



# Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills (Interim Guidance)

Federal Facilities Restoration and Reuse Office

Quick Reference Fact Sheet

Presumptive remedies are preferred technologies for common categories of sites based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. By streamlining site investigation and accelerating the remedy selection process, presumptive remedies are expected to ensure the consistent selection of remedial actions and reduce cost and time required to clean up similar sites. Presumptive remedies are expected to be used at all appropriate sites. Site-specific circumstances dictate whether a presumptive remedy is appropriate at a given site.

EPA established source containment as the presumptive remedy for CERCLA municipal landfill sites in September of 1993 (see Highlight 1 for components of the presumptive remedy). The municipal landfill presumptive remedy should also be applied to all appropriate military landfills. This directive highlights a step-by-step approach to determining when a specific military landfill is an appropriate site for application of the containment presumptive remedy. It identifies the characteristics of municipal landfills that are relevant to the applicability of the presumptive remedy, addresses characteristics specific to military landfills, outlines an approach to determining whether the presumptive remedy applies to a given military landfill, and discusses Administrative Record documentation requirements.

## PURPOSE

This directive provides guidance on applying the containment presumptive remedy to military landfills. Specifically, this guidance:

- describes the relevant characteristics of municipal landfills for applicability of the presumptive remedy;
- presents the characteristics specific to military installations that affect application of the containment presumptive remedy; and
- provides a decision framework to determine applicability of the containment presumptive remedy to military landfills.

## BACKGROUND

Municipal landfills are those facilities in which a combination of household, commercial and, to a lesser extent, industrial wastes have been co-disposed. The presumptive remedy for municipal landfills, source containment, is described in detail in the directive entitled Presumptive Remedy for CERCLA Municipal Landfill Sites. Highlight 1 outlines the components of the containment presumptive remedy. Highlight 2

lists the characteristics of municipal landfills that are compatible with the presumptive remedy of containment.

The presumptive remedy process involves streamlining of the remedial investigation/feasibility study (RI/FS) by:

- relying on existing data to the extent possible rather than characterizing landfill contents (limited or no landfill source investigation);
- conducting a streamlined risk assessment; and
- developing a focused feasibility study that analyzes only the presumptive remedy and the no action alternatives.

The Presumptive Remedy for CERCLA Municipal Landfill Sites, Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites, and Streamlining the RI/FS for CERCLA Municipal Landfill Sites Directives provide a complete discussion of these streamlining principles.

EPA anticipates that the containment presumptive remedy will be applicable to a significant number of landfills found at military facilities. Although waste types may differ between municipal and military landfills, these differences do not preclude use of

source containment as the primary remedy at appropriate military landfills. An examination of 31 Records of Decisions (RODs) that document the remedial decisions for 51 landfills at military installations revealed that no action was chosen for 10 landfills and remedial actions were chosen at 41 landfills (See Appendix A). Of these 41 landfills, containment was selected at 23 (56%) of the landfills. For the remaining 18 landfills where other remedies were selected, institutional controls only were selected at 3, excavation and on-site consolidation was selected at 4 landfills, and excavation and off-site disposal was selected for the remaining 11 landfills.

<b>Highlight 1</b>
<b>Components of the Containment Presumptive Remedy</b>
<ul style="list-style-type: none"> <li>• Landfill cap</li> <li>• Source area groundwater control to contain plume</li> <li>• Leachate collection and treatment</li> <li>• Landfill gas collection and treatment</li> <li>• Institutional controls to supplement engineering controls</li> </ul>

### **CHARACTERISTICS OF MILITARY LANDFILLS**

The size of the landfill and the presence, proportion, distribution and nature of wastes are fundamental to the application of the containment presumptive remedy to military landfills.

The military landfills examined range in size from 300 square feet to 150 acres with a wide variety of waste types. Of the 41 landfills, 14 (34%) are one acre or less in size, and containment was not selected for any of these landfills. Twenty-seven (66%) of the landfills are more than one acre in size and containment was chosen at 23 (85%) of these landfills. This indicates that the size of the landfill area is an important factor in determining the use of source containment at military landfills.

The wastes most frequently deposited at these military landfills were municipal-type wastes: household wastes, commercial (e.g., hospital wastes, grease, construction debris), and industrial (e.g., process wastes, solvents, paints). Containment was the remedy selected at the majority of these sites. Military-specific wastes (e.g., munitions) were found at only 5 of the 51 landfills.

Highlight 3 lists typical municipal and military wastes. Column A lists wastes that are common to both

<b>Highlight 2</b>
<b>Appropriate Municipal Landfill Characteristics for Applicability of the Presumptive Remedy</b>
<ul style="list-style-type: none"> <li>• Risks are low-level, except for hot spots</li> <li>• Treatment of wastes is usually impractical due to the volume and heterogeneity of waste</li> <li>• Waste types include household, commercial, nonhazardous sludge, industrial solid wastes</li> <li>• Lesser quantities of hazardous waste are present as compared to municipal wastes</li> <li>• Land application units, surface impoundments, injection wells, or waste piles are not included</li> </ul>

municipal landfills and military landfills. Column B lists wastes that are usually specific to military bases, but may not pose higher risks than other industrial wastes commonly found in municipal landfills (Low-Hazard Military-Specific Wastes), depending on the volume and heterogeneity of the wastes. Column C lists high-hazard military wastes that, because of their unique characteristics, would require special consideration (High-Hazard Military-Specific Wastes)

Military-specific wastes (both low- and high-hazard) need to be addressed in site-specific analyses when determining the applicability of the containment presumptive remedy to military landfills. High-hazard military-specific waste materials (e.g., military munitions) require special consideration when applying the presumptive remedy. While the analysis ([Feasibility Study Analysis for CERCLA Municipal Landfill Sites](#)) that justified the selection of source containment as the presumptive remedy for municipal landfill sites did not specifically take into account high-hazard military wastes, the high-hazard materials present in some military landfills may be compared to the hazardous wastes at municipal landfills and could potentially be treated as “hot spots,” as discussed in the [Presumptive Remedy for CERCLA Municipal Landfill Sites Directive](#) (see pages 5-6 of this guidance for a discussion of hot spots).

