United States General Accounting Office

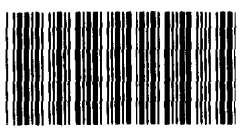
GAO

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

June 1990

DRINKING WATER

Compliance Problems Undermine EPA Program as New Challenges Emerge



GAO/RCED-90-127

GAO

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

Resources, Community, and
Economic Development Division

B-239165

June 8, 1990

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

Dear Mr. Chairman:

At your request, we have assessed implementation of the Safe Drinking Water Act program by the Environmental Protection Agency (EPA) and the states. Specifically, this report discusses (1) the extent to which community water systems (systems serving permanent residents) have complied with the act's requirements for monitoring water supplies and meeting drinking water standards, (2) the effectiveness of EPA and state enforcement programs in ensuring compliance with these requirements, and (3) the impacts of new drinking water requirements on the program.

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, 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 IV.

Sincerely yours,

J. Dexter Peach
Assistant Comptroller General

Executive Summary

Purpose

While improved treatment by public water supply systems has virtually eliminated the threat of typhoid fever, cholera, and other diseases that once plagued the nation's drinking water supplies, waterborne disease outbreaks continue to occur. In recent years, public health and environmental officials have also become increasingly concerned about a proliferation of man-made chemical contaminants found in drinking water supplies. Many of these contaminants have been linked to cancer, birth defects, and other serious health problems.

Concerned about the effectiveness of the Environmental Protection Agency's (EPA) efforts to safeguard water supplies from contamination, the Chairman, Environment, Energy, and Natural Resources Subcommittee, House Committee on Government Operations, asked GAO to assess key elements of the agency's safe drinking water program. Among the issues GAO examined were (1) the extent to which community water systems (systems serving permanent residents) have complied with requirements for monitoring water supplies and meeting drinking water standards, (2) the effectiveness of state enforcement programs to ensure compliance with these requirements, and (3) the impacts of new drinking water requirements, mandated by the 1986 amendments to the Safe Drinking Water Act.

Background

The Safe Drinking Water Act, enacted in 1974, required EPA to establish drinking water standards, covering certain drinking water contaminants, to be met by the nation's 58,000 community water systems. The act also required water systems to monitor the water delivered to consumers to detect whether it exceeds the standards. EPA generally delegates primary responsibility to the states for enforcing the monitoring requirements and drinking water standards and for overseeing community water systems. In 1986 Congress amended the act to significantly increase the number of contaminants to be regulated, strengthen EPA enforcement authority, and establish various other requirements.

To comply with the program, a water system must collect samples of its drinking water and have them tested in an approved laboratory for a variety of contaminants. The test results are then reported to the state, which analyzes the data to determine whether (1) the system has met its monitoring requirements and (2) the water quality has violated a drinking water standard. The state, in turn, reports violations of monitoring requirements and drinking water standards to EPA, which maintains a national data base on system compliance.

Systems with serious and/or chronic problems are deemed to be in "significant noncompliance" and receive priority attention for enforcement. EPA policy requires states to take "timely and appropriate" enforcement action against these significant noncompliers. The policy sets specific time frames within which the state must take enforcement action and establishes criteria for what actions qualify as appropriate. If a state does not take timely and appropriate action in a particular case, that water system becomes a target for EPA enforcement.

Results in Brief

Despite EPA reports that water systems are largely meeting monitoring requirements and drinking water standards, GAO found substantial evidence that (1) violations are probably going undetected and unreported by water systems and (2) identified violations are going unreported by states to EPA. Although states have a number of quality assurance measures at their disposal that would alleviate these compliance problems, financial constraints are leading many to curtail these measures.

Based on its detailed review of enforcement cases in six states, GAO also found that enforcement is often neither timely nor appropriate against significant noncompliers. More important, state enforcement actions are often ineffective in returning these violators to compliance. Of particular concern is that many of the significant violations GAO reviewed, some posing serious health risks, have persisted for years. In some of these cases, states took no enforcement action; in others, enforcement action did not bring about compliance or did so only after lengthy delays. Additional hindrances to a return to compliance include (1) the difficulties small systems have in paying for costly corrective actions and (2) technical barriers such as a lack of alternative water sources.

The addition of new regulatory requirements to the drinking water program will make an already complex problem more difficult for EPA, the states, and water systems. EPA estimates, for example, that these new requirements, which will affect nearly all water systems, will add about $2.5 billion in annual compliance costs. With compliance becoming increasingly difficult for water systems, EPA and the states are bracing for substantially increased regulatory costs of their own in assisting systems, monitoring systems' compliance, and taking enforcement action against violators.

Principal Findings

Considerable Noncompliance

EPA data show that the large majority of community water systems comply with all drinking water requirements and that only a small percentage are in significant noncompliance. However, interviews with state and federal program managers and EPA studies reveal that the number of violations is considerably understated. The reasons reflect problems at the water system, state, and federal levels:

- At the water system level, some violations are not detected due to sampling error by water system operators. EPA and state officials cite as causes (1) the increasingly technical nature of water sample collection and (2) inadequately trained or inexperienced operators, particularly at small systems. GAO fieldwork in three EPA regions and six states also disclosed cases of intentional falsification of data, although the full extent of this problem is unclear.
- At the state level, EPA studies show that (1) some identified violations are not reported to EPA and (2) some states have adopted policies suspending or restricting certain EPA monitoring requirements. As a result of the policies, water systems are not performing all required water tests. Both findings were substantiated by GAO's work.
- At the federal level, EPA lacks key data needed to determine water system compliance and must rely instead on state tracking systems which, in some cases, are known to be inadequate.

Among the most effective tools states use to help ensure compliance are periodic visits to water systems called sanitary surveys. During these surveys, state officials may test water quality, observe operator procedures, and/or check the condition of equipment. However, although EPA regulations require the surveys, financial constraints are leading many states to cut back on these and other quality assurance activities.

Enforcement Not Timely, Appropriate, or Effective

In evaluating state enforcement efforts, GAO reviewed 95 cases of significant noncompliance in six states and found that states took timely and appropriate enforcement action, as defined by EPA policy, in only 24 cases. Of greater concern is that state efforts to return significant noncompliers to compliance were often ineffective, or succeeded only after years of continuous violation. GAO found, for example, that 46 of the 95 cases persisted for more than 4 years. While extenuating circumstances (such as funding constraints among small water systems) help to explain the problem in some instances, in others, states allowed lengthy

delays for voluntary compliance before initiating appropriate enforcement action. Where state actions were delayed or ineffective, EPA rarely stepped in and exercised its own enforcement authority.

Acknowledging the need to improve enforcement, the EPA Administrator announced in April 1989 that the agency will encourage states to increase the number of enforcement actions to be taken against noncomplying water systems. As discussed in chapter 3, GAO supports this policy but emphasizes the need to focus on the quality of such actions—on whether they will achieve compliance.

Impacts of New Regulations

As problematic as compliance and enforcement already are, they may become more so in coming years as EPA establishes new standards and other requirements for water systems. EPA estimates that annual water systems' costs may increase by $2.5 billion in the coming years. Already faced with funding shortages, states will see their own regulatory costs increase by hundreds of millions of dollars annually. With water systems and states both experiencing increased difficulties implementing the program, EPA also expects a correspondingly greater burden on its own resources.

Ultimately, the program's success will depend on the ability of systems, states, and EPA to meet these resource needs. In chapter 4, GAO discusses recent EPA initiatives to deal with the financial problems and cites information from GAO's own review supporting the need for such efforts.

Recommendations

Among GAO's recommendations in chapter 2 is that the Administrator improve water systems' compliance by (1) encouraging more consistent use of state-sponsored operator certification and training programs in order to reduce operator error, (2) improving internal controls to detect and deter intentional falsification of sampling data, and (3) encouraging more consistent implementation by states of sanitary survey programs. GAO also makes a number of recommendations in chapter 3 to improve compliance through better EPA and state enforcement.

Agency Comments

GAO discussed the facts in this report with EPA officials, who generally agreed with their accuracy. GAO 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

CDC	Centers for Disease Control
EPA	Environmental Protection Agency
GAO	General Accounting Office
MCL	maximum contaminant level
SNC	significant noncomplier

Introduction

Most Americans take the availability of safe drinking water supplies for granted. In the United States over the past several decades, improved treatment practices and drinking water regulations have virtually eliminated such diseases as typhoid and cholera and have reduced the incidence of other debilitating diseases. However, outbreaks of some diseases, such as giardiasis, continue to occur. According to the Centers for Disease Control (CDC),[1] 485 disease outbreaks caused by the ingestion of contaminated water,[2] involving over 110,000 individuals, were reported to state and local health authorities between 1971 and 1985. Moreover, CDC and Environmental Protection Agency (EPA) officials estimated that the actual number of such outbreaks is 20 to 80 percent more than the number reported because contaminated drinking water is often not suspected as the cause of illness.

Perhaps of greater significance are the long-term adverse health effects caused by ingesting contaminated drinking water. EPA and CDC researchers have found that over time, some drinking water contaminants can damage the liver, kidneys, heart, and other body organs. While uncertainty exists about the potential long-term effects of certain contaminants, health and environmental officials are concerned that prolonged consumption of some contaminants, even at low levels, can cause cancer, leukemia, and other serious health problems.

To protect the public from these risks, the Safe Drinking Water Act, enacted in 1974, required EPA to establish (1) standards or treatment techniques for contaminants that could adversely affect human health and (2) requirements for monitoring the quality of drinking water supplies and for ensuring the proper operation and maintenance of water systems. To oversee the program, states assuming "primacy" (responsibility) would, with EPA's oversight, assess compliance with these standards and requirements and take enforcement action when warranted. If necessary, EPA would step in with its own enforcement, as detailed under the act's federal enforcement procedures.

By the mid-1980s, however, EPA had not regulated many contaminants, and had not revised most interim drinking water regulations, which had

[1] An agency within the U.S. Department of Health and Human Services, the CDC is responsible for, among other things, identifying and defining preventable health problems, surveilling diseases, and developing and applying disease prevention and control.

[2] As defined by CDC and EPA officials, an outbreak occurs when two or more persons experience a similar illness after ingesting drinking water and evidence implicates the water as the source of sickness. A single case of chemical poisoning constitutes an outbreak if evidence shows that the water has been contaminated by the chemical.

been in effect since 1977. Compliance with drinking water requirements was uneven, with the most problems occurring at small community water systems serving nearly 25 million people, or approximately 11 percent of the nation's population. Congress amended the act in 1986 to (1) establish deadlines to accelerate EPA's efforts to set standards, (2) establish a monitoring program for certain unregulated contaminants, (3) require EPA to issue criteria for determining which surface water systems must filter their supplies, and (4) require disinfection of all public water systems. The act also gave EPA new authority to ensure timely and effective enforcement of all drinking water regulations.

How EPA's Drinking Water Program Works

Under the drinking water program, EPA and the states rely heavily on water systems[3] to demonstrate compliance with monitoring requirements and with water quality standards called "maximum contaminant levels" (MCL). To meet monitoring requirements, the water system operator periodically must collect water samples at the locations and frequencies specified by EPA and have the samples tested in an approved laboratory.[4] The frequency of required monitoring varies depending on the contaminant, the water source (surface water or groundwater), and, in some instances, the size of the population served. Some states test the system's water directly, at least for a portion of the contaminants being monitored.

The test results are then reported to the state, which (1) determines whether the system has met its monitoring and reporting requirements and (2) analyzes the test data to determine whether the system has violated any drinking water standard. If violations have occurred, the state is responsible for taking enforcement action, giving priority to systems deemed to be in "significant noncompliance." As detailed in chapter 2, such a designation is based on the frequency and/or magnitude of violations. EPA policy requires states to take timely and appropriate enforcement action against significant noncompliers (SNC), and to that end establishes time frames for such action and criteria for determining what actions qualify as appropriate. EPA is responsible for taking enforcement action in cases where the state does not take such action.

[3]As defined in the act, a public water system provides piped water for human consumption and must have at least 15 service connections or regularly serve at least 25 individuals.

[4]To be approved, testing laboratories must demonstrate to EPA or the states that they are capable of performing the analytical measurements required in the drinking water program and obtaining accurate results.

States report to EPA violations of monitoring and/or water quality requirements by systems, and whether they took timely and appropriate enforcement action against SNCs. As part of its oversight responsibility, EPA maintains a national data base on system compliance and publishes national compliance statistics.

Objectives, Scope, and Methodology

Citing the importance of safe drinking water to public health, the Chairman, Environment, Energy, and Natural Resources Subcommittee, House Committee on Government Operations, asked GAO to assess EPA and state implementation of the Safe Drinking Water Act program. Based on the Chairman's initial request and our subsequent discussions with his office, GAO agreed to

- determine the extent of community water systems' compliance with monitoring requirements and drinking water standards under the act;
- evaluate EPA and state enforcement actions to bring violators into compliance; and
- determine the status of EPA efforts to set standards for contaminants specified in the 1986 Safe Drinking Water Act amendments, and the effect those standards and other new requirements will have on the program.

We performed the bulk of our work at the Office of Drinking Water, at EPA headquarters; three EPA regional offices, and two state drinking water program offices in each of the three EPA regions. Choosing EPA regions for geographical diversity, we selected Regions I, VI, and X, headquartered respectively in Boston, Massachusetts; Dallas, Texas; and Seattle, Washington. Within the regions we also conducted fieldwork in Massachusetts and Vermont, in Region I, Oklahoma and Texas, in Region VI, and Oregon and Washington, in Region X. Our review focused on community water systems, which are the primary source of drinking water for most Americans. The review did not address noncommunity water systems.[5]

To obtain information for this review, we collected (1) documents on specific compliance problems, the procedures used to identify and report violations, and enforcement cases; (2) EPA regulatory and economic

[5]Community water systems primarily serve year-round residents, while noncommunity water systems, operating at sites such as campgrounds, lodges, and other public accommodations, serve transients or intermittent users at least 60 days out of the year. For an assessment of EPA's noncommunity water system program in Region III, see the EPA Office of the Inspector General's report Noncommunity Water System Program (E1HW7-03-0171-81928, Sept. 26, 1988).

impact analyses; and (3) Federal Managers' Financial Integrity Act reports (also prepared by EPA). The Financial Integrity Act reports provided information on internal control weaknesses in processing and reporting water system compliance data.

