts, review and plan forecasted activities, discuss critical path activities, develop an action item list, follow-up on any actions previously assigned, and identify any additional potential issues.

d) Working Group Meetings (assume 2 per week; 1 hour each)
These technical meetings will review site progress and resolve issues.

e) Onboard Reviews (as needed)
Depending on the number and/or type of comments developed during the review of CARA and/or Contractor plans, an onboard review may be required. Onboard reviews shall be attended by any CARA personnel necessary to answer submitted comments. At a minimum, the CARA Supervisor shall participate.

f) Daily Coordination
Provide coordination/interaction with RSA activities to support CARA operations.

2.1.1.2. Inventory Management and Procurement

The CARA, or Logistics Support Contractor (TBD)[1], shall perform inventory control and, as required, procure CARA and USAESCH[2] equipment to support the mission. Inventory control includes, but is not limited to: taking inventory, issue and receiving, scheduling/delivering/picking up items for calibration.

2.1.1.3. Facilities

Identify facility deficiencies and report to appropriate installation personnel, coordinate any routine maintenance (grounds, electrical, heating, ventilation, and air conditioning (HVAC), etc.), provide arms room (as necessary).

2.1.1.4. CARA Vehicles (as required)

Coordinate with the RSA motor pool, or commercial service provider, any necessary maintenance or repairs.

2.1.1.5. Reporting

Prepare the following reports and submit them electronically to the USAESCH PM. The USAESCH PM will make distribution to appropriate RSA PDT Members.

- Customer Reports – Submitted monthly and should contain, at a minimum, the following information: total costs incurred to date, to include any unanticipated costs, and the amount of funds remaining. (See Attachment D for an example customer report).

- Lessons Learned – Prepare, at least annually, a report on project lessons learned identifying deficiencies or better practices.

- Other Reports (as required) – Submit any other reports pertaining to the IM Sites electronically to the USAESCH PM.

2.1.2. Task 1.2, IM Sites: Plans

Prepare and submit for acceptance the following plans IAW Section 3.3.

- SOPs – Develop SOPs specific to CARA operations to support the RSA mission IAW Section 3.3.1.

- Air Monitoring Concept Plan – Prepare and submit for acceptance an Air Monitoring Concept Plan which defines the approach that will be taken by the CARA team to provide health and safety air monitoring support at the IM Sites.
    - This plan shall, at a minimum, include the following information:
        a) Summary of approach to provide technical assistance and support in order to successfully meet the requirements of this SOW;

[1] If required, the USAESCH will contract with a Logistics Support Contractor to provide support to CARA and the RSA Sites.
[2] If required, CARA will maintain USAESCH chemical and UXO equipment.

b) Types of instrumentation to be used during intrusive operations (workspace), headspace monitoring of samples for clearance, quadrant monitoring at the PDS and medical tent, first entry at the sited storage location;
c) Types of instrumentation to be used for confirmation and historical monitoring;
d) Provide a detailed list of latest guidance, regulations, and standard operating procedures (SOPs) for air monitoring activities;
e) List of chemical agents of concern (AOCs) and the corresponding airborne exposure limits (AELs)/permissible exposure limits (PELs) and instrument/detector to be utilized for each AOC (refer to Attachment A for details);
f) Monitoring strategy which depicts the methods CARA plans to use to monitor the airborne concentrations of chemical materiel and specified industrial compounds during intrusive operations;
g) Sampling locations, monitoring levels and intended usage of instrumentation;
h) Method certification and validation for equipment procedures;
i) Personnel certification requirements;
j) Air monitoring operations.

- Pre-Approved Templates – Prepare and submit for acceptance the following types of templates. These templates will be used once a specific site is identified to speed up the preparation of required plans.

    - Site-Specific Air Monitoring Plan Addendum, IAW Section 3.3.3.
    - Site-Specific Final Report (SSFR), IAW Section 3.3.6.
    - Other – any templates identified by CARA or the project team to support the requirements of this SOW.

- Support to Contractor Plans (as required) – Provide support to Contractor Plans IAW Section 3.3.2.

Table 3, in Section 3.3 provides a list of submittals and associated due dates.

2.1.3. Task 1.3, IM Sites: Equipment Baseline (as required)

Perform an air monitoring equipment baseline at RSA. The information collected during this baseline will help to develop the best strategy for air monitoring at these sites. Cost estimate should provide estimated duration and number of personnel.

2.2. TASK 2, IM SITES: SITE-SPECIFIC REQUIREMENTS

CARA shall provide all personnel, supplies, and equipment necessary to successfully meet the requirements of this SOW. The RSA Site Manager shall identify sites requiring CARA Support and notify the USAESCH PM. The USAESCH PM will coordinate with the CARA Supervisor to execute fieldwork. Upon identification of a site, available information and specific requirements will be added to this SOW as an addendum and, if necessary, an additional cost estimate will be developed by CARA. Upon acceptance of the SOW addendum and cost estimate the associated plans will be developed.

Each site shall have an individual onsite supervisor that has working knowledge of associated work plans and air monitoring plans. The supervisor shall be the field point of contact for all issues related to CARA operations and shall report directly with the onsite USAESCH OESS, if applicable.

Table 1 provides a breakout of the minimum personnel requirements for one intrusive IM Site.

Table 1 Team to Support One Intrusive IM Site [to be finalized by CARA]
(1) Chemical Engineer Technician (CET) Supervisor
(8) CETs (2 Rescue; 4 Decontamination/ Personnel Decontamination Station (PDS); 2 Transport)
(5) Air Monitoring (3 MINICAMS; 1 GC/MS; 1 Maintenance Personnel)
(1) Equipment Specialist
EOD Soldiers (on site)

Typically only one IM Site will be intrusive at a time, but several sites may be open. This will allow the teams to rotate between sites depending on schedules, tenant coordination, and other factors. Refer to Attachment B for a current working schedule.

In the event CARA cannot support more than one intrusive operation at a time, they shall inform the USAESCH PM at least 90 days prior to site mobilization. The USAESCH PM shall coordinate with RSA to provide appropriate personnel to meet these requirements (i.e., contractor or Edgewood Chemical Biological Center (ECBC) personnel).

Anticipated Work Schedule:

- Regular Schedule: 4-10 hour days (Monday-Thursday).
- 10 Overtime hours/week.
- Possible weekend and nighttime operations (mission dependent). Refer to Attachment A for a list of sites that may require night-time operations.
- Schedule may vary from site to site.

2.2.1. Task 2.1, MSFC-003-R-01, Inactive Old Bone Yard Disposal Site #1

The objective of this task is to perform the following activities to support operations at this IM Site. Refer to Attachments A and B for site-specific information, AOCs, and current working schedule.

2.2.1.1. Equipment & Maintenance Support

The CARA, or Logistics Support Contractor (TBD), shall provide all necessary equipment and for the maintenance and repair of the provided equipment to meet the requirements of this SOW in a manner which minimizes equipment downtime utilizing economically sound solutions to the greatest extent practicable.

This includes, but is not limited to, the following:

- Air Monitoring, IAW Section 3.1.1.
- PPE, IAW Section 3.1.2.
- PDS/Rescue, IAW Section 3.1.3.
- MEC Field Assessment/Packaging/Transportation, IAW Section 3.1.4.
- Engineering Controls (as required), IAW Section 3.1.5.
- Communications, IAW Section 3.1.6.
- Command and Control, IAW Section 3.1.7.
- Other (as required), IAW Section 3.1.8.

2.2.1.2. Reporting

Prepare the following reports and submit them electronically to the USAESCH PM. The USAESCH PM will make distribution to appropriate RSA PDT Members.

- Daily Operational Reports (only required during intrusive operations), IAW Section 3.2.1.
- Accident Reporting, IAW Section 3.2.2.

2.2.1.3. Plans

Prepare and submit the following plans IAW Section 3.3.

- SOPs, IAW Section 3.3.1.
- Support to Contractor Plans, IAW Section 3.3.2.
- Site-Specific Air Monitoring Plan Addendum, IAW Section 3.3.3.
- Site-Specific Final Report, IAW Section 3.3.6.

Table 3, in Section 3.3 provides a list of submittals and associated due dates.

2.2.1.4. Fieldwork

Provide all personnel and equipment necessary to successfully execute fieldwork to meet requirements of this SOW. Several types of fieldwork may be required to support this site.

This includes, but is not limited to the following:

- Mobilization/Demobilization, IAW Section 3.4.1.
- Pre-Operational Surveys and Exercises, IAW Section 3.4.2.
- Air Monitoring, IAW Section 3.4.6.
- PDS/Rescue, IAW Section 3.4.7.
- MEC Field Assessment/Package/Transport, IAW Section 3.4.8.
- Storage, IAW Section 3.4.11.

2.2.2. Task 2.2, RSA-112, Suspected Former Demil/Disposal, Area W

The objective of this task is to perform the following activities to support operations at this IM Site. Refer to Attachments A and B for site-specific information, AOCs, and current working schedule.

2.2.2.1. Equipment & Maintenance Support

The CARA, or Logistics Support Contractor (TBD), shall provide all necessary equipment and for the maintenance and repair of the provided equipment to meet the requirements of this SOW in a manner which minimizes equipment downtime utilizing economically sound solutions to the greatest extent practicable.

This includes, but is not limited to, the following:

- Air Monitoring, IAW Section 3.1.1.
- PPE, IAW Section 3.1.2.
- PDS/Rescue, IAW Section 3.1.3.
- MEC Field Assessment/Packaging/Transportation, IAW Section 3.1.4.
- Engineering Controls (as required), IAW Section 3.1.5.
- Communications, IAW Section 3.1.6.
- Command and Control, IAW Section 3.1.7.
- Other (as required), IAW Section 3.1.8.

2.2.2.2. Reporting

Prepare the following reports and submit them electronically to the USAESCH PM. The USAESCH PM will make distribution to appropriate RSA PDT Members.

- Daily Operational Reports (only required during intrusive operations), IAW Section 3.2.1.
- Accident Reporting, IAW Section 3.2.2.

2.2.2.3. Plans

Prepare and submit the following plans IAW Section 3.3.

- SOPs, IAW Section 3.3.1.
- Support to Contractor Plans, IAW Section 3.3.2.
- Site-Specific Air Monitoring Plan Addendum, IAW Section 3.3.3.
- Site-Specific Final Report, IAW Section 3.3.6.

Table 3, in Section 3.3 provides a list of submittals and associated due dates.

2.2.2.4. Fieldwork

Provide all personnel and equipment necessary to successfully execute fieldwork to meet requirements of this SOW. Several types of fieldwork may be required to support this site.

This includes, but is not limited to the following:

- Mobilization/Demobilization, IAW Section 3.4.1.
- Pre-Operational Surveys and Exercises, IAW Section 3.4.2.
- Air Monitoring, IAW Section 3.4.6.
- PDS/Rescue, IAW Section 3.4.7.
- MEC Field Assessment/Package/Transport, IAW Section 3.4.8.
- Storage, IAW Section 3.4.11.

2.2.3. Task 2.3, RSA-113, Inactive Disposal Trenches/Burn Pits, Area W

The objective of this task is to perform the following activities to support operations at this IM Site. Refer to Attachments A and B for site-specific information, AOCs, and current working schedule.

2.2.3.1. Equipment & Maintenance Support

The CARA, or Logistics Support Contractor (TBD), shall provide all necessary equipment and for the maintenance and repair of the provided equipment to meet the requirements of this SOW in a manner which minimizes equipment downtime utilizing economically sound solutions to the greatest extent practicable.

This includes, but is not limited to, the following:

- Air Monitoring, IAW Section 3.1.1.
- PPE, IAW Section 3.1.2.
- PDS/Rescue, IAW Section 3.1.3.
- MEC Field Assessment/Packaging/Transportation, IAW Section 3.1.4.
- Engineering Controls (as required), IAW Section 3.1.5.
- Communications, IAW Section 3.1.6.
- Command and Control, IAW Section 3.1.7.
- Other (as required), IAW Section 3.1.8.

2.2.3.2. Reporting

Prepare the following reports and submit them electronically to the USAESCH PM. The USAESCH PM will make distribution to appropriate RSA PDT Members.

- Daily Operational Reports (only required during intrusive operations), IAW Section 3.2.1.
- Accident Reporting, IAW Section 3.2.2.

2.2.3.3. Plans

Prepare and submit the following plans IAW Section 3.3.

- SOPs, IAW Section 3.3.1.
- Support to Contractor Plans, IAW Section 3.3.2.
- Site-Specific Air Monitoring Plan Addendum, IAW Section 3.3.3.
- Site-Specific Final Report, IAW Section 3.3.6.

Table 3, in Section 3.3 provides a list of submittals and associated due dates.

2.2.3.4. Fieldwork

Provide all personnel and equipment necessary to successfully execute fieldwork to meet requirements of this SOW. Several types of fieldwork may be required to support this site.

This includes, but is not limited to the following:

- Mobilization/Demobilization, IAW Section 3.4.1.
- Pre-Operational Surveys and Exercises, IAW Section 3.4.2.
- Air Monitoring, IAW Section 3.4.6.
- PDS/Rescue, IAW Section 3.4.7.
- MEC Field Assessment/Package/Transport, IAW Section 3.4.8.
- Storage, IAW Section 3.4.11.

2.2.4. Task 2.4, RSA-114, Inactive Madkin Mountain Rock Quarry

The objective of this task is to perform the following activities to support operations at this IM Site. Refer to Attachments A and B for site-specific information, AOCs, and current working schedule.

2.2.4.1. Equipment & Maintenance Support

The CARA, or Logistics Support Contractor (TBD), shall provide all necessary equipment and for the maintenance and repair of the provided equipment to meet the requirements of this SOW in a manner which minimizes equipment downtime utilizing economically sound solutions to the greatest extent practicable.

This includes, but is not limited to, the following:

- Air Monitoring, IAW Section 3.1.1.
- PPE, IAW Section 3.1.2.
- PDS/Rescue, IAW Section 3.1.3.
- MEC Field Assessment/Packaging/Transportation, IAW Section 3.1.4.
- Engineering Controls (as required), IAW Section 3.1.5.
- Communications, IAW Section 3.1.6.
- Command and Control, IAW Section 3.1.7.
- Other (as required), IAW Section 3.1.8.

2.2.4.2. Reporting

Prepare the following reports and submit them electronically to the USAESCH PM. The USAESCH PM will make distribution to appropriate RSA PDT Members.

- Daily Operational Reports (only required during intrusive operations), IAW Section 3.2.1.
- Accident Reporting, IAW Section 3.2.2.

2.2.4.3. Plans

Prepare and submit the following plans IAW Section 3.3.

- SOPs, IAW Section 3.3.1.
- Support to Contractor Plans, IAW Section 3.3.2.
- Site-Specific Air Monitoring Plan Addendum, IAW Section 3.3.3.
- Site-Specific Final Report, IAW Section 3.3.6.

Table 3, in Section 3.3 provides a list of submittals and associated due dates.

2.2.4.4. Fieldwork

Provide all personnel and equipment necessary to successfully execute fieldwork to meet requirements of this SOW. Several types of fieldwork may be required to support this site.

This includes, but is not limited to the following:

- Mobilization/Demobilization, IAW Section 3.4.1.
- Pre-Operational Surveys and Exercises, IAW Section 3.4.2.
- Air Monitoring, IAW Section 3.4.6.
- PDS/Rescue, IAW Section 3.4.7.
- MEC Field Assessment/Package/Transport, IAW Section 3.4.8.
- Storage, IAW Section 3.4.11.

2.2.5. Task 2.5, RSA-063, Inactive Chemical Munitions Disposal Area M

The objective of this task is to perform the following activities to support operations at this IM Site. Refer to Attachments A and B for site-specific information, AOCs, and current working schedule.

2.2.5.1. Equipment & Maintenance Support

The CARA, or Logistics Support Contractor (TBD), shall provide all necessary equipment and for the maintenance and repair of the provided equipment to meet the requirements of this SOW in a manner which minimizes equipment downtime utilizing economically sound solutions to the greatest extent practicable.

This includes, but is not limited to, the following:

- Air Monitoring, IAW Section 3.1.1.
- PPE, IAW Section 3.1.2.
- PDS/Rescue, IAW Section 3.1.3.
- MEC Field Assessment/Packaging/Transportation, IAW Section 3.1.4.
- Engineering Controls (as required), IAW Section 3.1.5.
- Communications, IAW Section 3.1.6.
- Command and Control, IAW Section 3.1.7.
- Other (as required), IAW Section 3.1.8.

2.2.5.2. Reporting

Prepare the following reports and submit them electronically to the USAESCH PM. The USAESCH PM will make distribution to appropriate RSA PDT Members.

- Daily Operational Reports (only required during intrusive operations), IAW Section 3.2.1.
- Accident Reporting, IAW Section 3.2.2.

2.2.5.3. Plans

Prepare and submit the following plans IAW Section 3.3.

- SOPs, IAW Section 3.3.1.
- Support to Contractor Plans, IAW Section 3.3.2.
- Site-Specific Air Monitoring Plan Addendum, IAW Section 3.3.3.
- Site-Specific Final Report, IAW Section 3.3.6.

Table 3, in Section 3.3 provides a list of submittals and associated due dates.

2.2.5.4. Fieldwork

Provide all personnel and equipment necessary to successfully execute fieldwork to meet requirements of this SOW. Several types of fieldwork may be required to support this site.

This includes, but is not limited to the following:

- Mobilization/Demobilization, IAW Section 3.4.1.
- Pre-Operational Surveys and Exercises, IAW Section 3.4.2.
- Air Monitoring, IAW Section 3.4.6.
- PDS/Rescue, IAW Section 3.4.7.
- MEC Field Assessment/Package/Transport, IAW Section 3.4.8.
- Storage, IAW Section 3.4.11.

2.2.6. Task 2.6, RSA-064, Inactive Munitions Demil/Disposal, Area BB

The objective of this task is to perform the following activities to support operations at this IM Site. Refer to Attachments A and B for site-specific information, AOCs, and current working schedule.

2.2.6.1. Equipment & Maintenance Support

The CARA, or Logistics Support Contractor (TBD), shall provide all necessary equipment and for the maintenance and repair of the provided equipment to meet the requirements of this SOW in a manner which minimizes equipment downtime utilizing economically sound solutions to the greatest extent practicable.

This includes, but is not limited to, the following:

- Air Monitoring, IAW Section 3.1.1.
- PPE, IAW Section 3.1.2.
- PDS/Rescue, IAW Section 3.1.3.
- MEC Field Assessment/Packaging/Transportation, IAW Section 3.1.4.
- Engineering Controls (as required), IAW Section 3.1.5.
- Communications, IAW Section 3.1.6.
- Command and Control, IAW Section 3.1.7.
- Other (as required), IAW Section 3.1.8.

2.2.6.2. Reporting

Prepare the following reports and submit them electronically to the USAESCH PM. The USAESCH PM will make distribution to appropriate RSA PDT Members.

- Daily Operational Reports (only required during intrusive operations), IAW Section 3.2.1.
- Accident Reporting, IAW Section 3.2.2.

2.2.6.3. Plans

Prepare and submit the following plans IAW Section 3.3.

- SOPs, IAW Section 3.3.1.
- Support to Contractor Plans, IAW Section 3.3.2.
- Site-Specific Air Monitoring Plan Addendum, IAW Section 3.3.3.
- Site-Specific Final Report, IAW Section 3.3.6.

Table 3, in Section 3.3 provides a list of submittals and associated due dates.

2.2.6.4. Fieldwork

Provide all personnel and equipment necessary to successfully execute fieldwork to meet requirements of this SOW. Several types of fieldwork may be required to support this site.

This includes, but is not limited to the following:

- Mobilization/Demobilization, IAW Section 3.4.1.
- Pre-Operational Surveys and Exercises, IAW Section 3.4.2.
- Air Monitoring, IAW Section 3.4.6.
- PDS/Rescue, IAW Section 3.4.7.
- MEC Field Assessment/Package/Transport, IAW Section 3.4.8.
- Storage, IAW Section 3.4.11.

2.2.7. Task 2.7, RSA-281, Disposal Trenches at RSA-046 Range

The objective of this task is to perform the following activities to support operations at this IM Site. Refer to Attachments A and B for site-specific information, AOCs, and current working schedule.

2.2.7.1. Equipment & Maintenance Support

The CARA, or Logistics Support Contractor (TBD), shall provide all necessary equipment and for the maintenance and repair of the provided equipment to meet the requirements of this SOW in a manner which minimizes equipment downtime utilizing economically sound solutions to the greatest extent practicable.

This includes, but is not limited to, the following:

- Air Monitoring, IAW Section 3.1.1.
- PPE, IAW Section 3.1.2.
- PDS/Rescue, IAW Section 3.1.3.
- MEC Field Assessment/Packaging/Transportation, IAW Section 3.1.4.
- Engineering Controls (as required), IAW Section 3.1.5.
- Communications, IAW Section 3.1.6.
- Command and Control, IAW Section 3.1.7.
- Other (as required), IAW Section 3.1.8.

2.2.7.2. Reporting

Prepare the following reports and submit them electronically to the USAESCH PM. The USAESCH PM will make distribution to appropriate RSA PDT Members.

- Daily Operational Reports (only required during intrusive operations), IAW Section 3.2.1.
- Accident Reporting, IAW Section 3.2.2.

2.2.7.3. Plans

Prepare and submit the following plans IAW Section 3.3.

- SOPs, IAW Section 3.3.1.
- Support to Contractor Plans, IAW Section 3.3.2.
- Site-Specific Air Monitoring Plan Addendum, IAW Section 3.3.3.
- Site-Specific Final Report, IAW Section 3.3.6.

Table 3, in Section 3.3 provides a list of submittals and associated due dates.

2.2.7.4. Fieldwork

Provide all personnel and equipment necessary to successfully execute fieldwork to meet requirements of this SOW. Several types of fieldwork may be required to support this site.

This includes, but is not limited to the following:

- Mobilization/Demobilization, IAW Section 3.4.1.
- Pre-Operational Surveys and Exercises, IAW Section 3.4.2.
- Air Monitoring, IAW Section 3.4.6.
- PDS/Rescue, IAW Section 3.4.7.
- MEC Field Assessment/Package/Transport, IAW Section 3.4.8.
- Storage, IAW Section 3.4.11.

2.2.8. Task 2.8, MSFC-035, Inactive Sump/Tiled Drain Field – East TA

This site has a low-probability for UXO and CWM. Therefore, only the following CARA support is required:

- On-Call UXO/Air Monitoring Support, IAW Section 3.4.13.

Refer to Attachments A and B for site-specific information, AOCs, and current working schedule.

2.2.9. Task 2.9, RSA-188, Northern Burial Area/Burning Ground #3

This site has a low-probability for CWM. Therefore, only the following CARA support is required:

- On-Call UXO/Air Monitoring Support, IAW Section 3.4.13.

Refer to Attachments A and B for site-specific information, AOCs, and current working schedule.

2.2.10. Task 2.10, RSA-257, Rock Pond

This site has a low-probability for CWM. Therefore, only the following CARA support is required:

- On-Call UXO/Air Monitoring Support, IAW Section 3.4.13.

Refer to Attachments A and B for site-specific information, AOCs, and current working schedule.

2.2.11. Task 2.11, RSA-264, RR Spring

This site has a low-probability for UXO and CWM. Therefore, only the following CARA support is required:

- On-Call UXO/Air Monitoring Support, IAW Section 3.4.13.

Refer to Attachments A and B for site-specific information, AOCs, and current working schedule.

2.2.12. Task 2.12, RSA-066, Inactive Ash Disposal Site, Area X-1 (optional)

This is an optional task and is not required at this time. Site-specific requirements shall be identified in this section as an addendum to this SOW.

2.2.13. Task 2.13, RSA-068, Inactive Chemical Disposal, Area Z (optional)

This is an optional task and is not required at this time. Site-specific requirements shall be identified in this section as an addendum to this SOW.

2.2.14. Task 2.14, RSA-110, Former Drum Storage/Construction Debris, Area Y (optional)

This is an optional task and is not required at this time. Site-specific requirements shall be identified in this section as an addendum to this SOW.

2.2.15. Task 2.15, RSA-051, Inactive Munitions Demil & Disposal, Area I (optional)

This is an optional task and is not required at this time. Site-specific requirements shall be identified in this section as an addendum to this SOW.

2.2.16. Task 2.16, RSA-052, Inactive Munitions Demil & Disposal, Area N (optional)

This is an optional task and is not required at this time. Site-specific requirements shall be identified in this section as an addendum to this SOW.

2.2.17. Task 2.17, RSA-061, Inactive Munitions Demil/Disposal Area P (optional)

This is an optional task and is not required at this time. Site-specific requirements shall be identified in this section as an addendum to this SOW.

2.2.18. Task 2.18, Additional IM Sites Fieldwork (optional)

This is an optional task and is not required at this time. Any additional IM Sites requiring CARA support shall be identified in this section as an addendum to this SOW.

2.3. TASK 3, MEC/CWM SITES

The following tasks are required to support the MEC/CWM Sites as a whole.

2.3.1. Task 3.1, MEC/CWM Sites: Annual Support

This task may be performed by the same personnel executing the requirements of Task 1.1.

The objective of this task is for CARA to provide annual support to the MEC/CWM Sites. This includes, but is not limited to the following:

2.3.1.1. CARA Supervisor

Provide an CARA Supervisor, physically located at RSA, to serve as the primary POC for this project and coordinate directly with the USAESCH PM identified in Section 4.1. The CARA Supervisor shall perform annual project and program management support. This support includes, but is not limited to, participating in meetings and project discussions with USAESCH and RSA, plan development and reviews, equipment and facility maintenance coordination, and perform reporting requirements. Specifically, the CARA Supervisor will be required to obtain access to the RSA computer network. Appropriate forms and training requirements shall be provided to the designated CARA Supervisor. This computer access will primarily be used to submit necessary JORs related to CARA operations.

Meetings include, but are not limited to, the following:

g) Project Kick-Off Meetings (assume 1 per month; 4 hours each)
Initial planning meetings to meet members of the RSA PDTs, discuss project schedules and project specifics, and identify roles and responsibilities.

h) Scoping Meetings (assume 1 per month; 2 hours each)
These meetings ensure that the approaches pursued by CARA and/or the Prime Contractor are acceptable to all stakeholders and protect the legal and program obligations of the Army. It allows for collective input from all parties so that a wider range of alternatives can be considered and expedites decision making and problem resolution.

i) Progress Meetings (assume 2 per month; 2 hours each)
These meetings will be used to review the past months' efforts, review and plan forecasted activities, discuss critical path activities, develop an action item list, follow-up on any actions previously assigned, and identify any additional potential issues.

j) Working Group Meetings (assume 2 per week; 1 hour each)
These technical meetings will review site progress and resolve issues.

k) Onboard Reviews (as needed)
Depending on the number and/or type of comments developed during the review of CARA and/or Contractor plans, an onboard review may be required. Onboard reviews shall be attended by any CARA personnel necessary to answer submitted comments. At a minimum, the CARA Supervisor shall participate.

l) Daily Coordination
Provide coordination/interaction with RSA activities to support CARA operations.

2.3.1.2. Inventory Management and Procurement

The CARA, or Logistics Support Contractor (TBD), shall perform inventory control and, as required, procure CARA and USAESCH equipment to support the mission. Inventory control includes, but is not limited to: taking inventory, issue and receiving, scheduling/delivering/picking up items for calibration.

2.3.1.3. Facilities

Identify facility deficiencies and report to appropriate installation personnel, coordinate any routine maintenance (grounds, electrical, HVAC, etc.), provide arms room (as necessary).

2.3.1.4. CARA Vehicles (as required)

Coordinate with the RSA motor pool, or commercial service provider, any necessary maintenance or repairs.

2.3.1.5. MEC/CWM Removal Equipment (as required)

Procure and maintain any equipment necessary to perform MEC/CWM removals IAW Section 3.4.5.

2.3.1.6. Reporting

Prepare the following reports and submit them electronically to the USAESCH PM. The USAESCH PM will make distribution to appropriate RSA PDT Members.

- Customer Reports – Submitted monthly and should contain, at a minimum, the following information: total costs incurred to date, to include any unanticipated costs, and the amount of funds remaining. (See Attachment D for an example customer report).

- Lessons Learned – Prepare, at least annually, a report on project lessons learned identifying deficiencies or better practices.

- Other Reports (as required) – Submit any other reports pertaining to the MEC/CWM Sites electronically to the USAESCH PM.

2.3.2. Task 3.2, MEC/CWM Sites: Plans

Prepare and submit for acceptance the following plans IAW Section 3.3.

- SOPs - Develop SOPs specific to CARA operations to support the RSA mission IAW Section 3.3.1.

- MEC/CWM Removal Concept Work Plan – Submit and gain acceptance of a MEC/CWM Removal Concept Plan which defines the approach that will be taken by the CARA team to perform surface and subsurface MEC/CWM removal and support, as required.

  This plan shall, at a minimum, meet the requirements of DID Worldwide Environmental Remediation Services (WERS)-001.01, Work Plans. Refer to Attachment E for all DIDs.

- Pre-Approved Templates – Prepare and submit for acceptance the following types of templates. These templates will be used once a specific site is identified to speed up the preparation of required plans.

  1) Forms for Reporting MEC
  2) Site-Specific MEC/CWM Removal Work Plan Addendum, IAW Section 3.3.4.
  3) Site-Specific Safety & Health Plan
  4) Site-Specific Sampling & Analysis Plan (SAP)
  5) Site-Specific CWM Site Plan (CSP), IAW Section 3.3.5.
  6) Site-Specific Explosives Site Plan (ESP), IAW Section 3.3.5.
  7) Site-Specific Chemical Safety Submission (CSS), IAW Section 3.3.5.
  8) Site-Specific Explosives Safety Submission (ESS), IAW Section 3.3.5.
  9) Other – any templates identified by CARA or the project team to support the requirements of this SOW.

- Support to Contractor Plans (as required) – Provide support to Contractor Plans IAW Section 3.3.2.

Table 3, in Section 3.3 provides a list of submittals and associated due dates.

2.4. TASK 4, MEC/CWM SITES: SITE-SPECIFIC REQUIREMENTS

CARA shall provide all personnel, supplies, and equipment necessary to successfully meet the requirements of this SOW. The RSA Site Manager shall identify sites requiring CARA Support and notify the USAESCH PM. The USAESCH PM will coordinate with the CARA Supervisor to execute fieldwork. Upon identification of a site, available information and specific requirements will be added to this SOW as an addendum and, if necessary, an additional cost estimate will be developed by CARA. Upon acceptance of the SOW addendum and cost estimate the associated plans will be developed.

Each site shall have an individual onsite supervisor that has working knowledge of associated work plans and air monitoring plans. The supervisor shall be the field point of contact for all issues related to CARA operations and shall report directly with the onsite USAESCH OESS, if applicable.

Table 2 provides a breakout of the minimum personnel requirements for one intrusive MEC/CWM Site.

Table 2 Team to Support One Intrusive MEC/CWM Site [to be finalized by CARA]
(1) CET Supervisor
(3) CETs
(3) Air Monitoring (1 MINICAMS; 1 GC/MS; 1 Maintenance Personnel)
(1) Equipment Specialist
EOD Soldiers (on call)
(1) Senior UXO Supervisor (SUXOS)
(2) UXO Technicians (UXO Tech II or higher)

Typically only one MEC/CWM Site will be intrusive at a time, but several sites may be open. This will allow the teams to rotate between sites depending on schedules, tenant coordination, and other factors. Refer to Attachment B for a current working schedule.

In the event CARA cannot support more than one intrusive operation at a time, they shall inform the USAESCH PM at least 90 days prior to site mobilization. The USAESCH PM shall coordinate with RSA to provide appropriate personnel to meet these requirements (i.e., contractor or ECBC personnel).

Anticipated Work Schedule:

- Regular Schedule: 4-10 hour days (Monday-Thursday).
- 10 Overtime hours/week.
- Possible weekend and nighttime operations (mission dependent). Refer to Attachment A for a list of sites that may require night-time operations.
- Schedule may vary from site to site.

2.4.1. Task 4.1, MSFC-003-R-01, Inactive Old Bone Yard Disposal Site #1

This requirement is separate from Task 2.1.

The objective of this task is to perform the following activities to support operations at this MEC/CWM Site.

2.4.1.1. Equipment & Maintenance Support

The CARA, or Logistics Support Contractor (TBD), shall provide all necessary equipment and for the maintenance and repair of the provided equipment to meet the requirements of this SOW in a manner which minimizes equipment downtime utilizing economically sound solutions to the greatest extent practicable.

This includes, but is not limited to, the following:

- Air Monitoring, IAW Section 3.1.1.
- PPE, IAW Section 3.1.2.
- PDS/Rescue, IAW Section 3.1.3.
- MEC Field Assessment/Packaging/Transportation, IAW Section 3.1.4.
- Engineering Controls (as required), IAW Section 3.1.5.
- Communications, IAW Section 3.1.6.
- Command and Control, IAW Section 3.1.7.
- Other (as required), IAW Section 3.1.8.
- MEC Removal Equipment, IAW Section 3.1.9.

2.4.1.2. Reporting

Prepare the following reports and submit them electronically to the USAESCH PM. The USAESCH PM will make distribution to appropriate RSA PDT Members.

- Daily Operational Reports (only required during intrusive operations), IAW Section 3.2.1.
- Accident Reporting, IAW Section 3.2.2.

2.4.1.3. Plans

Prepare and submit the following plans IAW Section 3.3.

- SOPs, IAW Section 3.3.1.
- Support to Contractor Plans, IAW Section 3.3.2.
- Site-Specific Air Monitoring Plan Addendum, IAW Section 3.3.3.
- Site-Specific MEC/CWM Removal Work Plan Addendum, IAW Section 3.3.4.
- Site-Specific Safety Submission, IAW Section 3.3.5.
- Site-Specific Final Report, IAW Section 3.3.6.

Table 3, in Section 3.3 provides a list of submittals and associated due dates.

2.4.1.4. Fieldwork

Provide all personnel and equipment necessary to successfully execute fieldwork to meet requirements of this SOW. Several types of fieldwork may be required to support this site.

This includes, but is not limited to the following:

- Mobilization/Demobilization, IAW Section 3.4.1.
- Pre-Operational Surveys and Exercises, IAW Section 3.4.2.
- Vegetation Removal, if required, IAW Section 3.4.3.
- Geophysical Surveys, IAW Section 3.4.4.
- MEC/CWM (including MPPEH and MD) Removal, IAW Section 3.4.5.
- Sample Collection & Analysis, if required, IAW Section 3.4.9.
- Air Monitoring, IAW Section 3.4.6.
- PDS/Rescue, IAW Section 3.4.7.
- Life Support, IAW Section 3.4.10.
- MEC Field Assessment/Package/Transport, IAW Section 3.4.8.
- Storage, IAW Section 3.4.11.

Figures and information depicting areas requiring MEC/CWM removal at this site are identified in Attachment F.

Refer to Attachments A and B for site-specific information, AOCs, and current working schedule.

2.4.2. Task 4.2, MSFC-034, Former Chemical Production & Filling Area and RSA-238, Former Huntsville Arsenal Plant No. 2 Mustard Lines 5 & 6

The objective of this task is for CARA to perform the following activities to support operations at this MEC/CWM Site.

These sites shall be executed together but fieldwork will only occur at one site at a time.

2.4.2.1. Equipment & Maintenance Support

The CARA, or Logistics Support Contractor (TBD), shall provide all necessary equipment and for the maintenance and repair of the provided equipment to meet the requirements of this SOW in a manner which minimizes equipment downtime utilizing economically sound solutions to the greatest extent practicable.

This includes, but is not limited to, the following:

- Air Monitoring, IAW Section 3.1.1.
- PPE (for CARA personnel only), IAW Section 3.1.2.
- Engineering Controls (as required), IAW Section 3.1.5.
- Communications, IAW Section 3.1.6.
- Command and Control, IAW Section 3.1.7.
- Other (as required), IAW Section 3.1.8.

2.4.2.2. Reporting

Prepare the following reports and submit them electronically to the USAESCH PM. The USAESCH PM will make distribution to appropriate RSA PDT Members.

- Daily Operational Reports (only required during intrusive operations), IAW Section 3.2.1.
- Accident Reporting, IAW Section 3.2.2.

2.4.2.3. Plans

Prepare and submit the following plans IAW Section 3.3.

- SOPs, IAW Section 3.3.1.
- Support to Contractor Plans, IAW Section 3.3.2.
- Site-Specific Air Monitoring Plan Addendum, IAW Section 3.3.3.
- Site-Specific Final Report, IAW Section 3.3.6.

Table 3, in Section 3.3 provides a list of submittals and associated due dates.

2.4.2.4. Fieldwork

Provide all personnel and equipment necessary to successfully execute fieldwork to meet requirements of this SOW. Several types of fieldwork may be required to support this site.

This includes, but is not limited to the following:

- Mobilization/Demobilization, IAW Section 3.4.1.
- Pre-Operational Surveys and Exercises, IAW Section 3.4.2.
- Air Monitoring, IAW Section 3.4.6.

Refer to Attachments A and B for site-specific information, AOCs, and current working schedule.

2.4.3. Task 4.3, Additional MEC/CWM Sites Support (Optional)

This is an optional task and is not required at this time. Any additional MEC/CWM Sites requiring CARA support shall be identified in this section as an addendum to this SOW.

2.5. TASK 5, GARRISON SUPPORT

CARA shall provide all personnel, supplies, and equipment necessary to successfully meet the requirements of this SOW. This task includes responses that are unplanned and may require a rapid response by the onsite CARA MEC/CWM Team identified in Table 2. Therefore, the MEC/CWM Team shall be physically located at RSA to meet these requirements.

2.5.1. Task 5.1, Initial Responses Upon Discovery of Suspected MEC/CWM (as required)

The activity responsible for discovery of the suspected MEC/CWM shall make proper notifications IAW RSA 75-4, *RSA Garrison: Munitions and Explosives of Concern Program Policy*. The RSA Site Manager shall notify the USAESCH PM who shall notify the CARA

Supervisor and provide all available information. The CARA Supervisor shall coordinate with the MEC/CWM Team, identified in Table 2, to respond to the site and perform the following tasks:

a) Determination (if possible)
    1. UXO qualified personnel shall determine whether or not item is a MEC concern.
    2. Report findings to RSA Site Manager and the USAESCH PM.
    3. If MEC, formal reporting procedures identified in RSA 75-4 will be followed.
b) Identification (if possible)
    1. Take pictures with a digital camera, provide to the USAESCH PM, RSA, and CARA Headquarters (HQ).
    2. Provide available information and feedback to CARA HQ for the responding EOD unit.
c) Coordination
    1. Provide liaison office support to the responding EOD unit.
d) Advice & Assistance
    1. Provide air monitoring equipment and operators (if necessary) IAW Section 3.4.6.
    2. Package and transport items to sited storage location and final disposition IAW Sections 3.4.8 and 3.4.11.

2.5.2. Task 5.2, On-Site UXO/Air Monitoring Support (as required)

The objective of this task is for CARA to provide onsite UXO and/or air monitoring support during construction or maintenance in areas of high probability.

The RSA Site Manager shall identify sites requiring on-site UXO/air monitoring support and notify the USAESCH PM. The USAESCH PM will coordinate with the CARA Supervisor to execute support.

Upon identification of a site, available information and specific requirements will be added to this SOW as an addendum and, if necessary, an additional cost estimate will be developed by CARA. Upon acceptance of the SOW addendum and cost estimate the associated plans will be developed.

Each site shall have an individual onsite supervisor that has working knowledge of associated work plans and air monitoring plans. The supervisor shall be the field point of contact for all issues related to CARA operations and shall report directly with the onsite USAESCH OESS, if applicable.

2.5.3. Task 5.3, On-Call UXO/Air Monitoring Support (as required)

Provide on-call UXO and/or air monitoring support during construction or maintenance in areas previously cleared or designated as low probability.

The RSA Site Manager shall identify sites requiring on-call UXO/air monitoring support and notify the USAESCH PM. The USAESCH PM will coordinate with the CARA Supervisor to execute support.

Upon identification of a site, available information and specific requirements will be added to this SOW as an addendum and, if necessary, an additional cost estimate will be developed by CARA. Upon acceptance of the SOW addendum and cost estimate the associated plans will be developed.

Each site shall have an individual onsite supervisor that has working knowledge of associated work plans and air monitoring plans. The supervisor shall be the field point of contact for all issues related to CARA operations and shall report directly with the onsite USAESCH OESS, if applicable.

3.0 GENERAL REQUIREMENTS

CARA, or the Logistics Support Contractor (TBD), may be required to perform the following.

3.1. EQUIPMENT & MAINTENANCE SUPPORT

3.1.1. Air Monitoring

Ensure sufficient number of instruments and detectors are available to provide monitoring for all agents identified in Attachment A and any duplication/spare equipment necessary to limit down time.

3.1.1.1. Gases & Gas Equipment

Maintain inventory log, order, issue, receive and store, and disposition or return of empty gas cylinders.

3.1.1.2. Miniature Chemical Agent Monitoring System (MINICAMS) and Gas Chromatography/Mass Spectrometry (GC/MS)

Maintain inventory log, operational status, and instrument/operator certifications. Perform annual preventative maintenance, method development, identify deficiencies, transport items for repair, and retrieve repaired equipment from service provider. Monitor calibration items to ensure all calibrations are current.

3.1.1.3. Other Detectors

Maintain inventory log, operational status, and instrument/operator certifications. Perform annual preventative maintenance at manufacturer's or Army recommended intervals, method development, identify deficiencies, transport items for repair, and retrieve repaired equipment from service provider. Monitor calibration items to ensure all calibrations are current.

3.1.2. Personal Protective Equipment (PPE)

Provide appropriate PPE (masks, gloves, etc.) for all onsite CARA personnel for intrusive tasks. CARA shall also provide certified personnel to supply breathable air (cascade) in a Level A/Level B operation and perform fittest requirements for all onsite personnel, as required.

Maintain inventory log, operational status, and instrument/operator certifications. Perform annual preventative maintenance, identify deficiencies, transport items for repair, and retrieve repaired equipment from service provider.

3.1.2.1. Periodic Testing of Respiratory Equipment

Perform and/or coordinate periodic testing of respiratory equipment.

3.1.3. PDS/Rescue

Provide all equipment and supplies to fully operate the PDS and Emergency PDS (EPDS) for all onsite Government and contractor personnel to meet the requirements of Section 3.4.7.

Provide all equipment and supplies necessary to fully operate the rescue team during all downrange operations to meet the requirements of Section 3.4.7.

3.1.4. MEC Assessment/Packaging/Transportation

Operate all equipment provided by RCWM Directorate to meet the requirements of Section 3.4.8 to perform non-intrusive assessment (i.e., portable isotopic neutron spectroscopy (PINS) or x-ray) to determine the appropriate fill to allow for items to be segregated accordingly and placed into pre-treatment storage prior to treatment and/or disposal.

Provide all equipment necessary to package and transport recovered MEC with an unknown liquid fill and any suspect CWM to the sited storage location.

3.1.5. Engineering Controls

Provide engineering controls, as required, to protect the public and site workers during intrusive operations to include filter units, hot box operations, analysis, or monitoring operations. CARA shall only be responsible for providing engineering controls available in CARA's inventory. CARA shall notify the USAESCH PM immediately of any engineering controls they will not be able to provide and the USAESCH PM will coordinate with RSA to request support from either the Prime or Logistics Support Contractor (TBD) or ECBC.

3.1.6. Communications

Procure and maintain communication equipment compatible with Installation Emergency Operations Center (IEOC) requirements for CARA personnel.

3.1.7. Command and Control

Provide all command and control equipment and supplies necessary to successfully operate the CARA command post.

3.1.8. Other (as required)

Provide and maintain any additional equipment and supplies necessary to successfully meet the requirements of this SOW.

3.1.9. MEC/CWM Removal Equipment

Procure and maintain any equipment necessary to perform MEC/CWM removals IAW Section 3.4.5.

3.2. REPORTING

3.2.1. Daily Operational Reports (non-intrusive operations)

Submitted at the completion of each work day and should contain, at a minimum, the following information: a list of all CARA personnel onsite (i.e. names and positions) and time onsite, location of work area, type of work executed, any problems encountered (if any) and the corrective action taken. The example CARA Daily Operational Report, provided as Attachment C, is not required for this task. A daily email submitted to the USAESCH PM shall suffice.

3.2.2. Daily Operational Reports (intrusive operations)

Submitted at the completion of each work day and should contain, at a minimum, the following information: a list of all CARA personnel onsite (i.e. names and positions) and time onsite, location of work area, type of work executed, monitoring results, detection limits, sample identification and clearance data, lab results, munitions clearance and results, any problems encountered (if any) and the corrective action taken. (See Attachment C for an example CARA daily operational report).

3.2.3. Accident Reporting (as required)

Report all accidents IAW DA Pam 385-40, *Army Accident Investigations and Reporting*. During fieldwork, all accidents shall be reported immediately to the USAESCH CWM Design Center and the USAESCH OESS and the SUXOS, if onsite.

3.3. PLANS

The CARA, or Logistics Support Contractor (TBD), shall develop, submit, and gain acceptance of the following plans related to CARA operations. All plans shall be prepared IAW applicable data-item-descriptions (DIDs) provided in Attachment E. All plans shall be submitted electronically to the USAESCH PM. The USAESCH PM will make distribution to appropriate RSA PDT members.

Each submittal shall identify the specific members and title of the CARA and any subcontractor personnel that had significant input into the report's preparation or review.

Various USAESCH and RSA team members will have the opportunity to review CARA submittals. CARA shall review all comments pertaining to their submittals received through the USAESCH PM and evaluate their appropriateness based upon their merit and the requirements of this SOW. CARA shall issue to the USAESCH PM a formal, annotated response to each comment. CARA shall not non-concur with a comment without discussing with the USAESCH PM.

Table 3 provides a list of submittals and associated due dates.

3.3.1. SOPs

Develop SOPs specific to CARA operations at RSA.

3.3.2. Support to Contractor Plans

For plans developed by the Contractor, CARA shall provide information for sections and/or technical input to the Contractor for sections pertaining to CARA operations. This may include, but is not limited to, munitions assessment, packaging operations, transportation of recovered items, PPE, air monitoring, decontamination, rescue, scrap handling, and headspacing.

3.3.3. Site-Specific Air Monitoring Plan (AMP) Addendum

Using the pre-approved template, submit and gain acceptance of site-specific addendums to the Air Monitoring Concept Plan for each site requiring health and safety air monitoring support. These addendums shall detail the equipment assignments and agents of concerns specific to each site.

3.3.4. Site-Specific MEC/CWM Removal Work Plan Addendum

Using the pre-approved template, prepared IAW Task 3.2, submit and gain acceptance of site-specific addendums to the MEC/CWM Removal Concept Work Plan, as required. These addendums shall detail the activities to take place to meet the requirements specific to each site.

3.3.5. Site-Specific Safety Submissions

Using the pre-approved template, prepared IAW Task 3.2, submit and gain acceptance of a site-specific safety submissions (i.e., CSP, CSS, ESP, ESS), as required. These shall be prepared IAW Department of Defense (DoD) 6055.09-M and DID WERS-003.01, Safety Submissions. Refer to Attachment E for all DIDs. Upon USAESCH concurrence, RSA shall route the required safety submission for US Army Technical Center for Explosives Safety (USATCES) and DoD Explosives Safety Board (DDESB) approval.

3.3.6. Site-Specific Final Report (SSFR)

Using the pre-approved template, prepared IAW Task 1.2, submit and gain acceptance of a SSFR in a timely and efficient manner that conforms to task requirements and applicable standards. This report shall be prepared IAW the general format presented in DID WERS-13.01. Refer to Attachment E for all DIDs. The SSFR shall include the results for all field activities conducted by CARA including any construction support. In addition to the DID requirements, CARA shall include all quality control (QC)/quality assurance (QA) documentation and signed clearance maps.

Specific requirements:

- Data evaluation and maps associated with the geophysical surveys will be incorporated into the SSFR.
- Geospatial Information System (GIS) data shall be formatted and submitted IAW DID WERS-007.01, Geospatial Information and Electronic Submittals.

All final mapping will be generated using GIS and provided to the USAESCH in Environmental Systems Research Institute (ESRI) ArcView digital design files on a DVD.

Table 3 – Submittal Guidance

Submittals	Due Dates (Calendar Days)
Pre-Approved Templates	
Draft Pre-Approved Templates	No Later Than (NLT) 31 August 2014
Draft-Final Pre-Approved Templates	14 days after receipt of comments and/or onboard review for each plan
Final Pre-Approved Templates	14 days after receipt of comments and/or onboard review for each plan
Air Monitoring Concept Plan	
Draft Air Monitoring Concept Plan	NLT 31 August 2014
Draft-Final Air Monitoring Concept Plan	14 days after receipt of comments and/or onboard review for each plan
Final Air Monitoring Concept Plan	14 days after receipt of comments and/or onboard review for each plan
MEC/CWM Removal Concept Plan	
Draft MEC/CWM Removal Concept Plan	NLT 31 August 2014
Draft-Final MEC/CWM Removal Concept Plan	14 days after receipt of comments and/or onboard review for each plan
Final MEC/CWM Removal Concept Plan	14 days after receipt of comments and/or onboard review for each plan
Standard Operating Procedures (SOPs)	
Draft SOPs	As required, identified by CARA and/or USAESCH team members
Draft-Final SOPs	14 days after receipt of comments and/or onboard review for each SOP
Final SOPs	14 days after receipt of comments and/or onboard review for each SOP
Support to Contractor Plans	
Advanced Reviews	Provide comments to the USAESCH within 14 days of receipt of document, unless otherwise noted.
Backcheck Comments	Backcheck comments and ensure they were incorporated into the document. Provide concurrence and/or additional comments within 14 days of receipt of document, unless otherwise noted.
Information for Contractor Plans	Provide any necessary information pertaining to CARA operations within 14 days of request for information.
Site-Specific Air Monitoring Plan (AMP) Addendum	
Draft Site-Specific Air Monitoring Plan (AMP) Addendum	Within 14 days of receiving site-specific information
Draft-Final Site-Specific Air Monitoring Plan (AMP) Addendum	14 days after receipt of comments and/or onboard review for each plan
Final Site-Specific Air Monitoring Plan (AMP) Addendum	14 days after receipt of comments and/or onboard review for each plan
Site-Specific MEC/CWM Removal Work Plan Addendums	

Draft Site-Specific MEC/CWM Removal Work Plan Addendum	Within 14 days of receiving site-specific information
Draft-Final Site-Specific MEC/CWM Removal Work Plan Addendum	14 days after receipt of comments and/or onboard review for each plan
Final Site-Specific MEC/CWM Removal Work Plan Addendum	14 days after receipt of comments and/or onboard review for each plan
Site-Specific Safety Submissions	
Draft Site-Specific Safety Submissions	With Site-Specific MEC/CWM Removal Work Plan Addendum
Draft-Final Site-Specific Safety Submissions	14 days after receipt of comments and/or onboard review for each plan
Final Site-Specific Safety Submissions	14 days after receipt of comments and/or onboard review for each plan
Site-Specific Final Report (SSFR)	
Signed Clearance Maps	Within 10 days of completion of fieldwork
Draft Site-Specific SSFR	Within 30 days of completion of fieldwork
Draft-Final Site-Specific SSFR	14 days after receipt of comments and/or onboard review for each plan
Final Site-Specific SSFR	14 days after receipt of comments and/or onboard review for each plan

3.4. Fieldwork

CARA and Explosive Ordnance Disposal (EOD) personnel are under the operational control of the US Army Engineering and Support Center, Huntsville's (USAESCH) CWM Design Center. All CARA and EOD personnel will use only approved operational procedures as they support USAESCH. The CARA Supervisor shall report any problems immediately to the USAESCH CWM Design Center and/or the USAESCH Ordnance and Explosives Safety Specialist (OESS), if onsite. Any problems shall be resolved by the USAESCH, RSA, and the 20th CBRNE Command.

3.4.1. Mobilization/Demobilization

Successfully mobilize all equipment, materials, and supplies to the identified sites in an expedited, safe, and secure fashion.

As part of mobilization, the following general activities may be required:

a) Job Order Request (JOR) – For all CARA led responses, the CARA Supervisor shall submit all necessary requests through the Garrison JOR system prior to any mobilization or field efforts. As part of this process, CARA will be responsible for ensuring that all utilities are shut off during work (unless otherwise instructed) prior to going intrusive.
b) Badge Requirements – CARA shall complete any necessary badge requirements to gain access to the site. These requirements will be provided with the site-specific information, if applicable.
c) Establishment of a command post.
d) Training and briefing – prior to field activities, CARA shall ensure that all CARA field personnel participate in the required three (3)-day site-specific training.

This training may include the following:

- Activities to be performed;
- Archeological and historical resources awareness;
- Threatened and endangered species habitat awareness;
- MEC known and suspected to be present at the sites;
- Action to take upon encountering MEC: and
- Safe work practices.

Demobilization from the specific site will consist of the performance of the same activities (or their undoing) in reverse order. In general, staging areas should be demobilized last, so that they can be used as staging areas for the demobilization efforts.

3.4.2. Pre-Operational Surveys and Exercises

Prepare for, coordinate, support as necessary, participate, and successfully complete the pre-operational survey and exercises consisting of the following: (1) the Table-Top Exercise; (2) Huntsville Survey; and (3) Pre-Operational Survey.

CARA shall provide a field crew roster, training records, mask fit and medical screening records to the USAESCH PM for approval of all site personnel prior to the start of field activities. This information shall also be maintained onsite and be made available upon request.

3.4.3. Vegetation Removal

Prior to the initiation of field activities at MEC/CWM Sites, CARA, or the Logistics Support Contractor (TBD), may be required to perform vegetation removal at affected areas. This requirement will be identified in the site-specific information.

3.4.4. Geophysical Surveys

Prior to the initiation of intrusive field activities at MEC/CWM Sites, CARA, or the Logistics Support Contractor (TBD), may be required to perform a geophysical investigation IAW the requirements of DID WERS-004.01. This includes, but is not limited to, the following:

a) Geophysical survey
b) Geophysical anomaly reacquisition
c) Associated data processing
d) Anomaly selection and decision criteria
e) Dig sheet development
f) Data management
g) Quality control

The primary geophysical measurement quality objectives are to detect the various types of ordnance present at the site and to report their horizontal position (reacquired location) within 1 meter of the item location. Specific instruments and methodologies shall be identified in the Site-Specific Work Plan Addendums.

3.4.5. MEC/CWM (Including MPPEH and MD) Removal

Intrusive investigations shall be performed in accordance with procedures outlined in the Interim Guidance Draft Army Regulation, *CWM Responses and Related Activities* (1 April 2009)*;* Engineering Pamphlet (EP) 1110-1-18, *Military Munitions Response Process*; EP 75-1-3, *Recovered Chemical Warfare Materiel (RCWM) Response*; and the Occupational Safety and Health Administration (OSHA) requirements in 29 CFR 1910.120 and for excavations in 29 CFR 1926 Subpart P. MEC disposal operations shall be performed in accordance with Engineering Manual (EM) 385-1-97, *Explosives – Safety and Health Requirements Manual* and TM 60A-1-1-31, *EOD Disposal Procedures*. The site-specific safety and health plan developed for the site shall be followed at all times, as will procedures outlined in DoD 6055.09-M, *Ammunition and Explosives Safety Standards*.

Specific Requirements:

a) The CARA, or Logistics Support Contractor (TBD), shall remove MEC/CWM, including MPPEH and MD, at the project site in the areas and to depths designated in the site-specific information. The means and methods of clearance area boundary delineation shall be described in the Site-Specific Work Plan Addendums.
b) All MPPEH and any material determined through inspection not to contain an explosive hazard shall be processed and disposed of by CARA at an approved location within RSA.
c) All munitions debris shall be smelted or made otherwise unidentifiable by their basic content before being turned over to the Defense Reutilization Management Office (DRMO) with a certified 1348.
d) IAW QASAS disposition instructions/requirements, CARA will transport, store, and destroy any MEC/MPPEH. IAW Section IV.B, of the Alabama Department of Environmental Management (ADEM) Permit Number AL7 210 020 742 (provided as a separate document), munitions or components containing colored smokes, white phosphorous, red phosphorous, hexachlorethane, or riot control agents may not be open detonated.
    - Any items unable to be destroyed will be transferred by hand receipt (i.e. DD Form 1911) to the appropriate authority as designated by RSA for transport, storage, and further assessment, and proper disposition at a later date.
e) All cultural debris will be sent to DRMO after a certified 1348 is completed.
f) Escort USAESCH, RSA and other personnel as identified over the clearance area to ensure that all personnel are familiar with the clearance areas and ensure the areas are properly delineated.

Upon completion of each MEC/CWM (including MPPEH and MD) removal, CARA shall ensure that the clearance areas are visibly delineated on the ground by stakes or other approved suitable method(s) so that the limits of clearance are easily discernible by personnel in the field. The stakes shall consist of materials resistant to deterioration, e.g., pressure treated wood, or other similar approved materials. The intent is to provide stakes which do not readily deteriorate and which are still visible after moderate re-growth of vegetation.

CARA shall provide a signed map of the cleared area as a separate deliverable, in addition to being included in the SSFR.

Provide a GIS file with X, Y, and Z coordinates of all material found (MEC/CWM, MPPEH, MD, etc.) as well as the entire cleared area.

3.4.6. Air Monitoring

Provide sufficient number of operators, certified and trained, to perform air monitoring for chemical and industrial AOCs identified in Attachment A during site operations. CARA may be required to monitor at the workspace, headspace, quadrant/PDS, medical tent, storage location, and perimeter for identified chemical and industrial AOCs.

Provide all documentation showing that all onsite personnel have received the training and medical surveillance requirements IAW the approved Accident Prevention Plan and/or Site Safety and Health Plan. CARA shall also provide and maintain the most current signed copy of their CASARM plan onsite.

Maintain MSDSs for all AOCs onsite, chemicals used as calibration gases or standards, and for all dilute agent standards. This information shall be up-to-date and made available upon request.

3.4.7. PDS/Rescue

Provide a PDS Team to successfully operate the PDS/EPDS. During operations in hazardous environments, the PDS Team shall be comprised of at least four personnel: (1) PDS Supervisor – responsible for managing decontamination operations; and (3) PDS Assistants – responsible for supporting decontamination operations.

Provide at least two dedicated personnel and necessary equipment to perform rescue operations downrange.

3.4.8. MEC Field Assessment/Package/Transport

Coordinate with the 20th CBRNE Command to provide Explosives Ordnance Disposal (EOD) support to perform the initial assessment of any recovered MEC, to include items with an unknown liquid fill and any suspect CWM.

Provide sufficient number of personnel and equipment to package and transport recovered MEC with an unknown liquid fill and any suspect CWM to the sited storage location.

Coordinate with the RCWM DIRECTORATE to perform non-intrusive assessment (i.e. PINS or x-ray) to determine the appropriate fill to allow for items to be segregated accordingly and placed into pre-treatment storage prior to treatment and/or disposal.

Provide armed escorts, as required, per AR 190-11 and the *Interim Guidance (Draft Army Regulation XXX), CWM Responses and Related Activities*.

3.4.9. Sample Collection & Analysis

All work under this task shall be conducted IAW the Installation-Wide QA Program Plan (QAPP) for the Shaw, Inc. (a CB&I company) Program Management Contract (PMC), RSA, Madison County, Alabama, Final Revision 1, September, 2010 [to be provided as a separate document], Site-Specific Work Plan Addendums, DID WERS-009.01, and applicable SOPs, regulations, and guidance documents. CARA, or the Logistics Support Contractor (TBD), shall propose on the sampling rationale, and methods that will be utilized to ensure that data generated are of an acceptable quality for its intended use. CARA, or the Logistics Support Contractor (TBD), shall

also propose on the quantity, quality and the methods used to verify adherence to the precision, accuracy, representatives, comparability, completeness, and sensitivity (PARCCS) parameters for sample collection, handling, laboratory analysis, verification and validation. All samples shall be analyzed using modified Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) with updates.

Specific Requirements:
The CARA, or the Logistics Support Contractor (TBD), shall be responsible for the following:

a) On-site sample coordinator to ensure all hold time, packaging, and shipping requirements are met. Assign and track all sample numbers in a sample log.
b) Delivery of split samples to ECBC for low-level agent analysis, as required.
   NOTE: The USAESCH will be responsible for obtaining ECBC support for low-level agent analysis.
c) Subcontract with an accredited hazardous, toxic, and radioactive waste (HTRW) Laboratory to perform analysis for analytes identified in the site-specific information. HTRW Laboratory must meet the following requirements, at a minimum:
   1. Maintain appropriate National Environmental Lab Accreditations (i.e. NELAP, NELAC) and/or Environmental Laboratory Accreditation Program (ELAP) certification.
   2. All laboratory procedures will be compliant with DoD Quality System Management (QSM) and all reporting limits for laboratory methods will at a minimum meet health based environmental screening limits (HBESL) requirements.
   3. Obtain any/all laboratory data (including raw data from analysis instruments, analytical results, and chain of custody) from the HTRW laboratory in a deliverable report submitted to the USAESCH PM thirty (30) with the SSFR.
      This report shall, at a minimum, include the following sections:
      - Cover letter that includes Site Name, Site Number, and Sample Delivery Group Number
      - Case narrative
      - Executive summary (detection highlights)
      - Methods summary
      - Method/analyst summary
      - Sample summary
      - Analytical results by method/sample
      - QC data association summary
      - QC results by method
      - Sample receipt documents
      - Chain of custody
      - Supporting documentation
        - Raw data
        - Standard logs
d) Maintain approved copies of all pertinent SOPs and chemical agent standard analytical reference material (CASARM) plans and make them available upon request.
e) Any deviations that may affect data quality objectives (DQOs) shall be conveyed to the USAESCH PM and RSA Site Manager immediately.

3.4.10. Life Support

Life support for personnel includes, but is not limited to, potable water; coordination of emergency medical support mutually agreed upon by Redstone Arsenal with local hospitals, evacuation, maintenance, transportation by ground or air, and accommodations for hygiene (for example, portable toilets).

For those MEC/CWM Sites led by the Prime Contractor, the Prime Contractor shall coordinate and provide all necessary life support for all Government and contractor personnel.

For those MEC/CWM Sites led by CARA, the CARA, or the Logistics Support Contractor (TBD), shall coordinate and provide all necessary life support for all site personnel.

3.4.11. Storage

Perform first entry monitoring, inspections and inventories, and escort, as required, for access to the sited storage location.

Maintain explosives inventories (once explosives operations are authorized by CARA personnel on RSA). If required, CARA shall be responsible for providing an explosives storage magazine (i.e., ATF Type II) that shall be sited within the sited storage location.

Coordinate with Installation Quality Assurance Specialist (Ammunition Surveillance) (QASAS) for storage requirements.

RSA shall be responsible for any required upgrades or maintenance at the sited storage location.

3.4.12. On-Site UXO/Air Monitoring Support

Provide onsite UXO and/or air monitoring support during construction or maintenance in areas of high probability IAW with previous sections and previously approved air monitoring plans and SOPs.

3.4.13. On-Call UXO/Air Monitoring Support

Provide on-call UXO and/or air monitoring support during construction or maintenance in areas previously cleared or designated as low probability IAW with previous sections and previously approved air monitoring plans and SOPs.

4.0 GENERAL INFORMATION

4.1. All questions and coordination pertaining to this project shall be sent through the USAESCH PM, Ms. Ashley Roeske, at 256-895-1429 (office) or 256-655-1591 (cell), or by email at Ashley.E.Roeske@usace.army.mil.

4.2. The CARA Supervisor, identified in Task 1.1, shall serve as the central POC for this project and shall coordinate directly with the USAESCH PM and CARA HQ. The POC's contact information shall be provided to the USAESCH PM within 10 working days of receiving this SOW. Any changes to the POC's information, or the POC itself, should be provided to the USAESCH PM immediately.

4.3. CARA may not request and will not be paid any contingency costs.

4.4. CARA shall provide all personnel working this project with a brief site familiarization briefing.

4.5. The USAESCH reserves the right to request a corrective action from CARA for any procedure, analysis, or deliverable it believes to be in nonconformance of this SOW. CARA shall be responsible for all incurred costs related to the nonconformance and corrective actions. This includes, but is not limited to, reimbursement of analytical laboratory costs, equipment rental, and consumable material. Nonconformance to this SOW or failure to rectify nonconformance through a corrective action to the satisfaction of the USAESCH may result in the termination of this SOW.

4.6. CARA shall not publicly disclose any data generated or reviewed under this SOW. CARA shall refer all requests for information concerning site conditions to the RSA PAO with a copy furnished to the USAESCH PM and RSA Site Manager. Reports and data generated under this SOW are the property of the DoD and distribution to any other source, unless authorized by the USAESCH PM or RSA Site Manager, is prohibited.

5.0 PERIOD OF PERFORMANCE

5.1. The completion date for this SOW is **30 December 2020**.

5.2. Requirements shall be evaluated annually and any necessary updates/amendments to this SOW shall be incorporated. The completion date for this SOW may be reduced or extended based on the level of CARA support required for the RSA mission. Prior to any changes in duration, the CARA team shall be contacted and provided the opportunity to comment and/or submit a revised cost estimate, if applicable.

APPENDIX B
SITE MAPS

Not Used

Figures are provided within the Work Plan and applicable Appendices.

APPENDIX C
POINTS OF CONTACT

Emergency Contact List

Fire, Police, Emergency Medical Services:	(256)876-2117 from cell or 911 *must state you are on Redstone Arsenal
Emergency Medical Care: Huntsville Hospital 101 Sivley Road SW Huntsville, AL 35801	 (256)265-8137 or (256)265-8144
Poison Control Center	(800)222-1222
National Response Center Environmental Emergencies	 (800)424-8802
Installation Emergency Operation Center (IEOC)	(256)313-1043
Redstone Arsenal Military Police	(256)876-2222
Redstone Garrison Safety Office	(256)313-3297
NASA Emergency Operations Center	(256)544-5793
NASA Safety Office	(256)544-0974
Project Management Contacts	
USAESCH Project Manager, Ashley Roeske Chief, OEC, Allyn Allison Chief, OEC Safety, Greg Parsons OEC Operations, Wilson Walters USAESCH OESS, Jay Lewis OEC Emergency Hotline	 (256)895-1429 (office) (256)655-1591 (cell) (256)895-1121 (office) (256)426-5841 (cell) (256)895-1589 (office) (256) 426-2689 (cell) (256)895-1290 (office) (256) 990-1512 (cell) (256)529-8468 (cell) (256)895-1598
Redstone Arsenal Site Manager, Jason Watson Chief, IRB, Terry de la Paz	 (256)842-1448 (office) (256)361-8399 (cell) (256)955-6968
CARA Site Supervisor, John Robbins Site Supervisor, Mark Hammond Safety Officer, Lloyd Wallace Headquarters, Dan Lindsay	 (870)717-1195 (cell) (870)643-9015 (cell) (410)436-9259 (office) (443)910-7486 (cell) (410)436-0037 (office) (443)910-5841 (cell)
NASA Project Manager, Amy Keith	 (256)544-7434

APPENDIX D
ACCIDENT PREVENTION PLAN

APPENDIX D
ACCIDENT PREVENTION PLAN

Munitions and Explosives of Concern/Chemical Warfare Materiel Construction Footprint Clearance

MSFC-003-R-01, Inactive Old Bone Yard Disposal Site #1
U.S. Army Garrison-Redstone

OCTOBER 2015

STATEMENT OF INDEPENDENT TECHNICAL REVIEW

This Accident Prevention Plan has been created as a joint effort between CARA and the USAESCH. Independent reviews from both agencies have been conducted which are appropriate to the level of risk and complexity inherent in this project. This plan has been prepared and reviewed as denoted by the signatures below.

Plan Concurrence

Lloyd Wallace
CARA Headquarters
Safety Officer

5 OCT 2015
Date

ROESKE.ASHLEY.ELIZABETH.1277832069

Digitally signed by ROESKE.ASHLEY.ELIZABETH.1277832069
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=ROESKE.ASHLEY.ELIZABETH.1277832069
Date: 2015.09.21 16:13:22 -05'00'

Ashley Roeske
USAESCH Chemical Warfare Design Center
Project Manager

Date

Jason Watson
U.S. Army Garrison - Redstone, Installation Restoration Branch
Site Manager

4 OCT 2015
Date

Amy Keith
NASA, Marshall Space Flight Center, Environmental Engineering & Occupational Health Office
Project Manager

10/5/15
Date

Plan Approval

Christopher Chesney
CARA
Director

5 OCT 2015
Date

TABLE OF CONTENTS

Section **Page**

List of Tables

List of Figures

List of Attachments

1.0 Background Information

Accident prevention is a key program element to achieve compliance and strive towards our ultimate goal of zero safety incidents. Personnel active in site operations will be thoroughly familiar with the programs and procedures outlined in this Accident Prevention Plan (APP) prior to conducting work at the site.

This APP covers the field activities associated with the construction footprint clearance at this site. The project will adhere to the highest levels of safety for the public and project staff while focusing on the clearance of subsurface anomalies within the construction footprint. The locations currently requiring repairs and/or replacement of underground utilities are identified in Figure 1-3 of the Work Plan.

1.1. Site Location and Project Objective

The 20th Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives (CBRNE) Analytical and Remediation Activity (CARA) is supporting the United States (U.S.) Army Engineering and Support Center, Huntsville (USAESCH) under scope of work (SOW) dated April 21, 2014 (Appendix A of Work Plan). This SOW requires CARA to provide Unexploded Ordnance (UXO) and chemical agent (CA) qualified and trained personnel and equipment to support removal of anomalies within the construction footprint at Redstone Arsenal (RSA) Marshall Space Flight Center (MSFC) environmental site MSFC-003-R-01 (Figure 1-2 of the Work Plan).

The MSFC-003-R-01 site encompasses approximately 51 acres and lies in the approximate center of the NASA property in a partially controlled and developed area.

MSFC-003-R-01 consists of the following four historical area surface sites and overlies two separate groundwater units (RSA-148 and RSA-149):

- MSFC-3 (including the Permanent Toxic Storage Area) (approximately 24 acres);
- MSFC-3E (also called RSA-002-R-01 in RSA's Military Munitions Response Program site inspection) (approximately 6 acres);
- MSFC-82 (approximately 17 acres); and
- MSFC-82S (approximately 4 acres).

MSFC-3 and MSFC-82 are referred to as the "Boneyard" and reference was made in 1957 that it was used by various laboratories and construction contractors to dispose of scrap material that would normally be disposed at the sanitary landfill or turned into salvage. Additionally, historical area MSFC-82 was reported to be contaminated with mustard (H), arsenic, white phosphorus (WP) and Lewisite (L) and may contain burn pits where chemical artillery shells (i.e., 4.2-inch chemical mortars) were demilitarized and likely buried.

Based on historical documents, the "Boneyard" (MSFC-3 and MSFC-82) was decontaminated in two separate phases in 1957 and 1960. Decontamination activities included subsurface exploration, clearing and burning vegetation, screening, removal of all metal debris, and disking the top 4 to 6 inches of soil with bleach.

In 1961, the rail line area located between MSFC-3 and MSFC-82 was decontaminated. In May 1963, a 4-foot (ft)-wide by 8-ft-deep trench was decontaminated in an area across the center of MSFC-3 and a north-south trench beginning at the east-west trench and terminating at the north site boundary. The trench was for installation of a 42-inch industrial waste line. No details on the findings from either of these actions have been located.

NASA rocket test stands were constructed between 1964 and 1966 in the area surrounding MSFC-003-R-01. This construction included installation of large-diameter test stand deluge pipes below grade across MSFC-003-R-01. During an interview, Mr. Davis at the MSFC Environmental Office stated "pick-up truck loads" of munitions were removed from the site during the deluge pipe installations. No records of the types of munitions removed or ultimate disposition were located.

During October 1999, a munitions and explosives of concern (MEC) item was discovered when excavating a ditch in MSFC-003-R-01. The item was believed to be a 4.2-inch mortar. Then in 2000, 52 empty chemically configured 4.2-inch mortars were unearthed during the repair of one of the test stand deluge pipes. CA was not detected.

MSFC-3E, formerly named RSA-002-R-01, is located east of MSFC-3. Records indicate that all of the miscellaneous debris within the footprint of the water reservoirs created for the Saturn Test Stand in MSFC-3 were relocated to MSFC-3E. Debris is known to be present at depths of one to four ft below ground surface. Records also indicate that prior to the NASA MSFC construction activities, surface debris and materials were removed from throughout the site. This was recently substantiated in January 2012 when unauthorized trenching activities uncovered an unknown quantity of red phosphorus burster tubes, 75 millimeter (mm) M89 hexachloroethane (HC) smoke projectiles, small crushed steel drums, and other unknown wastes.

MSFC-82S and the southern two-thirds of MSFC-82 are located within the boundary of historical Area 11, 1 of 17 contaminated grounds documented as accepting reject chemical munitions from the deactivation of the Huntsville Arsenal. These areas were noted as burning and destruction grounds contaminated with mustard, arsenic, WP, and L. The boundary of historical Area 11 also includes RSA-052. Historical aerial photograph review did not indicate that disposal trenches are present in MSFC-82S. Review of 1956 and 1959 aerial photographs of MSFC-82 indicated several trench features are present, but this time period coincides with the decontamination activities described above. In addition, previous geophysical surveys at MSFC-82 did not indicate burial features, so it is unlikely that Area 11 activities took place in this area.

The 2012 *Historical Review of Documents for Burial Sites at Redstone Arsenal, Alabama* (U.S. Army Chemical Materials Activity [CMA], 2012) provides detailed information on the lethal, incendiary, and non-lethal chemical munitions and containers that may be found in MSFC-003-R-01.

CARA field activities will include location of subsurface anomalies; air monitoring for chemical and industrial agents of concern during intrusive activities; assessment, package, and transport of items suspected of having an unknown liquid fill and conventional MEC; personnel and equipment decontamination; and onsite UXO support. CARA will work in concert with the NASA and

Installation construction contractors who will perform any excavations and repairs in accordance with their established plans and procedures.

1.2. Phases of Work and Hazardous Activities

The underground utilities at MSFC-003-R-01 are in a deteriorated state due to their age, and will continue to deteriorate, thus allowing for the need to perform additional construction footprint clearances. These additional areas will be incorporated into this plan through a Work Plan Variance and will be submitted to the Army and to the Alabama Department of Environmental Management (ADEM) for review and approval prior to fieldwork.

Activity hazard analyses (AHA) have been prepared for each of the anticipated work activities and are included in Attachment 2 of this APP. AHAs for the following activities have been prepared:

a. Air Monitoring – CARA
b. Anomaly Location and Reacquisition
c. Decontamination Station for Personnel, Equipment, and CA Contaminated Media (CACM)
d. MEC Demolition Operations
e. Drum Handling
f. Earth Covered Magazine Operations
g. Emergency Rescue Operations
h. Intrusive Excavation of MEC (high CWM Probability areas)
i. Explosive Storage and Transportation Operations
j. Fueling Operations
k. Handling CACM
l. Mobilization/Demobilization
m. Security Operations
n. Vegetation Removal
o. Vehicle, Heavy Equipment, and All-Terrain Vehicle Operations
p. X-ray and Portable Isotropic Neutron Spectrometry (PINS) operations

2.0 Statement of Safety and Health Policy

This APP has been developed in recognition of the responsibilities of CARA and the need for management to establish a policy with regard to the prevention of on-the-job injuries. Through application of these safety policies and procedures, it is CARA's primary goal to reduce to a minimum the human suffering by employees resulting from occupational injuries. Not only can injuries have a serious physical and emotional impact on the employees themselves, but can also have a negative effect on family members and co-workers.

In addition, the deterrent and eroding effect injuries have on the project cost must be recognized. Insurance costs combined with the indirect costs of injuries are a matter of serious concern and it is CARA's intention that they be reduced. This desired reduction could take place, over the long term, if the frequency of injuries is kept to a minimum. As it affects CARA, the elimination of on-the-job injuries is an important responsibility of management. This responsibility must be assumed and treated in the same manner as our business philosophies relating to services rendered.

CARA's Safety and Occupational Health Program to become effective, it will be necessary for each employee to take a serious interest in the prevention of injuries. Management fully intends to provide, in administration of the program, the leadership and direction to which supervisory personnel and employees will respond. It is CARA's earnest request that all concerned devote their serious attention toward making this Safety and Health Program an integral part of the day-to-day business operations. Always remember that no job is so important and no service is so urgent that we cannot take the time to perform our work safely.

All site operations will be performed in accordance with (IAW) applicable federal, state, and local regulations and procedures, Occupational Safety and Health Administration (OSHA) requirements, client requirements, CARA's Corporate Safety and Occupational Health Program (CBRNE 385-1), and this APP. All site personnel involved in the construction footprint clearance will comply with the requirements of this plan.

3.0 Responsibilities and Lines of Authority

All personnel are responsible for continuous adherence to this APP and safety and health procedures during the performance of their work.

3.1. Identification and Accountability of Personnel Responsible for Safety

No person may work in a manner that conflicts with the intent of, or the inherent safety and environmental precautions expressed in these procedures. After due warning, any person who intentionally violates these safety procedures will be dismissed from the site. Employees and subcontractors may be subject to progressive discipline and may be terminated for continued violations. All on-site personnel (including CARA and Construction Teams) will be trained IAW this document.

3.1.1. CARA Site Supervisor – John Robbins and Mark Hammond

Responsibilities include:

- Ensuring conformance with CARA Headquarters, and other Regulatory policies and procedures.
- Coordinating project with the client Project Manager.
- Ensuring that the project personnel satisfy CARA and regulatory safety and health requirements.
- Providing management of all aspects of project work.
- Setting the tone for safety on the job site.
- Ensuring personnel have the equipment, training, and resources to perform the job safely.
- Ensuring that the project personnel implement the project APP.
- Ensuring that the project personnel have the appropriate regard for safe job performance.

3.1.2. CARA Safety Officer – Lloyd Wallace

Responsibilities include:

- Overseeing the development, maintenance, and implementation of the APP/Site Safety and Health Plan (SSHP), as required.
- Performing Safety Program audits as required.
- Providing consultation to Site Supervisors.
- Making changes to the APP/SSHP if warranted by changed conditions.
- Evaluating occupational exposure monitoring/air sampling data and adjusting APP/SSHP requirements, as necessary.
- Administering and enforcing the general Safety and Health Program.
- Authorizing the level of personnel protection required.
- Investigating significant accidents and illnesses and implementing corrective action plans.
- Reviewing air-monitoring parameters based on expected contaminants.
- Establishing employee exposure monitoring notification programs.
- Developing site specific employee/community emergency response plans based on expected hazards.

- Providing technical, analytical, and report writing support to ensure the technical quality of deliverables to the customer.
- Reviewing and approval of the APP/SSHP, as required.
- Conducting field safety and health audits to ensure Safety and Health Plan conformance and policy compliance.
- Certifying that all workers have proper training per OSHA 29 Code of Federal Regulation (CFR) 1910.120(e), *Hazardous Materials Training Curriculum Guidelines – (Non-mandatory),* and in accordance with Engineering Manual (EM) 385-1-1, *Safety and Health Requirements Manual* (U.S. Army Corps of Engineers [USACE], 2014) .
- Updating equipment or procedures based on information obtained during site operations.

3.1.3. CARA UXO Personnel

In addition to the above personnel, CARA will provide the following UXO personnel meeting the qualifications of Department of Defense (DoD) Explosives Safety Board (DDESB) Technical Paper 18, *Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel,* to perform tasks in accordance with EM 385-1-97, *Explosives Safety and Health Requirements Manual* (USACE, 2013).

- CARA Senior UXO Supervisor (SUXOS) – To Be Determined (TBD)
- CARA Site Safety and Health Officer (SSHO)/UXO Safety Officer (UXOSO) – TBD
- CARA UXO Quality Control Specialist (UXOQCS) – TBD, may be dual-hatted with the UXOSO upon approval by the USAESCH in accordance with EM 385-1-97 (USACE, 2013).

3.2. Lines of Authority Regarding Safety

It is important for each employee involved with the project to know and understand the lines of authority. The management of field operations and personnel for this project is outlined in Section 2.5 of the Work Plan. All personnel will be informed of these lines of authority during the site-specific training.

4.0 Contractors, Subcontractors, and Suppliers

Each contractor and subcontractor working on the project site will be required to adhere to this APP and SSHP and the requirements presented below. Contractors anticipated for this site include the construction contractor performing the actual maintenance and/or repairs of the underground utilities.

All contractor and subcontractor personnel are subject to the same training and medical surveillance requirements as CARA and USAESCH personnel, which is dependent upon their specific job activity. All activities involving the potential for worker exposure to site-related hazardous materials will require medical and training certification as mandated by 29 Code of CFR 1910.120, *Hazardous Waste Operations and Emergency Response*; 29 CFR 1910.1200, *Occupational Safety and Health Standards-Hazard Communication*; EM 385-1-1 (USACE, 2014); Department of the Army (DA) Interim Guidance (Army Regulation [AR] 385-XX), *CWM Responses and Related Activities* (DA, 2009) (as applicable); *Interim Guidance on Occupational Health Practices for the Evaluation and Control of Occupational Exposures to Nerve Agents GA, GB, GD, GF, and VX and Mustard Agents H, HD, and HT* (DA, 2012b); DA Pamphlet (PAM) 385-61, *Toxic Chemical Agent Safety Standards* (DA, 2012a) (as applicable), and federal, state, and local regulations.

All contractor and subcontractor personnel will be required to sign in daily and to attend a daily meeting discussing operations and safety issues. All incidents involving contractor and subcontractor employees shall be reported immediately to the Site Supervisor, and a copy of the subcontractor's injury/illness report shall be submitted to the SSHO/UXOSO within 24 hours.

Contractors and subcontractors are required to read and sign the APP and comply with all requirements of this APP and SSHP. Contractors not in compliance will be immediately dismissed from the site.

Suppliers delivering various materials to the project site or providing equipment and/or equipment maintenance will comply with all RSA rules and regulations. Supplier personnel will not be permitted into restricted areas unless training and medical surveillance are in accordance with 29 CFR 1910.120. They will follow CARA-specific and RSA hot work rules if spark- or flame-producing work is required. Trucks will be loaded and unloaded in a safe and effective manner, and materials will be stored safely in designated locations only. Associated packaging will be properly disposed, and litter will not be permitted to accumulate. Operators of mobile equipment on site must observe all traffic rules, such as speed limits and rights-of-way of pedestrians or troops.

The management organization of each contractor and subcontractor is responsible for the compliance of their personnel with this APP as well as their own Health and Safety program. The Site Supervisor or SUXOS and SSHO/UXOSO will ensure contractor and subcontractor compliance with this APP. Since contractors and subcontractors are hired for their specific expertise, they must assume primary responsibility for the safety and health of their personnel. However, CARA is still responsible for the actions of the personnel on site, which is why all site personnel must abide by this APP.

The contractor or subcontractor's field supervisor or crew leader will be responsible for performing daily safety inspections of their operations, including:

a. Compliance with 29 CFR 1910, *Occupational Safety and Health Standards,* and EM 385-1-1 (USACE, 2014).
b. Performance of all work in accordance with accepted work plans and specifications.
c. Providing and complying with personal protective equipment (PPE) as prescribed in the APP.
d. Reporting immediately any unsafe conditions, faulty equipment, incidents, and near misses to the Site Supervisor or SUXOS.
e. Providing awareness level training to affected CARA or other site personnel regarding any material, equipment, or operation that may pose a hazard.

5.0 Training

5.1. Safety Indoctrination Training

Safety indoctrination will be conducted for all site workers prior to the job start-up and as needed thereafter. The SSHO/UXOSO will conduct initial site-specific training prior to job start-up to ensure that employees have a thorough understanding of the APP, standard operating procedures (SOPs), and physical, safety, biological, and chemical hazards of the site.

Site-specific health and safety training may include the following topics:

- Site history and background.
- Names of onsite employees and their duties.
- Personnel responsibilities for safety and health.
- Review of the APP.
- Acute and chronic effects of exposure to hazardous substances, such as CA that may be present, characteristics of CA, the potential routes and symptoms of exposure for these substances, the exposure limits, and the level of personal exposure that can be anticipated.
- Air monitoring procedures—including the functions, limitations, use, and maintenance of monitoring equipment.
- SOPs prepared specifically to address various aspects of this project.
- Site control measures.
- Fire prevention measures.
- Engineering controls, such as dust suppression techniques.
- PPE.
- Discussion of action levels for changing site PPE or evacuating the site.
- Conventional munitions and explosives of concern (MEC) demolitions operations.
- Heat or cold stress prevention, treatment, and monitoring.
- Proper use of heavy equipment and machinery.
- Threatened and endangered species.
- Biological hazards including, snakes, plants, and insect-borne disease.
- Other physical hazards such as slips, trips, and falls; noise; electrocution; being struck by something and being caught in or between something.
- Activity Hazard Analyses.
- Personal cleanliness and restrictions on eating, drinking, and smoking.
- Emergencies and review of emergency procedures and facilities, including universal precautions.
- Responsibilities and procedures for maintaining quality control (Section 4 of the Work Plan).

Personnel will also be instructed in the use of the buddy system, which is a method of organizing work groups so that there is someone that is always available to:

- Provide his or her partner with assistance in an emergency,
- Observe his or her partner for signs of chemical or physical exposure,
- Periodically check the integrity of his or her partner's PPE, and
- Notify the emergency response personnel when an emergency occurs.

All employees will be made aware of the project emergency assistance network, the most probable route of evacuation from the site in the event of an emergency, and other emergency procedures included in the Project Plans. All employees will be briefed on the procedures and hazards specific to the site.

At the completion of safety indoctrination, all employees will be required to sign a form that states they have received site-specific training, and read, understood, agreed with, and will abide by the health and safety procedures outlined in the APP. Appendix F of the Work Plan contains a Plan Acceptance Form.

5.2. Mandatory Training and Certifications

In accordance with 29 CFR 1910.120(e); EM 385 1-1 (USACE, 2014); and EM 385-1-97 (USACE, 2013), mandatory training and certifications applicable to the field personnel and subcontractors include at a minimum:

a. APP/SSHP training
b. Hazardous Waste Operations and Emergency Response (HAZWOPER) 40-hour training
c. Twenty-four-hour supervised training
d. Hazardous Waste Site Supervisor training (for HAZWOPER supervisors)
e. Thirty-hour OSHA Construction Safety Training (for UXOSO/SSHO)
f. Eight-hour HAZWOPER refresher training (annually)
g. Hazard communication training
h. Cardiopulmonary resuscitation (CPR) and first-aid training for a minimum of 2 people onsite.

Recertification or refresher training for the above mandatory training shall also be completed as required.

UXO personnel shall meet the minimum requirements of DDESB TP 18.

Depending on the nature of work and risk assessment, the above requirements may be altered for certain activities.

5.3. Site-Specific Non-Stockpile Medical Training

In accordance with the Interim Guidance (AR 385-XX) (DA, 2009) all onsite medical support personnel (i.e., paramedics) must complete and hospital emergency services teams must be provided the Non-Stockpile Chemical Medical Training specific to this site within the last 6 months.

5.4. Hazard Communication

In accordance with the 29 CFR 1910.1200 and CFR 1926.59, *Safety and Health Regulations for Construction-Hazard Communication*, copies of all material safety data sheets (MSDS) for hazardous chemical materials that are used during site operations or that are present onsite will be available onsite from the SSHO/UXOSO. Hazard communication training in accordance with 29 CFR 1910.1200 and CFR 1926.59; DA PAM 40-173, *Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT* (DA, 2003); DA PAM 385-61 (DA, 2012a); and EM 385-1-1 (USACE, 2014) will be presented during the initial training. Training will include, but not be limited to, all hazards or potential hazards associated with site activities, and any hazardous chemical materials brought to or found on site. MSDS for chemicals potentially present are maintained on site by the SSHO/UXOSO.

5.5. First Aid, CPR and Bloodborne Pathogens

Personnel assigned to conduct fieldwork for this project do not conduct first aid or CPR as a primary job function. Rather, selected employees have been trained in CPR and first aid for emergency use only. Indoctrination to 29 CFR 1910.1030, *Bloodborne Pathogens*, will be provided to employees either during their first aid training or during the initial site health and safety meeting. Acting in the capacity of a designated emergency first aid provider is not mandatory, and anyone who is uncomfortable with the possibility of being so designated should notify the SSHO/UXOSO. In accordance with EM-385-1-1 (USACE, 2014), at least two persons currently certified in CPR and first aid shall be present on site at all times during site operations.

5.6. Visitor Training

When a visitor arrives onsite, a site-specific visitor safety briefing shall be given by the SSHO/UXOSO. The visitor training will include discussion of operational hazards and activities, emergency evacuation, assembly points, and required PPE.

5.7. Daily Tailgate Meetings

All personnel who plan to enter the site during intrusive activities will attend the daily tailgate safety meeting. This meeting, conducted by the SSHO/UXOSO, will cover specific health and safety issues, site activities for that day, changes in site conditions, topics covered in the initial health and safety meeting as they apply to daily activities, PPE, personnel and equipment, potential physical hazards, emergency warning signal, rally point, etc. Issues discussed in the daily tailgate meeting will be documented on a form, which will be signed by all the attendees and retained by the SSHO/UXOSO. A sample Daily Safety Briefing Form is provided in Appendix F of the work plan.

5.8. Training Documentation

Documentation of training requirements is the responsibility of each employer. Written documentation verifying compliance with 29 CFR 1910.120 (e)(3), (e)(4) (as applicable) and (e)(8) must be submitted to the SSHO/UXOSO prior to entering the site. Types of training documentation include 40-hour HAZWOPER, eight-hour refresher, supervisor training, 30-hour OSHA construction safety, UXO, bloodborne pathogens, hazard communication, first aid, CPR, current physician's certificate, and hearing conservation training. Documentation of all workers' current training credentials will be kept on site and will be verified and maintained by the SSHO.

All personnel onsite conducting MEC (and potential chemical warfare materiel [CWM]) operations must meet the requirements of DDESB TP 18. Non-UXO-qualified personnel will be given training in the awareness of the various types of MEC for the site. Documentation of the MEC/CWM awareness will be kept onsite.

If training deficiencies are identified, the SSHO/UXOSO will document the lack of training and request that the person or persons leave the site until the documentation of the training is presented. If the training can be conducted onsite, the SSHO/UXOSO will coordinate that training and allow the involved persons to remain onsite and under escort until that training deficiency is corrected.

6.0 Safety and Health Inspections

6.1. Responsibility

For each project, the Site Supervisor is responsible for ensuring that routine internal safety inspections are performed, for tracking corrective actions to completion, and performing inspections. The CARA Safety Officer is responsible for developing and implementing the project safety and health inspection program contained in this plan as well as conducting inspections.

The SSHO/UXOSO is responsible for conducting safety and health inspections or walk arounds, identifying and reporting deficiencies, and working with the project team to develop corrections. The SSHO/UXOSO will follow-up on any deficiency in a timely manner and halt operations if necessary in order to ensure that individuals are not exposed to an unsafe environment.

6.2. Inspections

Safety and health inspections will be conducted by the SSHO/UXOSO, the CARA Safety Officer, the Site Supervisor, the UXOQCS, or a qualified appointee. Personnel responsible for safety and health inspections will meet the criteria of an OSHA competent person. Safety and health inspections will be conducted at least weekly during field operations and when the following events occur:

- The introduction of new substances, procedures, or equipment that presents potential new hazards into the workplace.
- New, previously unidentified hazards are recognized.
- Receipt of complaints of unsafe conditions.
- In the event of an occupational injury or illness.

Safety inspections are conducted by physically walking around the work areas and observing conditions for routine and emergency access, evacuation technique, PPE, work practices, site access control, first aid equipment, firefighting equipment, and sanitation. The inspections may include conversations with workers and supervisors and review of certifications and training documentation.

All deficiencies or nonconformance will be documented. If safety hazards exist, it may be necessary to stop work until corrections are in place. Many deficiencies can be corrected immediately by placing barriers, installing signs, changing procedures, etc. The status of each deficiency will be tracked by the SSHO/UXOSO to ensure that a correction is made. If necessary, the SSHO/UXOSO will stop work until the deficiency is corrected. Follow-up reporting on deficiencies will be included on succeeding safety and health inspection documentation until the deficiency is resolved.

6.3. Recordkeeping

A record of each inspection will be maintained in the project files. The record must include the name of the inspector, unsafe conditions and work practices identified, and actions taken to correct unsafe conditions and work practices. A standard safety inspection form has been developed to assist the inspections and provide documentation of safety and health nonconformance. The Safety Inspection form is located in Appendix F of the Work Plan.

7.0 Accident Reporting

7.1. Accident Reporting

Exposure hours must be reported by the SSHO/UXOSO each month for exposure analysis. The exposure hours consist of the number of hours worked by CARA personnel in the field. The reporting of exposure hours is submitted internally by the Site Supervisor. The construction contractor and subcontractors are responsible for their own reporting requirements.

In the event an accident occurs at the site, the SSHO/UXOSO will investigate the accident after all emergency actions have been taken. ENG Form 3394 (Appendix F of the Work Plan) will be filled out by the SSHO/UXOSO and submitted to the USAESCH OESS. All accidents involving CARA employees will be reported in accordance with the requirements of CARA Policy Statement #16, *Workers' Compensation* (Attachment 3 of this APP), and an accident report will be initiated through the Army "Report It" system (https://reportit.safety.army.mil/). A verbal or email notification should be given to the CARA Safety Officer immediately following the incident.

All accidents will be reported to the CARA Safety Officer, USAESCH OESS, USAESCH Project Manager and RSA Site Manager as soon as possible but not more than 24 hours afterwards. CARA will thoroughly investigate the accident and submit the findings of the investigation along with appropriate corrective actions to the USAESCH Project Manager and RSA Site Manager as soon as possible, but no later than five (5) working days following the accident.

An accident will be reported immediately to the CARA Safety Officer, USAESCH, and RSA if any of the following occur as a result of the accident:

1. A fatal injury or illness.
2. A permanent total disability injury/illness.
3. A permanent partial disability injury/illness.
4. The hospitalization of three or more people resulting from a single occurrence.
5. Property damage in the amount of $200,000 or more or damage in the amount specified by USACE in current accident reporting regulations.
6. Arc flash incident/accident.
7. Army aircraft destroyed or missing.
8. Three or more individuals ill or with medical condition suspected to be related to a site condition, or a hazardous or toxic agent on site.
9. Unfavorable criticism of the Army.

For Items 1 and 4, OSHA must be notified within eight hours of the accident. If possible, notification should go through the CARA Safety Officer; however, it may be necessary to make the notification directly in order to meet the deadline.

Other lost-time or OSHA recordable accidents involving anyone on site will be formally reported via ENG Form 3394 (Appendix F of the Work Plan) within two days. Any recordable accidents involving CARA personnel will also be reported in accordance with the requirements of CARA Policy Statement #16, *Workers' Compensation* (Attachment 3 of this APP). The onsite USAESCH

OESS will be verbally notified within one day of any accident or injury that may require reporting. An OSHA 300 log of work-related injuries and illnesses will be maintained at the site. A copy of the OSHA 300 log is provided in Appendix F.

7.2. Accident Investigations

Accident investigations are an important element of the project safety program because they provide useful information to prevent similar incidents. Incident investigations identify root causes, system failures, unsafe acts and conditions, and noncompliance with or inadequacy of the APP. All significant near miss, injury, illness, or major equipment or property damage incidents (including work interruptions) require an investigation.

The Site Supervisor and CARA Safety Officer must conduct the onsite investigation immediately and prepare an incident investigation report. The Site Supervisor is responsible for ensuring that all incidents are reported and investigated in a timely manner and that appropriate corrective actions are identified and implemented. The CARA Safety Officer usually leads investigations with the assistance of the SUXOS and SSHO/UXOSO.

The general information collected by the accident investigation includes:

- Location, time, and date.
- Description of the operation being performed at the time of the accident.
- Outline of the sequence of events that led up to the accident.
- All personnel associated with the work task and incident.
- All eyewitnesses.

The investigation team should proceed in the following manner:

1. Identify, secure, and document any evidence, tools, or other materials pertinent to the investigation.
2. Identify and interview all involved employees and eyewitnesses.
3. Provide a private place and time for each individual to prepare a written statement.
4. Prepare and issue a written report.

8.0 Medical Support

The onsite Emergency Medical Technician (EMT) is designated as the first responder for medical emergencies or minor injuries. At least two employees certified in first aid and CPR will be on site during field activities. The names and qualifications of the designated individuals will be provided to USACE at the beginning of field activities.

A map with driving instructions and a list of emergency numbers will be placed in each site vehicle (Figure D-8.1). This information also will be carried by all personnel with health and safety responsibilities. Emergency contact numbers are provided in Appendix C of the Work Plan.

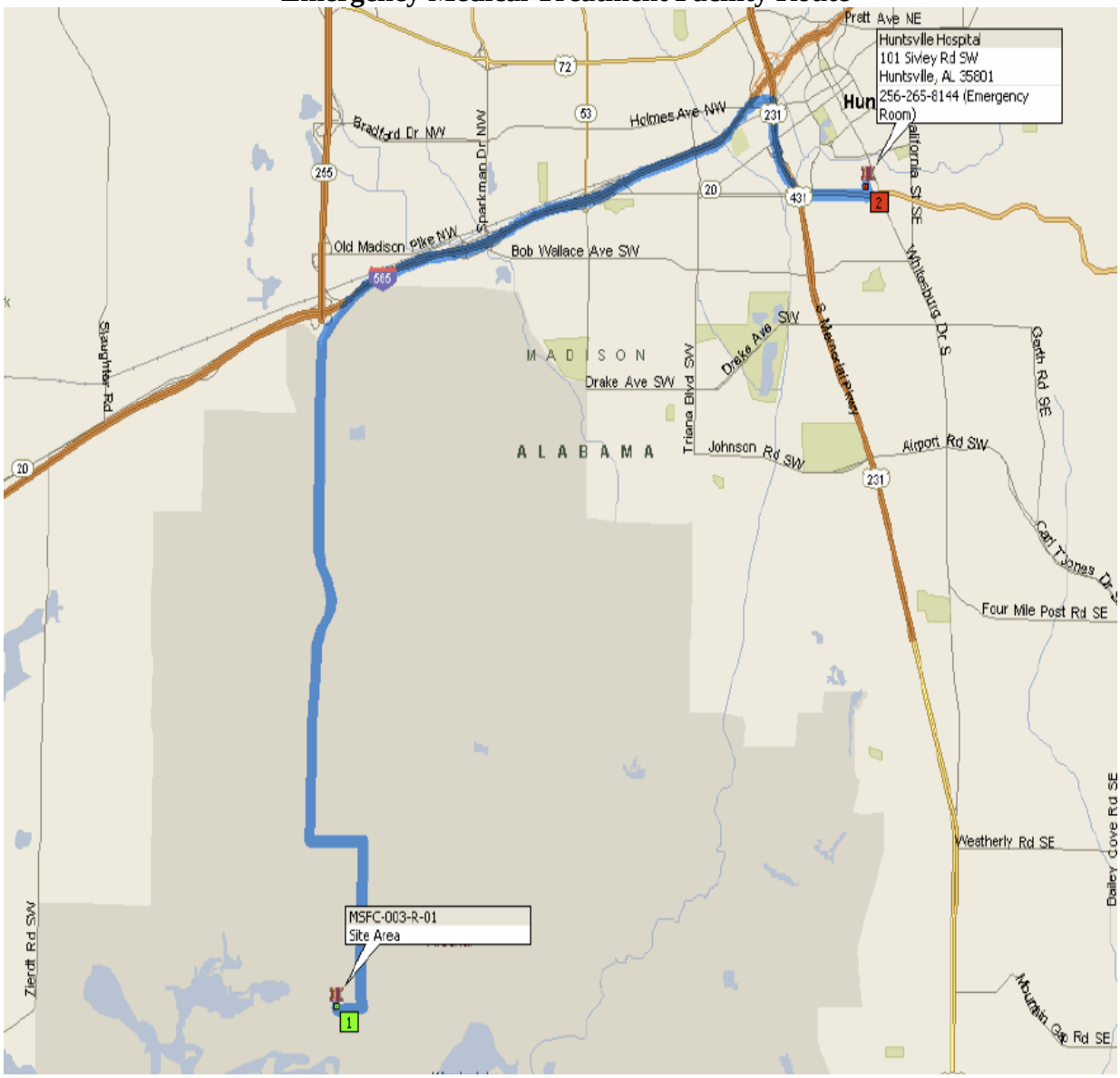
Onsite ambulance services will be contracted by NASA with a local ambulance company for operations related to the construction footprint clearance due to the suspected presence of CWM. The ambulance company will provide an ambulance and two EMTs with at least one EMT to be certified in Advanced Life Support (ALS) to stand by during intrusive excavation work. This company will provide emergency treatment and transport for decontaminated casualties to the approved hospital. The signed contract for onsite medical support will be maintained onsite by the UXOSO.

Suspected or actual CA casualties will be transported to Huntsville Hospital. A location map for Huntsville Hospital is shown in Figure D-8.1 along with driving directions from the MSFC-003-R-01 site. Approximate driving time is fifteen minutes. On-site EMT personnel will make the determination as to whether an aircraft ambulance is necessary dependant on the injuries sustained or condition of the casualty. The signed Memorandum of Agreement/Contract for the hospital will be maintained onsite by the UXOSO.

Huntsville Hospital and the onsite EMTs will be provided training in the treatment of chemical agent casualties as required by the Interim Guidance for CWM Responses and Related Activities. A list of hospital personnel and EMT staff receiving training for treatment of CA casualties will be maintained onsite by the UXOSO once intrusive operations begin.

Non-chemical casualties will be transported to Huntsville Hospital.

Figure D-8.1
Emergency Medical Treatment Facility Route



Mile	Instruction	For	Toward
0.0	**Depart MSFC-003-R-01 on Local road(s) (South)**	**65 yds**	
0.1	Turn LEFT (East) onto Saturn Rd	0.2 mi	
0.3	Turn LEFT (North) onto Dodd Rd	1.3 mi	
1.6	Turn LEFT (West) onto Martin Rd SW	0.5 mi	
2.1	Turn RIGHT (North) onto Rideout Rd	3.9 mi	
6.0	Take Ramp (RIGHT) onto I-565 [US-72 ALT]	4.4 mi	I-565 E
10.4	At exit 19A, take Ramp (RIGHT) onto US-231 [US-431]	0.8 mi	US-231 S / US-431 S / Memorial Pkwy
11.2	Keep STRAIGHT onto Ramp	98 yds	US-431 S / SR-53 N / SR-20 / Governors Dr
11.2	Road name changes to US-431 [SR-1]	0.3 mi	
11.5	Turn LEFT to stay on US-431 [SR-1]	0.7 mi	
12.2	Turn LEFT (North) onto Gallatin St SW	142 yds	
12.3	**Arrive Huntsville Hospital [101 Sivley Rd SW, Huntsville, AL 35801]**		

9.0 Personal Protective Equipment

9.1. PPE Summary

As a general rule, levels of PPE will need to be reassessed if any of the following occur:

- Appearance of previously unidentified or unanticipated chemicals, conditions or task hazards;
- Airborne concentrations of known chemicals exceed the action levels;
- Ambient weather conditions change that impact the use of assigned PPE;
- A new task is introduced or a previously assigned and evaluated task is expanded in scope; or
- PPE may be downgraded when the hazardous material or contaminant source has been removed at the discretion of the UXOSO.

It is the responsibility of each employee to report to work wearing proper attire and to assemble the necessary PPE prior to initiating its donning. If respiratory protection is to be used, it is the responsibility of the employee to report to work clean shaven to ensure a tight and effective seal with the face piece.

Personnel working at the site shall use the appropriate type of PPE specified in this plan for each individual task. This APP makes provisions for the use of the following levels of PPE, in accordance with the hazards and contamination level anticipated for each task or operation: Level D, Modified Level D, Level C, Level B, and Level A. The following paragraphs describe the PPE requirements for activities and locations on the sites. Criteria for selection, upgrade, and downgrade of PPE are found in Table D-9.1. The starting PPE for intrusive excavations at the site will be Modified Level D.

The SSHO/UXOSO will make sure that the proper PPE is used, the donning and doffing procedures are known, personnel are trained in the proper PPE, and that the PPE fits properly. The SSHO/UXOSO will also ensure PPE use complies with applicable regulations of OSHA, USACE, and the Army. The SSHO/UXOSO will maintain a written certification that identifies the name of each employee training, the date(s) of the training, and the subjects taught. When the SSHO/UXOSO has reason to believe that an affected employee who has been trained does not have the understanding and skilled required of the training, the SSHO/UXSO shall retrain the employee. Additional information and requirements are provided in CARA SOP-001-04, *PPE* (Attachment 3 of this APP).

9.2. Task-Specific Levels of PPE

9.2.1. Level D PPE

For non-intrusive activities the level of protection that will be worn by personnel at the site is Level D. Level D PPE is not allowed in areas of the site where airborne hazards are known or expected to exist. Level D should also be worn only if the activity in which personnel are engaged does not have the potential for splash, immersion or any other contact with hazardous substances.

Level D includes the following, and may be used as appropriate:

- Coveralls or work clothing;
- Sturdy work boots or shoes, with steel toe when working around heavy equipment. Geophysical survey and reacquisition personnel will not use boots containing steel;
- Safety glasses with side shields or goggles when an eye hazard exists;
- Hard hat when working around heavy equipment or when an overhead hazard exists;
- Chaps for protection during brush clearing operations involving the use of hand held equipment (e.g., string trimmers);
- Leather or canvas work gloves when a scrape or cut hazard exists; and
- Hearing protection, when working around heavy equipment or powered tools.

9.2.2. Modified Level D PPE

For intrusive excavations or other activities considered to have potential exposure to CAs, the minimum level of protection that will be worn by personnel at the site is Modified Level D.

Modified Level D includes the following, and may be used as appropriate:

- Coveralls or other approved work clothes;
- Safety boots/shoes, chemical resistant, steel toe and shank when working around heavy equipment. Geophysical survey and reacquisition personnel will not use boots containing steel;
- Boots, outer, chemical resistant;
- Approved respirator, National Institute of Occupational Safety and Health (NIOSH)-approved or military mask – slung or readily available;
- Gloves; Leather or canvas work gloves when a scrape or cut hazard exists;
- Safety glasses or chemical splash goggles when an eye hazard exists;
- Hard hat (as required when adjacent to heavy equipment or an overhead hazard exists); and
- Hearing protection (as required when near heavy equipment).

9.2.3. Level C PPE

Level C affords protection from casual contact with contaminated soil and materials, and also protects against a potential for airborne exposure to hazardous substances.

Level C includes the following, and may be used as appropriate:

- Full-face, air-purifying respirator (NIOSH-approved or military mask);
- Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; sleeved chemical-resistant apron; disposal chemical-resistant overalls);
- Gloves, inner;
- Gloves, outer, chemical resistant;
- Safety boots/shoes, chemical resistant, steel toe and shank when working around heavy equipment. Geophysical survey and reacquisition personnel will not use boots containing steel;

- Coveralls;
- Boot covers, outer, chemical resistant;
- Hard hat (as required when adjacent to heavy equipment and an overhead hazard exists); and
- Hearing protection (as required when near heavy equipment).

NOTE: Chemical protective undergarments (CPUs) must be worn with Level C protection when personnel are exposed to blister agents unless a waiver to this requirement is submitted and approved in accordance with DA PAM 385-30, *Mishap Risk Management* (DA, 2014).

9.2.4. Level B PPE

Level B PPE offers superior protection against the inhalation of airborne contaminants due to the use of supplied air or self-contained breathing apparatus (SCBA) respirators. However, the type of protective suit used with this level of protection is not airtight and skin exposure to hazardous vapors is possible. Therefore, this level of protection is not acceptable for use where liquid or vapor contact with CAs presents a serious safety or health threat via dermal contact. Level B can, however, be used under conditions where: 1) the chemical warfare agent and other chemical hazards of concern are not acutely skin toxic; 2) there is no potential for liquid contact, and vapor levels are being monitored when working with acutely skin toxic materials; and 3) it is needed to protect site workers from non-chemical warfare agent hazardous wastes.

Level B includes the following, and may be used as appropriate:

- NIOSH-approved, positive pressure, full-face piece, SCBA;
- Suit, hood;
- Gloves, outer, chemical resistant;
- Gloves, inner;
- Boots, outer, chemical resistant, steel toe and shank when working around heavy equipment. Geophysical survey and reacquisition personnel will not use boots containing steel;
- Coveralls.

-OR-

- NIOSH-approved, positive-pressure, full-face piece, SCBA, or positive pressure, supplied-air respirator with escape SCBA (NIOSH approved);
- Hooded, chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one- or two-piece chemical-splash suit; disposal chemical-resistant overalls);
- Gloves, outer, chemical resistant;
- Gloves, inner;
- Boots, outer, chemical resistant, steel toe and shank when working around heavy equipment. Geophysical survey and reacquisition personnel will not use boots containing steel;
- Coveralls;

- Boot covers, outer, chemical resistant;
- Hard hat (as required when adjacent to heavy equipment and an overhead hazard exists); and
- Hearing protection (as required when near heavy equipment).

NOTE: CPUs must be worn with Level B protection when personnel are exposed to blister agents unless a waiver to this requirement is submitted and approved in accordance with DA PAM 385-30 (DA, 2014).

9.2.5. Level A PPE

During intrusive operations at MSFC-003-R-01, only CARA personnel will operate in Level A. Level A PPE provides the highest available level of protection against both inhalation and skin contact hazardous exposures. The Level A suit is fully encapsulating, but unlike the Level B encapsulating suit, the Level A suit is air tight and must be tested to ensure that hazardous gases and vapors do not leak into the suit. Since Level A is usually worn in areas where highly toxic and corrosive materials are known to exist, the Level A suit is constructed of materials capable of resisting degradation and permeation by the CAs or other hazardous substances of concern. To ensure that the Level A suit to be used on site will resist CAs and provide adequate protection, Level A suits proposed for site activities have been approved by the Chemical Agent Safety and Health Policy Action Committee (CASHPAC). Since Level A affords the greatest level of protection to dermal hazards, it shall be worn in all instances where potential for contact with liquid CA exists, or when the nature and degree of potential exposure are unknown.

Level A includes the following, and may be used as appropriate:

- NIOSH-approved, positive-pressure, full-face piece, SCBA, or positive-pressure supplied-air respirator with escape SCBA;
- CASHPAC-approved, totally-encapsulating (vapor-tight), chemical protective suit;
- Coveralls;
- Gloves, outer, chemical resistant;
- Gloves, inner;
- Boots, chemical resistant, steel toe and shank when working around heavy equipment. Geophysical survey and reacquisition personnel will not use boots containing steel;
- Hard hat (as required when adjacent to heavy equipment and an overhead hazard exists); and
- Hearing protection (as required when near heavy equipment).

Table D-9.1
PPE Ensemble Selection Criteria

Level of Protection	Criteria for Use	Upgrade Criteria
Level D	Initial PPE for all work outside of EZs or during nonintrusive activities in low or high CWM probability areas.	If unanticipated chemical hazards are encountered.
Modified Level D	Initial level of protection for all work in EZ with suspected CAs or CA contamination.	Upgrade to Level C if: • An unknown liquid filled item is discovered. • Air monitoring detects possible CA (unconfirmed detection). • Air monitoring detects other chemicals above action levels (see Table D1-7.1 of SSHP). • Presence of strange odor. • Discovery of discolored soils.
Level C	Initial level of protection when: • Item with unknown fill is discovered. • Air monitoring detects CA above Action Levels below 1 x STEL. • Presence of strange odor. • Discovery of discolored soils. • No chemical splash hazards.	Upgrade to Level B if: • No chemical splash hazard exists. • Air monitoring detects CA at or above 1 x STEL. • Air monitoring detects industrial chemicals above 1 x OSHA PEL.
Level B	Initial level of protection when: • Air monitoring detects CA above 1 x STEL but less than 10 x STEL. • Air monitoring detects industrial chemicals above Level C criteria[1]. • No chemical splash hazards.	Upgrade to Level A if: • Chemical splash hazard exists. • Air monitoring detects CA at or above 10 x STEL. • Air monitoring detects industrial chemicals above action level for Level B.
Level A[2]	Initial level of protection when: • Chemical splash hazard exists. • Air monitoring detects possible CA above 10 x STEL[3]. • Air monitoring detects industrial. chemicals above action level for Level B.	N/A

NOTES:
[1] Criteria consist of airborne concentrations exceeding the protective factor of the PPE or exceeds the immediately dangerous to life or health (IDLH) (see Table D1-7.1 of the SSHP)
[2] Level A PPE will only be worn by CARA personnel.
[3] MINICAMS are not calibrated or certified at these levels.
EZ – Exclusion zone
N/A – Not applicable
PPE – Personal protective equipment
STEL – Short-term exposure limit
CA – Chemical Agent: e.g., mustard (H, HD), Lewisite (L), and tabun (GA).
Industrial Chemicals – e.g. Chloropicrin (PS), cyanogen chloride (CK), phosgene (CG), chloroform (CHCl3), hydrogen cyanide (AC), adamsite (DM), diphosgene (DP), and chloroacetophenone (CN).

9.3. Respiratory Protection Program

The respiratory protection requirements have been designed to comply with applicable Army regulations and the OSHA regulations found in 29 CFR 1910.134, *Respiratory Protection,* and the requirements of EM 385-1-1 (USACE, 2014) and shall not be changed without prior approval from the CARA Safety Officer and USAESCH. A SOP regarding the Respiratory Protection Program is found in CARA SOP-001-02, Appendix G (Attachment 3 of this APP).

9.4. Respirator Inspection, Cleaning, Maintenance, and Storage

Information regarding the inspection, cleaning, maintenance and storage of respirators is found in CARA SOP-001-02, Appendix G (Attachment 3 of this APP).

9.5. PPE Inspection, Cleaning, Maintenance, and Storage

All PPE shall be inspected before being used to ensure that it is in functional order and that its structural integrity has not been compromised. Reusable PPE (such as safety glasses and hard hats) also will be inspected before being used if it has been in storage for any length of time and following any maintenance. Site personnel finding a piece of PPE that is defective will report it to the UXOSO, and the defective article will be repaired or replaced.

Any PPE stored and designated as emergency rescue equipment will be inspected when it is brought to the site or secured for the project, and periodically thereafter, to ensure that the equipment is not being adversely affected by prolonged storage. Any equipment found to be defective will be replaced immediately. Inspections will be recorded on the Safety Log.

PPE will be maintained in accordance with the manufacturer's instructions, and only by personnel who have received proper instruction in the maintenance of the PPE. PPE will be stored in order that the equipment’s natural shape is not compromised.

10.0 Site Plans

The work at the site will involve potentially hazardous activities during the course of operations. To prepare for the potential hazards, site plans have been developed and summarized to ensure the prevention of accidents.

10.1. Layout Plans

10.1.1. Site Work Zones

The establishment of the work zones will help ensure that personnel are properly protected against the hazards present where they are working, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in an emergency. The work zones allow the use of multiple teams or portions of teams conducting excavations simultaneously. The following sections outline the requirements for the exclusion zone (EZ), contamination reduction zone (CRZ), and the support zone (SZ).

10.1.2. Exclusion Zone (EZ)

The EZ is the area in which contamination does or could occur. An EZ will be established during site operations to prevent personnel from entering the active work areas without proper PPE. Within the EZ, personnel performing intrusive operations will wear modified Level D or greater if upgrade criteria are encountered. See Section 9.0 of this APP for a thorough discussion of PPE criteria. An EZ will be established during these operations to prevent personnel from entering these areas without proper PPE. This boundary will be physically marked, at access points such as roads and trails, by tape or temporary barriers or well defined by physical and geographic boundaries. The closure of access roads and trails will be coordinated with the tenant.

The EZ used during the intrusive activities at the MSFC-003-R-01 site will be related to either the munition with the greatest fragmentation distance (MGFD) or the maximum credible event (MCE) and their respective hazardous fragmentation distance (HFD) or 1% Lethality Distance. If the area of intrusive operations has the potential of having both a MGFD and a threat of encountering CA, the larger of the HFD or 1% Lethality Distance will be used. For the intentional detonation of conventional MEC, the MFD will be used unless approved engineering controls are incorporated to reduce this distance. The calculated distances and associated safety criteria are provided in the Chemical Safety Submission (CSS) (Appendix K of the Work Plan).

All site personnel will be properly trained in controlling and minimizing access to the EZ. If an unauthorized person enters the EZ, work will stop and he or she will be stopped and escorted out of the EZ where he or she will be met by the SSHO/UXOSO, USAESCH Ordnance and explosives (OE) Safety Specialist (OESS), or Site Supervisor to determine if there is a need for decontamination or medical assistance. Work will not commence again until the unauthorized person has left the EZ. In addition, site control measures will be reevaluated. The unauthorized entry will be recorded in the field notebook.

10.1.3. Contamination Reduction Zone (CRZ)

The CRZ is the transition area between the contaminated area and the clean area and will be established at least 50 meters from the excavation site or work area, preferably upwind in the prevailing wind direction, and uphill (if possible). This zone provides an area to prevent or reduce the transfer of hazardous materials that may have been picked up by personnel or equipment leaving the EZ.

A personnel decontamination station (PDS) will be established in the CRZ to facilitate decontamination in the event of a chemical of concern or an item with an unknown liquid fill being encountered and to prevent EZ personnel from transferring contamination to the SZ. This PDS will be established during all intrusive anomaly operations. At a minimum, personnel within the EZ will proceed through the PDS and complete a gross decontamination of boots and hands. All personnel entering or exiting the EZ during down range set-up and intrusive operations will be required to report to the PDS. To minimize the setup and takedown of the PDS, whenever possible, the PDS will be setup at location that can serve more than one grid where intrusive operations will be conducted.

10.1.4. Support Zone (SZ)

The support zone is considered a clean area and will be located at a sufficient distance from the intrusive activity to ensure the safety of the support zone personnel. The support zone is separated from the CRZ by the contamination control line. Public access beyond the contamination control line will be prevented during intrusive operations.

The support zone contains the command post and other support supplies. Level D PPE is appropriate apparel within this zone. Contaminated clothing and equipment are not permitted in the support zone. Since activities may be conducted during the winter months, special types of PPE and other safety equipment susceptible to freezing (e.g., eye wash and decontamination solutions) will be stored in a heated space.

10.1.5. Public Safety Protocols

Site perimeters will be marked or guarded to ensure the public does not inadvertently enter into the area encompassed by the EZ or within the Minimum Separation Distance for the Munitions with the Greatest Fragmentation Distance (MGFD). EZs may be reduced using engineering controls (e.g., barricades, sandbags). All intrusive activity will cease should a member of the public enter within the EZ, or should a member of the public or project personnel inadvertently enters an unauthorized area.

10.1.6. Emergency Protocols

If an emergency occurs while personnel are in site work zones, voice alarms or three blasts on an air horn will be used to alert site personnel that an emergency exists. The alarm will indicate to site personnel that they are to cease work activities, secure the site, and proceed back through the marked ingress/egress corridor (if they are in the EZ) and assemble at the designated assembly point.

10.1.7. No Significant Effects (NOSE)

The NOSE is the distance at which the general population (to include more susceptible subpopulations) would not experience any significant effects from exposure to CA. There will not be any occupied buildings within the EZ, therefore the NOSE distance does not apply for these operations.

10.2. Emergency Response Plans

Site personnel must be prepared to respond and act quickly in the event of an emergency or accidental release. Emergency preparedness and response procedures will aid in protecting site

workers and the surrounding environment. All personnel working on site shall be familiar with the emergency response procedures. Additional information is available in Sections 14.0 and 15.0 of the SSHP (Attachment 1 of the APP)

10.2.1. Procedures and Tests

Pre-operational surveys and tabletop exercises will be conducted prior to any intrusive operations where a high probability of encountering CWM has been determined. The pre-operational surveys and tabletop exercises will be performed after the initial mobilization of key site personnel, contractors, and equipment.

The USAESCH will prepare the Huntsville Survey, tabletop exercises, and MACOM Pre-Operational Survey Plan, assemble the preoperational survey teams, and conduct the MACOM pre-operational survey (delegated by USACE Headquarters) for the start-up of chemical operations. Local emergency responders and stakeholders will be invited to the Tabletop Exercises, which will evaluate the responses to various emergency scenarios in a meeting room environment. All essential site personnel are required to participate in the exercises. In addition, all personnel who will be involved in site operations, including medical support, security, RSA Fire Department, etc., will be involved.

The site team must pass the Huntsville Survey and Tabletop Exercise that shall be undertaken by USAESCH personnel. The day prior to the actual Huntsville Survey will culminate with a full-blown internal site exercise. All equipment necessary for the exercise will be used and not simulated, although a complete removal of clothing from personnel during decontamination will not be performed.

However, outer PPE will be removed down to undergarments. Advance planning with all key players inside and outside of site personnel will be performed. Installation Emergency Operations Center (IEOC), security, hospital support, medical teams, RSA Fire Department, RSA Installation Restoration Branch (IRB), etc., who are directly involved in the event of an actual incident will be brought in early and their concerns and requirements seriously addressed and incorporated into the training.

10.2.1.1. Pre-Emergency Planning

Potential health and safety hazards associated with the conduct of site activities are identified by competent persons and identified in the AHAs included in Attachment 2 of this APP. Once identified, these hazards are assessed to determine the risk that these hazards could result in an emergency situation. Contingency plans for responding to potential emergency situations have been developed as needed and are included in this section. Phone numbers for the local and site emergency response authorities have been collected and are provided in Appendix C of the Work Plan.

10.2.1.2. Testing

CARA will implement a test of the emergency response plan at least once during fieldwork. This test will be performed by simulating an emergency situation, i.e., spill, medical emergency, fire, etc., and testing the effectiveness of the communication system, medical response and first-aid supplies, employee accountability at designated assembly areas, communication methods,

established hospital routes, and required notifications. The RSA Fire Department should be offered to assist in the emergency drill and become oriented to the site layout. Contractors and subcontractors should also participate in the drill.

10.2.1.3. Personnel Roles

For non-CWM events, the RSA Fire Department will evaluate the emergency situation and implement the response. CARA personnel will provide support as needed. For CWM events, the responsibilities of specific project individuals are as follows:

- Site Supervisor or SUXOS. At all times during scheduled work activities, the Site Supervisor, SUXOS, or qualified alternate will be present. This individual will be responsible for implementing emergency procedures and determining appropriate response actions until the RSA Fire Department is present. Specific responsibilities for the Site Supervisor or SUXOS include:
  - Evaluating and assessing emergency incidents or situations.
  - Assigning personnel and coordinating response activities on site.
  - Assuring that field personnel are aware of the potential hazards associated with the site.
  - Summoning a RSA Fire Department emergency response team.
  - Notifying the USAESCH OESS of an emergency situation.
  - Coordinating response to an incident with RSA.
  - Assuring that all CARA emergency equipment is routinely inspected and functional.
  - Working with the SSHO/UXOSO regarding the correction of any work practices or conditions that may result in injury to personnel or exposure to hazardous substances.
  - Assuring that appropriate emergency response agencies are aware of the provisions made herein.
  - Evaluating the safety of site personnel in the event of emergency and providing evacuation coordination if necessary.
  - Maintaining site facilities and assisting site personnel in accessing those facilities.
- SSHO/UXOSO. The SSHO/UXOSO will assist the Site Supervisor or SUXOS in evaluating health and safety concerns with respect to MEC emergency response actions and has authority to take action for providing a safe workplace to site workers during such events.
- USAESCH Project Manager and/or RSA Site Manager. Will provide support to emergency responders and dedicate appropriate project resources to the response effort. If required, the will mobilize additional personnel and equipment to the site. The RSA Site Manager will notify and provide the U.S. Army Garrison and Chief Installation Restoration Branch with recommendations concerning any additional action(s) to be taken.

10.2.1.4. Emergency Equipment

All emergency equipment will be maintained in proper working order and inspected by the SSHO/UXOSO to ensure completeness and proper working order. The results of the inspection will be documented in the safety log. In the event that any of the disposable items are used, the SSHO/UXOSO will ensure they are replaced immediately.

10.2.1.5. Critique and Follow-Up Procedures

The Site Supervisor, SUXOS, and SSHO/UXOSO will investigate the cause of the incident to prevent a recurrence. The investigation should begin as soon as practical after the incident is under control but not later than the first workday after the incident. Investigations will follow the procedures described below:

- Interview witnesses and participants as soon as possible or practical.
- Determine the chronological sequence of events (opinions as to cause should not be solicited at this time).
- Note the location, movement, displacement, sounds, noises, or other sensory perceptions experienced by the participants or witnesses.
- Evaluate weather data.
- Verify the condition of all safeguards.

After the facts have been collected, causal factors should be identified. Two types of causal factors typically exist: apparent and contributing. Apparent factors are those that are selfevident or readily deduced. Contributing factors usually become apparent by questioning why the apparent causal factor was allowed to exist. For example an employee receives an apparent case of contact dermatitis from poison ivy. Contributing factors may include lack of PPE, no training on recognition of poison ivy, or cross contamination by coming into contact with tools that were contaminated with urushiol oils.

10.2.2. Emergency Notification, Reporting, and Posting of Emergency Phone Numbers

The Site Supervisor, SUXOS, SSHO/UXOSO, USAESCH OESS, and CARA Safety Officer will be notified immediately in the event of an emergency. The Site Supervisor, SUXOS, or SSHO/UXOSO will immediately evaluate the incident and, if necessary, notify RSA Fire Department (911) emergency support service. If the emergency is a CA incident, the onsite medical support team will also be notified. If not previously notified, the USAESCH Project Manager and RSA Site Manager will be advised of the situation.

Emergency telephone numbers are listed in Appendix C of the Work Plan. This list will be maintained with current contacts, and telephone numbers will be posted in a conspicuous area along with other emergency phone numbers. Since most workers will be at various site locations, a copy will be kept in each vehicle.

The CARA SOP-001-02, *Risk Management*, for internal incident notification, reporting, and management procedures is provided in Attachment 3 of this APP and will be followed in the event of a CARA reportable incident. Reporting shall be by phone call initially with a follow-up email.

The information provided during notification should include:

- Name and telephone number of the individual reporting the incident
- Location and type of incident
- Nature of the incident (fire, explosion, spill, or release) and substances involved
- Number and nature of medical injuries
- Movement or direction of spill/vapor/smoke

- Response actions currently in progress
- Estimate of quantity of any released materials
- Status of incident
- Other pertinent information.

