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Introduction to:

Land Disposal Restrictions
(40 *CFR* Parts 268)

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LAND DISPOSAL RESTRICTIONS

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1. INTRODUCTION

The primary goal of the RCRA Subtitle C program is to protect human health and the environment from the dangers associated with generation, transportation, treatment, storage, and disposal of hazardous waste. Disposal of hazardous waste on the land is a practice of particular concern to the RCRA program. Land disposal units, such as landfills and surface impoundments, must comply with stringent requirements for liners, leak detection systems, and groundwater monitoring. The land disposal restrictions (LDR) provide a second measure of protection from threats posed by hazardous waste disposal. LDR provides that a hazardous waste cannot be land disposed until the waste is treated (or meets specific treatment standards) to reduce the mobility or toxicity of the hazardous constituents in the waste. This training module presents an overview of the land disposal restrictions program.

When you have completed this module, you will be able to describe the LDR requirements. Specifically, you will be able to:

- Define the basic terms and describe the structure of the LDR regulations
- Identify the statutory basis for LDR
- Describe the applicability of LDR
- Explain how EPA sets treatment standards
- Identify treatment standards for wastes subject to land disposal restrictions and cite the CFR section
- Describe and identify how extensions and variances from treatment requirements are obtained, including FR citations
- Define generator and treatment, storage, and disposal facility (TSDF) requirements under the LDR program
- Summarize the schedule of existing restrictions and the plan for restricting newly identified wastes.

Use this list of objectives to check your knowledge of this topic after you complete the training session.

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2. REGULATORY SUMMARY

The LDR program found at 40 CFR Part 268 requires that a hazardous waste must be treated (or meet specified levels for hazardous constituents) before land disposal is allowed. Each waste code has one or more specific treatment standards listed in Part 268, Subpart D. Treatment standards are expressed either as required technologies that must be applied to the waste or contaminant concentration levels that must be met. Treatment standards are based on the performance of the best demonstrated available technology (BDAT) that is able to substantially diminish the toxicity of a waste or to reduce the mobility of the hazardous constituents in a hazardous waste. Wastes that do not meet treatment standards cannot be land disposed unless EPA has granted a variance, extension, or exclusion (or the waste is managed in a "no-migration unit"). In addition to the disposal prohibition, there are prohibitions and limits in the LDR program regarding the dilution and storage of wastes. The program also includes tracking and recordkeeping requirements.

2.1 LDR AND EPA'S GROUNDWATER PROTECTION STRATEGY

A large part of the hazardous waste management regulatory program, including the LDR program, is designed to protect groundwater. Hazardous waste can pollute groundwater through the process known as leaching, in which precipitation percolating through the ground draws contaminants out of buried waste and carries them into groundwater. Placing barriers between wastes and underground water sources is one way to prevent migration of hazardous contaminants into groundwater. Thus, many RCRA regulations focus on requiring hazardous waste containment. For example, RCRA regulations require installation of impermeable liners beneath hazardous waste landfills. Such barriers separate vulnerable groundwater from hazardous constituents likely to leach from the buried wastes.

The land disposal restrictions are based on a different groundwater protection principle. Instead of requiring barriers between groundwater and hazardous wastes, LDR requires that hazardous wastes undergo fundamental physical or chemical changes so that they pose less of a threat to groundwater. For example, many of the chemicals capable of contaminating groundwater are organic compounds. Incineration or burning can destroy these organic compounds, usually breaking them down into less dangerous by-products like carbon dioxide and water. Thus, incineration of organic-bearing hazardous wastes can protect groundwater by destroying organic contaminants before they have a chance to enter underground water supplies. The obvious advantage of such hazardous waste treatment is that it provides a more permanent and lasting form of groundwater protection than does simple hazardous waste containment. Structural barriers separating hazardous contaminants from groundwater can eventually break down or leak. In contrast, treatment that simply destroys harmful contaminants or reduces a waste's toxicity before it enters the environment is a permanent groundwater protection solution.

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Not all types of contaminants found in hazardous wastes can be destroyed. In particular, metal elements are common toxic contaminants that cannot be broken down through combustion. Treatment techniques other than incineration, however, can be used for such wastes. For example, through a process called stabilization or immobilization, metal contaminants can be chemically and physically bound into the wastes that contain them. Although this process does not reduce the overall concentration of toxic metals in a hazardous waste, it does immobilize these constituents, making them less likely to leach from the waste. Reducing the mobility or leachability of hazardous constituents in a waste is thus another means of permanently achieving LDR's groundwater protection goal. Congress understood that hazardous waste could be made less dangerous to groundwater in two main ways: by reducing a waste's toxicity through destruction or removal of harmful contaminants, or by reducing a waste's leachability by immobilizing hazardous contaminants. When directing EPA to establish the LDR program in RCRA §3004(m), Congress specified that EPA should "promulgate regulations specifying those levels or methods of treatment, if any, which substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from the waste."

As the above statutory excerpt indicates, Congress gave EPA very specific directions for establishing the LDR program. In particular, Congress required that EPA specify how hazardous wastes should be treated to satisfy LDR's goal of groundwater protection. The rules EPA set up governing how different hazardous wastes must be treated are known as treatment standards. Treatment standards are simply instructions on how a hazardous waste should be treated. This module will explain how to identify the treatment standard applicable to a hazardous waste and the methodology EPA used to develop treatment standards.

