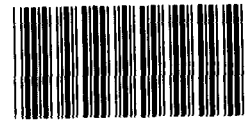


June 1990

HAZARDOUS WASTE

Funding of Postclosure Liabilities Remains Uncertain



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United States
General Accounting Office
Washington, D.C. 20548

**Resources, Community, and
Economic Development Division**

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To the President of the Senate and the
Speaker of the House of Representatives

The Superfund Amendments and Reauthorization Act of 1986 directed that we study options for a program to manage liabilities associated with hazardous waste disposal facilities after closure which complements the policies set forth in the Hazardous and Solid Waste Amendments of 1984 and assures the protection of human health and the environment. This report presents the results of our review by discussing

- the likelihood that permitted hazardous waste disposal facilities will leak after closure,
- the magnitude of liabilities that may be incurred,
- the adequacy of current postclosure funding assurance requirements, and
- the feasibility of other mechanisms that could provide greater postclosure funding assurances.

Copies are being sent to appropriate House and Senate Committees; the Administrator, Environmental Protection Agency; and other interested parties. Copies will also be made available to others upon request.

This report was prepared under the direction of Richard L. Hembra, Director of Environmental Protection Issues, who may be contacted at (202) 275-6111. Other major contributors are listed in appendix II.



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Executive Summary

Purpose

Although past land disposal of hazardous waste has resulted in major environmental contamination and serious health effects, land disposal of these wastes continues. About 13 million metric tons of hazardous waste is land disposed each year. Better disposal practices—including treatment of wastes to reduce toxicity—and containment methods are now required at operating hazardous waste disposal facilities; nevertheless, the possibility exists that hazardous substances will eventually leak from these facilities and costly cleanup actions would be required to protect the public health and environment.

Concerned about the funding of long-term liabilities—costs, damages, or other expenses—that may be associated with permitted hazardous waste facilities once they have closed, the Congress required GAO to conduct a study of options for managing postclosure liabilities. GAO focused its study on the extent and magnitude to which postclosure liabilities are expected to occur at permitted facilities when closed and the need for, and viability of, options for funding these liabilities.

Background

The Resource Conservation and Recovery Act (RCRA) regulates the management and disposal of hazardous waste. As implemented by the Environmental Protection Agency (EPA), the act requires owners/operators of disposal facilities to obtain an operating permit in order to continue waste disposal operations. To obtain a permit, facilities must meet certain standards intended to prevent and/or detect leakage to the environment. About 200 land disposal facilities have, or are expected to obtain, operating permits.

After a disposal facility ceases operation, EPA requires that closure activities be performed, including the installation of covers over the disposed waste. EPA further requires the owner/operator to perform maintenance and monitoring activities at the facility for a 30-year postclosure period. Owners/operators must provide financial assurance that funds will be available to conduct mandatory postclosure activities.

Certain liabilities, such as costs for cleanup and third-party damages, may result during postclosure if facilities leak and contaminate the groundwater. A postclosure liability trust fund to manage these costs was established under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). However, concerned that, as structured, the postclosure fund may not provide sufficient resources, the Congress suspended the transfer of any liability to the fund.

Results in Brief

The long-term effectiveness of current land disposal practices in controlling the migration of hazardous waste is not known, but EPA and others believe it is likely that some of the permitted hazardous waste disposal facilities will release hazardous substances into the environment at some period after they close. However, the timing and magnitude of any resulting postclosure liabilities—such as the costs of corrective action and off-site damages—are uncertain.

Although EPA is aware of the potential for releases, it has not developed a strategy for addressing long-term postclosure concerns. EPA has given this issue a low priority in the RCRA program because of limited resources and the lack of historical data on the magnitude and extent of the potential problem.

EPA does require funding assurances for mandatory postclosure care and known corrective action costs, but it does not require funding assurances for potential but unknown postclosure liabilities. Although there are several options for funding postclosure liabilities, few of these are currently viable in large part because the risk associated with closed hazardous waste facilities is difficult to quantify. As data on long-term risks become available, the Congress will be in a better position to decide on the need for additional postclosure funding mechanisms.

Principal Findings

Extent of Liabilities Uncertain

EPA requires facilities obtaining operating permits to design and construct disposal units with waste migration prevention measures, such as liners and covers, intended to mitigate releases into the environment. Little experience-based data exist, however, on the long-term performance of these technology requirements in preventing waste migration. Although at least one company producing liner and cover material estimates that the material will last hundreds of years, EPA and others believe that permanent containment of wastes is not possible and that leakage will occur at some time after the 30-year postclosure period. (See ch. 2.)

When leakage occurs, liabilities could be incurred for extended maintenance and monitoring, compliance monitoring, corrective action, and third-party damages. However, the extent of any liabilities will be contingent on factors that cannot currently be assessed, such as the rate

and timing of leakages, the magnitude of contamination by hazardous substances, and the exposure to such contamination.

EPA officials have identified activities, such as extended postclosure care and long-term research, that may be required to identify and reduce the potential for leakage after facilities close. However, EPA has not developed a strategy to comprehensively obtain data on the effectiveness of current disposal requirements and examine long-term postclosure issues because (1) experience with current disposal requirements is limited and (2) available resources have been needed in other RCRA program efforts that address more immediate environmental concerns. Such a strategy needs to be developed and implemented in a timely manner in order to assure that actions needed to reduce postclosure concerns are promptly taken.

Funding Mechanisms Questionable

Owners/operators are liable for any postclosure costs that may occur. However, few funding assurances exist for postclosure liabilities. EPA only requires funding assurances for maintenance and monitoring costs for 30 years after closure and corrective action costs once a problem is identified. No financial assurances exist for potential but unknown corrective actions, off-site damages, or other liabilities that may occur after the established postclosure period. EPA could require funding assurances for certain potential liabilities, but it does not believe it would be appropriate to require a facility to provide funding assurances for liabilities that may not occur. (See ch. 3.)

Options such as insurance and risk pooling could be pursued to better assure funding of postclosure liabilities; however, their availability is limited because the risks involved with postclosure are viewed as high and very difficult to assess and quantify. Federally administered programs—such as a modified postclosure trust fund or federal insurance—could also be established; however, the appropriate structure for any such program cannot be assessed because of the lack of data on the extent and magnitude of postclosure liabilities. Such information can only be obtained when EPA implements a strategic plan for developing data and measures to assess postclosure risks. As EPA collects and analyzes the data, the need for and structure of a postclosure funding mechanism can be better determined.

It is important that EPA deal with the issue of long-term postclosure liability in an orderly, reasonable, and timely manner. GAO anticipates that EPA can develop a strategic plan to address the postclosure liability issue

in time for the debate on the reauthorization of CERCLA which is expected in 1991. Moreover, EPA should be prepared to take interim measures—such as extending the postclosure care period—to provide greater protection to the public health and the environment until more definitive data are developed.

Recommendation

GAO recommends that the Administrator, EPA, develop and implement a strategy to address the long-term effectiveness of current hazardous waste disposal requirements so that decisions can be made about postclosure liability funding mechanisms. Such a strategy should outline the activities EPA needs to undertake and/or complete to assess postclosure risks, evaluate actions such as extended postclosure care to reduce risks, and assess available alternatives for funding postclosure liabilities. The strategy should also identify required EPA resources and establish time frames for completing such activities. Further, GAO recommends that the Administrator periodically report to the Congress the agency's progress in obtaining the necessary data on the effectiveness of current disposal requirements and as information becomes available, be prepared to take interim measures to provide greater public protection until more definitive data are developed.

Agency Comments

In its comments on a draft of this report (see app. I), EPA stated that sufficient information to implement a strategic plan will probably not be obtained in time for the CERCLA reauthorization. GAO, however, does not anticipate EPA implementing the strategic plan before CERCLA reauthorization and only intends that the strategy be developed in time for anticipated 1991 hearings. EPA should implement the plan after discussing the strategy with the Congress.

GAO clarified statements in the final report to address other EPA concerns.

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Abbreviations

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
EDF	Environmental Defense Fund
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIA	Federal Insurance Administration
GAO	General Accounting Office
HSWA	Hazardous and Solid Waste Amendments of 1984
NRC	Nuclear Regulatory Commission
NSWMA	National Solid Wastes Management Association
OSW	Office of Solid Waste
PCLTF	Postclosure Liability Trust Fund
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act of 1986

Introduction

As evidenced by the events at Love Canal, Times Beach, and thousands of other sites contaminated by hazardous wastes, land disposal of these wastes presents a significant threat to human health and the environment. Hazardous waste disposal can contaminate the land as well as ground and surface waters. Once contaminated, cleanup of a hazardous waste site can cost millions, take many years to complete, and in some cases it may not be possible to remove all contamination. Moreover, many contaminants are toxic, may lead to cancer, or have other adverse human health effects.

Despite the acknowledged problems of hazardous waste, land disposal of some of these wastes continues. About 275 million metric tons of hazardous waste are managed annually. Although a national hazardous waste management program has been established to minimize the disposal and environmental impacts of hazardous waste, about 13 million metric tons are still land-disposed each year.