A complete incident report shall be completed by the Site Supervisor or SUXOS and provided to the Garrison Safety Office and USAESCH OESS in accordance with Section 7.0.

10.2.3. Spill Plans

The occurrence of chemical leaks or spills is anticipated to be remote due to the preventative measures implemented on the site and the nature of the contaminated materials present. There is, however, a potential for the occurrence of spills or leaks due to spills from fuels, oils, etc. used in servicing heavy equipment. The following spill prevention and control measures outline the procedures for the coordination of and response to potential spills or discharges of hazardous materials.

10.2.3.1. Pre-Emptive Measures

The following measures shall be taken to minimize the possibility of spills or discharges:

a. Site controls are to be maintained so that only authorized personnel have access to work areas.
b. Site personnel will be advised of appropriate spill/discharge control measures.
c. Appropriate secondary containment structures will be used for storage of hazardous materials and wastes on site at RSA-approved and permitted earth covered magazines (ECMs).
d. Storage containment as applicable shall be examined daily.

10.2.3.2. Spill Response

If a hazardous material such as a fuel spill is observed at the site, the SSHO/UXOSO and Site Supervisor or SUXOS will be immediately notified. An assessment of the magnitude and potential impact of the release will be made. If it is safe to do so, site personnel will attempt to locate the source of the release, prevent further release, and contain the spilled and/or affected materials as follows:

a. The spill or release area will be approached from upwind.
b. Hazards will be identified based on available information from witnesses or material identification documents (i.e., placards, safety data sheets [SDS], and logbooks). The potential hazards will be evaluated to determine the proper personal protection levels, methods, and equipment necessary for response.
c. If necessary, the release area will be evacuated, isolated, and secured.
d. Work zones shall be set up, if not already done so.
e. If possible, spill containment will initially be made without entering the immediate hazard area.

f. Entry to the release area will be made by personnel with the PPE, training, methods, and equipment necessary to perform the work. Hazardous spill containment and collection will be performed as follows:
   i. Contain the spill with absorbent socks, booms, granules, or construction of temporary dikes.
   ii. Control the spill at the source by plugging leaks, uprighting containers, overpacking containers, or transferring contents of a leaking container.
   iii. Collect the spilled material with shovels, pumps, or heavy equipment as necessary.
   iv. Store the spilled material for treatment or disposal. Treatment and/or disposal options of the material will depend on the amount and type of material.

If site personnel cannot safely respond to an environmental release, evacuation of the area may be warranted. In the event that a spill cannot be controlled or represents a potential impact to human health and/or the environment, CARA will contact the RSA Fire Department. Upon their arrival at the site, the SSHO/UXOSO will brief emergency responders of the status and any potential hazards.

10.2.4. Fire Emergency Plan

10.2.4.1. Training

Site employees will be informed of any potential fire hazards and the requirements and procedures of this plan during indoctrination training and in daily tailgate meetings. This training will be documented.

10.2.4.2. Testing

CARA will implement a test of this emergency action plan at least once during fieldwork. This will be performed by simulating a fire emergency and testing the effectiveness of the medical response, first-aid supplies, employee accountability at the designated assembly area, communication methods, established hospital routes, and required notifications. The RSA Fire Department should be invited to assist in the emergency drill and become oriented to the site layout. Contractors and subcontractors should also participate in the drill. This may be performed during the Huntsville Survey or Tabletop Exercises.

10.2.4.3. Notification

In the event of a fire or potential fire/explosives-related emergency, all activities shall halt, and the Site Supervisor or SUXOS, SSHO/UXOSO, and RSA Fire Department (911) shall be notified immediately. Be sure to state you are located on RSA when calling 911 for on base assistance. If it is safe to do so, qualified site personnel may use fire-fighting equipment available on site to remove and isolate flammable or other materials that may contribute to the fire.

10.2.4.4. Escape Procedures and Routes

The Site Supervisor, SUXOS, or SSHO/UXOSO will order personnel to evacuate the area if warranted. In the event that site evacuation is required, a continuous, uninterrupted air horn will be sounded for approximately 10 seconds. Radio or cell phone communication may also be used to alert site workers and provide special instructions as long as these devices do not compromise MEC safety. Evacuations may or may not be limited to the specific EZ or site area. The safe

evacuation distance will be determined by the SSHO/UXOSO and the Site Supervisor or SUXOS in consultation with the USAESCH OESS, or RSA Fire Department.

Upon evacuation notification, personnel will immediately report to the designated upwind assembly or rally point for a "head count" and further instructions. The Site Supervisor, SUXOS, and SSHO/UXOSO will remain in contact to ensure that evacuation procedures are properly executed. If the designated assembly or rally point is inaccessible, personnel shall evacuate to an upwind location as determined by the Site Supervisor, SUXOS or SSHO/UXOSO and perform a "head count." The Site Supervisor or SUXOS will utilize the Site Entry/Exit Log to ensure all personnel are present or accounted for at the assembly point(s).

When evacuating:

a. Close, but do not lock any gates.
b. Use communications devices to alert personnel to stay clear of the site.
c. Use vehicles to block access routes to the site, but ensure they can be moved rapidly if emergency vehicles must use the access route.

10.2.4.5. Rescue and Medical Duties

If medical attention is necessary, personnel will follow the medical support procedures provided in Section 8.0 of this APP. Upon arrival of the RSA Fire Department emergency responders, the Site Supervisor or SUXOS and/or SSHO/UXOSO will advise the fire chief or lead representative of the location, nature, and identification of the hazardous materials on site, as well as any other specific hazards inherent to the site such as MEC. The Fire Department will coordinate large area evacuation as necessary.

10.2.4.6. Emergency Contacts and Reporting

Emergency telephone numbers are listed in Appendix C of the Work Plan. This list will be posted in a conspicuous area and maintained in each vehicle. Fires will be reported in accordance with Section 10.2.2.

10.2.5. Person Overboard/Abandon Boat

Watercraft is not anticipated to be used for this project.

10.3. Alcohol and Drug Abuse Prevention Plan

CARA will institute and maintain a program for achieving the objective of drug free and alcohol free workspace for all CARA personnel on site in accordance with CARA Policy Statement #7, *Alcohol and Drug Abuse Prevention/Control Program Policy*, and CARA Policy Statement #16, *Workers' Compensation* (both provided in Attachment 3 of this APP). CARA ensures consistent and uniform application of this policy and, when required interfaces with supervisor and employee to evaluate performance and behavior.

10.3.1. Safety and Environmental Provisions

In some instances employees may be required to undergo random toxicological tests to ensure their continuing fitness for duty to comply with contract mandated requirements or government regulations, or if performing work at locations where the nature of their duties is such that there is the potential for serious physical injury to themselves, to others, or the general public, or potential

for significant damage to property or the environment. Any employee may be terminated from employment for a positive test result. Refusal or failure to submit to testing following an on-the-job accident or random test will result in termination of employment.

Assignment of employees to such job sites will be done on a voluntary basis. Employees who refuse to participate in the random testing program and whose job duties would normally expose them to random testing will be considered for placement in other positions not requiring random testing. Every reasonable effort will be made to accommodate such transfers; however, if suitable work for which the employee is qualified is not available, the employee will be subject to termination. A positive test result will lead to immediate removal from the site, in addition to either corrective action in accordance with this policy or the employee's termination in accordance with the CARA Policy Statement #5, *Incident Reporting* (Attachment 3 of this APP).

Searches are another means of protecting the safety of individuals and property at those locations where the nature of the work has the potential for serious injury or damage. Reasonable searches may be conducted of individuals, their personal vehicles, effects, and other areas under the individual's control while at such work sites.

An employee bringing onto the job sites; having possession of; being under the influence of; possessing in the employee's body, blood or urine (at levels exceeding or equal to established cut-off levels); or using, consuming, transporting, selling, attempting to sell, or giving away any illegal drugs (including prescription drugs illegally obtained or prescribed for the individual only), or alcohol, at any time, is guilty of misconduct and is subject to discipline to include discharge, suspension without pay or other actions even for a first offense. RSA reserves the right to inspect the property and person of individuals suspected of illegal drug or alcohol possession while on RSA property.

10.3.2. Employee Personal Conduct

CARA reserves the right to take any disciplinary action it considers appropriate, including termination, at any time. Listed below are some other examples where immediate termination could result. Being on the project site or working under the influence of alcohol or illegal drugs, or the possession, distribution, sale, transfer, or use of alcoholic beverages or illegal drugs in the workplace, while on duty, or while operating employer-owned or leased vehicles or equipment. CARA adheres strictly to its CARA Policy Statement #7, *Alcohol and Drug Abuse Prevention/Control Program Policy,* and CARA Policy Statement #16, *Workers' Compensation* (both provided in Attachment 3 of this APP).

10.3.3. Confidentiality of Records

All information concerning an applicant's or employee's medical condition or test results will be kept strictly confidential, with information released only upon a legitimate need-to-know basis.

10.4. Site Sanitation Plan

10.4.1. Housekeeping

Work areas will be kept as clean as possible, taking in consideration the nature of the work. Regular cleaning (e.g. sweeping, removing garbage) will be conducted in an effort to maintain safe and sanitary working conditions.

The floors of indoor workspaces (e.g. office) shall be kept as dry as possible, using mats, if necessary, to keep water from causing an unsafe slip hazard.

10.4.2. Drinking Water
An adequate supply of cool drinking water will be maintained at all work locations.

10.4.3. Non-Potable Water
Outlets and tanks dispensing non-potable water shall be clearly marked.

10.4.4. Toilets
Due to the duration of the work, a chemical toilet will not be provided and is not required per EM 385-1-1 (USACE, 2014).

10.4.5. Washing Facilities
Washing facilities will be provided at toilet facilities as needed to maintain healthful and sanitary conditions. Each washing station will contain water, soap, and a means of drying. If it is not practical to provide running water, hand sanitizers may be used as suitable.

10.4.6. Waste Disposal
Waste disposal procedures are detailed in Section 3.7 of the Work Plan.

10.5. Access and Haul Road Plan
All roads used during this project will be used in a safe manner to reduce any potential hazards involving vehicles or heavy equipment. Site vehicles will be driven in a safe manner by a licensed driver. All speed limits on public roads will be observed, and speed on the site will be adjusted as appropriate for existing road conditions. The AHA regarding heavy equipment and vehicle safety is provided in Attachment 2 of this APP.

10.6. Respiratory Protection Plan
The respiratory protection requirements are presented in Section 9.3 of this document. The respiratory protection program is covered in the CARA SOP-001-02, Appendix G (Attachment 3 of this APP).

10.7. Health Hazard Control Program
The health hazard controls are covered in detail in Section 2.0 of the SSHP (Attachment 1 of this APP).

10.8. Hazard Communications Program
The hazard communication training is presented in Section 5.4 of this document. The Hazard Communication Program is covered in the CARA SOP-001-02, Appendix E (Attachment 3 of this APP).

10.9. Process Safety Management Plan
Process Safety Management requirements are not anticipated to be part of this project.

10.10. Lead Abatement Plan

Contact with lead is not anticipated as part of any the operations conducted during this project. In the unlikely event that lead is encountered during operations, workers will be required to avoid the area of contamination and consult with the SSHO/UXOSO and Site Supervisor for further instruction.

10.11. Asbestos Abatement Plan

Contact with asbestos is not anticipated as part of any of the operations conducted during this project. In the unlikely event that asbestos is encountered during operations, workers will be required to avoid the area of contamination and consult with the SSHO/UXOSO and Site Supervisor for further instruction.

10.12. Radiation Safety Program

Operations involving x-ray analysis of munitions may be conducted onsite to determine the presence of liquid fillers. The safety program associated with this equipment is included in the CARA SOP-002-01, *Radiographic Operations,* and CARA SOP-003-01, *Radiation Safety for Use of the PINS* (Attachment 3 of this APP).

10.13. Abrasive Blasting Plan

Abrasive blasting is not required as part of the operations during this project.

10.14. Heat/Cold Stress Monitoring Plan

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Extremely hot weather can cause physical discomfort, loss of efficiency, or personal injury. Because heat stress is probably one of the most common potential illnesses at a site, particularly when increased dermal PPE is required for worker protection, regular preventive measures are vital. Individuals vary in their susceptibility to heat stress. Personnel (including subcontractor employees) potentially exposed to heat stress conditions will be made aware of the sources of heat stress, how the body handles heat, heat-related illnesses, preventive/corrective measures, and first-aid procedures.

Additional information and requirements for heat and cold stress monitoring are provided in Section 8.0 of the SSHP (Attachment 1 of this APP) and CARA SOP-001-02, Appendix K (Attachment 3 of this APP).

10.15. Crystalline Silica Monitoring Plan

The field effort for this project will not involve operations that could expose site workers to crystalline silica.

10.16. Night Operations Lighting Plan

Night work may be required if the intrusive work impacts tenants that have daytime schedules that are mission critical. A kick-off meeting will be held prior to initiating site work with tenant organizations, the RSA Garrison Safety Office, and the Installation Emergency Operations Center to outline contingency plans and determine the final work schedule. Adequate portable lighting to support night work activities on site shall be provided in accordance with the guidelines established in EM 385-1-1 (USACE, 2014).

These work activities will require artificial lighting to illuminate specific work areas as required to maintain safe working conditions. EM 385-1-1 (USACE, 2014) will be referenced for specific performance standards. Minimum Lighting Requirements, for the construction, general outdoor and work areas will be used as initial performance criteria for the night operations plan. The lighting and monitoring requirements for lighting during night operations are shown in Table D-10.1.

The UXOSO will conduct prescribed light surveys to verify employees working on specific site work areas have adequate lighting in accordance with EM 385-1-1 (USACE, 2014).

Table D-10.1
Lighting Requirements for Night Operations

Location	Illuminance – lx (lumens per square foot)	Monitoring Frequency
Construction areas-general outdoor	33 (3)	Initial shift start/mid-shift
Work areas-general	325 (30)	

During night work, portable light plants or fixtures shall be positioned to provide minimal lighting in select site work areas such as:

- Active work area
- CRZ or PDS
- Support area, i.e., medical support staging area.

The lighting shall be directed towards the work area and positioned to provide optimum work area illumination. CARA expects to utilize portable light plants in select work areas during sundown-to-sunrise work hours as required to maintain work schedules. In these work areas, lamps of the light plant will be directed down and in a fashion to reduce glare hazards to the workers. Location of nearby roads will be considered and lighting positioned to minimize glare to operators of motor vehicles. Walking and working surfaces will be maintained to the extent possible to minimize slip, trip, and fall hazards such as dense vegetation, accumulation of debris, and ruts/depressions generated from use of heavy equipment. Portable light plants will be turned off when work is discontinued in an area.

UXO personnel will also utilize hand-held, portable, or body-attached lighting to provide focused beam lighting on MEC being investigated. If at any time site personnel are not comfortable with lighting conditions providing a safe work environment, activities shall be halted and necessary adjustment to portable lighting made or additional light plants procured.

A Testo 545 Light Meter or equivalent with National Institute of Standards and Technology calibration certificate will be used to measure lighting at the site. Before the light meter is used, it will be calibrated according to the manufacturer recommendations. The light meter units will be set to measure in foot-candles/lumens/square feet. A light monitoring log will be maintained. All light measurement logs will be turned over to site Quality Control for the site report. The SSHO/UXOSO will be trained in the use of the light meter.

10.17. Fire Prevention Plan

To ensure adequate fire prevention, the SSHO/UXOSO will inspect the site to ensure all flammable and combustible materials are being safely stored in appropriately configured storage areas and containers. The SSHO/UXOSO will also ensure that no flammable/combustible materials are stored near any sources of ignition, and that sources of ignition are removed a safe distance from storage areas. If needed, storage areas will be segregated from the remainder of the site using flagging. Portable fire extinguishers shall be located on site. The Fire Prevention Plan is part of the Emergency Response SOP and Fire Fighting SOP (Attachment 3 of this APP).

10.18. Wild Land Fire Management Plan

Wild land fire management plans are not required for this project.

10.19. Hazardous Energy Control Plan

This procedure shall be used by site personnel to ensure that the machine or equipment being worked on is isolated from all potential hazardous energy sources, and locked out or tagged out before an employee performs any servicing or maintenance activity where the unexpected start-up or release of energy could cause an injury. The Hazardous Energy Control Plan is provided in Section 2.3.5 of the SSHP (Attachment 1 to this APP).

10.20. Critical Lift Procedures

Crane lift operations are not expected to be necessary during this project. If required, development of lift plans will be in accordance with EM 385-1-1. All hoisting operations will be preplanned and the exact size and weights of loads to be lifted will be evaluated based on the manufacturing maximum load limits for the entire range of the lift. Lift geometry, including crane position, height of lift, load radius, and boom length and angle, for the entire range of lift will be documented. Crane operators will be checked for qualification with proper certification. A standardized Critical Lift Plan form is located in Appendix F of the Work Plan.

10.21. Contingency Plan for Severe Weather

Severe weather is defined as high winds, electrical storms, tornadoes, extremely hot weather (> 100°F), or extremely cold weather (< 0°F). If such conditions arise, it may be necessary to cease operations and evacuate the site. The SSHO/UXOSO will be responsible for monitoring the weather. Should severe weather conditions threaten, the SSHO/UXOSO is responsible for deciding if site operations should be halted. Procedures for actions during severe weather are detailed in Section 2.6 of the SSHP (Attachment 1 to this APP).

10.22. Float Plan

A float plan is not required for this project.

10.23. Fall Protection Plan

Activities to be performed during this construction footprint clearance are not anticipated to require fall protection. Should the need for fall protection arise, a fall protection plan will be provided.

10.24. Demolition Plan (Engineering and Asbestos Surveys)

No building demolition is planned for this project.

10.25. Excavation and Trenching Plan

CARA anticipates all excavation activities to be performed by hand or earthmoving machinery. The tenant or activity requiring the work will coordinate all utility clearances and dig permits with RSA for all excavation sites. If utilities are identified within proposed excavation locations, RSA will coordinate utility shutoffs. If an overhead line cannot be deenergized, a clearance distance will be maintained by the use of a physical limiting device.

Clearance distances are provided in EM 358-1-1 (USACE, 2014).

A safe means of access and egress will be provided for excavations 4 feet or greater, and in accordance with 29 CFR 1926, Subpart P, *Excavations*. If an excavation to 5 feet is required, the sidewall slope shall be a minimum 1-1/2 to 1. All excavation activities shall be evaluated by an excavation-competent person. Excavations may be adjacent to active roadways, where traffic control measures would apply. These control measures will be addressed in the construction contractor's safety plans. Excavations shall be backfilled as soon as reasonably practical. In the event an excavation must remain open awaiting analytical data, Class II perimeter protections shall be erected around the excavation.

10.26. Emergency Rescue (Tunneling)

Tunneling is not required as part of this project.

10.27. Underground Construction Plan

Underground construction plan is not required for this project.

10.28. Compressed Air Plan

The Compressed Air Plan is an overview of the requirements of 29 CFR 1910.101, *Compressed Gases;* 29 CFR 1910.101, *Air Receivers;* and 29 CFR 1910.253, *Oxygen-Fuel Gas Welding and Cutting*. The plan is intended to provide procedures for safely handling gas cylinders and any other pressurized gases used on this project. The Safe Procedures for Handling, Storage and Use of Pressurized Cylinders is provided in the SOP (Attachment 3 of this APP).

10.29. Formwork and Shoring Erection and Removal Plan

If shoring is required, it will be erected and handled by the construction contractor in accordance with manufacturer's instructions.

10.30. Precast Concrete Plan

A precast concrete plan is not required for this project.

10.31. Lift Slab Plan

A lift-slab plan is not required for this project.

10.32. Steel Erection Plan

Steel erection activities at the site are not anticipated.

10.33. Blasting Plan

Details specific to explosives operations conducted on site are presented in the Explosives Management Plan (Section 5.0 of the Work Plan).

10.34. Diving Plan

Diving will not be a conducted during this project.

10.35. Confined Space

If required, confined space entry will be performed in accordance with 29 CFR 1910.146, *Permit-Required Confined Spaces,* and EM 385-1-1 (USACE, 2014). All confined space or permit required confined space entry operations will be executed under direct supervision from a confined space competent entry supervisor. The RSA Fire Department will be contacted for rescue services as applicable to the permit requirements. All personnel participating in confined space operations shall have received applicable confined space entry or attendant training. Confined space supervisor shall have completed supervisor training and demonstrated proficiency in confined space operations.

11.0 Risk Management Process

11.1. Activity Hazard Analysis

The following AHAs for expected major phases/activities of work are provided in Attachment 2 of this APP.

a. Air Monitoring – CARA
b. Anomaly Location and Reacquisition
c. Decontamination Station for Personnel, Equipment, and CA Contaminated Media (CACM)
d. MEC Demolition Operations
e. Drum Handling
f. Earth Covered Magazine Operations
g. Emergency Rescue Operations
h. Intrusive Excavation of MEC (high CWM Probability areas)
i. Explosive Storage and Transportation Operations
j. Fueling Operations
k. Handling CACM
l. Mobilization/Demobilization
m. Security Operations
n. Vegetation Removal
o. Vehicle, Heavy Equipment, and All-Terrain Vehicle Operations
p. X-ray and Portable Isotropic Neutron Spectrometry (PINS) operations

The AHA describes steps to safely mitigate classic safety hazards; explosive ordnance and explosives hazards; and chemical, physical, and biological hazards. Personnel involved with hazardous tasks will be qualified to participate by previous or site specific training, as applicable.

12.0 References

29 Code of Federal Regulations (CFR) 1910.101, ***Compressed Gases.***

29 Code of Federal Regulations (CFR) 1910.120, ***Occupational Safety and Health Standards.***

29 Code of Federal Regulations (CFR) 1910.120, ***Hazardous Waste Operations and Emergency Response***.

29 Code of Federal Regulations (CFR) 1910.120, Appendix E, ***Training Curriculum Guidelines – (Non-Mandatory)***

29 Code of Federal Regulations (CFR) 1910.134, ***Respiratory Protection.***

29 Code of Federal Regulations (CFR) 1910.169, ***Air Receivers.***

29 Code of Federal Regulations (CFR) 1910.253, ***Oxygen-Fuel Gas Welding and Cutting.***

29 Code of Federal Regulations (CFR) 1910.1030, ***Bloodborne Pathogens.***

29 Code of Federal Regulations (CFR) 1910.1200, ***Hazard Communication.***

29 Code of Federal Regulations (CFR) 1926, ***Safety and Health Regulations for Construction.***

29 Code of Federal Regulations (CFR) 1926.59, ***Hazard Communication.***

29 Code of Federal Regulations (CFR) 1926.65, Appendix E, ***Training Curriculum Guidelines – Non-Mandatory.***

29 Code of Federal Regulations (CFR) 1926, Subpart P, ***Excavations***.

U.S. Army Corps of Engineers (USACE), 2013, EM 385-1-97, ***Explosives Safety and Health Requirements Manual,*** U.S. Department of the Army, CESO-ZA.

U.S. Army Corps of Engineers (USACE), 2014, EM 385-1-1, ***Safety and Health Requirements Manual,*** U.S. Department of the Army, CESO-ZA.

U.S. Army Garrison-Redstone (RSA), 2014, ***Redstone Arsenal Explosives Safety Management Program (ESMP)***, June.

U.S. Department of Defense Explosives Safety Board (DDESB), Technical Paper (TP) 18, ***Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel***.

U.S. Department of the Army (DA), 2003, DA Pamphlet (PAM) 40-173, ***Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT,*** June.

U.S. Department of the Army (DA), 2009, Interim Guidance (Army Regulation (AR) 385-XX), ***Chemical Warfare Materiel Responses and Related Activities,*** April.

U.S. Department of the Army (DA), 2012a, DA Pamphlet (PAM) 385-61, ***Toxic Chemical Agent Safety Standards,*** November.

U.S. Department of the Army (DA), 2012b, ***Interim Guidance on Occupational Health Practices for the Evaluation and Control of Occupational Exposures to Nerve Agents, GA, GB, GD, GF and VX and Mustard Agents H, HD, and HT,*** November.

U.S. Department of the Army (DA), 2014, DA Pamphlet (PAM) 385-30, ***Mishap Risk Management,*** December.

APPENDIX D, ATTACHMENT 1
SITE SAFETY AND HEALTH PLAN (SSHP)

APPENDIX D, ATTACHMENT 1
SITE SAFETY AND HEALTH PLAN (SSHP)

Munitions and Explosives of Concern/Chemical Warfare Materiel
Construction Footprint Clearance

MSFC-003-R-01, Inactive Old Bone Yard Disposal Site #1
U.S. Army Garrison-Redstone

OCTOBER 2015

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS (continued)

Section **Page**

TABLE OF CONTENTS (continued)

Section **Page**

TABLE OF CONTENTS (continued)

List of Tables

List of Figures

1.0 Site Description and Contamination Characterization

1.1. Site Description

A description of the George C. Marshall Space Flight Center (MSFC) site MSFC-003-R-01 is contained in Section 1.0 of the Work Plan.

1.2. Contamination Characterization

Based on historical information, MSFC-003-R-01 was used for the demilitarization and disposal of conventional munitions and explosives of concern (MEC) and chemical warfare materiel (CWM). Potential agents of concern include nerve, blister, and industrial agents.

The Air Monitoring Plan (Appendix J of the Work Plan) detail specifics on which of the agents of concern will be analytes for air monitoring and analysis based on physical characteristics and documented use.

2.0 Hazard and Risk Analysis

2.1. Introduction

Work activities, natural phenomena, and biological and chemical hazards are some factors which may present a risk to workers on this project. However, the overall level of risk is dependent upon the type of work being performed. This Section identifies the hazards associated with specific tasks being performed during this project and the procedures that are to be employed to prevent accidents, injuries, and illness.

2.2. Activity Hazard Analysis

Individual hazard analyses have been performed for the tasks associated with MSFC-003-R-01. A copy will be maintained onsite of all activity hazard analysis (AHAs) for each of the major tasks identified, including potential hazards, control measures, training and personal protective equipment (PPE) requirements. If new operations are introduced to this site, a hazard analysis will be performed by the 20th Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives (CBRNE) Analytical and Remediation Activity (CARA) Site Supervisor, or designee. If operations change significantly during the course of this project, the hazard analysis will be updated to accommodate these changes. Any changes to PPE or safe operating procedures will be approved by the Site Supervisor, or designee. It will be the responsibility of the Site Supervisor, or designee, to ensure that the required controls are being properly implemented for each operation or task.

Attachment 2 to the Accident Prevention Plan (APP) contains the AHAs for each of the major tasks identified.

2.3. Classic Safety Hazards

The following classic safety hazards may be encountered during the course of site operations.

2.3.1. Slips, Trips, and Fall Hazards

Work areas may contain slip, trip, and fall hazards for workers, such as:

- Holes, pits, or ditches;
- Slippery surfaces;
- Steep and uneven grades;
- Guy wires and ropes;
- Objects such as nails, metal shards, and broken glass or remnant branches and vegetative debris; or
- Weather conditions such as rain, snow, and ice will make surfaces slippery and obscure visibility.

Site personnel will be instructed to look for these potential safety hazards and immediately inform the Site Safety and Health Officer (SSHO)/Unexploded Ordnance (UXO) Safety Officer (UXOSO) or the Site Supervisor about any new hazards. If the hazard cannot be immediately removed, action must be taken to warn site workers about the hazard. Proper housekeeping must be maintained on site, particularly adjacent to office trailers. Small holes and pits along high foot traffic areas should be covered or barricaded to prevent injury.

2.3.2. Motor Vehicles and Heavy Equipment Operations

Working with large motor vehicles and heavy equipment can be a major hazard. Injuries can result from equipment hitting or running over personnel or vehicles overturning. Vehicles and heavy equipment design and operation will be according to 29 Code of Federal Regulations (CFR) Subpart O, 1926.600 through 1926.602, *Motor Vehicles, Mechanized Equipment, and Marine Operations*. The types of heavy equipment anticipated to be used onsite include backhoe, front-end loader, excavator, forklift, flatbed truck, pick-up trucks, and trailers.

Procedures for mitigation and prevention of hazards associated with motor vehicles and heavy equipment is contained in the Heavy Equipment and Vehicle Safety standard operating procedure (SOP) located in Attachment 3 of the APP.

2.3.3. Trenching and Excavation

When excavations are planned for greater than four feet deep, potential hazards include:

- Cave ins,
- Items falling into the excavation, and
- Personnel falling into the excavation.

Safety considerations during Trenching and Excavation SOP located in Attachment 3 of the APP, contains procedures to mitigate and prevent trenching and excavation hazards.

2.3.4. Anomaly Excavation

Selected anomalies within the construction footprint, which are impeding intrusive repairs, will be removed. A small backhoe may be used if hand digging is too difficult (procedures and precautions identified in Section 2.3.2 will be implemented for heavy equipment).

If a backhoe is used, a safety arc will be established by extending boom/bucket to its full length and visibly marking the area. Recognized hand and arm signals will be used to communicate between the operator and safety observer. Operations will cease when this fails. Machinery will be operated only by qualified personnel, in accordance with manufacturers' instructions and recommendations, and in a manner that will not endanger persons or property.

2.3.5. Hazardous Energy Control

It is important to be aware of hazardous energy to prevent accidents. At this site, electricity is the primary hazardous energy of concern. Accidents occur when electrical equipment is not properly used and/or installed. Accidents also occur when equipment is not properly isolated, shut down, and/or de-energized.

The Electrical Safety SOP located in Attachment 3 of the APP, contains procedures for mitigating and preventing electrical hazards.

Lockout/Tagout procedures will be used for all maintenance procedures to ensure the equipment is isolated from all potential hazardous energy sources (electrical and mechanical). Lockout/Tagout SOP is provided in Attachment 3 of the APP.

2.3.6. Pressurized Cylinders

Compressed air and gas cylinders are associated with the supplied air systems for breathing air and analytical instruments used in the miniature chemical agent monitoring system (MINICAMS). Hazards arise from leaking cylinders and subsequent gas build up (e.g., hydrogen used for gas chromatographs) or from the rapid release of compressed gases if a valve is broken off the cylinder. Such an accident can propel the cylinder like a missile. The SOP for Handling, Storage and Use of Pressurized Cylinders is provided in Attachment 3 of the APP.

2.3.7. Underground and Overhead Utilities Hazards

Underground and overhead utility hazards may exist in the intrusive operations area. These hazards include, but are not limited to, utilities such as sewer, telephone, cable, fiber optic, water, fuel, gas, and electrical.

The Redstone Arsenal (RSA) utility locating services will be contacted to identify the locations of buried utilities before subsurface activities begin. Prior to commencing any intrusive activities, the Site Supervisor or SUXOS will be provided with a digging clearance as appropriate and document the assessment. If the local utility service cannot access all areas of the site where utilities may be located, geophysical instruments and utility locators will be used to survey for buried utilities. Off-site intrusive activities will require contact and coordination with the Alabama One Call 811 service.

2.4. MEC and Explosives

There is a high possibility of encountering MEC at MSFC-003-R-01. There is also a hazard associated with explosives used for conventional MEC demolition operations.

All site personnel will be given ordnance familiarity training prior to working on the site. Personnel should be alert for MEC and munitions debris (MD). The following general precautions concerning ordnance will be observed at all times:

- DO NOT touch or move any ordnance items regardless of the markings or apparent condition.
- DO NOT use radios or cellular phones near suspect ordnance items.
- DO NOT walk across an area where the ground cannot be seen. If dead vegetation or animals are observed, leave the area immediately due to potential contamination by chemical agent (CA).
- DO NOT drive vehicles into a suspected MEC area; use clearly marked lanes.
- DO NOT carry matches, cigarettes, lighters, or other flame-producing devices into the primary work area.
- DO NOT rely on color code for positive identification of ordnance items or their contents.
- Approach ordnance items from the side; avoid approaching the front or rear areas.
- Always assume ordnance items contain a live charge until it can be ascertained otherwise.

The following actions will be taken if MEC is found:

- Personnel who are not UXO-qualified should leave the immediate vicinity and clearly mark the location from a safe distance. DO NOT touch, move, or otherwise disturb the item.

- Do not be misled by markings on the ordnance item stating practice bomb or inert. Even practice bombs have explosive charges that are used to mark/spot the point of impact; or the item could be mismarked.
- Notify the SUXOS and the SSHO/UXOSO when MEC is encountered.

2.5. Chemical Hazards

Table D1-2.1 lists potential contaminants that are considered acute hazards and may be present at MSFC-003-R-01 and the characteristics, potential routes of exposure and symptoms for each contaminant that may be encountered. Other information, such as Permissible Exposure Limits (PEL), Worker Protection Limits (WPL), Short-Term Exposure Limit (STEL), and Vapor Screening Level (VSL) are presented in the Air Monitoring Plan (Appendix J of the Work Plan). These chemical hazards may be encountered when digging in areas where CWM was previously handled, decontaminated, burned, or buried.

All site personnel will be given chemical and industrial agent familiarity training prior to working on the site. All site workers will implement the following actions to reduce or prevent exposure to contaminants:

- Intrusive operations in high-probability CWM areas shall be performed in Modified Level D PPE with National Institute of Occupational Safety and Health (NIOSH)-approved CBRN escape respirators. If suspect CA or CWM is detected, personnel shall don escape respirators and evacuate upwind to the emergency personnel decontamination station (EPDS) and then proceed to the personnel decontamination station (PDS).
- Gloves shall be used at all times during intrusive operations in the exclusion zone (EZ) where the possibility for CA exposure exists. Outer work gloves, i.e., leather or heavy cotton, can be used for added abrasion protection.
- Risk of exposure to chemical hazards can be minimized by not moving or handling suspect CWM/CA-contaminated media without proper precautions and watching for distressed or dead vegetation that may indicate the presence of chemical hazards.
- Chemical and industrial agent air monitoring shall be conducted in conjunction with intrusive activities in order to detect the presence of hazardous chemicals in accordance with the Air Monitoring Plan (Appendix J of the Work Plan).
- Minimize potential for breaking intact CWM (e.g., containers suspected to be associated with CA, unidentifiable intact containers that contain a liquid or potential CA residue, containers with CWM markings) by using hand methods of excavating around suspect items, where possible, and practicing anomaly avoidance for intrusive operations. Signs of broken glass may indicate CAs are present.
- CARA personnel will be present to arrange for further assessment of suspect CWM. Work may continue at other site locations while awaiting the assessment of any suspect CWM containers as long as there was not a chemical agent incident or ring off on near-real-time (NRT) monitors. CARA personnel will be responsible for the assessment, transport, and packing of the suspect CWM.
- If further assessment determines that the item is not CWM but is still an unknown, or if container markings clearly indicate that the contents are not CA and the container is not

explosively configured, it will be transported to and staged within an approved earth covered magazine (ECM) until characterization can be performed.

Table D1-2.1
Toxicological and Physical Effects of Chemicals of Concern

Compound	WPL (mg/m^3)	STEL/ VSL (mg/m^3)	OSHA PEL[a]	TLV[b]	IDLH[c]	IP[d] (eV)	Physical Description/Health Effects/Symptoms
Tabun (GA)	0.00003	0.0001	N/A	N/A	0.1 mg/m^3	N/A	Nerve agent. Clear, colorless to pale or dark amber liquid with a fruity odor similar to bitter almonds. GA can be absorbed into the body by inhalation, ingestion, skin contact, or eye contact. Exposure to GA can cause death within minutes.
Mustard (H, HD, HS)	0.0004	0.003	N/A	N/A	0.7 mg/m^3	N/A	Blister agent. Yellow, oily liquid. Garlic odor. Reddening of skin or appearance of blisters may occur several hours after exposure.
Mustard T Mixture (HT)	HT is measured as HD per DA PAM 385-61.						Blister agent. Oily, colorless liquid, with almost no odor. HT is a mixture composed of mostly HS mixed with ingredients designed to cause the mustard to adhere to objects and enhance its persistence. Reddening of skin or appearance of blisters may occur several hours after exposure.
Mustard Lewisite Mixture (HL)	HL is measured as L per DA PAM 385-61.						Blister agent. Oily, colorless liquid with a garlic-like odor. Mustard-Lewisite mixture is a mixture of Lewisite and sulfur mustard (HD). Reddening of skin or appearance of blisters may occur several hours after exposure.
Mustard Sesqui Mustard Mixture (HQ)	HQ will be measured as H per RSA Project Team.						Blister agent. Oily, colorless liquid with a garlic-like ordor. HQ is a mixture H and sesqui mustard (Q).
Nitrogen Mustard (HN-3)	0.003	0.003	N/A	N/A	N/A	N/A	Blister agent. Colorless to pale yellow, oily liquid. Faint fishy or musty odor. Reddening of skin or appearance of blisters may occur several hours after exposure.
Lewisite (L)	0.003	0.003	N/A	N/A	N/A	N/A	Blister agent. Oily, colorless liquid with an odor like geraniums. Reddening of skin or appearance of blisters may occur several hours after exposure.
Chloroform ($CHCl_3$)	N/A	N/A	240 mg/m^3 50 ppm[e]	10 ppm	500 ppm	11.42	Clear, colorless liquid with a pleasant sweet odor. Central nervous system effects include headache, drowsiness, dizziness. Ingestion causes severe burning in mouth and throat, pain in the chest and vomiting. Individuals with pre-existing skin disorders, eye problems or impaired liver, kidney or respiratory function may be more susceptible to adverse effects.

Table D1-2.1 (continued)
Toxicological and Physical Effects of Chemicals of Concern

Compound	WPL (mg/m^3)	STEL/ VSL (mg/m^3)	OSHA PEL[a]	TLV[b]	IDLH[c]	IP[d] (eV)	Physical Description/Health Effects/Symptoms
Chloropicrin (PS)	N/A	N/A	0.7 mg/m^3 0.1 ppm	0.1 ppm	2 ppm	N/A	Colorless to faint-yellow, oily liquid with intensely irritating odor. High level exposures followed by burning of the nose and throat, coughing, shortness of breath, dizziness, nausea or vomiting, headache, and extreme eye irritation. Skin contact results in immediate burning or stinging pain followed by redness. Symptoms of exposure include severe irritation of the eyes, skin, and respiratory passages; lacrimation, nausea, vomiting, colic, diarrhea, bronchitis, and pulmonary edema. It may also cause vertigo, fatigue, and cough.
Chloroacetophenone (CN)	CN will be indirectly measured by monitoring for PS and $CHCl_3$ per the RSA Project Delivery team.						Colorless to gray crystalline solid with a sharp irritating odor. Exposure causes irritation to the eyes, skin, and respiratory system, and pulmonary edema.
Phosgene (CG)	N/A	N/A	0.4 mg/m^3 0.1 ppm	0.1 ppm	2 ppm	11.55	Colorless gas (> 47 deg F) or fuming liquid (<47 deg F) with odor like musty hay. Avoid contact with skin, eyes, and respiratory system. Irritates eyes and causes vomiting, dry burning in throat, dizziness, cough, foamy sputum, difficulty breathing, chest pain, and frostbite (liquid).
Cyanogen Chloride (CK)	N/A	N/A	0.6 mg/m^3 0.3 ppm[e]	0.3 ppm[e]	N/A	12.49	Colorless liquid with a pungent, biting odor that evaporates quickly to form a colorless gas. Irritation to respiratory tract causing possible pulmonary edema. Exposure to high concentrations disrupts cell respiration. Causes irritation to eyes, coughing, weakness, headache, giddiness, dizziness, confusion, nausea, vomiting, and irritation to skin.
Hydrogen Cyanide (AC)	N/A	N/A	11 mg/m^3 10 ppm (skin)	N/A	50 ppm	13.60	Colorless or pale-blue liquid or gas (> 78 deg F) with bitter almond-like odor. Exposure through inhalation, skin absorption, ingestion, skin and/or eye contact. Symptoms include asphyxia, lassitude (weakness, exhaustion), headache, confusion, nausea, vomiting, increased rate and depth of respiration or respiration slow and gasping; thyroid, blood changes. Target organs are central nervous system, cardiovascular system, thyroid, blood.

Table D1-2.1 (continued)
Toxicological and Physical Effects of Chemicals of Concern

Compound	WPL (mg/m^3)	STEL/ VSL (mg/m^3)	OSHA PEL[a]	TLV[b]	IDLH[c]	IP[d] (eV)	Physical Description/Health Effects/Symptoms
Adamsite (DM)[f]	No air monitoring is required if appropriate engineering/process controls are used to minimize exposure, per CMA MCP.						Vomiting compound used as a riot-control agent. Light green to yellow crystals (solid) at room temperature. When dispersed by heat, fine particulate smoke; canary yellow when concentrated, colorless when diluted with air. Can affect the body through inhalation, ingestion, skin contact, or eye contact.
Diphosgene (DP)	DP will be measured as CG per the RSA Project Team.						Colorless liquid with odor. The substance decomposes on heating producing toxic and corrosive fumes, including chlorine and phosgene. Reacts with water to produce toxic and corrosive fumes. The substance is irritating to the respiratory tract, the skin and the eyes. Lachrymation. Inhalation of this substance may cause lung edema.
Thiodiglycol	N/A	N/A	N/A	N/A	N/A	N/A	Mustard agent breakdown product. Colorless to pale yellow liquid. Odor similar to mustard. Eye, lung, and skin irritation.
1,4 Dithiane	N/A	N/A	N/A	N/A	N/A	N/A	Mustard agent breakdown product. White to off-white crystals with an unpleasant odor similar to mustard. Eye, lung, and skin irritation.
2-chlorovinyl arsenous acid (CVAA)	N/A	N/A	N/A	N/A	N/A	N/A	Lewisite breakdown product. Dilute acid.
2-chlorovinyl arsenous oxide (CVAO)	N/A	N/A	N/A	N/A	N/A	N/A	Lewisite breakdown product. White powder. No discernible odor.
N-Ehyldiethanolamine	N/A	N/A	N/A	N/A	N/A	N/A	Agent breakdown product. Clear, almost colorless liquid. Causes eye irritation and mild skin irritation. May cause respiratory and digestive tract irritation.
Ehyldiethanolamine	N/A	N/A	N/A	N/A	N/A	N/A	Agent breakdown product. Clear, almost colorless liquid. Causes eye irritation and mild skin irritation. May cause respiratory and digestive tract irritation. The toxicological properties of this material have not been fully investigated.
Diethanolamine	N/A	N/A	N/A	1 mg/m^3	N/A	N/A	Agent breakdown product. Colorless crystals or a syrupy, white liquid (above 82^0F) with a mild, ammonia-like odor. Irritation of the eyes, skin, throat; eye burns, corneal necrosis; skin burns; lacrimation (discharge of tears), cough, sneezing.

Table D1-2.1 (continued)
Toxicological and Physical Effects of Chemicals of Concern

Compound	WPL (mg/m^3)	STEL/ VSL (mg/m^3)	OSHA PEL[a]	TLV[b]	IDLH[c]	IP[d] (eV)	Physical Description/Health Effects/Symptoms
White Phosphorous (WP)	N/A	N/A	0.1 mg/m^3	N/A	5 mg/m^3	N/A	White to yellow, soft, waxy solid with acrid fumes in air. Ignites spontaneously in moist air. Irritation to eyes, respiratory tract, eye and skin burns, abdominal pain, nausea, and jaundice, causes anemia.
Red Phosphorous	N/A	N/A	N/A	N/A	N/A	N/A	Formed by heating WP to 250-300°C out of contact with air. Reddish-brown amorphous powder. More stable than WP: not luminous, not spontaneously inflammable. Need to heat to 260°C before it ignites. Vapor not said to be toxic.
Triethanolamine (TEA)	N/A	N/A	25 ppm	5 mg/m^3	200 ppm	7.5	Agent breakdown product. Colorless to light yellow, viscous liquid with ammonia like odor. If ingested may cause burns in the mouth, pharynx, and esophagus, abdominal pain, nausea, vomiting and diarrhea. Corrosive. May cause irritation, redness, and pain, with skin/eye contact, and corneal damage. Repeated ingestion has caused kidney and liver damage in animals.
Picric Acid	N/A	0.3 mg/m^3 (skin)	0.1 mg/m^3 (skin)	N/A	75 mg/m^3	N/A	Chemical compound formally called 2,4,6-trinitrophenol (TNP). Yellow crystalline as a solid, faint yellow to clear in liquid. An explosive mixture results when the aqueous solution crystallizes. Irritation to eyes, skin; sensitization dermatitis; yellow-stained hair, skin; lassitude (weakness, exhaustion), myalgia, anuria, polyuria; bitter taste, gastrointestinal disturbance; hepatitis, hematuria (blood in the urine), albuminuria, nephritis
Arsenic (As)	N/A	N/A	0.05 mg/m^3	0.01 mg/m^3	N/A	N/A	Appearance and odor vary depending on the specific compound. Irritation to skin, respiratory distress, kidney damage, muscle tremors and convulsion, and possible liver damage.
Diphenylchlorarsine (DA)	N/A	N/A	N/A	0.01 mg/m^3 [g]	N/A	N/A	Vomiting agent. Odorless toxic liquid once used as a harassing agent Low melting solid. Known to cause sneezing, coughing, headache, salivation, and vomiting.

Table D1-2.1 (continued)
Toxicological and Physical Effects of Chemicals of Concern

Compound	WPL (mg/m^3)	STEL/ VSL (mg/m^3)	OSHA PEL[a]	TLV[b]	IDLH[c]	IP[d] (eV)	Physical Description/Health Effects/Symptoms
Lead (Pb)	N/A	N/A	0.050 mg/m^3	0.050 mg/m^3	100 mg/m^3	N/A	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypotension
Phenyldichloroarsine (PD)	N/A	N/A	N/A	0.01 mg/m^3 [g]	N/A	N/A	Organic arsenical vesicant and vomiting/incapacitating agent used as CWM. PD is odorless, colorless substance that can form hydrochloric acid upon contact with water. Another product of hydrolysis is phenylarsenious acid, which is a severe irritant to mucus membranes and skin. In an impure state PD may have a slight brown color and emit a horseradish or garlic like odor. PD can damage the eyes, lungs, throat and nasal membranes. It also induces nausea and vomiting. Blistering resultant from exposure may be delayed for as little as 30 minutes or as long 32 hours depending on concentration and dose.
2,4,6-Trinitrotoluene (TNT)	N/A	N/A	1.5 mg/m^3 (skin)	0.1 mg/m^3 (skin)	500 mg/m^3	10.59	Yellow-colored solid sometimes used as a reagent in chemical synthesis, but best known as an explosive material. Liver damage, jaundice; cyanosis; sneezing, coughing, sore throat; peripheral neuropathy, muscular pain; kidney damage; cataract; sensitive dermatitis; leukocytosis; anemia; cardiac irregularities.
2,4,6-Trinitrophenylmethylnitramine (Tetryl)	N/A	N/A	1.5 mg/m^3	N/A	500 mg/m^3	N/A	Explosive compound used to make detonators and explosive booster chargers. Yellow crystalline solid powder material. Sensitization dermatitis, itch, erythematic (skin redness); edema on nasal folds, cheeks, neck; keratitis (inflammation of the cornea); sneezing; anemia; cough, coryza; irritability; malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion), insomnia; nausea, vomiting; liver, kidney damage.
2,4-Dinitrotoluene (DNT)	N/A	N/A	1.5 mg/m^3	0.2 mg/m^3	50 mg/m^3	N/A	Organic compound. Pale yellow crystalline solid, well known as a precursor to TNT. Drowsiness, nausea, weakness. Headache, labored breathing. Blue lips or fingernails.

Table D1-2.1 (continued)
Toxicological and Physical Effects of Chemicals of Concern

Compound	WPL (mg/m^3)	STEL/ VSL (mg/m^3)	OSHA PEL[a]	TLV[b]	IDLH[c]	IP[d] (eV)	Physical Description/Health Effects/Symptoms
Cyclonite (RDX)	N/A	N/A	1.5 mg/m^3 (REL)	N/A	N/A	N/A	Explosive nitroamine that is a white, crystalline solid. Irritation eyes, skin; headache, irritability, lassitude (weakness, exhaustion), tremor, nausea, dizziness, committing, insomnia, convulsions.
Chlorine	N/A	N/A	1 ppm[e]	N/A	10 ppm	11.48	Greenish-yellow gas with a pungent, irritating odor. Exposure through inhalation, skin and/or eye contact. Symptoms include burning of eyes, nose, mouth, rhinorrhea (discharge of thin nasal mucus); cough, choking, substernal pain,; nausea, vomiting; headache, dizziness; syncope; pulmonary edema; pneumonitis; reduced oxygen in blood; dermatitis, frostbite (from contact)

NOTES:
CMA MCP-Chemical Materials Activity Monitoring Control Plan
DA PAM-Department of the Army Pamphlet
N/A-Not available.
REL-Recommended Exposure Limit

a PEL – Permissible Exposure Limit. Occupational Safety and Health Administration (OSHA)-enforced average air concentration to which a worker may be exposed for an 8-hour workday without harm.
b TLV – Threshold Limit Value. Time-weighted average air concentration to which a worker may be exposed for an 8-hour workday without harm. Recommended by the American Conference of Governmental Industrial Hygienists (ACGIH), 2012 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
c IDLH – Immediately Dangerous to Life or Health. Air concentration at which an unprotected worker can escape without debilitating injury or health effects. IDLH values are published in the NIOSH Pocket Guide to Chemical Hazards, November 2010.
d IP – Ionization Potential. Measured in electron volts (eV), used to determine if field air monitoring equipment can detect substance. Values are publish in the NIOSH Pocket Guide to Chemical Hazards, November 2010.
e (ceiling) – Ceiling concentration which should not be exceeded at any time.
f Adamsite Department of Energy TEEL value is 0.016 mg/m^3. (http://www.atlintl.com/DOE/teels/teel/search.html)
g Measured as arsenic.

2.6. Physical Hazards

2.6.1. Severe Weather

During the course of site operations, severe weather may be encountered, including thunderstorms, rainstorms, and other unsafe weather conditions (e.g., high winds and tornadoes, snow, ice or flooding). Criteria indicating that severe weather conditions may exist include:

- High winds (greater than 40 miles per hour – depending on the tree cover and other site-specific conditions)
- Tornado watch or warning in place for an area including the site
- Visible lightning
- Extreme temperatures (e.g., greater than 100 degrees or less than 0 degrees Fahrenheit [^{0}F])
- Heavy rainfall that can create poor ground conditions and make visibility difficult
- Muddy or soft ground that can affect medical support and emergency vehicles.

RSA, as well as MSFC, have audible alarm notification systems for impending severe weather. All site personnel shall be instructed to the warning notification process and alarms. In cases where work is being performed in close proximity to established safe areas (i.e., storm shelters), this will be evaluated and information discussed as a component of the daily safety briefing. During RSA weather-related declared closings, CARA personnel will not attempt to go on site, administratively or otherwise. Conditions may occur where the Program Manager or Project Manager suspends work as a result of unsafe site conditions.

The SSHO/UXOSO is solely responsible for deciding if field activities should cease due to severe weather. The USAESCH Ordnance and Explosives Safety Specialist (OESS) will be consulted prior to the cessation of operations. If work is suspended, the SSHO/UXOSO will notify field team leaders who have radios or cellular telephones. These individuals will be responsible for relaying the work suspension to other personnel in their areas. All personnel will render the work place temporarily closed and move to designated assembly areas or seek shelter within vehicles in the support zone (SZ) for further instruction.

Once the severe weather hazard has passed, the SSHO/UXOSO in consultation with the SUXOS and USAESCH OESS will notify personnel that work may resume. The SSHO/UXOSO will monitor weather forecasts and reports of current weather conditions both before and during field activities to determine if severe weather is forecast or imminent.

Inclement weather may also create conditions that restrict access due to muddy or soft ground conditions. The SSHO/UXOSO in conjunction with applicable support personnel will evaluate environmental conditions and take appropriate action for worker safety.

2.6.1.1. Tornados

A tornado is a violent destructive whirling wind accompanied by a funnel-shaped cloud which progresses in a narrow path over land. Tornadoes are violent storms of short duration which occur during all seasons and in all 50 states. When a tornado is expected in or near the area, a tornado watch is issued by the Weather Bureau. When a tornado watch is issued, the SSHO/UXOSO shall monitor the National Weather Service advisories. A tornado warning is issued when a tornado has actually been sighted. The tornado warning will state where the tornado was sighted, where the tornado is expected to move, and when it is expected to affect the area warned. RSA maintains a

tornado early warning system. Personnel shall be briefed on the audible system and precautionary measures.

When a tornado warning is issued, emergency precautions shall be taken immediately. An emergency alarm shall be sounded and all employees shall move to designated emergency shelters. The predetermined shelter should be located in a reinforced building, the basement of a building, an inner hallway on a lower floor, or a similar location away from windows. A large room with a wide, free-span roof shall not be used.

Battery powered radios shall be available in the event of a power failure. During the tornado alert, weather information shall be monitored for further advisories.

Once a tornado has actually been sighted immediate action should be taken to protect employees from being blown away, struck by falling objects, or injured by flying debris. The best protection is an underground shelter or a substantial steel framed or reinforced concrete building. If none of these shelters are available, have employees assemble in an interior hallway, well away from glass windows. Stay away from glass enclosed places or areas with wide-span roofs such as auditoriums and warehouses. If in a car or mobile home/office type structure, abandon them immediately. Most deaths occur in cars and mobile homes. Leave them and go to a substantial structure or designated tornado shelter.

If in open country and no suitable structure is nearby, lie flat in the nearest ditch or depression and use your hands to cover your head.

After Severe Storms:

- Walk or drive carefully; snakes, scorpions, fallen trees, and power lines may be a hazard.
- Do not attempt to ford water crossing roads.
- Test drinking water for contamination. Wells should be pumped out and tested before drinking.
- Only cleanup crews, medical personnel, and authorized supervisory personnel should be allowed at a disaster area.
- Do not handle live electrical equipment in wet areas. Electrical equipment should be checked and dried before start-up.
- Use battery powered lanterns or flashlights to examine buildings. Flammables may be inside.
- Report broken utility lines to Department of Public Works or local authorities.
- Keep tuned to local radio or television for advice and instructions on where to obtain medical care and assistance for housing, clothing, and food.
- Stay out of flooded areas until advised to go back in.
- Dry out water-impacted building interiors as quickly as possible to prevent mold growth.

Additional information on severe weather is available in the Severe Weather SOP in Attachment 3 of the APP.

2.6.1.2. Lightning

Lightning's distance from you can be estimated noting the time from its flash to the bang of associated thunder. For each five-second count from flash to bang (F-B), lightning is one mile away. Thus, an F-B of 10 means that lightning is 2 miles away, and an F-B of 15 means that lightning is 3 miles away, and so on. Because the distance from Strike A to Strike B to Strike C can be 0.5 to 1.5 miles apart, the lightning safety evacuation plan will be implemented at a count of 30 (7 miles), or as soon as lightning is observed or thunder is heard. This is commonly referred to as the 30/30 rule. In addition, CARA personnel can contact Test Area 1 or 10 where advance lightning detection equipment is available. RSA has warning capabilities associated with MEC operations when lightning is within a 10-mile radius. CARA will utilize this warning notification tool when MEC operations are being conducted.

If a lightning storm is expected or observed, all outdoor site activities must cease. Personnel should seek shelter indoors. A safe shelter may consist of:

- Fully enclosed metal vehicles with windows up.
- Enclosed buildings.
- Low ground away from trees.

Unsafe shelter areas include all nearby outdoor metallic objects such as flagpoles, fences, high mast light poles, gates, etc. Avoid trees, water, and open fields, and avoid using the telephone. Feeling one’s hair standing on end and/or hearing "crackling noises" are signs of being in lightning's electric field. Individuals experiencing these signs will immediately remove objects containing metal or metal parts (including baseball caps), place their feet together, duck their head, and crouch down with their hands on their knees. A waiting period of at least 15 minutes from the last nearby lightning strike will be observed before resuming activities.

People who have been struck by lightning do not carry an electrical charge in their bodies and are safe to handle. Cardiopulmonary resuscitation (CPR) will be performed immediately on victims of a lightning strike by someone qualified to do so. Additionally, emergency help will be immediately sought. The Severe Weather SOP shall be followed (Attachment 3 of the APP).

2.6.2. Hazardous Noise

Planned activities will involve the use of heavy equipment, such as excavation equipment, drill rigs, vacuum systems, portable generators, etc. The unprotected exposure of site workers to this noise during activities can result in noise-induced hearing loss. CARA personnel working on this project shall participate in a hearing conservation program in accordance with CARA’s SOP-001-02, Appendix Q, *Hearing Conservation Program* (Attachment 3 of the APP).

The SSHO/UXOSO shall verify these requirements have been met for each CARA site worker. The SSHO/UXOSO shall ensure that ear protection, such as disposable earplugs, is made available and used by all personnel near operating heavy equipment or other sources of high intensity noise. Hearing protection is required any time the noise level reaches 85 decibels, A-scale or greater. This will be confirmed by taking sound level measurements with a calibrated sound pressure meter when all equipment is mobilized to the site.

2.6.3. Heat Stress

A discussion of heat stress symptoms and heat stress mitigation and prevention is provided in Section 8.0.

2.6.4. Cold Stress

A discussion of cold stress symptoms and cold stress mitigation and prevention are provided in Section 8.0.

2.7. Ionizing Radiation

Workers may be exposed to ionizing radiation when conducting x-raying of munitions. CARA personnel will perform x-ray operations if a suspect CWM item is encountered. CARA will execute this work under CARA SOP-002-01, *Radiographic Operations*, and CARA SOP-003-01, *Radiation Safety for Use of the PINS* (Attachment 3 of the APP). All personnel not directly involved with the x-ray operations will depart the x-ray location during such operations.

2.8. Biological Hazards

2.8.1. Snakes

There are various types of venomous snakes indigenous to Alabama. Venomous snakes include the copperhead, eastern cottonmouth, and timber rattlesnake. The degree of toxicity resulting from snake bites depends on the potency of the venom, the amount of venom injected, and the size of the person bitten. Poisoning may occur from injection or absorption of venom through cuts or scratches. About 8,000 people are bitten by venomous snakes a year in the United States; however, only 5-10 people die. In contrast, 15,000 to 20,000 die every year from the side effects of aspirin. Venomous snake bites are medical emergencies, and they can be deadly if not treated quickly. However, the chances of being envenomed are extremely low. Getting the victim to an emergency room as soon as possible is the very best treatment.

Three of Alabama’s venomous snake species (copperhead, eastern cottonmouth, and timber rattlesnake) are pit vipers (Figure D1-2.1). The "pit" in pit viper refers to the heat-sensing pit located between the eye and the nostril on either side of the snake's head. In addition to the heatsensing pit, all three of these venomous snakes have vertical pupils. All harmless snakes in Alabama have round pupils and lack the heat-sensing pits. Another characteristic of all Alabama's venomous snakes is the single row of scales on the underside of the tail after the anal plate (vent). While close inspection of a snake's face and/or its tail is a definitive way to distinguish a venomous snake from a harmless species, it requires one to get dangerously close to a potently dangerous animal. It is far better to learn the pattern and coloration of a few snakes so that a specimen can be identified from a safe distance.

The best snakebite treatment is to avoid being bitten. The following suggestions will help in this process:

- Learn to identify poisonous snakes – this will be reviewed during site-specific safety training. Regardless of type, all snakes should be avoided.
- Wear long pants and work boots as protection and/or snake chaps when applicable.
- Watch where you sit and where you place your hands and feet.

- Avoid rock piles, stacks of old boards, and brush in wooded areas. If movement is necessary, use a remote means to initially relocate the material. Prior to entering a heavily wooded or brush area, look and listen carefully.
- Never handle any snake, whether dead or alive. According to the Centers for Disease Control and Prevention (CDC), most snakebites are the direct result of handling or harassing snakes, which bite as a defensive measure.
- Do not attempt to capture or kill ANY snakes.

A snake bite is usually characterized by extreme pain and swelling at the site of the bite; the presence of one or more puncture wounds created by the fangs; and a general skin discoloration. The manifestations of the bite include general weakness, rapid pulse, nausea and vomiting, shortness of breath, dimness of vision, tingling or numbness of the tongue, mouth or scalp, and shock.

Physical reactions are aggravated by acute fear, anxiety, the amount of venom injected and the speed of absorption of venom into the victim's circulation, the size of the victim, protection provided by clothing (including shoes and gloves), quick antivenom therapy, and location of the bite.

First Aid – The rules to follow if someone is bitten by a snake are:

1) Allow bite to bleed freely for 15-30 seconds.
2) Cleanse and rapidly disinfect area with Betadine, assuming the victim is not allergic to iodine, fish or shellfish. Remove clothing (pant legs, shirt sleeves, rings and jewelry on bitten side).
3) If bite is on the hand, finger, foot or toe, wrap the leg/arm rapidly with 3" to 6" Ace or crepe bandage past the knee or elbow joint immobilizing it. Overwrap bite marks. But first, if possible, apply hard direct pressure over bite using a 4 x 4 gauze pad folded in half twice to 1 x 1. Tape in place with adhesive tape. Soak gauze pad in Betadine solution if available and victim is not allergic to iodine, fish or shellfish.
4) Strap gauze pad tightly in place with adhesive tape.
5) Overwrap dressing above, over and below bite area with ACE or crepe bandage, but not too tight. Wrap ACE (elastic) bandage as tight as one would for a sprain, but not too tight (you should be able to fit two fingers under the bandage). Check for pulses above and below elastic wrap; if absent it is too tight. Unpin and loosen. If pulses are strong (normal) it may be too loose.
6) Immobilize bitten extremity, use splinting if available.
7) If possible, try to keep the bitten extremity at heart level or in a gravity-neutral position. Raising it above heart level can cause venom to travel into the body. Holding it down, below heart level can increase swelling.
8) Evacuate to nearest hospital or medical facility as soon as possible
9) If possible, try to get a good look at the snake so it can be identified for proper selection of anti-venom, but do not try to capture or kill it.

10) Bites to face, torso or buttocks are more of a problem. ACE/crepe bandaging cannot be applied to such bites. A pressure dressing made of a gauze pad may help to contain venom.

Do not make an incision through the fang marks; this procedure is too hazardous to underlying structures and at best removes only 20% of the venom. Do not use cold compresses, ice, dry ice, chemical ice packs, spray refrigerants, or other methods of cold therapy.

Several other factors must be considered by the caregiver:

1) **Shock** - The victim should remain in a comfortable prone position and body temperature should be stabilized.
2) **Breathing and heartbeat** - If breathing stops, mouth-to-mouth resuscitation should be administered. If breathing stops and there is no pulse, cardiopulmonary resuscitation (CPR) should be performed by a trained individual.
3) **Medicine to relieve the pain** - The victim should not be given alcohol, sedatives, or any medicine containing aspirin. Some painkillers may be given after consulting with a doctor or medical personnel for specific medications that may be used.

Identification Features -- Non-poisonous snakes are often erroneously identified as poisonous. The features identified in Table D1-2.2 will assist in properly identifying a snake as poisonous or non-poisonous.

Table D1-2.2
Snake Identification Features

Feature	Poisonous	Non-Poisonous
Eye Pupils	Elliptical, or cat-like	Round
Sensing Pits	Pit between the eyelids and nostrils	No pit between the eyelids and nostrils
Teeth	Two enlarged teeth (fangs) in front of the upper jaw	All teeth are approximately the same size
Scales	Form a single row on the underside and below the tail	Arranged in a double row on the underside of the tail
Head	Head much wider than the neck	Head slightly wider than the neck
Tail	Single anal plate	Divided anal plate

Figure D1-2.1
Snake Illustrations

D1-2.1a – Copperhead

D1-2.1b – Eastern Cottonmouth

D1-2.1c – Timber Rattlesnake

2.8.2. Alligators

Alligators (Figure D1-2.2) occur from southeast Oklahoma and east Texas on the western side of their range and from North Carolina to Florida on the eastern side of their range. They prefer freshwater lakes, slow-moving rivers, and their associated wetlands; but they also can be found in brackish water habitats. They have been reportedly spotted in the Tennessee River and other aquatic habitats on RSA, such as the Wheeler National Wildlife Refuge. Evidence suggests that back in the 1970s approximately 13 alligators were set loose in Swan Pond inside Test Area 1.

Alligators are ectothermic (cold blooded); they rely on external sources of heat to regulate their body temperature. Alligators control their body temperature by basking in the sun or moving to areas with warmer or cooler air or water temperatures. Alligators are most active when temperatures are between 82° to 92°F (28° to 33° Celsius[^{o}C]). They stop feeding when the ambient temperature drops below approximately 70°F (21°C), and they become dormant below 55°F (13°C). Alligators are dormant throughout much of the winter season. During this time, they can be found in burrows (or "dens") that they construct adjacent to an alligator hole or open water, but they occasionally emerge to bask in the sun during spells of warm weather.

The following guidelines should be followed when working in known alligator communities:

- Be aware of the possibility of alligator attacks when in or near fresh or brackish water bodies. Attacks may occur when people do not pay close enough attention to their surroundings. Alligators are most active between dusk and dawn. Alligators mate in April and May and nest in June and July. During the mating season, males may become territorial. During the nesting season, females will defend their nests at all costs.
- Remain farther than 25 feet from an alligator, and do not attempt to harass. Larger alligators have been known to jump 6 feet in a split second and can achieve speeds of up to 30 miles per hour.
- DO NOT feed alligators; it is unlawful. Report anyone that you see feeding alligators to RSA Security. A fed alligator is one who has learned to associate humans with food.

A majority of alligator attacks occur in shallow water when the victim had been splashing around. To the alligator, this signals that a wounded animal has entered the water. If attacked, fight back by hitting the alligator. In a majority of alligator attack cases, the victim was released when the victim smacked the alligator on the head. Do not attempt a tug-of-war with the alligator, this will usually encourage the alligator to pull back and maneuver into a “death roll”, often resulting in the loss of a limb. DO NOT try to pry the alligator’s mouth open; the average alligator compresses his mouth with a force of approximately 3000 pounds per square inch.

Alligator bites will typically require more active first aid, depending on the severity of the attack. Alligators harbor a number of very infectious bacteria in their mouth, so even a mild attack can result in a life-threatening infection.

Some common rules to administer first aid in the event of an alligator bite include:

1) If the attack has resulted in the amputation of a limb, control bleeding on the stump (the part of the amputated limb still attached to the victim). Use pressure directly on the wound and elevate the limb above the heart if possible. Do not use a tourniquet unless medical

care will be delayed for several hours. Once bleeding is controlled, treat the victim for shock.

2) If bite is on the hand, finger, foot or toe, wrap the leg/arm rapidly with 3" to 6" Ace or crepe bandage past the knee or elbow joint immobilizing it. Overwrap bite marks. But first, if possible, apply hard direct pressure over bite using a 4 x 4 gauze pad folded in half twice to 1 x 1. Tape in place with adhesive tape. Soak gauze pad in Betadine solution (assuming the victim is not allergic to iodine, fish or shellfish). Strap gauze pad tightly in place with adhesive tape
3) Overwrap dressing above, over and below bite area with ACE or crepe bandage, but not too tight. Wrap ACE (elastic) bandage as tight as one would for a sprain, but not too tight. Check for pulses above and below elastic wrap; if absent it is too tight. Unpin and loosen.
4) Check the bitten extremity to see if there are any broken bones. If found, immobilize by use splinting, if available.
5) Evacuate to nearest hospital or medical facility as soon as possible

Figure D1-2.2
Alligator Illustration

2.8.3. Insect and Arachnid Bites and Stings

Poisonous insects and insect-like creatures that may be encountered include the following:

- Spiders
- Bees (honeybees, bumble bees, wasps, and hornets)
- Fire ants
- Scorpions
- Chiggers
- Ticks

If insect bites become red or inflamed, or if symptoms such as nausea, dizziness, shortness of breath, etc., appear, notify your SSHO/UXOSO. Immediate care is needed if a person is highly allergic to insect bites/stings. Personnel with insect sting allergies should inform the SUXOS and SSHO/UXOSO. Personnel who have significant reactions from insect stings should carry appropriate medication prescribed by their physician. If an allergic person receives a spider bite or insect bite/sting, seek immediate medical attention, keep the victim calm, and check vital signs frequently.

2.8.3.1. Spiders

The two poisonous spiders likely to be encountered are the brown recluse and the black widow (Figure D1-2.3). The brown recluse is up to one inch long with a violin or "fiddle" shaped mark on the top of the head. The black widow is a smaller, bulbous black spider with a red hourglass-shaped mark on the underside.

Workers involved in brush clearing, surveying, and other similar activities should avoid spiders and webs.

Persons who are believed to have been bitten by a brown recluse or black widow spider should be immediately transported to the occupational clinic or hospital. The spider should be collected (if possible) for confirmation of the species. Reactions to a brown recluse spider bite include mild to severe pain within two to eight hours and a star-shaped area around the bite within three to four days. Significant tissue death and loss accompanies a brown recluse spider bite. Reactions to a Black Widow spider include intense pain at the site of the bite after approximately 15 to 60 minutes, followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils, and generalized swelling of face and extremities.

Figure D1-2.3
Spider Illustrations

D1-2.3a – Brown Recluse

D1-2.3b – Black Widow

2.8.3.2. Ticks

Ticks are vectors of many different diseases, including Rocky Mountain spotted fever, Q fever, tularemia, Colorado tick fever, and Lyme disease (Figure D1-2.4). Ticks attach to their host's skin and intravenously feed on its blood, creating an opportunity for disease transmission. The first symptoms of disease are flu-like chills, fever, headache, dizziness, fatigue, stiff neck, and bone pain. If immediately treated by a physician, most individuals recover fully in a short period of time. If not treated, more serious symptoms can occur. Recently, Lyme disease has been the most prevalent type of disease transmitted by ticks in the United States.

If a site employee believes he/she has been bitten by a tick, or if any of the signs and symptoms appear, the employee will contact the SSHO/UXOSO, who will notify the CARA Safety Officer and USAESCH OESS. An evaluation will be made to visit a physician for an examination and possible treatment.

The following precautions should be taken when working in areas that might be infested with ticks:

1) Cover your body as much as possible. Wear long pants and long-sleeved shirts. Light-color clothing makes spotting of ticks easier.
2) Try to eliminate possible paths by which the tick may reach unprotected skin. For example, tuck bottoms of pants into socks or boots and sleeves into gloves (duct tape may be used to help seal cuffs and ankles). If heavy concentrations of ticks or insects are anticipated or encountered, Tyvek® coveralls may be used for added protection.
3) Conduct periodic and frequent (e.g., hourly) surveys of your clothing for the presence of ticks. Remove any ticks and insects that become attached to clothing.
4) Spray outer clothing, particularly your pant legs and socks, but not your skin, with an insect repellent that contains permethrin or permanone; or use a repellent with N,N-diethyl-meta-toluamide, which can be applied to the skin.
5) When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible.
6) Tuck pant legs into boot tops or tape pants to boot tops to prevent ticks from crawling up the pant leg (this may not be an option at sites where extreme heat stress is anticipated).

If a tick is discovered, the following procedures can be used to remove it:

1) Do not detach a tick with your bare fingers; bacteria from a crushed tick may be able to penetrate even unbroken skin. Fine-tipped tweezers should be used.
2) Grip the tick as close to your skin as possible and gently pull it straight away from you until it releases its hold.
3) Do not twist the tick as you pull, and do not squeeze its bloated body. That may actually inject bacteria into your skin.
4) If the tick resists, cover the tick with salad oil for about 15 minutes to asphyxiate it, and then remove it with tweezers.
5) Do not use matches, a lit cigarette, nail polish or any other type of chemical to “coax” the tick out.

6) Be sure to remove all parts of the tick's body, thoroughly wash your hands and the bite area with soap and water, and disinfect the area with alcohol or a similar antiseptic after removal.
7) For several days to several weeks after removal of the tick, look for the signs of the onset of Lyme disease, such as a rash that looks like a bulls-eye or an expanding red circle surrounding a light area.
8) Look for the signs of the onset of Rocky Mountain spotted fever, such as a rashlike inflammation consisting of red spots under the skin that appear 3 to 10 days after the tick bite.
9) Notify the UXOSO of any tick bites as soon as possible.

Figure D1-2.4
Tick Illustration

2.8.3.3. Chiggers

Chiggers are red, six-legged arachnids. Chiggers are barely visible to the naked eye (their length is less than 1/150th of an inch) (Figure D1-2.5). Chiggers do not burrow into the skin. They generally attach to those areas of the body where clothing fits tightly, such as at the sock line and waistline, and they feed at the base of a hair follicle or in a pore. Chiggers usually dislodge within several hours of attachment. The bites commonly cause itching in about 3 to 6 hours, and dermatitis develops in about 10 to 16 hours. Some people experience allergic reactions to the bites and develop blister-like lesions. Chiggers most commonly live in forests, grassy fields, gardens, parks, and in moist areas around lakes or rivers. Most of the larvae that cause chigger bites are found on plants that are relatively close to the ground surface, because they require a high level of humidity for survival.

For personal protection, apply insect repellent to clothing and exposed skin.

Figure D1-2.5
Chigger Illustration

2.8.3.4. Fire Ants

Fire ants are aggressive, reddish-brown to black ants that are 1/8 inch to 1/4 inch long (Figure D1-2.6). They construct nests that are often visible as dome-shaped mounds of soil, sometimes as large as 3 feet across and 1½ feet in height. In sandy soils, mounds are flatter and less visible. Fire ants usually build mounds in sunny, open areas such as lawns, pastures, cultivated fields, and meadows, but they are not restricted to these areas. Mounds or nests may be located in rotting logs, around trees and stumps, under pavement and buildings, and occasionally indoors. Fire ants use their stingers to immobilize or kill prey and to defend ant mounds from disturbance by larger animals, such as humans. Any disturbance sends hundreds of workers out to attack anything that moves. The ant grabs its victim with its mandibles (mouthparts) and then inserts its stinger. The process of stinging releases a chemical alerts other ants and induces them to sting. In addition, one ant can sting several times without letting go with its mandibles.

Once stung, humans experience a sharp pain that lasts a couple of minutes. Then the sting starts itching and a welt appears. Fire ant venom contains alkaloids and a relatively small amount of protein. The alkaloids kill skin cells; this attracts white blood cells, which form a pustule within a few hours of being stung. The fluid in the pustule is sterile, but if the pustule is broken, the wound may become infected. The protein in the venom can cause allergic reactions that may require medical attention -- nausea, vomiting, dizziness, perspiration, cyanosis, and asthma.

Site personnel will comply with the following work practices:

1) Personnel with a known hypersensitivity to fire ants will inform the SUXOS and UXOSO of this condition prior to performing site activities.
2) Personnel with a known hypersensitivity condition will keep emergency medication available.
3) All personnel will remain vigilant for the presence of fire ants. The location of discovered mounds will be reported to other site personnel.
4) If stung, immediately inform the UXOSO to receive treatment (same as for other biting insects) and observe for allergic reaction.

Figure D1-2.6
Fire Ant Illustration

2.8.3.5. Mosquitoes

Mosquitoes are vectors for West Nile virus (WNV) infection, a condition that can vary in presentation in different individuals (Figure D1-2.7). Most persons who become infected with WNV develop no clinical illness or symptoms. West Nile Fever – Of the approximately 20 percent of infected people who develop symptoms, most develop what has been termed West Nile fever. Symptoms include fever, headache, fatigue, skin rash on the trunk of the body (occasionally), swollen lymph glands (occasionally), and eye pain (occasionally). The incubation period for the development of these symptoms is 2 to 14 days.

2.8.3.5.1. West Nile Meningitis/Encephalitis

Severe infections involve the central nervous system, resulting in aseptic meningitis and encephalitis. Characteristic symptoms of meningitis include fever, headache, stiff neck, and changes in the white cells of the spinal fluids (Pleocytosis) with a predominance of lymphocytes. Characteristic symptoms of encephalitis include fever, headache, alteration of consciousness, lethargy, confusion, coma, limb paralysis, and cranial nerve palsies and tremors.

West Nile poliomyelitis is a flaccid paralysis syndrome associated with WNV infection and is less common than meningitis or encephalitis. This syndrome is generally characterized by the acute onset of asymmetric limb weakness or paralysis in the absence of sensory loss. The paralysis can occur in the absence of fever, headache, or other common symptoms associated with WNV. Paralysis of the respiratory muscles leading to respiratory failure can sometimes occur (fatal).

WNV infection can be suspected in a person based on geographical location, clinical symptoms, and patient history; but laboratory testing is required for a confirmed diagnosis. The most efficient diagnostic method is the detection of specific antibodies to WNV in serum collected within 8 to 14 days of illness onset or cerebral spinal fluid collected within 8 days of illness onset.

WNV Treatment – There is no specific treatment for WNV infection. The more severe infections may require hospitalization and supportive care to prevent secondary infections.

2.8.3.5.2. Hazard Mitigation and Prevention

The best way to prevent infections with WNV and other mosquito-borne diseases is to avoid getting mosquito bites. Cover up by wearing shoes, socks, long-sleeved shirts, and long pants.

Consider using a mosquito repellant that contains N,N-diethyl-meta-toluamide on exposed skin. Carefully read and follow directions on the container and wash treated skin when mosquito exposure has ended. All mosquitoes need standing water for the first stages of development. Eliminate stagnant water around the work areas, where mosquitoes can lay eggs, by disposing of old tin cans, jars, tires, and any other container that can hold water. Stack tubs, buckets, barrels, etc. upside down so that water cannot accumulate in them.

Figure D1-2.7
Mosquito Illustration

2.8.3.6. Bees, Wasps, Hornets, and Other Insects

Contact with stinging insects like bees, wasps, hornets, and yellow jackets may result in site personnel experiencing adverse health effects that range from mild discomfort to a life threatening reaction (Figure D1-2.8). Therefore, stinging insects present a serious hazard to site personnel, and extreme caution must be exercised whenever site and weather conditions increase the risk of encountering stinging insects.

Nests and hives for bees, wasps, hornets, and yellow jackets often occur in ground, trees, and brush. The area will be checked for obvious nests and hives before it is cleared. If a nest or hive is found, the SSHO/UXOSO will be contacted before the nest is disturbed or removed. Bites and stings can be painful and may elicit an allergic reaction.

Individuals with life-threatening allergies shall not work in areas where there is a great potential for insect stings. If simple first-aid measures do not alleviate the symptoms following an insect sting, the victim will be taken to the nearest medical center. An attempt will be made to kill the offending insect and take it to the emergency room with the victim if this can be done quickly and without endangering personnel.

Some of the factors related to stinging insects that increase the degree of risk associated with accidental contact are:

- The nests for these insects are frequently found in remote, wooded, grassy areas.
- The nests can be situated in trees, rocks, bushes, or in the ground and are usually difficult to see.
- Accidental contact with these insects is highly probable, especially during warm weather conditions when the insects are most active.

- If a site worker accidentally disturbs a nest, the worker may be inflicted with multiple stings, causing extreme pain and swelling that can leave the worker incapacitated and in need of medical attention.
- Some people are hypersensitive to the toxins injected by a sting and, when stung, experience a violent and immediate allergic reaction resulting in a life-threatening condition known as anaphylactic shock.
- Anaphylactic shock manifests itself very rapidly and is characterized by extreme swelling of the body, eyes, face, mouth, and respiratory passages.
- The hypersensitivity needed to cause anaphylactic shock can, in some people, accumulate over time and exposure; therefore, even if someone has been stung previously and has not experienced an allergic reaction, there is no guarantee that they will not have an allergic reaction upon receipt of another sting.

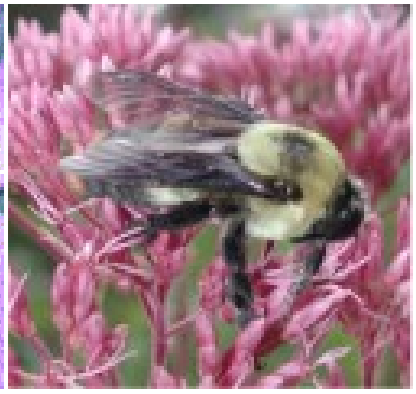
With these things in mind and with the high probability of contact with stinging insects, all site personnel shall comply with safe work practices:

1) If a worker knows that he is hypersensitive to bee, wasp, or hornet stings, he must inform the SSHO/UXOSO of this condition prior to participation in site activities. The SSHO/UXOSO will question all site personnel concerning allergies or sensitivities prior to initiating work on site.
2) All site personnel shall be watchful for the presence of stinging insects and their nests and shall advise the UXOSO if a stinging insect nest is located or suspected in the area.
3) Any nests located on site shall be flagged off, and site personnel shall be notified of its presence.
4) If stung, site personnel shall immediately notify the UXOSO to obtain treatment and allow the UXOSO to observe them for signs of allergic reaction.
5) Site personnel with a known hypersensitivity to stinging insects shall keep required emergency medication on or near their person at all times.

Stings of bees, wasps, and hornets are responsible for more deaths in the United States than bites and stings of all venomous creatures. This is due to the sensitization by the victim to the venom from repeated stings, which can result in anaphylactic reactions. The stinger may remain in the skin and should be removed by teasing or scraping rather than pulling. An ice cube placed over the sting will reduce pain. An analgesic-corticosteroid lotion is often used. People with known hypersensitivity to such stings should carry a kit containing antihistamine and epinephrine. Acquisition and maintenance of these kits is the responsibility of the individual.

Figure D1-2.8
Bees, Wasps, Hornets, and Other Insects Illustrations

D1-2.8a – Western Honey Bee



D1-2.8b – Bumblebee

D1-2.8c – Yellow Jacket

D1-2.8d – Paper Wasp

D1-2.8e - Hornet

2.8.4. Poisonous Plants

Poison ivy (*Rhus radicans*), Poison oak (*Rhus diversiloba*), and poison sumac (*Rhus vernex*) are identified by three or five leaves radiating from a stem (Figure D1-2.9). The plant tissues have an oleoresin, which is active in live, dead, and dried parts and produces a delayed allergic hypersensitivity. The oleoresin may be carried through smoke, dust, contaminated articles, and the hair of animals. The best antidote for poisonous plants is recognition and avoidance.

Poison ivy has three almond-shaped leaflets ranging from light green (usually the younger leaves) to dark green (mature leaves), turning bright red in fall. The leaflets of mature leaves are somewhat shiny. The leaflets are 3 to 12 centimeters (cm) long, rarely up to 30 cm. Each leaflet has a few or

no teeth along its edge, and the leaf surface is smooth. Leaflet clusters are alternate on the vine, and the plant has no thorns. Vines growing on the trunk of a tree become firmly attached through numerous aerial rootlets. Flowering occurs from May to July. The yellowish- or greenish-white flowers are typically inconspicuous and are located in clusters up to 8 cm above the leaves. The berry-like fruit, a drupe, mature by August to November with a grayish-white color.

Atlantic poison oak is an upright shrub that can grow to 1 meter (3 feet) tall. The leaves are 15 cm (6 inches) long, alternate, with three leaflets on each. The leaflets are usually hairy and are variable in size and shape, but most often resembling white oak leaves; they usually turn yellow or orange in autumn. The fruit is small, round, and yellowish or greenish.

Poison sumac is a shrub or small tree, up to 20 feet in height, with 7-13 leaflets per leaf. These are oval to oblong, acuminate (tapering to a sharp point), cuneate (wedge-shaped) at the base, undulate (wavy-edged), underside is glabrous (hair-less) or slightly pubescent (down-like hair) beneath, and usually 2-4 inches long. Its flowers are greenish, in loose axillary panicles (clusters) 3-8 inches long. The fruits are subglobose (not quite spherical), gray, flattened, and about 0.2 inches across.

The allergic reaction associated with exposure to these plants will generally cause the following signs and symptoms:

- Blistering at the site of contact, usually occurring within 12 to 48 hours after contact.
- Reddening, swelling, itching, and burning at the site of contact.
- Pain, if the reaction is severe.
- Conjunctivitis, asthma, and other allergic reactions if the person is extremely sensitive to the poisonous plant toxin.

Crusting and scaling occurs within a few days. Symptoms usually disappear in 1 to 2 weeks in cases of mild exposure and up to 3 weeks when exposure is severe.

Reaction to poisonous plants can be prevented if the exposed skin is washed with mild soap and water within 10 minutes of contact. Contact can be prevented by site workers wearing appropriate clothing.

Preventive measures that can prove effective for most site personnel are:

1) Avoid contact with any poisonous plants and keep a steady watch to identify, report, and mark poisonous plants found outside.
2) Clean tools suspected of being in contact with poisonous plants.
3) Wash hands, face, or other exposed areas at the beginning of each break period and at the end of each workday.
4) Avoid contact with, and wash on a daily basis, contaminated tools, equipment, and clothing.
5) Barrier creams, detoxification and wash solutions may prove effective and should be tried to find the best preventive solution.
6) Avoid spreading oils from these plants to hands, other parts of the body, and onto surfaces where other personnel without proper PPE may become affected.

Figure D1-2.9
Poisonous Plants Illustrations

D1-2.9a – Poison Ivy D1-2.9b – Poison Oak D1-2.9c – Poison Sumac

2.8.5. Bloodborne Pathogens

Bloodborne pathogens enter the human body and blood circulation system through punctures, cuts, or abrasions of the skin or mucous membranes. They are not usually transmitted through ingestion (swallowing), through the lungs (breathing), or by contact with whole, healthy skin. However, under the principle of universal precautions (see below), all blood should be considered infectious, and all skin and mucous membranes should be considered to have possible points of entry for pathogens.

Potential bloodborne pathogen exposures include those instances listed below and personnel should wear the proper PPE (including gloves and masks when appropriate) to prevent exposure to bloodborne pathogens.

Potential exposures include:

- Contact with contaminated medical equipment or medical waste or sharps,
- Medical emergency response operations such as administering first aid or CPR, and
- Contact with human wastes such as domestic sewage.

2.8.6. Rats, Mice, and Bats

Rats, mice, and bats may be found at this site. These animals may carry rabies and they should be avoided. In addition, Hanta Virus is also a concern when encountering these animals. Hanta Virus is a disease spread primarily from infected rodent droppings. Hanta Virus results from intimate contact with rodents, such as may occur in agricultural areas with dense human and rodent populations or during soil excavation. Hanta virus is not transferred from person to person. The overwhelming evidence is that spread is from rodent to humans through contact with infected rodent secretions or airborne transmission by infected dust particles.

If rodent nests are discovered, field team members should be apprised of their locations and should avoid working adjacent to the nests. If work must be performed at that location, a 5% bleach solution should be sprayed on the nest and adjacent areas to kill the virus. If work must be performed at a location where rodent infestation is evident, personal protective equipment should be worn.

The PPE ensemble will include:

- Full face air purifying respirator (APR) with N-100 cartridges,
- Coveralls,
- Boot covers, and
- PVC or latex gloves.

Preventative measures should focus on cleaning all cuts and scratches with soap and water, followed by rinsing with hydrogen peroxide. Put liquid skin on the affected areas. The best preventative measure is to avoid all rodent nests during field work.

2.9. Action Levels and Mitigation Methods

2.9.1. Implementation of Engineering Controls and Work Practices

Engineering controls and work practices will be implemented as necessary based on the criteria discussed in the hazard mitigation and prevention sections above.

2.9.2. Upgrades/Downgrades in Levels of PPE

The level of PPE needed to protect employees from site hazards and the situations that would dictate an upgrade or downgrade in PPE is discussed in Section 9.0 of the APP.

2.9.3. Work Stoppage and/or Emergency Evacuation of On-Site Personnel

All employees have the right and obligation to request a work stoppage if they observe an unsafe condition or behavior. The SSHO/UXOSO will determine if an emergency evacuation is necessary in addition to a work stoppage.

2.9.4. Prevention and/or Minimization of Public Exposure

The prevention and/or minimization of public exposure to hazards created by site activities are discussed Section 9.7.

3.0 Staff Organization, Qualifications and Responsibilities

Sections 3.5.3 and 3.5.4 of the Work Plan provides detail on the project team, qualifications, and responsibilities of the different organizations and staff involved in this project. Section 3.0 of the APP provides the identification and accountability of personnel responsible for safety.

4.0 Training

Training requirements are discussed in Section 5.0 of the APP.

5.0 Personal Protective Equipment

PPE is discussed in Section 9 of the APP. Personnel engaged in hazardous waste operations are required to be enrolled in a medical monitoring program as required by 29 CFR 1910.120. A letter signed by a physician attesting to each worker's fitness for duty must be provided to the SSHO/UXOSO prior to beginning work. A copy of these letters will be filed onsite. Medical Surveillance, Control/Access to Employee Medical Records, and Emergency Care is described CARA Policy Statement #16, *Workers' Compensation* (Attachment 3 of the APP).

6.0 Medical Support

Medical Support is discussed in Section 8.0 of the APP.

7.0 Exposure Air Monitoring and Air Sampling Program

7.1. Introduction

Airborne exposure limits (AELs) for CA have been adopted by the U.S. Army for chemical workers and the general population. The exposure limits apply to all CA operations and activities conducted where the probability for contact with CA is greater than "seldom" as determined by an approved Determination of Applicability or other acceptable and approved risk assessment document. The AELs for CAs, along with exposure limits for other airborne hazards, are discussed in more detail in the following sections.

7.2. Organizational Responsibilities

CARA is responsible for the overall coordination of the field operations. Key personnel related to the air monitoring are the Site Supervisor and/or SUXOS, the SSHO/UXOSO, the Down Range Team Leader, PDS Supervisor, and the Air Monitoring Team.

7.2.1. SUXOS

Besides directing the overall operations, the Site Supervisor and/or SUXOS assists the SSHO/UXOSO with reporting the results of the air monitoring with site workers (when received from the Air Monitoring Team) and forwards all air monitoring records to the appropriate organizations, if required. The purpose of forwarding air monitoring records is to assist those organizations with maintaining exposure records for their workers.

7.2.2. SSHO/UXOSO

The SSHO/UXOSO briefs the site workers on the results of air monitoring and is responsible for changes to PPE level. The SSHO/UXOSO is responsible for ensuring that health education materials used in worker training programs are readily accessible to all individuals with an exposure potential to CAs and industrial chemicals. The SSHO/UXOSO must also verify that all of the required health-related training has been conducted and has been renewed annually (Section 7.9).

The SSHO/UXOSO is responsible for coordinating for the monitoring of selected industrial chemicals and airborne particulates (when using heavy equipment) during excavation operations. This air monitoring will be conducted with approved industrial air monitors, photoionization detectors (PIDs), colorimetric tubes, and particulate air monitors.

7.2.3. Down Range Team

A more detailed discussion of the Down Range Team air monitoring responsibilities is included in Section 7.6.

7.2.4. PDS Supervisor

The PDS Supervisor is responsible for coordinating the CA monitoring of potentially contaminated personnel in the PDS after decontamination has been conducted.

7.2.5. Air Monitoring Team

The responsibilities of the Air Monitoring Team include:

- Conduct on-site analysis and confirmation for air samples collected from workspace, headspace, quadrant, and perimeter monitoring.
- Collect and retain all CA-related air monitoring data related to CA and industrial chemicals. Resulting data analysis from daily air monitoring should be summarized and presented to the SSHO/UXOSO, Site Supervisor, and the USAESCH OESS. A complete data submittal will be provided to the USAESCH Project Manager at the completion of the project.

A more detailed discussion of the Air Monitoring Team's procedures and responsibilities is included in the Air Monitoring Plan (Appendix J of the Work Plan).

7.3. Definitions

7.3.1. Airborne Exposure Limit (AEL)

AELs are the allowable concentrations in the air for workplace and general population exposures. AELs include IDLHs, WPLs, STELs, PELs, and TLVs.

7.3.2. Excursion

An increase in the concentration of CA, industrial chemical, or particulate present in an environment above a given concentration reference point, e.g., the concentration goes above the WPL's 8-hour time-weighted average (TWA) concentration.

7.3.3. Immediately Dangerous to Life or Health (IDLH)

An atmosphere that poses an immediate threat to life and health would cause irreversible adverse health effects or would impair an individual's ability to escape from a dangerous atmosphere, regardless of PPE use. For planning purposes, the respirator wearer shall be unaffected by the environment for up to 30 minutes without any respirator being worn. IDLH also includes atmospheres where oxygen content by volume is less than 19.5 percent.

7.3.4. Worker Population Limit (WPL)

The WPL is the maximum allowable 8-hr TWA concentration that an unmasked worker can be exposed to for an 8-hour workday and 40-hour week for 30 years without adverse effect.

7.3.5. Short-Term Exposure Limit (STEL)

The STEL is the maximum concentration to which unprotected chemical workers may be exposed to for up to 15 minutes continuously.

7.3.6. Permissible Exposure Limit (PEL)

The Occupational Safety and Health Administration (OSHA) sets PELs to protect workers against the health effects of exposure to hazardous substances. PELs are regulatory limits on the amount or concentration of a substance in the air. OSHA PELs are based on an 8-hour TWA exposure and may be reported as a TWA exposure limit, a 15-minute STEL, or a ceiling (*NIOSH Pocket Guide to Chemical Hazards*, November 2010).

7.3.7. Threshold Limit Value® (TLV)

TLVs are advisory exposure guidelines, not legal standards, established by the American Conference of Government Industrial Hygienists (ACGIH®). TLVs refer to airborne concentrations of chemical substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime without adverse health effects. The TLV may be a TWA exposure limit (TLVTWA), a 15-minute STEL (TLV-STEL), or a ceiling (TLV-C) (*ACGIH 2015 Threshold Limit Values for Chemical Substances, Physical Agents, and Biological Exposure Indices*).

7.4. Monitoring Requirements

The Implementation Guidance Policy requires that any workplace associated with, near, or surrounding activities involving CA will be monitored. Air monitoring for both the WPL and the STEL are required when CA is potentially present.

References for the guidance policy follow.

1) *Memorandum, Implementation Guidance Policy for New Airborne Exposures Limits for GB, GA, GD, GF, VX, H, HD, and HT*, Raymond J. Fatz, Deputy Assistant Secretary of the Army (Environment, Safety and Occupational Health) OASA (I&E), dated June 18, 2004.

2) *Implementation Guidance Policy for Revised Airborne Exposures Limits for GB, GA, GD, GF, VX, H, HD, and HT*, Department of the Army, Office of the Assistant Secretary of the Army Installations and Environment, 18 June 2004.

3) *Centers for Disease Control Interim Recommendations for Airborne Exposure Limits for Chemical Warfare Agents H and HD (Sulfur Mustard),* U.S. Department of Health and Human Services, Centers for Disease Control, *Federal Register*, Vol. 69, No. 85, Monday, May 3, 2004, p. 24164-24168.

7.4.1. WPL Monitoring

WPL monitoring applies only to specified CAs during this project and will be performed for identified areas where workers may have an exposure potential to CA. The monitoring may be either historical, real-time, or near-real-time based on the Air Monitoring Plan for the site (Appendix J of the Work Plan). Records will be maintained of excursions above the WPL including location, time, date, and the names of potentially exposed personnel, at a minimum. Historical monitoring for the WPL is conducted using Depot Area Agent Monitoring System (DAAMS) located at the work site. WPL monitoring for CA will be conducted during all intrusive activities.

7.4.2. STEL Monitoring

Areas involving operations where a release of CA into the operating environment at levels exceeding the STEL can reasonably be expected to occur will be monitored. This will be defined as areas where excavation for suspected CWM occurs or other locations where a potential release of CA might occur. The monitoring will be conducted using equipment capable of measuring the CA level in real-time or near-realtime ensuring that the duration of 15 minutes associated with the STEL is not exceeded. The monitoring equipment must be set to an alarm or notification level to

account for the accuracy and precision of the equipment being used. Records will be maintained of excursions above the STEL including location, time, date, and the names of potentially exposed personnel, at a minimum. Near-real-time monitoring is conducted using the Miniature Chemical Agent Monitoring System (MINICAMS).

7.5. Exceedance of AELs

7.5.1. Excursion of WPL for CA

Regardless of monitoring method, when monitoring indicates exceedances of CA levels above the WPL, the following actions will be completed:

- Restrict the area until the source is identified and corrected and subsequent monitoring indicates CA levels are below the WPL. Demonstration that the CA levels are below the WPL will be provided by monitoring events (e.g., using the DAAMS). Restrictions include administrative controls (reducing stay time), increased PPE, and engineering controls (running filtration system), at the discretion of the SSHO/UXOSO.
- Notice of the WPL excursion will be provided to all site workers. At the first opportunity such as the next site safety briefing, the SSHO/UXOSO will notify the site workers on the WPL excursion. Written notice will be posted at the site office, command post, or other convenient location. The notice must include the following information:
    - Location of the WPL excursion (e.g., anomaly ID or grid coordinates).
    - Period when the excursion occurred (e.g., between 0900 and 1300 hours).
    - Name of CA detected (e.g., mustard).
    - WPL of CA in mg/m3 (e.g., 0.0004 mg/m3 for mustard).
    - Concentration of CA exceeding the WPL in mg/m3.
    - Names of exposed employees (Note: when exposure results are sent to the medial monitoring clinic appropriate to the employee, the Social Security Numbers of exposed employees must be included with the monitoring results).
    - Statement of future action to limit future excursions.
- Notice must also be provided to a competent medical authority. The SSHO/UXOSO will send a copy of the WPL excursion notice to the appropriate medical monitoring clinic for each employee who may have been exposed. The information provided to the clinic must include the Employee Identification Numbers of the potentially exposed workers. This may be done directly or through the CARA Safety Officer (see Emergency Contact Sheet in Appendix C to the Work Plan). The same information contained in the WPL excursion notice plus the contact information for the SSHO/UXOSO must be provided.
- WPL Excursion Response Plan. The Command Post team (including the Site Supervisor, SUXOS, SSHO/UXOSO, and USAESCH OESS) must prepare a plan to investigate, identify, and control the source of the exceedance of WPLs. A separate plan must be developed for each exceedance. The plan must include a description of the area of the release, objectives, procedures to be followed, safety measures, and personnel to carry out the plan.

7.5.2. Excursion of STEL for CA

When monitoring indicates excursion of CA in excess of the STEL, the following actions will be completed:

- Reporting of a chemical event must occur for the following circumstances:
  - CA exceeding the STEL is confirmed outside of any engineering controls designed to protect workers or the environment.
  - Unprotected personnel have been exposed to a known release of CA exceeding the STEL for 15 minutes or more.
- Decontamination of personnel exposed to an environment with liquid or aerosol CA, or where CA exceeded the STEL. Such personnel will require decontamination to below the STEL prior to release from the CRZ.
- Monitoring of PPE exposed to an environment where CA exceeded the STEL. PPE exposed to CA cannot be reused and must be disposed.
- Medical examinations must be performed of exposed and potentially exposed workers defined as:
  - Exposed workers exhibit clinical signs or symptoms consistent with vesicant exposure.
  - Potentially exposed workers are defined as individuals who were present within an exclusion zone where:
    - Mustard or nitrogen mustard levels exceed the protective capability of the PPE, or
    - Mustard or nitrogen mustard levels exceed the STEL in the presence of unprotected workers or there is a breach in the PPE of a worker.

7.5.3. Excursion of PELs, TLVs®, and AELs

Excursion of the AELs for volatile organic compounds (VOCs) and airborne particulates will also require immediate actions to be taken. Discussion of the types of air monitoring and associated actions required if excursion occurs for VOCs and airborne particulates is covered in Section 7.6.4 and Table D1-7.1.

7.6. Monitoring Procedures

7.6.1. WPL Monitoring for CA During Open Air Operations

The Air Monitoring Team will conduct area monitoring to the WPL for CA at open air worksites where encountering CA is determined to be greater than "seldom". Monitoring will be conducted as described in the Air Monitoring Plan (Appendix J of the Work Plan).

7.6.2. STEL Monitoring for CA During Open Air Operations

The Air Monitoring Team will also conduct monitoring to the STEL for CA and other chemicals of concern at open air worksites where encountering CA is determined to be greater than "seldom". Monitoring will be conducted as described in the Air Monitoring Plan (Appendix J of the Work Plan).

7.6.3. STEL Monitoring for CA at Other Locations

Monitoring for the STEL is required to confirm the decontamination of personnel that have been exposed or potentially exposed to CA. This monitoring will be conducted in the monitoring

chamber of the PDS. Procedures for the monitoring chamber are presented in the Air Monitoring Plan (Appendix J of the Work Plan).

Monitoring for the STEL is also used to determine whether soil samples or equipment has been contaminated. In these instances, monitoring will be conducted in accordance with the Air Monitoring Plan (Appendix J of the Work Plan).

7.6.4. Hazardous and Toxic Waste (HTW) Air Monitoring

Monitoring of HTW air contaminants will be conducted according to the Air Monitoring Plan (Appendix J of the Work Plan). The Air Monitoring Team will conduct VOC monitoring during downrange excavation in accordance with the Air Monitoring Plan (Appendix J of the Work Plan).

7.7. Air Monitoring within the Exclusion Zone (EZ)

Components of monitoring and action levels are noted in Table D1-7.1 of this Section. CA monitoring will be conducted within the EZ (within the work zone) for all intrusive work taking place in an area where the probability of encountering CA is "frequent," "likely," or "occasional," as determined by an approved Determination of Applicability or other acceptable and approved document. Table D1-7.1 details the compounds that will be monitored at the site, parties responsible for monitoring, and how detections are confirmed.

7.8. MINICAMS Alarms

7.8.1. Immediate Actions

By definition, two consecutive alarms for CA and three consecutive alarms for industrials at a single monitoring position constitute one ringoff. If a MINICAMS alarm occurs that exceeds the current level of PPE protection, the Down Range Team will don respirators (if the current PPE is Modified Level D), all intrusive activities within the EZ will cease, and the Down Range Team will proceed to the PDS. The Air Monitoring Team will perform confirmation analyses if necessary, as indicated in the Air Monitoring Plan (Appendix J of the Work Plan).

7.8.2. Alarm Notification

If CA or industrial chemicals are detected in the air, the USAESCH OESS and the SSHO/UXOSO will be notified immediately. Appendix J of the Work Plan contains additional information on communication, notification, and other required actions associated with the detection of airborne CAs.

7.8.3. Alarm Confirmation

The MINICAMS is a very sensitive instrument and will respond to interferences. As a result, the MINICAMS may produce false alarms. The action levels for air monitoring are listed in Table D1-7.1 and the Air Monitoring Plan (Appendix J of the Work Plan). Alarm confirmation will be performed in accordance with the Air Monitoring Plan (Appendix J of the Work Plan).

7.9. Training Requirements

In order to comply with air monitoring requirements, the following CA specific training topics will be included in worker hazard communication training:

- An explanation of the types of activities at the site that have a CA exposure potential.
- Methods used to recognize and evaluate work areas with a CA exposure potential.

- An explanation of the potential acute and chronic health effects associated with CA exposure and the purpose and description of the CA medical surveillance program.
- Protective measures including administrative controls, engineering controls, PPE, and safe work practices.
- Emergency procedures including self-aid, buddy-aid, first aid, and decontamination.
- An explanation of the CA material safety data sheets (MSDSs) and applicable SOPs regarding the Handling and Disposal of Materials Contaminated with CA.
- Emergency evacuation and notification procedures.

Site workers must have direct access to CA MSDSs and must be readily accessible during an emergency.

Table D1-7.1
Summary of Air Monitoring Limits and Procedures

Contaminants of Concern	Classification/ Description	Monitored By	Alarming Instrument	Airborne Exposure Limits (AEL)			Action Level	Action Taken (Summary)
				WPL[a] (mg/m^3)	STEL/VSL[a] (mg/m^3)	OSHA[b] PEL		
Tabun (GA)	Chemical agent. Nerve agent.	Air Monitoring Team	MINICAMS	0.00003	0.0001	N/A[c]	0.7 x STEL/ VSL	See Table D-9.1 in the APP.
							WPL	If WPL exceeded, impose administrative controls, provide notice to workers, and implement excursion response.
Mustard (H, HD, HS)	Chemical agent. Blister agent.	Air Monitoring Team	MINICAMS	0.0004	0.003	N/A[c]	0.7 x STEL/ VSL	See Table D-9.1 in the APP.
							WPL	If WPL exceeded, impose administrative controls, provide notice to workers, and implement excursion response.
Mustard T Mixture (HT)	Chemical agent. Blister agent.	Air Monitoring Team	HT is measured as HD[a].					
Mustard Lewisite Mixture (HL)	Chemical agent. Blister agent.	Air Monitoring Team	HL is measured as L[a].					
Mustard Sesqui Mustard Mixture (HQ)	Chemical agent. Blister agent.	Air Monitoring Team	HQ will be measured as H[d].					
Nitrogen Mustard (HN-3)	Chemical agent. Blister agent.	Air Monitoring Team	MINICAMS	0.003[e]	0.003[e]	N/A[c]	0.7 x STEL/ VSL	Upgrade to Level C PPE or higher. See Table D-9.1 in the APP.
Lewisite (L)	Chemical agent. Blister agent.	Air Monitoring Team	MINICAMS	0.003	0.003	N/A[c]	0.4 x STEL/ VSL	Upgrade to Level C PPE or higher. See Table D-9.1 in the APP.
Chloropicrin (PS)	Industrial chemical.	Air Monitoring Team	MINICAMS	N/A	N/A	0.7 mg/m^3 0.1 ppm	0.7 x OSHA PEL	Upgrade to Level C PPE or higher. See Table D-9.1 in the APP.

Table D1-7.1 (continued)
Summary of Air Monitoring Limits and Procedures

Contaminants of Concern	Classification/ Description	Monitored By	Alarming Instrument	Airborne Exposure Limits (AEL)			Action Level	Action Taken (Summary)
				WPL[a] (mg/m^3)	STEL/VSL[a] (mg/m^3)	OSHA[b] PEL		
Chloroacetophenone (CN)	Industrial chemical.	Air Monitoring Team	CN will be indirectly measured by monitoring for PS and $CHCl_3$[d].					
Phosgene (CG)	Industrial chemical.	Air Monitoring Team	MINICAMS	N/A	N/A	0.4 mg/m^3 0.1 ppm	0.7 x OSHA PEL	Upgrade to Level C PPE or higher. See Table D-9.1 in the APP.
Cyanogen Chloride (CK)	Industrial chemical.	Air Monitoring Team	MINICAMS	N/A	N/A	0.6 mg/m^3 [f] 0.3 ppm [f]	0.7 x OSHA PEL	Upgrade to Level C PPE or higher. See Table D-9.1 in the APP.
Chloroform ($CHCl_3$)	Industrial chemical.	Air Monitoring Team	MultiRAE®	N/A	N/A	240 mg/m^3 50 ppm (ceiling)	0.5 x OSHA PEL	Upgrade to Level C PPE or higher. See Table D-9.1 in the APP.
Hydrogen Cyanide (AC)	Industrial chemical.	Air Monitoring Team	MultiRAE®	N/A	N/A	11 mg/m^3 10 ppm (skin)	0.5 x OSHA PEL	Upgrade to Level C PPE or higher. See Table D-9.1 in the APP.
Adamsite (DM)[g]	Industrial chemical.	Air Monitoring Team	No air monitoring is required if appropriate engineering/process controls are used to minimize exposure[h].					
Diphosgene (DP)	Industrial chemical.	Air Monitoring Team	DP will be measured as CG[h].					

NOTES:
N/A Not Applicable
MultiRAE® One MultiRAE handheld detector can support a photoionization detector (PID) and two E-Chem sensors at the same time, thus allowing for the simultaneous monitoring of up to three chemicals, oxygen deficiency and lower explosive limit.
a – From DA PAM 385-61, Table 2-1.
b – OSHA's recommended PEL in mg/m^3 TWA and parts per million (ppm).
c – Not Estimated/Determined
d – Per the RSA Site Project Team.
e – From the U.S. Army Chemical Materials Agency, Programmatic Laboratory and Monitoring Quality Assurance Plan (LMQAP), Table 7-1.
f – No OSHA standard available for CK, so the NIOSH recommended exposure limit (REL) in ppm and mg/m3 TWA or STEL will be used at the request of the RSA Site Project Team. NIOSH RELs are recommended standards based solely on public health considerations. The REL value for CK is in agreement with that published in the U.S. Army Chemical Materials Activity, Programmatic Monitoring Concept Plan (CMA MCP).
g - Adamsite Department of Energy temporary emergency exposure limit (TEEL) value is 0.016 mg/m^3. (http://www.atlintl.com/DOE/teels/teel/search.html)
h – Per the CMA MCP.

8.0 Heat and Cold Stress

8.1. Heat Stress

Sweating does not cool the body unless the sweat is evaporated from the body. During the project activities, a number of the site personnel may be required to wear semipermeable or impermeable PPE. The use of this PPE reduces the body's ability to eliminate large quantities of heat because the evaporation of sweat is decreased. The body's effort to maintain an acceptable temperature may become impaired and this may cause heat stress. Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks. If semi-permeable and impermeable PPE is used at these sites, heat stress is a MAJOR HAZARD to involved site workers.

Heat stress related problems include heat rash, fainting, heat cramps, heat exhaustion, and heat stroke. Heat rash occurs because sweat is not evaporating; making the skin wet most of the time. Standing erect and immobile allows blood to pool in the lower extremities. As a result, blood does not return to the heart to be pumped back to the brain and fainting may occur. Heat cramps are painful spasms of the muscles due to excessive salt loss from profuse sweating. Heat exhaustion occurs due to the large fluid and salt loss from profuse sweating. A person's skin is clammy and moist; and nausea, dizziness, and headaches may occur.

Heat stroke occurs when the body's temperature regulatory system has failed. Skin is hot, dry, red, and spotted. These skin color changes may not be readily evident in darker skinned individuals and other signs must be relied upon. The affected person may be mentally confused, delirious, and convulsions may occur. A person exhibiting signs of heat stroke should be removed from the work area to a shaded area immediately. The person should be soaked with water and fanned to promote evaporation. Medical attention must be obtained immediately. EARLY RECOGNITION AND TREATMENT OF HEAT STROKE ARE THE ONLY MEANS OF PREVENTING BRAIN DAMAGE OR DEATH.

8.1.1. Work/Rest Schedule

The management of risk for heat stress exposures centers around the principal of job-specific controls. Controls that will be implemented to reduce the potential for worker heat stress includes: use of acclimated workers, providing adequate replacement fluid, educating workers to recognize the early symptoms of heat stress, use of cooling vest, physiological monitoring, and developing a work/rest schedule that will prevent the onset of heat stress. When the ambient temperature exceeds 75^{o}F, the SSHO/UXOSO will institute a work-rest regimen. The work-rest regimen for down range workers will be according to outside temperatures and dictated by the regimens specified in Table D1-8.1. As a minimum, rest periods will be 15 minutes. Based on the results of physiological monitoring and worker observations, the SSHO/UXOSO can adjust the work schedules.

A wet bulb globe temperature (WBGT) monitor will be used to monitor for conditions that pose a threat of heat stress to workers. WBGT monitoring should be conducted by the SSHO/UXOSO when workers are dressed in Level D or Modified Level D ensembles and the ambient temperature exceeds 75^{o}F. Once the WBGT has been determined, the SSHO/UXOSO can estimate workers' metabolic heat load using Table D1-8.1 and D1-8.2 to determine the appropriate work-rest

regimen. Modification to the work/rest schedule can be instituted by the SSHO/UXOSO based on physiological monitoring data. The values outlined in the Table D1-8.2 are designed for acclimated workers clothed in a permeable work ensemble and should be used in conjunction with CARA SOP-001-02, Appendix K, *Heat Stress Prevention and Monitoring* (Attachment 3 of the APP).

Table D1-8.1
Examples of Activities within Metabolic Rate Categories

Categories	Example Activities
Resting	Sitting quietly.
Light	Sitting with moderate leg and arm movement. Using table saw. Standing with light or moderate work (at bench or operating machine).
Moderate	Scrubbing in standing position. Walking about with moderate lifting. Walking on level surface while carrying 7lb load.
Heavy	Sawing by hand. Shoveling. Intermittent heavy lifting.

NOTES: Source – 2015 TLVs and Biological Exposure Indices (BEIs) booklet published by the ACGIH.

Table D1-8.2
Work-Rest Schedule Based on WBGT Reading (Permeable Ensembles[1]) in ^{0}F (^{0}C)

Work – Rest Regimen	Work Load[2]		
	Light	Moderate	Heavy
Continuous work	87.8 (31.0)	82.0 (28.0)	---
75% Work – 25% Rest, each hour	87.8 (31.0)	84.2 (29.0)	81.5 (27.5)
50% Work – 50% Rest, each hour	89.6 (32.0)	86.0 (30.0)	84.2 (29.0)
25% Work – 75% Rest, each hour	90.5 (32.5)	88.7 (31.5)	86.7 (30.5)

NOTES:
1 For impermeable ensembles, use a WBGT correction of -10.
2 Corresponds to categories in Table D1-8.1. Source – 2015 TLVs and BEIs booklet published by the ACGIH.

The worker's heart rate and temperature will be tracked by the emergency medical technicians (EMTs) or other persons designated by the SSHO/UXOSO to evaluate the effectiveness of the work-rest schedule. The results of down range worker monitoring will be recorded and reviewed by the SSHO/UXOSO. The work-rest schedule will be shortened or extended based on the recommendations of the EMTs for individuals or entire teams.

- To monitor a worker's heart rate, the SSHO/UXOSO, or his designee, will count the radial pulse or the worker during a 30-second period as early as possible in the rest period.
    - If the worker's heart rate exceeds 110 beats per minute at the beginning of the rest period, the next work cycle should be shortened by one-third (the rest time should remain constant).

  - If the worker's heart rate still exceeds 110 beats per minute at the next rest period, the following work cycle will be shortened again by a third.
- A clinical thermometer or similar device (e.g. temperature strip) or other appropriate method determined by the EMTs should be used to measure the temperature of workers at the end of the work period (before drinking).
  - If the temperature of a worker increases >2°F during the work period, shorten the next work cycle by one-third.
  - If the temperature continues to be elevated >2°F, the next work cycle will again be shortened by a third. This process will continue until elevated temperatures are not observed. Workers can return to work after heart rate and temperature return to normal (usually after 15- minute rest period).
- At the judgment of the SSHO/UXOSO, the work cycle may be extended if oral temperatures of the team remain within 1°F and heart rates are below 110 beats per minute.

8.1.2. Early Symptoms of Heat Stress Related Problems

Workers should recognize the early symptoms of heat stress. These symptoms include:

- Decline in task performance,
- Lack of coordination,
- Decline in alertness,
- Unsteady walk,
- Excessive fatigue,
- Muscle cramps, or
- Dizziness.

8.1.3. Prevention of Heat Stress

Proper training and preventive measures will aid in averting loss of worker productivity and serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat related illnesses. To avoid heat stress, the following steps should be taken:

- Adjust work schedules.
  - Modify work/rest schedules according to monitoring requirements.
  - Mandate work slowdowns as needed.
- Perform work during cooler hours of the day, if possible, or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Ensure workers are acclimated to weather conditions and have extensive experience in the selected level of protection. Workers can be acclimatized by gradually increasing the workload over a period of days.
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluids intake must approximately equal

the amount of water lost in sweat, e.g. 8 fluid ounces (0.23 liters) of water must be ingested for approximately every 8 ounces (0.23 kg) of weight loss. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:

  - Maintain water temperature at 50° to 60°F (10° to 16.6°C).
  - Provide small disposable cups that hold about 4 ounces (0.1 liter).
  - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or diluted drinks) before beginning work.
  - Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.

- Train workers to recognize the symptoms of heat-related illnesses.
- Provide potassium supplements (banana or potassium chloride tablets).
- Rotate personnel and alternate job functions.

8.2. Cold-Related Illness

Exposure to low temperatures presents a risk to employee safety and health both through the direct effect of the low temperature on the body and collateral effects such as slipping on ice, decreased dexterity, and reduced dependability of equipment. Work conducted in the winter months can become a hazard for field personnel due to cold exposure. All personnel must exercise increased care when working in cold environments to prevent accidents that may result from the cold. The effects of cold exposure include frostbite and hypothermia. Wind increases the impact of cold on a person's body. Systemic cold exposure is referred to as hypothermia. Local cold exposure is generally labeled frostbite. Recognition of the symptoms of cold-related illness will be discussed during the health and safety briefing conducted prior to the onset of site activities.

Hypothermia is a life-threatening condition in which the core body temperature falls below 95^0F. Hypothermia can occur at temperatures above freezing particularly when the skin or clothing becomes wet. During exposure to cold, maximum shivering occurs when the core temperature falls to 95^0F. As hypothermia progresses, depression of the central nervous system becomes increasingly more severe (Table D1-8.3). This accounts for the progressive signs and symptoms ranging from sluggishness and slurred speech to disorientation and eventually unconsciousness.

Frostbite is both the general and medical term given to areas of cold injury. Unlike hypothermia, frostbite rarely occurs unless environmental temperatures are less than freezing and usually less than 20^0F. Frostbite injuries occur most commonly on the distal parts of the body (nose, earlobes, hands, and feet) that are subject to intense vasoconstriction.
The three general categories of frostbite are:

- **Frostnip** - A whitened area of the skin that is slightly burning or painful.
- **Superficial frostbite** - Waxy, white skin with a firm sensation but with some resiliency. Symptomatically feels “warm” to the victim with a notable cessation of pain.
- **Deep frostbite** - Tissue damage deeper than the skin, at times, down to the bone. The skin is cold, numb and hard.

Table D1-8.3
Progressive Clinical Symptoms of Hypothermia

Core Temperature (^{0}F)	Clinical Symptoms
95	Maximum shivering.
87 – 89	Consciousness clouded; blood pressure becomes difficult to obtain; pupils dilated.
84 – 86	Progressive loss of consciousness; muscular rigidity; respiratory rate decreases.
79	Victim rarely conscious.
70-72	Maximum risk of ventricular fibrillation

8.2.1. Preventing Cold Exposure

In preventing cold stress, the SSHO/UXOSO must consider factors relating to both the worker and the environment. Training, medical screening, establishment of administrative controls, selecting proper work clothing, and wind-chill monitoring all contribute to the prevention of hypothermia and frostbite.

- **Training** - Recognizing the early signs and symptoms of cold stress can help prevent serious injury. Thus, workers will be trained to recognize the symptoms of hypothermia and frostbite and have appropriate first-aid instruction. When the air temperature is below 50^0F, the SSHO/UXOSO will inform workers of the proper clothing requirements and any work practices that are in effect to reduce cold exposure.
- **Administrative Controls** - The SSHO/UXOSO will establish a work/rest schedule based upon worker monitoring. At the first sign of uncontrollable shivering the worker will be rested in a heated shelter. Work will stop when the air temperature reaches 0^0F.
- **Clothing** - Workers will be encouraged to layer clothing when air temperature is below 50^0F. Clothing that has a high insulation value will be worn under protective garments. Insulated gloves will be worn when the wind chill index is below 32^0F.

9.0 Standard Operating Procedures, Engineering Controls and Work Practices

9.1. General Safety

Field personnel must be able to recognize and understand potential hazards associated with the operations they will be performing. Personnel active in site operations must be thoroughly familiar with the programs, practices, and procedures outlined in this SSHP. SOPs for specific activities are contained in Attachment 3 of the APP.

The following are considered standard safe work practices for work on this project.

- Eating, drinking, chewing tobacco, smoking, and carrying matches or lighters are prohibited in a contaminated or potentially contaminated area or where the possibility for contamination transfer exists.
- Avoid contact with potentially contaminated substances or materials. Avoid, whenever possible, kneeling or sitting on the ground. Do not place monitoring equipment on potentially contaminated surfaces.
- All field members should be alert to all potentially dangerous situations e.g., presence of strong, irritating, unusual, or nauseating odors.
- For each site, field personnel shall be familiar with:
    - The potential harmful chemicals,
    - Terrain,
    - Location of work zones,
    - Location of emergency equipment, and
    - Designated PPE and clothing for work assignment.
- All workers will use protective equipment as specified in this SSHP.
- Workers should stay clear of the backhoe when in operation.
- Wearing personal protective equipment can result in an impairment of the ability to operate site equipment. All field personnel should pay specific attention to decreased performance capabilities resulting from the use of personal protective equipment, such as poor tactile skills when wearing certain types of gloves. Prior knowledge of limitations imposed by the use of such equipment will allow the worker to assess the decrease in his or her capability to perform field operations in a safe manner.
- Wearing of jewelry, such as rings and loose bracelets and necklaces, is prohibited for personnel operating mechanized or electrical field equipment in order to avoid their entanglement in or interference with such machinery or equipment.
- Overhead power lines or buried cables pose a danger of shock or electrocution if workers contact or sever them during operations. The location of these potential hazards should be ascertained before beginning site activities.
- Buddy system procedures will be enforced during site operations.
- Site personnel will perform only those tasks that they are qualified to perform.
- Site visitors are to be escorted by qualified personnel at all times.

- Running and horseplay are prohibited in all areas of the site.
- The number of personnel in the EZ will be the minimum number necessary to perform the task in a safe and efficient manner.

The SSHO/UXOSO will maintain and, when necessary, update the SOPs onsite.

9.2. Chemical Agent Safety

Personnel working in areas suspected of being contaminated with CA will implement the following measures:

- Clothing issued for work onsite will include PPE outer garments for Level C or Level B operations.
- If CA is detected while wearing the issued clothing, the clothing will be treated as investigation-derived waste (IDW) and disposed of appropriately. If CA is not detected, the issued clothing will be washed for re-use.
- Open sores or wounds will be evaluated by first aid personnel or SSHO/UXOSO and covered with a dressing prior to admittance to a work area with potential CA.
- Areas where CA is suspected of being present will be clearly identified to all site personnel. Personnel will be reminded of the possible presence of CA during morning safety meetings.
- Eating, drinking, chewing and smoking will not be permitted in work areas suspected of containing CA. The SSHO/UXOSO will designate safe locations (separated from the work areas) where these activities will be allowed.
- Supplies of decontaminating solutions and emergency flushing devices for personnel decontamination will be made available in work areas where intrusive activities are in progress.
- Each worker will be examined for signs of CA exposure before leaving the worksite. If signs of possible exposure are detected, the individual will be immediately transported to the local medical facility for further examination.

9.3. Ordnance Safety

Maximum safety in any UXO operation can be achieved through adherence to applicable safety precautions. Only those personnel necessary to the operation shall be allowed in the exclusion zone during UXO activities (U.S. Department of Defense [DoD] Manual 6055.09-M, *DoD Ammunition and Explosives Safety Standards* [DoD, 2010]). **Only personnel who are qualified under DoD Explosives Safety Board (DDESB) Technical Paper (TP) 18, *Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel*, are authorized to handle UXO.** Procedures for ordnance safety are contained in Engineering Manual (EM) 385-1-97, *Explosives Safety and Health Requirements Manual* (U.S. Army Corps of Engineers [USACE], 2013), a copy of which will be retained on site.

9.4. General Sanitation

EM 385-1-1, *Safety and Health Requirements Manual* (USACE, 2014), lists and describes these sanitation issues, to include the following:

9.4.1. Drinking Water
Cool potable drinking water will be provided in sanitary, portable containers at all sites. Disposable cups will be provided and used to drink from coolers/containers.

9.4.2. Toilets
Due to the duration of the work, a chemical toilet will not be provided and is not required per EM 385-1-1 (USACE, 2014).

9.4.3. Hand-Washing Facilities
Hand-washing facilities will be provided at this site during field activities. Personnel will ensure that hand washing is performed prior to eating or drinking.

9.4.4. Housekeeping
Places of employment shall be kept as clean as possible, taking into consideration the nature of the work. Regular cleaning shall be conducted in order to maintain the safe and sanitary conditions in the workplace.

9.5. Material Handling Procedures
Execution of on-site activities will require handling of numerous items. Precautions shall be taken when lifting or handling heavy or bulky items. Back strain or injury may be prevented by using proper lifting techniques.

The fundamentals of proper lifting include:

1) Consider the size, shape, and weight of the object to be lifted. Two persons must lift an object if it cannot be lifted safely alone (e.g., greater than 60 pounds).
2) The hands and the object should be free of dirt or grease that could prevent a firm grip.
3) Gloves must be used, and the object inspected for metal slivers, jagged edges, and burrs, rough or slippery surfaces.
4) Fingers must be kept away from points that could crush or pinch them, especially when putting an object down.
5) Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.
6) The load should be kept as low as possible, close to the body with the knees bent.
7) To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.

9.6. Drum/Container/Tank Handling
Improper handling of drums and containers can result in severe injuries. These include painful back sprains, smashed toes and fingers, or exposure to potentially hazardous chemicals, if the contents are leaking. Proper work practices can minimize risk of injury, so personnel should use the following recommendations:

1) Prior to handling the drum, read the label on the drum and look for symbols, words, or other marks that indicate if its contents are hazardous, corrosive, toxic, or flammable. If the drum is not labeled, consider the contents hazardous until they are positively identified.

2) Look around the drum to see if it is leaking. Before cleaning up any spill, make sure the substance has been identified. Make sure that you have been trained in the hazards of the chemical and have the correct materials for cleaning it up. Find and review the appropriate MSDS.
3) Before moving the drum or barrel, replace missing bungs and/or lids and secure as necessary.
4) Depending upon the contents of the drum, estimate its weight. Determine whether you can move it yourself or if you need assistance. A 55-gallon drum can weigh 400-800 pounds, depending on content.
5) Use a forklift or heavy equipment, a hand truck or a drum cart that is designed specifically for drum handling.
6) If the drum can be rolled, stand in front of it and place both hands on the far side of the chime. Pull the drum forward until it balances on the bottom chime. You can now roll the drum on its chime, being careful to keep your hands from crossing over one another. You can also lower the drum to the ground for rolling by shifting your hands to the bottom side of the chime (not where they will be crushed). Then slowly lower the drum to the floor. Keep your back straight and bend at your knees. Then roll the drum with both hands. Do not use your feet or grasp the ends.
7) To upend a barrel or drum, a drum lifter bar is preferable. If one is not available, crouch in front of the drum, knees apart and firmly grasp the chime on each side. Keep your back straight and use your leg muscles to lift. Balance the drum on the lower chime, shift your hands to the far edge, and ease the drum into the upended position.

Protect your hands, feet, back, and face during this work. Safety boots are required when moving heavy drums. Gloves, eye protection, aprons, and other PPE may be needed, depending upon the contents of the drum.

9.7. Public Safety

9.7.1. General

The public or other non-essential personnel will be kept out of the immediate work area by evacuating them beyond the public access exclusion distance (PAED) for MEC operations. If unauthorized personnel (e.g., workers, hunters, hikers) inadvertently enter the EZ or PAED, work will be stopped immediately. Work will not begin again until the unauthorized person is outside the EZ.