2.2 APPLICABILITY

To be subject to the land disposal restrictions, a waste must first be a RCRA hazardous waste. Unless a waste meets the definition of a solid and hazardous waste, its disposal cannot be subject to the LDR program.

Once listed or identified, a hazardous waste becomes restricted, or subject to LDR, when the Agency establishes treatment levels that the waste must meet before it can be land disposed. RCRA §3004(g) requires that EPA restrict hazardous wastes from land disposal within six months of promulgating a new listing or characteristic. Until the Agency establishes a treatment level, newly listed or identified wastes are not subject to LDR and they may continue to be land disposed. Once EPA promulgates final treatment levels specifically restricting a waste, however, handlers must manage it in accordance with all the requirements of Part 268 and the waste cannot be land disposed until it meets the treatment level.

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EXCLUSIONS

While the LDR program generally applies to all persons who generate, transport, treat, store, or dispose of a restricted hazardous waste, there are exclusions to the applicability of Part 268. The following hazardous wastes are not subject to the requirements of LDR (§268.1(e)):

- Waste generated by conditionally exempt small quantity generators as defined at §261.5
- Waste pesticide and container residues disposed by farmers on their own land pursuant to §262.70
- Newly identified or listed hazardous wastes for which EPA has yet to promulgate land disposal prohibitions or treatment standards
- Certain low volume releases, known as de minimis losses, or laboratory chemicals that are mixed with a facility's wastewater and are discharged under the regulation of the Clean Water Act (CWA).

Wastes meeting any of these descriptions may continue to be land disposed without being subject to the LDR program. Other restricted hazardous wastes must be managed in compliance with all requirements of Part 268 unless explicitly exempted by another part of the RCRA program.

2.3 TREATMENT STANDARDS

Restriction on the land disposal of a hazardous waste requires that the waste be adequately treated to fundamentally change the threat posed by the waste. Waste-specific restrictions are manifested as thresholds for adequate treatment, known as treatment standards. These treatment standards can be expressed as either numeric concentration levels for hazardous constituents, or as a required technology. Once a waste has been restricted and issued a treatment standard, a waste may be land disposed only after it meets the appropriate treatment standard.

TECHNOLOGY-BASED TREATMENT STANDARDS

Section 3004(m) of the Hazardous and Solid Waste Amendments requires EPA to promulgate treatment standards that reduce the toxicity or mobility of hazardous constituents so that short- and long-term threats to human health and the environment are minimized. To implement this mandate EPA chose to base treatment standards on technical practicability instead of risk assessment. To this end, EPA conducts extensive research into available treatment technologies. Of all the proven, available technologies, the one that best minimizes the mobility and/or toxicity of hazardous constituents is designated as the BDAT for that waste. The

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Agency then establishes a waste code-specific treatment standard based on the performance of the BDAT. These treatment standards are expressed as either concentration levels or required technologies.

When treatment standards are set as concentration levels, treatment is not limited to the BDAT used to establish the treatment standard; instead the Agency uses BDAT to determine what is the appropriate level of treatment for each hazardous constituent commonly found in the waste. The regulated community may then use any method or technology (except for impermissible dilution) to meet the treatment standard. After treatment, waste analysis or application of knowledge must be used to determine if the applicable concentration-based standards in §268.40 have been met.

When a treatment standard is a required technology, that technology must be used, unless it can be demonstrated that an alternative method can achieve a level of performance equivalent to the required technology (discussed below in section 2.4). Whenever possible, EPA prefers to use numeric treatment standards so as to stimulate innovation and development of alternative treatment technologies.

Since the physical and chemical composition of a waste significantly impacts the effectiveness of a given treatment technology, EPA divided the treatment standard for each waste code into two categories: wastewaters and nonwastewaters. The Agency defines these two categories based on the percentages of total organic carbon (TOC) and total suspended solids (TSS) present in a waste (§268.2), since these factors commonly impact the effectiveness of treatment methods.

CONSOLIDATED TABLE OF TREATMENT STANDARDS

While the treatment standards for hazardous wastes were previously presented in multiple tables, a single consolidated table has replaced them. If a waste has been restricted from land disposal, the treatment standard for both wastewaters and nonwastewaters can be found in Part 268, Subpart D, §268.40. There are three types of treatment standards:

- Constituent concentrations in mg/kg of the waste
- Constituent concentrations in an extract of the waste expressed in mg/l
- Treatment standards expressed as specified technologies and represented by a five letter code (described in §268.42).

Numeric standards are commonly expressed in mg/kg when the BDAT is a destruction or extraction technology such as incineration. Compliance with these treatment standards is measured by analyzing a representative sample of the waste for the total concentration of each hazardous constituent identified in the treatment standard, and comparing it to the level given for the waste code.

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Treatment standards given in mg/l are also concentration-based standards. In wastewaters, compliance is demonstrated by comparing the concentration of hazardous constituents found in a composite sample of the waste with the regulatory level. For nonwastewaters, an extract that reflects the potential of hazardous constituents to leach from the waste must first be prepared. The waste meets the treatment standard if the concentration of regulated constituents in the liquid extract are below the regulatory levels given for the waste code. In most cases EPA requires the use of the Toxicity Characteristic Leaching Procedure (TCLP) to obtain the waste extract, but the older and less sensitive Extraction Procedure (EP) may be used when noted.

