ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 260, 264, 265, 270, and 271

[FRL-3187-9]

Liners and Leak Detection for Hazardous Waste Land Disposal Units

AGENCY: Environmental Protection Agency.

ACTION: Notice of proposed rulemaking.

SUMMARY: Under the authority of sections 3004(a) and 3004(o)(4) of the Resource Conservation and Recovery Act (RCRA), EPA is proposing rules requiring new landfills, surface impoundments, waste piles, and land treatment units for the treatment, storage, or disposal of hazardous waste to utilize an approved leak detection system. EPA is also proposing that certain existing land disposal units utilize an approved leak detection system. In today's proposed rule, the Agency is also proposing double liners and leachate collection and removal systems above and between the liners for new waste piles, and replacements and lateral expansions of existing waste piles in parallel with minimum technology requirements for landfills and surface impoundments.

Today's proposal also requires the installation of double liners and leachate collection and removal systems for significant unused portions of existing units at hazardous waste landfills, waste piles, and surface impoundments. In addition, double liners and leachate collection and removal systems are being proposed for certain new units, and lateral expansions and replacements of existing units at landfills, waste piles, and surface impoundments at facilities permitted before November 8, 1984. Under today's proposal, owners or operators would be required to develop a construction quality assurance program for certain landfills, surface impoundments, and waste piles, as well as for construction of final covers at land treatment units.

DATES: The Agency will consider all comments received on or before July 28, 1987, before taking final action on the proposed rule. A public hearing will be held beginning at 9:30 a.m., June 19, 1987 in Washington, DC. Proposed effective dates for the various provisions are listed in the **SUPPLEMENTARY INFORMATION** section.

ADDRESSES: (1) *Hearings*—The public hearing will be held at the North Conference Area, Room 3, U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC to receive public comments on the proposed rule. Anyone wishing to make a statement at this hearing should write to Bill Richardson, Office of Solid Waste (WH-562), U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460. The hearing will begin at 9:30 a.m. with registration at 9:00 a.m. The hearing will end at 4:30 p.m. unless concluded earlier. Oral and written statements may be submitted at the public hearing. Persons wishing to make oral presentations must restrict them to 15 minutes and are encouraged to submit written copies of their complete comments for inclusion in the official record.

(2) *Written Comments*—The public must send one original and two copies of their comments to the following address: EPA RCRA Docket (WH-562), 401 M Street SW., Washington, DC 20460. Comments should be identified by regulatory docket reference code F-87-CCDP-FFFF. The docket is open from 9:30 a.m. to 3:30 p.m. Monday through Friday, except for Federal holidays. The public must make an appointment to review docket materials and should call Michelle Lee at (202) 475-9327 for appointments. The public may copy at no cost a maximum of 50 pages of material from any one regulatory docket. Additional copies cost $.20 per page.

FOR FURTHER INFORMATION: For general information, call the RCRA/Superfund Hotline, (800) 424-9346 toll-free or 382-3112 in Washington, DC.

For information on the technical aspects of this proposed rule, contact Walter DeRieux, Disposal Technology Section, Waste Management Division, Office of Solid Waste (WH-565E), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, (202) 382-4654.

SUPPLEMENTARY INFORMATION:

Preamble Outline

Proposed Effective Dates for Today's Proposal

Provision	Proposed effective date
Leak detection requirements	6 months after promulgation.
Double liner and a leachate collection and removal system above (for landfills and waste piles) and between the liners for:	
—New waste piles, lateral expansions and replacements of waste piles.	6 months after promulgation.
—Significant unused portions of units at existing landfills, waste piles, and surface impoundments.	24 months after promulgation.

Provision	Proposed effective date
—New landfills, surface impoundments, and waste piles and lateral expansions and replacements of landfills, waste piles, and surface impoundments at facilities permitted before November 8, 1984.	6 months after promulgation.
Construction quality assurance program for certain land disposal units.	12 months after promulgation.

I. Authority

The regulations established under this rulemaking will be issued under authority of sections 3004, 3005, and 3015 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, as amended, 42 U.S.C. 6924, 6925, and 6936.

II. Background

On October 21, 1976, Congress enacted the Resource Conservation and Recovery Act (RCRA) to protect human health and the environment and to conserve material and energy resources. In Subtitle C of the Act, EPA is directed to promulgate regulations that identify hazardous waste and to regulate generators and transporters of hazardous waste and facilities that treat, store, or dispose of hazardous waste.

Under Section 3004 of RCRA, owners and operators of treatment, storage, and disposal facilities (TSDFs) are required to comply with standards "necessary to protect human health and the environment." Since enactment of RCRA, EPA has promulgated interim status and permitting standards governing the design, operation, and maintenance of landfill, surface impoundment, waste pile, and land treatment facilities used to treat, store, or dispose of hazardous wastes. Regulations that established the major components of these standards were issued on May 19, 1980 (45 FR 33221); these were the first national standards that defined acceptable management practices for hazardous waste. These standards included Part 265 requirements applicable during the interim status period and Part 264 requirements applicable to permitted units.

On July 26, 1982 (47 FR 32274), EPA promulgated technical and permitting standards under Part 264 for landfills, waste piles, surface impoundments, and land treatment units. These regulations consisted of a set of design and operating standards separately tailored for each type of unit. The design and operating standards required landfills, surface impoundments, and waste piles to have a liner and leachate collection system to prevent migration of wastes to the subsurface soil or to ground water or surface water during the active life of the unit. The standards required unsaturated zone monitoring and a treatment demonstration for land treatment units.

On November 8, 1984, amendments to RCRA entitled the Hazardous and Solid Waste Amendments (HSWA) were signed into law. HSWA adds additional technological requirements to the design standards for land disposal units. The new Section 3004(o)(1)(A) of RCRA added by HSWA requires new landfills and surface impoundments, each new landfill and surface impoundment unit at existing facilities, and each replacement or lateral expansion of a landfill or surface impoundment at existing facilities for which a permit is issued after November 8, 1984, to install two or more liners and a leachate collection system above (for landfills) and between the liners. Under Section 3004(o)(2), the minimum technology requirements set forth in Section 3004(o)(1)(A) will not apply if the owner or operator successfully demonstrates that alternative design and operating practices together with location characteristics will prevent the migration of any hazardous constituents to ground water or surface water at least as effectively as such liners and leachate collection systems. Section 3004(o)(3) sets forth a variance from the minimum technology requirements for certain monofills.

Section 3004(o)(4)(A) of RCRA requires EPA to issue standards by May 8, 1987 requiring new landfills, surface impoundments, waste piles, land treatment units, and underground tanks to use approved leak detection systems. The statute defines an approved leak detection system as a system or technology that is capable of detecting leaks of hazardous constituents at the earliest practicable time. For the purpose of implementing the leak detection provision, Section 3004(o)(4)(B)(ii) defines new units as units on which construction begins after the date of promulgation of the final rule.

On July 15, 1985, EPA issued a final rule (50 FR 28702) to amend the existing hazardous waste regulations to reflect those statutory provisions of HSWA that took effect immediately or shortly after enactment. This rule incorporated into the existing hazardous waste regulations the Section 3004(o)(1)(A) regulations, requiring certain permitted and interim landfills and surface impoundments to have double liners and leachate collection systems. The July 15, 1985 regulations set top liner standards that could be met by a flexible membrane liner (FML), and bottom liner standards that could be met by three feet of compacted soil or other natural materials with a permeability of no more than 1×10^{-7} cm/sec. In the Proposed Codification Rule of March 28, 1986, EPA proposed amendments to these double liner and leachate collection system requirements. The March 28, 1986 proposal sets forth two designs for double liner systems. One design consists of FML top liner and a composite bottom liner consisting of a FML underlain by a low permeability soil layer, such as clay. The alternative design entails using a FML top liner and a clay bottom liner.

On July 14, 1986 (51 FR 25422), EPA promulgated regulations under RCRA Sections 3004(o)(4) and 3004(w) for tank systems storing or treating hazardous waste. Since that rule contains leak detection requirements for underground tanks, today's proposal will not address underground tanks. However, relevant issues to tank regulations (i.e., leak detection design standards, and construction quality assurance (CQA)) are discussed in Section V.E.

III. Overview of Today's Proposed Rule

A. Authority

The requirements in today's rule are being proposed under the authority of different sections of RCRA. In accordance with Section 3004(o)(4) of HSWA the Agency is today proposing leak detection requirements. That section requires the Agency to promulgate standards requiring new landfill units, surface impoundment units, waste piles, and land treatment units that treat, store or dispose of hazardous wastes to have approved leak detection systems or "a system or technology which the Administrator determines to be capable of detecting leaks of hazardous constituents at the earliest practicable time."

In order to meet this statutory mandate, the Agency is proposing to require new landfills, surface impoundments, and waste piles to design, construct, and implement a leak detection system capable of detecting leakage of hazardous constituents at the earliest practicable time over all areas likely to be exposed to waste and leachate during the active life and post-closure care period of the unit. As discussed more fully below, the Agency believes that for these units, the existing leachate collection and removal system between the liners (LCRS) with some additional modifications in the terms of

design and performance criteria best satisfies the statutory criteria for leak detection. By relying on the LCRS between the liners as the primary mechanism for detecting, the Agency is assured that the owner or operator will detect leaks through the top liner before hazardous constituents migrate out of the unit. The Agency believes that this is the earliest practicable time to detect such leaks.

For new land treatment units, the leak detection system being proposed today expands upon the existing Part 264 unsaturated zone monitoring requirements. These provisions currently require the owner or operator of a land treatment unit to conduct monitoring activities at specified intervals for hazardous constituents below the treatment zone. As discussed more fully below, the Agency is proposing to modify these provisions to further increase the capability of the existing unsaturated zone monitoring program to detect migration of hazardous constituents from the land treatment zone. By requiring an improved unsaturated zone monitoring program at specified intervals, the Agency believes that any leakage from a land treatment unit will be detected at the earliest practicable time in accordance with the Section 3004(o)(4) mandate.

All other requirements in today's rule are proposed under EPA's general authority to promulgate regulations for hazardous waste management facilities under Section 3004(a) of RCRA. Section 3004(a) requires EPA to promulgate regulations "as may be necessary to protect human health and the environment." Specifically, the requirements proposed under Section 3004(a) of RCRA are:

1. Response activities (action leakage rate and response action plan) for new landfills, surface impoundments, waste piles, and land treatment units and for replacements and lateral expansions of existing landfills and surface impoundments which received a RCRA permit after November 8, 1984.

2. Double liners and leachate collection and removal systems for new surface impoundments and landfills, and replacements and lateral expansions of existing surface impoundments and landfills at facilities which received a RCRA permit prior to November 8, 1984.

3. Double liner and leachate collection and removal systems for new waste piles and replacements and lateral expansions of waste piles at RCRA permitted facilities.

4. Double liners and leachate collection and removal systems for new interim status waste piles, and with respect to wastes received after the effective date of today's rule, replacements and lateral expansions of existing interim status waste piles that are within the waste management area identified in the Part B permit application.

5. Double liners and leachate collection and removal systems for significant portions of existing surface impoundments, waste piles, and landfills.

6. Leak detection and response activities for existing land treatment units.

7. Construction quality assurance requirements.

Essentially, today's proposal increases the level of technological control at land disposal units by requiring double liners and leachate collection and removal systems, a construction quality assurance program, and owner or operator initiated response activities. These increased levels of technological control are necessary to adequately protect ground water.

Double Liner Requirements

The Agency's ground-water protection strategy is based on two components—the imposition of sufficient technological controls (i.e., liner and leachate collection and removal systems) and monitoring and corrective action responsibilities. The ultimate goal of such a strategy is to prevent hazardous constituent migration from the land disposal unit into the environment. Originally, the Agency thought that a single liner and a leachate collection and removal system along with corrective action would provide sufficient protection of the environment. Accordingly, in 1982 in Agency promulgated single liner and leachate collection and removal systems for land disposal units. (See 47 FR 32274, July 26, 1982) for a complete discussion of how these requirements adequately protect groundwater).

In 1984, Congress required new landfills and surface impoundments and lateral expansions and replacements of existing landfills and surface impoundments at facilities permitted after November 8, 1984 to install double liners and a LDCRS. (Section 3004(o)(1) of HSWA). By requiring double liner systems for these landfills and surface impoundments, Congress obviously voiced dissatisfaction with the application of the single liner requirements to these units.

Although Congress did not apply the double liner requirements to other land disposal units, the Agency has subsequently collected data which shows that double liner systems are warranted for other new land disposal units replacements and lateral expansions.

As discussed more fully in the background document, the Agency has developed models assessing hazardous constituents migration into the environment from land disposal units. As a result of these models, it is evident to the agency that single-lined units allow substantially greater migration into the environment of hazardous constituents than would double-lined units. While the Agency could rely on corrective action to clean up releases of hazardous constituents into the environment from single lined units, it is less costly and more effective to prevent ground-water contamination by imposing adequate technological controls rather than to rely on cleaning up such contamination after the fact.

The technologies for detecting and remedying ground-water contamination are not completely reliable in all cases. Unique and heterogeneous hydrogeologic settings can make it difficult to site monitoring wells and detect releases. Cleanup technologies are new and have not been tested for all wastes in all settings. Moreover, the expense of these cleanup activities raises the possibility that owners or operators may not be able to pay for corrective actions, forcing the Agency to consider spending Superfund monies to accomplish the cleanup. Because of these uncertainties, the Agency believes it is more effective to prevent constituents from migrating into ground water in the first place. Therefore, the Agency believes that the imposing double liner and leachate collection removal systems for certain new units, replacements, and lateral expansions, the Agency is assuring protection of human health and the environment by protecting ground water from the migration of hazardous constituents. The Agency is not proposing to require other existing land disposal units to adopt such double-liner requirements because in order to meet these requirements, an existing unit would need to excavate or remove all hazardous wastes. Besides being impractical, the removal of hazardous wastes could also pose a substantial environmental threat.

Response Activities

Under today's program, the Agency is requiring the owner or operator of certain disposal units to conduct response activities (e.g., closing the units, repairing the leak) when leakage above a certain rate is discovered.

Although under Section 3004(o)(1) of HSWA, Congress mandated that EPA promulgate leak detection requirements for certain land disposal units, Congress was silent with regard to the appropriate response activities when leakage is detected at these units. EPA believes that it is critical that the owner or operator promptly initiate response activities when leakage above a certain rate is detected, therefore, the Agency is promulgating these response requirements under our general Section 3004(a) authority.

The goal of the response action program is to prevent the migration of hazardous constituents at levels exceeding health based standards for ground-water protection. Under today's proposal, the owner or operator will develop, and the Regional Administrator will approve, a RAP that effectuates this goal. Once the RAP has been approved, the owner or operator is expected to implement the RAP when leakage above a designated rate occurs. The Agency believes that it is necessary to require the owner or operator to initiate a response when certain levels of leakage occur because by requiring response actions promptly, the owner or operator is better able to minimize any environmental damage that may occur from migration of hazardous constituents out of the unit. We believe that since we are requiring owners or operators to detect leaks at the earliest practicable time, it makes sense to require early responses to those leaks. The prevention of leachate migration from the unit in levels exceeding health based standards for ground-water protection will obviate the need for corrective action because corrective action is tied to releases exceeding these standards. Since, it is less burdensome and more effective to prevent ground water contamination rather than to rely on corrective action, the Agency believes today's proposed response activity plan is necessary to protect human health and the environment.

Construction Quality Assurance Program

The Agency is today proposing to require owners and operators of certain treatment, storage, and disposal units to construct these units in accordance with design specifications and criteria. The purpose of the construction quality assurance program is to prevent hazardous constituent migration into the environment from hazardous waste management units. As discussed more fully below, studies conducted by the Agency demonstrate that construction related problems during liner system installation constitutes one of the major sources of liner system failure. Therefore, the Agency believes that in order to ensure that liners operate as a barrier to prevent hazardous constituent migration from the unit, it is necessary that the Agency require owners and operators of hazardous waste disposal units to conduct a construction quality assurance program.

B. Liquids Management Strategy

The fundamental goal of EPA's hazardous waste management regulations is the protection of human health and the environment. To fully understand the relationship of today's proposal to the hazardous waste land disposal regulatory program promulgated on July 26, 1982, the "liquids management strategy" must be considered. This strategy as it pertains to landfills, surface impoundments, and waste piles, will be discussed herein. Land treatment units will be discussed in Section D below.

EPA believes that in order to protect human health and the environment, a fundamental goal of RCRA regulations must be to minimize, to the extent achievable, the migration into the environment of hazardous constituents placed in land disposal facilities. One element of EPA's strategy for achieving this goal is the liquids management strategy for land disposal facilities. There are two aspects of the liquids management strategy: the minimization of leachate generation in the unit and the removal of leachate from the unit. First, the generation of leachate is minimized through the use of design controls and operational practices such as a run-on control system capable of preventing the flow of liquid onto the active portion of the unit, the placement of a cap on the unit at closure, and the restriction of liquid waste in landfills. Second, the removal of leachate is maximized by requiring leachate collection and removal systems above (for landfills and waste piles) and between the liners. Today's proposal focuses on leachate removal.

The Agency views leachate collection and removal systems as the principal means of removing liquids from units. Although a liner is a barrier to prevent migration of liquids out of the unit, no liner can be expected to remain impervious forever. As a result of waste interaction, environmental effects, and the effects of construction processes and operating practices, liners eventually may degrade, tear, or crack and may allow liquids to migrate out of the unit (47 FR 32284, July 26, 1982). Because generation of leachate cannot be eliminated completely during the active life and post-closure care period of a land disposal facility, leachate removal is essential to prevent subsurface migration (47 32313, July 26, 1982). For example, in a double liner system, measures must be taken to remove liquid that migrates through the top liner, thereby preventing hazardous constituents from migrating through the bottom liner and into the environment.

For facilities that clean close, the liquids management strategy is addressed by removing or decontaminating waste residues through the site-specific closure plan. The closure requirements ensure protection of human health and the environment by requiring that leachate migration from waste residues not present a hazard. The alternative closure rule for certain surface impoundments and waste piles proposed on March 19, 1987, also implements the liquids management strategy by requiring the owner or operator to demonstrate that leachate migration after closure will not present a threat to human health or the environment. The site-specific assessment of leachate migration for controlled conditions enables EPA to allow some leachate migration out of the facility and still be protective of ground water and surface water.

Today, the Agency is proposing leak detection performance and design criteria that will result in increased liquid removal and collection for landfills, surface impoundments and waste piles. Moreover, depending upon site-specific circumstances relating to the leakage, the Agency will require the owner or operator to take certain actions to prevent migration of hazardous constituents out of the units to the extent practicable.

Today's proposed rule, therefore, helps to implement the liquids management strategy. The land disposal system elements function in an integrated and interdependent manner along with a construction quality assurance program to prevent leachate migration out of the unit by maximizing its collection and removal. The liners serve as a barrier to leachate migration and facilitate its collection and removal; the leachate collection and removal system (LCRS) above the top liner in landfills minimizes the buildup of liquid pressure on the top liner; the LCRS system between the liners serves to reduce the buildup of head on the bottom liner; and the leak detection system notifies the owner or operator of leakage through the top liner, which may in turn require the owner and operator to implement certain response actions to

prevent migration of hazardous constituents from the unit.

C. Summary of Today's Proposed Rule for Landfills, Surface Impoundments, and Waste Piles

Today's proposed rule establishes:

- Leak detection requirements that result in detecting leaks "at the earliest practicable time."
- Requirements for response actions to certain detected leakage to prevent hazardous constituent migration out of the unit in excess of EPA-approved health based standards for groundwater protection.
- Double liners and LCRS requirements for certain land disposal units that are not currently required to be double lined.
- Construction quality assurance requirements for owners and operators of hazardous waste management facilities to ensure that land disposal units are constructed as designed.

Each of the elements of today's proposed rule is discussed briefly below:

1. Leak Detection Requirements for Newly Constructed Landfills, Surface Impoundments, and Waste Piles

Under today's proposal, owners or operators of all newly constructed landfills, surface impoundments, and waste piles are required to design, construct, operate, and maintain a system capable of detecting leakage of hazardous constituents at the earliest practicable time over all areas likely to be exposed to waste and leachate during the active life and post-closure care period of the unit (see Sections 264.221(g), 265.221(f), and conforming amendments to Subparts L and N of today's rules). In addition to this narrative standard, the Agency is also proposing specific performance and design standards for an approved leak detection system for these units.

Essentially, the leachate collection and removal system (LCRS) requirements proposed by the Agency on March 28, 1986 (Sections 264.221(c)(3) 265.221(a)(3) and conforming amendments to Subparts L and N) form the basis of today's proposed leak detection requirements. However, today's rule proposes to modify these LCRSs by specifying the following design criteria: a minimum bottom slope, drainage layer hydraulic conductivity and transmissivity, and a sump of appropriate size to collect and remove liquids efficiently. Additionally, the system must be capable of detecting a specified leak within a certain time period and must be able to collect and remove liquids rapidly to minimize head on the bottom liner (see Sections 264.221(h), 265.221(g) and conforming amendments to Subparts L and N of today's rule). In lieu of meeting these requirements, the owner or operator may receive a variance for an alternative system that meets certain specifications (Sections 264.221(i), 265.221(h) and conforming amendments to Subparts L and N).

In addition to the design criteria discussed above, the owner or operator must establish an action leakage rate (ALR) during the design of the unit. The ALR is the rate of leakage from the top liner into the LCRS that triggers interaction between the owner or operator and the Agency to determine the appropriate response action for the leakage. The ALR proposed today consists of a range between 5 and 20 gallons per acre per day. In the final rule, the Agency intends to select a value within that range as the appropriate ALR.

When the leakage from the top liner exceeds the ALR, the owner or operator is required to implement the appropriate site-specific response activity for leakage. Therefore, the Agency is also proposing today that the owner or operator develop a response action plan (RAP) which consists of an assessment of the reason for leakage, the current conditions of the unit components (e.g., bottom liner and leachate collection and removal system), the potential for migration out of the unit of hazardous constituents at levels exceeding health-based standards, and an assessment of the effectiveness of various responses.

Under today's proposal, the time when a RAP must be submitted depends upon the rate of the leakage. For rapid and large leakage, the owner must submit a RAP before the unit receives waste. For leakage that exceeds the ALR, but is less than rapid and large, a RAP must be submitted no later than 90 days after the ALR is exceeded. The RAP proposed by the owner or operator must be reviewed and approved by the Regional Administrator (RA). During this time (from determination of exceedance of the ALR to implementation of the RAP) the owner or operator continues to operate the unit and collect and remove leachate.

2. Leak Detection requirements for Certain Existing Landfill and Surface Impoundment Units

As discussed previously, Section 3004(o)(1)(A) of RCRA imposes double liner and leachate collection system requirements for new landfills, surface impoundments, and lateral expansions and replacements of existing landfill and surface impoundment units at facilities for which a permit is issued after November 8, 1984. The Agency is proposing today that units constructed prior to the effective date of this rule which must meet these requirements use their existing LCRS between the top and bottom liners as a leak detection system. Owners and operators of these units will *not* be required to modify the design of their existing leachate collection systems. However, they will be required to develop an ALR appropriate for the existing unit and to initiate a response action plan as discussed in the above section.

3. Double Liner and Leachate Collection Requirements for Certain Landfills and Surface Impoundments

The Agency proposed double liner and leachate collection system standards for new landfills and surface impoundments and lateral expansions and replacements of existing landfill and surface impoundment units at facilities for which a permit was issued after November 8, 1984. The Agency is proposing under the authority of Section 3004(a) of RCRA to extend these requirements to new waste piles, and lateral expansions and replacements of existing waste piles where construction begins six months after promulgation of today's rule. EPA is also proposing, under the authority of Section 3004(a) of RCRA, to extend these requirements to significant portions at existing landfills and surface impoundments and to new landfills and surface impoundments and lateral expansions and replacements of existing units at facilities permitted before November 8, 1984.

a. Double liners and leachate collection and removal systems for waste piles. The Agency is proposing that six months after promulgation of today's proposed rule, owners and operators must install double liners and leachate collection systems for new waste piles, and lateral expansions and replacements of existing waste piles where construction begins after the effective date of today's rule. Today's proposed rule applies to all waste piles, regardless of the date of permit issuance. As a result of this proposed rule, these waste piles will have technological requirements equivalent to those at designated landfills and surface impoundments. The Agency believes that, in order to protect human health and the environment it is critical that waste piles be provided protection equivalent to that provided at landfills and surface impoundments, because the potential for leachate migration from a waste pile can be similar to or greater than that from a landfill for an equivalent time period. Waste piles

generally have a longer active life, usually are not covered, and are more prone to liner damage from heavy equipment than landfills. As a consequence, double liners and LCRSs above and between the liners are being required by today's proposal.

Owners or operators of permitted and interim status waste piles may seek the same variances as those allowed to owners and operators of landfills and surface impoundments under 40 CFR 264.221 (d) and (e) and 264.301 (d) and (e). To receive a variance, the owner or operator must demonstrate that alternative design and operating practices, together with location characteristics, will prevent the migration of any hazardous constituent into the groundwater or surface water at least as effectively as the proposed liners and leachate collection system. The owner or operator may also receive a variance for a monofill under 40 CFR 264.251(e). Additionally, owners or operators of totally enclosed waste piles that meet the requirements of Section 264.250(c) are exempt from the double liner and leachate collection and removal system requirements under today's rule.

b. Double liners and leachate collection system requirements for significant unused portions of existing landfills, surface impoundments, and waste piles. Under today's proposal, existing units at interim status and permitted facilities must install double liners and leachate collection and removal systems on significant portions of those unlined areas upon which waste has not been placed 24 months after promulgation. EPA takes the position that double liners should be installed at significant unused portions of existing units where the opportunity to do so is the same as for new units. This action reduces the potential for adverse human health and environmental impacts by preventing the migration of hazardous constituents from the unit.

c. Double liners for certain landfill and surface impoundment units at facilities permitted before November 8, 1984. Under Section 3004(a) of RCRA, EPA is proposing that new landfills and surface impoundments, and lateral expansions and replacements of existing landfill and surface impoundment units at facilities permitted before November 8, 1984, will be required to have double liners and leachate collection and removal systems (LCRS). Today's proposal will apply to units at these facilities that begin construction 6 months after the date the final rule is published in the **Federal Register**. The potential for migration of hazardous constituents from these units is the same as for units at facilities permitted after November 8, 1984. Because units permitted after November 8, 1984 are required to have double liners and leachate collection systems, the Agency believes it is appropriate to require new landfills and surface impoundments, and lateral expansions and replacements of existing landfills and surface impoundments at facilities permitted before November 8, 1984, to also meet these requirements. Note that, as discussed in the previous section, new waste piles, and replacements and lateral expansions of waste piles at facilities permitted before November 8, 1984 must also meet these requirements.

There is, however, an exception to the applicability of the requirements discussed above. Under 40 CFR 264.221(f) and 264.251(f), the Agency is proposing today to exempt certain replacement surface impoundments, landfills, and waste piles permitted before November 8, 1984, from the double liner and leachate collection system requirements. In essence, owners or operators who demonstrate that they have a single liner at a surface impoundment or waste pile that currently meets the Part 264 single liner requirements and who have no reason to suspect that the liner is leaking will be exempt from the double liner and leachate collection system requirements.

EPA takes the position that if the owner or operator made a good faith effort to satisfy single liner requirements in effect at the time of permitting, it is unreasonable to require the owner or operator to assume the expense of a new double liner system when the single liner system is adequately working.

4. Construction Quality Assurance Program for Landfills, Surface Impoundments, and Waste Piles

Under Section 3004(a), today's proposed rule requires a construction quality assurance (CQA) program for the following components of landfills, surface impoundments, and waste piles: foundations; low permeability soils; FMLs; dikes; leachate detection, collection, and removal systems; and final covers. Under Sections 264.19 and 264.20, and 265.19 and 265.20, the owner or operator must ensure that these components meet or exceed all design criteria, plans, and specifications. The CQA requirements are implemented through a CQA plan which is specifically tailored for each unit. The plan addresses activities such as inspecting, monitoring, and sampling for the individual components.

The CQA plan must specify the unit-specific procedures that the owner or operator will use to comply with the CQA requirements and to identify implementation procedures for construction and installation. For units applying for RCRA permits, the CQA plan must be submitted with the permit application. For permitted facilities desiring to construct new units, or to laterally expand or to replace such units, the plan must be submitted as a permit modification (Section 264.20). For interim status units, the owner or operator is required to submit a plan for approval prior to construction (Section 265.20).

The CQA plan is prepared at the design stage and is implemented during the construction and installation phase. Today's proposal requires the owner or operator to develop a CQA plan to be submitted to the Regional Administrator (RA) for approval prior to construction. Under today's proposal, the owner or operator is required to retain a registered professional engineer to implement the plan (Sections 264.20(a) and 265.20(a)). A CQA report documenting proper implementation of the approved plan must be submitted to the RA following construction (Section 40 CFR 264.20(g) and 265.20(f)). Report submission (both permitted and interim status units) and approval (permitted units only) is required before waste can be received (with the exception of the closure report). The RA will review and approve the report within 30 days unless the owner or operator is notified otherwise. If the RA does not respond within 30 days (permitted units only) the report does not need to be reviewed and approved.

CQA serves to detect deviation from the design caused by error or negligence during the construction phase of a unit and to allow for suitable corrective measures before wastes are disposed in the unit. Without proper CQA, problems with components (e.g., leachate collection and removal system) due to construction may not be discovered until the component or system fails during operation. Improper construction has been cited as one of the major causes of waste migration out of units. Two studies conducted by EPA indicate that proper CQA is extremely important for successful performance of liners, covers, leachate collection systems, and leak detection systems (see Liner/Leak Detection Background Document). EPA believes that the CQA program is an integral part of the land disposal requirements because it will provide a high degree of confidence that all components are working as designed

when a unit is started up to receive waste.

The objective behind the proposed CQA program is directly related to both parts of the liquids management strategy: minimizing leachate generation and maximizing leachate removal. To ensure that the waste management system will meet these goals, all components of the total system must function as designed: top and bottom liners, leachate collection and removal systems above and between the liners, the leak detection system, and the final cover. The CQA program will aid in meeting these goals by ensuring the quality of each component of the land disposal unit.

D. Summary of Today's Proposed Rule for Land Treatment Units

1. Leak Detection for Land Treatment Units

There are differences between land treatment and waste disposal in a landfill, waste pile, or surface impoundment. The land treatment process involves waste biodegradation in the upper layers of the soil and reduction of constituent hazard levels during the degradation process. Treatment, storage, or disposal at a landfill, surface impoundment, or waste pile relies on containing the hazardous constituents (further description of differences is provided in Section V). Therefore, the Agency is proposing a leak detection methodology for land treatment units that differs from the methodology proposed for landfills, surface impoundments, and waste piles.

Under today's proposed rule, the owner or operator of new and existing land treatment units must comply with the leak detection requirements within 6 months after the date the final rule is published in the **Federal Register.**

The Agency is proposing that the owner or operator meet the existing unsaturated zone monitoring requirements under Part 264 for both new and existing land treatment units at interim status and permitted facilities. These requirements are the core of the leak detection program for land treatment units. EPA is proposing to expand these requirements by requiring the owner or operator to meet a 95-percent monitoring confidence level for detection of a significant increase of hazardous constituents below the treatment zone; to detect leaks at the earliest practicable time; to monitor soil and soil-pore liquid immediately below the treatment zone; and to inspect unsaturated zone monitoring equipment.

Under today's proposal, the owner or operator of new and existing units at interim status or permitted facilities must develop a response action plan (RAP) for widespread leakage. This must be prepared and submitted to the RA for approval before waste can be received at a new unit or, for existing units, after the effective date of today's rule. Owners or operators who discover leaks that are less widespread are not required to develop a RAP for the following reason: The existing land treatment provisions under Part 264 require that if the owner or operator detects concentrations of constituents statistically exceeding background levels, appropriate operational controls must be implemented, such as reducing the waste application rate at the land treatment unit.

The owner or operator of a new facility must address today's proposed land treatment requirements in the permit application. The owner or operator of existing permitted land treatment units must submit a permit modification to the RA and implement the revised unsaturated zone monitoring program six months after promulgation of the final rule. An owner or operator of an interim status unit must have a written unsaturated zone monitoring plan that specifically sets forth the responsibilities of the new leak detection requirements and must implement the plan six months after promulgation of the final rule.

2. Construction Quality Assurance for Land Treatment Units

Today's proposed CQA program for land treatment units only addresses covers. The owner or operator of such a unit must ensure that the final cover meets or exceeds all design criteria, plans, and specifications in the permit (for permitted units) or in the operating record (for interim status units). The CQA requirements applicable to covers at land treatment units are the same requirements applicable to landfills, surface impoundments, and waste piles as discussed in Section 4 above.

E. Integration With Double Liner and Leachate Collection and Removal System Requirements

Today's proposal has been developed in conjunction with the double liner and leachate collection system requirements proposed March 28, 1986 (51 FR 10706) to modify the July 15, 1985 rule (50 FR 28702). The March 28, 1986 proposed rules require new landfills and surface impoundments and lateral expansions, and replacements of existing landfills and surface impoundments at facilities which receive a RCRA permit after November 8, 1984, to have two or more liners and a leachate collection system above (for landfills) and between the liners. The liner system proposed in March 1986 comprises an FML top liner and either a compacted soil (clay) bottom liner or a composite bottom liner consisting of a FML underlain by compacted soil.

On April 17, 1987, EPA issued Hazardous Waste Management System; Minimum Technology Requirements: Notice of Availability of Information and Request for Comments (52 FR 12566). That notice included data on the two bottom liner designs proposed in the March 28, 1986 rule: Composite and compacted soil. In the notice, the Agency compared the leak detection performance characteristics, leachate collection efficiency, and the potential for leachate migration into and out of the two liner types. EPA requested comments on the data presented in the Notice. The comment period closes June 1, 1987.

The April 17, 1987 notice discusses the deficiencies in the performance expected of compacted soil bottom liners under most conditions. Under most conditions soil bottom liners cannot be considered best available technology. Deficiencies of the compacted soil liner include:

1. The compacted soil liner does not maximize leachate removal in the LCRS between the liners because the compacted soil will absorb some of the liquid from the leachate collection system between the liners. Therefore, the absorbed leachate would not be available for collection and removal by the LCRS and may eventually migrate out of the unit. For a LCRS to remove leachate rapidly, it must have two characteristics: (1) High hydraulic conductivity, and (2) relatively smooth flow conditions. A compacted soil bottom liner can decrease the hydraulic conductivity of the LCRS by penetrating the lower portion of the LCRS. Moreover, because the surface of the compacted soil is rougher than the surface of the FML, the flow velocity in the leak detection system (LDS) is significantly reduced.

2. Under most conditions the compacted soil liner will not allow leak detection at the earliest practicable time. The compacted soil absorbs liquid leaking through the top liner and, therefore, delays or reduces the capability to detect leaks. The compacted soil bottom liner is estimated to have a leakage detection capability of between 100 to 500 gallons per acre per day while composite bottom liners have a much more sensitive detection capability ranging from 0.1 to 1 gallon per acre per day.

3. The compacted soil bottom liner encourages the buildup of higher liquid pressures on the bottom liner by not allowing for rapid drainage of liquid to the sump. This increases the potential for migration through the bottom liner.

In summary, the compacted soil bottom liner has the capability of absorbing rather than allowing for the collection of large volumes of leachate, and the absorbed constituents may migrate out of the unit. Also, the compacted soil bottom liner may not provide for detection of leakage at the earliest practicable time in most cases. Based on the data presented in the notice, EPA believes that the composite bottom liner is, overall, a more effective technology than a compacted soil liner.

Although the leak detection portion of today's proposal is based on the use of the composite bottom liner as the best available technology for meeting the statutory leak detection requirements, the leak detection proposal does not exclude the use of compacted soil liners under unique site-specific circumstances. This is because use of the best available technology (i.e., composite bottom liners) may not be necessary for protection of human health and the environment in all cases. Today's proposal allows for the use of alternative leak detection systems, such as one that may include a compacted soil bottom liner, provided that it is capable of meeting the detecting leaks of hazardous constituents at the earliest practicable time over all areas likely to be exposed to waste and leachate during the active life and post-closure care period. It may be possible that under certain site-specific conditions, such as low rainfall, a compacted soil bottom liner could be used. Further discussion on this point is provided under preamble Section V.A.2.a.(4).

IV. Systems Approach

In developing today's proposal, EPA considered all of the design and operating requirements for a land disposal unit (i.e, the entire system) rather than focusing on individual components of the unit: The leachate collection and removal system (LCRS) (above and between the liners); the top liner (FML); the bottom liner; and the cover. Figure 1 shows a schematic of a typical double liner and leak detection system for a landfill. The double liner and leak detection system includes a top and bottom liner and an LCRS above the top liner and between the top and bottom liners. Each component of the system is designed to prevent groundwater contamination. Therefore, some redundancy is provided by requiring all of these components in the land disposal unit. EPA believes that although individual component failures can occur, the system remains intact unless a fatal combination of failures occurs, which has a very low probability. For example, rainwater that breaches the cover will be collected in the leachate collection system above the top liner, and no liquid will be allowed to build up on the top liner. Thus, a breach in the final cover will not necessarily result in a leak from the unit.

The response action plan (RAP) for leak detection is designed with the integrated systems approach in mind. Under this approach, the owner or operator can make a site-specific assessment to examine the size and nature of the leak and the capability of the whole system, as opposed to a single component, to prevent migration of hazardous constituents out of the unit. Through this assessment the appropriate response can be determined which will meet the goal of protecting ground water and surface water.

Leakage through the top liner above the action leakage rate does not automatically mandate that the top liner be repaired because the Agency believes that the bottom liner will most likely impede liquid from migrating out of the unit. However, to ensure that this is the case, the Agency is using the RAP to assess the capability of the entire system to deter migration of hazardous constituents and to ensure the appropriate response to achieve that goal.

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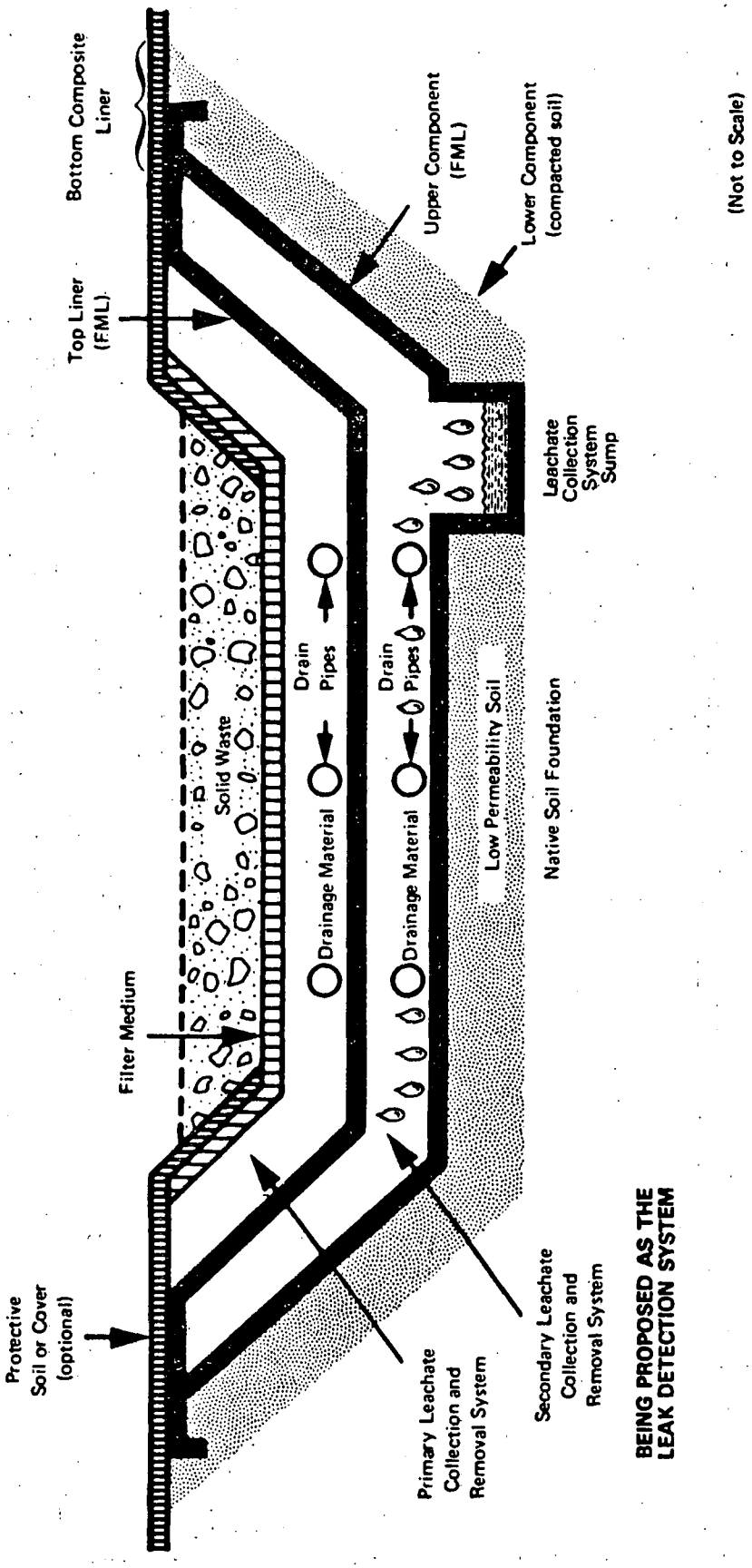
SCHEMATIC OF A DOUBLE LINER AND LEAK DETECTION SYSTEM FOR A LANDFILL



BEING PROPOSED AS THE LEAK DETECTION SYSTEM

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V. Section-By-Section Analysis of Proposed Rule

A. Leak Detection System

1. Background

a. Introduction. Today, EPA is proposing leak detection system (LDS) standards for surface impoundment, waste pile, land treatment, and landfill units in 40 CFR Subparts K through N. The proposed leak detection standards combine performance and design criteria.

The regulatory goal of preventing groundwater contamination is achieved in different ways with different types of units. For land treatment units, the existing standards require that hazardous constituents be degraded, transformed, or immobilized within the treatment zone. Owing to the unique features of the land treatment process, these units are discussed separately in Section V.A.3 of this preamble.

In today's proposed rule for surface impoundments, waste piles, and landfills, the Agency sets forth general performance criteria for the leak detection system that relate to detection sensitivity and detection time. Since there are many ways to achieve such goals, detailed specifications are not set forth in these rules. Rather, owners and operators are free to select a design that meets these performance criteria. EPA has developed and will continue to develop technical guidance documents to assist owners or operators and permitting authorities in evaluating the appropriateness of various designs, materials, and equipment.

The proposal also sets forth specific design criteria for the leak detection system that owners or operators must use as a minimum when designing a system. Owners or operators are not, however, precluded from using more stringent design criteria.

b. Objectives of the leak detection system. The regulatory objectives of today's proposed rule are to detect leaks at the earliest practicable time (in keeping with RCRA Section 3004(o)(4)(A)), to contain the leak within the engineered structure of the unit, to prevent ground-water contamination when technically feasible and thereby obviate the need for corrective action. Today's proposed leak detection regulations have the following key features:

(1) New and certain existing surface impoundments and landfills must have a leak detection system between the top and bottom liner capable of detecting leaks at the earliest practicable time.

(2) The technology-based standards for the leak detection system and bottom liner must be used to achieve the detection capability required for a leak detection system.

(3) The system must be able to detect leaks over all areas exposed to waste and leachate.

(4) The system must be operated during the active life and post-closure care period of the unit (if applicable).

(5) Response actions are required to prevent migration of hazardous constituents out of the unit to mitigate the potential for groundwater contamination.

c. Rationale of the proposed leak detection standards for surface impoundments, landfills, and waste piles. On March 28, 1986, the Agency proposed leachate collection and removal system requirements for surface impoundments and landfills based on a drainage layer technology (40 CFR 264.221(c) and 265.221(a) and conforming amendments to Subpart N). The leak detection system being proposed today relies on the proposed drainage layer technology requirements for leachate collection and removal systems between liners for surface impoundments and landfills. EPA selected a drainage layer technology as an approved leak detection system for several reasons. First, such a system is a proven technology that has been tested in land disposal sites under extreme weather and other unfavorable conditions, and that works well over a long period of time. Second, it is a highly reliable, low-maintenance system. Third, the drainage system is capable of detecting leaks in all areas between the liners. Fourth, because drainage layer technology is currently the basis for the existing leachate collection and removal systems, it combines two important functions, leak detection and leachate removal. An additional advantage of using the proposed leachate collection and removal system between the liners is that because of its basic capability to detect leaks, an owner or operator can continue to use the current design approach to meet today's requirements rather than developing new and potentially incompatible design concepts for the various components.

In selecting a leak detection system, EPA evaluated other systems and technologies including electrical resistivity, time domain reflectometry, acoustical emission monitoring, and other innovative technologies. These approaches were not selected for today's proposal for the reasons discussed below (for further information see the Liner/Leak Detection Background Document).

1. Electrical resistivity (ER) is a geophysical technique whereby an electrical current is introduced into the ground by a pair of surface electrodes, and the resultant potential field, as measured by a second pair of electrodes, is interpreted to detect anomolies (leaks). For the purpose of leak detection the current is passed from an electrode within the land disposal unit to an electrode outside the unit.

The method has been tested on a 1-acre single FML-lined surface impoundment and shows promise for detecting and locating leaks in this situation. Generally, ER has had limited application for the purpose of permanent leak detection at land disposal facilities to date; therefore, very little field data are available.

ER has several drawbacks. If using the electrode configuration as discussed above, ER is only applicable in a double-lined system where the bottom liner is compacted clay or is a composite that is also leaking. If the bottom FML is intact it will not allow a current path to be established between the electrodes. For this reason ER may not generally be applicable to double FML-lined units. ER may be used to detect top liner leakage in double FML-lined units by placing one set of electrodes between the liners, but wires and electrodes may corrode during the active and post-closure life of the unit. Additionally, ER cannot be used to evaluate the leakage rate but instead only locates leaks. ER applications to date have been temporary ones. For permanent applications the durability and reliability of the ER system components may be questionable and the burden associated with continuous or semi-continuous monitoring would be high. ER shows promise, however, for detecting the leak location at surface impoundments known to be leaking and for construction quality assurance (CQA) verification on certain portions of a liner such as the sump area.

2. Time domain reflectometry (TDR) measures the electrical property variations in the material along a pair of parallel transmission line conductors. TDR is sensitive to soil moisture content, making it attractive for leak detection. However, TDR has several drawbacks: (1) It must be installed in sand with a moisture content low enough to provide an adequate contrast between unwetted and wetted sand, (2) wires may corrode, and (3) although a drainage layer of well-compacted medium-to-fine grained sand increases horizontal dispersion of a leak, thus increasing the TDR response, too much fine sand rapidly attenuates the TDR signal and is not desirable for drainage.

3. Acoustic emission monitoring (AEM) detects vibrations produced by liquids leaking from a containment site by using transducers. The technology has not been proven at a full-scale site and has several drawbacks: (1) Sensors and wires may corrode during the active life and post-closure care period of the unit, (2) AEM may not detect small leaks or low velocity leaks where the flow is not turbulent, and (3) AEM is sensitive to background noises (for instance, nearby equipment or machinery), and (4) AEM is only reliable if it identifies leaks within a few minutes of the leak's occurance.

4. Other technologies were also considered but were found to be inappropriate as a primary leak detection system for landfills, surface impoundments, and waste piles. These technologies include lysimeters, seismic measurements, electromagnetics, and moisture blocks, all of which are still in the field-testing stage and may provide new technical capabilities under certain conditions in the future (see Liner/Leak Detection Background Document). On a site-specific basis, the owner or operator may request a variance from today's leak detection requirements (Section 264.221 (i) and 265.221 (h) and conforming amendments to Subparts L and N) in order to install one or a combination of these alternative technologies.

Once a leak has been detected, there is a need for interaction between the owner or operator and the Agency to determine the appropriate response action. The response action varies, depending upon the site-specific factors at the unit.

The Agency believes that it may be appropriate to require the owner or operator to undertake certain response activities when a leak above a predetermined value, the action leakage rate (ALR), is measured in the unit (Sections 264.226(c)(1) and 265.226(b)(1) and conforming amendments to Subparts L and N). Therefore, EPA is requiring the owner or operator to initiate a response action plan (RAP) when leakage in the sump exceeds the ALR.

The Agency believes that an appropriate response will vary depending upon the size of the leak. Therefore, in today's rules the Agency is proposing more stringent response activities for rapid and extremely large leaks than for smaller leaks. In addition to evaluating the size and nature of the leak, the Agency will consider the capabilities of the bottom liner and the leachate collection and removal system between the liners to determine an appropriate response action.

EPA takes the position that rapid and extremely large leaks require immediate attention. Therefore, EPA is proposing today that owner or operator prepare a RAP for such leaks before receiving waste at a unit. EPA believes lesser leaks do not require immediate action, and the response will be determined through an interactive process between EPA and the owner or operator, generally occurring at the time the ALR is exceeded.

Although not specifically required by the minimum technological requirements of HSWA, response activities are a logical outgrowth of an approved leak detection system. Moveover, such activities are consistent with the congressional intent underlying the leak detection provisions. Congress specifically noted that ground-water contamination would be prevented in most cases if leaks were detected at an early time. See Congressional Record-House, October 6, 1983, page 8150.

Cleanup of ground water after it has been contaminated with hazardous waste can be expensive or technically infeasible in some cases. The corrective actions may involve pumping and treating large volumes of contaminated ground water for many years. The leak detection program being proposed today is designed to address leakage before it can migrate out of the unit, thereby allowing actions to be taken to prevent ground-water and surface-water contamination before it can occur. For the above reasons, EPA believes that the response action parts of the leak detection standards are necessary to prevent ground-water contamination and provide protection of human health and the environment.

2. Proposed Rule for Surface Impoundments, Waste Piles, and Landfill Units

a. Detection Capability—(1) Overview—(a) Performance standards and rationale. Based on the narrative statutory language of Section 3004(o)(4) and its legislative history, today's proposed rule requires owners or operators of all newly constructed surface impoundment, waste pile, and landfill units to maintain a leak detection system capable of detecting hazardous constituent migration through the top liner at the earliest practicable time over all areas likely to be exposed to waste and leachate during the active life and post-closure care period. (See Sections 264.221(g) and 265.221(f) and conforming amendments to Subparts L and N.)

Section 3004(o)(4)(A) requires a leak detection system for all new landfills, surface impoundments, and waste piles. Section 3004(o)(4)(B)(ii) defines "new unit" as a unit on which construction will commence after the date that today's rule is promulgated in final form. A unit will also be considered a "new unit" if operation has begun subsequent to the promulgation of today's regulations in final form. The current definition of "commencing construction" in Section 260.10 for an existing facility will be used in today's proposal. Therefore, an owner or operator will be deemed to have "commenced construction" of a unit if:

(1) The owner or operator has obtained the Federal, State, and local approvals or permits necessary to begin physical construction, and;

(2) Either a continuous on-site physical construction program has begun, or, the owner or operator has entered into contractual obligations that cannot be cancelled or modified without substantial loss for physical construction of the unit to be completed within a reasonable time.

EPA is proposing that the leak detection system extend over all areas likely to be exposed to waste or leachate (Sections 264.221(g) and 265.221(f) and conforming amendments to Subparts L and N). This proposed requirement is consistent with the minimum technology double liner requirements under Section 3004(o) for surface impoundments and landfills. The minimum technology requirements call for placement of two or more liners with a leachate collection and removal system above (in the case of landfills) and between the liners, which is designed, constructed, operated, and maintained to prevent leachate migration out of the unit. EPA has interpreted these statutory provisions as necessitating double liners and leachate collection and removal systems under all areas likely to be exposed to waste or leachate (51 FR 28709). This interpretation is consistent with EPA's current regulatory practice regarding the design of liners and leachate collection and removal systems. Accordingly, to collect all potential leakage through the top liner, the leak detection system must extend under all areas likely to be exposed to waste or leachate.

Today's proposed rule also requires the leak detection system to operate effectively through the active life and post-closure care period of the unit (Sections 264.221(g) and 265.221(f) and conforming amendments to Subparts L and N). This is consistent with the proposed minimum technology double liner system requirements (40 CFR 264.221(c) and 265.221(a) and conforming amendments to Subpart N). These requirements call for a double liner

system designed to prevent leachate migration out of the unit during the active life and post-closure care period. By requiring a leak detection system with similar operating life requirements, there will be a mechanism for monitoring double liner system performance for the entire active life and post-closure care period (if applicable).

Sections 264.221(g) and 265.221(f) and conforming amendments to Subparts N and L of today's proposal also require a system that can detect leakage that migrates through the top liner into the space between the liners at the "earliest practicable time." The term "earliest practicable time" refers to the time after liquid has passed through a breach in the top liner until the time that a technology-based standard leak detection system can detect the liquid.

A leachate collection and removal system between the liners that employs a drainage layer technology will provide the most reliable, durable, and efficient system to satisfy the leak detection system performance standard. A drainage layer technology can provide 100 percent coverage under all areas that may be exposed to waste or leachate, requires little maintenance, is reusable, and provides a response mechanism (liquid collection and removal) at the same time the leak is being detected. This technology can provide continuous and accurate monitoring of top liner leakage through the active life and post-closure care period.

In addition to these technical reasons, this approach also has the advantage (for surface impoundments and landfills) of allowing the owner or operator to use the existing leachate collection and removal system between the liners, with only limited design modifications, for the leak detection system. This enables the owner or operator to use the current design approach to meet today's requirements rather than to develop new and potentially incompatible design concepts for the various components. It also minimizes additional operational and cost requirements associated with implementing a new leak detection system.

In developing today's proposal, EPA considered whether or not to establish the leak detection system below the bottom liner. The Agency rejected this option because it is inconsistent with its "liquids management strategy." Under this strategy the first line of defense in preventing ground- and surface-water contamination is to detect top liner leaks early enough to control the leak while the liquid is still in the unit. We believe that it is preferable to detect leaks from the top liner before leachate from the top liner migrates through the bottom liner.

Moreover, locating the leak detection system below the bottom liner would be inconsistent with the bottom liner performance standard of preventing hazardous constituent migration through the bottom liner. If a leak were detected below the bottom liner, there would be no backup liner to prevent ground-water contamination until the bottom liner leak is fixed. Instead, when the leak detection system is located between the top and bottom liners, the bottom liner acts as a barrier to allow leachate collection while the owner or operator performs a review and assessment of the leakage and implements, if necessary, a response action.

Based on these considerations, EPA is proposing to require the leak detection system to be located adjacent to and below the top liner and above the bottom liner. The Agency believes that using a leachate collection and removal system between the liners provides the best locational option for the leak detection system because: (1) All newly constructed landfills and surface impoundments falling under RCRA 3004(o)(1) will already have leachate collection and removal systems between the top and bottom liners and (2) detection of leakage that passes through the top liner will allow time to implement a response action well before leakage poses a threat to ground water.

EPA is today soliciting comments on the proper location for a leak detection system in a unit that contains more than two liners. As an example, a surface impoundment may have three liners, with leachate collection and removal systems between the top and middle liners and also between the middle and bottom liners. Under today's proposal, the leak detection system would be located above the bottom liner. For the surface impoundment example, therefore, the leak detection system would consist of the leachate collection and removal system between the middle and bottom liners. EPA requests comments on the appropriateness of this proposed requirement for systems that contain more than two liners.

In today's proposal, EPA has striven to develop leak detection system performance standards for the LCRS between the liners that not only comply with the statutory narrative requirements of Section 3004(o)(4) to detect leaks at the earliest practicable time, but also provide the level of protection of human health and the environment consistent with that inherent in the minimum technology double liner requirements of Section 3004(o)(1). The Agency's position is that it can achieve these objectives in the regulations for leak detection systems through two related leak detection system performance criteria: (1) Leak detection sensitivity and (2) leak detection time. These criteria will be discussed in detail subsequently in this preamble. The numerical values for these criteria are based on the best available technology (BAT) for composite bottom liners and leachate collection and removal systems.

Although today's proposal does not require that the leak detection system be able to detect the exact location of a leak in a top liner, this capability may be cost-effective for the owner or operator to install. The cost effectiveness of installation will depend on the unique features of each unit, such as the type of unit, operational status of the unit, type of top and bottom liner systems, and the design of the leachate collection and removal system. Even though installing a leak detection system with this capability may initially cost more, rapidly locating a leak can save time and resources when response measures for the liner are needed. However, we are not proposing detection of the exact location of a leak because with EPA's systems approach to leachate collection and removal, the inability to detect leak's exact location does not increase the potential for migration of hazardous constituents from the waste management unit.

Today's proposed rule will require the owner or operator to make a quantitative demonstration that the system performance criteria were met. This demonstration will be submitted as a part of the Part B application for facilities seeking permits or as part of a permit modification application for already permitted facilities (Section 270.17(b), 270.18(c) and 270.21(b)). If the facility is an interim status facility, the demonstration will be reviewed by EPA during permitting along with the double liner system requirements.

(b) Design and operating requirements. Today's proposed rule sets out specific minimum design and operating requirements for leak detection systems at both permitted and interim status facilities. (See Sections 264.221(h) and 265.221(g) and conforming amendments to Subparts L and N.) These design and operating requirements are being proposed for surface impoundments, waste piles, and landfills.

The requirements consist of both minimum design specifications and operating criteria for leak detection system components. The combination of

the performance criteria previously discussed, and minimum component and operating specifications, ensures that the leak detection system has a capability to detect leakage at the earliest practicable time over all areas likely to be exposed to waste or leachate. The minimum design specifications in today's proposal include drainage layer hydraulic conductivity and thickness for granular drainage media, hydraulic transmissivity for synthetic drainage media, bottom slope, and sump capacity. The minimum operating criteria specify removal of liquids rapidly to minimize the head on the bottom liner. The Regional Administrator will specify operating conditions in the permit to ensure the liquid head is minimized at all times.

In lieu of the design and operating criteria set forth in Sections 264.221(h) and 265.221(g) and conforming amendments to Subparts N and L, the owner or operator may choose to select an alternative leak detection system in accordance with Sections 264.221(i), 265.221(h), and conforming amendments to Subparts L and N. The alternative leak detection system would not be required to meet the LCRS requirements. This variance for the design and operating requirements will be discussed in Section a(4) below.

(2) Performance standards—(a) Leak detection sensitivity. The Agency is requiring leak detection systems for surface impoundments (Sections 264.221(h)(2) and 265.221(g)(2)), landfills (Sections 264.301(h)(2) and 265.301(g)(2)), and waste piles (Sections 264.251(h)(2) and 265.251(g)(2)) that are capable of detecting a rate of top liner leakage of no more than one gallon/acre/day (gpad). This "leak detection sensitivity" of one gpad is based on BAT leak detection sensitivities of leachate detection, collection, and removal systems (LDCRS) located between the top and bottom liners. Detection sensitivity refers to the smallest quantity of liquid that can pass through the top liner and be detected by the leak detection system.

As stated above, the detection sensitivity is reported in units of gpad. Areal units of acres were selected because the size of a typical surface impoundment, waste pile, or landfill unit is approximately one or more acres (see Liner/Leak Detection Background Document). The detection sensitivity is reported in 24-hour units (days) because leak detection using leachate collection and removal systems is on the order of days as opposed to other time units (see Liner/Leak Detection Background Document).

In establishing a detection sensitivity of one gpad, EPA considered the performance characteristics of compacted soil and composite bottom liners. EPA has conducted studies (see the EPA Background Document "Bottom Liner Performance in Double-Lined Landfills and Surface Impoundments") to evaluate the influence of bottom liner type on leak detection sensitivity. The studies included analytical and numerical evaluations of the performance of both compacted soil and composite bottom liners as well as an evaluation of small-scale and large-scale liner model test results. These studies showed that if the bottom liner is constructed of low-permeability compacted soil, a certain rate of liquid migration into the liner will occur due to gravitation and capillary forces. Drain flow will not occur in the LDCRS until the rate of liquid impingement onto the bottom liner exceeds the rate of liquid infiltration into the bottom liner due to these forces. The studies showed that if a top liner developed a leak that resulted in uniform leakage (similar to rain) onto a compacted soil bottom liner with a hydraulic conductivity of 1×10^{-7} cm/s, the bottom liner could absorb approximately 80 gpad under steady-state conditions before drain flow would begin. That means that the detection sensitivity of the leak detection system could be as high as 80 gpad or more, in this example.

