ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 445

RIN 2040–AC23

[FRL—5931–5]

Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards for the Landfills Point Source Category

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: This proposal represents the Agency's first effort to develop Clean Water Act (CWA) national effluent limitations guidelines and pretreatment standards for wastewater discharges from stand-alone landfills unassociated with other industrial or commercial activities.

The proposed regulation would establish technology-based effluent limitations for wastewater discharges to navigable waters associated with the operation of new and existing hazardous and non-hazardous landfill facilities regulated under Subtitle C or Subtitle D of the Resource Conservation and Recovery Act (RCRA). The proposal would also establish pretreatment standards for the introduction of pollutants into Publicly Owned Treatment Works (POTW) associated with the operation of new and existing hazardous landfills regulated under Subtitle C of RCRA. Sources of landfill wastewater at these facilities include, but are not limited to, landfill leachate and gas collection condensate.

The proposal would not establish pretreatment standards for the introduction of pollutants into Publicly Owned Treatment Works (POTW) associated with the operation of new and existing non-hazardous landfills regulated under Subtitle D of RCRA.

The proposal would not apply to wastewater discharges from captive landfills located at industrial facilities that commingle landfill process wastewater with non-landfill process wastewater for treatment, provided that the landfill receives only waste generated on-site or waste generated from a similar activity at another facility under the same corporate structure. Further, the proposed regulation would also not apply to wastewater discharges associated with treatment of contaminated groundwater from hazardous and non-hazardous landfills.

Compliance with this proposed regulation is estimated to reduce the discharge of pollutants by at least 800,000 pounds per year and to cost an estimated $ 7.71 million annualized (1996 dollars, post-tax for non-government facilities).

DATES: Comments on the proposal must be received by May 7, 1998.

In addition, EPA will conduct a workshop and public hearing on the pretreatment standards of the rule. The meeting will be held on February 24, 1998, from 10:00 am to 2:00 pm.

ADDRESSES: Send written comments and supporting data on this proposal to: Michael Ebner, US EPA, (4303), 401 M Street S.W., Washington, D.C. 20460. Please submit an original and two copies of your comments and enclosures (including references).

To ensure that EPA can read, understand and therefore properly respond to comments, the Agency would prefer that commenters cite, where possible the paragraph(s) or sections in the notice or supporting documents to which each comment refers. Commenters should use a separate paragraph for each issue discussed.

Commenters who want EPA to acknowledge receipt of their comments should enclose a self-addressed, stamped envelope. No facsimiles (faxes) will be accepted. Comments and data will also be accepted on disks in WordPerfect format or ASCII file format.

Comments may also be filed electronically to "Ebner.Michael@epamail.epa.gov". Electronic comments must be submitted as an ASCII or Wordperfect file avoiding the use of special characters and any form of encryption. Electronic comments must be identified by the docket number W–97–17 and may be filed online at many Federal Depository Libraries. No confidential business information (CBI) should be sent via e-mail.

The public record is available for review in the EPA Water Docket, 401 M Street S.W., Washington, D.C. 20460. The record for this rulemaking has been established under docket number W–97–17, and includes supporting documentation, but does not include any information claimed as Confidential Business Information (CBI). The record is available for inspection from 9 a.m. to 4 p.m., Monday through Friday, excluding legal holidays. For access to docket materials, please call (202) 260–3027 to schedule an appointment.

The workshop and public hearing covering the rulemaking will be held at the EPA headquarters auditorium, Waterfront Mall, 401 M St. SW, Washington, DC. Persons wishing to present formal comments at the public hearing should have a written copy for submittal.

FOR FURTHER INFORMATION CONTACT: For additional technical information contact Mr. Michael Ebner at (202) 260–5397. For additional economic information contact Mr. William Anderson at (202) 260–5131.

SUPPLEMENTARY INFORMATION: *Regulated Entities:* Entities potentially regulated by this action include:

Category	Examples of regulated entities
Industry	Landfills regulated under Subtitle C or Subtitle D of RCRA that collect and discharge landfill generated wastewaters and are not located at other industrial or commercial facilities.
State, municipal or tribal Government.	Landfills regulated under Subtitle C or Subtitle D of RCRA that collect and discharge landfill generated wastewaters and are not located at other industrial or commercial facilities.
Federal Government	Landfills regulated under Subtitle C or Subtitle D of RCRA that collect and discharge landfill generated wastewaters and are not located at other industrial or commercial facilities.

The preceding table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. This table lists the types of entities that EPA is now aware could potentially be regulated by this action. Other types of entities not listed in the table could also be regulated. To determine whether your facility is regulated by this action, you should carefully examine the applicability criteria in § 445.02 of the proposed rule. If you have questions regarding the applicability of this action to a particular entity, consult the person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

Supporting Documentation

The regulations proposed today are supported by several major documents:

1. "Development Document for Proposed Effluent Limitations

Guidelines and Standards for the Landfills Category" (EPA 821–R–97–022). Hereafter referred to as the Technical Development Document, presents EPA's technical conclusions concerning the proposal. EPA describes, among other things, the data collection activities in support of the proposal, the wastewater treatment technology options, wastewater characterization, and the estimation of costs to the industry.

2. "Economic and Cost-Effectiveness Analysis for Proposed Effluent Limitations Guidelines and Standards for the Landfills Category" (EPA 821–B–97–005).

3. "Statistical Support Document for Proposed Effluent Limitations Guidelines and Standards for the Landfills Category" (EPA 821–B–97–006).

4. "Environmental Assessment for Proposed Effluent Limitations Guidelines and Standards for the Landfills Category" (EPA 821–B–97–007).

How To Obtain Supporting Documents

The Technical and Economic Development Documents can be obtained through EPA's Home Page on the Internet, located at www.EPA.gov/OST/rules. The documents are also available from the Office of Water Resource Center, RC–4100, U.S. EPA, 401 M Street SW, Washington, D.C. 20460; telephone (202) 260–7786 for the voice mail publication request.

Table of Contents

I. Legal Authority

These regulations are proposed under the authority of Sections 301, 304, 306, 307, 308, and 501 of the Clean Water Act, 33 U.S.C. 1311, 1314, 1316, 1317, 1318, and 1361.

II. Background

A. Clean Water Act

Congress adopted the Clean Water Act (CWA) to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Section 101(a), 33 U.S.C. 1251(a)). To achieve this goal, the CWA prohibits the discharge of pollutants into navigable waters except in compliance with the statute. The Clean Water Act confronts the problem of water pollution on a number of different fronts. Its primary reliance, however, is on establishing restrictions on the types and amounts of pollutants discharged from various industrial, commercial, and public sources of wastewater.

Congress recognized that regulating only those sources that discharge effluent directly into the nation's waters would not be sufficient to achieve the CWA's goals. Consequently, the CWA requires EPA to promulgate nationally applicable pretreatment standards which restrict pollutant discharges for those who discharge wastewater indirectly through sewers flowing to publicly-owned treatment works (POTWs) (Section 307(b) and (c), 33 U.S.C. 1317(b) and (c)). National pretreatment standards are established for those pollutants in wastewater from indirect dischargers which may pass through or interfere with POTW operations. Generally, pretreatment standards are designed to ensure that wastewater from direct and indirect industrial dischargers are subject to similar levels of treatment. In addition, POTWs are required to implement local treatment limits applicable to their industrial indirect dischargers to satisfy any local requirements (40 CFR 403.5).

Direct dischargers must comply with effluent limitations in National Pollutant Discharge Elimination System ("NPDES") permits; indirect dischargers must comply with pretreatment standards. These limitations and standards are established by regulation for categories of industrial dischargers and are based on the degree of control that can be achieved using various levels of pollution control technology.

1. Best Practicable Control Technology Currently Available (BPT)—Sec. 304(b)(1) of the CWA

In the guidelines for an industry category, EPA defines BPT effluent limits for conventional, priority,[1] and

[1] In the initial stages of EPA CWA regulation, EPA efforts emphasized the achievement of BPT limitations for control of the "classical" pollutants (e.g., TSS, pH, BOD_5). However, nothing on the face of the statute explicitly restricted BPT limitation to

Continued

non-conventional pollutants. In specifying BPT, EPA looks at a number of factors. EPA first considers the cost of achieving effluent reductions in relation to the effluent reduction benefits. The Agency also considers: the age of the equipment and facilities, the processes employed and any required process changes, engineering aspects of the control technologies, non-water quality environmental impacts (including energy requirements), and such other factors as the Agency deems appropriate (CWA 304(b)(1)(B)). Traditionally, EPA establishes BPT effluent limitations based on the average of the best performances of facilities within the industry of various ages, sizes, processes or other common characteristic. Where, however, existing performance is uniformly inadequate, EPA may require higher levels of control than currently in place in an industrial category if the Agency determines that the technology can be practically applied.

2. Best Conventional Pollutant Control Technology (BCT)—Sec. 304(b)(4) of the CWA

The 1977 amendments to the CWA required EPA to identify effluent reduction levels for conventional pollutants associated with BCT technology for discharges from existing industrial point sources. In addition to other factors specified in Section 304(b)(4)(B), the CWA requires that EPA establish BCT limitations after consideration of a two part "cost-reasonableness" test. EPA explained its methodology for the development of BCT limitations in July 1986 (51 FR 24974).

Section 304(a)(4) designates the following as conventional pollutants: biochemical oxygen demand (BOD_5), total suspended solids (TSS), fecal coliform, pH, and any additional pollutants defined by the Administrator as conventional. The Administrator designated oil and grease as an additional conventional pollutant on July 30, 1979 (44 FR 44501).

3. Best Available Technology Economically Achievable (BAT)—Sec. 304(b)(2) of the CWA

In general, BAT effluent limitations guidelines represent the best economically achievable performance of plants in the industrial subcategory or category. The factors considered in assessing BAT include the cost of achieving BAT effluent reductions, the age of equipment and facilities involved, the process employed, potential process changes, and non-water quality environmental impacts, including energy requirements. The Agency retains considerable discretion in assigning the weight to be accorded these factors. Unlike BPT limitations, BAT limitations may be based on effluent reductions attainable through changes in a facility's processes and operations. As with BPT, where existing performance is uniformly inadequate, BAT may require a higher level of performance than is currently being achieved based on technology transferred from a different subcategory or category. BAT may be based upon process changes or internal controls, even when these technologies are not common industry practice.

4. New Source Performance Standards (NSPS)—Sec. 306 of the CWA

NSPS reflect effluent reductions that are achievable based on the best available demonstrated control technology. New facilities have the opportunity to install the best and most efficient production processes and wastewater treatment technologies. As a result, NSPS should represent the most stringent controls attainable through the application of the best available control technology for all pollutants (i.e., conventional, nonconventional, and priority pollutants). In establishing NSPS, EPA is directed to take into consideration the cost of achieving the effluent reduction and any non-water quality environmental impacts and energy requirements.

5. Pretreatment Standards for Existing Sources (PSES)—Sec. 307(b) of the CWA

PSES are designed to prevent the discharge of pollutants that pass through, interfere-with, or are otherwise incompatible with the operation of publicly-owned treatment works (POTW). The CWA authorizes EPA to establish pretreatment standards for pollutants that pass through POTWs or interfere with treatment processes or sludge disposal methods at POTWs. Pretreatment standards are technology-based and analogous to BAT effluent limitations guidelines.

The General Pretreatment Regulations, which set forth the framework for the implementation of categorical pretreatment standards, are found at 40 CFR Part 403. Those regulations contain a definition of pass-through that addresses localized rather than national instances of pass-through and establish pretreatment standards that apply to all non-domestic dischargers. See 52 FR 1586, January 14, 1987.

6. Pretreatment Standards for New Sources (PSNS)—Sec. 307(b) of the CWA

Like PSES, PSNS are designed to prevent the discharges of pollutants that pass through, interfere-with, or are otherwise incompatible with the operation of POTWs. PSNS are to be issued at the same time as NSPS. New indirect dischargers have the opportunity to incorporate into their plants the best available demonstrated technologies. The Agency considers the same factors in promulgating PSNS as it considers in promulgating NSPS.

B. Section 304(m) Requirements

Section 304(m) of the CWA, added by the Water Quality Act of 1987, requires EPA to establish schedules for (1) reviewing and revising existing effluent limitations guidelines and standards ("effluent guidelines") and (2) promulgating new effluent guidelines. On January 2, 1990, EPA published an Effluent Guidelines Plan (55 FR 80) that established schedules for developing new and revised effluent guidelines for several industry categories. One of the industries for which the Agency established a schedule was the Centralized Waste Treatment Industry.

The Natural Resources Defense Council (NRDC) and Public Citizen, Inc. filed suit against the Agency, alleging violation of Section 304(m) and other statutory authorities requiring promulgation of effluent guidelines (*NRDC et al.* v. *Reilly*, Civ. No. 89-2980 (D.D.C.)). Under the terms of a consent decree dated January 31, 1992, which settled the litigation, EPA agreed, among other things, to propose effluent guidelines for the "Landfills and Industrial Waste Combusters" category[2] by December 1995 and take final action on these effluent guidelines by December 1997. On February 4, 1997, the court approved modifications to the Decree which revise the deadlines to November 1997 for proposal and November 1999 for final action. EPA provided notice of these modifications on February 26, 1997, at 62 FR 8726. Although the Consent Decree lists "Landfills and Industrial Waste Combusters" as a single entry, EPA is publishing separate rulemaking

such pollutants. Following passage of the Clean Water Act of 1977 with its requirement for points sources to achieve best available technology limitations to control discharges of toxic pollutants, EPA shifted its focus to address the listed priority pollutants under the guidelines program. BPT guidelines continue to include limitations to address all pollutants.

[2] In the 1990 304(m) plan and the 1992 Decree, the category name was "Hazardous Waste Treatment, Phase II", subsequently renamed as "Landfills and Industrial Waste Combusters."

proposals for Industrial Waste Combusters and for Landfills.

III. Scope of the Proposed Regulation

EPA is today proposing effluent limitations guidelines and pretreatment standards for wastewater discharges associated only with the operation and maintenance of landfills regulated under Subtitles C and D of the Resource Conservation and Recovery Act (RCRA).[3] EPA's proposal would not apply to wastewater discharges associated with the operation and maintenance of land application or treatment units, surface impoundments, underground injection wells, waste piles, salt dome or bed formations, underground mines, caves or corrective action units.[4] Additionally, this guideline would not apply to waste transfer stations, or any wastewater not directly attributed to the operation and maintenance of Subtitle C or Subtitle D landfill units. Consequently, wastewaters such as those generated in off-site washing of vehicles used in landfill operations are not within the scope of this guideline.

The wastewater flows which are covered by the rule include leachate, gas collection condensate, drained free liquids, laboratory-derived wastewater, contaminated storm water and contact washwater from truck exteriors and surface areas which have come in direct contact with solid waste at the landfill facility. Groundwater, however, which has been contaminated by a landfill and is collected, treated, and discharged is excluded from this guideline. A discussion of the exclusion for contaminated groundwater flows is included in Section [VIII] of this notice. A description of sources of wastewater in the landfills category is also provided in Section [VIII].

EPA initially considered development of effluent guidelines to address any landfill discharging directly to the surface waters of the United States or introducing pollutants into a POTW. Consequently, EPA's technical evaluation for the proposal included an assessment of all landfill facilities which collect wastewater as a result of landfilling operations. However, EPA has decided not to include within the scope of this proposal landfill facilities operated in conjunction with other industrial or commercial operations which only receive waste from off-site facilities under the same corporate structure (intra-company facility) and/or receive waste generated on-site (captive facility) so long as the wastewater is commingled for treatment with other non-landfill process wastewaters. A landfill which accepts off-site waste from a company not under the same ownership as the landfill would not be considered a captive or intracompany facility and would be subject to the Landfills category effluent guideline when promulgated.

EPA has decided not to include these facilities within the scope of this proposed regulation for the following reasons.

First, EPA has preliminarily concluded that the wastewater generated by landfill operations at most of the captive and intracompany facilities are already subject to categorical effluent limitations (or pretreatment standards). The evidence EPA has reviewed to date supports the conclusion that these wastewater flows were either assessed and evaluated for the effluent limitations guideline applicable to the facility, or are the subject of Best Professional Judgment (BPJ) or Combined Wastestream Formula limits established by the permit writer or Control Authority.

The second reason EPA believes that it should exclude such landfills from this guideline is because landfill wastewaters at captive and intracompany landfills represent a very small portion of the wastewater flows treated at their wastewater treatment facilities (often less than one percent and typically less than three percent). In these circumstances, so long as the facilities combine the relatively small quantities of landfill wastewater with their other industrial process wastewater for treatment, there is little likelihood that the pollutants of concern in the landfill leachate will escape treatment. An additional factor lends intuitive support to this conclusion. It is likely that leachate from on-site landfills at industrial operations will reflect a pollutant profile similar to the facility's industrial process wastewater. EPA believes that landfill wastewaters generated at such facilities have a similar pollutant profile to the wastewater generated in the industrial operation. For example, the leachate from a landfill at a facility subject to the Petroleum Refining guideline will tend to be characterized by high organic loads, while the leachate from a facility regulated under the Nonferrous Metals guideline will be characterized by metal loadings. Consequently, based on the information EPA has reviewed to date, the Agency believes that the wastewater treatment currently in place at such industrial facilities is likely to treat the majority of the pollutants found in leachate at that facility. However, the Agency has only limited information on leachate quality at landfills associated with industrial operations. Accordingly, EPA requests additional data and solicits comments and data regarding its conclusion that landfill leachate at such facilities is likely to be treated effectively in the industrial wastewater treatment system and that additional effluent guidelines and categorical pretreatment standards are not necessary.

A third reason supporting exclusion of such facilities from this guideline is EPA's conclusion that the pollutants in on-site landfill wastewaters are receiving adequate treatment that is at least equivalent to that proposed here. EPA has compared the wastewater treatment technologies employed at these facilities to the treatment technologies being proposed for BPT/BAT and PSES for independently, commercially or municipally operated Subtitle C and D landfills. This assessment suggests that, in most cases, treatment for regulated pollutants being achieved at such facilities is comparable to those being proposed here.

Finally, EPA has also reviewed individual NPDES permits for captive and intracompany facilities to verify its preliminary conclusion that it may exclude such facilities from the scope of this regulation without jeopardizing receiving waters. The Agency has identified no captive or intracompany landfills that are not commingling the landfill wastewater for treatment with other wastewater at the facility. This review indicates that, for the most part, these landfill wastestreams are mixed with categorical wastes for treatment and subject to limitations comparable to those being considered here. Given these facts, EPA has concluded preliminarily that it should not include such captive or intracompany facilities within the scope of today's proposed action. However, EPA is requesting comment on its approach.[5] The Agency is particularly eager for data concerning

[3] EPA's Subtitle C and Subtitle D regulations define "landfill". *See* 40 CFR 257.2, 258.2 ("municipal solid waste landfill") and 260.10. Permitted subtitle C landfills are authorized to accept hazardous wastes as defined in 40 CFR Part 261. Subtitle D landfills are authorized to receive municipal, commercial or industrial waste that is not hazardous (or is hazardous waste excluded from regulation under Subtitle C). Details of the RCRA regulatory requirements are provided below at Section [IV].

[4] These terms are defined at 40 CFR 257.2 and 260.10.

[5] EPA acknowledges that its conclusions are tentative and not without uncertainty. A number of the facility operators identified themselves as subject to multiple categories. EPA applied its best judgment in many circumstances to determining the probable handling of the landfill waste streams. EPA is specifically soliciting data and other information on this issue.

treatment of such wastestreams at categorical and other facilities.

Based on its survey for this guideline, EPA identified over 200 captive and intracompany facilities with on-site landfills. A majority of these landfills are found at industrial facilities that are or will be subject to three effluent guidelines: Pulp and Paper (40 CFR Part 430), Centralized Waste Treatment (proposed 40 CFR Part 437, 60 FR 5464, January 27, 1995), or Organic Chemicals, Plastics and Synthetic Fibers (OCPSF) (40 CFR Part 414). In addition, EPA identified approximately 30 landfills subject to one or more of the following categories: Nonferrous Metals Manufacturing (40 CFR Part 421), Petroleum Refining (40 CFR Part 419), Timber Products Processing (40 CFR Part 429), Iron and Steel Manufacturing (40 CFR Part 420), Transportation Equipment Cleaning (new category to be proposed in 1998), and Pesticide Manufacturing (40 CFR Part 455). EPA did not, however, specifically consider the flows associated with this landfill leachate in the development of these guidelines.

Industry supplied data estimates that there are over 118 Pulp and Paper facilities with on-site landfills and that over 90 percent commingle landfill leachate with process wastewater for treatment on-site. Treatment at these facilities generally involves secondary biological treatment. The wastewater flow originating from landfills typically represents less than one percent of the total flow through the facilities' wastewater treatment plant and in no case exceeds three percent of the treated flow. Additionally, approximately six percent of the pulp and paper mills send landfill generated wastewater to a POTW along with process wastewater.

Based on this information, EPA has preliminarily concluded that landfill-generated wastewater at pulp and paper mill facilities will typically receive biological treatment equivalent to that proposed today for stand-alone landfills and consequently should be excluded from the scope of this regulation. This conclusion is based on several factors. Because landfill leachate is a regulated flow under the current permitting guidelines, permit writers must develop limits for landfill wastewater exercising their Best Professional Judgment (BPJ). Given the small volumes of landfill generated wastewaters and the fact that the treatment in place for industrial wastewaters will adequately treat the constituents typically found in landfill leachate, EPA believes that BPJ limits are likely to adequately control these discharges.

Based on responses to the 1992 Waste Treatment Industry: Landfills Questionnaire, EPA estimates that there are more than 30 facilities subject to the Organic Chemicals, Plastics and Synthetic Fibers guideline with on-site landfills.[6] At OCPSF facilities with on-site landfills, landfill leachate typically represents less than one percent of the industrial flow at the facility, in no case exceeds six percent of the flow and is typically commingled with process wastewater for treatment. EPA specifically considered landfill leachate in the development of the OCPSF guideline, although it is not specifically identified as a regulated flow in the applicability section of the rule. The development document for the guidelines discusses landfill leachate as one of the ancillary flows often treated at OCPSF facilities. Further, EPA has preliminarily concluded that the character of the landfill wastewater is similar to that being treated at the industrial operation and that landfill-generated wastewater will typically receive treatment equivalent to that proposed today for stand-alone landfills. Therefore, EPA concludes that so long as the landfill-associated discharge is subject to the same limits as the industrial operation that an appropriate level of control is being achieved.

As previously explained, on-site generated landfill wastewater that is commingled with other industrial wastewater at an industrial site is not included within the scope of the proposal. Thus, under the proposed approach, wastewater discharges from landfills located at Centralized Waste Treatment (CWT) facilities would be excluded from this regulation so long as the wastewater is commingled for treatment. In the Agency's current thinking, the categorical limitations and standards to be established for the Centralized Waste Treatment Category and codified at 40 CFR Part 429, would specifically cover landfill generated wastewater at CWT facilities (60 FR 5464, note: EPA currently intends to publish a reproposed CWT rule in 1998 and promulgate the final rule in 1999). Given the pollutant characteristics of the landfill leachate, landfill leachate flows would likely be subject to the CWT effluent limitations established under the Organics Subcategory.

Further, under this proposal, a landfill facility that accepts wastewater from off-site for treatment may, in some circumstances, itself be subject to either landfill limitations or CWT limitations. This will depend on whether the wastewater treated in its treatment system is exclusively landfill-generated wastewater or not. For example, if a landfill facility accepts any wastewater from a non-landfill source for treatment in its wastewater treatment system, then that treatment system is to be considered a CWT and would be subject to the guidelines and standards to be codified at 40 CFR Part 429. However, a landfill facility may accept wastewater for treatment that is generated off-site from off-site landfills. If a landfill facility accepts wastewater from landfill generated sources, and only from landfill generated sources, then that facility is subject to the effluent guidelines and standards proposed to be established for the landfills category. The final guideline for CWT will modify the definition of a CWT to clarify this applicability issue.

[6] Responses to the Questionnaire show that many OCPSF facilities also collect landfill leachate as well as contaminated groundwater. In the case of contaminated groundwater, these flows are addressed through corrective actions programs at the site and have not been considered for regulation under this guideline. The exclusion for contaminated groundwater is further discussed later in this section. Typically, contaminated groundwater is treated separately from other industrial wastewaters.

IV. Regulatory History of the Landfills Category

Depending on the type of wastes disposed at a landfill, the landfill may be subject to regulation and permitting under either Subtitle C or Subtitle D of RCRA. Subtitle C facilities receive wastes that are identified or listed as hazardous wastes under EPA regulations. Subtitle D landfills can accept wastes which are not required to be sent to Subtitle C facilities. The following sections outline some of the key regulations that have been developed to control the environmental impacts of Subtitle C and Subtitle D landfills.