Current Hazardous Waste Disposal Program

Through the enactment of the Resource Conservation and Recovery Act (RCRA), the Congress imposed strict controls over hazardous waste to protect human health and the environment. Subtitle C of RCRA establishes a “cradle-to-grave” system for managing hazardous waste from the time it is generated until its ultimate disposal. This system regulates the generation, transportation, treatment, storage, and disposal of hazardous wastes. The Environmental Protection Agency (EPA), which is responsible for implementing RCRA, has defined as hazardous any solid waste that is either ignitable, reactive, corrosive, or contains certain toxic constituents such as arsenic or lead. A solid waste is also considered hazardous if it is a “listed” waste; that is, if it is named on one of three lists of EPA-tested wastes and chemical products. Listed wastes include pesticides, acids, and other specifically identified wastes.

The hazardous waste facilities of greatest concern are land disposal facilities—facilities that place the wastes in the ground for permanent burial. RCRA established strong controls over hazardous waste disposal facilities to prevent the recurrence of past leakage problems. The act requires any owner/operator of a hazardous waste disposal facility to obtain a permit to operate. Further, land disposal facilities must meet certain standards for construction, operation, and closing of the facility in order to obtain the permit and remain in compliance with the permit conditions. The following standards are among those required for hazardous waste land disposal facilities:

- Waste migration protection measures, most notably the installation of a liner and leachate collection system,¹ to prevent the contamination of groundwater.
- Groundwater monitoring around the facility to detect leakage of hazardous constituents.
- Proper closure of facilities, including the placement of caps or covers over landfills to prevent the inflow of liquids that could generate leachate and result in environmental contamination.

Further, owners/operators obtaining a permit for a new facility must comply with location standards that prohibit the siting of new facilities in areas that could be affected by floods or earthquakes.

RCRA allowed hazardous waste disposal facilities in operation on or before November 19, 1980, to continue operating under interim status until a final permit had been issued or denied. Of the 1,467 RCRA hazardous waste land disposal facilities known to EPA,² relatively few sought and obtained permits to continue operations. As of January 1990, a total of 277 disposal facilities were on EPA's "permit track," of which 172 facilities had obtained the required operating permit, 24 facilities were under permit application and review, and 81 facilities had their operating permits denied. The remaining 1,190 facilities did not seek an operating permit.

Recent changes to RCRA have further strengthened the controls over the disposal of hazardous wastes. The Hazardous and Solid Waste Amendments of 1984 (HSWA) imposed several additional requirements over the construction of facilities and the disposal of hazardous wastes. HSWA required that any new or replacement facilities be constructed with two or more liners and leachate collection systems. Further, the amendments prohibited the disposal of bulk or noncontainerized liquid hazardous waste in any landfill. The amendments also established the objective to minimize the disposal of hazardous wastes in the land. In this regard, HSWA requires the treatment of wastes before they are disposed of to make them less hazardous or less likely to migrate.

¹Leachate is any liquid that has percolated through or drained from hazardous wastes.

²The total number of RCRA disposal facilities is continually changing because some facilities are "clean closed" and are therefore no longer considered subject to RCRA regulations, while additional facilities become subject to RCRA as they are made known to EPA.

Requirements for Postclosure

As part of the regulation of hazardous waste under RCRA, EPA established closure and postclosure requirements for owners/operators of disposal facilities. Closure is the period when wastes are no longer accepted at a facility, and during which the owner/operator must properly apply final covers to or cap the landfill, decontaminate or remove all contaminated equipment and structures, and certify that the facility has been properly closed. These activities are required to ensure that facilities are closed in a manner that (1) minimizes the need for additional care and (2) controls, minimizes, or eliminates the potential escape of hazardous substances to the environment.

To assure that hazardous waste land disposal facilities do not pose environmental or public health hazards after closure, such facilities must enter into a postclosure care period. During this period, owners/operators conduct maintenance and monitoring activities to ensure the integrity of the facility. As required by EPA, postclosure care consists of at least

- groundwater monitoring and reporting,
- maintenance and monitoring of the waste containment systems, and
- security around the facility when access may pose a hazard to human health.

EPA requires that these postclosure activities be conducted for a 30-year period following the closure certification. All disposal facilities must develop a plan outlining the postclosure activities and have the plan approved by EPA. Further, owners/operators must prepare postclosure cost estimates and demonstrate the financial ability to pay these costs before they can obtain a permit.

Despite the protective measures now required at facilities and the requirements for postclosure care and monitoring, longstanding concerns exist over the liabilities that could occur after closure and the ability of owners/operators to pay for such liabilities. The Congress addressed this issue with the enactment of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). The act, which established the Superfund program, also established a Post-closure Liability Trust Fund (PCLTF) to assume the liabilities at permitted hazardous waste disposal facilities after closure. Liability would be transferred to the fund within 5 years after closure and after demonstration of no likelihood of migration or release. After transfer of liability, the fund, generated from a tax on disposed hazardous waste, would pay for damages, such as groundwater contamination and necessary

cleanup actions, resulting from a release. The fund would also pay for monitoring and maintenance beyond the 30-year postclosure period. The balance in the fund was limited to \$200 million, although additional taxes could be collected if the balance dropped below that amount.

However, concerns about PCLTF and the unlimited liability that could be transferred to the government were raised in the deliberations on reauthorizing CERCLA in 1985. In particular, the Congress and EPA were concerned that the fund would not have sufficient resources to pay the liabilities. Subsequently, under Section 201 of the Superfund Amendments and Reauthorization Act (SARA), the Congress suspended the transfer of liability to the PCLTF. Further, the Congress repealed the tax and the trust fund and authorized the refund of the amounts collected to the owners/operators who had paid into the fund. CERCLA will be up for reauthorization in 1991.

Objectives, Scope, and Methodology

With the repeal of the Postclosure Liability Trust Fund, the Congress required us to study options for a program to manage postclosure liabilities. SARA Section 201 established the general requirements that a postclosure program should assure (1) incentives are created and maintained for the safe management and disposal of hazardous wastes, (2) the public will have reasonable confidence that hazardous wastes will be managed and disposed of safely and resources will be available to address any problems that may arise and will cover the costs of long-term care, and (3) owners/operators of hazardous waste disposal facilities will be able to manage their potential future liabilities and attract investment capital necessary to build, operate, and close such facilities in a manner that assures protection of human health and the environment. Another provision of section 201 was that separate assessments be made for different classes of treatment, storage, and disposal facilities that have been or probably will be issued a permit. Such assessments were to address the current and future financial capabilities of owners/operators, the current and future costs associated with facilities, and the availability of mechanisms to assure these costs can be financed.

In conducting our study, we found that several of these requirements could not be fully addressed. As discussed later in this report, data necessary to assess future costs and financial capabilities are not available. Consequently, to best address the overall issue of postclosure liability and provide the Congress now with a meaningful perspective on liability questions, we focused our work on addressing the following questions.

- What is the likelihood that permitted hazardous waste disposal facilities will leak in the postclosure period and/or beyond?
- What is the magnitude of liabilities that may be incurred after these facilities close?
- Do current mechanisms provide adequate funding assurances for these liabilities?
- How feasible are other mechanisms that could be used to provide greater assurance that funds will be available to address postclosure liabilities?

Further, in conducting our work, we found it necessary to limit our study to one class of facilities; specifically, facilities that have been granted a permit for land disposal of hazardous wastes. Other permitted facilities, such as treatment or storage facilities, are generally expected to “clean close” and remove all hazardous waste from the site. In clean closure situations, there are presumed to be no postclosure concerns. However, for various reasons these facilities may not be able to clean close, and in such situations these facilities become disposal facilities and must meet the postclosure requirements of all disposal facilities. For our study, we did not try to determine the extent to which such facilities will be required to become disposal facilities.

Because we limited the objectives of our review, we contacted the staff of the Senate Committee on Environment and Public Works and the House Committee on Energy and Commerce to discuss our objectives and to ensure that our review would satisfy the SARA requirements as well as the needs of the Congress.

In addressing these issues, we relied primarily on information from EPA’s Office of Solid Waste (OSW), which is responsible for managing the RCRA program, and contacted other government agencies such as the Departments of Commerce, Treasury, and the Interior and the Federal Emergency Management Agency (FEMA) and the Nuclear Regulatory Commission (NRC) concerning various aspects of our review. In addition, we gathered opinions and data on the postclosure liability issue from two environmental groups and the commercial hazardous waste management and treatment industries’ associations. We also spoke with owners/operators of hazardous waste facilities, including one who both generates and disposes of hazardous waste and others who only treat and/or dispose of hazardous waste.

To determine the likelihood of leakage at permitted hazardous waste facilities, we focused on the status of data collection and research in this

area by EPA's Land Disposal Technology Section in the Office of Solid Waste, Science Advisory Board, Office of Research and Development, and Risk Reduction Engineering Laboratory in Cincinnati, Ohio. We obtained information on the current technology requirements for hazardous waste disposal facilities and the long-term effectiveness of these requirements. We also obtained information from these offices on the data still needed to address concerns with the performance of the current technology requirements and the plans for obtaining these data. In addition, we gathered data and opinions about the durability of land-disposal technology requirements from researchers at the Geosynthetic Research Institute at Drexel University and Texas A & M University. We also spoke with representatives of the Office of Technology Assessment, the National Solid Wastes Management Association, the Hazardous Waste Treatment Council, and the Nuclear Regulatory Commission's Division of Low-Level Waste Management and Decommissioning concerning the likelihood of leakage from facilities constructed in accordance with current EPA requirements.

