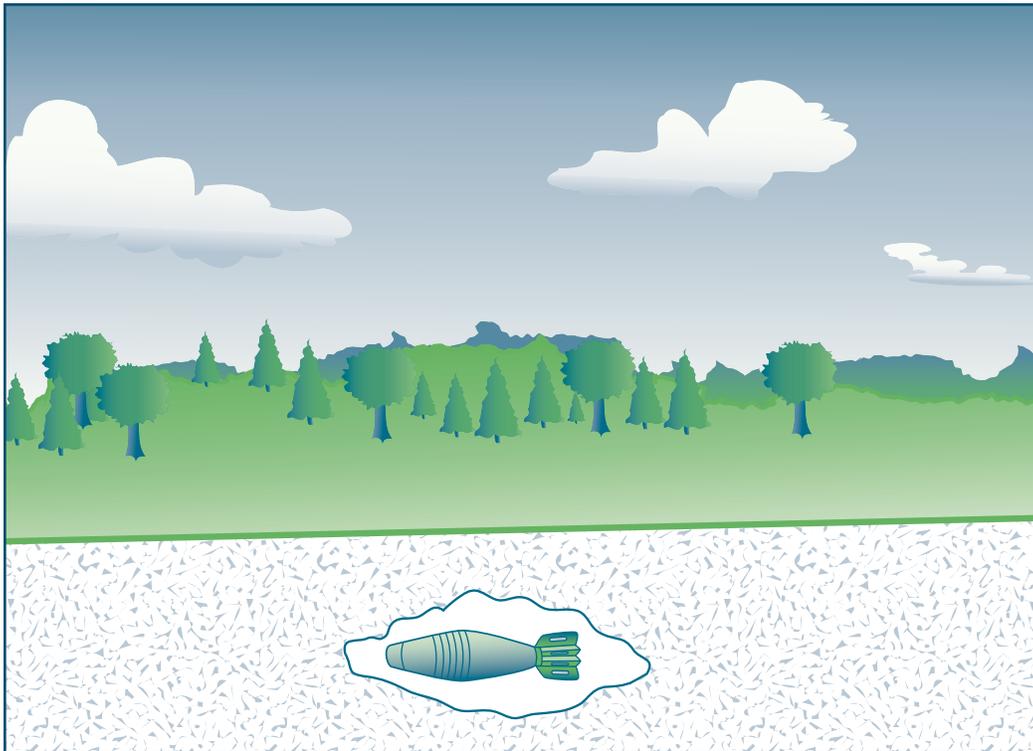




Technical/Regulatory Guidelines

Munitions Response Historical Records Review



November 2003

Prepared by
Interstate Technology & Regulatory Council
Unexploded Ordnance Team

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The Interstate Technology & Regulatory Council
Unexploded Ordnance Team**

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EXECUTIVE SUMMARY

This document is intended to serve as a guide for regulators, stakeholders, and others involved in oversight or review of munitions response historical records review (MR HRR) projects on munitions response sites. Given that historical research can be the basis for subsequent site investigation and remediation decisions, the completeness of the historical records review is a critical component of the munitions response process.

The goals of this document are as follows:

- educate state regulators and other stakeholders on the purpose, content, and terminology of MR HRRs;
- provide a uniform technical approach and useful tools that are compatible with any regulatory framework or authority for reviewing MR HRRs; and
- communicate state regulator expectations to those planning, initiating, and executing MR HRRs.

In most instances, an initial historical records review is conducted early in the munitions response process. The historical records review helps ensure the proper collection, analysis, and documentation of historical information pertaining to property potentially impacted by munitions-related activities. Historical research may indicate that a munitions response may be required to address potential hazards on these sites. Alternatively, historical research may establish that military munitions-related activities were never conducted on the property and, therefore, that no further action is warranted.

Although the military services and the Department of Defense's programs vary somewhat in the approach and timing for historical records review, regulators need to be able to evaluate the adequacy of historical research. An understanding of the various processes involved in the historical records review process, including the variability in historical evaluations from site to site, will enable regulators and others to effectively evaluate these historical reviews.

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MUNITIONS RESPONSE HISTORICAL RECORDS REVIEW

1.0 INTRODUCTION

This technical and regulatory guidance is intended for reviewers of munitions response (MR) historical records review (HRR) documents on other than operational ranges. Specifically, this document provides guidance for evaluating the adequacy of an MR HRR of property known or suspected to require a munitions response.

To achieve this purpose, the goals of this guidance document are as follows:

- educate state¹ regulators and other stakeholders on the purpose, content, and terminology MR HRRs;
- provide a uniform technical approach and useful tools that are compatible with any regulatory framework or authority for reviewing MR HRRs; and
- communicate state regulator expectations to those planning, initiating, and executing MR HRRs.

The proper collection, analysis, and documentation of historical information provide the basis for the MR site investigation and remediation process. National, state, and local attention has increasingly focused on this review because it is the first step in evaluating the potential for hazards resulting from munitions-related activities. Although the military services and U.S. Department of Defense (DoD) programs vary somewhat in their approaches and timing for these evaluations, an understanding of the various processes involved in conducting and documenting historical research will enable a reviewer or regulator to evaluate the adequacy of any MR HRR performed on a project of interest, regardless of regulatory framework used or military service conducting the MR HRR.

A high-quality, well-documented MR HRR assists site managers, regulators, and stakeholders in making confident, informed decisions concerning future site investigation and remediation work. MR HRR results may indicate that high volumes of munitions were used or that other munitions-related activities (e.g., storage, munitions demilitarization) were extensively conducted on the site. Alternatively, the MR HRR may establish that military munitions-related activities never occurred on the site and, therefore, that no further action is warranted.

Initially, a solid foundation of historical data can serve as the basis for identifying both a facility and individual sites within a facility as potentially containing munitions and explosives of concern. As the munitions response progresses, additional historical information may become available. Project decision makers can use this additional historical information to refine the actions required to improve the effectiveness and efficiency of the munitions response. However,

¹Throughout this document, the term “state” refers to all regulatory entities having the general regulatory responsibilities of states, including U.S. territories and commonwealths.

incomplete or inaccurate historical data can cause the munitions response to be less effective and result in unknown hazards remaining on the site after the munitions response is completed.

1.1 Terminology Used in this Document

The terminology of DoD's Military Munitions Response Program (MMRP) is changing at this writing and may continue to do so. Although not fully promulgated by DoD, new standardized terminology is imminent. This document will use the following terms, which are expected to be adopted by DoD in the near future:

- 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 (UXO), military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations. (10 U.S.C. §2710 [e] [2]).
- Military munitions—All ammunition products and components produced for or used by the armed forces for national defense and security, including 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.²
- 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 USC §2710 [e] [4]).

Readers of this and other documents concerning MR should be aware of the following formerly used terminology:

“**OEW**” (ordnance and explosive waste) predates “**OE**” (ordnance explosives), which has been replaced by “**MEC**” (munitions and explosives of concern) and has the same definition.

² 40 CFR §260.10 defines “military munitions” as all ammunition products and components produced or used by or for the U.S. Department of Defense or the U.S. Armed Services for national defense and security, including military munitions under the control of the Department of Defense, the U.S. Coast Guard, the U.S. Department of Energy (DOE), and National Guard personnel. The term “military munitions” includes confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries used by DoD components, 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. Military munitions do not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components thereof. However, the term does include nonnuclear components of nuclear devices, managed under DOE's nuclear weapons program after all required sanitization operations under the Atomic Energy Act of 1954, as amended, have been completed.

- Munitions and explosives of concern (MEC)—Distinguishes specific categories of military munitions that may pose unique explosives safety risks: (a) unexploded ordnance, as defined in 10 USC §2710 (e) (9); (b) discarded military munitions, as defined in 10 USC §2710 (e) (2); or (c) explosive munitions constituents (e.g., TNT, RDX) present in high enough concentrations to pose an explosive hazard.
- Munitions response—Response actions, including investigation, removal, and remedial actions to address the explosives safety, human health, or environmental risks presented by unexploded ordnance, discarded military munitions, or munitions constituents.
- Munitions Response Area (MRA)—Any area on a defense site that is known or suspected to contain unexploded ordnance, discarded military munitions, or munitions constituents. An MRA comprises one or more munitions response sites.
- Munitions Response Site (MRS)—A discrete location within a Munitions Response Area that is known to require a munitions response.
- Operational range—A military range currently used for range activities or a military range (a) not currently being used but still considered by the DoD component to be a range area; (b) under the jurisdiction, custody, or control of DoD; and (c) not put to a new use incompatible with range activities (10 USC §2710 [e] [5]). Operational ranges include the areas formerly known as active and inactive range areas.

1.2 The Role of Historical Records Review in the Military Munitions Response Program

Numerous regulatory and technical issues surround the investigation and environmental restoration of other than operational ranges at current and former DoD installations. To protect human health and the environment and support future beneficial land use, the resolution of these issues normally requires interaction among DoD, multiple regulatory authorities, and other stakeholders.

In most instances, an initial MR HRR is conducted early in the MR process. Examples of environmental documents that could include historical research aspects include installation operational histories, Base Realignment and Closure (BRAC) Environmental Baseline Surveys, and Archives Search Reports (ASRs) and Preliminary Assessments (PAs).

Some initial historical reviews may be cursory reviews that are not intended to be an all-inclusive, exhaustive review of available historical records. Such reviews are usually intended to provide enough information to identify areas that require an immediate response or to prioritize the site for the next step in the munitions response.

When scoping detailed investigations of an MRS, any initial historical research should be reviewed to determine whether additional research is warranted. It is critically important to recognize the potential limitations of many initial historical reviews. The historical research may not be exhaustive and may not have identified all potential munitions sites or hazards. In many

cases, additional historical research may be needed during a detailed site investigation either across the entire facility or targeted to address specific issues, operations, or areas on the facility.

As the munitions response progresses at a site, specific questions or data gaps can arise that are best addressed by further historical research. Thus, historical records review is a tool to be used throughout the entire munitions response process.

