ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 260, 261, 262, 264, 265, 268, 270, and 271

[SWH-FRL 3089-5]

Hazardous Waste Management System; Land Disposal Restrictions

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: The Environmental Protection Agency is today promulgating its approach to implementing the congressionally mandated prohibitions on the land disposal of hazardous waste. This action is responsive to amendments to the Resource Conservation and Recovery Act (RCRA), enacted through the Hazardous and Solid Waste Amendments of 1984 (HSWA).

Today's notice establishes procedures for setting treatment standards for hazardous wastes, for granting nationwide variances from statutory effective dates, for granting extensions of effective dates on a case-by-case basis, for evaluating petitions for a variance from the treatment standard, and for evaluating petitions demonstrating that continued land disposal of hazardous wastes is protective of human health and the environment.

In addition, EPA is promulgating specific treatment standards and effective dates for hazardous wastes included in the first phase of the land disposal prohibitions: certain dioxin and solvent-containing hazardous wastes. EPA also is promulgating the Toxicity Characteristic Leaching Procedure (TCLP) for use in determining whether these wastes meet the applicable treatment standards. Extensions of the effective date for certain categories of these wastes are also promulgated in today's rule.

Prohibitions on underground injection of these wastes are on a different schedule and are being addressed in a different rulemaking. The treatment standards, however, will apply when the restrictions are effective.

DATE: This final rule is effective November 8, 1986, except for the provisions in §§ 268.30(b) and 268.31(a), which will become effective on November 8, 1988.

ADDRESSES: The official record for this rulemaking under Docket Number LDR-3 is located in the RCRA Docket (Sub-basement), U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460, and is available for viewing from 9:30 a.m. to 3:30 p.m., Monday through Friday, excluding legal holidays. The public must make an appointment to review docket materials by calling Mia Zmud at (202) 475-9327 or Kate Blow at (202) 382-4675 for appointments. The public may copy a maximum of 50 pages of material from any one regulatory docket at no cost. Additional copies cost $.20/page.

FOR FURTHER INFORMATION CONTACT:

For general information about this rulemaking contact the RCRA Hotline, Office of Solid Waste (WH-562), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, (800) 424-9346 (toll free) or (202) 382-3000 in the Washington, DC metropolitan area.

For information on specific aspects of this rule contact: Stephen R. Weil or Jacqueline W. Sales, Office of Solid Waste (WH-562B), U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460 (202) 382-4770.

SUPPLEMENTARY INFORMATION:

Preamble Outline

I. Background

A. Summary of Hazardous and Solid Waste Amendments of 1984

The Hazardous and Solid Waste Amendments of 1984 (HSWA), enacted on November 8, 1984, impose substantial new responsibilities on those who handle hazardous waste.

In particular, the amendments prohibit the continued land disposal of untreated hazardous wastes beyond specified dates, "unless the Administrator determines that the prohibition . . . is not required in order to protect human health and the environment for as long as the wastes remain hazardous . . ." (RCRA sections 3004 (d)(1), (e)(1), (g)(5), 42 U.S.C. 6924 (d)(1), (e)(1), (g)(5)). Congress established a separate schedule in section 3004(f) for making determinations regarding the disposal of dioxins and solvents in injection wells.

Wastes treated in accordance with treatment standards set by EPA under section 3004(m) of RCRA are not subject to the prohibitions and may be land disposed. The statute requires EPA to set "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 so that short-term and long-term threats to human health and the environment are minimized" (RCRA section 3004(m)(1), 42 U.S.C. 6924(m)(1)).

Land disposal prohibitions are effective immediately upon promulgation unless the Agency sets another effective date based on the earliest date that adequate alternative treatment, recovery, or disposal capacity which is protective of human health and the environment will be available (RCRA sections 3004(h) (1) and (2), 42 U.S.C. 6924(h) (1) and (2)). However, these effective date variances may not exceed 2 years beyond the applicable statutory deadline. In addition, two 1-year case-by-case extensions of the effective date may be granted under certain circumstances.

For the purposes of the land disposal restrictions program, the legislation specifically defines land disposal to include, but not be limited to, any placement of hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome or salt bed formation, or underground mine or cave (RCRA section 3004(k), 42 U.S.C. 6924(k)).

Congress also has prohibited the storage of any hazardous waste that is subject to a prohibition from one or more methods of land disposal unless "such storage is solely for the purpose of the accumulation of such quantities of hazardous waste as are necessary to facilitate proper recovery, treatment or disposal" (RCRA section 3004(j), 42 U.S.C. 6924(j)).

There also is a statutory exemption from the land disposal restrictions for the treatment of wastes in a surface impoundment, provided that the impoundments meet minimum technological requirements (with limited exceptions) and that treatment residues that do not meet the treatment standard(s) are removed within 1 year of the entry of the waste into the impoundment (RCRA section 3005(j) (11)(A)(B), 42 U.S.C. 6925(j)(11)(A)(B)).

The legislation sets forth a series of deadlines for Agency action. At certain deadlines, further land disposal of a particular group of hazardous wastes is prohibited if the Agency has not set treatment standards under section 3004(m) for such wastes or determined, based on a case-specific petition, that there will be no migration of hazardous constituents from the unit for as long as the wastes remain hazardous. Other deadlines cause conditional restrictions

on land disposal to take effect if treatment standards have not been promulgated or if a petition has not been granted. In any case, where EPA does not set a treatment standard for a waste by the statutory date, it is not precluded from later promulgating a treatment standard for that waste. Similarly, where EPA has set a treatment standard, it is not precluded from revising that standard after the statutory date through rulemaking procedures. The relevant statutory deadlines are explained in detail in the following units.

1. Solvents and Dioxins

Effective November 8, 1986, the statute prohibits further land disposal (except by deep well injection) of the following wastes: dioxin-containing hazardous wastes numbered F020, F021, F022, and F023,[1] and solvent-containing hazardous wastes numbered F001, F002, F003, F004, and F005. (RCRA sections 3004 (e)(1), (e)(2), 42 U.S.C. 6924 (e)(1), (e)(2)). These wastes are listed in 40 CFR 261.31.

If EPA fails to set treatment standards or grant petitions for solvent- and dioxin-containing wastes by the statutory deadline, such wastes are prohibited from land disposal as of that deadline (other than in injection wells, where the prohibition is effective as of August 8, 1988). If EPA has set treatment standards, wastes that meet the level or are treated by the specified method may be land disposed. Wastes subject to a successful petition may also continue to be land disposed.

2. California List

Effective July 8, 1987 (32 months from November 8, 1984), the statute prohibits disposal (except with respect to deep well injection) for the following wastes, listed or identified under RCRA section 3001: [2]

a. Liquid hazardous wastes, including free liquids associated with any solid or sludge, containing free cyanides at concentrations greater than or equal to 1,000 mg/l.

b. Liquid hazardous wastes, including free liquids associated with any solid or sludge, containing the following metals (or elements) or compounds of these metals (or elements) at concentrations greater than or equal to those specified below:

(1) Arsenic and/or compounds (as As) 500 mg/l;

(2) Cadmium and/or compounds (as Cd) 100 mg/l;

(3) Chromium (VI) and/or compounds (as Cr VI) 500 mg/l;

(4) Lead and/or compounds (as Pb) 500 mg/l;

(5) Mercury and/or compounds (as Hg) 20 mg/l;

(6) Nickel and/or compounds (as Ni) 134 mg/l;

(7) Selenium and/or compounds (as Se) 100 mg/l;

(8) Thallium and/or compounds (as Tl) 130 mg/l.

c. Liquid hazardous wastes having a pH less than or equal to 2.0.

d. Liquid hazardous wastes containing polychlorinated biphenyls (PCBs) at concentrations greater than or equal to 50 ppm.

e. Hazardous wastes containing halogenated organic compounds in total concentrations greater than or equal to 1,000 mg/kg. (RCRA sections 3004(d) (1) and (2), 42 U.S.C. 6924(d) (1) and (2)).

If EPA fails to set treatment standards or grant petitions by July 8, 1987, for wastes appearing on the California List, these wastes will be prohibited from land disposal (other than in injection wells, where the applicable statutory deadline is August 8, 1988).

EPA will propose treatment standards for California List wastes in a future **Federal Register** notice.

During the period ending November 8, 1988 (48 months from November 8, 1984), disposal of contaminated soil or debris resulting from a response action taken under sections 104 or 106 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (Superfund), or a corrective action required under Subtitle C of RCRA, is not subject to any land disposal prohibition or treatment standard for F001–F005 solvent wastes, dioxin-containing wastes, and wastes covered by the California List. (RCRA sections 3004 (d)(3), (e)(3), 42 U.S.C. 6924 (d)(3), (e)(3)).

3. Scheduled Wastes

Section 3004(g) of RCRA (42 U.S.C. 6924(g)) requires the Agency to set a schedule for making land disposal restriction decisions for all hazardous wastes listed as of November 8, 1984, under RCRA section 3001. This list excludes solvent and dioxin wastes prohibited under section 3004(c) and California List wastes prohibited under section 3004(d). EPA submitted this schedule to Congress on May 28, 1986 (51 FR 19300).

RCRA section 3004(g)(6) (42 U.S.C 6924(g)(6)) provides that if EPA fails to set treatment standards or grant petitions by the statutory deadline for any hazardous waste according to the schedule, such hazardous waste may be disposed of in landfills or surface impoundments only in facilities in compliance with the minimum technological requirements set forth in RCRA section 3004(o), 42 U.S.C. 6924(o)).[3] If EPA fails to set treatment standards or grant a petition for any of the scheduled listed wastes by May 8, 1990, all such wastes will be prohibited from land disposal.

4. Newly Listed Wastes

The land disposal prohibitions apply to all hazardous wastes under RCRA section 3001 as of November 8, 1984, the date of enactment of HSWA. For any hazardous waste identified or listed under RCRA section 3001 after November 8, 1984, EPA is required to make land disposal restriction determinations within 6 months of the date of identification or listing (RCRA section 3004(g)(4), 42 U.S.C. 6924(g)(4)). However, the statute does not impose an automatic prohibition on land disposal if EPA misses a deadline for any newly listed or identified waste.

B. Summary of the Proposed Rule

On January 14, 1986, EPA proposed to establish a framework by which treatment standards for hazardous wastes restricted from land disposal would be established. EPA also proposed treatment standards and effective dates (dates by which wastes must be treated or be prohibited from land disposal unless subject to a successful petition) for the first class of hazardous wastes—solvents and dioxins—to be evaluated under the proposed framework (51 FR 1602).

1. Determination of Section 3004(m) Treatment Standards

In developing treatment standards under RCRA section 3004(m), the Agency proposed an approach using technology-based levels in conjunction with risk-based standards (screening levels). The technology-based levels were derived from the performance of the best demonstrated available technologies (BDAT). Performance of treatment processes was evaluated based upon the leachability of the residuals of such treatment in the land

[1] The final dioxin rulemaking (50 FR 1978, January 14, 1985) contains three waste codes, F026, F027, and F028, not specified in the statute. The additional waste codes are a result of reorganization and do not represent a substantive departure from the waste codes enumerated in section 3004(e)(1).

[2] This list is based on regulations developed by the California Department of Health Services for hazardous waste land disposal restrictions in the State of California. Thus, it has become known as the "California List."

[3] In this situation, placement of such wastes in other types of land disposal units (e.g., deep injection wells) would not be precluded by section 3004(g)(6). See Vol. 130, *Cong. Rec.* S9192 (daily ed., July 25, 1984).

disposal environment. The screening levels specified maximum concentration levels of individual hazardous constituents in extracts of hazardous wastes. The Agency also noted that air emissions contamination was not addressed in the proposed framework. However, when work was completed on the air model, more stringent screening levels would be set, if necessary, to protect this media.

To ensure that the total risks to human health and the environment were not increased as a result of implementing the land disposal restrictions, the Agency proposed to compare the risks of managing wastes in land disposal units with the risks of managing wastes in alternative treatment technologies. Treatment technologies found to pose greater risks than those posed by land disposal of the waste would be considered unavailable for purposes of establishing RCRA section 3004(m) treatment standards.

The proposed rule set treatment standards in the following way. If application of BDAT treatment resulted in concentration levels equal to or lower than the screening levels, the Agency proposed to issue the screening level as the treatment standard, capping off required BDAT treatment at these protective levels. If application of BDAT treatment resulted in levels less stringent than the screening levels, but BDAT realized substantial reductions in toxicity or mobility and did not pose greater risks than land disposal, then the technology-based level would become the treatment standard and the screening level would remain as a goal that could be reached as new technologies emerged.

The Agency proposed to apply this framework to the waste codes specified in section 3004(e) (i.e., F020–F023, F026 and F027 [4] for dioxin-containing wastes, and F001–F005 and the corresponding constituents listed in 40 CFR 261.33 (e) and (f) for solvent-containing wastes [5]).

[4] The Agency omitted F028 from the proposed rule because it is the residue from the thermal treatment of soils contaminated with other dioxin-containing wastes. This was an error, as this waste also is required to meet the treatment standard. F028 is included in today's final rule.

[5] The solvent wastes are listed as P022, U002, U031, U037, U052, U057, U070, U080, U112, U117, U121, U140, U151, U158, U161, U169, U196, U210, U211, U220, U226, U228 and U239.

The screening levels for dioxin-containing wastes were below established detection limits achievable using standard EPA analytical methods, thus, the Agency proposed treatment standards based on the detection limits. The proposed treatment standards for solvents were derived from screening levels and the potential effects of solvents on synthetic and clay liners.

The Agency requested comments on an alternative approach, that of establishing treatment standards under RCRA section 3004(m) based solely on the performance of the best demonstrated available technology (BDAT).

2. Variance Based on Lack of National Capacity

Because no incinerator or thermal treatment facility has been approved by EPA to treat dioxin-containing wastes, the Agency proposed to grant a 2-year national variance for all dioxin-containing wastes subject to the restrictions. The Agency also proposed to grant a 2-year nationwide variance for F001–F005 solvent wastes containing less than 1 percent (by weight) total organic constituents, and solvent-contaminated soils, because of capacity limitations on alternative treatment, recovery, and disposal technologies.

3. Petition Process

The Administrator is authorized to find that land disposal of a particular waste will be protective of human health and the environment if an interested person demonstrates, to a reasonable degree of certainty, that there will be no migration of hazardous constituents from the land disposal unit or injection zone for as long as the wastes remain hazardous (RCRA sections 3004 (d)(1), (e)(1), and (g)(5), 42 U.S.C. (d)(1), (e)(1), and (g)(5)). Under the proposed rule, this demonstration was to be made in the form of a petition to the EPA Regional Administrator or authorized State program director. The applicant would have been required to prove that a specified waste could be contained safely in a particular type of disposal unit. The Agency proposed that the "no migration . . . for as long as the wastes remain hazardous" standard could be met if the petitioner demonstrated that, by the time the constituent reached a point of potential human exposure, or a sensitive environment, it would be at a concentration level that did not threaten human health and the environment.

4. Storage of Prohibited Wastes

Section 3004(j) of RCRA specifies that any waste that is prohibited from one or more methods of land disposal also is prohibited from storage unless the storage is solely to accumulate sufficient quantities of the waste to allow for proper recovery, treatment, or disposal. The Agency interprets the statute to provide that the storage prohibition does not apply to wastes that have been treated in accordance with treatment standards or that have been subject to a successful petition demonstration. EPA proposed that generators and treatment, storage, and disposal facilities be allowed to accumulate prohibited wastes on-site for up to 90 days.

II. Summary of Today's Final Rule

A. Regulatory Framework

The Agency is finalizing the regulatory framework for implementing the land disposal restrictions and promulgating treatment standards and associated effective dates for certain solvent- and dioxin-containing wastes.

By each statutory deadline, the Agency will promulgate the applicable treatment standards under Part 268 Subpart D for each hazardous waste. After the standards are effective, wastes may be disposed of in a Subtitle C facility if they meet the applicable treatment standard.

After the effective dates of the prohibitions, wastes that do not comply with the applicable treatment standards will be prohibited from continued placement in land disposal units unless a petition has been granted by the Administrator under § 268.6 demonstrating that continued management of specific hazardous wastes in land disposal units is protective of human health and the environment for as long as the waste remains hazardous. EPA may provide an extension of the statutory effective date under § 268.5.

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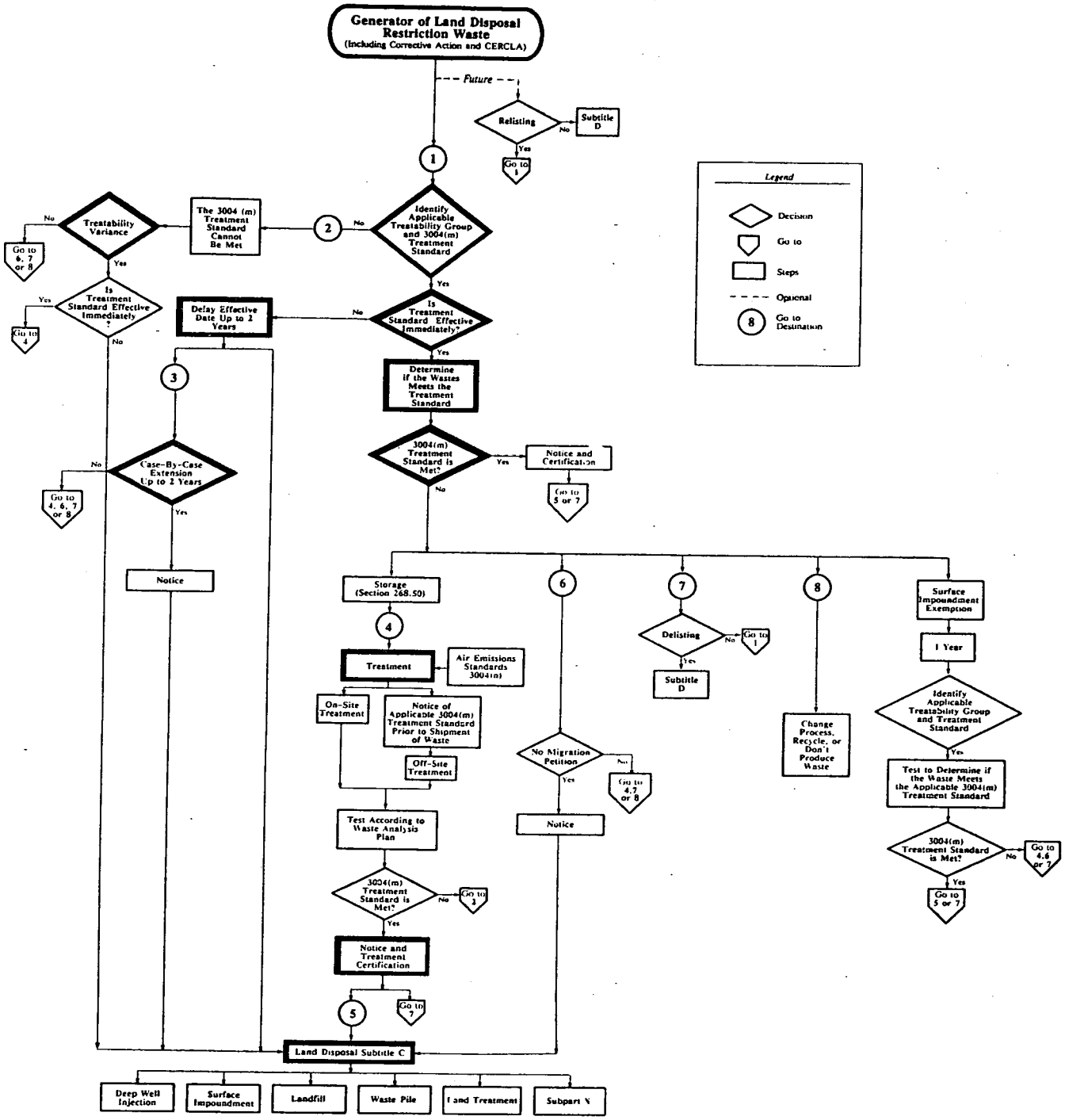

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B. Applicability

1. Scope of Land Disposal Restrictions

The definition of land disposal is not being limited to placement in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave as specifically identified in RCRA section 3004(k). The Agency also considers placement in concrete vaults or bunkers intended for disposal purposes as methods of waste management subject to the land disposal restrictions, as proposed. The Agency, however, is departing from the proposed rule with respect to open detonation. For purposes of clarification, the final rule notes that the Agency interprets any reference to open detonation to include open burning (see Unit III.A.). The Agency has concluded that these methods do not constitute land disposal, except in cases where the residuals from open detonation and open burning of explosives continue to exhibit one or more of the characteristics of hazardous waste.

The Agency interprets the land disposal restriction adopted in today's final rule as applying prospectively to the affected hazardous wastes. In other words, hazardous wastes placed into land disposal units after the effective date are subject to the prohibitions, but wastes land disposed prior to the applicable effective date do not have to be removed or exhumed for treatment. Similarly, the Agency interprets the restrictions on storage of prohibited wastes to apply only to wastes placed in storage after the effective date of an applicable land disposal restriction. If, however, wastes subject to land disposal restrictions are removed from either a storage or land disposal unit after the effective date, subsequent placement of such wastes in or on the land would be subject to the restrictions and treatment provisions.

The provisions of today's final rule also apply to wastes produced by generators of 100 to 1000 kilograms of hazardous waste in a calendar month.

The land disposal restrictions apply to both interim status and permitted facilities. All permitted facilities are subject to the restrictions, regardless of existing permit conditions, because the provisions of RCRA require compliance by all facilities even though the requirements are not specifically referenced in the permit conditions. The land disposal restrictions supersede 40 CFR 270.4(a), which currently provides that compliance with a RCRA permit constitutes compliance with Subtitle C.

2. CERCLA Response Action and RCRA Corrective Action Wastes

Under section 3004(e)(3) Congress provided a 48-month exemption (until November 1988) from the land disposal restriction provisions for disposal of contaminated soil and debris from CERCLA 104 and 106 response actions and RCRA corrective actions. Because of this statutory exemption, today's final rule is not applicable to these wastes. The exemption covers the disposal of any soil and debris wastes under section 3004 (d) and (e). All other CERCLA response action wastes and RCRA corrective actions wastes are subject to this rule.

CERCLA response actions and RCRA corrective actions often address waste matrices different than those associated with industrial waste processes on which this rule is primarily based. These waste matrices are different in terms of chemical/physical composition, concentrations, and media within and among sites. The Agency anticipates that treatability variances may be needed for some soils, debris, and other similar wastes. Therefore, before November 8, 1988, the Agency plans to perform additional characterization of soils and debris and other similar wastes and, where necessary, amend the treatment standards by adding additional standards specifically for these wastes.

Today's final rule provides a 2-year national variance for wastes from CERCLA response actions and RCRA corrective actions that are not soil and debris. These wastes must be disposed of in facilities that are in compliance with the requirements of section 3004(o).

CERCLA and RCRA soil and debris wastes include but are not limited to soils, dirt, and rock as well as materials such as contaminated wood, stumps, clothing, equipment, building materials, storage containers, and liners. In many cases soils and debris will be mixed with liquids or sludges. The Agency will determine on a case-by-case basis whether all or portions of such mixtures should be considered soil or debris.

3. Air Emissions

The framework for restricting wastes from land disposal focuses primarily on the relationship between the land disposal of hazardous waste and ground water quality. However, the Agency also is concerned with air emissions from land disposal of these wastes. The Agency plans to address the issue of releases to the air in a broad context in response to various provisions in RCRA including section 3001 (characterization of waste as hazardous) and section 3004 (restriction of waste from land disposal and standards for air emissions from land disposal).

Historically, the Agency has developed and promulgated rules under section 3001 of RCRA classifying wastes as hazardous based on the potential of these wastes to cause harm to human health and the environment if managed improperly. These determinations have included the potential for harm as a result of reactivity, ignitability, corrosivity, and toxicity via the ground water or surface water pathway. While the Agency has consistently maintained that exposure from air emissions is a potential problem for wastes that are treated and disposed improperly, work to develop a characteristic based on potential for air contamination has not as yet been completed. The Agency plans, however, to propose an air toxicity characteristic in the future to provide a more complete definition of hazardous waste, including a list of hazardous constituents that are of concern based on their potential for air contamination.

In conjunction with the development of an air toxicity characteristic, the Agency also plans to propose criteria and performance standards for air emissions in its development of treatment standards for wastes in accordance with section 3004(m). The development of these criteria is tied to the characterization of wastes as hazardous and that portion of the land disposal restrictions framework related to the risks posed by air emissions from best treatment technologies.

Both the air toxicity characteristic and the criteria for treatment standards based on air emissions are related to both the development of air emission standards under section 3004(n) and the petition demonstration for continued land disposal under section 3004(d). With respect to the former, section 3004(n) requires the Administrator to promulgate standards for the control and monitoring of air emissions from treatment, storage and disposal facilities. These standards are currently under development.

In establishing a framework for dealing with air emissions under the RCRA statute, the Agency must also develop criteria under section 3004 (d), (e), and (g) for determining when the statutory standard of "no migration of hazardous constituents from the disposal unit or injection zone for as long as the waste remains hazardous" has been met. As with other portions of the statute dealing with air emissions, the standards and criteria to be applied to the petition demonstration are closely

related to the factors and criteria to be used to determine when a waste should be managed as hazardous under section 3001 of RCRA. EPA expects that the technical analysis of air emissions that will provide a basis for future rulemaking under sections 3001 and 3004(n) will also be used as a guide in making decisions on petitions addressing air emissions concerns.

Implementation of two portions of the regulatory program, nevertheless, must proceed as the air strategy is being developed. These include the issuance of permits to treatment, storage and disposal facilities and the establishment of corrective action requirements as a part of those permits. In these cases, it is expected that air contamination from operating and closed facilities will be addressed on a case-by-case basis as part of the permit process.

C. Section 3004(m) Treatment Standards

As discussed earlier, the Agency proposed two major approaches to setting treatment standards under section 3004(m). The first approach involved development of treatment standards based on either technology- or risk-based screening levels. The second approach was based entirely on technology-based standards expressed as BDAT. The Agency is promulgating the second approach as the framework under which disposal of solvents, dioxins, and the scheduled wastes will be evaluated.

The risk-based methodology proposed by the Agency considered the degree of hazard posed by wastes land disposed in Subtitle C facilities. This led to the development of "maximum acceptable contaminant concentrations" (or screening levels), which were based on the recognition that the potential for harm to human health and the environment will differ depending on the toxicity, mobility, and persistence of the waste stream. This approach also recognized that in some cases, any single technology-based level may provide more protection than is necessary, while in other cases, may provide insufficient safeguards for human health and the environment. Moreover, under the proposed approach, relatively "low hazard" wastes could be considered suitable for land disposal without any treatment at all.

Although a number of comments on the proposed rule favored the first approach; that is, the use of screening levels to "cap" treatment that can be achieved under BDAT, several commenters, including eleven members of Congress, argued strongly that this approach did not fulfill the intent of the law. They asserted that because of the scientific uncertainty inherent in risk-based decisions, Congress expressly directed the Agency to set treatment standards based on the capabilities of existing technology.

The Agency believes that the technology-based approach adopted in today's final rule, although not the only approach allowable under the law, best responds to the above-stated comments. Accordingly, the final rule establishes treatment standards under RCRA section 3004(m) based exclusively on levels achievable by BDAT. The Agency believes that the treatment standards will generally be protective of human health and the environment. Levels less stringent than BDAT may also be protective.

The plain language of the statute does not compel the Agency to set treatment standards based exclusively on the capabilities of existing technology. RCRA section 3004(m) requires EPA to "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 so that short-term and long-term threats to human health and the environment are minimized" (42 U.S.C. 6924(m)). By calling for standards that minimize threats to human health and the environment, the statute clearly allows for the kind of risk-based standard originally proposed by the Agency. However, the plain language of the statute does not preclude a technology-based approach. This is made clear by the legislative history accompanying the introduction of the final section 3004(m) language. The legislative history provides that "[T]he requisite levels of [sic] methods of treatment established by the Agency should be the best that has been demonstrated to be achievable" and that "[T]he intent here is to require utilization of available technology in lieu of continued land disposal without prior treatment" (Vol. 130, *Cong. Rec.* 9178, (daily ed., July 25, 1984)). Thus, EPA is acting within the authority vested by the statute in selecting to promulgate a final regulation using its proposed alternative approach of setting treatment standards based on BDAT.

The Agency believes that its major purpose in adopting the risk-based approach of the proposal (i.e., to allow different standards for relatively low-risk, low-hazard wastes) may be better addressed through changes in other aspects of its regulatory program. For example, EPA is considering the use of its risk-based methodologies to characterize wastes as hazardous pursuant to section 3001.

D. Petition Procedures for Demonstrating Land Disposal To Be Protective of Human Health and the Environment ("No-migration" Petitions)

In carrying out the directives of RCRA sections 3004 (d)(1), (e)(1), and (g)(5), the Agency proposed to consider petitions to allow land disposal of restricted wastes, provided that petitioners demonstrated that any migration from the disposal site would be at concentrations that did not pose a threat to human health and the environment.

Today's final rule adopts the statutory language requiring petitioners to demonstrate "to a reasonable degree of certainty that there will be no migration of hazardous constituents from the disposal unit or injection zone for as long as the wastes remain hazardous." The Agency will allow continued land disposal of hazardous wastes without further treatment only where it can be demonstrated, to a reasonable degree of certainty, that the statutory standard will be met.

Since the Agency expects that there will be relatively few cases in which this demonstration can be made, and, therefore, that relatively few petitions might be submitted for review, the Agency is requiring that petitions be submitted to the Administrator rather than to permit writers in authorized States or Regional EPA offices as originally proposed. As noted in the proposed rule, a petition may be submitted at any time prior to or after the effective date of the ban (see Unit IV.G.). However, submission of a petition will not stay the effective date of the prohibitions.

E. Variance From the Treatment Standard

The Agency recognizes that there may exist unique wastes that cannot be treated to the levels specified as the treatment standard (or, in some cases, by the method specified). In such cases, generators or owners/operators may submit a petition to the Administrator requesting a variance from the treatment standard. Today's final rule includes procedures for obtaining such a variance (see Unit IV.H.). Following a restriction effective date and while the Agency is reviewing the request for a variance, the generator may not land dispose the waste. Alternatively, continued land disposal in surface impoundments meeting the standards of § 268.4(a)(3) may be feasible for some wastes.

F. National Variance From the Effective Date

The Agency has the authority to grant national variances to the effective date based upon a lack of capacity to treat the wastes. The new effective date of the prohibition is to be established based on the earliest date on which treatment capacity that is protective of human health and the environment will be available. In no case can this extension be longer than 2 years. During the period of such a variance, the waste is not subject to the land disposal restrictions or any requirements relating to such restrictions. However, during the period of such an extension, the wastes must be managed in facilities that are in compliance with the requirements of section 3004(o) (42 U.S.C. 6924(o)).

G. Case-by-Case Extensions

The Agency will consider granting up to a 1-year extension (renewable once) of a ban effective date if the applicant demonstrates that a binding contract has been entered into to construct or otherwise provide alternative capacity that cannot reasonably be made available by the applicable effective date due to circumstances beyond the applicant's control. The Agency is departing from the procedures outlined in the proposed rule by deleting the proposed cancellation penalty clause for contracts to construct or provide capacity. The final rule makes it clear that in demonstrating that capacity cannot reasonably be available the applicant may show that it is not feasible to provide such capacity (see Unit IV.F.). During the period that the extension is in place, the waste is not subject to the land disposal restrictions; thus, the successful applicant also is exempt from the prohibition on storage under § 268.50. However, during the period of the extension, the wastes must be disposed of in facilities meeting the requirements of RCRA section 3004(o) (42 U.S.C. 6924(o)).

H. Storage of Prohibited Wastes

The Agency proposed a 90-day storage limit to allow the generator and owner/operator of a hazardous waste treatment, storage, or disposal facility time to accumulate sufficient quantities of wastes to allow for proper recovery, treatment, and disposal. Commenters to the rule stated that 90 days was insufficient and more time should be allowed for storage. In today's final rule the Agency is removing the 90-day storage limit for owners/operators. Owners/operators may store restricted wastes as needed to accumulate sufficient quantities to allow for proper recovery, treatment, and disposal. However, where storage occurs beyond one year, the owner/operator bears the burden of proving that such storage is solely for the purpose of accumulating sufficient quantities to allow for proper recovery, treatment, or disposal. Generators who need to store restricted wastes for periods in excess of the accumulation time limits in 40 CFR 262.34 must obtain interim status and eventually a permit. The Agency is maintaining the proposed 10-day storage limit for restricted waste at transfer facilities. The prohibition on storage applies to restricted wastes, and does not apply to wastes that meet the treatment standard or are the subject of a successful petition under § 268.6 or extension under § 268.5.

I. Treatment Standards and Effective Dates for Solvents

The Agency proposed to establish treatment standards for F001, F002, F003, F004, and F005 solvent wastes and their corresponding P and U wastes (40 CFR 261.3 (e) and (f)) using screening levels and a liner protection threshold. Today's rule, however, addresses only the F001 through F005 solvent wastes (including solvent mixtures). The Agency will evaluate the P and U solvent wastes in accordance with the schedule for listed wastes. In today's rule, the Agency is promulgating technology-based treatment standards for the F001–F005 solvents. The Agency also is promulgating the effective dates for F001–F005 solvent wastes essentially as proposed, with modifications to the range of applicable wastes. The land disposal restrictions become effective on November 8, 1986, for all F001–F005 solvent wastes, with the exception of the following wastes which will receive a 2-year variance that extends the effective date for the land disposal restrictions to November 8, 1988:

(1) The generator of the solvent waste is a small quantity generator of 100–1000 kilograms of hazardous waste per month; or

(2) The solvent waste is generated from any response action taken under sections 104 or 106 of CERCLA or any RCRA corrective action, except where the waste is contaminated soil or debris not subject to the provisions of this chapter until November 8, 1988; or

(3) The solvent waste is a solvent-water mixture, a solvent-containing sludge, or a solvent-contaminated soil (non-CERCLA or RCRA corrective action) containing less than 1 percent total F001–F005 solvent constituents listed in Table CCWE of § 268.41.

J. Treatment Standards and Effective Dates for Dioxins

The proposed rule set treatment standards for dioxin-containing wastes (F020, F021, F022, F023, F026, F027) below the current detection limit of 1 ppb for each of the chlorinated dibenzo-p-dioxins (CDDs) and chlorinated dibenzofurans (CDFs) (i.e., all isomers of tetra-, penta-, and hexachlorodibenzo-p-dioxins and dibenzofurans, respectively), and the applicable *detection limits for the specified* chlorophenols.[6] The proposed standards required that these constituents be below the 1 ppb limit in the waste extract before being land disposed. Wastes having concentrations that meet or exceed the 1 ppb limit may be treated in accordance with the criteria established for incineration (40 CFR 264.343 and 265.352), and thermal treatment (40 CFR 264. 383) for dioxins. The Agency is promulgating the dioxin treatment standards as proposed (see Unit VI). The Agency also is setting treatment standards for F028, which was not included in the proposed rule.

As proposed, the Agency is establishing a 2-year national variance from the effective date for all dioxin-containing wastes covered under today's final rule. Accordingly, treatment standards for dioxin-containing wastes will not take effect until November 8, 1988.

K. Rationale for Immediate Effective Dates

Today's rule provides for an effective date of November 8, 1986. It is clear from the statute that today's rule must go into effect no later than the effective date of the prohibition on solvents and dioxins in section 3004(e). Absent any regulations, the prohibition on solvents and dioxins in section 3004(e) takes effect automatically on November 8, 1986. Therefore, November 8, 1986 is the latest date for EPA to promulgate regulations that will prevent the "hammer" in section 3004(e) from falling. Section 3004(h) of RCRA provides that a prohibition in regulations under section 3004 (d), (e), (f), or (g) takes effect immediately upon promulgation. For section 3004(e), that date is November 8, 1988. Moreover, section 3004(m) provides that regulations setting treatment standards

[6] In addition to CDDs and CDFs, the constituents of concern for the dioxin-containing wastes also include 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, 2,3,4,6-tetrachlorophenol, and pentachlorophenol (see Appendix VII to Part 261). The treatment standards for these constituents are 50, 50, 100, and 10 ppb, respectively.

must have the same effective date as the applicable regulation promulgated under subsection (d), (e), (f), and (g). Therefore, since the statute clearly provides that the regulations implementing section 3004(e) go into effect on November 8, 1986, EPA finds that good cause exists under section 3010(b)(3) of RCRA to provide for an effective date of November 8, 1986. For the same reason, EPA finds that there is good cause under section 553(d)(3) of the Administrative Procedure Act, 5 U.S.C. § 553(d)(3), to waive the requirement that regulations be published at least 30 days before they become effective.

III. Agency Response to Major Comments on Proposed Rule

EPA received approximately 200 comments responding to the proposed rule. Comments were submitted by treatment, storage, and disposal (TSDF) facilities, environmental organizations, trade associations, companies, State and Federal regulatory agencies, and private citizens.

The Agency received considerable comment on all aspects of the proposed rule. In today's final rule, major comments on applicability, treatment alternatives (BDAT), capacity, petitions, storage, CERCLA interface, solvents, and dioxins are addressed. Responses to comments not addressed in today's rule are available in the background document to this rulemaking (see Comment Response Background Document For the Land Disposal Restrictions Volume I, November 7, 1986), available in the RCRA docket.

The Agency received numerous comments on the ground water back calculation model used in developing health-based screening levels. However, because the approach promulgated in today's rule does not employ screening levels, the Agency is not addressing these comments in the final rule. The Agency does anticipate using similar models in future regulatory actions. We will address the issues raised by the applicable comments in these future rulemaking activities.

A. Applicability

1. Open Burning and Open Detonation

The majority of the commenters were opposed to the inclusion of open detonation and open burning as forms of land disposal. It was argued that these two methods of waste management are treatment rather than disposal, as supported by the standards in 40 CFR 265.382 for owners and operators who thermally treat explosive wastes using open detonation or open burning. The commenters stated that most wastes handled in this manner are hazardous because they exhibit the characteristic of reactivity (i.e., they are explosive), and when these wastes are open burned or detonated they are rendered nonreactive. The commenters also indicated that no other available technologies provide a safer alternative to handling these wastes.

Although the Agency did not specifically address open burning in the proposed rule, current EPA regulations classify both open detonation and open burning as types of thermal treatment under Subpart D of Part 265. Because open detonation and open burning are similar waste management methods for treatment of explosive wastes, the same regulatory requirements apply to both methods under 40 CFR 265.382. Therefore, we believe that considering open burning in conjunction with open detonation for purposes of this final rule is reasonable and consistent with the current regulatory structure.

Upon reevaluation, the Agency agrees that open burning and open detonation of explosive wastes does not constitute land disposal. EPA does not believe that Congress intended to prohibit these activities because open burning and open detonation are not included in the definition of land disposal in section 3004(k). They are primarily treatment processes that typically result in by-products which are no longer reactive and, therefore, are not considered hazardous. The Agency also agrees with commenters that open detonation and open burning may be the only safe waste management method for handling explosive wastes.

In view of these considerations, the Agency has concluded that the land disposal restrictions program is not applicable to open detonation and open burning.

2. Wastes Produced by Small Quantity Generators

While EPA is authorized to vary standards for small generators under RCRA section 3001(d), this authority is circumscribed by the need to protect human health and the environment. The Agency has carefully considered the risks posed by land disposal of small generator wastes and has weighed these against the impacts of the land disposal restrictions on these generators. Given the smaller aggregate amounts of hazardous waste produced by small generators, it is arguable that the relative risks of land disposal to human health and the environment are lower. However, the major concern with land disposal is the toxicity of the waste rather than the quantity. As EPA explained in a recent rulemaking imposing certain RCRA regulatory requirements on generators of 100 to 1000 kg of hazardous waste per month, data from EPA's National Small Quantity Hazardous Waste Generator Survey indicate that both small and large quantity generators produce many of the same types of waste and use many of the same waste management practices. 50 FR 31285 (Aug. 1, 1985). Therefore, it is appropriate to include wastes produced by small quantity generators in the land disposal prohibitions.

B. Treatment Alternatives (BDAT)

1. BDAT Expressed as a Performance Standard

Generally, commenters supported the Agency's interpretation of section 3004(m) regarding the criteria for the selection of BDAT. The statute specifies that BDAT may be expressed as either a performance standard or a method of treatment. Wherever possible, the Agency prefers to establish BDAT treatment standards as performance standards rather than adopting an approach that would require the use of specific treatment methods. To date, all treatment technologies considered as BDAT can result in a wide range of performance values depending on the operation of the technology. EPA believes performance standards ensure that the technology is properly operated. Additionally, the Agency believes concentration-based performance standards offer the regulated community greater flexibility to develop and implement compliance strategies as well as incentive to develop innovative treatment technologies.

2. Process Variability

One commenter asserted that normal process variability has not been accounted for in the Agency's calculation of treatment standards. The commenter urged the Agency to calculate variability factors which account for variations in influent composition, system performance, sampling and analytical test methods, and site specific conditions. The commenter further stated that the variability factors should be used to develop BDAT treatment standards on a daily maximum basis.

The Agency agrees with the comments that treatment standards need to incorporate a variability analysis. Since variability in performance occurs even at facilities that are well designed and well operated, EPA believes it is appropriate to include such an analysis in the development of BDAT treatment

standards. This analysis is not intended to account for performance differences which occur as a result of treating a waste that is significantly different in composition or for differences which occur from improper or poor treatment of the same waste. Instead, incorporation of a variability factor into the development of a BDAT standard is intended to account for variations which arise from mechanical limitations in the equipment used to maintain treatment parameters at the proper setting, small variations in the waste, and variations in analytical test methods.

The variability factor, as outlined in the Notice of Availability of Data (see 51 FR 31783, September 5, 1986), is the ratio of the calculated 99th percentile concentration, C_{99}, to the mean treatment concentration. A detailed discussion of the statistical calculation used to account for process variability is provided in Unit IV.A.

3. Criteria for Well-Designed and Operated Treatment Systems

One commenter asserted that the Agency should document in the record its rationale for evaluating and editing data based on the performance of the treatment system. The commenter stated that the Agency should not simply presume that well designed and operated treatment systems are those that achieve the lowest performance values but should instead consider the effects of the characteristics of the waste on treatment performance. The Agency is aware that the level of treatment achievable is dependent upon the physical and chemical characteristics of the waste. Accordingly, it is necessary for the Agency to assess design and operating parameters in determining whether a system is performing well, in addition to its consideration of the performance value achieved. Because the parameters that comprise a well-designed and operated system will vary for each technology, it is difficult for EPA to generalize the specific parameters that need to be examined. Whenever the Agency has little or no data on the design and operation of the system, the Agency will evaluate the constituent concentrations in the waste before and after treatment and use engineering judgment to determine whether the system is performing well. The Agency also will use a statistical outlier analysis to confirm engineering judgment. The statistical analysis to be used was published in the **Federal Register** on September 5, 1986 (51 FR 31783). The rationale the Agency used for editing performance data can be found in the technical support documents.

C. Capacity

1. Capacity for Waste-as-Fuel

Several commenters argued that EPA did not consider waste-as-fuel as a treatment alternative in estimating capacity. As one commenter pointed out, this is a potentially large treatment option that cannot be ignored. EPA did not consider this alternative because the data were not available. Since the November 14, 1986, proposed rule the Agency has received waste-as-fuel data from the "Telephone Verification Survey of Commercial Facilities that Manage Solvents" (August 1986). Data from this survey were noticed for public comment on September 5, 1986 (51 FR 31788) and have been included in capacity estimates for today's final rule.

2. Commercial vs. Private Capacity

Several commenters stated that EPA should not consider private capacity as available alternative treatment capacity. They explained that private facilities may not be willing to accept off-site wastes because liability could be considerable, permit conditions may prohibit accepting off-site waste, or on-site capacity may be fully committed to nonhazardous wastes.

EPA recognizes the issues raised by commenters and agrees that private capacity should not automatically be considered as available alternative treatment capacity. However, when there is insufficient available commercial treatment capacity, EPA plans to consider the potential for private facilities to become commercial facilities. EPA will include private capacity if there is sufficient evidence that the private facilities plan to accept off-site wastes. Because limited information exists on the planned public availability of current private capacity, EPA has no basis for including private capacity in total capacity estimates for solvents and dioxins subject to today's final rule.

3. Permitted Facility vs. Interim Status Facility Capacity

Several commenters stated that only existing permitted treatment facilities should be considered in estimating available capacity. They argued that interim status facilities may not receive final permits and consequently may not provide available capacity.

In calculating available capacity for solvents and dioxins, EPA included capacity that is currently available from some interim status facilities and all permitted facilities. The interim status facilities included did not notify the Agency of an intent to close and, therefore, can be expected to provide capacity for the November 8, 1986, effective date. In future capacity determinations, EPA will assess, on a case-by-case basis, the number of interim status facilities expected to accept wastes.

4. Existing Facility vs. Planned Facility Capacity

Several commenters stated that only existing, permitted facilities should be considered in estimating available capacity, because it is uncertain whether "planned" facilities will be on-line by the effective date of the restrictions with approval to operate from Federal, State, and local agencies. EPA will include planned capacity only when there is sufficient evidence that the planned facilities will be fully operational by the effective date of the prohibitions. In the case of solvents and dioxins, such evidence does not exist; therefore, planned facilities have not been included in the capacity estimates for today's rule.

5. National vs. Regional Capacity

Several commenters stated that EPA should determine available capacity under section 3004(h)(2) on a regional basis rather than on a national basis, and variances should be regionalized based on the availability of treatment. These commenters stated that it is realistic to assume that economic and transportation problems affect the availability of alternative capacity for a particular generator. They pointed out that national capacity for some treatment technologies is based on a few high-volume treatment facilities, and emphasized the need for Federal, State, and local efforts to construct more waste treatment facilities.

EPA recognizes these problems. However, the legislative history (S. Rep. No. 284, 98th Cong., 1st Sess. 19.(1983)), clearly states that "the available capacity determination is to be done on a national basis" in order to prevent a situation in which regions obtaining variances would become the "dumping ground" for wastes generated in regions implementing the land disposal restrictions. Accordingly, EPA believes that national capacity determinations under section 3004(h)(2) are more in accord with the statutory intent.

D. Petitions Demonstrating Land Disposal of Untreated Waste is Protective

1. Generic Petitions for Sites With Similar Hydrogeologic Properties

Several commenters suggested that the Agency accept generic petitions that address similar management techniques

for the same or similar wastes in hydrogeologic settings with similar characteristics. Commenters felt that a generic petition, once approved, would allow all such sites where the same or similar wastes were managed with a similar technique to automatically receive approval for land disposal without individual petition demonstrations.

RCRA sections 3004 (d)(1), (e)(1), and (g)(5) do not preclude the submission of generic petitions. However, as a practical matter, the usefulness of the generic petition is limited, since a petition demonstration must include site- and waste-specific data (see § 268.6 (a) and (b)). Accordingly, petitioners must demonstrate that each scenario covered under the generic petition is similar. For example, a demonstration that the hydrogeological characterization of sites is similar would require a detailed assessment of each site addressed in the petition. As a result, the Agency expects few, if any, generic petitions.

2. Conditional Petition Approval Based on Prima Facie Evidence

Several commenters expressed concern over the possibility that land disposal restrictions would become effective prior to Agency rulings on petitions, causing disruption in waste disposal activities. To prevent this situation, the commenters suggested that approval of a petition be granted on the basis of superficial evidence of compliance with the statutory standard. The Agency would perform a brief review of the petition for completeness, and would then grant conditional approval until such time that a full technical review could be completed. Other commenters argued that the statute requires a demonstration that the statutory standard is met, not merely an application for petition approval. It would not be possible, according to these commenters, for the Agency to grant approval for such a demonstration without a full technical review.

Other commenters suggested that the statute provides the Agency with the flexibility of granting a 2-year extension of the effective date, pursuant to section 3004(h)(2) upon receipt of prima facie evidence that the "no migration" standard has been met. Commenters argued that this superficial showing of evidence would satisfy the requirements of the extension to identify the adequate alternative disposal capacity that protects human health and the environment.

The Agency agrees with those commenters who stated that the statute calls for a positive demonstration that the statutory standard is met, which implies that a full review of the petition has been made. Thus, the Agency will not grant a conditional variance for disposal of untreated restricted waste in a Subtitle C unit based on a superficial review of the evidence. The Agency will only make the decision regarding the granting of a variance after an in-depth review of a fully developed no migration demonstration submitted by the petitioner.

Under section 3004(h), the Agency is allowed to set different effective dates for the restrictions based on lack of available capacity for treatment, recovery, or disposal. The Agency does not believe that submission of a petition request is relevant to such a finding.

3. Eligibility for Petitions

The Agency requested comment on an approach limiting eligibility for petitions to those wastes for which no alternative treatment is available. Several commenters objected to this approach, stating that the statute and the legislative history do not limit eligibility for petitions.

Other commenters agreed with this approach for several reasons. They argued that the statute clearly reflects congressional intentions that restricted wastes be treated prior to land disposal. They also argued that rendering ineligible those wastes that can be treated to meet a BDAT standard fulfills the spirit of the law and gives a clear signal to industry to plan for expanded treatment capacity. Additionally, they noted that this approach would reduce the burden on the Agency and the States for petition review, so that resources could be devoted to petitions for untreatable wastes.

The Agency continues to believe that the better reading of the law allows no basis for limiting eligibility for the petition process in the manner discussed. RCRA sections 3004 (d), (e) and (g) set up the petition process as a clear albeit limited alternative treatment prior to land disposal of hazardous wastes. Accordingly, the final regulations do not limit eligibility for petitioners.

E. Storage of Prohibited Wastes

A number of commenters argued that because transporters, recyclers, or treatment facilities often give priority to larger volumes of waste or even refuse to take small quantities, more than 90 days are needed to accumulate sufficient quantities.

All of the comments received regarding the proposed storage limit for waste treatment, storage, and disposal stated that 90 days is inadequate. Some commenters stated that additional time is needed because some waste streams are accumulated more slowly than others. More specifically, one commenter presented the case of a plant that generates a very small amount of spent solvents (e.g., one drum every three months), but is not a small quantity generator due to other nonrestricted waste streams. Because of the small amounts generated, the turnaround time during which waste is accumulated to an amount sufficient for a transporter to pick up consistently takes longer than the 90-day period. Additionally, another commenter stated that because halogenated solvents are often blended with other materials before incineration, the 90-day period will be insufficient due to the evaluations and trial burns that will be required for these new blends of wastes. Other commenters cited the frequent back-ups and delays at treatment facilities that may require storage for more than 90 days; however, these factors are not directly relevant to the statute, which allows storage only for the purpose of accumulating sufficient quantities necessary to facilitate proper recovery, treatment, or disposal.

