Unexploded Ordnance (UXO)

The Department of Defense (DoD) defines military munitions/explosive ordnance as any munition, weapon delivery system, or ordnance item that contains explosives, propellants, or chemical agents. UXO is military munitions/explosive ordnance that has been primed, fused, armed, or otherwise prepared for action, and that has been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material, and remains unexploded either by malfunction, design, or for any other cause.

**UXO vs HTRW**

With respect to its threat to human health and the environment, UXO differs from other hazards in several ways that can be inferred from the quick comparison chart below. Hazardous, toxic, and radiological wastes (HTRW) generally present a threat to human health and the environment through repeated and accumulated exposures to certain contaminants above acceptable exposure limits. UXO presents an immediate risk of acute physical injury from fire or explosion resulting from accidental or unintentional detonation.

<table>
<thead>
<tr>
<th>General Characteristics</th>
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<tr>
<td><strong>UXO</strong></td>
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<tr>
<td>Not very mobile</td>
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<tr>
<td>Not chemical specific</td>
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<tr>
<td>Not concentration dependent</td>
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<tr>
<td>Single exposure</td>
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<tr>
<td>Narrow target population</td>
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<td>Immediate acute physical injury</td>
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**UXO Risk Assessments**

Risk models use site-specific data on the distribution and density of UXO to estimate the threat to human health and the environment according to current and reasonably anticipated future land use. The models are used to determine risk on the basis of the characteristics of the UXO present (amount, depth, size, and type), the characteristics of the site (topography, vegetation, soil type, and climate), and the range of potential exposure (current and future land use, and population size and proximity to site).

**UXO Safety and Reporting**

It is important to understand how to react responsibly in the presence of UXO.

If you encounter UXO:
- STOP! Do not move closer.
- DO NOT touch, move, or disturb UXO.
- Do not transmit radio frequencies (walkie-talkies, citizens band radio, cellular telephones, etc.).
- Do not attempt to remove anything near UXO.
- Clearly mark the UXO area.
- Complete Reporting Memorandum listing:
  - Time of encounter (date, time)
  - Location (coordinates, street/grid names)
  - Individuals present (names, organizations)
  - Ordnance condition (buried, partially buried, exposed)
  - Type of ordnance (rocket, grenade, projectile)
  - Estimated size of ordnance (length, width, height)
  - Distinctive features of ordnance (shape, color, markings)
  - Nearby structures (landmarks, names, types, distance from ordnance).
- Forward the completed memorandum to the nearest EOD personnel (if available) or public safety office.

In case of emergency, call (404) 362-3333 (52nd Ordnance Group)

**UXO Response Process**

DoD Components conduct UXO response actions to address explosives safety hazards posed to public health, welfare, or the environment. Depending on the amount of time available for responding to the threat, response actions may take place within a few hours or may last several years. Where UXO presents an imminent, immediate threat to human health or the environment, the DoD Component may initiate an Emergency Response to address the immediate, unacceptable hazards (e.g., possibility of acute
physical injury, death, destruction of property). Under circumstances that only allow a response within a few months, the Component may initiate a *Time-Critical Removal Action (TCRA)*, which may involve surface clearance, fencing or other measures to deny access, restrictive signs to warn of the hazards, or a combination of the foregoing. However, Components typically conduct UXO response activities as *Non-Time-Critical Removal Actions (NTCRA)*, following a longer process that involves the public and regulatory communities early and continually throughout the process, as depicted in Figure 1. Even during the NTCRA process, circumstances may give rise to the need to conduct a more expedited response, such as an Emergency Response or a TCRA. The standard phases of the NTCRA are explained below:

*Removal Preliminary Assessment (PA)* This phase involves recognizing the existence of the site in question, determining whether a UXO hazard is present, and identifying whether further action is needed.

*Removal Site Investigation (SI)* During this phase, an Archives Search Report (ASR) is begun. Information from the ASR is combined with results from a preliminary risk assessment to verify the extent of the suspected UXO hazard. Components of the ASR include a historical records search, interviews with knowledgeable personnel, and interpretation of aerial photos and old maps to gain a better understanding of the types and amounts of UXO hazards potentially present.

*Engineering Evaluation/Cost Analysis (EE/CA)* A geophysical survey is performed in suspected UXO areas. A geostatistically based sampling program can be used to develop a sampling strategy to characterize areas suspected of containing UXO.

In this phase, a range of site-specific response actions, consistent with future land use, are evaluated according to criteria in the National Contingency Plan. This evaluation compares and contrasts the alternatives with respect to their overall protectiveness, implementability, and cost. The evaluation results provide the basis for selection of the action to be taken. The EE/CA is made available for public comment to solicit input on the potential response and reasonably anticipated future land uses. After the installation has responded to the public comments, the response action is finalized in an Action Memorandum (AM).

*Removal Design (RD)* During the design phase, an RD plan is prepared that will achieve the UXO response objectives outlined in the Action Memorandum. The plan defines the contract specifications, response plans, safety and personnel qualifications, and anticipated depth of clearance. During this phase, an explosives safety submission must be prepared for the DoD Explosives Safety Board (DDES) to review and approve prior to start of the Removal Action.

*Removal Action (RA)* During this phase, the selected solution is implemented according to the specifications defined in the RD plan. The removal action may consist of detonating UXO in place or at off-site demolition grounds, provided that DDES approves the explosive safety submission.

