Superfund LDR Guide #6B
Obtaining a Soil and Debris Treatability Variance for Removal Actions

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Office of Emergency and Remedial Response
Hazardous Site Control Division

Quick Reference Fact Sheet

The Office of Emergency and Remedial Response (OERR) issued a series of Superfund LDR Guides in July and December of 1989. This series included: *Overview of RCRA Land Disposal Restrictions (LDRs)* (Superfund LDR Guide #1); *Complying with the California List Restrictions* (Superfund LDR Guide #2); *Treatment Standards and Minimum Technology Requirements Under the LDRs* (Superfund LDR Guide #3); *Complying with the Hammer Restrictions Under the LDRs* (Superfund LDR Guide #4); *Determining When the LDRs are Applicable to CERCLA Responses* (Superfund LDR Guide #5); *Obtaining a Soil and Debris Treatability Variance for Remedial* (Superfund LDR Guide #6A) and *Removal* (Superfund LDR Guide #6B) *Actions*; and *Determining When the LDRs are Relevant and Appropriate to CERCLA Responses* (Superfund LDR Guide #7). Since the issuance of these guides, the Environmental Protection Agency, with cooperation from outside parties (e.g., environmental groups, industry representatives), has conducted an analysis of the potential impacts associated with applying the LDR treatment standards to Superfund and RCRA Corrective Action cleanups. As a result of these analyses, it was decided that the Agency will promulgate a third set of treatment standards (in addition to the wastewater and nonwastewater categories currently in effect) specifically for soil and debris wastes. In the interim, there is the presumption that CERCLA response actions involving the placement of soil and debris contaminated with RCRA restricted wastes will utilize a Treatability Variance to comply with the LDRs and that, under these variances, the treatment levels outlined in Superfund LDR Guide #6B will serve as alternative "treatment standards" for removal actions. **This guide has been prepared to outline the process for obtaining and complying with a Treatability Variance for soil and debris that are contaminated with RCRA hazardous wastes until such time that the Agency promulgates treatment standards for soil and debris.**

BASIS FOR A TREATABILITY VARIANCE

When promulgating the LDR treatment standards, the Agency recognized that treatment of wastes to the treatment standards established using the best demonstrated available technology (BDAT) would not always be possible or appropriate (RCRA §268.44). In addition, the Agency recognized the importance of ensuring that the LDRs do not unnecessarily restrict the development and use of alternative and innovative treatment technologies for remediating hazardous waste sites. Therefore, a Treatability Variance process is available to comply with the LDRs when a Superfund waste differs significantly from the waste used to set the LDR treatment standard such that:

- The LDR standard cannot be met; or
- The BDAT used to set the standard is inappropriate for the waste.

Highlight 1: SOIL AND DEBRIS

Soil. Soil is defined as materials that are primarily of geologic origin such as sand, silt, loam, or clay, that are indigenous to the natural geologic environment at or near the CERCLA site. (In many cases, soil is mixed with liquids, sludges, and/or debris.)

Debris. Debris is defined as materials that are primarily non-geologic in origin, such as grass, trees, stumps, and man-made materials such as concrete, clothing, partially buried whole or empty drums, capacitors, and other synthetic manufactured materials, such as liners. (It does not include synthetic organic chemicals, but may include materials contaminated with these chemicals).

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During on-site removal actions, on-scene coordinators (OSCs) must comply with the LDRs if the LDRs are ARARs and compliance with the LDRs is practicable. For removals involving off-site deposition, OSCs must simply determine if the LDRs are applicable. When managing restricted soil and debris wastes (see **Highlight 1**), it is presumed that OSCs will comply with the LDRs through a Treatability Variance because, except for the dioxin standards which are based on treating contaminated soil, the LDR treatment standards are based on treating less complex matrices of industrial process wastes. A Treatability Variance does not remove the requirement to treat restricted soil and debris wastes. Rather, under a Variance, an OSC selects alternate treatment levels the Agency has established, which are based on data from actual treatment of soil or best management practices for debris.

