[6560-01-M]

(40 CFR PART 250 SUBPART D)

SECTION 3004—STANDARDS APPLICABLE TO OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

Section 3004 of RCRA requires the Administrator to promulgate such performance standards for owners and operators of hazardous waste treatment, storage, and disposal facilities (hereinafter sometime referred to as facilities or facility) as may be necessary to protect human health and the environment. These standards must include requirements for site location and design, operating methods, contingency plans, continuity of operation, personnel training, financial responsibility, recordkeeping, reporting, monitoring, inspection, and compliance with the Subpart B manifest system and the Subpart E permit system.

Section 3004 standards not only establish the levels of environmental protection that hazardous waste treatment, storage, and disposal facilities must achieve, they also are the criteria against which EPA officials will measure applications for permits. Facilities which handle waste identified or listed as hazardous under Subpart A must comply with these standards. Facilities on a generator's property as well as those not on his property (hereinafter referred to as off-site facilities) are covered by these regulations and do require permits (under Subpart E), but generators and transporters who do not own or operate facilities for the treatment, storage, or disposal of hazardous waste do not need permits under RCRA.

These facility standards are key provisions in the cradle-to-grave system mandated by RCRA for handling and tracking hazardous waste. The manifest system established in Subpart B regulations comes to a close when manifested hazardous waste is received by a treatment, storage, or disposal facility and notice of receipt is sent to the generator.

In order to facilitate understanding of these rules, much of this preamble discusses the Subpart D standards in the order they appear in the regulation. These standards can best be understood when read along with the Subpart A and Subpart B standards under RCRA which also appear in today's FEDERAL REGISTER and when read in conjunction with the other standards EPA already has proposed under RCRA which are cited in the Summary of today's proposed rules under 40 CFR Part 250. Many issues overlap these regulations.

This preamble summarizes and explains the reasoning behind many of the requirements in this regulation and specifically requests comments on many issues. Because a requirement in the Subpart D regulation is not highlighted in the preamble, however, does not mean that comments on the requirement are not solicited. Comments are invited on all issues raised in the proposed regulations, this preamble and the documents referenced in the preamble. Comments also are solicited on any issues raised by Section 3004 of RCRA which may not have been addressed in today's FEDERAL REGISTER.

REGULATORY STRUCTURE

EPA considered three different ways to write standards for hazardous waste treatment, storage, and disposal facilities. Under one approach, EPA would set ambient standards for air and water quality and for other relevant parameters. The Agency would set standards at levels it believes protect human health and the environment. It is not always possible, however, to know why an ambient standard has been exceeded; that is, the source of the pollutant is difficult to determine and to remedy. Consequently, this type of standard is difficult to enforce. Also, it is extremely difficult to gather the data necessary to set safe levels for the thousands of substances that might be found in hazardous waste and to monitor for those substances.

The second type of standard the Agency has considered writing would prescribe design and operating requirements for hazardous waste management activities. Such standards can be enforced, but could tend to hold technology stagnant.

The third type of standard would directly regulate the release of pollutants from a given source. although new technology could be encouraged by this approach because an owner or operator would be free to choose his technology, such standards would be of limited utility because a hazardous waste management site often discharges a variety of pollutants in different forms from several points and so would be very difficult to regulate as a single, given source. As with ambient standards, EPA also would have great difficulty gathering the data to determine the amount of each pollutant that could safely be released into the environment and it also would be difficult and expensive to monitor for each pollutant. EPA decided to combine the strengths of all three types of standards in the Subpart D rules, although the Agency is relying primarily on the second type—design and operating standards.

DESIGN AND OPERATING STANDARDS

The design and operating standards are divided into four overlapping categories: (1) General facility standards applicable to all hazardous waste treatment, storage, and disposal facilities (with a few readily apparent exceptions); (2) standards for storage applicable to all facilities which store waste identified as hazardous pursuant to Subpart A (with the exception of facilities where generators properly store waste on-site for 90 days or less before shipment to an off-site treatment, storage, or disposal facility); (3) standards for treatment and disposal facilities categorized by method of treatment or disposal employed; and (4) standards for special waste applicable to waste the Agency has identified as requiring special handling because it is produced in very large quantities, it presents a relatively low level of hazard and it may be unsuitable to be managed by Subpart D control techniques.

The Agency intends that permit writers incorporate all those design and operating standards of Subpart D which are applicable to a given site in each permit they issue. For example, incineration standards will not be inserted in the permit of a facility which only disposes of waste by landfilling, nor will the same monitoring requirements be incorporated in each permit. EPA also intends that State adoption of equivalent or more stringent design and operating standards will be a requirement for EPA approval of a State hazardous waste program under Subpart F. Thus, in most cases, States also will incorporate such standards as conditions in the permits or licenses they issue.

Most of the design and operating standards prescribe very specific requirements with which facilities must comply. The Agency has, however, received comments on the drafts of these regulations that the design and operating standards do not allow enough flexibility to cope with the different design and operating problems facilities face which vary with facility location and the type or types of waste handled. Recognizing that these very specific Subpart D standards might discourage the development of new technologies or that different design and operating requirements might be necessary for a particular facility which is disposing of only one type of waste or waste from only one waste stream, EPA has inserted "Notes" after certain of the design and operating standards. Each Note describes the circumstances in which the Regional Administrator may allow deviation from the specific Subpart D standard to which the Note applies. Generally the Notes authorize the Regional Administrator to allow deviation from a specific requirement when the applicant for a permit demonstrates that an alternate requirement or an existing natural condition at the site will achieve at least an equivalent degree of containment, destruction, or environmental protection as the Subpart

D design or operating requirement. So, for example, § 250.43-2 (Security) requires that a facility have a 6 foot fence completely surrounding it which is capable of preventing the unknowing and unauthorized entry of persons and domestic livestock. The Note, however, states that a facility does not need such a fence if the applicant can demonstrate (at the time the permit is issued) that the facility is surrounded by some other barrier which is capable of accomplishing the same result.

The Note mechanism was chosen over the alternative of more general design and operating standards, and over the alternative of a general variance procedure, because the Agency believes the use of individual Notes best fulfills the Congressional mandate of establishing such performance standards as may be necessary to protect human health and the environment. The Agency could have written more general standards and not used Notes. Going back to the example of the 6 foot fence, EPA might just have established a requirement that the active portion of a facility be surrounded by a barrier capable of preventing the unknowing and unauthorized entry of persons and domestic livestock. Without further guidance, however, it is very likely that such a requirement would receive widely varying interpretations by permit-writers and might well have automatically necessitated an applicant's producing evidence to show that his facility met the standard. Putting the "6 foot" number in the standard, however, both gives a facility owner/operator a very specific requirement he can use to meet the standard and gives both the permit applicant and the Regional Administrator a specific requirement (without the necessity of an additional guidance manual) against which to judge an alternate barrier.

The Agency chose to use the Note mechanism rather than a general variance procedure for two reasons. First, when a Note immediately follows a design and operating standard, the Note can, if necessary, specify exactly the degree of containment, destruction, or environmental protection any alternate requirement must achieve.

Second, using the procedure of Individual Notes, the Agency can clearly establish that no deviations from certain requirements are allowed. In the Agency's judgment those requirements not accompanied by Notes must be met, as written, in order to ensure protection of human health and the environment.

Section 3005 of RCRA provides additional flexibility in the permitting system; this section states that permits may contain schedules for modification to bring facilities into compliance with section 3004 standards. Thus, in addition to the 3-tiered structure of design and operating standards, Notes, and Human Health and Environmental Standards (discussed *infra*), the permitting process will provide extra leeway, particularly for existing facilities.

The procedures governing permit applications, permit issuance, and use of the Notes will be explained in more detail in EPA's proposed Subpart E rules, which the Agency expects to publish in early 1979. EPA is also planning to publish a RCRA enforcement policy at that time which will discuss how the Agency intends to use its authority under Sections 3005(d) and 3008 to enforce these standards.

HUMAN HEALTH AND ENVIRONMENTAL STANDARDS

In addition to the design and operating standards, Subpart D contains three overriding standards called Human Health and Environmental Standards; these are designed to provide a fail-safe mechanism for the protection of groundwater, surface water, and air quality.

Section 1006 of RCRA directs EPA to integrate to the maximum extent practicable all provisions of RCRA with appropriate provisions of the other Acts of Congress which give EPA regulatory authority. One of the ways EPA has chosen to integrate RCRA with the Safe Drinking Water Act (SDWA), the Clean Air Act (CAA), and the Clean Water Act (CWA) is through the use of Human Health and Environmental Standards. Each of them—the groundwater, surface water, and air standard—establishes an overriding standard for treatment, storage, and disposal facilities by incorporating relevant limitations established under those acts.

The mandates in the Clean Water Act, the Clean Air Act, and the Safe Drinking Water Act are very close to EPA's mandate in RCRA—protection of human health and the environment. The incorporation of selected SDWA, CWA, and CAA standards not only ensures protection of human health and the environment, but also helps implement the RCRA Section 1006 directive to EPA to integrate and ensure consistency among the Agency's programs.

The Agency believes that this approach of combining overriding Human Health and Environmental Standards with specific design and operating standards (and Notes authorizing deviations therefrom) is the best way to fulfill the Congressional mandate in Section 3004 (to establish such performance standards as may be necessary to protect human health and the environment) and at the same time allow enough flexibility for permit writers to tailor the requirements in a permit to the particular circumstances of an individual facility.

Virtually every facility which conforms to the design and operating standards should achieve compliance with the Human Health and Environmental Standards because they are designed to ensure that compliance. The design and operating standards are a specific, certain, easily understood and enforceable set of rules, to the benefit of the regulated community, the States, and EPA. They are based on current state-of-the-art treatment, storage, and disposal practices and we have made the standards as specific and have quantified them as much as the current state-of-the-art allows.

The Agency considered using only design and operating standards, but we believe that no matter how specific and inclusive these standards are, there will nevertheless be a few unusual situations where use of the standards will not achieve the performance they are intended to achieve. Rather than trying to make the design and operating standards much more stringent to try to cover another small marginal group of situations, EPA has chosen to use the override mechanism of the Human Health and Environmental Standards. That is, where the permit writer has reason to believe that the design and operating standards will not achieve compliance with the Human Health and Environmental Standards, the latter will be used to establish more stringent design and operating criteria and the more stringent criteria will be incorporated as enforceable conditions of the permit.

Determining permit conditions using the Human Health and Environmental Standards, however, involves complex cause-and-effect calculations. Thus, the use of the Human Health and Environmental Standards is a less efficient way to implement a hazardous waste management regulatory program, and it provides less certainty for the regulated community as to what constitutes acceptable design and operating practice. Because of those features of the general Human Health and Environmental Standards, the Agency has chosen to rely on design and operating standards, (with accompanying Notes to allow justifiable deviations) as the principal mechanism for assuring the proper management of hazardous waste. Resort to the Human Health and Environmental Standards should be infrequent, but will be necessary to ensure protection of human health and the environment in unusual situations.

INTERIM STATUS STANDARDS

The requirements to be imposed on prospective permittees who have interim status pursuant to Section 3005(e) of RCRA presents a special problem.

These prospective permittees, who will have notified EPA of their hazardous waste activities and will have applied for a permit, will be waiting for EPA issuance or denial of a permit. Based on the time-consuming complexity of determining hazardous waste permit requirements, the limited staff that EPA expects to have available to issue permits, and based on the experience that EPA has had with the NPDES permit program under the Clean Water Act, we estimate that completing the issuance of all permits will take several years. Therefore, many prospective permittees will have interim status for an extended period of time. In keeping with the intent of Congress that hazardous waste management be regulated by national standards as quickly as possible, EPA believes that these prospective permittees should comply with selected minimal requirements of the Subpart D standards during interim status.

The Agency does not believe that permit applicants with interim status should be expected to meet all of the Subpart D standards because many of the specific requirements of the design and operating standards may be inappropriate for certain facilities and alternate requirements may be substituted when a permit is issued. Some permittees also may be allowed a reasonable period of time to comply with certain of the Subpart D standards because Section 3005(c) of RCRA provides that EPA (or a State when it is issuing the permit under a program authorized by EPA pursuant to Section 3006) may incorporate schedules for modifications in the permits it issues. Because these determinations are meant to be made in the permit issuance process, where there is full opportunity for public participation, the Agency does not believe it is appropriate to impose all of the Subpart D requirements prior to permit issuance. On the other hand, EPA believes that the prospective permittees should begin to meet certain manifest, recordkeeping, monitoring, and other less technical requirements of the Subpart D standards which will definitely be included in the permit without modification and which can help achieve RCRA's goal of protection of human health and the environment. For the same reasons, the prospective permittee also, insofar as possible, should meet the financial responsibility requirements for facility closure and post-closure monitoring and maintenance; some funds then will be available even if the facility is closed prior to issuance of a permit or as a consequence of failure to obtain a permit. Section 250.40 of Subpart D delineates the selected Subpart D standards that are applicable during interim status.

EPA considered making these interim status standards part of the permit application process under Section 3005(b) of RCRA, i.e., having the permit application require an owner or operator to submit information about how he is implementing the interim status standards. EPA would then review the application and assess the owner's or operator's explanation before notifying a prospective permittee that he has fulfilled the requirements for interim status (assuming some such notification by EPA will be provided under Subpart E regulations). The Agency, however, considers that requiring this additional information would impose too great a burden on the regulated community and evaluating the information would impose too great a burden on EPA. We believe that the mandate of RCRA will better be served by having our staff work on issuing and denying permits rather than on making complicated assessments relating to interim status. Comments are requested on all aspects of the Agency's approach to interim status standards.

APPLICABILITY OF STANDARDS TO INACTIVE FACILITIES

Neither RCRA nor its legislative history discusses whether the Section 3004 standards for owners and operators of hazardous waste treatment, storage, and disposal facilities apply or were intended to apply to inactive facilities, i.e., those facilities which have ceased receiving, treating, storing and disposing of wastes prior to the effective date of the Subtitle C regulations. This is an important issue, however, because some, and perhaps most, inactive facilities may still be "disposing" of waste within the meaning of that term in Section 1004(3) of RCRA. "Disposal" includes:

> the discharge, dumping, spilling, leaking * * * of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters.

Many inactive facilities may well be leaking solid or hazardous waste into groundwater and thus be "disposing" under RCRA.

RCRA is written in the present tense and its regulatory scheme is organized in a way which seems to contemplate coverage only of those facilities which continue to operate after the effective date of the regulations. The Subpart D standards and Subpart E permitting procedures are not directed at inactive facilities. Enormous technical, legal, and economic problems would arise if these standards were to be directly applied to inactive facilities and all such facilities were required to upgrade. Such an approach also does not seem equitable because of the enormous difficulty of bringing a closed facility into compliance, and because the present owner of land on which an inactive site is located might have no connection (other than present ownership of the land) with the prior disposal activities.

For those reasons, EPA does not plan to apply Subpart D standards to inactive facilities. The Agency believes that it can more equitably use Section 7003 (Imminent Hazard) of RCRA to bring suit against inactive facilities which pose human health and environmental problems, although this remedy also is available only against the present owner of the land on which an inactive site is located. This section is designed to prevent any imminent and substantial endangerment to human health or the environment from the improper handling, treatment, transportation, storage, or disposal of any solid or hazardous waste. Using Section 7003, EPA can sue the owner of an inactive facility which is discharging a hazardous waste into the air, land, or water and presenting an "imminent and substantial endangerment to health or the environment." Under this procedure, the Agency can seek whatever remedy may be necessary to control the problem. Comments are requested on this policy regarding inactive facilities.

APPLICABILITY OF STANDARDS TO EXISTING FACILITIES

EPA recognizes that many existing hazardous waste treatment, storage, and disposal facilities will have difficulty complying with some of these regulations. RCRA requires, however, that all existing facilities be upgraded to the level necessary to provide human health and environmental protection. Section 3005(c) allows the leeway for such upgrading by providing that permits may specify the time allowed to modify a facility to bring it into compliance with Subpart D standards.

One type of solid waste management facility, however, may accept hazardous waste without meeting all of the Subpart D standards and without obtaining a permit. Subpart B regulations provide that retailers, farmers, and persons who produce and dispose of no more than 100 kilograms of hazardous waste per month do not have to comply with all of the Subpart B rules. Section 250.29 provides, however, that those people must dispose of their hazardous waste in a RCRA-permitted hazardous waste facility or in a solid waste disposal facility in a State with an approved State plan under Subtitle D of RCRA, which facility has been permitted or otherwise certified by the State as meeting the criteria adopted pursuant to Section

4004 of RCRA (hereinafter called a "Subtitle D" facility).

EPA does not intend to require Subtitle D facilities which accept hazardous waste only from retainers, farmers, and from persons who produce and dispose of less than 100 kg a month, to obtain permits or to comply with all Subpart D standards. The Agency believes that the Section 4004 criteria will provide a level of protection of human health and the environment sufficient to allow small amounts of hazardous waste to be disposed of in such a facility along with the large amounts of solid waste. Even under worst case assumptions, if the amount of waste allowed under § 250.29 to be disposed of in Subtitle D facilities were to go to such facilities, the Agency calculates that the co-disposal ratio of solid to hazardous waste would not exceed 40: 1.

Comments on this approach of allowing Subtitle D facilities to receive small amounts of hazardous waste without meeting Subpart D standards are requested. Comments on alternate approaches also are requested. For example, should Subtitle D facilities be required to meet certain selected Subpart D regulations?

GENERAL FACILITY STANDARDS

Site Selection

Site selection is very important in planning a facility because the potential for damage to human health and the envrionment is enhanced if a facility is not properly located.

The general site selection standards (§ 250.43-1) prohibit locating a facility in areas where the facility might harm the environment (a wetland, for example) or where the environment might harm the facility (an active fault zone, for example). These standards also apply to esxisting facilities which may have to modify their operations to comply. If an existing facility cannot be modified to conform to applicable standards, it will have to close.

The Agency has considered writing regulations which would restrict the location of hazardous waste facilities in permafrost (permanently frozen subsoil) areas, which are very fragile ecosystems with significant potential erosion and groundwater contamination problems. However, because permafrost is, for the most part, confined to Alaska, EPA believes that the State of Alaska, rather than the Federal Government, should decide what is feasible and necessary to protect these remote areas in that State. Comment is solicited on the decision not to specifically address permafrost areas in these regulations.

A key issue in site selection is what provision for a site buffer zone should be made. The Agency believes that buffer zones reduce risks to public health and the environment by allowing unexpected discharges or releases from fires, explosions, spills, and underground leaks to be controlled before crossing the property boundary.

These proposed rules require 200 feet between the active portion of a facility and its property boundary line. Comment is requested as to whether 200 feet is an appropriate buffer distance to protect human health and the environment.

Section 250.43-7(c) also relates to site selection. As part of the permit application process, an owner/operator must submit a closure plan which includes a description of possible uses for the land after closure of the facility. The Agency wants to encourage, when possible, the return to another acceptable use of land where hazardous waste facilities have been operated.

Security, Contingency Plan and Emergency Procedures, Training

After examining its file of damage incidents which have occurred at hazardous waste management facilities, EPA has established standards in these rules for site security, contingency plans, and employee job training. Through such measures, the Agency hopes to eliminate many past causes of human health and environmental damage at hazardous waste facilities. The agency also is preparing a guidance manual on job training which will provide further information in this critical area.

Manifests, Recordkeeping, and Reporting Requirements

Section 250.43-5 specifies the manifest, recordkeeping, and reporting requirements for hazardous waste facilities. These requirements prescribe the final steps in the manifest system established in Subpart B rules to track hazardous waste from its origin with the generator through its trip with the transporter to its disposition at a treatment, storage, or disposal facility. This system is the heart of RCRA's cradle-to-grave management system for hazardous waste. Owners/operators of facilities which receive waste from off-site must sign and return the original manifest to the generator within 30 days, and must make annual reports to the Regional Administrator summarizing the information on the manifests (i.e., the types and amounts of waste received, source of waste, etc.).

All facility owners/operators are required to keep records of how waste is treated, stored, and disposed of. Such records must include the location of waste in landfills, operating conditions, personnel training, monitoring results, and incidents of damage to human health or the environment. All facility owners/operators must make quarterly reports of certain monitoring data to the EPA Regional Administrator. In addition, all facility owners/operators are required to immediately report damage incidents such as fires, spills, explosions, and problems detected *via* monitoring to the Regional Administrator. Reporting requirements for on-site facilities are specified in Subpart B.

The Agency believes that the reporting and recordkeeping required by these regulations are necessary to effectively regulate owners/operators of hazardous waste facilities. Much of the information required will be generated by standard business practices and operating procedures. In many instances, standard operating logs can be used to comply with the recordkeeping requirements.

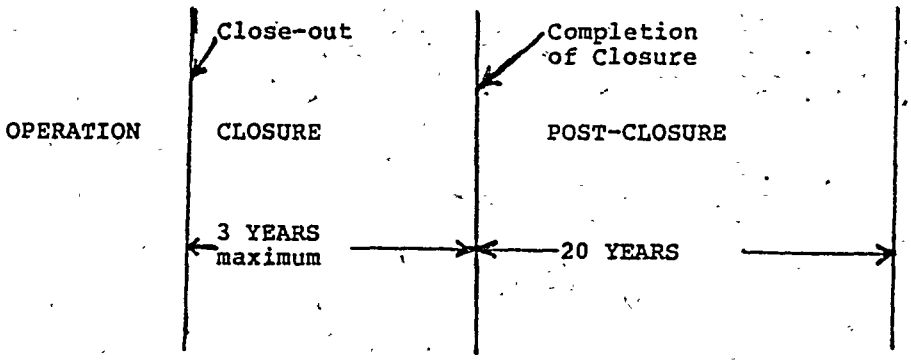
The Agency is considering changing the frequency of monitoring data reporting from quarterly to semi-annually or annually, and also is considering requiring facility owners/operators to return the original manifest to the generator immediately, rather than within 30 days. Comments on these proposals are requested. Comments also are requested on the utility, burden, and practicality of, and need for additional items in, the recordkeeping and reporting requirements.

Inspections

The proposed rules require daily visual inspection of hazardous waste facilities by the owners/operators of these facilities. This requirement is designed to insure that potentially dangerous situations are discovered quickly. Daily visual inspections are considered to be a good management practice which represents a minimum burden to hazardous waste facility owners and operators.

Closure and Post-Closure

The closure and post-closure standards (§ 250.43-7) specify what facility owners and operators must do after close-out (the time wastes are no longer received for treatment, storage, or disposal). As shown on the diagram below, closure is the period after close-out during which treatment, storage, and disposal operations are completed, final cover is applied to landfills, and equipment is dismantled and decontaminated. This period may not exceed three (3) years.



These proposed regulations require that notice of partial and final closure be given to the Regional Administrator. Such notice allows time for inspection to assure compliance with the standards. Professional certification also is required to provide added assurance that closure operations have been carried out properly. Filing a survey plat is considered necessary to insure that a properly recorded report of facility activities is available for future reference.

Post-closure is the period after closure during which certain monitoring and maintenance must be conducted. The regulations provide that post-closure care shall continue for 20 years. The facility owner or operator may, however, request the Regional Administrator to authorize a reduction or discontinuation of the post-closure requirements before the expiration of 20 years and must produce evidence to support the request. EPA is considering establishing criteria on which the Regional Administrator will base this determination.

Comments are requested on all of the preceding requirements, especially on the periods of time now specified in these proposed rules to complete closure and post-closure activities at hazardous waste facilities.

Groundwater and Leachate Monitoring

These proposed rules require groundwater and leachate monitoring at all landfills and surface impoundments (§ 250.43-8). Monitoring at landfarms is treated separately in § 250.43-5.

The goundwater monitoring requirements specify installation of a minimum of three monitoring wells hydraulically downgradient from the facility and one well upgradient from the facility.

The leachate monitoring requirements specify the installation of Leachate Monitoring System under the primary liner or natural soil barrier of landfills and surface impoundments. This standard is accompanied by a Note which allows an alternate monitoring system if it is equally capable of detecting a leak. Sampling and analysis is required at regular intervals to determine changes in concentrations of chemical constituents in groundwater and leachate.

The Agency recognizes that the technology of leachate monitoring is still being refined, but the equipment for such monitoring is currently available. EPA considers leachate monitoring extremely important because it can provide an early warning that groundwater contamination may occur. This early warning is crucial because once groundwater contamination has occurred, it is extremely difficult or impossible to remedy, particularly where an acquifer is located far beneath a facility. Groundwater monitoring alone does not sufficiently protect the environment because the leak must move through and cause extensive contamination of the zone of aeration before it reaches and contaminates the groundwater.

EPA is preparing a manual which will provide further guidance on groundwater and leachate monitoring.

Financial Requirements

Continuity-of-Operation: Closure. Hazardous waste facility owners and operators are responsible for closing their sites in accordance with the closure requirments of § 250.43-7. In order to ensure that adequate funds are available for closure when the time comes, the continuity-of-operation standard (§ 250.43-9(a)) requires that an owner/operator establish a trust fund for the amount of the estimated closure cost for the facility; the estimate must be accepted by the Regional Administrator and cash must be deposited before a permit will be issued.

EPA considered allowing owners/operators to post a surety bond rather than requiring them to establish trust funds. The Agency believed that provisions for surety bonds would help offset the financial burden which might occur when a facility owner or operator must deposit the total amount of cash for closure before the permit is granted. However, in conversations with surety brokers, the Agency found that many of the facilities we expected would want to use this method would not be able to qualify for surety bonds. Further, surety bonds are subject to year-to-year renewal and thus do not serve the purpose of providing an assured source of funds for closure. Because closure represents a minor portion of the total cost of operating a hazardous waste management business and because EPA considers the availability of funds to adequately close the site is essential to fully assure the protection of the public health and the environment, the Agency is proposing the establishment of this trust fund as a condition of receiving a permit.

Because the trust fund will be established at the beginning of operations but not used until closure, the interest that will accrue from the fund will be taken into account by the Regional Administrator in determining the fund size. A real interest rate of 2% is used in calculating the present value factor. For example, if an owner or operator estimated at today's prices a cost of $10,000 for final closure of a site expected to operate for eighteen years, the deposit required would be $7,000.

Continuity-of-Operation: Post-Closure Monitoring and Maintenance. Section 230.43-7 requires each hazardous waste disposal facility owner or operator to maintain the facility security and waste containment devices and monitor for possible leakage for the twenty years following site closure. Post-closure monitoring and maintenance requirements do not apply to treatment or storage facilities because when those facilities close no hazardous waste will remain at such sites.

Each disposal facility owner/operator must estimate the costs of complying with the post-closure regulation when applying for a permit. The estimate will be accepted or revised by the Regional Administrator as part of the permitting activity. To ensure the availability of the necessary funds, EPA is requiring each disposal facility to establish an individual trust fund for post-closure monitoring and maintenance which is to be built up over the life of the site or over twenty

years, whichever is shorter. EPA considered requiring a shorter period for deposit of the needed funds, but the preliminary economic impact work indicated that too short a pay-in period could cause a severe financial burden on a disposal site operator.

Another alternative considered would have required a permit holder to obtain a surety bond for the portion of the estimate that was not yet covered by deposits in the trust fund. As EPA discovered was the case when it examined this option for the closure standard, very few facilities have sufficient assets to obtain surety bonds in the required amounts, nor would surety bonds necessarily be renewed annually.

EPA again has used a real interest rate of 2% to calculate expected growth in the closure and post-closure monitoring and maintenance trust fund. EPA has made this choice on the assumption that nominal interest rates and the rate of inflation will move up and down together (as has been true for long periods of time) and that the rate of increase in real purchasing power of the funds in the trust will therefore remain constant at 2%. The Agency also is assuming that the rate of increase in the costs of the required task (i.e., post-closure monitoring and maintenance) will be the same as the rate of increase of prices in general as it is the latter rate that is reflected in nominal interest rates.

Financial Responsibility: Site Life Liability. EPA has interpreted the term financial responsibility in Section 3004 of RCRA to include the ability to pay for injuries to people and property which result from the escape of hazardous waste into the environment. The primary objective of the site life liability standard is to ensure that funds will be available to satisfy legitimate damage claims against a facility during its operating life.

The proposed regulations require a facility to show evidence of a minimum of $5 million of financial responsibility per occurrence per site for sudden and accidental occurrences during the life of the site. In addition, the owner or operator of a facility, or group of facilities, is required to have and maintain financial responsibility for non-sudden and accidental occurrences in the amount of $5 million per occurrence, and an annual aggregate of $10 million, including legal defense costs. Both types of insurance coverage in these amounts are now available from the private sector.

Financial responsibility, which is intended to include claims arising from both sudden and non-sudden escape of hazardous waste to the environment, can be established by liability insurance, self-insurance, a combination of the two, or some other form of financial responsibility acceptable to the Regional Administrator. If a company elects self-insurance, however, such insurance for all sites owned and insured may not exceed 10 percent of the firm's equity.

The major difficulty the Agency faces in establishing insurance and indemnification levels is the lack of actuarial data on a regulated waste management industry. While it is clear that the Subtitle C regulations will reduce both the number of damage cases and their severity, the degree to which this will occur is open to speculation.

EPA has used its existing damage case data from an unregulated industry to set the financial responsibility requirement, but the data on recent damage incidents do not allow us to compare in dollars the relative hazards posed by different wastes and different treatment, storage, and disposal processes. The dollar value of damage incidents in EPA files ranges from $100,000 to many millions of dollars. It is not unrealistic to imagine claims of several million dollars against a hazardous waste management facility.

The Agency has attempted to establish with very little actual data and minimal experience with a regulated hazardous waste industry a level of coverage that will provide reasonable protection to the public, but is not prohibitively expensive for many firms. The $5 million level for financial responsibility will apply to all permitted facilities.

Many of the comments EPA has received on this point during development of these regulations take the position that all hazardous waste management firms do not require this amount of protection. While this may be true, EPA has been unable to identify reliable criteria for determining different levels of financial responsibility for different permit holders.

Comments on how criteria for different levels of financial responsibility could reliably be determined are requested. EPA also requests comments on whether this provision of funds to satisfy damage claims is a legitimate Federal responsibility under RCRA. The Agency believes that such a provision is with the terms of the Act which require us to establish such requirements for financial responsibility "as may be necessary or desirable," but is interested in public reaction to our requiring this kind of financial responsibility.

The Agency also has received comments that such liability insurance is prohibitively expensive. EPA has discussed this point with several insurance industry representatives, has reviewed ranges of premium costs for such liability insurance being written today, and has concluded that insurance costs are not unreasonable.

Financial Responsibility: Post-Closure Liability for Hazardous Waste Disposal Facilities. EPA initially thought that liability insurance would be the best way to provide a post-closure source of funds to satisfy legitimate damage claims against hazardous waste disposal facilities. Most existing liability policies, however, only offer protection against sudden occurrences such as explosions, pipeline ruptures, or abrupt failures of containment vessels during facility operation. The critical insurance protection for post-closure liability is coverage for non-sudden occurrences. Coverage of non-sudden occurrences after facility closure is not readily available. EPA estimates that even if such coverage should become generally available, the premiums would be prohibitive.

Because of the uncertainties associated with long-term disposal of hazardous waste and the unavailability of post-closure non-sudden liability coverage from the private sector, EPA is considering seeking legislative authority to create a Federally administered fund to provide such protection. The fund would be available to satisfy legitimate claims for damage when damage occurs after a hazardous waste disposal facility has closed, but would be established in such a way as to encourage responsible waste management by the owner/operator during facility operation. As now envisioned, the fund would be administered by the Federal Government and financed from a surcharge levied on the disposal of hazardous waste. The fund would be responsible for damage claims and remedial action up to a specified amount per claim. Until the necessary legislative authority is granted by Congress, EPA is reserving proposal of this portion of the regulation.

Financial Responsibility: Request for Comments. In addition to the comments requested in the discussion of the various financial responsibility requirements, EPA encourages comment in the following areas:

(1) Are there reasonable alternatives (such as interest bearing accounts in financial institutions) to the "trust fund" mechanism for closure and post-closure financial requirements in the continuity of operation section (§ 250.43-9(a))?

(2) Are there reasonable alternatives to the proposed financial responsibility regulation (§ 250.43-9(b))?

(3) Should site life insurance coverage for non-sudden and sudden events exclude legal defense costs?

(4) Is a Federal fund for post-closure financial responsibility for hazardous waste disposal sites desirable and if so, how should it operate?

(a) What should the size of the fund be?

(b) Should there be a maximum amount available for any one claim; if so, what amount?

(c) What amount should be charged per unit of waste disposed?

(d) How should the fund be administered?

(e) What are the alternatives to a Federally administered fund?