9.7.2. Establishment of the EZ

The EZ is an area used to protect the public and non-essential personnel from inadvertent detonations, hazardous releases, or other physical hazards that could be present during site work. The EZs used at the MRSs are based on the chemical and munitions with the greatest fragmentation distance EZ, which is based on the MCE or the largest CA-filled munition which could be found at the site. More information pertaining to the specific EZ for the MRS can be found in subsequent work plans. The PAEDs are calculated based on the hazardous fragment distance or the 1% lethality value for each munitions listed, whichever is the greatest distance. The general public will be evacuated outside of the PAED.

If any non-essential personnel are located within the EZ and additional engineering controls will not be used for the reduction of the EZ, evacuations will be conducted prior to continuation of site work.

If disposal of conventional MEC cannot be completed within a single day, the area will be secured and guarded 24 hours per day to prevent unauthorized access until the MEC is disposed or moved to the approved storage facility.

10.0 Site Control Measures

A discussion of site control measures is provided in Section 3.0 of the Work Plan. Security measures (physical and procedural) are address in Section 7.0 of the Work Plan.

11.0 Personal Hygiene and Decontamination

11.1. Introduction

To prevent harmful materials from being transferred into clean areas or from exposing unprotected workers, all field personnel and equipment exiting an area of potential contamination when there are indications of CAs or industrial contaminants, either through air monitoring or visual inspection, will undergo decontamination. The extent of decontamination depends on a number of factors, the most important being the type and concentration of the contaminant involved. Decontamination will only be required if CA is detected or if suspected CWM is found. Department of the Army (DA) Interim Guidance Army Regulation (AR) 385-XX, *CWM Responses and Related Activities* (DA, 2009), requires confirmation of decontamination of injured personnel prior to leaving the site using either r the Automatic Continuous Air Monitoring System (ACAMS) or MINICAMS. Only the MINICAMS will be available for use; therefore, injured personnel that have been working within the EZ in the event of a detection of CA or release will process through the PDS and then will be monitored using the MINICAMS for verification of decontamination. This process will only apply to CA casualties. If severe trauma occurs, the decision that the personnel have been adequately decontaminated will be at the discretion of the SSHO/UXOSO. This Section discusses decontamination of personnel. Section 12 discusses decontamination of equipment.

NOTE: Site personnel will be instructed on which decontamination solution to use based on suspected contamination (e.g., bleach, etc.) during the site-specific training and daily safety briefing.

11.2. Decontamination Procedures for Personnel

11.2.1. General

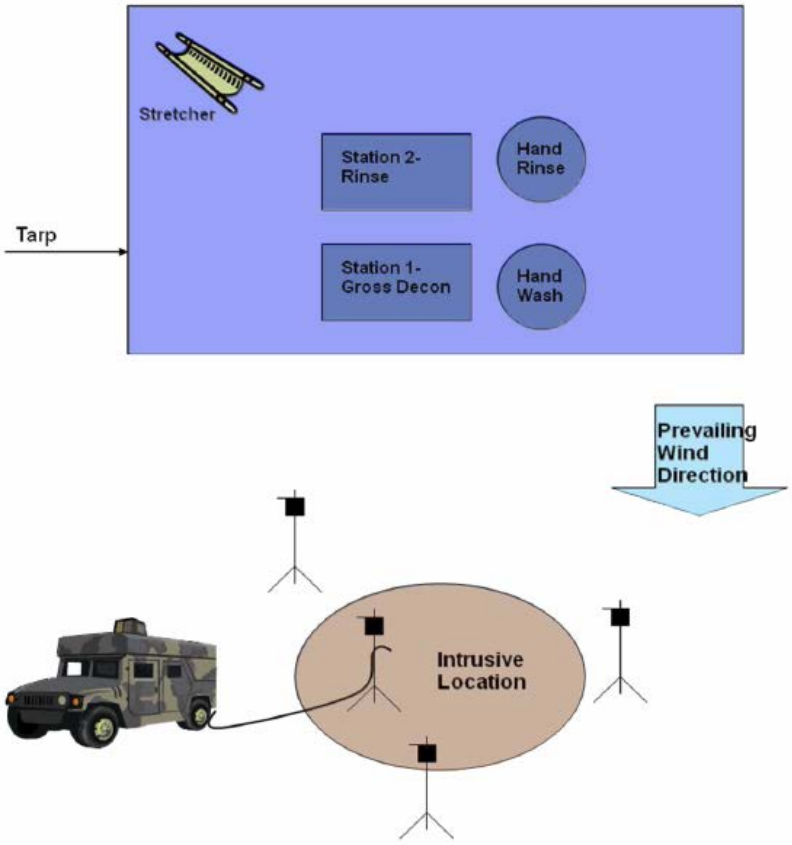
Where there is a possibility of contact with CA contamination, an EPDS will be established in the EZ (i.e. upwind at the 1% Lethality Distance) to reduce or control gross contamination at the source. This EPDS (step pan/water/bleach/brushes) will be setup downrange near the intrusive site (Table D1-11.1). Figures D1-11.1 and D1-11.2 show an example of an EPDS set-up. The EPDS is used for gross decontamination but, during a true emergency, may be by-passed if there is an imminent danger to one of the team members as a result of an accident. The EPDS should be placed upwind from the intrusive site, or closest to the upwind side if at all practical. The EPDS will be applicable for intrusive operations that practice avoidance of subsurface anomalies, such as installing monitoring wells or collecting soil samples. Collecting surface water or sediment samples from underwater will not require a decontamination station.

Table D1-11.1
EPDS Setup for Modified Level D Decontamination

Station		Tasks
Station 1:	Segregated equipment drop	Deposit equipment used downrange (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in containers with plastic liners. Segregation at the drop reduces the probability of cross contamination.
Station 2:	Gross decontamination	Use scrub brush and decon solution over the areas of the body which may have come into contact with contamination. If necessary, remove contaminated clothing and scrub skin underneath. If an airborne alarm occurs and is verified, scrub areas of exposed skin.
Station 3:	Rinse	Thoroughly rinse the areas of the body which were previously scrubbed with decon solution. A copious amount of water is recommended to thoroughly remove residual contamination and decontamination solution.

Figure D1-11.1
Example of an EPDS

Figure D1-11.2
Example EPDS Layout and Orientation



A PDS will be set up for all intrusive operations or operations where CWM or CA may be present. This PDS will be set-up in the CRZ to facilitate decontamination in the event of suspect CWM being encountered and to prevent EZ personnel from transferring contamination to the SZ. All personnel entering or exiting the EZ during set-up and intrusive operations will be required to report to the PDS. The full 8-station PDS will be set up for intrusive operations with significant risk of exposure to CA regardless of PPE level in current use. This is done as a contingency in the event that CA is detected. Refer to Figure D1-11.3 for a generalized PDS layout.

As personnel move through the PDS, PPE will be removed in the order of highest to lowest potential contamination. This outside-in removal process will be used to minimize the contamination of inner clothing or the body.

Personnel will, under all circumstances, wash hands, face, and other exposed skin areas immediately after leaving the CRZ for breaks, lunch, or at the end of each work day. Clean storage space will be provided for the employee's street clothes along with benches to facilitate changing of clothing.

The SSHO/UXOSO is responsible for ensuring the PDS is set-up each day and ready for operation in the event that CA and/or suspected CWM is detected. The PDS corridor will be lined with 10-mil or greater plastic sheeting (or equivalent) and will be large enough to contain the pans and tubs

required for the stations detailed in Section 11.2.2. The PDS must also accommodate any spillage, splash or over spray which may occur during the use of these stations. Used water will be poured or pumped into a container.

11.2.2. Personnel Decontamination Procedures

If suspected CWM or CA is encountered, downrange personnel will decontaminate thoroughly, remove PPE very carefully, and follow the decontamination procedures outlined in the following sections to minimize the potential for contaminant contact and migration. Site personnel using these procedures must remember and understand that improper decontamination can lead to not only personal contamination, but also to contamination of other site personnel, equipment, personal property, and the general public. If there are no indications of CA during intrusive activities, workers will still wash hands, face, and boots. Skin decontamination will be conducted using a soapy water wash and water rinse. If CA is detected on three consecutive MINICAMS cycles, downrange personnel will be monitored for verification of decontamination after processing through the PDS. The downrange personnel will enter the monitoring chamber of the PDS and use the MINICAMS to perform this decontamination verification. The procedure for conducting the decontamination verification is outlined in the Air Monitoring Plan located in Appendix J of the Work Plan.

Table D1-11.2 contains the standard operating procedures that will be followed during decontamination of personnel through the PDS wearing modified Level D protective ensemble. Personnel working in Levels C and B protection will undergo decontamination as indicated in Table D1-11.3. Personnel working in Level A protection will undergo decontamination as indicated in Table D1-11.4.

Figure D1-11.3
Generalized PDS Layout

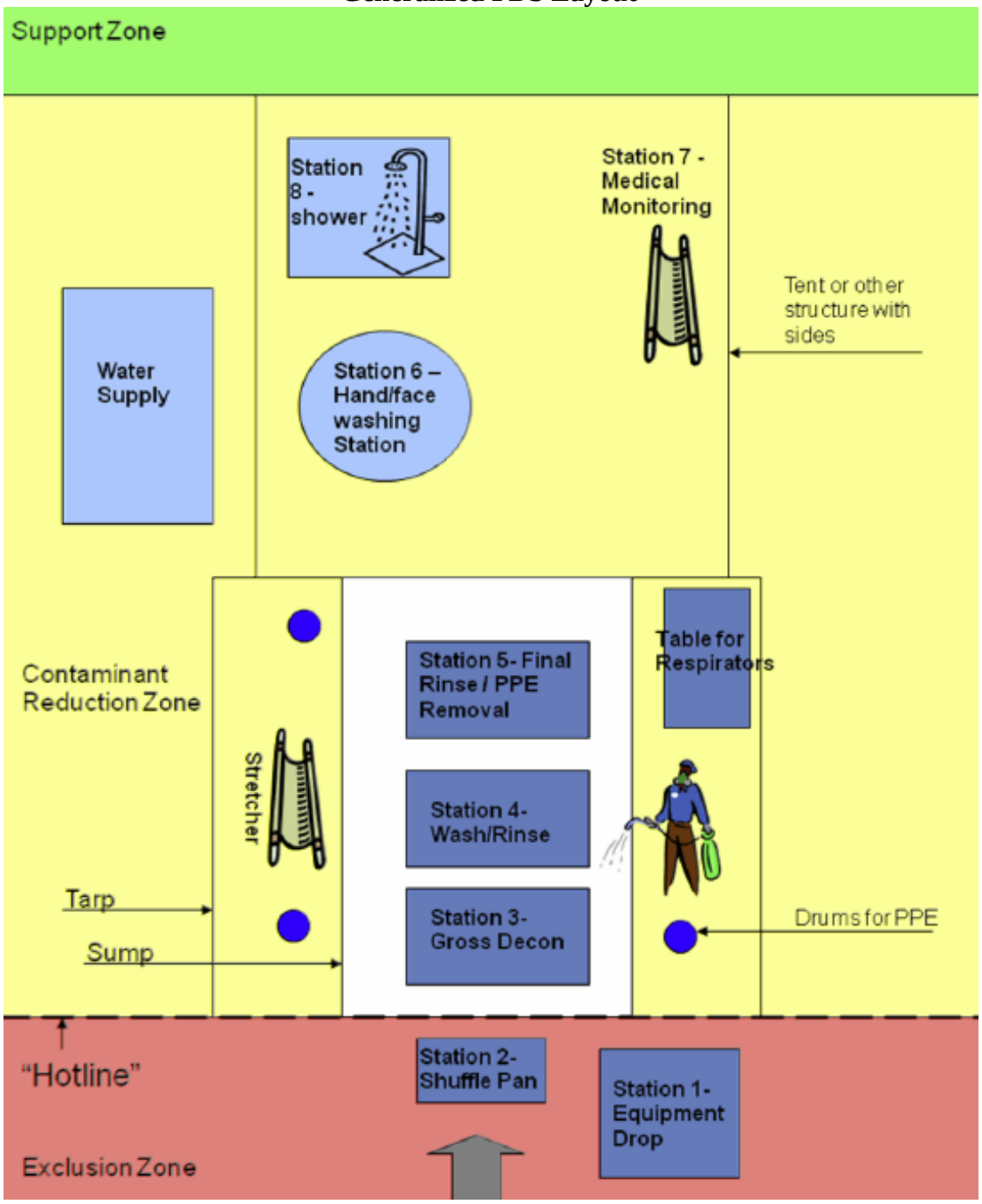


Table D1-11.2
Stations for Modified Level D Decontamination

Station		Tasks
Station 1:	Segregated equipment drop	Deposit equipment used downrange (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in containers with plastic liners. Segregation at the drop reduces the probability of cross contamination.
Station 2:	Boot decontamination	Water rinse for gross boot cleaning.
Station 3:	Gross decontamination	Wash boots and gloves with cleaning solution followed by a rinse.
Station 4:	PPE removal	Remove outer boots and gloves. If CA detected: Remove outer garments*.
Station 5:	Decontamination monitoring	Personnel will be monitored via MINICAMS for verification of decontamination
Station 6*:	APR removal	Remove mask and place in plastic bag
Station 7*:	Wash	Wash hands and face. (Wash basin with water needed)

*This station will be incorporated into Modified Level D decontamination procedures when multiple MINICAMS "alarms" occur.

Table D1-11.3
Stations for Levels C and B Decontamination

Station		Tasks
Station 1:	Segregated equipment drop	Deposit equipment used downrange (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in containers with plastic liners. Segregation at the drop reduces the probability of cross contamination.
Station 2:	Boot decontamination	Water rinse for gross boot cleaning.
Station 3:	Gross decontamination	Spray decon solution (bleach only when CA detected in air monitoring) on outer garments starting at the top of head and proceeding down to boots (concentrate on folds between fingers, underarms, and soles of boots).
Station 4:	Scrub outer garments	Scrub outer garments from head to toe using soap and water (again focus on folds, between fingers, underarms, and soles of boots).
Station 5:	Rinse outer garments	Rinse off soap and decon solution using copious amounts of water. (Repeat as necessary to completely remove decon solution and soap).
	PPE removal	1) Remove tape from wrist and ankles. 2) Remove outer garments. If SCBA worn, PDS personnel will remove SCBA before outer garments are cut. Worker will remain in mask. 3) Remove inner garments. 4) Remove mask
Station 6:	Decontamination monitoring	Personnel will be monitored via MINICAMS for verification of decontamination, if exposed to CA environment.
Station 7:	Shower and redress	Remove mask. Personnel enter field shower, shower and then dress. This step is only used in the event of CA detection downrange or if suspected CWM is discovered.

Table D1-11.4
Stations for Level A Decontamination

Station		Tasks
Station 1:	Segregated equipment drop	Deposit down range equipment (tools, sampling, devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloth or in container with 6-mil liner.
Station 2:	Boot decontamination	Water rinse for gross boot cleaning.
Station 3:	Gross decontamination	Spray decon solution on outer garments starting at the top of head and proceeding down to boots (concentrate on folds between fingers, underarms, and soles of boots).
Station 4:	Scrub outer garments	Scrub outer garments from head to toe using soap and water (again focus on folds, between fingers, underarms, and soles of boots).
Station 5:	Rinse outer garments	Rinse off soap and decon solution using copious amounts of water. (Repeat as necessary to completely remove decon solution and soap).
Station 6:	PPE removal	1) Cut off outer garments. 2) PDS worker removes SCBA from body 3) Remove inner garments 4) Remove mask
Station 7:	Decontamination monitoring	1) Personnel will be monitored via MINICAMS for verification of decontamination, if exposed to CA environment 2) Remove mask
Station 8:	Shower and redress	Personnel enter field shower, shower and dress. This step is only used in the event of CA detection downrange or if suspected CWM is discovered.

11.2.3. PDS Attendant Duties

The PDS attendant (designated by the PDS Supervisor) ensures the PDS is set-up and operated in a manner that prevents the contamination of site personnel and equipment and eliminates the migration of contamination to clean areas of the site. The staffing of the PDS will depend on the operations, PPE of the Down Range Team, and materials encountered. There will be a minimum of two PDS attendants during intrusive operations that may potentially encounter CWM.

The PDS attendant duties include:

1) On a daily basis, after the safety brief, prepare and direct assembly of the PDS required for the day's operation.
2) Receive and put away all equipment passed from the hot side of the hot line after ensuring items have been cleaned and decontaminated thoroughly.
3) After the final person has passed through the PDS, the attendant will retrieve and store away reusable equipment that has been previously decontaminated, including respirators, gloves, boots and suits.
4) At the end of each day, the attendant will secure the PDS and dispose of all materials, as required, including securing of disposal containers and transfer of used decontamination solutions to approved containers. See the IDW Plan in Section 3.7 of the Work Plan.

The PDS attendants shall wear a level of PPE that will provide adequate protection from the hazards associated with assisting site personnel through the PDS.

11.2.4. Daily PDS Shutdown Procedures

After assisting EZ personnel after the last work period, the PDS attendant, with the assistance of a buddy, will secure the PDS using procedures that allow the attendant to simultaneously decontaminate as the PDS is secured. To do this, the PDS attendant will initiate securing the PDS at the first station and work back conducting personal decontamination and PDS security at the same time.

This will be accomplished using the following general procedures (refer to Tables D1-11.1 through D1-11.4):

- First gather and remove from the PDS all reusable equipment and transfer to the SZ to be stowed.
- Wearing appropriate PPE (as specified in Section 9.0 of the APP), cross the hot line, if applicable, wash and rinse suit and then, moving from dirtiest to cleanest, transfer decontamination solutions to their respective storage containers.

These procedures will only be required in the event of CA or industrial chemical detection or if suspected CWM is found. The Down Range Team will secure the EPDS after the last work period.

11.3. Emergency Decontamination Procedures

11.3.1. General

In addition to routine decontamination procedures, emergency decontamination procedures must be established. In an emergency, the primary concern is to prevent loss of life or severe injury to site personnel. If immediate medical treatment is required to save a life, decontamination should be delayed until the person is stabilized. If decontamination can be performed without interfering with essential life-saving techniques or first aid, or if a worker has been contaminated with an extremely toxic or corrosive material that could cause severe injury or loss of life, decontamination must be performed immediately.

11.3.2. Physical Injury

Physical injuries can range from a sprained ankle to a compound fracture, from a minor cut to massive bleeding. Depending on the seriousness of the injury, treatment may be given at the site by personnel trained in first aid. For minor medical problems or injuries that involve CA, the normal decontamination procedure should be followed. Following decontamination procedures, onsite support personnel will stabilize for transport to a medical facility, if necessary.

For more serious injuries involving CA, additional assistance may be required at the site or the victim may need to be transported to a medical facility. Lifesaving care should be started immediately, without considering decontamination. The outside garments need not be removed unless they cause delays, interfere with treatment, or aggravate the problem. Respirators and backpack assemblies must always be removed. Chemical-resistant clothing can be cut away. If the outer contaminated garments cannot be safely removed, the individual should be wrapped in plastic, rubber, or blankets to help prevent contaminating medical personnel and the inside of the ambulance. Outside garments can be removed and decontamination performed at the medical facility. Should any decontamination of injured personnel be required after transport from the site, site personnel will accompany the injured to notify and assist the receiving medical facility. If

there are no indications of CA, injuries may be treated downrange without decontamination or moving the injured.

11.3.3. Heat Stress

Heat-related illnesses range from mild heat fatigue to life-threatening heat stroke. Heat stroke requires prompt treatment to prevent irreversible damage or death. Less serious stages of heat stress also require prompt attention because they can progress to heat stroke. Unless the victim is obviously contaminated, decontamination should be delayed or minimized and treatment given immediately. Protective clothing should be cut off.

11.3.4. Hypothermia and Frostbite

Cold-related illnesses range from mild to severe forms of hypothermia and frostbite. Both illnesses should be easily detected at mild stages of development. Decontamination procedures should be conducted as normal. However, staff should work as quickly as possible in order to begin proper treatment.

11.3.5. Chemical Exposure

Exposure to chemicals can be divided into two categories:

- Injuries from direct contact, such as acid burns or inhalation of toxic chemicals; and
- Injuries caused by gross contamination of clothing or equipment.

For inhaled contaminants, only qualified physicians can perform treatment. If the contaminant is on the skin or in the eyes, first-aid treatment generally includes flooding the affected area with water.

When protective clothing is grossly contaminated, contaminants may be transferred from the wearer to treatment personnel and cause injuries. Unless severe medical problems have occurred simultaneously with the chemical splash, the protective clothing should be washed off as rapidly as possible and then carefully removed.

11.4. Contamination Control

This Section outlines the measures that will be taken to control contamination and prevent it from leaving the EZ.

The decontamination procedures described in Section 11.2 will be the primary sources of contaminant control. Also, as indicated previously, all wastewater generated from decontamination procedures will be collected onsite, tested, if necessary, and disposed of in accordance with the IDW Plan contained in Section 3.7 of the Work Plan. In addition to these procedures, measures will be taken to limit the movement of vapors that may be generated within the EZ.

Eating, drinking, smoking, chewing, and application of cosmetics shall be restricted to the clean (support) zone, except drinking of replacement fluids, which shall be permitted in designated areas of the CRZ. Personnel who have been exposed to contaminated material (based on air monitoring data) will be processed through the decontamination line before they are allowed to drink or eat.

Personnel who may be required to wear respiratory protective equipment, either on a routine or emergency basis, must shave beards or other facial hair which interfere with the proper fitting of respirators. Any abrasions in the site personnel's skin (cuts, bruises, etc.) will be covered with a band-aid or adhesive tape before the operator dons protective clothing.

12.0 Equipment Decontamination

12.1. Procedures for Hand-Held Equipment Decontamination

All hand-held equipment and tools used inside the EZ will remain in the EZ until work is completed. If CA is detected and confirmed, hand tools and equipment used on the site will receive, at a minimum, a three-stage wash and rinse prior to leaving the EZ. The first stage is a wash in a 5% bleach solution. The second stage is a wash consisting of soapy water. The third step involves rinsing the item in clean water. All decontamination fluids will be collected in pans or buckets. The fluids will be containerized, tested, and disposed of properly based upon the analytical results. After this three-stage wash/rinse cycle, hand tools/equipment can be removed from the EZ, upon inspection and approval by the SSHO/UXOSO or UXO Quality Control Specialist (UXOQCS). If CAs were encountered during their use, these tools will be designated as 3X. Further use of these tools on this project will be allowed. Once all work is completed, these tools will be disposed as 3X scrap.

Hand tools and equipment with porous surfaces, such as those with wooden or foam covered handles, may allow for the absorption of contamination. If CA is suspected, items of this nature should be kept in the EZ until headspaced (heated and monitored for CA vapors) and disposed of as potential CA or hazardous waste, as analytical results indicate.

If directed by the USAESCH OESS, items with potentially absorbed or surface CA contamination will be tested by the Air Monitoring Team after the items have been decontaminated in accordance with the procedure in Section 11.2. Items will be headspaced for traces of CA in accordance with procedures presented in the Air Monitoring Plan (Appendix J of the Work Plan). Additional testing for contamination from other sources will be performed after CA decontamination as necessary.

Whenever possible, equipment that could receive internal contamination or equipment that cannot be washed and rinsed will be encapsulated in plastic prior to being placed in the EZ. For example, industrial air-monitoring equipment that is not water sealed can be wrapped in plastic with the exception of the air-sampling inlet. After the air monitor is taken from the EZ, the plastic can be removed, the inlet cleaned, and as long as a CA release did not occur during site activities, the monitor can be taken out of the CRZ. If a CA release did occur, then any hand-held equipment with the potential for internal contamination would be considered CA contaminated and would be double plastic bagged and held, pending guidance from USAESCH.

12.2. Headspace Procedures

Headspace monitoring during decontamination procedures will be performed by the Air Monitoring Team. Procedures for headspace monitoring are presented in the Air Monitoring Plan (Appendix J of the Work Plan).

12.3. Procedures for Heavy Equipment and Vehicle Decontamination

To the extent possible, all heavy equipment will remain outside of the EZ. If heavy equipment requires decontamination, a decontamination sump will be built adjacent to the PDS.

Proper decontamination of equipment is extremely important to ensure contamination is not spread to uncontaminated portions of the site or to site personnel. The layer of protection will be changed as needed to prevent the spread of contamination to surfaces inside the operator area.

All equipment requiring maintenance or repair will be staged in the CRZ prior to servicing. The SSHO/UXOSO or USAESCH OESS will properly inspect, and approve for general cleanliness, all heavy equipment prior to the equipment exiting the CRZ for the SZ. In order for a vehicle or piece of heavy equipment to pass inspection, it must be in a broom-clean condition, free of loose dirt or stabilized material on tailgates, axles, and wheels. All surfaces that contacted potentially contaminated materials, including soil, will be given a wash, in accordance with Section 11.2 of this SSHP, and clean water rinse. Approval for heavy equipment removal from the CRZ will be based on visual inspection of all exposed surfaces, and if needed, the analysis of smear samples.

Personnel assigned to heavy equipment and vehicle decontamination shall wear the protective equipment, clothing, and respiratory protection consistent with the levels of PPE worn during the site activities during which the heavy equipment/vehicle became contaminated. Unless a full-face piece respirator is worn as part of this requirement, the decontamination personnel will wear a splash shield during the decontamination of heavy equipment/vehicles.

Heavy equipment taken into the EZ will be left in the EZ and shall be inspected and decontaminated if a alarm or contact with suspect CA occurs. Gross decontamination (brush off and remove any visible contamination) will be performed and the equipment will be moved to the decontamination sump, pressure washed, and scrubbed to remove all gross debris. The equipment will then be washed with bleach solution and brushes. The equipment is then rinsed with water and retested. If no further contamination is detected, the equipment will be classified “3X.” If CA is detected, the equipment will be re-cleaned. To perform headspace analysis of heavy equipment, equipment will be covered in plastic.

Prior to transfer of previously CA-contaminated equipment outside of government control, decontamination must be conducted and verified in accordance with a method approved by USAESCH.

13.0 Emergency Equipment and First Aid

13.1. First Aid Equipment

First aid kits for the treatment of minor injuries and burns will be maintained onsite by the SSHO/UXOSO. The first aid kits will meet the requirements for Type III kits contained in EM 385-1-1 (USACE, 2014).

First aid kits will be kept at the following locations:

- All work vehicles used onsite.
- CP
- EPDS (if not already available in a nearby vehicle) and PDS

When required during intrusive operations, a fully equipped ambulance with two trained EMTs will be on standby at the site.

13.2. Fire Fighting Equipment

Fire extinguishers will be maintained onsite by the SSHO/UXOSO in accordance with EM 385-1-1 (USACE, 2014). Fire extinguishers will be placed in each work vehicle, in occupied trailers, and at all other locations specified by this Work Plan.

14.0 Emergency Response Plan

14.1. Introduction

Emergency response procedures are provided in Section 10.2 of the APP.

14.2. Emergency Medical Treatment and First Aid

Emergency medical treatment and first aid will be handled in collaboration with the onsite medical professionals (ambulance staff), if available during intrusive operations. When medical professionals are not stationed on site, emergency medical aid will be obtained by calling the local 911 service for the correct county. First aid procedures are covered by Section 8.0 of the APP. Huntsville Hospital is the designated hospital for chemical injuries. For non-chemical injuries, the injured person also will be transported to Huntsville Hospital. Location maps and directions are included in Section 8.0 of the APP and a copy will be provided in each vehicle onsite.

15.0 Emergency Response Team

In the event of an accident, the following parties will have the responsibilities detailed below.

For non-CWM events, the RSA Fire Department will evaluate the emergency situation and implement the response. CARA personnel will provide support as needed. For CWM events, the responsibilities of specific project individuals are as follows:

15.1. Emergency Response Team

- Locate all victims, assess their conditions, and make an on-scene determination of the resources needed to stabilize and transport.
- Request emergency response by outside agencies, if required.
- Assess the situation and determine the existing hazards, potential for additional hazards, and need for additional response. Supervisors must ensure the hazardous condition is stabilized, eliminated, or permanently fixed. If personnel or properties are jeopardized, a determination must be made to alert the local community.
- Remove injured personnel from the area. Decontamination, if required, will be accomplished through the PDS or EPDS.

15.2. Site Supervisor or SUXOS

At all times during scheduled work activities, the Site Supervisor, SUXOS, or qualified alternate will be present. This individual will be responsible for implementing emergency procedures and determining appropriate response actions until the RSA Fire Department is present. Specific responsibilities for the Site Supervisor or SUXOS include:

- Evaluating and assessing emergency incidents or situations.
- Assigning personnel and coordinating response activities on site.
- Assuring that field personnel are aware of the potential hazards associated with the site.
- Summoning a RSA Fire Department emergency response team.
- Notifying the USAESCH OESS of an emergency situation.
- Coordinating response to an incident with RSA.
- Assuring that all CARA emergency equipment is routinely inspected and functional.
- Working with the SSHO/UXOSO regarding the correction of any work practices or conditions that may result in injury to personnel or exposure to hazardous substances.
- Assuring that appropriate emergency response agencies are aware of the provisions made herein.
- Evaluating the safety of site personnel in the event of emergency and providing evacuation coordination if necessary.
- Maintaining site facilities and assisting site personnel in accessing those facilities.

15.3. SSHO/UXOSO

The overall responsibility during emergencies rests with the SSHO/UXOSO. In case of emergency, the SSHO/UXOSO will implement the site emergency procedures.

The SSHO/UXOSO is specifically responsible for the following:

- Implementing the site Emergency Response Contingency Plan (ERCP) located in the Emergency Response SOP (Attachment 3 of the APP), including ordering site evacuations, coordinating firefighting efforts, and directing spill control and cleanup.
- Supervising site evacuation and decontamination procedures.
- Contacting emergency services such as the fire department, ambulance and security services, as may be required as requested by the Emergency Rescue Team.
- Assisting in providing first aid services and medical support or evacuation for injured or exposed personnel.
- Determining the cause of the incident and ways to prevent future occurrences.
- Preparing a written incident report for submission to the RSA Site Manager and USAESCH Project Manager.

15.4. All Onsite Personnel

Onsite personnel are responsible for reporting emergencies immediately to their supervisors, alerting other employees, helping injured personnel, and assisting as directed to mitigate the incident.

15.5. Emergency Training

Prior to initiating the intrusive operations, the following will occur under the direction of the SSHO/UXOSO and CARA Safety Officer:

15.5.1. Team Training

This will include the following:

- Hazard communication;
- Emergency procedures;
- MEC-specific health and safety;
- CWM-specific health and safety; and
- Donning/Doffing of PPE.

15.5.2. Pre-Operational Exercises

All agencies involved in CWM response or similar activities that involve the recovery and assessment of munitions with an unknown liquid fill or the destruction of potential CWM will participate in a pre-operational survey. The pre-operational survey will be successfully completed prior to initiating any intrusive operations or prior to resuming such activities that have been interrupted for 90 or more consecutive days. The pre-operational survey will be conducted by USAESCH using a team of CA and remediation subject matter experts. The USATCES will participate in the pre-operational survey as technical advisor to and representative of the Office of the Directory of Army Safety. The pre-operational survey is an evaluation to ascertain that

personnel, equipment, and materials required for work activities are on site, that personnel are trained and qualified to perform their work assignments, and that work procedures and safety controls are appropriate for the tasks, effective in accomplishing the work objectives, and provide for an adequate level of safety. Pre-operational surveys are based on the approved Chemical Safety Submission, incorporate personnel interviews, records reviews, equipment and material inventories and performance tests, and simulations of planned work and emergency response activities.

At a minimum the pre-operational survey will:

- Ensure that DDESB safety submissions have been approved.
- Ensure that the work plan, APP, and SSHP have been completed and approved.
- Ensure that safety resources (fire and medical support) are qualified and available.
- Include simulated operations that are:
    - Conducted by the field team using dummy or inert material and using all required protective clothing and equipment.
    - Demonstrate the proficiency of the operational and support personnel in all phases of the planned operations in compliance with the Chemical Safety Submission (CSS) (Appendix K), applicable federal, state, and local regulations, and approved plans and procedures.

As part of the survey, the findings of the expert review team are provided to the team conducting the work and issues are identified, discussed, and addressed with the corrections documented.

Prior to the official pre-operational survey, USAESCH will conduct a preliminary review (a.k.a. Huntsville Survey) to confirm the readiness of the project team for the pre-operational survey. A team of experts directed by USAESCH performs a review similar to the team of subject matter experts for the pre-operational survey. If the project team is deemed not ready, the pre-operational survey is postponed to give more time for preparations and correct deficiencies. If the project team is deem ready, the preoperational survey will be conducted as scheduled.

15.5.3. Tabletop Exercises

Tabletop exercises will be conducted by USAESCH with the participation of other Army agencies and local responders (e.g. medical, police) involved in and supporting the CWM operation. Tabletop exercises use simulations to conduct drills of responses to differing CWM accident and incident scenarios. Tabletop exercises help ensure the effectiveness of the responses, to identify deficiencies or omissions in the emergency response process, and to establish continuity and coordination among the response agencies.

16.0 Confined Space Entry

If required, confined space entry will be performed in accordance with 29 CFR 1910.146, *Permit-Required Confined Spaces*, and EM 385-1-1 (USACE, 2014). All confined space or permit required confined space entry operations will be executed under direct supervision from a confined space competent entry supervisor. The RSA Fire Department will be contacted for rescue services as applicable to the permit requirements. All personnel participating in confined space operations shall have received applicable confined space entry or attendant training. Confined space supervisor shall have completed supervisor training and demonstrated proficiency in confined space operations.

17.0 Logs, Reports, and Recordkeeping

Recordkeeping procedures are provided in Section 3.0 of the Work Plan.

18.0 References

29 Code of Federal Regulations (CFR) 1910.120, ***Hazardous Waste Operations and Emergency Response.***

29 Code of Federal Regulations (CFR) 1910.146, ***Permit-Required Confined Spaces.***

29 Code of Federal Regulations (CFR) 1926, Subpart O, ***Motor Vehicles, Mechanized Equipment, and Marine Operations***.

American Conference of Governmental Industrial Hygienists (ACGIH), March, ***Threshold Limit Values for Chemical Substances, Physical Agents, and Biological Exposure Indices***, 2015.

U.S. Army Chemical Materials Activity (CMA), ***Programmatic Laboratory and Monitoring Quality Assurance Plan***, Final, Change 1. 2008.

U.S. Army Chemical Materials Activity (CMA), June, ***Programmatic Monitoring Concept Plan***, 2004.

U.S. Army Corps of Engineers (USACE), 2013, EM 385-1-97, ***Explosives Safety and Health Requirements Manual,*** U.S. Department of the Army, CESO-ZA.

U.S. Army Corps of Engineers (USACE), 2014, EM 385-1-1, ***Safety and Health Requirements Manual,*** U.S. Department of the Army, CESO-ZA.

U.S. Department of Army (DA), June, ***Memorandum, Implementation Guidance Policy for New Airborne Exposures Limits for GB, GA, GD, GF, VX, H, HD, and HT,*** Raymond J. Fatz, Deputy Assistant Secretary of the Army (Environment, Safety and Occupational Health) OASA (I&E), 2004.

U.S. Department of Army (DA), June, ***Implementation Guidance Policy for Revised Airborne Exposures Limits for GB, GA, GD, GF, VX, H, HD, and HT,*** Department of the Army, Office of the Assistant Secretary of the Army Installations and Environment, 2004.

U.S. Department of Army (DA) Pamphlet (PAM) 385-61, November, ***Toxic Chemical Agent Safety Standards***, 2012.

U.S. Department of Defense (DoD), 2010, DoDM 6055.09-M, ***DoD Ammunition and Explosives Safety Standards***, August.

U.S. Department of Defense Explosives Safety Board (DDESB), Technical Paper (TP) 18, ***Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel***.

U.S. Department of Health and Human Services, May, Centers for Disease Control (CDC), Federal Register, Volume 69, Number 85, ***Centers for Disease Control Interim Recommendations for Airborne Exposure Limits for Chemical Warfare Agents H and HD (Sulfur Mustard),*** 2004.

U.S. Department of Health and Human Services, September, Centers for Disease Control (CDC), ***NIOSH Pocket Guide to Chemical Hazards,*** 2010

APPENDIX D, ATTACHMENT 2
ACTIVITY HAZARD ANALYSIS (AHA)

Electronic Copy Only
(A printed copy will be maintained onsite during fieldwork)

List of AHAs

The following AHAs are included in this Attachment.

- Air Monitoring;
- Anomaly Location and Reacquisition;
- Decontamination Station for Personnel, Equipment, and CA Contaminated Media (CACM);
- MEC Demolition Operations;
- Drum Handling;
- Earth Covered Magazine (ECM) Entry Operations;
- Emergency Rescue Operations
- Intrusive Excavation of MEC (high CWM probability areas)
- Explosive Storage & Transportation Operations;
- Fueling Operations;
- Handling CACM;
- Mobilization/Demobilization;
- Security Operations;
- Vegetation Removal;
- Vehicle, Heavy Equipment, and All-Terrain Vehicle (ATV) Operations; and
- X-Ray and PINS Operations.

Activity Hazard Analysis (AHA)

Activity/Work Task: **AIR MONITORING**	Overall Risk Assessment Code (RAC) (Use Highest Code) **M**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL	
Contract Number: NA	
Date Prepared: 8-10-15	
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist	
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer	
Notes: (Field Notes, Review Comments, etc.)	

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
1. Set up and calibrate air monitoring equipment.	1a. Slip, trip and fall.	1a. Select a level area for the placement of the item and be aware of the condition of the ground on which you are working. Be certain to place your feet on as firm and solid a surface as possible.	L
	1b. Pinch hazard from assembly and placement of equipment.	1b. Wear leather gloves and place hands on smooth surfaces checking the area on which you are going to place your hands in order to avoid any sharp edges or pinch areas.	L
	1c. Vehicle and heavy equipment traffic in area.	1c. Be aware of any vehicles or heavy equipment in area and be certain to wear hard hat, safety glasses and high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc.	L
	1d. Noise in excess of OSHA standards	1d. If the heavy equipment used is louder than 85dB (A) then the appropriate hearing attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn.	L
	1e. Lifting hazards.	1e. Ensure that you, and if there are other individuals assisting you, each have solid footing, leather work gloves and use the proper lifting technique; bend at the knees keeping your back as straight as possible and lift with your knees, not your back. Ensure you have good visibility in the direction you are moving an item. Do not attempt to carry anything by yourself in excess of 50 lbs. or any item that blocks your visibility or is cumbersome to carry alone.	L

Job Steps	Hazards	Controls	RAC
	1f. Insect bites/West Nile Virus.	1f. Wear PPE and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify the UXOSO of flu-like symptoms.	L
	1g. Contact dermatitis and poison ivy.	1g. Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plans. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contact poison ivy.	L
	1h. Contact with chemical agent or other hazardous chemicals	1h. Personnel will don the proper PPE commensurate with the chemical hazard. CWM, HTW, and UXO training and safety awareness during site-specific training and refreshed during morning tailgate briefing. Use face shield as appropriate.	L
	1i. Pressurized cylinders – sudden release of contents	1i. Periodic inspection of all pressurized cylinders by air monitoring team. Proper storage of cylinders in accordance with SOPs.	L
	1j. Use of hand and power tools.	1j. When operating power tools they will be handled, operated and maintained IAW the manufactures instructions, the approved WP and any applicable SOPs. The power tool will be inspected prior to use to ensure that all of the hand and safety guards are in place and that the chain, if present, is properly tightened and that the tool is otherwise in good working order. Depending on the power tool PPE will vary and it too must be serviceable, operable and free of any defect. PPE will be worn IAW the approved WP and inspected by the user prior to donning. Hand and power tool use will be IAW EM 385-1-1. Only trained and authorized personnel will use hand and power tools.	L
	1k. Electrical Shock.	1k. Sites are remote and require portable, on board or trailer mounted generators to provide electrical power. All generators will be grounded, as stated in EM 385-1-1. In the event there is an electrical problem that cannot be corrected by merely un-plugging and re-plugging an item or replacing a blown fuse then an electrician will be contacted to correct the problem. All electrical appliances and equipment will have a third prong for proper grounding and all electrical outlets will have three pronged receptacles and meet the requirements of EM 385-1-1. GFCI circuitry will be used for all outdoor connections.	L

Job Steps	Hazards	Controls	RAC
	1l. Cold/Heat Stress	1l. All site activities must be conducted IAW the approved WP and APP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	L
	1m. Fire/Explosion	1m. Refueling of all vehicles, heavy equipment and other fueled equipment will be conducted in accordance with the SSHP, applicable SOPs and EM 385-1-1. Proper fire extinguishers will be on site and serviceable. There will be no “Hot Fueling” authorized at any time.	L
	1n. Monitoring Equipment Alarm/Ring-Off	1n. CARA shall maintain constant contact with the down-range personnel in the event chemical and/or industrial agent is detected.	M
	1o. Cuts from glassware	1o. Inspect glassware before handling. Sweep glass using scoop and broom. Do not pick up by hand.	M
2. Retrieval/Site Relocation Service/Recalibrate Air Monitoring Pumps/Systems/ Hoses	2. The Hazards itemized in Hazard 1 are also applicable to Hazard 2.	2. The Controls itemized in Control 1 are also applicable to Control 2.	L
3. Air Monitoring Pump/System Retrieval/Site Relocation	3. The Hazards itemized in Hazard 1 are applicable to Hazard 3.	3. The Controls itemized in Control 1 are also applicable to Control 3.	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Modified Level D up to Level B: Refer to APP and SSHP. Equipment (as applicable) Hard hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Respirator Magnetometers Geophysics Instruments Generator Air Monitoring Equipment MINICAMS DAAMS MultiRAE Sample Lines	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All personnel operating air monitoring equipment will be trained and qualified in accordance with CARA Internal Operating Procedures under the CARA Mobile Expeditionary Lab Chemical Air Monitoring Quality Management System. All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> HAZWOPER 40-hour MEC awareness Lifting/back safety Site safety orientation Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator.	Daily site safety inspection (UXOSO) – TBD CARA Daily site safety inspection (SUXOS) – TBD CARA Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability.

Activity Hazard Analysis (AHA)

Activity/Work Task: **ANOMALY LOCATION AND REACQUISITION**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**M**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL		
Contract Number: NA		
Date Prepared: 8-10-15		
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist		
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer		
Notes: (Field Notes, Review Comments, etc.)		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
1. Locate anomalies and sample points selected for intrusive MEC/CWM Construction Footprint Clearance.	1a. Slip, trip and fall.	1a. Worker awareness of potential slippery surfaces, holes and obstacles to include tripping hazards plus inspection and policing of debris.	L
	1b. Insect bites/West Nile Virus.	1b. Wear PPE and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify the UXOSO of flu-like symptoms.	L
	1c. Contact dermatitis and poison ivy.	1c. Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plans. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contact poison ivy.	L
	1d. Vehicle and heavy equipment traffic in area.	1d. Be aware of any vehicles or heavy equipment in area and be certain to wear hard hat, safety glasses and high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc.	L
	1e. Pinch hazard from assembly and placement of equipment.	1e. Wear leather gloves and place hands on smooth surfaces checking the area on which you are going to place your hands in order to avoid any sharp edges or pinch areas.	L

Job Steps	Hazards	Controls	RAC
	1f. Lifting hazards.	1f. Ensure that you, and if there is another individual assisting you, both have solid footing, leather work gloves and use the proper lifting technique, bend at the knees keeping your back as straight as possible and lift with your knees, not your back. Ensure you have good visibility in the direction you are carrying an item. Do not attempt to carry anything by yourself in excess of 50 lbs. or any item that blocks your visibility or is cumbersome to carry alone.	L
	1g. Cold/Heat Stress	1g. All site activities must be conducted IAW the approved WP and APP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	L
	1h. Fire/Explosion	1h. Battery Charging operations will be conducted IAW EM 385-1-1. Appropriate PPE will be worn. Site vehicle battery will not be used as a back-up for this operation, because it may damage the system and strand field crew. Proper fire extinguishers will be on site and serviceable.	L
2. Use stakes or flags to mark the locations and extent of the MEC/CWM Construction Footprint Clearance areas.	2. The Hazards itemized in Hazard 1 are applicable to Hazard 2. In addition hazard 2a is added.	2. The Controls itemized in Control 1 are also applicable to Control 2.	
	2a. MEC/CA Hazards.	2a. Non-UXO personnel shall attend site-specific MEC awareness (and recognition) training prior to the commencement of any site activities. Use only UXO personnel qualified in accordance with DDESB Technical Paper 18. UXO Technicians shall be present during any construction activities occurring in the munitions response site (MRS). Observe the route of advance, foot placement and heed the magnetometer alarm. Anomaly avoidance will be practiced during the installation of stakes or flags. If a MEC item is encountered alert the rest of the team and conduct an inspection of the item IAW the approved WP, SOP and EM 385-1-97.	M

Job Steps	Hazards	Controls	RAC
3. Clear lines of sight using hand tools where needed.	3. The Hazards itemized in Hazard 2 are applicable to Hazard 3. In addition hazard 3a is added. 3a. Use of hand and power tools	3. The Controls itemized in Control 2 are also applicable to Control 1. 3a. When operating power tools they will be handled, operated and maintained IAW the manufactures instructions, the approved WP and any applicable SOPs. The power tool will be inspected prior to use to ensure that all of the hand and safety guards are in place and that the chain, if present, is properly tightened and that the tool is otherwise in good working order. Depending on the power tool PPE will vary and it too must be serviceable, operable and free of any defect. PPE will be worn IAW the approved WP and inspected by the user prior to donning. Hand and power tool use will be IAW EM 385-1-1. Use the proper tools for the specific job being performed. Be certain that the tools to be used are serviceable and free of slippery surfaces. Only trained and authorized personnel will use hand and power tools.	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Modified Level D. Refer to APP and SSHP. Equipment (as applicable): Hard hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Respirator Magnetometers Geophysics Instruments	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> UXO Personnel must be qualified IAW DDESB TP18. HAZWOPER 40-hour Site safety orientation MEC awareness Lifting/back safety Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator.	Daily site safety inspection (UXOSO) – TBD CARA Daily site safety inspection (SUXOS) – TBD CARA Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability.

Activity Hazard Analysis (AHA)

Activity/Work Task: **DECONTAMINATION STATION FOR PERSONNEL, EQUIPMENT, AND CACM**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**M**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL		
Contract Number: NA		
Date Prepared: 8-10-15		
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist		
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer		
Notes: (Field Notes, Review Comments, etc.)		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
1. Establish location for desired work area to conduct operations, to include:	1a. Slip, trip and fall.	1a. Worker awareness of potential slippery/uneven surfaces and tripping hazards plus inspection and policing of debris.	L
a. Establish Work Area Control Zones (EZ, CRZ and SZ);	1b. Insect bites/West Nile Virus.	1b. Wear PPE and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify the UXOSO of flu-like symptoms.	L
b. Erection of PDS Tent or Shelter;	1c. Contact dermatitis and poison ivy.	1c. Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plans. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contact poison ivy.	L
	1d. Cold/Heat Stress	1d. All site activities must be conducted IAW the approved WP and APP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	L

Job Steps	Hazards	Controls	RAC
	1e. Contact with chemical agent or other hazardous chemicals	1e. Personnel will don the proper PPE commensurate with the PPE matrix in the APP. MEC, CWM, and chemicals of concern training and safety awareness during site-specific training and refreshed during morning tailgate briefing. During site-specific health and safety training, workers will be briefed concerning their rights and responsibilities regarding hazard communications. Material safety data sheets for relevant chemicals will be kept available on site at all times. Continuous air monitoring of work zone where PDS personnel are working.	M
	1f. MEC Hazards	1f. Non-UXO personnel shall attend site-specific MEC awareness (and recognition) training prior to the commencement of any site activities. Use only UXO personnel qualified in accordance with DDESB Technical Paper 18. UXO Technicians shall be present during any construction activities occurring in the munitions response site (MRS).Inspect the area selected for the PDS to be cleared of the presence of MEC using a magnetometer to assist in finding items in brush and dense vegetation. If an MEC item is encountered alert the rest of the team and conduct an inspection of the item IAW the approved WP, SOP and EM 385-1-97.	L
	1g. Lifting hazards.	1g. Ensure that you, and if there is another individual assisting you, both have solid footing, leather work gloves and use the proper lifting technique, bend at the knees keeping your back as straight as possible and lift with your knees, not your back. Ensure you have good visibility in the direction you are carrying an item. Do not attempt to carry anything by yourself in excess of 50 lbs. or any item that blocks your visibility or is cumbersome to carry alone.	L
	1g. Hand and Power tool operation	1g. When operating power tools they will be handled, operated and maintained IAW the manufactures instructions, the approved WP and any applicable SOPs. The power tool will be inspected prior to use to ensure that all of the hand and safety guards are in place and that the chain, if present, is properly tightened and that the tool is otherwise in good working order. Depending on the power tool PPE will vary and it too must be serviceable, operable and free of any defect. PPE will be worn IAW the approved WP and inspected by the user prior to donning. Hand and power tool use will be IAW EM 385-1-1. Only trained and authorized personnel will use hand and power tools.	L

Job Steps	Hazards	Controls	RAC
	1h. Electrical Shock.	1h. Ground-fault circuit interrupters shall be used on all power tools and extension cords. Extension cords, power tools, and equipment shall be inspected before each use, protected from damage, and kept out of wet areas. Only qualified electricians are permitted to work on electrical circuits. Electricians must follow NFPA 70 E (2009) when working on electrical circuits.	L
	1i. Pressurized cylinders – sudden release of contents	1i. Periodic inspection of all pressurized cylinders by PDS crew. Proper storage of cylinders in accordance with SOPs.	L
	1j. Vehicle and heavy equipment traffic in area.	1j. Be aware of any vehicles or heavy equipment in area and be certain to wear a hard hat, safety glasses, and a high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc.	L
2. PDS Tent is operational and ready for use for the following: a. Processing of Personnel b. Processing of CA Contaminated Material (CACM) c. Processing of Equipment	2. The Hazards itemized in Hazard 1 are applicable to Hazard 2. 2a. Contact with chemical agent or other hazardous chemicals	2. The Controls itemized in Control 1 are applicable to Control 2. 2a. Inherent with PDS operations, both the PDS Tent and Monitoring Tent are needed to be maintained at temperatures greater than 68°F. Electrical floor heating units are prohibited in the PDS or Monitoring Tent. Portable propane heaters can be used, but these cause “off gassing” of carbon monoxide (CO). A CO Meter capable of reading levels from 0 – 25ppm is required and will be periodically observed for current levels. If the level is reached or exceeded; the heating unit will be turned off; the PDS and Monitoring Tent will be opened and allow fresh air to ventilate through, until level is below 25ppm. PDS personnel will process, clean and “double bag” all equipment and any CACM, prior to turning these items over for continued evaluation. At no time, will PDS personnel open and remove an item that was originally processed as “bagged”. Should a bag appear to be opened, cut or torn, the PDS Supervisor will notify UXOSO for instructions.	L
	2b. Pressurized cylinders – sudden release of contents.	2b. The cylinders in question will be the propane heaters, if used and the SCBA tanks used by the field team and possibly the PDS personnel. The SCBAs will be handled IAW the WP and SOP. The propane heater will be checked once an hour to ensue it is operating properly and there are no obstructions in front of the jet.	L
3. Emergency Operations - a. Injured Down Range Member b. Rescue Crew sent to assist Team Down Range	3. The Hazards itemized in Hazard 1 and 2 are applicable to Hazard 3.	3. The Controls itemized in Control 1 and 2 are also applicable to Control 3.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Modified Level D up to possibly Level A. Refer to APP and SSHP. Equipment (as applicable): Hard hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Magnetometers Geophysics Instruments Generator Water Bleach Plastic sheeting and bags Breathing air cascade system SCBAs Respirator PDS trailer Sprayers and brushes Air monitoring equipment MINICAMS	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All personnel operating air monitoring equipment will be trained and qualified in accordance with CARA Internal Operating Procedures under the CARA Mobile Expeditionary Lab Chemical Air Monitoring Quality Management System. All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> UXO Personnel must be qualified IAW DDESB TP18. HAZWOPER 40-hour Site safety orientation MEC awareness Lifting/back safety Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator.	Daily site safety inspection (UXOSO) – TBD CARA Daily site safety inspection (SUXOS) – TBD CARA Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily SCBAs, respirators and PPE before each use Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability.

Activity Hazard Analysis (AHA)

Activity/Work Task: **MEC DEMOLITION OPERATIONS**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**M**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL	**Risk Assessment Code (RAC) Matrix**	
Contract Number: NA		
Date Prepared: 8-10-15		
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist		
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer		
Notes: (Field Notes, Review Comments, etc.)		

Severity	**Probability**				
	Frequent	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Job Steps	Hazards	Controls	RAC
1. Establish location for desired work area to conduct operations, to include: a. Establish Work Area Control Zones b. Mechanical Excavation c. Disposal Operations d. Post Blast Check of Demolition Area	1a. Slip, trip and fall.	1a. Worker awareness of potential slippery/uneven surfaces and tripping hazards plus inspection and policing of debris.	L
	1b. Insect bites/West Nile Virus.	1b. Wear PPE and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify the UXOSO of flu-like symptoms.	L
	1c. Contact dermatitis and poison ivy.	1c. Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plans. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contact poison ivy.	L
	1d. Cold/Heat Stress	1d. All site activities must be conducted IAW the approved WP and APP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	L

Job Steps	Hazards	Controls	RAC
	1e. Contact with chemical agent or other hazardous chemicals	1e. Personnel will don the proper PPE commensurate with the PPE matrix in the APP. MEC, CWM, and chemicals of concern training and safety awareness during site-specific training and refreshed during morning tailgate briefing. During site-specific health and safety training, workers will be briefed concerning their rights and responsibilities regarding hazard communications. Material safety data sheets for relevant chemicals will be kept available on site at all times. Continuous air monitoring of work zone where demolition personnel are working.	L
	1f. MEC Hazards	1f. Use only UXO personnel qualified in accordance with DDESB Technical Paper 18. UXO Technicians shall be present during demolition operations. Minimum separation distances (MSD) will be established in accordance with the approved Chemical Safety Submission (CSS).	M
	1g. Lifting hazards.	1g. Ensure that you, and if there is another individual assisting you, both have solid footing, leather work gloves and use the proper lifting technique, bend at the knees keeping your back as straight as possible and lift with your knees, not your back. Ensure you have good visibility in the direction you are carrying an item. Do not attempt to carry anything by yourself in excess of 50 lbs. or any item that blocks your visibility or is cumbersome to carry alone.	L
	1h. Hand and Power tool operation	1h. When operating power tools they will be handled, operated and maintained IAW the manufactures instructions, the approved WP and any applicable SOPs. The power tool will be inspected prior to use to ensure that all of the hand and safety guards are in place and that the chain, if present, is properly tightened and that the tool is otherwise in good working order. Depending on the power tool PPE will vary and it too must be serviceable, operable and free of any defect. PPE will be worn IAW the approved WP and inspected by the user prior to donning. Hand and power tool use will be IAW EM 385-1-1. Only trained and authorized personnel will use hand and power tools.	L
	1i. Vehicle and heavy equipment traffic in area.	1i. Be aware of any vehicles or heavy equipment in area and be certain to wear a hard hat, safety glasses, and a high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc. Use of “ground guides” will be used, when vehicle(s) are not equipped with an audible warning device and/or has an obstructed view.	M

Job Steps	Hazards	Controls	RAC
	1j. Pinch and cut hazard from handling sharp scrap material.	1j. Wear all required PPE, ensure that it is serviceable, and check hand placement to ensure there are no sharp surfaces or pinch areas.	M
	1k. Unintentional Detonation	1k. The UXOSO will establish clear and defined work zones, such as MSD between teams and non-essential personnel. All demolition operation will be conducted IAW TM60A1-1-31. All MEC work ceases when unauthorized personnel enter into the MSD.	M
	1l. Noise in excess of OSHA standards	1l. If the heavy equipment and/or power tools used are louder than 85dB (A) then the appropriate noise attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn.	M
	1m. Underground Utilities	1m. The local utility locating hotline will be contacted by the construction contractor to identify the locations of buried utilities before subsurface activities are allowed to commence.	L
	1n. Overhead Utilities	1n. Redstone or the construction contractor will coordinate all utility shutoffs prior to the execution of demolition activities. If an overhead line cannot be deenergized, a clearance distance will be established by the UXOSO in accordance with EM 385-1-1 and maintained by the use of a physical limiting device.	L
	1o. Fire/Explosion	1o. Refueling of all vehicles, heavy equipment and other fueled equipment will be conducted in accordance with the SSHP, applicable SOPs and EM 385-1-1. Proper fire extinguishers will be on site and serviceable. There will be no “Hot Fueling” authorized at any time.	L
	1p. Confined Space – Cave In/Entrapment	1p. Any excavation deeper than 4ft is classified as a confined space (non-permit required). Competent Soil Person will inspect the excavation daily and periodically to ensure engineering controls are adequate and working. Engineering controls are Sloping, Benching and Shoring. No work will be allowed in an excavation that has standing water. The water will be pumped out and re-entry will only be allowed after the Competent Person inspects the excavation site. Egress points are placed no further than 25ft from any workers. If ladders are used, they must:	M

Job Steps	Hazards	Controls	RAC
		a. Extend from the floor surface of the excavation and extend a minimum of 3ft beyond above ground level of the excavation b. Be clear of all equipment and engineering controls for workers to use c. Upon entry into the excavation, be OSHA rated and support the worker's weight to include tools and equipment	
	1q. Misfires	1q. Misfires will be handled, as prescribed in TM60A-1-1-31, Explosive Ordnance Disposal Procedures.	L
	1r. Severe Weather (Lightning, Winds, Snow)	1r. No demolition operations will be conducted during the onset of severe weather (strong winds above 25mph; lightning, snow and other visibility reducing events).	L
	1s. Low flying aircraft	1s. UXOSO or Demolition Team Leader will prepare and telephonically submit a NOTAM (Notice to Airmen) through the servicing Federal Aviation Administration Office during the entire Demolition Operation. Above Ground Limit (AGL or Ceiling Limitations) requirements for the NOTAM will be based on calculations from 1t below.	L
	1t. Hazardous Fragmentation	1t. Demolition Crew will adhere to HNC-ED-CS-S-98-7, August 1998, Use of Sandbags for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions to reduce the fragmentation hazards and establish the HFD as listed in DDESB TP16 or USACE Fragmentation Data Sheet for items being destroyed.	M
	1u. Transportation of explosive materials – accidents during transportation of explosive materials.	1u. Drivers operating will be licensed in accordance with federal, state, and local regulations. Vehicles transporting explosives off-road will not exceed 25 miles per hour. Chock wheels when loading or unloading donor explosives. Drivers will observe all posted speed limits while operating a motor vehicle on a public roadway.	M

Job Steps	Hazards	Controls	RAC
	1v. Transportation of explosive materials – accidental detonation of explosives	1v. Explosives will be transported in accordance with 49 Code of Federal Regulations, Parts 100-199. Refer to Explosives Management Plan in the Work Plan. Explosives will be transported in closed vehicles whenever possible. Observe the CEHNC, Safety Concepts and Basic Considerations for MEC Operations. When using an open vehicle, explosives will be covered with a flame resistant tarpaulin. Motor vehicles will be shut off when loading/unloading explosives. Beds of vehicles will have a nonconductive bed liner, dunnage, or sand bags to protect the explosives from contact with the metal bed and fittings. Initiating explosives, such as blasting caps, will remain separated at all times. Each vehicle used for the transport of donor explosives will be outfitted with a fire extinguisher and first aid kit. Do not fuel trucks when loaded with donor explosives. No donor explosives allowed in passenger compartment of vehicle. No smoking in or around a vehicle containing donor explosives.	**M**
	1w. Storage of explosive materials – accidental detonation of explosives.	1w. Materials will be stored in accordance with federal, state and local regulations. Refer to Explosives Management Plan, and Explosives Siting Plan in the Work Plan. Observe the CEHNC, Safety Concepts and Basic Considerations for MEC Operations.	**M**
	1x. Access survey of ingress/egress route – accidental detonation of explosives.	1x. Survey will be conducted by a UXO team and safe routes clearly marked and delineated. Observe the CEHNC Basic Safety Concepts and Considerations for Ordnance and Explosives Operations.	**M**
	1y. Public Protection	1y. CARA will position personnel strategically outside the EZ to maintain site security and to prevent site entry by unauthorized personnel. All demolition operations will cease in the event an unauthorized person enters the EZ.	**M**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Modified Level D up to possibly Level A. Refer to APP and SSHP. Equipment (as applicable): Hard hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Respirator Magnetometers Geophysics Instruments Donor explosives Barricades Warning signs Air Monitoring Equipment MINICAMS DAAMS MultiRAE Sample Lines	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All personnel operating air monitoring equipment will be trained and qualified in accordance with CARA Internal Operating Procedures under the CARA Mobile Expeditionary Lab Chemical Air Monitoring Quality Management System. All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> UXO Personnel must be qualified IAW DDESB TP18. HAZWOPER 40-hour Site safety orientation MEC awareness Lifting/back safety Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator.	Daily site safety inspection (UXOSO) – TBD CARA Daily site safety inspection (SUXOS) – TBD CARA Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily SCBAs, respirators and PPE before each use Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability. Explosive transporting vehicle (prior to use) Overhead and underground utilities Mechanized equipment initial equipment Mechanized equipment (daily)

Activity Hazard Analysis (AHA)

Activity/Work Task: **DRUM HANDLING**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**M**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL	**Risk Assessment Code (RAC) Matrix**	
Contract Number: NA		
Date Prepared: 8-10-15		
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist		
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer		
Notes: (Field Notes, Review Comments, etc.)		

Severity	Probability				
	Frequent	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Job Steps	Hazards	Controls	RAC
1. Transfer drums to/from transport vehicle:	1a. Slip, trip and fall.	1a. Worker awareness of potential slippery surfaces and tripping hazards plus inspection and policing of debris.	L
	1b. Cold/heat stress.	1b. UXOSO will implement heat stress/cold injury control program.	L
	1c. Vehicle and heavy equipment traffic in work area	1c. Operation of heavy equipment in accordance with SSHP. Be alert when working around heavy equipment. Use ground guide when backing vehicles and heavy equipment	L
	1d. Noise in excess of OSHA standards	1d. If the heavy equipment and/or power tools used are louder than 85dB (A) then the appropriate noise attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn	L
	1e. Lifting hazards	1e. Ensure that you, and if there is another individual assisting you, both have solid footing, leather work gloves and use the proper lifting technique, bend at the knees keeping your back as straight as possible and lift with your knees, not your back. Ensure you have good visibility in the direction you are carrying an item. Do not attempt to carry anything by yourself in excess of 50 lbs. or any item that blocks your visibility or is cumbersome to carry alone..	M
	1f. Insect bites/West Nile Virus.	1f. Wear PPE and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify the UXOSO of flu-like symptoms.	L

Job Steps	Hazards	Controls	RAC
	1g. Contact dermatitis and poison ivy.	1g. Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plans. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contact poison ivy.	L
	1h. Pressurized cylinders – sudden release of contents.	1h. Periodic inspection of all pressurized cylinders by air monitoring team. Proper storage of cylinders in accordance with SOPs.	L
	1i. Hand and Power tool operation	1i. When operating power tools they will be handled, operated and maintained IAW the manufactures instructions, the approved WP and any applicable SOPs. The power tool will be inspected prior to use to ensure that all of the hand and safety guards are in place and that the chain, if present, is properly tightened and that the tool is otherwise in good working order. Depending on the power tool PPE will vary and it too must be serviceable, operable and free of any defect. PPE will be worn IAW the approved WP and inspected by the user prior to donning. Hand and power tool use will be IAW EM 385-1-1. Only trained and authorized personnel will use hand and power tools.	L
	1j. Contact with chemical agent or other hazardous chemicals	1j. Personnel will don the proper PPE commensurate with the PPE matrix in the APP. MEC, CWM, and chemicals of concern training and safety awareness during site-specific training and refreshed during morning tailgate briefing. During site-specific health and safety training, workers will be briefed concerning their rights and responsibilities regarding hazard communications. Material safety data sheets for relevant chemicals will be kept available on site at all times. Headspace air monitoring of drum contents prior to transportation/storage..	L
	1k. Pinch and cut hazards	1k. Wear all required PPE, ensure that it is serviceable, and check hand placement to ensure there are no sharp surfaces or pinch areas.	L

Job Steps	Hazards	Controls	RAC
2. Drum Transport:	2a. Vehicle and heavy equipment traffic in work area.	2a. Be aware of any vehicles or heavy equipment in the area and be certain to wear hard hat, safety glasses and high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc.	L
	2b. Noise in excess of OSHA standards.	2b. If the heavy equipment and/or power tools used are louder than 85dB (A) then the appropriate noise attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn.	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Modified Level D up to possibly Level B. Refer to APP and SSHP. Equipment (as applicable): Hard hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Respirator Air monitoring equipment MINICAMS Drum dolly and skid/steer loader or forklift with drum grappler.	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All personnel operating air monitoring equipment will be trained and qualified in accordance with CARA Internal Operating Procedures under the CARA Mobile Expeditionary Lab Chemical Air Monitoring Quality Management System. All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> HAZWOPER 40-hour Site safety orientation Lifting/back safety Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator.	Daily site safety inspection (UXOSO) – TBD CARA Daily site safety inspection (SUXOS) – TBD CARA Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily SCBAs, respirators and PPE before each use Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability.

Activity Hazard Analysis (AHA)

Activity/Work Task: **ECM OPERATIONS**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**L**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL	**Risk Assessment Code (RAC) Matrix**	
Contract Number: NA	**Severity** / **Probability**	
Date Prepared: 8-10-15	**Frequent** / **Likely** / **Occasional** / **Seldom** / **Unlikely**	
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist	Catastrophic: E / E / H / H / M	
	Critical: E / H / H / M / L	
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer	Marginal: H / M / M / L / L	
	Negligible: M / L / L / L / L	
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	**RAC Chart**
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	E = Extremely High Risk
		H = High Risk
	Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA	M = Moderate Risk
		L = Low Risk

Job Steps	Hazards	Controls	RAC
NOTE: The use of existing earth covered magazines (ECMs) within the 8200 block will be provided by the installation as part of the approval process of the specific Chemical Safety Submission (CSS). The delivery; placement; site set-up and establishment of physical security requirements are addressed in both the CSS and referenced Work Plan Appendix. The installation is responsible for erecting security perimeter fencing; electrical hook-up for power and lighting; appropriate lightning protection and providing the required physical security of the ECM (static or roving guard patrols). These operations are addressed by separate AHAs. Refer to the necessary AHA.			
NOTE: This operation is under the direct supervision and control of the CARA personnel (US Government). The ECM Entry Team (CARA) Leader is solely responsible for conducting these operations IAW established SOPs, directives and guidelines. The ECM Entry Team Leader will establish an Exclusion Zone for each IHF Entry operation.			
1. ECM Operations, to include – a. Initial Entry, after first suspect CWM/RCWM item has been placed; and b. Every subsequent entry into the ECM	1a. Slip, trip and fall.	1a. Select a level area for the placement of the item and be aware of the condition of the ground on which you are working. Be certain to place your feet on as firm and solid a surface as possible.	**L**
	1b. Pinch hazard from assembly and placement of equipment.	1b. Wear leather gloves and place hands on smooth surfaces checking the area on which you are going to place your hands in order to avoid any sharp edges or pinch areas.	**L**
	1c. Vehicle and heavy equipment traffic in area.	1c. Be aware of any vehicles or heavy equipment in area and be certain to wear hard hat, safety glasses and high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc.	**L**
	1d. Noise in excess of OSHA standards	1d. If the heavy equipment used is louder than 85dB (A) then the appropriate hearing attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn.	**L**

Job Steps	Hazards	Controls	RAC
	1e. Lifting hazards.	1e. Ensure that you, and if there are other individuals assisting you, each have solid footing, leather work gloves and use the proper lifting technique; bend at the knees keeping your back as straight as possible and lift with your knees, not your back. Ensure you have good visibility in the direction you are moving an item. Do not attempt to carry anything by yourself in excess of 50 lbs. or any item that blocks your visibility or is cumbersome to carry alone.	L
	1f. Insect bites/West Nile Virus.	1f. Wear PPE and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify the UXOSO of flu-like symptoms.	L
	1g. Contact dermatitis and poison ivy.	1g. Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plans. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contact poison ivy.	L
	1h. Contact with chemical agent or other hazardous chemicals	1h. Personnel will don the proper PPE commensurate with the chemical hazard. CWM, HTW, and UXO training and safety awareness during site-specific training and refreshed during morning tailgate briefing. Use face shield as appropriate. CARA will perform first-entry monitoring prior to any entry into the ECM is authorized.	L
	1i. Pressurized cylinders – sudden release of contents	1i. Periodic inspection of all pressurized cylinders by air monitoring team. Proper storage of cylinders in accordance with SOPs.	L
	1j. Use of hand and power tools.	1j. When operating power tools they will be handled, operated and maintained IAW the manufactures instructions, the approved WP and any applicable SOPs. The power tool will be inspected prior to use to ensure that all of the hand and safety guards are in place and that the chain, if present, is properly tightened and that the tool is otherwise in good working order. Depending on the power tool PPE will vary and it too must be serviceable, operable and free of any defect. PPE will be worn IAW the approved WP and inspected by the user prior to donning. Hand and power tool use will be IAW EM 385-1-1. Only trained and authorized personnel will use hand and power tools.	L

Job Steps	Hazards	Controls	RAC
	1k. Electrical Shock.	1k. Sites are remote and require portable, on board or trailer mounted generators to provide electrical power. All generators will be grounded, as stated in EM 385-1-1. In the event there is an electrical problem that cannot be corrected by merely un-plugging and re-plugging an item or replacing a blown fuse then an electrician will be contacted to correct the problem. All electrical appliances and equipment will have a third prong for proper grounding and all electrical outlets will have three pronged receptacles and meet the requirements of EM 385-1-1. GFCI circuitry will be used for all outdoor connections.	L
	1l. Cold/Heat Stress	1l. All site activities must be conducted IAW the approved WP and APP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	L
	1m. Fire/Explosion	1m. Refueling of all vehicles, heavy equipment and other fueled equipment will be conducted in accordance with the SSHP, applicable SOPs and EM 385-1-1. Proper fire extinguishers will be on site and serviceable. There will be no “Hot Fueling” authorized at any time.	L
	1n. Monitoring Equipment Alarm/Ring-Off	1n. CARA shall maintain constant contact with the ECM entry personnel in the event chemical and/or industrial agent is detected.	L
	1o. MEC Hazards	1o. Only CARA personnel will properly package and handle items with an unknown liquid fill and conventional MEC in accordance with the approved Chemical Safety Submission (CSS).	L
	1p. Unintentional Detonation	1p. Establish clear and defined work zones, such as MSD between teams and non-essential personnel. All ECM operations will be conducted in accordance with the approved CSS and Work Plan.	L
	1q. Storage of explosive materials – accidental detonation of explosives.	1q. Materials will be stored in accordance with federal, state and local regulations. Refer to Explosives Management Plan, and Explosives Siting Plan in the Work Plan. Observe the CEHNC, Safety Concepts and Basic Considerations for MEC Operations.	L
	1r. Public Protection	1r. CARA and/or the Security Force will position personnel strategically outside along the transportation route to block public/unauthorized access during the transportation of items from the site to storage. Once inside the storage location, all public/unauthorized access will be restricted.	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Modified Level D up to possibly Level A. Refer to APP and SSHP. Equipment (as applicable): Hard hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Respirator Barricades Warning signs Mobile analytical platform Air Monitoring Equipment MINICAMS DAAMS Approved packaging material Emergency Personnel Decontamination Station (EPDS) equipment.	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All personnel operating air monitoring equipment will be trained and qualified in accordance with CARA Internal Operating Procedures under the CARA Mobile Expeditionary Lab Chemical Air Monitoring Quality Management System. All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> HAZWOPER 40-hour Site safety orientation MEC awareness Lifting/back safety Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator.	Daily site safety inspection (UXOSO) – TBD CARA Daily site safety inspection (SUXOS) – TBD CARA Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily SCBAs, respirators and PPE before each use Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability.

Activity Hazard Analysis (AHA)

Activity/Work Task: **EMERGENCY RESCUE OPERATIONS**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**M**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL	**Risk Assessment Code (RAC) Matrix**	
Contract Number: NA		
Date Prepared: 8-10-15		
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist		
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer		
Notes: (Field Notes, Review Comments, etc.)		

Severity	Probability				
	Frequent	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Job Steps	Hazards	Controls	RAC
1. Establish location for desired work area to conduct operations, to include: a. Establish Work Area Control Zones b. Assist with Personnel Decontamination c. Perform Rescue of Injured Down Range Member d. Perform Medical Monitoring of Injured Identification	1a. Slip, trip and fall.	1a. Worker awareness of potential slippery/uneven surfaces and tripping hazards plus inspection and policing of debris.	L
	1b. Insect bites/West Nile Virus.	1b. Wear PPE and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify the UXOSO of flu-like symptoms.	L
	1c. Contact dermatitis and poison ivy.	1c. Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plans. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contact poison	L
	1d. Vehicle and heavy equipment traffic in area.	1d. Be aware of any vehicles or heavy equipment in area and be certain to wear a hard hat, safety glasses and a high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc.	L

Job Steps	Hazards	Controls	RAC
	1e. Lifting hazards.	1e. Ensure that you, and if there is another individual assisting you, both have solid footing, leather work gloves and use the proper lifting technique, bend at the knees keeping your back as straight as possible and lift with your knees, not your back. Ensure you have good visibility in the direction you are carrying an item. Do not attempt to carry anything by yourself in excess of 50 lbs. or any item that blocks your visibility or is cumbersome to carry alone.	L
	1f. Cold/Heat Stress	1f. All site activities must be conducted IAW the approved WP and APP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	M
	1g. Contact with chemical agent or other hazardous chemicals.	1g. Personnel will don the proper PPE commensurate with the PPE matrix in the APP. MEC, CWM, and chemicals of concern training and safety awareness during site-specific training and refreshed during morning tailgate briefing. During site-specific health and safety training, workers will be briefed concerning their rights and responsibilities regarding hazard communications. Material safety data sheets for relevant chemicals will be kept available on site at all times. Continuous air monitoring of work zone where PDS personnel are working.	L
	1h. MEC Hazards	1h. Non-UXO personnel shall attend site-specific MEC awareness (and recognition) training prior to the commencement of any site activities. Use only UXO personnel qualified in accordance with DDESB Technical Paper 18. UXO Technicians shall be present during any construction activities occurring in the munitions response site (MRS). If an MEC item is encountered alert the rest of the team and conduct an inspection of the item IAW the approved WP, SOP and EM 385-1-97.	L
	1i. Noise in excess of OSHA standards	1i. If the heavy equipment and/or power tools used are louder than 85dBA then the appropriate hearing attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn.	L

Job Steps	Hazards	Controls	RAC
	1j. Fire/Explosion	1j. Refueling of all vehicles, heavy equipment and other fueled equipment will be conducted in accordance with the SSHP, applicable SOPs and EM 385-1-1. Proper fire extinguishers will be on site and serviceable. There will be no “Hot Fueling” authorized at any time.	L
	1k. Pressurized cylinders – sudden release of contents	1k. Periodic inspection of all pressurized cylinders by field crew. Proper storage of cylinders in accordance with SOPs. Some operations require the use of a Cascade System (multiple pressurized cylinders) to provide breathable air for downrange team. The valves, gauges and connections are needed to be visibly checked hourly while team is downrange.	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Level C up to possibly Level A. Refer to APP and SSHP. Equipment (as applicable): Hard hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Communication devices Respirator Rescue equipment	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All personnel operating air monitoring equipment will be trained and qualified in accordance with CARA Internal Operating Procedures under the CARA Mobile Expeditionary Lab Chemical Air Monitoring Quality Management System. All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> UXO Personnel must be qualified IAW DDESB TP18. HAZWOPER 40-hour Site safety orientation MEC awareness Lifting/back safety Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator.	Daily site safety inspection (UXOSO) – TBD CARA Daily site safety inspection (SUXOS) – TBD CARA Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily SCBAs, respirators and PPE before each use Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability.

Activity Hazard Analysis (AHA)

Activity/Work Task: **INTRUSIVE EXCAVATION OF MEC (HIGH CWM PROBABILITY MRS)**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**M**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL		
Contract Number: NA		
Date Prepared: 8-10-15		
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist		
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer		
Notes: (Field Notes, Review Comments, etc.)		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
1. Excavation of Munitions and Explosives of Concern (MEC)	1a. Slip, trip and fall.	1a. Worker awareness of potential slippery/uneven surfaces and tripping hazards plus inspection and policing of debris.	L
	1b. Insect bites/West Nile Virus.	1b. Wear PPE and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify the UXOSO of flu-like symptoms.	L
	1c. Contact dermatitis and poison ivy.	1c. Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plans. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contact poison ivy.	L
	1d. Cold/Heat Stress	1d. All site activities must be conducted IAW the approved WP and APP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	L

Job Steps	Hazards	Controls	RAC
	1e. Contact with chemical agent or other hazardous chemicals	1e. Activities performed in high probability areas shall be performed in Modified Level D PPE with CBRN slung respirators. An EPDS and PDS shall be established and functional before intrusive activities begin. Near Real Time air monitoring for H, L, HN-3, GA, CG, PS, and CK. A MultiRAE will be used for real time detection of VOCs and AC and chloroform. If CWM and/or CA is suspected, or confirmed, personnel will proceed through the EPDS and be screened by a gross level detector, i.e., MINICAMS, and proceed through the PDS in accordance with CARA SOP-011 and the SSHP. Upgrade in PPE to Level A is possible based on air monitoring action levels and potential CA exposure evaluation	M
	1f. MEC Hazards	1f. Non-UXO personnel shall attend site-specific MEC awareness (and recognition) training prior to the commencement of any site activities. Use only UXO personnel qualified in accordance with DDESB Technical Paper 18. UXO Technicians shall be present during any construction activities occurring in the munitions response site (MRS). Inspect the area for the presence of MEC using a magnetometer to assist in finding items in brush and dense vegetation. If an MEC item is encountered alert the rest of the team and conduct an inspection of the item IAW the approved WP, SOP and EM 385-1-97.	M
	1g. Lifting hazards.	1g. Ensure that you, and if there is another individual assisting you, both have solid footing, leather work gloves and use the proper lifting technique, bend at the knees keeping your back as straight as possible and lift with your knees, not your back. Ensure you have good visibility in the direction you are carrying an item. Do not attempt to carry anything by yourself in excess of 50 lbs. or any item that blocks your visibility or is cumbersome to carry alone.	M
	1h. Vehicle and heavy equipment traffic in area.	1h. Be aware of any vehicles or heavy equipment in area and be certain to wear a hard hat, safety glasses and a high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc.	M

Job Steps	Hazards	Controls	RAC
	1i. Hand and Power tool operation	1i. When operating power tools they will be handled, operated and maintained IAW the manufactures instructions, the approved WP and any applicable SOPs. The power tool will be inspected prior to use to ensure that all of the hand and safety guards are in place and that the chain, if present, is properly tightened and that the tool is otherwise in good working order. Depending on the power tool PPE will vary and it too must be serviceable, operable and free of any defect. PPE will be worn IAW the approved WP and inspected by the user prior to donning. Hand and power tool use will be IAW EM 385-1-1, Chapter 13. Only trained and authorized personnel will use hand and power tools.	L
	1j. Pinch and cut hazard from handling sharp scrap material.	1j. Wear all required PPE, ensure that it is serviceable, and check hand placement to ensure there are no sharp surfaces or pinch points.	L
	1k. Unintentional Detonation	1k. Establish clear and defined work areas/zones, such as Minimum Safe Distance (MSD) between teams and nonessential personnel. All MEC/UXO work ceases when unauthorized personnel enter into the work area.	M
	1l. Noise in excess of OSHA standards	1l. If the heavy equipment and/or power tools used are louder than 85dBA then the appropriate noise attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn.	L
	1m. Underground Utilities	1m. The local utility locating hotline will be contacted to identify the locations of buried utilities before subsurface activities are allowed to commence.	L
	1n. Overhead Utilities	1n. Redstone or the construction contractor will coordinate all utility shutoffs prior to the execution of demolition activities. If an overhead line cannot be deenergized, a clearance distance will be established by the UXOSO in accordance with EM 385-1-1 and maintained by the use of a physical limiting device.	L
	1o. Fire/Explosion	1o. Refueling of all vehicles, heavy equipment and other fueled equipment will be conducted in accordance with the SSHP, applicable SOPs and EM 385-1-1. Proper fire extinguishers will be on site and serviceable. There will be no “Hot Fueling” authorized at any time.	L

Job Steps	Hazards	Controls	RAC
	1p. Confined Space – Cave In/Entrapment	1p. Any excavation deeper than 4ft are classified as confined spaces (non-permit required). Competent Soil Person will inspect the excavation daily and periodically to ensure engineering controls are adequate and working. Engineering controls are Sloping, Benching and Shoring. No work will be allowed in an excavation that has standing water. The water will be removed and re-entry will only be allowed after the Competent Person inspects the excavation site. Egress points are placed no further than 25ft from any workers. If ladders are used, they must – a. Extend from the floor surface of the excavation and extend a minimum of 3ft beyond surface level of the excavation b. Be clear of all equipment and engineering controls for workers to use c. Upon entry into the excavation, be OSHA rated and support the worker's weight to include tools and equipment	L
	1q. Hazardous Fragmentation	1q. The UXOSO is responsible for maintaining the minimum separation distance (MSD) as indicated in the approved Chemical Safety Submission (CSS).	M
	1r. Buried hazardous materials	1r. Notify the UXOSO and OESS immediately if buried hazardous materials are encountered during excavations.	M
	1s. Severe weather.	1s. The UXOSO will monitor weather conditions each day in order to plan and prepare for hazardous conditions. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). Follow procedures outlined in the APP.	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Modified Level D up to possibly Level A. Refer to APP and SSHP. Equipment (as applicable): Hard hat Safety Glasses Chemical resistant boots Work Gloves over butyl rubber gloves Tyvek F ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Respirator Magnetometers Geophysics Instruments Barricades Warning signs Air Monitoring Equipment MINICAMS DAAMS MultiRAE Sample Lines Emergency personnel decontamination station (EPDS) PDS	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All personnel operating air monitoring equipment will be trained and qualified in accordance with CARA Internal Operating Procedures under the CARA Mobile Expeditionary Lab Chemical Air Monitoring Quality Management System. All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> Tabletop and Pre-Operational Surveys UXO Personnel must be qualified IAW DDESB TP18. HAZWOPER 40-hour Site safety orientation MEC awareness Lifting/back safety Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator. Onsite Emergency Medical Technicians shall have completed the Chemical Agent Casualty Training in accordance with the Interim Guidance for CWM Responses and Related Activities.	Daily site safety inspection (UXOSO) – TBD CARA Daily site safety inspection (SUXOS) – TBD CARA Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily SCBAs, respirators and PPE before each use Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability. Overhead and underground utilities Mechanized equipment initial equipment Mechanized equipment (daily)

Activity Hazard Analysis (AHA)

Activity/Work Task: **EXPLOSIVE STORAGE AND TRANSPORTATION (ESAT) OPERATIONS**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**M**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL		
Contract Number: NA		
Date Prepared: 8-10-15		
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist		
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer		
Notes: (Field Notes, Review Comments, etc.)		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
1. Establish location for desired work area to conduct operations, to include:	1a. Slip, trip and fall.	1a. Worker awareness of potential slippery/uneven surfaces and tripping hazards plus inspection and policing of debris.	L
a. Establish Explosive Storage Area (ESA)	1b. Insect bites/West Nile Virus.	1b. Wear PPE and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify the UXOSO of flu-like symptoms.	L
b. Receipt/Store/Issue/ Inventory/Restock Explosive material	1c. Contact dermatitis and poison ivy.	1c. Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plans. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contact poison ivy.	L
	1d. Cold/Heat Stress	1d. All site activities must be conducted IAW the approved WP and APP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions. Personnel will don the proper PPE commensurate with the chemical hazard encountered and the work performed.	L

Job Steps	Hazards	Controls	RAC
	1e. Contact with chemical agent or other hazardous chemicals.	1e. Personnel will don the proper PPE commensurate with the PPE matrix in the APP. MEC, CWM, and chemicals of concern training and safety awareness during site-specific training and refreshed during morning tailgate briefing. During site-specific health and safety training, workers will be briefed concerning their rights and responsibilities regarding hazard communications. Material safety data sheets for relevant chemicals will be kept available on site at all times. Continuous air monitoring of work zone where demolition personnel are working.	L
	1f. Static Electricity (Grounding/Lightning Protection)	1f. The ESA bunker will be grounded IAW with the WP, SOP and DA Pam 385-64. Lightning protection system will be installed and tested in accordance with DA PAM 385-64 and AR 385-64. Electrical work and grounding to be performed by a certified electrician.	L
	1g. Fire/Explosion (Range Fires/ Unintentional Detonation/Compatibility of Explosives)	1g. Fire Protection Plan - The ESA area will require general and specific housekeeping on a routine basis to keep vegetation and flammable material maintained to a level that will not propagate the spread of a fire. All trash will be removed from the fencing around the ESA. The ESA will be protected by at least one 20 A:B:C fire extinguisher mounted on the outside of the ESA fence, near the entrance. All spark emitting devices, matches and flame producing items will not be carried into the ESA. These items will be left outside in a designated location. In the event of a fire at or near the ESA, all site personnel will be evacuated to a distance outside the approved Inhibited Building Distance (IBD), as stated in the approved Chemical Safety Submission (CSS). An honest attempt to fight the fire will be made with all available firefighting equipment on hand. A reasonable decision will be made by the UXOSO when these means have been exhausted and any further attempts will endanger site personnel. At no time will anyone attempt to evacuate the explosives from the ESA; should the bunker door be open at the time, it will be shut and secured if time permits. The UXOSO will notify and meet the responding local fire department at the IBD boundary and brief them on the following: • Total Quantity of Explosives, by hazard classification, inside the ESA; • Time the fire started; and • The amount of time the bunkers have been engulfed by flames.	L

Job Steps	Hazards	Controls	RAC
		1g. Unintentional Detonation - Establish clear and defined work areas/zones, such as Minimum Safe Distance (MSD) between teams and non-essential personnel. All MEC work ceases when unauthorized personnel enter into the work area.	L
		1g. Explosive Compatibility - Explosive compatibility will be maintained in accordance with DA PAM 385-64; TM 9-1300- 206; the CSS and SOP. In certain instances, it may be necessary to store incompatible items in the same magazine. If this should occur, a waiver will be requested IAW DOD 6055.9-M, and then a barricade, such as sandbags, within the magazine, will physically separate the incompatible items.	L
	1h. ESA Structure and Security	1h. Bunker Structure - Approved explosive storage facilities may be provided at the site, either by the U.S. Army Corps of Engineers (USACE) or by the installation. Use of existing magazines for explosive storage will comply with local storage criteria and procedures. If no explosives storage facilities are available: • Use approved BATF Type 2 structures; • Locate, install, and maintain the magazines to comply with the magazine criteria and quantity distance requirements established in DOD 6055.9-M DOD Ammunition and Explosives Safety Standards; • Install sufficient magazines to comply with the explosive compatibility requirements, (i.e., bulk explosives, initiating explosives); • Establish security, such as fencing, to prevent unauthorized access and/or theft, as required.	L
		1h. Security - Appropriate fencing; hinges and hasps; keys and locks; key control; signage and placards and inspections (physical security) protection will be installed on all site(s), in accordance with AR 190-11, the CSS and SOP. An emergency notification list containing the names, telephone numbers, and local addresses of the individuals to be notified in the event of an emergency, will be posted on the outside and inside of the magazine door. These individuals should be the same individuals authorized to sign for explosives, as well as the site manager and UXOSO.	
	1i. MEC Hazards	1i. If a MEC item is encountered alert the rest of the team and conduct an inspection of the item IAW the approved WP, SOP and EM 385-1-97.	M

Job Steps	Hazards	Controls	RAC
	1j. Severe Weather (containing potential electrical charge)	1j. UXOSO will verify through local and national weather forecast agencies that an optimum time frame to complete all Explosive Storage and Transportation (ESAT) operations is in effect for the area. There will be no scheduled ESAT operations during weather conditions that pose static electrical charges, or minimize visibility.	L
	1k. Pinch and cut hazard from handling debris material.	1k. Wear all required PPE, ensure that it is serviceable, and check hand placement to ensure there are no sharp surface or pinch areas.	L
	1l. Vehicle and heavy equipment traffic in area.	1l. Be aware of any vehicles or heavy equipment in area and be certain to wear a hard hat, safety glasses and a high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc. Use of “ground guides” will be used, when vehicle(s) are not equipped with an audible warning device and/or has an obstructed view.	L
	1m. Noise in excess of OSHA standards	1m. If the heavy equipment and/or power tools used are louder than 85dB (A) then the appropriate noise attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn.	L
	1n. Lifting hazards.	1n. Ensure that you, and if there is another individual assisting you, both have solid footing, leather work gloves and use the proper lifting technique, bend at the knees keeping your back as straight as possible and lift with your knees, not your back. Ensure you have good visibility in the direction you are carrying an item. Do not attempt to carry anything by yourself in excess of 50 lbs. or any item that blocks your visibility or is cumbersome to carry alone.	L

Job Steps	Hazards	Controls	RAC
2. Transport Explosive from Storage Area to Disposal Site and return of un-used Explosives to include: a. Explosive Transportation Route b. On Call Provider c. Project End Use Disposal	2. The Hazards itemized in Hazard 1 are applicable to Hazard 2, with the exception of Hazard 2f; 2h; 2i and 2n. In addition hazard 2a and 2b are added.	2. The Controls itemized in Control 1 are also applicable to Control 2. 2a is changed as follows:	
	2a. Contact with chemical agent or other hazardous chemicals	2a. UXO Workers will don the nitrile gloves, as an inner and outer liner to the issued leather gloves, when handling raw and bulk explosives.	L
	2b. Transportation of Explosives (Unintentional Detonation)	2b. On Site - UXOSO will develop an Explosive Transportation Route to ensure that non-essential personnel; buildings, roads and railways are not exposed to potential hazards, when transporting explosives from the ESA to the disposal site. Explosive Vehicle will be inspected and maintained IAW DA Pam 385-64 and SOP. This will include – • One 20 A:B:C or two 10 A:B:C rated fire extinguishers (**do not** use the extinguisher located at the ESA); • Flame Retardant Tarpaulin to cover explosives; • Approved Electro-Magnetic Radiation (EMR) container for initiators; • Appropriate Signage/Placards; and, • Non-conductive bed liner (plywood sheet) for transport vehicle	L
		2b. Off Site - Certain or remote sites may have established the use of an “On-Call” explosives provider, as a sub-contractor, listed in the Explosive Management Plan (EMP). SSHO/UXOSO will ensure that the provider transports, placards and conforms to the required Department of Transportation (DOT) regulations, prior to arrival on site. The “On Call” supplier will be briefed on the Explosive Transportation Route by the UXOSO. A licensed Blaster will sign receipt of all requested explosives from the “On Call” supplier. The “On Call” supplier will remain on site, but outside the Munition with the Greatest Fragmentation Distance (MGFD), until all disposal operations are completed.	L
	2c. Intentional Detonation	2c. Refer to Demolition Operations AHA.	M

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Modified Level D up to possibly Level A. Refer to APP and SSHP. Equipment (as applicable): Hard hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Respirator Magnetometers Geophysics Instruments Donor explosives Barricades Warning signs Air Monitoring Equipment MINICAMS DAAMS MultiRAE Sample lines	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All personnel operating air monitoring equipment will be trained and qualified in accordance with CARA Internal Operating Procedures under the CARA Mobile Expeditionary Lab Chemical Air Monitoring Quality Management System. All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> UXO Personnel must be qualified IAW DDESB TP18. HAZWOPER 40-hour Site safety orientation MEC awareness Lifting/back safety Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator.	Daily site safety inspection (UXOSO) – TBD CARA Daily site safety inspection (SUXOS) – TBD CARA Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily SCBAs, respirators and PPE before each use Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability.

Activity Hazard Analysis (AHA)

Activity/Work Task: **FUELING OPERATIONS**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**M**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL	**Risk Assessment Code (RAC) Matrix**	
Contract Number: NA		
Date Prepared: 8-10-15		
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist		
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer		
Notes: (Field Notes, Review Comments, etc.)		

Severity	Probability				
	Frequent	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Job Steps	Hazards	Controls	RAC
Fueling operations.	Exposures to fuels.	Personnel shall periodically review the Material Safety Data Sheets (MSDS) for the fuels that are being used at the project. The handling and use of fuels shall be performed in well-ventilated areas – preferably outside of buildings. Personnel shall avoid skin and eye contact with fuels. Safety glasses and disposable nitrile gloves shall be worn while handling fuels. If personnel sustain skin contact with fuels, then the affected area shall be immediately washed with soap and water. If fuel contact with clothing is made, then clothing shall be removed and changed immediately.	L
	Fire: extinguisher requirements.	10 pound A:B:C fire extinguisher shall be readily available when fueling equipment at any location on site. Trucks with flammable/combustible fuels must be equipped with 20 pound A:B:C fire extinguisher. Personnel who intend to extinguish small fires shall be trained in the use of fire extinguishers. Equipment and property are of secondary concern in a fire situation - personnel shall never try to extinguish a fire if there is any doubt that it can be extinguished safely.	L
	Fire: elimination of ignition sources – hot surfaces.	All vehicles and equipment shall be shut down prior to fueling. Small equipment, such as generators, mowers, pressure washers, etc. shall be allowed to cool prior to re-fueling. Heavy equipment with the fuel cap near the engine or near other hot surfaces shall also be allowed to cool prior to re-fueling.	M
	.		

Job Steps	Hazards	Controls	RAC
	Fire: elimination of ignition sources – arcs/sparks/open flames.	Smoking shall not be allowed within 50 feet of fueling operations. Personnel shall visually survey the immediate area for open flames and other ignition sources prior to commencing fueling operations. Personnel are prohibited from using cell-phones or two-way radios during all fueling operations.	L
	Fire: elimination of ignition sources – static electricity.	Personnel shall never fill portable fuel cans that are in the bed of a pickup truck or in the trunk of an automobile. Filling fuel containers on plastic pickup truck bed-liners can cause static electric discharges, which may ignite the fuel. The fuel can(s) shall be removed from the truck bed or automobile trunk and placed on the ground before adding fuel. Electrical continuity shall be maintained between the portable fuel can and the tank being filled. A bonding cable shall be used to maintain continuity between the metal fuel container and the equipment fuel tank. Allowing free-fall of fuel into the tank is prohibited. Personnel shall not re-enter vehicles while fueling is underway due to the static electric charge generated between clothing and vehicle seats. If you absolutely have to get in your vehicle while the gas is pumping, make sure you get out, close the door touching the metal, before you pull the nozzle out. This way the static from your body will be discharged before you remove the nozzle.	L
	Storage and transportation: five gallon cans in pick-up trucks.	Gasoline shall be stored and transported in properly marked/labeled five-gallon safety cans (equipped with self-venting cap and flash arrestor). Gasoline cans shall be secured to prevent movement during transportation. No more than six - five gallon containers of gasoline may be transported in vehicles (back of pick-up trucks or trailers) at the same time unless all the Department of Transportation (DOT) Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding (as required), and the appropriate HM 126 Training (as well as having been provided emergency response information and training.) The total quantity of hazardous materials may never exceed 440 pounds total. Hazardous materials must be secured prior to transporting.	L
	Communication of hazards.	Drivers must be notified that they are transporting hazardous materials. Drivers shall review MSDS for the fuels transported in their vehicle.	L

Job Steps	Hazards	Controls	RAC
	Storage of fuels on-site.	Portable safety gasoline cans must be stored within a flammable materials storage area, have appropriate warning signs, be posted as “No Smoking’, and have a fire extinguisher available in the area.	M
	Spills.	All spills shall be immediately cleaned-up. Spill control equipment shall be readily available. All spills shall be reported to the SUXOS and UXOSO.	M
	Storage and transportation: safety containers and saddle tanks in pickup trucks.	Gasoline shall not be transported in portable saddle tanks – only diesel fuel shall be transported in saddle tanks. All portable saddle tanks mounted in pick-up trucks shall be manufactured to meet DOT specifications. Portable saddle tanks shall be securely mounted to the pick-up truck, as recommended by the manufacturer. Saddle tanks shall be properly marked (see 49 Code of Federal Regulation 172.101) with the proper shipping name and labeled for “No Smoking.” No more than 110 gallons of diesel fuel may be transported in a saddle tank unless all the DOT Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding, and the appropriate HM 126 Training (as well as having been provided emergency response information and training.)	L
	Bulk storage of diesel fuel on-site.	Caps on saddle tanks shall be securely closed. Saddle tanks shall be inspected weekly to check for leaks. Bulk storage tanks shall not be permitted on site without express permission from the Shaw Project Manager and Health and Safety Manager.	M

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE):Level D. Refer to APP and SSHP. Equipment (as applicable): Hard hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Respirator Magnetometers Geophysics Instruments Saddle tanks Bonding cable Five-gallon safety cans (equipped with self-venting cap and flash arrestor) Basic spill kit (55-gallon open top drum, shovels, plastic sheeting, sorbent pads and granular material)	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. Training Requirements: HAZWOPER 40-hour Site safety orientation MEC awareness Lifting/back safety Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator	Daily site safety inspection (UXOSO) – TBD Daily site safety inspection (SUXOS) – TBD Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Vehicle inspection daily Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Survey area for ignition sources (prior to commencing fueling operations) Verify MSDSs for fuels are available in vehicles transporting fuels Saddle tanks (daily) Verify eye wash bottle is readily available Fire extinguisher (weekly and before fueling equipment)

Activity Hazard Analysis (AHA)

Activity/Work Task: **HANDLING CACM**	Overall Risk Assessment Code (RAC) (Use Highest Code) **M**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL	
Contract Number: NA	
Date Prepared: 8-10-15	
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist	
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer	
Notes: (Field Notes, Review Comments, etc.)	

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
CACM identification, handling, packaging, staging, and transportation	1a. Slip, trip and fall.	1a. Worker awareness of potential slippery/uneven surfaces and tripping hazards plus inspection and policing of debris.	L
	1b. Insect bites/West Nile Virus.	1b. Wear PPE and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify the UXOSO of flu-like symptoms.	L
	1c. Contact dermatitis and poison ivy.	1c. Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plans. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contact poison ivy.	L
	1d. Cold/Heat Stress	1d. All site activities must be conducted IAW the approved WP and APP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	L
	1e. MEC Hazards	1e. Inspect the area for the presence of MEC using a magnetometer to assist in finding items in brush and dense vegetation. If an MEC item is encountered alert the rest of the team and conduct an inspection of the item IAW the approved WP, SOP and EM 385-1-97.	M

Job Steps	Hazards	Controls	RAC
	1f. Contact with chemical agent or other hazardous chemicals	1f. Activities performed in high probability areas shall be performed in Modified Level D PPE with CBRN slung respirators. An EPDS and PDS shall be established and functional before intrusive activities begin. Near Real Time air monitoring for H, L, HN-3, GA, CG, PS, and CK. A MultiRAE will be used for real time detection of VOCs and AC and chloroform. Upgrade in PPE to Level A is possible based on air monitoring action levels and potential CA exposure evaluation	M
	1g. Lifting hazards.	1g. Ensure that you, and if there is another individual assisting you, both have solid footing, leather work gloves and use the proper lifting technique, bend at the knees keeping your back as straight as possible and lift with your knees, not your back. Ensure you have good visibility in the direction you are carrying an item. Do not attempt to carry anything by yourself in excess of 50 lbs. or any item that blocks your visibility or is cumbersome to carry alone.	L
	1h. Hand and Power tool operation	1h. When operating power tools they will be handled, operated and maintained IAW the manufactures instructions, the approved WP and any applicable SOPs. The power tool will be inspected prior to use to ensure that all of the hand and safety guards are in place and that the chain, if present, is properly tightened and that the tool is otherwise in good working order. Depending on the power tool PPE will vary and it too must be serviceable, operable and free of any defect. PPE will be worn IAW the approved WP and inspected by the user prior to donning. Hand and power tool use will be IAW EM 385-1-1. Only trained and authorized personnel will use hand and power tools.	L
	1i. Vehicle and heavy equipment traffic in area.	1i. Be aware of any vehicles or heavy equipment in area and be certain to wear hard hat and high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc.	L
	1j. Pinch and cut hazard from handling scrap metal.	1j. Wear all required PPE, ensure that it is serviceable, and check hand placement to ensure there are no sharp surfaces or pinch points.	L

Job Steps	Hazards	Controls	RAC
	1k. Unintentional Detonation	1k. Establish clear and defined work area zones, such as Minimum Safe Distance (MSD) between teams and nonessential personnel. All MEC/UXO work ceases when unauthorized personnel enter into the work area.	L
	1l. Noise in excess of OSHA standards	1l. If the heavy equipment and/or power tools used are louder than 85dB (A) then the appropriate hearing attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn.	L
	1m. Underground Utilities	1m. The local utility locating hotline will be contacted to identify the locations of buried utilities before subsurface activities are allowed to commence.	L
	1n. Fire/Explosion	1n. Refueling of all vehicles, heavy equipment and other fueled equipment will be conducted in accordance with the SSHP, applicable SOPs and EM 385-1-1. Proper fire extinguishers will be on site and serviceable. There will be no “Hot Fueling” authorized at any time.	L
	1o. Confined Space – Cave In/Entrapment	1o. Any excavation deeper than 4ft are classified as confined spaces (non-permit required). Component Soil Person will inspect the excavation daily and periodically to ensure engineering controls are adequate and working. Engineering controls are Sloping, Benching and Shoring. No work will be allowed in an excavation that has standing water. The water will be removed and re-entry will only be allowed after the Component Person inspects the excavation site. Egress points must be placed no further than 25ft from any worker. If ladders are used, they must – a. Extend from the floor surface of the excavation and extend a minimum of 3ft beyond surface level of the excavation b. Be clear of all equipment and engineering controls for workers to use c. Upon entry into the excavation, be OSHA rated and support the worker’s weight to include tools and equipment	L
	1p. Pressurized cylinders – sudden release of contents	1p. Periodic inspection of all pressurized cylinders by field crew. Proper storage of cylinders in accordance with SOPs.	L

Job Steps	Hazards	Controls	RAC
	1q. Use of operational chemicals such as 5% bleach (sodium hypochlorite)	1q. Read and follow MSDS for each chemical used. Do not use any chemical that you have not been trained to safely use. Wear proper PPE. Properly label all containers.	L
	1r. Heal in items that are not intact	1r. Heel will be removed using small hand tools or brushes. Use caution with brushes so CA material does become airborne. Place Heel or CA into poly drum with associated soil and neutralize with bleach in accordance with SOP.	L
	1s. Cross contamination	1s. Avoid contamination on exterior of drums and containers. Have neutralent bleach readily accessible. Frequent change out of gloves that may become contaminated. Use of EPDS to minimize spread of potential and confirmed contamination. Equipment used to handle CACM will remain in the exclusion zone until released by air monitoring.	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Level C and Level B PPE: Refer to APP and SSHP. Equipment (as applicable) Hard hat Safety Glasses Chemical resistant boots Work Gloves over butyl rubber gloves Tyvek F ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Respirator Air Monitoring Equipment MINICAMS DAAMS MultiRAE Sample Lines Drums Plastic sheeting and bags Bleach (or compatible decontamination solution)	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All personnel operating air monitoring equipment will be trained and qualified in accordance with CARA Internal Operating Procedures under the CARA Mobile Expeditionary Lab Chemical Air Monitoring Quality Management System. All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> HAZWOPER 40-hour MEC awareness Lifting/back safety Site safety orientation Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator.	Daily site safety inspection (UXOSO) – TBD CARA Daily site safety inspection (SUXOS) – TBD CARA Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability.

Activity Hazard Analysis (AHA)

Activity/Work Task: **MOBILIZATION/DEMOBILIZATION**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**L**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL	**Risk Assessment Code (RAC) Matrix**	
Contract Number: NA		
Date Prepared: 8-10-15		
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist		
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer		
Notes: (Field Notes, Review Comments, etc.)		

Severity	Probability				
	Frequent	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Job Steps	Hazards	Controls	RAC
1. Site Set Up or Tear Down, to include install or dismantle equipment	1a. Slip, trip and fall.	1a. Worker awareness of potential slippery/uneven surfaces and tripping hazards plus inspection and policing of debris.	L
	1b. Insect bites/West Nile Virus.	1b. Wear PPE and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify the UXOSO of flu-like symptoms.	L
	1c. Contact dermatitis and poison ivy.	1c. Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plans. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contact poison ivy.	L
	1d. Pinch hazard from assembly and placement of equipment.	1d. Wear leather gloves and place hands on smooth surfaces checking the area on which you are going to place your hands to avoid sharp areas and pinch points.	L
	1e. Cold/Heat Stress	1e. All site activities must be conducted IAW the approved WP and APP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	L

Job Steps	Hazards	Controls	RAC
	1f. Lifting hazards.	1f. Ensure that you, and if there is another individual assisting you, both have solid footing, leather work gloves and use the proper lifting technique, bend at the knees keeping your back as straight as possible and lift with your knees, not your back. Ensure you have good visibility in the direction you are carrying an item. Do not attempt to carry anything by yourself in excess of 50 lbs. or any item that blocks your visibility or is cumbersome to carry alone.	L
	1g. Vehicle and heavy equipment traffic in area.	1g. Be aware of any vehicles or heavy equipment in area and be certain to wear a hard hat, safety glasses, and a high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc	L
	1h. Use of hand and power tools	1h. Use the proper tools for the specific job being performed. Be certain that the tools to be used are serviceable and free of slippery surfaces. Hand and power tool use will be IAW EM 385-1-1.	L
	1i. Fire/Explosion	1h. Refueling of all vehicles, heavy equipment and other fueled equipment will be conducted in accordance with the SSHP, applicable SOPs and EM 385-1-1. Proper fire extinguishers will be on site and serviceable. There will be no “Hot Fueling” authorized at any time.	L
	1j. Noise in excess of OSHA standards	1i. If the heavy equipment and/or power tools used are louder than 85dBA then the appropriate noise attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn.	L
	1k. Collapse Hazards	1k. Secure all locking pins and bracing supports for portable shelters and tents IAW manufacturer’s manual. **Do not** use “make shift” replacement parts to secure braces or supports. Shelters and tents with missing parts will not be erected until authorized parts are on hand.	L

Job Steps	Hazards	Controls	RAC
	1l. MEC Hazards	1l. Non-UXO personnel shall attend site-specific MEC awareness (and recognition) training prior to the commencement of any site activities. Use only UXO personnel qualified in accordance with DDESB Technical Paper 18. UXO Technicians shall be present during any construction activities occurring in the munitions response site (MRS). Inspect the area for the presence of MEC using a magnetometer to assist in finding items in brush and dense vegetation. If an MEC item is encountered alert the rest of the team and conduct an inspection of the item IAW the approved WP, SOP and EM 385-1-97.	L
	1m. Severe Weather	1m. Personnel need to be aware of special precautions to safely erect or tear down portable shelters and tents in adverse weather conditions. Tents and collapsible shelters will be anchored to the ground to prevent being blown over in strong winds. Tents and collapsible shelters will be lowered and secured when wind speeds exceed 25mph.	L
	1n. Underground Utilities	1n. The local utility locating hotline will be contacted to identify the locations of buried utilities before subsurface activities are allowed to commence.	L
	1o. Electrical Shock.	1o. Ground-fault circuit interrupters shall be used on all power tools and extension cords. Extension cords, power tools, and equipment shall be inspected before each use, protected from damage, and kept out of wet areas. Only qualified electricians are permitted to work on electrical circuits. Electricians must follow NFPA 70 E (2009) when working on electrical circuits.	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Level D. Refer to APP and SSHP. Equipment (as applicable): Hard hat Safety Glasses Safety toed boots Work Gloves ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Magnetometers Geophysics Instruments Barricades Warning signs	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> UXO Personnel must be qualified IAW DDESB TP18. HAZWOPER 40-hour Site safety orientation MEC awareness Lifting/back safety Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator.	Daily site safety inspection (UXOSO) – TBD CARA Daily site safety inspection (SUXOS) – TBD CARA Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily PPE before each use Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability. Overhead and underground utilities Mechanized equipment initial equipment Mechanized equipment (daily)

Activity Hazard Analysis (AHA)

Activity/Work Task: **SECURITY OPERATIONS**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**L**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL	**Risk Assessment Code (RAC) Matrix**	
Contract Number: NA		
Date Prepared: 8-10-15		
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist		
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer		
Notes: (Field Notes, Review Comments, etc.)		

Severity	**Probability**				
	Frequent	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Job Steps	**Hazards**	**Controls**	**RAC**
NOTE: Security personnel will be provided by either the Installation's Directorate of Emergency Services (DES) or NASA's Protective Services and will adhere to established SOPs and AHAs. The following Hazards and Controls are specific to security operations involving MEC/CWM and/or CA.			
Security operations	Site and MEC Hazards	The CARA Site Supervisor or SUXOS will meet with each day's on-coming Security Guards, prior to "End of Day" Activities at the site. The guards will receive a detailed briefing pertinent to that day's operation, to include – • Recovered MEC; • Any "On Going" operation of a hazardous or potential exposure situation and safeguards in place to prevent exposure; • Any personnel remaining at the site after hours; and, • Any other information deemed necessary to assist guards in performing their duties	L
	Contact with chemical agent or other hazardous chemicals.	Security Guards will not be exposed to or put in a manner that a chance of exposure may exist at all sites. UXOSO will brief all Security Guard personnel on site's Work Areas; Control Zones and barricades. Security Guards will not enter any enclosed building, tent or other structure, even if to prevent unauthorized access by intruder(s).	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Level D. Refer to established DES and NASA Protective Services SOPs and AHAs. Equipment (as applicable): Refer to established DES and NASA Protective Services SOPs and AHAs.	Qualified Personnel All Security Guards will meet DES and NASA Protective Services requirements. Certificates of all training will be maintained with the Security Guards Supervisor. Training Site safety orientation MEC awareness Emergency procedures Applicable AHAs	As required by DES and NASA Protective Services.

Activity Hazard Analysis (AHA)

Activity/Work Task: **VEGETATION REMOVAL**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**M**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL	**Risk Assessment Code (RAC) Matrix**	
Contract Number: NA	**Severity** / **Probability**	
Date Prepared: 8-10-15	**Frequent** / **Likely** / **Occasional** / **Seldom** / **Unlikely**	
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist	Catastrophic: E / E / H / H / M	
	Critical: E / H / H / M / L	
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer	Marginal: H / M / M / L / L	
	Negligible: M / L / L / L / L	
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	**RAC Chart**
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	E = Extremely High Risk
		H = High Risk
	Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA	M = Moderate Risk
		L = Low Risk

NOTE: All vegetation removal will be performed by the Installation or NASA contractor. CARA will provide onsite UXO support to perform anomaly avoidance.

Job Steps	Hazards	Controls	RAC
1. Pre-Vegetation Removal UXO Survey	1a. Slip, trip and fall.	1a. Ensure that you are thoroughly inspecting the ground in front of you for possible wet or muddy spots, holes, vines rocks etc. that could cause you to slip, trip or fall.	L
	1b. MEC Hazards	1b. Inspect the area to be cleared of vegetation for the presence of MEC hazards using a magnetometer to assist in finding items in brush and dense vegetation. If a suspected MEC item is encountered and it is not acceptable to move, it will be marked with crossed pin flags and dealt with IAW the approved WP and SSHP. If the item is acceptable to move, it will be relocated to an area outside of the area to be cleared and reported IAW the approved WP and SSHP.	M
	1c. Insect bites/West Nile Virus.	1c. Wear PPE and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify the UXOSO of flu-like symptoms.	L
	1d. Contact dermatitis and poison ivy.	1d. Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plans. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contact poison ivy.	L

Job Steps	Hazards	Controls	RAC
	1e. Cold/Heat Stress	1e. All site activities must be conducted IAW the approved WP and APP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	L
2. Manual Vegetation Removal	2a. Slip, trip and falls	2a. Ensure that you are thoroughly inspecting the ground in front of you for possible wet or muddy spots, holes, vines rocks etc. that could cause you to slip, trip or fall. Ensure that you have solid footing and are not in an awkward position when operating/using hand and power tools.	L
	2b. Power tool operation	2b. When operating power tools such as weed eaters, chainsaws etc. they will be handled, operated and maintained IAW the manufactures instructions, the approved WP and any applicable SOPs. The power tool will be inspected prior to use to ensure that all of the hand and safety guards are in place and that the chain, if present, is properly tightened and that the tool is otherwise in good working order. Depending on the power tool PPE will vary and it too must be serviceable, operable and free of any defect. PPE will be worn IAW the approved WP and inspected by the user prior to donning. Hand and power tool use will be IAW EM 385-1-1. Only trained and authorized personnel will use hand and power tools.	L
	2c. Noise in excess of OSHA standards	2c. If the power tools used are louder than 85dB (A) then the appropriate hearing attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn.	L
	2d. Insect bites/West Nile Virus.	2d. The same as 1c. above.	L
	2e. Contact dermatitis and poison ivy.	2e. The same as 1d above.	L
	2f. MEC Hazards	2f. The same as 1b above.	L
	2e. Heat and Cold Stress	2g. The same as 1e above.	L

Job Steps	Hazards	Controls	RAC
3. Mechanical Vegetation Removal	3a. Vehicle and Heavy equipment in the area	3a. Be aware of any heavy equipment in area and be certain to wear hard hat, safety glasses and orange safety vest when working around heavy equipment. Heavy equipment operator must be currently certified for the piece of equipment he is operating. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the shredder, if applicable. When the heavy equipment is in use a safety UXO technician observer must be present to ensure that the operation is run IAW the approved WP, SOP and AHA. Any heavy equipment used must have a back-up alarm, be in good working order and free of oil or hydraulic fluid leaks. Depending on the type of vegetation removal equipment being used it may be necessary to establish a safety area to ensure no one is hit with flying debris from the blades.	L
	3b. Noise in excess of OSHA standards	3b. More than likely the vegetation equipment used will be louder than 85dB (A) then the appropriate hearing attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn by the operator and the personnel within close proximity to the equipment.	L
	3c. MEC Hazards	3c. The operator must be observant to the possible presence of MEC and if encountered stop the equipment and proceed IAW the approved WP and APP.	L
	3d. Contact with chemical agent or other hazardous chemicals	3d. Personnel will perform vegetation removal in Modified Level D PPE. CWM, HTW, and UXO training and safety awareness during site-specific training and refreshed during morning tailgate briefing. Use face shield as appropriate. Have material on hand for EPDS contingency.	L
	3e. Heat and Cold Stress	3e. The same as 1e.	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Modified Level D: Refer to APP and SSHP. Equipment (as applicable) Hard hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Respirator Magnetometers Geophysics Instruments	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> HAZWOPER 40-hour MEC awareness Lifting/back safety Site safety orientation Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator.	Daily site safety inspection (UXOSO) – TBD CARA Daily site safety inspection (SUXOS) – TBD CARA Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability.

Activity Hazard Analysis (AHA)

Activity/Work Task: **VEHICLE, HEAVY EQUIPMENT and ALL TERRAIN VEHICLE (ATV)**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**M**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL		
Contract Number: NA		
Date Prepared: 8-10-15		
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist		
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer		
Notes: (Field Notes, Review Comments, etc.)		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
1. General Operations of Motorized Vehicles, to include:	1a. Slip, trip and fall.	1a. Worker awareness of potential slippery surfaces and tripping hazards plus inspection and policing of debris.	L
a. Pre-operational; During and After Checks	1b. Insect bites/West Nile Virus.	1b. Wear PPE and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify the UXOSO of flu-like symptoms.	L
b. Safe Normal Vehicle Operations	1c. Contact dermatitis and poison ivy.	1c. Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plans. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contact poison ivy.	L
c. Perform Operator Level Maintenance	1d. Cold/Heat Stress	1d. All site activities must be conducted IAW the approved WP and APP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	L

Job Steps	Hazards	Controls	RAC
	1e. Contact with chemical agent or other hazardous chemicals	1e. Vehicle operators need to be aware of potential exposure to corrosive and/or flammable liquids when conducting vehicle inspections. Operators will not eat, drink or smoke when performing these tasks. Any visible leaking will be immediately reported to their supervisor. Any spills of vehicle additives (anti-freeze, oil, hydraulic fluids, etc.) will be cleaned up immediately. Personnel will don the proper PPE commensurate with the chemical hazard encountered and the work is being accomplished.	L
	1f. Pinch and cut hazard from operating near sharp edges	1f. Operators will use good and serviceable leather gloves when performing service checks. Potential pinch and cut hazards when performing vehicle inspections inside the engine compartment; around doors; latches and lift gates.	L
	1g. Failure of Integral Safety Equipment	1g. During the inspection of the vehicle, if the operator notices that any of the vehicle's integral safety equipment (lights, brakes and turn-signals) is inoperable; that vehicle is no longer operational and cannot be used until repaired. Any issued safety equipment (first aid kit, fire extinguisher, etc) will be present and operational before the vehicle is operated. All vehicles, regardless of type, that are removed from the site for repairs will be re-inspected and accepted by a Competent person or assigned operator, IAW EM385-1-1.	L
	1h. Severe Weather	1h. Vehicle operators need to be aware of special controls to safely operate vehicles in adverse weather conditions. This may include reducing speed to maintain control; braking distances and improve visibility.	L
	1i. Fire/Explosion	1i. Refueling of all vehicles, heavy equipment and other fueled equipment will be conducted in accordance with the SSHP, applicable SOPs and EM 385-1-1. Proper fire extinguishers will be on site and serviceable. There will be no "Hot Fueling" authorized at any time.	L
	1j. MEC Hazards	1j. If an MEC item is encountered alert the rest of the team and conduct an inspection of the item IAW the approved WP, SOP and EM 385-1-97.	L

Job Steps	Hazards	Controls	RAC
	1k. Operator Distractions (Cell Phones; Eating; Smoking; Road Rage; Traffic Flow and Exhaustion)	1k. Vehicle Operators will follow and adhered to all local, state or foreign rules of Safe Vehicle Operations. Obeying posted speed limits; traffic signals and signs; weight and height restrictions for any over-weight or over-height vehicles, and common courtesy on the road. Defensive Driving habits are needed to be adhered to avoid the perils of Road Rage. Trip planning will assist the operator in avoiding construction and traffic hazards. Eating, smoking and use of cellular phones by the vehicle operator, while driving or during refueling operations is prohibited. Vehicle operators' conducting long distance hauls of over 8 hours in length; will take a mandatory Rest Halt at least once every four hours for 25 minutes. A Rest Halt can be taken by any vehicle operator should the need arise. During a Rest Halt, the vehicle operator will reinspect the vehicle to ensure that all integral safety equipment is still operational. If any safety equipment fails, the operator will notify their supervisor; give their location and remain at that location, until repairs can be completed.	L
	1l. Towing Hazards	1l. Use of "ground guides" will be used, when vehicle(s) are not equipped with an audible warning device and/or there is an obstructed view, or the vehicle is in a congested area. When transporting Heavy Equipment by trailers, the trailer will be "chocked" with approved devices when unhooked from the transporting vehicle. When attempting to hook onto the trailer, "ground guides" will not place any part of their body between the trailer and vehicle.	L
	1m. Noise in excess of OSHA standards	1m. If the heavy equipment and/or power tools used are louder than 85dB (A) then the appropriate hearing attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn.	M
2. General Operations of Heavy Equipment Vehicles, to include: a. Pre-operational, During and After Checks b. Normal Vehicle Operations c. Perform Operator Level Maintenance	2. The Hazards itemized in Hazard 1 are applicable to Hazard 2. In addition hazard 2c; 2d and 2e are added. 2a. Contact with chemical agent or other hazardous chemicals	2. The Controls itemized in Control 1 are also applicable to Control 2. 2a. Where appropriate, Equipment Operators will place a supplemental drip pan or catch basin underneath the engine and transfer case at the end of each day. If the vehicle's engine/transmission/transfer case compartments are sealed at the bottom, a drip pan is not needed.	L L

Job Steps	Hazards	Controls	RAC
	2b. Failure of Integral Safety Equipment	2b. Heavy Equipment will be inspected and tested, in accordance with manufacturer's recommendations and certified in writing by a Competent person prior to being placed in use. If at any time, the equipment is removed and subsequently returned to the site, it will be re-inspected and recertified, IAW EM 385-1-1. Heavy Equipment will be equipped with Roll Over Protection System (ROPS).	L
	2c. Vehicle and heavy equipment traffic in area.	2c. Be aware of any vehicles or heavy equipment in area and be certain to wear a hard hat, safety glasses and a high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc.	L
	2d. Underground Utilities	2d. The local utility locating hotline will be contacted to identify the locations of buried utilities before subsurface activities are allowed to commence.	L
	2e. Confined Space – Cave In/Entrapment	2e. Any excavation deeper than 4ft into which a piece of heavy equipment is to operate in is classified as a confined space (non-permit required). Competent Soil Person will inspect the excavation daily and periodically to ensure engineering controls are adequate and working. Engineering controls for excavation vehicles are Sloping and, Benching. No work will be allowed in an excavation that has standing water. The water will be removed and re-entry will only be allowed after the Competent Person inspects the excavation site. Egress points are placed no further than 25ft from any workers. If ladders are used, they must – a. Extend from the floor surface of the excavation and extend a minimum of 3ft beyond surface level of the excavation b. Be clear of all equipment and engineering controls for workers to use c. Upon entry into the excavation, be OSHA rated and support the worker's weight to include tools and equipment	L

Job Steps	Hazards	Controls	RAC
3. General Operations of All Terrain (ATV) Vehicles, to include: a. Pre-operational, During and After Checks b. Normal Vehicle Operations c. Perform Operator Level Maintenance	3. The Hazards itemized in Hazards 1 and 2 are applicable to Hazard 3 exception of 2e. In addition hazard 3b is added. 3a. Failure of Integral Safety Equipment 3b. ATV Hazards	3. The Controls itemized in Controls 1 and 2 are also applicable to Control 3. 3a. All ATV Equipment will be inspected and tested, in accordance with manufacturer's recommendations and certified in writing by a Competent person prior to being placed in use, IAW EM 385-1-1. ATVs will be used only off road, unless equipped for paved road use by manufacturer. ATVs will only be operated during daylight hours, unless equipped for night use by manufacturer. All ATVs will be equipped with mufflers, spark arrester, tail lights, stop lights and an audible signal device (horn). Only ATVs with four or more wheels may be used. 3b. Passengers are prohibited on Class I ATVs (Class I ATV – single seat centered over the engine). Passengers are only allowed to occupy a seat, they may not sit in the bed of the ATV, in the trailer if so equipped or on any other part of the ATV. Maintain safe and appropriate separation distances between ATV, when traveling as a group. The manufacturer's recommended payload will not be exceeded at any time	L L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment (PPE): Level D and Modified Level D: Refer to APP and SSHP. Equipment (as applicable) Hard hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Respirator Magnetometers Geophysics Instruments Generator Air Monitoring Equipment MINICAMS DAAMS MultiRAE Sample Lines Helmet Seatbelt Insurance card Driver's license Vehicle registration	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All personnel operating air monitoring equipment will be trained and qualified in accordance with CARA Internal Operating Procedures under the CARA Mobile Expeditionary Lab Chemical Air Monitoring Quality Management System. All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> HAZWOPER 40-hour MEC awareness Lifting/back safety Site safety orientation Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator.	Daily site safety inspection (UXOSO) – TBD CARA Daily site safety inspection (SUXOS) – TBD CARA Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability.

Activity Hazard Analysis (AHA)

Activity/Work Task: **X-RAY & PINS OPERATIONS**	Overall Risk Assessment Code (RAC) (Use Highest Code)	**M**
Project Location: MSFC-003-R-01, Redstone Arsenal, AL	**Risk Assessment Code (RAC) Matrix**	
Contract Number: NA		
Date Prepared: 8-10-15		
Prepared by (Name/Title): Jay Lewis, OE Safety Specialist		
Reviewed by (Name/Title): Lloyd Wallace, CARA Safety Officer		
Notes: (Field Notes, Review Comments, etc.)		

