Soil Treatment Standards

DATE: October 19, 1998

MEMORANDUM

SUBJECT: Phase IV Land Disposal Restrictions Rule – Clarification of Effective Dates

FROM: Elizabeth A. Cotsworth, Acting Director /S/
Office of Solid Waste

TO: RCRA Senior Policy Advisors, Regions I - X

The Phase IV Land Disposal Restrictions (LDR) final rule, published on May 26, 1998, establishes or revises treatment standards for metal and mineral processing wastes, amends the definition of solid waste for mineral processing wastes, and promulgates treatment standards for contaminated soil subject to the LDRs (63 FR 28556). My office has received a number of questions regarding the dates by which the individual provisions in the rule become effective. The purpose of this memo is to clarify the effective dates for the major provisions of the Phase IV rule. It is supplemental to the final rule preamble at page 28556 ("Effective Dates") and pages 28634-5 ("State Authority"). I invite you to share this information with enforcement personnel, members of the public, and other interested parties.

The Phase IV rule presents an unusually complex set of effective date considerations because portions of the rule are promulgated under the authority of the Hazardous and Solid Waste Amendments of 1984 (HSWA) and some are not, and because some of the provisions of the rule are more stringent than current Federal regulations and some are not. To assist the public's understanding of how these factors come into play and to be precise about when various parts of the Phase IV final rule become effective, I have attached four items to this memorandum. These attachments are:

(1) A matrix showing the various types of wastes covered by the Phase IV rule and when and how they are regulated in States at different stages of RCRA authorization;

(2) A matrix showing the different parts of the Phase IV rule and when and how they are effective in States at different stages of RCRA authorization; and

(3) A general discussion of considerations that come into play in determining the effective

dates of RCRA rules. These involve not only the normal practice of EPA regarding the effective dates of regulations we adopt, but also consideration of whether: (1) a regulation is promulgated under the HSWA; (2) a regulation is new or modifies previous regulations that may or may not have already been adopted by a State and for which the State has (or has not yet) been authorized; and (3) a regulation is more or less stringent than any preceding regulation it may modify; and

(4) A copy of an OSW memorandum dated December 19, 1994 explaining one circumstance in which EPA will not override authorized State treatment standards.

Please note that the first two documents contain essentially the same information, but are organized quite differently so that audiences with different types of questions can use whichever document better suits their needs. The third attachment is a more general background discussion, with some examples from the Phase IV rule used to illustrate various scenarios. Attachment Four is referenced in the other attachments.

On a related, but separate matter, I would like to highlight a separate point of confusion in the "effective dates" section of the Phase IV rule at 63 FR 28556. The word "except" was inadvertently omitted in the first line. EPA plans to correct this point of confusion in an upcoming Federal Register technical correction to the Phase IV rule. For your information, the section should have read as follows, with the missing word shown in italics:

"EFFECTIVE DATES: This final rule is effective on August 24, 1998 *except:*

- Prohibition on underground injection of certain wastes at 40 CFR Section 148.18, which is effective May 26, 2000;
- Definition of solid waste provisions at Section 261.2, 261.4(a)(15), and 261.4(b), which are effective November 27, 1998;
- Exclusion of recycled wood preserving wastewaters at Section 261.4(a)(9), which is effective May 26, 1998;
- Prohibition on land disposal of wastes from elemental phosphorus processing and on mixed radioactive wastes at Section 268.34(b), which are effective May 26, 2000; and
- Land Disposal Restrictions treatment standards at Section 268.49 for soil contaminated with previously prohibited wastes, which are effective on May 26, 1998."

I hope this information will be useful in implementing the Phase IV Rule. If you have questions, please direct them to Sue Slotnick, in the Waste Treatment Branch of the Office of Solid Waste, at (703) 308-8462.

Attachments

ATTACHMENT ONE

Table A: Waste Treatment Requirements by Waste Type and State Authorization Status

DEFINITIONS: 1. "Fed" means the federal Part 268 requirements in the Phase IV final rule apply, including the §268.48 universal treatment standards (UTS) for underlying hazardous constituents (UHCs).
2. "State" means that there is an existing authorized State treatment standard and that the existing State standard applies until the State adopts the Phase IV final rule. (Note: for wastes for which there is no existing State standard, "Fed" applies.)

	Status of State authorization for LDR rules							
WASTE	State not authorized for LDRs	State authorized for LDRs up to but not including the Third Third rule	State authorized for Third Third rule	State authorized for 1993 rule for ignitable and corrosive wastes	State authorized for Phase II	State authorized for Phase III	Material is a haz waste in State's authorized program	Material is not a haz waste in State's authorized program
D004 - D011 TC metal waste	Fed	Fed	Fed	Fed	Fed	Fed	N/A	N/A
Characteristic mineral processing wastes with metal constituents	Fed	N/A	N/A	N/A	N/A	N/A	Fed	State
D001 ignitable and D002 corrosive wastes required to meet 268.48 for metal UHCs.	Fed	Fed	Fed	State	State (the State UTS apply until State adopts Phase IV metal UTS)	State (the State UTS apply until State adopts Phase IV metal UTS)	N/A	N/A
D003 reactive wastes required to meet 268.48 for metal UHCs	Fed	Fed	Fed	State	State	State	N/A	N/A
D012 to D043 required to meet 268.48 for metal UHCs	Fed	Fed	Fed	Fed	State	State	N/A	N/A
Listed wastes with regulated metal constituents	Fed	State	State	State	State	State	N/A	N/A

ATTACHMENT ONE

Table B: Applicability of Soil Treatment Standards

DEFINITIONS: 1. "Fed" means the soil standards in Phase IV are applicable unless the State has a more stringent treatment standard in which case the State standard applies.

2. "State" means an existing State treatment standard applies.

SOIL CONTAMINATED WITH: 1/	State not authorized for LDRs	State authorized for LDRs up to but not including the Third Third rule	State authorized for Third Third rule	State authorized for 1993 rule for ignitable and corrosive wastes	State authorized for Phase II	State authorized for Phase III	Material is a haz waste in State's authorized program	Material is not a haz waste in State's authorized program
D004 - D011	Fed	Fed	State	State	State	State	N/A	N/A
Characteristic mineral processing wastes	Fed	Fed	Fed	Fed	Fed	Fed	Fed	N/A
D001, D002	Fed	Fed	Fed	State	State	State	N/A	N/A
D003	Fed	Fed	Fed	Fed	Fed	State	N/A	N/A
D012 to D043	Fed	Fed	Fed	Fed	State	State	N/A	N/A
Listed wastes	Fed	State	State	State	State	State	N/A	N/A

1/ For all characteristic and listed wastes below, the treatment standards apply to all hazardous constituents subject to treatment, including underlying hazardous constituents. See §268.49 (d).

ATTACHMENT TWO

Table of Effective Dates of Major Phase IV Provisions

Description of provision	*Effective date*	*Effect of State authorization status on effective date*	*40 CFR citation in Phase IV rule*
Land Disposal Restrictions for wastes, soil, and debris exhibiting the Toxicity Characteristic (TC) for metals. This includes both the characteristic metal wastes regulated in the Third Third LDR rule and those not regulated in that rule because they passed the Extraction Procedure (EP) test then in effect. The Phase IV LDRs state that wastes exhibiting the Toxicity Characteristic (TC) for metals are prohibited from land disposal unless they meet LDR treatment standards, and that all underlying hazardous constituents (UHCs) in the waste must meet the new Universal Treatment Standards (UTS).	August 24, 1998	These LDR requirements are HSWA regulations that are more stringent than previous federal requirements, and therefore took effect in all States, regardless of authorization status, as of 90 days after publication of the Phase IV final rule. Even in States authorized for the Phase II LDR rule and thus with authorized UTS for metal constituents, the new concentration levels for metals in the Phase IV rule apply to TC metal and characteristic mineral processing wastes because these wastes have never had UHC requirements before. [Note: the new Phase IV concentration levels for metal constituents will also apply to TC metal wastes *without* underlying hazardous constituents, i.e., to the key metal that makes the waste characteristic. This is true even in States that are authorized for the old (Third Third) treatment standards for EP/TC metal wastes. The reason is that the Phase IV LDRs require meeting UTS standards different than the metal characteristic level.] [For detail on the effect of State authorization on the effective date for soil contaminated with TC metal wastes and mineral processing wastes, see the section concerning soil standards below.]	Prohibition at §268.34; requirement to treat UHCs at §268.40 (e); and treatment standards at §§268.40, 268.48, and 268.49.

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Table of Effective Dates of Major Phase IV Provisions

Description of provision	*Effective date*	*Effect of State authorization status on effective date*	*40 CFR citation in Phase IV rule*
Land Disposal Restrictions for Characteristic mineral processing wastes, soil, and debris (including manufactured gas plant waste).	August 24, 1998	The LDRs are effective in all States, provided the material is a solid waste and a hazardous waste under a State's authorized program. Phase IV treatment standards apply to any characteristic mineral processing wastes, whether ignitable, corrosive, reactive, organic TC, or metal TC. These are newly prohibited in this rule.	Prohibition at §268.34; requirement to treat UHCs at §268.40 (e); and treatment standards at §§268.40, 268.48, and 268.49.

ATTACHMENT TWO

Table of Effective Dates of Major Phase IV Provisions

Description of provision	*Effective date*	*Effect of State authorization status on effective date*	*40 CFR citation in Phase IV rule*
Modified UTS for all metal hazardous constituents in listed and in non-Phase IV characteristic wastes. (Non-Phase IV characteristic wastes are ignitable, corrosive, reactive, and TC wastes *except* the TC metal and characteristic mineral processing wastes.)	August 24, 1998 in unauthorized States. See next column for authorized States.	The effective date depends not only on the State's authorization status, but on the particular waste. 1. In States that are authorized for LDR rules promulgated prior to the Phase II rule (e.g. the Solvents and Dioxins rule, or the Third Third rule) but are not authorized for the Phase II rule, treatment standards are in effect as follows: • For *listed* wastes regulated by a federal rule for which the State is authorized, the existing authorized treatment standards, including the particular constituent concentration levels appearing in the State rules, remain in effect until the State is authorized for the Phase II rule. This is consistent with the December 19, 1994 memo (Attachment Four) which states: "the States authorized for some or all of the LDRs will continue to implement those portions of the program for which they are authorized." • For *listed* wastes regulated by a federal rule but not under an authorized State rule and which contain metal constituents (e.g. newly-listed wastes such as K088), the new Phase IV UTS concentration levels apply. This is because there is no authorized State-established treatment standard for these wastes. • For *non-Phase IV characteristic* wastes containing metal UHCs, the UTS promulgated in the Phase IV rule at 40 CFR 268.48 apply to the UHCs because the State has no authorized requirement to treat UHCs.	§§268.40 and 268.48

ATTACHMENT TWO

Table of Effective Dates of Major Phase IV Provisions

Description of provision	*Effective date*	*Effect of State authorization status on effective date*	*40 CFR citation in Phase IV rule*
Modified UTS, contd.		2. In States that are authorized through the Phase II or Phase III LDR rules and thus have authorized treatment standards for some or all *non-Phase IV characteristic* wastes, the existing State treatment standards remain in effect for such wastes until the States are authorized for Phase IV. This is true for all *listed* and *characteristic* wastes for which the State has an authorized treatment standard, and is consistent with the December 1994 memorandum (Attachment Four). One result is that the numerical UTS level for a metal constituent in a non-Phase IV waste (e.g., D018) may differ from the level for that same constituent in a Phase IV waste (e.g., D008) until Phase IV authorization occurs. [Note: if a waste has multiple waste codes, the more stringent standard applies. 40 CFR 268.40 (c).]	
Conditional exclusion for secondary materials from mineral processing, and other changes to the definition of solid waste for mineral processing materials.	November 27, 1998 in unauthorized States. See next column for authorized States.	Since the definition of solid waste is a non-HSWA provision, the Phase IV changes are effective November 27, 1998 in unauthorized States. In authorized States, the Phase IV changes are not effective until the States adopt and become authorized for them. States are required to become authorized for changes to the status of characteristic by-products and sludges at §261.2 because those changes are more stringent than existing federal regulations. States are not required to become authorized for the change to the status of spent materials at §261.2, because that provision is less stringent.	§261.2, §261.4

ATTACHMENT TWO

Table of Effective Dates of Major Phase IV Provisions

Description of provision	*Effective date*	*Effect of State authorization status on effective date*	*40 CFR citation in Phase IV rule*
Wood preserving wastewater exclusion.	May 26, 1998 in unauthorized States. See next column for authorized States.	Since the provision is deregulatory, EPA used a good cause finding to set a shorter date than the six months usually allowed for compliance. In unauthorized States, the exclusion was effective upon publication of the Phase IV rule. In States that are authorized for the definition of solid waste (50 FR 614, January 4, 1985), the exclusion is not effective until the State adopts it and is authorized for it. However, States are not required to become authorized for the exclusion because it is a less stringent requirement than existing regulations.	§261.4

ATTACHMENT TWO

Table of Effective Dates of Major Phase IV Provisions

Description of provision	*Effective date*	*Effect of State authorization status on effective date*	*40 CFR citation in Phase IV rule*
Soil treatment standards	Prior to adoption by States of the Phase IV soil treatment standards, other LDR standards (including Phase IV) apply. See above sections in this table. The soil treatment standards are effective only for soil: (1) in States not authorized for the LDR program; and (2) in all States if the soil fails the TCLP test for one or more metal constituent (TC metal soil) (3) in all States if the soil is contaminated with a characteristic mineral processing waste See next column.	Because the soil treatment standards are less stringent then existing Federal requirements, they are generally not available in authorized States unless and until the States adopt the standards. To the extent they do not conflict with any independent State land disposal restrictions or treatment requirements, the soil treatment standards are also available in States in which EPA is responsible for implementation of the LDR program as follows: (1) <u>States in which EPA is responsible for implementing the land disposal restriction program in its entirety.</u> In these States, there are no authorized State LDR requirements against which to assess the relative stringency of the soil treatment standards. Therefore, as new HSWA requirements in a non-authorized State, the soil treatment standards are effective and implemented by EPA unless and until the State adopts and becomes authorized for the standards. (2) <u>States that are authorized to implement the LDR program but in which EPA is responsible for implementation of the land disposal restriction treatment standards for certain wastes.</u> Soil treatment standards are available for soil contaminated by the wastes for which EPA is responsible for implementation of land disposal restriction treatment standards, provided the State does not have a treatment standard in State law that is more stringent then the soil treatment standards. For example, for TC metal wastes, EPA is responsible for implementing the LDR treatment standards. Therefore, for TC metal soil, the soil treatment standards are available. However, many States have treatment standards for metals that are more stringent than the soil treatment standards; in this case the more stringent State treatment standards would control in lieu of the federal soil standards.	§268.49

ATTACHMENT TWO

Table of Effective Dates of Major Phase IV Provisions

Description of provision	*Effective date*	*Effect of State authorization status on effective date*	*40 CFR citation in Phase IV rule*
Soil standards, contd.		For example, the soil treatment standard for lead is 90% reduction or 7.5 ppm (whichever is less stringent), but many States have a treatment standard for lead of 5 ppm (which they adopted from the LDR Third Third rule). In this case, the more stringent State treatment standard of 5 ppm would apply to TC characteristic levels of lead in contaminated soil unless and until the State adopted the soil treatment standards. Note, soil contaminated with TC metal wastes must meet LDRs for underlying hazardous constituents in all States. [Note: if a State becomes authorized only for Phase II and not yet for Phase IV, the soil standards for D012 -D043 in Phase IV (i.e., 10 X UTS or 90% reduction) will be superseded at the time of authorization by the Phase II treatment standards, which provide no special standards for contaminated soils.]	

ATTACHMENT THREE: Considerations Bearing Upon the Effective Dates of RCRA Rules

A number of competing considerations come into play in determining the effective dates of RCRA rules. These involve not only the normal practice of EPA regarding the effective dates of regulations we adopt, but also consideration of whether: (1) the regulation is promulgated under the Hazardous and Solid Waste Amendments of 1984 (HSWA); (2) the regulation is new or modifies previous regulations that may or may not have already been adopted by a State and for which the State has (or has not yet) been authorized; and (3) the regulation is more or less stringent than any preceding regulation it may modify. The discussion below should provide you with the general framework for how these factors apply to various scenarios, including those presented in the Phase IV final rule, 63 FR 28556 (May 26, 1998). More specific guidance on the effective dates of major Phase IV requirements is provided in Attachments One and Two.

Effective dates of RCRA regulations in general

RCRA rules normally take effect six months after they are published, as provided in RCRA section 3010 (b). However, under that provision, EPA may establish a shorter effective date where there is good cause to do so. In addition, other statutory provisions -- among them, the LDR provisions -- mandate particular effective dates.

Effective dates of RCRA regulations in unauthorized States

In the small number of States and territories that are not authorized for any part of the RCRA program, RCRA regulations take effect on the effective date stated in the rule, and are implemented exclusively by EPA. This is true for both non-HSWA and HSWA regulations and for EPA modifications to those regulations, regardless of whether the modification makes the original regulation more or less stringent. A regulation in this category goes into effect on the date specified in the final rule.

More commonly, a State or territory will be authorized for some parts of the RCRA program, but not others. These States are typically referred to as "base-program authorized." In a base-program authorized State, the effective dates of new RCRA regulations are governed primarily by whether the regulation is promulgated under a HSWA or non-HSWA statutory provisions, as discussed below.

Authorized States implement the authorized State RCRA program in lieu of the Federal RCRA program. However, sometimes a base-program authorized State or territory may have adopted a new RCRA regulation but not yet received authorization to implement the regulation. This means the State would implement the State program, including any new RCRA regulations it may have adopted, and, at the same time, EPA would implement any parts of the Federal program for which the State is not yet authorized, subject to two main factors: (1) whether a regulation is promulgated under HSWA or under non-HSWA statutory provisions; and (2) whether a new regulation is more or less stringent than existing regulations. These two factors are discussed below. Generally speaking, however, under RCRA EPA does not preempt more stringent State

requirements so the more stringent of the State or Federal program applies. Thus, modifications to Federal requirements that make the requirements less stringent, such as the soil treatment standards, are not effective in any State that has either adopted or become authorized for more stringent treatment standards (such as the treatment standards in the Third Third LDR rule) unless and until the State adopts the modified regulations.

Effective dates of non-HSWA regulations in authorized States

Non-HSWA regulations are those that implement portions of RCRA enacted prior to the 1984 Hazardous and Solid Waste Amendments (HSWA). If a State is authorized for the RCRA program and EPA promulgates a *new, non-HSWA requirement,* the requirement does *not* become effective in the authorized State at the time specified in the promulgated regulation. Rather, the authorized State must adopt the regulation and receive EPA authorization for the new, non-HSWA regulation before it becomes effective in that State. (RCRA section 3006(b) and 40 CFR 271.3 (b).) Similarly, if a State is already authorized for a non-HSWA regulation and EPA *modifies* the federal counterpart of that regulation, the modification is not effective in that State until the State adopts and becomes authorized for it. An example of a modification to a non-HSWA requirement is the Phase IV change to the definition of solid waste for mineral processing wastes.

States are required to adopt and become authorized for modifications to non-HSWA requirements that make the regulations more stringent. Therefore, all modifications that make the federal program *more stringent* will eventually become effective in all States. However, if a modification makes the federal regulation *less stringent* than the existing authorized State regulation, the State is not required to change its program. (RCRA section 3009) An example of a less stringent modification to a non-HSWA requirement is the new Phase IV exclusion from RCRA for recycled wastewaters from wood preserving.

Effective dates of HSWA regulations in authorized States

In contrast to the case of non-HSWA regulations, when EPA promulgates a *new HSWA requirement* (such as new LDR treatment standards for a waste that had none before), the new HSWA requirement takes effect in all States on the effective date stated in the rule, and is implemented exclusively by EPA until States become authorized for it. (RCRA section 3006 (g)). Also in contrast to the case of non-HSWA regulations, when EPA *modifies* a HSWA regulation to make it *more stringent*, the modification goes into effect on the effective date stated in the rule (and under EPA implementation) *regardless of the State's authorized status or program.* An example is the part of the Phase IV rule requiring that underlying hazardous constituents meet LDRs in a characteristic waste for which a treatment standard already exists. But, as with modifications to non-HSWA regulations, if the HSWA modification is *less stringent* than a State's authorized program, an authorized State may choose not to adopt the federal change and EPA will not implement the less stringent federal regulation in that State.