(f) Should the fund provide separate regulations for publicly owned and privately owned facilities?

Further, the Agency is considering, and solicits comments on additional closure and post-closure financial responsibility provisions designed to insure that adequate funds are available for closure and post-closure care. To that end, a system of periodic checks would be established. The closure and post-closure financial responsibility provisions would require the facility to biannually re-evaluate and revise the estimate of the amount of total and annual payments necessary to provide adequate financing for closure and post-closure care. A report of the re-evaluation and revision would be included in the annual report required to be submitted to the Regional Administrator. The evaluation and revision would be subject to the approval of the Regional Administrator. In addition, the provisions would require the owner/operator to certify in the annual report that he has made the required annual payments to the trust funds.

STANDARDS FOR STORAGE

The storage standards proposed in § 250.44 are intended to prevent the release of hazardous waste from storage areas into the environment. Section 1004(33) of RCRA defines "storage" as the containment of hazardous waste, either on a temporary basis or for a period of years, in such a manner as not to constitute disposal of hazardous waste. Section 1004(3) of RCRA defines "disposal" as

> the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters.

Because "storage" cannot constitute "disposal," the regulations for hazardous waste storage operations require that storage be conducted in such a manner that no discharge or release of any waste occurs.

An issue central in the storage standards is when storage begins. The Agency believes that it would be inappropriate to require generators to comply with Subpart D storage regulations the instant a waste is generated because they really are not storage facility operators. However, the Agency also recognizes that generators tend to accumulate considerable quantities of hazardous waste over extended periods of time. With prolonged storage, the Agency believes the generator does become a storage facility operator, with the attendant environmental risks, and should have to comply with the storage regulations.

The Agency has decided to allow generators a reasonable period of time to accumulate hazardous waste on-site (with the intent to ship off-site) within which time they will not be considered storage facility operators. Ninety days has been selected as this interim period, as EPA considers that the likelihood of discharge of waste to the environment occurring within 90 days is low. Accordingly, a storage facility is defined as any facility that stores hazardous waste, except a facility used by a generator to store his own hazardous waste on-site in DOT specification containers for less than 90 days for subsequent transport off-site.

In order to prevent the release of waste to the environment, the standards for storage (§ 240.44) include the requirement that storage tanks and containers be of sturdy and leakproof construction. The Occupational Safety and Health Administration (OSHA) has written explicit design specifications for tanks and containers used to store flammable and combustible liquids (29 CFR 1910, Subpart H, § 1910.106). EPA proposes to require that facility owners/operators store all of their hazardous waste in tanks and containers which meet the specifications in OSHA's regulations for flammable and combustible liquid containers. OSHA's specifications are designed to ensure that no discharge from containers meeting those specifications will occur. Subpart D standards go beyond OSHA specifications, however, by providing that storage tanks and containers must be constructed of materials which are compatible with the hazardous waste to be contained or must be protected by a liner compatible with the waste to be contained. Comments are requested on this proposal to adopt OSHA's specifications for storage containers.

STANDARDS FOR TREATMENT/DISPOSAL

Section 250.45 prohibits treatment or disposal of certain kinds of waste in landfills, surface impoundments, basins, or landfarms unless the owner/operator can demonstrate that such treatment or disposal will not exceed OSHA's permissible contaminant levels for any listed airborne contaminants (29 CFR § 1910.1000) above such non-point sources and that it will not contribute two or more airborne contaminants to the air in a manner which will cause a specified equation to exceed unity. EPA believes that this prohibition is justified because reactive, ignitable, and volatile waste pose special treatment and disposal problems. The Agency does not know of any way to ensure protection of human health and the environment without imposing this prohibition and attendant Note requirement. Comments on this approach are requested.

Air sampling at non-point sources (e.g., surface impoundments, landfills) is not required in these regulations. Sampling at a non-point source may be made a permit condition, however, in a situation such as this, where the owner/operator is authorized to deviate from a design and operating standard. Air sampling procedures for non-point sources are under development. A manual will be provided by EPA following promulgation of these rules to describe the procedures by which air sampling at non-point sources could be accomplished.

Incineration

The standards in § 250.45-1 apply to hazardous waste incinerators which are defined as combustion devices. One example of an incinerator is a rotary kiln. These regulations also apply to cement kilns, utility boilers, and any other devices which burn hazardous waste by combustion.

The Subpart D performance standards for the incineration of hazardous waste prescribe conditions for destruction of the waste introduced and for control of the resulting emissions. Thus, these proposed rules include specifications on residence time, combustion temperature, excess air, combustion efficiency, scrubber efficiency, and automatic feed cutoffs. Trial burns are required for incinerators burning waste of a type which has not previously been burned in similar incinerators. The results of trial burns must be submitted to the Regional Administrator. Additionally, an emission standard for particulates is given.

EPA sponsored a program to assess processes for destroying chemical waste in commercial scale incinerators, as well as programs to destroy chemical waste in experimental incineration units. EPA has concluded that thermal destruction as a method of treatment of primarily organic chemical waste is both technically feasible and environmentally sound.

The successful utilization of certain cement kilns for destruction of chlorinated organic waste is one of the more important results of EPA's program. Cement kilns use the halogen content of the waste to reduce alkalinity in the cement clinker while using the hydrocarbons as fuel. The BTU value of wate reduces the fuel otherwise required to produce cement. Com-

bustion conditions in the kiln are more rigorous than those in incinerators designed solely for hazardous waste disposal. Thus, the combustion conditions are usually more than adequate for the destruction of halogenated and non-halogenated hydrocarbon fuels, including PCBs.

EPA has received comments that incineration should not be so strictly regulated that already costly incineration facilities become more so. EPA believes that because incineration has been found to be technically feasible and environmentally sound, and because it reduces or eliminates the volume and/or toxicity of waste to be land disposed, it should be actively encouraged.

Comments are requested on all of the regulations prescribed for incineration, particularly the standards for which explicit limiting values are proposed. These include 99 percent halogen removal in emission control systems, 99.9 percent combustion efficiency, 99.99 percent destruction efficiency, 1000° C combustion zone temperature, two-second retention time, 0.08 grains per dry standard cubic foot stack concentration limit for particulates, and the monitoring requirements.

Landfills

The Agency recognizes that the state-of-the-art for predicting discharges or releases from landfills is poor and thus believes that the only option available to ensure protection of human health and the environment is to prescribe design and operating standards which will provide maximum containment in landfills; that is what these standards are designed to do. The Notes accompanying the landfill standards allow the substitution of alternate standards if the permit applicant can demonstrate to the Regional Administrator that the alternative will provide equivalent or better performance than the specified standard.

Maximizing containment minimizes the escape of hazardous waste constituents. Although EPA recognizes that some escape of waste constituents conceivably may not present a hazard to the environment, the Agency is not aware of any method for designing landfills to allow specific constituent release rates, nor is the Agency aware of any method to determine what release rates would be acceptable. The Agency also cannot predict how long hazardous waste in a landfill will remain hazardous. Accordingly, the only viable alternative the Agency sees to fulfill its Section 3004 mandate to protect human health and the environment is to require that landfills be designed, constructed, and operated so that discharges are minimized or do not occur.

The landfill designs in these proposed standards are separated into two categories; different designs are required for different natural geologic and climatic conditions at the selected site. Where site conditions allow, i.e., at those sites which have extensive homogeneous clay deposits and where the evaporation rate exceeds precipitation by at least 20 inches per year, the landfill design must include 10 feet of natural in-place soil with a permeability of $<1\times10^{-7}$ cm/sec. as a liner. No leachate collection is necessary at such sites, provided that a "bathtub" situation is not expected to occur, i.e., provided that liquids would not accumulate in the landfill to the extent that they overflow to the surface or create leaks to the groundwater due to excessive hydraulic head.

Two alternate landfill designs are suggested where the geology and climate of the site location do not allow the use of the design just discussed. Both of these latter designs utilize a liner system(s) in conjunction with leachate collection. The decision of which design to use is entirely up to the owner/operator. Design I consists of a leachate collection and removal system on top of a soil liner or natural soil or mantle barrier at least 5 feet thick with a permeability not greater than 1×10^{-7} cm/sec. Design II is a more complex design involving a double liner, leachate collection and removal, and a leachate detection and removal system. The double liner consists of a soil liner (3 feet thick with a permeability of $<1\times10^{-7}$ cm/sec.) overlying a synthetic membrane (>20 mils thickness with a permeability of $<1\times10^{-7}$ cm/sec.). The leachate collection and removal system must be placed on top of the soil liner to collect and remove leachate generated in the fill. a leachate detection and removal system must be located beneath the synthetic bottom liner. The top soil liner will provide primary containment of the waste and protection for the synthetic membrane liner. The synthetic liner will provide containment of any waste which migrates or leaks through the soil liner. The Agency feels there is, at present, inadequate information available on the long-term reliability of synthetic liners, used by themselves, for waste containment in landfills. Therefore, Design II provides a bottom leachate detection and removal system to ensure complete containment of waste and leachate. The presence of such a bottom leachate detection and removal system also makes unnecessary the need for leachate (zone of aeration) monitoring under the Landfill, and prevents the possibility of groundwater contacting the bottom of the landfill due to the pumping mechanisms inherent in the leachate detection and removal system.

Discouraging the landfilling of liquid hazardous waste is another key element of EPA's strategy for maximizing the containment of waste in landfills. It is important to understand that the regulations do not categorically ban liquids from landfills. Rather, they require that liquids be modified and/or treated to a non-flowing consistency prior to landfilling or *in situ*. The Agency feels it is important to discourage the landfilling of liquid hazardous waste because such waste increases the likelihood that hazardous materials will enter the environment. The hydraulic head created by liquids is the driving force which causes landfills to leak. The Agency wants to prevent hydraulic head from being created; thus, these standards emphasize leachate collection and require that liquids be modified before landfilling.

Comments are requested on all of the regulations for land filling hazardous waste, particularly the standards for which explicit limiting values are proposed. These include the 1.5 meter (5 foot) separation between the bottom of the liner system(s) or natural in-place soil or mantle barrier and the water table, the 150 meter (500 foot) separation from any functioning public or private water supply, the 20 mil minimum thickness and 1×10^{-12} cm/sec. or less permeability of synthetic membrane liners, the design specifications for landfill construction, the criteria for soil liners and natural impermeable soil barriers, the minimum capacity for leachate collection sumps, and the final cover specifications.

Basins and Surface Impoundments

For the purpose of these regulations, a "basin" is any uncovered aboveground device constructed of artificial materials which is used to retain hazardous waste as part of a treatment process. Basins usually have a capacity of less than 100,000 gallons. Examples of basins are open mixing tanks, clarifiers, and settling tanks. In comparison, surface impoundments, which may serve the same purpose, are any natural topographic depressions, artificial excavations, or dike arrangements which: (1) Are used primarily for holding, treatment, or disposal or waste; (2) may be constructed above, below, or partially in the ground or in navigable waters (e.g., wetlands), and (3) may or may not have a permeable bottom and/or sides.

Although basins are a subset of surface impoundments and both may serve the same purposes, i.e., containment of hazardous waste for treatment or retention, the difference in

construction and the attendant environmental problems associated with each require that they be subject to different standards in certain areas. Compare § 250.45-3 standards with § 250.45-4 standards.

Surface impoundments usually are built by constructing earth dikes around the impoundment area. They are usually lined, either with soil (natural in-place soil or reworked/reconstructed soil) or synthetic materials. Liners and dikes are the primary barriers to movement of hazardous waste from the impoundment. The surface impoundment regulations primarily are concerned with ensuring the impermeability, structural stability, and integrity of dikes, soil barriers, and synthetic liners.

In comparison, basins are usually constructed entirely above ground from materials such as concrete or steel. The construction material(s) serves as the primary barrier to movement of waste from such structures. Basins may be lined or unlined, but basin liners serve only to protect against corrosion of, or waste incompatibility with, construction materials. Because of the materials used and the above-ground construction of basins and because they generally are small, most corrosion problems, cracks, or other damage to them that can lead to hazardous waste migration or seepage can be detected through visual inspection. Surface impoundments however, which usually are at least partially underground and which use liners and dikes for containment must be subject to different standards in order to protect groundwater and surface water as hazardous waste constituent migration from surface impoundments usually cannot be detected visually.

Another reason basins are subject to different standards is that they are temporary structures and thus Subpart D standards require that they be removed or decontaminated at facility closure. In comparison, some surface impoundments could be used for permanent disposal of hazardous waste. If they are used for permanent disposal, they must be designed, constructed, and closed according to § 250.45-2 landfill regulations. Even if not used for permanent containment, however, they still must be closed pursuant to specifications which are different than those for basin closure.

Landfarming

Landfarming is an environmentally acceptable method for treating and disposing of some hazardous waste, provided certain operating and design parameters are used. Section 250.45-5 of these proposed rules contains standards for landfarming which EPA believes will protect human health and the environment.

Certain types of waste generally should not be landfarmed. Excessive volatilization, i.e., vaporization, of a hazardous waste, for example, releases contaminants to the air. Therefore, hazardous waste with a vapor pressure exceeding 78 mm Hg at 25°C generally should not be landfarmed. However, the Agency recognizes that it may be possible to safely landfarm hazardous waste with vapor pressures exceeding 78 mm Hg using special methods such as subsurface soil injection, so an exception to this general prohibition is provided. A note accompanying the standard allows volatile wastes to be landfarmed provided the facility owner/operator demonstrates that such a practice will not violate permissible airborne contaminant levels.

Environmentally persistent organics ideally should not be landfarmed in such concentrations that they could not be degraded fairly quickly. However, landfarming of this class of waste is not specifically banned by the regulations because of the difficulty in defining the term "environmentally persistent organics." Such a definition logically should include either a finite half-life or finite time that it takes such substances to be degraded to harmless by-products. Degradation, however, includes reactions of a chemical, biological, and/or photochemical nature. Degradation is dependent on many factors, including the concentration of the compound in the soil, and the definition may need to include this parameter in order to protect human health and the environment. EPA does not have the data needed to make such a definition at this time. Comment is requested on the subject of defining environmentally persistent organics. For example, should we shift the burden to the owner/operator to show that an organic applied in a certain concentration will be degraded within a certain amount of time?

The regulations require that landfarms be located on areas of fine grained soil types (OH, CH, MH, CL, and OL) as defined by the Unified Soil Classification System. These soils were selected for their favorable waste attenuating characteristics. The potential for attenuation is based on surface area per unit weight and silt/clay/colloid composition. Use of alternate soil types is allowed, provided they prevent vertical migration of hazardous constituents. Comment is requested concerning the appropriateness of specifying soil types and the suitability of the soils specified. Suggestions on alternate (or additional) soil types and soil classification systems, with appropriate supporting data, are solicited.

The landfarming regulations require extensive soil monitoring to detect and provide time for preventing the migration of hazardous waste below the zone of incorporation, i.e., the depth to which the soil on a landfarm is plowed or tilled to receive waste. Because soil monitoring will detect migration long before groundwater is threatened, groundwater monitoring is not required. The Agency also is not requiring groundwater monitoring because we are not aware of any documented case of groundwater pollution resulting from hazardous waste landfarming. The Agency requests comment on whether groundwater monitoring is desirable at landfarms, and if so, why.

Soil conditions at a landfarm are determined by soil monitoring. Soil monitoring consists of taking core samples, sample analysis, and statistical comparison of analytical results to previously established background soil conditions. The soil monitoring regulations require one soil core per acre semi-annually. The depth of the core is three times the depth of the zone of incorporation. The bottom one-third of the soil core is quantitatively analyzed to determine if there is a significant increase, above background, in the concentration of constituents that make the waste hazardous. A significant increase over background is considered unacceptable and remedial actions are required. Comments are requested on all aspects of the soil monitoring requirements. Specific information is needed on the adequacy, statistical or otherwise, of the number, depth, and frequency of soil cores required. Suggestions for alternate approaches are requested, e.g., a formula for the number of cores to be taken per unit area, based on landfarm size and representative soil types. Specific information and suggestions are also requested for the purpose of defining, via statistical methods, "significant increase above background." The information submitted should reflect dependence of the defining statistical method on the method developed for determining the number of soil cores to be taken per unit area.

One objective of these proposed rules on landfarming is to prevent the conversion of huge tracts of productive land to land with limited potential for future use. Comments on whether this is a reasonable Federal objective under RCRA are requested. Meeting this objective requires that the soil of the treated area(s) of a landfarm be returned to it previously existing (i.e., pre-landfarming) condition when landfarming operations cease. New facilities will utilize soil monitoring background data developed prior to beginning operation for this purpose. Existing facilities must use the background soil conditions of similar local soils as the basis for comparison unless site

data exist that establish background conditions for the soil of the treated area(s) prior to any waste application.

The soil in a landfarm functions as a filter medium which, when subject to application of waste containing non-degradable contaminants, eventually becomes loaded with such contaminants, especially heavy metals. Left unattended, the contaminants of the soil-filter medium will eventually be carried away by surface run-off, or will migrate to groundwater due to natural changes in physical and chemical soil parameters. Therefore, the contaminated soil-filter medium, if it would be considered a hazardous waste under Subpart A, must either be decontaminated or disposed of as a hazardous waste. Comments are requested, though, on whether under certain specified circumstances the soil-filter medium could be left as it is at the end of operations without the potential for human health or environmental damage.

Growth of food chain crops upon hazardous waste landfarms is prohibited. The purpose of this prohibition is to protect against human consumption of toxic materials that may adhere to or be taken up by such crops. The Agency recognizes, however, that certain hazardous waste probably could be safely applied to land on which food chain crops are grown if certain management practices are employed. For example, for waste similar to sewage sludge from publicly owned treatment works, EPA may be able to develop mangement controls (control of application rates, soil/waste pH, etc.) similar to those we are currently developing for such sludges under Section 4004 of this Act and Section 405 of the Clean Water Act which will ensure protection of human health.

EPA has considerable data on the effect that POTW sewage sludge has on food crops and thus we can develop rules for landfarming POTW sludge which will allow growth of food chain crops on such land but, the Agency has little or no information on the effects of other types of sludge on food crops. Given the possibility of high levels of toxic constituents in the hazardous waste that might be landfarmed under these regulations, the absence of adequate information on crop uptake of the contaminants in these wastes, and the lack of data on management control that would be necessary to allow growth of food crops, the Agency deems a general prohibition on the growth of food crops on such land warranted. Comments and data are requested that would assist the Agency in developing regulations that would provide for the controlled application of hazardous waste to food chain croplands.

Chemical, Physical, and Biological Treatment Facilities

The section of the proposed Subpart D standards which specifically addresses chemical, physical, and biological treatment facilities (§ 250.45-6) deserves special emphasis. Treatment is defined in Section 1004(34) of RCRA to include any process designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste, render it nonhazardous, safer for transport, amenable for recovery, amenable for storage, or reduced in volume.

Although this section in the regulation is relatively short, it covers a large and important facet of hazardous waste management. The Agency prefers chemical, physical, and biological treatment rather than disposal techniques such as landfilling as a means of waste management because such treatment can detoxify a waste and thus reduce the potential for human health or environmental damage. Treatment also reduces the burden that present practices place on future resources.

The reason why these standards are not extensive is that treatment techniques vary widely and thus it is very difficult to write design and operating standards which apply to all possible chemical, physical, and biological treatment systems. Furthermore, the Agency wants to allow flexibility so that owners and operators of treatment facilities can match treatment processes with waste types. Treatment processes should be tailored to fit the individual requirements of the facility and hazardous waste being handled. The advantages of writing standards which allow a facility operator to tailor his processes to the waste being handled are that such standards allow flexibility in the construction of treatment facilities thereby encouraging design innovations, and they encourage treatment by not regulating it extensively.

If in treating hazardous waste, facilities produce residues which are not hazardous according to Subpart A standards, such residues are not subject to Subtitle C regulations. Thus, the treatment facility would be subject to Subtitle C regulations and need a permit because it is treating hazardous waste, but any non-hazardous residuals such as chemically fixed waste, or neutralized acid or alkaline waste, do not have to be handled at a permitted facility, nor do they need a manifest if shipped offsite. One example of a residue which may be non-hazardous is the ash from a hazardous waste incinerator.

Commercial products

EPA knows of several instances where waste which is likely to be hazardous under Subpart A rules is being used to make commercial products. Hazardous waste can be used, for example, to make soil conditioners and fertilizers, fuel oil, and construction products. EPA believes it must regulate hazardous waste which is used to make commercial products when such regulation appears necessary to protect human health and the environment. Except for radioactive special waste, there currently are no Subpart D standards covering commercial products made from hazardous waste. The Agency has, however, considered and is continuing to consider developing standards for such reuse of hazardous waste. We believe such protection probably could best be achieved by imposing standards on product quality control.

One approach the Agency has considered is to require that any product made from hazardous waste not pose a threat to human health or the environment greater than the threat posed by the virgin product it replaces. Commercial products made from a hazardous waste which met this criterion which then cease being hazardous waste for purposes of Subtitle C of RCRA and thus would no longer be subject to Subtitle C regulations. There are probably other viable approaches as well.

Comments on feasible regulatory approaches for commercial products made from a hazardous waste are requested. In addition, the Agency requests any data that are available which we might use to support future standards in this area.

SPECIAL WASTE STANDARDS

In the course of preparing Subtitle C regulations under RCRA, the Agency realized that some portions of certain very large volume wastes will be hazardous under Subpart A standards and thus will come within the purview of the Subtitle C regulatory scheme. These wastes are cement kiln dust, utility waste (fly ash, bottom ash, and scrubber sludge), phosphate mining and processing waste, uranium and other mining waste, and gas and oil drilling muds and oil production brines.

The Agency has very little information on the composition, characteristics, and the degree of hazard posed by these wastes, nor does the Agency yet have data on the effectiveness of current or potential waste management technologies or the technical or economic practicability of imposing the Subpart D standards on facilities managing such waste.

The limited information the Agency does have indicates that such waste

occurs in very large volumes, that the potential hazards posed by the waste are relatively low, and that the waste generally is not amendable to the control techniques developed in Subpart D. The Agency is calling such high-volume hazardous waste "special waste" and is proposing to regulate it with special standards.

The following table provides some information about those wastes which, when hazardous, the Agency proposes to regulate with special standards. With two exceptions, EPA does not know how much of the total amount of waste generated in these categories is, in fact, hazardous and thus subject to Subtitle C regulations. Only waste which is hazardous under Subpart A standards, however, is "special waste" under this Subpart. Any portion of the waste on the following table which is not hazardous under Subpart A standards is not regulated at all under Subtitle C and thus is not "special waste."

Special Waste

[Metric tons/yr]

Waste	Quantity	Possible hazard
Cement Kiln Dust	12 million*	Alkalinity and heavy metals
Utility Waste (fly ash, bottom ash, scrubber sludge).	66 million*	Heavy metals (trace)
Phosphate Mining, Beneficiation, and Processing Waste.	400 million	Radioactivity (low levels)
Uranium Mining	150 million	Radioactivity
Other Mining Waste	~2 billion*	Heavy metals, acidity
Gas and Oil Drilling Muds and Oil Production Brines.	5 million*	Alkalinity, heavy metals, toxic organics, salinity

NOTE.—It is not yet known how much of the total quantity of waste marked with an asterisk (*) is, in fact, hazardous waste.

A proposed rulemaking will be published at a later date regarding the treatment, storage, and disposal of special waste. The Agency will be developing additional information in order to write substantive standards for special waste, and hereby solicits information and comment from the public which may assist the Agency in developing its proposals. For the time being, all facilities which handle special waste will be exempted from the storage standards (§ 250.44) and the treatment and disposal standards (§ 250.45). In order to provide some protection from special waste and to collect additional information on special waste streams, EPA has prepared special standards for each type of special waste. Many of the general facility standards in § 250.43 are prescribed for special waste. In addition, some special waste must meet standards which are designed to control potential problems unique to that waste.

Dredge Spoils

Certain dredge spoils may prove to be hazardous and thus subject to these regulations. The Agency has little information regarding hazard levels and potential threats to human health and the environment associated with on-land disposal of these wastes. Information on acceptable waste management techniques and associated economics is also limited. Therefore, EPA is considering designating dredge spoils as a special waste under Section 250.46, thus deferring most requirements pending further study. As an alternative, the agency is considering exempting these wastes from RCRA requirements and covering them solely via regulation under section 404 of the Clean Water Act. Comments on how these wastes should be managed are invited.

Infectious Waste

EPA has received comments from the U.S. Army Environmental Hygiene Agency (USAEHA) that infectious waste defined as a hazardous waste pursuant to Subpart A should be considered a special waste and allowed to be disposed of at a landfill facility which does not meet all of the Subpart D landfill standards. USAEHA also suggested that certain infectious waste could be adequately managed at facilities that meet the Section 4004 "Criteria for Classification of Solid Waste Disposal Facilities" proposed under Subtitle D of RCRA (43 FR 4914). The U.S. Army Environmental Hygiene Agency agrees, however, that certain infectious waste, because of the extreme hazard associated with it, should go to facilities with a demonstrated capability to manage such waste.

EPA believes the above proposal has some merit, and is considering various administrative and regulatory options which we could employ to accomplish it. Consideration is being given to designating all or certain categories of infectious waste which is hazardous under Subpart A as "special waste." The Agency would then write different Subpart D regulations for such infectious waste.

The Agency invites comments from the public on this issue.

OPERATING AND DESIGN MANUALS AND INDUSTRY-SPECIFIC MANUALS

To assist with the implementation of these regulations, the Agency is preparing a number of detailed manuals.

The operating and design manuals will provide much more detailed information on waste management technologies than that given in the regulations. The manuals will cover acceptable practices for different types of treatment, storage, and disposal facilities, including landfills, landfarms, storage facilities, incinerators, chemical, physical, and biological treatment facilities, and surface impoundments. Manuals on monitoring and training also are being developed. These manuals will be organized to correspond closely with the regulations, but will be guidance manuals with no regulatory effect. The Agency expects to issue the manuals prior to final promulgation of the Subtitle C regulations.

The industry-specific guidance manuals will help various industries understand how the regulations apply to them. They will be issued as concise brochures. Sample diagrams and terms meaningful to the particular industry will be used. Eventually, manuals will be prepared for all major industrial categories. Initially, though, these manuals will be prepared for industries comprised primarily of small companies which can least afford to devote much effort toward understanding these regulations. The first industry-specific guidance manuals are being prepared for the electroplating and battery manufacturing industries.

OTHER ISSUES

Definition of Aquifer

As defined in § 250.41, an aquifer means any water-bearing stratum or unit which, due to its ability to store and transmit water, is capable of yielding a useable quantity of groundwater to a well or spring. The key concept in this definition is "a useable quantity of groundwater." EPA has received many inquiries about how one determines a useable quantity. EPA, at this time, has not decided on what basis to make this determination (it could, for example, be 600 gal/day which is enough for a single household of 4 people) since relatively low yield aquifers can still be useable in certain

circumstances. Comment is requested on the current definition of aquifer, specifically on how the Agency should define a "useable quantity" of water.

Test of Significance

The term "significant" or "significantly" as used in these proposed rules has not always been defined in quantitative terms. A statistical test or tests to quantitatively define "significant" will be developed where the Agency believes it is necessary and will be cited or referenced where appropriate in the final rules. One method specified in these rules is the use of Student's t-test.

Comment and information from the public regarding appropriate statistical methods or tests to apply in these regulations where the term "significant" is used, but no quantification is made would be appreciated.

INTEGRATION WITH OTHER ACTS

Underground Injection and Ocean Disposal

The disposal of hazardous waste by underground injection and ocean disposal is not covered by these proposed rules where these activities are regulated under the Safe Drinking Water Act (SDWA), and the Marine Protection, Research, and Sanctuaries Act (MPRSA). Most underground injection facilities, however, involve aboveground storage of waste prior to injection. Some of these facilities will have to comply with both the Subpart D (RCRA) standards and the Underground Injection Control (UIC) regulations to be promulgated under the SDWA. The UIC regulations also will include closure procedures for underground injection wells. Similarly, most ocean disposal operations involve onshore facilities which must comply with the Subpart D (RCRA) standards.

NPDES Permitted Facilities

These proposed rules apply to owners/operators of all treatment, storage, and disposal facilities which receive hazardous waste. Accordingly, they may apply to some National Pollutant Discharge Elimination System (NPDES) permitted facilities, such as publicly or industrially owned waste water treatment plants which handle hazardous waste. The regulatory considerations for publicly owned facilities differ from those for industrially owned facilities, and accordingly are discussed separately below.

These hazardous waste control regulations apply only to the transport of hazardous waste directly by truck or rail to publicly owned treatment works (POTW). Once a hazardous waste, transported to a POTW, has been mixed with sewage, the resulting mixture is no longer considered a solid waste under RCRA. However, the General Pretreatment Regulations (43 FR 27736, June 26, 1978) and the specific pretreatment standards (40 CFR Chapter I, Subchapter N) regulate these materials prior to their introduction by industry into the municipal system, during transport to the publicly owned treatment works, and their treatment and disposal at the treatment works. The pretreatment requirements apply regardless of whether the materials are discharged into municipal sewers or are transported by truck or rail to the publicly owned treatment works. Therefore, these proposed hazardous waste rules are in addition to the pretreatment requirements and only apply to the handling of hazardous waste during delivery to a POTW by truck or rail and before it is mixed with sewage.

Industrially owned waste water treatment plants which discharge directly to surface waters are currently permitted under the NPDES program. These NPDES permits apply only to surface discharges to navigable waters. Since these facilities frequently involve surface impoundments which receive and treat hazardous waste, the possibility exists for subsurface discharges and/or air emissions which are harmful to human health and the environment. Thus, if these impoundments receive hazardous waste, as defined in Subpart A, these facilities are subject to these proposed rules in addition to the current NPDES program. (It should be noted that any hazardous waste (sludge) generated by such industrial wastewater treatment plants is also subject to these regulations.)

Similarly, industrially owned wastewater treatment plants which discharge to publicly owned treatment works are currently regulated by pretreatment standards. Where these facilities involve surface impoundments for hazardous waste, as defined in Subpart A, such facilities are subject to these proposed rules in addition to the pretreatment standards.

Several commenters to previous drafts of these proposed rules have expressed concern that it is inappropriate to apply RCRA Subtitle C technical and other standards to hazardous waste impoundments in an industrial wastewater treatment train subject to pretreatment standards and/or a NPDES permit, especially for existing impoundments which show no signs of leaching to groundwater or of emissions to the air. In response to these comments, it should be noted that these proposed rules allow the owner/operator of any existing hazardous waste impoundment which does not meet all the design and operating standards to show that such an impoundment provides the same or greater degree of performance (e.g., containment) as an impoundment which meets the standards. Thus, if an owner/operator of an existing hazardous waste impoundment can show by monitoring and other means that the impoundment does not leak or exceed air emission requirements, that impoundment may be issued a permit even if it does not meet all the design and operating standards specified herein. The Agency solicits comment on this point with respect to existing hazardous waste impoundments.

Integration with BAT/Pretreatment Standards

Best Available Technology (BAT) toxic effluent guidelines and pretreatment standards are being developed for specific industries under the Clean Water Act during the same time frame as these proposed rules. The Agency may review the Subpart D facility standards on a case-by-case basis for those industries for which BAT and pretreatment standards are being developed in order to ensure that the two programs together provide the greatest environmental protection. Such evaluation would include consideration of compliance costs. At present, however, the proposed regulations apply to all industries, except as specified in § 250.46.

Clean Air Act

Owners and operators of hazardous waste management facilities must comply with all applicable standards promulgated under the Clean Air Act. Where applicable, new source performance standards for industrial incinerators promulgated under Section 111 of the Clean Air Act supersede emission standards for hazardous waste incineration established in these Subpart D rules.

Toxic Substances Control Act

Final rules regarding disposal and marking requirements for polychlorinated biphenyls (PCB's) were promulgated on February 17, 1978, pursuant to Section 6(e) of the Toxic Substances Control Act (TSCA). Those rules are intended to protect the environment from further contamination resulting from improper handling and disposal of PCB's.

The Agency is now considering various options for the integration of the Subpart D standards and TSCA rules for disposal of PCB's and other special chemicals. The options with respect to integration of the PCB regulations with the Subpart D standards are:

(1) Publish two sets of rules which are totally independent;

(2) Specify that the PCB rules supersede the Subpart D regulations in areas of overlap;

(3) Amend the PCB rules to make them identical with the Subpart D standards in areas of overlap. Administer the two rules jointly, citing both authorities (TSCA and RCRA);

(4) Merge the PCB rules with the Subpart D standards and co-promulgate them;

(5) Specify that Subpart D regulations are independent of the PCB rules, but integrate the permitting process.

