UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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OFFICE OF
SOLID WASTE AND
EMERGENCY RESPONSE

MEMORANDUM

Subject: **Transmittal of EPA Munitions Response Guidelines**
OSWER Directive 9200.1-101

From: John E. Reeder, Director
Federal Facilities Restoration and Reuse Office
Office of Solid Waste and Emergency Response

David J. Kling, Director
Federal Facilities Enforcement Office
Office of Enforcement and Compliance Assurance

To: Superfund Division Directors, Regions 1-10
Regional Counsels, Regions 1-10

This memo transmits the document *OSWER Directive 9200.1-101, EPA Munitions Response Guidelines*. The guidelines have been developed to assist project managers overseeing response actions involving munitions and explosives of concern (MEC) and munitions constituents (MC) at locations other than operational ranges. These locations are former military ranges that have been closed by the Department of Defense (DoD), or other sites that DoD has determined are no longer acceptable or compatible for use as an operational range.

The guidelines are designed to be used by EPA Regions for providing regulatory oversight where a DoD component will be conducting a munitions response action as the lead agency at locations other than an operational range. These guidelines are also relevant, however, when EPA or another federal agency, tribe, or state has the lead.

This document will be distributed to federal facility remedial project managers, and posted in interim final form on OSWER's website. For additional information, you may contact John Reeder, Director of the Federal Facilities Restoration and Reuse Office on 703-603-9089, or your staff may contact Doug Maddox on 703-603-0087.

EPA Munitions Response Guidelines

OSWER Directive 9200.1-101

EPA Office of Solid Waste and Emergency Response

Federal Facilities Restoration and Reuse Office

Interim Final

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EPA Munitions Response Guidelines

EPA Office of Solid Waste and Emergency Response (OSWER)
Federal Facilities Restoration and Reuse Office (FFRRO)

1. Purpose of the EPA Munitions Response Guidelines

These Guidelines provide a framework to EPA Regional Offices overseeing responses involving munitions and explosives of concern (MEC)[1] and munitions constituents (MC) at locations other than operational ranges where explosive hazards or environmental contamination are known or suspected to be present. These Guidelines build on the joint *Department of Defense (DoD)/EPA Interim Final Management Principles for Implementing Response Actions at Closed, Transferring, and Transferred (CTT) Ranges ("DoD/EPA UXO Principles")*, signed March 7, 2000. For the most part, these Guidelines address situations where a DoD Component, (e.g., the U.S. Army Corps of Engineers (USACE)) will be conducting the munitions response action as the Lead Agency and EPA is responsible for regulatory oversight. These Guidelines may also be relevant when EPA or other federal agencies have the lead. EPA and DoD's military services have traditionally worked together effectively at these sites and expect continued strong collaboration in the future.

EPA has issued extensive regulations, guidance, and policies addressing responses at contaminated sites, and these Guidelines are not intended to supersede, limit or change any of those documents. These Guidelines focus instead on the unique aspects of responding to sites where explosive hazards may pose an additional, or the principal threat.

These Guidelines address:

- General regulatory authorities
- Use of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), and other authorities
- Involvement of State and Tribal environmental regulators and the public
- Explosives safety principles
- Site characterization principles
- Transfer of ranges
- Land use and institutional controls
- Enforcement principles

EPA's interim final *Handbook on the Management of Munitions Response Actions* [2] (*EPA Handbook*) supplements these Guidelines by providing EPA, state regulators and the public with more detailed information on the technical issues associated with munitions response actions. In addition, the *EPA Handbook* provides a common nomenclature to aid in the management of MEC and MC and facilitates a common understanding of the state of the art of detection and response activities. The *EPA Handbook* is updated periodically and can be found on the Federal

[1] MEC includes unexploded ordnance (UXO), discarded military munitions (DMM), and munitions constituents in concentrations high enough to pose an explosive hazard.
[2] EPA 505-B-01-003, May 2005

Facilities Restoration and Reuse Office (FFRRO) munitions website at http://www.epa.gov/fedfac/documents/munitions.htm.

This document is intended solely as guidance. The statutory provisions and EPA regulations described in this document contain legally binding requirements. This document is not a regulation itself, nor does it alter or substitute for those provisions and regulations. Thus, it does not impose any legally binding requirements on EPA, States, Tribes, DoD, other federal agencies, or other members of the regulated community. This guidance does not confer legal rights or impose legal obligations upon any member of the public.

While EPA has made every effort to ensure the accuracy of the discussion in these Guidelines, the obligations of the regulated community are determined by statutes, regulations, or other legally binding requirements. In the event of a conflict between the discussion in this document and any statute or regulation, this document would not be controlling.

These Guidelines may not apply to a particular situation based upon site-specific circumstances. Interested parties are free to raise questions about the substance of this guidance and the appropriateness of the application of these guidelines to a particular situation. EPA and other decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from those described in this guidance where appropriate.

This document may be revised periodically by EPA without public notice. EPA welcomes public input on this document at any time.

2. Munitions Response Sites in the United States

Millions of acres of former munitions use or manufacturing areas have been transferred from DoD control to non-Federal entities or other Federal agencies to be used for other purposes (most of these properties now are identified as Formerly Used Defense Sites (FUDS)). DoD is currently working to further define its inventory of munitions response sites (MRS) and associated acreage that are potentially contaminated. Furthermore, active military installations and installations affected by the Base Realignment and Closure (BRAC) program may have locations other than operational ranges contaminated with MEC/MC. While some MRS are fairly small (e.g., small arms ranges, burial pits and trenches), others may be dozens or even hundreds of square miles in area (e.g., former bombing ranges). In addition to MEC, these MRS may potentially have soil, ground water, and surface water contamination from MC or other sources (including explosives and heavy metals, depleted uranium, and at a small number of sites, chemical warfare agents (CWA) or chemical warfare material (CWM)). The MC may derive from a number of sources. Such sources include: live-fire training or testing, low order detonations of munitions used in training or testing, open burning and open detonation (OB/OD) treatment/destruction activities, or munitions burial. Of course, explosives safety (e.g., the potential for the detonation of MEC) is the principal concern during munitions response actions involving MEC.

The National Defense Authorization Act for Fiscal Year (FY) 2002 (P.L. 107-107) directed DoD to “develop and maintain an inventory of defense sites that are known or suspected

to contain unexploded ordnance, discarded munitions or munitions constituents." DoD's initial inventory was published in May 2003 and is undergoing review and updates. The DoD inventory contained approximately 3,783 MRS at the end of FY 2009.

The actual and potential human health and environmental effects can vary from being fairly localized to being widespread. Many incidents involving MEC have been documented in the press and elsewhere. Some of these have resulted in injuries or death to civilians who discovered and interacted with (i.e., disturbed or moved) the MEC. A number of exposures to CWA with associated health effects have also been reported. According to a December 2003 GAO report, DoD estimates that over 15 million acres of land are either suspected, or known to be contaminated with military munitions. DoD estimates cleanup of these sites will cost from $8 Billion to $35 Billion.[3]

3. Scope of the EPA Munitions Response Guidelines

These Guidelines have been developed to provide guidance to project managers overseeing munitions response actions at locations other than operational ranges where MEC/MC are suspected to be or have been encountered. These locations can be former military ranges that have been closed by DoD or whose current or potential use or setting makes their use as ranges no longer acceptable or compatible (as determined by DoD). These locations may include former ranges located on Federal Land Manager (FLM) properties (e.g., DOI and USDA) that were transferred from DoD, privately owned FUDS and BRAC properties, as well as closed ranges on active installations. Other sites where MEC/MC may be encountered include scrap yards, disposal pits, former ammunition plants, former DoD ammunition depots, former OB/OD units, and former research and testing facilities.

Types of response actions include, but are not limited to, assessments, investigations and cleanups under the authorities of CERCLA, RCRA, and, where appropriate, response actions under other Federal environmental authorities, such as the Safe Drinking Water Act (SDWA). The Guidelines may be useful in situations involving enforcement, permitting, and emergency or time critical actions where MEC/MC are involved.

Historically DoD "operational ranges" were referred to as "active" or "inactive," ranges, while "Locations other than operational ranges" were referred to as "closed, transferred, and transferring ranges and other sites."[4] Although DoD has changed the nomenclature to "operational ranges" or "locations other than operational ranges," there is no substantive change from those used in EPA's Military Munitions Rule. These Guidelines have adopted the latest DoD nomenclature[5] to promote consistent understanding.

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[3] "GAO-04-147, *Military Munitions - DoD Needs to Develop a Comprehensive Approach for Cleaning Up Contaminated Sites*, December 2003.

[4] The Military Munitions Rule defines (for RCRA purposes) and uses the terms "active" and "inactive" ranges (40 CFR 266.201, 62 FR 6631 and 6654, February 12, 1997).

[5] DoD Memorandum on Definitions Related to Munitions Response Actions, December 18, 2003., http://www.epa.gov/fedfac/pdf/MRP_Definitions_12-18-03.pdf.

Although these Guidelines do not specifically address chemical warfare material (CWM) or biological warfare material (BWM), the principles are generally applicable to these materials. Specific information on CWM and BWM may be added in future revisions.