COMPLYING WITH A TREATABILITY VARIANCE FOR SOIL AND DEBRIS WASTES

Soils

Once the OSCs have identified the RCRA waste codes present at the site, the next step is to identify the BDAT constituents requiring control and to divide these constituents into one of the structural/functional groups shown in column 1 of **Highlight 2**. After dividing the BDAT constituents into their respective structural/functional groups, the next step is to compare the concentration of each constituent with the **threshold concentration** (see column 3 of **Highlight 2**) and to select the appropriate concentration level or percent reduction range. If the concentration of the restricted constituent is less than the threshold concentration, the waste should be treated to

Highlight 2: ALTERNATE TREATABILITY VARIANCE LEVELS AND TECHNOLOGIES FOR STRUCTURAL/FUNCTIONAL GROUPS

Structural Functional Groups	Concentration Range (ppm)	Threshold Concentration (ppm)	Percent Reduction Range	Technologies that achieved recommended effluent concentration guidance**
ORGANICS	**Total Waste Analysis/***	**Total Waste Analysis/***		
Halogenated Non-Polar Aromatics	0.5 - 10	100	90 - 99.9	Biological Treatment, Low Temp. Stripping, Soil Washing, Thermal Destruction
Dioxins	0.00001 - 0.05	0.5	90 - 99.9	Dechlorination, Soil Washing, Thermal Destruction
PCBs	0.1 - 10	100	90 - 99.9	Biological Treatment, Dechlorination, Soil Washing, Thermal Destruction
Herbicides	0.002 - 0.02	0.2	90 - 99.9	Thermal Destruction
Halogenated Phenols	0.5 - 40	400	90 - 99	Biological Treatment, Low Temp. Stripping, Soil Washing, Thermal Destruction
Halogenated Aliphatics	0.5 - 2	40	95 - 99.9	Biological Treatment, Low Temp. Stripping, Soil Washing, Thermal Destruction
Halogenated Cyclics	0.5 - 20	200	90 - 99.9	Thermal Destruction
Nitrated Aromatics	2.5 - 10	10,000	99.9 - 99.99	Biological Treatment, Soil Washing Thermal Destruction
Heterocyclics	0.5 - 20	200	90 - 99.9	Biological Treatment, Low Temp. Stripping, Soil Washing, Thermal Destruction
Polynuclear Aromatics	0.5 - 20	400	95 - 99	Biological Treatment, Low Temp. Stripping, Soil Washing, Thermal Destruction
Other Polar Organics	0.5 - 10	100	90 - 99	Biological Treatment, Low Temp. Stripping, Soil Washing, Thermal Destruction
INORGANICS	**TCLP**	**TCLP**		
Antimony	0.1 - 0.2	2	90 - 99	Immobilization
Arsenic	0.3 - 1	10	90 - 99.9	Immobilization, Soil Washing
Barium	0.1 - 40	400	90 - 99	Immobilization
Chromium	0.5 - 6	120	95 - 99.9	Immobilization, Soil Washing
Nickel	0.5 - 1	20	95 - 99.9	Immobilization, Soil Washing
Selenium	0.005	0.05	90 - 99	Immobilization
Vanadium	0.2 - 20	200	90 - 99	Immobilization
Cadmium	0.2 - 2	40	95 - 99.9	Immobilization, Soil Washing
Lead	0.1 - 3	300	99 - 99.9	Immobilization, Soil Washing
Mercury	0.0002 - 0.008	0.08	90 - 99	Immobilization

- *TCLP also may be used when evaluating waste in which organics are not a principal constituent that have been treated through an immobilization process.*
- ** *Other technologies may be used if treatability studies or other information indicates that they can achieve the necessary concentration or*

within the concentration range. If the waste concentration is above the threshold, the waste should be treated to reduce the concentration of the waste to within the specified percent reduction range. Once the appropriate treatment range is selected, the third step is to identify and select a specific technology that can achieve the necessary concentration or percent reduction. Column 5 of **Highlight 2** lists technologies that (based on existing performance data) can attain the alternative Treatability Variance levels.