The alternatives suggested by commenters ranged from setting a storage limit of 180 days to not limiting the storage period. The majority of commenters suggested that the Agency establish a 1-year storage limit. Several of these commenters stated that the provision should be similar to the existing speculative accumulation provision in 40 CFR 261.1(b)(8). This provision allows for a material to be accumulated for recycling provided that during the calendar year (commencing January 1) at least 75 percent of the material accumulated at the beginning of the time period is recycled or is transferred to a different site for recycling.

In the proposed rule, the Agency allowed treatment, storage, and disposal facilities the same time periods for accumulating restricted wastes in tanks and containers as specified under 40 CFR 262.34 for large quantity generators accumulating hazardous waste prior to shipment off-site for treatment or disposal. Effective September 22, 1986, generators of 100–1000 kg/mo can store hazardous waste for 180 or 270 days depending on transportation distances. (See 51 FR 10175 (March 24, 1986).) For hazardous waste storage facilities operating under interim status or a RCRA permit, the Agency proposed a 90-day limit for the storage of restricted wastes.

After considering the length of an appropriate storage limit, the Agency agrees with the commenters that 90 days may not be sufficient time to accumulate quantities necessary to facilitate proper recovery, treatment and disposal of restricted wastes. However, the Agency does not believe that the storage time permissible at a waste management facility should be indefinite but, rather, must have some limit because the legislative history indicates that Congress' concern in enacting this provision was to foreclose the possibility of using long-term storage as a means of avoiding a land disposal prohibition. (S. Rep. No. 284, 98th Cong., 1st Sess. 18 (1983).)

The Agency disagrees with the commenters who felt that a system similar to the speculative accumulation provision (40 CFR 261.1(b)(8)) should be implemented for the storage of restricted wastes. The speculative accumulation provision is designed to determine when a material becomes a waste and relies on assumptions that the materials will be continuously removed from storage. The Agency does not believe that this provision is applicable to the storage of restricted wastes.

The Agency believes that a storage limit of up to one year should generally provide sufficient time for an owner/operator to accumulate sufficient quantities to facilitate proper recovery, treatment, or disposal of restricted hazardous wastes while meeting the intent of Congress to prohibit long-term storage as a means of avoiding the land disposal restrictions. The burden is on the Agency to demonstrate that storage of restricted wastes for periods less than or equal to one year is not in compliance with the storage provisions. The Agency also recognizes that there may be instances where one year does not provide sufficient time to accumulate such quantities. Therefore, the Agency will allow an owner/operator to store restricted wastes beyond one year. Although the owner/operator is not required to submit any data or application to EPA, in the event of an enforcement action, the burden of proving compliance with § 268.50(b) is on the owner/operator. The Agency believes that this is reasonable because the record for this rulemaking indicates that less than one year should be sufficient. This provision does not apply to situations where back-ups at treatment or recovery facilities, operational difficulties, and repairs and maintenance result in additional delays.

Comments received on the proposed 90-day limit on the length of storage of restricted wastes also indicate that a substantial number of generators without permits or interim status will need to accumulate restricted wastes for more than 90 days to comply with Part 268.

Section 3005(e) allows generators to apply for facility interim status if their accumulation will exceed the time limits of 40 CFR 262.34, as long as the storage is necessary to comply with the land disposal restrictions. 40 CFR 270.70(a) codifies that provision. This section provides that facilities "in existence on the effective date of statutory or regulatory changes . . . that render the facility subject to the requirement to have a permit" may qualify for interim status if they make the appropriate application. A generator who is accumulating hazardous wastes in tanks or containers before the effective date of today's rule, is "in existence" and may qualify for interim status provided that the above stated requirements are met. Section 3005(e)(1) allows interim status only where new regulatory requirements subject an existing facility to permitting requirements. It is not intended to provide an opportunity for a facility to newly engage in hazardous waste management.

Generators who need to obtain interim status should submit a Part A application to the Agency as provided in Part 270. In the Part A application, the generator must demonstrate that the additional accumulation time is necessary as a result of the land disposal restrictions of Part 268.

The Part A must be submitted to the Agency by the deadline specified in § 270.10(e). Note that the § 270.10(e) deadline is the earlier of the following two alternative dates: (1) Six months after publication of regulations which first require the facility to comply with Part 265, or (2) thirty days after the date they first become subject to the standards in Part 265. It is expected that the deadline for most, if not all, of the large quantity generators will be established by the second alternative. By operation of 40 CFR 270.10(e)(ii), the generator becomes first subject to the permitting requirements when he exceeds the generator accumulation time limit. For example, the generator would be required to submit the Part A within 30 days after the 90-day accumulation period ends. Therefore, it is critical that any generator who will be newly subject to the interim status requirements becomes familiar with the Part 270 requirements and submit a Part A application on time.

The Agency believes that generators will ship restricted wastes off-site in accordance with the 90-day provision in 40 CFR 262.34 whenever possible in order to remain subject only to the generator standards. Generators applying for interim status must comply with the applicable requirements of Part 265. Furthermore, if requested by the Administrator, the facility will be required to submit to Part B permit application.

The Agency received only one comment addressing the proposed 10-day storage limit for transporters of restricted wastes. The commenter stated that 10 days would be insufficient because it does not allow for unexpected back-ups and delays. Although such situations may occur, the Agency does not have data indicating that such delays occur frequently so as to create a serious problem. Therefore, the rule being promulgated today maintains the 10-day limit for the storage of restricted waste at a transfer facility to allow for activities incidental to normal transporter practices.

To implement the storage provision, the Agency is requiring owners/operators to comply with the same requirements for dating containers as set forth for generators under 40 CFR 262.34(a)(2). The Agency believes that the restrictions on the storage of wastes under § 268.50 are consistent with the intent of Congress to preclude the possibility of using long-term storage as a means of avoiding a land disposal prohibition and are sensitive to the time constraints of the regulated community expressed by the commenters.

F. CERCLA Interface

1. 48-Month Exemption for CERCLA Wastes That Are Soil or Debris

Several commenters requested clarification of § 268.1(c)(3), namely the scope of the 48-month exemption for certain CERCLA wastes (soil or debris) from the solvents and dioxins land disposal restrictions. It was suggested that this exemption should be defined to include all CERCLA bulk wastes. In addition, it was questioned whether State-ordered, State-funded, or private party-funded response action wastes are granted the same exemption.

The Agency does not believe the 48-month exemption can be interpreted to include CERCLA bulk wastes that are clearly not contaminated soil or debris. CERCLA soil and debris have been defined to include, but not be limited to, soil, dirt, and rock as well as natural and manufactured materials such as contaminated wood, stumps, clothing, equipment, building materials, storage containers, and liners. In many cases, soil or debris will be mixed with liquids

or sludges. The Agency considers liquid- or sludge-containing wastes, including bulk wastes that are not contaminated soil or debris, generated by a CERCLA response action, to be subject to the land disposal restriction requirements. However, a variance from the land disposal restriction requirements, based on insufficient treatment capacity, was granted for these restricted wastes until November 1988. The Agency is preparing guidance that will further define CERCLA soil and debris wastes in order to assist the regulated community in determining which wastes are covered under the exemption. In addition, before November 8, 1988, the Agency will further analyze the solvent and dioxin treatment standards to determine if these standards are applicable to contaminated soil or debris.

Only those wastes that result from CERCLA Fund-financed actions (section 104) and the exercise of CERCLA's enforcement authority (section 106) are included in the exemption. Response action wastes that result from State-ordered, State-funded, or private party-funded responses taken under the authority of CERCLA or exclusive of this authority are not included in the exemption. Relevant sections of the National Contingency Plan (NCP, 50 FR 47912, November 20, 1985) that address these distinctions include Subpart F, § 300.62 (State participation) and § 300.71 (other party responses). Wastes not included in the exemption and prohibited from land disposal are subject to the schedule imposed by the land disposal restriction requirements. Responses generating these wastes may be preauthorized under section 111 of CERCLA (see § 300.25 of the NCP) and, if so, are eligible for the recovery of certain costs under CERCLA section 107. Other party responses under NCP § 300.71(a)(4) are required to comply with all legally applicable or relevant, and appropriate requirements. RCRA clearly states that the exemption applies to all CERCLA soil and debris land disposed before November 8, 1988. After this date, these wastes will be managed in accordance with the requirements of the land disposal restrictions applicable to CERCLA wastes.

2. Capacity Shortfall Due to CERCLA Wastes

Several commenters stated that the Agency had not adequately evaluated the effect on treatment capacity of CERCLA wastes. As indicated in Unit V, CERCLA capacity estimates have been revised to incorporate the results of a recently completed EPA analysis of future volumes of wastes resulting from CERCLA responses. A variance has been granted for CERCLA wastes, that are not soil or debris, until November 8, 1988. The Agency acknowledges that CERCLA demand for treatment capacity may compete with generator demand for the same treatment capacity. However, the Agency's "Off-Site Policy" for disposing CERCLA waste contains stringent criteria that could render some existing capacity unavailable for the management of CERCLA wastes.

G. Solvents

1. Definition of Solvent Wastes

A number of commenters stated that the scope of the land disposal restrictions for solvent-containing wastes extends beyond congressional intent. In particular, the commenters stated that the land disposal restrictions rule should address only F001–F005 hazardous wastes (regulated as of July 1, 1983) specified in section 3004(e). Another specific concern raised by the commenters was that the impacts of including the P and U hazardous wastes as listed in 40 CFR 261.33 (e) and (f), respectively, have not been adequately assessed; therefore, these wastes should not be included in the first class of solvent-containing wastes (i.e., F001–F005) subject to the land disposal restrictions.

In proposing treatment standards for solvent-containing wastes, the Agency included the corresponding commercial chemical products and off-specification species (P and U hazardous wastes) as listed in 40 CFR 261.33 (e) and (f), respectively, and solvent mixtures containing 10 percent or more of the listed solvents (pursuant to the solvent mixtures rule, 50 FR 53315, December 31, 1985). The Agency proposed to exercise its statutory authority under section 3004(g) [7] and include the corresponding P and U wastes with decisions on the F001–F005 wastes because the data indicate that these wastes may pose hazards similar to the spent solvents when disposed in Subtitle C facilities.

However, we are continuing to gather data to better define and characterize the P and U wastes and to assess treatment and recycling capacity for these wastes. Because the Agency agrees with the commenters that we do not have sufficient data to promulgate treatment standards for these wastes by the November 8, 1986, deadline, we will postpone decisions on the P and U wastes until we address the lists of scheduled wastes.

With respect to solvent mixtures, the provisions under section 3004(g)(4) require the Agency to make a determination within six months whether to subject newly identified or listed hazardous wastes to the land disposal restrictions (the statute does not impose an automatic prohibition if the Agency misses the deadline). Because six months have already elapsed since the Agency promulgated the final rule to bring certain spent solvent mixtures into the hazardous waste system,[8] the Agency is including solvent mixtures in today's rule.

2. Impacts on Small-Quantity Generators and Small-Volume Wastes

Several comments were received concerning the impacts of the land disposal restrictions on small-quantity generators and small-volume waste types. One commenter was concerned that the economic impacts on small-quantity generators of solvents have not been adequately assessed.

An assessment of the economic impacts on small-quantity generators from land disposal restrictions affecting solvent-containing wastes is included in the "Regulatory Analysis of Proposed Restrictions on Land Disposal of Certain Solvent Wastes." Total small-quantity generator costs attributed to the land disposal restrictions were found to be significant, but the costs and associated economic impacts for individual facilities were found to be small. Overall, based on economic ratios that were determined for small-quantity generators that dispose of solvent-containing wastes, the land disposal restrictions appeared not to impose significant economic burdens on these generators.

3. Disposal of Lab Packs Containing Solvents

Several commenters addressed disposal of small quantities of solvent-containing wastes in lab packs.

Commenters requested that solvent-containing lab packs be exempt from the land disposal restrictions. They stated that such an exemption would be consistent with existing exemptions under 40 CFR 264.316 and would allow the disposal of only small quantities of solvent wastes.

Another commenter questioned whether the entire lab pack is banned from land disposal if all the packaged wastes are not solvents. Alternatively, the commenter proposed to remove

[7] Section 3004(g) requires that the Administrator shall, "not later than the date specified in the schedule . . . promulgate final regulations prohibiting one or more methods of land disposal."

[8] The Agency promulgated the solvent mixtures final rule on December 31, 1985. The rule became effective on January 30, 1986 (see 50 FR 53315).

restricted solvents before land disposal of the lab pack.

Neither the legislative history nor the statute indicates that lab packs can be excluded from the land disposal restrictions if they contain solvents designated as F001–F005 or other restricted wastes. Under the approach promulgated in today's rule, listed solvents are subject to the land disposal restrictions. If a lab pack contains these restricted wastes, the entire lab pack is subject to the land disposal restrictions. As a practical matter this means that the lab pack may not be land disposed unless the solvents or other restricted wastes are removed before land disposal, the solvents in the lab pack meet the treatment standard, or a successful petition demonstration has been made under § 268.6.

H. Dioxins

1. Quantity of Dioxin-Containing Wastes Generated

Several commenters argued that the Agency underestimated the actual quantity of dioxin-contaminated soil subject to the proposed rule. Specifically, one commenter argued that EPA did not take into consideration the dioxin-contaminated sites in the States of Arkansas, New Jersey, and New York in developing the estimate for the quantity of dioxin-contaminated soil in the U.S.

In the proposed rule, EPA acknowledges that the estimated quantity of dioxin-contaminated soil present in the U.S. was derived by assessing estimates for such contaminated soil from the State of Missouri. At this time, the Agency does not have data to determine more accurately the total quantity of dioxin-contaminated soil from sites in the U.S. other than the State of Missouri. Thus, EPA decided to estimate the quantity of dioxin-contaminated soil nationwide based solely on the data provided for the State of Missouri. In making this determination, the Agency should have noted that the estimated quantity of 1.1 billion pounds for dioxin-contaminated soil was accurate within a range of ±20 percent. If this quantity is understated, then the Agency acknowledges that the national estimate is also underestimated. However, such an underestimation would have no effect on the decisions made in today's rule regarding capacity because there is inadequate disposal or treatment capacity even for substantially lower quantities of dioxin-containing wastes.

2. Treatment Standard for Dioxin-Containing Wastes

One commenter argued that as the analytical methodology improves, increasing amounts of materials which might contain insignificant levels of dioxins would be prohibited from land disposal.

The treatment standard for the listed dioxin-containing wastes is based on the current limits of technology available to treat dioxin-containing wastes. The treatment standard for these wastes was proposed at the detection limit afforded by test method 8280 for the CDDs and CDFs in waste extracts because current analytical techniques are not capable of detecting dioxin-containing wastes at the levels achievable by incineration. Research analytical methods indicate that incineration to six 9s destruction removal efficiency (DRE) can achieve reduction in the treatment residuals five to seven orders of magnitude from those concentrations in the starting material. The treatment standard of 1.0 ppb however, represents the routinely achievable detection limit for the CDDs and CDFs using test method 8280. (See 51 FR 19862.)

If additional data become available which demonstrate a lower detection limit for these dioxin wastes, the treatment standard may be revised as necessary.

Lowering the detection limit and changing the subsequent treatment standard will not prohibit significantly increased amounts of materials containing low concentrations of dioxins from land disposal. The prescribed toxicity characteristic leaching procedure (TCLP) is designed to determine the leachability of both organic and inorganic contaminants present in liquid, solid, and multiphase wastes. The constituents of concern in the listed dioxin-containing wastes are not mobile, and are generally in low concentrations. The treatment standard would have to be significantly lower than 1 ppb in order to significantly increase the amount of material that does not meet the treatment standard (before any treatment). In addition, to the extent that incineration achieves 99.999 percent (six 9s) destruction removal efficiency (DRE) (as required under the dioxins listing rule), a lowering of the detection limit will only verify that treatment is achieving levels far below the standard method detection limit. As the detection limit approaches the actual treatment level, the Agency will lower the treatment standard to that level.

3. Land Disposal Restrictions Effective Date

Several commenters addressed EPA's proposal to delay the effective date for the land disposal restrictions for dioxin-containing wastes. All commenters agreed that the 2-year variance to the effective date was necessary because of a lack of available treatment capacity. The commenters also argued that unless treatment capacity is available by the effective date, they will be confronted with an unavoidable noncompliance situation due to the limitations on storage of resticted wastes.

The Agency, in today's rule, is granting the maximum 2-year variance allowed under section 3004(h)(2) for the listed dioxin-containing wastes. At the present time, there is no data to show that treatment capacity for dioxin-containing wastes will not be available after the effective date, or after the additional two 1-year extensions which are available to generators on a case-by-case basis.

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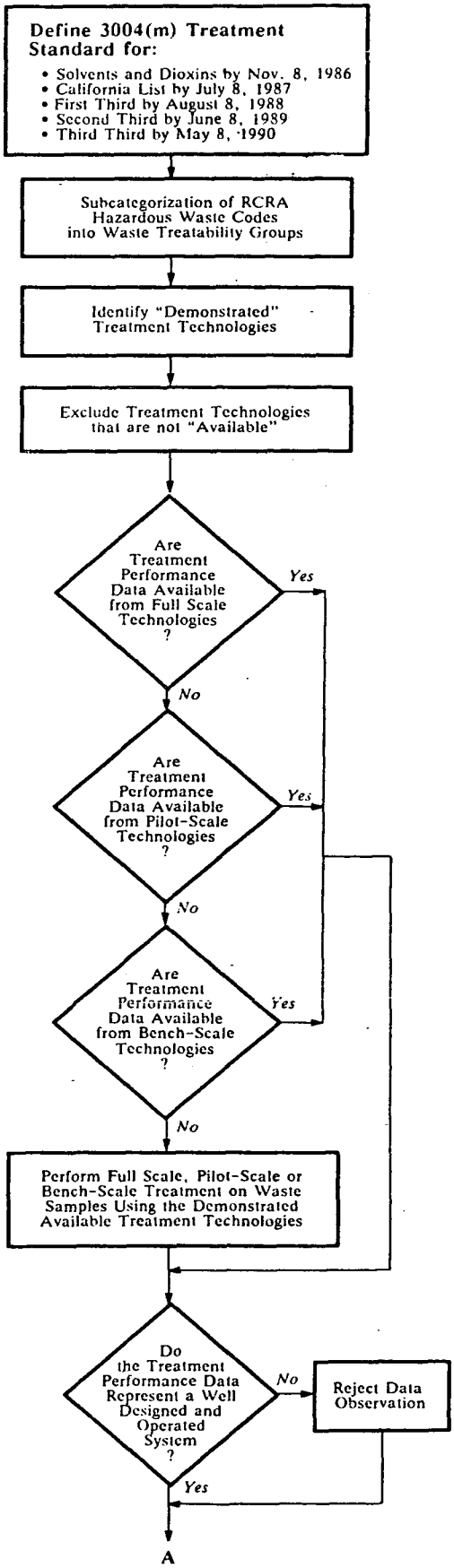

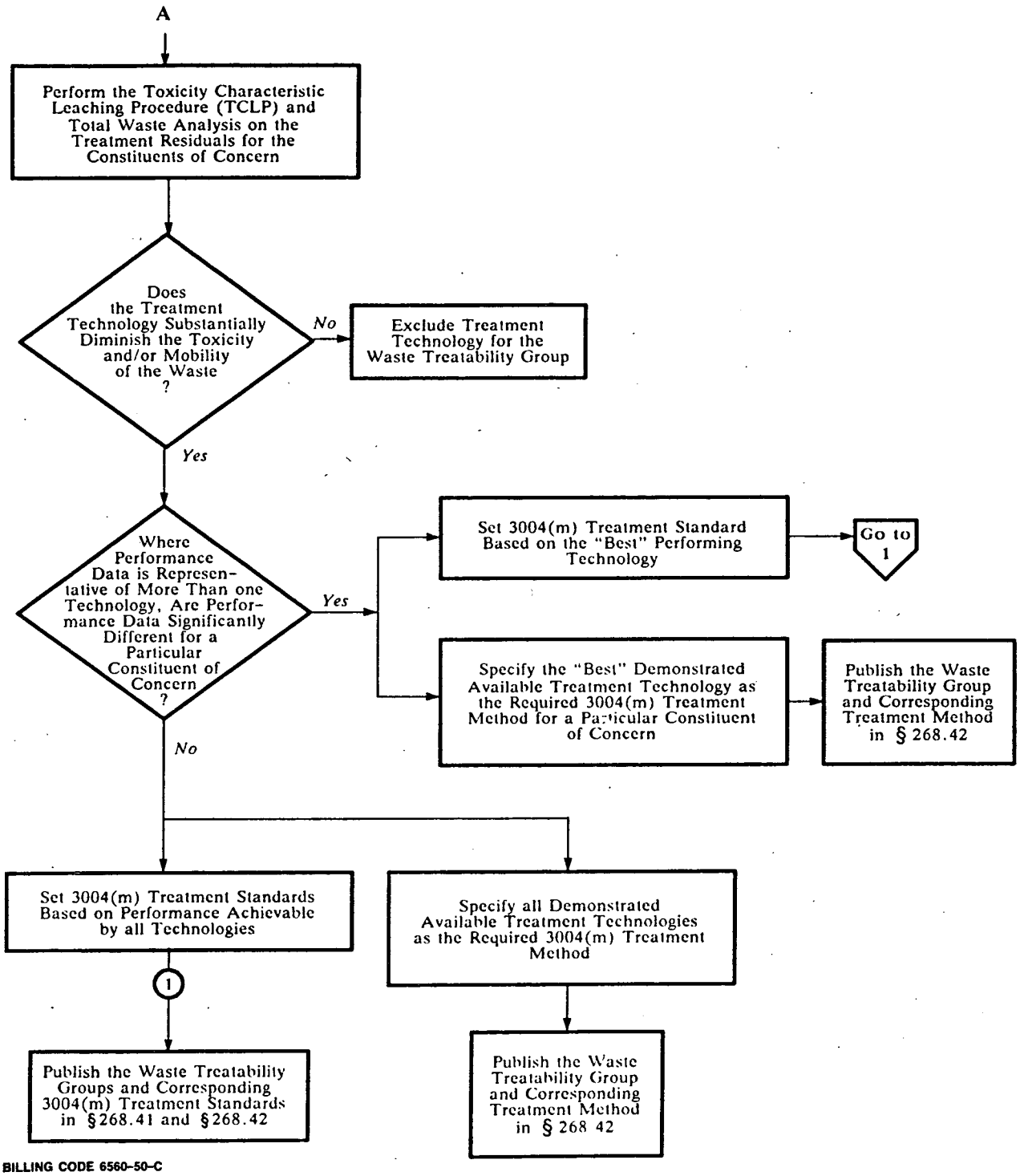

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IV. Detailed Analysis of the Final Regulatory Framework

A. Determination of Best Demonstrated Available Treatment Technologies (BDAT)

This section establishes the framework under which treatment standards based on the Best Demonstrated Available Technology will be developed in accordance with 3004(m).

1. Waste Treatability Groups

Fundamental to waste treatment is the concept that the type of treatment technology used and the level of treatment achieved depend on the physical and chemical characteristics of the waste. In the proposed rule, the Agency discussed establishing broad "waste treatability groups" based on similar physical and chemical properties (e.g., metal-bearing sludges or wastes containing cyanides in order to account for differences in types of treatment used and effectiveness of treatment on different wastes. While not directly addressing this approach, commenters stated that the proposed solvent treatment standards did not account for waste matrix effects. These commenters suggested that waste matrix effects could be considered by pooling all available data on the applicable constituents from the plants sampled, presumably without regard to the varying treatability of the specific wastes sampled or the design and operation of the treatment system.

EPA disagrees with this approach because the use of such a pooled data set would result in the establishment of an artificially high treatment standard. This would occur because the broad range of treatment levels associated with numerous waste matrices will yield a high variability factor. The approach of pooling all treatment data would actually result in the masking of different waste matrices as opposed to accounting for matrix effects as suggested by the commenter. While EPA believed, that waste matrix effects were considered in the proposed solvent standards, EPA recognizes, nonetheless, that these effects may not have been fully accounted for in the proposed standards. The Agency anticipates that in future rulemakings, treatment groups could require further subdivision to more fully account for waste matrix effects subject to the availability of sufficient resources. In any event, EPA remains convinced that waste matrix effects are best accounted for by establishing treatability groups and subgroups wherever possible. The legislative history of 3004(m) supports this approach by providing that treatment determinations do not have to be made only by waste code and by authorizing EPA to establish "generic" treatment standards for similar wastes (130 Congressional Record section 9179, daily edition July 25, 1984).

EPA believes that in addition to the types of treatability groups described in the proposed rule, grouping and subgrouping wastes by industry or manufacturing process may be used to account for waste matrix effects on treatment performance (i.e. similar manufacturing operations appear to generate wastes with similar treatability characteristics). For example, in today's rule, EPA has sufficient data to create a separate treatability group for wastewaters containing spent methylene chloride generated by the pharmaceutical industry. However, while the Agency believes that industry-specific analyses will generally account for waste matrix effects, some wastes (*e.g.*, contaminated soils) cannot be categorized by industry. Therefore, EPA may also establish treatability groups for wastes from unknown sources. Finally, as noted in the proposal, EPA intends to focus on the constituents in sections 3004 (d), (e), and (g) and Appendix VIII to Part 261.

2. Determination of "Demonstrated" Treatment Technologies

EPA proposed to determine which technologies are "demonstrated" for a specific waste by studying available data on the types of treatment (including recycling methods) currently used to treat a representative sample of wastes falling within a waste treatability group. To make this determination, EPA proposed first to examine wastes treated by full-scale treatment technologies. A technology may be demonstrated if currently used to treat wastes within the group or wastes judged to be similar. EPA proposed not to consider treatment demonstrated on the basis of insufficient or inadequate full-scale data, for example, if the facility was not designed to remove the constituent or the facility was not well operated. If the treatment of these wastes (or wastes judged to be similar) was not demonstrated by any full scale facility, EPA proposed to study data from pilot-scale and bench-scale treatment operations to determine if a technology was demonstrated. Some commenters were concerned, however, with the use of pilot-scale and bench-scale operations as the basis for determining whether a technology was demonstrated. The Agency agrees with the commenters position that its determinations should not be based on emerging and innovative technologies. This would be in violation of the intent of the statute as indicated in the legislative history; "[t]he requisite levels of [sic] methods of treatment established by the Agency should be the best that has been demonstrated to be achievable" and not a "BAT-type process which contemplates technology-forcing standards." (Vol. 130 Cong. Rec. S9178 (daily ed., July 25, 1984). To the extent that bench- and pilot-scale data represent such emerging and innovative technologies, the Agency believes the proposed approach was too broad. Therefore, today's final rule represents a change in the definition of demonstrated in response to comments. To be considered a "demonstrated" treatment technology for purposes of the final rule, a full scale facility must be known to be in operation for the waste or similar wastes. EPA is amending the proposed approach to the extent that the Agency will not, at this initial stage, examine data to see if the data from the treatment facility represents a well-designed and operated system, because this factor is more appropriately taken into account when evaluating the performance of the treatment operations. EPA believes that this procedure will address the issues raised by commenters who were concerned that the Agency specify the design and operating parameters upon which determinations were made. Accordingly, if no full scale treatment operations are known to exist for a waste or wastes with similar treatability characteristics, the Agency will be unable to identify any "demonstrated" treatment technologies for the waste and, accordingly, the waste will be completely prohibited from continued placement in land disposal units (unless handled in accordance with the exemption and variance provisions promulgated in today's final rule). The Agency is, however, committed to establishing new treatment standards as soon as new or improved treatment processes become demonstrated as full-scale operations.

While, the Agency did not consider pilot- and bench-scale operations in identifying "demonstrated" treatment technologies for solvents and dioxins, in certain circumstances, data from these operations may continue to be used by the Agency in evaluating the performance of demonstrated full scale treatment operations for certain wastes. A more detailed discussion of the circumstances that would prompt the use of data from pilot- or bench-scale operations in assessing treatment performance, as well as the manner in

which such data will be used, is presented below.

3. Determination of "Available" Treatment Technologies

EPA proposed the following criteria for "available" treatment technologies: (1) The technology does not present a greater total risk than land disposal; (2) if the technology is a proprietary or patented process it can be purchased from the proprietor; and (3) the technology provides substantial treatment. Today's final rule includes an additional criteria in the determination of "available" treatment technologies. Treatment technologies that are prohibited under section 3004(n) because of air emissions will be excluded as "available" technologies for purposes of establishing treatment standards.

EPA will not set treatment standards based on a technology that does not meet the above criteria. Thus, the decision to classify a technology as "unavailable" may have a direct impact on the treatment standard. If the best technology is unavailable, the treatment standard would have to be based upon the next best treatment technology that was determined to be available. To the extent that the resulting treatment standards are less stringent, greater concentrations of hazardous constituents in the treatment residuals could be placed in land disposal units.

There may also be circumstances where EPA concludes that for a given waste none of the demonstrated treatment technologies are "available" for purposes of establishing the treatment standards. These wastes will be prohibited from continued placement in or on the land unless managed in accordance with the exemption and variance provisions promulgated in today's final rule. The Agency, however, is committed to establishing new treatment standards as soon as new or improved treatment processes become "available".

a. *Treatment technologies that present greater total risks than land disposal methods.* As explained in the proposed rule, EPA will evaluate the risks associated with treatment technologies and land disposal methods. Based on a comparative risk assessment, those technologies that are found to present greater total risks than land disposal of the untreated waste will be excluded (i.e., considered "unavailable") as a basis for establishing treatment standards.

If all demonstrated treatment technologies are determined to present greater risks than land disposal for the waste treatability group, the Agency will not be able to identify any "available" treatment technologies and, accordingly, will not set a treatment standard for that group. As a result of such a determination, the waste will be prohibited from land disposal unless managed in accordance with the exemptions and variance provisions in today's final rule or a new or improved technology emerges that is determined not to pose greater total risks than direct land disposal. Treatment technologies identified as riskier than land disposal and, therefore, classified as unavailable for purposes of establishing standards may still be used by facilities in complying with treatment standards expressed as performance levels. EPA is committed to developing sufficient regulatory controls or prohibitions over the design and operation of these technologies to ensure that their use in complying with the treatment standards do not result in increased risks to human health and the environment.

b. *Proprietary or patented processes.* If the demonstrated treatment technology is a proprietary or patented process that is not generally available, EPA will not consider the technology in its determination of the treatment standards. In the proposed rule, EPA explained that proprietary or patented processes will be considered available if the Agency determines that the treatment method can be purchased from the proprietor or is commercially available treatment. The services of the commercial facility offering this technology can often be purchased, although the technology itself cannot. In these cases, the Agency proposed that the technology should be considered "available" to treat wastes generated by those other than the owner of the proprietary process.

EPA received some comments supporting and others disagreeing with this approach. The comments objecting to this approach stated that EPA should use the best demonstrated treatment regardless of its commercial availability and thereby, provide strong financial incentives for development of new technologies on the grounds that excluding such technologies from the analysis may result in less stringent treatment standards. The Agency believes, however, that its proposal represents a reasonable compromise that is intended to exclude only those technologies that would not be made available even with strong regulatory and economic incentives. Therefore, EPA intends to retain the position expressed in the proposed regulation that proprietary technology that cannot be purchased or is not commercially available treatment cannot be the basis for the treatment standard. The Agency will review the availability of proprietary or patented processes on a case-by-case basis.

Treatment technologies classified as proprietary are unavailable for the purposes of establishing the treatment standards but may still be used by facilities in complying with treatment standards expressed as performance levels.

c. *Substantial treatment.* In order to be considered "available", a demonstrated treatment technology must "substantially diminish the toxicity" of the waste or "substantially reduce the likelihood of migration of hazardous constituents" from the waste in accordance with section 3004(m). By requiring that substantial treatment be achieved in order to set a treatment standard, the statute ensures that all wastes are adequately treated before being placed in or on the land, and that the Agency does not require a treatment method that provides little or no environmental benefit. As part of the proposed regulation, the Agency stated that treatment will always be deemed substantial if it results in nondetectable levels of the hazardous constituents of concern in the TCLP extract or if the technology can achieve the protective screening concentration levels. Although the screening level approach has been eliminated in today's rule, EPA still intends to evaluate whether or not a treatment technology provides substantial treatment on a case-by-case basis when the treatment technology does not achieve nondetectable constituent concentrations in the residual. This approach is necessary due to the difficulty in establishing a meaningful guideline that can be applied broadly to the many wastes and technologies that will be considered. As stated in the proposed regulation, EPA will consider the following factors in an effort to evaluate whether or not a technology is substantial on a case-by-case basis:

(i) Number and types of constituents treated;

(ii) Performance (concentration of the constituents in the treatment residuals); and

(iii) Percent of constituents removed.

Several commenters objected to this approach. These commenters believed that EPA should have a standard by which to judge whether a technology is simply "treatment for treatment's sake." Although EPA is sympathetic to this concern, no workable suggestions for a standard were provided. The Agency believes that there will be ample opportunity for comment on EPA's

individual BDAT decisions as they are developed. Futhermore, available EPA data show that few, if any, demonstrated technologies will not achieve a high percentage of removal, destruction, or immobilization in the wastes for which they are demonstrated. As a result, the Agency finds no alternative to the approach as proposed (omitting, of course, consideration of the no-longer used screening levels).

If none of the demonstrated treatment technologies achieve substantial treatment of a waste, the Agency cannot establish treatment standards for the constituents of concern in that waste.

4. Collection and Analysis of Performance Data

a. *Collection of performance data.* Once the demonstrated available treatment technologies have been determined for a waste treatability group, the Agency will collect data representing treatment performance and information on the design and operation of the treatment system. In developing technology-based standards for today's final rule, treatment performance is evaluated using the TCLP. The Agency, in future land disposal restrictions rulemakings, may consider using a total waste analysis as the basis for determining treatment standards.

Wherever possible, the Agency will evaluate treatment technologies using full-scale systems. If performance data from properly designed and operated full-scale treatment methods for a particular waste or waste judged to be similar are not available, EPA will use data from pilot-scale operations. Similarly, where pilot-scale data cannot be obtained, EPA will use data from bench-scale treatment operations. Whenever bench- and pilot-scale data are used, EPA may explain the use of such data in the preamble or background documents and will request comments on the use of such data. When data on treatment performance for a particular waste or similar wastes are judged by EPA to be insufficient, EPA will generate data and information through sampling and analysis regarding the operational parameters and performance of the demonstrated available treatment technologies.

The Agency realizes that in some instances all wastes represented by a particular waste code may not be included in the analysis, therefore, the possibility exists that some unique waste matrices may not be considered in establishing the treatment standard. EPA is providing the opportunity for interested parties to petition the Agency for variances to the treatment standards based on a demonstration that the treatment standards for a particular waste cannot be attained (see Unit IV.H.). The variance process allows the applicant to present information which, if properly considered when the treatment standard was originally developed, would have required EPA to create a separate treatability subgroup for the waste (see the relevant BDAT background document for information regarding the technologies used to develop the standard).

b. *Treatment design and operation.* The Agency will not establish treatment standards using performance data that are determined not to be representative of a well-designed and operated treatment system. The effectiveness of a particular treatment technology will depend, to a significant extent, on how well the system is designed and operated. In the proposed rule, the Agency stated its intention to use only treatment data from well-designed and operated systems. Commenters criticized the Agency for not specifying the parameters on which these determinations were made. Today's rule does not represent a change from the proposed rule with regard to EPA's consideration of the design and operation of treatment in developing treatment standards. Instead, we have revised the BDAT background document to better explain EPA's rationale for data editing with regard to the design and operation of the treatment system. It is difficult for EPA to generalize on the specific parameters that will be examined because parameters that comprise a well designed and operated system will vary for each technology. EPA intends to explain the factors considered in connection with individual regulatory packages. For example, some of the critical design and operating parameters for steam stripping include the number of equilibrium stages in the column, the temperature at which the unit is designed to operate, and how well the design temperature is controlled. In evaluating performance data from a steam stripping operation, the Agency would examine the design specifications (e.g. the basis for selecting the number of stages and design temperature) for the treatment unit in order to determine the extent to which the hazardous constituents could be expected to volatilize. After the design specifications are established, the Agency would collect data (e.g., hourly readings of the column temperature) throughout the operation of the treatment process demonstrating that the unit was operating according to design specifications. If the data collected varies considerably from the design requirements, it could form the basis of a determination that the treatment was improperly operated. If the temperature data show, for example, that for significant periods of time the temperature varied considerably from the design requirements, the Agency would not use this data to determine the levels of performance achievable by BDAT.

Ideally, for all treatment data EPA will have associated design and operating data. However, because treatment performance data are limited, EPA may use treatment performance data for which there are few or no associated design and operating data. In these instances, EPA will use engineering judgement based on a comparison of constituent concentrations before and after treatment to determine whether the data reflect a well-designed and operated treatment system. The Agency will also use a statistical outlier analysis to confirm the engineering analysis. An outlier in a data set is an observation that is significantly different from the trend in the data. The measure of difference is determined by the statistical method known as the Z-score. The Z-score is calculated by dividing the difference between the data point and the average of the data set by the standard deviation. For data that are normally distributed, 95.5 percent (or two standard deviations) of the measurements will have a Z-score between −2.0 and 2.0. A data point outside this range is not considered to be representative of the population from which the data are drawn. The Agency requested comment on this analysis in its September 5, 1986 Notice of Availability (51 FR 31783). A comprehensive discussion of this statistical method can be found in many statistics texts (see, for example, *Statistical Concepts and Methods* by Bhattacharyya and Johnson, 1977, John Wiley Publications, NY). The Agency believes this approach is reasonable in view of statutory time constraints.

5. Identification of "Best" Demonstrated Available Treatment Technologies and Determination of Treatment Standards

In the proposed regulation, EPA based the calculation of the treatment standards on the mean of all data points after rejection of outliers by inspection. Commenters criticized the proposed method to setting treatment standards stating that: (1) EPA did not account for process variability; (2) the Agency did not explain how it would assess whether a treatment system was well designed and operated; and (3) the Agency did not explain how it would

determine treatment standards where more than one technology applied to a waste. In response to these comments, EPA revised its methodology for establishing treatment standards. The revised approach incorporates several statistical methods that were presented in EPA's Notice of Availability, September 5, 1986 (51 FR 31783).

a. *Analysis of variance.* EPA is using the statistical method known as analysis of variance in the determination of the level of performance that represents BDAT. This method provides a measure of the differences between data sets. If the differences are not statistically different, the data sets are said to be homogeneous.

This method may be used in two cases. The first case is where more than one technology can be used to treat a waste. In this case, the analysis of variance method would be used to determine whether BDAT would represent a level of performance achieved by only one technology or represent a level of performance achievable by more than one or all of the technologies.

If the Agency found that the levels of performance for one or more technologies are not statistically different (i.e., the data sets are homogeneous), EPA would average the long term performance values achieved by each technology and then multiply this value by the largest variability factor associated with any of the acceptable technologies. If EPA found that one technology performs significantly better (i.e., the data sets are not homogeneous), BDAT would be the level of performance achieved by the best technology multiplied by its variability factor.

The second case where the analysis of variance may be used is where different wastes with common constituents are treated with the same technology. The Agency could use this statistical method to determine whether separate BDAT values should be established for each waste or whether the levels of performance are homogeneous and, therefore, amenable to a single concentration level for a given constituent.

To determine whether any or all of the treatment performance data sets are homogeneous using the analysis of variance method, it is necessary to compare a calculated "F value" to what is known as a "critical value". These critical values are available in most statistics texts (see for example, *Statistical Concepts and Methods* by Bhattacharyya and Johnson, 1977, John Wiley Publications, NY).

Where the F value is less than the critical value, all treatment data sets are homogeneous. If the F value exceeds the critical value, it is necessary to perform a "pair wise F" test to determine if any of the sets are homogeneous. The "pair wise F" test would be done for all of the various combinations of data sets using the same method and equation as the general F test.

The F value is calculated as follows:

(i) All data need to be logtransformed.

(ii) The sum of the data points for each data set are computed (Ti).

(iii) The statistical parameter known as the sum of the squares between data sets (SSB) is computed:

$$SSB = \sum_{i=i}^{k} \frac{Ti^2}{n_i} - \frac{Ti^2}{N}$$

where:

k=number of treatment technologies
n_i=number of data points for technology i
N=number of data points for all technologies
T=sum of data points for all technologies

(iv) The sum of the squares within data sets (SSW) is computed:

$$SSW = \sum_{i=1}^{k} \sum_{j=1}^{ni} x^2_{i,j} - \sum_{i=1}^{k} \frac{Ti^2}{ni}$$

where:

x_{ij}=the observations (j) for treatment technology (i)

(v) The degrees of freedom corresponding to SSB and SSW are calculated. For SSB, the degrees of freedom is given by k–1. For SSW, the degrees of freedom is given by N–k.

(vi) Using the above parameters, the F value is calculated as follows:

$$F = \frac{MSB}{MSW}$$

where:

MSB=SSB/(k–1) and
MSW=SSW/(N–k).

A computational table summarizing the above parameters is shown below.

COMPUTATIONAL TABLE FOR THE F VALUE

Source	Sum of squares	Degrees of freedom	Mean square	F
Between	SSB	k–1	MSB=SSB/k–1	MSB/MSW
Within	SSW	N–k	MSW=SSW/N–k	

b. *Process variability.* Since variability in performance principally arises from inherent mechanical limitations in maintaining control parameters at the optimum setting, calculation of the treatment standard now incorporates a process variability factor. An example of process variability would be an automatic pH control system used to maintain the proper pH range for precipitation of a toxic metal. In this system, a pH sensing device provides a signal to the controller that the pH is not at the set point (i.e., the optimum design point). The controller then changes (either pneumatically or electrically) the position of the valve that supplies the reagent(s) used to adjust pH. The Agency would consider such a system to be well-operated provided that it is properly designed, calibrated, and maintained. Nevertheless, this system cannot be operated without any variation in the level of performance. Control valves are not manufactured in such a way that they can precisely add the exact amount of reagent needed to be at the set point; either too much or too little reagent will be added. Also, there is a lag time between the time when the sensing device detects a problem and the time that the controller adjusts the valve to the correct position. Additionally, there can be process upsets that require greater changes to the system corresponding to greater variations in performance. Another source of variability will occur during the analysis of the treatment samples. Finally, it is acknowledged that EPA approved methods will exhibit some degree of variability in test results for identical samples. All of the above variations can be expected to occur at well designed and operated treatment facilities. Therefore, setting treatment standards utilizing a variability factor should be viewed not as "relaxing" 3004(m) requirements, but rather as a function of the normal variability of the treatment processes. A plant will have to be designed to meet the mean achievable treatment performance level in order to be assured that the performance levels remain within the limits of the treatment standard. The Agency will calculate a variability factor for each constituent of concern

COMPUTATIONAL TABLE FOR THE F VALUE—Continued

Source	Sum of squares	Degrees of freedom	Mean square	F
Within	SSW	N–k	MSW=SSW/N–k	

within a waste treatability group using the statistical calculation presented in the Notice of Availability. The equation for calculating the variability factor, as shown below, is the same as has been used by EPA for the development of numerous regulations in the Effluent Guidelines Program under the Clean Water Act.

$$VF = \frac{C_{99}}{MEAN}$$

where:

VF = Estimate of daily maximum variability factor determined from a sample population of daily data

C_{99} = Estimate of performance values for which 99 percent of the daily observations will be below. C_{99} is calculated using the following equation: $C_{99} = \text{Exp}(\bar{y} + 2.33Sy)$ where $\bar{y}$ and Sy are the mean and standard deviation, respectively, of the logtransformed data.

mean = average of the individual performance values.

EPA is establishing this figure as a daily maximum because the Agency believes that on a day-to-day basis the waste should meet the applicable treatment standards. In addition, establishing this requirement makes it easier to check compliance on a single day. The 99th percentile is appropriate because it accounts for almost all process variability.

6. Dilution Prohibition

In the proposed rule, EPA recognized that successful implementation of the land disposal restrictions program required that dilution be prohibited as a partial or complete substitute for adequate treatment of restricted wastes. The legislative history indicates that such a prohibition "is particularly important where regulations are based on concentrations of hazardous constituents." (H.R. Rep. No. 198, Part I, 98th Cong., lst Sess. 38 (1983)).

The commenters unanimously support a prohibition on dilution. Their comments indicate a concern with dilution after the waste is generated but before the applicable treatment standard and effective date have been determined, and after the treatment standard has been determined but before the residuals are land disposed. It should be noted that this prohibition does not affect provisions in other EPA regulations which may allow dilution for other purposes.

a. *Dilution before determination of the applicable treatment standard and effective date.* One commenter urged EPA to prohibit dilution to avoid an effective date. Today's rule does not include this provision. EPA's proposed prohibition was limited to dilution for the purpose of substituting for adequate treatment under section 3004(m). A prohibition on dilution for the purpose of avoiding an effective date is outside the scope of this proposal and, therefore, would have to be the subject of a separate proposal. However, as noted in the waste analysis section to today's rule, the applicable treatment standards are to be determined by generators in accordance with § 268.7.

b. *Dilution to meet the treatment standards.* One commenter suggested that EPA reiterate that dilution with non-aqueous agents (e.g., flyash, sawdust, or other materials) is also prohibited. The Agency agrees and intends that the addition of any other material, either liquids or non-liquids, is prohibited as a substitute for treatment under section 3004(m).

Several commenters expressed concern that some treatment processes (e.g., equalization ponds), which require the addition of other materials to physically or chemically treat the wastes, would be prohibited. As stated in the preamble to the proposed rule (51 FR 1680), the Agency recognizes that many treatment methods require the addition of reagents. These reagents, however, produce physical or chemical changes and do not merely dilute the hazardous constituents into a larger volume of waste so as to lower the constituent concentration. In establishing BDAT, EPA considered dilution which is a normal part of the production process or a necessary part of the process to treat a waste. The legislative history indicates that this is consistent with congressional intent (see S. Rep. No. 284, 98th Cong., 1st Sess. 17 (1983)). In prohibiting dilution as a substitute for adequate treatment, the Agency does not intend to prevent the regulated community from adding materials that are necessary to facilitate proper treatment in meeting treatment standards (e.g., adding lime to neutralize or precipitate a waste prior to further treatment). In addition, EPA does not intend to disrupt or alter the normal and customary practices of properly operated treatment facilities. For example, treatment facilities could mix compatible wastes in order to treat (e.g., incinerate) at capacity levels rather than treating wastes in small batches.

c. *Dilution of residuals.* One commenter recommended that the language of the prohibition should be modified to reflect that the prohibition on dilution also applies after treatment. In particular, wastes meeting Subpart D treatment standards must not be mixed with wastes that do not meet such standards in order to achieve the treatment standard for the mixture. EPA agrees with the commenter and intends that this type of dilution after treatment or at any other time is prohibited under § 268.3. The Agency believes that the language in § 268.3 prohibiting dilution "as a substitute for adequate treatment to achieve compliance with Subpart D" is sufficiently broad enough to cover this scenario.

EPA is adopting the proposed prohibition with the following modifications. First, the prohibition extends to transporters and handlers which were inadvertently excluded from the proposed prohibition. Since the proposal cited legislative history which included the transportation and handling stages within the prohibition as the basis for § 268.3, the Agency believes that the favorable comments indicate support for such a modification which conforms more closely to congressional intent. In addition, support for the prohibition was very broad and did not indicate any intent to treat transporters or handlers differently. EPA believes that this modification is reasonable and necessary in order to implement this provision.

Second, the prohibition extends only to the act of dilution itself. The Agency's proposed language would have prohibited "attempted dilution" but not dilution itself. This is clearly not what was intended by EPA. Overall, the commenters who supported the prohibition expressed concern with the act of dilution.

B. Comparative Risk Assessment and Available Treatment Alternatives

1. Proposed Use of Comparative Risk Assessment

EPA proposed the use of comparative risk analyses as part of its evaluation of treatment technologies in conjunction with establishing treatment standards. As described in the proposed rule, a number of criteria affect the determination of "available" treatment technologies for the purpose of setting treatment standards. Among the criteria considered is whether application of a treatment technology (including land disposal of treatment residuals) poses greater risks to human health and the environment than those posed by direct land disposal of the waste. Comparative risk analyses were proposed to prevent situations in which regulations restricting hazardous wastes from land disposal would encourage treatment technologies posing greater risks to

human health and the environment than risks posed by direct land disposal.

2. Agency Response to Comments

The majority of the comments supported the concept of conducting comparative risk assessments. However, several comments strongly opposed this concept. Both sets of commenters had specific criticisms and suggestions.

The commenters who objected to the use of comparative risk assessment stated that EPA does not have the authority under RCRA to conduct such analyses. The Agency disagrees with the commenters. The Agency interprets the provisions in section 3004(m) to direct EPA to set treatment standards which minimize threats to the "environment" as applying to all media (i.e., air, land, and water). Because there is no language indicating that this term does not include all media, accordingly, EPA does not believe that the section 3004(m) standard can be read to preclude comparative risk analyses. Therefore, EPA believes that Congress did not intend that risks to human health and the environment be increased as a result of implementation of the land disposal prohibitions. The national policy provision in section 1003 supports this approach in stating that hazardous wastes should be treated in order to minimize the present and future threat to human health and the environment. Moreover, this provision, as well as the legislative history (e.g., H.R. Rep. No. 198, Part I, 98th Cong., 1st Sess. 32 (1983)), does not focus merely on the risks of land disposal, but instead demonstrates a concern for the toxicity and mobility of hazardous wastes in all media. EPA believes that it is desirable, reasonable, and consistent with the intent of Congress to include comparative risk assessments in the determination of available technologies for purposes of setting technology-based treatment standards.

One commenter felt that the use of comparative risk assessments are reasonable, but questioned whether it is appropriate to use worst case scenarios in assessing the relative risks. The suggested approach is to utilize a "middle-of-the-road" scenario in evaluating risks at both land disposal and alternative treatment facilities. In response to the comment, the Agency is not using best or worst case scenarios. Instead, EPA has chosen to analyze several land disposal and treatment facilities which represent high, medium, and low exposure sites. High risk, low risk, and representative waste streams were modeled through each of these facilities in order to capture the entire range of waste site scenarios.

Several commenters were critical of EPA's proposal to evaluate population risk in assessing comparative risks. The Agency believes it useful to consider population in comparative risk analyses because it can identify sources of increased risks where a comparison with the Maximum Exposed Individual (MEI) risks may not do so. For example, the MEI risks of incinerating certain wastes may be low in comparison to the MEI risks of land disposal. This could be due to few people living in the immediate path of an incinerator plume. The Agency does, however, want to consider cases where there may be a larger population affected by incinerator emissions.

One commenter was concerned that the treatment methods for a given waste may be riskier in absolute terms than the treatment method for another waste. Their concern was that the riskier technology could be used to define the treatment standard as long as the process poses comparatively less risk than land disposal. In the context of ensuring that the land disposal restrictions do not shift higher risks to other media, the Agency maintains that comparative risk analyses are not the proper vehicle for making absolute risk determinations. The analyses are aimed at assessing whether the land disposal of a given waste or waste stream will pose relatively greater risks than alternative treatment technologies. As stated above, if the alternative treatment method is determined to be less risky than land disposal it will be used in the determination of BDAT. The Agency does, however, have the authority to impose additional controls on the technology if it later determines that the actual risks are unacceptable. Such a determination could lead to either a modification of the BDAT standard or the imposition of additional standards on treatment facilities.