Severity	**Probability**				
	Frequent	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (probability/severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of the AHA

RAC Chart

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Job Steps	Hazards	Controls	RAC
Arrival of new personnel at site.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.	**M**
Assessment of suspect CWM using X-Ray and PINS analysis	Poor Planning	Complete Inspections/Workplace Hazards, as described in CARA SOP-001, Appendix C. Use Risk Management Program frequently – for each task to be completed.	**M**
	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.	**M**
	Struck-by/Against.	Wear reflective warning vests when exposed to vehicular traffic. Personnel working on or near roads and only remain on road long enough to complete work. Personnel walking along roadway shall stay off roadway as far as possible and walk on the side facing traffic.	**M**
	Munitions and Explosives of Concern (MEC) / Unexploded Ordnance (UXO), Chemical Agent (CA).	Non-UXO personnel shall attend site-specific MEC Awareness (and recognition) Training prior to the commencement of any site activities. Use only UXO personnel qualified in accordance with DDESB Technical Paper 18, Minimum Qualifications for UXO Technicians and Personnel. UXO Technicians shall be present during any activity occurring in a Munitions Response Areas. Perform all work in accordance with approved Work Plan. Material safety data sheets for relevant chemicals will be kept on site at all times. Personnel will wear PPE commensurate with chemical hazard. When items are already	**M**

Job Steps	Hazards	Controls	RAC
		stored within an ECM, first entry air monitoring will be performed for CA as appropriate.	
	Blast overpressure fragmentation blast.	The UXO Safety Officer is responsible for the location of each UXO team. Minimum safe distance maintained between two teams will never be less than 200 feet or the K40 overpressure distance in the formula: Minimum safe distance = 40 times the cube root of the net explosive weight of the munition with the greatest fragmentation distance at the Munitions Response Site.	M
	Accidental detonation of MEC.	Observe the requirements of Explosives Safety and Health Manual EM 385-1-97. Be alert and mark all MEC located. Only clear and grub to within four inches of the ground surface. UXO trained personnel will escort non-UXO personnel at all times. Surface sweeps will be conducted with magnetometers or other suitable geophysical instrumentation to detect potential MEC.	M
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Personnel shall not jump from elevated surfaces. Personnel shall use caution when walking on rocky, slippery, or uneven terrain.	M
	Hand injuries.	Items to be handled shall be inspected for sharp edges prior to being handled. Personnel shall wear leather gloves when handling sharp materials. Personnel shall be aware of and avoid pinch point hazards.	L
	Hazardous atmospheres.	Personnel shall immediately notify the SSHO if odors are detected. Follow procedures outlined in the Site Safety and Health Plan.	L
	Heat stress and cold stress.	Dust shall be monitored and controlled. PPE use is required when working in contaminated areas.	M
	Dust.		L
	Fire.	Smoking shall be permitted in designated areas. Vehicles shall not be parked in tall dry grass. Engines shall be shut off before refueling. A 10 pound A:B:C:fire extinguisher shall be available on heavy equipment Gasoline shall be stored in safety cans with flash arrestors and spring-loaded vents.	L
	Exposure to ionizing radiation.	Workers will be briefed concerning potential radiation injuries. Area in front of X-ray and/or PINS equipment will be closed to personnel to avoid exposure to radiation. Personnel using X-ray or PINS will wear dosimeters for exposure monitoring. Keep nonessential personnel 100 feet from operations. X-ray unit's calibration/leak test must be current and documentation maintained on file. Units will be	M

Job Steps	Hazards	Controls	RAC
		properly stored and secured when not in use. personnel will maintain control of the unit and key at all times when in use.	
	Electrical Hazards.	No frayed electrical cords will be permitted on site. GFCI devices will be used on all outdoor circuits. Proper lock-out/tag-out procedures will be used when repairing or installing electrical equipment.	M
	Insect bites/West Nile Virus.	Wear personal protective equipment (PPE) and tape joints to keep insects away from the skin. Use protective insect repellents containing N,N-Diethyl-m-toluamide, such as, 3M Ultrathon or equivalent and clothing insecticide preparations containing permethrins (Repel Permanone or equivalent) to prevent insect bites. Check limbs/body for insects/insect bites before showering. Notify Site Safety and Health Officer (SSHO) of flu-like symptoms.	L
	Contact dermatitis and poison ivy.	Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plants. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic (visqueen) where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contract poison ivy.	L
	Severe weather.	The SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). Follow procedures outlined in the APP.	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment: Modified Level D, up to possibly Level A. Refer to APP and SSHP. Equipment (as applicable) Hard hat Safety Glasses Chemical resistant boots Work Gloves over butyl rubber gloves Tyvek F ANSI Class 2 reflective warning vests Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Communication devices Respirator Air Monitoring Equipment MINICAMS DAAMS MultiRAE Sample Lines Drums Plastic sheeting and bags Bleach (or compatible decontamination solution) X-ray PINS Assessment equipment	<u>Competent Person (CP)/Qualified Person (QP)</u> CARA Site Supervisor: John Robbins and Mark Hammond All personnel operating air monitoring equipment will be trained and qualified in accordance with CARA Internal Operating Procedures under the CARA Mobile Expeditionary Lab Chemical Air Monitoring Quality Management System. All competent/qualified personnel required as part of this AHA will provide proof of competency (documentation of training or experience) to the UXOSO prior to performing activities. <u>Training</u> HAZWOPER 40-hour MEC awareness Lifting/back safety Site safety orientation Emergency procedures Hazard communication Applicable AHAs Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures All site personnel will attend safety orientation and be certified to be able to wear their assigned respirator.	Daily site safety inspection (UXOSO) – TBD Daily site safety inspection (SUXOS) – TBD Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use. Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability.

APPENDIX D, ATTACHMENT 3
STANDARD OPERATING PROCEDURES (SOPs)

Electronic Copy Only
(A printed copy will be maintained onsite during fieldwork)

List of SOPs

The following SOPs are included in this Attachment.

- CARA Policy Statement #7, Alcohol and Drug Abuse Prevention/Control Program Policy
- CARA Policy Statement #16, Workers' Compensation
- CARA SOP-001-02, Risk Management
- CARA SOP-002-01, Radiographic Operations
- CARA SOP-003-01, Radiation Safety for Use of the PINS
- CARA SOP-004-01, Personal Protective Equipment
- SOPP 27.0, Digital Geophysical Mapping Surveys
- All Terrain and Utility Vehicle Safety
- Emergency Response and Fire Prevention Plan
- End of Day Operations
- Decontamination of Excavator Buckets
- Fire Fighting Plan
- Heavy Equipment and Vehicle Safety
- Lockout/Tagout Program
- Safe Procedures for Handling, Storage, and Use of Pressurized Cylinders
- Security Officer Operations
- Severe Weather Operations
- Soil Handling
- Safety Considerations During Trenching and Excavation

DEPARTMENT OF THE ARMY
CBRNE ANALYTICAL AND REMEDIATION ACTIVITY
2433 DIRK DRIVE
ABERDEEN PROVING GROUND, MARYLAND 21010-5424

REPLY TO
ATTENTION OF

AFCB-CAR-DIR

12 September 2013

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: CBRNE Analytical and Remediation Activity Policy Statement #7, Alcohol and Drug Abuse Prevention/Control Program Policy

1. References:

a. AR 600-85, Army Substance Abuse Program (ASAP).

b. AR 50-6, Chemical Surety.

c. Memorandum, 20th Support Command, AFCB-CS, 10 Apr 08, subject: 20th Support Command (CBRNE) Standard Operating Procedures (SOP) No. 56, Army Substance Abuse Program (ASAP).

2. CBRNE Analytical and Remediation Activity has a zero tolerance for alcohol or drug abuse or use of illegal drugs. Any Civilian employee who is found to abuse alcohol or drugs or use illegal drugs will be referred to the Installation Employee Assistance Program Coordinator by their Supervisor.

3. It is the Activity's goal to prevent illegal drug use, misconduct and the abuse of alcohol or the use of illicit drugs by supporting training requirements for both military and Department of the Army Civilians. The annual prevention education is a minimum of three hours for Civilian employees and an additional one hour block for all Supervisors.

4. This policy supersedes all previous versions.

5. The proponent for this policy is the Surety Officer, 410-436-9562.

CHRISTOPHER K. CHESNEY
Director

DISTRIBUTION:
All CARA Elements

DEPARTMENT OF THE ARMY
CBRNE ANALYTICAL AND REMEDIATION ACTIVITY
2433 DIRK DRIVE
ABERDEEN PROVING GROUND, MARYLAND 21010-5424

REPLY TO
ATTENTION OF

AFCB-CAR-DIR

2 June 2014

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: CBRNE Analytical and Remediation Activity Policy Statement #16, Workers' Compensation

1. This policy applies to all CARA Civilian personnel who sustain any injury while on the job at their parent installation or while on TDY status.

2. Workers who sustain an on-the-job injury will immediately report it to their supervisor. Each employee will adhere to the "Clinic First Policy" and AR 690-800, Insurance and Annuities. This states that when a non-emergency job related injury occurs, i.e., not life threatening, procedures will require that the injured employee be initially referred to the local medical clinic for evaluation.

3. The Safety Officer will be notified by the employee's supervisor of all job-related injuries and the status of the injured employee, i.e., on leave or back to work.

4. If the employee is in a TDY status and seeks medical treatment from a private facility, all receipts related to that treatment will be submitted to their immediate supervisor for processing through the installation's Federal Employees Compensation Act (FECA) Claims Administrator.

5. Proponent for this policy is the Safety Office at 410-436-9259.

CHRISTOPHER K. CHESNEY
Director

DISTRIBUTION:
All CARA Elements

RISK MANAGEMENT

SOP-001-02

DATE: 2 September 2014

SIGNATURE PAGE

CBRNE Analytical and Remediation Activity (CARA)

Print Form

Document #: SOP-001-02

Document Name: Risk Management

Prepared by: WALLACE.LLOYD.JAMES.1034683820 | PRINTED NAME: Lloyd J. Wallace

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CARA FORM 5, 1 JUL 12

Table of Contents

REVISION HISTORY

Revision #	Description of Revision	Approver / Date
0	Original document.	Randall L. Bartley / 21 Sep 12
1	Changed/Replaced: Physician with Licensed Healthcare Provider throughout document Modified: Appendix K Appendix Q	Christopher K. Chesney / 19 Nov 13
2	Changed Safety POC Multiple Updates and verbiage reflecting newest revision AR 385-10, Nov. 2013	Christopher K. Chesney

1. Purpose. Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives (CBRNE) Analytical and Remediation Activity (CARA) Risk Management Manual is established to provide effective procedures for reducing or eliminating accidents and injuries to personnel on and off duty, and to minimize or eliminate damage to equipment and property within CARA.

2. Responsibilities.

a. The Director of CARA is responsible for the overall safety program.

b. Section Chiefs and Supervisors are responsible for ensuring the guidelines within this SOP are followed. Section Chiefs are also responsible for complying with the approved Inter-service Support Agreement (ISA) with the host installation. Where an approved ISA is not in effect, the CBRNE Analytical and Remediation Activity (CARA) Risk Management standing operating procedure (SOP) will apply.

c. The Safety and Occupational Health Specialist (SOHS) is responsible for implementation and oversight of the CARA Risk Management SOP.

d. Safety of Occupational Health Officer (SOHO)/Collateral Duty Safety Officer (CDSO) will:

(1) Ensure accidents are reported, investigated and recorded.

(2) Establish a notification system to ensure all accidents are reported.

(3) Promptly inform the safety program channels of all accidents and all accidents involving ammunition, explosives, or pyrotechnics.

(4) Assist supervisors and employees on completing manual and/or electronic accident reports.

(5) Review all accident reports for completeness and accuracy.

(6) Submit copies of electronically completed DA Forms 285 via “report it” for all on-duty Class C, D, & E accidents NLT 30 days after the date of the accident.

(7) Maintain local accident files.

(8) Analyze accident data to identify accident trends and initiate corrective actions.

(9) Provide accident data to the 20th CBRNE Command SOHO quarterly.

e. Section Chiefs, Supervisors, employees, contractors, and military personnel assigned to CARA are responsible for maintaining safe work areas and working

conditions. Conduct periodic inspections of their work areas, document inspection and ensure hazards have been identified and corrected.

f. Every individual is responsible for maintaining safe working habits and for reporting unsafe conditions and practices to Supervisors as soon as an unsafe condition or practice is observed or becomes evident.

3. Continuity Planning.

a. In order to plan for future deployments and personnel turn-over, the CARA SOHS will maintain a continuity mechanism via book or binders. This allows new safety personnel to quickly and effectively understand the current status of the safety program.

b. The continuity book will include:

(1) Safety Officer Orders (signed) - including SOHS, and CDSOs.

(2) Safety Directory- Contact information for all CDSOs within CARA and installation safety contacts.

(3) Local command safety Policy Letter (signed).

(4) Local Safety Program SOPs (signed).

(5) FY Safety Objectives with Metrics (signed annually) - keep previous years objectives.

(6) Safety Committee Charter (signed).

(7) Safety Committee Minutes - Keep last four meetings.

(8) Command inspection schedule - schedule of inspections for subordinate units for the FY.

(9) Command Inspection Results - copy of last two 20th CBRNE Command level safety inspections and copies of all inspections completed on subordinate commands for previous two years.

(10) Safety Training Statistics - utilized for annual internal audit and awards justification.

(11) Director and Safety Officer Training Documents - may include CP-12 Individual Development Program (signed), CDSO and Director training certificates, and additional required training.

(12) Accident Statistics - utilized for trend analysis, annual internal audit and awards justification.

(13) Internal Project/Exercise Schedule- Utilized for planning safety training and exercise observations.

(14) Last Annual Internal Safety Audit.

c. Upon deployment of the SOHS a CDSO will be designated on orders by the director to maintain the CARA safety program utilizing the established continuity book or binders.

4. Applicability. This SOP is applicable to all CARA Civilians, Soldiers, contractors, property, and areas under control of CARA.

5. SOP Components. The five major safety plan components are as follows:

a. Safety Program Management.

b. Inspections and Assessments.

c. Accident Investigation and Reporting.

d. Safety Promotion and Awareness.

e. Hazard Analysis and Awareness.

6. Facilities and Areas. The following buildings and areas, and any future facilities as determined by the CARA Director, are under CARA's control and the responsibility of the tenant subordinate element.

HQ	Bldg E2433
AVN	Bldg 1060- APG
RRE	Bldg E4220, E5848
RRW	Bldg 24-770, Pine Bluff Arsenal
LAB	Bldgs E1042, E2410
LOG	Bldg E2200

7. Plan Execution. Surveys and Inspections.

a. The areas of responsibility for each subordinate element will be inspected on a monthly basis using SSB Form 1023, Fire Prevention Inspection, or local inspection form (see Appendix O); by Supervisors or Appointed Fire Marshalls. A building that is not being utilized will only be inspected on an annual basis until turned into Aberdeen Proving Ground (APG) Installation Support Activity (APGISA) or local activity.

b. The SOHS will conduct announced and unannounced inspections of areas and buildings under CARA control. Results of inspections will be forwarded to the appropriate company or section for corrective action.

c. Safety related work orders that result from an inspection, at any level, will be prepared by the responsible section or Logistics Office and the SOHS will be consulted for the risk assessment code (RAC).

8. Orientation, Education, and Training Program.

a. SOHS will provide newly assigned CARA personnel with a safety orientation. This orientation contains topics which have an impact upon the individual and his/her duties at CARA.

b. Chiefs will include a safety orientation for new personnel in their initial briefing.

c. Training will establish a database with all employees required to have Occupational Safety and Health Association (OSHA) 40-hour training and 8-hour refresher training for duration of employment. Units will maintain hard copies of certificates.

9. Reports.

a. All official reports of accidents/incidents, injuries, and investigations will be in accordance with (IAW) Army Regulation (AR) 385-10, The Army Safety Program, Chapter 3, Accident Investigation and Reporting.

b. All CARA accidents or injuries will be reported IAW Appendix M (Accident Reporting Procedures) for CARA.

c. The SOHS will maintain a file of accident/incident, injury and investigation reports for CARA.

10. Liaison and Coordination.

a. The SOHS will maintain an active liaison with the Edgewood Chemical Biological Center (ECBC), US Army Research, Development, and Engineering Command (RDECOM), Corps of Engineers (COE), and APG Safety Offices for technical support.

b. Coordination between SOHS and CARA's Training Technician will be maintained to implement and review training requirements for safety education.

11. Proponent. The SOHS is the proponent for the Risk Management SOP. Any recommendations or additions should be forwarded to the SOHS.

12. Point of Contact. Point of contact for the CARA SOHS can be reached by dialing 410-436-9259 or DSN 584-9259.

APPENDIX A – REFERENCES

29 CFR 1910 Occupational Safety and Health Standards

AR 11-34, The Army Respiratory Protection Program

AR 50-1, Biological Surety

AR 50-6, Chemical Surety

AR 385-10, The Army Safety Program

AR 600-55, The Army Driver and Operator Standardization Program (Selection, Training, Testing, And Licensing)

DA PAM 40-8, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX; Supplemental Guidance

DA PAM 40-173, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT; Supplemental Guidance

DA PAM 385-10, Army Safety Program

DA PAM 385-30, Mishap Risk Management

DA PAM 385-40, Army Accident Investigation and Reporting

DA PAM 385-61, Toxic Chemical Agent Safety Standards

DA PAM 385-64, Ammunition and Explosives Safety Standards

FORSCOM Regulation 385-1, Forces Command Safety Program, 31 March 2010

APGR 420-1, Fire and Emergency Services Program

APGR 385-4, The APG Safety and Occupational Health (SOH) Program

MIL-STD 882D, DoD Standard Practice For System Safety

TM 3-4240-346-10, Change 1, Operator's Manual for Chemical-Biological Mask, M40 Series

TM 3-4240-346-20&P, Unit Maintenance Manual for Chemical Biological Mask: M40A1

CBRNE 385-1, Safety and Occupational Health Program- 23 May 2012

APPENDIX B - INITIAL SAFETY ORIENTATION

1. Purpose and Scope. The safety policy of this Activity is to conduct all operations in a manner that ensures the highest degree of safety. Everyone in this Activity shall aggressively pursue the prevention of an unsafe act, condition or practice. The accident prevention effort will include, but will not be limited to, prevention of exposure to toxic agents and materials, motor vehicle accidents, fires, explosive accidents, and other incidents.

2. Responsibilities. Everyone is responsible for the conduct of operations and maintenance of a safe, healthy and clean working environment. Wearing of proper protective clothing and equipment, and use of detection and warning devices will be standard procedure during all operations in this activity to minimize existing or potential hazards. In the absence of the CARA Safety Officer, a designated representative will assume responsibilities.

3. In-processing into CARA will include receiving a safety briefing from the SOHS or a designated section safety representative. All Remediation Response West (RRW) personnel are to receive a safety briefing from their local section safety representative. The in-processing safety briefing is to include at a minimum the following areas.

a. Procedures for reporting safety problems.

b. Field hazards.

c. Personnel safety, both on and off duty.

d. Chemical agents and hazards.

e. Required safety classes.

f. Initial radiation briefing (for radiation workers only).

g. Accident reporting.

h. Hazard communication training.

APPENDIX C – INSPECTIONS / WORKPLACE HAZARDS

1. Purpose and Scope. To develop a process to ensure all buildings and operations under the CARA are safe and comply with all Army, state and federal regulations.

2. The SOHS will conduct inspections of all CARA buildings and hazardous operations. Each building will be inspected at least once every 24 months. Those areas or operations of a more hazardous nature will be inspected more frequently as determined by the SOHS.

a. Inspections may be conducted with or without prior notice.

b. When an imminent dangerous situation is discovered or reported, immediate mitigating actions must be taken, followed by notification to the immediate Supervisor, Safety Officer or Section Chief as soon as possible. All workplace hazards that have the potential for injury of personnel, loss of equipment or a negative effect on mission accomplishment must be corrected within 30 days. If corrections cannot be made within 30 days the Hazard must be added to an abatement plan with follow-up actions at every safety committee meeting until corrected.

c. Written reports on findings of violations resulting from the inspections will be given to the head of the section for corrective actions. These reports or findings will cite hazards, safety management deficiencies and recommended corrective actions.

d. Follow-up actions will be taken by the SOHS to ensure identified deficiencies are corrected and implementation of necessary management controls.

3. One copy of the deficiency will be held in the suspense file in the Safety Office and the second given to the responsible individual. The responsible individual's copy will be returned to the SOHS with corrective action noted and/or paperwork attached.

4. Supervisors are to conduct periodic inspections of their assigned work areas. During inspections annotate any hazards, report significant hazards to the SOHS to ensure a work order has been submitted to mitigate any hazards that could jeopardize the safety of their employees.

APPENDIX D - SAFETY PROMOTION/ADVANCMENT

1. Safety Culture Advancement

a. Leaders at all levels will develop and promote the advancement of safety cultures through strong leadership and SOH program involvement (i.e., safety council participation, work place surveys, accident review boards (ARBs), and hazard elimination).

b. Employees provide input and voice concerns about potential hazards, CARA Director or a representative will conduct bi -annual safety meetings where leadership and employees are encouraged to discuss hazards in the work place and develop solutions to eliminate or reduce the risk.

c. Employees will be recognized for their active involvement in the SOH program.

2. Presentations. In addition to orientation and classroom presentations to instill safety in the minds of assigned personnel, briefings by the CARA Director, Section Chief or SOHS will be given as needed. This indicates command interest and emphasis to help motivate interest and participation in the safety program.

3. Visual Aids. Visual aids are used to convey proper safety practices quickly and effectively. Maximum use will be made of visual aids in promoting safety within CARA. Some effective aids are as follows:

a. Posters

b. Pamphlets

c. Displays

d. Descriptive stickers

e. Movies

f. PowerPoint Briefings

4. Active Participation. All individuals will be encouraged to take active roles in the accident prevention program since everyone is affected in some way. Group discussion/decision periods will be promoted since the more a person takes part and

contributes to a program, the more he/she will associate with that program and its goals. Effective participation includes, but is not limited to, the following:

a. Meetings. Meetings will be used to isolate particular safety problems quickly and formulate corrective actions. The activities and recommendations of key personnel will tend to encourage participation and gain support of the remainder of section personnel.

b. Courses/Training. Subjects that section personnel may receive training on include but are not limited to:

(1) Cardiopulmonary Resuscitation (CPR) & First Aid Training

(2) Defensive Driving Course

(4) Back Injuries Prevention Program

(3) Office Safety

(4) Army Motor Vehicle Accident Prevention Program

(5) Prevention Of Heat Injuries

(6) Sight Conservation

(7) Hearing Protection

(8) Radiation Safety

(9) OSHA 40-Hour Hazardous Waste Operations (HAZWOPER) Course

(10) Confined Space Entry and Rescue

(11) OSHA 8-Hour Refresher and Supervisors Course

(12) Motorcycle Safety Course

(13) Alcohol and Drug abuse

(14) RM Basic course (formally known as CRM Basic)

(15) And any other safety training topic as required to meet mission needs.

5. Army Safety Awards Program - CARA will encourage the involvement of an agency safety awards program IAW AR 385-10 Chapter 8.

APPENDIX E - HAZARD COMMUNICATION

1. Purpose and Scope. To provide guidance on CARA's Hazard Communication Program. All CARA personnel will comply with the guidelines listed in 29 Code of Federal Regulation (CFR) 1910.1200, Hazard Communication Standard and local installation guidelines.

2. Each section is responsible for maintaining the Material Safety Data Sheets (MSDS) / Safety Data Sheets (SDS) GHS system, an inventory listing for all hazardous materials/chemicals used, stored, or handled within their respective areas. Ensure this information is accessible to all CARA personnel; deployed and non-deployed.

3. A copy of the latest chemical agent MSDS are located on the CARA shared drive. Example: z: \Safety\MSDS\Chemical Agent & Standards

4. Section Chiefs and Supervisors will ensure training is conducted and recorded IAW 29 CFR, and ensure proof of training is maintained in individual's training record.

APPENDIX F - MISHAP RISK MANAGEMENT PLAN

1. General Program Requirements.

a. Purpose and Scope. This plan establishes management policies, objectives, and responsibilities for execution of the Mishap Risk Management Plan in all operational aspects of CARA. This plan establishes the procedures and methodology by which risk assessments (RAs) will be developed, the decision authority and the overall management for the CARA risk management SOP.

b. References.

(1) AR 385-10, The Army Safety Program

(2) DA PAM 385-61, Toxic Chemical Agent Safety Standards

(3) DA PAM 385-30, Mishap Risk Management

(4) MIL-STD 882D, DoD Standard Practice For System Safety

c. Objectives.

(1) To use Risk Management (formally CRM) process and its components as a tool for identifying risks.

(2) To identify hazards and associated risks through formal documentation.

(3) Risk acceptance decisions are documented.

2. Organization. The following personnel may be involved in formulating RAs depending on mission or task. This list is not all inclusive:

a. CARA SOHS

b. Section Chiefs

c. Supervisors

d. CARA Subject Matter Experts (SMEs)

e. External SMEs

3. Risk Management.

a. RA. The risk associated with a hazard is a function of its probability and severity. Therefore, all hazards will be evaluated to determine or verify probability and severity. Probability will be categorized as frequent, likely, occasional, seldom, and unlikely. The categories for severity will be catastrophic, critical, moderate, and negligible.

b. Mishap Risk Management Process probability categories.

		Key phase			
Term-keyword	**Symbol**	**Single item/activity**	**Fleet or inventory of items-multiple activities**	**Individual**	**All Personnel exposed to the hazard**
Frequent	A	Likely to occur often in the life of an item or activity, with a probability of occurrence greater than 10^{-1} in that life.	Continuously experienced.	Occurs very often in the career. Expected to occur several times during mission or operations. Always occurs.	Occurs continuously during a specific mission, operation, or during a career.
Likely	B	Will occur several times in the life of an item or activity, with a probability of occurrence less than 10^{-1} and greater than 10^{-2} in that life.	Will occur frequently.	Occurs several times in the career. Expected to occur during a specific mission or operation.	Occurs at a high rate, but experienced intermittently (regular intervals, generally often.)
Occasional	C	Likely to occur sometime in the life of an item or activity, with a probability of occurrence less than 10^{-2} and greater than 10^{-3} in that life.	Will occur several time	Occurs some time in career. May occur during a specific mission or operation, but not often.	Occurs several times in a career.
Seldom	D	Unlikely but possible to occur in the life of an item or activity, with a probability of occurrence less than 10^{-3} and greater than 10^{-6} in that life.	Unlikely, but can reasonably be expected to occur.	Possible to occur sometime in a career, but rarely. Not expected to occur during a specific mission or operation.	Occurs rarely within the exposed population as isolated incidents.
Unlikely	E	So unlikely, it can be assumed occurrence may not be experienced, with a probability of occurrence less than 10^{-6}.	Unlikely to occur, but possible	Occurrence not impossible, but can assume will almost never occur during a career. Can assume will not occur during a specific mission or operation.	Occurs very rarely (almost never or improbable). Incident may occur over a career.
Note: Service life and career are defined as a period of 20 years unless specific as other.					

c. Mishap Risk Management Process Categories.

Table 3-4.				
Severity	**Symbol**	**Quantitative Value**	**Quantitative Value**	**Definition**
Catastrophic	I	1 or more deaths or permanent total disabilities.	Loss exceeding $1M	Loss of ability to accomplish the mission or mission failure. Death or permanent total disability (accident risk). Loss of major or mission-critical system or equipment. Major property (facility) damage. Unacceptable collateral damage.
Critical	II	1 or more permanent partial disabilities or temporary total disability resulting in more than 3 months lost time	Loss exceeding $200K but less than $1M	Significantly (severely) degraded mission capability or section readiness. Permanent partial disability, temporary total disability exceeding 3 months time (accident risk). Extensive (major) damage to equipment or systems. Significant damage to property. Significant collateral damage.
Marginal	III	1 or more injuries or illnesses resulting in less than 3 months lost time	Loss exceeding $20K but less than $200K	Degraded mission capability or section readiness. Minor damage to equipment or systems, or property. Lost days due to injury or illness not exceeding 3 months (accident risk).
Negligible	IV	1 or more injuries or illnesses requiring first aid or medical treatment	Loss less than $20K	Little or no adverse impact on mission capability. First aid or minor medical treatment (accident risk). Slight equipment or system damage, but fully functional and serviceable. Little or no property damage.

d. Risk Matrix.

Table 3-5. Standardized Army Risk Matrix					
	Probability				
Severity	Frequent A	Likely B	Occasional C	Seldom D	Unlikely E
Catastrophic I	E (1)	E (1)	H (2)	H (2)	M (3)
Critical II	E (1)	H (2)	H (2)	M (3)	L (4)
Marginal III	H (2)	M (3)	M (3)	L (4)	L (5)
Negligible IV	M (3)	L (4)	L (4)	L (5)	L (5)

e. Risk Matrix Codes and descriptions.

Table 3-6. Risk Matrix codes and descriptions		
Symbol	Risk Assessment Code (RAC)	Description
E	1	Extremely High
H	2	High
M	3	Moderate
L	4	Low
L	5	Low

f. Making Decisions. The matrix below shows the level of required risk acceptance for all situations involving explosives, chemical agent and biological safety where the explosives, chemical agent and biological agent are the initial cause of the risk. The appropriate acceptance level is determined by three factors.

(1) The length the mission, personnel, equipment, property, or environment will be exposed to significant risk; duration of risk. When determining duration of risk, consideration must be given as to whether the mission is recurring or nonrecurring.

(2) Recurring missions are those that are anticipated to occur again in the near future.

(3) Nonrecurring missions are missions that are not anticipated to occur again in the near future.

g. Risk Acceptance Matrix.

Table 3-7 Duration of Risk

Category of Risk	1 month or less	Greater than 1 month, less than 1 year	Greater than 1 year, less than 5 years	Permanent or greater than 5 years	Chartered system development programs
Extremely high risk	General Officer	MSC CG- General officer	Army Headquarters CG	ASA(I&E)	Component Acquisition Executive (CAE)
High risk	Brigade CO or responsible O-6	General officer[1]	MSC CG- General officer	Army Headquarters CG	Program Executive Officer (PEO)
Moderate risk	Battalion CO[1] or responsible O-5	Brigade CO[1] or responsible O-6	General Officer[1]	General officer[1]	Program manager
Low risk	Company CO[2] or responsible O-3	Battalion CO[2] or responsible O-5	Brigade CO[1] or responsible O-6	Brigade CO[1] or responsible O-6	Program manager
Tolerable risk	Not required	Not required	Not required	Not required	Not required

Legend for Table 3-7:
In organizations led by civilian leaders, equivalent civilian grades may be substituted for military ranks.
The term "Army Headquarters" used in the table includes ACOMs, ASCCs, DRUs, and the Army National Guard.
Notes:
1 May delegate in writing authority to accept risk at the next lower level.
2 May delegate in writing authority to accept risk at lower levels.
3 When the risk acceptance authority resides in a combatant command, refer to para C1.5 of Dod 6055.09-STD.
4 Table 4-2 cannot be used for risk acceptance of new construction involving explosives or chemical agent violations

h. Risk Resolution.

(1) When a requirement mandated by AR 385-10 cannot be met, a RA Team, composed of persons from the above list (Appendix F, Paragraph 2) will be formed.

Note: Not all individuals identified in Paragraph 2 are necessary or required to compose the RA Team, but only those deemed necessary based on involvement, knowledge, specialized qualifications or functional area.

(2) The consequences of risk acceptance of the proposed configuration and alternative actions will be expressed using projected costs, if available, due to deaths, injuries and equipment damage. The RA team and/or safety personnel will calculate personnel death or injury costs using AR 385-10. The decision to accept risk will also consider other factors such as impact on schedule and operational effectiveness.

(3) The RA team will completely identify the potential methods of controlling or mitigating a hazard and the expected effectiveness of each option. The report will be submitted immediately when a Category IA, IB, IC, ID, IIA, IIB, IIC, or IIIA hazard is identified.

(4) The SOHS will complete and sign the Risk Assessment Sheet (RAS) and forward for decision approval.

(5) The RAS will be signed by the decision authority level representative determined by the decision authority matrix.

4. Administration. A copy of the approved CRAS will be kept on file in the CARA Safety Office.

NOTE: Major Command (MACOM) Commanders may further delegate waiver approval authority through command channels to levels indicated above. Level of approval authority should be IAW the risk involved.

APPENDIX G – RESPIRATORY PROTECTION PROGRAM

1. Purpose and Scope. To establish and implement an effective Respiratory Protection Program (RPP) capable of properly protecting personnel during routine and emergency operations. This appendix applies to all Military, Civilian, and contractor personnel within CARA whose work requires the use of respiratory protection devices.

2. Responsibilities.

a. CARA Director will:

(1) Ensure CARA has a written and functioning respiratory protection program.

(2) Enforce CARA SOP -001, APGR 385-4 & 29 CFR 1910.134.

b. SOHS will:

(1) Ensure National Institute for Occupational Safety and Health (NIOSH) approved respirators are used for commercial chemical operations. For military unique agents the approved respiratory device is the M40A1 protective mask.

(2) Review and approve SOP for respiratory protection.

(3) Conduct regular worksite inspections to determine if the respiratory protection equipment is properly used and maintained.

(4) Ensure workplace monitoring is conducted to determine hazards.

(5) Ensure that all respiratory protection elements are IAW 29 CFR 1910.134 OSHA Respiratory Protection Program.

c. Operations. The Operations Office will support the sections with coordination and resources for training.

d. Chemical Equipment Room (CER) will:

(1) Have the necessary quantity of serviceable respiratory protection equipment readily available to support mission requirements.

(2) Conduct required periodic maintenance and testing on all respiratory protection equipment and maintain required maintenance records.

(3) Conduct mask fit test.

e. Section Chiefs and Supervisors will:

(1) Ensure personnel assigned to or being considered for employment requiring the use of respiratory devices is examined by the local health clinic to ensure they are capable of performing their work while wearing the prescribed respiratory protection.

(2) Ensure personnel are fully aware of this requirement, the reason for the equipment, and the importance of compliance with regulatory guidance.

(3) Ensure personnel properly wear the required respiratory protection devices as specified by the SOP.

(4) Ensure personnel are trained and certified in use and maintenance of respiratory devices.

(5) Provide a suitable location for the proper storage of respiratory protection devices.

(6) Coordinate and schedule training for all personnel required to work with hazardous chemicals. This includes military masks, commercial respirators, supplied air, and self-contained breathing apparatus (SCBA).

(7) Maintain training records for individuals upon completion of required training and update training database.

f. Users will:

(1) Report for all scheduled medical exams, as well as health education briefings concerning respiratory hazards.

(2) Report any problems or difficulties with wearing respirators to their immediate Supervisor.

(3) Wear and care for assigned respiratory protection equipment, IAW approved SOP or user's manual.

(4) Perform monthly inspections of their assigned masks and annotate on provided DA Form 2404 Equipment Inspection & Maintenance Worksheet.

3. Selection Procedures

a. Military protective masks and SCBA will be worn, maintained and inspected IAW the Technical Manual (TM) 3-4240-346-10, Operator's Manual for Chemical-Biological Mask M40 Series.

b. For operations where oxygen deficiency is not a factor (between 19.5% and 23.0%-O^2), and concentrations do not exceed those considered to be Immediately Dangerous to Life and Health (IDLH), filter type protective masks may be used. Site specific work plans and Hazard Analysis (HA) will dictate or specify the type and level of respiratory needed for that work site.

c. The wearer will be medically cleared, properly fitted and trained in the use and care of respiratory devices. The wearer's face will be clean-shaven to the extent that there is no possible interference of any facial hair growth with the sealing surfaces of the protective mask to assure that an effective seal can be maintained.

4. Medical Evaluations

a. Employees who are either required to wear respirators, or who choose to wear a respirator voluntarily, must pass a medical exam before being permitted to wear a respirator. Employees are not permitted to wear respirators until a licensed healthcare provider has determined that they are medically able to do so. Any employee refusing the medical evaluation will not be allowed to work in an area requiring respirator use.

b. A licensed healthcare provider at Kirk Army Health Clinic will provide the medical evaluation.

c. Supervisors will ensure they complete the protective mask/respirator request form with their employee. Once the request form has been completed the employee will be scheduled for a medical exam with the Kirk Army Health Clinic. Upon written approval from the licensed healthcare provider the employee will be referred to the CER for mask issue and fit testing.

5. Fit Testing

a. Fit testing is required for all employees who are required to wear respirators. The fit testing will be conducted only after the individuals medical evaluation has been completed and signed by a licensed healthcare provider.

b. All fit testing will be conducted IAW Logistics SOP # 700-1 for testing and sanitizing of the M40 and M45 series protective mask.

6. Maintenance, Cleaning, and Storage of Protective Masks.

a. Semi-annual maintenance will be performed on all M40A1 protective masks by the CER. This maintenance will include replacement of worn or deteriorated parts, filters, and fit testing as prescribed in the applicable TM. (RRW will utilize and comply with Pine Bluff Arsenal (PBA), Arkansas fit testing maintenance procedures & maintain documentation showing fit testing has been accomplished IAW Army & OSHA Standards).

b. SCBA will be maintained and inspected IAW applicable equipment manuals.

c. Canister and filter replacements will be IAW requirements of the latest TMs and supply bulletins (SBs). In addition to the replacement requirements for the canister or filter elements given in the appropriate TMs and SBs, the following replacement requirements apply:

(1) Replaced annually.

(2) Whenever the mask is suspected to have been exposed to a contaminated environment.

(3) The canister/filter will be replaced after two hours of use in a known contaminated area or sooner if risk assessments or operations conditions dictate.

(4) As prescribed by special directives.

d. Whenever canisters/filters are changed/replaced, masks must be fit tested IAW established regulations and procedures.

e. Initial fit. When a protective mask is issued or the filter element is changed, the mask will be inspected for serviceability, checked for leaks, and fit tested to the wearer.

f. Each individual is responsible for the condition of his or her own mask. This includes a detailed visual inspection after each use and on a monthly basis. The monthly inspection will be documented on the inspection card/Department of the Army (DA) Form 2404. Any deficiencies will be noted and reported to the Supervisor.

g. Leak checks. Personnel employed in operations where the mask is required for protection will check for proper fit and leakage prior to being worn.

h. Individual cleaning and maintenance will be performed IAW the operator's manual.

i. Protective masks will be stored so they are not exposed to sunlight, heat, extreme cold, moisture, or any other environment that may cause deterioration. Protective masks will be stored in the carriers provided, hung by the shoulder strap or D-ring on the carrier.

7. Respirator Use

a. Employees will use their respirators under conditions specified by this program, and IAW training they receive on the use of their particular model of respirator. In addition, the respirator shall not be used in a manner for which it is not certified by NIOSH or by its manufacturer.

b. All employees will conduct seal checks each time they wear their respirator. Employees are not permitted to wear respirators if they have any condition, such as

facial hair, or dentures, that prevents them from achieving a good seal. Employees are not permitted to wear anything that will interfere with the face piece–to–face seal.

8. Donning Procedures.

a. Stop breathing and close eyes.

b. Open carrier with left hand and hold open while grasping face piece with the right hand. Remove mask from carrier.

c. Put the chin in the pocket and press face piece snugly against the face.

d. Grasp the top tab and pull head harness over the head. Be sure the ears are between the temple straps and cheek straps. While holding the face piece to your face with one hand, maintain seal. Using other hand tighten cheek straps one at a time. Be sure head pad is centered at the high point of rear of the head.

e. Cover openings at bottom of outlet valve with palm of one hand and squeeze the outlet valve cover. Breathe out hard to assure any contaminated air is forced out around edges of face piece.

f. With palm of hand, cover inlet port of the canister(s) and breathe in. Face piece should collapse against the face and remain so while holding breath. If it does, face piece is airtight.

g. Cover openings at bottom of outlet valve with palm of one hand and squeeze the outlet valve cover. Breathe out hard so that air escapes around edges of face piece.

h. Resume normal breathing.

9. Doffing and Emergency Procedures. All doffing and emergency procedures will be conducted IAW CARA SOP 385-4 (Personal Protective Equipment).

10. Air Quality. For supplied-air respirators, only Grade D or higher breathing air shall be used in the cylinders. Cylinders will only be filled by; trained and qualified personnel. Any air purchased by a vendor will be verified by the supervisor to be Grade D or higher prior to use.

11. Program Evaluation. The SOHS will conduct annual evaluations of the respirator protection program. The evaluation will include consultations with employees who use respirators. Any findings will be documented, forwarded to leadership for action, and filed in safety records.

12. Documentation and Recordkeeping

a. A written copy of this program will be kept on the CARA share drive, and a copy will also be forwarded to RRW. This program will be available to all employees who wish to review it.

b. The CER will maintain all fit testing records with proof of medical documentation, and these records will be updated as personnel receive initial or refresher fit testing. All medical records will be maintained by Kirk Army Health Clinic.

APPENDIX H - FIRE PREVENTION, EVACUATION AND FIREFIGHTING PLAN

1. Purpose. To provide a plan of action in the event of a fire as it concerns buildings and/or facilities assigned or under the direct control of the CARA.

2. Scope. This procedure is applicable to all personnel occupying the buildings assigned to CARA when a fire or training drill occurs. CARA subordinate elements will comply with their host installation's Fire Prevention Plan.

3. Policy. At no time during a fire will personnel take any unnecessary risks or expose themselves to the possibility of personal injury.

4. Definitions.

a. Area Fire Marshal. An individual, who coordinates fire prevention activities as outlined in this plan. CARA's Area Fire Marshal is the SOHS.

b. Building Fire Marshal. An individual assigned to one or more buildings or sections of buildings to assist the Area Fire Marshal in conducting the monthly fire inspections.

c. Fire Point. The place where any installed portable fire extinguishing equipment is located (i.e., fire extinguisher or standpipe hose).

d. Evacuation Leader. An individual appointed to assist the Building Fire Marshal in evacuation of the building. When the number of personnel is limited, one individual may perform several functions of this plan.

5. Responsibilities and Procedures.

a. The CARA SOHS is the POC for all CARA Area Fire Marshal responsibilities.

b. All Section Chiefs will ensure that a copy of the Fire Evacuation Plan, located at the end of this appendix, is visible and openly posted in all occupied buildings. Section Chiefs will also ensure that an SSB Form 1023, or local form, is completed monthly (APG only).

c. All personnel working in buildings assigned to CARA will maintain their work areas to reduce the possibility of fire hazards.

d. The Area Fire Marshal will:

(1) Ensure that high standards of housekeeping and fire prevention practices are maintained, using SSB Form 1023 as a guide to conduct and record the monthly inspections.

(2) Schedule and direct evacuation drills at least semi-annually.

(3) Ensure compliance with APGR 420-1 or local installation fire prevention regulation.

(4) Fire Marshals will be designated and appointed in writing.

e. The Building Fire Marshal or Evacuation Leader will ensure that all personnel have safely evacuated the area for which he/she is responsible and advises the Fire Department Officer in Charge (OIC) of it upon their arrival.

f. Personnel will assemble at the designated assembly area(s) and remain there until further advised by appropriate officials. Routes to be followed during evacuation and assembly areas are shown on the Fire Evacuation Plans posted in selected areas.

Simple Evacuation Plan- CARA 22 July 2014

FIRE EVACUATION PLAN

1. Purpose. To provide a plan of action to be taken in case of a fire as it concerns Building____ _____.

2. Scope. This procedure is applicable to all personnel in Building_____when a fire or training drill occurs.

3. Policy. **At no time during a fire will personnel take any unnecessary risks or expose themselves to the possibility of personal injury.**

4. Responsibilities and Procedures.

a. The **first** individual who becomes **aware of a fire** in or near building_____ will immediately warn the occupants by shouting "FIRE." The individual will then **sound the local alarm**, if one is provided. This is accomplished by pulling the lever in the fire station pull box.

b. The individual will go to the **"safest/nearest" telephone** (which could be their cell) dial 911, emergency number as posted on each phone, report the fire, and provide the Control Center with any requested information. The individual will **remain in a safe area in the vicinity of the fire and direct the Fire Department to the scene of the fire.**

c. Upon activation of the alarm, personnel will secure important and classified documents and records, close doors and windows turn off industrial type machinery, evacuate the building, and proceed to the designated assembly area. DO NOT DISCONNECT office machines or turn off lights. Special attention must be given to personnel who are visiting building/area and may not be familiar with the evacuation plan.

d. The Building Fire Marshal or Evacuation Leader will see that all personnel have safely evacuated the area for which he/she is responsible.

e. Personnel will assemble 50ft north of the building by the visitor's parking lot and remain there until further advised by appropriate officials. Routes to be followed during evacuation and assembly areas are shown on the Fire Evacuation Plan diagram posted within each room.

POC for this document is CARA Safety

APPENDIX I – EXPLOSIVES SAFETY PLAN

1. Purpose and Scope: To set guidance IAW AR 385-10, DA PAM 385-64 and local regulations for all explosive operations and personnel within the CARA.

2. CARA will ensure that only trained, certified and knowledgeable personnel perform operations involving ammunition and explosives.

3. Explosive plans and procedures will be developed and approved by the CARA Director for all operations involving ammunition, explosives, or other hazardous operations. Excluded are emergency operations.

4. CARA personnel will ensure that all ammunition and explosives are stored and maintained IAW ARs. Ammunition shall be properly packaged, marked, and storage compatibility and explosive limits of munitions bunkers maintained.

5. Transportation of ammunition and explosives shall be IAW applicable local directives, ARs and Department of Transportation (DOT) requirements.

APPENDIX J - CHEMICAL SAFETY PROGRAM

1. Purpose and Scope: This appendix describes the requirements of all CARA personnel that are involved in chemical agent operations.

2. CARA Director is responsible for the establishment and implementation of an effective Chemical Safety Program that is consistent with the requirements of AR 50-6, AR 385-10, and DA PAM 385-61, DA PAM 40-8, DA PAM 40-173, applicable FMs, TMs and interim guidance.

3. Personnel involved in chemical surety operations will be trained and certified IAW the provisions and requirements of DA PAM 385-61, Ch 7, paragraph 2 and CARA Chemical Surety Guide.

4. All personnel in a designated chemical surety position will be certified in the Chemical Personnel Reliability Program (CPRP) meeting the requirements of AR 50-6.

5. Chemical plans and procedures will be prepared for those operations of a hazardous nature, involving recovered chemical warfare materiel (RCWM) or any other military unique compound. All chemical plans and procedures will contain the applicable safety and operational requirements of DA PAM 385-61. For emergency operations involving Chemical Surety Materiel (CSM) the CARA Chemical Accident/Incident Response and Assistance Procedures (CAIRA) will be used.

6. Each employee, as a condition of employment, shall adhere to all safety and operational requirements and instructions. In addition, each employee will use the personal protective clothing and equipment provided, IAW established procedures and appropriate TMs.

7. A minimum of two qualified personnel are required to conduct chemical surety operations IAW AR 50-6.

8. Transportation of CSM will be conducted IAW:

   a. DOT Regulations.

   b. ARs and Policies.

   c. CARA SOP 50-1, Off-Post Escorts, or CARA SOP 50-2, On-Post Escorts.

9. CARA's response to Chemical Accidents/Incidents will be conducted IAW Chapter 5, (Chemical Accident or Incident Response and Assistance (CAIRA) Plan) to The APG Emergency Response Plan.

APPENDIX K - HEAT STRESS PREVENTION AND MONITORING

1. Purpose. Heat stress may occur at any time work is performed at elevated temperatures. If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur such as fatigue, irritability, anxiety, and decreased concentration or dexterity, and possibly death. Because heat stress is one of the most common and potentially serious illnesses at field sites, regular monitoring and other preventive measures are vital to ensure worker safety. Wearing chemical protective clothing often decreases natural body heat loss (cooling) and increases the risk of heat stress. Employees who are taking prescription over-the –counter medications should consult with their personal physician prior to working in high-temperature environments to see if their medication would impair their ability to handle heat stress.

2. Heat Stress Disorders, Symptoms and Treatment.

a. Heat Rash: Heat rash, also known as prickly heat, may occur in hot and humid environments where sweat is not easily removed from the surface of the skin by evaporation and is aggravated by chafing cloths. When extensive or complicated by infection, heat rash can be so uncomfortable that it inhibits sleep and impairs a worker's performance.

(1) Symptoms - Mild red rash, especially in areas of body that come in contact with protective gear.

(2) Treatment - Decrease amount of time spent working in protective gear and provide body powder to help absorb moisture and decrease chafing. Heat rash can be prevented by showering, resting in cool a place, and allowing the skin to dry.

b. Heat Cramps: Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused by both, too much, or too little salt. Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution, excess salt can build up in the body if the water loss through sweating is not replaced. This cannot be relied on as a guide to the need for water; instead water must be taken every 15 to 20 minutes in hot environments..

(1) Symptoms - Acute painful spasms of voluntary muscles, most notably the abdomen and extremities.

(2) Treatment - Move the victim to cool area and loosen clothing. Have the victim drink 1 to 2 cups of potable water or diluted commercial electrolyte solution (e.g., Gatorade, Quench) immediately and then every 20 minutes thereafter until symptoms subside. Electrolyte supplements can enhance recovery; however, it is best to double the amount of water required by the dry mix package directions or add water to the liquid form.

c. Heat Exhaustion: Heat exhaustion is a state of weakness or exhaustion caused by the loss of fluids from the body. Heat exhaustion is not as dangerous as heat stroke, but if not properly managed in the field it may lead to heat stroke.

(1) Symptoms - Pale, clammy, and moist skin, profuse sweating, and extreme weakness. Body temperature is normal, pulse is weak and rapid, and breathing is shallow. The person may have a headache, may vomit, may feel dizzy, and may be irritable or confused.

(2) Treatment - Move the victim to a cool, air-conditioned or temperature-controlled area, loosen clothing, place in a position with the head lower than the feet (shock prevention), and allow the victim to rest. Consult a physician. Ensure that the victim is not nauseated or vomiting. If not nauseated or vomiting, give the victim small sips of cool water or diluted electrolyte replenishment solution (one to one dilution with water, or if mixing from powder, double the water added). If this is tolerated have the victim drink 1 to 2 cups of fluid immediately, and every 20 minutes thereafter until symptoms subside. Seek medical attention at the advice of the consulting physician.

d. Heat Stroke: Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of the body's heat regulating mechanisms, i.e., the individual's temperature control system (sweating) stops working correctly. Body temperature rises so high that brain damage and death may result if the person is not cooled quickly.

(1) Symptoms - red, hot, dry skin (although the person may have been sweating earlier); nausea, dizziness, confusion, extremely high body temperature (i.e., 104°F or greater as measured with an oral thermometer), rapid respiratory and pulse rate, seizures or convulsions, unconsciousness or coma.

(2) Treatment - Immediately call for emergency medical assistance. Remove the victim from the source of heat and cool the victim quickly. If the body temperature is not brought down quickly, permanent brain damage or death may result. Remove all PPE and as much personal clothing as decency permits. Fan the person while sponging or spraying with cool or tap water. Apply ice packs (if available) to the back of the neck, armpits, groin area, or behind the knees. Place the victim flat on their back or with head and shoulders slightly elevated. If conscious, and not nauseated or vomiting, the victim may be provided sips of cool water. Do not give the victim coffee, tea, or alcoholic beverages. Emergency medical personnel will take over treatment upon arrival.

3. Recognition and Risk Assessment: In the planning stages of a project, the potential for heat stress disorder must be considered as a physical hazard in the site-specific Health and Safety Plan (HASP). Risk assessment can be accomplished in the development stages of a project by listing in the HASP the most likely heat stress disorders that may occur. The Field Safety Officer (FSO) must make decisions on the proper safety procedures and recommend them to the site manager. Each worker must evaluate the risk associated with his or her work and be actively alert to these hazards. Any site worker may stop work if safety procedures are not followed or the risk is too great. In addition, all personnel must be aware of these symptoms in both themselves and their co-workers. In situations where two heat stress plans may be involved due to joint operations the most stringent plan will be utilized.

4. Prevention and Protection Program: Heat stress is affected by several interacting factors including, but not limited to, age, obesity, physical condition, substance abuse, level of personal protective equipment (PPE) worn, and environmental conditions (temperature, shade, humidity). Site workers must learn to recognize and treat various forms of heat stress. The following recommendations should be followed to prevent heat stress.

a. Ensure all personnel have a medical clearance from the Kirk Army Health Clinic for working in hot environments.

b. The most important measure to prevent heat-related illness is adequate fluid intake. Workers should drink 1/2 to 1 quarts of liquids per hour in high heat conditions. Most of this liquid should be water. Under heavy work and heat conditions, the body may lose up to 2 gallons of fluids per day. To prevent heat stress symptoms, the individual must ensure replacement of this fluid.

c. Provide water that is maintained at 50 to 60°F. Workers should drink 16 ounces of water before beginning work, and a cup or two at each break period.

d. Provide a shaded area for rest breaks. Ensure that adequate shelter is available to protect personnel against heat and direct sunlight. When possible, shade the work area.

e. Discourage the intake of caffeinated drinks during working hours.

f. Monitor for signs of heat stress.

g. Encourage workers to maintain a good diet during these periods. In most cases, a balanced diet and lightly salted foods should help maintain the body's electrolyte balance. Bananas are especially good for maintaining the body's potassium level.

h. If utilizing commercial electrolyte mixes, double the amount of water called for in the package directions. There are indications that “full-strength” preparations taken under high heat stress conditions may actually decrease the body’s electrolytes.

i. Acclimate workers to site work conditions by slowly increasing workloads (i.e., do not begin work activities with extremely demanding tasks).

j. Rotate shifts of workers who are required to wear impervious clothing in hot weather.

k. In extremely hot weather, conduct field activities in the early morning and evening.

l. Provide cooling devices to aid natural body heat regulation. These devices, however, add weight and their use should be balanced against worker efficiency. An example of a cooling aid is long cotton underwear, which acts as a wick to absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing.

m. Good hygienic standards must be maintained by frequent showering and changes of clothing.

n. Clothing should be permitted to dry during rest periods.

o. Whenever working in the sun, provide employees with sunscreen with both UVA and UVB protection.

p. Persons who notice skin problems should immediately consult medical personnel.

5. Heat Stress Monitoring and Work Cycle Pre- Entry Management: When strenuous field activities are part of on-going site work conducted in hot weather, the following guidelines should be used to monitor the body’s physiological response to heat, and to manage the work cycle, even if workers are not wearing impervious clothing. These procedures will be instituted for pre-entry screening by area medical personnel supporting site activities when the temperature exceeds 70°F and the tasks/risk analysis indicates an increased risk of heat stress problems. Consult the HASP and a safety professional (e.g., Division Environmental Health and Safety (EHS) Manager, FSO) if questions arise as to the need for specific heat stress monitoring. In all cases, the site personnel must be aware of the signs and symptoms of heat stress and provide adequate rest breaks and proper aid as necessary. The local Occupational Health Clinic will provide annual screening for medical conditions that increase the risk of heat stress and other heat related injuries.

a. Measure Heart Rate – Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the rest period. The heart rate at the beginning of the

rest period should not exceed 110 beats per minute. If the heart rate is higher, the next work period should be shortened by 33%, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats per minute at the beginning of the next rest period, the following work cycle should be further shortened by 33%. The procedure is continued until the rate is maintained below 110 beats per minute.

b. Measure Body Temperature – When ambient temperatures are over 90°F, body temperatures should be measured with a clinical thermometer as early as possible in the rest period. If the oral temperature exceeds 99.6°F (or 1 degree change from baseline) at the beginning of the rest period, the following work cycle should be shortened by 33%. The procedure is continued until the body temperature is maintained below 99.6°F (or 1 degree change from baseline). Under no circumstances should a worker be allowed to work if their oral temperature exceeds 100.6°F.

c. Measure Body Water Loss – Body water loss greater than 1.5% of total body weight is indicative of a heat stress condition. Body weight is measured before PPE is donned and after the PPE is removed following a work cycle. Body water loss can be measured with an ordinary bathroom scale; however, the scale must be sensitive to one-half pounds increments. A worker is required to drink additional fluids and rest if their body water loss is greater than 1.5%.

NOTE: For purposes of this operating practice, a break is defined as a 15-minute period and/or until an individual's vital signs are within prescribed guidelines. All measurements for heat stress monitoring will be conducted and recorded on local forms utilized by the area medical personnel supporting site activities.

d. Environmental Monitoring – Monitoring Wet Bulb Globe Temperature (WBGT) environmental heat measurements must be made at, or as close as possible to, the specific work area where the worker is exposed. When appropriate, indoor and outdoor WBGT measurements can be made. When a worker is not continuously exposed in a single hot area but moves between two or more areas having different levels of environmental heat, or when the environmental heat varies substantially at a single hot area, environmental heat exposures should be measured for each area and for each level of environmental heat to which employees are exposed. WBGT should be calculated using the appropriate formula.

An environmental evaluation of the WBGT level or dry-bulb equivalent should be made at, or as close as possible to, the specific work area where the employee is exposed. WBGT should be calculated using the appropriate formula. For indoor and outdoor conditions with no solar load, WBGT is calculated as:

$$WBGT = 0.7\ WB + 0.3\ GT$$

For outdoor with solar load, WBGT is calculated as:

$$WBGT = 0.7\ WB + 0.s\ GT + 0.1\ DB$$

Where:

WBGT = Wet- Bulb Globe Temperature Index
WB = Natural Wet-Bulb Temperature
DB = Dry-Bulb Temperature
GT = Globe temperature

Depending on PPE, clothing and work level, symptoms of heat stress can occur when the ambient temperature is as low as 60 to 70 degrees Fahrenheit. For this reason, weather forecasts will be monitored to determine when heat stress conditions should be anticipated. This is defined as WBGT levels greater than 50 degrees Fahrenheit or ambient temperatures greater than 70 degrees Fahrenheit. When heat stress potential exists, heat stress control measures will be identified in all pre-job planning, and continuous WBGT monitoring of the work areas will be conducted. Control measures will be developed relative to anticipated WBGT levels, PPE, clothing, and work operations.

1. Work Load and PPE: Workload level or metabolic rate is assumed to be moderate (range of resting to very heavy) as defined by ACGIH and PPE is assumed to be impervious. Workloads greater or less than moderate or reduced PPE may require modification of work-rest cycles

2. Modifying Work-Rest Cycles: Work-rest cycles allow the body an opportunity to get rid of excess heat, slow down the production of internal heat, and provide greater blood flow to the skin. Short but frequent rest cycles are best for those working in hot environments. ACGIH heat stress guidelines were followed when preparing the work-rest cycles described in Table-1

3. Job Planning-Heat Stress Prevention Measures: To prevent heat exhaustion and fatigue while wearing impermeable or semi-permeable clothing, maximum working times will be established prior to beginning each designated task or operation. Factors such as relative humidity, suit ventilation, activity levels, and screening based on the WBGT index will be considered. The WBGT offers an index of the environmental contribution to heat stress and heat strain. The current ACGIH heat stress and strain guidelines will be used to monitor the environment in the work area and derive the WBGT index, and set stay times and subsequent work-rest criteria for each operation. As mentioned in the guidelines, the stay times and work-rest criteria MUST be adjusted to address the use of impervious protective clothing.

Table 1. Permissible Heat Exposure Threshold limit Values (ACGIH)

(Moderate Work Load)

	Clothing and TLVs			
Work-Rest Regimen	**Light Summer**	**Coveralls**	**Rain Suit**	**Acid Suit Ensemble or Level C PPE**
Continuous Work	80°F	78°F	74°F	72°F
75% Work, 25% Rest, Each Hour	82°F	80°F	76°F	74°F
50% Work, 50% Rest, Each Hour	85°F	83°F	79°F	77°F
25% Work, 75% Rest, Each Hour	88°F	86°F	82°F	80°F

Notes:
These TLVs are based on the assumption that nearly all acclimatized, fully clothed workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 100.4°F. They are also based on the assumption that the WBGT of the resting place is the same or very close to that of the workplace. Where the WBGT of the work area is different from that of the rest area, a time-weighted average should be used (consult the ACGIH *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*, 2004.)

These TLVs apply to physically fit and acclimatized individuals. a TLV values in °F are WBGT temperatures.

ACGIH = American conference of Government Industrial Hygienists
PPE = Personal Protective equipment
TLV = Threshold Limit Value
WBGT = Wet-Bulb Globe Index

e. Employee Heat Stress Training – All employees expected to work in hot environments or considered to be at high risk for heat strain will receive annual training. Examples of high risk personnel are previous heat injuries, emergency response team members, all personnel who wear impermeable PPE (such as butyl rubber aprons),Tyvex or similar suits with chemical protective mask, or OSHA level A-D. All training will be documented with sign in roster.

Employee training must include:

- Purpose and advantages of worker participation.
- Worker Responsibilities.
- Effects of drugs, medications, and alcohol.
- Importance of Hydration.
- Buddy system.
- Signs and symptoms of heat illness.
- Emergency response and first aid procedures.

f. Physiological Monitoring – Monitoring is mandatory for workers in OSHA level A, B, C (if impermeable) and equivalent PPE. Symptoms of excessive heat strain always over-ride physiological data or work rest cycles. No individual with symptoms of excessive heat strain (headache, dizziness, nausea, excessive fatigue, etc.) should continue work in the heat. One or more of the following criteria define excessive heat strain and will be used for immediate termination of heat stressful exposure.

(1) Sustained heart rate greater than 180 beats per minute minus the individual's age.

(2) Body core temperature greater than 101.3 F for medically selected and acclimatized individuals or 100.4 F for un-acclimatized individuals.

(3) Heart rate is in excess of 120 bpm after 1 minute of rest. If 120 are not quite obtainable after 1 minute of rest, an additional minute of rest may be reasonable to achieve 120 as long as the worker is asymptomatic.

(4) There are symptoms of sudden and severe fatigue, nausea, dizziness, breathing difficulty, chest pain/tightness, lightheadedness, or other signs of illness. A worker whose entry is terminated for these symptoms should be evaluated by medical personnel.

(5) Monitoring of personnel at job sites will be conducted by onsite support medical personnel utilizing local forms.

APPENDIX L - MOTOR VEHICLE ACCIDENT PREVENTION

1. Purpose and Scope: To provide a documented motor vehicle accident plan for all CARA personnel to follow IAW AR 385-10, Chapter 11 and other local state and federal regulations.

2. Personnel who operate section motor vehicles and equipment must possess a valid state driver's license and US Government Motor Vehicle Operator's Identification Card (OF 346).

3. Driver certification will be centralized at CER IAW AR 600-55. Sections are not authorized to certify operators on military vehicles.

4. CARA personnel must undergo an interview by the Section Chief or designated individual and a medical evaluation IAW AR 600-55 to determine their suitability to operate military vehicles and equipment. (The toxic physical fulfills the requirement for medical evaluation.)

5. Section Chiefs will ensure that personnel are trained, as a minimum, on the following prior to testing and certification by the APG Transportation Division:

a. State, local, and post traffic laws and regulations.

b. Army Accident Avoidance Course-Current within 4 years.

c. Controls peculiar to the vehicle.

d. Accident reporting procedures.

e. Practical on the road training by a trained and licensed operator.

6. CARA personnel have the responsibility to abide by all state, local, and post traffic laws and regulations while operating an Army Motor Vehicle (AMV).

7. Vehicle operators will:

a. Perform Preventive Maintenance Checks and Services (PMCS) IAW the applicable TM before operating an AMV, and will not operate a vehicle found to be mechanically defective.

b. Follow safe backing procedures when driving AMVs to include use of ground-guides. The assistant driver or other responsible passenger will be used as a ground guide. Operators will ensure that guides stay clear of the vehicle path and in full view of the operator at all times during the backing movement. If a guide is not available, the driver will get out of the vehicle and make a complete check around the vehicle to ensure it is safe to back up.

APPENDIX M - ACCIDENT REPORTING PROCEDURES

1. Recordable/Reportable Accidents.

a. A recordable accident is an injury that results in a full lost duty day beyond the day of injury, or permanent total disability, or damage to Army property (or non-Army property resulting from Army operations) that result in damage cost of $2,000 or more.

b. Reportable accidents are all Army accidents/incidents, including occupational illnesses and injuries, regardless of how minor, will be reported to the SOHS as soon as possible but not later than two days after the accident occurs.

2. The Safety Office will report all Class A-D ground accidents, regardless of circumstance, to higher headquarters IAW DA PAM 385-40. All aviation Class A-E accidents and near-miss investigations will be reported IAW CARA Aviation SOP.

a. During duty hours.

(1) Accidents, which occur during duty hours to CARA Soldiers, Civilians and contractors, must be reported as soon as possible, but not to exceed two days to the SOHS.

(2) Individuals will report the accident to his/her immediate Supervisor, who will in turn notify the SOHS. If the Supervisor is not available, the individual or co-worker will report the accident to the SOHS.

(3) Employees should report to their designated US Army Health Clinic (or local hospital if in a TDY status) for examination, treatment and /or referral to an outside doctor. An Authorization for Medical Exam/Treatment CA-16, and a Form 1236 (Record of Injury) must be completed.

(4) Accidents involving Civilian employees require the Supervisor and employee to report to the Federal Employees Compensation Act (FECA) office within 10 days for timely filing of a CA-1 form with the Office of Workers' Compensation Program (OWCP). If an injured employee is in a TDY status, alternate filing arrangements must still take place. Both Supervisor and employee must be present to complete the CA-1 form unless employee is TDY or injury prevents travel. Copies of initial and all future medical reports should be sent to the FECA office. This allows for close monitoring of the claimant's medical treatment and resolution.

(5) Motor vehicles will not be moved if the accident occurs on post during duty hours. The Section Chief, Supervisor, SOHS, and the police will be immediately notified is such cases.

b. Off-duty hours. All accidents that occur on post after duty hours that involve either AMV or privately owned vehicles (POV) shall immediately be reported to the Military Police before moving vehicle(s). Accidents involving AMVs after duty hour's off-post shall also be immediately reported to the Police.

c. All accidents involving employees during work related operations will be reported to the applicable supervisor and CARA Safety as soon as practical.

APPENDIX N – SAFETY AWARDS

1. Purpose. To recognize the achievements of Civilians in the field of accident prevention.

2. Responsibilities. The SOHS has oversight over the Safety Awards Program and is responsible for its implementation throughout CARA. Section Chiefs are responsible for forwarding recommendations through the SOHS to the Director for safety awards.

3. Criteria for Award. Safety awards may be awarded to either individuals or elements of CARA such as Teams or Section.

a. The name(s) of personnel recommended for safety award(s) along with a narrative description will be forwarded to the SOHS, who will submit recommendations to the Director for approval/disapproval.

b. Safety award(s) for CARA are considered in the following manner:

(1) Any CARA member may recommend a safety award for an element of CARA. Recommendation must be made on a memorandum addressed to the Director of CARA through local chain of command and the SOHS.

(2) Each recommendation for award will be forwarded through the SOHS Safety Officer, who will present the recommendation (and any pertinent accompanying documentation) to the Director for consideration.

c. The presentation of safety award(s) will be made during formal section formations or other suitable occasions in order to lend emphasis to the importance of the CARA Composite Risk Management Plan, and to provide an incentive to both individuals and elements of CARA to improve their safety record.

4. Types of Awards.

a. Section Safety Award - Awarded to sections, or teams whose personnel have had no reportable accidents/ disabling injuries during the previous fiscal year, both on and off duty.

b. Suggestion Award - Awarded to an individual to recognize a suggestion that benefits the health and safety of the section as a whole (as occurs).

APPENDIX O - WORKPLACE SAFETY

1. Purpose: To set guidance IAW DA PAM 385-10, and local regulations for workplace safety for all operations and personnel within CARA.

2. Scope: This procedure is applicable to all CARA personnel who conduct operations both on and off APG and PBA.

3. Policy: The workplace safety program will address the following area of concern.

   a. Hazard communication program.

   b. Lockout/tag out.

   c. Confined space.

   d. Fall protection.

   e. Blood borne pathogens.

   f. Ergonomics.

   g. Material handling.

4. Responsibilities and Procedures: The CARA SOHS will be responsible for documenting inspections utilizing an OSHA applicable check sheet or in MFR format, and will maintain copies in the safety files.

APPENDIX P – AVIATION SAFETY PROGRAM

1. Purpose: To provide an overview of the CARA Aviation Section that supports the 20th Support Command (SUPCOM). To outline responsibilities for support to the 20th CBRNE Command and its organic Aviation Section.

2. Scope: This Appendix is applicable to all CARA personnel.

3. References:

a. DA PAM 10-1

b. Phillips Army Airfield (PAAF) SOP

c. CARA Aviation Section SOP

4. Responsibilities:

a. The Commander of the 20th CBRNE Command is responsible for all missions undertaken by the Command. The Commander will allocate resources, assign priorities and ensure safe operation.

b. The CARA Director will provide command guidance to the Aviation Section. The CARA Director will represent the Aviation Section in requesting funding, staffing and other resources.

c. The CARA Operations will assign flight missions to the Aviation Section and provide guidance on priorities.

d. The Aviation Section is under the day to day supervision of the Aviation Section Chief.

e. The Aviation Section is stationed at PAAF and will comply with their published procedures. A memorandum of agreement (MOA) exists between the section and PAAF that addresses the following areas.

(1) Flight records

(2) Aviation Life Support Equipment

(3) Flight operations

(4) See MOA for Safety Functions

APPENDIX Q – HEARING CONSERVATION PROGRAM

1. Purpose: To establish policies, procedures, and practices for the control of noise hazards and to protect CARA workers from hearing loss due to occupational noise exposure.

2. References:

a. AR 40-5, Preventive Medicine.

b. OSHA 29 Code of Federal Regulations (CFR) 1910.95, Occupational Noise Exposure.

3. Application:

The Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure standard 29 CFR 1910.95 establishes a permissible exposure limit (PEL) for occupational noise exposure, and requirements for audiometric testing, hearing protection, and employee training if those sound levels are exceeded. This regulation defines an "Action Level" (AL) as a "dose" of 50%, which is equivalent to an eight-hour time weighted average of 85 dBA. When noise levels exceed this amount, an effective hearing conservation program is required, which will include as a minimum:

Requirements:	**Section:**
1. Noise monitoring	29 CFR 1910.95(d)
2. Audiometric testing	29 CFR 1910.95(g)
3. Hearing protectors	29 CFR 1910.95(i)
4. Education and training	29 CFR 1910.95(k)
5. Recordkeeping	29 CFR 1910.95(m)

Note: The OSHA regulation only indicates a minimum level of hearing protection and focuses on permanent hearing loss. Short durations of noise, especially sharp bursts of noise at these levels can not only induce hearing loss but can also affect an employee's health and safety.

4. Background: Occupational noise can cause hearing loss, and increase the worker's susceptibility to other workplace problems including physical and psychological disorders, interference with speech and communication, and disruption of job performance associated with excessive noise intensities. This exposure to noise produces hearing loss of a neural type involving injury to the inner ear hair cells. The loss of hearing may be temporary or permanent. Brief exposure causes a temporary loss. Repeated exposure to high noise levels will cause a permanent loss.

Permanent hearing loss is preventable with continued use of the Occupational Exposure Limits (OEL) proper hearing protection and reduction of workplace noise levels to below 85decibels. This will benefit not only employees who can listen and communicate well throughout their lifetimes. But also help the employer in terms of reduced exposure to hearing loss compensation claims and a potential for increased general safety and job performance.

5. Responsibility for Compliance

Hearing conservation is a component of the Directors readiness program. The administration of this program will be the responsibility of the SOHS. Administrative responsibilities include:

a. Coordination and supervision of noise exposure monitoring.

b. Identification of employees to be added to the program.

c. Coordination and supervision of audiometric testing.

d. Supervision and approval of hearing protector selection.

e. Supervision of employee training program.

f. Coordination and supervision of required recordkeeping.

g. Annual evaluation of hearing conservation program.

h. Coordination of required changes/ improvements in the program

6. Noise Monitoring

a. When information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 decibels, the employer shall develop and implement a monitoring program.

b. Employers shall identify employees for inclusion in the hearing conservation program and enable the proper selection of hearing protection.

c. All continuous, intermittent and impulsive sound levels from 80 decibels to 130 decibels shall be integrated into the noise measurements.

d. Instruments used to measure employee noise exposure shall be calibrated to ensure measurement accuracy.

e. Monitoring shall be repeated whenever a change in production, process, equipment or controls increase noise exposures to the extent that additional employees are exposed at or above the action level, or attenuation provided by hearing protectors becomes inadequate.

f. The employer will notify each employee exposed at or above the occupational exposure level of the results of the monitoring.

g. Monitoring will be coordinated by the SOHS with assistance from Kirk U.S. Army Health Clinic (KUSAHC) Industrial Hygiene.

h. The results of the noise exposure measurements will be recorded and accessible to all employees.

7. Audiometric Testing

a. Each employee's audiogram will be compared to his/her baseline audiogram by a qualified evaluator to determine if a Standard Threshold Shift (STS) has occurred.

b. A Standard Threshold Shift is defined by OSHA as a change in hearing threshold relative to the baseline of an average of 10dB or more at 2000, 3000, and 4000 Hz in either ear.

c. In determining if a Standard Threshold Shift has occurred, san allowance can be made for age. The age correction values to be used are found in Appendix F of 29 CFR 1910.95

d. The audiologist, otolaryngologist, or a physician shall review problem audiograms and shall determine whether there is a need for further evaluation.

e. If the annual audiogram shows that an employee has suffered a standard threshold shift, the employer may obtain a retest.

8. Actions for Standard Threshold Shift

Unless the physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, the employer shall ensure that the following steps are taken when a standard threshold shift occurs

a. Employees not using hearing protection will be trained, fitted, and required to use hearing protectors if they are exposed to an 8 hour TWA average sound level of 85 decibels or greater.

b. Employees already wearing hearing protectors will be retrained, refitted, and required to wear hearing protectors of greater attenuation.

c. The Kirk Health Clinic will inform the employee, in writing within 21 days of the determination of the existence of a permanent Standard Threshold Shift.

d. The employee's supervisor will counsel the employee on the importance of using proper hearing protectors and refer the employee for further evaluation.

e. Persistent significant threshold shifts must be entered on the OSHA log if determined to be work related.

9. Protection Equipment

Supervisors shall ensure that hearing protectors are worn by employees who are subject to sound levels equal to or greater than an 8-hour TWA of 85 decibels. Employees will be provided suitable hearing protection at no cost to the employee. Supervisors will ensure their employees are properly trained and fitted for hearing protection prior to working in noise hazard areas. Employees will be held accountable

for not properly using or maintaining their protective equipment. The employer shall establish and maintain an audiometric testing by making audiometric testing available to all employees whose exposure is equal to or exceeds an 8-hour time-weighted average of 85 decibels. The program shall be at no cost to the employee.

10. Employee Education/Training

Annual refresher training will be given to each employee included in the hearing conservation program. The training will include the effects of noise on hearing, purpose and use of hearing protectors, advantages of various types of attenuation, instruction in the selection fitting use and care of protectors, and the purpose of audiometric testing. All training will be documented and a sign in log will be maintained within the applicable organizations division. Specific training related to proper use and maintenance will be accomplished during the employee's annual physical.

11. Recordkeeping

Noise exposure measurement records will be maintained for two years. Audiometric test records will be maintained for the duration of the affected workers employment. Access to records required by this program shall be provided upon request by employees.

12. Program Evaluation

The hearing Protection Program will be evaluated by SOHS whenever there is a change in procedures or equipment that causes noise levels to change, or during the standard SOP review.

APPENDIX R – FORMS

EMPLOYEE REPORT OF ALLEGED UNSAFE OR UNHEALTHFUL WORKING CONDITIONS

For use of this form, see AR 385-10; the proponent agency is Office of The Inspector General.

This form is provided for the assistance of any complainant and is not intended to constitute the exclusive means by which a complaint may be registered with the local Safety Office (Ref OSHA Poster on rights of employees and their representatives).

The undersigned *(check one)*

☐ Employee ☐ Representative of employees ☐ Other *(Specify)* _____

believes that a job safety or health hazard exists at the following place of employment

Does this hazard *(s)*immediately threaten serious physical harm? ☐ Yes ☐ No
If "yes" checked, immediately contact your supervisor or safety representative.

Name of official in charge _____ Telephone _____

Operation/Activity _____

Exact location of worksite _____

1. Kind of operation _____

2. Describe briefly the hazard which exists there including the appropriate number of employees exposed to or threatened by such hazard

3. List by number and/or name the particular occupational safety and health standard*(s)* which may have been violated, if known

4. *(a)* To your knowledge, has this hazard been the subject of any union/management grievance or have you *(or anyone you know)* otherwise called it to the attention of, or discussed it with the employer or any representative thereof? _____

(b) If so, please give the results thereof, including any efforts by management to eliminate or reduce the severity of the hazard

5. Please indicate your desire:

☐ I do not want my name revealed to the official in charge.

☐ My name may be revealed to the official in charge.

WORK LOCATION	TELEPHONE NO.	DATE

TYPED OR PRINTED NAME OF EMPLOYEE OR EMPLOYEE REPRESENTATIVE	SIGNATURE

DA FORM 4755, OCT 78 USAPPC V1.00

FIRE PREVENTION INSPECTION
(APGR 420-1)

BUILDING: _____ DATE: _____
OCCUPANCY: _____ ASSIGNED TO: _____
PERSON IN CHARGE: _____ PHONE NO (w)_____ (h)_____
ALTERNATE POC: _____ PHONE NO (w)_____ (h)_____

IS BUILDING CUSTODIAN INFORMATION CURRENT? [ ] Yes [ ] No "1-6.10.2(a)-(c)"

Where discrepancies are found, circle "code reference" column for applicable item and give a brief detail of such conditions and action taken on the reverse side of this report. Check N/A if item is not applicable.

	YES	CODE REFERENCE	N/A
GENERAL FIRE SAFETY REQUIREMENTS			
1. Is housekeeping in, around and under building satisfactory?		3-7.1 - 3-7.3.4.	
2. Is trash collected in noncombustible containers with covers as required?		3-7.3. - 3-7.3.2.	
3. Is storage, including that in closets, basements & attics satisfactory?		3-11.1. - 3-11.3.	
4. Are fire doors & draft stop doors in good repair & working satisfactorily?		3-5.4.a. thru .g.	
5. Is condition of aisles, exits, fire escapes & doors satisfactory?		3-5.3. (a) & (b)	
6. Are Fire & Evacuation Plans posted & telephone emergency labels attached?		3-4.2. & 3-1.6.	
7. Are fire extinguishers readily visible/accessible and checked monthly?		3-3.3.2.- 3-3.3.11.9.	
8. Are there any holes in walls or ceiling?	NO	3-13.6. & 3-13.8.	
9. Are illuminated exit signs & emergency lighting working properly?		3-3.7. thru 3-3.7.6	
10. Where smoking is prohibited, are restricted areas properly posted?		3-6.1. thru 3-6.4.	
11. Are corridors/stairways clear and unobstructed to required clear width?		3-5.3. (a) or (b)	
12. Any evidence of burned matches or smoking material on floor, in waste paper baskets, or No Smoking Areas?	NO	3-6.5.	
HEATING & VENTILATING EQUIPMENT			
13. Is furnace or mechanical room reasonably clean?		3-7.1 - 3-7.3.4.	
14. Does heating equipment, including smoke pipes, appear in good condition?			
15. Is required clearance provided between heating equipment & combustibles?			
16. Is mechanical room being used for general storage?	NO	3-11.4.	
17. Are exhaust fans, hoods, ducts, vents, and filters reasonably clean?			
ELECTRICAL			
18. Are branch circuits identified inside fuse or breaker boxes?		4-1.6.	
19. Are extension cords being used in lieu of permanent wiring?	NO	4-3.2.	
20. Is general wiring in accordance with regulations?		4-1.3. thru 4-4.8.	
21. Are extension cords being used properly?		4-3.1. thru 4-3.6.	
22. Are cover plates installed on receptacles, light switches, pull & junction boxes?		4-1.9.	
23. Is there adequate clearance around electrical service equipment?		4-1.5.	
24. Are electrical appliances properly used and properly installed?		4-5.1. thru 4-5.11.	
SPECIAL HAZARDS (Flammable Liquids - Paints, Gases, Expl. Chemicals)			
25. Are flammable liquids, gases, paints, explosives, chemicals, etc., stored & handled in accordance with regulations?		Chapters 5 thru 7	
26. Are dip tanks in good condition and equipped with fusible links?		5-1.2.5.	
27. Are containers of flammable liquids properly color coded & identified?		5-7.1. & 5-7.2.	
28. Are paint spray areas clean and operating in accordance with regulations?		7-4.1. thru 7-4.9.	
29. Are compressed gas cylinders secured and protected?		7-1.1.thru 7-1.4.19.	
30. Is proper Fire symbol posted (Circle posted symbol) None 1 2 3 4		7-8.14. thru 7-8.18.	
31. Is proper chemical symbol posted (Circle posted symbol) C D G V Z or Other Symbol: _ _ _ _ _ _ _		7-9.10. & 7-10.11.	
32. Are proper radiation symbols and warnings posted?		7-9.12.	
OTHER			
33. Use reverse side of this form for any hazard noted and not listed.		ALL APGR 420-1	

COMPLETE OTHER SIDE.

SSB FORM 1023. 01 Aug 02 (PREVIOUS EDITION IS OBSOLETE)

REMARKS: (Give brief detail of hazards noted.)

1) ITEM NO'S	DISCREPANCY	ACTION TAKEN BY INSPECTOR

2) Are fire evacuation drills held as required? [ ] YES [ ] NO [ ] N/A

Does all fire alarm & protection equipment appear to be in good condition? [ ] YES [ ] NO

3) OTHER: (Alarm tests, sprinkler tests, and other information)

Sprinkler System: TYPE: W D Pre Action Deluge Domestic

GAUGE Readings: AIR WATER (DRY) / WET

Fire Alarm/ King-Fisher Systems: A/C Power System Trouble Zones out

Type of Fire Alarm System : Combo IRAC

Fire Alarm / Sprinkler System Out of Service: Date: W/O Submitted

4) SIGNATURE OF INSPECTOR: _____

Organization _____ Bldg. _____ Phone: _____

5) NOTES: Reviewing Official _____

A. If conditions are noted requiring immediate attention and action cannot be secured, notify the Fire Chief's Office immediately at extension 4-0501 or 4-0502.
B. For detail of Regulations, see APGR 420-1.
C. Turn in this report promptly to the Fire & Emergency Services Division, Bldg. 2200.
D. Building Fire Marshals will forward reports through the Area Fire Marshal for their Organization or Activity.

APPENDIX S - ACRONYMS

CDSO	Additional Duty Safety Officer
AL	Action Level
AMV	Army Motor Vehicle
APG	Aberdeen Proving Ground
APGISA	Aberdeen Proving Ground Installation Support Activity
AR	Army Regulation
ARB	Accident Review Board
CAIRA	Chemical Accident/Incident Response and Assistance
CARA	CBRNE Analytical and Remediation Activity
CER	Chemical Equipment Room
CFR	Code of Federal Regulations
COE	Corps of Engineers
CPR	Cardiopulmonary Resuscitation
CPRP	Chemical Personnel Reliability Program
CRAS	Composite Risk Assessment Sheet
CRM	Composite Risk Management (now RM)
CSM	Chemical Surety Material
DA	Department of the Army
DOT	Department of Transportation
ECBC	Edgewood Chemical Biological Center
EHS	
EOD	Explosive Ordnance Disposal
FECA	Federal Employees Compensation Act
FSO	Field Safety Officer

HA	Hazard Analysis
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IAW	In Accordance With
IDLH	Immediately Dangerous to Life and Health
ISA	Inter-service Support Agreement
NLT	No Later Than
MACOM	Material Command
MOA	Memorandum of Agreement
MSDS	Material Safety Data Sheets
NIOSH	National Institute for Occupational Safety and Health
OIC	Office in Charge
OSHA	Occupational Safety and Health Association
OWCP	Office of Workers' Compensation Program
PMCS	Preventive Maintenance Checks and Services
POV	Privately Owned Vehicles
PAAF	Phillips Army Air Field
PBA	Pine Bluff Arsenal
PEL	Permissible Exposure Limit
PPE	Personal Protective Equipment
RA	Risk Assessment
RAC	Risk Assessment Code
RCWM	Recovered Chemical Warfare Material
RDECOM	US Army Research, Development, and Engineering Command
RM	Risk Management
RPP	Respiratory Protection Program

RRW	Remediation Response West
SB	Supply Bulletin
SCBA	Self-Contained Breathing Apparatus
SOHO	Safety and Occupational Health Officer
SOHS	Safety and Occupational Health Specialist
USARCRC/SC	United States Combat Readiness Center/ Safety Center
SOP	Standing Operating Procedures
TM	Technical Manual
WBGT	Wet Bulb Globe Temperature

RADIOGRAPHIC OPERATIONS

SOP-002-01

DATE: 15 September 2014

SIGNATURE PAGE

Print Form

CBRNE Analytical and Remediation Activity (CARA)

Document #:	SOP-002-01		
Document Name:	Radiographic Operations		
Prepared by:	WALLACE.LLOYD.JAMES.1034683820	PRINTED NAME	Lloyd J. Wallace

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PRINTED NAME	Christopher K. Chesney		

CARA FORM 5, 1 JUL 12

Table of Contents

REVISION HISTORY

Revision #	Description of Revision	Approver / Date
00	Original document.	Randall L. Bartley / 21 Sep 12
01	-Change AR 25-400-2 to DA PAM 385-24 -Change DA PAM 40-18 to DA PAM 385-25	Christopher K. Chesney / 15 Sep 14

Chapter 1 – GENERAL

1.1 Purpose. To establish guidelines and procedures for the safe operation of the YXLON SMART Portable XRAY.

1.2 Scope. These procedures are applicable to Chemical, Biological, Radiological, Nuclear and High Yield Explosives (CBRNE) Analytical and Remediation Activity (CARA) personnel who conduct radiographic operations.

1.3 References.

a. Army Regulation (AR) 25-400-2 – The Army Records Information Management System (ARIMS)

b. AR 40-5 – Medical Services – Preventive Medicine

c. AR 385-10 – The Army Safety Program

d. Nuclear Regulatory Commission (NRC) Regulatory Guide 8.10 – Operating Philosophy for Maintaining Occupational Radiation Exposure As Low As is Reasonable Achievable (ALARA)

e. NRC Regulatory Guide 8.13 – Instruction Concerning Prenatal Radiation Exposure

f. NRC Regulatory Guide 8.29 – Instruction Concerning Risks from Occupational Radiation Exposure

g. Technical Bulletin (TB) 9-6665-285-15 – Army Calibration Program for RADIAC Survey Meters

h. TB 43-180 – Calibration and Repair Requirements for the Maintenance of Army Material

i. Department of the Army Pamphlet (DA PAM) 385-10 - The Army Safety Program

j. DA PAM 385-24 - The Army Radiation Safety Program

k. DA PAM 385-25 - Occupational Dosimetry and Dose Recording for Exposure to Ionizing Radiation.

l. DA PAM 385-30 - Mishap Risk Management

m. 10 Code of Federal Regulations (CFR) part 19 and 20

n. 49 CFR part 172 and 173

o. CBRNE 385-1, Safety and Occupational Health Program

1.4 General. The YXLON SMART Portable XRAY machine is capable of producing large quantities of radiation, which can cause bodily harm if operated incorrectly or operated by untrained or unqualified personnel.

1.5 Responsibilities.

a. The Director of CARA will:

(1) Establish and implement a formal Radiation Safety Program.

(2) Designate in writing a qualified Radiation Safety Officer (RSO) and Alternate Radiation Safety Officer (ARSO).

b. The RSO will:

(1) Ensure strict compliance with this Standing Operating Procedures (SOP), Operators Manual, and applicable references.

(2) Provide the Director, radiation workers, and visitors, with advice and assistance on all requirements pertaining to radiation safety, operational procedures and Command policy.

(3) RSO or his designated representative shall conduct and document local training and initial qualification courses on radiation safety for all radiation workers within the unit.

(4) Maintain records for the Radiation Safety Program.

(5) Perform accurate radiation surveys or ensure surveys are performed by qualified personnel.

(6) Evaluate the hazard potential and adequacy of radiation protection measures and operating procedures for existing and proposed operations.

(7) Investigate and report appropriate findings of any radiological accident or incident.

(8) Ensure that radiation protection instruments respond to the type of energy and intensity of radiation to be measured, are properly calibrated, and available in sufficient quantity.

(9) Conduct surveys/inspections as needed to ensure compliance with the Radiation Safety Program.

(10) Designate in writing, qualified Radiographers and Assistant Radiographers.

c. The ARSO shall:

(1) Assume the full duties and responsibilities of the RSO in his absence.

(2) Ensure strict compliance with this SOP and applicable references.

d. Radiographers shall:

(1) Ensure strict compliance with this SOP and applicable references.

(2) Meet the training requirements outlined in this SOP.

(3) Ensure safe operation of all XRAY producing devices.

(4) All radiographer qualified personnel will operate as site radiation safety officers when the activity RSO or ARSO is not present.

e. Radiation Barrier Monitors/Guards:

(1) Will remain outside of the controlled area during XRAY operations.

(2) Will keep personnel from crossing into the radiation areas, unless directed otherwise by the RSO, ARSO, or Radiographer.

(3) Ensure strict compliance with this SOP.

(4) Meet training requirements as specified in this SOP.

(5) Video cameras can be used in lieu of barrier guards.

1.6 Policies.

a. In accordance with DA-PAM 385-24 all electronically produced radiation equipment will be added to the CARA Army Radiation Authorization (ARA).

b. Visitors will be escorted by the RSO or ARSO during XRAY operations.

c. Personal dosimeters will be worn at all times by personal working within the hazard area of XRAY operations.

d. The CARA RSO will serve as the point of contact for all XRAY issues.

e. Eating, drinking, smoking, storage or use of food, beverages, tobacco and cosmetics are prohibited inside the XRAY areas.

f. Radiation protection records will be maintained IAW DA PAM 385-25.

Chapter 2 – TRAINING REQUIREMENTS

2.1 General. The following training requirements are required for all CARA personnel involved with XRAY operations.

a. The RSO shall complete the following:

(1) Radiological Safety Course, three weeks, Fort Leonard Wood, MO or equivalent.

NOTE: Course can be waived by Radiation Control Committee (RCC) taking into consideration education and on-the-job training.

(2) School of Military Packing and Transportation (SMPT) 80 Course (initial training or equivalent course).

(3) SMPT 40 Refresher Course every two years after initial training.

(4) Annual Basic Radiation Refresher Course.

(5) Periodic training every two years: Operational Radiation Safety Course, one week, Fort Leonard Wood, MO or equivalent.

b. ARSO shall complete the following:

(1) Operational Radiation Safety Course, one week, Fort Leonard Wood, MO or equivalent.

(2) SMPT 80 Course (initial training or equivalent course).

(3) SMPT 40 Refresher Course every two years after initial training.

(4) Annual Basic Radiation Refresher Course.

(5) Periodic training every two years: Operational radiation Safety Course, one week, Fort Leonard Wood, MO or equivalent.

c. Radiographers shall complete the following:

(1) Radiation Safety and Ordnance Radiography, Level 1 & 2, Naval EOD Technical Division (NAVEODTECHDIV), Indian Head, MD or equivalent.

(2) Annual Basic Radiation Refresher Training.

d. Radiation Barrier Monitors/Guards shall complete the following:

(1) Initial Radiation Training.

(2) On the Job Training.

(3) Annual Basic Radiation Refresher Training.

Chapter 3 – XRAY OPERATIONS CONDUCTED AT OPEN FACILITIES

3.1 XRAY Operations at Open Facilities.

a. For the purposes of this SOP all CARA radiographic operations are conducted in a field environment and that site shall be considered an “open facility” and is subject to the following physical and operational requirements.

b. The XRAY tube head and all objects to be irradiated must be within a conspicuously posted perimeter that limits the area in which exposure rate can exceed 100 millirem (mr) per hour. This area shall be designated the high radiation area.

NOTE: HIGH RADIATION AREA BOUNDARIES SHALL BE CALCULATED ONLY. VERIFICATION SURVEYS SHALL NOT BE PERFORMED.

c. The high radiation area barrier shall be conspicuously posted with signs containing the radiation symbol and the words **“High Radiation Area”**. These signs must be visible to anyone approaching the high radiation area from any accessible route.

d. The perimeter of the high radiation area shall be a physical barrier established by an enclosure such as barrier tape, rope, or other feature.

e. A second physical barrier shall be established at the point at which the exposure rate equals 2 mr in any one hour. This barrier shall be conspicuously posted with signs containing the radiation symbol and the words **“Caution: Radiation Area”**. These signs should be visible to any person approaching the radiation area barrier from any accessible direction.

f. Posted next to the XRAY tube head is a rotating/flashing red light and warning sign stating, “**XRAY Is On When Lit**”.

g. The RSO shall be notified of the time and location of planned “open facility” XRAY operations. The RSO shall ensure that notification of the XRAY operation is made to affected activities that will be in close proximity of the radiation area.

h. There shall be a calibrated RADIAC instrument in accordance with TB 43-180 to survey and verify the radiation area boundary.

i. All personnel involved with the XRAY operations shall wear a thermo luminescent dosimeter (TLD) and an alarming pocket dosimeter.

j. No radiographer shall unlock/enable the XRAY control unit until ready to energize the XRAY tube. The operating XRAY control unit key shall be maintained at all times by the qualified radiographer in charge. When in use the radiographer in charge must maintain position in close proximity to the XRAY control unit to enable shut down of XRAY production if necessary

k. Prior to the first use at the beginning of each shift, the XRAY tube head, cables and console shall be checked for obvious defects.

l. All XRAY operations will be conducted under the supervision of at least one Ordnance Radiographer meeting the training requirements of Para. 2.1c (1).

m. Whenever possible, shielding will be used to reduce harmful ionizing radiation during XRAY operations. Examples of shielding are: conducting operations inside a bunker with the doors closed, using sandbags or earthen berms, or using the lead lined box.

3.2 Violations/Penetration of Radiation Area Boundary. The following actions shall be taken if an unauthorized person enters the radiation boundary area:

a. The radiation barrier guards shall contact the radiographer in charge to terminate the exposure.

NOTE: UNDER NO CIRCUMSTANCES SHALL THE RADIATION BARRIER GUARD CROSS THE UNRESTRICTED BOUNDARY DURING XRAY OPERATIONS.

b. The person shall be detained and positive identification determined.

c. Stop the XRAY operation until the RSO authorizes the operation to be restarted.

d. Note the distance the person was from the XRAY tube head and time.

e. The RSO will conduct an investigation to determine how, why, and where the violation of the boundary occurred. Emphasis shall be placed on recreating the individual's route into the radiation exposure area.

Chapter 4 – OPERATION OF YXLON SMART PORTABLE XRAY UNIT

4.1 GENERAL. Operation of the YXLON SMART Portable XRAY Unit will be in accordance with the SMART Portable XRAY Unit Instruction and Maintenance Manual.

Chapter 5 – PERSONNEL MONITORING INSTRUCTIONS

5.1 General. All radiography personnel assigned to work in the area of XRAY radiation are required to wear a TLD and a pocket dosimeter.

a. Personal Dosimetry.

(1) Standard (TLD) will be provided to all radiation workers make and model number to be determined by United States Army TMDE Activity (USATA). Dosimeters will be collected quarterly and sent to the USATA Support Laboratory (AMSAM-USATA-SR-D), Bldg 5417, Redstone Arsenal, AL 35898-5400.

(2) Personal dosimeters must be used IAW DA PAM 385-25 and maintained in an approved location during periods of non-use.

(3) Occupational radiation exposures will be maintained ALARA IAW NRC Regulatory Guide 8.10.

b. Surveys. All radiation surveys will be conducted using a radiographic survey meter, which has been calibrated IAW TB 43-180 and is capable of measuring Beta, Gama, and Neutron.

5.2 Requirements. All radiographers shall comply with the following requirements:

a. When conducting XRAY operations all radiographers shall wear audible/visual dosimeters, having a range of 0 – 200 mr, in addition to the TLD. Audible/visual dosimeters shall have a current calibration sticker attached.

b. Each radiographer is responsible for monitoring his or her own radiation exposure.

APPENDIX A – Hazard Analysis Matrix

OPERATION	HAZARD	EFFECT	RAC	COUNTERMEASURES	RAC
XRAY	Exposure to high levels of ionizing radiation	Radiation exposure above safe levels	IIC High	Only trained and certified operators will operate the XRAY system. Calibrated Radiac equipment is available and personal dosimeters worn (TLD) (Alarming Dosimeter). Cardinal rule observed limiting time, increasing distance, and using available shielding i.e., bunker, lead blankets, or lead lined box. High and low radiation areas will be clearly marked and identified. High radiation area will be determined using the Inverse Square Law. Barrier monitors or devices will be in place restricting entrance to 2mr radiation area.	IIE Low
Handling XRAY Equipment	Lifting	Personal injury	IIIC Medium	Personnel will be trained in proper lifting techniques. Two person lift will be utilized.	IIID Low
XRAY	High Voltage	Personal injury from electrical shock	IIC High	Electrical cords and connections will be inspected for serviceability prior to connecting to live power and starting operations. In wet weather all exposed connections will be covered. All electrical cords will be the three phase grounded type.	IID Low
Unpacking and packing equipment	Lifting	Personal Injury	IIIC Medium	Personnel will be trained in proper lifting techniques. Two person lift will be utilized.	IIID Low
Site set up and teardown	Slip, trips, and falls	Personal Injury	IIIC Medium	Area where operations are being conducted will be inspected for hazards. All hazards will be removed or identified.	IIID Low
Handling UXO or unknown containers	Unintentional explosion or exposure to chemical	Personal Injury	IC High	Unsafe or unstable munitions will not be moved until render safe procedures have been implemented by qualified EOD personnel. All items will be handled carefully and will not be rolled, bounced, or treated in a rough manner. Most items can be XRAYed inside their over pack i.e., prop charge canister or MRC. Preferred method. If item has to be removed from over pack low level monitoring will be in place to identify if item is leaking. When handling items outside their over pack operators as a minimum will wear gloves and M40 mask. If items are being XRAYed to determine condition of fuze, only trained and qualified EOD personnel will handle item. Item will be handled the minimum necessary in order to acquire an XRAY.	IE Low

Reviewed by: CARA Safety Office
Date: September 2014
IAW: AR 385-10, DA PAM 385-10, DA PAM 385-30

APPENDIX B – Acronyms

ALARA	As Low As Reasonably Achievable
AR	Army Regulation
ARA	Army Radiation Authorization
ARIMS	Army Record Information Management System
ARSO	Alternate Radiation Safety Officer
CARA	CBRNE Analytical and Remediation Activity
CBRNE	Chemical, Biological, Radiological, Nuclear and High Yield Explosives
DA	Department of The Army
DOD	Department of Defense
EOD	Explosive Ordnance Disposal
IAW	In Accordance With
MR	Millirem
MRC	Multiple Round Container
NRC	Nuclear Regulatory Commission
RAC	Risk Assessment Code
RCC	Radiation Control Committee
RSO	Radiation Safety Officer
SMPT	School of Military Packaging and Transportation
SOP	Standing Operating Procedure
TB	Technical Bulletin
TLD	Thermo Luminescent Dosimeter
USATA	United States Army TMDE Activity
UXO	Unexploded Ordnance
NAVEODTECHDIV	Naval EOD Technical Division

RADIATION SAFETY FOR USE OF THE PINS

SOP-003-01

DATE: 15 September 2014

SIGNATURE PAGE

CBRNE Analytical and Remediation Activity (CARA)

Print Form

Document #:	SOP-003-01		
Document Name:	Radiation Safety for use of the PINS		
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DIRECTOR	CHESNEY.CHRISTOPHER.KEITH.1120825158	DATE	29 SEP 2014
PRINTED NAME	Christopher K. Chesney		

CARA FORM 5, 1 JUL 12

Table of Contents

Appendices

REVISION HISTORY

Revision #	Description of Revision	Approver / Date
00	Original document.	Randall L. Bartley / 21 Sep 12
01	-Change DA PAM 40-18 to DA PAM 385-25 -Change AR 25-400-2 to DA PAM 385-25 -Change 20th SUPCOM (CBRNE) to 20th CBRNE Command	Christopher K. Chesney / 15 Sep 14

SUPERVISOR'S STATEMENT

I have personally reviewed this Standing Operating Procedure (SOP) and to the best of my knowledge believe that the information listed herein is correct. I, by my signature, attest that the operators who have signed this SOP have received the required instruction. I understand and am fully capable of performing my responsibilities.

PRINT NAME	SIGNATURE	DATE

OPERATOR'S STATEMENT

I have read the general and specific requirements of this SOP. I, by my signature below, indicate that I thoroughly understand and agree to abide by these instructions. I understand that I am fully capable of performing my responsibilities as delineated within this SOP.

PRINT NAME	SIGNATURE	DATE

1. Purpose. To establish SOP, policy, and responsibilities to assure maximum safety in the use, handling, storage, and disposal of the Portable Isotopic Neutron Spectroscopy (PINS).

2. Scope. This procedure is applicable to all CBRNE Analytical and Remediation Activity (CARA) personnel authorized to operate the PINS.

3. References:

a. Army Regulation (AR) 25-400-2 – The Army Records Information Management System (ARIMS)

b. AR 40-5 – Medical Services – Preventive Medicine

c. AR 385-10 – The Army Safety Program

d. Nuclear Regulatory Commission (NRC) Regulatory Guide 8.10 – Operating Philosophy for Maintaining Occupational Radiation Exposure As Low As is Reasonable Achievable (ALARA)

e. NRC Regulatory Guide 8.13 – Instruction Concerning Prenatal Radiation Exposure

f. NRC Regulatory Guide 8.29 – Instruction Concerning Risks from Occupational Radiation Exposure

g. Technical Bulletin (TB) 9-6665-285-15 – Army Calibration Program for RADIAC Survey Meters

h. TB 43-180 – Calibration and Repair Requirements for the Maintenance of Army Material

a. Department of Army Pamphlet (DA PAM) 385-25 - Occupational Dosimetry and Dose Recording for Exposure to Ionizing Radiation.

b. DA PAM 385-24 - The Army Radiation Safety Program

c. PINS Chemical Assay System, User's Manual, v. 4.4

d. 10 Code of Federal Regulations (CFR) part 19 and 20

e. 49 CFR part 172 and 173

4. Policy.

a. Use of the PINS is authorized under the 20th CBRNE Command NRC license. Movement of the PINS shall be coordinated through the CARA Operations Office, Aberdeen Proving Ground (APG), MD, 410-436-8534 or DSN 584-8534 and the CARA Radiation Safety Officer (RSO).

b. Notification to the 20th CBRNE Command Radiation Safety Staff Officer (RSSO) may be by telephone at 410-436-9504 or DSN 584-9504, but shall be followed by written notification. Written notification can be accomplished by FAX (410) 436-0005, DSN 584-0005 or electronic mail to the RSSO.

c. The PINS Californium 252 (Cf-252) radioactive source will be secured in its shipping and storage container when not in use or when neither the RSO nor the Field Radiation Safety Officer (FRSO) is on duty.

d. Only currently certified radiation workers authorized by the RSO/Alternate RSO (ARSO) should be allowed to work within the established 2 millirem (mr) line. Persons under 18 years of age, females known or suspected as being pregnant, are prohibited from working within the 2 mr line. These individuals exposure to radiation will be governed per the requirements in the CFR.

e. Visitors will be escorted by the RSO or ARSO.

f. The restricted area will be posted with a “CAUTION RADIATION AREA” sign in accordance with (IAW) 10 CFR 20.203(c).

g. When operating the PINS there must always be an RSO/ARSO present to ensure safety and license compliance.

h. Personal dosimeters will be worn at all times by personnel working within the restricted area IAW requirements of DA PAM 385-25.

i. The CARA RSO will serve as the point of contact (POC) for all radiological issues concerning the PINS and the NRC license.

j. Eating, drinking, smoking, storage or use of food, beverages, tobacco, and cosmetics are prohibited in the controlled or storage areas.

k. Radiation protection records will be maintained IAW AR 25-400-2.

l. Inventory of radioactive materials will be maintained IAW DA PAM 385-24.

5. Responsibilities.

a. CARA Director will:

(1) Issue letter orders appointing RSO and ARSO. A copy of the letter orders and training certificates shall be submitted to the 20th CBRNE Command for concurrence and inclusion into the centralized radiation protection files.

(2) Assure this procedure and all pertinent regulatory requirements are adhered to in order to promote proper radiation safety.

(3) Designate a person in writing to be responsible for preparing and maintaining the radiation exposure records (Automated Dosimetry System and DD Form 1952, Dosimeter Application And Record Of Occupational Radiation Exposure) IAW DA PAM 385-24. This includes records of bioassay, pocket dosimeters, etc.

b. RSO is responsible for the following:

(1) Ensuring the PINS is used in a controlled area in a safe manner IAW this SOP.

(2) Posting the restricted area IAW 10 CFR. The entrances to the controlled area require the “CAUTION RADIATION AREA” signs while the storage area only requires the “CAUTION RADIOACTIVE MATERIALS”.

(3) Providing personal dosimeters for radiation workers IAW DA PAM 385-24, and maintaining control of dosimeters to prevent access to dosimeters by unauthorized personnel.

(4) Performing quarterly review of personnel radiation exposure records (Automated Dosimetry System) IAW DA PAM 385-24.

(5) Approving in writing the storage location for personnel dosimeters IAW DA PAM 385-24.

(6) Conducting semi-annual inventory and periodic update as required of radioactive items IAW DA PAM 385-24 and maintaining a file copy and providing a copy to the 20th CBRNE Command RSSO.

(7) Advising and coordinating with 20th CBRNE Command RSSO on any impending change to the current inventory of radiation sources.

(8) Conducting the required leak test on the PINS at least once every six months.

(9) Providing written notification to the local fire department of the type(s) and location(s) of radioactive material(s) IAW DA PAM 385-24.

(10) Providing annual briefing and Hazardous Material (HAZMAT) Familiarization and Safety in Transportation training to radiation workers regarding radiation hazards and biological effects of ionizing radiation. Ensuring certifying officials of Radiation Material Movement Forms (CARA Form 4) have completed 80 hours of initial Packaging of Hazardous Material for Transportation training and 40 hours of refresher training every two years.

(11) Maintaining records of requisitions, receipts, transfers, and disposal of radioactive items IAW DA PAM 385-24.

(12) Assuring survey meters are marked and calibrated in accordance with TB 43-180 for “Health and Safety Instruments.” (Documentation of calibration of survey meters shall be maintained on file IAW AR 25-400-2.)

(13) Providing and documenting required training for operator/users of the PINS.

(14) Conducting and documenting radiological surveys of the restricted and storage areas at least monthly.

(15) Investigating each case of excessive or abnormal exposure IAW DA PAM 385-24 and reporting the results to the Garrison RSO and the 20th CBRNE Command RSSO. Referring any actual or suspected overexposure to the local medical authority.

(16) Instructing radiation workers of the proper use of protective clothing and proper decontamination procedures when handling radioactive materials. Providing required safety equipment and supplies to personnel working with radiological materials and for the decontamination of radiologically contaminated areas.

(17) Posting the required notices and documents where the workers may observe them.

(18) Securing all radioactive material when not in use to preclude use or removal by unauthorized personnel. Prior to being relieved from duty assignment, transfer control of the PINS to an authorized (qualified) individual or secure the PINS and notify the 20th CBRNE Command RSSO.

c. The ARSO should assist the RSO in the performance of duties and act on behalf of the RSO when deemed necessary by the RSO.

d. ARSO will:

(1) Ensure PINS is being used in a safe manner in the field.

(2) Security and proper storage of source in field.

(3) All personnel are wearing film badges and following SOPs.

(4) Shipping and paperwork of sources to and from external designations.

(5) Ensure all radiation surveys are being done and recorded.

e. Operating Personnel:

(1) All operating personnel working with the PINS or working within the restricted area as described herein, shall be familiar with this SOP and ensure that all work is conducted IAW the provision thereof.

(2) Additional instruction given by the RSO or ARSO in the interest of radiation safety will be followed.

(3) Each radiation worker is responsible for wearing and accounting for his or her personal dosimeter.

(4) Each person is responsible for obtaining and using the required safety equipment (survey instruments, disposable gloves, and extension tongs).

(5) Any unusual occurrence or accident, which involves or potentially involves radioactive material, must be reported to the RSO.

6. Training Requirements.

a. RSOs shall complete the following:

(1) Radiological Safety Course, three weeks, Fort Leonard Wood, MO or equivalent.

NOTE: Course can be waived by Radiation Control Committee (RCC) taking into consideration education and on-the-job training.

(2) School of Military Packing and Transportation (SMPT) 80 Course (initial training or equivalent course).

(3) SMPT 40 Refresher Course every two years after initial training.

(4) Annual Basic Radiation Refresher Course.

(5) Periodic Training every Two Years: Operational Radiation Safety Course, 1 week, Fort Leonard Wood, MO or equivalent.

b. ARSO shall complete the following:

(1) Operational Radiation Safety Course, 1 week, Fort Leonard Wood, MO or equivalent.

(2) SMPT 80 Course (initial training).

(3) SMPT 40 Refresher Course every two years after initial training.

(4) Annual Basic Radiation Refresher Course.

(5) Periodic Training every Two years: Operational Radiation Safety Course, 1 week, Fort Leonard Wood, MO or equivalent.

c. PINS Operators:

(1) Must be assigned as an authorized user (designated in writing by RSO).

(2) Annual Basic Radiation Course.

(3) Hazardous Material Familiarization Course (Ammo 67). This course is not required if personnel have been to the initial SMPT 80 Course (every two years).

7. Operating Procedures.

a. Use: The PINS shall be utilized IAW this SOP, Operators Manual and IAW the conditions of the 20th CBRNE Command NRC License. All operations utilizing the PINS will be conducted with the minimum of two personnel; an FRSO and an authorized PINS operator.

b. Receipt, Transfer, and Disposal:

(1) The PINS source will be inspected for damage after each shipment by the CARA RSO or designated alternate. PINS shipments returning from the field will be evaluated prior to being placed in storage. Damaged devices shall be reported immediately to the CARA RSO and 20th CBRNE Command RSSO. The inspection will consist of monitoring the package with an appropriate survey instrument and an evaluation for removable contamination. The evaluation will be performed as soon as practicable after receipt, but no later than three hours after the package is received if received during normal working hours, or 18 hours if received after normal working hours. The evaluation will consist of monitoring the package with an appropriate survey instrument and an evaluation for removable contamination. Contamination smears will be submitted to US Army Test, Measurement, and Diagnostic Equipment Activity (USATA) for analysis.

(2) The CARA RSO or designated alternate will also notify the 20th CBRNE Command RSSO if radiation levels on the external surface of the package are found to be in excess of 200 mr per hour, or at three feet from the external surface of the package in excess of 10 mr per hour.

(3) Package shipments will also be evaluated upon arrival at remote site locations. Contamination smears will be evaluated with the appropriate calibrated survey instrument. If the evaluations determine that the removable contamination is below 50 counts per minute (cpm) the PINS can be used; however, PINS having removable contamination levels above 50 cpm will not be used. If the remote site is located in CONUS, the site RSO will ship the smears by express mail to the USATA for analysis. If the remote site is in OCONUS, the site RSO will collect and hold all smear samples until the team returns to home base. The smear samples will then be submitted to the USATA for analysis.

(4) The PINS shall only be shipped under the guidance given in Appendix B. A Radioactive Material Movement CARA Form 4-R will be completed prior to each shipment of the PINS. ARSOs will make a copy of the transportation paperwork before departing with the radiation source and a copy of the completed document will be given to CARA RSO.

(5) An instrument survey will also be performed during remote site inspections. If the radiation levels on the external surface of the package are found to be in excess of 200 mr per hour, or at three feet from the external surface of the package in excess of 10 mr per hour, the PINS will not be used. The 20th CBRNE Command RSSO will be notified as soon as possible when such an incident occurs.

(6) Requisition and transfer documents shall be retained on file IAW AR 25-400-2.

(7) Documentation of the survey and contamination surveys of each outgoing package must be maintained on file. All packaging, marking, and labeling requirements commensurate with 49 CFR 172, 173, and DA PAM 385-24 must be satisfied. The owner must maintain a copy of the documents.

c. Security and Storage:

(1) During on-site inspections, the ARSO is responsible for ensuring that the PINS is properly stored and secured when not in use. The source will be stored in its Department of Transportation (DOT) approved shipping container.

(2) The PINS shall be stored in areas set aside for the secure storage of radioactive material only. Such an area will be free from the danger of flooding and outside the danger of flammables or explosives.

(3) Teams required to move to another location during an on-site inspection will ensure that the PINS is stored in a secure area during movement. The PINS will be considered under the control of ARSO during such a move. Upon arrival at the new location, an inventory will be performed to verify that security was not breached.

(4) No maintenance or tampering will be allowed on the PINS.

d. Posting of Notices to Workers.

(1) Posting of notices to workers will be IAW 10 CFR 19, 20, and 21.

(2) The following documents will be posted in a conspicuous location to permit individuals engaged in PINS operations to observe them on the way to and from the PINS area:

(a) Form NRC-3, Notice to Employees

(b) Section 206 of the Energy Reorganization Act of 1974

A copy of the NRC License or the following statement: The US NRC Licenses and related documents appropriate to the use of the PINS are available for review at the on-site inspection agency. Personnel may also examine information concerning these documents by contacting:

CBRNE Analytical and Remediation Activity (CARA)
ATTN: AFCB-CAR-DIR (RSO) Safety
Aberdeen Proving Ground, MD 21010-5424

Requests for further information concerning these licenses or documents may be made by calling (410) 436-9259, DSN 584-9259.

(3) The following documents below will either be posted with the documents listed above or identified in a statement that informs the reader where the documents can be reviewed:

(a) SOP

(b) Copy of the NRC License

(c) 10 CFR 19, 20, and 21

(d) NRC Regulatory Guide 8.10

(e) NRC Regulatory Guide 8.13

(f) NRC Regulatory Guide 8.29

(g) DA Authorizations, Letter Orders, Training Documents, Administrative and Technical Guidelines, etc.

e. Personal Dosimetry.

(1) Standard Thermoluminesent Dosimeters (TLD) will be provided to all radiation workers make and model number to be determined by USATA. Dosimeters

will be collected quarterly and sent to the USATA Support Laboratory (AMSAM-USATA-SR-D), Bldg 5417, Redstone Arsenal, AL 35898-5400.

(2) Personal dosimeters must be used IAW DA PAM 385-25 and maintained in an approved location during periods of non-use.

(3) Occupational radiation exposures will be maintained ALARA IAW NRC Regulatory Guide 8.10.

f. Protective Equipment.

(1) No special protective clothing or gloves are required when handling the PINS.

(2) The radioactive source will be moved only by its attached lanyard.

(3) Occupational radiation exposures will be maintained ALARA IAW NRC Regulatory Guide 8.10.

g. Surveys.

(1) All radiation surveys will be conducted using a radiographic survey meter, which has been calibrated IAW TB 43-180 and is capable of measuring Beta, Gama, and Neutron.

(2) The PINS and each working area will be surveyed if the capsule has been compromised or involved in an accident. Each survey will be documented in the PINS logbook.

(3) All personnel working with or handling radioactive materials will wash their hands immediately after leaving the radiation work area.

(4) A survey of each area in which sources of radiation are stored will be performed monthly using a portable survey meter. Results of these surveys will be documented and maintained on file.

(5) Shipments of radioactive material must be monitored with a survey meter and results documented on the Radioactive Material Movement (CARA Form 4).

h. Leak Tests.

(1) A leak test will be performed on every radioactive source at least once every six months.

(2) If the PINS is shipped to a remote location during the last two months of a leak test cycle, it should be leak tested prior to the shipment.

(3) A leak test will also be performed after the completion of an on-site inspection.

(4) Leak test results must be documented and retained on file.

i. ALARA Program.

(1) The Director shall be committed to the program prescribing to keeping individual and collective exposures ALARA.

(2) Enforcement of the ALARA program will be the responsibility of the RSO. The RSO will achieve this through program reviews and education programs for the radiation workers.

(3) Educational responsibilities will be conducted as follows:

(a) The RSO will schedule briefings and educational sessions to inform workers of the ALARA program efforts.

(b) The RSO will ensure that workers and ancillary personnel who may be exposed to radiation receive instructions concerning the ALARA philosophy and management's commitment.

(4) The RSO will review the personal dosimetry records quarterly to verify that individual and collective exposures are maintained below established regulatory levels.

(5) An annual review of the ALARA program will be submitted to the 20th CBRNE Command RSSO. The review will include a summary of the quarterly individual and collective exposures and reports concerning excesses to the ALARA levels.

(6) The RSO shall investigate all exposures that exceed either Level I or Level II and document the results. Documentation shall include statements from the individual, RSO evaluation of the investigation, and recommendations. Level I investigations shall be maintained on file in the activities radiation protection files IAW AR 25-400-2.

(7) The 20th CBRNE Command RSSO will be notified immediately when Level II is exceeded. The RSSO will provide the RSO with instructions concerning a Level II investigation. A copy of the Level II investigation shall be forwarded to the RSSO and shall be maintained on file in the 20th CBRNE Command radiation protection files IAW DA PAM 385-25.

(8) Trigger limits are listed in Table 1 below:

TABLE 1

Survey Trigger Levels

	Investigational Levels	
	LEVEL I	LEVEL II
Instrument Survey		
Beta/gamma/neutron	2x background	10x background
Alpha	2x background	10x background
Removable contamination (dpm/100cm^2)		
Beta	44	110
Low risk beta or XRAY	440	1100
Alpha	4.4	11

j. Waste Disposal.

(1) Any radioactive waste generated will be stored in a plastic bag inside a properly marked container IAW DA PAM 385-24.

(2) An inventory list will be maintained on waste present in the designated container. The inventory list should include a NSN (if applicable), radionuclide, item name, quantity, and activity per item.

(3) Records of waste disposal will be maintained and disposal will be coordinated with the installation RSO IAW DA PAM 385-24.

8. Emergency Procedures.

a. In the event that a radioactive source is damaged or suspected of leaking, the device will be isolated and the local RSO, Director, Operations, and 20th CBRNE Command RSSO will be notified.

b. Personnel not directly involved in contamination containment and clean up will vacate the affected area to prevent unnecessary personal contamination.

c. The contaminated area will be secured to prevent unauthorized entry.

d. Personnel who may have been contaminated will not leave the area until monitored for contamination of skin and clothing.

e. Procedures for containment and decontamination of radioactive material provided in DA PAM 385-24 will be followed.

f. Whenever personnel are injured during any radiation accident, the installation medical officer will be notified as soon as possible. Radiation accidents/incidents must be reported to the RSO immediately.

g. Personnel with minor wounds will be decontaminated prior to leaving the controlled area. In the event the person must be transported immediately for medical treatment, precautions will be taken to prevent the spread of contamination by the individual. The RSO or ARSO will accompany the injured person to the medical center and will carry the appropriate survey meter for monitoring the level of contamination. Procedures indicated in paragraph 8.e above will be followed.

h. Personnel incurring radiation injury will not be allowed to return to duty until the attending physician and the RSO obtain approval of such.

i. Decontaminated areas must be surveyed and approved for reentry by the RSO prior to reoccupying the area.

j. In the event of a fire, immediately notify the local Fire Department. If possible, radioactive devices should be removed to a safe area.

k. In the event that a radioactive source is involved in a fire, personnel shall remain upwind from the source. All windows and doors to the immediate area must be closed, and ventilation and air systems shall be turned off.

l. Personnel must take every precaution to avoid exposure to potential airborne contaminants such as smoke, mist, dust, fumes, or other visible gases.

m. A determination of the cause of any accident/incident will be made by the RSO and a full report filed with the RSSO IAW AR 385-10 within 15 days. Reports shall contain the following information:

(1) Name of reporting organization.

(2) Location and type of incident.

(3) Source of ionizing radiation (radioisotope, quantity, etc.).

(4) Name and SSN of injured, contaminated, or overexposed personnel.

(5) Chronological description of the incident from occurrence to resolution.

(6) Individual account of the incident as it relates to each person indicated in 8.m. (4) above.

(7) Steps to be taken to prevent recurrence.

n. The RSO will arrange for special processing of dosimetry badges worn by individuals who are known to have received or are suspected to have received external exposure exceeding the limits specified in Table 1.

o. Telephone numbers for emergency assistance personnel are as follows:

MEDICAL ASSISTANCE: 911

MILITARY POLICE: 911

FIRE DEPARTMENT: 911

CARA RSO: (410) 436-9259 or, after hours, (410) 436-6200

20th CBRNE Command RSSO: (410) 436-0192 or after hours (410) 436-6200
FAX Commercial: (410) 436-0005
DSN 584-0192 or after hours 584-6200
FAX DSN: 436-0005
e-mail: RSSO

9. Glossary.

ALARA: As low as reasonably achievable means making every reasonable effort to maintain exposures to radiation as far below the dose limits in this part as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements, and other nuclear energy and licensed materials in the public interest.

Airborne Radioactive Material: Any radioactive material dispersed in the air, in the form of dust, fumes, mists, vapors, or gases.

Dosimeter: An instrument that measures and indicates the amount of x-rays or radiation absorbed in a given period.

Alternate Radiation Safety Officer (ARSO): An individual who is designated by the CARA Radiation Safety Officer (RSO) to perform radiation safety duties in the absence of the RSO during OCONUS operations.

Ionizing Radiation: Electromagnetic or particulate radiation capable of producing ions directly or indirectly, in its passage through matter. For the purpose of this SOP, ionizing radiation refers to alpha particles, beta particles, neutron particles, gamma rays, and x-rays.

Radiation Area: An area in which a major portion of the body could receive a radiation dose of 5 mr or more in any one hour or a radiation dose of 100 mr or more in any five consecutive days.

High Radiation Area: Any area, accessible to personnel, in which there exists radiation at such levels, that a major portion of the body could receive in an hour a dose in excess of 100 mr.

Radiation Incident: The unplanned loss of control of radioactive material. Incidents may be caused by such events as fire, explosion, loss, theft, or enemy action.

Radiation Worker: An individual whose work is performed in a restricted area and whose duties may involve exposure to ionizing radiation.

Radioactive Material: Any material or combination of materials, which spontaneously emits ionizing radiation.

NOTE: Radioactive materials, as referenced above, include natural elements such as radium, accelerator-produced radionuclides and NRC licensed material.

Radioactive Waste - includes the following:

Property which has become contaminated to the extent that decontamination is economically unsound.

Surplus radioactive material whose sales, transfer, or donation is prohibited.

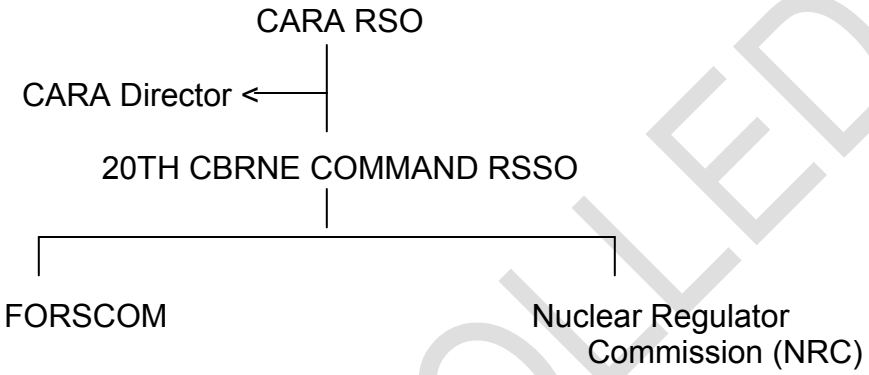
Surplus radioactive material, which is determined to be unwanted after having been advertised as being surplus.

Waste, which is radioactive, resulting from production, possession, or use of radioactive material.

Radiological Safety Officer (RSO): An individual who is designated by the Director of the activity to provide consultation and advice on the degree of hazards associated with ionizing radiation and on the effectiveness of measures to control these hazards. This individual shall be qualified technically by virtue of education, training, and experience commensurate with the type and hazard of the radiation source(s) for which he will be responsible. The term “Radiological Safety Officer” is not intended to denote commissioned status.

Radiation Safety Staff Officer (RSSO): An individual who is designated by the Major Command (MACOM) Commander to manage the MACOM Radioactive Material Control Point (RMCP) and oversee the operation of the Radiation Safety Program conducted by subordinate installation commands.

APPENDIX A
Radiation Accident/Incident Notification Tree



APPENDIX B
SHIPMENT/RECEIPT PROCEDURES

1. **GENERAL.** Container Description:

a. The Frontier Technology Corporation Model 50240 shipping package is a Type A package meeting DOT Specification, 7A. The package is designed to transport Special Form Californium-252 neutron sources up to approximately 12 micrograms, but it may also be used to transport Type A quantities of radioactive materials in Special Form provided that pertinent regulations are complied with.

b. The Model 50240 container is constructed per Frontier Technology Corporation (FTC) drawing number A50240-AA00, Rev. 0. Basically, it is a five gallon United States Department of Transportation (USDOT) Specification 17C steel drum filled with water-extended-polyester (WEP) shielding material. The radioactive source is located within a two inch schedule 40 steel pipe. Weight of the container is approximately 45 pounds.

2. **ACTIONS TO BE TAKEN UPON RECEIPT OF LOADED PACKAGE.**

CAUTION: Persons trained and authorized to handle radioactive materials should perform these steps under supervision of the RSO.

a. Monitor Radiation - Survey total Gamma and Neutron fields. Verify Transport Index stated on package.

b. Monitor Radioactive Contamination - Perform smear test of package for removable radioactive contamination.

c. Check Security Seal - A security seal should be present. It could be in the form of a wire with a lead seal. The seal should be unique, either by having an imprint or a serial number. The serial number, if used, should also be listed on the shipping papers.

3. **ACTIONS TO BE TAKEN PRIOR TO OPENING PACKAGE.**

a. Place the Container - Move the container to the location where it is to be unloaded; this location should be adjacent to the work area.

b. Obtain Tools Necessary to Unload the Package:

Wire cutters
7/16 inch wrench
Pliers
Screwdriver (flat blade)

4. **UNLOADING PROCEDURE.**

CAUTION: The loaded package contains radioactive material that emits significant amounts of neutron and gamma radiation.

CAUTION: Unloading should be performed under supervision of the RSO or by persons trained and authorized to handle radioactive material.

CAUTION: Prior to and during the performance of each step of this procedure, monitor the area where you will be working for neutron and gamma radiation. Perform smear tests for removable radioactive material on the outside of the package prior to unloading, and on each internal surface as it is exposed during unloading.

a. Cut the seal wire securing the bolt in the bolt ring. Remove the seal wire from the bolt.

b. Remove the bolt ring and drum cover.

c. Just inside the rim is a two inch steel pipe cap. Remove the cap by turning it counter-clockwise.

d. The top of the WEP shield plug is now visible inside the 2-inch steel pipe. A cavity in the top of the shield plug. Each source is attached to a lanyard with an identification tag. Always handle the source by grasping the identification tag at the end of the lanyard.

CAUTION: This will expose the unshielded source. The neutron and gamma radiation levels in air at one meter from an unshielded 2.7 microgram Cf-252 source are approximately 6.0 mr/hour. Use distance and limit time to reduce exposure to personnel.

5. **SHIPPING PROCEDURE:**

a. Replace the source in the cavity in the pipe. Replace the WEP shield plug. Ensure the lanyard and tag are accessible.

b. Replace the drum cover onto the drum and insert the bolt and tighten the bolt until snug.

c. Place a lead wire seal through the hole in the bolt and seal.

d. Inspect the Radioactive Material Labels on the container. The container should have two DOT "Radioactive Yellow" labels on the container, one on each side.

e. Survey the package for neutrons and gamma. Total level at any one point on the external surface of the package must not exceed 200 mr/hour, and the total dose rate at one meter from the package must not exceed 10 mr/hour.

f. Ensure the radioactive material labels are accurate and complete. The dose rate at one meter should be written in the box on the label. "Cf-252" should be written on the contents line, and the source activity normally .09 GBq should be written on the activity line.

g. Perform a swipe test for removable contamination on the external surface of the DOT shipping container. Removable contamination must not exceed twice background with a portable survey instrument. Place the wipe in a plastic bag and forward to USATA Redstone.

h. Ensure the proper shipping name "Radioactive Material, Special Form, Non-Fissile, Type A Package, UN 3332" are on each side of the package. Marking must be in a color, which contrasts with the color of the package. Letters must be at least ½ inch high and marking must be durable.

i. Mark package with name and address of consignee and consignor.

j. Examine package for damage and completeness. The package must be in an unimpaired condition and securely closed so there will be no leakage of radioactive material under conditions normally incident to transportation.

k. The package is now ready to ship. It must be shipped as a hazardous material with appropriate shipping paper and shipper's declaration.

