US Army Corps of Engineers®

EP 75-1-2
01 August 2004

MUNITIONS AND EXPLOSIVES OF CONCERN (MEC) SUPPORT DURING HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW) AND CONSTRUCTION ACTIVITIES

ENGINEER PAMPHLET

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DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

EP 75-1-2

CEMP-CE

Pamphlet
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Explosives

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1. Purpose. This pamphlet provides U.S. Army Corps of Engineers (USACE) personnel with procedural guidance, technical specifications, personnel and training requirements, and health and safety criteria for Munitions and Explosives of Concern (MEC) support during HTRW and construction activities.

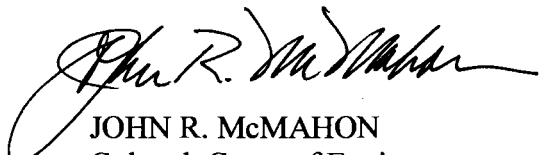
2. Applicability. This pamphlet applies to all Headquarters, U.S. Army Corps of Engineers (HQUSACE) elements, USACE Major Subordinate Commands (MSCs), USACE geographic districts, and field operating activities having responsibilities for civil works and/or military programs with HTRW-related and construction projects that have the potential for encountering MEC. The MEC support requirements presented in this pamphlet are applicable to anomaly avoidance activities conducted during HTRW activities, standby MEC support during construction activities, and subsurface removal of MEC during construction activities. Guidance presented in this pamphlet is consistent with policy in ER 385-1-95. Contact the Military Munitions Center of Expertise (MM CX) for additional information.

3. Distribution Statement. Approved for public release; distribution is unlimited.

4. References. Required and related references are at Appendix A.

5. Explanation of Acronyms and Terms. Acronyms and special terms used in this pamphlet are explained in the glossary.

FOR THE COMMANDER:



JOHN R. McMAHON
Colonel, Corps of Engineers
Chief of Staff

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This pamphlet supersedes EP 75-1-2, dated 20 November 2000.

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CHAPTER 1

Introduction

1-1. General. This Engineer Pamphlet (EP) presents procedures for providing Munitions and Explosives of Concern (MEC) support during Hazardous, Toxic, and Radioactive Waste (HTRW) and construction activities. MEC support activities include: anomaly avoidance activities conducted during HTRW activities; standby MEC support during construction activities; and subsurface removal of MEC during construction activities.

a. During the investigative/design phase of any project on a site known or suspected to contain MEC, provisions for MEC support will be included. MEC support refers to anomaly avoidance techniques implemented to avoid any potential surface MEC and any subsurface anomalies. The U.S. Army Corps of Engineers (USACE) primarily implements anomaly avoidance procedures on HTRW sites. Intrusive anomaly investigation is not authorized during anomaly avoidance activities. Although the examples of anomaly avoidance techniques in this EP pertain to HTRW-related activities, the procedures may be modified to address other types of activities, as appropriate. For additional information on anomaly avoidance techniques, contact the Military Munitions Center of Expertise (MM CX). See Chapter 5 for a discussion on anomaly avoidance procedures to be used during HTRW activities and Chapter 6 for MEC support during construction activities.

b. MEC support during construction activities, including the remediation phase of an HTRW project, on a site with known or suspected MEC may include only MEC standby support or may require a subsurface removal response. As described in Chapter 12 of DOD 6055.9 STD, the level of MEC support required during construction activities is dependent on the probability of encountering MEC. Contact the MM CX for guidance and assistance in determining the level of support.

(1) If the probability of encountering MEC is low (e.g., current or previous land use leads to an initial determination that MEC may be present), only MEC standby support will be required. MEC standby support is discussed in paragraph 6-6 of this document.

(2) When a determination is made that the probability of encountering MEC is moderate to high (e.g., current or previous land use leads to a determination that MEC was employed or disposed of in the area of concern), Unexploded Ordnance- (UXO-) qualified personnel must conduct a subsurface removal for the known construction footprint and remove all discovered MEC.

(3) The level of effort for construction support is site/task-specific and will be determined on a case-by-case basis by the project delivery team (PDT).

c. If MEC is encountered after initiation of an HTRW or construction project where MEC support has not been instituted, the procedures published in this EP will apply.

d. The MM CX will determine procedures for sampling and cleanup of Munitions Constituents (MC) contaminated with primary explosives on a case-by-case basis. The HTRW Design District is responsible for the design and removal or remedial action to clean up soils contaminated with secondary explosives. Refer to ER 1110-1-8153 for definitions of primary and secondary explosives. Contact the MM CX for the latest procedures to be used for MC sampling.

1-2. Responsibilities.

a. All USACE personnel involved with the Military Munitions Response Program are responsible for safely executing military munitions response projects, including MEC support during HTRW and construction activities, in accordance with applicable laws, regulations, and policies. A detailed discussion of USACE organizational responsibilities for military munitions response projects is presented in ER 1110-1-8153. Safety and health requirements, responsibilities, and procedures for MEC operations (response actions and any other MEC activity) are defined in ER 385-1-95.

b. All USACE organizations will ensure that all personnel with authorized access to the site for MEC support during HTRW and construction activities are familiar with, and have access to, copies of the accepted Work Plan and Accident Prevention Plan/Site Safety and Health Plan (APP/SSHP). In addition, each organization will ensure that such personnel receive the appropriate training, medical surveillance, and personal protective equipment (PPE) required by the safety plan, contract specifications, Occupational Safety and Health Administration Standards, USACE regulations, and applicable Department of Defense (DOD) and Department of the Army (DA) regulations.

1-3. Functional Roles. The following section provides a description of the functional roles for MEC support activities. A more comprehensive description of the functional roles for the organizations discussed below is also provided in ER 1110-1-8153.

a. Headquarters, U.S. Army Corps of Engineers (HQUSACE). If an Explosives Safety Submission (ESS) is required for MEC support activities, it will be reviewed and approved by the MM CX acting for HQUSACE.

b. Major Subordinate Command (MSC). If an ESS is required for MEC support activities, it will be monitored by an MSC in accordance with ER 1110-1-8153.

c. District. A district will:

(1) Execute MEC support activities.

(2) Assign a Project Manager (PM) to lead the PDT, coordinate all project activities, serve as a liaison with other stakeholders, and review/approve project documents as required.

(3) Conduct MEC support activities with either in-house resources or by contract.

(4) Coordinate the MEC support project with the MM CX.

(5) Prepare a project-specific Statement of Work (SOW) and Independent Government Estimates (IGE) for MEC support activities.

(6) Submit plans developed for MEC support activities to the MM CX. All MEC concerns will be addressed before initiating any on-site activities.

(7) If an ESS is required, review the ESS and provide comments and written concurrence or nonconcurrence.

(8) Supervise the fieldwork. MEC operations will be supervised by UXO-qualified personnel as defined in ER 385-1-95.

(9) Conduct appropriate quality verification activities.

(10) Coordinate requests for explosives ordnance disposal (EOD) support from the 52nd Ordnance Group (EOD) with the MM CX.

(11) Coordinate with the appropriate Military Munitions Design Center (MM DC), as necessary.

d. MM DC. If an ESS is required for planned MEC support activities at a site, the appropriate MM DC will ensure its proper planning and preparation. The MM DC provides construction support/MEC support as defined by the district.

e. MM CX. The MM CX will:

(1) Review and provide comments and written concurrence or nonconcurrence on MEC support-related products (e.g., SOW, Work Plan, and ESS) to ensure compliance with Federal, DOD, DA, and USACE MEC safety and environmental regulations.

(2) Provide MEC technical support to any USACE office conducting construction and/or HTRW operations in areas where MEC is suspected or known to exist.

(3) Develop and/or approve MEC-specific contract requirements, including military munitions response contractor personnel qualifications and work standards, for contract acquisition.

(4) Assimilate and analyze lessons learned from MEC support projects and provide them to the HTRW CX for inclusion in the USACE lessons learned database.

(5) Coordinate support with the 52nd Ordnance Group (EOD) in accordance with the Memorandum of Agreement between the U.S. Army Engineering and Support Center, Huntsville (USAESCH) and the 52nd Ordnance Group (EOD).

(6) Coordinate the review and approval of an ESS (if required) with the U.S. Army Technical Center for Explosives Safety, and the Department of Defense Explosives Safety Board (DDESB).

(7) Provide construction support/MEC avoidance to districts as requested.

f. OE Safety Specialist. If a subsurface removal response is being conducted in support of construction activities, an OE Safety Specialist will be present to provide safety oversight. Otherwise, an OE Safety Specialist is generally not required on-site. Additional information on the requirements for when an OE Safety Specialist is required on site is available in ER 385-1-95.

CHAPTER 2

Statement of Work/Independent Government Estimates

2-1. Introduction. This chapter provides guidance on preparing an SOW and IGE for MEC support during HTRW and construction activities. The district is responsible for executing the SOW and IGE for MEC support activities.

2-2. SOW.

a. General. Safety and health are overriding concerns during MEC support project design and execution. The MM CX safety personnel are points-of-contact (POCs) for MEC safety issues and have particular, specialized expertise in identifying, interpreting, and implementing applicable safety requirements for military munitions response to MEC projects. Each SOW for MEC support activities must be closely coordinated with these personnel.

b. Preparation.

(1) The PM along with the PDT is responsible for preparing the SOW required for MEC support activities in conjunction with HTRW or construction activities. The MM CX may be consulted to provide the appropriate statements or paragraphs concerning background and authority for the task order or contract award.

(2) Appendix B provides an example SOW for anomaly avoidance during HTRW activities on sites with known or suspected MEC. Appendix C provides an example SOW for MEC support during construction activities on sites with known or suspected MEC. The appropriate MEC support SOW may be used as an addendum to a larger SOW for an existing project. If the intrusive investigation of anomalies is deemed necessary, the SOW for MEC support during construction activities should be used.

(3) The examples provided in Appendices B and C should be followed to ensure that the applicable requirements (i.e., site visit, Work Plan preparation, MEC support procedures, quality control, reporting, and public affairs assistance) are included. The MM CX should assist in the drafting of SOW verbiage when MEC support is required for HTRW activities not specifically referenced in Appendix B or when construction activities other than those presented in Appendix C are proposed and MEC support is required.

(4) Neither of these examples contains provisions for a records search by the contractor to determine what types of MEC might be encountered. Districts should consider completing a records search to determine the probability for contact with MEC and the potential types and quantities before using the SOW in Appendix B or C.

c. Review Process. Following the preparation of the SOW by the PDT, the PM will submit copies to the MM CX for review. The MM CX will provide comments and written concurrence or nonconcurrence for the decision/approval authority. The MM CX will be allowed 15 calendar days from receipt of the SOW for this review. If no comments are received within this time frame, concurrence may be assumed by the executing agency.

2-3. Preparation of the IGE. Once the SOW is prepared, an IGE for anomaly avoidance during HTRW or construction activities is prepared. The structure of the cost estimate will vary depending on the contract type. The recommended USACE software programs to be used in preparing cost estimates are the Micro Computer-Aided Cost Engineering System (MCACES), Gold Version 5.3; MCACES for Windows; Lotus 123™ spreadsheets; or Excel™ spreadsheets. The cost estimator or project engineer may develop crew and productivity sheets for the various field activities or tasks in the SOW to determine the duration or number of hours for the various labor categories needed to support each task. The labor rates are burdened rates and reflect all contractor mark-ups. Materials, travel, and per diem are duration driven and are totaled separately from the labor. The materials estimated can be purchased, rented, or allocated to overhead.

CHAPTER 3

Planning Considerations for MEC Support

3-1. Introduction. This chapter discusses the requirements that must be addressed prior to initiating MEC support activities during HTRW and construction activities on sites known or suspected to contain MEC. The objective of MEC support activities is to conduct safe and efficient operations while limiting potential exposure to a minimum number of personnel for a minimum time and to the minimum amount of MEC.

3-2. Planning Documents. Site-specific planning documents that detail the methodologies that will be used during the MEC support project will be prepared. For anomaly avoidance activities, the planning document is the HTRW Work Plan. For MEC support during construction activities, the planning documents include the Work Plan and appropriate subplans and appendices (and an ESS, if required). For range construction projects (including target maintenance), the planning documents include plans and specifications (an ESS is not required). The planning documents will be prepared in accordance with the project SOW and contract requirements. The PDT will ensure that these documents are consistent with each other.