Effective dates of LDR regulations

As noted above, the RCRA statute provides for particular effective dates for some types of EPA regulations. One such provision is RCRA section 3004 (h) (1), which states that Land Disposal Restriction prohibitions and treatment standards ordinarily are to take effect immediately, or at the first time (not to exceed two years) that treatment capacity is available. EPA has typically made LDR prohibitions and treatment standards effective within 90 days of promulgation, the 90 days serving as a period during which administrative arrangements for treatment are finalized, i.e., the period it takes for treatment capacity to become available as a practical matter.

Special case of effective dates when EPA changes LDR treatment standard levels --the EPA Guidance Memorandum of December 19, 1994

Shortly after EPA promulgated the Universal Treatment Standards (UTS) in the Phase II LDR rule, the Agency issued a guidance memorandum dated December 19, 1994 stating that when EPA changes only numerical treatment standard levels, the changes can be regarded as neither more nor less stringent for State authorization purposes (Attachment 4). For States authorized for the Phase II rule, the memorandum indicates that an existing authorized State treatment standard will continue to apply unless and until a State chooses to adopt the new federal LDR numerical standard . (Of course, the 1994 guidance memorandum has no application in unauthorized States.)

Application of the December 1994 Guidance Memorandum to the Phase IV final rule

The situation just described, in which EPA changes the numerical treatment standard levels for wastes with existing State-authorized treatment standards, is in contrast to the case in which EPA establishes, for a class of wastes, an entire set of new Land Disposal Restrictions that goes beyond mere changes in required constituent concentration levels. The Phase IV rule presents both situations and therefore some additional explanation is needed for how the approach in the 1994 memorandum applies to Phase IV.

For the TC metal and characteristic mineral processing wastes ("Phase IV wastes"), EPA promulgated a new set of LDRs including new prohibitions for some of the wastes (a subset of the TC metal wastes were already prohibited in the Third Third LDR rule), a new requirement that underlying hazardous constituents meet UTS for all wastes in the set, and revised UTS for metal hazardous constituents. EPA views these regulations, which are essentially inseparable, as an entire set of new and more stringent LDRs for the purposes of determining State authorization requirements and effective dates. Therefore, this set of more stringent, HSWA LDR regulations apply in all States 90 days after publication of Phase IV and are implemented by EPA until States become authorized. The other situation, the one in which only the numerical levels change, occurs in Phase IV as well because EPA modified the UTS for metal constituents in all wastes, based on new data. Some of those wastes, of course, have existing authorized treatment standards, for example, D018 through D043 organic TC wastes with underlying hazardous metal constituents in States authorized for the Phase II LDR rule, plus metal constituents in listed wastes. Therefore, under the approach taken in the 1994 memorandum, the Phase IV

modifications to UTS for metal constituents in "non-Phase IV wastes" are considered neither more nor less stringent for State authorization purposes and are not effective until a State adopts and is authorized for them. The affected "non-Phase IV wastes" are listed and characteristic metal-bearing wastes, excluding TC metal and characteristic mineral processing wastes, that have numerical treatment standards.

Phase IV soil treatment standards

Like all LDR treatment standards, the soil treatment standards are promulgated pursuant to HSWA. Therefore, the rules for effective dates for HSWA regulations apply but have limited impact because the soil treatment standards are generally less stringent than the treatment standards for pure hazardous wastes, which currently apply to contaminated soil. Because the soil treatment standards are generally less stringent than current Federal requirements, they will not go into effect in authorized States until the States adopt and become authorized for them -- even though the soil treatment standards are promulgated pursuant to HSWA.

More specifically, if a State is authorized to implement the LDR treatment standards for any given waste or constituent, and that waste or constituent is contained in contaminated soil that is subject to LDRs, the more stringent treatment standard for the pure waste or constituent continues to apply to contaminated soil until the State adopts and becomes authorized for the soil treatment standards. Similarly, if a State has adopted, under State law, an LDR treatment standard for any given waste or constituent but has not yet received authorization for the requirement, and that waste or constituent is contained in contaminated soil that is subject to LDRs, the more stringent State requirement continues to apply until the State adopts, under State law, the soil treatment standards. This occurs because, under RCRA, EPA does not preempt more stringent State requirements, whether or not those State requirements are authorized.

Despite this convention, if a State were, through implementation of State waiver authorities or other State laws, to allow compliance with the soil treatment standards in advance of adoption or authorization, EPA would not generally consider such application of the soil treatment standards a concern for purposes of enforcement or State authorization. Thus, by using State law to waive authorized or non-authorized State requirements, a State can allow immediate implementation of the soil treatment standards without jeopardizing their RCRA authorization. (This is similar to the approach the Agency took in promulgation of the corrective action management unit rule. See 58 FR 8677, February 16, 1993.)

ATTACHMENT FOUR

December 19, 1994

MEMORANDUM

SUBJECT: Universal Treatment Standards Authorization Implications

FROM: Michael Shapiro, Director /S/
Office of Solid Waste (5301)

TO: Waste Management Division Directions
Regions I - X

The purpose of this memorandum is to clarify State implementation of the Universal Treatment Standards (UTS) promulgated as part of the Phase II Land Disposal Restrictions (LDR) rule (September 19, 1994, 59 FR 47980).

As described in the Phase II LDR final rule, UTS will simplify the LDR program by establishing one set of concentration based treatment standards for each hazardous constituent, regardless of the restricted waste the constituent is a component of. This is in contrast to the previous system where treatment levels for a particular constituent could vary between different restricted wastes. EPA believes that the simplification provided by the UTS will greatly assist compliance with and enforcement of the LDR program.

The UTS are promulgated pursuant to HSWA authority, and traditionally more stringent HSWA standards are immediately effective in authorized States. In most cases, the UTS limits are the same as the previous treatment standards, while about forty percent of the standards either went up or down. In reviewing the treatment standards, we concluded that a numerical comparison exaggerates the degree of change. In particular, the differences in numerical values for many of the organic constituents actually reflect adjustments in the limits of analytical detection. Thus, actual treatment will likely continue to destroy or remove organic to nondetectable levels. Even in those cases where the numerical limits have actually changed, the technology basis has not. Therefore, the changes to the treatment standards should not be viewed as more or less stringent.

As a result, EPA has decided not to implement the UTS separately for those wastes for which the state has received LDR

authorization. Under this approach, the States authorized for some or all of the LDRs will continue to implement those portions of the program for which they are authorized, whether or not they have adopted the new standards, and, in EPA's view, the regulated industry will be subject to the state standards, regardless of whether they differ from the new UTS. EPA strongly urges states to implement the new UTS standards as quickly as possible, both for simplicity of implementation and national consistency. But, state law (as interpreted by the state) would determine which standards applied. This approach would avoid the dual regulatory problem which would occur during the time before new HSWA requirements are adopted and authorized in the State.

EPA proposed a similar approach to state adoption of HSWA rules in the Subpart S rule (55 FR 30860), and did not receive any negative comments. EPA believes that Congress did not intend for the authorized State program's authority to return, in part, to EPA every time EPA promulgates modifications to HSWA program requirements. At the same time, however, this memo is not relinquishing EPA's statutory responsibility to implement significant new HSWA rules in States as soon as the rules become effective. Thus, this new approach will be reserved only for areas of the hazardous waste program already authorized and regulated by the state, not new areas of HSWA regulations. For example, the September 19, 1994 Phase II rule established treatment standards for several newly listed wastes; these new requirements are immediately effective in all the States and will be enforced by EPA.

The authorization approach discussed in this memo will be available only when changes to the treatment standard occur to existing HSWA programs in States authorized for those programs. As we develop rules in the future, we will address issues of applicability of the new approach in the preamble.

EPA has a strong interest in uniformity and consistency of regulations and believes that the improvements in the UTS meet these objectives. Thus, please encourage the States in your Region to adopt and apply for authorization of the Phase II rule. States that are currently authorized for portions of the LDRs may submit an abbreviated authorization revision application to the Region for the UTS. This application should consist of a letter from the State to the appropriate Regional office, certifying that it has adopted treatment standards equivalent to the UTS for those restricted wastes which are a part of the State's authorized LDR program. The State should also submit a copy of its final rule or other authorizing authority. A revised Program Description, Memorandum of Agreement and Attorney General's statement is not necessary because the only change the State would be making is to the treatment standards it is already authorized for. We expect the Regions will be able to act

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federal register

Tuesday
May 26, 1998

Part II

Environmental Protection Agency

40 CFR Parts 148, 261, 266, 268, and 271
Land Disposal Restrictions Phase IV: Final Rule Promulgating Treatment Standards for Metal Wastes and Mineral Processing Wastes; Mineral Processing Secondary Materials and Bevill Exclusion Issues; Treatment Standards for Hazardous Soils, and Exclusion of Recycled Wood Preserving Wastewaters; Final Rule

other reactions generating titanium gases. This reaction alone would classify the process as mineral processing since the ore and titanium gas are clearly physically and chemically dissimilar from that point on in the process. The Agency stated in 1989 that once mineral processing began, all wastes generated after that point would be classified as mineral processing wastes, even those wastes which are similar to those generated in beneficiation.

Thus, all wastes associated with the chloride-ilmenite production of titanium tetrachloride are mineral processing wastes. They are neither high volume nor low toxicity and therefore are not eligible for the Bevill exemption.

VII. LDR Treatment Standards for Soil

This section discusses final regulations establishing land disposal treatment standards specific to contaminated soil. Contaminated soil is subject to the land disposal restrictions, generally, when it contains a listed hazardous waste or when it exhibits a characteristic of hazardous waste. (Throughout this discussion, the specific term "hazardous contaminated soil" refers to soil which contains a listed hazardous waste or exhibits a characteristic of hazardous waste; the more general term "contaminated soil" refers to both hazardous contaminated soil and other soils—such as decharacterized soil—which may be subject to the land disposal restrictions.) Prior to today's rule, contaminated soil subject to LDRs was subject to the same land disposal restriction treatment standards that apply to industrial hazardous waste: soil contaminated by listed hazardous waste was subject to the standards that apply to those listed wastes and soil that exhibited a characteristic of hazardous waste was subject to the same standards that apply to the characteristic waste. Today's final rule establishes a new treatability group—contaminated soils—and establishes land disposal restriction treatment standards specifically tailored to that treatability group. Although EPA believes generators of contaminated soil will typically choose to comply with the new soil treatment standards promulgated today, under today's final rule, they have the option of complying either with the existing treatment standards for industrial hazardous waste (i.e., the universal treatment standards) or the soil treatment standards. This is consistent with the approach the Agency took in promulgating LDR treatment standards for hazardous contaminated debris. 57 FR 37221, August 18, 1992.

EPA first proposed tailored land disposal restriction treatment standards for contaminated soil in September 1993. 59 FR 48122—48131 (September 14, 1993). In the September 1993 proposal, EPA requested comment on three soil treatment standard options. These three options involved various combinations of percent reduction requirements for hazardous constituents (typically ninety percent—90%) and multipliers of the universal treatment standards (typically ten times the UTS—10 x UTS). In response to comment on the September 1993 proposal, EPA deferred a final decision on soil treatment standards to the Agency's broader evaluation of application of RCRA requirements to remediation wastes, the Hazardous Waste Identification Rule for Contaminated Media, or HWIR-Media.

On April 29, 1996, as part of the HWIR-Media proposal, EPA again proposed tailored land disposal restriction treatment standards for contaminated soils. 61 FR at 11804 (April 29, 1996). In the April 29, 1996 proposal, soil-specific treatment standards would have required reduction in concentrations of hazardous constituents by 90% with treatment for any given constituent capped at ten times the universal treatment standard. *Id.* This is commonly referred to as "90% capped at 10 times UTS."

In 1995, 1996 and 1997, EPA proposed new land disposal restriction treatment standards for waste identified as hazardous because of metal content and for mineral processing wastes. 60 FR 43654 (August 22, 1995) for metal wastes; 61 FR 2338 (January 25, 1996) for mineral processing wastes; and, 62 FR 26041 (May 12, 1997) supplemental proposal for both types of waste. In these proposals, soil contaminated with metal or mineral processing waste would have been subject to the new treatment standards for those wastes. This was consistent with the way EPA had historically addressed contaminated soil and, at the time, considered proper given that the proposals to establish soil-specific treatment standards were not yet resolved.

EPA did not reopen the issue of whether LDRs apply to contaminated soil or whether it is appropriate to require that contaminated soil achieve the same LDR treatment standards as the contaminating waste (soil contaminated by listed waste) or the characteristic property (soil that exhibits a characteristic of hazardous waste) in the August 22, 1995, January 25, 1996, or May 12, 1997 proposals. Commenters, nonetheless, strongly opposed application of the new LDR treatment standards for metal and mineral processing wastes to soil contaminate, with those materials. At about the same time, EPA decided to go forward with the soil-specific LDR treatment standards proposed in April 1996. Therefore, the Agency is promulgating the land disposal restriction treatment standards tailored to contaminated soils proposed on April 29, 1996 (i.e., 90% capped at 10xUTS) today, with the new LDR treatment standards for metal and mineral processing wastes. The soil-specific treatment standards promulgated today may be applied to any contaminated soil that is restricted from land disposal, including but not limited to soil contaminated by metal and mineral processing wastes.

The land disposal restriction treatment standards for contaminated soil promulgated today differ from the standards proposed on April 29, 1996 in three major ways. First, the Agency proposed that the soil treatment standards would be available only for contaminated soil that was managed under an approved cleanup plan (termed a remediation waste management plan, or RMP). In today's final rule, the Agency is making the soil treatment standards available for all contaminated soil that is restricted from land disposal. Second, the Agency proposed that, for soil contaminated by listed hazardous waste, treatment would be required only for the hazardous constituents that originated from the contaminating listed hazardous waste. When the soil treatment standards are used, today's final rule requires all hazardous contaminated soil, including soil contaminated by listed hazardous waste, to be treated for each underlying hazardous constituent reasonably expected to be present when such constituents are initially found at concentrations greater than ten times the universal treatment standard. Third, in response to comments asserting that the proposed regulations governing the applicability of LDRs to contaminated soils were difficult to understand, the Agency has reformatted these regulations into an easier-to-read table. These changes, as well as other significant issues associated with the soil treatment standards and responses to comments, are discussed below.

Today's promulgation of land disposal restriction treatment standards specific to contaminated soil is largely based on the April 29, 1996 proposal (62 FR at 18804–18818). It also relies on the Agency's first effort to establish soil-specific treatment standards, the LDR Phase II proposal (58 FR 48092, September 14, 1993). Today's action

resolves the portions of the April 29, 1996 and September 14, 1993 proposals that address land disposal restriction treatment standards for contaminated soil. However, other elements of the April 29, 1996 proposal remain open and will be acted on in a future rulemaking. Responses to comments submitted on the soil treatment standards proposals are included in the Soil Treatment Standards Response to Comments Background Document, available in the docket for today's action.

A. Application of Land Disposal Restriction Treatment Standards to Contaminated Soil and Justification for Soil Specific LDRs

Prior to today's rule, soil that contained listed hazardous waste or exhibited a characteristic of hazardous waste were prohibited from land disposal unless they had been treated to meet the treatment standards promulgated for pure industrial hazardous waste. This means the same treatment standards which apply to a pure, industrial hazardous waste were also applied to contaminated soil. 61 FR at 18804 (April 29, 1996) and other sources cited therein. In most cases then, contaminated soils were subject to the treatment standards listed in 40 CFR 268.40, and the associated treatment standards in 40 CFR 268.48(a) table Universal Treatment Standards (UTS).[14]

As EPA has discussed many times, the treatment standards developed for pure, industrial hazardous waste may be unachievable in contaminated soil or may be inappropriate for contaminated soil due to particularities associated with the soil matrix and the remediation context under which most contaminated soil is managed, as discussed below. For that reason, EPA is promulgating today's LDR treatment standards specifically tailored to contaminated soil and to the remedial context.

With respect to the soil matrix, the treatment standards developed for pure hazardous waste (i.e., the universal treatment standards) are generally either technically unachievable or technically or environmentally inappropriate. For metal constituents, the UTS may not be achievable in contaminated soil even using model technologies such as stabilization or high temperature metal recovery. Stabilization technologies are sensitive to soil characteristics such as the presence of oxidizing agents and hydrated salts, the distribution of soil particle size and the concentrations of sulfate and chloride compounds. Various combinations of soil characteristics can impair the effectiveness or rate of reaction in stabilization technologies. For example, insoluble materials, such as materials that will pass through a number 200 mesh sieve, can delay setting and curing during stabilization, or small soil particles can coat larger soil particles weakening bonds between particles and cement or other reagents. High temperature metal recovery technologies may not be appropriate for some contaminated soil given the low concentrations of metals that might be present in the soil. In addition, clay and silt content in some soil matrices may add undesired impurities to the metal concentrates or alloys that are formed during high temperature metal recovery.

Although EPA has data showing that some soils can be treated to the existing universal treatment standards for metals using stabilization[15] and high temperature metals recovery, the Agency continues to believe that tailored soil treatment standards are appropriate for metal contaminated soil to ensure that the wide variety of soils can be effectively treated to meet the treatment standards. In addition, the soil treatment standards will have the added environmental benefit of encouraging greater use of innovative soil treatment technologies such as soil or enhanced soil (acid) washing. See, Proposed BDAT Background Document for Hazardous Soils, August 1993; Technical Resource Document: Solidification/Stabilization and its Application to Waste Materials, EPA/530/R-93/012, June 1993; and, Technology Screening Guide for Treatment of CERCLA Soils and Sludges, EPA 540/2-88/004, September 1988.

For soil contaminated with organic constituents, EPA has noted many times that, notwithstanding the fact that such soils can be treated by combustion to meet the universal treatment standards, it is generally unsuitable or impractical from a technical standpoint to combust large volumes of mildly contaminated soil. See, for example, 55 FR at 8760 and 8761 (March 8, 1990) and 61 FR 18806-18808 (April 29, 1996). In addition, the Agency has documented potential difficulties that may arise from the combustion of soil due to soil/contaminant characteristics that affect incineration performance such as the concentrations of volatile metals, the presence of alkali salts, fine particles of soils such as clays and silts, and the ash fusion point of the contaminating waste. For example, operation of an incinerator at or near the waste ash fusion temperature can cause melting and agglomeration of inorganic salts; the loading of clays and silts in some soils may also result in high loadings of particulate matter in flue gases. Proposed BDAT Background Document for Hazardous Soils, August 1993 and Technology Screening Guide for Treatment of CERCLA Soils and Sludges, EPA 540/2-88/004, September 1988.

With respect to the remedial context, EPA, the states, and the regulated and environmental communities have long recognized that application of the LDR treatment standards developed for pure, industrial hazardous waste to contaminated soil can be counterproductive. See, for example, "Hazardous Waste: Remediation Waste Requirements Can Increase the Time and Cost of Cleanups" U.S. General Accounting Office, GAO/RCED-98-4, October 1997. Application of LDRs developed for pure, industrial hazardous waste to contaminated soil often presents remediation project managers with only two choices: pursue a legal option of capping or treating hazardous contaminated soil in place thereby avoiding a duty to comply with LDRs, or excavate the soil and treat it to the full extent of best demonstrated available technology, usually, for organic constituents, incineration. EPA has found that this situation often creates an incentive to select remedies that minimize application of LDRs (e.g., remedies that involve capping or leaving untreated soil in place) a result obviously not contemplated by Congress in enacting the LDR program.[16] 62 FR at pages 64505-64506 (Dec. 5, 1997) and 61 FR at 18808 (April 29, 1996) and other sources cited therein.