The proportion and distribution of hazardous wastes in a landfill are important considerations. Generally, municipal landfills produce low-level threats with occasional hot spots. Similarly, most military landfills present only low-level threats with pockets of some high-hazard waste. However, some military facilities (e.g., weapons fabrication or testing, shipbuilding, major aircraft or equipment repair depots) have a high level of industrial activity in comparison to overall site activities. In these cases, there may be a higher

### Highlight 3: Examples of MLF and Military Wastes

*Column A: Municipal landfills contain predominantly non-hazardous materials. However, industrial solid waste and even some household refuse (e.g., pesticides, paints, and solvents) can possess hazardous components. Furthermore, hazardous wastes are found in most municipal landfills due to past disposal practices.*

*Column B: These types of wastes are specific to military bases, but generally are no more hazardous than some wastes found in municipal landfills.*

*Column C: These wastes are extremely hazardous and may possess unique safety, risk and toxicity characteristics. Special consideration and expertise are required to address these wastes.*

A Municipal-Type Wastes	Military-Specific Wastes	
	B Low-Hazard Military-Specific Wastes	C High-Hazard Military-Specific Wastes
<p><b><u>Predominant Constituents</u></b> Household refuse, garbage, and debris Commercial refuse, garbage, and debris Construction debris Yard wastes</p> <p><b><u>Found In Low Proportion</u></b> Asbestos Batteries Hospital wastes Industrial solid waste Paints and paint thinner Pesticides Transformer oils Other solvents</p>	<p>Low-level radioactive wastes Decontamination kits Munitions hardware</p>	<p><b><u>Military Munitions</u></b> Chemical warfare agents (e.g., mustard, tear agents) Chemical warfare agent training kits Artillery, Small arms, Warheads Other military chemicals (e.g., demolition charges, pyrotechnics, propellants) Smoke grenades</p>
	<p>Note: The majority of military landfills contain primarily non-hazardous wastes. The materials listed in these columns are rarely predominant constituents of military landfills.</p>	

proportion and wider distribution of industrial (i.e., potentially hazardous) wastes present than at other less industrialized facilities.

### PRACTICAL CONSIDERATIONS

Site-specific conditions may limit the use of the containment presumptive remedy at military landfills. For example, the presence of high water tables, wetlands and other sensitive environments, and the possible destruction or alteration of existing habitat as a result of a particular remedial action could all be important factors in the selection of the remedy.

Reasonably anticipated future land use is also an important consideration at all sites. However, at military bases undergoing base closure procedures, where expeditiously converting property to civilian use is one of the primary goals, land use may receive heightened attention. Thus, at closing bases, it is particularly important for reuse planning to proceed concurrently with environmental investigation and restoration activities. The local reuse group is responsible for developing the preferred reuse alternatives. The base cleanup team should work

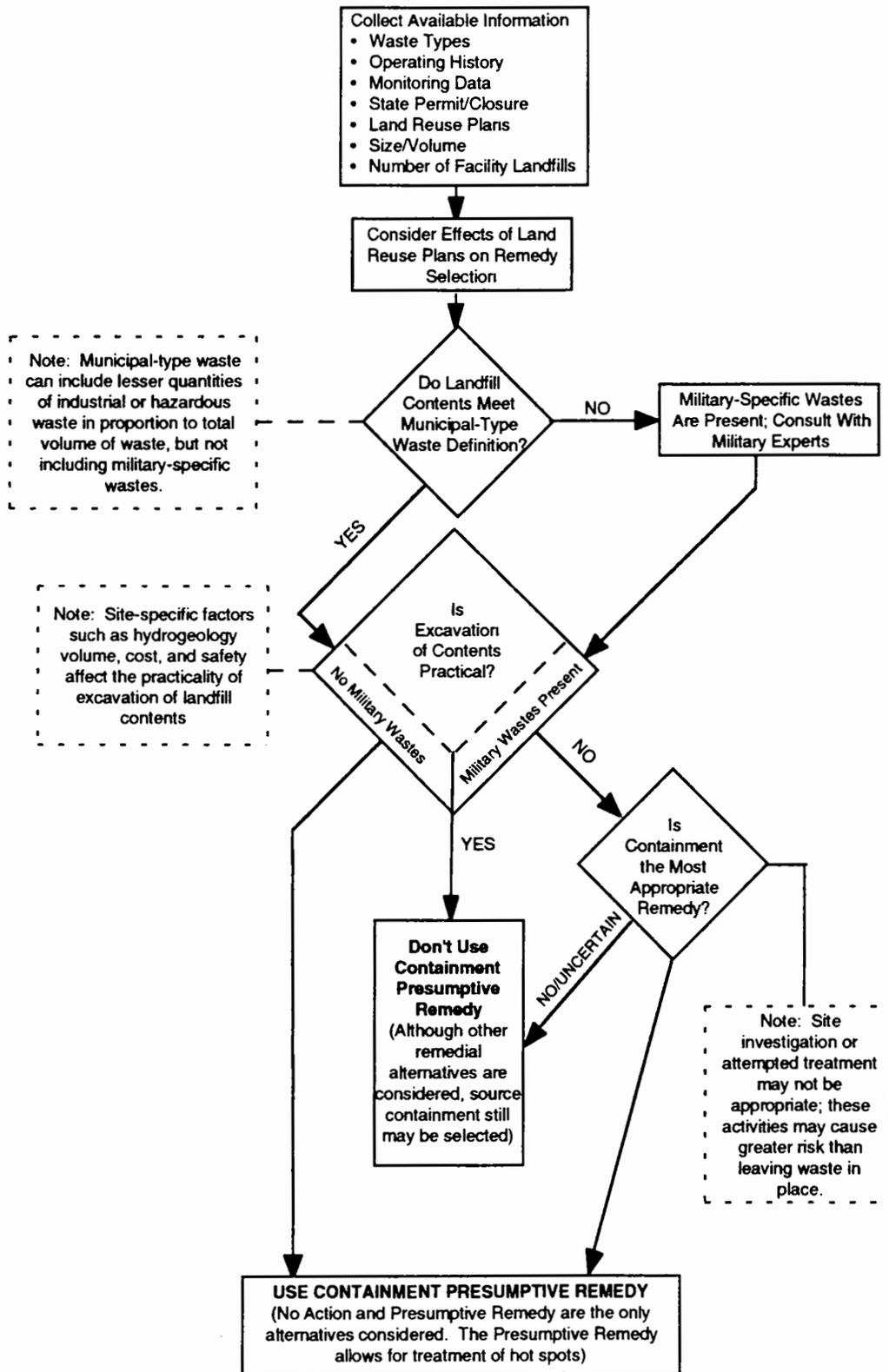
closely with the reuse group to integrate reuse planning into the cleanup process, where practicable (see the Land Use in CERCLA Remedy Selection Directive).