A. RCRA Subtitle C

Subtitle C of RCRA directs EPA to promulgate regulations to protect human health and the environment from the improper management of hazardous wastes from "cradle-to-grave". Among EPA's key duties under RCRA Subtitle C is the requirement to promulgate regulations identifying the characteristics of hazardous waste and listing particular hazardous wastes. (Section 3001). EPA must also promulgate standards that apply to generators and transporters of hazardous waste as well as standards for the owners and operators of hazardous waste treatment, storage and disposal (TSD) facilities (Sections 3002–3004). In addition, RCRA Section 3005 required

EPA to establish a permitting system for each owner or operator of a TSD facility.

These regulations establish a system for tracking the disposal of hazardous wastes and performance design requirements for landfills accepting hazardous waste. RCRA Subtitle C hazardous waste regulations apply to landfills that presently accept hazardous wastes or have accepted hazardous waste at any time after November 19, 1980.

1. Land Disposal Restrictions

The Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA), enacted on November 8, 1984, largely prohibit the land disposal of untreated hazardous wastes. Once a hazardous waste is prohibited from land disposal, the statute provides only two options for legal land disposal: (1) Meet EPA-established treatment standard for the waste prior to land disposal, or (2) dispose of the waste in a land disposal unit that has been found to satisfy the statutory no migration test. A no migration unit is one from which there will be no migration of hazardous constituents for as long as the waste remains hazardous (RCRA Sections 3004 (d),(e),(g)(5)).

Under Section 3004, the treatment standards that EPA develops may be expressed as either constituent concentration levels or as specific methods of treatment. The criteria for these standards is that they must 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)). For purposes of the restrictions, the RCRA program defines land disposal to include, among other things, any placement of hazardous waste in a landfill. Land disposal restrictions are published in 40 CFR Part 268.

EPA has used hazardous waste treatability data as the basis for land disposal restrictions standards. First, EPA has identified Best Demonstrated Available Treatment Technology (BDAT) for each listed hazardous waste. BDAT is that treatment technology that EPA finds to be the most effective treatment for a waste which is also readily available to generators and treaters. In some cases EPA has designated as BDAT for a particular waste stream a treatment technology shown to have successfully treated a similar but more difficult to treat waste stream. This ensured that the land disposal restrictions standards for a listed waste stream were achievable since they always reflected the actual treatability of the waste itself or of a more refractory waste.

As part of the Land Disposal Restrictions (LDR), Universal Treatment Standards (UTS) were promulgated as part of the RCRA phase two final rule (July 27,1994). The UTS are a series of concentrations for wastewaters and non-wastewaters that provide a single treatment standard for each constituent. Previously, the LDR regulated constituents according to the identity of the original waste; thus, several numerical treatment standards might exist for each constituent. The UTS simplified the standards by having only one treatment standard for each constituent in any waste residue.

The LDR treatment standards established under RCRA may differ from the Clean Water Act effluent guidelines proposed here today both in their format and in the numerical values set for each constituent. The differences result from the use of different legal criteria for developing the limits and resulting differences in the technical and economic criteria and data sets used for establishing the respective limits.

There may be differences in how standards are expressed for the LDR and effluent guidelines. For example, LDR may establish a single concentration limit for particular waste hazardous constituents whereas the effluent guidelines establish monthly and daily average limits. Additionally, the effluent guidelines provide for several types of discharge, including new versus existing sources and indirect versus direct discharge.

The differences in numerical limits established under the Clean Water Act may differ not only from LDR and UTS but also from point-source category to point-source category (e.g., Electroplating, 40 CFR Part 413; and Metal Finishing, 40 CFR Part 433). The effluent guidelines limitations and standards are industry-specific, subcategory-specific, and technology-based. The numerical limits are typically based on different data sets that reflect the performance of specific wastewater management and treatment practices. Differences in the limits reflect differences in the statutory factors that the Administrator is required to consider in developing technically and economically achievable limitations and standards—manufacturing products and processes (which, for landfills involves types of waste disposed), raw materials, wastewater characteristics, treatability, facility size, geographic location, age of facility and equipment, non-water quality environmental impacts, and energy requirements. A consequence of these differing approaches is that similar or identical waste streams are regulated at different levels dependent on the receiving body of the wastewater, e.g. a POTW, a surface water, or a land disposal facility.

2. Minimum Technology Requirements

In order to further protect human health and the environment from the adverse affects of hazardous waste disposed in landfills, the 1984 Hazardous and Solid Waste Amendments (HSWA) to RCRA established minimum technology requirements for landfills receiving hazardous waste. These provisions required the installation of double liners and leachate collection systems at new landfills, replacements of existing units, and lateral expansions of existing units. HSWA also required all hazardous waste landfills to install groundwater monitoring wells by November 8, 1987. Performance regulations governing the operation of hazardous waste landfills are included in 40 CFR Parts 264 and 265.

B. RCRA Subtitle D

Landfills managing non-hazardous wastes are regulated under the RCRA Subtitle D program. A brief summary of these RCRA Subtitle D regulations is provided below.

- 40 CFR Part 257, Subpart A Criteria

EPA promulgated these criteria on September 13, 1979 (44 FR 53460) under the authority of RCRA Sections 1008(a) and 4004(a) and Sections 405(d) and (e) of the Clean Water Act. These criteria apply to all solid waste disposal facilities and practices. However, certain facilities and practices are not covered by the criteria, such as agricultural wastes returned to the soil as fertilizers or soil conditioners; overburden resulting from mining operations; land application of domestic sewage or treated domestic sewage; hazardous waste disposal facilities which are subject to regulations under RCRA Subtitle C (discussed below); municipal solid waste landfills that are subject to the revised criteria in 40 CFR Part 258 (discussed below); and use or disposal of sewage sludge on the land when the sewage sludge is used or disposed in accordance with 40 CFR Part 503 (*See* 40 CFR Part 257.1(c)(1)–(11)).

The criteria include general environmental performance standards addressing eight major areas: flood plains, protection of endangered species, protection of surface water,

protection of groundwater, limitations on the land application of solid waste, periodic application of cover to prevent disease vectors, air quality standards (prohibition against open burning), and safety practices ensuring protection from explosive gases, fires, and bird hazards to airports. Facilities which fail to comply with any of these criteria are considered open dumps, which are prohibited by RCRA Section 4005. Those facilities which meet the criteria are considered sanitary landfills under RCRA Section 4004(a).

• 40 CFR Part 258 Revised Criteria for Municipal Solid Waste Landfills (MSWLFs)

On October 9, 1991, EPA promulgated revised criteria for MSWLFs in accordance with the authority provided in RCRA Sections 1008(a)(3), 4004(a), 4010© and CWA Sections 405(d) and (e) (*see* 56 FR 50978). Under the terms of these revised criteria, MSWLFs are defined to mean a discrete area of land or an excavation that receives household waste, and is not a land application unit, surface impoundment, injection well, or waste pile, as those terms are defined in 40 CFR 257.2 and 258.2. A MSWLF unit also may receive other types of RCRA Subtitle D wastes, such as commercial solid waste, nonhazardous sludge, and industrial solid waste. Such a landfill may be publicly or privately owned. A MSWLF unit may be a new unit, existing MSWLF unit or a lateral expansion.

The MSWLF revised criteria include location standards (Subpart B), operating criteria (Subpart C), design criteria (Subpart D), groundwater monitoring and corrective action (Subpart E), closure and post-closure care criteria (Subpart F), and financial assurance requirements (Subpart G). The design criteria provide that new MSWLF units and lateral expansions of existing units (as defined in Section 258.2) must be constructed in accordance with either (1) a design approved by a Director of a State whose MSWLF permit program has been approved by EPA and which satisfies a performance standard to ensure that unacceptable levels of certain chemicals do not migrate beyond a specified distance from the landfill (Sections 258.40(a)(1), (c), (d), Table 1) or (2) a composite liner and a leachate collection system (Sections 258.40(a)(2), (b)). The groundwater monitoring criteria generally require owners or operators of MSWLFs to monitor groundwater for contaminants and generally implement a corrective action remedy when monitoring indicates that a groundwater protection standard has been exceeded. However, certain small MSWLFs located in arid or remote locations are exempt from both design and groundwater monitoring requirements. The closure standards require that a final cover be installed to minimize infiltration and erosion. The post-closure provisions generally require, among other things, that groundwater monitoring continue and that the leachate collection system be maintained and operated for 30 years after the MSWLF is closed. The Director of an approved State may increase or decrease the length of the post-closure period.

Again, as is the case with solid waste disposal facilities which fail to meet the open dumping criteria in 40 CFR Part 257, Subpart A, MSWLFs which fail to satisfy the revised criteria in Part 258 constitute open dumps (40 CFR 258.1(h)). All solid waste disposal facilities, i.e., MSWLFs, that are subject to the requirements in the Part 258 revised criteria and which collect and discharge landfill-generated waste waters are included in this category.

• 40 CFR Part 257, Subpart B CESQG Revised Criteria

A Conditionally Exempt Small Quantity Generator (CESQG) is generally defined as one who generates no more than 100 kilograms of hazardous waste per month in a calendar year (40 CFR 261.5(a)). Such CESQGs (with certain exceptions) are not subject to RCRA Subtitle C requirements. However, on July 1, 1996, EPA (1) amended Part 257 to establish criteria that must be met by non-municipal, non-hazardous solid waste disposal units that receive CESQG waste and (2) established separate management and disposal standards (in 40 CFR 261.5(f)(3) and (g)(3)) for those who generate CESQG waste (*see* 61 FR 342169). The CESQG revised criteria for such disposal units include location standards, groundwater monitoring, and corrective action requirements.

V. Industry Profile

The growth of the landfills industry is a direct result of RCRA and subsequent EPA and State regulation that establish the conditions under which solid waste may be disposed. The adoption of increased control measures required by RCRA has had a number of ancillary effects.

The RCRA requirements have affected the landfill industry in different ways. On the one hand, it has forced many landfills to close because they lacked adequate on-site controls to protect against migration of hazardous constituents in the landfill, and it was not economical to upgrade the landfill facility. As a result, a large number of landfills, especially facilities serving small populations, have closed rather than incur the significant expense of upgrading.

Conversely, large landfill operations have taken advantage of economies of scale by serving wide geographic areas and accepting an increasing portion of the nation's solid waste. For example, responses to EPA's Waste Treatment Industry Survey indicated that 75 percent of the nation's municipal solid waste was deposited in large landfills representing only 25 percent of the landfill population.

EPA has identified several trends in the waste disposal industry that may increase the quantity of leachate produced by landfills. More stringent RCRA regulation and the restrictions on the management of wastes have increased the amount of waste disposed at landfills as well as the number of facilities choosing to send wastes off-site to commercial facilities in lieu of pursuing on-site management options. This will increase treated leachate discharges from the nation's landfills, thus potentially putting at risk the integrity of the nation's waters. Further, as a result of the increased number of leachate collection systems, the volumes of leachate requiring treatment and disposal has greatly increased.

EPA identified approximately 11,000 landfill facilities located throughout the country in 1992. Out of the 11,000 facilities, EPA has determined that the vast majority of these facilities either are closed or do not generate wastewaters that EPA is proposing for regulation. Based on survey responses, EPA believes that 164 facilities would be affected by this proposed regulation.

In the case of landfills subject to regulation under Subtitle D, EPA projects that there are 158 facilities which discharge in-scope wastewater directly to receiving streams and which may be affected by this proposal. EPA estimates that there are 762 facilities which collect in-scope wastewaters but discharge indirectly to a POTW and would not be affected by this proposal because EPA is not proposing to regulate indirect discharges from non-hazardous, Subtitle D landfills. There are an additional 343 facilities which collect in-scope wastewaters but do not discharge to surface waters or to POTWs, and are also not affected by this proposal. The means for disposing of their wastewaters include hauling off-site to a centralized waste treatment facility, evaporation, recirculation back to the landfill, and land application.

With respect to landfills subject to regulation under Subtitle C, EPA estimates that there are six hazardous landfill facilities which discharge indirectly to POTWs that may be affected by this proposal. EPA estimated that there are no hazardous landfills discharging directly to surface waters. EPA estimates that there are 141 hazardous landfills which collect in-scope wastewaters but do not discharge wastewater to surface waters or to a POTW. Methods of wastewater disposal include hauling wastewater off-site to a centralized waste treatment facility, underground injection, and solidification. Additionally, EPA estimates that there are more than 250 industrial facilities which contain landfills but would be excluded from this regulation as a result of the factors discussed in Section [III].

VI. Summary of EPA Activities and Data Gathering Efforts

This section describes the sources of data used by EPA in support of this proposal.

A. Preliminary Data Summary for the Hazardous Waste Treatment Industry

EPA's initial effort to develop effluent limitations guidelines and pretreatment standards for the waste treatment industry began in 1986. The Agency looked at a range of facilities, including landfills, that received waste from off-site for treatment, recovery or disposal. The purpose of this study was to develop information to characterize the hazardous waste treatment industry, its operations, and pollutant discharges to the nation's waters. EPA published the results of its examination of the industry in the "Preliminary Data Summary for the Hazardous Waste Treatment Industry" in 1989 (EPA 440/1-89-100). This report focused on three types of hazardous waste treatment industries: landfills, incinerators with wet scrubbers, and aqueous hazardous waste treaters.

After a thorough analysis of the landfill data presented in the Preliminary Data Summary, EPA decided it should develop an effluent guidelines regulation for the landfills category. EPA's decision to develop effluent limitations guidelines was based on the Preliminary Data Summary's assessment of the current and future trends in the landfill industry, its analysis of the concentrations of pollutants in the raw leachate, and the study's discussion on the treatment and control technologies available for effective pollution reduction in landfill leachate.

The Preliminary Data Summary outlined several trends in the waste disposal industry that are likely to affect the amount of leachate produced by landfills and leachate characteristics. The summary projected an increase in the amount of waste disposed at landfills as a result of more stringent regulations and restrictions on certain waste management practices. The increase in the number of facilities choosing to send wastes off-site to commercial facilities in lieu of pursuing on-site management options ultimately increases the amount of leachate discharged each year from the nation's landfills, thus potentially putting at risk the integrity of the nation's waters.

Another trend identified in the Preliminary Data Summary is the installation of leachate collection systems. Many of these systems are a result of current RCRA regulations which require leachate collection systems in hazardous landfills or federal regulations requiring them in municipal landfills. As a result of the increased number of leachate collection systems, the volumes of leachate requiring treatment and disposal has greatly increased. This increased volume of leachate was another reason EPA felt it necessary to propose an effluent guideline for landfills.

B. Survey Questionnaires

A major source of information and data used in developing effluent limitations guidelines and standards was industry responses to detailed technical and economic questionnaires, and the subsequent Detailed Monitoring Questionnaires (DMQs) distributed by EPA under the authority of Section 308 of the Clean Water Act. For the Landfills industry, the data collection process was done in several steps. First, EPA identified a population of 595 Subtitle C landfills and 10,330 Subtitle D landfills in the country.

Second, a screener survey was developed to collect initial information on all possible landfill sites in the U.S. and to update information on ownership and facility contacts. Screener surveys were mailed to all 595 Subtitle C landfills and to 4401 Subtitle D landfills (approximately 43 percent). Information collected by the screener surveys included:

- mailing address;
- landfill type, including types and amount of solid waste disposed;
- landfill capacity;
- wastewater generation rates as a result of landfill operations, including leachate, gas condensate, and contaminated groundwater;
- regulatory classification;
- ownership status;
- discharge status;
- monitoring practices; and
- treatment technology.

Of the 4,996 screener questionnaires mailed, there were 3,628 respondents. Of these, 3,581 were of sufficient quality to be used for data analysis. Of these, EPA identified 1,024 landfills that generate and collect one or more types of in-scope wastewaters.

Once the information from the screener surveys was tabulated and analyzed, EPA then developed a technical Detailed Questionnaire to obtain more information from the in-scope facilities identified in the screener surveys.

In determining which in-scope facilities should receive the technical Detailed Questionnaire, EPA weighted the list toward those landfills with wastewater treatment facilities in place. All in-scope facilities selected fell into the following four categories:

1. Questionnaires were sent to all commercial, municipal, or government facilities identified from the screener that had wastewater treatment (for their landfill generated wastewaters) and were direct or indirect dischargers.
2. A 25 percent sample of landfills were selected from the list of commercial, municipal, or government facilities identified from the screener that had wastewater treatment, but were zero or alternative dischargers (i.e., do not discharge to a POTW or to a surface water).
3. A 40 percent sample of landfills were selected from the list of non-commercial private (captive or intra-company) facilities identified from the screener that had wastewater treatment.
4. A 10 percent sample of landfills were selected from the list of facilities identified from the screener that collected and discharged in-scope wastewater, but did not have wastewater treatment.

This selection criteria resulted in a mailing of the Detailed Questionnaires to 252 in-scope facilities. The Detailed Questionnaires solicited technical and economic information on landfill operations, employment, revenue, wastewater generation, wastewater treatment, and wastewater monitoring data.

Of the 252 recipients, 220 responded with sufficient technical data to be included in the final EPA Detailed Questionnaire database.

In addition to the Detailed Questionnaire, EPA also requested detailed wastewater monitoring information from 27 in-scope facilities from the questionnaire mailing list. These facilities were selected based

upon their responses to the Detailed Questionnaire. EPA reviewed each facility's monitoring summary provided in the questionnaire, discharge permit requirements, and their on-site treatment technologies. From these responses, EPA determined that 27 facilities could provide useful information on technology performance and pollutant removals.

The selected facilities were requested to send analytical data (1992, 1993, and 1994 annual data) on daily equalized influent to their wastewater treatment system, as well as effluent data from the treatment system. The three years of analytical data were used to help EPA calculate the variability factors (Section IX of today's notice) used in determining the industry effluent limits. Analytical data for intermediate waste treatment sampling points were also requested for some facilities. In this manner, EPA was able to obtain performance information across individual treatment units in addition to the entire treatment process.

EPA also conducted a thorough review of each DMQ response to ensure that the data provided was representative of the facility's treatment system. EPA collected data from 24 semi-continuous and continuous treatment systems and two batch treatment systems.

C. Wastewater Sampling and Site Visits

EPA conducted wastewater characterization site visits at 15 landfill facilities. The purpose of these visits was to collect information on the facility's landfilling operations and collect influent raw wastewater samples to help characterize the Landfill industry. The selection of facilities was based on the responses to the Detailed Questionnaire on type of landfill (e.g., construction and demolition, ash, sludge, industrial, and hazardous). EPA visited facilities from as broad a cross section of the industry as possible.

EPA spent one day at each landfill. During the site visits, EPA collected information on the types of waste accepted, acceptance criteria, and landfill operating practices. EPA emphasized obtaining wastewater characterization information, such as the type, source, and quantity of raw wastewaters generated, and wastewater collection methods employed. Grab samples of the untreated wastewater were collected from each landfill and the data that resulted from these samples were used in the characterization of the Landfills industry.

EPA conducted engineering site visits at 19 facilities. The purpose of these visits was to evaluate each facility as a potential week-long sampling candidate. The selection of these facilities was based on the responses to the Detailed Questionnaire on types of wastewater treatment on site. Facilities selected for engineering site visits employed various types of treatment, including: equalization, chemical precipitation, biological, filtration, and reverse osmosis. During the engineering site visit, EPA obtained information on:

- the facility and its operations;
- the wastes accepted for treatment and the facility's acceptance criteria;
- the raw wastewater generated and its sources;
- the wastewater treatment on site;
- the location of potential sampling points; and
- the site-specific sampling needs, issues of access, and required sampling safety equipment.

EPA conducted week-long sampling efforts at six landfills. Selection of these facilities was based on the analysis of the information collected during the engineering site visits.

EPA then prepared a detailed sampling plan for each sampling episode. Wastewater samples were collected at influent, intermediate, and effluent sample points throughout the entire on-site wastewater treatment system. Sampling at 5 of the facilities consisted of 24-hour composite samples for 5 consecutive days. For the sixth facility, composites were taken of 4 completed batches over 5 days. Grab samples were collected for oil and grease, and the volatile organic grab samples were composited in the laboratory prior to analysis. Samples were then analyzed using EPA's Office of Water approved analytical methods. EPA sampling assesses the following technologies:

- Equalization
- Chemical precipitation
- Aerobic biological
- Anaerobic biological
- Carbon adsorption
- Multimedia filtration
- Reverse osmosis
- Air stripping
- Steam stripping
- Sludge dewatering

Data resulting from the influent samples were used to develop the list of pollutants of interest (POIs) and raw wastewater characteristics. The data collected from the influent, intermediate, and effluent points were used to analyze the effective treatment at the facilities, develop current discharge concentrations, pollutant loadings, and the Best Available Treatment (BAT) options for the Landfills industry. Data collected from the effluent points were used to calculate long term averages (LTAs) for each of the proposed regulatory options.

D. Additional Data Sources

In developing the Landfills effluent guidelines, EPA evaluated the following data sources:

- CERCLA Site Discharges to POTWs Treatability Manual;
- Fate of Priority Pollutants in Publicly Owned Treatment Works (50 POTW Study) database;
- EPA's National Risk Management Research Laboratory (NRMRL) treatability database; and
- Industry Supplied Data.

These data sources and their uses for the development of the Landfills effluent guidelines are discussed below.

Data from the "CERCLA Site Discharges to POTWs Treatability Manual" (EPA 540/G–90/005, August 1990) were used to supplement the groundwater data collected during characterization and week-long sampling events. The purpose of the study was to:

- Identify the variety of compounds and concentration ranges present in groundwater at CERCLA sites;
- Collect data on the treatability of compounds achieved by various on-site pretreatment systems; and
- Evaluate the impact of CERCLA discharges to a receiving POTW.

A total of eighteen CERCLA facilities were sampled in this study; however, only facilities which received contaminated groundwater as a result of landfilling activities were selected to be used in conjunction with EPA groundwater sampling data. The data from seven CERCLA facilities were combined with EPA sampling data to help characterize the Hazardous Landfill Subcategory and to develop both the current discharge concentrations and pollutant loadings for facilities in the Hazardous Landfill Subcategory. In addition, data from three CERCLA facilities which employed carbon adsorption were combined with EPA sampling data to conduct the pass-through analysis and to evaluate the performance of carbon adsorption treatment technology.

EPA used the data included in the report entitled "Fate of Priority Pollutants in Publicly Owned Treatment Works" (EPA 440/1–82/303, September 1982), commonly referred to as the "50–POTW Study", in determining those pollutants that would pass through a POTW. This study presents data on the performance of 50 representative POTWs which were operating at or near the efficiency required to meet

secondary treatment (30 mg/l BOD^5 and 30 mg/l TSS). The 50–POTW study data was edited prior to its use in the landfills regulation. The data editing hierarchal rules were devised to minimize the possibility that low POTW removals might simply reflect low influent concentrations instead of being a true measure of treatment effectiveness. The hierarchial data editing rules for the 50–POTW study were as follows: (1) Detected pollutants must have at least three pairs (influent/effluent) of data points to be included, (2) average pollutant influent levels less than 10 times the pollutant analytical Minimum Level (ML) were eliminated, and (3) if none of the average pollutant influent concentrations exceeded 10 times the ML, then the average influent values less than 20 µg/l were eliminated. The remaining averaged pollutant influent values and the corresponding averaged effluent values were then used to calculate the average percent removal for each pollutant when conducting the POTW pass-through analysis for this industry, which is discussed in detail in the Technical Development Document.

EPA's National Risk Management Research Laboratory (NRMRL) developed a treatability data base (formerly called the Risk Reduction Engineering Laboratory (RREL) data base). This computerized data base provides information, by pollutant, on removals obtained by various treatment technologies. The data base provides the user with the specific data source, and the industry from which the wastewater was generated. The NRMRL data base was used when conducting the POTW pass-through analysis by supplementing the treatment information provided in the 50–POTW study when there was insufficient information on specific pollutants. For each of the pollutants of interest (POIs) not found in the 50–POTW data base, data from portions of the NRMRL data base were obtained. These files were edited so that only treatment technologies representative of typical POTW secondary treatment operations (activated sludge, activated sludge with filtration, aerobic lagoons) were used. The files were further edited to include information pertaining to domestic or industrial wastewater, unless only other wastewater data were available. Pilot-scale and full-scale data were used; bench-scale data were eliminated. Data from papers in peer-reviewed journals or government reports were used; lesser quality references were edited out. From the remaining pollutant removal data, the average percent removal for each pollutant was calculated.

