

GAO

Report to the Chairman, Environment,
Energy and Natural Resources
Subcommittee, Committee on
Government Operations, House of
Representatives

March 1990

WATER POLLUTION

Serious Problems Confront Emerging Municipal Sludge Management Program



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

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March 5, 1990

The Honorable Mike Synar
Chairman, Environment, Energy and Natural
Resources Subcommittee
Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

In response to your September 14, 1988, request, we have assessed progress by the Environmental Protection Agency (EPA) in developing a municipal sludge management program, as required by the Clean Water Act. Specifically, the report examines (1) the status of existing EPA and state municipal sludge management efforts under EPA's interim sludge program, (2) major obstacles EPA and states may face in implementing the permanent national sludge management program, and (3) the key issues related to EPA's development of technical sludge standards.

As arranged with your office, unless you publicly announce its contents earlier, we will make no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies to other appropriate congressional committees; the Administrator, EPA; and the Director of the Office of Management and Budget. We will also make copies available to other interested parties.

This work was performed under the direction of Richard L. Hembra, Director, Environmental Protection Issues, who may be reached at (202) 275-6111. Other major contributors to this report are listed in appendix I.

Sincerely yours,

J. Dexter Peach
Assistant Comptroller General

Executive Summary

Purpose

The generation of sewage sludge by municipal treatment plants has emerged as a major waste management problem in recent years. Nationwide, treatment plants have doubled their annual generation of sludge since the early 1970s to the present level of 7.7 million dry metric tons and are expected to double sludge generation once again by the year 2000. Increased awareness of sludge's potential toxicity has compounded concern over how to deal with it in an environmentally safe manner. Many of the pollutants sometimes found in sludge have been linked to serious health problems, including cancer and heart failure.

As requested by the Chairman, Environment, Energy and Natural Resources Subcommittee, House Committee on Government Operations, GAO reviewed the Environmental Protection Agency's (EPA) emerging national sludge management program. Specifically, GAO examined (1) the status of existing EPA and state municipal sludge management efforts under EPA's interim sludge program, (2) major obstacles EPA and states may face in implementing the permanent national sludge program, and (3) the key issues relating to EPA's development of technical sludge standards.

Background

Sewage sludge is the solid matter extracted from wastewater during the treatment process of municipal sewage treatment plants. It can either be (1) used as a fertilizer, soil conditioner, or for other beneficial land uses or (2) disposed of as a waste in a landfill, through incineration, or by other methods. EPA policy encourages beneficial uses of sludge as a way to help deal with the nation's growing landfill problem.

To regulate the use and disposal of sewage sludge, the Congress required EPA to develop regulations for state sludge management programs by December 15, 1986. Among other things, such requirements include provisions for identifying the treatment plants to be regulated and for monitoring sludge contaminant levels. The Congress also required EPA to issue technical standards by August 31, 1987, to be implemented through the management programs. These standards, which specify pollutant concentration limits for various sludge disposal/use options, are particularly important because they will heavily influence the cost and feasibility of the disposal/use options used by treatment plants.

While EPA has recently issued its sludge management regulations, it does not plan to issue its final technical standards until at least 1991. Until that time, EPA requires that interim technical sludge standards be applied through permits to "priority" treatment facilities (i.e., genera-

tors of toxic and/or high volumes of sludge) in each state. In addition to using the standards to protect human health from contaminated sludge, this interim program (begun in February, 1987) is intended to help states establish the administrative mechanisms that will eventually be needed to implement the permanent national sludge program. Importantly, EPA regions must fulfill program responsibilities where states do not participate or do not meet all program requirements.

Results in Brief

GAO found that fundamental problems have prevented the interim sludge program from meeting its objectives of protecting human health from contaminated sludge and helping states to establish administrative mechanisms for sludge management. Among them, (1) state participation in the interim program has been low and (2) EPA regions generally have not fulfilled basic program responsibilities, such as identifying the treatment plants to be permitted, in those states not fully participating in the program. At both the state and EPA level, insufficient resources have been a major factor in the inadequate implementation of program requirements.

Among the major obstacles that may complicate subsequent implementation of the permanent program are (1) continued questions over the sufficiency of EPA and state resources and (2) the need to develop an enforcement program to deter program violations and to bring about compliance when violations do occur. GAO believes that to the extent EPA can anticipate and deal with these issues before they become major factors in the permanent program, the agency can go a long way toward averting the type of problems that have affected the interim program.

EPA has experienced great difficulty and years of delays in developing its final technical sludge regulations. Reaction to the Agency's long-awaited February 1989 technical regulations proposal indicates that these problems have yet to be resolved. State and treatment plant officials and scientists are particularly concerned that the proposal's pollutant limits would discourage beneficial uses of sludge.

Principal Findings

Interim Program Goals Largely Unfilled

While state participation may grow in coming months, few states have entered into the formal agreements that signal a willingness to partici-

pate fully in the program. Other states entering into less formal agreements have programs that omit key responsibilities, such as identifying priority facilities or setting permit limits.

Where states do not implement the interim program (or do not undertake all program responsibilities), EPA regions have generally not done so in their place. Inventories of priority sludge-generating facilities, for example, have yet to be completed in a majority of EPA's 10 regions. In addition, the results of an EPA-contracted study suggest that regions are not (1) applying interim technical sludge standards to regulated facilities when states do not do so nor (2) issuing required approvals for those standards that are being developed by states.

Our discussions with state and EPA regional sludge program officials, as well as a 1987 EPA-contracted state survey, suggest that a major reason for low state participation has been limited resources to carry out this program. The regional sludge officials also suggested that if limited resources affect state participation, it will inevitably affect regional performance as well. As one noted, the single full-time EPA employee managing a region's interim program is not enough to issue permits, monitor compliance, and assume other program responsibilities when states are not carrying out the program.

Obstacles Facing the Permanent Program

As with the interim program, a major factor affecting the permanent program will be the extent to which states participate—and the sufficiency of EPA's resources if they do not. While future state participation is uncertain, the prospect that the experience of the interim program may carry over to the permanent program provides cause for concern. An additional concern is whether similar experiences in other water programs, such as EPA's industrial pretreatment program, is indicative of how such problems may affect the sludge program.

To some extent, the resource issue reflects a generic and growing problem in many environmental programs where responsibilities have increased while funding has diminished. EPA has initiated efforts to assist states in developing other funding sources, such as fees and dedicated revenues from fines and penalties. Given the prospect that these broader agency efforts could help improve state participation in the sludge program, GAO believes that EPA's sludge program staff should supplement them by encouraging treatment plant and state officials to explore alternative methods to finance sludge programs.

In addition to improving prospects for state participation, GAO believes that EPA needs to anticipate key program gaps where possible and address them before they become major implementation problems. Based on its past reviews of other environmental programs, GAO believes that one such gap is the absence of an effective enforcement program. Such a program was not in place during the interim program, and while EPA has taken some initial steps toward developing one for the permanent program, much needs to be done to have one in place when that program begins. Among the key elements needed are (1) criteria that allow regulators to set enforcement priorities, (2) criteria that identify what type of enforcement actions are appropriate and when they should be taken, and (3) headquarters' oversight over EPA regional and state enforcement efforts.

Difficulties in Developing Technical Standards

The main concern of many state sludge program officials, treatment plant officials, and scientists about EPA's proposed technical standards is that the stringency of the standards would reduce or eliminate beneficial uses of sludge (such as land application). This view was substantiated by (1) a recent Association of Metropolitan Sewerage Agencies survey that found that of the 25 responding treatment plants with beneficial use programs, only 1 could continue the program if the technical regulations were implemented as proposed and (2) a scientific peer review panel report that reached a similar conclusion and questioned the scientific basis for developing the pollutant limits proposed. In addition, GAO found that delays and uncertainties over these regulations are affecting states' participation in the interim program and their willingness to seek approval for the permanent program.

Recommendations

Based on experience with other environmental programs and specific interim sludge program concerns, GAO's recommendations generally encourage EPA to anticipate and address gaps in the permanent sludge program before they become major implementation problems. Among them are that the Administrator, EPA, take certain steps to (1) improve headquarters' oversight of regional and state issuance of sludge permits (chapter 2), (2) establish a strong enforcement component before the permanent program begins (chapter 3), and (3) assist states in seeking alternative ways to fund state sludge programs (chapter 3).

Agency Comments

GAO discussed its findings with EPA officials and has included their comments where appropriate. However, as requested, GAO did not obtain official comments on a draft of this report.

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Abbreviations

AMSA	Association of Metropolitan Sewerage Agencies
CWA	Clean Water Act
EDF	Environmental Defense Fund
EPA	Environmental Protection Agency
GAO	General Accounting Office
MEI	Most Exposed Individual
NPDES	National Pollutant Discharge Elimination System
NRDC	Natural Resources Defense Council
OWAS	Office of Water Accountability System
POTW	publicly-owned treatment works
RCED	Resources, Community, and Economic Development Division
SAIC	Science Applications International Corporation
SPMS	Strategic Planning and Management System
WDNR	Wisconsin Department of Natural Resources
WQA	Water Quality Act

Introduction

The generation of municipal sewage sludge has emerged as a major waste management problem in recent years. Sewage sludge is the solid matter extracted from wastewater during the treatment process of municipal sewage treatment plants. Nationwide, these plants (referred to as "publicly-owned treatment works," or POTWs) have doubled their annual generation of sludge since the early 1970s to the present level of 7.7 million dry metric tons. The volume of sludge is expected to double again by the year 2000.