Because of the differences between the remedial context (responding to wastes which have already been released to the environment) and

[14] The exception is when waste contaminating soil is subject to a specified treatment method; in that case, the contaminated soil would also be subject to the specified treatment method.

[15] These soil treatment data have been claimed as confidential business information.

[16] As discussed in the April 29, 1996 proposal, EPA has, in the past, justified the existing treatment standards, in part, because they create an incentive to generate less of the affected waste in the first instance. See, Steel Manufacturers Association v. EPA, 27 F.3d 642, 649 (D.C. Cir. 1994). In the remedial context, the waste is already in existence; therefore waste minimization is not an issue. Thus, application of the current LDR treatment standards to remediation waste can have the perverse effect of creating an incentive to avoid "generating" waste by leaving it in the ground. The Agency believes that the goals of remediation are better served by more aggressive remedial approaches, such as excavation and management (including some degree of treatment) of remediation wastes, that generally result in more permanent remedies. Such approaches should, therefore, be encouraged.

regulation of wastes generated by on-going industrial process (preventing wastes from being released into the environment in the first instance), EPA has rejected the conclusion that treatment standards for soil must be based upon the performance of the "best" demonstrated available treatment technology in the way the Agency has historically interpreted these terms. Instead, the Agency has chosen to develop soil treatment standards that can be achieved using a variety of treatment technologies which achieve substantial reductions in concentration or mobility of hazardous constituents and, because they are generally used to treat contaminated soils in remedial settings, do not present site managers with the type of dilemma described above. As EPA has long maintained, the strong policy considerations that argue for using the traditional BDAT analysis as the basis for LDR treatment standards for hazardous wastes generated by on-going industrial operations do not apply when evaluating BDAT in the remedial context. In the remedial context, for example, waste minimization is not an issue and the additional increment of treatment necessary to achieve traditional BDAT may yield little if any environmental benefit over other treatment options that adequately protect human health and the environment. 54 FR 41568 (October 19, 1989). Indeed there is a legitimate question as to whether a technology whose use results in foregoing other substantial environmental benefits (such as more aggressive, permanent remedies) can be considered a "best" technology. *Portland Cement Association* v. *Ruckelshaus*, 486 F. 2d 375, 385–86 at n. 42 (D.C. Cir. 1973); Essex Chemical Corp. v. Ruckelshaus, 486 F. 2d 427, 439 (D.C. Cir. 1973). This issue was discussed fully in the April 29, 1996 proposal and in a number of other EPA documents, see, for example, 54 FR 41568 (October 19, 1989) and 61 FR at 18808 (April 29, 1996) and other sources cited therein.

The soil treatment standards promulgated today will significantly improve management of contaminated soil and remediations that involve contaminated soil. However, the Agency emphasizes that today's rule does not resolve the larger, more fundamental issues associated with application of RCRA Subtitle C to remediation generally. The Agency maintains that additional reform is needed to address, more fundamentally, the application of certain RCRA subtitle C requirements to all remediation wastes, including contaminated soil. The Agency will continue to participate in discussions of potential legislation to promote this additional needed reform. If legislation is not forthcoming, the Agency may reexamine its approach to remediation waste management, including the soil treatment standards.

B. Detailed Analysis of Soil Treatment Standards

All land disposal restriction treatment standards must satisfy the requirements of RCRA section 3004(m) by specifying levels or methods of treatment that "substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from that waste so that short-term and long-term threats to human health and the environment are minimized." As EPA has discussed many times, the RCRA Section 3004(m) requirements may be satisfied by technology-based standards or risk-based standards. This conclusion was upheld in Hazardous Waste Treatment Council v. EPA, 886 F.2d 355, 362–64 (D.C. Cir. 1989), where technology-based LDR treatment standards were upheld as a permissible means of implementing RCRA Section 3004(m) provided they did not require treatment beyond the point at which threats to human health and the environment are minimized. Today's treatment standards for contaminated soils are primarily technology-based; however, a variance from the technology-based standards is allowed when EPA or an authorized state makes a site-specific determination that threats posed by land disposal of any given volume of contaminated soil are minimized at higher concentrations.

1. Technology Basis for Soil Treatment Standards

The land disposal restriction treatment standards for soil require that concentrations of hazardous constituents subject to treatment be reduced by ninety percent (90%) with treatment for any given constituent capped at ten times the universal treatment standard (10 X UTS). In other words, if treatment of a given constituent to meet the 90% reduction standard would reduce constituent concentrations to less than 10 X UTS, treatment to concentrations less than 10 X UTS is not required. This is commonly referred to as "90% capped by 10xUTS."

As first discussed in the September 14, 1993 proposal, the Agency has not used the statistical methods historically used in the land disposal restriction program to establish the soil treatment standards. In the past, the Agency has typically evaluated treatability data to identify the "most difficult to treat" waste and established treatment standards based on a statistical analysis of data from the best demonstrated available treatment technology for that waste. See, for example, 55 FR 26594 and 26605, June 23, 1989. While the existing regulations allow treatment using any technology that will satisfy the treatment standards, the practical impact of that approach is that treatment using the most aggressive treatment technology available (i.e., for organic constituents, destruction of organic constituents based upon the performance of incineration) is often necessary to achieve the treatment standards.

For contaminated soil, the Agency has chosen to establish technology-based soil treatment standards at levels that are achievable using a variety of common remedial technologies which destroy, remove or immobilize substantial amounts of hazardous constituents. 58 FR 48129 (September 14, 1993). The levels chosen—90% reduction capped at 10 X UTS—are within the zone of reasonable levels the Agency could have selected as treatment standards for contaminated soil.

Soil treatability data from EPA's Soil Treatment Database indicate that the soil treatment standards are achievable and that the Agency has selected a reasonable level of performance for the standard. After screening the Database to eliminate data from tests reflecting poorly designed or operated treatment, tests where EPA believes inappropriate technologies were applied (for example, data from "immobilization" of organic constituents), and other inappropriate data, the Agency was left with 2,541 data pairs representing treatment of eighty hazardous constituents including nine BDAT list metals.[17] EPA then analyzed these data to determine if the soil treatment standards could be reliably achieved using demonstrated soil treatment technologies. Based on this analysis, the Agency concluded that the soil treatment standards can be reliably achieved using a variety of available soil treatment technologies. The Agency concluded that the soil treatment standards can be reliably achieved using: biological treatment, chemical extraction, dechlorination, soil washing, stabilization and thermal desorption. Of course, since soil treatment is generally matrix dependent, the exact treatment technology which

[17] A complete discussion of the Agency's method for screening the Soil Treatment Database can be found in the LDR Phase II proposal (58 FR 48129—48131, September 14, 1993) and the Best Demonstrated Available Technology Background Document for Hazardous Soil (August 1993).

might be applied to any given contaminated soil will depend on the specific properties of the soil and the hazardous constituents of concern. Choices about which soil treatment technology to apply should be informed by appropriate use of bench and pilot scale studies and good engineering judgement. EPA acknowledges that the treatment efficiency necessary to achieve the soil treatment standards will depend on, among other things, the initial concentrations of hazardous constituents in any given volume of contaminated soil. Thus, not all soil treatment technologies will be capable of treating every contaminated soil to meet the standards adopted in this rule. However, the Agency finds that the soil treatment standards typically can be achieved by at least one of the demonstrated technologies, even in the case of hard-to-treat hazardous constituents such as dioxins and furans, polychlorinated biphenyls, and polynuclear aromatics.

Furthermore, the Agency has concluded that it is appropriate to express the soil treatment standards as a treatment performance goal capped by specific treatment levels. More specific standards, for example, a single numerical standard for all soil, could be counterproductive—less often achievable—given the varying combinations of hazardous constituents and soil properties that might be encountered in the field. 58 FR 48130 (September 14, 1993). An express objective of this rule is to increase the range of appropriate treatment alternatives available to achieve the LDR treatment standards in soil to increase the likelihood that more remediations will include treatment as a component of the remedy. This objective could be impeded by adopting single numeric values as treatment standards, since that approach would reduce needed flexibility. The resulting soil treatment standards, while still technology-based, thus depart from EPA's past methodology developed for process wastes in that they are not based exclusively on the application of the most aggressive technology to the most difficult to treat waste and are not expressed as a single numeric value.

Like any land disposal restriction treatment standard, the soil treatment standards may be achieved using any treatment method except treatment methods which involve impermissible dilution (e.g., addition of volume without destroying, removing or immobilizing hazardous constituents or transfer of hazardous constituents from soil to another medium such as air). For organic constituents, the soil treatment standards for volatile organic constituents are based on the performance of biotreatment, chemical extraction, dechlorination, thermal desorption or soil vapor extraction. The standards for semivolatile organic constituents are based on the performance of biotreatment, chemical extraction, dechlorination, soil washing, thermal desorption, or soil vapor extraction. The standards for organochlorine pesticides are based on the performance of biotreatment, dechlorination, hydrolysis, or thermal desorption. The standards for phenoxyacetic acid pesticides are based on the performance of dechlorination. The standards for polychlorinated biphenyls are based on the performance of chemical extraction, dechlorination, or thermal desorption. The standards for dioxins and furans are based on the performance of dechlorination or thermal desorption. EPA does not have specific data in the record on treatment of organophosphorous insecticides. Because they are based on a similar chemical structure, these contaminants, however, are likely as difficult to treat as other polar nonhalogenated organic compounds and are expected to respond to treatment in a manner similar to other polar nonhalogenated phenols, phenyl ethers, and cresols. Therefore, EPA believes that organophosphorous insecticides can be treated using the same technologies as would otherwise be used to treat polar nonhalogenated organics, i.e., biotreatment, chemical extraction, or thermal desorption. For all organic constituents the soil treatment standards are also achievable using combustion. EPA notes also that a number of judicial opinions have upheld EPA's extrapolation of achievability results for technology-based treatment standards based on chemical structure and activity similarity, as has been used here. See, e.g., *Chemical Manufacturers Ass'n* v. *EPA*, 870 F. 2d 177, 248 (5th Cir. 1989) and *National Ass'n of Metal Finishers* v. *EPA*, 719 F. 2d 624, 659 (3d Cir. 1983). For metals, the soil treatment standards are based on the performance of stabilization, and for mercury, chemical extraction. Achievability of the soil treatment standards is discussed, in detail, in section VII.B.8 of today's preamble.

a. Measuring Compliance With the Soil Treatment Standards For hazardous constituents which have a treatment standard measured by total waste analysis (i.e. standards for organic constituents and for cyanide), compliance with the 90% reduction standard should generally be measured using total constituent concentrations. For hazardous constituents which have a treatment standard measured based on concentrations in a TCLP extract (i.e., standards for metals and for carbon disulfide, cyclohexanone and methanol), compliance with the 90% reduction standard should generally be measured in leachate using the toxicity characteristic leaching procedure. The exceptions to these rules would be, for example, if soils contaminated with metal constituents were treated using a technology which removed or destroyed, rather than stabilized, metals. In an example like this, compliance with the 90% reduction standards should generally be measured using total constituent concentrations.

EPA takes this opportunity to clarify that when establishing the concentrations of hazardous constituents in any given volume of contaminated soil from which the 90% reduction will be measured, normal soil characterization techniques and procedures for representative sampling should be used. For example, it is not necessary to measure the 90% reduction from the soil sample with the lowest concentrations of hazardous constituents. EPA will publish additional guidance on establishing and validating 90% reduction levels for contaminated soil in the near future.

Today's rule does not change existing policies or guidance on soil sampling or site characterization. Although soil is often characterized using composite sampling, EPA notes that, consistent with the way the Agency measures compliance with other LDR treatment standards, compliance with the soil treatment standards will be measured and enforced using grab samples. This is appropriate because well-designed and well-operated treatment systems should ensure that soil is uniformly treated.

b. Major Comments A number of commenters expressed concern about the achievability of the soil treatment standards and/or the methodology EPA used to develop the soil treatment standards. These concerns are discussed in Section VII.B.8 of today's preamble and in the response to comments document, available in the docket for today's rulemaking.

2. The Soil Treatment Standards Satisfy RCRA Section 3004(m) Requirements

The technology-based "90% capped by 10 X UTS" treatment standard for contaminated soil is sufficiently stringent to satisfy the core requirement of RCRA Section 3004(m) that short-term and long-term threats to human health and the environment posed by

land disposal are minimized. Technology-based standards provide an objective measure of assurance that hazardous wastes are substantially treated before they are land disposed, thus eliminating the "long-term uncertainties associated with land disposal." Eliminating these uncertainties was a chief Congressional objective in prohibiting land disposal of untreated hazardous wastes. Hazardous Waste Treatment Council v. EPA, 886 F.2d at 361–64. In addition, the extent of treatment required, 90 % reduction capped at treatment to concentrations within an order of magnitude of the UTS, "substantially" reduces mobility or total concentrations of hazardous constituents within the meaning of RCRA Section 3004(m)(1).

EPA has made two changes from proposal which strengthen the soil treatment standards to assure that they minimize threats to human health and the environment. First, the Agency has modified its approach to which hazardous constituents will be subject to treatment. In today's rule, when the soil treatment standards are used, EPA requires treatment for all hazardous constituents reasonably expected to be present in contaminated soil when such constituents are initially found at concentrations greater than ten times the universal treatment standard. This treatment is required both for soil contaminated by listed hazardous waste and soil that exhibits (or exhibited) a characteristic of hazardous waste. Constituents subject to treatment are discussed further in Section VII.B.4 of today's preamble.

To further ensure that contaminated soil treated to comply with the soil treatment standards is safely managed, EPA has included additional restrictions on the use of treated contaminated soil in hazardous waste-derived products that are used in a manner constituting disposal (i.e., when such products will be placed on the land). The restrictions on use of treated contaminated soil in hazardous waste-derived products that are used in a manner constituting disposal are discussed in Section VII.B.5 of today's preamble.

Finally, the Agency reiterates that, in the remediation context, in assessing whether threats posed by land disposal have been minimized, one should appropriately consider the risks posed by leaving previously land disposed waste in place as well as the risks posed by land disposal of waste after it is removed and treated. 62 FR at 64506 (December 5, 1997). For example, if a treatment standard for organic constituents based on performance of incineration typically results in already land disposed materials such as contaminated soils being capped in place rather than more aggressively remediated, threats posed by land disposal of the waste ordinarily would not be minimized. Conversely, a treatment standard that results in substantial treatment followed by secure land disposal can be said to minimize threats, taking into account the totality of threats posed (i.e. including those posed if the soil were left in place untreated). *Id.* The soil treatment standards will ordinarily ensure that contaminated soil is appropriately treated within the meaning of RCRA Section 3004(m), considering both the threats posed by new land disposal of treated soil and the threats posed by on-going land disposal of existing contaminated soil (e.g., if the soil were left in place untreated).

EPA recognizes that some people may be concerned that a situation may arise where the soil treatment standards are at levels that are higher than those that EPA or an authorized state believes should be required for soil cleanup under a cleanup program. The Agency acknowledges that this may occur. The soil treatment standards, like other land disposal restriction treatment standards, are based on the performance of specific treatment technologies. As discussed earlier in today's preamble, technology-based standards have been upheld as a permissible means of implementing RCRA Section 3004(m). Most soil cleanup levels are based not on the performance of specific treatment technologies but on an analysis of risk. For this reason, technology-based treatment standards will sometimes over-and sometimes under-estimate the amount of treatment necessary to achieve site-specific, risk-based goals.

The purpose of the land disposal restriction treatment standards is to ensure that prohibited hazardous wastes are properly pre-treated before disposal (i.e., treated so that short- and long-term threats to human health and the environment posed by land disposal are minimized). As discussed above, the Agency believes the soil treatment standards promulgated today fulfill that mandate for soil that contains prohibited listed hazardous waste or exhibits a characteristic of prohibited hazardous waste. However, technology-based treatment standards are not necessarily appropriate surrogates for site-specific risk-based cleanup levels. In a circumstance where the soil treatment standards result in constituent concentrations that are higher than those determined, on a site-specific basis, to be required for soil cleanup, existing remedial programs such as RCRA Corrective Action, CERCLA and state cleanup programs could be applied to ensure that remedies are adequately protective. These programs already ensure protection of human health and the environment when managing most contaminated soils—i.e., soils that are not subject to the LDRs—and other remediation wastes. Furthermore, as discussed later in today's rule, treated contaminated soil would remain subject to regulation under RCRA Subtitle C unless and until EPA or an authorized state made an affirmative decision that the soil did not contain hazardous waste or, in the case of characteristic soil, no longer exhibited a hazardous characteristic.

3. Variance From the Soil Treatment Standards at Risk-Based Levels

EPA has long indicated that its preference would be to establish a complete set of risk-based land disposal treatment standards at levels that minimize short- and long-term threats to human health and the environment. See, for example, 55 FR at 6641 (Feb. 26, 1990). However, the difficulties involved in establishing risk-based standards on a nationwide basis are formidable due in large part to the wide variety of site-specific physical and chemical compositions encountered in the field and the uncertainties involved in evaluating long-term threats posed by land disposal. *Id.*; 60 FR 66380—66081 (Dec. 21, 1995). For these reasons the Agency has chosen to establish land disposal restriction treatment standards based on the performance of specific treatment technologies. Although technology-based treatment standards are permissible, they may not be established at levels more stringent than those necessary to minimize short and long-term threats to human health and the environment. Hazardous Waste Treatment Council, 886 F. 2d at 362 (land disposal restriction treatment standards may not be established, "beyond the point at which there is not a "threat" to human health or the environment").

While using risk-based approaches to determine when threats are minimized on a national basis has proven extremely difficult, these difficulties will diminish when evaluating risks posed by a specific contaminated soil in a particular remediation setting since, during remediation, one typically has detailed site-specific information on constituents of concern, potential human and environmental receptors, and potential routes of exposure. For this reason, EPA is establishing a site-specific variance from the technology-based soil treatment standards, which

can be used when treatment to concentrations of hazardous constituents greater (i.e., higher) than those specified in the soil treatment standards minimizes short- and long-term threats to human health and the environment. In this way, on a case-by-case basis, risk-based LDR treatment standards approved through a variance process could supersede the technology-based soil treatment standards. This approach was first discussed in the September 14, 1993 proposal, where EPA proposed that determinations that contaminated soil did not or no longer contained hazardous waste could supersede LDR treatment standards, if the "contained-in" level also constituted a "minimized threat" level. It was repeated in the April 29, 1996 proposal where the Agency proposed that, in certain circumstances, variances from land disposal restriction treatment standards could be approved in situations where concentrations higher than the treatment standards minimized threats.[18] 58 FR at 48128 (September 14, 1993) and 61 FR at 18811 and 18812 (April 29, 1996).

At this time, EPA is allowing the risk-based variances only for contaminated soils. The Agency believes this limitation is appropriate for a number of reasons. First, contaminated soils are most often generated during agency overseen cleanups, such as CERCLA cleanups, RCRA corrective actions or state overseen cleanups. This type of involvement in cleanups positions EPA and authorized states to appropriately consider site-specific, risk-based issues. Second, during remediation, experts and field personnel typically gather detailed site-specific information on risks posed by specific hazardous constituents or combinations of hazardous constituents, potential direct and indirect exposure routes, risk pathways and human and environmental receptors. Through application of this information, overseeing agencies can eliminate many of the long-term uncertainties associated with land disposal and, therefore, make appropriate risk-based decisions regarding the extent of treatment needed to minimize short- and long-term threats to human health and the environment from any given hazardous constituent or combination of hazardous constituents. EPA and state officials already routinely make these types of decisions when developing site-specific, risk-based cleanup levels and when making decisions about whether any given contaminated medium contains hazardous waste.[19] After experience implementing the site-specific minimize threat variance for contaminated soil, the Agency may consider extending it to other environmental media and remediation wastes.