The Agency's current position is that the PCB disposal rules should be merged with the Subpart D regulations and co-promulgated (Option 4). This will allow integrated implementation via RCRA permits and EPA/State hazardous waste programs.

Similar options were considered for other specific toxic chemical disposal regulations which could be promulgated under either TSCA or RCRA authority. The Agency's current plan is to amend Subpart D regulations when necessary in the future when the Agency believes that special requirements in addition to the Subpart D design and operating standards are necessary in order for a specific toxic chemical waste to be properly disposed of.

The Agency requests comment on the above options, and the position taken by the Agency with respect to this issue.

COMPLIANCE AND PENALTIES

Failure to comply with these regulations or with permit conditions may result in civil and/or criminal penalties of as much as $25,000 a day for each day of violation, as specified in Section 3008 of the Act. A facility owner and/or operator must comply fully with all applicable regulations in order to receive a permit under Subpart E or the permit must contain a compliance schedule for modifying the facility to conform to the Subpart D standards.

BACKGROUND DOCUMENTS

Twenty-seven (27) background documents have been developed to support these proposed rules. All of these documents are in draft form, and are subject to change as new data and information are received. These background documents basically correspond to each section of the proposed rules. Copies of these documents will be available for review in the EPA Regional Office libraries and the EPA library reading room, Room 2404, Waterside Mall, 401 "M" Street, S.W., Washington, D.C. Comments on these documents are invited.

A list of these background documents is as follows:

(1) Groundwater Human Health and Environmental Standard

(2) Surface Water Human Health and Environmental Standard

(3) Air Human Health and Environmental Standard

(4) General Facility Standards

(5) General Site Selection

(6) Security

(7) Contingency Plan and Emergency Procedures

(8) Training

(9) Manifest System, Recordkeeping and Reporting

(10) Visual Inspections

(11) Closure and Post-Closure

(12) Groundwater and Leachate Monitoring

(13) Financial Requirements

(14) Standards for Storage

(15) Standards for Treatment/Disposal

(16) Incineration

(17) Landfills

(18) Surface Impoundments

(19) Basins

(20) Landfarms

(21) Chemical, Physical, and Biological Treatment Facilities

(22) Cement Kiln Dust Waste

(23) Utility Waste

(24) Phosphate Rock Mining, Beneficiation, and Processing Waste

(25) Uranium Mining Waste

(26) Other Mining Waste

(27) Gas and Oil Drilling Muds and Oil Production Brines

Economic, Environmental, and Regulatory Impacts

In accordance with Executive Orders 11821, as amended by Executive Order 11949, and OMB Circular A-107, EPA policy as stipulated in 39 FR 37419, October 21, 1974, and Executive Order 12044, respectively, analyses of the economic, environmental, and regulatory impacts are being performed for the entirely of Subtitle C, Hazardous Waste Management. Drafts of these analyses have been completed and will be available for review by January 8, 1979, in the EPA Regional Office libraries and the EPA library reading room, Room 2404, Waterside Mall, 401 M Street, S.W., Washington, D.C. Final versions of these documents will be issued at the time of promulgation.

Dated: December 11, 1978.

DOUGLAS M. COSTLE,
Administrator.

It is proposed to amend Title 40, CFR, Part 250 by adding a new Subpart D consisting of §§ 250.40-250.46; Subpart E consisting of § 250.50; and Subpart F consisting of § 250.60 as follows:

PART 250—HAZARDOUS WASTE GUIDELINES AND REGULATIONS

Subpart D—Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

Sec.

Subpart E—Permits for Treatment, Storage, or Disposal of Hazardous Waste

Subpart F—Guidelines for Authorized State Hazardous Waste Programs

AUTHORITY: Secs. 1006, 2002(a), 3004, 3005, and 3006, Pub. L. 94-580, 90 Stat. 2802, 2804, 2807 (42 U.S.C. 6905, 6912, 6924), 2808 (42 U.S.C. 6925), and 2809 (42 U.S.C. 6926).

Subpart D—Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

§ 250.40 Purpose, scope, and applicability.

(a) The purpose of the requirements in this Subpart is to establish mini-

mum national standards defining acceptable hazardous management practices applicable to owners and operators of facilities which treat, store, and dispose of hazardous waste.

(b) In order to receive EPA approval under Subpart F (State Program Requirements), a State must demonstrate that its program contains standards that are equivalent in degree of control to, and at least as stringent as, the standards contained in this Subpart. However, even where a State program is approved, EPA retains independent authority to enforce the requirements in this Subpart pursuant to Section 3008 of the Act.

(c) Except as otherwise provided in this paragraph, an owner/operator of a facility that stores, treats, and/or disposes of hazardous waste shall comply with all of the applicable requirements of §§ 250.42, 250.43, 250.44, and 250.45 unless he is in compliance with a current and effective permit issued by EPA pursuant to Subpart E.

(1) An owner/operator of a facility that treats, stores, and/or disposes of any of the special wastes covered by § 250.46 shall comply with the applicable requirements of § 250.46 with respect to the special waste.

(2) During the period of interim status, as identified in Section 3005 of the Act, an owner/operator of a facility that treats, stores, and/or disposes of hazardous waste shall, at a minimum, comply with the following requirements, as applicable, for active portions of the facility:

(i) Security requirements under § 250.43-2;

(ii) Contingency Plan and Emergency Procedures requirements under § 250.43-3;

(iii) Training requirements under § 250.43-4;

(iv) Manifest System, Recordkeeping, and Reporting requirements under § 250.43-5;

(v) Visual Inspection requirements under § 250.43-6;

(vi) Closure and Post-Closure requirements under § 250.43-7 (a,b,d,e,f,g,h,j,k,l, and m);

(vii) Groundwater and Leachate Monitoring requirements under § 250.43-8 (c) and (d), where a facility has a groundwater and/or leachate monitoring system in place.

(viii) Financial Requirements in lieu of § 250.43-9 as follows:

(A) On the effective date of these regulations, each owner/operator of a facility receiving hazardous waste shall provide a cash deposit equal to the entire amount of the estimated closure costs of the facility in a trust fund designated "in trust for closure of (facility name)". Upon granting of a permit under Subpart E, this fund will be incorporated into the required fund under § 250.43-9(a)(1)(ii). Any excess shall be refunded at that time. Should closure occur prior to permitting under Subpart E, upon completion of all closure requirements provided under this section, any excess funds shall be reimbursed to the owner/operator upon written concurrence by the Regional Administrator.

(B) On the effective date of these regulations, each owner/operator of a disposal facility receiving hazardous waste shall estimate the cost of complying with the post-closure monitoring and maintenance requirements under § 250.43-7, and shall establish a fund in accordance with this estimate in the same manner as is prescribed in § 250.43-9(a)(2)(ii). Upon granting of a permit under Subpart E, this fund will be incorporated into the fund required under § 250.43-9(a)(2)(ii) and the payment rates thereon shall be adjusted as may be appropriate. Should closure occur prior to permitting under Subpart E, reimbursement of post-closure costs shall be in accordance with § 250.43-9(a)(2)(iii).

(C) Regulations under § 250.43-9(a)(3) shall apply during interim status.

(D) If the owner/operator can demonstrate that full compliance with the closure and post-closure financial responsibility requirements of paragraphs (A) and (B) above would render the facility owner/operator insolvent, the Regional Administrator may consider the financial status of the facility to be a mitigating factor, and may enter into a written agreement with the owner/operator for partial compliance with the financial responsibility requirements of this section.

(ix) Standards for Storage requirements under § 250.44(b), (h), and (i).

(x) Storage Container requirements under § 250.44-2(a), (b), (d), (f), and (g).

(xi)0 Standards for Treatment/Disposal requirements under § 250.45(a) and (b).

(xii) Landfill I requirements under § 250.45-2(b) (3, 4, and 5), (c), and (d).

(xiii) Surface Impoundment requirements under § 250.45-3(d) (3, 5, and 6), and (e).

(xiv) Basin requirements under § 250.45-4(h).

(xv) Landfarm requirements under § 250.45-5 (g), and

(xvi) Chemical, Physical, and Biological Treatment Facilities requirements under § 250.45-6(l).

(3) Owners/operators of publicly owned treatment works (POTW) which receive hazardous waste by truck or rail are exempt from all requirements of this Subpart except the requirements of § 250.43-5(a).

(4) Except as otherwise provided in paragraphs (3) and (5), every facility owner/operator shall apply to EPA for an identification code before commencing hazardous waste treatment, storage, or disposal activities in accordance with the procedures of §§ 250.822 and 250.823 in Subpart G.

(5) An owner/operator of a solid waste management facility which only receives hazardous waste from persons subject to § 250.29 in Subpart B is exempt from the requirements of this Subpart.

(6) An owner/operator (1) of any facility treating, storing, or disposing of solid waste which receives waste which is not manifested under Subpart B of this Part, and is not certified under Subpart C as coming from generators covered by § 250.29, and is in a quantity greater than 100 kilograms, and (2) who knows or has reason to believe that the waste is or may be hazardous shall report to the Regional Administrator the names, addresses and identification numbers (if known) of the generator and the transporter of the waste.

(d) The Regional Administrator shall use the requirements of this Subpart as the basis for:

(1) Assessing the equivalency of a State hazardous waste program in making determinations to approve such programs pursuant to Subpart F, and

(2) Issuing, reissuing or revising permits pursuant to Subpart E.

(i) The Regional Administrator shall incorporate each of the applicable requirements of §§ 250.43, 250.44, and 250.45 as conditions in each permit except:

(A) where the Regional Administrator determines that the requirements will not achieve compliance with the requirements of § 250.42, in which case, the Regional Administrator shall substitute and incorporate in the permit more stringent requirements which will achieve compliance with the requirements of § 250.42, or

(B) where the Regional Administrator substitutes and incorporates an alternative requirement in the permit in accordance with paragraph (ii).

(ii) The Regional Administrator may substitute and incorporate an alternative requirement in the permit only if the alternative requirement:

(A) Is authorized by a note immediately following the requirement for which it is to be substituted, and

(B) Provides the same or greater degree of performance as the requirement for which it is to be substituted pursuant to criteria prescribed in the note.

(iii) For permits that the Regional Administrator has issued, he shall use the requirements of this Subpart as a basis for reopening permits for revision and reissuance in accordance with Subpart E, where he has evidence showing that compliance with the requirements of this Subpart.

(3) Bringing enforcement actions against a facility that:

(i) Has a State issued permit or license pursuant to authority under Subpart F, but where there is evidence that compliance with such permit or license will not provide compliance with the standards of this Subpart, or

(ii) Does not have a permit or a pending permit application.

(e) The requirements contained in these regulations do not apply to the following:

(1) Solid or dissolved materials in domestic sewage;

(2) Solid or dissolved materials in irrigation return follows;

(3) Industrial discharges which are point sources subject to permits under Section 402 of the Clean Water Act;

(4) Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954, as amended;

(5) Point source air emissions regulated under the authority of Sections 111 and 112 of the Clean Air Act, as amended;

(6) The disposal of hazardous waste via underground injection pursuant to Safe Drinking Water Act (SDWA) regulations; or

(7) The disposal of hazardous waste via ocean disposal pursuant to Marine Protection, Research, and Sanctuaries Act (MPRSA) regulations.

§ 250.41 Definitions.

(a) When used in this Subpart, the following terms have the meanings given in the Act:

(1) "Administrator"—Sec. 1004(1)
(2) "disposal"—Sec. 1004(3)
(3) "Federal Agency"—Sec. 1004(4)
(4) "hazardous waste management"—Sec. 1004(7)
(5) "open dump"—Sec. 1004(14)
(6) "person"—Sec. 1004(15)
(7) "resource recovery"—Sec. 1004(22)
(8) "sanitary landfill"—Sec. 1004(26)
(9) "sludge"—Sec. 1004(26A)
(10) "solid waste"—Sec. 1004(27)
(11) "solid waste management"—Sec. 1004(28)
(12) "solid waste management facility"—Sec. 1004(29)
(13) "State"—Sec. 1004(31)
(14) "storage"—Sec. 1004(33)
(15) "treatment"—Sec. 1004(34)

(b) Other terms used in this Subpart have the following meanings:

(1) "Act" means the Resource Conservation and Recovery Act of 1976, Public Law 94-580.

(2) "Active Fault Zone" means a land area which, according to the weight of the geologic evidence, has a reasonable probability of being affected by movement along a fault to the extent that a hazardous waste facility would be damaged and thereby pose a threat to human health and the environment.

(3) "Active Portion" means that portion of a facility where treatment, storage, or disposal operations are being conducted. It includes the treated area of a landfarm and the active face of a landfill, but does not include those portions of a facility which have been closed in accordance with the facility closure plan and all applicable closure standards.

(4) "Annular Space" means the space between the bore hole and the casing. A bore hole is the man-made hole in a geological formation for installation of a monitoring well.

(5) "Aquifer" means a geologic formation, group of formations, or part of a formation that is capable of yielding useable quantities of groundwater to wells or springs.

(6) "Attenuation" means any decrease in the maximum concentration or total quantity of an applied chemical or biological constituent in a fixed time or distance traveled resulting from a physical, chemical, and/or biological reaction or transformation occurring in the zone of aeration or zone of saturation.

(7) "Basin" means any uncovered device constructed of artificial materials, used to retain wastes as part of a treatment process, usually with a capacity of less than 100,000 gallons. Examples of basins include open mixing tanks, clarifiers, and open settling tanks.

(8) "Cell" means a portion of waste in a landfill which is isolated horizontally and vertically from other portions of waste in the landfill by means of a soil barrier which meets criteria specified in Section 250.45-2(b) (14).

(9) "Chemical Fixation" means the treatment process involving reactions between the waste and certain chemicals, resulting in solids which encapsulate, immobilize or otherwise tie up hazardous components in the waste so as to minimize the leaching of hazardous components and render the waste nonhazardous or more suitable for disposal.

(10) "Close Out" means the point in time at which facility owners/operators discontinue operation by ceasing to accept hazardous waste for treatment, storage, or disposal.

(11) "Closed Portion" means that portion of a facility which has been closed in accordance with the facility closure plan and all applicable closure requirements in this Subpart.

(12) "Closing Date" means the date which marks the end of a reporting quarter or reporting year.

(13) "Closure" means the act of securing a facility pursuant to the requirements of Section 250.43-7.

(14) "Closure Procedures" means the measures which must be taken to effect closure in accordance with the requirements of Section 250.43-7 by a facility owner/operator who no longer accepts hazardous waste for treatment, storage, or disposal.

(15) "Coastal High Hazard Area" means the area subject to high velocity waters, including, but not limited to, hurricane wave wash or tsunamis as designated on Flood Insurance Rate Maps (FIRM) as zone VI-30.

(16) "Combustion Zone" means that portion of the internal capacity of an incinerator where the gas temperatures of the materials being burned are within 100°C of the specified operating temperature.

(17) "Common Code" means the unique code assigned by the Chemical Abstract Services to each EPA hazardous waste and to each DOT hazardous waste material listed in Section 250.14 of Subpart A.

(18) "Container" means any portable enclosure in which a material can be stored, handled, transported, treated, or disposed.

(19) "Contamination" means the degradation of naturally occurring water, air, or soil quality either directly or indirectly as a result of man's activities.

(20) "Contigency Plan" means an organized, planned, and coordinated course of action to be followed in the event of a fire, explosion, or discharge or release of waste into the environment which has the potential for endangering human health or the environment.

(21) "Cover Material" means soil or other material that is used to cover hazardous waste.

(22) "Delivery Document" means a shipping paper, bill of lading, waybill, dangerous cargo manifest, or other shipping document, used in lieu of the original manifest to fulfill the recordkeeping requirement of § 250.33 of Subpart C.

(23) "Direct Contact" means the physical intersection between the lowest part of a facility (e.g., the bottom of a landfill, a surface impoundment liner system or a natural in-place soil barrier, including leachate detection/removal systems) and a water table, a saturated zone, or an underground drinking water source, or between the active portion of a facility and any navigable water.

(24) "Disposal Facility" means any facility which disposes of hazardous waste.

(25) "Endangerment" means the introduction of a substance into groundwater so as to:

(i) Cause the maximum allowable contaminant levels established in the National Primary Drinking Water standards in effect as of the date of promulgation of this Subpart to be exceeded in the groundwater; or

(ii) Require additional treatment of the groundwater in order not to exceed the maximum contaminant levels established in any promulgated National Primary Drinking Water regulations at the point such water is used for human consumption; or

(iii) Reserved (Note: Upon promulgation of revisions to the Primary Drinking Water Standards and National Secondary Drinking Water Standards under the Safe Drinking Water Act and/or standards for other specific pollutants as may be appropriate).

(26) "EPA" means the U.S. Environmental Protection Agency.

(27) "EPA Region" means the States and other jurisdictions in the ten EPA Regions as follows:

Region I—Maine, Vermont, New Hampshire, Massachusetts, Connecticut, and Rhode Island.
Region II—New York, New Jersey, Commonwealth of Puerto Rico, and the U.S. Virgin Islands.
Region III—Pennsylvania, Delaware, Maryland, West Virginia, Virginia, and the District of Columbia.
Region IV—Kentucky, Tennessee, North Carolina, Mississippi, Alabama, Georgia, South Carolina, and Florida.
Region V—Minnesota, Wisconsin, Illinois, Michigan, Indiana, and Ohio.
Region VI—New Mexico, Oklahoma, Arkansas, Louisiana, and Texas.
Region VII—Nebraska, Kansas, Missouri, and Iowa.
Region VIII—Montana, Wyoming, North Dakota, South Dakota, Utah, and Colorado.
Region IX—California; Nevada, Arizona, Hawaii, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.
Region X—Washington, Oregon, Idaho, and Alaska.

(28) "Facility" means any land and appurtenances, thereon and thereto, used for the treatment, storage, and/or disposal of hazardous waste.

(29) "Fertilizer" means any substance containing one or more recognized plant nutrient(s) which is used for its plant nutrient content, and which is designed for use or claimed to have value in promoting plant growth.

(30) "Final Cover" means cover material that is applied upon closure of a landfill and is permanently exposed at the surface.

(31) "Five-Hundred-Year Flood" means a flood that has a 0.2 percent or one in 500 chance of recurring in any year. In any given 500-year interval, such a flood may not occur, or more than one such flood may occur.

(32) "Flash Point" means the minimum temperature at which a liquid or solid gives off sufficient vapor to form an ignitable vapor-air mixture near the surface of the liquid or solid. An ignitable mixture is one that, when ignited, is capable of the initiation and propagation of flame away from the source of ignition. Propagation of flame means the spread of the flame from layer to layer independent of the source of ignition.

(33) "Food Chain Crops" means tobacco; crops grown for human consumption; or crops grown for pasture, forage or feed grain for animals whose products are consumed by humans.

(34) "Floodplain" means the lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year.

(35) "Freeboard" means the vertical distance between the average maximum level of the surface of waste in a surface impoundment, basin, open tank, or other containment and the top of the dike or sides of an impoundment, basin, open tank, or other containment.

(36) "Fugitive Emissions" means air contaminant emissions which are not planned and emanate from sources other than stacks, ducts, or vents or from non-point emission sources.

(37) "Generator" means any person or Federal Agency whose act or process produces hazardous waste identified or listed under Subpart A; provided, however, that certain producers may or may not be generators depending on whether they meet the criteria specified in Section 250.29 of Subpart B.

(38) "Groundwater" means water in the saturated zone beneath the land surface.

(39) "Hazardous Waste" has the meaning given in Section 1004(5) of the Act as further defined and identified in Subpart A.

(40) "Hazardous Waste Facility Personnel" means all persons who work at a hazardous waste treatment, storage, or disposal facility, and whose actions or failure to act may result in damage to human health or the environment.

(41) "Hazardous Waste Landfill" means an area in which hazardous waste is disposed of in accordance with the requirements of § 250.45-2.

(42) "Hydraulic Gradient" means the change in hydraulic pressure per unit of distance in a given direction.

(43) "Identification Code" means the unique code assigned by EPA to each generator, transporter, and treatment, storage, or disposal facility, pursuant to regulations published in § 250.40(c) herein and Subpart G.

(44) "Incinerator" means an engineered device using controlled flame combustion to thermally degrade hazardous waste. Examples of devices used for incineration include rotary kilns, fluidized beds, liquid injection incinerators, cement kilns, and utility boilers.

(45) "Incompatible Waste" means a waste unsuitable for commingling with another waste or material, because the commingling might result in:

(i) Generation of extreme heat or pressure,

(ii) Fire,

(iii) Explosion or violent reaction,

(iv) Formation of substances which are shock sensitive friction-sensitive, or otherwise have the potential of reacting violently,

(v) Formation of toxic (as defined in Subpart A) dusts, mists, fumes, gases, or other chemicals, and

(vi) Volatilization of ignitable or toxic chemicals due to heat generation, in such a manner that the likelihood of contamination of groundwater, or escape of the substances into the environment, is increased, or

(vii) Any other reactions which might result in not meeting the Air Human Health and Environmental Standard. (See Appendix I for more details.)

(46) "Landfarming of a Waste" means application of waste onto land and/or incorporation into the surface soil, including the use of such waste as a fertilizer or soil conditioner. Synonyms include land application, land cultivation, land irrigation, land spreading, soilfarming, and soil incorporation.

(47) "Leachate" means the liquid that has percolated through or drained from hazardous waste or other man emplaced materials and contains soluble, partially soluble, or miscible components removed from such waste.

(48) "Leachate Collection and Removal System" means a system capable of collecting leachate and/or liquids generated within a hazardous waste landfill, and removing the leachate and/or liquids from the landfill. The system is placed or constructed above the landfill liner system.

(49) "Leachate Detection System" means a gravity flow drainage system installed between the top and bottom liners of a surface impoundment capable of detecting any leachate that passes through the top liner.

(50) "Leachate Detection and Removal System" means a system capable of detecting the presence of leachate and/or liquids beneath the bottom liner system of a landfill, and is capable of periodically removing leachate and/or liquids if found or known to be present.

(51) "Leachate Monitoring System" means a system beneath a facility used to monitor water quality in the unsaturated zone (zone of aeration) as necessary to detect leaks from landfills and surface impoundments. (For example, a pressure-vacuum lysimeter may be used to monitor water quality in the zone of aeration.)

(52) "Liner" means a layer of emplaced materials beneath a surface impoundment or landfill which serves to

restrict the escape of waste or its constituents from the impoundment of landfill.

(53) "Manifest" has the meaning given in Section 1004(12) of the Act as further defined and specified in Subpart B.

(54) "Manifest Document Number" means the serially increasing number assigned to the manifest by the generator for recordkeeping and reporting purposes.

(55) "Monitoring" means all procedures used to systematically inspect and collect data on operational parameters of the facility or on the quality of the air, groundwater, surface water, or soils.

(56) "Monitoring Well" means a well used to obtain water samples for water quality analysis or to measure groundwater levels.

(57) "Navigable Waters" means "waters of the United States, including the territorial seas". This term includes, but is not limited to:

(i) All waters which are presently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide, intermittent streams, and adjacent wetlands. "Wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, prairie potholes, wet meadows, prairie river overflows, mudflats, and natural ponds.

(ii) Tributaries of navigable waters of the United States, including adjacent wetlands;

(iii) Interstate waters, including wetlands; and

(iv) All other waters of the United States, such as intrastate lakes, rivers, streams, mudflats, sandflats, and wetlands, the use, degradation or destruction of which would affect or could affect interstate commerce; including, but not limited to:

(A) Intrastate lakes, rivers, streams, and wetlands which are or could be used by interstate travelers for recreational or other purposes;

(B) Intrastate lakes, rivers, streams, and wetlands from which fish or shellfish are or could be taken and sold in interstate commerce; and

(C) Intrastate lakes, rivers, streams, and wetlands which are used or could be used for industrial purposes by industries in interstate commerce.

(v) All impoundments of waters of the United States otherwise defined as navigable waters under this paragraph.

(58) "Non-Point Source" means a source from which pollutants emanate in an unconfined and unchannelled manner, including, but not limited to, the following:

(i) For non-point sources of water effluent, this includes those sources which are not controllable through permits issued pursuant to Sections 301 and 402 of the Clean Water Act. Non-point source water pollutants are not traceable to a discrete identifiable origin, but result from natural processes, such as nonchannelled run-off, precipitation, drainage, or seepage.

(ii) For non-point sources of air contaminant emissions, this normally includes any landfills, landfarms, surface impoundments, and basins.

(59) "On-site" means on the same or geographically contiguous property. Two or more pieces of property which are geographically contiguous and are divided by public or private right(s)-of-way are considered a single site.

(60) "Open Burning" means the combustion of any material without the following characteristics:

(i) Control of combustion air to maintain adequate temperature for efficient combustion,

(ii) Containment of the combustion-reaction in an enclosed device to provide sufficient residence time and mixing for complete combustion, and

(iii) Emission of the gaseous combustion products through a stack duct or vent adequate for both visual monitoring and point source sampling.

(61) "Owner/Operator" means the person who owns the land on which a facility is located and/or the person who is responsible for the overall operation of the facility.

(62) "Partial Closure Procedures" means the measures which must be taken by facility owners/operators who no longer accept hazardous waste for treatment, storage, or disposal on a specific portion of the site.

(63) "Permitted hazardous waste management facility (or permitted facility)" means a hazardous waste treatment, storage, or disposal facility that has received an EPA permit in accordance with the requirements of Subpart E or a permit from a State authorized in accordance with Subpart F.

(64) "Point Source" means any discernible, confined, and discrete conveyance, including, but not limited to, the following:

(i) For point sources of water effluent, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated feeding operation, vessel, or other floating craft from which pollutants are or may be discharged; and

(ii) For point sources of air contaminant emissions, any stack, duct, or vent from which pollutants are or may be discharged.

(65) "Post-Closure Care" means the monitoring and facility maintenance activities conducted after closure.

(66) "Publicly Owned Treatment Works" or "POTW" means a treatment works as defined in Section 212 of the Clean Water Act (CWA), which is owned by a State or municipality (as defined by Section 502(4) of the CWA). This definition includes any sewers that convey wastewater to such a treatment works, but does not include pipes, sewers, or other conveyances not connected to a facility providing treatment. This term also means the municipality as defined in Section 502(4) of the CWA, which has jurisdiction over the indirect discharges to, and the discharges from, such a treatment works.

(67) "Reactive Hazardous Waste" means hazardous waste defined by § 250.13(c)(1) of Subpart A.

(68) "Recharge Zone" means an area through which water enters an aquifer.

(69) "Regional Administrator" means the Regional Administrator for the Environmental Protection Agency Region in which the facility concerned is located, or his designee.

(70) "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the 100-year flood without cumulatively increasing the water surface elevation more than a designated height.

(71) "Reporting Quarter" means the three (3) month time period covered by each quarterly report; the reporting quarters end on the last day of March, June, September, and December.

(72) "Reporting Year" means the twelve month time period covered by each annual report; the reporting year ends on the last day of September.

(73) "Representative Sample" means a sample having average characteristics of all groundwater in the aquifer beneath the facility.

(74) "Retention Time" means the time hazardous waste is subjected to the combustion zone temperature.

(75) "Run-off" means that portion of precipitation that drains over land as surface flow.

(76) "Saturated Zone (Zone of Saturation)" means that part of the earth's crust in which all voids are filled with water.

(77) "Scavenging" means the unauthorized or uncontrolled removal of hazardous waste materials from a facility.

(78) "Secondary Container" means a storage device into which a container can be placed for the purpose of containing any leakage of hazardous waste from such emplaced container.

(79) "Spill" means any unplanned discharge or release of hazardous waste onto or into the land, air or water.

(80) "Soil Barrier" means a layer of soil of a minimum of 1.5 meters (5 feet) in thickness with a permeability of 1×10^{-7} cm/sec or less which is used in construction of a landfill or a surface impoundment.

(81) "Soil Conditioner" means any substance added to the soil for the purpose of improving the soil's physical properties by increasing water content, increasing water retention, enhancing aggregation, increasing soil aeration, improving permeability, increasing infiltration, or reducing surface crusting.

(82) "Sole Source Aquifers" means those aquifers designated pursuant to Section 1424(e) of the Safe Drinking Water Act of 1974 (Pub. L. 93-523) which solely or principally supply drinking water to a large percentage of a populated area.

(83) "Storage Facility" means any facility which stores hazardous waste, except for generators who store their own waste on-site for less than 90 days for subsequent transport off-site, in accordance with regulations in Subpart B.

(84) "Storage Tank" means any manufactured non-portable covered device used for containing pumpable hazardous waste.

(85) "Surface Impoundment" means a natural topographic depression, artifical excavation, or dike arrangement with the following characteristics: (i) It is used primarily for holding, treatment, or disposal of waste; (ii) it may be constructed above, below, or partially in the ground or in navigable waters (e.g., wetlands); and (iii) it may or may not have a permeable bottom and/or sides. Examples include holding ponds and aeration ponds.

(86) "Training" means formal instruction, supplementing an employee's existing job knowledge, designed to protect human health and the environment via attendance and successful completion of a course of instruction in hazardous waste management procedures, including contingency plan implementation, relevant to those operations connected with the employee's position at the facility.

(87) "Transporter" means a person or Federal Agency engaged in the transportation of hazardous waste by air, rail, highway, or water.

(88) "Treated Area of a Landfarm" means that portion of a landfarm that has had hazardous waste applied to it, to include the zone of incorporation.

(89) "Treatment Facility" means any facility which treats hazardous waste.

(90) "Triple Rinsed" refers to a container which has been flushed three times, each time using a volume of diluent at least equal to ten percent of the container's capacity.

(91) "True Vapor Pressure" means the pressure exerted when a solid and/or liquid is in equilibrium with its own vapor. The vapor pressure is a function of the substance and of the temperature.

(92) "24-hour, 25-year Storm" means a storm of 24-hour duration with a probable recurrence interval of once in twenty-five years as defined by the National Weather Service in Technical Paper Number 40, "Rainfall Frequency Atlas of the United States", May 1961, and subsequent amendments, or equivalent regional or State rainfall probability information developed therefrom.

(93) "Unsaturated Zone (Zone of Aeration)" means the zone between the land surface and the nearest saturated zone, in which the interstices are occupied partially by air.

(94) "United States" means the 50 States, District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.

(95) "Underground Drinking Water Source" (UDWS) means:

(i) An aquifer supplying drinking water for human consumption, or

(ii) An aquifer in which the groundwater contains less than 10,000 mg/1 total dissolved solids; or

(iii) An aquifer designated as such by the Administrator or a State.

(96) "Underground Non-Drinking Water Source" means an underground aquifer which is not a UDWS.

(97) "Vapor Recovery System" means a vapor gathering system capable of collecting vapors and discharged gases and a vapor processing system capable of processing such vapors and gases so as to prevent emission of contaminants to the atmosphere.

(98) "Volatile Waste" means waste with a true vapor pressure of greater than 78 mm Hg at 25° C.

(99) "Water Table" means the upper surface of the zone of saturation in groundwaters in which the hydrostatic pressure is equal to atmospheric pressure.

(100) "Wetlands" means those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances do or would support, a prevalence of vegetation typically adapted for life in saturated or seasonally saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas, such as sloughs, potholes, wet meadows, river outflows, mudflats, and natural ponds.

(101) "Zone of Incorporation" means the depth to which the soil on a landfarm is plowed or tilled to receive waste.

§ 250.42 Human health and environmental standards.

§ 250.42-1 Groundwater human health and environmental standard.

All facilities shall be located, designed, constructed, and operated in such a manner as to prevent:

(a) Endangerment of an Underground Drinking Water Source beyond the facility property boundary, or

(b) Endangerment of an aquifer which is designated as a sole or principal source aquifer according to Section 1424(e) of the Safe Drinking Water Act of 1974 (Pub. L. 93-523, 88 Stat. 1661, 1678, 42 U.S.C. 300f, 300h-3(e)).

§ 250.42-2 Surface water human health and environmental standard.

All facilities shall be located, designed, constructed, and operated in such a manner as to prevent any surface or sub-surface discharge from the facility into navigable waters from causing a violation of Water Quality Standards promulgated or approved under Section 303 of the Clean Water Act, or a violation of the controls on the discharge of oil or hazardous substances under Section 311 of the Clean Water Act.

§ 250.42-3 Air human health and environmental standard.

All facilities shall be located, designed, constructed, and operated in such a manner as to prevent air emissions from such facilities from causing a violation of standards or regulations promulgated pursuant to Sections 110, 111, and 112 of the Clean Air Act.

§ 250.43 General facility standards.