### DECISION FRAMEWORK TO EVALUATE APPLICABILITY OF THE PRESUMPTIVE REMEDY TO MILITARY LANDFILLS

This Section and Highlight 4 describe the steps involved in determining whether the containment presumptive remedy applies to a specific military landfill.

*1. Collect Available Information.* Determine the sources, types and volume of landfill wastes using historical records and available sampling data. This information should be sufficient to determine whether source containment is the appropriate remedy for the landfill. If adequate data does not exist, the collection of additional sampling or monitoring data may be necessary. The installation point of contact (environmental coordinator, base civil engineer, or public works office) should be contacted to obtain records or disposal procedures. Current and former employees are also good sources of information.

### Highlight 4: Decision Framework



2. *Consider the Effects of Land Reuse Plans on Remedy Selection.* For smaller landfills (generally less than 2 acres), land reuse plans may influence the decision on practicality of excavation and consolidation or treatment of landfill contents. Excavation is a remedial alternative that is fundamentally incompatible with the presumptive remedy of source containment.

3. *Do Landfill Contents Meet Municipal Landfill-Type Waste Definition?* To determine whether a specific military landfill is appropriate for application of the containment presumptive remedy, compare the characteristics of the wastes to the information in Highlights 2 and 3.

4. *Are Military-Specific Wastes Present?* Military wastes, especially high-hazard military wastes, may possess unique safety, risk, and toxicity characteristics. If historical records or sampling data indicate that these wastes may have been disposed at the site, special consideration should be given to their handling and remediation. Caution is warranted because site investigation or attempted treatment of these contaminants may pose safety issues for site workers and the community. Highlight 3 (Columns B and C) presents examples of these types of materials. Some high-hazard military-specific wastes could be considered to present low-level risk depending on the location, volume, and concentration of these materials relative to environmental receptors. Consult specialists in military wastes when determining whether military-specific wastes at a site fall into Column B or Column C (See Highlight 5). Responsibilities for response are clearly spelled out in the joint regulation entitled: Interservice Responsibilities For Explosive Ordnance Disposal.

5. *Is Excavation Practical?* The volume of landfill contents, types of wastes, hydrogeology, and safety considerations are important criteria when assessing the practicality of excavation and consolidation or treatment of wastes. Consideration of excavation must balance the long-term benefits of lower operation and maintenance costs and unrestricted land use versus the initial high capital construction costs and potential risks associated with excavation. Although no set excavation volume limit exists, landfills with a content of more than 100,000 cubic yards (approximately 2 acres, 30 feet deep) would normally not be considered for excavation. If military wastes are present, especially high-hazard military wastes such as ordnance, safety considerations may be very important in determining the practicality of excavation.

If excavation of the landfill contents is going to be considered as an alternative, the presumptive remedy should not be used. Therefore, a standard feasibility study would be required to adequately analyze and select the appropriate remedial actions.

## Highlight 5

### Specialists In Military Wastes

The installation point of contact will notify the major military command's specialists in military wastes (Explosive Ordnance Disposal Team) for assistance with regard to safety and disposal issues related to any type of military items.

Army Chemical warfare agents specialists:

- The Army Ordnance Environmental Support Office (OESO) and the Program Manager for Chemical Demilitarization, U.S. Army Chemical Material Destruction Agency, Aberdeen Proving Ground, Maryland 21010-5401, (410) 671-1435/3325.

Navy ordnance related items specialists:

- The Navy OESO, Naval Surface Warfare Center, Indian Head, Maryland 20460-5035, (301) 743-4534/4906/4450.

Navy Low-Level Radioactive wastes specialists:

- The Naval Sea Systems Command Detachment, Radiological Affairs Support Office, Yorktown, Virginia 23691-5908, (804)887-4692.

Air Force Ordnance specialists:

- The Air Force Civil Engineering Support Agency, Contingency Support Division Tyndall AFB, 32403-5319, (904) 283-6410.

6. *Is Containment the Most Appropriate Remedy?* In most cases, if excavation is not practical, then containment will be the appropriate remedial response. The site manager will make the initial decision of whether a particular military landfill site is suitable for the presumptive remedy or whether a more comprehensive RI/FS is required. This determination should be made before the RI/FS is initiated. Generally, this decision will depend on whether the site is a potential candidate for excavation, and if not, whether the nature of contamination is such that a streamlined risk evaluation can be conducted<sup>1</sup>. A site generally is eligible for a streamlined risk evaluation if groundwater contaminant concentrations clearly exceed chemical-specific standards or other conditions exist that provide a justification for action (e.g., direct contact with landfill contents due to unstable slopes).

<sup>1</sup>See the directive: Role of the Baseline Risk Assessment In Superfund Remedy Selection Decisions.

The presumptive remedy also allows for the treatment of hot spots containing military-specific wastes. Four questions must be answered to warrant characterization and treatment of any area as a hot spot. They are:

1. Does evidence exist to indicate the presence and approximate location of waste?
2. Is the hot spot known to be principal threat waste?<sup>2</sup>
3. Is the waste in a discrete, accessible part of the landfill?
4. Is the hot spot known to be large enough that its remediation will reduce the threat posed by the overall site but small enough that it is reasonable to consider removal (e.g., 100,000 cubic yards or less)?