Section 268.40 also prescribes treatment standards expressed as specified technologies. These wastes must be treated using the technology. Table 2 in §268.42 provides full descriptions that elaborate on the five letter codes used in §268.40. Examples include incineration (INCIN), fuel substitution (FSUBS), and mercury retorting (RMERC). In most cases, once treated by the required technology, wastes can be land disposed without being tested. There are, however, some exceptions. For example, all F024 wastes must be incinerated. Following incineration, the remaining residues must then also meet the concentration levels specified in §268.40.

UNIVERSAL TREATMENT STANDARDS

Use of BDAT to set treatment standards for hazardous wastes gave rise to an unintended consequence: the numeric treatment standard applied to an individual hazardous constituent, like benzene, could vary depending on the performance of the BDAT on each listed or characteristic wastestream that was evaluated. For example, nonwastewater forms of the listed wastes F005 and U019 both require treatment for benzene; however, the treatment standard originally set for benzene in the spent solvent is 3.7 mg/kg, while the standard originally set for unused, discarded benzene is 36 mg/kg.

To simplify the LDR program and eliminate this lack of consistency between standards, the Agency examined the range of numeric standards applied to each hazardous constituent found in restricted hazardous wastes. Based on the range, EPA assigned a single numeric value to each constituent for its respective wastewater and nonwastewater forms. A consolidated list of each constituent and its two treatment standards can be found in §268.48 and is known as the universal treatment standards (UTS). The values assigned to hazardous constituents in the UTS were then used to adjust numeric levels found in the treatment standards table of §268.40. Applying these universal treatment standards has not changed the hazardous constituents that must be treated in a particular waste, as only the numeric standards were amended. As a result, a common constituent found in multiple different wastes will nonetheless carry the same numeric treatment level. The treatment standards found in §268.40 for F005 and U019 nonwastewaters,

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therefore, continue to address benzene, but the level for each has been adjusted to 10 mg/kg.

Creation of the UTS significantly simplifies the process of assigning treatment standards to wastes that are newly identified or listed in the future. When a new waste contains hazardous constituents that have already been addressed in the UTS, the Agency will be able to apply the existing BDAT based numeric standards for those particular constituents. Constituents not already included in the UTS can be evaluated individually and then added to §268.48.

2.4 VARIANCES, EXTENSIONS, AND EXEMPTIONS

If a restricted waste does not meet the appropriate treatment standard, it is ineligible for land disposal. This subset of restricted wastes that cannot be land disposed because they do not yet meet their treatment standards are termed "prohibited" wastes. Although most prohibited wastes become eligible for land disposal through treatment to §268.40 standards, that may not be possible in all cases. As a result, EPA created procedures that allow otherwise prohibited wastes to be land disposed under special circumstances. The following exemptions, variances, and extensions established under Part 268 allow wastes for which treatment standards have been promulgated to be land disposed without meeting treatment standards, or to be treated to a less stringent level or by a different technology:

- National Capacity Variance (§§268.30-268.37)
- Case-by-Case Extension to an Effective Date (§268.5)
- No-Migration Variance (§268.6)
- Variance from a Treatment Standard (§268.44)
- Equivalent Method Variance (§268.42(b))
- Surface Impoundment Treatment Exemption (§268.4).

While wastes subject to any of these provisions continue to be restricted under LDR, they are not prohibited from land disposal under these limited conditions.

NATIONAL CAPACITY VARIANCE

When developing a treatment standard, EPA reviews current and alternative treatment, recovery, and disposal capacity to see if it is adequate for current and future waste management needs. If there is inadequate capacity for certain waste codes, EPA may grant a nationwide extension of the prohibition deadline for up to two years (RCRA §3004(h)(2)). This extension is known as a national capacity variance. To make capacity determinations, EPA compares the quantity of the restricted waste generated with the nationally available treatment, recovery, or protective disposal capacity at permitted and interim status facilities which will be in operation by the effective date. If there is a significant shortage of capacity, EPA will establish an alternative effective date based on the earliest date such capacity will be

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available. If a waste benefiting from a national capacity variance is disposed of in a landfill or surface impoundment, however, the disposal unit must be in compliance with the minimum technological requirements of RCRA §3004(o).

CASE-BY-CASE EXTENSION

A lack of adequate treatment capacity may at times occur not just on a national level, but at times could be limited to regional or local conditions. So EPA may extend the effective date of a treatment standard on a case-by-case basis when petitioned to do so. Case-by-case extensions are granted for one year, and are renewable for an additional year. Such individual extensions cannot exceed a total of 24 months (RCRA §3004(h)(3)). EPA grants case-by-case extensions only when generators or TSDF owners/operators make the appropriate demonstrations enumerated in §268.5.

If hazardous wastes benefiting from a case-by-case extension to an effective date are disposed in landfills or surface impoundments, these disposal units must also meet the minimum technological requirements for liners and leak-detection and be in compliance with groundwater monitoring requirements.