3. Use of Comparative Risk Assessment in the Final Framework

Results of the comparative risk analysis will not be used to allow continued land disposal of untreated hazardous waste. As discussed in section A of this unit, treatment technologies that are determined to pose greater risks than direct land disposal of a waste will be considered "unavailable" as a basis for establishing the treatment standard for the waste.

C. Application of Standards

1. Leaching Procedure

a. *Final decision.* The Agency proposed to use the Toxicity Characteristic Leaching Procedure (TCLP) to determine whether applicable treatment standards have been met. Although EPA is changing its overall approach in today's final rule (i.e., from risk-based decisions to technology-based decisions), the Agency will continue to require the use of the TCLP to determine whether a waste requires treatment or when a treated waste meets the applicable treatment standards. Today the Agency is promulgating the TCLP with improvements and modifications based on the comments received on the proposed rule, as well as applicable comments received on the Toxicity Characteristic (TC) proposed rule (51 FR 21648, June 13, 1986). The Agency is promulgating the TCLP in today's final rule specifically for evaluation of the solvent and dioxin-containing wastes. The revised TCLP is promulgated as Appendix I to Part 268.

Because the Agency is continuing to investigate other means of defining BDAT (e.g., a definition based on the concentration of hazardous constituents in the waste, at least in the case where treatment is based on destruction), EPA will make decisions regarding the applicability of the TCLP to other restricted wastes according to the final schedule for land disposal restrictions which was promulgated on May 28, 1986. In addition, the Extraction Procedure (EP) will continue to be used in determining which nonlisted wastes are hazardous in accordance with the EP toxicity characteristic (40 CFR 261.24). The Agency expects to promulgate the TC by early 1988.

b. *Response to comments.* The general comments EPA received on the leaching test as it applies to its use in this rulemaking, and EPA's response to these comments are summarized below. Technical and procedural comments on the TCLP, and related issues are summarized and addressed in a background document supporting the use of the TCLP in today's final rule (Ref. 3). The background document also summarizes modifications to the TCLP based on further evaluation of the procedure.

(1) Use of the TCLP is premature. Many of the commenters argued that use of the TCLP was premature. Reasons that were given include: (i) An inadequate amount of time was given to evaluate the method and its impact on current waste management practices, due to the unavailability of test equipment; (ii) the institution of a new test would impose unreasonable delays on treatment facilities who need to test the wastes prior to disposal; and (iii) the test had not been properly validated.

EPA does not believe that these concerns are sufficient reasons to prevent the use of the TCLP in today's regulation. In view of the statutory deadlines, EPA was aware that the time available for public review of the leaching test would be relatively short. As a result, during the course of developing and evaluating the TCLP, public presentations were held to familiarize interested parties with the test procedure, in order to facilitate their evaluation of the test.

In addition, most of the equipment needed to conduct the TCLP is the same as that used for the existing EP. The only "new" equipment is the Zero-Headspace Extractor (ZHE) and ancillary equipment (e.g., TEDLAR bags and gas-tight syringes) needed for evaluation of volatile organic compounds.

In addition to the data and information made available to the public in the January 14, 1986 proposal, information on the development and evaluation of the TCLP was provided in the toxicity characteristic proposed rule. Further supporting information on the leaching test was also provided through notices of availability of reports on July 9, 1986 (51 FR 24856) and September 19, 1986 (51 FR 33297). EPA received over 150 comments on the TCLP in response to these proposals and notices. These comments were considered in issuing today's final rule. EPA, therefore, does not agree with the commenter's claim that they have not had adequate opportunity to evaluate the method. The Agency believes that adequate data has been developed and noticed for public comment to allow generators to adequately evaluate the procedure.

Another general concern expressed by commenters related to the belief that the institution of a new test would present unreasonable delays on treatment facilities. Although there may be some delay, EPA does not believe that this would be caused by the introduction of a new testing protocol or a protocol requiring new equipment. Some form of waste analysis is required in order to implement the land disposal restrictions rule. EPA anticipates that the institution of a new protocol will not cause delays beyond those required to perform any waste characterization. The procedures used in conducting the TCLP are very similar to the existing EP. Therefore, the Agency expects that laboratories familiar with the EP protocol should have little problem conducting the TCLP.

Commenters also expressed concern that the TCLP was not ready for application because the method had not been properly tested or validated. The TCLP has been the subject of an extensive evaluation. EPA has completed both intra- and inter-laboratory (collaborative) studies of method reproducibility using a variety of wastes. Industry groups and commercial laboratories participated in EPA's TCLP collaborative evaluation. In addition, the Electric Power Research Institute (EPRI) also evaluated the TCLP in a collaborative study. Finally, six industry associations submitted data to the Agency from a collaborative study of the TCLP. (The results of these studies are detailed in the TCLP Background Document supporting today's rule (Ref. 3)). Based on all these efforts, EPA believes that the test has been sufficiently evaluated.

(2) The TCLP is inappropriate for use in the land disposal restriction's rule. Approximately one third of all commenters addressing the leaching test argued that it is inappropriate for such use. Specifically, these commenters argued that the method would be inappropriate as a means to evaluate Subtitle C hazardous wastes because it was developed based on a municipal/industrial waste codisposal scenario.

They specifically pointed out that hazardous waste landfills do not contain municipal wastes and, therefore, that the leaching medium within these landfills was unlikely to contain acetate or acetic acid, common degradation products of decomposing refuse. These commenters further suggested that a water leaching medium would be more representative of a Subtitle C disposal facility.

Several commenters also disagreed with application of the TCLP because of other differences between Subtitle C and Subtitle D land disposal facilities. They asserted that Subtitle C facilities differ in design from municipal facilities in several respects, including minimization of surface and ground water intrusion and containment of accumulated fluids through the 30-year post-closure period beyond the operating life of the facility. They pointed out that well-engineered hazardous waste land disposal units provide a physical-chemical environment that is significantly different from the municipal landfill.

EPA recognizes that RCRA Subtitle C and Subtitle D facilities differ in many respects. However, commenters generally addressed only the fairly narrow example of a well engineered Subtitle C landfill that accepts treated wastes or that is dedicated to a particular waste. Subtitle C facilities include not only these types of landfills but also existing facilities which may be unlined or which may contain a variety of untreated wastes. The current regulations do not prohibit the landfilling of mildly acidic wastes, nor is it uncommon to put liquid acidic wastes in surface impoundments. Thus, a significant number of facilities may not conform to the model suggested by the commenters. In view of these differences, EPA does not believe the commenters have shown that it is unreasonable to assume that wastes in a Subtitle C environment may be subject to mildly acidic conditions. In view of these factors, and considering the time constraints imposed on the Agency's issuance of land disposal regulations, EPA believes it is justified in using the TCLP for the wastes covered by today's rule.

In this regard, it is important to note that the leaching of the organics covered by today's rule is not significantly effected by minor changes to the predominantly aqueous leaching media used in the TCLP (Ref. 24). Thus, the Agency believes it is being prudent in not introducing yet another leaching test for regulatory application.

(3) Effect of the TCLP on constituents other than solvents and dioxins. Because today's final rule addresses only solvents and dioxins, EPA is not responding to those comments dealing with inorganics at this time. EPA has received substantial comment regarding the TCLP's use of a "stronger" leaching fluid for wastes of moderate to high alkalinity, and the need for particle size reduction of all wastes, including monolithic materials. A detailed discussion is available in the TCLP background document.

(4) Potential laboratory capacity shortfall. Several commenters, anticipating that the TCLP may eventually be required as a result of both the land disposal restrictions program and the toxicity characteristic, were concerned over a potential laboratory capacity shortfall. They indicated that commercial laboratories are currently backlogged with work, and that TCLP requirements under both rules would make the situation critical.

We disagree with these commnenters. Many commercial laboratories are presently performing TCLP analyses. For example, over 20 laboratories were involved in EPA's TCLP collaborative effort. In addition, EPA is aware that laboratories have been in the process of gearing-up to perform TCLP analyses, primarily in anticipation that the TCLP will be required as part of both the land disposal restrictions rule and the toxicity characteristic. In addition, due to the phased approach for the restrictions rule, and the fact that the toxicity characteristic will not be

promulgated until early 1988, EPA believes that the laboratory capacity problem will not be as severe as commenters suggest. By the time the toxicity characteristic becomes effective, EPA believes that sufficient laboratory capacity should exist to conduct the required analyses. Several commenters agreed with EPA, indicating that there are (or would be) a sufficient number of laboratories that will be able to perform the TCLP.

(5) TCLP reproducibility. EPA also received substantial comments regarding the precision or reproducibility of the TCLP, most of which were critical of the method's precision. While specific comments regarding method precision are addressed in the TCLP background document, the outcome of EPA's general evaluation of these comments is presented below.

The relevant question with respect to method precision is; "is the method sufficiently precise for its intended application?" In other words, given a particular waste, can the same conclusions derived from results of running the TCLP in one laboratory (i.e., are treatment levels exceeded) be reached in other laboratories. EPA believes that the TCLP is sufficiently precise in this application, as indicated below.

A total of three separate multi-laboratory collaborative evaluations of the precision of the TCLP were conducted (Ref. 3). One of these evaluations was sponsored by the Electric Power Research Institute (EPRI), and was limited to investigating the precision of the method for inorganic parameters and dealt specifically with utility industry wastes. This study is unique in that it attempted to determine the relative contribution to total variability due to the three major components of variability; sampling variability, analytical variability, and variability due to the TCLP itself. EPRI also conducted side by side comparisons of the EP to the TCLP. This study was similar to a study EPRI did on the EP in 1979 (Ref. 3).

EPRI's evaluation concluded in general, that the TCLP's reproducibility was equal to or greater than that of the EP (Ref. 3). More significantly, EPRI found that the most frequently encountered source of variability in the TCLP extracts was the analytical variability associated with analysis of duplicate extracts by different laboratories. EPRI, however, also indicated that the interpretation of results may depend on the statistical approach used to analyze the data. Nevertheless, it appears that regardless of how data are interpreted, analytical variability can account for a major source of variability in results.

EPA's collaborative study addressed the conventional bottle extraction (i.e., for metals, semi-volatile organics, and pesticides and herbicides) and the Zero-Headspace Extractor (ZHE) used for volatile organics. The results of this study, noticed in the September 21, 1986 **Federal Register**, presented the full results of the evaluation for the conventional extraction, and a summary of the results for the ZHE extraction. This report has since been finalized. The general conclusion reached in this study was that "the TCLP could be applied consistently by a diverse group of organizations."

The third collaborative effort was sponsored by six industry trade associations, and dealt with both the conventional bottle extraction and the ZHE. This study also compared the precision of the EP to the TCLP, and, like the EPRI study, concluded that the precision of the TCLP was approximately the same as, or slightly better than, that of the EP. This study further concluded, however, that the TCLP procedure was not a precise test, but attributed the major source of variability to the "lack of homogeneity of wastes and the resulting difficulty in obtaining representative samples . . ." One comment received, however (from one of the participating trade associations), concluded that the association's study seemed to be consistent with the EPA effort in that the data for metals and non-volatile organics showed adequate reproducibility, and that the "*preliminary*" data for volatile organics also indicated adequate reproducibility.

EPA believes that these three efforts adequately demonstrate the precision of the TCLP, and also support EPA's contention that precision over the existing EP has been improved. Specifically, these studies show that considering the variability contributed by both sampling and analytical variability, the TCLP can be applied consistently among laboratories with reasonable precision.

Nevertheless, EPA agrees with the conclusion in the industry association study that sampling variability is likely to be the most significant contribution to total variability. (EPA is also concerned, to a lesser extent, with the contribution of analytical variability.) Further, EPA believes that sampling variability may actually be more of a problem than indicated in these studies. Whereas extra efforts are usually made in collaborative studies to minimize variability due to the samples, such efforts are not always entirely successful. When sampling for waste analyses or characterizations, it is likely that sample representativeness will not receive the same close attention that it receives during collaborative efforts.

EPA believes that the best way to deal with the variability problem is to take multiple "representative" samples of wastes following a well-developed sampling plan, and to subject these samples to the intended analyses. Following fairly simple and fundamental statistical concepts, the results can then be subjected to a statistical evaluation designed to determine whether applicable regulatory levels are exceeded with a certain degree of confidence (e.g., the upper limit of the 90 percent confidence interval). This approach is detailed in Chapter 9 of EPA's 3rd edition of its solid waste testing manual (Test Methods For Evaluating Solid Waste—SW–846), which is complete with several easy ways to follow example (Ref. 3).

(6) Applicability of the TCLP to multi-phasic (oily) wastes. EPA has also received substantial comment on the applicability of the TCLP to oily wastes. Commenters were both concerned that the TCLP would not distinguish "liquid" oils from solid materials, resulting in little or no filtration of oil through the TCLP's glass fiber filter (GFF), and that the TCLP's GFF would treat these oils as liquids, resulting in too much oil passing through the filter. These commenters further criticized the TCLP because it treated aqueous liquids and non-aqueous (oily) liquids in an identical manner, when these commenters perceived these liquids to behave differently in the environment.

Materials which filter through the GFF are defined as liquids and are analyzed directly, whereas the "solid" portion of the waste (i.e., that portion which does not pass through the GFF) is extracted with an amount of extraction fluid equal to twenty times its weight. This differentiation is especially critical for oily wastes (which are known to pose filtration problems, especially with the EP's membrane filter), as exceedance of the treatment level can depend very heavily on whether the "liquid oil" within the waste is defined as a liquid (passes through the GFF and is analyzed directly), or is defined as a solid (does not filter and is extracted with twenty times its weight of extraction fluid).

EPA agrees that this is a difficult issue and believes that it is important that the TCLP be capable of indicating the movement of oily material, as these materials have been known to migrate from wastes.

Data is available which suggests that the TCLP's GFF more readily passes oily material than does the EP's membrane filter. In developing the TCLP, EPA investigated eleven wastes in its lysimeter evaluations, three of which were oily wastes (Ref. 24). During this phase of the research, it was demonstrated that oil is capable of migrating from the "solid" matrix of the waste as droplets.

While the GFF was selected mainly for operational reasons, the research also indicated that it was consistently more efficient at detecting contamination due to movement of the oil than was the EP's membrane filter. The GFF is therefore expected to provide a more reasonable differentiation between liquids and solids.

While the GFF then, is an improvement upon the EP's membrane filter, in terms of its ability to pass oils, EPA is continuing to investigate if the TCLP's filtration regime should be altered to better predict movement of the oily phase of a waste. Upon completion of these evaluations, EPA may propose modifications to the TCLP specifically for wastes containing oily or other non-aqueous liquids. In the meantime, given the GFF's ability to better indicate the movement of oil, EPA believes that the TCLP's filtration regime will be sufficiently capable of indicating whether oily wastes meet the treatment levels.

(7) Complexity of TCLP. Several commenters were also concerned that the TCLP is too complex and too dependent on the use of skilled personnel and specialized equipment like the ZHE. Many of these commenters suggested changes to the ZHE protocol. Commenters further asserted that the procedure was overly burdensome, especially for wastes containing solids and multiple liquid phases.

As indicated previously, the TCLP involves two separate procedures with differing equipment. The conventional bottle extraction conducted for "non-volatile" constituents is much simplified over the EP protocol. In fact, one of the conclusions of the EPRI collaborative TCLP study was that "the main advantage of the TCLP appears to be in the ease of use." The TCLP extraction for volatiles, involving the ZHE, is agreeably more complicated than the conventional extraction. The two protocols, however, are very similar, and EPA believes that analysts familiar with the EP method will have little problem, successfully conducting the TCLP. As with any new procedure, there will be some learning involved, especially with regard to the ZHE device. Familiarization with the device should be fairly rapid, however.

EPA has also taken steps to simplify the procedure, both on our own further evaluation of the method, and in response to the comments received on the method. EPA is also considering further simplification of the ZHE protocol, as indicated in the background document. Finally, while EPA believes that the protocol can be successfully run by technicians and analysts, as with any waste characterization (including the EP), the oversight of skilled chemists is always essential.

(8) Operational difficulty of the TCLP with some waste types. EPA has received many comments addressing the operational difficulties perceived in performing the TCLP on some waste types. For example, EPA is aware that the TCLP will be more difficult to perform on wastes containing immiscible liquid phases, and on wastes which contain low percent solids (e.g., <5 percent solids). EPA is also aware that the ZHE device may be difficult to clean after extraction of a particularly contaminated waste.

To help generators in dealing with these problems in a consistent manner, EPA is in the process of preparing a guidance section for the TCLP, that will offer suggestions on the best way to deal with these problems. In addition, this guidance will offer suggested reporting forms for recording results, and will also contain helpful suggestions in dealing with minor problems. This guidance section will accompany the method when it is published in SW-846. The background document supporting the TCLP provides more detail regarding the content of the guidance section, along with responses to comments addressing technical and procedural issues (Ref. 3).

(9) Specific wastes and compounds. Many commenters also expressed their concern that application of the TCLP would be inappropriate for their specific wastes. These commenters, however were most concerned with inorganic constituents and the effect of the acetic acid (used in the TCLP) on these constituents. These commenters asserted that their wastes were not managed in municipal landfills (which the acetic acid is designed to simulate) and thus, that the use of acetic acid would be inappropriate. As mentioned earlier, since today's rule applies only to solvents and dioxins, and since the TCLP is only used in the rule as a monitoring technique, EPA is not responding to these comments at this time.

Similar comments were received which assert that reproducibility testing performed on the TCLP should have been done with "their wastes." EPA would like to reemphasize that these were two outside evaluations of the TCLP (Ref. 3). Nonetheless, EPA believes that it would be unnecessary to conduct precision studies on all wastes that may be subject to the TCLP. This would be a waste of resources. Rather, in precision studies, it is more important to test a range of wastes, in terms of physical and chemical characteristics. Between all the investigations conducted on the TCLP, a wide variety of wastes have been tested, including those that would sufficiently challenge the procedure, such as oily (multi-phasic) wastes. This is important, as many of these commenters were specifically referring to oily wastes. EPA believes that the TCLP has been sufficiently tested on a variety of wastes.

Other commenters were concerned that the TCLP would be inefficient at extracting chlorinated (volatile) compounds, as they observed that during the research EPA conducted to develop the TCLP, chlorinated compounds were extracted in the laboratory procedure at levels significantly less than the levels expected (Ref. 24). EPA acknowledged the poor extraction of volatile compounds in general during this research. These results led EPA to the conclusion that volatiles were being lost to the headspace within the conventional (bottle) extraction and as a result of the air pressure filtration. Consequently, the Agency determined that a device which precludes headspace and enables the use of piston pressure for liquid/solid separation was necessary, and the Zero-Headspace Extractor was developed to minimize the loss of volatiles.

2. Testing and Recordkeeping

Under the framework being finalized today, determination of whether a hazardous waste treatment residue requires further treatment prior to land disposal generally depends on whether the concentration of constituents in an extract from the waste (using the TCLP) exceeds the applicable treatment standards. Because this determination is critical to the scheme, EPA is imposing certain waste testing/analysis requirements.

In the proposed rule, the Agency solicited comments on the issue of who should bear responsibility for testing restricted wastes and certifying that the wastes meet the applicable treatment standards. The commenters were equally divided on these issues. Some commenters believed that the generator

should be responsible for testing, certification, and recordkeeping. Others agreed with the proposed approach requiring the disposal facility to certify that the wastes meet the treatment standards.

Because the approach promulgated today does not cap BDAT with screening levels, more wastes will require treatment to meet the specified treatment standards. The Agency believes that the shift towards treatment of restricted wastes will place an increased responsibility on treatment facilities to ensure that treated wastes meet the specified treatment standard. Although the provisions in section 3004(m)(2) place the ultimate responsibility on the disposal facility to ensure that only wastes which meet the treatment standards are land disposed, the Agency believes that testing and certification by the treatment facility is critical to implemention of the regulatory program. Thus, the Agency is requiring that the treatment facility provide waste analysis data showing that a waste meets the applicable treatment standard to ensure that only wastes which meet the standards will be transported to disposal facilities. In cases where the generator is shipping a waste directly to the disposal facility (i.e., the waste naturally meets the treatment standard, or has been treated on-site), the generator is responsible for testing and recordkeeping. However, the disposal facility has the ultimate responsibility to ensure that all restricted wastes meet applicable treatment standards before being land disposed. The disposer also is required to maintain all records.

The rules promulgated today are not intended to shift responsibility for improper disposal to the generator. Of course, nothing in these rules prevents the generator and disposer from entering into a private agreement to allocate liability in the event that prohibited wastes are land disposed.

a. *Generator requirements.* For today's final rule, the generator of a restricted waste must notify the treatment facility in writing of the appropriate treatment standard for the waste. The generator may make this determination based on waste analysis data, knowledge of the waste, or both. Where this determination is based solely on the generator's knowledge of the waste, the Agency is requiring that the generator maintain in the facility operating record all supporting data used to make this certification. A waste analysis must be conducted if there is reason to believe that the composition of the waste has changed or if the treatment process has changed. The notification must specify the EPA Hazardous Waste Number, the applicable treatment standard, the manifest number associated with the shipment of waste, and the waste analysis data (if available). The notice must be placed in the operating record of the treatment facility along with a copy of the manifest. Generators who are also treatment, storage, and disposal facilities must place the same information in the operating record, although a formal notification and manifest is not required.

According to the provisions in § 268.7, a generator who determines that a waste can be land disposed without treatment must submit to the disposal facility a certification statement and a notice which contains the EPA Hazardous Waste Number, the manifest number, the applicable treatment standard(s), and the waste analysis data (if available) or cross references to relevant data submitted at an earlier time. The certification is required only in cases where the generator is representing that the waste meets the treatment standard. Generators who dispose on-site must put the same information in the operating record (except for the manifest number).

b. *Treatment facility requirements.* The treatment facility is responsible for treating the restricted waste to the level specified in the applicable treatment standard. An off-site treatment facility must obtain the required data from the generator prior to treatment and place that data in the operating record.

Treatment residues must be tested prior to land disposal according to the requirements of the treatment facility's waste analysis plan to determine if treatment has achieved the required levels.

For instance, if the waste analysis plan calls for testing of each batch of waste from an incineration process, these data must be submitted to the land disposal facility along with the certification statement. If a particular generator's waste does not vary and is consistently treated by the same treatment facility using the same treatment process, the treatment facility's waste analysis plan may require less frequent testing of the treatment residue. It should be emphasized that a waste analysis must be conducted if there is any reason to believe that the composition of the waste has changed or if the treatment process has changed.

Each waste shipment must be accompanied by a certification statement including cross references to any relevant data submitted at an earlier time, and a notice which includes the EPA Hazardous Waste Number, the manifest number, the applicable treatment standard(s), and waste analysis data (if available). The disposal facility must place the certification notice and accompanying data in the operating record. A treatment facility that disposes on-site must put the same information in the operating record (except for the manifest number).

c. *Land disposal facility requirements.* The disposal facility, which is ultimately responsible for verifying that only wastes meeting the treatment standards are land disposed, must maintain all documentation that the waste has been treated in accordance with the standards. If generation, treatment, and disposal all occur at the same site, all testing records must be placed in the operating record. The Agency believes that this approach will produce the desired result—an assurance that wastes placed in land disposal units have met the applicable treatment standards.

The testing and recordkeeping requirements promulgated in today's rule do not relieve the generator of his responsibility under 40 CFR 262.20 to designate a facility on the manifest which is permitted to accept the waste for off-site management.

d. *Implementation of final rule.* To implement the additional waste testing/analysis standards, the Agency has included a reference to the requirements of 40 CFR Part 268 in the general waste analysis requirements of 40 CFR 264.13 (a)(1) and (b)(6) for permitted facilities, and in 40 CFR 265.13 (a)(1) and (b)(6) for interim status facilities. Consistent with the current approach to waste analysis requirements in Parts 264 and 265, the Agency has added these specific waste analysis requirements in today's final rule that must be incorporated into the general waste analysis as a separate section in Part 268. The Agency has also revised the operating record requirements in 40 CFR 264.73 and 40 CFR 265.73 to indicate that waste analyses conducted pursuant to such requirements must be recorded and maintained in the land disposal facility's operating record.

e. *Waste analysis.* Wastes must be tested in accordance with a facilities waste analysis plan. Where treatment standards are expressed as a concentration in a waste extract, EPA is requiring that the TCLP be used to determine whether the waste meets the treatment standard (see Appendix I to Part 268). Guidance on methods for waste sampling and analysis is provided

in *Test Methods for Evaluating Solid Wastes,* 2nd Edition, EPA Document SW-846, 1982, as amended. In addition, guidance on the preparation of waste analysis plans is provided in *Waste Analysis Plans, A Guidance Manual,* September 1984. A revised edition of this waste analysis plan (WAP) guidance is forthcoming.

The current WAP guidance describes four basic components of the waste analysis plan. It discusses how the owner or operator of a treatment, storage, or disposal facility should describe:

(1) Specific wastes that will be managed;

(2) Waste-associated properties that are of concern in ensuring safe and effective management;

(3) Specific waste parameters that must be quantified before waste is accepted for treatment, storage and/or disposal;

(4) Methods and frequency of sampling and analysis required to obtain the data on waste characterization and the attendant quality control/quality assurance procedures.

For the purposes of compliance with the land disposal restrictions rule, a waste analysis plan for an off-site disposal facility must address the procedures for screening incoming shipments of waste to ensure that wastes received conform to the certification made by the generator or treatment facility. That is, the waste analysis plan must address the procedures necessary for determining whether an extract of the waste or treated waste meets the treatment standards.

These testing requirements for treatment residuals apply to generators who treat, store, and dispose onsite. Less frequent testing may be appropriate when there are fewer and less variable waste streams at combined facilities, but waste must be tested if the composition or treatment method changes. In developing these waste analysis plans, the Agency recommends that the land disposal facilities follow the general guidelines in the WAP guidance.

For each waste stream, the waste constituents regulated under the land disposal restrictions rule must be comprehensively analyzed. Although the frequency of testing will depend to some extent upon the variability of the waste stream, the Agency recommends that a comprehensive analysis of each waste stream be performed at least annually by the generator or treater. When the comprehensive analysis is performed, however, it must contain data on all the applicable constituents in Subpart D so that the owner/operator will be able to determine whether the waste meets all applicable treatment standards. If the owner/operator of the land disposal facility does not receive this information in writing from the generator or treatment facility, he must perform the analysis to determine whether the waste meets the treatment standards according to the waste analysis plan. The test results of this comprehensive analysis must be placed in the land disposal facility's operating record.

The Agency believes that this approach is consistent with existing industry practice. Off-site land disposal facilities already require extensive waste analysis information from the generator or treatment facility before they initially accept hazardous wastes for disposal.

Finally, by requiring that all waste analyses be placed in the operating record, the owners/operators will be able to demonstrate compliance with the waste analysis requirements in § 268.7.

Where the treatment standard for the applicable waste is a specified method of treatment, the last facility to treat the waste must send a certification to the land disposal facility that the waste has been treated using the specified technology. The certification, which is to be placed in the land disposal facility's operating record, must include the statement required under § 268.7(b)(1).

3. RCRA Facilities Operating Under a Permit or Interim Status

These regulations, when they become effective, will place an increased demand on existing hazardous waste treatment facilities. EPA believes that it is important for these facilities to have the regulatory flexibility to add restricted wastes to their treatment inventories quickly. This flexibility is necessary to permit the prompt treatment of restricted wastes.

Treatment facilities operating under interim status are generally provided with the flexibility to handle new wastes by 40 CFR 270.72, which specifies permissible changes during interim status. Under this section, interim status facilities may add new wastes, increase design capacity (if they can demonstrate a lack of available capacity), or make changes in treatment, storage, or disposal processes (if the changes are necessary to comply with Federal regulations or State or local laws). 40 CFR 270.72(e), however, limits these changes to alterations and expansions of a facility that do not exceed 50 percent of the capital cost of a comparable new facility. In cases where changes exceed 50 percent, the changes cannot be made until the facility receives a RCRA permit.

In the preamble to the proposed rule, the Agency requested comments on whether an amendment to 40 CFR 270.72 is necessary to provide interim status facilities the flexibility to manage restricted wastes. EPA received few comments recommending such a change, however, the commenters did not provide data indicating that this provision would prevent modifications needed in order to comply with today's rule. The Agency is reviewing this issue and will modify 40 CFR 270.72, if needed, by promulgating a rule at a later date. However, at this time, we believe that 40 CFR 270.72 allows sufficient flexibility for interim status facilities to readily manage restricted wastes.

Treatment facilities operating under a permit have significantly less flexibility to make changes than interim status treatment facilities. Under current regulations, these facilities may add new wastes or change treatment, storage, or disposal processes, usually through major permit modifications. Major permit modifications, which are substantially the same as permit issuance procedures, require a draft permit, public notice and comment, and opportunity for a public hearing. In many cases, these procedures can be time-consuming and may discourage facilities from changing permit conditions to treat restricted wastes, thereby limiting available treatment capacity.

To provide greater flexibility to permitted facilities, the Agency proposed to allow treatment facilities to manage restricted wastes not listed in their permit after a minor permit modification (51 FR 1692). The EPA received several comments on this issue. In general, industry supported the increased flexibility provided in the proposed rule. Environmentalists, however, argued that permit modifications which permit management of new wastes should not be granted without the opportunity for at least abbreviated public notice and comment. They stated, however, that certain restrictions should be placed on new wastes that could be added to a permit through minor modification procedures.

After reviewing these comments the EPA has decided to add a new section (40 CFR 270.42(o)) to allow permit holders greater flexibility in treating restricted wastes. Under this new provision, owners and operators of treatment facilities may treat restricted wastes not listed in their permits after Federal or State approval of a minor permit modification request. However,

in response to public comments and to ensure that changes made under this provision are in fact minor, the EPA has restricted the scope of 40 CFR 270.42(o) in several important respects.

First, new waste must be treated in accordance with the treatment standards issued under Subpart D of Part 268. This will ensure that the treatment is appropriate for the restricted waste. Second, as suggested by the commenters, minor permit modifications are not allowed under this provision if treatment of the new waste will present substantially different risks from the risks associated with wastes listed in the permit. For example, a facility not already permitted to handle acutely hazardous or reactive wastes would not be allowed to treat such wastes under this provision. Finally, under this provision, treatment of the new waste cannot involve any permit changes other than the addition of waste codes and administrative or technical changes necessary to handle the waste, such as changes in the waste analysis plan. Changes in treatment processes or the addition of new treatment processes will continue to require a major permit modification.

This amendment to the minor modification requirements should provide flexibility to permitted facilities treating restricted wastes. It should be emphasized, that the modifications allowed under this provision are significantly limited and they apply only to restricted wastes as described above. The purpose of the amendment is to allow the prompt treatment of restricted wastes in accordance with the land disposal restrictions standards and to increase available treatment capacity. Without these changes, the EPA believes that the ability of permitted facilities to treat restricted wastes promptly will be significantly reduced.

Because of the conditions limiting the applicability of this provision, any permit modifications made under it will be minor. For this reason the EPA does not believe that public notice and comment procedures are necessary, just as they are not required for other minor permit modifications. Such procedure would eliminate the flexibility provided by the minor modification procedures and could complicate or delay treatment of restricted wastes.

The EPA acknowledges that 40 CFR 270.42(o) only partially addresses the difficulties that will be faced by permitted facilities seeking to treat restricted wastes. In particular, it does not allow the modification of existing treatment processes or the addition of new treatment processes to handle restricted wastes. The Agency believes that such changes raise more complicated issues than does the addition of waste codes. However, the Agency is exploring this issue as part of an overall review of the minor permit modification regulations. The EPA is now conducting regulatory negotiations on minor modifications, announced on July 16, 1986 in the **Federal Register,** (51 FR 25739), and anticipates issuing a proposed rule revising this regulation in 1987.

D. Determination of Alternative Capacity And Ban Effective Dates

RCRA section 3004(h)(2) states that the Agency may grant a nationwide variance of up to 2 years from the statutory effective date if adequate alternative treatment, recovery, or disposal capacity which protects human health and the environment is not available. EPA will consider several factors when calculating alternative capacity and when determining the length of any variance from the effective dates of the restrictions. These factors are discussed below.

1. Effective Dates

EPA will develop estimates of treatment capacity needed versus capacity available to determine if current capacity for alternative treatment, recovery, and disposal technologies is adequate to manage restricted wastes. These estimates will be developed from currently available data on capacity requirements and technology capacity.

If capacity is available, the prohibition will go into effect immediately. If capacity is not available, the Administrator may set an alternative effective date on the basis of the earliest date on which adequate alternative treatment, recovery, or disposal capacity which protects human health and the environment becomes available. Establishment of the effective date will not be affected by the processing of petitions under section 3004 (d), (e), and (g). The relationship between the variance to the effective date and the case-by-case extension under section 3004(h)(3) is discussed later in this unit.

2. Regional and National Capacity

The Agency will determine both the quantity of restricted waste generated and the capacity of alternative treatment, recovery, and disposal technologies on a nationwide basis. If there is a significant shortfall in capacity to treat all of the restricted waste, the Agency will extend the effective date of the prohibitions. If national capacity is only slightly lacking, EPA may grant case-by-case effective date extensions while allowing the nationwide prohibition to go into effect immediately. If national capacity is sufficient, the prohibition will become effective immediately, even if, for instance, the only capacity for a waste generated in California is located in Ohio.

Many commenters urged EPA to make regional instead of national estimates of required and available capacities. However, the national approach is consistent with congressional intent. The Senate legislative history provides that "the available capacity determination is to be done on a national basis" (S. Rep. No. 284, 98th Cong., 1st Sess. 19 (1983)). That is, the effective date of the prohibitions for a given waste should not vary from region to region because one region has sufficient alternative capacity and another does not. If land disposal were prohibited in only a portion of the country, it is possible that waste generated in one region would be transported outside of that region and land disposed elsewhere. As the Senate report points out, those regions of the country in which land disposal is allowed might become the "dumping ground" for wastes generated in regions where land disposal is banned (S. Rep. No. 284, 98th Cong., 1st Sess. 19 (1983)).

3. The Nationwide Variance and the Case-By-Case Extension

In cases where EPA has not granted a nationwide variance, it is not precluded from granting case-by-case effective date extensions. It may be more desirable to grant case-by-case extensions to specific applicants who lack alternative capacity than to allow everyone, even those for whom alternatives are available, to continue to land dispose restricted wastes. This approach is consistent with congressional intent to prohibit land disposal at the earliest possible time.

EPA also may grant variances of less than 2 years, even though not all facilities under construction will be completed. Wastes requiring the capacity from uncompleted facilities also could be handled by case-by-case extensions, without allowing continued land disposal nationwide.

If the Agency proposes an immediate effective date, it will accept applications for case-by-case extensions before the final rule is promulgated so the extensions will be effective when the final rule is published in the **Federal Register.** EPA will consider information provided by case-by-case extension applicants as well as comments submitted during the public comment

period, in determining whether to grant a nationwide variance in the final rule.

The Agency will consider the possibility of granting a nationwide variance after the prohibition becomes effective if available data (including data from case-by-case extension applications) indicate that nationwide capacity is inadequate. EPA also will consider whether it should shorten the period of a nationwide variance based on new information showing that nationwide capacity is adequate. However, after EPA promulgates a nationwide effective date, this date is not likely to be amended because it is unlikely that Federal rulemaking activities could be completed in significantly less than 2 years.

4. Determination of Capacity Requirements by Waste Treatability Group

In general, EPA will develop treatment standards for waste groups derived from the physical/chemical characteristics of the restricted wastes. EPA also will determine the quantities of wastes that require specific treatment of recovery methods by waste treatability group. These treatability groups will enable EPA to compare required capacity (capacity demand) with available capacity (capacity supply). In addition, EPA will consider other increases in capacity demand generated by emergency and remedial responses, and to the extent possible, the impact of other final rulemakings that affect availability of or demand for treatment capacity. As necessary, EPA will set different effective dates for different waste groups or subdivisions of waste groups.

In some cases, the same technology will apply to several waste groups that must be regulated in the same or in sequential rulemakings. However, total capacity may not be sufficient to treat all of these groups of wastes. In such cases, the Agency will subdivide the waste groups in order to use all available treatment capacity on specific subgroups so as to implement the restrictions as quickly as possible. Under this approach, as much waste as possible would be prohibited immediately.

5. Definition of Available Capacity

In estimating available capacity, the Agency will consider current on-line facilities, which include permitted facilities and facilities operating under RCRA interim status, and planned facilities and capacity extensions that will be on-line by the effective date of a land disposal prohibition.

Current on-line facilities consist of off-site and on-site facilities, including both stationary and mobile facilities which have been approved by Federal, State, and local agencies to operate and accept certain wastes. Facilities operating under RCRA interim status meet these criteria, and therefore will be included in the capacity determination. Some commenters disagreed with this approach, suggesting that interim status facilities may not receive final permits. However, unless EPA receives notification of intent to close an interim status facility, the Agency will assume continued operation of a facility throughout the permitting process and continued available capacity on the effective date of a prohibition.

Planned facilities are facilities that are under development or under construction. Planned facilities include new off-site and on-site treatment, recovery, and disposal facilities, as well as planned capacity additions or expansions to existing facilities.

Some commenters questioned the validity of including planned facilities in estimates of available capacity. They stated that the Agency could not make accurate predictions about such capacity. The Agency will consider planned capacity only if it is reasonably certain that the facility will be on-line by the effective date of a prohibition. To predict whether a facility will be on-line in time, EPA will consider the time needed to complete the facility, including reasonable estimates of time needed to site the facility, obtain permits, construct, and test. In most cases, EPA will consider the capacity of planned facilities only when all permits required for construction have been approved and sufficient additional evidence of intent to build are available (such as contracts issued for construction). Planned capacity was not included in the estimates of available capacity for solvents and dioxins.

6. Definition of Alternative Treatment Capacity

The Agency believes that treatment technologies that will achieve the standards established under section 3004(m) can be considered available treatment capacity under the provision in section 3003(h)(2).

Section 3004(m) directs EPA to establish standards based on treatment that will minimize long- and short-term threats to human health and the environment. The Agency believes that this provision generally will be satisfied by technologies classified as BDAT. In most cases, treatment levels or methods based on BDAT are expected to fully protect human health and the environment. Accordingly, technologies that form the basis for such standards are candidates for the capacity evaluation under section 3004(h) (2) and (3).

In those cases where standards based on BDAT are not deemed to be fully protective of human health and the environment, the Agency may, as a matter of policy, exercise its discretionary authority not to extend the effective date of a prohibition in cases where the existing capacity of fully protective technologies, coupled with the existing capacity of treatment technologies that meet BDAT , is adequate to address the restricted wastes.

The Agency believes that this approach is consistent with Congressional intent. The section 3004(h) variance is intended to encourage the development of protective alternative treatment, recovery,and disposal capacity. (S. Rep. No. 284, 98th Cong., 1st Sess. 18 (1983), H.R. Rep. No. 198, 98th Cong., 1st Sess. 37 (1983)). However, in cases where BDAT is not fully protective, the regulated community will have little incentive to develop protective alternative treatment methods during the variance period in light of the fact that, at the end of any such variance, hazardous waste may be land disposed if the wastes comply with less protective technology-based standards. In such a case, the effect of the variance would simply be to delay compliance with BDAT and not, as Congress intended, to provide limited additional time for the development of protective alternative technologies.

Treatment methods that are not identified as the basis for BDAT for the waste group being considered also will be included in the capacity determination, as long as EPA judges that the method can achieve the treatment standards for the wastes in question and will pose less risk than land disposal. EPA believes that this approach is consistent with the congressional intent to ban hazardous wastes from land disposal at the earliest possible date, as discussed earlier.

7. Definition of Alternative Recovery and Disposal Capacity

In assessing available capacity, the Agency will consider the capacity of all on-line recovery and disposal facilities that are protective of human health and the environment. These include disposal facilities for which EPA has granted a site-specific petition demonstrating no migration of hazardous constituents for as long as the wastes remain hazardous (but not facilities where a petition is

pending, but not granted). Planned facilities, including expansion of existing facilities, also will be considered where appropriate.

However, alternative land disposal methods (e.g., deep well injection) will not be considered as available capacity for a restricted waste unless EPA has determined that such methods of disposal are fully protective of human health and the environment. Therefore, EPA will not consider underground injection to be available disposal capacity, until the Agency has determined whether the injection of such wastes is fully protective of human health and the environment. Although EPA is not including underground injection into deep wells in its capacity determinations this does not preclude its use for disposal of these wastes before August 1988.

8. Estimation of Capacity

EPA will estimate the annual unused or surplus capacity of alternative treatment, recovery, and disposal facilities that is available nationwide to manage wastes restricted from land disposal. The Agency will compare nationwide capacity (capacity supply) to the quantities of restricted waste generated annually nationwide (capacity demand).

Surplus capacity will be expressed as throughput capacity. Because data on unused throughput may be difficult to obtain in some instances, EPA may use other available information to calculate capacity, such as the difference between practical maximum design capacity and capacity currently utilized. As discussed earlier, when information is available, EPA will consider both current surplus capacity and planned capacity when calculating surplus capacity. However, today's final rule considers only current surplus capacity because data on planned capacity were not available.

Current surplus capacity is defined as present capacity which is not being used. Surplus capacity can be any of the following:

(i) Commercially available.

(ii) Private capacity which can be used to process additional waste produced by the facility.

(iii) Private capacity, where the owner is willing and able to accept wastes from other generators, i.e., to provide commercial services.

EPA assumes that commercial facilities are willing to accept wastes that they are capable of treating. In cases where commercial capacity is inadequate, EPA will consider the likelihood that available private capacity not needed to process additional waste produced by the facility will be converted to commercial capacity. However, due to limited information on the availability of private capacity for solvents and dioxins, EPA has considered only commercial capacity for this rulemaking.

In today's final rule, capacity estimates are based on currently available information, including the "National Survey of Hazardous Waste Generators and Treatment facilities regulated under RCRA in 1981" (OSW RIA Mail Survey, RCRA LDR–2 docket for the proposal), a 1986 EPA study on incinerator and cement kiln capacity (Ref. 15), a 1984 survey of the National Association of Solvent Recyclers (Ref. 6), and the 1986 EPA National Screening Survey of Hazardous Waste Facilities (Ref. 21). The Agency is developing a new survey of commercial and private treatment facilities which will address the concerns of commenters who pointed out the need for an updated data base. EPA intends to use data from this survey in making capacity determinations for future rulemakings.

9. Applicability of the Minimum Technological Requirements

Section 3004(h)(4) provides that during the period of a national variance under (h)(2) or a case-by-case extension under (h)(4), the waste may be disposed in a landfill or surface impoundment only if the facility is in compliance with section 3004(o).

E. Exemption for Treatment in Surface Impoundments

The Agency proposed to exempt treatment surface impoundments from the land disposal restrictions under the conditions specified in section 268.4. This exemption is authorized by sections 3005(j)(11)(A) and (B). EPA received few comments on the proposed interpretation of sections 3005(j)(11)(A) and (B). Most commenters criticized EPA's general approach as being too restrictive, though some commenters viewed it as too lenient. Some commenters suggested that the Agency not allow treatment of restricted wastes in surface impoundments. After careful review and consideration of the comments, EPA still believes that its proposed approach is the most defensible and logical reading of the statutory language and is consistent with congressional intent. Therefore, the Agency is promulgating exemption for treatment in surface impoundments essentially as proposed.

Under today's final rule, a waste that otherwise would be prohibited from one or more methods of land disposal may be treated in a surface impoundment that meets certain technological requirements as long as treatment residuals that do not meet the applicable treatment standard are removed within 1 year of the entry of the waste into the impoundment.

The provision applies only to restricted wastes and not to wastes that meet the treatment standards established under section 3004(m), or that have been exempted from the effective date of the prohibition by a case-by-case extension or have been exempted from the ban through the petition process. Such wastes are not considered "prohibited" wastes and, accordingly, may be given additional treatment in a surface impoundment without complying with the restrictions imposed by section 3005(j)(11)(B). This provision also applies to both permitted and interim status surface impoundments used for the treatment of hazardous wastes. For the purpose of this rulemaking, EPA considers the term "surface impoundment" to include both single units and series of surface impoundments. The Agency believes that Congress did not intend to preclude the use of a series of impoundments.

1. Sampling and Removal of Treatment Residuals

Within 1 year after a restricted waste is placed in an impoundment, representative samples of the treatment residuals must be tested to determine whether they meet the applicable treatment standards. Sampling techniques are detailed in the *Waste Analysis Plans, A Guidance Manual,* September 1984 (ref. 8). The sampling plan must be designed such that the sludge and supernatant (liquid portion) are tested separately, rather than mixed to form a homogeneous sample. If the treatment residuals meet the applicable treatment standard, they remain subject to regulation under Subtitle C of RCRA but are no longer restricted wastes and may remain in the surface impoundment for disposal. Treatment residuals that exceed the treatment standards must be removed at least annually from the time the waste is first placed in the impoundment. These residuals may not be placed in any other surface impoundment for subsequent management.

Treatment impoundments do not necessarily have to be drained in order to remove treatment residuals. (See Vol. 130, *Cong. Rec.* S13815, (daily ed. October 5, 1984)). In the case where the treatment residual is a liquid, that residual may be removed by pumping. If the volume flowing annually through an impoundment (or series of impoundments) is greater than the

volume of the impoundment, this flow-through constitutes removal of the supernatant for purposes of this requirement. However, as stated earlier, any treatment residual that exceeds the applicable treatment standards and, therefore, must be removed annually from the impoundment or series of impoundments, may not be placed in any other surface impoundment for subsequent management.

The two general methods available for removing residuals with a lower water content, such as sludges and solids, are excavation and dredging. The technique used depends upon such variables as surface impoundment design characteristics (e.g., shape, surface area, depth, presence of liner, type of liner), waste characteristics and type, and accessibility of the impoundment.

One commenter argued that the annual removal requirements does not address the potential for damage to the liner. The Agency recognizes that there is a potential for liner damage during the removal process. However, the annual removal requirement is a statutory standard under section 3005(j)(11)(B). The Agency may issue guidance at a later date regarding removal requirements such as testing for liner damage and prohibiting certain types of removal methods.

2. Applicability of Minimum Technological Requirements

Under today's final rule, an owner/operator operating an impoundment under the treatment surface impoundment exemption must certify to the Administrator that the impoundment meets the liner, leachate collection system, and ground water monitoring requirements imposed by section 3004(o)(1), unless the impoundment qualifies for certain exemptions.[9] A surface impoundment is exempted from liner and leachate collection system requirements if the impoundment has at least one liner that is not leaking, is located more than one-quarter mile from an underground source of drinking water, and is in compliance with certain ground water monitoring requirements in section 3005(j)(2), or if it is demonstrated that there will be no migration of any hazardous constituent to ground water or surface water at any future time according to section 3005(j)(4). (See "Interim Status Surface Impoundments Retrofitting Variances Guidance Document," EPA/530-SW-86-017, July 18, 1986, for information concerning the requirements specified in RCRA sections 3005(j)(2) and (j)(4).) An owner or operator of an existing surface impoundment must apply to the Administrator prior to November 8, 1986, to be considered for waivers of the minimum technological requirements.

Several commenters suggested that EPA also should allow an owner/operator to treat restricted wastes in a surface impoundment if they are exempt from the minimum technological requirements under sections 3005(j)(3) or (13). (Paragraph (j)(3) pertains to certain wastewater treatment units; paragraph (j)(13) pertains to certain impoundments subject to corrective action requirements.) However, in specifying the requirements in section 3005(j)(11)(A) for surface impoundments that are used to treat restricted wastes, Congress specifically included only the section 3005(j)(2) and (4) exemptions to the minimum technological requirements. Therefore, only these two exemptions are included in the final rule. Accordingly, an impoundment that was granted an exemption from the minimum technological requirements under sections 3005(j)(3) or (13), nonetheless, would be prohibited from treating restricted wastes.

F. Case-By-Case Extensions

According to section 3004(h)(3), in cases where adequate alternative treatment, recovery, or disposal capacity cannot reasonably be made available by the effective date, any person who generates or manages a restricted hazardous waste may submit an application to the Administrator for an extension of the effective date if such alternative capacity can be provided at a later date. Pursuant to this provision, the Agency proposed to allow a case-by-case extension of the effective date if the applicant can demonstrate that he has entered into a binding contract to construct or otherwise provide such alternative treatment, recovery or disposal capacity. The applicant must also demonstrate that, due to circumstances beyond his control, such alternative capacity reasonably cannot be made available by the applicable effective date. In the event that an extension is granted, an applicant is exempted from the land disposal restrictions, including the conditional prohibition on storage under § 268.50. Any landfill or surface impoundment receiving waste during the extension must comply with the ground water monitoring, liner, and leachate collection system requirements in § 268.4(a)(3).

The majority of the commenters supported the proposed approach for case-by-case extensions. However, the Agency received comments requesting modifications to several aspects of the proposed rule. Section 268.5 of today's final rule incorporates the procedures for case-by-case extensions essentially as proposed, but with modifications based on these comments.

1. Demonstrations Included in Applications

a. *The applicant has made a good-faith effort to locate and contract with alternative technologies nationwide.* EPA proposed to require applicants to make a good-faith effort to locate available capacity before being granted a case-by-case extension. Section 3004(h)(3) requires that the applicant demonstrate a binding contractual commitment to provide capacity and show that "such" capacity (i.e., the capacity contracted for) cannot reasonably be made available by the effective date. Thus, there is no requirement on the face of the statute that the applicant be denied an extension if alternate capacity is currently available. As noted in the proposal, however, the legislative history to the original Senate bill suggests that requiring facilities to investigate available capacity is consistent with congressional intent. Thus, the good-faith showing provided in today's rule, though not statutorily required, is consistent with the legislative history and is within the Agency's authority.

The applicant may provide copies of correspondence with commercial facilities that leave rejected the waste on the basis of waste composition or capacity shortages as part of the demonstration for § 268.5(a)(1) and (a)(3).[10] EPA's "1985 Hazardous Waste Treatment Directory" (available at no charge in limited quantities from the RCRA/Superfund Hotline or available for sale through the National Technical Information Service (NTIS) as PB86 #178431/AS) lists commercial treatment and recycling facilities that are identified from the Hazardous Waste Data Management Systems (HWDMS). A more up-to-date list of commercial treatment and recycling facilities is being prepared from data gathered from the 1986 National Screening Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities. The new Treatment Facility Directory

[9] EPA construes section 3005(j)(11)(A) to impose an additional condition on the treatment of hazardous wastes in surface impoundments under section 3005(j)(11)(B).