An affirmative answer to all of the above would indicate that it is likely that the integrity of the containment system would be threatened, or that excavation and treatment of hot spots would be practicable, and that a significant reduction in risk at the site would occur as a result of treating hot spots. For further information and case studies on treatment of hot spots, please refer to the Presumptive Remedy for CERCLA Municipal Landfill Sites Directive.

## CASE HISTORIES

The following case histories present examples of where the containment presumptive remedy was or was not applied, based on site-specific conditions. In some cases, even through a containment remedy was selected, the streamlining principles of the presumptive remedy process were not followed. In other cases, land reuse considerations precluded use of a containment remedy. The purpose of this guidance is to encourage use of the streamlining principles outlined in the presumptive remedy process to save cost and time.

### Disposal of MLF-Type Wastes

At the **Michaelsville Landfill Site**, in Aberdeen, Maryland, the majority of wastes in the 20-acre landfill were domestic wastes and trash from non-industrial operations. The remaining portion of the wastes included sludges from the waste water treatment plant, asbestos shingles and pesticides. The selected containment remedy included a multi-layered cap, surface water controls, and a gas venting system. Off-site incineration and excavation were also considered. This is a case where the streamlining principles of the presumptive remedy process could have been utilized,

at a savings in study costs and time, because the wastes were municipal-type wastes that could be easily contained without further consideration of treatment alternatives.

The **Naval Reactor Facility (NRF)** site in Idaho Falls, Idaho was established in 1949 as a testing site for the nuclear propulsion program. The three landfill units at the site received solid wastes similar to municipal landfills. These wastes included petroleum and paint products, construction debris, and cafeteria wastes. Historical records do not indicate that any radioactive wastes were disposed of in these landfill units. The selected remedy for the landfills at the site included the installation of a native soil cover designed to incorporate erosion control measures to reduce the effects from rain and wind. The remedy also provided for maintenance of the landfill covers, including subsidence correction and erosion control. Monitoring of the landfills will include sampling of soil gas to assess the effectiveness of the cover and sampling of the groundwater to ensure that the remedy remains protective. Institutional controls will also be implemented to prevent direct exposure to the landfill. The NRF site is an example of where the streamlining principles of the presumptive remedy process, including a streamlined risk assessment and a focused feasibility study were successfully employed.

### Co-Disposal of High-Hazard Wastes

At the **Massachusetts Military Reservation**, in Cape Cod, Massachusetts, anecdotal information indicated that munitions had been disposed of at an unidentified location in a landfill that primarily contained municipal-type waste. Ground penetrating radar was utilized to determine if there were any discrete disposal areas containing potential hot spots at this site and found none. Because the munitions waste was not in a known discrete and accessible area, it could not be treated as a hot spot. Consequently, without excavating or treating the munitions waste as a hot spot, the authorities decided to cap the landfill. In this case, the streamlining principles of the presumptive remedy process were applied. For example, site investigation was limited and treatment options were not considered.

### Land Reuse Considerations

At **Fort Devens** in Ayer, Massachusetts, a closing base, a well serving as a primary source of potable groundwater for the base was located several hundred feet upgradient from the base landfill. Anticipating additional groundwater use under its reuse plan, the redevelopment

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<sup>2</sup>Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.

authority decided that the well's pumping rate would need to increase to accommodate demands after land reuse. Selection of source containment, the presumptive remedy, to remediate this landfill would have required applying institutional controls and restricting increased groundwater use, because raising pumping rates would have unacceptably increased the risk of contaminants migrating into the well. Under these circumstances, authorities proposed to enable increased pumping of the well by consolidating the landfill with other landfills in the area. All hazardous wastes in the landfill, including low-hazard wastes that would otherwise have been contained, will be treated or disposed on or off the site. Due to future land use considerations, the streamlined presumptive remedy process was not used at this site. Instead, a standard feasibility study was conducted to analyze both excavation and containment as remedial alternatives.

**The Brunswick Naval Air Station**, in Brunswick Maine, contained several landfill sites. One of the first RODs signed, for Sites 1 and 3, called for construction of a 12-acre RCRA Subtitle C cap and a slurry wall, as well as for groundwater extraction and treatment. Subsequently, during the remedy selection process for Site 8, the public objected to containment as the proposed remedy for this relatively small (0.6 acre) site on the grounds that should the base eventually close, containment would create several useless parcels of land. After public comment, the Navy reconsidered, proposing instead to excavate Site 8 and consolidate the removed materials — which consisted of construction debris and soil contaminated with nonhazardous polycyclic aromatic hydrocarbons as part of the necessary subgrade fill for the landfill cap to be constructed at Sites 1 and 3. In this case, land reuse considerations preempted the use of the presumptive remedy.

## **PRESUMPTIVE REMEDY ADMINISTRATIVE RECORD DOCUMENTATION REQUIREMENTS**

The Administrative Record must contain the following generic and site-specific information documenting the selection or non-selection of the containment presumptive remedy. The administrative record requirements for all Superfund sites including military landfills are explained in the Final Guidance on Administrative Records for Selecting CERCLA Response Actions. If the military landfill in question contains the Military-Specific Wastes as described under Columns B and C in Highlight 3, then the site-specific administrative record should address whether anything about these wastes would make the engineering controls specified in the presumptive remedy for municipal landfills less suitable as a remedy.

### Generic Information

A. *Generic Documents*. These documents should be placed in the docket for each federal facility site where the containment presumptive remedy is selected. Each EPA Regional Office has copies of the following presumptive remedy documents:

- Presumptive Remedy: Policy and Procedures, OSWER Directive 9355.0-47FS
- Presumptive Remedy for CERCLA Municipal Landfill Sites OSWER Directive 9355.0-049FS
- Application of the Municipal Landfill Presumptive Remedy to Military Landfills, OSWER Directive 9355.0-62FS
- Feasibility Study Analysis for CERCLA Municipal Landfill Sites

B. *Notice Regarding Backup File*. The docket should include a notice specifying the location of and times when public access is available to the generic file of backup materials used in developing the Feasibility Study Analysis for CERCLA Municipal Landfill Sites. This file contains background material such as technical references and old feasibility studies. Each EPA Regional Office has a copy of this file.