4. General Regulatory Authorities

Multiple regulatory authorities may be relevant to munitions responses. DoD and the FLMs (e.g., Bureau of Land Management (BLM), Forest Service, and Fish and Wildlife Service (FWS)) generally operate under CERCLA as the federal cleanup authority for conducting responses at munitions response areas. The *DoD/EPA UXO Principles* cited earlier refer to the use of "a process consistent with CERCLA" and CERCLA as the "preferred response mechanism" for munitions response actions. As explained in the *DoD/EPA UXO Principles*, following the CERCLA process will generally "meet any applicable RCRA corrective action requirements". However, it may be appropriate for EPA or another regulatory entity to use other applicable authorities.

EPA recognizes that there are situations where RCRA or another authority is more appropriate to be used for a munitions response.[6] For example, under RCRA, EPA may use its imminent hazard authority under Section 7003 to seek the abatement of an imminent and substantial endangerment to human health or the environment caused by solid or hazardous waste. States may have similar authorities that can be used. Relying on RCRA authority may be also appropriate where the site has a regulated treatment, storage or disposal facility (e.g., the closing of a RCRA-permitted OB/OD unit at a BRAC site). At the Massachusetts Military Reservation (MMR), for example, a RCRA order was used to dispose of the MEC determined safe to move and store pending on-site disposal. At the Former Lowry Bombing and Gunnery Range in Colorado, the State, under its own authorities, reached an agreement with the USACE to conduct the munitions response.

Other authorities besides CERCLA that may be appropriate for a given munitions response include, but are not limited to, the following:

- Safe Drinking Water Act (SDWA, 1974, 42 U.S.C. §300f et seq.; 40 CFR Parts 141-149);
- Resource Conservation and Recovery Act (RCRA, 1976, 42 U.S.C. §6901 et seq.; 40 CFR Parts 240-282);
- Clean Water Act (CWA, 1972, 33 U.S.C. §1251; 40 CFR, Parts 100-136, 140, 230-233, 401-471, 501-503);
- Clean Air Act (CAA, 1970, 42 U.S.C. §§ 7401, 7412(r) and 7603;
- State Superfund Laws;
- State RCRA Programs;
- Other State hazardous waste management programs;
- Tribal hazardous waste management programs.

[6] Coordination between RCRA Corrective Action and Closure and CERCLA Site Activities, 9/24/1996, http://www.epa.gov/fedfac/documents/924memo.htm

5. Authorities for Munitions Response

5.1 Defining Appropriate Regulatory Authority

While a site-specific determination must be made, MEC/MC encountered at locations other than operational ranges, as described in this guidance, would meet the definition of a hazardous substance under CERCLA if the constituents are listed hazardous substances (see 40 CFR 302) or if the MEC/MC meets the definition of RCRA hazardous waste.[7] Releases or threats of releases associated with MEC/MC at locations other than operational ranges should be evaluated in the same manner as any other release to determine if the material present meets the CERCLA definition of a hazardous substance. Although some material associated with munitions use may not be a hazardous substance (e.g., munitions debris such as inert scrap), a munitions response may still be appropriate to address MEC/MC which poses a threat, and a response should be evaluated on a site-specific basis to ensure that human health and the environment are protected.

In cases of collected munitions debris (including munitions fragments), under DoD regulations and policy, DoD must certify the debris as safe and not presenting an explosive hazard, prior to shipment to a recycler (unless the recycler is qualified to treat/recycle the explosive component). Similarly, shipping munitions debris that is not free of explosives, and therefore is still reactive, to a scrap metal recycler would be in violation of the RCRA Subtitle C hazardous waste regulations (unless the recycler is RCRA-permitted to treat/recycle the explosive component). Ensuring proper characterization of material to be shipped from a munitions response site can help avoid mishaps such as occurred March 18, 1997, when shipped munitions debris exploded and killed a worker at Dick's Auto Wrecker, a scrap yard, in Fontana, CA.

Where CERCLA is used as the authority to take a response action, any munitions response should comply with CERCLA and the National Oil and Hazardous Substance Contingency Plan (NCP), and should consider other appropriate Agency guidance (e.g., Data Quality Objectives (DQOs)), as well as the guidance provided in the *DoD/EPA UXO Principles*. As specified in the *DoD/EPA UXO Principles*, where DoD is conducting response actions under its Defense Environmental Restoration Program (DERP), those response actions must be consistent with CERCLA and the NCP, and consider EPA policy and guidelines (see CERCLA Section 120, 10 U.S.C. 2701 et seq. (DERP), and Executive Order 12580). Use of CERCLA at facilities that are not listed on the National Priorities List does not, in and of itself, preclude States from asserting their authorities. (See CERCLA 120(a)(4)).

CERCLA Section 120(a)(2) prohibits Federal Agencies from adopting or utilizing any guidelines, rules, regulations, and criteria for CERCLA preliminary assessments and remedial actions that are inconsistent with EPA's guidelines, rules, regulations, and criteria. Consistency

[7] A review of operational records regarding the types of munitions used at a site, together with observations of items on the surface, in most cases, should provide a trained investigator, with knowledge of the hazards associated with the munitions believed to be present, the basis for establishing whether the material meets the criteria for characterization as a RCRA hazardous waste, either because it meetings a listing description in 40 CFR part 261 or exhibits a characteristic of ignitability, reactivity, corrosivity, or toxicity..

with the NCP and consideration of EPA policy and guidelines apply to every phase of response (e.g., removal, PA/SI, RI, FS, RD, RA, O&M).

5.2 Use of Removal or Remedial Authorities Under CERCLA

Since explosive hazards to public and worker safety is generally the primary risk associated with munitions, such hazards are usually the first to be addressed at a site. Nevertheless, not all situations in which MEC are, or may be encountered, require an explosives or munitions emergency response or a time-critical removal action. In these situations, it may be appropriate to take additional time in establishing a response action without compromising safety or increasing risks, and if time allows, pursue consultation with the regulatory agency regarding an appropriate course of action. Such a determination needs to be made by an explosives or emergency response specialist or expert. If an immediate response is not necessary to address an explosives hazard, it may be appropriate to conduct a non-time critical removal or a remedial action (e.g., immediate action is not necessary to prevent an explosion or exposure or the area is very remote).

Explosives or munitions emergency responses and time-critical removal actions typically are carried out with reduced levels of public and regulatory involvement due to the exigencies of the specific situation. EPA should give considerable deference to explosives or munitions emergency response specialists (e.g., explosive ordnance disposal (EOD) and other UXO-qualified personnel) with regard to explosives safety considerations. However, this does not preclude regulators from conducting oversight and requesting information regarding time critical, non-time critical, or remedial actions (for example, determining whether the response action is protective where chemicals of concern may remain in the soil).

Consistent with the NCP, EPA expects the Lead Agency to consider, among other things, the following when evaluating what kind of munitions response should be taken:

- **Explosives or Munitions Emergency Responses** generally should be used when an immediate or imminent and substantial threat to public health or the environment is present and may require immediate and expeditious action to eliminate the threat;
- **Time-critical removals** generally are actions that must be initiated quickly and require a **planning period** of less than six months;
- **Non-time-critical removals** generally are those that allow a planning period of six months or more;
- **Remedial actions** will generally be needed at sites with extensive subsurface munitions response and/or soil and ground water contamination from MCs where complex long term cleanup decisions are required.

Many sites will involve a combination of actions to achieve permanent remedies. For example, the munitions response might include:

- **Time-critical removals** to conduct surface clearance, erect access barriers, such as fences, or to otherwise prevent exposure to explosive hazards that, because they are in close proximity to nearby populations, pose an immediate threat;

- **Non-time-critical removals** involving surface removals to facilitate additional characterization or investigations; and,
- **Remedial actions** (including investigation and response) designed to achieve permanent remedies by addressing issues related to land use, degree of surface and/or subsurface clearance required, type of remedy, use of institutional controls, or soil, surface water, and ground water remediation.

5.3 Emergency Response Under RCRA or CERCLA

An explosives or munitions emergency response generally refers to a situation in which there is an imminent and substantial threat to human health or the environment and which requires immediate and expeditious action to eliminate the threat. The Military Munitions Rule provides that "explosives or munitions emergency response specialists" (see Appendix A for definitions) base any determination of the need for an emergency action upon an "actual or potential immediate threat to human health, including safety, or the environment, including property."[8] Significantly, the RCRA Munitions Rule assigns to the explosives or munitions emergency response specialists the responsibility for making this determination, which will ordinarily be a judgment call by the specialist. The preambles to the final[9] and proposed[10] RCRA Munitions Rule give examples of emergency and non-emergency situations, and state that if, in the opinion of the explosives emergency response specialist, there is time for consultation with regulatory authorities, then DoD should so consult.

The urgency of a situation may or may not allow for consultation with EPA, Tribal Governments, or States. Similarly, the urgency of addressing a specific emergency with imminent risks may make timely coordination with FLMs and/or the public difficult or impracticable. The RCRA Munitions Rule exempts explosives or munitions emergency or time critical responses from the RCRA Subtitle C hazardous waste regulatory requirements, including notifications, except that a record of the response must be kept.[11] Some States, however, have added additional requirements in adopting the RCRA Munitions Rule (e.g., a notification requirement). EPA Regions should contact the State regulatory agency to determine if such additional requirements have been adopted.