To determine the liabilities that may be incurred after permitted facilities close, we focused on obtaining available cost data on five areas—routine maintenance and monitoring, compliance monitoring, corrective action, third-party damages, and natural resource damages. Centralized data on these cost areas are not available from EPA. However, to provide a perspective on postclosure costs, we obtained data from the Permits Branch in the Office of Solid Waste, EPA Regions IV and VI, and from owners/operators on estimated routine postclosure maintenance and monitoring costs at 12 facilities. Data on other postclosure liabilities, however, were generally unavailable from EPA or other sources. Nevertheless, we obtained summary data on estimated corrective action costs from EPA and discussed natural resource damages with officials in the Department of the Interior's Office of Environmental Project Review involved in the development of regulations for assessing natural resource damages.

To address the third question, we discussed financial assurance mechanisms with OSW's Closure and Financial Responsibility Section in the Permits and State Programs Division. We also obtained opinions on long-term financial assurance concerns from seven owners/operators, three financial analysts from investment-related firms, three environmental

groups, and three trade associations. We also reviewed data we had collected during previous reviews that addressed financial assurance mechanisms.³

To address the final question on options that could be pursued to provide reasonable confidence of postclosure liability funding, we talked with officials from EPA's Permits and State Programs Division as well as ICF, Inc., the EPA contractor for its 1985 postclosure liability trust fund model. We obtained their views and perspectives on the trust fund option, as well as EPA's policy regarding the liabilities of owners/operators. We also obtained and reviewed two studies related to options for funding postclosure liabilities, EPA's 1985 Report to the Congress on the Post-Closure Liability Trust Fund and the Treasury Department's 1982 report, Hazardous Substance Liability Insurance. To determine the availability of private insurance to cover postclosure liabilities, we spoke with representatives of the American Insurance Association and with the senior economist at the Treasury Department responsible for developing the 1982 report on the availability of insurance for post-closure liabilities. We also attended a February 1989 hazardous substances insurance conference and reviewed conference papers on environmental pollution insurance availability. Further, we discussed the possibility of federal insurance to cover these liabilities with NRC and FEMA.

Our review was conducted between October 1988 and June 1989, with selected updates through January 1990, in accordance with generally accepted government auditing standards. We provided a draft of this report to EPA for formal review and comment. EPA's comments and our responses are in appendix I.

³Hazardous Waste: Environmental Safeguards Jeopardized When Facilities Cease Operating (GAO/RCED-86-77, Feb. 11, 1986) and Hazardous Waste: Issues Surrounding Insurance Availability (GAO/RCED-88-2, Oct. 16, 1987).

Extent Of Postclosure Liabilities Unknown

EPA requires permitted facilities to meet certain requirements intended to prevent the leakage of hazardous substances into the environment. The requirements for liners, leachate collection systems, covers, and postclosure maintenance are believed capable of preventing leakage in the short term. However, for the long term—beyond 30 years—there are questions about the effectiveness of EPA's current requirements and concerns that leakage may occur.

Leakage that does occur after closure could result in significant liabilities such as corrective action costs and off-site damage claims. However, because of a lack of experience-based information, insufficient data exist on the extent and timing of potential leakage as well as the actions required to correct such leakage. Consequently, the magnitude of post-closure liabilities that could be incurred simply cannot be measured at this time.

EPA is concerned about the effectiveness of its standards for the long-term prevention of waste migration and the potential for postclosure liabilities. Both GAO and EPA's Science Advisory Board have recommended the development of a strategy—describing activities and time frames for their completion—to address such concerns. However, because post-closure at currently operating hazardous waste disposal facilities is not viewed as a current environmental problem, EPA has made this issue a lower priority in the RCRA program and has not developed the necessary strategy.

Current Requirements May Not Prevent Leakage After Postclosure

The land disposal of hazardous waste presents the possibility that hazardous substances may migrate from the disposal facility and pose a risk to human health and the environment. To reduce this risk before the wastes are placed in the ground, hazardous waste must meet specified treatment standards to make it less toxic and mobile. HSWA prohibits the disposal of untreated hazardous wastes beyond specified dates and requires EPA to establish treatment standards after which waste treated in accordance with the standards could be land disposed. Treatment standards have been established for most hazardous wastes and standards for all remaining wastes are scheduled for issuance in May 1990.

Nevertheless, although some wastes degrade or can be made less hazardous through treatment, some substances remain hazardous forever. Consequently, in order to reduce the potential for leakage of these substances from permitted disposal facilities after they close, all such facilities must meet a number of construction standards to prevent

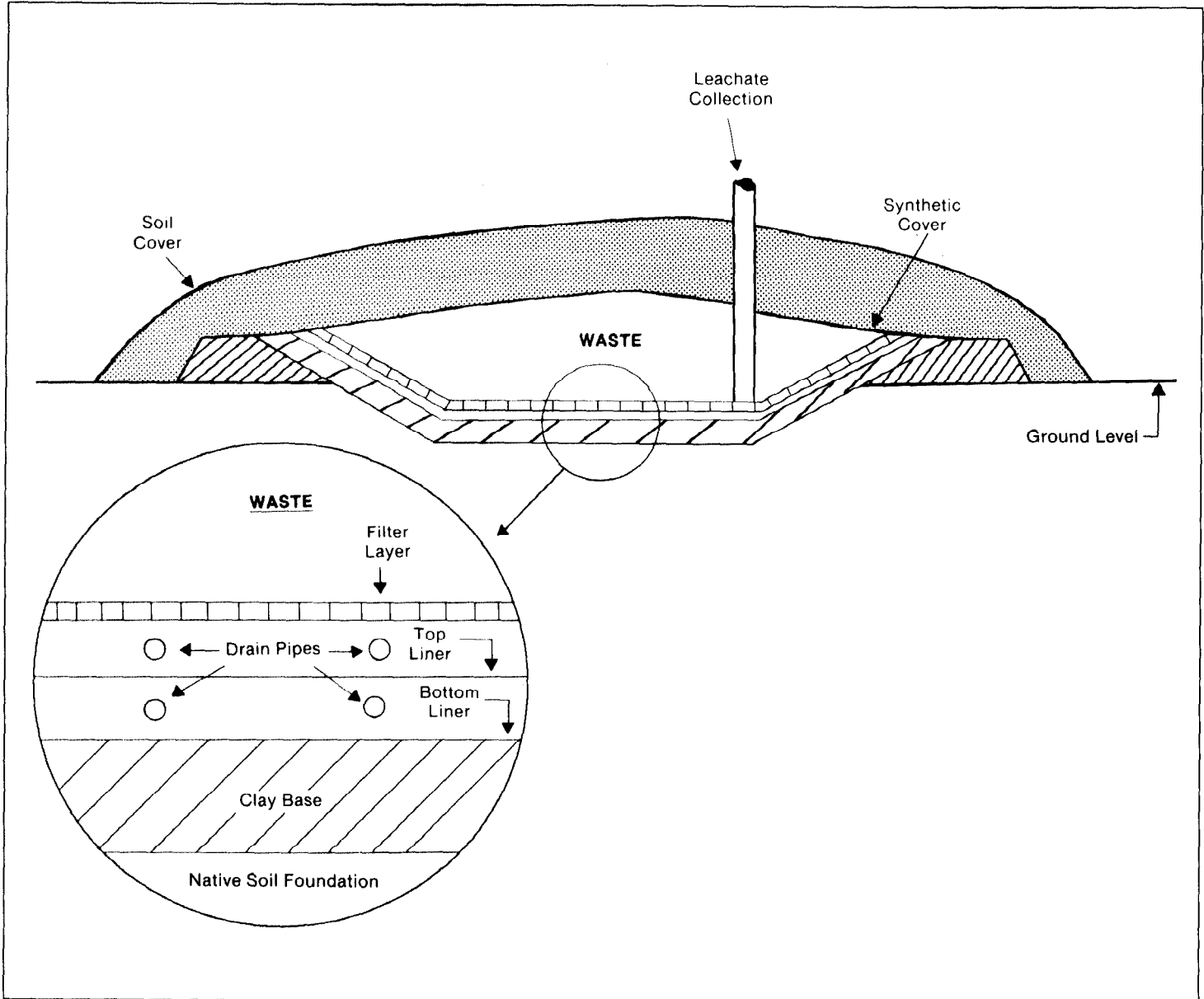
and/or reduce the migration of hazardous wastes. These standards require, according to EPA guidance, that all owners/operators must do the following:

- Place double liners under any new landfill unit or any replacement or expansion of an existing unit.¹ Draft EPA guidance for double liners directs that the top liner be constructed of a flexible synthetic material, such as high-density polyethylene, and the bottom liner be constructed of either compacted low-permeability soil or a combination of a synthetic material and compacted low-permeability soil.
- Install leachate collection systems over the top liner and between the two liners. Leachate collection systems consist of a drainage layer to collect liquids generated in the disposal unit and a mechanism such as a pump to remove them.
- Cover the disposal units at closure. EPA's minimum technology guidance recommends that covers be of a multilayer design that includes a synthetic material and compacted soil.