Compared to compacted soil bottom liners, the EPA studies have shown that composite bottom liners consisting of an upper FML component and a lower compacted soil component will absorb much less liquid than a compacted soil bottom liner. The study results indicate leak detection sensitivities for composite bottom liners in the range of 0.001 to 0.1 gpad (see Liner/Leak Detection Background Document).

The results from the comparative study of low-permeability compacted soil bottom liners and composite bottom liners clearly demonstrated that LDCRS underlain by composite bottom liners are generally more effective. The study results also indicated that properly designed and constructed composite liners can result in LDCRS detection sensitivities of less than 0.1 gpad (see Liner/Leak Detection Background Document). The Agency is today proposing a detection sensitivity based on composite bottom liner of one gpad rather than 0.1. A value of one gpad has been selected to account for construction, operational, and other factors that limit the "practical" detection capability of a LDCRS. However, since the actual detection sensitivities associated with composite bottom liners were found to be less than 0.1 gpad, the Agency is considering lowering the detection sensitivity standard from the proposed value of one gpad to 0.1 gpad. EPA is requesting comment on the appropriate value for detection sensitivity within the range of 0.1 gpad to one gpad.

Today's proposal requires owners or operators to design a LDCRS to meet the detection sensitivity criterion and demonstrate that the system satisfies this criterion. EPA plans to issue guidance for making such a demonstration. This demonstration will be based on a calculation of the rate of migration of liquids into the bottom liner based on uniform top liner leakage and saturated, steady-state conditions (see Liner/Leak Detection Background Document). The owner or operator will not be required to account for liquids held in storage in the LDCRS by capillary tension.

(b) Detection time. The EPA is requiring leak detection systems for surface impoundments (Sections 264.221(h)(2) and 265.221(g)(2)) landfills (Sections 264.301(h)(2) and 265.301(g)(2)) and waste piles (Sections 264.251(h)(2) and 265.254(g)(2)) to be capable of detecting top liner leakage of one gpad or greater within one day of the leakage having passed through the top liner. Detection time refers to the time from when liquid enters the LDCRS between the liners to when it reaches the LDCRS collection laterals or sump.

A leak detection time design goal of one day was established based on the capabilities of currently available drainage materials. The one-day criterion has been established based on saturated, steady-state analyses using drainage layer materials meeting the proposed design specifications for drainage materials described in Sections 264.221(h)(1) and 265.221(g)(1) and conforming amendments to Subparts L and N (see Liner/Leak Detection Background Document). These drainage material specifications minimize capillary tension in the LDCRS, thereby permitting the use of saturated steady-state analyses to evaluate leak detection time. This is discussed in the following paragraphs.

The leak detection time criterion is based on steady-state analyses of drainage layer materials that exhibit minimal wetting up. The following is a brief explanation of some factors that affect detection time. An initially dry granular drainage layer material will absorb some moisture before drain flow

begins. This wetting up is due to the presence of capillary tensions in the pores of partially-saturated granular materials. The more finely grained the granular material, the larger the capillary tension and the greater the capillary rise or wetting up. During the wetting-up period, leachate fills up the pore volume of the leak detection layer. Drain flow will not occur and liquid will not be detected in the leak detection system sump until the drainage layer has wetted up. For sands with hydraulic conductivities of 1×10^{-2} cm/s, the wetting up period can amount to hundreds of days for small leaks in the top liners of typical landfill facilities. For thin synthetic drainage layers with only a fraction of the thickness of a sand drainage layer and for granular drainage media with hydraulic conductivities in the range of 1 cm/s or greater (such as clean coarse sand or clean pea gravel), the wetting up period is dramatically reduced. With gravels and synthetic drainage layers, only very small amounts of leachate will be held in storage through capillary tension. These types of drainage media, coupled with the use of a composite bottom liner, result in a leak detection system with rapid detection times (as long as the leakage rate through the top liner exceeds the detection sensitivity).

Today's proposed rule requires granular drainage materials with hydraulic conductivities equal to or greater than 1 cm/s so that capillary tension in the leak detection system will be small. Further, with the use of a bottom liner meeting today's proposed leak detection sensitivity criterion, only slight leakage will occur in the bottom liner before it is detected. EPA studies (which are discussed more fully in the Liner/Leak Detection Background Document) have shown that under these conditions, flow in the LDCRS between the top and bottom liner can be evaluated using saturated, steady-state analyses assuming an impermeable bottom liner. The EPA studies present these analyses for a range of waste management unit designs involving various drainage distances and hydraulic gradients. From these analyses, it was concluded that with the drainage layer materials specified in today's proposal and current good design practice, leak detection times on the order of one day or less would be calculated. These calculations were the basis for selecting a one-day detection time criterion.

The leak detection time criterion is a design objective that the owner or operator must satisfy through a quantitative demonstration during the design process. It is not a measured objective; the owner or operator is not required to carry out a field demonstration. Today's proposed rule, therefore, requires the owner or operator of permitted facilities to demonstrate, as part of the Part B permit application, how an individual landfill, waste pile, or surface impoundment unit complies with the leak detection performance criteria (Sections 270.17, 270.18 and 270.20). Interim status units regulated under Part 265 will be required to maintain a similar demonstration. The demonstration must be presented to EPA during permitting along with the other double liner system requirements. To make this demonstration, the owner or operator will be required to prepare detailed plans and engineering reports showing how the facility was designed and how it will be operated.

In demonstrating that the LDCRS satisfies the detection time performance criteria, all owners or operators will be required to consider a number of factors in the design demonstration, including: (1) The location of the top liner leak (distance to collection laterals and sumps), (2) the type of drainage media (granular or synthetic) and its properties, (3) the bottom slope of the LDCRS, and (4) the design of the top and bottom liner systems (FML or composite). The owner or operator will be expected to show how the LDCRS meets the detection time performance criterion for a worst-case leakage scenario (longest flow path to the detection point).

In completing the quantitative demonstration to satisfy the leak detection time performance criterion, the owner or operator will be allowed to assume saturated steady-state flow conditions. In addition, the owner or operator will be required to specify materials for LDCRS that meet the minimum LDCRS component design specifications proposed in today's rule for drainage media hydraulic conductivity and thickness (or hydraulic transmissivity for synthetic drainage media), bottom slope, and sump design. These minimum component design specifications will be discussed in Section V.2.a.(4) of this preamble.

(c) Collection efficiency. In developing today's proposal, the Agency also considered LDCRS collection efficiency. Collection efficiency refers to the quantity of liquid removed from the LDCRS sump divided by the quantity of liquid that enters the LDCRS (i.e., the quantity of liquid that passes through the top liner). A high efficiency collection system is a prerequisite to maximizing leachate collection and removal and minimizing the hydraulic head on the bottom liner.

EPA rejected explicitly setting a collection efficiency criterion because it is unnecessary, given the Agency's criteria for detection sensitivity, detection time, and minimum component design specifications. By complying with these other system criteria and component specifications, the owner or operator will inherently design a system with a high collection efficiency.

The collection efficiency of the LDCRS can be maximimized by minimizing: (1) Liquid migration into the bottom liner, and (2) liquid storage due to capillary tension in the pore volume of the drainage material in the LDCRS. Since today's proposal provides system requirements that minimize both migration into the bottom liner and LDCRS storage due to capillary tension, a very high collection efficiency is ensured.

Liquid migration into the bottom liner will be minimized through owner or operator compliance with the leak detection sensitivity and detection time criteria proposed today. By satisfying these criteria, the owner or operator will minimize liquid head in the LDCRS which in turn minimizes migration into the bottom liner. Since the absorptive capacity of a properly designed and constructed composite bottom liner is much less than that for a compacted low-permeability soil bottom liner, the collection efficiency of a LDCRS underlain by a composite bottom liner will be significantly larger than the collection efficiency of a LDCRS underlain by a compacted soil bottom liner. A thorough comparison of the collection efficiencies associated with both compacted soil and composite bottom liners is in the background technical documentation ("Background Document on Bottom Liner Performance in Double-Lined Landfills and Surface Impoundments") to EPA's April 17, 1987 Hazardous Waste Management System; Minimum Technology Requirements: Notice of Availability of Information and Request for Comments (52 FR 12566). The background document and notice present data comparing the performance capabilities of compacted soil and composite bottom liners.

(3) Design specifications. The Proposed Codification Rule of March 28, 1986 (51 FR 10707–12) requires owners and operators of certain surface impoundment and landfill units to install a leachate collection and removal system between the liners that is designed, constructed, maintained, and operated to detect, collect, and remove liquids that leak through any area of the

top liner during the active life and post-closure care period (Sections 264.221(c)(iii)(3) and 265.221(a)(iii)(3) and conforming amendments to Subpart N). That proposal further requires the leachate collection and removal system to be constructed of materials that are chemically resistant to the waste or leachate in the unit and to be designed and operated to function without clogging during the active life and post-closure care period of the unit.

The LCRS standards proposed on March 28, 1986 serve as the basis for today's proposed leak detection system. However, today's proposal also adds the following design requirements to those LCRS standards for new surface impoundments, waste piles, and landfills (see Liner/Leak Detection Background Document for supporting information):

(a) Bottom slope drainage layer—2 percent.

(b) Granular drainage layer hydraulic conductivity—1 cm/s.

(c) Granular drainage layer thickness—12 inches.

(d) Synthetic drainage layer hydraulic transmissivity—5×10^{-4} m^2/s.

(e) Sump capacity and monitoring requirements.

For granular drainage layers, hydraulic conductivity and thickness are being specified, while for synthetic drainage material a hydraulic transmissivity is being specified. Transmissivity is defined as hydraulic conductivity multiplied by thickness; therefore, in meeting the hydraulic conductivity and thickness, the hydraulic transmissivity will automatically be met for granular drainage material.

(a) Bottom slope. Under today's proposal the LDCRS must have a minimum bottom slope of 2 percent (Sections 264.221(h)(1), 264.251(h)(1) and 264.301(h)(1), and Sections 265.221(g)(1), 265.251(g)(1) and 265.301(g)(1)). The bottom slope of the LDCRS is important, because the rate of liquid movement through the LDCRS is proportional to the bottom slope. The steeper the slope, the faster a given leak will travel to the sump. The minimum bottom slope specified in today's proposal applies to all components in the LDCRS. Therefore, the minimum bottom slopes of the drainage media, collector pipes, collection laterals, and all other piping and/or drainage features must be at least 2 percent. This requirement will result in areas of the unit with bottom slopes greater than 2 percent.

The Agency selected the minimum 2 percent bottom slope to promote drainage in the unit. EPA has previously recommended this value as a minimum (Draft, Minimum Technology Guidance Document on Double Liner Systems, May 24, 1985, EPA/530-SW-85-014) based on the results of analytical studies and earlier design and construction practices. Today's minimum specified 2 percent bottom slope will create no new requirements for most owners and operators because EPA's existing technical guidance calls for a 2 percent bottom slope; consequently, most facilities are constructed with at least this minimum slope. EPA is concerned, however, that some waste management units designed with 2 percent bottom slopes actually end up with bottom slopes of less than 2 percent due to imperfect construction or post-construction settlement. The Agency is therefore considering increasing the minimum bottom slope requirement from today's proposed value of 2 percent to a value within the range of 2 to 4 percent. EPA requests comments on the appropriate value for minimum bottom slope.

The Agency believes that many owners and operators will elect to use bottom slopes greater than 2 percent for at least two reasons: (1) the larger the unit's bottom slope, the greater the efficiency of the leachate collection and removal system above the top liner (i.e., the top liner slope will parallel the bottom liner slope), the smaller the potential for liquid migration through the top liner since leachate is being efficiently collected, and the lower the probability that leakage will exceed the action leakage rate since leachate will not be building up on the top liner, and (2) the larger the unit's bottom slope, the easier it will be for the owner and operator to make a quantitative demonstration that the unit's design satisfies the detection sensitivity and detection time performance criteria.

(b) Hydraulic conductivity of granular drainage materials. Under today's proposal, granular drainage materials used in the LDCRS must have a minimum hydraulic conductivity (also called permeability) of 1 cm/s (see Liner/Leak Detection Background Document). (See Sections 264.221(h)(1)(i) and 265.221(g)(1)(i) and conforming amendments to Subparts L and N.) Hydraulic conductivity describes the velocity of liquid flow through the drainage layer under a hydraulic gradient equal to one. Because the velocity of liquid flow is directly proportional to hydraulic conductivity, hydraulic conductivity is the single most important variable controlling leak detection time. The larger the hydraulic conductivity of the drainage layer, the shorter the time for detecting leaks in the sump. In order to determine whether a granular material meets the proposed minimum specification, owners and operators will need to present results from hydraulic conductivity tests conducted on saturated samples of the drainage material. The tests should be performed under conditions simulating those that will exist in the unit.

Saturated hydraulic conductivities for granular drainage materials can vary over several orders of magnitude. In developing today's proposed specification for hydraulic conductivity, EPA considered granular drainage materials with hydraulic conductivities ranging from 10^{-3} cm/s to 10 cm/s. The lower value in this range corresponds to the hydraulic conductivity of silty sand, and the upper value corresponds to the hydraulic conductivity of clean gravel. In selecting the proposed design criterion from the considered range, EPA investigated the effect of hydraulic conductivity on detection time. Details of this investigation are presented in the Liner/Leak Detection Background Document. This background documentation presents results of analytical and numerical simulations of typical leachate collection and removal systems. In the simulations, the hydraulic conductivity of the drainage media was varied and the effect on detection time (and other parameters) was determined. The simulations showed that hydraulic conductivities in the range of 1 cm/s are required to develop unit designs that minimize capillary tensions in the LDCRS granular materials and that satisfy the detection time criterion previously discussed.

The conclusions drawn from the analytical and numerical simulations result in a minimum hydraulic conductivity specification in today's proposed rule that is two orders of magnitude larger than that recommended for leachate collection and removal system between the liners in EPA's May 24, 1985 Draft Minimum Technology Guidance on Double Liner Systems. The Agency notes that today's specification will require the owner and operator to use clean coarse sands, gravel, or synthetic drainage materials to meet the requirements. EPA solicits comments on the new proposed specification for minimum hydraulic conductivity.

(c) Thickness of granular drainage materials. The Agency is today proposing a minimum 12-inch thickness for the granular drainage layer in the LDCRS. (See Sections 264.221(h)(1)(i) and 265.221(g)(1)(i) and conforming amendments to Subparts L and N.) The purpose of this minimum thickness

specification is to ensure that the granular material in the LDCRS can be constructed to specification and that an underlying FML component of the bottom liner is not damaged by equipment during placement of the granular material. The minimum 12-inch value is from EPA's technical guidance on double liner systems (also see Liner/Leak Detection Background Document). This thickness of granular drainage material provides an LDCRS that automatically satisfies the proposed minimum hydraulic transmissivity ($5 \times 10^{-4} m^2/s$).

(d) Hydraulic transmissivity of synthetic drainage materials. Today's proposal requires synthetic drainage layer materials to have a hydraulic transmissivity of $5 \times 10^{-4} m^2/s$ or greater. (See Sections 264.221(h)(1)(2) and 265.221(g)(1)(2) and conforming amendments to Subparts L and N.) Hydraulic transmissivity of a layer of drainage material is equal to its hydraulic conductivity multiplied by its thickness. Hydraulic transmissivity, therefore, is a measure of the quantity of liquid that can flow through a layer of drainage material in a unit of time. The larger the hydraulic transmissivity, the larger the amount of liquid that can flow through a drainage layer under any given head. This parameter is important because if the hydraulic transmissivity of the drainage layer is inadequate, the drainage layer will not be able to accept large amounts of leakage while still maintaining gravity flow conditions in the LDCRS.

EPA has arrived at the minimum value of $5 \times 10^{-4} m^2/s$ for hydraulic transmissivity based on numerical simulations of typical leachate collection and removal systems. In these simulations, EPA considered a range of synthetic drainage materials. From the results of the simulations (which are discussed in detail in the Liner/Leak Detection Background Document), EPA concluded that a hydraulic transmissivity of $5 \times 10^{-4} m^2/s$ would enable the LDCRS to collect and remove relatively large amounts of leakage while maintaining gravity flow conditions. This specification therefore ensures that liquids in the LDCRS will be rapidly collected and that the hydraulic head on the bottom liner will be minimized.

The Agency notes that the minimum hydraulic transmissivity specification in today's proposal is about one order of magnitude larger than the minimum value cited in its May 24, 1985 Draft Minimum Technology Guidance on Double Liner Systems. EPA continues to consider values for minimum LDCRS hydraulic transmissivity, in the range of $3 \times 10^{-5} m^2/s$ to $5 \times 10^{-4} m^2/s$. Comments are solicited on the appropriate value from within this range.

EPA has not explicitly set a hydraulic conductivity minimum specification for synthetic drainage materials. The Agency believes it unnecessary because all available synthetic materials meeting today's proposed hydraulic transmissivity specification also exceed the proposed hydraulic conductivity criterion for granular drainage materials.

Adequate hydraulic transmissivity is a prerequisite to minimizing the hydraulic head on the bottom liner. This is an integral part of EPA's strategy to prevent migration of hazardous constituents out of waste management units. Since the migration rate is dependent on the liquid pressure head, as long as the head on the bottom liner is kept to a minimum, the potential for migration through a composite bottom liner is very small.

EPA believes that as a result of today's proposal, minimum hydraulic head for virtually all leakage scenarios at landfills and waste piles will be maintained. However, in a worst-case scenario for surface impoundments, the gravity flow capacity of the LDCRS could be exceeded because the hydraulic head above the top liner can be much larger than in a landfill or waste pile. At a surface impoundment, the owner or operator can use external pumps to augment the hydraulic capacity of the LDCRS for a major top liner leak. Using external pumps could be advantageous in handling the hydraulic flow from a major top liner leak because such a leak will result in a significant quantity of leachate that must be removed rapidly by the LDCRS. In addition, many surface impoundments can be rapidly emptied. Therefore, for worst-case top liner leaks at surface impoundments, response actions are available to reduce the hydraulic head acting on the bottom liner.

(e) Sump. Under today's proposal, the LDCRS must include a sump of appropriate size to collect liquids efficiently and to prevent liquids from backing up into the drainage layer. (See Sections 264.221(h)(4) and 265.221(g)(4) and conforming amendments to Subparts L and N.) EPA is requiring that each unit have its own sump and that each sump provide a method for measuring and recording the liquid volume present in the sump and the liquids removed to determine the leachate flow rate.

EPA believes that the owner or operator should minimize the head in the sump at all times. If liquids are being collected in the sump, EPA expects the owner or operator to institute monitoring and pumping schedules so as to minimize hydraulic head in the sump. Although EPA recognizes that the head in the sump may exceed 12 inches periodically, EPA expects the average liquids level in the sump to be well below 12 inches. As an example, an RA might find acceptable a monitoring and pumping schedule that allowed the liquids level in the sump to rise to several feet if this occurred only periodically and for only a short period of time, and if at other times the liquids level in the sump was kept well below 12 inches.

The hydraulic head in the LDCRS sump must be kept small to minimize the potential for hazardous constituent migration out of the unit. The reason for this is twofold: (1) Sumps are often of complex geometry, resulting in a greater potential for breaches in both FMLs (seam defects, tears, etc.) and compacted soil liner components (cracks); and (2) because the sump may not have an adequate bottom slope, liquid entering the sump simply will pond over any bottom liner breaches, creating the potential for leachate migration into and possibly through the bottom liner.

In today's proposed rule, the owner or operator is required to provide a method for measuring and recording the leachate volume present in the sump on a daily basis, as well as the leachate removed, to determine the leakage rate in the unit. The leachate volume in the sump typically will be determined by measuring the liquid level in the sump. The leachate volume removed from the sump can be determined by collecting (in barrels, tanks, etc.) and measuring the quantity of liquid pumped out of the sump or, alternatively, by recording the times when the pump is operating and then multiplying this time by the pumping rate. The leakage rate is assumed to be equal to the volume of liquid entering the sump over a period of time divided by the time and then also divided by the unit area served by the sump. The actual leakage rate through the top liner may be different (larger or smaller) than the measured leakage rate at the sump depending on: (1) The collection efficiency of the system and (2) the presence of water in the LDCRS from construction, ground-water infiltration, consolidation of compacted soil liners, or additional sources of liquid other than leakage. The measured leakage rate at the sump, however, is

what is considered in today's proposal in all references to leakage rate.

Today's proposed rule requires the owner or operator of a surface impoundment, waste pile, or landfill unit to inspect for leakage in the LDCRS sump daily during the active life (including the closure period) and weekly during the post-closure care period (if applicable). (See Sections 264.226(c)(1) and 265.226(b)(1) and conforming amendments to Subparts L and N.) EPA believes that this monitoring schedule will ensure that a minimum hydraulic head is maintained in the sump and that accurate information will be collected on the rate at which liquids are entering the sump.

For permitted units, today's proposed rule provides the RA with the authority to specify all monitoring, inspection, maintenance, reporting, response, and recordkeeping activities that are necessary to ensure that the objectives of detecting leakage at the earliest practicable time and of minimizing the hydraulic head on the bottom liner are met. (See Section 264.226(e) and conforming amendments in Subparts L and N.)

(4) Variances. Under Sections 264.221(i) and 265.221(h) and conforming amendments to Subparts L and N of today's proposed rule, the Regional Administrator (RA) may specify in the permit an alternative leak detection system. There are three types of variances for alternative leak detection technologies or systems although there is no variance from leak detection. The first is where the RA finds that there is no potential for migration of hazardous constituents from a unit to ground water or surface water during the active life and post-closure care period (Sections 264.221(i)(1), 265.221(h)(1) and conforming amendments to Subparts L and N). The second is if the RA finds that an alternative design or operating practice, together with location characteristics, will prevent the migration of any hazardous consituents into the ground water or surface water at least as effectively as the LDCRS (40 CFR 264.221(d), 265.221(c) and conforming amendments to Subparts L and N) or the unit is a monofill and meets requirements as specified in 40 CFR 264.221 (e), 265.221(d) and conforming amendments to Subparts L and N. The third is if the owner or operator proposes an alternative leak detection system or technology that is capable of detecting leaks of hazardous constituents at the earliest practicable time over all areas likely to be exposed to waste and leachate during the active life and post-closure care period (Sections 264.221(i)(3), 265.221(h)(3), and conforming amendments to Subparts L and N).

In deciding whether to allow a variance for an alternative leak detection system or technology under today's proposal, the RA will consider: (1) The ability of the proposed system or technology to operate effectively through the active life and post-closure care period of the unit; (2) the nature and quantity of the wastes; and (3) the ability of the system to detect leaks and, in combination with response actions to be taken, prevent migration of hazardous constituents out of the unit during the active life and post-closure care period.

In seeking a variance for an alternative leak detection system technology, the owner or operator will be required to demonstrate how the proposed alternative satisfies the general narrative statutory standard under Sections 264.221(g) and 265.221(f) and conforming amendments to Subparts L and N.

Owners or operators also will be required to demonstrate how the proposed alternative enables them to meet the response action requirements of today's proposed rule to prevent migration of hazardous constituents out of the unit during the active life and post-closure care period. For example, if an alternative leak detection system technology did not provide information about leakage until after the leakage had migrated through the bottom liner, response actions stemming from leak detection would occur too late to prevent migration of the leakage from the unit. Therefore, under today's proposed rule, such an alternative leak detection system technology would be unacceptable. The alternative leak detection technology proposed by the owner or operator must provide a trigger mechanism to initiate interaction with EPA for review of site-specific conditions to determine an appropriate response action. Variances for permitted facilities will be reviewed in the context of the 40 CFR Part 124 permitting procedures. For interim status facilities, EPA is considering variance review and approval under the procedures presently used for closure plans.

Examples of where the use of an alternative leak detection technology might be appropriate include small (e.g., less than one acre), temporary (e.g., one year or less) surface impoundment and waste pile units that could be quickly emptied and repaired in the case of a significant top liner leak. For this set of conditions, the use of a leak detection system based on geophysical methods involving the embedding of probes in a thin sand LCRS between the top and bottom liners might be shown to satisfy the previously cited general narrative statutory standards for leak detection systems. The geophysical method used could be set up to operate on a continuous monitoring basis or, alternatively, frequent discrete surveys could be carried out. Since the active life of these units would be relatively short, questions regarding the long-term reliability of the alternative technology would not be applicable. Further, in the event of a top liner breach, responses could be initiated to empty and repair the liner, thereby preventing migration of hazardous constituents out of the unit.

EPA is interested in comments on how locational characteristics should be considered in allowing a variance for an alternative leak detection system at facilities that have received a variance from double liners based on an alternative design and operating practice, together with locational characteristics, that prevent the migration of any hazardous constituents into groundwater or surface water at least as effectively as the required double liner system. (Sections 264.221(g), 265.221(c) and conforming amendments to Subparts L and N). For example, should a compacted soil bottom liner together with certain locational characteristics be considered to provide equivalent protection of human health and the environment as the leak detection system requirements in the proposed rule? More specifically, if locational factors such as climate (precipitation), hydrogeologic conditions, surface water conditions, and subsurface soil profile indicate that there is no potential for migration of hazardous constituents from a unit to groundwater or surface water, should a variance be allowed for a leak detection system incorporating a compacted soil bottom liner? EPA believes that in rare site-specific cases it may be possible for locational characteristics (e.g., very low precipitation and long travel time to groundwater) to allow compacted soil bottom liners to meet the requirements for alternative leak detection systems (Sections 264.221(i)(2) and 265.221(h)(2) and conforming amendments to Subparts L and N).

Sections 264.221(j), 265.221(i) and conforming amendments to Subparts L and N propose additional requirements for leak detection systems that are not located completely above the seasonal high water table. The owner or operator must demonstrate that the operation of the leak detection system will not be

adversely affected by the presence of groundwater.

b. Action leakage rate—(1) Proposed rule. Under the authority of Section 3004(a) of RCRA, EPA is proposing that the owner or operator establish an action leakage rate (ALR) during the design of the unit (Sections 264.221(k), 265.221(j) and conforming amendments to Subparts L and N). The ALR notifies the owner or operator of a leakage rate that may require implementation of a response action to prevent hazardous constitiuent migration out of the unit. The Agency believes that this requirement is necessary to assure protection of human health and the environment because it aids in preventing hazardous constituent migration from the land disposal unit. The ALR is a mechanism to trigger an assessment of the need to implement the RAP which is an integral part of EPAs systems approach.

The ALR constitutes a trigger for initiating interactions between the owner or operator and EPA. The owner or operator is required under today's proposal to monitor the rate of leakage into the LDCRS sump on a daily basis. The owner or operator also is required to determine whether the measured rate of leakage over a specified period of time exceeds the ALR (Sections 264.226(c)(2) and 265.226(b)(2) and conforming amendments to Subparts L and N). If the measured rate of leakage is less than the ALR, no action is required by the owner or operator, other than to remove the liquids from the sump to maintain a minimum hydraulic head in all parts of the LDCRS. If the measured leakage rate exceeds the ALR, today's proposal requires the owner or operator to initiate implementation of the RAP.

Under today's proposal, the owner or operator must establish an action leakage rate during the unit's design (Sections 264.221(k) and 265.221(j) and conforming amendments to Subparts L and N). The owner or operator has a choice between using a standard value for ALR specified by EPA in the final rule or, alternatively, a site-specific ALR obtained after EPA approval of a site-specific ALR demonstration by the owner or operator. EPA is not proposing a standard value for the ALR, but rather a range of 5–20 gallons per acre per day (gpad) from which EPA will select a value in finalizing this rule.

(2) Rationale. In developing today's proposal for leak detection systems, EPA selected an approach based, on the current technology capabilities of the top liner to prevent migration of liquid through the liner. EPA believes it is not appropriate to select a value that is below current capability of the top liner to control migration. EPA believes that an ALR in the range of 5 to 20 gpad is consistent with a technology based standard for FML top liners. This value is based on an evaluation of top liner leakage scenarios at surface impoundments, landfills, and waste piles. EPA is proposing a range of values for public comment because of limited data, particularly on the top liner's performance during the operating period after installation. Technical support for the proposed range for ALR values is presented in the Liner/Leak Detection Background Document supporting today's proposal. As discussed in that document, the proposed ALR range of 5 to 20 gpad is representative of a very high level of construction quality assurance at surface impoundments. The Agency believes that this range for ALR is appropriate, based on the current capabilities inherent in FML seaming techniques and CQA programs (using ponding tests, geophysical techniques, etc. to detect top liner defects before the surface impoundment unit is put into operation).

Although only one standard ALR will be cited in the final rule, lower ALRs could be considered for landfills and waste piles with properly designed and functioning leachate collection and removal systems above the top liner (since the hydraulic head acting on the top liner would be lower than the head acting on a surface impoundment). Additionally, in lieu of meeting the standard ALR value, owners or operators may demonstrate that a site-specific ALR is appropriate as discussed in Section 4 below.

The option of allowing no leakage in the LDCRS was not accepted for today's proposed rule because it would ignore the finite capabilities of lining systems and drainage media to contain and transmit leakage. Therefore, not allowing any leakage in the LDCRS would not be consistent with current BAT. The option of allowing a large leakage rate as the ALR was not selected because a large leakage rate may exceed the gravity flow capacity of the LDCRS, thereby increasing the hydraulic head on the bottom liner. As previously noted in this preamble, as the hydraulic head on the bottom liner increases, the potential for hazardous constituent migration into and through the bottom liner also increases. Thus, allowing leakage rates that increase the hydraulic head on the bottom liner is inconsistent with EPA's goal of preventing hazardous constituent migration from the waste management unit.

Today's proposal for the ALR is a logical extension of EPA's overall systems approach to preventing migration of hazardous constituents out of the unit. The ALR provides the mechanism or trigger to allow EPA to use a site-specific evaluation for the leak detection program. This mechanism and the associated response action program is a key element in the EPA regulatory program for preventing contamination of ground water and protecting human health and the environment. The top and bottom liners together with the LCRS above the top liner, the LDCRS between the top and bottom liners, and the trigger and response action program function together in an integrated, interdependent manner to achieve the objective of preventing hazardous constituent migration out of the unit by maximizing leachate collection and removal.

EPA is continuing to investigate the appropriate ALR based on BAT for top liners, and requests comments on the appropriate value for the ALR within the proposed range of 5–20 gpad. In particular, EPA is interested in comments on the appropriateness of the proposed range for surface impoundments. Owners or operators with data that support selection of an ALR are encouraged to provide these data to the EPA. The Agency also is interested in public comment on whether different ALR values are appropriate for FML and composite (FML plus compacted soil) top liner systems.

(3) Basis for the trigger. EPA is basing the trigger mechanism for today's proposed rule on the hydraulic rate of top liner leakage as opposed to the hazardous constituent concentration in the liquid collected in the LDCRS sump. EPA is not using constituent concentration as part of the determination as to whether the ALR has been exceeded because it would make the determination more complex and more costly to the owner or operator.

The determination would become more complex if based on hazardous constituents because: (1) Samples for chemical analyses must be taken carefully by trained personnel, whereas maintenance personnel can measure the quantity of liquid in the LDCRS sump using unsophisticated equipment; (2) complex chemical analyses are expensive and time-consuming, whereas liquid in the sump can be measured frequently and inexpensively; (3) chemical analyses take time to perform and a timelag exists between the time of

sampling and the time when a determination can be made whether the ALR has been exceeded; (4) chemical analyses are subject to more uncertainty than are volumetric measurements; and (5) trigger levels would have to be set for each hazardous constituent.

As a result of the complexities outlined above and the burden to the owner or operator of performing chemical analyses, monitoring hazardous constituents in the LDCRS sump is not feasible on a daily or weekly basis. While EPA believes that periodic monitoring of constituent concentrations is important and that most owners or operators will choose to conduct periodic monitoring, it is not desirable, feasible, or necessary to use hazardous constituent monitoring as the trigger. However, discussed subsequently in the preamble, hazardous constituent concentrations are an important factor in selecting the appropriate response action as part of the assessment in the response action plan.

(4) Site-specific ALR. Today's proposed rule permits the owner or operator to use an EPA-specified ALR which will be selected from the range of 5 to 20 gpad or, alternatively, to use a site-specific ALR obtained after EPA approval of a site-specific ALR demonstration by the owner or operator. The purpose of a site-specific ALR is to provide a mechanism to account for conditions that reduce the potential migration of hazardous constituents through the top liner. If site-specific factors enhance the capability of the top liner LCRS to collect and remove leachate or enhance attenuation of hazardous constituents in the waste containment unit, the owner or operator has an opportunity to demonstrate that the standard EPA-specified ALR is less appropriate than a site-specific ALR.

To obtain approval for a site-specific ALR, the owner or operator must make a conclusive demonstration to the Regional Administrator. If the RA does not approve the demonstration, the owner or operator may modify the demonstration or may submit a new demonstration for approval. The site-specific ALR demonstration must show that only small, isolated leakage through the top liner is allowed and that it does not affect the overall performance of the top liner. In deciding whether to grant a site-specific ALR, the RA will consider the following four factors:

(1) The design, construction, and operation of the top liner and the leachate collection and removal system above the top liner;

(2) The attenuative capacity and thickness of any soil component of the top liner;

(3) All other factors that would influence the potential for leachate to migrate through the top liner; and

(4) The quality and comprehensiveness of the engineering data and analyses provided to the RA in support of the site-specific ALR.

EPA believes a site-specific ALR will only be appropriate in unique situations.

(5) Monitoring requirements. Today's proposed rule requires the owner or operator to monitor on a daily basis during the active life for the presence of liquids in the LDCRS sump and determine when the ALR has been exceeded (Sections 264.226(c)(1) and 265.226(b)(1) and conforming amendments to Subparts L and N). This determination is made by measuring the amounts of liquid in the LDCRS sump at the beginning and end of the monitoring interval and the amount of liquid that was removed from the sump during that period. The RA may specify an alternative approach for determining whether the ALR has been exceeded in the facility permit (Section 264.226(2)(iii) and conforming amendments to Subparts L and N). In addition, today's proposed rule empowers the RA to specify more stringent monitoring and inspection requirements for permitted units if the RA believes such requirements are justified because of the operating characteristics of the unit (Section 264.226(e) and conforming amemdments to Subparts L and N).

EPA recognizes that there may be events that cause the ALR to be exceeded for short periods but that do not reflect a diminished integrity of the top liner system. These temporary flow rate increases may be due to singular precipitation events, such as exceptional rainfalls. Leakage rate increases due to these precipitation events would occur during or shortly after the event itself. EPA does not consider temporary flow rates exceeding the ALR for a day or two by a small margin to significantly increase the potential for the migration of hazardous constituents from the unit. EPA believes that it is acceptable to provide some flexibility to the owner or operator in determining whether a leakage rate exceeding the ALR triggers interaction with EPA.

Today EPA is proposing that the owner or operator monitor for the liquid in the LDCRS removal sump daily during the active life and closure period of the unit and at least weekly during the post-closure period (if applicable). Analysis of the data to determine if the ALR has been exceeded will be required on a weekly basis during the active life and closure period and quarterly during the post-closure period (Section 264.226(c)(2), 265.226(b)(2), and conforming amendments to Subparts L and N). EPA believes that a time-weighted value is appropriate for a trigger for lower leakage rates. From recent experience with leak detection systems, EPA recognizes that the system will not provide an instantaneous measurement of the actual leakage rate and that some period of time is needed for the system rate to provide an accurate indication of leakage through the top liner. For instance, EPA believes that it may be reasonable to allow an owner or operator up to 30 days to determine whether the ALR has been exceeded if the maximum daily leakage rate recorded on a daily basis does not exceed 50 gpad during any one day within the 30 days (see Liner/Leak Detection Background Document). The leakage rate for the 30-day period would be equal to the total leakage during 30 days divided by 30. If during any monitoring interval during the 30 days the leakage rate exceeds the 50 gpad value, the ALR would be triggered immediately, and the owner or operator would have 7 days to notify the RA. Today's proposed rule also allows the RA to approve an alternative method for determining if the action leakage rate of the top liner is exceeded. EPA solicits comments on the above approach to allow the RA some flexibility in specifying permit conditions for determining whether the ALR has been triggered.

c. Response action plan. (1) Background—(a) Introduction. Under the authority of Section 3004(a) of RCRA, EPA is proposing a response action plan (RAP) for leakage exceeding the ALR (Sections 264.222, and 265.222, and conforming amendments to Subparts L and N). The Agency believes that this requirement is necessary to assure protection of human health and the environment. The RAP is a site-specific plan that the owner or operator develops to address leakage through the top liner to assure that it does not migrate out of the unit. It is based on an assessment of the capability of the total system rather than of individual components. The goal of the RAP is to prevent the migration of hazardous constituents out of the unit at levels exceeding health-based standards by providing a mechanism for appropriate actions to mitigate the potential for such migration should the leak detection system reveal the presence of liquids between the top and bottom liners. In the RAP, the owner or operator

characterizes the reason for leakage, assesses current conditions of the double liner system, assesses the potential for migration out of the unit, reviews various responses and their effectiveness, and recommends a response. The RA will review and approve the RAP with the recommended response.

The RAP proposed today is an integral component of EPA's systems approach, wherein the goal of protecting human health and the environment is achieved through the design and operation requirements for an entire unit, rather than its individual components. With this thought in mind, the appropriate response actions to any leakage event are linked to the system capabilities rather than the capabilities of any single system component. The appropriate response actions must consider not only the concentrations of hazardous constituents in the liquid contained in the leak detection system but also the overall ability of the lining system (in particular, the ability of the leak detection system and the bottom liner) to contain top liner leakage within the unit.

In today's proposal, the Agency is taking the position that migration of hazardous constituents out of the unit at concentrations below EPA approved health based standards for ground-water protection will be protective of human health and the environment. Therefore, the presence of such liquids in the leak detection system between the liners is consistent with EPA's objectives for protection of human health and the environment for a land disposal unit. Furthermore, the presence of hazardous constituents in the leak detection system at concentrations exceeding EPA's health-based standards is not necessarily a problem, since the overall lining system, with a composite bottom liner and a leak detection system between the top and bottom liner, should protect human health and the environment. The role of the RAP in this instance is to provide an opportunity to review the design, construction, and operation of the unit, and all factors that might affect the performance of the lining system in order to ensure that the entire unit can meet its performance goal of protecting human health and the environment. The RAP will initiate any necessary actions to ensure compliance with this goal.

The leak detection approach proposed in this rule differs from the leak detection approach in the Tank Rule (51 FR 25487, July 14, 1986). The Tank Rule requires the unit to be taken out of service and replaced or repaired if leakage is detected. The difference between the leak detection approaches that EPA is using for tanks and for landfills, waste piles, and surface impoundments results from differences in the design and materials used for construction, operating practices, and waste placed in these units. To replace a steel tank or repair a leak in the tank is feasible and relatively easy. However, EPA's position is that, in most cases, requiring the repair of a top liner in a landfill when the liner is covered by waste is not a practical approach. Top liners at surface impoundments and certain waste piles where the waste is periodically removed are repairable; EPA has data showing surface impoundment liners are commonly repaired or replaced when they are damaged. Also, a top liner leak in a landfill would be very difficult to locate, and repairing the leak would require excavating large quantities of the previously placed hazardous waste. Therefore, the leak detection approach proposed today recognizes the system's capabilities in determining the appropriate response action.

Today the Agency is proposing that a RAP be required for all newly constructed landfills, surface impoundments, and waste piles; replacement landfill, surface impoundment, and waste pile units; and landfill and surface impoundment units required to have double liners after November 8, 1984, at both permitted and interim status facilities (Section 264.222, and conforming amendments to Subparts L and N). EPA is proposing a RAP as a means to implement the appropriate response activity for leakage on a site-specific basis. The RAP sets forth actions to be taken to ensure that hazardous constituent migration out of the unit is prevented at levels exceeding EPA-approved health-based standards for ground water protection. Although the statute requires only leak detection and not a response action (Section 3004(o)(4)(A)), EPA considers the RAP, with its response action requirement, to be a logical step to minimizing head-on the bottom liner and preventing hazardous constituent migration out of the unit.

RAPs are required for two leakage rates: (1) Rapid and extremely large leakage and (2) leaks less than rapid and extremely large that exceed the ALR. Rapid and extremely large leakage (RLL) is defined as the maximum design leakage rate that the LDCRS can remove under gravity flow conditions (i.e., without the fluid head on the bottom liner exceeding one foot of water in granular leak detection systems and without the fluid head exceeding the thickness of synthetic leak detection systems). In determining the design value for the RLL rate, the owner or operator should use an adequate safety margin to allow for uncertainties in the design, construction, and operation of the LDCRS (e.g., decreases in the flow capacity of the system in time resulting from siltation, creep of synthetic components of the system, etc.). (See Liner/Leak Detection Background Document for further information.)

EPA takes the position that leakage in excess of the RLL can significantly increase the potential for migration of hazardous constituents out of the unit. If a leak occurs, and the leakage rate exceeds the gravity flow capacity of the leak detection system, the hydraulic head on the bottom liner can become equal to the elevation difference between the liquid level in the unit and the elevation of the bottom liner. In the case of a surface impoundment, or in the case of a failure of the LCRS above the top liner, this elevation difference can be large (see Liner/Leak Detection Background Document). Based on the increased migration potential if the RLL is exceeded, the procedures for submitting a RAP differ for RLL and less than RLL. The owner or operator must have an approved RAP for RLL before receiving waste as a result of this increased migration potential. For leakage less than RLL, EPA allows the owner or operator to submit the RAP in the permit application or to develop the RAP subsequent to the leakage event. The EPA does not believe that leakage below rapid and extremely large poses as great an immediate threat; therefore, the RAP for these leaks can be developed after the ALR is exceeded.

(b) Overview of RAP requirements and implementation—(i) RAP for leakage greater than ALR, but less than rapid and large.

Leachate collection and removal and sampling. If the owner or operator detects leakage exceeding the ALR, but not exceeding the RLL rate, he must immediately notify the Regional Administrator. The owner or operator must continue leachate collection and removal to minimize the head on the bottom of the liner as currently required in the LCRS requirements. If he has not yet submitted a RAP for these lower leakage rates to EPA, he must submit one within 90 days of detecting leakage above the ALR. The RAP must identify the hazardous constituents which are present in the waste and project which constituents will be present in the sump. The Regional Administrator will review this list and specify which hazardous

constituents must be sampled in the sump of the LCDRS to give a reasonably accurate representation of the concentrations of hazardous constituents in the leachate.

The RAP must also require the owner or operator to sample the designated constituents as soon as possible after the RAP is implemented. If the sampling shows that the concentration of all of the constituents are below EPA-approved health-based standards (explained in more detail below), the RAP may limit response action to the continued collection and removal of leachate. If, however the owner or operator finds that the concentration of any of the sampled constituents exceeds a health-based standard, he must implement the approved response for leakage above health-based standards. The RAP would require the owner or operator to consider a series of factors that relate to the potential for the leachate to escape from the unit into the environment. These factors are described in more detail in section V.A.2.C.(2)(a) below.

Major response action. The RAP must then require the owner or operator to implement a response that is appropriate in light of all the factors and conditions considered. The goal of the response will be to prevent migration out of the unit of any leachate with constituent concentrations exceeding the health-based standards. For leaks that exceed the ALR, but are less than rapid and large, acceptable responses include:

- Terminating receipt of waste and closing the unit;
- Repairing any leaks expeditiously;
- Instituting operational changes to reduce leakage into the LDCRS between the liners;
- Collecting and removing leachate, and, in addition, accelerating groundwater monitoring; and
- Maintaining current operating procedures (including the collection and removal of leachate).

The owner or operator may choose to write a RAP that sets out a range of top liner leakage rates and corresponding responses. For example, the owner or operator may recommend in the RAP the following responses to the corresponding leakage bands for a landfill where the RLL rate has been determined to be 2,000 gpad:

Leakage band	Response
20–200 gpad	Increase the LDCRS pumping and monitoring.
200–2,000 gpad	Change operating practices to reduce the leakage to less than 200 gpad.
Greater than 2,000 gpad (RLL).	Modify the operating practice to minimize precipitation infiltration into the waste and partially close the unit.

This approach offers the owner or operator greater flexibility by allowing the leakage rate to fluctuate within reasonable limits without requiring the owner or operator to change to a different response with every increase or decrease in the leakage rate.

Although EPA encourages owners and operators to submit broad RAPs responding to a wide range of possible scenarios, EPA is not requiring them to do so. The owner or operator may choose, for a leak that exceeds the ALR, but is less than rapid and large, to submit a narrower RAP focusing on the problem actually observed. EPA, however, expects that these more specific RAPs will frequently need modifications, and predicts that most owners and operators will find it in their interest to submit broader and more flexible plans.

The Regional Administrator will review the owner or operator's submission and evaluate it against the goal of preventing migration of leachate with hazardous constituent concentrations exceeding health-based standards. Upon reaching a tentative conclusion to approve, disapprove, or modify the RAP, the Regional Administrator will provide the owner and operator with a chance to comment. The Regional Administrator will also provide the public with an opportunity to comment. More details on the criteria and procedures the Regional Administrator will use in reviewing the RAP appear in Section V.A.2.C.(2)(c) below.

Implementation of response and follow-up. Once the owner or operator is required to implement a Regional Administrator-approved RAP, the owner or operator must sample the leachate to determine hazardous constituent concentrations and then select the appropriate response action from the Regional Administrator-approved RAP. If constituent concentrations are below health-based standards, the owner or operator may continue following current operating procedures. If, however, constituents exceed the health-based standards, the owner or operator must implement the response action approved in the RAP for leakage above health-based standards. Within 60 days of selecting and initiating a response action under a RAP, the owner or operator must submit a report to the Regional Administrator that describes how effective the response has been in preventing migration out of the unit of any leachate that exceeds health-based levels. After reviewing this report, the Regional Administrator may require modifications or different responses that are necessary to assure that migration of leachate exceeding these levels does not in fact occur. Finally, the proposed regulations will also require owners and operators who are conducting responses under approved RAPs to report to the Regional Administrator any significant increase in leakage rates. This report must be submitted within 45 days of the detection of the change and must describe, among other things, any change in the response that the owner or operator has implemented or plans to implement to address the increased leakage. The Regional Administrator may require additional or different responses as necessary. If these additional or different responses require a change in the RAP, the Regional Administrator will require the owner or operator to submit a modification to the plan and review it under the procedures referred to above and described more fully in section V.A.2.C. (2)(c) below.

Variance. The RAP may also provide the owner or operator with an opportunity to demonstrate at any time that the elevated rate of liquid appearing in the LDS is not the result of a leak in the top liner, but rather from an alternative source, such as fluids trapped between the liners during construction, or water that escaped during consolidation of the compacted soil component of a composite top liner. The owner or operator will not be required to implement the RAP if the Regional Administrator approves the demonstration before the deadline for RAP implementation. If the demonstration is not approved before this date, the owner must begin to implement an appropriate response. He may halt all response activity, however, as soon as EPA approves the demonstration. The requirements for this demonstration are described in more detail in a separate section below.

(ii) RAP for Rapid and large leakage. Many of the substantive and procedural RAP requirements are the same for leakage that exceeds the RLL rate as those discussed in the previous section for leakage less than RLL. The discussion below highlights the differences.

Initial responses. The RAP for leaks exceeding RLL must be submitted for certain existing units within 12 months of promulgation of this rule and, for new units, before hazardous waste is placed in them. Consequently, EPA will require

the owner or operator to begin implementing the RAP immediately upon detecting leakage that exceeds the RLL level.

Additionally, the RAP for RLL leaks will require the owner or operator to undertake more serious responses more quickly. This program will require operational changes that will reduce the volume of leachate flowing into the LDCRS, such as a partial cover or a limit or restriction on receipt of liquid wastes or repair of the liner in a surface impoundment. EPA believes this more stringent initial response is necessary because leakage exceeding the RLL rate interferes with the functioning of the leak detection system. These large leachate quantities can "swamp" the LDS, making it difficult or impossible to tell whether leak rates continue to increase. This requires immediate response to restore the function of the LDS.

EPA is also concerned that the volume of leachate between the liners in an RLL situation may threaten the ability of the containment system to prevent migration. The large volume may significantly increase the hydraulic head that exerts pressure on the bottom liner, and, consequently, increases the possibility that contaminated leachate may escape from the unit to contaminate soil or ground water. Hence, EPA is proposing to require all RAPs for RLL to require owners and operators to undertake immediate responses even before sampling the leachate in the LDS. EPA requires that this immediate response would, at a minimum, involve operational changes to reduce leakage into the LDCRS between the liners. EPA would also expect the RAP to include a very aggressive immediate response (such as immediate repair of the upper liner) to be implemented if the volumes of leachate in the leak detection system indicate the possibility of a drastic leak in the upper liner.

Sampling and major response actions. During implementation of these initial responses, the owner or operator must also sample the leachate in the LDCRS sump for the hazardous constituents specified in the RAP. If concentration levels do not exceed approved health-based levels, the owner or operator will not have to undertake further responses if the head on the bottom liner is minimized. If, however, they do exceed health-based levels, the RAP will require the owner or operator to implement a Regional-Administrator approved response action selected from a broader range of actions in the RAP. The range of appropriate responses will be narrower for RLL leaks than for leaks below RLL levels because the large volumes increase the chance of system failure. Appropriate responses would include:

- Terminate receipt of waste and close unit;
- Repair leaks expeditiously; and
- Introduce further or more permanent operational changes to reduce leakage first to a rate below RLL, and ultimately, to a rate that prevents migration out of the unit.

EPA believes that evaluation of a range of RLL rates is important at some types of units, such as surface impoundments, where scenarios exist for top liner rates of leakage significantly in excess of the RLL. The RAP should include an assessment of the possible response activities not only for RLL, but also for leakage significantly in excess of RLL, if this level of leakage is likely to occur at that unit. The detailed assessments for rates of leakage significantly in excess of the RLL must address the same site-specific factors required for assessments of the possible RLL response activities. It is expected that the RAP for leakage rates significantly in excess of the RLL will provide for extraordinary measures to rapidly reduce the hydraulic head acting on the bottom liner. Again, the goal of the RAP will be to prevent migration out of the unit of hazardous constituents at concentrations exceeding health-based levels.

Elimination of variance. The final significant difference for a RAP for RLL is the elimination of the variance procedure. EPA has not been able to imagine a scenario where other sources of liquid, such as construction water, could generate the quantity of liquid required to meet the RLL test. Furthermore, even if all of the liquid came from sources other than a leak in the upper liner, the volumes involved would threaten the ability of LDCRS to function. Response action would be needed to maintain the capability of the LDCRS to detect additional new leakage and minimize the head on the bottom liner.

(c) Leachate quality levels. The issue concerning what level of release of hazardous constituents out of the unit that must be prevented to protect human health and the environment is relevant in a broad range of regulatory contexts currently being examined by EPA, including closure and corrective actions under RCRA and response actions under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) programs. The Agency is proposing today to use EPA-approved health-based standards for setting the maximum concentrations of hazardous constituents deemed by EPA to meet its prevent migration goal. It is EPA's position that the assessment of migration potential for hazardous constituents out of the unit will, in most cases, need to be based on the quality of the leachate in the leak detection system and not on the projected quality of leachate leaving the unit. Therefore, if hazardous constituents in the leachate are below the health-based standards, assuming a drinking water ingestion scenario, the owner or operator would not be required to initiate a response action.

The Agency has used health-based standards and criteria in several aspects of the RCRA program that involve protection of ground water, assuming human consumption. For example, the ground-water protection standards of Subpart F, de-listing procedures of Section 261, and clean closure process under Sections 264.228 and 265.228 for storage or treatment surface impoundments involve the use of EPA-approved health-based standards for evaluating compliance with an environmental performance standard. The Agency believes that such approaches are protective of human health and the environment, and is, therefore, proposing to use the health-based standards as the levels to which the response action plan must prevent migration of hazardous constituents out of the unit.

The owner or operator should use the Maximum Contaminant Levels (MCLs) established as drinking water standards under the Safe Drinking Water Act, as the primary Agency-approved health-based standards. The Agency is in the process of proposing and finalizing additional MCLs, and will continue to do so over the next several years. The Agency does not believe it is appropriate to use the Maximum Contaminant Level Goals (MCLGs), since these criteria are not considered to be relevant and appropriate regulatory standards.

Where no MCLs exist, however, the owner or operator should use the Reference Doses (RFDs), for any threshold constituents and the Carcinogenic Potency Factors (CPFs) for non-threshold constituents, assuming a risk level of 10^{-6} for Class A and B carcinogens and 10^{-5} for Class C carcinogens.

Under certain circumstances, the Agency believes that the levels based on MCLs, RFDs, and CPFs, as described above, may be lowered to ensure adequate protection of human health and the environment. The Agency may

lower these levels, as appropriate, under either of the following circumstances:

a. Where a mixture of contaminants is present, resulting in exposure to multiple contaminants that could cause adverse effects on the same human organ; or

b. Where an unusual exposure scenario or a vulnerable population at the site requires a more stringent target level.

If an EPA-approved health-based standard does not exist for a hazardous constituent, EPA is considering allowing the owner or operator to base the response action plan on not exceeding the background ground-water protection level for that constituent.

The Agency is in the process of developing guidance on the use of Agency-approved health-based standards for protecting ground water in the context of the clean closure and corrective action regulations, and for implementing the Subpart F provisions. In the future, as additional Agency-approved health-based standards are developed, these sources of information will be updated.

(2) Rule requirements—(a) Elements of the RAP. The common RAP elements for rapid and extremely large leakage and for other leakage below RLL but above the ALR are presented under Sections 264.222 (b) and (e) and conforming amendments to Subparts L and N for permitted facilities, and Sections 265.222 (b) and (e), and conforming amendments to Subparts L and N for interim status facilities. At a minimum, the owner or operator must include the following site-specific information in the RAP: (1) A general description of the operation of the unit; (2) a description of the hazardous constituents contained in the unit; (3) a description of the range of events that may potentially cause leakage exceeding both the ALR (if appropriate) and RLL; (4) a discussion of the important factors that can affect the amount of liquid entering the leachate collection and removal system between the liners; (5) a description of major mechanisms that will prevent migration of hazardous constituents out of the unit; and (6) a detailed assessment describing the effectiveness of each of a given range of possible responses. Each of these categories of required information is briefly addressed below.

First, the response action plan must include a general description of the operation of the unit including whether or not at closure the wastes will be decontaminated in place, removed from the unit, or left in place. The site-specific information should include, as a minimum, the type, size, and location of the unit; the design of the unit including details of the lining system; the geographic and climatic setting; and the operating history and practices at the unit, including the age of the unit, planned unit active life, ongoing activities at the unit, volume of wastes being stored or disposed, methods of waste placement, equipment used, intermediate cover practices, and the closure plan.

Second, the response action plan must also include a general discussion of the hazardous constituents contained in the unit. This discussion should include, at a minimum, a summary of the results of analyses carried out as part of the site-specific waste analysis plan (Sections 264.13(b) and 265.13(b)) as well as description of the physical characteristics of the waste.

Third, the response action plan must include a discussion of all events that may potentially cause leakage exceeding both the ALR (if appropriate) and the RLL. These potential causes will be site-, design-, and operation-specific. In general, they may include operational accidents, design deficiencies identified subsequent to the start of unit operation (such as inadequate connections between liners and liner penetrations such as pipes and manholes), unforeseen incompatible wastes, equipment damage, unforeseen site subgrade settlements, and catastrophic natural events such as earthquakes or tornadoes, if applicable.

Fourth, the response action plan must include a discussion of the important factors that can affect the amount of liquid entering the leachate collection and removal system between the liners. These factors should include, but not be limited to, the size and type of top liner breach, the potential for additional breaches in the future, the amount of liquid head in the leachate collection and removal system above the top liner, the potential for leachate generation in the unit due to the moisture content of the waste, the anticipated amount and frequency of precipitation, and the potential for surface water run-on. The potential for sources of liquid other than top liner leakage should also be considered, including liquids from construction water, consolidation of any compacted soil component of the top liner, or water due to ground-water infiltration.

Fifth, the response action plan must include a description of major mechanisms that will prevent migration of hazardous constituents out of the unit. This description should include an evaluation of the capabilities of the entire land disposal unit as well as the capability of each individual unit component. Particular attention should be given to: the condition of the composite bottom liner; the condition and operational capability of the leak detection system between the top and bottom liners; the condition and operational capabilities of the top liner and the leachate collection and removal system above the top liner; the potential to repair or retrofit the top liner if the RLL is exceeded; and the potential for the use of intermediate covers and run-on controls to limit leachate production potential in the unit.

Last, the response action plan must include a detailed assessment describing the feasibility of each of a range of responses for preventing hazardous constituent migration out of the unit. The discussion in section (b) above sets out the range of acceptable responses for RLL leakage and leakage that is less than rapid and large.

In developing the site-specific information for the response action plan, the owner or operator should evaluate the condition of the liners by reviewing activities that have occurred at the unit from the time of construction to the present. An analysis of the results of a rigorous construction quality assurance (CQA) plan should provide a good data base to assess the condition of the liners after construction of the unit. Results of CQA testing will be particularly valuable if key areas of the liner were tested hydraulically for leaks.

Other information that the owner or operator may use in assessing liner condition during development and implementation of a RAP includes: (1) A review of operational practices during the active life, (2) leachate analysis to indicate whether unanticipated waste constituents are present, (3) coupon testing in the sump above the top liner of a landfill or waste pile or in the waste at a surface impoundment to determine any chemical compatibility problems, and (4) an assessment of operating activities that may have damaged the liner. A review of the double liner system design can also reveal whether the design concept had any weaknesses that could increase the probability of a liner breach. The evaluation of the design will also indicate areas that include redundancy or design concepts that will minimize leakage if a breach occurs. This type of review of site-specific information can often isolate the location and extent of damage to a liner and can provide information showing that the breach is the result of a design, construction, or operational activity.

In the specific case of a breach in the top liner, the full extent of damage typically cannot be determined without

a field investigation to evaluate the liner condition. However, EPA believes that a field evaluation, including inspection and liner testing, is not currently an appropriate across-the-board requirement of the liner assessment element of the RAP. Field evaluation may be feasible in some cases where the owner or operator has conducted electrical resistivity surveys, performed acoustical monitoring, conducted a visual examination of a surface impoundment after draining, or performed evaluation of the working face of a landfill. In other cases, as in a landfill where the breach is under a significant depth of waste, field evaluation will not usually be feasible. The owner or operator, when feasible, may provide field data as part of a response action plan to demonstrate the condition of the liner.

Leakage bands. Since the likelihood exists that leakage through the top liner will fluctuate during the active life and post-closure care period, the owner or operator may develop a RAP that addresses a range of leakage bands with corresponding responses. A leakage band refers to a range of top liner leakage rates. With a specific response tied to a leakage band instead of a single leakage rate, the leak can fluctuate over time without the need to implement a different response. EPA believes that the responses should be flexible enough to accommodate reasonable fluctuations in top liner leak rates.

Examples of response actions for RLLs. To assist owners or operators in understanding today's proposed rule, EPA is providing three examples of when certain response actions that may be appropriate for three different RLL scenarios.

The first example is a disposal surface impoundment where both the top and bottom liners have been breached as a result of equipment falling into the surface impoundment and the quality of the leachate is above health-based standards. After detecting rapid and large leakage, the owner or operator determines that removing the waste and repairing the liners is not feasible. The double liner system is no longer functioning as designed, and migration of hazardous constituents (exceeding health-based standards) out of the unit is expected. In this case, the appropriate action is to drain the surface impoundment and repair or close the unit.

In the second scenario, the owner or operator of a surface impoundment detects rapid and extremely large leakage between the liners above health-based standards. The top liner has been breached at the water line. An assessment of the unit reveals that the bottom composite liner and LDCRS have not been damaged and continue to function as designed to prevent leachate migration into the ground water and surface water. In this situation, the owner or operator continues to collect and remove leachate while draining the impoundment below the breached area and repairing the top liner. If repair is not possible, the owner or operator may elect to retrofit a new top liner over the existing one, or alternatively, the RA may allow operation of the unit with reduced liquid depth so that the waste is not in contact with the area of the breach. Although this action is feasible for a surface impoundment, in most cases it would not be for a landfill.