3-3. MEC Support Work Plan.

a. For anomaly avoidance and construction activities, a MEC Support Work Plan will be prepared to supplement the prime contractor's or USACE's Work Plan/Site Plan. The MEC Support Work Plan will be prepared in accordance with the project SOW and contract requirements.

b. Content. The MEC Support Work Plan does not need to be comprehensive, as it is a supplement to the overall site Work Plan. The MEC Support Work Plan will detail the management approach and operational procedures that will be used to complete the MEC support activity. The MEC Support Work Plan will indicate the specific geophysical instrument that the UXO team intends to use. The MEC Support Work Plan will include an APP/SSHP that specifically addresses MEC operations. The PDT will ensure that the MEC Support Work Plan and all appropriate subplans (e.g., APP/SSHP, ESS, etc.) are consistent.

c. The MEC Support Work Plan will be submitted by the contractor to the PM for review and comment by the PDT. The PM will then forward one copy to the MM CX. The MM CX will review and provide comments and written concurrence or nonconcurrence on

the planning documents containing MEC support provisions. The MM CX will be allocated 15 calendar days from the date of receipt for this review. If no comments are received from the MM CX within this time frame, concurrence will be assumed by the executing agency.

d. The accepted MEC Support Work Plan will serve as the contractual basis for all subsequent MEC activities. Current copies of the MEC Support Work Plan will be kept for reference by the PM, the contractor's senior site representative or safety manager, the UXO team, and the OE Safety Specialist (if required onsite). The accepted MEC Support Work Plan will be maintained in the district office.

e. For those sites where subsurface removal in support of construction activities is required, the MEC Support Work Plan will contain the appropriate subplans and appendices from the following list, based on the MEC support project requirements and information already contained in the overall Work Plan:

(1) Technical Management Plan.

(2) Explosives Management Plan.

(3) Explosives Siting Plan (ESP).

(4) Geophysical Prove-out Plan and Report.

(5) Geophysical Investigation Plan.

(6) Geospatial Information and Electronic Submittals.

(7) Work, Data, and Cost Management Plan.

(8) Property Management Plan.

(9) Quality Control (QC) Plan.

(10) Environmental Protection Plan.

(11) Investigative Derived Waste (IDW) Plan.

(12) Appendix – Task Order SOW.

(13) Appendix – Site Maps.

(14) Appendix – Local POCs.

(15) Appendix – APP/SSHP.

(16) Appendix – Munitions Constituents Sampling and Analysis Plan.

(17) Appendix – Contractor Forms.

(18) Appendix – Minimum Separation Distance (MSD) Calculation Sheets.

(19) Appendix – Resumes.

f. Modifications. Changes may be required to the MEC Support Work Plan and/or APP/SSHP after approval by the Contracting Officer. A modification that affects any MEC subsurface removal operational and/or safety procedure may also require a revision to and re-approval of the ESP and/or ESS.

3-4. ESP.

a. General.

(1) An ESP, a component of the MEC Support Work Plan, is prepared only for MEC support during construction activities where MEC removal is planned. The ESP will provide explosives safety criteria for planning and siting explosive operations. The ESP discusses the proposed MSDs for unintentional detonations, intentional detonations, and siting of critical project components. The ESP will describe the basis of design, all design calculations, and proposed hazard mitigation measures to be implemented to protect the public, non-project personnel, and site workers from explosive hazards. The ESP will be reviewed by the PDT to ensure that the appropriate MSD criteria have been applied.

(2) The ESP will discuss the following explosive operations: Munitions Response Areas (MRAs), explosives storage magazines, and planned or established demolition areas. The location of these explosives operations will be sited on a map with a scale of 1 inch equals 400 feet. A larger scale may be used if available and if a map using such a scale is not too large to be included in the Work Plan. A smaller scale is acceptable if distances can be accurately shown. If an unscaled map is used, the map must have labeled distances. The MSDs calculated for the operation will be discussed in the text of the plan and Quantity-Distance (Q-D) arcs for the above-listed project elements will be drawn on the map.

(3) Q-D. Explosives safety distance tables prescribe the necessary separations and specify the maximum quantities for various classes of explosives permitted in any one location. The Q-D tables provided in DOD 6055.9-STD reflect the acceptable minimum criteria for the storage and handling of various classes and amounts of explosives. These distances will be used for siting storage locations. The project will site Open Burn/Open Detonation areas in accordance with EP 1110-1-17.

b. MRAs. During intrusive operations (i.e., operations that involve or result in the penetration of the ground surface at an area known or suspected to contain MEC. See EP 1110-1-18 for additional details), the MSD will be determined using two sets of criteria. The first set of criteria has been established for unintentional detonations (i.e., not planned in advance), and the second set of criteria has been established for intentional detonations (i.e., planned, controlled detonations). Details on calculating MSDs are published in EM 1110-1-4009.

(1) Unintentional Detonations. For an unintentional detonation, the applicable MSDs are the MSDs for unintentional detonations and the team separation distance (TSD). The MSD for unintentional detonations is the minimum distance that non-essential personnel and the public must be separated from intrusive operations. The TSD is the minimum distance that project teams must be separated during intrusive operations.

(2) Intentional Detonations. The MSD for intentional detonations is the distance that both project personnel and the public must be from the intentional detonation.

c. Explosives Storage Magazines.

(1) The ESP will provide the following information on explosives storage magazines:

(a) Type(s) of magazines used (e.g., Bureau of Alcohol, Tobacco, and Firearms (ATF) classification, portable, commercial, above ground, shed, earth covered, etc.). See DOD 6055.9-STD for further information and definitions on the types of magazines to be used for explosives storage.

(b) Net Explosive Weight (NEW) and hazard division to be stored in each magazine. Generally, recovered MEC is considered Hazard Division 1.1. See 6055.9-STD for further information and definitions on Hazard Divisions.

(c) Q-D criteria used to site the magazine.

(d) Design criteria for any proposed engineering controls to be used to mitigate exposures to the public when Q-D criteria cannot be met.

(2) Magazines must also be properly placarded, and the property must be secured. DOD magazines storing explosives must have the appropriate fire fighting symbol or locally required DOD Hazard Classification assigned. Additional details on how explosives must be stored and secured are published in EP 1110-1-18.

d. Planned or Established Demolition Areas. The MSDs for these areas will be based on the MSD criteria for intentional detonations.

e. Footprint Areas. The following footprint areas will be discussed in the ESP: blow-in-place, collection points, and in-grid consolidated shots. These areas, however, do not have to be shown on the site map. The MSDs for these footprint areas are described in the following paragraphs.

(1) Blow-in-Place. Blow-in-place is the preferred method for disposal of MEC. Blow-in-place occurs when a MEC is prepared for detonation and detonated in-place. The MSD for blow-in-place areas will be determined using the MSD criteria for intentional detonations.

(2) Collection Points. Collection points are areas where recovered MEC that is acceptable to move is temporarily accumulated within a search grid pending relocation to another area for storage or destruction. Collection points will be limited to the amount of explosives such that the K50 total of the rounds to be destroyed will not exceed the MSD. (The K value is the safety factor used in determining the MSD for unintentional detonations. See DOD 6055.9-STD for additional details on the establishment of K values.) The MSD for collection points will be determined using the MSD criteria for unintentional detonations.

(3) In-Grid Consolidated Shots. In-grid consolidated shots occur when recovered MEC that is acceptable to be relocated is collected and destroyed within a search grid. In contrast to an established demolition ground, consolidated shots occur within a search grid rather than in a separate area. The procedures for in-grid consolidated shots are presented in the USAESCH document titled “Procedures for Demolition of Multiple Rounds (Consolidated Shots) on OE Sites.”

f. Exceptions. The calculated MSDs for unintentional detonations specified above are considered minimums for execution of normal operations. When site conditions exist that make it impossible or impractical to comply with these minimums, the PM may request consideration of a possible reduction. Any request for a reduction of these MSDs will be

staffed through the MM CX for calculation. This information will be forwarded to the PM, who will forward it to the District Safety Office for a decision concerning the reduction of the exclusion area. For any requested reduction to the specified MSDs for unintentional detonations, a detailed hazard analysis, which explains why these reductions are necessary and acceptable, must be documented.

3-5. Conventional ESS.

a. ESS.

(1) The purpose of the ESS is to ensure that all applicable DOD and DA regulations regarding safe and secure handling of military munitions are followed.

(2) Intrusive activities cannot commence until the DDESB approves the ESS and the contractor has been directed to incorporate changes resulting from ESS approval into the MEC Support Work Plan. A copy of the approved ESS will be maintained at the project site. All operations will be executed in accordance with the approved ESS.

(3) Detailed guidance on the preparation and approval process associated with the ESS may be found in EP 385-1-95b and DDESB's "Memorandum Guidance for Clearance Plans."

b. Construction support involving removal of MEC in the construction footprint will require submittal and approval of an ESS. An ESS is not required for standby construction support or anomaly avoidance. The ESS will be tailored to meet site-specific requirements.

c. When an element of the approved ESS changes, the ESS must be changed. The contractor shall prepare the proposed change and forward it to the PM, who will forward it to the MM CX for review. The MM CX will forward the proposed changes to the appropriate agency for approval. For a change that specifies less restrictive requirements (e.g., reduction in the exclusion zone), the contractor shall comply with the accepted ESS until the change is approved. When the proposed changes would result in more restrictive requirements (e.g., increase in the exclusion zone), the contractor shall apply the more restrictive measures immediately during the ESS change approval process.

3-6. Personnel Qualifications and Work Standards. USACE has set forth personnel standards applicable to all UXO personnel working for USACE. These qualifications and standards, which detail the educational and experience requirements for UXO personnel, are available in EP 1110-1-18.

3-7. Training. USACE and contractor personnel shall be in compliance with training requirements prior to conducting MEC support activities. Training requirements are published in EP 1110-1-18. The training topics included in EP 1110-1-18 pertain to 29 CFR 1910, 29 CFR 1926, Initial Training, Refresher Training, Cardiopulmonary Resuscitation (CPR)/First Aid, Medical Surveillance, Visitor Training, and Blood Borne Pathogen training. Additional training information is contained in ER 385-1-95.

3-8. Explosives Safety. There are no "safe" methods for dealing with MEC, merely procedures and process controls that are designed to reduce potential hazards. Maximum safety in conducting any MEC operations can be achieved through adherence to applicable safety precautions, a planned approach, intensive supervision, and MEC safety oversight. UXO-qualified personnel will conduct a site safety briefing prior to commencing operational activities each workday. All activities with potential exposure to MEC will be reviewed to identify the associated risks and appropriate mitigation procedures. Operations within areas suspected of containing MEC must be conducted in a manner that exposes a minimum number of people to the smallest quantity of explosives for the shortest period of time.

a. General Safety Considerations.

(1) General safety considerations applicable to personnel, both essential and non-essential, at project sites where MEC may be encountered include:

(a) Do not carry fire or spark-producing devices.

(b) Do not conduct explosive or explosive-related operations, without approved procedures, proper supervision, and MEC standby support.

(c) Do not become careless by reason of familiarity with MEC or the reported probability level of MEC.

(d) Do not conduct explosive or potentially explosive operations during inclement weather.

(e) Avoid contact with MEC except during MEC removal conducted during construction activities.

(f) Conduct MEC-related operations during daylight hours only.

(g) Employ the "buddy system" at all times.

(2) EP 385-1-95a provides additional considerations for safety at project sites where MEC may be encountered.

b. Activity Hazard Analysis.

(1) Activity Hazard Analyses will be performed in accordance with EM 385-1-1. Activity Hazard Analyses will be conducted by personnel who are knowledgeable with respect to MEC safety standards and requirements. These personnel must understand the specific operational requirements and hazard analysis methodologies. A hazard analysis will be performed for each activity to determine the significance of any potential explosive-related hazards. For example, residual explosives from ordnance fillers may be exposed during an HTRW sampling activity. Explosive residues may be in the form of powder or various granular and powder-based pellets. These contaminants can enter the body through the skin or by ingestion if proper personal hygiene practices are not followed. Explosive fillers such as white phosphorus are dangerously reactive in air and acute exposure can result in serious injury to the skin, eyes, and mucous membranes. They are also a fire hazard.

(2) Safety requirements (or alternatives) that will either eliminate the identified hazards or control them to reduce the associated risks to an acceptable level will be developed. The adequacy of the operational and support procedures that will be implemented to eliminate, control, or abate identified hazards or risks will then be evaluated and a second risk assessment completed to verify that a satisfactory safety level has been achieved.

c. Hazards of Electromagnetic Radiation to Ordnance.

(1) Some ordnance items and other electro-explosive devices (EEDs) are particularly susceptible to electromagnetic radiation (EMR) in the radio frequency (RF) range originating from devices such as radio, radar, and television transmitters. The presence of antennas and communication and radar devices will be noted on initial site visits and/or preliminary assessments of eligibility. In addition, active and passive subsurface detection devices emit EMR/RF. Each type of equipment producing EMR/RF must be reviewed and a hazard analysis completed. The level of EMR/RF susceptibility and potential hazard is a result of the design and type of MEC or EED that may be present. Therefore, a knowledge of what MEC is normally unsafe in the presence of EMR/RF is important so that preventive steps can be taken if such MEC is encountered. The MM CX will be consulted when geophysical investigations are planned in areas potentially containing electric-fuzed ordnance.