We also performed a number of activities to respond to each of the three objectives. To respond to the first objective, we interviewed state and federal program managers and reviewed documents on state quality assurance and internal control programs intended to ensure that water systems comply with drinking water requirements and accurately report compliance data to the state. To assess the reliability of national compliance statistics, we (1) analyzed EPA regional studies on the accuracy of the compliance data states report to EPA and (2) studied how EPA's data management system identifies significant noncompliers. In addition, we asked state and EPA officials about the extent to which they believe water system operators file test results that are erroneous or falsified and about the measures they are taking to detect and deter these practices.

For the second objective, we examined state and EPA enforcement policies and procedures, including EPA criteria on how states should address systems in significant noncompliance with the act's regulations. To test the states' enforcement performance, we reviewed 95 cases of significant noncompliance at 75 community water systems located in six states. We designed our review to include all possible types of cases, including those in which the water system returned to compliance, cases involving enforcement action, and pending cases. Individual review cases within each category were randomly selected. We reviewed the states' files on the selected cases in detail and interviewed state program managers about enforcement actions and other efforts to return the water systems to full compliance. Where necessary, we followed up on selected cases with EPA regional officials.

We chose 1987 as the base year for this review because we wanted to include cases that were initiated after EPA's enforcement policy was implemented in October 1986. In addition, we wanted SNC violations that were as recent as possible without being so new that one would not expect the states to have responded. We decided that selecting SNC violations identified during 1987 would allow sufficient time for state and EPA enforcement actions to occur. We reviewed these actions through May 1989. We called each state to update our information as to whether systems that were still in significant noncompliance as of May 1989 remained so as of February 1990. Our results represent only the cases

reviewed and not all significant noncompliance cases nationwide. (See app. II for a detailed description of our methodology in selecting the enforcement cases.)

For the third objective, we interviewed officials in EPA's Office of Drinking Water to determine the status and implications of EPA efforts to set additional drinking water standards and implement other requirements contained in the 1986 Safe Drinking Water Act amendments. To obtain additional information on the impact of these activities on the program, we also interviewed EPA regional water program officials, drinking water program officials in the six states, and representatives from the Association of State Drinking Water Administrators, the American Water Works Association, and the League of Women Voters. We also reviewed EPA regulatory and economic impact analyses for promulgated and proposed drinking water regulations and examined impact studies conducted by the Association of State Drinking Water Administrators and the League.

Our audit work was conducted between July 1988 and March 1990 in accordance with generally accepted government auditing standards. During our review, we discussed our audit findings with EPA officials responsible for implementing and enforcing the Safe Drinking Water Act program, and have incorporated their comments where appropriate. However, in accordance with the wishes of the requester's office, we did not solicit formal comments from EPA on a draft of this report.

Many Water Systems Are Not Complying With Monitoring and Contaminant Level Requirements

Despite EPA reports showing that community water systems are largely complying with drinking water requirements, the extent of compliance has been considerably overstated. Part of this discrepancy can be explained by how EPA distinguishes between "significant" violators and the much larger universe of other violators. We found that under EPA's criteria, violations not classified as significant can include cases of chronic noncompliance with monitoring requirements and instances where MCLs are exceeded by substantial margins.

In addition to this definitional issue, we found deficiencies in the detection and reporting of violations at each major point in the regulatory process, from the time a system samples its water supply to the time EPA records the system's compliance status in its national data base. Specifically, we found deficiencies at the water system, state, and federal levels.

- At the water system level: Some violations are probably going undetected because of errors in the way system operators take and test water samples. We also found instances where test results were intentionally falsified, although the extent of this problem is unclear. While states can take certain internal control and quality assurance measures to increase water system compliance, such measures are sometimes not implemented effectively, or not implemented at all.
- At the state level: States, for a variety of reasons, are not reporting some water system violations to EPA. The existence of state and regional policies that revise or suspend certain EPA monitoring requirements contributes fundamentally to the problem of underreporting.
- At the federal level: EPA lacks key information needed to determine water system compliance and must rely instead on state tracking systems. In the absence of such information, the agency's data management system sometimes produces incomplete or overstated compliance rates.

EPA's Statistics Indicate Substantial Compliance

EPA's annual statistics disclose the number of water systems that comply fully with drinking water requirements, systems classified as SNCs, and "other noncompliers" that have at least one violation and whose problems are not serious enough to cause the systems to be classified as SNCs. Using fiscal year 1988 statistics, the most recent year for which complete statistics are available, EPA estimated that (1) 72 percent of all community water systems had no reported violations, (2) only 2 percent of community water systems were classified as SNCs, and (3) about one quarter of the water systems were identified as "other noncompliers"—

a relatively small percentage considering that a single violation of only one requirement would warrant such a classification.

Such statistics would appear to indicate that most water systems are monitoring their water and meeting quality standards as required and that the large majority of violations that do occur are not serious. However, as discussed in the remainder of this chapter, (1) the criteria EPA uses to distinguish between SNCs and other violators minimizes some potentially serious problems and (2) the number of water systems reported to be in full compliance may be overstated by a significant margin, reflecting problems at the water system, state, and federal levels.

Definition of "Significant Noncompliance" Understates Seriousness of Many Compliance Problems

According to EPA program managers, the criteria for significant noncompliance were established to focus limited enforcement resources on the systems with the worst problems. However, the narrowness of this definition has excluded substantially more systems with serious and/or chronic compliance problems.

Some Violators Not Classified as "Significant" Nonetheless Have Serious Problems

Community water systems may be classified as SNCs depending on either (1) the frequency with which they violate program requirements or (2) the severity of their violations (e.g., the extent to which they exceed a contaminant level). For one contaminant group, for example, water systems are required to sample for microbiological and turbidity contaminants and meet MCL requirements on a monthly basis.[1] A system that violates MCL requirements for 4 or more months during any 12-month period would be classified as in significant noncompliance, as would a system that fails to conduct any required monitoring for 12 consecutive months. EPA also employs an "aggregate" criterion for significant noncompliance, which encompasses water systems with any combination of monitoring or MCL violations for 12 consecutive months.

[1]Microbiological contaminants, such as bacteria, may cause acute health effects, including gastroenteritis, diarrhea, and hepatitis. Some of the smallest water systems may be allowed to sample their water for microbiological contaminants quarterly instead of monthly, and others sample monthly, but determine compliance with the MCL requirement quarterly. High levels of turbidity, which is a "cloudiness" in water caused by minute suspended particles, may reduce the efficiency of disinfection treatment and mask the presence of microbiological contaminants. Turbidity requirements apply only to water systems that obtain their water from surface sources.

However, under such a restrictive definition, water systems with serious and/or chronic compliance problems may be classified as "other," or "nonsignificant," noncompliers. For the same contaminant group described above, for example, a system may have three violations of MCL requirements within 12 months—or fail to take any samples for as many as 11 months out of 12—and still not be considered a significant noncomplier. Similarly, a system may have a combination of three MCL violations plus eight monitoring violations within a 12-month period and still not be classified as a significant noncomplier.

The SNC criteria for chemical and radiological contaminants also leave room for serious violations that EPA would not classify as significant. In general, a water system is considered to be in violation if its test results exceed the MCL for a contaminant. However, for each chemical and radiological contaminant, EPA has established "SNC levels" that determine when a violation warrants classification as an SNC. Although for some contaminants, the MCL and the SNC levels are the same, for others, the SNC level may far exceed the MCL. For example, a nitrate violation is considered to be significant noncompliance if the test result exceeds 200 percent of the MCL, while the SNC level for a selenium violation is 500 percent of the MCL.

To find out more about the violators classified as other noncompliers, we asked EPA's Office of Drinking Water to break down its compliance data for microbiological and turbidity contaminants. These statistics confirm that many water systems categorized as other noncompliers appear to have serious compliance problems. For example, we found that although only 134 water systems were identified as SNCs because they had four or more microbiological MCL violations within a 12-month period, 602 systems had three within the same period.

Thus, a considerable number of water systems have violations that may be serious but would not cause them to be categorized as SNCs under EPA's criteria. The distinction between SNCs and other noncompliers is important because, as discussed in the next section, the SNC criteria were established based on available enforcement resources and have traditionally accounted for the majority of EPA enforcement targets.

SNC Criteria Largely Determined by Enforcement Resources Rather Than Public Health Considerations

Although EPA encourages states to take action against other violators, SNCs have been the primary focus of EPA's enforcement policy and tracking system and state enforcement goals. According to EPA drinking water officials, when the agency developed its SNC criteria in the mid-1980s, its major consideration was controlling the enforcement work load. Public health was also considered, but only to the extent that the criteria allowed states to focus their limited enforcement resources on the worst problems. The SNC criteria replaced an earlier classification of high priority violators called "persistent violators."

The shift to SNCs did cut the number of high priority enforcement targets considerably. For example, the officials estimated that under the previous criteria, 6,000 to 7,000 "persistent" violators of microbiological and turbidity requirements were identified in fiscal year 1984. However, when the new SNC criteria were applied to fiscal year 1985 violations in the comparable contaminant category, the number of SNCs dropped to approximately 2,000.

While we agree that it makes sense to set priorities for enforcement when resources are scarce, EPA's current SNC criteria minimize the number of potentially serious problems that may be targeted for enforcement action. Officials with EPA's Office of Drinking Water acknowledge that the SNC criteria need to be expanded, explaining the need in part by the fact that in some regions, few systems meet the existing criteria. One manager added that the lack of SNCs in a particular region does not indicate a lack of water systems with serious problems. In his view, expanding the SNC criteria will help EPA avoid the appearance that the program is not addressing all serious problems.

In April 1989 EPA established a national work group to consider possible changes to its SNC criteria to better reflect public health considerations. According to an October 1989 proposal issued by the work group, a number of the changes under consideration will have the effect of increasing the number of high priority enforcement targets. The work group also proposed a three-tiered system for categorizing violations and prioritizing enforcement targets, with the first tier including SNC violations and representing the top enforcement priority. The second tier would include violations that are serious but that have not yet reached the SNC level, and the third tier would contain all other violations. EPA plans to complete the redefinition of SNC criteria by the end of fiscal year 1990.

Violations Are Going Undetected or Unreported by Water Systems

Beyond the issue of how EPA categorizes known violations, we found evidence suggesting that violations are either not being detected at all by water systems or are being detected but are not being reported. As noted in chapter 1, states vary as to how much they rely on water system operators to collect and analyze water samples and then report the results to state drinking water authorities. Where water systems, and not states, are responsible for sample collection, the potential for obtaining inaccurate information is greater—particularly in the case of smaller water systems, which are less likely to have trained full-time operators.

Based on our discussions with program managers in the six state programs, it appears that violations are, in fact, going undetected because of unintentional errors in the way system operators take and test water samples. The program managers also identified instances of intentional falsification of test results, although most states do not actively monitor the extent of this problem.

Unintentional Sampling Error by Water System Operators

To obtain test results that accurately reflect water quality, sample collectors must follow exacting procedures established by EPA and state regulatory agencies. Consequently, sampling is best done by trained individuals who understand how to take the samples and interpret the results. Untrained collectors are more likely to produce invalid test results.

EPA and state program managers told us about a number of circumstances that may lead to errors by water system operators. In the case of turbidity, for example, inaccurate readings may result if on-site test equipment is not regularly calibrated or maintained. In the case of some organic compounds that are volatile and may dissipate in the air, inaccurate readings may result unless the sample collector seals the container properly, making sure that it contains no air bubbles and is not exposed to sunlight or high temperatures.

These officials expressed concern about operator sampling technique and the accuracy of the test results. For the most part, they attributed potential problems to inadequate operator training and the lack of full-time operators or the high turnover among operators at small water systems. They also indicated that errors will increase as additional MCL and

other requirements are implemented as a result of the 1986 Safe Drinking Water Act amendments. They explained that under these requirements, more contaminants will be regulated and that many will require increasingly sophisticated sample collection procedures.

EPA region X officials, for example, told us that while the quality of laboratory analysis in the region is generally good, they are not confident that operators are using proper sample collection techniques and attributed the problem to insufficient training. Despite these concerns, however, the officials note there is little evidence that this problem affects public health. Program managers in Oregon and Washington confirmed that some system operators lack adequate training in key functions such as proper sample collection and maintenance. They indicated that operators of small systems are particularly likely to lack training, and Washington officials said that high turnover among these operators is an additional complicating factor.

Operator sampling error is also a concern in New England because approximately 75 percent of the water systems there serve 500 people or less. According to an EPA region I manager, small systems have the most difficulty attracting trained operators and all too often, the person who takes the samples and performs other tasks is "whoever happens to be around."

In contrast, EPA region VI officials were fairly confident about their compliance data because the states collect many samples themselves. These officials told us that most region VI states collect organic and inorganic chemical samples themselves. Until recently, Louisiana even collected the microbiological samples for its water systems. However, the officials said that resource constraints resulting from implementation of the 1986 amendments to the Safe Drinking Water Act may require some states to turn over these activities to system operators, perhaps increasing problems with compliance data. According to a Louisiana program manager, about 2 years ago resource constraints forced the state to establish a fee system to help pay for state sample collection. Then, because the fees were inadequate to cover costs (a situation exacerbated by the 1986 amendments), the state revised its regulations to require system operators to collect their own samples as of July 1, 1990.[2] Texas officials also

[2]However, water system operators were very concerned about the impact this would have on their own operating costs; the Louisiana Municipal Association filed suit on their behalf and obtained an injunction preventing the state from implementing the new regulations. As of March 1990, state officials were debating a major budget increase for the drinking water program, which would provide sufficient funds for continued state sample collection.

told us that as the provisions of the 1986 amendments begin to take effect, it will be difficult for the state to continue collecting samples without additional resources.