Along with the concern over increasing sludge volume has come an increasing awareness of its potential adverse effects on public health and the environment. While sludge contains nutrients (such as nitrogen and phosphorus) that can allow it to be used as a fertilizer and for other beneficial uses, it can also contain heavy metals and organic compounds that can contribute to serious human health problems, including cancer, kidney and liver damage, and heart failure.

To protect public health and the environment from the potential adverse effect of pollutants in sludge, the Clean Water Act of 1977, and later the Water Quality Act of 1987, directed the Environmental Protection Agency (EPA) to develop a national sludge management program. Nevertheless, EPA was unable to meet the statutory promulgation schedules. Responding to congressional concerns over these delays and the effectiveness of the emerging program, this report evaluates EPA's current efforts and the future prospects in this area.

Sludge Generation, Use, and Disposal

POTWs may use one or more levels of treatment to clean wastewater. These processes remove the wastewater solids, which are ultimately used and/or disposed of as sludge. Primary treatment uses gravity to remove the solids that readily settle out of the wastewater. Secondary treatment uses a biological treatment process, such as the use of bacteria, to break down and convert the organic substances in the wastewater, generating sludge as a residue. Finally, advanced wastewater treatment uses chemicals to remove organic materials and nutrients and to separate solids from the wastewater, generating additional sludge as a by-product.

If the influent entering the POTW from its sewer system contains highly toxic materials, such materials can find their way into the POTW's sludge as part of the cleansing process. Therefore, an important part of many POTWs' sludge management efforts is the requirement under the National

Pretreatment Program that industrial dischargers “pretreat” their wastewater before discharging it into the POTW’s sewer system.¹

Use and Disposal

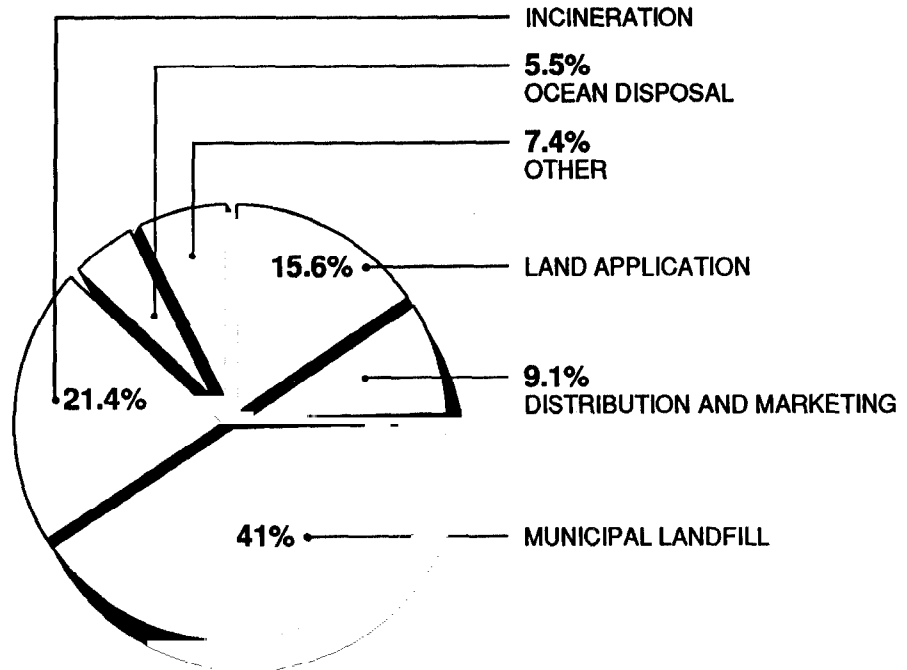
While EPA’s policy encourages the beneficial uses of sludge, a POTW’s decision whether sludge can be used beneficially or must be disposed of as a waste depends on a number of factors, such as the cost of each disposal/use option, the contaminant levels in the sludge, the availability of markets for sludge use, and the availability of sites for disposal. In some cases, local public concern with certain options may also be a factor. Treatment facilities may use one or more use and/or disposal methods due to capacity limitations of any single option.

As figure 1.1 indicates, the major beneficial uses of sludge are land application and distribution and marketing. Land application is the spreading of sludge on or just below the soil surface and is usually practiced in four settings; agricultural land, forest land, land dedicated to sludge disposal, or land reclamation. Distribution and marketing, according to EPA, refers to the free distribution or sale of sludge products (e.g., fertilizers or soil conditioners) to commercial growers, landscaping firms, parks, highway departments, and the public.

A POTW may also seek to dispose of its sludge, particularly if the sludge’s toxicity prevents its use for beneficial purposes. Among the alternatives are disposal in a solid waste landfill, disposal in a “sludge-only” landfill, incineration, and ocean disposal. Disposal options, however, are becoming limited. Ocean disposal of sludge will be banned as of 1991 under recent legislation, and constrained landfill capacity has become common across the United States (eastern states in particular have little or no remaining capacity). In addition, siting new landfills is becoming increasingly difficult due to concerns over groundwater contamination and other environmental considerations and as a result of public opposition.

¹The Congress established the National Pretreatment Program in 1972, although POTWs were not required to have EPA-approved pretreatment programs until July 1983. For GAO’s recent evaluation of this program, see Water Pollution: Improved Monitoring and Enforcement Needed for Toxic Pollutants Entering Sewers (GAO/RCED-89-101).

Figure 1.1: Alternative Use/Disposal Practices for Municipal Sludge



Source: data from 40 CFR 257 and 503, February 1989

Development of Sludge Management Regulations

While earlier legislation contained certain specific EPA requirements relating to sludge (such as requiring the Administrator to encourage recycling of potential sewage pollutants), it was the 1977 amendments to the Clean Water Act (CWA) that first required EPA to promulgate sludge disposal regulations. These regulations, required to be promulgated by December 1978, were to identify (1) sludge use and disposal options, (2) factors to be taken into account in the implementation of each use or disposal option, and (3) limits on the concentration of pollutants for each use or disposal practice. While EPA studied and provided guidance on sludge management issues, the agency did not meet the requirements to issue the regulations called for by this statute.

Water Quality Act's Requirement for a National Sludge Management Program

The Water Quality Act of 1987 (WQA) reaffirmed the Congress's intent for EPA to regulate the use and disposal of sewage sludge and placed new emphasis on identifying and limiting those toxic pollutants in sludge that may adversely affect health and the environment. It required EPA to meet a schedule for developing the key components of a national sludge management program, including

- procedures for the approval of state sludge management programs by December 15, 1986,² and
- technical regulations specifying toxic pollutant concentration limits in sludge and acceptable sludge management practices by August 31, 1987.

EPA published the final program approval regulations on May 2, 1989. The Agency expects to issue its technical regulations (proposed in February 1989) in 1991—4 years after the 1987 deadline set in the WQA and 13 years after the initial deadline for regulations called for in the 1977 act. EPA cites the complexity of the scientific issues in developing technical regulations as a major contributor to these delays.

Requirement for an Interim Sludge Program Until the Permanent Program Begins

Rather than waiting for the promulgation of the technical sludge regulations, the WQA required EPA to immediately begin incorporating sludge "conditions" as part of the POTW's National Pollutant Discharge Elimination System (NPDES) permit.³ To meet this requirement, EPA formulated an "interim implementation strategy," whereby an EPA region or a participating state would manage an interim program for sludge disposal and use. Among the key tasks to be accomplished under the interim program are

- the identification of "priority facilities" to be permitted, including POTWS with pretreatment programs, incinerators, and facilities suspected of posing significant sludge contamination risks, and

²The appearance of a 1986 deadline here and elsewhere in the Water Quality Act of 1987 is explained by the history of the act's passage. The bill containing the deadlines was passed twice and vetoed both times. When it was finally enacted in 1987 in an override of the last veto, the 1986 deadlines had not been updated.

³The NPDES program, established in 1972, limits the amount and concentration of specific pollutants a POTW may discharge into a U.S. body of water. The WQA required POTWs' permits issued under the NPDES program to include these "conditions" or take other appropriate measures to protect the environment and public health. The conditions set limits on contaminant levels in sludge or impose other requirements intended to control sludge contamination. NPDES permits remain valid for a maximum of 5 years. Hence, as these permits come up for renewal, they must be amended to include EPA-approved sludge conditions. The conditions would be subject to further revision when the final technical regulations (expected in 1991) are promulgated.

- the establishment of sludge conditions where (1) all POTWS' NPDES permits contain some minimum conditions (i.e., compliance with existing requirements) and (2) priority POTWS' permits contain additional requirements concerning appropriate contaminant levels and management practices for the various sludge use and disposal options. EPA published "case-by-case" guidance in September 1988 to assist in the development of these management practices and contaminant levels.

According to EPA's interim strategy, its purpose is not only to impose conditions into permits, but also to build on states' sludge management experience and to expand state programs where necessary in anticipation of their roles under the permanent program. Nevertheless, there is no statutory or regulatory requirement that a state must participate in the interim program; a state could elect not to participate and yet later assume full responsibility for the permanent sludge management program once it is established. If a state does not wish to participate in the interim program or fulfill certain requirements, EPA regional offices are required to implement the interim program or fulfill those missing requirements in its place.

Objectives, Scope, and Methodology

In a letter dated September 14, 1988, the Chairman, Environment, Energy and Natural Resources Subcommittee, House Committee on Government Operations, requested that we examine issues relating to EPA and state sludge management. Based on subsequent discussions with the Chairman's office, we agreed to

- determine the status of existing EPA and state municipal sludge management efforts under EPA's interim program,
- identify major obstacles EPA and states may face implementing the permanent national sludge management program, and
- discuss the key issues relating to the development of EPA's emerging technical regulations.