(2) As part of the hazard analysis, the MSD between an EMR/RF emitting device and potential EEDs will be calculated. This calculation is based on the characteristics of the transmitting device and the potential EEDs. The important characteristics of the EMR/RF source device include:

(a) The transmitter frequency (f, in MHz).

(b) The peak envelope transmitting power (Pt, in W).

(c) The transmitter gain (GdB).

(3) Minimum safe distances from EMR/RF sources are listed in Tables 2-2, 2-3, and 2-4 of TM 9-1375-213-12.

3-9. PPE.

a. All UXO team members will be trained in the use of, medically qualified for, and physically able to wear the prescribed PPE. PPE for MEC support operations will be determined by site-specific and task-specific analyses, documented in the APP/SSHP, and worn as indicated in the plans. Specific requirements for PPE are described in the following paragraphs.

(1) PPE will comply with the most stringent requirements of EM 385-1-1 and the applicable portions of 29 CFR 1910 Subpart I or 29 CFR 1926 Subpart E.

(2) Footwear. In addition to the applicable requirements in the references cited above, shoes or boots with high traction soles and ankle protection will be used. During geophysical detection activities, UXO personnel will not wear safety shoes or other footwear that would cause interference with instrument operations.

(3) Clothing. Short sleeve shirts and long pants are considered the minimum clothing suitable for MEC operations and will be worn at all work sites, unless variations are described, analyzed, and documented in the accepted APP/SSHP.

(4) Head Protection. Personnel working in or visiting designated hardhat areas will be required to wear head protection meeting ANSI Z89.1 standards. Hardhat areas for MEC operations will not be designated unless the activity hazard analysis shows a possible overhead hazard.

b. UXO personnel using PPE will be knowledgeable of the limitations of the selected PPE as well as the reduced performance levels the equipment might impose on them when they are conducting assigned tasks.

3-10. Fire Prevention.

a. Fire prevention awareness is especially important in areas with known or suspected MEC. Smoking will be permitted only in controlled areas where all combustibles (e.g., vegetation, fuel cans, sampling supplies) have been removed or sufficient firebreaks have been established. Personnel may attempt to extinguish minor fires with fire extinguishers if they are trained to do so safely without endangering themselves or others within the vicinity of the fire.

b. If a fire becomes uncontrollable or extends into areas that may contain MEC, all personnel must immediately suspend any fire fighting efforts and retreat to a safe distance, which is at least the maximum fragment distance of the military munition with the greatest fragmentation distance (MGFD), (i.e., the military munition with the greatest fragmentation distance that might be recovered as a result of previous training activities based on historical information). Personnel will retreat upwind of the fire. The senior UXO-qualified person present will then lead an immediate evacuation of the area using available resources to ensure the safety of all personnel.

3-11. Emergency Procedures. MEC operations may result in accidents or incidents, regardless of the safeguards implemented. The APP/SSHP will describe site-specific emergency response procedures, including identification of all appropriate POCs. All personnel must be briefed on the emergency response procedures and protocols discussed in the APP/SSHP.

a. Contingency Plan. A contingency plan will be developed if anomaly avoidance is going to be conducted, to detail the procedures that will be used in the event that munitions with unknown fillers and/or Recovered Chemical Warfare Materiel (RCWM), unusual odors, or discolored soil are encountered. The contingency plan will be initiated if munitions with unknown fillers and/or RCWM, unusual odors, or discolored soil is encountered or site personnel exhibit symptoms attributable to a chemical exposure (i.e., respiratory irritation and/or skin irritation).

b. Emergency Response. In the event of a MEC-related emergency on-site during anomaly avoidance, the senior UXO-qualified person present will direct the course of action until the local POC designated in the Work Plan has been notified. In the event of a MEC-

related emergency on-site during construction support, the Senior UXO Supervisor (SUXOS) will direct the course of action until the local POC designated in the Work Plan has been notified. It may be necessary for other on-site personnel to provide assistance. If an emergency response rescue operation is required, no one will reenter the accident area until the hazards of the situation have been assessed by the responsible individual (see above), and all required resources are on-hand to complete the rescue without jeopardizing the safety of rescue personnel.

c. Emergency Rescue. The senior UXO-qualified person or the local POC, as applicable, will direct any MEC-related emergency response rescue operation. Response considerations include the following elements:

(1) Designation of an emergency response vehicle(s) to remain on-site during rescue operations.

(2) Determination of existing hazards, as well as the potential for additional hazards.

(3) Notification of local officials.

(4) Coordination with USACE in the review of the need to alert the local community and/or subsequent coordination with installation or other customer's Public Affairs Office.

(5) Assessment of the situation and condition of any victims.

(6) Determination of the resources needed for victim stabilization and transport and additional emergency support.

(7) Enforcement of the "buddy system". No one will be permitted to enter a rescue area alone.

(8) Oversight of the removal of injured personnel from the area.

(9) Consultation with on-site safety officers to establish decontamination protocols. Decontamination of injured parties will be accomplished after stabilization of their medical conditions. Decontamination need not be accomplished if the victim's condition is poor and if the decontamination process may cause an immediate threat or additional injury to the victim. If contamination is suspected, the victim will be wrapped in material that will prevent the spread of contamination during extraction and transport. Emergency medical personnel will be advised of potential injuries, as well as potential contamination, of the patient as early

as possible. The patient will not be transported to a medical facility without prior notification of, and coordination with, the receiving facility regarding potential contamination.

d. Mishap Reporting and Investigation Requirements. The following information provides guidelines to be followed for reporting explosive mishaps on MEC support projects. Site-specific reporting and investigation procedures, including identification of appropriate POCs, will be included in the APP/SSHP.

(1) Reporting Requirements. All mishaps shall be investigated by the contractor and reported to the Contracting Officer and OE Safety Specialist or to the government authority cited in the SOW. Notification and reporting of mishaps will be in accordance with USACE Supplement 1 to AR 385-40 and EM 385-1-1. Any mishap will be reported on ENG Form 3394, Accident Investigation Report.

(a) For anomaly avoidance and standby support projects on Formerly Used Defense Sites (FUDS), the senior UXO-qualified person on-site is responsible for mishap reporting. For subsurface removal projects in support of construction activities at FUDS, the contractor's UXO Safety Officer (UXOSO) is responsible for mishap reporting. For contracts under the supervision of the district, mishaps will be reported to the district safety office. An information copy of the accident report will be forwarded to the MM CX. USACE district personnel will report through command channels to the HQUSACE Safety and Occupational Health Office.

(b) On active installations, the installation safety officer is responsible for reporting any explosive mishaps.

(c) RCWM Incidents. Chemical event reports are required to be submitted in accordance with AR 50-6. Reporting requirements are identified in EP 75-1-3. A site-specific POC will be identified and documented in accordance with the reporting requirements listed above.

(2) Investigation Requirements. In the event of a mishap, the contractor shall implement emergency procedures and secure the scene to keep unauthorized persons away for their protection and to preserve the evidence for the subsequent mishap investigation. On active installations, the U.S. Army Safety Center (USASC) maintains the prerogative to investigate Class A or Class B explosive mishaps (as defined in AR 385-40). If USASC chooses to investigate, it is the lead agency. If USASC chooses not to investigate, then the district is the lead agency.

3-12. Hazardous Waste Manifest.

a A hazardous waste manifest (EPA Form 8700-22) is required when transporting MEC over pubic roads. Information guidance on the hazardous waste manifest is provided in 49 CFR 172.205 and 40 CFR 262.20.

b Government personnel who are tasked to certify MEC on hazardous waste manifests will be trained in accordance with the requirements of DOD 4500.0-R, Defense Transportation Regulation, Part II, Cargo Movement, Chapter 204, Paragraph D.1.b. or D.1.e.

c The MM CX is available to assist with the proper identification of MEC on the hazardous waste manifest. In addition to the MM CX, the following personnel, based on their knowledge and training, may assist with proper identification; any USACE OE Safety Specialist, contractor UXO Technician, or Military EOD Technician.

CHAPTER 4

Geophysical Detection Equipment

4-1. Introduction. This chapter presents an overview of available geophysical detection systems, their capabilities and limitations. There are many techniques beyond those mentioned in this chapter that have application to the detection of surface MEC and subsurface anomalies. No single detection system can effectively detect all types of military munitions at all locations and depths.

4-2. Factors to Consider.

a. When selecting a geophysical survey instrument for the detection of subsurface anomalies, it is necessary to consider the maximum possible depth of MEC. If MEC is intentionally buried, the factors affecting burial depth may include the type of soil, mechanical versus hand excavation, depth of the water table, etc. If the military munition was fired or dropped, then the depth of penetration can be estimated by considering the soil type, military munition type and weight, and impact velocity. There are many cases where UXO can penetrate deeper than geophysical instruments can currently reliably detect. On such sites, it is possible that undetected UXO remains deeper than it can be detected from the existing ground surface.

b. Geophysical detection equipment used to locate subsurface MEC for avoidance or removal is seldom 100 percent effective. In many cases, military munitions may simply be located too deep, may be too small to be detected, or may be constructed of a material difficult to detect. Since the total number of subsurface MEC at a site is almost never known, complete detection cannot be documented. In addition, most commonly used geophysical survey systems will not detect subsurface bulk explosives. These factors must be considered when designing and implementing MEC support. If subsurface bulk explosives are anticipated based on archival data, then special avoidance techniques must be developed and increased safety precautions employed. Contact the MM CX for additional information. The limitations of detection capabilities must be conveyed to all on-site personnel so that there is a common understanding of expectations.

c. Data collection capability typically depends on the complexity and type of the geophysical instrument used. For instance, most handheld magnetometers cannot record the data produced. However, more complex systems are capable of collecting the data for downloading and processing. Requiring an instrument with the capacity to collect data is

activity-dependent. Anomaly avoidance procedures generally do not require data collection. However, removal operations in support of construction activities generally require the area to be mapped and, therefore, require instruments that are capable of downloading information.

4-3. Types of Instrumentation. The most successful geophysical detection systems for MEC rely on one of two technologies, magnetometry or electromagnetics. Magnetometers are limited to detecting ferrous items. Electromagnetic detectors can detect any conductive metal.

a. Magnetometry.

(1) Magnetometers were one of the first tools used for locating buried military munitions and remain one of the best. Most bombs and gun shells contain iron that causes a disturbance in the earth's geomagnetic field. A magnetic survey measures differences from the earth's normal magnetic field that can be attributed to the presence of ferrous objects. Some magnetometers, which are called gradiometers, use two magnetic sensors configured to measure the difference over a fixed distance of the magnetic field (gradient), rather than the absolute magnetic field. Magnetometers are extremely sensitive and capable of identifying small anomalies. They respond only to ferro-magnetic metals. In addition, magnetometers are sensitive to iron-bearing minerals contained in soils and rock.

(2) Magnetometry will not detect subsurface bulk explosives. If subsurface bulk explosives are anticipated based on the site's history, increased safety precautions and special techniques will be employed. Contact the MM CX for additional information.

(3) Two types of magnetometers and gradiometers are most often used to detect buried military munitions, fluxgate magnetometers and optically pumped magnetometers.

(a) Fluxgate Magnetometers. Fluxgate magnetometers measure the magnetic field component along the axis of the core of the fluxgate. They are inexpensive, reliable, rugged, and have low energy consumption. Fluxgate magnetometers have long been a standard tool of EOD teams, used for a quick, inexpensive field reconnaissance of a site containing ferrous military munitions. However, most fluxgate magnetometers provide analog rather than digital output, which makes it difficult to apply computer enhancement techniques. Fluxgate magnetometers are the instruments typically used for downhole geophysics for anomaly avoidance.

(b) Optically Pumped Magnetometers. Optically pumped magnetometers (traditionally cesium-vapor or potassium-vapor magnetometers) measure the local absolute total magnetic field. They utilize digital technology and are more expensive to purchase than fluxgate

instruments. However, their high sensitivity, speed of operation, and high quality digital signal output make them a good choice for situations where data or digital post-processing is required.

b. Electromagnetic Detectors.

(1) Electromagnetic induction geophysical instruments are also extensively used to detect buried military munitions. They differ from magnetometers in that they are not limited to detecting ferrous items; they can detect any conductive metal. In addition, electromagnetic detectors are not affected by most of the iron-bearing rocks and soil that adversely affect magnetometers.

(2) There are numerous types of conductivity meters available. However, two types are most commonly used in the search for military munitions- frequency-domain electromagnetics and time-domain electromagnetic conductivity.