For on-site actions, during the implementation of the selected treatment technology, periodic analysis using the appropriate testing procedure (i.e., total waste analysis for organics and TCLP for inorganics) will be required to ensure that the alternate treatment levels for the BDAT constituents requiring control are being attained, and thus, can be land-disposed without further treatment.

Because of the variable and uncertain characteristics associated with unexcavated wastes, from which only sampling data are available, treatment systems generally should be designed to achieve the more stringent end of the treatment range (e.g., 0.5 for chromium, see column 2 of **Highlight 2**) to ensure that the treatment residuals from the most contaminated portions of the waste fall below the "no exceedance" levels (e.g., 6.0 ppm for chromium). Should data indicate that the treatment levels set through the Treatability Variance are not being attained (i.e., treatment residuals are greater than the "no exceedance" level), OSCs should consult with the Response Operations Branch at Headquarters.

Debris Wastes

OSCs should use the same process described above for obtaining a Treatability Variance for types of debris that are able to be treated to the alternate treatment levels (e.g., paper, plastic). However, for most types of debris (e.g., concrete, steel pipes), which generally cannot be treated, OSCs should use best management practices. Depending on the specific characteristics of the debris, these practices may include decontamination (e.g., triple rinsing) or destruction.

OBTAINING A TREATABILITY VARIANCE FOR SOIL AND DEBRIS WASTES

Once it is determined that a CERCLA waste is a soil or debris, and that a Treatability Variance will be necessary (i.e., the LDRs are applicable and practicable for the removal action addressing soil and debris wastes, and there is a reasonable doubt that the LDR treatment standards can be met consistently for all the wastes), OSCs should

Highlight 3 - INFORMATION TO BE INCLUDED IN A TREATABILITY VARIANCE ACTION MEMORANDUM AND EE/CA TO OBTAIN A SOIL AND DEBRIS TREATABILITY VARIANCE DURING CERCLA REMOVAL ACTIONS

Information to be included in a Treatability Variance Memorandum and EE/CA for a soil and debris Treatability Variance during on-site and off-site removal actions is listed below. For off-site Treatability Variances, the complete list of documentation requirements should be combined and submitted as a separate document.

ON-SITE AND OFF-SITE

- Description of the soil or debris waste and the source of the contamination;
- Description of the Proposed Action (e.g., "excavation, treatment, and off-site disposal");
- Intent to comply with the LDRs through a Treatability Variance; and
- For the selected removal action (emergency and time-critical) or for each alternative for which a Treatability Variance is required (non-time-critical removals), the specific treatment level range to be achieved (see **Highlight 2** to determine these treatment levels and **Highlight 7** for an example of the variance process).

OFF-SITE ONLY

- Petitioner's name and address and identification of an authorized contact person (if different); and
- Statement of petitioner's interest in obtaining a Treatability Variance.

initiate the process of obtaining a Treatability Variance.

In general, for on-site removal actions, the Treatability Variance will be in the form of a memorandum attached to the Action Memorandum that documents the removal action to be taken. This attachment should include the necessary information to justify the need for a Treatability Variance (see **Highlight 3**). Treatability Variances for on-site removal actions are approved by Regional Administrators or their designees.

For off-site removal actions, an OSC must submit to Headquarters a formal Treatability Variance petition complying with the requirements of 40 CFR 268.44 for site-specific variances. Because most removal actions involve off-site actions, OSCs will generally have to prepare formal Treatability Variance petitions. The process also should include local notice and an opportunity for the public to comment, consistent with the NCP administrative record requirements in 40 CFR 300.820.

Processes for obtaining a Treatability Variance depend upon the type of removal action. These actions are classified according to the expediency required in a given situation: (1) emergency, (2) time-critical, and (3) non-time-critical. The process for obtaining a Treatability Variance for each of these removal actions is described below. Each of these actions are defined in the NCP (55 FR 8666, March 8, 1990).

Emergency and Time-Critical Actions

There is no formal procedure for identifying and analyzing alternatives for emergency and time-critical removal actions. Because of the need for a quick response to a release, the removal action selection process may occur at different stages of these removals, depending on the threats present.