(a) All facilities with point source discharges to navigable waters, including discharges from leachate collection systems and/or surface water run-off collection systems, shall comply with all applicable regulations promulgated under the Clean Water Act (Pub. L. 92-500, as amended by Pub. L. 95-217). Additionally, facilities with discharges to municipal sewer systems shall meet applicable Clean Water Act pretreatment standards and have the approval of the municipal treatment system authority for that discharge.

(b) Diversion structures to divert all surface water run-off from the active portions of a facility for the 24-hour, 25-year storm shall be constructed, properly maintained and operated.

NOTE.—Owners/operators do not need to construct such diversion structures if they can demonstrate, at the time a permit is issued under Subpart E, that surface water run-off will not enter the facility and come into contact with the hazardous waste.

(c) Surface water run-off up to the quantity anticipated from a 24-hour, 25-year storm from active portions of a facility shall be collected and confined to a point source before discharge or treatment, as may be required by regulations promulgated under the Clean Water Act (Pub. L. 92-500, as amended by Pub. L. 95-217).

NOTE.—Owners/operators do not have to collect and confine surface water run-off from active portions of a facility if they can demonstrate that alternative non-point source control procedures will provide the same or greater degree of protection from surface water or groundwater pollution.

(d) Owners/operators shall not allow open burning of hazardous waste.

NOTE.—Open burning of hazardous waste may be permitted provided that the owner/operator can demonstrate that alternative treatment and disposal methods, including recycling or salvaging of materials, have been evaluated and determined to be technically or economically infeasible, or that the transport, treatment, and disposal of such waste poses a greater risk to human health or the environment than open burning.

(e) Any person who generates or removes a hazardous waste from a facility shall comply with the requirements of Subpart B.

(f) All owners/operators shall obtain a detailed chemical and physical analysis of each hazardous waste handled at the facility at the time of initiating management of the hazardous waste. This analysis shall identify the hazardous characteristics of the waste which must be known to enable the owner/operator to comply with the requirements of this Subpart, or with the conditions of a permit issued under the provisions of Subpart E.

NOTE.—The chemical and physical analysis may be limited based upon the method of treatment, storage, and/or disposal, and upon existing available evidence regarding the waste's composition.

(g) The detailed analysis of each waste stream shall be obtained or repeated as necessary by the owner/operator. (For example, a minimal analysis (pursuant to paragraph (h) below) of the waste might indicate a change in the waste stream characteristics, or the owner/operator might become aware of a modification in the manufacturing process generating the waste). The detailed waste sampling frequency shall be no less than annually.

(h) All owners/operators shall sample each truckload or other shipment or batch of hazardous waste, designated for treatment, storage, or disposal at the facility. Each sample, at a minimum, shall be analyzed for the following properties:

(i) Physical appearance, such as color and physical state (e.g., liquid, solid, semi-solid)

(ii) Specific gravity

(iii) pH

(iv) Vapor pressure, if applicable.

NOTE.—In the case of on-site facilities, less frequent sampling and analysis may be allowed if the owner/operator can demonstrate that no loss in control over facility operations will occur.

(i) Owners/operators shall close, in accordance with the requirements of § 250.43-7, all portions of a facility which does not comply with the applicable requirements of this Subpart.

(j) All owners/operators shall comply with applicable requirements of State Water Quality Management Plans approved by the Administrator under Section 208 of the Clean Water Act (Pub. L. 92-500, as amended by Pub. L. 95-217).

(k) Non-point source discharges from facilities into navigable waters shall not cause or contribute to the violation of water quality standards promulgated or approved under Section 303 of the Clean Water Act (pub. L. 92-500, as amended by Pub. L. 95-217).

§ 250.43-1 General site selection.

(a) Facilities shall not be located in an active fault zone.

(b) In accordance with Executive Order 11988, "Floodplain Management", a facility shall not be located in a "regulatory floodway" as adopted by communities participating in the National Flood Insurance Program (NFIP) managed by the Federal Insurance Administration (FIA) of the U.S. Department of Housing and Urban Development. In cases where regulatory floodways have not been designated by the FIA, the owner/operator shall obtain an analysis, using FIA-approved methods, to determine whether the facility is located within a non-regulatory floodway (i.e., a floodway which is currently not regulated by the FIA). A facility shall not be located in an area determined by the analysis to be a regulatory floodway.

(c) In accordance with Executive Order 11988, "Floodplain Management", a facility shall not be located in a "coastal high hazard area" as defined on a Flood Insurance Rate Map (FIRM) by the FIA. In cases where a coastal high hazard area has not been designated by the FIA, the facility owner/operator shall obtain an analysis, using FIA-approved methods, to determine whether the facility is located within a coastal high hazard area. A facility shall not be located in an area determined by the analysis to be a coastal high hazard area.

NOTE.—A facility may be located in a coastal high hazard area if it can be demonstrated that the facility is designed, constructed, operated and maintained so that the facility will not be inundated by high velocity waters, including but not limited to hurricane wave wash or tsunamis, designated on Flood Insurance Maps as zone VI-30.

(d) In accordance with Executive Order 11988, "Floodplain Management", a facility shall not be located in a 500-year floodplain.

NOTE.—A facility may be located in a 500-year floodplain if it can be demonstrated, at the time a permit is issued pursuant to Subpart E, that the facility is designed, constructed, operated, and maintained so that it will not be inundated by a 500-year flood.

(e) In accordance with Executive Order 11990, "Protection of Wetlands", a facility shall not be located in a wetland.

NOTE.—A facility may be located in wetlands if:

(1) The owner/operator obtains a National Pollutant Discharge Elimination System permit under Section 402 of the Clean Water Act (Pub. L. 92-500, as amended by Pub. L. 95-217, 33 U.S.C. 1251 et seq.), and,

(2) In the case where dredging or filling of the wetland is directly associated with the facility, the owner/operator obtains a permit issued under authority of Section 404 of the Clean Water Act (Pub. L. 92-500, as amended by Pub. L. 95-217, 33 U.S.C. 1251 et seq.).

(f) A facility shall not be located so as to be likely to jeopardize the continued existence of Endangered and Threatened Species as listed pursuant to the Endangered Species Act of 1973 (16 U.S.C., 1530 et seq.) in 50 CFR; nor result in the destriction or adverse modification of their Critical Habitat as contained in 50 CFR Part 17, Subpart F: Critical Hibitat, 1760 et seq.

NOTE.—A facility may be located in a Critical Habitat area if, after consultation with the Office of Endangered Species, U.S. Fish and Wildlife Service, Department of the Interior, it can be demonstrated that, at the time a permit is issued pursuant to Subpart E, the treatment, storage, and/or disposal operations carried out by the facility will not jeopardize the continued existence of Endangered and Threatened Species located within the Critical Habitat areas listed in 50 CFR Part 17.

(g) A facility shall not be located in the recharge zone of a sole source aquifer designated pursuant to Section 1424(e) of the Safe Drinking Water Act (Pub. L. 93-523).

NOTE.—A facility may be located in the recharge zone of a sole source aquifer if it can be demonstrated, at the time a permit is issued pursuant to Subpart E, that the facility is located, designed, constructed, operated, maintained, and monitored to prevent endangerment of the sole source aquifer.

(h) Active portions of a facility shall be located a minimum of 60 meters (200 feet) from the property line of the facility.

NOTE.—Facility owners/operators may locate active portions of their facilities closer than 60 meters (200 feet) from their property line if it can be demonstrated that unexpected releases or discharges of hazard-

ous waste resulting from fires, explosions, spills, and underground leaks can be controlled before they cross the facility property boundary.

§ 250.43-2 Security.

(a) A facility shall have a 2 meter (6 foot) fence completely surrounding the active portion of the facility capable of preventing the unknowing and/or unauthorized entry of persons and domestic livestock.

NOTE.—A facility does not have to have a 2 meter (6 foot) fence surrounding the active portion of the facility if it can be demonstrated, at the time a permit is issued pursuant to Subpart E, that the active portion of the facility is surrounded by a natural or artificial barrier capable of preventing the unknowing and/or unauthorized entry of persons and domestic livestock.

(b) Ingress through each gate or other access on to the active portion of the facility shall be controlled by an attendant, or a mechanical or an electromechanical device, whenever the facility is in operation (e.g., security personnel, key cards, or television monitors). Each gate or other access shall be secured to prevent ingress whenever the facility is not in operation.

(c) A sign, in the English language and in any other predominant language of the area surrounding the facility (e.g., facilities in States bordering Mexico and Canada shall have signs posted in Spanish and French, respectively), having the following legend—WARNING—Unauthorized Personnel Keep Out—shall be posted at each access to the active portions of the facility. The sign shall consist of block letters not less than four (4) inches in height. The letters shall be of a color offering high contrast with the background color of the sign.

NOTE.—A facility may deviate from the specified four (4) inch block letters and legend of the sign provided that it can be demonstrated that an alternative legible and clearly visible sign, warning against unauthorized entry, is posted at each access point to the active portion(s) of a facility, or it can be demonstrated that such precautionary measures are not needed because of the particular operation of and the waste handled at the facility.

§ 250.43-3 Contingency plan and emergency procedures.

(a) Contingency plan: (1) The owner/operator shall develop a contingency plan for each facility so as to prevent or minimize human health or environmental damage in the event of a discharge or release of hazardous waste. The provisions of the plan shall, as a minimum, follow the provisions of the Section 311 Spill Prevention, Control, and Countermeasures Plan (SPCC) of the Clean Water Act. The provisions of the plan shall be implemented immediately in the event of a discharge or release of hazardous waste from the facility.

(2) A copy of the contingency plan shall be filed with the Regional Administrator and with all local police departments, fire departments, hospitals and emergency response teams who may be called upon to provide emergency services. Where a permit is issued by EPA under Subpart E, the contingency plan shall be submitted to the Regional Administrator as part of the permit application and shall become a condition of any permit issued. Amendments to the plan due to changes in the facility design, construction, operation, or maintenance which materially increase the potential for discharges of hazardous waste shall be reported immediately, in writing, to the aforementioned parties having copies of the plan. The plan shall be revised in cases of changed circumstances, changed regulations, and failure of the plan to be adequate in an emergency.

(3) The plan shall describe arrangements made with local police departments, fire departments, hospitals, and emergency response teams to coordinate emergency services. These arrangements shall include:

(i) Familiarization of police, fire departments, and emergency response teams with layout of and waste handled at the facility, and associated hazards, places where facility personnel would normally be working, entrances to and roads inside the facility and possible evacuation routes; and

(ii) Where necessary, agreements designating primary emergency authority to one police and one fire department jurisdiction in the event that more than one might respond to the emergency, and agreements with any others to provide support to the primary emergency authority.

NOTE.—Arrangements need not be made with local police agencies, fire departments, hospitals, and emergency response teams if the owner/operator can demonstrate that hazards do not exist at the facility which necessitate the services of the above mentioned organizations.

(4) At all times when the facility is in operation, there shall be at least one person present with the responsibility of coordinating all emergency response measures. This facility emergency coordinator shall be thoroughly familiar with all aspects of the facility's contingency plan, all operations activities at the facility, the location and characteristics of waste handled, the location of manifests within the facility, and the facility layout. (The emergency coordinator's responsibilities are more fully spelled out in § 250.43-3(c).)

(5) The names, addresses, and phone numbers (office and home) of all persons qualified to act as facility emergency coordinators under paragraph (a)(4) shall be listed in the contingency plan.

(6) The plan shall include a list, physical description, and description of the capabilities of all emergency equipment at the facility, including fire extinguishing systems, spill control equipment, alarms (internal and external), and decontamination equipment.

(7) The plan shall include an evacuation plan for facility personnel and shall outline evacuation routes, signal(s) to be used to begin evacuation, and alternate evacuation routes if the primary routes potentially can be blocked by discharges of hazardous waste and fires.

(8) The plan shall include an outline of a program for familiarizing employees with emergency procedures, emergency equipment, and emergency systems, to include the following:

(i) Alarm signal, shutdown of operations, evacuation, and drills on these procedures.

(ii) Key parameters for incinerator automatic waste feed cut-off as prescribed in § 250.45-1(b)(4); and

(iii) Procedures for repair and replacement of facility monitoring equipment.

(b) *Preparedness and prevention.*

(1) Facilities shall be designed, operated, and constructed so that the likelihood of a discharge, fire, or explosion harmful to human health or the environment is minimized.

(2) All facilities subject to EPA's oil and hazardous substances pollution prevention regulations shall have, as a minimum, a valid SPCC Plan as required by regulations issued pursuant to Section 311 of the Clean Water Act (CWA).

(3) All facilities shall be equipped with the following: (i) An alarm, a telephone (immediately available at the scene of operations), a hand-held two-way radio, or similar device capable of summoning external emergency assistance (i.e., local police departments, fire departments, and emergency response teams).

NOTE.—An alarm, telephone, or two-way radio is not needed if the owner/operator can demonstrate that hazards at the facility requiring external emergency assistance do not exist.

(ii) An internal communications system capable of providing immediate emergency instruction (voice or signal) to facility employees.

(4) At any time that hazardous waste is being poured, mixed, spread, or otherwise handled, all employees involved in the operation shall have immediate access to an internal or external alarm or emergency communication device, either directly or through visual or voice contact with another employee. If at any time

during operation of the facility there is a sole employee on the premises, he shall have immediate access to an alarm, telephone (immediately available at the scene of operation), handheld two-way radio, or similar device capable of summoning external emergency assistance.

(5) A facility shall have the following:

(i) Portable fire extinguishers, fire control equipment, spill control equipment, and decontamination equipment;

(ii) Water at adequate volume and pressure to supply water hose streams, foam producing equipment, automatic sprinklers, or water spray systems; and

(iii) Special extinguishing equipment, such as that utilizing foam inert gas, or dry chemical.

NOTE.—Fire extinguishing equipment, fire control equipment, is not needed if the owner/operator can demonstrate that hazards at the facility which necessitate the need for such equipment do not exist.

(6) All facility fire protection equipment, spill control equipment, and decontamination equipment shall be tested, inspected, and maintained in satisfactory operating condition to serve its purpose in time of emergency.

(7) Aisle space shall be maintained for unobstructed movement of personnel, and maintained so that fire protection equipment, spill control equipment, and decontamination equipment can be brought to bear on any area of facility operation in time of emergency.

NOTE.—Aisle space need not be maintained for unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment if the owner/operator can demonstrate that the aisle space is not necessary for the movement of personnel and it is not necessary to bring in fire protection equipment, spill control equipment, and decontamination equipment.

(8) Precautions shall be taken to prevent accidental ignition of ignitable materials. Sources of ignition, including but not limited to open flames; lightning; smoking; cutting and welding; hot surfaces; frictional heat; static, electrical, and mechanical sparks, spontaneous ignition, including heat-producing chemical reactions; and radiant heat, shall be eliminated or ignitable materials protected from such sources of ignition.

(9) While ignitable or reactive waste is being handled, smoking shall not be permitted and no one near the waste shall possess an open flame. Smoking and open flame shall be prohibited at the facility except in designated localities. "No Smoking" signs shall be conspicuously posted where hazard from ignitable or reactive waste is normally present.

(c) *Response and recovery.* (1) In the event that a facility has a discharge or release of hazardous waste, a fire, or an explosion which has the potential for damaging human health or the environment, the facility's emergency coordinator shall telephone the United States Coast Guard National Response Center's twenty-four (24) hour toll free number, 800-424-8802, or the Government official designated in the applicable regional contingency plan pursuant to 40 CFR 1510 as the on-scene coordinator for that geographic area, to report such an incident immediately after discovering it and adhere to the requirements of Section 250.37 in Subpart C for reporting.

(2) Where applicable, the facility's emergency coordinator shall activate internal facility alarms or communication systems to notify all personnel of an imminent or actual emergency situation.

(3) The facility's emergency coordinator shall notify appropriate agencies with designated response roles immediately if an emergency at the facility presents a potential threat to local populated areas, or if their assistance is necessary.

(4) The facility's emergency coordinator shall notify appropriate local authorities immediately if his assessment indicates that evacuation of local areas may be advisable. The emergency coordinator shall be prepared to assist authorities in making the final determination as to whether evacuation is necessary.

(5) In the event of a discharge, the facility's emergency coordinator shall identify the character, exact source, volume, and extent of the discharged materials by review of facility records and manifests, and if necessary, by chemical analysis.

(6) The facility's emergency coordinator shall assess possible hazards to local communities associated with a discharge. This assessment shall include consideration of indirect effects, such as toxic, irritating, or asphyxiating gases, hazardous surface run-off due to water or chemical agents used to control fire, and heat-induced explosions.

(7) The facility's emergency coordinator, in cooperation with appropriate Federal, State, and local officials, shall determine what actions should be taken to mitigate damage or injury to the community and its residents. This determination shall indicate whether:

(i) Local communities may have been exposed to a hazardous substance; and

(ii) Evacuation of local populated areas should be initiated because of imminent danger (i.e., from toxic combustion products, ignitable or explosive vapors, threatened explosions, etc.).

(8) The facility's emergency coordinator shall take all reasonable measures necessary to ensure that fires and explosions do not re-occur and do not spread to other hazardous waste at the facility. These shall include, where applicable, cessation of processes and operations, collection and containment of discharged waste, removal or isolation of containers, etc.

(9) The facility's emergency coordinator shall provide for treatment, storage, or disposal or recovered waste, contaminated soil, or material resulting from an accident at the facility. The recovered waste, contaminated soil, or contaminated material shall be analyzed to determine whether it is a hazardous waste, or assumed to be a hazardous waste.

(10) The facility's emergency coordinator shall ensure that no waste which may be incompatible with the released material is accepted for treatment, storage, or disposal at the facility until clean-up procedures are completed, emergency equipment restored to pre-accident condition, and the affected area is declared safe by EPA, State, or local officials.

(11) Where applicable, the facility's emergency coordinator shall, subsequent to shut-down of operations in response to a discharge, fire, or explosion, monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment.

(12) The facility's emergency coordinator shall ensure that all emergency equipment specified in the plan, including vehicles, pumps, and temporary storage containers, are cleaned and restored to pre-accident condition before operations are resumed.

(13) The facility's emergency coordinator shall record the time, date, and nature of the emergency, and convey a preliminary report with this and any other pertinent information on the emergency to the Regional Administrator, as required in § 250.43-5(c)(1) of this Subpart.

§ 250.43-4 Training.

(a) Within six (6) months after the effective date of these regulations, or after the date of employment, whichever is later, personnel at new and existing facilities shall have attended and successfully completed a course of instruction or shall have deomonstrated a sufficient degree of competence in hazardous waste management procedures relevant to the position in which they are employed.

(b) Owners/operatores of facilities shall:

(1) Maintain the following records and make them available to the Regional Administrator upon request:

(i) A list of the job titles of all positions at the facility related to hazardous waste management;

(ii) A written job description for each position listed under paragraph (b)(1)(i) which shall include the requisite skill, education, responsibilities, and duties related to each position;

(iii) A written description of the type and quantity of introductory and continuing training that will be administered to each person filling a position listed under paragraph (b)(1)(i);

(iv) Records that document that the training required under paragraph (a) has been administered to facility personnel;

(2) Have their personnel trained in contingency procedures as prescribed in the facility's contingency plan required under § 250.43-3, and

(3) Have their personnel take part in an annual review and update of their initial training in contingency procedures and other hazardous waste management procedures relevant to those operations at which they are employed.

§ 250.43-5 Manifest system, recordkeeping, and reporting.

(a) *Manifest system.* An owner/operator of a facility which receives hazardous waste accompanied by a manifest or a delivery document shall:

(1) Provide at least one (1) copy of the manifest or delivery document, after it has been signed and dated by an authorized representative of the facility, to the transporter as certification of receipt of the shipment covered by the manifest or delivery document.

(2) Forward, within thirty (30) days, the original copy of the manifest or delivery document, after it has been signed and dated by an authorized representative of the facility, to the generator as certification of receipt of the shipment covered by the manifest or delivery document.

(3) Acknowledge each individual shipment received; when a single manifest is used for multiple shipments as described in § 250.22(f) of Subpart B, by initialling each shipment, and then complying with paragraph (a)(2).

(4) Indicate, in the comments section of the manifest or delivery document, discrepancies, such as differences between the type and/or quantity of hazardous waste designated on the manifest or delivery document, and the type and/or quantity of hazardous waste actually received. The owner/operator shall notify the Regional Administrator immediately when such discrepancies are discovered by forwarding a copy of the manifest or delivery document to the Regional Administrator.

(b) *Recordkeeping.* (1) An owner/operator of a facility shall keep an operating log. This log shall, at all reasonable times, be open for inspection by any duly designated employee or agent of EPA.

(2) The following information shall be recorded promptly, as it becomes available, and maintained in the operating log until closure of the facility:

(i) A record of each hazardous waste treated, stored, or disposed of at the facility to include the following:

(A) A description of each hazardous waste by its U.S. Department of Transportation (DOT) proper shipping name (40 CFR 172), or by the U.S. Environmental Protection Agency (EPA) name (as listed in § 250.14 of Subpart A), if the DOT proper shipping name is not applicable. However, if the DOT proper shipping name "NOT OTHERWISE SPECIFIED" (NOS) is used, the EPA name must also be designated on records after the DOT proper shipping name NOS;

(B) The DOT hazard class of each waste (as identified in 49 CFR 172), or the EPA characteristic(s) or property (as identified or listed in §§ 250.13 or 250.14 of Subpart A) if the DOT hazard class is not applicable. However, if the DOT hazard class "OTHER REGULATED MATERIALS" (ORM) is used, the EPA characteristics or property (as identified or listed in §§ 250.13 or 250.14 of Subpart A) must also be designated on records after the DOT hazard class ORM;

(C) The quantity (in units of volume or weight of pounds (P), tons (T), gallons (G), or cubic yards (CY)) of each hazardous waste treated, stored, or disposed; the method of treatment, storage, and disposal used for each hazardous waste; and the dates of treatment, storage, and disposal of each hazardous waste.

(ii) Locations, with respect to permanently surveyed benchmarks, where each type of waste is stored or disposed. The location of wastes in landfills shall be recorded as specified in § 250.45-2(b)(3) and in surface impoundments as specified in § 250.45-3(d)(3).

(iii) Waste analyses, as specified in § 250.43 (f), (g), and (h);

(iv) Monitoring data, as required in § 250.43-8;

(v) Summary reports and records of all incidents requiring initiation of a contingency plan, or resulting in human health or environmental damage;

(iv) Records or results of visual inspections as required by § 250.43-6(b).

(3) Records required under paragraphs (b)(2) (i) and (ii) above specifying the location and types of disposed wastes shall be turned over to the Regional Administrator upon closure of the facility.

(4) Records of operating conditions (temperature, pressure, residue time, feed rate, etc.) as required in § 250.45 shall be maintained for a period of three (3) years.

(5) Training records required under § 250.43-4(b)(1) (i)-(iii) shall be maintained until closure of the facility. Training records required under § 250.43-4(b)(1)(iv) shall be retained for a period of three (3) years; but employee training records may accompany personnel transferred within the same company.

(6) An owner/operator of a facility accepting deliveries of hazardous waste from off-site sources for treatment, storage, or disposal shall retain for a period of three (3) years a copy of each manifest or delivery document as certified by the generator, transporter, and owner/operator of the facility.

(c) *Reporting.* (1) An owner/operator of a facility shall comply with the requirements under § 250.43-3(c)(1) in reporting incidents such as fires, explosions, and discharges or releases of hazardous materials into the environment which have the potential for damaging human health or the environment.

(2) An owner/operator of a facility shall report to the Regional Administrator monitoring data as required in § 250.43-8(c)(4) and (d)(1).

(3) An owner/operator of a facility shall notify the Regional Administrator prior to cessation of treatment, storage, and/or disposal operations, or prior to final facility closure as specified in § 250.43-7.

(4) Owners/operators of facilities which treat, store, or dispose of hazardous waste on the site of waste generation shall comply with the reporting requirements of § 250.23(d) and (e) of Subpart B.

(5) An owner/operator of a facility which receives hazardous waste for treatment, storage, or disposal shall:

(i) Prepare an annual report summarizing the information from all manifests or delivery documents for shipments of hazardous waste certified as received during the reporting year;

(ii) Send the annual report within four (4) weeks after the closing date of the reporting year to the Regional Administrator;

(iii) Include in the annual report the following information (see Figure 1 for the report form);

(A) The identification code, name, and address of the facility;

(B) The closing date of the reporting year;

(C) The identification code of each hazardous waste generator from which a hazardous waste was received during the reporting year; for international shipments, the name and address of the generator shall be designated;

(D) The name and common code as they appear on the manifest under "shipping description" of each hazard-

ous waste which was received from each hazardous waste generator;

(E) The quantity of each hazardous waste received from each generator;

(F) The units of volume or weight of each quantity of hazardous waste in pounds (P), tons (T), gallons (G), or cubic yards (CY);

(G) The method of treatment, storage, or disposal for each hazardous waste; and

(H) A certification which reads: "I have personally examined and am familiar with the information submitted in this certification, and I hereby certify under penalty of law that this information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment." An authorized representative of the owner/operator of the facility shall sign and date the certification.

(6) An owner/operator of a facility which receives one or more deliveries of hazardous waste which is not accompanied by a manifest or delivery document, except where a manifest or delivery document is not required because of the generator exemptions in § 250.29 of Subpart B, shall submit a quarterly report of all such shipments of hazardous waste to the Regional Administrator. The quarterly report shall include the following information (see Figure 1 for the report form):

(i) The identification code, name, and address of the facility;

The closing date of the reporting quarter:

(iii) The word "unmanifested" under the column entitled Manifest Document Number on the report form;

(iv) The name and address of the generator, if known, or the transporter;

(v) The name and common code of the hazardous waste (under "shipping description"), by its Department of Transportation (DOT) proper shipping name (49 CFR 172), or by the U.S. Environmental Protection Agency (EPA) name (as listed in § 250.14 of Subpart A) if the DOT proper shipping name is not applicable. However, if the DOT proper shipping name "NOT OTHERWISE SPECIFIED" (NOS) is used, the EPA name and common code (as listed in § 250.14 of Subpart A) must also be designated on the manifest after the DOT proper shipping name NOS;

(vi) The quantity of each hazardous waste received;

(vii) The units of volume or weight of each quantity of hazardous waste in pounds (P), tons (T), gallons (G), or cubic yards (CY);

(viii) A certification which reads: "I have personally examined and am familiar with the information submitted in this certification, and I hereby certify under penalty of law that this information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment," and shall certify the information on the report by having an authorized representative of the owner/operator of the facility sign and date the certification; and

(ix) A brief explanation of why the shipment was unmanifested, if known, in the comments section of the report form.

§ 250.43-6 Visual inspections.

(a) An owner/operator of a facility, at least once each day, shall visually inspect the following:

(1) Storage areas for rust, corrosion, cracks in storage devices, missing or improper labels, and spills;

(2) Dikes for possible damage or structural weakening and drainage systems for possible stoppage;

(3) Operating and monitoring equipment and readings to ensure normal operation and readings;

(4) Emergency response equipment to ensure that it meets the requirements specified in § 250.43-4 (1)(4);

(5) Fences or barriers surrounding the facility for possible damage;

(6) Vegetation on or around the facility for possible damage; and

(7) The active portion of the facility for fugitive air emissions.

NOTE.—Visual inspections for certain aspects of facility operations may be conducted less frequently than daily if the facility owner/operator can demonstrate that lesser requirements would still provide adequate protection of human health and the environment.

(b) The observations made in each visual inspections shall be recorded in the facility's daily operating log.

§ 250.43-7 Closure and post-closure.

(a) In addition to complying with the requirements of this Section, an owner/operator of a facility shall also comply with the applicable Financial Requirements in Section 250.43-9.

(b) An owner/operator of a facility from which hazardous waste will not be removed and will remain in the facility after closure (e.g., a landfill) shall record in the deed of the property on which the facility is located a stipulation that use of the property by the owner/operator or any future owner of the property after closure shall be conducted in a manner to prevent disturbance of the integrity of the final cover, the liner or the monitoring systems of the facility.

(c) The owner/operator of a facility shall submit a closure plan to the Regional Administrator prior to beginning treatment, storage and/or disposal operations or at the time of and as part of the application for a permit pursuant to Subpart E. The closure plan shall include, but not be limited to:

(1) A description of how the facility shall be closed.

(2) A description of possible uses of the land after closure.

(3) The anticipated time until close-out, the estimated time(s) required for closure and any anticipated partial closures.

(d) An owner/operator of a facility other than a landfill shall notify the Regional Administrator:

(1) Of intent to close-out the facility at least 15 days before close-out; and

(2) Of completion of closure at least 90 days before closure.

(e) An owner/operator of a landfill facility shall notify the Regional Administrator:

(1) Of intent to partially close the facility (i.e., close a portion of the facility) at least 15 days before partial closure;

(2) Of intent to close-out the facility at least 15 days before close-out; and

(3) Of completion of closure at least 180 days before closure.

(f) Within 90 days after close-out, all disposal operations shall be completed and all hazardous waste shall be removed from storage and treatment operations and disposed of in accordance with requirements in Subparts B, C, and D.

(g) Closure shall be completed within 3 years after close-out.

(h) At completion of closure, all equipment used in the operation shall be properly disposed of or decontaminated by removal of all hazardous waste and residues.

(i) At completion of closure, all facilities shall be secured so that humans or animal life cannot come into contact with hazardous waste, and so that discharges of waste harmful to human health or the environment will not occur.

(j) At completion of closure, all required equipment shall be provided and arrangements shall be made to continue post-closure monitoring as required in paragraph (m)(1)(i) at landfills, and other facilities where hazardous waste has not been removed as part of closure.

(k) At completion of closure, and again upon completion of post-closure care (in the case of a landfill and other facilities where hazardous waste is not removed as part of closure), the owner/operator shall submit to the Regional Administrator certification by the owner/operator and certification by a registered professional engineer that the facility has been closed in accordance with the requirements of this Subpart.

(l) Within 180 days after completion of closure, the owner/operator of a landfill or other facility, where haz-

ardous waste is not removed as part of closure, shall file with the local land authority and the Regional Administrator, a survey plat, certified by a registered professional land surveyor, indicating the type and location of hazardous waste disposed of in the facility.

(m) An owner/operator of a landfill or other facility where hazardous waste is not removed as part of closure shall provide post-closure care for a period of at least 20 years from the date of closure.

NOTE.—The owner or operator may request that, at the discretion of the Regional Administrator, a determination be made of whether some or all post-closure requirements may be discontinued earlier than 20 years after closure. The facility owner or operator shall bring forth evidence showing why post-closure care need not continue, i.e., no leaks have been detected, advanced technology was used, alternate disposal techniques were employed, etc.

(n) Post-closure care shall consist of at least the following:

(1) Monitoring and reporting of in accordance with the requirements of § 250.43-8(c) (2, 3 and 4) and (d) (1 and 2).

(2) Maintenance of facility security and waste containment devices.

(o) If the owner/operator of a facility transfers the ownership or operation of the facility during the 20-year post-closure care period, the new owner/operator shall comply with the requirements of this Section.

§ 250.43-8 Groundwater and leachate monitoring.

An owner/operator of a landfill or surface impoundment facility shall install, maintain and operate a Groundwater Monitoring System and a Leachate Monitoring System as specified in this Section and shall comply with the Sampling and Analysis and the Recordkeeping and Reporting requirements of this Section.

(a) *Groundwater monitoring system.* (1) A Groundwater Monitoring System shall consist of a minimum of four (4) monitoring wells meeting the following specifications:

(i) At least one well shall be located in an area hydraulically upgradient from the active portion of the facility so as to yield samples representative of the background quality of the groundwater which flows under the facility.

(ii) A minimum of three (3) monitoring wells shall be installed hydraulically downgradient of the active portion of the facility and shall be sunk to different depths in order to detect any leachate which has migrated into groundwater(s) underlying the facility property. Each well shall be constructed to draw samples from the depths where the facility owner/operator can demonstrate that contamination is most likely to occur.

(iii) At least one of the three (3) wells specified in (ii) shall be located immediately adjacent to the active portion of the facility. The other wells shall be located within the property line of the facility to provide the greatest opportunity for interception of any leachate that migrates into groundwater(s) underlying the facility.

(2) All monitoring wells shall be cased, and the annular space shall be backfilled with an impermeable material in order to prevent surface water from entering the well bore and interaquifer water exchange.

NOTE.—A Groundwater Monitoring System shall not be required or a lesser degree of groundwater monitoring may be utilized, if the owner/operator can demonstrate, at the time a permit is issued under Subpart E, that the geologic and hydrologic conditions underlying the facility indicate no potential for discharge to groundwater. Wells may be sunk to draw samples at a single depth if it can be demonstrated by the facility owner/operator that it is the depth where contamination is likely to occur.