Some commenters expressed concern that allowing site-specific, risk-based minimize threat determinations would abrogate the Agency's responsibilities under RCRA Section 3004(m). The Agency strongly disagrees. RCRA Section 3004(m) requires EPA to establish "levels or methods of treatment, if any, * * *." In the case of contaminated soil, EPA is establishing those levels today based on the performance of available, appropriate soil treatment technologies. Providing a variance process to modify a level or method of treatment on a case-by-case basis reduces the likelihood that in any particular situation technology-based treatment standards will result in treatment beyond the point at which threats are minimized. The Agency is requiring that minimize threat variance determinations for contaminated soils be evaluated using the existing site-specific variance process set out in 40 CFR 268.44(h). EPA recently added language to this provision to clarify that variances cannot be approved without opportunity for public participation, including notice by appropriate means, opportunity for public comment and adequate explanation of an ultimate determination. 62 FR at 64507 (Dec. 5, 1997).

While not required, EPA anticipates that decisions about site-specific minimize threat decisions variances will often be combined with decisions that soil no longer contains hazardous waste. As discussed later in today's preamble, Agency guidance on "contained-in" determinations is essentially the same as the requirements for site-specific, risk-based minimize threat determinations promulgated today. For that reason, EPA believes it will always be appropriate to combine a contained-in determination with a site-specific, risk-based minimize threat variance. In these cases, EPA encourages program implementors and facility owners/operators to include information about the "contained-in" decision in the public notice of the site-specific minimize threat variance. In cases where a site-specific minimize threat variance is combined with a decision that a soil no longer contains hazardous waste, once treated to comply with the treatment standard imposed by the variance, the soil would no longer have any obligations under RCRA Subtitle C and could be managed—including land disposed—without further control under RCRA Subtitle C. The contained-in policy is discussed in more detail in Section VII.B.8 and Section VII.E of today's preamble.

EPA reminds program implementors that, consistent with the rest of the land disposal restriction program, site-specific determinations that threats are minimized cannot be based on the potential safety of land disposal units, or engineered structures such as liners, caps, slurry walls or any other practice occurring after land disposal. American Petroleum Inst. v. EPA, 906 F.2d 729, 735–36 (D.C. Cir. 1990) (land treatment cannot be considered in determining whether threats posed by land disposal have been minimized because land treatment is a type of land disposal and section 3004(m) requires that threats be minimized before land disposal occurs); see also S. Rep. No. 284, 98th Cong. 1st sess. at 15, stating that engineered barriers cannot be considered in assessing no-migration variances because "[a]rtificial barriers do not provide the assurances necessary to meet the standard." This means that site-specific minimize threat determinations must be based on the inherent threats any given contaminated soil would pose. The Agency recognizes that this will have the effect of precluding site-specific minimize threat variances for remedies that rely, even in part, on capping, containment or other physical or institutional controls. In

[18] In the April 29, 1996 proposal, the Agency proposed to limit variances based on a site-specific minimize threat determination to contaminated soils where all concentrations of hazardous constituents were below a "bright line," that is, below a certain risk level. The Agency also requested comment on extending site-specific minimize threat variances to other contaminated soils. Based on further consideration and consideration of comments, the Agency is persuaded that a site-specific minimize threat variance should be available to all contaminated soils. The Agency believes this is proper because the outcome of a site-specific, risk-based minimize threat variance—alternative, site-specific LDR treatment standards based on risk—will be the same regardless of the initial concentrations of hazardous constituents. In any case, the Agency is not, at this time, taking action on the portion of the April 29, 1996 proposal that would have established a "bright line" to distinguish between higher- and lower-risk media. If, in the future, the Agency takes action to establish a bright line, it will address the relationship of a bright line to site-specific minimize threat variances.

[19] While not forbidden, the Agency believes that site-specific, risk-based minimize threat determinations will rarely be made in the context of an independent or voluntary cleanup action, since, in these types of actions, an overseeing Agency will not, typically, have been involved in the identification exposure pathways and receptors of concern or the calculation of site-specific, risk-based cleanup levels. Of course, generators could apply for a site-specific, risk-based minimize threat variance during an independent or voluntary cleanup and, provided EPA or an authorized state agreed that the proposed alternative treatment standards minimized threats considering appropriate exposure pathways and receptors, a variance could be approved.

addition to being compelled by the statute, the Agency believes this approach is proper, in that it may encourage remedy choices that rely more predominantly on treatment to permanently and significantly reduce the concentrations (or mobility) of hazardous constituents in contaminated soil. The Agency has a strong and longstanding preference for these types of more permanent remedial approaches.

In addition, at a minimum, alternative land disposal restriction treatment standards established through site specific, risk-based minimize threat variances should be within the range of values the Agency generally finds acceptable for risk-based cleanup levels. That is, for carcinogens, alternative treatment standards should ensure constituent concentrations that result in the total excess risk from any medium to an individual exposed over a lifetime generally falling within a range from 10^{-4} to 10^{-6}, using 10^{-6} as a point of departure and with a preference, all things being equal, for achieving the more protective end of the risk range. For non-carcinogenic effects, alternative treatment standards should ensure constituent concentrations that an individual could be exposed to on a daily basis without appreciable risk of deleterious effect during a lifetime; in general, the hazard index should not exceed one (1). Constituent concentrations that achieve these levels should be calculated based on a reasonable maximum exposure scenario—that is, based on an analysis of both the current and reasonably expected future land uses, with exposure parameters chosen based on a reasonable assessment of the maximum exposure that might occur. The Agency believes these represent an appropriate range of minimum values for site-specific, risk-based minimize threat determinations because sites cleaned up to these levels are typically released from regulatory control under the Federal CERCLA program and the RCRA corrective action program. See, for example, the National Contingency Plan (55 FR 8666, March 8, 1990) the 1990 RCRA Corrective Action Subpart S Proposal (55 FR 30798, July 27, 1990), and the 1996 RCRA Corrective Action Subpart S ANPR (61 FR 19432, May 1, 1996). In addition to achieving protection of human health, alternative treatment standards must ensure that environmental receptors are protected and must also ensure that no unacceptable transfer of contamination from one medium to another, for example, from soil to ground water, will occur.[20] Protection of environmental receptors and against cross-media contamination may, in some cases, require more stringent (i.e., lower) alternative treatment standards than would be necessary to protect human health alone. The Agency recognizes that this approach is different from the approach used in developing national risk-based minimize threat levels proposed in the Hazardous Waste Identification Rule (HWIR-Waste). 60 FR 66344 (December 21, 1995). This difference is proper, in that the HWIR-Waste proposal contemplated nationally-applicable risk-based LDR treatment standards and, therefore, had to consider the myriad of potential exposure pathways and receptors which might occur at any given site, nation wide. A site-specific minimize threat determination is informed by actual and reasonable potential exposure pathways and receptors at a specific land disposal location.

Although not expressly limited to land disposal of contaminated soil on-site, EPA anticipates that site-specific minimize threat variances will, most often, be applied to these activities. The basis for developing an alternative land disposal restriction treatment standard during the site-specific minimize threat variance is application of risk information about specific exposure pathways and receptors of concern. To apply such a variance to off-site land disposal, the treatment standard would have to be informed by the exposure pathways and receptors present at the off-site land disposal areas (assuming no physical or engineered structures or other post-land-disposal controls). While such an analysis is allowed, this information is not, to the Agency's knowledge, routinely gathered during site remediation.

Most commenters supported the concept of using a treatment variance to reduce the likelihood that, in any particular case, technology-based soil treatment standards might prompt treatment beyond the point at which threats to human health and the environment are minimized.

One commenter was concerned that establishing a risk-based minimize threat variance without adequate minimum standards would be contrary to law and impossible to oversee. EPA was, in part, persuaded by these comments and has added a requirement that, at a minimum, alternative LDR treatment standards approved through a site-specific minimize threat variance be within the range of acceptable values the Agency typically uses for cleanup decisions, as discussed above. In addition, as discussed above, the Agency has clarified that, unlike some CERCLA or RCRA corrective action remedies, site-specific minimize threat variances may not rely on post-land disposal controls.

4. Constituents Subject to Treatment

For soil contaminated by listed hazardous waste, EPA proposed that treatment would be required for each hazardous constituent originating from the contaminating waste. For soil which exhibits (or exhibited) a characteristic of hazardous waste, EPA proposed that treatment would be required: (1) in the case of TC soil, for the characteristic contaminant; (2) in the case of ignitable, reactive or corrosive soil, for the characteristic property; and, (3) in both cases, for all underlying hazardous constituents. 61 FR at 18809 (April 29, 1996). Under the 1996 proposal, treatment would have been required only when those constituents were initially present at concentrations greater than ten times the universal treatment standard. EPA also requested comment on, among other things, whether, for soil contaminated by listed hazardous waste, treatment should be required for all underlying hazardous constituents present at concentrations above ten times the UTS. Underlying hazardous constituent is defined in 40 CFR 268.2(i) as, "any constituent listed in 40 CFR 268.48 table UTS, except fluoride, sulfides, vanadium, selenium, and zinc, which can reasonably be expected to be present at the point of generation of the hazardous waste, at a concentration above the constituent-specific UTS treatment standards."

Many commenters supported the proposed approach. Some commenters, however, expressed concern that, because contaminated soil often contains numerous hazardous constituents from a variety of sources, limiting treatment of soil contaminated by listed hazardous waste to constituents originating from the contaminating waste might result in soil contaminated with listed waste undergoing less treatment than soil which exhibits (or exhibited) a characteristic of hazardous waste. One commenter also asserted that the proposed approach to constituents subject to treatment was, in the case of soil contaminated by listed hazardous waste, inconsistent with the Chemical Waste opinion. On further consideration, EPA was persuaded that it is prudent to apply the logic of the

[20] Unacceptable cross-media transfer would include, for example, transfer of contaminants from soil to air in excess of applicable air emission standards.

Chemical Waste opinion both to soil contaminated by listed hazardous waste and to soils which exhibit a characteristic of hazardous waste.

As the Agency explained in the 1996 proposal, contaminated soils are potentially contaminated with a wider range of hazardous constituents than most pure hazardous wastes generated by on-going industrial processes—in no small part because contaminated soils generally reflect uncontrolled disposal settings. 58 FR at 48124 (September 14, 1993). Since the Chemical Waste opinion addressed a similar situation (certain characteristic hazardous wastes that might contain a variety of hazardous constituents), the Agency is persuaded that it is prudent to apply the logic of the Chemical Waste opinion to contaminated soil and require treatment of all underlying hazardous constituents. See Chemical Waste Management v. US EPA, 976 F.2d at 16–18 (D.C. Cir 1992). Therefore, when the soil treatment standards are used, today's final rule requires that all contaminated soil subject to the LDRs be treated to achieve the soil treatment standards for each underlying hazardous constituent reasonably expected to be present in the soil when such constituents are initially found at concentrations greater than ten times the universal treatment standard. In addition to treatment of all underlying hazardous constituents as discussed above, as proposed, characteristic soil must also be treated, in the case of TC soil, for the TC constituent and, in the case of ignitable, corrosive, or reactive soil, for the characteristic property.

Although, when the soil treatment standards are used, treatment is now required for each underlying hazardous constituent when such constituents are initially found at concentrations greater than ten times the universal treatment standard, it will not be necessary to monitor soil for the entire list of underlying hazardous constituents. Generators of contaminated soil can reasonably apply knowledge of the likely contaminants present and use that knowledge to select appropriate underlying hazardous constituents, or classes of constituents, for monitoring. This is consistent with the approaches EPA typically takes in remedial programs, where it emphasizes that remediation managers should focus investigations on constituents of concern and with regulations that allow generators to rely on knowledge to determine whether any given solid waste is hazardous. *Cf.* 61 FR at 19444 where EPA encouraged remediation managers to "tailor [facility investigations] to the specific conditions and circumstances at the facility and focus on the units, releases, and exposure pathways of concern."

For nonanalyzable constituents, EPA is promulgating the approach discussed in both the September 14, 1993 and the April 29, 1996 proposals. In situations where contaminated soil contains both analyzable and nonanalyzable organic constituents, treating the analyzable constituents to meet the soil treatment standards is also reasonably expected to provide adequate treatment of the nonanalyzable constituents. In situations where contaminated soil contains only nonanalyzable constituents (i.e., soil contaminated only by nonanalyzable U or P listed wastes), treatment using the specified method for the appropriate U or P listed waste is required. 61 FR at 18810, April 29, 1996. Most commenters supported this approach.

5. Relationship of Soil Treatment Standards to Naturally Occurring Constituents

In the April 29, 1996 proposal EPA requested comment on whether concentrations of naturally occurring constituents should be evaluated when identifying constituents subject to treatment. Commenters who addressed this issue overwhelmingly recommended that, for naturally occurring constituents, EPA cap LDR treatment requirements for soil at natural background concentrations. After considering these comments, EPA was persuaded that treatment to comply with LDRs should not be required if constituent concentrations fall below naturally occurring background concentrations, provided the soil will continue to be managed on site or in an area with similar natural background concentrations. If soil will be sent for land disposal off-site, compliance with LDRs is required, since the Agency believes that natural background concentrations on-site will not automatically correspond to natural background concentrations at a remote land disposal facility.

The Agency notes that, for purposes of this discussion, natural background concentrations are constituent concentrations that are present in soil which has not been influenced by human activities or releases. Since these constituent concentrations are present absent human influence and EPA has determined that soil (like other environmental media) is not, of itself, a waste but may be regulated as hazardous waste under RCRA only when it contains (or contained) waste, EPA is not convinced the Agency would have the authority to require compliance with LDRs when constituent concentrations fall below background concentrations even if it felt compelled to do so. (Of course, such constituents could be regulated as hazardous constituents under state and Federal cleanup authorities, including RCRA corrective action and other authorities.)

Since natural background concentrations may vary across geographic areas, and to ensure that LDRs will only be capped at background where appropriate, EPA will require that individuals who wish to cap LDR treatment at natural background concentrations apply for and receive a treatment variance. EPA will presume that when LDRs would require treatment to concentrations that are less than natural background, such a variance will be appropriate, based on the finding that it is inappropriate, for contaminated soil, to require treatment to concentrations less than natural background concentrations. This issue has been clarified in today's final regulations, see 40 CFR 268.44(h)(4).

6. Restrictions on Use of Treated Hazardous Contaminated Soil in Products Used in a Manner Constituting Disposal

Although, as discussed earlier in today's preamble, EPA believes the soil treatment standards satisfy the requirements of RCRA Section 3004(m), EPA has determined that additional restrictions are necessary for hazardous contaminated soils that are used to produce products which are, subsequently, used in a manner constituting disposal (i.e., used to produce products which are placed in or on the land). Under current regulations, hazardous waste-derived products that are used in a manner constituting disposal must, among other things, comply with the applicable land disposal restriction treatment standards in 40 CFR part 268.40, that is, the Universal Treatment Standards. See 40 CFR 266.23(a). EPA has concluded that hazardous contaminated soil used to produce products which are, subsequently, used in a manner constituting disposal must continue to meet the universal treatment standards. Such products, then, are not eligible for the soil treatment standards promulgated today. EPA has made this decision for several reasons. First, EPA has chosen technology-based treatment standards (such as today's soil treatment standards) as a means of implementing the LDR statutory requirements in order to eliminate as many of the uncertainties associated with land disposal of hazardous waste as possible.

55 FR at 6642 (Feb. 26, 1990). These uncertainties increase sharply when one considers possible dispositions of hazardous waste-derived products used in a manner constituting disposal. These products can be placed virtually anywhere, compounding potential release mechanisms, exposure pathways, and human and environmental receptors. 62 FR at 64506 (Dec. 5, 1997) and 53 FR at 31197–98 (August 17, 1988). For these reasons, the Agency in 1988 determined that these wastes should be treated to reflect the best treatment available, 53 FR at 31197–98, and the Agency believes this reasoning continues to hold with respect to contaminated soils. Second, EPA has determined that the soil treatment standards adopted in today's rule are justified, in many instances, in order to encourage remediation involving treatment over remedies that involve leaving un-treated contaminated soils in place. The Agency is less sure that this is a desirable incentive if the contaminated soils are to be used in a manner constituting disposal, again because of the uncertainties posed by this method of land disposal.

Note that EPA has explained, however, that remediation activities involving replacement of treated soils onto the land is not a type of use constituting disposal, in part, because it is a supervised remediation instead of an unsupervised recycling activity. 62 FR 26063 (May 12, 1997). This interpretation is not affected by today's rulemaking.

7. Availability of Soil Treatment Standards

EPA proposed that soil-specific land disposal restriction treatment standards would be available only for contaminated soils managed under an agency approved, site-specific cleanup plan termed a Remediation Management Plan or "RMP." The Agency also specifically requested comment on whether soil-specific treatment standards should be made available to all contaminated soil. 61 FR at 18813 (April 29, 1996). The majority of commenters who addressed this issue strongly supported extending the soil treatment standards to all contaminated soil. These commenters argued that extending soil-specific LDRs to all contaminated soil would encourage voluntary and independent cleanups, especially at low and medium priority sites where a regulatory agency might not have the resources to provide real-time oversight through a "RMP." After considering these comments, EPA is persuaded that the soil treatment standards should be available for all contaminated soil and has revised the regulations accordingly.

EPA's thinking in proposing to require a site-specific remediation management plan to take advantage of the soil treatment standards was that site-specific oversight, and potentially modification of the treatment standards, would be necessary to ensure that all contaminated soils were appropriately treated. 61 FR at 18807 (April 29, 1996). However, EPA now concludes that the soil treatment standards will ensure adequate treatment of all contaminated soils for two reasons.

First and primarily, the residuals from treatment of hazardous contaminated soil will typically continue to be regulated as hazardous waste and will remain subject to applicable RCRA Subtitle C requirements. 61 FR at 18810 (April 29, 1996). Non-soil residuals, such as wastes generated during application of separation technologies, will be regulated as hazardous wastes if they exhibit a characteristic of hazardous waste or if they derive from treating a soil which contains listed hazardous waste. Therefore, these types of non-soil residuals will typically be subject to the universal treatment standards in 40 CFR 268.40. See 57 FR at 37240 (Aug. 18, 1992) where EPA took the same approach for residues from treating contaminated debris. Soil residuals will also be regulated as hazardous waste unless it is determined that the soil does not contain hazardous waste.[21] For example, application of a thermal desorption technology would likely generate two types of residuals: treated soil (soil residual) and concentrated contaminants removed from the soil and captured in an air pollution control device (non-soil residual). If the contaminated soil contained a listed hazardous waste or exhibited a characteristic of hazardous waste at the time of treatment, both residuals would continue to be subject to RCRA Subtitle C regulations. The non-soil residual would be required to comply with applicable universal treatment standards prior to land disposal; the soil residual would generally require land disposal in a Subtitle C unit unless a "contained-in" determination was made. Therefore, although a remediation management plan is no longer required to take advantage of the soil treatment standards, a site-specific decision is still required before treated contaminated soil can exit the system of RCRA regulations.

Second, as noted earlier, EPA has extended the treatment requirement to all underlying hazardous constituents reasonably expected to be present in contaminated soils when such constituents are found at initial concentrations greater than ten times the universal treatment standard and retained current treatment requirements for hazardous contaminated soils used to produce products that are subsequently used in a manner constituting disposal.

8. Achievability of Contaminated Soil Treatment Standards

The soil treatment standards promulgated today are based primarily on the data for soil treatability found in EPA's Soil Treatment Database (SDB). See, Best Demonstrated Available Treatment Background Document for Hazardous Soils, August 1993 and LDR Phase 2 proposal at 58 FR 48122, Sept. 14, 1993. Data from the soil treatment database are corroborated by more recent performance data for non-combustion treatment of remediation wastes. See Soil Treatability Analysis: Analysis of Treatability Data for Contaminated Soil Treatment Technologies (April 1998, USEPA) and references cited in note 5 below.