Finally, EPA solicited any data on landfill wastewaters that may be relevant from the landfills industry. Several facilities supplied EPA with leachate and groundwater characterization and treatability studies. The data included in these studies were analyzed and compared to EPA sampling data collected at the facilities. Analysis of the industry provided data confirmed the results of several of EPA sampling episodes.

VII. Development of Subcategorization Approach

For today's proposal, EPA considered whether a single set of effluent limitations and standards should be established for this industry, or whether different limitations and standards were appropriate for subcategories within the industry. In reaching its preliminary decision that subcategorization is required, EPA considered various factors. The CWA requires EPA, in developing effluent limitations, to assess several factors including manufacturing processes, products, the size and age of site, wastewater use, and wastewater characteristics. The landfills industry, however, is not typical of many of the other industries regulated under the CWA because it does not produce a product. Therefore, EPA developed additional factors that specifically address the characteristics of landfill operations. Similarly, several factors typically considered for subcategorization of manufacturing facilities were not considered applicable to the landfills industry. The factors considered for subcategorization are listed below:

- Regulatory classification;
- Types of wastes received;
- Wastewater characteristics;
- Facility size;
- Ownership;
- Facility location;
- Economic impacts;
- Treatment technologies and costs;
- Facility age;
- Energy requirements; and
- Non-water quality impacts.

A. Selection of Subcategorization Approach

Based on its assessment of the above factors, EPA has preliminarily determined that it should segment the landfill industry and develop different effluent limitations and pretreatment standards for subcategories of the industry. EPA concluded that the most appropriate basis for subcategorization is by landfill classification under RCRA for the reasons explained in greater detail below. Subcategorization on this basis incorporates many of the most relevant differences within the landfills industry. EPA found the types of waste received at the landfill and the resulting characteristics of the wastewater most clearly correlated with the RCRA classification of a landfill. Additionally, the Agency believes that this subcategorization approach has the virtue of being the easiest to implement because it follows the same classification previously established under RCRA and currently in use (and widely understood) by permit writers and regulated entities. The Agency believes that any subcategorization at odds with existing RCRA classification approaches would potentially create unnecessary confusion to the regulated community. The proposed subcategories are described below.

Subcategory I: Subtitle D Non-Hazardous Landfills

Subcategory I would apply to wastewater discharges from all landfills classified as RCRA Subtitle D non-hazardous landfills subject to either of the criteria established in 40 CFR Parts 257 (Criteria for Classification of Solid Waste Disposal Facilities and Practices) or 258 (Criteria for Municipal Solid Waste Landfills) as explained above at Section [IV].

Subcategory II: Subtitle C Hazardous Landfills

Subcategory II would apply to wastewater discharges from a solid waste disposal facility subject to the criteria in 40 CFR 264 Subpart N—Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities and 40 CFR 265 Subpart N—Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities. Hazardous waste landfills are subject to requirements outlined in 40 CFR Parts 264 and 265 that include the requirement to maintain a leachate collection and removal systems during the active life and post-closure period of the landfill as explained previously at Section [IV].

B. Factors Considered for Basis of Subcategorization

1. Types of Waste Landfilled

The type of solid waste which is deposited in a landfill often has a direct correlation with the characteristics of the leachate produced by that landfill. EPA believes that the most practical method of distinguishing the type of waste deposited in a landfill is achieved by utilizing the RCRA classification of

landfills that distinguishes between hazardous or non-hazardous waste landfills.

There are also a number of unique landfill cells and monofills dedicated to accept only one type of non-hazardous solid waste which may include construction and demolition debris, ash, or sludge. The Agency is not proposing to further subcategorize Subtitle D landfill facilities according to the specific type of waste received. This decision is based on two considerations.

The first consideration is based on EPA's evaluation of leachate characteristics. EPA evaluated leachate characteristics from many Subtitle D landfills and concluded that raw leachate was not significantly different among monofills to merit subcategorization. This is not unexpected, as the waste deposited in municipal landfills and dedicated monofills is not mutually exclusive. Although dedicated cells may prohibit disposal of municipal refuse, a municipal waste landfill may also accept ash, sludge, and construction and demolition wastes. EPA concluded that there were no pollutants of concern identified in dedicated monofills which were not already present in municipal landfills. EPA concluded that the pollutants proposed to be regulated for the Subtitle D Subcategory will effectively address the discharges from all types of Subtitle D landfills, including those accepting only one type of waste.

The second consideration was based on ease of implementation. As discussed above, there is overlapping waste acceptance criteria, and distinct effective dates which define the type of landfill. Additionally, there are many facilities which operate both dedicated monofills and municipal landfills and which commingle wastewater prior to treatment. The Agency believes that establishing one subcategory for all non-hazardous landfills will ease implementation issues and adequately control discharges from the landfills industry. EPA solicits comment on the decision not to subcategorize Subtitle D monofills.

2. Wastewater Characteristics

EPA concluded that leachate characteristics from non-hazardous and hazardous landfills differed significantly in the types of pollutants detected and the concentrations of those pollutants. As expected, EPA found that the leachate from hazardous landfills contained a greater number of contaminants at higher concentrations compared to leachate from non-hazardous landfills. This supported subcategorization based on RCRA classification of hazardous and non-hazardous landfills.

3. Facility Size

EPA considered subcategorization of the landfills industry on the basis of site size. Three parameters were identified as relative measures of facility size: number of employees, amount of waste disposed, and wastewater flow. EPA found that landfills of varying sizes generate similar wastewaters and use similar treatment technologies. Furthermore, wastewaters from landfills can be treated to the same level regardless of facility size. EPA determined that the industry should not be subcategorized based on facility size. EPA does not propose a de-minimis flow exclusion for this guideline.

4. Ownership

EPA considered subcategorizing the industry by ownership. A significant number of landfills are owned by state, local, or federal governments, while many others are commercially or privately owned. Although there are distinct economic considerations to account for, there is no distinction in the wastewater characteristics and wastewater treatment employed at commercial or municipally owned landfills. EPA determined that the industry should not be subcategorized based on ownership.

5. Geographic Location

EPA considered subcategorizing the industry by geographic location. Landfill sites are not limited to any one region of the United States. Landfills from all sections of the country were represented in EPA's survey of the industry. Although wastewater generation rates appear to vary with annual precipitation, which is indirectly related to geographic location, a direct correlation in leachate characteristics to geographic location could not be established. Additionally, the data collected by EPA did not indicate any significant variations in wastewater treatment technologies employed by facilities in colder climates versus warmer climates, nor in the discharge water quality. EPA determined that geographic location is not an appropriate method for subcategorization.

EPA noted that geographic location may have a differential impact on the cost of operating a landfill. For example, the cost of additional land required for the installation of a treatment system or the tipping fees charged for waste disposal may vary from region to region. These issues were addressed in the estimated costs and impacts of the proposal.

6. Economic Characteristics

EPA also considered subcategorizing the industry based on the economic characteristics of the landfill facilities. If a group of facilities with common economic characteristics, such as revenue size, was in a much better or worse financial condition than others, then it might be appropriate to subcategorize based on economics. However, analysis of the financial conditions of facilities showed no significant pattern of variation across possible subcategories.

7. Treatment Technologies and Costs

The Agency did not consider treatment technologies or costs to be a basis for subcategorization.

8. Age

EPA considered whether age-related changes in leachate concentrations of pollutants necessitate different discharge limits for different age classes of landfills. Several considerations lead to the conclusion that age-related limits are not appropriate.

First, a facility's wastewater treatment system typically receives and commingles leachate from several landfills or cells of different ages. The Agency has not observed any facility which has found it advantageous or necessary to treat age-related leachates separately. Second, based on responses to the questionnaire, discussions with landfill operators and historical data, EPA understands that leachate pollutant concentrations appear to change substantially over the first two to five years of operation but then change only slowly thereafter.

These two observations imply that treatment systems must be designed to accommodate the full range of concentrations expected in influent wastewaters. EPA concluded that the proposed BPT/BAT/PSES/NSPS/PSNS treatment technologies are successfully able to treat the variations in landfill wastewaters likely to occur due to age-related changes.

Finally, EPA has taken into account the ability of treatment systems to accommodate age-related changes in leachate (influent) concentrations, as well as short-term fluctuations by proposing effluent limitations which reflect the variability observed in monitoring data spanning up to three years. Additionally, age-related effects on treatment technologies, costs and pollutant loads were addressed by utilizing data collected from a variety of

landfills in various stages of age and operation (e.g. closed, inactive, active).

EPA solicits comment and data on its conclusions regarding the relationship of wastewater characteristics to the age of the landfill.

9. Energy Requirements

The Agency did not subcategorize by energy requirements because this is not a significant factor in this industry and is not related to wastewater characteristics. Energy costs resulting from this regulation were accounted for in the economic impact assessment for this regulation.

10. Non-Water Quality Impacts

The Agency evaluated the impacts of this regulation on the potential for increased generation of solid waste and air pollution. The non-water quality impacts did not constitute a basis for subcategorization. The non-water quality impacts and costs of solid waste disposal is included in the economic analysis and regulatory impact analysis for this regulation.

VIII. Wastewater Characterization

This section describes the sources of wastewater flows proposed to be regulated at landfills. This section also characterizes and describes these wastewater discharge flows.

A. Sources of Landfill Generated Wastewater

Approximately 7.1 billion gallons of in-scope wastewater were generated at landfill facilities in 1992. EPA has proposed to regulate the following landfill sources of wastewater: leachate, gas collection condensate, truck/equipment washwater, drained free liquids, laboratory wastewaters, and contaminated stormwater. Additional sources of wastewaters generated by landfills but not proposed to be regulated under this guideline include contaminated groundwater, non-contaminated stormwater, and sanitary wastewaters. These wastewaters are described below.

1. *Leachate*, as defined in 40 CFR 258.2, is liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials removed from such waste. Over time the potential for certain pollutants to movement into the wider environment increase. As water passes through the landfill, it may "leach" pollutants from the disposed waste moving them deeper into the soil. This presents a potential hazard to public health and the environment through groundwater contamination and other means. One measure used to prevent the movement of toxic and hazardous waste constituents from a landfill is a landfill liner operated in conjunction with a leachate collection system. Leachate is typically collected from a liner system placed at the bottom of the landfill. Leachate also may be collected through the use of slurry walls, trenches or other containment systems. The leachate generated varies from site to site based on a number of factors including: the types of waste accepted; operating practices (including shedding, daily cover and capping); the depth of fill; compaction of wastes; annual precipitation; and landfill age. Landfill leachate accounts for over 95 percent of the in-scope wastewaters.

2. *Gas Collection Condensate* is liquid which has condensed in a gas collection system during the extraction of gas from the landfill. Gases such as methane and carbon dioxide are generated due to microbial activity within the landfill and must be removed to avoid hazardous conditions. The gases tend to contain high concentrations of water vapor which is condensed in traps staged throughout the gas collection network. The gas condensate contains volatile compounds and accounts for a relatively small percentage of flow from a landfill.

3. *Drained Free Liquids* are aqueous wastes drained from waste containers (e.g. drums, trucks) or wastewater resulting from waste stabilization prior to landfilling. Landfills which accept containerized waste may generate this type of wastewater. Wastewaters generated from these waste processing activities are collected and usually combined with other landfill generated wastewaters for treatment at the wastewater treatment plant. Due to the limited amount of data submitted to EPA on the characteristics of drained free liquids, and due to the potentially unique nature of these flows, the Agency solicits comments and data on including drained free liquids within the scope of this guideline.

4. *Truck/Equipment Washwater* is generated during either truck or equipment washes at landfills. During routine maintenance or repair operations, trucks and/or equipment used within the landfill (e.g., loaders, compactors, or dump trucks) are washed and the resultant wastewaters are collected for treatment. In addition, it is common practice for many facilities to wash the wheels, body, and undercarriage of trucks used to deliver the waste to the open landfill face upon leaving the landfill. On-site wastewater treatment equipment and storage tanks are also periodically cleaned.

5. *Laboratory-Derived Wastewater* is generated from on-site laboratories which characterize incoming waste streams and monitor on-site treatment performance.

6. *Contaminated Stormwater* is runoff that comes in direct contact with the waste or waste handling and treatment areas. Stormwater which does not come into contact with the wastes .

7. *Non-contaminated Stormwater* includes stormwater which flows off the cap or cover of the landfill and does not come in direct contact with solid waste. The Agency is not proposing to regulate non-contact stormwater because non-contact stormwater flows are not considered process wastewaters and are already subject to existing stormwater regulations. Non-contaminated storm water discharged through municipal storm water systems or that discharge directly to waters of the United States are subject to National Pollutant Discharge Elimination System (NPDES) storm water permit requirements under 40 CFR 122.26 (b)(14)(v).

8. *Contaminated Groundwater* is water below the land surface in the zone of saturation which has been contaminated by landfill leachate. EPA is also not proposing to include within the scope of regulated flows groundwater which has been contaminated by a landfill and is collected and discharged. The reasons for this decision are as follows.

During development of this proposal, EPA considered whether it should also include contaminated groundwater flows within the scope of this guideline. Historically, many landfill operations have caused the contamination of local groundwater, mostly as a result of leakage from unlined landfill units in operation prior to the minimum technology standards for landfills established by RCRA Subtitle C and D regulations. Subsequently, State and Federal action under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) has required facilities to clean up contaminated groundwater. In many cases this has resulted in the collection, treatment and discharge of treated groundwater to surface waters. In addition, in the case of RCRA Subtitle C hazardous waste landfills and Municipal solid Waste Landfills (MSWLF), applicable regulatory standards require groundwater monitoring and post-closure care and, in the event of groundwater contamination, corrective action measures. These requirements may also result in treatment of contaminated groundwater by such landfill facilities.

EPA, however, has not included contaminated groundwater flows within its assessment for this guideline. Several reasons support EPA's decision not to include contaminated groundwater within the flows evaluated for this proposal.

EPA evaluated flows, pollutant concentrations, treatment in place, and current treatment standards for discharges of contaminated groundwater from landfills. From this evaluation, EPA concluded that pollutants in contaminated groundwater flows are often very dilute or are treated to very low levels prior to discharge. EPA concluded that, whether as a result of corrective action measures taken pursuant to RCRA authority or State action to clean up contaminated landfill sites, landfill discharges of treated contaminated groundwater are being adequately controlled. Consequently, further regulation under this proposed rule would be redundant and unnecessary.

EPA is aware that there may be some landfill facilities that collect and treat both landfill leachate and contaminated groundwater flows. In the case of such facilities, EPA believes that decisions regarding the appropriate discharge limits again should be left to the judgment of the permit writer. As indicated above, contaminated groundwater may be very dilute or may have characteristics similar in nature to leachate. In cases where the groundwater is very dilute the Agency is concerned that contaminated groundwater may be used as a dilution flow. In these cases, the permit writer should develop BPJ permit limits based on separate treatment of the flows or develop BPT limits based on the combined wastestream formula in order to prevent dilution of the regulated leachate flows. However, in cases where the groundwater may exhibit characteristics similar to leachate, commingled treatment is appropriate because it is obviously more cost effective and environmentally beneficial than separate treatment. EPA recommends that the permit writer consider the characteristics of the contaminated groundwater before making a determination if commingling groundwater and leachate for treatment is appropriate.

B. Wastewater Characterization

The Agency's sampling program for this industry detected over 80 pollutants (conventional, priority and non-conventional) in waste streams at treatable levels. EPA has characterized landfill generated wastewater using data obtained in EPA sampling episodes and industry supplied data obtained through the EPA 308 Questionnaires. As previously explained, EPA sampled at five hazardous landfills and 13 non-hazardous landfills. EPA analyzed untreated and treated wastewaters for over 470 pollutants at each landfill, including 233 priority and nonconventional organic compounds, 69 priority and nonconventional metals, four conventional pollutants, and 123 toxic and nonconventional pollutants including pesticides, herbicides, dioxins and furans. EPA developed a list of pollutants of interest (POIs) for the landfills industry by eliminating pollutants not considered to be at treatable levels in raw wastewaters. The list of POIs was carried forward in the analysis.

EPA asked all facilities receiving EPA Detailed Questionnaires to provide summary characterization data for their landfill generated wastewaters. The Agency requested selected facilities to submit detailed analytical data and Detailed Monitoring Reports (DMRs) on their wastewaters as part of the Detailed Monitoring Questionnaire. Additionally, EPA reviewed several other wastewater characterization data sources for comparison purposes.

1. Raw Wastewater at Subtitle D, Municipal Solid Waste (MSW) Landfills

Wastewater generated at MSW landfills contained a range of conventional, toxic and nonconventional pollutants. Wastewaters contained significant concentrations of common nonconventional metals such as iron, magnesium, manganese and boron. Generally, concentrations of toxic heavy metals were found at relatively low concentrations. EPA did not find toxic metals such as arsenic, cadmium, mercury and lead at treatable levels in any of EPA's sampling episodes at MSW landfills.

Typical organic pollutants found in MSW landfill leachate included 2-butanone (methyl ethyl ketone) and 2-propanone (acetone) which are common solvents used in household products (such as paints and nail polish) and common industrial solvents such as 4-methyl-2-pentanone and 1,4-dioxane. Trace concentrations of a few pesticides were detected in wastewaters from municipal landfills. Additionally, the wastewater was characterized by high loads of organic acids such as benzoic acid and hexanoic acid resulting from anaerobic decomposition of solid waste.

EPA identified 34 pollutants of interest for MSW landfills including: eight conventional/nonconventional pollutants, eight metals, 16 organics/pesticides/herbicides, and two dioxins/furans. Three hundred sixteen pollutants were never detected in EPA sampling episodes and approximately 120 pollutants were detected but were not considered to be at treatable levels. A list of the pollutants and sampling results may be found in the Technical Development Document.

2. Raw Wastewater at Subtitle D, Non-Municipal Landfills

Certain Subtitle D landfills do not accept municipal household refuse and do not accept hazardous waste. These unique facilities, termed "monofills" because they accept only one type of waste, typically accept one of the following types of solid waste: municipal incinerator ash, wastewater treatment sludge, and construction and demolition (C&D) wastes.

Because of the unique nature of these monofills, EPA performed an analysis to determine if significant differences existed in raw wastewater characteristics from Subtitle D Municipal Solid Waste (MSW) landfills and these monofill facilities. However, characterization and treatment data collected as part of EPA's sampling episodes focused primarily on the more prevalent MSW landfills. To complete this analysis, additional data on raw wastewaters from monofill facilities were collected from several sources including prior EPA studies and industry-supplied data. These data were evaluated to identify any pollutants found at significant concentrations in monofills which were not found in MSW landfills.

Based on a review of these data sources, EPA observed that the pollutants present in raw wastewaters from monofills were not significantly different from those found in MSW landfills, and, in fact, only a subset of MSW landfill POIs were found in raw wastewaters from these monofill facilities. In addition, concentrations of virtually all pollutants found in ash, sludge, and C&D waste monofills were significantly lower than those found in raw wastewaters from MSW landfills. As described in Section [VII] of today's notice, EPA proposes to establish equivalent effluent limitations for all Subtitle D non-hazardous landfills.

EPA also examined wastewater at non-hazardous landfill facilities for the presence of dioxins and furans to determine whether these analytes should be proposed for regulation. Scientific study has identified that there are 210 isomers of chlorinated dibenzo-p-dioxins (CDD) and chlorinated dibenzofurans (CDF). Dioxins and furans are formed as by-products in

many industrial operations including petroleum refining, pesticide and herbicide production, paper bleaching, and production of materials involving chlorinated compounds. Dioxins and furans are not water-soluble and are not expected to leach out of non-hazardous landfills in significant quantities. EPA is primarily concerned with the 2,3,7,8-substituted congeners, of which 2,3,7,8-TCDD is considered to be the most toxic and is the only one that is a priority pollutant. Non-2,3,7,8-substituted congeners are believed to be less toxic in part because it appears that they are not absorbed by living organisms.

As part of EPA sampling episodes at 13 Non-Hazardous landfills, raw wastewater samples were collected and analyzed for a total of 17 congeners of dioxins and furans. Additional raw leachate data were analyzed from ash monofills in previous EPA studies. EPA found low levels of only three congeners, OCDD, HpCDD, and HxCDD, in raw wastewaters at several landfills. All observed concentrations of dioxins/furans in raw, untreated wastewater were well below the Universal Treatment Standards proposed for FO39 wastes (multi-source leachate) in 40 CFR 268.1 which establish minimum concentration-based standards based on an acceptable level of risk. At the concentrations found in raw landfill wastewaters, dioxins and furans are expected to partition to the biological sludge as part of the proposed BPT/BAT treatment technologies. Partitioning of dioxins/furans to the sludge was included in the evaluation of treatment benefits and water quality impacts. The most toxic dioxin congener, 2,3,7,8-TCDD, was never detected in raw wastewater at a Subtitle D Landfill.

Based on this review of all available data, the Agency is not proposing to establish effluent limitations for dioxins and furans because the concentrations of the congeners that were detected in raw untreated leachate were found at very low levels, often approaching background levels and already below Universal Treatment Standards. Additionally, the most toxic congener, 2,3,7,8-TCDD, was never detected in untreated raw leachate. EPA sampling data and calculations conclude that the concentrations of dioxins and furans present in the wastewater will not prevent the sludge from being redeposited in a nonhazardous landfill.

3. Raw Wastewater at Subtitle C Hazardous Landfills

Raw wastewaters from Subtitle C Hazardous landfills were also characterized through EPA sampling episodes and industry-supplied data obtained through the EPA 308 Questionnaires. Wastewater generated at Subtitle C hazardous landfills contained a wide range of conventional, toxic, and nonconventional pollutants at treatable levels. There was a significant increase in the number of pollutants found in raw wastewaters at hazardous facilities compared to non-hazardous landfills. Pollutants which were common to both untreated nonhazardous and hazardous wastewaters were generally an order of magnitude higher in hazardous landfill wastewater. The list of pollutants of interest for the Subtitle C Hazardous Landfill Subcategory, which includes 80 parameters, reflects the more toxic nature of hazardous landfill wastewater and the wide range of industrial waste sources.

Pollutants typical of raw leachate from hazardous facilities included higher levels of arsenic, chromium, copper, nickel and zinc than found at non-hazardous facilities. However, cadmium, lead and mercury were not detected at treatable concentrations in the raw wastewater for any of the hazardous landfills sampled during EPA sampling episodes.

EPA identified 65 pollutants of interest for Subtitle C hazardous landfills including: 11 conventional/nonconventional pollutants, 13 metals, 37 organics/pesticides/herbicides, and four dioxins/furans. Two hundred fifty pollutants were never detected in EPA sampling episodes and approximately 155 pollutants were detected but were not considered to be present at treatable levels. A list of the pollutants and sampling results may be found in the Technical Development Document.

EPA also examined wastewater at hazardous landfill facilities for the presence of dioxins and furans to determine whether these analytes should be proposed for regulation. As part of EPA sampling episodes at two in-scope Subtitle C landfills and two in-scope pre-1980 industrial landfills, raw leachate samples were collected and analyzed for 17 congeners of dioxins and furans. Again, EPA did not detect the most toxic dioxin congener, 2,3,7,8-TCDD, at an in-scope hazardous/industrial landfill. EPA did find low levels of several congeners in raw wastewaters at several landfills. Low levels of four congeners, OCDD, OCDF, HpCDD, and HpCDF, were detected in over half of the landfills sampled. However, all concentrations of dioxins/furans in raw, untreated wastewater were well below the Universal Treatment Standards proposed for FO39 wastes (multi-source leachate) in 40 CFR 268.1 which establish minimum concentration-based standards based on an acceptable level of risk. At the concentrations found in raw landfill wastewaters, dioxins and furans are expected to partition to the biological sludge as part of the proposed BPT/BAT/PSES treatment technologies. Partitioning of dioxins/furans to the sludge was included in the evaluation of treatment benefits and water quality impacts.

Based on a review of all available data, the Agency is not proposing to establish effluent limitations for dioxins and furans for the same reasons it is not proposing limitations and standards for these pollutants in wastewater at non-hazardous landfills.

C. Wastewater Flow and Discharge

1. Wastewater Flow and Discharge at Subtitle D Non-Hazardous Landfills

Approximately 6.7 billion gallons of in-scope wastewater were generated at non-hazardous landfills in 1992. As mentioned previously, flows collected from leachate collection systems are the primary source of wastewater, accounting for over 95 percent of the in-scope wastewaters.

Landfill facilities have several options for the discharge of their wastewaters. EPA estimates that there are 158 Subtitle D Non-hazardous facilities discharging wastewater directly into a receiving stream or body of water, accounting for 1.2 billion gallons per year. In addition, there are 762 facilities discharging wastewater indirectly to a POTW, accounting for 4.6 billion gallons per year.