Many MEC may be corroded, encased, or otherwise degraded, making it difficult or impossible to determine their actual condition and the explosives hazard they present. When such uncertainty is involved, response personnel ordinarily assume the item presents a potentially acute explosive hazard. Deference should be given to this judgment, but the explosive emergency response specialist should be able to describe and document afterwards the basis for this determination. Explosives or munitions emergency responses are normally appropriate for discrete emergency situations, and may be appropriate during planned munitions responses (such as during the site assessment or investigation phases).

[8] 40 CFR 260.10.
[9] http://www.epa.gov/fedrgstr/EPA-WASTE/1997/February/Day-12/f3218.htm
[10] 60 FR 56476, November 8, 1995
[11] 40 CFR 270.1(c)(3)(iii).

EPA recommends that the Lead Agency give at least oral notification to the State or Tribal governments and to the relevant FLM Agency within 24 hours of initiating an emergency response, with written notification occurring within 7 days thereafter. As mentioned above, some States, in adopting the RCRA Munitions Rule, require State notification.

5.4 Removal Actions

The following should be noted when conducting a removal action:

- Explosives safety, including that of the response personnel, typically is the primary factor to be considered in determining the best approach to the removal action.
- Removal alternatives under CERCLA should be evaluated under the criteria set forth in the NCP (NCP Section 300.415).
- Removal actions should, to the extent practicable, contribute to the efficient performance of any anticipated long-term remedial action (NCP Section 300.415(c)).
- In accordance with the NCP, the Lead Agency should seek EPA Regional, Tribal, State, and local participation in the process (i.e., coordination), including comment on the cleanup alternatives, with the exception of when an emergency precludes it (see DERP, for specific DoD requirements and NCP Section 300.415(m)). In addition, the Lead Agency is expected to coordinate and communicate with property owners and/or tenants, including civilian, Federal, Tribal, State, and local government agencies.
- At the conclusion of a removal action, an evaluation should be made regarding the need for further investigation and/or response. Since the decision could be "no further action," another removal(s), or a remedial action(s), regulatory consultation generally should be pursued. At NPL sites, EPA concurrence is expected for "no further action" decisions.
- If DoD, in coordination with environmental regulators, determines, based on explosives safety, human health, and environmental concerns, that the removal action will not fully address the threat posed and remedial action may be required, the Lead Agency is responsible for (and EPA/states should expect) an orderly transition from removal to remedial response activities.
- Non-time critical removal actions should be implemented in compliance with applicable or relevant and appropriate requirements (ARARs), which may be waived in accordance with the NCP, and after a full evaluation of the alternatives in advance of the response determinations.

In summary, munitions responses may appropriately include one or more removals. Removal actions alone may be sufficient to address the risk at the site or may be combined with a subsequent remedial action. The decision to conduct a removal or remedial action should be made only after careful consideration of site-specific data.

5.5 Remedial Cleanup Process

Pursuant to the NCP, remedial action alternatives (which may address the need for land use controls) are evaluated using the nine evaluation criteria (see 40 CFR 300.430 (e)(9)(iii)). Often, the most relevant of these criteria for remedial actions at MRS where there are explosive safety considerations are overall protection of human health and the environment, compliance with ARARs, short term effectiveness, and implementability. Explosive safety considerations may also be important in evaluating whether to waive an ARAR because of "technical impracticability".

The level of cleanup for MRS will normally be governed by the reasonably anticipated future land use and associated activities. In some cases, explosives safety, costs, technical feasibility or other considerations may limit a munitions response and restrict future land use. Land use controls (LUCs) may be necessary in some situations. However, as stated in the NCP, "the use of institutional controls shall not substitute for active response measures . . . as the sole remedy unless such active measures are determined not to be practicable based on the balancing of alternatives . . . "[12]

5.6 Military Munitions Rule

In its Military Munitions Rule, issued on February 12, 1997, EPA clarified the regulation of military munitions under RCRA. Specifically, military munitions that are used for their intended purpose are not discarded, are therefore not solid wastes under RCRA's Subtitle C regulations, and are consequently not regulated as hazardous waste.[13] On the other hand, if a military munition is used or fired and lands off-range and is not promptly rendered safe or retrieved, it would be a solid waste and potentially subject to the corrective action authorities under RCRA sections 3004(u), 3004(v) and 3008(h) or the imminent and substantial endangerment authorities of RCRA section 7003.[14]

Under the Military Munitions Rule, military munitions that have been used as intended in training or in research, development, testing or evaluation would remain excluded from the *regulatory* definition of solid waste even if the facility where that use occurred becomes a location other than an operational range because that regulatory exclusion is not limited to operational ranges. However, it is EPA's long held view that MEC, including UXO, and MC resulting from military munitions used for their intended purpose, that are left and remain on "locations other than operational ranges" would at some point become RCRA *statutory* solid waste. As a result, it potentially could be subject to the imminent and substantial endangerment authorities of RCRA 7003. This position was reiterated in EPA's October 21, 2005 guidance memo to Regional Enforcement Managers. [15]

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[12] 40 CFR 300.430(a)(iii)(D).
[13] 40 C.F.R. 266.202(a)(1). Military munitions used in training or in research, development, testing or evaluation are not regulated as solid wastes. In addition, military munitions that are being recovered, collected, or destroyed on-range are not regulated as solid wastes when these range clearance activities take place *at an operational range*.
[14] 40 C.F.R. 266.202(d).
[15] EPA Memo to Regional Enforcement Managers Concerning Military Munitions on Closed Ranges (October 21, 2005). http://www.epa.gov/fedfac/pdf/ffeo_munitions_memo.pdf .

As a result, a range that is closed or transferred and becomes a location other than an operational range does not become a treatment, storage, or disposal facility potentially subject to the regulatory requirement under RCRA to obtain a hazardous waste permit or conduct corrective action even if military munitions remain at the location. However, when a munitions response action is carried out (whether the response is compelled under a RCRA 7003 order or is otherwise carried out), and the response occurs at a location other than an operational range, the response activity is not covered by the intended use exemption from the regulatory definition of solid waste.[16] Therefore, the response activity would be subject to any applicable RCRA Subtitle C hazardous waste regulations if the material meets a listing description (see 40 CFR part 261, subpart D) or exhibits any of the characteristics of ignitability, corrosivity, reactivity, or toxicity under the criteria of 40 CFR parts 261.21, 261.22, 261.23 or 261.24. However, if the known or suspected presence of military munitions, other explosive material or an explosive device, as determined by an explosive or munitions emergency response specialist, would present an immediate threat to human health, public safety, property or the environment, the management of such material would not be subject to the RCRA Subtitle C management standards and a RCRA permit would not be required.[17] Regions or States should make a case-by-case evaluation of MEC, including UXO, and MC to determine whether it is subject to RCRA regulations, and if so, how the regulations apply.

Finally, nothing in RCRA or in EPA's Military Munitions Rule bars a State from exercising its own solid and hazardous waste authority over waste military munitions, including MEC/MC, regardless of whether they have adopted the Military Munitions Rule as part of their authorized RCRA program. DoD and/or other appropriate responsible parties have an obligation at "locations other than operational ranges" to clean up MEC/MC when required under state and federal statutory authorities, and such cleanup may be subject to state and EPA oversight.

5.7 Transfer of Munitions Response Sites

As specified in the *DoD/EPA UXO Principles*, DoD should generally retain ownership or control of those areas at which it has not yet assessed or responded to potential explosive hazards. Nonetheless, it is possible for property to be transferred prior to the initiation or completion of a munitions response. Where Federal property known to, or suspected of, requiring a munitions response is proposed for transfer by lease or deed, an evaluation of the risks associated with MEC/MC should be part of the Environmental Baseline Survey (EBS), Environmental Condition of Property (ECOP)[18] document, Finding of Suitability for Lease (FOSL), Finding of Suitability for Transfer (FOST), Finding of Suitability for Early Transfer (FOSET), or comparable process for non-BRAC transfers. Key to any transfer is adequate disclosure to the transferee of the potential presence of MEC/MC.

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[16] The intended use exclusion from the definition of solid waste for recovery, collection, and on-range destruction of unexploded ordnance and munitions fragments during range clearance activities is limited to operational ranges. 40 CFR 266.202(a)(1)(iii).

[17] See 40 CFR 264.1(g)(8) for this and other specific instances where a permit or the RCRA Subtitle C standards would not be applicable for the management of military munitions. For details on how RCRA Subtitle C requirements, including permitting, apply generally to remediation waste (including MEC/MC addressed as part of a remediation), see Management of Remediation Waste under RCRA, OSWER, October 1998, EPA 530-F-026.

[18] Required by Army Regulation 200-1, Section 15-6b for transfer of property between agencies.