(a) Frequency-Domain Electromagnetics. Frequency-domain electromagnetic (FDEM) instruments can be useful to detect large buried caches of military munitions and detecting disturbed earth associated with pits and trenches. In addition, some types of FDEM instruments are the best geophysical tools available for detecting very small, very close objects such as the metal firing pins in plastic land mines buried just beneath the ground surface. However, since the resolution ability decreases dramatically with depth, frequency-domain conductivity meters are not optimum for detecting individual, deeply buried military munitions. Most commercial coin detectors are frequency-domain conductivity meters.

(b) Time-Domain Conductivity Electromagnetics. Time-domain conductivity electromagnetic (TDEM) instruments provide an excellent compromise between detection depth and resolution. These instruments provide a capability to locate all types of metallic military munitions and will see typical intact military munitions to depths of between 1 to 2 meters depending upon site-specific conditions.

4-4. Geophysical Investigation Performance.

a. General. The performance of military munitions detection instruments varies as a result of different site characteristics such as soil type, moisture content, depth to groundwater, vegetation, and type of military munition. Environmental and military munitions factors affecting the performance of detection instruments are so numerous that a prove-out of potential detection instruments for removal operations will be performed on the site to determine which instrument performs the best.

b. Data Quality Objectives/Performance Goals. Geophysical investigation data quality objectives and performance goals will be included in the contractor's SOW. The contractor may propose and document alternative objectives and goals for the Contracting Officer's consideration.

c. Horizontal Accuracy. Horizontally, 95 percent of all reacquired anomaly locations must lie within a 1 meter radius of their original surface location as marked on the dig sheet. Horizontally, 95 percent of all excavated items must lie within a 35-centimeter radius of their mapped surface location as marked in the field after reacquisition.

d. False Positives. If there are more than 15 percent "false positives" (anomalies reacquired by the contractor that result in no detectable metallic material recovered during excavations, calculated as a running average for the sector), a re-evaluation of the data, detection methods being utilized, and overall project QC will be performed at no cost to the government. A written response explaining the reason for the excessive false positive results and a Corrective Action Plan, if appropriate, will be submitted to the Contracting Officer within 10 days of identification of the situation.

4-5. Geophysical Prove-Out (GPO). Before geophysical surveys for buried military munitions can begin on a site, the proposed survey methods and techniques must be tested and evaluated. The purpose of the GPO is to demonstrate and document the site-specific capabilities of the proposed survey platform, sensors, navigation equipment, data analysis, data management and associated equipment and personnel to operate as an integrated system capable of meeting data quality objectives necessary to achieve project performance goals. The results of the GPO will identify realistic capabilities and limitations of applying geophysics at a particular site and aid in determining proper post-processing procedures for the geophysical data. Additionally, a prove-out demonstration offers the client an opportunity to observe the contractor's methods and to evaluate the contractor's ability to meet data quality objectives and compliance with project requirements. A prove-out must be constructed so that it is representative of the project site and the specific buried military munition items known or suspected to exist. The objective of the GPO is mainly to establish and maintain high levels of QC throughout this phase of the project. EM 1110-1-4009 provides a detailed list of general objectives for a GPO. The specific project objectives will be described in the GPO Work Plan. A GPO is needed for removal actions, but is not required for anomaly avoidance. Only a daily geophysical instrument function test is required for anomaly avoidance.

4-6. Equipment Standardization and QC Tests. Geophysical instruments have a number of standardization tests that need to be performed in order to ensure that they are functioning properly. For this discussion we will focus on the EM61 and GEM-3 (trade names of specific geophysical survey instruments) to identify some specific tests to be conducted.

a. Out-of-Box Equipment Tests. Past experience has shown that, too often, non-functioning equipment arrives at the site, causing delays in surveying, producing unreliable data, and increasing false alarms or missing buried military munitions. For this reason, the following out-of-box equipment tests are mandated to ensure that all instruments are operating correctly:

(1) Inventory and inspect all components.

(2) Assemble the instrument and power up.

(3) Test the instrument's cable connectors for shorts using the cable shake test.

(4) Null instrument (Electromagnetic (EM) only). The EM instrument will be nulled prior to conducting the following tests. Standard EM61 backpacks are provided with potentiometers for the top and bottom coils, which can be adjusted to null (zero) the instrument.

(a) Static Test. Establish an area for these tests that offers convenient access, is free of metal (surface and subsurface), and is sufficiently far from roads and power lines, transmitters, etc., to avoid these sources of noise. This same point may be used throughout the duration of the project for the daily static (background) test and response tests and for nulling instruments. Collect readings for a minimum of 3 minutes after instrument warm-up. Data collected during static tests will be retained for documentation.

(b) Instrument Response Test. The Instrument Response Test quantifies the response of the instrument to a standard test item. A steel trailer ball is a preferred test item that is easily acquired and transported. Leaving the instrument in the same position as used in the Static Test, place the test item below the sensor, then collect data for a minimum 3-minute period. The test will document the amplitude of response to the test item and instrument drift. To pass the Instrument Response Test, the value of the response must vary less than 20 percent from test to test.

b. Initial Geophysical Instrument Checks. Initial geophysical instrument checks will be performed on the first day of the survey. These tests include the following:

(1) Six-Line Test. This test is used for all geophysical instruments. Use an area that has little background noise and no sources of anomalous responses. The test line will be well marked to facilitate data collection over the exact same line each time the test is performed. Background response over the test line is established in Lines 1 and 2. A standard test item, such as a steel trailer hitch ball, will be used for Lines 3 through 6. Heading effects, repeatability of response amplitude, positional accuracy, and latency are evaluated in Lines 3 through 6. For anomaly avoidance, a test similar to a six-line test would be used in lieu of a prove-out.

(2) Azimuthal Test and Octant Test. These tests, applicable to magnetic instruments only, are performed to document the differences in readings based on orientation.

(3) Height Optimization Test. This test is applied to magnetic instruments, as well as for the GEM-3 instrument, and the EM61 used in harness or "litter" mode. A line is established with at least one test object along its length. Data is collected with the instrument using a minimum of three different sensor heights. The goal is to optimize the target signal-to-noise ratio and maintain adequate sensitivity.

(4) Pull-Away Test. This test demonstrates the effects of navigational equipment and/or vehicles used to tow sensors or arrays.

c. Daily Instrument Checks. Data collected in these tests must be closely examined each morning, before starting the collection of survey data. These tests will be performed for both removals and anomaly avoidance procedures.

(1) Cable Shake Test.

(2) Null instrument (EM only).

(3) Static Test: This test will be performed twice daily in the same location, prior to data collection, and at the end of the day. Data will be recorded during a minimum 3-minute duration static test to demonstrate stability of readings.

(4) Instrument Response Test: Following the static test, a standard test item will be placed below the sensor, and readings recorded for at least 3 minutes. Instrument response of equal amplitude from test to test demonstrates that the calibration of the instrument has not changed.

(5) Personnel Test: The instrument operator moves around the stationary, operating instrument to scan for any effects of metal remaining on his or her person.

4-7. Maintenance. Preventive maintenance will be performed on a regularly scheduled basis in accordance with the manufacturer's directions. If an equipment problem is encountered, maintenance will be performed as soon as possible and records of the unscheduled maintenance and corrective action will be maintained and will indicate equipment identification, problem description, corrective action, the person performing the maintenance, and associated costs. Equipment Standardization and QC Tests will be performed and the test results reviewed and accepted by the site or project geophysicist prior to the use of all repaired or new equipment received at the site.

CHAPTER 5

Anomaly Avoidance Procedures During HTRW Investigation/Design Activities

5-1. Introduction.

a. This chapter discusses anomaly avoidance procedures during the investigative/design phase of any project on a site with known or suspected MEC. USACE implements anomaly avoidance procedures primarily on HTRW sites where there is the potential to encounter MEC. HTRW-related activities during the investigative/design phase which have the potential for encountering MEC include, but are not limited to, surveying and mapping, environmental and natural resource assessments, surface and subsurface sampling, boring and drilling, and groundwater monitoring.

b. The purpose of anomaly avoidance during HTRW-related activities is to avoid any potential surface MEC and subsurface anomalies during sampling activities. Intrusive anomaly investigation is not authorized during anomaly avoidance operations. Procedures for dealing with explosives-contaminated soils are addressed in paragraph 1-1d of this pamphlet.

5-2. UXO Team Composition. For anomaly avoidance on an HTRW site with known or suspected MEC, the contractor shall provide a UXO team consisting of a minimum of two personnel, one of whom must be a UXO Technician II. This individual will be the UXO team leader. The UXO team must be on-site during all sampling activities. The UXO team may include additional UXO-qualified personnel, geophysicists, or any other team member, depending on site- and task-specific conditions/requirements. Contact the MM CX for a description of the current qualifications for contractor UXO personnel.

5-3. Planning. The MEC contractor shall prepare a Work Plan to supplement the HTRW contractor's or USACE's Work Plan/Site Plan, as described in Chapter 3.

5-4. Responsibilities. The UXO team members have the following responsibilities for anomaly avoidance procedures during an HTRW investigation project on a site with known or suspected MEC:

a. Provide the MEC recognition, location, and safety functions for the HTRW contractor during HTRW sampling activities.

b. Conduct MEC safety briefings for all site personnel and visitors.

c. Obtain utility clearance and/or excavation permits for underground utilities, if required, before the UXO team begins any incremental subsurface geophysical survey activities. The UXO team is responsible for verifying that all necessary excavation permits are on-site prior to commencing operations. The prime contractor is responsible for contacting the appropriate agency(ies) or company(ies) to mark the location of all subsurface utilities in the construction area. All located utilities will be marked by paint, pin flags, or other appropriate means to visually delineate their approximate subsurface routing. The color used for marking will not conflict with the colors used in MEC operations. If subsurface utilities are suspected to be present in an excavation area, the UXO team must attempt to verify their location.

5-5. Authority. The senior UXO-qualified person has final on-site authority on MEC procedures and safety issues.

5-6. Access Surveys. The UXO team must conduct a surface access survey and a subsurface survey for anomalies before any type of activities commence, including foot and vehicular traffic.

a. HTRW sampling personnel must be escorted by UXO-qualified personnel at all times in areas potentially containing MEC until the UXO team has completed the access surveys and the cleared areas have been marked. Escorted HTRW personnel will follow behind the UXO escort. If anomalies or MEC are detected, the UXO escort will halt escorted personnel in place, select a course around the item, and instruct escorted personnel to follow.

b. The UXO team will conduct an access survey of the footpath and/or vehicular lanes approaching and leaving HTRW sampling areas with known or suspected MEC. Typically, the access route will be at least twice as wide as the widest vehicle that will use the route.

c. The UXO team must also complete an access survey of an area around the proposed investigation site that is large enough to support all planned operations. The size of the surveyed area will be site-specific and will take into account, for example, maneuverability of required equipment (e.g., drill rigs, excavation equipment, etc.), parking of support vehicles, and establishment of decontamination stations. As a minimum, the surveyed area will have a dimension in all directions equal to twice the length of the longest vehicle or piece of equipment to be brought on-site.

d. Geophysical instrumentation capable of detecting the smallest known or anticipated military munition will be used to locate anomalies just below the surface that may be

encountered through erosion from rain or continual vehicular traffic. The various types of geophysical detection instruments are discussed in Chapter 4.

e. If anomalies or surface MEC are encountered, they will be marked with flagging and the investigation area will be relocated to avoid contact. The UXO team will clearly mark the boundaries of the surveyed area using survey flagging and pin flags. The UXO team will establish a system of flagging colors that will distinguish anomalies, surface MEC, and route boundaries from each other as well as from any utility markings that have been used at the site.

f. If surface MEC is encountered, the UXO team will assess the condition of the MEC to determine if a disposal action is required. MEC disposition will follow the procedures discussed in paragraph 5-13.

g. No personnel will be allowed outside the surveyed areas.

5-7. Surface Soil Sampling. Surface soil samples are normally collected at depths from zero to 6 inches below ground surface. The following paragraphs describe anomaly avoidance procedures for soil sampling between zero and 6 inches below ground surface on an HTRW site with known or suspected MEC. Soil sampling at depths greater than 6 inches below ground surface on an HTRW site with known or suspected MEC will follow the procedures discussed in paragraph 5-10.

a. The UXO team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site, as described in paragraph 5-6.

b. The UXO team must visually survey the surface of each proposed surface soil sampling site for any indication of MEC or MC impact. In addition, the UXO team must conduct a survey of the proposed sampling locations using geophysical instruments capable of detecting the smallest known or anticipated military munition to a depth of 1 foot. The various types of geophysical detection instruments are discussed in Chapter 4.

c. If anomalies are detected at a proposed sampling location or too many anomalies are detected in a general area of interest, the HTRW personnel will select an alternate location for collection of surface soil samples. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance during HTRW sampling activities.