More Consistent Use of Operator Certification and Training Programs Could Help Reduce Operator Error

Operator certification and training programs can be an effective means of preventing operator sampling error. These programs are intended to ensure that water systems are operated and maintained by qualified individuals, sampling techniques are properly employed, and the program generally complies with drinking water regulations. Several years ago, EPA Region VI conducted an informal study, comparing small systems with and without certified operators, to assess the impact of certified operators on small water system compliance. The study found more compliance problems at systems lacking certified operators than at those having them. A study conducted in Utah, analyzing legislation to convert the state's voluntary operator certification program to a mandatory one, obtained similar results.

However, according to an Office of Drinking Water official, there is no national operator certification program or any regulation requiring states to have such programs themselves. Although information from the Association of Boards of Certification[3] shows that 45 states have mandatory operator certification programs and 2 others have voluntary programs, the same organization collected data indicating that at least 11 states exempt systems serving 500 people or fewer from having certified operators. An EPA official told us that other states use different criteria, such as the number of service connections, to exempt small water systems from operator certification. These exemptions are significant because over 60 percent of all community water systems nationwide serve 500 people or fewer.

Within the three EPA regions we visited, we found that all but one of the states have some type of operator certification program, although the requirements vary considerably.[4] Consistent with EPA's findings, our findings show that some states exempt small water systems from operator certification requirements because (1) the requirements are considered unnecessarily burdensome and (2) the smallest systems are often operated by part-time employees or volunteers and cannot attract or

[3]The Association of Boards of Certification seeks to improve certification laws and promote certification as a means of ensuring effective operations by personnel of water utilities and pollution control systems. The organization assists certifying authorities to develop strong administrative programs and effective uniform certification criteria and standards.

[4]Within EPA Region I, Rhode Island does not require its water systems to have certified operators.

pay for an operator who meets all qualifications. Although the percentage of the population served by these systems is low, small water systems can represent a significant proportion of the total number of water systems. For example, systems serving 500 people or fewer account for 75 percent of Louisiana's systems and 90 percent of New Mexico's.

System operators' compliance with operator certification requirements also varies considerably from state to state. Although both Oklahoma and Washington officials estimate compliance levels to be over 90 percent, the Vermont program manager estimates that fewer than 5 percent of the state's community water systems have certified operators. He told us, however, that with recent legislation strengthening the state's authority to enforce the requirement, the state expects to have all system operators certified by 1993. Massachusetts' compliance rate is about 50 percent, with small systems largely accounting for the problem. Massachusetts officials explained that the certification program is managed outside of the state environmental agency by a state Board of Certification, which, in their view, has neither the staff nor the expertise to properly certify all water system operators. Massachusetts program officials introduced legislation to bring the certification program under their control, thus allowing them to administer and enforce the requirements, but it was not enacted.

Under recently issued EPA regulations, all surface water systems are required to have operators that are "approved" to the satisfaction of the state. However, according to an Office of Drinking Water official, EPA has not established any minimum qualifications for water system operators; it will be up to the states to determine what they consider acceptable.

In addition to providing the training associated with operator certification programs, some states have developed special training initiatives that focus on small water systems because these systems tend to have the most compliance problems. Organizations such as the American Water Works Association and the National Rural Water Association also sponsor some training activities. However, no requirements exist for states to conduct training programs, and resource constraints often limit the frequency and content of the training that is provided. Moreover, with the addition of increasingly technical drinking water regulations pursuant to the 1986 amendments, training will need to become more widespread and comprehensive as the program itself grows in complexity.

Falsification of Data or Manipulation of Samples

Water system compliance is likely to be overstated not only because violations caused by operators' sampling errors go undetected, but also because some operators may be deliberately falsifying test results. How often this practice happens is unclear, however, because most states do not actively seek it out. While most EPA and state officials we interviewed stated they do not believe data falsification is extensive, they did tell us that (1) falsifying test results is relatively easy, (2) incentives to do so will increase, and (3) they had already identified suspected instances of falsification.

Data falsification occurs when water system operators intentionally compromise their compliance data to make it appear that they have done the required sampling and that water quality is within acceptable limits. Program officials described several methods of falsification:

- Although most water samples are analyzed in approved laboratories, system operators often have control over sample collection and thus have an opportunity to influence test results. One way for water system operators to ensure that test results are within acceptable limits is to take samples from sources known to be free of contamination.
- Although system operators are supposed to take daily water samples for turbidity, test them using on-site equipment, and report the results to the state at the end of each month, the operators can simply report plausible test results without ever actually testing their water.
- To falsify microbiological tests, operators can take measures to eliminate any contamination before the sample is tested. For example, boiling or microwaving the sample will kill bacteria, as will rinsing the container with chlorine prior to collection of the sample.

EPA and state officials acknowledge that water system operators have several incentives to falsify compliance data: for instance, to avoid having to employ costly corrective treatment or having to notify the public that its drinking water is contaminated. In an illustrative case, detected by EPA region I officials, one operator falsified data so that his system would not have to treat its water. In 1988 EPA determined that the operator of a Vermont surface water system had reported exactly the same test results for turbidity every day for months, despite storms, seasonal changes, and other factors that normally affect turbidity levels. Therefore, regional officials observed the system operator for several days and verified that the operator was neither taking nor analyzing samples. In addition, EPA took and analyzed samples and found that several exceeded the MCL.

When confronted with this information, the operator admitted he took samples only 2 or 3 days per month but reported daily tests. He explained to EPA representatives that despite several meetings at which state officials expressed concern about the system's lack of filtration, the local water department board had strongly resisted employing such treatment. According to the operator, he realized that low turbidity results would help the department avoid having to install a filtration system. In December 1988 EPA issued a notice of violation that cited the system's failure to comply with turbidity monitoring requirements since January 1979. Additional legal action is underway.

While most of the EPA and state officials we interviewed said that such problems are not widespread, they all cited cases in which data falsification had been detected or was strongly suspected. For example, program managers in all six states had identified cases in which reported turbidity results were too consistent to be credible. In Oklahoma and Texas, program managers estimated that from 3 to 5 percent of the surface water systems may have falsified data. Oklahoma and Oregon managers also cited instances in which system operators had dosed microbiological samples with chlorine in an attempt to eliminate bacteria.

State officials provided other examples of questionable practices that would lower the number of reported violations, including the following:

- In Oregon, state officials cited cases in which system operators repeatedly took turbidity samples until they found one complying with standards; the systems then reported only the satisfactory result to the state. According to these officials, they have been informed by testing laboratory representatives that this practice also occurs with other contaminants.
- When Oklahoma officials investigated one system with suspiciously consistent turbidity results, the operator said that his predecessor told him to take a water sample, "hold it up to the light, and if it looks pretty clear, give it a .3." He was also told not to report a result over 1 (the MCL) under any circumstances.

While EPA and state officials asserted that such problems are not widespread, we found relatively few efforts among them to actively seek out the problems. An EPA region X official acknowledged that state efforts to detect data falsification occur haphazardly. He noted that state officials identify such cases if they notice incongruous or overly consistent test results and if they have sufficient resources to follow up on them. Washington officials agreed that part of the reason they have not identified a

larger number of definitive cases of data falsification is that the state has not had the resources to investigate suspicious data. Similarly, program managers in several other states told us that they investigate only if they notice suspicious data or receive consumer complaints about poor quality water.

Still, we did identify a few limited efforts among the states we visited to identify data falsification systematically. An EPA region I enforcement official obtained, from the Vermont program office, special computer printouts that flagged systems whose turbidity results showed little or no variation. He then determined whether the test results were logical in light of the systems' condition and other factors. In addition to identifying the case described earlier in this section, the official identified 13 others in the region warranting further investigation. Oklahoma and Texas systematically review monthly turbidity reports to identify questionable data. In addition, Oklahoma's program manager told us that testing laboratories in the state periodically analyze microbiological samples to detect the presence of excess chlorine, since adding chlorine can disguise microbiological contamination problems.

We found nothing in our review to suggest that the majority of water system operators do not make a good faith effort to comply with program requirements. However, based on the information obtained during our state visits, data falsification may be occurring more frequently than either EPA or state officials suspect. Moreover, as discussed in chapter 4, the incentives to do so will increase as water systems are required to comply with the broader and more stringent requirements in the 1986 amendments to the Safe Drinking Water Act. Accordingly, we believe that EPA needs to encourage these types of efforts to detect and deter data falsification to ensure the credibility of self-monitoring under the program.

Sanitary Surveys Are Often Not Implemented Effectively

According to EPA and state officials, comprehensive inspections of water systems, or sanitary surveys, are among the most important tools states can use to help ensure water system compliance with drinking water requirements. In addition to being an overall review of the facility and its operations, sanitary surveys provide states an opportunity to conduct specific activities that may reduce the potential for both operator sampling error and falsified test results. Such activities may include sampling the water, observing the system operator's sampling and testing procedures, reviewing collection procedures to ensure the operator

understands them, and checking the system's turbidity test equipment to ensure its proper calibration and functioning.

EPA regulations also emphasize the importance of sanitary surveys, requiring them as a condition for states to obtain primacy. However, the regulations do not specify what states must do during the surveys or how often states must conduct them. As discussed in this section, we found that sanitary survey programs can vary widely in both frequency and content and that resource constraints are substantially affecting many of these programs.

State Emphasis on Sanitary Surveys Varies

Both Texas and Oklahoma place strong emphasis on sanitary surveys, conducting them the most frequently of the six states we visited. In both states, survey results are directly linked to enforcement, thus reinforcing the importance of ensuring that water systems are properly designed, operated, and maintained. Texas officials told us that they conduct comprehensive surveys of surface water systems annually and groundwater systems biannually. They believe that sanitary surveys are the most important tool in ensuring safe drinking water and that periodic sampling only reveals "the tip of the iceberg" about water quality. In Oklahoma, sanitary surveys are conducted more frequently than in Texas, but are somewhat less comprehensive.

According to EPA region VI officials, although all six states within the region have emphasized sanitary surveys, the need to emphasize compliance monitoring and enforcement activities will move states away from sanitary surveys and other quality assurance efforts. In Louisiana, financial problems have forced the state to make severe cutbacks in its sanitary survey activities; the number of comprehensive surveys has been reduced by more than two-thirds and the briefer inspection-type surveys have been eliminated almost entirely.

According to region X officials, region X states' sanitary survey programs have also been affected by limited resources and the increased emphasis on enforcement. The Washington program manager told us that his state has not conducted routine sanitary surveys since the late 1970s. Although the state does maintain a field presence through special-purpose investigations, these reviews generally focus on a specific problem and do not entail a comprehensive system review. The Washington manager told us that the lack of sanitary surveys is the most glaring weakness in the state's drinking water program.

Similarly, Oregon's program managers told us that the state has been conducting sanitary surveys on a 3-year cycle but cannot meet this time frame any longer. According to the fiscal year 1989 state/EPA agreement, Oregon now plans to survey its water systems once every 5 years. Here, too, state officials pointed to the lack of resources as the underlying cause of the cutback.

A program manager in EPA Region I told us that all of the New England states are having financial problems and that a reduction in the frequency of sanitary surveys is among the effects. In Massachusetts, program officials told us that they survey every water system at least once every 3 years. Their goal is to conduct a "short-form" review at each system annually and a comprehensive review every 3 years. Currently, the state conducts approximately 50 comprehensive reviews and 100 shorter ones each year. In Vermont, according to state officials, the state reviews groundwater systems every 3 years and surface water systems annually.

Thus, while some states' sanitary survey programs appear to be comprehensive, other states' surveys are either less comprehensive or have been discontinued altogether. Although most program managers agree on the value of sanitary surveys as a quality assurance tool, recent resource cutbacks have made it increasingly necessary to reduce or eliminate this program element. According to a 1988 review of the costs of implementing the 1986 Safe Drinking Water Act amendments, the single largest expenditure in state drinking water programs is for water system inspections and sanitary surveys.[5] Although 43 percent of the respondents cited inspections/sanitary surveys as the most important program activity for ensuring the safety of water supplies and protecting public health, 75 percent of the respondents indicated that they were likely to reduce this activity unless they receive additional resources to implement new regulatory requirements.

EPA's dilemma is that while sanitary surveys are required as a condition of retaining primacy, the agency is reluctant to "force the issue" in the wake of state funding problems. When asked whether states that have discontinued their sanitary surveys, such as Washington, are violating EPA regulations, an official with EPA's Office of Drinking Water stated that because EPA has not established any requirements or criteria for

[5]EPA and the Association of State Drinking Water Administrators conducted a joint survey in 1988 and issued a report in June 1989. A total of 36 states and one territory responded to the association's questionnaire.

how frequently these reviews must be conducted, the states might not be in technical violation as long as they have conducted sanitary surveys at some point. This approach, however, seems to reflect a policy of "looking the other way" at state noncompliance with the requirement for sanitary surveys. We believe that this policy not only contravenes the spirit of EPA's own requirement, but is ill-advised in light of the quality assurance these programs provide. As discussed in chapter 4, to the extent that EPA can assist states in dealing with the resource issue, sanitary survey programs may be salvaged and a valuable quality assurance tool preserved. However, the first step is for EPA to clarify its regulatory requirement to make plain when sanitary surveys are required and how they should be conducted.