Although case-by-case extensions usually apply to only the waste generated at the individual facility that sought an extension, EPA has, at times, granted a number of "generic" case-by-case extensions with broad applicability. The last of these "generic" case-by-case extensions to an LDR effective date, a limited extension for the disposal of hazardous debris, expired May 8, 1994.

NO-MIGRATION VARIANCE

Hazardous wastes subject to LDR can be land disposed in a particular unit without meeting treatment standards if a petitioner can demonstrate that there will be no migration of hazardous constituents from the unit for as long as the waste remains hazardous (§268.6). "No migration" is interpreted to mean that constituents will not leave the unit boundary at concentrations above Agency-approved health-based levels. A no-migration variance may be granted for up to 10 years, but it may not extend beyond the term of the particular disposal unit's RCRA permit.

No-migration petitions must include a site description, waste characterization, and monitoring plans for evaluation by the Agency. Long-term modeling estimates of concentrations in the unsaturated zone and the air pathway must also be submitted for review.

Virtually every no-migration petition granted has been for underground wells that inject hazardous waste deep beneath the surface. A notable exception is the conditional no-migration variance granted for the U.S. Department of Energy's Waste Isolation Pilot Plant (WIPP) in New Mexico. This variance permits DOE to

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dispose of untreated mixed radioactive and hazardous wastes in an underground salt dome for the duration of a test period.

VARIANCE FROM A TREATMENT STANDARD

Under certain circumstances, generators or TSDFs may petition the Agency for a variance from using a required technology or from meeting a concentration-based treatment standard. EPA established this variance from a treatment standard to account for those wastes for which applicable treatment standards and BDAT methods are inappropriate (§268.44). Petitioners must demonstrate that the waste is significantly different from the wastes evaluated by EPA when developing the codified treatment standard or that such standard or method is inappropriate for the waste. A treatability variance may apply generically to all waste meeting a description, or it may be narrower in scope, applying only to a specific waste generated at a particular site (55 FR 22526; June 1, 1990).

EQUIVALENT TREATMENT METHOD VARIANCE

A waste with a specified technology as a treatment standard in §268.42 must be treated using that method of treatment prior to disposal. A person may, however, submit an application to the Regional Administrator demonstrating that an alternate treatment method can achieve a performance equivalent to that of the specified treatment standard and can protect human health and the environment (§268.42(b)). If the petition is approved, an equivalent method variance is granted and the alternate method may be used in lieu of the specified technology.

SURFACE IMPOUNDMENT TREATMENT EXEMPTION

The management of liquid wastes in surface impoundments often serves as a means of treatment. Typically, particulates suspended in liquid wastes settle to the bottom of impoundments, forming sludges in which contaminants concentrate. This precipitation process may result in the generation of sludges that are hazardous wastes. Since management of wastes in surface impoundments is considered land disposal, such generation and placement of hazardous sludges on the land without prior treatment would normally be inconsistent with LDR's mandate. Section 268.4 allows this practice, however, by providing an exemption for wastes treated in surface impoundments. Wastes may be treated and generated in surface impoundments without first meeting treatment standards provided that (1) the surface impoundment meets certain technological requirements, (2) the treatment residues that do not meet applicable standards are removed from the impoundment annually, and (3) the removed residues are not managed in another surface impoundment.

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2.5 ALTERNATIVE TREATMENT STANDARDS

In addition to these waste code- or site-specific exception procedures, the Agency also created a number of broad alternative treatment standards that facilities may choose to utilize in lieu of meeting the waste code-specific treatment standards. These alternative treatment standards are only available for certain forms of restricted wastes.

LAB PACK WASTES

Laboratories commonly generate small volumes of many different listed and characteristic wastes. Rather than manage all these disparate wastes individually, laboratories commonly take advantage of regulatory provisions that allow them to overpack many small containers of hazardous waste into a larger drum. These containers are known as lab packs, and they have been given an alternative treatment standard that allows generators to apply one treatment standard for the entire lab pack rather than applying the treatment standard for each individual waste code contained within the lab pack (§268.42(c)). The primary condition for application of this alternative, however, is that the lab pack may not contain any of the mercury-bearing waste codes identified in Part 268, Appendix IV.

DEBRIS

Section 268.45 contains alternate treatment standards for manufactured items and environmental media that are contaminated with hazardous waste. These alternative standards were developed because materials such as rocks, bricks, and industrial equipment (known generically as debris) contaminated with hazardous waste may not be amenable to the waste code-specific treatment standards in §268.40. Section 268.45 allows an owner/operator to choose among several types of treatment technologies, based on the type of debris and the waste with which it is contaminated. The alternative treatment standards for debris can be divided into three categories: extraction technologies, destruction technologies, and immobilization technologies. When using an alternate debris treatment standard, the waste handler must ensure that the treatment process meets the design and operating requirements established in §268.45, and that he or she treats for each contaminant, or hazardous constituent, subject to treatment (defined in §268.45(b)). In order to be eligible for land disposal, the debris must meet the specified performance standards in Table 1 of §268.45. For example, a contaminated boulder which is sand-blasted to remove surface contamination must be treated to a "clean debris surface" and at least 0.6 centimeter of the surface layer of the boulder must be removed. Once hazardous debris has been treated according to the specification of one of these technologies, it may be land disposed in a hazardous waste unit. If hazardous debris no longer exhibits any characteristic following treatment with an extraction (e.g., sandblasting) or destruction (e.g., incineration) technology, it is eligible for land disposal and can be disposed as nonhazardous or simply returned to the environment (§261.3(f)).