5-8. Passive Soil Gas Sampling. Passive soil gas sampling typically involves excavation of holes (1-inch to 1½-inches in diameter) to a depth of less than 5 feet and the installation and subsequent removal of sampling devices (typically 24-inch-long by ½-inch-inside-diameter tubes). The following paragraphs describe anomaly avoidance procedures for passive soil gas sampling on an HTRW site with known or suspected MEC.

a. The UXO team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site, as described in paragraph 5-6.

b. The UXO team must visually survey the surface of the proposed passive soil gas sampling sites for any indication of MEC or MC impact. In addition, the UXO team must conduct a survey of the proposed sampling locations using geophysical instruments capable of detecting the smallest known or anticipated military munition to the specified emplacement depth for the sampling canister.

c. Utilities will be cleared and dig permits will be obtained in accordance with the procedures outlined in paragraph 5-4c.

d. If the emplacement depth is greater than the geophysical instrument's detection capabilities, then the UXO team must incrementally complete the geophysical survey every 12 inches while excavating for emplacement of the sampling canisters. While the UXO team is completing their geophysical survey remaining project personnel must withdraw out of the immediate area.

e. If anomalies are detected at a proposed sampling location or too many anomalies are detected in a general area of interest, the HTRW personnel will select an alternate location for collection of passive soil gas samples. If an anomaly is detected during an incremental geophysical survey, the hole will be backfilled in accordance with site-specific procedures. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance.

f. Unless a path is clearly marked, the HTRW sampling personnel must be escorted by a UXO-qualified person when they subsequently return to each soil gas sampling site to retrieve the sampling canisters.

5-9. Active Soil Gas Sampling and Direct Push Technology (DPT). Active soil gas sampling typically involves manual or mechanical penetration at the desired location followed by withdrawal and collection of a soil gas sample. DPT is a common method for mechanical

penetration during active soil gas sampling. The following paragraphs describe anomaly avoidance procedures for active soil gas sampling and use of DPT on an HTRW site with known or suspected MEC.

a. The UXO team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site, as described in paragraph 5-6.

b. Active soil gas sampling and DPT installations will follow the same anomaly avoidance procedures outlined below for soil boring and monitoring well installations. The actual sampling will occur through the pilot hole or a boring located within a 2-foot radius of the pilot hole installed by the UXO team. If the pilot hole cannot be used to obtain a representative soil gas sample, it must be backfilled in accordance with site-specific procedures prior to the installation and sampling of the soil gas sampling point. The backfilling of the pilot hole will be performed to prevent the soil gas sampling from being diluted by atmospheric air that may be drawn in through the pilot hole. Following collection of the soil gas sample, the sampling location must be backfilled in accordance with site-specific procedures.

5-10. Subsurface Soil Sampling and Monitoring Well Installation. Subsurface soil sampling is defined as the collection of samples below a nominal depth of approximately 6 inches by means of a split-spoon, Shelby tube, or bucket auger soil sampler using drilling techniques. Drilling techniques are also used to install groundwater monitoring wells for HTRW investigative sampling. The following paragraphs describe anomaly avoidance procedures for subsurface soil sampling and monitoring well installations on an HTRW site with known or suspected MEC.

a. The UXO team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site, as described in paragraph 5-6.

b. Utilities will be cleared and dig permits will be obtained in accordance with the procedure outlined in paragraph 5-4c.

c. The UXO team must complete a subsurface geophysical survey of the proposed drill hole location(s). If an anomaly is detected, HTRW sampling personnel must select a new drill hole location. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance. If the subsurface sampling or well installation depth is greater than

the geophysical instrument's detection capabilities, the UXO team must incrementally complete the geophysical survey as outlined below.

(1) Pilot Hole/Incremental Geophysical Survey. Once an access survey has been completed, the UXO team will install a pilot hole at each proposed drill hole location. While the UXO team is completing their geophysical survey remaining project personnel must withdraw out of the immediate area.

(a) If an anomaly is detected, the pilot hole will be backfilled in accordance with site-specific procedures and HTRW sampling personnel must select a new drill hole location. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance.

(b) As long as no anomalies are detected, the pilot hole will be advanced to the maximum reach of the auger or to the maximum depth of the proposed drill hole, whichever is less. During the excavation of the pilot hole the drill rig's auger will be withdrawn and the hole checked for anomalies every 12 inches. The pilot hole will also be inspected upon reaching the final depth, providing a total clearance depth equal to the pilot hole depth plus 12 inches. If no anomalies are detected to the total depth of the proposed drill hole, the drill rig may be brought on-site and utilized.

(c) In cases where the pilot hole does not reach the full depth of the proposed boring (e.g., the proposed depth of the drill hole is more than the maximum depth of the auger, or the UXO team cannot penetrate the soils using the auger), the drill rig may be brought on-site and advanced in 12-inch increments beyond the clearance depth of the pilot hole. At the end of each 12-inch increment, the drill rig's auger must be withdrawn from the hole so that the UXO team may screen for anomalies as described above. As necessary with loose soils, a polyvinyl chloride (PVC) pipe (minimum 3 inches inner diameter) will be inserted to keep the hole open and to allow for incremental geophysical screening.

(d) When working in impact areas, the UXO team may discontinue incremental screening once the drilling has extended to depths of 30 feet below ground surface, the depth of penetration of the MEC has been exceeded, or the planned depth of drilling has been reached, whichever is less.

(e) For all other areas, incremental screening will be determined based on an assessment of the site's characteristics and history.

(2) Monitoring of Drilling by Others. Once the UXO team determines that a proposed drill hole location is free of anomalies, using the procedures described above, the drilling contractor shall be notified that the site is available for subsurface sampling or monitoring well installation.

(a) The drilling contractor's actual drill hole must be located within a 2-foot radius of the pilot hole installed by the UXO team. While this proximity to the pilot hole may affect the accuracy of "blow counts" for the HTRW team, anomaly avoidance takes precedence.

(b) Any drilling beyond the clearance depth of the pilot hole will be conducted in 12-inch increments to allow the UXO team to screen for anomalies. In order to avoid magnetic interference from the augers, the drill rig must withdraw its augers from the hole for the geophysical survey. As necessary with loose soils, a PVC pipe (minimum 3 inches inner diameter) may be inserted to keep the hole open and to allow for incremental geophysical screening. Drilling equipment and/or metallic support materials (e.g., drill rig, augers, drill rods, casings, etc.) may create an interference affecting the operation of the geophysical survey instrument during the incremental inspection process. In such an event, the item(s) creating the interference must be relocated outside the interference range of the geophysical instrument during each incremental inspection of the drill hole. If an anomaly is detected, the drill hole will be backfilled in accordance with site-specific procedures and HTRW sampling personnel must select a new drill hole location.

(c) When working in impact areas, the UXO team may discontinue incremental screening once the drilling has extended to a depth of 30 feet below ground surface, the depth of penetration of the MEC has been exceeded, or the planned depth of drilling has been reached, whichever is less.

(d) For all other areas, incremental screening will be determined based on an assessment of the site's characteristics and history.

5-11. Test Pit and Trench Excavations. Test pits and trench excavations are used to identify and characterize large subsurface HTRW areas of concern. The following paragraphs describe anomaly avoidance procedures for test pit and trench excavations on an HTRW site with known or suspected MEC.

a. The UXO team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site as described in paragraph 5-6.

b. The UXO team must complete a subsurface geophysical survey of the proposed excavation locations. If an anomaly is detected, HTRW sampling personnel must select a new excavation location. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance. If the proposed excavation depth is greater than the geophysical instrument's detection capabilities, the UXO team must incrementally complete the geophysical survey as outlined below.

(1) Underground Utilities. The procedures outlined in paragraph 5-4c will be followed.

(2) Excavation Procedures. Once an access survey has been completed, HTRW personnel may begin excavation in 1-foot increments. While the UXO team is completing their geophysical survey remaining project personnel must withdraw out of the immediate area.

(a) At the end of each 1-foot increment, the UXO team will screen for anomalies. If an anomaly is detected, HTRW sampling personnel must modify the excavation location to avoid the anomaly. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance.

(b) If MEC is uncovered in an excavation, all operations will cease. The UXO team will assess the condition of the MEC to determine if disposal action is required. MEC disposition will follow the procedures discussed in paragraph 5-13. Once MEC has been encountered in an excavation, no further excavation is allowed at that location until EOD has removed the MEC. Once the MEC is removed, excavation using anomaly avoidance techniques may continue. If munitions with unknown fillers are discovered refer to the procedures identified in Chapter 7. The After Action Report will indicate that MEC was encountered and summarize the resulting activities.

c. Waste and/or Other Materials Encountered. In the event that potentially hazardous waste, debris, or drums are encountered during test pit or trenching operations, excavation activities will cease. The HTRW Site Safety and Health Officer (SSHO) will assess the situation and may direct a change to the PPE for site workers. The SSHO will notify the appropriate personnel in accordance with the site-specific Work Plan. Wastes will be handled in accordance with the site-specific IDW Management Plan.

5-12. Groundwater Monitoring/Aquifer Characterization. Groundwater monitoring activities include measurement of groundwater elevations, measurement of free product thickness, and collection of analytical samples. Groundwater monitoring wells may also be used for aquifer

characterization activities (e.g., slug tests). Unless a path is clearly marked, the HTRW sampling personnel must be escorted by UXO-qualified personnel, as described in paragraph 5-6a, when they subsequently return to conduct groundwater monitoring/aquifer characterization activities.

5-13. MEC Disposition. Since the purpose of MEC support during HTRW activities is anomaly avoidance, the UXO team is not tasked to perform MEC disposition. MEC disposition will not be covered in the planning documents for the project, and, therefore, the UXO team is not capable of or equipped to perform MEC disposition. In the event that MEC is encountered that cannot be avoided or, based on its fuzing or current condition, presents an imminent hazard requiring immediate attention, the UXO team will notify the local POC designated in the Work Plan. The UXO team will not destroy any of the MEC encountered. The local POC will notify the appropriate authority of the MEC discovery and the UXO team will safeguard the site pending arrival of the appropriate authority.

a. On active installations, MEC disposition requests will normally require reporting to the Range Control Officer, Facility Engineer, Post Headquarters, or POC designated in the Work Plan.

b. On FUDS, the local POC will facilitate the EOD response. If the local POC designated in the Work Plan is not the local law enforcement agency, the local POC will inform the local law enforcement agency of the discovery. The local POC will also contact the MM CX.

5-14. Quality Management. HTRW Design Districts will include anomaly avoidance capability in all applicable indefinite delivery order contracts for HTRW reports, designs, or remedial actions on FUDS or active military sites. MEC concerns must be addressed before initiating any HTRW field investigation activities. Prior to initiation of on-site activities, items developed for MEC support of HTRW activities (i.e., SOW and Work Plan) must be submitted to the appropriate MM DC and the MM CX for review in accordance with the roles and responsibilities set forth in Chapter 1. The executing district is responsible for supervising the fieldwork and ensuring compliance with all approved plans by all USACE and contractor personnel. The MM CX may also conduct random inspections to verify conformance. A separate on-site, full-time UXO Quality Control Specialist (UXOQCS) is not required for MEC avoidance activities. However, the MEC support contractor shall perform QC reviews of its MEC-related field activities. Upon completion of the MEC support activities, the PM will ensure that an After Action Report is submitted to the MM CX.

CHAPTER 6

MEC Support during Construction Activities

6-1. Introduction.

a. This chapter discusses procedures for MEC support during construction activities (including construction activities related to remedial actions) on sites with known or suspected MEC. The purpose of MEC support during construction activities is to reduce the potential for exposure to MEC.

b. MEC support during construction activities may require only MEC standby support or subsurface removal, depending on an assessment of the probability of encountering MEC and the level of confidence associated with the determination.

(1) If the probability of encountering MEC is low (e.g., current or previous land use leads to an initial determination that MEC may be present), only MEC standby support will be required. MEC standby support is discussed in paragraph 6-6 below.

(2) When a determination is made that the probability of encountering MEC is moderate to high (e.g., current or previous land use leads to a determination that MEC was employed or disposed of in the area of concern), UXO-qualified personnel must conduct a subsurface removal of the known construction footprint and remove all discovered MEC.

(3) The level of effort for construction support is site/task-specific and will be determined on a case-by-case basis by the PDT in coordination with the MM CX.

c. When a determination is made that the probability of encountering MEC on a construction site is moderate to high (i.e., a subsurface removal of the known construction footprint will be conducted), an OE Safety Specialist will be on-site to provide safety oversight. When a determination is made that the probability of encountering MEC on a construction site is low (i.e., only MEC standby support is required), an OE Safety Specialist is generally not required on-site.