Also, there are a number of facilities which use treatment and disposal practices that result in no discharge of wastewater to surface waters. The Agency estimates that there are 343 of these "zero or alternative discharge" facilities. Disposal options resulting in no discharge for landfill generated wastewater include off-site treatment at another landfill wastewater treatment system or a Centralized Waste Treatment facility, deep well injection, incineration, evaporation, land application and recirculation.

The recirculation of leachate is generally believed to encourage the biological activity occurring in the landfill and accelerate the stabilization of the waste. The recirculation of landfill leachate is not prohibited by federal regulations, although many States have prohibited the practice. EPA estimates that 350 million gallons per year are recirculated back to Subtitle D non-hazardous landfill units.

2. Wastewater Flow and Discharge at Subtitle C Hazardous Landfills

Approximately 367 million gallons of in-scope wastewater were generated at hazardous landfills in 1992. In-scope wastewaters do not include non-contact stormwater or contaminated groundwater.

Landfill facilities have several options for the discharge of their wastewaters. EPA's survey of the landfills industry did not identify any hazardous landfills covered by the proposed guideline which discharge in-scope wastewaters directly to surface waters. EPA estimates that there are six facilities discharging wastewater indirectly to a POTW, accounting for 40 million gallons per year.

The Agency estimates that 141 hazardous landfill facilities utilize zero or alternative-discharge disposal options. EPA estimates that 103 facilities ship wastewater off-site for treatment, often to a treatment plant located at another landfill or to a Centralized Waste Treatment facility. Shipping off-site accounts for eleven million gallons per year of wastewater. Another 37 facilities utilize underground injection for disposal of their wastewaters, accounting for 315 million gallons per year; and one facility solidifies less than 0.1 million gallons per year of landfill wastewater.

IX. Development of Effluent Limitations Guidelines and Standards

A. Description of Available Technologies

There are a large number of different wastewater treatment systems in use at landfills. The treatment technologies described below provide some indication of the range of wastewater treatment systems observed at landfill wastewater treatment plants. In-operation wastewater treatment technologies include physical/chemical pollutant removal systems and biological removal systems. Based on information obtained from the Detailed Questionnaires and engineering site and sampling visits described above, EPA concluded that a number of treatment systems currently in place need to be upgraded to improve effectiveness and remove additional pollutants.

Among the physical/chemical treatment technologies in use are:

- *Equalization tanks.* Equalization dampens variation in hydraulic and pollutant loadings, thereby reducing shock loads and increasing treatment facility performance;
- *Neutralization.* Neutralization dampens pH variation prior to treatment or discharge;
- *Coagulation/Flocculation.* Coagulation/flocculation provides additional pollutant removal through aggregation of colloidal solids;
- *Gravity Separation.* Gravity-assisted separation allows suspended matter, heavier than water, to become quiescent and settle; and free oils, lighter than water, to become quiescent and float;
- *Emulsion Breaking.* The addition of a de-emulsifiers (heat, acid, metal coagulants, and clays) break down emulsions to produces a mixture of water and free oil and/or an oily floc;
- *Chemical Precipitation.* The addition of chemicals to wastewater to convert soluble metal salts to insoluble metal oxides which are then removed by filtration;
- *Chemical Oxidation/Reduction.* By chemical addition, the structure of pollutants are changed so as to disinfect, increase biodegradation and adsorption, or convert pollutants to terminal end products;
- *Air/Steam Stripping.* Air/Steam stripping involves the removal of pollutants from wastewater by the transfer of volatile compounds from the liquid phase to a gas stream;
- *Multimedia/Sand Filtration.* Multimedia/sand filtration involves a fixed (gravity or pressure) or moving bed of porous media that traps and removes suspended solids from water passing though the media;
- *Ultrafiltration.* Extremely fine grade filters are used to remove organic pollutants from wastewater according to the organic molecule size;
- *Reverse Osmosis.* Reverse osmosis relies on differences in dissolved solids concentrations and selective semipermeable membranes to allow for the concentration of dissolved inorganic pollutants;
- *Fabric Filters.* Fabric filters screen suspended matter by means of a cloth or paper barrier;
- *Carbon Adsorption.* In this process, wastewater is passed over a medium of activated carbon which adsorbs certain pollutants; and
- *Ion Exchange.* The use of certain resins in contact with wastewater removes contaminants of similar charge.

Biological treatment technologies in use are:

- *Aerobic Systems.* Aerobic systems utilize an acclimated community of aerobic microorganisms to degrade, coagulate, and remove organic and other contaminants;
- *Activated Sludge.* Activated sludge is a continuous flow, aerobic biological treatment process which employs suspended-growth aerobic microorganisms to biodegrade organic contaminants;
- *Anaerobic Systems.* Anaerobic systems involve the conversion of organic matter in wastewater into methane and carbon dioxide by anaerobic microorganisms (methanogens);
- *Facultative Systems.* Facultative systems stabilize wastes by incorporating a combination of aerobic, anaerobic, and facultative (thriving in either aerobic or anaerobic conditions) microorganisms;
- *Rotating Biological Contactors.* Rotating biological contactors (RBCs) employ a fixed-film aerobic biological system adhering to a rigid media mounted on a horizontal, rotating shaft;
- *Trickling Filters.* In this process, wastewater passes over a structure packed with an inert medium (e.g. rock, wood, plastic) coated with a biological film capable of absorbing and degrading organic pollutants;
- *Sequential Batch Reactors.* A sequence of batch operations in a single reactor containing acclimated microorganisms is used to degrade organic material. The batch process allows for equalization, aeration, and clarification in a single tank;
- *Powdered Activated Carbon Biological Treatment.* The addition of granular activated carbon to biological treatment systems enhances the removal of certain organic pollutants;
- *Nitrification Systems.* These systems involve nitrifying bacteria in order to convert ammonia-nitrogen compounds to less toxic, nitrate-nitrite compounds;
- *Denitrification Systems.* These systems convert nitrate-nitrite to nitrogen gas under anoxic conditions; and
- *Wetlands Treatment.* These systems employ natural or man-made wetlands systems which treat wastewater through utilizing natural processes of sedimentation, adsorption, and organic degradation.

The treatment sequence employed at any particular facility may vary with the character of the wastewater generated at the landfill. The optimal treatment system at a facility depends upon many factors including permit requirements, design considerations, landfill acceptance criteria, and management practices. Various forms of equalization and aerobic biological systems were the most widely-found treatment technology in the landfills industry, including aerated lagoons, activated sludge systems, and sequential batch reactors. Biological systems in the landfill industry generally utilized high retention times to enhance performance by reducing variations in raw wastewater flow and pollutant loads.

B. Technology Options Considered for Basis of Regulation

This section explains how EPA selected the effluent limitations and standards proposed today for the Subtitle C Landfill and Subtitle D Landfill Subcategories. To determine the technology basis and performance level for the proposed regulations, EPA developed a database consisting of daily effluent data collected from the Detailed Monitoring Questionnaire and EPA's Wastewater Sampling Program. This database is used to support the BPT, BCT, BAT, NSPS, PSES, and PSNS effluent limitations and standards.

The effluent limitations and pretreatment standards EPA is proposing to establish today are based on well-designed, well-operated systems. Below is a summary of the technology bases for the proposed effluent limitations and pretreatment standards in each subcategory. When final guidelines are promulgated, a landfill operator is free to use any wastewater treatment technology at the facility so long as the numerical discharge limits are achieved.

1. Best Practicable Control Technology Currently Available (BPT)

a. Introduction. EPA today proposes BPT effluent limitations for the two discharge subcategories for the Landfills Point Source Category. The BPT effluent limitations proposed today would control identified conventional, priority, and non-conventional pollutants when discharged from landfill facilities. For further discussion on the basis for the limitations and technologies selected see the Technical Development Document.

As previously discussed, Section 304(b)(1)(A) of the CWA requires EPA to identify effluent reductions attainable through the application of "best practicable control technology currently available for classes and categories of point sources." The Senate Report for the 1972 amendments to the CWA explained how EPA must establish BPT effluent reduction levels. Generally, EPA determines BPT effluent levels based upon the average of the best existing performances by plants of various sizes, ages, and unit processes within each industrial category or subcategory. In industrial categories where present practices are uniformly inadequate, however, EPA may determine that BPT requires higher levels of control than any currently in place if the technology to achieve those levels can be practicably applied. See *A Legislative History of the Federal Water Pollution Control Act Amendments of 1972*, U.S. Senate Committee of Public Works, Serial No. 93–1, January 1973, p. 1468.

In addition, CWA Section 304(b)(1)(B) requires a cost reasonable assessment for BPT limitations. In determining the BPT limits, EPA must consider the total cost of treatment technologies in relation to the effluent reduction benefits achieved. This inquiry does not limit EPA's broad discretion to adopt BPT limitations that are achievable with available technology *unless* the required additional reductions are "wholly out of proportion to the costs of achieving such marginal level of reduction." See *Legislative History*, op. cit. p. 170. Moreover, the inquiry does not require the Agency to quantify benefits in monetary terms. See e.g. *American Iron and Steel Institute* v. *EPA*, 526 F. 2d 1027 (3rd Cir., 1975).

In balancing costs against the benefits of effluent reduction, EPA considers the volume and nature of expected discharges after application of BPT, the general environmental effects of pollutants, and the cost and economic impacts of the required level of pollution control. In developing guidelines, the Act does not require or permit consideration of water quality problems attributable to particular point sources, or water quality improvements in particular bodies of water. Therefore, EPA has not considered these factors in developing the limitations being proposed today. See *Weyerhaeuser Company* v. *Costle*, 590 F. 2d 1011 (D.C. Cir. 1978).

b. BPT Technology Options Considered for the Non-Hazardous Landfills Subcategory. In the Agency's engineering assessment of the best practicable control technology currently available for treatment of wastewaters from landfills, EPA first considered three technologies commonly in use by landfills and other industries as options for BPT. These technology options were chemical precipitation, biological treatment, and multimedia filtration. EPA removed chemical precipitation from further consideration as a BPT treatment option for the following reason. While chemical precipitation is an effective treatment technology for the removal of metals, non-hazardous landfills typically have low concentration of metals in treatment system influent wastewater. Observed metals concentrations were typically not found at levels which would inhibit biological treatment or that could be effectively removed by a chemical precipitation unit.

- Option I—Biological Treatment. EPA first assessed the pollutant removal performance of biological treatment. EPA selected this as Option I due to its effectiveness in removing the large organic loads commonly associated with leachate. BPT Option I consists of aerated equalization followed by biological treatment. Various types of biological treatment such as activated sludge, aerated lagoons, and anaerobic and aerobic biological towers or fixed film reactors were included in the calculation of limits for this option. The costing for Option I was based on the cost of aerated equalization followed by an extended aeration activated sludge system and clarification, including sludge dewatering. Approximately half of the direct discharging municipal solid waste landfills employed some form of biological treatment, but only 15 percent had a combination of equalization and biological treatment.
- Option II—Biological Treatment and Multimedia Filtration. The second technology option considered for BPT treatment of non-hazardous landfill wastewater was aerated equalization and biological treatment as described in Option I, followed by multimedia filtration. Approximately 11 percent of the direct discharging municipal facilities used the technology described in Option II.

EPA proposes to adopt BPT effluent limitations for the Non-Hazardous Landfills Subcategory based on Option II because of the proven ability of biological treatment systems in controlling organics, and because of the effectiveness of multimedia filtration in removing TSS which may remain after biological treatment. EPA's decision to base BPT limitations on Option II treatment reflects primarily two factors: (1) the degree of effluent reductions attainable and (2) the total cost of the proposed treatment technologies in relation to the effluent reductions achieved.

No basis could be found for identifying different BPT limitations based on age, size, process or other engineering factors. Neither the age nor the size of the landfill facility will directly affect the treatability of the landfill wastewaters. For the non-hazardous landfills, the most pertinent factors for establishing the limitations are costs of treatment and the level of effluent reductions obtainable.

EPA has selected Option II based on the comparison of the two options in terms of total costs of achieving the effluent reductions, pounds of pollutant removals, economic impacts, and general environmental effects of the reduced pollutant discharges. BPT Option II removed 85,000 pounds more of conventional pollutants than Option

I with only a moderate, associated cost increase.

Finally, EPA also looked at the costs of all options to determine the economic impact that this proposal would have on the landfill industry. EPA's assessment showed that under either option there were significant economic impacts on only two facilities. Further discussion on the economic impact analysis can be found in Section XI of today's notice.

EPA identified 34 pollutants of interest for the Non-Hazardous Subcategory as explained previously. EPA is proposing to regulate the following pollutants under BPT, BAT, and NSPS for direct discharging non-hazardous landfills: BOD_5, TSS, pH, ammonia, alpha terpineol, benzoic acid, p-cresol, phenol, toluene, and zinc.

c. BPT Technology Options Considered for the Hazardous Landfill Subcategory. EPA's survey of the hazardous landfills industry identified no in-scope respondents who discharge directly to surface water. All of the hazardous landfills within the scope of the proposal are either indirect or zero/alternative dischargers. EPA consequently could not evaluate any treatment systems in place at direct discharging hazardous landfills for establishing BPT effluent limitations. Therefore, EPA relied on information and data from widely available treatment technologies in use at hazardous landfill facilities discharging indirectly and at non-hazardous landfills discharging directly—so-called "technology transfer." EPA based BPT limits for hazardous landfills on chemical precipitation to achieve metals removals and secondary biological treatment to achieve organics removals.

In this instance, EPA concluded that the technology in place at some indirect hazardous landfills is appropriate to use as the basis for regulation of direct dischargers. EPA would expect that the wastewater characteristics from direct discharge hazardous waste landfills be similar to the wastewater from indirect discharge hazardous waste landfills. The technologies in place at indirect dischargers selected for the basis of regulation included chemical precipitation for metals removal and secondary biological treatment for removals of organics. Secondary biological treatment was selected as the basis for BPT, BAT, and NSPS regulation for non-hazardous landfills, and EPA believes that secondary biological treatment is also appropriate for the treatment of hazardous landfill leachate. With the exception of conventionals such as BOD_5 and TSS, the treatment systems in place at indirect hazardous facilities achieved low effluent concentrations as a result of average removals of 88 to 98 percent of organic toxic pollutants, and 55 to 80 percent of metal pollutants. Because of the ability of the POTW to treat conventionals such as BOD_5 and TSS, biological treatment systems discharging indirectly are not necessarily operated for optimal control of these parameters. Therefore, because the performance of biological treatment systems for conventionals is well documented, EPA transferred the limits for conventionals from well operated biological treatment systems in place at non-hazardous landfills.

EPA considered three potential technology options for establishing BPT effluent limitations for the Hazardous Landfill Subcategory. These technology options all included aerated equalization, and consisted of chemical precipitation, biological treatment, and zero or alternative discharge. EPA evaluated chemical precipitation as a treatment technology because of metals concentrations typically found in hazardous landfill leachate and the efficient metals removals achieved through chemical precipitation. EPA also evaluated biological treatment as an appropriate technology because of its ability to remove organic loads present in the leachate. Finally, EPA considered a zero or alternative discharge option as a potential BPT requirement because a significant segment of the industry is currently not discharging wastewaters to surface waters or to POTWs. The zero or alternative disposal option would require facilities to dispose of their wastewater in a manner that would not result in wastewater discharge to a surface water or a POTW.

Methods of achieving zero or alternative discharge currently in use by hazardous landfills are deep well injection, solidification, and contract hauling of wastewater to a Centralized Wastes Treatment (CWT) facility or to a landfill wastewater treatment facility. Thirty-seven facilities are estimated to inject landfill wastewaters underground on-site, 103 facilities send their wastewater to a CWT or landfill treatment system, and one facility solidifies wastewater.

EPA has tentatively determined that it should not propose zero or alternative discharge requirements because, for the industry as a whole, zero or alternative discharge options are either not viable or the cost is wholly disproportionate to the benefits and thus it is not "practicable."

One demonstrated alternative disposal option for large wastewater flows is underground injection. However, this is not considered a practically available option on a nationwide basis because it is not allowed in many geographic regions of the country where landfills may be located.

The second widely used disposal option involves contract hauling landfill wastewater to a CWT. EPA's survey demonstrated that only landfills with relatively low flows (under 500 g.p.d.) currently contract haul their wastewater to a CWT. The costs of contract hauling are directly proportional to the volume and distance over which the wastewater must be transported, generally making it excessively costly to send large wastewater flows to a CWT, particularly if it is not located nearby. EPA evaluated the cost of requiring all hazardous landfills to achieve zero or alternative discharge status. For the purposes of costing, EPA assumed that a facility would have to contract haul wastewater off-site because it may be impossible to pursue other zero or alternative discharge options. EPA concluded that the cost of contract hauling off-site for *high flow* facilities was unreasonable high and disproportionate to the removals potentially achieved. In addition, EPA concluded that the wastewater shipped to a CWT will typically receive treatment equivalent to that proposed today, and that zero/alternative discharge requirements would result in additional costs to discharge without greater removals for hazardous landfill wastewaters.

Based on the characteristics of hazardous landfill leachate and on an evaluation of appropriate technology options, the Agency selected aerated equalization followed by chemical precipitation and biological treatment as BPT technology for the Hazardous Landfill Subcategory. EPA relied on data from two facilities employing variations of this technology to calculate the proposed BPT limits for toxic pollutants. One facility employed equalization and a chemical precipitation unit followed by an activated sludge system. The second facility used equalization tanks followed by a sequential batch reactor which was able to achieve metals reductions. Both of these systems were indirect dischargers, as stated above. In the case of BPT regulation for conventional pollutants, EPA concluded that establishing limits based on indirect discharging treatment systems was not appropriate because indirect discharging treatment systems are generally not operated for optimal control of conventional pollutants which are amenable to treatment in a POTW. Therefore, in establishing limits

for conventional pollutants, EPA is proposing to establish BPT limitations equal to those established for non-hazardous landfills. For a discussion of the costs and economic impact of the treatment options considered by the Agency, see Section XI.

2. Best Conventional Pollutant Control Technology (BCT)

a. Introduction. In July 1986, EPA promulgated a methodology for establishing BCT effluent limitations. EPA evaluates the reasonableness of BCT candidate technologies—those that are technologically feasible—by applying a two-part cost test: (1) A POTW test; and (2) an industry cost-effectiveness test.

EPA first calculates the cost per pound of conventional pollutant removed by industrial dischargers in upgrading from BPT to a BCT candidate technology and then compares this cost to the cost per pound of conventional pollutants removed in upgrading POTWs from secondary treatment. The upgrade cost to industry must be less than the POTW benchmark of $0.25 per pound (in 1976 dollars).

In the industry cost-effectiveness test, the ratio of the incremental BPT to BCT cost divided by the BPT cost for the industry must be less than 1.29 (i.e., the cost increase must be less than 29 percent).

b. Rationale for Setting BCT Equivalent to BPT. In today's proposal, EPA is proposing to establish BCT effluent limitations guidelines equivalent to the BPT guidelines for the conventional pollutants for both subcategories. In developing BCT limits, EPA considered whether there are technologies that achieve greater removals of conventional pollutants than proposed for BPT, and whether those technologies are cost-reasonable according to the BCT Cost Test. In each subcategory, EPA identified no technologies that can achieve greater removals of conventional pollutants than proposed for BPT that are also cost-reasonable under the BCT Cost Test, and accordingly EPA proposes BCT effluent limitations equal to the proposed BPT effluent limitations guidelines.

3. Best Available Technology Economically Achievable (BAT)

a. Introduction. EPA today is proposing BAT effluent limitations for both subcategories in the Landfills Category based on the same technologies selected for BPT. The BAT effluent limitations proposed today would control identified priority and non-conventional pollutants discharged from facilities.

EPA has not identified any more stringent treatment technology option which it considered to represent BAT level of control applicable to facilities in this industry.

b. Rationale for Setting BAT Equivalent to BPT for the Non-Hazardous Landfill Subcategory. EPA evaluated reverse osmosis technology as a potential option for establishing BAT effluent limits more stringent than BPT for the control of toxic pollutants. Reverse osmosis was selected for evaluation because of its effective control of a wide variety of toxic pollutants in addition to controlling conventional and non-conventional parameters.

EPA evaluated BAT treatment options as an increment to the baseline treatment technology used to develop BPT limits. Therefore, the BAT Option III consisted of BPT Option II (biological treatment followed by multimedia filtration) followed by a single-stage reverse osmosis unit.

After an assessment of costs and pollutant reductions associated with reverse osmosis, EPA has concluded that it should not propose BAT limits based on more stringent treatment technology than the BPT technology. EPA concluded that a biological system followed by multimedia filtration would remove the majority of toxic pollutants, leaving the single-stage reverse osmosis to treat the very low levels of pollutants that remained. In the Agency's analysis, BPT Option II removed 6,800 toxic pounds whereas BAT Option III removed 8,000 toxic pounds. EPA's economic assessment showed that BAT Option III had significantly higher annual compliance costs than the other options evaluated and resulted in six additional facilities experiencing moderate economic impacts (refer to Section XI). In addition, establishment of BAT Option III would not result in effluent limitations significantly more stringent that those established under BAT Option II, which is currently achieving very low Long-Term Average (LTA) effluent concentrations. Therefore, the Agency questioned whether the small additional removal of toxic pounds achieved by BAT Option III were justified by the large incremental cost for the reverse osmosis treatment system. It should be noted that reverse osmosis was much more effective at removing the often high quantities of dissolved metals such as iron, manganese and aluminum. However, these parameters were not included in the calculation of toxic pounds due to their use as treatment chemicals. EPA is requesting comment on whether it should base BAT limits on reverse osmosis because of the additional removals obtained. For further discussion of the economic impacts and costs of this option, see the discussion in Section [XI].

c. Rationale for Setting BAT Equivalent to BPT for the Hazardous Landfill Subcategory. As stated in the BPT analysis, EPA's survey of the hazardous landfills industry identified no in-scope respondents which were classified as direct dischargers. All of the hazardous landfills in the EPA survey were indirect or zero or alternative dischargers. Therefore, the Agency based BPT limitations on technology transfer and treatment systems in place for indirect dischargers. In EPA's engineering assessment of the possible BAT technology for direct discharging hazardous facilities, EPA evaluated the same three potential technology options as those evaluated for BPT for the Hazardous Landfill Subcategory. These technology options were chemical precipitation, biological treatment, and zero or alternative discharge as explained above. EPA has identified no other technologies that would represent BAT level of control for this industry.

EPA determined that it should establish BAT limits based on the same technology evaluated for BPT limits. As explained above, zero or alternative discharge is not an available alternative.

4. New Source Performance Standards (NSPS)

a. Introduction. As previously noted, under Section 306 of the Act, new industrial direct dischargers must comply with standards which reflect the greatest degree of effluent reduction achievable through application of the best available demonstrated control technologies. Congress envisioned that new treatment systems could meet tighter controls than existing sources because of the opportunity to incorporate the most efficient processes and treatment systems into plant design. Therefore, Congress directed EPA, in establishing NSPS, to consider the best demonstrated process changes, in-plant controls, operating methods and end-of-pipe treatment technologies that reduce pollution to the maximum extent feasible.

b. Rationale for Setting NSPS Equivalent to BPT/BCT/BAT. EPA proposes New Source Performance Standards (NSPS) that would control the same conventional, priority, and non-conventional pollutants proposed for control by the BPT/BCT/BAT effluent limitations guidelines. The conventional treatment technologies used to control pollutants at existing

facilities are fully applicable to new facilities. Furthermore, EPA has not identified any other technologies or combinations of technologies that are demonstrated for new sources that are different from those used to establish BPT/BCT/BAT for existing sources. Therefore, EPA proposes NSPS limitations that are identical to those proposed in each subcategory for BPT/BCT/BAT. Again, the Agency is requesting comments to provide information and data on other treatment systems that may be pertinent to the development of standards for this industry.

5. Pretreatment Standards for Existing Sources (PSES)

a. Introduction. Section 307(b) of the Act requires EPA to promulgate pretreatment standards to prevent pass-through of pollutants from POTWs to waters of the U.S. or to prevent pollutants from interfering with the operation of POTWs. After a thorough analysis of indirect discharging landfills in the EPA database, EPA has decided not to propose PSES for the Non-Hazardous Landfill Subcategory for the reasons explained in more detail below. However, EPA does propose to establish PSES for the Hazardous Landfill Subcategory based on aerated equalization, chemical precipitation and biological treatment technology.

b. Pass-Through Analysis. Before proposing pretreatment standards, the Agency examines whether the pollutants discharged by an industry pass through a POTW or interfere with the POTW operation or sludge disposal practices. In determining whether pollutants pass through a POTW, the Agency compares the percentage of a pollutant removed by POTWs with the percentage of the pollutant removed by discharging facilities applying BAT. A pollutant is deemed to pass through the POTW when the average percentage removed nationwide by representative POTWs (those meeting secondary treatment requirements) is less than the percentage removed by facilities complying with BAT effluent limitations guidelines for that pollutant.