[10] In cases where a waste cannot be treated by the BDAT method or to the specified level using BDAT, the generator or owner/operator may petition the Agency for a variance from the treatment standard under § 268.44.

prepared from this screening questionnaire is expected to be available in November, 1986.

b. *Binding contractual commitment.* One commenter argued that the use of the case-by-case extension would be limited to on-site alternative capacity because of the requirement in § 268.5(a)(2) for a binding contractual commitment. EPA disagrees with the commenter. The Agency believes that the requlation is consistent with the statutory provision which requires that the applicant enter into a binding contractual commitment "to construct or *otherwise provide* alternative . . . capacity" (emphasis added). In other words, a generator may enter into a binding contractual commitment with a commercial facility to guarantee that the capacity to manage his waste will be available at the commercial facility. This demonstration requires a commercial facility to agree that alternative capacity under development at the facility is set aside for the applicant's waste. One commenter argued that, in such situations, the generator would not be a party to the contractual commitment to construct the facility. EPA agrees with the comment, but the point is not relevant since the generator would have a contract with a commercial facility which will provide the needed alternative capacity.

One commenter argued that State law defines binding contractual commitments, therefore, the Agency does not need to judge whether the penalties for cancelling the contract are adequate. EPA agrees with the commenter. Accordingly, the Agency is amending the regulatory language by deleting the stipulation for a cancellation penalty clause.

c. *Lack of capacity is beyond the applicant's control.* For technologies under construction, the applicant may document the completion schedule, including dates already passed, (e.g., date of permit application submission) to demonstrate that the technology cannot be made available by the effective date. This schedule, if available, also will be used by the Agency to identify key target dates that should be discussed in progress reports.

Several commenters stated that the legislative history allows EPA to consider economic factors in evaluating requests for case-by-case extensions. The Agency agrees that the statutory language can be construed to allow an applicant to show that if would not be feasible to use existing capacity. Although the legislation as enacted did not include House of Representatives language expressly providing a variance based on "severe economic hardship," the conference report did add language allowing for a demonstration that adequate alternative capacity cannot "reasonably" be made available by the effective date. Therefore, in making its determinations concerning the availability of such alternative capacity, EPA will consider the feasibility of providing alternative capacity during the period of the requested extension in order to determine whether capacity reasonably is available. The determination of feasibility may involve consideration of the technical and practical difficulties associated with providing alternative capacity.

d. *The capacity will be sufficient to manage all of the waste covered by the application.* One commenter stated that research and development activities generate variable amounts of waste, so it may be difficult to prove that alternative capacity will be sufficient for all the wastes covered by an extension. EPA recognizes that the amount of waste affected by the land disposal regulations may vary according to economic conditions and unforeseen changes in quantities of waste produced or in consitituents present in the waste. However, the Agency expects applicants to plan to provide adequate capacity for all wastes expected to be affected by the restriction decisions. Therefore, EPA expects applicants to make capacity determinations on the basis of the maximum volume of waste expected to be subject to the land disposal restrictions.

The Agency is requiring under § 268.5(a)(4) that the applicant provide information (e.g., waste quantities and operating capacity) to demonstrate that, after the extension, sufficient capacity will exist for the waste covered by the application for extension. EPA will not grant an extenion in cases where alternative capacity is not being provided for the entire volume of waste addressed in the application.

The Agency will grant extensions to applicants demonstrating planned changes to a process that eliminate wastes, decrease volume, or render a waste treatable. Any waste not eliminated by process changes instituted as a result of the extension must be sent to other specified capacity.

e. *Detailed schedule for providing capacity.* The completion schedule, if available, will be used to identify the dates and events that should be addressed in the progress reports. Progress reports should indicate either the existence of alternate capacity that will be available according to the time frame outlined or the circumstances causing delays in the schedule and the efforts required to compensate for the loss of time. If capacity is not available near the end of the first extension, the applicant must request a renewal of the extension, not to exceed one year. In cases where it is obvious that the schedule to provide capacity will exceed one year, the request for a second extension should be straightforward, since the second extension was foreseen from the start.

f. *Document locations with adequate capacity to manage waste during an extension.* The applicant must demonstrate that sufficient capacity will exist during the extension to store, dispose of, or otherwise manage the waste. This demonstration must include the location of all off-site waste management facilities and a short description of the porocesses that will be used for waste management during the extension (e.g., storage in on-site tanks). The identification of off-site facilities that will accept the waste during the extension should be part of the demonstration. This information will be shared with the States and will be available for inspection in the event of a public hearing on the extension decision.

g. *Any surface impoundment or landfill managing wastes during an extension must meet the requirements of § 268.5(h)(2).* During the period of a national variance under section 3004(h)(2) or a case-by-case extension under section 3004(h)(4), the waste may be managed in a landfill or a surface impoundment in compliance with section 3004(o). This section, enacted as part of the 1984 amendments to RCRA, imposes minimum technological requirements on certain new landfill and surface impoundment units, and on replacements and lateral expansions of existing units. The proposed rule would have construed section 3004(h) to require the unit to comply with the requirements set out in section 3004(o). Thus, the proposal would have required existing units to comply with section 3004(o) requirements during the period of a variance, even though the plain language of section 3004(o) exempts such units.

Upon reconsideration, however, EPA believes that the proposed interpretation is not the appropriate reading of the statutory language. On its face, the statute requires the "facility" to be in compliance with section 3004(o). The facility includes the area within the property boundary and encompasses all waste management units (both new and existing). Accordingly, a straightforward reading of the statute would provide that the facility is in compliance with section 3004(o) as long as the new units,

lateral expansions and replacements referred to in section 3004(o) are in compliance with the requirements of that section. Because existing units are excluded from section 3004(o), they would also not be required to comply with the minimum technological requirements under section 3004(h)(4). Section 3004(h)(4) thus makes clear that obtaining a variance from the effective date of the land disposal prohibitions does not relieve the owner or operator of a disposal facility of the obligation to comply with the technical requirements independently imposed by other statutory provisions.

In addition, this interpretation is reasonable in view of the fact that the alternative capacity under consideration in today's rule includes treatment in surface impoundments that meet the requirements of section 3005(j)(11). These requirements include double liners (with limited exceptions). Construing section 3004(h) to require minimum technological requirements for all units would mean that a prohibited waste that was granted a variance from the effective date due, in part, to a lack of double-lined surface impoundment capacity would nonetheless have to be disposed of in an impoundment in compliance with section 3004(o). EPA believes that the statute should not be construed to require such an illogical result. Therefore, today's rule requires that the facility be in compliance with the regulatory provisions that incorporate the requirements of section 3004(o).

2. Where To Send Extension Applications

A petitioner should submit one copy of the application for extension to the applicable land disposal restrictions effective dates to:

The Administrator, U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460.

An additional copy marked "Extensions" should be submitted to:

Office of Solid Waste (WH-565), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460.

Applications containing confidential information should be sent with only the inner envelope marked "Extensions" and "Confidential Business Information" and with the contents marked in accordance with the requirements of 40 CFR Part 2 (41 FR 36902, September 1, 1976, as amended by 43 FR 40000).

3. Review of Applications for an Extension

Several commenters recommended that the Agency establish regulatory time constraints for reviewing extension applications under § 268.5(e). One commenter specifically requested deadlines similar to those for evaluation of delisting petitions pursuant to section 3001(f)(2). In particular, they stated that the Agency should impose internal processing deadlines for review of extension applications and set a limit on the period for public comment. Although EPA fully understands the need to grant extensions before the effective date of the land disposal restrictions, EPA will not commit to establishing a set response time for extension applications for several reasons.

First, EPA cannot anticipate the level of resources necessary to process applications. As of August 8, 1986, three months before the statutory restrictions on solvents become effective, EPA had received only one request for an extension, despite one comment predicting extensive use of this provision. Second, experience with the permitting and delisting processes has shown that the review process often includes several requests for clarification or additional information before an application is considered completed. Turnaround time regarding deficiencies can vary depending on the responsiveness of the applicants. Finally, time required for consultation with the affected States is difficult to predict.

While the Agency will not specifically limit its internal review period, EPA has recommended that applicants submit extension requests at least six months before an effective date (when possible) to provide a reasonable opportunity to process applications before the effective date. To further expedite the review process, the Agency will limit the public comment period to 30 days.

Under some circumstances, capacity under development will not become available until after a national variance expires. In these situations, persons requiring an extension should submit an application as soon as the capacity shortage is identified.

4. Applicability of Case-by-Case Extensions

One commenter stated that EPA shoud grant case-by-case extensions only in cases where a national capacity shortfall exists. The Agency disagrees with the commenter. The case-by-case extension process was intended to cover those rare situations when an individual applicant can demonstrate that capacity will not be reasonably available to him even if national capacity is otherwise sufficient. As stated earlier, the variance is based on the "feasibility" of providing alternative capacity.

5. Length of the Case-by-Case Extension and Renewals

As discussed in the proposed rule, case-by-case extensions cannot extend beyond 48 months from the statutory land disposal restriction dates. Therefore, extensions will not exceed the following dates:

November 8, 1990, for certain listed dioxin-containing and solvent wastes;
July 8, 1991, for wastes identified as California List wastes;
August 8, 1992, for the first third of the listed hazardous wastes;
June 8, 1993, for the second third of the listed hazardous wastes; and
May 8, 1994, for the remaining hazardous wastes, including characteristic hazardous wastes.

On the applicable effective date, a restricted waste is subject to the provisions of Part 268 until a case-by-case extension is granted. For example, if a person requests an extension on January 8, 1987, for a solvent waste restricted from land disposal on November 8, 1986, the waste is restricted from land disposal from November 8, 1986, until the extension is granted. The extension would not exceed the November 8, 1990, deadline.

The effective date for certain newly listed wastes may fall after the May 8, 1990, date for scheduled wastes. Such wastes may require extensions beyond the May 8, 1994, date. EPA expects that the short duration of the extensions (not to exceed two years) will encourage generators of hazardous waste to minimize the quantity of hazardous waste subject to the land disposal restrictions. Generators should explore changes in process substitution, materials recovery, recycling and reuse, and alternative treatment as alternative methods of complying with the land disposal restrictions. EPA has prepared a report to Congress for presentation during November 1986, on waste minimization which identifies some waste minimization practices.

6. Consultation With Affected States

All states will be notified via **Federal Register** announcement of tentative decisions to permit extensions for restricted wastes. States that anticipate that they may be affected by a specific extension should contact EPA. EPA then consult with appropriate agencies in the affected States as required by section 3004(h)(3). EPA expects that states most interested in extension decisions will be those in which the waste was generated, those accepting waste during the extension period, and those with capacity under development. Applicants

can expedite the review process by submitting information outlining how the wastes will be managed in each of the affected States as part of the demonstrations under § 268.5 (a)(4), (a)(6), and (a)(7).

G. Evaluation of Petitions Demonstrating Land Disposal To Be Protective of Human Health and the Environment

The statutory standard for evaluation of these petitions requires that the applicable land disposal method be protective of human health and the environment. The statute further specifies that a method of land disposal may not be determined to be protective unless it has been demonstrated, to a reasonable degree of certainty, that there will be no migration of hazardous constituents from the disposal unit or injection zone for as long as the wastes remain hazardous. (RCRA section 3004(d), 42 U.S.C. 2964(d)(1)).

In demonstrating "no migration," the petitioner must take into consideration the likely effects of long-term geologic processes and climatic phenomena, such as, but not limited to, earthquakes and floods, and any other events that can be reasonably predicted. The petitioner should not assume that any man-made barriers or engineered systems will satisfy the "no migration" standard, because artificial barriers alone cannot be relied upon to provide the long-term assurances that the statutory standard requires. However, these units may satisfy the standard when the petitioner is requesting temporary storage of restricted waste on the land.

The Agency has identified three scenarios that may satisfy the requirements of the statutory standard of "no migration". The first involves a situation where environmental parameters are such that no detectable migration of hazardous constituents would occur from the disposal unit. For example, this scenario may occur when a waste consisting of relatively immobile hazardous constituents is placed in a monofill located in an arid climate with no ground water recharge. Another example involves placement of a small volume of compatible waste in a massive and stable salt dome formation. The second would rely on an active chemical or physical process, such as the neutralization of a corrosive waste in a surface impoundment, where no hazardous waste remains in the unit. This is especially applicable to characteristic wastes. The third involves the temporary storage of hazardous waste in a land-based unit, such as an indoor waste pile, where engineered containment systems are effective over the period the waste remains in storage.

The "no migration" standard clearly would be violated in a situation where unacceptable concentrations of hazardous constituents are occurring at the waste management boundary, even though the concentration at a potential receptor site some distance from the waste management boundary is below an applicable health-based level.

The Agency, generally, will deny a petition where there is a history of continuing mismanagement of hazardous waste at the disposal unit as evidenced by State or EPA monitoring and on-site inspection reports.

1. Procedures for Submitting and Reviewing Petitions

The Agency proposed that petition review would eventually be the responsibility of either the EPA Regional offices or authorized States. Upon reevaluation, the Agency believes that there will be relatively few petitions submitted. Accordingly, the Agency is requring that applicants submit petitions to the Administrator.

The five general steps of the petition review process involve the submittal of the petition, Agency review of the petition, notice of the Agency's tentative decision in the **Federal Register**, a 30-day public comment period, and notice of the Agency's final decision in the **Federal Register.** (See § 268.6.) Two copies of the petition should be submitted (by registered mail) to the Administrator. The Agency will initially review a petition for completeness. Once a petition is considered complete, it will be reviewed on the basis of the technical information supplied. The Agency will publish in the **Federal Register** a tentative decision to grant or deny a petition. The Agency will consider public comments and any new data submitted during the comment period. The Agency will then publish its final decision in the **Federal Register.**

During the petition review period, petition applicants are required to comply with all restrictions on land disposal of the waste. The receipt of a petition by the Agency does not delay the effective date of any restrictions applicable to the waste.

H. Treatability Variance

1. Basis for Establishing a Treatability Variance

Several commenters recognized that there may be particular waste streams that cannot be treated to the level (or by the method) specified by the treatment standard. The Agency agrees with these commenters, and is establishing a procedure to evaluate petitions for a variance from the treatment standard.

The Agency envisions that wastes may be subject to a treatability variance in cases where the treatment standard for a particular waste cannot be met because the waste does not fit into one of the BDAT treatability groups. A particular waste may be significantly different from the wastes considered in establishing treatability groups because the waste contains a more complex matrix which makes it more difficult to treat. For example, complex mixtures may be formed when a restricted waste is mixed with other waste streams by spills or other forms of inadvertent mixing. As a result, the treatability of the restricted waste may be altered such that it cannot meet the applicable treatment standard. In such a case, generators or owners/operators may petition the Agency for an alternative treatment standard.

On September 5, 1986, the Agency published a Notice of Availability of Data in the **Federal Register** (51 FR 31783) outlining its authority under section 7004(a) to act on petitions to amend or repeal any regulation under RCRA and requesting comments on a procedure by which petitions for a variance from the treatment standard would be evaluated. Commenters on the Notice of Availability generally supported the concept of a variance from the treatment standard. Two commenters specifically supported providing variances through a rulemaking procedure, while another commenter, though recognizing EPA's authority to amend the treatment standards by rulemaking, urged the Agency to adopt a more streamlined variance procedure similar to that used in other EPA rules. Commenters also suggested specific criteria to be considered in evaluating variance petitions.

EPA agrees that the Agency has the authority to choose between a rulemaking and a variance procedure when considering the unique aspects of wastes that were not considered in developing the treatment standards. Nothing in the language or legislative history of the statute suggests that Congress intended to preclude EPA from adopting a variance procedure once the Agency has issued treatment regulations under section 3004(m).

The Agency is promulgating procedures for a variance from the treatment standard under § 268.44 of today's rule. Essentially, the new provision will allow applicants to use procedures similar to those now used for rulemaking petitions under 40 CFR

260.20. In light of the comments, however, EPA intends to issue a proposal asking for further comments on the option of using a variance procedure rather than a rulemaking. Because there was insufficient time prior to today's rule to fully consider all issues relating to the establishment of a variance procedure, EPA believes it is more appropriate to request additional comments. Similarly, EPA will consider additional comments on the appropriate criteria by which to evaluate variance requests in the context of the future rulemaking. In the meantime, this preamble outlines some criteria that EPA believes should be considered by applicants for a variance from the treatment standard.

2. Demonstrations Included in a Petition

Variance petitions must demonstrate that the treatment standard established for a given waste cannot be met. This demonstration can be made by showing that attempts to treat the waste by available technologies were not successful, or through appropriate analyses of the waste which demonstrate that the waste cannot be treated to the specified levels. Variances will not be granted based on a showing that adequate BDAT treatment capacity is unavailable. Such demonstrations can be made according to the provisions in § 268.5 for case-by-case extensions of the effective date.

The Agency will consider granting generic petitions provided that representative data are submitted to support a variance for each facility covered by the petition.

Petitioners should submit at least one copy to:

The Administrator, U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460.

An additional copy marked "Treatability Variance" should be submitted to:

Chief, Waste Treatment Branch, Office of Solid Waste (WH-565), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460.

Petitions containing confidential information should be sent with only the inner envelope marked "Treatability Variance" and "Confidential Business Information," and the contents marked in accordance with the requirements of 40 CFR Part 2 (41 FR 36902, September 1, 1976, amended by 43 FR 40000).

The petition should contain the following information:

(1) The petitioner's name and address;

(2) A statement of the petitioner's interest in the proposed action;

(3) name, address, and EPA identification number of the facility generating the waste, and the name and telephone number of the plant contact;

(4) The process(es) and feed materials generating the waste and an assessment of whether such process(es) or feed materials may produce a waste that is not covered by the demonstration;

(5) A description of the waste sufficient for comparison with the wastes considered by the Agency in developing BDAT, and an estimate of the average and maximum monthly and annual quantities of waste covered by the demonstration; (Note: The petitioner should consult the appropriate BDAT background document for determining the characteristics of the wastes considered in developing treatment standards.)

(6) If the waste has been treated, provide a description of the system used for treating the waste, including the process design, operating conditions and an explanation of the reasons the treatment standards are not achievable or are based on inappropriate technology for treating the waste; (Note: The petitioner should refer to the appropriate BDAT background document as guidance for determining the design and operating parameters that the Agency used in developing treatment standards.)

(7) A description of the alternative treatment systems examined by the petitioner (if any), a description of the treatment system deemed appropriate by the petitioner for the waste in question, and, as appropriate, the concentrations in the treatment residual or extract of the treatment residual (using the TCLP) that can be achieved by applying such treatment to the waste;

(8) The dates of the sampling and testing;

(9) A description of the methodologies and equipment used to obtain representative samples;

(10) A description of the sample handling and preparation techniques, including techniques used for extraction, containerization, and preservation of the samples; and

(11) A description of the tests performed (including results).

After receiving a petition for a variance, the Administrator may request any additional information or waste samples which he may require to evaluate and process the petition.

Additionally, all petitioners must certify that the information provided to the Agency is accurate under § 268.4(b).

In determining whether a variance would be granted, the Agency will first look at the design and operation of the treatment system being used. If EPA determines that the technology and operation are consistent with BDAT, the Agency will evaluate the waste to determine if the waste matrix and/or physical parameters are such the BDAT properly reflects treatment of the waste.

In cases where more than one technology is applicable to a waste, the petitioner would have to demonstrate that the treatment standard cannot be met using any of the technologies, or that none of the technologies is appropriate for treatment of the waste. After the Agency has made a determination on the petition, the Agency's findings will be published in the **Federal Register**, followed by a 30-day period for public comment. After review of the public comments, EPA will publish its final determination in the **Federal Register** as an amendment to the treatment standards in Part 268 Subpart D.

V. Treatment Standards for Solvents

A. Introduction

On May 19, 1980 (45 FR 33119), the Agency listed 27 commonly used organic solvents as hazardous wastes when spent or discarded. The solvents were listed as EPA Hazardous Waste Nos. F001, F002, F003, F004, and F005. The listed solvents include certain spent halogenated and non-halogenated solvents, and still bottoms from the recovery of these solvents. Due to the manner in which the F001–F005 listings were originally structured, a major regulatory loophole was created by the Agency. As written, the listings only covered the pure form or the commercial grades of these solvents. Therefore, the Agency amended the listing to include mixtures containing a total of 10 percent or more (by volume) of one or more of the listed solvents, as published in the **Federal Register**, December 31, 1985 (50 FR 53315).

In the proposed rule to the land disposal restrictions, several commenters requested that the Agency clarify the scope of the spent solvent listings. The commenters stated that confusion exists regarding specifically what wastes are covered by the solvent listings. The Agency recognizes this problem and has incuded the following discussion in today's rule to provide further clarification of the F001–F005 solvent listings.

The spent solvent listings cover only those solvents that are used for their solvent properties—that is to solubilize (dissolve) or mobilize other constituents. For example, solvents used in degreasing, cleaning, fabric scouring; as diluents, extractants, reaction and synthesis media; and similar

applications are covered under the listing (when "spent"). A solvent is considered spent when it has been used and is no longer fit for use without being regenerated, reclaimed, or otherwise reprocessed.

Manufacturing process wastes where solvents were used as reactants or ingredients in the formulation of commercial chemical products are not covered by the listings. The products themselves also are not covered. See the original solvent listing background document (Novermber 14, 1980) available in the RCRA docket.

Today's final rule does not include treatment standards for the commercial chemical products, manufacturing chemical intermediates and off-specification commercial chemical products (P and U wastes) that correspond to the F001–F005 spent solvent wastes. These wastes will be addressed according to the schedule promulgated on May 28, 1986 (51 FR 19300). The final rule also does not cover the four newly listed solvents in the F001–F005 listing: benzene, 2-ethoxyethanol, 2-nitropropane, and 1,1,2-trichloroethane (51 FR 6537). The Agency currently is gathering data to fully characterize and evaluate these wastes. We expect to make decisions on these additional solvents when we address the first group of scheduled wastes.

In today's rule, the Agency is promulgating treatment standards for the following F001–F005 solvent constituents listed in Table CCWE:

tetrachloroethylene
trichloroethylene
methylene chloride
1,1,1-trichloroethane
carbon tetrachloride
chlorobenzene
1,1,2-trichloro-1,2,2-trifluoroethane
ortho-dichlorobenzene
trichlorofluoromethane
xylene
acetone
ethyl acetate
ethyl benzene
ethyl ether
methyl isobutyl ketone
n-butyl alcohol
cyclohexanone
methanol
cresols (cresylic acid)
toluene
isobutanol
carbon disulfide
nitrobenzene
pyridine
methyl ethyl ketone

Lab packs containing these solvents also are subject to the treatment standards promulgated in today's final rule.

The treatment standards become effective on November 8, 1986, for all F001 through F005 solvent wastes which do not meet any of the criteria established for a national two-year variance. Solvent wastes that meet at least one of the criteria are subject to the variance and will be restricted from land disposal effective November 8, 1988. The criteria are:

1. The generator of the solvent waste is a small quantity generator of 100–1000 kilograms of hazardous waste per month.

2. The solvent waste is generated from any response action taken under CERCLA or any corrective action taken under RCRA, except where the waste is contaminated soil or debris not subject to the provisions of this chapter until November 8, 1988.

3. The solvent waste is a solvent-water mixture, a solvent-containing sludge, or a solvent-contaminated soil (non-CERCLA or RCRA corrective action) containing less than 1 percent total F001–F005 solvent constituents listed in Table CCWE of § 268.41.

B. Treatment Standards For F001–F005 Spent Solvents

This unit describes the industries affected by the land disposal restrictions for the F001–F005 spent solvents and the demonstrated technologies which the Agency determined to be available. The unit further describes how the Agency developed treatment standards for these wastes.

1. Industries Affected

The Agency has identified a variety of industries which generate waste subject to the land disposal restrictions for F001–F005 spent solvents. Much of the F001–F005 spent solvents, as defined in 40 CFR 261.31, are generated from manufacturing operations where solvents are used as reactant carriers or for surface preparation. Such industries include pharmaceutical plants, semiconductor facilities, printing plants, and plastic and synthetic resin manufacturers. Another large group of spent solvent wastes is generated by paint and ink formulating facilities when tanks containing solvent-based materials are cleaned. Machine shops also generate significant amounts of solvents from degreasing operations. A further description of these industries and the characteristics of the wastes generated is presented in EPA's "BDAT Background Document for F001–F005 Spent Solvents" (Ref. 4).

2. Demonstrated Technologies for F001–F005 Spent Solvents

As presented in the proposed rule, the demonstrated treatment technologies for F001–F005 spent solvents are:

(1) Batch distillation
(2) Thin film evaporation
(3) Fractionation
(4) Incineration
(5) Steam stripping
(6) Biological treatment
(7) Carbon adsorption
(8) Air stripping
(9) Wet air oxidation

All of these technologies are demonstrated and commercially available. EPA has determined that none have been found to be riskier than land disposal. (See Unit IV.B. for a detailed discussion.)

Below is a brief description of each of these technologies and their general applicability to treatment of spent solvents. The BDAT background document provides a detailed discussion of these technologies.

a. *Batch distillation.* Batch distillation is used to separate various organic compounds from a contaminated spent solvent mixture in order to collect and reuse the individual compounds. The separation is accomplished by the addition of heat which causes the more volatile compounds to vaporize. Batch distillation generally is used in cases where the recovered solvent has sufficient economic value to offset the costs associated with the operation of the distillation system. As a consequence, batch distillation is generally applied to spent solvent wastes that are highly concentrated and yield significant amounts of material upon separation. This technology has been demonstrated for F001–F005 spent solvent wastes as well as those judged to be similar. EPA estimates that at least 400 facilities perform full-scale batch distillation on-site or as commercial treatment.

This technology yields a residue that contains a high amount of suspended solids, is quite viscous, and may require subsequent incineration. The level of performance achieved by this technology will depend on the temperature and duration of the distillation process.

b. *Thin film evaporation.* This technology is also a demonstrated distillation process. Thin film evaporation differs from batch distillation in that the waste stream for thin film evaporation must contain considerably less suspended solids. Use of this technology results in an overhead stream which almost always can be

reused as a solvent and a bottom stream which often is used as fuel for incinerators. Depending on the suspended solids level of the waste, treatment using thin film evaporation may result in a residue that requires land disposal. EPA has identified several full-scale facilities using thin film evaporation of waste solvents.

c. *Fractionation.* This technology also is a demonstrated distillation process. It differs from batch distillation and thin film evaporation in that it is designed to achieve a finer separation than these other treatment technologies. It would be used when there are recoverable quantities of more than one solvent in a waste. Generally, fractionation will result in multiple product streams while generating minimal amounts of residue to be land disposed. Fractionation is practiced by full scale facilities on spent solvent wastes.

d. *Incineration.* Incineration is a well demonstrated technology commonly used to treat spent solvent wastes. The Agency estimates that there are over 200 full-scale incinerators for hazardous wastes, many of which incinerate F001–F005 spent solvents. This technology destroys the organic fraction of the spent solvents by oxidation to carbon dioxide and water vapor. Chlorinated organics are converted to carbon dioxide, water vapor, and hydrochloric acid vapor.

Incineration generates one or two residual wastes that need to be land disposed depending on whether the incinerator includes air emission controls. The residual wastes are the incinerator ash and the scrubber sludges or air emission control dust. The vast majority of incinerator residue that will require land disposal is generated by rotary kiln incinerators that burn spent solvent wastes containing high concentrations of solids.

e. *Steam stripping.* While steam stripping is a distillation process, the technology is significantly different from the distillation processes previously discussed both from the standpoint of the type of wastes treated and the design and operation of the process. Steam stripping is used by a number of facilities to reduce organic concentration in dilute spent solvent wastes containing mostly water. As such, the stripped solvent is not generally recovered in commercially viable quantities. Data from the Agency's screening questionnaire for capacity showed that 17 full-scale facilities performed steam stripping of spent solvent wastes and that three facilities perform steam stripping specifically on F001–F005 spent solvents.

f. *Biological treatment.* Biological treatment is a demonstrated technology which involves the use of microorganisms to degrade spent solvent compounds. There are a number of different types of biological treatment processes. These processes include aerobic treatment such as activated sludge systems, aerated lagoons, and trickling filters, facultative degradation in waste stabilization ponds, and anaerobic digestion. In aerobic systems, organic compounds are degraded to carbon dioxide and water. Anaerobic processes convert organic wastes into methane and carbon dioxide. Facultative systems alternate between aerobic and anaerobic treatment.

Biological treatment residues include treated water and a biomass sludge. The sludge is a mixture of dead and living microorganisms containing nonbiodegradable inorganic compounds, as well as any organics that are not degraded (i.e. refractory organics) and are adsorbed by the biomass. Depending on the composition of the spent solvent wastewater, the biomass sludge may require treatment prior to land disposal. Treatment could consist of chemical fixation for metals and/or incineration for the organic compounds.

g. *Carbon adsorption.* Carbon adsorption is the use of specially prepared carbon granules (activated carbon) to remove contaminants from wastewaters. Carbon adsorption is applicable to wastewaters containing low concentrations of F001–F005 spent solvent wastes. The spent solvent wastes are removed by adsorption onto the carbon surface. The affinity that a particular spent solvent compound has for carbon will depend on the type of carbon used and the properties of the compound. The residues from carbon adsorption include spent carbon and treated wastewater. Once the quality of the treated wastewater approaches a predetermined level the spent carbon can be regenerated and reused or destroyed in an incinerator. This technology is generally used in combination with steam stripping or biological treatment. This technology is demonstrated for F001–F005 spent solvent wastewaters as well as those judged to be similar.

h. *Air stripping.* Air stripping uses forced air to remove low concentrations of volatile organic compounds, such as solvents, from wastewater. During air stripping, air and wastewater are brought into contact with each other for the purpose of transferring the volatile organic compounds from the wastewater to the air. Transfer is caused by a concentration gradient of the volatile organic compounds, which tends to move these compounds in a direction that will equalize the concentration in the air with that in the water. Air stripping has been used to treat contaminated ground water containing F001–F005 spent solvent constituents. This technology was not chosen as the basis of any BDAT treatment standards for reasons presented in the BDAT background document.

i. *Wet air oxidation.* Wet air oxidation utilizes elevated temperature and pressure to oxidize dissolved or suspended organic contaminants in wastewaters. The wastewater is fed to the wet air oxidation treatment system by a high-pressure pump. It is then mixed with compressed air and passed through a heat exchanger. The heated waste-air mixture exits the exchanger and enters a reactor where oxygen from the compressed air reacts with organic contaminants in the waste to form carbon dioxide and water vapor.

This technology has full scale applications but primarily in areas other than treatment of spent solvent wastes. The Agency is aware of one facility that treats F001–F005 spent solvent wastewater. Unlike the other technologies discussed, this technology was not considered a demonstrated technology at proposal. Subsequent to proposal, we received additional data showing this technology to be demonstrated for F001–F005 spent solvent wastes.

3. Determination of Treatment Standards (BDAT) for Spent Solvents

a. *Data base.* The majority of the data used in developing BDAT for F001–F005 solvents were from full scale treatment. The Agency included some pilot- and bench-scale data from treatment technologies which are also demonstrated on a full scale basis. Below is a description of all available treatment data by technology.

—For biological treatment, the Agency analyzed full scale treatment data from 28 plants in the organic chemicals, plastics, and synthetic fibers industries which manufacture, in total, over 200 different products. These data were from treatment of wastes containing F001–F005 constituents as a result of process contamination. While the waste are not included in EPA's definition of spent solvent wastes, the Agency believes that these wastes are similar to spent solvent wastes. The Agency has biological treatment data on carbon tetrachloride, chlorobenzene, cresols, 1,2-dichlorobenzene,

ethylbenzene, methylene chloride, nitrobenzene, tetrachloroethylene, toluene, trichloroethylene, 1,1,1-trichloroethane, and trichlorofluoromethanes.

—For steam stripping, the Agency analyzed full scale data from four plants and pilot scale data on treatment of contaminated ground water. The full scale data represented treatment of F001–F005 spent solvents at one plant; the remaining three plants were treating wastes containing F001–F005 consitituents generated as process contaminants. The Agency analyzed steam stripping data on ethylbenzene, methylene chloride, methyl isobutyl ketone, nitrobenzene, toluene, 1,1,1-trichloroethane, and trichloroethylene.

—For carbon adsorption, EPA analyzed full scale data from four plants and pilot scale data from two plants. At one of these full scale plants, carbon adsorption is used after biological treatment. The Agency obtained data on chlorobenzene, 1,2-dichlorobenzene, methylene chloride, nitrobenzene, toluene, and trichloroethylene from this facility. At another full scale plant, carbon adsorption follows steam stripping. The Agency obtained data on nitrobenzene and toluene from this facility. In the third case, EPA has full scale data from a plant in the pesticides industry which generates wastewater containing cresols. EPA has full scale data for process wastewater containing cresol at the fourth plant. Pilot scale data for trichloroethylene are available on treatment of contaminated drinking water. Pilot scale data are also available for methylene chloride, toluene, and xylene on treatment of runoff water from a waste disposal site.

—For wet air oxidation, the Agency analyzed pilot-scale data for methylene chloride, methanol, methyl ethyl ketone, tetrachloroethylene, toluene, 1,1,1-trichloroethane, and xylene. These data were submitted as part of a comment on the proposed rule.

—For air stripping, EPA analyzed pilot scale data from treatment of ground water contaminated with 1,1,1-trichloroethane, trichloroethylene, methyl isobutyl ketone, toluene, tetrachloroethylene, and ethylbenzene.

—The Agency also analyzed the extract of incinerator ash for ten incinerators at nine facilities. All incinerators were operating full scale and treating a variety of wastes including spent solvents. The F001–F005 constituents for which data were available are acetone, carbon disulfide, chlorobenzene, 1,2-dichlorobenzene, ethylbenzene, methylene chloride, methyl ethyl ketone, methyl isobutyl ketone, nitrobenzenes, tetrachloroethylene, toluene, 1,1,1-trichloroethane, trichloroethylene and xylene.

b. *Analysis of data and establishment of treatability group.* The Agency reviewed all available treatment data to determine if any data represented treatment from a system that was not well designed or operated. Consistent with the general framework for BDAT, such data were deleted (the BDAT background document provides a detailed analysis of the Agency's rationale for such data editing). The Agency then calculated average performance values for each specific waste treated with a particular technology. In cases where the Agency had data on treatment of the same or similar wastes using more than one technology, we performed an analysis of variance test to determine if one of the technologies performed significantly better. In cases where a particular technology performed better, the treatment standard was based on the best technology. If one of the technologies did not perform significantly better, we averaged the performance values and multiplied this value by the highest variability factor to derive the treatment standard.

In several cases, the Agency analyzed data from the treatment of different wastes containing the same constituent of concern but achieving significantly different levels of performance. The Agency established a separate treatability group in cases where the data and information on the waste were sufficient to do so. Within any treatability group, however, the Agency used the highest treatment value reflecting well designed and operated treatment to establish BDAT. EPA believes that this approach ensures that the treatment standard can be achieved by facilities managing F001–F005 solvents with a wide range of waste matrices.

As proposed, the Agency established a separate treatability group for spent solvent wastewaters. For purposes of defining applicability of the treatment standards for wastewater continuing F001–F005 spent solvents, wastewaters are defined as solvent-water mixtures containing total organic carbon of one percent or less. Within the general wastewater category, available data supported a separate treatability group for spent methylene chloride from the pharmaceutical industry. For spent solvents other than wastewaters, the Agency was not able to identify additional treatability groups.

c. *Development of the F001–F005 spent solvent treatment standards.* The Agency determined that available data support the establishment of the final treatment standards as shown for the treatability groups in Table 1. Consistent with the general framework, we believe that each treatment standard ensures substantial treatment of F001–F005 spent solvents. A discussion of our rationale for determining substantial treatment can be found in the BDAT background document.

In cases where data for F001–F005 spent solvents were not available to establish BDAT, the Agency evaluated the wastes to determine if treatment values could be transferred. EPA believes that based on chemical structure BDAT treatment values can be transferred to F001–F005 constituents, except for carbon disulfide, where data are unavailable. Chemical structure, especially as related to functional groups, is used to predict how organic compounds will react with other compounds and under various conditions. The structural groups considered by the Agency for F001–F005 spent solvents are halogenated aliphatics, halogenated alkenes, halogenated aromatics, ketones, alcohols non-halogenated aromatics, ethers, esters, phenols, and organic sulfur compounds. In the case of carbon disulfide, the Agency relied on Henry's Law constants to assess transfer of performance.

The Agency is aware that within similar structure groups compounds can exhibit a range of physical and chemical properties that affect treatability. EPA believes, however, that structure is the best method available at this time for estimating treatability. To best account for the range of physical and chemical properties that affect treatment within a structural group, the Agency will transfer treatment performance from the highest treatment value observed within the structural group.

In some instances, treatment standards were derived using analytical quantification levels that the Agency believes may not represent quantification levels over the entire range of F001–F005 spent solvents subject to today's final rule. In such instances, EPA increased the treatment standard to a level reflective of the quantification level which we believe

can be achieved for all F001–F005 spent solvents. Any changes made to the treatment standards as a result of quantification levels can be found in the BDAT development document.

The Agency proposed treatment standards for each of the F001–F005 constituents listed in Table CCWE of Subpart D in the proposed rule. During the comment period, the Agency obtained additional data which were summarized in the Notice of Availability of Data (51 FR 31783, September 5, 1986). EPA also reevaluated existing data using a number of statistical methods. These methods were also outlined in the Notice of Availability. Finally, the Agency revised the proposed data editing procedure which excluded data when the influent value less than the screening level (generally 2.0 ppm). In today's final rule all data are used provided influent concentrations are above quantification levels.

The departure from the proposed rule which most affected the final treatment standards is the incorporation of a variability factor. The BDAT background document contains all data used to develop the treatment standards and a discussion of procedures used to evaluate these data in determining BDAT for each constituent of concern within a treatability group.

TABLE 1.—TREATMENT STANDARDS (AS CONCENTRATIONS IN THE TREATMENT RESIDUAL EXTRACT)

[Note: The technologies shown are the basis of the treatment standards. They are not required to be used in meeting the treatment standards.]

Constituents of F001–F005 spent solvent wastes	Waste treatability groups for F001–F005 spent solvent wastes (mg/l)			
	Wastewater	Technology basis [1]	Wastewater generated by pharmaceutical plants [2]	All other [3]
Acetone	[4] 0.05	SS		0.59
n-Butyl alcohol	5.00	SS		[4] 5.00
Carbon disulfide	1.05	SS		4.81
Carbon tetrachloride	[4] 0.05	B		0.96
Chlorobenzene	0.15	B&AC		[4] 0.05
Cresols (cresylic acid)	2.82	AC		0.75
Cyclohexanone	[4] 0.125	SS		0.75
1,2-Dichlorobenzene	0.65	B&AC		[4] 0.125
Ethyl acetate	[4] 0.05	SS		0.75
Ethylbenzene	[4] 0.05	B		0.053
Ethyl ether	[4] 0.05	SS		0.75
Isobutanol	[4] 5.00	SS		[4] 5.00
Methanol	[4] 0.25	SS		0.75
Methylene chloride	0.20	B	12.7	0.96
Methyl ethyl ketone	[4] 0.05	SS		0.75
Methyl isobutyl ketone	[4] 0.05	SS		0.33
Nitrobenzene	0.66	SS&AC		[4] 0.125
Pyridine	1.12	B&AC		0.33
Tetrachloroethylene	0.079	B		[4] 0.05
Toluene	1.12	B&AC		0.33
1,1,1-Trichloroethane	1.05	SS		0.41
1,1,2-Trichloro-1,2,2,-trifluoroethane	1.05	SS		0.96
Trichloroethylene	0.062	B&AC		0.091
Trichlorofluoromethane	[4] 0.05	B		0.96
Xylene	[4] 0.05	AC		0.15

[1] In some instances other technologies achieved somewhat lower treatment values, but waste characterization data were insufficient to identify separate treatability groups. Refer to the BDAT background document for a detailed explanation of the determination of the treatment standards.
SS = stream stripping
B = biological treatment
AC = activated carbon

[2] Wastewaters generated by pharmaceutical plants must be treated to the standards given for all other wastewaters except in the case of methylene chloride.

[3] The treatment standards in this treatability group are based on incineration.

[4] These treatment values represent the lowest level at which EPA can support analytical quantification over the range of wastes that will be subject to this rule. The treatment standards as derived from the data are somewhat lower because of the lower quantification levels associated with the treatment residuals actually tested. The data and the calculation of treatment standards not accounting for quantification limits are shown in the BDAT background document.

C. Comparative Risk Assessment Determinations for F001–F005 Spent Solvents

As discussed in the preamble to the proposed rule, the initial comparative risk studies of solvent wastes using EPA's RCRA Risk-Cost Analysis (WET) Model indicated that the best demonstrated treatment technologies do not pose total risks to human health and the environment greater than those posed by the direct land disposal for most categories of solvent wastes subject to today's rulemaking (i.e., all solvent wastes except metal-bearing solvents). Results of the analysis are summarized in the preamble to the proposed rule (See 51 FR 1720). More detailed information is available in the Background Document for the Comparative Risk Assessment (Ref. 5).

Because results of the WET model analysis indicated that incineration of metal-bearing solvent wastes in some situations may lead to increased risks to human health or the environment, the Agency has conducted a detailed analysis of these risks. Results of the detailed analysis (Ref. 5) indicate that in most cases direct land disposal of metal-bearing wastes is more risky than incineration. These risks, however, are not expected to occur for thousands, and in some cases, millions of years. The detailed analysis also demonstrates that in some cases incineration of these wastes is more risky than land disposal when compared to the performance of a well-operated and engineered unit located in a geographical area that provides optimal containment (e.g., compacted clay).

The Agency stated in the proposed rule that whenever it is uncertain that a technology is riskier than land disposal, the Agency will consider the treatment "available" for determining BDAT and will develop data to support additional regulatory controls. Therefore, because the risk assessment does not indicate that incineration generally is more risky than direct land disposal, the Agency is classifying incineration as available for the purpose of establishing the treatment standard for metal-bearing solvent wastes. It is not possible for the Agency to establish additional regulatory requirements on metals emissions from incineration of metal-bearing solvent wastes within the statutory deadline for solvents waste, because the Agency lacks sufficient data on the feasibility of reducing metals emissions by waste pretreatment or incinerator controls.

However, the Agency has initiated a program under the authority of section 3004(n) (42 U.S.C. 6924(n)) to develop regulatory controls for metal emissions from incineration of hazardous wastes, including solvent wastes. EPA plans to publish a proposed rule by 1987 and a final rule by 1988. The Agency believes that development and implementation of this regulatory program will ensure that incineration of metal-bearing solvent wastes will be protective of human health and the environment.

D. Treatment and Recycling Capacity for Solvents

1. Quantity of Wastes Land Disposed

EPA estimates that 2,859 million gallons per year of solvent wastes are managed in units defined as land disposal under today's rule. This represents a significant increase over the 1,210 million gal/yr estimated in the proposed rule. In the proposed rule, EPA's estimate included all wastes designated as F001, F002, F003, F004, F005, the corresponding commercial

chemical products, off-specification products (P and U wastes), mixtures of these waste codes, and spent solvents from small quantity generators.

For today's rule, EPA has made several modifications to its estimate. First, as explained previously, the Agency decided not to promulgate the land disposal restrictions for those wastes designated as P and U wastes. The estimate of the total quantity of solvent wastes covered under today's rule, therefore, does not include the 11.2 million gal/yr of P and U wastes which previously were included in the proposed rule.

A second modification is more significant. The quantity estimate in the proposed rule included wastes that were mixtures of F001, F002, F003, F004, F005, and P and U wastes, but did not include those wastes that were reported as mixtures of F001–F005 with other nonsolvent waste codes. These waste quantities were not included in the proposed rule because EPA believed that a relatively small solvent portion of these mixtures could be segregated from a much larger component of the nonsolvent wastes. This assumption was based on limited descriptions of these wastes provided by some generators indicating that these wastes primarily were dilute solvent-water mixtures. In the proposal, EPA also determined that the resultant quantity of concentrated segregated solvent wastes could not be estimated properly due to the lack of concentration data for these particular solvent waste mixtures prior to segregation. Although EPA has not changed its position that the quantity of segregable solvent wastes cannot be accurately estimated, it is assuming that the entire quantity of these mixtures would require alternative treatment capacity. This is consistent with several comments indicating that EPA had grossly underestimated the quantity of wastes identified as solvent-water mixtures and generally had underestimated the other types of concentrated solvent wastes. Based on these comments, EPA believes it may have overestimated the ability of generators to separate the concentrated solvents from the nonsolvent components (primarily water) without treatment. This change results in an increase in solvent-water mixtures land disposed of 1,663 million gal/yr and an increase in quantity for all other waste types land disposed of 19 million gal/yr.

A third modification involved correction of invalid data used at proposal. The OSW RIA Mail Survey of Treatment, Storage, and Disposal Facilities regulated in 1981 was the primary source of quantity data for the proposed rule and for today's rule. Because some facilities indicated that they handled very large volumes of waste or were suspect because somewhat large quantities of recyclable organic liquids were being land disposed, EPA decided to verify whether these facilities had made an error in the data submitted. EPA performed follow-up inquiries to these facilities in order to confirm the descriptions of the physical/chemical forms of the wastes managed. These responses were the subject of a request for comment published September 5, 1986 (51 FR 31783).

Some of the facilities indicated that they no longer handled these wastes. However, EPA does not believe that these reported full or partial closures can be extrapolated accurately to the entire 1981 survey population because of the site-specific nature of these closures. Therefore, updating the survey for closures would require more extensive follow-up by EPA. EPA believes such broad modification to the survey, in order to extrapolate these closures to the universe of facilities, would unreasonably disrupt the statistical reliability of the 1981 survey.

However, EPA does believe that these telephone responses support very limited changes to the descriptions of wastes at five facilities in the data base. The responses from two facilities indicated that a 172.6 million gal/yr waste and a 28.3 million gal/yr waste that had been identified in the survey as organic liquids were actually solvent-water mixtures. Another response from a different facility indicated that a 2.6 million gal/yr waste that had been identified as an organic sludge was actually a solvent-water mixture that had been treated in an impoundment. This waste also had been double-counted as being handled in a landfill. Two additional wastes treated in impoundments also had been double-counted as being disposed in landfills. Therefore, the quantities of these wastes which were subtracted from the total quantity of waste landfilled and subtracted from the total.

A fourth change to EPA's estimate is based on EPA's determination that those wastes from the 1981 RIA Mail Survey that were not described should have been added to the total organic liquids land disposed rather than distributing the wastes to all physical/chemical forms. EPA believes that assuming the undescribed waste quantities are organic liquids is more consistent with the type of wastes identified as the basis for listing these solvent wastes as hazardous. Spent solvents and still bottoms usually are pumpable organic liquids. This modified assumption increases the estimated quantity of organic liquids by approximately 15 million gal/yr, and reduces to solvent-water estimate by an equal amount. This quantity represents a total of six wastes at two facilities.

Two final changes were made to the quantity of waste from small quantity generators and CERCLA actions. The 8.7 million gal/yr of solvent wastes from small quantity generators increased from the estimate of 7.8 million gal/yr in the proposed rule as a result of correcting a calculation error. More importantly, the proposed rule contained no quantity estimates for increases in solvent wastes anticipated to result from removal and/or remedial actions taken by the Agency under CERCLA or RCRA corrective action. For today's rule, this has been estimated to be 21.7 million gal/yr based on a recently completed EPA analysis of future land disposal. These quantities are explained in greater detail in Appendix B of the Background Document to today's rule (Ref. 2). Therefore, the overall total quantity of wastes including small quantity generator and CERCLA wastes is increased to 2,859 million gal/yr for today's rule.

2. Reanalysis of Land Disposal Practices Used

EPA has reanalyzed the 1981 data accounting for all of the changes described in the previous section. Complete analysis of the data is provided in the background document to support today's rule (Ref. 2). The following table indicates how the total quantity of wastes estimated in the previous section is distributed among the various land disposal management techniques covered under today's rule. These figures do not include wastes which were deep well injected.

land disposal practice	Quantity (million gal/yr)
Treated in surface impoundments	2,485.4
Stored in surface impoundments	309.2
Disposed in surface impoundments	6.00
Waste piles	0.78
Land application	0.001
Landfill	55.5
Total land disposed	2,858.881

3. Comments on EPA's Estimates

Several commenter objected to EPA's use of the 1981 RIA Mail Survey for estimation of the volumes of wastes land disposed, based on their belief that these data underestimate the quantity of hazardous waste which is being land

disposed annually. As explained earlier, EPA agrees that the quantity of solvent wastes identified as solvent-water mixtures was underestimated. Inclusion of the additional mixed solvent wastes has increased the total quantity of solvent-water mixtures to 2,652 million gal/yr. Nevertheless, EPA believes that the 1981 data is currently the only readily available source for estimating the quantities based on the physical/chemical characteristics that influence the selection of applicable treatment technologies.

Several commenters suggested that EPA use other data sources such as Part A applications, Part B applications, RCRA Biennial reports, and various state and regional reports. EPA agrees with the commenters that the data contained in these sources are more recent, than the 1981 data. However, none of the sources provide data that readily allow EPA to estimate national quantity of solvent wastes land disposed by individual management units and by physical/chemical forms.

One commenter also contended that EPA's 1981 data grossly underestimated the quantities of hazardous waste which were being land disposed; this statement was based on privately collected data from 725 facilities in standard industrial classification (SIC) code 2800 (Chemicals and Allied Products Manufacturers). The data indicated that this industry treated and disposed of approximately 202 million tons of hazardous waste per year. Since EPA estimated only 240 million tons per year for all hazardous waste facilities, the commenter believes that EPA underestimated the total quantity of hazardous waste. However, the same commenter acknowleged that EPA estimated that this same industry managed 66 percent of the total. These figures, when multiplied together, yield a total quantity of 158 million tons per year for this particular industry (SIC 2800). EPA does not believe that 158 million tons per year is a gross underestimation of 202 million tons per year. EPA's estimate was lower than the commenter's quantity estimate, but by only 22 percent.

However, the commenter did not indicate whether the privately collected quantity figures were for RCRA hazardous wastes or all wastes considered hazardous by state and local authorities. EPA's estimates of waste quantities specifically exclude hazardous wastewaters which are exempt from RCRA (such as those treated solely in tanks and subsequently discharged under NPDES permits). It was not clear that the commenter's estimate of 202 million tons per year of wastes treated and disposed includes or excludes these wastewaters. The same commenter provided more recent data, also based on an independent survey of this industry, that indicated the total amount of hazardous waste treated and disposed by responding plants in 1985 was 278.5 million tons per year (276.8 million tons per year of wastewater and 1.7 million tons per year of solid waste). Of the solid wastes treated and disposed, 0.57 million tons per year were landfilled, 0.52 million tons per year were incinerated, 0.46 million tons per year were disposed in surface impoundments, and 0.18 million tons per year were treated by other methods. The corresponding 1981 EPA estimates for all hazardous waste were, 3.0 million tons per year of hazardous waste landfilled, 1.7 million tons per year incinerated, 19 million tons per year disposed in surface impoundments, and 17 million tons per year treated by other means. EPA believes that these data, which represent significantly larger quantities of solid waste being land disposed, further indicate that EPA estimates of quantities of wastes being land disposed are reasonable and are not grossly underestimated.