A cross-sectional view of a typical closed hazardous waste disposal unit built to current EPA requirements is shown in figure 2.1.

¹The double liner requirements may be waived by EPA for certain monofill facilities and for facilities that can demonstrate that alternative design and operating practices will prevent waste migration as effectively as liners.

Figure 2.1: Cross-Sectional View of a Typical Permitted RCRA Hazardous Waste Disposal Unit After Closure



Source: GAO illustration based on EPA data.

These waste containment measures are intended to minimize the migration of hazardous substances through the end of the postclosure period and beyond. The liners and leachate collection systems are intended to prevent waste migration by collecting and removing leachate before it

can migrate during the unit's active life and postclosure period. The cover is expected to prevent the inflow of liquids, primarily rain water, into the waste unit after closure and thereby reduce the amount of leachate generated.

In addition to the design requirements, EPA requires that owners and operators perform maintenance and monitoring activities during a 30-year postclosure period. During this period, the owners/operators collect and dispose of any leachate generated in the unit, monitor the ground-water surrounding the unit to determine if the facility is leaking, and maintain the facility to ensure that the migration protection measures remain intact.

Long-Term Effectiveness of Waste Containment Measures Unknown

Under the current requirements, hazardous waste disposal units are expected to be effective in preventing leakage of hazardous constituents into the environment through the 30-year postclosure period. EPA's design and operating requirements for land disposal units specify that liners be constructed of materials to prevent the migration of any hazardous constituent through the liner during a unit's active life and postclosure period. The chief of OSW's Disposal Technology Section said that although little data are available on the actual use of liners in hazardous waste applications, EPA is confident that the current technology will be effective in preventing waste migration through the 30-year postclosure period. He said that properly closed units, with the required maintenance and leachate removal, will gradually "dewater" and dry out during the early years of postclosure and substantially reduce the likelihood of leakage during the 30-year postclosure period.

However, for the longer term—beyond the 30-year postclosure period—the effectiveness of the current technology requirements in preventing leakage is questionable. As stated in EPA's March 1986 proposed rule to assist in implementing the statutory provisions of HSWA

"EPA's position was, and still is, that absolute prevention of migration forever, or for the long term, is beyond the current technical state of the art. Thus, at some time, some migration through the liner will probably occur."

Officials in OSW's Disposal Technology Section and EPA's Risk Reduction Engineering Laboratory in Ohio told us that several concerns exist over the long-term viability of liners for preventing waste migration. They said that concerns include the cracking and tearing of the liners resulting from the stresses on the materials from landfill environments and

the durability of seams in the liner, both of which would allow the release of hazardous constituents. Further, as stated in a May 1988 EPA-contractor report on the service life of synthetic construction materials in landfill environments, other potential problems include the softening and perforation of liners and the inability to remove leachate from disposal units because of clogging of leachate collection systems.

Because of the potential for leakage through the liner in the long term, EPA views the covers as the mechanism to prevent leakage during the established postclosure period. Officials from OSW and the Risk Reduction Engineering Laboratory said that the cover will prevent the inflow of liquids that could leach hazardous constituents to the environment. They said that if liquids are prevented from entering the disposal unit, there is little chance of any significant leakage even if the liner fails. However, OSW officials said that they do not know the long-term effectiveness of covers.

EPA officials could not provide an estimate of how long properly designed and constructed disposal units will be able to contain wastes before leaking. They said that because of the lack of information on the long-term use of this technology, the effectiveness of current waste containment measures is unknown. However, the Chief of the Disposal Technology Section added that the materials used in disposal facilities is constantly improving and that at least one manufacturer has estimated that its liner material will last for 400 years. EPA officials said that although such estimates are hard to support, they are now optimistic that facilities will be able to contain wastes 100 years or more.

Industry officials believe that any risk of leakage from current facilities after the postclosure care period is minimal. According to representatives of the National Solid Wastes Management Association (NSWMA) and members of its Institute of Chemical Waste Management, the technology now being used will control the release of hazardous constituents for 100 years or more. They said that some applications of this technology have been in use for over 50 years with no leakage or degradation problems and that although these are not hazardous waste applications, they anticipate that no problems will occur using liners in hazardous waste facilities.

Others believe that the current disposal technology will be less effective over the long term. Officials in the Nuclear Regulatory Commission responsible for the disposal of low-level nuclear waste told us that their agency has concerns about the long-term integrity of waste containment

measures, particularly with regard to cover materials. According to the Chief of the Regulatory Branch in NRC's Division of Low-Level Waste Management and Decommissioning, the NRC is concerned that the covers will leak before the liners and result in a "bathtub" effect where the facility fills up with liquid and overflows. Because of this, NRC generally does not advocate the use of liners in low-level nuclear waste disposal facilities but instead requires that the waste be made structurally stable, including encapsulation, before it is placed in the ground. The NRC official said that EPA's approach of using liners to contain wastes will necessitate permanent maintenance and monitoring of facilities to prevent leakage of leachate as long as the waste stays hazardous.

University researchers we talked with also said that problems may exist with the long-term effectiveness of current waste containment technology. One researcher said that there is little doubt that current hazardous waste facilities will leak. He said that present research shows that these systems will fail at some point, particularly after postclosure care ends, and that he views today's disposal of hazardous waste as merely a storage mechanism for hazardous waste that may have to be removed eventually. Another university researcher told us that the technology used today is the best available but that it is simply unknown if it will keep wastes in place.

Magnitude of Postclosure Liabilities Not Determinable

Postclosure liabilities are for the most part directly related to the leakages that may occur before and after a facility closes. Only one postclosure liability—maintenance and monitoring—is required in all situations and can be estimated. Other postclosure liabilities that may be incurred—compliance monitoring, corrective action, third-party damages, and natural resource damages—cannot be determined because of the unknown extent and timing of potential leakages and, in some cases, a lack of available data.

Maintenance and Monitoring Costs

Maintenance and monitoring costs during the postclosure phase include the costs of groundwater monitoring and maintenance activities to ensure the integrity of the site. Owners/operators are required to maintain and monitor their facilities for 30 years after closure, although the cognizant EPA Regional Administrator can extend this period if necessary to protect human health and the environment or shorten it if protection is no longer necessary. As a part of the permitting process, owners/operators are required to estimate the costs of maintenance and monitoring during the postclosure phase.

EPA, however, does not maintain centralized data on the postclosure cost estimates prepared by permitted facilities. According to officials in OSW's Financial Responsibility Section, these estimates are updated annually and EPA does not want to place an additional reporting burden on industry by requiring that these data be sent to headquarters. They said that these data are consequently available only at each facility or at the appropriate state or EPA regional office.

We did obtain postclosure cost estimates on 12 facilities to provide some perspective on the magnitude of these costs. These estimates show that postclosure maintenance and monitoring costs are very site-specific and depend on factors such as facility size and the extent of groundwater monitoring required. For example, the cost estimates ranged from \$115,000 for 30 years at one facility to \$22.5 million for the same time period at another.

Compliance Monitoring Costs

Compliance monitoring is required at RCRA facilities if groundwater contamination is detected through routine maintenance and monitoring. Under a compliance monitoring program, an owner/operator is to evaluate the concentration of certain hazardous substances to determine if the facility complies with the groundwater protection standard established for that facility.

According to OSW officials, compliance monitoring costs cannot be estimated with any certainty. They pointed out that compliance monitoring will be required only when contamination is detected and can involve the installation of additional monitoring wells, more frequent testing, and analysis of samples for a wider range of hazardous constituents. Moreover, the compliance monitoring costs that will occur during postclosure will be specific to the facility and the hazardous constituents involved and cannot be predicted for permitted facilities currently operating. They added that costs may range from very small if no new wells are needed to very large if a significant compliance program is required. For example, data obtained from one EPA region show a facility currently in postclosure is conducting a compliance and postclosure care program estimated to cost \$4.9 million—\$129,000 per year—over a 62-year period.

Corrective Action Costs

A major cost of a leaking facility is associated with corrective action; that is, the activities taken to halt and repair the problem and to bring groundwater back into compliance with the groundwater protection

standard contained in the facility's permit. Corrective action remedies at hazardous waste disposal facilities can range from actions such as repairing liners to prevent leakage, pumping of groundwater to remove contamination, or removing the hazardous substances.

Corrective action costs can be substantial. Costs to cleanup Superfund sites average over \$10 million per hazardous waste site and are increasing. Further, EPA estimates that 30 percent of the closing RCRA facilities probably will require clean-up action at an average cost of \$6.3 million per facility. However, these costs may not be comparable to those that may be incurred in the future at currently operating disposal units. OSW officials point out that past unpermitted hazardous waste disposal facilities were (1) poorly located, (2) contained untreated and liquid wastes, and (3) not built to prevent the migration of wastes. As a consequence, the officials believe that the corrective action at these older facilities will be more substantial than that which may be required at state-of-the-art disposal units.