1.3 DoD's Military Munitions Response Program

In September 2001, DoD established the Military Munitions Response Program within the Defense Environmental Restoration Program (DERP) to address UXO, discarded munitions, and munitions constituents used or released in support of military readiness on MMRP sites. DoD established the management structure and initial program requirements for the MMRP in "Management Guidance for the Defense Environmental Restoration Program." In addition to defining the essential requirements for responses at its MMRP sites, DoD

- established a requirement to identify through an inventory, to be completed by September 30, 2002, all locations other than operational ranges that require a military munitions response;
- defined how to use the new Program Element established for military munitions response;
- defined the data elements necessary to develop credible cost estimates and support the MMRP; and
- established the requirement to identify, characterize, track and report data on military munitions and military munitions responses in a manner that is compatible with the Installation Restoration Program (IRP) and which supports inclusion in the Restoration Management Information System (RMIS).

In addition to developing a munitions response inventory, DoD is developing an MMRP Site Prioritization Protocol. This protocol is being developed in response to a provision in the fiscal year 2002 National Defense Authorization Act amending the Defense Environmental Restoration Program (10 USC §2701 et seq.) that requires DoD to

...develop, in consultation with representatives of the States and Indian Tribes, a proposed protocol for assigning to each defense site a relative priority for response activities related to unexploded ordnance, discarded military munitions, and munitions constituents based on the overall conditions at the defense site. After public notice and comment on the proposed protocol, [DoD] is to issue a final protocol and apply the final protocol to all defense sites listed on the inventory....

The development of DoD's munitions response inventory and the prioritization protocol will provide additional organization and structure to the identification and investigation of MRSs nationwide. The munitions response inventory and prioritization will likely identify numerous sites with limited information concerning historical munitions use or potential hazards.

The military services differ somewhat in their approaches to executing the MMRP, which somewhat complicates describing the MR HRR process. Brief descriptions of the military services' MMRP and their approach to MR HRR are provided below.

1.3.1 U.S. Army Corps of Engineers

The Army is the Executive Agent for DoD's Formerly Used Defense Sites (FUDS)³ program. The U.S. Army Corps of Engineers (USACE) executes the FUDS program for the Army and investigates—and, when appropriate, performs required responses to address—contamination resulting from former DoD use of FUDS. Because many FUDS have been inactive for long periods of time, often little is known about potential hazards on many of these sites.

At the request of an installation, the USACE may also implement munitions responses on MRSs that are located on installations realigning or closing under BRAC or on active installations on other than operational ranges. In this instance, USACE provides technical support services to the installation. For example, USACE has produced several ASRs at BRAC installations in support of BRAC Environmental Baseline Surveys.

Archive Search Reports are an MR HRR process developed by USACE. A USACE ASR is an initial HRR typically conducted at FUDS with the potential for munitions contamination. The purpose of this records search is to locate and retrieve sufficient information related to the presence and use of military munitions at the site to determine program eligibility. Specialists from the USACE St. Louis and Rock Island Districts perform record reviews, conduct personal interviews, and perform site visits to gather information for documentation to be incorporated into the ASR. When evidence of military munitions use is found, it is documented in the ASR. This serves as initial documentation of the FUDS as an MRS. If the ASR documents that munitions-related activities did not occur at the site, it may be proposed for elimination from the MMRP.

Non-DoD Munitions Response Projects

Although the vast majority of munitions responses are funded and managed by DoD, other agencies, such as the Department of Energy and Bureau of Land Management, may lead a munitions response cleanup.

Civilian entities are also managing and funding munitions responses at a limited number of sites. Examples include the Tourtelot site in Benicia, California and portions of the former Lowry Bombing and Gunnery Range in Aurora, Colorado. At both sites a land developer is performing the munitions response.

In the case of civilian-funded and -managed munitions responses, it is recommended that the project managers formally determine the regulatory framework that will be followed and that the MR HRR be documented appropriately.

In the event the ASR documents that a site may contain MEC, additional, more exhaustive historical investigation may be required. In this case, additional historical information will typically be documented in the subsequent project investigation documents such as the PA, Site Inspection (SI), Remedial Investigation (RI), Feasibility Study (FS), Engineering

³ FUDS are defined as real property that was formerly owned by, leased by, possessed by, or otherwise under the jurisdiction of the Secretary of Defense or the Components (including governmental entities that are the legal predecessors of DoD or the Components) and those real properties where accountability rested with DoD but where the activities at the property were conducted by contractors (i.e., government-owned, contractor-operated properties) that were transferred from DoD control prior to October 17, 1986. The status of a site as a FUDS is irrespective of current ownership or current responsibility within the federal government.

Evaluation/Cost Analysis (EE/CA), or RCRA [Resource Conservation and Recovery Act] Facility Assessment (RFA).

It is USACE policy to provide the draft ASR to regulators, property owners, and, when appropriate, to other stakeholders for review and comment. Additional information about the site received from this review process is added to the ASR before it becomes final.

1.3.2 U.S. Navy (Including Marine Corps)

The Navy is responsible for addressing all MMRP activities on Navy and Marine Corps active and BRAC installations. Thus, Navy MRSs are on installations that are active or were recently active. Accordingly, information about Navy MRSs is usually more current than information about FUDS.

The Navy currently follows the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) process for its MRSs and the information gathered during the MR HRR is documented in the PA. Subsequent historical information discovered after issuance of the PA is included in the appropriate CERCLA document such as the SI, RI/FS, MR project work plans, or record of decision (ROD).

The Marine Corps has completed comprehensive ASRs on ten installations.

1.3.3 U.S. Air Force

The U.S. Air Force has a similar MR mission and follows a process that is very similar to that previously described for the U.S. Navy.

1.4 Document Organization

This document provides information on how the MR HRR process works (see Figure 1.1), how it fits into the overall planned munitions response, and how to review historical research for completeness and accuracy. This information is contained in the following chapters of this document:

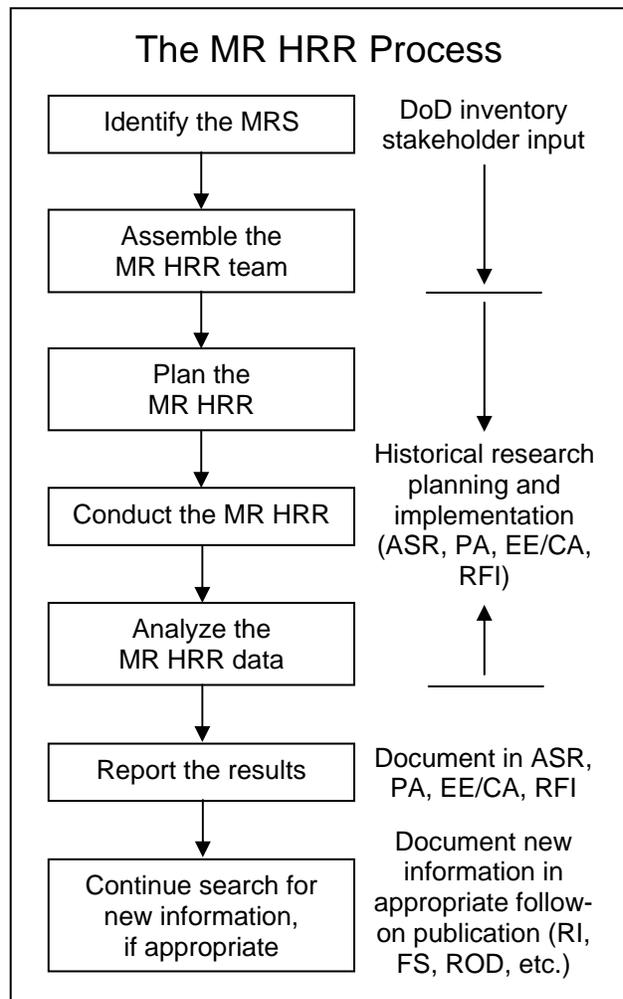


Figure 1-1. Munitions Response Historical Records Review process.

- Chapter 2, “Build the MR HRR Team,” describes how to identify the members of the team and the roles of the various team members in developing and evaluating the MR HRR. Established at this early stage of the munitions response, this team continues to work together through the various phases of the munitions response.
- Chapter 3, “Plan the Project,” describes the basis for planning the MR HRR, including developing project investigation goals and data quality objectives.
- Chapter 4, “Conduct the Research,” describes how the actual research is performed and documented through implementation of the MR HRR plan.
- Chapter 5, “Analyze and Interpret the Data,” describes how the information acquired during the MR HRR is reviewed, selected for relevance, and documented.
- Chapter 6, “Report the Results,” describes how the MR HRR is organized and documented and provides tips for reviewers of MR HRR documents.

2.0 BUILD THE MR HRR TEAM

This section describes the MR HRR team, identification of team members, and the roles of the various team members in conducting and reviewing an MR HRR.

Conducting a, MR HRR requires a skilled and diverse team, typically composed of project managers, technical experts, and a review team. Project management is responsible for overall scoping of the project and direction of the technical team. Technical experts conduct the research, analyze the data, and document the results. The review team provides feedback to the project management and technical team during the project.

DoD should involve regulators and, when appropriate, non-DoD federal land managers in the MR HRR as early as possible so that they can help guide the project, including building the MR HRR review team.

2.1 Identifying Potential Team Members

The technical team's roles are to physically conduct the research and to provide subject matter expertise for the project. The team is composed of researchers and various subject matter experts assembled to facilitate the efficient research into the unique history of each MRS. The size and composition of the technical team varies by project depending on the anticipated amount, type, and complexity of the research to be conducted, as well as the specific objectives established for the MR HRR project.

The unique composition of each technical team should be discussed during the scoping of the project. Some types of expertise are routinely required for most MR HRRs, and others are used only to address specific, narrowly scoped issues. For example, local and military historians are commonly involved in many MR HRR projects, whereas chemical safety specialists become involved only in projects with specific chemical munitions concerns. The technical team is dynamic and may change as the project progresses and research needs evolve.