Adequate disclosure (to ensure protection of human health and the environment) would generally include a discussion of what is known about the property in terms of former land uses, the potential for MEC, including CWM configured as a munition or CWM that is not configured as a munition (e.g., Chemical Agent Identification Set (CAIS)), to be present, the potential for MC contamination to exist, MRS that have been investigated and those that have not, how investigated (e.g., geophysical surveys and digs, samples taken), what MEC, CWM, and/or MC contaminants were found and where, and what remediation was done and where. Then, as appropriate for protection of human health and the environment, access control mechanisms should directly relate to what is known about the MRS, addressing uncertainties and potential risks (e.g., if the MRS has not yet been adequately characterized and remediated), commensurate with the reasonably anticipated future land uses.

Prior to transfer by deed, the requirements of Section 120(h)(3) of CERCLA must be met (i.e., the CERCLA covenant that all necessary remedial action (including munitions response) has been taken must be given, or the covenant may be deferred by EPA and/or the Governor). In the case of early transfer under CERCLA Section 120(h)(3)(C), the statutory conditions for the deferral again must be met. (For additional EPA guidance on Early Transfer, see "*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)*", June 16, 1998.)

Where a cleanup action for MEC/MC has occurred, some level of LUCs will often be necessary to address the possibility that some MEC/MC may remain on the site. These land use restrictions should be incorporated into an enforceable mechanism which should apply to subsequent property owners and be monitored by the Lead agency with periodic reports to the regulatory agency(ies). Where Federal property is being transferred with known or suspected MEC/MC, all areas need to be evaluated in the CERCLA (including section 120(h)(3)) and the NCP context, or under an equivalent RCRA process.

6. Involvement of State Environmental Regulators, Tribal Governments and the Public

The Agency believes that military munitions in the environment are best addressed after consultation with and input from EPA Regional, State, tribal, and local authorities, as appropriate. The Defense Environmental Restoration Program was required by Section 211 of the Superfund Amendments and Reauthorization Act of 1986. It specifically requires that DoD afford “an adequate opportunity for timely review and comment” to EPA, State, and local officials before commencement of a response action, except where such consultation would be impractical.

6.1 Response Under RCRA and/or Other State Authorities

Existing State authorities can be used to effectively resolve many of the munitions related issues. As with CERCLA, RCRA or State equivalent authorities can cover the major steps in the process needed to manage MEC/MC from discovery to destruction.

Participation of States and Tribes in the evaluation and cleanup of MEC/MC is an important aspect in overall protection of human health and the environment. In many cases, a State or Tribal Government may be the lead regulator for a munitions response. In recognition of their status as co-regulators and/or sovereigns, State environmental regulatory agencies and Tribal Governments should be:

- provided with meaningful opportunities to participate in the response process, along with the Lead Agency (e.g., site characterization, oversight of responses, concurrence that a site response is complete) and;

- provided with meaningful opportunities to participate in the development of, and to comment on, project documents prepared to support the response action.

6.2 Public Participation

Community engagement and public participation are a high priority for EPA. In accordance with CERCLA and the NCP, and consistent with existing EPA policies developed by OSWER as well as DoD and DoD Component policies, public participation is essential to developing a sound, credible, and publicly acceptable cleanup action. Communication with all parties often will help educate the public on the hazards associated with MRS, facilitate understanding and answer community concerns often generated by the discovery of MEC/MC or by the initiation of a munitions response. Enhanced outreach to communities may be appropriate to address public concerns, and efforts in this regard by the responsible Lead Agency should be encouraged. It may be appropriate to give project teams and communities a specific contact in the event munitions are discovered or suspected by members of the public (e.g, Call 911). Also, at FUDS, which normally have been in the public/private domain for many years, public participation often results in the revelation of site-specific information pertinent or critical to the site investigation process, potentially resulting in efficiencies and cost savings.

We recommend that the Lead Agency responsible for conducting and overseeing a munitions response action take steps to identify and address the issues and concerns of all stakeholders. Public involvement programs related to a munitions response action should be developed and implemented in accordance with applicable EPA and DoD policies. Such communication efforts typically start with identifying all the stakeholders and interested parties, and generally have the overall goal of ensuring that decisions made regarding the munitions response action reflect a broad spectrum of stakeholder input.

7. Explosives Safety Considerations

7.1 Safety Considerations Related to Response Actions

The NCP assigns DoD as the "removal response authority with respect to incidents involving DoD weapons and munitions or weapons and munitions under the jurisdiction, custody or control of DoD."[19] EPA shares DoD's concerns regarding the safe management of MEC. In formulating its regulations and policies, DoD has focused on the acute hazards associated with

[19] 40 CFR 300.120(d).

MEC in a manner that best minimizes human health and environmental effects, while maximizing the safety of response personnel. Because MEC can be extremely dangerous, DoD's general practice is to destroy MEC, especially UXO, in place by detonation (commonly referred to as blow-in-place or BIP). However, EPA and other environmental regulators overseeing munitions response actions may have independent authority, responsibility, and/or the technical expertise to evaluate the public safety and environmental aspects of munitions response actions. In certain site- or situation-specific circumstances, EPA and other environmental regulators may challenge a DoD field expert's disposition decision and seek to elevate the issue to higher levels of authority to achieve a mutually agreeable resolution.

EPA expects great weight and deference to be given to the decisions of explosives or munitions emergency response specialists and to UXO qualified personnel at the field level unless there is a clear and compelling reason to question the expert's technical judgment in a given instance. Therefore, as a matter of policy (and a matter of regulation under RCRA in emergency situations), EPA should defer to explosives or munitions emergency response specialists and to UXO qualified personnel on the safest approach to addressing the explosives hazards of the munitions. However, if EPA Regional field personnel believe there is a clear and compelling reason to question the technical judgment in a given instance, EPA staff and the Lead Agency counterparts immediately should consult with Regional management and the appropriate corresponding levels within the Lead Agency organization.

Once found, several options exist for addressing UXO and DMM. Explosive safety concerns may necessitate destroying UXO, and in some cases DMM, where it is found (i.e., Blow-in-Place (BIP)[20]). Where there are environmental and/or safety concerns to BIP and it is safe to move the UXO and/or DMM, it may be consolidated at a safe, central area or at a controlled detonation chamber on or off-site and destroyed. When a technically qualified individual determines that the risks associated with its movement are acceptable, UXO and DMM may be consolidated at a central area that is sited per DoD Explosive Safety Board (DDESB) criteria.[21] The application of render safe procedures (RSP)[22] during a munitions response is rare due to the extreme risk to personnel involved. However, when a military Explosive Ordnance Disposal (EOD) technician determines that BIP poses an immediate, certain, and unacceptable risk, RSP may be an option. When RSP are applied, the possibility of an unintentional detonation should be considered and protective measures taken. "Render-safe" is not a treatment/disposal procedure. If successful, RSP allows a munition to be moved to another location for treatment/disposal. Finally, it may be possible in very unusual circumstances to transport some UXO and/or DMM off-site for treatment/disposal. Such shipping will not ordinarily be a feasible option, and would require that a military EOD technician first certify that each item is safe to ship within the public domain. Such shipments require compliance with the DOT shipping regulations, and as applicable, the RCRA Subtitle C hazardous waste regulations, as well as state and local regulations.

[20] Munitions Response Committee White Paper, Destruction in Place (Blow-in-Place (BIP)), dated 2 November 2004.
[21] DDESB Standard 6055.09.
[22] The render safe procedure (RSP) involves the application of special explosive ordnance disposal procedures, methods and tools to provide the interruption of functions or separation of essential components of unexploded ordnance (including improvised explosive devices) to prevent an unacceptable detonation.

There are several competing safety considerations concerning munitions associated with a munitions response such as:

- Can the UXO and/or DMM be BIP safely?
- Are the risks associated with movement acceptable?
- Is it safe to transport the munition on-site for consolidation and treatment/disposal?
- Is it safe to store the munition on site for a limited or extended period pending final treatment/disposal?
- Is it safe to transport the munition off site over public traffic routes for storage and final treatment/disposal?

These considerations affect subsequent decisions on whether to (1) BIP the item, (2) move the item for consolidated detonation on-site, or (3) transport the item off-site for treatment/disposal.

7.2 Site-Specific Health and Safety Plans

The NCP provides that Site-Specific Health and Safety Plans (SSHP)[23] should be prepared for every non-emergency CERCLA action (investigation and response). Such plans should be standard for munitions responses, even if not performed under CERCLA. There is a large body of DoD, USACE, and other DoD Component guidance concerning explosives safety that is applicable during munitions responses that should be reflected in SSHPs. DDESB policy requires, except in emergency situations, that explosives safety submissions and the explosives safety aspects of any transfer be reviewed and approved by the DDESB. Given the public health and safety implications of investigations and removal actions conducted during a munitions response action, EPA recommends that SSHPs be reviewed by regulators (EPA and/or the relevant State or Tribal Government) prior to initiation of work.

8. Site Characterization Expectations

8.1 Site Assessment Considerations

DoD's FY 2002 Appropriations Bill included requirements for it to establish and maintain an inventory of munitions response sites and establish a means for prioritizing cleanup of these sites. This inventory provides the numbers of munitions response sites and estimates of the acreage of these sites. DoD has put forth timeframes for reporting of these activities. The inventory can be found at the Defense Environmental Network and Information eXchange (DENIX) at www.denix.osd.mil.