4. Summary of Quantities Requiring Capacity

Based on the 1981 RIA Mail Survey quantity data presented in the previous section, EPA estimates that a total of 19.0 million gal/yr of pumpable organic solvent wastes will require incineration capacity, 3.4 million gal/yr will require distillation capacity, and 15.3 million gal/yr will require fuel substitution capactity.

EPA also estimates that 21.7 million gal/yr of solvent-containing sludge mixtures will require some form of high solids combustion treatment, such as rotary kiln incineration.

A total quantity of 2,481 million gal/yr of solvent wastes described as solvent-water mixtures also will require some form of wastewater treatment. The following table summarizes this information.

Alternative treatment technology	Quantity requiring capacity (million gal/yr)
Distillation	3.4
Fuel Substitution	15.3
Incineration	19.0
Solvent-containing sludge treatment	21.7
Wastewater treatment	2,481.0

These quantities do not include the 8.7 million gal/yr of solvent wastes from small quantity generators, nor do they include the 20.2 million gal/yr increase in solvent wastes anticipated to be generated from remedial and removal actions taken under CERCLA and RCRA correction action. The waste characterization data which would be necessary to assign treatment technologies for these two waste sources are very limited. Although it is possible that all small quantity generator wastes may have to go to incineration, EPA believes that a more reasonable approach is to extrapolate the waste characterization data from the 1981 survey to the total quantity by applying the ratio of quantities which were directed to each technology. Since the solvent wastes from small quantity generators are not anticipated to include solvent-water mixtures nor any solvent-inorganic sludge mixtures, the ratio developed from the distillation, fuel substitution, and incineration quantities have been applied:

Alternative treatment technology	Capacity required (million gal/yr)
Distillation	0.8
Fuel Substitution	3.5
Incineration	4.4

All 16.1 million gal/yr of increased capacity needed for RCRA corrective action and the 4.1 million gal/yr for CERCLA responses has been assigned to incineration based on studies of current projects.

5. Comments on Types of Treatment Required

Solvent wastes identified as F001, F002, F003, F004, and F005 typically are described as spent solvents or still bottoms as specifically identified in the listing for these waste codes. However, these waste code designations are used to identify wastes which are regulated as F001–F005 wastes as a result of the mixture rule (in 40 CFR 261.3), i.e., a spill residue or combination of solvent wastes with other wastes or materials, such as wastewater, soil, organic or inorganic sludges.

In the preamble to the proposed rule, EPA made clear its assumption that those wastes that are solvent-water mixtures are indeed F001–F005 wastes that are derived from the mixture rule in 40 CFR 261.3. The Agency also assumed that these wastes contain less than 1.0 percent total organic carbon and approximately 99 percent water. This is consistent with EPA's guidance in defining wastewater as a waste with primarily water and a small amount of contaminants. In addition, several of the large volume, solvent-water mixtures

identified in the TSDF mail survey specifically described their wastes as containing 99 percent water.

Several commenters suggested that defining solvent-water mixtures as those wastes containing less than 1.0 percent total organics would exclude many non-hazardous wastewaters which they indicate typically can contain greater than 1.0 percent total organics. One commenter suggested that the level be raised to 4.0 percent total organics. However, none of these commenters submitted any data substantiating these comments.

Another commenter stated that EPA had overestimated the concentrations of solvents in wastes identified as wastewaters. The commenter supplied data on wastes containing part per million levels of individual solvent constituents. EPA believes that the commenter had misinterpreted EPA's intended use of these data. EPA recognizes that there are many wastewaters that contain only parts per million or even parts per billion levels of individual solvent constitutents. However, EPA used a summation of the individual solvent concentrations to arrive at the estimations of total solvent concentrations in wastewaters classified as F001–F005. EPA has established a definition of solvent-water mixtures based on this maximum solvent concentration that it believes is representative of this type of waste. As explained in the proposed rule, the Agency believes this assumption is corroborated by data that indicate that the majority of wastewaters from the organic chemicals manufacturing industry being treated in surface impoundments contains less than 1.0 percent total solvents.

In the proposed rule, the Agency selected the analysis of total organic carbon (TOC) as a surrogate analysis for the total solvent concentration. Several commenters objected to the use of the TOC test because it measures both hazardous and nonhazardous organics, and is not appropriate for nonliquids. While the Agency recognizes that there is no standard method which specifically defines a total solvent concentration in wastewater, there do exist several standard methods for the individual solvent constitutents for which the F001–F005 solvent wastes are listed (40 CFR 261 Appendix VII). These individual solvent concentrations then can be summed to yield a total solvent concentration for a particular waste. The Agency never intended to include nonhazardous wastes or wastewaters in this rule, and the Agency agrees with the commenters that there may exist nonhazardous wastes and wastewaters with greater than 1.0 percent total organic carbon. Therefore, the Agency has reevaluated its position on the method for determining that an F001, F002, F003, F004, and F005 waste is considered a solvent-water mixture (wastewater). For the purposes of today's rule, the Agency is defining an aqueous solvent waste as any F001, F002, F003, F004, and F005 solvent waste that is primarily water and contains either (1) less than 1.0 percent total organic carbon or (2) less than 1.0 percent total solvents (defined as the arithmetic summation of the individual solvent concentrations for those constituents for which all of these waste codes are listed in 40 CFR 261 Appendix VII, as determined by GC or GC/MS methods in accordance with the appropirate standard methods for those constitutents and waste type). The Agency still believes that the total organic carbon analysis provides an inexpensive screening technique for identifying some F001 through F005 wastes as solvent-water mixtures. However, those facilities that have wastes that exceed a total organic carbon content of 1.0 percent can elect to utilize the more rigorous measurement of less than 1.0 percent total solvent concentration. This choice of methods is intended for use as a screening procedure only to identify those F001, F002, F003, F004, and F005 solvent wastes that are to be designated as a solvent-water mixture. For the purposes of today's rule, the Agency does not intend this definition to be used to classify a wastewater as a hazardous solvent waste. However, this does not preclude the Agency from modifying or clarifying this definition in the future.

In a similar manner, the Agency believes that the 1.0 percent total solvent concentration can be extended to define the solvent wastes that are primarily inorganic sludges or soils. The Agency recognizes that there is no standard method for the analysis of total organic carbon in inorganic solids and thus, is establishing the use of the analysis for the individual solvent constituents in inorganic sludges and soils for the determination of 1.0 percent total solvents. For the purposes of today's rule, the Agency therefore, is defining solvent-inorganic sludge mixtures and solvent-contaminated soil as any F001, F002, F003, F004, and/or F005 solvent waste which is primarily inorganic and contains no greater than 1.0 percent total organic carbon or no greater than 1.0 percent total solvents (defined as the arithmetic summation of the individual solvent concentrations for those constituents for which all of these waste codes are listed in 40 CFR 261 Appendix VII, as determined by GC or GC/MS methods in accordance with the appropriate standard methods for those constituents and waste type). The Agency believes that this is consistent with congressional intent to ban high concentration wastes, whenever capacity shortfalls are demonstrated to exist.

All other F001, F002, F003, F004, and/or F005 solvent wastes by nature of these definitions exceed either 1.0 percent total solvent concentration or exceed 1.0 percent total organic carbon and are, therefore, not considered to be solvent-water mixtures, solvent-inorganic sludges mixtures, or solvent-contaminated soils.

E. Unused Capacity of Solvent Treatment and Recycling Facilities

EPA estimated that solvent wastes restricted from land disposal as a result of today's final rule will be directed to incineration and wastewater treatment methods that can achieve the treatment standards. Some solvent wastes will also be directed to recycling methods, including distillation and blending as fuel. In this unit, EPA estimates the unused capacity that is currently available to treat or recycle solvent wastes.

As explained in Unit V., private treatment, recycling, and disposal capacity will be considered in two circumstances: (1) If a private owner or operator plans to accept restricted waste commercially on or before the effective date of the restrictions; or (2) when a private owner or operator has excess capacity. At this time, EPA does not have complete information on the extent to which these circumstances will occur. The Agency plans to conduct a treatment, storage, and disposal facility (TSDF) survey in the near future which it hopes will provide comprehensive data on the availability of private capacity to manage hazardous wastes that are prohibited from land disposal. However, for the purposes of this rulemaking, the determinations of the capacity to treat and recycle solvent wastes will be based on unused capacity at facilities that are or will be offering commercial services by November 1986.

1. Capacity for Wastewater Treatment

BDAT wastewater treatment methods for solvent-water mixtures are biological degradation, steam stripping, and carbon adsorption. In addition, other technologies, such as resin adsorption,

although not BDAT, may be capable of meeting the treatment standards for some wastes. All of the treatment methods are referred to as tank treatment under the RCRA TSDF regulations.

For the proposed rule, the OSW RIA Mail Survey was EPA's only source of information concerning the unused capacity at tank treatment facilities. However, the RIA Mail Survey was not designed to evaluate capacity of specific tank treatment systems. It requested information on total tank treatment capacity, but did not request information for specific tank treatment systems. Thus, within the time constraints for the proposed rule, the Agency was unable to determine available capacity for each treatment system. Accordingly, to prepare the proposed rule, the Agency estimated the total unused treatment tank capacity at commercial facilities that managed solvents. This unused capacity was estimated to be 112 million gallons. In the proposed rule, EPA stated that these commercial facilities managed other hazardous wastes, and that the Agency could not determine the portion of the 112 million gallons of unused treatment capacity that was available to treat solvent wastes.

EPA, however, recently has completed a comprehensive analysis of additional data from the RIA data base for these commercial facilities and has identified the specific types of tank treatment. This new analysis of the RIA Mail Survey data indicates that very little of the tank system capacity at the survey facilities was designed for treatment of solvent wastes. Because of the very limited data on treatment capacity for solvents in the RIA Mail Survey data base, EPA decided to use the 1986 National Screening Survey, which contains data on all facilities, to identify facilities that manage solvents. These facilities were contacted in the August 1986 "Telephone Verification Survey of Commercial Facilities That Manage Solvents" (51 FR 31786). This new data base reveals that there is one extremely large commercial facility that offers biological treatment for solvents, at an available capacity of about 2 billion gallons/yr. In addition, one commercial facility that offers steam stripping for solvents, and two commercial facilities offer carbon adsorption for solvents. These four facilities represent the entire capacity available for wastewater treatment for solvents.

2. Capacity for Incineration

For the proposed rule, EPA estimated that unused commercial incineration capacity is less than 25.6 million gallons per year. This calculation was based on the maximum design capacity of operational commercial incinerators and a utilization rate of 80 percent (Ref. 2). Some commenters stated that incineration capacity was limited to a very few commercial facilities, and that available capacity would not be adequate for the restricted solvent wastes. In response to these concerns, EPA used the results of the 1986 National Screening Survey to verify the commercial status of incinerator facilities and reevaluate the capacity at commercial facilities. Of the 14 commercial incinerators included in the incinerator capacity analysis for the proposed rule, three no longer offer commercial incinerator services. However, one other facility now offers commercial incinerator services. In addition, four of these facilities plan to have a new commercial incinerator operating in 1987, and another company plans to complete a large new incinerator facility in 1987. None of the facilities indicated that they planned to close in 1987. Based on the new data, EPA concludes that there are currently 12 commercial incinerator facilities, and that the number of commercial incinerator facilities will remain fairly constant or increase over the next two years. Even if an existing commercial incinerator facility closes, EPA believes, based on the pattern of construction indicated by the data, that it is reasonable to assume that another facility will begin operation of a new incinerator.

In addition to verifying the status of the commercial incinerator facilities, EPA obtained some additional data on design capacity and utilization. Using the available data for each facility, EPA estimates that the available incineration capacity at these facilities is approximately 28 million gallons per year. This estimate is slightly more than the estimate used for the proposed rule. When information was not available on the utilization rate, the calculation was based on a utilization rate of 80%.

Because there will be an increased demand for incineration capacity for CERCLA wastes that are not covered by this rule (i.e., wastes other than F001–F005), not all of this 28 million gallons per year capacity will be available for the restricted solvent wastes. Data from site analyses conducted by EPA show that the increased demand for off-site commercial incineration of non-solvent CERCLA wastes that will require capacity is 5.4 million gallons per year. Therefore, the available incineration capacity for the restricted solvent wastes is 22.6 million gallons per year.

3. Capacity for Fuel Substitution

Commenters expressed concern that in the proposal rule, EPA did not include capacity estimates for fuel substitution. A commenter stated that fuel substitution is a potentially very large source of alternative capacity and should be included in the capacity estimates for the final rule. EPA recognizes the importance of fuel substitution but did not have a sufficient data base to develop estimates for the proposed rule. Since the proposal, EPA has developed a new data base from the 1986 National Screening Survey. This information was included in the Notice of Availability on September 5, 1986. The new data base shows that at least 20 hazardous waste management facilities use hazardous waste as fuel. The available capacity for fuel substitution at these facilities is approximately 24 million gallons. Because many facilities that are not regulated hazardous waste management facilities recycle hazardous waste as fuel, the available capacity for fuel substitution is greater than 24 million gallons.

4. Capacity for Distillation

In the proposed rule, EPA estimated that the unused capacity for distillation is 225 million gallons per year. Several commenters questioned the applicability of some distillation systems to the restricted solvent wates. EPA recognizes that not all waste may be acceptable for all systems. However, the additional distillation capacity needed for the restricted solvent wastes is only 4 percent of the available capacity. Therefore, EPA assumes that it is reasonable to expect that there is adequate distillation capacity for the restricted solvents.

F. Determination of the Effective Date

Comparison of the data developed in Sections D and E above results in the demand and capacity estimates in the following table:

ESTIMATES OF DEMAND AND AVAILABLE CAPACITY

Treatment or Recovery Technology	Unused Capacity (Millions of Gallons Per Year)	Capacity Needed (Total)
Wastewater	2,103.0	2481.0
Incineration	22.6	65.3
Fuel Substitution	24.0	18.8
Distillation	225.0	4.2

Analysis of the demand and capacity shows that available wastewater treatment and incineration capacity for solvent wastes will be exhausted by this

regulation but capacity for fuel substitution and distillation will remain. As explained previously, the capacity required for small quantity generator wastes cannot be determined precisely, therefore, the Agency has distributed the capacity demand for these wastes between incineration, distillation and fuel substitution based on the relative demand projected for those technologies. EPA has assigned the entire capacity demand for CERCLA response action and RCRA corrective action wastes to incineration because this technology is currently projected to be the alternative technology used during the next year for the majority of these wastes. As a result of this analysis, EPA has clearly identified the basis for extension of the effective date for at least some wastes requiring incineration and wastewater treatment.

In order to address the shortage of incineration capacity, EPA is granting a two year national variance to CERCLA response action and RCRA corrective action wastes (20.2 million gal/year), solvent-containing sludges and solids (21.7 million gal/year) and small quantity generator wastes (4.4 million gal/year) requiring incineration. This combination of variances should provide full utilization of available incineration capacity. The demand for wastewater treatment capacity cannot be similarly segregated because of EPA's limited data base. Therefore, EPA will grant a variance to all solvent wastewaters because of the significant capacity deficiency identified.

VI. Treatment Standards for Dioxin-Containing Wastes

A. Introduction

Today's final rule for dioxins adopts most of the provisions of the proposed rule and outlines EPA's response to major comments received on the proposal.

Under today's rule, wastes identified by the hazardous waste codes F020, F021, F022, F023, F026, F027, and F028 must be treated to a level below 1 ppb in the waste extract for each of the following specific categories of CDDs and CDFs [11]:

HxCDD—hexachlorodibenzo-p-dioxins
HxCDF—hexachlorodibenzofurans
PeCDD—pentachlorodibenzo-p-dioxins
PeCDF—pentachlorodibenzofurans
TCDD—tetrachlorodibenzeno-p-dioxins
TCDF—tetrachlorodibenzofurans

One ppb is the routinely achievable detection limit using method 8280 of SW-846 [12] (40 CFR 261 Appendix X).

These listed wastes also must be treated below the detection limits for 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, 2,3,4,6-tetrachlorophenol, and pentachlorophenol. The detection limits for these constituents are 50, 50, 100, and 10 ppb, respectively in the waste extracts using method 3510/8270 identified in the SW-846.

Wastes that meet the applicable treatment standards may be disposed in a RCRA Subtitle C land disposal facility which has been fully permitted and has an approved waste management plan, in accordance with the dioxin-listing rule (50 FR 1978). Dioxin-containing wastes at or exceeding the detection limit for these constituents of concern in the waste extracts using the TCLP must be treated in accordance with the requirements specified in the dioxin-listing rule, specifically incineration (40 CFR 264.343 and 40 CFR 265.352) or thermal treatment (40 CFR 265.383) to six 9s destruction and removal efficiency (DRE), or tank treatment (40 CFR 264.200) (if such treatment can achieve concentrations of CDDs, CDFs and certain chlorophenols to below detection in the extracts from the treatment residuals).

EPA is also granting the maximum two-year variance to the effective date of the land disposal restrictions for dioxin-containing wastes because of a finding that there is a lack of capacity to treat and dispose of these wastes. Thus, the effective date of this final rule is November 8, 1988. These wastes are subject to all special management requirements specified in the dioxin-listing rule and the minimum technological requirements of section 3004(o).

In the proposed rule, the Agency did not set treatment standards for EPA Hazardous Waste No. F028 (residuals resulting from incineration or thermal treatment of soil contaminated with F020, F021, F022, F023, F026, and F027). It was stated in the proposal that F028 is a treatment residual from incineration or thermal treatment of dioxin-containing soil to six 9s DRE. Because incineration is the best technology identified to treat dioxin-containing wastes, the Agency concluded, that in most cases, the F028 waste would meet the treatment standard. The Agency recognizes that there may be instances in which this is not the case. Accordingly, EPA now believes that it erred in concluding that all F028 wastes would meet the designated treatment standard of no detection. Instead, it is appropriate to require that F028 wastes, like other dioxin-containing wastes, be tested to determine whether detectable levels of specific categories of CDDs and CDFs and certain chlorophenols are present in the extracts from the waste or treatment residuals. The final rule has been modified to reflect this change.

B. Summary of Regulations Affecting Land Disposal of Dioxin-Containing Wastes

In the dioxin-listing rule, EPA also specified additional management standards relating to land disposal of these wastes. Specifically, the Agency prohibited the management of the listed dioxin-containing wastes at interim status land disposal facilities. There are exceptions for interim status surface impoundments holding wastewater treatment sludges that are created in the impoundments as part of the plant's wastewater treatment system and interim status waste piles that meet the requirements of 40 CFR 264.250(c)).

The dioxin-listing rule also establishes special management standards for dioxin-containing wastes in permitted land disposal facilities intending to manage these wastes. These facilities are required to submit a waste management plan to address the additional design and operating measures over and above those in Part 264 which the facility intends to adopt to prevent migration of the waste. The plan is to be submitted by the owner or operator of the disposal facility as part of the Part 264 permit application (see 50 FR 1979 for additional information).

The Agency believes that such a waste management plan will help provide assurance that these wastes are properly managed in a land disposal situation. It should be noted, however, that under today's rule, these requirements apply only to the land disposal of dioxin-containing wastes that meet the treatment standard. Also, these standards do not supersede the minimum technology requirements

[11] The following acronyms and definitions are used: PCDDs—all isomers of all chlorinated dibenzo-p-dioxins. PCDFs—all isomers of all chlorinated dibenzofurans. CDDs—and CDFs—isomers of tetra-, penta-, and hexachlorodibenzo-p-dioxins and -dibenzofurans, respectively. TCDDs and TCDFs—all isomers of the tetrachlorodibenzo-p-dioxins and -dibenzofurans, respectively. TCDD and TCDF—the respective 2,3,7,8-isomers. The prefixes Tr, T, Pe, and Hx denote the tri-, tetra-, penta-, and hexachlorodioxin and -dibenzofuran congeners, respectively.

[12] In test method 8280, the proposed quantification level for dioxin in water is 10 ppt. However, due to the interferences inherent in leachate samples and the variability of waste matrices, the Agency considers that, generally, dioxin wastes subject to today's rule will have a detection limit of 1 ppb. It should be noted that because the treatment standard for dioxins is set at "no detection" it is important to calibrate to the levels specified in 8280.

imposed by section 3004(o). All the prohibitions established under the dioxin-listing rule remain in effect even if the wastes meet the treatment standard.

C. Analysis of Treatment Technologies for Dioxin-Containing Wastes and Determination of BDAT

1. Applicable Treatment Technologies

The dioxin-listing rule establishes standards for incineration and certain thermal treatment. It states that incinerators burning the listed CDD/CDF-containing wastes must achieve a destruction and removal efficiency of six 9s, in addition to the other standards contained in 40 CFR 264.343 and 265.352.

In the dioxin-listing rule, the Agency acknowledged that there are presently a number of emerging thermal treatment technologies that may be applicable for the treatment of dioxin-containing wastes in order to render them nonhazardous (or at least, less hazardous). However, in the absence of performance standards, such treatment units would not be allowed, and this would stifle and discourage the development of new treatment alternatives for these very toxic wastes. Accordingly, the Agency revised the dioxin-listing rule to allow for interim status thermal treatment units to treat the dioxin-containing wastes if it has been certified that the units meet the applicable performance standards in 40 CFR 264.383 (including six 9s DRE for principal organic hazardous constituents (POHCs)).

The dioxin-listing rule also requires special management practices for the treatment and storage of dioxin-containing wastes in tanks. Secondary containment will be required as a permit condition for all tanks that treat or store CDD- and CDF-containing wastes. Specifically, the dioxin-listing rule requires the owners/operators of tank facilities storing or treating CDD- and CDF-containing wastes to provide EPA with the following information in its permit application specifying: the precise design of the secondary containment system and its accompanying leak detection method; the choice of construction material and specifications; and whether additional run-on or precipitation controls are needed to preserve the system's integrity. These technical requirements are specified in 40 CFR 270.16(g) and must be addressed by each individual facility in its RCRA permit application. This information will be evaluated by the EPA before a permit is issued.

As was stated in the proposal, the Agency is aware of much research currently being conducted to develop and evaluate treatment technologies applicable to dioxin-containing wastes. In the proposal, the Agency presented a list of treatment technologies that were in one of three stages of development or consideration. Recently available information and data have allowed the Agency to revise this list. Additional information on the technologies under evaluation for the treatment of these wastes is available in the background docket for today's rule.

The Agency will continue to gather data and information on these and other emerging technologies in order to evaluate their future potential as applicable technologies for the treatment of dioxin-containing wastes. As stated in today's rule however, any technology for the treatment of dioxin-containing waste must be done in accordance with the dioxin-listing rule. Many of the technologies being analyzed are thermal treatments, or can be conducted in tanks, including infrared heating and chemical detoxification.

2. Comparative Risk Assessment Determinations for Dioxin-Containing Waste

In support of today's rule, the Agency conducted a more detailed comparative risk analysis on soils contaminated with 2, 3, 7, 8-TCDD, still bottoms contaminated with dioxins and toluene, and unused formulations of pentachlorophenol contaminated with dioxins. A detailed characterization of each waste stream is available in the regulatory impact analysis for dioxin-containing waste (Ref. 9).

The analysis of the comparative risks of land disposal and incineration to six 9s DRE indicates that both technologies potentially result in insignificant risks to human health. Land disposal presents very low risks provided that run-off or wind dispersal of contaminated particles is prevented, and dioxin-containing wastes are not co-disposed with other materials that may mobilize the dioxins (e.g., solvents). Regulations previously established (50 FR 1979) governing the management of dioxin-containing wastes are likely to prevent such releases. Similarly, incineration to six 9s DRE is likely to destroy all of the constitutents of concern in these wastes and is also not predicted to present significant risks.

It is possible that, in some cases, incineration may result in greater risks than land disposal. This could occur if incinerator scrubber waters containing undetectable levels of dioxins were discharged untreated to surface waters. However, EPA believes this is unlikely because facilities incinerating dioxin-containing wastes will likely be required under the Clean Water Act to treat the scrubber water prior to discharge, and because treatment of scrubber water by carbon absorption should be effective in preventing releases of dioxin contaminants.

Provided that the discharge of untreated scrubber water is prohibited, restricting land disposal of contaminated soils will likely result in increases in total population risks and decreases in risk to the most exposed individuals (MEI). Under the same conditions (i.e., incineration to six 9s DRE and prohibitions on untreated scrubber water discharge), restricting the land disposal of still bottoms may result in an increase in total population risks, but would significantly reduce the maximum MEI risk. For unused formulations of pentachlorophenol, both the total population and health risk would be significantly reduced by incineration at six 9s DRE.

It should be noted that the greatest risks to human health resulting from the land disposal restriction are likely to be caused by changes in the extent of transportation and handling of dioxin-containing wastes. The comparative risk analysis shows that risks from transportation and handling of dioxin-containing wastes are typically much greater than the risk posed from land disposal or incineration. The Agency however, is not able to predict whether transportation distances and the extent of handling will increase or decrease as a result of this rule.

Because the risk assessment does not indicate that incineration is clearly more risky than direct land disposal, the Agency is classifying incineration at six 9s DRE as available for the purpose of establishing the treatment standard for dioxin-containing waste.

3. Demonstrated Technologies and Determination of BDAT

The only sufficiently demonstrated technology for the treatment of dioxin-containing wastes is incineration. Data from the field demonstration of EPA's Mobile Incineration System (MIS) on F020, F022, F023, F026, and F027 wastes at the Denney Farm site in McDowell, Missouri indicate that an incineration unit operating at six 9s DRE is capable of treating dioxin-containing wastes and the constituents of concern subject to this rule to non-detectable levels.

Although the field demonstration at Denney Farm did not include the burning of F021 wastes, the Agency believes that the existing data from the MIS field demonstration and other

available data show that similar non-detectable levels of CDDs, CDFs and pentachlorophenol would occur as the result of incineration at six 9s DRE. As stated in the proposed rule, six 9s DRE for dioxin-containing waste is determined using a POHC with a lower heat of combustion than the CDDs and CDFs contained in the waste. The more difficult a waste is to incinerate, the lower its heat of combustion. Conversely, a constituent with a high heat of combustion is easier to incinerate. In the case of the F021 waste, the Agency believes that six 9s DRE can be achieved for the CDDs and CDFs in these wastes, since F021 wastes and CDDs and CDFs have similar degrees of incinerability (heats of combustion).

The Agency has also determined that incinerators operating in accordance with the performance standards specified in 40 CFR 761.70 for PCB wastes, namely six 9s destruction, also meet the demonstrated component of the BDAT standard. For more information on this determination, the reader is referred to the preamble discussion in the proposed rule (51 FR 1730–1735).

Incineration to six 9s DRE achieves lower concentrations of CDDS, CDFs and certain chlorophenols in the treatment residuals than incineration to four 9s DRE (current standard for all RCRA hazardous waste except dioxin-containing wastes). The efficiency of incineration has been demonstrated by the successful dioxin burn at six 9s DRE in the EPA MIS at the Denney Farm Site in McDowell, Missouri and the incineration of PCB wastes at six 9s destruction at a number of facilities. Data indicate that residuals resulting from the incineration of CDDs and CDFs at six 9s DRE contain these toxicants at concentrations about five to seven orders of magnitude less than those in the starting material. For example, solid residues resulting from the incineration at six 9s DRE of dioxin wastes containing 10 ppm TCDD may be expected to contain less than .1 ppb TCDD. Additional data from the incineration of dioxin-containing wastes at six 9s DRE show no detectable levels of CDDs/CDFs or the chlorophenols in the residuals. Most of the analysis was conducted in accordance with the methods specified in SW–846 (method 8280). (40 CFR 261, Appendix X)

Additional data indicate that incinerators operating as six 9s DRE achieved extremely low concentrations of CDDs, CDFs, and PCBs in the treatment residuals, in most cases, far below those levels measured with standard analytical techniques. Detailed information on the determination of BDAT is available in the preamble discussion in the proposed rule.

D. Determination of Alternative Capacity and Effective Dates

1. Required Alternative Treatment Capacity for Dioxin-Containing Wastes

Approximately 14.7 million pounds (6,650 metric tons) of dioxin-containing wastes are presently covered by the dioxin-listing rule. (Ref. 9). These wastes are primarily associated with the past production and manufacturing use of tri- and tetrachlorophenol and current manufacturing uses of pentachlorophenol. The Agency believes that the quantity of dioxin-containing wastes currently generated and subject to today's land disposal restriction rule amounts to 3 million pounds annually (1,350 metric tons). For the purposes of this rulemaking, the Agency estimates that approximately 1 billion pounds (500,000 metric tons) is dioxin-contaminated soil. This assessment is taken from an estimate that 1.1 billion pounds of dioxin-contaminated soil exist in the State of Missouri. See the background docket for additional information. The Agency is continuing to evaluate the universe of these wastes. As better information becomes available, the Agency will revise its estimates accordingly. Additional information on the quantity estimates of dioxin-containing wastes subject to the land disposal restriction can be found in the regulatory impact analysis for this rule.

2. Treatment, Disposal, and Recovery Capacity Currently Available

Under the dioxin-listing rule, facilities which intend to treat or dispose of dioxin-containing waste must do so in accordance with the special management standard specified in the rule (50 FR 1978). Currently, Agency information on the activities of generators and treatment, storage, and disposal facilities indicate that there is no available disposal or recovery capacity for dioxin-containing wastes. In addition, there are no Agency approved incinerators or other thermal treatment units to treat dioxin-containing wastes. Although several petitions have been received by the Agency, no incineration or thermal treatment units have been certified/permitted as required in the dioxin-listing rule.

Owners/operators of incinerators approved to burn PCB's pursuant to the provisions of the Toxic Substances Control Act, may wish to apply for certification. As pointed out earlier, PCB incinerators are a logical choice to burn these wastes because they are required to meet the same performance standard (six 9s DRE) required under the dioxin-listing rule. There are currently three commercial incinerators approved under TSCA to burn PCBs. In addition to these units, several other incinerators under development may be available (contingent on certification) for treating CDD- and dioxin-containing wastes. However, the Agency has no indication whether or when any of these or any other facility will be able to treat dioxin-containing wastes.

The Agency has full confidence in the safeguards provided by the required management standards. EPA is committed to move rapidly to assure that approved capacity is available to properly manage the listed dioxin-containing wastes. Agency efforts in this area include identifying facilities that can properly manage dioxin-containing wastes, and encouraging owners and operators to apply for the necessary Federal, State, and local permits. The EPA Regional offices will work closely with these facilities to expedite their permit applications.

VII. State Authority

A. Applicability of Rules in Authorized States

Under section 3006, EPA may authorize qualified States to administer and enforce the RCRA program within the State. Following authorization, EPA retains enforcement authority under sections 3008, 3013, and 7003 although authorized States have primary enforcement responsibility. The standards and requirements for authorization are found in 40 CFR Part 271.

Before the November 8, 1984, RCRA amendments, a State with final authorization administered its hazardous waste program in lieu of EPA administering the Federal program in that State. The Federal requirements no longer applied in the authorized State, and EPA could not issue permits for any facilities that the State was authorized to permit. When new, more stringent Federal requirements were promulgated or enacted, the State was obliged to enact equivalent authority within specified time frames. New Federal requirements did not take effect in an authorized State until the State adopted the requirements as State law.

In contrast, under section 3006(g) (42 U.S.C. 6926(g)), new requirements and prohibitions imposed under RCRA take effect in authorized States at the same time that they take effect in

nonauthorized States. EPA is directed to carry out these requirements and prohibitions in authorized States, including the issuance of permits, until the State is granted authorization to do so. While States must still adopt the newly enacted RCRA provisions as State law to retain final authorization, these provisions are effective in authorized States in the interim.

Today's rule is promulgated pursuant to sections 3004 (d) through (k), and (m), of RCRA (42 U.S.C. 6924). Therefore, it is being added to Table 1 in 40 CFR 271.1(j), which identifies the Federal program requirements that are promulgated pursuant to the newly enacted RCRA provisions and take effect in all States, regardless of their authorization status. States may apply for either interim of final authorization for the provisions in Table 1, as discussed in the following section. Table 2 in 40 CFR 271.1(j) is being modified also to indicate that this rule is a self-implementing provision of the RCRA amendments.

B. Effect on State Authorizations

As noted above, EPA will implement today's rule in authorized States until their programs are modified to adopt these rules and the modification is approved by EPA. Because the rule is promulgated pursuant to the RCRA amendments, a State submitting a program modification may apply to receive either interim or final authorization under section 3006(g)(2) or 3006(b), respectively, on the basis of requirements that are substantially equivalent or equivalent to EPA's. The procedures and schedule for State program modifications for either interim or final authorization are described in 40 CFR 271.21. It should be noted that the interim authorization will expire on January 1, 1993 (see 40 CFR 271.24(c)).

40 CFR 271.21(e)(2) requires that States that have final authorization must modify their programs to reflect Federal program changes, and must subsequently submit the modification to EPA for approval. The deadline for State program modifications for today's final rule is July 1, 1989, if regulatory changes are necessary, or July 1, 1990, if statutory changes are necessary. These deadlines can be extended in exceptional cases (see 40 CFR 271.21(e)(3)). Once EPA approves the modification, the State requirements become Subtitle C RCRA requirements.

States with authorized RCRA programs may have requirements similar to those in today's rule. These State regulations have not been assessed against the Federal regulations being promulgated today to determine whether they meet the tests for authorization. Thus, a State is not authorized to implement these requirements in lieu of EPA until the State program modification is approved. Of course, States with existing standards may continue to administer and enforce their standards as a matter of State law. In implementing the Federal program EPA will work with States under agreements to minimize duplication of efforts. In many cases, EPA will be able to defer to the States in their efforts to implement their programs, rather than take separate actions under Federal authority.

States that submit official applications for final authorization less than 12 months after the effective date of these regulations may be approved without including equivalent standards. However, once authorized, a State must modify its program to include standards substantially equivalent or equivalent to EPA's within the time periods discussed above.

C. State Implementation

There are three unique aspects of today's rule which affect State implementation and impact State actions on the regulated community:

1. Under Part 268, Subpart C, EPA is promulating land disposal restrictions for all generators and disposers of certain types of hazardous waste. In order to retain authorization, States must adopt the regulations under this Subpart since State requirements can be no less stringent than Federal requirements.

2. Also under Part 268, EPA may grant a national variance from the effective date of land disposal prohibitions for up to 2 years if it is found that there is insufficient alternative capacity to land disposal. Under § 268.5, case-by-case extensions of up to 1 year (renewable for an additional year) may be granted for specific applicants lacking adequate capacity.

The Administrator of EPA is solely responsible for granting variances to the effective date because these determinations must be made on a national basis. In addition, it is clear that section 3004(h)(3) intends for the Administrator to grant case-by-case extensions after consulting the affected States, on the basis of national concerns which only the Administrator can evaluate. Therefore, States cannot be authorized for this aspect of the program.

3. EPA may grant petitions of specific duration to allow land disposal of certain hazardous waste where it can be demonstrated that there will be no migration of hazardous constituents for as long as the waste remains hazardous.

States which have the authority to impose prohibitions may be authorized under section 3006 to grant petitions for exemptions from bans. Decisions on site-specific petitions do not require the national perspective required to prohibit waste or grant extensions. In accordance with section 3004(i), EPA will publish notice of the State's final decision on petitions in the **Federal Register.**

One commenter argued that EPA should publish all petitions submitted by authorized States, as well as publish final decisions. EPA does not believe that section 3004(i) mandates this result. In order to be authorized to administer the petition process, a State will have to adopt notice and comment requirements equivalent to those in today's rules. Publication of the final decision in the **Federal Register** will satisfy the need to inform the general public by informing the public of which facilities are allowed to receive prohibited waste, and by informing other applicants as to the types of petitions that have been accepted.

States are free to impose their own disposal prohibitions if such actions are more stringent or broader in scope than Federal programs (RCRA section 3009 and 40 CFR 271.1(i)). Where States impose bans which contravene an EPA action, such as granting a case-by-case extension or petition, the more stringent State prohibitions governs and EPA's action is without meaning in the State.

VIII. Effects of the Land Disposal Restrictions Program on Other Environmental Programs

A. Discharges Regulated Under the Clean Water Act

Compliance with land disposal restriction requirements does not relieve facility owners of the obligation to comply with all other Federal, State, and local environmental requirements, including the requirements of the Clean Water Act. Under the Clean Water Act, facility owners must comply with all applicable pretreatment requirements (for discharges to a publicly owned treatment works) and all requirements of an NPDES permit (for discharges to surface water).

The Agency recognizes that generators and treaters of hazardous wastes may choose to dispose of restricted wastes using non-RCRA disposal options.

Two disposal options regulated under the Clean Water Act are direct discharge to surface waters and indirect

discharge to publicly owned sewage treatment works (POTWs). Decisions to discharge restricted solvent wastes using these options will depend upon a number of factors including the physical form of the waste, the degree of pretreatment required prior to discharge, State and local regulations, and the cost of disposal. The Agency conducted an analysis to determine the impact of the land disposal restrictions on these alternative disposal methods (Ref. 10). The analysis focused primarily on the discharge of solvent wastes to POTWs because the Agency lacked data to analyze the impacts from spent solvent wastes discharged directly to receiving waters. However, inadequate data on these above mentioned factors precluded the Agency from conducting a quantitative assessment of the potential effect of the land disposal restrictions on increased demand for disposal to POTW's.

The results of the analysis indicated that the quantity of F001–F005 solvents discharged to POTWs could potentially increase as much as five times, although it is likely that the actual increase will be much less. The analysis also demonstrated that the discharge of solvent constitutents to POTWs will probably result in some exposure to humans. However, the risks to public health and the environment from these discharges could not be determined.

B. Discharges Regulated Under the Marine Protection, Research, and Sanctuaries Act

Two options regulated under the Marine Protection, Research, and Sanctuaries Act (MPRSA) (33 U.S.C. 1401 et seq.) are ocean dumping and ocean-based incineration. EPA is in the process of revising the MPRSA regulations. If the Agency were to relax the current regulations, there could be increased demand for ocean-based waste management due to the impact of the land disposal restrictions. If, for example, the regulations were revised to allow the issuance of permits to applicants whose wastes fail to comply with one or more of the MPRSA environmental criteria but who successfully demonstrate a need for the permit, the demand for ocean disposal could increase substantially.

The Agency conducted an analysis of the potential shift in demand for ocean disposal (ocean dumping or ocean-based incineration) resulting from the restrictions on land disposal of solvent, dioxin, and California list wastes. The results are described in "Assessment of Impacts of Land Disposal Restrictions on Ocean Dumping and Ocean Incineration of Solvents, Dioxins, and California List Wastes" (Ref. 12). This assessment is based on a methodology to score and rank waste streams for relative acceptability for ocean disposal, supplemented with an analysis of cost factors and capacity constraints.

The scoring/ranking methodology is based on technical requirements (e.g., physical form and heating value) and MPRSA environmental criteria (e.g., constituent concentrations, toxicity, solubility, density, and persistence of the waste) associated with ocean disposal of hazardous waste. The capacity analysis assumes that those wastes least acceptable for ocean disposal will be treated or disposed of by land-based methods. The cost analysis assumes that additional land-based treatment capacity would be built to treat waste streams for which the costs of land-based treatment would be less than the costs of ocean disposal (including on land transportation to a port located on the East Coast).

The results of the cost/capacity analysis indicates that, as a result of the land disposal restrictions, approximately 9.2 million gallons per year of solvent wastes and 1.2 million gallons per year of dioxin wastes potentially could create demand for ocean dumping and ocean-based incineration. Such demands result from capacity short-falls of land-based incineration and the relatively lower cost of ocean dumping and ocean-based incineration, taking into account the costs of transportation on land. These results estimate the demand that may be created if the ocean dumping regulations are revised to allow the issuance of permits for wastes that do not comply with MPRSA environmental criteria, because the analysis did not take into account technical requirements or environmental criteria.

The Agency expanded the cost/capacity analysis to eliminate those wastes that do not meet technical requirements or MPRSA criteria. The results of that analysis indicated that none of the solvent and dioxin waste streams identified as likely to create potential demand for ocean disposal in the cost/capacity analysis would be acceptable for ocean dumping, based on existing ocean dumping regulations. Conversely, all the waste streams identified by the cost/capacity analysis would be acceptable for ocean-based incineration, based on technical requirements and the proposed ocean incineration regulations.

C. Air Emissions Regulated Under the Clean Water Act

Many of the technologies capable of achieving the treatment standard for a restricted waste may result in cross-media transfer of hazardous constituents into the air. Examples would be air-stripping of volatile organics from wastewater and incineration of metal-bearing spent solvents. Unless air controls are added, these technologies may result in transfer of organics and metals, respectively, to the atmosphere.

The Agency has undertaken several efforts to address the potential problem, as discussed in the comparative risk assessment section. The Agency has initiated a program to address metal emissions from incinerators. EPA also has initiated two programs under section 3004(n) to address air emissions from other sources. The first program will address leaks from equipment, such as pumps, valves, and vents from units processing concentrated organics waste streams. Several units identified as BDAT in this rulemaking, batch distillation, thin film evaporation, fractionation, and incineration, would process waste streams with greater than ten percent organics and would be covered by this rulemaking. The Agency expects to propose these standards in November 1986. The second program under section 3004(n) will address all remaining sources of air emissions, such as residual air emissions from land disposal units and non-land disposal sources (e.g., tanks and waste transfer and handling). These standards are scheduled to be proposed in November 1987, and promulgated in November 1988.

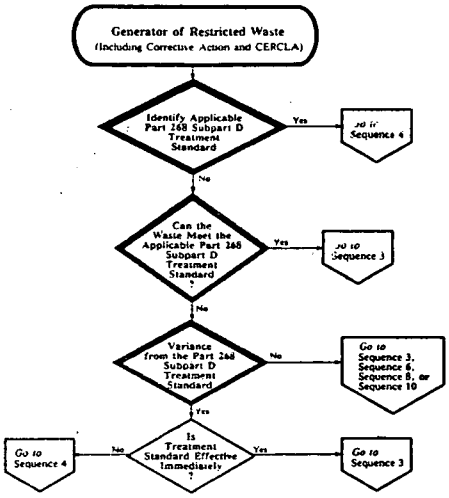
IX. Implementation of the Part 268 Land Disposal Restrictions Program

As a result of the regulations being promulgated today under Part 268, several options will be available to the generator or owner/operator of a treatment, storage, and disposal facility for the management of restricted hazardous wastes. In order to provide direction to those who manage restricted hazardous wastes, the following decision-making sequences are offered for determining appropriate waste management procedures. This unit provides references to applicable 40 CFR Parts 264 and 265 requirements as well as Part 268 requirements for implementation of the various waste management options. The Agency expects to produce an expanded version of this section as guidance to the regulated community.

All of the sequences in the generator's decision-making process must commence with a determination as to whether the hazardous waste is listed in Part 268 Subpart C. If the hazardous

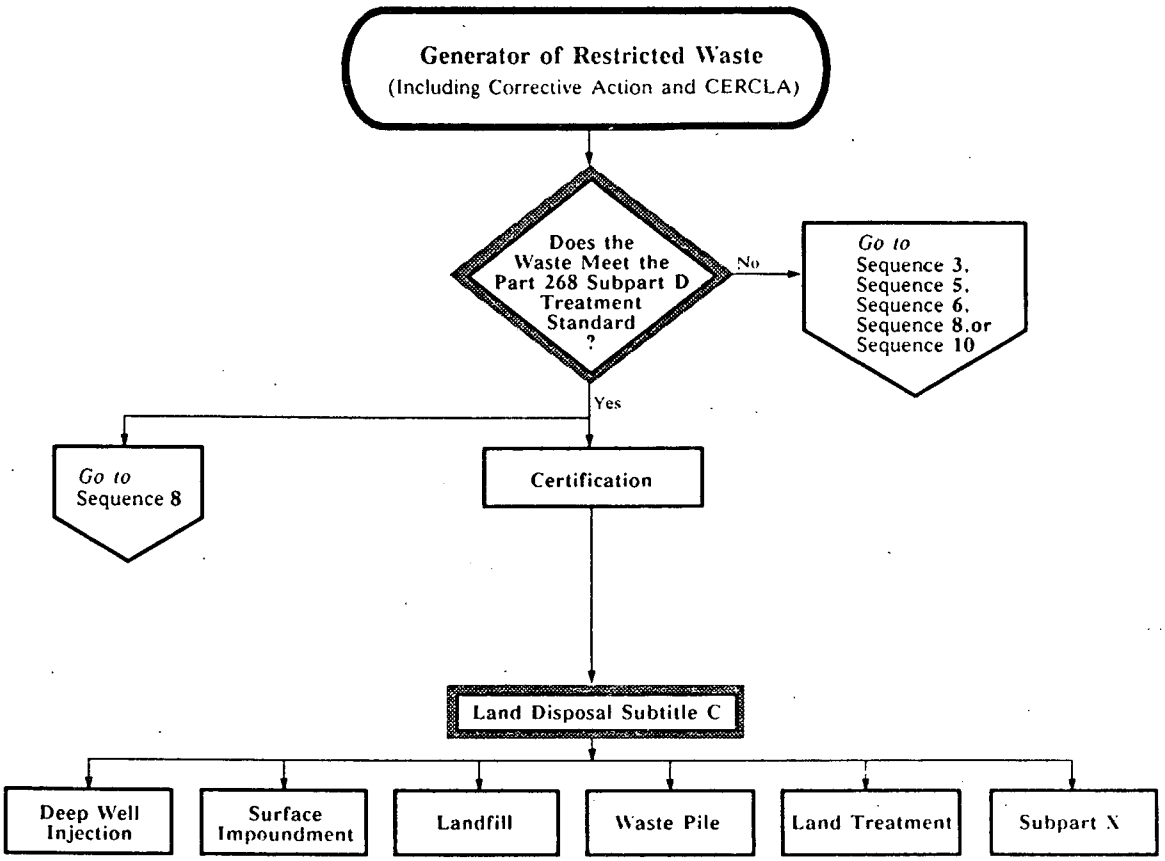
waste is not a restricted waste, it is not subject to land disposal restrictions under Part 268. It must, nevertheless, be managed in accordance Parts 264 and 265.

Sequence 1: Waste Characterization



Sequence 1 in the generator's decision-making process commences with a determination of the appropriate treatability group and corresponding Part 268 Subpart D treatment standard (§§ 268.41, 268.42, or 268.43). The Agency is requiring that applicable Part 268 Subpart D treatment standards for a restricted waste be determined at the point of generation. To require otherwise would allow the generator to dilute waste in order to circumvent an effective date or otherwise alter the applicable treatment standard. The Part 268 Subpart D treatment standards are expressed either as performance standards in the waste extract in § 268.41, as required treatment methods in § 268.42, or as concentrations in the waste in § 268.43. After the generator establishes the applicable Part 268 Subpart D treatment standard, the next step in the sequence is to determine the effective date of the applicable treatment standard. EPA has the discretionary authority to delay the effective dates of the Part 268 treatment standards on the basis of available national treatment capacity. Determinations as to the adequacy of treatment capacity for restricted wastes are based on the quantity of restricted wastes generated and the available capacity of alternative treatment, recovery, and disposal technologies. For those wastes where EPA determines that alternative capacity is adequate, the treatment standards will take effect immediately upon promulgation. When the Part 268 Subpart D treatment standards are expressed as concentrations in the waste extract (§ 268.41), the need for treatment depends upon the nature and concentration of the hazardous constituents. This will be determined either through analysis of constituents in the waste extract specified in § 268.7, using the Toxicity Characteristic Leaching Procedure (Appendix I to Part 268) or through knowledge of the hazardous constituents in the waste extract based on the materials and the manufacturing processes generating the waste. Where the Part 268 Subpart D treatment standards are specified as a required method (§ 268.42), it is not necessary for the generator to determine the concentration of the hazardous constituents in the waste or waste extract. When the Part 268 Subpart D treatment standards are expressed as concentrations in the waste (§ 268.43), the need for treatment is determined either through analysis of the hazardous constituents in the waste, as specified in § 268.7 or through knowledge of the hazardous constituents in the waste based on the materials and the manufacturing processes generating the waste.

Sequence 2: Wastes That Naturally Meet Part 268 Subpart D Treatment Standard



Sequence 2 in the generator's decision-making process commences with the determination that the concentration of hazardous constituents in the waste is lower than the applicable Part 268 Subpart D treatment standard. Therefore, the waste is exempt from the statutory prohibition on land disposal.

The generator must submit a notice (§ 268.7(a)(2)(i)) and include: (1) EPA Hazardous Waste Number; (2) the applicable treatment standard; (3) the manifest number associated with the shipment of waste; and (4) waste analysis data, where available. The generator must also submit a certification statement to the land disposal facility as required under § 268.7(a)(2)(ii). The land disposal facility must verify the records submitted by the generator in accordance with the facility's waste analysis plan. A generator that also operates an on-site land disposal facility must put the same information (except for the manifest number) as would be in the notice (§ 268.7(a)(2)(i)) in the operating record of the land disposal facility.