APPENDIX C
Permanent Transport Document

1. Purpose: This document provides information required by International Air Transport Association - Dangerous Goods Regulations for the movement of the Cf-252 radioactive source and must be maintained with the shipping papers.

2. Required Information:

a. RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, NON-FISSILE UN 3332

b. Cf-252

c. .1 GBq

d. Radioactive Yellow III

e. Transport Index _____ (reading at one meter)

f. Surface Dose Rate _____mr/hour

g. NRC License No. 19-31127-01

h. Package Weight - 45 lbs

3. Additional Requirements:

a. Vehicle placarding is required.

b. The source in its approved shipping container must be secured in the transport vehicle to prevent shifting or movement.

c. If a fire is involved, personnel must take every precaution to avoid exposure to smoke, mist, dust, or fumes or any other visible gases. Personnel should move upwind a minimum distance of 500 meters.

d. Fire fighting personnel shall wear self contained breathing apparatus.

e. In the event of a major transportation accident, the following personnel must be notified:

(1) CARA RSO at 410-436-9259.

(2) Risk Management Office, 20th CBRNE Command, (410) 436-0192, DSN 584-0192

(3) After duty hours the 20th CBRNE Command Staff Duty Officer at (410) 436-6200, DSN 584-6200.

APPENDIX D
CARA Form 4 - Radioactive Material Movement

RADIOACTIVE MATERIAL MOVEMENT

☐ SHIPMENT ☐ RECEIPT

TCN/GBL: _____ Number of containers: _____

NSN/SN: _____ PINS Container #: _____ Nomenclature: _____

SHIP FROM:	SHIP TO:
_____	_____
_____	_____
_____	_____

☐ UN Code:

IMCO Class 7 Radioactive Substances

☐ Instruments and Articles

☐ Articles Manufactured from Natural or Depleted Uranium

☐ Low Specific Activity Substances

Radionuclide	Physical and Chemical Form	Radionuclide Category Special Form	Normal Form	Total Activity	
		☐ A1	☐ A2	GBq	mCi
		☐ A1	☐ A2	GBq	mCi
		☐ A1	☐ A2	GBq	mCi

Radiation Level: Surface _____ mrem/hr One meter (TI) _____ mrem/hr

Surface Contamination Less than _____ dpm/cm^2

☐ Two each D.O.T. _____ Labels

☐ No D.O.T. label required

☐ Radioactive materials placards required

☐ Outside of inner package must be marked "Radioactive"

Mode of Transportation

☐ Military Vehicle

☐ Ground Transport Only

☐ Cargo Air Only

Comments:

Emergency Contact: CARA Radiation Safety Officer (RSO) at 410-436-9259, after duty hours at 410-436-6200

This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled and are in the proper condition for transportation according to the applicable regulations of the Department of Transportation.

RSO/Alternate RSO Name:	RSO/Alternate RSO Signature:	Date:
_____	Click to Approve	_____

Transportation Agent:	Transportation Agent Signature:	Date:
_____	Click to Approve	_____

CARA FORM 4, 15 JUL 2012

APPENDIX E
HAZARD ANALYSIS

OPERATION	HAZARD	EFFECT	RAC	COUNTERMEASURES	RAC
Set up	Lifting heavy equipment	Back injury or strain	III C Med	Personnel will use proper lifting techniques. Use two people to lift heavy boxes.	III D Low
Set up	Slips trips and falls	Personal injury	III C Med	Personnel will inspect the area and remove possible tripping hazards.	III D Low
				If tripping hazards cannot be removed they will be marked for easy identification	
Filling the Mother Dewar	Liquid Nitrogen	Skin burns or eye injury	II C High	Wear goggles or a face shield when filling the mother dewar	II E Low
"	"	"	"	Gloves must be impervious to liquids and large enough to be tossed off incase of a spill	"
"	"	"	"	Avoid wearing anything that could trap or hold spilled liquid	"
Filling the mother dewar	Liquid Nitrogen	Skin burns or eye injury	II C High	Always maintain control of the fill hose and open valve on cylinder very slowly.	II E Low
Filling the mother dewar	Liquid Nitrogen	Asphyxiation	II D Med	Transfer LN outside or in a large well ventilated room.	II E Low
Set up and shut down of PINS	High Voltage	electrical shock to the operator	II C High	Properly connect all cables prior to turning on the power	II E Low
"	"	"	"	Manually zero the High Voltage and turn the power off before disconnecting cables.	"
"	"	"	"	Don't use any component of the PINS system on or near water.	"
"	"	"	"	Plug MCA and PC power cords into the same outlet to avoid ground loops.	"
PINS operation	Radiation	Radiation exposure can cause health problems	III B Med	Minimize your time near the source and maximize your distance.	III D Low
"	"	"	"	When setting up or changing the assay configuration, first move the source and moderator block 15 feet away.	"
"	"	"	"	Do not replace the source and moderator block until ready to begin the assay.	"
"	"	"	"	Before using the source create a minimum 15 foot exclusion zone around the assay location.	"

OPERATION	HAZARD	EFFECT	RAC	COUNTERMEASURES	RAC
PINS operation	Radiation	Radiation exposure can cause health problems	III B Med	Mark the 15 foot exclusion zone with yellow/magenta rope or tape and radiation signs.	III D Low
"	"	"	"	Set up the MCA and computer outside the exclusion zone. An 80 foot cable is provided.	"
PINS operation	Radiation	Radiation exposure can cause health problems	III B Med	When assay is completed move the source from the moderator block directly to the DOT approved shipping container.	III D Low
				Always handle the source by using the attached lanyard.	
				Always store the source in it's DOT approve shipping container.	
PINS operation	Chemical	Exposure to hazardous chemicals	II C High	Whenever possible PINS items that are contained within the MRC or propelling charge container.	II E Low
				If item is not contained wrap in clear 6 mil plastic as a temporary measure and conduct Low level monitoring.	
				As a minimum operators must wear mask and gloves when physically handling munitions.	
PINS operation	Chemical	Exposure to hazardous chemicals	II C High	If items must be removed from overpack in order to assay, appropriate PPE must be worn and low level monitoring conducted.	II E Low

Note: It was prepared IAW AR 385-10 and DA PAM 385-30. The CARA Safety Office reviewed this HA September 2014

PERSONAL PROTECTIVE EQUIPMENT

SOP-004-01

DATE: 19 September 2014

SIGNATURE PAGE

Print Form

CBRNE Analytical and Remediation Activity (CARA)

Document #:	SOP-003-01		
Document Name:	Radiation Safety for use of the PINS		
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CARA FORM 5, 1 JUL 12

Table of Contents

REVISION HISTORY

Revision #	Description of Revision	Approver / Date
0	Original document.	Randall L. Bartley / 21 Sep 12
1	Spell out OSHA & CARA	Christopher K. Chesney/19 Sep 14

Supervisor's Statement

SUPERVISOR'S STATEMENT: I have personally reviewed this SOP and to the best of my knowledge believe that the information listed herein is correct. I, by my signature, attest that the operators who have signed this SOP have received the required instruction. I understand and am fully capable of performing my responsibilities.

PRINT NAME	SIGNATURE	DATE

Operator's Statement

OPERATOR'S STATEMENT: I have read the general and specific requirements of this SOP. I, by my signature below, indicate that I thoroughly understand and agree to abide by these instructions. I understand that I am fully capable of performing my responsibilities as delineated within this SOP.

PRINT NAME	SIGNATURE	DATE

Chapter 1 – GENERAL

1.1 Purpose. This SOP prescribes those procedures to be followed when using the following personal protective equipment (PPE): Occupational Safety and Health Administration (OSHA) Level B, Responder CSM, Trellchem OSHA Level A, Spiroline Escape 915 and Interspiro Spiromatic 9030, Cascade System and Tyvex “F”.

1.2 Scope. This SOP applies to all CBRNE Analytical and Remediation Activity (CARA) personnel.

1.3 Responsibilities.

a. Chiefs and supervisors will ensure that operators demonstrate proficiency and confidence with self contained breathing apparatus (SCBA) and chemical suits through documented training prior to mission use.

b. The chemical equipment room is responsible for all SCBAs and maintenance and repairs of all chemical suits.

c. Maintenance service on the SCBAs will be performed only by personnel certified by the manufacturer to perform such services, and must be in possession of a valid service certificate.

d. Operators are responsible for inspecting their equipment for serviceability prior to use and cleaning equipment before turn in or next use.

1.4 Training Requirements.

a. All personnel who respond to chemical events, or work in a chemical environment must have documented training on the use of all types, and levels of protective ensembles exercised by CARA.

b. Personnel trained and certified by the manufacturer, or elements within Department of Defense (DOD), are authorized to instruct operators in the use of SCBA.

c. All personnel working in a chemical environment must have demonstrated and documented proficiency in SCBA preparation and cylinder change out prior to being deployed.

d. Wearers of SCBA and OSHA Level A chemical ensembles (suits) must show proficiency in donning and doffing of equipment prior to being deployed.

e. Chiefs and supervisors can authorize personnel to be instructors on chemical suits and operational procedures based on demonstrated and documented proficiency.

Chapter 2 – INTERSPIRO SPIROMATIC 9030

2.1 Components.

a. Mask

b. Belt and Harness Assembly

c. Manifold Assembly

d. Cylinder (60 minute bottle)

e. Emergency Escape Hose

f. Savox Radio System (optional)

2.2 Preparation for Use.

NOTE: The prepping procedures are the same for all chemical protective ensembles involving the Interspiro Spiromatic 9030 system.

a. Open the toggle switch on the harness and check that the strap loop is big enough for the cylinder to be used. If not, press the small locking hook and enlarge the diameter of the loop.

b. Slide the cylinder into the strap loop and push it in until the valve snaps into its holder and locks. (The cylinder valve connection thread should be on the same side as the toggle link.)

c. Adjust the strap loop by pushing the strap into the guide plate until it fits snugly around the cylinder, making sure that the hook on the side engages in one of the oblong holes.

d. Close the toggle link.

e. Connect the regulator unit to the cylinder valve and tighten the hand wheel connector by hand.

f. Connect the pressure gauge manifold to the harness, making sure that hoses are not twisted. The pressure gauge manifold should be slipped into the double strap section of the right shoulder strap.

g. Insert the extra loop of the right shoulder strap into the clip of the pressure gauge manifold. Stretch the loop down and insert into top and bottom webbing buckle.

h. Connect the breathing valve to the face piece by pushing the valve into the connection piece and by turning it counter clockwise to engage its bayonet coupling.

i. Lock the breathing valve into position with the speech cone or radio attachment as applicable, by tightening the locking screws.

j. Connect the mask hose to the manifold.

k. Close the bypass by turning the knob fully counter clockwise.

l. Ensure that the black lever on the breathing valve is in the OFF position.

m. Open the cylinder valve carefully. Turn on the positive pressure by slowly lifting the black lever to the ON position, away from the valve housing. A strong flow of air should be heard.

n. Turn off the positive pressure and read the pressure gauge it should read between ¾ and full. Close the cylinder valve. The needle of the pressure gauge should not move for one minute. If it does, turn in the SCBA for maintenance.

o. With the cylinder valve still closed, open the bypass valve slightly in order to allow the air to slowly evacuate. Read the pressure gauge when the alarm sounds. The pressure gauge should read ¼ full.

p. Turn the positive pressure on to purge the system and then turn off the positive pressure.

q. Close the bypass valve.

NOTE: If at any time during preparation there is a failure of steps a-q defective equipment will be turned in for replacement and maintenance, personnel will not proceed down range unless they have sufficient air to accomplish their mission.

Chapter 3 – SPIROLINE ESCAPE 915 AND CASCADE SYSTEM

3.1 Components.

a. Cylinder (15 minute bottle)

b. Manifold Assembly.

c. Spiromatic Mask.

d. Savox Radio System (Optional).

e. Cylinder Harness Assembly.

f. Belt and Harness Assembly.

3.1.2 Preparation for Use.

a. The Spiroline Escape 915 is an emergency escape cylinder. Ensure that the emergency cylinder is fully charged. (Gauge reading full – 4500 PSI for a 15-minute bottle.)

b. Check to see that the emergency cylinder is secured in the harness by the two straps. If not, tighten straps around the cylinder and through the clips.

c. Connect the breathing valve to the mask by pushing the valve into the connection piece and turning it counter clockwise, so that it rests in its bayonet coupling.

d. Mount the Savox radio control unit through the round opening located in front of the mouth. It is secured by tightening the screw clamp from inside the mask (do not over-tighten).

e. Attach the cable assembly to the control unit by screwing the connector clockwise (do not twist from the cable unit).

f. Mount the M30 hood by unscrewing the airline hose at the manifold. Insert the hose through the small opening by the neck on the inner flap. Mount the hood and sleeve, and reconnect the hose to the manifold.

NOTE: Disconnection and connection of the hose has to be done by a qualified person.

g. Make sure you have the Savox battery box and the cable adapter for your radio. (Check to make sure you have the right adapter. You have one adapter for Saber and one adapter for the MX 300.

3.1.3 Donning the Spiroline Escape 915.

a. Extend the shoulder and waist straps and put on the apparatus (using the buddy system).

b. Loop the face piece neck strap over your head.

c. Attach strap assembly on breathing hose to lower section of the head harness (this will prevent any restriction of head movement).

d. Adjust the shoulder and waist straps so that the apparatus is firmly secure and comfortable.

e. Connect the air supply using the 4 foot hose with regulatory and adapter hose. Connect it to a 30 or 60-minute bottle and then connect it to the manifold.

f. Check to see if the positive protector switch is off (lever against the valve housing).

g. Turn on the air from the air bottle that is connected to your manifold. Turn the valve on until your pressure gauge on the manifold reads 85-PSI NIOSH requirement or 110 optimum pressure.

h. Put the mask to your face and tighten the straps to where you get a good snug fit. You can start breathing as soon as the mask is placed on your face. By inhaling, the positive pressure turns on automatically; by exhaling, the diaphragm assembly resets in the correct position.

i. Stop breathing and listen for any leaks. If you hear any, that means you are not getting a good seal (check your hair to see if it is interfering with the face seal).

j. Check the positive pressure by holding your breath and inserting two fingers between the sealing edge and your face (a strong air flow should be heard).

k. Resume normal breathing.

l. Connect the Savox battery box to the radio cable from your mask and secure it to your waist strap with the clip.

m. Connect the radio to the Savox battery box.

n. Turn the radio on and check to see if your radio operates in both the voice-operated position (switch in top position) and in the manual position (switch in the bottom position should be orange)

o. You are now ready for operation.

3.1.4 Doffing the Spiroline Escape 915.

a. To remove the face piece; first loosen the head harness.

b. Turn off the positive pressure by pressing the black lever on the breathing valve towards the housing.

c. Remove your mask.

d. Disconnect the supplied airline.

e. Disconnect the waist strap.

f. Loosen the shoulder strap.

g. Remove the Spiroline tank, straps, and mask.

NOTE: Equipment should be serviced prior to storage.

3.1.5 Emergency Operations.

a. Loss of air to the facemask in the supplied air mode indicates that the supplied air has been disrupted. This requires immediate corrective action (turn on 15 minute escape bottle and immediately exit the area for the PDS).

(1) Open the cylinder valve on the emergency escape/egress cylinder fully (counter clockwise).

(2) Disconnect the supplied airline from the manifold.

(3) Exit the hazard area immediately. You only have 15 minutes of air in your escape bottle.

b. A free-flow condition at the facemask can indicate an increased supply pressure, which has caused the safety to open or a malfunction of the breathing valve.

(1) Open the cylinder valve on the emergency escape/egress cylinder (counter clockwise).

(2) Disconnect the supplied airline from the manifold.

(3) The cylinder contains less than 15 minutes of air, exit the hazard area immediately.

NOTE: Immediately check red bypass valve to ensure it is closed by turning knob fully counter clockwise.

3.2 Cascade System.

3.2.1 Supplied Air Using a 2-Cylinder Unit.

a. The 2-cylinder unit can supply four personnel up to 2 hours of air depending on the workload. Heavy work requires more air; light work requires less.

b. The cascade system operator must monitor the gauge located at the cylinder and manifold during operations.

3.2.1.1 Components. The 2-cylinder unit consists of the following.

a. Two cylinders (4500 PSI each).

b. One cart.

c. One 4-man manifold.

d. One auto alarm on the unit.

e. One remote auto alarm with light, sound, and 300 foot cable.

f. One regulator to adjust the airflow.

g. Two check valves (controls airflow).

h. One gauge, which reads air in cylinders.

i. One gauge that reads regulated air.

j. 1200 foot air hose (300 foot maximum line per person; four personnel maximum).

3.2.1.2 Putting the Supplied Air System into Operation.

a. Connect the air hoses from the manifold to the air cylinders.

b. Check the audio alarm. The alarm uses two 9-volt batteries.

c. Turn the airflow on from one of the cylinders. The pressure gauge should read 4500 PSI. Turn the air off and bleed the line from the manifold and do the same for the other cylinder.

NOTE: The cascade system operator must know how much air is in the tanks and Start operations with sufficient air to complete the operation.

d. Connect your 300 foot air hoses to the four-way manifold.

e. Lay out your hoses.

f. Adjust the gauge on the four-way manifold between 100 and 110 PSI (maintain a minimum of 100 PSI to keep the personnel at 85 PSI).

NOTE: 85 PSI NIOSH approved and 110 PSI optimum pressure.

g. Have each person (up to four) connect their Spiroline Escape 915 to one of the 300 foot air hoses.

h. The personnel will check their equipment and make sure it's operating properly.

NOTE: You can use this system with OSHA Level A or B protective suits. This system can connect up to the manifold and supply air to the user's system. Caution must be used with hoses; they must not be stepped on, crimped, pulled with great force, or pulled around sharp corners. Operators must verify escape bottle is full and in the off position.

i. You are now ready for operation.

3.2.2 Supplied Air Using a Multi-Cylinder Unit.

a. A multi-cylinder using 25-300 cf air cylinders can supply up to four personnel with 25 hours of air depending on the workload.

b. There are 25 air cylinders mounted on a trailer. The cylinders are hooked up in sets of five and there are five sets of cylinders per trailer.

c. The cascade system operator must monitor the gage located at the cylinder and manifold during operations.

3.2.2.1 Components. The multi-cylinder unit consists of the following:

a. 25 cylinders 300 cf 4500 PSI each.

b. One trailer.

c. One 4-man manifold.

d. One regulator to adjust the airflow.

e. One gauge that reads air in cylinders.

f. One gauge that reads regulated air.

g. 1200 foot air hose (300 foot maximum line per person; 4 personnel maximum).

3.2.2.2 Putting the Supplied Air System into Operation.

a. Connect your air cylinders in series.

b. Connect your regulator to the line.

c. Connect your manifold to the regulator.

d. Turn on the air from the cylinders, checking for leaks. Your gauge should read 4500 PSI or sufficient air to complete operations.

e. Hook your hoses to the manifold.

f. Adjust the air between 100-110 PSI with the manifold control valve, located at the manifold assembly.

g. Verify that the air is maintained at a minimum of 85 PSI on the 915 escape system gauge.

h. The system is ready to be put into operation.

3.3 Specific Information.

3.3.1 Site Operations.

a. Don equipment at the PDS before going down range IAW paragraph 2.3.

b. Hook up a 30/60-minute air bottle to your manifold.

c. Proceed down range to the cascade system.

d. Connect the cascade-tethered line to your manifold.

e. Turn off the air supplied by the 30/60-minute bottle that you brought down range. If you are not getting air, turn the bottle back on and check your hose to make sure it is connected to the manifold and the system is on. If you still don't get air after checking everything, disconnect the tethered line and evacuate. If your airflow is operational, proceed to the work area.

NOTE: If at any time while working you lose air, turn your escape bottle on and evacuate.

f. Upon exiting the work area, you will reconnect your 30/60 minute air bottle to your manifold, turn the air on, and disconnect the air line from the cascade system.

g. Check your air; make sure you can breathe properly. If not, reconnect the airline from the cascade system. Check the air in the cylinder, regulator, and hoses for tightness and verify that they are connected properly.

h. Reconnect the airline from your 30/60-minute air bottle. Disconnect the airline from the cascade system if you are breathing properly. If not, use the escape bottle and proceed to the hotline.

Chapter 4 - RESPONDER CSM & TRELLCHEM HPS TYPE LEVEL "A" SUIT WITH SELF CONTAINED BREATHING APPARATUS

4.1 General.

a. Responder CSM is a totally encapsulating suit with a large view 40 mil PVC face shield with a 5 mil Teflon overlay, front entry, expanded back (to accommodate SCBA) 48" gas tight PVC zipper, triple storm flap, attached sock boots, replaceable MILSPEC butyl gloves, and double sealed seams. OSHA Level A with responder suit consists of the following:

(1) Suit – Responder CSM

(2) Boots – Butyl safety toe, TAP (M2A1)

(3) Gloves – Butyl, TAP (M3)

(4) SCBA – Interspiro Spiromatic 9030 with NIOSH approval number TC-13F-197

(5) Flame shield (optional dependent upon hazard analysis)

(6) Ice vest (optional dependent upon hazard analysis)

b. Trellchem HPS type T is a totally encapsulating gas-tight suit made of Viton/butyl rubber coated fabric/multi layer polymer barrier laminate film combination and a unique inner extra chemical resistant barrier which offers a higher chemical resistance. OSHA Level A with the Trellchem suit consists of the following:

NOTE: If wearing Responder CSM or Trellchem HPS suits being used with tethered air line; operators can wear a 30 minute bottle in their back pack to cut down on weight.

(1) Suit – Trellchem HPS

(2) Boots – Butyl safety toe, TAP (M2A1)

(3) Gloves – Butyl, TAP (M3)

(4) SCBA – Interspiro Spiromatic 9030 with NIOSH approval number TC-13F-197

c. The Trellchem and Responder CSM suit may be used during operations involving G, V, H, Lewisite and commercial chemicals and where liquid and vapor levels are above the IDLH.

d. Maintenance service on the Interspiro SCBAs will be performed only by personnel trained and certified by the manufacturer to perform such services, and must be in possession of a valid Service Certificate.

4.2 Preparation for Use (Interspiro Spiromatic). Specific Procedures.

a. Open the toggle switch on the harness and check that the strap loop is big enough for the cylinder to be used. If not, press the small locking hook and enlarge the diameter of the loop.

b. Slide the cylinder into the strap loop and push it in until the valve snaps into its holder and locks. (The cylinder valve connection thread should be on the same side as the toggle link.)

c. Adjust the strap loop by pushing the strap into the guide plate until it fits snugly around the cylinder, making sure that the hook on the side engages in one of the oblong holes.

d. Close the toggle link.

e. Connect the regulator unit to the cylinder valve and tighten the hand wheel connector by hand.

f. Connect the pressure gauge manifold to the harness, making sure that hoses are not twisted. The pressure gauge manifold should be slipped into the double strap section of the right shoulder strap.

g. Insert the extra loop of the right shoulder strap into the clip of the pressure gauge manifold. Stretch the loop down and insert into top and bottom webbing buckle.

h. Connect the breathing valve to the face piece by pushing the valve into the connection piece and by turning it counter clockwise to engage its bayonet coupling.

i. Lock the breathing valve into position with the speech cone or radio attachment as applicable, by tightening the locking screws.

j. Connect the mask hose to the manifold.

k. Close the bypass by turning the knob fully counter clockwise.

l. Ensure that the black lever on the breathing valve is in the OFF position.

m. Open the cylinder valve carefully. Turn on the positive pressure by slowly lifting the black lever to the ON position, away from the valve housing. A strong flow of air should be heard.

n. Turn off the positive pressure and read the pressure gauge. Close the cylinder valve. The needle of the pressure gauge should not move for 1 minute. If it does, turn in the SCBA for maintenance.

o. With the cylinder valve still close, open the bypass valve slightly in order to allow the air to slowly evacuate. Read the pressure gauge when the alarm sounds. The pressure gauge should read ¼ full (approximately 1090 PSI).

p. Turn on the positive pressure to purge the system, and then turn off the positive pressure.

q. Close the bypass valve.

4.3 Donning Chemical Suits with Interspiro.

4.3.1 General.

a. Wearers require buddy assistance while donning both the Trellchem and Responder CSM suit.

b. Even though the SCBA air tank is identified as having a 60-minute wear capability, as an added safety margin, wear time will be limited to 45 minutes.

NOTE: The donning and doffing procedures for the Trellchem and the Responder are interchangeable.

4.3.2 Specific Procedures.

a. Make sure the suit has been visually inspected; air pressure tested, and is free from defects. Also, make sure the correct suit has been selected for the intended use.

b. Ensure the SCBA is prepared for use, serviceable, and the air pack is full with Grade D quality breathing air.

c. If desired, anti-fog solution may be applied to the inside of the visor at this time, following recommended instructions.

d. Underclothing should be worn under the suit. As a minimum, long sleeve shirt and long pants, or long “underwear” are recommended.

e. Remove all personal affects, which might result in damage to the suit, i.e., pens, badges, jewelry, etc.

f. Tuck pant cuff into socks to make donning of suit legs and sock boots easier.

g. Don the Interspiro SCBA, check out and put on system, complete all connections, and make all adjustments that are necessary. Do not put on the face piece at this time.

h. Let the face piece dangle forward.

i. Grip the waist buckle and pull the straps, adjusting to fit the waist and chest comfortably.

j. While seated, place both legs into the suit.

k. Place both feet into outer over boots and pull down splashguards over the tops of the boots.

l. Stand up and attach the internal waist-belt.

m. Ensure that the positive pressure lever is turned off (black lever on the face piece in the down position).

n. Using the right hand, reach back and check the cylinder valve; it should be all the way open.

o. Check the pressure shown on your pressure gauge, it should read 4500 PSI or full.

p. Check the bypass operation by turning the knob clockwise and listening for the flow of air. Close the bypass by turning the knob counter clockwise until the flow of air stops. Resume normal breathing. The apparatus is ready to use.

q. Place arms and head inside the suit and have assistant close zipper, then zipper cover should be closed.

r. Have assistant check to make certain the zipper and zipper cover are completely closed, the face shield is clear, and the suit appears to be working properly.

s. Check to ensure the user can easily remove their arm from the sleeve while wearing the suit.

4.4 Doffing.

4.4.1 General.

NOTE: While still down range if all air is lost to the face mask operators should be reminded that there is some air inside the suit and not to suffocate with mask on; remove the mask inside the suit and exit down range immediately.

a. Leave the work area or “hot zone” while enough air supply remains to safely decontaminate and remove suit (normally 15 minutes).

b. Wearers require buddy assistance while doffing OSHA Level A suits.

c. Drop all equipment including radios and communications gear at the equipment drop.

4.4.2 Specific Procedures. Doff the Responder suit according to the following steps:

a. Place all equipment and tools on the equipment drop.

b. Step into the shuffle pan and splash the liquid over both boots. Scrape dirt from bottom of boots if necessary.

c. One hot side PDS attendant will decontaminate the outside of the Responder or Trellchem suit at the outer garment wash.

d. One hot side PDS attendant will rinse the suit at the outer garment rinse location.

e. Approach the hotline by the route designated for personnel wearing SCBA.

f. One hot side PDS attendant will gross-level monitor for agent contamination. If results are positive, return to the outer garment wash and decon again. If results are negative, proceed to the outer garment removal.

g. Remove the boots and place in container provided.

WARNING: Do not touch the outside of the suit when doffing and always fold it outward away from the body. Failure to doff the suit properly could result in sickness or death due to contamination.

h. Open the zipper cover and unzip the suit.

i. Two hot side PDS attendants will assist in removing the suit.

j. Carefully pull arms and hands out of the suit, gloves, and sleeves and remove suit down to the waist.

NOTE: Step over the hotline as you remove each leg from the suit.

k. Proceed through the contamination reduction area to the SCBA drop location.

l. Close the cylinder valve.

m. Remove the face piece.

n. Unfasten the straps.

o. Lean forward and grasp one of the shoulder straps. Let the other shoulder strap slide off your shoulder and swing the unit in front of you.

p. Set the suit down using both hands.

q. Proceed to the medical station for observation.

4.5 Suit Inspection and Pressure Testing.

4.5.1 General. Suits should receive a visual inspection and air pressure test at the following times:

a. Upon receipt from the manufacturer, unless air test has been completed by the manufacturer.

b. After each use or annually, whichever is happens first.

c. Suit should receive a visual inspection prior to use.

d. Air test and visual inspection should be performed whenever suit integrity is in question.

4.5.2 Visual Inspections.

a. Lay the suit on a clean, smooth surface.

b. Using a flashlight inside, examine the outside of the suit for holes, cuts, or abrasions.

c. Examine the seam tape for lifts or delamination and mark any areas that need to be repaired.

d. Examine the face shield lens for a tight seal and make sure the window offers clear vision.

e. Examine the suit gloves to make sure there are no holes or tears.

f. Examine the zipper and zipper cover to make sure they are in good working order. Lubricate the zipper using a small amount of paraffin.

g. Examine the suit exhalation valves to make sure they are not obstructed and are in good working order.

h. Examine all suit snaps, closures, adjustment straps, and options to make sure they are in good working order.

i. Examine the suit warning labels to make sure they are firmly attached and can be read easily.

j. Examine the suit material for wear cracks (similar to those found in old tires), ozone deterioration (white chalky spots), and delamination of coating from fabric. Any suits showing these signs should be replaced.

k. Defects, such as holes or malfunctioning zipper, mean that it is time to discard the suit.

NOTE: Chemical suits will be removed from service after five years from the date of manufacture stamped on the suit-warning label.

NOTE: Responder CSM suits will have a log sheet attached to each suit to record and track maintenance, number of exposures, and wear time. Suits must be replaced when damaged, significant wear or toxic chemical contamination occurs.

NOTE: Trellchem suits will have a log sheet attached to each suit to record and track maintenance, number of exposures, and wear time.

4.5.3 Air Pressure Testing. Consult Technical Manuals for the air pressure testing of the Chemical OSHA Level A suits.

4.5.4 Laundering.

a. The suits may be hand washed using warm water and a mild detergent.

b. After washing, rinse well with warm water and hang to dry.

c. Suits will not be reused if contaminated.

4.6 Emergency Procedures.

4.6.1 General. The following events require immediate corrective action:

a. Loss of demand air supply.

b. Free flow of the air supply.

4.6.2 Specific Procedures.

a. Loss of demand air supply.

(1) Verify that you have not run out of air by reading the pressure gauge.

(2) Check that the cylinder valve is fully open.

(3) If the air supply is insufficient turn the bypass knob clockwise to add air (Interspiro).

(4) Regulate the airflow by opening and closing the bypass valve.

(5) Leave the contaminated area.

b. Free flow of air supply.

(1) If the unit is free flowing, you will notice air blowing into the face piece and out of the exhalation valve.

(2) Close the cylinder valve by reaching back with your left hand. Open and close valve as required to provide air.

(3) Leave the contaminated area.

c. Use of rescue air during operation.

(1) Leave the contaminated area if possible.

(2) Remove cap from rescue hose and attach hose to regulator with 2 feet hose and new cylinder filled with Grade D breathable air.

CHAPTER 5 - TYVEX "F" WITH OSHA LEVEL B or C

5.1 General.

a. Tyvex "F" is lightweight and provides an exceptionally high level of protection for long periods against chemical warfare agents. It is made by laminating the basic Tyvex flash-spun bonded polyethylene material to a barrier film, which is coated with polymer.

b. Tyvex "F" may be used during operations involving G, V, H, and L agents.

c. Tyvex "F" is Department of the Army Safety approved for OSHA Level B and C decontamination operations.

d. Tyvex "F" is a (one time use) disposable suit, which must be discarded after being worn in a chemical environment.

5.2 Components.

a. Tyvex "F" w/OSHA Level B consists of the following:

(1) Suit – Tyvex "F"

(2) Boots – Butyl Safety Toe, TAP (M2A1)

(3) Gloves – Butyl, TAP (M3)

(4) SCBA – Interspiro Spiromatic 9030 with NIOSH approval number TC-13F-197

(5) SCBA – Interspiro Spiromatic 915 with cascade system

(6) CPU (chemical protective undergarments) – during H & L operations

(7) Chemical over boots – (optional but recommended)

NOTE: OSHA Level B can be worn with the Interspiro 9030 or 915 system. When using the 915 it will be accompanied by the cascade system.

b. Tyvex "F" w/OSHA Level C consists of the following:

(1) Suit – Tyvex "F"

(2) Boots – Butyl Safety Toe, TAP (M2A1)

(3) Gloves – Butyl, TAP (M3)

(4) Mask – Chemical protective mask (M40A1)

(5) CPU (chemical protective undergarments) – during H & L operations

(6) Chemical over boots (optional)

5.3 Prepare the Interspiro Spiromatic 9030 or 915 System with Cascade for Use.

a. Reference Chapter 2, Section B for preparing Interspiro 9030 for use.

b. Reference Chapter 3, Section A and B for preparing the Interspiro 915 and Cascade System for use.

5.4 Donning.

5.4.1 General.

a. During mustard operations CPUs will be worn under the Tyvex F suit.

b. Wearer requires buddy assistance when donning Tyvex OSHA Level B.

c. Tape wrist, ankles, zipper flap, area around mask and hood of the Tyvex suit remember to leave a buddy tab for PDS operators.

5.4.2 Specific Procedures.

a. Inspect suit for serviceability (check for rips, tears, broken zippers, abrasions etc.)

NOTE : If the suit is found unserviceable for any reason, the user will cut the suit in two and dispose of immediately.

b. Ensure SCBA is prepared for use, serviceable and bottle is showing full.

c. Don Tyvex suit feet first and pull up to waist.

d. Put TAP boots on ensuring that suit legs are on the outside of TAP boots. If using over booties ensure suit legs are on the outside of the over booties.

e. Place arms in suit and zip to the top. Secure zipper flap on suit with tape if adhesive or Velcro strip does not seal.

f. Don air pack (regulator end down) and let mask dangle forward or over shoulder.

g. Grip the waist buckle and pull straps; adjusting to fit the waist and chest comfortably.

h. Ensure that the positive pressure lever is turned off (black lever on face piece in down position).

i. With right hand reach back and ensure cylinder is all the way open.

j. Put mask on face and inhale. The positive pressure will be automatically turned on. Then tighten head harness straps to ensure a snug fit.

k. Stop breathing and listen for leaks.

l. Check positive pressure by holding your breath and inserting two fingers between the sealing edge and your face. A strong sound of escaping air should be heard.

m. Place Tyvex hood over head and edge of face piece so no skin is exposed.

NOTE: ChemTape is authorized to seal gaps around the face piece and neck area of the suit.

n. Check pressure gauge to ensure the bottle reads full.

o. Perform a final buddy check.

5.5 Doffing.

5.5.1 General.

a. No PPE to include SCBA will be reused if it knowingly comes in contact with liquid contamination.

b. Wearers require buddy assistance while doffing OSHA Level B.

c. Drop all equipment including radios and communications gear at the equipment drop.

5.5.2 Specific Procedures.

a. Decon the hood and suit with the appropriate decon at the outer garment wash.

b. Decon the SCBA with household bleach at the outer garment wash.

c. Rinse the suit and SCBA at the outer garment rinse location.

d. Monitor for agent contamination. If contamination still exists, return to outer garment wash and decon again. If tests are negative, proceed to the glove/boot wash and rinse, and the hood wash and rinse.

NOTE: Two PDS Operators must assist the wearer during removal of the SCBA in the contamination reduction area (CRA).

e. Proceed through the CRA to the outer garment drop.

f. At the outer garment drop one PDS operator will remove the backpack with SCBA and hold it. The other PDS operator will cut the Tyvex off and place it in the containers provided.

g. Remove undergarments and place in the containers provided.

h. Remove face piece. The PDS operator turns off the air tank and places the face piece and SCBA in separate containers.

i. Proceed to shower and medical station.

APPENDIX A- HEAT STRESS PREVENTION AND MONITORING

All operations will be conducted IAW Appendix K of the CARA Risk Management SOP.

APPENDIX B – REFERENCE PUBLICATIONS

1. DA PAM 385-61, Toxic Chemical Agent Safety Standards.

2. Operating Instructions for Interspiro Spiromatic 9030 and Spiroline Escape 915 Breathing Systems.

3. Responder CSM Manufacture's Instruction Manual.

4. Trellchem Instruction Manual.

5. CARA Risk Management SOP

6. Memorandum, Office of the secretary, installations and Environment, 18 June 2004, Subject: implementation Guidance Policy for New Airborne Exposure Limits for GB, GA, GD, GF, VX, H, HD, and HT (appendices only).

SHAW ENVIRONMENTAL & INFRASTRUCTURE, INC. (A CB&I COMPANY) STANDARD OPERATING PROJECT PROCEDURE Redstone Arsenal, Madison County, Alabama

Subject: Digital Geophysical Mapping Surveys

1.0 Purpose and Summary

This standard operating project procedure (SOPP) establishes guidelines and procedures for use by field personnel in conducting digital geophysical mapping (DGM) surveys.

2.0 Table of Contents

3.0 Responsibility Matrix

3.1 Site Manager

The Site Manager or Field Team Leader is responsible for ensuring that field activities are completed to meet the project objectives and that they are conducted in accordance with the project plans and requirements and performed according to their respective procedures. The Site Manager is responsible for ensuring that all site personnel are trained in the procedures, that the procedures are adhered to, and that all activities are documented.

3.2 Field Team

All members of the field team (samplers, technicians, field geologists, engineers, etc.) are responsible for understanding and implementing this field procedure as well as ensuring that all team members also perform work in accordance with this procedure.

3.3 Quality Control Site Manager

The Quality Control Site Manager (QCSM) is responsible for ensuring field activities are completed to meet the project objectives and conducted in accordance with the project plans and requirements. The QCSM is responsible for verifying that all site personnel are properly trained.

3.4 Quality Assurance/Quality Control Manager

The Quality Assurance (QA)/Quality Control (QC) Manager is responsible for ensuring that this SOPP is correctly implemented and that the quantity and quality of field data collected meet the requirements of the site-specific field sampling plan (SFSP), Munitions and Explosives of concern (MEC) Work Plan, or Geophysical Investigation Plan (GIP) prepared for each site.

4.0 Acronyms and Abbreviations

AGI	Advanced Geosciences, Inc.
ASCII	American Standard Code for Information Interchange
DGM	digital geophysical mapping
DGPS	differential global positioning system
DVD	digital versatile disc
EM	electromagnetic
FADL	field activity daily log
FDEM	frequency domain electromagnetic
FTP	file transfer protocol
GDB	Geosoft database
GIP	Geophysical Investigation Plan
GIS	Geographic Information System
GPS	global positioning system
Hz	hertz
ID	identification
ISO	industry standard object
IVS	Instrument Verification Strip
MEC	munitions and explosives of concern

mph	miles per hour
MS	Microsoft
NMEA	National Marine Electronics Association
NRL	Naval Research Laboratory
OB/OD	open burning and open detonation
PM	Project Manager
QC	quality control
QCSM	Quality Control Site Manager
RSA	Redstone Arsenal
RTK	real-time kinematic
RTS	robotic total station
Shaw	Shaw Environmental & Infrastructure, Inc. (a CB&I company)
SFSP	site-specific field sampling plan
SNR	signal-to-noise ratio
TDEM	time domain electromagnetic
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist

5.0 Text

5.1 Introduction

This document applies to all project sites at Redstone Arsenal (RSA) where geophysical methods may be used to aid in site characterization under the current contract.

Multiple investigation strategies and approaches that use different technologies are necessary due to the diverse environmental conditions present and the wide range of site activities associated with munitions that have occurred in the past. Some of the more common site activities described in the historical record include burial of munitions in trenches and pits, storage and demilitarization, open burning and open detonation (OB/OD), and use of areas as firing ranges.

Purpose and Scope

The purpose of this document is to review the general procedures for conducting geophysical surveys at sites throughout RSA. The content and format of the document is based on standard industry requirements for performing geophysical surveys for munitions response projects. Detection of munitions and their constituents is one of the principal goals of the current program. DGM is the primary methodology discussed; however, the basic use of hand-held detectors (analog geophysics) is also presented.

Individual work plans are developed under this contract to support the investigation process at each site. Although there are several different work plan formats, the general site investigation strategy and geophysical approach are discussed in each work plan. All work plans and the work each describes will be consistent with the substantive requirements of the U.S. Army Engineering and Support procedures described in WERS-004.01.

5.2 Planning Activities

This section discusses the general process for the review of historical information and previous geophysical data and how the information is used to support and plan the activities for the current investigation. In order to determine the optimum investigation strategy at each site, a review process is performed that includes assessment of historical aerial photographs, work plans, reports, and digital geophysical data collected in support of previous site investigations. The former and current uses of the site and MEC types and distribution are accounted for during planning activities and design of the investigative program. Aerial photographs are used to examine vegetation density and terrain to facilitate planning for civil surveys and the selection of positioning systems/methods for geophysical surveys. The photographs are also used to identify potential disposal features to ensure these features are accounted for when determining the investigation strategy for the current program.

5.2.1 Previous Geophysical Surveys

As part of the current program, Shaw Environmental & Infrastructure, Inc. (Shaw) (a CB&I company) will review the results of the previous DGM and analog geophysical investigations to determine if the data are of sufficient quantity and quality to meet the current program objectives and to identify any potential data gaps.

5.2.1.1 Analog Geophysics

Geophysical surveys were performed at some RSA sites with analog instruments and techniques (e.g., instrument-assisted visual surface sweeps, anomaly avoidance activities, and use of digital sensors in “analog” mode). For example, Environmental Science and Engineering, Inc., used the EM31 along transects in certain areas to scan the subsurface for anomalies. The previous analog surveys did not employ positioning methods such as real-time kinematic (RTK) global positioning system (GPS), robotic total station (RTS), or differential global positioning system (DGPS), and the general results of the surveys were transcribed onto hard copy maps and included with site characterization reports. In some cases, only descriptive (written) information for the surveys exist. Although the information from these previous survey efforts is used to plan the investigative strategy for the current program, the locations of the features and anomalies are not accurate enough to support intrusive activities without confirmation of the presence and locations of the features during the current program.

5.2.1.2 DGM

Previous DGM activities at RSA sites were primarily designed to identify relatively large areas where metal is buried within disposal features such as trenches and pits. As such, the spacing between adjacent acquisition lines and measurements along the lines were relatively large (e.g., 5 to 20 feet). The previous DGM investigations also predominantly used manually constructed grid systems in which the positions of the geophysical measurements were obtained using the fiducial method. DGM data collected at a relatively large line and station spacing within manually constructed grid systems may contain errors of several feet or more throughout the survey area,

depending upon the specific procedures used to construct the grid system. In addition, the relatively large spacing between measurements does not support the optimum placement of test pits where there are nearby cultural features (e.g., subsurface utilities, buildings, etc.) or within features that may not contain significant amounts of metal (e.g., historical trenches at MSFC 82). Accurate coordinates for features detected in previous geophysical surveys are necessary to ensure the intrusive investigation during the current program provides representative results and is conducted in the safest manner possible, especially when there are subsurface hazards such as utilities present.

When civil survey information is available, the relative coordinates from previous DGM surveys will be transformed into state planar coordinates and transcribed onto site maps for further analysis. As part of the analysis, data may be reprocessed and/or reanalyzed in order to support the goals of the current program. If the review process indicates the previous DGM data have the potential to directly support the current intrusive investigation without additional contemporary data collection, the minimum search area during anomaly reacquisition will be as large as the expected residual error in order to ensure the feature or anomaly is successfully reacquired. When features or anomalies exist near utilities or other sources of cultural interference or the feature is not anticipated to contain significant amounts of metal, the anomaly reacquisition process will include reconnaissance data collection over the feature while recording sensor data continuously to support the optimum placement of test pits (e.g., MSFC 003/82).

5.2.2 Site Characterization Approach

Geophysical surveys that utilize both analog and digital detector technologies are necessary for the current program. For the purposes of this document, analog geophysics primarily refers to hand-held detectors (Schonstedt, Minelab Explorer, etc.) used in “analog” mode, meaning a sound, meter deflection, light-emitting diode, or digital readout is used to alert the instrument operator and data are not recorded for analysis at a later time. DGM refers to the digital recording of sensor and accurate position data for analysis at a later time using sensors such as the EM61-MK2, EM31, G858G, Foerster, etc.

The specific site characterization activities are provided in the work plan for each site, and the work plan takes priority over the general discussion presented herein. For some sites, the Unexploded Ordnance (UXO) Estimator software will be used to determine the amount of site coverage necessary to support characterization goals, such as may be the case when there is not sufficient historical information and/or MEC is anticipated to occur randomly throughout the site. The parameters for the UXO Estimator will be proposed to the client in the work plan for concurrence. When the UXO Estimator approach is used, all MEC-like anomalies will be intrusively investigated. If target or impact areas exist at any of the sites, Visual Sample Plan software may be used to substantiate the transect spacing necessary to detect these features. The initial parameters will be proposed to the client in the work plan for concurrence. Once the target or impact area boundary is successfully located with the transects, full-coverage

DGM grids may be positioned within the impact area to provide additional characterization information. A portion of the MEC-like anomalies will be proposed for excavation.

In general, analog geophysics will be performed as part of the initial site activities associated with the instrument-assisted visual surface sweep as well as along transects for initial investigation of sites/areas that are relatively large and densely wooded, and/or where historical information does not strongly support activities associated with munitions. DGM will be applied over select portions of sites based on the results of the instrument-aided visual surface sweep and where the historical record indicates the presence of features related to munitions use.

For partially or densely wooded sites where the historical data indicate the presence of relatively large disposal features such as trenches, burn pads, and OB/OD areas, the initial characterization of the site will include a system of localized DGM transects at adequate intervals to allow for detection and characterization of the features of interest with a high degree of confidence. Test pits will be placed within the features of interest and intrusively investigated for subsurface characterization.

In “open” areas where dense vegetation and canopy are not present, DGM transects will be considered in order to characterize subsurface features of relatively large size (pits and trenches, target areas, burn pads, and OB/OD areas). Since RTK GPS or DGPS can be used for accurate positioning along the transects, smaller-scale individual anomalies (e.g., kick-outs from OB/OD areas) can also be adequately assessed using this methodology. Based on the results of the initial transects, additional transects may be performed to refine the boundaries of the features and/or DGM may be performed over full-coverage grids as a follow-on activity. When used, the sizes for the DGM full coverage grids are anticipated to be 100 by 100 feet or 50 by 50 feet in size. A portion of the MEC-like anomalies will be investigated within the grids and along the transects unless UXO Estimator is used to determine the coverage, in which case all MEC-like anomalies will be excavated.

Sites less than approximately 5 acres, and possibly up to 10 to 15 acres in size, that have been impacted by munition-related activities documented as part of the historical record will be characterized using full-coverage DGM over all accessible areas within the site, and a portion of the MEC-like anomalies will be proposed for excavation.

A hybrid approach, termed the “density transect method,” is warranted for characterization activities at some RSA sites. Density transects involve the use of hand-held detectors to estimate subsurface anomaly density by counting subsurface detector “hits” along transects. Transects are divided into segments of equal length, and an autonomous GPS (e.g., Trimble GEO XH or equivalent) is used to determine the position of each transect segment. A similar approach involves the use of a detector commonly used for DGM (e.g., EM61-MK2) along the transect segments and with sensor data digitally recorded without associated positioning information. Regardless of

the detector technology used, the subsurface "hit" information is uploaded to the Geographic Information System (GIS) and a map of subsurface anomaly density is generated. Potential follow-on activities include full coverage DGM grids and the intrusive investigation of select anomalies to support subsurface characterization. At sites where previous geophysical data exist and are determined to be of sufficient quality to support the current program objectives, the contemporary investigative strategy will largely consist of anomaly reacquisition and intrusive investigation of suspect features and select individual anomalies. If previous geophysical data are determined to have data gaps or uncertainties, additional geophysical data collection is most likely required under the current contract.

Shaw anticipates using the Geonics EM31 SH frequency domain electromagnetic (FDEM) instrument when the primary objective is to map relatively larger burial features such as trenches and OB/OD pits when the depth and contents are unknown. The EM61-MK2 time domain electromagnetic (TDEM) technology will be deployed when full-coverage DGM is warranted to detect individual MEC items or if the objective includes the necessity to detect individual MEC items along transects (e.g., OB/OD kick-outs). If there are multiple objectives at a site, the EM61-MK2 may be used to detect individual items as well as larger-scale features such as burial pits and trenches if the historical record supports relatively shallow burial of the metal. When MEC or burial features are expected at depths in excess of 10 to 15 feet, the G858G magnetometer may be used to facilitate the detection of deeper masses of buried metal. At sites where the thickness, depth, or bottom of the trench supports follow-on investigations, an Advanced Geosciences, Inc. (AGI) Sting/Swift Resistivity unit (or equivalent) will be used to produce vertical profiles of the structure.

5.3 Site Characteristics

5.3.1 Site Description

This information will be provided in the SFSP, MEC Work Plan, or GIP for each site**.**

5.3.2 Previous Site Investigations and Geophysical Data

This information will be provided in the SFSP**,** MEC Work Plan, or GIP for each site. Some SFSPs will have an appendix that provides a detailed review of the previous geophysical data.

5.3.3 Past, Current, and Future Use

This information will be provided in the SFSP**,** MEC Work Plan, or GIP for each site.

5.3.4 Topography, Soil, and Geologic Conditions

This information will be provided in the SFSP**,** MEC Work Plan, or GIP for each site. Of specific importance to the DGM or analog geophysics will be sites where magnetic soils are present that may create elevated levels of "noise" in the geophysical data.

5.3.5 Vegetation

This information will be provided in the SFSP, MEC Work Plan, or GIP for each site.

5.3.6 Shallow Groundwater Conditions

This information will be provided in the SFSP, MEC Work Plan, or GIP for each site.

5.3.7 Specific Areas of Investigation

This information will be provided in the SFSP, MEC Work Plan, or GIP for each site.

5.3.8 Anticipated MEC Type, Composition, Quantity, and Depth

This information will be provided in the SFSP, MEC Work Plan, or GIP for each site.

5.3.9 Anticipated Worker Hazards

Steep and uneven terrain, poisonous plants, and protruding tree branches are common hazards for geophysical surveys. All site personnel will adhere to the practices, procedures, and training and monitoring requirements mandated by the accident prevention plan and site-specific safety and health plan. Because of the potential MEC hazard, qualified UXO personnel using hand-held detectors will perform an instrument-aided visual surface sweep or general reconnaissance of the areas of interest prior to any DGM activities so the DGM team can proceed with survey activities without escort.

5.3.10 Presence of Man-Made Features

Man-made features within or close to the DGM survey areas have the potential to negatively impact geophysical investigations. These features include but are not limited to the following: radio transmitters, above- and below-ground power lines and utility corridors, fences, trash dumpsters, monitoring wells, benches, metal signs, manhole covers, buildings, and vehicles. All of these features may introduce noise in the DGM data, and therefore, the position of these features will be accurately documented with the proposed positioning system(s) so that they can be accounted for during the interpretation.

In areas where power lines or radio transmitters are present, static noise tests may be performed prior to production DGM or anomaly reacquisition efforts in order to assess the impact of these features on the DGM data. Modifications to the existing DGM system or data processing procedures and parameters may be performed in areas where the source of the noise can be mitigated by changes to existing protocol. Any changes to the DGM system or data processing flow during the project will be documented in the digital project files.

5.3.11 Site-Specific Dynamic Events

Dynamic events (rain, lightning, solar flares, etc.) may temporarily impact data quality during DGM data collection and/or anomaly reacquisition activities. Weather is monitored by the UXO Safety Officer (or Safety Officer, if no UXO Safety Officer is

assigned to the project), prior to start of daily field activities, and throughout the day as necessary. The following procedures will be followed during these anticipated events:

- **Rain**. Depending on its intensity, rain can be a significant impediment to survey operations. The Site Geophysicist will assess the intensity of rainfall and its effects on survey instrumentation and safety considerations, such as site access (driving and passable roads), hazards (slip, trip, fall), and potential for flash flooding. General guidance for common conditions is as follows:
  - Drizzle or Intermittent Light Rain – Use electrical tape around instrument electronic connections.
  - Continuous Medium or Heavy Rain – As necessary, take cover and cease operations until conditions improve.
- **Lightning.** Because most geophysical instruments contain sufficient metal and geometry to pose a preferred pathway for electrical discharge (lightning rod effect), observed lightning in the area will be deemed a safety hazard and will be cause for the cessation of survey activities until the lightning activity has ceased. Site personnel and equipment will be sheltered in a safe area. The Site Geophysicist or UXO Safety Officer will document that lightning is present and log the times when site survey activities are shut down and resumed. The 30/30 rule is adopted in accordance with guidelines from the National Lightning Safety Institute:
  - If 30 seconds or less "Flash To Bang," seek proper shelter.
  - Back-up rule (if you can't see the lightning): If you can hear thunder, seek proper shelter.
  - Wait 30 minutes or more after last thunder before leaving proper shelter.
- **Solar Flares.** Strong solar flare activity can produce magnetic storms, resulting in disruptions to the earth's magnetic field. If severe conditions are observed, it may be necessary to modify or delay some activities associated with the DGM program when GPS or certain magnetic sensors are deployed. The Site Geophysicist will be responsible for checking the National Oceanic and Atmospheric Administration Web site (www.swpc.noaa.gov) on a weekly basis and notifying the Shaw Project Manager (PM) if conditions may warrant any modification of field activities.

5.4 Site Preparation Activities

This section describes the activities that will be performed in advance of the geophysical surveys at RSA. As part of the design of contemporary geophysical surveys, it may be necessary to evaluate and review geophysical data from previous analog and/or DGM surveys.

5.4.1 Civil Survey

Survey control used for the contemporary geophysical program and other site activities will be established using existing control points or monuments with a horizontal accuracy of Class I, Third Order or better.

The Project or Site Geophysicist will direct a licensed land surveyor supported by a UXO escort to construct a system of monuments or control points at each site. During these activities, MEC anomaly avoidance will be practiced per RSA Regulation 75-4, Revision 1. The monuments and control points may be used by Shaw personnel to construct grids or transects to support the geophysical survey and/or the licensed surveyor will perform these activities under the direction of the Project or Site Geophysicist. The surveyor will also survey utilities identified during the utility markout (Section 5.4.3).

The location of the site boundary, transect endpoints, points along each transect at regular intervals, and grid corners will be predefined using the project GIS, and the coordinate data will be uploaded to a survey-grade RTK GPS, DGPS, autonomous GPS, or RTS for use by the licensed surveyor or Shaw field crews. A survey pin and a pin flag will be placed at each location and a unique identifier written on the pin flag. The acceptable error tolerance(s) for the civil survey activities depends on the overall investigative strategy at each site. The general tolerances for the civil survey are defined in Section 5.7. The tolerances for the civil survey may also be defined in the work plan for each site.

The survey pins at each transect endpoint or grid corner will be used as control points for certain positioning systems, e.g., RTS, as well as a QC check for the positioning accuracy and repeatability for some types of DGM surveys. MEC anomaly avoidance will be practiced during the civil survey per RSA Regulation 75-4, Revision 1.

When RTK GPS or RTS is used to construct the grid or transect network to support the accurate mapping of individual anomalies to detect individual MEC items using DGM, grid corners and transect end points will generally require a tolerance of ± 0.33 foot from the stakeout point defined in the GIS. For applications involving the detection and delineation of larger scale features such as disposal areas, the tolerance will be approximately ± 3 feet. In areas of dense vegetation and canopy where autonomous GPS or DGPS is used to stakeout points for the instrument-aided visual surface sweep or density transects, no tolerance is specified; the stakeout points will be digitally recorded using the GPS along with the estimated accuracy of each point.

In certain situations, it may not be feasible to use an RTK GPS or RTS to survey the corners of a full-coverage DGM grid to support detection of individual MEC items, such as may be the case when the grid is placed near the center of a densely forested area. In this scenario, a measuring tape and the “right angle technique” will be used to construct the grid, which is assumed to exist within an area with no relief. The diagonals of the grid will be measured to a tolerance of ± 1 foot from the predicted

measurement. Subsequent DGM data will be acquired in a relative coordinate system using fiducial positioning, and the dig list will also be in relative coordinates. Autonomous GPS will be used to survey the corners and centroid of the grid to facilitate placement of the DGM image on the site base map.

The tolerance for surveying the boundary of a site is ± 1 foot regardless of the vegetation or canopy conditions.

5.4.2 Vegetation Clearance

Vegetation clearance/removal will be required to facilitate contemporary geophysical activities at most RSA sites. In general, brush and smaller vegetation will be removed in accordance with the Record of Environmental Consideration that is completed as part of the Job Order Request for each site. The Site Geophysicist or Unexploded Ordnance Quality Control Specialist (UXOQCS) is responsible for evaluating the geophysical survey area to ensure it is safe from hazards and the vegetation clearance is performed adequately to meet the objectives at each site. During vegetation clearance activities, MEC anomaly avoidance will be practiced per RSA Regulation 75-4, Revision 1.

5.4.3 Utility Markout

Metallic utilities can be detected with DGM instruments and are a potential hazard during drilling and exploratory test pit activities. Other utilities (fiber optic, PVC, clay) require avoidance during intrusive activities as well. Therefore, a utility markout is required before beginning any intrusive work on a site. Further, it will be performed prior to completing the geophysical surveys such that this information is available during data processing. The Shaw QCSM will coordinate with the appropriate authority at RSA to ensure that all underground utilities are identified. During the utility markout, MEC anomaly avoidance will be practiced per RSA Regulation 75-4, Revision 1.

5.4.4 Instrument-Aided Visual Surface Sweep

Instrument-aided visual surface sweeps may be performed at each RSA site with appropriate hand-held analog detectors (e.g., Schonstedt or all metals) prior to follow on activities as warranted. The grid size for the instrument-aided visual surface sweep may vary from ¼ acre to several acres in size depending upon the site characteristics and follow-on activities as warranted. When DGM data collection and anomaly reacquisition activities are proposed, the purposes of the instrument-aided visual surface sweep are to 1) identify potential surface MEC/munitions debris and features such as craters, disturbed ground, etc.; 2) identify relatively larger scrap metal on the surface; and 3) as necessary, remove larger pieces of scrap surface metal over the entire site or at specific locations that would interfere with the subsequent DGM data collection and/or anomaly reacquisition activities. In addition, the number of anomalies identified during the detector-aided visual survey will be recorded. Anomalies will be recorded on a total number per grid basis (i.e., individual anomaly locations will not be recorded). The results of the instrument-aided visual surface sweep will be documented using a ruggedized personal digital assistant/GPS system so the digital data can be

directly integrated with the project GIS. Anomaly avoidance will be practiced during the instrument-aided visual surface sweep as well as during the vegetation clearance, civil survey, and utility markout.

Most of the previous geophysical surveys at RSA were designed to detect large aggregates of metal that exist in burial pits or trenches. It will not be necessary to remove smaller individual pieces of scrap metal from the surface (e.g., beverage cans, wire, etc.).

If anomaly reacquisition and intrusive activities are the only tasks deemed necessary at a particular site only the specific locations selected for investigation may be cleared by the UXO technicians.

If a MEC/CWM hazard is encountered, work will be stopped and it will be reported to the Environmental Management Department, who will notify the appropriate authorities as described in the MEC anomaly avoidance procedures in RSA Regulation 75-4, Revision 1.

Instrument-Aided Visual Surface Sweep Quality Control

An instrument check will be performed at the start of each day. Once the instrument has been determined to be working according to the manufacturer's operating manual, the operator will perform a function test using the detection methods described in the manual. A function test will consist of using the instrument over a minimum of three test sources. The same sources will be used during each function test to ensure consistency. The instrument detection indicator, as described in the operator's manual, will be noted in the instrument logbook. For site checks, a 6-inch length of ½-inch steel reinforcing rod or comparable object will be available to each operator at the work site.

5.5 Personnel Roles and Responsibilities

This section reviews the responsibilities of project personnel. Qualified personnel from the Shaw geophysics group will manage daily activities associated with the geophysical component of the investigations and are accountable with other Shaw project personnel for meeting the investigation objectives for each site.

When DGM is performed, each team will consist of a minimum of two individuals, one or both of whom will be experienced in data acquisition with the specific DGM system used. Both team members may operate a DGM instrument, provided visual and/or voice contact can be maintained during data collection for safety purposes.

5.5.1 Project Manager

The Shaw PM will have overall control of the logistics of all field activities and work with the Project and Site Geophysicists as well as the Shaw Site Manager to direct the DGM field teams. The Site Manager and PM report to the Shaw RSA Program Manager, and these individuals will be the central point of contact for the Army.

5.5.2 Project Geophysicist

The Project Geophysicist will report to the Shaw PM and have overall responsibility for design, implementation, and management of all geophysical elements required for the work effort. The Project Geophysicist will have a degree in geophysics, geology, geological engineering, or a closely related field, and will have a minimum of 5 years of directly related geophysical experience and a minimum of 5 years of experience working on MEC projects. This individual will be the project geophysicist of record and will primarily be responsible for planning the civil survey, data collection and processing logistics, and oversight of the data processing/ interpretation and some of the QC components of the project.

5.5.3 Site Geophysicist

The Site Geophysicist will manage the day-to-day DGM activities at the site and primarily be responsible for data collection and initial QC of the geophysical field data. The Site Geophysicist will be a member of one acquisition team (or direct the teams in the field) and have a degree in geophysics, geology, geological engineering, or a closely related field, and have a minimum of 2 years of directly related geophysical experience. The Site Geophysicist will report to the Project Geophysicist and the Shaw Site Manager.

5.5.4 Quality Control Geophysicist

The QC Geophysicist is responsible for oversight of geophysical activities and ensuring compliance with geophysical QC requirements associated with the achievement of the performance and quality metrics. Specifically, the QC Geophysicist is responsible for the following:

- Assisting the site QCSM in planning and ensuring the performance of preparatory, initial, follow-up, and completion inspections for the major DGM activities.
- Documenting the acceptable performance and completion of significant QC activities (e.g., blind seeding [Appendix A]) as specified in this document.
- Reviewing the DGM data with the Project Geophysicist.
- Identifying any nonconformance and verifying that appropriate root cause analysis and corrective actions are implemented for DGM activities.
- Performing visual monitoring (as necessary) of data acquisition, processing, and interpretation activities to ensure conformance with the objectives of the work plan.
- Ensuring that the requisite documentation, including submittals, is generated and retained per RSA requirements.

The QC Geophysicist will have daily access to all geophysical QC and DGM data but may only be present on site as needed. It is expected that the Project and QC Geophysicists will provide detailed review of the DGM data at the onset of the project.

5.5.5 Data Processor and Analyst

The data processor and analyst for each project will have a degree in geophysics, geology, geological engineering, or a closely related field and at least 3 years of experience in processing geophysical data for MEC projects. The geophysical data processor will report to the Project Geophysicist.

5.5.6 Subcontractors

If a subcontractor is used to collect DGM data, they will provide a Project Geophysicist and a QC Geophysicist as described above as well as all field geophysicists needed to execute the work. However, Shaw will be responsible for developing the data quality objectives for the project and doing all work planning. In addition, a Shaw geophysicist meeting the training requirements of a QC Geophysicist will perform QA of the data and interpretation of geophysical survey results provided by the subcontractor and will be ultimately responsible for the final reporting product produced. The Shaw PM will be the subcontractor's primary point of contact for the project and will receive guidance for all technical aspects of the investigative program from the Shaw geophysicists. For all communications, Shaw will be the liaison between the subcontractor, the Army, and the U.S. Army Engineering Support Center, Huntsville representatives.

5.6 DGM Investigations

This section discusses the technologies, equipment, and approaches that are applicable for the objectives of the current program and how the data are collected, processed, and analyzed to allow investigation of the features and anomalies of interest. The DGM sensor validation process performed at the beginning of each project phase is also discussed.

Contemporary DGM investigations performed in support of the current project include planning/design, data collection (or review of previously collected data), analysis of data to formulate a dig list of features and anomalies for investigation, and anomaly resolution. QC is performed throughout the DGM investigation using a process-oriented approach. For the purposes of this document, anomaly resolution includes the anomaly reacquisition, intrusive investigation, and reporting of the excavation results.

Applicable technologies for the objectives at the RSA sites include TDEM, FDEM, and magnetometry. These technologies are proposed for deployment using both analog and digital systems based on the investigative strategy proposed for each site. If site characteristics, logistics, or safety concerns prevent drilling or exploratory test pits at a particular site, multi-electrode electrical resistivity or TDEM/FDEM soundings may provide a useful estimate of the vertical extent of waste materials. If cultural features prevent the collection of high-quality geophysical data from the surface, appropriate downhole technologies (e.g., borehole magnetometry, electromagnetics [EM], or radar) or cross-hole acoustic applications may ultimately be employed. If any of these technologies or methodologies is determined to be applicable to a specific RSA site, its application will be described in detail in the work plan. In a similar manner, if marine

DGM is proposed for use at a particular site, the technology and methodology will be addressed in the work plan.

5.6.1 Sensors

This section presents DGM sensor technologies and equipment proposed for use at RSA and how each system is anticipated to be used during the site characterization process.

5.6.1.1 TDEM – Geonics EM61-MK2

The Geonics EM61-MK2 is a four-channel high-sensitivity TDEM device designed to detect ferrous and nonferrous metallic objects with good spatial resolution and minimal interference from adjacent metallic features. TDEM sensors utilize a transmitter that generates a pulsed primary EM field in the earth, which in turn induces small electrical currents in nearby metallic objects. The decay of the current produces a secondary magnetic field measured by the receiver coils of the EM61-MK2. Measurements are acquired a relatively long time after the primary pulse, allowing the current induced in the ground to dissipate, leaving only the current in the metal to produce a significant secondary field.

A single EM61-MK2 unit consists of two 1-meter by 0.5-meter rectangular coils arranged in a coaxial geometry and separated by 40 centimeters. System electronics measure secondary voltages induced in the bottom and/or top coils in conjunction with position data from the positioning system (e.g., RTS, RTK GPS, DGPS). Data are recorded to a Juniper Allegro data logger (or equivalent) using Geonics EM61-MK2 software. Measurements will be collected at a rate of 10 to 15 hertz (Hz) along with the data from the positioning system, which will be recorded at a rate of 1 to 4 Hz depending upon the application. Two measurement modes are possible. In “4” mode, the instrument measures the EM response from the lower coil at four intervals or “time gates” (216, 366, 660, and 1,266 microseconds). In “D” or “Differential” mode, measurements are recorded for the first two time gates from the lower coil and the 660 time gate from both the lower and upper coil. Unless otherwise noted in the work plan for each site, the “4” mode of acquisition will be used.

The EM61-MK2 will be deployed as a wheeled cart system with the lower coil approximately 16 inches above the ground surface. If a different platform such as a stretcher or tethered carry is used, an adequate description will be provided in the work plan for the particular site. The sensor height above the ground surface for any application will be documented on the Field Activity Daily Log (FADL) (Appendix B). When RTK GPS, DGPS, or the RTS is used, the relative offset between the sensor (center of EM61 coils) and positioning system antenna or prism will be recorded on the FADL to an accuracy of 1 inch when used in full-coverage mode to detect individual MEC items. If the EM61-MK2 is used to map disposal features, the relative offset will be measured to an accuracy of 0.5 foot.

Applications

The EM61-MK2 will primarily be used to collect high-resolution data within full-coverage grids at a line spacing of less than 3.3 feet to support the detection of individual MEC items and relatively small burial features anticipated to exist at relatively shallow depths. When used in "full coverage" mode, the resulting data will directly support anomaly reacquisition and intrusive activities.

The system may also be used along transects for initial anomaly density mapping purposes (density transects) in areas of vegetation and canopy when there is a requirement to detect relatively deeper individual MEC items. When used for this application, the wheel counter mode of operation will be used if the surface is relatively smooth. This application may directly support anomaly reacquire and intrusive activities when large-scale disposal features are detected.

At sites that are free of thick vegetation and canopy, the EM61-MK2 may be used as a DGM tool along transects to permit accurate reacquisition and subsequent intrusive investigation of select individual anomalies.

The EM61-MK2 may also be used during anomaly reacquisition activities to verify and refine, as necessary, the locations of specific anomalies detected during previous geophysical investigations.

5.6.1.2 FDEM – Geonics EM31 SH

The Geonics EM31 SH is an FDEM instrument that detects ferrous and nonferrous metals and provides information on lateral variations in the ground conductivity.

The use of the EM31 SH FDEM technology is warranted for the RSA project for the following reasons:

- Presence of trenches and burial features that are of significant size at some sites
- Unknown contents and depth extent of trenches and disposal features at some sites
- Ability to detect changes in magnetic properties of the soil, such as those that could occur from surface burning (i.e., does not require metal to be present to detect burn pad)
- Ability to detect changes in the conductive properties of soils in the absence of metal (i.e., can detect burial features such as OB/OD pits that contain little or no metal, or metal that is deep and outside of the range of the EM61).

The EM31 SH instrument consists of a boom approximately 6.5 feet in length with a transmitter coil on one end and a receiver coil at the other end of the boom. System electronics measure two components of the EM field (quadrature and in-phase) in conjunction with position data from the positioning system (e.g., RTS, RTK GPS, or

DGPS). Data are recorded using a Juniper Allegro data logger (or equivalent) using the Geonics EM31pro software. Measurements will be collected at a rate of 3 to 10 Hz along with the data from the positioning system, which will be recorded at a rate of 1 to 4 Hz depending upon the application.

The quadrature phase component of the EM field is linearly related to subsurface electrical conductivity and the instrument is sensitive to conductivity changes to a depth of approximately 10 to 12 feet when used in the vertical dipole mode. The in-phase component of the EM31 signal is most sensitive to ferrous and nonferrous metallic items and can detect a single, isolated 55-gallon metal drum to a depth of approximately 6 to 8 feet below the ground surface.

The use of the EM31 SH is proposed instead of the standard version of the EM31. Benefits of the EM31 SH over the standard version include much higher lateral resolution, the ability to detect relatively smaller metal items, and increased lateral and vertical sensitivity to variations in ground conductivity at depths approaching 8 to 10 feet. The EM31 SH is also less sensitive than the EM31 to above- and below-ground cultural features due to its smaller radius of investigation and is more portable in areas of dense vegetation due to the decreased length between the transmitter and receiver coils (6.5 feet versus 12 feet for the standard EM31).

The instrument is transported at waist height and the height above the ground surface will be measured and documented on the FADL (Appendix B) for each operator during the initial project activities. When RTK GPS, DGPS, or RTS is used, the relative lateral offset between the sensor (center of EM31 console) and positioning system antenna or prism transported on the back of the instrument operator will be recorded on the FADL to an accuracy of 1.5 feet.

Applications

The primary use of the EM31 SH for the RSA project will be to identify the lateral extent of relatively larger features, such as burial pits, trenches, detonation pits, and burn pads along localized transects spaced approximately 10 to 25 feet apart. In the absence of large aggregates of metal, the instrument has the potential to identify natural changes in the conductivity of the soils and near-surface geology as well as regions of relatively high total dissolved solids content of groundwater within approximately 10 feet of the surface.

The EM31 SH may also be used during anomaly reacquisition activities to verify and refine, as necessary, the locations of specific burial features detected in previous geophysical surveys in order to ensure the most accurate placement of test pits.

5.6.1.3 Magnetometry - Geometrics G858

Magnetic surveys will be conducted with a Geometrics G858G gradiometer. Magnetometers measure the intensity of the naturally occurring geomagnetic field in units of nanoTeslas. The geomagnetic field is distorted in the presence of objects and

features that are easily magnetized, such as iron and steel. The G858G measures the intensity of the earth's total magnetic field with two independent magnetic sensors spaced a fixed distance apart. The change in magnetic intensity between the two sensors, or magnetic gradient, provides useful information in areas of elevated anomaly density and near cultural features as it simplifies larger and more complex anomaly signatures into their individual constituents more readily than the total magnetic field. The total magnetic field from one or both of the sensors can be used during analysis to more readily infer the presence of objects and features that are more distant from the sensors, which is useful along transects and for indicating the presence of relatively deep objects.

The geomagnetic field undergoes diurnal variations, and a single-sensor magnetometer (G856 or G858) may be used as a base station magnetometer during some applications to record the diurnal variations so their effect can be removed during data during processing.

The use of magnetometer technology is warranted at RSA at sites where aggregates of ferrous metal (e.g., 55-gallon drums) may be buried in excess of 10 to 15 feet below the ground surface.

The G858G will be configured as a vertical or horizontal gradiometer with appropriate sensor spacing depending upon the specific application and objective. The sensor spacing will be documented in the work plan for the respective RSA site. Sensor measurements will be collected at a rate of 10 Hz and position data will be recorded simultaneously from the positioning system (e.g., RTS, RTK GPS, or DGPS) at a rate of 1 to 4 samples per second.

The G858G will be transported approximately 5 to 7 feet in front of the instrument operator and the bottom sensor will be approximately 2 feet above the ground surface as dictated by near-surface vegetation conditions to permit the detection of small ferrous objects outside of waste disposal areas. When RTK GPS, DGPS, or the RTS is used, the relative lateral offset between the sensor (center of gradiometer) and positioning system antenna or prism transported on the back of the instrument operator will be recorded on the FADL to an accuracy of 1.5 feet.

The line spacing used will be approximately one-half of the smallest dimension of the expected feature(s) of interest. Where the orientation of the features of interest can be identified on aerial photographs, the line spacing will be increased while still maintaining the ability to accurately characterize the dimensions and general contents of the burial feature.

Applications

The primary application for the G858G will be detection of burial trenches and pits that contain large aggregates of ferrous metal buried in excess of 10 to 15 feet below the ground surface. The system will be used to collect data along localized transects spaced

approximately 10 to 25 feet apart. For mapping of burial pits, trenches, and disposal areas the system will be operated in the vertical magnetic gradient mode with a vertical sensor separation less than of less than 3 feet.

5.6.1.4 Electrical Resistivity – AGI Sting/Swift Resistivity Meter

Electrical resistivity methods involve the measurement of the apparent resistivity (resistance of a material to the flow of current) of soils, rock, and subsurface materials as a function of depth or position. The most common electrical methods are vertical electrical soundings (resistivity soundings) and resistivity profiling, though for mapping organic contaminants, complex resistivity/induced polarization methods are sometimes used.

Five electrode arrays are commonly used: Wenner, Schlumberger, pole-dipole, dipole-dipole, and gradient. The measured quantity in resistivity work is apparent resistivity. If the Earth were uniform, apparent resistivity would represent true Earth resistivity. For the real-Earth model, apparent resistivity is taken to be the bulk or average resistivity of all soils and rock influencing the flow of current.

During resistivity surveys, current is injected into the earth through a pair of current electrodes, and the potential difference is measured between a pair of potential electrodes. Measurement of apparent resistivity, which is the bulk or average resistivity of all soils and rock influencing the flow of current, is calculated by multiplying a geometric factor (specific to the array being used and electrode spacings) by a measured potential difference and dividing by the input current. In resistivity profiling, the electrode spacing is fixed at a distance dependent on the desired depth of exploration, and measurements are taken at successive intervals along a profile line. Data are generally presented as profiles or contour maps and interpreted qualitatively.

An AGI Super Sting Resistivity System (or equivalent) with up to 112 electrodes at approximately 3 to 6 foot take-outs (or as terrain and depth dictate) will be employed to produce a continuous two-dimensional subsurface map of the near-surface materials based on the horizontal and vertical distribution of apparent resistivity. The system is a computer-controlled resistivity instrument that allows for rapid acquisition of multi-electrode (traditional) resistivity measurements.

The electrode locations will be documented using the same instrument used for navigation during the DGM surveys. If no navigational instrument is currently on site for concurrent DGM surveys, a sub-meter GPS system or better will be utilized.

Once the EM or magnetic surveys are complete and the trenches are mapped laterally, resistivity lines will be placed in orientations and spacings believed to best characterize the feature(s).

Applications

Resistivity measurements are used for a wide variety of reasons. In general, resistivity values are dependent upon several factors such as composition, grain size, water content, air or void space content, etc. In general, fine-grained materials such as clay have a lower resistivity and coarse-grained materials such as gravels have a higher resistivity. However, resistivity measurements can typically reveal many other conditions in the subsurface. They can also be used to look for contrasting conductivities such as buried debris versus host soils, voids, fractures, geologic features, and other conditions related to engineered structures.

5.6.2 Positioning Systems and Methods

In "open" areas free of tall vegetation and canopy, an RTK GPS will be used to provide position information for the DGM data. In general, RTK GPS will be used for most applications involving full-coverage DGM grids to ensure anomalies are accurately located and can be reacquired and excavated in the most effective fashion. DGPS may be used for transect applications designed to detect relatively larger features such as disposal areas.

In areas where there is interference from tree canopy, an RTS or the fiducial method of positioning may be used when the objective is accurate mapping of individual anomalies to directly support anomaly reacquisition and intrusive activities. When anomaly reacquisition of relatively smaller individual anomalies is not required, such as may be the case when the objective is to identify general regions of potential waste burial or regions of relatively higher anomaly density, an autonomous GPS may be used.

A Leica RTK GPS System 1200 (or equivalent) will be used for high-resolution spatial positioning. The Leica system utilizes a base station that is set on a known position. The base station determines its location using satellites and then applies a correction based on the offset from the known coordinates at the location. This correction is then transmitted to a rover that is in direct communication with the base station through a radio link. The Leica System 1200 units are capable of recording survey-grade measurements in real time and providing immediate accuracy of less than several inches. In some areas, it may be desirable to use a GLONASS-enabled RTK GPS system. GLONASS is the Russian equivalent of the United States' GPS; a GLONASS-enabled GPS instrument is able to utilize positioning signals from both U.S. and Russian satellites, resulting in significantly better performance, particularly in areas with some tree cover. Use of a GLONASS-enabled system also requires different acquisition and processing software than a standard RTK GPS system.

The Trimble Geo XH 5000 or 6000 series (or equivalent) are autonomous GPS systems capable of providing real-time positions of several feet to several tens of feet depending upon the number satellites visible and the satellite geometry. Position data are recorded by the unit and can also be output as a real-time data stream via a serial adapter to the geophysical sensor's data logger.

The Leica TPS1200 (or equivalent) is a motorized RTS that uses automatic target recognition to track the location of a prism and has a highly accurate distance/azimuth measurement system to produce ± 2 millimeters accuracy. The RTS system hardware consists of three integrated components: (1) the Leica TPS1200 dual-laser RTS, (2) the RTS rover remote link control panel, and (3) a survey prism that is tracked by the RTS base station. The position data are recorded onto a data storage card on the RTS. The data storage card can be used to transfer position data between the RTS and field computers. For DGM, RTS position data can also be output as a real-time data stream via a serial adapter from the remote link to the geophysical sensor's data logger.

The fiducial positioning method relies on data collection in a straight line between two known (georeferenced) locations at a constant pace, and the sensor measurements are translated from relative distance traveled between the two known locations into actual georeferenced coordinates using the state planar locations of the known locations. In order to provide accurate positions, the terrain between the two known locations should be relatively flat and smooth.

The determination of the specific positioning method used in areas of canopy (RTS or fiducial) will be addressed during reconnaissance activities during the initial stages of the field program. In addition to providing position data for the geophysical sensor measurements, the RTS or GPS systems will be used for other location tasks, including:

- **Feature Identification**: The RTS or GPS systems will be used to augment DGM and improve the resulting product through capture of visual observations made during the DGM program. RTS or GPS will be used to record the positions of cultural features (e.g., resistivity electrodes, fences, vehicles, wells, structures, manhole covers, aboveground utilities, sign posts, etc.) so that these features can be accounted for during the interpretation of the geophysical data.

- **Anomaly Reacquisition**: RTS or GPS will be used for anomaly reacquisition of smaller scale individual anomalies detected during DGM activities as well as test pit locations placed within disposal features. The "Stakeout-Mode" feature for these units facilitates quick and reliable relocation of the specified coordinates.

Position data for the project will be reported in State Plane, Alabama East Zone, North American Datum 1983 in U.S. Survey feet in order to be compatible with existing project information and other sources of data.

5.6.3 Initial Validation of Instrumentation

A geophysical-prove out is not proposed for this project to validate the use of the DGM sensors and associated positioning systems for detecting large-scale features such as burial trenches and pits, as the ability of the systems to perform that task has been well documented and it would not be cost-effective to simulate large-scale burial conditions for the purpose of proving the application of the instruments. However, instrument

functional checks will be performed over an instrument verification strip (IVS) prior to the project start and minimally once each day to ensure the sensitivity and repeatability of the G858G magnetometer (gradiometer) and EM61-MK2. The EM31 SH functionality and repeatability will be determined by performing the instrument functional checks specified in the operational manual for the instrument and collecting repeat data during data collection activities. An IVS is not applicable for resistivity surveys. The positioning systems used with the DGM sensors are also evaluated on a daily basis.

All instrument functional checks will be conducted at specific areas within each site that are characterized by "background" characteristics (e.g., free of large sources of metal or man-made interference). Results of the instrument tests will be digitally documented and submitted to the Army to ensure the information generated provides data of sufficient quantity and quality to meet the project objectives.

Shaw will utilize an IVS approach to validate the EM61-MK2 and G858G sensors, positioning methods, and data acquisition protocol. One IVS is proposed for each project site; however, based on logistical considerations, a nearby IVS may be substituted. Prior to construction of the IVS by Shaw geophysicists, surface and vegetation clearance of the proposed IVS location will be performed. After the clearance activities have been completed, a background geophysical survey will be performed using the EM61-MK2 or G858G over an area of approximately 0.125 acre. If anomalies are present during the background survey, the IVS will be positioned within the area to minimize their effect. Anomalies that are detected during the background survey may be removed prior to construction of the IVS by qualified UXO technicians if approval is granted by the Army.

A majority of the IVSs for this project will consist of two small industry standard objects (ISO). The small ISO is a 1-inch by 4-inch pipe nipple made from Schedule 40 black carbon steel from McMaster Carr Hardware (or equivalent). The ISOs will be buried flush with the surface at vertical and horizontal orientations, approximately 15 to 20 feet apart in a "background" area of the site (i.e., area void of subsurface metal and EM interference). The positions of the IVS items will be recorded or verified by a licensed land surveyor to an accuracy of ± 1.5 inches.

The geophysical instruments will be passed over the IVS a minimum of four times in order to establish an average value as a baseline for the site being studied. Thereafter, the instruments will be passed over the IVS each day and the daily values compared to the baseline value. A daily value within ± 25 percent of the baseline value will be considered acceptable.

MEC items that are anticipated to have unique decay properties (e.g., thermite bomblets), or items not accounted for by the Naval Research Laboratory (NRL) detection curves or Fort Ord Ordnance Detection and Discrimination Study program may be included within the IVS for a particular site (e.g., smoke grenade canisters). If

included, the signal responses and anomaly characteristics for these items will be used during the data analysis stage to refine or prioritize the anomaly list when applicable to the goals of the specific project. Surrogates will not be used in place of MEC items, as they would not provide useful information beyond that which already exists.

The IVS will be used to document the positioning repeatability, adequacy of the data acquisition parameters, and dynamic noise for the G858G. No criterion for signal repeatability is proposed, as the primary use of the system is to detect large-scale burial features.

The ISOs will be used to confirm the sensitivity of the EM61-MK2 and adequacy of the data acquisition parameters for detection of individual MEC items in terms of the sampling frequency, positioning system accuracy and precision, and sensor height above the ground surface. The amplitude of the items whose long axes are oriented perpendicular to the path of instrument travel or those that are vertical will be greater than 75 percent of the average determined during the first five runs of the IVS. Additionally, the EM61-MK2 measurements will be compared to standardized, physics-based models of the ISOs created specifically for munitions response projects by the NRL. For sites where full-coverage DGM is collected to support the characterization objectives, multiple acquisition lines will be collected at offset distances from the IVS in order to determine the across-track sampling requirements. A minimum of three parallel lines (two on each side of the IVS centerline) spaced at approximately 1.25 to 1.5 feet will be collected. Additional lines may be collected at increased offsets from the centerline, if necessary, to provide a complete, two-dimensional view of the anomaly characteristics. A dynamic “noise” line will be collected parallel to the IVS centerline at an offset distance of approximately 15 to 20 feet to assess the background noise at the site.

Based on past experience, it is anticipated that the minimum threshold for anomaly selection will be four to five times the site “noise.” Additionally, Shaw will perform a “walk-away” test to document the range of instrument responses for an ISO at minimum response orientation. The distances for the test will range from zero offset (center of coil directly over the item) to 3.3 feet (edge of coil directly over the item). This information will be useful in the design of the blind seeding program for sites where full coverage DGM is applied.

Shaw assumes an Army representative will be present in the field during the first IVS for each project cycle to approve the results. If the G858G and/or EM31 SH are the only instruments used during a project cycle, the initial testing will be performed and approval to proceed will be granted based on meeting the performance metrics specified in Section 5.7. Concurrence of the IVS results for the EM61-MK2 when used for full-coverage DGM applications will be based on meeting the following metrics:

- **Background Static Geophysical Sensor Check.** Ninety-five percent of the static measurements for the EM61-MK2 will be within 2.5 millivolts (mV) of background after instrument nulling.

- **IVS Check.** The responses for the EM61-MK2 for any ISO will not fall below a secondary detection band placed 25 percent below the lower boundary of the respective NRL detection curves. The allowable position offset will be ± 1.2 feet based on the location of the Channel 2 peak response compared to the location of the center of each ISO.

- **Background Dynamic Geophysical Sensor Check.** The standard deviation for dynamic noise at the IVS (i.e., areas where no metal is present) for each of the EM61-MK2 data channels will not exceed 1.0 mV, based on a leveled data set.

- **Known Location Check.** The acceptable difference in location measurement at a grid corner, survey monument, or control point at the IVS in static mode will be less than or equal to 0.5 foot when RTK GPS or RTS is used for positioning.

The stated metrics may be modified based on the initial results of the IVS, and any modifications will be documented in the IVS report. The results of the pre-project instrument functional checks and the initial IVS performed in support of full-coverage DGM will be submitted in a letter report to the Army for review and will include, at a minimum, the following information:

- As-built map of the IVS

- Digital photographs of the inert and ISO seed items as used and in the open hole

- Graphical plots of the EM61-MK2 DGM system responses for the ISOs superimposed on the NRL standardized curves as well as a summary table of EM61-MK2 instrument responses and decay parameters for each IVS item

- Color-coded maps of the geophysical data with track path superimposed

- Geophysical interpretation, including initial anomaly selection criteria

- Proposed geophysical equipment, techniques, and methodologies

- Recommended QC performance metrics

- Digital data and Microsoft® (MS) Access database (or equivalent)

If the deployment form for the EM61-MK2 or G858G is modified or multiple configurations of these instruments are used (e.g., RTK GPS, RTS, or fiducial positioning), each system will be run through the IVS. This will be performed in the IVS runs conducted at least daily during the DGM production survey.

As part of the IVS effort, all instrument functional and quality tests will be digitally documented and stored in the project MS Access database (or equivalent) for review by the Army.

If aboveground power line interference is present near any of the geophysical survey areas, static geophysical sensor data will be acquired prior to the initiation of production survey activities so that the information can be incorporated into the anomaly selection criteria, as applicable.

5.6.4 Data Collection

Overall, DGM data will be collected along transects and full-coverage grids using the performance metrics and quality objectives specified in Section 5.7 to ensure the information from the specific effort is of sufficient quantity and quality to meet the project objectives at each site.

5.6.4.1 Sampling Rates and Data Density

Along transects, the DGM sensor data will be acquired at the following minimum rates:

- EM31 SH – 3 to 5 Hz (preferably 10 Hz when used for some anomaly reacquire/ reconnaissance activities and when searching for magnetic soil anomalies (burn pads without associated metal)
- G858G – 10 Hz
- EM61-MK2 – 10-15 Hz.

At sites where full-coverage DGM data collection is necessary with the EM61-MK2 to meet the project objectives, data will be acquired along lines spaced at appropriate intervals to detect the items and features of interest at each site. In general, a line spacing of 2.5 to 3.3 feet will be sufficient to detect individual small and large MEC, respectively. Depending on all factors, coverage in excess of 90 percent is expected at the site-specific line spacing. When small burial pits of MEC are sought, the line spacing may be increased to approximately 5 feet.

For larger features of interest, such as burial pits and trenches, the line spacing will be selected to ensure the feature is traversed a minimum of two times during initial data collection activities. Refinement transects may be performed to more fully characterize the boundaries and contents of the features of interest.

RTK GPS, DGPS, autonomous GPS, or RTS data will be streamed into the data recorder for the geophysical sensors using a National Marine Electronics Association (NMEA) data string or pseudo-NMEA data string at a rate of 1 to 4 Hz.

Performance metrics for elements associated with data acquisition, such as platform speed and along- and across-track coverage, are reviewed in Section 5.7.

5.6.4.2 Production Rates

DGM production rates are highly variable and depend on several factors, including topography, vegetation, presence of water, site access, proximity of the survey area to the mobilization area, weather conditions, and the spacing between adjacent acquisition lines. Daily production rates will be included in the site-specific work planning documents as warranted.

5.6.4.3 General Data Collection Procedures

If DGM is necessary to meet the objectives at a particular site, a system of transects or full-coverage grids will be used, and geophysical measurements will be acquired along parallel to sub-parallel survey lines that are spaced at appropriate intervals to detect the items and features of interest.

General procedures for one-dimensional transect and two-dimensional full-coverage grids include the following:

- Conduct tailgate safety meeting. Remind crews to use project-specific file naming protocol for all files.
- The lead Site Geophysicist or designee (field geophysicist) for the DGM team will review the intended survey area on a daily basis for proper vegetation removal and safety hazards. Set up visual navigation aids (fiberglass measuring tapes, traffic cones, spray paint, etc.) as necessary to assist team in acquiring data at regular intervals over the survey area.
- If RTK GPS is used, set up the base station system at an approved monument or control point.
- Perform daily morning instrument functional checks at the certified test area using appropriate positioning system/method and site control.
- Set up the RTS unit at an appropriate location within the survey parcel. Determine the coordinates of the RTS using minimum of two control points and verify the location using a third independent control point. If autonomous GPS or DGPS is used, check the relative position quality and number of satellites available. When fiducial positioning is used, ensure the intended survey area is identified and the unique site identification (ID) is entered into the respective instrument data logger.
- Commence DGM data acquisition over area of interest; review static data for 15 to 30 seconds prior to beginning.
- Systematically survey the site in the most effective pattern. Traverse intended survey area at a consistent pace of approximately 3 miles per hour (mph) or less as terrain and safety dictate; minimize sensor bounce and sway, especially over rougher terrain. To ensure that the spatial coverage necessary is achieved, the

instrument operator may navigate using several methods: 1) GPS (when used), 2) traffic cones placed at regular intervals along each acquisition line, 3) observing the tracks of previous lines and offsetting the new line to obtain adequate coverage, or 4) the use of spray paint chalk or other approved marker to mark the position of the next line as the current line is walked.

- Terminate data acquisition session when area planned for survey is complete or DGM system batteries need replacement. Review static data for 15 to 30 seconds prior to ending each acquisition session.

- Perform end-of-day instrument functional checks at the certified test area using appropriate positioning system/method and site control.

- Fill out FADL.

- Create digital "readme file" for each day's collection activities that documents file names, survey areas, and any quality issues encountered.

- Download DGM data to the dedicated geophysics field computer and immediately back up to digital versatile disc (DVD) or a USB drive and/or transfer to the Shaw DGM processing center using a secure file transfer protocol (FTP) or SharePoint site.

- Preprocess data and review track path and sensor data. Overlay data on the site base grid layout map or transect map to determine coverage and general data quality.

5.6.4.4 Daily Instrument Tests

As part of the data collection process, instrument functional checks will be performed at the start of the project and at the beginning and end of each day to ensure the geophysical instrumentation is operating as intended. The test regimen will be performed at a predetermined area within each site. The DGM QC program (Section 5.7) specifies the daily tests required and the performance metrics that need to be achieved to ensure proper execution of all components of the work performed to detect, locate, and reacquire anomalies. The QC program will be administered by the Project and QC Geophysicists.

5.6.5 Data Processing

Shaw's standard data processing includes review of data in the field for general quality followed by more intensive analysis at the data processing center to include latency and drift correction, statistical assessment of the DGM performance metrics, and generation of color-coded images of the geophysical sensor data and track path. Shaw will use the equipment manufacturers' software, in-house software, and Geosoft's Oasis Montaj UX Process software to complete all processing tasks.

Shaw will use the following software to process/analyze the geophysical data:

- Geonics DAT31MK2 or DAT61MK2, for review of FDEM/TDEM data and output of a merged file with positions in American Standard Code for Information Interchange (ASCII) format.

- Because of the particular type of NMEA Message utilized by a GLONASS-enabled RTK GPS system, if such a system is used it will be necessary to use NAV31 and/or NAV61 software for data acquisition, together with Trackmaker31 and/or Trackmaker61 software for initial processing.

- Geometrics Magmap 2000 for initial review of magnetometer data, de-spiking, base station correction, and output of a merged file with positions in ASCII format.

- The EarthImager 2D or RES2DINV inversion software to review of the raw resistivity data, to perform a data point noise analysis, and to edit noisy data. Inversion processing are performed to analyze and compare the measured pseudo-apparent resistivity section and calculated pseudo-apparent resistivity section.

- Geosoft Oasis Montaj for latency and drift corrections, interpolation and generation of color-coded images, and statistical analysis of the data in terms of the performance metrics such as spatial sample density, static, static spike, dynamic noise, and IVS results. Oasis Montaj will also be used to review the results of previous geophysical surveys when the digital data can be located.

- Leica or Trimble software for location survey and cultural feature mapping tasks as well as for statistical review of position data.

Geosoft Oasis Montaj will be the primary software used for most data processing tasks. The Oasis processing log file (process.log) will be recorded by the software and serve as the digital documentation for the processing parameters used for each data acquisition session.

5.6.5.1 Data Organization, Initial Processing, and Data Tracking

The data processing begins by organizing the data on the Shaw secure server using the following structure:

Site Name (e.g., RSA-141)
Geodata
051412 (May 14, 2012)
Raw
Proc
GIS

The raw data for the DGM sensors will be copied to the “proc” directory for further processing and will never be compromised so the sequence of events can be reconstructed in the future, if necessary. The raw binary data are converted to an ASCII format using Geonics DAT31MK2, DAT61MK2, Trackmaker software, or Geometrics MAGMAP 2000 software and concurrently reviewed to ensure the sensor and positioning equipment are functioning properly and that the data are accurately

positioned along survey lines and corrected for acquisition geometry. The final step of the process includes output of an ASCII "XYZ" file that includes the coordinates (State Plane, Alabama East Zone, North American Datum 1983, U.S. Survey feet), sensor measurements for each data channel, and a quality indicator for the positioning device (if applicable). The format of the "XYZ" file will be consistent for the project and compatible with Oasis Montaj.

Each data acquisition file name is digitally documented using a data tracking spreadsheet, MS Access database, or the project database. Other information recorded in the database includes the responsible geophysical crew, the grid(s) or area that the file covers, date collected, date processed, data transferred to the Army, and the initials of the data processor. Comments are included, as necessary, to support the project record.

5.6.5.2 Review of Instrument Functional Checks/Daily Tests

The ASCII data from the initial processing are imported into Oasis Montaj using a predefined processing script. The data for each morning and evening test sequence are reviewed by the data processor to document compliance with the performance metrics. The general steps performed include the following:

a) Review of Geophysical Sensor QC Data: Sensor QC test results (e.g., static background and spike, cable shake, personnel, dynamic noise evaluation, and IVS repeat) will be reviewed to ensure proper system function. This step validates the repeatability of the geophysical sensor and technology and the standard response to known items in both static and dynamic modes of operation (EM61-MK2) and provides information on the background noise in the survey area. Conformance with the performance metrics is digitally documented for each data acquisition session using MS Excel or the MS Access database.

b) Review of Position and Spatial Sampling QC Data: Positioning system and spatial sample density QC test results (static position, comparison with a known control point, along- and across-track measurement spacing, and sensor velocity) will be reviewed to ensure sufficient amounts of data are being collected based on the specific objectives for each site. This step validates the repeatability and accuracy of the positioning system as well as the overall data acquisition protocol in terms of the navigation procedures. Conformance with the performance metrics is digitally documented for each data acquisition session using MS Excel or the MS Access database.

For each data acquisition file, a unique line code will be entered into the Oasis Montaj database that documents the date of acquisition, responsible crew (if multiple teams are used), and the sensor technology if multiple technologies are used.

5.6.5.3 Final Data Processing

The data processor will use a predefined Oasis Montaj script(s) for each data acquisition file to correct the data for latency, level the data to a common background

(drift removal) using the UX Process drift correction tool (EM61-MK2 and EM31 SH in-phase), and interpolate the sensor data channels to generate color-coded images used for analysis and interpretation. The minimum curvature gridding routine will be used to interpolate the data using an appropriate cell size, blanking distance, and initial search radius that is determined after assessing the initial DGM data. The color-coded images will be transcribed onto the plan map of the site for analysis and interpretation.

The Oasis Montaj processing log file contains the data processing parameters used and will be recorded during the processing of each data acquisition session. The Oasis Montaj processing logs will be maintained throughout the duration of the project on the Shaw secure server.

Additional tasks during the final data processing include deletion of turnarounds and overlapping data past the edge of the defined data acquisition area (i.e., grid edges) and examination of the data with respect to the location of significant cultural or natural features (monitoring wells, trees, utilities, etc.) observed on site base map. If any data gaps are present, the data processor will digitize the area and transfer the coordinates to the Site Geophysicist for subsequent fill-in. The location of data gaps will be recorded in an Oasis Montaj database.

The final processed data for each acquisition session will be copied to a "master" Oasis Montaj database for the project to track the data acquisition process on a daily basis and to allow continual review of the data by the QC and Project Geophysicists and the Army in an efficient manner. The raw and final processed data for each data acquisition session will be provided to the Army for independent interpretation/evaluation at intervals agreed to at the start of each project cycle. A secure FTP or SharePoint site for the project will be used to transfer the DGM data.

For QC purposes, the data will be pre-processed in the field and all files backed up and saved for later in-house processing. The final inversion models derived from the EarthImager 2D or RES2DINV (or equivalent) software will result in the generation of two-dimensional resistivity image sections.

5.6.5.4 Anomaly Selection

For DGM data that are collected with the EM31 SH, G858G magnetometer, or EM61-MK2 to detect and accurately locate relatively larger burial features such as trenches and pits, the signal intensity and shape of the anomalies will be the primary components used to interpret the data and select optimum locations for test pits.

For DGM data acquired over full-coverage grids or along transects with the EM61-MK2 in an attempt to detect and accurately locate relatively smaller MEC items, anomalies for potential investigation are selected via a three-step process: (1) initial automated selection, (2) anomaly refinement and potential classification, and 3) random and/or manual selection and final prioritization. If the UXO Estimator is used to determine site coverage, only steps 1 and 2 are applied.

The first step is automated anomaly selection based on a predefined signal intensity threshold. One dimensional transect data are analyzed using the "uceanompick gx" module (or equivalent) with appropriate parameters determined from the NRL detection curves, IVS results, and production data. The Oasis Montaj program "gridpeak.gx" (or the Blakely method in UX Process) is used for threshold selection when full coverage grids are evaluated. Based on historical excavation results, the MEC potentially present in the survey areas, and previous munitions response project experience, it is anticipated that a signal intensity of approximately 4 to 5 mV will be used for the EM61-MK2 Channel 2 data (or equivalent sum channel intensity). The stated signal intensities represent a signal-to-noise ratio (SNR) of approximately 4 to 5 based on the anticipated background "noise" and will ensure that false positives are minimized (i.e., excavations where no metal items are identified that are consistent with the geophysical anomaly characteristics). Automatic selection of anomalies using a computer algorithm is implemented as a QC tool to minimize the occurrence of human error in the decision process.

DGM data collected in areas of low to medium anomaly density where anomaly signatures do not overlap may be further evaluated, as necessary, to classify anomalies based on anomaly attributes such as signal intensity, relative size, signal shape, and decay information. At this stage, anomalies caused by documented cultural features (subsurface utilities, power lines, monitoring wells, etc.) are removed from consideration. In regions of high anomaly density where it is generally not possible to differentiate individual anomalies, the analyst will manually draw a polygon around the saturated anomaly area and select specific areas for potential investigation using test pits.

If UXO Estimator is used to determine the site coverage, all anomalies thought to be related to munitions are placed on the dig list and investigated. In order to support the process, a signal threshold is applied to the entire anomaly population. The value for the signal threshold is based on information such as the NRL detection curves/Fort Ord Ordnance Detection and Discrimination Study, IVS information, and historical excavation results. A threshold value of approximately three to five times above the site noise is selected to eliminate a potential high number of false positives. The value selected for the signal threshold ensures potential MEC items of interest at the site are investigated with a high degree of confidence.

When the UXO Estimator is not used to determine site coverage, the anomaly prioritization and selection process uses the information from the automatic selection and initial classification processes in conjunction with historical excavation results and related site information on the size and distribution of MEC anticipated to determine an optimum anomaly sampling strategy that meets the objectives of the Army. Using the automatically selected anomalies and classification information as a guide, the interpreter selects candidate anomalies or features for investigation using random

(statistical) and/or biased methods. A "target" Geosoft database (GDB) (Oasis Montaj database) is updated with the prioritized anomaly selections during this process.

When full-coverage DGM is applied over an entire project site, a portion of the anomalies will be investigated to support site characterization. The portion of anomalies to investigate will be determined using the classification approach previously described and/or a statistics module that is based on estimation of the required sample size for populations. The input parameters for the module are confidence level, proportion of anomalies anticipated to be MEC, and error tolerance. Based on Shaw's past experience using the module, 10 to 50 percent of the anomalies are usually selected for investigation.

The final dig list will contain locations of individual anomalies and/or test pit locations selected for investigation. The dig list will document, at a minimum, a unique site and target ID, easting and northing coordinates, sensor intensity information, and any additional fields for sensor calculations necessary to support the selection or prioritization of anomalies such as decay constants, relative size, SNR, and comments. Test pit locations may be provided to the Shaw GIS department as shape files to permit the most efficient and accurate upload of the information to the anomaly reacquisition system.

5.6.6 Anomaly Reacquisition

Anomaly reacquisition consists of the relocation of the interpreted coordinates for each anomaly on the dig list and adjustment of the location in the field, as necessary, in order to minimize the size of the hole that requires excavation while ensuring the actual item(s) that caused the anomaly are identified.

The reacquisition team will be provided with a color-coded image of the area and the dig list with the proposed intrusive locations transcribed onto the map to facilitate the efficient reacquisition of each anomaly. The color-coded image will also assist the reacquisition team with the specific reacquisition protocol in areas of medium and high anomaly density or when performing reacquisition of anomalies from previous geophysical surveys that were collected in a relative coordinate system and whose location may be have errors of several feet or more.

5.6.6.1 Contemporary DGM

For DGM programs performed under the current contract, the "Stakeout" mode of the respective positioning system (RTK GPS or RTS) will be used to relocate anomalies and features of interest that will be investigated using hand digging or mechanical excavation (i.e., test pits). When individual anomalies within full-coverage grids are reacquired, the same sensor technology used during data acquisition will be used for anomaly reacquisition (e.g., EM61-MK2). The location specified on the dig list will be reacquired to a tolerance of ± 0.5 foot, the surface location marked with a nonmetallic pin flag or boot mark, and the offset documented. A 3-foot radius will be searched around the marked location and the optimum location for the intrusive investigation

determined. The offset between the final location marked for digging and the reacquired location will also be documented.

For individual anomalies detected on transects where the original position data were acquired with RTK GPS or RTS, a rectangular area whose long axis is perpendicular to the direction of travel of the instrument will be searched with the EM61-MK2 or G858G and a pin flag positioned at the peak instrument response nearest to the axis of the transect. The rectangular area that will be searched will be approximately 4 feet in width by 2 to 3 feet in length. Shaw does not anticipate the use of a DGM sensor to reacquire large-scale disposal features such as pits and trenches where test pits will be used for characterization. However, if a proposed test pit location is within 10 feet of a known utility or sensitive area, a DGM sensor will be used so the excavation occurs in the safest manner possible.

5.6.6.2 Historical DGM

One of the primary tasks at each site where previous DGM data exist is to perform anomaly reacquisition of burial trenches and pits. A significant amount of the previous geophysical data were collected with the EM31 and/or G858G over relative grid systems where the fiducial mode of positioning was used to locate the DGM sensor measurements. At many of the sites, there are significant anomalies in the geophysical data that resulted from cultural features such as monitoring wells, fences, and utilities along the edges of roads. When the DGM data are transformed into the appropriate state planar coordinate system and transcribed onto the current aerial photograph of the site, it is possible to estimate the location error in the original survey in different areas by comparing the location of specific anomalies in those areas with the location of the actual features in the aerial photograph.

Based on a review of previous data, the estimated errors are less than 5 feet in most areas. However, because some of the burial features in these areas are less than 10 to 15 feet in width, an RTK GPS or RTS will be used for anomaly reacquisition. A high proportion of the test pits were selected in areas where large amounts of metal are anticipated, and an EM61-MK2 will be used to further validate the optimum placement of the test pit by collecting reconnaissance data within a localized area (25 to 30 square feet) near each proposed test pit location.

In relatively few areas, test pits are proposed where large accumulations of metal are not present. If a significant amount of buried metal is not anticipated, the EM31 SH may be employed during anomaly reacquisition. Regardless of the instrument used, the search pattern will include several data profiles parallel and perpendicular to the anticipated orientation of the trench for verification prior to excavation activities.

5.7 Quality Control

The Shaw quality system used a process-oriented approach to ensure the resulting data from the DGM investigation are of sufficient quantity and quality to meet the project objectives. The Shaw project, site, and QC geophysicists, equipment operators, and

data processor/analyst implement our field and office QC program in a systematic fashion.

During field operations, the DGM system equipment must be verified to be low in background noise, have repeatable signatures of QC test items, and be within project tolerance for the position tests. During the processing and analysis of the data, important metrics that are checked for conformance are related to instrument functionality, sample density, coverage, dynamic noise, positioning system functionality and repeatability, and anomaly selection and prioritization.

5.7.1 Daily Tests

The performance metrics proposed for the geophysical instruments and quality metrics for the spatial sampling components of the DGM system and "noise" are derived from previous industry experience and the table "Performance Requirements for RI/FS Using DGM Methods."

The project MS Access database (or equivalent) will be used to digitally document the activities associated with the DGM process for the entire project duration. The information will be updated on a daily basis and uploaded to the project FTP or SharePoint site on a weekly basis for review by the Army.

Test Site Establishment

An instrument functional check near each project site will be established at a convenient location determined to have "background" characteristics (e.g., free of large sources of metal or man-made interference). The test area will consist of a marked reference area where instrument function checks may be performed. Multiple test areas will likely be necessary for larger project sites, and one of the test sites will be coincident with the IVS.

Instrument functional checks that occur on a daily basis during DGM field operations include the following:

- Instrument warm-up (all DGM instruments)
- Instrument operator(s) metal check (ensure no metal present on data acquisition personnel)
- Personnel test (all DGM instruments)
- Cable shake test (all DGM instruments)
- Static background test (all DGM instruments)
- Static Response (spike) test (EM61-MK2 and G858G)
- IVS check (EM61-MK2 and G858G)

- Known position check (occupation of survey monument or control point with RTK GPS, RTS, DGPS, or autonomous GPS)

- Repeat data collection (EM31 SH only).

The manufacturer recommended test procedures for the EM31SH (instrument zero and phasing checks) will be performed at the start of each day of use. The procedure is documented in the EM31 SH instrument manual.

A FADL will be filled out each day by the Site Geophysicist or designee. A copy of the FADL is included in Appendix B. At the beginning of each project, the make, model, and serial number of each piece of major equipment will be noted on the FADL. A digital image of the data acquisition platform will also be acquired on the first day and each time thereafter when a significant change to the platform occurs.

General descriptions for the instrument functional checks follow:

Record Sensor Position. At the beginning of the survey, and thereafter at any changes in form factor, the relative position of the geophysical sensor with respect to the positioning system antenna or prism will be measured and documented, as will the platform or sensor height above the ground surface. The result of the test is documented on the FADL.

Instrument Warm-Up. Most instruments require a few minutes to warm up before data collection begins to minimize sensor drift. All instruments will be allowed to warm up for at least 5 minutes prior to data collection. This procedure will be followed each time the instrument is powered up (e.g., at the start of the day and after breaks). The test is documented on the FADL.

Operator Metal Check. The operator(s) will visually check each other for metal objects and operators will check their own pockets for metal.

Personnel Test. The Personnel Test is performed to ensure that no relatively larger metal items are present on data acquisition personnel (e.g., keys, boots, belt buckles). With the instrument held in static position, the operator(s) move adjacent to the sensor while measurements are being recorded for a period of approximately 15 seconds. The results of the test are digitally documented with the project MS Access database (or equivalent).

Cable Shake Test. The cable shake test is performed for a period of approximately 15 seconds to document any cable or connection problems. With the instrument motionless and recording data, each data cable is gently shaken, and the cable connector is wiggled to test for shorts or bad connections. The results of the test are digitally documented using the project MS Access database (or equivalent).

Static Background Test. The Static Background Test monitors the instrument background readings and electronic drift, and identifies potential site interferences. With the instrument held in a static position, measurements are recorded for a period of approximately 30 seconds (the initial test at the start of the project may be recorded for a duration of up to 60 minutes). The results of the Static Background Test are digitally documented using the project MS Access database (or equivalent).

Static Response (Spike) Test. The Static Spike Test monitors the impulse response and repeatability of measurements over a standard test item. The standard test item is a 1-inch by 2-inch or 1-inch by 4-inch pipe nipple. For the EM61-MK2 and G858G, the standard test item is placed at a predefined location on the man-portable unit on a rigid bracket or tube, and measurements are recorded for a duration of 30 seconds. During project execution, the reference response will be calculated as the average of the first four project tests (two days). The results of the Static Spike Tests are digitally documented using the project MS Access database. The static response test may be integrated with the static background test to facilitate documentation of the results using the MS Access database.

IVS Check. The repeatability of geophysical mapping data is monitored by the collection of replicate data over the IVS items. During the initial test, five runs of the IVS centerline will be performed, and an average response will be calculated for each IVS item and compared to the NRL detection curves. The results of the test are digitally documented using the project MS Access database.

Contact Resistance Test. Initial QA/QC Contact Resistance Tests are performed prior to the acquisition of resistivity measurements along each of the electrode spread layouts, and subsequent rolls. The test is performed to confirm adequate electrode-to-ground electric coupling. This test does not result in any digital data; however, the operator sees results on the instrument console as the test is performed.

Known Position check. The acceptable difference in location measurement at a grid corner, transect endpoint, or survey monument is less than or equal to 0.15 m (0.5 ft) when the DGM system positioning unit (RTK GPS or RTS) is coincident with the known location.

Additional tests for the G858G (octant test, height of sensor above ground) may be performed if the G858G is used for the detection of small MEC within full coverage grids, which is not anticipated.

Some of the instrument function checks discussed above are quantitatively evaluated during the initial data processing that occurs each day. Table 1 summarizes the metrics for the instrument functional checks based on Shaw experience in performing DGM for munitions response projects.

Table 1
DGM Instrument Functional Check Interval and Performance Metrics

Test	Sensor / Acceptance Criteria	Frequency of Testing			
		Start of Day	Start and End of Day	First Day of Project Only	Equipment Change
Instrument Warm-up	Equipment Specific –typically 5 minutes and readings have stabilized.	X			X
Record Sensor Position	EM61-MK2 – ±1 inch when performing full coverage grids for identification of individual MEC EM61-MK2, G858G, EM31 SH (1.5 ft when mapping burial features)			X	X
Personnel Test (15 seconds)	EM61-MK2 – 2.5 mV for all data channels G858G – 3 nT for all data channels EM31 SH – 1 ppt (in-phase)		X		X
Cable Shake Test (15 seconds)	EM61-MK2 – Data spiking > 3 mV not evident in profile for all data channels G858G – Data spiking > 3 nT not evident in profile for all data channels EM31 SH – Data spiking > 1 ppt not evident in in-phase profile		X		X
Static Background Test (30 seconds; ~ Up to 60 minutes at start of project)	EM61-MK2 – 95% within 2.5 mV for all data channels G858G – 95% within 3 nT for all data channels EM31 SH – 95% within 1 ppt (in-phase)		X		X
Static Response (Spike) Test (30 seconds)	EM61-MK2 and G858G – within 10 percent of reference response determined at start of project EM31SH – NA		X		X
IVS Check	EM61-MK2 – Within 25% of respective NRL detection curves and position offset < 1.2 ft (3 ft when mapping burial features) G858G – Amplitude > 75% of reference value over vertical ISO and position offset < 1.5 ft (3 ft when mapping burial features) EM31 SH – NA All Daily IVS Checks Within ± 25% of Baseline Value from First Day		X	X – Min. 4 Passes For Baseline Value	X

Test	Sensor / Acceptance Criteria	Frequency of Testing			
		Start of Day	Start and End of Day	First Day of Project Only	Equipment Change
Known Position Check	RTK GPS, RTS – within 0.5 ft of monument or control point DGPS – within 3.5 ft of monument or control point Autonomous GPS – within 35 ft of monument or control point Fiducial – full coverage grids; diagonals ± 1 ft in flat terrain		X		
Production Repeat Data	EM31 SH only – within 1.5 ppt (in-phase) and 2 mS/m (quadrature)	X*			
Background Dynamic Sensor Check	EM61-MK2 – stdev < 1 mV (1.5 mV when mapping burial features) G858G – stdev < 1 nT (1.5 nT when mapping burial features) EM31 SH – stdev < 1 ppt (in-phase); (1.5 ppt when mapping burial features)	X (one check per acquisition session or parcel and/or use)			

mV - Millivolt(s).
nT - NanoTesla(s).
ppt - Parts per thousand.
mS/m - Millisiemens per meter.
stdev - Standard deviation.
* - Repeat data for the EM31 SH are usually collected at the end of each acquisition file.

In addition to the analysis of the field tests during data processing, quantitative criteria are proposed for the following spatial sampling components of the DGM system:

- ***Along-Track Sampling:*** Ninety-eight percent of the EM61-MK2 measurements for each linear mile or parcel (e.g., 1 acre grid) will be less than or equal to 0.8 foot and less than 1.5 feet when mapping burial features with the EM31SH and/or the G858G. The Oasis Montaj histogram tool will be used to evaluate this metric.

- ***Across-Track Sampling:*** The metric is only applicable to full coverage DGM surveys with the EM61-MK2. Greater than 90 percent of each parcel (e.g., 1 acre grid) will be covered at project line spacing, excluding data gaps because of vegetation or other obstacles that preclude the survey platform from providing complete coverage. Areas that exceed 1.25 times the project line spacing, excluding data gaps from trees or other obstacles, may be identified by the data processor as potential "fill-in" areas; data gaps will be not be specified by the processor where the collection of additional data will not provide useable information (e.g., high-density anomaly areas, buildings, adjacent to cultural features, etc.). This metric is intended to control data gaps from inconsistent navigation that are not associated

with trees or other obstructions. The Oasis Montaj tool ucefootprint.gx may be used to evaluate this metric.

The color-coded images generated from the final processed data must be representative of the site conditions. During the interpretation phase, checks performed to ensure the representativeness of the data include the following:

- ***Latency Correction:*** The data will be aligned to one sample increment or so that excessive "chevrons" are not apparent in the final data product.

- ***Dynamic Position Check:*** The metric is only applicable to full-coverage DGM surveys designed to detect individual MEC items. A minimum of 75 percent of the anomalies from the grid corner nails for the full coverage DGM grids will be selected by the Shaw data interpreter or QC Geophysicist during the project. The interpreted locations will be compared to the known locations of the grid corners and 95 percent will be less than or equal to 1.1 feet plus half of the design line spacing (root mean square error) from the known locations when RTK GPS or RTS positioning systems are used.

- ***Blind Seed Items:*** When used for full coverage DGM applications, all blind seed items must be interpreted to within 1.1 feet plus half of the design line spacing (root mean square error) of any part of the blind seed item projected to the surface. Blind seed items will consist of small ISOs or inert MEC and will not be buried past a depth where the SNR is less than 5 based on the NRL detection curves.

- ***Data Consistency:*** Consistent channel naming conventions, processing parameters and methods will be used for all data sets and channels within each data set by using Oasis Montaj scripts.

- ***Overlapping Data Acquisition Lines:*** Numerous data acquisition lines that overlap within a confined area at large angles have the potential to degrade the representativeness of the sensor data. As necessary, portions of overlapping acquisition lines will be modified to include only those lines necessary for data interpretation.

After the geophysical data are interpreted, specific anomalies may be reacquired and excavated by UXO-qualified personnel. In order to ensure these processes meet the project objectives, the following checks related to the DGM system are performed:

- ***Anomaly Reacquisition:*** Reacquisition of anomalies must be successful to within 2.0 feet of their interpreted location as specified on the dig list for full-coverage DGM grids. The reacquired amplitude will be recorded and will typically be greater than or equal to the original amplitude and 95 percent of their locations will be less than or equal to 3.3 feet for individual "point source" anomalies. A "lot" will consist of the equivalent of 4 quarter-acre grids. Reacquired anomalies less than or equal to 75 percent of the original amplitude or greater than or equal to 125 percent

of the original amplitude will be re-examined for both position and anomaly attributes to ensure the correct anomaly has been reacquired.

- ***Anomaly Selection:*** All anomalies included on the dig sheet will meet the anomaly selection criteria as established at the beginning of the project. If the anomaly selection criteria are modified during project execution based on the intrusive findings, the Army will be notified and consulted via a field change request prior to implementation.

- ***Feedback Process:*** For anomalies that are intrusively investigated during the project, the Project, QC, or Site Geophysicist will review the excavation results with respect to the geophysical anomaly characteristics and selection criteria. If there are potential discrepancies, they will be documented in the project MS Access database (or equivalent).

- ***Hole Checks:*** Acceptance sampling for anomaly resolution will only be used if full coverage DGM within grids is applied to support the detection of individual MEC items. If the EM61-MK2 indicates that metal is no longer present (Channel 2 less than or equal to 5 mV or as determined by the IVS results), the excavation can be backfilled. If metal is determined to still be present, the excavation will continue to a depth agreed upon by the Army. An appropriate lot size will be selected and a sufficient number of holes will be checked with the DGM sensor used during production activities to ensure there is a 90 percent confidence that less than 5 percent of the uninvestigated anomalies are unresolved based on the USACE table "Performance Requirements for RI/FS Using DGM Methods."

Blind seed items will be used as a QC tool when full-coverage DGM is applied to support the detection of individual MEC items. Blind seeds (small ISOs) will be placed throughout the full-coverage DGM grids at predetermined depths and orientations so that each team encounters an average of one blind seed item per day. No seed item will be buried at a depth where the NRL response curves indicate that the resulting SNR will be less than 5 for Channel 2 of the EM61-MK2. The Shaw QC Geophysicist and/or UXOQCS will utilize the project MS Access database (or equivalent) to document the blind seed item type, depth, orientation, and actual coordinates. These data will be merged with the results from the interpretation, which include the EM61-MK2 signal intensity, interpreted coordinates, and decay information. After the interpretation for a grid is submitted to the client, the blind seed information for that grid or area may be released to the data interpreter, if necessary.

If a blind seed item is not selected as a potential target of interest during the interpretation or does not meet the blind seed item positioning metric, a root cause analysis will be performed. Based on the analysis of the information, corrective action(s) will be proposed to the Shaw PM and the Army. Corrective actions may consist of reprocessing or re-collection of data, or adjustment of the interpretation criteria and/or protocol.

The results for all instrument functional checks and spatial sampling quality objectives will be documented in the project MS Access database (or equivalent). If the stated performance metrics or quality objectives are modified the revised metric(s) or objectives will be provided in SFSP**,** MEC Work Plan, or GIP for the particular site.

Shaw geophysicists will complete a Data Use Form for production geophysical data when a performance metric or quality objective does not meet the agreed to criteria and the production data is determined to be useable for the final data product. The Data Use Form documents the nonconforming condition, proposed resolution, and technical rationale for including the data in the final product.

5.7.2 Anomaly Reacquisition QC Program

Instrument functional checks will be performed for the DGM system prior to use each day during anomaly reacquisition. The instrument functional checks will consist of equipment warm-up, static background test, static spike test, and a known position check.

5.7.3 Corrective Measures

In the event of a failure of the DGM performance or quality metrics, Shaw's Project and QC Geophysicists will perform a root-cause analysis to identify the reason for the failure and quantity of data affected and whether corrective actions can be taken to correct, mitigate, or eliminate the cause of the failure. The results will be submitted to the Shaw PM and Army.

Specific corrective measures are dependent on the type of geophysical equipment used and will be developed on a site- and instrument-specific basis. However, the following are the basic corrective measures Shaw will employ for the DGM program:

- Replace sensors or instrumentation if they fail to meet performance metrics.
- Re-excavate anomaly locations if the Project or QC Geophysicist determines that the excavated item(s) are not associated or consistent with the initial target anomaly.
- Re-collect field data.

5.8 Deliverables

5.8.1 Information Management

The geophysical data files will be organized on Shaw's secure computer network. Electronic files will include DGM data, location survey data, and data transfer transmittal information to the client representative. Standardized file naming conventions and directory names will be used. File directory structures for field data

will be organized by day of year, with subdirectories for specific field activities (raw data, processed data, etc.).

5.8.2 Interim Reporting

Access to interim DGM data will be provided via a secure project SharePoint or FTP site. All digital data will be provided in formats compatible with the Army computer systems. Interim data will include the following:

- Raw and processed DGM data, with associated README files
- Draft processed/interpreted data for each parcel (or grid) as Oasis packed maps and GDB files
- Draft dig sheets from the geophysical interpretation as MS Excel spreadsheets or MS Access tables
- Anomaly resolution information in the project MS Access database (or equivalent).

At the beginning of the project, the client or representative will be supplied with ArcMap Shape files of the geophysical survey area boundaries and grids as well as the coordinate information for all monuments, control points, and grid corners.

Raw and processed data will be delivered to the client on a weekly basis during project execution. Final processed DGM data for each site will be delivered within three weeks of the end of DGM data collection activities.

5.8.3 Final Reporting

The final report for each site will include text describing the geophysical survey and summarizing the results. Digital data associated with DGM investigation such as raw, processed, and final processed data and results of the QC tests will be provided on compact disc or DVD. Data will include README files describing the archived fields. Final data will be presented in GDB formats with associated packed Oasis maps.

5.9 References

U.S. Army Engineering and Support Center - Huntsville (USAESCH), 2002, ***Geophysical Investigations for Buried Munitions, Operational Procedures and Quality Control Manual***, ***Draft Final***, June.

U.S. Army Engineering and Support Center - Huntsville (USAESCH), 2007, **Military Munitions Response Actions – Engineering Manual.**

U.S. Army Engineering and Support Center – Huntsville (USAESCH), 2010, **Geophysics.**

U.S. Army Engineering and Support Center - Huntsville (USAESCH), 2011, **Performance Requirements for RI/FS Using DGM Methods.**

U.S. Army Corps of Engineers (USACE), 1996. **Risk Assessment Handbook, Volume II: Environmental Evaluation.**

List of Appendices

Appendix A Blind Seeding
Appendix B Field Activity Daily Log

APPENDIX A

BLIND SEEDING

Blind Seed Field Documentation Form

Seed ID/Civil Survey ID	Item Type	Photo IDs	Line No.	X	Y	Depth (top)	Inclination	Azimuth	Date/ Time	Comments

Inclination: 0 = horizontal, 90 degrees = vertical
Azimuth: 0 = north-south, 90 = east-west

APPENDIX B

FIELD ACTIVITY DAILY LOG

Shaw Shaw E & I, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG				
	DATE			
	NO.			
	SHEET	OF		

PROJECT NAME:	PROJECT NO.:
FIELD ACTIVITY SUBJECT:	
DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:	
VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
WEATHER CONDITIONS:	IMPORTANT TELEPHONE CALLS:
SHAW E & I PERSONNEL ON SITE:	
SIGNATURE:	DATE:

327D-6-02

ALL TERRAIN AND UTILITY VEHICLE SAFETY

1.1 OBJECTIVE

The use of All Terrain Vehicles (ATVs) or Utility Vehicles (UVs) on site becomes practical and necessary based on certain site locations and site conditions. The safe use of this equipment must be paramount during site operations in order to protect the health and well being of site personnel as well as visitors. Accordingly, the objective of this document is to develop an effective ATV/UV safety program to be instituted for sites where these types of vehicles will be used.

1.2 PURPOSE

The purpose of this SOP is to establish requirements for training and the safe operation of ATVs while conducting work on site.

1.3 DEFINITIONS

In accordance with EM 385-1-1, definitions are as follows:

- ATVs are vehicles intended for off-road use that travel on four low-pressure tires with a seat designed to be straddled by the operator.
- UVs are designed to perform off-road utility tasks such as passenger and cargo transportation (e.g., Rangers, Rhinos, Gators, Mules).

1.4 TRAINING

Operators of ATVs will require the following training:

- Nationally accredited ATV training course (such as provided by the Specialty Vehicles Institute of America, or through in-house resources that have been certified as trainers by an accredited organization) and subsequently passing an operating skills tests prior to using an ATV on site

Operators of UVs will require the following training:

- On site training by the SSHO regarding the use and familiarity of all controls and the understanding of proper moving, stopping, turning, and other operation characteristics of the vehicle used onsite.
- Operators must review all training materials provided by the manufacturer for the specific vehicles, which must address: basic riding tips, reading terrain,

climbing hilly terrain, descending a hill, traversing slopes, water crossings, securing cargo, loading/unloading, and equipment troubleshooting.

1.5 RESPONSIBILITIES

1.5.1 Driver/Operator. The driver/operator of contractor owned, rented, or leased ATV/UV is responsible for complying with the following guidelines.