EPA officials could not estimate what range of corrective action costs would be required. They said that this can only be done once experience is gained on the effectiveness of current measures for preventing waste migration. Further, the RCRA corrective action program is being implemented in the absence of regulations because the draft regulations are currently under review at the Office of Management and Budget. Therefore, according to EPA officials, future corrective action costs cannot be estimated.

Third-Party Damages

Third-party damages include personal injury, economic loss, and property damage claims where disposal facilities can be sued by third parties for damages resulting from leakages that migrate off-site.

As discussed in our recent reports on insurance availability, data on pollution liability claims by third parties are not available.² The insurance industry does not maintain centralized pollution claims data. In our reports we suggested, among other things, that to determine the cost and extent of third-party liabilities, the Congress consider requiring insurers or responsible parties, as appropriate, to report to EPA the amounts of indemnity payments made to cover pollution cleanup and related third-

²Hazardous Waste: Issues Surrounding Insurance Availability (GAO/RCED-88-2, Oct. 16, 1987) and Hazardous Waste: The Cost and Availability of Pollution Insurance (GAO/PEMD-89-6, Oct. 28, 1988).

party bodily injury and property damage. Until such information becomes more available, there remains no basis for projecting the potential for such claims.

Natural Resource Damages

Leakage from hazardous waste facilities could also result in damages to natural resources. As defined by CERCLA, natural resources are land, fish, wildlife, biota, air, water, groundwater, and other such resources belonging to or otherwise controlled by the United States, any state or local government, or any foreign government.

The Department of the Interior is responsible for assessing natural resource damages resulting from the release of hazardous substances. Assessments for natural resource damages are meant to supplement corrective action responses, and in this regard represent those damages and costs above and beyond cleanup costs undertaken to protect public health. According to Interior's August 1, 1986, final rule implementing its natural resource damage assessments, these assessments provide a process for determining proper compensation to the public for injury to natural resources.

However, at this time, no assessments of natural resource damages resulting from the release of hazardous wastes have been made by the Department. According to officials from Interior's Office of Environmental Project Review, the Department's policy is to settle natural resource cases before they reach the assessment stage, and to date no cases of natural resource damages resulting from hazardous waste have been brought before them for settlement or assessment. The Interior officials could not provide an estimate of a "typical" natural resource damage claim resulting from leakage at a hazardous waste facility because each assessment of natural resource damages is site-specific.

Additionally, portions of Interior's regulations for assessing natural resource damages have recently been declared invalid by the U.S. Court of Appeals for the District of Columbia Circuit.³ As a result of the court's July 14, 1989, rulings, Interior must revise its regulations and, according to Interior officials, such a revision could increase the amounts assessed in natural resource damage claims.

³Ohio v. United States Dep't of the Interior, 880 F.2d 432 (D.C. Cir. 1989) and Colorado v. United States Dep't of the Interior, 880 F.2d 481 (D.C. Cir. 1989).

EPA Does Not Have a Strategy for Addressing Long-Term Postclosure Concerns

EPA is aware of the potential liability problems that may occur after operating facilities close. OSW officials said that they want to prevent a recurrence of the problems that led to the creation of the Superfund, and they believe the current measures for controlling the migration of hazardous constituents is the best technology available to do this. Nevertheless, they are unsure of the long-term effectiveness of liners and covers and are concerned that leakage of hazardous constituents could occur. The OSW officials said that because of these concerns, they intend to examine this issue over the next few years.

However, EPA has not developed a strategic plan for addressing this issue. As stated in our report Hazardous Waste: New Approach Needed to Manage the Resource Conservation and Recovery Act (GAO/RCED-88-115, July 19, 1988), the RCRA program needs strategic planning that identifies measurable goals, tasks necessary to accomplish the goals, milestones, resources, organizational responsibilities, and a system for measuring performance. With regard to the long-term prevention of hazardous waste migration, such a strategy would include identifying and resolving technological concerns, gathering data on the effectiveness of current applications, and considering revisions to postclosure care requirements to better ensure that the integrity of facilities is maintained.

The need for strategic planning in the area of hazardous waste disposal has also been raised by EPA's Science Advisory Board, a public advisory group that provides advice to EPA. In an October 1987 report on EPA's land disposal research program, the Board determined that it is difficult to predict that improved land disposal will be protective of human health and the environment for the long-term future. The report concluded that there is a need to evaluate and understand the long-term performance of what are now considered environmentally sound land disposal practices to ensure that these practices are environmentally sound for many decades. The report further concluded that there is an absence of a waste management strategy—detailing projects, timetables, and funding—necessary to develop the scientific and technical knowledge for developing land disposal guidance and regulations.

According to EPA officials, a comprehensive strategy for addressing long-term postclosure concerns at permitted hazardous waste facilities has not been developed. The officials stated that no strategy exists in large part because postclosure concerns at operating facilities currently have a low priority relative to other aspects of the RCRA program. They pointed out that EPA is conducting several activities that have statutorily

mandated deadlines, such as the permitting of incinerators and the issuance of hazardous waste treatment standards and that these activities have been given high priority by EPA. One official added that the remaining EPA resources are directed at issues that provide the most environmental benefit and that postclosure concerns at operating facilities is not a current environmental problem.

Moreover, if resources were available, EPA believes that it would be inappropriate at this time to develop such a strategy. The Director, Permits and State Programs Division, said that it is simply too early to develop and/or obtain the data necessary to assess how long liner and cover materials will last. He said that EPA should be in a better position to make such judgments in a few years when data on actual uses of liners in hazardous waste applications are available. Consequently, EPA will take a "wait and see" attitude on the performance of the systems.

Nevertheless, the osw officials pointed out that several efforts have been initiated, or will be initiated, that will address postclosure liability concerns, including the following.

- Development of the leak detection rule that would require all disposal facilities to report leakage through the first liner to EPA. This information should enable EPA to obtain a better perspective on the performance of double liner systems in actual applications.
- Research on the long-term performance of liners and covers. Such research will provide better data on the potential problems that may occur with these systems and identify measures to prevent such problems.
- Extension of the postclosure maintenance and monitoring period. EPA has already issued a proposed rule that would extend the 30-year postclosure period at solid waste facilities—which dispose of household garbage, commercial refuse, and other generally nonhazardous wastes—because of the potential for leakage from these facilities after the postclosure care period ends. Under this proposal, owners/operators must conduct a second, less intensive phase of postclosure care for a period to be determined by the appropriate state. EPA has stated that it is considering a similar extension for certain hazardous waste facilities.

However, EPA officials were unable to provide information on when these activities will be undertaken and/or completed. For example, they said that the leak detection rule is currently on hold and little effort is being put towards completion and issuance of the rule because of other priorities within EPA. Consequently, they do not know when they will be

collecting complete data on the performance of liner systems in actual applications. Similarly, osw officials were unable to estimate when the agency will be considering an extension to the postclosure period for hazardous waste facilities. It is generally assumed that the postclosure maintenance and monitoring period will be longer than 30 years, but EPA currently does not have firm plans for extending the postclosure care period at hazardous waste facilities.

Options for Funding Postclosure Liabilities

Although it is likely that some permitted hazardous waste disposal facilities will leak, what is not known is when and if such leakage will release hazardous constituents and threaten human health and the environment. However, should leakage resulting in significant postclosure liabilities occur, there is little assurance that funds will be available to pay for these liabilities. Current EPA financial assurance requirements do not provide secure funding for known postclosure liabilities—required, identified, and quantifiable costs such as maintenance and monitoring—nor do they cover unknown liabilities such as potential on-site cleanups or off-site damages.

There are private and public sector funding options that could be pursued to better ensure that any needed postclosure liability funds would be available. Many of these options, however, have limited applicability. Currently, public sector options—in particular a modified postclosure liability trust fund—appear to be the most viable approach to providing postclosure funding assurance. However, structuring such a fund at this time is hampered because the liabilities are still very difficult to estimate.

Little Assurance That Funds Will Be Available for Postclosure Liabilities

As directed by RCRA, EPA has established financial requirements to assure funds are available to pay for certain postclosure liabilities. As provided by its regulations, EPA allows owners/operators to use any of five mechanisms to provide financial assurance based on the estimated cost of maintenance and monitoring activities during the postclosure period. These five mechanisms are as follows.

- **Trust fund:** an agreement with an authorized bank or other institution to act as a trustee of payments made by the facility owner/operator. EPA requires that annual payments be made into this account for either 20 years or the remaining operating life of the facility, whichever is shorter. The trust fund should contain a sum equal to the postclosure cost estimate after the end of the pay-in period.
- **Surety bond:** a contract with a qualified surety company that guarantees payment for, or performance of, postclosure activities if the owner/operator is unable to do so.
- **Letter of credit:** a letter issued by an authorized bank or other institution in which payment of postclosure costs is guaranteed by the issuer if the owner/operator is unable to do so.
- **Postclosure insurance:** Insurance issued by a licensed company to pay postclosure costs for the owner/operator, with payment limited to the face value of the policy.

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- **Financial test/corporate guarantee:** A method of demonstrating adequate resources to cover postclosure costs, through a combination of assets, net worth and net worth multipliers, financial ratios, and/or bond ratings. A parent company of an owner/operator may instead provide a written guarantee that sufficient postclosure funds are available if it meets the financial test.