(b) *Leachate monitoring system.* (1) A Leachate Monitoring System shall be installed within the zone of aeration underlying the facility without drilling through the bottom and side liners or soil barriers of the landfill or surface impoundment and shall be designed to collect samples in the zone of aeration between the bottom of the liner or soil barrier of the landfill or surface impoundment and the top of the water table.

NOTE.—A Leachate Monitoring System shall not be required if the owner/operator can demonstrate that an alternative leachate monitoring technique will detect leaks as effectively as the system prescribed in this paragraph. A Leachate Detection and Removal System installed below the liner or soil barrier of landfills pursuant to § 250.45-2(b)(12) and a Leachate Detection System installed below the liner or soil barrier of surface impoundments pursuant to § 250.45-3(c)(3) shall be considered an acceptable substitute for a Leachate Monitoring System.

(c) *Sampling and analysis.* (1) The background level of the quality of both the groundwater and the water in the zone of aeration underlying the facility shall be established by conducting the comprehensive analysis specified in paragraph (c)(6) on samples collected from the Groundwater Monitoring and Leachate Monitoring Systems on a monthly basis for at least one year. For a new facility, comprehensive analysis of monthly samples shall begin at least 3 months prior to the treatment, storage or disposal of any hazardous waste at the facility.

NOTE.—Samples withdrawn from a Leachate Monitoring System during the background monitoring schedule may be analyzed for representative characteristics of the comprehensive analysis if an adequate volume of sample cannot be collected to analyze for all of the characteristics specified in the comprehensive analysis.

(2) After the background level has been established pursuant to paragraph (c)(1), samples shall be taken from the Groundwater Monitoring System at least once a year and analyzed pursuant to the requirements of paragraph (c)(6) and, in addition, samples shall be taken from the Groundwater Monitoring System on the following frequency and analyzed pursuant to the requirements of paragraph (c)(5):

(i) Semi-annually, of the groundwater flow rate ranges between 25 and 50 m/year (82 and 164 ft/year) or

(ii) Quarterly, if the groundwater flow rate is greater than 50 m/year (164 ft/year).

(3) After the background level has been established pursuant to paragraph (c)(1), samples shall be taken from the Leachate Monitoring System at least once a year and analyzed in accordance with the requirements of paragraph (c)(6) and, in addition, samples shall be taken from the Leachate Monitoring System at least once each quarter and analyzed in accordance with the requirements of paragraph (c)(5).

NOTE.—This requirement is waived if the owner/operator can demonstrate that the quantity of any samples that can be obtained from the Leachate Monitoring System is insufficient for conducting the required analyses.

(4) If after the background levels are established pursuant to paragraph (c)(1), the analyses of samples taken pursuant to paragraph (c)(2) or (c)(3) shows that the quality of the groundwater or the water in the zone of aeration significantly differs, as determined by the Student's t, single-tailed test at the 95 percent confidence level, from the background quality of these waters, the owner/operator shall:

(i) Notify the Regional Administrator within 7 days after such a finding;

(ii) Determine, if possible, the cause of the difference in quality (e.g., the result of a spill, a design failure, an improper operating procedure); and

(iii) Determine the extent of groundwater contamination or the potential for groundwater contamination and discontinue operation of the facility until the Regional Administrator determines what actions are to be taken.

(5) A minimum analysis shall quantify the following characteristics of the sample:

(i) Specific conductivity, mho/cm at 25°C;

(i) pH;

(iii) Concentration of chloride, mg/liter;

(iv) Concentration of total dissolved solids, mg/liter;

(v) Concentration of dissolved organic carbon, mg/liter; and

(vi) The concentrations of the principal hazardous constituents, or indicators thereof, found in the largest quantity in the hazardous waste disposed of in the facility, mg/liter.

(6) A comprehensive analysis shall quantify the following characteristics of the sample:

(i) Those characteristics listed in paragraph (5); and

(ii) The concentrations of the contaminants and the levels of the properties listed in Appendix II, except radioactivity levels if the facility does not treat, store, or dispose of waste containing radioactive substances.

(iii) Concentration of beryllium, mg/liter.

(iv) Concentration of nickel, mg/liter.

(v) Concentration of cyanide, mg/liter.

(vi) Concentration of phenolic compounds (as phenol) mg/liter.

(vii) Presence of organic constituents as determined by a scanning by gas chromatography.

NOTE.—After the background level has been established, pursuant to paragraph (c)(1), the comprehensive analysis may be reduced to eliminate the analysis of characteristics that would not result from waste treated, stored or disposed of at the facility.

(d) *Recordkeeping and reporting.* (1) An owner/operator of a facility shall forward to the Regional Administrator at the end of each reporting quarter two copies of the monitoring data developed pursuant to the requirements of paragraphs (c)(2) and (c)(3) during the reporting quarter.

(2) An owner/operator of a facility shall be required to retain, for a minimum of 3 years, all records of monitoring and analytical activities and data, including all original strip chart recordings and instrumentation, calibration, and maintenance records.

§ 250.43-9 Financial requirements.

(a) *Continuity of operation.* (1) *Requirements for facility closure.* (i) *Cost estimation.* An owner/operator of a facility shall file as a part of his application for a permit for the facility an estimate of the costs of closing the facility after its capacity is reached or operations have otherwise terminated, in accordance with the requirements of Section 250.43-7. The Regional Administrator will evaluate this cost estimate and either accept the estimate as made or shall revise it in accordance with his evaluation.

(ii) *Financial assurance for facility closure.* An owner/operator of a facility shall establish a secured closure trust fund designated, "in trust for the closure of the facility." A bank or other financial institution approved by the Regional Administrator shall act as the trustee of the closure trust fund. The trust instrument shall provide (1) that disbursement is permissible only upon written approval of the Regional Administrator, and (2) whenever, on the basis of any information that the owner or operator is in violation of any of the closure requirements for the facility, that the Regional Administrator shall have the right to use part or all of the closure trust fund to carry out the closure requirements. The trustee shall release these funds upon receiving a copy of a properly served Notice of Violation for one or more closure violations pursuant to § 22.36 (c) and (d) of the Consolidated Rules of Practice Governing Administrative Assessment of Civil Penalties or Suspension of Permits (43 FR 34729 et. seq.). An owner/operator of a facility shall deposit into the closure trust fund, as a condition of receiving a permit, a cash deposit equal to the cost estimate for closure, multiplied by the appropriate present value factor from Table I. If site life exceeds 20 years, the present value factor can be determined by using the following formula:

$$PVF = \left(\frac{1}{1.02}\right)^{SL}$$

where:

PVF=present value factor
SL=site life in years

TABLE I

Site Life in Years	Present Value Factor
1	.980
2	.961
3	.942
4	.924
5	.906
6	.888
7	.871
8	.853
9	.837
10	.820
11	.804
12	.788
13	.773
14	.758
15	.743
16	.728
17	.714
18	.700
19	.686
20	.673

(iii) *Reimbursement for closure costs.* When an owner or operator has ceased operations at the facility and has completed closure of the site, as required under § 250.43-7, he may apply to the Regional Administrator for return of the principal and interest in the closure trust fund. Upon determination that closure has been satisfactorily accomplished, the Regional Administrator shall release all funds accumulated in the closure trust fund.

(2) *Requirements for post-closure monitoring and maintenance.* (i) *Cost estimate.* An owner/operator of a landfill or other facility where hazardous waste is not removed as part of closure shall file with the Regional Administrator as part of his application for a permit, an estimate of the annual cost of post-closure monitoring and routine maintenance at the site in accordance with the closure regulations in § 250.43-7. The Regional Administrator shall evaluate the cost estimate, and, after such modification as may be necessary in light of his evaluation, shall give notice of acceptance of the cost estimate. This cost estimate, which will be referred to as the annual post-closure operating cost, will then be used to determine the annual cash payments during the life of the facility into a post-closure monitoring and maintenance trust fund to be used for monitoring and maintenance (as required under Section 250.43-7 of this subpart) for a period of twenty years after facility closure.

(ii) *Financial assurance for post-closure monitoring and maintenance.* An owner/operator of a landfill or other facility where hazardous waste is not removed as part of closure, shall establish a post-closure monitoring and maintenance trust fund designated, "in trust for the post-closure monitoring and maintenance of the facility." A bank or other financial institution approved by the Regional Administrator shall act as trustee of the trust fund. The trust instrument shall provide that whenever, on the basis of any information, the Regional Administrator determines that the owner or operator of the facility is in violation of any of the post-closure monitoring and maintenance requirements, the Regional Administrator shall have the right to use part of all of the fund to carry out the post-closure monitoring and maintenance for the facility. The trustee shall release these funds upon receiving a copy of a properly served Notice of Violation for one or more post-closure monitoring and maintenance violations pursuant to §§ 22.36

(c) and (d) of the Consolidated Rules of Practice Governing Administrative Assessment of Civil Penalties or the Revocation or Suspension of Permits (43 FR 34729 et. seq.). The amount of the annual cash payment shall be calculated by multiplying the annual post-closure operating costs determined under § 250.43-9(a)(2)(i) by 16.35, and dividing that product by the sum of Annuity factor from Table 2 appropriate to the period of payment.

TABLE 2

Period of Payment	Sum of Annuity Factor
1	1.000
2	2.020
3	3.060
4	4.122
5	5.204
6	6.308
7	7.434
8	8.583
9	9.755
10	10.950
11	12.169
12	13.412
13	14.680
14	15.974
15	17.293
16	18.639
17	20.012
18	21,513
19	22,841
20	24.297

(iii) *Reimbursements for post-closure costs.* One year after closure and annually, thereafter, for a period of twenty years, an owner/operator, who has carried out all necessary post-closure maintenance and monitoring requirements specified in § 250.43-7, may, upon applications to the Regional Administrator, be reimburse out of the post-closure monitoring and maintenance trust fund an amount equal to the estimated costs for monitoring and routine maintenance for that year. Request for release of funds for reimbursement must be accompanied by an itemized list of costs incurred. Upon determination that the expenditures incurred are in accordance with the approved plan and/or are justified, the Regional Administrator may release the funds. Any funds remaining in the trust at the end of the twentieth year will likewise be released to the owner/operator.

(3) *Access and default.* Whenever on the basis of any information the Regional Administrator determines that an owner/operator of a facility is in violation of any of the requirements for closure and/or for post-closure monitoring and maintenance in § 250.43-7, the Regional administrator, his officers, employees and agents, shall have the right to enter upon the facility and carry out the closure and/or the post-closure monitoring and maintenance requirements. The Regional Administrator may use part of all of the post-closure monitoring trust fund and maintenance to carry out these requirements and shall obtain such funds by applying to the trustee.

(b) *Financial responsibility.* (1) *Financial responsibility required of owners or operators during site operation.* (i) *Amount of financial responsibility.* An owner or operator of a hazardous waste treatment, storage, or disposal facility shall have and shall maintain financial responsibility for sudden and accidental occurrences in the ount of $5 million per occurrence, exclusive of legal defense costs, for claims arising out of injury to persons or property from the release of escape of hazardous waste into the envrironment from each such facility. Additionally, an owner or operator of a hazardous waste treatment, storage, or disposal facility, or a group of such facilities, shall have and shall maintain financial responsibility for nonsudden and accidental occurrences in the amount of $5 million per occurrence with a $10 million annual aggregate for claims arising out of injury to persons or property from the gradual or steady state release or escape of hazardous waste to the environment from such facility, or group of facilities.

(ii) *Establishment of financial responsibility.* Financial responsibility may be established by any one or a combination of the following:

(A) Evidence of liability insurance.

(B) Self insurance.

(C) Other evidence of financial responsibility. Evidence of financial responsibility acceptable to the Regional Administrator must be maintained during the operation of the facility. The level of self insurance shall not exceed 10 percent of equity.

(2) *Establishement of post-closure financial responsibility for hazardous waste disposal facilities.* [Reserved]

(c) *Transfer of ownership during post-closure.* If the owner/operator of a facility transfers the ownership or operation of the facility during the 20-year post-closure care period, the funds remaining in the post-closure monitoring and maintenance trust fund shall remain in that trust fund for the remainder of the post-closure care period. Any reimbursement of these funds as provided in § 250.43-9 (a)(2)(iii) shall be made to the new owner/operator only if he notifies the Regional Administrator that he agrees to assume full compliance with the post-closure monitoring and maintenance requirement to § 250.43-7.

§ 250.44 Standards for storage.

(a) An owner/operator of a storage facility as defined in § 250.41, shall store the hazardous waste in either a storage tank or a storage container and shall comply with the requirements of this Section.

(b) Storage of hazardous waste shall be conducted in such a manner that no discharge of hazardous waste occurs.

(c) An owner/operator of a storage facility shall visually inspect the facility daily in accordance with the requirements of § 250.43-6 for the purpose of detecting any potential discharge of hazardous waste.

(d) An owner/operator of a storage facility may be required by the Regional Administrator to comply with all or part of the groundwater and leachate monitoring requirements of § 250.43-8, if the Regional Administrator determines that there is a potential for discharge of the hazardous material.

(e) Each storage area shall have a continuous base which is impervious to the material to be stored, and shall be designed and constructed so that any surface water run-off or spills can be contained until the waste can be removed.

(f) A hazardous waste which the Regional Administrator determines could cause the Air Human Health and Environmental Standard (§ 250.42-3) to be exceeded if it were held open to the environment, particularly with regard to volatility and toxicity, shall be stored in a storage tank(s) or a storage container(s) until the hazardous waste is disposed of, treated or incinerated in accordance with the requirements of this Subpart.

(g) Storage tanks and containers shall be of sturdy and leak-proof construction in accordance with the Occupational Safety and Health Administration's regulations for storage of flammable and combustible liquids (29 CFR Part 1910, Subpart H, § 1910.106).

(h) Storage tanks and containers shall be constructed of materials which are compatible with the hazardous waste to be contained or shall be protected by a liner compatible with the hazardous waste to be contained so that the ability of the storage tank or container to contain the waste is not impaired.

(i) A hazardous waste shall not be contained in an unwashed storage tank or container that previously held an incompatible material (see Appendix I).

(j) The identity and location of all stored hazardous waste shall be known (e.g., via labeling and recordkeeping) throughout the entire storage period.

§ 250.44-1 Storage tanks.

(a) Storage tanks which contain volatile waste shall not be vented directly to the atmosphere if they have a storage capacity in excess of 19,000 liters (5,000 gallons).

(b) All storage tanks above ground shall have a spill confinement structure(s) (e.g., dike or trench), with

a capacity equal to the entire contents of the largest storage tank, plus sufficient freeboard to allow for the containment of precipitation resulting from a 24-hour, 25-year storm.

(c) Diking requirements and operating procedures for storage tanks shall be in accordance with EPA's oil or hazardous substances pollution prevention regulations (40 CFR Part 112, Subchapter D) issued pursuant to Section 311 of the Clean Water Act.

§ 250.44-2 Containers.

(a) If a container is not in good condition or if the contents of a storage container begin to leak, the hazardous waste in the container shall be recontainerized in a storage container(s) in good condition.

(b) A storage container holding hazardous waste shall not be opened, handled or stored in a manner which may rupture the container or cause it to leak.

(c) A storage facility which stores hazardous waste in storage containers shall have a spill confinement structure(s) (e.g., dike or trench), with a capacity equal to 10 percent of the containerized waste, plus sufficient freeboard to allow for containment of precipitation resulting from a 24-hour, 25-year storm.

(d) Storage containers holding hazardous wastes which are incompatible (see Appendix I) shall be separated from each other or protected from each other in order to prevent the wastes from mixing, should the containers break or leak.

(e) Empty combustible storage containers (e.g., fibrous and paper containers) which previously contained hazardous waste shall be:

(1) Incinerated in a facility which complies with the requirements of § 250.45-1, or

(2) Disposed in a landfill which complies with the requirements of § 250.45-2.

(f) Empty non-combustible storage containers (e.g., metal and glass containers), which previously contained hazardous waste, shall be:

(1) Cleaned by removing hazardous waste residuals at a permitted facility, and

(i) Transported to a drum reconditioner; or

(ii) Transported to a metal or glass recovery facility as scrap for resource recovery; or

(2) Transported to a permitted drum reconditioner, with appropriate manifest; or

(3) Reused with the same type of waste previously contained, or with another compatible waste provided such reuse is lawful under currently applicable U.S. DOT regulations, including those set forth in 49 CFR 173.28.

(g) Paper bags contaminated with hazardous waste shall be stored in closed secondary containers.

(h) All containers received at hazardous waste facilities shall be in compliance with § 250.25 (containers) of Subpart B.

§ 250.45 Standards for treatment/disposal.

(a) Where practical, disposal of hazardous waste shall be avoided and alternatives such as destruction, treatment to render the waste non-hazardous, or treatment for purposes of resource recovery and reuse shall be employed.

(b) All facilities which dispose of discrete radioactive wastes shall be licensed by the U.S. Nuclear Regulatory Commission, or an Agreement State.

(c) An owner/operator of a facility shall not treat or dispose of hazardous waste in a landfill, surface impoundment, basin, or landfarm if the waste has any one of the following characteristics:

(i) Ignitable waste, as defined in § 250.13(a), Subpart A;

(ii) Reactive waste, as defined in § 250.13(c), Subpart A;

(iii) Contains chemical groups which are incompatible with wastes in the facility with which they may become mixed (see Appendix I); or

(iv) Volatile waste.

NOTE.—A landfill, surface impoundment, basin, or landfarm facility may be used to treat or dispose of ignitable, reactive, volatile, or incompatible waste provided that the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that such treatment or disposal will not: (1) contribute any airborne contaminant to the atmosphere such that concentrations above the source have the potential: (i) to exceed permissible exposure levels for that airborne contaminant promulgated in 29 CFR 1910.1000 (see Appendix III) pursuant to the Occupational Safety and Health Act of 1970, or (ii) to contribute two or more listed airborne contaminants in a manner which causes the sum of the following expression to exceed unity:

$$E_m = \frac{C_1}{L_1} + \frac{C_2}{L_2} + \cdots \frac{C_n}{L_n}$$

Where:

E_m is the equivalent exposure of a mixture of airborne contaminants, C is the concentration of a particular contaminant, L is the exposure limit for that contaminant (29 CFR 1910.1000, Table Z-1, Z-2, Z-3), and (2) damage the structural integrity of the landfill, surface impoundment, or basin, or affect the attenuation capacity of a landfarm, through heat generation, fires, or explosive reactions.

§ 250.45-1 Incineration.

(a) An owner/operator of an incinerator shall comply with the requirements of this Section when burning hazardous waste.

(b) *Trial burns.* (1) The owner/operator shall conduct a trial burn for each hazardous waste which is significantly different in physical and chemical characteristics from any previously demonstrated under equivalent conditions. The trial burn shall include as a minimum the following determinations:

(i) An analysis of the hazardous waste for concentrations of halogens and principal hazardous components;

(ii) An analysis of the ash residues and scrubber effluent for the principal hazardous components;

(iii) An analysis of the exhaust gas for the concentrations of the principal hazardous components, hydrogen halides, CO, CO_2, O_2, and total particulates;

(iv) An identification of sources of fugitive emissions and their means of control;

(v) A measurement of combustion temperature and computation of residence time;

(vi) A computation of combustion efficiency and destruction efficiency;

(vii) A computation of scrubber efficiency in removing halogens;

(2) The results from each trial burn shall be submitted to the Regional Administrator.

(c) *Monitoring.* The owner/operator shall monitor and record the following in each trial burn and each operational burn:

(1) Combustion temperature;

(2) Carbon monoxide and oxygen concentrations in the exhaust gas on a continuous basis, and

(3) The rate of hazardous waste, fuel, and excess air fed to the combustion system at regular intervals of no longer than 15 minutes.

(d) *Combustion criteria.* (1) The incinerator shall operate at greater than 1000° C combustion temperature, greater than 2 seconds retention time, and greater than 2 percent excess oxygen during incineration of hazardous waste, unless the waste is hazardous because it contains halogenated aromatic hydrocarbons, in which case the incinerator shall operate at greater than 1200° C combustion temperature, greater than two seconds retention time, and greater than 3 percent

excess oxygen during incineration of the hazardous waste.

(2) The incinerator shall be operated at a combustion efficiency equal to or greater than 99.9 percent, as defined in the following equation:

$$CE = \frac{C_{CO_2}}{C_{CO_2} + C_{CO}} \times 100$$

Where:

CE=combustion efficiency
C_{CO_2}=concentration of CO_2 in exhaust gas
C_{CO}=concentration of CO in exhaust gas

Incinerators that burn waste that is hazardous only because it is listed in § 250.14(b)(1) are exempt from this required.

NOTE TO (b) (1) AND (2).—Incinerators may operate at other conditions of temperature, retention time, and combusion efficiency if the facility owner/operator can demonstrate that an equivalent degree of combustion will be provided under alternate combustion criteria to the conditions prescribed above.

(3) The incinerator shall be operated with a functioning device to cut off automatically waste feed to the incinerator when significant changes occur in flame combustion temperature, excess air, or scrubber water pressure.

(e) *Destruction and emission control criteria.* (1) The incinerator shall be designed, constructed, and operated to maintain a destruction efficiency of 99.99 percent as defined in the following equation:

$$DE = \left(\frac{W_{in} - W_{out}}{W_{in}}\right) \times 100$$

Where:

DE=destruction efficiency
W_{in}=mass feed rate of principal toxic components of waste going into the incinerator (g/min)
W_{out}=mass emissions rate of principal toxic components in waste in the incinerator combusion zone (g/min).

Incinerators that burn waste that is hazardous only because it is listed in § 250.14(b)(1) are exempt from this requirement.

(2) An incinerator used to thermally degrade hazardous waste containing more than 0.5 percent halogens shall be equipped with emission control equipment capable of removing 99 percent of the halogens from the exhaust gases.

(3) The incinerator shall be operated in a manner that assures that emissions of particulate matter do not exceed 270 milligrams per dry standard cubic meter (0.12 grains per dry standard cubic foot) at zero excess air. Compliance with this requirement may be achieved by having particulate emissions which, when corrected to 12 percent CO_2 by the formula below, are less than 180 milligrams per standard cubic meter (0.08 grains per dry standard cubic foot).

$$PE_c = PE_m \times \frac{C_s}{C_m \times 1.5}$$

Where:

Pe_c=corrected particulate emissions, mg/m³ (gr/dscf)
PE_m=measured particulate emissions, mg/m³ (gr/dscf)
C_s=stoichiometric CO_2 concentration, ppm
C_m=measured CO_2 concentration, ppm

(4) The incinerator shall be designed, constructed, and operated so that fugitive emissions of unburned hazardous waste and combustion products are controlled.

§ 250.45-2 Landfills.

(a) *Site Selection.*

(1) A landfill shall be located, designed, constructed, and operated to prevent direct contact between the landfill and navigable water.

(2) A landfill shall be located, designed, and constructed so that the bottom of its liner system or natural in-place soil barrier is at least 1.5 meters (5 feet) above the historical high water table.

NOTE.—The bottom of any liner system or natural in-place soil barrier may be located less that 1.5 meters (5 feet) above the historical high water table, provided the owner/operator can demonstrate, to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that no direct contact will occur between the landfill and the water table and a leachate monitoring system as required by § 250.43-8 can be adequately installed and maintained in the lesser space.

(3) A landfill shall be at least 150 meters (500 feet) from any functioning public or private water supply or livestock water supply.

NOTE.—A landfill may be less than 150 meters (500 feet) from any functioning public or private water supply or livestock water supply, provided the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that:

(i) No direct contact will occur between the landfill and any functioning public or private water supply or livestock water supply;

(ii) No mixing of the landfill leach- ate (including groundwater or surface water contaminated with leachate) with the public or private water supply or livestock water supply will occur; and

(iii) A groundwater monitoring system as required by § 250.43-8 has been installed and is being adequately maintained.

(b) *Construction and operation.* (1) A landfill shall be located, designed, constructed, and operated to minimize erosion, landslides, and slumping.

(2) A landfill shall be located, designed, constructed, and operated so that its liner system or natural in-place soil barrier is compatible with all of the waste to be landfilled.

(3) The exact location of each hazardous waste and the dimensions of each cell with respect to permanently surveyed bench marks shall be recorded. The contents of each cell shall also be recorded. These records shall be handled as specified in § 250.43-5(b).

(4) Waste, containerized or non-containerized, that is incompatible (see Appendix I) shall be disposed of in separate landfill cells.

(5) Each container of liquid hazardous waste shall be surrounded by an amount of sorbent inert material capable of absorbing all of the liquid contents of the container.

(6) The following hazardous waste shall not be disposed in a landfill:

(i) Ignitable waste, as defined in § 250.13(a) of Subpart A;

(ii) Reactive waste, as defined in § 250.13(c) of Subpart A;

(iii) Volatile waste;

NOTE.—See Note in § 250.45(c).

(iv) Bulk liquids, semi-solids, and sludges.

NOTE.—Bulk liquids, semi-solids, and sludges may be disposed of at a landfill provided such waste is pretreated and/or stabilized (e.g., chemically fixed, evaporated, mixed with dry inert absorbant), or treated and/or stabilized in the landfill (e.g., mixed with municipal refuse at acceptable ratios) to reduce its liquid content or increase its solid content so that a non-flowing consistency is achieved to eliminate the presence of free liquids prior to final disposal in a landfill.

(7) Diversion structures (e.g., dikes, drainage ditches) shall be constructed such that surface water runoff will be prevented from entering the landfill.

NOTE.—Diversion structures may not be necessary provided the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to

Subpart E, that the landfill facility is located so that the local topography will prevent surface water runoff from entering the facility.

(8) Surface water which has been in contact with the active portions of a landfill shall be collected and treated or disposed of as a hazardous waste in accordance with requirements in this Subpart unless it is analyzed and found not to be hazardous waste as identified or listed in Subpart A or it is collected and discharged into a navigable water in compliance with a NPDES permit issued under the Clean Water Act.

(9) Where gases are generated within the landfill, a gas collection and control system shall be installed to control the vertical and horizontal escape of gases from the landfill.

NOTE.—Gas collection and control systems shall not be required provided the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that gases will not be generated in the landfill or that gases generated will not be in violation of the air contaminant limits specified in the Note associated with § 250.45(c) and will not create a flammable or explosive atmosphere.

(10) A minimum of 15 centimeters (6 inches) of cover material shall be applied daily on active portions of a landfill. Active portions which will not have additional waste placed on them for at least one week shall be covered with 30 centimeters (12 inches) of cover material.

NOTE.—An owner/operator may use covers of different thicknesses and/or apply them at different frequencies if he can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that the possibility of fire or explosion or the harboring, feeding, and breeding of land burrowing animals and vectors will be controlled to an equivalent degree.

(11) In areas where evaporation exceeds precipitation by 20 inches or more and where natural geologic conditions allow, a landfill shall have a natural in-place soil barrier on the entire bottom and sides of the landfill. This barrier shall be at least 3 meters (10 feet) in thickness and consist of natural in-place soil which has a permeability of less than or equal to 1×10^{-7} cm/sec. and meets the requirements of § 250.45(b)(14).

NOTE.—A natural in-place soil barrier using natural in-place soils of different thicknesses and permeabilities may be used, provided the barrier has a thickness greater than or equal to 1.5 meters (5 feet), and provided that the owner/operator of the landfill can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that it will provide equivalent containment of leachate.

(12) An owner/operator of a landfill using the design in paragraph (b)(11) or any similar design which does not have a leachate collection system shall demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that liquids will not accumulate in the landfill to the extent that they may be discharged to the surface or to groundwater.

(13) In areas where climatic and natural geologic conditions do not allow meeting the requirements of paragraph (b)(11), a landfill shall have either one of the following liner systems covering the entire bottom and sides of the landfill:

(i) *Design I.* The liner system shall have a slope of at least 1 percent at all points and be connected at all low points to one or more leachate collection sumps, (which meet the specifications in paragraph (b)(17)), so that leachate formed in the landfill will flow by gravity into the leachate collection sump(s) from which the leachate can be removed and treated or disposed of as specified herein. The liner system shall consist of:

(A) A soil liner which is at least 1.5 meters (5 feet) in thickness and composed of natural in-place soil or emplaced soil which has a permeability less than or equal to 1×10^{-7} cm/sec. and meets the requirements of paragraph (b)(14); and

(B) A leachate collection and removal system overlying the soil liner which is at least 30 centimeters (12 inches) in thickness and composed of permeable soil capable of permitting leachate to move rapidly through the system and into the leachate collection sump(s).

(ii) *Design II.* The liner system shall have a slope of at least 1 percent at all points and be connected at all low points to one or more leachate collection sumps (which meet the specifications of paragraph (b)(17)), so that leachate formed in the landfill will flow by gravity into the leachate collection sump(s) from which the leachate can be removed and treated or disposed of as specified herein. The landfill liner system shall consist of:

(A) A leachate detection and removal system, placed on the natural base of the landfill, which shall consist of a minimum of 15 centimeters (6 inches) of permeable soil capable of permitting leachate to move rapidly through the system and into the leachate collection sumps;

(B) A membrane liner system overlying the leachate detection and removal system composed of a 15 centimeter (6 inch) layer of clean permeable sand or soil overlaid with a synthetic membrane liner which meets the specifications in paragraph (b)(17) and which is overlaid with a 15 centimeter (6 inch) layer of clean permeable sand or soil;

(C) A soil liner overlying the membrane liner system which is at least 1 meter (3 feet) in thickness and composed of soil which has a permeability less than or equal to 1×10^{-7} cm/sec. and meets the requirements of paragraph (b)(14); and

(D) A leachate collection and removal system overlying the soil liner which is at least 30 centimeters (12 inches) in thickness and composed of permeable soil capable of permitting leachate to move rapidly through the system and into the leachate collection sumps.

NOTE.—A landfill may use a different liner system than the two described above provided the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that the alternate liner system includes a liner and a leachate collection and removal system that provides equivalent or greater leachate containment, collection, and removal.

(14) The soils used in a soil liner or natural inplace soil barrier shall meet the following minimum criteria:

(i) Be classified under the Unified Soil Classification System CL, CH, SC and OH (ASTM Standard D2487-69),

(ii) Allow greater than 30 percent passage through a no. 200 sieve (ASTM Test D1140),

(iii) Have a liquid limit equal to or greater than 30 units (ASTM Test D423),

(iv) Have plasticity greater than or equal to 15 units (ASTM Test D424),

(v) Have a pH of 7.0 or higher (see Appendix IV), and

(vi) Have a permeability not adversely affected by anticipated waste.

NOTE.—Soil not meeting the above criteria may be used provided the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that such soil will provide equivalent or greater structural stability and waste containment and attenuation, and will not be adversely affected by the anticipated waste.

(15) A synthetic membrane liner shall meet the following minimum criteria:

(i) Be of adequate strength and thickness to insure mechanical integrity and have a minimum thickness of 20 mils;

(ii) Be compatible with the waste to be landfilled;

(iii) Be resistant to attack from soil bacteria and fungus;

(iv) Have ample weather resistance to withstand the stress of extreme heat, freezing, and thawing;

(v) Have adequate tensile strength to elongate sufficiently and withstand the stress of installation and/or use of machinery and equipment;

(vi) Be of uniform thickness, free from thin spots, cracks, tears, blisters, and foreign particles;

(vii) Be placed on a stable base; and

(viii) Have a permeability less than or equal to 1×10^{-12} cm/sec or its equivalent.

(16) A landfill overlying an underground drinking water source shall have a groundwater monitoring system and a leachate monitoring system as specified in § 250.43-8.

(17) A leachate collection sump (as required in the liner systems specified in paragraph (b)(13)) shall be designed and constructed:

(i) Of materials both compatible with and impermeable to the leachate formed in the landfill;

(ii) So that the sump is accessible for removal of leachate if the sump pump becomes inoperative and/or the stand pipe for removal of leachate becomes damaged; and

(iii) With a volume equal to or greater than three-months expected volume of leachate but no less than 1,000 gallons.

(18) The owner/operator shall remove leachate from a leachate collection sump as frequently as necessary to maintain gravity flow in the leachate collection and removal system and shall check the leachate collection sump at least monthly to assure compliance with this requirement.

(19) Landfill liner systems and natural in-place soil barriers shall not be placed over earth materials exhibiting a permeability of greater than 1×10^{-4} cm/sec.

(c) *Closure.* (1) At closure, the owner/operator of a landfill shall place a final cover over the landfill. This final cover shall consist of at least 15 centimeters (6 inches) of soil with a permeability less than or equal to 1×10^{-7} cm/sec which meets the criteria of § 250.45-2(b)(14), underlying 45 centimeters (18 inches) of soil capable of supporting indigenous vegetation. The top 15 centimeters (6 inches) of this cover shall be topsoil.