This approach to the definition of pass-through satisfies two competing objectives set by Congress: (1) that wastewater treatment performance for indirect dischargers be equivalent to that for direct dischargers and (2) that the treatment capability and performance of the POTW be recognized and taken into account in regulating the discharge of pollutants from indirect dischargers. Rather than compare the mass or concentration of pollutants discharged by the POTW with the mass or concentration of pollutants discharged by a BAT facility, EPA compares the percentage of the pollutants removed by the proposed treatment system with the POTW removal. EPA takes this approach because a comparison of mass or concentration of pollutants in a POTW effluent with pollutants in a BAT facility's effluent would not take into account the mass of pollutants discharged to the POTW from non-industrial sources nor the dilution of the pollutants in the POTW effluent to lower concentrations from the addition of large amounts of non-industrial wastewater.

For past effluent guidelines, a study of 50 representative POTWs was used for the pass-through analysis. Because the data collected for evaluating POTW removals included influent levels of pollutants that were close to the detection limit, the POTW data were edited to eliminate low influent concentration levels. For analytes that included a combination of high and low influent concentrations, the data was edited to eliminate all influent values, and corresponding effluent values, less than 10 times the minimum level. For analytes where no influent concentrations were greater than 10 times the minimum level, all influent values less than five times the minimum level and the corresponding effluent values were eliminated. For analytes where no influent concentration was greater than five times the minimum level, the data was edited to eliminate all influent concentrations, and corresponding effluent values, less than 20 µg/l. These editing rules were used to allow for the possibility that low POTW removal simply reflected the low influent levels.

EPA then averaged the remaining influent data and the remaining effluent data from the 50 POTW database. The percent removals achieved for each pollutant was determined from these averaged influent and effluent levels. This percent removal was then compared to the percent removal for the BAT option treatment technology. Due to the large number of pollutants applicable for this industry, additional data from the Risk Reduction Engineering Laboratory (RREL) database was used to augment the POTW database for the pollutants for which the 50 POTW Study did not cover. For a more detailed description of the pass-through analysis, see the Technical Development Document.

c. Rationale for Not Proposing PSES for the Non-Hazardous Landfill Subcategory. The Agency today is not proposing to establish pretreatment standards for existing sources (PSES) for the Non-Hazardous Landfill Subcategory. The Agency decided not to propose PSES for this subcategory after an assessment of the effect of landfill leachate on receiving POTWs. EPA looked at three measures of effects on POTWs: biological inhibition levels; contamination of POTW biosolids; and pass-through. Only one of these, the pass-through analysis, would support establishing pretreatment standards, and then only in the case of a single pollutant, ammonia.

With respect to biological inhibition, EPA found that typical concentrations of raw leachate were below published biological inhibition levels. Inhibition levels are concentration ranges of certain pollutants which may upset or interfere with the operation of a biological treatment system. In the evaluation of landfill wastewater data, EPA determined that the majority of pollutants typically found in raw leachate were at levels comparable to wastewater typically found at the headworks of a POTW.

Further, EPA also projected that there would not be contamination problems of POTW biosolids as a result of treating landfill leachate so as to prevent use or disposal of its sewage sludge. Furthermore, in EPA's study of the indirect dischargers, EPA found no documented persistent problems with POTW upsets as a result of wastewater from non-hazardous facilities. EPA is soliciting information on POTW upsets or POTW sludge contamination problems from accepting landfill leachate.

Finally, EPA conducted a pass-through analysis on the pollutants proposed to be regulated under BPT/BAT for non-hazardous landfills to determine if the Agency should establish pretreatment standards for any pollutant. (The pass-through analysis is not applicable to conventional parameters such as BOD_5 and TSS.) The results showed that only one regulated pollutant, ammonia, appeared to "pass-through" a POTW. However, upon further evaluation, the Agency concluded that it should not propose pretreatment standards for ammonia as explained below. The Agency is soliciting comments and information on its decision not to propose pretreatment standards for non-hazardous landfills. Specifically, EPA would like information on the levels of ammonia present in landfill wastewaters, and on any problems experienced by POTWs due to the acceptance of landfill leachate with high ammonia concentrations.

The Agency evaluated a number of considerations in addition to the pass-through analysis to determine the need for ammonia pretreatment standards. In part, this reflects the unique properties of ammonia and its effects on receiving streams and of the treatment achieved in a POTW. As previously explained, the pass-through analysis is based on a comparison of the performance of representative POTWs achieving secondary treatment and the performance of direct dischargers meeting limits achieved by BAT technology. In the case of ammonia, POTWs generally achieve 60 percent ammonia removal through secondary treatment. However, many POTWs have installed additional treatment specifically for the control of ammonia and typically achieve removals in excess of 95 percent—much higher than the 60 percent removal used in the pass-through analysis. The treatment systems selected as the basis for the proposed BPT/BAT limits for direct dischargers achieved average ammonia removals of 81 percent. Thus, while ammonia would pass through POTWs as tested by the removals (60 percent) achieved in EPA's 50–POTW study, it does not pass through those POTWs with additional installed ammonia control technology (95 percent removal).

Consequently, EPA did consider establishing pretreatment standards for ammonia for indirect dischargers whose POTWs do not have nitrification or other advanced control of ammonia. However, EPA tentatively rejected this option as not needed because, as described below, ammonia is either adequately controlled by local limits or the ammonia concentrations in leachate typically discharged to POTWs are within the range of concentrations typically found at the headworks to a POTW. Nevertheless, EPA will further consider this issue and request comment on whether to establish ammonia pretreatment standards equivalent to those proposed for direct dischargers. EPA is requesting additional data pertinent to this issue from POTWs and indirect discharging landfills. If it is determined that, based on comments received by the Agency, EPA should establish pretreatment standards for ammonia, EPA would propose to establish pretreatment standards for ammonia equivalent to those proposed today for direct discharging facilities.

In order to determine the need for ammonia pretreatment standards for the landfills industry, EPA considered the following factors: "typical" ammonia concentrations of raw leachate, "typical" ammonia concentrations at the headworks of a POTW, the ammonia concentrations currently being discharged to POTWs by landfills, national estimates of ammonia loads discharged to POTWs and to receiving streams, as well as the economic costs, of establishing pretreatment standards for ammonia.

As discussed previously, EPA found no documented persistent problems with POTW upsets as a result of accepting landfill generated wastewater. EPA is soliciting comment specifically with regard to problems associated with any ammonia discharges in landfill leachate.

In order to evaluate ammonia wastewater concentrations, EPA focused primarily on the means, medians, and 99th percentile of the data collected. For raw wastewater (including all direct and indirect discharging facilities), EPA found that the median concentration of ammonia in raw landfill leachate was 82 mg/l, and that the average concentration was 240 mg/l. Additionally, there were several notable outliers which contained high levels of ammonia in raw leachate due to site specific characteristics of the landfill.

In terms of current treatment performance for landfills discharging to POTWs, 99 percent of the landfill facilities are currently discharging wastewater which contains less than 90 mg/l of ammonia. Of the indirect landfills which provided data, one facility was discharging 1,018 mg/l of ammonia to a 114 MGD POTW which currently has ammonia control (nitrification) in place. In general, POTWs with nitrification achieve over 95 percent removal of ammonia. The remainder of the landfills discharged an average concentration of 37 mg/l of ammonia to POTWs, with one-half of the facilities discharging less than 32 mg/l. In comparison, typical ammonia concentrations in raw domestic sewage range from one to 67 mg/l. Therefore, with the exception of the outlier noted above, the average concentration of ammonia in leachate discharged to POTWs was within the range of wastewater typically accepted at the headworks to a POTW, although it should be noted that the upper ranges of leachate concentrations were higher than the upper ranges observed in domestic sewage. This evidence supports the conclusion that, in all but a handfull of cases, ammonia is not passing through POTWs. In most instances, observed ammonia discharge levels to POTWs fall within a POTWs treatment capabilities. Therefore, EPA does not believe that national pretreatment standards are necessary.

Additionally, EPA evaluated total wastewater flows and loads of ammonia to receiving streams associated with non-hazardous landfill indirect dischargers. EPA estimated that the non-hazardous landfill industry discharges 3.2 million pounds per year of ammonia to POTWs, which results in 1.3 million pounds per year being discharged to receiving streams, assuming that the POTWs have secondary treatment but do not have additional treatment for ammonia control. (As noted above, EPA is aware that many POTWs do have additional ammonia control.) Over 65 percent of the landfills discharge less than 10 pounds per day to the POTW (3,500 pounds/year), which results in discharging less than four pounds per day (1,400 pounds/year) to receiving streams, again assuming secondary treatment only. In light of existing ammonia control, actual discharges to receiving streams are likely to be even smaller.

EPA did, however, evaluate the economic costs of options for PSES for ammonia. EPA's economic assessment of these showed that ammonia removal options generally achieved removals at very high cost given the small reduction in quantity discharged. For the control of ammonia there are two technology options available in the landfill industry.

The first available option is biological treatment. EPA evaluated PSES Option I equivalent to BPT/BAT Option I, which was equalization plus biological treatment. This option had a total annualized cost of $28.2 million (1992 dollars) and had an average cost-effectiveness of $1,072/lbs-equivalent (1981 dollars). The second technology option available for the control of ammonia is ammonia stripping with appropriate air pollution controls. However, this technology is not demonstrated within the landfills industry, the costs are significantly higher than biological treatment evaluated as PSES Option I, and there are no pollutant removals achieved incremental to PSES Option I.

In summary, EPA concludes that landfills typically discharge wastewater to POTWs containing ammonia concentrations comparable to that of raw domestic sewage and that the POTWs can adequately treat this wastewater. Further, POTWs retain the ability to establish local limits on ammonia where necessary because ammonia discharges are often a water quality issue. Where such discharges are harmful is dependent upon localized conditions such as the pH and temperature of the receiving stream. As a result, in these cases where it is

necessary to protect water quality, many POTWs have established local limits to control ammonia.

EPA has analyzed the impact of ammonia discharges from landfills on receiving streams, and potential environmental benefits achieved through establishing pretreatment standards for ammonia. Based on its assessment, EPA concluded that ammonia removals achieved by national pretreatment standards would provide little, if any improvement in water quality. Consequently, for all the reasons explained above, EPA concluded that there are minimal benefits to be achieved through establishing national pretreatment standards for ammonia.

d. Technology Options Considered for PSES for Hazardous Landfill Subcategory. EPA proposes to establish pretreatment standards for existing sources for the Hazardous Landfill Subcategory based on the same technologies as proposed for BPT, BAT, and NSPS for this subcategory. These standards would apply to existing facilities in the Hazardous Subcategory that discharge wastewater to publicly-owned treatment works (POTWs) and would prevent pass-through of pollutants and help control sludge contamination. Based on EPA's pass-through analysis, four of the pollutants of concern that may be discharged by hazardous landfills would pass through POTWs and are proposed for regulation. These are ammonia, alpha terpineol, aniline, benzoic acid, p-cresol, and toluene. Nine of the pollutants proposed to be regulated under BPT, BAT, and NSPS would not pass through a typical POTW. For a more detailed analysis of the pass-through, refer to the Technical Development Document. According to EPA's database, all existing indirect dischargers already meet this baseline standard; and therefore, no incremental costs, benefits, or economic impacts would be realized. As discussed above, the Agency is soliciting comment on the preliminary decision not to adopt zero or alternative discharge standards for hazardous landfills.

6. Pretreatment Standards for New Sources (PSNS)

a. Introduction. Section 307 of the Act requires EPA to promulgate both pretreatment standards for new sources (PSNS) and new source performance standards (NSPS). New indirect discharging facilities, like new direct discharging facilities, have the opportunity to incorporate the best available demonstrated technologies including: process changes, in-facility controls, and end-of-pipe treatment technologies.

b. Rationale for Setting PSNS Equivalent to PSES for All Subcategories. In today's rule, EPA proposes to establish pretreatment standards for new sources equivalent to the PSES standards for all subcategories. In developing PSNS limits, EPA considered whether there are technologies that achieve greater removals than proposed for PSES which would be appropriate for PSNS. In the Hazardous Subcategory, EPA identified no technology that can achieve greater removals than PSES. In the Non-Hazardous Subcategory, EPA will not establish PSNS limitations for the same rationale for not establishing PSES limits. As discussed above, the Agency is soliciting comment on the preliminary decision not to adopt zero or alternative discharge standards for new sources of hazardous landfills.

C. Development of Effluent Limitations

EPA based the proposed effluent limitations and standards in today's notice on widely-recognized statistical procedures for calculating long-term averages and variability factors. The following presents a summary of the statistical methodology used in the calculation of effluent limitations.

Effluent limitations for each subcategory are based on a combination of long-term average effluent values and variability factors that account for variation in day-to-day treatment performance within a treatment plant. The long-term averages are average effluent concentrations that have been achieved by well-operated treatment systems using the processes described in the following section (Treatment Systems Selected for Basis of Regulation). The variability factors are values that represent the ratio of a large value that would be expected to occur only rarely to the long-term average. The purpose of the variability factor is to allow for normal variation in effluent concentrations. A facility that designs and operates its treatment system to achieve a long-term average on a consistent basis should be able to comply with the daily and monthly limitations in the course of normal operations.

The variability factors and long-term averages were developed from a data base composed of individual measurements on treated effluent. A combination of EPA sampling data and industry supplied data was used. While EPA sampling data reflects the performance of a system over a five-day period, industry supplied data (collected through the Detailed Monitoring Questionnaire) reflects up to three years worth of monitoring data. EPA used a combination of EPA and industry supplied data whenever possible in order to better account for the variability of leachate over time.

Daily maximum limits were calculated as follows. A modified delta-lognormal distribution was fitted to daily concentration data from each facility that had enough detected concentration values for parameter estimation. This is the same distributional model used by EPA in the final rulemakings for the Organic Chemicals, Plastics and Synthetic Fibers (OCPSF) and Pesticides Manufacturing categories and the proposed rulemaking for the Pulp and Paper category. This model provided estimates of the long-term average (mean) and daily variability (variance) at a facility. Variability factors, corresponding to the 99th percentile, were then computed for each facility. Data were combined from the selected facilities in each subcategory by finding the median of facility long-term averages and the average of facility variability factors. Finally, the daily maximum limitation for a subcategory was calculated by multiplying the median long-term mean by the average variability factor. The monthly maximum limitation was calculated similarly except that the variability factor corresponding to the 95th percentile of the distribution of monthly averages was used instead of the 99th percentile of daily concentration measurements.

The daily variability factor is defined as the ratio of the estimated 99th percentile of the distribution of daily values divided by the expected value, or mean, of the distribution. Similarly, the monthly variability factor is defined as the estimated 95th percentile of the distribution of 4-day or 20-day averages (depending on the pollutant parameter) divided by the expected value of the monthly averages.

The modified delta-lognormal distribution models the data as a mixture of non-detect observations and measured values. This distribution was selected because the data for most analytes consisted of a mixture of measured values and non-detects. The modified delta-lognormal distribution assumes that all non-detects have a value equal to the reported detection limit and that the detected values follow a lognormal distribution.

There were several instances where variability factors could not be calculated from the landfills data base because all effluent values were measured at or below the minimum detection level. In these cases,

variability factors were transferred from biological systems used in the final rulemaking of the OCPSF guideline.

D. Treatment Systems Selected for Basis of Regulation

1. BPT for Non-Hazardous Landfills

There were 46 in-scope landfill facilities in the EPA data base that employed various forms of biological treatment considered for BPT. EPA determined an average of the best of these facilities by applying the criteria outlined below.

The first criterion used in the selection of the average of the best facilities was effective treatment of BOD_5. EPA evaluated 25 facilities which provided BOD_5 effluent data to determine treatment performance. Because BPT is based on the effectiveness of biological treatment, facilities which used additional forms of treatment for BOD_5 (other than biological treatment) were eliminated. EPA, therefore, removed two sites using carbon treatment in addition to biological treatment from the list of candidate BPT facilities. EPA eliminated another facility from consideration due to the fact that it used two separate treatment trains in treating its wastewater, one with biological treatment and the other with chemical precipitation, before commingling the streams at the effluent sample point. After the elimination of these three facilities, 22 facilities remained in the EPA non-hazardous landfill data base.

To ensure that the facilities were operating effective biological treatment systems, EPA first evaluated influent concentrations of BOD_5 entering the treatment system. Three facilities had average influent BOD_5 concentrations below 55 mg/l, and were not considered for BPT because the influent concentration was considered to be too low to evaluate removals across the treatment system. Seven other facilities did not supply BOD_5 influent data and were eliminated from the BPT list. Two other facilities were dropped because raw wastewater streams consisted primarily of stormwater or groundwater which were considered dilution flows.

The next requirement for BPT selection in the Non-Hazardous Landfill Subcategory was that the biological treatment system at the facility had to achieve a BOD_5 effluent concentration less than 50 mg/l. Facilities not able to maintain an effluent concentration below 50 mg/l were not considered to be operating their biological system effectively. Three of the remaining 10 facilities did not achieve a BOD_5 effluent concentration of less than 50 mg/l, thus leaving seven facilities in the data base.

The seven facilities which met all of the BPT criteria employed various types of biological treatment systems including activated sludge, sequential batch reactors, aerobic and anaerobic biological towers or fixed film, and aerated ponds or lagoons. Most of the facilities employed equalization tanks in addition to the biological treatment while several facilities also included chemical precipitation and neutralization in their treatment systems. The biological systems were followed by a clarification or sedimentation stage. All seven facilities employing well-operated biological treatment systems were used to calculate the effluent limitations for BOD_5. The treatment system average BOD_5 influent concentrations ranged from 150 mg/l to 7,600 mg/l.

EPA used the data from the seven facilities identified as having good biological treatment systems to calculate the limits for additional pollutant parameters, including alpha terpineol, ammonia, benzoic acid, p-cresol, phenol, toluene and zinc. Because one facility employed air stripping, EPA did not use its data for determining the proposed limit for ammonia or toluene. Many of the facilities selected as BPT did not provide data for all the pollutants identified for regulation by EPA. In these cases, EPA based the limits on the BPT facilities for which data was available.

While the BOD_5 edits discussed above ensure good biological treatment and a basic level of TSS removal, treatment facilities meeting this level may not necessarily be operated for optimal control of TSS. In order to ensure that the TSS data base for setting limitations reflects proper control, additional editing criteria for TSS were established.

Two criteria were used for including TSS performance data. The primary factor in addition to achieving the BOD_5 criteria cited above was that the facility had to employ technology sufficient to ensure adequate control of TSS, namely a sand or multimedia filter. Three of the seven well-operated biological systems used a sand or multimedia filter as a polishing step for additional control of suspended solids prior to discharge.

The second factor EPA considered was whether the treatment system achieved an effluent TSS concentration less than or equal to 100 mg/l. Treatment facilities meeting these criteria were included among the average best existing performers for TSS. One of the three facilities had additional treatment for TSS prior to the filter and was therefore eliminated from consideration in the determination of the TSS limits. The remaining two facilities had TSS effluent concentrations well below 100 mg/l and thus EPA concluded that they should be included among the average, best existing performers for TSS. All of the estimated costs were based on a facility installing aerated equalization tanks followed by an activated sludge biological system and a multimedia filter and included a sludge dewatering system. The cost models are described in detail in the Technical Development Document.

2. Hazardous Landfills

EPA identified only three in-scope respondents in the Hazardous Landfill Subcategory, all of which discharged indirectly to POTWs. The leachate from one of the three facilities was very dilute and required only minimum treatment prior to discharge. This facility was not determined to be one of the best performers in the industry. The two remaining facilities both had extensive treatment systems in place and were selected as the best performers for the subcategory. The treatment at one facility consisted of equalization, a chemical precipitation unit followed by an activated sludge system. The second facility utilized equalization and three sequential batch reactors operated in parallel.

EPA identified 72 pollutants of interest in hazardous landfill wastewater. EPA is proposing to regulate the following pollutants under BPT, BAT, and NSPS for direct discharging hazardous landfills: BOD_5, TSS, pH, ammonia, arsenic, chromium (total), zinc, alpha terpineol, aniline, benzene, benzoic acid, naphthalene, p-cresol, phenol, pyridine, and toluene.

X. Costs and Impacts of Regulatory Alternatives

A. Methodology for Estimating Costs and Pollutant Reductions Achieved by Treatment Technologies

EPA estimated industry-wide compliance costs and pollutant loadings associated with the effluent limitations and standards proposed today using data collected through survey responses, site visits, and sampling episodes. Costs were calculated based on a computerized design and cost model developed for each of the technology options considered. EPA used vendor supplied cost estimates for several technologies which were not available from the computerized model. Current pollutant loads and projected pollutant load reductions were estimated using

treatment data collected through industry provided survey responses and EPA sampling data.

EPA developed industry-wide costs and loads based the obtained from the 252 facilities which received the Detailed Questionnaire. The Detailed Questionnaire recipients were selected from 3,628 screener survey responses, which itself was a subset of the entire landfill population of 10,925. The statistical methodology for this selection is further explained in the Statistical Support Document. EPA calculated costs and loads for each of the 252 questionnaire recipients and then modeled the national population by using statistically calculated survey weights.

EPA evaluated each of the 252 Detailed Questionnaire recipients to determine if the facility would be subject to the proposed limitations and standards and would therefore incur costs as a result of the proposed regulation. One hundred twenty-one of the 252 facilities were not expected to incur costs because:

- 47 facilities indicated that they were zero or alternative dischargers (i.e., did not discharge their landfill generated wastewaters either directly or indirectly to a surface water).
- 43 landfills were located at industrial sites subject to other Clean Water Act categorical standards would not be subject to the limitations and standards under the proposed approach for this guideline.
- The remaining 31 respondents either did not generate in-scope wastewaters or not operate an in-scope landfill.

Each of the 131 facilities selected for cost analysis was assessed to determine the landfill operations, wastewater characteristics, and wastewater treatment technologies currently in place at the site. Landfill industry costs were projected for several technology options based on costs developed for 128 Subtitle D and three Subtitle C facilities.

In order to develop costs, the current performance of existing wastewater treatment in place was taken into account. In the Detailed Questionnaire, EPA solicited effluent monitoring data in order to evaluate current performance. In cases where no effluent data was provided, EPA modeled the current discharge concentrations of each pollutant of interest in the wastewater at each facility. The current discharge concentrations were modeled from facilities providing data with similar wastewater treatment operations and similar wastewater characteristics. Data utilized for modeling was obtained from the Detailed Questionnaire, the Detailed Monitoring Report (DMR) Questionnaire, and EPA sampling.

Facilities whose current discharges were not meeting the concentrations proposed in today's notice were projected to incur costs as a result of compliance with this guideline. A facility which did not have the BPT treatment technology in-place was costed for installing the BPT technology. A facility already having BPT treatment technology in-place, but not currently meeting the proposed limits, was costed for system upgrades where applicable. Typical upgrades to treatment systems included increasing aeration capacity or residence time, installing new equipment, or increasing chemical usage.

Next, a computer cost model or vender quotes were used to estimate compliance costs for the landfills technology options after taking into account treatment in place, current discharge concentrations of pollutants, and wastewater flow rates for each facility. The computer cost model was programmed with technology-specific modules which calculated the costs for various combinations of technologies as required by the technology options and the facilities' wastewater characteristics. The model calculated the following costs for each facility:

- Capital costs for installed wastewater treatment technologies.
- Operating and maintenance (O&M) costs for installed wastewater treatment technologies; including labor, electrical, and chemical usage costs.
- Solids handling costs; including capital, O&M, and disposal.
- Monitoring costs

Additional cost factors were developed and applied to the capital and O&M costs in order to account for site work, interface piping, general contracting, engineering, instrumentation and controls, buildings, site improvements, legal/administrative fees, interest, contingency, and taxes and insurance.

Other direct costs associated with compliance included retrofit costs associated with integrating the existing on-site treatment with new equipment, RCRA Part B permit modification costs for hazardous facilities, and monitoring costs.

The capital costs (equipment, retrofit and permit modification) were amortized assuming 15 years and seven percent interest and added to the O&M costs (equipment and monitoring) to calculate the total annual costs incurred by each facility as a result of complying with this guideline. The costs associated with each of the 131 facilities in the cost analysis were then modeled to represent the national population by using statistically calculated survey weights.

For many low-flow facilities, EPA concluded that contract hauling wastewater for off-site treatment was the most cost effective option. Where applicable, EPA calculated costs for hauling wastewater to a Centralized Waste Treatment facility for treatment in lieu of installing additional treatment on-site.