In addition, EPA allows owners/operators to use state-authorized mechanisms that provide assurance equivalent to the mechanisms specified above. In this regard, states allow modifications of the above assurance mechanisms and/or disallow the use of others such as the financial test.

Financial Assurances for Known Postclosure Liabilities Not Secure

EPA allows the use of any of these five mechanisms to assure funding for known postclosure maintenance and monitoring activities and has proposed allowing all mechanisms but insurance and surety bonds to assure postclosure corrective actions once they are identified. However, most of these mechanisms are not currently viable for postclosure liabilities. On the basis of our past reports and information provided by representatives of the American Insurance Association and owners/operators, postclosure insurance, surety bonds, and letters of credit are currently limited in their use as financial mechanisms because providers of these mechanisms are concerned that they may be held liable for large cleanup costs should leakage occur.

As a result, owners/operators either use the financial test or the trust fund, which may not provide secure funding assurance. As discussed in a February 1986 report,¹ the financial test was most often used to meet RCRA financial assurance requirements for closure/postclosure costs. EPA has no centralized data that identify the financial assurance mechanisms used by owners/operators for postclosure care costs; however, officials from OSW's Closure and Financial Responsibility Section told us that the financial test is the primary mechanism used for postclosure liabilities. Representatives of one owner/operator we talked with during our review said that the financial test is the preferred mechanism because it is the most readily available and does not require a dedicated fund that ties up resources that could be used for other business purposes.

¹Hazardous Waste: Environmental Safeguards Jeopardized When Facilities Cease Operating (GAO/RCED-86-77, Feb. 11, 1986).

However, the financial test may not be an adequate mechanism for establishing financial responsibility. As discussed in our February 1986 report, if the financial strength of facilities changes rapidly, the test may not be a good predictor that adequate funds will be available. We recommended that EPA monitor and periodically reevaluate the use of the financial test. The Environmental Defense Fund (EDF) also believes that the financial test is not a secure postclosure funding mechanism. EDF representatives stated that unsecured "self-insurance" provides financial assurance only if it can be assumed that the self-insuring firms will remain solvent and that even extremely large and well established corporations are not immune to significant financial shocks.

EPA considers the financial test to be a viable approach to financial responsibility. The Chief of OSW's Financial Responsibility Section pointed out that because an owner/operator's financial status is reviewed by EPA regions or authorized state programs every year, a facility that has received a permit and does not meet its annual financial test review will be required to provide alternative assurance of its ability to fund postclosure costs. If it cannot provide other funding assurances, the facility will be closed. Nevertheless, OSW officials said that six states have disallowed the use of the financial test because the states want a firmer set-aside of moneys than the test provides. Further, although EPA does not plan to disallow use of the financial test, it is currently reviewing this mechanism and will modify it in a proposed rule that is expected to be issued in the spring of 1990. An OSW official said that the test will be revised to make it both more viable for use by more owners/operators and render it a better predictor of bankruptcy.

The other most widely used mechanism, the trust fund, is allowed by EPA to provide a financial assurance mechanism affordable to owners/operators with limited resources who generally cannot qualify for other mechanisms, such as the financial test. As stated in our 1986 report, the trust fund mechanism may not provide funding assurance. Because the trust fund can be paid into over a 20-year period, sufficient funds may not be available if a facility should close during the early years of the pay-in period.

No Financial Assurance Requirements for Unknown Liabilities

Postclosure financial assurance is currently required by EPA only for 30-year maintenance and monitoring as well as identified corrective action costs. Financial assurances are not required, however, for potential but unknown postclosure liabilities such as on-site cleanup or off-site damages. According to the Director, Permits and State Programs Division,

EPA only requires owners/operators to set aside funds for known contingencies; EPA does not believe it would be appropriate to require funds be set aside for unknown contingencies. Consequently, although EPA does not want situations to occur in the future where funds are not available to cover liabilities, it does not require large amounts of funds be set aside for liabilities that may not occur. The director added that such additional financial responsibility requirements could cause facilities to close, which would have serious negative effects such as reducing hazardous waste disposal capacity and increasing illegal dumping.

Nevertheless, OSW officials stated that there is no assurance that funds would be available for unknown liabilities that may occur after permitted facilities close. They said that no one can predict what the future financial situation of any owner/operator will be in the long-term with any certainty, and if an owner/operator were to become bankrupt or otherwise go out of business, there is little likelihood that funding would be available for unanticipated postclosure costs.

The OSW officials added that these facilities can qualify for coverage under the Superfund in situations where the owner/operator is unable or unwilling to pay for cleanup actions. However, Superfund moneys are limited, and leaking RCRA sites would have to be on the National Priorities List—a listing of the worst hazardous waste sites needing priority cleanup actions—to receive funding. Further, Superfund pays only for cleanup actions and natural resource damages and does not provide compensation for personal injury and economic losses that may result from releases of hazardous wastes.

EPA has the authority to require additional financial assurances for certain unknown liabilities. Section 3004(a) of RCRA authorizes EPA to promulgate financial requirements for corrective action as it deems necessary or desirable. According to EPA, this authority is not limited to known releases. However, although EPA has issued a proposed corrective action rule in October 1986 that would require facilities with known releases to provide corrective action funding assurances, at that time EPA stated that it will not pursue such financial assurances for unknown releases until more analysis on the issue is completed.

Options for Funding Postclosure Liabilities

There are various options for funding postclosure liability costs that have been, or could be, pursued. These options are as follows.

- Private sector funding options, such as insurance, coinsurance, reinsurance, and risk pooling.
- Public sector options, such as federal insurance and modifications to the terminated postclosure liability trust fund.

Private Sector Options

Private sector options for funding postclosure liabilities include private insurance, coinsurance, reinsurance, and voluntary risk pooling. Because of the unknown liabilities and perceived risk associated with hazardous waste disposal facilities after they close, these postclosure funding mechanisms are currently not viable options. Private insurance, coinsurance, and reinsurance are currently unavailable for postclosure liability coverage. Voluntary risk pools to cover postclosure liabilities have proved to be unsuccessful and are generally believed inappropriate for the hazardous waste disposal industry.

Private Insurance

Private insurance has been unavailable for closed hazardous waste facilities for many years. The Treasury Department reported in 1982 that a system of private insurance for postclosure financial responsibility was not feasible.² The Treasury report, mandated by Section 107(k)(4)(A) of CERCLA, found that insurers would not (1) accept uncertain and potentially unlimited liability, (2) provide financial assurance for liability in perpetuity, and (3) assume all managerial liabilities for insured sites. For these reasons, the report concluded that this type of comprehensive private insurance was not feasible for the foreseeable future.

More recently, we issued two reports that addressed the availability of pollution insurance.³ Although these reports did not directly address the availability of postclosure insurance, they concluded that the insurance industry generally regarded pollution risks as uninsurable at that time and therefore insurance for hazardous waste facilities was extremely limited.

A representative of the American Insurance Association stated that the postclosure insurance market does not exist, and they did not foresee that this market would open up anytime in the near future. According to the representative, the unavailability of private hazardous waste insurance is primarily due to the following factors.

²Hazardous Substance Liability Insurance, U.S. Department of the Treasury, March 1982.

³Hazardous Waste: Issues Surrounding Insurance Availability (GAO/RCED-88-2, Oct. 16, 1987) and Hazardous Waste: The Cost and Availability of Pollution Insurance (GAO/PEMD-89-6, Oct. 28, 1988).

- The inability to measure or quantify the liability exposure at hazardous waste facilities along with a perception by the insurance industry that liabilities are certain to occur after these facilities close.
- An unwillingness by the industry to guarantee coverage on a perpetual, noncancellable basis to cover the entire 30-year postclosure period.
- The financial liability of the insurance industry in the pollution arena, where the conduct of the policyholder is no longer relevant and insurers would be ultimately liable for cleanup costs.

EPA has also determined that private insurance for postclosure is not available. In its October 1986 proposed rule for corrective action, EPA indicated that it was aware of only one company that had offered postclosure insurance and that this company stopped offering such insurance as of 1986.

Private Coinsurance and Reinsurance

Both coinsurance and reinsurance are types of insurance that spread the risks associated with any potential insurance losses. In a coinsurance scheme, an owner/operator would share the losses sustained under an insurance policy with the insurance company. Reinsurers share in the risks of insuring potential losses with insurance companies in exchange for a portion of the premium.

Neither coinsurance nor reinsurance is a viable option for assuring postclosure liability funding. As stated in the 1982 Treasury study, other private sector insurance arrangements such as coinsurance and reinsurance encounter many of the same shortcomings as private insurance, and consequently these options are not feasible in the foreseeable future. The senior economist responsible for the study told us that the feasibility of both coinsurance and reinsurance is dependent upon the existence of a robust private insurance market to cover these liabilities. As previously discussed, this market does not exist.

As discussed in our October 1987 report, the availability of reinsurance for hazardous waste facilities has been limited since 1984, when foreign reinsurers began to leave the reinsurance market. A representative of the American Insurance Association stated that the association does not expect a resurgence in the reinsurance market for pollution liabilities.