States Are Underreporting Violations to EPA

Once the state receives water system test results, it determines whether the results indicate a violation of either monitoring or MCL requirements and reports identified violations to the EPA regional office. The regional office periodically audits the state-reported compliance data through "data verification studies," which are intended to detect systemic reporting problems. We found that the EPA verification studies contained substantial evidence that states are underreporting violations to EPA. Information on state reporting practices obtained during our site visits confirmed the findings reported by EPA.

To conduct their "data verification" studies, EPA regional officials select a random sample of water systems and then compare the state's raw compliance data, such as monitoring records and laboratory reports, with the information states reported to the agency's data management system. In total, we reviewed data verification studies conducted by all 10 EPA regional offices covering 38 states plus Puerto Rico and the Virgin Islands.[6]

Our examination of EPA's studies disclosed that although the percentage of total errors identified from state to state varied widely, the percentage of errors found to involve the underreporting of violations was consistently high. For example, EPA regional offices reviewed the accuracy of microbiological compliance data in all 40 states in which data verification studies were performed. EPA found reporting errors in over 25 percent of the sample cases in 15 states; in 6 of the 15 states, the error

[6]We obtained the most recent study available in each case. The frequency of EPA's reviews depends on the resources and priorities of individual EPA regional offices. The studies included in our analysis used data from fiscal years 1984 through 1989; 50 percent of the studies were based on data from fiscal year 1987 or later.

rate exceeded 50 percent. In 25 states, over 75 percent of all reporting errors involved the underreporting of violations. EPA reviewed the accuracy of compliance data for turbidity, chemical contaminants, and radiological contaminants in fewer locations, but the results were generally consistent with what the agency found in its examination of data for microbiological contaminants.

Reasons for Underreporting of Violations

The studies cite a variety of reasons why violations were underreported. Four EPA regions indicated that reporting violations to EPA was sometimes given a lower priority than other activities. At least five regions reported that state program staff were not always sufficiently knowledgeable about federal regulations to recognize all violations and report them properly. In Region II, for example, one state was incorrectly classifying water systems with monitoring violations as "non-reporters."

State and regional policies that revise or suspend certain monitoring requirements are a major factor contributing to the problem of underreporting violations. Specifically, according to EPA's data verification studies in at least six regions, monitoring for chemical and/or radiological contaminants was suspended under state policies. For example, the fiscal year 1988 study for Michigan disclosed that the state had not enforced federal monitoring requirements for inorganic chemicals since 1982 because EPA and the state agreed that limited resources should be used to test for volatile organic compounds instead. Other states established similar policies for a variety of reasons. In addition to revealing the suspension of monitoring requirements, the data verification studies disclosed that some states did not have systems to track water system compliance with chemical and/or radiological monitoring requirements and thus could not determine whether monitoring violations had occurred.

During our site visits, we also identified regional and state policies that led to the underreporting of violations. For example, under an EPA region X policy, microbiological monitoring violations are not reported to the national data base as long as a water system has taken over 50 percent of the required samples during a month. In the case of turbidity, the regulations require daily monitoring, but in Region X, monitoring violations are not reported as long as the water system has tested its water at least 20 days during the month.

As a result of such policies, monitoring is partially completed or not required at all, and monitoring violations are not being reported to EPA.

The problem presents a dilemma for EPA: On one hand, states or EPA regions may present a compelling case why such policies may be warranted. On the other hand, EPA is tolerating state and regional policies that directly conflict with existing requirements. Whether or not the policies are justified, our primary concern is that the present situation undermines a program that relies primarily on adherence to published regulatory requirements. In addition to encouraging noncompliance, these policies also lead to statistics that mislead EPA managers and the public into believing that required monitoring is being conducted and that compliance is being achieved.

EPA Data Management Problems

Once states determine whether water systems have violated monitoring or MCL requirements, they report identified violations to EPA, where the data are compiled and summarized to develop national compliance rates. However, because EPA is missing key information, it cannot determine accurate compliance rates for many contaminants.

This complex problem arises, in part, from the fact that EPA's data management system is an "exception" system; states only report violations. Thus, a lack of reported violations is taken to mean a water system is in full compliance. However, in the case of chemical and radiological monitoring requirements, the fact that no violations have been reported for a particular system could mean that the water system is in full compliance—but it could also mean that (1) required monitoring has not been conducted, but the compliance period has not ended yet or (2) a violation has been detected, but has not yet been reported.

These ambiguities are complicated by inconsistencies in how states track these violations and report them to EPA. The required monitoring frequency for chemical and radiological contaminants is every 1, 3, or 4 years, depending on the contaminant and type of water source, and EPA requires no set point within these periods when tests must be conducted. As already noted, EPA's data verification studies disclosed that some states do not have systems to track compliance with chemical and radiological monitoring requirements. In addition, even when states report violations to EPA, the agency does not know when the compliance period begins and ends for a particular contaminant and water system or whether the state is reporting violations when they occur or at the end of the compliance period. Although states are required to report such information, some do not or report data subject to multiple interpretations. According to an official from EPA's Office of Drinking Water, the

agency is unwilling to assume that all systems for which no monitoring violations have been reported are in full compliance.

Because of these concerns, EPA cannot use its data management system to generate an SNC list for chemical and radiological monitoring violations and must instead rely on the states to compile such lists. In addition, EPA can only report limited information on overall compliance. For example, in fiscal year 1987 EPA reported that 2.3 percent of all water systems were SNCs because they had never tested for chemical and radiological contaminants and, for the remaining 97.7 percent, could report only that these water systems had monitored at least once since the requirements took effect in June 1977.[7] However, these figures do not reveal much about compliance, since some water systems have been required to monitor some contaminants annually since 1977. There could well be a significant gap between "monitoring at least once since the requirements took effect" and full compliance. Unless states improve their tracking systems, EPA will continue to have problems in determining the extent of water system compliance with chemical and radiological requirements.

Conclusions

Although published EPA data show that (1) most water systems are complying with monitoring and contaminant level requirements and (2) the relatively few violating systems have generally committed minor infractions, we found considerable noncompliance with these requirements. Part of this discrepancy is a matter of definition: Under EPA's criteria, "significant noncompliance" may exclude both cases of chronic noncompliance with monitoring requirements and cases where MCLs are exceeded by substantial margins.

Beyond these definitional concerns over how EPA categorizes known violations, many violations are either not being detected at all, or are being detected but are not accounted for in EPA compliance data. This problem reflects weaknesses in the manner in which (1) water systems sample water supplies, analyze the results, and report them to the state; (2) the state reports on systems' compliance with monitoring and MCL requirements; and (3) EPA determines compliance.

[7]As of March 1990, EPA's fiscal year 1988 annual compliance report was still in draft. The draft report identified the number of water systems that were SNCs as a result of chemical and radiological monitoring violations, but was silent as to the compliance status of the remaining water systems.

At the water system level, we found some violations are being committed unintentionally by system operators who take and test water samples incorrectly. This, we found, is particularly true at smaller water systems, which often do not have the resources to hire and retain highly trained operators. The addition of increasingly technical drinking water regulations in coming years will only add to the problem. While some states sponsor training programs for operators of small water systems, such programs will need to become more widespread and comprehensive as the drinking water regulations themselves grow in complexity. More consistent use of operator certification programs can also help avert such problems. While EPA is planning to require some water systems to have state-approved operators, the agency does not plan to establish any minimum criteria for how this requirement should be met.

A second problem at the water system level is the potential for deliberate falsification of compliance data or manipulation of the test itself to produce the desired result. While the extent of this problem is unknown, we found that (1) falsifying data and manipulating test results are relatively easy to accomplish, (2) ample evidence exists that the practices are occurring, and (3) incentives to engage in these activities will increase because violations of new drinking water regulations may require costly treatment measures or other facility improvements. While some states have undertaken modest efforts to detect such problems, few have a systematic program to identify and investigate potential data falsification. We believe that EPA should encourage states to more actively seek out data falsification and should provide guidance on ways to do this. The few efforts identified in our review are a good starting point for building an active and effective deterrence program.

Our review also suggests that better compliance by water systems could be achieved through more consistent implementation of sanitary surveys. Although most state program managers agree that sanitary surveys are a valuable quality assurance tool, some states' survey programs omit important functions or have been discontinued altogether because of funding difficulties. Compounding this problem is EPA's ambiguous policy toward the surveys: Although EPA regulations require the surveys, states without them may not be considered in violation because the agency has not established how frequently they must be conducted.

We acknowledge the difficulties for EPA and the states in supporting such programs as program responsibilities expand during an era of limited resources. However, we believe that an unenforced requirement

reduces the program's credibility and that EPA should either properly implement or eliminate it. Given the value of the surveys as a needed quality assurance tool, we believe the preferable alternative is to assist states in finding alternative ways to fund such programs. Such assistance could also be used to encourage states to retain or establish other quality assurance programs, such as operator certification and training programs. EPA's current efforts to help states find alternative funding sources to support these and other activities are discussed in chapter 4.

In addition to the problems affecting water system compliance, another is that the states are not reporting some violations to EPA because of state policies that suspend or restrict federal monitoring requirements. While in certain cases, states may present a compelling case why a particular requirement is counterproductive, we believe that an open disregard for existing requirements provides a chance for abuse and undermines the program's credibility. In addition to encouraging noncompliance, these policies also lead to statistics that mislead EPA managers and the public into believing that required monitoring is being conducted and that compliance is being achieved. We believe that EPA needs to evaluate such policies and—within the constraints of the Safe Drinking Water Act—decide whether changes should be made to existing regulations. Once those decisions are made, however, the agency needs to ensure that the regulations are observed and enforced.

At the federal level, we found that EPA is missing key information it needs to track water systems' compliance and thereby perform its oversight responsibilities. Without such information, EPA's data management system provides incomplete information about compliance with certain requirements.

Finally, an additional tool needed to encourage compliance is a credible enforcement program. Such a program helps deter deliberate noncompliance problems such as those discussed in this chapter and provides systems with the incentive to meet their responsibilities under the drinking water program. As discussed in the following chapter, however, improvements need to be made to ensure that EPA's enforcement program stands as a credible deterrent to noncompliance.

Recommendations

We recommend that the Administrator, EPA, follow through on the agency's reexamination of its SNC criteria in order to more comprehensively identify chronic noncompliance with monitoring requirements

and substantial violations of MCL requirements. In addition, we recommend that the Administrator improve water systems' compliance with program requirements by directing the Office of Drinking Water to do the following:

- Promote more consistent and effective use of state-sponsored training programs and operator certification programs, which would reduce operator error. These efforts should include guidance on (1) how training programs should help water systems deal with the increasingly technical drinking water regulations now being promulgated by EPA and (2) what the minimum criteria should be for state operator certification requirements.
- Evaluate the extent to which intentional falsification of test data or manipulation of the water sampling process may be occurring. The Office of Drinking Water should also provide guidance to the states on how to best discourage these practices by water systems and to detect them when they do occur, so that appropriate enforcement action may be taken.
- Encourage states to implement sanitary survey programs more consistently. Specifically, the Office should clarify to the states its ambiguous policy on whether sanitary survey programs are required. In addition, the Office should encourage all quality assurance efforts—including operator certification and training as well as sanitary surveys—by assisting states in finding alternative ways to fund such programs (as discussed in ch. 4 of this report).
- Evaluate state policies that suspend or restrict federal monitoring requirements and determine (within the constraints of the Safe Drinking Water Act) whether modifications should be made to existing regulations. Once these policies are evaluated, the Office should ensure that the states observe the final decisions and enforce the regulations.

Enforcement Inadequate in Deterring and Correcting Noncompliance

In recent years, EPA has put more emphasis on enforcement as a means of returning violators of safe drinking water requirements to compliance. EPA first implemented criteria for identifying water systems that deviate significantly from these requirements in fiscal year 1986, saying it would give high priority to enforcement against these systems. The agency also required states to take timely and appropriate enforcement action against these violators and, in fiscal year 1987, provided the states with specific guidance as to what constitutes such action.

However, our review of SNC enforcement cases in six states indicated that state enforcement actions often do not meet the timeliness and appropriateness criteria. Moreover, such actions are often ineffective in returning SNCs to compliance, or do so only after lengthy delays. Our case reviews disclosed that some systems had been in noncompliance for many years and, in several cases, became a health threat despite long-term enforcement efforts. Many of these long-term cases have been complicated by situations in which system ownership is in dispute or systems have had difficulty paying for needed corrective action.

When states do not take timely and appropriate enforcement action, the Safe Drinking Water Act requires that EPA either issue an administrative order or commence a civil action. However, EPA has taken such actions infrequently. Moreover, EPA rarely has stepped in on its own initiative and exercised its enforcement authority when state action was delayed or ineffective.

Safe Drinking Water Act Requirements and EPA Enforcement Policy

In the 1986 amendments to the Safe Drinking Water Act, Congress granted EPA enforcement authority to issue administrative orders (orders that systems take action to comply) and impose administrative penalties up to a total of $5,000 for noncompliance with such an order. In addition, the existing civil penalty authority was increased from $5,000 per day to $25,000 per day. Congress also removed the requirement that violations be shown to be willful as a prerequisite for obtaining penalties.

Another key change in the 1986 amendments was to require enforcement action against all violations of the drinking water regulations. If the state does not act, the law requires EPA to issue an administrative order or commence a civil action. Previously, states were only required to report to EPA on the steps being taken (which may or may not have

included an enforcement action) to bring the violator back into compliance. If the state action was deemed to be unsatisfactory by EPA, the earlier statute provided only that EPA "may commence a civil action."