Generally, a request for a Treatability Variance is a memorandum attached to the Action Memorandum. During emergency and some time-critical responses, however, there may not be sufficient information available about the need for a Treatability Variance when the Action Memorandum is signed. In those cases, the request for a Treatability Variance should be a memorandum (or formal petition, for off-site actions) that amends the Action Memorandum. Sample language for this Action Memorandum is provided in **Highlight 4**. In all cases, the Treatability Variance memorandum should be from the OSC to Regional Administrators or their designee who has the authority to approve Action Memoranda. Public comment on the Treatability Variance should be solicited, whenever possible, given the urgency of the situation, in accordance with the administrative record and public participation procedures described in the NCP (40 CFR 300.820).

Highlight 4 - SAMPLE LANGUAGE FOR THE ACTION MEMORANDUM

Because existing and available data do not demonstrate that the full-scale operation of this treatment technology can attain the LDR treatment standards consistently for all soil or debris wastes to be addressed by this action, this selected removal alternative will comply with the LDRs through a Treatability Variance. The treatment level range established through a Treatability Variance and achieved through [specify technology] will attain the Agency's interim "treatment levels/ranges" for each constituent restricted at the site.

Non-Time-Critical Actions

For these actions, sufficient lead-time is generally available to conduct a more detailed analysis of alternatives before the Action Memorandum is signed. The process by which alternatives are analyzed is described through the

Highlight 5 - SAMPLE LANGUAGE FOR THE EE/CA

Description of Alternatives:

This removal alternative will comply with the LDRs through a Treatability Variance under 40 CFR 268.44. This Variance will result in the use of [specify technology] to attain the Agency's interim "treatment levels/ranges" for the contaminated soil at the site.

Evaluation of Alternatives:

The LDRs are applicable and can be practicably met for [Enter number] of [Enter total number of alternatives] removal alternatives being considered. [Enter number] of the [Enter total number of alternatives] alternatives would comply with the LDRs through a Treatability Variance.

steps of the Engineering Evaluation/Cost Analysis (EE/CA) process. Sample language for the EE/CA is provided in **Highlight 5**. The EE/CA process includes gathering information that will aid in determining whether an LDR requirement is applicable and selecting a recommended action. The EE/CA process is similar to the RI/FS process and generally includes six steps:

- Site characterization;
- Identification of removal action objectives;
- Identification of removal action alternatives;
- Analysis of removal action alternatives;
- Comparative analysis of removal action alternatives; and
- Recommendation of removal action alternative.