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2.6 PROHIBITIONS

In addition to prohibiting the land disposal of wastes that do not meet treatment standards, the LDR rules include two other important prohibitions. One forbids the storage of wastes as a substitute for meeting the required treatment standards. The other prohibits the dilution of wastes as a substitute for legitimate treatment. Like the prohibition on land disposal, these prohibitions no longer apply once a waste meets its waste code-specific treatment standard.

STORAGE PROHIBITION

EPA promulgated the storage prohibition in order to prevent waste from being stored as a way of avoiding treatment requirements (§268.50). This section forbids the storage of waste subject to a treatment standard unless the waste is being stored in order to accumulate such quantities as necessary to facilitate proper recycling, treatment, or disposal. During the first year of storage, EPA bears the burden of proving that the waste is being stored in order to avoid meeting treatment standards rather than to facilitate legitimate recycling, treatment, or disposal. There is no strict time limit on legitimate waste storage; however, after the first year of storage, the burden of proof for showing that a waste is indeed being legally accumulated to facilitate proper future management shifts from EPA to the waste handler.

Generators accumulating waste on-site in accordance with §262.34 and transporters storing waste at a transfer facility for 10 days or less are exempt from the storage prohibition. The storage prohibition also does not apply to wastes which qualify for an exemption from a treatment standard such as a case-by-case extension under §268.5, a no-migration petition under §268.6, or a national capacity variance, or to wastes that were placed into storage prior to the effective date of a prohibition on land disposal.

DILUTION PROHIBITION

Dilution of wastes as a substitute for appropriate treatment is generally prohibited (§268.3). There are, however, certain cases where dilution is permissible. Dilution as a necessary part of a legitimate waste treatment process is allowed. Dilution is inherent in some types of legitimate waste handling, such as the aggregation of similar wastes to facilitate subsequent treatment. As a general rule, if aggregated wastes are all legitimately amenable to the same treatment, and this treatment is used for the aggregated wastes, the aggregation step does not constitute impermissible dilution. In addition, certain characteristic wastes which are managed in Clean Water Act-regulated treatment systems can be diluted to meet treatment standards (§268.3(b)). As well, certain characteristic wastes may currently be diluted to render them nonhazardous before disposal in a deep injection well regulated under the Safe Drinking Water Act (§268.19c)(3)). The table found at the end of this section may be used to determine if a particular waste is subject to a prohibition on dilution when handled in a particular manner.

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2.7 TRACKING AND RECORDKEEPING REQUIREMENTS

Generators and TSDFs managing wastes that are subject to LDR (restricted wastes) have certain notification, certification, waste analysis, and recordkeeping requirements under §268.7. Much like a hazardous waste manifest, the LDR notification and certification paperwork helps hazardous waste handlers and EPA enforcers ensure that wastes are properly managed. A notification accompanies each shipment of waste that is subject to LDR and often includes such information as the waste code(s), the hazardous constituents present in the waste, and waste analysis data. If a waste can be land disposed without further treatment, a certification to that effect also accompanies each shipment of waste. The requirement that such paperwork be retained by hazardous waste handlers allows EPA to track wastes that are subject to LDR and to ensure that those wastes receive proper treatment prior to disposal. Section 268.7(a) contains the tracking requirements for generators, §268.7(b) specifies the requirements for treatment facilities, §268.7(c) contains the regulations applicable to disposal facilities, and §268.7(d) contains special notification and certification requirements that apply to hazardous debris.

GENERATORS

Generators must determine if their hazardous waste is subject to LDR at the point of generation. They may make this determination by testing or applying knowledge. If a waste is subject to LDR and does not meet applicable treatment standards, generators must notify the treatment facility in writing (§268.7(a)(1)). This notice accompanies the manifest and must include the following information:

- EPA hazardous waste code
- Identification of the waste as a wastewater or nonwastewater
- Manifest number associated with the waste shipment
- Waste analysis data (if available)
- For certain wastes, any additional hazardous constituents present
- Where hazardous debris is to be treated by an alternative technology of §268.45, a statement to that effect and the contaminants subject to treatment.

If a generator's waste already meets applicable treatment standards, the generator, in accordance with §268.7(a)(2), must submit a certification stating that the waste meets the required treatment standards. This certification accompanies a copy of the notification statement described above.

According to §268.7(a)(3), if a generator's waste qualifies for an exemption from a treatment standard, such as a national capacity variance, case-by-case extension, or no-migration exemption, the generator must submit to the disposal facility a notification similar to that given in §268.7(a)(1), except that it must also identify the date that the waste will become subject to LDR prohibitions.