The soil treatment data base contains 6,394 pairs of data points (for the same sample, one datum for untreated soil and one datum for treated soil) describing the treatment of hazardous constituents in contaminated soils managed under the RCRA and the Superfund programs. After screening the database to eliminate data from tests reflecting poorly designed or operated treatment, tests where EPA believes inappropriate technologies were applied (for example, data from immobilization of organic constituents) and other inappropriate data, the Agency was left with 2,541 pairs of data points. These data pairs depict treatment of ninety-four hazardous constituents, including eighty-five organic constituents and nine BDAT list metals. The retained 2,541 pairs of data points from the soil treatment database represent the treatment of organic and metal constituents by various technologies including: combustion, biological treatment, chemical/solvent extraction, dechlorination, thermal desorption, air/steam extraction, photolysis, soil washing, stabilization, and vitrification. The soil treatment database includes performance data from bench, pilot, and full scale technologies. A complete discussion of the Agency's method for

[21] The exception would be soil residuals from treatment of soils which were determined no longer to contain a listed hazardous waste or were decharacterized and yet remained subject to LDRs. In this case, since the treatment would be performed on non-hazardous soil, the soil residuals would also be considered non-hazardous.

screening the Soil Treatment Database can be found in the LDR Phase II proposal (58 FR 48129–31, September 14, 1993) and the Best Demonstrated Available Technology Background Document for Hazardous Soil (August 1993).

A number of commenters were concerned that aggregated data, i.e., the 2,541 pairs of data points representing the combined performance of combustion and non-combustion technologies, may mask the performance of non-combustion technologies alone. Commenters urged EPA to disaggregate these performance data to allow for more accurate analysis of non-combustion technology performance. As a result, EPA has disaggregated the combustion and non-combustion treatment data for purposes of analyzing the achievability of today's soil treatment standards. See generally, Soil Data Analysis: Soil Treatability Analysis of Treatability Data for Contaminated Soil Treatment Technologies (April 1998, USEPA) and Additional Information on Treatability of Contaminated Soils as Discussed in Section VII.B.8. of Phase IV Final Rule Preamble (April 1998, USEPA).

After separating out combustion data, the remaining non-combustion soil treatment data base is reduced from 2,541 to 2,143 paired data points. These 2,143 [22] data pairs depict the treatment of 72 organics [23] and nine metals in contaminated by biological treatment, chemical and solvent extraction, chlorination, thermal desorption, air and steam stripping, hydrolysis, photolysis, soil washing, and stabilization.

As discussed earlier in today's preamble, EPA did not use the traditional BDAT approach to develop the soil treatment standards. Instead, the Agency evaluated data from the 2,143 non-combustion data pairs in the soil treatment database to identify, generally, the level of performance non-combustion soil treatment technologies achieve. In light of our multi-faceted objectives regarding remediation of contaminated soils (discussed earlier in this preamble), this approach and methodology are appropriate. As noted earlier in today's preamble, the numerical values chosen for soil treatment standards—90% reduction capped at ten times the UTS—are within the zone of reasonable values from which the Agency can properly select.

For soil contaminated with organic constituents, the retained 2,143 data pairs from the soil treatment database show generally that soils with moderate levels of contamination are more amenable to treatment by non-combustion technologies than soils with high levels of contamination. However, the data also show that the soil treatment standards promulgated today can be achieved by non-combustion technologies even in cases when soils contain elevated levels of harder-to-treat organic hazardous constituents, such as dioxins and furans, polychlorinated biphenyls (PCBs), and polynuclear aromatics (PNAs). The available data on the performance of non-combustion technologies suggest that some technologies are more effective with certain organics within specific families or chemical functional groups. For example, while many organic treatment technologies were effective in removing volatile organics from the soils, dechlorination is more effective than other non-combustion treatment technologies for treating chlorinated organics. For soil contaminated by metals, the retained 2,143 data points from the soil treatment database show that metals can typically be treated via stabilization to meet the soil treatment standards.

Although, for the reasons discussed earlier in today's preamble, EPA has elected to base the soil treatment standards on the performance of non-combustion technologies, combustion of soil is not prohibited. This is consistent with all other numerical treatment standards, which can likewise be achieved through use of any technology (other than impermissible dilution). It may be that combustion is, in fact, chosen as the remedial treatment technology at certain sites, most likely because of economic considerations (such as in the case of low soil volumes where on-site treatment units are not economically viable). Selection of the best treatment technology for the specific soil type and range of contaminants present at any given remediation site is a site-specific decision assuming, for soils subject to the LDRs, that the selected technology does not involve impermissible dilution and that today's soil treatment standards are met. Further details about the results of EPA's examination of treatment technologies for different groups of contaminants are discussed in the succeeding sections.

a. Comments. Many commenters expressed concern that the retained 2,541 data points from the soil treatment database might not adequately address the many types of soils and contaminated site scenarios that may arise in the field. Among other things, these commenters asserted that: (1) the list of chemical organic constituents for which EPA has data may be too small to extrapolate to other organics in the list of underlying hazardous constituents that must meet treatment standards; (2) for organic constituents, many of the treatment test results examined by EPA involved mostly combustion rather than non-combustion technologies; (3) for soils with multiple hazardous constituents and other complex soil matrices, the soil treatment standards could only be met via incineration; and, (4) EPA should not pool data from bench, pilot, and full scale treatment applications. For the most part, these commenters suggested that EPA either exempt hazardous contaminated soil entirely from a duty to comply with land disposal restriction treatment standards or, if hazardous contaminated soil were to remain subject to LDRs, allow risk-based treatment standards to be developed entirely on a site-by-site basis pursuant to state oversight.

EPA closely considered these comments and carefully re-evaluated the data from the soil treatment database as well as other data from more recent sources. These evaluations are summarized in the background documents for today's final rule. EPA is not, at this time, taking action to categorically exempt large volumes of hazardous remediation waste (including contaminated soil) from RCRA hazardous waste management requirements and, therefore, the issue of achievability of today's soil treatment standards is germane.

Notwithstanding the treatment results described in this section below, which support the achievability of today's soil treatment standards, EPA realizes that national, technology-based treatment standards are sometimes not achievable because of site- and waste-specific characteristics. Thus, EPA has long provided for treatment variances under these circumstances (see 40 CFR 268.44). In addition, because EPA and authorized states are in a position during remediation to make site-specific risk-based minimize threat determinations, the Agency is also adopting in today's rule a new type of variance for contaminated soils. This variance can be granted if, on a case-by-case basis, it is determined that the technology-based treatment standard

[22] One single datum from the vitrification of p,p'DDT was not included since it appears to have resulted from treatment that was not optimally designed or conducted.

[23] Out of 85 organic constituents, only 13 were treated exclusively by combustion. See, however, the discussion later in this preamble with regard to presence of data from incineration and extrapolation of data among organic constituents.

would prompt treatment beyond the point at which threats are minimized.

Fundamentally, EPA agrees with many commenters that today's land disposal treatment standards for contaminated soil may not remove all of the barriers RCRA can impose on efficient and aggressive site remediation. As discussed earlier in today's preamble, the Agency hopes the application of RCRA Subtitle C requirements to remediation of contaminated soils and other wastes will be addressed through legislation. If there is no legislative action, EPA may choose to take additional regulatory action, which may include either a re-examination of the application of LDRs to contaminated soil or other remediation wastes or a re-evaluation of today's soil treatment standards, or both. In the meantime, today's rule represents a significant improvement over the current practice of applying the treatment standards developed for pure industrial hazardous waste to contaminated soil.

b. Analysis of Data from the Soil Treatment Database. The soil treatment standards promulgated today are based EPA's Soil Treatment Database (SDB). See, Best Demonstrated Available Treatment Background Document for Hazardous Soils (August 1993); LDR Phase 2 proposal (58 FR 48122, Sept. 14, 1993); and Soil Treatability Analysis: Analysis of Treatability Data for Contaminated Soil Treatment Technologies (April 1998, USEPA) (hereinafter, this document is referred as the "Soil Treatability Analysis Report"). General concerns about the soil treatment database (and in particular, concerns about achieving the 10 times UTS or 90% reduction standard) are addressed here. Results of our analysis of the soil treatment database data on treatment performance for various technologies are shown in Table 1 below. Results of additional analysis for various organic and metal contaminant groups are shown in Tables 2–5 below. Further details of the analysis and additional findings are contained in the technical background documents in this docket.

TABLE 1.—SUMMARY OF TREATMENT RESULTS PER TECHNOLOGY IN SOIL DATA BASE[24]

Treatment technology	Total paired data points in the soil data base	Untreated	Treated			
		Data points meeting 10 times UTS standard	Data points meeting 10 times UTS but not 90% reduction standard	Data points meeting 90% reduction but not 10 times UTS standard	Data points meeting both 10 times UTS and 90% reduction standards	Data Points failing both 10 times UTS and 90% reduction standards
Biological Treatment	250	86	176	168	109	15
Chemical Treatment	242	58	226	206	200	10
Dechlorination	154	53	134	100	84	4
Stabilization	269	140	250	239	232	12
Stripping	236	88	206	103	103	30
Washing	35	10	21	14	11	11
Thermal Desorption	957	338	833	759	692	57
Total	2143[25]	773	1846	1589	1431	139

In aggregate, the results on Table 1 indicate that the Agency's selection of standards are within the range of reasonable values for non-combustion technologies to achieve. These data show that 139 (or 6%) paired data points out of 2143 would fail to meet the 10 times UTS or 90% reduction standard. Among possible reasons for these treatment performance deviations are that some soil samples represent cases in which the selected technology was not appropriate for the range of hazardous constituents in an organic chemical admixture. A better selection of treatment technology may include either a more aggressive non-combustion technology or may involve use of two or more technology trains in order to meet the soil treatment standards. It is common practice to employ multiple treatment trains at facilities that have complex chemical mixtures or soil textures at a site. As further explained in succeeding sections of this preamble and in various background documents, EPA believes that the hazardous soil treatment standards promulgated today are within a regime of reasonable treatment levels normally achieved by non-combustion technologies. See, e.g., Soil Treatability Analysis Report and Extrapolation of Treatment Performance Data in the Soil Data Base Among Hazardous Constituents in Contaminated Soils (April 1998, USEPA).

(1) Concerns About Presence of Data from Incineration and Extrapolation of Data to Other Constituents. As mentioned earlier, EPA has segregated the available treatment data (2,541 paired data points) so that we can better examine the 2,143 paired data points describing the treatment of hazardous soils by non-combustion technologies. Although 50 organic constituents in the original 2,541 paired data points were treated by combustion (i.e., incineration), only 13 of these 50 organics were treated exclusively by combustion. These 13 hazardous constituents are: 1,2,4-trichlorobenzene; p,p'-DDD; p,p'DDE; 2,4-dichlorophenol; methoxychlor; 2,4,6-trichlorophenol; 2,4,5-trichlorophenol; carbon tetrachloride; chloroform; hexachloroethane; 1,2-dibromo-3-chloro-propane; isodrin; and gamma-BHC. None of the data describing combustion of these 13 constituents or the other 37 organics (for which there are some combustion results) were relied upon in assessing achievability of today's hazardous soil treatment limits.

With respect to commenters' concerns about extrapolating the SDB data to organic and inorganic constituents that will need to be treated, EPA analyzed the various non-combustion technologies and their average treatment efficiencies against various chemical clusters and chemical functional groups of hazardous constituents. See: (1) Extrapolation of Treatment Performance Data in the Soil Data Base Among Hazardous Constituents in Contaminated Soils (April 1998, USEPA); (2) Derivation of Treatment Achievability Results of Organic Functional Groups and Types of Compounds (April 1998, USEPA); (3) Soil Treatability Analysis Report (USEPA, 1998); and (4) Additional

[24] For discussion of these treatment data, see Soil Treatability Analysis Report, and Extrapolation of Treatment Performance Data in the Soil Data Base Among Hazardous Constituents in Contaminated Soils (April 1998, USEPA).

[25] As noted earlier, EPA examined in detail up to 2,541 pairs of data points in total, and the number of non-combustion data pairs examined is 2,143.

Information on Treatability of Contaminated Soils as Discussed in Section VII.B.8. of the Final Rule Preamble (April 1998, USEPA).

The results are summarized in Tables 1–5 below. These results show that non-combustion technologies can achieve today's soil treatment standards. 93.5% (2,004 of the 2,143 data pairs) of the treatment test results meet the 10 times UTS or 90% reduction standard. Furthermore, non-combustion technologies can meet the soil treatment standards even in cases when soils contain elevated levels of harder-to-treat organic hazardous constituents, such as dioxins and furans, polychlorinated biphenyls (PCBs), and polynuclear aromatics (PNAs). See Appendix D in Soil Treatability Analysis Report.

As noted earlier, available data on the performance of non-combustion technologies treating organics also show that some technologies are more effective with certain organics within specific families or chemical functional groups, e.g., organic treatment technologies removing volatile organics from the soils and dechlorination removing halogenated organics. Treatability tests at certain complex sites corroborate these findings of achievability from the SDB.

Regarding organics, at the Ninth Avenue Dump Site in Indiana, hazardous soils were contaminated with low to moderate concentrations of PNAs, aromatics, chlorinated aliphatics, and phthalates. Untreated constituents showed concentrations that were about the same or up to two orders of magnitude higher than today's soil treatment standards.[26] Among the volatiles were toluene (1,100 ppm), total xylene (2,100 ppm), ethylbenzene (420 ppm), 1,1,1-trichloroethane (120 ppm), trichloroethene (93 ppm), tetrachloroethene (380 ppm), 1,1-dichloroethane (81 ppm), and methylene chloride (800 ppm). The following semivolatile organics-PNAs (and their highest concentration) were phenanthrene (92 ppm) and naphthalene (84 ppm). Bis(2-ethylhexyl) phthalate, a semivolatile phthalate, was reported at 110 ppm. The soil particle distribution of the contaminated soil was not quantified, but the soil was reported as comprised primarily of sand and silt. Biotreatment achieved the following average treatment reduction efficiencies:

- Volatile chlorinated aliphatics—99.9%;
- Ethylbenzene—100%;
- Volatile aromatics—99.9%;
- Semivolatile PNAs—97.4%;
- Bis(2-ethylhexyl)phthalate—93.2%.

Regarding complex metal remediations, the full-scale stabilization study conducted at the Portable Equipment Salvage Company, a transformer and metal salvage operation in Oregon, involved untreated levels of lead up to 880 mg/l (TCLP) and zinc up to 71 mg/l (TCLP). Organics were also present—the highest sample showing 610 mg/l lead (TCLP), 14,000 ppm oil and grease, 41,000 ppm total organic carbon, and 7.1 pH. The facility conducted treatability studies on three soil textures found at the site: (1) sandy loam, (2) loamy sand, and (3) loam. The stabilized sandy loam sample showed a concentration of 0.5 ppm lead, a 99.72% reduction efficiency. The facility also treated two samples of loamy sand, one to 47 mg/l lead (TCLP) (a 93.65% reduction efficiency) and the other to 2.5 mg/l lead (TCLP) (a 99.72% reduction efficiency). The treated loam sample showed 0.10 mg/l lead, a 99.97% reduction.

More information underlying EPA's rationale for extrapolating the available treatment performance data to other organic and inorganic hazardous constituents regulated under the land disposal restrictions can be found in the RCRA Docket for this rule (see Appendix D in Soil Treatability Analysis Report) and memorandum to docket on extrapolation of treatment performance data among different hazardous constituents.

Finally, we note that even though there were treatment data on soils containing cyanide in the larger data base (6,394 paired data points), none of the retained 2,541 or 2,143 paired data points included treatment data on cyanide. However, the current UTS for cyanide is based on the performance of alkaline dechlorination, a non-combustion technology. Cyanides can form complexes with metals and organics and, therefore, technologies capable of removing both organic and metals are also able to remove cyanide from contaminated soils. As a result, it is reasonable to expect that the average treatment performance attained by treating organics in soils will also be achieved for cyanide-bearing contaminated soils. We note that, for example, 90% reduction can be achieved based on the performance efficiency that thermal desorption attained in removing PNA's (with more than five rings) and chlorinated organics from contaminated soil. These constituents are among the hardest chemical species to remove via thermal desorption. For these reasons, the Agency has concluded that today's soil treatment standard for cyanide can be achieved by a non-combustion technology as well.

(2) Technology Scale and Soil Variability Issues. As noted earlier, several commenters objected to EPA's pooling of treatment data from pilot, bench, and full scale processes, and urged EPA to consider only performance data from full-scale field studies characterizing the treatment of soil volumes. EPA prefers, generally, to rely on full scale studies for the purpose of developing and promulgating treatment standards, and this is true with respect to the soil treatment standards as well. However, in this case as well as in many prior LDR treatment standard efforts, EPA's data base includes more than just full scale data upon which EPA can properly rely. Bench and pilot scale technologies can be appropriately considered by EPA (and EPA has historically done so) in setting treatment limits as long as full scale operations of the treatment system under consideration exist or have been demonstrated on wastes/soils. Except for hydrolysis,[27] the technologies in the SDB are demonstrated full scale, and the administrative docket contains bench, pilot, and full scale studies that reflect the Agency's field experiences at contaminated sites.

Furthermore, in this rulemaking, given the variability of hazardous soils (in terms of types, concentrations and numbers of hazardous constituents and soil matrices), plus the special policy considerations associated with remediations, the Agency is adopting treatment standards from the zone of reasonable values that could be permissibly selected based upon the treatment performance data. Thus, the data are not being used so much to establish a precise performance level as to confirm the typical achievability of the promulgated standards, i.e., ten times UTS or 90% reduction.

With respect to the SDB and commenters' concerns about the impact of soil variability on achievability of the soil treatment standards by non-combustion technologies, EPA collected 6,394 pairs of data point describing the treatment of various hazardous soils.

[26] The following constituents were present at levels below the soil treatment standards: fluorene, fluoranthene, pyrene, acenaphthalene, benzo(a)anthracene, chrysene, di-n-butyl phthalate, and diphenylnitrosamine.

[27] Hydrolysis can be of normal occurrence or intentionally induced at hazardous waste sites. EPA does not have full-scale ex-situ demonstration studies on this technology but considers the data in the SDB to be indicative of what levels can be achieved.

The retained 2,143 non-combustion paired data points are reasonably sufficient to adequately describe the treatment of metal, organics, and multiple metal and organic contaminants that are frequently found at different type of sites, including both Superfund and RCRA sites. For instance, the SDB has treatment data on soils with varying textures including top soils, silty/loam soils, and clay soils. For the 14 different soil type groupings analyzed, only 139 out of 2,143 data pairs (about 6.5%) would not meet today's soil treatment standards (see Appendices C and D in Soil Treatability Analysis Report).

With respect to these 6.5% data pairs, several potential reasons exist to explain why 90 % reduction or 10 times UTS level might not have been achieved. First, the treatment study objectives may not primarily have been to test whether these standards could be met. For example, the treatment study may have been designed either to assess the feasibility of using a particular (but not necessarily optimum) technology on a particular contaminated soil, or to meet a prescribed risk-based level under a RCRA or CERCLA site remediation plan.

Second, a treatment technology may have been applied to soils contaminated with multiple hazardous constituents where the technology may have been inappropriate for a subset of those contaminants (and for which data were reported anyway). For example, air stripping is a technology that operates best on volatile organics within a given range of Henry constant values. In contrast, air stripping of semivolatile organics and metals is expected to be much poorer. (In this type of situation, a technology amendment or treatment train may be appropriate, i.e., air stripping may be improved if steam stripping is applied first to enhance the pool of semivolatiles that can respond to the physical separation treatment process.)

Third, these treatment data likely include instances when a treatment technology encountered soil heterogeneities that resulted in undertreatment of portions of the soil. For instance, during the clean up of contaminated debris and soils, detailed sampling protocols are typically developed to ensure that desired treatment constituent concentrations are met because of the deleterious impact of heterogeneous soil strata and the presence of debris on treatment technology performance. Re-processing can often be required to comply with the applicable treatment standards.

Another alternative is to optimize specific technology operating parameters that can enhance the ability of the technology to meet the prescribed treatment limits. Optimization can involve: (1) feeding the correct soil/debris particle size fractions to the treatment system, (2) creating more turbulence between soil and gaseous/liquid treatment fluids, (3) using a greater-than-normal amount of chemical agents, (4) operating at the higher end of an operating temperature range, (5) adjusting the pH of the soil, (6) adding adequate pre-/post-treatment steps that address specific contaminants that may be expected to receive sub-optimal treatment, or (7) allowing longer residence time in the treatment unit.