EPA estimated pollutant reductions by taking the difference in the current performance of the landfill industry and the expected performance after installation of the BPT/BAT/PSES treatment technology. Pollutant reductions were estimated for each pollutant of interest at each facility. Current performance discharge concentrations were taken from data supplied by the facility, or were modeled based on data supplied from similar treatment systems at similar landfills. The discharge concentrations expected to be achieved were taken from EPA sampling data or from industry supplied data at facilities selected as the best performers. The loads associated with each of the 131 facilities determined in the cost analysis were then modeled to represent the national population by using statistically calculated survey weights.

B. Costs of Compliance

The Agency estimated the cost for landfill facilities to achieve each of the effluent limitations and standards proposed today. These estimated costs are summarized in this section and discussed in more detail in the Technical Development Document. All cost estimates in this section are expressed in terms of 1992 dollars.

The Agency did not evaluate the costs of compliance for direct dischargers from hazardous landfills. EPA's survey of hazardous landfills in the United States indicated that there were no in-scope respondents which were classified as direct dischargers.

All of the indirect discharging hazardous landfills in EPA's survey of the industry are expected to be in compliance with the baseline treatment standards established for indirect dischargers. The Agency has therefore projected that there will be no costs associated with compliance with the proposed regulation.

There are no costs associated with PSES for the Non-Hazardous Landfill Subcategory because the Agency is not establishing PSES limits for non-hazardous landfills. However, as explained previously, the Agency is considering whether to establish

pretreatment standards for ammonia for those facilities who discharge to POTWs without advanced ammonia control. EPA estimated that it would cost $28.2 million (1992 dollars) annualized for all indirect discharging landfill facilities were it to install ammonia pretreatment, regardless of whether or not the POTW had advanced ammonia control.

TABLE I.B–1.—COST OF IMPLEMENTING PROPOSED REGULATIONS

[In millions of 1992 dollars]

Subcategory	Number of facilities	Capital costs	Annual O&M costs
Non-hazardous Direct Dischargers (BPT)	158	$5.70	$6.85
Hazardous Direct Dischargers (BPT)	0	0	0
Hazardous Indirect Dischargers (PSES)	6	0	0

C. Pollutant Reductions

The Agency estimated pollutant reductions for landfill facilities achieving each of the effluent limitations and standards proposed today. These estimated reductions are summarized in this section and discussed in more detail in the document "Environmental Assessment of Proposed Effluent Limitations and Standards for the Landfills Category."

The Agency did not evaluate pollutant reductions for direct dischargers from hazardous landfills. Because there were no in-scope respondents which were classified as direct dischargers.

All of the indirect discharging hazardous landfills in EPA's survey of the industry are expected to be in compliance with the baseline treatment standards established for indirect dischargers. The Agency has therefore projected that there will be no pollutant reduction benefits associated with compliance of the proposed regulation.

There are no pollutant reductions associated with PSES for the Non-Hazardous Subcategory because the Agency is not proposing to establish PSES limits for non-hazardous landfills.

TABLE II.C–1.—POLLUTANT REDUCTIONS ACHIEVED BY IMPLEMENTING PROPOSED REGULATIONS

Subcategory	Number of facilities	Conventional pollutant removals (pounds)	Toxic pollutant removals (pounds)
Non-hazardous Direct Dischargers (BPT)	158	640,000	270,000
Hazardous Direct Dischargers (BPT)	0	0	0
Hazardous Indirect Dischargers (PSES)	6	0	0

XI. Economic Analysis

A. Introduction and Overview

This section of the notice reviews EPA's analysis of the economic impacts of the proposed regulation. The economic impacts of several regulatory options were evaluated in each subcategory for BPT, BAT, PSES, NSPS, and PSNS. The technical evaluation and description of each option and the rationale for selecting the proposed option is given in Section [IX] of today's notice. EPA's detailed economic impact assessment can be found in the report titled "Economic Analysis and Cost Effectiveness Analysis of the Proposed Effluent Limitations Guidelines and Standards for the Landfills Category" (hereafter "EA"). The report estimates the economic effect on the industry of compliance with the regulation in terms of facility closures (severe impacts) and financial impacts short of closure (moderate impacts) for privately owned landfill facilities. For publicly owned landfill facilities, the report estimates financial impacts short of closure. The report also includes analysis of the effects of the regulation on new landfill facilities and an assessment of the impacts on small businesses and other small entities. The report includes a separate section called "Cost-Effectiveness Analysis", which presents an analysis of the cost-effectiveness of the proposed regulation.

The proposed regulatory option for BPT/BCT/BAT for the Non-Hazardous Subcategory is Option II, which is estimated to have a total annualized cost (for privately owned facilities post-tax costs were evaluated) of $6.85 million (1992$). The proposed regulatory option for BPT/BCT/BAT for the Hazardous Subcategory is Option I, which is estimated to have no costs associated with compliance. The proposed regulatory option for PSES for the Hazardous Subcategory is Option I, which is also estimated to have no costs associated with compliance.

TABLE III.A–1.—TOTAL COSTS OF PROPOSED REGULATORY OPTIONS

Proposed options	Total capital costs (Mil 1992$)	Total O&M costs (Mil 1992$)	Post-tax total annualized costs (Mil 1992$)
NON-HAZARDOUS SUBCATEGORY			
BPT/BCT/BAT=Option II	$18.54	$5.70	$6.85

TABLE III.A–1.—TOTAL COSTS OF PROPOSED REGULATORY OPTIONS—Continued

Proposed options	Total capital costs (Mil 1992$)	Total O&M costs (Mil 1992$)	Post-tax total annualized costs (Mil 1992$)
HAZARDOUS SUBCATEGORY			
BPT/BCT/BAT=Option I	0.00	0.00	0.00
PSES=Option I	0.00	0.00	0.00

B. Baseline Conditions

The first step in the development of an economic analysis is the definition of the baseline state from which any changes are to be measured. The baseline should be the best assessment of the way the world would look absent the proposed regulation. In this case, the baseline has been set by assuming the status quo will continue absent the enactment of the regulation.

An after-tax cash flow test was conducted on the privately owned facilities where information was available. The test consisted of calculating the after-tax cash flows for each facility for both 1991 and 1992. If a facility experienced negative after-tax cash flows averaged across the two years, the facility was deemed to be a baseline closure. Seven facilities failed the test, and thus were deemed to be baseline closures.

In recent years, the landfill industry has been affected by a number of opposing forces. Growth in composting and recycling as well as increased source reduction has resulted in a continuing decline in the share of waste received at landfills. The number of landfills has declined rapidly since 1988, although estimated total landfill capacity has not significantly declined. Modern landfills have taken advantage of economies of scale and have offset landfill capacity lost due to closure of very small landfills. The privately owned landfill segment of the industry has also experienced industry consolidation as the result of recent mergers and acquisitions.

The Agency recognizes that its data base, which represents conditions in 1992, may not precisely reflect current conditions in the industry today. EPA recognizes that the questionnaire data were obtained several years ago and thus may not precisely mirror present conditions at every facility. Nevertheless, EPA concluded that the data provide a sound and reasonable basis for assessing the overall ability of the industry to achieve compliance with the regulations. The Agency solicits information and data on the current size of the industry and trends related to the growth or decline in the need for the services provided by these facilities.

C. Methodology

The landfills industry is characterized by facilities owned by public or private entities. Consequently, EPA used two different criteria to evaluate economic impacts on privately owned or publicly owned facilities. From the Detailed Questionnaire database, EPA estimates that there are 60 privately owned and 98 publicly owned landfill facilities affected by this regulation.

For privately owned landfill facilities, EPA applied two financial tests to determine facility level economic impacts. The first is the after-tax cash flow test. This test examines whether a facility loses money on a cash basis. The second test is the ratio of the facility's estimated compliance costs to the facility's revenue.

The economic impact analysis for privately owned facilities measures three types of primary impacts.

- Severe impacts, defined as facility closures, were projected if the proposed regulation would be expected to cause a facility to incur, on average, negative after-tax cash flow over the two-year period of analysis.
- Moderate impacts were defined as a financial impact short of entire facility closure. All facilities were assessed for the projected incurrence of total annualized compliance costs exceeding five percent of facility revenue.
- Possible employment losses were assessed for facilities estimated to close or discontinue waste treatment operations as a result of regulation.

For publicly owned landfill facilities, EPA applied two financial tests to determine facility level economic impacts. The first test is the compliance cost share of household income. This test examines whether a facility's estimated annualized compliance costs will equal or exceed one percent of the median household income in the jurisdiction governed by the municipality that owns the facility. The second test is the total landfill disposal cost share of household income. This test examines whether a facility's total landfill costs, including compliance costs, equal or exceed one percent of the median household income in the jurisdiction governed by the municipality that owns the facility.

The economic impact analysis for publicly owned facilities measures two types of primary impacts: severe impacts and moderate impacts. Each impact analysis measure is reviewed briefly below.

- Severe impacts were evaluated by application of the compliance cost share of household income test. A facility is deemed to be severely impacted if the compliance cost share of median household income was equal to or greater than one percent.
- Moderate impacts were evaluated by application of the total landfill disposal cost share of household income. A facility is deemed to be moderately impacted if the total landfill disposal cost share of median household income was equal to or greater than one percent.

The economic impact analysis for the proposed landfill regulation assumes that landfill facilities would not be able to pass the costs of compliance on to their customers through price increases. While a zero cost pass-through assumption is typically characterized as a conservative assumption, in this case, it is presumably an accurate assumption since the affected facilities represent a portion of the broader landfills services industry.

D. Summary of Economic Impacts

1. Economic Impacts of Proposed BPT

The statutory requirements for the assessment of BPT options are that the total cost of treatment must not be wholly disproportionate to the additional effluent benefits obtained. EPA evaluates treatment options by first calculating pre-tax total annualized costs and total pollutant removals in pounds. EPA then compared the ratio of the costs to the removals for each option. The selected option is then compared to the range of ratios in previous regulations to gauge its impact. The results of the cost and removal comparison are presented in Table IV.D–1. In the Non-Hazardous

Subcategory, Option I has a ratio of $8.83 per pound while Option II has a ratio of $10.16 per pound. Option II provides significant additional pollutant removals at a relatively low cost, thus EPA is proposing limits based on this option. Option II is also found to be within the historical bounds of BPT cost to removal ratios.

TABLE IV.D–1.—BPT COST REASONABLENESS ANALYSIS

Options	Pre-tax total annualized costs (Mil 1992$)	Total removals (lbs)	Average cost reasonableness (1992 $/lb)
NON-HAZARDOUS SUBCATEGORY			
I	$5.97	676,280	$8.83
II	7.73	760,782	10.16
HAZARDOUS SUBCATEGORY			
I	0.00	0	

The proposed regulatory option for BPT is Option II for both privately and publicly owned facilities. The postcompliance analysis under Option II projects two facility closures as a result of the compliance with the proposed option. The direct job losses associated with postcompliance closure are 20 Full Time Equivalent (FTE) positions. Table V.D–2 summarizes the economic impacts for the BPT options.

TABLE V.D–2.—IMPACTS OF EVALUATED BPT OPTIONS

Options	Post-tax total annualized costs (Mil 1992$)	Severe impacts	Moderate impacts	Direct employment losses (FTEs)
NON-HAZARDOUS SUBCATEGORY				
I	$5.43	2	0	20
II	6.85	2	0	20
HAZARDOUS SUBCATEGORY				
I	0.00	0	0	0

2. Economic Impacts of Proposed BAT Option

In the Non-Hazardous Subcategory, an additional technology Option BAT III (reverse osmosis) was evaluated for economic achievability. Option III has significantly higher annualized compliance costs than BPT Options I and II. As a result, the number of facilities experiencing moderate economic impacts increased from none under BPT Option II to six under BAT Option III, while the number of facilities experiencing severe economic impacts remained unchanged. BAT Option III is found to be not economically achievable due to the large portion of the affected population experiencing at least moderate economic impact.

TABLE VI.D–3.—IMPACTS OF EVALUATED BAT OPTIONS

Options	Post-tax total annualized costs (Mil 1992$)	Severe impacts	Moderate impacts	Direct employment losses
NON-HAZARDOUS SUBCATEGORY				
III	$29.16	2	6	20 FTEs

3. Economic Impact of Proposed PSES

The proposed regulatory option for PSES for the Hazardous Subcategory is Option I. The postcompliance analysis under the selected option projects no incremental costs of compliance and no economic impact. As discussed in Section [IX], no PSES options are evaluated for the Non-Hazardous Subcategory.

4. Economic Analysis of Proposed NSPS and PSNS

EPA is establishing NSPS limitations equivalent to the limitations that are established for BPT/BCT/BAT for both the Non-Hazardous and Hazardous Subcategories. In general, EPA believes that new sources will be able to comply at costs that are similar to or less than the costs for existing sources, because new sources can apply control technologies more efficiently than sources that need to retrofit for those technologies. BPT/BCT/BAT limitations are found to be economically achievable; therefore, NSPS limitations

will not present a barrier to entry for new facilities.

EPA is setting PSNS equal to PSES limitations for existing sources for the Hazardous Subcategory. Given EPA's finding of economic achievability for the PSES regulation, EPA also finds that the PSNS regulation will be economically achievable and will not constitute a barrier to entry for new sources.

5. Firm Level Impacts

Firms differ from facilities in that firms are business entities or companies, which may operate at several physical locations. Facilities are individual establishments defined by their physical location, whether or not they constitute an independent business entity on their own. Some facilities in the survey sample are single-facility firms. In these cases, the firm-level impact depends only on the facility-level impact. In other cases, though, sampled facilities are owned by multi-facility firms, so that the impact on the parent firm depends not only on that facility, but also on the impacts on and characteristics of other facilities owned by the same firm.

In this analysis, significant adverse impacts on firms are indicated when firm-level compliance costs exceed five percent of firm revenues. Using this criterion, EPA finds no significant adverse impacts on affected firms and therefore determines that the proposed effluent guideline will not impose unreasonable economic burdens on firms that own in-scope landfills.

6. Community Impacts

Community impacts are assessed by estimating the expected change in employment in communities with landfills that are affected by the proposed regulation. Possible community employment effects include the employment losses in the facilities that are expected to close because of the regulation and the related employment losses in other businesses in the affected community. In addition to these estimated employment losses, employment may increase as a result of facilities' operation of treatment systems for regulatory compliance. It should be noted that job gains will mitigate community employment losses only if they occur in the same communities in which facility closures occur.

The proposed regulation is estimated to result in one post-compliance closure of a sampled facility (which represents two facilities in the nationally estimated impacts). The post-compliance closure results in the direct loss of 10 Full-Time Equivalent (FTE) positions (which represents 20 FTE positions in the nationally estimated impacts). Secondary employment impacts are estimated based on multipliers that relate the change in employment in a directly affected industry to aggregate employment effects in linked industries and consumer businesses whose employment is affected by changes in the earnings and expenditures of the employees in the directly and indirectly affected industries.

For the sampled facility projected to close as a result of the proposed rule, the application of the state specific multiplier of 4.935 to the 10 direct FTE losses leads to an estimated community impact of 49 total FTE losses as the result of the proposed rule. The county in which the closure is projected to occur has a current employment of 20,000 FTEs dispersed among 1,200 establishments. The direct and secondary job losses represent 0.25 percent of current employment in the affected county. The additional 10 direct FTE losses represented by the sampled facility in the calculation of national estimates cannot be attributed to any particular community. The secondary effects can be estimated at the national level by using the national average multiplier of 4.049, resulting in an estimate of 40 total FTE losses associated with the represented facility closure. These losses are mitigated by the job gains associated with the operation of control equipment which are estimated to be 79 FTEs.

7. Foreign Trade Impacts

EPA does not project any foreign trade impacts as a result of the effluent limitations guidelines and standards. International trade in landfill services for the disposal of hazardous and nonhazardous wastes is virtually nonexistent.

E. Cost-Effectiveness Analysis

EPA also performed a cost-effectiveness analysis (refer to Cost Effectiveness section of the "EA") of the potential regulatory options for the Non-Hazardous Subcategory. The cost-effectiveness analysis compares the total annualized cost incurred for a regulatory option to the corresponding effectiveness of that option in reducing the discharge of pollutants.

Cost-effectiveness calculations are used during the development of effluent limitations guidelines and standards to compare the efficiency of one regulatory option in removing pollutants to another regulatory option. Cost-effectiveness is defined as the incremental annual cost of a pollution control option in an industry subcategory per incremental pollutant removal. The increments are considered relative to another option or to a benchmark, such as existing treatment. In cost-effectiveness analysis, pollutant removals are measured in toxicity normalized units called "pounds-equivalent." The cost-effectiveness value, therefore, represents the unit cost of removing an additional pound-equivalent (lb. eq.) of pollutants. In general, the lower the cost-effectiveness value, the more cost-efficient the regulation will be in removing pollutants, taking into account their toxicity. While not required by the Clean Water Act, cost-effectiveness analysis is a useful tool for evaluating regulatory options for the removal of toxic pollutants. Cost-effectiveness analysis does not take into account the removal of conventional pollutants (e.g., oil and grease, biochemical oxygen demand, and total suspended solids).

For the cost-effectiveness analysis, the estimated pounds-equivalent of pollutants removed were calculated by multiplying the number of pounds of each pollutant removed by the toxic weighting factor for each pollutant. The more toxic the pollutant, the higher the pollutant's toxic weighting factor will be and, accordingly, the use of pounds-equivalent gives correspondingly more weight to pollutants with higher toxicity. Thus, for a given expenditure and pounds of pollutants removed, the cost per pound-equivalent removed would be lower when more highly toxic pollutants are removed than if pollutants of lesser toxicity are removed. Annual costs for all cost-effectiveness analyses are reported in 1981 dollars so that comparisons of cost-effectiveness may be made with regulations for other industries that were issued at different times.

The results of the cost effectiveness analysis for the potential BAT Option III for the Non-Hazardous Subcategory are presented in Table VIII. E–1. The potential option has an incremental (to BPT Option II) cost effectiveness of $13,346 per lb.-equivalent. The result of the cost effectiveness analysis reinforces the conclusion that BAT Option III is not economically achievable.

TABLE VIII.E–1.—BAT COST EFFECTIVENESS ANALYSIS

Option	Pre-tax total annualized costs (Mil 1981$)	Incremental removals (lb. eq.)	Incremental cost-effectiveness ($/lb. eq.)
NON-HAZARDOUS SUBCATEGORY			
III	$21.97	1,646	$13,346

XII. Water Quality Analysis and Environmental Benefits

A. Introduction

EPA evaluated the environmental benefits of controlling priority and nonconventional pollutant discharges to surface waters and publicly-owned treatment works (POTWs). Pollutant discharges into freshwater and estuarine ecosystems may alter aquatic habitats, adversely affect aquatic biota, and may adversely impact human health through the consumption of contaminated fish and water. Furthermore, pollutant discharges to a POTW may interfere with POTW operations by inhibiting biological treatment or by contaminating POTW biosolids.

Many pollutants commonly found in landfill wastewaters have at least one toxic effect (e.g., the pollutant may be a human health carcinogen or toxic to either some human system or to aquatic life). In addition, several of these pollutants bioaccumulate in aquatic organisms and persist in the environment.

The Agency's analysis focused on the effects of toxic pollutants and did not evaluate the effects of two conventional pollutants and five nonconventional pollutants including total suspended solids (TSS), five-day biochemical demand (BOD_5) chemical oxygen demand (COD), total dissolved solids (TDS), total organic carbon (TOC), hexane extractable material, and total phenolic compounds. Although the Agency is not able to monetize the benefits associated with reductions of non-toxic parameters, discharges of these parameters can have adverse effects on human health and the environment. For example, suspended particulate matter can degrade habitat by reducing light penetration and thus primary productivity and can alter benthic spawning grounds and feeding habitats by accumulation in streambeds. High COD and BOD_5 discharges can deplete oxygen levels, which can result in mortality or other adverse effects on fish.

B. Water Quality Impacts and Benefits

The Agency's analyses of these environmental and human health risk concerns and of the water quality-related benefits resulting from the proposed effluent guidelines are contained in the "Environmental Assessment of the Proposed Effluent Guidelines for the Landfill Category." This assessment both qualitatively and quantitatively evaluates the potential: (1) Ecological benefits; (2) the human health benefits; and (3) the economic productivity benefits of controlling discharges from hazardous and non-hazardous landfills based on site-specific analyses of current conditions and the conditions that would be achieved by proposed process changes. In-stream pollutant concentrations from direct and indirect discharges are estimated using stream dilution modeling. Potential impacts and benefits are then estimated.

Ecological benefits are projected by comparing the steady-state in-stream pollutant concentrations, predicted after complete immediate mixing with no loss from the system, to EPA published water quality criteria guidance or to documented toxic effect levels (i.e., lowest reported or estimated toxic concentration) for those chemicals for which EPA has not published water quality criteria. In performing these analyses, EPA used guidance documents published by EPA that recommend numeric human health and aquatic life water quality criteria for numerous pollutants. States often consult these guidance documents when adopting water quality criteria as part of their water quality standards. However, because those State-adopted criteria may vary, EPA used the nationwide criteria guidance as the most representative value. For arsenic, the Agency also recognizes that currently there is no scientific consensus on the most appropriate approach for extrapolating the dose-response relationship to the low-dose associated with drinking water exposure. EPA used the findings from the analysis of reduced occurrence of pollutant concentrations in excess of both aquatic life and human health criteria or toxic effect levels to assess improvements in recreational fishing habitats and, in turn, to estimate, if applicable, a monetary value for enhanced recreational fishing opportunities. Such benefits are expected to manifest as increases in the value of the fishing experience per day fished or the number of days anglers subsequently choose to fish the cleaner waterways. These benefits, however, do not include all of the benefits that are associated with improvements in aquatic life, such as increased assimilation capacity of the receiving stream, improvements in taste and odor, or improvements to other recreational activities such as swimming and wildlife observation.

Human health benefits are projected by: (1) Comparing estimated in-stream concentrations to health-based water quality toxic effect levels or EPA published water quality criteria; and (2) estimating the potential reduction of carcinogenic risk and non-carcinogenic hazard from consuming contaminated fish or drinking water. Upper-bound individual cancer risks, population risks, and non-cancer hazards (systemic) are estimated using modeled in-stream pollutant concentrations and standard EPA assumptions regarding ingestion of fish and drinking water. Modeled pollutant concentrations in fish and drinking water are used to estimate cancer risk and non-cancer hazards (systemic) among the general population, sport anglers and their families, and subsistence anglers and their families. Due to the hydrophobic nature of the two chlorinated dibenzo-p-dioxin (CDD) congeners and one chlorinated dibenzofuran (CDF) congener being evaluated, human health benefits are projected for these pollutants only by using the Office of Research and Development's Dioxin Reassessment Evaluation (DRE) model to estimate the potential reduction of carcinogenic risk and non-carcinogenic hazard from consuming contaminated fish. The DRE model estimates fish tissue concentrations of the CDD/CDF congeners by calculating the equilibrium between the pollutants in fish tissue and those adsorbed to the organic fraction of sediments suspended in the water column. Of these health benefit measures, the Agency is able to monetize only the reduction in

carcinogenic risk using estimated willingness-to-pay values for avoiding premature mortality. The values used in this analysis, if applicable, are based on a range of values from a review of studies quantifying individuals' willingness to pay to avoid increased risks to life. In 1992 dollars, these values range from $2.1 to $11.0 million per statistical life saved.

Economic productivity benefits, based on reduced incidences of inhibition of POTW operations and reduced sewage sludge contamination (defined as a concentration of pollutants in sewage sludge that would not permit land application or surface disposal of the sludge in compliance with EPA's regulations) are also evaluated for current and proposed pretreatment levels. Inhibition of POTW operations is estimated by comparing modeled POTW influent concentrations to available published information on inhibition levels. Potential contamination of sewage sludge is estimated by comparing projected pollutant concentrations in sewage sludge to EPA standards on the use or disposal of sewage sludge 40 CFR Part 503. Sewage sludge disposal benefits are estimated on the basis of the incremental quantity of sludge that, as a result of reduced pollutant discharges to POTWs, meets criteria for the generally less expensive disposal method, namely land application and surface disposal. The POTW inhibition and sludge values used in this analysis are not, in general, regulatory values. EPA based these values upon engineering and health estimates contained in guidance or guidelines published by EPA and other sources. Therefore, EPA does not intend to base its regulatory approach for proposed pretreatment discharge levels upon the finding that some pollutants interfere with POTWs by impairing their treatment effectiveness or causing them to violate applicable limits for their chosen disposal methods. However, as discussed above, EPA *did* find that some pollutants would pass through POTW treatment systems as a basis for its determination to establish pretreatment standards in certain cases. Nonetheless, the values used in this analysis help indicate the potential benefits for POTW operations and sludge disposal that may result from the compliance with proposed pretreatment discharge levels.