The review team's role is to provide the opportunity for regulatory and stakeholder participation in the MR HRR project. The review team is composed of project management, regulators, federal land managers, and other stakeholders. Again, due to the wide variety and diversity in historical research projects, the composition of review teams varies. However, early and meaningful stakeholder involvement facilitates the ultimate acceptance of the MR HRR results. It is recommended that the review team be both diverse and inclusive.

In a thorough planning process, it is important to consider the skill sets of those conducting the MR HRR in light of the suspected activities of the site. Any preexisting knowledge available regarding the site should be used when identifying potential team members. This information and the rationale for building the MR HRR technical and review teams should be clearly documented in the MR HRR project records.

2.1.1 Technical Expertise

Recreating a living military history for a munitions response site can be a complex process. The technical expertise of the experts conducting an MR HRR should match the complexity of the project.

Records that may need to be researched include a variety of military documents, such as technical reports, training records, supply logs, and aerial photos. These documents are uniquely military and may not be meaningful without the appropriate background and training. Additionally, other records that may need to be searched often exist outside these military sources and can include real estate records, industrial records, and scientific journals. Table 2-1 identifies examples of technical expertise that should be considered for potential incorporation into the MR HRR technical team.

Table 2-1. Examples of technical expertise available for MR HRR teams

Support category	Source	Technical expertise
Military historian	U.S. Army Ordnance Center and School	Knowledgeable in past military activities, including research, testing, and training activities that occurred over time
Local historian	Historical society, local universities	Knowledgeable of past activities in local area, which may include past military activities; have access to useful historical documentation (e.g., newspapers)
Archivist	Library, museum or university	Versed in records sources and record keeping for historical activities
Mapping/GIS specialist	Various	Able to integrate past records with current geographical tools to pinpoint areas of potential interest
Aerial photo specialist	EPA's Environmental Photographic Interpretation Center, USACE Topographic Engineering Center, National Imagery and Mapping Agency	Specialize in analyzing aerial photos for evidence of ground activities that may be associated with the release of hazardous materials and UXO
Munitions management and explosives specialist or chemical safety specialists	Department of Defense Explosives Safety Board, military service munitions managers and safety centers	Trained in the identification of munitions with regard to explosive configuration and type of fill; also responsible for safe dispositions of such items
Community involvement	Contractors and nonprofit groups	Specialize in conducting outreach to identify veterans and other individuals for subsequent interviews

The types of training and munitions-related activities suspected to have been conducted at a site influence the type of records that will need to be reviewed and the location of such records. For example, records for a range used for research, development, testing, and evaluation differ from those associated with munitions production or demilitarization facilities. Similarly, potential contaminants of concern may also differ based on the suspected activities that were or may have been conducted at the site. This kind of information will influence the technical team composition.

2.1.2. Project Stakeholders

A variety of federal, state, tribal or local government representatives and other stakeholders should be invited to participate on the review team. Stakeholder participation on the review team will help to ensure the completeness of the research and can increase the likelihood of the acceptance of the MR HRR results.

A “stakeholder” can be defined in the broadest terms possible, meaning that everyone with a stake in the process is, in fact, a stakeholder. Stakeholders for a given site include everyone from the potentially responsible party and the state regulator to the neighborhood association adjacent to the site. While some stakeholder groups have financial or regulatory responsibility and liability, these criteria should not be the only defining factors in developing the MR HRR review team. Any group that expresses a clear interest and commitment to the process is a stakeholder and should be considered in the MR HRR process.

Table 2-2 provides examples of potential MR HRR review team members and broad stakeholder groups and their respective responsibilities and interests. This is only a representative sampling of stakeholder types, team representatives, and their potential roles and interests; stakeholders and their respective roles differ from site to site and must be identified through site-specific efforts. If a community advisory group such as a Restoration Advisory Board (RAB) has been established, it should be consulted regarding review team composition. Additional outreach to other potential stakeholders may also be necessary.

An Example of Team Assessment: Photographic Interpretation

In evaluating a WW I-era range such as Spring Valley in Washington, D.C., expert interpretation of aerial photos is an important component of the research process. The MR HRR team for such a site requires technical support skilled in identifying ground scars that may have been pits or trenches used during research, development, testing, and evaluation of munitions and munition filler.

The adequacy of the team and the acceptance of its findings depends on

- the presence or absence of such skills on the team,
- team members’ understanding of the photo analysis process,
- early identification of stakeholder support and concerns regarding assessment process to be applied,
- the process for addressing uncertainty associated with approach, and
- clear conveyance of the assessment and decision processes in final report.

Addressing these points proactively positively affects stakeholder support of the MR HRR findings, trust of subsequently released information and outreach efforts, and acceptance of proposed field investigative approaches based on the records research.

Table 2-2. Stakeholder roles and interests in the MR HRR process

Stakeholder category	Team examples	Roles and interests
DoD representative	Army, Air Force, Navy, Marines, USACE	Provides project leadership and ensures successful completion of project objectives.
State agencies	State environmental agencies, state historical preservation office	Enforce applicable state laws and regulations in protection of human health and the environment, areas of historical significance, etc.
Federal environmental and land management agencies	EPA regional staff, U.S. Fish and Wildlife Service, U.S. Forest Service, Bureau of Land Management	Manage federal lands, protect natural resources, and enforce federal standards in protecting health and the environment.
Tribal government	Tribal chairman, governor, or chief; tribal council; tribal historic preservation officer; environmental project manager	Indian tribes are individual sovereign nations that have signed treaties and/or are recognized by the federal government. This unique relationship affords them consultation rights unavailable to other groups and the full protection of all applicable federal and state historic preservation laws. Efforts to address environmental contamination where American Indian concerns may exist are conducted through a government-to-government consultation process. Federal laws mandate contacting local tribal nations immediately when the planning process begins and consulting with them often when traditional cultural and religious significance has been attached to property within the project area.
City and county agencies	Department of Public Works, Department of Health, etc.	Ensure safe water supplies, local public health, etc.
Land owners	Industrial, commercial, residential	Concerned with property value, liability, and health issues; control right of access to property during investigation and cleanup.
Community advisory boards	Restoration Advisory Boards, citizen advisory boards	Provide cross section of community perspectives regarding local concerns and how they may relate to the cleanup of military contamination.
Nonprofit organizations	Local environmental groups, local churches, community organizations	Active in a variety of health and environmental issues, often politically active.
Individual residents	Tenants and neighbors of properties under investigation	May possess useful knowledge of past and/or current land use, recovered material, etc.

2.2 Invitation to Participate

Once the identification of potential team members has been completed and evaluated, project management should invite these people to participate in the MR HRR process. While many invited stakeholders decline to participate due to time or financial constraints, inviting a spectrum of entities adds to the defensibility of the project on both technical and participatory levels. It also builds support for the project down the road and can uncover sources of information that may have been otherwise overlooked.

2.3 Communication

As in any working process involving multiple entities, balancing the diversity of perspectives is important. Setting up clear goals, establishing appropriate communication mechanisms, and delineating acceptable opportunities for input helps establish an inclusive, effective, and efficient process. It is also important to recognize the distinction between partnering and stakeholder involvement and regulatory approval authorities. The states and EPA are ultimately responsible for regulatory approvals.

2.3.1 Roadmap for Process

A key step in keeping the team focused and productive is developing a roadmap for development and execution of the MR HRR. The box at right presents example steps in such a roadmap. Maintaining flexibility to meet diverse needs and communicating with team members regarding financial, schedule, and political constraints are the cornerstones of developing an inclusive, cost-effective process.

Developing a Roadmap for MR HRR Process Development

1. Hold the initial team meeting:
 - a. Discuss the scope of the project.
 - b. Identify stakeholder concerns.
 - c. Present the process for team function, work plan development, and research execution.
 - d. Discuss other needed or interested members.
 - e. Obtain feedback on above from participating stakeholders.
 - f. Develop follow-up action items with names of individuals taking the leads and date and location of next meeting.
2. Circulate feedback and selected team structure, communication approaches and next steps.
3. Develop MR HRR work plan, including clear decision matrices through identified team process and feedback loops.
4. Execute MR HRR research, data evaluation, and report development.
5. Provide draft report for stakeholder (MR HRR Review Team?) review.
6. Address comments in collective process agreed to at the beginning of the process.
7. Provide final MR HRR report for inclusion in the information repository.

2.3.2. Mechanisms for Communication

Working bodies with excellent individual skill sets can function very poorly as a unit if communication issues are not addressed early in the process. For instance, some stakeholders may have the time only to observe and simply want to be kept informed, while others may request a more direct role in work plan development and the decision-making process.

Identifying these different needs early and developing the mechanisms to meet them are crucial in maintaining transparency and support for the project. The more transparent the research process, the more likely that technical inadequacies and nontechnical hurdles will be avoided, improving stakeholder perception and, thus, acceptance of the final report.

Communication tools for simple information distribution include newsletters, e-mail updates, Web pages, and working meeting minutes. For stakeholders wanting more detailed involvement, two-way communication tools such as the following may be necessary:

- public meetings hosted by the MR HRR team,
- presentations of progress at local meetings hosted by others, and
- invitations to stakeholders to observe or participate in working meetings.

Using such two-way communication tools not only keeps participating stakeholders informed and involved, but also helps ensure the necessary feedback loops to keep the project on course. At sites with community involvement plans, the plan should be consulted for specifics on mechanisms for communication with stakeholders.

Feedback loops for active team members and those observing the process provide vital mechanisms for progress review and stakeholder input. For example, drafts of progress reports and the MR HRR report itself should be distributed to stakeholders, with comments being incorporated or resolved through clear explanation and subsequent discussion. Reviewers of MR HRR documents should be able to identify where these feedback loops were implemented.

2.4 Classified Historical Munitions Documents

Some historical records regarding munitions-related activities may contain classified or sensitive information. It is not uncommon for information generated decades ago to remain classified. Persons reviewing classified historical records must have the appropriate security clearance. The team may not have direct access to classified documents or information; however, the existence of classified or otherwise restricted information regarding an MRS and how such classified information was addressed should be clearly documented and discussed, to the extent possible and in an unclassified manner, with the team.