To address the first objective, we gathered information from a variety of sources on EPA's interim program and on existing sludge management efforts by both participating and non-participating states. Two EPA-contracted analyses provided some information on existing state sludge management efforts, including data on program staffing, budget, and state legal authorities relied upon to implement a state sludge program. As agreed with the Chairman's office, we also performed detailed work

in EPA's Region V (Chicago) and the Region V states of Ohio and Wisconsin in order to obtain insights into specific aspects of how existing sludge management programs operate.⁴

To supplement these efforts and to understand how states and EPA's regions are implementing the interim sludge program, we interviewed state and EPA officials responsible for sludge management, as well as officials in the headquarters' Office of Water Enforcement and Permits. We also reviewed (1) headquarters' evaluations of the implementation of the interim program by EPA's regions and (2) data from EPA's Office of Water Accountability System (OWAS). The OWAS is a management control system used by headquarters to track implementation of water programs. In the case of the sludge program, OWAS tracks the extent to which permits are being modified to include sludge conditions, one of the primary objectives of the interim program.

In addressing the second objective (obstacles EPA and states may have implementing the permanent program), we first reviewed the comments by states, POTW officials, and other commenters on EPA's sludge management program, as summarized in the 65-page preamble to EPA's May 2, 1989, final rule.⁵ We also interviewed officials from some of these organizations, as well as representatives of the Association of Metropolitan Sewerage Agencies (AMSA) and officials from EPA Headquarters and Regional Offices.⁶ Additional insights into these issues were obtained from the EPA-contracted studies mentioned previously and from our reviews of the Ohio and Wisconsin programs. We also examined recent GAO analyses of other water quality programs (particularly EPA's pretreatment and NPDES programs) to see whether the past experiences of these programs could provide insights into potential problems facing the emerging sludge program, as well as possible solutions.

⁴Region V was particularly useful for this purpose, given the large number of sludge-generating facilities in the upper Midwest, and Wisconsin and Ohio provided a useful contrast in alternative state approaches toward sludge management.

⁵Interviews with state officials included sludge program coordinators from 17 states. As explained in chapter 2, the states were chosen for geographical diversity and to reflect variation in the level of state participation in the interim program.

⁶Interviews with regional officials included pretreatment coordinators in all 10 EPA regions. These officials were asked for their views on potential conflicts and coordination problems between the sludge and pretreatment programs. As explained in chapter 3, these officials were chosen because in addition to their familiarity with the operations of pretreatment programs in their respective regions, they have some responsibility for compliance with certain POTW sludge requirements.

To address the third objective, the key issues relating to the proposed EPA technical sludge regulations, we examined written comments submitted to EPA on the draft regulations and interviewed officials from EPA's Office of Water Regulations and Standards, states, and other affected public and private groups. Among the other information sources used was EPA's analysis of the projected impacts of the regulations on industry and the environment, and an analysis of the proposed regulations by a scientific peer review group (discussed in chapter 4).

Importantly, we did not attempt to assess the technical merits of the specific pollutant limits in the regulations, which were in the proposal stage during our review and may change significantly. Rather, we identified the status of these efforts and the issues likely to arise as the technical regulations development process moves toward implementation.

Our work was conducted in accordance with generally accepted government auditing standards between September 1988 and October 1989. The views of EPA officials responsible for the sludge management program were sought during our review, and their comments have been incorporated where appropriate. In accordance with the wishes of the Chairman's office, however, we did not request formal comments from the Agency on a draft of this report.

Interim Sludge Management Program Surfaces Problems Needing Attention Before Permanent Program Begins

As noted in chapter 1, the primary goals of the interim program are (1) to protect human health through permits regulating sludge pollutants and (2) to help states in establishing or refining the administrative mechanisms that will be needed to implement the permanent national sludge program, due to begin in 1991. We found, however, that neither of these objectives are being fully met. Among the problems affecting the interim program are the following:

- While EPA is counting on broad participation by the states in the interim program, only eight states as of November 1989 have entered into the formal agreements that signal their willingness to participate fully in the program.¹ Although other states are implementing certain aspects of the program, many omit basic components, such as the identification of facilities to be given sludge conditions in their permits.
- EPA regions have generally not undertaken interim program responsibilities as required in those states not fully participating in the program. Here, too, these omissions include basic program components such as identifying the facilities to be permitted.
- EPA headquarters' knowledge of essential information needed to track the progress of regions and states is incomplete. While some improvements are being made, additional actions are needed to further improve headquarters' oversight and to instill in the regions a sense of accountability for meeting program goals.

The primary reasons for these problems are (1) insufficient state and EPA resources and (2) delays and other problems related to EPA's promulgation of its technical regulations.

State Participation in the Interim Program Has Been Low

EPA had hoped for strong state participation in the interim program, given (1) the interim program objective of developing the administrative tools and skills to implement the permanent program and (2) EPA's strong desire to have states assume responsibility for the permanent program. As of November 1989, however, only eight states have entered into the Memoranda of Agreement that signify a willingness to participate fully in the program. Furthermore, a number of these formal agreements—as well as the less formal agreements involving many other

¹ According to an official with EPA's Office of Water Enforcement and Permits, at least eight more states are developing agreements with EPA regions.

states—omit key responsibilities. One EPA-contracted study, for example, cited agreements that did not require identification of priority facilities nor the incorporation of sludge conditions into permits.² Among the other omissions cited were provisions related to monitoring and enforcement.

Based on our discussions with state and EPA regional officials, and on the Agency's own program evaluations, we found a number of reasons that explain the low rate of state participation in the program. Among the key reasons are the following:

- Many states have indicated that they do not have sufficient staff and other resources necessary to fully implement the program.
- The delay in EPA's promulgation of the technical regulations has resulted in a situation where states would find it difficult to estimate budgetary requirements and perform other tasks in developing their sludge programs. Compounding this concern has been a consensus among state officials we interviewed that if the regulations are issued as they appeared in EPA's February 1989 proposal, they would reduce or eliminate beneficial uses of sludge.

States Cite Inadequate Resources as a Barrier to Program Participation

Among the earlier indications that resource constraints may affect state participation are the results of a 1987 EPA-contracted study, which concluded that states would need additional resources to be able to implement the requirements of the national sludge management program.³ In particular, a majority of states responding to the study's survey specifically cited the need for more staff and computer hardware and software.

Half of the EPA regional sludge officials we contacted also cited resource constraints as an important factor explaining low state participation in the interim program, and the problem has been documented in past communications between headquarters and the regions. As part of a 1988 headquarters evaluation of Region IX's program, for instance, the region noted that the lack of resources was preventing the states in its region from developing basic program elements required in the interim strategy, and cited the lack of inventories of sludge generation facilities as an

²Science Applications International Corporation, Status of State-EPA Sludge Management Agreements: Interim Sludge Permitting and Enforcement (McLean, VA: 1989).

³Roy F. Weston, Inc., Status of State Sludge Management Programs (Washington, D.C.: January 6, 1987).

example. In August 1988 comments on the interim strategy, Region III's Permits Enforcement Branch Chief asserted that "the most significant implication of the strategy is the lack of resources devoted to the sludge program," noting that this was both a regional and state concern.

Our discussions with sludge program coordinators from 17 states also confirm resource constraints as an issue affecting both near-term participation in the interim program and the longer-term prospects for seeking permanent program approval.⁴ While two coordinators indicated that resource constraints were not a major obstacle for their states, the rest indicated either that resources were an immediate problem or that the magnitude of a potential resource need was as yet unclear. Among these, five indicated that resource problems were inhibiting their current efforts to implement interim program responsibilities. Problems cited were consistent with the results of those noted above, including shortages of staff to develop inventories of priority facilities and review permits, and a shortage of computer hardware and software.

Our review of the Ohio and Wisconsin programs suggests that the magnitude of additional resources needed by states may depend on the level of development of their existing sludge management programs. According to an official with the Ohio Environmental Protection Agency's Public Wastewater Section, for example, the agency's information systems do not enable it to monitor whether permit limits are being exceeded. Among the problems cited was the agency's lack of resources to employ individuals to analyze the sludge management information. A similar concern about the lack of personnel was expressed by the supervisor of the Office of Water Pollution Control of one of the Ohio Environmental Protection Agency's district offices. This official said that his office needed an additional full-time employee for reviewing and monitoring POTW sludge management activities, noting that his staff currently reviews the sludge management files when they happen to have the time to do so.

By contrast, Wisconsin's sludge management program has an information management system that allows it to monitor the specific sludge use and disposal activities of POTWs and uses this information to ensure that POTWs do not exceed the pollutant limits established in the state regulations. The state's Department of Natural Resources receives soil tests

⁴In addition to geographical diversity, the 17 states were selected to reflect variation in the level of state participation in the interim program.

Chapter 2
Interim Sludge Management Program
Surfaces Problems Needing Attention Before
Permanent Program Begins

from farmers and the Agricultural Extension Department of the University of Wisconsin. It uses this information, together with data on past sludge application at these sites, to calculate future sludge application rate recommendations for certain crops. According to an official with the state's Department of Natural Resources, the state legislature has provided strong support for water quality programs and other elements of its sludge program.

State Participation Also
Affected by Problems in
Developing Technical
Regulations

Some states have also expressed a reluctance to actively participate in the interim program and to seek approval for their permanent program, due to delays and uncertainties in promulgating the technical sludge regulations. EPA's interim strategy encourages states to seek program approval before the promulgation of the technical standards. Nevertheless, in the comments on both the 1986 and 1988 versions of EPA's proposed sludge management program regulations, many states said that without knowing what the technical regulations are it would be difficult to estimate budgetary requirements and perform other necessary tasks in developing state sludge management programs. For this reason, some expressed an unwillingness to commit themselves to seek program approval until they knew more about the scope and content of the technical regulations.