6-2. UXO Team Composition.

a. General. For construction activities on sites with known or suspected MEC, the contractor shall provide a UXO team consisting of a minimum of two UXO-qualified

personnel (one UXO Technician III and one UXO Technician II). The UXO team may include additional UXO-qualified personnel, depending on site- and task-specific conditions/requirements. The number of UXO teams will vary depending upon the total level of effort. Qualifications for contractor UXO personnel are discussed in EP 1110-1-18.

b. If subsurface removal is required in support of construction activities (i.e., there is a moderate to high probability of encountering MEC), the UXO team(s) must also meet the following standards:

(1) Each UXO team will not include more than six team members in addition to the UXO Technician III. The UXO Technician III will supervise all MEC operations and all personnel assigned to his/her team.

(2) A SUXOS will be on-site and will not supervise more than 10 UXO Technician IIIs. There will not be more than one SUXOS per project without prior approval from the Contracting Officer.

(3) The position of UXOSO will be required on all subsurface removal projects in support of construction activities; however, the positions of UXOSO and UXOQCS may be dual-hatted when there are less than 15 personnel on-site.

(4) A UXOQCS may not be required full-time on-site. However, QC functions will be performed for all field activities.

6-3. Planning.

a. The MEC support contractor shall prepare a Work Plan and ESS (if required) to supplement the construction contractor's or USACE's Work Plan/Site Plan as described in Chapter 3.

b. The UXO team will review any archival information available regarding the area of the proposed construction activities. If possible, the UXO team will determine the probable types of MEC that may be encountered and identify specific safety considerations.

6-4. Responsibilities. The UXO team members have the following responsibilities for MEC support during construction on a site with known or suspected MEC:

a. Provide the MEC recognition, location, and safety functions for the prime contractor during HTRW sampling activities.

b. Conduct MEC safety briefings for all site personnel and visitors.

6-5. Authority. The OE Safety Specialist has final on-site authority on MEC procedures and safety issues. If an OE Safety Specialist is not present on-site, the UXOSO, or if a UXOSO is not assigned to the site, the senior UXO-qualified person has final on-site authority for MEC procedures and safety issues.

6-6. Standby Support.

a. Standby support is required for construction activities on sites with known or suspected MEC if the probability of encountering MEC is low.

b. The UXO team will meet with on-site management and construction personnel and conduct a general work and safety briefing, including:

(1) Probable site hazards and site-specific safety considerations.

(2) MEC standby support procedures.

(3) Responsibilities and lines of authority for any MEC response.

(4) Emergency response procedures.

c. The UXO team will physically preview the actual construction footprint with the on-site management of the construction contractor and discuss visual observations and potential areas of concern. In the event that surface MEC is discovered, the UXO team will place flagging adjacent to the discovery for subsequent visual reference, select a course around the item, and lead any on-site personnel out of the area. The UXO team will assess the condition of the MEC to determine if a disposal action is required. If MEC is found on the surface, the PDT will perform a detailed assessment of the site to determine if the potential for encountering MEC is still low. If the potential for encountering MEC is raised to moderate to high, a subsurface removal for the construction footprint will be required. Refer to paragraph 6-7 for subsurface removal requirements.

d. The UXO team will monitor all excavation activities in areas known or suspected to contain MEC. One member of the team will be positioned to the rear and upwind of the excavation equipment for continuous visual observation of activities. If the construction contractor unearths or otherwise encounters a military munition with an unknown filler, all excavation activities will cease. The UXO team will assess the condition of the military

munition to determine if a disposal action is required. Once MEC has been encountered in an excavation, no further excavation will be allowed at that location until EOD has removed the MEC. Excavation will not continue until a detailed assessment of the potential of encountering additional MEC is completed. If the PDT determines that the item was an anomaly and no other MEC are expected, then the excavation may continue. If the PDT determines through the available data that the probability of encountering additional MEC is moderate to high, then a subsurface removal of the construction footprint is required. Refer to paragraph 6-7 for subsurface removal requirements. The After Action Report will indicate that MEC was encountered and will summarize the resulting activities.

e. The UXO team is generally not tasked to perform MEC disposition activities during standby support of construction activities. If MEC that requires disposal is encountered, the procedures outlined in paragraph 5-13 of this pamphlet will be followed.

6-7. Subsurface Removal in Support of Construction Activities.

a. A subsurface removal of the identified construction footprint is required when the probability of encountering MEC during construction-related excavation activities is moderate to high.

b. A subsurface removal requires close coordination among the on-site USACE management personnel, the construction contractor, and the MEC support contractor.

c. A surface removal may be required to remove any existing MEC from the surface of the work area prior to proceeding with subsurface removal activities. All military munitions debris, target materials, and non-MEC-related materials, which may interfere with a subsurface geophysical survey, will also be removed from the surface of the work area and staged for later disposition. The UXO team will perform surface removal activities.

d. Safety Considerations.

(1) Subsurface removal actions must be accomplished in strict accordance with the approved Work Plan, including all subplans (e.g., APP/SSHP, ESP, and ESS, if required) and appendices. Prior to commencing subsurface removal activities, the UXO team will provide a general work and safety briefing to all on-site personnel. This briefing will address the following:

(a) Probable site hazards and site-specific safety considerations.

(b) Responsibilities and lines of authority for any military munitions response to MEC.

(c) Emergency response procedures.

(2) Utility clearance and/or excavation permits, if required, must be obtained prior to the commencement of any intrusive activities near underground utilities. The UXO team is responsible for verifying that all necessary excavation permits are on-site prior to commencing operations. The construction contractor is responsible for contacting the appropriate agency(ies) or company(ies) to mark the location of all subsurface utilities in the construction area. All located utilities will be marked by paint, pin flags, or other appropriate means to visually delineate their approximate subsurface routing. The color will not conflict with the colors used in MEC activities. In the event that subsurface utilities are suspected in an excavation area, the UXO team must attempt to verify their location. The UXO team must be aware that not all utility lines will be detectable with geophysical equipment (i.e., not all utility lines are constructed of ferrous material).

(3) MSDs must be established in accordance with Chapter 3 for all MEC procedures (i.e., anomaly excavation, access and identification of MEC, MEC recovery, and MEC destruction). During these operations, non-essential personnel will withdraw to the MSD of the MGFD involved.

e. Area Preparation.

(1) Area preparation includes reduction and/or removal of vegetation that may impede or limit the effectiveness of subsurface removal actions. Vegetation reduction/removal may be accomplished through manual removal, mechanical removal, controlled burning, or defoliation. Selection of the appropriate land clearing strategy will be based on the type, fuzing and concentration of MEC; type and concentration of vegetation; topography; drainage patterns; terrain and soil conditions; and the level of required environmental and natural resource protection.

(2) Area preparation is not considered a MEC procedure. The UXO escort and anomaly avoidance procedures for access surveys presented in paragraph 5-6 of this pamphlet will be followed.

f. Geophysical Mapping/Analysis.

(1) A subsurface geophysical survey will be conducted to identify and locate all anomalies in the identified construction footprint. The various types of geophysical detection

instruments are discussed in Chapter 4. Subsurface geophysical surveys may be completed using detection instruments with real time or post-processing identification and discrimination techniques. All anomalies will be prominently marked with survey flagging or pin flags for subsequent intrusive investigation.

(2) Subsurface geophysical surveys are not considered a MEC procedure. The UXO escort and anomaly avoidance procedures for access surveys presented in paragraph 5-6 of this pamphlet will be followed.

(3) After the dig list is developed, the selected anomalies will be reacquired in accordance with the Geophysical Investigation Plan.

g. Anomaly Excavation.

(1) Anomaly excavation operations are required to intrusively investigate and identify the source of all anomalies located during the geophysical survey. During excavation operations, only essential project personnel may be within the exclusion zone. All anomaly excavation operations will comply with the provisions of 29 CFR 1926, Subpart P.

(2) UXO-qualified personnel will manually complete anomaly excavations of less than 1 foot. If an anomaly is deeper than 1 foot, earth-moving machinery (EMM) may be used to assist in excavation efforts unless site constraints or accessibility restrict or prohibit such use. EMM will not be used to excavate within 12 inches of an anomaly. When an anomaly excavation gets within approximately 12 inches of an anomaly, manual excavation must be used to complete the excavation.

(3) Only UXO-qualified members of a UXO team may conduct manual excavation operations. A non-UXO-qualified member of the UXO team may operate EMM used to assist in anomaly excavations. If more than one EMM will be used within the same work area, the TSDs described in Chapter 9 of EM 1110-1-4009 will apply to the EMMs.

(4) After the probable source of the anomaly is identified and removed, an approved geophysical instrument will be used to validate the process. If the geophysical instrument does not continue to detect an anomaly, then the excavation may be backfilled and restored in accordance with contract requirements.

6-8. MEC Destruction.

a. The Work Plan will include procedures for destruction of MEC recovered during construction activities. Destruction of recovered MEC can take one of three forms: in-place, on-site, or off-site. The decision regarding which technique to use is based on the risk involved in employing the disposal operation based on site-specific characteristics and the nature of the MEC recovered as determined by the UXO team. Additional information on MEC disposal operations can be found in TM 60A-1-1-31.

(1) In-Place Destruction. In-place destruction (blow-in-place) is a technique used when it is determined that moving the MEC to an alternate location for destruction is not acceptable. This technique is preferred because it exposes the minimum number of personnel. All in-place destructions will be conducted in a manner that ensures maximum control of the site. When this technique is employed, engineering controls may be used to minimize the blast effects.

(2) On-Site Destruction. If MEC is recovered in close proximity to occupied buildings, it may not be possible to safely destroy the item in-place. In this instance, the item may be moved to a part of the project site where destruction and disposal can safely take place. When a MEC is destroyed on-site, engineering controls may be used to minimize the blast effect, as well as to minimize residual contamination. Guidance for the on-site destruction of MEC is found in EP 1110-1-17.

(3) Off-Site Destruction. If transported off-site for destruction, MEC will be transported by either military vehicles or by a qualified UXO contractor. MEC is typically transported to an active military installation where it can be safely destroyed. Off-site transportation will be conducted in accordance with EP 385-1-95a and EP 1110-1-18. All UXO must be certified for shipment in accordance with paragraph 1-9 of TB 700-2. Paragraph 6-8c below provides additional information on transportation of MEC.

b. Safety. The following safety considerations for MEC destruction will be addressed in the Work Plan.

(1) The UXO team conducting MEC destruction activities will consist of at least three personnel, with a minimum of two UXO-qualified personnel, one UXO Technician III and one UXO Technician II. One member of the UXO team must always be located outside the MSD for intentional detonations to give warning and assist in rescue activities in the event of an accident.

(2) Explosives or accessory equipment that is obviously deteriorated or damaged will not be used.

(3) Blasting caps will be at least a commercial No. 8 or equivalent and, for destruction activities requiring multiple caps, be from the same manufacturer.

(4) Blasting caps must be transported in approved containers and not be exposed to direct sunlight.

(5) The explosive end of blasting caps, detonators, and explosive devices will be pointed away from the body during handling.

(6) Blasting caps will not be buried. Detonating cord will be used to position blasting caps above the ground.

(7) Electric blasting caps must be tested for continuity prior to connecting them to the firing circuit. Upon completion of testing, the lead wires will be short-circuited by twisting the bare ends of the wires together.

(8) In the event of an electric misfire or non-detonation, the MEC destruction site must not be approached for at least 30 minutes. For non-electric procedures wait 1 hour after the maximum delay predicted for any part of the disposal shot has passed before starting to investigate. A post-search of the detonation site must be conducted to ensure complete MEC destruction and to ensure that no fires have started.

c. Transport.

(1) Existing site conditions may require that MEC that has been certified as acceptable-to-ship in accordance with TB 700-2 be transported to a designated MEC destruction location either on or off the project site.

(2) A Transportation Plan detailing the route and procedures to be used to transport the MEC must be prepared and accepted prior to engaging in any transport activities to ensure that all safety aspects of the movement have been addressed. The transport of MEC off-site must be performed in accordance with the provisions of EP 385-1-95a, EP 1110-1-18, and applicable state and local laws. Contractor personnel who, by contract requirement, are tasked with the responsibility of transporting or preparing shipments of MEC for transport over public roads must meet all training requirements of 49 CFR Part 172 and applicable state requirements.

(3) Safety. MEC will be transported from the discovery location to an alternate destruction location only as a last resort. Transportation of MEC will be in accordance with paragraph 1-9 of TB 700-2. Armed fuzes must be transported only when absolutely necessary and when all other avenues for in-place disposal have been exhausted. Safety considerations for the transport of MEC include the following:

(a) MEC packaging designs must provide a container with appropriate blocking and bracing to prevent migration of the hazardous filler. Padding will also be added to protect any exposed filler from heat, shock, and friction.

(b) Base-ejection-type projectiles must be transported with the base oriented to the rear of the vehicle and the projectile secured.