If classified information is uncovered during an MR HRR, it is critical that the team discuss options for handling classified information. Many times, similar information is available from nonclassified sources. In such cases, the person reviewing the classified information should confirm that no new information is available in the classified documents. When possible, an unclassified summary of relevant information should be developed for review and/or a request for declassification of the information should be requested. Issues associated with the declassification of historical records are beyond the scope of this document.

3.0 PLAN THE PROJECT

This section describes important considerations when planning an MR HRR project:

- making the initial identification of the site;
- establishing the project objectives for the MR HRR;
- planning and performing the initial site visit, if necessary;
- developing the MR HRR project work plan;
- developing data quality objectives (DQOs); and
- developing a preliminary conceptual site model (CSM).

3.1 Initial Identification of an MRS

The munitions response site must be identified based on credible evidence that military munitions-related activities occurred at the site. The DoD components identify MRSs on BRAC and active installations. The U.S. Army Corps of Engineers identifies FUDS.

As a result of a congressional mandate, DoD is conducting a comprehensive inventory of MRSs. DoD's initial munitions response inventory—which DoD is reconciling with the states, tribes, EPA, and other federal land managers—was reported in DoD's Fiscal Year 2002 Annual Report to Congress. DoD intends to update the initial munitions response inventory in subsequent annual reports to Congress. It should be noted that identifying all possible FUDS continues to be a DoD challenge.

As state regulators have become more involved in the oversight of munitions responses, it has become more common for states, tribes, and federal land managers to identify potential MRSs. Several states are performing at least a limited preliminary investigation when credible evidence of a potential new MRS is found. As DoD completes its munitions response inventory and reconciles it with the states, tribes, EPA and other federal agencies, the need for such actions will decrease.

A key issue at this early investigation stage is identifying sites that pose an immediate threat to human health or the environment based on either munitions-related activities that occurred at the MRS, discoveries of MEC, or incidents involving MEC. Under the MMRP Site Prioritization Protocol proposed by DoD as a federal rule, all MRSs will be objectively assigned a relative priority based on the explosive safety hazards, chemical agent hazards, and environmental risk at the site.

DoD recognizes approximately 24 FUDS potentially contaminated with military munitions in the state of New Jersey that may require a munitions response; however, the State of New Jersey believes that there may be as many as 38 such sites.

The State of New Jersey is conducting preliminary research into these potential sites to determine whether enough evidence exists to recommend DoD evaluation for inclusion of these sites in its FUDS program.

The first step in identifying sites potentially contaminated with MEC is to examine the title of the property and attempt to determine whether the site is—or was formerly—owned by, leased to, or otherwise possessed by or under the jurisdiction of DoD. This determination can then be followed by additional research of historical records to attempt to determine the past use of the facility, whether military munitions-related activities occurred at the site, and whether any munitions response has been performed in the past. It should be noted that not all FUDS necessarily require a munitions response. For example, Cameron Station in Alexandria, Virginia, a former Army logistics facility recently closed under BRAC, is already being reused as a major residential area. It did not require a munitions response because no military munitions-related activities that could result in the presence of MEC occurred there.

Because some military munitions-related activities (e.g., unauthorized disposals, unauthorized burial of munitions, maneuvers) are not well documented, these types of hazards may not be discovered for years. It is important to recognize that additional MR HRR efforts may be required at any point during the munitions response process.

There is always the possibility that some types of MEC involvement will not be identified during the MR HRR. Even a thorough MR HRR process cannot eliminate the possibility of unexpected discoveries.

For example, at a National Guard site in Colorado, the historical site information indicated that the range had been used for weekend training of local guardsmen on field artillery (155-mm and 8-inch guns). Later, several 3.5-inch rocket warheads and rocket motors were found, indicating that the Guard had also conducted rocket training at the site. The area with rockets was added to the conceptual site model, and plans were made to investigate the remainder of the site for other undocumented munitions-contaminated areas.

3.2 Establishing MR HRR Objectives

MR HRR objectives should be developed once a site is known or suspected to require a munitions response. Examples of such objectives include the following:

- Determine the boundaries of the overall installation or MRS.
- Determine site owners and uses.
- Determine the types of military munitions-related activities that occurred at the site.
- Determine the configuration, types, and general location of military munitions potentially present on the site.
- Determine whether a time-critical response action may be required.
- Identify likely locations of military munitions-related activities (e.g., former ranges or target areas, demilitarization points, storage or transfer sites).
- Establish the approximate dates that munitions-related activities occurred at the various identified locations.
- Document background information including climate, weather extremes and rainfall, geology, topography, vegetation, and current site use.
- Identify any known site-specific gaps and or needs.

3.3 Planning and Performing an Initial Site Visit

An initial site visit is generally required for FUDS. Because there may be so little known about the site and/or the surrounding area, a brief initial site visit can be helpful in developing a general understanding of the site and determining whether military munitions-related activities occurred at the site. The site visit may also help determine whether a time-critical response is needed.

Because of the lack of information on many of the older sites, it is usually helpful to have some basic historical documents, such as historical maps of a former military base identifying areas used for training and administration, available for use during the initial site visit. If the site visit is to a FUDS on private property, the property owner must be contacted to provide permission prior to entering the site. If the FUDS is on public property, the appropriate official(s) should be notified.

The following are examples of the types of information typically gathered on an initial site visit:

- obvious MEC areas of interest;
- location of buildings and old building foundations;
- current land use;
- local emergency support, such as police, fire, and emergency response;
- terrain and vegetation conditions; and
- photographs of areas of interest.

Site Visits

Observing safety requirements is the most important part of participating in any site visit to a potential MRS.

The visit party should always be kept to a small group; however, some members of the MR HRR team may be allowed to participate in the site visit for the following reasons:

- One or more community members discovered the potential MRS, and their presence is required to direct the site visit party to the potential contaminated areas.
- Members of the MR HRR team can help lend credibility to the findings of the site visit party by independently documenting site conditions.
- The landowner of a FUDS may want to participate in the site visit.

This site information should be recorded and used in the development of the preliminary CSM and to support the planning for any future site work.

3.4 Developing an MR HRR Work Plan

The various DoD military services may vary in their approach to planning for MR HRRs. In the case of the U.S. Navy, initial MR HRR planning takes place as part of the planning for the PA because this is when the Navy performs its initial formal MR HRR data-gathering effort. USACE uses a standardized plan for a FUDS initial ASR investigation, followed by any additional historical research necessary as part of a PA or an EE/CA investigation. The PA or EE/CA plans should contain a section on MR HRR that is specific to the MRS being investigated.

An important aspect of developing an adequate MR HRR plan is to identify the potential data sources likely to contain information pertaining to the specific MRS being investigated. Planners should also consider the type of military munitions-related activities known or suspected to have been conducted at the MRS and recognize that the uses may have changed over time. Determining the type of military munitions-related activities or other military activities will guide the records search. For example, detailed munitions storage records may identify lot numbers, quantities, the date of logistics actions (e.g. receipt, issue, transfer), and the destination of shipments. These records may help to verify the disposition of munitions that were at the site. Appendix B lists potential sources (DoD, other federal government, local government, and private) of MR HRR information that should be considered for inclusion in the MR HRR plan when relevant to a specific MRS. Appendix C lists archival record groups used by the National Archives and Federal Records Centers.

One federal government source of information worthy of specific note is the USACE Topographic Engineering Center (TEC) in Alexandria, Virginia. This facility has access to government historical and current aerial photography and the experts required to locate and analyze it. The TEC is an operational unit that analyzes photos in support of the U.S. military and therefore is not an archive per se. However, the TEC has accepted funding to perform historical aerial photo acquisition and analysis in the past, and its work has resulted in significant savings in time and funding through the accurate documentation of MRSs.

Because the level of documentation of military munitions-related activities varies, MR HRRs on sites that lack complete documentation of these activities often benefit from information obtained during personal interviews. Interviewees are often genuinely interested in passing on the information they have, and efforts to contact them, including contacting local veterans organizations and requesting their assistance on veterans and project Web sites, can be worthwhile. The interviewer should try to gauge the usefulness of the person being interviewed. It is also helpful to record or tape interview for the record. Information gathered from personal interviews should be augmented with other data sources, if available. Interviews with World War II veterans have been a valuable source of information for numerous FUDS projects. It should be noted that firsthand knowledge, particularly of military munitions- and training-related activities that occurred in preparation for WWII and the Korean War, is becoming hard to obtain.

Personal Interviews

A World War II veteran recently came forward and expressed willingness to discuss his knowledge of the use of munitions-related activities on a FUDS on a remote Alaskan island. A personal interview with the USACE St. Louis District resulted in identifying a previously unknown potential chemical warfare material burial site.

Other methods of soliciting information from persons with knowledge of the site's past use include hosting a public open house near the MRS, placing notices in local publications, setting up a Web site (or posting a notice on an existing state or city Web site) with an e-mail point of contact, and operating a toll-free telephone number. All of these information sources are potentially applicable and may produce important information regarding a specific MRS.

Finally, personnel involved in overseeing or managing a munitions response should be aware of the potential importance of previously collected site information. Some site characterization efforts have ignored or not adequately considered site information developed by prior investigative efforts. As the national DoD effort to a complete munitions response inventory continues, it may not be unusual to find MRSs that have undergone some previous munitions response action, including investigation. While data from previous investigations can be a good source of information for an MR HRR, there is the potential that the previous sources are not accurate. Therefore, the information should be reviewed to verify the accuracy of the results. If possible, the raw data should be used in this review.

In the case of FUDS, non-DoD entities, potential land developers, and others may have conducted investigations of which DoD is not aware. All members of the MR HRR review team can make a significant contribution to the MR HRR by contributing knowledge of the local area.

3.5 Developing MR HRR Data Quality Objectives

The data collection process needs to be structured to achieve the desired results. EPA has developed a seven-step process for developing DQOs that can be applied to MR HRR planning to help guide this process.