### Site-specific Information

A. *Site-Specific Documents*. These should include:

- Focused FS or EE/CA. A focused feasibility study (or, for non-time-critical removal actions, a focused engineering evaluation/cost analysis) which analyzes only the presumptive remedy and the no action alternative. The focused feasibility study does not account for the full range of alternatives that are addressed in a standard feasibility study. This study should present the data and explain the rationale for the selection of the containment presumptive remedy for the military landfill under investigation. This explanation should specify the site-specific conditions (e.g., waste types, volumes, and risk data) that support the use of the presumptive remedy. It should also state that guidance in this document (Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills) was used in selecting the containment presumptive remedy. In addition, the focused FS or EE/CA should include a site-specific explanation of how the application of the presumptive remedy satisfies the NCP's three site-specific remedy selection criteria (state ARAR compliance, state acceptance and community acceptance).

B. *Site-specific comments.* If these have been received, the record should include:

- copies of the comments received; and
- copies of generic responses to the comments, including:
  - a brief discussion relating each relevant generic response to circumstances at the specific site; and
  - an explanation for this site of the rejection of any technology suggested in a site-specific comment but not analyzed in an existing generic EPA response.

## CONCLUSION

This directive recommends the use of the containment presumptive remedy at appropriate military landfills. The remedies selected at numerous military installations indicate that source containment is applicable to a significant number of military landfills. These landfills need not be identical to municipal landfills in all regards. Key factors in the determination include the size of the landfill, volume and the type of landfill contents, future land use of the area, and the presence, proportion, and distribution of high-hazard military wastes.

## REFERENCES

California Base Closure Environmental Committee, Integrating Land Use and Cleanup Planning at Closing Bases, December 1994.

RCRA, 40 CFR Part 258, Definitions.

U.S. Department of Navy Interservice Responsibilities for Explosive Ordnance Disposal OPNAVINST8027.1G (also known as MCO 8027.1D, AR 75-14; or AFI 32-3002); February 14, 1992.

U.S. Environmental Protection Agency, OSWER Directive 93557-04, Land Use in CERCLA Remedy Selection, May 1995.

U.S. Environmental Protection Agency, OSWER Directive 9355.0-49FS, Presumptive Remedy for CERCLA Municipal Landfill Sites, October 1993.

U.S. Environmental Protection Agency, OSWER Directive 9355.3-06FS, A Guide to Principal Threat and Low Level Threat Wastes, November 1991.

U.S. Environmental Protection Agency, OSWER Directive 9355.0-30, Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, April 22, 1991.

U.S. Environmental Protection Agency, OERR, EPA/540/P-91/001, Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites, February 1991.

U.S. Environmental Protection Agency, OSWER Directive 9833.3A.1, Final Guidance on Administrative Records for Selecting CERCLA Response Actions, December 3, 1990.

U.S. Environmental Protection Agency, OSWER Directive 9355.3-11FS, Streamlining the RI/FS for CERCLA Municipal Landfill Sites, September 1990.

### Notice:

The policies set out in this document are intended solely as guidance to the U.S. Environmental Protection Agency (EPA) personnel: they are not final EPA actions and do not constitute rulemaking. These policies are not intended, nor can they be relied upon, to create any rights enforceable by any party in litigation with the United States. EPA officials may decide to follow the guidance provided in this document, or to act at variance with the guidance, based on an analysis of specific site circumstances. EPA also reserves the right to change this guidance at any time without public notice.

**APPENDIX A:  
DATA SUMMARY TABLE FOR MILITARY LANDFILLS**

<b>ROD / Site Name, State, Region, ROD Sign Date</b>	<b>Disposal Area, Size, Volume of Waste</b>	<b>Type of Waste Deposited</b>	<b>Contaminants of Concern</b>	<b>Remedy</b>
Brunswick NAS, Sites 1 and 3 (OU1), ME, Region 1  6/16/92	Site 1, 8.5 acres, volume unknown; Site 3, 1.5 acres, volume unknown. Sites are in close proximity and not easily distinguishable	Household refuse, waste oil, solvents, pesticides, paints, isopropyl alcohol	SVOCs, inorganics, metals, VOCs, PAHs, PCBs, pesticides	<b>Remedy:</b> Capping (RCRA Subtitle D cap) of 12 acres with a slurry wall and pump and treat ground water within cap and slurry wall.
Brunswick NAS, Site 8 (OU4), ME, Region 1  8/31/93	Site 8, 0.6 acres	Rubble, debris, trash, and possibly solvents	PAHs, metals, pesticides, PCBs, and VOCs	<b>Remedy:</b> Excavation, containerization, and transport to landfill Sites 1 and 3 for use as fill under cap.
Brunswick NAS, Sites 5 and 6 (OU3), ME, Region 1  8/31/93	Site 5, 0.25 acres	Asbestos-covered pipes	Asbestos	<b>Remedy:</b> Excavation, containerization, and transport to landfill Sites 1 and 3 for use as fill under cap.
Brunswick NAS, Sites 5 and 6 (OU3), ME, Region 1  8/31/93	Site 6, 1.0 acre	Construction debris and aircraft parts, asbestos pipes	Asbestos	<b>Remedy:</b> Excavation, containerization, and transport to Sites 1 and 3 landfill for use as fill under cap.
Loring AFB Landfills 2 and 3 (OU2), ME, Region 1  9/30/94	Landfill 2, 9 acres	Domestic waste, construction debris, flightline wastes, sewage sludge and oil-filled switches	PCBs, VOCs, SVOCs, pesticides	<b>Remedy:</b> Capping (RCRA Subtitle C, multi-layer cap), gas assessment and controls, and institutional controls.
Loring AFB Landfills 2 and 3 (OU2), ME, Region 1  9/30/94	Landfill 3, 17 acres	Waste oil/fuels, solvents, paints, thinners, and hydraulic fluids	VOCs, SVOCs, PAHs, pesticides, PCBs, metals	<b>Remedy:</b> Capping (RCRA Subtitle C, multi-layer cap), gas assessment and controls, and institutional controls.
Newport Naval Education and Training Center, McAllister Point Landfill, RI, Region 1  9/27/93	McAllister Point Landfill, 11.5 acres	Domestic refuse, spent acids, paints, solvents, waste oils, and PCB-contaminated transformer oil	VOCs, PAHs, PCBs, pesticides, phenols, metals	<b>Remedy:</b> Capping, (RCRA Subtitle C, multi-layer cap) gas management, surface controls, and institutional controls.