States' reservations about the unknowns related to the technical regulations also surfaced in evaluations of regional sludge programs conducted by EPA headquarters during 1988. Region V's evaluation, for example, noted that all of its six states were reluctant to develop interim programs in advance of the technical regulations. In one of these states, Wisconsin, a Department of Natural Resources (WDNR) official explained to us that municipalities would incur unnecessary costs if the state imposed interim sludge limits in permits that may change when the technical regulations are promulgated.⁵ Similarly, Region IX's evaluation cited a unanimous preference among its states to wait until at least a draft of the technical regulations was available before pursuing the matter.

Such a draft of the regulations surfaced in the form of EPA's draft technical regulations proposed in February 1989. In light of this development, we asked sludge coordinators from the 17 states cited above for

⁵According to an official with EPA's Office of Water Enforcement and Permits, this comment reflects a misunderstanding in that the program does not require the inclusion of new numeric limits in permits, but rather the incorporation of current state sludge limits, management practices, and monitoring requirements.

an update on their views whether issues and uncertainties of the technical regulations would affect their current participation in the interim program or subsequent participation in the permanent program. Coordinators from nine of the states said that based on their reaction to the February 1989 proposal, their states would wait until the final technical regulations are issued (i.e., until at least 1991) before making any decision to seek approval for their sludge programs. Another said that the proposal has already led the state to decide not to seek program approval. Among these 10 states is one that has a Memorandum of Agreement with EPA to implement the interim program. Among the key issues affecting these states' willingness to participate was what they viewed as the detrimental effect that the proposed regulations would have on beneficial uses of sludge.⁶

EPA Regions Have Been Slow to Implement Basic Components of the Interim Strategy

Among the regions' key responsibilities under the interim program is the issuance of permits with sludge conditions:

- In states that implement the NPDES program, but which have not decided to participate in the interim sludge program, the interim strategy requires the region to issue a "sludge rider" to the state NPDES permit that adds interim sludge conditions.
- In states participating in the program, EPA regions are responsible for reviewing and certifying state-issued permits to ensure that the permits include sludge conditions that protect public health and the environment.

Hence, some EPA regional action is required whether the state is building sludge conditions into permits or not. Nevertheless, a June 1989 EPA-contracted study found that none of the regions had issued any sludge riders, nor did they certify any of the state-issued permits with sludge conditions.⁷

⁶Although 10 of the 17 coordinators indicated that the technical regulations directly affected their desire to participate in EPA's sludge management efforts, 16 said that the technical regulations, as proposed, would have a detrimental effect on the beneficial uses of sludge in their state. Regarding the seven states that did not cite the proposal as directly affecting their participation, (1) six said that they expect to apply for permanent program approval regardless of the technical regulations proposal and (2) one cited other reasons for deciding not to participate.

⁷Science Applications International Corporation, Status of State-EPA Sludge Management Agreements: Interim Sludge Permitting and Enforcement (McLean, VA: 1989). In states without NPDES authority, the SAIC study shows that EPA regions are issuing the NPDES permits.

Beyond this fundamental problem, EPA regions' 1988 mid-year evaluations disclosed that in most regions other basic components of the interim program were not being implemented. According to the evaluations, for example, inventories of priority facilities had not been completed in 6 of EPA's 10 regions. The evaluation for one region noted that "there was no evidence the Region (alone or in conjunction with the states) had made any effort to identify POTWs with known or suspected sludge use and disposal problems" (i.e., permitting priorities).

Both the mid-year evaluations and our discussions with regional sludge officials suggest reasons why these activities are not being accomplished. As was the case with a number of states, several regions cited delays in promulgating the technical regulations as a major problem. The most commonly cited reason, however, was a lack of resources to fully implement the program, particularly when a number of states in a region have not opted to implement the program themselves. As noted by the sludge program coordinator of Region IX, for example, the one full-time EPA employee devoted to managing the interim program in a region is not enough to issue permits, monitor compliance, and assume other program responsibilities when states are not participating in the program. Similarly, Region III's Permits Enforcement Branch Chief noted in his August 1988 comments on the interim strategy (cited previously) that additional staff was needed to maintain sufficient knowledge on states' programs, review the adequacy of state permits, write sludge riders when necessary, and for other purposes.

Improvements Needed in Headquarters' Oversight Over Regions' and States' Permitting

While states and EPA regions are responsible for implementing the key components of the interim program, the responsibility for overseeing how well the program works lies with EPA headquarters. To do this, headquarters relies on a tracking system called the Office of Water Accountability System (OWAS). OWAS sets specific annual program objectives to be met by regional office commitments for a variety of water-related programs. For the interim sludge program, the system tracks the number of permits that have been modified to include sludge conditions. As discussed in this chapter, however, the system presently does not give headquarters an accurate picture of how well this key activity is being carried out.

To adequately track the incorporation of sludge conditions into permits, we believe headquarters needs to know (1) how many of the permits being issued or renewed should and do include these conditions and (2)

whether the content of the conditions is sufficient to achieve their objectives—to protect human health and the environment. Regarding the first of these elements, OWAS began collecting information on the number of permits containing sludge conditions for priority facilities (by EPA region and by state) in the first quarter of fiscal year 1989. However, the system did not track the total number of priority POTWS that need to be issued permits with sludge conditions and therefore could not identify how many permits were being issued that did not contain such conditions. Without this information, it was difficult to gauge the Agency's success in performing this key task.

According to an official in EPA's Office of Water Enforcement and Permits, one of the reasons for this omission was that until fiscal year 1990, such information was not required for sludge in EPA's Strategic Planning and Management System (SPMS). SPMS is EPA's agency-wide system for planning and performance monitoring and determines the level of detail with which OWAS tracks sludge permits. According to this official, OWAS will expand its coverage in fiscal year 1990 so that EPA will be able to identify (1) the total number of permits being issued or reissued (each requiring sludge conditions) and (2) the number of these permits that are actually modified to include the required sludge conditions.

When implemented, we believe that this improvement will provide the Agency with a better indication of the regions' and states' success in revising permits to include sludge conditions. However, to obtain a sufficiently accurate picture of program performance in this area, the system also needs to provide information on the content of these sludge conditions. Such a system would identify, for example, whether recommended concentration levels for pollutants were being included for different sludge use and disposal practices, and whether the permit identified "best management practices" to be employed in the use and disposal of sludge (e.g., sludge application rate for an agricultural site).

To understand more about the content of the sludge conditions being written into NPDES permits, an EPA-contracted study reviewed the conditions developed for a number of priority facilities.⁸ The study concluded that the permits reviewed were not implementing many of the requirements of the interim strategy, such as the incorporation of sludge conditions into permits and clauses allowing for the inclusion of the technical standards once they are promulgated ("reopener clauses"). According to

⁸Science Applications International Corporation, *Review of Sludge Conditions In Municipal NPDES Permits Issued to Class I Facilities* (McLean, VA: July 1989).

the official cited earlier in EPA's Office of Water Enforcement and Permits, the Agency hopes to build on this one-time "snapshot" by tracking data on permit content on a quarterly basis. We believe such an improvement would give a more accurate picture of the program's success and therefore serve as a useful tool in setting the Agency's sludge policies. It could also be used to hold regions accountable for both the number and content of the sludge conditions in permits they are issuing and approving.

Conclusions

The primary goals of EPA's interim sludge management program are to protect human health and the environment by limiting the contamination of sludge from certain facilities and to help EPA and the states in developing the administrative mechanisms that will be needed for the upcoming permanent program. Among the key prerequisites needed to accomplish these goals are (1) strong participation in this voluntary program by states, (2) oversight by EPA regions of participating states and direct involvement where states do not participate, and (3) oversight of both regional and state activity by EPA headquarters. We believe, however, that fundamental problems at each of these levels has left the goals of the interim program largely unfulfilled.

Although it is possible that state participation may grow in coming months, only eight states have thus far entered into agreements to participate fully in the program. Other states entering into less formal agreements have programs that omit key responsibilities, such as identifying priority facilities or setting permit limits. Where states do not implement the interim program (or do not undertake all program responsibilities), EPA regions are required to do so. However, regions have also been slow to implement basic requirements of the program, such as identifying the facilities to regulate.

One key explanation for both limited state participation and poor regional performance appears to be limited resources with which to carry out the program. Regarding state participation, this concern was expressed by many of the state sludge program coordinators we interviewed, by many of EPA's regional sludge program coordinators, and was the conclusion of an EPA-contracted study reporting on the status of existing state sludge management efforts. Consequently, with few states assuming interim program responsibilities, a larger burden has fallen on EPA regions. With a small staff available to handle the permitting, monitoring, and enforcement required under the program (typically one full-

time employee), the typical EPA region has been ill-equipped to fill the gap.

EPA has recognized resource shortages as a chronic and generic problem affecting many environmental programs and is attempting to take measures to deal with it. These efforts are discussed in chapter 3, where we suggest how EPA sludge officials might build on them to further improve the prospects that resources among both states and regions will be adequate to fulfill their responsibilities under the permanent program.

Another factor affecting both state participation and regional performance has been a reluctance to issue interim sludge conditions under the program, since these conditions will likely be revised after EPA's technical regulations are issued (currently scheduled for 1991). In addition to being an administrative burden, this was cited as a problem for POTWS because it would require them to revise their processes to meet one set of standards, only to revise them again to meet subsequent standards. Beyond the effect of this uncertainty, the draft technical standards proposed by EPA in February 1989 were criticized by the states and cited by some as a factor that may affect their participation in the interim program and/or willingness to apply for permanent program approval. The importance of timely and credible technical regulations for the entire program, and our views on how to minimize the chance for further delays, are discussed in chapter 4.