EPA's seven-step process for developing DQOs, followed by the potential applicability of each step to an MR HRR, are as follows:

1. State the problem: Introduces the need for conducting an MR HRR.
2. Identify the decisions: Identifies the decisions that the MR HRR data is needed to support.
3. Identify inputs to the decision: Identifies data needed to support the decisions from Step 2.
4. Define the study boundary: Places limits on the study to keep it focused on the needed data. Study limits may include the physical boundaries of the site, the years the site had military munitions involvement, or identifying a specific site within an overall facility that is being targeted for study.
5. Develop decision rules: Identifies how decisions regarding sources of MR HRR data will be made and the person or group responsible for making these decisions.
6. Specify tolerance limits on error: This step is more applicable to acquiring hard data such as laboratory analysis of groundwater; however, it can be used in the MR HRR planning process to state that all historical data within the parameters identified in Step 4 above will be included in the MR HRR archive file regardless of its apparent importance.
7. Optimize sampling design: States the methods for conducting the MR HRR and archiving the data.

Thus, the DQO process can be applied to provide order and structure to the MR HRR planning process.

3.5.1 MR HRR Quality Control

Establishing a good quality control (QC) program is an important element in any successful MR HRR. This ensures that decision makers have high-quality data on which to base their decisions and demonstrates to stakeholders that each phase of the munitions response is meeting established objectives. This munitions response “QC foundation” should be started in the planning stages for the MR HRR.

Because the details of developing a QC program can be fairly complex, it is best to have someone trained in QC involved with the establishment of the MR HRR QC program.

U.S. Navy Automated Quality Assessment Program System (AQAPS)

U.S. Navy munitions responses should employ AQAPS, which was developed to capture quantifiable data from various sources in a usable, repeatable, and verifiable format. It incorporates the EPA DQO development process and includes question sets to guide the user in the development of project DQOs. AQAPS has several different modules designed to provide structure to the munitions response, including MR HRR, and its use should support stakeholder confidence by providing a transparent measure of project success.

QC planning for MR HRR may include the following processes:

1. Develop a standardized data management form for cataloging MR HRR information. This form should be completed for every data item reviewed for inclusion in the munitions response database and form a permanent record of the review, collection, archiving, and QC checks on the data. A copy of the data item (for example, a map, report or personal interview) can be attached to the form. Figure 3-1 shows a sample standardized MR HRR data form; Appendix D includes a full-page form.

MR HRR Data Management Form	
Date: _____	
Time: _____	
Data Item Number: _____	Data Quality: High Medium Low
Project Name: _____	Copy Attached: Yes No
Data Source: _____	Archivist Name: _____
Data Location: _____	QC Name: _____
Summary of the Data:	

Figure 3-1. Sample MR HRR project data management form.

2. Develop a system for rating the quality of each data item added to the MR HRR archive to help subsequent data reviewers recognize the relative potential confidence that should be attributed to the data item. Simple designators of “high,” “medium,” and “low” can be used to designate the data quality:
 - High quality: Verifiable data source such as a document, map, or personal interview with supporting documentation.
 - Medium quality: Written records, without the original source, or personal interviews where several interviewees provide similar accounts.
 - Low quality: Original data source formerly verifiable but no longer available (for example, recollections of lost documents and maps) or personal interviews, without backup documentation or with contradictory documentation.
3. Maintain a master log of all data items added to the project archive. Each data item should be assigned a data item number, and this data item number should be recorded on the data management form and on the master data log.
4. Establish a regular schedule of data QC checks. At minimum, the assigned QC representative should periodically inspect the data archive to ensure that each data item has an assigned data item number, the data management form is completely and properly filled out, the proper quality rating has been assigned, and the data item is recorded on the master data log.

3.5.2 Establishing a Data Archive

One of the critical MR HRR planning decisions concerns the establishment of a data archive for the MRS. Two primary methods of archiving data have proven successful. The selection of the archive method should be based on how the archive data will be used.

The simplest data archive method is to compile hard-copy documents and records in files or binders. This archive method works best for sites with small, manageable amounts of data, including small MRSs that were not in use for a long period of time.

Larger MR projects can quickly amass a large quantity of data that can become difficult to manage and access using a hard-copy file system. Consequently, the majority of MR HRRs in the future are likely to use a geographic information system (GIS) to catalog and manage the data. In addition to serving as an easily accessible data archive, GIS databases and maps can also serve as an excellent public outreach tool for communicating with stakeholders.

The term “GIS” means different things to different people, and there are various commercial components available today in the information technology (IT) marketplace. Nevertheless, most users of GIS consider it to be an integrated IT toolset that applies some or all of the following components to produce a usable, geospatially referenced system for a specific customer’s needs:

- computer-aided design and draw (CADD),

- automated mapping,
- Global Positioning System (GPS) data,
- database architecture, and
- remote sensing data.

A useful GIS can incorporate various data sets in a computerized geographically integrated system, enabling project decision makers to submit different queries to the system and receive the appropriate data. An example query would be as follows: “Select all archived firing orders for a specific firing range during the period 1949–1955.” A properly designed system would be able to produce all of the archived data meeting those specifications.

MR HRR data within a GIS may be made accessible to the public via a public access information terminal or the Internet. A popular way to configure a public access information terminal has been to use a facility map as a base layer with a drop-down menu of additional available data layers that can be drawn on top of the base layer. However, this approach may be difficult in the future because of the development of Homeland Security requirements.

For the purposes of MR HRR planning, the project decision makers should evaluate the MR HRR’s data archiving, data management, and data presentation needs to design an adequate GIS.

3.6 Developing a Preliminary Conceptual Site Model

A conceptual site model is a method of organizing, displaying, and using site data that facilitates developing the hypothesis for the site history/status and drawing logical conclusions about the site. At this early stage of the munitions response, the preliminary CSM should contain all known information on site use, concentrating on the delivery mechanism whereby the suspected MEC was placed in its current location.

The preliminary CSM can be used to begin to organize and apply the site data. For example, if the site is known to have been a munitions manufacturing plant, the subsequent site investigation work will concentrate on looking for evidence of explosives residues in real property (e.g., manufacturing buildings, internal and external piping and sewer systems, and sumps) of settling lagoons, and of open burn and open detonation (OB/OD) areas, all of which can be expected to be found on former munitions manufacturing sites.

On the other hand, if the site is known to have been a range used for artillery training, subsequent site investigations will concentrate on looking for evidence of the type of munitions associated with the delivery system used. These would include, but are not limited to the

The Camp Hale GIS will be used to coordinate and document munitions cleanup activities at Camp Hale, Colorado. It will store all information relevant to cleanup activities at Camp Hale:

- physical site data,
- historical usage data,
- current survey data,
- analysis results, and
- project status information.

The GIS will serve as a centralized repository for all project data and will include customized tools to facilitate data acquisition and analysis. The GIS is designed to facilitate and coordinate access to the database records via the Internet using an interactive map interface. Internet access to the data will be provided at varying levels of access privilege to project managers, stakeholders, and the general public.

following: impact areas and their associated safety zones, target areas, firing points, firing fans and munitions storage pads. In addition to munitions manufacturing facilities and ranges, other potential locations at which munitions-related activities could have occurred include, but are not limited to, the following: live training or maneuver areas, explosive ordnance disposal (EOD) ranges, demilitarization facilities, and munitions storage areas, and munitions transfer points (e.g., truck and rail yards).

An example of a preliminary CSM for an artillery range should consist of a tabular and/or a graphic representation of the suspected site characteristics and should also include other known features of the site, including the terrain, vegetation, geology, and hydrology of the site. The preliminary CSM may also contain data on site access and receptors that may come in contact with the MEC and MC if this information is known. Figure 3-2 shows a preliminary graphic CSM for an example artillery range. Table 3-1 shows an example of a tabular CSM.

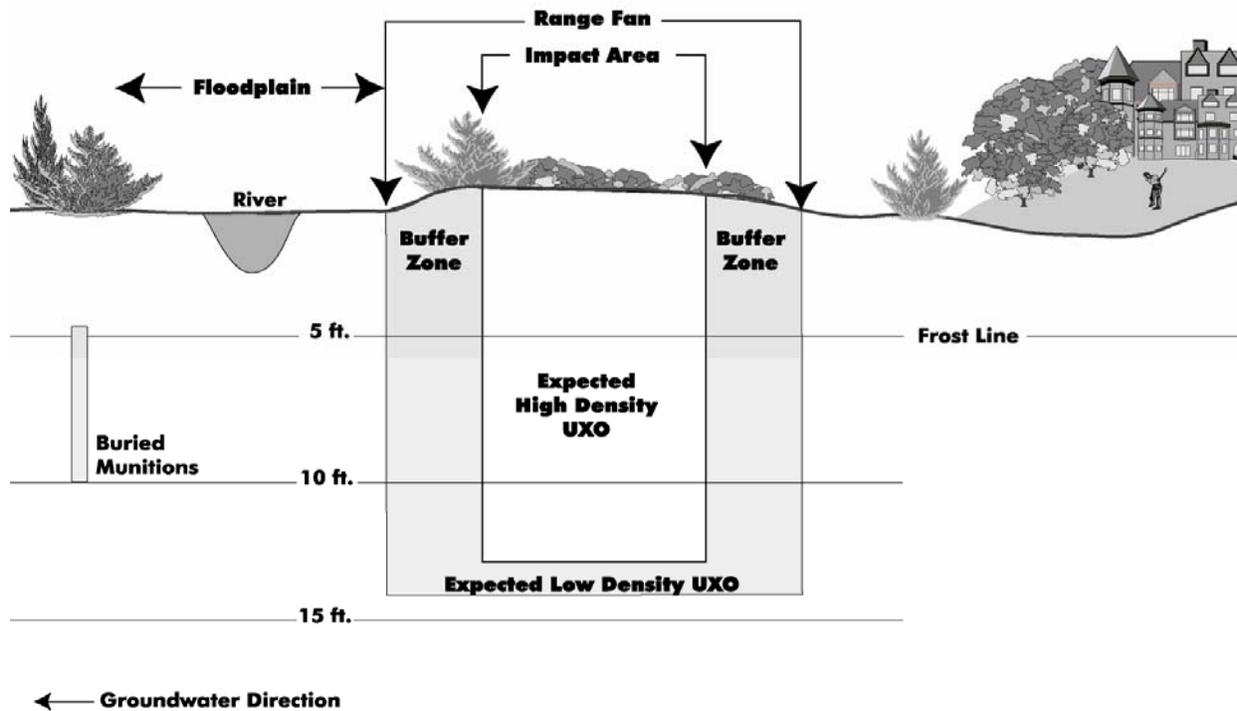


Figure 3-2. Preliminary graphic CSM for an example artillery range. (Source: *Handbook on Management of Unexploded Ordnance at Closed, Transferred and Transferring Ranges (Interim Final)* (EPA 2002).