(c) Incendiary loaded munitions will be placed on a bed of sand and covered with sand.

(d) Loose pyrotechnic, tracer, flare, and similar mixtures will be placed in No.10 mineral oil or equivalent.

(e) White phosphorus-filled munitions will be immersed in water, mud, or wet sand.

(4) Manifest. A manifest will be prepared in accordance with 49 CFR 172.205 and 40 CFR 262.20 when transporting MEC over public roads in non-emergency situations. In emergency situations, military EOD personnel will respond. For the purposes of transportation and storage, MEC will be hazard classified in accordance with TB 700-2. Government personnel who are tasked to sign shipping papers must be trained and be given signature authority by their agency in accordance with the requirements of DOD 4500.9-R.

d. Explosives Management.

(1) If explosives will be required for the destruction of MEC, then an Explosives Management Plan will be prepared as part of the Work Plan. The Explosives Management Plan will be used to provide details on the management of explosives for a specific project in accordance with applicable regulations. The plan will include information on Acquisition, Initial Receipt, Storage, Transportation, Receipt Procedures Inventory, Unaccounted for UXO/Unauthorized Use of Explosives, and other areas.

(2) Explosives used for the destruction of MEC must be acquired and managed in accordance with applicable Federal, state, and local laws and regulations including, but not limited to, the following:

(a) ATFP 5400.7 and 27 CFR.

(b) DOD 6055.9-STD.

(c) 49 CFR.

(d) 29 CFR 1910 and 1926.

(e) FAR 45.5.

(3) Acquisition. Explosives may be purchased only under a license issued by the ATF. The license holder must provide written authorization designating the individual(s) authorized to purchase, store, or utilize explosives. This letter must specify the name, home address, date and place of birth, and the social security number of the designated individual(s). A copy of the letter must be maintained at the project office. In addition, the designated individual purchasing explosives may also be required to have a Blaster's License issued by the state in which the project is located. Explosives must be purchased from an ATF-licensed commercial distributor. The license holder must provide the distributor a certified statement of the intended use of the explosive material.

e. Temporary Explosives Storage Facilities on FUDS.

(1) When the contractor establishes a temporary storage area for explosives on a FUDS site, Type 2 magazines conforming to the standards set forth in Section 55.208 of ATF P 5400.7 must be used. The location of the proposed magazines and the Q-D arcs must be shown on a site map attached to the ESP. The Q-D arcs must be based on the NEW established for each magazine using the appropriate tables in DOD 6055.9-STD. In the event that existing site conditions prohibit the siting of the magazines in conformance with derived Q-D arcs and the NEW cannot be reduced to achieve conformance, the PM must request assistance in the design of engineering controls or structural modifications necessary to bring the magazine within the stated Q-D criteria.

(2) Explosives and initiators must be stored separately. If magazines are also used to temporarily store acceptable-to-ship MEC, each MEC must be stored in accordance with its appropriate HD and the storage compatibility group criteria listed in Chapter 3 of DOD 6055.9-STD. Each magazine must display the placards required by Department of Transportation regulations 49 CFR Part 172, Subpart F, for the HD of the MEC or explosives stored in the magazine.

(3) Lightning protection is not required for magazines located on FUDS if all of the following criteria are met:

(a) The magazine is constructed of 3/16-inch-thick steel or greater.

(b) The magazine is properly grounded.

(c) The magazine is located at least 6 and 1/2 feet from the nearest fence or any other magazine.

f. Temporary Storage Facilities on Base Realignment and Closure (BRAC) Sites/Active Installations.

(1) Temporary storage facilities for projects on BRAC sites or active installations must be determined using the installation's criteria.

(2) Lightning protection for temporary explosives storage facilities to be located on BRAC sites or active installations must meet the provisions of Chapter 7 of DOD 6055.9-STD.

g. Security.

(1) The Work Plan will describe the inventory control system to be implemented for explosives management. Magazine Data Cards documenting explosives transfers for each magazine must be completed with a copy maintained within the associated magazine. Explosives issued and unexpended must be returned to the magazine at the end of each workday.

(2) The inventory control system must include provisions for the physical inventory of the stored MEC and explosives at least weekly. Actual quantities must be reconciled with the quantities annotated on the corresponding Magazine Data Cards. Any discrepancies must be immediately reported to the USACE representative and an audit initiated to determine the source of the discrepancy.

(3) A physical security survey will be conducted in accordance with AR 190-11 to determine if fencing or guards are required when temporary storage facilities are used. Generally, a fence around the magazines is needed, but the contractor is responsible for determining the degree of protection required to deter the theft of MEC or explosives stored in the magazines.

(4) Locks used on magazines at a FUDS will meet the standards listed in Section 55.208 (a) (4), ATF P 5400.7. BRAC and Installation Restoration site requirements must be determined using the installation's criteria. A key control system will be documented in the Work Plan.

h. Fire Prevention. A Fire Prevention Plan will be prepared and coordinated with the fire department with primary response responsibility. Fire extinguishers of an appropriate size and type must be located at all temporary explosives storage facilities.

i. Records. Records must be maintained for all transactions and expenditures of explosive materials for a period of five years from the date of transaction in accordance with ATF regulations. These records must be maintained at the project office during on-site operations and subsequently at the business office of the ATF license holder.

j. Munitions Debris Management. The Work Plan must include operational and QC procedures for the processing, demilitarization, and disposition of inert ordnance, range-related debris, and munitions debris that fall within the classification of Material Potentially Presenting an Explosive Hazard (MPPEH). Contact the MM CX for the requirements on MPPEH processing and disposition.

6-9. Quality Management.

a. QC.

(1) The UXO team is responsible for the QC of all surface and subsurface removal activities and for ensuring that only those procedures and processes conforming to contractual requirements and accepted project plans are implemented. The UXO team will develop a Quality Control Plan (QCP) outlining the quality activities to be used for continually assessing the implementation, effectiveness, compliance, and adequacy of operations.

(2) A separate UXOQCS is not required on-site full-time for MEC support activities. However, the MEC support contractor shall perform QC reviews of all field activities in accordance with the accepted QCP.

(3) The QCP will provide procedures for validation of the following:

(a) Surface removal and related activities are conducted in accordance with accepted project plans.

(b) Subsurface removal and related activities are conducted in accordance with accepted project plans.

(c) Actual probabilities of detection are consistent with removal reliability levels and USACE and DDESB requirements.

(d) Subsurface removal operations provide for an adequate level of confidence of MEC detection and removal to specified depths.

(e) Disposition of MEC and materials classified as MPPEH has been completed and documented. Procedures are available from the MM CX.

b. Quality Assurance.

(1) Districts should include MEC support capabilities in all applicable contracts for construction activities on FUDS or active military sites. MEC concerns must be addressed before initiating any construction activities. Items developed for MEC support of construction activities (i.e., SOW, Work Plan, APP/SSHP, ESP, and ESS, if required) must be submitted to the MM CX for review and approval in accordance with the roles and responsibilities set forth in Chapter 1 of this pamphlet prior to initiation of on-site activities.

(2) The district is responsible for supervising the fieldwork and ensuring contractor compliance with all accepted plans. The MM CX may also conduct random inspections to verify conformance. Upon completion of the MEC support activities, the PM will ensure that an After Action Report is submitted to the MM CX.

CHAPTER 7

Procedures When RCWM is Encountered

7-1. Introduction.

a. This chapter discusses MEC support procedures to be followed in the event that RCWM or munitions with unknown fillers are encountered on a project site. Detailed procedures for planning and executing RCWM response actions are located in EP 75-1-3.

b. An item configured as a military munition containing a chemical substance that is intended to kill, seriously injure, or incapacitate a person through its physiological effects is considered Chemical Warfare Materiel (CWM). CWM also includes V- and G- series nerve agent, H- series blister agent, and lewisite in other-than-munition configurations. Due to their hazards, prevalence, and military-unique application, chemical agent identification sets are also considered to be CWM. CWM does not include riot control agents, chemical herbicides, smoke and flame producing items, or soil, water, debris, or other media contaminated with chemical agent. Non-stockpile CWM that was previously discarded, buried, or fired and discovered either unexpectedly or during planned environmental restoration operations is referred to as RCWM.

c. Soil, water, debris, and other media contaminated with chemical agent are not considered to be RCWM. The procedures described in ER 1110-1-8153 will be followed when only agent-contaminated media are suspected.

7-2. Response Procedures.

a. Any time that RCWM or munitions with unknown fillers are encountered during MEC support, all work will immediately cease. Project personnel will withdraw along cleared paths upwind from the discovery. A team consisting of a minimum of two personnel will secure the area to prevent unauthorized access. Personnel will position themselves as far upwind as possible while still maintaining the security of the area.

b. Notification.

(1) When RCWM or munitions with unknown fillers are identified on FUDS project sites, the UXO team will notify the local POC designated in the Work Plan. The local POC will facilitate the EOD unit’s response and two personnel will secure the site until the EOD

unit's arrival. If the local POC designated in the Work Plan is not the local law enforcement agency, the local POC will inform the local law enforcement agency of the discovery. The EOD unit will notify the U.S. Army Technical Escort Unit (TEU) and secure the area until TEU's arrival. After notifying the local law enforcement agencies, the local POC will notify the USAESCH Chemical Warfare Design Center to inform them of the actions taken.

(2) On active installations, the UXO team will normally notify the Range Control Officer, the Facility Engineer, Post Headquarters, or the POC designated in the Work Plan.

c. Reporting. Chemical event reports must be submitted in accordance with AR 50-6. Specific reporting requirements are identified in EP 75-1-3.

GLOSSARY

Section I
Acronyms

ANSI.....American National Standards Institute
APP.....Accident Prevention Plan
AR.....Army Regulation
ATF.....Bureau of Alcohol, Tobacco, and Firearms
ATF P .....Bureau of Alcohol, Tobacco, and Firearms Publication
BRAC .....Base Realignment and Closure
CERCLA .....Comprehensive Environmental Response, Compensation, and Liability Act
CFR.....Code of Federal Regulations
CPR.....Cardiopulmonary Resuscitation
CWM .....Chemical Warfare Materiel
CX.....Center of Expertise
DA .....Department of the Army
DDESB.....Department of Defense Explosives Safety Board
DOD .....Department of Defense
DOT.....Department of Transportation
DPT.....Direct Push Technology
EED .....Electro-explosive Device
EM .....Electromagnetic
EM .....Engineer Manual
EMM.....Earth-Moving Machinery
EMR .....Electromagnetic Radiation
EOD.....Explosives Ordnance Disposal
EP .....Engineer Pamphlet
ER.....Engineer Regulation
ESP .....Explosives Siting Plan
ESS .....Explosives Safety Submission
FDEM.....Frequency-Domain Electromagnetics
FUDS.....Formerly Used Defense Sites
GPO .....Geophysical Prove-Out
HD .....Hazard Division
HQUSACE .....Headquarters, U.S. Army Corps of Engineers

HTRW ..... Hazardous, Toxic, and Radioactive Waste
IDW ..... Investigative-Derived Waste
IGE ..... Independent Government Estimate
MC ..... Munitions Constituents
MCACES ..... Micro Computer-Aided Cost Engineering System
MEC ..... Munitions and Explosives of Concern
MGFD ..... Munition with the Greatest Fragmentation Distance
MM CX ..... Military Munitions Center of Expertise
MM DC ..... Military Munitions Design Center
MPPEH ..... Material Potentially Presenting an Explosives Hazard
MRA ..... Munitions Response Area
MSC ..... Major Subordinate Command
MSD ..... Minimum Separation Distance
NEW ..... Net Explosive Weight
OE ..... Ordnance and Explosives
PDT ..... Project Delivery Team
PL ..... Public Law
PM ..... Project Manager
POC ..... Point of Contact
PPE ..... Personal Protective Equipment
PVC ..... Polyvinyl Chloride
QC ..... Quality Control
Q-D ..... Quantity-Distance
QCP ..... Quality Control Plan
RCWM ..... Recovered Chemical Warfare Materiel
RF ..... Radio Frequency
SOW ..... Statement of Work
SSHO ..... Site Safety and Health Officer
SSHP ..... Site Safety and Health Plan
SUXOS ..... Senior UXO Supervisor
TB ..... Technical Bulletin
TDEM ..... Time-Domain Conductivity Electromagnetics
TEU ..... Technical Escort Unit
TM ..... Technical Manual
TSD ..... Team Separation Distance
USACE ..... U.S. Army Corps of Engineers
USAESCH ..... U.S. Army Engineering and Support Center, Huntsville
USASC ..... U.S. Army Safety Center

UXO .....Unexploded Ordnance
UXOSO .....UXO Safety Officer
UXOQCS.....UXO Quality Control Specialist