*Post-Removal Action (Post-RA)* This phase may be required in the Action Memorandum and can include public education, periodic UXO sweeps, long-term monitoring, land use restrictions, and additional UXO actions if land use changes.

**Public Involvement**

Public involvement is a key component in the entire removal process. Each UXO project phase has a specific requirement to keep the public informed and to seek public support. Communication with the public and regulators is critical to successful and timely project completion. This can be accomplished through the use of Restoration Advisory Boards, which consist of volunteer public and government stakeholders for a specific site.
### UXO Clearance Standards

Figure 2 shows a hypothetical area with UXO. If a response involves clearance, the preferred method of determining clearance depth is to use site-specific information, including site conditions and planned land use. This figure illustrates the generic clearance depths recommended by DDESB, when site-specific planning is not possible, to support different future land uses. The figure also shows the current assessment technologies available for identifying and characterizing the presence of UXO at the stated depths.

### Recent Developments

The following DoD and Federal regulations also influence the UXO response process.

- **DoD 6055.9-STD DoD Ammunition and Explosives Safety Standards**, effective August 1997, establishes uniform safety standards applicable to ammunition and explosives and to both associated and unassociated personnel and property. This standard supersedes DoD 6055.9-STD Ammunition and Explosives Safety Standards, October 1992. This information is available on the DDESB web page.

- EPA’s Military Munitions Rule, finalized August 12, 1997, identifies the point at which conventional and chemical military munitions become a solid waste under the Resource Conservation and Recovery Act (RCRA) and provides for the safe storage and transportation of such waste.

- The DoD Range Rule, proposed September 26, 1997, includes Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-like methodology and focuses on the specific needs of range evaluation and response. The Range Rule is being developed by DoD, in consultation with EPA, other Federal agencies, states, and Native American tribes to identify appropriate response actions on military ranges that (1) have been taken out of service and put to a new use, (2) are formerly used defense sites, and/or (3) are slated for transfer out of military control. The Range Rule public comment period ended in December 1997. *When it is finalized, the Range Rule is expected to become the assessment and response standard for these ranges.* A new, comprehensive UXO risk model is being developed in conjunction with the Range Rule. Box 2 outlines the five phases of the proposed Range Rule.

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**Figure 2. Determining Clearance Depths Based on Future Land Use**

<table>
<thead>
<tr>
<th>Assessment Technology</th>
<th>Clearance Depth</th>
<th>Note</th>
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<tbody>
<tr>
<td>Less than 1 foot</td>
<td>• gradiometers • magnetometers • electromagnetic induction • ground-penetrating radar • multiple sensors • infrared sensors • synthetic aperture radar • sampling</td>
<td></td>
</tr>
<tr>
<td>up to 4 feet</td>
<td>• gradiometers • magnetometers • multiple sensors • ground-penetrating radar • sampling</td>
<td></td>
</tr>
<tr>
<td>up to 10 feet</td>
<td>• multiple sensors • ground-penetrating radar • sampling</td>
<td></td>
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</tbody>
</table>

Note: Size of ordnance items is exaggerated for clarity.

1. If construction will occur, UXO must be cleared to 4 feet below planned excavation depths.
2. Does not include emerging active or passive assessment technologies.
Proposed Range Rule Process

<table>
<thead>
<tr>
<th>Assessment Stages</th>
<th>Definition</th>
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<tr>
<td><strong>Range Identification</strong></td>
<td>This phase focuses on identifying all closed, transferred, and transferring ranges.</td>
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<tr>
<td>**Range Assessment &amp;</td>
<td>During this phase, DoD assesses the explosives safety, human health, and environmental risks the range might pose. An accelerated</td>
</tr>
<tr>
<td>Accelerated Response</td>
<td>response is any readily available, proven method of addressing the identified risks, particularly explosives risks posed by</td>
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<td>military munitions or other materials on military ranges.</td>
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<tr>
<td>**Range Evaluation &amp;</td>
<td>This phase includes detailed investigations into the types of munitions used on the range, materials associated with these munitions,</td>
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<tr>
<td>Site-specific Response</td>
<td>and the environmental setting. The site-specific response evaluation examines various alternatives for addressing risks that have not</td>
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<td>been reduced or eliminated by responses taken earlier in this process.</td>
</tr>
<tr>
<td><strong>Recurring Review</strong></td>
<td>The purpose of recurring reviews is to ensure that range response actions continue to ensure explosives safety and protection of human</td>
</tr>
<tr>
<td></td>
<td>health and the environment.</td>
</tr>
<tr>
<td><strong>Administrative Closeout</strong></td>
<td>Following a review to ensure that the range is unlikely to pose further risk and that the response objectives were achieved, DoD ends</td>
</tr>
<tr>
<td></td>
<td>the response action.</td>
</tr>
</tbody>
</table>

Where to Learn More

Federal Regulations and Guidance


Other Information


Points of Contact

- Navy Ordnance Environmental Support Office: (301) 744-4450/4534
- U.S. Army Engineering and Support Center Huntsville: (205) 895-1545

This and other documents on the BRAC Environmental Program are available at: http://www.dtic.mil/enviro/brac/brac/off/

We welcome and invite your comments on this fact sheet, as we seek ways to improve the information provided. Please send comments to the following address:

OADUSD (Environmental Cleanup)
Attn: Fast-Track Cleanup
3400 Defense Pentagon
Washington, DC 20301-3400