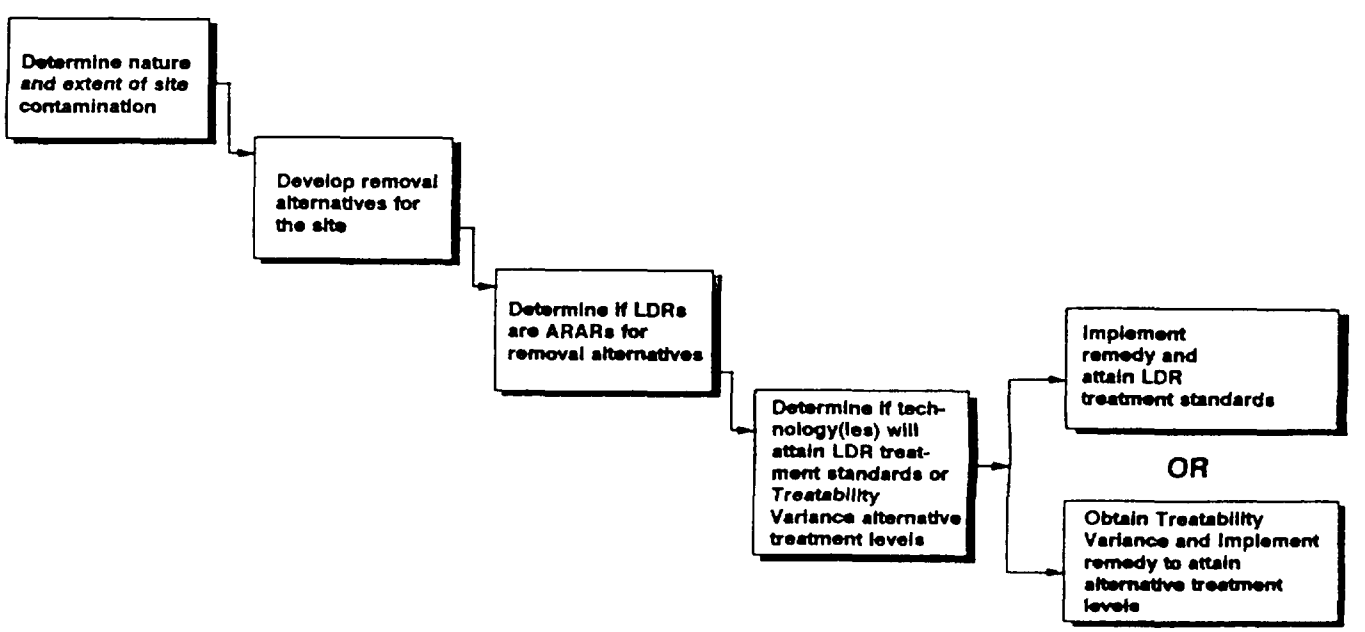
For non-time-critical removals, the information to justify a Treatability Variance should be included in a memorandum attached to the EE/CA. Public comments on the Treatability Variance should be solicited for a period of at least 30 days when the EE/CA is made available, in accordance with the administrative record requirements in the NCP (40 CFR 300.820).

SUMMARY

Because of the important role the LDRs may play in Superfund removals, OSCs need to incorporate early in the removal process the necessary investigative and analytical procedures to determine if the LDRs are ARARs for on-site removal alternatives that involve the "placement" of wastes, and if compliance with the LDRs is practicable. When the LDRs are ARARs and compliance is practicable (or for off-site actions, when LDRs are applicable), OSCs should determine if treatment processes can attain either the LDR treatment standards or the alternate levels that would be established under a Treatability Variance.

Once removal alternatives are identified, OSCs should determine if alternatives involve placement of restricted RCRA wastes, and if so, identify the BDAT constituents requiring control. Next, OSCs should evaluate those alternatives that involve treatment and placement of restricted RCRA hazardous wastes to ensure the technology process(es) will attain the appropriate treatment levels (i.e., either the LDR treatment standard or Treatability Variance alternate treatment levels for restricted RCRA hazardous wastes), and, in accordance with Superfund goals, reductions of 90 percent or greater for Superfund primary contaminants of concern). If a Treatability Variance is necessary, a request for a Variance must be made in the Action Memorandum (or in an amendment to the Action Memorandum) and EE/CA Report, and public comment solicited. The results of these evaluations are also documented in the Action Memorandum and EE/CA Report. The integration of the LDRs into the removal actions is illustrated in **Highlight 6**. An example of the process for complying with a Treatability Variance for contaminated soil and debris is presented in **Highlight 7**.

Highlight 6: LDRs IN THE REMOVAL PROCESS



Highlight 7: IDENTIFICATION OF TREATMENT LEVELS FOR A TREATABILITY VARIANCE

As part of the removal investigation, it has been determined that soils in one location at a site contain F006 wastes and cresols (which site records indicate were an F004 waste). Arsenic, which was determined to be a characteristic RCRA hazardous waste, also was found in soils at a separate location. Cadmium, chromium, lead, and arsenic were identified as contaminants found in the highest concentrations. The concentration range of all of the constituents found at the site included:

Constituent	Total Concentration (mg/kg)	TCLP (mg/l)	Constituent	Total Concentration (mg/kg)	TCLP (mg/l)
Cadmium	2,270 - 16,200	120 - 146	Nickel	100 - 140	1 - 6.5
Chromium	3,160 - 4,390	30 - 56	Silver	1 - 3	---
Cyanides	80 - 150	1 - 16	Cresols	50 - 600	.25 - 4
Lead	500 - 625	2 - 12.5	Arsenic	800 - 1,900	3 - 9