NOTE.—A final cover using different thicknesses and permeabilities may be used provided the owner/operator can demonstrate to the Regional Administrator that it will provide equivalent control of infiltration of water, equivalent control of sublimation or evaporation of harmful pollutants into the air, and equivalent erosion control. The owner/operator must also demonstrate that the final cover will support indigenous vegetation.

(2) Where trees or other deep-rooted vegetation are to be planted on the completed landfill, the final cover shall consist of the 15 centimeter (6 inch) soil layer specified in paragraph (c)(1) underlying at least 1 meter (3 feet) of soil capable of supporting the deep-rooted vegetation and indigenous vegetation.

NOTE.—The upper layer soil thickness for deep-rooted vegetation may be less than 1 meter (3 feet) provided the owner/operator can demonstrate to the Regional Administrator that the roots of the vegetation will not penetrate the 6-inch clay cover.

(3) The final grade of the final cover shall not exceed 33 percent. Where final grades exceed 10 percent, horizontal terraces shall be constructed. Terraces shall be of sufficient width and height to withstand a 24-hour, 25-year storm. A terrace shall be placed at every 10 feet of rise in elevation when the slope is less than 20 percent and at every 20 feet or rise in elevation when the slope is greater than 20 percent.

NOTE.—The final grade may be of different design and slope provided the owner/operator can demonstrate to the Regional Administrator that water will not pool on the final cover and that erosion will be minimized.

(d) *Post-closure care.* (1) During the post-closure period, which shall continue at the landfill for a period of at least 20 years (see § 250.43-7), the owner-operator of the landfill:

(i) Shall maintain the soil integrity, slope, and vegetative cover of the final cover and all diversion and drainage structures;

(ii) Shall maintain the groundwater and leachate monitoring systems and collect and analyze samples from these systems and collect and analyze samples from these systems in the manner and frequency specified in § 250.43-8;

(iii) Shall maintain surveyed bench marks;

(iv) Shall maintain and monitor the gas collection and control system where such a system is installed to control the vertical and horizontal escape of gases; and

(v) Shall restrict access to the landfill as appropriate for its post-closure use.

NOTE.—The owner or operator of a landfill may request that certain post-closure requirements be discontinued earlier than 20 years after closure. The facility owner or operator shall submit information to the Regional Administrator to indicate that such post-closure care need not continue; (e.g., no leaks have been detected, technology has advanced, alternate disposal techniques are to be employed.) The Regional Administrator shall have the discretion to allow discontinuance of one or more of these post-closure requirements.

(2) No buildings intended for habitation shall be constructed over a landfill where radioactive waste as listed in Subpart A has been disposed.

§ 250.45-3 Surface impoundments.

(a) *Site selection.* (1) A surface impoundment shall be located, designed, constructed, and operated to prevent direct contact between the surface impoundment and navigable water.

(2) A surface impoundment shall be located, designed, and constructed so that the bottom of its liner system or natural in-place soil barrier is at least 1.5 meters (5 feet) above the historical high water table.

NOTE.—The bottom of any liner system or natural in-place soil barrier may be located less than 1.5 meters (5 feet) above the historical high water table provided the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that no direct contact will occur between the surface impoundment and the water table, and a leachate monitoring system as required in § 250.43-8 can be adequately installed and maintained in the lesser space.

(3) A surface impoundment shall be located at least 150 meters (500 feet) from any functioning public or private water supply or livestock water supply.

NOTE.—A surface impoundment may be located less than 150 meters (500 feet) from any functioning public or private water supply or livestock water supply provided the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that:

(i) No direct contact will occur between the surface impoundment and any functioning public or private water supply or livestock water supply;

(ii) No mixing of the leachate (including groundwater or surface water contaminated with leachate) with the public or private water supply or livestock water supply will occur; and

(iii) A groundwater monitoring system as required by § 250.43-8 has been installed and is being adequately maintained.

(4) A surface impoundment shall be located, designed, constructed, and operated to minimize landslides, slumping, and erosion.

(b) *Hazardous waste suitable for surface impoundments.* (1) A surface impoundment shall not be used to contain hazardous waste which is:

(i) Detrimental to any material being used as a barrier to the waste movement from the surface impoundment,

(ii) Ignitable waste, as defined in § 250.13(a) of Subpart A,

(iii) Reactive waste, as defined in § 250.13(c) of Subpart A, or

(iv) Volatile waste.

NOTE.—(Relative to ii, iii, and iv) see Note associated with § 250.45(c).

(2) Hazardous waste which is incompatible (see Appendix I) shall not be emplaced together in a surface impoundment.

(3) All hazardous waste shall be tested, prior to placement in a surface impoundment, for compatibility with the intended liner materials to determine whether it will have any detrimental effect (e.g., cause cracks, dissolution, decrease mechanical strength, or increase permeability) on the soils or lining materials used to prevent leakage from the surface impoundment.

(c) *Design and construction.* (1) A surface impoundment shall be de-

signed and constructed so as to be capable of preventing discharges or releases to the groundwater or navigable water.

(2) Where natural geologic conditions allow, a surface impoundment shall have a natural in-place soil barrier on the entire bottom and sides of the impoundment. This barrier shall be at least 3 meters (10 feet) in thickness and composed of natural in-place soil which meets the specifications of paragraph (c)(4).

NOTE.—An owner/operator of a surface impoundment may use a natural in-place soil barrier of different thicknesses and different specifications if the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that equivalent or greater waste containment can be achieved. However, under no circumstances shall the thickness of the natural in-place soil barrier be less than 1.5 m (5 feet), or its permeability be greater than 10^{-7} cm/sec.

(3) Where geologic conditions do not allow use of the design in paragraph (c)(2), a surface impoundment shall have a liner system covering the entire bottom and sides of the impoundment. This liner system shall consist of top liner, a bottom liner and a leachate detection system which meet the following specifications:

(i) The top liner shall consist of emplaced soil at least 30 centimeters (12 inches) in thickness which meets the criteria in paragraph (c)(4), or an artificial liner which meets the criteria in paragraph (c)(5).

(ii) The bottom liner shall consist of natural in-place soil or emplaced soil which meets the criteria in paragraph (c)(4) and is at least 1.5 meters (5 feet) in thickness, or an artificial liner which meets the criteria in (c)(5).

(iii) The leachate detection system shall be a gravity flow drainage system installed between the top and bottom liners and shall be capable of detecting any leachate that passes through the top liner. Provisions shall be made for pumping out any leachate that passes through the top liner and for removal of noxious gases that occur in the system.

NOTE.—An owner/operator may use a different design if he can demonstrate that an equivalent or greater degree of waste containment is achieved. The Regional Administrator shall take into account the length of time the surface impoundment has been in existence, projected facility life, and artificial liner, natural in-place soil, or emplaced soil permeability and thickness when arriving at a decision regarding whether an equivalent degree of containment exists. In the case of existing facilities, the facility owner/operator may conduct leachate (zone of aeration) monitoring to determine whether any significant increase in the background levels of chemical species has occurred. If no significant increase is observed, the design shall be considered to provide the same or greater degree of performance.

(4) Soils used for surface impoundment liners or natural in-place soil barriers shall:

(i) Be classified under the Unified Soil Classification Systems as CL, CH, SC, or OH, (ASTM Standard D2487-69);

(ii) Allow more than 30 percent passage through a No. 200 sieve (ASTM Test D1140);

(iii) Have a liquid limit equal to or greater than 30 (ASTM Test D423);

(iv) Have a plasticity index equal to or greater than 15 (ASTM Test D424);

(v) Have a pH of 7.0 or higher (See Appendix IV);

(vi) Have a permeability equal to or less than 1×10^{-7} cm/sec. (ASTM Test D2434); and

(vii) Have a permeability not adversely affected by the waste to be placed in the impoundment.

NOTE.—Soil not meeting the above criteria may be used provided that the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that such soil will provide equivalent or greater structural stability and waste containment properties and will not be adversely affected by the waste to be placed in the impoundment.

(5) Artificial liners for surface impoundments (e.g., concrete, plastic) shall:

(i) Be of sufficient strength to insure mechanical integrity;

(ii) Have a minimum thickness of 30 mils;

(iii) Be compatible with the waste to be placed in the impoundment;

(iv) Have a permeability less than or equal to 1×10^{-7} cm/sec.;

(v) Have an expected service life at least 25 percent longer than the expected time of facility usage;

(vi) Be placed on a stable base;

(vii) Satisfactorily resist attack from ozone, ultraviolet rays, soil bacteria, and fungus;

(viii) Have ample weather resistance to withstand the stress of freezing and thawing;

(ix) Have adequate tensile strength to elongate sufficiently and withstand the stress of installation and/or the use of machinery or equipment;

(x) Resist laceration, abrasion and puncture from any matter that may be contained in the fluids it will hold;

(xi) Be of uniform thickness, free of thin spots, cracks, tears, blisters, and foreign particles; and

(xii) Be easily repaired.

(6) To prevent their rupture, all artificial liners in a surface impoundment where mechanical equipment is used for operation (e.g., sludge dredging and collecting) shall have a protective cover of selected clean earth material, not less than 45 centimeters (18 inches) thick, placed directly on top of the liner.

(7) A surface impoundment shall have a groundwater monitoring system and a leachate monitoring system that meet the specifications in § 250.43-8.

(8) All surface impoundment dikes shall be designed and constructed in a manner that will prevent discharge or release of waste from the facility, both horizontally and vertically.

(9) All earthen dikes at the facility shall be constructed of clay-rich soil with a permeability less than or equal to 1×10^{-7}cm/sec.

(10) All earthen dikes shall have an outside protective cover (e.g., grass, shale, rock) to minimize erosion by wind and water.

(11) Those surface impoundments which are intended to be closed without removing the hazardous waste shall meet the landfill requirements under Section 250.45-2.

(d) *Operation and maintenance.* (1) A surface impoundment shall be operated and maintained so that discharges or releases to groundwater and navigable water do not occur.

(2) The freeboard maintained in a surface impoundment shall be capable of containing rainfall from a 24-hour, 25-year storm but shall be no less than 60 centimeters (2 feet).

(3) Records shall be kept of the contents and location of each surface impoundment. These records shall be maintained as specified in § 250.43-5(b).

(4) The integrity of the natural in-place soil barrier or the liner system installed in a surface impoundment shall be maintained until closure of the impoundment. The liner system or natural in-place soil barrier shall be repaired immediately upon detection of any failure (e.g., liner puncture).

(5) Surface impoundment dikes shall be visually inspected daily, as specified under Section 250.43-6, for the purpose of detecting and correcting any deterioration. Any maintenance or corrective action necessary to restore the dike to its original condition shall be accomplished expeditiously.

(6) Any system provided for detecting the failure of a liner system or natural in-place soil barrier shall be visually inspected daily, as specified in § 250.43-6, to insure that it is operating properly for the purpose intended.

(e) *Closure and post-closure.* (1) Upon final close-out, all hazardous waste and hazardous waste residuals shall be removed from the surface impoundment, if the impoundment does not meet the landfill requirements under § 250.45-2, and disposed of as hazardous waste pursuant to the requirements of this Part.

(2) Upon final close-out of a surface impoundment which meets the criteria for landfills under § 250.45-2, all haz-

ardous waste and hazardous waste residuals shall be:

(i) Removed and disposed as hazardous waste pursuant to the requirements of this Part, or

(ii) Treated in the impoundment pursuant to the note following § 250.45-2(b) (6) (iv), and then the impoundment shall be closed according to the closure requirements for landfills under § 250.45-2(c).

(3) Emptied surface impoundments shall be filled with an inert fill material and seeded with a suitable grass or ground cover crop, or converted to some other acceptable use that meets the requirement under § 250.43-7.

(4) Those surface impoundments which were closed as landfills shall meet all post-closure requirements for landfills under § 250.45-2(d).

§ 250.45-4 Basins.

(a) A basin shall be constructed of impermeable materials of sufficient strength and thickness to ensure mechanical integrity and to prevent the discharge of waste to navigable waters or groundwater.

(b) A basin shall not be used to contain hazardous waste which is:

(1) Detrimental to the basin's construction materials;

(2) Ignitable waste, as defined in § 250.13(a) of Subpart A;

(3) Reactive waste, as defined in § 250.13(c) of Subpart A; or

(4) Volatile waste.

NOTE.—With respect to (b) (2, 3 and 4), see Note associated with § 250.45(c).

(c) Hazardous waste which is incompatible (see Appendix I) shall not be placed together in a basin.

(d) A hazardous waste shall be tested prior to placement in a basin to determine whether it will have any detrimental effect (e.g., cause dissolution or corrosion, increase permeability, decrease mechanical strength) on materials used for construction of the basin.

(e) The materials used for construction of basins shall be compatible with the hazardous waste and treatment chemicals to be used under expected operating conditions (i.e., temperature, pressure) or shall be protected by a liner compatible with the hazardous waste and treatment chemicals to be used under expected operating conditions.

(f) A basin shall be monitored or visually inspected daily in accordance with the requirements under § 250.43-6 for leaks, corrosion, cracks, or other damages. Any damage detected shall be repaired immediately.

(g) A basin shall have a groundwater monitoring system meeting the specifications of § 250.43-8.

NOTE.—A basin does not need a groundwater monitoring system if the facility owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that any leaking can be detected by visual inspection or other means.

(h) At final closure, all hazardous waste and hazardous waste residues shall have been removed from a basin and disposed of as hazardous waste pursuant to the requirements of Subparts B, C, and D.

250.45-5 Landfarms.

(a) *Hazardous waste not amenable to landfarming.* The following hazardous waste shall not be landfarmed:

(1) Ignitable waste, as defined in § 250.13(a) of Subpart A;

(2) Reactive waste, as defined in § 250.13(c) of Subpart A;

(3) Volatile waste;

(4) Waste which is incompatible when mixed (see Appendix I).

NOTE.—See Note associated with § 250.45(c).

(b) *General requirements.* (1) A landfarm shall be located, designed, constructed, and operated to prevent direct contact between the treated area and navigable water.

(2) A landfarm shall be located, designed, constructed, and operated to minimize erosion, landslides, and slumping in the treated area.

(3) A landfarm shall be located, designed, constructed and operated so that the treated area is at least 1.5 meters (5 feet) above the historical high water table.

NOTE.—The treated area may be located less than 1.5 meters (5 feet) above the historical high water table if the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that no direct contact will occur between the treated area and the water table.

(4) The treated area of a landfarm shall be at least 150 meters (500 feet) from any functioning public or private water supply or livestock water supply.

NOTE.—The treated area of a landfarm may be less than 150 meters (500 feet) from any functioning public or private water supply or livestock water supply, provided the facility owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that:

(i) No direct contact will occur between the treated area of the landfarm and any functioning public or private water supply or livestock water supply;

(ii) No migration of hazardous constituents from the soil in the treated area of the landfil to any public or private water supply or livestock water supply will occur; and

(iii) A soil monitoring system as specified in § 250.45-5(e) has been installed and is being adequately maintained.

(5) A landfarm shall be located on an area that has fine grained soils (i.e., more than half the soil particles are less than 73 microns in size which are of one of the following types, as defined by the Unified Soil Classification System (ASTM Standard D 2487-69): OH—organic clays of medium to high plasticity; CH—inorganic clays of high plasticity, fat clays; MH—inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts; CL—inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays; OL—organic silts and organic silt-clays of low plasticity.

NOTE.—A landfarm may be located on an area with soil types other than those specified above provided the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that the alternative soil types will prevent hazardous constituents from vertically migrating a distance that exceeds three times the depth of the zone of incorporation or 30 centimeters (12 inches), whichever is greater.

(c) *Site preparation.* (1) Surface slopes of a landfarm shall be less than 5 percent, to minimize erosion in the treated area by waste or surface runoff, but greater than zero percent to prevent the waste or water from ponding or standing for periods that will cause the treated area to become anaerobic.

NOTE.—Surface slopes of the landfarm may be greater than 5 percent provided the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that such slopes will not result in erosion caused by waste or surface run-off in the treated area.

(2) Caves, wells (other than active monitoring wells), and other direct connections to the subsurface environment within the treated area of a landfarm, or within 30 meters (100 feet) thereof, shall be sealed.

(3) Soil pH in the zone of incorporation shall be equal to or greater than 6.5 (see Appendix IV).

NOTE.—Soil pH in the zone of incorporation may be less than 6.5 provided the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that hazardous constitutents, especially heavy metals, will not migrate vertically a distance that exceeds three times the depth of the zone of incorporation or 30 centimeters (12 inches), whichever is greater.

(d) *Waste application and incorporation.* (1) Waste application and incorporation practices shall prevent the zone of incorporation from becoming anaerobic.

(2) Waste shall not be applied to the soil when it is saturated with water.

NOTE.—Waste may be applied to the soil when it is saturated with water provided the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that the soil-waste mixture will remain aerobic and that hazardous constituents, especially heavy metals, will not migrate vertically a distance

that exceeds three times the depth of the zone of incorporation or 30 centimeters (12 inches), whichever is greater.

(3) Waste shall not be applied to the soil when the soil temperature is less than or equal to 0° C.

(4) The pH of the soil-waste mixture in the zone of incorporation shall be equal to or greater than 6.5 and maintained until the time of facility closure.

NOTE.—The pH of the soil-waste mixture in the zone of incorporation may be less than 6.5 provided the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that hazardous constituents, especially heavy metals, will not vertically migrate a distance that exceeds three times the depth of the zone of incorporation or 30 centimeters (12 inches), whichever is greater.

(5) Supplemental nitrogen and phosphorous added to the soil of the treated area, for the purpose of increasing the rate of waste biodegradation, shall not exceed the rates of application recommended for agricultural purposes by the United States Department of Agricultural or Agricultural Extension Service.

(e) *Soil monitoring.* (1) Background soil conditions shall be determined by taking one soil core per acre in the area to be treated. The depth of the soil core shall be three times the depth of the zone of incorporation or 30 centimeters (12 inches), whichever is greater. The bottom one-third of the soil core shall be quantitatively analyzed for those constituents known or expected to be in the waste which make it hazardous. At new facilities, soil cores shall be taken and analyzed prior to beginning operation. At existing facilities, background soil cores shall be taken and analyzed within six months after the effective date of these regulations.

(2) Soil conditions in the treated area of a landfarm shall be determined by taking one soil core per acre, semi-annually. The depth of the soil core shall be three times the depth of the zone of incorporation or 30 centimeters (12 inches), whichever is greater. The bottom one-third of the soil core shall be quantitatively analyzed for the constituents in the waste which make it hazardous.

NOTE.—Soil monitoring may be conducted by taking less than one soil core per acre and/or by monitoring less frequently than semi-annually, provided the owner/operator can demonstrate to the Regional Administrator, at the time a permit is issued pursuant to Subpart E, that hazardous constituents, especially heavy metals, will be detected before vertically migrating a distance that exceeds three times the depth of the zone of incorporation or 30 centimeters (12 inches), whichever is greater.

(3) If soil monitoring shows that the concentration of a hazardous constituent in the bottom one-third of the soil core has significantly exceeded the background levels established in accordance with paragraph (e)(1), the owner/operator shall: (i) Notify the Regional Administrator within seven days;

(ii) Determine, by soil monitoring, the areal extent of vertical contaminant migration in the soil; and

(iii) Discontinue all landfarming in the contaminated area, as determined in (ii), until corrective measures can be taken.

(f) *Growth of food-chain crops.* Food-chain crops shall not be grown on the treated area of a landfarm.

(g) *Closure.* (1) A landfarm shall be designed and operated so that, by the time of closure, the soil of the treated area(s):

(i) Is returned to its pre-existing condition, as established in paragraph (e)(1) if the facility began operation after promulgation of this requirement (i.e., a new facility).

(ii) Is returned to equivalent pre-existing condition, as determined by soil analysis of similar local soils that have not had hazardous waste applied to them, if the facility began operation prior to the promulgation of this requirement (i.e., an existing facility). Soil analysis of similar local soils shall not be required at existing facilities if background soil data are available and those data establish background conditions for the treated area(s).

(2) Soil of the treated area(s) of a new or existing facility that does not comply with paragraph (g)(1)(i) or (ii), respectively, shall be analyzed to determine if it meets the characteristics of a hazardous waste as defined in Subpart A. In the event the soil is determined to be a hazardous waste, it shall be removed and managed as a hazardous waste in accordance with all applicable requirements of this Part.

NOTE.—The soil at a landfarm, if determined to be a hazardous waste, need not be removed provided the owner/operator can demonstrate to the Regional Administrator that, because of its special design and/or because of its location, the landfarm provides long term integrity and environmental protection equivalent to a landfill as specified in § 250.45-2. In the event of such a showing, the owner/operator shall comply with the applicable closure and post-closure provisions of § 250.43-7 and 250.45-2(c and d).

§ 250.45-6 Chemical, physical, and biological treatment facilities.

(a) The materials used in construction of the treatment facility shall be compatible, under expected operating conditions (e.g., temperature, pressure), with the hazardous waste and any treatment chemicals or reagents used in the treatment process.

(b) The hazardous waste shall be analyzed, as appropriate, prior to selection of a treatment technique to determine:

(1) The proper treatment technique, the proper feed rates of treatment chemicals or reagents, and the proper operating conditions (e.g., temperature, pressure, flow rate);.

(2) If the waste or treatment chemicals or reagents will have any detrimental effect (e.g., cause corrosion, dissolution, saltings or scalings) on the materials used for construction;

(3) If the waste contains any components or contaminants which may interfere with the intended treatment process (e.g., biological treatment, solidification, adsorption processes) or decreases the effectiveness of the treatment;

(4) If the waste contains components or contaminants which may cause the uncontrolled release of toxic gases or fumes (e.g., H_2S, HCN) during the intended treatment;

(5) If the waste contains components or contaminants which may form highly toxic components with the treatment chemicals or reagents (e.g., halogenated hydrocarbons) during the intended treatment.

NOTE.—The analyses of hazardous waste may be omitted provided the owner/operator can demonstrate to the Regional Administrator that the information provided in the manifest is adequate to make the determinations required in paragraph (b), or the facility owner/operator has sufficient information documenting that the subject hazardous waste is similar to a hazardous waste which has been previously treated at the facility where the same treatment conditions and the same treatment chemicals or reagents were used.

(c) Trial tests (bench scale, pilot plant scale, or other appropriate tests) shall be performed for each hazardous waste which is new or significantly different from hazardous waste previously treated to determine treatment technique and operating conditions, and to evaluate the effectiveness of the treatment process and consequences of the proposed treatment.

(d) All treatment chemicals or reagents used in a treatment process shall be stored in such a manner as to minimize the potential for spills, fires, explosions, or uncontrolled discharges or releases.

(e) All uncovered reaction vessels shall be sized to provide no less than 60 centimeters (2 feet) freeboard to prevent splashing or spillage of hazardous waste during the treatment (e.g., neutralization, precipitation).

(f) A facility shall have the capacity to receive emergency transfer of reactor contents, or shall have emergency storage capacity to be used in the event of an equipment breakdown or malfunction.

(g) A facility which continuously feeds hazardous waste into the treatment process shall be equipped with an automatic waste food cutoff or a by-pass system which is activated when a malfunction in the treatment process occurs.

(h) Upon final closure, all hazardous waste and hazardous waste residuals shall be removed from the facility, and treated or disposed of as hazardous waste pursuant to the requirements of this Part.

(i) All residuals or by-products from a treatment process (e.g., sludges, spent resins) shall be analyzed to determine whether they are hazardous waste within the meaning of Subpart A, or assumed to be a hazardous waste.

NOTE.—Analyses of treatment residuals or by-products may be omitted provided the owner/operator can demonstrate that the subject residuals and/or by-products are similar to those previously produced at the facility.

§ 250.46 Special waste standards.

Owners and operators of facilities that treat, store, or dispose of any of the special waste covered in this Section shall comply with the respective requirements specified in this Section and shall not have to comply with the other requirements of this Subpart or Subparts B and C with respect to a special waste.

§ 250.46-1 Cement kiln dust waste.

The treatment, storage, and disposal of cement kiln dust waste determined to be a hazardous waste under § 250.13 of Subpart A are subject to the requirements of the following Sections of this Subpart:

250.43(f) (General Facility Standards—waste analysis);
250.43-1 (General Site Selection—for new sources only);
250.43-2 (Security);
250.43-5(a), (b)(1), (b)(2)(i), (b)(6-7), and (c) (Manifest System, Recordkeeping, and Reporting);
250.43-6 (Visual Inspections);
250.43-7(k), (l), and (m) (Closure and Post-Closure); and
250.43-8(a) and applicable requirements of (c) and (d) which relate to groundwater monitoring, (Groundwater and Leachate Monitoring—for groundwater monitoring only).

§ 250.46-2 Utility waste.

(a) The treatment, storage, and disposal of flue-gas desulfurization waste, bottom ash waste and fly ash waste, which is generated by a steam power plant solely from the use of fossil fuels, and which is determined to be a hazardous waste under § 250.13 of Subpart A, are subject to the requirements of the following Sections of this Subpart:

250.43(f)(h) (General Facility Standards—waste analysis);
250.43-1 (General Site Selection—for new sources only);
250.43-2 (Security);
250.43-5(a), (b)(1), (b)(2)(i), (b)(6-7), and (c) (Manifest System, Recordkeeping, and Reporting);
250.43-6 (Visual Inspections);
250.43-7(k), (l) and (m) (Closure and Post Closure);
250.43-8(a) and applicable requirements of (c) and (d) which relate to groundwater monitoring, (Groundwater and Leachate Monitoring—for groundwater monitoring only)

§ 250.46-3 Phosphate rock mining, beneficiation, and processing waste.

(a) The treatment, storage, and disposal of hazardous waste listed in this paragraph (and which is listed as hazardous waste in § 250.14 of Subpart A) are subject to the requirements specified in paragraphs (b) and (c).

(1) Over burden, slimes (phosphoric clays) and tailings from phosphate rock mining;

(2) Waste gypsum from phosphoric acid production; and

(3) Slag and fluid bed prills from elemental phosphorus production.

(b) The requirements of the following Sections of this Subpart are applicable to waste listed under paragraph (a):

250.43(f) (General Facility Standards—waste analysis);
250.43-1 (General Site Site Selection—for new sources only);
250.43-2 (Security);
250.43-5(a), (b)(1), (b)(2)(i), (b)(6-7), and (c) (Manifest System, Recordkeeping, and Reporting);
250.43-6 (Visual Inspections);
250.43-7 (k), (l), and (m) (Closure and Post-Closure); and
250.43-8(a), and applicable requirements of (c) and (d) which relate to groundwater monitoring, (Groundwater and Leachate Monitoring—for groundwater monitoring only).

(c) Additionally, the following requirements are applicable to waste listed under paragraph (a):

(1) Location of waste deposits shall be recorded on reference maps which shall be maintained through the operating and post-closure periods.

(2) Land reclaimed by filling with waste listed in paragraph (a) shall be used for residential development only where provisions have been made to prevent alpha radiation exposure from Radon 222 inhalation from exceeding background levels by 0.03 Working Level Units and gamma radiation from exceeding background levels by 5 micro Roentgens/hour. The possible need for special construction methods for structures on such reclaimed land shall be identified to any future land owner(s) by recording a stipulation in the deed of the reclaimed land.

(3) Building products manufactured from waste listed in paragraph (a) shall not be used if such products cause alpha radiation exposure from Radon 222 inhalation to exceed background levels by 0.03 Working Level Units or cause gamma radiation to exceed background levels by 5 micro Roentgens/hour. Purchasers of waste and of products manufactured from waste shall be advised of this requirement by the seller.

(4) Analysis required under § 250.43-8(c)(5) shall also include determination of Radium concentration in picocuries/gram.

(5) Analysis required under § 250.43-8(c)(6) shall also include the following:

(i) Radium, picocuries/gram
(ii) Phosphate, mg/liter
(iii) Fluoride, mg/liter

§ 250.46-4 Uranium mining waste.

(a) The treatment, storage, and disposal of overburden and waste rock resulting from uranium mining (which is hazardous waste listed in § 250.14 of Subpart A) are subject to the requirements of the following Sections of this Subpart and to the additional requirements in paragraph (b):

250.43(f) (General Facility Standards—waste analysis);
250.43-1 (General Site Selection—for new sources only);
250.43-2 (Security);
250.43-5(a), (b)(1), (b)(2)(i), (b)(6-7), and (c) (Manifest System, Recordkeeping, and Reporting);
250.43-6 (Visual Inspections);
250.43-7(b), (k), (l), and (m) (Closure and Post-Closure); and
250.43-8(a), applicable requirements of (c) and (d) which relate to groundwater monitoring, (Groundwater and Leachate Monitoring—for groundwater monitoring only).

(b) Additionally, the following requirements are applicable to waste identified under paragraph (a):

(1) Location of waste deposits shall be recorded on reference maps which shall be maintained throughout the operating and post-closure periods.

(2) Land reclaimed by filling with waste identified in paragraph (a) shall be used for residential development only where provisions have been made to prevent alpha radiation exposure from Radon 222 inhalation from exceeding background levels by 0.03 Working Level Units, and gamma radiation from exceeding background levels by 5 micro Roentgens per hour. The possible need for special construction methods for structures on such reclaimed land shall be identified to any future land owner(s) by recording a stipulation in the deed of the reclaimed land.

(3) Building products manufactured from waste identified in paragraph (a) shall not be used if the products cause alpha radiation exposure from Radon 222 inhalation to exceed background levels by 0.03 Working Level Units or

gamma radiation to exceed background levels by 5 micro Roentgens per hour. Purchasers of waste and of products manufactured from waste shall be advised of this requirement by the seller.

(4) Analysis required under § 250.43-8(c)(5) shall also include determination of Radium concentration in picocuries/gram.

(5) Analysis required under § 250.43-8(c)(6) shall also include the following:

(i) Radium, picocuries/gram
(ii) Thorium, picocuries/gram
(iii) Processing reagents, mg/gr.
(iv) Molybdenum, mg/gr.

(6) As part of closure of subject disposal facilities, the site shall be reclaimed so as to support plant life indigenous to the surrounding area and shall be revegetated with such plant life.

NOTE.—Other plant life may be substituted if the substitute species provide an equivalent degree of stability to the soil.

§ 250.46-5 Other mining waste.

The treatment, storage, and disposal of discarded material from the extraction, beneficiation, and processing of ores and minerals, except phosphate rock and uranium ores (which are covered under §§ 250.46-3 and 250.46-4), which are determined to be hazardous waste under § 250.13 of Subpart A are subject to the requirements of the following Sections of this Subpart:

250.43(f) (General Facility Standards—waste analysis);
250.43-1 (General Site Selection—for new sources only);
250.43-2 (Security);
250.43-5(a), (b)(1), (b)(2)(i), (b)(6-7), and (c) (Manifest System, Recordkeeping, and Reporting);
250.43-6 (Visual Inspections);
250.43-7(k), (l), and (m) (Closure and Post-Closure);
250.43-8(a) and applicable requirements of (c) and (d) which relate to groundwater monitoring, (Groundwater and Leachate Monitoring—for groundwater monitoring only).

§ 250.46-6 Gas and oil drilling muds and oil production brines.

The treatment, storage, and disposal of oil and gas drilling muds and oil production brines which are determined to be hazardous waste under § 250.13 of Subpart A are subject to the requirements of the following Sections of this Subpart:

250.43(f) (General Facility Standards—waste analysis);
250.43-1 (General Site Selection—for new sources only);
250.43-2 (Security);
250.43-5(a), (b)(1), (b)(2)(i), (b)(6-7), and (c) (Manifest System, Recordkeeping, and Reporting);
250.43-6 (Visual Inspections); and
250.43-7(k), (l), and (m) (Closure and Post-Closure).

[6560-01-C]

Figure 1

FORM APPROVED
OMB NO.

TSDF (TREATMENT, STORAGE OR DISPOSAL FACILITIES) REPORT

IDENTIFICATION

NAME

ADDRESS

TSDF IDENTIFICATION CODE

CLOSING DATE

WASTE INFORMATION

GENERATOR I.D. CODE	MANIFEST DOCUMENT NUMBER	SHIPPING DESCRIPTION	QUANTITY	UNIT OF MEASURE

DRAFT

COMMENTS

CERTIFICATION

"I have personally examined and am familiar with the information submitted in this certification, and I hereby certify under penalty of law that this information is true, accurate, and complete. I am aware that there are significant penalities for submitting false information, including the possibility of fine and imprisonment."