The last scenario involves rapid and extremely large leakage above health-based standards caused by a major storm (50-year storm) at a landfill where repairing the leak is not feasible. The landfill has a remaining active life of 6 months and will be closing shortly. The LDCRS and bottom liner are functioning properly. The FML component of the composite bottom liner allows for rapid and efficient leachate collection and prevents migration into the liner. The owner or operator proposes a RAP that uses operational changes to reduce leakage into the space between the liner to a range of between 200–500 gpad for 6 months, and following that time, the unit will be closed with an initial rapid reduction in leakage. The operational changes proposed include: placing predominantly dry waste in the unit; immediately covering active portions of the unit as they are filled; covering daily to significantly reduce the rate of liquid infiltration into the waste; developing a precipitation runoff system within the unit; increasing the frequency of leak detection and ground-water monitoring; and developing a contingency RAP for closure if the high leakage rate continues or increases. This proposed RAP would be acceptable.

The range of responses for leakage less than rapid and large includes the responses for RLL and adds the following responses:

(1) The owner or operator continues to remove and treat leakage with increased ground-water monitoring. This response may be appropriate for a unit where the leakage periodically exceeds the ALR in the range of 50–100 gpad, but the system is functioning to protect ground water and surface water. Although migration out of the unit is not expected, the facility is located near a sensitive environment. The owner or operator continues to remove and monitor the quality of leachate. The frequency of ground-water monitoring and reporting is increased to confirm that no leakage is leaving the unit.

(2) The owner or operator maintains current operating practices because the leachate quality in the LDCRS is below EPA-approved health-based standards for ground-water protection. An example where this response may be appropriate is a unit where the ALR is exceeded infrequently and can be correlated to heavy rainfall. Analysis of the leachate has shown hazardous constituent concentrations are below EPA health-based standards. Assessment of the double liner system indicates the bottom liner and sump are continuing to function as designed, and leakage can be collected and removed efficiently when it occurs. A second example is where it has been shown that the leachate in the LDCRS is most probably due to a source other than top liner leakage (e.g., consolidation of a compacted soil component of the top liner) and analysis of the leachate shows it to meet the aforementioned health-based standards.

Another example where maintaining current operating practices might be appropriate involves a landfill with a leakage rate determined to be approximately 100 gpad, and the owner or operator will be closing the unit within one year. Assessment of the unit has shown that the remainder of the unit system is functioning to prevent migration of hazardous constituents out of the unit. Following RA approval, the facility continues current operating practices. The pumping rate is increased to maximize leachate collection and minimize the head on the bottom liner, and leachate quality is monitored.

The owner or operator may develop other appropriate responses that involve operational changes at the unit. EPA believes that there should be some flexibility in the responses allowed and realizes that not all units will require the responses discussed above. Therefore, EPA is allowing the owner or operator the opportunity to develop other operational responses if they are appropriate and protect human health and the environment. The response chosen by the owner or operator and approved by the RA will depend on the unit design, construction and operation, hazardous constituent concentrations in the leachate, and other factors that influence the leachate quality and mobility.

Actions to take in implementing a response action plan (RAP). Sections 264.222(d), 264.222(g), 265.222(d), 265.222(g), and conforming amendments to Subparts L and N of the proposed rule

require the owner or operator to perform the following actions after detecting leakage above the ALR: (1) Notify the RA in writing within 7 days of the occurrence, (2) collect and remove accumulated liquids, (3) immediately implement the RAP (if already part of the facility permit or interim status plan) or submit to the RA within 90 days a RAP developed after the occurrence (for facilities where the RAP was not preapproved), (4) immediately sample the leachate in the LDCRS and determine the concentrations as specified in the RAP, and (5) report in writing to the RA on the effectiveness of the response as soon as practicable after the response has been in place for 60 days, and annually thereafter for leakage that is less than RLL, or at subsequent time periods as specified by the RA for RLL. These five actions are described in more detail below:

(1) If leakage into the LDCRS exceeds the ALR, the owner or operator must notify the RA of the occurrence in writing within 7 days after determining that the ALR is being exceeded in accordance with Sections 264.222(d)(1), 264.226(g)(1), 265.222(d)(1), 265.226(g)(1) and conforming amendments to Subparts L and N. The notification to the RA must indicate preliminary liquid volumes that have been detected, collected, and removed.

(2) The owner or operator must continue to collect and remove all volumes of liquids that accumulate between the liners following the detection of leakage exceeding the ALR. Leachate collection and removal reduces the liquid head on the bottom liner, decreasing the potential for migration out of the unit. In this way, the leakage is being mitigated even before the RAP is implemented; this is especially important for greater leakage rates.

(3) The owner or operator of a landfill, surface impoundment, or waste pile unit at a permitted facility must implement the RAP immediately if it is part of the permit. For RLL, the RAP must be included in the permit; for leakage less than RLL, submission with the permit application is optional. If the RAP for less than rapid and extremely large is not part of the permit, it is developed after finding leakage exceeding the ALR and must be submitted to the RA for approval before implementation. Procedures for submittal of the RAP to the RA are discussed subsequently.

The owner or operator of an interim status facility where the RAP was submitted to the RA before receiving waste (for RLL and, optionally, for leakage less than RLL) must implement the RAP immediately. The RAP for leakage that is less than rapid and extremely large may be submitted at any time within 90 days after the ALR is exceeded. A RAP prepared while the facility is under interim status will be included in the draft facility permit at the time of permitting. The facility then will be subject to the same requirements under Part 264 (Sections 264.222, and conforming amendments to Subparts L and N).

(4) Immediately upon determining that the ALR has been exceeded, the owner or operator must sample the leachate in the LCRS sump and have it analyzed as specified in the RAP to determine the concentration of specified Appendix VIII hazardous constituents (40 CFR Part 261). The owner or operator must provide the analytical results to the RA at the earliest practicable time.

(5) Sections 264.222(d)(5), 264.222(g)(5), 265.222(d)(5), and 265.222(g)(5) and conforming amendments to Subparts L and N require that, after the implementation of a response activity, the owner or operator must report to the RA on its effectiveness. The report must describe the effectiveness of the response action in preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of EPA-approved health-based standards for ground-water protection. An initial report demonstrating the effectiveness of the RAP must be submitted to the RA by the owner or operator and as soon as practicable after the response action has been implemented for 60 days. Following this initial submittal, a report must be submitted annually (for leakage less than RLL) or at a time period specified by the RA (for leakage exceeding the RLL). These subsequent reports submitted after the initial report must discuss the effectiveness of the ongoing response action program.

The RA will review the initial report and subsequent reports on the effectiveness of the response along with the leachate quality analyses to determine if the response selected is preventing hazardous constituent migration out of the unit. The RA will make this determination based on the criteria discussed in Section V.A.2.c(2)(c) of this preamble. If the RA or owner or operator determines that the response activity is not effective in meeting these criteria, either at initial implementation or at any time subsequent to initial implementation, the RA will require the owner or operator to recommend an alternative response action that is already identified in the RAP or to develop a new response action as part of a permit modification or plan amendment (Section 264.222(d)(5), 264.222(g)(5), 265.222(d)(5), 265.222(g)(5), and conforming amendments to Subparts L and N). EPA believes that, in most cases, a RAP that is prepared prior to a leakage event, will need some revision due to the difficulty in predicting site-specific factors. Unit conditions and operating practices may change from the time of the RAP submittal and may, therefore, need to be reassessed at the time of the leakage event. Any new recommended responses must be reviewed and approved by the RA. The RAP review process will be an interactive process between the RA and the owner or operator in determining an effective response activity that prevents hazardous constituent migration out of the unit. EPA believes that in many cases a RAP developed before waste is received at a unit will require some level of modification if it is implemented.

EPA is aware that leakage rates can fluctuate and change over time; therefore, EPA is today proposing a requirement for the owner or operator to identify significant changes in the liquid volume between the liner during monitoring and submit a report to the RA (Sections 264.222(i), and 265.222(i) and conforming amendments to Subparts L and N). EPA believes a "significant change" to be of such a magnitude that it cannot be attributed to predictable, temporary fluctuations as described in the RAP. The Agency requests comments on what a correct value for a significant change should be. EPA is considering using a 100 gpad or 25–50 percent increase in leakage, whichever is larger, to define a significant change.

Today's proposed rule will require the owner or operator to submit a report to the RA within 45 days detection of a significant change in leakage rate. The report must include an assessment of the problem causing the leakage fluctuation and a determination of whether the fluctuation is of concern. A fluctuation caused by heavy rain which is infrequent may not be of concern, whereas a spike determined to have occurred as the result of a new top liner breach of considerable size would definitely be of concern. The assessment must include, at a minimum, a profile of the liquid quantity collected and removed versus time, and characterization of changes in the rate of top liner leakage.

In the report, the owner or operator will also be required to describe any proposed change in response activities and the schedule for implementation. The RA will review the report and will

assess the appropriateness of the revised response activities and implementation schedule.

(b) How and when to submit a RAP. The requirements for submitting a RAP differ for permitted and interim status facilities, and for RLL and leakage less than RLL. For newly permitted facilities, the owner or operator must include in the permit application a RAP setting forth actions to be taken immediately following detection of rapid and extremely large volumes of leakage between the liners. The owner or operator of a permitted facility that is building a new unit or replacing a unit must include a RAP for RLL in a request for a permit modification. In either case, the RAP must be approved before the unit can receive waste.

For leakage rates less than rapid and extremely large, the owner or operator of a permitted facility has the option to submit the RAP with the permit application or with a permit modification or to submit a request for a permit modification to the RA within 90 days of detecting leakage above the ALR. A RAP submitted as part of the permit application or modification must be implemented as specified in the permit. If a RAP is submitted after detecting leakage exceeding the ALR, the RA's approval is required before implementation; however, the owner or operator should make immediate efforts to reduce leakage, and at a minimum, carry out the activities under Section 264.222(g) and conforming amendments to Subparts L and N.

The owner or operator of an interim status facility required to comply with the leak detection requirements must submit a RAP for RLL 120 days prior to accepting waste at the unit (Section 265.222(a), and conforming amendments to Subparts L and N). The owner or operator of an interim status facility also may choose to file a RAP prior to receiving waste for leakage less than the RLL. Alternatively, the RAP for leakage rates above the ALR but below the RLL may be submitted to the RA when leakage is detected (Section 265.222(e)(1)(ii) and conforming amendments to Subparts L and N). The owner or operator must submit to the RA a request to amend the RAP (for less than RLL) within 90 days after exceeding the ALR. Within 60 days of receipt, the RA will approve, modify, or disapprove the RAP or will request to have the RAP amended.

(c) EPA review of the RAP. The RAP is submitted to the RA for review either as part of the permit application, as a request for permit modification, or as a plan in the case of interim status facilities. The RA will review and approve or disapprove the RAP 264.222(c)(1), 264.222(f)(1), and 265.222(f)(1), 265.222(c)(1), and conforming amendments to Subparts L and N. The RA will approve the RAP if he determines that the plan prevents, to the extent technically feasible with current technology, hazardous constituent migration out of the unit at concentrations in excess of EPA-approved health-based standards for ground-water protection.

In making this determination, EPA will consider the overall design, operation, and performance of the unit, as well as several specific factors which will include, but not be limited to (1) the actual or anticipated types and concentrations of hazardous constituents in the leachate between the liners, (2) the mobility of the hazardous constituents in the actual or anticipated leachate, (3) the degree to which the liquid head on the bottom liner will be minimized by implementation of the RAP, (4) the rate of top liner leakage and the cause of this leakage, (5) the current condition of the liners and leachate collection and removal systems, (6) the design and current condition of the entire double liner system, (7) future planned activities including remaining active life time period, and closure and post-closure care activities, and (8) environmental factors such as the amount and frequency of precipitation, and whether the unit is located in a highly vulnerable hydrogeologic setting. Each of these factors is briefly addressed below.

In considering the acceptability of a RAP, the RA will review the actual or anticipated types, concentrations, and mobilities of the hazardous constituents in the leachate between the liners. The quality of the leachate will be evaluated for at least two criteria, (1) the potential threat it poses to human health and the environment, and (2) the potential deleterious effects the leachate may have on the physical properties of lining system components. With respect to the first criteria, if the leachate meets EPA-approved health-based standards for ground-water protection, human health and the environment are protected and the only necessary response activity will be continued pumping of leachate and periodic monitoring of leachate quality. However, if hazardous constituent concentrations exceed the health-based standards, additional response activities may be required. In addition, if the actual or anticipated leachate contains significant concentrations of hazardous constituents, the RA will expect the RAP to address the potential deleterious effects of the constituents on the lining system components (e.g., swelling of FMLs or synthetic components of the leak detection system).

In reviewing the RAP, the RA will also consider the degree to which the liquid head on the bottom liner is minimized. This is an important consideration, as the rate of leakage through a defect in the FML component of a composite bottom liner is proportional to the hydraulic head acting on top of the bottom liner. Since leakage through an FML defect would be the most probable cause of leakage into and through a composite bottom liner, the hydraulic head on the bottom liner must be minimized if leakage into and through the bottom liner is to be minimized.

The RA will also consider the rate of top liner leakage and the cause of leakage. If the rate of leakage is stable and relatively low, and if the cause of leakage is believed to be well understood and not progressive, then limited response actions, such as an increased frequency of leachate monitoring and removal, may be acceptable to the RA. Causes of leakage that might fall into this category include top liner breaches associated with an operational accident or leakage through a connection between the top liner and a pipe or other structure penetrating the liner. On the other hand, if the rate of leakage is high or is increasing over time, or if it is believed that the causes of top liner failure is progressive (e.g., due to chemical incompatibility between the liner and leachate), then more rigorous response actions will likely be required.

The RA will also evaluate the design and current condition of the double liner system as well as the design and current condition of the individual lining system components. The Part B permit application, CQA documentation and operating report will be used in the assessment. The Part B permit application will be reviewed to ensure proper material selection and design. CQA documentation will be reviewed to establish that the system components were properly installed and to identify potential problem areas. Unit operating records will be reviewed for events that may have resulted in a top liner breach or in deterioration, clogging, or other malfunction of a system component. The current condition of the entire double liner system will be reviewed to understand the degree to which the overall system can function to meet the goal of preventing migration of hazardous constituents out of the unit. The overall lining system will also be reviewed for any special features beyond the minimum technological

requirements that might enhance the containment capabilities of the unit.

In reviewing the RAP, the RA will look at future planned activities. In particular, the RA will review at what stage the unit is in its active life. For example, if a landfill were to exhibit top liner leakage in the range of several hundred gallons/acre/day early in its operational life, operational changes, intermediate covers, or other measures would be expected response activities in the RAP to reduce the rate of top liner leakage. However, if the landfill were near the end of its active life, and review of the planned closure and post-closure activities showed the plans to be acceptable, and if the LDCRS and bottom liners were believed to be functioning properly, the RA might accept more limited response activities, such as increased leachate monitoring and removal, for the remaining active life.

Lastly, in assessing the acceptability of a RAP, the RA will consider site-specific environmental factors. These factors include the amount and frequency of precipitation (which will influence the leachate generation potential of a unit), and weather extremes.

EPA is currently developing technical guidance for owners or operators and regulatory authorities to assist them in the development, review and implementation of response action plans. In this guidance document, factors that must be considered in a RAP, and criteria for evaluation of a RAP will be presented in detail. Comments are solicited on the appropriate factors and criteria to include in the guidance document.

The RA will identify in the RAP monitoring activities for specific hazardous constituents identified in 40 CFR Part 261, Appendix VIII. Specifically, the RA will require the owner or operator to test the liquids in the sump of the LDCRS to determine whether specified hazardous constituents are present. Other chemical and physical properties for testing may also be identified by the RA.

Permitted facilities. Sections 264.222 (c) and (f) and conforming amendments to Subparts L and N, propose review and approval procedures that EPA will use for the RAP (RLL and other leakage rates). This review will occur in the context of the 40 CFR Part 124 permitting procedures described below. After completing review of the RAP as part of a permit application or request for a permit modification, the RA either will deny the permit or permit modification and notify the owner or operator or will prepare a draft permit or permit modification. The RA will give notice of the draft permit or permit modification in the **Federal Register**. A 30-day public comment period and public hearing will follow the notification. Thirty days after the close of the public comment period, the RA will decide whether to approve, modify, or disapprove the permit or permit modification. The decision as well as the response to public comment will be published in the **Federal Register**.

If the permit or modification (including the RAP) is approved, the RA will prepare the final permit. If the permit requires modification, the owner or operator will be notified and given 30 days to respond.

Interim status facility. Sections 265.222 (c) and (f), and conforming amendments to Subparts L and N propose review and approval procedures EPA will use for the RAP (RLL and other leakage rates). After receiving a RAP, the RA will provide public notice of the plan through a local newspaper. A 30-day public comment period will follow the notification. The RA, in response to public request or his own discretion, may also hold a public hearing. The RA will approve, modify, or disapprove the plan within 90 days of receipt. If the RA does not approve the plan, he will notify the owner or operator in writing of the reasons, and the owner or operator will be required to submit a new or modified plan within 30 days. The RA will approve or modify this plan within 60 days, at which time this plan becomes the approved RAP.

(d) Demonstration showing alternative source of liquids. Sections 264.222(h), and 265.222(h), and conforming amendments to Subparts L and N propose a variance from continued RAP implementation for leakage less than RLL if the owner or operator of a permitted or interim status facility can demonstrate that the leakage is from a source other than the top liner. Upon triggering the ALR, the owner or operator has the opportunity to demonstrate that the top liner ALR appears to have been exceeded because of an error in sampling, analysis, or evaluation; or the top liner ALR has been exceeded due to sources of liquid other than leakage through the top liner, such as liquids trapped between the liners during construction, or water due to consolidation of a compacted soil component of a composite top liner.

The owner or operator will not be required to implement the RAP if the demonstration is approved before the specified implementation time of the RAP. The response action can be discontinued after a successful demonstration if implementation had already begun. This opportunity for a variance applies to leakage less than RLL. EPA's position is that not all of a RLL can be attributed to sources other than leakage through the top liner such as construction water. Rapid and extremely large leakage volumes would be of concern in any case.

The owner or operator is required to notify the RA in writing as soon as practicable of the intent to make a variance demonstration for liquids from a source other than top liner leakage. Within 90 days of this notification, the owner or operator must submit a report demonstrating that the liquid resulted from a source other than top liner leakage. The demonstration by the owner or operator must contain sufficient scientific and technical information to clearly show the source of the liquids. The report must include all data, analyses, documentation, and calculations used to make the demonstration. If the RA approves the demonstration, the response action, if already implemented, can be discontinued. The owner or operator then must submit an application for a permit modification for permitted facilities or plan modification for interim status facilities. The application must make appropriate changes to the RAP (if the plan was prepared previously) at the unit within 90 days of the RA's approval of the demonstration. A successful determination by the RA will result in discontinuing the response action for the current leakage, as described in the approval notice, and the modification of the permit or plan. The owner or operator may be required to monitor the leachate volumes more frequently and provide periodic leachate analyses to assure that conditions remain similar. If the RA determines the demonstration is not successful, the owner or operator must continue RAP implementation.

Any subsequent increases in leakage or hazardous constituent concentration above that specified in the demonstration will reinitiate the RAP, unless another demonstration is successfully completed and approved by the RA. In some cases, the demonstration approval may require a reduction in the leakage rate to a rate specified in the demonstration within a certain number of years. An example of this would be a demonstration based on water trapped during construction. The RAP also may be reinitiated if the owner or operator does not comply with the requirements of the demonstration approval.

The EPA allows the owner or operator to make demonstrations as provided above, because EPA believes that there

is a need for a certain amount of flexibility in the leak detection requirements. EPA's position is that the requirements cannot be rigid and all-inclusive.

(e) Significant change in leakage rate. Sections 264.222(i) and 265.222(i) and conforming amendments to Subparts L and N, propose requirements for significant change in leakage rates. If during monitoring of leakage, the owner or operator detects a significant increase in the leakage rate, he must submit a report to the RA within 45 days including the following information:

(1) An assessment of the problem causing the leak that includes a profile of liquid quantity collected and removed versus time, and characterization of changes in the rate of top liner leakage;

(2) A description of any change in the response to be implemented as approved in the RAP.

(3) A schedule for implementation; and

(4) Other information that the owner or operator deems appropriate to fully describe the response that will be implemented.

If the RA determines that the current RAP needs to be modified the owner or operator must submit an application for a permit modification (within 60 days) or an interim status plan amendment (within 120 days) to make any appropriate modifications to the RAP. The procedures in 40 CFR Part 124 will be applied to permitted facility permit modifications. Procedures modelled after the 40 CFR Part 265.112 closure plan procedures will be applied to interim status plan amendments.

(f) An example of a RAP. The following is an example of a RAP for a surface impoundment:

Facility Description: The site is a 1.6 acre surface impoundment with rough dimensions of 200 feet by 350 feet. The surface impoundment will contain 11 feet of liquids with two feet of freeboard. The sidewall slopes are 3H:1V. The pond design incorporates a bottom composite liner; a leachate detection, collection, and removal system (LDCRS) between the bottom and top liner; and a top liner comprised of two sections, a composite section across the base and a single FML on the side slopes.

No protective cover is provided above the top FML. The drainage media for the LDCRS consists of a 0.25 inch thick synthetic drainage layer with an in-plane hydraulic conductivity of 10 cm/sec. The minimum bottom slope of the surface impoundment is 2 percent.

The surface impoundment is located above the historical high water table, rainfall averages about 40 inches per year, and the temperature ranges from 95 °F down to −20 °F. Run-on drainage control is prevented by the judicious use of ditches and berms.

Response Action Plan: A response action plan has been submitted and the following specifics have been established:

The action leakage rate (ALR) is 15 gallons per acre per day. This value was selected as an example from the range proposed in today's rule. This value is only slightly higher than the value determined by analysis of leakage by using conservative assumptions of liquid head and liner breaches and defects.

The rapid and large leakage rate (RLL) is determined to be 3,000 gpad. The sump system was also evaluated and found to be capable of handling the RLL value of 3,000 gpad without a resultant rise of over 1 foot of liquid on the bottom liner (a factor of safety of two is included in this calculation; i.e., the system is actually designed to remove about 6,000 gpad without 1 foot of head buildup). EPA considered this level of safety factor to be appropriate in a situation where a significant remediation action is necessary to ensure continued performance of the LDCRS system.

The RAP states that the response action plan for leakage rates between the ALR and the RLL will be developed if leakage exceeds the ALR. Construction and operation activities and operating record data on the past performance of the unit will be reviewed in determining the appropriate response activities to be implemented if the leakage rate exceeds the ALR and is less than the RLL value. The RAP will be submitted to the RA for approval before implementation.

Some examples of expected probable causes of a liner breach would be a seam failure or puncture caused by an accident as the ponds were filled or cleaned, an accident caused by human or animal activities in and around the ponds, or weather-induced accidents, such as wind-driven ice chunks impinging on exposed liner material. These breaches most probably would occur on the side slopes near the liquid level and would result in an almost immediate increase in leachate detected at the sump. The response would be the same for most leakage rate increases, which would be an immediate inspection of the exposed liner to determine if a liner breach had occurred at a location where it could be repaired immediately.

If the breach is at the liquid level, the owner or operator will lower the liquid level below the breach to repair it. If the breach is below the liquid level, it may be possible to locate the leakage area by electrical resistivity or acoustical methods (other techniques may be equally satisfactory) and then determine a plan of action.

Location of a significant breach is not expected to be difficult because there should be an immediate reduction in the leakage rate shortly after the pond liquid level is lowered below the breach. It also should be relatively easy to identify the breach location by electrical resistivity or acoustic survey. Once a repair is implemented, the leakage rate should provide an almost immediate indication of the effectiveness of the repair.

If the RLL occurs, no further liquid will be placed in the ponds. The liquid level will be lowered as necessary to complete a survey of the exposed liner. The unit will not be placed back into service until the owner or operator demonstrates to the RA that the leak in the top liner has been repaired to control the leakage rate.

3. Proposed Rule for Land Treatment Units

The goal of land treatment is to reduce the hazardousness of waste applied in or on the soil through degradation, transformation, and immobilization processes. EPA believes that land treatment can be a viable management practice for treating and disposing of some types of hazardous waste. However, the general approach to preventing hazardous constituents from migrating into ground water is somewhat different for land treatment units than for other land disposal units. At surface impoundments, waste piles, and landfills this objective is met by the double liner and leachate collection system and the final cover that prevent liquids from entering the unit and migrating into the subsoils. Land treatment units are dissimilar to other land disposal units in that they are not designed and operated to minimize liquid releases to ground water. On the contrary, they are open systems that freely allow liquid (without hazardous constituents) to move out of the unit. The land treatment regulatory approach, however, does seek to minimize the uncontrolled migration of hazardous constituents into the environment. This is accomplished by using a defined layer of surface and subsurface soils (referred to as the "treatment zone") to degrade, transform, or immobilize the hazardous constituents contained in the leachate passing through the system. Such treatment processes achieve the same general objectives as the liquids management strategy used at other

types of land disposal in that they act to prevent hazardous constituents from migrating into the environment.

Because land treatment depends upon a number of soil and waste interactions for success, it is especially important that the unit be carefully operated and monitored. The current design and operating requirements under Parts 264 and 265 require an owner or operator of a land treatment unit to monitor the unsaturated zone to provide information that he will use in modifying his operating practices to maximize the success of treatment processes. The principle objective of the current unsaturated zone monitoring requirements is to provide effective management of liquids in the unit to minimize the risk of ground-water contamination. At surface impoundments, waste piles, and landfills this objective is met by the double liner and leachate collection system, and the final cover that prevents liquids from entering the unit and migrating into the subsoils.

Both soil-core and soil-pore liquid monitoring are required in existing EPA rules. These two monitoring procedures are intended to complement one another. Soil-core monitoring will provide information primarily on the movement of "slower-moving" hazardous constituents (such as heavy metals), whereas soil-pore liquid monitoring will provide essential data on fast-moving, highly soluble hazardous constituents that soil-core monitoring may miss.

For example, if a significant increase of a hazardous constituent is detected in unsaturated zone monitoring, the owner or operator is required under the existing Part 264 to examine more closely the unit characteristics that significantly affect the mobility and persistence of that constituent. These significant unit characteristics may include treatment zone characteristics (e.g., pH, cation exchange capacity, organic matter content), or operational practices (e.g., waste application method and rate). Modifications to one or more of these characteristics may be necessary to maximize treatment of the hazardous constituent within the treatment zone and to minimize additional migration of that constituent to below the treatment zone.

EPA is today proposing leak detection requirements for new land treatment units under the authority of 3004(o) of RCRA and for existing land treatment units under the authority of 3004(a) of RCRA. The Agency believes that requiring leak detection at existing land treatment units, while not mandated by RCRA, is necessary to assure protection of human health and the environment because it prevents hazardous constituent migration from the treatment zone. Additionally, due to the nature of the unit, leak detection can be implemented as easily at an existing land treatment unit as at a new land treatment unit.

a. Permitted facilities. The current regulations for land treatment at permitted facilities under Part 264 require the following:

(1) The owner or operator must obtain a detailed chemical and physical analysis of a representative sample of the waste to establish what hazardous constituents will be at the unit (40 CFR 264.13).

(2) The owner or operator must provide a clear definition of the treatment zone.

(3) The owner or operator must demonstrate that hazardous constituents in the waste can be completely degraded, transformed, or immobilized in the treatment zone (40 CFR 264.272). The treatment demonstration is used to define two elements of the land treatment program. First, it establishes what wastes may be managed at the unit. Second, it defines the initial set of waste management practices (including waste application rates) that will be incorporated into the facility permit.

(4) The owner or operator must design, construct, operate and maintain the unit to maximize the degradation, transformation, or immobilization of hazardous constituents in the treatment zone. The RA will specify waste application method and rate, measures to control soil pH, measures to enhance microbial or chemical reactions, measures to control moisture content, run-off and run-on control, wind dispersal control, and weekly inspection after storms (40 CFR 264.273).

(5) Food chain crops cannot be grown in or on the treatment zone unless the owner or operator can successfully demonstrate that there is no substantial risk to human health (40 CFR 264.276).

(6) The owner or operator must establish an unsaturated zone monitoring program capable of determining whether hazardous constituents have migrated below the treatment zone. (40 CFR 264.278). The purpose of unsaturated zone monitoring is to provide feedback on the success of treatment in the treatment zone. The information obtained from this monitoring will be used to adjust the operating conditions at the unit in order to maximize degradation, transformation, and immobilization of hazardous constituents in the treatment zone. It is this section of the existing land treatment program that EPA is proposing to amend today to cover the leak detection requirements under Section 3004(o)(4) of RCRA.

The monitoring program must include both soil-core and soil-pore liquid monitoring. The owner or operator is required to monitor immediately below the treatment zone to determine if statistically significant increases in the concentrations of hazardous constituents have occurred.

Under the existing Part 264 regulation the appearance of hazardous constituents below the treatment zone does not in itself constitute a violation. The Agency is today proposing that the Part 264 land treatment regulations be applied to interim status units as part of the leak detection system. Additional requirement, discussed below will also be included.

In today's proposal, EPA is adding new leak detection requirements for both new and existing land treatment units. Although RCRA only requires leak detection at new units, EPA believes that existing units can comply with the standard in the same manner. Installation of soil-pore liquid monitoring equipment as well as soil-core sampling can be accomplished as easily at a new as an existing unit. Therefore, existing units should be required to provide the same level of protection for human health and the environment.

Today's proposal expands the current Part 264.278 unsaturated zone monitoring requirements by adding the following new requirements: (1) Detection of leakage at the earliest practicable time; (2) a 95-percent confidence level for detecting hazardous constituents below the treatment zone; (3) monitoring to be conducted above the seasonal high water table; (4) a response action plan (RAP) for widespread leakage; and (5) inspection of unsaturated zone monitoring equipment. These new requirements are explained briefly in the following paragraphs (for further information see the Liner/Leak Detection Background Document).

1. *Earliest Practicable Time.* Sections 264.278(a) and 265.278(a) of today's proposal require detection of leakage out of the treatment zone at the "earliest practicable time". EPA interprets the term "earliest practicable time" as the quarterly unsaturated zone monitoring period. Migration of contaminants at land treatment facilities would generally be slow and EPA believes detection of a statistically significant increase of hazardous constituents below the treatment zone within a monitoring

period would allow sufficient time to protect groundwater and surface water.

2. *Confidence Level.* In Sections 264.278(b) and 265.278(b) of today's proposal, EPA is adding to the existing requirements a 95-percent confidence level of detecting hazardous constituent migration out of the treatment zone. Land treatment units have no barrier to downward migration, and ground water can be located as close as 1 meter to the bottom of the treatment zone (Section 264.271(c)(2)). For this reason, EPA believes that the owner or operator must detect leakage out of the unit at the earliest practicable time and at the 95-percent confidence level to assure protection of ground water and surface water.

Today's proposal requires the use of a 95-percent confidence level of detection because the unsaturated zone monitoring generally is less reliable in detecting hazardous constituent migration from the treatment zone than a drainage-type leak detection system. By requiring a 95-percent confidence level, EPA is assuring that the unsaturated zone monitoring system will consist of a sufficient number of sampling points at appropriate locations and depths to determine the spatial and temporal variations in constituent concentration through the treatment zone. A well-managed and properly designed site with uniform waste application will require fewer sample locations than a poorly managed site. The owner or operator must consider site-specific variations and the inherent uncertainty associated with soil-core and soil-pore liquid sampling procedures for the analysis of certain hazardous constituents (e.g., volatile organic chemicals). The owner or operator must characterize the total treatment zone as well as individual lysimeter results.

EPA is proposing the confidence level value to be 95 percent as a result of recently developed guidance on unsaturated zone monitoring. Detailed information explaining what the owner or operator must do to comply with this requirement is explained in *Permit Guidance Manual on Hazardous Waste Land Treatment Demonstrations* (Utah Water Research Laboratory, July 1986, NTIS PB 86229–184) and *Permit Guidance Manual on Unsaturated Zone Monitoring for Hazardous Waste Land Treatment Units* (U.S. EPA, October 1986, EPA/530–SW–86–040).

3. *Monitoring Location.* Sections 264.278(d) and 265.278(d) of today's proposal require that soil-core and soil-pore liquid monitoring be conducted immediately below the treatment zone and entirely above the seasonal high water table (SHWT). To determine the SHWT at a facility, the owner or operator must use the SHWT data published for that region for the smallest area encompassing the facility.

Current regulations require unsaturated zone monitoring below the treatment zone but do not specify that the monitoring must also be above the SHWT. In order to detect contamination before it reaches ground water, EPA is requiring monitoring above the ground-water table. Today's proposal requires the owner or operator to install all lysimeters and collect all soil cores above the published SHWT. By requiring monitoring above the SHWT the owner or operator can be assured that soil-core samples and soil-pore liquid samples are collected within the unsaturated zone throughout the year.

Unsaturated zone monitoring at land treatment units must include soil monitoring and soil-pore liquid monitoring immediately below the treatment zone. At least 15 cm (6 inches) of soil depth below the treatment zone is needed for adequate soils sampling. Thirty cm (12 inches) of soil will be sufficient, in most cases, for placement of the soil-pore liquid sampling device wholly below the treatment zone. However, due to the difficulties associated with field monitoring, sample collection will often occur somewhere above or below the desired depth. Hence, sufficient soil depth (above the SHWT) must be available to account for the inherent errors associated with field monitoring. The Agency believes that a one-meter soil depth will accomplish this. The seasonal high water table specified in local soil surveys (which have many times been conducted by the Soil Conservation Service and State Agricultural Extension Agency), will often fluctuate over time. In most cases, EPA believes that the one-meter soil buffer will adequately account for this fluctuation.

4. *Response Action Plan.* Existing regulations (Section 264.278) require the owner or operator to report to the Regional Administrator (RA) within 7 days when there is a statistically significant increase of hazardous constituents below the treatment zone. The owner or operator also must submit to the RA within 90 days an application for a permit modification to modify the operating practices at the facility to maximize the success of degradation, transformation, or immobilization processes in the treatment zone.

Sections 264.278(i) and 265.278(j) of today's proposed rule require the owner or operator to develop a response action plan (RAP) after the effective date of this rule, for widespread leakage before waste can be received. The RAP will specify actions to take upon finding widespread leakage. Widespread leakage is defined as a statistically significant increase (as defined in the guidance manuals cited above) in concentration of hazardous constituents at a specified percentage of the unsaturated zone monitoring points. EPA has not chosen a percentage but believes it should be within the range of 50–90 percent. EPA is requesting comments on an appropriate value for defining widespread leakage or on whether an alternate approach would be more appropriate. Comments on whether the distribution of hazardous constituent concentration below the unit should be assessed and how the results of that assessment should be addressed are also requested.

The owner or operator of a new land treatment facility, that has not yet received a permit, must submit a RAP for widespread leakage with the permit application. For an existing land treatment unit that does not meet the RAP or other requirements specified in Sections 264.278 and 264.284 on the date of promulgation of this final rule, the owner or operator must submit an application for a permit modification to the RA by the effective date of this rule and receive RA approval. New units or replacements at existing facilities must submit a RAP and a request for a permit modification and receive RA approval before receiving waste. The RAP for land treatment contains similar information requirements as discussed previously for landfills, surface impoundments, and waste piles. These include: (1) General description of the unit operation, (2) a description of the hazardous constituents contained in the unit, (3) an assessment of potential causes of widespread leakage of hazardous constituents from the treatment zone, (4) a discussion of important factors that can affect leakage of hazardous constituents from the treatment zone, (5) a description of major mechanisms that will prevent migration of hazardous constituents out of the treatment zone, and (6) a detailed assessment describing the effectiveness and feasibility of each potential response as described subsequently. The RA will review the RAP and will approve, disapprove, or modify the plan following the same procedures as for other types of units (Section V.A.2.c. of this preamble).

Upon detecting widespread leakage, the owner or operator must implement the RAP immediately and notify the RA in writing within 7 days. With this notification, the owner or operator must include preliminary constituent

concentrations and the extent of the contamination. Preliminary constituent concentration refers to the concentration of any hazardous constituent monitored that significantly increases above background (see guidance manuals cited above). Any area of the unit containing hazardous constituents at concentrations significantly above background levels will be considered part of the contaminated area. Notification for leakage that is less than widespread is already required under existing regulations (Section 264.278(g)).

The possible courses of action to take upon finding widespread leakage include changing the operating practices or closing the facility. Changing the operating practices may include changing the type of waste treated, the timing of application, a reduction of the amount of waste applied, or a reduction in the application frequency. Closing the facility may be necessary if changing operating practices cannot be shown to be protective of ground water and surface water or if the owner or operator finds the changes to be cost prohibitive.

The EPA considered other possible response actions but did not choose to include them in today's proposal. These actions include increasing the frequency of ground-water monitoring, installing a cover over the unit, and excavating the unit. The EPA takes the position that more frequent ground-water monitoring would be too slow to detect contamination and does not achieve the goal of preventing ground-water contamination. The installation of a temporary landfill cover over the unit or part of the unit is counter to the principles of land treatment, which is to allow natural aerobic processes to degrade waste. The last option considered by EPA is requiring excavation of the unit and disposal of the contaminated soil. Although this option would be expensive compared to closing the unit, in some instances it may be the only way to prevent groundwater contamination. EPA is requesting comment on whether to include any other response actions in the final rule and specifically requests comments on excavation of the unit as an option.

5. *Inspection.* The new Sections 264.284 and 265.283 being added in today's proposal require the owner or operator to establish an inspection program for the unsaturated zone monitoring equipment during the active life and the post-closure care period of the facility. The program established must allow for determining deterioration, malfunction, or improper operation of unsaturated zone monitoring equipment. The program also will determine the effectiveness of controls implemented in response to hazardous constituent migration beyond the treatment zone, the concentrations of which statistically exceed background levels. Under section 264.15, the owner or operator will be required to keep a detailed log of all inspection information to demonstrate compliance with unsaturated zone monitoring permit requirements. The RA may require additional inspection and monitoring requirements in the permit to ensure detecting hazardous constituent migration out of the treatment zone at the earliest practicable time. Inspection and monitoring requirements contained in the facility permit must prevent hazardous constituent migration so that ground water and surface water will not be contaminated.

b. Interim status facilities. The current 40 CFR Section 265.278 regulations for unsaturated zone monitoring for interim status facilities require the owner or operator to have an unsaturated zone monitoring plan designed to detect vertical migration of hazardous constituents below the active portion of the land treatment facility. While permitted facilities are required to follow the leak detection program, interim status requirements are self-implementing by the owner or operator. EPA involvement is sometimes necessary. In these instances EPA has found the use of a plan facilitates EPA and owner or operator interaction. Therefore, today's proposal is requiring the owner or operator of an interim status facility to develop and retain at the facility an unsaturated zone monitoring plan.

The interim status monitoring plan must provide background concentrations of hazardous waste and constituents. The plan must include the use of soil cores for soil monitoring and lysimeters (or other such devices) for soil-pore liquid monitoring. It should be noted that the existing interim status requirements are less stringent than the existing Part 264 requirements for permitted facilities. For example, there is no requirement that owners or operators of interim status facilities modify their operating practices if there is a statistically significant increase of hazardous constituents as is required for permitted units under Section 264.278.

In today's proposed rule, EPA is replacing the current Section 265.278 requirements with the existing Section 264.278 requirements and the proposed land treatment leak detection requirements discussed in Section V.A.3.a. Accordingly, the leak detection program for interim status land treatment facilities will be essentially the same as that for permitted facilities. We believe that this is appropriate because the level of confidence needed for protection of human health and the environment for an interim status facility is the same as that for a permitted facility.

The major difference in the proposed regulations for interim status and permitted facilities is the mechanism for implementing the above requirements. Permitted facilities are required to establish a leak detection program through the permit process, while interim status requirements are implemented through an unsaturated zone monitoring plan. The plan provides interaction between the owner or operator and EPA concerning the specifics of the unsaturated zone monitoring. Under Section 265.278 the owner or operator must develop and implement an unsaturated zone monitoring plan which incorporates the existing 264.278 requirements in addition to the leak detection land treatment requirements proposed today. The Agency will briefly discuss these requirements and explain these standards.

(1) Proposed interim status monitoring plan requirements. The unsaturated zone monitoring plan must include at least the following:

(a) A description of how the owner or operator will monitor the soil and soil-pore liquid to determine, at the earliest practicable time, whether hazardous constituents have migrated out of the treatment zone over all areas likely to be exposed to waste and leachate during the active life and post-closure care period. The description must identify the hazardous constituents or the principal hazardous constituents (PHC) to be monitored (Section 265.278(a)).

(b) A description of the number, location, and depth of soil-pore liquid monitoring devices, such as lysimeters, and soil sampling points necessary to represent to a 95-percent confidence level the quality of soil and soil-pore liquid below the treatment zone and the quality of background soil and soil-pore liquid quality (Section 265.278(b)).

(c) A description of the methodology for establishing background values for each hazardous constituent to be monitored (Section 265.278(c)).

(d) A description of the frequency, timing, and depth of soil and soil-pore liquid monitoring based on the frequency, timing, and rate of waste

application and the soil permeability (Section 265.278(d)).

(e) A description of sampling and analytical procedures designed to ensure sampling results that provide a reliable indication of soil-pore liquid quality and the chemical makeup of the soil below the treatment area. Procedures for sample collection, sample preservation, shipment, and analytical procedures for the chain-of-custody control should be included (Section 265.278(e)).

(f) A description of the statistical procedure to determine if there is a significant increase over background values in the monitoring data. This description must include the time after sampling within which such a determination will be made. The plan must specify a statistical procedure that is appropriate for the distribution of data used to establish background values and that provides a reasonable balance between the probability of a false determination and failure to identify migration (Section 265.278(f)).

(g) A RAP that describes actions to take upon finding widespread leakage (Section 265.278(j)).

Although the requirements under Section 264.278 and 265.278 are similar, they differ procedurally. The monitoring plan for interim status facilities must be submitted to the RA for review and approval by the effective date of the final rule. Public notification of the plan will be provided through a local newspaper notice. A 30-day public comment period will follow and a public hearing may be held in response to public request or at the RA's discretion, when such a hearing may clarify one or more issues concerning the plan. The RA will give public notice of the hearing at least 30 days before it occurs. (It may be given at the same time as the notice of the opportunity to submit comments). The RA will approve, modify, or disapprove the plan within 90 days of its receipt. If the RA does not approve the plan he will provide the owner or operator with a detailed written statement of the reasons for his disapproval and the owner or operator must modify the plan or submit a new plan. The RA will approve or modify this plan in writing. If the plan is modified, it will become the approved plan.

(2) Amendments to the interim status monitoring plan. In today's proposal, if the owner or operator determines that there is a statistically significant increase of hazardous constituents below the treatment zone or that widespread leakage has occurred, the owner or operator must notify the RA in writing within 7 days of the occurrence. The submittal must include the identity and preliminary concentrations of constituents detected. An amended operating plan must be submitted to the RA within 90 days of the occurrence, demonstrating that operating practices have been modified sufficiently to maximize the success of degradation, transformation, or immobilization processes in the treatment area.

After the modified plan has been submitted to the RA, the public will be notified through a local newspaper. A 30-day public comment period will be held, as well as a public hearing, if necessary. Within 30 days following the close of the comment period, the RA will approve, disapprove, or modify the plan. If the plan is disapproved, the owner or operator will be notified and will have 30 days to respond. Following the public comment period the RA will make a final decision whether to approve the plan.

c. Demonstrations. Upon determining that there is a statistically significant increase in hazardous constituents below the treatment zone, the owner or operator of a permitted or interim status facility may choose to demonstrate that a source other than the land treatment unit caused the increase. The owner or operator also may demonstrate that what appeared to be an increase resulted from an error in sampling, analysis, or evaluation. (Sections 264.278(h) and 265.278(h).

To make this demonstration, the owner or operator must notify the RA within 7 days of the statistically significant increase of hazardous constituents below the treatment zone and his intent to make a demonstration. Within 90 days, the owner or operator must submit a report to the RA demonstrating that the source is not from the land treatment unit or that there was an error in sampling, analysis, or evaluation. The RA will review the demonstration report and notify the applicant as to whether or not such a determination is successful. The applicant is allowed 45 days to comment on such a determination. The RA will respond to these comments and make a final decision on the applicant's demonstration. If the RA approves the demonstration, then the owner or operator must also submit within 90 days a modified unsaturated zone monitoring plan to make any appropriate changes (interim status) or a request for a permit modification (permitted). The owner or operator must continue to monitor as specified.

B. Extension of Double Liner Requirements

Under the authority of Section 3004(a) of RCRA, EPA is proposing to extend the double liner and leachate collection system requirements to (1) new waste piles and lateral expansions and replacements of existing waste piles; (2) significant portions of existing landfills, surface impoundments, and waste piles; and (3) new units, lateral expansions, and replacements of existing units at landfills, surface impoundments, and waste piles at facilities permitted before November 8, 1984.

EPA believes these requirements are necessary to protect human health and the environment by preventing migration of hazardous contituents out of the unit and contamination of ground water and surface water.

Under the current regulations, waste piles and significant portions of landfills, surface impoundments, and waste piles must have single liners (either clay or FML depending on the unit) with a LCRS above the liner (for landfills and waste piles). Landfills and surface impoundments, and replacements and lateral expansions of landfills and surface impoundments at facilities permitted before November 8, 1984 are not required by EPA to have liners if the units were existing before 1982; conversely, if these units were in existence subsequent to the effective date of the rule, they were required to have either clay or FML liners, depending upon the type of unit.

Based on the data presented in the Liner/Leak Detection Background Document, the Agency believes that single liners are inadequate to protect human health and the environment. There is a greater potential for leachate migration through a single liner than a double liner. Since there is a reasonable probability that damage to the top liner may occur, the Agency believes that a double liner system with a LCRS between the liners to collect and remove liquids provides a mechanism to ensure that migration out of the unit is prevented.

EPA believes that a double liner system incorporating leachate collection between the liners is in most cases sufficient to prevent migration of hazardous constituents out of the unit. If a double liner system is employed at a land disposal unit, the modeling data that the Agency has gathered indicate that there will be minimal hazardous constituent migration from the unit.

1. Waste Piles

(a) Background. 40 CFR 264.251(a) currently requires permitted waste piles to have a single liner that is designed, constructed, and installed to prevent any leachate migration out of the waste pile and into the surrounding environment during the active life (and the closure period if applicable) of the waste pile. The liner may be constructed of materials (such as low-permeability soils) that allow leachate migration into the liner as long as the liner prevents any migration of waste out of the pile into the adjacent subsurface soil, ground water or surface water at any time during the active life. A leachate collection and removal system (LCRS) that is designed, constructed, maintained, and operated to collect and remove leachate from the waste pile is required directly above the liner (40 CFR 264.251(a)). An owner or operator of a permitted facility whose waste pile is inside or under a structure that provides protection from precipitation so that neither runoff nor leachate is generated is exempted from liner and leachate collection and removal system requirements provided that: (1) Liquids or materials containing free liquids are not placed in the waste pile; (2) the waste pile is protected from surface water run-on by the structure or in some other manner; (3) the waste pile is designed and operated to control waste dispersal by wind, where necessary, by means other than wetting; and (4) the waste pile will not generate leachate through decomposition or other actions. For waste received beginning May 8, 1985, the owner or operator of an interim status waste pile is subject to the requirements for liners and leachate collection systems under 40 CFR 264.251 for each new unit, replacement of existing unit, or lateral expansion of an existing unit that is within the area identified in the Part A permit application.

In today's proposal, EPA is requiring double liners and leachate collection and removal systems for waste piles because we believe that waste piles pose a potential threat to human health and the environment similar to the threat from landfills. There is, however, one difference between the double liner requirements for landfills and those for waste piles. 40 CFR 264.301 provides that the liner must function or operate during the active life and post-closure care period for a landfill. This provision is somewhat different for waste piles under today's proposal which specifies that the liners and leachate collection and removal systems for waste pile units only need to function or operate during the active life of the waste pile (Section 264.251(c)). Current regulations require waste piles to decontaminate or remove the waste at closing (40 CFR 264.258), thus obviating the need for post-closure care. This difference, however, may be of minimal impact, because the active life of a waste pile can be equivalent to or longer than the combined active life and post-closure care period for landfills.

EPA assessed the potential for migration of leachate from waste piles through a modeling study (see Liner/Leak Detection Background Document). This study indicates that the potential for migration from a waste pile is almost equivalent to the potential for migration from landfills. Because EPA has imposed double liner and leachate collection system requirements for certain landfills, the Agency's position is that it is appropriate to do the same for certain waste piles, given ground water migration considerations.

Moreover, EPA believes that waste piles have a greater potential for equipment-related liner damage than landfills, because during the active life of a waste pile, equipment is used to remove and replace waste periodically. Because waste is not removed from above the liner at a landfill, the liner is not exposed to such heavy equipment operation. Equipment-related liner damage has the potential to allow constituent migration beyond the waste pile, thus increasing the potential for leachate migration out of the unit. If the liner is breached in a single-lined waste pile, there would be no backup liner to contain leachate. Therefore, we believe today's proposed double liner and leachate collection system requirements are appropriate. In addition, it would not be possible to use the proposed leak detection system if the unit is not double lined. Therefore, an alternate leak detection system would have to be used at single-lined waste piles. EPA believes that the proposed double liner and leachate collection and removal system standards are an integral component for leak detection systems at waste piles containing liquids or exposed to precipitation. The leak detection system proposed for waste piles is the best mechanism for providing information about any potential leakage rate, quality, and sources of detected liquids.

Moreover, EPA believes that there are additional reasons why unenclosed waste piles in particular merit double liners and LCRSs. EPA believes that these unenclosed waste piles generally have a higher percentage of their waste areas exposed to precipitation than landfills do and that waste generally is exposed to precipitation for a longer period at waste piles than at landfills. Most landfill owners or operators partially close their units on a periodic basis by placing a temporary or intermediate cover over the in-place waste to minimize leachate generation. Therefore, these unprotected waste piles have a greater potential for leachate generation. In addition, the active life for a new landfill unit is typically 6 months to 5 years, while a waste pile may be used for storage for a much longer period, in some cases for 20 years or more.

As a result of all of the above-cited factors, EPA believes waste piles pose a threat to human health and the environment similar to landfills. Since double liners and LCRSs are required for landfills, EPA believes it is appropriate to require the same standards at waste piles in order to protect human health and the environment.

(b) Proposed rule—(1) Double liner and leachate collection and removal system standards. Today EPA is proposing a double liner system for new lateral expansions and replacements of all permitted waste piles irrespective of when the permit was received (Section 264.251) and interim status waste piles (Section 265.254). This rule is effective 6 months after the date of promulgation. Owners or operators of waste piles may qualify, however, for the exemption contained in Section 264.250 for totally enclosed waste piles. As discussed herein, variances for certain monofills and approved alternative designs may be granted.

EPA is proposing today to require owners or operators of new waste piles and lateral expansions or replacements of existing waste piles to install double liners and leachate collection and removal systems that essentially are equivalent to those for landfills in the Proposed Codification Rule of March 28, 1986 (51 FR 10707–12). As with landfills, EPA is not proposing to require retrofitting of existing waste piles. Today's proposed double liner requirements call for a flexible membrane liner (FML) top liner and a bottom liner of either a compacted clay or, alternatively, a composite liner consisting of a FML top component and a compacted clay lower component. Owners or operators also are required to install a leachate collection and removal system above the top liner and between the liners. On April 17, 1987, EPA issued Hazardous Waste Management; Minimum Technology Requirements; Notice of Availability of

Information and Request for Comments, which showed that compacted clay bottom liners may impair the leak detection sensitivity and the detection time, and collection efficiency of the leachate detection, collection, and removal system (LDCRS). EPA currently is evaluating the comments received on that Notice. For the reasons set forth in the Notice, EPA believes that it is likely that we will require the composite bottom liner as the generally applicable standard in the finalization of the double liner requirement for surface impoundments, waste piles, and landfills. We have not proposed the requirement for a composite liner as the basic standard in this rule to allow EPA the option of allowing both types of bottom liners for now, and to be consistent with the March 28, 1986 proposed double liner rule for landfills and surface impoundments.

EPA believes that, based on information now available for the Agency (and discussed in the Notice), the composite bottom liner, or an equivalent design, will be required in the final double liner requirements for waste piles, surface impoundments and landfills.

EPA invites comments about whether such double liners and leachate collection and removal systems are necessary at waste piles to protect human health and the environment. Comments are requested to provide data that may show that alternative requirements for waste piles provide adequate protection of human health and the environment. In addition, EPA believes that there exists a wide range of operating conditions and active life periods for waste piles. EPA is interested in comments about whether today's proposal is appropriate for all waste piles or if alternative liner and leak detection system requirements might be applicable for some types of units. EPA encourages owners or operators to provide information and data about this issue.

(2) Totally enclosed units. Today's proposal exempts the owner or operator of a new waste pile or of a lateral expansion or replacement of an existing waste pile from the double liner and leachate collection and removal system requirements if the waste pile complies with the requirements of 40 CFR 264.250(c). This regulation currently allows an owner or operator to be exempted from the single liner requirements if: (1) The waste pile is inside or under a structure that provides protection from precipitation so that neither runoff nor leachate is generated; (2) liquids or materials containing free liquids are not placed in the pile; (3) the pile is protected from surface water run-on by the structure or in some other manner; (4) the pile is designed and operated to control waste dispersal by wind, where necessary, by means other than wetting; and (5) the pile will not generate leachate through decomposition or other reactions. EPA today is proposing to continue this exemption for the owner or operator of a new waste pile, lateral expansion, and replacement of an existing waste pile at a permitted facility who meets these conditions from the double liner system requirements. If the owner or operator meets the foregoing conditions, the waste in the waste pile will have such a low water content that no free liquids will be present, and no leachate will drain out of the waste pile at any time after placement.

Totally enclosed waste piles that contain liquid or waste that will generate leachate do not qualify for the 40 CFR 264.250(c) exemption. EPA recognizes that enclosed waste piles with moist waste will have a greatly diminished capacity for leachate generation compared to unenclosed wastes from precipitation. However, because the active life and operating practices (frequency of waste "turnover") of the waste pile are unrestricted, significant amounts of leachate can be generated within enclosed units. In addition, enclosed waste piles are allowed a hydraulic head above the liner to no more than 30 cm (one foot) 40 CFR 264.251(a)(2). This level of liquid above the liner represents a mechanism for migration potential similar to that for landfills and unenclosed waste piles. Thus, the Agency believes it appropriate to require minimum technology double liner systems for enclosed waste piles containing moist wastes that will generate leachate. EPA requests comments on this issue and encourages owners or operators to submit information and data about operating practices at existing facilities that support the appropriateness of today's proposal, or alternatively, that provide the basis for modified requirements.

(3) Leak detection requirements for totally enclosed units. The proposed leak detection rule allows the owner or operator to use an alternative leak detection technology. Because waste piles that qualify for the waiver under 40 CFR 264.250(c) are not required to meet the double liner and leachate collection and removal system requirements under Section 264.251, a drainage layer type of leak detection system would not be possible. Recognizing this, EPA's position is that the owner or operator of a waste pile that qualifies for a waiver under 40 CFR 264.250(c) should be able to use an enclosure and waste inspection program as an alternative leak detection system. If no enclosure leaks or run-on are detected and the waste pile contains no free liquids, then the waste pile would not be considered to be leaking. The owner or operator using this type of alternative leak detection system would be required to maintain the waste pile in a condition such that it would meet the requirements of 40 CFR 264.250(c).

EPA believes that an inspection program in which the owner or operator inspects the waste pile after every precipitation event (rain, snow, or ice) and checks the waste pile and enclosure for leaks would satisfy the requirements of Section 3004(o)(4) of RCRA. For example, the owner or operator would check the roof and sidewalls of the enclosure for leaks, the floor of the enclosure for puddles or wet spots, the waste pile for signs of moisture infiltration and lastly, the perimeter of both the waste pile and enclosure for signs of runoff or seepage. By inspecting the enclosure and waste pile in this way after each precipitation event, EPA is satisfying the statutory mandate of requiring leak detection at the "earliest practicable time."

EPA believes the owner or operator of a protected waste pile, meeting the requirements of Section 264.250(c), should have the option of implementing the proposed enclosure inspection program as an alternative to the leak detection system. If the owner or operator of an enclosed waste pile does not meet the requirements of Section 264.250(c), a leak detection system must be installed that meets the leak detection system performance standard for detection sensitivity and detection time under Section 264.251 (g), (h), (i), and (j). The Agency is seeking comments about the types of systems that could satisfy the leak detection system performance standard for detection sensitivity and detection time at waste piles that have single liners and leachate collection and removal above the liner or that have no lining system at all.

(4) Variances. Current regulations provide owners or operators of permitted (40 CFR Part 264) and interim status (40 CFR Part 265) surface impoundments and landfills with certain exemptions from the minimum technology double liner standards. One type of exemption (e.g., Section 264.221(d)) applies if the owner or operator can demonstrate that

alternative design and operating procedures together with location characteristics will prevent the migration of any hazardous constituents into ground water or surface water at least as effectively as the minimum technology double liner system. The second type of exemption (e.g. Section 264.221(e)) applies to certain types of monofills. EPA is proposing today to extend these two types of exemptions for landfills and surface impoundments to waste piles. EPA believes that extension of these exemptions to waste piles is appropriate because: (1) Waste piles falling under the exemptions will handle wastes similar to those at landfills and surface impoundments; and (2) waste pile lining systems have similar designs and design lives to landfills and surface impoundments.

Today's proposed rule presents a variance for double liners and leachate collection and removal systems for waste piles under Sections 264.251(d) and 265.254(c). To receive a variance under these sections, the owner or operator must demonstrate that alternative design and operating procedures, together with location characteristics, will prevent the migration of any hazardous constituents into ground water or surface water at least as effectively as a double liner system required under Section 264.251(c) or 265.254(b).

The owner or operator of a permitted waste pile must apply to make a variance demonstration as part of a new permit or as a permit modification. For interim status units, the owner or operator must submit a variance request to the RA and have the variance approved by the RA before receiving hazardous waste. EPA is using procedures similar to the interim status closure plan development and approval process under Section 265.112 (see Section V.A.3.b.(1)). The public participation process found in Section 265.112 is applicable also. The regulations on variances do not require a specific administrative procedure. When EPA finalizes this rule, we plan to employ the interim status closure plan procedures (40 CFR 265.112) for variance approval. However, it is EPA's position that this demonstration must be a comprehensive state-of-the-art evaluation that is representative of the potential worst-case scenarios. The owner or operator seeking a variance must include a complete description of the waste pile components, unit operation, and location characteristics. The description should include sufficient information for the RA to determine that the proposed waste pile provides the same level of protection of ground water and surface water from contamination as a waste pile with a minimum technology double liner system. Concerns that the owner or operator should consider in developing a variance demonstration include, at a minimum:

(1) Waste (types; quantities; porosity; hydraulic conductivity; waste interactions; mobility in unsaturated/saturated zone, etc.)

(2) Unit components (liners; leachate collection and removal system; detection system; cover design; intermediate cover layers; construction quality assurance (CQA) program for design and construction; etc.)

(3) Unit operation (treatment, storage, or disposal; length of the active life; leachate removal; repair of a leaking liner; etc.)

(4) Location characteristics (precipitation; climate; unsaturated zone; saturated zone; flood plain; etc.)

In making a variance demonstration, the owner or operator will need to demonstrate to EPA quantitatively how the proposed alternative design and operating procedures satisfy double liner system and leak detection system performance criteria. These criteria may include those proposed today for the LDCRS (detection sensitivity and detection time) as well as other criteria, such as collection efficiency. Also, the owner or operator may be required to demonstrate that the hydraulic modeling methodology used to make the demonstration is at least as conservative as that considered today for the LDCRS design. The owner or operator may be required to provide independent documentation and verification of the proposed design approach (including who developed the approach, their credentials and experience; laboratory bench- or full-scale physical demonstrations; numerical simulations; assumptions of the approach; clear and complete report presentation, etc.). The owner or operator may be required further to present quantitative results using the alternative design approach, along with various failure scenarios, including scenarios where primary design components are assumed to fail and a secondary system becomes necessary to minimize releases to the environment. For these scenarios, the owner or operator may be required to report such things as: (1) Maximum rate of leakage out of the unit for a given scenario; (2) duration of leakage; (3) breakthrough time; (4) cumulative leakage out of the unit; and (4) potential response actions.