**APPENDIX A:  
DATA SUMMARY TABLE FOR MILITARY LANDFILLS (CONT.)**

<b>ROD / Site Name, State, Region, ROD Sign Date</b>	<b>Disposal Area, Size, Volume of Waste</b>	<b>Type of Waste Deposited</b>	<b>Contaminants of Concern</b>	<b>Remedy</b>
Otis Air National Guard, Camp Edwards, Massachusetts Military Reservation, MA, Region 1  1/14/93	Landfill Number 1 (LF-1), 100 acres; volume not reported	General refuse, fuel tank sludge, herbicides, blank ammunition, paints, paint thinners, batteries, pesticides, hospital wastes, sewage sludge, coal ash, possibly live ordnance	VOCs, SVOCs, inorganics	<b>Remedy:</b> Capping (RCRA Subtitle C, multi-layer cap), institutional controls, soil cover inspection and ground water monitoring.
Pease AFB (OU1), NH, Region 1  9/27/93	LF-5, 23 acres	Domestic and industrial wastes, waste oils and solvents, and industrial wastewater treatment plant sludge	VOCs, PAHs, arsenic and other metals	<b>Remedy:</b> Excavation, dewatering and consolidation of waste under a cap (RCRA Subtitle C); regrading and capping of existing landfill; institutional controls; and extraction and treatment of ground water with discharge to base wastewater treatment facility.
Fort Dix Landfill Site, NJ, Region 2  9/24/91	Main area, 126 acres	Domestic waste, paints and paint thinners, demolition debris, ash, and solvents	VOCs, metals	<b>Remedy:</b> Capping 50-acre portion (NJAC 7:26 closure plan for hazardous waste); installing gas venting system and an air monitoring system; ground water, surface water, and air monitoring; and institutional controls.
Naval Air Engineering Center (OU3), NJ, Region 2  9/16/91	Site 26, 1500 sq. ft., volume not reported	Oil, roofing materials, building debris	No contaminants identified above established cleanup levels.	<b>Remedy:</b> Source: No action.
Naval Air Engineering Center (OU3), NJ, Region 2  9/16/91	Site 27, 6 acres	Scrap steel cable	No contaminants identified.	<b>Remedy:</b> Source: No action.
Naval Air Engineering Center (OU17), NJ, Region 2  9/26/94	Site 29, 20-acres	Construction debris, metal, asbestos, solvents, other miscellaneous wastes	VOCs, SVOCs, metals	<b>Remedy:</b> Source: No action.
Plattsburgh AFB, LF-022, NY, Region 2  9/30/92	LF-022, approx. 13.7 acres, approx. 524,000 cy	Household refuse	Metals, pesticides	<b>Remedy:</b> Capping (NY State requirements for solid waste landfills, 12 inch soil cap) and institutional controls.

**APPENDIX A:  
DATA SUMMARY TABLE FOR MILITARY LANDFILLS (CONT.)**

<b>ROD / Site Name, State, Region, ROD Sign Date</b>	<b>Disposal Area, Size, Volume of Waste</b>	<b>Type of Waste Deposited</b>	<b>Contaminants of Concern</b>	<b>Remedy</b>
Plattsburgh AFB, LF-023, NY, Region 2  9/30/92	LF-023, approx. 9 acres, approx. 406,000 cy	Household refuse, debris, car parts	Metals, VOCs, SVOCs, PCB, pesticides	<b>Remedy:</b> Capping ( NY State requirements for solid waste landfills, low permeability cap) and institutional controls.
U.S. Army Aberdeen Proving Grounds, MD, Region 3  6/30/92	Michaelsville Landfill, 20 acres, greater than 100,000 cy	Household refuse, limited quantities of industrial waste, area used for burning	Metals, pesticides, VOCs, PCBs	<b>Remedy:</b> Capping, (MD regs. for sanitary landfill; RCRA Subtitle C multi-layer cap, 0-2 feet compacted earth material), surface water controls, and gas venting system.
Marine Corps Base, Camp Lejeune (OU1), NC, Region 4  9/15/94	Site 24, 100 acres, volume not reported	Fly ash, cinders, solvents, used paint stripping compounds, sewage sludge, spiractor sludge, construction debris	Pesticides, metals	<b>Remedy:</b> Source: No Action.
Robins AFB (OU1), GA, Region 4  6/25/91	Main area (Landfill No. 4), 45 acres, greater than 100,000 cy	Household refuse, industrial waste	VOCs, metals	<b>Remedy:</b> Capping (RCRA Subtitle C cap), Renovation of soil cover (w/soil & clay).
Twin Cities AFB Reserve, MN, Region 5  3/31/92	Main area, approx. 2 acres, volume not reported	Household refuse, small amounts of industrial; some burned waste	VOCs, metals	<b>Remedy:</b> Source: institutional controls, natural attenuation, groundwater and surface water monitoring.
Wright-Patterson AFB, OH, Region 5  7/15/93	LF-8, 11 acres, 187,300 cy	General refuse and hazardous materials	PAHs, pesticides, PCBs, VOCs, metals, inorganics	<b>Remedy:</b> Capping (Ohio EPA regulations for sanitary landfills), institutional controls, ground water treatment and monitoring.
Wright-Patterson AFB, OH, Region 5  7/15/93	LF-10, 8 acres, 171,600 cy	General refuse and hazardous materials	PAHs, pesticides, PCBs, VOCs, metals, inorganics	<b>Remedy:</b> Capping, institutional controls, ground water treatment and monitoring.

APPENDIX A:  
DATA SUMMARY TABLE FOR MILITARY LANDFILLS (CONT.)