EPA evaluated the potential aquatic life and human health impacts of direct wastewater discharges on receiving stream water quality at current levels of treatment and at proposed BAT treatment levels. EPA performed this analysis for a representative sample set of 43 direct non-hazardous landfills discharging 32 pollutants to 41 receiving streams. Results were extrapolated based on the statistical methodology used for estimated costs, loads, and economic impacts.

The proposed regulation is projected to reduce excursions of chronic aquatic life criteria or toxic effect levels due to the discharge of three pollutants (ammonia, boron and disulfoton) in four receiving streams. EPA projects that a total of 97 excursions in 38 receiving streams at current conditions would be reduced to 44 excursions in 34 streams. In-stream concentrations of one pollutant (arsenic) are projected to exceed human health criteria (developed for consumption of water and organisms) in four receiving streams at both current and proposed BAT discharge levels. Estimates of the increase in value of recreational fishing to anglers range from $126,000 to $450,000 annually (in 1992 dollars) based on the baseline value of the fishery and the estimated incremental benefit values associated with freeing the fishery from contaminants.

EPA modeled cancer cases and systemic health effects resulting from the ingestion of fish and drinking water contaminated by non-hazardous landfill wastewater. EPA concluded that current wastewater discharges from landfills result in far less than one annual cancer case per year for all populations evaluated. Because the baseline cancer rate is negligible, EPA projects no reduction in cancer cases to be achieved by this regulation. Systemic health effects from one pollutant (disufoton) are projected in two receiving streams at both current and proposed BAT discharge levels affecting a total population of 643 subsistence anglers and their families.

EPA's survey of hazardous landfills in the United States indicated that there were no in-scope respondents which were classified as direct dischargers. Therefore, the Agency did not evaluate potential aquatic life and human health impacts of direct wastewater discharges from hazardous landfills.

All of the in-scope hazardous landfills in EPA's survey of the industry are expected to be in compliance with the baseline treatment standards established for indirect dischargers. The Agency has therefore projected that there will be no costs or benefits associated with compliance of the proposed regulation.

EPA did, however, evaluate the effects of landfill wastewater discharges of 60 pollutants on receiving stream water quality at current and proposed pretreatment levels. The EPA Detailed Questionnaire identified three hazardous landfills discharging to three POTWs with outfalls located on three receiving streams.

In-stream concentrations are not projected to exceed chronic aquatic life criteria or toxic effect levels. In-stream concentrations of one pollutant (arsenic) are projected to exceed human health criteria (developed for consumption of water and organisms) in one receiving stream at both current and proposed pretreatment levels. No benefits, based on enhanced recreational fishing opportunities are therefore projected to be achieved by regulation.

EPA modeled cancer cases and systemic health effects resulting from the ingestion of fish and drinking water contaminated by landfill wastewater. EPA concluded that current wastewater discharges from landfills result in far less than one annual cancer case per year. Because the baseline cancer rate is negligible, EPA projects no reduction in cancer cases to be achieved by this regulation. No systemic health effects are projected at current or proposed pretreatment levels.

Additionally, EPA concluded that there are no inhibition or sludge contamination problems at the three POTWs receiving wastewater.

XIII. Non-Water Quality Environmental Impacts

The elimination or reduction of one form of pollution may create or aggravate other environmental problems. Therefore, Sections 304(b) and 306 of the Act require EPA to consider non-water quality environmental impacts of effluent limitations guidelines and standards. Accordingly, EPA has considered the effect of these regulations on air pollution, solid waste generation, and energy consumption. While it is difficult to balance environmental impacts across all media and energy use, the Agency has determined that the impacts identified below are justified by the benefits associated with compliance with the limitations and standards.

A. Air Pollution

The primary source of air pollution from landfills is due to the microbial breakdown of organic wastes from within the landfill. Landfills are known to be major sources of greenhouse gas emissions such as methane and carbon dioxide. These emissions are now regulated under the Clean Air Act as a result of the landfill New Source Performance Standards and Emissions Guidelines, promulgated by EPA on March 12, 1996. Many municipal solid waste (MSW) landfills are required to

collect and combust the gases generated in the landfill.

Wastewater collected from within the landfill contains organic compounds which include volatile organic compounds (VOC) and hazardous air pollutants (HAP). These wastewaters must be collected, treated and stored in units which are often open to the atmosphere and will result in the volatilization of certain compounds. The regulations proposed today involve the use of an aerated biological system. Wastewater aeration may increase the volatilization of certain organic compounds. However, the increase in air emissions due to this proposed regulation will be minimal due to the low levels of VOCs present in landfill wastewaters and will not significantly increase the air emissions from landfills.

In addition, EPA is addressing emissions of VOCs from industrial wastewater through a Control Techniques Guideline (CTG) under Section 110 of the Clean Air Act. In September, 1992, EPA published a draft document entitled "Control of Volatile Organic Compound Emissions from Industrial Wastewater" (EPA-453/0-93-056). This document addresses various industries, including the hazardous waste treatment, storage, and disposal industry, and outlines emissions expected from their wastewater treatment systems, and methods for controlling them.

B. Solid Waste

Solid waste will be generated due to a number of the proposed treatment technologies. These wastes include sludge from biological treatment systems and chemical precipitation systems. Solids from treatment processes are typically dewatered and disposed in the on-site landfill. Therefore, the increased amount of sludge created due to this regulation will be negligible in comparison with the daily volumes of waste processed and disposed of in a typical landfill.

C. Energy Requirements

EPA estimates that the attainment of these standards will increase energy consumption by a very small increment over present industry use. The treatment technologies proposed are not energy-intensive, and the projected increase in energy consumption is primarily due to the incorporation of components such as power pumps, mixers, blowers, power lighting and controls. The costs associated with these energy costs are included in EPA's estimated operating costs for compliance with the proposed guideline.

XIV. Related Acts of Congress, Executive Orders, and Agency Initiatives

A. Paperwork Reduction Act

The proposed effluent guidelines and standards contain no information collection activities and, therefore, no information collection request (ICR) has been submitted to the Office of Management and Budget (OMB) for review and approval under the provisions of the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.*

B. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA), 5 U.S.C. 601 *et seq.*, provides that, whenever an agency is required to publish general notice of rulemaking for a proposed rule, the agency must prepare (and make available for public comment) an initial regulatory flexibility analysis (IRFA). The agency must prepare an IRFA for a proposed rule unless the Administrator certifies that it will not have a significant economic impact on a substantial number of small entities. EPA is today certifying, pursuant to Section 605(b) of the RFA, that the proposed rule will not have a significant economic impact on a substantial number of small entities. Therefore, the Agency did not prepare an IRFA.

While EPA has so certified today's rule, the Agency nonetheless prepared a regulatory flexibility assessment equivalent to that required by the Regulatory Flexibility Act as modified by the Small Business Regulatory Enforcement Fairness Act of 1996. The assessment for this rule is detailed in the "Economic Analysis of Proposed Effluent Limitations Guidelines and Standards for the Landfill Category."

The proposal, if promulgated, will not have a significant economic impact on a substantial number of small entities for the following reasons. The RFA defines "small entity" to mean a small business, small organization or small governmental jurisdiction. Today's proposal would establish requirements applicable to landfill facilites which may be owned by small businesses or small governmental jurisdictions. EPA's assessment found that, of the 151 facilities [7] that may be potentially affected if the proposal is promulgated, only 39 facilities are small entities. Of the 39 affected small entities, nine are privately owned and 30 are government owned. The costs to the entities is not projected to be great—in all cases less than one percent of revenues. Based on this assessment, the Administrator certifies that the proposed rule will not have a significant economic effect on a substantial number of small entities.

C. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Pub. L. 104-4 establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and tribal governments and the private sector. Under Section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with "Federal mandates" that may result in expenditures to State, local, and tribal governments, in the aggregate, or to the private sector, of $100 million or more in any one year. Before promulgating an EPA rule for which a written statement is needed, Section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule. The provisions of Section 205 do not apply when they are inconsistent with applicable law. Moreover, Section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective or least burdensome alternative if the Administrator publishes with the final rule an explanation why that alternative was not adopted. Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including tribal governments, it must have developed under Section 203 of the UMRA a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant Federal intergovernmental mandates, and informing, educating, and advising small governments on compliance with the regulatory requirements.

EPA has determined that this rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local, and tribal governments, in the aggregate, or the private sector in any one year. EPA has estimated the total annualized costs of the proposed rule to State, local, and tribal governments as $5.4 million (1996$). EPA has estimated total annualized cost of the proposed rule to private facilities as $2.3 million (1996$, post-tax). Thus, today's rule is not

[7] This is the total number of affected facilities, net of baseline closures among privately owned facilities.

subject to the requirements of Sections 202 and 205 of the UMRA.

EPA has determined that this rule contains no regulatory requirements that might significantly or uniquely affect small governments. Thus, today's rule is not subject to the requirements of Section 203 of the UMRA.

D. Executive Order 12866

Under Executive Order 12866, [58 FR 51735 (October 4, 1993)] the Agency must determine whether the regulatory action is "significant" and therefore subject to OMB review and the requirements of the Executive Order. The Order defines "significant regulatory action" as one that is likely to result in a rule that may:

(1) have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

(2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

It has been determined that this proposed rule is not a "significant regulatory action" under the terms of Executive Order 12866 and is therefore not subject to OMB review.

E. National Technology Transfer and Advancement Act

Under § 12(d) of the National Technology Transfer and Advancement Act, the Agency is required to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, business practices, etc.) that are developed or adopted by voluntary consensus standard bodies. Where available and potentially applicable voluntary consensus standards are not used by EPA, the Act requires the Agency to provide Congress, through the Office of Management and Budget, an explanation of the reasons for not using such standards.

EPA is not proposing any new analytical test methods as part of today's proposed effluent limitations guidelines and standards. EPA performed literature searches to identify any analytical methods from industry, academia, voluntary consensus standard bodies and other parties that could be used to measure the analytes in today's proposed rulemaking. The results of this search confirm EPA's determination to continue to rely on its existing analytical test methods for the analytes for which effluent limitations and pretreatment standards are proposed. Although the Agency initiated data collection for these effluent guidelines many years prior to enactment of the NTTAA, traditionally, analytical test method development has been analogous to the Act's requirements for consideration and use of voluntary consensus standards.

The proposed rule would require dischargers to monitor for BOD_5, TSS, pH, ammonia, arsenic, chromium (total), zinc, alpha terpineol, aniline, benzene, benzoic acid, p-cresol, phenol, naphthalene, pyridine, and toluene.

Except for alpha terpineol, aniline benzoic acid, p-cresol, and pyridine, methods for monitoring these pollutants are specified in tables at 40 CFR Part 136. When available, methods published by voluntary consensus standards bodies are included in the list of approved methods in these tables. Specifically, voluntary consensus standards from the American Society for Testing and Materials (ASTM) and from the 18th edition of Standard Methods (published jointly by the American Public Health Association, the American Water Works Association and the Water Environment Federation) are approved for pH, ammonia, arsenic, chromium (total), and zinc. Standard Methods are available for BOD_5, TSS, benzene, phenol, napthalene, and toluene. In addition, USGS methods are approved for BOD_5, TSS, pH, ammonia, arsenic, chromium (total) and zinc.

For alpha terpineol, aniline, benzoic acid, p-cresol, and pyridine, EPA proposes to use EPA Methods 1625 and 625 which are promulgated at 40 CFR Part 136. These analytical methods were used in data collection activities in support of today's proposed limitations. With the exception of alpha terpineol, these analytes are not specified as analytes in the method.

EPA requests comments on the discussion of NTTAA, on the consideration of various voluntary consensus standards, and on the existence of other voluntary consensus standards that EPA may not have found.

XV. Regulatory Implementation

A. Applicability

Today's proposal represents EPA's best judgment at this time as to the appropriate technology-based effluent limits for the landfills industry. These effluent limitations and standards, however, may change based on comments received on this proposal, and subsequent data submitted by commenters or developed by the Agency. Therefore, while the information provided in the Technical Development Documents may provide useful information and guidance to permit writers in determining best professional judgment permit limits for landfills, the permit writer will still need to justify any permit limits based on the conditions at the individual facility.

B. Upset and Bypass Provisions

A "bypass" is an intentional diversion of waste streams from any portion of a treatment facility. An "upset" is an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. EPA's regulations concerning bypasses and upsets are set forth at 40 CFR 122.41(m) and (n).

C. Variances and Modifications

The CWA requires application of the effluent limitations established pursuant to Section 301 or the pretreatment standards of Section 307 to all direct and indirect dischargers. However, the statute provides for the modification of these national requirements in a limited number of circumstances. Moreover, the Agency has established administrative mechanisms to provide an opportunity for relief from the application of national effluent limitations guidelines and pretreatment standards for categories of existing sources for priority, conventional and non-conventional pollutants.

1. Fundamentally Different Factors Variances

EPA will develop effluent limitations or standards different from the otherwise applicable requirements if an individual existing discharging facility is fundamentally different with respect to factors considered in establishing the limitation or standards applicable to the individual facility. Such a modification is known as a "fundamentally different factors" (FDF) variance.

Early on, EPA, by regulation, provided for FDF modifications from BPT effluent limitations, BAT

limitations for priority and non-conventional pollutants and BCT limitation for conventional pollutants for direct dischargers. For indirect dischargers, EPA provided for FDF modifications from pretreatment standards for existing facilities. FDF variances for priority pollutants were challenged judicially and ultimately sustained by the Supreme Court. (*Chemical Manufacturers Ass'n* v. *NRDC*, 479 U.S. 116 (1985)).

Subsequently, in the Water Quality Act of 1987, Congress added new Section 301(n) of the Act explicitly to authorize modification of the otherwise applicable BAT effluent limitations or categorical pretreatment standards for existing sources if a facility is fundamentally different with respect to the factors specified in Section 304 (other than costs) from those considered by EPA in establishing the effluent limitations or pretreatment standard. Section 301(n) also defined the conditions under which EPA may establish alternative requirements. Under Section 301(n), an application for approval of FDF variance must be based solely on (1) information submitted during the rulemaking raising the factors that are fundamentally different or (2) information the applicant did not have an opportunity to submit. The alternate limitation or standard must be no less stringent than justified by the difference and not result in markedly more adverse non-water quality environmental impacts than the national limitation or standard.

EPA regulations at 40 CFR 125 Subpart D, authorizing the Regional Administrators to establish alternative limitations and standards, further detail the substantive criteria used to evaluate FDF variance requests for existing direct dischargers. Thus, 40 CFR 125.31(d) identifies six factors (e.g., volume of process wastewater, age and size of a discharger's facility) that may be considered in determining if a facility is fundamentally different. The Agency must determine whether, on the basis of one or more of these factors, the facility in question is fundamentally different from the facilities and factors considered by EPA in developing the nationally applicable effluent guidelines. The regulation also lists four other factors (e.g., infeasibility of installation within the time allowed or a discharger's ability to pay) that may not provide a basis for an FDF variance. In addition, under 40 CFR 125.31(b)(3), a request for limitations less stringent than the national limitation may be approved only if compliance with the national limitations would result in either (a) a removal cost wholly out of proportion to the removal cost considered during development of the national limitations, or (b) a non-water quality environmental impact (including energy requirements) fundamentally more adverse than the impact considered during development of the national limits. EPA regulations provide for an FDF variance for existing indirect dischargers at 40 CFR 403.13. The conditions for approval of a request to modify applicable pretreatment standards and factors considered are the same as those for direct dischargers.

The legislative history of Section 301(n) underscores the necessity for the FDF variance applicant to establish eligibility for the variance. EPA's regulations at 40 CFR 125.32(b)(1) are explicit in imposing this burden upon the applicant. The applicant must show that the factors relating to the discharge controlled by the applicant's permit which are claimed to be fundamentally different are, in fact, fundamentally different from those factors considered by EPA in establishing the applicable guidelines. The pretreatment regulation incorporate a similar requirement at 40 CFR 403.13(h)(9).

An FDF variance is not available to a new source subject to NSPS or PSES.

2. Permit Modifications

Even after EPA (or an authorized State) has issued a final permit to a direct discharger, the permit may still be modified under certain conditions. (When a permit modification is under consideration, however, all other permit conditions remain in effect.) A permit modification may be triggered in several circumstances. These could include a regulatory inspection or information submitted by the permittee that reveals the need for modification. Any interested person may request modification of a permit modification be made. There are two classifications of modifications: major and minor. From a procedural standpoint, they differ primarily with respect to the public notice requirements. Major modifications require public notice while minor modifications do not. Virtually any modifications that results in less stringent conditions is treated as a major modification, with provisions for public notice and comment. Conditions that would necessitate a major modification of a permit are described in 40 CFR 122.62. Minor modifications are generally non-substantive changes. The conditions for minor modification are described in 40 CFR 122.63.

3. Removal Credits

The CWA establishes a discretionary program for POTWs to grant "removal credits" to their indirect discharges. This credit in the form of a less stringent pretreatment standard, allows an increased concentration of a pollutant in the flow from the indirect discharger's facility to the POTW (*See* 40 CFR 403.7). EPA has promulgated removal credit regulations as part of its pretreatment regulations. Under EPA's pretreatment regulations, the availability of a removal credit for a particular pollutant is linked to the POTW method of using or disposing of its sewage sludge. The regulations provide that removal credits are only available for certain pollutants regulated in EPA's 40 CFR Part 503 sewage sludge regulations (58 FR 9386). The pretreatment regulations at 40 CFR Part 403 provide that removal credits may be made potentially available for the following pollutants:

(1) If a POTW applies its sewage sludge to the land for beneficial uses, disposes of it on surface disposal sites or incinerates it, removal credits may be available, depending on which use or disposal method is selected (so long as the POTW complies with the requirements in Part 503). When sewage sludge is applied to land, removal credits may be available for ten metals. When sewage sludge is disposed of on a surface disposal site, removal credits may be available for three metals. When the sewage sludge is incinerated, removal credits may be available for seven metals and for 57 organic pollutants (40 CFR 403.7(a)(3)(iv)(A)).

(2) In addition, when sewage sludge is used on land or disposed of on a surface disposal site or incinerated, removal credits may also be available for additional pollutants so long as the concentration of the pollutant in sludge does not exceed a concentration level established in Part 403. When sewage sludge is applied to land, removal credits may be available for two additional metals and 14 organic pollutants. When the sewage sludge is disposed of on a surface disposal site, removal credits may be available for seven additional metals and 13 organic pollutants. When the sewage sludge is incinerated, removal credits may be available for three other metals (40 CFR 403.7(a)(3)(iv)(B)).

(3) When a POTW disposes of its sewage sludge in a municipal solid waste landfill (MSWLF) that meets the criteria of 40 CFR Part 258, removal credits may be available for any pollutant in the POTW's sewage sludge (40 CFR 403.7(a)(3)(iv)(C)). Thus, given compliance with the requirements of

EPA's removal credit regulations,[8] following promulgation of the pretreatment standards being proposed today, removal credits may be authorized for any pollutant subject to pretreatment standards if the applying POTW disposes of its sewage sludge in a MSWLF that meets the requirements of 40 CFR Part 258. If the POTW uses or disposes of its sewage sludge by land application, surface disposal or incineration, removal credits may be available for the following metal pollutants (depending on the method of use or disposal): arsenic, cadmium, chromium, copper, iron, lead, mercury, molybdenum, nickel, selenium and zinc. Given compliance with Section 403.7, removal credits may be available for the following organic pollutants (depending on the method of use or disposal) if the POTW uses or disposes of its sewage sludge: benzene, 1,1-dichloroethane, 1,2-dibromoethane, ethylbenzene, methylene chloride, toluene, tetrachloroethene, 1,1,1-trichloroethane, 1,1,2-trichloroethane and trans-1,2-dichloroethene.

Some facilities may be interested in obtaining removal credit authorization for other pollutants being considered for regulation in this rulemaking for which removal credit authorization would not otherwise be available under Part 403. Under Sections 307(b) and 405 of the CWA, EPA may authorize removal credits only when EPA determines that, if removal credits are authorized, that the increased discharges of a pollutant to POTWs resulting from removal credits will not affect POTW sewage sludge use or disposal adversely. As discussed in the preamble to amendments to Part 403 regulations (58 FR 9382–83), EPA has interpreted these sections to authorize removal credits for a pollutant only in one of two circumstances. Removal credits may be authorized for any categorical pollutant (1) for which EPA have established a numerical pollutant limit in Part 503; or (2) which EPA has determined will not threaten human health and the environment when used or disposed in sewage sludge. The pollutants described in paragraphs (1)–(3) above include all those pollutants that EPA either specifically regulated in Part 503 or evaluated for regulation and determined would not adversely affect sludge use and disposal.

Consequently, in the case of a pollutant for which EPA did not perform a risk assessment in developing its Round One sewage sludge regulations, removal credit for pollutants will only be available when the Agency determines either a safe level for the pollutant in sewage sludge or that regulation of the pollutant is unnecessary to protect public health and the environment from the reasonably anticipated adverse effects of such a pollutant.[9]

EPA has concluded that a POTW discharge of a particular pollutant will not prevent sewage sludge use (or disposal) so long as the POTW is complying with EPA's Part 503 regulations and so long as the POTW demonstrates that use or disposal of sewage sludge containing that pollutant will not adversely affect public health and the environment. Thus, if the POTW meets these two conditions, a POTW may obtain removal credit authority for pollutants other than those specifically regulated in Part 503 regulations. What is necessary for a POTW to demonstrate that a pollutant will not adversely affect public health and the environment will depend on the particular pollutant, the use or disposal means employed by the POTW and the concentration of the pollutant in the sewage sludge. Thus, depending on the circumstances, this effort could vary from a complete 14-pathway risk assessment modeling exercise to a simple demonstration that available scientific data show that, at the levels observed in the sewage sludge, the pollutant at issue is not harmful. As part of its initiative to simplify and improve its regulations, at the present time, EPA is considering whether to propose changes to its pretreatment regulations so as to provide for case-by-case removal credit determinations by the POTWs' permitting authority.

EPA has already begun the process of evaluating several pollutants for adverse potential to human health and the environment when present in sewage sludge. In November 1995, pursuant to the terms of the consent decree in the *Gearhart case*, the Agency notified the United States District Court for the District of Oregon that, based on the information then available at that time, it intended to propose only two pollutants for regulation in the Round Two sewage sludge regulations dioxins/dibenzofurans (all monochloro to octochloro congeners) and polychlorinated biphenyls.

The Round Two sludge regulations are not scheduled for proposal until December 1999 and promulgation in December 2001. However, given the necessary factual showing, as detailed above, EPA could conclude before the contemplated proposal and promulgation dates that regulation of some of these pollutants is not necessary. In those circumstances, EPA could propose that removal credits should be authorized for such pollutants before promulgation of the Round Two sewage sludge regulations. However, given the Agency's commitment to promulgation of effluent limitations and guidelines under court-supervised deadlines, it may not be possible to complete review of removal credit authorization requests by the time EPA must promulgate these guidelines and standards.

D. Relationship of Effluent Limitations to NPDES Permits and Monitoring Requirements

Effluent limitations act as a primary mechanism to control the discharges of pollutants to waters of the United States. These limitations are applied to individual facilities through NPDES permits issued by EPA or authorized States under Section 402 of the Act.

The Agency has developed the limitations and standards for this proposed rule to cover the discharge of pollutants for this industrial category. In specific cases, the NPDES permitting authority may elect to establish technology-based permit limits for pollutants not covered by this proposed regulation. In addition, if State water quality standards or other provisions of State or Federal law require limits on pollutants not covered by this regulation (or require more stringent limits on covered pollutants) the permitting authority must apply those limitations.

Working in conjunction with the effluent limitations are the monitoring conditions set out in an NPDES permit. An integral part of the monitoring conditions is the point at which a facility must monitor to demonstrate compliance. The point at which a sample is collected can have a dramatic effect on the monitoring results for that facility. Therefore, it may be necessary to require internal monitoring points in order to ensure compliance. Authority to address internal waste streams is provided in 40 CFR 122.44(I)(1)(iii) and 122.45(h). Permit writers may establish additional internal monitoring points to

[8] Under Section 403.7, a POTW is authorized to give removal credits only under certain conditions. These include applying for, and obtaining, approval from the Regional Administrator (or Director of a State NPDES program with an approved pretreatment program), a showing of consistent pollutant removal and an approved pretreatment program. *See* 40 CFR 403.7(a)(3)(I), (ii), and (iii).