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Under §262.34, generators may treat hazardous waste in accumulation tanks, containers, or containment buildings provided the units are in compliance with certain standards applicable to TSDFs. EPA believes that generators should have the same recordkeeping and documentation responsibilities that apply to TSDFs when treating wastes to meet LDR treatment standards. Therefore, §268.7(a)(4) requires generators to prepare a waste analysis plan (WAP) when treating wastes to meet LDR. The WAP must justify the frequency of testing based on a detailed analysis of a representative sample of the waste. The plan must contain all information necessary for proper treatment of the waste in accordance with Part 268, and must be retained in the facility's records (55 FR 22670; June 1, 1990). Generators who are conducting partial treatment, but not treating to meet treatment standards, or that are treating wastes in units not subject to §262.34 are not required to have a WAP.

TREATMENT FACILITIES

The tracking and recordkeeping requirements that apply to treatment facilities are found at §268.7(b). Hazardous waste treaters are required to test treated waste to ensure that all applicable treatment standards are met. These tests must be performed as specified in the facility's WAP (all TSDFs must have WAPs under §§264/265.13). If a facility ships treated waste off-site for disposal, a notification similar to the generator's notice must accompany the waste to the disposal facility. The treater's notice must include relevant waste codes, additional hazardous constituents present, manifest information, and waste analysis data (§268.7(b)(4)). The treater must also include a certification that the shipment of waste meets treatment standards (§268.7(b)(5)). If the waste or a residue of the waste will be sent for further treatment or storage at another facility, the treater must comply with the notification and certification requirements for a generator.

LAND DISPOSAL FACILITIES

Section 268.7(c) enumerates the paperwork requirements that apply to the final link in the cradle-to-grave management of hazardous waste, the land disposal facilities. Hazardous waste disposers must ensure that incoming wastes or residues meet the applicable treatment standards by testing the waste in accordance with their facility's waste analysis plan. Additionally, disposers must maintain records on-site of all notifications and certifications received from generators and treatment facilities.

SPECIAL REQUIREMENTS FOR TREATED DEBRIS

Generators or treaters of hazardous debris who claim that their hazardous debris is excluded from the definition of hazardous waste under §261.3(f) are required to comply with certain notification and certification requirements (§268.7(d)). Since these wastes are no longer hazardous, the paperwork will not be sent to the disposal facility. Instead, relevant notices and certifications are submitted to EPA and retained on-site by the original generator or treater on a one-time basis.

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2.8 CHARACTERISTIC HAZARDOUS WASTES

Just like listed wastes, restricted characteristic wastes must also meet treatment standards before they are eligible for land disposal. Since the land disposal restrictions attach at the point of generation, treatment standards applicable to characteristic wastes cannot be circumvented by simply removing the characteristic. Once a waste is both decharacterized and treated to meet standards that applied at the point of generation, however, the waste may be land disposed in a nonhazardous, Subtitle D landfill.

TREATMENT STANDARDS

Special requirements have been established regarding wastes that exhibit a characteristic (§268.9). As general principle, a hazardous waste must meet all applicable treatment standards to be eligible for land disposal. For purposes of LDR, a generator with a listed hazardous waste must, therefore, determine if the waste also exhibits any hazardous waste characteristics (§262.11(c)). If the listed waste exhibits a characteristic of hazardous waste, the treatment standard for both waste codes must be met. An exception occurs, however, when the treatment standard for the listed waste specifically includes a standard for the constituent that causes the waste to exhibit the characteristic. Therefore, compliance with the treatment standard for the listed waste will satisfy both requirements, as the standard for the listed waste will operate in lieu of the treatment standard for the characteristic waste code.

PAPERWORK REQUIREMENTS

While characteristic wastes are subject to the standard notification requirements of §268.7, there are special provisions for wastes from which the characteristic has been removed. When these wastes meet treatment standards and no longer exhibit any characteristic, LDR notification and certification paperwork need not accompany the shipment to a Subtitle D facility. Instead, §268.9(d) requires that a one-time notice and certification be filed with the implementing agency and maintained on-site. Subsequent shipments of similar waste would not require additional notice except on an annual basis if the process or recipient facility changed.

DILUTION OF CHARACTERISTIC WASTES AND TREATMENT OF UNDERLYING HAZARDOUS CONSTITUENTS

When treatment standards were first promulgated for characteristic wastes, EPA determined that protection of human health and the environment could be adequately accomplished for many of these wastes merely by removal of the characteristic. Thus, the treatment standards for these wastes appeared as the specified technology, "DEACT," or deactivation. While Part 268, Appendix VI recommends particular methods of treatment to accomplish deactivation, simple dilution with soil or water was an acceptable means to achieve compliance.

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Dilution of this kind was not considered impermissible under §268.3, since it was performed as part of a specified technology.

However, in the case Chemical Waste Management, Inc. et al. v. EPA, the plaintiffs won a judgment against the Agency alleging, among other things, that accomplishment of deactivation via dilution failed to meet the statutory mandates of RCRA §3004(m) because dilution does not reduce the mobility or toxicity of the hazardous constituents present in the wastes. By way of judgment, on September 25, 1992, the DC Circuit Court of Appeals immediately vacated the treatment standards for ignitable (D001) and corrosive (D002) wastes, and remanded the treatment standards applicable to many other characteristic wastes.

In response to the court decision, EPA published revised treatment standards for D001 and D002 wastes in the May 24, 1993, Federal Register (58 FR 29860). These revised standards require that certain ignitable and corrosive wastes not only be deactivated to remove the hazardous characteristic, but that they also be legitimately treated to meet numeric concentration levels for any hazardous constituents also present in the wastes. These constituents are known as "underlying hazardous constituents" because they require treatment to meet LDR standards, but nonetheless do not themselves cause the waste to exhibit a characteristic.