- Proper use of personal protective equipment (PPE) while operating a ATV/UV, as suggested in the operator's manual for the specific equipment. Required ATV PPE includes gloves and an approved motorcycle helmet with full-face shield or goggles.
- Passengers are prohibited on ATVs.
- Do not exceed the manufacturer's recommended payload.
- ATV/UV operation is limited to daylight hours unless the vehicle is equipped with proper lighting for night usage.
- Do not operate an ATV/UV with less than 4 wheels.
- Report any and all mechanical problems immediately.
- Prior to operation ensure the following items are in working order; warning signal device (horn), tail lights, and stop lights, if equipped.
- Maintain the recommended amount of air pressure in the vehicle tires.
- ATV/UVs must be equipped with a muffler and spark arrester.
- UVs must be equipped with a rollover protective structure.
- The operator's manual will remain on the vehicle and be sufficiently protected from the elements.

1.5.2 Site Safety and Health Officer. The SSHO is responsible for the following:

- Ensuring that all vehicle accident reports are processed and the required number of copies submitted to local, state, and federal agencies, to the resource manager and to the insurance carrier if applicable.
- Ensuring that appropriate individuals, beginning with the CSHM are notified by telephone of accidents that involve fatalities or multiple serious injuries.
- Verifying that all accidents are documented and investigated. The investigation should be of sufficient depth to determine the cause and action required to prevent recurrence. Copies of all motor vehicle investigations shall be forwarded to the CARA Safety Officer. (corrective actions must be outline in accident detailed section of online incident report)
- Ensuring that during the selection process for leased or purchased vehicles, consideration is given to obtaining vehicles with essential safety devices.

1.5.3 Defects. All defects shall be corrected before the vehicle is placed in service.

1.6 SEAT BELTS

OSHA has determined that the use of seat belts in motor vehicles can significantly reduce the seriousness of occupational motor vehicle accidents. Accordingly, all CARA and subcontractor employees driving UVs will ensure that all occupants use seat belts, if available on the vehicle.

1.7 STATE AND LOCAL LAWS

- Drivers shall operate vehicles in accordance with the law.
- Drivers shall not operate vehicles that are known to be defective or not in compliance with the law.
- Drivers are personally liable and responsible for the consequences of state and community violations.

1.8 SAFE DRIVING PRACTICES

- Personnel shall operate vehicles in a defensive manner, i.e., remain alert and aware of surroundings, anticipate potential hazards based on existing conditions, and drive in such a manner as to avoid hazards around the site.
- Personnel operating ATV/UVs shall be considerate of, and courteous to, the traveling public and/or pedestrians and should yield the right-of-way to avoid accidents.
- Personnel shall drive at a safe speed while operating the ATV/UV.
- Personnel shall drive at all times with sufficient space around the vehicle to provide time to see conflicts arising, to react quickly, and to stop. These five keys to defensive driving will help accomplish a good space cushion:
  - Aim high in steering.
  - Get the big picture.
  - Keep your eyes moving.
  - Leave yourself an out.
  - Make sure they see you.

1.9 GENERAL SAFETY RULES

- **Gasoline** - Gasoline and other flammable/combustible liquids shall not be carried in or on vehicles other than in permanent gas tanks or in UL approved safety cans. UL approved safety containers must be properly secured when being carried in the back of UVs.
- **Laws and Regulations** - Learn and obey all local, state, and federal laws.

- **Slow Down** - Slow down and use caution at blind intersections and crossings when visibility is limited or when passing work crews.
- **Seat Belts** - Operator and passengers must keep seat belts (if equipped) fastened at all times when vehicle is in motion.
- **Backing Up** - Never start or back up equipment or vehicles until you are sure the way is clear. If necessary, have another person guide you safely.
- **Ear Protection** - Earplugs or other approved ear protection shall be worn when necessary.
- **Housekeeping** - Operators should keep deck plates, steps, rungs, and hand rails on equipment free of grease, oil, ice, and mud.
- **Inspections**- Equipment and vehicles shall not be used until known defects or discrepancies are corrected. Inspections shall be made at the start of each day and defects or discrepancies shall be reported to the SSHO immediately.
- **Overloading** - Avoid overloading vehicle beds. Excessive material can damage the unit and falling material can cause serious injury.
- **Securing Loads** - The operator of the vehicle is responsible for ensuring that their load is secure and will not shift during transport.

EMERGENCY RESPONSE AND FIRE PREVENTION PLAN

1.1 PRE-EMERGENCY PLANNING

1.1.1 Situations requiring emergency response can be minimized by planning and approaching the circumstances in a calm, deliberate manner.

1.1.2 Agencies that may provide emergency response, such as the Emergency Management Agencies (EMAs), police department, Fire Department and medical support services will receive an operations schedule on a daily or weekly basis.

1.1.3 The SSHO/UXOSO will be the on-site project emergency coordinator (as conditions dictate) in case of an accident or incident requiring emergency response. All personnel will be briefed at the morning tailgate safety meetings the location of the cellular telephones and who has on-site radio communications. This information will also be included in all visitor briefings.

1.1.4 A warning system using a series of three five-second blasts on portable air horns or vehicle horns will notify site personnel that an accident or incident has occurred and evacuation is required. Upon hearing the evacuation warning, all personnel will immediately clear the site and respond to the designated rally point. This rally point will be revised based upon prevailing weather conditions and will be briefed by the SSHO/UXOSO at the morning tailgate safety briefing. At the rally point, all personnel will be accounted for and interviewed to assure no one has sustained injuries because of the accident or incident.

1.1.5 If an emergency response rescue operation is required, no personnel will re-enter the area until the situation has been assessed and it is determined that resources are on-hand to handle the rescue without jeopardizing additional personnel.

1.2 PERSONNEL ROLES AND LINES OF AUTHORITY

6.2.1 This plan describes the various roles, responsibilities, and communication procedures that will be followed by personnel working on this project in the event of an emergency.

1.2.2 The primary On-Site Project Emergency Coordinator for this site is the on-site SSHO/UXOSO or his designee (Site Manager). The on-site Emergency Coordinator will determine the nature of the emergency and take appropriate action.

1.2.3 Prior to field activities, the SSHO/UXOSO shall plan emergency egress routes and discuss them with all personnel who will be conducting fieldwork. Initial planning includes establishing and testing emergency warning signals and evacuation routes to prevent delays in the event of an emergency.

1.3 EMERGENCY CONTACTS

Emergency telephone numbers for the closest hospitals capable of providing emergency service, EMAs, Poison Control Center, Alabama Department of Environmental Management (ADEM), local Police and Fire Department, and key safety and management personnel from the Corps of Engineers (COE) District, (U.S. Army Engineering Support District, Huntsville (USAESCH), RSA, CARA, and NASA will be listed in the Work Plan and will be posted in the field trailer and other conspicuous locations. The SSHO/UXOSO will be responsible for taking necessary action and contacting the appropriate emergency contacts.

1.4 EMERGENCY RECOGNITION AND PREVENTION

Emergencies can take many forms: exposure to chemical agents or industrial chemicals of various types, illnesses or injuries, chemical exposure, fires, or sudden changes in the weather. The remaining sections of the ERCP outline general emergency and contingency planning procedures to be followed at the site. Emergency information and instructions shall be posted as appropriate.

1.5 EMERGENCY EVACUATION FROM EXCLUSION AND CONTAMINATION REDUCTION ZONES

Any personnel requiring emergency medical attention shall be evacuated immediately from Exclusion and Contamination Reduction Zones. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury and the nature of the contaminant. For some emergency victims, immediate decontamination may be an essential part of life saving first aid (e.g., victims contaminated with mustard or Lewisite). For others, decontamination may aggravate the injury or delay life saving treatment. If decontamination does not interfere with essential treatment, it should be performed.

1.5.1 If decontamination can be performed:

- Wash external clothing and cut it away.

  NOTE: soap and water will be used to decontaminate injured victims potentially contaminated with mustard or nitrogen mustard.

1.5.2 If decontamination cannot be performed:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel
- Alert emergency and off-site medical personnel to potential contamination; instruct them about specific decontamination procedures

- Send along site personnel familiar with the incident.

1.6 FIRST AID

1.6.1 At least two people trained and certified in First Aid/CPR will be present on-site at all times during intrusive activities. This may include on-site staff or the Emergency Medical Technicians on-site. Life support techniques such as CPR and treatment of life threatening problems such as shock will be given top priority. Professional medical assistance shall be obtained at the earliest possible opportunity.

1.6.2 To provide first-line assistance to field personnel in the case of illness, injury, or fire the following items will be immediately available:

- First aid kit;
- Portable emergency eye wash;
- Supply of clean water and 5 percent bleach solution;
- Fire extinguisher;
- Portable spill kit or equivalent (30 gallon size);
- Air horn; and
- Cellular telephone or 2-way radio.

1.7 EMERGENCY ACTIONS

If actual or suspected serious injury occurs, these steps shall be followed:

- Remove the exposed or injured person(s) from immediate danger.
- Render first aid if necessary. Decontaminate affected personnel after critical first aid is given, if chemical agent exposure is suspected.
- Obtain paramedic services or ambulance transport to local hospital. This procedure shall be followed even if there is no visible injury.
- Other personnel in the work area shall be evacuated to a safe distance until the Emergency Coordinator determines that it is safe for work to resume. If there is any doubt regarding the condition of the area, work shall be delayed until all hazard control issues are resolved.
- Notify USAESCH Project Manager, RSA Site Manager, and CARA Safety Officer. RSA will make the required notifications to State and County Agencies.

1.8 EMERGENCY EVACUATION PLAN

1.8.1 General Evacuation Plan

1.8.1.1 In the case of an operational shutdown due to severe weather conditions, or if other hazards exist on-site, the Emergency Coordinator or Site Manager will sound the

alarm (three blasts each of five second duration on an air horn). All personnel in the work area will secure their equipment and proceed to the off-site assembly point, located a safe distance (designated at morning safety meeting) at an upwind location from the site. The Emergency Coordinator or his alternate will obtain the site entry/exit logs to ensure that all personnel have been safely evacuated. The Site Manager will coordinate with the Emergency Coordinator to determine when it is safe to re-enter the site and resume work.

1.8.1.2 In the general case of a large fire, explosion, or toxic vapor release, a site evacuation shall be ordered and the following steps implemented:

- Sound the alarm (three blasts each of a five-second duration on an air horn), notify appropriate emergency response agencies, and advise USAESCH and RSA project management personnel.
- Evaluate downwind impact in order to assist emergency response agencies. All personnel will evacuate in the upwind direction.
- All personnel will assemble in an upwind area when the situation permits, and a head count will be taken.
- Determine the extent of the problem. Dispatch a response team in protective clothing and self-contained breathing apparatus on-site to evacuate any missing personnel (when conditions do not endanger safety of rescue personnel) and to correct the problem.

1.8.2 Evacuation Signals and Routes

1.8.2.1 Two-way radio communication, direct voice communication, or an air-horn (three blasts - each of five seconds duration) will be used to notify employees of the necessity to evacuate an area involved in a release/spill of a hazardous material. Each work location will have a two-way radio. A two-way radio will be in the project command post to monitor for emergencies. Total site evacuation will be initiated only by the Emergency Coordinator. However, in his absence, the decision to preserve the health and safety of employees will take precedence.

1.8.2.2 Evacuation routes will be discussed and described in tailgate safety meetings. The route to the Medical Center will be posted in each work area. Periodic drills (before each new phase of work) will be conducted to familiarize each employee with the proper routes and procedures.

1.8.3 Evacuation Procedures

If evacuation is necessary, the following actions will be taken:

- The alarm will be activated.

- No further entry of visitors, contractors, or trucks will be permitted. Vehicle and equipment traffic within the site will cease to allow safe exit of personnel and movement of emergency equipment.
- Shut off all machinery and equipment, if safe to do so.
- All on-site personnel, visitors, and contractors in the Support Zone will assemble at the office trailer, or other designated area, for a head count and wait for further instructions from the Emergency Coordinator.
- Upon completion of the head count, the senior person will provide the information to the Emergency Coordinator.
- Visitors will also be accounted for.
- A final tally of persons will be made by the Emergency Coordinator or his designee. No attempt will be made to find persons not accounted for if the rescue attempt involves endangering the lives of employees.
- Personnel will be assigned by the Emergency Coordinator to be available at the main entrance point to direct and brief emergency responders.
- Re-entry into the site will be made only after clearance has been given by the Emergency Coordinator. At his direction, a signal or other notification will be given for re-entry into the facility.
- Drills will be held at the beginning of the intrusive fieldwork and at intervals during the intrusive work. Drills will be treated with the same seriousness as an actual emergency.

1.9 EMERGENCY ALERTING AND RESPONSE

To minimize hazards to the environment or to human health, the procedures listed below are to be implemented in the event of a spill or discharge involving a hazardous substance. It is the responsibility of on-site employees to report any such emergencies to the on-site Emergency Coordinator who will be responsible for implementing emergency response procedures.

1.9.1 Initial Notification

- STEP 1: Notify appropriate management personnel in the following order until one of these people are contacted. Senior ranking person will take over responsibilities when they arrive.

  Contact

  1st. Site Manager/Supervisor
  2nd. SSHO/UXOSO
  3rd. UXOQC

- STEP 2: If the emergency coordinator determines that assistance is needed to respond to the emergency, he/she can notify the appropriate personnel. The Emergency Contact List will be posted onsite.
- STEP 3: If the on-site Emergency Coordinator determines that a spilled material is "in such quantity or concentration as may be harmful or poses a foreseeable risk of harm to public health or welfare or to natural resources," the coordinator will immediately notify the appropriate personnel.
- STEP 4: The USAESCH Project Representative will be notified immediately and given a copy of the spill report within 48 hours. He/she will be advised concerning all notification and response actions. Depending on type of spill, it may be necessary to notify FDEP. Determinations as to reportable quantities for specific chemicals or materials will be obtained by the Site Manager from FDEP. The FDEP notification will be accomplished after notifying USAESCH and following emergency response actions.
- STEP 5: The on-site emergency coordinator will contact the National Response Center (800-424-8802) when a hazardous substance is released in excess of the reportable quantity.

1.10 EMERGENCY SERVICES

All personnel shall be provided concise and clear directions and accessible transportation to local emergency services. A map outlining directions to the nearest hospital will be posted on-site.

1.10.1 Emergency Equipment

In the decontamination area, an emergency equipment station will be present. This station will consist of a combination emergency eye wash station, first aid kit, two-way radio or cellular phone, emergency alarm (e.g., air horn), and a fire extinguisher. Each piece of heavy equipment, site trailer, and each vehicle will be equipped with a fire extinguisher.

1.10.2 Critique of Response and Follow-up

All response actions will be evaluated for effectiveness by SSHO/UXOSO and Site Manager/Supervisor. Corrective actions will be communicated to personnel and procedures will be revised as required.

1.11 SPILL INCIDENT REPORTS

A written report detailing the spill or discharge shall include, at a minimum, the cause and resolution of the incident, the date the incident occurred, and any outside agencies involved. The report shall be submitted to the USAESCH and RSA within 48 hours of the incident.

1.11.1 Special Notifications and Procedures in the Event of a Spill

Additional notifications, including emergency telephone numbers, if needed, for local, state, and federal agencies which may require notification are included in the Notification Plan kept onsite.

- If the incident threatens human health or the environment outside of the project site boundaries, the emergency coordinator will notify the local Police Department first, then the local Fire Department, and the Emergency Management Agency. Assistance will be provided to these organizations to determine if public evacuation is necessary.
- If a reportable quantity of a hazardous material is released off-site, the Emergency Coordinator will notify the National Response Center (800-424-8802). The following information will be provided to the National Response Center:
  - Name and telephone number
  - Name and address of facility
  - Time and type of incident
  - Name and quantity of materials involved, if known
  - Possible hazards to human health and/or the environment outside of the facility
- If hazardous waste has been released or produced through control of the incident, ensure that:
  - Waste is collected and contained
  - Containers of waste are removed or isolated from the immediate site of the emergency
  - Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided
  - Ensure that all emergency equipment used is decontaminated, recharged, and ready for use before site operations are resumed

1.12 FIRE PREVENTION AND CONTINGENCY MEASURES

1.12.1 Because flammable materials are present at this site, fire is an ever-present hazard. CAR and subcontractor personnel are not trained professional fire fighters. Personnel will attempt to extinguish incipient (early) stage fires using portable fire protection equipment. Therefore, in the event of any fire that cannot be extinguished utilizing portable extinguishers, personnel will notify the Emergency Coordinator by radio and evacuate the area. The Emergency Coordinator will immediately notify the RSA Fire Department.

1.12.2 The following procedures will be used to prevent the possibility of fires and resulting injuries.

- Sources of ignition will be kept away from areas where flammable materials are handled or stored.
- The air will be monitored for explosive vapors before and during hot work and periodically where flammable materials are present, and during confined space work. Hot work permits will be required for all such work.
- Fire extinguishers will be placed in all areas where a fire hazard may exist.
- Before workers begin operations in an area, the senior person will give instruction on egress procedures and assembly points.

1.12.3 The following procedures will be used in the event of a fire:

- Anyone who sees a fire will notify his or her Supervisor who will then contact the Emergency Coordinator by radio. Portable fire extinguishing equipment will be utilized to the extent practicable or the Emergency Coordinator will activate the emergency alarm (three blasts for site evacuation) and notify the RSA Fire Department.
- When the emergency alarm sounds, workers will disconnect electrical equipment in use (if possible) and proceed to the nearest exit point/assembly area.
- Work crews will be comprised of pairs of workers (buddy system) who join each other immediately after hearing the fire alarm and remain together throughout the emergency. Workers will assemble at the assembly point for the site for a head count.
- When a small fire has been extinguished, the Emergency Coordinator will be notified.

1.13 HAZARDOUS WEATHER CONTINGENCY MEASURES

1.13.1 The Emergency Coordinator will be responsible for assessing hazardous weather conditions (i.e., high winds, tornado, etc.) and notifying personnel of specific contingency measures. Notifications will include:

- CARA employees, subcontractors, and visitors
- USAESCH Project Manager and the USAESCH Site Safety

1.13.2 Operations will not be started or continued when the following hazardous weather conditions are present:

- Tornado
- Lightning
- Heavy Rains/Snow
- High Winds (>40 mph)

1.13.3 The response to these conditions includes the following actions:

- Excavation/soil stockpiles will be covered with visqueen/plastic and temporary barricades will be placed along perimeter of open excavation.
- All equipment will be shut down and secured to prevent damage.
- Personnel will be moved to safe refuge, initially crew trailers. The Emergency Coordinator will determine when it is necessary to evacuate personnel to off-site locations.

1.14 CHEMICAL SPILLS OR RELEASES

The occurrence of chemical leaks or spills is anticipated to be remote, due to the preventative measures implemented on the site and the nature of the contaminated materials present. There is, however, a potential for the occurrence of spills or leaks (to include the potential for chemical agent contaminated media (CACM) or chemical warfare materiel (CWM) during excavation operations or due to spills from fuels, oils, etc., used in servicing heavy equipment. Salvage drums, spill containment, and sorbent material will be available for personnel to respond in the event that such a release should occur. Safe handling procedures will be implemented in order to minimize the handling required to over-pack the drums and stage them in a designated area. The following actions will be taken in the event of a release of any chemical, fuel, or contaminated water at the site:

- **Small Quantity Spill:** This will be defined as 25 gallons or less of liquid material. Before responding, make sure personnel are in the appropriate level of protection. Use sorbent material as necessary to effect cleanup, and containerize all liquids and debris. Make sure the incident is immediately reported to the RSA Site Manager, USAESCH Project Manager and USAESCH Site Safety.
- **Large Quantity Spill:** This will be defined as over 25 gallons of liquid material. Immediate notification will be made to the RSA Site Manager and USAESCH Project Manager and USAESCH Site Safety. The RSA Site Manager will direct efforts to contain and mitigate the spill, as well as coordinate with the USAESCH Project Manager and local officials to determine if additional notification or area evacuation is required. The SSHO/UXOSO and the Air Monitoring Team (if necessary) will be responsible for performing air monitoring.

1.15 SPILL PREVENTION AND CONTROL PROCEDURES

1.15.1 During site preparation, primary staging areas will be constructed. Proper bermed and lined staging areas will reduce the amount of cleanup required as a result of spills or leaking drums.

1.15.2 A sufficient supply of appropriate emergency response cleanup and personal protective equipment will be visually inventoried and inspected on a weekly basis by the SSHO/UXOSO.

1.15.3 The materials listed below will be kept on-site for spill control. The majority of this material will be located in the support zone inside a supply trailer. Small quantities of appropriate materials may be placed on pallets and located in the active work areas.

- Sand or clay to solidify/adsorb liquid spills.
- Five percent bleach solution to decontaminate chemical agent.
- The following equipment will be kept on-site and dedicated for spill cleanup:
- Sausage-shaped absorbent booms for diking liquid spills, drains, or sewers;
- Sorbent sheets (diapers) for absorbing liquid spills;
- Over-pack drums for containing leaking spills; and
- Fifty-five gallon open-top drums for containing waste materials.

1.15.4 All contaminated soils, absorbent materials, solvents, and other materials resulting from the cleanup of spilled or discharged substances will be properly stored, labeled, and disposed of off-site.

1.16 CHEMICAL SPILL CONTINGENCY MEASURES

In the event of release or spill of a hazardous material the following measures will be taken immediately:

- Administer first aid to injured/contaminated personnel. Any person observing a spill or release will act to remove and/or protect injured/contaminated persons from any life-threatening situation. First aid and/or decontamination procedures will be implemented as appropriate.
- Warn unsuspecting person/vehicles of the hazard. All personnel will act to prevent any unsuspecting persons from coming in contact with spilled materials by alerting other nearby persons.
- Stop the spill at the source, if possible. This may involve activities such as uprighting a drum, closing a valve, or temporarily sealing a hole with a plug.
- Utilizing radio communications, notify the Emergency Coordinator of the spill/release, including information on material spilled, quantity, personnel injuries, and immediate life threatening hazards.
- Follow procedures outlined earlier for the notification of proper on-site personnel and off-site agencies.

1.16.1 Containment and Control Measures

1.16.1.1 The Emergency Coordinator will make a rapid assessment of the spill/release and direct confinement, containment and control measures. Depending upon the nature of the spill, measures may include, but not be limited to:

- Constructing a temporary containment berm utilizing on-site clay absorbent earth.
- Digging a sump, installing a polyethylene liner, and diverting the spill material into the sump placing drums under the leak to collect the spilling material before it flows over the ground.
- Transferring the material from its original container to another container.

1.16.1.2 Supplies necessary to clean up a spill will be immediately available on-site. Such items may include, but are not limited to: backhoe or trackhoe, shovel, rake, clay absorbent, polyethylene liner, personal safety equipment, and miscellaneous hand tools. The major supply of material and equipment will be located in a supply trailer in the Support Zone. Smaller quantities of supplies will be kept at active work locations for emergencies.

1.16.2 Cleanup Inspection and Notification

1.16.2.1 The Emergency Coordinator/Site Manager will jointly inspect the spill site to determine that the spill has been cleaned up. If necessary, soil, water or air samples may be taken and analyzed to demonstrate the effectiveness of the spill clean-up effort.

1.16.2.2 The Emergency Coordinator will determine the cause of the spill and determine remedial steps to ensure that recurrence is prevented. The Emergency Coordinator will review the cause with the SSHO/UXOSO, CARA Safety Officer, RSA Site Manager, and USAESCH Project Manager and obtain concurrence with the remedial action plan.

1.17 TRANSPORTATION SPILL INCIDENTS

Spillage resulting from site transportation incidents will be immediately reported to the Emergency Coordinator, who will send personnel to contain and clean up the spill (if possible without risk to personnel). Any soils contaminated by the spill incident will be removed and processed as described in Section 10.2.3 of the APP (Appendix D).

1.18 FIRE AND AIRBORNE RELEASE PROCEDURES

1.18.1 The following preventative measures will be implemented to minimize the potential for airborne chemical release and fire incidents:

- Operate the intrusive excavation and trenching operations in accordance with the Work Plan and the APP (Appendix D) for this site.
- Perform air monitoring activities to evaluate airborne releases of chemical agent and industrial chemicals.

1.18.2 In addition, the following fire prevention measures will be implemented on site:

- Sources of ignition other than heavy equipment will be prohibited inside the Exclusion Zone during intrusive activities.

1.19 CHEMICAL AGENT OR RELEASE REPORTING

1.19.1 The Garrison Safety Office will submit any required Chemical Event Reports. A Chemical Event Report, RCS: CSGPO-453 (an example will be kept on site) must be made within three hours of the occurrence of any one of the following (per AR 385-XX):

- Any detection of agent outside a munition body or bulk storage container which is confirmed by other positive detections;
- Discovery of an actual or suspected chemical agent – filled munition or container that may require emergency transportation or disposal;
- Actual or suspected exposure of personnel to an agent above the allowable limits contained in AR 385-61, DA PAM 40-8 or DA PAM 40-173; or
- Any of the above occurrences involving items configured as weapons containing chemical agents or industrial chemicals: chloropicrin, chloracetophenone, chloroform, phosgene, or fuel components (benzene, ethylbenzene, xylene, toluene).

1.19.2 If it appears that Chemical Event Reporting may be needed, the USAESCH Safety Specialist or the following USAESCH personnel should be notified immediately:

- Allyn Allison: (256) 895-1543
- Wilson Walters: (256) 895-1578 or (256) 990-1512; and
- Greg Parsons: (256) 895-1589.

1.19.3 The Site Manager, SSHO/UXOSO or UXOQC should be prepared to provide the information requested in the Chemical Event Report.

END OF DAY OPERATIONS

1.1 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the minimum procedures and safety and health requirements applicable to the conduct of End of Day operations.

1.2 SCOPE

This SOP applies to all site personnel, including contractor and subcontractor personnel, involved in the conduct of End of Day operations. This SOP is not intended to contain all of the requirements needed to ensure complete compliance, and should be used in conjunction with project plans and applicable Federal, state and local regulations.

1.3 REGULATORY REFERENCES

Applicable sections and paragraphs in the USACE EM 385-1-1, Safety and Health Requirements Manual are used as references for the conduct of demolition/disposal operations.

1.4 RESPONSIBILITIES

1.4.1 USAESCH Project Manager - The USAESCH Project Manager (PM) shall be responsible for ensuring the availability of the resources needed to implement this SOP, and shall also ensure that this SOP is incorporated in plans, procedures and training for sites where this SOP is to be implemented.

1.4.2 Site Supervisor - The Site Supervisor will be responsible for assuring that adequate safety measures and housekeeping are completed during End of Day activities in an efficient and economical manner. The Site Supervisor will select a specific time period each day for this operation to safely be accomplished. A longer period of time may be required at the end of each week to complete weekly maintenance of equipment, tools, and vehicles.

1.4.3 Site Safety and Health Officer - The Site Safety and Health Officer (SSHO) for the site is responsible for ensuring that all operations are being conducted in a safe and compliant manner.

1.5 GENERAL REQUIREMENTS

Due to the potential exposure to hazardous materials, soils, or vapors, all “End of Day” operations will be treated as if a significant health risk is present to all unprotected personnel.

1.5.1 Intrusive Sites

Prior to beginning “End of Day” operations, the downrange team at that time – or one dedicated for this operation – will proceed downrange and complete the following:

- All intrusive sites deeper than 4 feet and wider than 4 feet will be covered with plywood sheeting if possible and surrounded with orange high visibility fencing at a minimum; these actions will serve to reduce the potential of fall-ins. Two sides of the fencing will have a sign stating both "Keep Out" (on one side) and "Hazardous Area" on the other.
- All intrusive sites containing toxic or hazardous waste will be completely covered with 6-mil plastic sheeting and secured with sufficient sandbags in order to minimize "off-gassing" into the atmosphere.
    - Intrusive sites positively identified as "hazardous waste" will be checked by approved site personnel in the appropriate PPE with a PID at the source and at the breathing level to ensure that these sites have been mitigated and closed.
    - Intrusive sites positively identified as containing CACM will be checked using the MINICAMS (or similar unit) at the site. Once two "clear" cycles have been obtained, the SSHO will request through the USACE OESS that the site be declared "open" to continue "End of Day" operations.
- Those sites that have been thoroughly investigated, but are awaiting final clearance will still be covered with plastic. Once the site has been deemed "clear"; through the approved testing authority, the site will be allowed to remain "uncovered" in plastic, but protected by plywood sheeting and fencing material, until back-filled.

1.5.1.1 Containment Structures

In the event that operations at the site are being conducted under a controlled environment, such as portable or permanent structure, "End of Day" operations are conducted similarly to those as described above in paragraph 1.5.1 and several additional tasks; both inside and outside the structure that may require additional time, personnel and efforts to complete:

- Air Filtration System – refuel, filters bank exchange and maintenance.
- Environmental Air Handling System – refuel and maintenance.
- Removal of drums, soils, and other generated waste material, if approved to be moved.
- Cascade air system – replenish spent tanks, hose line maintenance.
- Securing containment structure from unauthorized entrance.

1.5.2 Drums

1.5.2.1 Soil Drums

The Downrange Team will use the associated closure rings to close and seal all open top drums prior to any "End of Day" operation. Any soils collected on drop cloths or around the lids will be returned into the drums prior to closing.

1.5.2.2 Liquid Drums

Any contaminated liquid waste will be collected and placed into the appropriate Liquid Waste Drums by the Downrange Team, prior to any "End of Day" operation. All bung closures will be closed. Plastic funnels will be used to prevent any spillage. Step pans containing decontamination solution may be returned into identified "holding" containers for reuse for the next day's operation.

1.5.2.3 Waste Materials

A 55-gallon drum, lined with 6-mil plastic, will be placed downrange for collection of all waste materials (e.g. - torn boot covers, tape, gloves, etc.). Prior to "End of Day" operations, the 6-mil liner containing the waste material will be returned to the Personnel Decontamination Station and held for head-spacing. A new liner will be placed in the drum during "End of Day" operations.

1.5.2.4 Contaminated Equipment and Tools

Those items frequently used by the Downrange Team (e.g. - rakes, shovels, etc) will have excess dirt or soil brushed off; rinsed with decontamination solution; placed inside a 6-mil plastic bag; taped closed for reuse for next day's operation, and laid on a 6-mil plastic drop cloth. Items should be marked down range and remain down range.

1.5.2.5 Hazardous Waste Containers

Prior to the beginning of this operation, instructions on the safe opening and closing of these containers will be given by the SSHO. Prior to "End of Day" operations, the Downrange Team will close and latch these containers, when they are being used.

1.5.3 Personnel Decontamination Station (PDS)

The PDS will remain intact and manned throughout the "End of Day" operations to handle any emergency situation that may arise. Once the last person conducting "End of Day" operations has been processed through the PDS, the PDS Supervisor will notify the SSHO and request permission to close out the PDS, as prescribed in the Work Plan.

1.5.4 Heavy Equipment

The Downrange Team will stage, ground, or otherwise safely turn off all heavy equipment used during normal operations. Personnel performing weekly "End of Day" maintenance operations are to take care so that the 6-mil plastic around the bucket of the excavator is not to ripped or torn.

1.5.5 Site Personnel

All Exclusion Zones (CRZ and Hot Line) will be enforced throughout this operation. Proper use of PPE will be mandated during this operation. All site personnel conducting "End of Day" operations will process through the PDS during entry and exit from the work site and will adhere to the 2-Man Rule at all times.

1.5.5.1 Downrange Team

The Downrange Team will perform as many "End of Day" operations as possible. Every effort to contain the spread of contamination or "cross-contaminating" of equipment will be adhered.

1.5.5.2 Cascade Operator

The Cascade Operator will perform all required "End of Day" tasks, as outlined in the Cascade Operations SOP, as applicable.

1.5.5.3 Air Monitoring Personnel

Air Monitoring Personnel will be allowed to conduct their "End of Day" operations IAW their established policies and guidelines, as long as the site is open to conduct "End of Day" operations. Replacement of DAAMS Pumps due to time factors may have to be handled by the on-coming Downrange Team. Mid-Day challenges of the downrange Mini-Cams vehicle, though inside the CRZ, can be accomplished without Air Monitoring Personnel going downrange.

DECONTAMINATION OF EXCAVATOR BUCKETS

1.1 INTRODUCTION

Each excavation should be constructed in a fashion which exposes only an excavator bucket to potential CA contamination. If other portions of the excavator become contaminated (confirmed through sampling), these portions should be decontaminated in a similar fashion to what is presented below. Operations for decontamination of excavator buckets and other similar equipment should follow an established set of rules in order to be accomplished efficiently and safely. This SOP provides the necessary guidelines for decontaminating and verifying the decontamination of excavator buckets and similar equipment, such as hoppers that have been used to contain CA-contaminated soil and certain chemical agent contaminated media (CACM).

1.2 EQUIPMENT

The following equipment will be needed:

- Excavator bucket, hopper, or items to be decontaminated.
- Sump or containment berm to collect decontamination fluids and water.
- Brushes, scrapers, etc. that can be decontaminated or disposed of.
- Hand tools, for disassembling any parts.

1.3 GENERAL REQUIREMENTS

1. Personnel conducting the decontamination shall be wearing at least Level C PPE (see SOP for Personal Protective Equipment).
2. Place the item to be decontaminated over the sump or containment berm to collect any contaminated material that might fall or be washed off the item.
3. Brush or knock off any loose material.
4. Disassemble any separate pieces that may be hiding contaminated soil.
5. Wash the item and pieces (don’t forget the bolts) with a 5% bleach solution.
6. Wash the item and pieces with soapy water.
7. Rinse the item and pieces with clean water.
8. Allow the item and pieces to dry.
9. Once dry, place the item in a hotbox or place under plastic sheeting in the sun and monitor with the DAAMS to determine if any CA remains.

10. If the headspace monitoring, detects any CA, the item and pieces should be washed with bleach (start again at #5 above).
11. When a non-detect result (or result below the GPL) for CA is returned, the equipment may be reassembled and returned to the owner. If a clean result cannot be obtained, the equipment must be incinerated or must remain in government control.
12. The wash fluids, rinses, and containment materials should all be collected and drummed. This material should be tested in accordance with the IDW plan to determine proper disposal.

FIRE FIGHTING PLAN

The purpose of this Fire Fighting Plan is to define the general procedures to protect human health and the environment both in the event of a fire at the site.

1.2 Sources

Although fires and explosions may arise spontaneously, they are more commonly the result of carelessness during the conduct of site activities, such as moving drums, mixing/bulking of site chemicals, and during refueling of heavy or hand held equipment. Some potential causes of explosions and fires include:

- Mixing of incompatible chemicals, which cause reactions that spontaneously ignite due to the production of both flammable vapors and heat.
- Ignition of explosive or flammable chemical gases or vapors by external ignition sources.
- Ignition of materials due to oxygen enrichment.
- Agitation of shock or friction-sensitive compounds.
- Sudden release of materials under pressure.

1.3 Immediate Action

1.3.1 Upon detecting a fire/explosion, employees will determine whether the fire is small enough to readily extinguish with immediately available portable extinguishers or water, or if other fire-fighting methods are necessary. Non-essential personnel will be directed away from the area of the fire. If it is judged that a fire is small enough to fight with available extinguishing media, employees will attempt to extinguish the fire provided that:

- They are able to approach the fire from the upwind side, or opposite to the direction of the fire's progress.
- The correct extinguisher is readily available. (Type ABC fire extinguishers will be provided in work areas and on vehicles.)
- No known complicating factors are present, such as the likelihood of rapid spread, imminent risk of explosion, or gross contamination.

1.3.2 Personnel leaving a fire/explosion area will account for all employees in that work area as soon as possible. The SSHO/UXOSO or designee will perform a head count for that work area.

1.4 Notification

The SSHO/UXOSO will be notified as soon as possible of the location, size, and nature of the fire/explosion. As conditions dictate, the SSHO/UXOSO will declare an

emergency, initiate the remedial procedures, request assistance from the appropriate local emergency response unit, and make the necessary telephone notifications to the USAESCH on-site Safety and USAESCH PM. Outside personnel responding to the fire/explosion may seek assistance from the SSHO/UXOSO with regard to the routing of equipment within the incident site to the most favorable and safe position while minimizing and/or avoiding exposure to any site contaminants.

1.5 Rescue

If employees are unable to evacuate themselves from a fire/explosion area for any reason, their rescue will be the first priority of responders. The SSHO/UXOSO will determine whether on-site resources are sufficient to proceed, or if rescue must be delayed until the appropriate emergency responders arrive.

1.6 Fire Protection

1.6.1 To ensure adequate fire protection, the SSHO/UXOSO will inspect the site to ensure all flammable and combustible materials are being safely stored in appropriately configured storage areas and containers. The SSHO/UXOSO will also ensure that no flammable/combustible materials are stored near any sources of ignition, and that sources of ignition are located a safe distance from storage areas. If needed, storage areas will be segregated from the remainder of the site using flagging.

1.6.2 Explosions and fires not only pose the obvious hazards of intense heat, open flames, smoke inhalation, and flying objects, but may also cause the release of toxic chemicals into the environment. Such releases can threaten both personnel on-site and members of the public living or working nearby. Site personnel involved with potentially flammable material or operations shall follow the guidelines listed below and EM 385 1-1 to prevent fires and explosions:

- Potentially explosive/flammable atmospheres involving gases or vapors shall be monitored using a combustible gas indicator.
- Prior to initiation of site activities involving explosive/flammable materials, all potential ignition sources shall be removed or extinguished.
- Non-sparking and explosion-proof equipment shall be used whenever the potential for ignition of flammable/explosive gases/vapors/liquids exists.
- Dilution or induced ventilation may be used to decrease the airborne concentration of explosive/flammable atmospheres.
- Smoking shall be prohibited at, or near, operations that may present a fire hazard, and the area shall be conspicuously posted with signs stating “No Smoking or Open Flame within 50 Feet.”
- Flammable and/or combustible liquids must be handled only in approved, properly labeled containers equipped with flash arrestors and self-closing lids.
- Transfer of flammable liquids from one metal container to another shall be done only when the containers are electrically bonded if capacity is greater than 5 gallons; otherwise, the containers are kept in metallic contact.

- The motors of all equipment being fueled shall be shut off during the fueling operations.
- Metal drums used for storing flammable/combustible liquids shall be equipped with self-closing safety faucets, vent bung fittings, grounding cables and drip pans, and shall be stored outside buildings in an area approved by the SSHO/UXOSO.

1.7 Decontamination

At the conclusion of fire fighting activities, the SSHO/UXOSO will:

- Determine, to the extent practical, the nature of the contaminants encountered during the incident.
- Equipment not easily decontaminated shall be labeled and isolated for further action, such as determining specific contaminants by wipe sampling or awaiting the delivery of specific decontamination media and supplies.

1.8 Fire Extinguisher Information

1.8.1 The four classes of fire, along with their constituents, are as follows:

Class A - Wood, cloth, paper, rubber, many plastics, and ordinary combustible materials.
Class B - Flammable liquids, gases, and greases.
Class C - Energized electrical equipment.
Class D - Combustible metals such as magnesium, titanium, sodium, and potassium.

1.8.2 Examples of proper extinguishing agents are as follows:

Class A - Water or ABC Dry Chemical
Class B - ABC Dry Chemical
Class C - ABC Dry Chemical
Class D - Metal-X Dry Chemical (not anticipated and not on-site.)

HEAVY EQUIPMENT AND VEHICLE SAFETY

1.0 INTRODUCTION

Motor vehicle usage presents the most significant work risk to employees. The United States Bureau of Labor Statistics indicates that motor vehicle deaths and injuries continue to be the number one cause of work-related death and serious injury. Accordingly, it is essential that an effective vehicle safety program be instituted for each worksite.

This section establishes requirements for safe operation of vehicles and heavy equipment. Vehicles are defined as any automobile (car, truck, or otherwise) used on the project to transport personnel or haul equipment to, around, and from the site. Heavy equipment refers to backhoes, track hoes, skid loaders, forklifts, or any other piece of heavy machinery used to move equipment or for excavation. This procedure is an overview of the guidelines in the EM 385-1-1 chapters 16, “Machinery and Mechanized Equipment” and 18, “Motor Vehicle and Aircraft Safety”.

1.1 OBJECTIVE

The objective of this document is to outline requirements and safe practices for operation of heavy equipment and vehicles.

1.2 PURPOSE

This document provides information and procedures in order for personnel to operate heavy equipment and vehicles safely.

1.3 REFERENCES

Procedures and information contained in this document were obtained from the below listed references:

- USACE EM 385-1-1, Safety and Health Requirements Manual;
- USACE EP 385-1-97, Explosives Safety and Health Requirements Manual;
- USACE EP 1110-1-18, Engineering and Design;
- OSHA Regulation 29 CFR 1926, Subpart P, Appendix A and 29 CFR 1926.652, Subpart P, Appendix F, Safety and Health Requirements for Construction;
- AR 385-55, Prevention of Motor Vehicle Accidents;
- DA Pam 385-16, System Safety Engineering and Management; and

1.4 RESPONSIBILITIES

1.4.1 Driver/Operator

The driver of contractor owned, rented, or leased vehicles or heavy equipment is responsible for:

- Operating the motor vehicle while in possession of a valid driver's license;
- Operating the vehicle in a safe and legal manner;
- Refraining from eating, drinking, smoking, or using a cellular telephone while the vehicle is in motion;
- The safety of passengers; and
- Reporting immediately any motor vehicle that is found to be defective or not operating properly.

1.4.2 Site Safety and Health Officer

The SSHO/UXOSO is responsible for the following:

- Ensuring that all vehicle accident reports are processed and the required number of copies submitted to local, state, and federal agencies, to the resource manager and to the insurance carrier.
- Ensuring that appropriate individuals, beginning with the Safety Officer, the Project Health and Safety Manager, are notified by telephone of accidents that involve fatalities or multiple serious injuries.
- Verifying that all accidents are documented and investigated. The investigation should be of sufficient depth to determine the cause and action required to prevent recurrence. Copies of all motor vehicle investigations shall be forwarded to the Safety Officer.
- Ensuring that during the selection process for leased or purchased vehicles, consideration is given to obtaining vehicles with essential safety devices. Such devices include anti-locking brakes, air bags, both front and rear seat shoulder harnesses, and all season traction tires. Motor vehicles must be equipped with first aid kits. Shoulder safety belts must not be attached to doors.

1.4.3 Inspections

Before initial use, equipment not otherwise inspected by State or local authorities will be inspected by a qualified mechanic and found in safe operating condition. The inspection will be documented in writing and available upon request.

The vehicle and heavy equipment operators are responsible for inspecting their equipment daily to assure that the following parts, equipment, and accessories are in safe operating condition and free of apparent damage that could cause failure while in use:

- Service brakes, including trailer brake connections;
- Parking system (hand brake);
- Emergency stopping system (brakes);
- Tires;
- Horn;

- Steering mechanism;
- Coupling devices;
- Seat belts;
- Operating controls;
- Accessories including lights, reflectors, windshield wipers, and defrosters where such equipment is necessary; and
- Safety devices.

Records of inspection and maintenance will be kept at the site and available upon request. All vehicles operated during the night will have the following lights:

- Two headlights, one on each side of the front;
- Two red (or amber) taillights; one on each side of the rear;
- Directional signal lights (both front and back); and
- Three emergency flares, reflective markers, or equivalent portable warning device.

1.4.4 Brake systems

All vehicles, except trailers having a gross weight of 5,000 pounds or less will be equipped with service brakes and manually operated parking brakes. Service and parking brakes will be adequate to control the movement of, to stop, and to hold the vehicle under all conditions of service. Service brakes on trailers and semi-trailers will be controlled from the driver's seat of the prime mover. Braking systems on every combination of vehicle will be designed in approximate synchronization on all wheels and develop the required braking effort on the rear-most wheels first. The design will also provide for application of the brakes by the driver of the prime mover form the cab. The only exception is vehicles in tow by an approved tow bar hitch.

1.4.5 Required equipment

All motor vehicles (cars and trucks) will have the following equipment:

- An operable speedometer;
- An operable fuel gage;
- An operable audible warning device (horn) in operating condition;
- A windshield equipped with an adequate windshield wiper;
- An operable defrosting and defogging device;
- An adequate rear view mirror or mirrors;
- Cabs, cab shields, and other protection to protect the driver from the elements and falling or shifting materials;
- Non-slip surfaces on steps;
- A power-operated starting device;

- Lap and shoulder belts; and
- Operating brakes.

Glass in windshields, windows, and doors will be safety glass. Any cracked or broken glass will be replaced.

1.4.6 Defects

All defects shall be corrected before the vehicle is placed in service. These requirements also apply to equipment such as lights, reflectors, windshield wipers, defrosters, fire extinguishers, etc., where such equipment is necessary.

1.5 SEAT BELTS

OSHA has determined that the use of seat belts in motor vehicles can significantly reduce the seriousness of occupational motor vehicle accidents. Accordingly, all contractor employees driving motor vehicles on this project (including rental cars, pick-up trucks, personal vehicles which are used for company compensated business travel, etc.) shall ensure that all occupants use seat belts, both shoulder and lap belts.

1.6 STATE AND LOCAL LAWS

- Drivers shall operate vehicles in accordance with the law (i.e. posted speed limits).
- Drivers shall not operate vehicles that are known to be defective or in violation with the law.
- Drivers are responsible for the consequences of state and community violations.
- The use of devices designed to identify active police speed detection systems (i.e. radar detectors) is prohibited in all company and subcontractor owned, leased, and rented vehicles, and in personal vehicles used for company compensated business travel.

1.7 SAFE DRIVING PRACTICES

- Personnel shall operate vehicles in a defensive manner, i.e., being always on the alert and trying to anticipate what might occur under the existing conditions and driving in such a manner as to avoid hazards.
- Personnel operating vehicles shall be considerate of, and courteous to, the traveling public and/or pedestrians and should yield the right-of-way to avoid accidents.
- Headlights will be switched to low beam when approaching oncoming traffic.
- Personnel will have headlights on during periods of darkness and during fog, smoke, rain, or unfavorable atmospheric conditions.
- Personnel shall drive at speeds consistent with posted speed limits and prevailing conditions, such as weather, traffic, and road conditions.
- Personnel shall drive at all times with sufficient space around the vehicle to provide time to see conflicts arising, to react quickly, and to stop. These five keys to defensive driving will help accomplish a good space cushion.
  - Aim high in steering;

- Get the big picture;
- Keep your eyes moving;
- Leave yourself an out; and
- Make sure they see you.

1.8 GENERAL SAFETY RULES

- **Blind Curves** - Slow down and sound horn when approaching a blind curve.
- **Driver's License** - Operation of a vehicle without a valid operator's license is prohibited. Personnel operating vehicles regulated by the United States Department of Transportation (DOT) shall have a current commercial driver's license (CDL).
- **School Buses** - Obey school bus laws. Slow down and prepare to stop when approaching school buses, children on foot, or on bicycles.
- **Emergency Vehicles** - Give ambulances, fire-fighting equipment, and other vehicles the right-of-way during emergencies and lend assistance if required.
- **Gasoline** - Gasoline and other flammable/combustible liquids shall not be carried in or on vehicles other than in permanent gas tanks or in UL approved safety cans. UL approved safety containers must be properly secured when being carried in the back of pick-up trucks.
- **Laws and Regulations** - Learn and obey all local, state, and federal laws.
- **Parking** - Equipment and vehicles shall be parked off roads and highways whenever possible. When it is not possible, the vehicle shall be marked by red lights or flares at night and red flags during the day. Wheels should be blocked or chocked. Vehicles will be attended until the motor has been shut off and the key removed from the ignition.
- **Passing** - Do not pass when visibility is restricted for any reason.
- **Pedestrians** - Be constantly alert for pedestrians. Remember they have the right-of-way.
- **Slow Down** - Slow down and use caution at blind intersections and crossings when visibility is limited or when passing work crews.
- **Speeding** - Speeding is strictly prohibited.
- **Visibility** - Make sure all windshields, side and rear windows, mirrors, and lights are clean before moving vehicles.
- **Warning Signs and Traffic Signals** - Be alert for and strictly obey all directional and warning signs and signals.
- **Seat Belts** - Operator and passengers must keep seat belts fastened at all times when vehicle is in motion.

1.9 DOT REGULATED VEHICLES/EQUIPMENT

- **Commercial Driver's License** - All CARA and subcontractor personnel operating a DOT regulated vehicle must hold a valid Commercial Driver's License from their state of residence.

- **Backing Up** - Never start or back up equipment or vehicles until you are sure the way is clear. If necessary, have another person guide you safely. Back up alarms, when required, must be working and audible over the surrounding noise.
- **Ear Protection** - Earplugs or other approved ear protection shall be worn when necessary. Use of earplugs in cars or trucks on public highways may be against local laws.
- **Fueling and Repair** - No fueling or repair shall be made to equipment while it is in operations. The motor shall be turned off and the bucket, blade, gate, or boom shall be lowered to the ground or blocks.
- **Housekeeping** - Operators should keep deckplates, steps, rungs, and hand rails on equipment free of grease, oil, ice, and mud. The inside of the cabs shall also be kept clean and free of tools, equipment, and flammable items.
- **Inspections** - Equipment and vehicles shall not be used until known defects or discrepancies are corrected. Inspections shall be made daily and defects or discrepancies shall be reported to the supervisor immediately.
- **Jumping** - Jumping on or off equipment is prohibited. When climbing on or off equipment or vehicles, face the unit and use secure hand and foot holds to prevent slips and falls. Always look where you are stepping.
- **Know Your Equipment or Vehicle** - It is your responsibility to be thoroughly familiar with all features and manuals and if you are in doubt as to correct operating techniques or safety features, ask your supervisor at once.
- **Overloading** - Avoid overloading vehicle beds and equipment buckets and beds. Excessive material can damage the unit and falling material can cause serious injury.
- **Power Lines** - When operating trucks, cranes, shovels, or other units, always use caution around power lines and maintain a minimum safe clearance of 10 feet or more depending upon the voltage.
- **Riders** - Only authorized persons will be permitted to ride in equipment or vehicles. The number of passengers in a passenger-type vehicle will not exceed the number that can be seated.
- **Securing Loads** - The operator of the vehicle is responsible for ensuring that their load is secure and will not shift during transport.
- **Long Hauls** - On long hauls, binders should be checked periodically (at least during each rest or service stop) to make sure they are still secure and tight.
- **Overhanging and Oversize Loads** - When it is necessary to transport overhanging or oversize loads, the appropriate signs and red flags (not less than 144 in^2) and red lights will be used. When necessary, use flag cars.
- **Safety Chains** - Safety chains of sufficient size and strength shall be installed on all trailers being towed. Personnel are not permitted between towed loads and towing vehicles except when hooking or unhooking.
- **Safety Hooks** - Use safety hooks with latches on all winch truck cables.
- **Side Roads and Railroad Tracks** - Stop and look both ways before crossing railroad tracks or before driving onto a highway from a side road.

- **Stopping** - Do not stop vehicles in the middle of the road to talk to occupants in another vehicle. Always pull to the side or off the road to maintain a clear, safe road.
- **Turn Signals** - Always use turn signals, emergency and other signals as appropriate when turning, stopping, passing, or performing other vehicle operations.
- **Vehicle Maintenance** - It is the driver's responsibility to see that his vehicle is in good mechanical condition before and during operation. Special emphasis should be placed on ensuring the brakes, lights, horn, windshield wiper, tires, and steering assembly are in good order. Defects must be reported and corrected immediately.

1.10 HEAVY EQUIPMENT OPERATIONS

1.10.1 Team Composition

The minimum team make-up will be**:**

- One qualified operator, either a UXO Technician or Non-UXO trained individual;
- One ground guide, UXO Technician I or II, (the Safety Observer can fill this role and that of safety Observer if conditions permit); and
- One Safety Observer, UXO Technician III.

Team Leader - An UXO Technician III (Team Leader) will serve as the Team Leader and overall Safety Observer, directing the site personnel and equipment during the operation. Depending on the complexity of the operation, he may also serve as the backup guide. The Team Leader will be trained, as a competent person when required.

Ground Personnel - Team members working on heavy equipment operations will be qualified through on-the-job training (OJT) and will perform such tasks as magnetometer checks, manual excavation and checks of the excavation for UXO items. When using a UXO Tech I for manual excavation, a UXO Technician III must be present to supervise.

Equipment Operators - All site personnel, regardless of affiliation, who operate heavy equipment, will have qualified formal training, equivalent previous employment experience or OJT. Documentation of operator training will be kept on file at the site. As a minimum, the operator will perform daily inspection and maintenance of equipment as stated in the operation manual for that piece of equipment. Daily inspections must be documented (See figure 1).

1.10.2 Use of Non-UXO Personnel

Use of Non-UXO personnel as operators on UXO sites is authorized. There is no requirement for additional safety barriers or shielding during the operation. When the operation has come within one foot of the UXO item or anomaly being investigated, unless the operator has been designated essential personnel, the Non-UXO operator must move outside the pre-designated Minimum Safe Distance (MSD), until recalled by the UXO Technician III.

1.10.3 Equipment Procedures

1.10.3.1 The hazards associated with heavy equipment involve moving parts and exposure to possible pinch points. Safe operating procedures for each type of equipment or

activity must be reviewed and followed. Safety protection, including equipment guards, which must not be removed, shall be provided to mitigate this problem. Site personnel operating or working within close proximity to heavy equipment will wear hard hats, eye protection, steel-toed boots, and hearing protection (as necessary).

1.10.3.2 Heavy equipment used on the site must meet the requirements of OSHA, DOT, and general industry standards. The operator will be responsible for completing daily written inspections of all heavy equipment and provide copies of the inspection as well as required certifications to the Site Manager (SM). All personnel who operate equipment must use any safety devices, such as seat belts, that the equipment is equipped with during operation. All operators will follow the following heavy equipment operating rules:

- Only personnel trained in the operation of heavy equipment are permitted to operate such equipment;

- Personnel may only operate equipment for which they have received training and certification. Trainees may operate heavy equipment, but only under competent supervision;

- Before operating any heavy equipment, the operator must conduct a pre-operational check of the piece of equipment. Brakes, hydraulic lines, light signals, fire extinguishers, fluid levels, steering, tires, horn, and other safety devices will be checked daily and maintained in good working order throughout the duration of its use. If it is found to be unsafe, the operator must report the condition immediately to the appropriate supervisor, and the piece of equipment placed in an unserviceable status until it has been repaired or replaced.

- Heavy equipment will not be backed up unless the vehicle has a reverse signal alarm audible above the surrounding noise level or a ground guide is used.

- Heavy equipment will be provided with necessary safety features including seat belts, roll-over protection, emergency shut-off during roll-over, backup warning lights, and audible alarms as applicable.

- Blades and buckets will be lowered to the ground and parking brakes will be set before shutting off any heavy equipment.

- Special consideration must be given to the proper functioning of tires, horns, lights, batteries, controllers, lift systems (including forks, chains, cable and limit switches), brakes, and steering mechanisms;

- All heavy equipment must be operated at an authorized safe speed, consistent with conditions, and at a safe distance from other vehicles. Heavy equipment must be under positive control at all times;

- No riders other than the driver are permitted on heavy equipment at any point;

- When heavy equipment is left unattended, loads must be lowered, controls neutralized, power shut off, and brakes set. Wheels should be chocked if the equipment is parked on an incline.

- Backhoe outriggers shall be equipped with cleated pads (or cribbing used) when operating in soft sandy soil rather than rubber pads (for hard surfaces).

- When working near a backhoe or excavator, field personnel will maintain sight contact with the operator. Field personnel shall not work within the swing radius of the equipment while the equipment is operating. The swing radius will be defined with traffic cones, barrier tape, or other suitable means, such as inscribing the radius on the soil surface using the backhoe bucket.

- Personnel will not cross the demarcated line without first establishing eye contact with the operator. The operator will cease vehicle operations and remove his hands and feet from the controls and/or turn the equipment off, before allowing personnel access to the area within the swing radius. Operations will resume only after all personnel have left the area within the swing radius.

1.10.4 Personnel Protective Equipment (PPE)

The appropriate level of PPE contingent to on-site operations, or at a minimum—Level D PPE—will be required for personnel engaged in heavy equipment operations. Clothing items will be:

- Coveralls or work clothing as prescribed by Accident Prevention Plan (APP);

- Work gloves, leather or canvas, as prescribed by APP;

- Safety glasses - as wind conditions and airborne particulate matter dictates;

- Hardhats;

- Highly Visible Safety Vests;

- Work Boots, steel toe - Sturdy and of sufficient height to aid in ankle support;

- Hearing Protection - Will be determined through a Noise Survey for any heavy equipment brought on site. Until the survey is completed and the degree of attenuation determined, personnel on the team will wear appropriate hearing protection; and

- Dust Masks - as wind conditions and airborne particulate matter dictates.

1.11 GENERAL HEAVY EQUIPMENT SAFETY PRECAUTIONS

1.11.1 Underground Utilities

Utilities companies shall be contacted within established or customary local response times advised of the proposed work and asked to locate underground utilities (sewer, telephone, electric, water, gas or any other utility) prior to start of actual excavation. When these locations cannot be established, the excavation may proceed, provided the heavy equipment operation does so with caution, and only after site personnel, using detection equipment, have made an attempt to locate utilities. While the excavation is opened, and underground utilities exposed, they shall be protected, supported or removed as necessary to safeguard workers.

1.11.2 Exposure to Vehicle Traffic

Team members exposed to vehicular traffic shall be provided and wear warning vests or other suitable garment with a highly visible (reflector) material. Traffic direction paddles or saw horse type barricades may also be required to halt or redirect vehicular traffic around the excavation site.

1.11.3 Exposure to Falling Loads

No worker shall be permitted underneath loads handled by lifting or digging equipment. Workers are required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling material.

1.11.4 Equipment Warning Device

All heavy equipment will be equipped with an audile warning system that sounds when the equipment is backing up. Heavy equipment needing to be moved adjacent to an excavation or approach the edge, and the operator does not have a clear and direct view of the edge, will institute a warning system, such as barricades, stop logs or arm and hand signals from the safety observer.

1.11.5 Loose Rock or Soil

Workers will be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. All equipment or materials will be placed at least 2 feet (.61m) from the edge of excavations, or by use of retaining devices that are sufficient to prevent the equipment or material from falling or rolling into the excavation. Also, scaling the excavation face to remove loose rock or soil and the installation of protective barriers at intervals on the face to stop or contain falling material will be used when appropriate.

1.11.6 Cave-In

Excavations will be protected from cave-ins by adequate protective systems (sloping and benching or shielding and support).

1.11.7 Operation of Heavy Equipment

Heavy Equipment will not be operated without a spotter. This includes moving, repositioning, and using the front and rear attachments. Prior to starting an excavation, a safety arc will be etched in the ground with the front or rear boom, fully extended. If operating on a hard surface, the safety arc will be marked on the ground, with bright spray paint. Prior to anyone entering the safety arc, the operator will:

- Swing the boom fully to one side;
- Lower the bucket to the ground;
- Place engine in idle speed; and
- Hold his hands clear of the controls or in the “Hands Up” position.

1.11.8 UXO Precautions

All heavy equipment operations will adhere to the MSD, if applicable, as described in the site Work Plan. The lateral distances will be maintained when conducting heavy equipment operations on a UXO site. These distances may be reduced or extended by the USACE Site Safety Representative, based on an assessment of site history, size of site, expected UXO, terrain features or other such factors that may apply. The following distances shall apply as applicable:

- 200 feet minimum or the K-50 factor distance (whichever is greater) from non-UXO trained site personnel, unrelated to the operation.
- 200 feet minimum or the K-50 factor distance (whichever is greater) from another heavy equipment operation or other manual intrusive operations.
- All excavations will be conducted offset laterally for the suspected UXO item or anomaly being investigated.
- The heavy equipment will uncover no more than six (6) inches of earth per dig.
- The heavy equipment will not be used to excavate closer than 12 inches from UXO.
- Suspend all operations immediately upon approach of an electrical storm.
- Observe the hazards of electromagnetic radiation (EMR) precautions when working in the vicinity of electrically initiated or susceptible UXO.
- Do not handle any munitions and explosives of concern (MEC) unnecessarily.
- Incorporate appropriate property protective measures for shock and fragmentation when conducting MEC operations.

1.12 HEAVY EQUIPMENT TRAINING

1.12.1 Competent Person

The Team Leader will serve, as the “Competent Person” for all heavy equipment operations.

Heavy Equipment Inspection Report

Date:	**Vehicle Make:**	**Rental/Lease/Private** *(circle one)*
Lic Plate #:	**Veh VIN#:**	
Starting Mileage/Hours for Week:	**Ending Mileage/Hours for Week:**	
General Vehicle Inspection		

Check { } with R for repair needed; X for OK; / for adjustment made

1. Windshield { }	**3. Vehicle Interior { }**
2. Vehicle Exterior { }	**4. Leaks { }**
5. Lights: a. Headlights { } d. Brake Lights { } b. Tail lights { } e. Back-up Alarm { } c. Turn Signals { }	
6. Brakes { }	**10. Belts { }**
7. Horn { }	**11. Defroster { }**
8. Tires/Tracks (Tread wear/pressure) { }	**12.Radiator/Hoses** (DON'T check when hot) { }
9. Windshield Wipers/Washer { }	**13. Battery { }**
14. Fluid Levels: (Circle approximate level) a. Oil Full 1qt low Added_____ b. Coolant: Full Need coolant Added_____ c. Transmission: Full 1pt low Added_____ d. Fuel: Full ½ ¼ Empty	e. Hydraulic Fluid Full 1qt low Added_____ f. Grease Fittings Full Added_____ g. ROPS Certificate Yes No
Comments/Repairs/Service(s) Needed: Next Service @_____hrs	

LOCKOUT/TAGOUT PROGRAM

1.1 INTRODUCTION

1.1.1 Objective

This procedure shall be used by CARA and subcontractor personnel responsible for operating the machine or equipment to ensure that the machine or equipment being worked on is isolated from all potential hazardous energy sources, and locked out or tagged out before an employee performs any servicing or maintenance activity where the unexpected energization, start-up, or release of energy could cause an injury. Energy sources can be electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

1.1.2 Purpose

This procedure establishes the minimum safety requirements to ensure the proper deactivation of movable, electrically energized, pressurized equipment and systems; and systems containing hazardous materials prior to repairing, cleaning, oiling, adjusting, or similar work. This procedure complies with the requirements in 29 CFR 1910.147.

1.1.3 Requirements

This procedures applies to all equipment that receives energy from electrical power, hydraulic fluid under pressure, compressed air, steam, energy stored in springs, potential energy from suspended parts, or any other source that may cause unexpected movement when it is necessary to perform work on that system. It also applies to similar functions performed on systems containing hazardous materials.

1.1.4 Definitions

Lockout - The placement of a lockout device on an energy isolating device, in accordance with this procedure, is ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed. The lockout device can be key operated or a combination device.

Tagout - The placement of a tagout device on an energy isolating device, in accordance with this procedures, is to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed by the authorized person who originally placed the tagout device in position.

Authorized employee - A person who locks or implements a tagout system procedure on machines or equipment to perform the servicing or maintenance on that machine or equipment.

1.2 LOCKOUT/TAGOUT STEPS

Prior to initiating any repairs, modifications, and/or adjustments to operating equipment, these steps will be followed:

1. The immediate supervisor with jurisdiction over the equipment and all affected employees will be notified that the energy sources are to be deactivated.
2. All sources of power that must be locked out, blocked, or released will be identified by the immediate Supervisor and the employee who will work on the equipment.
3. In order to ensure that the equipment cannot be re-energized while maintenance activities are performed, the employee will lockout/blank out all potential energy sources. (Employees will be assigned padlocks with their names or identification numbers affixed to the locks. The locks will be individually keyed to prevent another employee from removing the lock inadvertently.) If more than one employee is assigned to work on the equipment, a multi-lockout hasp will be used so that all employees working on the equipment can apply their locks and ensure their safety.
4. A tagout device will be affixed to all components or systems de-energized to indicate that lockout has been performed.
5. After the servicing and/or maintenance is complete and the equipment is ready for normal operations, check the area around the machine or equipment. After all tools have been removed from the machine or equipment, guards have been reinstalled, remove all lockout or tagout devices. Operate the energy isolating devices to restore energy to the machine or equipment.

1.3 SPECIAL CONDITIONS

1.3.1 During certain operations, it may be necessary to energize the equipment for a short period of time. Employees in the immediate area will be notified and directed to stay clear of the equipment. If the equipment is to be deactivated again, the employee should repeat steps 3 to 5 of this procedure before work resumes.

1.3.2 If the work is completed and a lock remains on the equipment, it shall not be removed until the employee responsible for the lock is found or the supervisor of the employee investigates and ascertains that the equipment is safe to operate. Unauthorized removal of a lock will subject the violator to disciplinary action up to dismissal.

1.4 TRAINING

Initial and annual training will be given to all employees to ensure that the purpose and function of this energy and control program are understood.

1.5 PERIODIC INSPECTION

The Site Safety and Health Officer will conduct an annual audit of the energy control program to ensure that the requirements of these procedures are being followed. A record of annual audits will be kept to comply with the requirement for periodic inspections.

SAFE PROCEDURES FOR HANDLING, STORAGE AND USE OF PRESSURIZED CYLINDERS

1.1 PURPOSE

The purpose of this procedure is to outline the minimum requirements for safe handling and use of compressed gas and gas cylinders. This procedure is an overview of the requirements of 29 CFR 1910.101, .169, and .253. It is anticipated that pressurized cylinders will be used to store and supply standards for air monitoring and Grade D breathing air for Level B activities. This procedure is intended to provide procedures for safely handling these cylinders and any other pressurized gases used on this project.

1.2 USE OF COMPRESSED AIR OR GASES

- Compressed air or other compressed gases are not to be used to blow dirt, chips, or dust from clothing.
- The use of compressed air is to be controlled, and proper personal protective equipment or safeguards utilized, as to protect against the possibility of eye injury to the operator or other persons.
- Compressed gases are not to be used to elevate or otherwise transfer any hazardous substance from one container to another unless the containers are designed to withstand the pressure with a safety factor of at least four.

1.3 COMPRESSED GAS CYLINDERS

- Cylinders must never be dropped, struck, or permitted to strike each other violently. Use carts or racks to move compressed gas cylinders; correct material handling techniques must be exercised when moving cylinders.
- Valve protection caps must always be kept on cylinders when they are being moved, stored, or until ready for use.
- Cylinder valves are to be kept closed except when gas is being used or when connected to a permanent manifold. Valves of empty cylinders must be closed.
- Cylinders must never be used as rollers or supports, or for any purpose other than carrying gas.
- Cylinders of compressed gas shall be stored in areas where they are protected from external heat sources such as flame impingement, intense radiant heat, electric arc, or high temperature steam lines.

- Cylinders are to be stored in an assigned area with full and empty cylinders separated. Stored fuel gases and oxygen cylinders are to be separated by 20 feet, or by a fire wall at least five (5) feet high having a fire-resistance rating of at least one-half (1/2) hour.
- Oxygen, nitrogen, helium, or freon cylinders must be stored upright or transported in a horizontal position with the exception of acetylene cylinders, which must always be kept in an upright position in accordance with EM 385-1-1. All horizontally placed cylinders are to be secured by chocks or ties to prevent rolling.
- Cylinders are to be secured to a fixed object by chain or equivalent fastening device whenever they are placed in an upright position. The protective cap is not to be removed or the cylinder valve opened until the cylinder is secured.
- The repair of leaks must never be attempted on a pressurized system. If leaks develop, system pressure should be reduced to atmospheric pressure as rapidly as possible, and the SSHO/UXOSO notified immediately.
- Identification of the gas to be used must always be assured before connecting cylinders for use. All cylinders are to be labeled as to contents in addition to proper color-coding. Color-coding of cylinders should be posted.
- Compressed gas cylinders in portable service are to be conveyed by suitable trucks to which they are securely fastened. All gas cylinders in service must be securely held in substantial racks or secured to other rigid structures so that they will not fall or will not be knocked over.
- Gas cylinders moved by hoist must be handled in suitable cradles or boxes.
- Cylinders must not be placed where they might form part of an electrical circuit.
- Transfer of acetylene from one cylinder to another is prohibited.
- Oxygen cylinders are never to be stored near:
  - ◊ Highly combustible materials; especially oil and grease.
  - ◊ Reserve stocks of acetylene or other fuel gas cylinders.
  - ◊ Any other substance likely to cause or accelerate fire.
- All cylinders used and stored on site must have been hydrostatically tested within the last 5 years and have the date stamped on the cylinder. Any cylinder not having a current hydrostatic test should be rejected.
- Compressed gas cylinders must be legibly marked for identifying the gas content with either the chemical or the trade name of the gas. Such marking is to be by means of stenciling, stamping or labeling, and must not be readily

removable. Whenever practical, the marking is to be located on the shoulder of the cylinder.

- Compressed air and oxygen are not interchangeable as gases. Oxygen shall never be used for the following:
  - ◊ As breathing air.
  - ◊ To purge pipelines, tanks, or any confined area.
  - ◊ To supply a head-pressure tank.
  - ◊ To power pneumatic tools.
  - ◊ In oil preheating burners.
  - ◊ To start internal combustion engines.
  - ◊ Ventilation.
  - ◊ Cleaning clothing.
  - ◊ In any other way as a substitute for compressed air.
- Use of a cylinder's contents for purposes other than those intended by the supplier is prohibited.

SECURITY OFFICER OPERATIONS

1.1 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the minimum procedures and safety and health requirements applicable to subcontracted Security Officer Operations.

1.2 SCOPE

This SOP applies to all Installation approved Security Officer personnel involved in the conduct of their assigned duties at RSA to support the MSFC-003-R-01 MEC/CWM Construction Footprint Clearance. This SOP is not intended to contain all of the requirements needed to ensure complete compliance, and should be used in conjunction with project plans and applicable Federal, state and local regulations. Consult the documents listed in section 1.3 of this SOP for additional compliance issues.

1.3 REGULATORY REFERENCES

Applicable sections and paragraphs in the documents listed below will be used as references for the conduct of site operations:

- Army Regulation 190-11;
- Army Regulation 190-13;
- Local and State Regulations;
- USACE EM 385-1-1, Safety and Health Requirements Manual; and
- MSFC-003-R-01, MEC/CWM Construction Footprint Clearance Work Plan.

1.4 RESPONSIBILITIES

1.4.1 Project Manager - The US Army Engineering and Support Center, Huntsville (USAESCH) Project Manager (PM) shall be responsible for ensuring the availability of the resources needed to implement this SOP, and shall also ensure that this SOP is incorporated in plans, procedures, and training for sites where this SOP is to be implemented.

1.4.2 Site Supervisor - The Site Supervisor will be responsible for assuring that adequate safety measures are completed in an efficient and economical manner. The Site Supervisor or his designee will conduct daily briefings to all on-coming and off-going Security Officers pertaining to daily security requirements or security changes to this SOP.

1.4.3 Site Safety and Health Officer - The Site Safety and Health Officer/UXO Safety Officer (SSHO/UXOSO) for this site is responsible for ensuring that all operations are being conducted in a safe and compliant manner. The SSHO/UXOSO will conduct all project

required Safety Training to all Security Officers and coordinate these actions with the Security Officer Supervisor, as to not detract from the duties of the SSHO/UXOSO. The SSHO/UXOSO will ensure that the Security Officers are provided any site specific safety equipment needed to perform their duties. The SSHO/UXOSO will also update the Security Officer Book with current project information.

1.4.4 Security Officer Supervisor - The Security Officer Supervisor will be trained and qualified to perform their duties and ensure that the Security Officer personnel are also qualified. The Supervisor will:

- Manage all the necessary maintenance on the project or company provided equipment;
- Ensure that security personnel are completing all required reports and log entries in accordance with the security company's integral policies and this SOP;
- Notify the SM or SSHO/UXOSO of any newly arrived Security Officer personnel;
- Coordinate scheduling of the new personnel project training, prior to their arrival on the site; and
- Ensure that all newly assigned personnel have reviewed and signed the "Instructions for the Security Force" prior to assuming any duties.

1.4.5 Security Officer Personnel - Security Officer personnel will comply with their company's internal policies as well as the policies and guidance listed in this SOP. Security Officers will – at a minimum – complete the following during their shift (*see Attachment 1-Instructions for the Security Force).* On Duty Security Officers will:

- Keep a concise log of all activities that occur during their shift;
- Provide an adequate briefing to their replacements and finally to the Site Supervisor, or designee, at the end of that day's shift;
- Arrive on site prepared for assumption of duties, as requested by the Site Supervisor, or designee, or as directed by their Security Officer Supervisor;
- Review the Security Guard Book, to ensure that any changes to security protocols are in place and enforced; and
- Notify the appropriate personnel of any violation, incident or accident concerning this site or any project equipment immediately.

If someone is inquiring as to what activities are going on at this site give the person a USACE fact sheet which pertains to this site (if available).

1.5 TRAINING REQUIREMENTS

Due to the nature of this project, all site personnel—including contractors and subcontractors—must attend a Site Hazardous Communication Brief before they can work onsite. The SSHO/UXOSO will provide a copy of the brief to the Security Officer Supervisor, who will assist in the training of any Security Officer personnel performing a single shift replacement. Any new Security personnel identified as part of the permanent force will also attend the training provided by the SSHO/UXOSO. These briefings will be scheduled as not to detract from their duties to the project.

Attachment 1
Instructions for the Security Force

With an Intrusion Detection System (IDS) in place and functional, security officers will visually check the site at random intervals at least three times every 24 hours, unless otherwise instructed by the Site Supervisor or SSHO/UXOSO. If the IDS has not been installed or is non-functional, security officers will maintain 24-hr surveillance of the ECM
When there is more than one officer required, both officers will make radio communication on a periodic basis between posts. The security patrol will be equipped with a mobile phone and a 2-way radio.

In the event an intruder is detected at either site, the officers will take appropriate action to stop the intruder and maintain the security of the site. If necessary, the office will call for appropriate additional support from the local Police Department. Response times would be in accordance with standard police protocols (e.g. 10 to 20 minutes).

The patrol will check the integrity of the fence, including the gate and lock, and observe the condition of the ECM and surrounding area. If there are signs of unauthorized activity or if any out-of-the-ordinary circumstances are noticed, site management personnel will be called in the following order.

Title	**Name**	**Cell**
USACE Safety Specialist	Jay Lewis	(256)529-8468
Site Supervisor	John Robbins or Mark Hammond	(870)717-1195 or (870)643-9015
SSHO/UXOSO	To be determined	
UXOQCS	To be determined	

The security guard will not enter the ECM under any circumstances. Questions concerning these instructions should be directed to the Site Supervisor. All safety incidents and near misses will be reported to the Site Safety and Health Officer.

I have read and understand the above instructions.

Signature _____ Date _____

Name (Printed) _____

SEVERE WEATHER OPERATIONS

1.1 PURPOSE

The purpose of this procedure is to provide the minimum requirements and site personnel actions in the event of site evacuation, as a result of severe weather at any field operation.

1.2 SCOPE

This SOP applies to all site personnel involved in field operations regardless of affiliation. This SOP is not intended to contain all of the requirements needed to ensure complete compliance, and should be used in conjunction with project plans and applicable Federal, state and local regulations. Consult the documents listed in Section 2.3 of this SOP for additional compliance issues.

1.3 REFERENCES

Applicable sections and paragraphs in the documents listed below will be used as references for the conduct of Severe Weather operations:

- EM 385-1-97, Explosives Safety and Health Requirements Manual;
- EM 1110-1-4009, Ordnance and Explosive Response; and
- EM 385-1-1, USACE, Safety and Health Requirements Manual

1.4 RESPONSIBILITIES

1.4.1 Site Safety and Health Officer/UXO Safety Officer (SSHO/UXOSO)

Upon notification that a severe weather situation exists, the SSHO/UXOSO will notify site personnel, by radio, cellular phone or sound a horn for 3 five-second blasts. If operations, that might put site personnel at risk, are on going at the time, either the SSHO/UXOSO or USACE On-Safety Representative will cease all operations and have all teams/crews evacuate to either the site office or the closest “Safe Haven.”

The SSHO/UXOSO will direct site personnel as to the nature of severe weather and to ready site vehicles for evacuation. During this type of emergency, site personnel should not be concerned with assigned vehicles. Time permitting, a select number of site personnel will attempt to safely secure mission essential equipment (e.g. Geophysical GPS/Radio Relay Systems, RTK GPS Systems, computers, etc.) and prepare to evacuate the area to the recommended “Safe Haven.” The SSHO/UXOSO will maintain radio

communications with all site personnel, necessary support elements and record the events in the site Safety Log.

Upon arrival at the "Safe Haven," the SSHO/UXOSO will conduct a head count of all site personnel and Site Visitors, using that day's Daily Safety Brief Sign-In Roster and Site Visitors Log.

1.4.2 Individual/Personnel initially reporting Severe Weather

The individual or personnel initially spotting a severe weather situation (lightning, tornado) will immediately report it to either the SSHO/UXOSO or USACE On-Site Safety Representative by the quickest means possible.

1.4.3 Site Personnel

Upon the notification to evacuate the work site for the designated Rally Point, site personnel will do so in an orderly manner. Vehicle operators will not exceed the posted or site enforced speed limit, unless directed by USACE On-Site Safety Representative; however that speed will not exceed the conditions of the roadway.

1.4.4 USACE On-Site Safety Representative

Severe weather occurring before normal working hours, the USACE Site Safety Representative will decide whether a work delay is required and notify the SSHO/UXOSO. The SSHO/UXOSO will begin a site recall procedure with all site section supervisors, who will in turn notify their personnel.

1.5 GENERAL INFORMATION

The majority of field operations are conducted at either heavily wooded sites, or sites that consist of large rolling and sloping pastures and grasslands, consisting of clay or loose sand, and some even contain large areas of ravines and drop-offs. As a result of this, even small amounts of rain could cause vehicle entry/exit problems and personnel slipping hazards that may result in damage or injury to site personnel and equipment.

Almost all of the areas are susceptible to severe thunderstorms, with heavy downpours of rain, lightning, hail, strong microburst winds, flash floods and tornadoes. These storms are known to manifest themselves very quickly and leave very little time to react. In the event of severe weather in the area, the SSHO/UXOSO maintains a portable Severe Weather Alert radio and the Site Manager will have access to the National Weather Advisory system, via the internet or by phone.

1.5.1 Thunderstorms

Thunderstorms affect relatively small areas when compared with hurricanes and winter storms. Despite their small size, ALL thunderstorms are dangerous. The typical thunderstorm is 1.5 miles in diameter and lasts an average of 30 minutes. In order for a thunderstorm to form it needs three things; Moisture – to form clouds and rain; Unstable Air – warm air that can rise rapidly; and Lift – cold or warm fronts, sea breezes, mountains, or the sun's heat are capable of lifting air to help form thunderstorms.

The life cycle of a thunderstorm constitutes three distinct stages, which are detailed below:

- Developing Stage – Towering cumulus cloud indicates rising air; little if any rain during this stage; and occasional lightning.
- Mature Stage – Most likely time for hail, heavy rain, frequent lightning, strong winds, and tornadoes; storm occasionally has a black or dark green appearance; and lasts an average of 10 – 20 minutes but may last much longer in some cases.
- Dissipating Stage – Rainfall decreases in intensity; can still produce a burst of strong winds; and lightning remains a danger.

1.5.1.1 How Far Away is the Thunderstorm?

- Count the number of seconds between a flash of lightning and the next clap of thunder.
- Divide the number of seconds by five (5) to determine the distance to the lightning in miles.

1.5.2 Lightning

Lightning poses the greatest potential threat to site personnel and site operations, due to its unpredictable nature. Lightning results from the buildup and discharge of electrical energy between positively and negatively charged areas. Rising and descending air within a thunderstorm separates these positive and negative charges. Water and ice particles also effect distribution.

A cloud-to-ground lightning strike begins as an invisible channel of electrically charged air moving from the cloud toward the ground. When one channel nears an object on the ground, a powerful surge of electricity from the ground moves upward to the clouds and produces the visible lightning strike.

In accordance with current USACE policies, all operations cease when lightning is observed and the “Flash to Bang Time” is 30 seconds or less (approx. 6 miles from site). The safe evacuation of personnel is paramount and equipment is secondary. Using a personal lightning detector, such as the Strike Alert Personal Lightning Detector, will allow the field team to monitor whether lightning is occurring in the vicinity, the nearest distance that lightning is occurring, and whether the storm is approaching or receding. The personal lightning detector should be operated, monitored and maintained by the SSHO. Personal lightning detectors will provide an extra measure of safety, especially when storms are approaching; however, the other lightning safety measures described below must still be maintained.

Those site personnel in and around the site office will seek shelter inside the building. Site personnel working out in the field will seek shelter inside a site vehicle with the windows rolled up and the doors closed.

Site personnel that are using any electronic equipment with an antenna (i.e. RTK system, G-858 or EM-61, etc.) will cease all operations and seek shelter upon visually seeing lightning at any distance.

1.5.2.1 30/30 Lightning Safety Rule

The following guidelines are recommended by the Lightening Safety Group:

- Go indoors or seek shelter if, after seeing lightning, you cannot count to 30 before hearing thunder.
- Stay indoors or under shelter for 30 minutes after hearing the last clap of thunder.

1.5.2.2 Lightning Safety Rules

- Move to a sturdy building or car. Do not take shelter in small sheds, under isolated trees, or in convertible automobiles. Stay away from tall objects such as towers, fences, telephone poles, and power lines.
- If lightning is occurring and a sturdy shelter is not available, get inside a hard top automobile and keep the windows up. Avoid touching any metal.
- Utility lines and metal pipes can conduct electricity. Unplug appliances, office machines etc. not necessary for obtaining weather information. Avoid using the telephone or any electrical item. Use phones **ONLY** in an emergency.

1.5.2.3 If Caught Outdoors and No Shelter is Available

- Find a low spot away from trees, fences, and poles. Make sure the place you pick is not subject to flooding.
- If you are in the woods, take shelter under the shorter trees.
- If you feel your skin tingle or your hair stand on end, squat low to the ground on the balls of your feet. Place your hands over your ears and your head between your legs. Make yourself the smallest target possible and minimize your contact with the ground. **DO NOT** lay down.

1.5.3 Tornadoes

Tornadoes produce extreme high destructive winds and devastation. Tornadoes are generally produced along the leading edges of thunderstorms that form, with little or no warning. Before thunderstorms develop, a change in wind direction and an increase in wind speed with increasing height create an invisible, horizontal spinning effect in the lower atmosphere. Rising air within the thunderstorm updraft tilts the rotating air from horizontal to vertical. An area of rotation, 2 – 6 miles wide, now extends through much of the storm. Most tornadoes form within this area of strong rotation.

Most project sites do not afford adequate tornado "Safe Havens," or adequate "Safe Havens" are so far away that they afford little or no help to those site personnel working in remote site locations.

The SSHO/UXOSO and Site Manager will attempt to locate those "Safe Havens" and brief site personnel of their locations, during the Daily Tailgate Safety Briefing.

1.5.3.1 When and Where Tornadoes Occur

- Tornadoes can occur any time of the year.
- Tornadoes have occurred in every state, but they are most frequent east of the Rocky Mountains during the spring and summer months.
- In the southern states, peak tornado occurrence is March – May, while peak months in the northern states are during the late spring and summer.
- Tornadoes are most likely to occur between 3 and 9 p.m., but can occur anytime.
- The average tornado moves from southwest to northeast.
- Tornadoes can accompany tropical storms and hurricanes as they move onto land.

1.5.3.2 Tornado Safety Rules

- In a building, move to a pre-designated shelter, such as a basement.
- If a below ground shelter is not available, move to a small interior room or hallway on the lowest floor and get under a sturdy piece of furniture. Put as many walls as possible between you and the outside.
- Stay away from windows.
- Get out of automobiles.
- Do not try to outrun a tornado in your car; instead, leave it immediately for safe shelter.
- If caught outside or in a vehicle, lie flat in a nearby ditch or depression and cover your head with your hands.
- Be aware of flying debris. Flying debris from tornadoes causes most fatalities and injuries.

- Office trailers, even if tied down, offer little protection from tornadoes. You should leave an office trailer and go to the lowest floor of a sturdy nearby building, or follow the procedures detailed in the 6th bullet above.

1.5.4 Flash Floods/Floods

Due to the massive amounts of rain that can be dropped from thunderstorms, the site may be susceptible to flash floods. Some of the existing roads may be unimproved dirt and are easily turned into mud, creating an unsafe driving environment. Those roadways that are paved also place the vehicle in low-lying areas that may be washed out. Do not attempt to cross any roadway that has become submerged by water.

1.5.4.1 Flash Flood/Flood Safety Rules

- If you are in a low lying area, at the first sign of rain evacuate to high ground.
- Designate an evacuation route in the event of flooding.
- Avoid walking or driving in flood waters.
- Stay away from high water, storm drains, ditches, ravines, or culverts. If the water is moving swiftly, even water only six (6) inches deep can knock you off your feet.
- If you come upon flood waters, stop, turn around, and go another way.

1.5.5 Straight-line/High Winds

When this is associated with a passing front generating potential severe weather, the winds can increase in speed rather rapidly. Dust and debris pose an eye hazard. High winds can rip vehicle doors and rear hatches from site personnel's grasp causing damage and injury. Site personnel in the field should select an area or park the vehicle in such a matter that provides a windbreak. If this can not be accomplished, open doors and hatches with care. Vehicles should not be left with doors, hoods or hatches open.

1.5.5.1 Straight-line/High Winds Safety Rules

- In a building, move to a pre-designated shelter, such as a basement.
- If a below ground shelter is not available, move to a small interior room or hallway on the lowest floor and get under a sturdy piece of furniture. Put as many walls as possible between you and the outside.
- Stay away from windows.
- If caught outside, lie flat in a nearby ditch or depression and cover your head with your hands.
- Be aware of flying debris. Flying debris from tornadoes causes most fatalities and injuries.

- Office trailers, even if tied down, offer little protection from straight-line/high winds. You should leave an office trailer and go to the lowest floor of a sturdy nearby building, or follow the procedures detailed in the 4th bullet above.

- Move to a sturdy building or car. Do not take shelter in small sheds, under isolated trees, or in convertible automobiles.

- If high winds are occurring and a sturdy shelter is not available, get inside a hard top automobile and keep the windows up.

1.5.6 Hail

Hail can occur in conjunction with a thunderstorm and can cause damage to equipment and injuries to personnel. Hail occurs when strong rising currents of air within a storm, called updrafts, carry water droplets to a height where freezing occurs. These water droplets become frozen and the ice particles grow in size, becoming too heavy to be supported by the updraft, and fall to the ground. Speeds of the falling ice particles, hail, can exceed 100 miles an hour, with size exceeding that of a softball.

1.5.6.1 Hail safety Rules

- Seek shelter, preferably in a building, or hard-top automobile.

- If in the open, seek shelter in a culvert if there is no flooding under a rock outcrop or under trees if there is no lightning associated with the hail storm.

- Exercise caution when driving on hail, it is very slippery, so avoid it if at all possible.

- If driving when a hail storm starts, pull under an overpass if possible, if not pull well off the road with your lights on in order that advancing motorists can see you.

SOIL HANDLING

1.1 INTRODUCTION

Operations for handling potentially contaminated soil must follow a basic set of rules or procedures. This SOP provides the necessary guidelines for placing potentially contaminated soil in drums, roll-offs, or other containers.

1.2 EQUIPMENT

The following equipment will be needed:

- Excavator, to move soil from excavation or soil pile
- Skid-steer loader or forklift to move pallets and drums
- Drum funnel
- Hand tools, for moving soil from excavator bucket to drum, sealing drums, etc
- Air monitoring equipment including MINICAMS, PID, dust monitor

1.3 GENERAL REQUIREMENTS

- Drums should be staged in one of three locations based on their status:
- Clean, empty drums may be staged where convenient but not with drums that have been used.
- Drums that have been filled but have not been cleared based on headspacing or low-level analysis of samples must remain in a down range holding area
- Drums for which headspacing and low-level results of samples are available, may be staged to the Drum Staging Area to await offsite disposition.
- Drums should be placed on pallets close to the excavation and within reach of the excavator.
- Roll-off containers should be placed within reach of the excavator, or a loader can be filled by the excavator and then used to dump the soil into the roll-off.
- PPE Levels worn will be determined based on air monitoring as described in the work plan.
- Drums should remain down range until the following criteria are met:
    - the drum exteriors are decontaminated, if required

- the results of headspacing and/or sampling indicate the disposition of the drum, *i.e.* - whether the contents require decontamination, or that they may be staged for disposal.

1.4 DRUMS

The following steps will be followed when moving soil from the excavation or from a soil pile that requires drumming:

1. The day's operation of pallets and drums will be staged near the area of the excavation or soil pile to be drummed.

2. A pallet will be placed on an elevated platform (such as two 4x4 boards) and the drums placed on the pallet.

3. The drums will be pre-marked IAW the work plan so that proper tracking can be accomplished.

4. Perforated pipes with end caps will be placed within the drums for future decontaminating, if it becomes necessary.

5. A soil funnel will be placed in the first drum to be filled.

6. The excavator will extract a bucket of soil from the excavation or soil pile and hold it over the drum. The soil/drum handlers will pull the soil off of the bucket with hand tools while the operator gently shakes the soil out. If the soil has already been sifted, this step can be skipped and soil may be placed directly in the drum. The handlers will watch for anything unusual such as metal, glass, big limbs, etc. Soil samples may be collected during this process.

7. Once the drum is approximately 1/2 to 2/3 full (may vary depending on weight of soil, not to exceed weight restrictions of disposal contractor), the funnel will be moved to the next drum and the procedure repeated until the drums on the pallet are all 1/2 to 2/3 full, or the specified soil has been drummed.

8. When all the drums are filled, they will be sealed and secured to the pallet. The pallet will then be moved to the Holding Area.

9. Any soil samples collected in association with the pallet being moved to the Holding Area can be given to the loader/forklift operator who will deliver it to the PDS. The pallets with drums will be staged in the Holding Area on the east side of road in a designated area depending on disposition. The drums that require decontamination will be kept separate and will be accumulated

until either room is needed or the excavation operation is completed; at that time bleach can be added to decontaminate the soil.

1.5 ROLL-OFFS

Materials from the excavation or soil pile will be placed in a roll-off container with the following considerations.

- Roll-offs will be used for wastes that will be sent to a landfill for disposal.
- The excavator will fill the roll-off directly while the handler and safety observer watch the excavation hole for unusual debris.
- Following completion of the day's activities, the roll-off must be covered with a lid or tarp to prevent the infiltration of rainwater or other materials.
- Once the roll-off is full it will be staged for further disposition.

SAFETY CONSIDERATIONS DURING TRENCHING AND EXCAVATION

1.1 INTRODUCTION

USA Environmental will control the hazards posed by open excavation through strict compliance with the procedures outlined in this document. This plan addresses U.S. Army Corps of Engineers excavation requirements contained in Section 25 of the US COE *Safety and Health Requirements Manual* (EM-385-1-1) and OSHA requirements as specified in 29 CFR 1926.651 (*Excavation and Trenching)*. In the event of a conflict between these referenced standards, the more stringent will prevail. Thus, limiting/preventing potential exposures of project personnel must be the FIRST consideration during all intrusive excavations. This will be accomplished by providing protective clothing/respiratory protection, conducting air monitoring during intrusive activities, and decontaminating personnel/equipment.

1.2 GENERAL REQUIREMENTS

1.2.1 Site Reconnaissance

A visual surface reconnaissance and geophysical survey (e.g., magnetometer) will be performed over the excavation area prior to any intrusive work. The objective of this survey is to identify physical hazards, suspected hazards, unexploded ordnance, chemical warfare material, energetic materials, flammables, pyrotechnics, underground utilities, and unknown buried objects. Subsurface contacts are located and marked with a non-metallic identifier and recorded by position.

1.2.2 Underground Installations/Utility Locations

1.2.2.1 The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to beginning an excavation. Utility companies or a utility locator organization shall be contacted at least seven working days prior to excavation activities and asked to establish the location of underground utilities. Utilities must be located before excavation activities commence.

1.2.2.2 Equipment operators shall maintain a reasonable clearance between any underground utility and the cutting edge or point of powered equipment. When excavating with powered equipment within 18 inches of the markings of underground facilities, personnel should conduct the excavation in a careful and prudent manner by excavating by hand to determine the precise location of the facility/utility to prevent

damage. While the excavation is open, underground installations shall be protected, supported or removed as necessary to safeguard employees.

1.3 PROCEDURES FOR EXCAVATING SUSPECTED RCWM

1.3.1 Excavation Procedure

1.3.1.1 Personnel involved in excavation operations using heavy equipment will follow the following procedures:

- Stage equipment in the Contamination Reduction Zone (CRZ);
- Ensure correct PPE is being used;
- Inspect PPE prior to use;
- Determine wind direction by position of streamers;
- Conduct a geophysical survey over the surface excavation area with a magnetic locator or other handheld instrument to verify the position of subsurface contacts;
- Mark the position of contacts and alert equipment operator to the suspected depth, approximate size, and orientation of subsurface relative to the surface;
- Equipment operator will ensure observer is clear from the operating radius of the excavation equipment prior to operating the equipment;
- Perform radio/communications check with the SSHO/UXOSO;
- Extend boom to the maximum length and position bucket to scrape surface with teeth extended down;
- Scrape 4 to 6 inches of top soil from the surface;
- Operator lowers the equipment and the boom to the ground and removes hands from controls prior to signaling for entry of observer to investigate the open trench;
- The team revalidates positions of contacts and sweeps the clear soil area for additional contacts that may result from movement of sub-grade material;
- Observer watches the excavation process for any suspect material that may be encountered. The operator immediately halts excavation when a closer look or sampling is necessary;
- Conduct air monitoring of exposed surface, excavated soil and the breathing zone of excavating teams (CARA monitors chemical agents and industrial chemicals – in accordance with the Air Monitoring Plan.);
- Account for the position of all field personnel and resume the excavation procedures;

- Excavated fill is to be staged no higher than one half the depth of the trench and staged no closer than two feet from the trench;
- Repeat excavation procedures until sampling and excavation is complete;
- Close excavation with excavated materials and tamp;
- Decontaminate excavation equipment with steam cleaner and decontaminate bucket in accordance with the excavator bucket decontamination SOP; and
- Do not drive equipment over a trench that has been backfilled.

1.3.1.2 The Down Range Team may initially excavate using a backhoe or by shovel. If suspected CWM or MEC is located, excavation by backhoe will cease and subcontract personnel will excavate with shovels until all identifiable CWM or MEC have been removed. Backhoe operation may then resume. The Down Range Team will maintain a buffer zone between the edge of the excavation and the excavation equipment.

1.4 ACCESS AND EGRESS

If employees are required to enter an excavation that requires shoring, structural ramps or ladders will be used as a means for access or egress. A competent person qualified in structural design must design the ramps. Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement. If ladders are used, the ladder shall be located every 25 feet of lateral travel distance. Ramps or ladders must be provided when entering an excavation 4' or greater in depth.

1.5 EXPOSURE TO FALLING LOADS

No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand beyond the swing radius of the backhoe to avoid being struck by any spillage. Employees may ONLY collect samples from the backhoe bucket when the bucket has been lowered to the ground and the operator has removed his hands from the controls. ***Never approach a backhoe unless the operator sees you***.

1.6 WARNING SYSTEM FOR MOBILE EQUIPMENT

When mobile equipment is operated adjacent to an excavation or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

1.7 HAZARDOUS ATMOSPHERES

Refer to the air monitoring Section of the approved Work Plan.

1.8 PROTECTION FROM HAZARDS ASSOCIATED WITH WATER ACCUMULATION

1.8.1 Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees. These precautions may include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, and/or use of safety harnesses and lifelines. All water removal operations must be monitored by a competent person.

1.8.2 If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation. Excavations subject to run-off from heavy rains will require an inspection by a competent person before personnel are allowed to enter the excavation.

1.9 PROTECTION OF EMPLOYEES FROM LOOSE ROCK OR SOIL

1.9.1 Adequate protection shall be provided to protect employees who enter excavations or trenches from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material, installation of protective barricades at intervals as necessary on the excavation face to stop and contain falling material, or other means that provide equivalent protection.

1.9.2 Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations.

1.9.3 Excavation entry should be reviewed during site specific training, or prior to excavation activities. Those persons directly involved in the management of excavations at the site will have previously obtained the proper training, which at a minimum would have included:

- Review of OSHA Regulation for Safety and Health Requirement for Construction/Excavations – *OSHA Regulation 29 CFR 1926, Subpart P, Appendix A and 29 CFR 1926.652, Subpart P, Appendix F*.
- Proper Shoring and Sloping Techniques.
- Soil classification (Annex A of this SOP) and evaluation at the excavation site.
- Responsibilities of a Competent Person.

1.10 SELECTION OF PROTECTIVE SYSTEMS

If CARA personnel or subcontractors are required to enter excavations greater than 5 ft in depth, the sides of the excavation must be protected to prevent cave-in. Sloping and benching precautions to protect against cave-ins for this project will be in accordance with 25.C of EM 385-1-1.

1.11 INSPECTIONS

1.11.1 Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a "competent person" for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. The competent person for this project will be the SSHO/UXOSO. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Additionally, an inspection shall be made after every rainstorm or other hazard increasing occurrence. Inspections are required when employee exposure (i.e., personnel may be required to go into an excavation or trench that is greater than 5 feet deep) can be reasonably anticipated. Inspections must be documented by the "competent person."

1.11.2 When the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

Annex A

Soil Classification for Heavy Equipment Operations

1.0 SOIL TYPES

The following soil types may be encountered in the course of excavating soil. Knowledge of soil characteristics of the soil types is beneficial to understanding the hazards associated with each.

- **Cemented Soil** – A soil in which a chemical agent, such as calcium carbonate, holds the particles together whereas a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

- **Cohesive Soil** – A fine grained soil (clay) or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical side-slopes and is "plastic" when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

- **Dry Soil** – A soil that does not exhibit visible signs of moisture content.

- **Fissured Soil** – A soil material that has a tendency to break along definite planes of fracture with little resistance or a material that exhibits open cracks, such as "tension cracks," in an exposed surface.

- **Granular Soil** – Means gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

- **Layered System** – Means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

- **Moist Soil** – Means a condition in which a soil looks and feels damp. Moist cohesive soils can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

- **Plastic Soil** – means a property of a soil, which allows the soil to be deformed or molded without cracking, or appreciable volume change.

- **Saturated Soil** – Means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a penetrometer or sheer vane.

2.0 SOIL CLASSIFICATION

If personnel are to enter the excavation, the soils of the excavation must be classified to determine the design of the appropriate protective system. Each soil and rock deposit at an excavation site must be classified by a competent person, as either stable rock, Type A, Type B, or Type C soil.

The soil classification results must be made based on the results of at least one visual test (tension cracks or signs that the soil has been previously disturbed) and one manual test (use of pocket penetrometer or shear-vane to measure unconfined compression strength). The definitions of the various soil classifications are presented below.

- **Stable Rock** is natural solid mineral matter that can be excavated with vertical sides and will remain intact while exposed.
- **Type A Soils** are cohesive soils with an unconfined compressive strength of 1.5 tons per square foot (tsf) (144 kPa) or greater. Examples of Type A cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. A soil cannot be classified as Type A if it is fissured; subject to vibration from traffic, pile driving, or similar effects; has previously been disturbed, is part of a sloped, layered system where the layers dip into the excavation on a slope of 4 horizontal to 1 vertical (4H:1V) or greater; or has seeping water.
- **Type B Soils** are cohesive soils with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa). Examples of other Type B soils are: angular gravel; silt; silt loam; previously disturbed soils unless otherwise classified as Type C; soils that meet the unconfined compressive strength or cementation requirements of Type A soils but are fissured or subject to vibration; dry unstable rock; and layered systems sloping into the trench at a slope less than 4H:1V (only if the material would be classified as a Type B soil).
- **Type C Soils** are cohesive soils with an unconfined compressive strength of 0.5 tsf (48 kPa) or less. Other Type C soils include: granular soils such as gravel, sand and loamy sand, submerged soil, soil from which water is freely seeping, and submerged rock that is not stable. Also included in this classification is material in a sloped, layered system where the layers dip into the excavation or have a slope of four horizontal to one vertical (4H:1V) or greater.

Table 1-1
Maximum Allowable Slopes

Soil or Rock Type	Maximum Allowable Slopes (H:V) for Excavations less than 20 feet in depth	
Stable Rock	Vertical	(90 deg.)
Type A	¾:1	(53 deg)
Type B	1:1	(45 deg)
Type C	1 ½:1	(34 deg)

Exception: Simple slope excavations, which are open 24 hours, or less (short term) and 12 feet or less in depth shall have a maximum allowable slope of ½:1.

APPENDIX E
SAMPLING AND ANALYSIS PLAN (SAP)
QUALITY ASSURANCE PROJECT PLAN (QAPP) WORKSHEETS

Not Used

APPENDIX F
FORMS

Electronic Copy Only
(A printed copy will be maintained onsite during fieldwork)

List of Forms

The following forms are included in this Appendix.

- 3-Phase Inspection Checklist – Intrusive Investigation
- 3-Phase Inspection Checklist – Pre-Operational Survey
- Air Purifying Respirator Facepiece Inspection Sheet
- ATF Form 5400.5, Report of Theft or Loss-Explosives Materials
- Common Operating Picture (COP)
- Container Form
- Container Log
- Critical Lift Plan
- DA Form 285, Technical Report of U.S. Army Ground Accident
- DA Form 2404, Equipment Inspection and Maintenance Worksheet
- DA Form 4755, Employee Report of Alleged Unsafe or Unhealthful Working Conditions
- DA Form 5513-R, Key Control Register and Inventory
- Daily Quality Control Report
- Daily Quality Control/Safety Report
- DD Form 1348-1A, Issue Release/Receipt Document
- DD Form 626, Motor Vehicle Inspection (Transporting Hazardous Materials)
- DD Form 1911, Materiel Courier Receipt
- ENG Form 3394, USACE Accident Investigation Report
- ENG Form 6048, USACE Munitions Response Quality Assurance Report (QAR) Form
- Explosives Transportation Vehicle Safety Checklist
- Explosives Usage Record
- Field Activity Daily Log
- General Demolition Electric Misfire Checklist
- Guard Instructions
- Hazardous Waste Profile Sheet
- Heavy Equipment Daily Inspection List
- Instrument Calibration Checklist
- Loss/Damage/Destruction Report
- Magazine Data Card
- MEC Disposal Checklist
- Nonconformance Report
- OSHA Form 300, Log of Work-Related Injuries and Illnesses
- OSHA Form 301, Injuries and Illnesses Incident Report
- Plan Acceptance Form, Site Safety and Health Plan
- Post-Exposure Evaluation and Followup
- Report and Investigation of Exposure Incident
- Respirator Fit Test Log
- Safety Meeting Attendance Log
- Site Visitors Log

MSFC-003-R-01 MEC/CWM Construction Footprint Clearance	**Contract No:** **Task Order No.**
Definable Feature of Work: Intrusive Investigation Location: Pine Bluff Arsenal, Arkansas	Inspection Date: Specification(s):Final MEC/CWM Const. Footprint Clearance Work Plan and Appendices

Requirements/Reference	Yes	No	N/A	Remarks
Preparatory Inspection				
1. Has the field team reviewed and understood the WP intrusive investigation requirements?				
2. MC sampling and analysis will be performed during the field activities with constructions support from the UXO group?				
3. Has MC field sampling team reviewed the SAP with the Field Team Lead(s)?				
4. Are MC sampling supplies on site and ready for use?				
5. Have the field team(s) identified all recording/documentation requirements and have specified field forms on hand?				
6. Is all MC sampling equipment on site and operable?				
7. Have field operations been planned and scheduled to be conducted by personnel divided into teams with each team assigned duties?				
8. Has a Command Post been developed for communication and field directive activities?				
9. Command Post Teams will consist of SUXOS, UXOSO, UXOQCS and a Field Data Coordinator?				
10. Has a Down Range Teams been developed for the intrusive work?				
11. The Down Range Teams are configured per the Work Plan?				
12. Are Air Monitoring Teams dedicated to intrusive field activities in high CWM probability areas?				
13. Has a Rescue Teams been developed with a minimum of two people with a dedicated vehicle assigned?				
14. Has a Personal Decontamination System Team been developed? (The PDS Team operates the PDS and is responsible for decontaminating potentially contaminated personnel and also for verifying that decontamination has been completed?				
15. Is the PDS be staffed by per CARA standard operating procedures?				

MSFC-003-R-01 MEC/CWM Construction Footprint Clearance			**Contract No:** **Task Order No.**	
Definable Feature of Work: Intrusive Investigation Location: Pine Bluff Arsenal, Arkansas			Inspection Date: Specification(s): Final MEC/CWM Const. Footprint Clearance Work Plan and Appendices	
Requirements/Reference	Yes	No	N/A	Remarks
16. Is the CARA Assessment/Package/Transport Team prepared for potential assessment and recovery of recovered CWM?				
17. Has USAESCH reviewed and approved qualification of UXO teams? (Non-UXO qualified personnel will not perform any excavation nor handle MEC)				
18. Certifications for all project personnel completing OSHA 40-hour training course for hazardous waste site workers as required by specific task have been verified?				
19. All workers have undergone Pre-Op Surveys/exercises and received other site specific training specified in the RI WP?				
20. A medical surveillance program has been conducted on each member of the field personnel, with the most recent exam for each member having occurred within the last 12 months?				
21. All UXO personnel have met the requirements set forth in DDESB TP 18, Minimum Qualifications for Unexploded Ordnance Technicians and Personnel?				
22. Team members are familiar with the schedule of daily operations, which governs all activities necessary to complete the intrusive excavation, is presented in the RI WP?				
23. Team members are aware the investigations for DGM anomalies are scheduled to be conducted with UXO teams configured per the WP?				
24. Team members are aware that excavation will initially be to the side of the anomaly using hand tools. A visual and electronic search of the excavation will then be made. This process will be repeated until the audible signal from the analog metal detector indicates the object is close to the surface of the excavation?				
25. Upon determination of the anomalies, additional soils are to be removed to further locate the anomalies?				

MSFC-003-R-01 MEC/CWM Construction Footprint Clearance	**Contract No:** **Task Order No.**
Definable Feature of Work: Intrusive Investigation Location: Pine Bluff Arsenal, Arkansas	Inspection Date: Specification(s): Final MEC/CWM Const. Footprint Clearance Work Plan and Appendices

Requirements/Reference	Yes	No	N/A	Remarks
26. Team is aware if subsurface contact proves to be MDAS or other metallic material, visible metal will be removed from the excavation and rechecked with a Schonstedt magnetometer by the UXO Sweep Team?				
27. Team is aware the vicinity around the excavation will be checked to ensure other anomalies were not masked by the recovered item of subsurface contacts?				
28. Team is aware once intrusive investigation (including MC sampling where applicable), the hole will be backfilled using native material from the hole. No MEC/MD will be replaced back into the hole?				

QA/QC Specialist Signature _____ Date: _____

Identification of Participating Organizations

USACE Representative _____

SUXOS/UXOQCS, Field Team Lead _____

CARA Personnel _____

Construction Contractor personnel

RSA Personnel

NASA personnel

MSFC-003-R-01 MEC/CWM Construction Footprint Clearance	**Contract No:** **Task Order No.**
Definable Feature of Work: Intrusive Investigation Location: Pine Bluff Arsenal, Arkansas	Inspection Date: Specification(s): Final MEC/CWM Const. Footprint Clearance/Work Plan and Appendices

Requirements/Reference	Yes	No	N/A	Remarks
Initial Inspection or Follow-up Inspection (Circle Applicable Type)				
1. Has the field team reviewed and understood the RI WP intrusive investigation requirements?				
2. MC sampling and analysis will be performed during the RI activities with constructions support from the UXO group?				
3. Has MC field sampling team reviewed the SAP with the Field Team Lead(s)?				
4. Are MC sampling supplies on site and ready for use?				
5. Have the field team(s) identified all recording/documentation requirements and have specified field forms on hand?				
6. Is all MC sampling equipment on site and operable?				
7. Have field operations been planned and scheduled to be conducted by personnel divided into teams with each team assigned duties?				
8. Has a Command Post been developed for communication and field directive activities?				
9. Command Post Teams will consist of SUXOS, UXOSO, UXOQCS and a Field Data Coordinator?				
10. Has a Down Range Teams been developed for the intrusive work?				
11. The Down Range Teams are configured per the RI Work Plan?				
12. Is ECBC Air Monitoring Teams dedicated to intrusive field activities in high CWM probability areas?				
13. Has a Rescue Teams been developed with a minimum of two people with a dedicated vehicle assigned?				
14. Has a Personal Decontamination System Team been developed? (The PDS Team operates the PDS and is responsible for decontaminating potentially contaminated personnel and also for verifying that decontamination has been completed?				
15. Is the PDS be staffed by per CARA standard operating procedures?				

MSFC-003-R-01 MEC/CWM Construction Footprint Clearance			**Contract No:** **Task Order No.**	
Definable Feature of Work: Intrusive Investigation Location: Pine Bluff Arsenal, Arkansas			Inspection Date: Specification(s): Final MEC/CWM Const. Footprint Clearance Work Plan and Appendices	
Requirements/Reference	Yes	No	N/A	Remarks
Initial Inspection or Follow-up Inspection (Circle Applicable Type)				
16. Is the CARA Assessment/Package/Transport Team prepared for potential assessment and recovery of recovered CWM?				
17. Has USAESCH reviewed and approved qualification of UXO teams? (Non-UXO qualified personnel will not perform any excavation nor handle MEC)				
18. Certifications for all project personnel completing OSHA 40-hour training course for hazardous waste site workers as required by specific task have been verified?				
19. All workers have undergone Pre-Op Surveys/exercises and received other site specific training specified in the RI WP?				
20. A medical surveillance program has been conducted on each member of the field personnel, with the most recent exam for each member having occurred within the last 12 months?				
21. All UXO personnel have met the requirements set forth in DDESB TP 18, Minimum Qualifications for Unexploded Ordnance Technicians and Personnel?				
22. Team members are familiar with the schedule of daily operations, which governs all activities necessary to complete the intrusive excavation, is presented in Table 3-6 of the RI WP?				
23. Team members are aware the investigations for DGM anomalies are scheduled to be conducted with UXO teams configured per the RI WP?				
24. Team members are aware that excavation will initially be to the side of the anomaly using hand tools. A visual and electronic search of the excavation will then be made. This process will be repeated until the audible signal from the analog metal detector indicates the object is close to the surface of the excavation?				
25. Upon determination of the anomalies,				

MSFC-003-R-01 MEC/CWM Construction Footprint Clearance			**Contract No:** **Task Order No.**	
Definable Feature of Work: Intrusive Investigation Location: Pine Bluff Arsenal, Arkansas			Inspection Date: Specification(s): Final MEC/CWM Const. Footprint Clearance Work Plan and Appendices	
Requirements/Reference	Yes	No	N/A	Remarks
Initial Inspection or Follow-up Inspection (Circle Applicable Type)				
additional soils are to be removed to further locate the anomalies?				
26. Team is aware if subsurface contact proves to be MDAS or other metallic material, visible metal will be removed from the excavation and rechecked with a Schonstedt magnetometer by the UXO Sweep Team?				
27. Team is aware the vicinity around the excavation will be checked to ensure other anomalies were not masked by the recovered item of subsurface contacts?				
28. Team is aware once intrusive investigation (including MC sampling where applicable), the hole will be backfilled using native material from the hole. No MEC/MD will be replaced back into the hole?				

QA/QC Specialist Signature _____ Date: _____

Identification of Participating Organizations

USACE Representative _____

SUXOS/UXOQCS, Field Team Lead _____

PBA Personnel _____

MSFC-003-R-01 MEC/CWM Construction Footprint Clearance	**Contract No:** **Task Order No. 0**
Definable Feature of Work: Pre Operational Surveys/Exercises Location: Redstone Arsenal, Alabama	Inspection Date: Specification(s): Final MEC/CWM Const. Footprint Clearance Work Plan and Appendices

Requirements/Reference	Yes	No	N/A	Remarks
Preparatory Inspection				
1. A detailed plan with the activities necessary to mobilize personnel and equipment for site work, as well as those activities necessary to shut down the site at the conclusion of the field work have been developed and approved?				
2. A notice-to proceed (NTP) has been received from the USAESCH contracting office?				
3. An approved Work Plan, Standard Operating Procedures, and Historical Records Review have been reviewed prior to mobilization and documents are readily available onsite?				
4. A Command Post (CP) has been established which consist of an office facility and equipment storage facility?				
5. Equipment and materials necessary have been identified and mobilization established? Section 3.3.3 of WP notes equipment previously identified				
6. Training and Briefing are conducted prior to field activities, on daily basis and upon new developments occur?				
7. A form of communication has been established and checked prior to field activities?				
8. Support and work zones have been established; work zones have been prepared with clearing of brush and debris?				
9. For intrusive investigations, anomalies identified from the geophysical data interpretation have been reacquired in phases so as to optimize conduct of the intrusive phase of work?				
10. Pre-operational surveys (both USAESCH and Department of the Army) and Tabletop Exercises have been conducted upon mobilizing and setup of the site facility? (Before any field operations is performed)				
11. USAESCH has prepared a Pre-operational Survey Plan, assembled the				

MSFC-003-R-01 MEC/CWM Construction Footprint Clearance	**Contract No:** **Task Order No.**
Definable Feature of Work: Pre Operational Surveys/Exercises Location: Redstone Arsenal, Alabama	Inspection Date: Specification(s): Final MEC/CWM Const. Footprint Clearance Work Plan and Appendices

Requirements/Reference	Yes	No	N/A	Remarks
Pre-operational survey team, and conduct the MACOM pre-operational survey for the startup of chemical operations/CWM intrusive operations?				
12. Local emergency responders and stakeholders have been invited to the Tabletop Exercises?				
13. Senior-level Shaw personnel from management and health and safety are scheduled to provide oversight of the pre-operational surveys and exercises?				
14. All personnel who should be involved in the operation including medical, MINICAM operators, security, etc. are scheduled?				
15. An internal full blown exercise was conducted within Shaw prior to the actual pre-operational exercise?				
16. Early planning with all key players inside and outside of Shaw has been performed? (Security, hospitals, medical teams, any internal parties; who could directly be involved in actual accident…)				
17. Pre-planning have been established for personnel and rental equipment, unless otherwise needed for the demobilization effort, will be demobilized as early as possible upon completion of use for its intended purpose?				
18. The Command Post and Waste Storage Area are scheduled to be dismantled only after all investigation derived waste (IDW) has been transported off-site?				

QC Representative Signature _____ Date: _____

Identification of Participating Organizations

USACE Representative _____

CARA _____

Construction Contractor _____

MSFC-003-R-01 MEC/CWM Construction Footprint Clearance	**Contract No:** **Task Order No.**
Definable Feature of Work: Pre Operational Surveys/Exercises Location: Redstone Arsenal, Alabama	Inspection Date: Specification(s): Final MEC/CWM Const. Footprint Clearance Work Plan and Appendices

Requirements/Reference	Yes	No	N/A	Remarks
Initial Inspection or Follow-up Inspection (Circle Applicable Type)				
1. Mobilization and Demobilization plan outline is utilized?				
2. Not-to-Proceed documentation is readily available for review?				
3. A Command Post with electrical and phone services as primary location for training and equipment storage?				
4. Equipment and materials necessary to perform work have been obtained; readily available for field personnel?				
5. Daily briefings are conducted with discussion of weather conditions, the previous day's findings (if related to safety issues), emergency response and evacuation procedures, and a review of the general procedures to deal with MEC, if encountered?				
6. Communication equipments are available; continuously checked at each safety briefing and throughout field activities?				
7. Support and work zones are maintained throughout field activities; affected areas are cleared of brush and debris?				
8. Pre-operational Surveys and Tabletop exercises have been performed and documented?				

MSFC-003-R-01 MEC/CWM Construction Footprint Clearance	**Contract No:** **Task Order No.**
Definable Feature of Work: Pre Operational Surveys/Exercises Location: Redstone Arsenal, Alabama	Inspection Date: Specification(s): Final MEC/ CWM Const. Footprint Clearance Work Plan and Appendices

Requirements/Reference	Yes	No	N/A	Remarks
9. Site restoration is being coordinated through PBA and USAESCH?				
10. Personnel and equipment are demobilized as early as possible upon completion of use for its intended purpose?				
11. Command Post and Waste Storage Area are dismantled only after all investigation derived waste (IDW) is transported off-site?				

QC Representative Signature _____ Date: _____

Identification of Participating Organizations

USACE Representative _____

CARA _____

Construction Contractor _____

AIR PURIFYING RESPIRATOR
FACEPIECE INSPECTION SHEET

Device:_____ ID#:_____

Date Inspected:_____ Inspected by: _____

CHECKLIST

Facepiece: _____ O-rings:_____

Head harness:_____ Lens: _____

Exhalation valve:_____ Antifogging Agent Application on lenses: _____

Inhalation valve:_____ Speaking diaphragm:_____

Remarks: _____

_____

_____

_____

_____

_____

_____

OMB No. 1140-0026 (09/30/2016)

U.S. Department of Justice
Bureau of Alcohol, Tobacco, Firearms and Explosives

Report of Theft or Loss-Explosive Materials

For ATF Use Only

Date Received	Date E-Mailed to JSOC & Field Division	BATS ID
		Case Number

To Be Completed By Person Making Report

Upon discovery of any theft or loss of any of your explosive materials:
- First, contact ATF toll free at 1-800-461-8841 between 8:00 a.m. - 5:00 p.m. EST or after hours and weekends contact ATF at 1-800-800-3855 to report the theft or loss;
- Second, contact your local law enforcement office to report the theft or loss to obtain a police report; and
- Third, complete this form and attach any additional reports, sheets or invoices necessary to provide the required information, and fax the form with additional material(s) to the ATF U.S. Bomb Data Center (USBDC) at 866-927-4570 or email to USBDC@atf.gov.

1. Date	2. Type of Report *(Check one)*: ☐ Theft ☐ Loss ☐ Attempted Theft/Suspicious Activity ☐ Supplement
3. Full Name of Person Making the Report *(Last, First, Middle)*	4a. Licensee or Permittee Name
4b. Federal Explosives License or Permit Number	
5a. Office Address *(Street Address, City, State, and Zip Code)*	5b. Telephone Number 5c. E-mail Address
6. Actual Location of Theft or Loss *(If different from item 5a)*	

7. Theft or Loss	Date	Time	8. Name of Local Law Enforcement Officer to Whom Reported
a. Discovered			9. Name and Address of Local Authority to Whom Reported
b. When Was the Magazine Last Checked			
c. Occurred *(Show approximate if exact not known)*			
d. Reported to ATF by Telephone			10. Telephone Number
e. Reported to Local Authorities			11. Police Report Number

12. Explosive Materials Lost or Stolen *(Attach invoices or additional sheets, if necessary)*

a. Manufacturer and/or Importer	b. Brand Name	c. Date Shift Code	d. Size *(Length & Diameter)*	e. Quantity *(Pounds of Explosives, Number of Dets)*	f. Type and Description *(Dynamite, Blasting Agents, Detonators, etc. Include for each type, size, MS delay or length of legwire, as applicable)*

13. Theft or Loss Occurred from *(Check applicable box on each row)*

a. Magazine Type:

☐ 1 ☐ 2 ☐ 2 Det. Box ☐ 3 Day Box ☐ 4 ☐ 5

☐ Outdoor ☐ Indoor

☐ Permanent ☐ Portable ☐ Mobile Truck ☐ Mobile Trailer

☐ Overnight Storage ☐ Day Storage

b. Types of Locks *(Check all that apply)*:

☐ Padlock ☐ Mortise ☐ 3-Point ☐ Puck Lock ☐ Other *(Explain)* _____

c. Location Description/Type:

☐ Licensed/Permitted Premises ☐ Remote Storage ☐ Work Site ☐ In Transit ☐ During Operations

14. Method of Entry:

☐ Door Was a Key Used? ☐ Yes ☐ No Suspected Employee-Involved Theft? ☐ Yes ☐ No

☐ Wall(s) ☐ Roof ☐ Floor/Bottom

Lock(s) Defeated? *(If yes, check additional appropriate boxes)* ☐ Yes ☐ No

☐ Lock Shackle Cut *(How?)* _____ ☐ Lock Pried, Twisted or Levered

☐ Lock Left Unlocked ☐ Lock Picked or Shimmed

☐ Keyway Drilled Out ☐ Lock Body Drilled Out or Cut

☐ Other *(Explain)* _____

Manufacturer and Model of Lock:	Location of Magazine Keys: ☐ Office ☐ Employee ☐ Other *(Address)* _____	Are All Keys Accounted For? ☐ Yes ☐ No

15. Hood Defeated? *(If yes, check all applicable)* ☐ Yes ☐ No

☐ Hood Cut ☐ Hood Removed

☐ Other *(Explain)* _____ ☐ Hood Broken

Hood Width *(Inches)* _____ Hood Length (Inches) _____

Hood Depth *(Inches)* _____ Hood Thickness (Inches) _____

16. Circumstances Pertaining to the Theft, Loss or Suspicious Activity *(Any details you can provide)*

16a. Was Theft or Loss Disclosed During an ATF Inspection or Being Reported as a Result of Inspection? ☐ Yes ☐ No

16b. Additional Security Measures in Place?

☐ Alarm ☐ Security System/Service ☐ Fencing ☐ Lighting ☐ Other *(Explain)* _____

17. Signature and Title of Person Making Report	18. Date

Reporting Instructions

Email or fax this completed form to the ATF address listed below or call if no fax is available:

Bureau of Alcohol, Tobacco, Firearms and Explosives
U.S. Bomb Data Center
99 New York Ave., N.E. 8.S-295
Washington, DC 20226
Toll Free Fax: 1-866-927-4570
Email Address: USBDC@atf.gov

Questions regarding the completion of this form should be referred to the U.S. Bomb Data Center toll free at 1-800-461-8841.

Privacy Act Information

The following information is provided pursuant to section 3 of the Privacy Act of 1974 (5 U.S.C. § 522a(e)(3).

1. **Authority.** Solicitation of this information is made pursuant to Title XI of the Organized Crime Control Act of 1970 (18 U.S.C. Chapter 40). Disclosure of a theft or loss of explosive materials is mandatory pursuant to 18 U.S.C. § 842(k) for any person who has knowledge of such theft or loss from his stock.

2. **Purpose.** The purpose for the collection of this information is to give ATF notice of the theft or loss of explosive materials, and to furnish ATF with the pertinent facts surrounding such theft or loss. In addition, the information is used to confirm and verify prior notification of this theft or loss of explosive materials.

3. **Routine Uses.** The information will be used by ATF to aid in the administration of laws within its jurisdiction concerning the regulation of explosive materials and other related areas. In addition, the information may be disclosed to other Federal, State, foreign, and local law enforcement of laws within their jurisdiction. System of records notice Justice/ATF-008 Regulatory Enforcement Record System FR Vol.68 No.16 Page 3558 dated January 24, 2003.

4. **Effects of not supplying information requested.** 18 U.S.C. § 842(k) makes it unlawful for any person, who has knowledge of the theft or loss of explosive materials from his stock, to fail to report such theft or loss within twenty-four hours of discovery thereof, to the Secretary and to appropriate local authorities. The penalty for violation of this section is a fine of not more than $1,000 or imprisonment for not more than one year, or both. 18 U.S.C. § 844(b).

Paperwork Reduction Act Notice

This request in accordance with the Paperwork Reduction Act of 1995. The purpose of this information collection is to report the theft or loss of explosive materials. The information is used for investigative purposes by ATF officials. This information is mandatory by statute. (18 U.S.C. § 842)

The estimated average burden associated with this collection of information is 1 hour and 48 minutes per respondent or recordkeeper, depending on individual circumstances. Comments concerning the accuracy of this burden estimate and suggestions for reducing this burden should be addressed to Reports Management Officer, Document Services, Bureau of Alcohol, Tobacco, Firearms and Explosives, Washington, DC 20226.

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Hazardous Waste – D003 – Explosive Waste Profile Sheet

Section 1. Generator & General Waste Stream Information

1a. Generator Command & Office Symbol:

1b. Name of Waste Stream:

1c. Generating Process:

1d. General classification of waste stream:

(☐) - Unfired Munitions or (☐) - Unfired Component	(☐) - Expended Munitions or (☐) - Expended Component	(☐) - Explosive Contaminated Solid	(☐) - Explosive Contaminated Solvent
NSN/MCN:	NSN/MCN:	NSN/MCN:	NSN/MCN:
MIDAS FG:	MIDAS FG:		

Generation Quantity & Rate Info.	**Average / Estimated NEW:**
	Hazard Class Division (HCD): **Storage Compatibility Group (SCG):**

Section 2. Detailed Waste Stream Description:

2a. Does the waste stream exhibit the EPA hazardous waste characteristic of reactivity (D003) due to explosivity? **Yes – (☐), No – (☐)**

(☐) Ease of detonation or explosive reaction when exposed to pressure or heat;
(☐) Ease of detonation or explosive decomposition or reaction at standard temperature and pressure; or,
(☐) Defined as a forbidden explosive by the Department of Transportation)

2b. What is the basis for this determination?

(☐) Generator Knowledge – general knowledge of process and chemicals used (MSDS, Government spec. etc.)
(☐) Generator Knowledge – based on DOD documents (such as AEC spent munitions characterizations, MIDAS, etc.), specify source:

(☐) Analytical data on specific waste stream (attach copy):

2c. In addition to explosivity, does the waste stream exhibit reactivity (D003) due to some other reaction? **Yes – (☐), No – (☐)**

(☐) Formation of potentially explosive mixtures when mixed with water;
(☐) It is normally unstable and readily undergoes violent change without detonating;
(☐) Violent reactions when mixed with water;
(☐) Generation of toxic fumes in quantities sufficient to present a danger to human health or the environment when mixed with water;
(☐) Cyanide or sulfide waste which generate toxic fumes when exposed to acidic conditions;

2d. Does the Waste Steam exhibit any other EPA characteristic waste codes? Yes (☐), No (☐)

(☐) - D001 – Ignitable (F.P.= _____) or (☐) - D002 – Corrosive (pH <2____) or (☐) - other (D004 – D043) **See below**

(☐) - D004 – D011 – Metals – list all:	(☐) - D012 – D043 – Pesticides, VOCs, SVOCs – list all:

2e. Does Waste Steam exhibit Listed (F, K, P, U) hazardous waste codes? Yes – (☐), No – (☐)

(☐) - F001 – F005 Solvents or (☐) - other F**xxx** codes – list all:	(☐) - K Listed codes, list all:
(☐) - P Listed codes, list all:	(☐) - U Listed codes, list all:

Section 3. Generator Certification:

I hereby certify that all information submitted in this and all attached documents is to the best of my knowledge an accurate representation of the waste turned in to the ASP and that all known or suspected hazards and associated EPA waste codes have been disclosed.