Examples of situations that the Agency is considering for approval of a variance from these design requirements include:

1. A landfill or waste pile receiving only wastes treated to the land disposal restriction BDAT levels and having a low rate of net infiltration due to climatic factors or engineering controls.

2. A unit located and/or designed to have low rates of net infiltration and long times of travel to the saturated zone.

3. A unit receiving wastes with completely immobilized hazardous constituents.

4. A surface impoundment where active physical, chemical, or biological processes rapidly degrade all of the unit's hazardous constituents.

5. A unit operated solely for the purposes of short-term storage.

These samples are illustrative of the types of design, operation, and location characteristics the Agency is considering a variance from the design requirements. The Agency requests comments on the appropriateness of these conditions for approval of a design variance.

Today's proposal provides a second variance from the double liner system requirements under Sections 264.251(e) and 265.254(d) for owners and operators of monofills containing only hazardous wastes from foundry furnace emission controls or metal casting molding sands if such wastes do not contain constituents that would render the waste hazardous for reasons other than the EP toxicity characteristics in Section 261.24, 40 CFR Ch. 1. To obtain a waiver, today's proposed rule further requires that the waste pile have at least one liner for which there is no evidence that the liner is leaking. For purposes of the waiver, the "liner" means either a liner designed, constructed, installed and operated to prevent hazardous waste from passing into the liner at any time during the active life of the facility, or a liner designed, constructed, installed, and operated to prevent hazardous waste from migrating beyond the liner during the active life of the facility. It also requires the monofill to be located more than one-quarter mile from an underground source of drinking water (as defined by Section 144.3, 40 CFR Ch. 1) and, lastly, to be in compliance with generally applicable ground-water monitoring requirements for facilities with permits under RCRA Section 3005(c). The owner or operator may be exempt from today's requirements if the unit meets the requirements for waste piles permitted prior to November 8,

1984 as discussed in Section V.B.3. (Sections 264.251(f) and 265.251 (f)).

2. Significant Portions

As discussed previously, under the authority of Section 3004(o) of RCRA, EPA has imposed minimum technological requirements (i.e., double liners and leachate collection and removal systems) for surface impoundments and landfills. Today's proposed rule extends EPA's minimum technology double liner system standards to significant portions of existing surface impoundments (Sections 264.221(c) and 265.221(a)), waste piles (Sections 264.251(c) and 265.254(a)), and landfills (Sections 264.301(c) and 265.301(a)). This requirement would go into effect 24 months after promulgation of today's proposed rule.

(a) Background. EPA's current regulations require units not covered with waste at permit issuance to install a single liner (with a leachate collection and removal system above the liner for a landfill or waste pile). This means that even if a landfill or surface impoundment unit is exempt from the double liner standards, any portion of the unit not covered with waste at permit issuance is still subject to EPA's current single liner standards in Sections 264.221(a), 264.251(a), and 264.301(a).

The statutory authority to implement a requirement for a minimum technology double liner system for significant portions of existing units is in RCRA Section 3004(a). This statutory provision provides EPA with the authority to promulgate regulations protecting human health and the environment at new land disposal facilities or facilities in existence on the date of promulgation of such regulations.

EPA is proposing to require double liners and leachate collection and removal systems for those portions of landfill, surface impoundment and waste pile units that are not defined as existing portions in Section 260.10, do not have a liner system that meets the Part 264 single liner standard, and meet the definition of a significant portion. The single liner requirement will remain in effect until the significant portions rule becomes effective.

(b) Proposed rule—(1) Double liner standard. The proposed rule defines "significant portion" (in the amendments to Section 260.10) as:

> any unlined area of a unit that has not received waste and, if double-lined before receiving waste, would significantly reduce the potential for migration of hazardous constituents out of the unit, thereby reducing the potential for ground-water and surface-water contamination.

The phrase is used in revisions to the Part 264 design and operating requirements for surface impoundments, waste piles, and landfills.

The surface impoundment proposed regulation (Section 264.221) reads as follows:

> (c) The owner/operator of each new surface impoundment, each new surface impoundment unit at an existing facility, each replacement of an existing surface impoundment unit, and each lateral expansion of a surface impoundment unit must install two or more liners and a leachate collection system between such liners. This requirement shall apply to the owner/operator of all such units, regardless of the date of permit issuance, as well as to the owner/operator of significant portions of surface impoundment units, effective 24 months after promulgation of this rule. The requirements of this paragraph apply with respect to all waste received after the issuance of the permit or modified permit. The liners and leachate collection system must protect human health and the environment.

The language of the proposed waste pile regulation (Section 264.251(c)) and landfill regulation (264.301(c)) is virtually identical to that specified for surface impoundments. This change is simultaneously made for interim status surface impoundments, waste piles, and landfills as a result of the requirements under Sections 265.221(a) and conforming amendments to Subparts L and N, that required owners or operators to install liners and LCRSs in accordance with Sections 264.221(c) and conforming amendments to Subparts L and N of this chapter.

The Agency is proposing that, effective 24 months after promulgation of this rule, owners or operators of permitted and interim status landfill, surface impoundment, and waste pile units that qualify as existing units provide a minimum technology double liner system on those unlined areas upon which waste has not been placed if such a double liner system would significantly reduce the potential for adverse human health and environmental impacts from the unit. EPA is allowing 24 months because we believe it may take that long to install liners with ongoing placement of waste.

The Agency is also proposing in today's rule to amend the present single liner requirements. Under the proposal, the owner or operator would be required to provide double liners and LCRSs for significant portions of unlined areas of existing units. Owners or operators of nonsignificant portions would, conversely, not be required to line these portions of the unit. We believe that by requiring significant portions of units to be double lined would minimize the potential for leachate migration.

(2) Exemption from leak detection requirements. Today's proposed rule does not require a leak detection system to be installed at the significant portions of any unlined areas that have not received wastes at existing units (interim status and permitted). We believe it would be unreasonable to require leak detection at significant portions for several reason. One reason is that the possibility of leakage from other areas of the unit could cause a false indication of leakage through the top liner of the significant portion. Also, EPA is not requiring leak detection for significant portions because of potential problems from requiring a response action. EPA believes that response actions to migration out of a unit should be developed and implemented on a unit basis. If there are different operational requirements for different portions of one unit, it would be difficult or impossible to determine if the portion of the unit with more stringent operational controls is meeting its specific requirements. This is because current monitoring techniques would not be able to determine which area of the unit was leaking. Therefore, EPA would not know whether or not the "significant portion" was in compliance with the double liner standards.

(3) Description of "significant portion". Today's proposal defines "significant portion" of any unlined area of a unit that has not received waste as that portion which, if double lined before receiving waste, would significantly reduce the potential for migration of hazardous constituents out of the unit, thereby reducing the potential for ground-water and surface-water contamination from the unit (Section 260.10). If lining an unused portion of an existing unit would result in significant reductions in the potential for hazardous constituents to migrate out of the unit, then the unused portion would be considered "significant" and the owner or operator would have to install double liners and LCRS. One of the main criteria in determining significant portions is the size of a unit's area that would be double lined. The second criterion is the amount of leachate that the double liner system would collect and remove.

These criteria for distinguishing significant portions from nonsignificant portions are not meant to be precise because EPA believes that a more flexible standard is needed. This standard will cover areas in existing units that require site-specific

evaluation by EPA and, therefore, require more flexibility than the evaluation of a new facility. However, the following examples provide guidance on EPA's thinking of what are significant and nonsignificant portions:

- An example of a "significant portion" of an existing landfill unit would be an exposed unlined bottom area of several acres that was not covered by waste. If waste were to be placed in this area of the unit with double liners and leachate collection, a significant benefit to human health and the environment would likely result, because large amounts of leachate would be collected and removed over a 5-year period.
- An example of a portion of an existing unit that may not be a "significant portion" is the unlined area of a surface impoundment located above the liquid surface level that would be covered with waste if the liquid level were raised.
- In most cases, "significant portions" will be those areas in a unit where the addition of a double liner system will provide hydraulic control of leachate or liquid waste and ensure collection and removal.
- "Significant portions" may include both the bottom and sidewalls of existing units.

The primary purpose of requiring minimum technology requirements for significant portions is to provide these portions with the same level of protection that other newly constructed land disposal units provide by controlling migration of hazardous constituents out of the unit to prevent ground-water contamination. By requiring a double liner system for significant portions, EPA is minimizing the total number of landfill, surface impoundment, and waste pile units that can receive hazardous waste without providing the same level of human health and environmental protection as other units with minimum technology double liner systems.

(4) Variances. Under today's proposal, owners or operators of significant portions of permitted and interim status units wanting to use designs different from those specified under the minimum technology requirements may do so if they can demonstrate that the alternative design and operating procedures, together with location characteristics, will prevent the migration of any hazardous constituents into ground water or surface water at least as effectively as a minimum technology double liner system.

The owner or operator of a permitted unit must apply for a permit modification to make such a variance demonstration. For interim status units, the owner or operator must have the variance demonstration approved before receiving hazardous waste. A description of the components of this variance demonstration was given previously in Section V.C.1.(b)(5) of this preamble.

Today's proposed rule also provides a provision for owners or operators of significant portions of permitted or interim status facilities to seek a waiver from the double liner system requirements for monofills containing only hazardous wastes from foundry furnace emission controls or metal casting molding sands if such wastes do not contain constituents that would render the waste hazardous for reasons other than the EP toxicity characteristics in Section 261.24, 40 CFR Ch. 1. Further requirements to obtain such a waiver were given previously in Section V.C.1.(b)(5) of this preamble.

(5) Issues. One issue with which EPA is concerned is that owners or operators of existing units may initiate rapid lateral spreading of waste onto areas of significant portions that are uncovered with waste in an effort to circumvent the proposed double liner system requirements before this rule is promulgated. EPA is considering restricting the potential for any lateral spreading by requiring owners or operators of existing facilities affected by this proposal to document clearly that wastes were placed in a "normal" manner up to the date this rule becomes effective. EPA requests comments on this issue and whether this documentation should be used by the permitting agency before rendering a decision as to whether an unused portion of an existing facility is a significant portion.

A second issue, particularly for waste piles and landfills, is whether the working face of the unit should be considered part of a significant portion. If so, the entire working face would be subject to minimum technology double liner system requirements. While placing a lining system on the working face is desirable, the practicality of doing such is questionable, and the benefit to human health and the environment is unclear. The Agency is investigating this question, and seeks comments on this issue.

The third issue is whether significant portions should be addressed under today's proposed rule. EPA recognizes that there are very few units with existing portions that would qualify as significant portions. Also, evaluating whether a portion is significant may need to be accomplished on a site-specific basis. The Agency is requesting comments on whether to regulate significant portions under today's proposal or, alternatively, under the authority of Section 3005(c)(3) of RCRA.

3. New Units, Replacement Units, and Lateral Expansions of Units at Facilities Permitted Before November 8, 1984

a. Background. As noted previously, under the authority of Section 3004(o)(1) of RCRA, EPA has imposed minimum technological requirements for double liners and leachate collection and removal systems on new landfills and surface impoundments, and replacements and lateral expansions of landfills and surface impoundments at facilities permitted after November 8, 1984. Also, under 3004(a) authority, EPA is proposing to extend these requirements to new waste piles and lateral expansions and replacements of existing waste piles. Under the current regulations, new or replacement landfills, surface impoundments, or waste piles at facilities that were permitted before November 8, 1984, are not subject to the minimum technology double liner system standards. Today's proposed rule also extends EPA's minimum technology double liner system standards to new landfills, surface impoundments, and waste piles, and replacement units and lateral expansions of surface impoundments (Section 264.221(c)), waste piles (Section 264.251(c)), and landfills (Section 264.301(c)) at facilities permitted *before* November 8, 1984. This requirement is proposed to go into effect 6 months after promulgation of today's proposed rule.

b. Proposed rule—(1) Double liner system requirement. The Agency is proposing that new landfills, surface impoundments and waste piles, and replacements and lateral expansions of existing landfills, surface impoundments, and waste piles at facilities that were permitted before November 8, 1984, meet the double liner and. LCRS requirements currently proposed for landfills, surface impoundments, and waste piles. This proposal is to be effective for these units 6 months after promulgation of this rule. The primary purpose of proposing that the minimum technology requirements be applied to new units, replacement units; and lateral expansions at facilities permitted before November 8, 1984, is to assure that these units provide protection of human health and the environment. This proposal will result in minimizing the number of units in which waste can be placed that do not protect human health and the environment. EPA believes the opportunity for constructing units which meet these requirements at

facilities permitted prior to November 8, 1984 is the same as for units at facilities permitted after November 8, 1984.

On March 28, 1986 (51 FR 10722) EPA proposed to amend 40 CFR 270.41(a)(3) to give the Agency authority to modify a permit. This amendment will enable EPA to require double liners and leachate collection and removal systems for units permitted before November 8, 1984.

Only eight facilities potentially will be affected by this proposed extension of the double liner standard. The Agency believes that all these cases will involve lateral expansions or replacements but not new units.

(2) Exemption for certain replacement units. As discussed earlier in this preamble, the Agency is proposing today to require minimum technology double liner and leachate collection systems for certain landfills, surface impoundments, and waste piles at facilities that were permitted before November 8, 1984. However, the Agency also is proposing that certain replacement units at surface impoundments, landfills, and waste piles be exempted from the proposed double liner and leachate collection and removal system requirements, as well as the leak detection system requirements proposed today. EPA can exempt these units from the leak detection requirements because they are not required by the statute to have leak detection.

As stated in the Draft Minimum Technology Guidance Document of May 24, 1985 (EPA/530–SW–85–012), a unit qualifies as a replacement unit when (a) the unit is taken out of service (the receipt of waste is stopped or the normal input of waste is significantly reduced), (b) all or substantially all of the waste is removed, and (c) the unit is reused. However, a unit is not considered a replacement unit if the waste is removed from the unit, treated, and only the treated waste is placed back into the same unit as part of closure or post-closure care activities of the facility.

The Agency is proposing to exempt from the proposed double liner system and leak detection system requirements those replacements of landfills, surface impoundments, and waste piles that meet all of the following conditions:

(1) The existing unit received a final permit before November 8, 1984;

(2) The existing unit was constructed in compliance with the single liner requirements (and leachate collection and removal system requirements for landfills and waste piles) or requirements for equivalent protection (the variance) contained in Part 264, and the liner or leachate collection and removal system was not replaced; and

(3) There is no reason to believe that the liner or leachate collection system is not functioning as designed.

EPA is proposing to exempt units that meet the above criteria from the double liner system and leak detection system requirements, because the owner or operator of these units made a good faith effort to satisfy the liner system requirements that were in effect at the time the facility was permitted (and the liner or leachate. collection system is still functioning as designed). EPA also considered that in order to double line these units, in many cases the owner or operator would be required to replace the whole unit. Retrofitting the unit by placing an additional liner on top of the existing liner would not be feasible for three reasons: (a) Existing single liners would not meet bottom liner requirements for a double liner system; (b) reduced capacity may not meet unit owner or operator needs; and, (c) retrofitting a new design may not be compatible with the previously designed system and would not meet new technology-based standards for liners.

(3) Variances. Owners or operators of new units, replacement units, and lateral expansions of units at facilities permitted before November 8, 1984, may use the same variances as previously described in Section VI.C.1.(b)(5) of this preamble.

C. Construction Quality Assurance (CQA) Program

1. Background

Under the authority of Section 3004(a) of RCRA, EPA is today proposing CQA requirements. EPA believes these requirements are necessary to protect human health and the environment by preventing leachate from migrating out of the unit and contaminating ground water and surface water. CQA is needed to ensure that the unit is constructed to exceed design criteria, plans, and specifications necessary to prevent migration of leachate out of the unit.

In 40 CFR Parts 264 and 265, the overall goal of the design and operating standards for landfills, surface impoundments, waste piles, and land treatment units is to minimize leachate formation and its migration into the subsurface soil, ground water, and surface water. To meet this goal, owners or operators must install liners; leachate detection, collection, and removal systems; dikes; and final covers.

In 1983, EPA conducted a study assessing existing technology for liner installation at hazardous waste land disposal facilities (see Liner/Leak Detection Background Document). The data base used in the study comprised information from the literature supplemented by data collected through 40 interviews with technical experts in industry, State regulatory agencies, trade and professional associations, research organizations, and waste management companies. This study's conclusions were: (1) Construction-related problems during liner system installation constituted one of the major causes of liner system failure and (2) a rigorous construction quality assurance program could have identified and corrected many of the problems that contributed to such failure. The study also concluded that construction techniques that were available at that time could be used to install flexible membrane liner (FML) and clay liner systems that meet the Agency's performance standards for liner systems. However, the study noted that a comprehensive monitoring and audit program during construction would be needed to attain the Agency's performance standards for liner systems.

In 1985, EPA conducted another study to supplement existing information on liner performance (see Liner/Leak Detection Background Document). This study was designed to evaluate the factors that contributed to successes and failures at 27 landfills and surface impoundments selected for case studies.

The results of this study showed that there were two main elements related to successful liner installation. The first element was a proper philosophical and conceptual approach applied to all stages of liner system construction and use, including design, material selection, contractor selection, liner system installation, facility operation, and closure. The second element was the extensive use of formal quality assurance programs to ensure that the components of the unit were constructed properly in all facets and stages of a unit's construction. The report stated that a quality assurance program resulted in a better constructed lining system.

As a result of these studies, EPA believes that one of the principal factors in ensuring that the design and operating standards of Parts 264 and 265 are met is a program that ensures that all the components of the waste management unit are constructed and installed properly. Therefore, EPA is proposing today a construction quality assurance program for waste management facilities.

2. Proposed Rule

a. The Construction Quality Assurance (CQA) Program. The CQA program proposed today (Section 264.19 for permitted units and Section 265.19 for interim status units) is a program that uses scientific and engineering principles and practices to ensure, within a reasonable degree of certainty, that a constructed hazardous waste landfill, surface impoundment, waste pile, or land treatment unit meets or exceeds the design criteria, plans, and specifications. The CQA program must begin during the facility's design and continue through the completion of the facility's construction. The CQA program for landfills, surface impoundments, and waste piles ensures that the following components are properly designed, constructed, and documented:

(1) Foundations,
(2) Compacted low-permeability soil liners,
(3) Flexible membrane liners (FMLs),
(4) Dikes,
(5) Leachate detection, collection, and removal systems, and
(6) Final covers.

For land treatment units, the CQA program proposed today addresses final covers only.

A CQA program will be required for all units and significant portions of units, both permitted and interim status, on which construction begins 12 months after promulgation of this rule. Under today's proposed rule, an owner or operator has begun construction on a unit or portion of a unit if the following conditions are met:

(1) The owner or operator has obtained the Federal, State, and local approvals or permits necessary to begin physical construction.

(2) A continuous on-site, physical construction program has begun, or the owner or operator has entered into contractual obligations that cannot be cancelled or modified without substantial loss for physical construction of the facility to be completed within a reasonable time.

Today's proposed rule also applies to interim status, good-faith compliance provisions under Section 265.310(e); that is, to comply with the good-faith provisions, interim status units will now also be required to implement a CQA program (Section 265.19).

A properly executed CQA program consists of the development and approval of a CQA plan, implementation of the approved CQA plan, and the submission of a CQA report signed and sealed by a registered professional engineer or the equivalent.

Today's proposed CQA program is essentially comprised of two parts: performance standards and CQA guidance documents. The first part specifies using performance-type standards for the six major components of land disposal facilities listed above. The Agency is supplementing the performance standards with guidance documents because EPA believes that certain parts of the overall construction quality assurance program (e.g., detailed, site-specific, construction monitoring and testing protocol) are not appropriate for coverage by regulation and that guidance is a more effective mechanism. Consider, for example, the specific test methodologies and the number of tests that should be conducted during a given installation. EPA's position is that these will vary significantly for different types of units, materials, and locations. Also, the knowledge and technology in many areas is still being developed, and detailed regulations requiring a specific test or methodology may limit the use of improved tests or methods. Therefore, specific tests and methods for monitoring activities are not included in today's proposed rule, although the rule does require the owner or operator to provide a description of the type and number of tests to be used. This EPA guidance document is intended to provide detailed information on the site-specific aspects of the CQA program and examples of the types of information that will be necessary for the owner or operator to document and submit. EPA does not intend that the approaches described in the guidance document should be the only approaches for meeting construction quality assurance requirements. In fact, improved technologies and approaches are welcome. The guidance document simply indicates approaches that may be used and also indicates the level of control EPA considers acceptable.

On November 21, 1985, the Agency noticed for public comment in the **Federal Register** (50 FR 48129) the availability of a draft guidance document entitled "Construction Quality Assurance for Hazardous Waste Land Disposal Facilities," EPA/530-SW-021. Construction quality assurance activities are also outlined in the draft "Minimum Technology Guidance on Double Liner Systems for Landfills and Surface Impoundments—Design, Construction, and Operation," dated May 24, 1985. Public comments received on these documents were used in preparing the final Construction Quality Assurance Guidance (EPA 530-SW-86-031, OSWRR Policy Directive No. 9472.003, available from NTIS), as well as today's proposed rule. EPA also is planning to expand this guidance document by gathering information on leak detection systems.

b. The Construction Quality Assurance (CQA) Plan. EPA takes the position that a site-specific CQA plan prepared by the owner or operator is needed to address the components of a hazardous waste land disposal unit. Therefore, the Agency is proposing that, effective 12 months after promulgation of today's proposed rule, owners or operators are required to prepare a CQA plan before constructing all new units, replacement units, lateral expansions, and unconstructed components of existing units, regardless of whether those units are permitted or in interim status (Sections 264.19 and 265.19). However, if the owner or operator of a facility seeking a permit can demonstrate that having detailed construction specifications at the time of initial submission is not practicable, the Regional Administrator (RA) may allow phasing of the CQA plan submission and approval.

Under today's proposal, the CQA plan must document the owner's or operator's commitment to CQA for the specific unit or portion of a unit to be constructed. For facilities seeking a permit, the CQA plan must be included in the permit application, and construction cannot begin until the RA approves the permit (Section 264.20(a)). If the facility is already permitted, then the plan must be submitted as a permit modification. The permitting agency must review the plan for completeness and approve it (following public participation), before implementation. Today's proposal allows the owner or operator to amend the CQA plan at any time before and during the active life (including the closure period) of the unit.

Also, today's proposal contains a provision that requires the owner or operator to modify the CQA plan whenever the owner or operator requests a permit modification (under Section 264.20(e)) to authorize a change in operating activities or facility design that would affect the construction quality assurance plan.

Under today's proposal, for new construction at interim status facilities, the owner or operator must document compliance with all CQA program requirements and must retain this documentation at the facility for future review as described in 265.20. The RA may review this documentation during a site inspection of the facility. The CQA program will be the chief means for an interim status facility owner or operator, to demonstrate that EPA regulations

were properly implemented. Also, the owner or operator can use the CQA documentation to demonstrate that the completed facility meets or exceeds the design criteria, plans, and specifications.

(1) Elements of a CQA plan. The CQA plan must address those activities that pertain to each of the following areas in sufficient detail to show, that, if the CQA plan is properly implemented, the constructed facility will meet or exceed the design plans and specifications (Sections 264.20 and 265.20).

(a) Responsibility and authority. As proposed, the plan must include a detailed description of the responsibility and authority of organizations and key personnel positions involved in preparing and implementing the construction quality assurance plan.

(b) Construction quality assurance personnel qualifications. Under today's proposal, the CQA plan must describe the qualifications of the CQA officer and supporting personnel. The position descriptions must demonstrate that the personnel possess the training and experience necessary to fulfill their identified responsibilities.

(c) Monitoring activities. The CQA plan should detail the observations and tests that will be monitored to ensure the quality of the installation of the components.

(d) Sampling requirements. A description of sampling and testing activities must be provided in sufficient detail, both in concept and specifics, to project the quality of materials that were installed during construction. The description of sampling activities should include:

(i) The types of sampling activities;

(ii) The types of samples;

(iii) The number and locations of samples;

(iv) The frequency of testing;

(v) Data evaluation procedures;

(vi) Acceptance and rejection criteria;

(vii) Plans for implementing any corrective measures that sampling results warrant; and

(viii) Procedures for handling testing errors.

(e) Documentation. The CQA plan must describe in detail procedures for documenting construction quality assurance activities. Documentation must include such items as daily summary reports, monitoring data sheets, change orders, meeting memoranda, photographs, problem identification and reports on corrective measures, block evaluation reports for large projects (phased construction quality assurance reports on construction activities for portions of a large unit), design acceptance reports (for errors, inconsistencies, and other problems), and final documentation, including record drawings. Provisions for the final storage of all records also must be discussed in the construction quality assurance plan.

(2) Components covered by the CQA plan. Under today's rule, a CQA plan must cover the following components of land disposal units: foundations; compacted low-permeability soil liners; flexible membrane liners; dikes; leachate detection, collection and removal systems; and final covers. The specific components that must be addressed in any given CQA plan will vary depending on the type of unit. The following is a description of some key construction factors that may affect the engineered components at land disposal units. The CQA plan is intended to identify these factors so that problems are rectified during construction in a manner consistent with the design intent.

(a) Foundations (Sections 264.20(b)(1) and 265.20(b)(i)). Under today's proposal, the CQA plan must confirm that foundations are constructed with structurally stable subgrades for the facility components and waste above. Furthermore, the foundation also must provide satisfactory contact with the overlying liner or other system components.

Important steps in soil subgrade preparation for foundation construction at landfills, surface impoundments, and waste piles include excavation, placement, and compaction of soil lifts; embankment and slope construction; surface finishing; and soil sterilization. These factors are important to ensure that the requirements under Sections 264.20(b)(1) and 265.20(b)(1) are met. EPA believes that the criteria in Sections 264.20(b)(1) and 265.20(b)(1) are necessary to ensure proper foundation preparation. The following is a list of some of the key factors that need to be addressed in the CQA plan:

Compaction. If a recompacted soil subgrade is not compacted adequately, it may not have the strength and stability needed to support a liner, and, as a result, it may settle unevenly under the weight of equipment or waste. This differential settlement may create areas where the liner is unsupported or otherwise stressed. An unsupported compacted soil liner may settle differentially, creating channels or cracks in the liner where permeability will be higher. An unsupported or stressed flexible membrane liner (FML) may fail under tension. To achieve proper subgrade compaction, specifications must be adequate, and followed strictly. If the design specifies subgrade reinforcement, then such reinforcement is also required in the construction quality assurance plan. Compaction relates to stability and strength of the constructed foundation.

Saturated subgrade. A subgrade may fail if it becomes wet or disturbed before or during liner placement. This occurred during construction of the Mt. Elbert reservoir (Morrison, et al., 1981). At Mt. Elbert, liner placement and seaming stopped because of rain. When placement recommenced, some soft, moist, subgrade areas were inadvertently overlooked. After backfill placement, it was discovered that the liner failed in tension. These areas had to be excavated and the liner patched. This experience demonstrates the necessity for a firmly compacted subgrade to ensure strength and stability of the foundation and a monitoring program to confirm that design conditions are met.

Slope construction. The steepness of the side and bottom slopes that the design specifies must be adhered to during installation to prevent problems during the remainder of the installation or during facility operation. Two difficulties with over-steepened side slopes that have been reported are: (1) equipment problems leading to liner damage and (2) sloughing of the earthen side slope material. If the design specifies slope reinforcement (synthetic or otherwise), then such reinforcement also must be required in the construction quality assurance plan.

The bottom slope must be designed and constructed to allow for adequate gravity flow of liquids after any projected settlement has occurred. Another concern for the slope of the bottom is that a slope which is too flat may allow gas or liquid to accumulate under the liner. As a result, a flexible membrane liner can be raised, stretched, and eventually ruptured because of the pressure against the liner. A clay liner also can be damaged by that pressure. Some designs specify pressure relief systems to preclude such problems. If pressure relief systems are specified, then they also must be required by the construction quality assurance plan.

Surface texture. Flexible membrane liners can be damaged if the subgrade surface is not smooth. For example, a flexible membrane liner may be punctured by small rocks. Such a puncture of a flexible membrane liner because of a rough subgrade may occur at the time of liner placement or after waste has been placed in the unit.

Failure to remove roots and vegetation of all types and to sterilize the subsoil also can cause liner failures. Existing vegetation can grow through

liners, and some types of grasses can germinate after liner placement and grow through the liner. This can provide channels for leachate movement. In addition, the decay of organic matter produces gas that can accumulate and exert pressure on the liner, as described above. Because surface texture problems can cause liner breaches, the CQA plan must address these types of problems.

(b) Dikes (Sections 264.20(b)(2) and 265.20(b)(2)). The CQA plan activities for dikes are necessary so that a completed dike meets or exceeds design criteria, plans, and specifications. These activities may include examining the prepared dike foundation, monitoring incoming materials, monitoring and testing fill placement and compaction, constructing a drainage system, and implementing erosion control measures. These factors are important to ensure the requirements under §§ 264.20(b)(2) and 265.20(b)(2) are met. EPA believes that the criteria in §§ 264.20(b)(2) and 265.20(b)(2) are necessary to ensure that dikes are properly constructed to ensure structural strength and stable support for the overlying facility, thereby ensuring protection of human health and the environment.

A dike in a hazardous waste unit functions as a hydraulic barrier as well as a retaining structure, resisting the lateral forces of the wastes, liners, and leachate collection systems. A dike is also the above-ground extension of the foundation, providing support to the facility components above. In addition, dikes can be used to separate cells for different wastes within a large landfill or surface impoundment. Dikes, therefore, must be designed, constructed, and maintained with sufficient structural stability to prevent failure.

Materials to be used for the dike must be monitored to confirm that they are the same as the design specifies and that they are uniform, so that no unsuitable materials are included in the dike. A test fill must be constructed to verify that the specified soil density, moisture content, compactive effort and strength relationships hold for field conditions and to determine the suitability of the proposed construction procedure.

Dike construction generally involves standard earthwork construction practices. Adequate CQA during dike construction will identify problems resulting from using inadequate construction methodologies or materials that could result in dike failure from slope instability, settlement, seepage problems, or erosion.

(c) Low-Permeability Soil Liners (Sections 264.20(b)(3) and 265.20(b)(3)). The CQA program for low-permeability soil liners must confirm that the liners meet or exceed the design intent. The purpose of a compacted low-permeability soil liner depends on the overall liner system design. For soil liners used as the lower component of a composite liner, the soil component serves as a protective bedding material for the upper component of the FML and minimizes the leakage rate through any breaches in the upper component. An objective for all low-permeability soil liners is to serve as long-term, structurally stable bases for all material above them.

Before construction, adequate studies should have confirmed that the low-permeability soil liner design meets or exceeds regulatory requirements. These studies should include an evaluation of the proposed material source area to confirm the existence of an adequate quantity of suitable material, particle size distribution, Atterburg limits, compaction, permeability, liner-leachate compatibility tests, and appropriate consolidation and strength tests of fabricated samples of the proposed soil liner.

EPA has published a technical resource document "Design, Construction, and Evaluation of Clay Liners for Hazardous Waste Facilities" (EPA/530-SW-86-007, March 1986) that provides detailed information on constructing a compacted soil liner.

The following is a summary of the key factors that need to be addressed for the construction of compacted low-permeability soil liners at landfills, surface impoundments, and waste piles. The construction process primarily consists of material excavating, stockpiling and handling, moisture conditioning, and placing and compacting soil lifts. The major problems in construction relate to (1) proper material stockpiling and handling; (2) using proper compaction equipment; (3) placing of lifts in the proper thickness; (4) promoting bonding between lifts; (5) obtaining and maintaining proper moisture content and distribution; and (6) attaining the specified relative compaction. These factors are important to ensure the requirements under §§ 264.20(b)(3) and 265.20(b)(3) are met. EPA believes that the criteria in §§ 264.20(b)(3) and 265.20(b)(3) are necessary to ensure that low-permeability compacted soil liners are properly constructed to ensure against imperfections, improper materials and improper permeability. These criteria will ensure the unit is built as designed and is protective of human health and the environment.

Material stockpiling and handling. The main concerns regarding the soil stockpiling relate to preventing the soil from being contaminated or becoming too wet or too dry. Contaminants that might become mixed with the soil and increase permeability, decrease strength, or cause other deficiencies include sand, silt, vegetation, and debris from preparing the site. Higher permeability may allow waste or leachate to leave the unit or may allow ground water to enter the unit. To prevent contamination, excavated materials must be examined to remove undesirable contaminants before the soil is placed in the stockpile area. Whether referred to as blemishes, macrofeatures, or structural nonuniformities, material imperfections may increase the overall permeability by several orders of magnitude.

Methods to identify and remove these contaminants should be included in the CQA program both to prevent and to detect these imperfections. Details of the information that should be gathered before, during, and after constructing of a compacted soil (which should serve to reduce the number of these imperfections) are given in the guidance document entitled "Construction Quality Assurance for Hazardous Waste Land Disposal Facilities," EPA/530-SW-86-031.

Permeability testing. EPA requires, as part of the CQA program, a test fill to be constructed using the same borrow soil, compaction equipment, and construction procedures as proposed in the full-scale unit. According to Sections 264.20(3)(iii)(A) and 265.20(3)(iii)(A), a test fill is required because of concern that laboratory permeability tests will overestimate the actual field permeability. A field hydraulic conductivity test of the compacted soil in the test fill is necessary to confirm that the materials and procedures used in the field will result in a compacted soil liner with a hydraulic conductivity of 1×10^{-7} cm/sec or lower. Field testing is not intended to preclude using laboratory testing in the design or construction phases or as a means of evaluating liner-leachate compatibility. The design phase and the construction quality assurance program both may include a mixture of field and laboratory hydraulic conductivity tests.

As appropriate methods are developed and verified, EPA intends to require hydraulic conductivity tests to be conducted on the full-scale facility. In the meantime, field hydraulic conductivity tests can be performed in

the test fill without causing delays during the full-scale facility construction. The field test used in the test fill should be performed long enough to verify that the hydraulic conductivity of the compacted soil liner is 1×10^{-7} cm/sec or less.

In addition to being used as a site for the field hydraulic conductivity test, the test fill also will verify other elements of the soil liner design and construction. The test fill construction will allow the construction quality assurance monitors to verify that equipment and construction procedures for breaking up clods (Sections 264.20(3)(iv)(D) and 265.20(3)(iv)(D)), moisture conditioning (Sections 264.20(3)(iv)(F) and 265.20(3)(iv)(F)), and compacting the soil are adequate to meet the specified density, moisture content, and permeability criteria. In addition, construction monitoring activities, including measuring of lift thickness (Sections 264.20(b)(3)(iv)(C)) and 265.20(b)(3)(iv)(C) and compaction equipment coverages (Sections 264.20(b)(3)(iv)(I) and 265.20(b)(3)(iv)(I)), can be correlated with in-place density and moisture content tests and with the field hydraulic conductivity.

(d) Flexible Membrane Liners (FML) (Sections 264.20(b)(4) and 265.20(b)(4)). The CQA plan for the FML must address the following points: (1) Conformance of testing the liner material to confirm that materials used in the manufacture of the liner are as specified in the design; (2) monitoring the delivery and unloading of the liner material to confirm that it is the material specified in the design and that it is not damaged, (3) observing and testing the subgrade to confirm that the subgrade has been prepared and compacted properly; (4) monitoring the liner deployment to observe any damage to the subgrade or to the liner during deployment; (5) monitoring and testing seaming operations; (6) monitoring installation procedures so that improper techniques or workmanship that can result in inadequate seams or liner damage are identified and corrected; (7) checking for identifying any tears, punctures, or other breaches in the liner so that they can be properly patched and repaired; and (8) continuous monitoring while placing cover soil or other materials over the liner to observe any damage to the liner, in which case it can be repaired properly. These factors are important to ensure the requirements under Sections 264.20(b)(4) and 265.20(b)(4) are met. EPA believes that the criteria in Sections 264.20(b)(4) and 265.20(b)(4) are necessary to ensure that the flexible membrane liner is constructed to ensure tight seams, use of proper materials as approved, and proper manufacture of the FML. These factors will ensure the unit is built as designed and is protective of human health and the environment.

The following is a summary of key factors that must be considered when constructing a FML. The most significant consideration relates to installation procedures; however, many other areas must be monitored so that the installed liner meets the CQA design specifications.

Storing and handling. Properly storing and handling of liner materials at the site is necessary to prevent their degradation as a result of exposure to the elements or physical damage, so that the properties of the materials that are installed are the same as those the design specifies. The main concerns in storing and handling are protecting the material from wind, sunlight, hail, vandalism, and equipment damage.

Some FML materials can be damaged when the material is folded and unfolded repeatedly. Other FML materials should not be folded. Weather can affect the performance of the membrane in several ways. Relatively gentle breezes (as little as 10 miles per hour) can easily lift and tear liner sheeting. Hail can impact and puncture some materials. The ultraviolet component of sunlight damages some FML materials over time. Another effect of exposure to sunlight with some FML materials is blocking, which occurs when the liner material sticks together as a result of the combination of heat from the sun and pressure from the weight of the liner material. When the material is unfolded or unrolled, delaminating or ripping of the blocked material can occur. The material storage and handling damage can be detected easily by visual inspection and repaired or replaced with little technical difficulty. For the above reasons, inspection of the liner material after it is received at the facility and before installation to confirm that it is the material specified in the design and is not damaged, is required under Sections 264.20(b)(4)(iv)(B) and 265.20(b)(4)(iv)(B).

Installation. Installation can be divided into two operations: liner placement and seaming. Proper placement of liner materials is essential: to guard against damage to the liner material during and after placement so that subsequent seaming operations can be performed effectively.

Another concern about liner placement is the occurrence of "bridging" in the liner material where depressions or angles form in the subgrade. Bridging exists when the liner extends from one side of a depression or angle to the other, leaving a void beneath the liner at the apex. The liner essentially is unsupported at this spot and could fail under stress. Bridging occurs most often at penetrations and where steep sidewalls meet the bottom of a unit. To prevent bridging, installers must keep the liner in a relaxed condition and in contact with the subgrade at these locations.

Seaming is perhaps the most critical operation in flexible membrane liner installation. Furthermore, seaming procedures are material-specific. If procedures are performed improperly, serious performance problems can result. Different types of geomembranes may use different seaming techniques. Problems can occur when seaming during adverse weather and when using improper seaming techniques or materials. In addition, special problems are associated with sealing liner penetrations and with seaming new liner material to old liner material. Therefore to ensure tight seems (Sections 264.201(b)(4)(i) and 265.20(b)(4)(i)) EPA is requiring inspection and testing to provide protection of human health and the environment.

Adverse weather. Weather conditions that affect liner seam viability include wind, moisture, and temperature. Wind-blown sand, dust, and other debris can adhere to field joints during their preparation. Another wind-related problem is simply that the liner may be blown around so that it is difficult to hold in place during the seaming operation, and wrinkles may appear in the seams as a result.

Excessive moisture can cause problems in several ways. Moisture in the seam area will vaporize during seaming and cause vapor bubbles which weaken the seam. Seaming during high relative humidity or during precipitation will cause poor seam adhesion unless the areas are kept dry. In addition, moisture under the seaming area, particularly when the temperature is below the dew point, may condense in the seam interface and prevent proper adhesion. To eliminate these problems, seaming should not occur during precipitation or high moisture conditions and particular care should be taken during conditions of high relative humidity to keep the seam area dry. If a good seam quality assurance program is conducted, faulty seams can be identified and repaired.

Temperature extremes or changes can interfere with the seaming process by changing dimensions of the liner material or by preventing the seaming

equipment from operating properly. Thermal expansion and contraction of some liner materials may stress the seams and cause them to fail. Either high or low temperatures may interfere with the ability of a method to produce a good seam.

Improper materials and techniques. A common problem with adhesive seaming is using improper materials or the wrong adhesives; that is, materials that can damage the liner or cause improper bonding. If an adequate quality assurance program is developed and followed, improper materials can be identified and replaced.

Improper seaming techniques may include applying too much or too little adhesive, applying adhesive unevenly, providing insufficient support beneath the seaming area, or applying pressure to the seam incorrectly. Applying an insufficient amount of adhesive will prevent complete bonding, while applying too liberal an amount of adhesive or applying it unevenly can cause blisters in the seam. If such problems occur, good quality assurance should identify and correct them.

Allowing insufficient time for the seaming system to take effect before stresses are applied to the seam can be a problem with the installation of any field seaming system.

A problem common to both solvent and extrusion welding systems is that breaks in the solvent or extrudate feed will cause gaps in the seam. The solutions to these problems are (1) to follow recommended seaming practices, (2) to use experienced personnel, and (3) to conduct a good quality assurance program to identify problem areas for repair. Because of the reasons above EPA is requiring observation of placement of the FML to ensure that design requirements are met and observation of any liner damage that may occur as a result of adverse weather conditions, inadequate temporary anchoring, or rough handling, under Sections 264.20(b)(4)(iv) (F) and (G) and 265.20(b)(4)(iv) (F) and (G).

Sealing around penetrations is critical to the integrity of any lined facility, because improperly devised or sealed penetrations may leak. Problems occur when the liner and appurtenance are incompatible regarding seaming, when the penetration stresses the liner in some way, and when the subgrade adjacent to the structure is weak or relatively compressible.

Materials and equipment. Procedures for monitoring and testing materials and equipment as they arrive at the site should confirm that materials and equipment used to construct the liner or cover are the correct ones and that they are not defective. Using improper or defective materials could result in such problems as ineffective seaming and leaks in the liner itself. Using the wrong equipment also could cause incomplete seaming; it could create such problems as mechanical damage to the liner during fill placement or inadequate subgrade performance. An effective monitoring program can detect these problems (Sections 264.20(b)(4)(iv)(A) and 265.20(b)(4)(iv)(A)).

Testing of field seams. Sections 264.20(b)(4)(iv)(6) and 265.20(b)(4)(iv)(6), require observation and testing of seams to ensure proper seaming and conformance to the seam strength specified in the design. Field seam testing ensures that seams have been constructed to be continuous and of the specified strength. Because field seam integrity (strength) generally determines the success of the entire job, it is important for the best available field seam monitoring, testing protocol, and equipment to be used during construction. This will reduce the risk that the liner will fail to perform its intended function.

There are different types of tests to measure the various seam properties and seaming methods. These tests fall into two general categories: nondestructive (qualitative) and destructive (quantitative). A good quality control program will include tests of both types. One hundred percent of field and factory seams should be tested by nondestructive testing techniques to verify their continuity. Some seams at or adjacent to structures and penetrations cannot be tested. These locations should be limited in number and the seaming of those locations should be continuously observed by construction quality assurance monitors. Periodic samples should be removed from both factory and field seams and tested for seam integrity by destructive tests (shear and peel tension tests). Areas in field seams where samples are removed for destructive tests must be patched with a new piece of the same liner material and then nondestructively tested.

(e) Leachate Detection, Collection, and Removal Systems (Sections 264.20(b)(5) and 265.20(b)(5)). The CQA program for leachate collection and removal systems (LCRS) must provide reliance that the installed system meets or exceeds the design specifications. The functions of a LCRS above the top liner in a double-lined landfill or waste pile unit are to minimize leachate head on the top liner and to collect and remove liquids from the unit, during the active life and post-closure care period. The purpose of a LCRS between the two liners of a double-lined waste unit is to rapidly collect and remove liquids entering the system, also through the post-closure care period. By providing for rapid leachate removal, the LCRS between the liners will greatly minimize the hydraulic head on the secondary liner and, thereby, minimize or eliminate leachate migration out of the unit. If the LCRS between the liners is also used to detect leaks in the top liner, the CQA program must ensure that the system is installed as designed for that purpose by meeting the sensitivity and detection time performance standards presented in this proposal.

Observing and testing the subcomponent materials of the LCRSs as they are delivered to the site and installed are necessary to confirm and document that these materials conform to the design criteria, plans, and specifications. This observation and testing applies to the granular materials, geosynthetic materials, piping and sumps, and any other materials that make up a LCRS. The factors are important to ensure that the criteria under Sections 264.20(b)(5) and 265.20(b)(5) are met.

EPA believes these requirements are necessary to protect human health and the environment.

Below are summaries of key factors that need to be addressed while constructing a LCRS. The major problems related to installation are (1) damage to the collection system during installation resulting from excessive stress and (2) leachate flow obstruction through the system.

Leachate collection pipes. Leachate collection pipes installed in trenches at the base of a landfill or waste pile and between the liners in a landfill, surface impoundment, or waste pile are subjected to loads from construction equipment during installation and operation, and the waste itself. In a well-designed trench, only a small fraction of the load of a wheel or tracked vehicle applied at the top of the trench should be transmitted through the trench backfill to the pipe. However, the percentage of the load transmitted increases rapidly as the vertical distance between the loaded surface and the top of the pipe decreases. In addition, moving loads cause impact loading, which is generally considered to have a one and one half to two times the effect of stationary loading. Thus, backfill procedures and equipment traffic over pipe trenches must be monitored carefully to prevent damage to pipes.

Leachate flow. The second consideration when installing a leachate

collection system is to provide confidence that the flow of leachate through the system is not impaired by construction activities or occurrences. Collection systems generally are designed so that leachate generated within the unit drains first through a soil or geosynthetic filter before entering the LCRS drainage layer. The purpose of this filter is to remove any fine particles that otherwise would clog the LCRS drainage layer and prevent its functioning. The filter, therefore, must be designed and constructed carefully to perform under the expected conditions. The leachate then flows through the LCRS drainage layer, which is comprised of permeable soils or geosynthetic drainage materials placed over the liner. If this layer does not have sufficient transmissivity (thickness times hydraulic conductivity) to accommodate the maximum leachate flow, the flow will be held up, and hydraulic head will build up on the liner. Achieving the designed thickness can be made more difficult by improper installation procedures, such as placing a granular drainage layer during high wind or intense rain, which may displace the soil so that it is no longer of uniform thickness. Another weather-related problem is drainage material contamination with fine soil particles, which decreases the permeability. This can occur as a result of soil particle erosion into granular or geosynthetic drainage layers from runoff from facility side slopes, mud, or windblown dust. These types of problems can be minimized by monitoring and testing activities that check the critical factors in the leachate collection system.

Installation procedures must be monitored to confirm that the drainage soils meet design specifications for size distribution of particles. In particular, excessively fine soils must not be allowed, because they will decrease the hydraulic conductivity of the layer and will clog collection pipes. Similarly, geosynthetic materials must be conformance tested to ensure that they meet design specifications, and they also must be covered to keep them clean.

Geosynthetic components. Geosynthetic components (geotextiles, geonets, and geocomposites) can be damaged during installation if proper placement and seaming techniques are not used. Some geotextiles will degrade very quickly when exposed to the sun's ultraviolet radiation. Thus, these materials must be stored with protective covering and, once installed, must be covered.

Protective soil. Protective soil includes any cover material placed over a lining system to protect it from mechanical, weather, or other environmental damage, such as wave action, exposure to the elements, vehicular or animal traffic, suction pressures exerted by an aerator, or high-temperature wastes in a surface impoundment. Protective soil may be an integral part of the leachate collection system in a landfill or waste pile. Because protective soil has so many important roles in liner systems, improperly placed soil can adversely affect the liner system performance. Improperly placed protective soil may not provide the desired protection for the liner system, or it may itself fail and cause the liner system to fail.

(f) Final Cover Systems (Sections 264.20(b)(6) and 265.20(b)(6)). The successful construction of the final cover, like the other components, relies on following recommended practices for construction, employing experienced personnel, and conducting a CQA program. The CQA plan for final covers at all land disposal units must provide assurance that (1) all layers of the final cover are monitored for uniformity, imperfections, and damage; (2) the materials for each layer are as specified in the design specifications; and (3) each layer is installed or constructed to meet the design requirements.

The following is a summary of the key factors that must be addressed to ensure that the requirements are met.

Subsidence. Subsidence under a final cover may cause problems similar to those experienced when the subgrade under a liner subsides. A flexible membrane liner may fail in tension if the waste that comprises its subgrade subsides differentially. If the final cover uses a compacted clay layer, the clay layer may develop cracks as a result of differential subsidence that allows rainwater to infiltrate. In addition, differential subsidence may result in rainwater ponding above the final cover. The ponded rainwater may have an increased chance of penetrating the cover even if the clay is intact because of the increased pressure head on the liner. If a cover of any type has failed, ponding prevents runoff from leaving the area and provides additional opportunities for leachate production.

For covers, the problem of subgrade subsidence begins with waste placement. The waste may not have sufficient bearing strength to support the weight of additional waste and soil cover material placed above it. In addition, if the waste is not compacted well and placed so that void spaces are filled, proper compaction of the liner bedding material will not be sufficient to prevent subsidence. Therefore, to minimize subsidence, waste placement must be considered a part of final cover subgrade preparation. Cover subsidence resulting from improper waste compaction may be less of a problem today than it has been in the past. Wastes were not compacted well or at all in older landfills or disposal surface impoundments when problems associated with final cover subsidence were not well known. Now, however, virtually all landfills compact their waste. Nonetheless, differential settlement because of waste subsidence continues to be a serious problem that must be anticipated in the cover system design. Some key considerations follow:

(i) The stress-strain properties of the cover system FML, geosynthetics and soils;

(ii) The ability to maintain minimum slopes for gravity drain systems;

(iii) The slope stability of layers above FMLs and geosynthetics;

(iv) The use of subgrade reinforcement or stabilization methods, such as geosynthetic reinforcement or dynamic compaction.

Installation procedures. The construction process for final covers at landfills and disposal surface impoundments involves subcomponents similar to many of the components previously discussed, such as foundations, compacted low-permeability soil liners, flexible membrane liners, and drainage layers (leachate collection systems). There are few examples to substantiate the quality of final covers that are constructed to comply with the landfill and surface impoundment requirements in Parts 264 or 265. However, EPA believes that most of the installation problems for final covers for these units should be similar to those experienced installing liners, dikes, and leachate collection systems.

For example, the compacted low-permeability soil layer and FML in a final cover is constructed much like the low-permeability soil and FML liner. However, the foundation for the final cover may have a lower bearing strength than the soil liner foundation; this may require using different construction techniques to achieve the required permeability in the field. Additionally, the design may specify foundation (waste) soil reinforcement and such soil reinforcement must be carefully monitored during installation by construction quality assurance personnel. As with the compacted low-permeability soil and FML liner, it is necessary to monitor the construction of

the compacted low-permeability soil and FML cover layer.

Installation procedures for FMLs in a final cover include proper on-site storage, handling and placing of the panels to ensure proper positioning, allowing enough slack in the material for it to fit around angles and penetrations, proper seaming and anchoring procedures, and installation only during proper weather conditions. A more complete discussion of problems and monitoring activities for flexible membrane liners and other subcomponents of the cover is contained in Sections C.2.b(2) (b) through (d).

Vegetative layers. The key factors that need to be addressed for constructing the vegetative layer of the final cover at land disposal units include: vegetative layer soil quality and thickness, seeding uniformity and timing, and vegetation establishment. The vegetative layer is the only layer of the final cover required for properly operated land treatment units under a permit.

Vegetation establishment and maintenance can be accomplished only by carefully addressing the soil type and the nutrient and pH levels to provide the proper soil conditions for successful seed germination and vigorous growth. The thickness of the vegetative soil layer also must be as specified in the design to provide proper root development and a sufficient moisture reserve to sustain the vegetation during dry periods.

The timing of the seeding is probably the most important factor in successfully establishing a vegetative cover. The timing will depend on whether the plant species selected is a cool- or warm-season species and on local climate conditions. The recommendations of the local county agricultural extension agent or seed company should be used. The CQA plan must address seeding procedures so that the recommendations are followed.

For covers at interim status land treatment units, the closure plan may require the cover design to provide infiltration control. In such a case, the CQA plan should address factors similar to those discussed above for landfills and disposal surface impoundments. The monitoring activities for the infiltration control components would be determined on a case-by-case basis according to the cover design.

c. Construction Quality Assurance Documentation. After completing construction at a unit regulated through either Part 264 or 265, the owner or operator must prepare a CQA report (Sections 264.20(g) and 265.20(g)), which demonstrates that the CQA plan was implemented as approved, and submit it to the Regional Administrator (RA). This report must include (1) a summary of all of the observations, daily inspection reports, inspection data sheets, and any photographic or video records; (2) problem identification and corrective measure reports; (3) design engineer acceptance reports (for errors, inconsistencies, and other problems); (4) deviations from design and material specifications (with justifying documentation); (5) as-built drawings; and (6) a summary for each component describing how the monitoring activity results demonstrate that the constructed unit meets the design intent and purpose.

The CQA report must be signed by a qualified registered professional engineer, or the equivalent (CQA officer), in charge of the CQA program and must state that the report accurately represents the activities and findings of the CQA program and that the program was implemented according to requirements of the approved CQA plan (Sections 264.20(g)(3) and 265.206(g)(3)). EPA requests comments on whether signatures of the facility owner or operator, CQA officer, and design engineer (if involved) should be included with the documentation as confirmation that each party understood and accepted the areas of responsibility and lines of authority and performed their functions according to the CQA plan.

The CQA report is not intended to present the CQA plan as a guarantee of facility construction and performance. Rather, the primary purpose of this documentation is to improve confidence in the constructed facility through written evidence that the CQA plan was implemented as approved (or as modified) and that the construction proceeded according to design criteria, plans, and specifications.

Permitted units. For construction activities at permitted units, the owner or operator must submit the CQA report to the RA for acceptance before waste is received at the unit. The RA has 30 days to review and approve the CQA report. If the RA does not respond within 30 days, the CQA report does not need to be review and approved before waste is received. When EPA reviews the CQA report and has comments that need to be addressed before the report can be accepted, additional time beyond the 30 days may be required. In this case, the RA can extend the 30-day review period in additional 30-day increments, as needed. If the owner or operator does not respond satisfactorily to the Agency's comments, additional 30-day time periods may be necessary to complete review and approval of the report.

EPA takes the position that restricting the waste receipt before the CQA report is approved will ensure that the implemented CQA plan will comply with the permitting agency requirements. In addition, the Agency believes that the benefits to be derived from a properly executed CQA program will be significant.

Interim status units. For new construction activities at interim status units, the owner or operator is to follow the same CQA report requirements that are described above for permitted units. However, unlike the proposed Part 264 requirements, the proposal for Part 265 does not include a schedule for report submission and review. For Part 265, the owner must provide the completed report to the RA and place a copy in the facility files (Section 265.20(f)).

If a liner and leachate collection and removal system has been installed in good faith compliance with administrative regulations and guidance documents, the LCRS need not be retrofitted when the permit is issued (Section 3015(b) of RCRA). For landfills and surface impoundments, EPA believes that meeting the construction quality assurance requirements in this proposed rule pertaining to double liners and leachate collection systems is evidence of the owner or operator's good-faith.

EPA is aware that the owner or operator may not have developed all the construction information necessary to finalize the CQA report at the completion of construction. This especially may be true when the construction schedule involves the phased construction of a unit (Sections 264.20(a) and 265.20(a)). EPA also recognizes that the design or materials may be updated when long construction periods are involved in completing a unit's construction. This proposal allows phasing of the CQA report for specific segments of a unit, if approved by the RA. As the construction activities for a specified phase are completed, the owner or operator must submit the CQA report to the RA for the completed segment of the unit.

d. Managing of the Construction Quality Assurance Program. Managing the CQA program is an important part of ensuring that the unit meets or exceeds the specified design. The activities for a CQA program can be divided into four parts: (1) development of the CQA plan, (2) approval of the plan by the regulatory agency, (3) implementation of the plan with documentation that demonstrates proper implementation,

and (4) submittal of the CQA report, demonstrating compliance with the plan (applicable to permitted units only). In developing today's rule, EPA considered which individual should be responsible for the CQA program parts.

The Agency is proposing that the development of the CQA plan be conducted by the owner or operator. The Agency proposes this because the facility owner or operator is ultimately responsible for the design, construction, and operation of the hazardous waste land disposal facility and also must comply with the requirements of the regulatory agency in order to obtain a permit. EPA believes that requiring the owner or operator to develop the CQA plan is consistent with the reponsibilities for facility design, construction, and operation.

The second part, approving the CQA plan, requires the regulatory agency to review and approve the CQA plan for consistency with the design specifications and to verify that every element of the CQA program has been taken into account.

The Agency is asking for comments on who should be responsible for documenting that the implementation was properly conducted. Under today's proposal the CQA plan would be implemented by the owner or operator by retaining a registered professional engineer. The Agency is seeking comments regarding the following:

(i) Whether the plan should be implemented by an independent registered professional engineer (should it be an independent third party); and,

(ii) Whether the plan should be implemented by EPA or by an EPA-controlled contractor.

The Agency is proposing that the owner or operator use a registered professional engineer or the equivalent as the appropriate party responsible for implementing the plan. This approach would afford the greatest flexibility to the owner or operator. EPA believes that the use of a registered professional engineer or the equivalent will provide an acceptable level of assurance to EPA that the CQA program was implemented as approved in the plan.

The first alternative approach to today's proposal on which the Agency is seeking comments would require the owner or operator to engage an independent third party to implement the CQA plan. Using a third party would provide more independence in implementing the CQA plan than would the proposal; however, this may result in a greater burden on the owner or operator because of the need for coordination with the third party. This additional coordination may result in more cost and time for construction contractors and owners or operators. EPA is seeking comments about whether the benefits to human health and the environment from this alternative are justified.

The second alternative approach that EPA is considering would have EPA or a CQA contractor reporting directly to EPA implement the CQA plan on every project. This approach potentially could delay each project because of a nationwide network that would need to be developed to manage EPA CQA contractors. Also, this option would result in a need for a significant increase in EPA resources to provide an adequate number of CQA contractors to satisfy the construction schedules for every project and to prevent or minimize construction schedule delays.

EPA believes that by using a registered professional engineer chosen by the owner or operator or the equivalent, there is a balance between the burdens of program implementation and the need for assurance of proper unit construction. EPA also recognizes that most owners or operators currently are selecting the CQA plan to be implemented by an independent third party to implement the CQA plan.

The fourth issue in the CQA program involves who should be responsible for review and acceptance of the CQA report. EPA considered several options in this fourth management area for units regulated through Part 264, as discussed below. There is no provision in today's proposal for the regulatory agency to review and approve the CQA report for facilities regulated through Part 265.

The first option that EPA considered would require the permitting agency to review and approve all CQA reports before allowing the owner or operator to receive waste at the newly constructed unit. Requiring review and approval of all CQA reports could result in prolonged review and approval periods, EPA chose not to use this option.

The second option involves employing an independent registered professional engineer selected by the owner or operator, who would review and approve all CQA documentation and reports before the newly constructed unit may receive wastes. Under this option, the Agency could select certain construction quality assurance reports for review and approval by an independent professional engineer. This option was not selected in today's proposal because EPA believes that if the owner or operator pays for the contractors services the engineer is not sufficiently independent.

A third option would require the owner or operator to state to the permitting agency that the CQA final report, which was prepared and signed by a registered professional engineer, was correct before the unit could receive wastes. This option would not provide EPA with the opportunity to review and approve selected CQA final reports. This option was not selected for today's proposal, because EPA needs that opportunity to review and approve selected CQA documentation reports to verify that plans were implemented properly.

A fourth option, which provides EPA with the choice of reviewing and approving selected CQA final reports for permitted units before waste receipt would be allowed, is presented in today's proposal. This provision does not allow waste receipt until the CQA final report is approved. This option was selected because (1) it was viewed as less burdensome to the owner or operator by allowing the registered professional engineer who implements the CQA plan to prepare and sign the plan; and (2) it gives EPA the opportunity to review and approve selected CQA documented reports. Furthermore, it allows EPA the option of using contracted engineers to conduct the review (in a similar manner to the current review process for Part B permit applications in many regions).

As discussed above, EPA is proposing to select certain CQA final reports for review and approval. Such selection would be random. EPA has several concerns and requests public comments about the following aspects of today's selected approach.

(i) Should the RA be allowed multiple 30-day periods to review and comment on the CQA report submitted by the owner or operator until the RA is satisfied that the plan was implemented as approved?

(ii) During permitting agency review and comment on the CQA documentation report, should the facility be denied waste receipt until the agency is satisfied that the CQA plan was implemented as approved?

(iii) In today's proposal, EPA requires that the CQA officer be a registered professional engineer or the equivalent. However, EPA requests comments on whether it is appropriate to require the CQA officer to be a registered professional engineer or the equivalent. The Agency believes that the CQA officer's responsibilities determine the necessary qualifications. Typically, the responsibilities of a CQA officer include the following:

- Serving as the liaison for the owner or operator, design engineer, or construction contractor personnel and

helping to interpret and clarify construction documents.