This work is governed by a variety of Federal and state enforcement and oversight authorities. The *DoD/EPA UXO Principles* discusses a clear preference for EPA and DoD to follow CERCLA process and legal requirements to conduct identification, investigation, and removal or remedial actions. Since the publication of the *DoD/EPA UXO Principles,* both EPA and DoD have set forth additional policies and guidance on the MMRP response processes and

[23] 40 CFR 300.430(b)(6).

procedures pursuant to Federal statutory authorities. While these have primarily focused on the provisions of CERCLA as the preferred regulatory approach, other statutes, such as RCRA, may provide comparable methods for site characterization and cleanup.

Instructions from the Office of the Deputy Under Secretary of Defense for Installation and Environment direct the DoD Component organizations (USAF, USN, USMC, USACE) to meet the requirements of the DoD Munitions Response Site Prioritization Protocol (MRSPP).[24] This includes gathering site characterization information to score one or more of the three MRSPP modules. The modules address potential explosive safety hazards, risks associated with the release of MC, and risks associated with chemical warfare material. In order to meet these requirements, DoD began to undertake preliminary assessments while the MRSPP was being developed and subject to rulemaking. Those efforts are now largely complete. DoD began to undertake site inspections in FY 2006. DoD completed most PAs by 2007 and is on track to complete most SIs by 2010.

EPA issued OSWER Directive 9200.3-60: *Recommendations for EPA Regional Offices on Preliminary Assessments and Site Inspections for the Department of Defense Military Munitions Response Program* on 5 April 2010 to:

- provide background on the DoD MMRP and explains the reasons behind DoD's accelerated site assessment schedule and the relationship to the Munitions Response Site Prioritization Protocol;
- clearly state EPA policy that Federal Facility Hazardous Waste Compliance Docket requirements apply to Federal Facility munitions response sites, even if munitions (unexploded ordnance or discarded military munitions) are the only contaminant;
- state that munitions response sites at NPL sites should be added to the FFA (or other site enforceable agreements) and munitions response sites should not be treated any differently than other contaminated sites under CERCLA or RCRA;
- identify deficiencies in MMRP PA and SI at both NPL and non-NPL sites (e.g., adequate data for possible HRS scoring) and notifications to HQ EPA offices for resolution and tracking of issues that cannot be resolved at the site level;
- provide recommendations for streamlining review of MMRP PA and SI documents and how to triage reviews if necessary due to resource limitations; and
- provide enforcement considerations to compel accelerated cleanup at munitions response sites and uses the Safe Drinking Water Act as an example of an appropriate authority to utilize.

EPA Regional Office personnel are included in annual and semi-annual reviews for NPL, non-NPL, and FUDS with their Federal and state counterparts – especially for Defense State Memorandum Of Agreement (DSMOA) reviews – where MMRP or other DoD environmental programs are appropriate. It is recommended that EPA Regional personnel be included in discussions with State, Federal Agency (DoD FLMs, etc), and Tribal personnel to ensure that project planning, scoping, characterization, remediation, and re-use reflect consensus opinions that are protective of human health and the environment, including protectiveness for future re-use.

[24] 32 CFR Part 179.

For NPL sites with MMRP sites, these sites should be addressed under CERCLA 120 Inter-Agency Agreements/Federal Facility Agreements (IAG/FFA). For non-NPL sites, including FUDS with MMRP sites, EPA Regions, in consultation with State, Tribal and/or Federal Agency counterparts, should determine the level of EPA involvement. In general, it may be beneficial for EPA to be involved at sites where DoD is pursuing no further action (NFA) or No Defense Action Indicated (NDAI) determinations to ensure that site conditions are protective of human health and the environment. In addition, it may also be beneficial for EPA to be involved at MRS that receive a high score (e.g., 1, 2, or 3) under the MRSPP.

8.2 Historical Documentation of Site Activities

Relevant historical information concerning a site is fundamental to planning an appropriate and thorough site characterization. DoD compiles this information in an historical records search (formerly called an Archive Search Report (ASR), but now are included in MMRP Preliminary Assessment (PA) reports), which is normally based upon a search and review of historical records; aerial photography; historical facility maps; construction drawings; shipping records; records of any previous clearance activity; records of any disposal or open burning/open detonation (OB/OD) activities; and other available information, and routinely includes interviews with personnel who were/are employed or were/are stationed at the site, or who otherwise would have direct knowledge of relevant activities there. EPA recommends that before starting an historical records search/PA, the Lead Agency coordinate with the lead regulatory agency in scoping the work.

The historical records search/PA can be used to identify potential MEC, types and quantities of MEC, and MEC management methods. This information can then be used to:

- identify the types of military munitions used at the facility and areas or locations at which they were produced, maintained, demilitarized (e.g., OB/OD), used, or buried;
- identify areas of the facility where munitions-related activities (e.g., impact areas, firing points, training areas, OB/OD sites) may have occurred, thereby identifying where to focus the site investigation and reducing the size of the area to be investigated;
- prioritize the investigation in terms of likelihood of munitions presence, type of munitions used, potential for MC contamination, public access to the area, and planned current or reasonably anticipated and appropriate end uses;
- identify investigative technologies and approaches (e.g., the types of geophysical equipment or sampling methods and parameters) most likely to find the MEC; and
- consider the need to address explosives safety issues prior to initiating the investigation.

While historical records searches/PAs are important to characterizing a site, Regions should be mindful that their reliability may be limited by such factors as poor records, incomplete information, or faulty memories. Therefore, we suggest that they be scrutinized to identify potential gaps and ascertain their accuracy and thoroughness.

The Interstate Technology and Regulatory Council (ITRC) UXO Team has written a technical guidance document entitled, “Munitions Response Historical Records Review

(November 2003)".[25] This document is a guide for regulators, stakeholders, and others involved in the oversight of historical records review projects on munitions response sites.

8.3 Systematic Planning Process

As with any other environmental investigation, effective site characterization uses a Systematic Planning Process (SPP) to develop the goals of the investigation (i.e., the specific decisions to be made), identify the specific objectives of the investigation, and design an appropriate sampling and analysis effort. (USACE uses an analogous process called Technical Project Planning (TPP) - see USACE Engineering Manual EM 200-1-2 for more information on the TPP process.) Involvement of EPA or other (State, Tribal, FLM) staff in the SPP process, from scoping through development of the sampling and analysis plan (SAP) and quality assurance project plan (QAPP) or equivalent documents is encouraged for acceptance of the site characterization results. This involvement will help ensure that the information from the sampling and analysis efforts provides the data that are usable for the decisions to be made and that the involved authorities share a common understanding with the explosives emergency response specialist(s) or other response personnel as to safety considerations. The Uniform Federal Policy for Quality Assurance Project Plans methods and tools, which are based on systematic planning concepts, has been endorsed by EPA (OSWER Directive 92720.17 dated June 7, 2005) and DoD (DoD Instruction 4715.15 dated December 11, 2006) for use at federal facility chemical hazardous waste sites. The methods and tools have also been adapted for use at military munitions response sites. The UFP-QAPP Guidance and related documents can be found at the following website: http://www.epa.gov/fedfac/qualityassurance.htm.

8.4 Use of Conceptual Site Models

An important aspect of the SPP at the MRS is the development and continuous refinement of a sound conceptual site model (CSM). The CSM establishes a working hypothesis on the type of munitions-related activities that were conducted at the MRS, the potential for and type of MEC present, the nature and extent of any MC contamination and the likely pathways of exposure to current and future human and ecological receptors, that will guide the investigation at the site.

The initial CSM should be created once project decision goals are defined and historical information on range or site use and the results of previous environmental investigations are gathered. The CSM then continues to evolve as new data about the site are collected, since information gathered at each stage of the site characterization and remediation process is used to review earlier hypotheses and guide any appropriate revisions.

Chapter 7 of the *EPA Handbook* offers more detail on the CSM process, but in summary, the CSM describes the site and its environmental setting, and presents hypotheses about the types and locations of contaminants, their routes of migration, and potential receptors and exposure routes. This might include such things as:

- topography and vegetative cover;

[25] http://itrcweb.org/Documents/UXO-2.pdf.

- past munitions-related activities (e.g., handling, storage, live-fire training or testing, munitions demilitarization or disposal operations) and the potential explosives or environmental hazards present;
- expected locations of MEC (surface or subsurface) or the expected level of MC contamination based on the munitions-related activities conducted at the MRS;
- potential exposure pathways to human and ecological receptors (including threatened and endangered species);
- environmental factors such as frost line, erosion activity, and the groundwater and surface water flows that influence or have the potential to change pathways to receptors;
- human factors that influence pathways to receptors;
- location of cultural or archeological resources; and
- reasonably anticipated future land use.