Printed Name: **Signature:** **Title:** **Date:**

Section 4. OBOD Waste Acceptance Determination:

I hereby certify that I have reviewed this D003 HW profile sheet and all attached documents and have compared this profile sheet with the acceptance criteria established in the RCRA Subpart X permit. Based on this review this waste stream is:

(☐) **Approved /** (☐) **- Disapproved for acceptance** and **treatment via:** (☐) **- OB / Open Burning or** (☐) **OD / Open Detonation** at the RSA.

Printed Name: **Signature:** **Date:**

Profile No. **Expiration Date:** **HAZMAT -** ☐ **DOT Class:**

Common Operating Picture (COP)

SITE:

CP CELL PHONE(s): **DATE:**

USACE SAFETY SPECIALIST(s):

WEATHER:

PERSONNEL ON SITE:

OTHER PERSONNEL ONSITE:

OPERATIONAL DETAILS:

Briefly summarize activities planned for the day.

NOTES:

WORK ZONES:

Provide a figure depicting the work zones for the day.

*Project sensitive information. Should will not be released outside Army channels without prior approval.

Container Form

U.S. Army Garrison - Redstone

Container: _____

Date Generated: _____

Which set of drums: _____
(if applicable)

Container Type (circle):

- Steel Open Top
- Steel Closed Top
- Polyethylene
- Other: (describe) _____

Waste Type (circle):

- Soil
- Decon Water
- Scrap
- PPE

Size: _____

Estimated Weight: _____

Source of container contents, location, and depth:

_____

_____

_____

_____

Sample identifiers:

_____

_____

_____

_____

Comments:

_____

_____

_____

_____

Container Log

Container Number	Container Size/Type	Waste Type	Estimated Weight	Date Generated	Associated w/ Sample No(s).	Trailer Number	Manifest Number	Date Shipped	Disposal Site	Waste Approval Code
:										

Critical Lift Plan

Site _____ **Date** _____

Make and Model of Crane:	Size of Load: (LxWxH or LXD) ____ units
Weight of Load:	Weight of rigging components:
Total Weight:	
Manufacturer's Load Limits as specified in load charts:	

Geometry of the Lifting Procedure

Crane Position During Lift:	Height of Lift:
Load Radius During Lift:	Boom Length and Angle During Lift:
Name of Crane Operator:	
Qualifications:	
Name of Rigger:	
Qualifications:	
Name of Lift Supervisor (operator or rigger can qualify):	
Qualifications:	
Please provide a sketch of the lifting points involved in this operation.	

Describe the rigging procedures and hardware requirements for this lifting operation.
Describe the ground conditions, outrigger or crawler track requirements. (If applicable, include design of mats necessary to achieve a level and stable foundation to bear the capacity of the lift)
For floating cranes or derricks, describe the operating base (platform) conditions and any potential list (tilt).
Are there any adverse weather conditions apparent or forecasted within the timeframe of the operation? (high winds, poor visibility, lightning, etc.) Under what conditions will operations be stopped?, Please list these limiting conditions.
Are all involved personnel involved in the lifting operations familiar with hand signaling/communication procedures that may be needed during the lifting operations?

Are there any known mechanical or safety problems with this crane? If so, please explain them and how they will effect this lifting operation.
Does this Crane have a current and up-to-date maintenance log?
Is the crane equipped with a fire extinguisher meeting the minimum 10-B:C requirement?

All Cranes used on the Withlacoochee RI/FS Project will meet the requirements of the USACE Safety and Health Requirements Manual.

All Personnel involved in this critical lifting operation must sign and date below:	
Signature	Date

TECHNICAL REPORT OF U.S. ARMY GROUND ACCIDENT

For use of this form, see DA Pamphlet 385-40; the proponent agency is OCSA.

FOR USACRC USE ONLY

REQUIREMENTS CONTROL SYMBOL
CSOCS-308

SECTION A - ACCIDENT INFORMATION

1. CHECK ONE
☐ a. ORIGINAL
☐ b. CHANGE

2. UIC *(Unit Identification Code) (6-Digit Code of Unit Having Accident)*

3a. UNIT NAME AND MILITARY ADDRESS *(Accountable Unit)*

3b. BRANCH *(Armor, Infantry, etc.)*

4. DATE OF ACCIDENT
a. YEAR | b. MONTH | c. DAY

5. TIME OF ACCIDENT *(Local Military Time)*

6. PERIOD OF DAY *(Check one)*
☐ a. Dawn ☐ b. Day
☐ c. Dusk ☐ d. Night

7. ACCIDENT OCCURRED *(Check one)*
☐ a. On Post
☐ b. Off Post

8. IF ON POST, NAME OF INSTALLATION/FACILITY

9. ACCIDENT OCCURRED DURING *(Check one)*
☐ a. Combat
☐ b. Non-Combat

10. WERE EXPLOSIVES OR AMMUNITION INVOLVED *(Causal or Contributing Role)*
☐ Yes *(See DA PAM 385-40)*
☐ No

11a. EXACT LOCATION OF ACCIDENT *(Detailed enough to locate site)*

11b. TYPE OF LOCATION

11c. GRID COORDINATES OR LAT/LONG

SECTION B - PERSONNEL INFORMATION

12. NAME *(Last, First, MI)*

13. SOCIAL SECURITY NUMBER *(SSN)*

14. DOB *(YYYYMMDD)*

15. GENDER *(Check)*
☐ a. Male
☐ b. Female

16. RANK OR GRADE

17. MOS OR JOB SERIES

18a. ADDRESS *(Use Official Address for All Military or Government Personnel) (If different than Block 3, add UIC.)*

18b. For injured Army Civilians or Contractors, enter home address

19a. DUTY STATUS AT TIME OF ACCIDENT *(Check one)*
☐ On Duty
☐ Off Duty

19b. IF OFF DUTY *(if on leave/pass)*
☐ Leave ☐ Pass
Date From:
Date To:

20. FLIGHT STATUS *(Check one)* ☐ a. Yes ☐ b. No

21a. TIME BEGAN WORK:

21b. CONTINUOUS WORK w/o SLEEP:

22. HRS. SLEEP IN LAST 24:

23. DAYS LOST/RESTRICTED *(not counting day of injury)*
a. Hospitalized: ____ Days
b. Not Hospitalized: ____ Days
c. Restricted Activity: ____ Days

24. TREATED IN EMERGENCY ROOM
☐ a. Yes
☐ b. No

25a. OSHA 300 Log Case Number:

25b. Name of Physician/Health Care Provider:

25c. If treatment was given away from worksite, where was it given?
Facility:
Street:
City: State:

26. SEVERITY OF ILLNESS/INJURY *(Check most severe)*

- ☐ a. **Fatal** *(Date of Death ____)*
- ☐ b. **Permanent Total Disability.** Person can never again do gainful work.
- ☐ c. **Permanent Partial Disability.** Person loses or can never again use a body part
- ☐ d. **Days Away from Work.** Person misses one or more workdays; bed rest/on quarters.
- ☐ e. **Restricted Work Activity.** Person is temporarily unable to perform regular duties; job transfer/light duty/profile.
- ☐ f. **Medical Treatment Beyond First Aid.** Loss of consciousness, needle stick, etc.
- ☐ g. **First Aid Only.** Person has one-time treatment of minor injury. *(No lost work days.)*
- ☐ h. **No Injury.**

27. CLASSIFICATION AT TIME OF ACCIDENT *(Check)*

- ☐ a. Active Army
- ☐ b. Army Civilian
- ☐ c. Army Contractor
- ☐ d. Army Direct Contractor
- ☐ e. Nonappropriated Fund *(NAF)*
- ☐ f. Other U.S. Military
- ☐ g. ROTC
- ☐ h. Dependent
- ☐ i. NGB Tech
- ☐ j. NGB IDT
- ☐ k. NGB AT
- ☐ l. NGB ADSW
- ☐ m. NGB AGR
- ☐ n. NGB ADT
- ☐ o. NG Activated
- ☐ p. USAR IDT
- ☐ q. USAR AT
- ☐ r. USAR ADT
- ☐ s. USAR FTM
- ☐ t. USAR AGR
- ☐ u. USAR Activated
- ☐ v. Foreign Nat. Direct Hire
- ☐ w. Foreign Nat. Indirect Hire
- ☐ x. Foreign Nat. KATUSA
- ☐ y. Foreign Mil. Attached to the U.S. Army
- ☐ z. Public
- ☐ aa. Not reported

28. CAUSE OF INJURY/OCCUPATIONAL ILLNESS *(Number in order of severity) (No more than 3)*

- a. Struck Against
- b. Struck By
- c. Fell from Elevation
- d. Fell from Same Level
- e. Caught In/ Under/ Between
- f. Rubbed/Abraded
- g. Bodily Reaction
- h. Overexertion
- i. Exposure
- j. External Contact
- k. Ingested
- l. Inhaled

29. BODY PART(S) AFFECTED *(Number in order of severity) (No more than 3)*

- a. Body *(General)*
- b. Head
- c. Forehead
- d. Eyes
- e. Nose
- f. Jaw
- g. Neck
- h. Trunk
- i. Chest
- j. Heart
- k. Back
- l. Shoulder
- m. Arm
- n. Wrist
- o. Hand
- p. Fingers
- q. Leg
- r. Knee
- s. Ankle
- t. Foot
- u. Toes
- v. Other *(Specify)*

30. TYPE OF INJURY/ILLNESS *(Number to Correspond with Block 29)*

- a. Burns *(Chemical)*
- b. Burns *(Thermal)*
- c. Amputation
- d. Decompression Sickness
- e. Asphyxiation *(Suffocation)*
- f. Fractures
- g. Dislocation
- h. Abrasions
- i. Concussion
- j. Sprain/Strain
- k. Cuts/Lacerations
- l. Contusion
- m. Puncture Wound
- n. Hernia, Rupture
- o. Frostbite
- p. Heat Stroke
- q. Heat Exhaustion
- r. Noise Injury/Illness
- s. Needle Stick or Sharp
- t. Loss of Consciousness
- u. Other *(Specify)*

SECTION B - PERSONNEL INFORMATION *(Continued)*

41. If drug use by this individual caused/contributed to this accident, check appropriate block.

☐ a. Prescription ☐ b. Illegal ☐ c. Over-the-counter ☐ d. Supplements ☐ e. None

42. Were vision enhancement devices being used? *(Check appropriate block.)*

☐ a. Yes *(Specify type/model in c and d.)* ☐ b. No c. TYPE: _____ d. MODEL: _____

43. Standard/Reference covering activity/task

☐	a. Soldier's Manual *(Task No.)* _____	☐	e. Federal/State Law
☐	b. CTT *(Task No.)* _____	☐	f. Other *(Specify):* _____
☐	c. AR/TM/FM *(Specify)* _____	☐	g. None *(Go to Block 45.)*
☐	d. SOP		

44. WAS ACTIVITY/TASK PERFORMED IAW STANDARD/REFERENCE? *(Check one)*

☐ a. Yes ☐ b. No *(If NO, complete blocks 45-47.)*

45. DID INDIVIDUAL MAKE A MISTAKE? *(Check one)*

☐ a. Yes *(If YES, complete blocks 46-47.)* ☐ b. No

46. What was the mistake? How was the activity/task performed incorrectly? *(Explain below.)*

47. Why was mistake made/activity performed incorrectly? *(Check all that apply.)*

☐	a. Inadequate school training *(content/amount)*	☐	g. Poor/bad attitude/indiscipline	☐	m. Inadequate written procedures *(AR, TM, SOP)*
☐	b. Inadequate unit training *(content/amount)*	☐	h. Lack of rest/sleep	☐	n. Improper supervision
☐	c. Inadequate on-the-job training	☐	i. Effects of alcohol/drugs/illness	☐	o. Other *(Specify in narrative)*
☐	d. Fear/excitement/anger	☐	j. Inadequate facilities		
☐	e. Overconfident in own/others abilities/complacent	☐	k. Inadequate services		
☐	f. In a hurry	☐	l. Improper equipment design		

48. Time licensed on this vehicle *(Check one)*

☐ a. Less than one year
☐ b. One to two years
☐ c. Over two years
☐ d. Unlicensed

49. Total AMV driving mileage *(Check one)*

☐ a. Less than 1,000 miles
☐ b. 1,000 - 5,000 miles
☐ c. 5,000 - 10,000 miles
☐ d. Over 10,000 miles

50a. Total time in unit *(Check one)*

☐ Less than 6 months
☐ 6 months - 1 year
☐ Over one year

50b. Date Assigned/Hired *(YYYYMMDD)*

50c. Date of redeployment from combat zone, if applicable *(YYYYMMDD)*

51. WHICH ITEM FROM SECTION C APPLIES TO THE INDIVIDUAL NAMED IN BLOCK 12?
(This is needed in order to relate the person in Block 12 to the equipment/vehicle below.)

☐ Item A ☐ Item B ☐ Item C ☐ Other *(Specify)* _____

SECTION C - PROPERTY/MATERIEL INVOLVED *(Whether Damaged or Not)*

	ITEM A	ITEM B	ITEM C
52. Type of item			
53a. Model number			
b. Serial number			
54. Ownership *(DoD, DA, POV, Unit Person)*			
55. Dollar cost of damage.			
56. Rollover protection system installed?	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No ☐ NA
57. Was this item being towed?	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No ☐ NA
58. If towed, enter letter for item doing towing.			
59. Types of collision codes *(Pick up to three from list below and enter in blocks.) (In sequence)*			

Types of Collisions

1- Going forward and collided with moving vehicle
2- Going forward and collided with parked vehicle
3- Collision while backing
4- Collision with pedestrian
5- Collision with object (other than vehicle/pedestrian)
6- Overturned
7- Ran off the road
8- Jackknifed
9- Going forward and rear-ended moving vehicle
10- Going forward and rear-ended parked vehicle
11- Collision while turning
12- Other *(Specify)*

SECTION F - CORRECTIVE ACTION AND COMMAND REVIEW

65. The investigation board will formulate the findings and recommendations on letter sized paper in accordance with the examples contained in DA PAM 385-40, paragraph 4-3.

66a. PRINTED/TYPED NAME OF COMMANDER		66b. RANK
66c. SIGNATURE	66d. DATE OF SIGNATURE *(YYYYMMDD)*	66e. TELEPHONE NO. 66f. EMAIL ADDRESS

	a. TYPED NAME/EMAIL ADDRESS	b. SIGNATURE	c. TITLE	d. RANK/DATE
67.				
68.				
69.				

SECTION G - SAFETY OFFICE USE ONLY

70. LOCAL REPORT NO.	71. ARMY HEADQUARTERS

72. ACCIDENT TYPE *(Check choice)*

☐	a. Army Motor Vehicle	☐	h. Other Army Vehicle	☐	o. Personal Injury - Other
☐	b. Army Combat Vehicle	☐	i. Fire	☐	p. Property Damage - Other
☐	c. Army Operated Vehicle	☐	j. Chemical Agent	☐	q. POV - On Official Business
☐	d. POV - Not on Official Business	☐	k. Explosive	☐	r. Space
☐	e. Marine Diving	☐	l. Missile	☐	s. Commercial Carrier/Transportation
☐	f. Marine Underway	☐	m. Radiation		
☐	g. Marine Not Underway	☐	n. Nuclear		

73. NAME OF SAFETY POINT OF CONTACT *(POC)*	74a. PHONE NO. OF SAFETY OFFICER POC *(DSN, Commercial, etc.)* 74b. EMAIL ADDRESS	75. DATE REPORT COMPLETED BY SAFETY OFFICER *(YYYYMMDD)*

SECTION H - EXPLOSIVES/AMMUNITION

76. EXPLOSIVE/AMMUNITION INFORMATION:	ITEM 1	ITEM 2	ITEM 3	ITEM 4
a. LOT #				
b. QUANTITY				
c. NET EXPLOSIVE WEIGHT (NEW)				
d. DoDIC/DoDAC				

77. SPECIAL INTEREST

78. SUPPLEMENTAL INFORMATION

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see DA PAM 750-8; the proponent agency is DCS, G-4.

1. ORGANIZATION					2. NOMENCLATURE AND MODEL	
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION

7. APPLICABLE REFERENCE			
TM NUMBER	TM DATE	TM NUMBER	TM DATE

COLUMN a – Enter TM item number.

COLUMN b – Enter the applicable condition status symbol.

COLUMN c – Enter deficiencies and shortcomings.

COLUMN d – Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e – Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X" – Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X" – Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed locally, until corrective action can be accomplished.

HORIZONTAL DASH "(-)" – Indicates that a required inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)" – Indicates a material defect other than a deficiency which must be corrected to increase efficiency or to make the item completely serviceable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL - Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT - Status symbols will be recorded in red.

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE *(Person(s) performing inspection)*	8b. TIME	9a. SIGNATURE *(Maintenance Supervisor)*	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO. *a*	STATUS *b*	DEFICIENCIES AND SHORTCOMINGS *c*	CORRECTIVE ACTION *d*	INITIAL WHEN CORRECTED *e*

EMPLOYEE REPORT OF ALLEGED UNSAFE OR UNHEALTHFUL WORKING CONDITIONS

For use of this form, see DA PAM 385-10; the proponent agency is OCSA.

This form is provided for the assistance of any complainant and is not intended to constitute the exclusive means by which a complaint may be registered with the local Safety Office (Ref OSHA Poster on rights of employees and their representatives).

The undersigned *(check one)*

☐ Employee ☐ Representative of employees ☐ Other *(Specify)* _____

believes that a job safety or health hazard exists at the following place of employment

Does this hazard *(s)* immediately threaten serious physical harm? ☐ Yes ☐ No

If "yes" checked, immediately contact your supervisor or safety representative.

Name of official in charge _____ Telephone _____

Operation/Activity _____

Exact location of worksite _____

1. Kind of operation _____

2. Describe briefly the hazard which exists there including the appropriate number of employees exposed to or threatened by such hazard

3. List by number and/or name the particular occupational safety and health standard*(s)* which may have been violated, if known

4. *(a)* To your knowledge, has this hazard been the subject of any union/management grievance or have you *(or anyone you know)* otherwise called it to the attention of, or discussed it with the employer or any representative thereof?

(b) If so, please give the results thereof, including any efforts by management to eliminate or reduce the severity of the hazard

5. Please indicate your desire:

☐ I do not want my name revealed to the official in charge.

☐ My name may be revealed to the official in charge.

WORK LOCATION	TELEPHONE NO.	DATE
TYPED OR PRINTED NAME OF EMPLOYEE OR EMPLOYEE REPRESENTATIVE	SIGNATURE	

Report No. _____

DAILY QUALITY CONTROL REPORT

DATE_____

DAY	S	M	T	W	**TH**	F	S

USACE TECHNICAL MANAGER_____

PROJECT_____

DELIVERY ORDER NO._____

CONTRACT NO._____

WEATHER	**Sunny**	Clear	Overcast	Rain	Snow
TEMP: H/L	To 32	**32-50**	50-70	70-85	85 up
WIND	**Still**	Moderate	High		
HUMIDITY	Dry	**Moderate**	High		

1. Onsite Personnel and Areas of Responsibility:

Name	Trade	Hours	Employer	Location & Description of Work

2. Operating Equipment (Not hand tools):

Equipment	Quantity	Rental Y/N	Total Hours

3. Work Performed Today: (Indicate location and description of work performed by site personnel.)

4. Control Activities Performed: (Specify feature of work and indicate whether P for Preparatory, I for Initial, or F for Follow-Up Phase. For Preparatory Inspections: Identify feature of work and attach completed checklist, list requests for information (RFIs) issued and responses. For Initial Inspections: Identify feature of work and attach completed checklist. For Follow-Up Inspections: List inspection milestones reached, inspections performed, results of inspection compared to specification requirements, Corrective Action Reports issued/closed, and corrective actions taken.)

5. Tests Performed and Test Results: (Identify test requirements by paragraph number in specifications and/or sheet number in plans.)

6. Material Received: (Note inspection results and storage provided.)

7. Job Safety: (List items checked, results, instructions and corrective actions taken.)

8. Remarks: (Instructions received or given. Conflict(s) in Plans and/or specifications. Delays encountered.)

9. List of Attachments: (List all attachments to this report, include date and reference number where applicable. Attachments are to include copies of inspection checklists, test reports, data reports, and field measurement/calculation sheets.)

_____

_____

_____

_____

Report Verification: On behalf of **ORGANIZATION NAME**, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as may be noted above.

_____ _____

UXO QC Specialist Date

DAILY QUALITY CONTROL/SAFETY REPORT

SENIOR UXO SUPERVISOR:

PROJECT NUMBER:

CONTRACT NO.:

PHASE:

DAY OF THE WEEK

S	M	T	W	TH	F	S

DATE:

WEATHER CONDITIONS

WEATHER	am: pm:	
TEMP:	am: pm:	
WIND	am: pm:	Report No.:
HUMIDITY	%	

1. Project Personnel:

Name	Employer	Signature

2. Safety Discussion:

Safety Brief Topics

3. Work Performed Today: (Indicate location and description of work performed by onsite personnel.

Activities Conducted
Survey *Surface Clearance* *Subsurface Investigation*

4. Quality Control:

QC Activities Conducted
Grid/Location, Activity, Pass/Fail

5. Safety Inspections:

Safety Activities Conducted

6. Additional Comments:

Remarks

SUXOS Signature _____ Date _____

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1 2 3	4 5 6	7	23 24	25 26 27 28 29	45	46 47 48 49 50	51	52 53	54 55 56	57 58 59	60	61 62	63 64	65 66	67 68 69	70	71	72 73	74 75 76 77 78 79 80	1. TOTAL PRICE	2. SHIP FROM	3. SHIP TO
DOC IDEN	RI FROM	M&S	UNIT ISS	QUANTITY	SER	SUPPLE-MENTARY ADDRESS	SIG	FUND	DIS-TRI-BU-TION	PRO-JECT	PRI	REQD DEL DATE		ADV	RI	O/P	COND	MGT	UNIT PRICE: DOLLARS / CTS	DOLLARS / CTS	4. MARK FOR	

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS
10. QTY. REC'D	11.UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC / 15. SL
16. FREIGHT CLASSIFICATION NOMENCLATURE				
17. ITEM NOMENCLATURE				
18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE	
22. RECEIVED BY			23. DATE RECEIVED	

24. DOCUMENT NUMBER & SUFFIX (30-44)

25. NATIONAL STOCK NO. & ADD (8-22)

26. RIC (4-6)
UI (23-24)
QTY (25-29)
CON CODE (71)
DIST (55-56)
UP (74-80)

27. ADDITIONAL DATA

PREVIOUS EDITION MAY BE USED

FormFlow (DLA)

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1 2 3	4 5 6	7	23 24	25 26 27 28 29	45	46 47 48 49 50	51	52 53	54 55 56	57 58 59	60	61 62	63 64	65 66	67 68 69	70	71	72 73	74 75 76 77 78 79 80	1. TOTAL PRICE	2. SHIP FROM	3. SHIP TO
DOC IDEN	RI FROM	M&S	UNIT ISS	QUANTITY	SER	SUPPLE-MENTARY ADDRESS	SIG	FUND	DIS-TRI-BU-TION	PRO-JECT	PRI	REQD DEL DATE		ADV	RI	O/P	COND	MGT	UNIT PRICE: DOLLARS / CTS	DOLLARS / CTS	4. MARK FOR	

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS
10. QTY. REC'D	11.UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC / 15. SL
16. FREIGHT CLASSIFICATION NOMENCLATURE				
17. ITEM NOMENCLATURE				
18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE	
22. RECEIVED BY			23. DATE RECEIVED	

24. DOCUMENT NUMBER & SUFFIX (30-44)

25. NATIONAL STOCK NO. & ADD (8-22)

26. RIC (4-6)
UI (23-24)
QTY (25-29)
CON CODE (71)
DIST (55-56)
UP (74-80)

27. ADDITIONAL DATA

PREVIOUS EDITION MAY BE USED

FormFlow (DLA)

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIALS)

(Read Instructions before completing this form.)

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.	1. BILL OF LADING/TRANSPORTATION CONTROL NUMBER

SECTION 1 - DOCUMENTATION	ORIGIN a.	DESTINATION b.
2. CARRIER/GOVERNMENT ORGANIZATION		
3. DATE/TIME OF INSPECTION		
4. LOCATION OF INSPECTION		
5. OPERATOR(S) NAME(S)		
6. OPERATOR(S) LICENSE NUMBER(S)		
7. MEDICAL EXAMINER'S CERTIFICATE*		

8. *(X if satisfactory at origin)*

a. HAZMAT ENDORSEMENT		d. ERG OR EQUIVALENT COMMERCIAL:		YES		NO	
b. VALID LEASE*		e. DRIVER'S VEHICLE INSPECTION REPORT*					
c. ROUTE PLAN		f. COPY OF 49 CFR PART 397					

9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*	YES	NO
a. TRUCK/TRACTOR		
b. TRAILER		

SECTION II - MECHANICAL INSPECTION

All items shall be checked on empty equipment prior to loading. Items with an asterisk shall be checked on all incoming loaded equipment.

10. TYPE OF VEHICLE(S)	11. VEHICLE NUMBER(S)

12. PART INSPECTED *(X as applicable)*	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT		ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
a. SPARE ELECTRICAL FUSES					k. EXHAUST SYSTEM					
b. HORN OPERATIVE					l. BRAKE SYSTEM*					
c. STEERING SYSTEM					m. SUSPENSION					
d. WINDSHIELD/WIPERS					n. COUPLING DEVICES					
e. MIRRORS					o. CARGO SPACE					
f. WARNING EQUIPMENT					p. LANDING GEAR*					
g. FIRE EXTINGUISHER*					q. TIRES, WHEELS, RIMS					
h. ELECTRICAL WIRING					r. TAILGATE/DOORS*					
i. LIGHTS AND REFLECTORS					s. TARPAULIN*					
j. FUEL SYSTEM*					t. OTHER *(Specify)*					

13. INSPECTION RESULTS *(X one)* ACCEPTED ☐ REJECTED ☐

(If rejected give reason under "Remarks". Equipment will be approved if deficiencies are corrected prior to loading.)

14. SATELLITE MOTOR SURVEILLANCE SYSTEM: *(X one)* ACCEPTED ☐ REJECTED ☐

15. REMARKS

16. INSPECTOR SIGNATURE *(Origin)*	17. INSPECTOR SIGNATURE *(Destination)*

SECTION III - POST LOADING INSPECTION

This section applies to Commercial and Government/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.

	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
18. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CFR					
19. LOAD PROPERLY SECURED TO PREVENT MOVEMENT					
20. SEALS APPLIED TO CLOSED VEHICLE; TARPAULIN APPLIED ON OPEN EQUIPMENT					
21. PROPER PLACARDS APPLIED					
22. SHIPPING PAPERS/DD FORM 2890 FOR GOVERNMENT VEHICLE SHIPMENTS					
23. COPY OF DD FORM 626 FOR DRIVER					
24. SHIPPED UNDER DOT SPECIAL PERMIT 868					

25. INSPECTOR SIGNATURE *(Origin)*	26. DRIVER(S) SIGNATURE *(Origin)*
27. INSPECTOR SIGNATURE *(Destination)*	28. DRIVER(S) SIGNATURE *(Destination)*

INSTRUCTIONS

SECTION I - DOCUMENTATION

General Instructions.

All items (2 through 9) will be checked at origin prior to loading. Items with an asterisk (*) apply to commercial operators or equipment only. Only Items 2 through 7 are required to be checked at destination.

Items 1 through 5. Self explanatory.

Item 6. Enter operator's Commercial Driver's License (CDL) number or Military OF-346 License Number. CDL and OF-346 must have the HAZMAT and other appropriate endorsements IAW 49 CFR 383.

Item 7. *Enter the expiration date listed on the Medical Examiner's Certificate.

Item 8.a. Hazardous Materials Certification. In accordance with applicable service regulations, ensure operator has been certified to transport hazardous materials. Check the expiration date on driver's HAZMAT Certification.

b. *Valid Lease. Shipper will ensure a copy of the appropriate contract or lease is carried in all leased vehicles and is available for inspection. (49 CFR 376.12 and 376.11(c)(2)).

c. Route Plan. Prior to loading any Hazard Class/Division 1.1, 1.2, or 1.3 (Explosives) for shipment, ensure that the operator possesses a written route plan in accordance with 49 CFR Part 397. Route Plan requirements for Hazard Class 7 (Radioactive) materials are found in 49 CFR 397.101.

d. Emergency Response Guidebook (ERG) or Equivalent. Commercial operators must be in possession of an ERG or equivalent document. Shipper will provide applicable ERG page(s) to military operators.

e. *Driver's Vehicle Inspection Report. Review the operator's Vehicle Inspection Report. Ensure that there are no defects listed on the report that would affect the safe operation of the vehicle.

f. Copy of 49 CFR Part 397. Operators are required by regulation to have in their possession a copy of 49 CFR Part 397 (Transportation of Hazardous Materials Driving and Parking Rules). If military operators do not possess this document, shipper will provide a copy to operator.

Item 9. *Commercial Vehicle Safety Alliance (CVSA) Decal. Check to see if equipment has a current CVSA decal and mark applicable box. Vehicles without CVSA, check documentation of the last vehicle periodic inspection and perform DD Form 626 inspection.

SECTION II - MECHANICAL INSPECTION

General Instructions.

All items (12.a. through 12.t.) will be checked on all incoming empty equipment prior to loading. All UNSATISFACTORY conditions must be corrected prior to loading. Items with an asterisk (*) shall be checked on all incoming loaded equipment. Unsatisfactory conditions that would affect the safe off-loading of the equipment must be corrected prior to unloading.

SECTION II *(Continued)*

Item 12.a. Spare Electrical Fuses. Check to ensure that at least one spare fuse for each type of installed fuse is carried on the vehicle as a spare or vehicle is equipped with an overload protection device (circuit breaker). (49 CFR 393.95)

b. Horn Operative. Ensure that horn is securely mounted and of sufficient volume to serve purpose. (49 CFR 393.81)

c. Steering System. The steering wheel shall be secure and must not have any spokes cracked through or missing. The steering column must be securely fastened. Universal joints shall not be worn, faulty or repaired by welding. The steering gear box shall not have loose or missing mounting bolts or cracks in the gear box mounting brackets. The pitman arm on the steering gear output shaft shall not be loose. Steering wheel shall turn freely through the limit of travel in both directions. All components of a power steering system must be in operating condition. No parts shall be loose or broken. Belts shall not be frayed, cracked or slipping. The power steering system shall not be leaking. (49 CFR 396 Appendix G)

d. Windshield/Wipers. Inspect to ensure that windshield is free from breaks, cracks or defects that would make operation of the vehicle unsafe; that the view of the driver is not obscured and that the windshield wipers are operational and wiper blades are in serviceable condition. Defroster must be operative when conditions require. (49 CFR 393.60, 393.78 and 393.79)

e. Mirrors. Every vehicle must be equipped with two rear vision mirrors located so as to reflect to the driver a view of the highway to the rear along both sides of the vehicle. Mirrors shall not be cracked or dirty. (49 CFR 393.80)

f. Warning Equipment. Equipment must include three bidirectional emergency reflective triangles that conform to the requirements of FMVSS No. 125. FLAME PRODUCING DEVICES ARE PROHIBITED. (49 CFR 393.95)

g. Fire Extinguisher. Military vehicles must be equipped with one serviceable fire extinguisher with an Underwriters Laboratories rating of 10 BC or more. (Commercial motor vehicles must be equipped with one serviceable 10 BC Fire Extinguisher). Fire extinguisher must be located so that it is readily accessible for use and securely mounted on the vehicle. The fire extinguisher must be designed, constructed and maintained to permit visual determination of whether it is fully charged. (49 CFR 393.95)

h. Electrical Wiring: Electrical wiring must be clean and properly secured. Insulation must not be frayed, cracked or otherwise in poor condition. There shall be no uninsulated wires, improper splices or connections. Wires and electrical fixtures inside the cargo area must be protected from the lading. (49 CFR 393.28)

INSTRUCTIONS

SECTION II *(Continued)*

i. Lights/Reflectors. (Head, tail, turn signal, brake, clearance, marker and identification lights, Emergency Flashers). Inspect to see that all lighting devices and reflectors required are operable, of proper color and properly mounted. Ensure that lights and reflectors are not obscured by dirt or grease or have broken lenses. High/Low beam switch must be operative. Emergency Flashers must be operative on both the front and rear of vehicle. (49 CFR 393.24, 25, and 26)

j. Fuel System. Inspect fuel tank and lines to ensure that they are in serviceable condition, free from leaks, or evidence of leakage and securely mounted. Ensure that fuel tank filler cap is not missing. Examine cap for defective gasket or plugged vent. Inspect filler necks to see that they are in completely serviceable condition and not leaking at joints. (49 CFR 393.83)

k. Exhaust System. Exhaust system shall discharge to the atmosphere at a location to the rear of the cab or if the exhaust projects above the cab, at a location near the rear of the cab. Exhaust system shall not be leaking at a point forward of or directly below the driver compartment. No part of the exhaust system shall be located where it will burn, char or damage electrical wiring, fuel system or any other part of the vehicle. No part of the exhaust system shall be temporarily repaired with wrap or patches. (49 CFR 393.83)

l. Brake System (to include hand brakes, parking brakes and Low Air Warning devices). Check to ensure that brakes are operational and properly adjusted. Check for audible air leaks around air brake components and air lines. Check for fluid leaks, cracked or damaged lines in hydraulic brake systems. Ensure that parking brake is operational and properly adjusted. Low Air Warning devices must be operative. (49 CFR 393.40, 41, 42, 43, 44, 45, 47, 48, 49, 50, 51, 52, 53, and 55)

m. Suspension. Inspect for indications of misaligned, shifted or cracked springs, loosened shackles, missing bolts, spring hangers unsecured at frame and cracked or loose U-bolts. Inspect for any unsecured axle positioning parts, and sign of axle misalignment, broken torsion bar springs (if so equipped). (49 CFR 393.207)

n. Coupling Devices (Inspect without uncoupling). Fifth Wheels: Inspect for unsecured mounting to frame or any missing or damaged parts. Inspect for any visible space between upper and lower fifth wheel plates. Ensure that the locking jaws are around the shank and not the head of the kingpin. Ensure that the release lever is seated properly and safety latch is engaged. Pintle Hook, Drawbar, Towbar Eye and Tongue and Safety Devices: Inspect for unsecured mounting, cracks, missing or ineffective fasteners (welded repairs to pintle hook is prohibited). Ensure safety devices (chains, hooks, cables) are in serviceable condition and properly attached. (49 CFR 393.70 and 71)

o. Cargo Space. Inspect to ensure that cargo space is clean and free from exposed bolts, nuts, screws, nails or inwardly projecting parts that could damage the lading. Check floor to ensure it is tight and free from holes. Floor shall not be permeated with oil or other substances. (49 CFR 393.84)

p. Landing Gear. Inspect to ensure that landing gear and assembly are in serviceable condition, correctly assembled, adequately lubricated and properly mounted.

SECTION II *(Continued)*

q. Tires, Wheels and Rims: Inspect to ensure that tires are properly inflated. Flat or leaking tires are unacceptable. Inspect tires for cuts, bruises, breaks and blisters. Tires with cuts that extend into the cord body are unacceptable. Thread depth shall not be less than: 4/32 inches for tires on a steering axle of a power unit, and 2/32 inches for all other tires. Mixing bias and radial on the steering axle is prohibited. Inspect wheels and rims for cracks, unseated locking rings, broken, loose, damaged or missing lug nuts or elongated stud holes. (49 CFR 393.75)

r. Tailgate/Doors. Inspect to see that all hinges are tight in body. Check for broken latches and safety chains. Doors must close securely. (49 CFR 177.835(h))

s. Tarpaulin. If shipment is made on open equipment, ensure that lading is properly covered with fire and water resistant tarpaulin. (49 CFR 177.835(h))

t. Other Unsatisfactory Condition. Note any other condition which would prohibit the vehicle from being loaded with hazardous materials.

Item 14. For AA&E and other shipments requiring satellite surveillance, ensure that the Satellite Motor Surveillance System is operable. The DTTS Message Display Unit, when operative, will display the signal "DTTS ON". The munitions carrier driver, when practical, will position the DTTS message display unit in a manner that allows the shipping inspector or other designated shipping personnel to observe the "DTTS ON" message without climbing aboard the cab of the motor vehicle.

SECTION III - POST LOADING INSPECTION

General Instructions.

All placarded quantities items will be checked prior to the release of loaded equipment. Shipment will not be released until deficiencies are corrected. All items will be checked on incoming loaded equipment. Deficiencies will be reported in accordance with applicable service regulations.

Item 18. Check to ensure shipment is loaded in accordance with 49 CFR Part 177.848 and the applicable Segregation or Compatibility Table of 49 CFR 177.848.

Item 19. Check to ensure the load is secured from movement in accordance with applicable service outload drawings.

Item 20. Check to ensure seal(s) have been applied to closed equipment; fire and water resistant tarpaulin applied on open equipment.

Item 21. Check to ensure each transport vehicle has been properly placarded in accordance with 49 CFR 172.504.

Item 22. Check to ensure operator has been provided shipping papers that comply with 49 CFR 172.201 and 202. For shipments transported by Government vehicle, shipping paper will be DD Form 2890.

Item 23. Ensure operator(s) sign DD Form 626, are given a copy and understand the hazards associated with the shipment.

Item 24. Applies to Commercial Shipments Only. If shipment is made under DOT Special Permit 868, ensure that shipping papers are properly annotated and copy of Special Permit 868 is with shipping papers.

Item 26. Ensure driver/operator signs DD Form 626 at origin.

Item 28. Ensure driver/operator signs DD Form 626 at destination.

MATERIEL COURIER RECEIPT

SHIPPER	SHIPPER'S CONTROL/DOCUMENT NO.
	SUPPLY ACCOUNT NUMBER
DESTINATION	SUPPLY ACCOUNT NUMBER

I certify by my signature that I have received the materiel listed on this form and am aware of the applicable safety and security requirements.

SHIPMENT TRANSFERS

FIRST	LOCATION OF TRANSFER	DATE *(YYYYMMDD)*
RECIPIENT'S PRINTED NAME *(Last, First, Middle Initial)*	ORGANIZATION OR ACCOUNT NO.	
SIGNATURE		
SECOND	LOCATION OF TRANSFER	DATE *(YYYYMMDD)*
RECIPIENT'S PRINTED NAME *(Last, First, Middle Initial)*	ORGANIZATION OR ACCOUNT NO.	
SIGNATURE		
THIRD	LOCATION OF TRANSFER	DATE *(YYYYMMDD)*
RECIPIENT'S PRINTED NAME *(Last, First, Middle Initial)*	ORGANIZATION OR ACCOUNT NO.	
SIGNATURE		
FOURTH	LOCATION OF TRANSFER	DATE *(YYYYMMDD)*
RECIPIENT'S PRINTED NAME *(Last, First, Middle Initial)*	ORGANIZATION OR ACCOUNT NO.	
SIGNATURE		
FIFTH	LOCATION OF TRANSFER	DATE *(YYYYMMDD)*
RECIPIENT'S PRINTED NAME *(Last, First, Middle Initial)*	ORGANIZATION OR ACCOUNT NO.	
SIGNATURE		

SHIPMENT DESCRIPTION

LINE NUMBER	QUANTITY	SERIAL NUMBERS	REMARKS

KEY CONTROL REGISTER AND INVENTORY

For use of this form see AR 190-11; the proponent agency is ODCSOPS

UNIT/ACTIVITY	PERIOD COVERED

KEY CONTROL NUMBER(S)
(Insert serial number or other identifying number from the key)

1.	11.	21.	31.
2.	12.	22.	32.
3.	13.	23.	33.
4.	14.	24.	34.
5.	15.	25.	35.
6.	16.	26.	36.
7.	17.	27.	37.
8.	18.	28.	38.
9.	19.	29.	39.
10.	20.	30.	40.

KEY ISSUE AND TURN IN

KEY NUMBER	ISSUED (Date/Time)	ISSUED BY (Printed Name/Signature)	ISSUED TO (Printed Name/Signature)	TURNED IN (Date/Time)	RECEIVED BY (Printed Name/Signature)

KEY ISSUE AND TURN IN *(Continued)*

KEY NUMBER	ISSUED (Date/Time)	ISSUED BY (Printed Name/Signature)	ISSUED TO (Printed Name/Signature)	TURNED IN (Date/Time)	RECEIVED BY (Printed Name/Signature)

INVENTORIES (JOINT/SEMIANNUAL)

DATE	PRINTED NAME/SIGNATURE	DATE	PRINTED NAME/SIGNATURE

(For Safety Staff only)	REPORT NO.	EROC CODE	**UNITED STATES ARMY CORPS OF ENGINEERS** **ACCIDENT INVESTIGATION REPORT** *(For Use of this Form See Help Menu and USACE Suppl to AR 385-40)*	**REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)**

1. **ACCIDENT CLASSIFICATION**

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER		☐	

2. **PERSONAL DATA**

a. Name *(Last, First, MI)*	b. AGE	c. SEX ☐ MALE ☐ FEMALE	d. SOCIAL SECURITY NUMBER	e. GRADE

f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER ☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL ☐ TEMPORARY ☐ STUDENT ☐ OTHER *(Specify)*

3. **GENERAL INFORMATION**

a. DATE OF ACCIDENT *(month/day/year)*	b. TIME OF ACCIDENT *(Military time)* hrs	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:

e. CONTRACT NUMBER	f. TYPE OF CONTRACT	g. HAZARDOUS/TOXIC WASTE ACTIVITY
☐ CIVIL WORKS ☐ MILITARY ☐ OTHER *(Specify)*	☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER *(Specify)*	☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER *(Specify)*

4. **CONSTRUCTION ACTIVITIES ONLY** *(Fill in line and corresponding code number in box from list - see help menu)*

a. CONSTRUCTION ACTIVITY	(CODE) #	b. TYPE OF CONSTRUCTION EQUIPMENT	(CODE) #

5. INJURY/ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items e, f & g - see help menu)*

a. SEVERITY OF ILLNESS/INJURY	(CODE) #	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED	(CODE) #	g. TYPE AND SOURCE OF INJURY/ILLNESS	(CODE) #
PRIMARY		TYPE	
SECONDARY		SOURCE	
f. NATURE OF ILLNESS/INJURY	(CODE) #		

6. PUBLIC FATALITY *(Fill in line and correspondence code number in box - see help menu)*

a. ACTIVITY AT TIME OF ACCIDENT	(CODE) #	b. PERSONAL FLOATATION DEVICE USED?
		☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐☐ PICKUP/VAN ☐☐ AUTOMOBILE ☐☐ TRUCK ☐☐ OTHER *(Specify)*	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER *(Specify)*	(1) FRONT SEAT			
		(2) REAR SEAT			

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT *(Fill in line and correspondence code number in box from list - see help menu)*

a. TYPE OF VESSEL/FLOATING PLANT	(CODE) #	b. TYPE OF COLLISION/MISHAP	(CODE) #

10. ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

11. **CAUSAL FACTOR(S)** *(Read Instruction Before Completing)*

a. (Explain YES answers in item 13)	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a. *(CONTINUED)*	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12. **TRAINING**

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	(Month) (Day) (Year)

13. **FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES** *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14. **ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).**

DESCRIBE FULLY:

15. **DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.**

a. BEGINNING (Month/Day/Year)	b. ANTICIPATED COMPLETION (Month/Day/Year)		
c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT CORPS _____ CONTRACTOR _____	d. DATE *(Mo/Da/Yr)*	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL

16. **MANAGEMENT REVIEW** *(1st)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

17. **MANAGEMENT REVIEW** *(2nd - Chief Operations, Construction, Engineering, etc.)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

18. **SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW**

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS

SIGNATURE	TITLE	DATE

19. **COMMAND APPROVAL**

COMMENTS

COMMANDER SIGNATURE	DATE

*U.S. GOVERNMENT PRINTING OFFICE: 1993-0-791-757

10.	ACCIDENT DESCRIPTION *(Continuation)*

13a.	DIRECT CAUSE *(Continuation)*

13b.	INDIRECT CAUSES *(Continuation)*

14.	ACTION(S) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(S) *(Continuation)*

US ARMY CORPS OF ENGINEERS (USACE)
MUNITIONS RESPONSE
QUALITY ASSURANCE REPORT (QAR) FORM
The proponent agency is CESO. *See instructions on page 2.*

1. REPORT NO. *(1,2,3, etc., for the Task Order (T.O.))*

2. USACE REPRESENTATIVE'S NAME

3. DATE ACTIVITY COMPLETED

4. PROJECT NAME

5. PROJECT LOCATION

6. WEATHER CONDITIONS

7. CONTRACTOR

8. CONTRACT NUMBER

9. T.O. NUMBER

10. DISTRIBUTED TO (*check boxes and insert individual's name*)

☐ a. District Program/Project Manager ☐ b. Design Center

☐ c. Remedial Action District TM ☐ d. Contractor

11. RESPONSE DUE DATE (*Based on type of nonconformance, IF REQUIRED*)

12. TYPE OF ACTIVITY CONDUCTED (*Include types of inspections/audits conducted, operations observed, etc.*)

13. RESULTS AND OBSERVATIONS

14. DEFICIENCY TYPE (*select one*) ☐ a. Not Applicable ☐ b. Critical ☐ c. Major ☐ d. Minor

☐ e. Other, *Specify*

15. DATE

16. USACE REPRESENTATIVE'S SIGNATURE

17. CONTRACTOR REPRESENTATIVE'S NAME

18. DATE

19. CONTRACTOR REPRESENTATIVE'S SIGNATURE (*indicating receipt of the QAR*)

20. **The Contractor will provide the following information to the Contract Specialist by the "Response Due" date above. Please contact the Contracting Officer's Representative (COR) or Project Manager if you have any questions.**

a. Contractor Response as to Cause and Actions Taken to Correct Current Condition and to Prevent Recurrence (*cite applicable quality control procedures or changes in plans, procedures, or practices*).

b. Contractor Representative's Authentication (*form must be signed before returning*)

(1) Printed Name	(2) Title	(3) Date Signed	(4) Signature

c. Government Evaluation (*acceptance, partial acceptance, etc.*)

d. Government Actions (*reduced payment, cure notice, show cause, other*)

e. Close Out	Name	Title	Date (*YYYY-MM-DD*)	Signature
(1) Contractor Notified				
(2) USACE PDT Representative				
(3) Contracting Officer or COR				

INSTRUCTIONS FOR ENG FORM 6048

Block 1. Report number.

Block 2. Name of USACE representative conducting the quality assurance (QA) activity.

Block 3. Date QA Activity completed.

Block 4. Project Name, i.e., "Camp Swampy (MRS-02).

Block 5. Project Location, i.e., "Smithville, Alaska".

Block 6. Weather conditions, if applicable.

Block 7. Contractor and/or subcontractor executing the work.

Block 8. Contract number.

Block 9. Task Order number.

Block 10. List by name all official recipients of the QAR. At a minimum, the District Program/Project Manager must be selected.

Block 11. Enter the date that the contractor is to respond, if applicable.

Block 12. List all QA-related activities, inspections, audits conducted, operations observed, etc. Include specific references to applicable government quality requirements, i.e., Quality Assurance Surveillance Plans, Department of Defense, Army, and/or USACE requirements, policy, guidance, etc., requiring the inspection/audit being conducted. For example: "Spot-checked inventory of demolition explosives as required by the project QASP and approved Explosives Safety Submission (ESS)."

Block 13. Describe results and observations of each QA activity conducted. Attach discipline-specific checklists/documentation used. All deficiencies noted must include reference to the specific regulation or requirement that was violated. For example: "Demolition explosives stored on site were not inventoried weekly in accordance with ESS paragraph 4.2 and Work Plan paragraph 5.4. Last inventory was conducted 3 weeks ago on xx Feb 2013."

Block 14. Select the type of deficiency, if any, observed. Use contract-specific definitions if available, or use the following general definitions:

a. Check the appropriate box.

b. Critical: A deficiency that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services; or is likely to prevent performance of a vital agency mission.

c. Major: A deficiency, other than critical, that is likely to result in failure of the supplies or services, or to materially reduce the usability of the supplies or services for their intended purpose.

d. Minor: A deficiency that is not likely to materially reduce the usability of the supplies or services for their intended purpose or is a departure from established standards having little bearing on the effective use or operation of the supplies or services.

Block 15. Date the USACE Representative signs.

Block 16. QA representative's signature.

Block 17. Contractor Representative's printed name.

Block 18. Date Contractor Representative signs.

Block 19. Contractor representative signature. Signature does not indicate concurrence with stated findings, only that contractor has received the report.

Block 20a. Contractor indicates action(s) taken to determine cause of the deficiency, action taken to correct immediate deficiency, and action taken to prevent a recurrence of the deficiency. Include dates of actions taken and a schedule for completion of planned actions.

Block 20b. Contractor representative's printed name, title, date signed, and signature.

Block 20c. Indicate government acceptance of contractor's actions to correct identified deficiencies.

Block 20d. Indicate negative government actions taken as a result of the deficiency.

Block 20e. Signature of contractor, PDT representative and contracting officer or COR indicating close out for all deficiencies indicated.

INSTRUMENT CALIBRATION CHECKLIST **MSFC-003-R-01,**
MEC/CWM Construction Footprint Clearance

Date: _____ Work effort: _____

Answer each question by checking the appropriate column (yes, no, or NA). If "no" is checked, an explanation should be provided in the space available. This checklist is to be completed by the QA/QC Specialist.

Instrument Calibration	Yes	No	NA
Was a Master Equipment Log filled out for all field instruments on-hand? Exp: _____	☐	☐	☐
Were the equipment arrival date, equipment type, on-site storage location, and serial number recorded on a Master Equipment Log for each field instrument? Exp: _____	☐	☐	☐
Were factory calibration certificates received with the field instruments and recorded on the Master Equipment Log? Exp: _____	☐	☐	☐
Was the date of the next required factory calibration recorded on the Master Equipment Log? Exp: _____	☐	☐	☐
Was the frequency of calibration checks, calibration acceptance criteria, and corrective actions for calibration failures recorded on the Master Equipment Log for each piece of equipment? Exp: _____	☐	☐	☐
Was the date that the field instrument left the site recorded on a Master Equipment Log? Exp: _____	☐	☐	☐
Are instruments being calibrated before and after use when possible? Exp: _____	☐	☐	☐
Are instruments being calibrated against known standards and manufacturer specifications? Exp: _____	☐	☐	☐
Are instruments being calibrated within 5% of known standards, when applicable? Exp: _____	☐	☐	☐
Are all instrument calibrations being accurately documented on the appropriate calibration logs? Exp: _____	☐	☐	☐

List instruments used at the Site: _____

_____

_____

Corrective Actions

List all corrective actions. Initial and date in the last column when they have been implemented.

_____	_____	
_____	_____	
_____	_____	

The QA/QC Specialist shall sign this checklist upon completion of all items on the checklist.

QA/QC Specialist Signature: _____ Date _____

Explosives Transportation Vehicle Safety Checklist[1]

This checklist will be satisfactorily completed prior to loading an explosives transportation vehicle. The completed and signed checklist will be kept in the on-site safety files.

Senior UXO Supervisor (authorizing transportation of explosives): _____

Explosives to be Transported: _____

_____

Check the following items to ensure they are in good working order:

Initials	Item
1.	Vehicle body (including non-sparking bed or transportation box)
2.	Tires
3.	Windshield and wipers
4.	Rear view mirrors
5.	Placarding (as required by cargo)
6.	2 ABC fire extinguishers
7.	Lights (emergency, head, parking, running, interior, backing, turn signals)
8.	Engine (oil, coolant, belts, battery, brake fluid, wiper fluid)
9.	Horn
10.	Fuel
11.	Brakes
12.	Operational radio (successful communication check performed)
13.	Driver know the route to be taken (attach map if required)
14.	Load properly segregated and secured
15.	Permission received from Senior UXO Supervisor to transport explosives
16.	Perform notification of departure
17.	Perform notification on arrival at destination

Emergency Phone Numbers: _____

Driver _____ **Safety Observer** _____

[1] This checklist is for on-site explosives transportation only.

EXPLOSIVES USAGE RECORD

Location:	Date:
Action/Purpose:	

Explosives Issued

Quantity	Item	Lot Number

Issued By:	Received By:

Explosives Expended

Quantity	Item	Lot Number

Expended By:

Explosives Returned

Quantity	Item	Lot Number

Returned By:	Received By:

FIELD ACTIVITY
DAILY LOG

DAILY LOG	DATE			
	NO.			
	SHEET OF			

PROJECT NAME:	PROJECT NO.:
FIELD ACTIVITY SUBJECT:	
DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:	

VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
WEATHER CONDITIONS:	IMPORTANT TELEPHONE CALLS:
PERSONNEL ON SITE:	
SIGNATURE:	DATE:

Guard Instructions MSFC-003-R-01, MEC/CWM
Construction Footprint Clearance

Security officers will read and be briefed on the Physical Security Plan (Chapter 9 of the Work Plan) prior to initial work on site.

The priority of physical security is:

- First, to any RCWM in storage at the 8200 Block.
- Second, to the security of equipment and supplies at the investigation areas due to the sensitive nature of the work and the properties.
- Third, to the security of the equipment and supplies at the CP.

The security officers will ensure that all gates are secured and locked during the non-operational hours and monitored during operational periods at times when no RCWM is stored.

The security patrol will monitor the security of the ECM. If no RCWM is in storage, the security patrol will periodically check the building as they would any other building. When RCWM is stored in the ECM and if an intrusion detection system (IDS) is installed and functional, the security patrol will visit the facility every four hours to observe conditions. The patrol will check the integrity of the fence, including the gate and lock, and observe the condition of the ECM and surrounding area. If there are signs of unauthorized activity or if any out-of-the-ordinary circumstances are noticed, site management personnel will be called in the following order until one is contacted:

- USAESCH Safety Specialist – TO BE DETERMINED – PHONE
- SM/SUXOS – TO BE DETERMINED – PHONE
- SSHO – TO BE DETERMINED – PHONE
- UXOQCS – TO BE DETERMINED – PHONE

If RCWM is stored in the ECM and there is no IDS, or the IDS system is not working, then there will be a 24-hour armed guard posted at a location where access to the 8200 block can be monitored. Officers will walk around the IHF area at least once every two hours. Continuous observation of the ECM must be maintained.

Only authorized personnel from USAESCH, the Air Monitoring Team, and the Assessment/Package/Transport Team will be allowed access to the inside of the ECM area once RCWM has been placed in the facility.

In the event an intruder is detected, the officers will take appropriate action to stop the intruder and maintain the security of the site. If necessary, the officer will call for appropriate additional support from the Directorate of Emergency Services Office Hernando County Sheriff's Office (256-876-2222). Response times would be in accordance with standard police protocols (e.g. 10 to 15 minutes).

When there is more than one officer required, officers will ensure effective communication on a periodic basis between posts.

Questions concerning these instructions should be directed to the SM/SUXOS.

I have read and understand the above instructions.

Signature _____ Date _____

Name (Printed) _____

HEAVY EQUIPMENT DAILY INSPECTION LIST

Date: _____ **Project No.:** _____

Hour Meter: _____

Type of Equipment: _____

Name: _____

Model: _____

Serial No: _____

Item/Function		Item/Function	
Seatbelts	☐	***Hydraulic System***	
Windshield	☐	**Hoses**	☐
Tire Pressure	☐	**Fluid Level**	☐
Fire Extinguisher	☐	**Steering System**	☐
Brakes		***Engine***	
Service	☐	**Oil**	☐
Parking	☐	**Coolant**	☐
Back-up Alarm	☐	**Hoses**	☐
Horn	☐	**Belts**	☐
Attachment Condition	☐	**Grease Points**	☐

Date Last Services: _____

Items Serviced: _____

_____

Operators Signature: _____

Loss/Damage/Destruction Report

Memorandum Thru: Project Property Officer
Date: _____
For: Government Contracting Officer

Subject: LOSS/DAMAGE/DESTROYED PROPERTY
Report Number _____

Report prepared by: _____
COMPANY: _____
Contract: _____
Task order: _____
Location of Activity: _____
Report type: Lost ☐ Destroyed ☐ Damaged ☐
Nomenclature: _____
Serial Number: _____
Model: _____
PO/Subcontract No: _____
Date of Incident: _____
Manufacturer: _____
Year of Manuf.: _____
Mileage: _____
Bar Tag ID No: _____

Description of occurrence:

_____
_____
_____
_____
_____
_____

Corrective Action:

_____
_____
_____

Insurance: Yes: ☐ No: ☐
Technical Inspection Completed: Yes: ☐ No: ☐
Estimate to repair (provided by Parsons):
_____
Purchase price: _____

_____

_____

Signature and Title of Person Preparing Report

Magazine Data Card

Nomenclature _____ **Lot #** _____

Date	Quantity Out	Quantity In	Action	User	Balance

UXO Supervisor _____ **Date** _____

MEC Disposal Checklist

Be sure to equalize electrical potential "Ground" wherever appropriate.

_____ A. Approval of disposal plan from Senior UXO Supervisor and USACE OE SS.

_____ B. Site is secure. Appropriate EZ per work plan.

_____ C. Ensure the blasting machine is in control of the downrange team.

_____ D. Test the firing cable for continuity and short the wires or clips.

_____ E. Barricade the electric blasting caps (EBC).

_____ F. Remove the shunt on an EBC.

_____ G. Facing away from the barricade, test the continuity of the EBC with a galvanometer.

_____ H. Replace the shunt or short the EBC.

_____ I. Repeat steps F, G, and H for the second EBC.

_____ J. Recheck the firing cable to ensure the cable is shorted.

_____ K. Make a parallel circuit and connect the leg wires of the EBCs to the firing cable.

_____ L. Connect the EBCs to the main charge. Return to the firing point.

_____ M. Using binoculars, ensure the area is clear and blow the air or vehicle horn three times.

_____ N. Fire the charge.

_____ O. Conduct a destruction site inspection.

CHECKED BY	**APPROVED BY**
_____	_____

General Demolition Electric Misfire Checklist

_____ A. Repeat firing attempts.

_____ B. Check circuit with galvanometer.

_____ C. Switch blasting machines, if possible.

_____ D. Repeat firing attempts.

_____ E. Check circuit with galvanometer.

_____ F. Short firing cable wires.

_____ G. Wait 60 minutes before going downrange.

_____ H. Using new EBCs, countercharge the main charge.

General Demolition Non-Electric Misfire Checklist

_____ A. Wait 60 minutes plus time fuze burn time before going downrange.

_____ B. Using new firing train, countercharge the main charge.

CHECKED BY _____	APPROVED BY _____

REPORT NUMBER:	
[ ] FYI	[ ] QC APPROVAL

NONCONFORMANCE REPORT

Attach clarifications and additional information as needed. Identify attached material in appropriate section.

PART A: TO BE COMPLETED BY PROJECT MANAGER DESIGNEE.

PROJECT:		
PROJECT MANAGER:	CQC SYSTEM MANAGER:	
DATE ISSUED:		
DEFICIENCY DESCRIPTION & LOCATION:		
PLANNED ACTIONS	ASSIGNED RESPONSIBILITY	COMPLETION DUE DATE
PROJECT MANAGER SIGNATURE:		DATE:

PART B: TO BE COMPLETED BY CQC SYSTEM MANAGER DESIGNEE.

REVIEWED BY:	DATE:
REVIEWER COMMENTS:	

PART C: CORRECTIVE ACTION VERIFICATION

DISPOSITION: (CHECK ONLY ONE & EXPLAIN WHERE NEEDED)
[ ] APPROVED FOR CLOSURE WITHOUT STIPULATIONS
[ ] APPROVED FOR CLOSURE WITH STIPULATIONS:
[ ] CLOSURE DELAYED, FURTHER ACTION REQUIRED:

CQC SYSTEM MANAGER SIGNATURE:	DATE:

OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year _____

U.S. Department of Labor
Occupational Safety and Health Administration

You must record information about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an injury and illness incident report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Form approved OMB no. 1218-0176

Establishment name _____

City _____ State _____

Identify the person				Describe the case		Classify the case											
						CHECK ONLY ONE box for each case based on the most serious outcome for that case:				Enter the number of days the injured or ill worker was:		Check the "injury" column or choose one type of illness:					
(A) Case No.	(B) Employee's Name	(C) Job Title (e.g., Welder)	(D) Date of injury or onset of illness (mo./day)	(E) Where the event occurred (e.g. Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g. Second degree burns on right forearm from acetylene torch)	Death	Days away from work	Remained at work		Away From Work (days)	On job transfer or restriction (days)	(M) Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All other illnesses
								Job transfer or restriction	Other record-able cases								
						(G)	(H)	(I)	(J)	(K)	(L)	(1)	(2)	(3)	(4)	(5)	(6)
					Page totals	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Injury (1) | Skin Disorder (2) | Respiratory Condition (3) | Poisoning (4) | Hearing Loss (5) | All other illnesses (6)

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Year _____

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	0	0
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
0	0
(K)	(L)

Injury and Illness Types

Total number of… (M)			
(1) Injury	0	(4) Poisoning	0
(2) Skin Disorder	0	(5) Hearing Loss	0
(3) Respiratory Condition	0	(6) All Other Illnesses	0

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Establishment information

Your establishment name _____

Street _____

City _____ State _____ Zip _____

Industry description (e.g., Manufacture of motor truck trailers)

_____

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)

____ ____ ____ ____

OR North American Industrial Classification (NAICS), if known (e.g., 336212)

____ ____ ____ ____ ____ ____

Employment information

Annual average number of employees _____

Total hours worked by all employees last year _____

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

_____ _____
Company executive Title

_____ _____
Phone Date

OSHA's Form 301
Injuries and Illnesses Incident Report

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related injuries and Illnesses* and the accompanying *Summary*, these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains

If you need additional copies of this form, you may photocopy and use as many as you need.

Completed by _____

Title _____

Phone _____ Date _____

Information about the employee

1) Full Name _____

2) Street _____

City _____ State _____ Zip _____

3) Date of birth _____

4) Date hired _____

5) ☐ Male
☐ Female

Information about the physician or other health care professional

6) Name of physician or other health care professional

_____

_____

7) If treatment was given away from the worksite, where was it given?

Facility _____

Street _____

City _____ State _____ Zip _____

8) Was employee treated in an emergency room?
☐ Yes
☐ No

9) Was employee hospitalized overnight as an in-patient?
☐ Yes
☐ No

Information about the case

10) Case number from the Log _____ *(Transfer the case number from the Log after you record the case.)*

11) Date of injury or illness _____

12) Time employee began work _____ AM/PM

13) Time of event _____ AM/PM ☐ Check if time cannot be determined

14) **What was the employee doing just before the incident occurred?** Describe the activity, as well as the tools, equipment or material the employee was using. Be specific. Examples: "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."

15) **What happened?** Tell us how the injury occurred. Examples: "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."

16) **What was the injury or illness?** Tell us the part of the body that was affected and how it was affected; be more specific than "hurt", "pain", or "sore." Examples: "strained back"; "chemical burn, hand"; "carpal tunnel syndrome."

17) **What object or substance directly harmed the employee?** Examples: "concrete floor"; "chlorine"; "radial arm saw." If this question does not apply to the incident, leave it blank.

18) **If the employee died, when did death occur?** Date of death

Plan Acceptance Form, Site Safety and Health Plan

I have been informed of, and will abide by the procedures set forth in, this site-specific Safety and Health Plan and its attachments for the MEC/CWM Construction Footprint Clearance activities at MSFC-003-R-01, Inactive Old Bone Yard Disposal Site #1. By signing this Safety and Health Plan Acknowledgement Form, I certify receipt of hazard communication training required for safe performance of my job at Redstone Arsenal, Madison County, Alabama.

Printed Name	Signature	Representing	Date

MSFC-003-R-01, MEC/CWM Construction Footprint Clearance
POST-EXPOSURE EVALUATION AND FOLLOWUP

The following steps must be taken, and information transmitted, in the case of an employee's exposure to bloodborne pathogens:

Name of exposed person: _____ **Date of incident:** _____

Office: _____ **Time of incident:** _____

ACTION TAKEN	**DATE**
☐ Employee furnished with documentation regarding exposure incident	_____
☐ Source individual identified	_____
_____ Source individual's name	
☐ Source individual's blood tested and results given to exposed employee	_____
☐ Consent could not be obtained	
Reason: _____	
☐ Exposed employee's blood collected and tested	_____
☐ Appointment arranged for employee with healthcare professional	_____
_____ Professional's name	
Documentation forwarded to healthcare professional	_____

- ☐ Bloodborne Pathogens Standard
- ☐ Description of exposed employee's duties
- ☐ Description of exposure incident, including routes of exposure
- ☐ Results of source individual's blood testing
- ☐ Employee's medical records

Report
prepared by:: _____

Title: _____ Date: _____

MSFC-003-R-01, MEC/CWM Construction Footprint Clearance
REPORT AND INVESTIGATION OF EXPOSURE INCIDENT

Name of exposed person: _____ **Date of incident:** _____

Office: _____ **Time of incident:** _____

Location: _____

Potentially infectious materials involved:

Type: _____ **Source:** _____

_____ _____

Circumstances (work being performed, etc.): _____

_____

_____

How incident was caused (accident, equipment malfunction, etc.): _____

_____

_____

Personal protective equipment being used: _____

_____

_____

Actions taken (decontamination, clean-up, reporting, etc.): _____

_____

_____

Recommendations for avoiding a reoccurrence: _____

_____

_____

Report prepared by: _____

Title: _____ **Date:** _____

RESPIRATOR FIT TEST LOG

Employee:_____ Date of test_____

Fit-test administrator:_____ Date of last physical_____

RESPIRATOR

Manufacturer:_____ Model:_____

Size:_____ I. D. number:_____

TEST RESULTS

Test protocol

Pressure fit check:

_____ Positive

_____ Negative

Comfort

comfortable:_____

intolerable:_____

needs prescription inserts:_____

_____

_____ fit _____ no fit

Date of next fit test:_____

Remarks:_____

_____

_____

_____

_____

_____

_____

Safety Meeting Attendance Log

Date:	**Time:**	**Contract Number: ,**
Delivery Order Number:	**Location:**	
Weather Conditions: **(Low/High Temp, Wind/Speed/Dir)** **(Severe Weather)**		
Safety Meeting Topic **(Briefly describe)**		
Attendees:		

Name	Signature	Company

Attendees:		
Name	**Signature**	**Company**

_____

Site Safety and Health Officer/UXOSO

Site Visitors Log

Site:

Phase:

Page _____ of _____ Pages

Week Ending: _____

Name (Print)	Signature	Company	Escort Required (Yes/No) & Who	Date Time In	Date Time Out	On Site Safety Brief (Date)

APPENDIX G
MINIMUM SEPARATION DISTANCE CALCULATIONS

Fragmentation Data Review Form

Database Revision Date 8/21/2014

Category:	Chemical, WP, & Incendiary Rounds
Munition:	4.2 in M2/M2A1 (Chemical)
Case Material:	Steel, Mild
Fragmentation Method:	Naturally Fragmenting
Secondary Database Category:	Chemical Round
Munition Case Classification:	Extremely Heavy Case

DODIC:	C703
Date Record Created:	3/3/2009
Record Created By:	SDH
Last Date Record Updated:	4/15/2014
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	Tetryl
Explosive Weight (lb):	0.143
Diameter (in):	4.2000
Cylindrical Case Weight (lb):	11.24183
Maximum Fragment Weight (Intentional) (lb):	0.0782
Design Fragment Weight (95%) (Unintentional) (lb):	0.0096
Critical Fragment Velocity (fps):	805

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1.07
TNT Equivalent Weight - Impulse (lbs):	0.153
Kinetic Energy 10^6 (lb-ft²/s²):	0.0254

Single Sandbag Mitigation

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

Double Sandbag Mitigation

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

Water Mitigation

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

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

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	129
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	1000
MFD-V [Maximum Fragment Distance, Vertical] (ft):	757

Overpressure Distances

TNT Equivalent (Pressure):	1.07
TNT Equivalent Weight - Pressure (lbs):	0.153
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	10
Public Traffic Route Distance (2.3 psi); K24 Distance:	13
Inhabited Building Distance (1.2 psi), K40 Distance:	21
Intentional MSD (0.0655 psi), K328 Distance:	175

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

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	2.27	1.08
Mild Steel:	0.19	0.08
Hard Steel:	0.15	0.07
Aluminum:	0.38	0.17
LEXAN:	2.57	1.54
Plexi-glass:	1.44	0.73
Bullet Resist Glass:	1.15	0.54

Item Notes

This item is based on the 4.2 in M2 with Mustard fill of approximately 6 lbs. Heavier weights of fill should reduce the fragmentation distance. Fill weights less than 6 lbs would require a new analysis.

APPENDIX H
CONTRACTOR PERSONNEL QUALIFICATIONS

Not Used

APPENDIX I
TECHNICAL PROJECT PLANNING

Not Used

APPENDIX J
SUPPORT PLANS

CARA – Air Monitoring Plan

AIR MONITORING PLAN

FOR

NERVE, BLISTER AND INDUSTRIAL CHEMICALS

AT

REDSTONE ARSENAL, HUNTSVILLE, AL

AND

GEORGE C. MARSHALL SPACE FLIGHT CENTER

PREPARED FOR

U.S. Army Corps of Engineers
Huntsville Center
Ordnance & Explosives Directorate
Chemical Warfare Materiel Design Center
Huntsville, AL

PREPARED BY

U.S. Army 20th CBRNE Command
CBRNE Analytical and Remediation Activity (CARA)
2433 Dirk Road
Aberdeen Proving Ground, MD 21010

TABLE OF REVISIONS

REV #	DESCRIPTION OF CHANGE *(INCLUDE SPECIFIC SECTION)*

REVIEW AND APPROVALS

Approved By: Director, CARA	Approved By: Lab Manager, CARA MEL
Reviewed By:: Chief, CARA RRW	Reviewed By: Supervisor, CARA MEL
Reviewed By: Supervisor, CARA RRW	Reviewed By: Supervisor, CARA RRW
Reviewed By: Safety, CARA	Reviewed By: Quality Manager, CARA MEL
Reviewed By: Site Manager, REDSTONE ENVIRONMENTAL MANAGEMENT DIVISION	Approved By: Program Manager, U.S. ARMY ENGINEERING AND SUPPORT CENTER-HUNTSVILLE

TABLE OF CONTENTS

1. SCOPE AND PURPOSE

This document presents an air monitoring plan for the U.S. Army Engineering and Support Center – Huntsville (USAESCH) remediation efforts at Redstone Arsenal (RSA) and George C. Marshall Space Flight Center (MSFC), Huntsville, AL. The purpose of this plan is to illustrate the strategy used by CARA to monitor the airborne concentration of chemical warfare material (CWM) during remediation operations at RSA and MSFC. Specific sites covered by this plan can be found in the most recent version of the CARA scope of work for the RSA and MSFC. Site specific air monitoring plans will be included in the site specific work plan. An exemplar site specific plan is included in Appendix A of this document.

This plan establishes the policies, objectives, procedures, and responsibilities for the execution of a monitoring program at the job site. The rationale for monitoring strategies for perimeter and general area air monitoring and choice of monitoring equipment is described in the sections below. This monitoring plan applies to all facilities and operations within the job site involving air sampling and screening of soils containing suspected CWM.

The objectives of this plan are:

- To describe the monitoring concepts used for each recovered chemical warfare material (RCWM) operation performed at the job site.
- To assure that workers and public safety and health are maintained by providing adequate environmental monitoring as specified in the latest revision of DA PAM 386-61.

2. RESPONSIBILITIES

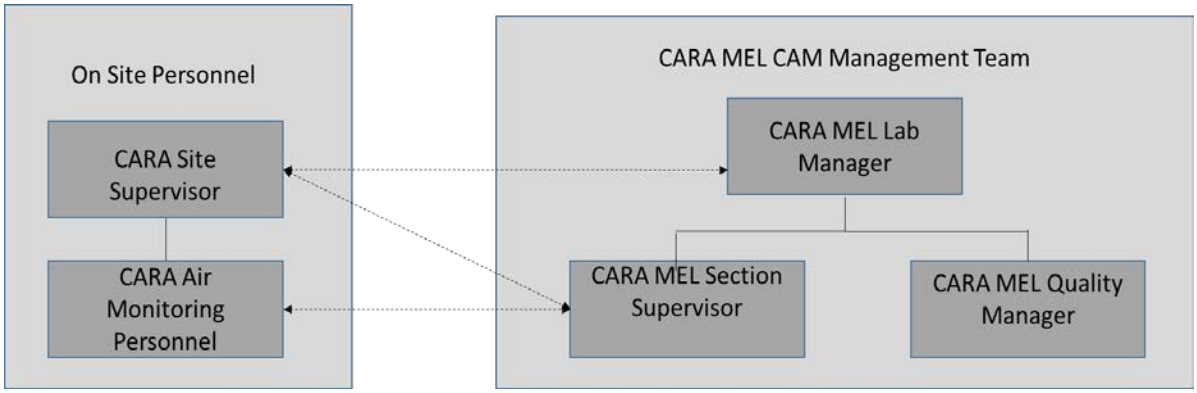
CARA will:

- Collect and retain all CWM-related air monitoring data generated during this project.
- Ensure communication to the USAESCH of all positive detections and provide a complete report at the conclusion of the project.
- Provide guidance on monitoring operations conducted on-site.
- Conduct on-site analysis and confirmation for air samples and headspace collected from soil, scrap, PPE and bulk item samples.
- Provide equipment and trained personnel to operate the MultiRAE®.
- Provide equipment and trained and certified personnel to operate MINICAMS and DAAMS GC and maintain certification data as part of the CARA MEL CAM 40-year database.
- Provide trained and certified personnel to collect monitoring samples for work space and historical monitoring stations.

- Perform air-monitoring procedures as outlined in the USAESCH Scope of Work, and consistent with CARA Mobile Expeditionary Lab Chemical Air Monitoring (CARA MEL CAM) Quality Management System (QMS).

3. CHAIN OF COMMAND

While onsite and during operations all CARA personnel shall look to the CARA Site Supervisor, or designee, for final decisions and tasks related to the project. The CARA Site Supervisor shall communicate applicable information to the USAESCH. CARA personnel shall communicate to the Site Supervisor and the CARA MEL CAM Management Team any technical or administrative issues that may affect compliance with the CARA MEL CAM QMS. Reporting of air monitoring activities will be provided to the CARA MEL CAM Management Team on a regular basis. All air monitoring decisions shall be vetted through the CARA MEL CAM QMS and have Lab Manager approval prior to implementation. The organizational chart below is a visual representation of the chain of command.



4. MONITORING

The intent of air monitoring is to indicate to workers when a hazardous atmosphere is present and to maintain a record of worker exposure to airborne chemical agent, thus ensuring the safety of the operators, the environment, and the surrounding communities. The choice of monitoring equipment is based on the type of monitoring to be performed and the types of agent involved. The location of monitors or sample ports is based on the operation, the airflow in the area, and the location of the source of agents.

4.1. Airborne Exposure Limits (AELs).

An airborne exposure limit is a general term that describes the maximum allowable air concentrations for occupational and general population exposure to chemical warfare material. Airborne exposure limits (AELs) for chemical warfare agents are contained in the most recent version of DA PAM 385-61. The U.S. Army has published revised

AELs in the Implementation Guidance Policy for Revised Airborne Exposure Limits for GB, GA, GF, VX, H, HD, and HT. The U.S. Army Chemical Materials Agency has published AELs for Lewisite and some industrial compounds in the Chemical Materials Agency Monitoring Concept Plan.

Airborne exposure limits (AELs) are the allowable concentrations in the air for workplace and general population exposures. AELs to be monitored at for this project include the worker population limit (WPL), short term exposure limit (STEL), vapor screening level (VSL), and permissible exposure limit (PEL). Definitions of these AELs are provided in Section 10 Glossary.

AELs are treated as time-weighted averages based upon concentration and actual time spent in a possible chemical/agent exposure situation. The averaging times can be adjusted to reflect actual work shift durations, as illustrated in the following example. The 8-hour WPL for H is 0.0004 mg/m3. If the work shift was extended to a 12-hour period, the 0.0004 mg H value would stay constant for the extended duration. Meaning that an employee cannot be exposed to a greater amount of agent just because the work shift is longer. The revised WPL for the extended period will actually be a lower value than the 8-hour WPL. The corresponding WPL for the 12-hour period would be calculated by:

$$12\ Hour\ WPL\ for\ H = (8\ Hour\ WPL) \times \left(\frac{8\ hours}{12\ hours}\right)$$

$$12\ Hour\ WPL\ for\ H = (0.0004\ mg/m^3) \times \left(\frac{8\ hours}{12\ hours}\right) = 0.00027\ mg/m^3$$

Given this example, the adjusted WPL for a 12-hour work shift would be 0.00027 mg/m^3 compared to the 0.0004 mg/m^3 for an 8 hour shift.

4.2. MINICAMS Alarm: A single event when the MINICAMS result exceeds the alarm set point. The Command Post is notified by the MINICAMS operator. The operator reports the MINICAMS reading in the hazard level units used at the station location (WPL, STEL/VSL).

4.3. MINICAMS Ring off: Three consecutive alarms from MINICAMS is considered a positive detection for industrial chemicals or two consecutive alarms for chemicals agents. Confirmation monitoring is required for all chemical agent ring offs and can be performed using either a co-located MINICAMS or DAAMS.

4.4. Unconfirmed positive response: A response detected by a low level detection device that corresponds to an expected chemical agent gate (MINICAMS) or retention time and mass fragmentation pattern (DAAMS). [The mass fragmentation requirement only applies to DAAMS samples analyzed using a mass selective detector (MSD)] An unconfirmed positive response triggers confirmation analysis.

4.5. Confirmed positive response: A response detected by both a primary and secondary (confirmation) low level detection devices that corresponds to an expected agent gate (MINICAMS) or retention time and mass fragmentation pattern (DAAMS-MSD). A confirmed positive response may also be referred to as a confirmed detection.

5. CHEMICAL AIR MONITORING OBJECTIVES AND OPERATIONS

The types of air monitoring operations that CARA has agreed to are detailed in the sections below. CARA shall conduct monitoring using MINICAMS, DAAMS and MultiRAE for low level monitoring.

5.1. WORKSPACE MONITORING

Conducted in the excavation pit, or similar area, to ensure worker safety and protection during intrusive operations. Real Time and/or Near Real Time (NRT) monitors will be used for this operation. . Monitoring devices or sample lines are placed in strategic locations in the work area where there is a potential for encountering agent vapors. The sample locations are determined based on such factors as the agent involved, the airflow patterns in the area, the operations(s) being performed, and the location of the source of potential release.

5.2. HEADSPACE CLEARANCE MONITORING

Conducted to clear items (packaging, soil, personal protective equipment (PPE), bulk items, sediment, etc) for contamination to a specific AEL dependent upon future disposition of the item. DA PAM 385-61 will be used to determine what AEL is appropriate for specific items and dispositions. Headspace operations will be conducted in accordance with CARA MEL CAM IOP-038 (Headspace Monitoring).

5.3. DAAMS HISTORICAL

Excavation pit, or similar area, historical monitoring at the WPL to ensure that chemical workers in the immediate area of the intrusive site have not been exposed. Sampling station locations within the site border will be determined by the Site Supervisor.

5.4. FIRST ENTRY MONITORING

First entry monitoring at an enclosed temporary facility storage facility (e.g. Interim Holding Facility (IHF)) to determine if the chemical of interest is at or above the specific AEL determined for safe entry dependent upon the PPE used. First entry monitoring is not required until RCWM are placed into the IHF.

5.5. PERSONNEL QUADRANT MONITORING

Personnel quadrant monitoring at the personnel decontamination station (PDS) and/or medical tent to assess personnel decontamination status. Quadrant monitoring will be performed on all potentially exposed personnel that are processed through the PDS. Quadrant monitoring will be conducted IAW Chapter 3.14.L of CARA SOP-011, *Personnel Decontamination Station.*

5.6. CONFIRMATION MONITORING

Validation of the presence of a chemical at or above the positive response level by a different method (e.g. different detector or different column). Industrial MINICAMS and MultiRAE have special confirmation conditions listed in Table 3 that differ from this definition.

6. AGENTS/CHEMICALS OF CONCERN

The nerve agent of concern for this project is Tabun (GA). The blister agents of concern for this project include mustard (H); distilled mustard (HD); mustard-T mixture (HT); Lewisite (L); HL (mixture of H and L); HQ (mixture of H with sesqui mustard (Q)); and nitrogen mustard-3 (HN3). Going forward, H represents H, HD, HT, and HQ. The HL will be monitored as L (DA PAM 385-61, Table 2-1). The industrial chemicals of concern for this project include phosgene (CG), diphosgene (DP), adamsite (DM), chloropicrin (PS), cyanogen chloride (CK), chloroacetophenone (CN), hydrogen cyanide (AC), o-chlorobenzylidene, and chloroform ($CHCl_3$). Additional information about the agents/chemicals of concern and their airborne exposure limits are detailed in Table 1. CARA will provide the chemical agent standard sand industrial chemical standards required to perform MINICAMS monitoring operations; only chloroform and AC will be provided for MultiRAE monitoring operations.

Table 1. Chemical Agents of Concern at RSA and MSFC.

Agent	Symbol	Chemical Name[Error! Reference source not found.]	CAS Number[Error! Reference source not found.]	Airborne Exposure Limit		
				WPL[Error! Reference source not found.] (mg/m^3)	STEL/VSL[Error! Reference source not found.] (mg/m^3)	OSHA PEL[g] (ppm, mg/m^3)
Tabun	GA	Dimethylphosphoramido-cyanidate	77-81-6	0.00003	0.0001	N/A
Levinstein Mustard	H	Bis(2-chloroethyl) Sulfide, Impure	505-60-2	0.0004	0.003	N/A
Distilled Mustard	HD	Bis(2-chloroethyl) Sulfide	505-60-2	0.0004	0.003	N/A
Mustard T Mixture	HT	HT: *see HD* T: Bis {2(2-chloroethyl-thio)ethyl} Ether	HT: *see HD* T: 63918-89-8	HT is measured as HD[d].		
Lewisite	L	Dichloro(2-chlorovinyl) Arsine	541-25-3	0.003	0.003	N/A
Mustard Lewisite Mixture	HL	H: *see H* L: *see L*	H: *see H* L: *see L*	HL is measured as L [d].		
Mustard Sesqui Mustard Mixture	HQ	H: *see H* Q: 1,2-Bis(2-chloroethyl-thio)ethane	H: *see H* Q: 3563-36-8	HQ will be measured as H[e].		
Nitrogen Mustard 3	HN3	2,2',2"-Trichlorotriethyl-Amine	555-77-1	0.003[c]	0.003[c]	N/A
Chloropicrin	PS	Trichloronitromethane	76-06-2	N/A	N/A	0.7 mg/m^3 0.1 ppm
Cyanogen Chloride	CK	Cyanogen Chloride	506-77-4	N/A	N/A	0.6 mg/m^3 0.3 ppm
Phosgene	CG	Carbonyl Chloride	75-44-5	N/A	N/A	0.4 mg/m^3 0.1 ppm
Chloroform	$CHCl_3$	Chloroform	67-66-3	N/A	N/A	240 mg/m^3 50 ppm
Hydrogen Cyanide	AC	Hydrogen Cyanide	74-90-8	N/A	N/A	11 mg/m^3 10 ppm
Adamsite[h]	DM	10-Chloro-5,10-Dihydrophenarsazine	578-94-9	No air monitoring required if appropriate engineering/process controls are used to minimize exposure[f].		
Diphosgene	DP	Trichloromethyl Chloroformate	503-38-8	DP will be measured as CG[f].		
Chloroacetophenone	CN	2-Chloroacetophenone	532-27-4	CN will be indirectly monitored for by monitoring for PS and $CHCl_3$ [e].		

a. From FM 3-11.9.
b. From DA PAM 385-61, Table 2-1.
c. From LMQAP, Table 7-1.
d. Per DA PAM 385-61.
e. Per the RSA Project Team via USAESCH Scope of Work (SOW).
f. Per the CMA MCP.
g. OSHA's recommended PEL in mg/m^3 TWA and parts per million (ppm).
h. Adamsite Department of Energy TEEL value is 0.016 mg/m^3. (http://www.atlintl.com/DOE/teels/teel/search.html)

7. HAZARD ANALYSIS ASSESSMENT

The hazard analysis for each site can be found in the site specific work plans. During operations, the work plans are located at the Command Post (CP).

8. INSTRUMENTATION AND MONITORING STRATEGY

CARA will provide the following instrumentation and monitoring strategy.

8.1. HANDHELD DETECTOR MONITORING

Handheld detection systems are those detection devices or systems that can provide an immediate response industrial chemical concentrations.

8.1.1. MultiRAE

MultiRAE detectors will provide warning of airborne exposure hazards at the work site. All positive indications will be immediately reported. The MultiRAE is a real time monitor and will be used for workspace monitoring for the industrial chemicals, chloroform and AC, indicated in Table 1. One MultiRAE handheld detector can support a photoionization detector (PID) and two E-Chem sensors at the same time, thus allowing for the simultaneous monitoring of up to three chemicals, oxygen deficiency and lower explosive limit.

Workspace monitoring for AC and chloroform will be performed using a MultiRAE that is co-located with the MINICAMS HSL during operations in a downwind position to the excavation pit to monitor real time.

8.2. LOW LEVEL MONITORING

Low-level monitoring systems are those detection devices or systems that can provide detection capability for concentrations at or below the established exposure limit for Chemical Warfare Material. Examples of low level detection systems are MINICAMS, DAAMS. A low-level alarm is integrated into the MINICAMS which produces an audible sound and flashing light when the appropriate concentration is detected

8.2.1. MINICAMS

MINICAMS are used to immediately warn of hazardous conditions and will be operated IAW IOP-010 (MINICAMS Operation) and the relevant analytical method.

8.2.1.1. MINICAMS MONITORING OPERATIONS

MINICAMS will be used for workspace, personnel quadrant, first entry, for GA, H, HN3, L, CK, CG, and PS from Table 1. Monitoring will be conducted at the STEL/VSL for GA,

H, HN3 and L and the permissible exposure limit (PEL) for CG, PS, and CK. Headspace monitoring will be conducted for GA, H, HN3 and L. MINICAMS may be used for confirmation in place of DAAMS at the discretion of the Lab Manager and Site Supervisor.

If either primary or confirmatory NRT monitors fail mid-day or end-of day challenges, operations shall cease until the NRT monitors can be shown to be operational and in control by passing a QC challenge. If DAAMS confirmation pumps are placed at the dig site, they may be used in lieu of the confirmation MINICAMS and operations may continue. In the event of these occurrences, all of the actions will be documented in the daily paperwork.

MINICAMS are set to alarm at 0.7 times the STEL/VSL hazard level for H, HN3 and GA; and 0.4 times the STEL/VSL for L. If an instrument is used to measure H, HN3 and L concurrently the alarm will be set for 0.4 times the STEL/VSL. In the event of a 0.4 times STEL/VSL detection for H or HN3 the operator will notify the site supervisor of the alarm but will continue to monitor until the instrument reads 0.7 times the STEL/VSL.

The MINICAMS used to monitor for CG, PS, and CK are set to alarm at 0.7 times the PEL values. Three consecutive MINICAMS alarms for industrial chemicals are considered a confirmed result. If DAAMS is being used as the confirmation the DAAMS pumps shall be started at the second alarm.

8.2.2. DAAMS GC

DAAMS samples will not be used to immediately warn of hazardous conditions, but they will be used to document conditions over time. DAAMS samples will be collected and analyzed IAW IOP-011 (DAAMS Sample Collection), IOP-016 (DAAMS GC) and the relevant analytical method.

8.2.2.1. DAAMS GC OPERATIONS

DAAMS will be used for monitoring in accordance with Section 3 for the agents identified in Table 1. A sample is collected on a DAAMS tube containing Tenax TA or other approved sorbents via a vacuum pump. The sample is desorbed from the DAAMS tube by a thermal desorption unit and transferred to a gas chromatograph. The GC analysis priority is; 1) confirmation samples; 2) confirmation QP samples 3) historical samples; and 4) historical QP samples.

DAAMS historical monitoring will be performed at the WPL using DAAMS GC. At a minimum, one DAAMS tube per DAAMS historical sampling station located in/around the intrusive site and the associated QPs will be analyzed daily. In the event that one of the DAAMS historical tubes yields an unconfirmed positive response, then the associated backup/confirmation tube will be analyzed.

The tubes will be set prior to the beginning of intrusive operations and changed at intervals no longer than the longest time interval used for field certification. In the event that CARA is directed to collect and analyze DAAMS tubes prior to the completion of the sampling cycle, the operator will note the effect of the premature sample collection on the validity of the sample result based on the percentage of sample that was collected compared to the sample quantity that should have been collected.

If NRT monitors fail mid-day or end-of day challenges DAAMS historical samples are not to replace MINICAMS operations. Operations shall cease until the NRT monitors can be shown to be operational and in control by passing a QC challenge. In the event of these occurrences, all of the actions will be documented in the daily paperwork along with the situation report.

8.2.3. CONFIRMATION MONITORING

Confirmation samples will be analyzed using the process and instrumentation described in Table 2, which identifies what confirmation method will be used for each agent at each monitoring location.

For a MINICAMS that is alarming for any nerve or blister agent, either DAAMS tubes or a co-located MINICAMS equipped with a different analytical column will be used for confirmation analysis. For the industrial chemicals, three consecutive MINICAMS alarms will be considered a confirmed result. For MultiRAE a continuous alarm lasting longer than approximately twenty seconds is considered a confirmed result.

Table 2. Confirmation Monitoring Requirements.

Location	Alarming Instrument (Primary)	Agent	Monitoring AEL	Alarm Setpoint	Confirmation Technique
Workspace	MINICAMS	H, L, HN3	STEL/VSL	0.7 STEL/VSL for H, HN3[1] 0.4 STEL/VSL for L	DAAMS or MINICAMS
		GA	STEL/VSL	0.7 STEL/VSL for GA	
		CG, PS, CK	PEL	0.7 PEL	Three consecutive instrument alarms
	MultiRAE	AC $CHCl_3$	PEL	0.5 PEL	Instrument alarm lasting longer than 20 seconds
Personnel Quadrant,	MINICAMS	H, L, HN3	STEL/VSL	0.7 STEL/VSL for H, HN3[1] 0.4 STEL/VSL for L	Repeat Decon and Remonitor
		GA	STEL/VSL	0.7 STEL/VSL for H, HN3 and GA	
Headspace	MINICAMS	H, L, HN3	STEL/VSL	0.7 STEL/VSL for H, HN3[1] 0.4 STEL/VSL for L	Decon and Remonitor
		GA	STEL/VSL	0.7 STEL/VSL for GA	
First Entry	MINICAMS	H, L, HN3	STEL/VSL	0.7 STEL/VSL for H, HN3[1] 0.4 STEL/VSL for L	DAAMS or MINICAMS
		GA	STEL/VSL	0.7 STEL/VSL for GA	
DAAMS Historical	DAAMS	H, L, HN3, GA	WPL	No audible alarm, notification made if result greater than agent(s) setpoint(s)	Alternate DAAMS GC method with a different column or detector.

[1] When L is a target of interest the alarm level of the MINICAMS will be set for 0.4Z on all relevant MINICAMS.

8.3. ALARM NOTIFICATION

Operators of air monitoring equipment shall notify the CARA Command Post of all positive detections using either gross or low level monitoring instrumentation. The CARA Command post shall then notify the onsite safety representative for the USAESCH of the detection and include the following information:

- Instrument type

- Target detected
- Level detected
- Level of confirmation (unconfirmed or confirmed)

9. QUALITY ASSURANCE AND CONTROL

Quality assurance and controls ensures the integrity of air monitoring activities and resulting data. The CARA MEL CAM will conduct operations in accordance with their QMS. CARA MEL CAM has IOPs regarding the personnel, instrumentation, and method certifications, quality control analysis, data reporting and review, and corrective actions. Onsite quality assurance staff shall ensure that compliance with the CARA MEL CAM quality system. All instruments shall be in control before leaving the site for the evening so that operations can begin on time in the morning.

9.1. ON-SITE METHOD CERTIFICATION

Before operations begin, the CARA MEL CAM will set up and complete site specific precision and accuracy (P&A) studies for each method they employ to conduct their operations. All certifications shall be conducted in accordance with CARA MEL CAM IOP-012 (Certification). The original and site-specific method certification data will be available to USAESCH in accordance with CARA MEL CAM IOP-018 (Data Reporting and Review).

9.2. QUALITY CONTROL SAMPLING

Two types of quality control samples will be collected during air monitoring operations. Positive detections are not confirmed until the instrumentation used to conduct confirmation monitoring has passed all of the quality control sampling.

9.2.1. Quality Lab Sample (QL)

A Quality Laboratory sample is a quality control sample used for DAAMS methods that has been spiked with a solution of an analyzed dilute chemical agent but which has not has not been aspirated at a sampling site.

9.2.2. Quality Plant Sample (QP)

A Quality Plant sample is a quality control sample used for both DAAMS and MINICAMS that has been spiked with a solution of an analyzed dilute chemical agent and exposed to the sampling environment.

9.2.3. MINCAMS Quality Sampling

MINICAMS instruments shall be challenged with QP samples in accordance the appropriate quality control sampling schedule as specified by the certification type.

9.2.4. DAAMS Quality Sampling

DAAMS GC shall be challenged with QL and QP samples in accordance with the appropriate quality control sampling schedule as specified by the certification type. Note that a QP sample must be collected for each type of sample analysis conducted. (i.e. DAAMS Historical, Confirmation) therefore multiple QP samples may exist.

9.3. DATA REVIEW

MINICAMS and DAAMS data will undergo review in accordance with IOP-018 (Data Review and Reporting). Data packages requested by the customer may be released in accordance with IOP-018 (Data Review and Reporting).

9.4. REPORTING

A daily report, during intrusive operations, will be written and submitted electronically by the CARA Site Supervisor. The report shall include all CARA personnel on site (i.e. names and position), location of work area, work executed, sample/location identification with monitoring results, monitoring analysis, and detection limits; and problems encountered and corrections, as applicable.

10. GLOSSARY

10.1.1. Worker Population Limit (WPL).

The WPL is the maximum allowable 8 hour time-weighted average concentration that an unmasked worker could be exposed to for an 8 hour work day, 40 hours per week, for 30 years without adverse effect. There is no health significance from a single or short-term exposure of this concentration. Low level monitoring using either near real time monitor or an historical monitor is conducted if workers are unmasked.

10.1.2. Short Term Exposure Limit (STEL).

The STEL is the maximum concentration to which unprotected chemical workers may be exposed for up to 15 minutes. Near real time monitoring is conducted at the STEL in areas where CWM may be present.

10.1.3. Depot Area Monitoring System (DAAMS).

The DAAMS is a portable air-sampling unit, which is designed to draw a controlled volume of air through a glass tube filled with solid sorbent collection materials (for example Tenax TA). As the air is passed through the solid sorbent tube, agent is collected on the sorbent bed. After sampling for the predetermined period of time and at a predetermined flow rate, the tube is removed from the sample pump. The tube is transferred to the mobile platform where it is analyzed. DAAMS monitoring is performed for one of two purposes – confirmation and historical monitoring. The purpose of DAAMS confirmation samples is to validate or invalidate a positive measurement from a near real time (MINICAMS) monitoring system. The purpose of historical DAAMS samples is to verify the absence of low level CWM in and around the site.

10.1.4. Miniature Continuous Air Monitoring Systems (MINICAMS®)

A MINICAMS is an automatic air monitoring system that collects compounds on a solid sorbent trap, thermally desorbs them into a capillary gas chromatography column for separation and detects the compounds with a Halogen Specific Detector (XSD) or Flame Photometric Detector (FPD). It is a lightweight, transportable, near real time (NRT) low-level monitor designed to respond in less than 15 minutes. The MINICAMS is designed to provide a visual and audible alarm if agent vapors exceed the alarm set point. MINICAMS can be configured to detect industrial compounds including phosgene, chloropicrin, and cyanogen chloride. Units for detecting industrial chemicals are configured with a sample loop and XSD detector. The useful length of HSLs will not be exceeded during this project, approximately 150 feet.

10.1.5. Mobile Platform

CARA has several mobile platforms available and will use the platform that best suits the environment and terrain. Currently, CARA has air monitoring vans, Real Time Analytical Platforms (RTAP), enclosed trailers, and Gators that may be used.

10.1.6. Internal Operating Procedures (IOP)

Approved air monitoring and analysis procedures under the CARA MEL CAM QMS. All personnel have access to current versions of the IOPs at the job site.

11. REFERENCES

References will be cited according to the abbreviation listed in parenthesis at the end of the description.

Army Material Command Chemical Materials Agency, Risk Management Directorate (AMSCM-RD), Memorandum for all CMA Commanders and Project Managers, dated 11/16/05, subject "*Request Amendment to or Clarification of Existing CMA Programmatic Guidance for Short Term Monitoring and Reporting."* (AMSCM-RD 11/16/05)

AMSCM-RD, Memorandum for Project Manager for Chemical Stockpile Elimination, Project Manager for Non-Stockpile Chemical Materiel, CMA Commanders, CMA Site Project Managers, CMA Safety, CMA Surety, CMA Site Advocates, CMA Monitoring Office, and Site Safety Offices, subject "*Performance Standard for Monitoring Potentially Exposed Workers.*" (AMSCM-RD 07/09/13)

CBRNE Analytical & Remediation Activity Chemical Agent Standard Analytical Reference Material Quality Assurance Plan for Chemical Agent Air Monitoring. Rev 6. June 2011. (20thCQAPCAAM)

Chemical Agent Standard Analytical Reference Material Quality Assurance Plan for Chemical Agent Air Monitoring. Rev 6. 2010. Research Development and Engineering Command, Directorate of Program Integration. CASARM Quality Assurance Team. Aberdeen Proving Ground, MD 21010. (CQAPCAAM)

Department of Army Pamphlet 385-61, Toxic Chemical Agent Safety Standards, 13 November 2012. (DA PAM 385-61)

U.S. Army Chemical Materials Agency, Programmatic Laboratory and Monitoring Quality Assurance Plan, Final, Change 1. 2008. (LMQAP)

U.S. Army Chemical Materials Agency. Programmatic Monitoring Concept Plan, June 2004; with Army Material Command chemical Materials Agency, Risk Management directorate (AMSCM-RD), Memorandum for all CMA Commanders and Project Managers, dated 11/16.2005, subject "*Request Amendment to or Clarification of Existing CMA Programmatic Guidance for Short Term Monitoring and Reporting*; with Change Pages date issued 3/7/06 . (CMA MCP)

U.S. Army Field Manual (FM) 3-11.9, Potential Military Chemical/Biological Agents and Compounds. (FM 3-11.9)

APPENDIX A

AIR MONITORING REQUIREMENTS SPECIFIC TO XXX, [SITE NAME]

Air monitoring will be conducted by CARA in accordance with the Air Monitoring Plan for Nerve, Blister and Industrial Chemicals at Redstone Arsenal, Huntsville, AL and George C. Marshall Space Flight Center (AMP). The monitoring equipment used for this site are MultiRAE, MINICAMS, and DAAMS GC. The location of monitors or sample ports is based on the operation, the airflow in the area, and the location of the source of agents. The general layout for the air monitoring is provided in Figure 1 on the following page. Targets of interest at this site include all of the targets listed in the AMP Section 6.

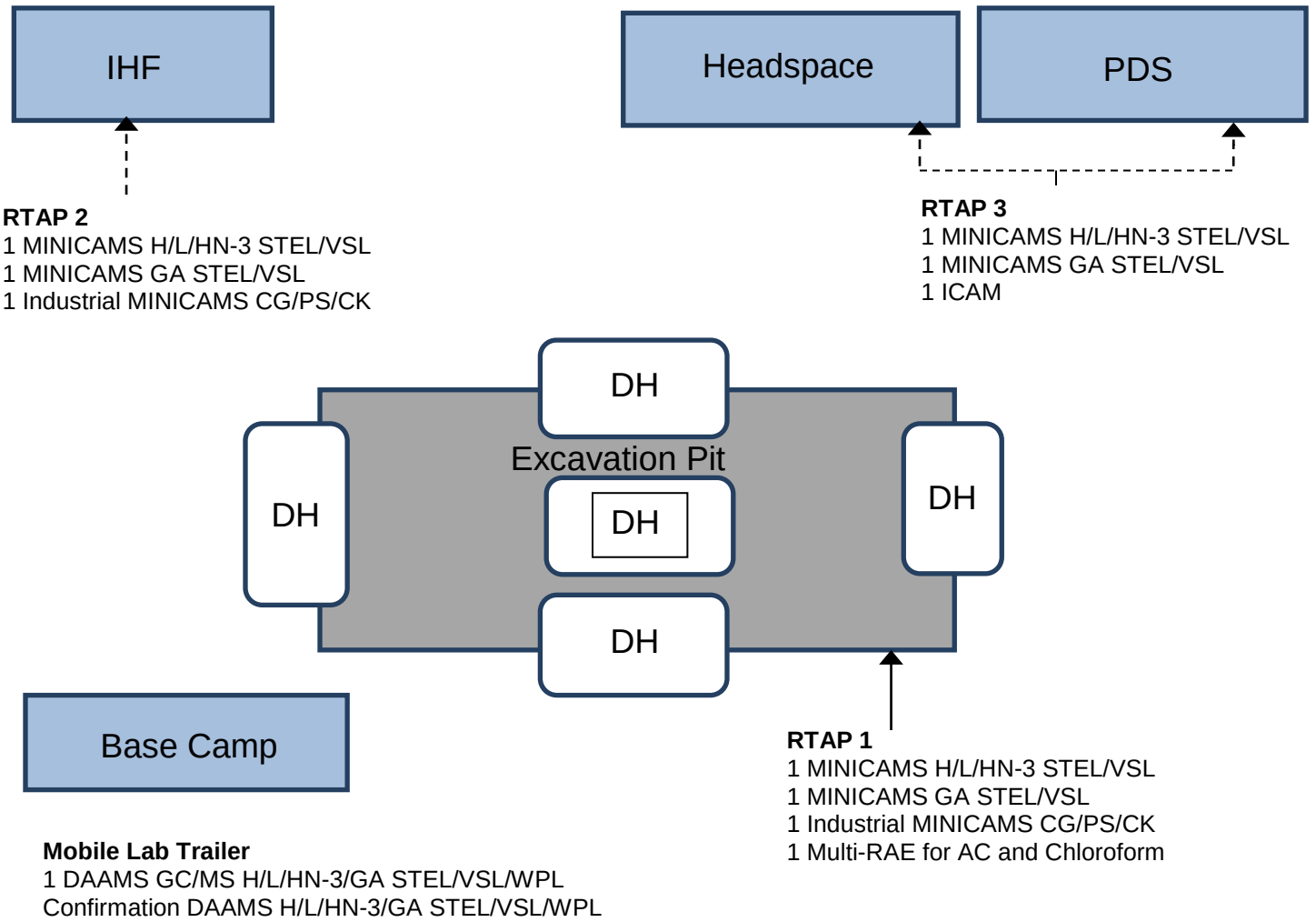
CARA will conduct air monitoring using the MINICAMS, DAAMS, and MulitRAE, to accomplish monitoring objectives set forth in the AMP Section 5.

MINICAMS will be used for workspace, headspace, personnel quadrant, first entry for the targets identified in AMP Tables 1. The useful length of heated sample lines (150 feet) will not be exceeded during this project.

DAAMS will be used for DAAMS historical, headspace, and confirmation monitoring for the agents identified in AMP Table 2.

MultiRAE will be used for personnel monitoring for the industrial chemicals listed in AMP Table 1.

Figure 1. General Monitoring Configuration for Intrusive Operations*



Key:
PDS – Emergency Personnel Decontamination Station

IHF – Interim Holding Facility

- - → Monitoring at these locations is secondary and not concurrent. The RTAP and/or heated sample lines will be moved and placed as appropriate at each location. PDS personnel monitoring and headspace monitoring for RTAP 3; and IHF monitoring for RTAP 2.

⟶ Heated sample lines routed for primary monitoring which is workspace monitoring for RTAP 1.

DH – DAAMS Historical

This monitoring layout is a general configuration for intrusive operations. Actual locations of all pumps will be dependent on site operations.

APPENDIX K
CHEMICAL SAFETY SUBMISSION

Not considered FINAL until signed by DDESB.

CHEMICAL SAFETY SUBMISSION FOR CHEMICAL WARFARE MATERIEL/MUNITIONS AND EXPLOSIVES OF CONCERN CONSTRUCTION FOOTPRINT CLEARANCE

U.S. ARMY GARRISON-REDSTONE SITE
MSFC-003-R-01, INACTIVE OLD BONE YARD DISPOSAL SITE #1

REDSTONE ARSENAL, MADISON COUNTY, ALABAMA

Prepared for:

U.S. Army Garrison – Redstone

Prepared by:

U.S. Army Engineering and Support Center, Huntsville

July 2015

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

Page

TABLE OF CONTENTS (continued)

Page

TABLE OF CONTENTS (continued)

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

LIST OF ACRONYMS

^{o}F	degrees Fahrenheit
AC	hydrogen cyanide
AEC	U.S. Army Environmental Command
AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
AR	Army Regulation
BEM	Buried Explosion Module
BIP	blown-in-place
CA	chemical agent
CARA	CBRNE Analytical and Remediation Activity
CASHPAC	Chemical Agent Safety and Health Policy Action
CBRN	chemical, biological, radiological, nuclear
CBRNE	Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives
CFR	Code of Federal Regulations
CG	phosgene
CK	cyanogen chloride
CMA	Chemical Materials Activity
CN	chloroacetophenone
CPU	chemical protective undergarment
CRZ	contamination reduction zone
CS	chlorobenzlidenemalonitrile
CSS	Chemical Safety Submission
CWM	chemical warfare materiel
DA	Department of the Army
DAAMS	depot area air monitoring system
DA PAM	Department of the Army Pamphlet
DDESB	Department of Defense Explosives Safety Board
DM	adamsite
DoD	U.S. Department of Defense
DMM	discarded military munitions
DoDI	Department of Defense Instruction
DOT	Department of Transportation
DP	diphosgene
DPW	Department of Public Works
ECM	earth covered magazine
EDS	Explosive Destruction System
EM	Engineering Manual
EOD	Explosive Ordnance Disposal
EP	Engineering Pamphlet
EPDS	emergency personnel decontamination station
ESS	Explosives Safety Submission
EZ	exclusion zone

LIST OF ACRONYMS (continued)

ft	feet
GA	tabun
GC/MS	gas chromatograph/mass spectrometry
H	mustard
HAZWOPER	Hazardous Waste Operations and Emergency Response
HC	Hexachloroethane
HCD	hazard/class division
HD	distilled mustard
HE	high-explosive
HFD	hazardous fragmentation distance
HL	mustard-Lewisite mixture
HN-3	nitrate mustard
HQ	sesqui-mustard mixture
HT	mustard-T mixture
HTW	hazardous and toxic waste
IBD	inhabited building distance
IDS	intrusion detection system
IM	Interim Measure
IMD	intermagazine distance
IRB	Installation Restoration Branch
IW-QAPP	Installation-Wide Quality Assurance Program Plan
L	Lewisite
MARB	Materiel Assessment Review Board
MCE	maximum credible event
MD	munitions debris
MDAS	material document as safe
MDEH	material document as explosive hazard
MEC	munitions and explosives of concern
MEQ	mission essential quantity
MFD	maximum fragment range
MGFD	munition with the greatest fragmentation distance
MINICAMS	miniature chemical agent monitoring system
mm	millimeter
MMAS	Mobile Munitions Assessment System
MPPEH	material potentially presenting an explosive hazard
MRC	multiple round container
MSD	minimum separation distance
MSFC	Marshall Space Flight Center
msl	mean sea level

LIST OF ACRONYMS (continued)

N/A	Not available/applicable
NASA	National Aeronautics and Space Administration
NEW	net explosive weight
NIOSH	National Institute of Occupational Safety and Health
OB/OD	open burn/open detonation
OE	ordnance and explosives
OESS	Ordnance and Explosives Safety Specialist
OSHA	Occupational Safety and Health Administration
PAED	public access exclusion distance
PDS	personnel decontamination station
PDT	Project Delivery Team
PID	photo ionization detector
PINS	portable isotopic neutron spectrometry
PMNSCM	Project Manager for Non-Stockpile Chemical Materiel
PPE	personal protective equipment
PS	chloropicrin
PTRD	public traffic route distance
QC	quality control
Q-D	quantity-distance
RCMD	Recovered Chemical Materiel Directorate
RCRA	Resource Conservation and Recovery Act
RCWM	recovered chemical warfare materiel
RFI	RCRA Facility Investigation
RSA	Redstone Arsenal
SCBA	self-contained breathing apparatus
SSHO	Site-Safety and Health Officer
SSHP	Site Safety and Health Plan
STEL	short-term exposure level
SUXOS	Senior Unexploded Ordnance Supervisor
SZ	support zone
TM	technical manual
TP	technical paper
TVA	Tennessee Valley Authority
UFC	Unified Facilities Criteria
U.S.	United States
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USATCES	U.S. Army Technical Center for Explosives Safety
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist

LIST OF ACRONYMS (continued)

UXOSO	Unexploded Ordnance Safety Officer
VOC	volatile organic compound
WNWR	Wheeler National Wildlife and Rescue
WP	white phosphorous
WPL	worker population limit

EXECUTIVE SUMMARY

ES 1.0. INTRODUCTION

ES 1.1. Project Authorization

This Chemical Safety Submission (CSS) discusses safety performance of operations to remove anomalies within the construction footprint at Redstone Arsenal's (RSA) Marshall Space Flight Center (MSFC)-003-R-01, Inactive Old Bone Yard Disposal Site #1, Madison County, Alabama, an Active Army Installation site where the probability of encountering chemical warfare materiel (CWM) is "occasional" or above. This work is performed under the Military Munitions Response Program and is separate from, and in addition to, the planned Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) and Interim Measures (IM). Any applicable data collected during the execution of work performed under this CSS will be incorporated into the planned RFI and IM.

Under Support Agreement, effective 21 April 2014, between the United States (U.S.) Army Engineering and Support Center, Huntsville (USAESCH) and the 20th Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives (CBRNE) Analytical and Remediation Activity (CARA), CARA is responsible for providing Unexploded Ordnance (UXO) and chemical agent (CA) qualified and trained personnel and equipment to support removal of anomalies within the construction footprint at the MSFC-003-R-01 site. This project falls under RCRA; U.S. Department of Defense (DoD); U.S. Department of the Army (DA); U.S. Army Corps of Engineers (USACE); and RSA regulations and guidance, as applicable. The provisions of 29 Code of Federal Regulations (CFR) 1910.120 will apply to all actions on the site.

The overall goals and objectives of this project (as stated in the Scope of Work dated 21 April 2014), are to implement all necessary contingencies for:

a) Munitions and Explosives of Concern (MEC), Material Potentially Presenting and Explosive Hazard (MPPEH), and Explosives Hazards;
b) Hazardous and Toxic Waste (HTW);
c) CWM and CA Contaminated Media;
d) Perform mobilization and demobilization activities for these tasks; and
e) Provide any information obtained during this effort to the Project Delivery Team (PDT) to incorporate into the planned RFI and IM for this site, as applicable.

The PDT for the intrusive operations will consist of the USAESCH, CARA, and the construction contractor, as well as other government and non-governmental agencies with specific expertise for implementation components of the field operations. CARA will provide the UXO support and CA air monitoring, per the Air Monitoring Plan, included as a sub-plan to the overall Work Plan (USAESCH, 2015).

ES 1.2. MEC and CWM Anticipated

During previous investigations (see Section 1.3), a variety of MEC and munitions debris (MD) were recovered from the site.

During previous intrusive activities, 52 empty chemically configured 4.2-inch mortars were unearthed during the repair of one of the test stand deluge pipes. CA was not detected. During this project, the items of interest include the 4.2-inch chemical-filled mortar. The 4.2-inch chemical-filled mortar is the munition with the greatest fragmentation distance (MGFD).

ES 2.0. SITE HISTORY AND BACKGROUND

RSA is located in Madison County, Alabama. The Installation consists of approximately 38,300 acres and is located adjacent to Huntsville, Alabama. The National Aeronautics and Space Administration's (NASA) George C. MSFC is located in the central portion of RSA. MSFC was deeded to NASA from the Army in 1960. MSFC contains a total of 1,826 acres of land used to conduct space flight research. The MSFC-003-R-01 site encompasses approximately 51 acres and lies in the approximate center of the NASA property in a partially controlled and developed area. The MSFC-003-R-01 environmental site boundary was established by the Army in 2009 to include the following historical waste disposal areas which were reportedly used for disposal and/or treatment of CWM, toxic materials, chemical wastes, and reject phosphorus-filled munitions from the 1940s:

- MSFC-3 (approximately 24 acres);
- MSFC-3E (approximately 6 acres);
- MSFC-82 (approximately 17 acres); and
- MSFC-82S (approximately 4 acres).

MSFC-3 and MSFC-82 are referred to as the "Boneyard" and reference was made in 1957 that it was used by various laboratories and construction contractors to dispose of scrap material that would normally be disposed at the sanitary landfill or turned into salvage. Additionally, historical area MSFC-82 was reported to be contaminated with mustard, arsenic, white phosphorus (WP) and Lewisite and may contain burn pits where chemical artillery shells (i.e., 4.2-inch chemical mortars) were demilitarized and likely buried.

Based on historical documents, the "Boneyard" (MSFC-3 and MSFC-82) was decontaminated in two separate phases in 1957 and 1960. Decontamination activities included subsurface exploration, clearing and burning vegetation, screening, removal of all metal debris, and disking the top 4 to 6 inches of soil with bleach.

In 1961, the rail line area located between MSFC-3 and MSFC-82 was decontaminated. In May 1963, a 4-foot (ft)-wide by 8-ft-deep trench was decontaminated in an area across the center of MSFC-3 and a north-south trench beginning at the east-west trench and terminating at the north site boundary. The trench was for installation of a 42-inch industrial waste line. No details on the findings from either of these actions have been located.

NASA rocket test stands were constructed between 1964 and 1966 in the area surrounding MSFC-003-R-01. This construction included installation of a large-diameter test stand deluge pipes below grade across MSFC-003-R-01. During an interview, Mr. Davis at the MSFC Environmental Office stated "pick-up truck loads" of munitions were removed from the site during the deluge pipe installations. No records of the types of munitions removed or ultimate disposition were located.

During October 1999, a MEC item was discovered when excavating a ditch in MSFC-003-R-01. The item was believed to be a 4.2-inch mortar. Then in 2000, 52 empty chemically configured 4.2-inch mortars were unearthed during the repair of one of the test stand deluge pipes. CA was not detected.

MSFC-3E, formerly named RSA-002-R-01, is located east of MSFC-3. Records indicate that all of the miscellaneous debris within the footprint of the water reservoirs created for the Saturn Test Stand in MSFC-3 were relocated to MSFC-3E. Debris is known to be present at depths of one to four ft below ground surface. Records also indicate that prior to the NASA MSFC construction activities, surface debris and materials were removed from throughout the site. This was recently substantiated in January 2012 when unauthorized trenching activities uncovered an unknown quantity of red phosphorus burster tubes, 75 millimeter (mm) M89 hexachloroethane (HC) smoke projectiles, small crushed steel drums, and other unknown wastes.

MSFC-82S and the southern two-thirds of MSFC-82 are located within the boundary of historical Area 11, 1 of 17 contaminated grounds documented as accepting reject chemical munitions from the deactivation of the Huntsville Arsenal. These areas were noted as burning and destruction grounds contaminated with mustard, arsenic, WP, and Lewisite. The boundary of historical Area 11 also includes RSA-052. Historical aerial photograph review did not indicate that disposal trenches are present in MSFC-82S. Review of 1956 and 1959 aerial photographs of MSFC-82 indicated several trench features are present, but this time period coincides with the decontamination activities described above. In addition, previous geophysical surveys at MSFC-82 did not indicate burial features, so it is unlikely that Area 11 activities took place in this area.

The 2012 *Historical Review of Documents for Burial Sites at Redstone Arsenal, Alabama* (U.S. Army Chemical Materials Agency (CMA), 2012) summarizes the lethal, incendiary, and non-lethal chemical munitions and containers that may be found in MSFC-003-R-01.

ES 3.0. SYNOPSIS OF SITE OPERATIONS

ES 3.1. Intrusive Operations

CARA shall provide UXO and CA qualified and trained personnel, to locate and intrusively investigate all anomalies within the construction footprint prior to intrusive construction activities at MSFC-003-R-01. The construction footprint will be finalized by the PDT prior to the start of each intrusive construction operation and will follow the requirements established in this approved CSS, but will not exceed the sited boundary as shown in Figures 1.2-1.3. Any intrusive construction activities exceeding the safety restrictions of this plan shall be submitted as an addendum to this plan and routed for proper approvals prior to the start of any ground disturbing activities.

CARA will execute this work using engineering controls, as necessary, to ensure unauthorized personnel and the public remain safely outside the Exclusion Zone (EZ).

ES 3.2. Munition with the Greatest Fragmentation Distance (MGFD)

The planned distance is based off the 4.2-inch M2/M2A1 chemical mortar. This information is provided in Table 1.1 and the Fragmentation Data Review Form included in Appendix A.

ES 3.3. Maximum Credible Event (MCE)

The MCE is selected for sites with a probability of encountering CWM greater than "seldom" and is based on the maximum release of CA from a container, or process that could occur as a result of an unintended, unplanned, or accidental release. The planned MCE for this project is 171 feet which is based upon the 1% lethality of an instantaneous release of 6.2 pounds of mustard (H) or distilled mustard (HD).

ES 3.4. Discovery Actions

Removal, assessment, and packaging of items suspected to contain an unknown liquid fill and items determined to be recovered CWM (RCWM) will be the responsibility of CARA, as directed by the Recovered Chemical Warfare Materiel Directorate (RCMD) (formerly the Project Manager for Non-Stockpile Chemical Materiel (PMNSCM)). The transportation of items to the approved storage facility will also be the responsibility of CARA. The storage and disposal of RCWM will be the responsibility of RCMD.

For areas where the probability of encountering CWM is greater than "seldom", an unknown liquid filled container is defined as either (a) a container with marking denoting CA or RCWM, or (b) an unidentifiable intact container that contains a liquid fill. Any unidentifiable intact container discovered that contains liquid will be assumed to contain a CA fill until otherwise determined.

The disposal of all waste derived during these construction operations is the responsibility of the Installation, or its designee.

The disposal of conventional MEC items will be the responsibility of personnel meeting the qualifications and requirements of Technical Paper (TP) 18 and DoD Instruction (DoDI) 4140.62.

If, during intrusive operations, an unknown liquid filled container is found that would exceed the prescribed MCE, the PDT may amend this CSS and gain approval prior to resuming any work.

ES 4.0. AIR MONITORING

Air monitoring for CA will be the responsibility of CARA's Air Monitoring Team. The Air Monitoring Team will monitor the EZ for CAs H, HD, nitrate mustard (HN-3), Lewisite (L), and Tabun (GA) using a miniature CA-monitoring system (MINICAMS) during intrusive operations. Additionally, Sesqui-mustard mixture (HQ) will be monitored as H, mustard-T mixture (HT) will

be monitored as HD, and mustard-lewisite (HL) will be monitored as L. Depot Area Air Monitoring System (DAAMS) tubes will be used for MINICAMS confirmation monitoring. CARA will also analyze for industrial chemicals phosgene (CG), chloropicrin (PS), cyanogen chloride (CK), chloroform, hydrogen cyanide (AC), chlorobenzlidenamalonitrile (CS), adamsite (DM), diphosgene (DP), and chloroacetophenone (CN).

The Air Monitoring Team will also monitor within the EZ for volatile organic compounds (VOCs) with a photo ionization detector (PID).

Air monitoring results will be used as a criterion in selecting the appropriate level of personal protective equipment (PPE) within the EZ.

ES 4.1. Actions To Be Taken

In the event of a MINICAMS alarm at prescribed action levels, the Air Monitoring Team will immediately notify all site personnel by radio. The CARA UXO Safety Officer (UXOSO) and the onsite USAESCH Ordnance and Explosives Safety Specialist (USAESCH OESS) will be responsible for providing further direction. Once the appropriate level of PPE is verified by the CARA UXOSO, the intrusive team may begin mitigation if there is an obvious source. Unknown liquid filled containers will be non-intrusively assessed by CARA.

ES 5.0. ENVIRONMENTAL SAMPLING

ES 5.1. Sampling Summary

Section 2.0 summarizes the sampling summary for this project. CARA will be conducting soil analysis in accordance with the approved Air Monitoring Plan. Headspace screening will be conducted by CARA in accordance with their procedures for CA. If headspace results show that CA is absent, the soil will be returned to the excavation site and any further waste characterization analysis will be performed as part of the planned RFI and IM for MSFC-003-R-01. If headspace results show that CA is present in detectable concentrations, the soil will be decontaminated in accordance with Department of the Army (DA) Pamphlet 385-61 until its headspace results are below the short-term exposure limit (STEL). The decontaminated soil will be containerized and stored in accordance with applicable laws and regulations until final characterization and disposition which will occur as part of the planned RFI and IM for MSFC-003-R-01.

ES 6.0. MONITORING AND DISPOSAL

Non-RCWM containers, range related debris, material documented as safe, waste water, and scrap encountered during intrusive operations will be handled based on the results of the headspace analysis. RCWM will be disposed of by RCMD.

ES 7.0. SITE USAGE AFTER CONSTRUCTION FOOTPRINT CLEARANCE

The primary objective of this project is to conduct a construction footprint clearance at the site. After completion of the construction footprint clearance, a site-specific after action report summarizing all MEC removal activities and findings will be submitted for incorporation into the planned RFI and IM. A no further action Explosives Safety Submission (ESS) or After Action Report will be submitted upon completion of the planned RFI and IM to close out any previous site plans and this CSS. The site usage restrictions are anticipated to remain the same after completion of this project and will not be reconsidered until completion of the planned RFI and IM.

1.0 INTRODUCTION

1.1. PROJECT AUTHORIZATION

Under Support Agreement, effective 21 April 2014, between the United States (U.S.) Army Engineering and Support Center, Huntsville (USAESCH) and the 20th Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives (CBRNE) Analytical and Remediation Activity (CARA), CARA is responsible for providing Unexploded Ordnance (UXO) and chemical agent (CA) qualified and trained personnel and equipment to support removal of anomalies within the construction footprint at the Redstone Arsenal (RSA) Marshall Space Flight Center (MSFC)-003-R-01, Inactive Old Bone Yard Disposal Site #1. This project falls under the Resource Conservation and Recovery Act (RCRA); U.S. Department of Defense (DoD); U.S. Department of the Army (DA); U.S. Army Corps of Engineers (USACE); and RSA regulations and guidance, as applicable. The provisions of 29 Code of Federal Regulations (CFR) 1910.120 will apply to all actions on the site. Figure 1.1 and Figure 1.2 show the locations of RSA and MSFC-003-R-01. MSFC-003-R-01 encompasses approximate 51 acres and lies in the approximate center of the National Aeronautics and Space Administration's (NASA) property in a partially controlled and developed area. The MSFC-003-R-01 environmental site boundary was established by the Army in 2009 to include the following historical waste disposal areas:

- MSFC-3 (approximately 24 acres);
- MSFC-3E (approximately 6 acres);
- MSFC-82 (approximately 17 acres); and
- MSFC-82S (approximately 4 acres).

The current project scope of work includes the construction footprint clearance to be conducted at MSFC-003-R-01 in areas where the probability of encountering chemical warfare materiel (CWM) is greater than "seldom".

The Project Delivery Team (PDT) for the intrusive operations will consist of the USAESCH, CARA UXO and CA qualified and trained personnel, and the construction contractor, as well as other government and non-governmental agencies with specific expertise for implementation components of the field operations.

This Chemical Safety Submission (CSS) applies to activities specific to the intrusive operations to remove anomalies within the construction footprint at the MSFC-003-R-01, Inactive Old Bone Yard Disposal Site #1, RSA, Madison County, Alabama, an Active Army Installation site where the probability of encountering CWM is "occasional" or above. The work performed under this CSS is separate from, and in addition to, the planned RCRA Facility Investigation (RFI) and Interim Measures (IM) and will be conducted in accordance with applicable CWM operations guidance: DoD 6055.09-M (DoD, 2008), Draft Army Regulation (AR) 385-XX (DA, 2009), and Engineering Manual (EM) 385-1-97 (USACE, 2013). Any applicable data collected during the execution of work performed under this CSS will be incorporated into the planned RFI and IM.

1.2. OBJECTIVES

The overall goals and objectives of this project (as stated in the Scope of Work dated 21 April 2014), are to implement all necessary contingencies for:

a) Munitions and Explosives of Concern (MEC), Material Potentially Presenting and Explosive Hazard (MPPEH), and Explosives Hazards;

b) Hazardous and Toxic Waste (HTW);

c) CWM and CA Contaminated Media;

d) Perform mobilization and demobilization activities for these tasks; and

e) Provide any information obtained during this effort to the PDT to incorporate into the planned RFI and IM for this site, as applicable.

1.3. SITE HISTORY AND BACKGROUND

RSA is located in Madison County, Alabama. The Installation consists of approximately 38,300 acres and is located adjacent to Huntsville, Alabama. NASA's George C. MSFC is located in the central portion of RSA. MSFC was deeded to NASA from the Army in 1960. MSFC contains a total of 1,826 acres of land used to conduct space flight research. MSFC-003-R-01 encompasses approximately 51 acres and lies in the approximate center of the NASA property and in a partially controlled and developed area. The MSFC-003-R-01 environmental site boundary was established by the Army in 2009 to include the following historical waste disposal areas: MSFC-3 (approximately 24 acres); MSFC-3E (approximately 6 acres); MSFC-82 (approximately 17 acres); and MSFC-82S (approximately 4 acres).

MSFC-3 and MSFC-82 are referred to as the "Boneyard" and reference was made in 1957 that it was used by various laboratories and construction contractors to dispose of scrap material that would normally be disposed at the sanitary landfill or turned into salvage. Additionally, historical area MSFC-82 was reported to be contaminated with mustard (H or HD), arsenic, white phosphorus (WP) and Lewisite (L) and may contain burn pits where chemical artillery shells (i.e., 4.2-inch chemical mortars) were demilitarized and likely buried.