The preliminary CSM should be refined whenever new data is discovered about the site that adds to or alters the current knowledge and understanding of the site. Revision of the CSM is a process that continues throughout the munitions response until the response is complete.

Table 3-1. Example of tabular CSM data

MEC-related activity	Primary source (area of potential concern type)	Primary release mechanism	Expected MEC contamination	Secondary source
Artillery range	Firing point	Mishandling, loss or burial;	Unfired (fuzed or unfuzed) munitions,	Munitions constituents (MC)
		excess propellant burn area;	discarded military munitions	
		burial		
	Buffer zone	Firing	UXO	MC
Burial		UXO	MC	
Impact area	Firing	UXO	MC	

4.0 CONDUCT THE RESEARCH

Once an adequate plan has been developed, the next phase of conducting an MR HRR is implementing the plan. Technical team members should investigate the identified archival repositories and document and archive their findings as outlined in the work plan. Examples of some specific methods for proper implementation of the research phase of the MR HRR plan are as follows:

- The researchers' mission is to find all of the relevant data available during the MR HRR. The importance of each data item is determined during the data analysis phase that takes place as the MR HRR report is assembled.
- Encourage researchers to keep an open mind and to look for leads to other sources of archival information. One document can sometimes reference additional sources of information not originally selected for inspection. Researchers should note such instances so that the referenced documents can be added to the source list.
- Consider assigning an experienced researcher to oversee the archive searches. The larger archive organizations, such as the National Archives system, have a specific procedure for accessing their documents that must be requested ahead of time. Experienced researchers are familiar with the system and can provide realistic time estimates for accessing the historical records and completing the research.
- Researchers should track the time spent investigating each information source. Documentation of the time spent at each information source provides an indication of the level of effort exerted in researching that source.
- Assign a person experienced in dealing with the public to perform personal interviews. The amount of information acquired from personal interviews can be limited by the relationship between the interviewer and the interviewee. In addition, the interviewer should be able to address issues related to potential legal liability on the part of the person being interviewed for past actions.
- Site maps and photos are helpful to identify specific areas where munitions-related activities took place, and the interviewer should have them available during personal interviews.

Searching at the U.S. National Archives and Records Administration

- Contact an archivist with the Archival Research Program. Each archivist has a specialty area.
- Records requests must be submitted in advance, although they can be submitted the same day as your visit.
- Archivists pull records at specified times during the day.
- For more information, visit the Archival Research Program, U.S. National Archives and Records Center Program Web site: <http://www.archives.gov/index.html>

- Consider conducting a second personal interview with potentially valuable interviewees on the MRS if necessary. Visits to the MRS by knowledgeable persons have triggered additional recollections that have yielded valuable information.

Frequent communication during the data-gathering stage can help ensure completeness of the MR HRR. For example, new information and leads to new information should be briefed to the project team, through whatever communication vehicles were identified at the time the team was formed. This communication can clarify the need to follow up on leads during the data-gathering stage. Again, good communication can help with the success of the project throughout.

All persons involved in the MR HRR should understand that the accumulation and analysis of historical research is a continuous process. It would be best if all information relevant to an MRS could be acquired, archived, analyzed, and used all at once at the beginning of the munitions response; however, this is not a reasonable expectation. MR HRR team members should be sensitive to new sources of historical information that should be addressed in the MR HRR.

New Historical Information

During the BRAC closure of Adak Island, Alaska, an archival document describing the location of 29 defensive minefields was discovered well after the remediation effort had begun. The Navy recognized the potential importance of this new information and, in consultation with stakeholders, developed a plan to investigate the suspected minefields.

The site inspections demonstrated that the minefields were never emplaced and that the document was a defensive plan that was never implemented. However, the Navy still achieved cost savings from this historical discovery because discovery of this document after site closure would have required additional site work to investigate the suspected minefields. Since this information was discovered prior to closure, it was a simple and relatively inexpensive matter to add the investigation of the suspected minefields to the site investigation work already planned.

5.0 ANALYZE AND INTERPRET THE DATA

Once MR HRR data collection and archiving are completed or significantly under way, it is appropriate to review the archived data for the purpose of drawing conclusions about the MRS that will help guide decisions about the munitions response. For smaller MRSs, this process may involve representatives from several agencies reviewing the hard-copy MR HRR report. This can be a daunting and inefficient task on complex MRSs. In this case, the efficiency and quality of the process can be improved by using a GIS archive system as described in Section 3.

5.1 Reviewing the Data

Regardless of the archive system used, data reviewers look for important data items relevant to understanding past uses of the site. Table 5-1 shows examples of these key data items and their relevance to the subsequent decision-making process.

Table 5-1. MR HRR data items and their relevance

Data item	Relevance
EOD response report	Indicates the type of munitions potentially present and shows where and when EOD personnel conducted a munitions or explosives emergency response.
Firing order	Authorization for unit commanders to conduct live-fire training. Provides the date and location of range use and the type and amount of military munitions used.
Munitions storage record	Records stockpile actions (e.g., receipt, issue, shipment, destruction) and movement of munitions on records such as Form 4508.
Facility map	Frequently shows the location of training areas, firing ranges, magazines, and OB/OD sites, munitions-related facilities, etc.
Command and unit history	All services require individual units to write yearly histories that can contain valuable training information, including the dates and location of live-fire training or testing.
Aerial photograph	When analyzed by a professional, aerial photographs from successive years can form a record of changing land use. Experienced analysts can frequently identify firing points, target impact areas, magazine storage areas, and OB/OD areas.
Personal interview	Can provide firsthand knowledge of the location and dates of military munitions-related activities. Whenever possible, information derived from personal interviews should be verified with other sources.
Newspaper article (installation and local)	Frequently covers major training activities and troop movements.
Land transfer record (particularly for FUDS)	Helps determine the use of the property after its transfer from DoD control.
Weather record	May indicate likelihood that MEC will surface over time by frost heave, erosion, etc. Can also help determine the best time for site investigations.

Data item	Relevance
Topography and vegetation data	Assists future planning of the required munitions response actions.
Geology data	Helps determine the most appropriate technologies for use at the MRS.
Surface water, wetland, endangered species and cultural resource	Assists future planning of the required munitions responses, particularly site characterization. Also helps to identify potential receptors likely to be impacted that can be included in the CSM
Groundwater data	Helps address potential groundwater contamination from MC if that is a potential concern at the site.

When data reviewers use the archived information in the MR HRR, they will be able to create an accurate picture of the military munitions–related activities that occurred at the site. This can be analyzed to determine the type of expected MEC at various sites, general condition and distribution (surface and subsurface), and other relevant factors (endangered species, terrain, vegetation, etc.) during subsequent munitions response activities.

Depending on the amount of data, an individual or a small team will review the archived information. They should identify, either in the GIS or on the hard-copy data management forms, the relevant data items to be referenced in the MR HRR report.

5.2 Gap Analysis

The data analysts should also look for data gaps that create uncertainties about the completeness of the MR HRR archive. Examples of data gaps that should be identified are as follows:

- Missing aerial photos from times of known significant military munitions activity.
- No data on range usage during a time of suspected significant military munitions activity.
- Missing documentation of known activities. For example, EOD incident reports are not found, even though there is validated evidence that an EOD incident or EOD activities occurred at the site.
- Munitions or old firing points observed at the site, but records do not show that these munitions or firing points were used. Data gaps related to the munitions and firing point are the number and type of munitions used, locations of all firing points, locations of impact areas, and the types of use (training, testing, maneuvers, demilitarization, etc.).

The data analysts should identify these missing data gaps and note them on the data management forms. This step will ensure that this missing information is addressed in the MR HRR and during development of the CSM. It will also enable listing historical data that may be pursued in the future.

5.3 Uncertainty Analysis

After review of the data and identification of missing data elements, data analysts can estimate their confidence in the accuracy and completeness of the archived MR HRR data. To perform the

uncertainty analysis, the data analysts can review the “data quality” determination (high, medium, or low) documented on the data management forms. MR HRR data consisting of predominantly high-quality data items result in a relatively high level of confidence in the decisions based on the MR HRR. Minimal or unimportant data gaps will further bolster confidence. The data analysts should include this uncertainty analysis in the MR HRR report as a qualitative discussion of the overall uncertainty of the MR HRR report along with specific discussions of the uncertainty of any critical aspects of the research. For example, if a specific interview was critical to the research, the quality of the particular interview may warrant separate discussion.

5.4 Peer Review

The project team should consider providing selected data items to outside experts for peer review. This peer review may serve to add expertise to the data analysis process that is missing from the internal capabilities of the project team. For example, if historical aerial photos are found in the archives that appear to possibly contain significant information that will benefit the MR HRR, the project managers should consider bringing an expert in historical photo analysis into the project to provide this specialty expertise. A Technical Advisory Team at the USACE Ordnance and Explosives Center for Expertise reviews all USACE ASRs that recommend further action.

5.5 Updating the Conceptual Site Model

One of the best tools for applying and visualizing all of this new site information is the CSM. As described in Section 3, project managers will have developed a preliminary CSM using whatever information was known about the MRS during MR HRR planning. The project managers can now update the CSM using the new MR HRR data, concentrating on identifying and documenting the important CSM elements such as

- known munitions-related activities,
- primary source and delivery methods for munitions,
- type of expected MEC,
- secondary sources (migration) of MEC or MC, and
- MEC and MC exposure pathways and receptors

The revised CSM and the selected relevant MR HRR data items can then be used to develop a report of the MR HRR as described in the next section.