Rather than taking enforcement action against all violations, EPA responded to the 1986 amendments with an enforcement policy that focused primarily on the most significant violators, or significant noncompliers.[1] This approach reflected constrained resources among EPA and state regulators and the knowledge that some violations are more serious than others. Furthermore, rather than requiring state action within 30 days of the state's learning of a violation (as the act requires), EPA ruled that a state can meet the agency's timeliness criteria if it takes enforcement action within 8 or 14 months after a water system is determined to be in significant noncompliance.[2]

EPA defined four types of enforcement actions as appropriate:

- Formal administrative orders or compliance orders compelling a water system to comply with drinking water requirements. The state regulatory agency usually issues these orders to the water system directly, although some states require prior approval by their attorney general. The orders may provide for penalties if the water system does not comply.
- Referral of a civil judicial case to the state attorney general. Upon receiving a civil referral, the state attorney general, or in some instances the local district attorney, files suit in civil court seeking a court order forbidding future violations and compelling the water system to take measures to come into compliance.
- Filing of a criminal judicial case in an appropriate state court.
- Negotiation of an informal bilateral compliance agreement by representatives of the water system and the state program office. The agreement must be signed and must contain compliance schedules indicating the steps that will return the water system to compliance.

According to EPA's enforcement policy, states should choose an enforcement action based on the seriousness of the violation, its circumstances, the water system's compliance history, and the economic benefit the

[1] As noted in chapter 2, although EPA encourages states to take action against all violators, SNCs have been the primary focus of EPA's enforcement policy and tracking system and state enforcement goals.

[2] An enforcement action is required within 8 months for microbiological and turbidity monitoring and MCL violations, and for total trihalomethane monitoring violations. The 14-month deadline applies to chemical and radiological monitoring and MCL violations.

system derives from noncompliance. In any case, enforcement should quickly correct the violation, deter future noncompliance, and be fair to the affected parties.

States Rarely Met EPA Enforcement Criteria

To determine how successfully states were implementing EPA's policy on timely and appropriate enforcement, we reviewed actions by six states against 75 water systems. The systems had a total of 95 SNC violations.[3] Overall, we found that states took timely and appropriate action in 24 of the 95 cases, or about 25 percent of the time. Among the specific findings discussed in this section are the following:

- States took timely action less often against systems that had a record of serious and continuous violations for many years (i.e., a record of violations beginning prior to the time EPA's enforcement policy was fully implemented in October 1986). In these cases, states generally either took no action or did so only after lengthy delays.
- States took inappropriate enforcement action most frequently in the more recent cases involving compliance agreements. In these cases, states often did not meet EPA's criteria on when such actions should be taken or what they should contain.

Many State Enforcement Actions Against Long-term SNCs Were Untimely

Of the 95 cases in our review, water systems returned to compliance without enforcement action in 17 of the cases. Under EPA policy, states were required to take enforcement action in the remaining 78 cases. We found that states met EPA's timeliness criteria in 43 of these 78 cases.[4] As table 3.1 shows, cases of untimely enforcement most frequently involved long-term SNC violations.

[3]Appendix II contains a detailed discussion of the methodology we used to select SNC violations for review.

[4]To determine whether state enforcement actions were timely in accordance with EPA criteria, we counted the number of months from the end of the quarter in which an SNC violation was first identified to the date of the enforcement action. In the case of long-term violators, which would have qualified as SNCs prior to when the SNC criteria were fully implemented in fiscal year 1987, we began the count with December 1986, the end of the first quarter in fiscal year 1987. When the only enforcement action in a case occurred prior to the SNC identification date or, in the case of long-term SNCs, prior to December 1986, we gave the state credit for a timely action.

Table 3.1: State Performance Against EPA Timeliness Criteria

	SNC violations identified in fiscal year 1987	Long-term SNC violations (pre-fiscal year 1987)	Total
Criteria met			
System returned to compliance without enforcement action.	12	5	**17**
States took timely enforcement action.	19	24[a]	**43**
Criteria not met			
State enforcement action was late.	7	9	**16**
States took no enforcement action and system did not return to compliance (as of May 1989).	3	16	**19**
Total	**41**	**54**	**95**

[a]This figure includes 11 cases in which we gave the states credit for enforcement actions that occurred prior to the implementation of EPA's enforcement policy. In five instances, states took enforcement action from 2 to 14 months before the policy took effect, and in the remaining six cases, the enforcement action occurred from 20 to 40 months earlier.

Of the 41 recent cases (i.e., cases first identified in fiscal year 1987), 31 were resolved in accordance with EPA policy as of May 1989. One explanation for the relative ease with which these cases were resolved is that a high proportion involved easily correctable problems. For example, over half of the cases involved systems identified as SNCs because they had never conducted required monitoring for chemical and/or radiological contaminants. To return to compliance, the water systems needed only to collect the applicable water samples and obtain acceptable test results.

The results of our analysis for the 54 long-term SNC violations were less satisfactory. Of the 54 cases, 29 were resolved in accordance with EPA policy—either the water systems returned to compliance without enforcement action or the states took timely action. As noted in table 3.1, however, 11 of the 24 "timely" actions actually occurred prior to the implementation of EPA's policy, some of them by a matter of years. Subsequent enforcement actions were not taken despite continued noncompliance. In the remaining 25 cases, the states did not meet EPA's timeliness criteria:

- In nine cases, enforcement actions were late, with states exceeding the deadlines by 6 months or less in six cases and by a year or more in three.

- In another 16 cases, enforcement action had never been taken. As of May 1989, the duration of these violations averaged over 5 years.[5]

Several factors contributed to the states' inability to meet EPA timeliness criteria when dealing with these long-term SNC violations. The lack of timely action stems in part from the states' reliance on efforts to achieve voluntary compliance, even after years of recalcitrance by system owners. We noted situations in which the states postponed appropriate enforcement action until long after serious compliance problems were first identified. In one case, for example, a system had not performed required monitoring for any of the regulated contaminants since June 1980, when it took one sample for microbiological contaminants. Even so, the state's first enforcement action did not occur until October 1987.

Still, while recalcitrance explains part of the problem, some cases are difficult to resolve simply through enforcement. In some of these cases, states delayed or did not take enforcement action in favor of working with the water system to resolve difficult problems encountered in locating alternative water sources and obtaining financing for drilling new wells or connecting to neighboring systems. In other cases, systems had been abandoned and the states could not find parties willing to take responsibility for operating the systems. The facts behind these difficult cases illustrate the problems states face in achieving the ultimate goal of the enforcement program—to bring SNCs back into compliance. These issues are discussed in more detail later in this chapter.

Many State Enforcement Actions Are Not Appropriate

As noted earlier, water systems returned to compliance without enforcement action in 17 of the 95 cases we reviewed, and, according to EPA policy, states were required to take action in the remaining 78 cases. We found that states met EPA appropriateness criteria in 33 of the 78 cases. In another 26 cases, states' actions were not appropriate,[6] and states took no enforcement action in 19 cases. All 26 cases in which state

[5]These systems were classified as in significant noncompliance when EPA fully implemented the criteria in fiscal year 1987. However, all of these cases involved longstanding violations (predating 1986) that would have qualified the water systems as SNCs at the time the violations were first committed.

[6]The 59 cases in which states took enforcement action involved 66 individual actions, including 37 bilateral compliance agreements, 17 administrative orders, and 12 civil referrals. The number of enforcement actions is different from the number of cases because (1) states took multiple enforcement actions in 15 cases and (2) in 9 instances states used a single action to address multiple violations (cases) at the same water system.

actions did not meet EPA's appropriateness criteria involved bilateral compliance agreements.[7]

Bilateral Compliance Agreements Usually Do Not Meet EPA's Appropriateness Criteria

We reviewed the extent to which bilateral compliance agreements met specific EPA criteria for their content and use. According to EPA guidance, such agreements must be written, be signed by both parties, and include a schedule with interim milestones and a final date for when compliance will be achieved. The guidance also states that actions stronger than bilateral compliance agreements should be used when the water system has had a long history of violations or has violated the terms of a previous compliance schedule.

Based on our review of the case files, 31 of the 37 bilateral compliance agreements did not meet EPA appropriateness criteria. Ten were not appropriate for multiple reasons. The most common problem, found in 28 instances, was that the agreements were never signed by water system representatives. Such signatures are important because they indicate a commitment to take the required corrective action.

In seven cases, we determined that issuing a bilateral compliance agreement was inappropriate in light of the water system's poor compliance history. For example, a municipal water system had almost continuous monitoring violations since late 1982. Documents in the case file indicate that the system operator was reluctant to test the water because a deteriorating distribution system and chronic pressure problems made it likely that the test results would exceed the MCL. Tests periodically conducted by the state confirmed such contamination. In July 1984 the state threatened legal action if the system did not initiate testing within 45 days. The system complied briefly, but has rarely taken required microbiological samples since August 1984. The state finally imposed a compliance schedule in March 1989, noting, "It is evident that the City has failed to voluntarily make more than minimal efforts to insure the potability of the water. . . ."

[7]To determine whether state enforcement actions actually qualified as "appropriate," we reviewed the applicable case files to verify that the actions took place and that the enforcement documents had been signed by the appropriate parties and formally issued. In instances where there may have been some ambiguity about whether the state took an appropriate action, our approach was to give the state credit for the action. When states reported that an enforcement action applied to a particular violation even though the action did not specifically cite the SNC violation, we gave the state credit for the action as long as it met EPA's appropriateness criteria. Similarly, where states took multiple enforcement actions to address a single case, we gave them credit for an appropriate action in that case if any one of the actions met appropriateness criteria.

Similar circumstances existed for the other six compliance agreements we deemed inappropriate because of the water systems' poor compliance history. For example, in three instances, states issued compliance schedules after earlier formal enforcement actions had proved ineffective.

We also found that four compliance agreements did not contain interim milestone dates, despite the fact that the agreements required substantive corrective action. Two compliance agreements did not include final completion dates. When corrective action entails a major construction project, milestone dates are essential for state regulators to monitor a water system's progress toward achieving compliance.

Other Enforcement Actions Meet Appropriateness Criteria

Because EPA essentially leaves it up to the states to determine what should be included in administrative orders and civil referrals, they need only be issued to be "appropriate." Hence, we determined that all 29 administrative orders and civil referrals reviewed were appropriate. Ultimately, however, the primary goal of these actions is to bring about compliance, and some of them are not achieving this end. As discussed in the following sections, ineffective enforcement action partially explains why some water systems have remained in significant noncompliance for years.

Many Significant Noncompliers Have Remained in Noncompliance for Years

One of the more striking observations to be made about the 95 enforcement cases we reviewed is the length of time many of the water systems have remained in significant noncompliance. Table 3.2 shows that as of February 1990, nearly half the cases had met the SNC criteria for over 4 years. In 31 of these 46 cases, water systems were still in significant noncompliance at that time.

Table 3.2: Number of Months GAO Review Cases Met SNC Criteria

Number of months	Cases returned to compliance as of 2/90[a]	Cases still SNCs as of 2/90[b]	Total
6 to 12	13	0	**13**
13 to 18	12	0	**12**
19 to 24	7	0	**7**
25 to 36	2	3	**5**
37 to 48	4	8	**12**
49 to 60	8	4	**12**
61 to 72	6	5	**11**
Over 72	1	22	**23**
Total	**53**	**42**	**95**

[a]For cases included in this column, the number of months denotes the time elapsed from when the system first qualified as an SNC to when the system returned to compliance.

[b]For cases included in this column, the number of months denotes the time elapsed from when the system first qualified as an SNC to February 1990.

Although we used compliance data from fiscal years 1983 through 1987 to determine when our review cases first qualified as SNCs, we identified a number of instances in which the water systems had serious violations that would have qualified them as SNCs even before fiscal year 1983. For example, in five cases, the water systems had been subject to "boil water orders" for 10 or more years as a result of known or suspected microbiological contamination.[8] In eight other instances, the case files contained evidence that chemical or radiological MCL violations, which were serious enough to warrant classifying the system as an SNC under current criteria, had existed since the late 1970s or early 1980s.

Long-term Significant Noncompliers Often Involve Difficult Compliance Issues

There is no simple explanation for why some water systems remain in significant noncompliance for years. Many of the cases involve multiple problems, and it was often difficult to single out a particular problem as the primary factor in delaying a water system's return to compliance. Ineffective enforcement—by states and EPA—is clearly an important contributing factor in the delays in resolving some of these cases. However, our case reviews disclosed other issues that contributed to the difficulty of achieving compliance, including (1) financing the cost of expensive corrective actions, (2) resolving difficult technical problems when water treatment alone was insufficient, and (3) sorting out legal

[8]When state regulatory officials determine that there is a significant threat of microbiological contamination, water systems may be ordered to notify consumers that they must boil their drinking water before using it.

disputes over system ownership to identify parties responsible for meeting drinking water requirements.

Some Enforcement Actions Taken Are Not Effective

Earlier, we noted that states have frequently not taken required enforcement action in a timely manner and that some actions have not met EPA's appropriateness criteria. In many instances, however, enforcement actions satisfying the EPA criteria have been taken but have not achieved their ultimate objective—to bring violating systems into compliance. We found this to be particularly true of civil referrals.

Under EPA's enforcement policy regarding civil referrals, states do not have to file suit in court before reporting an appropriate action. They may take credit for an appropriate enforcement action when the referral is made to the state attorney general.[9] According to officials from EPA's Office of Drinking Water, because filing the cases in court is outside the control of the state regulatory agency, program officials should not be held accountable for any delays that occur after the referral to the state attorney general. Although the EPA officials expressed concern about the possibility of civil referrals' "dying on the attorney general's desk," they had no information on the extent to which this may be occurring.

We found that 7 of the 12 civil referrals in our enforcement case reviews had not been filed as of September 1989. Significantly, in only one case among the unfiled referrals had the water system returned to compliance.[10] Two of the remaining six unfiled referrals involved a single case—a municipal water system that violated the microbiological MCL continuously since 1982. The state made the first referral in July 1985 after the town failed to comply with a consent order. The case was not filed in court because the state decided to negotiate a second consent order instead. However, after continued noncompliance and the town's failure to initiate corrective actions, the state made a second civil referral in January 1987. Although that action was also not filed, town residents finally passed a bond vote in March 1987 to finance the filtration plant needed to correct the problem.