It is not possible to determine precisely how many of these techniques were used in the 139 instances that failed the 90% reduction or 10 times UTS levels. However, EPA expects that not all optimization measures were used since the operators of the treatment technologies did not have as their primary objective the attainment of these particular levels, which are being adopted today as the soil treatment standard. On balance, the weight of evidence and analysis from the SDB are believed to reasonably indicate that today's standards are achievable for soils that may exhibit variability, particularly if optimization techniques or treatment technology trains are fully considered. Of course, should an unusual situation present itself in which these measures are not successful, a treatment variance can be sought under 40 CFR 268.44(h) or under the risk-based variance provisions being adopted in today's rule.

Furthermore, EPA has a number of bench and pilot studies on the treatment of contaminated soils from wood preserving, petroleum refining, and electroplating sites, which contain a wide range of constituents such as polynuclear aromatic, phenolic, chlorinated organics, spent solvents, creosote, and metals. It is reasonable to expect that these treatment results, showing achievability, also lend support to the conclusion that treatment at other RCRA and Superfund sites, containing these types of complex contaminant and soil variability scenarios, can be expected to achieve today's soil treatment standards.[28] See also Chapter 4 in Soil Treatability Analysis Report.

Pooled bench, pilot, and full scale data in the SDB are expected to depi what the various treatment technolo, can achieve for other hazardous soils managed under CERCLA and RCRA. As noted earlier, non-combustion technologies will behave better on a given range or class of organic and metal constituents. A given range of soil characteristics that may inhibit treatment performance can be amended to facilitate the treatment of hazardous soils. Available information on other full scale operations of the tested technologies demonstrate that optimization techniques can be used to overcome potential soil interferences and thus attain, generally, treatment design objectives. Hence, it is important to carefully evaluate the characteristics of each site against the expected capabilities of various non-combustion technologies, which are summarized below.

(3) Performance Data for Organic Constituents. EPA's conclusions with respect to achievability of soil treatment standards for organics in hazardous soils are based on the performance of biological treatment, chemical extraction, dechlorination, soil washing thermal desorption, and soil vapor extraction. Other treatment technologi capable of achieving the treatment limits (such as combustion) are not prohibited except for those that may constitute impermissible dilution. Tables 2 and 3 below provide an overview of the number of data points and the average treatment efficiency ranges that each of the technology categories achieved. Also, each Table below reports the range of test scales as well as the available treatment performance data per major chemical family category/cluster assigned to chemical constituents in the BDAT List. (For the whole list of BDAT constituents and their classification, see Appendix B in the BDAT Background Document for Hazardous Soils, August 1993.) Further details and discussion on the results for major chemical family categories/clusters is contained in the docket.

[28] See (1) *Remediation Case Studies: Bioremediation and Vitrification*, July 1997, EPA 542-R-97-008 or PB97-177554; (2) *Remediation Case Studies: Soil Vapor Extraction and Other In Situ Technologies*, July 1997, EPA 542-R-97-009 or NTIS PB97-177562; (3) *Analysis of Selected Enhancements for Soil Vapor Extraction*, September 1997, EPA-542-R-97-007; (4) *Remedial Case Studies: Thermal Desorption, Soil Washing, and In Situ Vitrification*, March 1995, EPA 542-R-95-005 or NTIS PB95-182945; (5) *Remediation Case Studies: Soil Vapor Extraction*, March 1995, EPA 542-4-95-004 or NTIS PB95-182937; and (6) *Remediation case Studies: Bioremediation*, March 1995, EPA 542-R-95-002 or NTIS PB95-182911.

TABLE 2.—SUMMARY OF NONTHERMAL TREATMENT PERFORMANCE DATA ON GROUPS OF ORGANIC HAZARDOUS CONSTITUENTS[29]

BDAT organic cluster	Biotreatment scale: 0.01 kg to 1,250,000 kg		Chemical extraction scale: 0.0075 kg to 37,000 kg		Dechlorination scale: 0.1 kg to 127,913 kg		Soil washing scale: 0.05–204 kg		Hydrolysis scale: 0.1 kg to 2.75 kg	
	Data points	Average removal efficiency	Data points	Average removal efficiency	Data points	Average removal efficiency	Data points	Average removal efficiency	Data points	Average removal efficiency
[illegible]tiles	48	>99%	9	>99%	13	96.3 to 99.3%	None	None	None	None
[illegible]atiles	185	55–98.2%[30]	163	62–98.8%	2	99.8%	13	81.8–97.2%	None	None
[illegible]chlorine	12	16.7–70.2%	None	None	13	>95.2%	None	None	2	67.9–91.7%
Phenoxyacetic Acid Pesticides	None	None	None	None	9	98.6–99.0%	None	None	None	None
Organo Phosphorous Insecticides[31]	None	None	None	None	None	None	None	None	None	None
Polychlorinated Biphenyls	None	None	52	71.5%–99.9%	69	68.8–97.1%	1	88.5%[32]	None	None
Dioxins and Furans	None	None	12	40–>97%	48	73.7–>99.8%	7	84.8%	None	None
Total Number of Data Points	245		236		154		21		2	

TABLE 3.—SUMMARY OF THERMAL PERFORMANCE DATA ON GROUPS OF ORGANIC HAZARDOUS CONSTITUENTS[33]

BDAT organic cluster	Thermal desorption[34] scale: 21.6 kg to 3,823,000 kg		Soil vapor extraction scale: 4.5 kg to >1,000 kg	
	Data points	Average removal efficiency	Data points	Average removal efficiency
Volatiles	293	79.2–99.9%	189	44–99.2%
Semivolatiles[35]	614	50–99.4%	47	0–57.2%
Organochlorines	12	88.5–98.8%	None	None
Phenoxyacetic Acid Pesticides	None	None	None	None
Organo Phosphorous insecticides[36]	None	None	None	None
Polychlorinated Biphenyls	1	87.5%	None	None
Dioxins and Furans	37	85.6–97.6%	None	None
Total Number of Data Points	957		236	

As shown on Tables 2 and 3, EPA lacks performance data for the thermal or non-thermal treatment of four organic constituents classified in the BDAT list as organophosphorous insecticides. These four constituents are disulfoton, famphur, methyl parathion, and phorate. However, we can determine achievability for these four organic constituents based upon the transfer of treatment data for other, similarly difficult to treat organics. Because of structural and chemical similarities, these four organophosphorous compounds are expected to behave similarly during treatment to other polar nonhalogenated phenols, phenyl ethers, and cresols. Thus, EPA believes that these four organophosphorus compounds can be treated by the same technologies as other polar nonhalogenated organic compounds, for which EPA has data. Therefore, based on the available data for polar nonhalogenated compounds, EPA concludes that the treatment standards for soils contaminated with these four organophosphorous compounds can be achieved by biodegradation, chemical extraction, and thermal desorption (semivolatiles).

(4) Other Indicia of Achievability for Organic Constituents

EPA also re-analyzed certain portions of the SDB with regard to ability of various technologies to meet today's soil treatment standards by looking more closely at organic treatability groups based on the structural features of the hazardous constituents of concern. The results of this analysis, presented in Table 4 below, corroborate those in Tables 1–3 and EPA's conclusion that the soil treatment standards—ten times UTS or 90% reduction—are within the zone of reasonable values that could have been selected. For further information on the derivation of Table 4, see the background document entitled "Derivation of Treatment Achievability Results for Organic Functional Groups and Types of Compounds."

[29] For a discussion of these treatment data, see the Soil Treatment Achievability Report: Extrapolation [illegible] Treatment Performance Data in the Soil Data [illegible] Among Hazardous Constituents in [illegible]tinated Soils (April 1998, USEPA); and the [illegible]onal Information on Treatability of Contaminated Soils as Discussed in Section VII.B.8. of Phase IV Final Rule Preamble, (April 1998, USEPA). These documents indicate the numbers and types of data pairs that meet the 10 times UTS level, both prior to treatment and after the treatment described in the table.

[30] Cyclical hydrocarbons with more than five rings undergo lower reduction efficiencies.

[31] EPA is transferring the available performance data from the chemical extraction and the biological treatment of (semivolatile) polar nonhalogenated organics in the hazardous solid treatment data base. Thus, the columns are intentionally left blank.

[32] Only one test was performed.

[33] For a discussion of these treatment data, see the Soil Treatment Achievability Report: Extrapolation of Treatment Performance Data in the Soil Data Base Among Hazardous Constituents in Contaminated Soils (April 1998, USEPA) and the Additional Information on Treatability of Contaminated Soils as Discussed in Section VII.B.8. of Phase IV Final Rule Preamble, (April 1998, USEPA). These documents indicate the numbers and types of data pairs that meet the 10 times UTS level, both prior to treatment and after the treatment described in the table.

[34] The term thermal desorption, as used in this table, is a general description of various thermal techniques. No conclusion may be drawn about the regulatory status or classification of a particular thermal desorber from the inclusion of treatment data from that device in this column.

[35] The performance of combustion and soil vapor extraction is less effective in treating semivolatile organics that contain aromatic and heterocyclical structures. The same is true for and nonvolatile chlorinated organics.

[36] EPA is transferring the available performance data from the chemical extraction and the biological treatment of (semivolatile) polar nonhalogenated organics in the hazardous soil treatment data base.

TABLE 4.—TREATMENT EFFICIENCY—PERCENT REDUCTION RANGES BY TECHNOLOGY FOR VARIOUS FUNCTIONAL GROUPINGS

[Average percent reduction in brackets; number of data points analyzed in parenthesas][37]

Treatability group	Biological treatment	Chemical extraction	Dechlorination	Thermal desorption[38]	Soil washing	Other technologies[39]
Halogenated Nonpolar Aromatics	52.05–99.97 [76.01] (2)	80.42 [80.42] (1)	99.05–100 [99.53] (2)	29.19–100 [95.31] (29)	66.21–95.6 [85.41] (4)	30.13—49.68 [42.41] (3)
Dioxins, Furans, PCBs, and Precursors	none	14.88–99.97 [90.13] (40)	91.66–99.88 [97.94] (20)	98.9–100 [99.57] (17)	none	none
Halogenated Phenols, Cresols, and Other Polar Aromatics	45.1–95.14 [81.05] (5)	63.83–93.18 [79.46] (3)	none	2.71–99.93 [56.21] (15)	8.25–99.06 [73.71] (6)	96.21 [96.21] (1)
Halogenated Aliphatics	99.87–99.99 [99.91] (3)	86.62–94.81 [91.09] (3)	89.06–100 [97.54] (7)	36.88–100 [96.49] (80)	58.68–99.4 [90.58] (9)	72–99.68 [95.66] (6)
Halogenated Cyclic Aliphatics, Ethers, Esters, and Ketones	9.76–99.77 [60.99] (8)	none	none	none	none	none
Nitrated Aromatics and Aliphatics	none	none	none	none	none	none
Simple Nonpolar Aromatics and Heterocyclics	99.97–100 [100] (10)	77.41–99.92 [90.77] (6)	96.39–100 [98.61] (10)	22.68–100 [94.3] (158)	47.74–99.91 [82.39] (14)	97.7 [97.7] (1)
Polynuclear Aromatic Hydrocarbons	5.13–99.85 [67.15] (75)	51.55–99.98 [95.72] (125)	10.92–97.42 [67.47] (3)	10.14–100 [94.19] (301)	81.83–92.19 [85.74] (3)	95.9–99.55 [97.73] (2)
Other Nonhalogenated Polar Organics	none	75.96–99.82 [98.35] (28)	90.81–99.89 [95.13] (10)	2.6–99.98 [82.04] (36)	51.07–99.97 [88.67] (10)	94.59–99.89 [97.24] (2)

(5) Performance Data for Metal Contaminants

Performance data for metals contaminants are based on the performance of stabilization and chemical extraction (mercury) of soils contaminated with metals. Other metal treatment technologies are not prohibited (except if impermissible dilution were to occur). The results of EPA's analysis of the data on treatment of metals in soils are summarized in Table 5 below.

TABLE 5.—SUMMARY OF PERFORMANCE DATA FOR HAZARDOUS METALS CONSTITUENTS[40]

BDAT metals cluster	Stabilization scale: bench, pilot, and full scale		Chemical extraction scale: pilot		Soil washing scale: bench & pilot	
	Data Points	Average removal efficiency	Data points	Avarage removal efficiency	Data points	Average removal efficiency
Metals	269	91.1–99.8%	4	97.7%[41]	14	17.9–97.2%
Total	269		4		14	

The results in Table 5 corroborate EPA's conclusion that the soil treatment standards—ten times UTS or 90% reduction—are within the zone of reasonable values that could have been selected. For further information on the derivation of Table 5, see Soil Treatability Analysis Report.

With respect to multiple metal constituents or organometallic constituents in a contaminated soil, we

[37] Table based on data from "*Delivery of Graphs and Data Tables Showing Corrected Treated Concentrations vs. Data Point Number Index for Selected Constituents*," February 19, 1992 (Administrative Record of the proposed LDR Phase 2 rules as F-93-CS2P-S0597). See also (1) Derivation of Treatment Achievability Results for Organic Functional Groups and Types of Compounds, April 1998 (USEPA); (2) Additional Information on Treatability of Contaminated Soils as Discussed in Section VII.B.8. of Phase IV Final Rule Preamble, (April 1998, USEPA); (3) Extrapolation of Treatment Performance Data in the Soil Data Base Among Hazardous Constituents in Contaminated Soils (April 1998, USEPA); and (3) Soil Treatability Analysis Report (April 1998, USEPA). These documents indicate the numbers and types of data pairs that meet the 10 times UTS level, both prior to treatment and after the treatment described in the table.

[38] The term thermal desorption, as used in this table, is a general description of various thermal techniques. No conclusion may be drawn about the regulatory status or classification of a particular thermal desorber from the inclusion of treatment data from that device in this column.

[39] These include air stripping, photolysis, and treatment trains.

[40] For a discussion of these treatment data, see the Soil Treatment Achievability Report; Extrapolation of Treatment Performance Data in the Soil Data Base Among Hazardous Constituents in Contaminated Soils (April 1998, USEPA); and the Additional Information on Treatability of Contaminated Soils as Discussed in Section VII.B.8 of Phase IV Final Rule Preamble, (April 1998, USEPA). These documents indicate the numbers and types of data pairs that meet the 10 times UTS level, both prior to treatment and after the treatment described in the table.

[41] Available data are exclusively for the treatment of mercury on soils.

recognize that a situation may call for two or more treatment technology trains to achieve the treatment standards promulgated today (e.g., one treatment for organics and another for metals). This must include proper consideration of the order in which various treatment processes should be applied to the contaminated soil so that treatment effectiveness is optimized. However, if these considerations have been properly made and the required treatment standards are not being met because, for example, of unique soil matrices or difficult to treat sites, then we expect that entities may elect to seek a treatment variance pursuant to 40 CFR 268.44(h) or a risk-based soil treatment variance, which is being adopted in today's rule.

c. Data Submitted by Commenters

At least four commenters submitted treatment data from studies describing the performance of innovative and conventional treatment technologies on hazardous soils. DuPont submitted bench, pilot, and full scale treatment data from various vendors describing the operation of soil washing. DuPont asserts these data supports the viability of soil washing as an innovative technology for hazardous soils.

The Environmental Technology Council (formerly the Hazardous Waste Treatment Council) submitted full, pilot, and bench scale treatment data from various vendors of innovative treatment technologies and provided an extensive review of EPA's soil treatment data base. See document entitled, Evaluation of Proposed BDAT Soil and Process Treatment Technologies—Report to the Hazardous Waste Treatment Council, November 1993 (filed as document number CS2P00060.E in Docket No. F-92-CS2P-FFFFF). Based on the ETC's technical report and the subsequent comments of the ETC to the HWIR-Media rule (see comments from the Environmental Technology Council, filed as comment number MHWP 00088 in Docket No. F-92-CS2P-FFFFF), the ETC believes that today's treatment standards for hazardous soils are achievable using thermal treatment. Although the ETC report stated that EPA may lack full-scale treatment data for several innovative or alternative technologies, the ETC data support EPA's view that the many full scale operations of non-combustion technologies demonstrated in the field were sufficient to support a view that the soil treatment standards were achievable. Further, the ETC pointed to various examples of how various non-combustion treatment technologies can be better optimized. EPA concurs with many of those observations on how non-combustion technologies can be optimized.

Two other commenters submitted data in the Phase 2 rule regarding the performance of non-combustion technologies—USPCI and Sierra Environmental Services. USPCI's performance data describe the treatment of polynuclear organics in soils via chemical oxidation followed by stabilization. These data were determined to be insufficient to support a broad national determination that stabilization of organics can be considered BDAT for organics. However, use of organic stabilization may, in some situations, be a permissible treatment option since the LDRs do not specifically prohibit the use of stabilization or solidification to treat nonwastewaters containing hazardous organic constituents. See Response to Comment Document, Comment from Chemical Waste Management, Inc. (No. PH4P-00048). There are, however, specific circumstances in which stabilization or solidification would be considered impermissible dilution. We expect that, for these types of situations to be properly evaluated, it will be necessary to petition for a treatment variance under 40 CFR 268.44(h) or under the provisions for a risk-based soil treatment variance being adopted in today's rule. The Agency also is currently considering whether, in the near future, to issue guidance on when stabilization or solidification of organic-bearing waste is appropriate and when it may constitute impermissible dilution.

Sierra Environmental Services submitted performance data regarding the treatment of carcinogenic polyaromatic hydrocarbons (cPAH) via bioremediation. These data are based on in-situ treatment of a 7.5 acre lagoon which was divided into two cells. Although the facility remediated 35 volatile, 65 semivolatile organics, PCBs, and pesticides, the facility only submitted data describing the treatment of major PAHs. Based on the performance of the biotreatment process applied to this site, the commenter argued the proposed treatment standards, if promulgated as proposed, would eliminate biotreatment as an alternative at this facility. EPA disagrees. Remediation processes that are applied in-situ do not trigger land disposal restrictions. If the facility were biotreating the lagoon sludges ex-situ, EPA concurs that the facility may be unable to land dispose the treated lagoon sludges. We also note that, under the existing regulations and regulations being adopted today, the commenter may be able to avail itself of a treatment variance, depending on the site-specific circumstances involved.

9. Applicability of Soil Treatment Standards and Readability of Final Regulations

Many commenters asserted that the proposed regulations governing applicability of LDRs to contaminated soil were difficult to understand and apply. EPA was persuaded by these comments and has reformatted the applicability regulations into an easier-to-read table. The Agency recognizes that determining whether or not LDRs apply to any given volume of contaminated soil can be complicated. To further assist program implementors and facility owners/operators, we will review and discuss the principles that govern LDR applicability for contaminated soil in this section of today's preamble.

The following principles informed EPA's decisions concerning application of LDRs to contaminated soils.

First principle: land disposal restrictions only attach to prohibited hazardous waste (or hazardous contaminated soil) when it is (1) generated and (2) placed in a land disposal unit.[42] Therefore, if contaminated soil is not removed from the land (i.e., generated), LDRs cannot apply. Similarly, if contaminated soil is removed from the land (i.e., generated) yet never placed in a land disposal unit, LDRs cannot apply.[43] In other words, LDRs do not apply to contaminated soil *in situ* or force excavation of contaminated soil. If soils are excavated, however, LDRs may apply, as discussed below.

Second principle: once a decision has been made to generate and re-land-dispose contaminated soils, LDRs generally only apply to contaminated soils that contain hazardous waste. The Agency considers soil to contain hazardous waste: (1) when it exhibits a

[42] As discussed earlier in today's final rule, all hazardous wastes that were listed or identified at the time of the 1984 Hazardous and Solid Waste Amendments to RCRA have been prohibited from land disposal. EPA is required to prohibit hazardous wastes listed or identified after 1984 within six months of the wastes' listing or identification. RCRA Section 3004(g)(4). A table in 40 CFR Part 268 Appendix VII. outlines the dates of LDR applicability for hazardous wastes.