Finally, problems with EPA headquarters' oversight of the regions and states have complicated headquarters' efforts to (1) understand how well the program is being implemented and (2) hold the regions accountable for meeting key program goals, particularly the incorporation of sludge conditions into permits. While some improvements have been made to track regional performance in this area, we believe that further improvements are needed.

Recommendations

To improve regions' and states' performance in the interim program and to lay the foundation for their implementation of the permanent program, EPA headquarters needs to build on its ongoing efforts to improve the way it tracks their performance. Specifically, we recommend that the Administrator direct that modifications be made so that the Agency can track both (1) the number of permits that are required to include sludge conditions as well as the number that actually do include the conditions and (2) the content of the conditions, such as whether pollutant

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Surfaces Problems Needing Attention Before
Permanent Program Begins

concentration levels were being included for different sludge use and disposal practices.

Obstacles EPA and States May Face in Implementing the Permanent Sludge Program

Beyond the problems that surfaced in the interim program, we identified a number of other potential problems that may complicate implementation of the permanent program. For some, the need for prompt EPA attention is apparent; for others, simple solutions may not exist.

Nevertheless, we believe that to the extent that EPA can anticipate and deal with these types of problems before they become major issues, it can go a long way toward averting the type of delays and inefficiencies that have affected the interim program. Among the potential obstacles discussed in this chapter are (1) continued questions over the sufficiency of resources to fully implement the program, (2) the need to develop an effective enforcement program to deter program violations and to bring about compliance when violations do occur, and (3) complications arising from the impacts of other pollution programs on sludge management, particularly the pretreatment program.

Concerns Over the Sufficiency of EPA and State Resources to Implement the Permanent Sludge Program

In chapter 2, we observed that insufficient resources were a contributing factor toward low state participation in the interim sludge program and toward incomplete implementation of program requirements by EPA regions. Likewise, a major factor affecting the success of the permanent sludge program will be the extent to which states participate—and the sufficiency of EPA’s resources if they do not. According to an official in EPA’s Office of Water Enforcement and Permits, the Agency has not yet evaluated its resource needs for the permanent program. However, based on past experiences of other environmental programs, as well as the types of problems affecting the interim sludge program that were discussed in chapter 2, there is cause for concern as to whether EPA will have sufficient resources to fully implement a national sludge program.

Extent of State Participation Will Affect EPA Resource Needs

As in other state-implemented environmental programs, EPA’s resource needs will depend largely on the level of state participation in the program and the quality of participation as those programs are carried out. In cases where states assume full program responsibility and effectively carry out the program’s objectives, EPA’s role can be expected to be one of oversight with little direct implementation. Where states elect not to participate in the program or experience difficulty in implementing some of its key elements, EPA will need to play a more direct role in basic program responsibilities such as writing sludge conditions into permits, monitoring compliance, and taking enforcement action when necessary.

EPA’s experience with the pretreatment program provides some indication of the problems it may face if such a direct implementation role is

required in the sludge program in many states. Among the problems we identified in that program was a lack of effective EPA and state oversight of POTW pretreatment programs, particularly in taking enforcement actions against noncomplying POTWs.¹ In acknowledging these problems to us, EPA headquarters and regional officials explained that a major contributing factor to the problem was that only half the states assumed primacy for that program, leaving EPA regions to manage the program in the other states. As a result, according to these officials, EPA regional resources for compliance and enforcement efforts had been stretched thin, affecting program performance.

While it is still unclear how many states will choose to implement the permanent sludge program, chapter 2's discussion of the interim program provides cause for concern. It notes, for example, that as of November 1989, only eight states had entered into the Memorandum of Agreement that signifies a willingness to participate fully in the interim program. Should a significant number of states choose not to fully implement the permanent program—or choose not to participate at all—EPA will be hard-pressed to fulfill the demands on its own staff and resources. As one indication, EPA's Region V (as other regional offices) was assigned an equivalent of one full-time employee during fiscal year 1989 to oversee the interim sludge program for the six states within its jurisdiction. In Wisconsin, a Region V state, 4 staff years were expended on the state's sludge program, and a state official indicated that an additional 2-1/2 staff years will be needed once the technical regulations are promulgated. Based on the projected staffing needs for this single state program, the need for additional EPA staff would appear inevitable if several states within a region elected not to participate.

The extent of the impact on EPA staff and resource needs will also depend heavily on whether the 39 states currently operating the NPDES program choose to participate in the permanent sludge program. According to an official with EPA's Office of Water Enforcement and Permits, for NPDES states that elect not to participate, EPA staff would have to gain familiarity with the NPDES permits and other aspects of these facilities before assuming many essential regulatory functions.

¹Water Pollution: Improved Monitoring and Enforcement Needed for Toxic Pollutants Entering Sewers (GAO/RCED-89-101, Apr. 25, 1989), pp. 32-33.

Resource Limitations Have Become a Generic Problem Affecting Environmental Programs

During the present climate of fiscal constraint, the resource problems facing the sludge program (and, for that matter, the pretreatment program) are common to many water quality programs and indeed to other environmental programs as well. The problem stems from an increase in regulatory responsibilities arising from new legislative requirements, often to be carried out without increased federal funding. The problem is particularly acute in the water quality area because at the same time program costs are rapidly increasing, federal support is decreasing. The reasons, according to EPA, are essentially twofold. First, half of the federal funds the states use to administer their surface water programs under the Clean Water Act come from "set-asides" under the Construction Grants and State Revolving Fund programs. Most of these set-asides terminate in fiscal year 1990 and the remainder by the end of fiscal year 1994. Second, the remaining sources of federal funds for state water program funds have remained essentially flat since 1981, resulting in a 30 to 40 percent cut in state purchasing power.²

EPA Encourages States to Use Alternative Financing Mechanisms for Environmental Programs

As program responsibilities increase and federal support decreases, it has become more difficult for states to assume primacy in programs such as sludge. Yet it would be impossible for EPA to manage a significant number of these programs for the states, given the limitations of its own resources. Given this dilemma, EPA has been examining alternative ways that states can supplement existing funds for environmental programs in general, and water quality programs such as sludge in particular. One 1988 study conducted by the Agency's Office of Policy, Planning and Evaluation found, for example, that nearly one-third of the states make widespread use of alternative financing mechanisms and that such mechanisms have been used to fund all or part of their environmental program operating costs.³

In addition to this EPA-wide effort, the Office of Water recently completed an analysis of alternative financing mechanisms to be used in paying for state water quality programs. Citing a number of successes among the states in this area, the analysis recommends a number of mechanisms for states to consider, such as increased or new fees for state services and dedicated revenues from fines and penalties. The analysis also recommends an active role for the Office of Water in encouraging use of such mechanisms through a variety of activities,

²Environmental Protection Agency, Transition '89: Major National Issues (Washington, D.C.: 1989), pp. 6-18.

³Environmental Protection Agency, State Use of Alternative Financing Mechanisms in Environmental Programs (Washington, D.C.: June 1988).

such as acting as a clearinghouse on state supplemental financing mechanisms, providing technical expertise, and providing seed money for specific financing projects.

Our review of the sludge program points to at least one instance where the use of such a mechanism may well make the difference whether the state assumes primacy for the sludge program or leaves it to EPA to manage. California was reluctant to assume responsibility for the sludge program due to a lack of funding support from the state legislature. Reflecting its preference for a state- rather than an EPA-administered program, however, a technical advisory committee representing California municipalities and treatment plants proposed in a June 7, 1989, letter that the state charge treatment plants a fee to cover the program's costs. As of December 1989, it was unclear whether the state will assume responsibility for the program.

While we have not evaluated the effectiveness of either the EPA-wide effort nor those of the Office of Water to encourage use of these types of alternative financing mechanisms, such assistance appears particularly appropriate, given the severity of the states' funding shortfall—and the poor prospects of dealing with it through additional federal grants to the states. Such efforts seem all the more appropriate regarding the sludge program in light of the findings above concerning the threat resource shortages pose to the development of the permanent sludge program. Accordingly, we believe that supplemental efforts along these lines by the EPA officials specifically responsible for sludge management (i.e., the cognizant officials in the Agency's Office of Water Enforcement and Permits and the regional offices' sludge coordinators) could help to increase the number of states willing to implement the program—and help to ensure that they have the resources to manage the program more effectively.

Filling Program Gaps: The Need for an Effective Enforcement Program

As is the case with other environmental programs, there are numerous complex elements in the national sludge program. In some cases, EPA will need experience with the program to identify key program gaps and how best to fill them. In cases where major program gaps can be anticipated, however, we believe the Agency can improve the prospects for its emerging sludge program by effectively addressing the gaps before they become major implementation problems.

Our own experience in evaluating EPA's NPDES permit, pretreatment, and other environmental programs suggests that a fundamental element of

the sludge program will be strong enforcement by EPA regions and delegated states. Effective enforcement serves as a deterrent to violations and, when violations do occur, helps to ensure that appropriate corrective action is taken in a timely manner. Without effective enforcement, the consequences of violating permit limits and other program requirements are greatly diminished—making it much less likely that these requirements will be observed.

As explained in this chapter, EPA has taken some initial steps toward developing an enforcement component in its sludge program, but has a long way to go if such a component is to be in place when the permanent program begins. Among the essential elements of an enforcement program are (1) criteria that allow regulators to set enforcement priorities, (2) criteria that identify what type of enforcement actions are appropriate and when they should be taken, and (3) effective oversight over EPA regional and state enforcement efforts by headquarters.