[9]While EPA's enforcement policy states that the referral should be made to the state attorney general, some states, such as Oklahoma, require that the referral be made to a local district attorney.

[10]The state dropped the civil action in this case and categorized the water system as returned to compliance when the state determined that the system no longer met the federal definition of a community water system because it regularly served fewer than 25 individuals. The case was closed 30 months after the referral date.

The other four water systems also had long-term compliance problems that had not been resolved; as of September 1989, they had had SNC-level violations for, on average, over 5 years. For these unfiled referrals, the time that had elapsed from the referral date through September 1989 was 19 months, 43 months, 53 months, and 75 months.

Interviews with officials in five of the six states confirmed difficulties in using the civil referral process. In Oklahoma, for example, program officials must work through the local district attorneys to file civil cases. The program manager told us that while some of these attorneys are cooperative, others want nothing to do with drinking water cases unless an imminent threat to public health exists. As a result, according to the state program manager, Oklahoma officials are referring fewer and fewer cases for civil action. Oregon officials told us that they are reluctant to use the civil referral process because state attorneys bill the drinking water program by the hour for the legal assistance, and a single case can be very expensive.

In contrast, Texas has devoted sufficient resources to its civil referral process to help ensure that drinking water cases are acted upon in a timely manner. The state attorney general has an environmental protection division with about 20 attorneys, including 8 to 10 who are dedicated specifically to drinking water cases. Program officials told us that the only limitation on the number of civil referrals is the program office's ability to compile the information needed to support them. During fiscal years 1987 and 1988, the program staff referred a total of 92 water systems to the attorney general's office for civil action. As of January 1990, 45 of these cases had been filed in court, and most had been resolved with an agreed final judgment (consent judgment) and a civil penalty. Of the remaining 47 cases, 13 were closed (largely because the issues that initially brought about the action were resolved), and 34 were as yet unfiled and still open.

State Efforts to Deal With Ineffective Enforcement Actions Have Only Partially Succeeded

Concerned about the effectiveness of the civil referral process, EPA considered requiring states to have the authority to issue administrative orders and penalties in order to retain primacy and requested comments on this matter in proposed regulations. However, after commenters indicated that their state legislatures would be reluctant to grant additional enforcement authority, EPA opted, in December 1989, to make no changes pending the results of its research on existing state enforcement authorities and their effectiveness. Officials in EPA's Office of Drinking Water expect to complete this study by the end of fiscal year 1990.

Nevertheless, 5 of the 6 states we visited obtained authority to issue administrative orders as an alternative to the cumbersome civil referral process.[11] However, we found that the usefulness of this authority may be limited unless (1) it is also accompanied by the authority to assess meaningful penalties and (2) the procedures that must be followed can achieve results in a timely fashion.

Washington program officials told us that the enactment of administrative order authority in 1986 was largely responsible for eliminating a large backlog of enforcement cases awaiting action. However, according to Washington officials, the real key to effective administrative authority is the state's ability to assess penalties for failure to comply with an order. These officials also say they have had some success using penalties as a bargaining tool to force water systems to take corrective action.

In contrast, Vermont does not have authority to assess administrative penalties. Administrative orders may contain a threat of penalties if a water system fails to comply, but the state must go to court to collect them. As a result, Vermont has rarely assessed any penalties. At one time, Massachusetts also had to refer cases to the state attorney general to get a civil penalty assessed, creating the same problems that administrative orders were intended to solve—backlogs of low priority cases at the state attorney general's office. The problem was alleviated after the drinking water program obtained its own authority to issue penalties in 1985.

Another potential problem with administrative order authority is the process required for its use. For example, EPA region VI officials told us that Louisiana has never issued an administrative order and, in fact, has rarely initiated the process because it is so cumbersome. The procedure requires the water system to have three opportunities to return to compliance before the state can issue the order. A Louisiana program manager confirmed that the administrative order process is lengthy and said that the state does not have enough program staff to handle the work load.

While EPA is understandably reluctant to force states to adopt specific enforcement authorities and practices, we believe the agency needs to ensure that states have some method to carry out their enforcement responsibilities effectively and to return violators to compliance. EPA

[11] As noted above, Texas officials believe the state has devoted the necessary resources to make the civil referral process work effectively.

does conduct an annual program review in each state to evaluate its ability to implement the requirements of the Safe Drinking Water Act. In conducting this review, EPA should examine whether those states that choose to rely on civil referrals have access to sufficient resources within the attorney general's office to obtain effective action. Similarly, where states have adopted administrative order authority, the agency should examine the need for (1) administrative penalty authority and (2) a workable process for issuing the orders.

EPA Follow-up Enforcement Restricted When State Actions Are Ineffective

According to EPA's enforcement policy, SNCs that have neither returned to compliance nor been subject to appropriate state enforcement actions go on an "exceptions list" and become potential targets for EPA enforcement. Of the 95 cases included in our review, we examined the 38 cases reported to be on this list to determine whether EPA had taken enforcement action. Evaluating EPA efforts in the 38 cases was somewhat problematic because some cases did not actually qualify as "exceptions."[12] Notwithstanding this classification problem, we found that EPA enforcement policy excludes some serious enforcement problems from this list and thus from EPA follow-up enforcement.

In a number of the long-term SNC cases, states had taken enforcement actions that were appropriate under EPA guidelines, but the actions were not effective in returning the systems to compliance—sometimes long after the violations first began. In such cases, EPA is authorized to step in and exercise its own enforcement authority to resolve the compliance problems. When asked why eight such cases were not targeted for EPA follow-up enforcement action, EPA regional officials told us that no federal action was taken because (1) the state was actively tracking the case, (2) state enforcement appeared to be sufficient, (3) the state did not request intervention, or (4) they assumed that the state was handling the case.

However, we found that these cases were lingering on with little or no progress and, in at least one instance, presented a potentially serious health risk. In this instance, a water system had serious violations since 1980 that, under the current criteria, would warrant classification as an SNC. State officials tracked the system—issuing notices of violation,

[12]States had taken appropriate action in 13 cases, and in another 7, the systems had actually returned to compliance. We found that EPA had initiated some type of enforcement action in 5 of the remaining 18 pending cases, and in several others, EPA's decision to forego enforcement action appeared reasonable. For example, four pending cases involved long-term fluoride MCL violations within EPA Region VI. Although EPA regional officials did issue proposed administrative orders in two similar cases, further action had been suspended pending the results of a feasibility study on fluoride removal.

making site visits, and imposing a boil water order—for several years. However, the first state action that was appropriate under EPA guidelines did not occur until May 1987, when the state imposed a compliance schedule. Local residents subsequently failed to approve formation of a water district, which would have made them eligible for state grant funds, and thus did not meet compliance schedule milestones. A new compliance schedule was established in June 1989, and at the same time, the state exempted the system from microbiological monitoring requirements.

A state official explained that despite the apparent health risk—of the few microbiological samples that have been taken, nearly all have tested positive—the exemption was granted to show good faith and provide an incentive for the system to make improvements. He said that the users know the system is contaminated and have been told to boil their water. When asked why EPA had not stepped in on this case, an EPA official told us that as long as the state has taken action and is making progress, the agency does not interfere.

Discussions with EPA officials in all three regions confirmed that despite EPA's expanded enforcement authority under the 1986 amendments to the Safe Drinking Water Act, EPA policy is generally to defer to the states on enforcement matters. They told us that the states have the primary enforcement responsibility and that EPA is reluctant to intervene unless states request assistance. Region I started issuing formal notices of violations to all new SNCs beginning in 1988 but otherwise relies on the states to refer cases for enforcement action. Although Region VI actively solicits enforcement referrals from its states, the region does not interfere when states do not request its involvement. Region X also relies on state referrals.

Based on the results of our case reviews, we believe that in light of the large number of long-term SNCs and the problems with ineffective enforcement in some states, EPA should be more aggressive in initiating enforcement actions itself when state action clearly has been delayed or ineffective. Beyond the assistance this would provide in returning some long-term SNCs to compliance, such a stance would emphasize that the ultimate goal of any enforcement action is to achieve compliance.

High Compliance Costs and Other Difficult Issues Also Hinder Timely Corrective Action

While improving state and EPA enforcement will address some of the long-term compliance problems in the drinking water program, this is by no means a complete solution. Some SNCs present intractable problems that enforcement actions may not cure—regardless of whether the actions meet EPA enforcement criteria. Even where corrective actions are underway, a major project, such as a filtration plant, can take several years to complete. In the meantime, these systems continue to be in noncompliance. Such problems, either individually or in combination, present significant obstacles to achieving full compliance and help explain why many SNCs have been out of compliance for lengthy periods.

Small Water Systems Have Difficulty Paying for Costly Corrective Actions

The difficulty of paying for needed system improvements was a recurring issue throughout our case reviews. Although the circumstances in each case were unique, one common element was the small size of most SNCs. Two-thirds of the 75 water systems we reviewed served 500 people or fewer, and 87 percent serve 3,300 people or fewer, percentages that reflect the makeup of the SNC universe overall. The small size of these water systems affects their ability to finance corrective actions and, to some extent, compete for grants and loans.

In some instances, the resource problems are compounded by water rates that are artificially low because users are not charged the true cost of providing drinking water. However, even substantial increases in water rates may not be enough to finance corrective actions. For example, in one of our review cases, a water system serving 125 people had to install new water lines, a storage tank, and a water treatment plant to comply with state and federal drinking water regulations. According to the program manager, the system is so poor that three members of the water board had to take out a personal loan to pay for the $2,000 construction permit. Total project costs, which were partially funded by the Farmers Home Administration, exceeded $200,000.

Ironically, although the smallest water systems are the least able to afford costly improvements, their size may hurt them when they compete for funding. According to the Oklahoma program manager, for example, applicants for state grant assistance are ranked in part on the basis of the number of people affected. Unless an imminent threat to public health exists at a small system, funding for a larger system is more likely to be approved before funding for a small one. Other state officials provided similar information.

Technical Problems Cause Delays in Achieving Compliance

States and water systems also face difficult technical issues, particularly when the drinking water contains chemical or radiological contaminants. The cost to install treatment can be prohibitive, and, in some instances, the effectiveness of available treatment technologies is questionable. For example, according to a Texas program manager, there is no viable treatment for fluoride contamination.

In other instances, treating the existing source will solve one problem but may create another. For example, Texas officials said although certain radiological contaminants can be treated, the water system then has the problem of disposing of the radioactive waste resulting from the treatment process. We learned of a similar problem sometimes caused by chlorination, the process used to disinfect drinking water. Chlorine may react with organic matter in the water to produce total trihalomethanes in excess of the MCL. According to the Oklahoma program manager, changing the primary disinfection agent from free chlorine to chloramines solves the trihalomethane problem, but produces a more persistent chlorine residual, which requires extra precautions from those using kidney dialysis machines and other users.

When treating the existing water source is financially or technically infeasible, a water system may have to locate an alternative water source and pay high costs for drilling new wells or for connecting to neighboring systems. Here, too, the system may not be guaranteed that its drinking water problems will be resolved. In one of our case reviews, a water system contaminated with selenium attempted to resolve the problem by completing the development of a partially developed well site it owned. However, this tactic was not successful—the new well not only exceeded the selenium limit, but also violated the MCLs for arsenic and radiological contaminants.

Difficult Legal Issues Sometimes Complicate Enforcement

Another difficult issue arises when state regulators cannot identify a system owner against whom to take enforcement action. In some instances, the original owner is no longer present, and the system users are unwilling to take responsibility for the operation and maintenance of the facility or for meeting drinking water requirements. Compounding the problem is the fact that virtually all of the ownership disputes seem to occur at the very smallest systems, where financing needed improvements presents a major obstacle, even if the users do agree to take responsibility.

In Washington, program officials told us that many of the ownership disputes occur at systems that were built by developers. The problems

often begin when the developer sells the properties. In some cases, the home owners form an association to operate and maintain the water system. Over the years, however, these associations tend to break down, while at the same time, the water system deteriorates. Sometimes, users deny that there is a "water system" or that they are hooked up to it. Another problem is that associations of homeowners are not eligible for most of the grant and loan programs available to finance improvements.

Our case reviews disclosed some unusual tactics employed by state program officials in trying to establish the ownership of systems and to achieve compliance. In Washington, for example, the lack of a responsible party at one water system led the state to act to put the system into receivership. According to state officials, they did so because it was highly unlikely that the system owner would be willing or able to make the needed improvements. The water system was in poor condition and the owner was in jail on an unrelated matter. Although the state obtained a default judgment against the system, it is considered uncollectible because the owner's assets are negligible. Moreover, the court has been unable to appoint a receiver because the fees a receiver could collect by operating the system are too small for the system to be profitable.

Conclusions

EPA counts on its enforcement program to deter violations of drinking water standards and other requirements and to return water systems to compliance when such violations do occur. Citing limited EPA and state resources, the agency has largely restricted potential targets for timely and appropriate enforcement action by states to the most serious violators—significant noncompliers. We found, however, that of the 95 cases we reviewed, EPA's criteria for timely and appropriate enforcement were met as required in 24 cases.

While extenuating circumstances exist in a number of these cases, some involve records of chronic violation by water systems that are capable of returning to compliance. To deal with such problems, the EPA Administrator announced, in April 1989, that the agency will encourage states to increase their number of enforcement actions. Moreover, the Office of Drinking Water developed a number of initiatives for fiscal year 1990 to strengthen its enforcement program, including a model for escalating state and EPA enforcement actions in cases involving water systems with chronic violations. While we support these actions, we believe EPA needs to make several fundamental changes in its approach toward enforcement for these efforts to have their intended effect.