Section II
Terms

Action Memorandum
Approves time-critical removal action and also concludes the engineering evaluation/cost analysis. Provides a concise, written record of the decision to select an appropriate removal action. As the primary decision document, it substantiates the need for a removal action, identifies the proposed action, and explains the rationale for the removal action selected. (EP 1110-1-18)

Active Installations
Installations under the custody and control of DOD. Includes operating installations, installations in a standby or layaway status, and installations awaiting closure under the Base Realignment and Closure (BRAC) legislation. (EP 1110-1-18)

Active Range
A military range that is currently in service and is being regularly used for range activities. (40 CFR 266.201)

Anomaly
Any item that is seen as a subsurface irregularity after geophysical investigation. This irregularity should deviate from the expected subsurface ferrous and non-ferrous material at a site (i.e., pipes, power lines, etc.). (EP 1110-1-18)

Anomaly Avoidance
Techniques employed by EOD or UXO personnel at sites with known or suspected MEC to avoid any potential surface MEC and any subsurface anomalies. This usually occurs at mixed hazard sites when HTRW investigations must occur prior to execution of a MEC removal action (i.e., creating safe travel lanes and work areas when HTRW investigations are to be performed prior to MEC removal). Intrusive anomaly investigation is not authorized during ordnance avoidance operations. (ER 1110-1-8153)

Base Realignment and Closure (BRAC)
Program governing the scheduled closing of Department of Defense sites. (Base Closure and Realignment Act of 1988, Public Law 100-526, 102 Stat. 2623, and the Defense Base Closure and Realignment Act of 1990, Public Law 101-510, 104 Stat. 1808)

Center of Expertise (CX)
A CX is a USACE organization approved by HQUSACE as having a unique or exceptional technical capability in a specialized subject area that is critical to other USACE commands. Specific mandatory services to be rendered by a CX are identified on the CX's homepage. These services may be reimbursable or centrally funded. The USAESCH is the MM CX for the USACE. (ER 1110-1-8153)

Chemical Warfare Materiel (CWM)
An item configured as a military munition containing a chemical substance that is intended to kill, seriously injure, or incapacitate a person through its physiological effects. Also includes V- and G- series nerve agent, H- series blister agent, and lewisite in other- than-munition configurations. Due to their hazards, prevalence, and military-unique application, chemical agent identification sets (CAIS) are also considered CWM. CWM does not include: riot control agents, chemical herbicides; smoke and flame producing items; or soil, water, debris, or other media contaminated with chemical agent. (HQDA Memorandum, Interim Guidance for Biological Warfare Materiel and Non-Stockpile Chemical Warfare Materiel Response Activities, 1997)

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)
CERCLA authorizes Federal action to respond to the release or threatened release of hazardous substances into the environment or a release or threat of release of a pollutant or contaminant into the environment that may present an imminent or substantial danger to public health or welfare. (EP 1110-1-18)

Construction Support
Support provided by qualified UXO personnel during construction activities at potential MEC sites to ensure the safety of construction personnel from the harmful effects of UXO. When a determination is made that the probability of encountering UXO is low (e.g., current or previous land use leads to an initial determination that UXO may be present), a minimum of a two person UXO team will stand by in case the construction contractor encounters a suspected UXO with unknown fillers. When a determination is made that the probability of encountering a UXO is moderate to high (current or previous land use leads to a determination that MEC was employed or disposed of in the parcel of concern, e.g., open burn and open detonation areas), UXO teams are required to conduct subsurface UXO removal for the known construction footprint either in conjunction with the construction contractor or prior to construction. The level of effort will be determined on a case-by-case basis in coordination with the MM MCX. (ER 1110-1-8153)

Design Center (DC)
A specified USACE field office assigned a singular technical mission that is permanent and USACE-wide in scope. The designated office is to be considered the "lead activity" in a specialized area where capability needs to be concentrated for maximum effectiveness, economy, and efficiency. The MM Design Center (in coordination with the PM) will execute all phases of the military munitions response project after the approval of the INPR unless the removal action is transferred to an approved district. Only the USAESCH MM Design Center is authorized to execute any phase of a RCWM response. (ER 1110-1-8153)

Discarded Military Munitions (DMM)
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 unexploded ordnance, 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. (10 U.S.C. 2710(e)(2))

Exclusion Zone
A safety zone established around a MEC work area. Only project personnel and authorized, escorted visitors are allowed within the exclusion zone. Examples of exclusion zones are safety zones around MEC intrusive activities and safety zones where MEC is intentionally detonated. For RCWM project sites, it is the area within the No Significant Effects (NOSE) zone.

Explosives or Munitions Emergency Response
All immediate response activities by an explosives and munitions emergency response specialist to control, mitigate, or eliminate the actual or potential threat encountered during an explosives or munitions emergency. An explosives or munitions emergency response may include in-place render-safe procedures, treatment or destruction of the explosives or munitions, and/or transporting those items to another location to be rendered safe, treated, or destroyed. Any reasonable delay in the completion of an explosives or munitions emergency response caused by a necessary, unforeseen, or uncontrollable circumstance will not terminate the explosives or munitions emergency. Explosives and munitions emergency responses can occur on either public or private lands and are not limited to responses at RCRA facilities. (Military Munitions Rule, 40 CFR 260.10)

Explosives Ordnance Disposal (EOD)
The detection, identification, field evaluation, rendering safe, recovery and final disposal of UXO or military munitions. (EP 1110-1-18)

EOD Personnel
Active duty military personnel who perform EOD operations.

Explosives Safety Submission (ESS)
The document which serves as the specifications for conducting work activities at the project. The ESS details the scope of the project, the planned work activities, and potential hazards (including the MCE) and the methods for their control. (EP 1110-1-18)

Formerly Used Defense Sites (FUDS)
FUDS include those properties previously owned, leased, or otherwise possessed by the U.S. and under the jurisdiction of the Secretary of Defense; or manufacturing facilities for which real property accountability rested with DOD but were operated by contractors (Government owned - contractor operated) and which were later legally disposed of. FUDS is a subprogram of the DERP. Restoration of military land was extended to formerly used sites in 1983 under Public Law 98-212 (DOD Appropriations Act of FY84).

Hazardous, Toxic, and Radioactive Waste (HTRW) Activities
HTRW activities include those activities undertaken for the Environmental Protection Agency's Superfund program, the Defense Environmental Restoration Program (DERP), including Formerly Used Defense Sites (FUDS) and Installation Restoration Program (IRP) sites at active DOD facilities, HTRW actions associated with Civil Works projects, and any other mission or non-mission work performed for others at HTRW sites. (EP 1110-1-18) For the purposes of UXO support, HTRW activities during the investigative/design phase of HTRW project on a site with known or UXO with unknown fillers require anomaly avoidance procedures. HTRW activities during the remedial action phase (construction) of HTRW project on a site with known or UXO with unknown fillers may require either standby support or subsurface removal.

Material Potentially Presenting an Explosive Hazard (MPPEH)
Material potentially containing explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris); or material potentially contaminated with a high enough concentration of explosives such that the material presents an explosive hazard (e.g., equipment, drainage systems, holding tanks, piping, ventilation ducts) associated with munitions production, demilitarization or disposal operations. Excluded from MPPEH are munitions within DoD's established munitions management system and other hazardous items that may present explosion hazards (e.g., gasoline cans, compressed gas cylinders) that are not

munitions and are not intended for use as munitions. (28 October 2003 ACSIM Memorandum)

Military Munitions
All ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the Department of Defense, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives and chemical warfare agents, chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components thereof. The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components, except that the term does include non-nuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) have been completed. (10 U.S.C. 2710(e)(3)(A))

Munitions Constituents (MC)
Any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions. (10 U.S.C. 2710 (e)(4))

Munitions and Explosives of Concern (MEC)
This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks, means:
(a) Unexploded Ordnance (UXO), as defined in 10 U.S.C. 2710 (e)(9);
(b) Discarded military munitions (DMM), as defined in 10 U.S.C. 2710 (e)(2); or
(c) Munitions constituents (e.g., TNT, RDX) present in high enough concentrations to pose an explosive hazard. (28 October 2003 ACSIM Memorandum)

Munitions Debris
Remnants of munitions (e.g., penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization or disposal. (28 October 2003 ACSIM Memorandum)

Munition with the Greatest Fragmentation Distance (MGFD)
The munition with the greatest fragment distance that might be recovered as a result of previous training during actions based on historical information. The selected MGFD must be realistic with reasonable probability of occurrence.

Munitions Response
Response actions, including investigation, removal and remedial actions to address the explosives safety, human health, or environmental risks presented by unexploded ordnance (UXO), discarded military munitions (DMM), or by munitions constituents (MC). (28 October 2003 ACSIM Memorandum)

Munitions Response Area (MRA)
Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples include former ranges and munitions burial areas. A munitions response area is comprised of one or more munitions response sites. (28 October 2003 ACSIM Memorandum)

Munitions Response Site (MRS)
A discrete location within a MRA that is known to require a military munitions response. (28 October 2003 ACSIM Memorandum)

OE Safety Specialist
USACE Personnel, classified as a GS-0018 Safety Specialist, and who is UXO-qualified. OE Safety Specialists perform safety, quality assurance and UXO subject matter expert functions for the Government. The Safety Specialist may reside in and report to the construction field office or may reside in the engineering/construction office within the MM Design Center. (ER 1110-1-8153)

Project Delivery Team (PDT)
The PDT is a multi-disciplined PDT led by the Project Manager with responsibility for assuring that the project stays focused, first and foremost on the public interest and on the customer's needs and expectations and that all work is integrated and done in accordance with a PMP and approved business and quality management processes. The PDT focuses on the quality of project delivery, with heavy reliance on partnering and relationship development to achieve better performance. (ER 5-1-11)

Project Manager (PM)
The PM is responsible for management and leadership of the project its entire life cycle, even when more than one USACE district or activity is involved. The PM will generally reside at the geographic district, but can be elsewhere as needed. The PM and PDT are responsible and accountable for ensuring the team takes effective, coordinated actions to deliver the completed project according to the PMP. The PM manages all project resources, information, and commitments, and leads and facilitates the PDT towards effective project development and execution. (ER 5-1-11)

Quality Assurance (QA)
An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed to meet project requirements defined in the PMP. (EP 1110-1-18)

Quality Control (QC)
The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established in the PMP: operational techniques and activities that are used to fulfill requirements for quality. (EP 1110-1-18)

Quantity-Distance (Q-D)
The quantity of explosive material and distance separation relationships that provide defined types of protection. These relationships are based on levels of risk considered acceptable for the stipulated exposures and are tabulated in the appropriate Q-D tables provided in DOD 6055.9-STD. Separation distances are not absolute safe distances but are relative protective safe distances. Greater distances than those shown in the Q-D tables shall be used whenever possible. (DOD 6055.9-STD)

Recovered Chemical Warfare Materiel (RCWM)
Non-stockpile CWM that was previously discarded, buried, or fired and discovered either unexpectedly or during planned environmental restoration operations. (ER 385-1-95)

Removal Action
The cleanup or removal of MEC from the environment to include the disposal of removed materiel. The term includes, in addition, without being limited to, security fencing or other measures to prevent, minimize, or mitigate damage to the public health or welfare or to the environment. (ER 1110-1-8153)

Resource Conservation and Recovery Act (RCRA)
Enacted in 1976, RCRA promotes the protection of health and the environment. It regulates waste generation, treatment, storage, transportation, and disposal for facilities currently in operation. The MEC removal process is affected by RCRA if MEC must be disposed off-site. (EP 1110-1-18)

Small Arms
Caliber 0.50 and smaller ordnance items. These items rarely contain explosive projectiles and present a very low hazard. (Huntsville Interim Guidance Document 99-02)

Stakeholder
Stakeholders include federal, state, and local officials, community organizations, property owners, and others having a personal interest or involvement, or having a monetary or commercial involvement in the FUDS property that is to undergo a MEC removal. (EP 1110-1-18)

Superfund Amendments and Reauthorization Act (SARA)
Enacted in 1986, this legislation establishes standards for cleanup activities, requires Federal facility compliance with CERCLA, and clarifies public involvement requirements. (EP 1110-1-18)

U.S. Army Technical Escort Unit (TEU)
Military chemical agent response unit.

Unexploded Ordnance (UXO)
Military munitions that:
(a) Have been primed, fuzed, armed, or otherwise prepared for action;
(b) Have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and
(c) Remain unexploded either by malfunction, design, or any other cause. (10 U.S.C. 2710(e)(9))

UXO Personnel
Contractor personnel who have completed specialized military training in EOD methods and have satisfactorily performed the EOD function while serving in the military. Various grades and contract positions are established based on skills and experience. Check with the MM MCX for current ratings. (ER 1110-1-8153)