ROD / Site Name, State, Region, ROD Sign Date	Disposal Area, Size, Volume of Waste	Type of Waste Deposited	Contaminants of Concern	Remedy
Hill AFB (OU4), UT, Region 8 6/14/94	Landfill 1, 3.5 acres, 140,000 cy	Burned solid waste, small amounts of waste oils and solvents (from vehicle maintenance facility).	VOCs (TCE)	<b>Remedy:</b> Capping (RCRA Subtitle D cap), pumping, treating, and discharging ground water to POTW, treating contaminated surface water, soil vapor extraction, implementing institutional controls and access restrictions.
Defense Depot, Ogden (OU1), UT, Region 8 6/26/92	Plain City Canal Backfill Area, 4,000 cy	Electrical wire, glass, ash, charcoal, asphalt, wood, concrete, plastic and metal fragments	Metals, PCBs, dioxins, furans, VOCs	<b>Remedy:</b> Excavation, sorting, and off-site disposal in a RCRA permitted facility.
Defense Depot, Ogden (OU3), UT, Region 8 9/28/92	Burial Site 3-A: CWA Identification Kit Burial Area (100 cy)	Vials of chemical surety agents, (CSAs) broken glass	VOCs, SVOCs, metals, CWAs	<b>Remedy:</b> Excavation, sorting, and off-site disposal in a RCRA permitted facility.
Defense Depot, Ogden (OU3), UT, Region 8 9/28/92	Burial Site 3-A: Riot Control and Smoke Grenade Burial Area (90 cy)	Unfused grenades and grenade fragments, as well as riot control grenades	VOCs, SVOCs, metals	<b>Remedy:</b> Excavation, sorting, and off-site disposal in a RCRA permitted facility.
Defense Depot, Ogden (OU3), UT, Region 8 9/28/92	Burial Site 3-A: Compressed Gas Cylinder Reburial Area	Two compressed gas cylinders and four smaller steel tanks removed from the Chemical Warfare Agent (CWA) Identification Kit and Riot Control and Smoke Grenade burial areas	Unknown, possible chemical warfare agents (CWAs)	<b>Remedy:</b> Excavation of compressed gas cylinders and disposal by a commercial operator.
Defense Depot, Ogden (OU3), UT, Region 8 9/28/92	Burial Site 3-A: Miscellaneous Items Burial Area (230 cy)	Chemical Warfare Agent (CWA) Identification Kits containing no CWAs, World War II gas mask canisters, paint, broken glass, wooden boxes, and pieces of iron	VOCs, SVOCs, metals	<b>Remedy:</b> Excavation and off-site disposal in a RCRA permitted hazardous waste landfill.

**APPENDIX A:  
DATA SUMMARY TABLE FOR MILITARY LANDFILLS (CONT.)**

<b>ROD / Site Name, State, Region, ROD Sign Date</b>	<b>Disposal Area, Size, Volume of Waste</b>	<b>Type of Waste Deposited</b>	<b>Contaminants of Concern</b>	<b>Remedy</b>
Defense Depot, Ogden (OU3), UT, Region 8  9/28/92	Water Purification Tablet Burial Area (110 cy)	Bottles containing halazone water purification tablets	No contaminants identified	<b>Remedy:</b> Excavation and off-site disposal in a RCRA permitted industrial waste landfill.
Defense Depot, Ogden (OU4), UT, Region 8  9/28/92	4-A, 7500, sq. ft., volume not reported	Wood, crating materials, paper, greases, debris, medical waste, oils, some burned waste	Pesticides, VOCs, PCBs	<b>Remedy:</b> Excavation and off-site disposal in a RCRA landfill.
Defense Depot, Ogden (OU4), UT, Region 8  9/28/92	4-B, (inside 4-E), less than 7500, sq. ft., volume not reported	Fluorescent tubes	None identified	<b>Remedy:</b> Excavation and off-site disposal in a RCRA landfill.
Defense Depot, Ogden (OU4), UT, Region 8  9/28/92	4-C, 6000 sq. ft., volume not reported	Food products, sanitary landfill waste	Pesticides, VOCs, PCBs	<b>Remedy:</b> Excavation and transportation to off-site disposal in a RCRA landfill.
Defense Depot, Ogden (OU4), UT, Region 8  9/28/92	4-D, 2000 sq. ft., volume not reported	Methyl bromide cylinders, halazone tablets (jars)	Possibly methyl bromide	<b>Remedy:</b> Excavation and transportation to off-site disposal in a RCRA landfill.
Defense Depot, Ogden (OU4), UT, Region 8  9/28/92	4-E, 7500 sq. ft., volume not reported	Oils, spent solvents, industrial waste	PCBs, VOCs, pesticides	<b>Remedy:</b> Excavation and transportation to off-site disposal in a RCRA landfill.
Rocky Mountain Arsenal, Shell Section 36 Trenches (OU23), CO, Region 8  5/3/90	Shell Trench Area, 8 acres	Rags, plastic and metal cans, glass jars, piping, pipe fittings, insulation, refuse, insulation, liquid and solid wastes generated from the manufacture of pesticides	VOCs, SVOCs, pesticides, and DNAPLs	<b>Remedy:</b> Capping (soil and vegetative cover RCRA Subtitle C), constructing a physical barrier.

APPENDIX A:  
DATA SUMMARY TABLE FOR MILITARY LANDFILLS (CONT.)