First, EPA needs to emphasize to states that actions taken need to be complete and effective. For example, the large majority of bilateral compliance agreements examined during our file reviews were either not signed by both parties, as required, or did not contain a compliance schedule with interim milestones and a final date when compliance will be achieved. These requirements help ensure that the agreements will be honored and that corrective actions will proceed as planned. In some cases, EPA criteria specify that an enforcement action stronger than a compliance agreement should have been used because the system in question had a poor compliance history.

Perhaps of greater concern, a number of enforcement actions that did meet the EPA criteria had little or no effect on system compliance. We found this to be particularly true for civil referrals, which EPA counts as appropriate regardless of whether they are filed in court. We believe that EPA is responsible for helping to ensure that the actions are not only appropriate according to its guidelines but also effective. Where states choose to enforce drinking water requirements through civil referrals, we believe EPA needs to determine, as part of its annual program review with the state, whether the state attorney general's office is willing and able to act on them.

Many states rely on administrative orders as a more feasible enforcement action to take than civil referrals. However, some state programs have had limited success in using these actions because the programs do not have the authority to levy administrative penalties or because the orders involve cumbersome administrative processes. As part of its annual program review, EPA needs to help ensure that states relying on administrative orders can implement them in a timely manner and implement them with the necessary "teeth" to be effective.

Second, we believe that EPA needs to broaden the universe of compliance problems for which it is willing to take follow-up enforcement action. At least some regional offices will only follow up on SNC cases when asked to do so by the state and will assume that a problem is being handled as long as the state has taken an appropriate action. Our review identified a number of such cases, however, that were making little or no progress toward resolution. At least one case presented a potentially serious health risk.

Still, it is important to realize that improving state and EPA enforcement is not a complete solution to the program's compliance problems. As revealed in our case reviews, some water systems clearly face problems

that cannot be resolved simply through stronger EPA or state enforcement. Chief among these problems are the staggering costs some systems face in resolving serious contamination problems—particularly in the wake of new contaminant limits and other challenges posed by the strengthened requirements of the 1986 amendments to the Safe Drinking Water Act. These problems and EPA's efforts to help states and water systems deal with them are discussed in the following chapter.

Recommendations

To help ensure that state and EPA enforcement actions meet program requirements and are effective in encouraging water systems' compliance with drinking water program requirements, we recommend that the Administrator do the following:

- Direct the Office of Drinking Water to help ensure that state enforcement actions meet EPA's appropriateness criteria. Specifically, the Office should issue guidance to EPA regions emphasizing that bilateral compliance agreements must be signed and must include a compliance schedule with interim milestones, if applicable, and a final date when compliance will be achieved. The guidance should also reiterate that a bilateral compliance agreement may not be an appropriate action when the violating water system has had a poor compliance history.
- Take steps increasing the prospect that appropriate state enforcement actions will return violating systems to compliance. Specifically, the Administrator should direct EPA regions to examine, as part of their annual program reviews, whether (1) states relying on civil referrals have the resources and commitment needed within the state drinking water program office and the attorney general's office to ensure that such referrals will be acted upon and (2) states relying on administrative orders have a workable procedure to implement them in a timely manner and have sufficient authority to assess penalties as part of the order.
- Direct the Office of Drinking Water to revise its enforcement guidance to regions to encourage them to more actively consider EPA follow-up enforcement action beyond cases referred to EPA by state authorities. This expanded universe of enforcement targets should include cases where state action may have been taken but was not effective in achieving compliance.

New Drinking Water Requirements Will Pose Additional Compliance and Enforcement Challenges

As mentioned in chapter 1, the Safe Drinking Water Act, enacted in 1974, required EPA to promulgate and periodically revise national drinking water regulations for public water systems. The 1986 amendments to the act significantly enhanced EPA and state drinking water program responsibilities, requiring standards for 83 additional contaminants, stringent filtration and disinfection requirements, and increased monitoring for regulated and unregulated contaminants.

Although it is too early to determine total programmatic impacts of the 1986 amendments, we found that EPA officials, state program managers, and representatives of industry and state associations expect the new requirements to have tremendous impacts on local, state, and federal drinking water programs. These individuals pointed out that small water systems will be particularly affected because they already lack the financial and technical resources necessary to implement the existing drinking water requirements. The same people also agreed that without additional resources, compliance and enforcement problems will increase dramatically.

Major Drinking Water Requirements Mandated by the 1986 Amendments

The 1986 amendments to the Safe Drinking Water Act include several new statutory mandates. Among other things, the amendments require EPA to

- set nonenforceable health goals, commonly called maximum contaminant level goals, and enforceable maximum contaminant levels or treatment techniques for 83 specific contaminants;
- establish criteria by which states determine which surface water systems must install filtration;
- promulgate treatment technique regulations that will require all public water systems to use disinfection;
- establish requirements for water systems to monitor for unregulated contaminants;
- publish a list of contaminants, which are known to occur or anticipated to occur in public water systems and which may require regulation, and set, every 3 years, maximum contaminant level goals and MCLs for at least 25 contaminants on the list; and
- develop corrosion control treatment requirements to minimize lead and copper deposits from plumbing materials such as lead pipes, solder, flux, or fittings.

EPA Has Proposed or Promulgated Regulations for Most New Drinking Water Requirements

EPA has thus far issued final or proposed regulations for most of the new drinking water requirements. Agency officials expect all of the new drinking water regulations to be promulgated and in effect by mid- to late 1994.

As of December 31, 1989, EPA had issued final regulations for 15 of the 83 contaminants, the surface water filtration criteria (also called the surface water treatment rule), disinfection treatment of surface water systems, and the monitoring of 51 unregulated contaminants. The agency had also issued in final form, the list of contaminants that may require regulation (also called the drinking water priority list). EPA had also proposed regulations for an additional 40 contaminants, treatment techniques for controlling lead and copper corrosion in plumbing materials, and monitoring requirements for an additional 100 unregulated contaminants.

At the completion of our review, EPA officials were developing regulations for the remaining 28 of the 83 contaminants, disinfection treatment of groundwater systems, and monitoring requirements for other unregulated contaminants. They were also developing regulations to control disinfection by-products, which can result from the disinfection of surface water and groundwater supplies. EPA plans to issue proposed regulations for these activities sometime in 1991 and final regulations in 1992.

Resource Constraints Will Increase Compliance and Enforcement Problems

These regulations will significantly increase program responsibilities for water systems, states, and EPA. According to information obtained from EPA and state officials, EPA's published cost analyses, and the results of studies conducted by representatives of water systems and states, the new requirements will cost millions of dollars to implement in coming years. As discussed below, these new costs will place considerable financial strain on many water systems and states, and will ultimately affect EPA's ability to implement the program.

Impacts on Water Systems

Under the 1986 amendments, water systems must adhere to more stringent water treatment, monitoring, and reporting requirements. According to EPA officials, many systems will have to install new equipment or modernize their infrastructure (i.e., distribution, storage, treatment, laboratory, and monitoring facilities) to comply with some of the new standards, particularly the new filtration requirement. Also, some systems will have to contract with certified laboratories to perform complicated

analytical services and hire skilled operators to take water samples and operate their facilities. EPA officials told us that these changes or improvements will be very expensive to many systems.

Table 4.1 summarizes EPA's latest available estimates of the number of community and noncommunity water systems affected by the new drinking water requirements and the total annual costs for implementing these requirements. It shows that compliance by water systems is projected to cost about $2.5 billion annually.[1] EPA officials stated that the numbers of water systems affected by each requirement and the annual compliance costs will probably be higher than the agency's estimates because the estimates (1) assume systems affected are in compliance with existing regulatory standards; (2) do not include costs for removing lead pipes and other plumbing fixtures, which is required under the lead and copper corrosion rule; and (3) do not include costs for regulating all 83 contaminants or costs for disinfecting surface water and groundwater supplies and controlling disinfection by-products.

Table 4.1: Estimated Annual Costs to Water Systems for Implementing 1986 Amendments to the Safe Drinking Water Act

1986 Dollars in millions

Rule	Number of systems affected	Annualized capital/ O & M costs[a]	Average annual monitoring cost	Total annual compliance cost
Volatile organic chemicals	1,824	$32.7	$23.1	$55.8
Filtration	10,228	511.6	17.1	528.6
Total coliforms	200,183	0	75.2	75.2
Synthetic organic chemicals	2,284	45.4	32.2	77.5
Inorganic chemicals	1,896	123.2	12.4	135.6
Lead/copper corrosion control	43,927	302.2	32.9	335.2
Radionuclides	22,867	790.3	2.6	792.9
Disinfection	103,354	474.8	12.8	487.7
Total	[b]	**$2,280.2**	**$208.3**	**$2,488.5**

Note: According to an economist in EPA's Office of Drinking Water, EPA presented its estimates in 1986 dollars to ensure consistency. Most estimates presented here result from regulatory and economic analyses EPA conducted in late 1986 and early 1987. Dollars are rounded to the nearest 100,000.

[a]Figures in this column include the estimated annualized costs over 20 years at a 10-percent discount rate and 1 year of annual operation and maintenance (O&M) expenses.

[b]The number of water systems affected can not be added together because some systems will be affected by multiple rules.

[1]Figures presented for water suppliers were taken from EPA's report Estimates of the Total Benefits and Total Costs Associated With Implementation of the 1986 Amendments to the Safe Drinking Water Act (Mar. 15, 1989).

EPA officials project that nearly all of the nation's 58,000 community water systems and the over 219 million customers they serve will be affected by one or more of the new regulations. The impacts on individual systems and consumers will vary depending on the applicable regulations and treatment requirements. The new filtration requirement is expected to be particularly costly to many water systems and, therefore, can cause increases in consumers' monthly water bills. For instance, EPA currently estimates that an average household receiving water from a small community water system that does not filter its water will see its monthly water bill increase by $30 to $50 when filtration costs are added. For the same size household served by a large system, EPA estimates that filtration will add $6 per month.[2]

Largest Impacts on Small Water Systems

A 1988 survey by the League of Women Voters Education Fund[3] found that many systems currently have serious financial problems that prevent adequate maintenance and treatment of their drinking water supplies. In most states, more than 90 percent of these troubled systems are classified as small systems. EPA's cost estimates show that compliance with the new drinking water requirements will affect water systems of all sizes; however, small systems will have greater difficulties meeting the new challenges. EPA officials explain that these small systems, which already account for more than 90 percent of current drinking water violations, lack the financial and technical resources needed to manage a water system. The EPA officials expect that the addition of new drinking water requirements, many of which will pose increased technical challenges, will only exacerbate problems for small systems.

EPA officials also suggested to us that such difficulties will inevitably increase compliance problems among small water systems. The problems officials are expecting include water systems that exceed MCL standards, fail to install required filtration equipment, do not perform required monitoring, or fail to take measures to prevent lead or copper corrosion.

[2]In contrast, EPA predicts that the monthly water bill for the same size household served by a small system that already filters its water will increase by an average of $2 to $6 per month, and households served by a large system that already filters its water will see their bills increase by about $1. EPA's analysis assumes that the average household contains 2.8 people and that each person uses 100 gallons of water per day.

[3]Conducted between December 1987 and June 1988, the League of Women Voters' survey was designed to identify the impact that complying with the 1986 amendments will have on water systems and states. The respondents included 572 local water officials in 49 states and state drinking water administrators in all 50 states and the Virgin Islands. The survey sample was composed mostly of larger water systems.

In addition, our contacts with state and EPA program managers suggest that the new requirements may lead some financially pressed water systems to find ways to avoid incurring additional expenditures. As noted in chapter 2, officials in all of the states we visited cited instances in which they detected or strongly suspected that water systems had falsified compliance data to make it appear that the systems were complying with drinking water requirements. While these officials believe such practices are not widespread, the incentives to engage in them will increase when expensive new regulations such as the filtration requirements take effect.

Impacts on States

Just as the 1986 amendments increased responsibilities for water systems, they also increased responsibilities for state drinking water programs. Among these new responsibilities is the authority to decide (1) the amount of monitoring water systems must conduct for regulated and unregulated contaminants, (2) which water systems must install filtration, (3) the vulnerability of water systems to certain types of contamination, and (4) when to issue variances and exemptions to the new requirements.

In 1988 EPA and the Association of State Drinking Water Administrators conducted a joint survey to obtain estimates of staff and funding resources states will need to implement the existing requirements and those established in the 1986 amendments.[4] Twenty-one of the 36 responding states reported that their resources are inadequate to meet current program requirements. Thirty-three of the states said that they have had to limit their drinking water program activities over the past 5 years because of insufficient funding and/or staffing.

According to the survey, it would cost states approximately $129 million annually to fully implement existing drinking water program requirements.[5] Of this total, $32 million is currently provided through federal grants and $63 million through state funding. The remaining $34 million represents the funding shortfall states said they have trying to comply with existing program requirements.

[4]A detailed questionnaire was sent to all states and territories. The 36 states and one territory that responded regulate approximately 78 percent of all community water systems.

[5]Because all U.S. states and territories did not respond to the survey, EPA and the Association extrapolated the results from the responding states and territory to obtain national estimates.

As table 4.2 indicates, the survey estimates that states will need over $185 million between 1987 and 1992 for onetime start-up costs to begin implementing many of the new requirements. After 1992, they will need approximately $152 million per year to meet the new requirements. According to EPA drinking water officials, states' initial and annual costs will actually be much higher because states' estimates, like those of the water systems discussed earlier, only include estimates for regulations EPA has promulgated or proposed and, therefore, do not include the cost of regulating all 83 contaminants or complying with the new disinfection treatment and disinfection by-product requirements.