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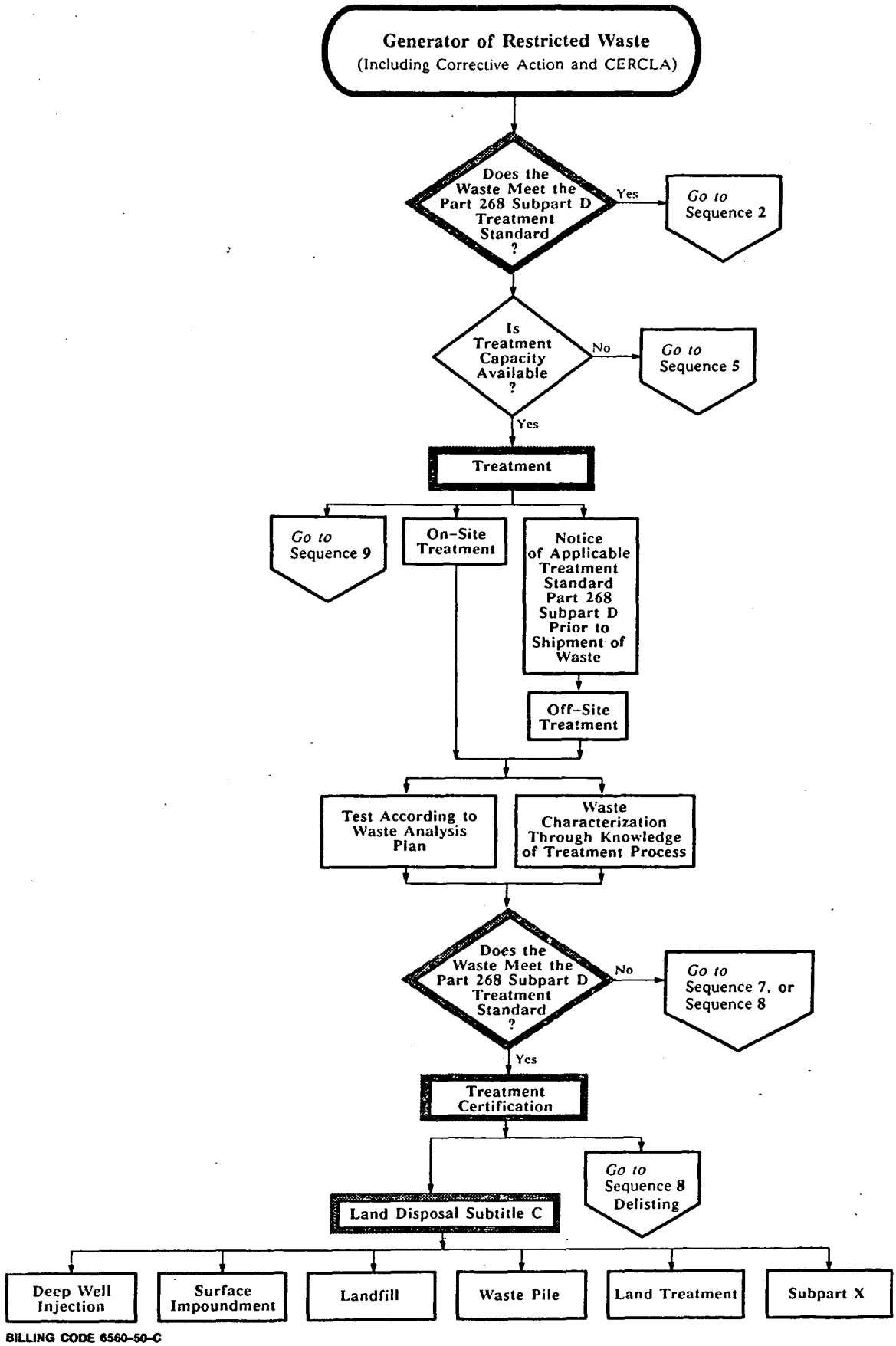
Sequence 3: Treatment of Restricted Wastes



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Sequence 3 in the generator's decision-making process commences with one of the following determinations: (1) The concentration of hazardous constituents in the waste extract exceeds the applicable § 268.41 treatment standard; (2) the waste must be treated in accordance with the treatment method required under § 268.42; or (3) the concentration of hazardous constituents in the waste exceeds the applicable § 268.43 treatment standard. In each case, continued placement of the restricted waste in land disposal units as of the applicable effective date specified in Part 268 Subpart C is prohibited.

Generators may store restricted wastes on site in containers and tanks according to the provisions in section 268.50 prior to treatment. This storage is solely for the purpose of the accumulation of such quantities of hazardous waste as is necessary to facilitate proper, recovery, treatment, or disposal.

The generator must treat the restricted waste in either an on-site or off-site treatment facility with interim status or a RCRA permit that is allowed to accept the restricted waste (as specified in 40 CFR Part 270).

An off-site treatment facility must obtain a notice from the generator specifying the EPA Hazardous Waste Number, the applicable treatment standard, and the manifest number associated with the shipment of waste § 268.7(a)(1)). This notice must be placed in the operating record of the treatment facility along with a copy of the manifest. Generators who are also treatment, storage, or disposal facilities must place the same information in the operating record of the facility, although a formal notice and manifest are not required. The testing and recordkeeping requirements promulgated in today's rule do not relieve the generator of his responsibilities under 40 CFR 262.20 to designate a facility on the manifest which is permitted to accept the waste for off-site management.

The determination that the treatment residue meets the applicable § 268.41 treatment standard can be made through knowledge of the hazardous constituents in the waste extract based on the processes used in the treatment of the waste or by analyzing the treatment residuals according to the waste analysis plan using the Toxicity Characteristic Leaching Procedure (Part 268, Appendix I). The determination that the treatment residue meets the applicable § 268.43 performance standard can be made through knowledge of the hazardous constituents in the waste based on the processes used in the treatment of the water or by analyzing the treatment residuals according to the waste analysis plan. In either case, if the concentration of hazardous constituents in the treatment residual extract exceeds § 268.41 treatment performance standards, or the concentration of hazardous constituents in the residual exceeds § 268.43 treatment standards, additional treatment must be performed before land disposal is permitted. Generators, transporters, handlers, storage facilities, or treatment facilities may not dilute restricted wastes as a substitute for adequate treatment to meet §§ 268.41 or 268.43 treatment standards. Such actions will be considered a violation of the dilution prohibition. In particular, wastes meeting Part 268 Subpart D treatment standards must not be mixed with wastes that do not meet such standards in order to achieve the treatment standard for the mixture (§ 268.3). EPA does not intend to disrupt or alter the normal and customary practices of properly operated treatment facilities. Treatment facilities can mix compatible wastes in order to treat at capacity levels. However, the concentration of a hazardous constituent in the treatment residual must not exceed the concentration of the most stringent applicable §§ 268.41 or 268.43 treatment standard for any given constituent.

When shipping the treatment residue to an interim status or RCRA permitted land disposal facility, the treatment facility must certify (as specified in § 268.7(b)(2)) that the treatment residue meets the applicable treatment standards in §§ 268.41, or 268.43, or has been treated using the required method in § 268.42 and, therefore, is no longer a restricted waste. The treater must also send a notice to the land disposal facility and include the EPA Hazardous Waste Number, the applicable treatment standard, the manifest number associated with the shipment of waste, and waste analysis data from treatment residues where available as specified in § 268.7(b)(1).

If the treatment residuals meet the delisting criteria, the generator or treatment facility may petition the Agency for a site-specific delisting pursuant to the provisions in 40 CFR 260.22. Delisted residuals can be managed in subtitle D facilities.

In some cases, the generator or treatment facility may conclude that it is technically infeasible to meet the §§ 268.41 or 268.43 treatment performance standards established for the waste. If a waste cannot meet the applicable treatment standards, the generator may petition EPA for a treatability variance under § 268.44 (See Sequence 7: Variance From a Treatment Standard, for a detailed discussion.

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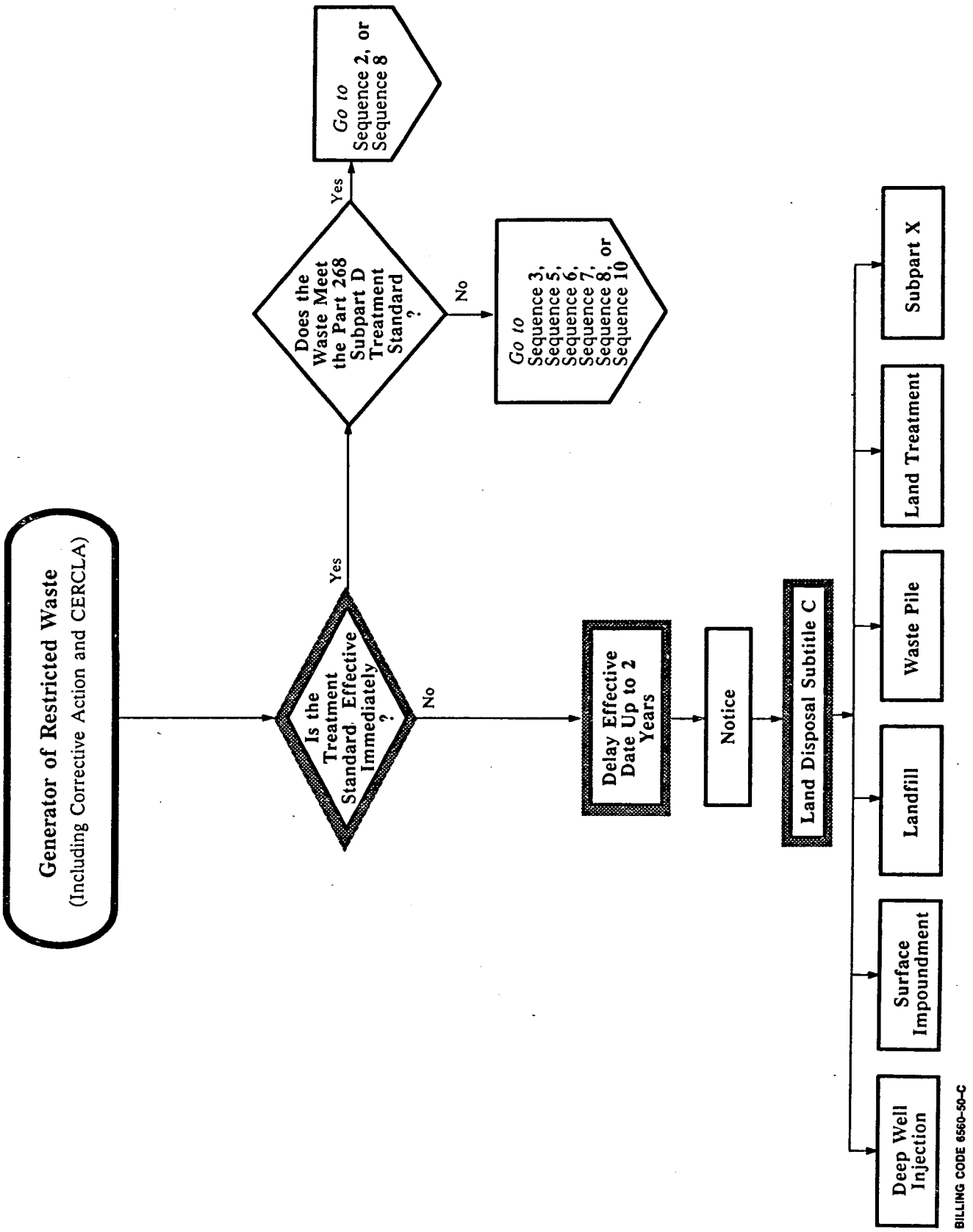
Sequence 4: National Capacity Variance



Sequence 4 in the generator's decision-making process commences for those wastes where the Agency has made the determination that capacity is not adequate on a nationwide basis. The Agency will exercise the discretion granted to it under Section 3004(h)(2) and authorize a nationwide variance of up to two years from the statutory effective date. The purpose of granting a national variance is to provide time for development of additional treatment, recovery or disposal capacity. Those wastes that EPA determines are eligible for nationwide variances are specified in Part 268 Subpart C.

During the national variance, the generator must send a notice (as specified in § 268.7(a)(3)) to the land disposal facility indicating that EPA has granted an extension of time in which to comply with the applicable Part 268 Subpart D treatment standard. At the end of the national variance, the Part 268 Subpart D treatment standards takes effect and the generator must follow any of the following sequences: Sequence 3: Treatment of a Restricted Waste, Sequence 5: Case-by-Case Extensions, Sequence 6: No Migration Petition, Sequence 8: Delisting, or Sequence 10: Change Production Process, Recycle or Don't Produce Waste.

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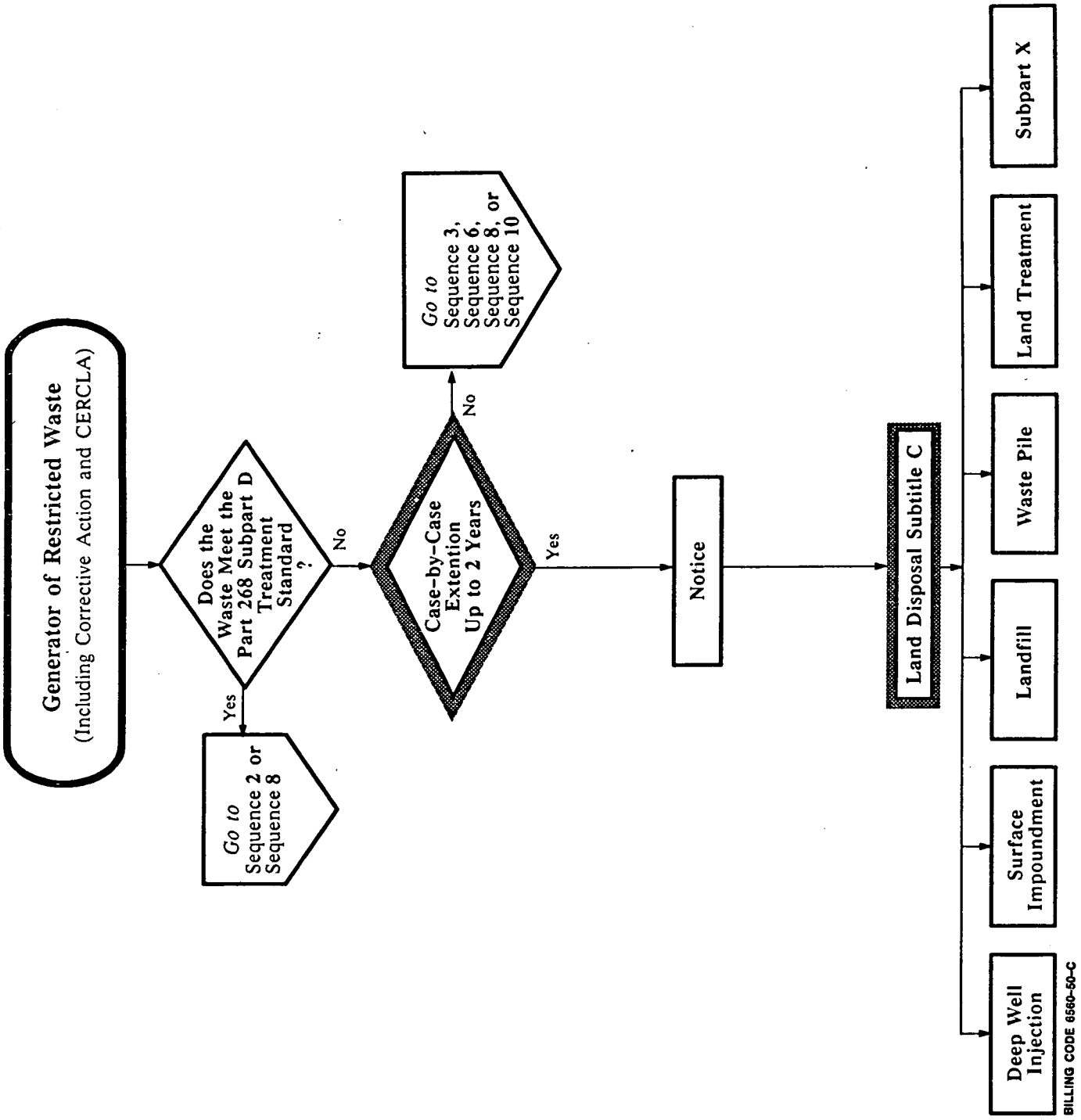
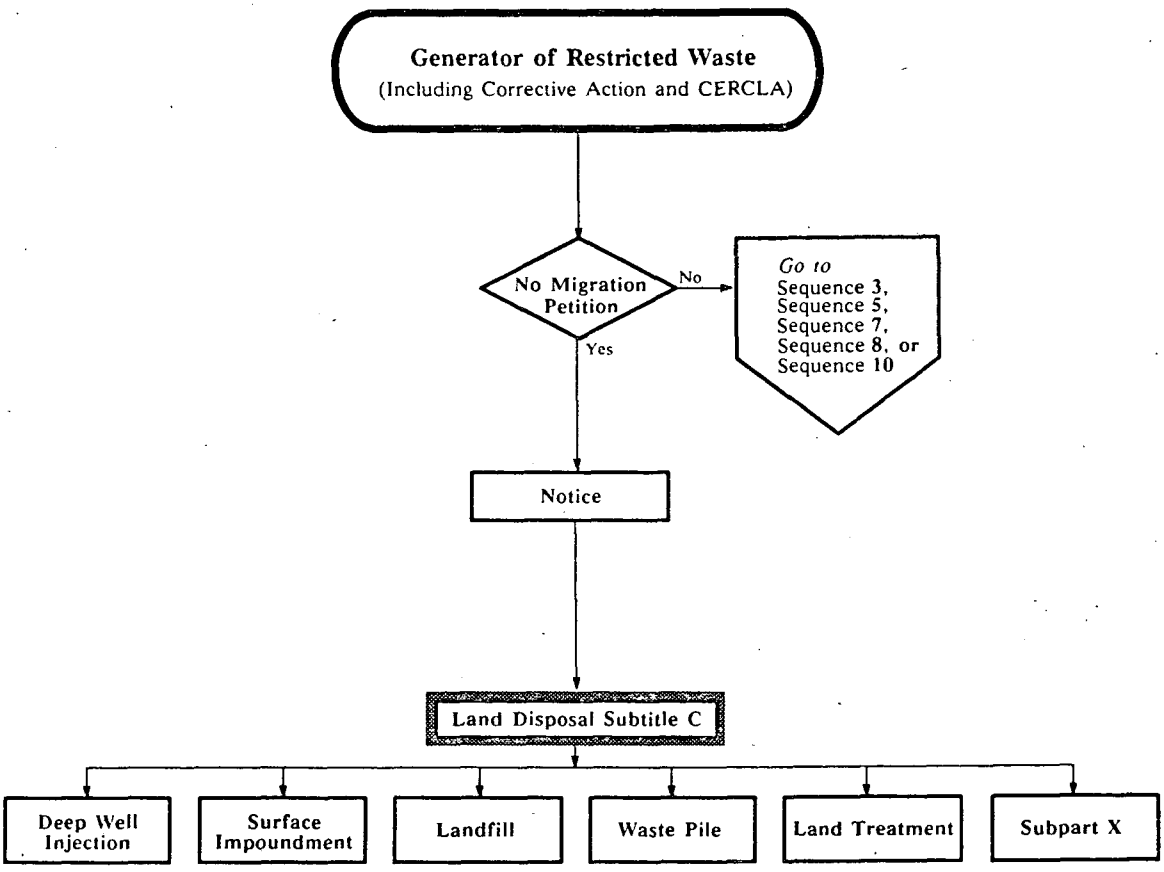
Sequence 5: Case-by-Case Extensions



Sequence 5 in the generator's decision-making process commences with a determination that the restricted waste does not comply with the applicable §§ 268.41 or 268.43 treatment standards or that the waste must be treated in accordance with the treatment method required under § 268.42. Continued placement of the restricted waste in land disposal units as of the applicable effective date, as specified in Part 268 Subpart C, is prohibited. The generator may submit an application to EPA, as specified in § 268.5, for an extension of time in which to comply with the Part 268 Subpart D treatment standards by demonstrating binding contractual commitments to construct or otherwise obtain access to alternative treatment, recovery or disposal capacity and that such capacity is not available by the date that the Subpart D treatment standards take effect due to circumstances beyond his control. Case-by-case extensions may be granted by EPA for two 1-year periods. The extension does not become effective until the notice of approval appears in the **Federal Register** as specified in § 268.5(e). The generator must forward a notice, as specified in § 268.7(a)(3), stating that the waste is exempt from the land disposal restrictions to the Subtitle C land disposal facility receiving the restricted waste.

If the generator is denied a case-by-case extension, the next step in this sequence is the consideration of the following waste management options: the generator must successfully find available treatment capacity (Sequence 3), submit a no migration petition (Sequence 6), submit a delisting petition (Sequence 8), change his production processes, or recycle so that restricted wastes are no longer generated (Sequence 10).

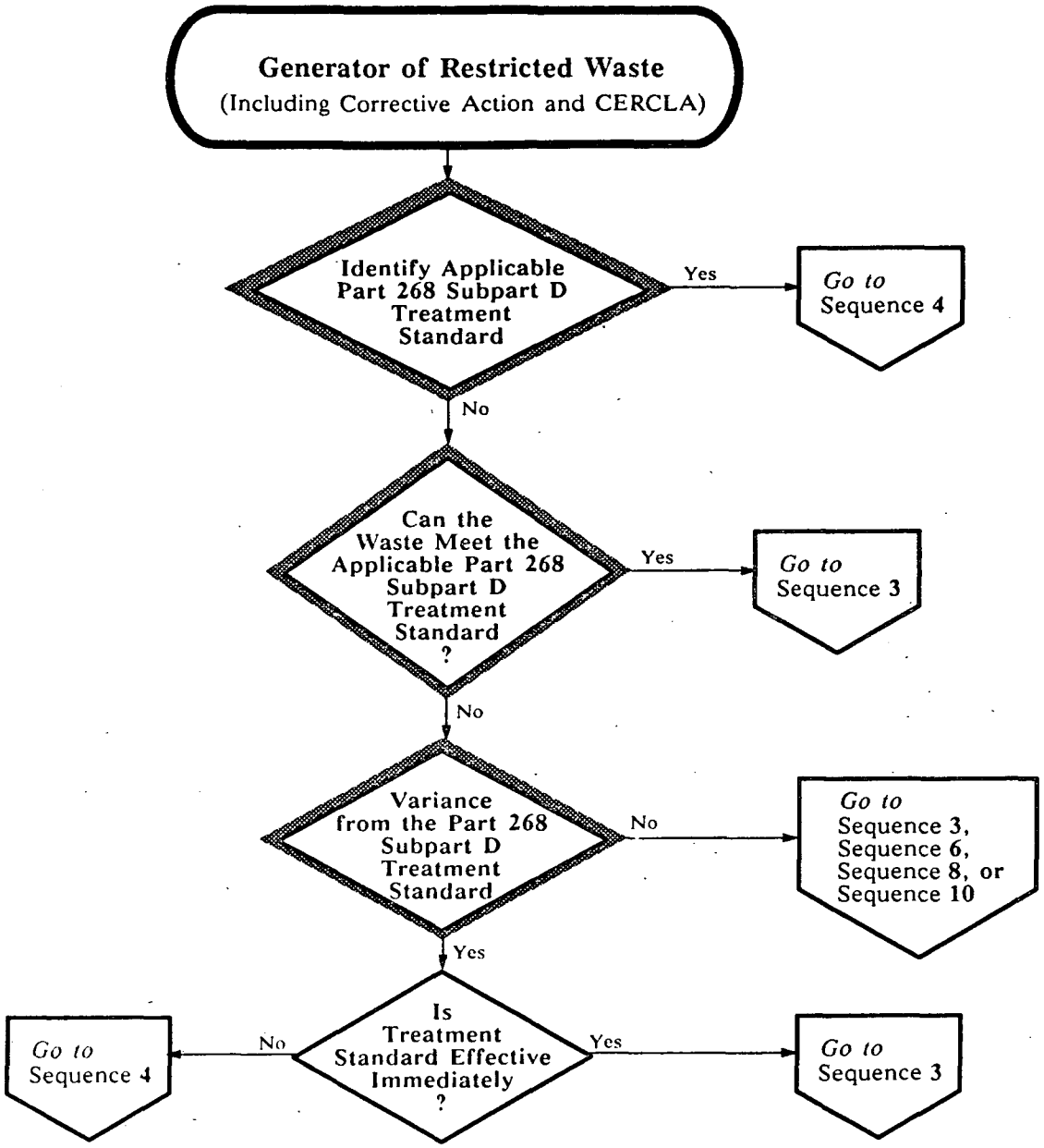
Sequence 6: No Migration Petition



Sequence 6 of the generator's decision-making process commences with a determination that the waste does not meet the §§ 268.41 of 268.43 treatment standards or that the waste must be treated by the method required in § 268.42 Wastes that do not comply with applicable §§ 268.41 or 268.43 treatment standards or are not treated by the method required in § 268.42 will be prohibited from continued placement in land disposal units as of the applicable effective date, unless the generator in conjunction with a Treatment, Storage, and Disposal Facility (TSDF) or a TSDF submits a no migration petition. The petition as specified in § 268.6 must demonstrate that there will be no migration of hazardous constituents from the continued land disposal of particular restricted hazardous wastes at a specific land disposal unit for as long as the waste remains hazardous. The land disposal facility must have either interim status or a RCRA permit, as required in 40 CFR Part 270, to manage the waste. The no migration petition will be a difficult demonstration, but the Agency has identified the following three scenarios that may satisfy the requirements of the statutory standard of "no migration": (1) A situation where environmental parameters are such that no detectable migration of hazardous constituents would occur from the disposal unit; (2) a situation where an active process is taking place rendering the waste non-hazardous; or (3) a situation where hazardous waste is being stored temporarily in a waste pile where engineered controls are sufficient to prevent migration in the short term. Although the Agency is not providing guidance on the no migration petition at this time, it is, however, offering the opportunity for preapplication meetings as assistance in preparing a no migration petition. As a result of such a meeting both the Agency and the petitioner will gain a better understanding of what must be included in the petition and the probability of developing a successful petition. An approved petition allows the land disposal of specific restricted wastes at a specific site. A facility must observe approval in the **Federal Register** (§ 268.6(g)) before it can land dispose a restricted waste. The generator must forward a notice as specified in § 268.7(a)(3) staring that the waste is exempt from the land disposal restrictions to the Subtitle C facility receiving the restricted waste.

Where a no migration petition is not granted, the generator may follow courses of action in accordance with the following sequences; Sequence 3: Treatment of a Restricted Waste, Sequence 5: Case-By-Case Extensions, Sequence 7: Variance From a Treatment Standard, Sequence 8: Delisting, or Sequence 10: Change Production Process, Recycle, or Don't Produce the Waste.

Sequence 7: Variance From a Treatment Standard

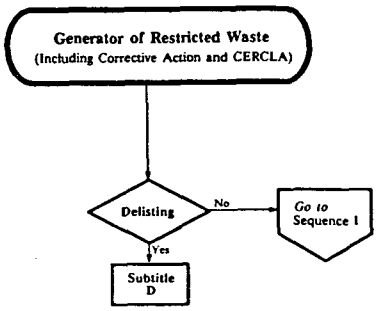


Sequence 7 of the generator's decision-making process begins when a generator determines that he cannot treat the waste to the Part 268 Subpart D treatment standard as specified in §§ 268.41, 268.42, or 268.48. The generator may submit a petition for a variance from the treatment standard as specified under § 268.44. The Agency envisions that wastes may be subject to a treatability variance in cases where a waste is not treatable to the level or by the method specified in the treatment standard. This may occur when a waste is significantly different from the wastes considered in establishing the treatment standard either because the waste matrix is complex and more difficult to treat or the waste contains higher concentrations of the hazardous constituents. The information as specified in §§ 268.44 must be included in the petition for a variance from a Part 268 Subpart D treatment standard.

When the Agency grants a variance from a treatment standard, it must subsequently make a national capacity determination regarding the availability of appropriate treatment capacity for that waste. For those wastes where EPA determines that capacity for the appropriate treatment technology is adequate, the performance standard set as a result of the variance from the treatment standard will take effect immediately upon promulgation. Otherwise, the Agency will grant a national capacity variance (Sequence 4) of up to two years during which time the continued placement of untreated waste in land disposal facilities regulated under Subtitle C of RCRA will be allowed.

Where a variance from a treatment standard is not granted, the waste may be managed in accordance with Sequence 3: Treatment of Restricted Wastes, Sequence 5: Case-By-Case Extension, Sequence 6: No Migration Petition, Sequence 8: Delisting, and Sequence 10: Change Production Process, Recycle, or Don't Produce the Waste.

Sequence 8: Delisting



Sequence 8 commences with the generator's determination that the waste is restricted (40 CFR Part 268 Subpart C). Upon evaluation of the available waste management options, and possibly after treatment (including treatment not meeting the treatment standards of §§ 268.41–268.43) the generator may decide to submit a petition to EPA for a site-specific delisting, pursuant to the provisions in 40 CFR 260.22. Delisted wastes are no longer considered hazardous and may be disposed in a Subtitle D facility.

The generator may choose to submit a delisting petition to the Agency after the restricted waste has been treated to the Part 268 Subpart D treatment standard as well as after the denial of any of the exceptions to achieving the Part 268 Supart D treatment standard.

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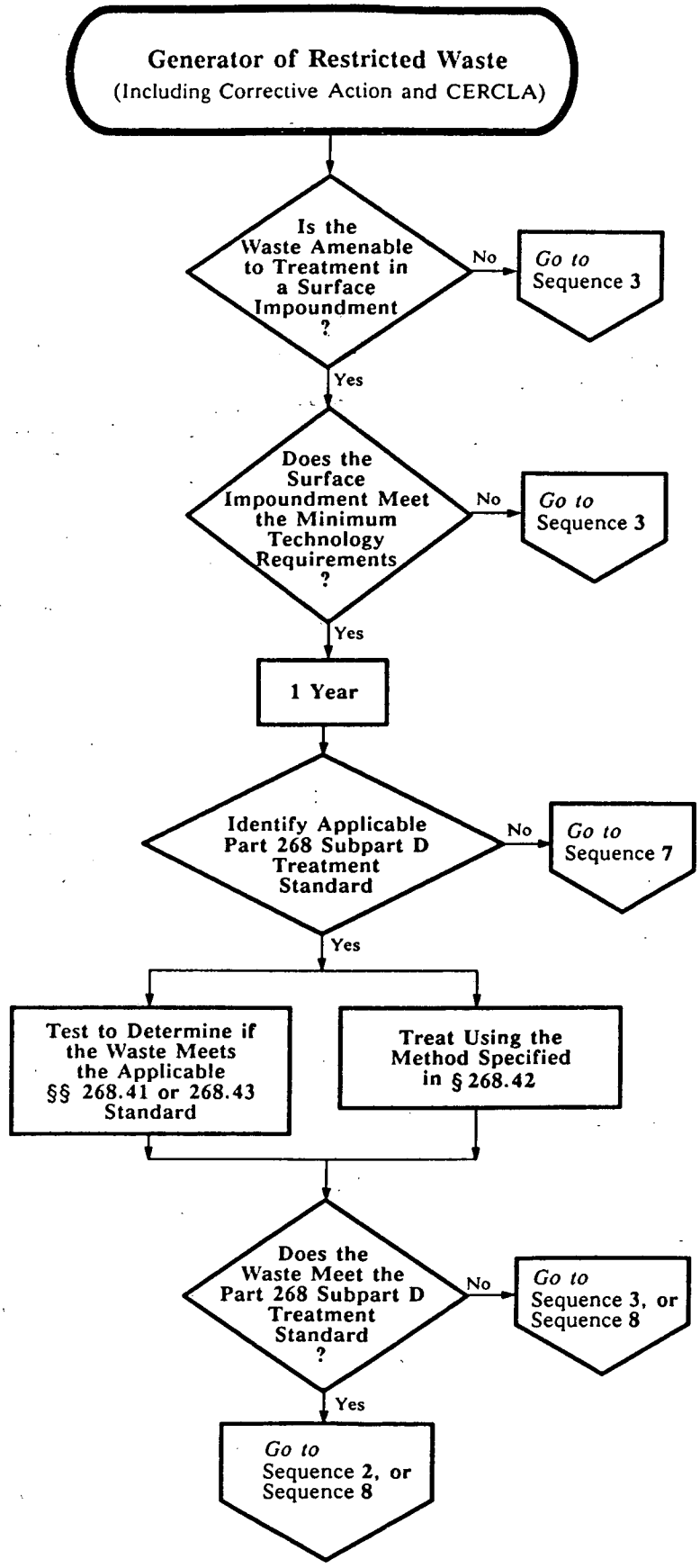
Sequence 9: Surface Impoundment Exemption



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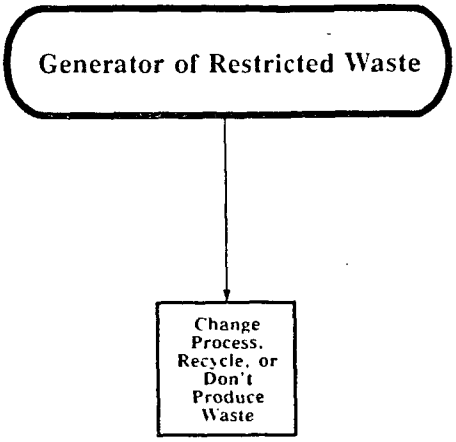
Sequence 9 in the generator's decision-making process commences with a determination by the generator that the restricted waste does not comply with the applicable Part 268 Subpart D treatment standard and will be prohibited from continued placement in land disposal units as of the applicable effective date. The generator may treat in an interim status or RCRA permitted surface impoundment meeting the minimum technology requirements in accordance with 40 CFR 264.221(c) and 265.221(a) and that is in compliance with 40 CFR Part 264 or 265 Subpart F as applicable (*i.e.*, it has been constructed with two or more liners, and a leachate collection system, and is in compliance with ground water monitoring requirements). On an annual basis, the facility must identify the treatability group and Part 268 Subpart D treatment standard applicable to the contents of the surface impoundment. If the applicable Part 268 Subpart D treatment standard is specified in § 268.42, the contents of the surface impoundment must be treated using the required method.

A request for a variance from the treatment standards, (as specified in § 268.44), set under Part 268 Subpart D may be submitted if in the identification of an applicable Part 268 Subpart D treatability group the response is negative.

The need for treatment depends on the concentration of the hazardous constituents in the waste extract as specified in § 268.41 or on the concentration of the hazardous constituents in the waste itself as specified in § 268.43. Therefore, the facility must analyze the contents of the surface impoundment annually in accordance with § 268.4(a)(2). Impoundment residues that do not meet the applicable Part 268 Subpart D treatment standards (§§ 268.41 or 268.43) must be removed and managed as a restricted waste, and cannot be further treated in a surface impoundment. The options available for management of the restricted waste are as discussed in Sequence 3: Treatment of Restricted Wastes, Sequence 6: No Migration Petition, and Sequence 8: Delisting.

Surface impoundment residues that meet the applicable Part 268 Subpart D treatment standard are exempt from the statutory prohibitions on land disposal. The residue may remain in the impoundment or may be otherwise land disposed in a Subtitle C facility. If the residue remains in the surface impoundment, certification that the hazardous waste complies with the treatment standard must be put in the operating record of the land disposal unit. Residues that are removed and land disposed off-site must be accompanied with the notice and certification as specified in § 268.7(a)(2).

Sequence 10: Change Production Process, Recycle or Don't Produce the Waste



Sequence 10 of the generator's decision-making process represents an opportunity that always presents itself to any generator of hazardous wastes; the decision to change production processes or to recycle wastes so that restricted hazardous wastes are no longer produced. Waste minimization is strongly encouraged.

X. Regulatory Requirements

A. Regulatory Impact Analysis

Executive Order 12291 requires EPA to assess the effect of contemplated Agency actions during the development of regulations. Such an assessment consists of a quantification of the potential benefits and costs of the rule, as well as a description of any beneficial or adverse effects that cannot be quantified in monetary terms.

In addition, Executive Order 12291 requires that regulatory agencies prepare an analysis of the regulatory impact of major rules. Major rules are defined as those likely to result in:

1. An annual cost to the economy of $100 million or more; or

2. A major increase in costs or prices for consumers or individual industries; or

3. Significant adverse effects on competition, employment, investment, productivity, innovation, or international trade.

The Agency has performed an analysis of the rule to assess the economic effect of associated compliance costs. Based on this analysis, EPA has determined that restricting the land disposal of solvent and dioxin wastes will constitute a major rule as defined by Executive Order 12291, because the total annualized cost of this rule is $152.4 million. In consequence, EPA has prepared a regulatory impact analysis of this rule.

The remainder of Unit X describes the economic analysis performed by EPA in support of today's final rule.

1. Cost and Economic Impact Methodology

EPA has assessed the cost and potential economic effects of today's rule and of the major regulatory alternatives. For its analysis of solvent wastes, EPA has examined two alternatives to today's final rule. The first alternative is to codify the statutory prohibition on land disposal of affected wastes. This approach would prohibit the land disposal of all solvent wastes at any concentration. The second approach is to use risk-based screening levels in the development of treatment standards. Costs and benefits of both these alternatives are described in more detail in the regulatory impact analysis of restricting solvents from land disposal.

For dioxin wastes, no less stringent alternative could be examined, because the dioxin listing requires incineration to six 9s DRE or the application of a thermal technology of equivalent performance.

The methodology for establishing total costs and impacts involves three steps. First, EPA estimates the population of facilities and waste management practices which will be affected. Next, total social costs of the regulation are derived by adding costs for individual facilities. Finally, economic impacts on affected facilities are assessed.

a. Affected population and practices. The affected population is the total number of hazardous waste treatment, storage and disposal facilities (TSDFs) and generators land disposing of affected wastes either directly at the generation site or indirectly through the purchase of commercial land disposal services. This group's waste management practices are assessed to identify costs of managing wastes and incremental cost increases attributable to today's rule.

The number of facilities that land dispose of affected wastes was determined using the EPA's 1981 RIA

Mail Survey.[13] Waste quantities and management practices for facilities responding to the Mail Survey are scaled up to represent the national population by means of weighting factors developed for the Survey. EPA estimates that 74 facilities comprise the total national population of commercial and noncommercial facilities land disposing of affected wastes on-site.

EPA estimates that generators sending more than 1,000 kilograms per month of waste off-site for management add an additional 5,511 plants. Generators of less than 1,000 kilograms per month were not included in the 1981 Survey because they were considered exempt at that time.

Because the 1984 RCRA amendments direct EPA to lower the exemption for small quantity generators (SQGs) from 1,000 to 100 kilograms per month by March 31, 1986, SQGs generating between 100 and 1,000 kilograms of waste per month for off-site disposal are also included in the affected population. The Agency estimates that SQGs add 14,400 plants to the affected population. Plant and waste specific data on this group are derived from EPA's Small Quantity Generator Survey.

Current management practices for these groups include the cost of compliance with regulations which have taken effect since 1981. In particular, EPA adjusted waste management practices as reported in 1981 to reflect compliance with the provisions of 40 CFR Part 264 of RCRA. In making this adjustment, the Agency assumes facilities elect the least costly legal methods of compliance.

b. Development of costs. Once waste quantity, type and method of treatment are known for the affected population, EPA estimates costs of compliance for individual facilities. The Agency developed facility-specific costs in two components, which are weighted and then summed to estimate total national costs of the rule. The first component of the total compliance cost is incurred annually for operation and maintenance (O&M) of alternative modes of waste treatment and disposal. The second component of the compliance cost is a capital cost, which is an initial outlay incurred for construction and depreciable assets. Capital costs are restated as annual values using a capital recovery factor based on a real cost of capital of 7 percent. These annualized costs are then added to yearly O&M costs to derive an annual equivalent cost. This is EPA's estimate of the impact of the regulation on annual firm cashflow.

c. Economic Impact Analysis. (1) Non-Commercial TSDFs and SQGs. Economic impacts on non-commercial facilities and SQGs are assessed in several steps. First, a general screening analysis compares facility-specific incremental costs to financial information about firms, disaggregated by Standard Industrial Classification (SIC) and number of employees per facility. This comparison generates two ratios, which are used to identify facilities likely to experience adverse economic effects. The first is a ratio of individual facility compliance costs to costs of production. A change exceeding five percent is considered to imply a substantial adverse economic effect on a facility. The second is a "coverage" ratio, relating cash from operations to cost of compliance. For this ratio, a value of less than 20 is considered to represent a significant adverse impact.

Once facilities experiencing adverse impacts are identified using the two screening ratios, more detailed financial analysis is performed to verify the results and focus more closely on affected firms. For this subset of facilities, the coverage ratio is adjusted to allow a portion of costs to be passed through. Economic effects on facilities are examined assuming product price increases of one and five percent are possible. Those facilities for which the coverage ratio is less than two are considered likely to close.

(2) Commercial TSDFs. Commercial TSDFs are defined here as those facilities which accept fees in exchange for managing wastes generated elsewhere. For this group of facilities, there exists no Census SIC from which to draw financial information. Two SICs which we might use as proxies, 4953 and 4959, do not distinguish between financial data for hazardous waste treatment firms and for firms managing municipal wastes. Consequently, our analysis of economic effects on commercial facilities is qualitative.

(3) Generators of large quantities of wastes. EPA's analysis of the effects of this rule on generating plants disposing of large quantities of affected wastes off-site assumes that commercial facilities can entirely pass on to them the costs of compliance with this regulation in the form of higher prices for waste management services. Because of data limitations in the Mail Survey, EPA has not developed plant-specific waste characterization, treatment methods, and compliance costs for generators, as it has for TSDFs. Our analysis of the economic effects of the rule on this group uses Survey data to develop model plants generating average, maximum and minimum waste quantities. This allows EPA to assess the range of possible effects on generating plants.

2. Costs and Economic Impacts

a. Total costs and economic impacts for solvent wastes. Total annualized compliance costs for facilities currently land disposing of solvent wastes are $147 million. Commercial TSDFs account for 62 percent of this total, while non-commercial TSDFs account for the balance. Although SQGs constitute 72 percent of the total population of TSDFs and generators of solvent waste, they account for only 12 percent of the total costs. These costs are not adjusted for the effect of taxation, which is merely a transfer from one sector of the economy to another. Costs are stated in 1985 dollars.

Economic effects have been assessed for both non-commercial and commercial facilities. Non-commercial facilities are those which do not accept fees in exchange for management and disposal of wastes generated by other plants. Among the 48 non-commercial facilities, twelve appear likely to be significantly affected because of compliance costs imposed by this rule. Based on further analysis, three of these twelve facilities seem likely to close. Employment effects associated with these potential closures amount to 224 jobs lost.

Among commercial facilities (i.e., those which manage the wastes of other firms for a fee) direct effects were impossible to assess due to the lack of any appropriate Standard Industrial Classification code (SIC) from which to draw Census financial data. Therefore, EPA's analysis has assumed that commercial facilities will be able to pass the increased costs of regulatory compliance on to their customers in the form of higher prices. The cost of compliance with today's rule is thus assumed to fall on consumers of commercial hazardous waste management services, and a qualitative assessment of economic effects on commercial facilities is performed.

We estimate that 26 commercial facilities will incur incremental costs as a result of today's final rule. Forty percent of these commercial facilities

[13] EPA conducted the RIA Mail Survey of hazardous waste generators and TSDFs to determine waste management practices in 1981. The survey included both generators of hazardous wastes and facilities treating, storing, or disposing of wastes. Facilities that handled less than 1000 kilograms of waste per month were not regulated in 1981 and thus, are not included in the data. For more information see the "National Survey of Hazardous Waste Generators and Treatment, Storage and Disposal Facilities Regulated under RCRA in 1981," (April 1984).

offer a range of hazardous waste management services, including land-based disposal, storage and treatment. For these facilities, the increased demand this rule will create for more highly-price treatment services may actually increase firm financial viability. For the 27 percent of commercial facilities which offer solely land-based management of restricted wastes, on the other hand, the increased emphasis on treatment prior to land disposal may reduce demand for these services. It was not possible to characterize the remaining 33 percent of commercial facilities based on services offered.

Based on RIA Mail Survey data, the five industrial sectors which send the majority of the solvent waste to each commercial facility have been identified. Actual plants generating these wastes cannot be identified using Mail Survey data. Therefore, EPA examines economic effects on generating plants using model plants generating minimum, maximum and average quantities for each sector identified in the RIA Mail Survey. Ratios of the compliance costs to costs of production, and gross margin to compliance costs are examined for each of the five sectors which sends affected waste to each of these 26 facilities. This procedure is intended to bound the range of economic effects likely to occur among generating plants. Economic effects presented in this unit are based on average waste quantities.

This analysis identifies 98 industrial sectors, representing 5,511 plants, generating solvent waste for off-site commercial management. Of these 5,511 plants, 1,004 may experience significant economic impacts. Among the most adversely affected plants are manufacturers of fabricated metals products (SIC 34). This sector includes 718 significantly affected facilities. Other affected sectors include SIC 33, primary metals products, in which 167 plants may close, and SIC 28, the chemical industry, in which 42 plants may close. Based on further analysis, 79 of these facilities appear likely to close. Job loss associated with these closures amounts to 5,240 jobs in the plating and polishing industry and 187 in the industrial inorganic chemicals industry. Total annualized costs for the 14,400 small quantity generators of solvent wastes are $18 million. Based on the estimated cost for off-site incineration, maximum incremental compliance charges for any individual SQG will not exceed $13,200 annually. Economic ratios were examined for all SQGs in each sector identified in the EPA survey as generating solvent wastes. Based on this examination, EPA identified 975 facilities which may be significantly affected by compliance costs of this rule. On closer examination, no SQGs appeared likely to close as a result of costs imposed by this rule.

b. Total costs and economic impacts for dioxin wastes. Total annualized compliance costs for the approximately 47 non-soil sources of dioxin wastes are $3.2 million. Costs for managing that portion of the estimated 1.1 billion pounds of existing dioxin-contaminated soil for which this regulation will require BDAT treatment are $2.2 million. A preliminary study of dioxin-contaminated soils suggests that only 5 percent of the total quantity will require incineration, and the costs reflect this finding. Ninety-five percent of these soils, EPA estimates, will not be subject to restrictions on land disposal because they will meet the treatment standard.

Economic effects appear most significant for plants in SIC 2869 as a result of the restriction of dioxin wastes. This sector manufactures industrial organic chemicals, with major products such as solvents, noncyclic organics, and polyhydric alcohols. One plant may close as a result of restrictions in this group. Other affected SIC sectors include 2879, in which one plant may close. SIC 2879 includes plants manufacturing pesticides and agricultural chemicals for household and farm use.

3. Benefits and Cost-Effectiveness of the Restrictions Rule

a. Benefits and cost-effectiveness of restricting land disposal of solvent-containing wastes. The Agency performed a benefits analysis that assessed the incremental reductions in human health effects taking into account net changes in risk resulting from the use of alternative solvent waste management practices. Based on this analysis of relative risks, it was determined that substantial reductions in both average and maximum health risks are possible when alternative technologies to land disposing solvent wastes are used. Incineration and distillation of halogenated (F001 and F002) solvent wastes result in substantial reductions in human health risk when compared to disposal of such wastes in land disposal units. Incineration reduces average risks by a minimum of four orders of magnitude from the levels for landfills, a factor that is similarly reflected by the reductions in risk to the most exposed individual (MEI). Risk reductions for halogenated solvent wastes disposed in surface impoundments are also substantial. For the non-halogenated wastes, although risk levels were substantially reduced, the reduction in human health risk were less significant, since initial levels were often below the Acceptable Daily Intake (ADI).

Benefits attributable to the restrictions on solvent wastes have also been assessed by the Agency in another regulatory impact analysis prepared in support of the overall land disposal restrictions program (see "Draft Regulatory Analysis of Proposal Restrictions on Land Disposal of Hazardous Wastes" in the RCRA docket entitled LDR-2). Relevant data on the restricted F001-F005 wastes provided in this analysis may be summed to obtain a total incremental benefit (number of cases of cancer or cancer-equivalence avoided) of 116 cases avoided or annualized benefits for solvents equal to 1.66 cases avoided. Division of the total annualized cost of the solvents land disposal restrictions, $147 million, by the annualized cases avoided, 1.66, determines that the cost of the regulation is $88.7 million per cancer case avoided.

The benefits in both RIA documents discussed above may be underestimated in this analysis because the estimates are based solely on the adverse human health effects resulting from exposure to the solvent constituents in these wastes. Other benefit considerations, specifically environmental benefits, risks from minimization of liner degradation, and risks attributable to mobilization of other toxic constituents land disposed with solvents, were not evaluated. Since the benefits analysis is based only on the toxicity of the solvents themselves, the benefits of the land disposal restrictions for spent solvent wastes may be significantly underestimated.

b. Benefits and cost-effectiveness of restricting land disposal of dioxin-containing wastes. The assessment of risk associated with today's rule depends to a significant degree on assumptions regarding baseline disposal practices and on the population exposed to releases from land disposal. These assumptions and their effect on the benefit estimates are discussed in detail in the supporting RIA (Ref. 9).

Based on the assumptions regarding incineration performances and baseline practices that effectively minimize risks, it appears that reductions in expected health effects would be insignificant for many of the affected dioxin wastes. Baseline MEI risks for some dioxin wastes were high and would be reduced significantly by incineration. The benefits of the rule depend strongly on whether discharge of untreated scrubber water (with undetectable levels of

dioxin) from incinerators are likely to occur and whether spills and run-off from landfill or incineration facilities are likely to result in contamination of surface waters. Such surface water contamination, however, is not expected to occur. Although the rule may not reduce expected levels of health effects for many types of dioxin wastes, it may reduce the uncertainty about potential risks associated with the current regulatory status for dioxins.

Quantification of the incremental benefits for restricting land disposal of dioxin wastes results in a calculated annualized dioxin benefit value of zero cases avoided, though as noted above, this risk estimate is very dependent on assumptions about population exposed and treatment of scrubber waters from incinerators (of which there are currently none), and may significantly underestimate actual risk reductions.

B. Regulatory Flexibility Analysis

Pursuant to the Regulatory Flexibility Act, 5 U.S.C. 601 et seq., whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis which describes the effect of the rule on small entities (i.e., small businesses, small organizations, and small governmental jurisdictions). This analysis is unnecessary, however, if the Administrator certifies that the rule will not have a significant economic effect on a substantial number of small entities.

EPA has examined the rule's potential effect on small business as required by the Regulatory Flexibility Act, and has concluded that this regulation will not have a significant effect on a substantial number of small entities. As a result of this finding, EPA has not prepared a formal Regulatory Flexibility Analysis in support of this rule. The following discussion summarizes the methodology used in the small business analysis and the findings on which the conclusions above are based. More detailed information is available in the documents assembled in the record prepared in support of this rulemaking.

1. Economic Impact on Small Businesses

EPA evaluated the economic effect of today's rule on small businesses, which are defined as those facilities employing fewer than 50 persons. Because of data limitations, this small business analysis excludes generators of large quantities of affected wastes. The universe of small businesses that were examined in the analysis here includes two groups: all TSDFs employing fewer than 50 people, and all SQGs which are also small businesses. Eleven TSDFs are small businesses. None of these exceed threshold values on the cost of production ratio. Twenty-five percent (twelve out of 48) of all non-commercial facilities are expected to experience adverse economic effects.

Of the total of 14,400 small quantity generators examined in this analysis, the vast majority (10,395 or 72 percent) are also small businesses. A total of 58 SQGs (or .6 percent of small businesses SQGs) exceeded threshold values on the cost of production ratio. For the population of small businesses as a whole, less than one percent are likely to be affected.

The small business analysis performed for sources of dioxin wastes revealed that no plants employing fewer than 50 persons experience significant economic effects as a result of costs imposed by this regulation.

2. Certification of Finding That No Regulatory Flexibility Analysis Is Required

This rule was submitted to the Office of Management and Budget (OMB) for review, as required by Executive Order 12291. EPA performed an analysis, described above, to determine whether this rule would impose significant costs on small entities (see U.S. EPA, 1985). Results of the analysis indicate that this rule will not have a significant economic impact on a substantial number of small entities.

Accordingly, I hereby certify that this regulation will not have a significant impact on a substantial number of small entities. Therefore, this regulation does not require a Regulatory Flexibility Analysis.

C. Review of Supporting Documents and Response to Public Comment

1. Review of Supporting Documents

The primary source of information on current land disposal practices and industries affected by restrictions on solvent waste is EPA's 1981 National Survey of Hazardous Waste Generators and Treatment, Storage and Disposal Facilities (referred to in this preamble as the "RIA Mail Survey"). Waste stream characterization data and engineering costs of waste management are based on the Mail Survey and on reports by the Mitre Corporation "Composition of Hazardous Waste Streams Currently Incinerated," (April 1983), and U.S. EPA "The RCRA Risk-Cost Analysis Model," (March 1984). The survey of Small Quantity Generators has been the major source of data on this group. EPA's Office of Research and Development developed estimates of the type and quantity of wastes containing dioxins and meeting the listing definitions for these wastes.