6.0 REPORT THE RESULTS

The results of documenting/archiving the MR HRR and analyzing the data are reported in the appropriate document depending on the regulatory process being followed, usually an ASR in the case of FUDS or a PA in the case of a BRAC or active facility MRS. The DoD component responsible for the MRS usually prepares the report, which is reviewed by the MRS project team prior to finalization. In the case of FUDS, the USACE Engineering and Support Center, Huntsville, Alabama, frequently has its St. Louis and Rock Island Districts review the report.

A typical organization for the MR HRR report is as follows:

- 1.0 Introduction
 - 1.1 Authority
 - 1.2 Subject
 - 1.3 Purpose
 - 1.4 Scope
 - 1.5 Project Team
- 2.0 Previous Investigations
 - 2.1 Responsible Service Investigations
 - 2.2 Other Investigations
- 3.0 Site Description
 - 3.1 Land Usage
 - 3.2 Climatic Data
 - 3.3 Geology and Soils
 - 3.4 Hydrology
 - 3.5 Ecology
 - 3.6 Demographics
- 4.0 Historic Munitions-Related Activities
 - 4.1 Historic Site Use Summary
 - 4.2 Review of Munitions-Related Records
 - 4.3 Summary of Interviews
 - 4.4 Aerial Photo Interpretation and Map Analysis
- 5.0 Real Estate
 - 5.1 Confirmed DoD Ownership
 - 5.2 Potential DoD Ownership
 - 5.3 Past Ownership Other than DoD
 - 5.4 Present Ownership
- 6.0 Report of Site Visit Inspection
- 7.0 Evaluation of Site Information
- 8.0 Evaluation of the Presence of MEC
 - 8.1 Evaluation of the Presence of MEC
 - 8.2 Data Gap Analysis
 - 8.3 Data Uncertainty Analysis
- 9.0 Technical Data on Suspected MEC
- 10.0 Conclusions and Recommendations

Appendices include references; glossary and acronyms; text and manuals; reports and studies; letters, memorandums, and miscellaneous items; real estate documents; newspapers and journals; interviews; current site photographs; historic site photographs; and historic maps and drawings.

Reviewing the MR HRR Report

MR HRR review team members should receive a draft version of the MR HRR report for review and comment prior to its finalization. The team should consider the following when conducting their review to determine the report's completeness and validity:

- Have the appropriate archives been thoroughly checked? Although not all of the sources of information listed in Appendix B need to be researched for each MRS, a reviewer of the MR HRR report should include checking to ensure regional and local sources were also adequately investigated.
- Have the correct record groups (Appendix C) been adequately researched? If a negative response is received from the National Archives system regarding a site, the record groups inspected should be examined to see whether the information is possibly located elsewhere within the system. For example, the review team should be suspicious of the adequacy of the MR HRR if the site is a former Air Force facility and Record Group 18 (Records of the Army Air Corps) have not been researched. Many Air Force facilities were formerly Army Air Corps bases, which warrants search of Record Group 18 for relevant information.
- Have adequate efforts been made to contact personnel that have worked or been stationed at the site? Personal interviews can be extremely valuable sources of information that are frequently overlooked.
- Are copies of the source documents referenced, available, and attached to the MR HRR? If so, questions can frequently be answered by referring to the original document that was the source of the statement or conclusion in question. GIS is an efficient way to arrange for reviewers and users of the MR HRR report to access the referenced archived data item.
- Is QC adequately addressed in the document?
- Have questions about classified information been addressed?
- What were the results of the initial site visit, and is another site visit needed now that the report is complete?

MR HRR document reviewers may want to develop a checklist of items to review prior to reviewing the MR HRR document. This may help guide the review process and maintain consistency among multiple reviewers. Appendix E is a sample MR HRR review checklist.

7.0 REFERENCES

- DoD (U.S. Department of Defense). 1998. *Unexploded Ordnance (UXO) Clearance, Active Range UXO Clearance, and Explosive Ordnance Disposal (EOD) Programs*. Washington, D.C.: Office of the Under Secretary of Defense (Acquisition and Technology).
- DoD. 2001. *Munitions Action Plan: Maintaining Readiness through Environmental Stewardship and Enhancement of Explosives Safety in the Life Cycle Management of Munitions*. Operation and Environmental Executive Steering Committee for Munitions (OEESCM).
- DoD. 2003. *Conceptual Site Models for Ordnance and Explosives (OE) and Hazardous, Toxic, and Radioactive Waste (HTRW) Projects, EM 1110-1-1200*. Washington, D.C.: Department of the Army.
- DoD and EPA (U.S. Environmental Protection Agency). 2000. *Management Principles for Implementing Response Actions at Closed, Transferring, and Transferred (CTT) Ranges, Interim Final*.
- EPA. 2002. *Handbook on the Management of Ordnance and Explosives at Closed, Transferring, and Transferred Ranges and Other Sites (Interim Final)*.
- EPA Federal Facilities Restoration and Reuse Office. 1999. "EPA Issues at Closed, Transferring, and Transferred Military Ranges," April 22 letter to Deputy Under Secretary of Defense (Environmental Security).

Online Sources of Additional Guidance

- U.S. Army Corps of Engineers Engineering and Support Center
Ordnance and Explosives Mandatory Center of Expertise and Design Center
<http://www.hnd.usace.army.mil/oew/index.asp>
- U.S. Department of Defense, Washington Headquarters Services
Communications and Directives Directorate, Directives and Records Division
<http://www.dtic.mil/whs/directives>
- U.S. Department of Defense Environmental Cleanup
(reports, policies, general publications, BRAC information and community involvement)
<http://www.dtic.mil/envirodod/>
- U.S. Department of Defense Explosives Safety Board (DDESB)
<http://www.ddesb.pentagon.mil>
- U.S. Department of Defense Office of the Deputy Under Secretary of Defense (Installations and Environment)
<http://www.acq.osd.mil/ens/>

U.S. Environmental Protection Agency
Federal Facilities Restoration and Reuse Office
<http://www.epa.gov/swerffrr/>

U.S. Environmental Protection Agency
Office of Solid Waste
RCRA, Superfund and EPCRA Call Center
<http://www.epa.gov/epaoswer/hotline/index.htm>

Guidance Documents

U.S. Army. 1998. *Environmental Restoration Programs Guidance Manual*.

U.S. Army Corps of Engineers, Engineering and Design Ordnance and Explosives Response, Ordnance and Explosives Response, EP 1110-1-18, April 24, 2000.

U.S. Army Corps of Engineers, Engineering and Design Ordnance and Explosives Response, Ordnance and Explosives Response, EM 1110-1-4009, June 23, 2000.

U.S. Department of Defense, Office of the Under Secretary of Defense (Acquisition and Technology). 1994. *Finding of Suitability to Transfer for BRAC Property*.

U.S. Department of Defense, Office of the Under Secretary of Defense (Acquisition and Technology). 1997. *Responsibility for Additional Environmental Cleanup after Transfer of Real Property*.

U.S. Department of Defense, Office of the Deputy Under Secretary of Defense (Installations and Environment). 2001. *Management Guidance for the Defense Environmental Restoration Program*.

U.S. Department of Defense and U.S. Environmental Protection Agency. 1999. *The Environmental Site Closeout Process Guide*.

U.S. Environmental Protection Agency. 1988. *CERCLA Compliance with Other Laws Manual, Interim Final*.

U.S. Environmental Protection Agency. 1998. *EPA Guidance on the Transfer of Federal Property by Deed Before All Necessary Remedial Action Has Been Taken Pursuant to CERCLA Section 120(h)(3)*.

U.S. Environmental Protection Agency. 1993. *Conducting Non-Time-Critical Removal Actions Under CERCLA*. PB93-963402.

U.S. Environmental Protection Agency. 1999. *Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*. PB98-963241.

U.S. Environmental Protection Agency. 2000. *Institutional Controls and Transfer of Real Property Under CERCLA Section 120(h)(3)(A), (B) or (C)*.

U.S. Environmental Protection Agency. 2000. *Use of Non-Time-Critical Removal Authority in Superfund Response Actions*.

Statutes and Regulations

Base Realignment and Closure Act (BRAC), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC §9601 *et seq.*

Defense Environmental Restoration Program, 10 USC §§2701–2708 and §2810.

Military Munitions Rule: Hazardous Waste Identification and Management; Explosives Emergencies; Manifest Exception for Transport of Hazardous Waste on Right-of-Ways on Contiguous Properties; Final Rule, 40 CFR §260 *et seq.*

National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR §300 *et seq.*

Resource Conservation and Recovery Act (RCRA), 42 USC §6901 *et seq.*

Superfund Implementation, Executive Order (EO) 12580, January 13, 1987 and EO 13016, Amendment to EO 12580, August 28, 1996.

U.S. Department of Defense, DoD Directive 6055.9-STD, Ammunition and Explosives Safety Standards, July 1999.

U.S. Department of Defense Explosives Safety Board, 10 USC §172.

U.S. Department of Defense Instruction (DODI) 4715.7, Environmental Restoration Program, April 22, 1996.