Based on the historical documents, the "Boneyard" (MSFC-3 and MSFC-82) was decontaminated in two separate phases in 1957 and 1960. Decontamination activities included subsurface exploration, clearing and burning vegetation, screening, removal of all metal debris, and disking the top 4 to 6 inches of soil with bleach.

In 1961, the rail line area located between MSFC-3 and MSFC-82 was decontaminated. In May 1963, a 4-foot (ft)-wide by 8-ft-deep trench was decontaminated in an area across the center of MSFC-3 and a north-south trench beginning at the east-west trench and terminating at the north site boundary. The trench was for installation of a 42-inch industrial waste line. No details on the findings from either of these actions have been located.

NASA rocket test stands were constructed between 1964 and 1966 in the area surrounding MSFC-003-R-01. This construction included installation of large-diameter test stand deluge pipes below grade across MSFC-003-R-01. During an interview, Mr. Davis at the MSFC

Environmental Office stated "pick-up truck loads" of munitions were removed from the site during the deluge pipe installations. No records of the types of munitions removed or ultimate disposition were located.

During October 1999, a MEC item was discovered when excavating a ditch in MSFC-003-R-01. The item was believed to be a 4.2-inch mortar. Then in 2000, 52 empty chemically configured 4.2-inch mortars were unearthed during the repair of one of the test stand deluge pipes. CA was not detected.

MSFC-3E, formerly named RSA-002-R-01, is located east of MSFC-3. Records indicate that all of the miscellaneous debris within the footprint of the water reservoirs created for the Saturn Test Stand in MSFC-3 were relocated to MSFC-3E. Debris is known to be present at depths of one to four ft below ground surface. Records also indicate that prior to the NASA MSFC construction activities, surface debris and materials were removed from throughout the site. This was recently substantiated in January 2012 when unauthorized trenching activities uncovered an unknown quantity of red phosphorus burster tubes, 75 millimeter (mm) M89 hexachloroethane (HC) smoke projectiles, small crushed steel drums, and other unknown wastes.

MSFC-82S and the southern two-thirds of MSFC-82 are located within the boundary of historical Area 11, 1 of 17 contaminated grounds documented as accepting reject chemical munitions from the deactivation of the Huntsville Arsenal. These areas were noted as burning and destruction grounds contaminated with mustard, arsenic, WP, and Lewisite. The boundary of historical Area 11 also includes RSA-052. Historical aerial photograph review did not indicate that disposal trenches are present in MSFC-82S. Review of 1956 and 1959 aerial photographs of MSFC-82 indicated several trench features are present, but this time period coincides with the decontamination activities described above. In addition, previous geophysical surveys at MSFC-82 did not indicate burial features, so it is unlikely that Area 11 activities took place in this area.

The 2012 *Historical Review of Documents for Burial Sites at Redstone Arsenal, Alabama* (U.S. Army Chemical Materials Agency (CMA), 2012) summarizes the lethal, incendiary, and non-lethal chemical munitions and containers that may be found in MSFC-003-R-01.

There are several parking areas, buildings, and test stand complexes within the MSFC-003-R-01 environmental site boundary. Activities within the site currently include office support, test stand operation, and pump house support to test stands. No recreational areas are present within the site. The former disposal areas that were not disturbed during MSFC construction are currently fenced, and MSFC staff does not enter them.

Current users of the site include authorized installation personnel, visitors, contractors, and trespassers. A gate and signs restrict vehicle traffic to portions of the site to authorized personnel and visitors. The following areas are not accessible unless accompanied with an escort: the western and northern portions of historical area MSFC-3 (water tanks 4668 and 4669, and Building 4667), historical areas MSFC-82 and MSFC-82S, and the eastern edge of historical area MSFC-3E. The following areas are accessible without escort: the area surrounding Building 4666 including the parking lot in historical area MSFC-3; and the majority of historical area MSFC-3E.

NASA maintains its ownership and control of MSFC through an irrevocable agreement with the Army. The current agreement expires in 2059 but is expected to be renewed indefinitely, as MSFC serves an important mission that is expected to continue indefinitely. The current access-restricted industrial land-use scenario is expected to remain in place throughout the site.

1.3.1. Climate Survey

RSA is located in a temperate climate with hot summers and mild winters. Based on the climatological data obtained from the National Weather Service, the average annual temperature at RSA is 60 degrees Fahrenheit (^{o}F), with an average temperature in summer of 71^{o}F and an average temperature in winter of 49^{o}F. Precipitation at RSA is generally in the form of rain with an average rainfall of 57.2 inches and an average annual snowfall of 2.7 inches. The highest amounts of rainfall occur during the months of November and December, and the lowest amounts of rainfall occur in October. Snowfall generally occurs between December through March, and the first freeze generally occurs in late October and the last freeze generally occurs in late March to early April. Warm, humid weather and frequent thunderstorms occur during the summer with temperatures often reaching the mid to upper 90^{o}F range.

1.3.2. Topography Summary

The topography of RSA is gently rolling and slopes from north to south towards the Tennessee River. Surface elevations at RSA range from 556 feet above mean sea level (msl) along the Tennessee River to 765 feet above msl along the northern boundary. The 100-year flood level of the Tennessee River is at an elevation of approximately 572.5 feet above msl. Much of the southern portion of the facility is topographically below this elevation.

The Tennessee River, which comprises the southern boundary of RSA, is the major drainage feature in the area and flows west. Primary surface water systems at RSA include the streams of Huntsville Spring Branch, Indian Creek, and McDonald Creek as well as the lower Southeast Boundary Stream. These surface water systems are major tributaries flowing southward to the Tennessee River (Rust, 1996). The Tennessee Valley Authority (TVA) manages the Tennessee River level and when the river level is raised, there are local and temporary changes in surface water flow.

Major onsite ponds include Swan Pond and Bradford Sinks, located in the southwestern corner of RSA. Leeds Pond, Rock Pond, and Cribbs Pond, are located south of Huntsville Spring Branch on the eastern border of RSA. A large swamp identified as Mother Lode Swamp is located adjacent to the Huntsville Spring Branch in the central portion of RSA. NASA Spring, also known as Mullins Big Spring, is located west of MSFC along Indian Creek.

1.3.3. Vegetation Summary

Ecologic and wetland resources are managed at RSA in accordance with the Integrated Natural Resources Management Plan. RSA is made up of three primary ecological units: upland forests, grasslands, and wetlands. Upland forests and grasslands are comprised of lands above an elevation of approximately 570 feet above msl. Upland forest land at RSA consists of pine plantations, mixed hardwood and pine, and hardwood forests. These forests contain deciduous and evergreen trees including loblolly, shortleaf, and Virginia pines; oaks; gums; and ash. Vines

and shrubs associated with the mostly young plantations include honeysuckle, blackberry, and trumpet creeper. Forested land provides habitat for mammals, birds, and other wildlife, including white-tailed deer, rabbits, squirrels, foxes, woodchucks, turkeys, owls, woodpeckers, turtles, snakes, and frogs.

Grasslands at RSA consist primarily of leased agricultural land used for grazing cattle. This habitat is host to mostly shrubs, vines, and grasses including elderberry, sumac, poison ivy, kudzu, fescue, broomsedge, white clover, ragweed, and poke weed. Grasslands provide food and cover for mammals, birds, and other wildlife, including opossums, woodchucks, coyotes, doves, falcons, hawks, starlings, and snakes.

Approximately 11,000 acres of wetland areas exist on RSA. These wetland areas are primarily controlled by the TVA's Wheeler Dam flood control program and secondarily by other factors, including beaver activity. Wetland areas at RSA include portions of the Tennessee River, Wheeler National Wildlife and Rescue (WNWR), creeks, lakes, swamps, and adjacent associated areas. The water level in the Tennessee River fluctuates seasonally according to the flood control mission of Wheeler Dam causing fluctuations in its tributary system. Beaver activity also influences low lying areas with periodic and sometimes permanent inundation.

Wetlands support a variety of plant life, including water oaks, black gum, Eastern cottonwood, black willow, lily pads, and aquatic grasses. Wetland areas host an abundance of mammals, reptiles, amphibians, fish, and invertebrates including beaver, muskrat, cottonmouth moccasin, water snakes, frogs, salamanders, turtles, bluegill, bass, crappie, catfish, and carp. Insect life is abundant, including dragonfly, horsefly, mosquito, gnats, ticks, and chiggers. WNWR attracts many species of waterfowl, including ducks and geese, and provides wintering habitat for migrating flocks.

1.3.4. Soil Conditions Summary

RSA is underlain by metamorphic and plutonic mid-Precambrian age basement rocks which are overlain by sedimentary rocks ranging in age from Ordovician to Pennsylvanian. The sedimentary rock unit underlying the greatest portion of the installation is Tuscumbia Limestone. The Mississippian age Tuscumbia Limestone is composed of gray, thin to thick bedded, fossiliferous limestone with chert layers and nodules. Enlarged openings have developed in the limestone along joints, fractures, bedding planes, and faults. Caves and cavities have formed from dissolution of the limestone and have contributed to the formation of sinkholes and depressions on the land surface.

The Fort Payne Chert and Chattanooga Shale underlie the Tuscumbia Limestone. The Fort Payne Chert consists of a dark gray siliceous limestone with abundant beds of up to 50 percent chert. The Fort Payne Chert is 155 to 185 feet thick, and contains many solutional features. The surface of the Fort Payne Chert is marked by a consistent layer of residual weathered material known as regolith, which is mostly clay and may be at thick as 100 feet. The regolith may also contain layers of chert rubble near bedrock. The Devonian age Chattanooga Shale is typically 10 feet thick and is composed of dark gray to black, thinly bedded shale with sandstone layers occurring at the base.

Residual soils are composed of sandy clay and chert and limestone fragments in a clay matrix, which overlie the Tuscumbia Limestone. Composition of the overburden is dependent upon the composition of the parent rock from which it was derived. Therefore, clayey sand lenses are present where overburden soils were formed from limestone containing significant amounts of sand.

1.4. SUSPECTED MEC AND CWM

1.4.1. Suspected MEC

The suspected MEC include the following:

- High-Explosives (HE) material;
- Bombs (M46 and M47);
- Hand grenades (M6, M7, M14, M15);
- Mortars (4.2-inch and M57);
- Smoke pots (M1 and M4); and
- Shells (M60, M88, M89, M104, M105, M110, and M1/M1A1).

Based on the review of historical records of quantities reportedly buried and/or disposed of and previous intrusive operations at this site, the most likely MEC item to be encountered will be the 4.2-inch M2/M2A1 chemical mortar.

1.4.2. MEC Migration

The depth of frost penetration line for Huntsville is approximately nine inches. MEC is anticipated to be buried at depths below the frost penetration line. Therefore, frost related migration of MEC is not considered a relevant pathway onsite (Unified Facilities Criteria (UFC)) 3-301-01 (USACE, 2013). The erosional forces due to ruptured underground water lines may result in the migration of MEC to the surface.

1.4.3. Suspected CWM

The *Historical Review of Documents for Burial Sites at Redstone Arsenal, Alabama* (CMA, 2012) reports that the munitions presented in Section 1.3 may be buried at MSFC-003-R-01. For this project, the suspected CWM to most likely be encountered will be the 4.2-inch chemical-filled mortar with 6.2 pounds of mustard (H) or distilled mustard (HD). This is based on estimated quantities of 4.2-inch chemical-filled mortars buried at the site and findings during previous intrusive activities. If at any time any new intact CWM items are identified, work will be halted, the project team will reassess the site conditions and submit a new CSS for approval, as needed.

1.5. CWM HANDLING PLAN

1.5.1. CWM Unexploded Ordnance Types

As described previously, the suspected CWM to most likely be encountered based on historical data and intrusive activities is the 4.2-inch chemical-filled mortar containing 6.2 pounds of H or HD.

1.5.2. On-Site Disposal Operations

There will be no on-site disposal operations conducted by CARA for the items suspected of containing and unknown liquid fill. In accordance with the scope of work, CARA may provide, as needed: x-ray, final packaging for off-site transport, portable isotopic neutron spectroscopy system (PINS), and/or transport of these items on public roadways. Upon recovery, it is anticipated that the item will be placed into earth covered magazine (ECM) 8211 until such time as the RCMD can arrange for further assessment and disposal.

1.5.3. Explosive and Chemical Siting Plan Requirements

When necessary, conventional munitions that are encountered during these intrusive activities that have been determined unacceptable to move by the CARA Senior UXO Supervisor (SUXOS) and CARA UXO Safety Officer (UXOSO), will be blown-in–place (BIP) by personnel qualified in accordance with DoD Explosives Safety Board (DDESB) Technical Paper (TP) 18 (DDESB, 2004) within the site boundary shown on Figure 1.2.

If determined acceptable to move by the CARA SUXOS and CARA UXOSO, consolidating multiple MEC within the munitions response site (MRS) it was found may be anticipated for this project, USAESCH publication *Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives (OE) Sites*, dated March 2000, will be used and a copy of this report will be available on site. The maximum net explosive weight (NEW) for a consolidated shot will be limited such that the K328 overpressure distance for the total NEW (including donor charges) does not exceed the minimum separation distance (MSD) for the intentional detonation. Collection points are those areas used to temporarily accumulate MEC determined acceptable to move by the CARA SUXOS and CARA UXOSO pending destruction at the end of the day using consolidated shots. MEC items at collection points must be laid out as shown in USAESCH publication *Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives (OE) Sites*, dated March 2000. The maximum NEW at a collection point will be limited such that the K40 overpressure distance for the total NEW does not exceed the hazardous fragmentation distance (HFD) for the area. Consolidating multiple MEC is anticipated for this project.

If determined by the CARA SUXOS, CARA UXOSO, and the USAESCH Ordnance and Explosives Safety Specialist (OESS), that a consolidated shot within the boundary of MSFC-003-R-01 is not practicable, the conventional munitions, determined acceptable to move, may be either transported to ECM 8208 while awaiting final disposition, or transported to the Installation's approved and sited Open Burn (OB)/Open Detonation (OD) site for final disposition. Pre-approved procedures will be executed to load the items onto the transport vehicle. Tiedowns and bracing will be inspected to ensure items are adequately secured.

Utilization of approved transportation routes which are least disruptive to Installation operations will be closed to the public during movement. Transportation and custody documentation will be completed by CARA Personnel.

For intentional detonation operations, sandbags or water mitigation may be used to reduce the intentional detonation minimum separation distance (MSD) for conventional MEC. Sandbags and water mitigation are not appropriate for suspected chemical or WP/incendiary munitions. If a suspect item is potentially chemically configured, or a potential WP/incendiary munition, engineering controls will not apply. If applicable, Sandbags (HNC-ED-CS-S-98-7 Amendment 2 with DDESB Approval 20 November 2014, HNC Safety Advisory dated 7 November 2011, and the DDESB Memorandum "Clarifications Regarding Use of Sandbags for Mitigation of Fragmentation and Blast Effects due to Intentional Detonation of Munitions", Nov. 29 2010) or Water Mitigation (HNC-ED-CS-S-00-3) may be used to reduce the intentional detonation MSD. Double Sandbag mitigation is authorized for robust and non-robust items with fragmentation characteristics and a NEW not exceeding that of a 75 mm M48, and a minimum withdrawal distance of 12.5 feet applies. Tamping (single or multiple items) may be used in accordance with DDESB TP 16 (DDESB, 2009) and the Buried Explosion Module (BEM) (Note: the most recent DDESB approved version of the BEM is available in DDESB TP 16 on the DDESB's secure website at http://www.ddesb.pentagon.mil/). These reports will be on site for all mitigation methods used.

On-call explosives will be utilized for this effort. Demolition operations will be conducted on the same day as delivery which will eliminate the need for storing commercial explosives on RSA. All commercial donor explosives will have assigned DoD hazard division/storage compatibility groups and will be handled in accordance with DoD 6055.09-M (DDESB, 2009) and DA Pamphlet (DA PAM) 385-64 (DA, 2011).

All explosive operations will follow the procedures outlined in Technical Manual (TM) 60A 1-1-31.

1.5.3.1. Maximum Fragment Distance (MFD)

For intentional detonations, the MFD or the calculated K328 overpressure distance (for non-fragmenting munitions) for the munition(s) being detonated, plus the NEW of any donor charges, will be used for all intentional detonations MSD, unless DDESB approved engineering controls are used to reduce that distance.

For unintentional detonations: Since the 1% lethality distance for the 6.2 pounds of H or HD is a distance of 171 feet and is larger than the HFD for ordnance (4.2-inch M2/M2A1 chemical mortar) of 129 feet, the project personnel will observe the 171 foot exclusion zone (EZ). See Appendix A and Section 1.8 for additional discussion.

The Storage Siting Plan is presented in Chapter 7 of this CSS.

1.5.4. Explosives Management Plan Requirements

Explosives will be obtained, as needed, from an on-call vendor/supplier. The necessary licenses or permits will be acquired authorizing the purchase, transportation and usage of explosives on

RSA and copies will be available for local, state and federal authorizes upon request. Individuals who are authorized to receive, issue, transport and use explosives will be accountable by signing receipt documents, as necessary. The individuals held accountable will obtain and return receipts for all explosives purchased and delivered, and certify in writing that the explosives were used for their intended purposes. Individuals authorized to receive, issue, transport, and use explosives will be identified by name in writing.

1.6. SUMMARY OF ACTIONS

1.6.1. CWM Actions

CARA will monitor the EZ for CAs H, HD, nitrate mustard (HN-3), Lewisite (L), and Tabun (GA) using a miniature CA-monitoring system (MINICAMS) during intrusive operations. Additionally, Sesqui-mustard mixture (HQ) will be monitored as H, mustard-T mixture (HT) will be monitored as HD, and mustard-lewisite (HL) will be monitored as L. Depot Area Air Monitoring System (DAAMS) tubes will be the primary equipment used for MINICAMS confirmation monitoring. A second MINICAMS, set to the appropriate action levels, may be used for MINICAMS confirmation monitoring at the discretion of the CARA Site Supervisor and USAESCH OESS. CARA will also analyze for industrial chemicals phosgene (CG), chloropicrin (PS), cyanogen chloride (CK), chloroform, hydrogen cyanide (AC), chlorobenzlidenamalonitrile (CS), adamsite (DM), diphosgene (DP), and chloroacetophenone (CN). CARA will also monitor within the EZ for volatile organic compounds (VOCs) with a photo ionization detector (PID).

If an air monitoring alarm occurs, the following sequence of events will be employed as CA alarm procedures:

1. After the first alarm, the down range team will don respirators (if in Modified Level D personal protective equipment [PPE]) and proceed upwind of the excavation or outside the 1% lethality distance. They will remain outside of the 1% lethality distance awaiting an additional cycle from the MINICAMS. At this point, the personnel decontamination station (PDS) personnel will begin to don the required PPE in order to support the down range team processing through the PDS.

2. If two additional cycles are clear, the down range team will remove their respirators and return downrange to continue operations.

3. If two additional cycles indicate the possible presence of CA at levels above their current PPE approval ratings, the down range team will be processed through the PDS.

4. If the alarm detection level equals below 1 x the short term exposure limit (STEL) for CA and there is not a splash hazard for CA, a team of two personnel will don their Level C PPE ensemble to mitigate the source of the alarm. The team will also remove and/or replace the DAAMS tubes for confirmation of the presence of CA.

5. If the alarm detection level equals to or above 1 x STEL (but below 10 x STEL) for CA and there is not a splash hazard, a team of two personnel will don their Level B PPE

ensemble to mitigate the source of the alarm. The team will also remove and/or replace the DAAMS tubes for confirmation of the presence of CA.

6. If the alarm detection levels equals 10 x STEL and there is a splash hazard, a team of two personnel will don their Level A PPE ensemble and will mitigate the source of the alarm. The team will also remove and/or replace the DAAMS tubes for confirmation of the presence of CA.

The Down Range Team (once the appropriate PPE level has been verified by the CARA UXOSO) will also perform mitigation activities once the source is confirmed. Mitigation procedures may include containerizing the surrounding soil or materials and covering the excavation. At this point, a Chemical Event Report will be initiated in accordance with Draft AR 385-XX (DA, 2009) and Appendix B of Engineering Pamphlet (EP) 75-1-3 (USACE, 2004) by the Garrison Safety Office.

If analysis of the DAAMS confirms the detection of CA and an item is encountered that suspected of being CWM, excavation will halt and the procedures in the following paragraphs shall be followed.

For the purposes of this effort, items suspected of being CWM will be defined as follows:

a) Chemical munitions. Such munitions, which included projectiles, rockets, mines, and bombs, and may have been manufactured by the US or foreign countries.

b) Bulk CA containers. Such containers include, but are not limited to, 55-gallon drums and 1-ton containers.

c) Miscellaneous containers (e.g., laboratory bottles) that based on location may contain CA.

d) Munitions with unknown liquid fills.

If an item consistent with the above is discovered, is impeding planned construction activities, and is deemed acceptable to move, the following procedures will be followed:

a) The Down Range Team, consisting of UXO-qualified personnel, will perform a preliminary visual assessment of the unknown item. If the item is suspected of containing an unknown liquid fill, further assessment by CARA will be performed. CARA will:

   i) Determine using organic x-ray equipment whether the item contains a liquid line.

   ii) Determine whether the condition of the item allows for it to be safely packaged, transported, and stored pending its assessment and final disposition.

   iii) Depending on the condition of the item:

      1) Safely package the item and place in a suitable container and transport to storage while awaiting further assessment and final disposition; or

      2) Secure the item in place and mitigate vapor hazards, if safe to do so; and

iv) Establish a chain of custody by completing a DD Form 1911 (Material Courier Receipt).

v) Perform further assessment using non-destructive testing (e.g., by x-ray, by use of a PINS), with the assessment provided to the Materiel Assessment Review Board (MARB). The MARB will analyze the assessment data to verify the fill, identify the most likely CA by type, and recommend final disposition (e.g., EDS). Where a positive determination of fill cannot be made, the most hazardous potential CA for the type of the item involved will be used.

b) Custody of the item will be maintained until such time as the fill is determined and final disposition is made. RCMD will be responsible for accountability of any items, as determined by the MARB to be RCWM, pending its final disposition. The Contractor will be responsible for accountability of any items, as determined by the MARB to not be RCWM, pending its final disposition.

c) Where the above assessment activities determine that the item is not RCWM, is not explosively configured, and is not suspected of being a WP/incendiary munition, it will be handled in accordance with Section 1.5.3.

Final assessments will be conducted when sufficient munitions (as determined by the PDT) are in storage to warrant mobilization of the Mobile Munitions Assessment System (MMAS) or PINS. After final determination of the filler by the MARB has been completed, RCMD will determine the disposition of the CA-filled rounds and conventional MEC will be disposed of locally using a method determined most reasonable and safe by the PDT and stakeholders.

If an item consistent with the above is discovered, is impeding planned construction activities, and is unacceptable to move, then appropriate actions, notifications, and requests for EOD support will be made in accordance with the Draft AR 385-XX (DA, 2009) and RSA regulations and guidance.

1.6.2. Detection Equipment and Response Techniques

The following sections provide summaries of detection equipment. Additional information is provided in the Work Plan (USAESCH, 2015).

1.6.2.1. Removal Depth

Removal will be performed to the depth of detection or to the depth required within the construction footprint to perform necessary operations.

1.6.2.2. Detection Equipment

A combination of one or more of the following detection technologies will be used, as applicable.

1.6.2.2.1. Analog Detection Using Flux Gate Magnetometers

The Schonstedt GA-52Cx or equivalent will be used. The GA-52Cx is a hand-held locator that detects the magnetic field of surface and subsurface ferrous metals and energized power lines. The locator provides audio detection signals that peak in frequency when the locator's tip is held directly over the target. Prior to daily field activities, UXO Technicians will ensure proper detector function by checking for appropriate battery levels and by passing the detectors over a test strip with buried industry standard objects.

1.6.2.2.2. Analog Detection Using Electromagnetic Induction

The White's Spectrum XLT E-Series or equivalent will be used. The White's Spectrum XLT E-Series All-Metals Detector is a hand-held, all-metals detector with a 9.5-inch search coil that detects surface and subsurface ferrous and non-ferrous metal items. The output signal is an audible tone or visual display. The XLT locator can be configured to operate in different soil types and to accommodate external magnetic fields such as those associated with iron-rich magnetic soil and overhead or buried power lines. The XLT also has software programs to remove noise associated with power lines. The interference programs will remove 50 hertz power line noise or 60 hertz power line noise. Prior to daily field activities, UXO Technicians will ensure proper detector function by checking for appropriate battery levels and by passing the detectors over a test strip.

1.6.3. Quality Control and Quality Assurance

It is CARA's policy to apply sound and cost-effective quality principles to all of its activities. The quality policies are established within the applicable Work Plan and its procedures are applicable to all participating project personnel and subcontractors. The plan is applicable to all site activities affecting quality including, investigations, handling of hazardous materials, and data management. Regardless of subcontractor or teaming agreements, CARA is solely responsible for the control of quality and for providing services and deliverables that conform to the requirements outlined in their scope of work.

Quality control (QC) will be accomplished in order to identify and implement quality requirements to ensure that overall project activities are accomplished using an acceptable level of internal controls and review procedures. The purpose of such controls is to eliminate conflicts, errors, and omissions and ensure the technical accuracy of all deliverables. To provide these results, CARA will implement a three-phase QC process during the execution of this project described in detail below.

1.6.3.1. Three Phase Quality Control Process

The three-phase QC process consists of the preparatory, initiation, and follow-up phases. Each QC phase is important for obtaining a high-quality product; the preparation and initiation phases will be particularly invaluable in preventing QC problems. Although every member of the CARA Team is responsible for quality workmanship, the CARA UXOSO/UXO QC Specialist (UXOQCS) for the project has the overall responsibility for the quality of the fieldwork and ensuring that the three-phase QC system is implemented in the field. The CARA Site Supervisor, or designee, has the responsibility for the quality of the deliverables developed for the project.

The three-phase QC system is summarized below and QC requirements for each phase are presented in the Work Plan (USAESCH, 2015).

1.6.3.1.1. Preparatory Phase

The preparation phase will be completed before initiating on-site work.

The following will be completed during this phase:

- Review specifications, references, and plans;
- Check field equipment, ensure it is appropriate for intended use and has been tested, submitted, and approved;
- Assign responsibilities and ensure field staff have necessary knowledge, expertise, and information to perform jobs;
- Verify training requirements (for example, DoD, USACE, Occupational Safety and Health Administration [OSHA]) of field personnel;
- Verify arrangements for support services;
- Inspect work area to verify required preliminary work has been completed;
- Review appropriate activity hazard analysis; and
- Ensure applicable process and procedures have been approved by the USACE PM.

Work Plans and operating procedures will be reviewed by the CARA UXOSO/UXOQCS during this phase to ensure they describe the prequalifying requirements or conditions, equipment, materials, methodology, and QC provisions. Discrepancies between existing conditions and approved plans and procedures will be resolved or corrective actions will be taken for unsatisfactory and nonconforming conditions identified during a preparatory phase inspection. This will be verified by the CARA UXOSO/UXOQCS or his designee, before granting approval for work to begin.

The CARA UXOSO will review the Accident Prevention Plan (APP) (Appendix D of the Work Plan) and the appropriate activity hazard analysis to ensure that applicable safety requirements have been achieved. Preparation phase inspection results will be documented using the Preparatory Phase Checklist, and will be summarized in the daily reports. The personnel qualifications checklist will be used to ensure personnel meet or exceed the training standards outlined by DoD, USACE, and OSHA, including applicable Hazardous Waste Operations and Emergency Response (HAZWOPER) Training. CARA forms and checklists associated with the completion of the preparatory phase activities are presented in Appendix F of the Work Plan (USAESCH, 2015).

1.6.3.1.2. Initial Phase

This phase must be performed at the beginning of work. The purpose of this phase will be to accomplish the following:

- Check preliminary work;
- Verify adequacy of QC controls to ensure full compliance with the work plan;
- Establish acceptable level of workmanship;
- Check safety to include compliance with the APP and Activity Hazard Analysis (AHA) forms; and
- Resolve differences of interpretation.

The CARA UXOSO/UXOQCS or designee will be responsible for ensuring that all discrepancies between site practices and approved plan specifications are identified, documented, and resolved. Corrective actions for unsatisfactory conditions or practices will be verified by the CARA UXOSO/UXOQCS or designee before granting approval to proceed. Initial phase results will be documented on the Initial Phase Checklist and summarized in the daily reports.

1.6.3.1.3. Followup Phase

Periodic checks shall be performed to ensure compliance with contract requirements. The purpose of this phase is to:

1. Ensure work is in compliance with requirements of the Work Plan;
2. Maintain the quality of workmanship required; and
3. Perform safety inspections.

The CARA UXOSO/UXOQCS is responsible for on-site monitoring of the practices and operations taking place, and verifying continued compliance with the specifications and requirements of approved project plans and procedures. The CARA UXOSO/UXOQCS is also responsible for verifying that a daily safety and health briefing is performed and documented as prescribed in the Site Safety and Health Plan (SSHP). The CARA UXOSO/UXOQCS will oversee and observe activities as specified in the initial inspection and will verify that corrective actions for unsatisfactory or nonconforming conditions have been taken before granting approval to continue work. Final follow up phase checks shall be conducted and all deficiencies corrected before starting additional features of work. Final follow up checks will be documented and summarized in the daily reports.

Additional preparatory and initial phases may be conducted on the same work being performed if (1) the quality of ongoing work is unacceptable; (2) there are changes in the on-site production supervision or work crew; (3) work is resumed after a substantial period of inactivity (2 weeks or more); or (4) other problems develop.

1.6.4. Conventional MEC Actions

During anomaly excavation, the equipment operator will excavate the overburden, but not within 12 inches of the anomaly, and deposit the soil onto plastic sheeting on the ground. Once the earth moving machinery is within 12 inches of the anomaly, the excavation will continue using hand tools. Observers, positioned upwind, will watch for signs for MEC, MD, CWM or intact containers with the excavation and removed spoils. Using hand signals, the observers will halt

the excavation if any type of media is uncovered. Media locations will be recorded and spoils separated to prevent possible cross contamination of soils. All excavations will be backfilled with the appropriate fill material.

Due to the potential for underground utilities interfering with the detection technologies, mechanized MEC operations may be considered for this project to intentionally dig up anomalies that could be MEC. These operations are classified as "low-input" processing operations since the activities are not intended to intentionally deform material including MEC. Excavation equipment will be hardened/armored appropriately and the equipment operator must be afforded protection for blast overpressure to the K24 factor by either distance or PPE. Using hearing protection that will reduce the sound by 9 will reduce the distance to the K18 factor. During low-input processing operations, nonessential personnel shall be provided protection for accidental (unintentional) detonations for the HFD or K40, whichever is greater.

If an item is encountered that appears to be a munition or an item that could be explosively configured, excavation will halt. The CARA UXOSO will be notified and the Down Range Team will begin a preliminary assessment. These assessment procedures will determine if the item is explosively configured. If the item is suspected of being CWM then the procedures in Paragraphs 1.6.1, shall be followed.

If an item is not suspected to be CWM, but is potential MEC, UXO qualified personnel will perform an assessment of the item to determine if it is fuzed or unfuzed, in accordance with EM 385-1-97 (USACE, 2013).

The munition with the greatest fragmentation distance (MGFD) for this project is the 4.2-inch M2/M2A1 chemical-filled mortar. The quantity distance is shown in Figure 1.3. The MSD is shown in Table 1.1. If a MEC item with a greater fragmentation distance is encountered, DDESB TP 16 (DDESB, 2009), or current version, will be consulted to determine if that item is listed, and if it is, the fragmentation distances for that item will be implemented immediately. If it is not listed, the project team will calculate the appropriate distance in accordance with the Generic Equations Calculator in TP 16 (DDESB, 2009). (NOTE: The Generic Equation Calculator (GEQ) is available on the DDESB's secure website at http://www.ddesb.pentagon.mil/.) If the new explosives safety quantity distance arcs can be implemented without the addition of engineering controls not specified in the CSS, operations may resume. If a munition exceeds the MGFD an amendment to the CSS will be initiated immediately.

The CARA SUXOS and the CARA UXOSO will follow the procedures in the approved Work Plan and this CSS for evacuation and site control, fragmentation distance, BIP procedures, and operations in populated/sensitive areas when destroying UXO in place. When this technique is employed, engineering controls may be used to minimize the blast and fragmentation effects.

If the CARA SUXOS and CARA UXOSO have determined a UXO is acceptable to move, the UXO may be moved to a collection point for destruction using consolidated shots; however the collection point will be an area that has been previously cleared for both MPPEH and CWM.

UXO which are unacceptable to move will be BIP the same day unless it is not practical to do so due to weather, etc. Similarly, UXO which are acceptable to move will be consolidated and

destroyed the same day if practical. In the event that UXO cannot be destroyed the same day, positive control of the UXO will be maintained (e.g., guarded) until the time that they are destroyed. The CARA SUXOS and CARA UXOSO will follow the procedures in the approved Work Plan and this CSS for evacuation and site control, fragmentation distance, BIP procedures, and operations in populated/sensitive areas when destroying UXO in place. When this technique is employed, engineering controls may be used to minimize the blast and fragmentation effects.

Prior to preparing MEC for detonation, non-essential personnel will be evacuated from the EZ and will remain outside the EZ until MEC operations are completed. While preparing MEC for detonation, the CARA UXOSO will ensure that the number of personnel on site is kept to the minimum required to safely accomplish the disposal mission. Authority to initiate demolition operations will rest solely with the CARA SUXOS. The CARA UXOSO will be responsible for ensuring all personnel have been accounted for and that the area is secure prior to authorizing the detonation of explosive charges. The CARA SUXOS will ensure that the Management Team is notified of an impending demolition shot.

Table 1.1
Minimum Separation Distances

Area	MEC (MGFD)	Minimum Separation Distance (feet)[1]				
		For Unintentional Detonations		For Intentional Detonations		
		Team Separation Distance (K40)	Hazardous Fragment Distance	Without Engineering Controls	Using Sandbag Mitigation	Using Water Mitigation
MSFC-003-R-01	4.2-inch M2/M2A1 (chemical)	21[2]	129[3]	1000	NA	NA

NOTES:
1. See Appendix A for calculation sheets and documentation of MSD. Note that the net explosive weight for the MGFD based on the hazardous fragmentation distance is the maximum net explosive weight NEW that may be collected at a collection point.
2. For mechanized MEC operations, the Team Separation Distance will equal the HFD or the 1%, whichever is greater. However, only 1 team is anticipated to be within the EZ at a time.
3. MSD during intrusive operations

NA – Sandbags and water mitigation are not permitted. These engineering controls are not specified in the Fragmentation Database. Other conventional rounds in the database may use sandbag or water mitigation with the separation distances, if applicable. If items without specified engineering controls are identified, the Buried Explosion Module, Version 6.3.2, or later, associated with TP 16 will be used in order to calculate the quantity of sand required to reduce fragmentation distances.

1.6.5. MPPEH Inspection Procedures

All MPPEH will be assessed and its explosive safety status determined and documented prior to transfer within the DoD or release from DoD control. Prior to release to the public, MPPEH will be documented by authorized and technically qualified personnel as material documented as safe (MDAS) after a 100% inspection and an independent 100% re-inspection to determine that it is safe from an explosives safety perspective. MPPEH processing will be in accordance with DoD Instruction (DoDI) 4140.62 (DoD, 2008) and EM 1110-1-4009 (USACE, 2007).

1.6.6. Activity Hazard Analyses for CWM and Explosive Related Tasks

The AHAs appropriate to this project are included in the Work Plan, and include the following activities:

- Intrusive Investigations;
- Decontamination Processes;
- ECM Entry;
- Air monitoring; and
- Intrusive operations in CWM-contaminated areas.

1.7. ORGANIZATIONAL RESPONSIBILITIES

1.7.1. U.S. Army Environmental Command (AEC)

This site is an AEC site, and as such, AEC will provide project management oversight for execution of this project, and serves as the Program Manager for DA. AEC's responsibilities include document reviews and providing funding.

1.7.2. U.S. Army Engineering and Support Center, Huntsville (USAESCH)

USAESCH, has prepared this CSS and as the Army's executing agency for this project, provides technical expertise for MEC/CWM and munitions constituents activities, and serves as the Project Manager for conducting this project. USAESCH responsibilities include procurement and direction of supporting agencies (e.g., CARA) and the coordination of document reviews and approvals. USAESCH will provide an onsite USAESCH OESS who will maintain command and control of the site during all intrusive fieldwork. The USAESCH will also coordinate pre-operational surveys (USAESCH Survey and DA Pre-Operational Survey) and tabletop exercises to provide an assessment of the intrusive team's capabilities prior to the commencement of intrusive activities.

1.7.3. U.S. Army Garrison – Redstone

RSA's Installation Restoration Branch's (IRB) responsibilities include providing a Site Manager to coordinate the review of project plans and documents, with tenants and organizations within the work area, working with news media and the public, and coordinating with federal, state, and local stakeholders on issues pertaining to implementation of this project and protection of ecological and cultural resources. Other responsibilities include providing proper notifications to state and local regulators, notifying the National Response Center and state officials in the event of a release or spill, Chemical Event Reporting in accordance with the Draft AR 385-XX (DA, 2009), and signing the hazardous waste manifest as generator of any hazardous waste.

RSA's Directorate of Public Works (DPW) will provide construction contractor personnel and equipment necessary to perform Army related activities within the construction footprint.

1.7.4. CBRNE Analytical and Remediation Activity (CARA)

CARA will provide UXO and CA qualified and trained personnel and equipment, to perform a construction footprint clearance at MSFC-003-R-01 in accordance with the CSS and Work Plans. CARA's UXO qualified personnel will meet the requirements of DDESB TP 18 (DDESB, 2004) and will provide the staff for the CARA SUXOS and CARA UXOSO/UXOQCS (the CARA

UXOSO is the same role as the Site Safety and Health Officer [SSHO]), as well as the down range UXO Teams. CARA's Air Monitoring Team will provide personnel and equipment necessary for the monitoring of airborne concentrations from CA and industrial chemicals in accordance with the approved Air Monitoring Plan. CARA will also provide personnel and equipment necessary for assessment, packaging, and transportation of items with an unknown liquid fill to ECM 8211. CARA provides a worldwide capability to conduct chemical, biological, radiological, and industrial hazards operations in support of the DoD, local, state and Federal agencies. In accordance with current ARs, at least two persons (officer, noncommissioned officer, or civilian) are required to conduct operations with the exact number depending on the mission. Current ARs also require that CARA conduct detailed assessment of items with unknown filler. CARA will prepare a report of the circumstances of discovery and results of assessment including photographs, x-rays, and monitoring data in accordance with the Draft AR 385-XX (DA, 2009). CARA is also responsible for escorting the transportation of RCWM over public highways, as applicable. The CARA teams will report directly to the CARA Site Supervisor who, in turn, will keep site management informed about decisions made regarding site activities.

1.7.5. National Aeronautics and Space Administration (NASA)

This site is within NASA's MSFC boundary, and as such, NASA shall provide necessary construction equipment and personnel to perform NASA related activities within the construction footprint. NASA shall also participate in document reviews and approvals and coordination with appropriate NASA personnel.

1.7.6. Recovered Chemical Materiel Directorate (RCMD)

The U.S. Army Chemical Material Agency's RCMD provides support to USAESCH for planning and implementation of storage and final disposition of RCWM, including destruction. RCMD will also provide multiple round containers (MRCs) for RCWM storage, the equipment needed for detailed non-intrusive assessment, and for RCWM destruction.

1.8. EXCLUSION ZONES

1.8.1. Fragmentation Distance of MGFD

The MGFD for this construction footprint clearance will be the 4.2-inch M2/M2A1 chemical-filled mortar. The MSD, for unintentional detonations, is a protective distance based on the HFD for the MGFD for work at MSFC-003-R-01. The MSD for intentional detonations is based on the MFD identified in the fragment calculations in DDESB TP 16 (DDESB, 2009) for the MGFD, unless reduced by DDESB approved engineering controls. The HFD is 129 feet for the 4.2-inch M2/M2A1 chemical mortar, per the fragmentation data sheets included in Appendix A.

1.8.2. Maximum Credible Event (MCE)

For the intrusive construction footprint clearance, a MCE will be considered when determining the EZ. The MCE is the worst case release of a CA from a munition, bulk container, or process that could reasonably be expected to occur as a result of an unintended, unplanned, or accidental

release. The MCE is the instantaneous release of 6.2 pounds of H or HD from a 4.2-inch chemical-filled mortar.

1.8.3. Public Access Exclusion Distance (PAED)

Under normal operations, the PAED is the greater distance of either the 1% lethality distance associated with a MCE or the inhabited building distance (IBD) or HFD associated with the MGFD. Since the 1% lethality is larger than the MGFD, CARA will maintain the 1% lethality distance as the EZ for the public.

1.8.4. 1% Lethality Distance

The 1% Lethality Distance is calculated based on the MCE and meteorological conditions and is established as the distance at which specified dosages would occur. The MCE determined for this project is for the instantaneous release of 6.2 pounds of H or HD from a 4.2-inch chemical-filled mortar. The D2PC parameters used to calculate this distance are included in Appendix C. Table 1.2 shows the worst-case 1% Lethality Distance based on the D2PC computer model. The actual distance for field operations will be the distances identified in Table 1.1 or will be based on continuous calculations of the D2PC computer model. The current 1% Lethality Distance from D2PC will be applied as a radius around the excavation site. Excavations may occur anywhere within the MSFC-003-R-01 site boundary shown on Figure 1.5.

Table 1.2
1% Lethality Distance Based On D2PC Computer Model

Quantity	Distance
6.2 pounds of H or HD	171 feet

1.8.5. Storage Facility

The use of existing ECMs within the 8200 Block will be used for this project. ECM 8211 will be used to store unknown liquid filled items awaiting assessment by the MARB and final disposition and/or treatment. ECM 8208 will be used for the storage of conventional MEC awaiting final disposition. Chapter 7 describes the siting for these ECMs.

1.9. MAPS AND DRAWINGS

1.9.1. Fragmentation Zones and 1% Lethality Distance

Figure 1.3 shows the Maximum Fragment Distance (MFD) of 1,000 feet and the 1% Lethality Distance of 171 feet for MSFC-003-R-01. Figure 1.6 shows the required IBD of 1,250 feet and the 1% Lethality Distance of 171 feet for the ECMs.

1.9.2. Public Access Exclusion Distance (PAED)

Figure 1.3 shows the PAED of 171 feet surrounding MSFC-003-R-01.

1.9.3. Public Traffic Route Distance (PTRD)

Figure 1.5 shows the required PTRD of 750 feet for the ECMs.

1.9.4. Installation Boundaries

Figure 1.2 shows the boundaries of MSFC-003-R-01 at RSA.

1.9.5. Explosives Storage Locations

Explosives will not be stored on site.

1.9.6. Munitions Storage Locations

Figure 1.4 shows the location of ECMs 8208 and 8211.

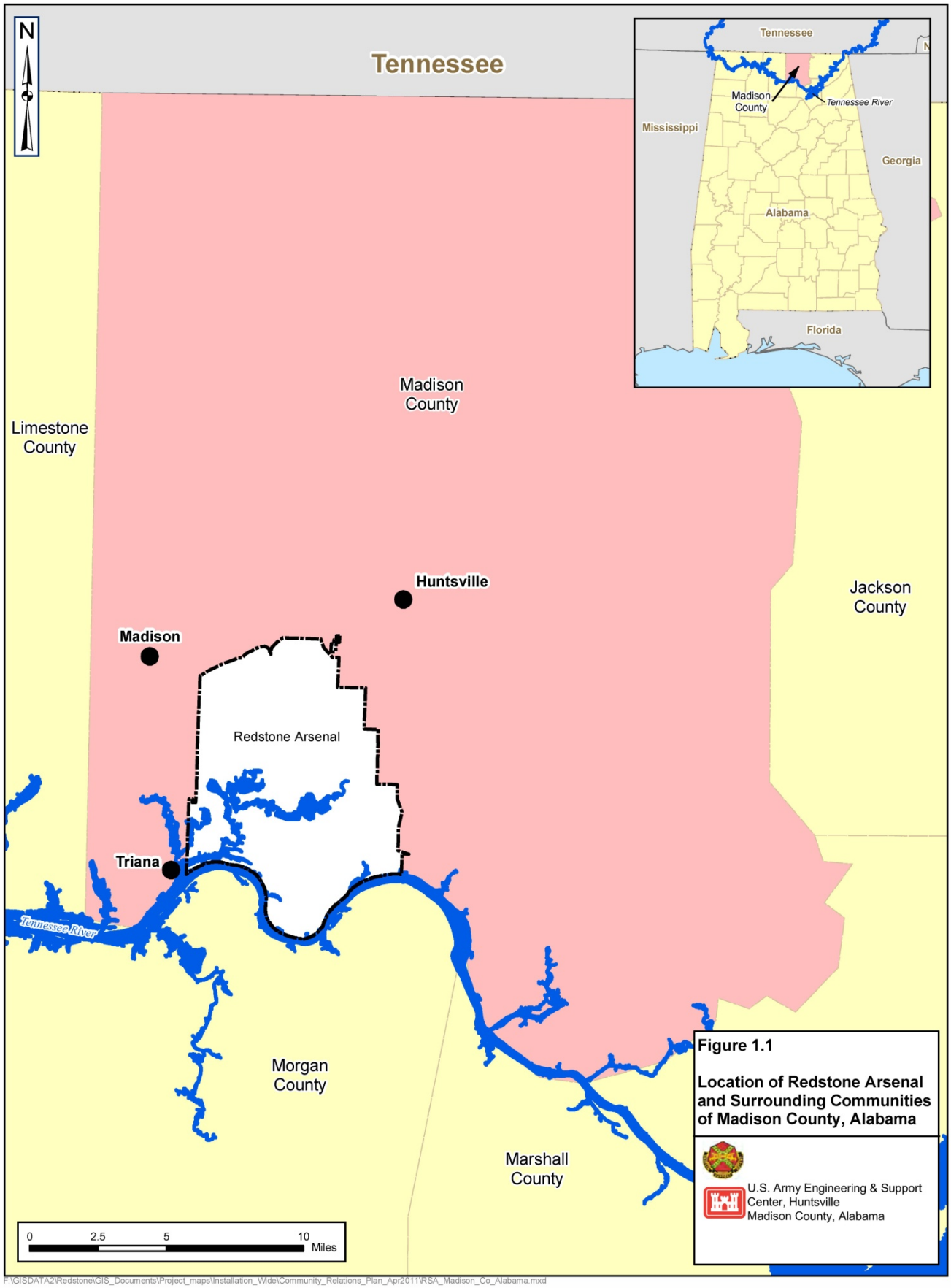
1.9.7. Overall Site Map

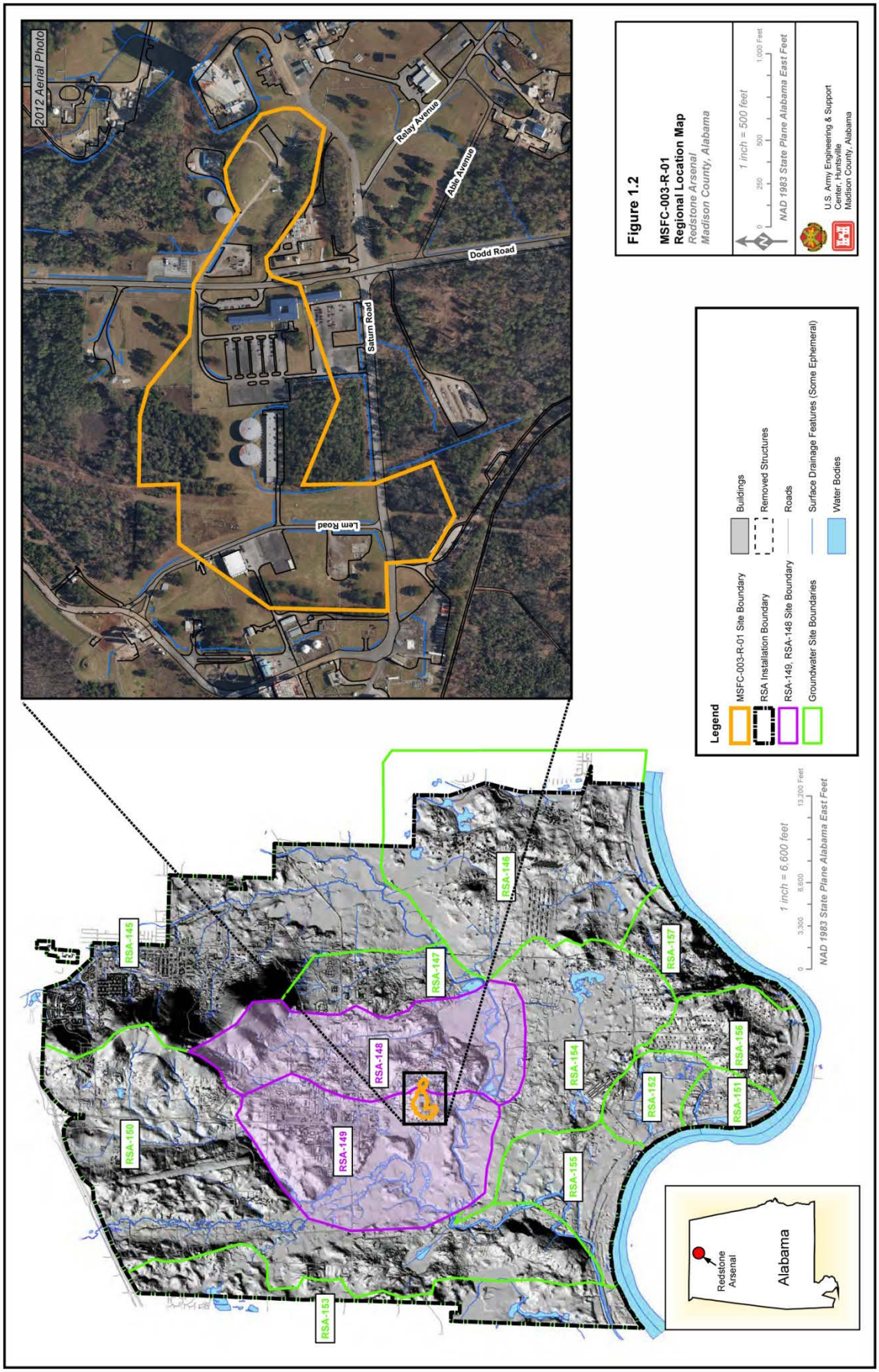
Figure 1.1 shows an overall map of RSA and off site areas.

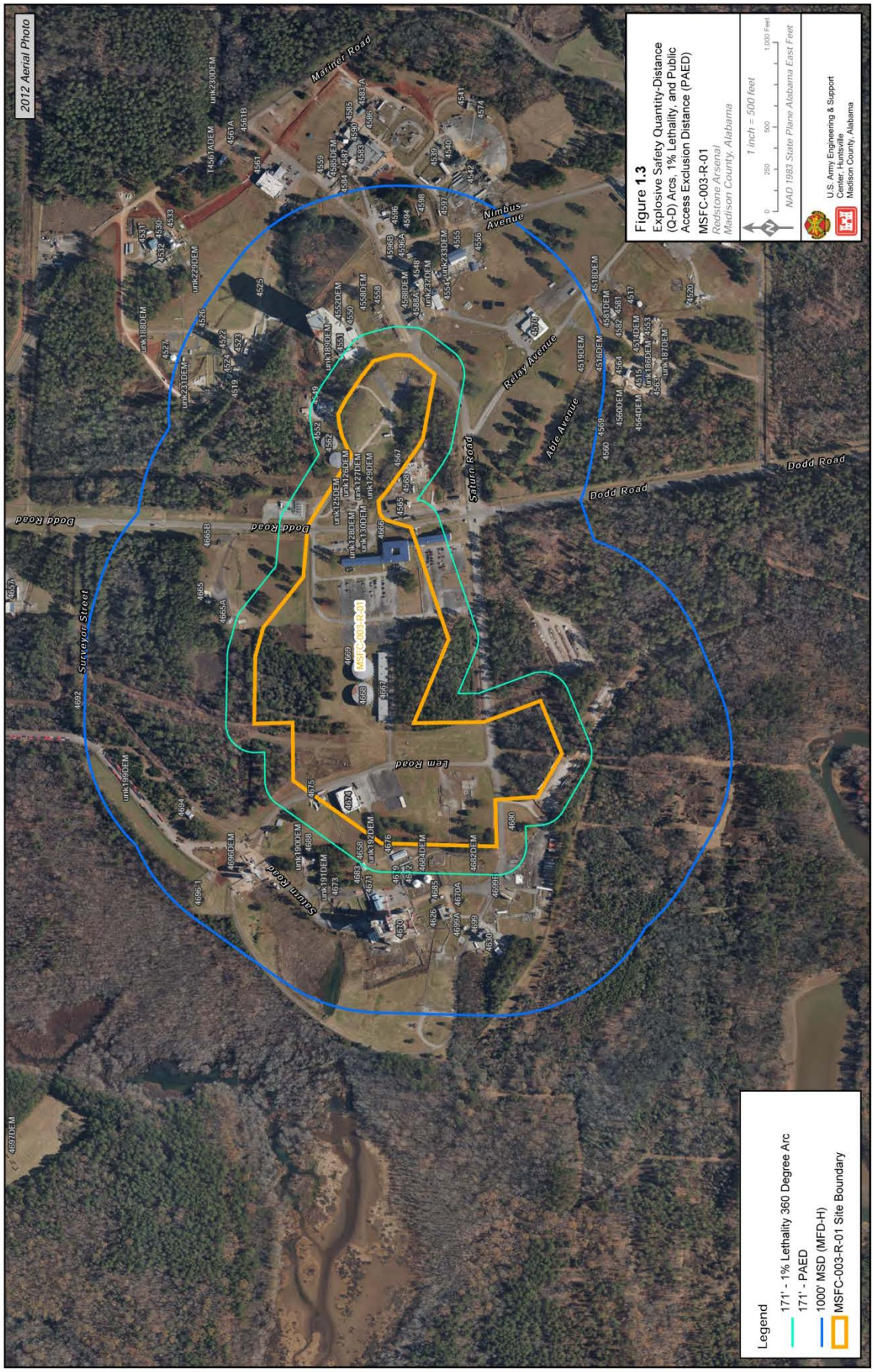
1.9.8. Predetermined MEC and CWM Disposal Locations

Figure 1.6 shows the location of RSA's OB/OD where conventional MEC may be destroyed. No predetermined MEC disposal locations on MSFC-003-R-01 are planned for this project. Whenever possible, conventional MEC will be destroyed at the location where it is found or at the Installation's sited and permitted OB/OD. Items with an unknown liquid fill will be stored in ECM 8211 awaiting final assessment and disposal in accordance with Chapter 9 of this submission.

FIGURES


N
Tennessee
Madison County
Tennessee River
Mississippi
Georgia
Alabama
Florida
Madison County
Limestone County
Huntsville
Jackson County
Madison
Redstone Arsenal
Triana
Tennessee River
Morgan County
Marshall County
0 2.5 5 10 Miles
Figure 1.1
Location of Redstone Arsenal and Surrounding Communities of Madison County, Alabama
U.S. Army Engineering & Support Center, Huntsville
Madison County, Alabama
P:\GISDATA2\Redstone\GIS_Documents\Project_maps\Installation_Wide\Community_Relations_Plan_Apr2011\RSA_Madison_Co_Alabama.mxd


2012 Aerial Photo
Relay Avenue
Able Avenue
Dodd Road
Saturn Road
Lem Road
Figure 1.2
MSFC-003-R-01
Regional Location Map
Redstone Arsenal
Madison County, Alabama
1 inch = 500 feet
0
250
500
1,000 Feet
NAD 1983 State Plane Alabama East Feet
U.S. Army Engineering & Support Center, Huntsville
Madison County, Alabama
Legend
MSFC-003-R-01 Site Boundary
RSA Installation Boundary
RSA-149, RSA-148 Site Boundary
Groundwater Site Boundaries
Buildings
Removed Structures
Roads
Surface Drainage Features (Some Ephemeral)
Water Bodies
1 inch = 6,600 feet
0
3,300
6,600
13,200 Feet
NAD 1983 State Plane Alabama East Feet
RSA-145
RSA-146
RSA-147
RSA-148
RSA-149
RSA-150
RSA-151
RSA-152
RSA-153
RSA-154
RSA-155
RSA-156
RSA-157
Redstone Arsenal
Alabama


2012 Aerial Photo
Figure 1.3
Explosive Safety Quantity-Distance (Q-D) Arcs, 1% Lethality, and Public Access Exclusion Distance (PAED)
MSFC-003-R-01
Redstone Arsenal
Madison County, Alabama
1 inch = 500 feet
NAD 1983 State Plane Alabama East Feet
U.S. Army Engineering & Support Center, Huntsville
Madison County, Alabama
Legend
171' - 1% Lethality 360 Degree Arc
171' - PAED
1000' MSD (MFD-H)
MSFC-003-R-01 Site Boundary
Mariner Road
Nimbus Avenue
Relay Avenue
Able Avenue
Saturn Road
Dodd Road
Surveyor Street
Lem Road

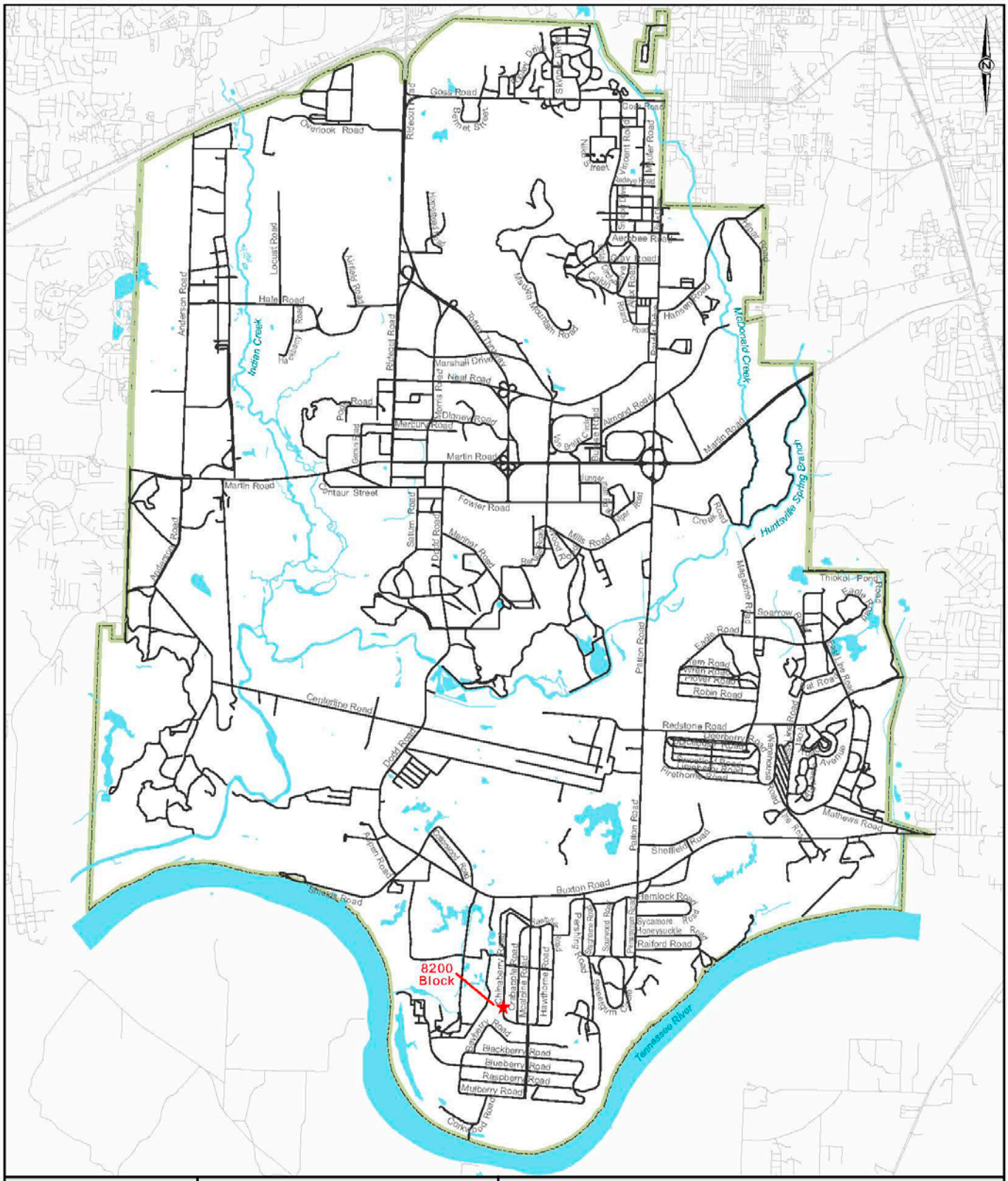


Figure 1.4
Storage Facility Location

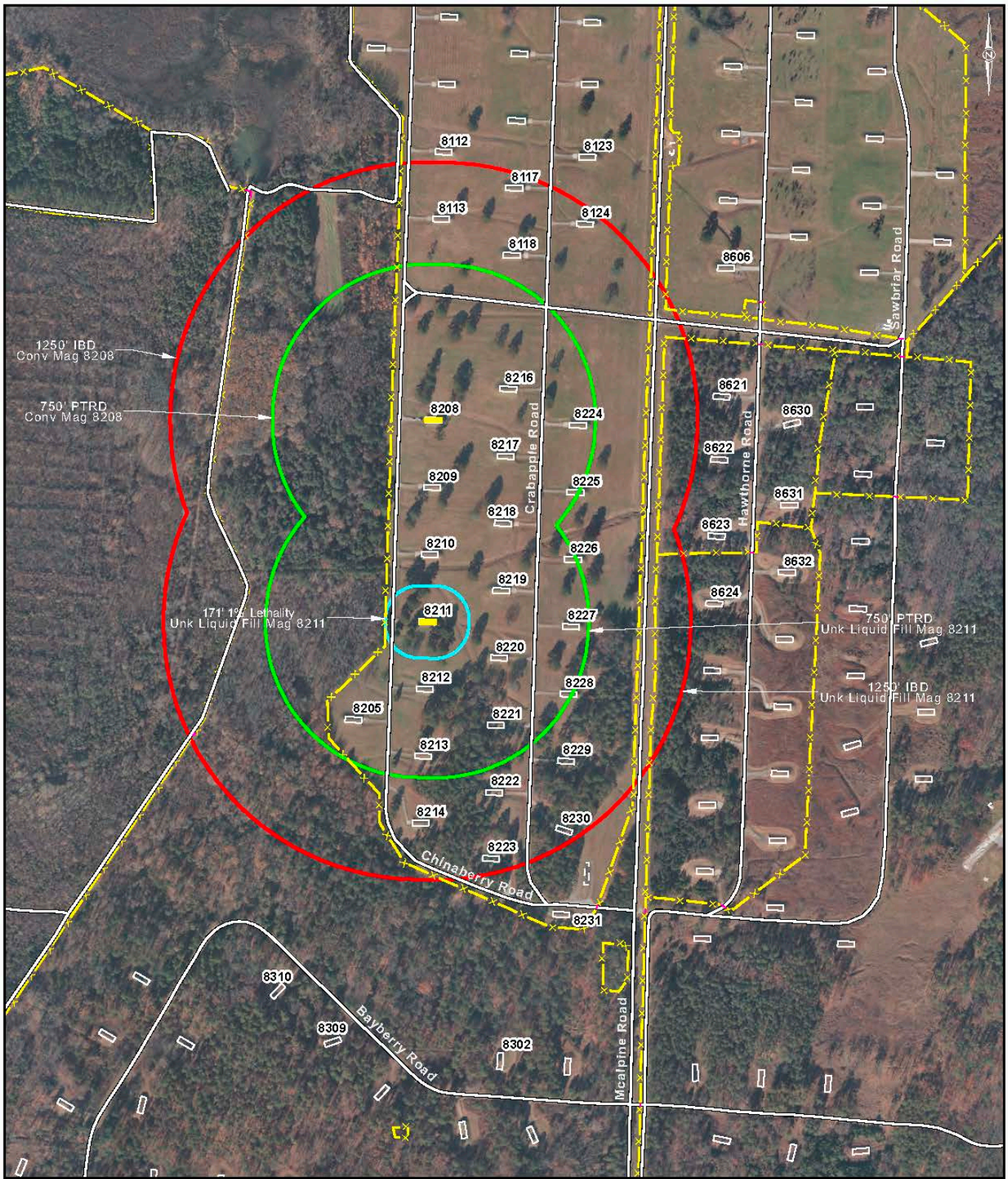


Figure 1.5

Hazard Arcs
ECMs 8208 and 8211

Road
Gate
Fence

Building Footprint
Existing
Demolished

Hazard Arc
1% Lethality
PTRD
IBD
ECMs Utilized

0 250 500 Feet

1:7,200

Dec. 2012 RGB Orthophotos - 3 Inch
Map Projection - Transverse Mercator
Horizontal Datum - North American Datum 1983
Grid Coordinate System - State Plane Alabama East
Planar Distance Units - U.S. Survey Feet

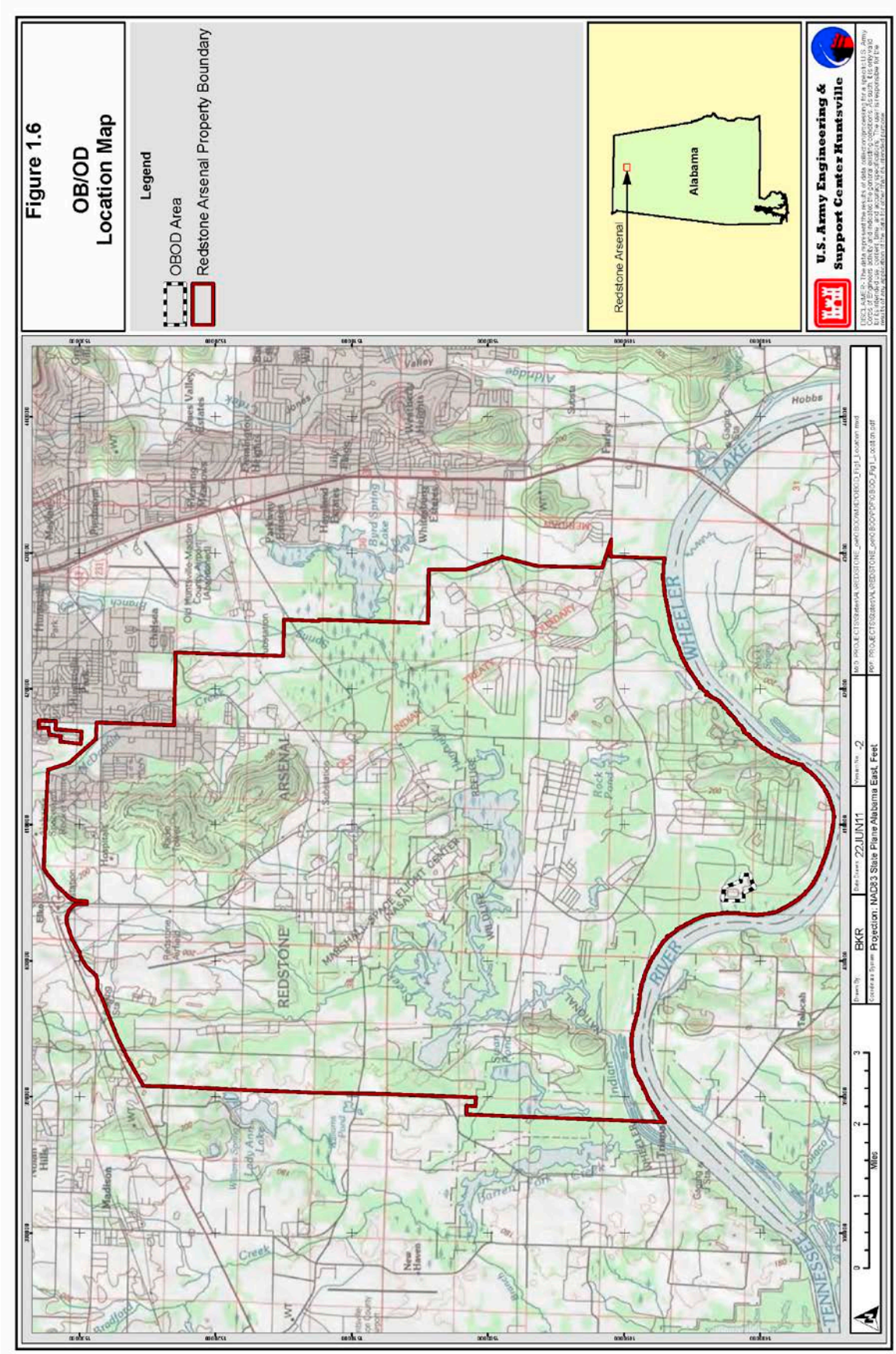


Figure 1.6
OB/OD
Location Map
Legend
OBOD Area
Redstone Arsenal Property Boundary
Redstone Arsenal
Alabama
U.S. Army Engineering & Support Center Huntsville
REDSTONE
ARSENAL
WHEELER
LAKE
RIVER
TENNESSEE
Hobbs
Projection: NAD83 State Plane Alabama East, Feet
22JUN11
BKR
Miles

2.0 SAMPLING PLAN SUMMARY

2.1. INTRODUCTION

This section describes the sampling procedures to be used at MSFC-003-R-01 during the construction footprint clearance activities. Headspace screening will be conducted by CARA in accordance with their procedures. After headspace screening, if headspace results show that CA is absent, the soils will be returned to the excavation site and used as backfill. No soil or aqueous samples are planned for this effort. Any further site characterization will be accomplished during the planned RFI and IM for this site.

2.2. SOIL SAMPLING

2.2.1. Excavation Sampling

No samples are planned to be collected during this effort. Site characterization activities will be accomplished during the RFI and IM for this site. Air monitoring will be conducted during excavations.

2.2.2. Soil Disposal Sampling

Due to the potential of encountering CWM or CA-contaminated soil, spoils will be placed on plastic sheeting or geo-textile cloth during intrusive excavations. If the source of the anomaly is not suspected to be an item with an unknown liquid fill, the excavated soil may be returned to the excavation. If the excavated anomaly is an item suspected to contain an unknown liquid fill, the excavated soil will undergo headspace screening by CARA. If headspace results show that CA is absent, the soil will be returned to the excavation site and any further waste characterization analysis will be performed as part of the planned RFI and IM for this site. If headspace results show that CA is present in detectable concentrations, the soil will be decontaminated in accordance with DA PAM 385-61 until its headspace results are below the STEL. The decontaminated soil will be containerized and stored in accordance with applicable laws and regulations until final characterization and disposition which will occur as part of the planned RFI and IM for this site.

2.3. AQUEOUS SAMPLING

Decontamination water and other aqueous material may be containerized and stored in accordance with applicable regulations and guidance. Final disposition will be determined and performed during the planned RFI and IM for this site.

2.4. SCRAP AND NON-CWM INTACT CONTAINER SAMPLING

Scrap recovered from the construction footprint may consist of cultural debris and MD. Debris material will be classified as either being a CA hazard or a non-CA hazard for all other debris.

Items assessed in the field to potentially contain a CA hazard (e.g., CWM-related, experimental test apparatus, and other potentially contaminated equipment) will be placed in containers or

wrapped in plastic capable of being sealed and heated. These items will be heated and the ambient air will be monitored for CA by CARA.

If monitoring reveals agent vapor is present above the STEL, the materials in the drum will be decontaminated, then the container will be sealed and the exterior washed with decontaminating 5% solution of sodium hypochlorite (or other appropriate solution, depending on the agent detected) and rinsed. Decontamination solution and rinse water will be retained for later disposal.

PPE will be initially segregated from the general waste stream. Upon processing through the PDS the PPE will be double-bagged and the date of use will be noted on the bags. If air monitoring has detected airborne concentrations of CA, the PPE itself will be headspaced onsite. If positive detections of CA occur, the PPE will be drummed and disposed of accordingly (as CA-contaminated) during the planned RFI and IM for this site. If there are not detections of CA during headspacing, the PPE can be placed in the general waste stream (i.e., dumpster).

General scrap, trash, and cultural debris will not require any monitoring if there are no indications of CA contamination. Non-contaminated (general) scrap will be disposed of in accordance with applicable laws and regulations.

Intact containers which cannot be definitively identified by the CARA SUXOS to not be CWM-related will be stored in ECM 8211 prior to being processed and disposed of in accordance with applicable local, state, and federal regulations, depending on the nature of the contents.

3.0 AIR MONITORING PLAN

3.1. INTRODUCTION

This air monitoring plan descries the procedures for monitoring airborne concentrations of CA during operations at MSFC-003-R-01. CARA will monitor the ambient air using a variety of instruments, including MINICAMS, DAAMS, and multi-gas detectors. Monitoring for dust levels will be conducted when heavy equipment is being used.

Air monitoring cannot be solely relied upon to determine agent presence at the excavation. Therefore, visual observations (e.g., looking for stained soil, free liquid, and items with unknown filler) will also be used to indicate the potential presence of agent and to determine what actions, if any, are to take place based on the suspected presence of agent.

3.2. CHEMICAL AGENT

The Air Monitoring Team will provide the following instrumentation to be used at MSFC-003-R-01 for CA:

- MINICAMS – used for workspace monitoring of H, HD, HN-3, L, GA, CG, PS, and CK agents. Used for personnel quadrant, first entry, and headspace monitoring for H, HD, HN-3, L, and GA. Used for confirmation monitoring of H, HD, HN-3, L, and GA as determined by the CARA Site Supervisor and USAESCH OESS.

- Gas Chromatograph/Mass Spectometry (GC/MS) equipped with Dynatherm – Used for permiter and confirmation monitoring of any positive alarms for H, HD, HN-3, L, and GA agents.

- DAAMS Tubes – used with the GC/MS for perimeter and confirmation monitoring of H, HD, HN-3, L, and GA agents.

- MultiRAE – used for workspace monitoring for Chloroform and AC.

- PID – used to measure VOCs at the point of source excavation. One MultiRAE handheld detector can support a photoionization detector (PID) and two E-Chem sensors at the same time, thus allowing for the simultaneous monitoring of up to three chemicals, oxygen deficiency, and lower explosive limit.

- Heated Sample Lines – Used to collect samples from locations throughout the site's working areas for MINICAMS analysis. The sample lines are made of Teflon inner lining and the samples lines will not exceed 150 feet.

If CA is indicated from the equipment alarm and confirmed (see Table 3.1), the current PPE will be evaluated and upgraded as necessary.

If an equipment alarm occurs that exceeds the current level of PPE protection, the downrange team will don respirators (if not currently worn), intrusive activities within the EZ will cease, and the downrange team will proceed upwind. If two additional cycles indicate the possible presence

of CA at levels exceeding the protectiveness of current PPE, intrusive personnel will be processed through the PDS. If necessary, a second team in the appropriate PPE will re-enter the EZ to mitigate potential sources of contamination and to retrieve the DAAMS pumps. Thereafter, down range personnel will evacuate to an upwind location in the support zone (SZ), going through the proper decontamination procedures. A more detailed discussion of the actions taken after a MINICAMS alarm is described in Chapter 1.6.1. The MINICAMS will be used to monitor workers potentially exposed to CA to confirm decontamination prior to the workers leaving the site as described in Chapter 4.

The Air Monitoring Team will use DAAMS to conduct perimeter confirmation monitoring and worker population limit monitoring. Personnel will wear appropriate PPE based on the air monitoring results as discussed in Chapter 4. Table 3.1 presents the action levels and other details for these monitoring instruments.

If the government's meteorological monitoring station is setup onsite, the weather conditions will be input into the D2PC model to estimate the appropriate EZ. If not, the default EZ will be used.

The CARA UXOSO will use a particulate monitor to monitor dust levels in the work area when heavy equipment is used.

4.0 PPE AND DECONTAMINATION SUMMARY

4.1. PPE SUMMARY

Personnel performing tasks at MSFC-003-R-01 shall use the appropriate level and type of PPE specified in this plan. This CSS makes provisions for using the following levels of PPE, in accordance with the hazards and contamination level anticipated for each task: Level D, Modified Level D, Level C, Level B, and Level A.

4.1.1. General Requirements

The CARA UXOSO will make sure that the proper PPE is used, the donning and doffing procedures are known, personnel are trained in the proper PPE, and that the PPE fits properly. The CARA UXOSO will also ensure PPE use complies with applicable regulations of OSHA, USACE, and the U.S. Army. As a general rule, levels of PPE will need to be reassessed if any of the following occur:

- Appearance of previously unidentified or unanticipated chemicals, conditions or task hazards;
- Airborne concentrations of known chemicals exceed the action levels;
- Ambient weather conditions change that impact the use of assigned PPE;
- A new task is introduced or a previously assigned and evaluated task is expanded in scope; or
- PPE may be downgraded when the hazardous material or contaminant source has been removed and at the discretion of the CARA UXOSO.

4.1.2. Task-Specific Levels of PPE

4.1.2.1. Level D PPE

For non-intrusive activities the level of protection that will be worn by personnel at the site is Level D. Level D PPE is not allowed in areas of the site where airborne hazards are known or expected to exist. Level D should also be worn only if the activity in which personnel are engaged does not have the potential for splash, immersion or any other contact with hazardous substances.

Level D includes the following, and may be used as appropriate:

- Coveralls or work clothing;
- Sturdy work boots or shoes, with steel toe when working around heavy equipment. Geophysical survey and reacquisition personnel will not use boots containing steel;
- Safety glasses with side shields or goggles when an eye hazard exists;
- Hard hat when working around heavy equipment or when an overhead hazard exists;

- Chaps for protection during brush clearing operations involving the use of hand held equipment (e.g., string trimmers);
- Leather or canvas work gloves when a scrape or cut hazard exists; and
- Hearing protection, when working around heavy equipment or powered tools.

4.1.2.2. Modified Level D PPE

For intrusive excavations or other activities considered to have potential exposure to CAs, the minimum level of protection that will be worn by personnel at the site is Modified Level D.

Modified Level D includes the following, and may be used as appropriate:

- Coveralls or other approved work clothes;
- Safety boots/shoes, chemical resistant, steel toe and shank when working around heavy equipment. Geophysical survey and reacquisition personnel will not use boots containing steel;
- Boots, outer, chemical resistant;
- Approved respirator, National Institute of Occupational Safety and Health (NIOSH)-approved or military mask – slung or readily available;
- Gloves; Leather or canvas work gloves when a scrape or cut hazard exists;
- Safety glasses or chemical splash goggles when an eye hazard exists;
- Hard hat (as required when adjacent to heavy equipment or an overhead hazard exists); and
- Hearing protection (as required when near heavy equipment).

4.1.2.3. Level C PPE

Level C affords protection from casual contact with contaminated soil and materials, and also protects against a potential for airborne exposure to hazardous substances.

Level C includes the following, and may be used as appropriate:

- Full-face, air-purifying respirator (NIOSH-approved or military mask);
- Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; sleeved chemical-resistant apron; disposal chemical-resistant overalls);
- Gloves, inner;
- Gloves, outer, chemical resistant;
- Safety boots/shoes, chemical resistant, steel toe and shank when working around heavy equipment. Geophysical survey and reacquisition personnel will not use boots containing steel;

- Coveralls;
- Boot covers, outer, chemical resistant;
- Hard hat (as required when adjacent to heavy equipment and an overhead hazard exists); and
- Hearing protection (as required when near heavy equipment).

NOTE: Chemical protective undergarments (CPUs) must be worn with Level C protection when personnel are exposed to blister agents.

4.1.2.4. Level B PPE

Level B PPE offers superior protection against the inhalation of airborne contaminants due to the use of supplied air or self-contained breathing apparatus (SCBA) respirators. However, the type of protective suit used with this level of protection is not airtight and skin exposure to hazardous vapors is possible. Therefore, this level of protection is not acceptable for use where liquid or vapor contact with CAs presents a serious safety or health threat via dermal contact. Level B can, however, be used under conditions where: 1) the chemical warfare agent and other chemical hazards of concern are not acutely skin toxic; 2) there is no potential for liquid contact, and vapor levels are being monitored when working with acutely skin toxic materials; and 3) it is needed to protect site workers from non-chemical warfare agent hazardous wastes.

Level B includes the following, and may be used as appropriate:

- NIOSH-approved, positive pressure, full-face piece, SCBA;
- Suit, hood;
- Gloves, outer, chemical resistant;
- Gloves, inner;
- Boots, outer, chemical resistant, steel toe and shank when working around heavy equipment. Geophysical survey and reacquisition personnel will not use boots containing steel;
- Coveralls.

  -OR-

- NIOSH-approved, positive-pressure, full-face piece, SCBA, or positive pressure, supplied-air respirator with escape SCBA (NIOSH approved);
- Hooded, chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one- or two-piece chemical-splash suit; disposal chemical-resistant overalls);
- Gloves, outer, chemical resistant;
- Gloves, inner;

- Boots, outer, chemical resistant, steel toe and shank when working around heavy equipment. Geophysical survey and reacquisition personnel will not use boots containing steel;
- Coveralls;
- Boot covers, outer, chemical resistant;
- Hard hat (as required when adjacent to heavy equipment and an overhead hazard exists); and
- Hearing protection (as required when near heavy equipment).

NOTE: CPUs must be worn with Level B protection when personnel are exposed to blister agents.

4.1.2.5. Level A PPE

During intrusive operations at MSFC-003-R-01, only CARA personnel will operate in Level A. Level A PPE provides the highest available level of protection against both inhalation and skin contact hazardous exposures. The Level A suit is fully encapsulating, but unlike the Level B encapsulating suit, the Level A suit is air tight and must be tested to ensure that hazardous gases and vapors do not leak into the suit. Since Level A is usually worn in areas where highly toxic and corrosive materials are known to exist, the Level A suit is constructed of materials capable of resisting degradation and permeation by the CAs or other hazardous substances of concern. To ensure that the Level A suit to be used on site will resist CAs and provide adequate protection, Level A suits proposed for site activities have been approved by the Chemical Agent Safety and Health Policy Action Committee (CASHPAC). Since Level A affords the greatest level of protection to dermal hazards, it shall be worn in all instances where potential for contact with liquid CA exists, or when the nature and degree of potential exposure are unknown.

Level A includes the following, and may be used as appropriate:

- NIOSH-approved, positive-pressure, full-face piece, SCBA, or positive-pressure supplied-air respirator with escape SCBA;
- CASHPAC-approved, totally-encapsulating (vapor-tight), chemical protective suit;
- Coveralls;
- Gloves, outer, chemical resistant;
- Gloves, inner;
- Boots, chemical resistant, steel toe and shank when working around heavy equipment. Geophysical survey and reacquisition personnel will not use boots containing steel;
- Hard hat (as required when adjacent to heavy equipment and an overhead hazard exists); and
- Hearing protection (as required when near heavy equipment).

Table 4.1
PPE Ensemble Selection Criteria

Level of Protection	Criteria for Use	Upgrade Criteria
Level D	Initial PPE for all work outside of EZs.	If unanticipated chemical hazards are encountered.
Modified Level D	Initial level of protection for all work in EZ with suspected CAs or CA contamination.	Upgrade to Level C if: • An unknown liquid filled item is discovered. • Air monitoring detects possible CA. • Air monitoring detects other chemicals above action levels. • Presence of strange odor. • Discovery of discolored soils.
Level C	Initial level of protection when: • Item with unknown fill is discovered. • Air monitoring detects CA above Action Levels and below 1 x STEL. • No chemical splash hazards.	Upgrade to Level B if: • No chemical splash hazard exists. • Air monitoring detects CA above 1 x STEL. • Air monitoring detects industrial chemicals above 1 x OSHA PEL.
Level B	Initial level of protection when: • Air monitoring detects CA above 1 x STEL but less than 10 x STEL. • Air monitoring detects industrial chemicals above Level C criteria[1]. • No chemical splash hazards.	Upgrade to Level A if: • Chemical splash hazard exists. • Air monitoring detects CA above 10 x STEL. • Air monitoring detects industrial chemicals above action level for Level B
Level A	Initial level of protection when: • Chemical splash hazard exists. • Air monitoring detects possible CA above 10 x STEL[2]. • Air monitoring detects industrial. chemicals above action level for Level B.	N/A

NOTES:
[1] Criteria consist of airborne concentrations exceeding the protective factor of the PPE or exceeds the immediately dangerous to life or health (IDLH) (see Table 3.1)
[2] MINICAMS are not calibrated or certified at these levels.
EZ – Exclusion zone
N/A – Not applicable
PPE – Personal protective equipment
STEL – Short-term exposure limit

4.2. PERSONNEL DECONTAMINATION PROCEDURES

During operations at MSFC-003-R-01, an emergency personnel decontamination station (EPDS) will be established in the EZ to reduce or control gross contamination at the source. This EPDS (step pan/water/bleach/brushes) will be set up downrange near the intrusive site. The EPDS is used for gross decontamination but, during a true emergency may be by-passed if there is an

imminent danger to one of the team members due to an accident. The EPDS should be placed upwind from the intrusive site, or closest to the upwind side if at all practical.

During intrusive operations, a PDS will also be established in the contaminant reduction zone (CRZ) to facilitate decontamination in the event of CA being encountered and to prevent EZ personnel from transferring contamination to the SZ. At a minimum, personnel within the EZ will proceed through the PDS and complete a gross decontamination of boots and hands. Personnel entering or exiting the EZ during set-up and intrusive operations will be required to report to the PDS. The PDS will be set up for intrusive operations regardless of PPE level in current use. This is done as a contingency in the event that CA is detected.

As personnel move through the PDS, PPE will be removed in the order of highest to lowest potential contamination. This outside-in removal process will be used to minimize the contamination of inner clothing or the body. Personnel will wash hands, face, and other exposed skin areas immediately after leaving the CRZ for breaks, lunch, or at the end of each work day.

The CARA UXOSO is responsible for ensuring the PDS is set-up each day and ready for operation prior to site personnel entering the EZ.

During intrusive operations at MSFC-003-R-01, the PDS will be established outside the EZ in the CRZ. The PDS will not be moved each time the excavation location moves. In order to complete the intrusive investigation efficiently, the PDS will be sited as infrequently as possible where multiple works areas can be reached within a reasonable distance. Personnel entering into the EZ or exiting from the EZ will process through the entry/exit point located at the Hot Line. All personnel will process through the decontamination procedures relevant to the level of protection being worn.

Monitoring for the STEL is required to confirm the decontamination of personnel that have been exposed or potentially exposed to CA. This monitoring will be conducted in the monitoring chamber of the PDS using the MINICAMS. The monitoring chamber consists of a tent or similar structure that can be closed off to the environment.

4.3. EQUIPMENT DECONTAMINATION PROCEDURES

4.3.1. General Decontamination Procedures

At a minimum, foreign debris will be brushed off of all equipment prior to leaving the EZ. In the event of contact with an intact item suspect of containing an unknown liquid fill, regardless of air detections, the equipment will be fully decontaminated. Agent contamination will be assumed, regardless of air detections, if visual observations (e.g. stained soil or items with unknown filler are encountered) indicate the presence or release of agent. Section 4.3.2 presents the specific equipment decontamination procedures. PPE that has been contaminated will be disposed of.

4.3.2. Specific Decontamination Procedures

4.3.2.1. Procedures for Handheld Equipment Decontamination

Hand-held equipment and tools used inside the EZ remain in the EZ until work is completed at MSFC-003-R-01. If CA is detected and confirmed, hand tools and equipment will receive, at a minimum, a three-stage wash and rinse prior to leaving the EZ. The first stage is a wash in a 5% bleach solution. The second stage is a wash consisting of soapy water. The third step involves rinsing the item in clean water. Decontamination fluids will be collected in pans or buckets. The fluids will be containerized, tested, and disposed of properly based upon the analytical results during the planned RFI and IM. After this three-stage wash/rinse cycle, hand tools/equipment will be further sampled (i.e., headspace analysis) to confirm decontamination prior to being removed from the EZ. Further use of these tools on this project will be allowed. Once all work is completed, these tools will be further sampled (i.e., headspace analysis) to determine final disposition as part of the planned RFI and IM.

Items that show evidence of off-gassing CA shall be classified as contaminated and disposed of in accordance with Draft AR 385-XX (DA, 2009) during the planned RFI and IM. Additional testing for contamination from other sources will be performed after CA decontamination as necessary.

Whenever possible, equipment that could receive internal contamination or equipment that cannot be washed and rinsed will be encapsulated in plastic prior to being placed in the EZ. For example, industrial air-monitoring equipment that is not water sealed can be wrapped in plastic with the exception of the air-sampling inlet. After the air monitor is taken from the EZ, the plastic can be removed, the inlet cleaned, and as long as a CA release did not occur during site activities, the monitor can be taken out of the CRZ. If a CA release did occur, then any hand-held equipment with the potential for internal contamination would be considered CA contaminated and would be double plastic bagged and further sampled (i.e., headspace analysis) to determine final disposition as part of the planned RFI and IM.

4.3.2.2. Procedures for Heavy Equipment and Vehicle Decontamination

Heavy equipment taken into the EZ will be left in the EZ and shall be inspected and decontaminated if agent is detected or contact with an item with unknown filler occurs. The intrusive team will perform gross decontamination (brush off and removal of visible contamination) and move the equipment to the decontamination pad, then wash and scrub the equipment to remove gross debris. The equipment will then be washed with bleach solution and brushes. The equipment is then rinsed with water and retested. For monitoring, the isolated portion of the equipment that came or potentially came in contact with an intact item suspected of containing an unknown liquid fill or agent contamination (i.e., a track hoe bucket) will be wrapped in plastic and headspace analysis performed for agent clearance. If a portion of the contaminated equipment cannot be isolated, then the entire equipment item will be covered in plastic for agent headspace analysis. If agent is detected, above the STEL, the equipment will be decontaminated again.

Solutions collected from the equipment decontamination pad will be containerized. Depending on the air monitoring results from the day's operations or findings, a sample may be collected for analysis prior to disposal during the planned RFI and IM. Samples will be sent to CA capable laboratory for agent analysis or analyzed onsite. The sample results will determine if the waste is to be handled as agent-contaminated waste. CARA will be responsible for collecting and sampling decontamination pad water, and the CA capable laboratory will perform the analysis.

5.0 MEDICAL SUPPORT SUMMARY

During operations at MSFC-003-R-01, on-site medical support will be included for all intrusive activities. Two state or National Registry of Emergency Medical Technicians, certified in advanced life support systems (paramedics) will be provided. The paramedics will have a fully equipped Department of Transportation (DOT)–approved ambulance necessary to treat those personnel who become injured or exposed to the agents of concern during the investigation at the site. The paramedics will be included in the intrusive operation as well as training, surveys, and exercises leading up to the intrusive work.

Emergency medical treatment and first aid will be handled by on-site medical support. Huntsville Hospital, Huntsville, Alabama, will handle all chemical related injuries as well as severe life threatening injuries. Directions to and address are provided in Figure 5.1.

Workers participating in CWM operations are required to participate in a medical monitoring program. This program includes baseline and annual health assessments. In addition, site workers will receive site-specific training to enable them to work safely and understand the significance of toxic chemical agent exposures. The training includes information on sources of exposure, adverse health effects, practices and controls to limit exposures, environmental issues, medical monitoring procedures, and employee responsibilities in the health protection program.

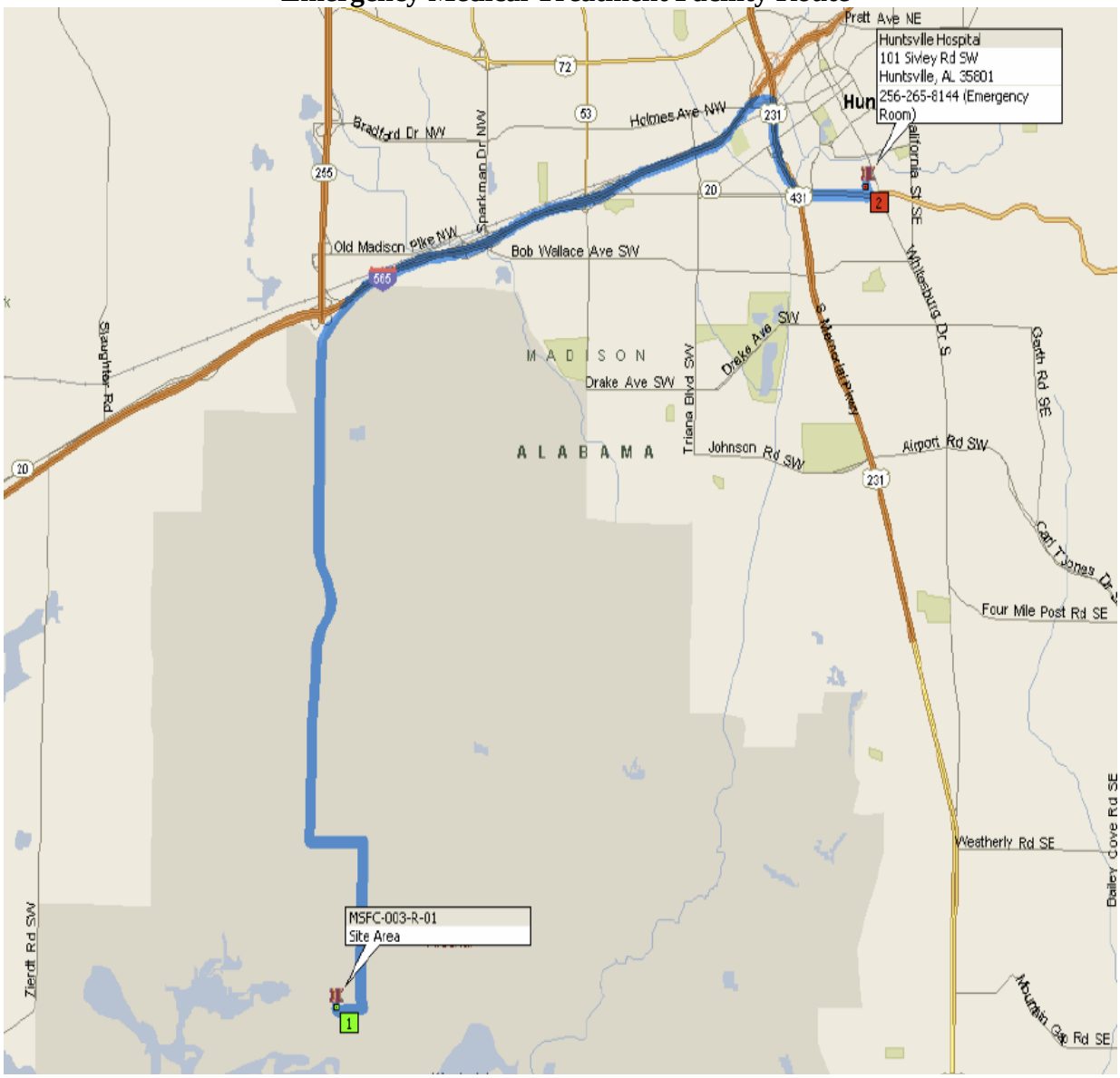
An Emergency Contact List is provided below as Table 5.1.

Table 5.1
Emergency Contact List

Fire, Police, Emergency Medical Services:	(256)876-2117 from cell or 911 *must state you are on Redstone Arsenal
Emergency Medical Care: Huntsville Hospital 101 Sivley Road SW Huntsville, AL 35801	 (256)265-8137 or (256)265-8144
Poison Control Center	(800)222-1222
National Response Center Environmental Emergencies	 (800)424-8802
Installation Emergency Operation Center (IEOC)	(256)313-1043
Redstone Arsenal Military Police	(256)876-2222
Redstone Garrison Safety Office	(256)313-3297
NASA Emergency Operations Center	(256)544-5793
NASA Safety Office	(256)544-0974
Project Management Contacts	
USAESCH Project Manager, Ashley Roeske Chief, OEC, Allyn Allison Chief, OEC Safety, Greg Parsons OEC Operations, Wilson Walters USAESCH OESS, Jay Lewis OEC Emergency Hotline	 (256)895-1429 (office) (256)655-1591 (cell) (256)895-1121 (office) (256)426-5841 (cell) (256)895-1589 (office) (256) 426-2689 (cell) (256)895-1290 (office) (256) 990-1512 (cell) (256)529-8468 (cell) (256)895-1598
Redstone Arsenal Site Manager, Jason Watson Chief, IRB, Terry de la Paz	 (256)842-1448 (office) (256)361-8399 (cell) (256)955-6968
CARA Site Supervisor, John Robbins Site Supervisor, Mark Hammond Safety Officer, Lloyd Wallace Headquarters, Dan Lindsay	 (870)717-1195 (cell) (870)643-9015 (cell) (410)436-9259 (office) (443)910-7486 (cell) (410)436-0037 (office) (443)910-5841 (cell)
NASA Project Manager, Amy Keith	 (256)544-7434

FIGURE

Figure 5.1
Emergency Medical Treatment Facility Route



Mile	Instruction	For	Toward
0.0	**Depart MSFC-003-R-01 on Local road(s) (South)**	**65 yds**	
0.1	Turn LEFT (East) onto Saturn Rd	0.2 mi	
0.3	Turn LEFT (North) onto Dodd Rd	1.3 mi	
1.6	Turn LEFT (West) onto Martin Rd SW	0.5 mi	
2.1	Turn RIGHT (North) onto Rideout Rd	3.9 mi	
6.0	Take Ramp (RIGHT) onto I-565 [US-72 ALT]	4.4 mi	I-565 E
10.4	At exit 19A, take Ramp (RIGHT) onto US-231 [US-431]	0.8 mi	US-231 S / US-431 S / Memorial Pkwy
11.2	Keep STRAIGHT onto Ramp	98 yds	US-431 S / SR-53 N / SR-20 / Governors Dr
11.2	Road name changes to US-431 [SR-1]	0.3 mi	
11.5	Turn LEFT to stay on US-431 [SR-1]	0.7 mi	
12.2	Turn LEFT (North) onto Gallatin St SW	142 yds	
12.3	**Arrive Huntsville Hospital [101 Sivley Rd SW, Huntsville, AL 35801]**		

6.0 PUBLIC PROTECTION PLAN SUMMARY

6.1. PUBLIC NOTIFICATIONS

No occupied buildings or ongoing operations are present inside the EZs. Public access during intrusive operations is restricted to outside the HFD/PAED.

In the event an emergency condition occurs (e.g., release of CA outside of engineering controls) RSA will be responsible for coordination of supporting agencies to safely notify endangered public.

In the event of an emergency condition, the USAESCH OESS, with assistance of the CARA SUXOS, will make initial notifications to the following:

- USAESCH Project Manager – Ashley Roeske, (256)895-1429
- RSA Garrison Safety Chief – Mike Moore, (256)313-3297
- IEOC – (256)313-1043
- RSA Site Manager – Jason Watson, (256)842-1448
- NASA Emergency Operations Center – (256)544-5793
- NASA Safety Office – (256)544-0974

During emergency operations, the excavation team will be instituting emergency procedures in an attempt to locate and control the source of the CA release. Emergency procedures include covering the excavation or open containers with plastic, containerizing soil in drums, and securing the lids of any open drums.

The Garrison Safety Office will initiate a Chemical Event Report and additional notifications will be made by the Garrison Safety Office in accordance with the Draft AR 385-XX (DA, 2009 and RSA regulations and guidance. The media shall be referred to the RSA Public Affairs Office.

6.2. DOWNWIND HAZARD MODELING CALCULATIONS (D2PC)

The D2PC is an atmospheric dispersion modeling program that assumes steady-state diffusion of potential releases without accounting for terrain, vegetation, and manmade structures. The D2PC is coupled with the information on the CA and their configuration identified from the selected MCE to produce dimensions or zones for safety. Using the D2PC computer modeling program, the greatest downwind hazard zone is calculated hourly and is applied to the area of operations.

7.0 STORAGE SITING PLAN SUMMARY

7.1. INTRODUCTION

Provisions have been made for the temporary storage of intact containers with an unknown liquid fill and for conventional MEC in support of operations at MSFC-003-R-01. Existing ECM 8211 will be used for the storage of intact containers with an unknown liquid fill until final assessment, destruction and disposal can be conducted. ECM 8208 will be used for the storage of conventional MEC until final disposal can be conducted. Physical security will be in compliance with AR 190-11. This plan addresses the siting requirements for ECMs 8208 and 8211. Post-recovery assessment activities are summarized in Chapter 11 of this document.

NOTE: The entire 8200 block is being sited under the *Explosive Destruction System (EDS) Assessment and Storage Complex at RSA 8200 Block Site Plan* and upon approval by DDESB will prevail over this CSS for storage.

This Storage Siting Plan for ECMs 8208 and 8211 is based on requirements outlined in the following documents:

- DoD Ammunition and Explosives Safety Standards, DoD 6055.9-M (DoD, 2008)
- Toxic Chemical Agent Safety Standards, DA Pam 385-61 (DA, 2012)
- Site and General Construction Plan Developer's Guide, U.S. Army Technical Center for Explosives Safety Pamphlet 385-02 (USATCES)
- EM 385-1-97 Appendix T (USACE, 2013)

7.2. STORAGE FACILITY DESCRIPTION

7.2.1. Location

Figure 1.6 shows the location of the storage compound. The 8200 Block is primarily occupied by RSA's IRB. However, four of the sixteen ECMs within the 8200 Block (ECMs 8209, 8210, 8218, and 8229) shall be occupied by the U.S. Army's Chemical Materials Activity (CMA) for the storage of programmatic donor explosives to support EDS operations unrelated to RSA.

7.2.2. Layout

Facilities 8208 and 8211 are existing ECMs designed to store hazardous waste, primarily items with an unknown liquid fill or RCWM. The facilities are concrete arch structures with concrete rear and front walls. Its internal dimensions are approximately 81 feet 3 inches long by 26 feet 6 inches wide by 12 feet 9 inches high. There is a single reinforced concrete door, located on the front of the ECM, approximately 4 feet wide by 8 feet tall. The interior of each ECM has approximately 2,146 square feet of clear space for storage and walkway. The design of the structure gives enough room to maneuver the containers within the building. The doors are equipped with a high-security locking hasp to accommodate a padlock. ECM 8211 has interior and exterior light fixtures. The floors are made of six-inch reinforced concrete. A spill berm,

with a spill pallet inside of the berm will be used for the storage of unknown liquid filled items in ECM 8211.

The ECMs are ventilated by passive airflow through louvered vents located on each end. The controls for the louvered vents are accessible from outside the ECM. The vents are normally closed when items with unknown liquid fill or RCWM is being stored.

A lightning protection system will be installed and tested that protects the ECM. The system will be installed in accordance with DA PAM 385-64 (DA, 2011) and AR 385-64 (DA, 1997). After installation, the lightning protection system will be visually inspected every six months and electrically tested every 24 months.

The ECM will be supplied with electric power to operate the lights (for ECM 8211) and intrusion detection system (IDS) (both ECMs). There are no electric transmission lines (> 69 kilovolts) in the 8200 Block. Nearby is the unmanned Substation Number 2 (Facility Number 8784), located at the corner of Patton Road and Buxton Road. The substation is located outside of the PTRD as required by DoD 6055.09-M. Overhead power lines (5 kilovolts) run along roads within the 8200 Block and service only the storage facilities. Though exact measurements were not taken, the distances from the lines to the ECMs are in excess of the minimum allowed to ECMs 8208 and 8211 as defined by DoD 6055.09-M (DDESB, 2008). No ECMs have overhead power connections. Each ECM has an underground service from a power pole at least 50 feet away. For ECM 8211, the waterproof internal light fixture is Underwriters Laboratory-tested for Class 1, Division 1 hazardous locations. The external lights will be activated for automatic lighting during periods of darkness.

ECM 8211 has one monitoring port near the entry door approximately 6 inches from the ground. When items with an unknown liquid fill or RCWM are stored inside, the air quality in the ECM will be monitored before personnel enter. A detailed layout of the ECM location is provided in Figure 1.6.

7.3. STORAGE SITING REQUIREMENTS

All activities within the 8200 Block are managed by the Garrison. There are no inhabited buildings within the 8200 Block and all operations are related to storage. The IBD, PTRD, intermagazine (IMD) and maximum NEW are shown in Table 7.1 for ECM 8208 and 7.2 for ECM 8211. The relationships established in these tables are depicted in Figure 1.7.

The maximum storage capacities for ECMs 8208 and 8211 were determined using DoD 6055.09-M (DDESB, 2008). Also, QD arcs from surrounding potential explosion sites were checked and there were no violations. RSA real property data was used to define and use the classification of each facility impacted by the QD arcs from the 8200 Block magazines. As requested by the RSA IRB, storage limits were determined for Hazard Class/Division (HCD) 1.1, 1.2.1, 1.2.2, 1.3, and 1.4. Segregation within the ECMs will be maintained in accordance with compatibility requirements.

The explosive QD is based on the maximum quantities of HCD 1.1 and 1.2 that would be present in the ECM.

Table 7.1
Hazard Distances and Operating Limits for ECM 8208

Type Distance	Nearest ES for Type Distance (feet)	ECM Side	Actual Distance (feet)	Required Distance (feet)	ECM NEW Calculations				
					1.1	1.2.1	1.2.2	1.3	1.4
IBD	None at <1,250	Front	≥1,250	1,250	30,518	28,118 MCE >450	250,000 [1]	250,000 [1]	MEQ
PTRD	None at < 750 feet	Front	≥ 750	750	30,518	28,118 MCE >450	250,000 [1]	250,000 [1]	MEQ
IMD	Note 2	Note 2	≥ 300 [2]	300	20,285	28,118 MCE >450	250,000 [1]	250,000 [1]	MEQ
NEW Limits for ECM 8208					**20,285**	**28,118 MCE >450**	**250,000**	**250,000**	**MEQ**

NOTES:
IBD – Inhabited Building Distance
IMD – Intermagazine Distance
MCE – Maximum Credible Event
MEQ – Mission Essential Quantity
NA – Not applicable
PTRD – Public Traffic Route
[1] Maximum NEW for this CSS is 250,000 pounds of HCDs 1.1, 1.2.x, and 1.3 (when NEW is not otherwise restricted by exposures or operational requirements).
[2] All ECMs within the RSA 8200 Block meet IMD greater than or equal to 300 feet from front/rear/side. There are no IMD exposures within 300' of this ECM.

Table 7.2
Hazard Distances and Operating Limits for ECM 8211

Type Distance	Nearest ES for Type Distance (feet)	ECM Side	Actual Distance (feet)	Required Distance (feet)	ECM NEW Calculations				
					1.1	1.2.1	1.2.2	1.3	1.4
IBD	None at < 1,250 feet	Front	≥ 1,250	1,250	30,518	28,118 MCE >450	250,000 [2]	250,000 [2]	MEQ
PTRD	None at < 750 feet	Front	≥ 750	750	30,518	28,118 MCE >450	250,000 [2]	250,000 [2]	MEQ
IMD	Note 3	Note 3	≥ 300 [3]	300	20,285	1,004 MCE ≤112	250,000 [2]	250,000 [2]	MEQ
NEW Limits for ECM 8211 [1]					**2,777 [4]**	**1,004 MCE <100**	**250,000**	**185,090 [4]**	**MEQ**

NOTES:
IBD – Inhabited Building Distance
IMD – Intermagazine Distance
MCE – Maximum Credible Event
MEQ – Mission Essential Quantity
NA – Not applicable
PTRD – Public Traffic Route
[1] This magazine is intended for HCD 1.2.x chemical munitions. Other HCDs are included for flexibility potential for contaminated munitions or components classified as other than HCD 1.2.x.
[2] Maximum NEW for this CSS is 250,000 pounds of HCDs 1.1, 1.2.x and 1.3 (when NEW is not otherwise restricted by exposures or operational requirements).
[3] All ECM's within the RSA 8200 Block meet IMD greater than or equal to 300 feet from the front/side/rear. There are no IMD exposures within 300' of this ECM.
[4] HCDs 1.1 and 1.3 are restricted by the planned siting restrictions of the EDS that will be approved by DDESB in the *Explosive Destruction System (EDS) Assessment and Storage Complex at RSA 8200 Block Site Plan.*

7.3.1. Public Access Exclusion Distance (PAED) and 1% Lethality Distance

The PAED is the greater of the 1% Lethality Distance and the IBD. The calculated 1% Lethality Distance for storage is based on the instantaneous release of mustard from a 4.2-inch chemical-filled mortar containing 6.2 pound of H or HD and it is based on the calculations for concentrations of CAs that would result in one fatality in one hundred persons. For siting purposes, personnel not directly associated with chemical operations are not allowed within the 1% Lethality Distance once items are stored in ECM 8211.

This measurement is used when determining the 1% Lethality Distance around ECM 8211 during storage and assessment. The PAED (1% Lethality Distance) was calculated using the D2PC computer model and the parameters are included in Appendix C.

Analysis, performed by the USAESCH, Dr. Crull, yielded that the design fragment from an unintentional detonation of a 4.2-inch M2/M2A1 HD filled chemical round in a prop charge can will not perforate the wall of the prop charge can or cause propagation to the round in the adjacent prop charge can. Hence, the MCE is based on the unintentional detonation of one 4.2-inch M2/M2A1 mortar.

7.4. DISCOVERY AND TRANSPORT FROM SITE TO STORAGE

CARA personnel will assess, package, and transport any munitions or containers determined to be acceptable to move which are suspected of containing an unknown liquid fill from MSFC-003-R-01 to the ECM. Each item will be placed within an approved container (i.e., MRC or prop charge can) then transported to the ECM for storage.

Stakeholders may decide that items with an unknown liquid fill or RCWM need to be transported off of RSA for destruction and/or treatment. If this procedure is determined to be the preferred operation, a transportation plan that includes roles and responsibilities of agencies involved in the movement will be prepared by RCMD once the specific types and quantities of materials to be transported are known.

7.4.1. Storage Access Control

When the ECM is being operated during receipt and storage of items containing an unknown liquid fill or RCWM, access controls will be implemented in the vicinity of the ECM so that direct access to the items in storage will be limited.

- Intrusion Detection System (IDS). An IDS will be installed and operated for the ECMs in accordance with the requirements of AR 190-11.
- Guard Force. A guard force will be provided when items have been placed inside the ECM for the following situations. Any unusual circumstances will be reported immediately to the USAESCH OESS, CARA Site Supervisor, CARA UXOSO and RSA Site Manager.
    - 24-hour armed guard to maintain constant, unobstructed observation of the ECM in the event of an IDS failure at ECM 8211. If IDS is operational, no 24-hour armed guard will be required.

  - Security Patrol every 24-hours at ECM 8211 and every 72-hours at ECM 8208 when IDS is operational and once every 2-hours at ECM 8211 and every 48-hours at ECM 8207 in the event of an IDS failure.

- Barriers. A fence will be maintained surrounding the entire 8200 Block. An internal fence will be maintained surrounding ECM 8211. When the ECM is occupied with personnel, the gates will remain open. All other times the gates will be closed and locked. Prior to storage of items with an unknown liquid fill or RCWM, the USAESCH OESS will verify the fence is intact and complies with this plan. Any deficiencies will be corrected before items will be placed inside ECM 8211.
- Lighting. Security lights will be mounted on the outside of the ECM 8211.
- Signs. The fence surrounding ECM 8211 will be posted with signs indicating that the area is restricted, dangerous and illegal for unauthorized entry. The signs will be approximately 18 by 24 inches and legible from a distance of 25 feet and will be in both English and Spanish. A large sign (4 by 6 feet) describing the conditions of entry will be posted at the gate. The sign reading "Danger-Unauthorized Personnel Keep Out" will be posted at the entrance gate and at other locations on the perimeter fence in sufficient numbers to be seen from any approach. A placard will be placed on the front of each ECM to identify the contents actually being stored inside.
- Access Control. During receipt and storage of items with an unknown liquid fill or RCWM, access controls will be implemented around the ECM area so that the direct access will be limited to CARA.
- Locks and Keys. The gate to the ECM will be locked; the USAESCH OESS will maintain control of keys for this lock while items are in storage. The ECM door will have two high security locks; CARA will maintain control of one key and the USAESCH OESS will maintain control of the other key to these locks while RCWM is inside the IHF.

8.0 MEC TRANSPORTATION PLAN SUMMARY

8.1. PROCEDURES

If determined by the CARA SUXOS, CARA UXOSO, and the USAESCH OESS, that a consolidated shot within the boundary of MSFC-003-R-01 is not practicable, the conventional munitions, that have been determined safe to move, will be either be transported to ECM 8208 while awaiting final disposition, or they will be transported to the Installation's approved and sited OB/OD site for final disposition.

As stated in Section 1.5.3., conventional MEC that is determined unacceptable to move by the CARA SUXOS and the CARA UXOSO will be BIP.

8.1.1. Packaging

In accordance with EM 385-1-97 (USACE, 2013), the following guidelines will be met:

- If loose pyrotechnic, pyrotechnic, tracer, flare, or similar mixtures are to be transported, they will be placed in Number 10 mineral oil or equivalent to minimize the fire and explosion hazards.

- Incendiary-loaded munitions will be placed on a bed of sand and covered with sand to help control the burn if a fire should start.

- If an unfired rocket motor will be transported, it will be positioned in the vehicle parallel to the rear axle and secured in place with sandbags. This will afford maximum protection for the personnel operating the vehicle.

- If a base-ejection projectile is being transported to a disposal facility, the longitudinal axis of the projectile will be oriented parallel to the rear axle and secured in place with sandbags. This will afford maximum protection for the personnel operating the vehicle.

- MEC with exposed hazardous fillers, such as HE, will be placed in appropriate containers with packing material to prevent migration of the hazardous fillers. Padding will be added to protect the exposed filler from heat, shock, and friction.

8.1.2. Manifesting and Placards

Placards with applicable hazard symbols will be placed on vehicles during transport of hazardous materials. CARA will prepare and maintain transportation documentation. Procedures for transporting RCWM are covered in Chapter 9 of this CSS.

8.1.3. Off-Site Selection

Most conventional MEC will be BIP. Conventional MEC may also be transported to ECM 8208 awaiting final disposition or the OB/OD area for final disposition.

8.1.4. On-Site Disposal Facility

An disposal facility on MSFC-003-R-01 will not be maintained.

8.2. EMERGENCY RESPONSE

8.2.1. Incident Containment and Controlling of Hazardous Waste

In the event of an emergency involving conventional MEC, the on-site team will perform initial emergency response in coordination with the USAESCH OESS. In the event of an emergency involving HTW, the onsite team will perform the required emergency response.

8.2.2. Hazardous Material Reporting

The CARA SUXOS will immediately notify the USAESCH Project Manager with the specifics of any HTW spill onsite (i.e. type of spill, materials spilled, quantity, location, etc.). The RSA Site Manager will notify the RSA Site Manager. If it is determined that the spill qualifies for off-site notification, the proper authorities will be notified by the RSA Site Manager.

8.2.3. Military Explosive Ordnance Disposal (EOD) Participation

Based on previous intrusive activities and historical data, the probability of finding explosively configured CWM is low. During intrusive operations, military EOD Technicians will not be required to be at the site. If an explosively configured CWM item is found, work will cease and guidance will be given by the USAESCH OESS and CARA Supervisor as to how to commence operations. U.S. Army Fort Campbell EOD stationed out of U.S. Army Garrison – Fort Campbell, Kentucky is the closest EOD response team and are the most likely to respond if needed.

9.0 RCWM TRANSPORTATION PLAN SUMMARY

9.1. DISCOVERY AND TRANSPORT TO STORAGE

Any unknown liquid filled containers encountered during the construction footprint clearance will undergo an initial assessment by the CARA field team. Items suspected to contain an unknown liquid fill will be properly secured and transported to ECM 8211 by CARA. The items will be packaged in an approved container before being transported to the ECM. The transport vehicle will be inspected using DD Form 626. Pre-approved procedures will be executed to load the containers onto the transport vehicle. Tiedowns and bracing will be inspected to ensure containers are adequately secured. Utilization of approved transportation routes which are least disruptive to Installation operations will be closed to the public during movement. Transportation and custody documentation will be completed by CARA Personnel.

9.1.1. Packaging

The CARA personnel will package the items into approved containers (i.e., MRC or prop charge can for transportation to the ECM.

9.1.2. Manifesting

RCMD, as the shipping agent, is responsible for manifesting the RCWM in compliance with existing rules and regulations

9.1.3. Vehicle Placards

Placards with applicable hazard symbols will be placed on vehicles during transport of items with an unknown liquid fill, RCWM or other hazardous materials.

9.2. OFF-SITE TRANSPORTATION

At this time, CARA will not be conducting any off site transportation of RCWM.

9.3. ON-SITE DISPOSAL

At this time, procedures do not call for the use of the Explosive Destruction System or the MMAS for operations at MSFC-003-R-01.

10.0 ENGINEERING CONTROL SUMMARY

10.1. INTRODUCTION

Based off of previous intrusive operations and historical data, the item of interest is the 4.2-inch chemical-filled mortar which has a 1% Lethality Distance of 171 feet. CARA will utilize this as the EZ distance until further operations require a change to the CSS.

10.2. ENGINEERING CONTROL STRUCTURE

Intrusive operations will not require the use of an engineering control structure.

10.3. CHEMICAL AGENT FILTRATION SYSTEM

Intrusive operations will not require the use of a CA filtration system.

10.4. EVACUATION AND SHELTER-IN-PLACE

No occupied building or ongoing operations are present inside the EZs. Prior to intrusive activities commencing, the public will be evacuated outside the PAED. In the event that there is a release of CA within MSFC-003-R-01, the chemical plume will not exceed the boundaries of RSA. If during further intrusive operations, an item is found that will change the EZ established in this CSS, the CSS will be amended and public notice and shelter-in-place plans will be implemented, as required.

11.0 POST RECOVERY ASSESSMENT ACTIVITIES SUMMARY

11.1. INTRODUCTION

If an item with an unknown filler is found at MSFC-003-R-01 during construction footprint clearance activities, it will undergo an initial assessment and the potential effects of the items will be mitigated prior to conducting post-recovery assessment. This section summarizes the assessment activities, and types of engineering controls used during post-recovery assessment.

NOTE: The 8200 Block, EDS and MMAS operations are being sited under the *Explosive Destruction System (EDS) Assessment and Storage Complex at RSA 8200 Block Site Plan* and upon approval by DDESB will prevail over this CSS.

11.2. ASSESSMENT

Following the discovery of an item with an unknown filler, CARA will determine the risk of movement and temporary storage of that item. If the item is not acceptable to be moved/stored, it will be secured, appropriately covered, and guarded until the appropriate action for can be determined. If the item is found acceptable to be moved/stored, it will be appropriately packaged and transported to the ECM. Following the recovery of items with an unknown fill, the MMAS may be deployed to the site to assess the unknown liquid filled items. When a treatment system is approved, a CSS specific to that equipment will be required. In addition, an amendment to this CSS may be required to address how the system will be used. A preoperational survey will normally be conducted prior to the start of treatment operations; exceptions will be approved by the Stakeholders. The Stakeholders may decide to ship the item off site for destruction and treatment. If shipment off site is determined to be the preferred operation, a Transportation Plan that includes the roles and responsibilities of agencies involved in the movement will be prepared by RCMD.

11.3. ASSESSMENT TECHNOLOGY

Equipment used in the assessment process may include an MMAS and the PINS. The MMAS is system designed to provide detailed information on the contents of recovered but unidentified munitions (especially those that may contain CA). Using highly sophisticated non-intrusive detection equipment—including x-ray—and onboard computers, MMAS greatly reduces the risk to public, military, and emergency workers during the assessment process.

The PINS is a method that allows identification of elements within a closed munition without opening the munition. A neutron source placed near the item being analyzed provides neutrons that penetrate the shell of the munition and interact with the contents. A gamma ray detector monitors the energies and intensities of gamma rays emitted as a result of the neutron interactions. The presence and relative concentration of specific chemical elements are determined based on characteristic gamma ray peaks in the energy spectrum so recorded. Information gathered using the PINS allows interpretation of the contents of sealed containers.

12.0 REFERENCES

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APPENDIX A

FRAGMENTATION DATA REVIEW FORM

Fragmentation Data Review Form

Database Revision Date 8/21/2014

Category:	Chemical, WP, & Incendiary Rounds
Munition:	4.2 in M2/M2A1 (Chemical)
Case Material:	Steel, Mild
Fragmentation Method:	Naturally Fragmenting
Secondary Database Category:	Chemical Round
Munition Case Classification:	Extremely Heavy Case

DODIC:	C703
Date Record Created:	3/3/2009
Record Created By:	SDH
Last Date Record Updated:	4/15/2014
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	Tetryl
Explosive Weight (lb):	0.143
Diameter (in):	4.2000
Cylindrical Case Weight (lb):	11.24183
Maximum Fragment Weight (Intentional) (lb):	0.0782
Design Fragment Weight (95%) (Unintentional) (lb):	0.0096
Critical Fragment Velocity (fps):	805

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	129
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	1000
MFD-V [Maximum Fragment Distance, Vertical] (ft):	757

Overpressure Distances

TNT Equivalent (Pressure):	1.07
TNT Equivalent Weight - Pressure (lbs):	0.153
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	10
Public Traffic Route Distance (2.3 psi); K24 Distance:	13
Inhabited Building Distance (1.2 psi), K40 Distance:	21
Intentional MSD (0.0655 psi), K328 Distance:	175

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

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1.07
TNT Equivalent Weight - Impulse (lbs):	0.153
Kinetic Energy 10^6 (lb-ft²/s²):	0.0254
Single Sandbag Mitigation	
Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted
Double Sandbag Mitigation	
Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted
Water Mitigation	
Minimum Separation Distance (ft):	Not Permitted
Water Containment System:	Not Permitted

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

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	2.27	1.08
Mild Steel:	0.19	0.08
Hard Steel:	0.15	0.07
Aluminum:	0.38	0.17
LEXAN:	2.57	1.54
Plexi-glass:	1.44	0.73
Bullet Resist Glass:	1.15	0.54

Item Notes

This item is based on the 4.2 in M2 with Mustard fill of approximately 6 lbs. Heavier weights of fill should reduce the fragmentation distance. Fill weights less than 6 lbs would require a new analysis.

APPENDIX B

AHAs

AHAs are provided in the APP (Appendix D of the Work Plan).

APPENDIX C

D2PC OUTPUT AND PARAMETERS

```
      ----------------------------------------
      | DOWNWIND HAZARD PROGRAM D2PC V2.0.4 |
      ----------------------------------------
  TYPE ? FOR DEFINITIONS


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


2. LOCATION              LOC
    AAD   ANNISTON ARMY DEPOT
    DPG   DUGWAY PROVING GROUND AND TOOELE ARMY DEPOT
    EWA   EDGEWOOD AREA,APG
    JHI   JOHNSTON ISLAND
    LBG   LEXINGTON-BLUE GRASS ARMY DEPOT
    NAP   NEWPORT AMMUNITION PLANT
    PBA   PINE BLUFF ARSENAL
    PAD   PUEBLO ARMY DEPOT
    RMA   ROCKY MOUNTAIN ARSENAL
    UAD   UMATILLA ARMY DEPOT
    EUR   USAEUR
    NDF   NOT DEFINED
INPUT:NDF


4. HEIGHT OF MIXING LAYER      HML
INPUT:760
```

5. MUNITION TYPE MUN

105 105-MM CARTRIDGE,M60,M360

155 155-MM PROJECTILE,M110,M121A1

8IN 8-INCH PROJECTILE,M126

500 500-LB BOMB,MK94

750 750-LB BOMB,MC-1

M55 115-MM ROCKET,M55

525 525-LB BOMB,MK116

139 BOMBLET,M139

M23 LAND MINE,M23

4.2 4.2-INCH CARTRIDGE,M2A4

TON TON CONTAINER

TMU TMU-28/B SPRAY TANK

NON NON MUNITION

INPUT:4.2

6. AGENT TYPE AGN

GA TABUN H1 HN-1,NITROGEN MUSTARD

GB SARIN H3 HN-3,NITROGEN MUSTARD

GD SOMAN HT 60% HD & 40% T

GF EA 1212 LL LEWISITE

VX EA 1701 AC HYDROGEN CYANIDE

BZ INCAP AGENT CG PHOSGENE

HY HYDRAZINE CK CYANOGEN CHLORIDE

UD UDMH DM ADAMSITE

HD DISTILLED MUSTARD EG ETHYL GB

QL ESTER DF DIFLURO

DC DICHLORO TC THIONYL CHLORIDE

PR PYRIDINE IP ISOPROPANOL

ZS ETHANOL KB AMINE

NA NOT AN AGENT

INPUT:HD

8. RELEASE TYPE REL

INS INSTANTANEOUS(EXPLOSIVE)

EVP EVAPORATION FROM A PUDDLE FORMED BY A SPILL

SEM UNIFORM RELEASE FOR AFINITE TIME

VAR SOURCE DEFINED AS A NUMBER OF UNIFORM RELEASES(MAX 6)

STK RELEASE OF HEATED EFFLUENT FROM STACK

STJ RELEASE FROM STACK WITH JET EFFECT

FLS FLASH FIRE FROM GROUND LEVEL

FIR FIRE BURNING FOR FINITE TIME

IGL M55 IGLOO FIRE

EVS EVAPORATION IN STILL AIR

INPUT:INS

9. STABILITY TYPE STB

A VERY UNSTABLE

B UNSTABLE

```
    C    SLIGHTLY UNSTABLE

    D    NEUTRAL

    E    SLIGHTLY STABLE

    F    STABLE

    U    UNDEFINED

    S    SELECT(PASQUILL)

    W    WOODS

INPUT:D


10. WINDSPEED (M/SEC)          WND

INPUT:1

BRT=25. DI=    2.0   100.0   150.0


  SURFACE

12. TEMPERATURE (DEG C)        TMP

INPUT:DF 95

DEG F TO DEG C .350E+02


22. TIME AFTER FUNCTIONING (MIN)  TIM

INPUT:60

ALL OTHER INPUT

ALL



 1 MUN:4.2  AGN:HD  REL:INS  WND= 1.0(M/S)  TMP=35.0(C)  NDF-   STB:D
```

Q(MG)	TS(MIN)	HTS(M)	HML(M)	SXS(M)	SYS(M)	SZS(M)	
1.421E+06	8.00E-02	0.00E+00	7.60E+02	3.80E+00	3.80E+00	2.00E-01	D

52. (M) IS DISTANCE TO 1% LETHALITY

64. (M) IS DISTANCE TO NO DEATHS

349. (M) IS DISTANCE TO NO EFFECTS

ALL OTHER INPUT

APPENDIX L
RISK ASSESSMENT WORK PLAN

Not Used