- Evaluating construction and monitoring personnel on job requirements.
- Reviewing design drawings and specifications for clarity and completeness.
- Scheduling site monitoring and testing.
- Directing, overseeing, or checking the CQA activities when performing site monitoring and testing.
- Providing CQA reports to the owner or operator on the results of monitoring and testing. This includes:

—Reviewing observation records and test results;
—Advising the owner or operator or the design engineer of work that the CQA officer believes should be corrected, rejected, or uncovered for observation or that may require special testing, inspection, or approval;
—Rejecting defective work and specifying corrective measures when authorized by the owner or design engineer.

EPA also recognizes that, in most States, legislation requires the CQA officer to be a registered professional engineer or the equivalent.

D. Permit Application

Sections 270.17(b), .18(c), and .21(b) of today's proposal amend the existing Part B permit application requirements of Part 270 for surface impoundments, waste piles, and landfills at facilities seeking a RCRA permit. These new provisions require owners and operators of such units to provide descriptive information, including detailed plans and engineering reports on how the double liner, leachate collection and removal, and leak detection system will be designed, constructed, operated and maintained to meet the requirements stipulated in applicable sections of Part 264. Today's proposal also requires owners and operators of these units that pursue a variance from the double liner, leachate collection and removal system, or leak detection system requirements to submit the appropriate detailed plans, and engineering and hydrogeologic reports describing alternative design and operating practices, as well as locational aspects. This information must demonstrate that the requirements for the variance are met. Section 270.20 is amended by adding a new paragraph (i) that requires the owner or operator to provide information required in the response action plan to meet the requirements of Section 264.278(i).

Sections 270.17(c), .18(d), .20(k) and .21(c) of today's proposal require the owner or operator to provide a description of how the leachate detection systems will be inspected to meet the monitoring and inspection requirements in Part 264.

E. Applicability to Hazardous Waste Tank Systems

The Agency is considering making several of the same standards being proposed today applicable to owners and operators of hazardous waste tank systems that use external liners as the means of providing secondary containment for their tank systems. In the July 14, 1986 revised tank system standards, EPA did not envision that tank liner systems would be designed, installed, and operated differently from those liner systems used at surface impoundments, landfills, or waste piles. Therefore, the Agency is evaluating the applicability of today's proposed standards for use in hazardous waste tank system design. The release detection and containment strategy that was established with the promulgation of the July 14, 1986 tank system standards is consistent with the approach described in today's proposal. However, EPA is unsure whether it would be appropriate to apply all of the standards being proposed today to hazardous waste tank systems. The requirements for liners established in the revised tank system standards are essentially performance standards. On the other hand, the standards contained in today's proposal are specific design standards. The Agency believes that certain aspects of today's proposed regulations can be incorporated into the Subpart J hazardous waste tank system standards. Specifically, these are (1) the Construction Quality Assurance (CQA) program of Sections 264.19, 264.20, 265.19, and 265.20 and (2) the design standards for leak detection systems of Sections 264.221(h) and 265.221(g).

The revised hazardous waste tank system standards under Sections 264.191, 264.192, 265.191 and 265.192 require that tank systems be properly designed and installed and so certified by a registered professional engineer or qualified installation inspector. The CQA program being proposed today is, in large part, an elaboration of the tank system performance standards and should enable the certifying engineer/installation inspector to evaluate the design/installation of the tank system more easily. EPA believes that the proposed CQA program is equally as applicable to a hazardous waste tank liner system as to a liner system for a surface impoundment, landfill, or waste pile. We solicit public comment on this matter.

In allowing an owner or operator to use an external liner system as a means of providing secondary containment for a hazardous waste tank system (see Sections 264.193 (d) and (e), 265.193 (d) and (e); 51 FR 25422, July 14, 1986), EPA intended that such a liner and the leak detection system be designed, installed, and operated similar to systems for land-based units such as surface impoundments. EPA thus believes that the standards being proposed today under Sections 264.221(h) and 265.221(g) may also be applicable to hazardous waste tank systems. EPA believes that a leak detection system (referred to as a leachate collection and removal system in this proposal) equivalent to that described for bottom liners in this proposal is also appropriate for hazardous waste tank systems. Presently, the hazardous waste tank system standards require that a release from the primary tank or its ancillary equipment be detected within 24 hours, *or* at the earliest practicable time if the owner or operator can demonstrate to the Regional Administrator that existing detection technologies or site conditions will not allow detection of a release within 24 hours (see Sections 264.193(c)(3) and 265.193(c)(3)). The Agency believes that existing detection technologies or site conditions might, in many cases, not allow the detection, within 24 hours, of releases from primary tank systems that use secondary containment liners similar to those used at land-based units (e.g., surface impoundments). For example, factors such as the rate of the leak, the viscosity of the waste, or the thickness and type of drainage layer could singularly, or in combination, act to retard the time to detection. Thus, EPA is particularly interested in the public's views on whether or not the proposed requirements in Sections 264.221(h)(2) and 265.221(g)(2) are appropriate for hazardous waste tank systems. The provision would require that the leak detection system be capable of detecting a leak of no more than 1 gallon per acre per day (not including liquids absorbed by the leachate collection and removal system) within 1 day after the leak occurs. Although these proposed standards tie this requirement to leakage from the top liner of a mandated two-liner system (top-bottom liner combination) for land-based units, the Agency believes that the shell of a storage/treatment tank may substitute for the top liner. Comments on the applicability of the 1-gallon leak detection limit to tank systems should be made considering any difference between tank systems and land-based

units (i.e., landfills, surface impoundments and waste piles) such as size of unit, liner system design, etc. For example, from a viewpoint of environmental protection, how does the proposed 1 gpad detection standard compare to the existing release detection standard for tank systems (i.e., detection within 24 hours or at the earliest practicable time if the owner or operator can demonstrate to the Regional Administrator that existing detection technologies or site conditions will not allow detection of a release within 24 hours)?

Would the proposed standard be considered more or less stringent than the existing leak detection standards for tank systems? Can the proposed detection standard be appropriately applied to the ancillary equipment (e.g., piping) that is associated with the hazardous waste storage/treatment tank?

The Agency has several options by which to apply these provisions to hazardous waste tank systems. First, this proposal, when promulgated in final form, could, where appropriate, add hazardous waste tank systems to the list of units for which these standards apply or, second, EPA could amend the existing Subpart J standards to include these provisions. Another option is to develop a separate and new proposal to apply these or similar provisions, pending review of public comments, to hazardous waste tank systems. A final option would not involve modifying the provisions applicable to the use of liners in providing secondary containment for tank systems. Rather, EPA could use the design and operating standards contained in today's proposal as a guide in evaluating the adequacy of secondary containment systems employing liners for hazardous waste tank systems.

VI. State Authority

A. Applicability of Rules in Authorized States

Under Section 3006 of RCRA, EPA may authorize qualified States to administer and enforce the RCRA program within the State. (See 40 CFR Part 271 for the standards and requirements for authorization.) Following authorization, EPA retains enforcement authority through Sections 3008, 3013, and 7003 of RCRA, although authorized States have primary enforcement responsibility.

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

In contrast, under Section 3006(g) of RCRA, 42 U.S.C. 6926(g), new requirements and prohibitions imposed by HSWA take effect in authorized States at the same time that they take effect in non-authorized States. EPA is directed to carry out these requirements and prohibitions in authorized States, including the issuance of permits, until the State is granted authorization to do so. While States must still adopt HSWA-related provisions as State law to retain final authorization, HSWA applies in authorized States in the interim.

B. Effect on State Authorization

1. Background

Today's proposal includes the provision to require new and certain existing land disposal units for the treatment, storage or disposal of hazardous waste to utilize an approved leak detection system. Also, in today's proposal, the Agency is requiring double liners and leachate collection and removal systems above and between the liners for new waste piles, and replacements and lateral expansions of existing waste piles in parallel with minimum technology requirements for landfills and surface impoundments.

Today's proposal also requires the installation of double liners and leachate collection and removal systems for significant portions of units at existing hazardous waste landfills, waste piles and surface impoundments. In addition, double liners and leachate collection and removal systems are being proposed for new units, and lateral expansions and replacements of existing units at landfills, waste piles and surface impoundments at facilities permitted before November 8, 1984. Under today's proposal, owners and operators would be required to develop a construction quality assurance program for certain landfills, surface impoundments and waste piles as well as for construction of final covers at land treatment units.

Certain portions of today's rule are promulgated pursuant to provisions added by HSWA. Section 3004(o)(4) of RCRA, as amended by HSWA, mandates promulgation of standards requiring utilization of approved leak detection systems at new landfills, surface impoundments, waste piles and land treatment units that store, treat or dispose of hazardous waste identified or listed under Section 3001.

Under today's proposal, owners or operators of newly constructed landfills, surface impoundments, waste piles and land treatment units must design, construct, operate and maintain a leak detection system that is capable of detecting leakage of hazardous constituents at the earliest practicable time over all areas likely to be exposed to leachate during the active life and post-closure care period of the unit.

To achieve this earliest practicable time detection requirement, the Agency is proposing performance and design criteria along with monitoring requirements for a leachate detection, collection and removal system that is to be located between the liners at newly constructed landfills, surface impoundments and waste piles. To achieve this earliest practicable time detection requirement at land treatment units, the Agency is proposing performance criteria and monitoring requirements. These requirements will augment the existing unsaturated zone monitoring requirements under Part 264 for both new and existing land treatment units.

2. HSWA

Today's rule is proposed pursuant to Section 3004(o) of RCRA, a provision added by HSWA. Therefore, the Agency is proposing to add the requirement to Table 1 in 271.1(j), which identifies the Federal program requirements that are promulgated pursuant to HSWA and take effect in all states, regardless of their authorized status. States may apply for either interim or final authorization for the HSWA provisions identified in Table 1, as discussed in the following section of this preamble.

As noted above, EPA will implement today's rule in authorized States until they modify their programs to adopt these rules and the modification is approved by EPA. Because this rule is proposed pursuant to HSWA, a State submitting a program modification may apply to receive either interim or final authorization under Section 3006(g)(2) or 3006(b), respectively, on the basis of requirements that are substantially equivalent or equivalent to EPA's. The procedures and schedule for State program modifications for either interim or final authorization are described in 40 CFR 271.21. It should be noted that all

HSWA interim authorizations will expire January 1, 1993 (See Section 271.24(c)).

40 CFR 271.21(e)(2) requires that States that have final authorization must modify their programs to reflect Federal program changes, and must subsequently submit the modifications to EPA for approval. The deadlines by which the State must modify its program to adopt this proposed regulation will be determined by the date of promulgation of the final rule in accordance with 271.21(e). These deadlines can be extended in certain cases (40 CFR 271.21(e)(3)). Once EPA approves the modification, the State requirements become Subtitle C RCRA requirements.

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

States that submit their official applications for final authorization less than 12 months after the effective date of these standards are not required to include standards equivalent to these standards in their application. However, the State must modify its program by the deadlines set forth in 271.21(e). States that submit official applications for final authorization 12 months after the effective date of these standards must include standards equivalent to these standards in their application. 40 CFR 271.3 sets forth the requirements a State must meet when submitting its final authorization application.

Listing of HSWA provisions:

40 CFR

260.10
264.15 (b)(1) and (b)(4)
264.117(a)(1)(ii)
264.118 (b)(1), (b)(2)(ii)
264.221 (g), (h), (i) and (j)
264.226 (c)(1), (c)(3)(i), (c)(3)(ii), (d) and (e)
264.228(b)(4)
264.251 (g), (h), (i) and (j)
264.254 (b)(1), (b)(3)(i), (b)(3)(ii), (c) and (d)
264.278 (a), (b)(1), (b)(2) and (d)
264.284 (a)(1), (b) and (c)
264.301 (g), (h), (i) and (j)
264.303 (b)(1), (b)(3)(i), (b)(3)(ii), (c) and (d)
264.310(b)(6)
265.15 (b)(1) and (b)(4)
265.117(a)(1)(ii)
265.118 (c)(1) and (c)(2)(ii)
265.221 (g), (h), (i) and (j)
265.226 (b)(1), (b)(3)(i), (b)(3)(ii) and (c)
265.254 (e), (f), (g) and (h)
265.260 (a)(1), (a)(3)(i), (a)(3)(ii) and (b)
265.278 (a), (b)(1), (b)(2) and (d)
265.284 (a)(1) and (b),
265.301 (g), (h), (i) and (j)
265.303 (a)(1), (a)(3)(i), (a)(3)(ii) and (b)
265.310(b)(5)

3. Non-HSWA

Today's rule also proposes standards that would not be effective in authorized States since the requirement would not be imposed pursuant to the HSWA. Thus, the requirements will be applicable only in those States that do not have interim or final authorization. In authorized States, the requirements will not be applicable until the State revises its program to adopt equivalent requirements under State law.

40 CFR 271.21(e)(2) requires that States that have final authorization must modify their programs to reflect Federal program changes and must subsequently submit the modifications to EPA for approval. The deadline by which the State must modify its program to adopt this proposed regulation will be determined by the date of promulgation of the final rule in accordance with Section 271.21(e). These deadlines can be extended in certain cases (40 CFR 271.21(e)(3)). Once EPA approves the modification, the State requirements become Subtitle C RCRA requirements.

States with authorized RCRA programs may already have requirements similar to those in today's rule. These State regulations have not been assessed against the Federal regulations being proposed today to determine whether they meet the tests for authorization. Thus, a State is not authorized to carry out these requirements in lieu of EPA until the State program modification is submitted to EPA and approved. Of course, States with existing standards may continue to administer and enforce their standards as a matter of State law.

States that submit their official application for final authorization less than 12 months after the effective date of these standards are not required to include standards equivalent to these standards in their application. However, the State must modify its program by the deadlines set forth in Section 271.21(e). States that submit official applications for final authorization 12 months after the effective date of those standards must include standards equivalent to these standards in their application. 40 CFR 271.3 sets forth the requirements a State must meet when submitting its final authorization application.

VII. Regulatory Requirements

A. Executive Order 12291

Executive Order 12291 requires the regulatory impact of potential Agency actions to be evaluated during regulation development. Such an assessment consists of a description of the potential benefits and the potential costs of the rule, including any beneficial and any adverse effects that cannot be quantified in monetary terms.

In addition, Executive Order 12291 requires that regulatory agencies prepare a Regulatory Impact Analysis in connection with major rules. Major rules are defined as those likely to result in (1) an annual effect on the economy of $100 million or more; (2) a major increase in costs or prices for consumers or individual industries; or (3) significant adverse effects on competition, employment, investment, productivity, innovation, or international trade.

1. Estimated Cost of the Proposed Rule

a. General Approach. EPA estimated incremental costs for provisions of the proposed rule which require compliance activities. The incremental cost of each provision was estimated by taking the difference between the cost of complying with the provision and the cost of complying with current regulations (the baseline for measurement).

In projecting both the costs of provisions and the costs of baseline scenarios, EPA developed estimates of affected populations, unit costs of compliance, and aggregate costs of compliance. Estimates of affected populations were based on hazardous waste facilities identified in the Part A data base as of early 1987 that have not lost their interim status. Unit cost of compliance, based on capital costs, operating and maintenance costs, closure costs, and post-closure costs (where appropriate), were developed using EPA's Liner Location and Cost Analysis Model. Both direct and indirect costs were included. Aggregate costs were then obtained by multiplying unit costs by the number of units in the affected population.

EPA used discounted cash flow analysis to convert streams of costs over time to equivalent annual costs over the life of the facility. First, EPA converted cost streams to present values by dividing costs incurred in each year by a discount factor, as follows:

$$PV = \sum_{i=0}^{n} \frac{(costs)}{(1+r)^n}$$

where the real rate of return (r) equals 3 percent and n is the number of periods in which costs are incurred. The cash flows do not include inflation, taxes, or depreciation. As such, the present value costs report the full social costs in real terms.

Second, in order to spread the costs evenly over the life of the facility, EPA annualized the present value costs by multiplying them by a capital recovery factor (CRF):

$$CRF = \frac{r(r+1)^{OL}}{(r+1)^{OL}-1}$$

Where OL is the operating life the facility. EPA assumed a 20-year operating life and a 3 percent real rate of return, which lead to a CRF of 0.0672. The annualized present value represents the annual revenue required to cover the costs imposed by the provision. This value provides a consistent basis for presenting and comparing costs of different provisions. However, it implicitly assumes that facilities can predict future costs and can recover them at a steady rate over the life of the facility.

EPA also estimated unit costs of response action for excessive leakage through the top liner at landfill and surface impoundment units. No aggregate response action costs were developed.

b. Double Liner and Leak Detection System—(1) Landfill Units. The proposed rule would require a leak detection system (LDS) between the double liners of a landfill. The owner or operator would be required to develop a minimum sensitivity value, which is the smallest quantity of liquid that can pass through a breach in the top liner and be detected by the LDS, and calculate the time required for detection of the liquid. The owner or operator would also be required to estimate an action leakage rate or ALR (gal/acre/day) to serve as a trigger for response action and prepare a response action plan (RAP) which would describe responses to be initiated by the owner or operator when leakage through the top liner exceeded the ALR.

In estimating the cost of complying with the LDS provisions, EPA assumed that the number of landfill facilities would remain equal to the current number in the affected population and that each unit would have a 20-year operating life and a 30-year post-closure care period. This simplifying assumption was necessary due to lack of data on the current and future number of new landfill units, replacement units, lateral expansions, and significant portions. It was also assumed that one cell would be opened and closed each year during the 20-year operating life of a unit.

Based on facilities listed in the Part A data base, the affected population was found to incldue 126 landfill facilities each with at least one unit, ranging in size from 500 MT/year to 150,000 MT/year. The affected population and the total incremental costs (above current statutory requirements) of compliance with the LDS provisions are shown in Table 1. EPA estimates that the incremental costs required to comply with the LDS provisions would be approximately $600,000.

(2) Surface Impoundment Units. The proposed rule would require an LDS between the double liners of a surface impoundment. In addition, the owner or operator would be required to develop a minimum sensitivity value, detection time, ALR, and RAP, as described for landfill units.

TABLE 1.—COST OF COMPLIANCE WITH DOUBLE LINER AND LEAK DETECTION SYSTEM PROVISIONS FOR LANDFILL UNITS

[1987 Dollars]

Size	Number of active units	Incremental annualized present value unit cost ($1,000)	Incremental annualized present value total cost ($1,000)
500 mt/yr	48	3.8	182.4
1,000 mt/yr	14	3.8	53.2
2,000 mt/yr	8	3.9	31.2
6,000 mt/yr	20	7.2	144.0
15,000 mt/yr	22	4.2	92.4
35,000 mt/yr	6	4.5	27.0
60,000 mt/yr	2	5.0	10.0
100,000 mt/yr	2	5.4	10.8
150,000 mt/yr	4	5.5	22.0
Total	126		573.0

To estimate the cost of compliance with the LDS provisions, EPA assumed that the number of surface impoundment units would remain equal to the current number in the affected population (except that no new impoundments larger than 15 acres would be constructed) and that each unit would have a 20-year operating life. Based on facilities identified in the Part A data in early 1987 the affected population was found to include 535 surface impoundment units, ranging in size from 0.25 acres to 15 acres. The affected population and the total incremental costs (above current statutory requirements) of compliance with the LDS provisions are shown in Table 2. EPA estimates that the incremental costs of complying with the LDS provisions would be approximately $1,700,000.

(3) Waste Pile Units. The proposed rule would require double liners in waste pile units, with a flexible membrane top liner and a flexible membrane/clay composite bottom liner. A leachate collection system would be required above the top liner, and an LDS would be required between the liners. In addition, the owner or operator would be required to develop a minimum sensitivity value, detection time, ALR, and RAP, as described for landfill units.

TABLE 2.—COST OF COMPLIANCE WITH DOUBLE LINER AND LEAK DETECTION SYSTEM PROVISIONS FOR SURFACE IMPOUNDMENT UNITS

[1987 Dollars]

Size	Number of active units[1]	Incremental annualized present value unit cost ($1,000)	Incremental annualized present value total cost ($1,000)
0.25 AC	216	2.9	626.4
0.50 AC	132	2.9	382.8
1.00 AC	70	3.1	217.0
2.00 AC	75	3.3	247.5
5.00 AC	30	4.6	138.0
15.00 AC	12	7.2	86.4
Total	535		1,697.6

[1] Based on 2.3 impoundments per active facility.

Costs were estimated jointly for the double liner and LDS provisions. It was assumed that facilities meeting minimum technology requirements for the double liner and the leachate collection and removal system between the liners would satisfy requirements for the leak detection system.

In estimating the cost of compliance with the double liner and LDS provisions, EPA assumed that the number of waste pile units would remain the same as the current number and that each unit would have an operating life of 20 years. Based on facilities identified in the Part A data base in early 1987, the affected population was found to include 72 waste pile facilities with at least one ranging in size from 250 cu. ft. to 1,000,000 cu. ft.

The affected population and the total incremental costs (above current statutory requirements) of compliance with the double liner and LDS provisions are shown in Table 3. EPA estimates that the incremental costs of compliance with the double liner would be approximately $800,000.

TABLE 3.—COST OF COMPLIANCE WITH DOUBLE LINER AND LEAK DETECTION SYSTEM PROVISIONS FOR WASTE PILE UNITS

[1987 Dollars]

Size	Number of active units [1]	Incremental annualized present value unit cost ($1,000)	Incremental annualized present value total cost ($1,000)
250 cu. ft	7	4.6	32.2
1,000 cu. ft	15	4.9	73.5
5,000 cu. ft	14	5.8	81.2
25,000 cu. ft	12	7.7	92.4
100,000 cu. ft	11	11.5	126.5
500,000 cu. ft	7	21.8	152.6
1,000,000 cu. ft	6	39.1	234.6
Total	72		793.0

[1] Outdoor (uncovered) waste piles.

c. Construction Quality Assurance—(1) Landfill Units. The proposed rule would require the owner/operator to complete a construction quality assurance (CQA) plan prior to construction, implement the plan during construction, and prepare a report following completion of construction to document CQA activities. CQA would not only be required for the opening and closing of cells during the operating life of the unit but for replacement of cell covers as necessary during the post-closure care period.

To estimate the cost of complying with the CQA provision, EPA assumed that the number of landfill units would remain equal to the current number in the affected population and that each unit would have a 20-year operating life and a 30-year post-closure care period. This assumption was made as a result of the limited data on the current and future number of new units, replacement units, lateral expansions, and significant portions. EPA also assumed that a cell would be opened and closed each year during the 20-year operating life, and that five cell covers would need to be replaced within the 26–30 year post-closure care period.

The affected population, which is the same as for the double liner and LDS provisions, is shown in Table 4. The total incremental costs (above current statutory requirements) of compliance with the CQA provision are also shown. EPA estimates that the incremental costs required to comply with the CQA provision would be approximately $13,400,000.

TABLE 4.—COST OF COMPLIANCE WITH CONSTRUCTION QUALITY ASSURANCE PROVISIONS FOR LANDFILL UNITS

[1987 Dollars]

Size	Number of active units	Incremental annualized present value unit cost ($1,000)	Incremental annualized present value total cost ($1,000)
500 MT/YR	48	102.6	4,924.8
1,000 MT/YR	14	101.7	1,423.8
2,000 MT/YR	8	100.2	801.6
6,000 MT/YR	20	96.4	1,928.0
15,000 MT/YR	22	123.4	2,714.8
35,000 MT/YR	6	113.7	682.2
60,000 MT/YR	2	149.4	298.8
100,000 MT/YR	2	127.4	254.8
150,000 MT/YR	4	104.3	417.2
Total	126		13,446.0

(2) Surface Impoundment Units. The proposed rule would require the owner or operator to prepare a CQA plan, implement the plan during construction, and then document CQA activities. To estimate the cost of complying with the CQA provision, EPA assumed that the number of surface impoundment units would remain equal to the current number in the affected population (except that no new impoundments larger than 15 acres would be constructed) and that each unit would have a 20-year operating life. The affected population and total incremental costs (above current statutory requirements) of compliance with the CQA provision are shown in Table 5. EPA estimates that the total cost would be approximately $2,200,000.

TABLE 5.—COST OF COMPLIANCE WITH CONSTRUCTION QUALITY ASSURANCE PROVISIONS FOR SURFACE IMPOUNDMENT UNITS

[1987 Dollars]

Size	Number of active units [1]	Incremental annualized present value unit cost ($1,000)	Incremental annualized present value total cost ($1,000)
0.25 AC	89	10.1	898.9
0.50 AC	54	10.0	540.0
1.00 AC	29	9.7	281.3
2.00 AC	31	9.1	282.1
5.00 AC	12	9.9	118.8
15.00 AC	5	11.1	55.5
Total	220		2,176.6

[1] Based on 2.3 impoundments per active facility. It was assumed that only disposal surface impoundments (41 percent of total active impoundments) would require CQA for cover installation.

(3) Waste Pile Units. The proposed rule would require the owner or operator to prepare a CQA plan, implement the plan during construction, and then document CQA activities. In estimating the cost of compliance with the CQA provision, EPA assumed that the number of waste pile units would remain equal to the current number in the affected population and that each unit would have a 20-year operating life. The affected population and total incremental costs (above current statutory requirements) of compliance with the CQA provision are shown in Table 6. EPA estimates that the incremental costs of compliance with the CQA provision would be approximately $600,000

TABLE 6.—COST OF COMPLIANCE WITH CONSTRUCTION QUALITY ASSURANCE PROVISIONS FOR WASTE PILE UNITS

[1987 dollars]

Size	Number of active units [1]	Incremental annualized present value unit cost ($1,000)	Incremental annualized present value total cost ($1,000)
250 cu. ft	7	8.1	56.7
1,000 cu. ft	15	8.0	120.0
5,000 cu. ft	14	8.0	112.0
25,000 cu. ft	12	7.9	94.8
100,000 cu. ft	11	7.9	86.9
500,000 cu. ft	7	7.5	52.5
1,000,000 cu. ft	6	7.2	43.2
Total	72		566.1

[1] Outdoor (uncovered) waste piles.

(4) Land Treatment Units. The proposed rule would require the owner or operator to prepare a CQA plan, implement the plan during construction, and then document CQA activities. These CQA activities would be required only during the construction of the final vegetative cover on the unit. In estimating the cost of compliance with the CQA provision, EPA assumed that the number of land treatment units would remain equal to the current number in the affected population and that each unit would have a 20-year operating life. The affected population and total incremental costs of compliance are shown in Table 7. EPA estimates that the total cost would be approximately $500,000.

TABLE 7.—COST OF COMPLIANCE WITH CONSTRUCTION QUALITY ASSURANCE PROVISIONS FOR LAND TREATMENT UNITS

[1987 dollars]

Size	Number of active units	Incremental annualized present value unit cost ($1,000)	Incremental annualized present value total cost ($1,000)
2.0 AC	8	4.7	37.6
5.0 AC	11	4.7	51.7
12.0 AC	15	5.9	88.5
35.0 AC	17	7.1	120.7
60.0 AC	13	7.7	100.1
200.0 AC	7	12.4	86.8
Total	71		485.4

d. Total Incremental Costs of the LDS, CQA, and Double Liner. The total costs of the LDS, CQA, and double liner provisions are shown in Table 8 for landfills, surface impoundments, waste piles, and land treatment units of different sizes. The total incremental cost of the provisions would be approximately $3,000,000 for the LDS and double liner and $16,600,000 for CQA, for a total of $19,600,000.

TABLE 8.—TOTAL COST OF COMPLIANCE WITH DOUBLE LINER, LEAK DETECTION SYSTEM, AND CONSTRUCTION QUALITY ASSURANCE PROVISIONS

[Incremental annualized present value cost in 1987 dollars]

Facility type	Liner/LDS ($1,000)	CQA ($1,000)	Total ($1,000) [1]
Landfill	573.0	13,446.0	13,905.2
Surface impoundment	1,697.6	2,176.6	3,874.7
Waste pile	793.0	566.1	1,352.9
Land treatment	—	485.4	485.4
Total	3,063.6	16,674.1	19,618.2

[1] Raw totals may be off slightly due to roundoff error in calculations.

e. Response Action Costs. Response action costs are the costs, incurred by the owner or operator of a landfill, surface impoundment, or waste pile, responding to excessive leakage through the top liner of a unit. As discussed under the LDS provisions above, the proposed rule would require the owner or operator to establish an action leakage rate (ALR) to serve as a trigger for initiating interaction between the owner or operator and EPA, to determine the appropriate response action for the leakage. The owner or operator would also be required to prepare a response action plan (RAP) as a means to implement the appropriate response action for leakage rates in excess of the ALR on a site-specific basis.

EPA used the Liner Location and Cost Analysis Model to gauge the frequency and magnitude of potential releases from landfills, surface impoundments, and waste piles. Modeling results indicated that leakage through the top liner during the operating life or post-closure care period that the ALR (20 gal/acre/day) should be very unlikely to occur, assuming that the units complied with all applicable provisions of the proposed rule. However, EPA presents the unit costs of responding to a leakage rate exceeding the ALR.

For a leak slightly larger than the ALR (100 gal/acre/day) EPA assumed that the appropriate response would be to increase pumping and monitoring. The cost of this increased pumping and monitoring would be insignificant.

For a leak substantially larger than the ALR (2,000 gal/acre/day) the appropriate response would depend on the type of facility which was leaking. In the case of landfills, the response was assumed to involve increased leachate collection in the primary LCRS, location of the general area of the leak (using the LDS), and installation of an intermediate flexible membrane barrier over the leaking area. Operational changes, such as use of daily cover and grading of the waste surface, would act to reduce water infiltration into the landfill. In addition, there would be early closure of the leaking area within a few months and a resulting loss of disposal capacity. EPA estimated the cost of this reponse to be approximately $600,000 in the case of a one-acre area.

In the case of surface impoundment, EPA assumed that the response to a large leak would require draining the unit into a redundant unit at the facility, removal and disposal of sludge from the bottom of the impoundment, and installation of a new flexible membrane liner over the existing top liner. The estimated cost for a five-acre impoundment would be $500,000.

For waste piles, EPA assumed that response action for a large leak would include location of the general area of the leak (using the LDS), removal of waste from the leaking area and placement on another part of the pile, and installation of a new section of flexible membrane liner over the existing top liner. The estimated cost to repair a one-acre area would be approximately $250,000.

2. Impacts on Small Business. For purposes of this analysis, EPA used Small Business Administration (SBA) criteria for defining small businesses. SBA regulations established size standards in terms of either maximum number of employees or maximum revenues, and vary the cutoff by 4-digit SIC code. For this analysis EPA used the SBA definitions for small businesses for each 4-digit SIC code with the number of employees as the primary method of delineating small businesses, except for those industries where the SBA defined small businesses by total revenues. Although size standards vary within industry sectors, in general, small firms in the manufacturing industries (SIC codes 2000–3999) are defined according to number of employees. Service and trade industries are usually defined

according to maximum revenue, with limits ranging from less than $3.5 million to $13.5 million in sales.

Using these definitions EPA evaluated the impact of today's rule on small businesses using regulation-induced business closures as the key indicator of regulatory impact. This test assumes that firms will spend up to 3 percent of total assets per year to meet regulatory requirements; any cost greater than 3 percent of total assets will result in forced closures. EPA also considered a second impact measure that compares the increased annual compliance costs to total production costs with 5 percent as the threshold for significance. Using these tests EPA has determined that the regulatory costs associated with the rule will not have a significant impact on a substantial number of small entities.

3. Benefits. EPA also evaluated the benefits of today's rule. EPA measured benefits in terms of reduction in human health risk. For purposes of this analysis, EPA evaluated the benefits of the proposal by comparing the risk that could result from an unlined hazardous waste landfill or surface impoundment to the reduced risks at these units that are attributed to a properly installed double liner and a leachate detection and collection system (as proposed today and in the proposed double liner and leachate collection rules of March 28, 1986).

EPA systematically evaluated this risk reduction using the Liner Location Model. This model is a composite of several submodels that act in concert to estimate the impacts from hazardous waste management/disposal practices. The model stochastically simulates the performance of the land disposal unit, using the best available data to describe the frequency of occurrence of individual failure events. The model uses an extensive set of generic climatic and hydrogeologic settings to simulate leachate release, subsurface transport, and constituent concentrations in ground water at specified distances from the disposal unit.

The model has several simplifying assumptions that should be understood so that its results can be interpreted properly. An important assumption that is typically used in analytical ground-water models is that the aquifer is homogeneous and isotropic. Under this assumption, plumes develop in a steady, symmetric manner, diluting with distance and time. In reality, however, homogeneous and isotropic conditions are rarely encountered in the real world, where structural, stratigraphic, and lithologic properties of aquifers create varying degrees of anisotropy and heterogeneities which are important determinants of ground-water flow. The discrepancies between model assumptions and actual conditions can cause models to underpredict or overpredict the rate at which contaminants are transported in the subsurface and the concentrations of constituents over space and time. For more information about the underlying assumptions and limitations of the model, refer to the "Liner Location Risk and Cost Analysis Model, Draft Phase II Report," March 1986 in the docket established for today's rule.

The results of the modeling analysis are not intended to be the final work on the risk reduction capabilities of the requirements proposed today, but rather a first attempt at an objective and systematic analysis. Due to the inherent limitations of analytic ground-water models used in generic analyses, combined with a limited data set and simplifying assumptions, the results presented below cannot be fully evaluated for their validity or representativeness. Therefore, the quantitative results should not be viewed as reflecting, in an absolute sense, an accurate and precise representation of the risk reduction capabilities of the technical strategies employed by today's proposed rule.

The basic approach to analyze the benefits of the requirements in today's proposal was to simulate risks under two scenarios: without liner controls, and with properly installed (using construction quality assurance) double liner and leachate detection and collection system controls. EPA evaluated the risk under each of these scenarios using information on the waste and locations from 55 hazardous waste facilities with landfills and surface impoundments. This sample of facilities comprises slightly over 10 percent of the approximately 500 operating land disposal facilities. For purposes of the analysis, the modeling assumed that the facilities operate for 20 years under both scenarios, and have a 30-year post-closure care period.

The analysis indicated that about two-thirds of the facilities included in the analysis have baseline risks that are less than 10^{-6}; one-third have risks that exceed 10^{-6} and are as high as 10^{-1} in the baseline. The effect of the proposed liner, leak detection, and construction quality assurance requirements is to reduce the risk by over an order of magnitude, such that less than one-fifth of the facilities have risks exceeding 10^{-6}.

The analysis further indicated that the technical design behind these proposed liner, leak detection, and construction quality assurance requirements is more effective for surface impoundments than for landfills. For landfills, a properly installed double liner and leachate collection system, together with a final cover placed at closure, substantially reduces release during the operating life and post-closure care period (assumed to be 50 years). However, for landfills, these technologies do not effectively reduce the longer term (400 year) risk because they do not significantly reduce the pollutant mass released from the unit. As a result, the leachate will not likely form and be released from the landfill until after post-closure, when the cap and leachate collection system begin to fail.

Despite the findings that the double liner, leachate collection, leak detection system and construction quality assurance requirements do not significantly reduce longer term risk (unless very long-term post-closure care were implemented), the extra years of containment should reduce the mass of those pollutants that degrade in the landfill environment.

Like landfills, properly installed double liner and leachate collection and detection systems at surface impoundments delay release, but unlike landfills, at impoundments they are also effective in reducing long-term risk. The analysis indicates that these requirements are effective in reducing the risk at almost two-thirds of the surface impoundments with risk when uncontrolled. Moreover, these requirements reduce the risk below 10^{-6} at half of the units with risk when uncontrolled.

The risk reduction capabilities at surface impoundments are attributable to the effectiveness in controlling releases during the operating life of the unit. The large hydraulic head that exists during the operating life results in extremely high releases from unlined units during this period, causing dissolved constituents to be released to the unsaturated zone at relatively high rates. The rapid initial release is virtually eliminated by a properly installed double liner and leachate detection collection system, causing the dissolved constituents to be retained in the impoundment. At closure, all liquids and dissolved constituents are removed; thus the total quantity of constituents released is substantially reduced.

B. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) of 1980 (Pub. L. 96-354), 5 U.S.C. 601 et seq., which amends the Administrative Procedures Act, required Federal regulatory agencies to consider small entities throughout the regulatory

process. The purpose of the RFA is to describe the effects the regulations will have on small entities and to examine alternatives that may reduce these effects. EPA has determined that today's proposed rule will not have a significant impact on a substantial number of small entities. EPA expects smaller firms to face larger costs per unit of production than large firms as a result of the regulation but expects both small and large firms to recover these costs in the market place. The competitive effects of this regulation on small entities, therefore, are not significant. A more detailed discussion of the impact of today's proposal may have on small firms is contained in the previous section concerning Executive Order 12291.

C. Paperwork Reduction Act

The information collection requirements of this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act*, 44 U.S.C. 3501 et seq. An information Collection Request document has been prepared by EPA (ICR No. 995 Amended) and a copy may be obtained from Rick Westlund, Information Policy Branch; EPA; 401 M St. SW. (PM-223); Washington, DC 20460 or by calling (202) 382-2745. Submit comments on these requirements to EPA and: Office of Information and Regulatory Affairs; OMB; 726 Jackson Place NW.; Washington, DC 20503 marked "Attention: Desk Officer for EPA." The final rule will respond to any OMB or public comments on the information collection requirements.

VIII. Supporting Documents

In preparing this proposal, the Agency has used many sources of data and information, the most significant of which are listed below. They have been placed in the rulemaking docket at the U.S. Environmental Protection Agency, EPA RCRA Docket (Sub-basement), 401 M Street SW., Washington, DC 20460. The docket is open from 9:30 AM to 3:30 PM, Monday through Friday, except on Federal holidays. The public must make an appointment to review docket materials by calling Michelle Lee at (202) 475-9327.

The major sources of information are the following, which are available for viewing only at the EPA RCRA Docket:

Background Documents

U.S. EPA, "Liner and Leak Detection Rule Background Document," Draft, prepared by GeoServices, Inc., May 1987.

U.S. EPA, "Bottom Liner Performance in Double-Lined Landfills and Surface Impoundments," Draft, prepared by GeoServices, Inc., April 1987.

Regulatory Impact Analyses

U.S. EPA, "Engineering Costs Documentation for Baseline and Proposed Double Liner Rule, Leak Detection System Rule, and CQA Program Costs for Landfills, Surface Impoundments, Waste Piles, and Land Treatment," Draft, prepared by Pope-Reid Associates, Inc., April 1987.

List of Subjects

40 CFR Part 260

Administrative practice and procedure, Confidential business information, Hazardous waste.

40 CFR Part 264

Hazardous waste, Insurance, Packaging and containers, Reporting and recordkeeping requirements, Security measures, Surety bonds.

40 CFR Part 265

Hazardous waste, Insurance, Packaging and containers, Reporting and recordkeeping requirements, Security measures, Surety bonds, Water supply.

40 CFR Part 270

Administrative practice and procedure, Confidential business information, Hazardous materials transportation, Hazardous waste, Reporting and recordkeeping requirements, Water pollution control, Water supply.

40 CFR Part 271

Administrative practice and procedure, Confidential business information, Hazardous materials transportation, Hazardous waste, Indian lands, Intergovernmental relations, Penalties, Reporting and recordkeeping requirements, Water pollution control, Water supply.

Dated: May 13, 1987.

Lee M. Thomas,

Administrator.

For the reasons given in the preamble, Parts 260, 264, 265, 270 and 271 of Chapter I of Title 40 of the Code of Federal Regulations are proposed for amendment as follows:

PART 260—HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

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

Authority: Sections 1006, 2002(a), 3001 through 3007, 3010, 3014, 3015, 3017, 3018, 3019 and 7004, of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912(a), 6921 through 6927, 6930, 6934, 6935, 6937, 6938, 6939 and 6974).

2. Section 260.10 is amended by adding the following definitions in alphabetical order:

§ 260.10 Definitions.

* * * * *

"Leakage" means, in the case of landfills, surface impoundments, or waste piles used for treatment, storage, or disposal, any liquids that flow through a liner as a liquid.

* * * * *

"Replacement unit", means a unit (1) that is taken out of service (i.e., the unit has stopped receiving waste, or the "normal" rate of waste receipt is significantly decreased), (2) where all or substantially all of the waste is removed, and (3) the unit is reused (i.e., the unit is used to treat, store, or dispose of *hazardous* waste). Replacement does not apply to a unit where waste is removed for treatment, followed by placement of the treated waste from the unit in the same unit as part of closure or post-closure care activities of the unit.

* * * * *

"Significant portion of an existing unit that has not received wastes" means any unlined area of a unit that has not received waste and, if double lined before receiving waste, would significantly reduce the potential for migration of hazardous constituents out of the unit thereby reducing the potential for ground water and surface water contamination.

* * * * *

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

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

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

2. Section 264.15 is amended by revising paragraphs (b)(1) and (b)(4) to read as follows:

§ 264.15 General inspection requirements.

* * * * *

(b)(1) The owner or operator must develop and follow a written schedule for inspecting all monitoring and leak detection equipment, safety and emergency equipment, security devices,

and operating and structural equipment (such as dikes and sump pumps) that are important to preventing, detecting, or responding to environmental or human health hazards.

* * * * *

(4) The frequency of inspection may vary for the items on the schedule. However, it should be based on the rate of possible deterioration of the equipment and the probability of an environmental or human health incident if the deterioration or malfunction or any operator error goes undetected between inspections. Areas subject to spills, such as loading and unloading areas, must be inspected daily when in use. At a minimum, the inspection schedule must include the items and frequencies called for in §§ 264.174, 264.194, 264.226, 264.254, 264.278, 264.303 and 264.347, where applicable.

* * * * *

3. Subpart B is amended by adding §§ 264.19 and 264.20.

§ 264.19 Construction quality assurance program: Objective.

(a) A construction quality assurance program is required for all landfills, surface impoundments, and waste piles to ensure, to a reasonable degree of certainty, that a completed unit or portion of a unit meets or exceeds all design criteria, plans, and specifications required in the permit. Land treatment units must have a construction quality assurance program to ensure, to a reasonable degree of certainty, that a completed unit or portion of a unit meets or exceeds all design criteria, plans, and specifications for construction of a cover over the closed portion of the unit, where applicable under § 264.280.

(b) The construction quality assurance program must address the following physical components of a landfill, surface impoundment, or waste pile, where applicable:

(1) Foundations;

(2) Dikes;

(3) Low-permeability soil liners;

(4) Flexible membrane liners;

(5) Leachate collection systems (includes leak detection systems); and

(6) Final cover systems.

§ 264.20 Construction quality assurance program: Elements of the program.

(a) The owner or operator of a new landfill, surface impoundment, waste pile, or land treatment unit, or a lateral expansion or replacement of an existing landfill, surface impoundment, waste pile, or land treatment unit of an existing unit and for which construction commences later than 12 months after promulgation of this rule, must have a written construction quality assurance plan. The owner or operator of an existing unit for which construction commences on a portion of the unit later than 12 months after promulgation of this rule must also have a written construction quality assurance plan for any component of that portion listed under § 264.19(b). The construction quality assurance plan must be developed, implemented, and documented under the direction of a construction quality assurance officer who is a registered professional engineer and is responsible for all aspects of the construction quality assurance program. The plan must be submitted with the permit application or as a permit modification in accordance with § 270.41 and approved by the Regional Administrator as part of the permit issuance or modification proceeding under Part 124 of this chapter. Approval by the Regional Administrator will assure that an approved construction quality assurance plan is consistent with § 264.19 and the applicable requirements of Subparts K, L, M, and N of this Part. The Regional Administrator may allow the construction quality assurance plan to be submitted and approved in phases based on a demonstration by the owner or operator that detailed construction specifications are not practicable at the time that the plan is initially submitted, due to the planned phased construction of the unit over an extended time period. If the Regional Administrator allows for phasing the submission of the construction quality assurance plan, a phased time schedule will be specified in the permit. A copy of the approved plan and all revisions to the plan must be kept by the owner or operator as part of the operating record required under § 264.73 until closure, and must be available for inspection by the Regional Administrator until the post-closure care period is completed and certified in accordance with § 264.117. The plan must identify steps necessary to monitor and document the quality of materials used and the condition and manner of their placement. The specific content of the construction quality assurance plan will depend on site-specific factors. The construction quality assurance plan must include at least the following information:

(1) General description of the units—Plans for the design, construction, operation, and closure of the unit(s) must be discussed. The description must identify the construction stages for the components at the unit(s);

(2) Responsibility and authority—A detailed description of the responsibility and authority of all organizations and key personnel positions involved in the development, implementation, and documentation of the construction quality assurance program must be provided. The description must assure that the objective of the construction quality assurance program identified in § 264.19(a) will be met;

(3) Construction quality assurance personnel qualifications— The qualifications of the construction quality assurance officer and supporting inspection personnel must be described in the contruction quality assurance plan. The position descriptions must demonstrate that the personnel will possess the training and experience necessary to fulfill their identified responsibilities;

(4) Inspection and sampling activities—The observations and tests that will be used to ensure that the materials and the constructed components meet the design specifications must be described. The description of the inspection and testing activities must be in sufficient detail to allow for review of both the conceptual approach and the specifics of title activities. The following areas must be included:

(i) Sampling and inspection activities for all constructed components;

(ii) Sample size and sample locations;

(iii) Frequency of testing;

(iv) Data evaluation procedures;

(v) Acceptance and rejection criteria; and

(vi) Plans for implementing corrective measures as addressed in the project specifications.

(5) Documentation of construction quality assurance activities—At the time of submittal of the construction quality assurance plan, a report outline is required that describes how the results of the construction quality assurance program activities for each constructed component will be documented.

(b) The owner or operator must describe in detail in the construction quality assurance plan how the components and materials used for their construction on-site will be inspected before, during, and after construction to comply with the following:

(1) For construction of foundations, the construction quality assurance program must:

(i) Ensure structurally stable subgrades for the overlying facility components as specified in the design specifications;

(ii) Ensure necessary strength, as specified in the design specifications, for resistance to settlement, compression, and uplift resulting from internal or external pressure gradients; and

(iii) Provide descriptions of the following inspection activities:

(A) Measurements of the depth and slope of the excavation to ensure that it meets design requirements;

(B) Observations to ensure proper placement of any recessed areas for pipes and other materials used for leak detection, leachate collection, and removal;

(C) Tests and observations to ensure that all characteristics of the compacted soil meet design specifications; and

(D) Observations of stripping and excavation to ensure that all soft, organic, and otherwise undesirable materials are removed.

(2) For dikes, the construction quality assurance program must:

(i) Ensure structural strength, as specified in the design;

(ii) Ensure stable support for the overlying facility components as specified in the design; and

(iii) Provide descriptions of the following inspection activities:

(A) Verification of material quality;

(B) Construction and use of a test fill to verify the specified density/moisture content/compactive effort/strength relationship for field conditions and construction equipment as needed to support the design specifications when field data on this relationship are not available;

(C) Measurement of loose lift thickness;

(D) Observation of clod size reduction and material homogenization operations, if applicable;

(E) Observation of type of compaction equipment, number of passes, and uniformity of compaction coverage;

(F) Testing of the compacted fill density; and

(G) Observation of proper placement of the vegetation layer on the dike surface.

(3) For low-permeability compacted soil liners, the construction quality assurance program must:

(i) Ensure inspection for imperfections including deleterious material, off-specification material, cracks, channels, structural and hydraulic non-uniformities, and any other conditions that may cause an increase in the permeability of the liner;

(ii) Ensure the installed material is the same as was evaluated for chemical resistance under §§ 264.221(a)(1), 264.251(a)(1)(i), 264.301(a)(1)(i), and any other material specifications;

(iii) Ensure that the liner has an installed permeability that meets the permit requirements.

(A) A test fill must be constructed to verify that the constructed liner complies with permit requirements for field permeability. The test fill compaction and testing must be well documented, and soil materials, procedures, and equipment used in the test fill construction and testing must be the same as those to be used during construction of the full-scale unit. The owner or operator must describe observations and tests to be used on the test fill, including a description of the testing sample arrays and replications to be conducted. The Regional Administrator will review for completeness the owner and operator's plan for the design and evaluation of the test fill to ensure that the evaluation conditions will accurately represent the performance of the full-scale unit.

(B) Based on the parameters evaluated and data collected from the test fill, the owner or operator must justify that the tests applied to the full-scale facility liner serve as surrogates for actual field permeability tests. The surrogate tests are a group of tests that do not actually measure field permeability but whose results, when considered together, can be used to estimate field permeability and, hence, can be used to assure the proper permeability of the installed liner in all areas.

(C) The Regional Administrator may approve an alternative approach to test fill construction and testing for demonstrating that the low-permeability soil liner meets the installed permeability requirement of the unit as required by the permit; and

(iv) Provide descriptions of the following inspection activities:

(A) Observation of the removal of roots, rocks, rubbish, or off-specification soil from the liner material;

(B) Identification of variations in soil characteristics that require a change in construction specifications;

(C) Observation of the spreading of liner material to obtain complete coverage and the specified loose lift thickness;

(D) Observation of the reduction of clod size to meet liner material specifications;

(E) Observation of the spreading and incorporation of soil amendments (if specified) to obtain uniform distribution of the specified amount in the liner material;

(F) Observation of the spreading and incorporation of water to obtain full penetration through clods and uniform distribution of the specified moisture content;

(G) Observation of the use of procedures, as specified in the construction quality assurance plan, for adjusting the soil moisture content in the event of a significant period of prolonged rain during construction;

(H) Observing and testing to ensure that significant water loss before and after compaction is prevented; and

(I) Observing and testing the soil liner compaction process to ensure that the compactive effort specifications are met.

(4) For flexible membrane liners, the construction quality assurance program must:

(i) Ensure tight seams and specified structural strength of the seams and joints, and the absence of tears, punctures, or other breaches. The field seams must be visually checked throughout their length and width and must also be destructively tested on a spot basis. The Regional Administrator will review for completeness the owner or operator's inspection and testing approach for destructive seam testing;

(ii) Ensure that the liner polymer material properties are the same as were evaluated for chemical resistance under §§ 264.221(a)(1), 264.251(a)(1)(i), or 264.301(a)(1)(i), and any other material specifications;

(iii) Include certification that adequate quality control was practiced during the manufacturing of the flexible membrane liner at the fabrication plant; and

(iv) Provide descriptions of the following inspection activities:

(A) Inspection of the liner material after it is received at the facility and before installation to confirm that it is the material specified in the design and is not damaged;

(B) Inspection of the liner material after storage at the facility to ensure that it is not damaged;

(C) Testing and observation of placement of the lower bedding layer to ensure that design requirements are met;

(D) Observation of placement of the flexible membrane liner to ensure that design requirements are met;

(E) Observation of any damage to the liner that may occur as a result of adverse weather conditions, inadequate temporary anchoring, or rough handling;

(F) Observation of the overlapping of flexible membrane liner sheets to ensure that off-specification seams do not result; and

(G) Observation and testing of seams to ensure proper seaming and conformance to the seam strength specified in the design.

(5) For leachate collection systems (above and between the liners, where required) the construction quality assurance program must:

(i) Ensure that material properties comply with the design criteria, plans, and specifications;

(ii) Ensure the materials are the same as were evaluated for chemical resistance under §§ 264.221(c)(3)(i), 264.251(a)(2)(i)(A), 264.251(c)(5)(i), 264.301(a)(2)(i)(A), or 264.301(c)(5)(i);

(iii) Provide descriptions of the following inspection activities:

(A) Observations and measurements to ensure that the pipes are placed at locations and in configurations specified in the design;

(B) Observations and tests to ensure that pipe grades are as specified in the design;

(C) Observations and tests to ensure that all pipes are joined together as specified in the design;

(D) Observations to ensure that the placement of any filter materials around the pipe meet the specifications in the design;

(E) Observations and tests to ensure that backfilling and compaction are completed as specified in the design and that, in the process, the pipe network is not damaged;

(F) Observations and tests to ensure that the drainage layer material is of the particle size as specified in the design and free from excessive amounts of fines or organic materials;

(G) Observations and tests to ensure that the thickness and coverage of the drainage layer complies with the design specifications,

(H) Survey of the drainage layer to ensure that grades are obtained as specified in the design;

(I) Observation of construction procedures to prevent the transport of fines by runoff into the leachate collection system;

(J) Observations to ensure that all synthetic drainage layer or geotextile materials are placed according to the placement plan;

(K) Measurements to ensure that the overlap of all synthetic drainage layer or geotextile material as specified in the design is achieved;

(L) Observations to ensure that the synthetic drainage layer or geotextile materials are free from excessive wrinkles and folds;

(M) Observations to ensure that weather conditions are appropriate for placement of the synthetic drainage layer or geotextile materials and that exposure to rain, wind, and direct sunlight during and after installation is in compliance with the manufacturer's recommendations;

(N) Inspection of filter layer placement to ensure that the design specifications, including material specifications, placement procedures, and thickness are met; and

(O) Inspection and testing of the sump, leachate removal and detection equipment, and any other associated equipment or structures to ensure that the design specifications, including material and equipment specifications, coating specifications, and mechanical and electrical equipment installation specifications, are met.

(6) For final cover, the construction quality assurance program must:

(i) Ensure all layers of the cover are inspected for uniformity, imperfections, and damage;

(ii) Ensure that the materials for each layer are as specified in the design material specifications;

(iii) Ensure each layer of the final cover is installed or constructed to meet the requirements specified in the design; and

(iv) Provide descriptions of the following inspection activities. (Some of these activities may not be appropriate for all land treatment unit covers; inspection activities for land treatment unit covers must also be based on the applicable requirements of § 264.280.) The Regional Administrator will review the owner or operator's planned inspection activities for completeness to ensure that the completed final cover will meet the design specifications.

(A) Procedures and methods consistent with those under § 264.20(b)(3) for observing and testing the installation of any low-permeability compacted soil layer to ensure that the design specifications are met;

(B) Procedures and methods consistent with those under § 264.20(b)(4) for observing and testing the installation of any flexible membrane layer to ensure the design specifications are met; and

(C) Procedures and methods for observing and testing other layers of the final cover (e.g., drainage and vegetative layer) to ensure that the design specifications are met. These activities must include inspection of the completed cover slope, vegetation, and drainage conduits to ensure that they meet the specified design.

(c) The Regional Administrator may specify in the permit specific additional procedures and methods for observing and testing the construction of components under §§ 264.20(b) (1), (2), (3), (4), (5), and (6) to ensure that the completed unit meets or exceeds all design criteria, plans, and specifications.

(d) The owner or operator will be exempted from any part of the requirements of paragraph (b) of this section if the Regional Administrator finds, based on a demonstration by the owner or operator, that alternative inspection practices, observations, or tests will ensure that the completed component meets or exceeds all design criteria, plans, and specifications.

(e) The owner or operator may request that the Regional Administrator amend his construction quality assurance plan at any time before and during the active life of the facility.

(1) The CQA officer may make some changes to the approved CQA plan under § 264.20(a) without seeking and receiving prior approval from the Regional Administrator. Changes which do not require Regional Administrator approval are limited to instances where the CQA officer certifies in the operating record that the revised CQA plan will provide equivalent or better certainty that the constructed component meets the design-specifications. Within seven days of modifying the CQA plan approved under § 264.20(a), the owner or operator must amend the operating record to include the revised CQA plan and certification.

(2) Changes other than those specified in paragraph (e)(1) of this section, must be submitted to the Regional Administrator and approved by the Regional Administrator prior to construction in accordance with the permit modification procedures in § 270.41. The owner or operator must submit a written request for a permit modification including a copy of the amended CQA plan prior to any construction relating to the amended area of the CQA plan at least 30 days prior to the proposed change in the facility construction. The Regional Administrator will approve, disapprove, or modify this amended plan in accordance with the procedures in Parts 124 and 270. In accordance with § 270.32 of this chapter, the approved CQA plan will become a condition of any RCRA permit issued.

(f) The owner or operator must notify the Regional Administrator at least 180 days prior to the date he expects to begin construction of the final cover. The notification must include the following:

(1) Schedule of major activities; and

(2) Supplemental information required in the construction quality assurance plan that was not previously included.

(g) Upon completion of construction of facility components listed under § 264.19(b), the owner or operator must submit a construction quality assurance report in writing to the Regional Administrator demonstrating compliance with the construction quality assurance plan. The owner or operator must submit this report before waste is received, except in the case of construction of the final cover. For the final cover, the report must be submitted

to the Regional Administrator within 60 days after cover construction is completed. Submission of the report may be phased, if approved by the Regional Administrator in the permit, to facilitate the permitting process or allow the phased construction of a unit. The construction quality assurance report must include at least the following:

(1) Summaries of all construction and material inspection activities to include:

(i) Observations;

(ii) Test data sheets;

(iii) Problem reports;

(iv) Repair activities;

(v) Deviations from the design and material specifications;

(vi) Design engineer acceptance reports (for errors, inconsistencies, and other problems);

(vii) As built drawings; and

(viii) Block evaluation reports for large projects.

(2) Summary discussion for each applicable component under § 264.19(b) that describes the major construction quality assurance inspection activities, detailing how the results demonstrate that the constructed unit meets or exceeds all design criteria, plans, and specifications. Summary tables, charts, and graphs must be used, where appropriate, to document implementation of the construction quality assurance program.

(3) Certification by the qualified registered professional engineer in charge of the construction quality assurance program, that the report accurately represents the activities and findings of the construction quality assurance program and that the program was implemented in accordance with all requirements of the approved construction quality assurance plan.

(h) The Regional Administrator will review the construction quality assurance documentation report required under paragraph (g) of this section and notify the owner or operator in writing whether it is accepted. If the Regional Administrator takes no action within 30 days from receipt of the construction quality assurance report, the owner or operator may receive waste. The Regional Administrator may notify the owner or operator that he does not intend to review the construction quality assurance report at this time. The Regional Administrator may extend the 30-day review period in order to request additional information on the implementation and documentation of the construction quality assurance program, or to complete an ongoing evaluation of the report; if such an extension is necessary, the Regional Administrator will notify the owner or operator in writing.

4. Section 264.73 is amended by revising paragraph (b)(6) to read as follows:

§ 264.73 Operating record.

* * * * *

(b) * * *

(6) Monitoring. testing, or analytical data where required by Subpart F and §§ 264.222, 264.226, 264.252, 264.254, 264.276, 264.278, 264.280, 264.302, 264.303, 264.309, and 264.347;

* * * * *

5. Section 264.117 is amended by revising paragraph (a)(1)(ii) to read as follows:

§ 264.117 Post-closure care and use of property.

(a)(1) * * *

(ii) Maintenance of monitoring, waste containment, leachate collection, and leak detection systems in accordance with the requirements of Subparts F, K, L, M, and N of this Part.

* * * * *

6. Section 264.118 is amended by revising paragraphs (b)(1) and (b)(2)(ii) to read as follows:

§ 264.118 Post-closure plan; amendment of plan.

* * * * *

(b) * * *

(1) A description of the planned monitoring and leak detection activities and frequencies at which they will be performed to comply with Subparts F, K, L, M, and N of this Part during the post-closure care period; and

(2) * * *

(ii) The function of the monitoring, leachate collection, and leak detection equipment in accordance with the requirements of Subparts F, K, L, M, and N of this Part; and

* * * * *

7. Section 264.221 is amended by redesignating paragraphs (f), (g), and (h) as paragraphs (m), (n), and (o), respectively.

8. Section 264.221 is amended by revising the introductory text of paragraph (c) and adding new paragraphs (f) through (l) to read as follows:

§ 264.221 Design and operating requirements.

* * * * *

(c) The owner or operator of each new surface impoundment, each new surface impoundment unit at an existing facility, each replacement of an existing surface impoundment unit, and each lateral expansion of a surface impoundment unit must install two or more liners and a leachate collection system between such liners. This requirement shall apply to the owner or operator of all such units, regardless of the date of permit issuance. This requirement also applies to the owner or operator of significant portions of surface impoundment units on which waste has not been placed, effective 24 months after promulgation of this rule. The requirements of this paragraph apply with respect to all waste received after the issuance of the permit or modified permit. The liners and leachate collection system must protect human health and the environment. At a minimum, the liners and leachate collection system must meet the following requirements:

* * * * *

(f) The owner or operator of any surface impoundment unit that is replaced later than 24 months after promulgation of this rule is exempt from the requirements of paragraphs (c) and (g) of this section provided:

(1) The existing surface impoundment unit received a final permit under this part prior to November 8, 1984;

(2) The existing unit was constructed in compliance with the requirements of paragraphs (a) or (b) of this section and the liner is not replaced; and

(3) There is no reason to believe that the liner is not functioning as designed.