For financial and value of shipment information for the general screening analysis, 1982 Census data was used, adjusted by 1983 Annual Census of Manufactures data. Producer price indices were also used to restate 1983 dollars in 1985 terms.

2. Response to Comments

Several commenters contend that EPA has grossly understated the total costs of this rule because the Agency failed to consider product substitution. In particular, commenters were concerned that some producers of certain inputs to other end products may suffer as downstream manufacturers switch to inputs which generate less hazardous waste.

EPA disagrees with the commenters' statement that the total cost of the rule is understated. In fact, because EPA's analysis does not allow for longer term market adjustments such as product substitution, it overstates total costs. The switch to products and inputs which generate less hazardous waste will undoubtedly cause short-term dislocation and economic hardship, both to the suppliers of highly polluting inputs and to the manufacturers forced by higher waste treatment costs to switch to higher cost inputs.

Other commenters argue that the Agency has not sufficiently balanced cost and risk in designing regulations restricting land disposal. EPA believes that its consideration of costs and benefits has been comprehensive and consistent with Executive Order 12291.

One commenter stated the EPA's assessment that land disposal restrictions on solvent wastes did not constitute a major rule was incorrect. EPA agrees with the commenter. Based on the Agency's reassessment of treatment costs, EPA now considers this final rule to be major by the criteria given in Executive Order 12291.

Another commenter expressed concern that restricted wastes will compete with non-restrictive wastes for alternative capacity. Given the cost differential between direct land disposal, which EPA is prescribing for regulated waste, and treatment through incineration or other treatment technology, it is likely that restricted wastes will use what limited incineration capacity exists.

The commenter correctly points out that the increased demand for waste treatment services may have the effect of driving up the price of these services, thus making it uneconomic for non-

restricted wastes to be treated in BDAT treatments. EPA also believes it likely that alternative capacity will be rationed through the medium of price, and that producers of non-restricted wastes may find the new price prohibitive. This effect of establishing treatment priorities is expected to prevent the use of limited incineration capacity on non-restricted wastes which do not present the environmental dangers associated with restricted wastes.

Finally, some commenters objected that EPA did not consider economic achievability in setting treatment standards. Economic achievability is not a consideration for rulemaking under RCRA.

D. Paperwork Reduction Act

The Paperwork Reduction Act of 1980, 44 U.S.C. 3501 et seq., requires that the information collection requirements of proposed and final rules be submitted to the Office of Management and Budget (OMB) for approval. OMB has approved the information collection requirements contained in this rule and assigned the OMB Control Number 2050–0062

This rule modifies another information collection requirement that has been approved by OMB under the Paperwork Reduction Act and given the number 2050–0012. The appropriate changes to these requirements have been approved by OMB.

XI. References

Background Documents

(1) U.S. EPA. "Background Document for Solvents, to Support Land Disposal Restrictions. Vol. I." U.S. EPA, OSW, Washington, DC, 1986.

(2) U.S. EPA. "Background Document for Solvents, to Support Land Disposal Restrictions, Vol. II." U.S. EPA, OSW, Washington, DC, 1986.

(3) U.S. EPA. "Background Document for Toxicity Characteristic Leaching Procedure: Final TCLP Response to Technical and Procedural Comments Pursuant to the Final Land Disposal Restrictions Rule for Solvents and Dioxins." U.S. EPA, OSW, Washington, DC, 1986.

(4) U.S. EPA. "BDAT Background Document for F001–F005 Spent Solvents." U.S. EPA, OSW, Washington, DC, 1986.

(5) U.S. EPA. "Comparative Risk Case Study for Metal-Bearing Solvent Wastes." U.S. EPA, OSW, Washington, DC, 1986.

(6) U.S. EPA. "Thermal Treatment Background Information, to Support Land Disposal Restrictions." U.S. EPA, OSW, Washington, DC, 1986.

Guidance Documents

(7) U.S. EPA. "Interim Status Surface Impoundments Retrofitting Variances Guidance Document." U.S. EPA, OSW, Washington, DC, EPA/530–SW–86–017, 1986.

(8) U.S. EPA. "Waste Analysis Plans, A Guidance Manual." U.S. EPA, OSW, Washington, DC, 1984.

Regulatory Impact Analysis

(9) U.S. EPA. "Regulatory Analysis of Restrictions on Land Disposal of Certain Dioxin-Containing Wastes." U.S. EPA, OSW, Washington, DC, 1986.

(10) U.S. EPA. "Regulatory Analysis of Restrictions on Land Disposal of Certain Solvent Wastes." U.S. EPA, OSW, Washington, DC, 1986.

Other References

(11) Acurex Corp. "Characterization of Hazardous Waste Incineration Residuals." U.S. EPA, Contract No. 68–03–3241, 1986.

(12) ICF, Inc. "Assessment of Impacts of LDR on Ocean Disposal of Solvents, Dioxins, and California List Wastes." U.S. EPA, OSW, EPA Contract No. 68–01–7259, 1986.

(13) ICF, Inc. "Scoping Analysis for RCRA Section 3005(j)(11)." U.S. EPA, OSW, EPA Contract No. 68–01–6621, 1985.

(14) Industrial Economics. "Regulatory Analysis of Waste-As-Fuel Technical Standards." Prepared for U.S. EPA, OSW, Washington, DC, 1986.

(15) Mitre Corp. "Incineration and Cement Kiln Capacity for Hazardous Waste Treatment." U.S. EPA, OSW, Washington, DC, 1986.

(16) NATO Committee. "NATO–CCMS Pilot Study on Disposal of Hazardous Wastes." Annex V., NATO Committee on the Challenges of Modern Society, Brussels, Belgium, 1981.

(17) Radian Corp. "Follow-Up Survey of Selected Facilities." U.S. EPA, Washington, DC, 1986.

(18) Reed, R.J. *North American Combustion Handbook, 1978.*

(19) U.S. EPA. "Analysis of the Quantity of Waste from CERCLA Actions." Raw Data. U.S. EPA, OERR, Washington, DC, 1986.

(20) U.S. EPA. "Development Document for Effluent Limitations Guidelines and Standards for the Pharmaceutical Manufacturing Point Source Category." U.S. EPA, OW, Washington, DC, EPA/440–1–83/084, pp. 120–130, 1983.

(21) U.S. EPA. "Telephone Verification Survey of Commercial Facilities That Manage Solvents." Compiled by Pope-Reid Assoc. and Radian Corp., U.S. EPA, OSW, Washington, DC, 1986.

(22) U.S. EPA. "RCRA Method 8280 for the Analysis of Polychlorinated Dibenzo-*P*-Dioxins and Polychlorinated Dibenzofurans." U.S. EPA, OSW, Washington, DC, September 15, 1986.

(23) Friedman, Paul (U.S. EPA, Office of Solid Waste), Memorandum entitled "Detection Limit of 8280 in TCLP Leachate." September 26, 1986.

(24) U.S. EPA. "Background Document for Proposed Toxicity Characteristic Leaching Procedure." U.S. EPA, OSW, Washington, DC, March 10, 1986.

List of Subjects in 40 CFR Parts 260, 261, 262, 264, 265, 268, 270, and 271

Administrative practice and procedure, Confidential business information, Environmental protection, Hazardous materials, Hazardous materials transportation, Hazardous waste, Imports, Indian lands, Insurance, Intergovernmental relations, Labeling, Packaging and containers, Penalties, Recycling, Reporting and recordkeeping requirements, Security measures, Surety bonds, Waste treatment and disposal, Water pollution control, Water supply.

Lee M. Thomas,

Administrator.

For reasons set out in the preamble, Chapter I of Title 40 is amended as follows:

PART 260—HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

I. In Part 260:

1. The authority citation for Part 260 continues to read as follows:

Authority: Secs. 1006, 2002(a), 3001 through 3007, 3010, 3014, 3015, 3017, 3018, and 3019, Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912(a), 6921 through 6927, 6930, 6934, 6935, 6937, 6938, and 6939).

§§ 260.1, 260.2, 260.3, 260.10, 260.20 [Amended]

2. By inserting in the first sentence "and 268" after the phrase "Parts 260 through 265" in the following places:

a. 40 CFR 260.1 (a) and (b)(1) through (4).

b. 40 CFR 260.2(a).

c. 40 CFR 260.3 introductory text.

d. 40 CFR 260.1C introductory text.

e. 40 CFR 260.20(a).

§ 260.2 [Amended]

3. In § 260.2, paragraph (b) is amended by inserting "and 268" after the phrase "Parts 260 through 266".

PART 261—IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

II. In Part 261:

1. The authority citation for Part 261 continues to read as follows:

Authority: Secs. 1006, 2002(a), 3001, and 3002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912(a), 6921, and 6922).

§§ 261.1, 261.4, 261.20, 261.30 [Amended]

2. By adding the Part number "268," after the phrase "Parts 262 through 265" in the following places:

a. 40 CFR 261.1(a) introductory text;

b. 40 CFR 261.4(c);

c. 40 CFR 261.20(b); and

d. 40 CFR 261.30(c).

§ 261.1 [Amended]

3. In § 261.1, paragraph (a)(1) is amended by inserting ", 268" after the phrase "Parts 262 through 266".

§ 261.4 [Amended]

4. By removing from paragraph (d)(1) introductory text of § 261.4 the Part number "267" and inserting the Part number "268" in its place.

§ 261.5 [Amended]

5. In § 261.5 paragraphs (b), (c), (e) introductory text, and (f)(2) are amended by inserting ", 268," after the phrase "Parts 262 through 266".

6. In § 261.5 paragraph (g)(2) is amended by inserting ", 268," after the phrase "Parts 263 through 266".

§ 261.6 [Amended]

7. In § 261.6 paragraph (a)(3) introductory text is amended by inserting Part number "268," after the phrase "Part 262 through 266 or Parts".

8. By revising paragraph (c)(1) of § 261.6 to read as follows:

§ 261.6 Requirements for recyclable materials.

* * * * *

(c)(1) Owners or operators of facilities that store recyclable materials before they are recycled are regulated under all applicable provisions of Subparts A through L of Parts 264 and 265, and under Parts 124, 266, 268, and 270 of this Chapter and the notification requirements under section 3010 of RCRA, except as provided in paragraph (a) of this section. (The recycling process itself is exempt from regulation.)

* * * * *

§ 261.7 [Amended]

9. In § 261.7 paragraphs (a) (1)(ii) and (2)(ii) are amended by adding the Part number "268," after the phrase "Parts 261 through 265, or Part".

PART 262—STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

III. In Part 262:

1. The authority citation for Part 262 continues to read as follows:

Authority: Secs. 1006, 2002, 3001, 3002, 3003, 3004, 3005, and 3017 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6906, 6912, 6922 through 6925, and 6937).

Subpart A—General

2. In § 262.11, paragraph (d) is added to read as follows:

§ 262.11 Hazardous waste determination.

* * * * *

(d) If the waste is determined to be hazardous, the generator must refer to Parts 264, 265, 268 of this chapter for possible exclusions or restrictions pertaining to management of his specific waste.

PART 263—STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

IV. In Part 263:

1. The authority citation for Part 263 is revised to read as follows:

Authority: Secs. 2002(a), 3002, 3003, 3004 and 3005 of the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976 and as amended by the Quiet Communities Act of 1978, (42 U.S.C. 6912a, 6922, 6923, 6924, 6925).

Subpart A—General

§ 263.12 [Amended]

2. By inserting ", 268" after the phrase "Parts 270, 264, and 265".

PART 264—STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE AND DISPOSAL FACILITIES

V. In Part 264:

1. The authority citation for Part 264 continues to read as follows:

Authority: Secs. 1006, 2002, 3004, and 3005 of the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912, 6924, and 6925).

Subpart B—General Facility Standards

2. In § 264.13, by revising paragraphs (a)(1) and (b)(6) and adding paragraph (b)(7) to read as follows:

§ 264.13 General waste analysis.

(a)(1) Before an owner or operator treats, stores, or disposes of any hazardous waste, he must obtain a detailed chemical and physical analysis of a representative sample of the waste. At a minimum, this analysis must contain all the information which must be known to treat, store, or dispose of the waste in accordance with the requirements of this part of Part 268 of this chapter or with the conditions of a permit issued under Part 270 and Part 124 of this chapter.

* * * * *

(b) * * *

(6) Where applicable, the methods which will be used to meet the additional waste analysis requirements for specific waste management methods as specified in §§ 264.17, 264.314, 264.341 and 268.7 of this chapter.

(7) For surface impoundments exempted from land disposal restrictions under § 268.4(a), the procedures and schedules for:

(i) The sampling of impoundment contents;

(ii) The analysis of test data; and,

(iii) The annual removal of residue which does not meet the standards of Part 268 Subpart D of this chapter.

* * * * *

Subpart E—Manifest System, Recordkeeping, and Reporting

3. In § 264.73, by revising paragraph (b)(3) and adding paragraphs (b)(10) through (b)(14) to read as follows:

§ 264.73 Operating record.

* * * * *

(b) * * *

(3) Records and results of waste analyses performed as specified in §§ 264.13, 264.17, 264.314, 264,341, 268.4(a), and 268.7 of this chapter.

* * * * *

(10) Records of the quantities (and date of placement) for each shipment of hazardous waste placed in land disposal units under an extension to the effective date of any land disposal restriction granted pursuant to § 268.5 or a petition pursuant to § 268.6, and the notice required by a generator under § 268.7(a)(3);

(11) For an off-site treatment facility, a copy of the notice required by a generator under § 268.7(a)(1);

(12) For an on-site treatment facility, the information contained in the notice required by a generator under § 268.7(a)(1), except for the manifest number;

(13) For an off-site land disposal facility, a copy of the notice and certification required by the owner or operator of a treatment facility under § 268.7(b) (1) and (2), or a copy of the notice and certification required by the generator under § 268.7(a)(2), whichever is applicable; and

(14) For an on-site land disposal facility, the information contained in the notice required undeer § 268.7(a)(2), except for the manifest number, or the information contained in the notice required by a treater under § 268.7(b)(1), except for the manifest number, whichever is applicable.

(Approved by Office of Management and Budget under control number 2050–0012)

PART 265—INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT STORAGE AND DISPOSAL FACILITIES

VI. In Part 265:

1. The authority citation for Part 265 continues to read as follows:

Authority: Secs. 1006, 2002(a), 3004, 3005 and 3015 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912,(a), 6924, 6925, and 6935).

Subpart B—General Facility Standards

2. In § 265.13, paragraphs (a)(1) and (b)(6) are revised and paragraph (b)(7) is added to read as follows:

§ 265.13 General waste analysis.

(a)(1) Before an owner or operator treats, stores, or disposes of any hazardous waste, he must obtain a detailed chemical and physical analysis of a representative sample of the waste. At a minimum, this analysis must contain all the information which must be known to treat, store, or dispose of the waste in accordance with the requirements of this part and Part 268 of this chapter.

* * * * *

(b) * * *

(6) Where applicable, the methods which will be used to meet the additional waste analysis requirements for specific waste management methods as specified in §§ 265.193, 265.225, 265.252, 265.273, 265.314, 265.341, 265.375, 265.402 and 268.7 of this chapter.

(7) For surface impoundments exempted from land disposal restrictions under § 268.4(a) of this chapter, the procedures and schedule for:

(i) The sampling of impoundment contents;

(ii) The analysis of test data; and,

(iii) The annual removal of residue which does not meet the standards of Part 268 Subpart D of this chapter.

Subpart E—Manifest System, Recordkeeping, and Reporting

3. In § 265.73, by revising paragraph (b)(3) and adding paragraphs (b)(8) through (b)(12) to read as follows:

§ 265.73 Operating record.

* * * * *

(b) * * *

(3) Records and results of waste analysis and trial tests performed as specified in §§ 265.13, 265.193, 265.225, 265.252, 265.273, 265.314, 265.341, 265.375, 265.402, 268.4(a) and 268.7 of this chapter.

* * * * *

(8) Records of the quantities (and date of placement) for each shipment of hazardous waste placed in land disposal units under an extension to the effective date of any land disposal restriction granted pursuant to § 268.5, or a petition pursuant to § 268.6 and the notice required by a generator under § 268.7(a)(3).

(9) For an off-site treatment facility, the notice required by a generator under § 268.7(a)(1);

(10) For an on-site treatment facility the information contained in the notice required by a generator under § 268.7(a)(1), except for the manifest number.

(11) For an off-site land disposal facility, the notice and certification required by the owner or operator of a treatment facility under § 268.7(b) or the certification required by the generator under § 268.7(a)(2), whichever is applicable;

(12) For an on-site land disposal facility, the information contained in the notice required by a generator under § 268.7(a)(2), except for the manifest number, or the information contained in the notice required by the treatment facility under § 268.7(b)(2), except for the manifest number, whichever is applicable.

(Approved by Office of Management and Budget under control number 2050-0012)

PART 268—LAND DISPOSAL RESTRICTIONS

VII. In Part 268:

1. The authority citation for Part 268 continues to read as follows:

Authority: Secs. 1006, 2002(a), 3001, and 3004 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912(a), 6921, and 6924).

2. By adding Subparts A, C, D, and E to Part 268 to read as follows:

Subpart A—General

* * * * *

Subpart C—Prohibitions on Land Disposal

Subpart D—Treatment Standards

Subpart E—Prohibitions on Storage

Subpart A—General

§ 268.1 Purpose, scope and applicability.

(a) This part identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise prohibited waste may continue to be land disposed.

(b) Except as specifically provided otherwise in this part or Part 261 of this chapter, the requirements of this part apply to persons who generate or transport hazardous waste and owners and operators of hazardous waste treatment, storage, and disposal facilities.

(c) Prohibited wastes may continue to be land disposed as follows:

(1) Persons have been granted an extension from the effective date of a prohibition pursuant to § 268.5, with respect to those wastes covered by the extension;

(2) Persons have been granted an exemption from a prohibition pursuant to a petition under § 268.6, with respect to those wastes and units covered by the petition; or

(3) Until November 8, 1988, land disposal of contaminated soil or debris resulting from a response action taken under section 104 or 106 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 or a corrective action required under the Resource Conservation and Recovery Act.

(4) Small quantity generators of less than 100 kilograms of hazardous waste per month, as defined in § 261.5 of this chapter.

§ 268.2 Definitions applicable to this part.

(a) When used in this part the following terms have the meanings given below:

"Hazardous constituent or constituents" means those constituents listed in Appendix VIII to Part 261 of this chapter.

"Land disposal" means placement in or on the land and includes, but is not limited to, placement in a landfill, surface impoundment, waste pile, injection well, land treatment facility,

salt dome formation, salt bed formation, underground mine or cave, concrete vault or bunker intended for disposal purposes, and placement in or on the land by means of open detonation and open burning where the residues continue to exhibit one or more of the characteristics of hazardous waste. The term "land disposal" does not encompass ocean disposal.

(b) All other terms have the meanings given under §§ 260.10, 261.2, 261.3, or 270.2 of this chapter.

§ 268.3 Dilution prohibited as a substitute for treatment.

No generator, transporter, handler, or owner or operator of a treatment, storage, or disposal facility shall in any way dilute a restricted waste or the residual from treatment of a restricted waste as a substitute for adequate treatment to achieve compliance with Subpart D of this part.

§ 268.4 Treatment surface impoundment exemption.

(a) The requirements of this part do not apply to persons treating hazardous wastes in a surface impoundment or series of impoundments provided that:

(1) Treatment of such wastes occurs in the impoundment;

(2) The residues of the treatment are analyzed, as specified in § 268.7, to determine if they meet the applicable treatment standards in § 268.41. The sampling method, specified in the waste analysis plan under § 264.13 or § 265.13, must be designed such that representative samples of the sludge and the supernatant are tested separately rather than mixed to form homogeneous samples. The treatment residues (including any liquid waste) that do not meet the treatment standards promulgated under Subpart D of this part, or are not delisted under § 260.22 of this chapter, must be removed at least annually. These residues may not be placed in any other surface impoundment for subsequent management. If the volume of liquid flowing through the impoundment or series of impoundments annually is greater than the volume of the impoundment or impoundments, this flow-through constitutes removal of the supernatant for the purpose of this requirement. The procedures and schedule for the sampling of impoundment contents, the analysis of test data, and the annual removal of residue which does not meet the Subpart D treatment standards must be specified in the facility's waste analysis plan as required under §§ 264.13 or 265.13 of this chapter;

(3) The impoundment must meet the design requirements of § 264.221(c) or § 265.221(a) of this chapter, regardless that the unit may not be new, expanded, or a replacement, and be in compliance with applicable ground water monitoring requirements of Subpart F of Part 264 or Part 264 of this chapter unless:

(i) Exempted pursuant to § 264.221 (d) or (e) of this chapter, or to § 265.221 (c) or (d) of this chapter; or,

(ii) Upon application by the owner or operator, the Administrator has granted a waiver of the requirements on the basis that the surface impoundment:

(A) Has at least one liner, for which there is no evidence that such liner is leaking;

(B) Is located more than one-quarter mile from an underground source of drinking water; and

(C) Is in compliance with generally applicable ground water monitoring requirements for facilities with permits; or,

(iii) Upon application by the owner or operator, the Administrator has granted a modification to the requirements on the basis of a demonstration that the surface impoundment is located, designed, and operated so as to assure that there will be no migration of any hazardous constituent into ground water or surface water at any future time.

(4) The owner or operator must submit to the Regional Administrator a written certification that the requirements of § 268.4(a)(3) have been met and submits a copy of the waste analysis plan required under § 268.4(a)(2). The following certification is required:

I certify under penalty of law that the requirements of 40 CFR 268.4(a)(3) have been met for all surface impoundments being used to treat restricted wastes. I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

§ 268.5 Procedures for case-by-case extensions to an effective date.

(a) Any person who generates, treats, stores, or disposes of a hazardous waste may submit an application to the Administrator for an extension to the effective date of any applicable restriction established under Subpart C of this Part. The applicant must demonstrate the following:

(1) He has made a good-faith effort to locate and contract with treatment, recovery, or disposal facilities nationwide to manage his waste in accordance with the effective date of the applicable restriction established under Subpart C of this Part;

(2) He has entered into a binding contractual commitment to construct or otherwise provide alternative treatment, recovery (e.g., recycling), or disposal capacity that meets the treatment standards specified in Subpart D;

(3) Due to circumstances beyond the applicant's control, such alternative capacity cannot reasonably be made available by the applicable effective date. This demonstration may include a showing that the technical and practical difficulties associated with providing the alternative capacity will result in the capacity not being available by the applicable effective date;

(4) The capacity being constructed or otherwise provided by the applicant will be sufficient to manage the entire quantity of waste that is the subject of the application;

(5) He provides a detailed schedule for obtaining required operating and construction permits on an outline of how and when alternative capacity will be available;

(6) He has arranged for adequate capacity to manage his waste during an extension and has documented in the application the location of all sites at which the waste will be managed; and

(7) Any waste managed in a surface impoundment or landfill during the extension period will meet the requirements of paragraph (h)(2) of this section.

(b) An authorized representative signing an application described under paragraph (a) of this section shall make the following certification:

I certify under penalty of law that I have personally examined and that I am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

(c) After receiving an application for an extension, the Administrator may request any additional information which he deems as necessary to evaluate the application.

(d) An extension will apply only to the waste generated at the individual facility covered by the application and will not apply to restricted waste from any other facility.

(e) On the basis of the information referred to in paragraph (a) of this section, after notice and opportunity for comment, and after consultation with appropriate State agencies in all affected States, the Administrator may grant an extension of up to 1 year from

the effective date. The Administrator may review this extension for up to 1 additional year upon the request of the applicant if the demonstration required in paragraph (a) of this section can still be made. In no event will an extension extend beyond 24 months from the applicable effective date specified in Subpart C of Part 268. The length of any extension authorized will be determined by the Administrator based on the time required to construct or obtain the type of capacity needed by the applicant as described in the completion schedule discussed in paragraph (a)(5) of this section. The Administrator will give public notice of the intent to approve or deny a petition and provide an opportunity for public comment. The final decision on a petition will be published in the **Federal Register.**

(f) Any person granted an extension under this section must immediately notify the Administrator as soon as he has knowledge of any change in the conditions certified to in the application.

(g) Any person granted an extension under this section shall submit written progress reports at intervals designated by the Administrator. Such reports must describe the overall progress made toward constructing or otherwise providing alternative treatment, recovery or disposal capacity; must identify any event which may cause or has caused a delay in the development of the capacity; and must summarize the steps taken to mitigate the delay. The Administrator can revoke the extension at any time if the applicant does not demonstrate a good-faith effort to meet the schedule for completion, if the Agency denies or revokes any required permit, if conditions certified in the application change, or for any violation of this chapter.

(h) Whenever the Administrator establishes an extension to an effective date under this section, during the period for which such extension is in effect:

(1) The storage restrictions under § 268.50(a)(1) do not apply; and

(2) Such hazardous waste may be disposed of at a facility only if each new landfill or surface impoundment unit, each replacement of an existing landfill or surface impoundment unit, and each lateral expansion of an existing landfill or surface impoundment unit at the facility is in compliance with the following requirements:

(i) The landfill, if the interim status, is in compliance with the requirements of Subpart F of Part 265 and § 265.301 (a), (c), and (d) of this chapter; or,

(ii) The landfill, if permitted, is compliance with the requirements of Subpart F of Part 264 and § 264.301 (c), (d) and (e) of this chapter;

(iii) The surface impoundment, if in interim status, is in compliance with the requirements of Subpart F of Part 265 and § 265.221 (a), (c), and (d) of this chapter regardless that the unit is not new, expanded or a replacement; or,

(iv) The surface impoundment, if permitted, is in compliance with the requirements of Subpart F of Part 264 and § 264.221 (c), (d) and (e) of this chapter.

(j) Pending a decision on the application the applicant is required to comply with all restrictions on land disposal under this part once the effective date for the waste has been reached.

(Approved by the Office of Management and Budget under control number 2050–0062)

§ 268.6 Petitions to allow land disposal of a waste prohibited under Subpart C of Part 268.

(a) Any person seeking an exemption from a prohibition under Subpart C of this part for the disposal of a restricted hazardous waste in a particular unit or units must submit a petition to the Administrator demonstrating, to a reasonable degree of certainty, that there will be no migration of hazardous constituents from the disposal unit or injection zone for as long as the wastes remain hazardous. The demonstration must include the following components:

(1) An identification of the specific waste and the specific unit for which the demonstration will be made;

(2) A waste analysis to describe fully the chemical and physical characteristics of the subject waste;

(3) A comprehensive characterization of the disposal unit site including an analysis of background air, soil, and water quality.

(b) The demonstration referred to in paragraph (a) of this section must meet the following criteria:

(1) All waste and environmental sampling, test, and analysis data must be accurate and reproducible to the extent that state-of-the-art techniques allow;

(2) All sampling, testing, and estimation techniques for chemical and physical properties of the waste and all environmental parameters must have been approved by the Administrator;

(3) Simulation models must be calibrated for the specific waste and site conditions, and verified for accuracy by comparison with actual measurements;

(4) A quality assurance and quality control plan that addresses all aspects of the demonstration must be approved by the Administrator; and,

(5) An analysis must be performed to identify and quantify any aspects of the demonstration that contribute significantly to uncertainty. This analysis must include an evaluation of the consequences of predictable future events, including, but not limited to, earthquakes, floods, severe storm events, droughts, or other natural phenomena.

(c) Each petition must be submitted to the Administrator.

(d) Each petition must include the following statement signed by the petitioner or an authorized representative:

I certify under penalty of law that I have personally examined and an familiar with the information submitted in this petition and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

(e) After receiving a petition, the Administrator may request any additional information that reasonably may be required to evaluate the demonstration.

(f) If approved, the petition will apply to land disposal of the specific restricted waste at the individual disposal unit described in the demonstration and will not apply to any other restricted waste at that disposal unit, or to that specific restricted waste at any other disposal unit.

(g) The Administrator will give public notice in the **Federal Register** of the intent to approve or deny a petition and provide an opportunity for public comment. The final decision on a petition will be published in the **Federal Register.**

(h) The term of a petition granted under this section shall be no longer than the term of the RCRA permit if the disposal unit is operating under a RCRA permit, or up to a maximum of 10 years from the date of approval provided under paragraph (g) of this section if the unit is operating under interim status. In either case, the term of the granted petition shall expire upon the termination or denial of a RCRA permit, or upon the termination of interim status or when the volume limit of waste to be land disposed during the term of petition is reached.

(i) Prior the Administrator's decision, the applicant is required to comply with all restrictions on land disposal under this part once the effective date for the waste has been reached.

(j) The petition granted by the Administrator does not reliveve the petitioner of his responsibilities in the management of hazardous waste under 40 CFR Part 260 through Part 271.

(Approved by the Office of Management and Budget under control number 2050–0062)

§ 268.7 Waste analysis.

(a) The generator must test his waste or an extract developed using the test method described in Appendix I of this part, or using knowledge of the waste to determine if the waste is restricted from land disposal under this part.

(1) If a generator determines that he is managing a restricted waste under this part and the waste requires treatment prior to land disposal, for each shipment of waste the generator must notify the treatment facility in writing of the appropriate treatment standard set forth in Subpart D of this part. The notice must include the following information:

(i) EPA Hazardous Waste Number;

(ii) The corresponding treatment standard;

(iii) The manifest number associated with the shipment of waste; and

(iv) Waste analysis data, where available.

(2) If a generator determines that he is managing a restricted waste under this part, and determines that the waste can be land disposed without further treatment, for each shipment of waste he must submit, to the land disposal facility, a notice and a certification stating that the waste meets applicable treatment standards.

(i) The notice must include the following information:

(A) EPA Hazardous Waste Number;

(B) The corresponding treatment standard;

(C) The manifest number associated with the shipment of waste;

(D) Waste analysis data, where available.

(ii) The certification must be signed by an authorized representative and must state the following:

I certify under penalty of law that I personally have examined and am familiar with the waste through analysis and testing or through knowledge of the waste to support this certification that the waste complies with the treatment standards specified in 40 CFR Part 268 Subpart D. I beleive that the information I submitted is true, accurate and complete. I am aware that there are significant penalties for submitting a false certification, including the possibility of a fine and imprisonment.

(3) If a generator's waste is subject to a case-by-case extension under § 268.5, a petition under § 268.6, or a nationwide variance under Subpart C, he must forward a notice to the land disposal facility receiving his waste, stating that the waste is exempt from the land disposal restrictions.

(b) For wastes with treatment standards expressed as concentrations in the waste extract (§ 268.41), the owner or operator of the treatment facility must test the treatment residues according to the waste analysis plan under §§ 264.13 or 265.13, or an extract development using the test method described in Appendix I of this part to assure that the treatment residues extract meet the applicable treatment standards.

(10) A notice must be sent to the land disposal facility which includes the following information:

(i) EPA Hazardous Waste Number;

(ii) The corresponding treatment standard:

(iii) The manifest number associated with the shipment of waste; and

(iv) Waste analysis data, where available.

(2) The treatment facility must submit a certification for each shipment of waste or treatment residue of a restricted waste to the land disposal facility stating that the waste or treatment residue has been treated to the performance standards specificed in Subpart D.

(i) For wastes with treatment standards expressed as concentrations in the waste extract or in the waste (§§ 268.41 or 268.43), the certification must be signed by an authorized representative and must state the following:

I certify under penalty of law that I have personally examined and am familiar with the treatment technology and operation of the treatment process used to support this certification and that, based on my inquiry of those individuals immediately responsible for obtaining this information, I believe that the treatment process has been operated and maintained properly so as to achieve the performance levels specified in 40 CFR Part 268 Subpart D without dilution of the prohibited waste. I am aware that there are significant penalties for submitting a false certification, including the possibility of fine and imprisonment.

(ii) For wastes with treatment standards expressed as technologies (§ 268.42), the certification must be signed by an authorized representative and must state the following:

I certify under penalty of law that the waste has been treated in accordance with the requirements of 40 CFR 268.42. I am aware that there are signficant penalties for submitting a false certification, including the possibility of fine and imprisonment.

(c) The owner or operator of any land disposal facility accepting any waste subject to restrictions under this part must have records of the notice and certification specified in either pargraph (a) or (b) of this section and obtain waste analysis data through testing of the waste to determine that the wastes are in compliance with the applicable treatment standards in § 268.41.

(Approved by the Office of Management and Budget under control number 2050–0062)

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Subpart C—Prohibitions on Land Disposal

§ 268.30 Waste specific prohibitions—Solvent wastes.

(a) Effective November 8, 1986, the spent solvent wastes specified in 40 CFR 261.31 as EPA Hazardous Waste Nos. F001, F002, F003, F004, and F005, are prohibited from land disposal (except in an injection well) unless one or more of the following conditions apply:

(1) The generator of the solvent waste is a small quantity generator of 100–1000 kilograms of hazardous waste per month; or

(2) The solvent waste is generated from any response action taken under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) or any corrective action taken under the Resource Conservation and Recovery Act (RCRA), except where the waste is contaminated soil or debris not subject to the provisions of this chapter until November 8, 1988; or

(3) The solvent waste is a solvent-water mixture, solvent-containing sludge, or solvent-contaminated soil (non-CERCLA or RCRA corrective action) containing less than 1 percent total F001–F005 solvent constituents listed in Table CCWE of § 268.41 of this part.

(b) Effective November 8, 1988, the F001–F005 solvent wastes listed in paragraphs (a) (1), (2), and (3) of this section are prohibited from land disposal. Between November 8, 1986, and November 8, 1988, wastes included in paragraphs (a) (1), (2), and (3) of this section may be disposed of in a landfill or surface impoundment only if the facility is in compliance with the requirements specified in § 268.5(h)(2).

(c) The requirements of paragraphs (a) and (b) of this section do not apply if:

(1) The wastes are treated to meet the standards of Subpart D of this part; or

(2) The wastes are disposed at a facility that has been granted a petition under § 268.6; or

(3) An extension has been granted under § 268.5.

§ 268.31 Waste specific prohibitions—Dioxin—containing wastes.

(a) Effective November 8, 1988, the dioxin-containing wastes specified in 40 CFR 261.31 as EPA Hazardous Waste Nos. F020, F021, F023, F026, F027, and F028, are prohibited from land disposal.

(b) The requirements of paragraph (a) of this section do not apply if:

(1) The wastes are treated to meet the standards of Subpart D of this part; or,

(2) The wastes are disposed at a facility that has been granted a petition under § 268.6; or

(3) An extension has been granted under § 268.5.

(c) Between November 8, 1986, and November 8, 1988, wastes included in paragraph (a) of this section may be disposed of in a landfill or surface impoundment only if the facility is in compliance with the requirements specified in § 268.5(h)(2).

Subpart D—Treatment Standards

§ 268.40 Applicability of treatment standards.

A restricted waste identified in this subpart may be land disposed without further treatment only if an extract of the waste or of the treatment residual of the waste developed using the test method of Appendix I of this part does not exceed the value shown in Table CCWE of § 268.41 for any hazardous constituent listed in Table CCWE for that waste. A restricted waste for which a treatment technology is specified under § 268.42(a) may be land disposed after it is treated using that specified technology or an equivalent treatment method approved by the Administrator under the procedures set forth in § 268.42(b).

§ 268.41 Treatment Standards expressed as concentrations in waste extract.

(a) Table CCWE identifies the restricted wastes and the concentrations of their associated hazardous constituents which may not be exceeded by the extract of a waste treatment residual developed using the test method in Appendix I of this part for the allowable land disposal of such waste. (Appendix II of this part provides Agency guidance on treatment methods that have been shown to achieve the Table CCWE levels for the respective wastes. Appendix II is not a regulatory requirement but is provided to assist generators and owners/operators in their selection of appropriate treatment methods.)

TABLE CCWE—CONSTITUENT IN WASTE EXTRACT

F001—F005 spent solvents	Concentration (in mg/l)	
	Wastewaters containing spent solvents	All other spent solvent wastes
Acetone	0.05	0.59
n-Butyl alcohol	5.0	5.0
Carbon disulfide	1.05	4.81
Carbon tetrachloride	.05	.96
Chlorobenzene	.15	.05
Cresols (and cresylic acid)	2.82	.75
Cyclohexanone	.125	.75
1,2-dichlorobenzene	.65	.125
Ethyl acetate	.05	.75
Ethyle benzene	.05	.053
Ethyl ether	.05	.75
Isobutanol	5.0	5.0
Methanol	.25	.75
Methylene chloride	.20	.96
Methylene chloride (from the pharmaceutical industry	12.7	.96
Methyl ethyl ketone	0.05	0.75
Methyl isobutyl ketone	0.05	0.33
Nitrobenzene	0.66	0.125
Pyridine	1.12	0.33
Tetrachloroethylene	0.079	0.05
Toluene	1.12	0.33
1,1,1-Trichloroethane	1.05	0.41
1,2,2-Trichloro-1,2,2-trifluroethane	1.05	0.96
Trichloroethylene	0.062	0.091
Trichlorofluoromethane	0.05	0.96
Xylene	0.05	0.15

F020–F023 and F026–F028 dioxin containing wastes	Concentration
HxCDD—All Hexachlorodibenzo-p-dioxins	< 1 ppb
HxCDF—All Hexachlorodibenzofurans	< 1 ppb
PeCDD—All Pentachlorodibenzo-p-dioxins	< 1 ppb
PeCDF—All Pentachlorodibenzofurans	< 1 ppb
TCDD—All Tetrachlorodibenzo-p-dioxins	< 1 ppb
TCDF—All Tetrachlorodibenzofurans	< 1 ppb
2,4,5-Trichlorophenol	< 0.05 ppm
2,4,6-Trichlorophenol	< 0.05 ppm
2,3,4,6-Tetrachlorophenol	< 0.10 ppm
Pentachlorophenol	< 0.01 ppm

(b) When wastes with differing treatment standards for a constituent of concern are combined for purposes of treatment, the treatment residue must meet the lowest treatment standard for the constituent of concern.

§ 268.42 Treatment standards expressed as specified technologies.

(a) The following wastes must be treated using the identified technology or technologies, or an equivalent method approved by the Administrator.

(1) [Reserved]

(b) Any person may submit an application to the Administrator demonstrating that an alternative treatment method can achieve a level of performance equivalent to that achieved by methods specified in paragraph (a) of this section. The applicant must submit information demonstrating that his treatment method will not present an unreasonable risk to human health or the environment. On the basis of such information and any other available information, the Administrator may approve the use of the alternative treatment method if he finds that the alternative treatment method provides a level of performance equivalent to that achieved by methods specified in paragraph (a) of this section. Any approval must be stated in writing and may contain such provisions and conditions as the Administrator deems appropriate. The person to whom such certification is issued must comply with all limitations contained in such determination.

§ 268.43 Treatment standards expressed as waste concentrations. [Reserved]

§ 268.44 Variance from a treatment standard.

(a) Where the treatment standard is expressed as a concentration in a waste or waste extract and a waste cannot be treated to the specified level, or where the treatment technology is not appropriate to the waste, the generator or treatment facility may petition the Administrator for a variance from the treatment standard. The petitioner must demonstrate that because the physical or chemical properties of the waste differs significantly from wastes analyzed in developing the treatment standard, the waste cannot be treated to specified levels or by the specified methods.

(b) Each petition must be submitted in accordance with the procedures in § 260.20.

(c) After receiving a petition for variance from a treatment standard, the Administrator may request any additional information or samples which he may require to evaluate the petition. Additional copies of the complete petition may be requested as needed to send to affected states and Regional Offices.

(e) The Administrator will give public notice in the **Federal Register** of the intent to approve or deny a petition and provide an opportunity for public comment. The final decision on a variance from a treatment standard will be published in the **Federal Register.**

(f) A generator, treatment facility, or disposal facility that is managing a waste covered by a variance from the treatment standards must comply with the waste analysis requirements for restricted wastes found under § 268.7.

(g) During the petition review process, the applicant is required to comply with all restrictions on land disposal under this part once the effective date for the waste has been reached.

Subpart E—Prohibitions on Storage

§ 268.50 Prohibitions on storage of restricted wastes.

(a) Except as provided for in paragraph (b) of this section, the storage

of hazardous wastes restricted from land disposal under Subpart C of this Part is prohibited, unless the following conditions are met:

(1) A generator stores such wastes on-site solely for the purpose of the accumulation of such quantities of hazardous waste as necessary to facilitate proper recovery, treatment, or disposal and the generator complies with the requirements in § 262.34 of this chapter. (A generator who is in existence on the effective date of a regulation under this part and who must store hazardous wastes for longer than 90 days due to the regulations under this Part becomes an owner/operator of a storage facility and must obtain a RCRA permit. Such a facility may qualify for interim status upon compliance with the regulations governing interim status under 40 CFR 270.70).

(2) An owner/operator of a hazardous waste treatment, storage, or disposal facility stores such wastes solely for the purpose of the accumulation of such quantities of hazardous waste as necessary to facilitate proper recovery, treatment, or disposal provided that each container or tank is clearly marked to identify its contents and the date it entered storage.

(3) A transporter may store manifested shipments of such wastes at a transfer facility for 10 days or less.

(b) An owner/operator of a treatment, storage or disposal facility may store such wastes for up to one year unless the Agency can demonstrate that such storage was not solely for the purpose of accumulation of such quantities of hazardous waste as are necessary to facilitate proper recovery, treatment, or disposal.

(c) A owner/operator of a treatment, storage or disposal facility may store such wastes beyond one year; however, the owner/operator bears the burden of proving that such storage was solely for the purpose of accumulation of such quantities of hazardous waste as are necessary to facilitate proper recovery, treatment, or disposal.

(d) The prohibition in paragraph (a) of this section does not apply to the wastes which are the subject of an approved petition under § 268.6 or an approved case-by-case extension under § 268.5.

(e) The prohibition in paragraph (a) of this section does not apply to hazardous wastes that meet the treatment standards specified under §§ 268.41, 268.42 and 268.43 or the treatment standards specified under the variance in § 268.44.

Appendix I to Part 268—Toxicity Characteristic Leaching Procedure (TCLP)

1.0 SCOPE AND APPLICATION

1.1 The TCLP is designed to determine the mobility of both organic and inorganic contaminants present in liquid, solid, and multiphasic wastes.

1.2 If a total analysis of the waste demonstrates that individual contaminants are not present in the waste, or that they are present but at such low concentrations that the appropriate regulatory thresholds could not possibly be exceeded, the TCLP need not be run.

2.0 SUMMARY OF METHOD (see Figure 1)

2.1 For liquid wastes (i.e., those containing insignificant solid material), the waste, after filtration through a 0.6- to 0.8-um glass fiber filter, is defined as the TCLP extract.

2.2 For wastes comprised of solids or for wastes containing significant amounts of solid material, the particle-size of the waste is reduced (if necessary), the liquid phase, if any, is separated from the solid phase and stored for later analysis. The solid phase is extracted with an amount of extraction fluid equal to 20 times the weight of the solid phase. The extraction fluid employed is a function of the alkalinity of the solid phase of the waste. A special extractor vessel is used when testing for volatiles (See Table 1). Following extraction, the liquid extract is separated from the solid phase by 0.6- to 0.8-um glass fiber filter filtration.

2.3 If compatible (i.e., multiple phases will not form on combination), the initial liquid phase of the waste is added to the liquid extract, and these liquids are analyzed together. If incompatible, the liquids are analyzed separately and the results are mathematically combined to yield a volume-weighted average concentration.

3.0 INTERFERENCES

3.1. Potential interferences that may be encountered during analysis are discussed in the individual analytical methods.

4.0 APPARATUS AND MATERIALS

4.1 *Agitation apparatus:* An acceptable agitation apparatus is one which is capable of rotating the extraction vessel in an end-over-end fashion (See Figure 2) at 30 ± 2 rpm. Suitable devices known to EPA are identified in Table 2.

4.2 *Extraction Vessel:*

4.2.1 Zero-Headspace Extraction Vessel (ZHE). This device is for use *only* when the waste is being tested for the mobility of volatile constituents (see Table 1). The ZHE is an extraction vessel that allows for liquid/solid separation within the device, and which effectively precludes headspace (as depicted in Figure 3). This type of vessel allows for initial liquid/solid separation, extraction, and final extract filtration without having to open the vessel (see Step 4.3.1). These vessels shall have an internal volume of 500 to 600 mL and be equipped to accommodate a 90-mm filter. Suitable ZHE devices known to EPA are identified in Table 3. These devices contain viton O-rings which should be replaced frequently.

For the ZHE to be acceptable for use, the piston within the ZHE should be able to be moved with approximately 15 psi or less. If it takes more pressure to move the piston, the O-rings in the device should be replaced. If this does not solve the problem, the ZHE is unacceptable for TCLP analyses and the manufacturer should be contacted.

The ZHE should be checked after every extraction. If the device contains a built-in pressure gauge, pressurize the device to 50 psi, allow it to stand unattended for 1 hour, and recheck the pressure. If the device does not have a built-in pressure gauge, pressurize the device to 50 psi, submerge it in water, and check for the presence of air bubbles escaping from any of the fittings. If pressure is lost, check all fittings and inspect and replace O-rings, if necessary. Retest the device. If leakage problems cannot be solved, the manufacturer should be contacted.

4.2.2 When the waste is being evaluated for other than volatile contaminants, an extraction vessel that does not preclude headspace (e.g., a 2-liter bottle) is used. Suitable extraction vessels include bottles made from various materials, depending on the contaminants to be analyzed and the nature of the waste (see Step 4.3.3). It is recommended that borosilicate glass bottles be used over other types of glass, especially when inorganics are of concern. Plastic bottles may be used only if inorganics are to be investigated. Bottles are available from a number of laboratory suppliers. When this type of extraction vessel is used, the filtration device discussed in Step 4.3.2 is used for initial liquid/solid separation and final extract filtration.

4.2.3 Some ZHEs use gas pressure to actuate the ZHE piston, while others use mechanical pressure (see Table 3). Whereas the volatiles procedure (see Section 9.0) refers to pounds-per-square inch (psi), for the mechanically actuated piston, the pressure applied is measured in torque-inch-pounds. Refer to the manufacturer's instructions as to the proper conversion.

4.3 *Filtration Devices:* It is recommended that all filtrations be performed in a hood.

4.3.1 Zero-Headspace Extractor Vessel (see Figure 3): When the waste is being evaluated for volatiles, the zero-headspace extraction vessel is used for filtration. The device shall be capable of supporting and keeping in place the glass fiber filter, and be able to withstand the pressure needed to accomplish separation (50 psi).

Note.—When it is suspected that the glass fiber filter has been ruptured, an in-line glass fiber filter may be used to filter the material within the ZHE.

4.3.2 Filter Holder: When the waste is being evaluated for other than volatile compounds, a filter holder capable of supporting a glass fiber filter and able to withstand the pressure needed to accomplish separation is used. Suitable filter holders range from simple vacuum units to relatively complex systems capable of exerting pressures of up to 50 psi or more. The type of filter holder used depends on the properties of the material to be filtered (see Step 4.3.3).

These devices shall have a minimum internal volume of 300 mL and be equipped to accommodate a minimum filter size of 47 mm (Filter holders having an internal capacity of 1.5 L or greater and equipped to accommodate a 142 mm diameter filter are recommended). Vaccum filtration is only recommended for wastes with low solids content (<10%) and for highly granular (liquid-containing) wastes. All other types of wastes should be filtered using positive pressure filtration. Filter holders known to EPA to be suitable for use are shown in Table 4.

4.3.3 Materials of Construction: Extraction vessels and filtration devices shall be made of inert materials which will not leach or absorb waste components. Glass, polytetrafluoroethylene (PTFE), or type 316 stainless steel equipment may be used when evaluating the mobility of both organic and inorganic components. Devices made of high-density polyethylene (HDPE), polypropylene, or polyvinyl chloride may be used only when evaluating the mobility of metals. Borosilicate glass bottles are recommended for use over other types of glass bottles, especially when inorganics are constituents of concern.

4.4 *Filters:* Filters shall be made of borosilicate glass fiber, shall contain no binder materials, and shall have an effective pore size of 0.6– to 0.8–um, or equivalent. Filters known to EPA to meet these specifications are identified in Table 5. Pre-filters must not be used. When evaluating the mobility of metals, filters shall be acid-washed prior to use by rinsing with 1.0 N nitric acid followed by three consecutive rinses with deionized distilled water (a minimum of 1–L per rinse is recommended). Glass fiber filters are fragile and should be handled with care.

4.5 *pH meters:* Any of the commonly available pH meters are acceptable.

4.6 *ZHE extract collection devices:* TEDLAR® bags or glass, stainless steel or PTFE gas tight syringes are used to collect the initial liquid phase and the final extract of the waste when using the ZHE device. The devices listed are recommended for use under the following conditions.

4.6.1 If a waste contains an aqueous liquid phase or if a waste does not contain a significant amount of non-aqueous liquid (i.e., <1% of total waste), the TEDLAR® bag should be used to collect and combine the initial liquid and solid extract. The syringe is not recommended in these cases.

4.6.2 If a waste contains a significant amount of non-aqueous initial liquid phase (i.e., >1% of total waste), the syringe or the TEDLAR® bag may be used for both the initial solid/liquid separation and the final extract filtration. However, analysts should use one or the other, not both.

4.6.3 If the waste contains no initial liquid phase (is 100% solid) or has no significant solid phase (is 100% liquid), either the TEDLAR® bag or the syringe may be used. If the syringe is used, discard the first 5 mL of liquid expressed from the device. The remaining aliquots are used for analysis.

4.7 *ZHE extraction fluid transfer devices:* Any device capable of transferring the extraction fluid into the ZHE without changing the nature of the extraction fluid is acceptable (e.g., a constant displacement pump, a gas tight syringe, pressure filtration unit (See Step 4.3.2), or another ZHE device).

4.8 *Laboratory balance:* Any laboratory balance accurate to within ±0.01 grams may be used (all weight measurements are to be within ±0.1 grams).

5.0 REAGENTS

5.1 *Reagent water:* Reagent water is defined as water in which an interferent is not observed at or above the method detection limit of the analyte(s) of interest. For non-volatile extractions, ASTM Type II water, or equivalent meets the definition of reagent water. For volatile extractions, it is recommended that reagent water be generated by any of the following methods. Reagent water should be monitored periodically for impurities.

5.1.1 Reagent water for volatile extractions may be generated by passing tap water through a carbon filter bed containing about 500 grams of activated carbon (Calgon Corp., Filtrasorb-300 or equivalent).

5.1.2 A water purification system (Millipore Super-Q or equivalent) may also be used to generate reagent water for volatile extractions.

5.1.3 Reagent water for volatile extractions may also be prepared by boiling water for 15 minutes. Subsequently, while maintaining the water temperature at 90± 5°C, bubble a contaminant-free inert gas (e.g., nitrogen) through the water for 1 hour. While still hot, transfer the water to a narrow-mouth screw-cap bottle under zero-headspace and seal with a Teflon-lined septum and cap.

5.2 1.0 N Hydrochloric acid (HCl) made from ACS reagent grade.