On September 19, 1994, when EPA promulgated treatment standards for the newly identified TC organic wastes (D018-D043) and revised the standards for some previously restricted characteristic wastes (D012-D017), the Agency also required treatment for underlying hazardous constituents beyond that necessary for removal of the characteristic. The creation of the UTS in §268.48 provided the Agency an easy source for the list of constituents and appropriate treatment levels. Wastes requiring treatment for underlying hazardous constituents must meet the numeric treatment levels enumerated in the UTS to be eligible for land disposal. Wastes subject to treatment for underlying hazardous constituents are easily identified, therefore, since their treatment standards in §268.40 require that they comply with the characteristic level "and meet §268.48 standards."

2.9 HISTORY OF THE LDR PROGRAM

The Hazardous and Solid Waste Amendments of 1984 (HSWA) established the authority for the LDR program. Due to the large number of hazardous waste codes that existed prior to HSWA, LDR treatment standards were developed in stages. In HSWA, Congress set a time frame for the implementation of treatment standards for all wastes listed or identified as hazardous on or before November 8, 1984. Congress set specific prohibition dates for certain high-risk and high-volume wastes and established a three-part schedule with specific deadlines for EPA to develop treatment standards for the remaining listed and characteristic wastes. Wastes identified subsequent to HSWA are considered newly identified or listed. Additional rulemakings, promulgated in "phases," have since begun to address

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these new wastes. This section highlights some especially pertinent parts of those rulemakings and identifies and explains certain complex areas.

SOLVENT AND DIOXIN-CONTAINING WASTE

The solvent and dioxin-containing wastes were the first wastes EPA addressed under the LDR program. Congress set a statutory deadline for EPA to establish treatment standards for these wastes because they are generated either in high volumes (solvent wastes) or are considered highly toxic (dioxin-containing wastes). EPA published a final rule on November 7, 1986 (51 FR 40572), establishing effective dates and treatment standards for F001-F005 solvent wastes (§268.30) and F020-F023 and F026-F028 dioxin-containing wastes (§268.31). The November 7, 1986, final rule also established the basic framework for the land disposal restrictions program.

CALIFORNIA LIST WASTE

A second group of hazardous wastes for which Congress set a specific LDR deadline is known as the California list. This list was compiled from a program established by California's Department of Health Services. The California list, which became effective July 8, 1987, prohibited the land disposal of liquid hazardous wastes containing certain toxic constituents or exhibiting certain properties unless subjected to prior treatment. The targets of the list included cyanides, pH, polychlorinated biphenyls (PCBs), halogenated organic compounds (HOCs), and metals. Certain HOC-containing wastes were also prohibited even when in solid form.

As waste code-specific treatment standards have been issued, the California list prohibitions have been superseded by treatment standards specific to the RCRA waste code addressing the constituent (or property) of concern. For example, the treatment standard for the characteristic D008 (lead) supersedes the California list prohibition on liquid hazardous wastes containing lead. While in most cases California list prohibitions have been superseded by more specific treatment standards, they remain applicable for:

- Liquid hazardous wastes that contain $\geq$ 134 mg/l of nickel or $\geq$ 130 mg/l of thallium
- Hazardous wastes containing HOCs at more than 1,000 ppm that are identified by a characteristic property that does not involve HOCs (see Part 268, Appendix III for a list of HOCs regulated under §268.32)
- Liquid hazardous wastes that contain over 50 ppm PCBs.

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THIRDS

HSWA §3004(d)(4) required EPA to prepare a schedule by November 8, 1986, for establishing treatment standards for all hazardous wastes identified or listed on or before November 8, 1984. When developing the schedule, EPA was required to rank the listed wastes from high to low priority, based on the wastes' intrinsic hazard and volume generated. High-volume, high-intrinsic hazard wastes were scheduled to be addressed first, while low-volume, lower-hazard wastes (including characteristic wastes) were to have treatment standards established last. Wastes with treatment standards promulgated in the first portion of the three part schedule are known as First Third wastes (53 FR 31138; August 17, 1988), wastes addressed in the second portion of the schedule are known as Second Third wastes (54 FR 26594; June 23, 1989), and wastes in the third category are known as Third Third wastes (55 FR 22520; June 1, 1990).

TREATMENT STANDARDS FOR NEWLY IDENTIFIED OR LISTED WASTES

In addition, HSWA requires EPA to establish treatment standards for all hazardous wastes listed or identified after November 8, 1984. EPA is developing treatment standards for these wastes in phases. The first of these rulemakings, termed Phase I, was published in the Federal Register on August 18, 1992 (57 FR 37194). In addition to promulgating restrictions for certain new wastes, Phase I finalized the alternative treatment standards for hazardous debris.

The Phase II rule was finalized in the Federal Register on September 19, 1994 (59 FR 47982). This final rule consolidated the existing treatment standards into §268.40, created the UTS, and promulgated treatment standards for toxicity characteristic (TC) organic wastes, coke by-products, and chlorotoluenes.