The U.S Army Corps of Engineers has also published a concise guide on the development and application of CSM's entitled "Conceptual Site Models for Ordnance and Explosives (OE) and hazardous, Toxic ,and Radiological Waste (HTRW) Projects.[26]

8.5 EPA Review and Approval of Sampling and Analysis Plans Under CERCLA

When removal or remedial investigations are conducted under CERCLA consistent with the NCP, Sampling and Analysis Plans (SAPs) are prepared to ensure that the data obtained are of the quantity and quality necessary to support the decisions made. These SAPs will generally consist of two parts: (1) a field sampling plan that describes the number, type, and location of samples and the types of analyses, and; (2) the Quality Assurance Project Plan (QAPP), which describes the current organization, functional activities, and data quality objectives (DQOs) and actions necessary to ensure that the data are adequate for use in selecting a remedy. NCP section 300.415(b)(4)(ii) requires EPA approval of SAPs for CERCLA non-time critical removal actions. SAPs for remedial investigation/feasibility study activities should be reviewed and approved by EPA in accordance with NCP Section 300.430(b)(8); QA/QC requirements for remedial design and remedial action activities generally will be consistent with NCP Section 300.435(b).

On a site-specific basis, where EPA is performing oversight, the party conducting the munitions response and EPA should agree on the standards and procedures for characterization of the MRS. Of most importance is agreement on the DQOs for site characterization. DQOs, once established, will guide site characterization planning, sampling method selection, analytical technique selection, and the level of uncertainty that is acceptable for decision-making purposes. See Chapter 7 of the *EPA Handbook* for more information on DQOs for munitions response actions.

[26] USACE EM 1110-1-1200, dated February 3, 2003

8.6 Integration of Explosives Safety and Environmental Investigations

The most effective approach to the characterization of an MRS integrates explosives safety considerations, geophysical investigations, and investigations for environmental contamination of MC. Such integration has been demonstrated in the field to be safer and more cost-effective because it typically eliminates duplication of efforts. For example, following the initial review of existing information and a visual reconnaissance of the range, a surface removal of MEC may be necessary to address the immediate explosives safety concerns. A next step might then be the use of a geophysical method, which may be necessary to map the site for potential subsurface MEC. Subsurface removal activities, when properly planned, executed, and recorded, can provide valuable information regarding the potential for MEC and MC to be identified and can help guide the follow-on investigations. If soil or ground water sampling is needed to determine the nature and extent of soil and/or ground water contamination, the results of the surface and subsurface clearance can guide where to take samples. Also, additional geophysical and other special procedures to protect against any explosive hazard might be put in place to allow for the safe extraction of core samples. In some instances, it may be necessary to modify a site investigation strategy due to explosives safety concerns.

8.7 Statistical Sampling

In general, EPA believes that statistical based sampling for MEC at an MRS is best used as a screening tool to provide preliminary information concerning site conditions. This can be particularly useful when developing transect based sampling to locate firing ranges, impact areas, and some disposal areas where approximate location and size are known. Transect spacing can be very effective in the initial "search mode" when developed and deployed based on dispersal patterns of known weapons systems used at a site. Other appropriate uses of statistics at munitions response areas include development and evaluation of detection systems at geophysical proveout (GPO) sites. For a GPO, the probability of detection and confidence intervals can be DoD contract requirements, as well as DQOs for site project team decisions.

Statistical based sampling has been used in the development of sampling and analysis plans, as well as for site closeout sampling for chemical releases, for many years. EPA has published a number of guidance documents to assist in the identification and selection of the proper statistical methods based on site conditions and the type of decisions that need to be made at a site.

For MRS, the USACE has developed several tools to assist in site characterization and prioritization activities. These include SiteStats/GridStats, OECert, and the UXO Calculator for preliminary site characterization and screening, as opposed to final cleanup decisions. There are several reasons for this approach. First, these tools assume a homogeneous distribution of MEC in the area under investigation. Real world experience has shown this type of distribution is not commonly found at MRS. In fact, information on type and location of range activities, targets, firing positions, and test areas enables the development of an investigation and sampling plan that starts with real world assumptions about the non-homogeneous nature of the MEC distribution based on knowledge about distribution and scatter patterns at similar ranges that have already been investigated. Such information, where available, enables investigation and

sampling approaches to radiate from the areas of potential MEC concentration to better determine the MRS. Second, the reliance on sampling of a very small area of the MRS (often less than 3 %) and extrapolating the results to make remedial action decisions introduces the likelihood for substantial uncertainty in the decision making process. This in turn can lead to revisiting decisions and additional clearance at sites that were considered cleared of MEC.[27] Third, the development of faster, better, cheaper, more comprehensive, and more reliable digital geophysical techniques (vehicle towed and airborne arrays, larger paths for handhelds, digital processing enabling faster and more accurate data acquisition) render such limited statistical approaches obsolete in most situations. Fourth, the total costs of cleanups based on more comprehensive digital geophysical investigations and the importance of reducing uncertainties for MRS investigations make it more cost effective to focus on more comprehensive geophysical surveys up front rather than an iterative explorative statistical approach. Statistical approaches may be appropriate in those situations when data acquisition is particularly difficult or expensive due to terrain or vegetation.

Over the past few years, efforts have been initiated by EPA's National Exposure Research Lab (NERL) and DoD's Strategic Environmental Research and Development Program (SERDP) to evaluate the strengths and limitations of statistical methods for different distributions of MEC in the environment. These efforts, particularly by SERDP, are moving toward the development of site planning and investigation tools that will allow project teams to evaluate different MEC distribution patterns. The Visual Sampling Plan is one such tool that is developing inputs to allow a site project team to evaluate the affects of different distribution patterns, sampling methods, confidence intervals, and costs.[28]

The use of statistics is more likely to be useful as a screening tool at larger MRS where extensive geophysical analysis is not practical. The use of statistical sampling for smaller MRS in place of more comprehensive geophysical analysis and intrusive investigations may not be either warranted or cost-effective. Similar considerations may be warranted for MEC in areas where terrain and vegetation make site investigations difficult to perform. When evaluating the use of statistical sampling methods, EPA recommends that the following factors should be taken into account:

- the decision should be made in conjunction with the project team;
- agreement on the criteria on which decisions will be based;
- agreement that statistical based sampling will provide a clear benefit to the decision making processes;
- agreement on the assumptions and decision rules that are used in the statistical method;
- the assumptions on which the statistical sampling techniques are based should be both clearly documented and appropriate to the particular site under investigation;
- the level of confidence in the detection technology (i.e., is electromagnetic induction (EM), magnetometers, signal processing program, or some other method best suited for

[27] For more discussion on EPA concerns on these models, see FFRRO's January 19, 2001 memorandum, *Interim Guidance on the Use of SiteStats/GridStats and Other Army Corps of Engineers Statistical Techniques Used to Characterize Military Ranges*.
[28] Current version available at http://dqo.pnl.gov/vsp.

site conditions; do the site GPO results provide probability of detection/confidence intervals that will support decision-making);
- use and amount of anomaly re-acquisition to verify findings of detection technology;
- presentation of the data, appropriate summary format; and
- quality and quantity of information from historical investigations.

8.8 Use of Geophysical Detection Techniques for MEC

Historically, MRS characterization has generally relied on procedures referred to as "mag and flag" to detect and define MEC. "Mag and flag" involves an operator responding to audible and/or visual signals representing anomalies as detected by a hand-held magnetometer (or similar device), and placing flags into the ground corresponding to the locations where signals were produced. These procedures have some weaknesses that can lead to lower probabilities of detecting MEC and higher levels of either false positives or false negatives. "False positives" are geophysical anomalies incorrectly identified as MEC. "False negatives" are either a lack of a geophysical anomaly where MEC are present or an MEC induced geophysical anomaly that is incorrectly identified as non-MEC, resulting in potential hazards remaining in the ground.

Some of the limitations of "mag and flag" include: decreased accuracy of anomaly detections, reviews, discriminations, and selections; lack of a digital record of signals for oversight or future review; decreased ability to determine adequacy and assign accountability; worker fatigue and time of day has been shown to influence quality, regardless of worker skill level; more difficult and expensive to provide oversight and independent review; and more costly in the short term, but especially in the long term, primarily because of the need to resolve false positives, but also to reacquire or return for subsequent reviews when needed.

Improvements have been achieved in the deployment of technologies used to detect MEC and the processing of data post deployment to more effectively identify it. The most appropriate and effective detection technologies at MRS will depend on the technology capabilities in relation to site-specific factors, such as munitions types, shapes, materials, mass, size, depth, extent of clutter, and environmental factors (e.g., soil, geology, terrain, vegetation, moisture, and temperature). The primary selection criterion is the technology ability to maximize the probability to detect a MEC item, but also important is the technology ability to minimize the probability of false alarms and to discriminate MEC from non-MEC items. Often, these determinations are made by applying the performance results from controlled tests and experiences at other similar MRS, supplemented by site-specific prove-outs.

Site-specific performances are verified by quality control checks during excavations and sometimes by measuring the ability to detect munitions seeded in the remedial area prior to the geophysical investigation. In many situations nationwide, the use of newer approaches and procedures will increase the amount of MEC detected, better distinguish between MEC and non-MEC items, reduce the number of false positives, and reduce the total investigative and remedial time and costs (primarily by fewer false positive digs).

As stated in the *DoD/EPA Principles*, digitally-recorded and geo-referenced sensor data should be collected and analyzed, and a permanent record of the sensor data and results kept.