SIGNATURE DATE

EPA Form 8700-13 (4-78)

[6560-01-M]

APPENDIX I

INCOMPATIBLE WASTE

Many wastes, when mixed with others at a hazardous waste facility, can potentially produce adverse human health and environmental effects through means such as the following: (1) heat generation, (2) violent reaction, (3) release of toxic fumes and gases as a result of mixing, (4) release of toxic substances in case of fire or explosion, (5) fire or explosion, and (6) generation of flammable or toxic gases.

Below is a summary list of potentially incompatible waste materials or components and the adverse consequences resulting from mixing of waste in one group with waste in another group.

The mixing of a Group A waste with a Group B waste may have the potential consequence as noted.

Group 1-A	*Group 1-B*
Acetylene sludge	Acid sludge
Alkaline caustic liquids	Acid and water
Alkaline cleaner	Battery acid
Alkaline corrosive liquids	Chemical cleaners
Alkaline corrosive battery fluid	Electrolyte, acid
Caustic wastewater	Etching acid liquid or solvent
Lime sludge and other corrosive alkalies	Liquid cleaning compounds
Lime wastewater	Pickling liquor and other corrosive acids
Lime and water	Spent acid
Spent caustic	Spent mixed acid
	Spent sulfuric acid

Potential consequences: Heat generation, violent reaction.

Group 2-A	*Group 2-B*
Asbestos waste, and other toxic wastes	Cleaning solvents
Beryllium wastes	Data processing liquid
Unrinsed pesticide containers	Obsolete explosives
Waste pesticides	Petroleum waste
	Refinery waste
	Retrograde explosives
	Solvents
	Waste oil and other flammable and explosive wastes

Potential consequences: Release of toxic substances in case of fire or explosion.

Group 3-A	*Group 3-B*
Aluminum	Any waste in Group 1-A or 1-B
Beryllium	
Calcium	
Lithium	
Magnesium	
Potassium	
Sodium	
Zinc powder and other reactive metals and metal hydrides	

Potential consequences: Fire or explosion; generation of flammable hydrogen gas.

Group 4-A	*Group 4-B*
Alcohols	Any concentrated waste in Groups 1-A or 1-B
Water	Calcium
	Lithium
	Metal hydrides
	Potassium
	Sodium
	SO_2Cl_2, $SOCl_2$, PCl_3, CH_3SiCl_3, and other water-reactive wastes

Potential consequences: Fire, explosion, or heat generation; generation of flammable or toxic gases.

Group 5-A	*Group 5-B*
Alcohols	Concentrated Group 1-A or 1-B wastes
Aldehydes	Group 3-A wastes
Halogenated hydrocarbons	
Nitrated hydrocarbons and other reactive organic compounds and solvents	
Unsaturated hydrocarbons	

Potential consequences: Fire, explosion or violent reaction.

Group 6-A	*Group 6-B*
Spent cyanide and sulfide solutions	Group 1-B wastes

Potential consequences: Generation of toxic hydrogen cyanide or hydrogen sulfide gas.

Group 7-A	*Group 7-B*
Chlorates and other strong oxidizers	Acetic acid and other organic acids
Chlorine	Concentrated mineral acids
Chlorites	Group 2-B wastes
Chromic acid	Group 3-A wastes
Hypochlorites	Group 5-A wastes and other flammable and combustible wastes.
Nitrates	
Nitric acid, fuming	
Perchlorates	
Permanganates	
Peroxides	

Potential consequences: Fire, explosion, or violent reaction.

Source: "Law, Regulations and Guidelines for Handling of Hazardous Waste". California Department of Health, February 1975.

APPENDIX II—EPA INTERIM PRIMARY AND PROPOSED SECONDARY DRINKING WATER STANDARDS

Parameter	Maximum Level
A. Interim primary	(mg/l)
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium (VI)	0.05
Flouride	1.4-2.4
Lead	0.05
Mercury	0.002
Nitrate (as N)	10
Selenium	0.01
Silver	0.05
Endrin	0.002
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005
2,4-D	0.01
2,4,5-TP Silvez	0.01
Radium	5 pCi/1
Gross Alpha	15 pCi/1
Gross Beta	4 millirem/yr
Turbidity	1/TU
Coliform Bacteria	1/100 ml
B. Secondary	(mg/l)
Chloride	250
Copper	1
Foaming Agents	0.5
Hydrogen Sulfide	0.05
Iron	0.3
Manganese	0.05
Sulfate	250
TDS	500
Zinc	5
Color	15 Color Units
Corrosivity	Non-corrosive
Odor	3 Threshold Odor Number
pH	6.5-8.5

APPENDIX III—PERMISSIBLE EXPOSURE LEVELS FOR AIRBONE CONTAMINANTS (29 CFR 1910.1000)

Permissible exposure levels for specified airborne contaminants are given in Tables Z-1 and Z-2 below. Permissible exposure levels for mineral dusts are given in Table Z-3 below. These values are taken from Occupational Safety and Health Administration regulations (29 CFR 1910.1000).

TABLE Z-1

Substance	p.p.m.[a]	mg./M³[b]
Acetaldehyde	200	360
Acetic acid	10	25
Acetic anhydride	5	20
Acetone	1,000	2,400
Acetonitrile	40	70
Acetylene dichloride, see 1, 2-Dichloroethylene		
Acetylene tetrabromide	1	14
Acrolein	0.1	0.25
Acrylamide—Skin		0.3
Acrylonitrile—Skin	20	45
Aldrin—Skin		0.25
Allyl alcohol—Skin	2	5
Allyl chloride	1	3
C Allyl glycidyl ether (AGE)	10	45
Allyl propyl disulfide	2	12
2-Aminoethanol, see Ethanolamine		
2-Aminopyridine	0.5	2

TABLE Z-1—Continued

Substance	p.p.m.[a]	mg./M³[b]
Ammonia	50	35
Ammonium sulfamate (Ammate)		15
n-Amyl acetate	100	525
sec-Amyl acetate	125	650
Aniline—Skin	5	19
Anisidine (o, p-isomers)—Skin		0.5
Antimony and compounds (as Sb)		0.5
ANTU (alpha naphthyl thiourea)		0.3
Arsenic and compounds (as As)		0.5
Arsine	0.05	0.2
Azinphos-methyl—Skin		0.2
Barium (soluble compounds)		0.5
p-Benzoquinone, see Quinone.		
Benzoyl peroxide		5
Benzyl chloride	1	5
Biphenyl, see Diphenyl		
Bisphenol A, see Diglycidyl ether		
Boron oxide		15
C Boron trifluoride	1	3
Bromine	0.1	0.7
Bromoform—Skin	0.5	5
Butadiene (1, 3-butadiene)	1,000	2,200
Butanethiol, see Butyl mercaptan		
2-Butanone	200	590
2-Butoxy ethanol (Butyl Cellosolve)—Skin	50	240
Butyl acetate (n-butyl acetate)	150	710
sec-Butyl acetate	200	950
tert-Butyl acetate	200	950
Butyl alcohol	100	300
sec-Butyl alcohol	150	450
tert-Butyl alcohol	100	300
C Butylamine—Skin	5	15
C tert-Butyl chromate (as CrO_3)—Skin		0.1
n-Butyl glycidyl ether (BGE)	50	270
*Butyl mercaptan	10	35
p-tert-Butyltoluene	10	60
Calcium arsenate		1
Calcium oxide		5
**Camphor	2	
Carbaryl (Sevin)		5
Carbon black		3.5
Carbon dioxide	5,000	9,000
Carbon monoxide	50	55
Chlordane—Skin		0.5
Chlorinated camphene—Skin		0.5
Chlorinated diphenyl oxide		0.5
*Chlorine	1	3
Chlorine dioxide	0.1	0.3
C Chlorine trifluoride	0.1	0.4
C Chloroacetaldehyde	1	3
α-Chloroacetophenone (phenacylchloride)	0.05	0.3
Chlorobenzene (monochlorobenzene)	75	350
o-Chlorobenzylidene malononitrile (OCBM)	0.05	0.04
Chlorobromomethane	200	1,050
2-Chloro-1,3-butadiene, see Chloroprene		
Chlorodiphenyl (42 percent Chlorine)—Skin		1
Chlorodiphenyl (54 percent Chlorine)—Skin		0.5
1-Chloro,2,3-epoxypropane, see Epichlorhydrin		
2-Chloroethanol, see Ethylene chlorohydrin		
Chloroethylene, see Vinyl chloride		
C Chloroform (trichloromethane)	50	240
1-Chloro-1-nitropropane	20	100

TABLE Z-1—Continued

Substance	p.p.m.[a]	mg./M³[b]
Chloropicrin	0.1	0.7
Chloroprene (2-chloro-1,3-butadiene)—Skin	25	90
Chromium, sol. chromic, chromous salts as Cr		0.5
Metal and insol. salts		1
Coal tar pitch volatiles (benzene soluble fraction) anthracene, BaP, phenanthrene, acridine, chrysene, pyrene		0.2
Cobalt, metal fume and dust		0.1
Copper fume		0.1
Dusts and Mists		1
Cotton dust (raw)		1
Crag herbicide		15
Cresol (all isomers)—Skin	5	22
Crotonaldehyde	2	6
Cumene—Skin	50	245
Cyanide (as CN)—Skin		5
Cyclohexane	300	1,050
Cyclohexanol	50	200
Cyclohexanone	50	200
Cyclohexene	300	1,015
Cyclopentadiene	75	200
2, 4-D		10
DDT—Skin		1
DDVP, see Dichlorvos		
Decaborane—Skin	0.05	0.3
Demeton —Skin		0.1
Diacetone alcohol (4-hydroxy-4-methyl-2-pentanone)	50	240
1,2-diaminoethane, see Ethylenediamine		
Diazomethane	0.2	0.4
Diborane	0.1	0.1
Dibutylphthalate		5
C o-Dichlorobenzene	50	300
p-Dichlorobenzene	75	450
Dichlorodifluoromethane	1,000	4,950
1,3-Dichloro-5,5-dimethyl hydantoin		0.2
1,1-Dichloroethane	100	400
1,2-Dichloroethylene	200	790
C Dichloroethyl ether—Skin	15	90
Dichloromethane, see Methylenechloride		
Dichloromonofluoromethane	1,000	4,200
C 1,1-Dichloro-1-nitroethane	10	60
1,2-Dichloropropane, see Propylenedichloride		
Dichlorotetrafluoroethane	1,000	7,000
Dichlorvos (DDVP)—Skin		1
Dieldrin—Skin		0.25
Diethylamine	25	75
Diethylamino ethanol—Skin	10	50
Diethylether, see Ethyl ether.		
Difluorodibromomethane	100	860
C Diglycidyl ether (DGE)	0.5	2.8
Dihydroxybenzene, see Hydroquinone		
Diisobutyl ketone	50	290
Diisopropylamine—Skin	5	20
Dimethoxymethane, see Methylal		
Dimethyl acetamide—Skin	10	35
Dimethylamine	10	18
Dimethylaminobenzene, see Xylidene		
Dimethylaniline (N-dimethyl-aniline)—Skin	5	25
Dimethylbenzene, see Xylene.		
Dimethyl 1,2-dibromo-2,2-dichloroethyl phosphate, (Dibrom)		3
Dimethylformamide—Skin	10	30
2,6-Dimethylheptanone, see Diisobutyl ketone		
1,1-Dimethylhydrazine—Skin	0.5	1
Dimethylphthalate		5
Dimethylsulfate—Skin	1	5

TABLE Z-1—Continued

Substance	p.p.m.[a]	mg./M³[b]
Dinitrobenzene (all isomers)—Skin		1
Dinitro-o-cresol—Skin		0.2
Dinitrotoluene—Skin		1.5
Dioxane (Diethylene dioxide)—Skin	100	360
Diphenyl	0.2	1
Diphenylmethane diisocyanate (see Methylene bisphenyl isocyante (MDI)		
Dipropylene glycol methyl ether—Skin	100	600
Di-sec, octyl phthalate (Di-2-ethylhexylphthalate)		5
Endrin—Skin		0.1
Epichlorhydrin—Skin	5	19
EPN—Skin		0.5
1,2-Epoxypropane, see Propyleneoxide		
2,3-Epoxy-1-propanol, see Glycidol		
Ethanethiol, see Ethylmercaptan		
Ethanolamine	3	6
2-Ethoxyethanol—Skin	200	740
2-Ethoxyethylacetate (Cellosolve acetate)—Skin	100	540
Ethyl acetate	400	1,400
Ethyl acrylate—Skin	25	100
Ethyl alcohol (ethanol)	1,000	1,900
Ethylamine	10	18
Ethyl sec-amyl ketone (5-methyl-3-heptanone)	25	130
Ethyl benzene	100	435
Ethyl bromide	200	890
Ethyl butyl ketone (3-Heptanone)	50	230
Ethyl chloride	1,000	2,600
Ethyl ether	400	1,200
Ethyl formate	100	300
C Ethyl mercaptan	10	25
Ethyl silicate	100	850
Ethylene chlorohydrin—Skin	5	16
Ethylenediamine	10	25
Ethylene dibromide, see 1,2-Dibromoethane		
Ethylene dichloride, see 1,2-Dichloroethane		
C Ethylene glycol dinitrate and/or Nitroglycerin—Skin	[a]0.2	1
Ethylene glycol monomethyl ether acetate, see Methyl cellosolve acetate		
Ethylene imine—Skin	0.5	1
Ethylene oxide	50	90
Ethylidine chloride, see 1,1-Dichloroethane		
N-Ethylmorpholine—Skin	20	94
Ferbam		15
Ferrovanadium dust		1
Fluoride (as F)		2.5
Fluorine	0.1	0.2
Fluorotrichloromethane	1,000	5,600
Formic acid	5	9
Furfural—Skin	5	20
Furfuryl alcohol	50	200
Glycidol (2,3-Epoxy-1-propanol)	50	150
Glycol monoethyl ether, see 2-Ethoxyethanol		
Guthion, see Azinphosmethyl		
Hafnium		0.5
Haptachlor—Skin		0.5
Haptane (n-haptane)	500	2,000
Hexachloroethane—Skin	1	10
Hexachloronaphthalene—Skin		0.2
Hexane (n-hexane)	500	1,800
2-Hexanone	100	410
Hexone (Methyl isobutyl ketone)	100	410
sec-Hexyl acetate	50	300
Hydrazine—Skin	1	1.3
Hydrogen bromide	3	10
C Hydrogen chloride	5	7
Hydrogen cyanide—Skin	10	11
Hydrogen peroxide (90%)	1	1.4
Hydrogen selenide	0.05	0.2
Hydroquinone		2
C Iodine	0.1	1
Iron oxide fume		10
Isoamyl acetate	100	525
Isoamyl alcohol	100	360
Isobutyl acetate	150	700
Isobutyl alcohol	100	300
Isophorone	25	140
Isopropyl acetate	250	950
Isopropyl alcohol	400	980
Isopropylamine	5	12
Isopropylether	500	2,100
Isopropyl glycidyl ether (IGE)	50	240
Ketene	0.5	0.9
Lead arsenate		0.15
Lindane—Skin		0.5
Lithium hydride		0.025
L.P.G. (liquified petroleum gas)	1,000	1,800
Magnesium oxide fume		15
Malthion—Skin		15
Maleic anhydride	0.25	1
C Manganese		5
Mesityl oxide	25	100
Methanethiol, see Methyl mercaptan		
Methoxychlor		15
2-Methoxyethanol, see Methyl cellosolve		
Methyl acetate	200	610
Methyl acetylene (propyne)	1,000	1,650
Methyl acetylene-propadiene mixture (Mapp)	1,000	1,800
Methyl acrylate—Skin	10	35
Methylal (dimethoxymethane)	1,000	3,100
Methyl alcohol (methanol)	200	260
Methylamine	10	12
Methyl amyl alcohol, see Methyl isobutyl carbinol		
Methyl (n-amyl) ketone (2-Heptanone)	100	465
C Methyl bromide—Skin	20	80
Methyl butyl ketone, see 2-Hexanone		
Methyl cellosolve—Skin	25	80
Methyl cellosolve acetate—Skin	25	120
Methyl chloroform	350	1,900
Methylcyclohexane	500	2,000
Methylcyclohexanol	100	470
0-Methylcliohexanone—Skin	100	460
Methyl ethyl ketone (MEK), see 2-Butanone		
Methyl formate	100	250
Methyl iodide—Skin	5	28
Methyl isobutyl carbinol—Skin	25	100
Methyl isobutyl ketone, see Hexone		
Methyl isocyanate—Skin	0.02	0.05
C Methyl mercaptan	10	20
Methyl methacrylate	100	410
Methyl propyl ketone, see 2-Pentanone		
C a Methyl styrene	100	480
C Methylene bisphenyl isocyanate (MDI)	0.02	0.2
Molybdenum:		
Soluble compounds		5
Insoluble compounds		15
Monomethyl aniline—Skin	2	9
C Monomethyl hydrazine—Skin	0.2	0.35
Morpholine—Skin	20	70
Naphtha (Coaltar)	100	400
Naphthalene	10	50
Nickel carbonyl	0.001	0.007
Nickel, metal and soluble cmpds, as NI		1
Nicotine—Skin		0.5
Nitric acid	2	5
Nitric oxide	25	30
p-Nitroaniline—Skin	1	6
Nitrobenzene—Skin	1	5
p-Nitrochlorobenzene—Skin		1
Nitroethane	100	310
Nitrogen dioxide	5	9
Nitrogen trifluoride	10	29
Nitroglycerin—Skin	0.2	2
Nitromethane	100	250
1-Ntropropane	25	90
2-Nitropropane	25	90
Nitrotoluene—Skin	5	30
Nitrotrichloromethane, see Chloropicrin		
Octachloronaphthalene—Skin		0.1
*Octane	500	2,350
*Oil mist, mineral		5
Osmium tetroxide		0.002
Oxalic acid		1
Oxygen difluoride	0.05	0.1
Ozone	0.1	0.2
Paraquat—Skin		0.5
Parathion—Skin		0.11
Pentaborane	0.005	0.01
Pentachloronaphthalene—Skin		0.5
Pentachlorophenol—Skin		0.5
*Pentane	1,000	2,950
2-Pentanone	200	700
Perchloromethyl mercaptan	0.1	0.8
Perchloryl fluoride	3	13.5
Petroleum distillates (naphtha)	500	2,000
Phenol—Skin	5	19
p-Phenylene diamine—Skin		0.1
Phenyl ether (vapor)	1	7
Phenyl ether-biphenyl mixture (vapor)	1	7
Phenylethylene, see Styrene		
Phenyl glycidyl ether (PGE)	10	60
Phenylhydrazine—Skin	5	22
Phosdrin (Mevinphos)—Skin		0.1
Phosgene (carbonyl chloride)	0.1	0.4
Phosphine	0.3	0.4
Phosphoric acid		1
Phosphorus (yellow)		0.1
Phosphorus pentachloride		1
Phosphorus pentasulfide		1
Phoshorus trichloride	0.5	3
Phthalic anhydride	2	12
Picric acid—Skin		0.1
Pival (2-Pivalyl-1,3-indandione)		0.1
Platinum (Soluble Salts) as Pt		0.002
Propargyl alcohol—Skin	1	
Propane	1,000	1,800
n-Propyl acetate	200	840
Propyl alcohol	200	500
n-Propyl nitrate	25	110
Propylene dichloride	75	350
Propylene imine—Skin	2	5
Propylene oxide	100	240
Propyne, see Methylacetylene		
Pyrethrum		5
Pyridine	5	15
Quinone	0.1	0.4
RDX—Skin		1.5
Rhodium, Metal fume and dusts, as Rh		0.1
Soluble salts		0.001
Ronnel		10
Rotenone (commercial)		5
Selenium compounds (as Se)		0.2
Selenium hexafluoride	0.05	0.4
Silver, metal and soluble compounds		0.01
Sodium fluoroacetate (1080)—Skin		0.05
Sodium hydroxide		2
Stibine	0.1	0.5
*Stoddard solvent	500	2,950
Strychnine		0.15
Sulfur dioxide	5	13
Sulfur hexafluoride	1,000	6,000
Sulfuric acid		1
Sulfur monochloride	1	6
Sulfur pentafluoride	0.025	0.25
Sulfuryl fluoride	5	20
Systox, see Demeton		
2,4,5T		10
Tantalum		5

TABLE Z-1—Continued

Substance	p.p.m.[a]	mg./M³[b]
TEDP—Skin		0.2
Tellurium		0.1
Tellurium hexafluoride	0.02	0.2
TEPP—Skin		0.05
C Terphenyls	1	9
1,1,1,2-Tetrachloro-2,2-difluoroethane	500	4,170
1,1,2,2-Tetrachloro-1,2-difluoroethane	500	4,170
1,1,2,2-Tetrachloroethane—Skin	5	35
Tetrachloroethylene, see Perchloroethylene		
Tetrachloromethane, see Carbon tetrachloride		
Tetrachloronaphthalene—Skin		2
Tetraethyl lead (as Pb)—Skin.		0.075
Tetrahydrofuran	200	590
Tetramethyl lead (as Pb)—Skin		0.07
Tetramethyl succinonitrile—Skin	0.5	3
Tetranitromethane	1	8
Tetryl (2,4,6-trinitrophenylmethylnitramine)—Skin		1.5
Thallium (soluble compounds)—Skin as Tl		0.1
Thiram		5
Tin (inorganic cmpds, except oxides		2
Tin (organic cmpds)		0.1
C Toluene-2,4-diisocyanate	0.02	0.14
o-Toluidine—Skin	5	22
Toxaphene, see Chlorinated camphene		
Tributyl phosphate		5
1,1,1-Trichloroethane see Methyl chloroform		
1,1,2-Trichloroethane—Skin	10	45
Titaniumdioxide		15
Trichloromethane, see Chloroform		
Trichloronaphthalene—Skin		5
1,2,3-Trichloropropane	50	300
1,1,2-Trichloro 1,2,2-trifluoroethane	1,000	7,600
Triethylamine	25	100
Trifluoromonobromomethane	1,000	6,100
2,4,6-Trinitrophenol, see Picric acid.		
2,4,6-Trinitrophenylmethylnitramine, see Tetryl		
Trinitrotoluene—Skin		1.5
Triorthocresyl phosphate		0.1
Triphenyl phosphate		3
Turpentine	100	560
Uranium (soluble compounds)		0.05
Uranium (insoluble compounds)		0.25
C Vanadium:		
V_2O_5 dust		0.5
V_2O_5 fume		0.1
Vinyl benzene, see Styrene		
Vinylcyanide, see Acrylonitrile		
Vinyl toluene	100	480
Warfarin		0.1
Xylene (xylol)	*100	435
Xylidine—Skin	5	25
Yttrium		1
Zinc chloride fume		1
Zinc oxide fume		5
Zirconium compounds (as Zr)		5

*1970 Addition.

[a]Parts of vapor or gas per million parts of contaminated air by volume at 25° C. and 760 mm. Hg pressure.

[b]Approximate milligrams of particulate per cubic meter of air.

TABLE Z-2

Material	8-hour time weighted average	Acceptable ceiling concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift.	
			Concentration	Maximum duration
Benzene (Z37.4-1969)	10 p.p.m	25 p.p.m	50 p.p.m	10 minutes.
Beryllium and beryllium compounds (Z37.29-1970).	2 μg./M³	5 μg./M³	25 μg./M³	30 minutes.
Cadmium fume (Z37.5-1970)	0.1 mg./M³	3 mg./M³		
Cadmium dust (Z37.5-1970)	0.2 mg./M³	0.6 mg./M³		
Carbon disulfide (Z37.3-1968)	20 p.p.m	30 p.p.m	100 p.p.m	Do.
Carbon tetrachloride (Z37.17-1967)	10 p.p.m	25 p.p.m	200 p.p.m	5 minutes in any 4 hours.
Ethylene dibromide (Z37.31-1970)	20 p.p.m	30 p.p.m	50 p.p.m	5 minutes.
Ethylene dichloride (Z37.21-1969)	50 p.p.m	100 p.p.m	200 p.p.m	5 minutes in any 3 hours.
Formaldehyde (Z37.16-1967)	3 p.p.m	5 p.p.m	10 p.p.m	30 minutes.
Hydrogen fluoride (Z37.28-1969)	do			
Fluoride as dust (Z37.28-1969)	2.5 mg./M³			
Lead and its inorganic compounds (Z37.11-1969).	0.2 mg./M³			
Methyl chloride (Z37.18-1969)	100 p.p.m	200 p.p.m	300 p.p.m	5 minutes in any 3 hours.
Methylene Chloride (Z37.3-1969)	500 p.p.m	1,000 p.p.m	2,000 p.p.m	5 minutes in any 2 hours.
Organo (alkyl) mercury (Z37.30-1969).	0.01 mg./M³	0.04 mg./M³		
Styrene (Z37.15-1969)	100 p.p.m	200 p.p.m	600 p.p.m	5 minutes in any 3 hours.
Trichloroethylene (Z37.19-1967)	do	do	300 p.p.m	5 minutes in any 2 hours.
Tetrachloroethylene (Z37.22-1967)	do	do	do	5 minutes in any 3 hours.
Toluene (Z37.12-1967)	200 p.p.m	300 p.p.m	500 p.p.m	10 minutes.
Hydrogen sulfide (Z37.2-1966)		20 p.p.m	50 p.p.m	10 minutes once only if no other measureable exposure occurs.
Mercury (Z37.8-1971)		1 mg./10M³		
Chromic acid and chromates (Z37.7-1971).		do		

TABLE Z-3—MINERAL DUSTS

Substance	Mppcf[a]	Mg/M³
Silica:		
Crystalline:		
Quartz (respirable)	250[c]	10mg/M³[e]
	%SiO₂+5	%SiO₂+2
Quartz (total dust)		30mg/M³
		%SiO₂+2
Cristobalite: Use ½ the value calculated from the count or mass formulae for quartz.		
Tridymite: Use ½ the value calculated from the formulae for quartz.		
Amorphous, including natural diatomaceous earth	20	80mg/M³
		%SiO₂
Silicates (less than 1% crystalline silica):		
Mica	20	
Soapstone	20	
Talc (non-asbestos form)	20[d]	
Talc (fibrous). Use asbestos limit		
Tremolite (see talc, fibrous)		
Portland cement	50	
Graphite (natural)	15	
Coal dust (respirable fraction less than 5% SiO₂)		2.4mg/M³ or
For more than 5% SiO₂		10mg/M³
		5SiO₂+2
Inert or Nuisance Dust:		
Respirable fraction	15	5mg/M³
Total dust	50	15mg/M³

NOTE: Conversion factors—mppcf×35.3=million particles per cubic meter=particles per c.c.

[a]Millions of particles per cubic foot of air, based on impinger samples counted by light-field technics.

[c]The percentage of crystalline silica in the formula is the amount determined from air-borne samples, except in those instances in which other methods have been shown to be applicable.

[e]As determined by the membrane filter method at 430× phase contrast magnification.

[d]Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

*Containing 1% quartz; if >1% quartz, use quartz limit.

APPENDIX IV—METHODS FOR DETERMINING SOIL pH

A. Method For Soil pH in Water (For Non-Calcareous Soils)

To 20 g. of soil in a 50-ml. beaker, add 20 ml. of distilled water, and stir the suspension several times during the next 30 minutes. Let the soil suspension stand for about 1 hour to allow most of the suspended clay to settle out from the suspension. Adjust the position of the electrodes in the claimps of the electrode holder so that, upon lowering the electrodes into the beaker, the glass electrode will be immersed well into the partly settled suspension, and the calomel electrode will be immersed just deep enough into the clear supernatant solution to establish a good electrical contact through the ground-glass joint or the fiber-capillary hole. Then insert the electrodes into the partly settled suspension as indicated above, measure the pH, and report the results as "soil pH measured in water."

B. Method For Soil pH in 0.01M $CaCl_2$ Solution (For Calcareous Soils)

Reagents

1. Stock calcium chloride solution ($CaCl_2$) 3.6M: Dissolve 1,059 g. of $CaCl_2.2H_2O$ in distilled water in a 2-liter volumetric flask. Cool the solution, dilute it to volume with distilled water, and mix it well. Dilute 20 ml. of this solution to 1 liter with distilled water in a volumetric flask, and standardize it by titrating a 25 ml. aliquot of the diluted solution with standard 0.1N $AgNO_3$, using 1 ml. of 5% K_2CrO_4 as the indicator.

2. Calcium chloride ($CaCl_2$) 0.01M: Dilute 50 ml. of stock 3.6M $CaCl_2$ to 18 liters with distilled water. If the pH of this solution is not between 5 and 6.5, adjust the pH by addition of a little $Ca(OH)_2$ or HCl. As a check on the preparation of this solution, measure its electrical conductivity. The specific conductivity should be 2.32 ± 0.08 mmho. per cm. at 25°C.

Procedure

To 10 g. of soil in a 50 ml. beaker, add 20 ml. of 0.01M $CaCl_2$ solution, and stir the suspension several times during the next 30 minutes. Let the soil suspension stand for about 30 minutes to allow most of the suspended clay to settle out from the suspension. Adjust the position of the electrodes in the clamps of the electrode holder so that, upon lowering the electrodes into the beaker, the glass electrode will be immersed well into the partly settled suspension and the calomel electrode will be immersed just deep enough into the clear supernatant solution to establish a good electrical contact through the groundglass joint or the fiber-capillary hole. Then insert the electrodes into the partly settled suspension as indicated above, measure the pH, and report the results as "soil pH measured in 0.01M $CaCl_2$.

SOURCE: "Methods of Soil Analysis". Part II, Chemical and Microbiological Properties, C. A. Black, Ed. (American Society of Agronomy), 1965.

Subpart E—Permits for Treatment, Storage, or Disposal of Hazardous Waste

AUTHORITY: Sec. 3005 Pub. L. 94-580, 90 Stat. 2808 (42 USC 6925).

§ 250.50 Reference.

Regulations developed pursuant to Section 3005 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (42 USC 6925), concerning permits for treatment, storage, and disposal of hazardous waste are being integrated with similar permit regulations under the Clean Water Act and the Safe Drinking Water Act, and will be proposed under Title 40, CFR, Parts 122, 124, and 128.

Subpart F—Guidelines for Authorized State Hazardous Waste Programs

AUTHORITY: Sec. 3006, Pub. L. 94-580, 90 Stat. 2809 (42 USC 6926).

§ 250.60 Reference.

Guidelines developed pursuant to Section 3006 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (42 USC 6926), concerning authorized State hazardous waste programs are being integrated with similar State authorization regulations under the Clean Water Act and the Safe Drinking Water Act, and will be proposed under Title 40, CFR, Parts 122 and 123.

[FR Doc. 78-34903 Filed 12-15-78; 8:45 am]

[6560.01-M]

[40 CFR Part 250]

[FRL 1014-7]

IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

Advance Notice of Proposed Rulemaking

AGENCY: Environmental Protection Agency.

ACTION: Advance Notice of Proposed Rulemaking.

SUMMARY: This Notice solicits data, information, case studies, and operating experience relevant to the expansion of the characteristics for identifying hazardous waste pursuant to Section 3001 of the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976. This Notice should be reviewed in the context of the Proposed Rulemaking for Section 3001 (Subpart A, 40 CFR Part 250) appearing in this same issue of the FEDERAL REGISTER.

DATES: Comments received on or before July 1, 1979 will be of primary importance in further development of these regulations. All comments will be available for public inspection by contacting the Docket Section at the address below.

ADDRESSEES: Comments to: John P. Lehman, Director, Hazardous Waste Management Division, Office of Solid Waste (WH-565), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460. Attn: Section 3001 ANPR. Official record for this rulemaking is available at: Docket Section, Rm 2111D, U.S. Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460, and available for viewing from 9 a.m. to 4 p.m., Monday through Friday, excluding holidays.

FOR FURTHER INFORMATION CONTACT:

Mr. Alan S. Corson (202) 755-9187.

SUPPLEMENTAL INFORMATION: This Notice begins a second phase of data gathering and information development that commenced with an Advance Notice of Proposed Rulemaking (ANPR) (May 2, 1977, 42 FR 22332-22334). The culmination of this first ANPR was a set of rulemaking proposals pursuant to Sections 3001, 3002, and 3004 of the Act (appearing in today's issue of the FEDERAL REGISTER) and proposals pursuant to Section 3006 (February 1, 1978, 43 FR 4942-4955), and Section 3003 (April 28, 1978, 43 FR 18506-18512).

This ANPR focuses on the need to expand the data and information available to the Agency to further develop EPA's actions under Section 3001, beyond the proposal which appears in today's FEDERAL REGISTER (40 CFR Part 250; Subpart A). Specifically, this ANPR solicits data, information, case studies, and operating experience which could lead to the addition of further characteristics for identification of hazardous waste. The attributes of waste under consideration for designation as additional characteristics include radioactivity, genetic activity, bioaccumulation, and additional aspects of toxicity which would include toxicity to aquatic organisms, toxicity to terrestrial plants, and toxicity to humans resulting from chronic exposure to organic chemicals.