(g) The owner or operator of any unit for which construction commences after the date of promulgation of this rule must design, construct, operate, and maintain a leak detection system capable of detecting leaks of hazardous constituents at the earliest practicable time over all areas likely to be exposed to waste and leachate during the active life and post-closure care period. Any liquid, waste, or waste constituent migrating into the leak detection system is assumed to originate from liquids leaking through the top liner of the unit unless the Regional Administrator finds, based on a demonstration by the owner or operator under § 264.222(h), that such liquid, waste, or waste constituent originated from another source.

(h) The leak detection system required under paragraph (g) of this section shall be part of the leachate collection system between the liners described under paragraph (c)(3) of this section. The leachate collection system between the liners shall, in addition to meeting the requirements of paragraph (c)(3) of this section, meet the following requirements for leak detection:

(1) The minimum bottom slope must be 2 percent, and drainage layer material must have the following hydraulic characteristics:

(i) For granular materials, a minimum hydraulic conductivity of 1 cm/sec and

a minimum layer thickness of 12 inches; or

(ii) For synthetic drainage layer materials, a hydraulic transmissivity of 5 x 10^{-4} m^2/sec or greater.

(2) Be capable of detecting a top liner leak in the sump of no more than 1 gallon per acre per day (not including liquids absorbed by the leachate collection system); and, be capable of detecting leakage in the sump in excess of 1 gallon per acre per day within 1 day after the leak occurs (not including liquids absorbed by the leachate collection system or bottom liner);

(3) Collect and remove liquids rapidly to minimize the head on the bottom liner. The Regional Administrator will specify design and operating conditions in the permit to ensure that the liquid head on the bottom liner is minimized at all times; and

(4) Include a sump of appropriate size to efficiently collect liquids and prevent liquids from backing up into the drainage layer. Each unit must have its own sump. The design of the sump and removal system must provide a method for measuring and recording the liquid volume present in the sump and liquids removed. The leachate volume in the sump must be determined on a daily basis during the active life of the unit and at least weekly during the post-closure care period (if applicable).

(i) In lieu of the requirements of paragraph (h) of this section, the Regional Administrator may specify in the permit an alternative leak detection system if:

(1) The Regional Administrator finds that there is no potential for migration of any hazardous constituents from a unit to ground water or surface water during the active life and post-closure care period of the unit; or

(2) The unit complies with the requirements of paragraphs (d) or (e) of this section; or

(3) The owner or operator proposes an alternative leak detection system or technology that will meet the requirements under paragraph (g) of this section. In deciding whether to allow an alternative leak detection system or technology, the Regional Administrator will consider:

(i) The durability and effectiveness of the proposed system or technology;

(ii) The nature and quantity of the wastes; and

(iii) The ability of the system or technology to detect leaks and, in combination with response actions to be taken in compliance with § 264.222, prevent migration of hazardous constituents out of the unit during the active life and post-closure care period so that ground water and surface water are not contaminated.

(j) The owner or operator of any unit that is required by paragraph (g) of this section to have a leak detection system and that is not located completely above the seasonal high water table must demonstrate that the operation of the leak detection system will not be adversely affected by the presence of ground water.

(k) The owner or operator must establish a top liner action leakage rate during the design of the unit for leak detection systems under paragraph (h) of this section. The action leakage rate is determined by:

(1) Using a standard value of (EPA is proposing to select a final value from the range of 5–20 gallons/acre/day); or

(2) A review by the Regional Administrator of an owner or operator demonstration, and a finding by the Regional Administrator, that a site-specific top liner action leakage rate is appropriate for initiating review of the actual leakage rate to determine if a response action is necessary. The site-specific top liner action leakage rate demonstration must be based on allowing only very small isolated leakage through the top liner that does not affect the overall performance of the top liner. In deciding whether to grant a site-specific action leakage rate, the Regional Administrator will consider at least the following factors:

(i) The design, construction, and operation of the top liner;

(ii) The attenuative capacity and thickness of any soil component of the top liner; and

(iii) All other factors that would influence the potential for leachate to migrate through the top liner.

(l) The owner or operator of a surface impoundment unit that is required to comply with § 264.221(c) and commenced construction on or before the effective date of this rule is required to have a leak detection program.

(1) Within 1 year of the effective date of this rule, the owner or operator must submit to the Regional Administrator an application for a permit modification to establish a leak detection program for the leachate collection system between the liners. The proposed leak detection program must include operation and maintenance of the system in a manner consistent with the requirements under paragraphs (g) and (h) of this section, considering the site-specific capabilities of the constructed unit to prevent migration of hazardous constituents out of the unit.

(2) The Regional Administrator will specify in the permit all monitoring, inspection, maintenance, reporting, response, and recordkeeping activities that are necessary to ensure that the leak detection program provides similar protection of ground and surface water to that provided by leak detection systems required under paragraphs (g) through (k) of this section and §§ 264.222 and 264.226, considering the capabilities of the constructed liners and the leachate collection system between the liners.

9. New § 264.222 is added to Subpart K to read as follows:

§ 264.222 Response actions.

(a) The owner or operator must include a response action plan in the permit application, or for units permitted prior to the effective date of today's rule, in a permit modification. This plan must set forth the actions to be taken immediately following a finding of rapid and extremely large volumes of leakage between the liners in accordance with the requirements under paragraph (b) of this section. A rapid and extremely large leak is the maximum design leakage rate that the leachate detection, collection, and removal system can remove under gravity flow conditions without the fluid head on the bottom liner exceeding 1 foot in granular leak detection systems and without the fluid head exceeding the thickness of synthetic leak detection systems. The owner or operator must use an adequate safety margin in determining the rapid and extremely large leak to allow for uncertainties in the design, construction, and operation of the leachate detection, collection, and removal system (e.g., the owner or operator must consider decreases in the flow capacity of the system in time resulting from siltation, creep of synthetic components of the system, etc.).

(b) The response action plan for rapid and extremely large volumes of leakage between the liner must, at a minimum, include the following information:

(1) A general description of the operation of the unit including the expected active life of the unit and whether or not at closure wastes will be decontaminated or removed from the unit or left in place;

(2) A description of the hazardous constituents contained in the unit;

(3) A description of the range of events that may potentially cause rapid and extremely large volumes of leakage into the space between the liners;

(4) A discussion of important factors that can affect leakage into the leachate collection and removal system between the liners (e.g., amount and frequency of precipitation, and amount of liquids in the unit);

(5) A description of major mechanisms that will prevent migration of hazardous constituents out of the unit (e.g., the condition of the liners and leachate collection system between the liners);

(6) A detailed assessment describing the effectiveness and feasibility of each of the following potential immediate interim responses for preventing hazardous constituent migration out of the unit by decreasing the volume of leakage into the leak detection system:

(i) The owner or operator limits or terminates receipt of waste;

(ii) The owner or operator provides expeditious repair of the leak(s); or

(iii) The owner or operator institutes operational changes at the unit that will minimize leakage into the space between the liners so that the leakage will be less than rapid and extremely large.

(7) The plan must also include the response the owner or operator will undertake after determining the concentration of hazardous constituents in the liquids in the sump of the leak detection system in accordance with the requirements under paragraph (c)(3) of this section.

(i) If any hazardous constituent concentrations in the leachate exceed health-based standards, the owner or operator must assess the effectiveness and feasibility of each of the following potential responses for preventing hazardous constituent migration out of the unit:

(A) The owner or operator terminates receipt of waste and closes the unit;

(B) The owner or operator provides expeditious repair of the leak(s); or

(C) The owner or operator institutes operational changes at the unit that will minimize leakage into the space between the liners so that the leakage will be less than rapid and extremely large. If as a result of these operational changes the leakage is still above the action leakage rate, the owner or operator must comply with the requirements set forth in paragraph (e) of this section; or

(ii) If all hazardous constituent concentrations in the leachate are below health-based standards, the owner or operator must assess the effectiveness and feasibility of each of the following potential responses for minimizing the head on the bottom liner:

(A) The owner or operator provides expeditious repair of the leak(s); or

(B) The owner or operator institutes operational changes at the unit.

(8) The response action plan must address a range of rapid and extremely large volumes of leakage appropriate for the unit with correlating recommended responses and indicate why other response actions were not chosen. Each response presented must be based on a demonstration incorporating the factors set forth in paragraphs (b) (1) through (7) of this section. Other factors that would influence the quality and mobility of the leachate produced and the potential for it to migrate out of the unit may also be considered in the demonstration.

(c)(1) The Regional Administrator will review and approve the response action plan for rapid and extremely large leaks if he determines that such plan prevents, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of EPA approved health based standards for ground-water protection. If the plan does not prevent hazardous constituent migration out of the unit in levels exceeding the ground-water protection standards, the Regional Administrator shall disapprove such plan.

(2) In making a determination under paragraph (c)(1) of this section, the Regional Administrator shall consider, but not be limited to the following factors:

(i) The type and amount of hazardous constituents that may be expected to be present in the leachate between the liners;

(ii) The mobility of hazardous constituents in the leachate;

(iii) The degree to which the liquid head on the bottom liner will be minimized by implementation of the response action plan;

(iv) Condition of the liners and leachate collection and removal system, (e.g., CQA documentation review or review of design for deficiency);

(v) Design of the double liner system, including design features that provide further protection beyond those required under § 264.221;

(vi) Future planned activities, including remaining active lifetime period, and closure and post-closure care activities; and

(vii) Environmental factors, including amount and frequency of precipitation, and whether the unit is located in a highly vulnerable hydrogeological setting.

(3) The Regional Administrator will identify in the response action plan monitoring activities for specific hazardous constituents identified in Appendix VIII of Part 261 of this chapter. Specifically, the Regional Administrator will require the owner or operator to test the liquids in the sump for the leachate detection, collection, and removal system to determine whether specified hazardous constituents are present and their concentration. The Regional Administrator may also identify additional physical and chemical properties to be tested for.

(d) When there is a rapid and extremely large volume of leakage between the liners the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days of the rapid and extremely large leakage. The notification must preliminarily identify the liquid volumes that have been detected, collected, and removed;

(2) Collect and remove accumulated liquids;

(3) Immediately implement the response action plan; and

(4) Immediately sample the leachate in the leachate detection, collection, and removal system to determine the quality of the leachate in accordance with the requirements under paragraph (c)(3) of this section. The owner or operator must provide this information to the Regional Administrator at the earliest practicable time.

(5) The owner or operator must report in writing to the Regional Administrator on the effectiveness of the response action as soon as practicable after the response has been in place for 60 days, and at other subsequent time periods as specified by the Regional Administrator. The report must describe the effectiveness of the response action in preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of levels above EPA-approved health based standards for ground-water protection. At a minimum, the report must address the factors set forth in paragraph (c)(2) of this section and any additional information required by the Regional Administrator. The Regional Administrator will review this report to determine whether or not the selected response is preventing hazardous constituent migration out of the unit. If the Regional Administrator determines that the existing response action is not preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit, the Regional Administrator will so inform the owner or operator. The owner or operator must then either:

(i) Implement alternative responses for the rate of leakage if the approved response action plan contains such alternatives; or

(ii) Amend the response action plan, if the approved response action plan does not contain an alternative response, by modifying the permit in accordance with Part 124 procedures. The owner or

operator must submit a permit modification to the Regional Administrator within 60 days. At a minimum, such modification must address information set forth in paragraph (b) of this section as well as the rate of leakage, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility or an accident). The permit modification will be processed in accordance with Part 124 procedures.

(e) Leaks that are less than rapid and extremely large.

(1) The owner or operator is required to prepare and submit to the Regional Administrator a response action plan for leaks that exceed the action leakage rate for the top liner but are less than rapid and extremely large. In order to satisfy this requirement, the owner or operator may either:

(i) Submit a response action plan with the permit application identifying actions to be taken when lower levels of leakage exceed the action leakage rate, or

(ii) Submit to the Regional Administrator a request for a permit modification in accordance with the Part 124 procedures to amend the response action plan within 90 days from the date that liquids first exceed the action leakage rate. The permit will be processed in accordance with Part 124 procedures.

(2) For leakage that exceeds the action leakage rate, the response action plan must, at a minimum, include the information set forth in paragraph (b) (1) to (5) of this section. The owner or operator must also include a detailed assessment describing the effectiveness and feasibility of each of the following responses for preventing hazardous constituent migration out of the unit in excess of health-based standards:

(i) The owner or operator terminates receipt of waste and closes the unit;

(ii) The owner or operator institutes operational changes at the unit that will reduce leakage between the liners to prevent hazardous constituent migration out of the unit;

(iii) The owner or operator provides expeditious repair of the leak(s);

(iv) The owner or operator continues to remove and treat the leakage with increased ground water monitoring activities; or

(v) The owner or operator maintains current operating procedures.

(3) The response action plan must recommend a specific response action for leakage above the action leakage rate for the unit and indicate why other response actions were not chosen. The response action plan may address a range of leakage with varying responses. Other factors that would influence the quality and mobility of the leachate produced and the potential for it to migrate out of the unit may also be considered in the demonstration.

(f)(1) The Regional Administrator will review and approve the response action plan for leakage less than rapid and extremely large if he determines that such plan prevents, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of EPA-approved health based standards for ground-water protection. If the plan does not prevent hazardous constituent migration out of the unit in levels exceeding the ground-water protection standards, the Regional Administrator shall disapprove such plan.

(2) In making a determination under paragraph (f)(1) of this section, the Regional Administrator shall consider, but not be limited to, considering the following factors:

(i) The type and amount of hazardous constituents that may be expected to be present in the leachate between the liners or the actual type and amount if the action leakage rate is exceeded;

(ii) The mobility of hazardous constituents in the leachate;

(iii) The degree to which the liquid head on the bottom liner will be minimized by implementation of the response action plan;

(iv) The rate of leakage, if the response action plan is submitted after the action leakage rate is exceeded, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility, accident, or minor leak);

(v) Condition of the liners and leachate collection and removal system, (e.g., CQA documentation review, review of design for deficiency, or review of the unit operating record concerning accidents that have occurred);

(vi) Design of the double liner system, including design features that provide further protection beyond those required under Section 264.221;

(vii) Future planned activities, including remaining active life time period, and closure and post-closure care activities; and

(viii) Environmental factors, including amount and frequency of precipitation, and whether the unit is located in a highly vulnerable hydrogeological setting.

(3) The Regional Administrator will identify in the response action plan monitoring activities for specific hazardous constituents identified in Appendix VIII of Part 261 of this chapter. Specifically, the Regional Administrator will require the owner or operator to test the liquids in the sump for the leachate detection, collection, and removal system to determine whether specified hazardous constituents are present and their concentration. The Regional Administrator may also identify additional physical and chemical properties to be tested for.

(g) If liquids leaking into the leak detection system specified under § 264.221(h) exceed the action leakage rate for the top liner, but are less than rapid and extremely large, the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days of the leakage exceeding the action leakage rate. The notification must preliminarily identify the liquid volumes that have been detected, collected, and removed;

(2) Collect and remove accumulated liquids;

(3) Implement the plan if it was previously submitted with the application pursuant to paragraph (e)(1)(i) of this section, or submit a permit modification pursuant to paragraph (e)(1)(ii) of this section.

(4) Immediately sample the leachate in the leachate detection, collection, and removal system to determine the quality of the leachate in accordance with the requirements under paragraph (f)(3) of this section. The owner or operator must provide this information to the Regional Administrator at the earliest practicable time. If the owner or operator determines that the leachate exceeds health-based standards he must implement any response action approved in the plan.

(5) The owner or operator must report in writing to the Regional Administrator on the effectiveness of the response action as soon as practicable after the response has been in place for 60 days, and annually thereafter. The report must describe the effectiveness of the response action in preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of levels above EPA-approved health based standards for ground-water protection. At a minimum, the report must address the factors set forth in paragraph (f)(2) above and any additional information required by the Regional Administrator. The Regional Administrator will review this report to determine whether or not the selected response is preventing hazardous constituent migration out of the unit. If the Regional Administrator determines that the existing response action is not preventing to the extent technically

feasible with current technology, hazardous constituent migration out of the unit, the Regional Administrator will so inform the owner or operator. The owner or operator must then either:

(i) Implement alternative responses for the rate of leakage if the approved response action plan contains such alternatives; or

(ii) Amend the response action plan, if the approved response action plan does not contain an alternative response, by modifying the permit in accordance with Part 124 procedures. The owner or operator must submit a permit modification to the Regional Administrator within 60 days. At a minimum, such modification must address information set forth in paragraph (b) of this section. The permit modification will be processed in accordance with Part 124 procedures.

(h) If the owner or operator determines that the top liner action leakage rate is being exceeded, he may demonstrate for leakage less than rapid and extremely large that the liquid resulted from an error in sampling, analysis, or evaluation, precipitation during construction, or a source other than leakage through the top liner. While the owner or operator may make a demonstration under this paragraph in addition to submitting an application under paragraph (e) of this section, he is not relieved of the requirement to submit a permit modification application or to implement the response unless the Regional Administrator approves the demonstration made by finding that the liquid resulted from a source other than a top liner leakage, and was attributed to precipitation during construction, or error in sampling, analysis, or evaluation. In making a demonstration under this paragraph, the owner or operator must:

(1) Notify the Regional Administrator in writing as soon as practicable, that he intends to make a demonstration under this paragraph;

(2) Within 90 days of notifying the Regional Administrator under (g)(1) of this section, submit a report to the Regional Administrator that demonstrates that the liquid resulted from a source other than top liner leakage or that the apparent noncompliance with the standards resulted from precipitation during construction, or error in sampling, analysis, or evaluation. The Regional Administrator shall review the demonstration and notify the applicant as to whether or not such a determination is successful. The applicant has 45 days to comment on such a determination. The Regional Administrator shall respond to those comments and make a final decision on the applicant's demonstration.

(3) If the Regional Administrator approves the demonstration in paragraph (h)(2) of this section, then the owner or operator must submit an application for a permit modification to the Regional Administrator to make any appropriate changes to the response action plan for the unit within 90 days of the Regional Administrator's determination under paragraph (h)(2) of this section.

(i) Within 45 days of detecting a significant change in the leakage rate, the owner or operator must submit to the Regional Administrator a report on the leakage that includes the following information:

(1) An assessment of the problem causing the leak that includes a profile of liquid quantity collected and removed versus time, and characterization of changes in the rate of top liner leakage;

(2) A description of any change in the response to be implemented as approved in the response action plan;

(3) A schedule for implementation; and

(4) Other information that the owner or operator deems appropriate to fully describe the response that will be implemented.

10. New § 264.223 is added to Subpart K to read as follows:

§ 264.223 Construction quality assurance.

Effective 12 months after promulgation of this rule, the owner or operator of each new surface impoundment unit or component constructed at a surface impoundment and listed under § 264.19(b) must conduct a construction quality assurance program in compliance with §§ 264.19 and 264.20.

11. Section 264.226 is amended by removing paragraph (a), redesignating paragraphs (b) and (c) as (a) and (b), respectively, and adding new paragraphs (c), (d), and (e) as follows:

§ 264.226 Monitoring and inspection.

* * * * *

(c) An owner or operator required to have a leak detection system under this subpart must:

(1) Monitor for and record on a daily basis the presence of liquids in the leak detection system removal sump during the active life (including the closure period) and at least weekly during the post-closure period (if applicable);

(2) Analyze the daily monitoring data during the active life under paragraph (c)(1) of this section on a weekly basis and the weekly monitoring data during the post-closure period under paragraph (c)(1) of this section on a quarterly basis to determine if the action leakage rate under paragraph (k) (1) or (2) of § 264.221 is exceeded under the conditions of paragraphs (c)(2) (i), (ii), or (iii) of this section:

(i) During the active life of the unit, the daily monitoring data averaged over one month exceed the action leakage rate or during the post-closure care period, the weekly monitoring data averaged over three months exceed the action leakage rate; or

(ii) During the active life, the daily rate for any one-day period during a week exceeds 50 gallons per acre per day or during the post-closure period, the weekly rate for any one-week period during a quarter exceeds 350 gallons per acre per week; or

(iii) In lieu of the requirements of paragraphs (c)(2) (i) and (ii) of this section, the Regional Administrator may specify in the permit an alternative method for determining if the action leakage rate under paragraph (k) (1) or (2) of § 264.221 is exceeded.

(3) Establish a monitoring and inspection program that will allow the determination of the following throughout the active life (including the closure period) and post-closure period:

(i) The rate of leakage into the leak detection system sump, and the removal rate;

(ii) The deterioration, malfunction, or improper operation of the leak detection system;

(iii) The effectiveness of additional controls implemented as part of a response action plan when the action leakage rate of the top liner is exceeded; and

(iv) The effectiveness of the bottom liner and leachate detection, collection, and removal system to control leakage below the action leakage rate.

(d) The owner or operator must record all inspection information required in paragraph (c) of this section in the inspection log required under § 264.15 of this part. The recorded information must be in sufficient detail to demonstrate that the leak detection permit requirements are being complied with.

(e) Specific inspection and monitoring requirements in addition to those described in paragraph (c) of this section may be required in the facility permit by the Regional Administrator as needed to assure detection of leaks at the earliest practicable time. Inspection and monitoring requirements contained in the facility permit will be based on preventing migration of liquids containing hazardous constituents out of the unit.

12. Section 264.228 is amended by adding a new paragraph (b)(4) to read as follows:

§ 264.228 Closure and post-closure care.

* * * * *

(b) * * *

(4) Maintain and monitor the leak detection system in accordance with §§ 264.221 (g) and (h), 264.226 (c), (d), and (e), and comply with all other applicable leak detection requirements of this subpart.

§ 264.251 [Amended]

13. Section 264.251 is amended by redesignating paragraphs (c), (d), (e), (f), and (g) as paragraphs (m), (n), (o), (p), and (q), respectively.

14. Section 264.251 is amended by revising the introductory text of paragraph (a) to read as follows:

§ 264.251 Design and operating requirements.

(a) Any waste pile that is not covered by paragraph (c) of this section must have a liner system for all portions of the waste pile (except for existing portions of such waste pile). The liner system must have: * * *

* * * * *

15. Section 264.251 is amended by adding new paragraphs (c) through (k) to read as follows:

§ 264.251 Design and operating requirements.

* * * * *

(c) The owner or operator of each new waste pile, each new waste pile unit at an existing facility, each replacement of an existing waste pile unit, and each lateral expansion of a waste pile unit must install two or more liners and a leachate collection system above and between such liners. This requirement shall apply to the owner or operator of all such units, regardless of the date of permit issuance. This requirement also applies to the owner or operator of significant portions of waste piles on which waste has not been placed, effective 24 months after promulgation of this rule. The requirements of this paragraph apply with respect to all waste received after the issuance of the permit or modified permit. The liners and the leachate collection systems must protect human health and the environment. At a minimum, the liners and leachate collection systems must meet the following requirements:

(1) The liners must include:

(i) A top liner designed, operated, and constructed of materials to prevent the migration of any hazardous constituent into such liner during the active life and post-closure care period, and a bottom liner designed, operated, and constructed to prevent the migration of any constituent through such liner during such period. The bottom liner must be constructed of at least a 3-foot-thick layer of compacted clay or other compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec; or

(ii) A top liner designed, operated, and constructed of materials to prevent the migration of any hazardous constituent into such liner during the active life and post-closure care period, and a bottom liner consisting of two components. The upper component of the bottom liner must be designed, operated, and constructed to prevent the migration of any hazardous constituent into this component during the active life and post-closure care period. The lower component of the bottom liner must be designed, operated, and constructed to minimize the migration of any hazardous constituent through the upper component if a breach in the upper component were to occur prior to the end of the post-closure care period. The lower component must be constructed of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.

(2) The liners must be:

(i) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;

(ii) Placed upon materials capable of providing support to the liners and resistance to pressure gradients above and below the liners to prevent failure of the liners due to settlement, compression, or uplift; and

(iii) Installed to cover all surrounding earth likely to be in contact with the waste or leachate.

(3) The leachate collection system immediately above the top liner must be designed, constructed, maintained, and operated to collect and remove leachate from the waste pile during the active life and post-closure care period. The Regional Administrator will specify design and operating conditions in the permit to ensure that the leachate depth over the top liner does not exceed 30 cm (1 foot).

(4) The leachate collection system between the liners must be designed, constructed, maintained, and operated to detect, collect, and remove liquids that leak through any area of the top liner during the active life and post-closure care period.

(5) The leachate collection systems must be:

(i) Constructed of materials that are chemically resistant to the waste managed in the waste pile and the leachate expected to be generated and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and any equipment used at the waste pile; and

(ii) Designed and operated to function without clogging during the active life and post-closure care period.

(d) Paragraph (c) of this section will not apply if the owner or operator demonstrates to the Regional Administrator, and the Regional Administrator finds for such waste pile, that alternative design and operating practices, together with location characteristics, will prevent the migration of any hazardous constituent into the ground water or surface water at least as effectively as such liners and leachate collection systems.

(e) The double liner requirement set forth in paragraph (c) of this section may be waived by the Regional Administrator for any monofill, if:

(1) The monofill contains only hazardous wastes from foundry furnace emission controls or metal casting molding sand, and such wastes do not contain constituents which would render the wastes hazardous for reasons other than the EP toxicity characteristics in § 261.24 of this chapter, and

(2)(i)(A) The monofill has at least one liner for which there is no evidence that such liner is leaking. For the purposes of this paragraph, the term "liner" means a liner designed, constructed, installed, and operated to prevent hazardous waste from passing into the liner at any time during the active life of the facility, or a liner designed, constructed, installed, and operated to prevent hazardous waste from migrating beyond the liner to adjacent subsurface soil, ground water, or surface water at any time during the active life of the facility.

(B) The monofill is located more than one-quarter mile from an underground source of drinking water (as that term is defined in § 144.3 of this chapter); and

(C) The monofill is in compliance with generally applicable ground water monitoring requirements for facilities with permits under RCRA section 3005(c); or

(ii) The owner or operator demonstrates that the monofill is located, designed, and operated so as to assure that there will be no migration of any hazardous constituent into ground

water or surface water at any future time.

(f) The owner or operator of any waste pile that is replaced later than 24 months after promulgation of this rule is exempt from the requirements of paragraphs (c) and (g) of this section provided:

(1) The existing waste pile unit received a final permit under this Part prior to November 8, 1984.

(2) The existing unit was constructed in compliance with the requirements of paragraphs (a) or (b) of this section and the liner or leachate collection system is not replaced; and

(3) There is no reason to believe that the liner or leachate collection system is not functioning as designed.

(g) The owner or operator of any unit for which construction commences after the date of promulgation of this rule must design, construct, operate, and maintain a leak detection system capable of detecting leaks of hazardous constituents at the earliest practicable time over all areas likely to be exposed to waste and leachate during the active life and post-closure care period. Any liquid, waste, or waste constituent migrating into the leak detection system is assumed to originate from liquids leaking through the top liner of the unit unless the Regional Administrator finds, based on a demonstration by the owner or operator under § 264.252(h), that such liquid, waste, or waste constituent originated from another source.

(h) The leak detection system required under paragraph (g) of this section shall be part of the leachate collection system between the liners described under paragraphs (c)(4) and (c)(5) of this section. The leachate collection system between the liners shall, in addition to meeting the requirements of paragraphs (c)(4) and (c)(5) of this section, meet the following requirements for leak detection:

(1) The minimum bottom slope must be 2 percent, and drainage layer material must have the following hydraulic characteristics:

(i) For granular materials, a minimum hydraulic conductivity of 1 cm/sec and a minimum layer thickness of 12 inches; or

(ii) For synthetic drainage layer materials, a hydraulic transmissivity of 5 x 10^{-4} m^2/sec or greater.

(2) Be capable of detecting a top liner leak in the sump of no more than 1 gallon per acre per day (not including liquids absorbed by the leachate collection system), and, be capable of detecting leakage in the sump in excess of 1 gallon per acre per day within 1 day after the leak occurs (not including liquids absorbed by the leachate collection system or bottom liner);

(3) Collect and remove liquids rapidly to minimize the head on the bottom liner. The Regional Administrator will specify design and operating conditions in the permit to ensure that the liquid head on the bottom liner is minimized at all times; and

(4) Include a sump of appropriate size to efficiently collect liquids and prevent liquids from backing up into the drainage layer. Each unit must have its own sump. The design of the sump and removal system must provide a method for measuring and recording the liquid volume present in the sump and liquids removed. The leachate in the sump must be determined on a daily basis during the active life of the unit and at least weekly during the post-closure care period (if applicable).

(i) In lieu of the requirements of paragraph (h) of this section, the Regional Administrator may specify in the permit an alternative leak detection system if:

(1) The Regional Administrator finds that there is no potential for migration of any hazardous constituents from a unit to ground water or surface water during the active life and post-closure care period of the unit, or

(2) The unit complies with the requirements of paragraphs (d) or (e) of this section, or

(3) The owner or operator proposes an alternative leak detection system or technology that will meet the requirements under paragraph (g) of this section. In deciding whether to allow an alternative leak detection system or technology, the Regional Administrator will consider:

(i) The durability and effectiveness of the proposed system or technology;

(ii) The nature and quantity of the wastes; and

(iii) The ability of the system or technology to detect leaks and, in combination with response actions to be taken in compliance with § 264.252, prevent migration of hazardous constituents out of the unit during the active life and post-closure care period so that ground water and surface water are not contaminated.

(j) The owner or operator of any unit that is required by paragraph (g) of this section to have a leak detection system and that is not located completely above the seasonal high water table must demonstrate that the operation of the leak detection system will not be adversely affected by the presence of ground water.

(k) The owner or operator must establish a top liner action leakage rate during the design of the unit for leak detection systems under paragraph (h) of this section. The action leakage rate is determined by:

(1) Using a standard value of (EPA proposing to select a final value from the range 5–20 gallons/acre/day); or

(2) A review by the Regional Administrator of an owner or operator demonstration, and a finding by the Regional Administrator, that a site-specific top liner action leakage rate is appropriate for initiating review of the actual leakage rate to determine if a response action is necessary. The site-specific top liner action leakage rate demonstration must be based on allowing only very small isolated leakage through the top liner that does not affect the overall performance of the top liner. In deciding whether to grant a site-specific action leakage rate, the Regional Administrator will consider at least the following factors:

(i) The design, construction, and operation of the top liner and the leachate collection and removal system above the top liner;

(ii) The attenuative capacity and thickness of any soil component of the top liner; and

(iii) All other factors that would influence the potential for leachate to migrate through the top liner.

16. New § 264.252 is added to Subpart L to read as follows:

§ 264.252 Response actions.

(a) The owner or operator must include a response action plan in the permit application, or for units permitted prior to the effective date of today's rule, in a permit modification. This plan must set forth the actions to be taken immediately following a finding of rapid and extremely large volumes of leakage between the liners in accordance with the requirements under paragraph (b) of this section. A rapid and extremely large leak is the maximum design leakage rate that the leachate detection, collection, and removal system can remove under gravity flow conditions without the fluid head on the bottom liner exceeding 1 foot in granular leak detection systems and without the fluid head exceeding the thickness of synthetic leak detection systems. The owner or operator must use an adequate safety margin in determining the rapid and extremely large leak to allow for uncertainties in the design, construction, and operation of the leachate detection, collection, and removal system (e.g., the owner or operator must consider decreases in the flow capacity of the system in time resulting from siltation, creep of synthetic components of the system, etc.).

(b) The response action plan for rapid and extremely large volumes of leakage between the liner must, at a minimum, include the following information:

(1) A general description of the operation of the unit including the expected active life of the unit and whether or not at closure wastes will be decontaminated or removed from the unit or left in place;

(2) A description of the hazardous constituents contained in the unit;

(3) A description of the range of events that may potentially cause rapid and extremely large volumes of leakage into the space between the liners;

(4) A discussion of important factors that can affect leakage into the leachate collection and removal system between the liners (e.g., amount and frequency of precipitation, and amount of liquids in the unit);

(5) A description of major mechanisms that will prevent migration of hazardous constituents out of the unit (e.g., the condition of the liners and leachate collection system between the liners);

(6) A detailed assessment describing the effectiveness and feasibility of each of the following potential immediate interim responses for preventing hazardous constituent migration out of the unit by decreasing the volume of leakage into the leak detection system:

(i) The owner or operator limits or terminates receipt of waste;

(ii) The owner or operator provides expeditious repair of the leak(s); or

(iii) The owner or operator institutes operational changes at the unit that will minimize leakage into the space between the liners so that the leakage will be less than rapid and extremely large.

(7) The plan must also include the response the owner or operator will undertake after determining the concentration of hazardous constituents in the liquids in the sump of the leak detection system in accordance with the requirements under paragraph (c)(3) of this section.

(i) If any hazardous constituent concentrations in the leachate exceed health-based standards, the owner or operator must assess the effectiveness and feasibility of each of the following potential responses for preventing hazardous constituent migration out of the unit:

(A) The owner or operator terminates receipt of waste and closes the unit;

(B) The owner or operator provides expeditious repair of the leak(s); or

(C) The owner or operator institutes operational changes at the unit that will minimize leakage into the space between the liners so that the leakage will be less than rapid and extremely large. If as a result of these operational changes the leakage is still above the action leakage rate, the owner or operator must comply with the requirements set forth in section (e) below: or

(ii) If all hazardous constituent concentrations in the leachate are below health-based standards, the owner or operator must assess the effectiveness and feasibility of each of the following potential responses for minimizing the head on the bottom liner:

(A) The owner or operator provides expeditious repair of the leak(s); or

(B) The owner or operator institutes operational changes at the unit.

(8) The response action plan must address a range of rapid and extremely large volumes of leakage appropriate for the unit with correlating recommended responses and indicate why other response actions were not chosen. Each response presented must be based on a demonstration incorporating the factors set forth in paragraph (b) (1) through (7) of this section. Other factors that would influence the quality and mobility of the leachate produced and the potential for it to migrate out of the unit may also be considered in the demonstration.

(c)(1) The Regional Administrator will review and approve the response action plan for rapid and extremely large leaks if he determines that such plan prevents, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of EPA-approved health based standards for ground-water protection. If the plan does not prevent hazardous constituent migration out of the unit in levels exceeding the ground-water protection standards, the Regional Administrator shall disapprove such plan.

(2) In making a determination under paragraph (c)(1) of this section, the Regional Administrator shall consider but not be limited to considering the following factors:

(i) The type and amount of hazardous constituents that may be expected to be present in the leachate between the liners;

(ii) The mobility of hazardous constituents in the leachate;

(iii) The degree to which the liquid head on the bottom liner will be minimized by implementation of the response action plan;

(iv) Condition of the liners and leachate collection and removal system, (e.g., CQA documentation review, or review of design for deficiency);

(v) Design of the double liner system, including design features that provide further protection beyond those required under § 264.251;

(vi) Future planned activities, including remaining active life time period, and closure and post-closure care activities; and

(vii) Environmental factors, including amount and frequency of precipitation, and whether the unit is located in a highly vulnerable hydrogeological setting.

(3) The Regional Administrator will identify in the response action plan monitoring activities for specific hazardous constituents identified in Appendix VIII of Part 261 of this chapter. Specifically, the Regional Administrator will require the owner or operator to test the liquids in the sump for the leachate detection, collection, and removal system to determine whether specified hazardous constituents are present and their concentration. The Regional Administrator may also identify additional physical and chemical properties to be tested for.

(d) When there is a rapid and extremely large volume of leakage between the liners the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days of the rapid and extremely large leakage. The notification must preliminarily identify the liquid volumes that have been detected, collected, and removed;

(2) Collect and remove accumulated liquids;

(3) Immediately implement the response action plan; and

(4) Immediately sample the leachate in the leachate detection, collection, and removal system to determine the quality of the leachate in accordance with the requirements under paragraph (c)(3) of this section. The owner or operator must provide this information to the Regional Administrator at the earliest practicable time.

(5) The owner or operator must report in writing to the Regional Administrator on the effectiveness of the response action as soon as practicable after the response has been in place for 60 days, and at other subsequent time periods as specified by the Regional Administrator. The report must describe the effectiveness of the response action in preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of levels above EPA-approved health based standards for ground-water protection. At a minimum, the report must address the factors set forth in paragraph (c)(2) of this section and any additional information required by the Regional Administrator. The

Regional Administrator will review this report to determine whether or not the selected response is preventing hazardous constituent migration out of the unit. If the Regional Administrator determines that the existing response action is not preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit, the Regional Administrator will so inform the owner or operator. The owner or operator must then either:

(i) Implement alternative responses for the rate of leakage, if the approved response action plan contains such alternatives; or

(ii) Amend the response action plan if the approved response action plan does not contain an alternative response, by modifying the permit in accordance with Part 124 procedures. The owner or operator must submit a permit modification to the Regional Administrator within 60 days. At a minimum, such modification must address information set forth in paragraph (b) of this section as well as the rate of leakage, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility or an accident). The permit modification will be processed in accordance with Part 124 procedures.

(e) *Leaks that are less than rapid and extremely large.* (1) The owner or operator is required to prepare and submit to the Regional Administrator a response action plan for leaks that exceed the action leakage rate for the top liner but are less than rapid and extremely large. In order to satisfy this requirement, the owner or operator may either:

(i) Submit a response action plan with the permit application identifying actions to be taken when lower levels of leakage exceed the action leakage rate; or

(ii) Submit to the Regional Administrator a request for a permit modification, in accordance with the Part 124 procedures, to amend the response action plan within 90 days from the date that liquids first exceed the action leakage rate. The permit modification will be processed in accordance with Part 124 procedures.

(2) For leakage that exceeds the action leakage, the response action plan must, at a minimum, include the information set forth in paragraph (b) (1) to (5) of this section. The owner or operator must also include a detailed assessment describing the effectiveness and feasibility of each of the following responses for preventing hazardous constituent migration out of the unit in excess of health-based standards.

(i) The owner or operator terminates receipt of waste and closes the unit;

(ii) The owner or operator institutes operational changes at the unit that will reduce leakage between the liners to prevent hazardous constituents migration out of the unit;

(iii) The owner or operator provides expeditious repair of the leak(s);

(iv) The owner or operator continues to remove and treat the leakage with increased ground water monitoring activities; or

(v) The owner or operator maintains current operating procedures.

(3) The response action plan must recommend a specific response action for leakage above the action leakage rate for the unit and indicate why other response actions were not chosen. The response action plan may address a range of leakage with varying responses. Other factors that would influence the quality and mobility of the leachate produced and the potential for it to migrate out of the unit may also be considered in the demonstration.

(f)(1) The Regional Administrator will review and approve the response action plan for leakage less than rapid and extremely large if he determines that such plan prevents, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of EPA-approved health based standards for ground-water protection. If the plan does not prevent hazardous constituent migration out of the unit in levels exceeding the ground-water protection standards, the Regional Administrator shall disapprove such plan.

(2) In making a determination under paragraph (f)(1) of this section, the Regional Administrator shall consider but not be limited to considering the following factors

(i) The type and amount of hazardous constituents that may be expected to be present in the leachate between the liners or the actual type and amount if the action leakage rate is exceeded;

(ii) The mobility of hazardous constituents in the leachate;

(iii) The degree to which the liquid head on the bottom liner will be minimized by implementation of the response action plan;

(iv) The rate of leakage, if the response action plan is submitted after the action leakage rate is exceeded, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility, accident, or minor leak);

(v) Condition of the liners and leachate collection and removal system, (e.g., CQA documentation review, review of design for deficiency, or review of the unit operating record concerning accidents that have occurred);

(vi) Design of the double liner system, including design features that provide further protection beyond those required under § 264.251;

(vii) Future planned activities, including remaining active life time period, and closure and post-closure care activities; and

(viii) Environmental factors, including amount and frequency of precipitation, and whether the unit is located in a highly vulnerable hydrogeological setting.

(3) The Regional Administrator will identify in the response action plan monitoring activities for specific hazardous constituents identified in Appendix VIII of Part 261 of this chapter. Specifically, the Regional Administrator will require the owner or operator to test the liquids in the sump for the leachate detection, collection, and removal system to determine whether specified hazardous constituents are present and their concentration. The Regional Administrator may also identify additional physical and chemical properties to be tested for.

(g) If liquids leaking into the leak detection system specified under § 264.251(h) exceed the action leakage rate for the top liner, but are less than rapid and extremely large, the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days of the leakage exceeding the action leakage rate. The notification must preliminarily identify the liquid volumes that have been detected, collected, and removed;

(2) Collect and remove accumulated liquids,

(3) Implement the plan if it was previously submitted with the application pursuant to paragraph (e)(1)(i) of this section, or submit a permit modification pursuant to paragraph (e)(1)(ii) of this section.

(4) Immediately sample the leachate in the leachate detection, collection, and removal system to determine the quality of the leachate in accordance with the requirements under paragraph (f)(3) of this section. The owner or operator must provide this information to the Regional Administrator at the earliest practicable time. If the owner or operator determines that the leachate exceeds healthbased standards, he must implement any response action approved in the plan.

(5) The owner or operator must report in writing to the Regional Administrator on the effectiveness of the response

action as soon as practicable after the response has been in place for 60 days, and annually thereafter. The report must describe the effectiveness of the response action in preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of levels above EPA-approved health based standards for ground-water protection. At a minimum, the report must address the factors set forth in paragraph (f)(2) of this section and any additional information required by the Regional Administrator. The Regional Administrator will review this report to determine whether or not the selected response is preventing hazardous constituent migration out of the unit. If the Regional Administrator determines that the existing response action is not preventing to the extent technically feasible with current technology, hazardous constituent migration out of the unit, the Regional Administrator will so inform the owner or operator. The owner or operator must then either:

(i) Implement alternative responses for the rate of leakage, if the approved response action plan contains such alternatives; or

(ii) Amend the response action plan, if the approved response action plan does not contain an alternative response by modifying the permit in accordance with Part 124 procedures. The owner or operator must submit a permit modification to the Regional Administrator within 60 days. At a minimum, such modification must address information set forth in paragraph (b) of this section. The permit modification will be processed in accordance with Part 124 procedures.

(h) If the owner or operator determines that the top liner action leakage rate is being exceeded, he may demonstrate for leakage less than rapid and extremely large that the liquid resulted from an error in sampling, analysis, or evaluation, precipitation during construction, or a source other than leakage through the top liner. While the owner or operator may make a demonstration under this paragraph in addition to submitting an application under paragraph (e) of this section, he is not relieved of the requirement to submit a permit modification application or to implement the response unless the Regional Administrator approves the demonstration made by finding that the liquid resulted from a source other than a top liner leakage, and was attributed to precipitation during construction, or error in sampling, analysis, or evaluation. In making a demonstration under this paragraph, the owner or operator must:

(1) Notify the Regional Administrator in writing as soon as practicable, that he intends to make a demonstration under this paragraph;

(2) Within 90 days of notifying the Regional Administrator under (g)(1) of this section, submit a report to the Regional Administrator that demonstrates that the liquid resulted from a source other than top liner leakage or that the apparent noncompliance with the standards resulted from precipitation during construction, or error in sampling, analysis, or evaluation. The Regional Administrator shall review the demonstration and notify the applicant as to whether or not such a determination is successful. The applicant has 45 days to comment on such a determination. The Regional Administrator shall respond to those comments and make a final decision on the applicant's demonstration.

(3) If the Regional Administrator approves the demonstration in paragraph (h)(2) above, then the owner or operator must submit an application for a permit modification to the Regional Administrator to make any appropriate changes to the response action plan for the unit within 90 days of the Regional Administrator's determination under paragraph (h)(2) of this section.

(i) Within 45 days of detecting a significant change in the leakage rate, the owner or operator must submit to the Regional Administrator a report on the leakage that includes the following information:

(1) An assessment of the problem causing the leak that includes a profile of liquid quantity collected and removed versus time, and characterization of changes in the rate of top liner leakage,

(2) A description of any change in the response to be implemented as approved in the response action plan;

(3) A schedule for implementation; and

(4) Other information that the owner or operator deems appropriate to fully describe the response that will be implemented.

17. New § 264.253 is added to Subpart L to read as follows:

§ 264.253 Construction quality assurance.

Effective 12 months after promulgation of this rule, the owner or operator of each new waste pile unit or component constructed at a waste pile and listed under § 264.19(b) must conduct a construction quality assurance program in compliance with §§ 264.19 and 264.20.

18. Section 264.254 is amended by removing paragraph (a), redesignating paragraph (b) as (a), and adding new paragraphs (b), (c), and (d) as follows:

§ 264.254 Monitoring and inspection.

* * * * *

(b) An owner or operator required to have a leak detection system under this subpart must:

(1) Monitor for and record on a daily basis the presence of liquids in the leak detection system removal sump during the active life (including the closure period);

(2) Analyze the daily monitoring data during the active life under paragraph (6)(1) of this section on a weekly basis to determine if the action leakage rate under paragraph (k) (1) or (2) of § 264.251 is exceeded under the conditions of paragraphs (b)(2) (i), (ii), or (iii) of this section:

(i) The daily monitoring data averaged over one month exceed the action leakage rate during the active life; or

(ii) The daily rate for any one-day period during a week exceeds 50 gallons per acre per day; or

(iii) In lieu of the requirements of paragraphs (b)(2) (i) and (ii) of this section, the Regional Administrator may specify in the permit an alternative method for determining if the action leakage rate under paragraph (k) (1) or (2) of § 264.251 is exceeded.

(3) Establish a monitoring and inspection program that will allow the determination of the following throughout the active life and the post-closure care period:

(i) The rate of leakage into the leak detection system sump, and the removal rate,

(ii) The deterioration, malfunction, or improper operation of the leak detection system;

(iii) The effectiveness of additional controls implemented as part of a response action plan when the action leakage rate of the top liner is exceeded; and

(iv) The effectiveness of the bottom liner and leachate detection, collection, and removal system to control leakage below the action leakage rate.

(c) The owner or operator must record all inspection information required in paragraph (b) of this section in the inspection log required under § 264.15 of this part. The recorded information must be in sufficient detail to demonstrate that the leak detection permit requirements are being complied with.

(d) Specific inspection and monitoring requirements in addition to those described in paragraph (b) of this section may be required in the facility

permit by the Regional Administrator as needed to assure detection of leaks at the earliest practicable time. Inspection and monitoring requirements contained in the facility permit will be based on preventing migration of liquids containing hazardous constituents out of the unit.

19. Section 264.278 is amended by revising paragraphs (a) introductory text, (b)(1), (b)(2), and the first sentence of paragraph (d) and adding new paragraphs (i), (j), and (k), to read as follows:

§ 264.278 Unsaturated zone monitoring.

* * * * *

(a) The owner or operator must monitor the soil and soil-pore liquid to determine at the earliest practicable time over all areas likely to be exposed to waste and leachate during the active life and post-closure care period whether hazardous constituents migrate out of the treatment zone.

* * * * *

(b) * * *

(1) Represent, to at least a 95% confidence level, the quality of background soil-pore liquid quality and the chemical make-up of soil that has not been affected by leakage from the treatment zone; and

(2) Indicate, to at least a 95% confidence level, the quality of soil-pore liquid and the chemical make-up of the soil below the treatment zone.

* * * * *

(d) The owner or operator must conduct soil monitoring and soil-pore liquid monitoring immediately below the treatment zone and entirely above the seasonal high water table. * * *

* * * * *

(i) The owner or operator must include in the permit application a response action plan that sets forth the action to be taken immediately following a finding, pursuant to paragraph (f) of this section of widespread leakage of hazardous constituents from the treatment zone.

The response action plan for widespread leakage must, at a minimum, include the following information:

(1) A general description of the operation of the unit;

(2) A description of the hazardous constituents contained in the unit;

(3) An assessment of potential causes of widespread leakage of hazardous constituents from the treatment zone;

(4) A discussion of important factors that can affect leakage of hazardous constitutents from the treatment zone;

(5) A description of major mechanisms that will prevent migration of hazardous constituents out of the treatment zone;

(6) A detailed assessment describing the effectiveness and feasibility of the following responses that the owner or operator may implement for any potential widespread leakage out of the treatment zone:

(i) The owner or operator terminates application of waste and closes the unit; or

(ii) The owner or operator institutes operational changes at the unit that will minimize leakage out of the treatment zone so that the permit conditions are met.

(j) For widespread leakage out of the treatment zone the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days following measurement of widespread leakage. The notification must indicate preliminary identification of hazardous constituents that have been detected, and the extent of the area and depth below the treatment zone where constituents have migrated; and

(2) Immediately implement the response action plan.

(k)(1) The owner or operator of a land treatment unit that does not meet the requirements of paragraphs (a), (b)(1), (b)(2), (d), and (i) of this section on the date of promulgation of this rule must, by the effective date of this rule, submit to the Regional Administrator an application for a permit modification to ensure compliance with those paragraphs.

(2) The Regional Administrator will specify in the permit all monitoring, inspection, maintenance, reporting, response, and recordkeeping activities that are necessary to ensure compliance with paragraphs (a), (b)(1), (b)(2), (d), and (i) of this section.

20. New § 264.284 is added to Subpart M to read as follows:

§ 264.284 Inspection.

(a) The owner or operator must establish an inspection program that will allow the determination of the following during the active life and post-closure care period:

(1) The deterioration, malfunction, or improper operation of unsaturated zone monitoring equipment required under § 264.278; and

(2) The effectiveness of additional controls implemented as part of any response action when hazardous constituents that migrate beyond the treatment zone statistically exceed background levels.

(b) The owner or operator must record all inspection information required in paragraph (a) of this section in the inspection log required under § 264.15 of this part. The recorded information must be in sufficient detail to demonstrate that the unsaturated zone monitoring permit requirements are being complied with.

(c) Specific inspection and monitoring requirements in addition to those described in paragraph (a) of this section and § 264.278 may be required in the facility permit by the Regional Administrator as needed to assure detection of the migration of hazardous constituents out of the treatment zone at the earliest practicable time. Inspection and monitoring requirements contained in the facility permit will be based on preventing migration of hazardous constituents, so that ground water and surface water will not be contaminated.

21. Section 264.301 is amended by redesignating paragraphs (f), (g), (h), (i), and (j) as paragraphs (m), (n), (o), (p), and (q), respectively and by revising paragraph (k) and the introductory text of paragraph (c) and adding new paragraphs (f) through (j) and (l), to read as follows:

§ 264.301 Design and operating requirements.

* * * * *

(c) The owner or operator of each new landfill, each new landfill unit at an existing facility, each replacement of an existing landfill unit, and each lateral expansion of a landfill unit must install two or more liners and a leachate collection system above and between such liners. This requirement shall apply to the owner or operator of all such units, regardless of the date of permit issuance. This requirement also applies to the owner or operator of significant portions of landfill units on which waste has not been placed, effective 24 months after promulgation of this rule. The requirements of this paragraph apply with respect to all waste received after the issuance of the permit or modified permit. The liners and the leachate collection systems must protect human health and the environment. At a minimum, the liners and leachate collection systems must meet the following requirements:

* * * * *

(f) The owner or operator of any landfill unit that is replaced later than 24 months after promulgation of this rule is exempt from the requirements of paragraphs (c) and (g) of this section provided:

(1) The existing landfill unit received a final permit under this Part prior to November 8, 1984;

(2) The existing unit was constructed in compliance with the requirements of paragraphs (a) or (b) of this section and

the liner or leachate collection system is not replaced; and

(3) There is no reason to believe that the liner or leachate collection system is not functioning as designed.

(g) The owner or operator of any unit for which construction commences after the date of promulgation of this rule must design, construct, operate, and maintain a leak detection system capable of detecting leaks of hazardous constituents at the earliest practicable time over all areas likely to be exposed to waste and leachate during the active life and post-closure care period. Any liquid, waste, or waste constituent migrating into the leak detection system is assumed to originate from liquids leaking through the top liner of the unit unless the Regional Administrator finds, based on a demonstration by the owner or operator under § 264.302(h), that such liquid, waste, or waste constituent originated from another source.

(h) The leak detection system required under paragraph (g) of this section shall be part of the leachate collection system between the liners described under paragraphs (c)(4) and (c)(5) of this section. The leachate collection system between the liners shall, in addition to meeting the requirements of paragraphs (c)(4) and (c)(5) of this section, meet the following requirements for leak detection:

(1) The minimum bottom slope must be 2 percent, and drainage layer material must have the following hydraulic characteristics:

(i) For granular materials, a minimum hydraulic conductivity of 1 cm/sec and a minimum layer thickness of 12 inches; or

(ii) For synthetic drainage layer materials, a hydraulic transmissivity of 5×10^{-4} m^2/sec or greater.

(2) Be capable of detecting a top liner leak in the sump of no more than 1 gallon per acre per day (not including liquids absorbed by the leachate collection system); and, be capable of detecting leakage in the sump in excess of 1 gallon per acre per day within 1 day after the leak occurs (not including liquids absorbed by the leachate collection system or bottom liner);

(3) Collect and remove liquids rapidly to minimize the head on the bottom liner. The Regional Administrator will specify design and operating conditions in the permit to ensure that the liquid head on the bottom liner is minimized at all times; and

(4) Include a sump of appropriate size to efficiently collect liquids and prevent liquids from backing up into the drainage layer. Each unit must have its own sump. The design of the sump and removal system must provide a method for measuring and recording the liquid volume present in the sump and liquids removed. The leachate in the sump must be determined on a daily basis during the active life of the unit at least weekly during the post-closure care period (if applicable).

(i) In lieu of the requirements of paragraph (h) of this section, the Regional Administrator may specify in the permit an alternative approved leak detection system if:

(1) The Regional Administrator finds that there is no potential for migration of hazardous contituents from a unit to ground water or surface water during the active life and post-closure care period of the unit; or

(2) The unit complies with the requirements of paragraphs (d) or (e) of this section; or

(3) The owner or operator proposes an alternative leak detection system or technology that will meet the requirements under paragraph (g) of this section. In deciding whether to allow an alternative leak detection system or technology, the Regional Administrator will consider:

(i) The durability and effectiveness of the proposed system or technology;

(ii) The nature and quantity of the wastes; and

(iii) The ability of the system or technology to detect leaks and, in combination with response actions to be taken in compliance with § 264.302, prevent migration of hazardous constituents out of the unit during the active life and post-closure care period so that ground water and surface water are not contaminated.

(j) The owner or operator of any unit that is required by paragraph (g) of this section to have a leak detection system and that is not located completely above the seasonal high water table must demonstrate that the operation of the leak detection system will not be adversely affected by the presence of ground water.

(k) The owner or operator must establish a top liner action leakage rate during the design of the unit for leak detection systems under paragraph (h) of this section. The action leakage rate is determined by:

(1) Using a standard value of (EPA is proposing to select a final value from the range 5–20 gallons/acre/day); or

(2) A review by the Regional Administrator of an owner or operator demonstration, and a finding by the Regional Administrator, that a site-specific top liner maximum leakage rate is appropriate for initiating review of the actual leakage rate to determine if a response action is necessary. The site-specific top liner maximum leakage rate demonstration must be based on allowing only very small isolated leakage through the top liner that does not affect the overall performance of the top liner. In deciding whether to grant a site-specific maximum leakage rate, the Regional Administrator will consider at least the following factors:

(i) The design, construction, and operation of the top liner and the leachate collection and removal system above the top liner;

(ii) The attenuative capacity and thickness of any soil component of the top liner; and

(iii) All other factors that would influence the potential for leachate to migrate through the top liner.

(l) The owner or operator of a landfill unit that is required to comply with § 264.301(c) and commenced construction on or before the effective date of this rule is required to have a leak detection program.

(1) Within one year of the effective date of this rule, the owner or operator must submit to the Regional Administrator an application for a permit modification to establish a leak detection program for the leachate collection system between the liners. The proposed leak detection program must include operation and maintenance of the system in a manner consistent with the requirements under paragraphs (g) and (h) of this section, considering the site-specific capabilities of the constructed unit to prevent migration of hazardous constituents out of the unit.

(2) The Regional Administrator will specify in the permit all monitoring, inspection, maintenance, reporting, response, and recordkeeping activities that are necessary to ensure that the leak detection program provides similar protection of ground and surface water to that provided by leak detection systems required under paragraphs (g) through (k) of this section and §§ 264.302 and 264.303, considering the capabilities of the constructed liners and the leachate collection system between the liners.

23. New § 264.302 is added to Subpart N to read as follows:

§ 264.302 Response actions.

(a) The owner or operator must include a response action plan in the permit application, or for units permitted prior to the effective date of today's rule, in a permit modification. This plan must set forth the actions to be taken immediately following a finding of rapid and extremely large volumes of leakage between the liners in accordance with the requirements under paragraph (b) of this section. A rapid and extremely large

leak is the maximum design leakage rate that the leachate detection, collection, and removal system can remove under gravity flow conditions without the fluid head on the bottom liner exceeding 1 foot in granular leak detection systems and without the fluid head exceeding the thickness of synthetic leak detection systems. The owner or operator must use an adequate safety margin in determining the rapid and extremely large leak to allow for uncertainties in the design, construction, and operation of the leachate detection, collection, and removal system (e.g., the owner or operator must consider decreases in the flow capacity of the system in time resulting from siltation, creep of synthetic components of the system, etc.).

(b) The response action plan for rapid and extremely large volumes of leakage between the liner must, at a minimum, include the following information:

(1) A general description of the operation of the unit including the expected active life of the unit and whether or not at closure wastes will be decontaminated or removed from the unit or left in place;

(2) A description of the hazardous constituents contained in the unit;

(3) A description of the range of events that may potentially cause rapid and extremely large volumes of leakage into the space between the liners;

(4) A discussion of important factors that can affect leakage into the leachate collection and removal system between the liners (e.g., amount and frequency of precipitation, and amount of liquids in the unit),

(5) A description of major mechanisms that will prevent migration of hazardous constituents out of the unit (e.g., the condition of the liners and leachate collection system between the liners);

(6) A detailed assessment describing the effectiveness and feasibility of each of the following potential immediate interim responses for preventing hazardous constituent migration out of the unit by decreasing the volume of leakage into the leak detection system:

(i) The owner or operator limits or terminates receipt of waste;

(ii) The owner or operator provides expeditious repair of the leak(s); or

(iii) The owner or operator institutes operational changes at the unit that will minimize leakage into the space between the liners so that the leakage will be less than rapid and extremely large.

(7) The plan must also include the response the owner or operator will undertake after determining the concentration of hazardous constituents in the liquids in the sump of the leak detection system in accordance with the requirements under paragraph (c)(3) of this section.

(i) If any hazardous constituent concentrations in the leachate exceed health-based standards, the owner or operator must assess the effectiveness and feasibility of each of the following potential responses for preventing hazardous constituent migration out of the unit

(A) The owner or operator terminates receipt of waste and closes the unit;

(B) The owner or operator provides expeditious repair of the leak(s); or

(C) The owner or operator institutes operational changes at the unit that will minimize leakage into the space between the liners so that the leakage will be less than rapid and extremely large. If as a result of these operational changes the leakage is still above the action leakage rate, the owner or operator must comply with the requirements set forth in paragraph (e) of this section; or

(ii) If all hazardous constituent concentrations in the leachate are below health-based standards, the owner or operator must assess the effectiveness and feasibility of each of the following potential responses for minimizing the head on the bottom liner:

(A) The owner or operator provides expeditious repair of the leak(s); or

(B) The owner or operator institutes operational changes at the unit.

(8) The response action plan must address a range of rapid and extremely large volumes of leakage appropriate for the unit with correlating recommended responses and indicate why other response actions were not chosen. Each response presented must be based on a demonstration incorporating the factors set forth in paragraph (b) (1) through (7) of this section. Other factors that would influence the quality and mobility of the leachate produced and the potential for it to migrate out of the unit may also be considered in the demonstration.

(c)(1) The Regional Administrator will review and approve the response action plan for rapid and extremely large leaks if he determines that such plan prevents, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of EPA-approved health based standards for ground-water protection. If the plan does not prevent hazardous constituent migration out of the unit in levels exceeding the ground-water protection standards, the Regional Administrator shall disapprove such plan.