Setting Enforcement Priorities by Identifying “Significant” Noncompliance

In an era of limited resources among environmental regulators, a generic problem has been their inability to take enforcement action against all violators. Many environmental programs therefore devise a system for setting enforcement priorities to target the most egregious violators for enforcement action. In the NPDES program, for example, EPA regions and delegated states prepare quarterly reports on the compliance status of major permittees. The most severe violations in these reports are designated as being in significant noncompliance, which may include violations of either pollutant limits or reporting requirements. The key part of the system is the identification of criteria for determining when noncompliance is “significant,” so that it is clear whether an enforcement action is necessary. In the NPDES program, for example, a violation of an effluent limit can be either “severe” (exceeding average monthly permit limits by a minimum amount) or “chronic” (exceeding average monthly permit limits by any amount). Two severe or four chronic violations of the same pollutant limit over a 6-month period constitutes significant noncompliance.

The history of the pretreatment program illustrates the problems of conducting enforcement without such criteria. As noted in our evaluation of that program, the lack of significant noncompliance criteria fostered inconsistencies among POTWS’ enforcement actions against noncomplying

industrial dischargers.⁴ These inconsistencies affected which industrial users were subject to an enforcement action, because what one POTW considers a major violation, others may not. After dischargers complained to EPA and the states about such inconsistencies, the Agency developed a definition of significant noncompliance to be used in enforcing pretreatment program requirements.

Acknowledging the possible need for criteria on significant noncompliance, EPA has asked a contractor to include this issue as part of a broader examination of existing state sludge programs. We believe that this represents a logical start in the process, and urge EPA to follow through with the promulgation of significant noncompliance criteria before the permanent program begins.

Identifying When Enforcement Is Needed and What Type of Action Is Appropriate

The experience of other programs also illustrates the importance of identifying specific criteria for when enforcement action is required and identifying what action is appropriate for a given violation. These criteria for “timely and appropriate” enforcement are essential for (1) the regulatory entity, so that it understands when and how to take action and to ensure that its enforcement policies are consistently implemented and (2) the regulated entity, so that it understands the consequences of noncompliance. Under the NPDES program, actions are classified as either informal or formal, depending on the severity of the violation, the compliance history of the permittee, and other factors. While the Agency has some discretion in taking informal actions, formal action is required before a permittee has been in significant noncompliance for two consecutive quarters and may include administrative orders to cease violations, administrative penalties, and other actions that reflect the more serious nature of this type of violation.

Without a requirement for timely and appropriate criteria to guide enforcement, regulators in other programs have been reluctant to “force the issue” with persistent violators. Our review of the pretreatment program, for example, cited this as a problem that explained POTW reluctance to enforce against noncomplying industrial dischargers.

⁴GAO/RCED-89-101, p. 31. For instance, headquarters considered a discharger in significant noncompliance with discharge limits if, for example, 66 percent or more of the measurements (analyses of its wastewater) exceed the same daily maximum limit or the same average limit in a 6-month period. EPA’s Region IV, on the other hand, considered a discharger in significant noncompliance if 20 percent or more of the wastewater samples collected during the past 12 months contain one or more violations, as long as more than four samples were taken.

Regarding state sludge management, Ohio and Wisconsin illustrate the variation in approaches toward enforcement. According to the head of the Public Wastewater Section of Ohio's Environmental Protection Agency, the state does not have formal criteria for timely and appropriate enforcement and relies heavily on informal actions, such as sending notices and letters to violators. A maximum fine of \$100 is presently permitted for a sludge management violation, although Ohio's Environmental Protection Agency is currently seeking legislative approval to raise the limit to \$1,000.

By contrast, Wisconsin uses specific criteria for timely and appropriate enforcement. These criteria define a sequence of escalating steps that strengthen the actions taken until compliance is achieved. The process begins with informal actions, such as visits, letters, and phone calls to violators. If informal means are unsuccessful, a formal notice of violation is sent, and the violator is given an opportunity to reach an agreement with state officials on a compliance schedule to correct the violation(s). If compliance is still not obtained, the case can be referred to the Wisconsin Department of Justice. At this point, failure to comply can result in fines up to \$10,000 per day. An important feature of Wisconsin's enforcement program is the use of a data management system for identifying and tracking enforcement cases. The system provides the oversight mechanism to ensure that formal enforcement actions are taken and that progress in achieving compliance is monitored.

As is the case with criteria for significant noncompliance, EPA acknowledged the possible need for timely and appropriate enforcement criteria in the preamble to its May 2, 1989, sludge regulations, noting that such guidance was a "likely candidate" as the sludge program moves forward. According to an official with EPA's Office of Water Enforcement and Permits (Enforcement Division), EPA plans to have the same contractor, cited previously, assist in developing criteria. Here again, we urge EPA to follow through on these initial steps with the promulgation of timely and appropriate enforcement criteria before the permanent program begins.

Headquarters' Oversight of Regional and State Enforcement

Other environmental programs typically provide for systematic headquarters' oversight over regional and state enforcement so that policy-level officials know whether timely and appropriate enforcement is being taken and can hold program officials accountable if it is not. In the NPDES program, for example, headquarters oversees the timeliness of enforcement actions by regional offices and delegated states through a

quarterly report called the exceptions list. This list includes all major permittees that were in significant noncompliance for two or more consecutive quarters for the same violation, but who had been issued no formal enforcement action. It contains the names of violating facilities, the length of time they have been in significant noncompliance, and an explanation of why formal enforcement actions were not taken. In some cases, this follow-up may require only a telephone call from lower level headquarters officials to the cognizant regional officials to discuss why timely enforcement was not taken and how the problem will be corrected; in others, it may involve discussion during visits to the region by the Deputy Assistant Administrator for the Office of Water or at an annual management meeting.

A similar oversight system was recently established in the pretreatment program, whereby regions and delegated states report POTWS failing to meet key program requirements on a "quarterly noncompliance report." EPA has since issued guidance to regions and delegated states on the type of enforcement actions to be taken against POTWS identified on the report.

An official with EPA's Office of Water Enforcement and Permits (Enforcement Division) told us that in the interim sludge program, headquarters is not tracking enforcement because it is presently emphasizing incorporation of sludge conditions into permits. Given the problems with permitting discussed in chapter 2, this emphasis may be understandable—for the interim program. However, we believe that for the permanent program, a strong enforcement capability will be essential to program success. Given the regions' performance in the interim program, such an oversight mechanism could improve their performance by making it clearer that they will be held accountable for effective enforcement. According to this official, headquarters plans to develop the capability during 1990 to track enforcement actions taken by regions and states. Still, it will be some time before headquarters' oversight capability in sludge enforcement matches its capability with the NPDES program—allowing it to systematically monitor the timeliness and appropriateness of such actions.

Impacts of the Pretreatment Program on Sludge Management

To some extent, the multimedia nature of sludge generation, use, and disposal makes it particularly difficult to regulate. Its generation from wastewater leads to regulation under surface water programs, but its use and disposal affects other media including air, soil, and groundwater. As such, regulating sludge in a state can involve a myriad of programs and agencies dealing with solid waste disposal, hazardous waste management, air regulation, and health-related issues. It is this aspect of sludge regulation that led the Weston study (discussed in chapter 2) to conclude from its review of existing state sludge programs that its "foremost conclusion" was that sludge programs are complex.

Of all these programs, however, the one that most affects sludge management is the pretreatment program:

- In many cases, POTWS' ability to avoid sludge contamination depends heavily on the effectiveness of industries' efforts to pretreat toxic discharges before they enter the waste stream leading to the treatment plant. EPA's pretreatment program, however, has not been fully effective in reducing such toxic discharges to permitted levels.
- From an administrative standpoint, effective coordination between the pretreatment and sludge programs will be essential, but may be difficult in states where EPA oversees one program and the state oversees the other. In such situations, particular difficulties can arise in resolving compliance problems.

Pretreatment Program May Not Be Effectively Reducing Sludge Contamination

The pretreatment program, authorized by the Federal Water Pollution Control Act Amendments of 1972, is intended to remove toxic pollutants from the effluent of industrial dischargers before they reach the POTW. One of the program's major objectives is to prevent contamination of sewage sludge; and as a practical matter, the extent to which sludge contamination can be controlled in many cases will depend on the effectiveness of pretreatment. As discussed in this chapter, however, our recent analysis of that program suggests that its objectives are not being satisfactorily met, including the objective to prevent sludge contamination.

EPA has underscored the importance of the pretreatment program to achieve success in sludge management. For example, in its Regulatory Impact Analysis accompanying the proposed technical sludge regulations issued in February 1989, EPA warns of the problems contaminated sludge can cause POTWS and notes that pretreatment can play an important role in reducing the concentrations of metals, inorganic chemicals, and organic chemicals in wastewater sludges. The analysis cites earlier

EPA estimates, based on 8 POTW case studies, that “full implementation” of the National Pretreatment Program can reduce contamination levels for total metals in POTWs’ sludge by more than 40 percent.

Our recent report on EPA’s pretreatment program, however, indicates that EPA has a long way to go before the pretreatment program is fully implemented and is effectively reducing toxic contaminants from reaching POTWs.⁵ In that report, we estimated that of the 1,500 POTWs participating in the program, about 41 percent of their industrial users exceeded one or more applicable discharge limits during the 12-month period examined. Among the problems resulting from such violations has been toxic contamination of POTW sludge. The report noted, for example, that at one city’s POTW, high levels of copper discharged by an industrial user reduced the life expectancy of the POTW’s sludge disposal site by 66 percent, forcing the city to find a new disposal site. At another, high cadmium content in sewage sludge resulted in the sludge being designated a hazardous waste for disposal purposes. This designation limits disposal options and increases disposal costs. The report cites the absence of aggressive enforcement by POTWs against violators as an important underlying cause for discharge limit violations and also cites weaknesses in enforcement against noncomplying POTWs by states and EPA regional offices.