5.3 1.0 N Nitric acid (HNO_3) made from ACS reagent grade.

5.4 1.0 N Sodium hydroxide (NaOH) made from ACS reagent grade.

5.5 Glacial acetic acid (HOAc) ACS reagent grade.

5.6 *Extraction fluid:*

5.6.1 Extraction fluid #1: This fluid is made by adding 5.7 mL glacial HOAc to 500 mL of the appropriate water (see Step 5.1), adding 64.3 mL of 1.0 N NaOH, and diluting to a volume of 1 liter. When correctly prepared, the pH of this fluid will be 4.93 ± 0.05.

5.6.2 Extraction fluid #2: This fluid is made by diluting 5.7 mL glacial HOAc with ASTM Type II water (see Step 5.1) to a volume of 1 liter. When correctly prepared, the pH of this fluid will be 2.88 ± 0.05.

Note.—It is suggested that these extraction fluids be monitored frequently for impurities. The pH should be checked prior to use to ensure that these fluids are made up accurately.

5.7 Analytical standards shall be prepared according to the appropriate analytical method.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All samples shall be collected using an appropriate sampling plan.

6.2 At least two separate representative samples of a waste should be collected. If volatile organics are of concern, a third sample should be collected. The first sample is used in several preliminary TCLP evaluations (e.g., to determine the percent solids of the waste; to determine if the waste contains insignificant solids (i.e., the waste is its own extract after filtration); to determine if the solid portion of the waste requires particle-size reduction; and to determine which of the two extraction fluids are to be used for the non-volatile TCLP extraction of the waste). These preliminary evaluations are identified in Section 7.0. The second and, if required, third samples are extracted using the TCLP non-volatile procedure (Section 8.0) and volatile procedure (Section 9.0), respectively.

6.3 Preservatives shall not be added to samples.

6.4 Samples can be refrigerated unless refrigeration results in irreversible physical change to the waste (e.g., precipitation).

6.5 When the waste is to be evaluated for volatile contaminants, care should be taken to minimize the loss of volatiles. Samples shall be taken and stored in a manner to prevent the loss of volatile contaminants. If possible, it is recommended that any necessary particle-size reduction should be conducted as the sample is being taken (See Step 8.5).

6.6 TCLP extracts should be prepared for analysis and analyzed as soon as possible following extraction. If they need to be stored, even for a short period of time, storage shall be a 4° C, and samples for volatiles analysis shall not be allowed to come into contact with the atmosphere (i.e., no headspace). See Section 10.0 (QA requirements) for acceptable sample and extract holding times.

7.0 PRELIMINARY TCLP EVALUATIONS

The preliminary TCLP evaluations are performed on a minimum 100 gram representative sample of waste that will not actually undergo TCLP extraction (designated as the first sample in Step 6.2). These evaluations include preliminary determination of the percent solids of the waste; determination of whether the waste contains insignificant solids, and is therefore, its own extract after filtration; determination of whether the solid portion of the waste requires particle-size reduction; and determination of which of the two extraction fluids are to be used for the non-volatile TCLP extraction of the waste.

7.1 *Preliminary determination of percent solids:* Percent solids is defined as that fraction of a waste sample (as a percentage of the total sample) from which no liquid may be forced out by an applied pressure, as described below.

7.1.1 If the waste will obviously yield no free liquid when subjected to pressure filtration (i.e., is 100% solids) proceed to Step 7.4.

7.1.2 If the sample is liquid or multiphasic, liquid/solid separation to make a preliminary determination of percent solids is required. This involves the filtration device described in Step 4.3.2 and is outlined in Steps 7.1.3 through 7.1.9.

7.1.3 Pre-weigh the filter and the container that will receive the filtrate.

7.1.4 Assemble the filter holder and filter following the manufacturer's instructions.

Place the filter on the support screen and secure.

7.1.5 Weigh out a representative subsample of the waste (100 gram minimum) and record the weight.

7.1.6 Allow slurries to stand to permit the solid phase to settle. Wastes that settle slowly may be centrifuged prior to filtration. Centrifugation is to be used only as an aid to filtration. If used, the liquid should be decanted and filtered followed by filtration of the solid portion of the waste through the same filtration system.

7.1.7 Quantitatively transfer the waste sample to the filter holder (liquid and solid phases). If filtration of the waste at 4° C reduces the amount of expressed liquid over what would be expressed at room temperature then allow the sample to warm up to room temperature in the device before filtering.

Note.—If waste material (>1% of original sample weight) has obviously adhered to the container used to transfer the sample to the filtration apparatus, determine the weight of this residue and subtract it from the sample weight determined in Step 7.1.5 to determine the weight of the waste sample that will be filtered.

Gradually apply vacuum or gentle pressure of 1–10 psi, until air or pressurizing gas moves through the filter. If this point is not reached under 10 psi, and if no additional liquid has passed through the filter in any 2-minute interval, slowly increase the pressure in 10-psi increments to a maximum of 50 psi. After each incremental increase of 10-psi, if the pressurizing gas has not moved through the filter, and if no additional liquid has passed through the filter in any 2-minute interval, proceed to the next 10-psi increment. When the pressurizing gas begins to move through the filter, or when liquid flow has ceased at 50 psi (i.e., filtration does not result in any additional filtrate within any 2-minute period), filtration is stopped.

Note.—Instantaneous application of high pressure can degrade the glass fiber filter and may cause premature plugging.

7.1.8 The material in the filter holder is defined as the solid phase of the waste, and the filtrate is defined as the liquid phase.

Note.—Some wastes, such as oily wastes and some paint wastes, will obviously contain some material that appears to be a liquid. But even after applying vacuum or pressure filtration, as outlined in Step 7.1.7, this material may not filter. If this is the case, the material within the filtration device is defined as a solid. The original filter is *not* to be replaced with a fresh filter under any circumstances. Only one filter is used.

7.1.9 Determine the weight of the liquid phase by subtracting the weight of the filtrate container (See Step 7.1.3) from the total weight of the filtrate-filled container. The weight of the solid phase of the waste sample is determined by subtracting the weight of the liquid phase from the weight of the total waste sample, as determined in Step 7.1.5 or 7.1.7. Record the weight of the liquid and solid phases. Calculate the percent solids as follows:

$$\text{Percent solids} = \frac{\text{Weight of solid (Step 7.1.9)}}{\text{Total weight of waste (Step 7.1.5 or 7.1.7)}} \times 100$$

7.2 *Determination of whether waste is liquid or has insignificant amounts of solid material:* If the sample obviously has a significant amount of solid material, the solid phase must be subjected to extraction; proceed to Step 7.3 to determine if the waste requires particle-size reduction (and to reduce particle-size, if necessary). Determine whether the waste is liquid or has insignificant amounts of solid material (which need not undergo extraction) as follows:

7.2.1 Remove the solid phase and filter from the filtration apparatus.

7.2.2 Dry the filter and solid phase at 100±20° C until two successive weighings yield the same value within ±1%. Record final weight.

Note.—Caution should be taken to insure that the subject solid will not flash upon heating. It is recommended that the drying oven be vented to a hood or appropriate device.

7.2.3 Calculate the percent dry solids as follows:

$$\text{Percent: dry solids} = \frac{\text{Weight of dry waste and filter} - \text{tared weight of filter}}{\text{Initial weight of waste (Step 7.1.5 or 7.1.1)}} \times 100$$

7.2.4 If the percent dry solids is less than 0.5%, consult Step 6.2 and proceed to Section 8.0 if non-volatiles in the waste are of concern, and to Section 9.0 if volatiles are of interest. In this case, the waste, after filtration is defined as the TCLP extract. If the percent dry solids is greater than or equal to 0.5%, and if the non-volatile TCLP is to be performed, return to the beginning of this Section (7.0) with a new representative waste sample, so that it can be determined if particle-size reduction is necessary (Step 7.3), and so that the appropriate extraction fluid may be determined (Step 7.4) on a fresh portion of the solid phase of the waste. If only the volatile TCLP is to be performed, see the Note in Step 7.4.

7.3 *Determination of whether the wastes requires particle-size reduction (particle-size is reduced during this Step):* Using the solid portion of the waste, evaluate the solid for particle-size. If the solid has a surface area per gram of material equal to or greater than 3.1 cm^2, or is smaller than 1 cm in its narrowest dimension (e.g., is capable of passing through a 9.5-mm (0.375-inch) standard sieve), particle-size reduction is not required (proceed to Step 7.4). If the surface area is smaller or the particle-size larger than described above, the solid portion of the waste is prepared for extraction by crushing, cutting, or grinding the waste to a surface area or particle-size as described above.

Note.—Surface area requirements are meant for filamentous (e.g., paper, cloth) and similar waste materials. Actual measurement of surface area is not required; nor is it recommended.

7.4 *Determination of appropriate extraction fluid:* If the solid content is greater than or equal to 0.5% of the waste and if TCLP extraction for non-volatile constituents will take place (Section 8.0), determination of the appropriate fluid (Step 5.6) to use for the non-volatiles extraction is performed as follows.

Note.—TCLP extraction for volatile constituents entails using only extraction fluid #1 (Step 5.6.1). Therefore, if TCLP extraction for non-volatiles extraction is not required, proceed to section 9.0.

7.4.1 Weigh out a small subsample of the solid phase of the waste, reduce the solid (if necessary) to a particle-size of approximately 1mm in diameter or less, and transfer 5.0 grams of the solid phase of the waste to a 500-mL beaker of Erlenmeyer flask.

7.4.2 Add 96.5 mL of reagent water (ASTM Type II) to the beaker, cover with a watchglass, and stir vigorously for 5 minutes using a magnetic stirrer. Measure and record the pH. If the pH is ≤5.0, extraction fluid #1 is used. Proceed to Section 8.0.

7.4.3 If the pH from Step 7.4.2 is >5.0, add 3.5 mL 1.0 N HCl, slurry briefly, cover with a watchglass, heat to 50 °C, and hold at 50 °C for 10 minutes.

7.4.4 Let the solution cool to room temperature and record the pH. If the pH is ≤5.0, use extraction fluid #1. If the pH is >5.0, use extraction fluid #2. Proceed to Section 8.0.

7.5 The sample of waste used for performance of this Section shall *not* be used any further. Other samples of the waste (see Step 6.2) should be employed for the Section 8.0 and 9.0 extractions.

8.0 PROCEDURE WHEN VOLATILES ARE NOT INVOLVED

Although a minimum sample size of 100 grams (solid and liquid phases) is required, a larger sample size may be more appropriate, depending on the solids content of the waste sample (percent solids, see Step 7.1), whether the initial liquid phase of the waste will be miscible with the aqueous extract of the solid, and whether inorganics, semivolatile organics, pesticides, and herbicides are all analytes of concern. Enough solids should be generated for extraction such that the volume

of TCLP extract will be sufficient to support all of the analyses required. If the amount of extract generated by the performance of a single TCLP extraction will not be sufficient to perform all of the analyses to be conducted, it is recommended that more than one extraction be performed and that the extracts from each extraction be combined and then aliquoted for analysis.

8.1 If the waste will obviously yield no liquid when subjected to pressure filtration (i.e., is 100% solid, see Step 7.1), weigh out a representative subsample of the waste (100 gram minimum) and proceed to Step 8.9.

8.2 If the sample is liquid or multiphasic, liquid/solid separation is required. This involves the filtration device described in Step 4.3.2 and is outlined in Steps 8.3 to 8.8.

8.3 Pre-weigh the container that will receive the filtrate.

8.4 Assemble the filter holder and filter following the manufacturer's instructions. Place the filter on the support screen and secure. Acid wash the filter if evaluating the mobility of metals (See Step 4.4).

Note.—Acid washed filters may be used for all non-volatile extractions even when metals are not of concern.

8.5 Weigh out a representative subsample of the waste (110 gram minimum) and record the weight. If the waste was shown to contain <0.5% dry solids (Step 7.2), the waste, after filtration is defined as the TCLP extract. Therefore, enough of the sample should be filtered so that the amount of filtered liquid will support all of the analyses required of the TCLP extract. For wastes containing >0.5% dry solids (Steps 7.1 or 7.2), use the percent solids information obtained in Step 7.1 to determine the optimum sample size (100 gram minimum) for filtration. Enough solids should be generated after filtration to support the analyses to be performed on the TCLP extract.

8.6 Allow slurries to stand to permit the solid phase to settle. Wastes that settle slowly may be centrifuged prior to filtration. Centrifugation is to be used only as an aid to filtration. If used, the liquid should be decanted and filtered followed by filtration of the solid portion of the waste through the same filtration system.

8.7 Quantitatively transfer the waste sample (liquid and solid phases) to the filter holder (see Step 4.3.2). If filtration of the waste at 4° C reduces the amount of expressed liquid over what would be expressed at room temperature, then allow the sample to warm up to room temperature in the device before filtering.

Note.—If waste material (>1% of the original sample weight) has obviously adhered to the container used to transfer the sample to the filtration apparatus, determine the weight of this residue and subtract it from the sample weight determined in Step 8.5, to determine the weight of the waste sample that will be filtered.

Gradually apply vacuum or gentle pressure of 1–10 psi, until air or pressurizing gas moves through the filter. If this point is not reached under 10 psi, and if no additional liquid has passed through the filter in any 2-minute interval, slowly increase the pressure in 10-psi increments to maximum of 50 psi. After each incremental increase of 10 psi, if the pressurizing gas has not moved through the filter, and if no additional liquid has passed through the filter in any 2-minute interval, proceed to the next 10-psi increment. When the pressurizing gas begins to move through the filter, or when the liquid flow has ceased at 50 psi (i.e., filtration does not result in any additional filtrate within a 2-minute period), filtration is stopped.

Note.—Instantaneous application of high pressure can degrade the glass fiber filter and may cause premature plugging.

8.8 The material in the filter holder is defined as the solid phase of the waste, and the filtrate is defined as the liquid phase. Weigh the filtrate. The liquid phase may now be either analyzed (see Step 8.13) or stored at 4 °C until time of analysis.

Note.—Some wastes, such as oily wastes and some paint wastes, will obviously contain some material that appears to be a liquid. But even after applying vacuum or pressure filtration, as outlined in Step 8.7, this material may not filter. If this is the case, the material within the filtration device defined as a solid and is carried through the extraction as a solid. The original filter is *not* to be replaced with a fresh filter under any circumstances. Only one the filter is used.

8.9 If the waste contains <0.5% dry solids (see Step 7.2), proceed to Step 8.13. If the waste contains ≥0.5% dry solids (see Step 7.1 or 7.2), and if particle-size reduction of the solid was needed in Step 7.3, proceed to Step 8.10. If particle-size reduction was not required in Step 7.3, quantitatively transfer the solid material into the extractor vessel, including the filter used to separate the initial liquid from the solid phase. Proceed to Step 8.11.

8.10 The solid portion of the waste is prepared for extraction by crushing, cutting, or grinding the waste to a surface area of particle-size as described in Step 7.3. When the surface area of particle-size has been appropriately altered, quantitatively transfer the solid material into the extractor vessel, including the filter used to separate the initial liquid from the solid phase.

Note.—Sieving of the waste through a sieve that is not Teflon coated should not be done due to avoid possible contamination of the sample. Surface area requirements are meant for filamentous (e.g., paper, cloth) and similar waste materials. Actual measurement of surface area is not recommended.

8.11 Determine the amount of extraction fluid to add to the extractor vessel as follows:

$$\text{Weight of extraction fluid} = \frac{20 \times \%\ \text{solids (Step 7.1)} \times \text{weight of waste filtered (Step 8.5 or 8.7)}}{100}$$

Slowly add this amount of appropriate extraction fluid (see Step 7.4) to the extractor vessel. Close the extractor bottle tightly (it is recommended that Teflon tape be used to ensure a tight seal), secure in rotary extractor device, and rotate at 30±2 rpm for 18±2 hours. Ambient temperature (i.e., temperature of room in which extraction is to take place) shall be maintained at 22±3 °C during the extraction period.

Note.—As agitation continues, pressure may build up within the extractor bottle for some types of wastes (e.g., limed or calcium carbonate containing waste may evolve gases such as carbon dioxide). To relieve excess pressure, the extractor bottle may be periodically opened (e.g., after 15 minutes, 30 minutes, and 1 hour) and vented into a hood.

8.12 Following the 18±2 hour extraction, the material in the extractor vessel is separated into its component liquid and solid phases by filtering through a new glass fiber filter, as outlined in Step 8.7. For final filtration of the TCLP extract, the glass fiber filter may be changed, if necessary, to facilitate filtration. Filter(s) shall be acid-washed (see Step 4.4) if evaluating the mobility of metals.

8.13 The TCLP extract is now prepared as follows:

8.13.1 If the waste contained no initial liquid phase, the filtered liquid material obtained from Step 8.12 is defined as the TCLP extract. Proceed to Step 8.14.

8.13.2 If compatible (e.g., multiple phases will not result on combination), the filtered liquid resulting from Step 8.12 is combined with the initial liquid phase of the waste as obtained in Step 8.7. This combined liquid is defined as the TCLP extract. Proceed to Step 8.14.

8.13.3 If the initial liquid phase of the waste, as obtained from Step 8.7, is not or may not be compatible with the filtered liquid resulting from Step 8.12, these liquids are not combined. These liquids, collectively defined as the TCLP extract, are analyzed separately, and the results are combined mathematically. Proceed to Step 8.14.

8.14 Following collection of the TCLP extract, it is recommended that the pH of the extract be recorded. The extract should be immediately aliquoted for analysis and properly preserved (metals aliquots must be acidified with nitric acid to pH <2; all other aliquots must be stored under refrigeration (4 °C) until analyzed). The TCLP extract shall be prepared and analyzed according to appropriate analytical methods. TCLP extracts to be analyzed for metals, other than mercury, shall be acid digested. If the individual phases are to be analyzed separately, determine the volume of the individual phases (to ±0.5%), conduct the appropriate analyses, and combine the results mathematically by using a simple volume-weighted average:

$$\text{Final Analyte Concentration} = \frac{(V_1)(C_1)+(V_2)(C_2)}{V_1+V_2}$$

where:
V_1 = The volume of the first phase (L).
C_1 = The concentration of the contaminant of concern in the first phase (mg/L).
V_2 = The volume of the second phase (L).
C_2 = The concentration of the contaminant of concern in the second phase (mg/L).

8.15 The contaminant concentrations in the TCLP extract are compared with the thresholds identified in the appropriate regulations. Refer to Section 10.0 for quality assurance requirements.

9.0 PROCEDURE WHEN VOLATILES ARE INVOLVED

The ZHE device is used to obtain TCLP extracts for volatile analysis only. Extract resulting from the use of the ZHE shall not be used to evaluate the mobility of non-volatile analytes (e.g., metals, pesticides, etc.).

The ZHE device has approximately a 500-mL internal capacity. Although a minimum sample size of 100 grams was required in the Section 8.0 procedure, the ZHE can only accommodate a *maximum* of 25 grams of solid (defined as that fraction of a sample from which no liquid (additional) may be forced out by an applied pressure of 50 psi), due to the need to add an amount of extraction fluid equal to 20 times the weight of the solid phase.

The ZHE is charged with sample only once and the device is not opened until the final extract (of the solid) has been collected. Repeated filling of the ZHE of obtain 25 grams of solid is not permitted. The initial filtrate should be weighed and then stored at 4 °C until either analyzed or recombined with the final extract of the solid.

Although the following procedure allows for particle-size reduction during the conduct of the procedure, this could result in the loss of volatile compounds. If possible (e.g., particle-size may be reduced easily by crumbling), particle-size reduction (See Step 9.2) should be conducted on the sample as it is being taken. If necessary, particle-size reduction may be conducted during the procedure.

In carrying out the following steps, do not allow the waste, the initial liquid phase, or the extract to be exposed to the atmosphere for any more time than is absolutely necessary. Any manipulation of these materials should be done when cold (4° C) to minimize loss of volatiles.

9.1 Pre-weigh the (evacuated) container which will receive the filtrate (See Step 4.6), and set aside. If using a TEDLAR® bag, all liquid must be expressed from the device, whether it be for the initial or final liquid/solid separation, and an aliquot taken from the liquid in the bag, for analysis. The containers listed in Step 4.6 are recommended for use under the following conditions.

9.1.1 If a waste contains an aqueous liquid phase or if the waste does not contain a significant amount of non-aqueous liquid (i.e., <1% of total waste), the TEDLAR® bag should be used to collect and combine the initial liquid and solid extract. The syringe is not recommended in these cases.

9.1.2 If a waste contains a significant amount of non-aqueous initial liquid phase (i.e., >1% of total waste), the syringe or the TEDLAR® bag may be used for both the initial solid/liquid separation and the final extract filtration. However, analysts should use one or the other, not both.

9.1.3 If the waste contains no initial liquid phase (is 100% solid) or has no significant solid phase (is 100% liquid), either the TEDLAR® bag or the syringe may be used. If the syringe is used, discard the first 5 mL liquid expressed from the device. The remaining aliquots are used for analysis.

9.2 Place the ZHE piston within the body of the ZHE (it may be helpful first to moisten the piston O-rings slightly with estraction fluid). Adjust the piston within the ZHE body to a height that will minimize the distance the piston will have to move once the ZHE is charged with sample (based upon sample size requirements determined from Section 9.0, Step 7.1 and/or 7.2). Secure the gas inlet/outlet flange (bottom flange) onto the ZHE body in accordance with the manufacturer's instructions. Secure the glass fiber filter between the support screens and set aside. Set liquid inlet/outlet flange (top flange) aside.

9.3 If the waste is 100% solid (see Step 7.1), weigh out a representative subsample (25 gram maximum) of the waste, record weight, and proceed to Step 9.5.

9.4 If the waste was shown to contain <0.5% dry solids (Step 7.2), the waste, after filtration is defined as the TCLP extract. Enough of the sample should be filtered so that the amount of filtered liquid will support all of the volatile analyses required. For wastes containing >0.5% dry solids (Steps 7.1 and/or 7.2), use the percent solids information obtained in Step 7.1 to determine the optimum sample size to charge into the ZHE. The appropriate sample size recommended is as follows:

9.4.1 For wastes containing <5% solids (see Step 7.1), weigh out a representative 500 gram sample or waste and record the weight.

9.4.2 For wastes containing >5% solids (see Step 7.1), the amount of waste to charge into the ZHE is determined as follows:

$$\text{Weight of waste to charge ZHE} = \frac{25}{\text{\% solids (Step 7.1)}} \times 100$$

Weigh out a representative subsample of the waste of the appropriate size and record the weight.

9.5 If particle-size reduction of the solid portion of the waste was required in Step 7.3, proceed to Step 9.6. If particle-size reduction was not required in Step 7.3, proceed to Step 9.7.

9.6 The waste is prepared for extraction by crushing, cutting, or grinding the solid portion of the waste to a surface area or particle-size as described in Step 7.3. Wastes and appropriate reduction equipment should be refrigerated, if possible, to 4 °C prior to particle-size reduction. The means used to effect particle-size reduction must not generate heat in and of itself. If reduction of the solid phase of the waste is necessary, exposure of the waste to the atmosphere should be avoided to the extent possible.

Note.—Sieving of the waste is not recommended due to the possibility that volatiles may be lost. The use of an appropriately graduated ruler is recommended as an acceptable alternative. Surface area requirements are meant for filamentous (e.g., paper, cloth) and similar waste materials. Actual measurement of surface area is not recommended.

When the surface area or particle-size has been appropriately altered, proceed to Step 9.7.

9.7 Waste slurries need not be allowed to stand to permit the solid phase to settle. Wastes that settle slowly shall not be centrifuged prior to filtration.

9.8 Quantitatively transfer the entire sample (liquid and solid phases) quickly to the ZHE. Secure the filter and support screens into the top flange of the device and secure the top flange to the ZHE body in accordance with the manufacturer's instructions. Tighten all ZHE fittings and place the device in the vertical position (gas inlet/outlet flange on the bottom). *Do not* attach the extraction collection device to the top plate.

Note.—If waste material (>1% of original sample weight) has obviously adhered to the container used to transfer the sample to the ZHE, determine the weight of this residue and subtract it from the sample weight determined in Step 9.4, to determine the weight of the waste sample that will be filtered.

Attach a gas line to the gas inlet/outlet valve (bottom flange) and, with the liquid inlet/outlet valve (top flange) open, begin applying gentle pressure of 1–10 psi (or more if necessary) to force all headspace (into a hood) slowly out of the ZHE device. At the first appearance of liquid from the liquid inlet/outlet valve, quickly close the valve and discontinue pressure. If filtration of the waste at 4°C reduces the amount of expressed liquid over what would be expressed at room temperature, then allow the sample to warm up to room temperature in the device before filtering. If the waste is 100% solid (see Step 7.1), slowly increase the pressure to a maximum of 50 psi to force most of the headspace out of the device and proceed to Step 9.12.

9.9 Attach the evacuated pre-weighed filtrate collection container to the liquid inlet/outlet valve and open the valve. Begin applying gentle pressure of 1–10 psi to force the liquid phase into the filtrate collection container. If no additional liquid has passed through the filter in any 2-minute interval, slowly increase the pressure in 10-psi increments to a maximum of 50 psi. After each incremental increase of 10 psi, if no additional liquid has passed through the filter in any 2-minute interval, proceed to the next 10-psi increment. When liquid flow has ceased such that continued pressure filtration at 50 psi does not result in any additional filtrate within any 2-minute period, filtration is stopped. Close the liquid inlet/outlet valve, discontinue pressure to the piston, and disconnect the filtrate collection container.

Note.—Instantaneous application of high pressure can degrade the glass fiber filter and may cause premature plugging.

9.10 The material in the ZHE is defined as the solid phase of the waste and the filtrate is defined as the liquid phase.

Note.—Some wastes, such as oily wastes and some paint wastes, will obviously contain some material that appears to be a liquid. But even after applying pressure filtration, this material will not filter. If this is the case, the material within the filtration device is defined as a solid and is carried through the TCLP extraction as a solid.

If the original waste contained <0.5% dry solids (see Step 7.2), this filtrate is defined as the TCLP extract and is analyzed directly. Proceed to Step 9.15.

9.11 The liquid phase may now be either analyzed immediately (see Steps 9.13 through 9.15) or stored at 4 °C under minimal headspace conditions until time of analysis. The weight of extraction fluid #1 to add to the ZHE is determined as follows:

$$\text{Weight of extraction fluid} = \frac{\text{20\% solids (Step 7.1)} \times \text{weight of waste filtered (Step 9.4 or 9.8)}}{100}$$

9.12 The following steps detail how to add the appropriate amount of extraction fluid to the solid material within the ZHE and agitation of the ZHE vessel. Extraction fluid #1 is used in all cases (see Step 5.6).

9.12.1 With the ZHE in the vertical position, attach a line from the extraction fluid reservior to the liquid inlet/outlet valve. The line used shall contain fresh extraction fluid and should be preflushed with fluid to eliminate any air pockets in the line. Release gas pressure on the ZHE piston (from the gas inlet/outlet valve), open the liquid inlet/outlet valve, and begin transferring extraction fluid (by pumping or similar means) into the ZHE. Continue pumping extraction fluid into the ZHE until the appropriate amount of fluid has been introduced into the device.

9.12.2 After the extraction fluid has been added, immediately close the liquid inlet/outlet valve and disconnect the extraction fluid line. Check the ZHE to ensure that all valves are in their closed positions. Physically rotate the device in an end-over-end fashion 2 or 3 times. Reposition the ZHE in the vertical position with the liquid inlet/outlet valve on top. Put 5–10 psi behind the piston (if necessary) and slowly open the liquid inlet/outlet valve to bleed out any headspace (into a hood) that may have been introduced due to the addition of extraction fluid. This bleeding shall be done quickly and shall be stopped at the first appearance of liquid from the valve. Re-pressurize the ZHE with 5–10 psi and check all ZHE fittings to ensure that they are closed.

9.12.3 Place the ZHE in the rotary extractor apparatus (if it is not already there) and rotate the ZHE at 30±2 rpm for 18±2 hours. Ambient temperature (i.e., temperature of room in which extraction is to occur) shall be maintained at 22±3 °C during agitation.

9.13 Following the 18±2 hour agitation period, check the pressure behind the ZHE piston by quickly opening and closing the gas inlet/outlet valve and noting the escape of gas. If the pressure has not been maintained (i.e., no gas release observed), the device is leaking. Check the ZHE for leaking as specified in Step 4.2.1, and redo the extraction with a new sample of waste. If the pressure within the device has been maintained, the material in the extractor vessel is once again separated into its component liquid and solid phases. If the waste contained an initial liquid phase, the liquid may be filtered directly into the same filtrate collection container (i.e., TEDLAR® bag) holding the initial liquid phase of the waste, unless doing so would create multiple phases, or unless there is not enough volume left within the filtrate collection container. A separate filtrate collection container must be used in these cases. Filter through the glass fiber filter, using the ZHE device as discussed in Step 9.9. All extract shall be filtered and collected in the TEDLAR® bag is used, if the extract is multiphasic, or if the waste contained an initial liquid phase (see Steps 4.6 and 9.1).

Note.—An in-line glass fiber filter may be used to filter the material within the ZHE when it is suspected that the glass fiber filter has been ruptured.

9.14 If the original waste contained no initial liquid phase, the filtered liquid material obtained from Step 9.13 is defined as the TCLP extract. If the waste contained in initial liquid phase, the filtered liquid material obtained from Step 9.13 and the initial liquid phase (Step 9.9) are collectively defined as the TCLP extract.

9.15 Following collection of the TCLP extract, the extract should be immediately aliquoted for analysis and stored with minimal headspace at 4 °C until analyzed. The TCLP extract will be prepared and analyzed according to the appropriate analytical methods. If the individual phases are to be analyzed separately (i.e., are not miscible), determine the volume of the individual phases (to ±0.5%), conduct the appropriate analyses, and combine the results mathematically by using a simple volume-weighted average:

$$\text{Final Analyte Concentration} = \frac{(V_1)(C_1)+(V_2)(C_2)}{V_1+V_2}$$

where:

V_1 = The volume of the first phases (L).
C_1 = The concentration of the contaminant of concern in the first phase (mg/L).
V_2 = The volume of the second phase (L).
C_2 = The concentration of the contaminant of concern in the second phase (mg/L).

9.16 The contaminant concentrations in the TCLP extract are compared with the thresholds identified in the appropriate regulations. Refer to Section 10.0 for qualify assurance requirements.

10.0 QUALITY ASSURANCE REQUIREMENTS

10.1 All data, including quality assurance data, should be maintained and available for reference or inspection.

10.2 A minimum of one blank (extraction fluid #1) for every 10 extractions that have been conducted in an extraction vessel shall be employed as a check to determine if any memory effects from the extraction equipment are occurring.

10.3 For each analytical batch (up to twenty samples), it is recommended that a matrix spike be performed. Addition of matrix spikes should occur once the TCLP extract has been generated (i.e., should not occur prior to performance of the TCLP procedure). The purpose of the matrix spike is to monitor the adequacy of the analytical methods used on the TCLP extract and for determining if matrix interferences exist in analyte detection.

10.4 All quality control measures described in the appropriate analytical methods shall be followed.

10.5 The method of standard addition shall be employed for each analyte if: 1) recovery of the compound from the TCLP extract is not between 50 and 150%, or 2) if the concentration of the constituent measured in the extract is within 20% of the appropriate regulatory threshold. If more than one extraction is being run on samples of the same waste (up to twenty samples), the method of standard addition need be applied only once and the percent recoveries applied to the remainder of the extractions.

10.6 Samples must undergo TCLP extraction within the following time period after sample receipt: Volatiles, 14 days; Semi-Volatiles, 40 days; Mercury, 28 days; and other Metals, 180 days. Extraction of the solid portion of the waste should be initiated as soon as possible following initial solid/liquid separation. TCLP extracts shall be analyzed after generation and preservation within the following periods: Volatiles, 14 days; Semi-Volatiles, 40 days; Mercury, 28 days; and other Metals, 180 days.

TABLE 1.—VOLATILE CONTAMINANTS [1]

Compound	CAS No.
Acetone	67-64-1
n-Butyl alcohol	71-36-6
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5
Chlorobenzene	108-90-7
Methylene chloride	75-09-2
Methyl ethyl ketone	78-93-3
Methyl isobutyl ketone	108-10-1
Tetrachloroethylene	127-18-4
Toluene	108-88-3
1,1,1-Trichloroethane	71-55-6
Trichloroethylene	79-01-6
Trichlorofluoromethane	75-69-4
Xylene	1330-20-7

[1] Includes compounds identified in the Land Disposal Restrictions Rule. If any or all of these compounds are of concern, the zero-headspace extractor vessel shall be used. If other (non-volatile) compounds are of concern, the conventional bottle extractor shall be used.

TABLE 2.—SUITABLE ROTARY AGITATION APPARATUS [1]

Company	Location	Model
Associated Design and Manufacturing Company.	Alexandria, VA (703) 549-5999.	4-vessel device, 6-vessel device
Lars Lande Manfacturing.	Whitmore Lake, MI (313) 449-4116.	10-vessel device, 5-vessel device
IRA Machine Shop and Laboratory.	Santurce, PR (809) 752-4004.	16-vessel device
EPRI Extractor		6-vessel device [2]
REXNORD	Milwaukee, WI (414) 643-2850.	6-vessel device
Analytical Testing and Consulting Services, Inc.	Warrington, PA (215) 343-4490.	4-vessel device

[1] Any device that rotates the extraction vessel in an end-over-end fashion at 30±2 rpm is acceptable.
[2] Although this device is suitable, it is not commercially made. It may also require retrofitting to accommodate ZHE devices.

TABLE 3.—SUITABLE ZERO-HEADSPACE EXTRACTOR VESSELS

Company	Location	Model No.
Associated Design & Manufacturing Co.	Alexandria, VA, (703) 549-5999	3740-ZHB, Gas Pressure Device.
Millipore Corp.	Bedford, MA, (800) 225-3384	SD1 P581 C5, Gas Pressure Device.
Analytical Testing & Consulting Services, Inc.	Warrington, PA, (215) 343-4490	CI02, Mechanical Pressure Device.

TABLE 4.—SUITABLE FILTER HOLDERS [1]

Company	Location	Model	Size
Nuclepore Corp.	Pleasanton, CA, (800) 882-7711	425910	142 mm.
		410400	47 mm.
Micro Filtration Systems	Dublin, CA, (415) 828-6010	302400	142 mm.
Millipore Corp.	Bedford, MA, (800) 225-3384	YT30142HW	142 mm.
		XX1004700	47 mm.

[1] Any device capable of separating the liquid from the solid phase of the waste is suitable, providing that it is chemically compatible with the waste and the constituents to be analyzed. Plastic devices (not listed above) may be used when only inorganic contaminants are of concern. The 142 mm size filter holder is recommended.

TABLE 5.—SUITABLE FILTER MEDIA

Company	Location	Model	Pore size[1]
Whatman Laboratory Products, Inc.	Clifton, NJ, (201) 773-5800	GFF	0.7

[1] Nominal pore size.

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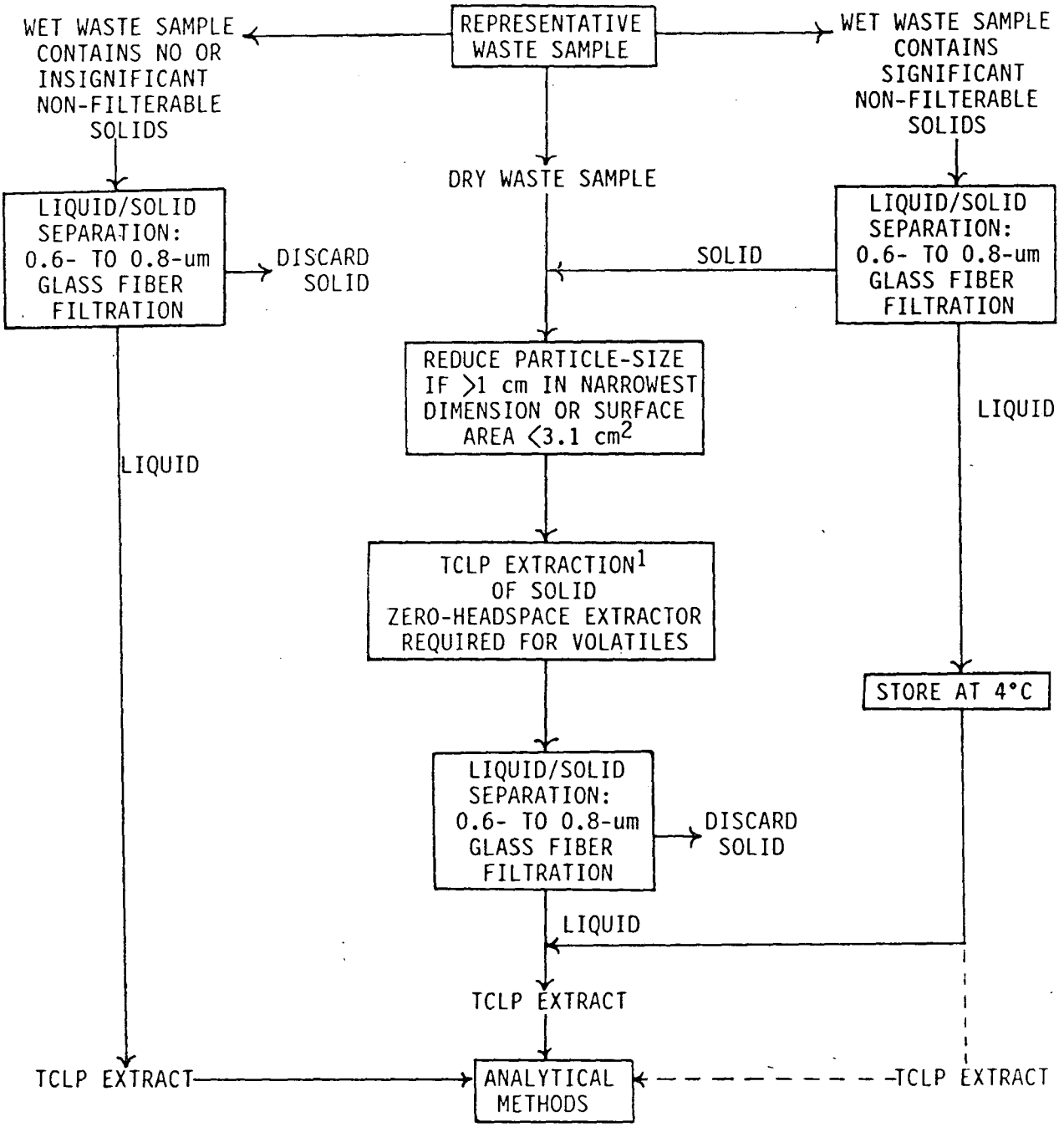

[1]The extraction fluid employed is a function of the alkalinity of the solid phase of the waste.

FIGURE 1: TCLP FLOWCHART

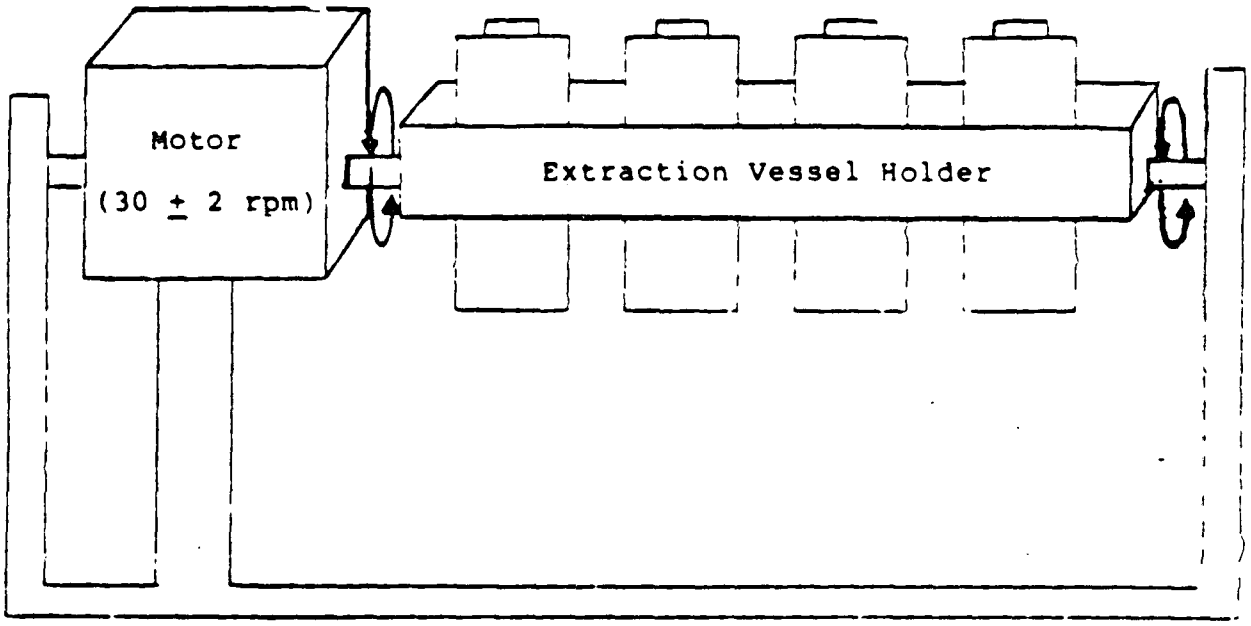

Figure 2: Rotary Agitation

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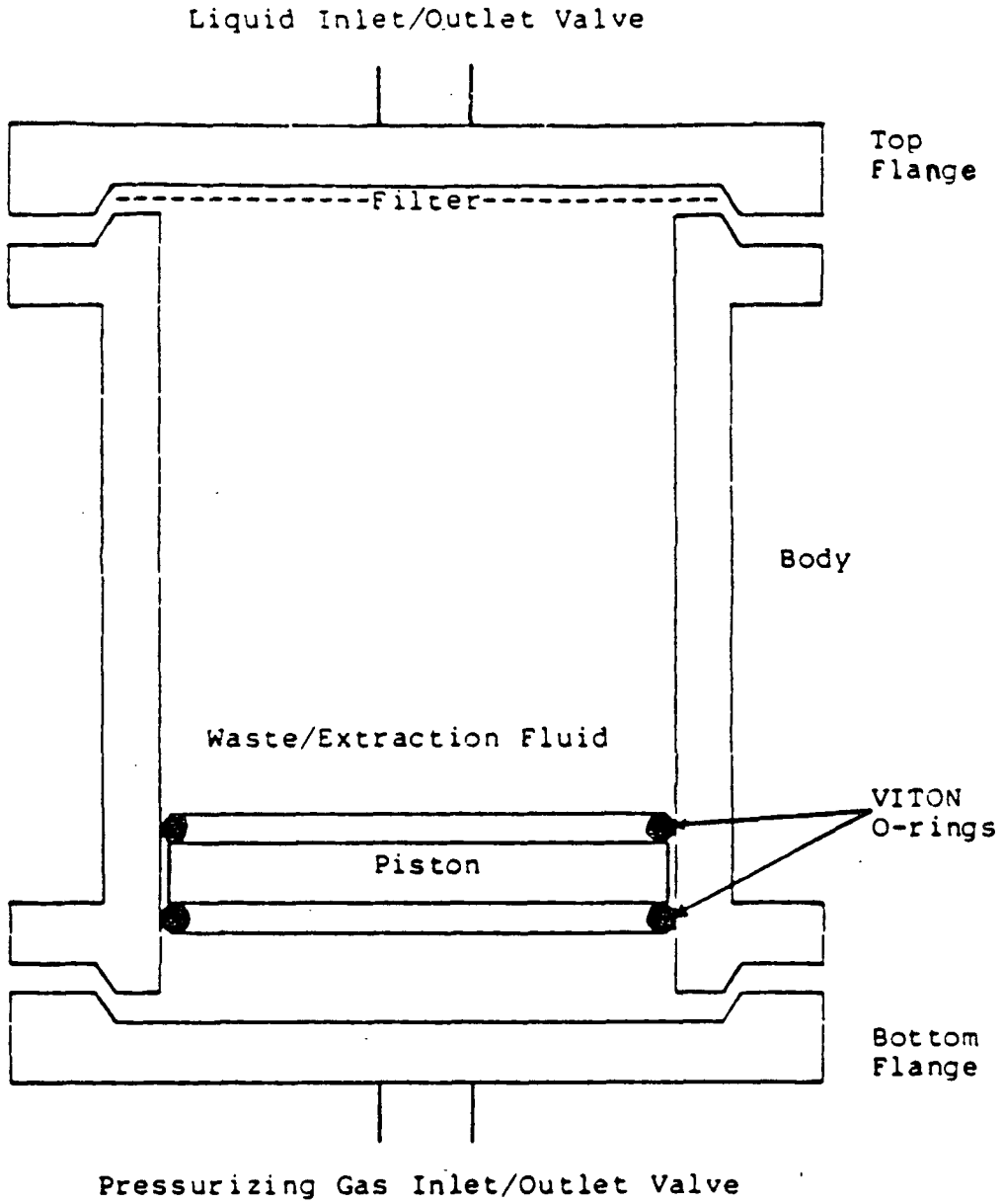

Figure 3: Zero-Headspace Extraction Vessel

APPENDIX II TO PART 268—TREATMENT STANDARDS (AS CONCENTRATIONS IN THE TREATMENT RESIDUAL EXTRACT)

[Note: The technologies shown are the basis of the treatment standards. They are not required to be used in meeting the treatment standards]

Constitutents of FO01-FO05 Spent Solvent Wastes	Waste Treatability Groups For FO01-FO05 Spent Solvent Wastes (mg/l)			
	Wastewater	Technology Basis [1]	Wastewater Generated by Pharmaceutical Plant [2]	All Other [3]
Acetone	0.05	SS		0.59
n-Butyl Alcohol	5.00	SS		5.00
Carbon disulfide	1.05	SS		4.81
Carbon tetrachloride	0.05	B		0.96
Chlorobenzene	0.15	B&AC		0.05
Cresols (cresylic acid)	2.82	AC		0.75
Cyclohexanone	0.125	SS		0.75
1,2-Dichlorobenzene	0.65	B&AC		0.125
Ethyl acetate	0.05	SS		0.75
Ethylbenzene	0.05	B		0.053
Ethyl ether	0.05	SS		0.75
Isobutanol	5.00	SS		5.00
Methanol	0.25	SS		0.75
Methylene chloride	0.20	B	12.7	0.96
Methyl ethyl ketone	0.05	SS		0.75
Methyl isobutyl ketone	0.05	SS		0.33
Nitrobenzene	0.66	SS&AC		0.125
Pyridine	1.12	B&AC		0.33
Tetrachloroethylene	0.079	B		0.05
Toluene	1.12	B&AC		0.33
1,1,1-Trichloroethane	1.05	SS		0.41
1,1,2-Trichloro-1,2,2-trifluoroethane	1.05	SS		0.96
Trichloroethylene	0.062	B&AC		0.091
Trichlorofluoromethane	0.05	B		0.96
Xylene	0.05	AC		0.15

[1] In some instances other technologies achieved somewhat lower treatment values but waste characterization data were insufficient to identify separate treatability groups. Refer to the BDAT background document for a detailed explanation of the determination of the treatment standards.
SS=steam stripping
B=biological treatment
AC=activated carbon
[2] Wastewaters generated by pharmaceutical plants must be treated to the standards given for all other wastewaters except in the case of methylene chloride.
[3] The treatment standards in this treatability group are based on incineration.

PART 270—EPA-ADMINISTERED PERMIT PROGRAMS; THE HAZARDOUS WASTE PERMIT PROGRAM

VIII. In Part 270:

1. The authority citation for Part 270 continues to read as follows:

Authority: Secs. 1006, 2002, 3005, 3007, 3019 and 7004 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912, 6925, 6927, 6939 and 6974), unless otherwise noted.

Subpart B—Permit Applications

2. In § 270.14, paragraph (b)(21) is added to read as follows:

§ 270.14 Contents of Part B: General requirements.

* * * * *

(b) * * *

(21) For land disposal facilities, if a case-by-case extension has been approved under § 268.5 or a petition has been approved under § 268.6, a copy of the notice of approval for the extension or petition is required.

* * * * *

Subpart C—Permit Conditions

3. In § 270.32, paragraph (b)(1) is revised to read as follows:

§ 270.32 Establishing permit conditions.

* * * * *

(b)(1) Each RCRA permit shall include permit conditions necessary to achieve compliance with the Act and regulations, including each of the applicable requirements specified in Parts 264 and 266 through 268 of this chapter. In satisfying this provision, the Administrator may incorporate applicable requirements of Parts 264 and 266 through 268 of this chapter directly into the permit or establish other permit conditions that are based on these parts.

Subpart D—Changes to Permits

4. In § 270.42, paragraph (o) is added to read as follows:

§ 270.42 Minor modifications of permits.

* * * * *

(o) Allow treatment of hazardous wastes not previously specified in the permit if:

(1) The hazardous waste has been prohibited from one or more methods of land disposal under Part 268 Subpart C and treatment standards have been established under Part 268 Subpart D;

(2) Treatment is in accordance with the standards established under § 268.41, or a variance established under § 268.44 of this part;

(3) Handling and treatment of the restricted waste will not present risks substantially different from those of wastes listed in the permit; and

(4) Federal or State approval of a minor permit modification request is granted. No permit changes can occur except for the addition of new waste codes and administrative or technical changes necessary to handle new wastes. Changes in treatment processes or physical equipment may not be made under this paragraph.

PART 271—REQUIREMENTS FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

IX. In Part 271:

1. The authority citation for Part 271 continues to read as follows:

Authority: Secs. 1006, 2002(a) and 3006 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, as amended (42 U.S.C. 6905, 6912(a), and 6926).

Subpart A—Requirements for Final Authorization

2. In § 271.1 paragraph (j) is amended by adding the following entry to Table 1 in chronological order by the date of publication.

§ 271.1 Purpose and scope.

* * * * *

(j) * * *

TABLE 1.—REGULATIONS IMPLEMENTING THE HAZARDOUS AND SOLID WASTE AMENDMENTS OF 1984

Date of promulgation	Title of regulation	Federal Register reference	Effective date
•	•	•	•
[Date of publication of the final rule in the Federal Register].	Land Disposal Restrictions for solvents and dioxins.	51 FR [insert Federal Register, page numbers].	Nov. 8, 1986.

3. In § 271.1 paragraph (j) is further amended by adding the date of publication and the **Federal Register** page numbers to the following entry in Table 2.

§ 271.1 Purpose and scope.

* * * * *

(j) * * *

TABLE 2.—SELF-IMPLEMENTING PROVISIONS OF THE HAZARDOUS AND SOLID WASTE AMENDMENTS OF 1984

Effective date	Self-implementing provision	RCRA citation	Federal Register reference
•	•	•	•
Nov. 8, 1986...	Land disposal prohibitions on dioxins and F001–F005 solvents.	3004(e)	[*insert date of publication*], 51 FR [*insert Federal Register page numbers*].
•	•	•	•

[FR Doc. 86–25224 Filed 11–6–86; 8:45 am]

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