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3. REGULATORY DEVELOPMENTS

Phases I and II did not address all the wastes newly listed or identified since November 8, 1984. Subsequent rulemakings must be promulgated to address these additional wastes not yet restricted from land disposal.

When finalized, the Phase III LDR rulemaking (proposed 60 FR 11702; March 2, 1995) will establish treatment standards for some newly listed wastes and will mandate RCRA-equivalent treatment be performed upon certain characteristic wastes that are injected into deep SDWA wells, managed in Subtitle D surface impoundments prior to CWA discharge, or discharged to land following CWA-equivalent management. By consent decree, EPA must promulgate the final rule for Phase III by January 1996.

Finally, Phase IV will restrict the land disposal of newly listed or identified wastes, including the previously exempt Bevill wastes, and wastes from wood preserving. These wastes are, of course, not subject to LDR until EPA finalizes treatment standards for these wastes. Phase IV will also adjust the treatment standards applicable to wastes that exhibit the toxicity characteristic for a metal constituent and will create influent treatment standards for restricted wastes managed in nonhazardous surface impoundments in order to mitigate the impact of sludges, leaks, and air emissions. Subject to the same consent decree, Phase IV has been assigned judicial deadlines of June 1995 and June 1996 for the proposed and final rulemakings.

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4. SPECIAL ISSUES

The following four points discuss LDR issues of special note or concern.

4.1 POINT OF GENERATION

Generators are required to classify their solid wastes as soon as they are subject to regulation in order to ensure that hazardous wastes will always be safely managed. Since LDR applies additional limits to the ways in which waste may be managed, it is also necessary to immediately determine if a hazardous waste is subject to LDR. Generators must, therefore, fully characterize their wastes at the point of generation to determine if their hazardous waste is subject to LDR (§262.11). If a waste is restricted at the point of generation, all Part 268 requirements continue to apply to the waste, even if it is subsequently de-characterized or excluded from the definition of hazardous or solid waste.

4.2 SOIL CONTAMINATED WITH A RESTRICTED HAZARDOUS WASTE

Cleanup, or remediation, of hazardous waste sites will often produce contaminated soil that, like debris, must be managed as a hazardous waste if it contains a listed waste or if it exhibits a characteristic. Land disposal of hazardous soils is prohibited unless such soils have been treated to meet the waste code specific treatment standards promulgated for the hazardous waste (i.e., the same treatment standard the waste would have to meet if it was newly generated rather than found in the soil matrix). Yet these remediation wastes, due to either their large volume or unique characteristics, are not always amenable to the same type of treatment. The Agency, therefore, proposed alternative treatment standards specific to hazardous waste contaminated soils as part of the Phase I rule (58 FR 48123; September 14, 1993). This part of the rule, however, has been postponed while EPA reconsiders hazardous waste classification issues for soil as part of the hazardous waste identification rule for contaminated media (59 FR 10778; March 8, 1994). Pending further guidance in that rule, which is scheduled to be proposed in September 1995, generators should seek site specific treatability variances for contaminated soils for which the promulgated treatment standard is inappropriate (59 FR 47986; September 19, 1994).

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4.3 DIOXIN-CONTAINING WASTE

The §268.40 treatment standards for dioxin-containing wastes are based on a BDAT of incineration. While any technology short of dilution is permissible for achieving these levels, only incineration has been able to reach these treatment levels. Currently there is only one commercial facility in the United States permitted to burn dioxin-containing wastes and thus there is likely to be a shortfall in capacity. In the interim, these listed wastes must be exported or stored until treatment capacity becomes available.

4.4 TC V. EP

When the TC superseded the EP, it added the organic constituents (D018-D043). Since the TC is more sensitive than the EP, it also increased the number of wastes considered characteristic for metals (D001-D011) and pesticides (D012-D017). Wastes that exhibit the TC for the new organic constituents, and wastes that exhibit the TC for D001-D017 but that do not also fail the EP, are both considered newly identified since the TC rule was promulgated after November 8, 1984. While HSWA requires EPA to set treatment standards for any newly identified or listed waste within six months of the identification of the waste, there is no statutory provision that automatically prohibits land disposal if EPA fails to set treatment standards within the Congressionally mandated time frame. With the Phase II rule (59 FR 47982; September 19, 1994) EPA finally promulgated treatment standards for TC organics and pesticides. Wastes which fail only the TC, and not the EP, for metal constituents still remain without treatment standards. These wastes are not yet restricted from land disposal and need not comply with any of Part 268.

Generators must go through a two-step process in order to determine if a metal waste is subject to LDR. First, generators must determine if the solid waste exhibits the TC. If a potentially characteristic waste does not exhibit the TC, then it is not subject to LDR or any other provision of RCRA Subtitle C (assuming it is not hazardous for any other reason). Second, if a waste does exhibit the TC for a metal constituent, then the generator must determine if LDR applies by checking to see if the waste also exhibits the characteristic of EP toxicity. If a waste exhibits the TC for any of the 11 original EP metals (D001-D011), and then also exhibits the EP for the same constituent(s), then the waste is subject to LDR and must be treated to meet the applicable treatment standard prior to disposal. Wastes which exhibit only the TC for a metal constituent are considered newly identified and will not be restricted from land disposal until the Phase IV rule becomes final.

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