(2) In making a determination under paragraph (c)(1) of this section, the Regional Administrator shall consider, but not be limited to considering the following factors:

(i) The type and amount of hazardous constituents that may be expected to be present in the leachate between the liners;

(ii) The mobility of hazardous constituents in the leachate;

(iii) The degree to which the liquid head on the bottom liner will be minimized by implementation of the response action plan;

(iv) Condition of the liners and leachate collection and removal system, (e.g., CQA documentation review or review of design for deficiency);

(v) Design of the double liner system, including design features that provide further protection beyond those required under § 264.301;

(vi) Future planned activities, including remaining active life period, and closure and post-closure care activities, and

(vii) Environmental factors, including amount and frequency of precipitation, and whether the unit is located in a highly vulnerable hydrogeological setting.

(3) The Regional Administrator will identify in the response action plan monitoring activities for specific hazardous constituents identified in Appendix VIII of Part 261 of this chapter. Specifically, the Regional Administrator will require the owner or operator to test the liquids in the sump for the leachate detection, collection, and removal system to determine whether specified hazardous constituents are present and their concentration. The Regional Administrator may also identify additional physical and chemical properties to be tested for.

(d) When there is a rapid and extremely large volume of leakage between the liners the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days of the rapid and extremely large leakage. The notification must preliminarily identify the liquid volumes that have been detected, collected, and removed;

(2) Collect and remove accumulated liquids;

(3) Immediately implement the response action plan; and

(4) Immediately sample the leachate in the leachate detection, collection, and removal system to determine the quality of the leachate in accordance with the requirements under paragraph (c)(3) of this section. The owner or operator must provide this information to the Regional

Administrator at the earliest practicable time.

(5) The owner or operator must report in writing to the Regional Administrator on the effectiveness of the response action as soon as practicable after the response has been in place for 60 days, and at other subsequent time periods as specified by the Regional Administrator. The report must describe the effectiveness of the response action in preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of levels above EPA-approved health based standards for ground-water protection. At a minimum, the report must address the factors set forth in paragraph (c)(2) of this section and any additional information required by the Regional Administrator. The Regional Administrator will review this report to determine whether or not the selected response is preventing hazardous constituent migration out of the unit. If the Regional Administrator determines that the existing response action is not preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit, the Regional Administrator will so inform the owner or operator. The owner or operator must then either:

(i) Implement alternative responses for the rate of leakage, if the approved response action plan contains such alternatives; or

(ii) Amend the response action plan if the approved response action plan does not contain an alternative response by modifying the permit in accordance with Part 124 procedures. The owner or operator must submit a permit modification to the Regional Administrator within 60 days. At a minimum such modification must address information set forth in paragraph (b) of this section as well as the rate of leakage, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility, or an accident). The permit modification will be processed in accordance with Part 124 procedures.

(e) *Leaks that are less than rapid and extremely large.* (1) The owner or operator is required to prepare and submit to the Regional Administrator a response action plan for leaks that exceed the action leakage rate for the top liner but are less than rapid and extremely large. In order to satisfy this requirement, the owner or operator may either:

(i) Submit a response action plan with the permit application identifying actions to be taken when lower levels of leakage exceed the action leakage rate; or

(ii) Submit to the Regional Administrator a request for a permit modification, in accordance with the Part 124 procedures, to amend the response action plan within 90 days from the date that liquids first exceed the action leakage rate. The permit modification will be processed in accordance with Part 124 procedures.

(2) For leakage that exceeds the action leakage rate, the response action plan must, at a minimum, include the information set forth in paragraph (b) (1) to (5) of this section. The owner or operator must also include a detailed assessment describing the effectiveness and feasibility of each of the following responses for preventing hazardous constituent migration out of the unit in excess of health-based standards:

(i) The owner or operator terminates receipt of waste and closes the unit;

(ii) The owner or operator institutes operational changes at the unit that will reduce leakage between the liners to prevent hazardous constituents migration out of the unit;

(iii) The owner or operator provides expeditious repair of the leak(s);

(iv) The owner or operator continues to remove and treat the leakage with increased ground water monitoring activities; or

(v) The owner or operator maintains current operating procedures.

(3) The response action plan must recommend a specific response action for leakage above the action leakage rate for the unit and indicate why other responses action were not chosen. The response action plan may address a range of leakage with varying responses. Other factors that would influence the quality and mobility of the leachate produced and the potential for it to migrate out of the unit may also be considered in the demonstration.

(f)(1) The Regional Administrator will review and approve the response action plan for leakage less than rapid and extremely large if he determines that such plan prevents, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of EPA-approved health based standards for ground-water protection. If the plan does not prevent hazardous constituent migration out of the unit in levels exceeding the ground-water protection standards, the Regional Administrator shall disapprove such plan.

(2) In making a determination under paragraph (f)(1) of this section, the Regional Administrator shall consider, but not be limited to considering the following factors:

(i) The type and amount of hazardous constituents that may be expected to be present in the leachate between the liners or the actual type and amount if the action leakage rate is exceeded;

(ii) The mobility of hazardous constituents in the leachate;

(iii) The degree to which the liquid head on the bottom liner will be minimized by implementation of the response action plan;

(iv) The rate of leakage, if the response action plan is submitted after the action leakage rate is exceeded, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility, accident, or minor leak);

(v) Condition of the liners and leachate collection and removal system, (e.g., CQA documentation review, review of design for deficiency, or review of the unit operating record concerning accidents that have occurred);

(vi) Design of the double liner system, including design features that provide further protection beyond those required under § 264.221;

(vii) Future planned activities, including remaining active life time period, and closure and post-closure care activities;

(viii) Environmental factors, including amount and frequency of precipitation, and whether the unit is located in a highly vulnerable hydrogeological setting.

(3) The Regional Administrator will identify in the response action plan monitoring activities for specific hazardous constituents identified in Appendix VIII of Part 261 of this chapter. Specifically, the Regional Administrator will require the owner or operator to test the liquids in the sump for the leachate detection, collection, and removal system to determine whether specified hazardous constituents are present and their concentrations. The Regional Administrator may also identify additional physical and chemical properties to be tested for.

(g) If liquids leaking into the leak detection system specified under § 264.301(h) exceed the action leakage rate for the top liner, but are less than rapid and extremely large, the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days of the leakage exceeding the action leakage rate. The notification must preliminarily identify the liquid volumes that have been detected, collected, and removed;

(2) Collect and remove accumulated liquids; and

(3) Implement the plan if it was previously submitted with the application pursuant to paragraph (e)(1)(i) of this section, or submit a permit modification pursuant to paragraph (e)(1)(ii) of this section.

(4) Immediately sample the leachate in the leachate detection, collection, and removal system to determine the quality of the leachate in accordance with the requirements under paragraph (f)(3) of this section. The owner or operator must provide this information to the Regional Administrator at the earliest practicable time. If the owner or operator determines that the leachate exceeds health-based standards he must implement any response action approved in the plan.

(5) The owner or operator must report in writing to the Regional Administrator on the effectiveness of the response action as soon as practicable after the response has been in place for 60 days, and annually thereafter. The report must describe the effectiveness of the response action in preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of levels above EPA-approved health based standards for ground-water protection. At a minimum, the report must address the factors set forth in paragraph (f)(2) of this section and any additional information required by the Regional Administrator. The Regional Administrator will review this report to determine whether or not the selected response is preventing hazardous constituent migration out of the unit. If the Regional Administrator determines that the existing response action is not preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit, the Regional Administrator will so inform the owner or operator. The owner or operator must then either:

(i) Implement alternative responses for the rate of leakage, if the approved response action plan contains such alternatives; or

(ii) Amend the response action plan, if the approved response action plan does not contain an alternative response, by modifying the permit in accordance with Part 124 procedures. The owner or operator must submit a permit modification to the Regional Administrator within 60 days. At a minimum such modification must address information set forth in paragraph (b) of this section. The permit modification will be processed in accordance with Part 124 procedures.

(h) If the owner or operator determines that the top liner action leakage rate is being exceeded, he may demonstrate for leakage less than rapid and extremely large that the liquid resulted from an error in sampling, analysis, or evaluation, precipitation during construction, or a source other than leakage through the top liner. While the owner or operator may make a demonstration under this paragraph in addition to submitting an application under paragraph (e) of this section, he is not relieved of the requirement to submit a permit modification application or to implement the response unless the Regional Administrator approves the demonstration made by finding that the liquid resulted from a source other than a top liner leakage, and was attributed to precipitation during construction, or error in sampling, analysis, or evaluation. In making a demonstration under this paragraph, the owner or operator must:

(1) Notify the Regional Administrator in writing as soon as practicable, that he intends to make a demonstration under this paragraph;

(2) Within 90 days of notifying the Regional Administrator under (g)(1) of this section, submit a report to the Regional Administrator that demonstrates that the liquid resulted from a source other than top liner leakage or that the apparent noncompliance with the standards resulted from precipitation during construction, or error in sampling, analysis, or evaluation.

The Regional Administrator shall review the demonstration and notify the applicant as to whether or not such a determination is successful. The applicant has 45 days to comment on such a determination. The Regional Administrator shall respond to those comments and make a final decision on the applicant's demonstration.

(3) If the Regional Administrator approves the demonstration in paragraph (h)(2) of this section, then the owner or operator must submit an application for a permit modification to the Regional Administrator to make any appropriate changes to the response action plan for the unit within 90 days of the Regional Administrator's determination under paragraph (h)(2) of this section.

(i) Within 45 days of detecting a significant change in the leakage rate, the owner or operator must submit to the Regional Administrator a report on the leakage that includes the following information:

(1) An assessment of the problem causing the leak that includes a profile of liquid quantity collected and removed versus time, and characterization of changes in the rate of top liner leakage;

(2) A description of any change in the response to be implemented as approved in the response action plan;

(3) A schedule for implementation; and

(4) Other information that the owner or operator deems appropriate to fully describe the response that will be implemented.

24. Section 264.303 is amended by removing paragraph (a), redesignating paragraph (b) as (a) and adding new paragraphs (b), (c), and (d) as follows:

§ 264.303 Monitoring and inspection.

* * * * *

(b) An owner or operator required to have a leak detection system under this subpart must:

(1) Monitor for and record on a daily basis the presence of liquids in the leak detection system removal sump during the active life (including the closure period) and at least weekly during the post-closure period;

(2) Analyze the daily monitoring data during the active life under paragraph (b)(1) of this section on a weekly basis and the weekly monitoring data during the post-closure period under paragraph (b)(1) of this section on a quarterly basis to determine if the action leakage rate under paragraph (k) (1) or (2) of § 264.301 is exceeded under the conditions of paragraphs (b)(2) (i), (ii), or (iii) of this section:

(i) The daily monitoring data averaged over one month exceeds the action leakage rate during the active life or the weekly monitoring data averaged over three months exceeds the action leakage rate during the post-closure period; or

(ii) The daily rate for any one-day period during a week exceeds 50 gallons per acre per day during the active life or the weekly rate for any one-week period during a quarter exceeds 350 gallons per acre per week during the post-closure period; or

(iii) In lieu of the requirements of paragraphs (b)(2) (i) and (ii) of this section, the Regional Administrator may specify in the permit an alternative method for determining if the action leakage rate under paragraph (k) (1) or (2) of § 264.301 is exceeded.

(3) Establish a monitoring and inspection program that will allow the determination of the following throughout the active life and post-closure care period:

(i) The rate of leakage into the leak detection system sump, and the removal rate;

(ii) The deterioration, malfunction, or improper operation of the leak detection system;

(iii) The effectiveness of additional controls implemented as part of a response action plan when the maximum leakage rate of the top liner is exceeded; and

(iv) The effectiveness of the bottom liner and leachate detection, collection, and removal system to control leakage below the action leakage rate.

(c) The owner or operator must record all inspection information required in paragraph (b) of this section in the inspection log required under § 264.15 of this part. The recorded information must be in sufficient detail to demonstrate that the leak detection permit requirements are being complied with.

(d) Specific inspection and monitoring requirements in addition to those described in paragraph (b) of this section may be required in the facility permit by the Regional Administrator as needed to assure detection of leaks at the earliest practicable time. Inspection and monitoring requirements contained in the facility permit will be based on preventing migration of liquids containing hazardous constituents out of the unit.

25. New § 264.304 is added to read Subpart N to as follows:

§ 264.304 Construction quality assurance.

Effective 12 months after promulgation of this rule, the owner or operator of each new landfill unit or component constructed at a landfill and listed under § 264.19(b) must conduct a construction quality assurance program in compliance with §§ 264.19 and 264.20.

26. Section 264.310 is amended by adding a new paragraph (b)(6) to read as follows:

§ 264.310 Closure and post-closure care.

* * * * *

(b) * * *

(6) Maintain and monitor the leak detection system in accordance with §§ 264.301 (g) and (h), 264.303 (b), (c), and (d), and comply with all other applicable leak detection requirements of this subpart.

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

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

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

2. Section 265.15 is amended by revising paragraphs (b)(1) and (b)(4) to read as follows:

§ 265.15 General inspection requirements.

* * * * *

(b)(1) The owner or operator must develop and follow a written schedule for inspecting all monitoring and leak detection equipment, safety and emergency equipment, security devices, and operating and structural equipment (such as dikes and sump pumps) that are important to preventing, detecting, or responding to environmental or human health hazards.

* * * * *

(4) The frequency of inspection may vary for the items on the schedule. However, it should be based on the rate of possible deterioration of the equipment and the probability of an environmental or human health incident if the deterioration or malfunction or any operator error goes undetected between inspections. Areas subject to spills, such as loading and unloading areas, must be inspected daily when in use. At a minimum, the inspection schedule must include the items and frequencies called for in §§ 265.174, 265.194, 265.226, 265.260, 265.278, 265.303, 265.347, 265.377, and 265.403.

* * * * *

3. Subpart B is amended by adding §§ 265.19 and 265.20.

§ 265.19 Construction quality assurance program: Objective.

(a) A construction quality assurance program is required for all landfills, surface impoundments, and waste piles to ensure, to a reasonable degree of certainty, that a completed unit or portion of a unit meets or exceeds all design criteria, plans, and specifications. Land treatment units must have a construction quality assurance program to ensure, to a reasonable degree of certainty, that a completed unit or portion of a unit meets or exceeds all design criteria, plans, and specifications for construction of a cover over the closed portion of the unit, where applicable under § 265.280.

(b) The construction quality assurance program must cover the following physical components of a landfill, surface impoundment, or waste pile, where applicable:

(1) Foundation;

(2) Dikes;

(3) Low-permeability soil liners;

(4) Flexible membrane liners;

(5) Leachate collection systems (includes leak detection systems); and

(6) Final cover system.

(c) The frequency of inspection may vary for the items on the schedule. However, it should be based on the rate of possible deterioration of the equipment and the probability of an environmental or human health incident if the deterioration or malfunction or any operator error goes undetected between inspections. Areas subject to spills, such as loading and unloading areas, must be inspected daily when in use. At a minimum, the inspection schedule must include the items and frequencies called for in §§ 265.174, 265.194, 265.226, 265.260, 265.278, 265.303, 265.347, 265.377, and 265.403, where applicable.

§ 265.20 Construction quality assurance program; Elements of the program.

(a) The owner or operator of a landfill, surface impoundment, waste pile, or land treatment unit, which is a new unit or replacement of an existing unit and for which construction commences later than 12 months after promulgation of this rule, must have a written construction quality assurance plan. The owner or operator of an existing unit for which construction commences on a portion of the unit later than 12 months after promulgation of this rule must also have a written construction quality assurance plan for any component of that portion listed under § 265.19(b). The construction quality assurance plan must be developed, implemented, and documented under the direction of a construction quality assurance officer responsible for all aspects of the construction quality assurance program. The construction quality assurance officer must be a registered professional engineer. The owner or operator must submit his construction quality assurance plan to the Regional Administrator for approval prior to starting construction. The Regional Administrator may determine within 30 days of receipt of the plan that the plan does not need to be reviewed for approval. If the Regional Administrator makes such a finding, he must notify the owner or operator in writing. The Regional Administrator, as part of his review of the plan, will provide the public, through a notice in local newspapers, the opportunity to submit written comments on the construction quality assurance plan and request modifications of the plan within 30 days of the date of the notice. He will also, in response to a request or at his own discretion, hold a public hearing whenever such a hearing might clarify one or more issues concerning the construction quality assurance plan. The Regional Administrator will give public notice of the hearing at least 30 days before it occurs. (Public notice of the

hearing may be given at the same time as notice of the opportunity for the public to submit written comments, and the two notices may be combined.) The Regional Administrator will approve, modify, or disapprove the construction quality assurance plan. If the Regional Administrator disapproves the plan he shall provide the owner or operator a detailed written statement of reasons for disapproval. The owner or operator shall modify the plan or submit a new construction quality assurance plan for approval. The Regional Administrator will approve or modify this plan in writing within 60 days following the close of the public comment period or public hearing, whichever is later. If the Regional Administrator modifies the plan, this modified plan becomes the approved construction quality assurance plan. Approval by the Regional Administrator will assure that the approved construction quality assurance plan is consistent with §§ 265.19, 265.20, and the applicable requirements of Subparts K, L, M, and N of this part. A copy of this modified plan must be mailed to the owner or operator. The Regional Administrator may allow phasing of the construction quality assurance plan to be submitted and approved in phases based on a demonstration by the owner or operator that detailed construction specifications are not practicable at the time that the plan is initially submitted, due to the planned phased construction of the unit over an extended time period. If the Regional Administrator allows for phasing the submission of the construction quality assurance plan, he will review and approve a phased time schedule. A copy of the approved plan and all revisions to the plan must be kept by the owner or operator as part of the operating record required under § 265.73 until closure, and must be available for inspection by the Regional Administrator until the post-closure care period is completed and certified in accordance with § 265.117. The plan must identify steps necessary to monitor and document the quality of materials used and the condition and manner of their placement. The specific content of the construction quality assurance plan will depend on site-specific factors. The construction quality assurance plan must include at least the following elements:

(1) General description of the units—Plans for the design, construction, operation, and closure of the unit(s) must be discussed. The description must identify the construction stages for the components at the unit(s);

(2) Responsibility and authority—A detailed description of the responsibility and authority of all organizations and key personnel positions involved in the development, implementation, and documentation of the construction quality assurance program must be provided. The description must assure that the objective of the construction quality assurance program identified in § 265.19(a) will be met;

(3) Construction quality assurance personnel qualifications—The qualifications of the construction quality assurance officer and supporting inspection personnel must be described in the construction quality assurance plan. The position descriptions must demonstrate that the personnel will possess the training and experience necessary to fulfill their identified responsibilities;

(4) Inspection and sampling activities—The observations and tests that will be used to ensure that the materials and the constructed components meet the design specifications must be described. The description of the inspection and testing activities must be sufficiently detailed to allow for review of both the conceptual approach and the specifics of the activities. The following areas must be included:

(i) Sampling and inspection activities for all constructed components;

(ii) Sample size and sample locations;

(iii) Frequency of testing;

(iv) Data evaluation procedures;

(v) Acceptance and rejection criteria; and

(vi) Plans for implementing corrective measures as addressed in the project specifications.

(5) Documentation of construction quality assurance activities—At the time of submittal of the construction quality assurance plan, a report outline is required that describes how the results of the construction quality assurance program activities for each constructed component will be documented.

(b) The owner or operator must describe in detail in the construction quality assurance plan how the components and materials used for their construction on-site will be inspected before, during, and after construction to comply with the following:

(1) For construction of foundations, the construction quality assurance program must:

(i) Ensure structurally stable subgrades for the overlying facility components as specified in the design specifications;

(ii) Ensure necessary strength, as specified in the design specifications, for resistance to settlement, compression, and uplift resulting from internal or external pressure gradients; and

(iii) Provide descriptions of the following inspection activities:

(A) Measurements of the depth and slope of the excavation to ensure that it meets design requirements;

(B) Observations to ensure proper placement of any recessed areas for pipes and other materials used for leak detection, leachate collection, and removal;

(C) Tests and observations to ensure that all characteristics of compacted soil meet the design specifications; and

(D) Observations of stripping and excavation to ensure that all soft, organic, and otherwise undesirable materials are removed.

(2) For dikes, the construction quality assurance program must:

(i) Ensure structural strength, as specified in the design;

(ii) Ensure stable support for the overlying facility components as specified in the design; and

(iii) Provide descriptions of the following inspection activities:

(A) Verification of material quality;

(B) Construction and use of a test fill to verify the specified density/moisture content/compactive effort/strength relationship for field conditions and construction equipment as needed to support the design specifications when field data on this relationship are not available;

(C) Measurement of loose lift thickness;

(D) Observation of clod size reduction and material homogenization operations, if applicable;

(E) Observation of type of compaction equipment, number of passes, and uniformity of compaction coverage;

(F) Testing of the compacted fill density; and

(G) Observation of proper placement of the vegetation layer on the dike surface.

(3) For low-permeability compacted soil liners, the construction quality assurance program must;

(i) Ensure inspection for imperfections including deleterious material, off-specification material, cracks, channels, structural and hydraulic non-uniformities, and any other conditions that may cause an increase in the permeability of the liner;

(ii) Ensure the installed material is the same as was evaluated for chemical resistance in accordance with §§ 265.221 (a)(2)(i), 265.251(b)(2)(i), or 265.301(a)(2)(i), and any other material specifications;

(iii) Ensure that the liner has an installed permeability that meets the requirements of Subparts K, L, and N of this Part.

(A) A test fill must be constructed to verify that the constructed liner complies with requirements for field permeability. The test fill compaction and testing must be well documented, and soil materials, procedures, and equipment used in the test fill construction and testing must be the same as those used during construction of the full-scale unit. The owner or operator must describe observations and tests to be used on the test fill, including a description of the testing sample arrays and replications to be conducted. The Regional Administrator will review for completeness the owner or operator's plan for the design and evaluation of the test fill to ensure that the evaluation conditions will accurately represent the performance of the full scale unit.

(B) Based on the parameters evaluated and data collected from the test fill, the owner or operator must justify that the tests applied to the full-scale facility liner serve as surrogates for actual field permeability tests. The surrogate tests are a group of tests that do not actually measure field permeability but whose results, when considered together, can be used to estimate field permeability and, hence, can be used to assure the proper permeability of the installed liner in all areas.

(C) The Regional Administrator may approve an alternative approach to test fill construction and testing for demonstrating that the low-permeability soil liner meets the installed permeability requirement of the unit as required; and

(iv) Provide descriptions of the following inspection activities:

(A) Observation of the removal of roots, rocks, rubbish, or off-specification soil from the liner material;

(B) Identification of variations in soil characteristics that require a change in construction specifications;

(C) Observation of the spreading of liner material to obtain complete coverage and the specified loose lift thickness;

(D) Observation of the reduction of clod size to meet liner material specifications;

(E) Observation of the spreading and incorporation of soil amendments (if specified) to obtain uniform distribution of the specified amount in the liner material;

(F) Observation of the spreading and incorporation of water to obtain full penetration through clods and uniform distribution of the specified moisture content;

(G) Observation of the use of procedures, as specified in the construction quality assurance plan, to adjust the soil moisture content in the event of a significant period of prolonged rain during construction;

(H) Observing and testing to ensure that significant water loss before and after compaction is prevented; and

(I) Observing and testing the soil liner compaction process to ensure that the compacted effort specifications are met.

(4) For flexible membrane liners, the construction quality assurance program must:

(i) Ensure tight seams and specified structural strength of the seams and joints, and the absence of tears, punctures, or other breaches. The field seams must be visually checked throughout their length and width and must also be destructively tested on a spot basis. The design engineer or the construction quality assurance officer will develop the inspection and testing approach for destructive seam testing to ensure that the design specifications are met;

(ii) Ensure that the liner polymer material properties are the same as were evaluated for chemical resistance in accordance with §§ 265.221(a)(2)(i), 265.254(b)(2)(i), or 265.301(a)(2)(i), and any other material specifications;

(iii) Include certification that adequate quality control was practiced during manufacture of the constructed flexible membrane liner at the fabrication plant; and

(iv) Provide descriptions of the following inspection activities:

(A) Inspection of liner material after it is received at the facility and before installation to confirm that it is the material specified in the design and is not damaged;

(B) Inspection of the liner material after storage at the facility to ensure that it is not damaged;

(C) Testing and observation of placement of the lower bedding layer to ensure that design requirements are met;

(D) Observation of placement of the flexible membrane liner to ensure that design requirements are met;

(E) Observation of any damage to the liner that may occur as a result of adverse weather conditions, inadequate temporary anchoring, or rough handling;

(F) Observation of the overlapping of flexible membrane liner sheets to ensure that off-specification seams do not result; and

(G) Observation and testing of seams to ensure proper seaming and conformance to the seam strength specified in the design.

(5) For leachate collection systems (above and between the liners, where required) the construction quality assurance program must:

(i) Ensure that material properties comply with the design criteria, plans, and specifications;

(ii) Ensure the materials are the same as were evaluated for chemical resistance in accordance with §§ 265.221(a)(3)(i), 265.254(b)(5)(i), or 265.301(a)(5)(i);

(iii) Provide descriptions of the following inspection activities:

(A) Observations and measurements to ensure that the pipes are placed at locations and in configurations specified in the design;

(B) Observations and tests to ensure that pipe grades are as specified in the design;

(C) Observations and tests to ensure that all pipes are joined together as specified in the design;

(D) Observations to ensure that the placement of any filter materials around the pipe meet the specifications in the design;

(E) Observations and tests to ensure that backfilling and compaction are completed as specified in the design and that, in the process, the pipe network is not damaged;

(F) Observations and tests to ensure that the drainage layer material is of the particle size as specified in the design and free from excessive amounts of fines or organic materials;

(G) Observations and tests to ensure that the thickness and coverage of the drainage layer complies with the design specifications;

(H) Survey of the drainage layer to ensure that specified grades are obtained as specified in the design;

(I) Observation of construction procedures to prevent the transport of fines by runoff into the leachate collection system;

(J) Observations to ensure that all synthetic drainage layer or geotextile materials are placed according to the placement plan;

(K) Measurements to ensure that the overlap of all synthetic drainage layer or geotextile material as specified in the design is achieved;

(L) Observations to ensure that the synthetic drainage layer or geotextile materials are free from excessive wrinkles and folds;

(M) Observations to ensure that weather conditions are appropriate for placement of the synthetic drainage layer or geotextile materials and that exposure to rain, wind, and direct sunlight during and after installation is

in compliance with the manufacturer's recommendations;

(N) Inspection of filter layer placement to ensure that the design specifications, including material specifications, placement procedures, and thickness are met; and

(O) Inspection and testing of the sump, leachate removal and detection equipment, and any other associated equipment or structures to ensure that the design specifications, including material and equipment specifications, coating specifications, and mechanical and electrical equipment installation specifications, are met.

(6) For final cover, the construction quality assurance program must:

(i) Ensure all layers of the cover are inspected for uniformity, imperfections, and damage;

(ii) Ensure that the materials for each layer are as specified in the design material specifications;

(iii) Ensure each layer of the final cover is installed or constructed to meet the requirements specified in the design; and

(iv) Provide descriptions of the following inspection activities. Some of these activities may not be appropriate for all land treatment unit covers; inspection activities for land treatment unit covers must also be based on the requirements of § 265.280.

(A) Procedures and methods consistent with those under § 265.20(b)(3) for observing and testing the installation of any low-permeability compacted soil layer to ensure that the design specifications are met;

(B) Procedures and methods consistent with those under § 265.20(b)(4) for observing and testing the installation of any flexible membrane layer to ensure that the design specifications are met; and

(C) Procedures and methods for observing and testing other layers of the final cover (e.g., drainage, and vegetative layer) to ensure that the design specifications are met. These activities must include inspection of the completed cover slope, vegetation, and drainage conduits to ensure that they meet the specified design.

(c) The owner or operator will be exempted from any part of the requirements of paragraph (b) of this section if the Regional Administrator finds, based on a demonstration by the owner or operator, that alternative inspection practices, observations, or tests will ensure that the completed component meets or exceeds all design criteria, plans, and specifications.

(d) The owner or operator may request that the Regional Administrator amend his construction quality assurance plan at any time before and during the active life of the facility.

(1) The CQA officer may make changes to the approved CQA plan under § 265.20(a) without seeking and receiving prior approval from the Regional Administrator. Changes that do not require Regional Administrator approval are limited to instances where the CQA officer certifies that the revised CQA plan will provide equivalent or better certainty that the constructed component meets the design-specifications. Within seven days of modifying the CQA plan approved under § 265.20(a), the owner or operator must amend the operating record to include the revised CQA plan and certification.

(2) Changes other than those specified in paragraph (d)(1) of this section, must be submitted to the Regional Administrator and approved by the Regional Administrator prior to construction. The owner or operator must submit a copy of the amended CQA plan to the Regional Administrator for approval prior to starting construction relating to the amended area of the CQA plan. The Regional Administrator will approve, disapprove or modify this amended plan in accordance with the procedures discussed under paragraph (a) of this section.

(e) The owner or operator must notify the Regional Administrator at least 180 days prior to the date he expects to begin construction of the final cover. The notification must include the following:

(1) Schedule of major activities; and

(2) Supplemental information required in the construction quality assurance plan that was not previously included.

(f) Upon completion of construction of facility components listed under § 265.19(b), the owner or operator must submit a construction quality assurance report in writing to the Regional Administrator demonstrating compliance with the construction quality assurance plan. The report must be certified by the construction quality assurance officer before waste is received, except in the case of construction of the final cover. For the final cover, the report must be submitted to the Regional Administrator within 60 days after cover construction is completed. Submission of the report may be phased, if approved by the Regional Administrator during approval of the construction quality assurance plan to allow for the phased construction of a unit. The construction quality assurance report must include at least the following:

(1) Summaries of all construction and material inspection activities to include:

(i) Observations;

(ii) Test data sheets;

(iii) Problem reports;

(iv) Repair activities;

(v) Deviations from the design and material specifications;

(vi) Design engineer acceptance reports (for errors, inconsistencies, and other problems);

(vii) As built drawings; and

(viii) Block evaluation reports for large projects.

(2) Summary discussion for each applicable component under § 265.19(b) that describes the major construction quality assurance inspection activities, detailing how the results demonstrate that the constructed unit meets or exceeds all design criteria, plans, and specifications. Summary tables, charts, and graphs must be used, where appropriate, to document implementation of the construction quality assurance program.

(3) Certification by the qualified registered professional engineer in charge of the construction quality assurance program that the report accurately represents the activities and findings of the completed construction quality assurance program and that the program was implemented in accordance with all requirements of the approved construction quality assurance plan.

4. Section 265.73 is amended by revising paragraph (b)(6) to read as follows:

§ 265.73 Operating record.

* * * * *

(b) * * *

(6) Monitoring, testing, or analytical data where required by §§ 265.90, 265.94, 265.226, 265.260, 265.276, 265.278, 265.280(d)(1), 265.303, 265.347, and 265.377; and,

* * * * *

5. Section 265.117 is amended by revising paragraph (a)(1)(ii) to read as follows:

§ 265.117 Post-closure care and use of property.

(a)(1) * * *

(ii) Maintenance of monitoring, waste containment, and leak detection systems in accordance with the requirements of Subparts F, K, L, M, and N of this Part.

* * * * *

6. Section 265.118 is amended by revising paragraphs (c)(1) and (c)(2)(ii) to read as follows:

§ 265.118 Post-closure plan; amendment of plan.

* * * * *

(c) * * *

(1) A description of the planned monitoring and leak detection activities and frequencies at which they will be performed to comply with Subparts F, K, L, M, and N of this Part during the post-closure care period; and

(2) * * *

(ii) The function of the monitoring, leachate collection, and leak detection equipment in accordance with the requirements of Subparts F, K, L, M, and N of this Part; and

* * * * *

7. Section 265.221 is amended by revising the section heading and by adding new paragraphs (f) through (j) to read as follows:

§ 265.221 Design and operating requirements.

* * * * *

(f) The owner or operator of any unit for which construction commences after the date of promulgation of this rule must design, construct, operate, and maintain a leak detection system capable of detecting leaks of hazardous constituents at the earliest practicable time over all areas likely to be exposed to waste and leachate during the active life and post-closure care period. Any liquid, waste, or waste constituent migrating into the leak detection system is assumed to originate from liquids leaking through the top liner of the unit unless the Regional Administrator finds, based on a demonstration by the owner or operator under § 265.222(h), that such liquid, waste, or waste constituent originated from another source.

(g) The leak detection system required under paragraph (f) of this section shall be part of the leachate collection system between the liners described under paragraph (a)(3) of this section. The leachate collection system between the liners shall, in addition to meeting the requirements of paragraph (a)(3) of this section, meet the following requirements for leak detection:

(1) The minimum bottom slope must be 2 percent, and drainage layer material must have the following hydraulic characteristics:

(i) For granular materials, a minimum hydraulic conductivity of 1 cm/sec and a minimum layer thickness of 12 inches; or

(ii) For synthetic drainage layer materials, a hydraulic transmissivity of 5 x 10^{-4} m^2/sec or greater.

(2) Be capable of detecting a leak of no more than 1 gallon per acre per day in the top liner (not including liquids absorbed by the leachate collection system); also, be capable of detecting leakage in excess of 1 gallon per acre per day within 1 day after the leak occurs (not including liquids absorbed by the leachate collecting system or bottom liner);

(3) Collect and remove liquids rapidly to minimize the head on the bottom liner; and

(4) Include a sump of appropriate size to efficiently collect liquids and prevent liquids from backing up into the drainage layer. Each unit must have its own sump. The design of the sump and removal system must provide a method for measuring and recording the liquid volume present in the sump and liquids removed so that the leachate flow rate can be determined on a daily basis.

(h) In lieu of the requirements of paragraph (g) of this section, the Regional Administrator may approve an alternative leak detection system if:

(1) The Regional Administrator finds, based on a demonstration by the owner or operator, that there is no potential for migration of hazardous constituents from a unit to ground water or surface water during the active life and post-closure care period of the unit; or

(2) The unit complies with the requirements of paragraphs (c) or (d) of this section; or

(3) The Regional Administrator finds, based on a demonstration by the owner or operator, that an alternative leak detection system or technology will meet the requirements of paragraph (f) of this section. In deciding whether to grant an alternative leak detection system or technology, the Regional Administrator will consider:

(i) The durability and effectiveness of the proposed system or technology;

(ii) The nature and quantity of the wastes; and

(iii) The ability of the system or technology to detect leaks and, in combination with response actions to be taken in compliance with § 265.222, prevent migration of waste out of the unit during the active life and post-closure care period so that ground water and surface water are not contaminated.

(i) The owner or operator of any unit that is required by paragraph (f) of this section to have a leak detection system and that is not located completely above the seasonal high water table must demonstrate that the operation of the leak detection system will not be adversely affected by the presence of ground water.

(j) The owner or operator must establish a top liner action leakage rate during the design of the unit for leak detection systems under paragraph (g) of this section. The action leakage rate is determined by:

(1) Using a standard value of (EPA is proposing to select a final value from the range of 5–20 gallons/acre/day); or

(2) A review by the Regional Administrator of an owner or operator demonstration, and a finding by the Regional Administrator, that a site-specific top liner action leakage rate is appropriate for initiating review of the actual leakage rate to determine if a response action is necessary. The site-specific top liner action leakage rate demonstration must be based on allowing only very small isolated leakage through the top liner that does not affect the overall performance of the top liner. In deciding whether to grant a site-specific action leakage rate, the Regional Administrator will consider at least the following factors:

(i) The design, construction, and operation of the top liner;

(ii) The attenuative capacity and thickness of any soil component of the top liner; and

(iii) All other factors that would influence the potential for leachate to migrate through the top liner.

The Regional Administrator will approve, modify, or disapprove the demonstration of an alternative site-specific action leakage rate within 60 days of its receipt. If the Regional Administrator does not approve the demonstration, the owner or operator may modify the demonstration or submit a new demonstration for approval.

8. Sections 265.221 and 265.222 are amended by redesignating paragraphs (a) and (b) of § 265.222 as paragraphs (k) and (l) of § 265.221, respectively.

9. Section 265.222 is revised to read as follows:

§ 265.222 Response actions.

(a) Prior to receipt of waste at the unit, the owner or operator must have a response action plan approved by the Regional Administrator that sets forth the actions to be taken immediately following a finding of rapid and extremely large volumes of leakage between the liners in accordance with the requirements under paragraph (b) of this section. A rapid and extremely large leak is the maximum design leakage rate that the leachate detection, collection, and removal system can remove under gravity flow conditions without the fluid head on the bottom liner exceeding 1 foot in granular leak detection systems and without the fluid head exceeding the thickness of synthetic leak detection systems. The owner or operator must use an adequate safety margin in determining the rapid and extremely large leak to allow for uncertainties in the design, construction, and operation of the leachate detection, collection, and removal system (e.g., the owner or operator must consider decreases in the

flow capacity of the system in time resulting from siltation, creep of synthetic components of the system, etc.). The response action plan must be submitted to the Regional Administrator at least 120 days prior to receipt of waste at the unit.

(b) The response action plan for rapid and extremely large volumes of leakage between the liner must, at a minimum, include the following information:

(1) A general description of the operation of the unit including the expected active life of the unit and whether or not at closure wastes will be decontaminated or removed from the unit or left in place;

(2) A description of the hazardous constituents contained in the unit;

(3) A description of the range of events that may potentially cause rapid and extremely large volumes of leakage into the space between the liners;

(4) A discussion of important factors that can affect leakage into the leachate collection and removal system between the liners (e.g., amount and frequency of precipitation, and amount of liquids in the unit);

(5) A description of major mechanisms that will prevent migration of hazardous constituents out of the unit (e.g., the condition of the liners and leachate collection system between the liners);

(6) A detailed assessment describing the effectiveness and feasibility of each of the following potential immediate interim responses for preventing hazardous constituent migration out of the unit by decreasing the volume of leakage into the leak detection system:

(i) The owner or operator limits or terminates receipt of waste;

(ii) The owner or operator provides expeditious repair of the leak(s); or

(iii) The owner or operator institutes operational changes at the unit that will minimize leakage into the space between the liners so that the leakage will be less than rapid and extremely large.

(7) The plan must also include the response the owner or operator will undertake after determining the concentration of hazardous constituents in the liquids in the sump of the leak detection system in accordance with the requirements under paragraph (c)(3) of this section.

(i) If any hazardous constituent concentrations in the leachate exceed health-based standards, the owner or operator must assess the effectiveness and feasibility of each of the following potential responses for preventing hazardous constituent migration out of the unit:

(A) The owner or operator terminates receipt of waste and closes the unit;

(B) The owner or operator provides expeditious repair of the leak(s); or

(C) The owner or operator institutes operational changes at the unit that will minimize leakage into the space between the liners so that the leakage will be less than rapid and extremely large. If as a result of these operational changes the leakage is still above the action leakage rate, the owner or operator must comply with the requirements set forth in paragraph (e) of this section; or

(ii) If all hazardous constituent concentrations in the leachate are below health-based standards, the owner or operator must assess the effectiveness and feasibility of each of the following potential responses for minimizing the head on the bottom liner:

(A) The owner or operator provides expeditious repair of the leak(s); or

(B) The owner or operator institutes operational changes at the unit.

(8) The response action plan must address a range of rapid and extremely large volumes of leakage appropriate for the unit with correlating recommended responses and indicate why other response actions were not chosen. Each response presented must be based on a demonstration incorporating the factors set forth in paragraphs (b) (1) through (7) of this section. Other factors that would influence the quality and mobility of the leachate produced and the potential for it to migrate out of the unit may also be considered in the demonstration.

(c)(1) The Regional Administrator will review and approve the response action plan for rapid and extremely large leaks if he determines that such plan prevents, to the extent technically feasible with current technology, hazardous constitutent migration out of the unit in excess of EPA-approved health based standards for ground-water protection. If the plan does not prevent hazardous constitutent migration out of the unit in levels exceeding the ground-water protection standards, the Regional Administrator shall disapprove such plan.

(2) In making a determination under paragraph (c)(1) of this section, the Regional Administrator shall consider, but not be limited to considering, the following factors:

(i) The type and amount of hazardous constituents in the leachate between the liners;

(ii) The mobility of hazardous constituents in the leachate;

(iii) The degree to which the liquid head on the bottom liner will be minimized by implementing action of the response action plan;

(iv) Condition of the liners and leachate collection and removal system (e.g., CQA documentation review or review of design for deficiency);

(v) Design of the double liner system, including design features that provide further protection beyond those required under Section 265.221;

(vi) Future planned activities, including remaining active life time period, and closure and post-closure care activities; and

(vii) Environmental factors, including amount and frequency of precipitation, and whether the unit is located in a highly vulnerable hydrogeological setting.

(3) The Regional Administrator will identify in the response action plan monitoring activities for specific hazardous constituents identified in Appendix VIII of Part 261 of this chapter. Specifically, the Regional Administrator will require the owner or operator to test the liquids in the sump for the leachate detection, collection, and removal system to determine whether specified hazardous constituents are present and their concentration. The Regional Administrator may also identify additional physical and chemical properties to be tested for.

(4) The Regional Administrator, as part of his review of the plan (initial or modified), will provide the public, through a notice in local newspapers, the opportunity to submit written comments on the response action plan and request modifications of the plan within 30 days of the date of the notice. He will also, in response to a request or at his own discretion, hold a public hearing whenever such a hearing might clarify one or more issues concerning the plan. The Regional Administrator will give public notice of the hearing at least 30 days before it occurs. (Public notice of the hearing may be given at the same time as notice of the opportunity for the public to submit written comments, and the two notices may be combined.) The Regional Administrator will approve, modify, or disapprove the response action plan within 90 days of its receipt. If the Regional Administrator disapproves the plan he shall provide the owner or operator a detailed written statement of reasons for disapproval. The owner or operator shall modify the plan or submit a new response action plan within 30 days after receiving such written statement. The Regional Administrator will approve or modify the plan within 60 days.

(d) When there is a rapid and extremely large volume of leakage between the liners the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days of the rapid and extremely large leakage. The notification must preliminarily identify the liquid volumes that have been detected, collected, and removed;

(2) Collect and remove accumulated liquids;

(3) Immediately implement the response action plan; and

(4) Immediately sample the leachate in the leachate detection, collection, and removal system to determine the quality of the leachate in accordance with the requirements under paragraph (c)(3) of this section. The owner or operator must provide this information to the Regional Administrator at the earliest practicable time.

(5) The owner or operator must report in writing to the Regional Administrator on the effectiveness of the response action as soon as practicable after the response has been in place for 60 days, and at other subsequent time periods as specified by the Regional Administrator. The report must describe the effectiveness of the response action in preventing hazardous constituent migration out of the unit in excess of the levels above EPA-approved health based standards for ground-water protection. At a minimum, the report must address the factors set forth in paragraph (c)(2) of this section and any additional information required by the Regional Administrator. The Regional Administrator will review this report to determine whether or not the selected response is preventing hazardous constitutent migration out of the unit. If the Regional Administrator determines that the existing response action is not preventing, to the extent technically feasible with current technology hazardous constituent migration out of the unit, the Regional Administrator will so inform the owner or operator. The owner or operator must then either:

(i) Implement alternative responses for the rate of leakage, if approved response action plan contains such alternatives; or

(ii) Amend the response action plan if the approved response action plan does not contain an alternative response. The owner or operator must submit a modification plan to the Regional Administrator within 60 days. At a minimum such modification must address information set forth in paragraph (b) of this section as well as the rate of leakage, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility or an accident). The plan will be processed in accordance with the procedure under paragraph (c)(4) of this section.

(e) Leaks that are less than rapid and extremely large. (1) The owner or operator is required to prepare and submit to the Regional Administrator a response action plan for leaks that exceed the action leakage rate for the top liner but are less than rapid and extremely large. In order to satisfy this requirement, the owner or operator may either:

(i) Submit a response action plan with the permit application identifying actions to be taken when lower levels of leakage exceed the action leakage rate; or

(ii) Submit to the Regional Administrator a request to amend the response action plan within 90 days from the date liquids first exceed the action leakage rate.

(2) For leakage that exceeds the action leakage rate, the response action plan must, at a minimum, include the information set forth in paragraph (b) (1) to (5) of this section. The owner or operator must also include a detailed assessment describing the effectiveness and feasibility of each of the following responses for preventing hazardous constituent migration out of the unit in excess of health-based standards:

(i) The owner or operator terminates receipt of waste and closes the unit;

(ii) The owner or operator institutes operational changes at the unit that will reduce leakage between the liners to prevent hazardous constituents migration out of the unit;

(iii) The owner or operator provides expeditious repair of the leak(s);

(iv) The owner or operator continues to remove and treat the leakage with increased ground-water monitoring activities; or

(v) The owner or operator maintains current operating procedures;

(3) The response action plan must recommend a specific response option for leakage above the action leakage rate for the unit and indicate why other responses actions were not chosen. The response action plan may address a range of leakage with varying responses. Other factors that would influence the quality and mobility of the leachate produced and the potential for it to migrate out of the unit may also be considered in the demonstration.

(f)(1) The Regional Administrator will review and approve the response action plan for leakage less than rapid and extremely large if he determines that such plan prevents, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of EPA-approved health based standards for ground-water protection. If the plan does not prevent hazardous constitutent migration out of the unit in levels exceeding the ground-water protection standards, the Regional Administrator shall disapprove such plan.

(2) In making a determination under paragraph (f)(1) of this section, the Regional Administrator shall consider, but not be limited to considering, the following factors:

(i) The type and amount of hazardous constituents that may be expected to be present in the leachate between the liners or actual type and amount if the action leakage rate is exceeded;

(ii) The mobility and migration potential of hazardous constituents in the leachate;

(iii) The degree to which the liquid head on the bottom liner will be minimized by implementation of the response action plan;

(iv) The rate of leakage, if the response action plan is submitted after the action leakage rate is exceeded, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility, accident, or minor leak);

(v) Condition of the liners and leachate collection and removal system (e.g., CQA documentation review or review of design for deficiency) or review of the unit operating record concerning accidents that have occurred);

(vi) Design of the double liner system, including design features that provide further protection beyond those required under § 265.221;

(vii) Future planned activities, including remaining active life time period, and closure and post-closure care activities;

(viii) Environmental factors, including amount and frequency of precipitation, and whether the unit is located in a highly vulnerable hydrogeological setting.

(3) The Regional Administrator will identify in the response action plan monitoring activities for specific hazardous constituents identified in Appendix VIII of Part 261 of this chapter. Specifically, the Regional Administrator will require the owner or operator to test the liquids in the sump for the leachate detection, collection, and removal system to determine whether specified hazardous constituents are present and their concentration. The Regional Administrator may also identify additional physical and chemical properties to be tested for.

(4) The Regional Administrator, as part of his review of the plan (initial or modified), will provide the public,

through a notice in local newspapers, the opportunity to submit written comments on the response action plan and request modifications of the plan within 30 days of the date of the notice. He will also, in response to a request or at his own discretion, hold a public hearing whenever such a hearing might clarify one or more issues concerning the plan. The Regional Administrator will give public notice of the hearing at least 30 days before it occurs. (Public notice of the hearing may be given at the same time as notice of the opportunity for the public to submit written comments, and the two notices may be combined.) The Regional Administrator will approve, modify, or disapprove the response action plan within 90 days of its receipt. If the Regional Administrator disapproves the plan he shall provide the owner or operator a detailed written statement of reasons for disapproval. The owner or operator shall modify the plan or submit a new response action plan within 30 days after receiving such written statement. The Regional Administrator will approve or modify the plan within 60 days.

(g) If liquids leaking into the leak detection system specified under § 265.221(g) exceed the action leakage rate for the top liner but are less than rapid and extremely large, the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days of the leakage exceeding the action leakage rate. The notification must preliminarily identify the liquid volumes that have been detected, collected, and removed;

(2) Collect and remove accumulated liquids; and

(3) Implement the plan if it was previously submitted with the plan pursuant to paragraph (e)(1)(i) of this section, or submit an amended response action plan pursuant to paragraph (e)(1)(ii) of this section.

(4) Immediately sample the leachate in the leachate detection, collection, and removal system to determine the quality of the leachate in accordance with the requirements under paragraph (f)(3) of this section. The owner or operator must provide this information to the Regional Administrator at the earliest practicable time. If the owner or operator determines that the leachate exceeds health-based standards he must implement any response action approved in the plan.

(5) The owner or operator must report in writing to the Regional Administrator on the effectiveness of the response action as soon as practicable after the response has been in place for 60 days, and annually thereafter. The report must describe the effectiveness of the response action in preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of levels above EPA-approved health based standards for ground-water protection. At a minimum, the report must address the factors set forth in paragraph (f)(2) of this section and any additional information required by the Regional Administrator. The Regional Administrator will review this report to determine whether or not the selected response is preventing hazardous constitutent migration out of the unit. If the Regional Administrator determines that the existing response action is not preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit, the Regional Administrator will so inform the owner or operator. The owner or operator must then either:

(i) Implement alternative responses for the rate of leakage, if approved response action plan contains such alternatives; or

(ii) Amend the response action plan if the approved response action plan does not contain an alternative response.

The owner or operator must submit a modification plan to the Regional Administrator within 60 days. At a minimum such modification must address information set forth in paragraph (b) of this section as well as the rate of leakage, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility or an accident). The plan will be processed in accordance with the procedure under paragraph (c)(4) of this section.

(h) If the owner or operator determines that the top liner action leakage rate is being exceeded, he may demonstrate for leakage less than rapid and extremely large that the liquid resulted from an error in sampling, analysis, or evaluation, precipitation during construction, or a source other than leakage through the top liner. While the owner or operator may make a demonstration under this paragraph in addition to submitting an application under paragraph (e) of this section, he is not relieved of the requirement to submit an amended plan or to implement the response unless the demonstration made under this paragraph successfully shows that the liquid resulted from a source other than top liner leakage, precipitation during construction, or error in sampling, analysis, or evaluation. In making a demonstration under this paragraph, the owner or operator must:

(1) Notify the Regional Administrator in writing as soon as practicable, that he intends to make a demonstration under this paragraph;

(2) Within 90 days of notifying the Regional Administrator under paragraph (h)(1) of this section, submit a report to the Regional Administrator that demonstrates that the liquid resulted from a source other than top liner leakage or that the apparent noncompliance with the standards resulted from precipitation during construction, or error in sampling, analysis, or evaluation. The Regional Administrator shall review the demonstration and notify the applicant as to whether or not such a determination is successful. The applicant has 45 days to comment on such a determination. The Regional Administrator shall respond to those comments and make a final decision on the applicant's demonstration.

(3) If the Regional Administrator approves the demonstration in paragraph (h)(2) of this section, then the owner or operator must submit an amended plan to the Regional Administrator to make any appropriate changes to the response action plan for the unit within 90 days of the Regional Administrator's determination under paragraph (h)(2) of this section.

(i) Within 45 days of detecting a significant change in the leakage rate, the owner or operator must submit to the Regional Administrator a report on the leakage that includes the following information:

(1) An assessment of the problem causing the leak that includes a profile of liquid quantity collected and removed versus time, and characterization of changes in the rate of top liner leakage;

(2) A description of any change in the response to be implemented as approved in the response action plan;

(3) A schedule for implementation; and

(4) Other information that the owner or operator deems appropriate to fully describe the response that will be implemented.

10. New § 265.224 is added to Subpart k to read as follows:

§ 265.224 Construction quality assurance.

Effective 12 months after promulgation of this rule, the owner or operator of each new surface impoundment unit or component constructed at a surface impoundment and listed under § 265.19(b) must conduct a construction quality assurance program in compliance with §§ 265.19 and 265.20.

11. Section 265.226 is amended by revising the section heading and adding new paragraphs (b) and (c) to read as follows:

§ 265.226 Monitoring and inspection.

* * * * *

(b) An owner or operator required to have a leak detection system under this subpart must:

(1) Monitor for and record on a daily basis the presence of liquids in the leak detection system removal sump daily during the active life (including the closure period) and at least weekly during the post-closure period (if applicable);

(2) Analyze the daily monitoring data during the active life under paragraph (b)(1) of this section on a weekly basis and the weekly monitoring data during the post-closure period under paragraph (b)(1) of this section on a quarterly basis to determine if the action leakage rate under paragraph (j) (1) or (2) of § 265.221 is exceeded under the conditions of paragraphs (b)(2) (i), (ii), or (iii) of this section:

(i) The daily monitoring data averaged over one month exceed the action leakage rate during the active life or the weekly monitoring data averaged over three months exceeds the action leakage rate during the post-closure period; or

(ii) The daily rate for any one-day period during a week exceeds 50 gallons per acre per day during the active life or the weekly rate for any one-week period during a quarter exceeds 350 gallons per acre per week during the post-closure period; or

(iii) In lieu of the requirements of paragraphs (b)(2) (i) and (ii) of this section, the Regional Administrator may specify in the permit an alternative method for determining if the action leakage rate under paragraph (j) (1) or (2) of § 265.221 is exceeded.

(3) Establish a monitoring and inspection program that will allow the determination of the following throughout the active life and post-closure care period:

(i) The rate of leakage into the leak detection system sump, and the removal rate;

(ii) The deterioration, malfunction, or improper operation of the leak detection system;

(iii) The effectiveness of additional controls implemented as part of a response action plan when the action leakage rate of the top liner is exceeded; and

(iv) The effectiveness of the bottom liner and leachate detection, collection, and removal system to control leakage below the action leakage rate.

(c) The owner or operator must record all inspection information required in paragraph (b) of this section in the inspection log required under § 265.15 of this part. The recorded information must be in sufficient detail to demonstrate that the leak detection requirements of §§ 265.221 and 265.222 are being complied with.

12. Section 265.254 is revised to read as follows:

§ 265.254 Design and operating requirements.

(a) With respect to waste received from May 8, 1985, until the effective date of this rule, the owner or operator of each new waste pile, each new waste pile at an existing facility, each replacement of an existing waste pile unit, and each lateral expansion of a waste pile unit is subject to the requirements for liners and leachate collection systems or equivalent protection provided in § 264.251 (a) and (b) of this chapter.

(b) With respect to waste received after the effective date of this rule, the owner or operator of each new waste pile, each new waste pile unit at an existing facility, each replacement of an existing waste pile unit, and each lateral expansion of a waste pile unit must install two or more liners and a leachate collection system above and between such liners. The liners and the leachate collection systems must protect human health and the environment. At a minimum, the liners and leachate collection systems must meet the following requirements:

(1) The liners must include:

(i) A top liner designed, operated, and constructed of materials to prevent the migration of any hazardous constituent into such liner during the active life and post-closure care period, and a bottom liner designed, operated, and constructed to prevent the migration of any constituent through such liner during such period. The bottom liner must be constructed of at least a 3-foot-thick layer of compacted clay or other compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec; or

(ii) A top liner designed, operated, and constructed of materials to prevent the migration of any hazardous constituent into such liner during the active life and post-closure care period, and a bottom liner consisting of two components. The upper component of the bottom liner must be designed, operated, and constructed to prevent the migration of any hazardous constituent into this component during the active life and post-closure care period. The lower component of the bottom liner must be designed, operated, and constructed to minimize the migration of any hazardous constituent through the upper component if a breach in the upper component were to occur prior to the end of the post-closure care period. The lower component must be constructed of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.

(2) The liners must be:

(i) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;

(ii) Placed upon materials capable of providing support to the liners and resistance to pressure gradients above and below the liners to prevent failure of the liners due to settlement, compression, or uplift; and

(iii) Installed to cover all surrounding earth likely to be in contact with the waste or leachate.

(3) The leachate collection system immediately above the top liner must be designed, constructed, maintained, and operated to collect and remove leachate from the waste pile during the active life and post-closure care period. The Regional Administrator will specify design and operating conditions in the permit to ensure that the leachate depth over the top liner does not exceed 30 cm (1 foot).

(4) The leachate collection system between the liners must be designed, constructed, maintained, and operated to detect, collect, and remove liquids that leak through any area of the top liner during the active life and post-closure care period.

(5) The leachate collection systems must be:

(i) Constructed of materials that are chemically resistant to the waste managed in the waste pile and the leachate expected to be generated and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and any equipment used at the waste pile; and

(ii) Designed and operated to function without clogging during the active life and post-closure care period.

(c) Paragraph (b) of this section will not apply if the owner or operator demonstrates to the Regional Administrator, and the Regional Administrator finds for such waste pile, that alternative design and operating

practices, together with location characteristics, will prevent the migration of any hazardous constituent into the ground water or surface water at least as effectively as such liners and leachate collection systems.

(d) The double liner requirement set forth in paragraph (b) of this section may be waived by the Regional Administrator for any monofill, if:

(1) the monofill contains only hazardous wastes from foundry furnace emission controls or metal casting molding sand, and such wastes do not contain constituents which would render the wastes hazardous for reasons other than the EP toxicity characteristics in § 261.24 of this chapter; and

(2)(i)(A) The monofill has at least one liner for which there is no evidence that such liner is leaking. For the purposes of this paragraph, the term "liner" means a liner designed, constructed, installed, and operated to prevent hazardous waste from passing into the liner at any time during the active life of the facility, or a liner designed, constructed, installed, and operated to prevent hazardous waste from migrating beyond the liner to adjacent subsurface soil, ground water, or surface water at any time during the active life of the facility.

(B) The monofill is located more than one-quarter mile from an underground source of drinking water (as that term is defined in § 144.3 of this chapter); and

(C) The monofill is in compliance with generally applicable ground water monitoring requirements for facilities with permits under RCRA § 3005(c); or

(ii) The owner or operator demonstrates that the monofill is located, designed, and operated so as to assure that there will be no migration of any hazardous constituent into ground water or surface water at any future time.

(e) The owner or operator of any unit for which construction commences after the date of promulgation of this rule must design, construct, operate, and maintain a leak detection system capable of detecting leaks of hazardous constituents at the earliest practicable time over all areas likely to be exposed to waste and leachate during the active life and post-closure care period. Any liquid, waste, or waste constituent migrating into the leak detection system is assumed to originate from liquids leaking through the top liner of the unit unless the Regional Administrator finds, based on a demonstration by the owner or operator under § 265.255(c), that such liquid, waste, or waste constituent originated from another source.

(f) The leak detection system required under paragraph (e) of this section shall be part of the leachate collection system between the liners described under paragraphs (b)(4) and (b)(5) of this section. The leachate collection system between the liners shall, in addition to meeting the requirements of paragraphs (b)(4) and (b)(5) of this section, meet the following requirements for leak detection:

(1) The minimum bottom slope must be 2 percent, and the drainage layer material must have the following hydraulic characteristics:

(i) For granular materials, a minimum hydraulic conductivity of 1 cm/sec and a minimum layer thickness of 12 inches; or

(ii) For synthetic drainage layer materials, a hydraulic transmissivity of 5 x 10^{-4} m^2/sec or greater.

(2) Be capable of detecting a leak of no more than 1 gallon per acre per day in the top liner (not including liquids absorbed by the leachate collection system); also, be capable of detecting leakage in excess of 1 gallon per acre per day within 1 day after the leak occurs (not including liquids absorbed by the leachate collection system or bottom liner);

(3) Collect and remove liquids rapidly to minimize the head on the bottom liner; and

(4) Include a sump of appropriate size to efficiently collect liquids and prevent liquids from backing up into the drainage layer. Each unit must have its own sump. The design of the sump and removal system must provide a method for measuring and recording the liquid volume present in the sump and liquids removed so that the leachate flow rate can be determined on a daily basis.

(g) In lieu of the requirements of paragraph (f) of this section, the Regional Administrator may approve an alternative leak detection system if:

(1) The Regional Administrator finds, based on a demonstration by the owner or operator, that there is no potential for migration of hazardous constituents from a unit to ground water or surface water during the active life and post-closure care period of the unit; or

(2) The unit complies with the requirements of paragraphs (c) or (d) of this section; or

(3) The Regional Administrator finds, based on a demonstration by the owner or operator, that an alternative leak detection system or technology will meet the requirements of paragraph (e) of this section. In deciding whether to grant an alternative leak detection system or technology, the Regional Administrator will consider:

(i) The durability and effectiveness of the proposed system or technology;

(ii) The nature and quantity of the wastes; and

(iii) The ability of the system or technology to detect leaks and, in combination with response actions to be taken in compliance with § 265.255, prevent migration of waste out of the unit during the active life and post-closure care period so that ground water and surface water are not contaminated.

(h) The owner or operator of any unit that is required by paragraph (e) of this section to have a leak detection system and that is not located completely above the seasonal high water table must demonstrate that the operation of the leak detection system will not be adversely affected by the presence of ground water.