APPENDIX A

Acronyms

ACRONYMS

AQAPS	Automated Quality Assessment Program System
ASR	Archive Search Report
BRAC	Base Realignment and Closure
CADD	computer-aided design and draw
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CSM	conceptual site model
DDESB	Department of Defense Explosives Safety Board
DERP	Defense Environmental Restoration Program
DMM	Discarded Military Munitions
DoD	(U.S.) Department of Defense
DOE	(U.S.) Department of Energy
DQO	data quality objective
ECOS	Environmental Council of the States
EE/CA	Engineering Evaluation/Cost Analysis
EO	Executive Order
EOD	explosive ordnance disposal
EPA	Environmental Protection Agency
EPIC	Environmental Photographic Interpretation Center
ERDC-TEC	Engineer Research and Development Center—Topographic Engineering Center
ERIS	Environmental Research Institute of the States
ESS	Explosive Safety Submission
FS	Feasibility Study
FUDS	Formerly Used Defense Site
GIS	geographic information system
GPS	Global Positioning System
HRR	Historical Records Review
IRP	Installation Restoration Program
IT	information technology
ITRC	Interstate Technology & Regulatory Council
MC	munitions constituents
MEC	munitions and explosives of concern
MMPEH	Material Potentially Presenting an Explosive Hazard
MMRP	Military Munitions Response Program
MR	munitions response

MRA	Munitions Response Area
MR HRR	Munitions Response Historical Record Review
MRS	Munitions Response Site
NCP	National Contingency Plan
NIMA	National Imagery and Mapping Agency
OB/OD	open burning/open detonation
OE	ordnance and explosives
OEESCM	Operation and Environmental Executive Steering Committee for Munitions
OEW	ordnance and explosive waste
ORS	ordnance and related scrap
PA	Preliminary Assessment
QC	quality control
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RMIS	Restoration Management Information System
ROD	record of decision
SI	Site Inspection
TEC	(USACE) Topographic Engineering Center
TSCA	Toxic Substances Control Act
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance

APPENDIX B

Potential MR HRR Information Sources

POTENTIAL MR HRR INFORMATION SOURCES

DoD Information Sources

- Air Force Historical Research Agency, Maxwell Air Force Base, AL
<http://www.maxwell.af.mil/au/afhra/>
- Defense Environmental Network & Information Exchange
<https://www.denix.osd.mil/>
- Defense Environmental Restoration Program—Formerly Used Defense Sites (DERP-FUDS),
<http://www.lrb.usace.army.mil/derpfuds/>
- Defense Supply Center Richmond, Richmond, VA
<http://www.dscr.dla.mil/>
- Defense Technical Information Center
<http://www.dtic.mil/>
- Defense Visual Information Center
<http://www.dodmedia.osd.mil/dvic/index.htm>
- Department of Defense Publications Archive
www.defenselink.mil/pubs/archive.html
- DoD Explosives Safety Board (DDESB)
<http://www.ddesb.pentagon.mil/>
- Explosive ordnance disposal detachments at nearby military facilities
- National Imagery and Mapping Agency, Bethesda, MD
<http://www.nima.mil/>
- Naval Construction Battalion Centers, Port Hueneme, CA
<http://www.ncbc.navfac.navy.mil/>
- Naval Facilities Historian's Office, Port Hueneme, CA
<http://www.ncbc.navfac.navy.mil/cecmuseum/historian.htm>
- Naval Historical Center, Washington, DC
<http://www.history.navy.mil/>
- U.S. Air Force Safety Center, Kirtland AFB, NM
<http://afsafety.af.mil/>

- U.S. Army Center for Health Promotion of Preventive Medicine, Aberdeen Proving Ground, MD
<http://chppm-www.apgea.army.mil/>
- U.S. Army Center of Military History, Fort McNair, Washington, DC
<http://www.army.mil/cmh-pg/>
- U.S. Army Soldier and Biological Chemical Command
<http://www.sbccom.army.mil/about/sbccom.htm>
- U. S. Army Corps of Engineers District Offices
<http://www.usace.army.mil/where.html>
- U. S. Army Corps of Engineers Office of History, Alexandria, VA
<http://www.hq.usace.army.mil/history/>
- U.S. Army Corps of Engineers Topographic Engineering Center (TEC), Alexandria, VA
<http://www.tec.army.mil/>
- U.S. Army Military History Institute, Carlisle, PA
<http://carlisle-www.army.mil/usamhi/>
- U.S. Army Ordnance Museum, Aberdeen Proving Ground, MD
<http://www.ordmusfound.org/>
- U.S. Army Safety Center, Fort Rucker, AL
<http://safety.army.mil/home.html>
- U. S. Army Technical Center for Explosives Safety, McAlester, OK
<http://www.dac.army.mil/es/>
- U.S. Army Technical Escort Unit Historical Office, Aberdeen Proving Ground, MD
- U.S. Army Test and Evaluation Command
<http://www.atec.army.mil/>
- U.S. Army War College Library, Carlisle Barracks, PA
<http://carlisle-www.army.mil/library/>
- U.S. Naval District, Washington, DC
<http://www.ndw.navy.mil/>
- U.S. Naval Explosive Ordnance Disposal Technology Division, Indian Head, MD
<https://naveodtechdiv.navsea.navy.mil/>

- U.S. Naval Ordnance Safety and Security Activity, Ordnance Environmental Support Office
- U.S. Naval War College Archives, Newport, RI
<http://www.nwc.navy.mil/>
- U.S. Navy Safety Center, Naval Air Station, Norfolk, VA
<http://www.safetycenter.navy.mil/>

Other Federal Government Information Sources

- Department of the Interior (DOI)
<http://www.doi.gov/>
- Department of the Interior Bureau of Land Management
<http://www.blm.gov/>
- Department of the Interior, U.S. Geological Survey (USGS)
<http://www.usgs.gov/>
- Federal Geographic Data Committee (geographic information systems)
<http://www.fgdc.gov/>
- General Services Administration
<http://www.gsa.gov/>
- The Library of Congress, Geography and Map, and Prints and Photographs Divisions, Washington, DC
<http://www.loc.gov/>
- U.S. EPA Environmental Photographic Interpretation Center (EPIC)
<http://www.epa.gov/nerlesd1/land-sci/epic/default.htm>
- U.S. National Archives and Records Administration (NARA)
<http://www.archives.gov/>
National Archives at College Park, MD, Washington National Records Center
Regional Records Services Facility (regional offices)
National Personnel Records Center Military Branch, St. Louis, MO

State and Local Information Sources

- City and county clerk's office (court documents, fire and police records, civil and criminal indices, property suits, ownership and title, proven association with property, dates of original construction)
- Commercial property history
- Corporate records

- Local law enforcement offices
- Local libraries
- Local newspapers
- State and local historical organizations
- State government archives

Private Information Sources

- American Legion
<http://www.legion.org/>
- Environmental activist groups
- LEXIS/NEXIS (for media search by keyword)
<http://www.lexis-nexis.com/>
- Mining or forestry companies
- Veterans of Foreign Wars (VFW)
<http://www.vfw.org/>
- Other veteran's organizations (good source for personal interviews)

APPENDIX C

Record Groups Used by the National Archives

Archival Record Groups

16	Records of the Department of Agriculture	112	Records of the Surgeon General's Office	237	Records of the Federal Aviation Administration
18	Records of the Army Air Corps	121	Records of the Public Buildings Service	250	Records of the Office of War Mobilization and Reconversion
26	Records of the U.S. Coast Guard	127	Records of the United States Marine Corps	269	Records of the General Services Administration
30	Records of the Bureau of Public Roads	145	Records of the Agricultural Stabilization and Conservation Service	270	Records of the War Assets Administration
38	Records of the Office of the Chief of Naval Operations	153	Records of the Adjutant General (Army)	291	Records of the Federal Property Resources Service
48	Records of the Department of the Interior	156	Records of the Office of the Chief of Ordnance	319	Records of Army-Intelligence
49	Records of the Bureau of Land Management	159	Records of the Office of the Inspector General	330	Records of the Office of the Secretary of Defense
52	Records of the Bureau of Medicine and Surgery	160	Records of Army Service Forces	334	Records of Interservice Agencies
57	Records of the United States Geological Survey	162	Records of the Federal Works Agency	337	Records of the Headquarters Army Ground Forces
69	Records of the Works Progress Administration	165	Records of the War Dept. Generals and Special Staffs	338	Records of US Army Commands, 1942-
71	Records of the Bureau of Yards and Docks	168	Records of the National Guard Bureau	341	Records of Headquarters U.S. Air Force (Air Staff)
72	Records of the Bureau of Aeronautics	175	Records of the Office of the Chemical Warfare Services	342	Records of US Air Force Commands, Activities, and Organizations
74	Records of the Bureau of Ordnance	177	Records of Chief of Arms	373	Records of the Defense Intelligence Agency
77	Records of the Office of the Chief of Engineers	181	Records of the Naval Districts and Shore Establishments	393	Records of the US Army Continental Commands
80	General Records of the Department of the Navy, 1798 - 1947	197	Records of the Civil Aeronautics Board	394	Records of US Army Commands, 1920-1942
92	Records of the Office of the Quartermaster General	207	Records of the Housing and Home Finance Agency	395	Records of US Army Overseas Operations & Commands 1898-1905
107	Records of the Office of the Secretary of War	218	Records of the Joint Chiefs of Staff	407	Records of the Adjutant General's Office, 1917-
111	Records of the Signal Corps	225	Records of Joint Army and Navy Boards	428	General Records of the Department of Navy, 1947-

APPENDIX D

MR HRR Data Management Form

APPENDIX E

MR HRR Review Checklist

MR HRR Review Checklist

Yes	No	Checklist Item
		1. Have the MRS's known years of operation been correctly identified?
		2. Have the MRS's known uses been correctly identified?
		3. Based on items #1 and 2 above, have the appropriate archived record sources been inspected?
		4. Has an archive data management system (for example, the form included in Appendix D or a GIS database) been used to manage the individual archive data items?
		5. If yes to #4, it is recommended that reviewers examine some individual data items to ensure that the original data is being managed adequately and is available for evaluation. Does this review of the data management system indicate adequate evaluation and management of individual data items?
		6. Is there adequate outreach to potentially knowledgeable individuals (for example, through a Web site, interviews with former facility employees, contact with local veteran's organizations)?
		7. Has a site historical photo analysis been conducted (if it is determined that this may provide useful information toward identifying specific locations of MEC contamination)?
		8. Does the discussion of the site conditions seem accurate and adequate?
		9. Does the discussion of historical munitions-related activities use adequately use the available archive data items to identify the type, amount and location of potential MEC?
		10. Has a preliminary conceptual site model been developed to represent the suspected MEC contamination and its method of delivery and potential receptors?
		11. Are the report's conclusions valid based on the historical evidence?

Note: The reasons for "no" answers to the above questions should be investigated to determine which specific areas of the MR HRR are inadequate and how to improve them.

APPENDIX F

ITRC Contacts, Fact Sheet, and Product List

ITRC Contacts

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