[9] In the Round One sewage sludge regulation, EPA concluded, on the basis of risk assessments, that certain pollutants (see Appendix G to Part 403) did not pose an unreasonable risk to human health and the environment and did not require the establishment of sewage sludge pollutant limits. As discussed above, so long as the concentration of these pollutant in sewage sludge are lower than a prescribed level, removal credits are authorized for such pollutants.

the extend consistent with EPA's regulations.

E. Implementation for Facilities With Landfills in Multiple Subcategories

According to the 1992 Waste Treatment Industry: Landfills Questionnaire, there are several facilities which operate both Subtitle C hazardous landfills and Subtitle D non-hazardous landfills on-site. Generally, for determination of effluent limits where there are multiple categories and subcategories, the effluent guidelines are applied using a flow-weighted combination of the appropriate guideline for each category or subcategory. Thus, the normal practice would be to develop flow-weighted limitations for the combined Subtitle C and Subtitle D wastestreams, a flow-weighted combination of the BPT, BAT, or PSES limits for the Landfills Category. However, under EPA's RCRA regulations, mixtures of hazardous and non-hazardous waste must be managed under RCRA hazardous waste regulations. Consequently, a commingled flow of hazardous and non-hazardous waste is to be treated as a hazardous waste. Therefore, if wastewater from a Subtitle C hazardous landfill and a Subtitle D non-hazardous landfill are commingled for treatment, then the effluent from that facility is subject to the limitations and standards proposed for the Hazardous Subcategory.

F. Implementation for Contaminated Groundwater Flows

As discussed in Section [VIII] groundwater flows are not subject to the effluent limits established in today's rule. According to the 1992 Waste Treatment Industry: Landfills Questionnaire, there are a number of facilities which collect contaminated groundwater in addition to flows regulated under this proposal, and many facilities commingle these flows for treatment. Due to this site-to-site variability, the Agency is not able to determine how the proposed guidelines should be implemented for commingled flows of groundwater and regulated wastewaters.

In the case of such facilities, EPA believes that decisions regarding the appropriate discharge limits again should be left to the judgment of the permit writer. As indicated by data collected through the questionnaires, groundwater characteristics are often site-specific and may contain very few contaminants or may, conversely, exhibit characteristics similar in nature to leachate.

In cases where the groundwater is very dilute the Agency is concerned that contaminated groundwater may be used as a dilution flow. In these cases, the permit writer should develop BPJ permit limits based on separate treatment of the flows, or develop BPJ limits based on the Combined Waste Stream formula, in order to prevent dilution of the regulated leachate flows. However, in cases where the groundwater may exhibit characteristics similar to leachate, commingled treatment may be appropriate, cost effective and environmentally beneficial. EPA recommends that the permit writer consider the characteristics of the contaminated groundwater before making a determination if commingling groundwater and leachate for treatment is appropriate.

XVI. Solicitation of Data and Comments

A. Introduction and General Solicitation

EPA invites and encourages public participation in this rulemaking. The Agency asks that comments address any perceived deficiencies in the record of this proposal and that suggested revisions or corrections be supported by data.

The Agency invites all parties to coordinate their data collection activities with EPA to facilitate mutually beneficial and cost-effective data submissions. EPA is interested in participating in study plans, data collection and documentation. Please refer to the "For Further Information" section at the beginning of this preamble for technical contacts at EPA.

To ensure that EPA can read, understand and therefore properly respond to comments, the Agency would prefer that commenters cite, where possible the paragraph(s) or sections in the notice or supporting documents to which each comment refers. Commenters should use a separate paragraph for each issue discussed.

B. Specific Data and Comment Solicitations

EPA has solicited comments and data on many individual topics throughout this preamble. The Agency incorporates each and every such solicitation here, and reiterates its interest in receiving data and comments on the issues addressed by those solicitations. In addition, EPA particularly requests comments and data on the following issues:

1. Exclusion from the scope of this rule of landfill facilities operated in conjunction with other industrial or commercial operations which only receive waste from off-site facilities under the same corporate structure (intra-company facility) and/or receive waste generated on-site (captive facility) so long as the wastewater is commingled for treatment with other non-landfill process wastewaters. (Refer to Section [III])

2. The Agency's decision not to further subcategorize the Landfills Category on the basis of Subtitle D monofills. (Refer to Section [VII])

3. The Agency's decision not to subcategorize the Landfills Category on the basis of the age of a landfill. EPA considered whether age-related changes in leachate concentrations of pollutants necessitate different discharge limits for different age classes of landfills. EPA solicits comment and data on its conclusions regarding the relationship of wastewater characteristics to the age of the landfill. (Refer to Section [VII])

4. The Agency's decision to include drained free liquids within the scope of the wastewaters to be covered under this proposal. Due to the limited amount of data submitted to EPA on the characteristics of drained free liquids, and due to the potentially unique nature of these flows, the Agency solicits comments and data on including drained free liquids within the scope of this guideline. (Refer to Section [VIII])

5. EPA's decision not to base BAT limits on Reverse Osmosis treatment technology. (Refer to Section [IX])

6. The Agency is requesting comments to provide information and data on other treatment systems that may be pertinent to the development of standards for this industry. (Refer to Section [IX])

7. EPA is soliciting information on POTW upsets or POTW sludge contamination problems as a result of accepting landfill leachate. (Refer to Section [IX])

8. The Agency is soliciting comments and information on its decision not to propose pretreatment standards for non-hazardous landfills. (Refer to Section [IX])

9. EPA did consider establishing pretreatment standards for ammonia for indirect dischargers whose POTWs do not have nitrification or other advanced, control of ammonia. EPA is soliciting comment on the feasibility of this option. (Refer to Section [IX])

10. EPA is soliciting comment with regard to problems at POTWs associated with ammonia discharges from landfills. (Refer to Section [IX])

11. The Agency is soliciting comment on the preliminary decision not to adopt zero or alternative discharge standards

for hazardous landfills. (Refer to Section [IX])

12. The Agency is soliciting comment on the preliminary decision not to adopt zero or alternative discharge standards for new sources of hazardous landfills. (Refer to Section [IX])

13. The Agency solicits information and data on the current size of the industry and trends related to the growth or decline in the need for the services provided by these facilities. (Refer to Section [XI])

Definitions, Acronyms, and Abbreviations

Agency: The U.S. Environmental Protection Agency.

BAT: The best available technology economically achievable, applicable to effluent limitations to be achieved by July 1, 1984, for industrial discharges to surface waters, as defined by Sec. 304(b)(2)(B) of the CWA.

BCT: The best conventional pollutant control technology, applicable to discharges of conventional pollutants from existing industrial point sources, as defined by Sec. 304(b)(4) of the CWA.

BPT: The best practicable control technology currently available, applicable to effluent limitations to be achieved by July 1, 1977, for industrial discharges to surface waters, as defined by Sec. 304(b)(1) of the CWA.

Clean Water Act (CWA): The Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. Section 1251 *et seq.*), as amended by the Clean Water Act of 1977 (Pub. L. 95–217), and the Water Quality Act of 1987 (Pub. L. 100–4).

Clean Water Act (CWA) Section 308 Questionnaire: A questionnaire sent to facilities under the authority of Section 308 of the CWA, which requests information to be used in the development of national effluent guidelines and standards.

Closed: A facility or portion thereof that is currently not receiving or accepting wastes and has undergone final closure.

Commercial Facility: A facility that treats, disposes, or recycles/recovers the wastes of other facilities not under the same ownership as this facility. Commercial operations are usually made available for a fee or other remuneration. Commercial waste treatment, disposal, or recycling/recovery does not have to be the primary activity at a facility for an operation or unit to be considered "commercial".

Contaminated Groundwater: Water below the land surface in the zone of saturation which has been contaminated by landfill leachate. Contaminated groundwater occurs at landfills without liners or at facilities that have released contaminants from a liner system. Groundwater may also become contaminated if the water table rises to a point where it infiltrates the landfill or the leachate collection system.

Contaminated Storm Water: Storm water which comes in direct contact with the waste or waste handling and treatment areas. Storm water which does not come into contact with the wastes is not subject to the proposed limitations and standards.

Conventional Pollutants: Constituents of wastewater as determined by Sec. 304(a)(4) of the CWA, including pollutants classified as biochemical oxygen demand, total suspended solids, oil and grease, fecal coliform, and pH.

Deep Well Injection: Disposal of wastewater into a deep well such that a porous, permeable formation of a larger area and thickness is available at sufficient depth to ensure continued, permanent storage.

Detailed Monitoring Questionnaire (DMQ): Questionnaires sent to collect monitoring data from 27 selected landfill facilities based on responses to the Section 308 Questionnaire.

Direct Discharger: A facility that discharges or may discharge treated or untreated wastewaters into waters of the United States.

Drained Free Liquids: Aqueous wastes drained from waste containers (e.g., drums, etc.) prior to landfilling. Landfills which accept containerized waste may generate this type of wastewater.

Effluent Limitation: Any restriction, including schedules of compliance, established by a State or the Administrator on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources into navigable waters, the waters of the contiguous zone, or the ocean. (CWA Sections 301(b) and 304(b).)

Existing Source: Any facility from which there is or may be a discharge of pollutants, the construction of which is commenced before the publication of the proposed regulations prescribing a standard of performance under Sec. 306 of the CWA.

Facility: All contiguous property owned, operated, leased or under the control of the same person or entity.

Gas Condensate: A liquid which has condensed in the landfill gas collection system during the extraction of gas from within the landfill. Gases such as methane and carbon dioxide are generated due to microbial activity within the landfill, and must be removed to avoid hazardous conditions.

Groundwater: The body of water that is retained in the saturated zone which tends to move by hydraulic gradient to lower levels.

Hazardous Waste: Any waste, including wastewater, defined as hazardous under RCRA, TSCA, or any State law.

Inactive: A facility or portion thereof that is currently not treating, disposing, or recycling/recovering wastes.

Indirect Discharger: A facility that discharges or may discharge wastewaters into a publicly-owned treatment works (POTW).

Landfill: An area of land or an excavation in which wastes are placed for permanent disposal, that is not a land application or land treatment unit, surface impoundment, underground injection well, waste pile, salt dome formation, a salt bed formation, an underground mine or a cave.

Landfill Generated Wastewaters: Wastewater generated by landfill activities and collected for treatment, discharge or reuse, include: leachate, contaminated groundwater, storm water runoff, landfill gas condensate, truck/equipment washwater, drained free liquids, floor washings, and recovering pumping wells.

Leachate: Leachate is a liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials removed from such waste. Leachate is typically collected from a liner system above which waste is placed for disposal. Leachate may also be collected through the use of slurry walls, trenches or other containment systems.

Leachate Collection System: The purpose of a leachate collection system is to collect leachate for treatment or alternative disposal and to reduce the depths of leachate buildup or level of saturation over the low permeability liner.

Liner: The liner is a low permeability material or combination of materials placed at the base of a landfill to reduce the discharge to the underlying or surrounding hydrogeologic environment. The liner is designed as a barrier to intercept leachate and to direct it to a leachate collection .

Long-Term Average (LTA): For purposes of the effluent guidelines, average pollutant levels achieved over a period of time by a facility, subcategory, or technology option. LTAs were used in developing the limitations and standards in the proposed landfill regulation.

National Pollutant Discharge Elimination System (NPDES) Permit: A permit to discharge wastewater into waters of the United States issued under

the National Pollutant Discharge Elimination system, authorized by Section 402 of the CWA.

New Source: As defined in 40 CFR 122.2, 122.29, and 403.3 (k), a new source is any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced (1) for purposes of compliance with New Source Performance Standards (NSPS), after the promulgation of such standards being proposed today under CWA section 306; or (2) for the purposes of compliance with Pretreatment Standards for New Sources (PSNS), after the publication of proposed standards under CWA section 307(c), if such standards are thereafter promulgated in accordance with that section.

Non-Conventional Pollutants: Pollutants that are neither conventional pollutants nor priority pollutants listed at 40 CFR Part 401.

Non-Hazardous Subcategory: For the purposes of this report, Non-Hazardous Subcategory refers to all landfills regulated under Subtitle D of RCRA.

Non-Water Quality Environmental Impact: Deleterious aspects of control and treatment technologies applicable to point source category wastes, including, but not limited to air pollution, noise, radiation, sludge and solid waste generation, and energy usage.

NSPS: New Sources Performance Standards, applicable to new sources of direct dischargers whose construction is begun after the promulgation of effluent standards under CWA section 306.

OCPSF: Organic chemicals, plastics, and synthetic fibers manufacturing point source category. (40 CFR Part 414).

Off-Site: Outside the boundaries of a facility.

On-Site: The same or geographically contiguous property, which may be divided by a public or private right-of-way, provided the entrance and exit between the properties is at a crossroads intersection, and access is by crossing as opposed to going along the right-of-way. Non-contiguous properties owned by the same company or locality but connected by a right-of-way, which it controls, and to which the public does not have access, is also considered on-site property.

Pass Through: A pollutant is determined to "pass through" a POTW when the average percentage removed by an efficiently operated POTW is less than the percentage removed by the industry's direct dischargers that are using the BAT technology.

Point Source: Any discernable, confined, and discrete conveyance from which pollutants are or may be discharged.

Pollutants of Interest (POIs): Pollutants commonly found in landfill generated wastewaters. For the purposes of this report, a POI is a pollutant that is detected three or more times above a treatable level at a landfill, and must be present at more than one facility.

Priority Pollutant: One hundred twenty-six compounds that are a subset of the 65 toxic pollutants and classes of pollutants outlined in Section 307 of the CWA. The priority pollutants are specified in the NRDC settlement agreement (Natural Resources Defense Council et al v. Train, 8 E.R.C. 2120 [D.D.C. 1976], modified 12 E.R.C. 1833 [D.D.C. 1979]).

PSES: Pretreatment standards for existing sources of indirect discharges, under Sec. 307(b) of the CWA.

PSNS: Pretreatment standards for new sources of indirect discharges, applicable to new sources whose construction has begun after the publication of proposed standards under CWA section 307(c), if such standards are thereafter promulgated in accordance with that section.

Publicly Owned Treatment Works (POTW): Any device or system, owned by a state or municipality, used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of a liquid nature that is owned by a state or municipality. This includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment (40 CFR 122.2).

RCRA: The Resource Conservation and Recovery Act of 1976 (RCRA) (42 U.S.C. Section 6901 *et seq.*), which regulates the generation, treatment, storage, disposal, or recycling of solid and hazardous wastes.

Subtitle C Landfill: A landfill permitted to accept hazardous wastes under Sections 3001 and 3019 of RCRA and the regulations promulgated pursuant to these sections, including 40 CFR Parts 260 through 272.

Subtitle D Landfill: A landfill permitted to accept only non-hazardous wastes under Sections 4001 through 4010 of RCRA and the regulations promulgated pursuant to these sections, including 40 CFR Parts 257 and 258.

Surface Impoundment: A natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), used to temporarily or permanently treat, store, or dispose of waste, usually in the liquid form. Surface impoundments do not include areas constructed to hold containers of wastes. Other common names for surface impoundments include ponds, pits, lagoons, finishing ponds, settling ponds, surge ponds, seepage ponds, and clarification ponds.

Toxic Pollutants: Pollutants declared "toxic" under Section 307(a)(1) of the Clean Water Act.

Truck/Equipment Washwater: Wastewater generated during either truck or equipment washes at the landfill. During routine maintenance or repair operations, trucks and/or equipment used within the landfill (e.g., loaders, compactors, or dump trucks) are washed and the resultant washwaters are collected for treatment.

Variability Factor: The daily variability factor is the ratio of the estimated 99th percentile of the distribution of daily values divided by the expected value, median or mean, of the distribution of the daily data. The monthly variability factor is the estimated 95th percentile of the distribution of the monthly averages of the data divided by the expected value of the monthly averages.

Zero Discharge: No discharge of pollutants to waters of the United States or to a POTW. Also included in this definition are alternative discharge or disposal of pollutants by way of evaporation, deep-well injection, off-site transfer, and land application

List of Subjects in 40 CFR Part 445

Environmental protection, Groundwater, Landfills, Leachate, Waste treatment and disposal, Water pollution control.

Dated: November 26, 1997.

Carol M. Browner,

Administrator.

Accordingly, 40 CFR Part 445 is proposed to be added as follows:

PART 445—LANDFILLS POINT SOURCE CATEGORY

General Provisions

Sec.

Subpart A—RCRA Subtitle C Hazardous Waste Landfill Subcategory

Sec.

Subpart B—RCRA Subtitle D Non-Hazardous Waste Landfill Subcategory

Tables to Part 445

Authority: Sections 301, 304, 306, 307, and 501, Pub. L. 95–217, 91 Stat. 156, and Pub. L. 100–4 (33 U.S.C. 1311, 1314, 1316, 1317, and 1361).

General Provisions

§ 445.1 Specialized definitions.

In addition to the definitions set forth in 40 CFR 122.2, 257.2, 258.2, 264.10, 401.11, and 403.3 the following definitions apply to this part:

(a) *Contaminated Groundwater* means water below the land surface in the zone of saturation which has been contaminated by activities associated with waste disposal.

(b) *Facility* is all contiguous property owned, operated, leased or under the control of the same person or entity.

(c) *Landfill unit* means an area of land or an excavation in which wastes are placed for permanent disposal, that is not a land application or land treatment unit, surface impoundment, underground injection well, waste pile, salt dome formation, a salt bed formation, an underground mine or a cave as these terms are defined in 40 CFR 257.2, 258.2 and 264.10.

(d) *Landfill Process Wastewater* means all wastewaters associated with, or produced by, landfilling activities except for sanitary wastewater, non-contaminated storm water, and contaminated groundwater. Landfill process wastewaters include, but are not limited to, leachate, gas collection condensate, drained free liquids, laboratory derived wastewater, contaminated storm water and contact washwater from washing truck and railcar exteriors and surface areas which have come in direct contact with solid waste at the landfill facility.

(e) *Non-contaminated Storm water* means storm water which does not come into contact with the solid waste, and includes wastewater which flows off the cap or cover of the landfill.

(f) *Off-site* means outside the boundaries of a facility.

(g) *On-site* means within the boundaries of a facility.

§ 445.2 Applicability.

(a) Except as provided in paragraphs (b), (c), (d) and (e) of this section, the provisions of this part apply to wastewater discharges of landfill process wastewater from landfill units.

(b) The provisions of this part do not apply to wastewater discharges from land application or land treatment units, surface impoundments, underground injection wells, waste piles, salt dome formations, salt bed formations, underground mines or caves as these terms are defined in 40 CFR 257.2 and 260.10.

(c) The provisions of this part do not apply to wastewaters generated off-site of a landfill facility; including wastewaters generated off-site from washing vehicles or from waste transfer stations.

(d) The provisions of this part do not apply to discharges of contaminated groundwater.

(e) The provisions of this part do not apply to wastewater discharges of landfill process wastewater that is commingled for treatment with other non-landfill process wastewater under the following conditions: The landfill must be operated in conjunction with other, on-site industrial and commercial activities; and the landfill generating the process wastewater must only receive wastes generated on-site or wastes received from off-site facilities under the same corporate structure.

Subpart A—RCRA Subtitle C Hazardous Waste Landfill Subcategory

§ 445.10 Applicability; description of the Hazardous Landfills Subcategory.

The provisions of this subpart apply to discharges of landfill process wastewater from landfills subject to the provisions established in 40 CFR Part 264. *Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, Subpart N–(Landfills)*, and 40 CFR Part 265 *Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, Subpart N–(Landfills)*, except as provided in § 445.2.

§ 445.11 Effluent limitations representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available (BPT).

Except as provided in 40 CFR 125.30 through 125.32, any existing point source subject to this part must achieve the effluent limitations listed in Table 1 of this part.

§ 445.12 Effluent limitations representing the degree of effluent reduction attainable by the application of the best conventional pollutant control technology (BCT).

Except as provided in 40 CFR 125.30 through 125.32, any existing point source subject to this subcategory must achieve the effluent limitations for BOD_5, TSS, and pH listed in Table 1 of this part.

§ 445.13 Effluent limitations representing the degree of effluent reduction attainable by the application of best available technology economically achievable (BAT).

Except as provided in 40 CFR 125.30 through 125.32, any existing point source subject to this subpart must achieve the effluent limitations listed in Table 1 of this part.

§ 445.14 New source performance standards (NSPS).

Any new source subject to this subpart must achieve the effluent limitations listed in Table 1 of this part.

§ 445.15 Pretreatment standards for existing sources (PSES).

Except as provided in 40 CFR 403.7 and 403.13, any existing source subject to this part that introduces pollutants into a publicly-owned treatment works must comply with 40 CFR Part 403 and achieve the pretreatment standards listed in Table 2 of this part.

§ 445.16 Pretreatment standards for new sources (PSNS).

Except as provided in 40 CFR 403.7, any new source subject to this subpart

that introduces pollutants into a publicly owned treatment works must comply with 40 CFR part 403 and achieve the pretreatment standards listed in Table 2 of this part.

Subpart B—Subtitle D Non-Hazardous Landfill Subcategory

§ 445.20 Applicability; description of the Non-Hazardous Landfill Subcategory.

The provisions of this part apply to discharges of landfill process wastewater from landfills subject to the provisions established in 40 CFR Part 258 (Criteria for Municipal Solid Waste Landfills) and 40 CFR Part 257 (Criteria for Classification of Solid Waste Disposal Facilities and Practices), except as provided in § 445.2.

§ 445.21 Effluent limitations representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available (BPT).

Except as provided in 40 CFR 125.30 through 125.32, any existing point source subject to this subpart must achieve the effluent limitations listed in Table 3 of this part.

§ 445.22 Effluent limitations representing the degree of effluent reduction attainable by the application of the best conventional pollutant control technology (BCT).

Except as provided in 40 CFR 125.30 through 125.32, any existing point source must achieve the effluent limitations for BOD_5, TSS, and pH listed in Table 3 of this part.

§ 445.23 Effluent limitations representing the degree of effluent reduction attainable by the application of best available technology economically achievable (BAT).

Except as provided in 40 CFR 125.30 through 125.32, any existing point source subject to this subpart must achieve the effluent limitations listed in Table 3 of this part.

§ 445.24 New source performance standards (NSPS).

Any new source subject to this subpart must achieve the effluent limitations listed in Table 3 of this part.

§ 445.25 Pretreatment standards for existing sources (PSES).

Any existing source subject to this subpart that introduces pollutants into a publicly-owned treatment works must comply with 40 CFR Part 403. There are no additional pretreatment requirements established for non-hazardous landfills.

§ 445.26 Pretreatment standards for new sources (PSNS).

Any new source subject to this subpart that introduces pollutants into a publicly-owned treatment works must comply with 40 CFR Part 403. There are no additional pretreatment requirements established for wastewater discharges from non-hazardous landfills.

TABLE 1 TO PART 445.—HAZARDOUS LANDFILL CONCENTRATION LIMITATIONS FOR DISCHARGES TO SURFACE WATERS

[Milligrams per liter (mg/l)]

Pollutant or pollutant property	Maximum for 1 day	Monthly average shall not exceed
BOD_5	160	40
TSS	89	27
Ammonia	5.9	2.5
Arsenic	1.0	0.52
Chromium (Total)	0.86	0.40
Zinc	0.37	0.21
Alpha Terpineol	0.042	0.019
Aniline	0.024	0.015
Benzene	0.14	0.036
Benzoic Acid	0.12	0.073
Naphthalene	0.059	0.022
P-Cresol	0.024	0.015
Phenol	0.048	0.029
Pyridine	0.072	0.025
Toluene	0.080	0.026
pH	Shall be in the range 6.0–9.0 pH units.	

TABLE 2 TO PART 445.—HAZARDOUS LANDFILL PRETREATMENT CONCENTRATION LIMITATIONS FOR DISCHARGES TO POTWS

[Milligrams per liter (mg/l)]

Pollutant or pollutant property	Maximum for 1 day	Monthly average shall not exceed
Ammonia	5.9	2.5
Alpha Terpineol	0.042	0.019
Aniline	0.024	0.015
Benzoic Acid	0.23	0.13
P-Cresol	0.024	0.015
Toluene	0.080	0.026

TABLE 3 TO PART 445.—NON-HAZARDOUS LANDFILL CONCENTRATION LIMITATIONS FOR DISCHARGES TO SURFACE WATERS

[Milligrams per liter (mg/l)]

Pollutant or pollutant property	Maximum for 1 day	Monthly average shall not exceed
BOD_5	160	40
TSS	89	27
Ammonia	5.9	2.5
Zinc	0.20	0.11
Alpha Terpineol	0.059	0.029
Benzoic Acid	0.23	0.13
P-Cresol	0.046	0.026
Phenol	0.045	0.026
Toluene	0.080	0.026
pH	Shall be in the range 6.0–9.0 pH units.	

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