ROD / Site Name, State, Region, ROD Sign Date	Disposal Area, Size, Volume of Waste	Type of Waste Deposited	Contaminants of Concern	Remedy
Fort Ord Landfills (OU2), CA, Region 9  8/23/94	Landfills, 150 acres	Household and commercial refuse, dried sewage sludge, construction debris, small amounts of chemical waste including paint, oil, pesticides, and epoxy adhesive, electrical equipment	VOCs	<b>Remedy:</b> Capping (California Code of Regulations for non-hazardous waste), institutional controls, extraction, treatment, and recharge of ground water.
Riverbank Army Ammunition Plant Site, CA, Region 9  3/24/94	Landfill, 4.5-acres, volume not reported	Paper, oils, greases, solvents, hospital wastes, construction debris, and industrial sludges	Metals	<b>Remedy:</b> Capping (RCRA Subtitle C clay cap) pump and treat ground water, discharge treated water to on-site ponds.
Williams AFB (OU1), AZ, Region 9  5/18/94	Landfill LF-04, 90-acres, 59,000 cy	Dried sewage sludge. Domestic trash and garbage, wood, metal, brush, construction debris, some solvents and chemicals	Soil, pesticides, SVOCs, inorganics, including beryllium, lead, and zinc GW: BTEX, VOCs, SVOCs	<b>Remedy:</b> Capping (permeable cap), stormwater runoff controls, institutional actions, and soil and ground water monitoring.
Williams AFB (OU1), AZ, Region 9  5/18/94	Pesticide Burial Area (DP-13), 0.4-acre, volume not reported	Pesticides	Pesticides, VOCs, metals	<b>Remedy:</b> Source: No action.
Williams AFB (OU1), AZ, Region 9  5/18/94	Radioactive Instrumentation Burial Area (RW-11), 100 sq. ft., volume not reported	Cement; radioactive instruments	Radium (background levels)	<b>Remedy:</b> Source: No action.
Elmendorf AFB (OU1), AK, Region 10  9/29/94	LF05, 17-acres, volume not reported	General refuse, scrap metal, used chemicals and other scrap material	VOCs, PCBs, Metals, PAH	<b>Remedy:</b> Source: No action.

**APPENDIX A:  
DATA SUMMARY TABLE FOR MILITARY LANDFILLS (CONT.)**

<b>ROD / Site Name, State, Region, ROD Sign Date</b>	<b>Disposal Area, Size, Volume of Waste</b>	<b>Type of Waste Deposited</b>	<b>Contaminants of Concern</b>	<b>Remedy</b>
Elmendorf AFB (OU1), AK, Region 10  9/29/94	LF07, 35-acres, volume not reported	Base generated refuse, scrap metal, construction rubble, drums of asphalt, empty pesticide containers, small amounts of shop wastes, and asbestos wastes	VOCs, PCBs, Metals, PAH	<b>Remedy:</b> Source: No action.
Elmendorf AFB (OU1), AK, Region 10  9/29/94	LF13, 2-acres, volume not reported	Empty drums, metal piping, drums of asphalt, and small quantities of quicklime	VOCs, PCBs, Metals, PAH	<b>Remedy:</b> Source: No action.
Elmendorf AFB (OU1), AK, Region 10  9/29/94	LF59, 2.5-acres, volume not reported	General refuse and construction debris, and tar seep	VOCs, PCBs, Metals, PAH	<b>Remedy:</b> Source: No action.
Fairchild AFB (OU1), WA, Region 10  2/13/93	Southwest area, 12.6 acres 407,300 cy	Coal ash, solvents, dry cleaning filters, paints, thinners, possibly electrical transformers.	VOCs	<b>Remedy:</b> Capping (RCRA Subtitle D), SVE / treatment system, extracting contaminated ground water and treating by air stripping and granular activated carbon, disposal off-site, monitoring off-site water supply wells.
Fairchild AFB (OU1), WA, Region 10  2/13/93	Northeast area, 6 acres with 291,000 cy of waste	Coal ash, solvents, dry cleaning filters, paints, thinners, possibly electrical transformers.	VOCs	<b>Remedy:</b> Capping (RCRA Subtitle D), SVE/ treatment system, extracting contaminated ground water and treating by air stripping and granular activated carbon, disposal off-site, monitoring off-site water supply wells.
Fort Lewis Military Reservation, Landfill 4 and the Solvent Refined Coal Pilot Plant, WA, Region 10  9/24/93	LF4, 52 acres	Domestic and light industrial solid waste (no landfill records were maintained).	VOCs metals	<b>Remedy:</b> Source: institutional controls, treat ground water and soil using SVE and air sparging system.

**APPENDIX A:  
DATA SUMMARY TABLE FOR MILITARY LANDFILLS (CONT.)**

<b>ROD / Site Name, State, Region, ROD Sign Date</b>	<b>Disposal Area, Size, Volume of Waste</b>	<b>Type of Waste Deposited</b>	<b>Contaminants of Concern</b>	<b>Remedy</b>
Naval Air Station, Whidbey Island, Ault Field (OU1), WA, Region 10  12/20/93	Area 6 Landfill; 40 acres; no volume reported. Within Area 6 there are 2 distinct areas where wastes were disposed.	Household waste, construction debris, yard waste, small volumes of solvents, oily sludges, thinners, and other hazardous compounds	VOCs	<b>Remedy:</b> Capping (Washington State Minimum Functional Standards for non-hazardous closure); RCRA Subtitle D), air stripping ground water, ground water monitoring, and institutional controls.
Naval Air Station, Whidbey Island, Ault Field (OU2), WA, Region 10  12/20/93	Area 2; 13 acres, no volume reported; Area 3, 1.5 acres; no volume reported; Both treated together due to close proximity.	Solid waste from the base, industrial wastes, and construction and demolition debris	Metals, PAHs	<b>Remedy:</b> Source: institutional controls, ground water monitoring.
Naval Reactor Facility, ID, Region 10  9/27/94	Landfill Unit 8-05-1, (350 ft by 450 ft.)(11,780 m3)	Construction debris, small quantities of paints, solvents, cafeteria wastes, and petroleum products	Metals, VOCs	<b>Remedy:</b> Capping (native soil cover, RCRA Subtitle C), institutional controls.
Naval Reactor Facility, ID, Region 10  9/27/94	Landfill Unit 8-05-51, (100-175 ft. by 450 ft. by 10- 15 ft.) (1,610 m3)	Construction debris, small quantities of paints, solvents, cafeteria wastes, and petroleum products	Metals, VOCs	<b>Remedy:</b> Capping (native soil cover, RCRA Subtitle C), institutional controls.
Naval Reactor Facility, ID, Region 10  9/27/94	Landfill Unit 8-06-53, (900 ft. by 1200 ft. by 7- 10 ft.)(45,114 m3)	Construction debris, small quantities of paints, solvents, cafeteria wastes, and petroleum products	Metals, VOCs	<b>Remedy:</b> Capping (native soil cover, RCRA Subtitle C), institutional controls.