The digitally recorded, geo-referenced permanent record allows for better analysis of the data. It also facilitates re-analysis of the data and permits a more accurate evaluation of the soundness of both the investigation and the remediation which are important for regulatory oversight and confidence in land use decisions. Finally, it provides a data base for initiating later investigations should MEC be found in the future. Some of these techniques are described in the *EPA Handbook*.

8.9 Maintenance of a Permanent Geophysical Record of the Investigation

It is strongly recommended that the Lead Agency develop and maintain a permanent record of the geophysical data gathered to characterize a MRS, including methods that log the data into a computer and electronically locate (via satellite or other accurate means) each detected geophysical anomaly; the exception may be when technology allows for the discrimination of MEC from munitions debris, range-related residues, scrap metal, or naturally occurring phenomena. These are referred to as "digitally recorded and geo-referenced" data. Geophysical data would not normally be collected for explosives or munitions emergency responses and other cases where such electronic records are impracticable. However, it may be prudent to follow explosives or munitions emergency responses with geophysical confirmation that the removal was complete. If such permanent record is maintained, EPA recommends that it be included in the administrative record and be provided upon request, in its entirety, to Federal and State regulators, FLMs, and Tribes.

8.10 Risk/Hazard Assessment for MEC/MC

A key consideration in the management of site conditions due to the presence of environmental contamination from MEC or MC is how to address potential risks and hazards to human health and the environment. These will consider the evaluation of baseline site conditions, as well as reasonably expected and anticipated future uses. These conditions require the evaluation of a variety of inputs to exposure scenarios for chemicals of concern, including MC, and interaction conditions for MEC. Incremental cancer risks and non-carcinogenic risks to human receptors, and ecological risks to other receptors for MCs will follow existing EPA guidance on the evaluation and calculation of potential impacts. These will continue to be evaluated through the CERCLA removal and remedial process and procedures, and in a manner consistent with the NCP.

In May 2004, the Munitions and Explosives of Concern Hazard Assessment (MEC-HA) technical work group (TWG) was established by EPA to develop a consensus methodology for assessing explosive safety considerations for human receptors at MRS. The TWG included representatives from EPA, DoD, FLMs. States and Tribal interests that are involved with MMRP activities. The work products developed by the TWG can be found at: http://www.epa.gov/fedfac/documents/hazard_assess_wrkgrp.htm. The MEC-HA only addresses explosive hazards from MEC.

An Interim MEC HA Methodology was released in October 2008 to promote consistent evaluation of explosive hazards at MRS, as well as providing a consistent methodology for evaluating removal and remedial action alternatives. The methodology provides instructions on

how to organize site information, how to identify and score munitions response sites – including an automated scoring workbook, output categories based on scoring, how to adjust scores based on changes to land use and land use activities, as well as the effects of cleanup actions, and how these factors address the CERCLA removal and remedial criteria analyses. It is important to understand that the MEC HA supports these analyses – it is not the decision tool. It does, however, help project teams and communities understand options for risk reduction. The input factors and associated scores are relative to each other in the context of the scoring matrix alone. They do not represent a "how clean is clean" approach and are not intended to be used in such a manner. After a 2 year initial implementation of the MEC HA, the TWG sponsor organizations will review the methodology and tools to determine if improvements should be made to improve their effectiveness.

9. Land Use Controls for Munitions Response

9.1 Early Discussions of Land Use Options

It is recommended that discussions with local land use planning authorities, local officials, and the public, as appropriate, be conducted as early as possible in the site response process to determine the site's reasonably anticipated future land use. These discussions can be useful to scope efforts to characterize the MRS, conduct risk assessments, and select the appropriate munitions response. Generally speaking, when a former range area will be used for residential development, sufficient information should be provided to all stakeholders, including regulators, local governments, developers, etc., to enable them to conclude that the land is suitable for the intended use and that appropriate remediation and institutional controls can be applied to ensure continued protectiveness. The general goal is to identify and apply the most appropriate technologies to investigate the range and address any MEC/MC such that the actual condition of the property is consistent with the reasonably anticipated future land use. In achieving this goal, EPA fully supports identification and application of the most appropriate, best proven and available technologies for use during the munitions response. Although removing all explosive or chemical hazards should normally be the goal, current technologies will often not allow this goal to be achieved with certainty. The point, as with any investigation in areas of future land use, is (a) to generally use the best demonstrated available technology, and (b) to establish appropriate public communication and land use controls commensurate with what is known about the adequacy of the detection and remediation technologies.

9.2 Use and Evaluation of Land Use Controls at Munitions Response Sites

LUCs include physical, legal (institutional), or administrative mechanisms that restrict the use of, or limit the access to, real property to prevent exposure to hazardous conditions that may pose a risk to human health and the environment. The NCP makes clear that such controls "shall not substitute for active response measures as the sole remedy unless such active measures are determined not to be practicable.[29] " The determination to include LUCs as part of a response action should be based on the reasonably anticipated future land use, and can take into account planned reuse and specific requirements of each property. Where employed, LUCs

[29] 40 CFR 300.430(a)(1)(iii)(D).

should be adequately defined, roles and responsibilities for the LUCs should be made clear, and the LUCs should be enforceable.

For various reasons, including technical limitations and inordinately high costs, removal of MEC/MC from a MRS to the degree that allows certain uses (for example, unrestricted use in a residential setting) may not be possible. In such cases, LUCs generally will be necessary to ensure protection of human health and safety; normally, LUCs should be identified and implemented early in the munitions response process to provide protectiveness. When supported by a site characterization that includes an adequate evaluation of reasonably anticipated future land use, final LUCs should be considered during the process of developing and evaluating remedial action alternatives, using the nine remedy selection criteria specified in the NCP.[30] This process should ensure that any LUCs chosen to be part of a remedial action are based on a detailed analysis of response alternatives and are not presumptively selected. Roles and responsibilities for monitoring, reporting, and enforcing the restrictions should be clear to all affected parties. LUCs should be clearly defined, set forth in a decision document, and be enforceable to be effective.

EPA believes that the Lead Agency should work with the appropriate authorities to implement the LUCs, as well as notify the current landowners and appropriate authorities of the potential presence of explosive hazards and institute an appropriate public education program. State laws often will be applicable to most LUCs, especially the requirements for deed restrictions and easements. The Lead Agency should also monitor the selected remedy to ensure long-term effectiveness of the response action, including any LUCs.

To expedite the property transfer process, it is recommended that the Lead Agency work with EPA and/or State regulators and the community to evaluate LUCs, while selecting the response action. As part of this effort, the Lead Agency should provide timely notice to prospective land owners/managers of the intent to use LUCs. Comments regarding LUCs received during the development of draft documents should be considered and responses to those comments should be reflected in the final decision documents, as appropriate. For BRAC properties, any unresolved regulatory comments should be included as attachments to the FOST, or other transfer documents. Where the military is performing the response action at FUDS, the assistance of Federal, State, and/or local regulators may be needed to evaluate and effectively implement land use controls on private or Federally-owned property.

10. Oversight and Enforcement Principles

10.1 Oversight by Regulators

Regulatory oversight and involvement in all phases of a munitions response is important to an effective response action by increasing the credibility of the cleanup and promoting public acceptance and confidence. Such involvement includes timely coordination between the Lead Agency and EPA, State, or Tribal regulators, and, where appropriate, the negotiation and execution of enforceable site-specific agreements. Specific enforcement questions should be

[30] 40 CFR 300.430(e)(9)(iii).

directed to the Federal Facilities Enforcement Office (FFEO) or the Office of Site Remediation Enforcement (OSRE) in EPA's Office of Enforcement and Compliance Assurance (OECA).

Therefore it is recommended that EPA, States, or Tribal government regulators conduct regulatory oversight at all MRS where a munitions response is being conducted. The level of regulatory oversight should be sufficient to achieve protection of human health and the environment. The level of external oversight by regulators will also depend on factors including, but not limited to, the known or potential nature and extent of explosive hazards, MC contamination, and other hazards at a site.

10.2 Negotiated Agreements: Federal Facility or Interagency Agreements

If the MRS is on the National Priorities List (NPL), each Federal Facility Agreement (FFA) or Interagency Agreement (IAG) that is negotiated shall have a schedule for the completion of each remedial action (see CERCLA section 120(e)(4)(B)). In some situations, an MRS that is within the boundaries of an NPL site may not be currently included in the list of areas of concern, facility inventory, or other description of sites to be addressed under a federal facilities agreement (FFA) or other document providing for regulatory oversight (e.g., RCRA §7003 order). The MRS should be added to the FFA (or other oversight document) as soon as practicable together with an enforceable schedule of milestones, including primary and secondary documents. To resolve any disagreements that arise over adding the MRS, Regions should use the tools provided by the applicable FFA, including the Dispute Resolution process. The Regions should report these instances to FFRRO along with an analysis of potential impacts to construction completion targets. In addition, Regions need to consult with FFRRO and the FFEO when adding MMRP sites to an FFA, and when MMRP sites are projected to affect construction completion targets.