[43] Note that, as discussed later in today's preamble, nothing in today's final rule affects implementation of the existing "area of contamination" policy. Therefore, soil managed within areas of contamination, even if it is "removed from the land" within such an area, would not be considered to be "generated." See the discussion of the area of contamination policy later in today's preamble.

characteristic of hazardous waste; and, (2) when it is contaminated by certain concentrations of constituents from listed hazardous waste. The contained-in policy is discussed in Section VII.E of today's preamble.

Third principle: once LDRs attach (generally, at the point of generation, see principle (1)) to any given hazardous waste or volume of hazardous contaminated soil, the LDR treatment standards continue to apply until they are met. This principle comes from application of the logic of the Chemical Waste opinion. In that opinion, the D.C. Circuit held that land disposal prohibitions attach at the point that a hazardous waste is generated and continue to apply until threats posed by land disposal of the waste are minimized. Chemical Waste Management v. EPA, 976 F.2d at 13, 14 and 24. In illustration of this principle, the court held that (in the case of characteristic hazardous waste) elimination of the property that caused EPA to identify a waste as hazardous in the first instance does not automatically eliminate the duty to achieve compliance with LDRs. As discussed later in this section of today's preamble, EPA has determined that, although the Chemical Waste opinion did not address contaminated soils *per se*, it is prudent to apply the logic of the Chemical Waste opinion to contaminated soils.

Using these principles, EPA created the regulations and table that govern application of LDRs to contaminated soils, as discussed below.

The regulations that address application of LDRs to soil that exhibits a characteristic of hazardous waste are relatively straightforward. Soil that exhibits a characteristic of hazardous waste when it is generated is subject to LDRs and must be treated to meet LDR treatment standards prior to land disposal. EPA's conclusion that soil that exhibits a characteristic of hazardous waste must be treated to meet LDRs prior to land disposal derives from a simple application of the principles above. First, LDRs have the opportunity to attach to contaminated soil at the point of generation (principle (1)) and, second, under the contained-in policy, soil that exhibits a characteristic of hazardous waste must be managed as hazardous waste (principle (2)) and, therefore, must comply with LDRs. Note that, once LDRs have attached to soil that exhibits a characteristic of hazardous waste, LDR treatment standards must be met prior to land disposal of the soil, even if the characteristic is subsequently eliminated (principle (3)).

The remainder of today's regulations on application of LDRs to contaminated soil, which are in table form, apply to soil contaminated with listed hazardous wastes. The table lists four scenarios.

In the first scenario, soil is contaminated with untreated listed hazardous waste that was prohibited from land disposal when first land disposed (e.g., prohibited hazardous waste that was illegally placed or prohibited hazardous waste that was spilled). In this case, LDRs have already attached to the hazardous waste. Therefore, since LDRs have attached to the waste and threats have not yet been minimized (i.e., treatment standards have not been met), under principle (3) LDRs continue to apply to the waste and, automatically, to any contaminated soil.[44] The Agency has concluded that LDRs apply to soils contaminated in this way regardless of whether the soil is determined not to (or no longer to) "contain" hazardous waste either when first generated or at any time in the future. This conclusion comes from application of principle (3): once something is prohibited from land disposal, LDRs continue to apply until threats to human health and the environment posed by land disposal are minimized regardless of whether the material is at some point determined no longer to be "hazardous."

In the next two scenarios, soil is contaminated with hazardous wastes that were not prohibited from land disposal when first land disposed, but, sometime after land disposal, LDRs have gone into effect. In these cases, whether or not LDRs apply to contaminated soil is governed by a determination of whether or not any given volume of contaminated soil "contains" hazardous waste at its point of generation. If any given volume of soil is determined to contain hazardous waste at its point of generation, LDRs attach (principles (1) and (2)) and, therefore, the LDR treatment standards must be met prior to placement of such soil in a land disposal unit (principle (3)). If any given volume of soil is determined not to contain hazardous waste at its point of generation, there is no hazardous waste to which a land disposal prohibition could attach and the soil, thus, would not be prohibited from land disposal (principles (1) and (2)). (It would be the same if a hazardous waste land disposed before the effective date of an applicable land disposal prohibition were delisted when first re-generated. In that case too, there would be no hazardous waste to which a land disposal prohibition could attach and the delisted waste, thus, would not be prohibited from land disposal.) Note that, under principle (3), once LDRs attach to contaminated soil, the treatment standards must be met prior to land disposal even if the soil is, subsequently, determined no longer to contain hazardous waste.

The final scenario requires no elaboration; it simply makes clear that if soil is contaminated by hazardous waste that was never prohibited from land disposal, LDRs do not apply. This is through application, primarily, of principle (2)—LDRs attach only to hazardous wastes or soil that contains hazardous waste.

Note that, because LDRs apply to the waste "contained-in" soil, and not the soil itself (see principle (2)), LDRs do not apply to soil that is at any time completely separated from its contaminating waste (i.e., the soil contains no solid or hazardous waste, it's "just soil"). One might determine that soil contained no solid or hazardous waste, for example, if concentrations of hazardous constituents fall below natural background levels or are at non-detectable levels. Such a determination would terminate all RCRA Subtitle C requirements, including LDRs, since waste would not longer be "contained-in" the soil. See September 15, 1996 letter from Michael Shapiro (EPA) to Peter Wright (Monsanto Company), making this finding; see also, 61 FR 18806 (April 29, 1996) and other sources cited therein.

The following examples illustrate application of LDRs to contaminated soil:

1. Generator A is excavating soil mildly contaminated with wastewater treatment sludge (listed waste F006). The sludge was land disposed before 1980. The soil does not exhibit a characteristic of hazardous waste and has been determined by an authorized state not to contain listed hazardous waste. The soil is not prohibited from land disposal. This is because, for LDR purposes, the point of generation is when the soil is first excavated from the land (principle (1)). Since no prohibited hazardous waste existed before that time (i.e., the contaminating waste was not prohibited) and the soil does not contain listed hazardous waste or exhibit a characteristic of hazardous waste at its point of generation, there is

[44] EPA is assuming that the waste did not meet a treatment standard when it was placed on the soil. Wastes which meet a treatment standard are no longer prohibited from land disposal and, unless it is determined to "contain" hazardous waste at its point of generation and are subsequently land disposed, soils contaminated by these wastes are, likewise, not prohibited from land disposal. See, RCA section 3004(m)(2) (hazardous wastes meeting treatment standards are no longer prohibited from land disposal).

no hazardous waste to which a land disposal prohibition could attach (principle (2)).

2. Generator B is excavating soil contaminated by leaks from a closing hazardous waste surface impoundment. The surface impoundment received listed hazardous wastes K062 (spent pickle liquor) and characteristic hazardous waste D018 (wastes that fail the TCLP test for benzene). The surface impoundment stopped receiving K062 waste in 1987 and D018 waste in 1993. The soil does not exhibit a characteristic of hazardous waste and has been determined by an authorized state not to contain listed hazardous waste. The soil is not prohibited from land disposal. This is because, for LDR purposes, the point of generation is when the soil is first excavated from the land (principle (1)). Since no prohibited hazardous waste existed before that time (i.e., the contaminating wastes were not prohibited) and the soil does not contain listed hazardous waste or exhibit a characteristic of hazardous waste at its point of generation, there is no hazardous waste to which a land disposal prohibition could attach (principle (2)).

3. Generator C is excavating soil contaminated with listed hazardous waste F024. The F024 waste was land disposed after 1991, after it was prohibited from land disposal, and was not first treated to meet applicable land disposal treatment standards (i.e., it was illegally land disposed or accidentally spilled). Since the contaminating waste was prohibited from land disposal and treatment standards were not achieved prior to land disposal, the LDR prohibition continues to apply to any soil contaminated by the waste (principle (3)) regardless of whether the soil "contains" hazardous waste when generated. The soil is prohibited from land disposal and, before land disposal, must be treated to meet applicable technology-based treatment standards or until a site-specific, risk-based minimize threat determination is made through the variance process.

4. Generator D is excavating soil contaminated by an accidental spill of benzyl chloride, which, when discarded, is listed hazardous waste P028 and is prohibited from land disposal. The accidental spill occurred yesterday. The contaminating waste was prohibited from land disposal and, since the treatment standards were not achieved prior to the accidental spill, the prohibition continues to apply to any soil contaminated by the waste (principle (3)). Thus, the soil is prohibited from land disposal and, before land disposal, must be treated to meet applicable technology-based treatment standards or until a site-specific, risk-based minimize threat determination is made through the variance process.

5. Generator E is excavating soil contaminated by listed hazardous waste F004 (generally, spent non-halogenated solvents). The F004 waste was land disposed in 1984, prior to the effective date of an applicable land disposal prohibition; however, on generation the soil contains high concentrations of cresols constituents, so that an authorized state determines it "contains" hazardous waste. The soil is prohibited from land disposal. Although the contaminating waste was not prohibited from land disposal, since the soil contained hazardous waste at the point of generation (and the waste had since become prohibited from land disposal), the land disposal prohibition attaches to the contaminated soil and, before land disposal, the soil must be treated to meet applicable technology-based treatment standards or until a site-specific, risk-based minimize threat determination is made through the variance process (principles (1), (2), and (3)).

EPA acknowledges that the reading of LDR applicability to contaminated soil discussed above creates potential administrative difficulties, since, in many cases, a factual determination will be required as to when hazardous wastes were land disposed in order to determine whether they were prohibited at that time and whether, therefore, the prohibition continues to apply to contaminated soil. The Agency expects that these difficulties will be minimal because, in most cases, contamination will be caused by hazardous wastes placed before the effective date of applicable land disposal prohibitions since land disposal after prohibition would be illegal. The exception is accidental spills of hazardous waste, which the Agency believes are (1) rare, and (2) known, so determining dates of land disposal should not be problematic. This issue was discussed in detail in the HWIR-Media proposal, 61 FR 18805 (April 26, 1996).

As discussed in the April 29, 1996 proposal, the Agency continues to believe that, if information is not available or inconclusive, it is generally reasonable to assume that contaminated soils do not contain untreated hazardous wastes placed after the effective dates of applicable land disposal prohibitions. This is because placement of untreated hazardous waste after applicable LDR effective dates would be a violation of RCRA, subject to significant fines and penalties including criminal sanctions. 61 FR at 18805 (April 29, 1996). Of course, program implementors and facility owners/operators cannot make the determination that information on the types of waste contamination or dates of waste placement is unavailable or inconclusive without first making a good faith effort to uncover such information. By using available site- and waste-specific information such as manifests, LDR records required under 40 CFR 268.7, vouchers, bills of lading, sales and inventory records, storage records, sampling and analysis reports, accident reports, site investigation reports, spill reports, inspection reports and logs, EPA believes that program implementors and facility owners/operators will typically be able to make informed decisions about the types of waste contamination and dates of waste placement. Most commenters supported this approach.

EPA notes that it is not critical for a decision about whether contaminated soil contains listed hazardous waste or exhibits a characteristic of hazardous waste to be made without removing any of the soil (other than the sample volume) from the land. In an area of generally dispersed soil contamination, soil may be consolidated or managed within the area of contamination to facilitate sampling, for example, to ensure that soil samples are representative or to separate soil from non-soil materials. However, care should be taken not to remove hazardous contaminated soils from separate areas of contamination at a facility and place such hazardous contaminated soil into a land disposal unit unless, of course, the soil meets applicable LDR treatment standards. The area of contamination policy is discussed later in this section of today's preamble.

A few commenters expressed concern or confusion over the application of LDRs to soil contaminated by accidental spills of hazardous wastes. The Agency clarifies that accidental spills of hazardous wastes (or products or raw materials) are not considered placement of hazardous waste into a land disposal unit since, in the case of a spill, prohibited waste is not being placed in one of the identified units named in RCRA Section 3004(m).[45] See, 45 FR 76626 (Nov. 19, 1980), issuing clarifying regulations at 40 CFR 264.10(g) to provide that hazardous waste treatment

[45] Although, if such a spill were not cleaned up in a timely way, EPA or an authorized state could determine that the contaminated area should be considered a land disposal unit for purposes of requiring cleanup under RCRA Subtitle C. 55 FR at 20809 (July 27, 1990).

and storage activities undertaken in immediate response to an accidental spill are exempt from the 40 CFR Part 264 and 265 regulations governing treatment and storage and do not require permits and Sept. 29, 1986 memo from J. Winston Porter (EPA Assistant Administrator) to Fred Hansen interpreting the 40 CFR 264.10(g) regulations; also see, 55 FR at 30808–30809 (July 27, 1990) ("a one-time spill of hazardous waste would not be considered a solid waste management unit.") However, contaminated soils generated through remediation of spills of untreated listed prohibited hazardous wastes are, as discussed above, subject to land disposal prohibitions since the LDR prohibition that had attached to the contaminating hazardous waste continues to apply until threats are minimized, and, therefore, any contaminated soil remains subject to LDRs (see principle (3)).

A number of commenters expressed concern that EPA's interpretation of LDR applicability to contaminated soil might preclude application of the existing area of contamination policy. In the area of contamination policy, EPA interprets RCRA to allow certain discrete areas of generally dispersed contamination to be considered a RCRA unit (usually a landfill). 55 FR 8758–8760 (March 8, 1999). This interpretation allows hazardous wastes (and hazardous contaminated soils) to be consolidated, treated *in situ* or left in place within an area of contamination without triggering the RCRA land disposal restrictions or minimum technology requirements—since such activities would not involve "placement into a land disposal unit," which is the statutory trigger for LDR. EPA clarifies that its interpretation of LDR applicability for contaminated soil does not, in any way, affect implementation of the area of contamination policy.

Finally, many commenters expressed concern over EPA's application of the LDR treatment standards to soil that is determined no longer to contain hazardous waste or exhibit a characteristic of hazardous waste. As discussed in detail in the 1996 proposal, at this time EPA has concluded that although the Chemical Waste opinion did not speak to contaminated soil specifically, it is prudent to apply the Chemical Waste logic—that a duty to comply with LDRs attaches to hazardous waste when it is first generated and elimination of the indicia of "hazardousness" does not, necessarily, fulfil the statutory land disposal restriction treatment standard—to contaminated soil. See Chemical Waste Management v. EPA, 976 F.2d at 13–16. Although, as discussed later in today's preamble, EPA believes that contained-in determinations will rarely, if ever, be made at constituent concentrations which do not minimize threats, without codifying the contained-in policy, the Agency cannot make the generic finding that this will be the case at every site. For this reason, EPA is requiring that the standards and procedures promulgated today for site-specific, risk-based minimize threat variances alone be used to make minimize threat determinations. This issue is discussed in section VII.E of today's preamble.

C. Conforming and Supporting Changes

To support the land disposal restriction treatment standards for contaminated soil, the Agency is today promulgating a number of conforming and supporting regulations, as follows.

1. Recordkeeping Requirements

A number of commenters expressed confusion over the recordkeeping and reporting requirements that would apply to contaminated soil. The Agency is today clarifying that contaminated soil subject to the land disposal restrictions must comply with the same recordkeeping and reporting requirements as other wastes subject to the land disposal restrictions. That is, the recordkeeping and reporting requirements of 40 CFR 268.7 will apply.

EPA has clarified this in the final regulations by adding appropriate recordkeeping requirements for contaminated soils to the tables in 40 CFR 268.7(a) and 40 CFR 268.7(b). These rules specify that, for contaminated soil, generators and/or treaters must include the following information with their land disposal restriction paperwork: the constituents subject to treatment as described in 40 CFR 268.49(d) and this statement, "this contaminated soil [does/does not] contain listed hazardous waste and [does/does not] exhibit a characteristic of hazardous waste and [is subject to/complies with] the soil treatment standards as provided by 268.49(c) or the universal treatment standards." Note that because in some cases contaminated soil will continue to be subject to LDRs even after it has been determined not to or no longer to contain listed hazardous waste (or de-characterized), the statement includes a notification of whether the soil is still considered hazardous. This is consistent with the approach the Agency used when establishing land disposal restriction treatment standards for hazardous contaminated debris.

2. Definition of Soil

The Agency is promulgating the definition of soil from the April 29, 1996 proposal with one change made in response to comments. Soil is defined as, "unconsolidated earth material composing the superficial geologic strata (material overlying bedrock), consisting of clay, silt, sand, or gravel size particles as classified by the U.S. Soil Conservation Service, or a mixture of such materials with liquids, sludges or solids which is inseparable by simple mechanical removal processes and is made up primarily of soil by volume, based on visual inspection." The Agency has added the phrase "by volume, based on visual inspection" in response to comments recommending that EPA explicitly conform the definition of soil with the definition of debris. See 57 FR 37222 (August 18, 1992). This clarification is consistent with the Agency's intent, as discussed in the 1996 proposal, that determinations of whether any material was "soil," "debris," or "waste" to be made in the field. 61 FR 18794 (April 26, 1996).

The definition of soil includes the concept that mixtures of soil and other materials are to be considered soil provided the mixture is made up predominantly of soil and that the other materials are inseparable using simple physical or mechanical means. This approach allows program implementors and facility owners/operators to determine whether any given material is soil, waste, or debris based on the results of simple mechanical removal processes commonly used to separate materials, such as pumping, dredging, or excavation by backhoe, forklift or other device. It avoids requiring chemical analysis for soil properties in order to differentiate precisely between wastes, soil and debris. As discussed in the April 29, 1996 and September 14, 1993 proposals, the Agency believes that attempting to distinguish more precisely between waste, soil or debris using chemical analysis or other tests would be prohibitively difficult to develop and support and cumbersome to administer. *Cf.* 57 FR at 37224, August 18, 1992, where the Agency adopted a similar classification system for hazardous debris. Most commenters supported this approach. Note that any non-soil that is separated from contaminated soil that contains listed hazardous waste or is found to exhibit a characteristic of hazardous waste should be considered hazardous waste and is subject to the applicable universal treatment standard.

EPA also emphasizes that any dilution of a prohibited contaminated soil (or of a prohibited hazardous waste with soil) as a substitute for adequate treatment to achieve compliance with LDR treatment standards or to circumvent the effective date of an LDR prohibition is considered a type of impermissible dilution and is illegal. Therefore, any deliberate mixing of prohibited hazardous waste with soil in order to change its treatment classification (i.e., from waste to contaminated soil) is illegal. Existing regulations concerning impermissible dilution already make this point. See 40 CFR 268.3(a) and (b); see also 57 FR at 37243 (Aug. 18, 1992) (adopting the same principle for contaminated debris). The Agency expects that deliberate mixing of hazardous waste with soil (and vice versa) will be rare because such actions are clearly illegal and would subject generators to substantial fines and penalties, including criminal sanctions. In addition, the resulting mixture (hazardous waste impermissible diluted by soil) would continue to be subject to the LDRs for the original hazardous waste (i.e., generally, the universal treatment standards), so no benefit in terms of reduced treatment requirements would occur. The Agency took a similar approach when promulgating treatment standards specific to hazardous debris. See 57 FR at 37224 (August 18, 1992).

The Agency notes that the normal mixing of contaminated soil from various portions of a site that typically occurs during the course of remedial activities or in the course of normal earthmoving and grading activities is not considered intentional mixing of soil with non-media or prohibited soil with non-prohibited soil and, therefore, is not a type of impermissible dilution.

D. Seeking Treatment Variances Because the National Treatment Standard is Unachievable or Inappropriate

Under existing regulations at 40 CFR 268.44, people may obtain a variance from a land disposal restriction treatment standard when a waste cannot be treated to the specified level or when a treatment standard may be inappropriate for the waste. With respect to contaminated soils, EPA has to this point presumed that a treatment variance would generally be needed because the LDR treatment standards developed for process wastes were either unachievable (generally applied to soil contaminated by metals) or inappropriate (generally applied to soil contaminated by organic constituents). See, for example, 55 FR 8760 (March 8, 1990); 58 FR 48092, 48125 (September 14, 1993); 61 FR 18805–18808, 18810–18812 (April 29, 1996); and, 61 FR 55717 (October 28, 1996). This presumption will no longer apply once today's soil treatment standards take effect. This is because today's standards were developed specifically for contaminated soils and are intended to specifically address the past difficulties associated with applying the treatment standards developed for process waste to contaminated soil.