(i) The owner or operator must establish a top liner action leakage rate during the design of the unit for leak detection systems under paragraph (f) of this section. The action leakage rate is determined by:

(1) Using a standard value of (EPA is proposing to select a final value from the range of 5–20 gallons/acre/day); or

(2) A review by the Regional Administrator of an owner or operator demonstration, and a finding by the Regional Administrator, that a site-specific top liner action leakage rate is appropriate for initiating review of the actual leakage rate to determine if a response action is necessary. The site-specific top liner action leakage rate demonstration must be based on allowing only very small isolated leakage through the top liner that does not affect the overall performance of the top liner. In deciding whether to grant a site-specific action leakage rate, the Regional Administrator will consider at least the following factors:

(i) The design, construction, and operation of the top liner and the leachate collection and removal system above the top liner;

(ii) The attenuative capacity and thickness of any soil component of the top liner; and

(iii) All other factors that would influence the potential for leachate to migrate through the top liner.

The Regional Administrator will approve, modify, or disapprove the demonstration of an alternative site-specific action leakage rate within 60 days of its receipt. If the Regional Administrator does not approve the demonstration, the owner or operator may modify the demonstration or submit a new demonstration for approval.

14. New § 265.255 is added to read as follows:

§ 265.255 Response actions.

(a) Prior to receipt of waste at the unit, the owner or operator must have a

response action plan approved by the Regional Administrator that sets forth the actions to be taken immediately following a finding of rapid and extremely large volumes of leakage between the liners in accordance with the requirements under paragraph (b) of this section. A rapid and extremely large leak is the maximum design leakage rate that the leachate detection, collection, and removal system can remove under gravity flow conditions without the fluid head on the bottom liner exceeding 1 foot in granular leak detection systems and without the fluid head exceeding the thickness of synthetic leak detection systems. The owner or operator must use an adequate safety margin in determining the rapid and extremely large leak to allow for uncertainties in the design, construction, and operation of the leachate detection, collection, and removal system (e.g., the owner or operator must consider decreases in the flow capacity of the system in time resulting from siltation, creep of synthetic components of the system, etc.) The response action plan must be submitted to the Regional Administrator at least 120 days prior to receipt of waste at the unit.

(b) The response action plan for rapid and extremely large volumes of leakage between the liner must, at a minimum, include the following information:

(1) A general description of the operation of the unit including the expected active life of the unit and whether or not at closure wastes will be decontaminated or removed from the unit or left in place;

(2) A description of the hazardous constituents contained in the unit;

(3) A description of the range of events that may potentially cause rapid and extremely large volumes of leakage into the space between the liners;

(4) A discussion of important factors that can affect leakage into the leachate collection and removal system between the liners (e.g., amount and frequency of precipitation, and amount of liquids in the unit);

(5) A description of major mechanisms that will prevent migration of hazardous constituents out of the unit (e.g., the condition of the liners and leachate collection system between the liners);

(6) A detailed assessment describing the effectiveness and feasibility of each of the following potential immediate interim responses for preventing hazardous constituent migration out of the unit by decreasing the volume of leakage into the leak detection system:

(i) The owner or operator limits or terminates receipt of waste;

(ii) The owner or operator provides expeditious repair of the leak(s); or

(iii) The owner or operator institutes operational changes at the unit that will minimize leakage into the space between the liners so that the leakage will be less than rapid and extremely large.

(7) The plan must also include the response the owner or operator will undertake after determining the concentration of hazardous constituents in the liquids in the sump of the leak detection system in accordance with the requirements under paragraph (c)(3) of this section.

(i) If any hazardous constituent concentrations in the leachate exceed health-based standards, the owner or operator must assess the effectiveness and feasibility of each of the following potential responses for preventing hazardous constituent migration out of the unit:

(A) The owner or operator terminates receipt of waste and closes the unit;

(B) The owner or operator provides expeditious repair of the leak(s); or

(C) The owner or operator institutes operational changes at the unit that will minimize leakage into the space between the liners so that the leakage will be less than rapid and extremely large. If as a result of these operational changes the leakage is still above the action leakage rate, the owner or operator must comply with the requirements set forth in paragraph (e) of this section; or

(ii) If all hazardous constituent concentrations in the leachate are below health-based standards, the owner or operator must assess the effectiveness and feasibility of each of the following potential responses for minimizing the head on the bottom liner:

(A) The owner or operator provides expeditious repair of the leak(s); or

(B) The owner or operator institutes operational changes at the unit.

(8) The response action plan must address a range of rapid and extremely large volumes of leakage appropriate for the unit with correlating recommended responses and indicate why other response actions were not chosen. Each response presented must be based on a demonstration incorporating the factors set forth in paragraphs (b) (1) through (7) of this section. Other factors that would influence the quality and mobility of the leachate produced and the potential for it to migrate out of the unit may also be considered in the demonstration.

(c)(1) The Regional Administrator will review and approve the response action plan for rapid and extremely large leaks if he determines that such plan prevents, to the extent technically feasible with current technology, hazardous constitutent migration out of the unit in excess of EPA-approved health based standards for ground-water protection. If the plan does not prevent hazardous constitutent migration out of the unit in levels exceeding the ground-water protection standards, the Regional Administrator shall disapprove such plan.

(2) In making a determination under paragraph (c)(1) of this section, the Regional Administrator shall consider, but not be limited to considering, the following factors:

(i) The type and amount of hazardous constituents in the leachate between the liners;

(ii) The mobility of hazardous constituents in the leachate;

(iii) The degree to which the liquid head on the bottom liner will be minimized by implementing action of the response action plan;

(iv) Condition of the liners and leachate collection and removal system (e.g., CQA documentation review or review of design for deficiency);

(v) Design of the double liner system, including design features that provide further protection beyond those required under § 265.254;

(vi) Future planned activities, including remaining active life time period, and closure and post-closure care activities; and

(vii) Environmental factors, including amount and frequency of precipitation, and whether the unit is located in a highly vulnerable hydrogeological setting.

(3) The Regional Administrator will identify in the response action plan monitoring activities for specific hazardous constituents identified in Appendix VIII of Part 261 of this chapter. Specifically, the Regional Administrator will require the owner or operator to test the liquids in the sump for the leachate detection, collection, and removal system to determine whether specified hazardous constituents are present and their concentration. The Regional Administrator may also identify additional physical and chemical properties to be tested for.

(4) The Regional Administrator, as part of his review of the plan (initial or modified), will provide the public, through a notice in local newspapers, the opportunity to submit written comments on the response action plan and request modifications of the plan within 30 days of the date of the notice. He will also, in response to a request or at his own discretion, hold a public hearing whenever such a hearing might clarify one or more issues concerning the plan. The Regional Administrator

will give public notice of the hearing at least 30 days before it occurs. (Public notice of the hearing may be given at the same time as notice of the opportunity for the public to submit written comments, and the two notices may be combined.) The Regional Administrator will approve, modify, or disapprove the response action plan within 90 days of its receipt. If the Regional Administrator disapproves the plan he shall provide the owner or operator a detailed written statement of reasons for disapproval. The owner or operator shall modify the plan or submit a new response action plan within 30 days after receiving such written statement. The Regional Administrator will approve or modify the plan within 60 days.

(d) When there is a rapid and extremely large volume of leakage between the liners the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days of the rapid and extremely large leakage. The notification must preliminarily identify the liquid volumes that have been detected, collected, and removed;

(2) Collect and remove accumulated liquids;

(3) Immediately implement the response action plan; and

(4) Immediately sample the leachate in the leachate detection, collection, and removal system to determine the quality of the leachate in accordance with the requirements under paragraph (c)(3) of this section. The owner or operator must provide this information to the Regional Administrator at the earliest practicable time.

(5) The owner or operator must report in writing to the Regional Administrator on the effectiveness of the response action as soon as practicable after the response has been in place for 60 days, and at other subsequent time periods as specified by the Regional Administrator. The report must describe the effectiveness of the response action in preventing hazardous constituent migration out of the unit in excess of the levels above EPA-approved health based standards for ground-water protection. At a minimum, the report must address the factors set forth in paragraph (c)(2) of this section and any additional information required by the Regional Administrator. The Regional Administrator will review this report to determine whether or not the selected response is preventing hazardous constitutent migration out of the unit. If the Regional Administrator determines that the existing response action is not preventing, to the extent technically feasible with current technology hazardous constituent migration out of the unit, the Regional Administrator will so inform the owner or operator. The owner or operator must then either:

(i) Implement alternative responses for the rate of leakage, if the approved response action plan contains such alternatives; or

(ii) Amend the response action plan if the approved response action plan does not contain an alternative response. The owner or operator must submit a modification plan to the Regional Administrator within 60 days. At a minimum such modification must address information set forth in paragraph (b) of this section as well as the rate of leakage, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility or an accident). The plan will be processed in accordance with the procedure under paragraph (c)(4) of this section.

(e) Leaks that are less than rapid and extremely large.

(1) The owner or operator is required to prepare and submit to the Regional Administrator a response action plan for leaks that exceed the action leakage rate for the top liner but are less than rapid and extremely large. In order to satisfy this requirement, the owner or operator may either:

(i) Submit a response action plan with the permit application identifying actions to be taken when lower levels of leakage exceed the action leakage rate; or

(ii) Submit to the Regional Administrator a request to amend the response action plan within 90 days from the date liquids first exceed the action leakage rate.

(2) For leakage that exceeds the action leakage rate, the response action plan must, at a minimum, include the information set forth in paragraph (b) (1) to (5) of this section. The owner or operator must also include a detailed assessment describing the effectiveness and feasibility of each of the following responses for preventing hazardous constituent migration out of the unit in excess of health-based standards:

(i) The owner or operator terminates receipt of waste and closes the unit;

(ii) The owner or operator institutes operational changes at the unit that will reduce leakage between the liners to prevent hazardous constituents migration out of the unit;

(iii) The owner or operator provides expeditious repair of the leak(s);

(iv) The owner or operator continues to remove and treat the leakage with increased ground-water monitoring activities; or

(v) The owner or operator maintains current operating procedures;

(3) The response action plan must recommend a specific response option for leakage above the action leakage rate for the unit and indicate why other responses actions were not chosen. The response action plan may address a range of leakage with varying responses. Other factors that would influence the quality and mobility of the leachate produced and the potential for it to migrate out of the unit may also be considered in the demonstration.

(f)(1) The Regional Administrator will review and approve the response action plan for leakage less than rapid and extremely large if he determines that such plan prevents, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of EPA-approved health based standards for ground-water protection. If the plan does not prevent hazardous constituent migration out of the unit in levels exceeding the ground-water protection standards, the Regional Administrator shall disapprove such plan.

(2) In making a determination under paragraph (f)(1) of this section, the Regional Administrator shall consider, but not be limited to considering, the following factors:

(i) The type and amount of hazardous constituents that may be expected to be present in the leachate between the liners or actual type and amount if the action leakage rate is exceeded;

(ii) The mobility and migration potential of hazardous constituents in the leachate;

(iii) The degree to which the liquid head on the bottom liner will be minimized by implementation of the response action plan;

(iv) The rate of leakage, if the response action plan is submitted after the action leakage rate is exceeded, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility, accident, or minor leak);

(v) Condition of the liners and leachate collection and removal system (e.g., CQA documentation review or review of design for deficiency or review of the unit operating record concerning accidents that have occurred);

(vi) Design of the double liner system, including design features that provide further protection beyond those required under § 265.221;

(vii) Future planned activities, including remaining active life time period, and closure and post-closure care activities;

(viii) Environmental factors, including amount and frequency of precipitation, and whether the unit is located in a highly vulnerable hydrogeological setting.

(3) The Regional Administrator will identify in the response action plan monitoring activities for specific hazardous constituents identified in Appendix VIII of Part 261 of this chapter. Specifically, the Regional Administrator will require the owner or operator to test the liquids in the sump for the leachate detection, collection, and removal system to determine whether specified hazardous constituents are present and their concentration. The Regional Administrator may also identify additional physical and chemical properties to be tested for.

(4) The Regional Administrator, as part of his review of the plan (initial or modified), will provide the public, through a notice in local newspapers, the opportunity to submit written comments on the response action plan and request modifications of the plan within 30 days of the date of the notice. He will also, in response to a request or at his own discretion, hold a public hearing whenever such a hearing might clarify one or more issues concerning the plan. The Regional Administrator will give public notice of the hearing at least 30 days before it occurs. (Public notice of the hearing may be given at the same time as notice of the opportunity for the public to submit written comments, and the two notices may be combined.) The Regional Administrator will approve, modify, or disapprove the response action plan within 90 days of its receipt. If the Regional Administrator disapproves the plan he shall provide the owner or operator a detailed written statement of reasons for disapproval. The owner or operator shall modify the plan or submit a new response action plan within 30 days after receiving such written statement. The Regional Administrator will approve or modify the plan within 60 days.

(g) If liquids leaking into the leak detection system specified under § 265.254(f) exceed the action leakage rate for the top liner but are less than rapid and extremely large, the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days of the leakage exceeding the action leakage rate. The notification must preliminarily identify the liquid volumes that have been detected, collected, and removed;

(2) Collect and remove accumulated liquids; and

(3) Implement the plan if it was previously submitted with the plan pursuant to paragraph (e)(1)(i) of this section, or submit an amended response action plan pursuant to paragraph (e)(1)(ii) of this section.

(4) Immediately sample the leachate in the leachate detection, collection, and removal system to determine the quality of the leachate in accordance with the requirements under paragraph (f)(3) of this section. The owner or operator must provide this information to the Regional Administrator at the earliest practicable time. If the owner or operator determines that the leachate exceeds health-based standards he must implement any response action approved in the plan.

(5) The owner or operator must report in writing to the Regional Administrator on the effectiveness of the response action as soon as practicable after the response has been in place for 60 days, and annually thereafter. The report must describe the effectiveness of the response action in preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of levels above EPA-approved health-based standards for ground-water protection. At a minimum, the report must address the factors set forth in paragraph (f)(2) of this section and any additional information required by the Regional Administrator. The Regional Administrator will review this report to determine whether or not the selected response is preventing hazardous constituent migration out of the unit. If the Regional Administrator determines that the existing response action is not preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit, the Regional Administrator will so inform the owner or operator. The owner or operator must then either:

(i) Implement alternative responses for the rate of leakage, if approved response action plan contains such alternatives; or

(ii) Amend the response action plan if the approved response action plan does not contain an alternative response.

The owner or operator must submit a modification plan to the Regional Administrator within 60 days. At a minimum such modification must address information set forth in paragraph (b) of this section as well as the rate of leakage, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility or an accident). The plan will be processed in accordance with the procedure under paragraph (c)(4) of this section.

(h) If the owner or operator determines that the top liner action leakage rate is being exceeded, he may demonstrate for leakage less than rapid and extremely large that the liquid resulted from an error in sampling, analysis, or evaluation, precipitation during construction, or a source other than leakage through the top liner. While the owner or operator may make a demonstration under this paragraph in addition to submitting an application under paragraph (e) of this section, he is not relieved of the requirement to submit an amended plan or to implement the response unless the demonstration made under this paragraph successfully shows that the liquid resulted from a source other than top liner leakage, precipitation during construction, or error in sampling, analysis, or evaluation. In making a demonstration under this paragraph, the owner or operator must:

(1) Notify the Regional Administrator in writing as soon as practicable, that he intends to make a demonstration under this paragraph;

(2) Within 90 days of notifying the Regional Administrator under paragraph (h)(1) of this section, submit a report to the Regional Administrator that demonstrates that the liquid resulted from a source other than top liner leakage or that the apparent noncompliance with the standards resulted from precipitation during construction, or error in sampling, analysis, or evaluation. The Regional Administrator shall review the demonstration and notify the applicant as to whether or not such a determination is successful. The applicant has 45 days to comment on such a determination. The Regional Administrator shall respond to those comments and make a final decision on the applicant's demonstration.

(3) If the Regional Administrator approves the demonstration in paragraph (h)(2) of this section, then the owner or operator must submit an amended plan to the Regional Administrator to make any appropriate changes to the response action plan for the unit within 90 days of the Regional Administrator's determination under paragraph (h)(2) of this section.

(i) Within 45 days of detecting a significant change in the leakage rate, the owner or operator must submit to the Regional Administrator a report on the leakage that includes the following information:

(1) An assessment of the problem causing the leak that includes a profile

of liquid quantity collected and removed versus time, and characterization of changes in the rate of top liner leakage;

(2) A description of any change in the response to be implemented as approved in the response action plan;

(3) A schedule for implementation; and

(4) Other information that the owner or operator deems appropriate to fully describe the response that will be implemented.

14. New § 265.259 is added to Subpart L to read as follows:

§ 265.259 Construction quality assurance.

Effective 12 months after promulgation of this rule, the owner or operator of each new waste pile unit or component constructed at a waste pile and listed under § 265.19(b) must conduct a construction quality assurance program in compliance with §§ 265.19 and 265.20.

15. New § 265.260 is added to Subpart L to read as follows:

§ 265.260 Monitoring and inspection.

(a) An owner or operator required to have a leak detection system under this subpart must:

(1) Monitor for and record on a daily basis the presence of liquids in the leak detection system removal sump during the active life (including the closure period).

(2) Analyze the daily monitoring data during the active life under paragraph (a)(1) of this section on a weekly basis to determine if the action leakage rate under paragraph (i) (1) or (2) of § 265.254 is exceeded under the conditions of paragraphs (a)(2) (i), (ii), or (iii) of this section:

(i) The daily monitoring data averaged over one month exceed the action leakage rate during the active life or the weekly monitoring data averaged over three months exceed the action leakage rate during the post-closure period; or

(ii) The daily rate for any one-day period during a week exceeds 50 gallons per acre per day; or

(iii) In lieu of the requirements of paragraphs (a)(2) (i) and (ii) of this section, the Regional Administrator may specify in the permit an alternative method for determining if the action leakage rate under paragraph (i) (1) or (2) of § 265.254 is exceeded.

(3) Establish a monitoring and inspection program that will allow the determination of the following throughout the active life and the post-closure care period:

(i) The rate of leakage into the leak detection system sump, and the removal rate;

(ii) The deterioration, malfunction, or improper operation of the leak detection system;

(iii) The effectiveness of additional controls implemented as part of a response action plan when the action leakage rate of the top liner is exceeded; and

(iv) The effectiveness of the bottom liner and leachate detection, collection, and removal system to control leakage below the action leakage rate.

(b) The owner or operator must record all inspection information required in paragraph (a) of this section in the inspection log required under § 265.15 of this part. The recorded information must be in sufficient detail to demonstrate that the leak detection requirements of §§ 265.254 and 265.255 are being complied with.

16. Section 265.278 is revised to read as follows:

§ 265.278 Unsaturated zone monitoring.

An owner or operator subject to this subpart must have in writing, and must implement, an unsaturated zone monitoring plan to discharge the following responsibilities:

(a) The owner or operator must monitor the soil and soil-pore liquid to determine at the earliest practicable time over all areas likely to be exposed to waste and leachate during the active life and post-closure care period whether hazardous constituents migrate out of the treatment zone.

(1) The owner or operator must specify the hazardous constituents to be monitored in the unsaturated zone monitoring plan. Hazardous constituents are constituents identified in Appendix VIII of Part 261 of this chapter that are reasonably expected to be in, or derived from, the waste that is land treated.

(2) The owner or operator may monitor for principal hazardous constituents (PHCs) in lieu of the constituents specified under paragraph (a)(1) of this section. PHCs are hazardous constituents contained in the wastes to be applied at the unit that are the most difficult to treat, considering the combined effects of degradation, transformation, and immobilization. The owner or operator may establish PHCs if he finds, based on waste analyses, treatment demonstrations, or other data, that effective degradation, transformation, or immobilization of the PHCs will assure treatment to at least equivalent levels for the other hazardous constituents in the wastes.

(b) The owner or operator must install an unsaturated zone monitoring system that includes soil monitoring using soil cores and soil-pore liquid monitoring using devices such as lysimeters. The unsaturated zone monitoring system must consist of a sufficient number of sampling points at appropriate locations and depths to yield samples that:

(1) Represent, to at least a 95% confidence level, the quality of background soil-pore liquid quality and the chemical make-up of soil that has not been affected by leakage from the land treatment area; and

(2) Indicate, to at least a 95% confidence level, the quality of soil-pore liquid and the chemical make-up of the soil below the depth to which the waste is incorporated into the soil.

(c) The owner or operator must establish a background value for each hazardous constituent to be monitored under paragraph (a) of this section.

(1) Background soil values may be based on a one-time sampling at a background plot having characteristics similar to those of the treatment area.

(2) Background soil-pore liquid values must be based on at least quarterly sampling for one year at a background plot having characteristics similar to those of the treatment area.

(3) The owner or operator must express all background values in a form necessary for the determination of statistically significant increases under paragraph (f) of this section.

(4) In taking samples used in the determination of all background values, the owner or operator must use an unsaturated zone monitoring system that complies with paragraph (b)(1) of this section.

(d) The owner or operator must conduct soil monitoring and soil-pore liquid monitoring immediately below the depth to which the waste is incorporated into the soil. The owner or operator must specify the frequency and timing of soil and soil-pore liquid monitoring in the unsaturated zone monitoring plan, based on the frequency, timing, and rate of waste application, and the soil permeability. The owner or operator must express the results of soil and soil-pore liquid monitoring in a form necessary for the determination of statistically significant increases under paragraph (f) of this section.

(e) The owner or operator must use consistent sampling and analysis procedures that are designed to ensure sampling results that provide a reliable indication of soil-pore liquid quality and the chemical make-up of the soil below the treatment area. At a minimum, the owner or operator must implement procedures and techniques for:

(1) Sample collection;

(2) Sample preservation and shipment;

(3) Analytical procedures; and

(4) Chain of custody control.

(f) The owner or operator must determine whether there is a statistically significant change over background values for any hazardous constituent to be monitored under paragraph (a) of this section below the depth to which the waste is incorporated into the soil each time he conducts soil monitoring and soil-pore liquid monitoring under paragraph (d) of this section.

(1) In determining whether a statistically significant increase has occurred, the owner or operator must compare the value of each constituent, as determined under paragraph (d) of this section, to the background value for that constituent according to a statistical procedure specified in the unsaturated zone monitoring plan.

(2) The owner or operator must determine whether there has been a statistically significant increase below the depth to which the waste is incorporated into the soil within a reasonable time period after completion of sampling.

(3) The owner or operator must determine whether there is a statistically significant increase below the depth to which the waste is incorporated into the soil using a statistical procedure that provides reasonable confidence that migration of hazardous constituents will be identified. The owner or operator must specify in the unsaturated zone monitoring plan a statistical procedure that he finds:

(i) Is appropriate for the distribution of the data used to establish background values; and

(ii) Provides a reasonable balance between the probability of falsely identifying migration from the treatment area and the probability of failing to identify real migration of hazardous constituents.

(g) If the owner or operator determines, pursuant to paragraph (f) of this section, that there is a statistically significant increase of hazardous constituents below the depth to which the waste is incorporated into the soil he must:

(1) Notify the Regional Administrator of this finding in writing within seven days. The notification must indicate what constituents have shown statistically significant increases.

(2) Within 90 days submit to the Regional Administrator for approval a written plan to modify the operating practices at the facility in order to maximize the success of degradation, transformation, or immobilization processes in the treatment area. The Regional Administrator will approve, modify, or disapprove the plan activities as he deems necessary to protect ground water. Such review will be completed within 60 days of its receipt. When reviewing the plan the Regional Administrator may include any additional activities he deems necessary. If the Regional Administrator does not approve the plan, the owner or operator must make modifications or submit a new response action plan for approval within 30 days. The Regional Administrator will approve or modify this plan in writing within 60 days. If the Regional Administrator modifies the plan, this plan becomes the approved plan, and a copy will be provided to the owner or operator.

(h) If the owner or operator determines, pursuant to paragraph (f) of this section, that there is a statistically significant increase of hazardous constituents below the depth to which the waste is incorporated into the soil, he may demonstrate that a source other than the land treatment unit caused the increase or that the increase resulted from an error in sampling, analysis, or evaluation. While the owner or operator may make a demonstration under this paragraph in addition to, or in lieu of, submitting a written plan to modify operating practices under paragraph (g)(2) of this section, he is not relieved of the requirement to submit a written plan to modify operating practices within the time specified in paragraph (g)(2) of this section unless the demonstration made under this paragraph successfully shows that a source other than the land treatment unit caused the increase or that the increase resulted from an error in sampling, analysis, or evaluation. In making a demonstration under this paragraph, the owner or operator must:

(1) Notify the Regional Administrator in writing within seven days of determining a statistically significant increase below the depth to which the waste is incorporated into the soil that he intends to make a determination under this paragraph;

(2) Within 90 days submit a report to the Regional Administrator demonstrating that a source other than the land treatment unit caused the increase or that the increase resulted from error in sampling, analysis, or evaluation;

(3) Within 90 days make any appropriate changes to the unsaturated zone monitoring plan at the facility; and

(4) Continue to monitor in accordance with the unsaturated zone monitoring plan.

(i) The owner or operator must keep at the facility his unsaturated zone monitoring plan, and the rationale used in developing or revising this plan.

(j) Prior to receipt of waste at the unit the owner or operator must have at the facility a response action plan approved by the Regional Administrator that sets forth the actions to be taken immediately following a finding, pursuant to paragraph (f) of this section, of widespread leakage of hazardous constituents below the depth to which the waste is incorporated into the soil. The response action plan for widespread leakage must, at a minimum, include the following information:

(1) A general description of the operation of the unit;

(2) A description of the hazardous constituents contained in the unit;

(3) An assessment of potential causes of widespread leakage of hazardous constituents below the depth to which waste is incorporated into the soil;

(4) A discussion of important factors that can affect leakage of hazardous constituents below the depth to which waste is incorporated into the soil;

(5) A description of major mechanisms that will prevent migration of hazardous constituents below the depth to which waste is incorporated into the soil;

(6) A detailed assessment describing the effectiveness and feasibility of the following responses that the owner or operator may implement for any potential widespread leakage below the depth to which waste is incorporated into the soil.

(i) The owner or operator terminates application of waste and closes the unit; or

(ii) The owner or operator institutes operation changes at the unit that will minimize leakage below the depth to which waste is incorporated into the soil so that the operating conditions are met.

(k) For widespread leakage out of the treatment zone the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days following measurement of widespread leakage. The notification must indicate preliminary identification of hazardous constituents that have been detected, and the extent of the area and depth below the treatment zone where constituents have migrated; and

(2) Immediately implement the response action plan.

(l) The Regional Administrator will approve, modify, or disapprove the response action plan activities as he deems necessary to protect ground water and surface water. Such review will be completed within 60 days of its receipt. When reviewing the response action plan the Regional Administrator may include any additional activities he

deems necessary in the plan. If the Regional Administrator does not approve the response action plan or request for amendment, the owner or operator must make modifications or submit a response action plan for approval within 30 days. The Regional Administrator will approve or modify this response action plan in writing within 60 days. If the Regional Administrator modifies the response action plan, this plan becomes the approved response action plan, and a copy will be provided to the owner or operator.

17. New § 265.283 is added to Subpart M to read as follows:

§ 265.283 Inspection.

(a) The owner or operator must establish an inspection program that will allow the determination of the following during the active life and post-closure care period:

(1) The deterioration, malfunction, or improper operation of unsaturated zone monitoring equipment required under § 265.278; and

(2) The effectiveness of additional controls implemented as part of any response action when hazardous constituents that migrate beyond the depth to which the waste is incorporated into the soil statistically exceed background levels.

(b) The owner or operator must record all inspection information required in paragraph (a) of this section in the inspection log required under § 265.15 of this part. The recorded information must be in sufficient detail to demonstrate that the unsaturated zone monitoring requirements are being complied with.

19. Section 265.301 is amended by revising the section heading and adding new paragraphs (f) through (j) to read as follows:

§ 265.301 Design and operating requirements.

* * * * *

(f) The owner or operator of any unit for which construction commences after the date of promulgation of this rule must design, construct, operate, and maintain a leak detection system capable of detecting leaks of hazardous constituents at the earliest practicable time over all areas likely to be exposed to waste and leachate during the active life and post-closure care period. Any liquid, waste, or waste constituent migrating into the leak detection system is assumed to originate from liquids leaking through the top liner of the unit unless the Regional Administrator finds, based on a demonstration by the owner or operator under § 265.302(d), that such liquid, waste, or waste constituent originated from another source.

(g) The leak detection system required under paragraph (f) of this section shall be part of the leachate collection system between the liners described under paragraphs (a)(4) and (a)(5) of this section. The leachate collection system between the liners shall, in addition to meeting the requirements of paragraphs (a)(4) and (a)(5) of this section, meet the following requirements for leak detection:

(1) The minimum bottom slope must be 2 percent, and drainage layer material must have the following hydraulic characteristics:

(i) For granular materials, a minimum hydraulic conductivity of 1 cm/sec and a minimum layer thickness of 12 inches; or

(ii) For synthetic drainage layer materials, a hydraulic transmissivity of 5×10^{-4} m^2/sec or greater.

(2) Be capable of detecting a leak of no more than 1 gallon per acre per day in the top liner (not including liquids absorbed by the leachate collection system); also, be capable of detecting leakage in excess of 1 gallon per acre per day within 1 day after the leak occurs (not including liquids absorbed by the leachate collection system on bottom liner);

(3) Collect and remove liquids rapidly to minimize the head on the bottom liner; and

(4) Include a sump of appropriate size to efficiently collect liquids and prevent liquids from backing up into the drainage layer. Each unit must have its own sump. The design of the sump and removal system must provide a method for measuring and recording the liquid volume present in the sump and liquids removed so that the leachate flow rate can be determined on a daily basis.

(h) In lieu of the requirements of paragraph (g) of this section, the Regional Administrator may approve an alternative leak detection system if:

(1) The Regional Administrator finds, based on a demonstration by the owner or operator, that there is no potential for migration of hazardous constituents from a unit to ground water or surface water during the active life and post-closure care period of the unit; or

(2) The unit complies with the requirements of paragraphs (c) or (d) of this section; or

(3) The Regional Administrator finds, based on a demonstration by the owner or operator, that an alternative leak detection system or technology will meet the requirements of paragraph (f) of this section. In deciding whether to grant an alternative leak detection system or technology, the Regional Administrator will consider:

(i) The durability and effectiveness of the proposed system or technology;

(ii) The nature and quantity of the wastes; and

(iii) The ability of the system or technology to detect leaks and, in combination with response actions to be taken in compliance with § 265.302, prevent migration of waste out of the unit during the active life and post-closure care period so that ground water and surface water are not contaminated.

(i) The owner or operator of any unit that is required by paragraph (f) of this section to have a leak detection system and that is not located completely above the seasonal high water table must demonstrate that the operation of the leak detection system will not be adversely affected by the presence of ground water.

(j) The owner or operator must establish a top liner action leakage rate during the design of the unit for leak detection systems under paragraph (g) of this section. The action leakage rate is determined by:

(1) Using a standard value of (EPA is proposing to select a final value from the range of 5–20 gallons/acre/day); or

(2) A review by the Regional Administrator of an owner or operator demonstration, and a finding by the Regional Administrator, that a site-specific top liner action leakage rate is appropriate for initiating review of the actual leakage rate to determine if a response action is necessary. The site-specific top liner action leakage rate demonstration must be based on allowing only very small isolated leakage through the top liner that does not affect the overall performance of the top liner. In deciding whether to grant a site-specific action leakage rate, the Regional Administrator will consider at least the following factors:

(i) The design, construction, and operation of the top liner and the leachate collection and removal system above the top liner;

(ii) The attenuative capacity and thickness of any soil component of the top liner; and

(iii) All other factors that would influence the potential for leachate to migrate through the top liner.

The Regional Administrator will approve, modify, or disapprove the demonstration of a site-specific action leakage rate within 60 days of its receipt. If the Regional Administrator disapproves the demonstration, the owner or operator may modify the demonstration or submit a new demonstration for approval.

19. Sections 265.301 and 265.302 are amended by redesignating paragraphs (a), (b), (c), and (d) of § 265.302 as paragraphs (k), (l), (m), and (n) of § 265.301, respectively.

20. Section 265.302 is revised to read as follows:

§ 265.302 Response actions.

(a) Prior to receipt of waste at the unit, the owner or operator must have a response action plan approved by the Regional Administrator that sets forth the actions to be taken immediately following a finding of rapid and extremely large volumes of leakage between the liners in accordance with the requirements under paragraph (b) of this section. A rapid and extremely large leak is the maximum design leakage rate that the leachate detection, collection, and removal system can remove under gravity flow conditions without the fluid head on the bottom liner exceeding 1 foot in granular leak detection systems and without the fluid head exceeding the thickness of synthetic leak detection systems. The owner or operator must use an adequate safety margin in determining the rapid and extremely large leak to allow for uncertainties in the design, construction, and operation of the leachate detection, collection, and removal system (e.g., the owner or operator must consider decreases in the flow capacity of the system in time resulting from siltation, creep of synthetic components of the system, etc.) The response action plan must be submitted to the Regional Administrator at least 120 days prior to receipt of waste at the unit.

(b) The response action plan for rapid and extremely large volumes of leakage between the liner must, at a minimum, include the following information:

(1) A general description of the operation of the unit including the expected active life of the unit and whether or not at closure wastes will be decontaminated or removed from the unit or left in place;

(2) A description of the hazardous constituents contained in the unit;

(3) A description of the range of events that may potentially cause rapid and extremely large volumes of leakage into the space between the liners;

(4) A discussion of important factors that can affect leakage into the leachate collection and removal system between the liners (e.g., amount and frequency of precipitation, and amount of liquids in the unit);

(5) A description of major mechanisms that will prevent migration of hazardous constituents out of the unit (e.g., the condition of the liners and leachate collection system between the liners);

(6) A detailed assessment describing the effectiveness and feasibility of each of the following potential immediate interim responses for preventing hazardous constituent migration out of the unit by decreasing the volume of leakage into the leak detection system:

(i) The owner or operator limits or terminates receipt of waste;

(ii) The owner or operator provides expeditious repair of the leak(s); or

(iii) The owner or operator institutes operational changes at the unit that will minimize leakage into the space between the liners so that the leakage will be less than rapid and extremely large.

(7) The plan must also include the response the owner or operator will undertake after determining the concentration of hazardous constituents in the liquids in the sump of the leak detection system in accordance with the requirements under paragraph (c)(3) of this section.

(i) If any hazardous constituent concentrations in the leachate exceed health-based standards, the owner or operator must assess the effectiveness and feasibility of each of the following potential responses for preventing hazardous constituent migration out of the unit:

(A) The owner or operator terminates receipt of waste and closes the unit;

(B) The owner or operator provides expeditious repair of the leak(s);

(C) The owner or operator institutes operational changes at the unit that will minimize leakage into the space between the liners so that the leakage will be less than rapid and extremely large. If as a result of these operational changes the leakage is still above the action leakage rate, the owner or operator must comply with the requirements set forth in paragraph (e) of this section; or

(ii) If all hazardous constituent concentrations in the leachate are below health-based standards, the owner or operator must assess the effectiveness and feasibility of each of the following potential responses for minimizing the head on the bottom liner:

(A) The owner or operator provides expeditious repair of the leak(s); or

(B) the owner or operator institutes operational changes at the unit.

(8) The response action plan must address a range of rapid and extremely large volumes of leakage appropriate for the unit with correlating recommended responses and indicate why other response actions were not chosen. Each response presented must be based on a demonstration incorporating the factors set forth in paragraphs (b)(1) through (7) of this section. Other factors that would influence the quality and mobility of the leachate produced and the potential for it to migrate out of the unit may also be considered in the demonstration.

(c)(1) The Regional Administrator will review and approve the response action plan for rapid and extremely large leaks if he determines that such plan prevents to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of EPA-approved health based standards for ground-water protection. If the plan does not prevent hazardous constituent migration out of the unit in levels exceeding the ground-water protection standards, the Regional Administrator shall disapprove such plan.

(2) In making a determination under paragraph (c)(1) of this section, the Regional Administrator shall consider, but not be limited to the following factors:

(i) The type and amount of hazardous constituents that may be expected to be present in the leachate between the liners;

(ii) The mobility of hazardous constituents in the leachate;

(iii) The degree to which the liquid head on the bottom liner will be minimized by implementation of the response action plan;

(iv) Condition of the liners and leachate collection and removal system, (e.g., CQA documentation review or review of design for deficiency);

(v) Design of the double liner system, including design features that provide further protection beyond those required under § 265.301;

(vi) Future planned activities, including remaining active life time period, and closure and post-closure care activities; and

(vii) Environmental factors, including amount and frequency of precipitation, and whether the unit is located in a highly vulnerable hydrogeological setting.

(3) The Regional Administrator will identify in the response action plan monitoring activities for specific hazardous constituents identified in Appendix VIII of Part 261 of this chapter. Specifically, the Regional Administrator will require the owner or operator to test the liquids in the sump for the leachate detection, collection, and removal system to determine whether specified hazardous constituents are present and their concentration. The Regional Administrator must also identify additional physical and chemical properties to be tested for.

(4) The Regional Administrator, as part of his review of the plan (initial), will provide the public, through a notice in local newspapers, the opportunity to submit written comments on the response action plan and request modifications of the plan within 30 days of the date of the notice. He will also, in response to a request or at his own discretion, hold a public hearing whenever such a hearing might clarify one or more issues concerning the plan. The Regional Administrator will give public notice of the hearing at least 30 days before it occurs. (Public notice of the hearing may be given at the same time as notice of the opportunity for the public to submit written comments, and the two notices may be combined.) The Regional Administrator will approve, modify, or disapprove the response action plan within 90 days of its receipt. If the Regional Administrator disapproves the plan he shall provide the owner or operator a detailed written statement of reasons for disapproval. The owner or operator shall modify the plan or submit a new response action plan for approval within 30 days after receiving such written statement. The Regional Administrator will approve or modify the plan within 60 days.

(d) When there is a rapid and extremely large volume of leakage between the liners the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days of the rapid and extremely large leakage. The notification must preliminarily identify the liquid volumes that have been detected, collected, and removed;

(2) Collect and remove accumulated liquids;

(3) Immediately implement the response action plan; and

(4) Immediately sample the leachate in the leachate detection, collection, and removal system to determine the quality of the leachate in accordance with the requirements under paragraph (c)(3) of this section. The owner or operator must provide this information to the Regional Administrator at the earliest practicable time.

(5) The owner or operator must report in writing to the Regional Administrator on the effectiveness of the response action as soon as practicable after the response has been in place for 60 days, and at other subsequent time periods as specified by the Regional Administrator. The report must describe the effectiveness of the response action in preventing hazardous constituent migration out of the unit in excess of levels above EPA-approved health board standards for ground water protection. At a minimum, the report must address the factors set forth in paragraph (c)(2) of this section and any additional information required by the Regional Administrator. The Regional Administrator will review this report to determine whether or not the selected response is preventing hazardous constituent migration out of the unit. If the Regional Administrator determines that the existing response action is not preventing, to the extent technically feasible with current technology hazardous constituent migration out of the unit, the Regional Administrator will so inform the owner or operator. The owner or operator must then either:

(i) Implement alternative responses for the rate of leakage, if the approved response action plan contains such alternatives; or

(ii) Amend the response action plan if the approved response action plan does not contain an alternative response. The owner or operator must submit a modification plan to the Regional Administrator within 60 days. At a minimum such modification must address information set forth in paragraph (b) of this section as well as the rate of leakage, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility or an accident). The plan will be processed in accordance with the procedure under paragraph (c)(4) of this section.

(e) Leaks that are less than rapid and extremely large.

(1) The owner or operator is required to prepare and submit to the Regional Administrator a response action plan for leaks that exceed the action leakage rate for the top liner but are less than rapid and extremely large. In order to satisfy this requirement, the owner or operator may either:

(i) Submit a response action plan with the permit application identifying actions to be taken when lower levels of leakage exceed the action leakage rate; or

(ii) Submit to the Regional Administrator a request to amend the response action plan within 90 days from the date liquids first exceed the action leakage rate.

(2) For leakage that exceeds the action leakage rate, the response action plan must, at a minimum, include the information set forth in paragraph (b) (1) to (5) of this section. The owner or operator must also include a detailed assessment describing the effectiveness and feasibility of each of the following responses for preventing hazardous constituent migration out of the unit in excess of health-based standards:

(i) The owner or operator terminates receipt of waste and closes the unit;

(ii) The owner or operator institutes operational changes at the unit that will reduce leakage between the liners to prevent hazardous constituents migration out of the unit;

(iii) The owner or operator provides expeditious repair of the leak(s);

(iv) The owner or operator continues to remove and treat the leakage with increased ground-water monitoring activities; or

(v) The owner or operator maintains current operating procedures.

(3) The response action plan must recommend a specific response action for leakage above the action leakage rate for the unit and indicate why other responses actions were not chosen. The response action plan may address a range of leakage with varying responses. Other factors that would influence the quality and mobility of the leachate produced and the potential for it to migrate out of the unit may also be considered in the demonstration.

(f)(1) The Regional Administrator will review and approve the response action plan for leakage less than rapid and extremely large leaks if he determines that such plan prevents, to the extent technically feasible with current technology, hazardous constituent migration out of the unit in excess of EPA-approved health based standards for ground-water protection. If the plan does not prevent hazardous constituent migration out of the unit in levels exceeding the ground-water protection standards, the Regional Administrator shall disapprove such plan.

(2) In making a determination under paragraph (f)(1) of this section, the Regional Administrator shall consider, but not be limited to considering the following factors:

(i) The type and amount of hazardous constituents that may be expected to be present in the leachate between the liners or the actual type and amount if the action leakage rate is exceeded;

(ii) The mobility and migration potential of hazardous constituents in the leachate;

(iii) The degree to which the liquid head on the bottom liner will be minimized by implementation of the response action plan;

(iv) The rate of leakage, if the response action plan is submitted after the action leakage rate is exceeded, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility, accident, or minor leak);

(v) Condition of the liners and leachate collection and removal system (e.g., CQA documentation review,

review of design for deficiency, or review of the unit operating record concerning accidents that have occurred);

(vi) Design of the double liner system, including design features that provide further protection beyond those required under § 265.301;

(vii) Future planned activities, including remaining active life time period, and closure and post-closure care activities;

(viii) Environmental factors, including amount and frequency of precipitation, and whether the unit is located in a highly vulnerable hydrogeological setting.

(3) The Regional Administrator will identify in the response action plan monitoring activities for specific hazardous constituents identified in Appendix VIII of Part 261 of this chapter. Specifically, the Regional Administrator will require the owner or operator to test the liquids in the sump for the leachate detection, collection, and removal system to determine whether specified hazardous constituents are present and their concentration. The Regional Administrator may also identify additional physical and chemical properties to be tested for.

(4) The Regional Administrator, as part of his review of the plan (initial or modified), will provide the public, through a notice in local newspapers, the opportunity to submit written comments on the response action plan and request modifications of the plan within 30 days of the date of the notice. He will also, in response to a request or at his own discretion, hold a public hearing whenever such a hearing might clarify one or more issues concerning the plan. The Regional Administrator will give public notice of the hearing at least 30 days before it occurs. (Public notice of the hearing may be given at the same time as notice of the opportunity for the public to submit written comments, and the two notices may be combined.) The Regional Administrator will approve, modify, or disapprove the response action plan within 90 days of its receipt. If the Regional Administrator disapproves the plan he shall provide the owner or operator a detailed written statement of reasons for disapproval. The owner or operator shall modify the plan or submit a new response action plan for approval within 30 days after receiving such written statement. The Regional Administrator will approve or modify the plan within 60 days.

(g) If liquids leaking into the leak detection system specified under § 265.301(g) exceed the action leakage rate for the top liner but are less than rapid and extremely large, the owner or operator must:

(1) Notify the Regional Administrator of this occurrence in writing within seven days of the leakage exceeding the action leakage rate. The notification must preliminarily identify the liquid volumes that have been detected, collected, and removed;

(2) Collect and remove accumulated liquids; and

(3) Implement the plan if it was previously submitted with the plan pursuant to paragraph (e)(1)(i) of this section, or submit an amended response action plan pursuant to paragraph (e)(1)(ii) of this section.

(4) Immediately sample the leachate in the leachate detection, collection, and removal system to determine the quality of the leachate in accordance with the requirements under paragraph (f)(3) of this section. The owner or operator must provide this information to the Regional Administrator at the earliest practicable time. If the owner or operator determines that the leachate exceeds health-based standards he must implement any response action approved in the plan.

(5) The owner or operator must report in writing to the Regional Administrator on the effectiveness of the response action as soon as practicable after the response has been in place for 60 days, and annually thereafter. The report must describe the effectiveness of the response action in preventing, to the extent technically feasible with current technology hazardous constituent migration out of the unit in excess of levels above EPA-approved health based standards for ground-water protection. At a minimum, the report must address the factors set forth in paragraph (f)(2) of this section and any additional information required by the Regional Administrator. The Regional Administrator will review this report to determine whether or not the selected response is preventing hazardous constituent migration out of the unit. If the Regional Administrator determines that the existing response action is not preventing, to the extent technically feasible with current technology, hazardous constituent migration out of the unit, the Regional Administrator will so inform the owner or operator. The owner or operator must then either:

(i) Implement alternative responses for the rate of leakage, if the approved response action plan contains such alternatives; or

(ii) Amend the response action plan if the approved response action plan does not contain an alternative response. The owner or operator must submit a modification plan to the Regional Administrator within 60 days. At a minimum such modification must address information set forth in paragraph (b) of this section as well as the rate of leakage, including the likelihood of any increase, and the cause of the leakage (e.g., liner incompatibility or an accident). The plan will be processed in accordance with the procedure under paragraph (c)(4) of this section.

(h) If the owner or operator determines that the top liner action leakage rate is being exceeded, he may demonstrate for leakage less than rapid and extremely large that the liquid resulted from an error in sampling, analysis, or evaluation, precipitation during construction, or a source other than leakage through the top liner. While the owner or operator may make a demonstration under this paragraph in addition to submitting an application under paragraph (e) of this section, he is not relieved of the requirement to submit an amended plan or to implement the response unless the demonstration made under this paragraph successfully shows that the liquid resulted from a source other than top liner leakage, precipitation during construction, or error in sampling, analysis, or evaluation. In making a demonstration under this paragraph, the owner or operator must:

(1) Notify the Regional Administrator in writing as soon as practicable, that he intends to make a demonstration under this paragraph;

(2) Within 90 days of notifying the Regional Administrator under paragraph (h)(1) of this section, submit a report to the Regional Administrator that demonstrates that the liquid resulted from a source other than top liner leakage or that the apparent noncompliance with the standards resulted from precipitation during construction, or error in sampling, analysis, or evaluation. The Regional Administrator shall review the demonstration and notify the applicant as to whether or not such a determination is successful. The applicant has 45 days to comment on such a determination. The Regional Administrator shall respond to those comments and make a final decision on the applicant's demonstration.

(3) If the Regional Administrator approves the demonstration in paragraph (h)(2) of this section, then the owner or operator must submit an amended plan to the Regional Administrator to make any appropriate changes to the response action plan for the unit within 90 days of the Regional

Administrator's determination under paragraph (h)(2) of this section.

(i) Within 45 days of detecting a significant change in the leakage rate, the owner or operator must submit to the Regional Administrator a report on the leakage that includes the following information:

(1) An assessment of the problem causing the leak that includes a profile of liquid quantity collected and removed versus time, and characterization of changes in the rate of top liner leakage;

(2) A description of any change in the response to be implemented as approved in the response action plan;

(3) A schedule for implementation; and

(4) Other information that the owner or operator deems appropriate to fully describe the response that will be implemented.

21. New § 265.303 is added to Subpart N to read as follows:

§ 265.303 Monitoring and inspection.

(a) An owner or operator required to have a leak detection system under this subpart must:

(1) Monitor for and record on a daily basis the presence of liquids in the leak detection system removal sump during the active life (including the closure period) and at least weekly during the post-closure period (if applicable);

(2) Analyze the daily monitoring data during the active life under paragraph (a)(1) of this section on a weekly basis and the weekly monitoring data during the post-closure period under paragraph (a)(1) of this section on a quarterly basis to determine if the action leakage rate under paragraph (j) (1) or (2) of § 265.301 is exceeded under the conditions of paragraphs (a)(2) (i), (ii), or (iii) of this section:

(i) The daily monitoring data averaged over one month exceeds the action leakage rate during the active life or the weekly monitoring data averaged over three months exceed the action leakage rate during the post-closure period; or

(ii) The daily rate for any one-day period during a week exceed 50 gallons per acre per day during the active life or the weekly rate for any one-week period during a quarter exceeds 350 gallons per acre per week during the post-closure period; or

(iii) In lieu of the requirements of paragraphs (a)(2) (i) and (ii) of this section, the Regional Administrator may specify in the permit an alternative method for determining if the action leakage rate under paragraph (j) (1) or (2) of § 265.301 is exceeded.

(3) Establish a monitoring and inspection program that will allow the determination of the following throughout the active life and post-closure care period:

(i) The rate of leakage into the leak detection system sump, and the removal rate;

(ii) The deterioration, malfunction, or improper operation of the leak detection system;

(iii) The effectiveness of additional controls implemented as part of a response action plan when the action leakage rate of the top liner is exceeded;

(iv) The effectiveness of the bottom liner and secondary leachate detection, collection, and removal system to control leakage below the action leakage rate; and

(b) The owner or operator must record all inspection information required in paragraph (a) of this section in the inspection log required under § 265.15 of this part. The recorded information must be in sufficient detail to demonstrate that the leak detection requirements of §§ 265.301 and 265.302 are being complied with.

22. New § 265.304 is added to Subpart N to read as follows:

§ 265.304 Construction quality assurance.

Effective 12 months after promulgation of this rule, the owner or operator of each new landfill unit or component constructed at a landfill and listed under § 265.19(b) must conduct a construction quality assurance program in compliance with §§ 265.19 and 265.20.

23. Section 265.310 is amended by adding a new paragraph (b)(5) to read as follows:

§ 265.310 Closure and post-closure care.

* * * * *

(b) * * *

(5) Maintain and monitor the leak detection system in accordance with §§ 265.301 (f) and (g), 265.303 (a) and (b), and comply with all other applicable leak detection requirements of this subpart.

PART 270—EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

1. The authority citation for Part 270 continues to read as follows:

Authority: Sections 1006, 2002, 3004, 3005, 3007, 3019, and 7004 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912, 6924, 6925, 6927, and 6974).

2. Section 270.17 is amended by revising paragraphs (b) and (c) to read as follows:

§ 270.17 Specific Part B information requirements for surface impoundments.

* * * * *

(b) Detailed plans and an engineering report describing how the surface impoundment is or will be designed, constructed, operated, and maintained to meet the requirements of §§ 264.221 and 264.222. This submission must address the following items as specified in §§ 264.221 and 264.222:

(1)(i) The liner system (except for an existing portion of a surface impoundment), if the surface impoundment must meet the requirements of § 264.221(a) of this chapter. If an exemption from the requirement for a liner is sought as provided by § 264.221(b) of this chapter, submit detailed plans and engineering and hydrogeological reports, as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the ground water or surface water at any future time;

(ii) The double liner system and the leachate collection and removal system, if the surface impoundment must meet the requirements of § 264.221(c) of this chapter. If an exemption from the requirements for double liners and a leachate collection and removal system is sought as provided by § 264.221 (d), (e), or (f) of this chapter, submit appropriate information;

(iii) The leak detection system, if the surface impoundment must meet the requirements of § 264.221(g) of this chapter. If approval of an alternative leak detection system is sought as provided by § 264.221(i) of this chapter or the leak detection system is located in a saturated zone, submit detailed plans and an engineering report explaining the leak detection system design and operation, and the location of the saturated zone in relation to the leak detection system;

(2) Prevention of overtopping; and

(3) Structural integrity of dikes;

(4) Determine if whether a granular or synthetic media meets the minimum requirements of § 264.221(h)(1) (i) and (ii) owner or operators must provide results from hydraulic conductivity tests conducted on saturated samples of the drainage media supporting the value used in the design.

(c) A description of how each surface impoundment, including the double liner system, leachate detection, collection, and removal system, cover systems, and appurtenances for control of overtopping, will be inspected in order to meet the requirements of § 264.226 (a), (c), and (e). This information should

be included in the inspection plan submitted under § 270.14(b)(5);

* * * * *

3. Section 270.18 is amended by revising paragraphs (c) and (d) to read as follows:

§ 270.18 Specific Part B information requirements for waste piles.

* * * * *

(c) Detailed plans and an engineered report describing how the waste pile is or will be designed, constructed, operated, and maintained to meet the requirements of §§ 264.251 and 264.252. This submission must address the following items as specified in §§ 264.251 and 264.252:

(1)(i) The liner system (except for an existing portion of a waste pile), if the waste pile must meet the requirements of § 264.251(a) of this chapter. If an exemption from the requirement for a liner is sought as provided by § 264.251(b) of this chapter, submit detailed plans and engineering and hydrogeological reports, as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the ground water or surface water at any future time;

(ii) The double liner system and the leachate collection and removal system, if the waste pile must meet the requirements of § 264.251(c) of this chapter. If an exemption from the requirements for double liners and a leachate collection and removal system is sought as provided by § 264.251 (d), (e), or (f) of this chapter, submit appropriate information;

(iii) The leak detection system, if the waste pile must meet the requirements of § 264.251(g) of this chapter. If approval of an alternate leak detection system is sought as provided by § 264.251(i) of this chapter or the leak detection system is located in a saturated zone, submit detailed plans and an engineering report explaining the leak detection system design and operation, and the location of the saturated zone in relation to the leak detection system;

(2) Control of run-on;

(3) Control of run-off;

(4) Management of collection and holding units associated with run-on and run-off control systems;

(5) Control of wind dispersal of particulate matter where applicable;

(6) Determine if whether a granular or synthetic media meets the minimum requirements of § 264.251(h)(1) (i) and (ii) owner or operators must provide results from hydraulic conductivity tests conducted on saturated samples of the drainage media supporting the value used in the design.

(d) A description of how each waste pile, including the double liner system, leachate detection, collection, and removal systems, and appurtenances for control of run-on and run-off, will be inspected in order to meet the requirements of § 264.254 (a), (b), and (d). This information should be included in the inspection plan submitted under § 270.14(b)(5).

* * * * *

4. Section 270.20 is amended by adding new paragraphs (j) and (k) to read as follows:

§ 270.20 Specific Part B information requirements for land treatment facilities.

* * * * *

(j) A response action plan that meets the requirements of § 264.278(i).

(k) A description of how each land treatment unit will be inspected in order to meet the requirements of § 264.284.

5. Section 270.21 is amended by removing paragraph (c) and redesignating paragraphs (d), (e), (f), (g), (h), (i), and (j) as (c), (d), (e), (f), (g), (h), and (i), respectively.

6. Section 270.21 is amended by revising paragraphs (b) and (c) to read as follows:

§ 270.21 Specific Part B information requirements for landfills.

* * * * *

(b) Detailed plans and an engineering report describing how the landfill is or will be designed, constructed, operated, and maintained to meet the requirements of §§ 264.301 and 264.302. This submission must address the following items as specified in §§ 264.301 and 264.302:

(1)(i) The liner system (except for an existing portion of a landfill), if the landfill must meet the requirements of § 264.301(a) of this chapter. If an exemption from the requirement for a liner is sought as provided by § 264.301(b) of this chapter, submit detailed plans and engineering and hydrogeological reports, as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the ground water or surface water at any future time;

(ii) The double liner system and the leachate collection and removal system, if the landfill must meet the requirements of § 264.301(c) of this chapter. If an exemption from the requirements for double liners and a leachate collection and removal system is sought as provided by § 264.301 (d), (e), or (f) of this chapter, submit appropriate information;

(iii) The leak detection system, if the landfill must meet the requirements of § 264.301(g) of this chapter. If approval of an alternative leak detection system is sought as provided by § 264.301(i) of this chapter or the leak detection system is located in a saturated zone, submit detailed plans and an engineering report explaining the leak detection system design and operation, and the location of the saturated zone in relation to the leak detection system;

(2) Control of run-on;

(3) Control of run-off;

(4) Management of collection and holding facilities associated with run-on and run-off control systems; and

(5) Control of wind dispersal of particulate matter, where applicable;

(6) Determine if whether a granular or synthetic media meets the minimum requirements of § 264.301(h)(1) (i) and (ii) owner or operators must provide results from hydraulic conductivity tests conducted on saturated samples of the drainage media supporting the value used in the design.

(c) A description of how each landfill, including the double liner system, leachate detection, collection, and removal systems, and cover systems, will be inspected in order to meet the requirements of § 264.303 (a), (b), and (d). This information should be included in the inspection plan submitted under § 270.14(b)(5).

* * * * *

7. Section 270.41(a)(5) is amended by adding new paragraphs (ix) and (x):

§ 270.41 Major modification or revocation and reissuance of permits.

(ix) When modification of a construction quality assurance plan is required under § 264.20(e)(ii).

(x) When modification of a response action plan is required under §§ 264.222, 264.252, 264.278(k) and 264.302.

* * * * *

(a) * * *

(5) * * *

PART 271—REQUIREMENTS FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

1. The authority citation for Part 271 continues to read as follows:

Authority: Sec. 1006, 2002(a) and 3006 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912(a), and 6926).

2. Section 271.1(j) is amended by adding the following entry to Table 1 in

chronological order by date of publication:

§ 271.1 Purpose and scope.

* * * * *

TABLE 1.—REGULATIONS IMPLEMENTING THE HAZARDOUS AND SOLID WASTE AMENDMENTS OF 1984

Promulgation date	Title of regulation	Federal Register reference	Effective date
			* * *
[Insert date of publication].	Liner and Leak Detection Rule.	52 FR [Insert Federal Register Page Numbers].	There are three (3) effective dates corresponding to various provisions of the proposal, i.e. 6 months, 12 months, and 24 months after publication of the final rule. The specific provisions are listed below with their corresponding effective dates: § 264.15 (b)(1) and (b)(4)—12 months. § 264.19 and § 264.20—12 months. § 264.73(b)(6)—6 months. § 264.117(a)(1)(ii)—6 months. § 264.118 (b)(1) and (b)(2)(ii)—6 months. § 264.221 (c) and (f)—24 months. § 264.221 (g), (h), (i), (j), (k) and (l)—6 months. § 264.222—6 months. § 264.223—12 months. § 264.226 (c), (d), and (e)—6 months. § 264.228(b)(4)—6 months. § 264.251 (a), (c), (d), (e), (f), (g), (h), (i), (j), and (k)—6 months. § 264.252—6 months. § 264.253—6 months. § 264.254 (b), (c), and (d)—6 months. § 264.278 (a), (b)(1), (b)(2), (d), (i), (j), and (k)—6 months. § 264.284—6 months. § 264.301 (c), (f), (g), (h), (i), (j), and (k)—6 months. § 264.302—6 months. § 264.303 (b), (c), and (d)—6 months. § 264.304—12 months. § 264.310(b)(6)—6 months. § 265.15 (b)(1) and (b)(4)—12 months. § 265.19 and § 265.20—12 months. § 265.73(b)(6)—6 months. § 265.117(a)(1)(ii)—6 months. § 265.118 (c)(1) and (c)(2)(ii)—6 months. § 265.221 (f), (g), (h), (i), and (j)—6 months. § 265.222—6 months. § 265.224—12 months. § 265.226 (b) and (c)—6 months. § 265.254 (a), (b), (c), (d), (e), (f), (g), (h), and (i)—6 months. § 265.255—6 months. § 265.259—12 months. § 265.260—6 months. § 265.278 (a), (b), (c), (d), (e), (g), (h), (i), (j), (k), and (l)—6 months. § 265.283—6 months. § 265.301 (f), (g), (h), (i), and (j)—6 months. § 265.302—6 months. § 265.304—12 months. § 265.310—6 months. § 270.17 (b)(1)(i) and (b)(1)(ii)—24 months. § 270.17(b)(1)(iii)—6 months. § 270.17 (b)(2), (b)(3), (b)(4), and (c)—24 months. § 270.18 (c)(1)(i) and (c)(1)(ii)—24 months. § 270.18(c)(1)(iii)—6 months. § 270.10 (c)(2), (c)(3), (c)(4), (c)(5), (c)(6), and (d)—24 months. § 270.20 (j) and (k)—6 months. § 270.21 (b)(1)(i), and (b)(1)(ii)—24 months. § 270.21(b)(1)(iii)—6 months. § 270.2 (b)(2), (b)(3), (b)(4), (b)(5), (b)(6), and (c)—24 months. § 270.41(iii)—12 months.

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