The implications of the Agency designating characteristics in addition to those cited in the proposed rulemaking elsewhere in today's FEDERAL REGISTER are potentially significant. Any person responding to this ANPR should review and evaluate the preamble to the above-mentioned proposed rule to fully appreciate these implications.

The additional characteristics and tests are described in paragraphs (a) and (b). Comments are specifically invited on the following questions.

1. Should the Agency add additional characteristics to those proposed in today's FEDERAL REGISTER? Are the at-

tributes which are candidates (items (a) and (b)) necessary and sufficient for this purpose?

2. How well do the suggested properties measure the characteristic in question? What alternative properties would be more effective and why?

3. How well do the suggested tests measure the property in question both qualitatively and quantitatively? and

4. What are the economic implications of using tests as determinants of whether or not a given waste is hazardous, including costs of testing and availability of testing facilities and personnel?

Dated: December 11, 1978.

DOUGLAS M. COSTLE,
Administrator.

(a) *Radioactivity.* A solid waste is a hazardous waste if it is not source, special nuclear or by-product material as defined by the Atomic Energy Act of 1954, as amended, and if a representative sample of the waste has either of the following properties:

(1) The average radium-226 concentration exceeds 5 picocuries per gram for solid wastes or 50 picocuries (radium-226 and radium-228 combined) per liter for liquid wastes; as determined by either of the methods cited in Appendix I; or

(2) The total radium-226 activity equals or exceeds 10 microcuries for any single discrete source.

(b) *Toxicity.* A solid waste is a hazardous waste if the extract obtained from applying the Extraction Procedure (see Section 250.13(d)(2) in Subpart A, 40 CFR Part 250) to a representative sample of the waste has any of the following properties, according to the tests specified in Appendices II–VI.

(1) Either contains more than one mg/liter of any compound on the Controlled Substances List in Appendix II or gives a positive response in any one of the tests for mutagenic activity, described in Appendix III.

A total of three assays would be conducted, one chosen from Group I, one from Group II, and one from those listed in Group III.

GROUP I—DETECTION OF GENE MUTATIONS

A. Point mutation in bacteria.

GROUP II—DETECTION OF GENE MUTATIONS

A. Mammalian somatic cells in culture.
B. Fungal microorganisms.

GROUP III—DETECTING EFFECTS ON DNA REPAIR OR RECOMBINATION AS AN INDICATION OF GENETIC DAMAGE

A. DNA repair in bacteria (including differential killing of repair-defective strains).
B. Unscheduled DNA synthesis in human diploid cells.
C. Sister-chromatid exchange in mammalian cells.
D. Mitotic recombination and/or gene conversion in yeast.

A result shall be considered positive for the mutagenic activity assays if a reproducible increase is observed in the effect being measured over negative control.

(2) Gives a positive result in the Bioaccumulation Potential Test defined in Appendix IV.

(3) Exceeds any of the applicable thresholds when evaluated according to paragraph (a) or (b) of this section.

(a) Analytic threshold.

A. Has a concentration of a substance for which an EPA National Interim Primary Drinking Water Standard has been established, which is greater than or equal to 10 times that standard.

B. Contains any organic substance which has a calculated human LD50 of less than 800 mg/kg, at a concentration in mg/l greater than or equal to 0.35 times its LD50 expressed in units of mg/kg. For the purposes of these regulations, metallic salts of organic acids containing 3 or fewer carbon atoms are considered not to be organic substances.

PROCEDURE FOR CALCULATING HUMAN LD50 VALUE

The LD50 value to be used will be that for oral exposure to rats. Where a value for the rat is not available, mouse oral LD50 data may be employed. Where an appropriate LD50 value for the rat or mouse is listed in the NIOSH *Registry of Toxic Effects of Chemical Substances* ("Registry"), this value may be used without validation. If other values are used, they must be supported by specific and verified laboratory reports. The appropriate conversion factors to use in calculating LD50's are

Rat×.16=human
Mouse×.066=human

Example: Tetraethylenepentamine

Listed oral rat LD50 is 3990 mg/kg, calculated human LD50 is 3990×0.16=638 mg/kg; 638×0.35=223 mg/l.

Thus, if the EP extract contains more than 223 mg/l of tetraethylenepentamine the waste is hazardous.

(b) Bioassay threshold.

A. Interferes with reproduction and/or growth as determined by the daphnia magna assay in Appendix V.

B. Interferes with plant growth in any one of the terrestrial plant assays in Appendix VI. All of the assays specified would be required.

APPENDIX I—RADIOACTIVE WASTE MEASUREMENTS

Radium-226 concentration can be determined by either of the following methods referenced in Part 300 of *Standard Methods for the Examination of Water and Wastewater*, 13th ed. APHA, AWWA, WPCF, New York (1970).

1. Precipitation method

2. Radon Emanation Technique Radium-226 concentration in liquid sources can be determined by the method referenced in *Interim Radiochemical Methodology for Drinking Water* (EPA-600/4-75-008 (Revised)). Additional Information Concerning Sample Preparation

1. *Radioassay Procedures for Environmental Samples* U.S. Department of Health, Education & Welfare, Public Health Service, Rockville, MD. (1967)

2. *Method for Determination of Radium-226 in Solid Waste Samples* available from USEPA Office of Solid Waste.

APPENDIX II—CONTROLLED SUBSTANCE LIST

NOTE.—Compounds and classes which have been reported to be either mutagenic, carcinogenic, or teratogenic an which would not give a positive indication of activity using the prescribed tests. Where a class of compounds is listed, inclusion on this list does not mean that all members of the class have been shown to be either mutagenic, carcinogenic, or teratogenic. Demonstration that specific class members contained in the waste have not been shown to be either mutagenic, carcinogenic, or teratogenic, will be sufficient for a demonstration of nonhazard by reason of mutagenic activity (M).

Aloperidin
Amantadine
4-Aminoantipyrin acetamide
Aminopterin
3-Amino-1,2,4-triazole
6-Azauridine
Azo dyes
Benzene
Bisulfan
Carbon tetrachloride
Chloroquine
Chlorambucil
Cobalt salts
Colchicine
Coumarin Derivatives
Cycasin
Cyclophosophamide
Dextroamphetamine sulfate
Diazepam (Valium)
Diethylstilbesterol
Dimethylaminoazobenzene
Dimethylnitrosamine
Diphenylhydantoin
Ethionine
Grisefulvin
1-Hydroxysafrole
Maleic Hydrazide
Methotrexate
Methylthiouracil
Mytomycin-C
d-Penicillamine
Phenylalanine
Phorbol esters
Quinine
Resperine
p-Rosanilin
Safrole
Serotonin
Streptomycin
Testosterone
Thioacetamide thiourea
Trimethadione
d-Tubocurarine

APPENDIX III—MUTAGENIC ACTIVITY DETECTION

GROUP I—DETECTION OF GENE MUTATIONS

a. *Point Mutations in Bacteria.*

1. *Positive Controls.* All assays must be run with a concurrent positive control. Positive control compounds or mixtures shall be selected to demonstrate both the sensitivity of the indicator organism and the functioning of the metabolic activation system.

2. *Negative controls.* A solvent negative control shall be included.

3. *Choice of Organisms.* The bacteria used shall include strains capable of detecting base pair substitutions (both transitions and transversions) and frame-shift mutations. The known spectrum of chemical mutagens capable of being detected by the strains shall be considered when selecting the strains. The strains shall also be highly sensitive to a wide range of chemical mutagens. They may include strains whose cell wall, DNA repair, or other capabilities have been altered to increase sensitivity (Ames, 1975; McCann *et al.*, 1975). Although sensitive bacterial assays for forward mutations at specific loci or over some portion of the entire genome may also be appropriate, at the present time the most sensitive and best-characterized bacteria for mutagenicity testing are those capable of indicating reverse mutations at specific loci.

4. *Methodology.*—(i) *General.* The test shall be performed in all respects in a manner known to give positive results for a wide range of chemical mutagens at low concentrations. Tests must be run with and without metabolic activation. The sensitivity and reproducibility of the metabolic activation systems and strains used shall be evaluated both by reference to past work with the method and by the concurrent use of positive controls.

(ii) *Plate assays.* In general, the EP extract should be tested by plate incorporation assays at various concentrations. Test conditions should minimize the possible effects due to extraneous nutrients, contamination by other bacteria, and high levels of spontaneous mutants.

(iii) *Liquid suspension assays.* A few chemicals (e.g., diethylnitrosamine and demethylnitrosamine) will give positive results only in tests in which the test substance, the bacteria, and the metabolic activation system are incubated together in liquid prior to plating, but not in a plate incorporation assay (Bartsch *et al.*, 1976). Thus, tests shall be conducted in liquid suspension as well as on agar plates.

(iv) *Doses.* The highest test dose which does not result in excessive cell death shall be used.

GROUP II—DETECTION OF GENE MUTATIONS

a. *Mammalian Somatic Cells in Culture.*

1. *Choice of cell systems.* A number of tests in mammalian somatic cells in culture are available in which specific locus effects may be detected in response to chemical exposure (Shapiro *et al.*, 1972; Chu, 1971). The cell line used shall have demonstrated sensitivity of chemical induction of specific-locus mutations by a variety of chemicals. The line shall be chosen for ease of cultivation, freedom from biological contaminants such as mycoplasmas, high and reproducible cloning efficiencies, definition of genetic detection, loci, and relative karyotypic stability. The inherent capabilities of the test cells for metabolic activation of promutagens to active mutagens shall also be considered, as well as the use of metabolic activation systems similar to those used with microorganisms.

2. *Methodology.*—(i) *General.* The test shall be performed in all respects in a manner known to give positive results for a wide range of chemical mutagens. The sensitivity of the system, metabolic activation capability, and its reproducibility must be evaluated by reference to past work and by the concurrent use of positive controls. Culture conditions which may affect the detection of mutations and give falsely high or low figures for reasons other than chemical induction shall be avoided. Definition of detected genetic loci studies and verifiction that the obseved phenotypic changes are indeed genetic alterations should be presented.

b. *Mutation in Fungi.*

1. *Controls.* All considerations discussed under Group I, a. are applicable.

2. *Choice of Organisms.* The fungi used shall include strains capable of detecting base pair substitutions (both transitions and transversions) and frame-shift mutations. More inclusive assay systems, such as those designed to detect recessive lethals, are also acceptable. The known spectrum of chemical mutagens capable of being detected by the strains shall be considered when selecting the strains. The strains shall also be highly sensitive to a wide range of chemical mutagens. Strains altered in DNA repair or other capabilities with the intent to increase sensitivity may be used, subsequent to validation. Either forward or reverse mutation assays may be applied.

3. *Methodology*—(i) *General.* All considerations discussed under Group I a, 4, (i) are applicable. *Care should be taken to investigate* stage sensitivity, i.e., replicating vesus non-replicating cells as well as possible requirement for post-treatment growth.

(ii) *Plate Assays.* While spot tests and plate incorporation assays are useful for preliminary testing, they shall not be considered conclusive.

GROUP III—DETECTING EFFECTS ON DNA REPAIR OR RECOMBINATION AS AN INDICATION OF GENETIC DAMAGE

a. *DNA Repair in Bacteria.*

1. *Controls.* All considerations discussed under Group I are applicable.

2. *General.* (i) When the DNA of a cell is damaged by a chemical mutagen, the cell will utilize its DNA repair enzymes in an attempt to correct the damage. Cells which have reduced capability of repairing DNA may be more susceptible to the action of chemical mutagens, as detected by increased cell death rates. For suspension tests using DNA repair-deficient bacteria, the positive control should be similar in toxicity to the test mixture.

(ii) The DNA repair test in bacteria determines if the test substance is more toxic to DNA repair-deficient cells than it is to DNA repair-competent cells. Such differential toxicity is taken as an indication that the chemical interacts with the DNA of the exposed cells to produce increased levels of genetic damage.

3. *Choice of Organisms.* Two bacterial strains, with no known genetic differences other than DNA repair capability, shall be used. The strains selected shall be known to be capable of indicating the activity of a wide range of chemical mutagens. The spectrum of chemical mutagens and chemical mixtures capable of being detected by the strains and procedures used shall be reported.

4. *Methodology*—(i) *Plate test.* The EP extract should be tested by spotting a quantity on an agar plate which has had a lawn of the indicator organisms spread over it. After a suitable incubation period, the zone of inhibition around the spot shall be measured for each strain and compared for the DNA repair-competent and DNA repair-deficient strains. If no discrete zone of inhibition is seen with either strain, then the results of the tests are not meaningful.

(ii) *Liquid suspension test.* The liquid suspension test shall also be performed by comparing the rates at which given concentrations of the test substances will kill each of the two indicator strains when incubated in liquid suspension. Conditions should be adjusted so that significant killing of the DNA repair-competent strain occurs, if this is possible. Methodology is discussed in Kelly *et al.* (1976).

(iii) *Doses.* The dose level of test substances used in the plate or suspension test shall be adjusted so that significant toxicity to the DNA repair-competent strain is measured. In the plate test, this means that a zone of inhibition must be visible; in the suspension test, significant loss of cell viability must be measured. This may not be possible if the test substance is not toxic to the bacteria or if, in the plate test, it does not dissolve in and diffuse through the agar. The same dose must be used in exposing the DNA repair-competent and repair-deficient strains.

b. *Unscheduled DNA Synthesis in Human Diploid Cells.*

1. *General.* DNA damage induced by chemical treatment of a cell can be measured as an increase in unscheduled DNA synthesis which is an indication of increased DNA repair. Unrepaired or mis-repaired alterations may result in gene mutations or in breaks or exchanges which can lead to deletion and/or duplication of larger gene sequences or to translocations which may affect gene function by position effects (Stich, 1970; Stoltz *et al.*, 1974).

2. *Methodology*—(i) *General.* Primary or established cell cultures with normal repair function shall be used. Standardized human cell strains from repositories are recommended. Controls should be performed to detect changes in scheduled DNA synthesis at appropriate sections in the experimental design. The media conditions shall be optimal for measuring repair synthesis.

(ii) *Dose.* At least five dose levels shall be used and the time in the cycle of cynchronour or non-proliferating cells at which exposure takes place shall be given. The maximum compound dose shall induce toxicity, and the dosing period with the test substance shall not be less than sixty minutes.

c. *Sister Chromatid Exchange in Mammalian Cells with and without Metabolic Activation.*

1. *Controls.* All considerations discussed under Group I a. are applicable.

2. *General.* Cytological techniques are available to evaluate the genetic damage induced by chemicals. In the past few years a technique has been developed for identifying sister chromatid exchanges much more simply and efficiently than by the autoradiographic method. The method utilizes the fact that a fluorescent stain Hoechst 33258 binds to thymidine-containing DNA but not, or far less efficiently, to BrdUrd-substituted DNA. This means that the order of fluorescence would be brightest for DNA unreplicated in BrdUrd, intermediate for DNA

after one round of replication in BrdUrd, and least for DNA following two rounds of replication in BrdUrd. Thus a sister chromatid exchange can be seen as a switch of fluorescence pattern at the point of exchange. Perry and Wolff (Nature 251, 156-158 (1974)) combined Hoechst staining with Giemsa staining such that the brightly fluorescing regions stain darkly with Giemsa, and the dully fluorescent regions hardly stain at all.

3. *Choice of Organisms.* Chromosomal preparations of human peripheral blood leukocytes or Chinese hamster ovary cells shall be used.

4. *Methodology*—(i) *General.* The test method must be capable of detecting sister chromatid exchanges. Procedures reported by Perry and Wolff (Nature 251, 156-158 (1974)) and Moorhead, *et al.* (Exp. cell Res. 20, 613-616 (1960)) are recommended. Metabolic activation with rat liver S-9 mix should be incorporated whenever it is appropriate.

(ii) *Doses.* Test substances shall be tested to the highest dose where toxicity does not interfere with the test procedure.

d. *Mitotic Recombination and/or Gene Conversion in Yeast.*

1. *Controls.* All considerations discussed under Group I are applicable.

2. *General.* One can effectively study the chromosomes of eukaryotic microorganisms by employing classical genetic methodologies which depend upon the behavior and interaction of specific markers spaced judiciously within the genome. These methods have been developed over several decades and have been applied in recent years to the study of induced genetic damage (Zimmerman, 1971, 1973, 1975; Brusick and Andrews, 1974).

3. *Choice of Organisms.* Diploid strains of yeasts that detect mitotic crossing-over and/or mitotic gene conversion shall be used. Additionally, as appropriate strains are developed, monitoring for induced non-disjunction and other effects may be possible. Mitotic crossing-over shall be detected in a strain of organism in which it is possible, by genetic means, to determine with reasonable certainty that reciprocal exchange of genetic information has occurred.

Strains employed for genetic testing shall be of proven sensitivity to a wide range of mutagens.

4. *Methodology*—(i) *General.* In general, wastes shall be tested in liquid suspension tests.

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Appendix IV—Bioaccumulation Potential Test

(a) General

Reverse-phase liquid chromatography is a separation process in which chemicals are injected onto a column of fine particles coated with a nonpolar (water insoluble) oil and then eluted along the column with a polar solvent such as water or methanol. Recent developments in this field have produced a permanently bonded reverse-phase column in which long-chain hydrocarbon groups are chemically bonded to the column packing material which leads to a more reproducible separation. The chemicals injected are moved along the column by partitioning between the mobile water phase and the stationary hydrocarbon phase. Mixtures of chemicals can be eluted in order of their hydrophobicity, with water soluble chemicals eluted first and the oil soluble chemicals last in proportion to their hydrocarbon/water partition coefficient. Calibration of the instrument using compounds of known octanol/water partition coefficient allows this procedure to be used to determine whether an unknown mixture contains compounds with octanol/water partition coefficients above a designated level.

Specific correlations exist between octanol/water partition coefficients and bioconcentration in fish. This test thus offers a rapid, inexpensive method of identifying those mixtures which contain compounds which pose a potential bio-accumulative hazard.

Compounds with log P 3.5, but which readily biodegrade would not be expected to persist in the environment long enough for accumulation to occur. Thus a degradation option has been included in order to exempt these substances from the hazardous waste control system.

(b) Chromatography conditions

A liquid chromatograph equipped with a high pressure stopflow injector and a 254 nm ultraviolet detector with an 8 ul cell volume and 1 cm path length is employed. The column is a Varian Preparative Micropak C-H (Catalog number 07-000181-00), or its equivalent, consisting of a 250 mm X 8 mm (i.d.) stainless steel cylinder filled with 10 micron lichrosorb to which octadecylsilane is permanently bonded.

The column is operated at ambient temperature. The solvent consists of a mixture of water and methanol (15:85, v/v) which is pumped through the column at 2.0 ml/minute.

(c) Retention volume calibration

Chemicals are dissolved in a mixture of acetone and cyclohexane (3:1, v/v). For preparing the calibration curve the quantity of individual chemicals in the solution is adjusted to give a chromatographic peak of at least 25 percent of the recorder scale. Acetone produces a large peak at approximately 2.6 minutes.

Six chemicals for which Log P has been reported are used to calibrate the elution time in units of Log P. The calibration mixture is summarized in Table 1 and includes benzene, bromobenzene, biphenyl, bibenzyl, p,p'-DDE, and 2,4,5,2',5'-pentachlorobiphenyl.

(d) Sensitivity calibration

The mixture is chromatographed and a calibration curve prepared daily to eliminate small differences due to flow rate or temperature and to follow the retention properties of the column during prolonged use. The calibration is made by plotting Log P vs the logarithm of the absolute retention time (log RT). Figure 1 is an example of such a calibration curve.

(e) Test procedure

(1) Prepare a calibration curve as described above.

(2) Calculate the geometric mean of the instrumental response to the chemicals listed in Table 1 with the exception of the acetone. This value, expressed in ug/25% full scale deflection, is designated the Instrumental Sensitivity (IS).

(3) Extract X liters of the Extraction Procedure extract to be tested, using dichloromethane, and concentrate the extract to a quantity suitable for injection onto the column. The quantity X is determined by the instrumental sensitivity and is given by the relationship: X in liters =IS in micrograms.

(4) Analyze the extract using the now calibrated chromatograph. A positive response is defined as an instrumental response greater than or equal to 25 percent full scale detector response in the region of Log P greater than or equal to 3.5.

(5) If a positive response is indicated in step (4), then subject a sample of the waste to a biodegradation assay and then retest. If a positive response with the degraded waste is not obtained, then the waste is not considered to be hazardous by reason of bioaccumulativeness.

TABLE I—*Partition Coefficients for Chemicals Used for Calibration*

	Log P
Acetone	0.55
Benzene	2.13
Bromobenzene	2.99
Biphenyl	3.76
Bibenzyl	4.81
p,p'-DDE	5.69
2,4,5,2',5'-Pentachlorobiphenyl	6.11

APPENDIX V—DAPHNIA MAGNA REPRODUCTION ASSAY

(A) METHOD

(1) Tests are run at only one dilution of the neutralized extract.

(2) First instar *D. magna,* 12 hours ±12 hours old are utilized.

(3) One *D. magna* is placed in 50 ml of extract solution in a 100 ml glass beaker with a watch glass.

(4) Temperature is maintained at 20.0 ± 0.5°C in an environmental chamber under 12-hour light/dark lighting regime.

(5) Dilution water is either filtered spring or well water (pH 7.8; alkalinity, 119 mg/l; hardness, 140 mg/l).

(6) All tests are run with ten replicates, and a set of ten controls. Test organisms are transferred to freshly prepared test solution in clear beakers and fed two ml of prepared food every Monday, Wednesday, and Friday, and the number of young in each beaker are counted.

(7) Test duration is 28 days or until all animals have died, whichever comes first.

(B) HANDLING

(1) Organisms should be handled as little as possible.

(2) Smooth glass tubes with rubber bulbs should be used for transferring daphnids.

(3) Food should be added to freshly prepared test solution in 100 ml beakers before animals are transferred.

(C) FOOD

(1) Food mixture of 1 mg/ml per animal used.

(2) 1 mg/ml preparation:

(i) Enough Ralston Purina Micro-Mixed Trout Chow is ground and then mixed at high speed with distilled water in a blender to produce 10 mg/ml concentration.

(ii) The mixture is then screened to remove unground particles, and refrigerated.

(iii) The mixture is diluted with distilled water to 1 mg/ml when needed.

(D) RESULTS

Comment is specifically requested concerning what biological measures to use in defining a significant change in growth or reproduction. Currently under study are the following indicators:

1. Average survival time during test period (days).
2. Average age at first brood release (days).
3. Average number of broods of young per adult.
4. Average number of young produced per adult.
5. Average number of young per brood.

APPENDIX VI—TERRESTRIAL PLANT ASSAYS

(A) SEED GERMINATION BIOASSAY PROTOCOL

(1) Seeds (radish, *Raphanus sativus* 'Early Scarlet Globe') sieved to reduce germination and growth variability. Mesh size: 2.36 mm, 2.00 mm, 1.70 mm (U.S.A. standard testing sieves). One size category used per bioassay.

(2) 100 ml extract solution diluted 1:10 put in chamber (Figure 2), blotter paper placed upright to absorb solution.

(3) 150 radish seeds placed in position; saturated paper laid over them and gently pressed until impression seen.

(4) Second Plexiglas sheet positioned so seeds and blotter paper sandwiched between; Plexiglas taped securely on sides and top (see Figure 2).

(5) Unit then put in germination chamber.

(6) Environmental chamber (temperature 25° C, no illumination) houses germination chamber for 48 hrs.

(7) Length of hypocotyl measure after incubation.

(8) Standard T-test used to compare dosed seeds to control.

(B) SEEDLING GROWTH STUDY PROTOCOLS

(1) Seedling growth studies are run using wheat (*Triticum aestivum*) and soybean (*Glycine max*).

(2) The seeds are soaked for approximately 3 hours in deionized water.

(3) 200 ml of soluble plant food with trace elements (1 tblsp per gal water) is added to approximately one liter of sand (acid-washed quartz sand to pass 60 mesh sieve, leached by triple rinse in distilled water) in which the seeds are planted, 25 soybean and 50 wheat seeds per container.

(4) When the seeds have sprouted (about 72 hrs) the extract diluted 1:10 is added in droplets. Constant pressure is applied via compressed air tank to test solution in a plastic bottle. Solution is forced through tygon tubing to a polyethylene nozzle (inverted buchner funnel). The volume is regulated with a screw clamp adjusted to a flow rate of 6 ml/sec. This design is simple and disposable or acid washable in order to assure ready availability of component parts which are easily cleaned between test runs.

(5) Seedlings are exposed daily to a dose sufficient to restore loss by evapotranspiration.

(6) At the end of 2 weeks of exposure plants are harvested and the following parameters are measure:

(i) Root biomass.

(ii) Shoot biomass.

(iii) Gross pathology (i.e., necrosis, chlorosis).

(C) RESULTS

Comments are specifically requested concerning the significance of these indicators as measures of damage.

[65601-01-C]

Figure 1

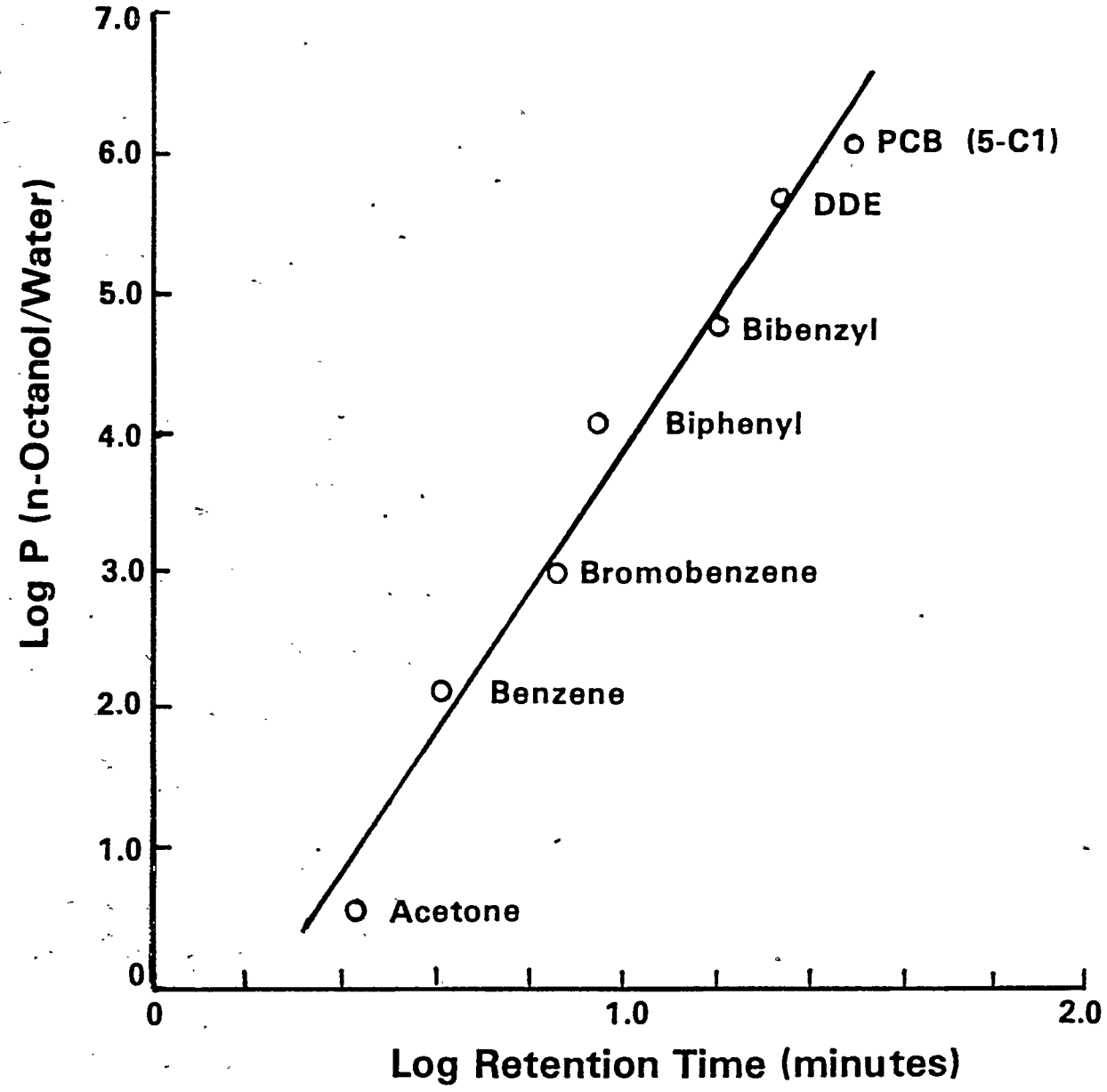
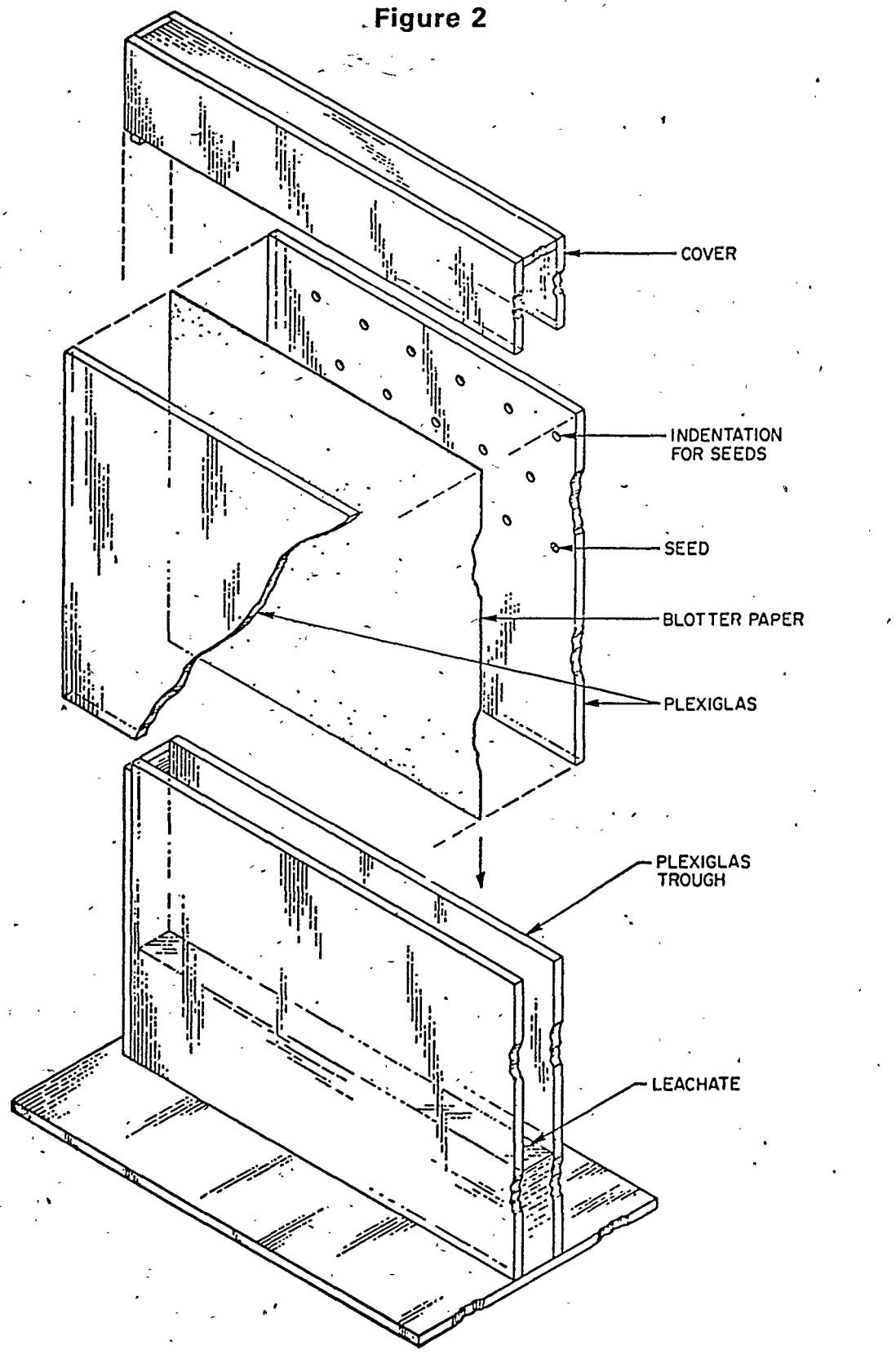


Figure 2



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