10.3 Treatment of Non-NPL, Privately Owned Formerly Used Defense Sites

As explained in EPA's FUDS policy,[31] privately owned non-NPL FUDS will generally be treated in the same manner as other privately owned sites. When EPA is conducting the oversight at FUDS, EPA Regions should establish their oversight role (e.g., reviews, approvals, split and independent sampling, timely submission of sampling and analysis results) and negotiate orders to conduct work with the parties responsible for releases of hazardous substances, including DoD, consistent with existing enforcement and cleanup policies.

To facilitate cleanup by responsible parties, and consistent with enforcement priorities, we recommend that Regions initiate potentially responsible party (PRP) searches at FUDS early in the CERCLA process where parties other than DoD may be liable for releases or threats of releases of hazardous substances. In addition, EPA may issue unilateral orders to compel cleanup by any or all of the responsible parties under an appropriate enforcement authority, including, but not limited to, CERCLA, RCRA or the SDWA, where EPA determines that a site may present an imminent and substantial endangerment. Cleanup agreements/orders would include schedules for response action(s) that EPA determines to be needed, based on the site-specific situation and nature of the contamination.

[31] "EPA Policy Towards Privately-Owned Formerly Used Defense Sites" (March 21, 2002).

In appropriate situations, EPA may implement CERCLA response actions at FUDS, as needed, to address releases and threats of releases of hazardous substances and proceed with cost recovery actions. It is EPA's expectation that States or Tribes will serve as the primary regulatory oversight agency at most non-NPL FUDS, although some circumstances (e.g., where the State is a PRP) may warrant substantial EPA involvement.

10.4 Dispute Resolution

To avoid or resolve disputes concerning investigations, selected remedies, or other aspects of response actions at munitions response areas, the Lead Agency, EPA, and State or Tribal organizations should strive to reach consensus, giving substantial deference to the expertise of other parties that can help achieve that consensus. Within any dispute resolution process, the parties should give considerable deference to explosives safety experts on explosives safety issues. See the Munitions Response Committee (MRC) Charter for a discussion of the collaborative decision making process (CDM). In summary:

- At NPL sites, disputes that cannot be mutually resolved at the field or Project Manager level should be elevated for disposition through the tiered process negotiated between DoD and EPA as part of the interagency agreement for the site, based on the Model FFA provisions. Where an agreement does not already exist, or where an existing FFA does not include MRS in the list of FFA sites, Regional Offices should work to negotiate a mutually acceptable FFA pursuant to CERCLA Section 120, or should propose to amend any existing agreement to cover the MRS within the NPL site by the beginning of the next FFA amendment cycle, or next fiscal year, whichever is earlier. Where such negotiations are unsuccessful, the issue should be elevated for resolution.

- At non-NPL sites where there are negotiated agreements, disputes that cannot be mutually resolved at the field or Project Manager level also should be elevated for disposition through a tiered process set forth in the site-specific agreement.

- At non-NPL sites without a negotiated agreement, dispute processes are negotiated on a site-specific basis.

- While EPA supports consultation with regulators, DERP specifies that an enforceable agreement requirement for DoD to consult regulators prior to taking a response action involving MEC "does not apply if the action is an emergency removal taken because of imminent and substantial endangerment to human health and the environment and consultation would be impracticable.[32] " Enforceable agreements should allow for emergency responses to the extent necessary. Language that allows for an emergency response to a non-specified incident, with later notification and documentation to regulators, is appropriate. (For an example of such language see EPA Region III's *"Former Nansemond Ordnance Depot Site, Suffolk, Virginia, Interagency Agreement to Perform a Time Critical Removal Action for Ordnance and Explosives Safety Hazards."*)

[32] 10 U.S.C. 2705(b)(2).

10.5 Enforcement

The facts at a particular site will determine what position the Agency takes. The Agency believes that military munitions in the environment are best addressed after consultation with and input from EPA Regional, state, tribal, and local authorities, as appropriate. Section 211 of the Superfund Amendments and Reauthorization Act that established DERP specifically requires that DoD afford "an adequate opportunity for timely review and comment" to EPA, state, and local officials before commencement of a response action, except in emergencies where such consultation would be impractical. (See 10 U.S.C. 2705(b)(2).)

When necessary, EPA will take enforcement actions against responsible parties, although Agencies should strive to negotiate agreements or orders to conduct the required work prior to issuance of a unilateral order. If EPA determines that conditions at a site pose an imminent and substantial endangerment and the responsible parties disagree with EPA's determination regarding the need for schedules or response action(s), an enforcement order based on the nature of the contamination and site-specific situation would be appropriate. EPA may issue an enforcement order to compel cleanup by any or all responsible parties under an appropriate enforcement authority, including, but not limited to, CERCLA, RCRA, or the SDWA. In appropriate situations, EPA may carry out a response action as needed to abate imminent and substantial and other threats and then proceed with cost recovery actions.

Environmental problems with similar circumstances should elicit consistent and fair application of enforcement tools, according to the EPA OECA's Operating Principles for an Integrated Enforcement and Compliance Assurance Program, issued in 1996. Those principles also state that development of response strategies should include "consideration of statutory authorities to decide whether a single or a multimedia approach might be most effective."

According to OECA policy, when necessary, EPA should take enforcement actions at Federal facilities to abate an imminent and substantial endangerment. If EPA determines a site poses an imminent and substantial endangerment, and the responsible parties fail to reach an enforceable site-specific agreement regarding response action with EPA, or otherwise fail to respond in a timely fashion, an enforcement order based on the nature of the contamination and site-specific situation may be appropriate.

Regions should consult the EPA intranet for information and for EPA regulations, policy, and guidance on relief available against Federal Agencies under environmental statutory imminent hazard authorities, including the text of sample orders and other Federal Facilities Enforcement Office policy and guidance with respect to imminent hazards.

If a Region believes that EPA should issue an order under the imminent hazard provisions of any environmental law requiring the responsible party to abate an imminent and substantial endangerment on a location other than an operational range, such an order would constitute an enforcement matter of national significance and under the appropriate delegation of authority require the concurrence of the Assistant Administrator for OECA.

APPENDIX A. Glossary of Key Terms

Discarded Military Munitions (DMM): Means 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. (10 U.S.C. 2710(e)(2))

Explosives or Munitions Emergency Response Specialist: Means an individual trained in chemical or conventional munitions or explosives handling, transportation, render-safe procedures, or destruction techniques. Explosives or munitions emergency response specialists include DoD explosive ordnance disposal (EOD) personnel, technical escort unit (TEU) personnel, and DoD-certified civilian or contractor personnel, and other Federal, State, or local government or civilian personnel similarly trained in explosives or munitions emergency responses (40 CFR Part 260.10, "Definitions").

Lead Agency: The agency that provides the OSC/RPM to plan and implement response actions under the NCP. The Lead Agency under CERCLA could be EPA, the USACE or other DoD component, other Federal Agency, etc. (40 CFR 300.5)

Military munitions: Means all ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the Department of Defense, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives and chemical warfare agents, chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components thereof. The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components, except that the term does include non-nuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) have been completed. (10 U.S.C. 2710(e)(3) and 40 CFR 260.10)

Military range: Means designated land and water areas set aside, managed, and used to research, develop, test, and evaluate military munitions and explosives, other ordnance, or weapon systems, or to train military personnel in their use and handling. Ranges include firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, and buffer zones with restricted access and exclusionary areas. (40 CFR 266.201)

Munitions and Explosives of Concern (MEC): This term, which distinguishes specific categories of military munitions that may pose unique explosive safety risks, means:

(1) Unexploded ordnance (UXO), as defined in 10 U.S.C. 2710(e)(9) and 40 CFR 266.201;
(2) Discarded military munitions (DMM), as defined in 10 U.S.C. 2710(e)(2);
(3) Munitions constituents (MC) present in high enough concentrations to pose an explosive hazard.

Munitions constituents (MC): Means any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions. (10 U.S.C. 2710(e)(4))

Munitions response: Means response actions, including investigation, removal actions, and remedial actions, to address the explosives safety, human health, or environmental risks presented by unexploded ordnance (UXO), discarded military munitions (DMM), or munitions constituents (MC). (32 CFR Part 179.3, Munitions Response Site Prioritization Protocol Final Rule)

Munitions response area (MRA): Means any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples are former ranges or munitions burial areas. An MRA is comprised of one or more munitions response sites. (32 CFR Part 179.3, Munitions Response Site Prioritization Protocol Final Rule)

Munitions response site (MRS): Means a discrete location within an MRA that is known to require a munitions response. (32 CFR Part 179.3, Munitions Response Site Prioritization Protocol Final Rule)

Operational Range: A range that is under the jurisdiction, custody, or control of the Secretary of Defense and

(1) that is used for range activities; or

(2) although not currently being used for range activities, it is still considered by the Secretary of the DoD to be a range and has not been put to a new use that is incompatible with range activities. (10 U.S.C. 101(e)(3))

Unexploded Ordnance (UXO): These Guidelines will use the term "UXO" as defined in the Military Munitions Rule. "UXO means military munitions that have been primed, fuzed, armed, or otherwise prepared for action, and have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, personnel, or material and remain unexploded either by malfunction, design, or any other cause." This definition also covers all ordnance-related items (e.g., low-order fragments) existing on a non-operational range. (40 CFR Part 266.201, 62 FR 6654, February 12, 1997).