Given the technical and regulatory challenges facing the pretreatment program, it may be difficult to fully achieve the program’s objectives in the immediate future. However, until the program is more effective, its goal of preventing sludge contamination will not be realized.

**Coordination With
Pretreatment Program
May Be More Difficult
When Different
Regulatory Authorities
Are Involved**

In addition to concerns about the effectiveness of the pretreatment program in reducing sludge contamination, the close ties between the two programs also raise administrative issues: decisions in one program about permit limits, enforcement actions, and other matters can strongly affect the other program. Because of the close coordination this mutual dependency requires, one environmental group commenting on EPA’s proposed regulations said that the same regulatory authority—be it a state or EPA region—should implement both the pretreatment and sludge programs. However, noting that the Clean Water Act intentionally authorized flexibility on this issue, EPA’s final regulation made state participation optional; a state could accept one program and defer to EPA on the other.

⁵GAO/RCED-89-101.

Such a situation could arise frequently because about half the states have opted not to implement the pretreatment program. EPA regional offices therefore act as “approval authorities” in overseeing these programs. If any of these states assume responsibility for sludge management (which is allowed by the sludge management regulations), then an EPA regional office will be in charge of the pretreatment program and a state authority will be in charge of the sludge program. Conversely, under the sludge management regulations, a state that operates its pretreatment program can defer authority to EPA to operate its sludge program.

As discussed in this chapter, our review suggests that (1) coordination with the pretreatment program may be difficult in states where different regulatory authorities are running each program and (2) such a problem could become particularly important in resolving compliance and enforcement problems involving sludge contamination.

Potential Effects of Coordination Problems on Compliance and Enforcement

To better understand the practical effect of having divided regulatory responsibility for the programs and the extent to which such close coordination can alleviate any problems, we asked the pretreatment coordinator in each EPA region to comment on (1) the overall effect of divided responsibility on communication and coordination among affected regulatory agencies and (2) any particular problems divided responsibility could pose for program implementation.⁶ We also interviewed officials with the Association of Metropolitan Sewerage Agencies (AMSA), an association representing POTWs, to obtain the POTW perspective on this issue.

All coordinators agreed that dividing responsibility for the two programs among federal and state regulators would make communication more difficult, although half the coordinators said that strong efforts to coordinate activities can compensate for this disadvantage. A majority of the coordinators, however, did agree that divided responsibility could pose a problem in resolving compliance issues involving sludge contamination. Among the points made were the following:

- If the sludge regulator takes action against a POTW for violating sludge standards, it should have control over the method available to return the POTW to compliance. This method will often have the POTW strengthen its pretreatment requirements. If the sludge regulator also manages the

⁶Pretreatment coordinators were interviewed because, in addition to being familiar with the operations of pretreatment programs in their respective regions, they have some responsibility for compliance with certain POTW sludge requirements.

pretreatment program, it would have such control. It would not, however, have control in a situation in which the state managed one program and a region managed the other.

- Compliance issues dealing with sludge contamination could arise where both the pretreatment authority and the sludge authority are authorized under their respective programs to take some kind of enforcement action.⁷ If the same authority manages both programs, consistency of enforcement would likely not be a problem. However, if responsibility were divided, disagreement over appropriateness of alternative enforcement actions could occur—with the POTW caught in the middle of the dispute.

Several coordinators added that state and federal regulators often bring different perspectives to compliance and enforcement issues, and obtaining agreement on the proper course in a given compliance/enforcement issue may be difficult. As noted by one of these officials, the magnitude of this kind of problem could grow significantly if, as expected, the technical sludge standards are more stringent than existing sludge standards. In such a case, one can expect more compliance problems and, hence, more enforcement cases.

A representative of the Association of Metropolitan Sewerage Agencies (AMSA) agreed that divided responsibility for the two programs would cause problems in resolving compliance issues, as did the chairman of AMSA's Sludge Management Committee. Citing the results of a recent survey of AMSA members, the AMSA representative said that state and EPA regulators often have different perspectives in regulating POTWs. POTWs generally think that states are more flexible and willing to work with them to resolve compliance problems. On the other hand, EPA regions are viewed as more prescriptive about how to address problems, and as threatening enforcement more frequently. The chairman of AMSA's Sludge Management Committee added that with the probability of such divergent views, written procedures on what constitutes appropriate enforcement could be useful in promoting consistent behavior among regulators.

Conclusions

Unlike the case of the interim program, which is scheduled to end in 2 years, we believe that at least some of the issues that may complicate

⁷Sludge regulators could take action if the POTW's sludge violates the technical standards. The pretreatment regulator can take action if industrial wastewater causes "interference" with the POTW's treatment process and results in contaminated sludge.

the permanent program can be anticipated by EPA and be alleviated—at least to some extent—before they become major implementation problems. In addition to the issues raised in this chapter, EPA may become aware of other problems as it continues to gain experience with the interim program.

We believe that enforcement provides a prime example where a more anticipatory approach could pay off for EPA. A credible enforcement program has been demonstrated to be an essential component needed to encourage compliance and to bring about compliance when violations occur. Water quality programs such as NPDES and pretreatment, as well as other environmental programs, have demonstrated that key enforcement program elements include (1) a system for setting enforcement priorities by identifying significant noncompliers and (2) criteria that identifies when enforcement is needed and the type of action that is appropriate. EPA has taken some initial steps in developing these elements; steps that we believe the Agency needs to pursue so that these elements are in place when the permanent program begins.

Regarding the latter of these two issues, the unique complexities of the sludge program, arising from its relationship to the pretreatment program, provide an added incentive for criteria on timely and appropriate enforcement. As discussed in this chapter, one specific area of concern to regulators as well as to POTW officials involves the potential for compliance problems in which separate regulatory entities under the two programs, one a state agency and one an EPA region, could take action against a POTW for the same sludge contamination problem. In such a situation, criteria indicating what represents timely and appropriate enforcement action can help to avoid inconsistent enforcement actions by the two regulators.

In addition, we believe EPA should begin now to develop the type of oversight mechanisms, employed by headquarters in other programs, that enable policy-level officials to know whether timely and appropriate enforcement is being taken—and that can be used to hold program officials accountable if it is not.

A more anticipatory approach can also help EPA deal with the likelihood of resource shortages in implementing the program. The likelihood of EPA resource problems will depend heavily on how many states participate and how well they implement the program. However, there is some

cause for concern, given the experience of other environmental programs and the low rate of state participation in the interim sludge program.

To some extent, the potential resource shortage reflects a generic and growing problem in environmental programs; particularly water programs, where responsibilities are increasing at the same time that federal funding sources are diminishing. Accordingly, EPA is presently encouraging states to develop other funding sources for environmental programs, such as fees and dedicated revenues from fines and penalties. Given the seriousness of the funding issue and the potential for alternative financing to improve state participation in the sludge program, we believe that EPA's sludge program staff should supplement the Agency's broader efforts in this area by encouraging POTW and state officials to explore alternative methods to finance sludge programs.

Recommendations

To improve the prospects for an effective permanent sludge program, we recommend that the Administrator, EPA, take measures to ensure that a strong enforcement component is in place when the permanent sludge program begins. Among the key elements that should be included are (1) criteria for significant noncompliance so that enforcement priorities can be determined, (2) criteria for timely and appropriate enforcement so that the type and timing of enforcement is known to both regulators and POTWs, and (3) effective oversight of EPA regional and state enforcement efforts by headquarters.

Given the problems posed by funding constraints for the sludge program and the prospect that EPA's alternative financing efforts could help alleviate these types of problems, we recommend that the Administrator, EPA, direct the Agency's sludge program officials to supplement these broader agency efforts by assisting POTWs and state sludge officials in seeking alternative ways to fund state sludge programs.

EPA's Continuing Difficulties in Developing Technical Regulations

The technical regulations, which contain the actual pollutant limits with which municipal sludge generators must comply, are a central element of the national sludge program. As noted in earlier chapters, EPA has experienced long delays in coming up with these regulations. This chapter discusses EPA's efforts to develop the technical regulations, including (1) the Agency's use of a "risk-based" approach in developing proposed pollutant limits for alternative use and disposal options and (2) the strong reaction the proposal has encountered from POTWS and scientists over the stringency of these limits and the methodology used to derive them.

It is important to point out that, as emphasized by EPA, its February 1989 proposal is subject to change. However, as discussed in this chapter, the significant problems confronting the proposal indicate that as the 1991 deadline for final technical regulations approaches, EPA continues to have difficulties in arriving at limits that balance the goal of protecting health and the environment with its policy of promoting beneficial uses of sludge.

Balancing the Risks of Contaminated Sludge With the Goal of Promoting Beneficial Uses

As noted in chapter 1, the Water Quality Act of 1987 required EPA to develop numerical limits for sludge pollutants to protect health and the environment. The act did not explicitly require that these limits be set in such a way as to encourage beneficial uses of sludge. However, reflecting congressional awareness of the potential benefits of reusing sewage sludge, it also authorized the Agency to conduct and initiate scientific studies, demonstrations and public information projects aimed at promoting beneficial uses of sewage sludge.

The difficulty in balancing these two objectives arises from concerns that under the tightened standards that could be required to implement the statutory requirement to "protect health and the environment," pollutant limits for beneficial use options could be particularly stringent. At some point, however, the stringency of the limits could preclude beneficial uses—even though promoting such uses is also an important environmental goal.