Four remedial alternatives are being considered: (1) Low temperature thermal stripping of soil contaminated with cresols followed by immobilization of the ash; (2) Immobilization of the soil in a mobile unit; (3) In-situ immobilization; and (4) Capping of wastes. Each of these alternatives must be evaluated to determine if they will result in significant reduction of the toxicity, mobility, or volume of the waste; whether "placement" occurs; and, if "placement" occurs, whether the treatment will attain the alternative treatment levels established through a Treatability Variance for the BDAT constituents requiring control.

STEP 1: IDENTIFY THE RESTRICTED CONSTITUENTS

- Because F006 and F004 wastes have been identified in soils at the site, the Superfund site manager must meet alternate treatment levels established through a Treatability Variance for the BDAT constituents. These constituents are: **Cadmium, Chromium, Lead, Nickel, Silver,** and **Cyanide** for F006 and **Cresols** for F004.

AND DIVIDE THE CONSTITUENTS INTO THEIR STRUCTURAL/FUNCTIONAL GROUPS (see **Highlight 2**):

- All of the F006 constituents are in the **Inorganics** structural/functional group.
- Cresols are in the **Other Polar Organic Compounds** structural/functional group.
- The action should result in the effective reduction (i.e., at least 90 percent) of all primary constituents of concern (i.e., **Cadmium, Chromium, Lead, and Arsenic**).

STEP 2: COMPARE THE CONCENTRATION THRESHOLD FOUND IN HIGHLIGHT 2 TO THE CONCENTRATIONS FOUND AT THE SITE AND CHOOSE EITHER THE CONCENTRATION LEVEL RANGE OR PERCENT REDUCTION RANGE FOR EACH RESTRICTED CONSTITUENT.

Constituent	Site Concentration	Threshold Concentration	Appropriate Range: Concentration	Appropriate Range: Percent Reduction	Range to be achieved (compliance analysis)
Cadmium	120 - 146 ppm	> 40 ppm		X	95-99.9 Percent Reduction (TCLP)
Chromium	30 - 56 ppm	< 120 ppm	X		0.5 - 6 ppm (TCLP)
Lead	2 - 12.5 ppm	< 300 ppm	X		0.1 - 3 ppm (TCLP)
Nickel	1 - 6.5 ppm	< 20 ppm	X		0.5 - 1 ppm (TCLP)
Cresols	50 - 600 ppm	> 100 ppm	X		90-99 Percent Reduction (TCLP)
Cresols (TCLP)	.25 - 4 ppm			X	
Arsenic	3 - 9 ppm	< 10 ppm	X		0.27 - 1 ppm (TCLP)

STEP 3: IDENTIFY TREATMENT TECHNOLOGIES THAT MEET THE TREATMENT RANGES.

- **Highlight 2** lists the technologies that achieved the alternate treatment levels for each structural/functional group.
- Because cresols are present in relatively low concentrations (assumed for the purposes of this example), a TCLP may be used to determine if immobilization results in a sufficient reduction of mobility of this restricted RCRA hazardous waste. (Measures to address any volatilization of organics during immobilization processes will be necessary.)
- Immobilization also will result in the effective reduction in leachability (i.e., at least 90 percent) of arsenic, a Superfund primary contaminant of concern.

Alternative	Effective Reduction of Toxicity, Mobility, Volume?	"Placement?"	Meet Treatability Variance Alternate Levels?
1. Low temperature stripping/ Immobilization	Yes	Yes	Yes
2. Immobilization in mobile unit	Yes	Yes	Yes
3. In-situ immobilization	Yes (Mobility)	No (LDRs not ARARs)	—

STEP 4: PREPARE ACTION MEMORANDUM OR EE/CE REPORT

- **Highlight 4** provides sample language for the Action Memorandum and **Highlight 5** provides the sample language for the EE/CA to present the intent to comply with the LDRs through a Treatability Variance.