Voluntary Risk Pooling

A risk pool is a group of riskbearers who spread and finance losses among themselves when private insurance is not available or prohibitively expensive. Risk retention groups, which are a form of risk pooling, can be established as insurance companies licensed by states. The Risk Retention Amendments of 1986 allow a broad range of firms with

similar liability risks to form self-insurance pools. In addition, Section 210 of SARA states that risk retention groups may operate to provide pollution liability insurance.

As discussed in the 1982 Treasury report, risk pooling is not a viable option for postclosure liability funding. Because postclosure liability is uncertain and potentially unlimited, Treasury determined that underwriting the risk of postclosure is no more acceptable to mutual associations than to individual insurance companies.

Representatives of hazardous waste disposal firms and NSWMA also pointed out that risk pooling was not a practical option for postclosure liabilities. In 1985 an attempt was made by NSWMA to establish a risk pool for operating hazardous waste facilities. The risk pool, Waste Insurance Liability Limited, failed to attract sufficient participation and was terminated because the association was unable to set initial capital contributions and annual premiums the prospective participants considered equitable. The hazardous waste disposal industry is composed of a very few large companies and many small companies, and some potential participants view the insurance coverage provided by the risk pool to be disproportionate with the financial commitment they would be required to make.

Public Sector Options

Public sector funding options—federal insurance or a federally administered trust fund—could be used to assure that moneys are available for any unfunded postclosure liabilities that may occur. These options provide the greatest degree of funding assurance since they provide federal funding guarantees. However, public sector options place more financial risk on the federal government.

Federal Insurance Programs

The federal government can, and does, serve as an insurer if private insurance is not available. Federal insurance has been established in several instances where liabilities may be incurred, private insurance for these liabilities could not be obtained, and the federal government believed it was in the national interest to assure funds would be available to cover any losses. The government can provide funding through a federal insurance program, by mandating risk pooling, and/or as a reinsurer or coinsurer. Such insurance programs have been established in the Federal Emergency Management Agency (FEMA) for flood and crime insurance and in the Nuclear Regulatory Commission for nuclear power plant accidents.

However, although postclosure liabilities at hazardous waste facilities are difficult to estimate and private insurance is generally not available, federal insurance officials do not believe that it is an area for federal insurance coverage. Officials from FEMA's Federal Insurance Administration (FIA) said that federal insurance may not be appropriate for postclosure liabilities at hazardous waste disposal facilities. The FIA officials cited a number of concerns with establishing a viable postclosure liability insurance program, including the following.

- The lack of actuarial experience with postclosure liability costs. The officials said that with flood insurance, for example, risks can be quantified based on historical data. However, the lack of experience-based data on postclosure liabilities makes it difficult to quantify the risks, costs, and coverage.
- Coverage of bodily injury claims. The federal insurance programs FIA administers have been limited to property damage only, and it is more difficult to quantify the risks associated with bodily injury and potentially more expensive.
- Certainty of risk. The possibility exists that even if facilities are built to current standards leakage will occur.
- The need for perpetual insurance coverage. In other areas insurance has a time limit, but postclosure coverage would be forever.

FIA's Deputy Administrator added that federal insurance is usually provided as a mechanism to influence behaviors and to achieve certain objectives while at the same time providing insurance coverage. For example, to obtain flood insurance, buildings must be built to certain standards which reduce the likelihood of flood damage. However, hazardous waste facilities already have to meet high standards for construction and maintenance, and therefore it appears that insurance is not needed to change the behaviors of facility owners/operators.

The deputy administrator told us that before any insurance program can be contemplated for postclosure liabilities at hazardous waste facilities, public policy objectives must first be established. He said that such a policy must determine if it is in the economic interest of the United States to establish such insurance and/or whether changes to current behavior are needed and would be obtained through the insurance.

A program based on the nuclear insurance program may also not be appropriate. The Price-Anderson Act created an insurance program for the nuclear industry to remove the deterrent to private sector participation in nuclear energy presented by potentially enormous liability claims

of a catastrophic accident. The act establishes a source of funds to compensate personal injury and property damage from a nuclear accident and limits the liability of any entity from such accidents. Price-Anderson is a combination of private insurance, mandatory risk pooling, and federal coinsurance. Each operating nuclear plant must carry \$200 million in private insurance as "primary" insurance. In cases where damages exceed that amount, each plant may be required to contribute a retrospective premium of up to \$63 million per reactor into an industry insurance pool. Because there are currently 114 operating reactors, this "secondary" insurance is equivalent to \$7.2 billion. The law contemplates that the Congress will review public liability exceeding this limit to determine whether additional compensation will be made by the federal government.

A Senior Insurance Indemnity Analyst in NRC's Office of Nuclear Reactor Regulation pointed out that although some aspects of Price-Anderson insurance could be applied to a postclosure liability program, such as coinsurance, this insurance concept is applicable to nuclear facilities only during their operating life. Once a facility gives up its operating license, it is no longer covered by the Price-Anderson provisions.

Modified Postclosure Liability Trust Fund

The Postclosure Liability Trust Fund was established in 1980 to provide a mechanism to assume the liabilities of owners/operators at RCRA permitted facilities after closure. The PCLTF was designed to accept the liabilities of owners/operators and to assume the costs of long-term monitoring and care at qualified hazardous waste disposal facilities. Moneys in the fund were to be generated through a tax on hazardous waste disposal, but if the fund balance exceeded \$200 million in any year, the tax would not be imposed the following year.

The ability of the PCLTF to pay for all postclosure liabilities, however, was questionable. EPA conducted a study in 1985 on the viability of the fund⁴ and determined that there was a 50-percent likelihood that the fund would be unable to maintain a positive balance after 50 years. EPA concluded that it would be difficult to guarantee the adequacy of the fund in perpetuity. Further, EPA recommended, in a letter to the Congress in June 1985, eliminating the PCLTF for the following reasons.

⁴Report to the Congress of the United States on the Post-Closure Liability Trust Fund Under Section 301(a)(2)(ii) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Office of Solid Waste, U.S. EPA, May 1985).

- The major provision of the PCLTF—the assumption by the fund of owner/operator liability within 5 years after a facility closed—was inconsistent with EPA's belief that liability should remain with the owner/operator.
- The 5-year period to qualify for PCLTF funds was inconsistent with the 30-year postclosure maintenance and monitoring phase.

Modifications to the PCLTF to make it more viable have been suggested by the NSWMA. Included among these modifications are the following.

- Remove the fund's \$200-million ceiling. This would provide a larger source of funds to pay for any liabilities that occur.
- Restructure the fund similar to coinsurance in which owners/operators would pay a deductible of \$1 million, the fund would pay out claims ranging from \$2 million to \$30 million, and owners/operators would pay claims above \$30 million.
- Require that any facility would have to be in operation for 10 years in order to qualify for coverage by the fund.
- Delay implementation of PCLTF coverage until after the 30-year post-closure period.

However, whether these modifications would make the fund viable are subject to question. According to a representative of EPA's contractor for the 1985 study, it is difficult to determine if the fund would be financially viable if such changes were made. He said that the fund would have a much greater likelihood of being solvent if the postclosure tax was increased or the fund ceiling of \$200 million removed.

The contractor representative said that until data are available on the extent and magnitude of the liabilities that could be incurred, it is impossible to determine an appropriate structure for the trust fund. The representative said that consequently the structure of the fund becomes a policy decision.

EPA, however, does not believe that a modified postclosure trust fund would be appropriate federal policy. According to the Director, Permits and State Programs Division, a federal trust fund runs counter to the objectives of HSWA, which establishes the federal policy of discouraging the land disposal of hazardous waste. He said that a trust fund would serve as an incentive to land disposal of these wastes and could result in increase disposal capacity, which is currently not needed nor is it desired by EPA.

Moreover, the establishment of a federal trust fund would serve as a disincentive for owners/operators to take all measures possible to prevent leakage from their facilities. The director said that EPA believes that the best mechanism for ensuring that facilities are properly constructed and maintained is the liability that could result from leakage of hazardous constituents. Consequently, EPA's policy is that owners/operators should retain liability for their facilities and that the federal government should not be involved with establishing a trust fund that would remove such liability.

Conclusions and Recommendation

The Congress, through the passage of RCRA and its amendments, and EPA, through its regulations implementing RCRA, have sought to minimize the environmental impacts of continued land disposal of hazardous wastes. The permitting of facilities, the development and implementation of waste migration prevention measures, and the maintenance and monitoring of facilities after they close are current standards that address past hazardous waste management practices that did not seek to minimize the leakage or release of pollutants to the environment.

Although these requirements represent a significant improvement in hazardous waste disposal practices, it remains likely that some permitted hazardous waste disposal facilities will leak sometime after they close. The current technology used to prevent the migration of waste—liners and covers—are not believed capable of preventing waste migration forever. In fact, these technologies may fail at some point after facilities close and the mandated 30-year maintenance and monitoring period has ended. Although treatment of wastes is now being required, some currently disposed wastes will remain hazardous for long periods and consequently leakage from permitted facilities could pose a risk to the public health and the environment.