Along with congressional expressions of support for beneficial uses, EPA has long supported beneficial uses as a matter of agency policy. In the preamble to the February 1989 proposal, it cited its "policy of strongly supporting the beneficial reuse of sewage sludge" and identified a

number of benefits from beneficial uses such as improved soil productivity, reduced health effects and other problems caused by incineration, and decreased dependence on chemical fertilizers.

EPA's Risk-Based Approach

EPA's regulatory approach in developing the sludge regulations was based on the act's requirement to "protect public health and the environment from any reasonably anticipated adverse effects" of pollutants in sludge. EPA reasoned that this requirement called for a different regulatory approach from the ones used in other environmental programs. In other Clean Water Act programs, for example, the Agency uses technology-based pollutant standards that reflect the capabilities of pollutant reduction equipment. In the case of the sludge program, EPA determined that the use of a risk assessment model for developing pollutant limits and management practices for each sludge use and disposal option would (1) protect individuals from events that are likely to occur and (2) meet the statutory requirement to protect health and the environment from reasonably anticipated adverse effects of a pollutant.

EPA's proposed sludge regulations were based on two risk assessment approaches. One approach evaluated the effect of pollutants on the "Most Exposed Individual" (MEI), plant, or animal. The second approach evaluated the effect of pollutants in sludge on the population as a whole. The Agency relied upon a 1982 survey of 48 POTWs for data on sludge contaminants. It then examined conditions that could (1) increase the toxicity and potency of a pollutant in the environment, (2) speed the movement of pollutants through the environment, and (3) intensify the adverse effect that the pollutant may have on human health and the environment. This was accomplished by a computer simulation of the movement of pollutants into and through the environment to determine the level of pollutants reaching an MEI. Based on its understanding of both (1) the effects of the pollutants on an MEI and (2) the level of pollutants reaching an MEI for each sludge use and disposal practice, the Agency then derived pollutant limits for a variety of sludge use and disposal options including land application, distribution and marketing, incineration, and disposal in landfills.

In commenting on this process, the Director of EPA's Office of Water Regulations and Standards emphasized in a September 1988 court brief that

the development of regulations in this area has been difficult for EPA.¹ She noted, for example, that the issues to be dealt with "require an assessment of environmental effects and interactions across a number of different media including air, soil, groundwater, surface water, and vegetation. . . ." The brief also noted that "EPA fully expects that numerous questions will be raised regarding the scientific information and mathematical models relied on by EPA to develop the proposed numerical limitations, as well as EPA's assumptions about the behavior of pollutants and their movement through the environment. . . ." As discussed in the remainder of this chapter, this expectation has proven to be correct.

Reaction to Proposal Has Been Critical

Reaction to EPA's methodology and the standards they produced has generally been critical, with most commenters indicating that reliance on the MEI concept, combined with consistently conservative assumptions, led to overly stringent pollutant limits. An exception to this reaction was the joint comments submitted by the Natural Resources Defense Council and the Environmental Defense Fund, which maintained that in many cases, the MEI should be afforded more protection and that more stringent pollutant levels may be appropriate to achieve that protection. NRDC and EDF also maintain that additional pollutants and disposal/use options need to be regulated.

As discussed in the following section, however, the majority of commenters, including treatment plant officials, state officials, and scientists of a peer review group created at EPA's request, have consistently questioned the scientific basis for the pollutant limits proposed, and asserted that the limits are overly stringent and that they will discourage beneficial uses of sludge.

POTWs Expressed Concern Over Proposal's Effect on Beneficial Uses of Sludge

POTWs have generally maintained that the proposed technical standards would discourage the development of beneficial uses of sludge and would do so on the basis of insufficient data on the effect of its pollutants.

Officials from the Association of Metropolitan Sewerage Agencies (AMSA) told us that a basic problem with the 1989 proposal was the quality of

¹The brief was part of EPA's response to a lawsuit by the Natural Resources Defense Council, which asked the U.S. District Court for the Eastern District of Pennsylvania to direct EPA to propose and promulgate technical regulations according to a specified schedule.

key assumptions, such as (1) the consistent reliance on worst-case scenarios and (2) various assumptions concerning the environmental and health effects of sludge use and disposal. In addition, they contended that a number of studies show that beneficial uses have minimal effect on health and the environment, but that such findings were not sufficiently reflected in EPA's proposed standards.

In addition to questioning the basis for the limits in the proposed regulations, AMSA has also maintained that the limits would significantly discourage the beneficial uses of sludge. AMSA first commented on this issue in a 1987 draft regulatory package developed by EPA. At that time, the association stated that it believed the pollutant limits in the draft would, if implemented, virtually eliminate the land application option for many POTWS.

During our subsequent interviews with AMSA officials, they indicated that their opinion had not changed after reviewing the 1989 proposal, and pointed to the results of a recent survey of AMSA members conducted on behalf of the association as further evidence supporting this view. The survey found that of the 25 responding POTWS that currently use some form of beneficial reuse, only one could continue to utilize its beneficial use program if the technical regulations were implemented as proposed.² Citing the effects of the pollutant limits on beneficial uses, and the data problems encountered in deriving them, AMSA concludes that EPA should not restrict the recycling of sludge on the basis of insufficient information on the effect of the pollutants in sludge.

Scientific Review Group Also Concerned About Proposal's Impact on Beneficial Uses

Some of the sharpest criticisms of the EPA proposal came from a scientific peer review group, which arrived at similar conclusions as those discussed previously regarding the methodology used to derive the pollutant limits and the effect of those limits on beneficial uses. The peer review group was created at the request of the Director of EPA's Criteria and Standards Division, and included EPA experts, environmental groups, members of academia, and local government.

The group's July 24, 1989, report said that while it commends EPA's efforts to evaluate pollutants' effects through a multi-media risk assessment approach, the proposed rule and the methodology behind it are

²These results are consistent with the views expressed to us by state sludge coordinators. As noted in chapter 2, 16 of 17 coordinators interviewed said that the technical regulations, as proposed, would have a detrimental effect on the beneficial uses of sludge in their state.

deficient in numerous ways.³ Among its major criticisms, it cited the combined use of "worst case scenarios" and consistently conservative assumptions that result in a series of unduly stringent pollutant limits. Specifically, in commenting on the approach behind these scenarios, the group said,

"It is certainly easier to develop a scenario so bizarre that no person will ever have that much exposure and then to protect that nonexistent person and thereby all existing persons. But . . . that approach leads to results that can not only be unrealistic, but where the degree of unreality cannot even be estimated. The regulation of sludge disposal options based on multi-media risk assessments should not be driven by these bizarre scenarios."

The peer review group took particular exception to how EPA used the concept of a Most Exposed Individual, which it cited as the "driving force of criteria setting." In defining the MEI as an extreme event, it said that the exposures to pollutants implied by the MEIs are "grossly exaggerated." It argued that reliance on this type of analysis is not consistent with the Agency's intent—or the act's requirement—to protect the public health and the environment from reasonably anticipated adverse effects associated with potential sewage sludge exposure.

In addition to its numerous other findings and recommendations, the report stated that EPA should revise the proposed rule to conform to its stated policy to encourage the beneficial use of municipal sewage sludge. With the public comment period having closed in August 1989, EPA has indicated that it plans to review these and other comments before revising its proposal, and that it will place particular emphasis on those comments relating to the beneficial uses of sludge.

Conclusions

The promulgation of technical sludge regulations has been a longstanding problem for EPA, with serious implications for the development of a national sludge management program. While the Agency's February 1989 proposal attempts to balance the goal of protecting health and the environment with that of promoting beneficial uses, most commenters have agreed that (1) it would discourage beneficial uses with little evidence of additional protection to health and the environment and (2) its pollutant limits are based on an unsound methodology.

³U.S. Department of Agriculture, Cooperative State Research Service, PEER REVIEW: Standards for the Disposal of Sewage Sludge (Riverside, California: July 1989).

EPA indicated that the basis for its approach was the Water Quality Act's requirement to "protect health and the environment from reasonably anticipated adverse effects" of pollutants in sludge. To implement this requirement, the Agency chose to rely heavily on the concept of a Most Exposed Individual. With the notable exception of NRDC and EDF, commenters have generally stated that reliance on the MEI concept, combined with consistently conservative assumptions, ultimately led to overly stringent pollutant limits. The scientific peer review group charged with reviewing the proposal has also questioned whether the uniform reliance by EPA on conservative assumptions and worst-case scenarios has gone beyond the "reasonably anticipated adverse effects" referred to by the statute.

While EPA said that it will (1) thoroughly evaluate the comments on its regulations by the scientific peer review group and other commenters before publishing final regulations and (2) place particular emphasis on those comments relating to the beneficial uses of sludge, the task will likely be difficult. As noted previously, these regulations have experienced years of delay, and the EPA has acknowledged that the complexity of the technical issues involved has made regulations development in this area very difficult. Moreover, given the importance of EPA's reliance on key provisions of the Water Quality Act as a basis for the proposal's methodology and its resulting pollutant limits, its reevaluation can be expected to involve sensitive legal issues as well as technical judgments. Consequently, we believe the attention of upper-level EPA management could be useful in resolving these issues. Such upper-level management attention may be particularly warranted in light of (1) the Agency's long history of problems in deriving technical limitations, (2) the possibility for further delay in the future, and (3) the fact that continued problems with the technical regulations, as noted in chapter 2, appear to be having detrimental effects on state participation in EPA national sludge management efforts.

Recommendations

In light of the long history of delays in issuing technical sludge regulations, the prospect of continuing difficulties, and the significance of timely development of these regulations to the emerging national sludge management program, we recommend that the Administrator, EPA, closely track the Agency's progress in its efforts to promulgate them. Specifically, the Administrator should ensure that further delays are minimized as EPA incorporates the views of interested parties on the draft technical regulations the Agency proposed in February 1989.

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