This is not to say that treatment variances based on the "unachievable" or "inappropriate" prongs of the test are now unavailable for contaminated soils. For example, in some cases it may prove that even though an appropriate technology, suited to the soil matrix and constituents of concern was used, a particular soil cannot be treated to meet the soil treatment standards using a well-designed well-operated application of one of the technologies EPA considered in establishing the soil standards. In these types of cases, under existing regulations, the soil treatment standard would be considered "unachievable" and a treatment variance could be approved. In other cases, under existing regulations, application of the soil treatment standards might be "inappropriate" in that, for example, it would present unacceptable risks to on-site workers.

As noted earlier in today's preamble, alternative LDR treatment standards established through treatment variances must, according to 40 CFR 268.44(m), "minimize threats to human health and the environment posed by land disposal of the waste." In cases where an alternative treatment standard does not meet this requirement, a treatment variance will not be approved even though application of a technology more aggressive than the technologies on which the soil treatment standards are based might then be necessary. For example, in cases where the soil treatment standards cannot be achieved through application of a well-designed, well-operated application of one of the model soil treatment technologies and application of the model technology or other non-combustion technologies will not result in constituent concentrations that minimize threats, a variance would not be approved and combustion would be necessary. This is proper given that the soil treatment standards were not developed using the methodology typically used in the land disposal restriction program (i.e., application of the most aggressive treatment technology to the most difficult to treat waste), but, instead are designed to accommodate a variety of soil treatment technologies that are typically used during remediation. Variances for treatment of contaminated soil will be applied during the remedial context, where, as discussed in Section VII.B.3 of today's preamble, EPA and authorized states will typically have detailed information about the risks posed by specific hazardous constituents, direct and indirect exposure routes, risk pathways and human and environmental receptors. This information can be used to inform decisions about whether threats are minimized.

E. The Contained-In Policy

The contained-in principle is the basis for EPA's longstanding interpretation regarding application of RCRA Subtitle C requirements to mixtures of contaminated media and hazardous wastes. Under the "contained-in" policy, EPA requires that soil (and other environmental media), although not wastes themselves, be managed as if they were hazardous waste if they contain hazardous waste or exhibit a characteristic of hazardous waste. See, for example, 53 FR 31138, 31148 (August 17, 1988) and 57 FR 21450, 21453 (May 20, 1992) (inadvertently citing 40 CFR 261(c)(2) instead of 40 CFR 261.3(d)(2)); see also Chemical Waste Management v. EPA, 869 F.2d 1526, 1539–40 (D.C. Cir. 1989) (upholding the contained-in principle as a reasonable interpretation of EPA regulations). In practice, EPA has applied the contained-in principle to refer to a process where a site-specific determination is made that concentrations of hazardous constituents in any given volume of environmental media are low enough to determine that the media does not "contain" hazardous waste. Typically, these so called "contained-in" determinations do not mean that no hazardous constituents are present in environmental media but simply that the concentrations of hazardous constituents present do not warrant management of the media as hazardous waste.[46] For contaminated soil, the result of "contained-in determinations" is that soil no longer "contains" a

[46] Of course, as noted earlier, EPA or an authorized state could determine, at any time, that any given volume of environmental media did not contain (or no longer contained) any solid or hazardous waste (i.e., it's just media). These types of determinations might be made, for example, if concentrations of hazardous constituents fall below background levels, or are at non-detectable levels. Such a determination would terminate all RCRA Subtitle C requirements, including LDRs. See, September 15, 1995 letter from Michael Shapiro (EPA) to Peter Wright (Monsanto Company), making this finding, and 61 FR 18806 (April 29, 1996).

hazardous waste; however, as discussed above, the result is not automatically that soil no longer must comply with LDRs.

In order to preserve flexibility and because EPA believes legislative action is needed, the Agency has chosen, at this time, not to go forward with the portions of the September 14, 1993 or April 29, 1996 proposals that would have codified the contained-in policy for contaminated soils. The Agency continues to believe that legislation is needed to address application of certain RCRA subtitle C requirements to hazardous remediation waste, including contaminated soil. If legislation is not forthcoming, the Agency may, in the future, re-examine its position on the relationship of the contained-in policy to site-specific minimize threat determinations based on implementation experience and/or may choose to codify the contained-in policy for contaminated soil in a manner similar to that used to codify the contained-in policy for contaminated debris.

1. Current Guidance on Implementation of the Contained-in Policy

EPA has not, to date, issued definitive guidance to establish the concentrations at which contained-in determinations may be made. As noted above, decisions that media do not or no longer contain hazardous waste are typically made on a case-by-case basis considering the risks posed by the contaminated media. The Agency has advised that contained-in determinations be made using conservative, health-based levels derived assuming direct exposure pathways. 61 FR at 18795 (April 29, 1996) and other sources cited therein. A compilation of many of the Agency's statements on the contained-in policy has been placed in the docket for today's rulemaking.

The land disposal restriction treatment standards for contaminated soil promulgated today do not affect implementation of the contained-in policy. They are not considered, and should not be used, as de facto "contained-out" concentrations although, in some cases, it may be appropriate to determine that soil treated to the soil treatment standards no longer contains hazardous waste. Remediation project managers should continue to make contained-in decisions based on site-specific conditions and by considering the risks posed by any given contaminated media.

2. Relationship of the Contained-In Policy to Site-Specific, Risk-Based Minimize Threat Determinations

As discussed above, the D.C. Circuit held in the Chemical Waste opinion that the RCRA Section 3004(m) obligation to minimize threats can continue even after a waste would no longer be identified as "hazardous." Chemical Waste Management v. EPA, 976 F.2d at 13–16. The Agency believes that it is prudent to apply the logic of the Chemical Waste opinion to contaminated soil. Therefore, when the contained-in policy is applied to soil that is already subject to a land disposal prohibition, the Agency is compelled to decide if a determination that soil does not or no longer "contains" hazardous waste is sufficient to determine that threats posed by subsequent land disposal of those soils have been minimized. As discussed earlier in today's preamble, EPA is not, at this time, able to make a generic finding that all contained-in determinations will automatically satisfy this standard. This is largely because, for reasons of needed administrative flexibility and because we believe legislation is needed, EPA has not codified standards for approving contained-in determinations and has not codified procedures for making such determinations. Absent such standards and procedures, the Agency cannot, at this time, make a generic finding that all contained-in determinations will result in constituent concentrations that also minimize threats within the meaning of RCRA Section 3004(m). These decisions, of course, could be made on a site-specific basis, by applying the standards and procedures for site-specific, risk-based minimize threat variances, promulgated today.

The regulations governing site-specific, risk-based minimize threat determinations promulgated today are, essentially, the same as the Agency's guidance for making contained-in determinations. See, for example, 61 FR 18795 (April 29, 1996) and other sources cited therein. That is, decisions should be made by considering the inherent risks posed by any given soil, assuming direct exposure (i.e., no post-land disposal controls) and applying conservative information to calculate risk. Therefore, the Agency expects that, in most cases, a determination that soils do not (or no longer) contain hazardous waste will equate with minimize threat levels and, therefore, encourages program implementors to combine contained-in determinations, as appropriate, with site-specific, risk-based minimize threat variances.

F. Relationship of Soil Treatment Standards to the Final HWIR-Media Rule

In the April 29, 1996 HWIR-Media proposal, EPA proposed to establish a comprehensive alternative management regime for hazardous contaminated media, of which the treatment standards for contaminated soil would have been a small part. The HWIR-Media proposal discussed a number of options for comprehensive management standards for hazardous contaminated media.

Today's action resolves and finalizes the portion of the HWIR-Media proposal that addressed land disposal restriction treatment standards for contaminated soil. See 61 FR 18805–18814, April 29, 1996. Other portions of the proposal are not resolved by this action and will be addressed by EPA in future actions. EPA continues to emphasize that, while the soil-specific LDR treatment standards will improve contaminated soil management and expedite cleanups, the Agency also recognizes that additional reform is needed, especially for management of non-media remediation wastes like remedial sludges. The Agency will continue to participate in discussions on potential legislation to promote this additional needed reform.

VIII. Improvements and Corrections to LDR Regulations

Summary: The regulated community has pointed out several examples of the LDR regulations that were unclear or had typographical errors. These sections are clarified and corrected below.

A. Typographical Error in Section 261.1(c)(10)

A typographical error was found in the cross reference in the note in § 261.1(c)(10). The first Phase IV final rule ("Minirule," 62 FR 25998) said "They are covered under the exclusion from the definition of solid waste for shredded circuit boards being recycled (261.4(a)(13))." The correct cross reference is to "(261.4(a)(14)." This typographical error is corrected in this final rule.

B. Typographical Error in Section 268.4(a)(2)(ii) and (a)(2)(iii)

These paragraphs have referred to § 268.8 for some time. Section 268.8 was where the so called "soft hammer" provisions were once found in the regulations. These provisions expired in 1990, and the provisions have been removed from the regulations; thus there is no need to continue to include references to § 268.8.

18. Subpart D is amended by adding § 268.49 to read as follows:

§ 268.49 Alternative LDR treatment standards for contaminated soil.

(a) Applicability. You must comply with LDRs prior to placing soil that exhibits a characteristic of hazardous waste, or exhibited a characteristic of hazardous waste at the time it was generated, into a land disposal unit. The following chart describes whether you must comply with LDRs prior to placing soil contaminated by listed hazardous waste into a land disposal unit:

If LDRs	And if LDRs	And if	Then you
Applied to the listed waste when it contaminated the soil*.	Apply to the listed waste now		Must comply with LDRs
Didn't apply to the listed waste when it contaminated the soil*.	Apply to the listed waste now	The soil is determined to contain the listed waste when the soil is first generated.	Must comply with LDRs.
Didn't apply to the listed waste when it contaminated the soil*.	Apply to the listed waste now	The soil is determined not to contain the listed waste when the soil is first generated.	Needn't comply with LDRs.
Didn't apply to the listed waste when it contaminated the soil*.	Don't apply to the listed waste now		Needn't comply with LDRs.

*For dates of LDR applicability, see 40 CFR Part 268 Appendix VII. To determine the date any given listed hazardous waste contaminated any given volume of soil, use the last date any given listed hazardous waste was placed into any given land disposal unit or, in the case of an accidental spill, the date of the spill.

(b) Prior to land disposal, contaminated soil identified by paragraph (a) of this section as needing to comply with LDRs must be treated according to the applicable treatment standards specified in paragraph (c) of this section or according to the Universal Treatment Standards specified in 40 CFR 268.48 applicable to the contaminating listed hazardous waste and/or the applicable characteristic of hazardous waste if the [illegible] is characteristic. The treatment [illegible]rds specified in paragraph (c) of [illegible]ction and the Universal Treatment Standards may be modified through a treatment variance approved in accordance with 40 CFR 268.44.

(c) Treatment standards for contaminated soils. Prior to land disposal, contaminated soil identified by paragraph (a) of this section as needing to comply with LDRs must be treated according to all the standards specified in this paragraph or according to the Universal Treatment Standards specified in 40 CFR 268.48.

(1) All soils. Prior to land disposal, all constituents subject to treatment must be treated as follows:

(A) For non-metals, treatment must achieve 90 percent reduction in total constituent concentrations, except as provided by paragraph (c)(1)(C) of this section.

(B) For metals, treatment must achieve 90 percent reduction in constituent concentrations as measured in leachate from the treated media (tested according to the TCLP) or 90 percent reduction in total constituent concentrations (when a metal removal treatment technology is used), except as provided by paragraph (c)(1)(C) of this section.

(C) When treatment of any constituent subject to treatment to a 90 percent reduction standard would result in a concentration less than 10 times the Universal Treatment Standard for that constituent, treatment to achieve constituent concentrations less than 10 times the universal treatment standard is not required. Universal Treatment Standards are identified in 40 CFR 268.48 Table UTS.

(2) Soils that exhibit the characteristic of ignitability, corrosivity or reactivity. In addition to the treatment required by paragraph (c)(1) of this section, prior to land disposal, soils that exhibit the characteristic of ignitability, corrosivity, or reactivity must be treated to eliminate these characteristics.

(3) Soils that contain nonanalyzable constituents. In addition to the treatment requirements of paragraphs (c)(1) and (2) of this section, prior to land disposal, the following treatment is required for soils that contain nonanalyzable constituents:

(A) For soil that also contains analyzable constituents, treatment of those analyzable constituents to the levels specified in paragraphs (c)(1) and (2) of this section; or,

(B) For soil that contains only nonanalyzable constituents, treatment by the method specified in § 268.42 for the waste contained in the soil.

(d) Constituents subject to treatment. When applying the soil treatment standards in paragraph (c) of this section, constituents subject to treatment are any constituents listed in 40 CFR 268.48, Table UTS—Universal Treatment Standards that are reasonably expected to be present in any given volume of contaminated soil, except fluoride, selenium, sulfides, vanadium and zinc, and are present at concentrations greater than ten times the universal treatment standard.

(e) Management of treatment residuals. Treatment residuals from treating contaminated soil identified by paragraph (a) of this section as needing to comply with LDRs must be managed as follows:

(1) Soil residuals are subject to the treatment standards of this section;

(2) Non-soil residuals are subject to:

(A) For soils contaminated by listed hazardous waste, the RCRA Subtitle C standards applicable to the listed hazardous waste; and

(B) For soils that exhibit a characteristic of hazardous waste, if the non-soil residual also exhibits a characteristic of hazardous waste, the treatment standards applicable to the characteristic hazardous waste.

19. Table 1 in Appendix VII to Part 268 is amended by removing the entries for waste code F033; revising the second entry for waste code F032, the second entry for F034, and the first entry for K088; revising the entries for D003-D011 and two entries for waste code F035; and, Table 2 is amended by revising entry number 9 and adding entries 12 and 13 to read as follows:

TABLE 1.—EFFECTIVE DATES OF SURFACE DISPOSED WASTES

[(Non-soil and Debris) Regulated in the LDRS—Comprehensive List]

Waste code	Waste category	Effective date
*	*	*
D003	Newly identified surface-disposed elemental phosphorus processing wastes	May 26, 2000.
D004	Newly identified D004 and mineral processing wastes	August 24, 1998.
D004	Mixed radioactive/newly identified D004 or mineral processing wastes	May 26, 2000.
D005	Newly identified D005 and mineral processing wastes	August 24, 1998.
D005	Mixed radioactive/newly identified D005 or mineral processing wastes	May 26, 2000.
D006	Newly identified D006 and mineral processing wastes	August 24, 1998.
D006	Mixed radioactive/newly identified D006 or mineral processing wastes	May 26, 2000.
D007	Newly identified D007 and mineral processing wastes	August 24, 1998.
D007	Mixed radioactive/newly identified D007or mineral processing wastes	May 26, 2000.
D008	Newly identified D008 and mineral processing waste	August 24, 1998.
D008	Mixed radioactive/newly identified D008 or mineral processing wastes	May 26, 2000.
D009	Newly identified D009 and mineral processing waste	August 24, 1998.
D009	Mixed radioactive/newly identified D009or mineral processing wastes	May 26, 2000.
D010	Newly identified D010 and mineral processing wastes	August 24, 1998.
D010	Mixed radioactive/newly identified D010 ormineral processing wastes	May 26, 2000.
D011	Newly identified D011 and mineral processing wastes	August 24, 1998.
D011	Mixed radioactive/newly identified D011or mineral processing wastes	May 26, 2000.
*	*	*
F032	All others	August 12, 1997.
*	*	*
F034	All others	August 12, 1997.
F035	Mixed with radioactive wastes	May 12, 1999.
F035	All others	August 12, 1997.
*	*	*
K088	All others	October 8, 1997.
*	*	*

* * * * *

TABLE 2.—SUMMARY OF EFFECTIVE DATES OF LAND DISPOSAL RESTRICTIONS FOR CONTAMINATED SOIL AND DEBRIS (CSD)

Restricted hazardous waste in CSD	Effective date
*	*
9. Soil and debris contaminated with K088 wastes	October 8, 1997.
*	*
12. Soil and debris contaminated with newly identified D004–D011 toxicity characteristic wastes and mineral processing wastes.	August 24, 1998.
13. Soil and debris contaminated with mixed radioactive newly identified D004–D011 characteristic wastes and mineral processing wastes.	May 26, 2000.

20. Appendix VIII to Part 268 is amended by revising the title and adding in alpha numeric order the entry "NA" to read as follows:

Appendix VIII to Part 268—LDR Effective Dates of Injected Prohibited Hazardous Wastes

NATIONAL CAPACITY LDR VARIANCES FOR UIC WASTES

Waste code	Waste category	Effective date
*	*	*
NA	Newly identified mineral processing wastes from titanium dioxide production and mixed radioactive/ newly identified D004–D011 characteristic wastes and mineral processing wastes.	May 26, 2000.
*	*	*

"reasonably expected to be present" guidance

View Record Detail

FAXBACK 13748

PPC 9554.1995(01)

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

June 14, 1995

Roy F. Weston, Inc.
Ms. Janell B. Bergman, P.G., CPG
Senior Project Manager
215 Union Boulevard, Suite 550
Lakewood, CO 80228-1842

Dear Ms. Bergman:

It is a pleasure to respond to your letter dated April 27 1995, regarding the Land Disposal Restrictions Phase II final rule (59 FR 47982). Specifically, you requested an interpretation of the phrase "which can reasonably be expected to be present" as it applies to underlying hazardous constituents in soil that exhibits the toxicity characteristic.

The preamble to the final phase II rule states: "regulated entities do not have to ascertain the presence of all hazardous constituents for which EPA is promulgating a universal treatment standard. Generators may base this determination on their knowledge of the raw materials they use, the process they operate, and the potential reaction products of the process, or upon the results of a one-time analysis of the entire list of constituents at 268.48." (See 59 FR 48015.)

In the case of contaminated soil, however, the "generator" may not be the party that caused the contamination, but rather may be the one performing the cleanup. As you point out, it may be difficult to determine exactly what constituents are reasonably expected to be present in the soil because of the lack of records about the site and the absence of anyone who has institutional memory about the cause of the contamination. It is appropriate, therefore, to use the constituents that are at levels above the Universal Treatment Standards, based on monitoring at the site, provided analysis has been conducted for the entire list of constituents at 268.48. These would be the constituents reasonably expected to be present at the point of generation (in a remediation, the point of generation is the point the contaminated

soil is picked up).

I hope you find this information helpful. If you have further questions, please call Rhonda Craig of my staff on (703) 308-8771.

Sincerely,

Michael Shapiro
Director
Office of Solid Waste

Attachment

Weston
215 Union Boulevard, Suite 550
Lakewood, CO 80228-1842
303-980-6800 FAX: 303-980-1622

27 April 1995

Mr. Michael Shapiro
Director, Office of Solid Waste
United States Environmental Protection Agency
401 M Street, SW
Washington, D.C. 20460

SUBJECT: Land Disposal Restrictions - Phase II

Dear Mr. Shapiro:

Roy F. Weston, Inc. requests an interpretation of a phrase pertaining to the recently published Land Disposal Restrictions - Phase II (59 FR 47982). Specifically, we request an interpretation of the phrase "which can reasonably be expected to be present" as it applies to underlying hazardous constituents that may be found in soil that exhibits the toxicity characteristic (TCLP). (Sections 268.2(i) and 268.40(e))

Application of this concept is straightforward as it applies to industrial waste streams; however, it becomes difficult when referring to contaminated soil where unknown wastes were deposited years ago. Weston requests EPA's interpretation of this concept as it applies to contaminated soils. Is it sufficient to use the list of constituents that have been detected at the site as the list of constituents reasonably expected to be present?

Thank you for your attention to this matter. We look forward to

your response to this question.

Sincerely,

ROY F. WESTON, INC.

Janell B. Bergman, P.G., CPG
Senior Project Manager

cc: Mr. Jim Thompson
Office of Regulatory Enforcement
RCRA Enforcement Division