If and when leakage does occur from permitted facilities, current post-closure funding mechanisms are not adequate for ensuring that sufficient resources will be available to pay for liabilities resulting from such leakages. The only postclosure funding mechanisms in place cover routine postclosure care for the established 30-year postclosure period and corrective action for known discharges. Should other problems arise during postclosure, there is no assurance that funds will be immediately available to take necessary actions. Although currently permitted hazardous waste facilities can pass financial tests, present financial conditions provide little guarantee that a facility owner/operator will be financially able to pay for liabilities 30, 50, or more years in the future.

EPA has acknowledged for several years that concerns exist over the long-term effectiveness of current waste disposal practices in controlling the migration of hazardous substances. EPA has stated that its current requirements—particularly liners—are not permanent leak prevention measures and that releases into the environment could occur after the established postclosure period ends. However, EPA does not have current plans to address this issue and better ensure longer term protection to the public. EPA officials generally agree this issue has low priority in the RCRA program but will be addressed at some future date.

We understand EPA's position on placing a low priority on long-term postclosure concerns at permitted hazardous waste land disposal facilities. EPA has limited resources to deal with the many environmental problems facing the nation, and focusing its actions to protect the public from current environmental dangers is a prudent use of resources. Potential environmental problems that may occur a half century or more from now may not warrant the most immediate attention.

However, on the basis of past history, we remain concerned that future EPA efforts directed towards long-term postclosure issues will be insufficient. It has been over 10 years since the Congress first established a mechanism—PCLTF—to ensure funding for postclosure liabilities and almost 5 years since EPA determined that the PCLTF would not be viable, yet little has been done to address and resolve long-term liability questions. In our view, the potential exists that efforts to address this issue will continue to be deferred as other environmental concerns arise, and actions needed to ensure that postclosure liability problems do not occur may be too little, too late. EPA's Science Advisory Board has expressed similar concerns about the current knowledge of the long-term effectiveness of land disposal practices and EPA's actions to address this concern.

To best assure that EPA obtains and develops adequate information to resolve postclosure liability concerns, the agency needs to develop a strategic plan outlining the activities it intends to take to address long-term postclosure issues and the time frame for completing these activities. At a minimum, such a plan should include (1) activities to determine the current effectiveness of waste migration prevention measures already in place and (2) research on the long-term performance of liners, covers, and other technology required to prevent waste migration. In addition, the plan should also address the issue of extending the postclosure care period. Extending this period would provide longer term care and monitoring at these facilities, better ensuring that waste containment measures are working and that any leakage would be detected.

We recognize that EPA has already identified some activities to conduct in these areas and has proposed a rule to collect data on leakage through liner systems. However, we believe a strategic plan is needed to provide direction to these efforts while giving assurance to the Congress and others that the concerns over long-term postclosure liabilities will be undertaken in an orderly, reasonable, and timely manner. Without such planning, the completion of all necessary actions to thoroughly assess the effectiveness of current disposal technology, and the identification

and availability of resources needed to conduct such actions, is far from certain.

As EPA collects and analyzes data on long-term postclosure risks and costs, the need for and structure of a mechanism to fund postclosure liabilities can be better determined. On the basis of environmental problems that have occurred from waste disposal in both the public and private sectors, we believe that it is a prudent course of action—from both public policy and financial management perspectives—to establish a program that better assures funds will be available to pay for future liabilities. However, not enough information is now available to determine the extent of these liabilities; ascertain the most appropriate structure for a postclosure liability funding mechanism; and ensure that, if warranted, funds collected to pay for these liabilities will be sufficient.

We anticipate that EPA can develop a strategic plan to address this issue in time for debates on the reauthorization of CERCLA—the legislation under which the postclosure liability issue has historically been discussed—which is expected in 1991. As the plan is then implemented and data collected, EPA can periodically provide data to the Congress to allow for deliberations on the establishment of additional postclosure funding mechanisms. If EPA cannot provide the data in a timely manner, possible interim measures—such as extending the postclosure care period—could be considered to provide greater protection to the public health and the environment until more definitive data are available.

Recommendation

The Administrator, EPA, should develop and implement a strategy to address the long-term effectiveness of current hazardous waste disposal requirements so that decisions can be made about postclosure liability funding mechanisms. Such a strategy should outline the activities EPA needs to undertake and/or complete to assess postclosure risks, require evaluations of actions to reduce risks such as extended postclosure care, and assess available alternatives for funding postclosure liabilities. The strategy should also identify required EPA resources and establish time frames for completing such activities. Further, the Administrator should periodically report to the Congress the agency's progress in obtaining the necessary data on the effectiveness of current disposal requirements and as information becomes available, be prepared to take interim measures to provide greater public protection until more definitive data are developed.

EPA Comments and Our Response

In EPA's comments (see app. I), EPA said that if it is our intent that EPA develop and implement a strategic plan to assess the need for a post-closure liability trust fund, sufficient information probably will not be obtained in time for CERCLA reauthorization hearings. According to EPA, substantive information would be unavailable for anticipated hearings since detecting groundwater contamination, necessary to determine the effectiveness of hazardous waste requirements, often takes 20 or more years.

It was not our intent that EPA collect all the data necessary to assess the long-term effectiveness of current disposal practices and the need for additional postclosure funding mechanisms in time for anticipated CERCLA reauthorization hearings. We recognize the inherent difficulties in accomplishing such actions in that time frame; consequently, our report recommends that EPA develop its strategy for obtaining the needed information in time for the hearings. We believe the timing for implementing and completing the actions contained in the strategy should be discussed by EPA with the Congress during the hearings, and need to be considered in light of other environmental concerns that place competing demands on EPA resources.

However, it should be noted that EPA's statement that the detection of groundwater contamination often takes 20 years or more underscores our position that actions to address long-term effectiveness of current disposal actions should be initiated in a timely manner. Such long delays in determining whether current waste disposal requirements are effective can result in a false sense of confidence in current hazardous waste management and has the potential to result in another Superfund situation in future years, a situation that the Congress has stated that it wants prevented through the RCRA hazardous waste management system.

Comments From the Environmental Protection Agency

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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OFFICE OF
POLICY, PLANNING AND EVALUATION

Mr. Richard L. Hembra
Director, Environmental Protection Issues
Resources, Community and Economic Development Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Hembra:

Thank you for the opportunity to review the General Accounting Office (GAO) draft report entitled "Hazardous Waste: Funding of Postclosure Liabilities Remains Uncertain" (GAO/RCED-90-64). Pursuant to Public Law 96-226, the Environmental Protection Agency is hereby providing the official Agency response to the draft report. Our response concerns specific sections of the report as indicated.

Executive Summary - Purpose (page 2)

The opening paragraph of the report, noting the environmental contamination caused by past land disposal, states that while better disposal and containment requirements now apply to land-disposed waste, the possibility remains for leaks requiring costly cleanup actions. However, the paragraph does not reflect the requirements of the land-disposal restrictions program. Since these treatments reduce the toxicity and mobility of wastes, they should decrease the future liabilities associated with land disposal at least as much as the technical requirements for liners and covers. GAO should note these requirements in conjunction with disposal and containment requirements. Subsequent sections of the report do mention the restrictions program, but not including it in the Executive Summary neglects a key component of the HSWA requirements.

See comment 1.

Chapter 3
Options for Funding Postclosure Liabilities (pages 36-49)

Now on pp. 27-37.

This chapter of the draft report argues that the current financial assurance requirements do not provide secure funding for known postclosure liabilities because the Agency allows the use of a financial test. GAO feels that such a test is inadequate for predicting the financial health of a firm in the distant future when such liabilities will come due.

See comment 2.

2

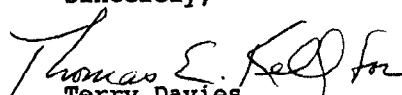
The Agency concurs that financial tests may not be good long-term predictors. For that reason, EPA requires yearly updates of the financial test to assure that a firm's financial health has not substantially deteriorated. Firms failing the financial test must provide an alternative assurance of its ability to comply with our requirements. GAO's characterization does not take into account that failing the financial test triggers the provision of other financial assurance mechanisms described in the report.

Conclusion and Recommendation (pages 53-54)

Regarding the first part of the recommendation, I have a concern. If it is GAO's intent that the Agency develop and implement a strategic plan to assess the need for a postclosure liability trust fund, it is unlikely that sufficient information could be obtained for CERCLA reauthorization hearings, as the GAO report suggests on page 53. Substantive information would be unavailable for anticipated hearings since detection of groundwater contamination, necessary to determine the effectiveness of hazardous waste requirements, often takes 20 or more years.

Thank you for the opportunity to respond to the draft report.

Sincerely,


Terry Davies
Assistant Administrator

Now on pp. 38-41.

Now on p. 40.

See comment 3.

The following are GAO's comments on the Assistant Administrator's letter dated February 16, 1990.

GAO Comments

1. We revised the report to reflect that required disposal practices include the treatment of waste to reduce its toxicity.
2. We clarified our discussion of financial tests in chapter 3 to note that firms failing the financial test must provide an alternative assurance of their ability to fund postclosure care costs. However, although such failures trigger the imposition of other funding assurance requirements, firms may be unable to provide such assurance, particularly in bankruptcy situations.
3. Response provided in chapter 4.

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