Table 4.2: Estimated Initial and Annual Costs to States for Implementing 1986 Amendments to the Safe Drinking Water Act

1988 Dollars in millions

Rule	Initial implementation costs (1987-1992)	Total annual costs (after 1992)
Volatile organic chemicals	$18	$17
Filtration	39	14
Total coliforms	18	18
Inorganic and synthetic organic chemicals	21	17
Lead/copper corrosion control	47	38
Radionuclides	20	13
Others (sanitary surveys/inspections and data entry/reporting)	22	35
Total	**$185**	**$152**

Note: Dollars are rounded to the nearest million.

According to the survey results, state officials expect the lead/copper corrosion control and filtration requirements to be the most costly and to absorb the largest portion of their financial resources during the initial years. Other major program expenditures will include costs for conducting sanitary surveys, identifying and classifying water systems requiring filtration, performing assessments of systems' vulnerability to contamination, expanding laboratory capabilities, and taking formal enforcement actions. Also, state officials indicated that more resources will have to be dedicated to enforcement during the later years if water systems do not get additional resources to implement existing and new program requirements.

Important State Activities Could Be Reduced

Faced with resource shortages of this magnitude, some states may have to shift their work priorities or further limit some program activities to implement the existing and new requirements. According to EPA officials and the results of the study conducted by EPA and the Association of

State Drinking Water Administrators, the activities most states identified as "very likely to be limited" include staff training and development, special studies, and public participation and education. States also indicated they may limit their enforcement efforts, laboratory capabilities, and inspections/sanitary surveys because of scarce resources. Such forecasts are particularly disturbing in light of our findings in chapter 2 that more consistent use of such activities is central to any effort to improve compliance and better protect public health from contaminated drinking water.

According to EPA headquarters and regional officials, too, resource shortages will exacerbate the kind of enforcement problems we identified in chapter 3. Many states will be forced to target a smaller percentage of violators and will be less able to take appropriate enforcement actions against known violators in a timely manner.

Impacts on EPA

According to EPA officials, the 1986 amendments had a tremendous impact on EPA immediately after Congress passed the law, requiring the agency to prepare and implement regulations for 83 contaminants and other requirements. They said that the amendments' future impacts depend on whether states and water systems get the additional resources needed for their drinking water programs. If states and systems obtain sufficient resources, EPA's role will be limited to overall program management and oversight activities. If they do not, EPA will have to get involved more directly in program activities such as developing state regulations and guidance, monitoring water systems' compliance efforts, and taking appropriate enforcement actions when necessary.

According to EPA drinking water officials, a further complication, reported by some state officials, is that overwhelming program costs may lead their states to return primacy to EPA. Although no state has officially initiated such action, the EPA officials indicated that this possibility is a growing concern within the agency—particularly with regard to states that are already having serious financial problems implementing existing drinking water requirements. The officials assert that if EPA has to carry out all or portions of the states' program responsibilities because the states either return primacy or cannot implement their programs fully, EPA, too, will face severe implementation problems.

EPA Efforts to Help Water Systems and States Obtain Additional Resources

Spurred by the agency's growing concern with the resource shortfall (both within the drinking water program and agencywide), EPA conducted two studies to identify alternative financing mechanisms states and water systems can use to generate additional funds for their programs. The first study, conducted in 1988 by EPA's Office of Policy, Planning, and Evaluation, identified states' current use of such methods to support a variety of environmental programs.[6] The second study, initiated in May 1988 by EPA's Office of Water and completed in late 1989, identified financing alternatives that can be used to meet resource needs for complying with existing and new drinking water requirements.

Both studies showed that states are increasingly using alternate financing mechanisms—such as fees, taxes, bonds, fines, and penalties—to generate additional revenues for their environmental programs. The revenues derived from the options varied in amounts from state to state and program to program. Nevertheless, fees were found to be the most widely used option.

Complementing these analyses is a more direct effort by EPA's Office of Drinking Water to mobilize state and local governments, water systems, and private organizations to use creative approaches to find additional resources for state and local drinking water programs. Under its "Mobilization Strategy," the Office plans, among other things, to

- educate state decision makers (i.e., governors, legislators, public health and environmental officials, and budget officials) about the need for additional resources;
- help operators of small systems understand the new drinking water requirements, provide training and technical assistance through a variety of existing networks, and assist the systems in obtaining additional resources from larger systems and private organizations;
- identify readily available low-cost technological solutions for water systems, particularly small systems, to use in order to comply fully with the new regulations; and
- better inform the general public of health risks associated with contaminated drinking water and the importance of maintaining safe drinking water supplies (to generate support for higher water rates).

[6]The study included eleven states: Florida, Georgia, Iowa, Louisiana, Missouri, Nebraska, New Jersey, Ohio, Oregon, Pennsylvania, and West Virginia. The final report, entitled States Use Of Alternative Financing Mechanisms In Environmental Programs, was issued in June 1988.

Now that most of the new regulations have been either proposed or promulgated, EPA officials said that they have begun shifting their efforts more toward the mobilization strategy. They added that EPA is strongly encouraging states and water systems to use alternative financing mechanisms and the mobilization initiatives, respectively, to meet their resource needs.

Representatives of water systems and states told us, however, that while they agreed that financing alternatives and EPA's mobilization strategy will help to generate additional revenue for environmental programs, they are skeptical about whether these activities will generate enough funds to meet future program needs. These representatives told us that even under the best of circumstances, alternative financing mechanisms and the mobilization initiatives will not generate enough revenue to cover all existing and new drinking water program expenditures.

Nevertheless, while such activities may not offer a complete solution to the financial challenges facing the program, our fieldwork confirmed the usefulness of alternative financing in supporting vital program elements. Texas, for example, which, as noted in chapter 2, has the most comprehensive sanitary survey program among the states we visited, pays for the surveys through an annual fee charged to water systems. The fee also covers other state services such as the collection and analysis of chemical samples and technical assistance. Fees range from $50 for water systems with 1 to 49 service connections to $5,000 for systems with 200,000 or more connections. According to the Texas state program manager, because systems pay for the surveys as part of the annual fee, they actually press the state to conduct them in a timely fashion to be sure they get their money's worth.

Alternative financing also benefits Texas' enforcement program. As discussed in chapter 3, Texas chooses to rely on resource-intensive civil referrals rather than administrative orders. The state attorney general's office, staffed with 8 to 10 attorneys specifically dedicated to handle drinking water cases, has been highly successful in bringing civil actions in drinking water cases. Under a 1983 state law, the attorney general's office is credited with a portion of the income it generates in fines and penalties to cover reasonable attorneys' fees and court costs. In the

drinking water program, penalty assessments have been substantial, totalling over $165,000 in fiscal year 1989 alone.[7]

In contrast, states without such financing schemes have had to cut back on vital program elements. As noted in chapter 2, funding constraints have forced Washington to discontinue sanitary surveys. A 1988 consultant report also warned that the state's drinking water program staff will need to double to carry out its responsibilities adequately after the regulations under the 1986 amendments take effect. In addition to recommending increased support from the state general fund, the report recommended that program staff investigate "the development of user funding" to support various program activities.

Conclusions

As required by the 1986 amendments to the Safe Drinking Water Act, EPA has issued or proposed many new regulations that will significantly affect EPA, states, and nearly all of the nation's 58,000 community water systems. Although actual impacts of the new drinking water requirements will not be known until all new regulations become effective, water systems (particularly small systems) are expected to incur enormous financial costs and face difficult new compliance challenges. Already facing huge gaps between program costs and available funding, states will see their own regulatory costs increase by hundreds of millions of dollars annually. With water systems and states both experiencing increased difficulties implementing the program, EPA also expects a correspondingly greater burden on its own resources.

While we emphasize in chapter 3 that improved enforcement is needed to encourage better compliance among water systems, EPA's alternative financing efforts reflect the reality that better enforcement alone will not do the job. Additional resources will be needed to increase water testing, perform sanitary surveys, train operators, and perform a variety of other activities needed to ensure the safety of the nation's drinking water. While EPA's alternative financing efforts are by no means a complete answer to the resource question, our own fieldwork suggests that these efforts offer some hope that vital program activities can be funded.

[7]Through April 1989, Texas had assessed $168,660 in penalties. According to program officials, the attorney general's office historically has collected approximately 90 percent of the amounts assessed.

Adverse Health Effects Associated With Ingesting Contaminated Drinking Water

According to officials from EPA and the Centers for Disease Control (CDC), over 600 contaminants have been detected in the nation's drinking water supplies. Some of the contaminants (such as fluoride, cadmium, and arsenic) occur naturally in drinking water, while others (such as alachlor and chlordane) are man-made. Generally man-made contaminants get into drinking water supplies through improper waste disposal, broken or faulty plumbing fixtures, agricultural runoff, leaks from underground gasoline and petroleum storage tanks, and discharges from power plants or medical facilities.

According to EPA and CDC officials, the type of health problems that can result from consuming contaminated drinking water depend on the contaminant, level of contamination in the water, susceptibility of the person consuming the water, and length of time a person consumed the contaminated water. Overall, EPA officials classify known and/or suspected health problems into three broad categories: acute, chronic, and carcinogenic effects.

Acute health effects result mainly from microbiological contamination. EPA officials told us that the effects usually appear from 1 hour to several days after ingestion. Gastroenteritis is the most common acute illness associated with ingesting contaminated drinking water. Other acute effects include headaches, vomiting, mild stomach cramps, mild cases of diarrhea, fatigue, and nausea. These symptoms generally last only a few hours or days and, for the most part, disappear without professional medical treatment.

Chronic health effects generally appear after longer incubation periods. EPA and CDC officials told us that these effects may not appear until years later and still not be attributed to contaminated drinking water. The most commonly known chronic health effects include hepatitis, and damage to the liver, kidneys, heart, and other body organs/systems.

The most dangerous potential health effects involve contaminants that cause carcinogenic effects. These effects are the most difficult to detect and attribute to contaminated drinking water. Most information available on the chronic and carcinogenic health effects is based on the results of laboratory tests performed on animals.

The following table lists 66 of the 83 contaminants EPA must regulate in accordance with the 1986 amendments to the Safe Drinking Water Act, and the known or suspected adverse health effects associated with

them. At the time of our review, EPA had not identified the adverse health effects associated with the remaining 17 contaminants.

Table I.1: Adverse Health Effects Associated With Drinking Water Contaminants

Contaminant	Adverse health effects
Volatile organic chemicals	
1. Benzene	Central nervous system effects, nausea, dizziness, and vomiting; also increases the risk of leukemia
2. Carbon Tetrachloride	Liver, kidney, and lung effects; also is a possible cancer-causing agent
3. 1,2-Dichloroethane	Heart, liver, kidney, and central nervous and circulatory system effects; also is a possible cancer-causing agent
4. Para-Dichlorobenzene	Kidney, liver, and central nervous, pulmonary, and circulatory system effects; also is a possible cancer-causing agent
5. 1,1-Dichloroethylene	Heart, liver, kidney, and central nervous system effects; also is a possible cancer-causing agent
6. Tetrachloroethylene	Liver, kidney, and central nervous system effects; also is a possible cancer-causing agent
7. 1,1,1,-Trichloroethane	Liver, central nervous and circulatory system effects
8. Trichloroethylene	Heart, liver, kidney, and central nervous system effects; also is a possible cancer-causing agent
9. Vinyl Chloride	Kidney, liver, and central nervous, cardiovascular, and pulmonary system effects
10. Cis-1,2-Dichloroethylene	Central nervous system, liver, and kidney effects
11. Trans-1,2, Dichloroethylene	Central nervous system, liver, and kidney effects
12. Chlorobenzene	Central nervous system, liver, and kidney effects
Microbiological contaminants and turbidity	
13. Total Coliforms	Although not necessarily disease-producing organisms, coliforms can be indicators of other organisms that cause assorted gastroenteric infections, dysentery, hepatitis, typhoid fever, and cholera.
14. Giardia Lambliaa	Gastrointestinal disorders such as diarrhea and abdominal cramps
15. Viruses[a]	Gastroenteritis, diarrhea, meningitis, and paralysis
16. Turbidity[a]	Interference with disinfection
17. Standard Plate Count[a] (Heterotrophic bacteria count)	Diarrhea, cramps, nausea, headaches, and fatigue
18. Legionella[a]	Diarrhea, cramps, nausea, headaches, and fatigue
Inorganic chemicals	
19. Asbestos	Benign tumors and, possibly, cancer of the stomach and pancreas
20. Barium	Gastrointestinal distress, hypertension, neuromuscular and cardiovascular system effects
21. Cadmium	Kidney and liver damage, gastrointestinal distress, anemia, hypertension, renal dysfunction, and bone damage
22. Chromium	Respiratory disorders, internal hemorrhage (bleeding), liver and kidney damage, nausea, vomiting, and gastrointestinal effects
23. Mercury	Gastrointestinal distress; kidney failure; and central nervous system effects, such as hearing impairments and speech and mental disturbances
24. Nitrate	"Blue Baby Syndrome" (i.e., asphyxiation by altering the oxygen-carrying capacity of the blood system), neuromuscular effects, kidney and central nervous system effects

(continued)

Contaminant	Adverse health effects
25. Nitrite[b]	Same adverse health effects as for nitrate
26. Selenium	Lesions of the heart, kidneys, and spleen; heart, liver, kidney, gastrointestinal and neurological effects
27. Arsenic	Hepatic and kidney damage and nervous system effects
28. Fluoride	Skeletal damage and dental fluorosis, i.e., brown staining or pitting of permanent teeth
29. Antimony	Nausea, vomiting, and abdominal cramps
30. Nickel	Gastrointestinal problems
31. Sulfate	Diarrhea; gastroenteritis; and dehydration, particularly in infants
32. Lead	Delays in neurological and physical development, brain damage, peripheral nerve dysfunction, increased blood pressure, low birth weight, and kidney and central nervous system effects
33. Copper	Gastrointestinal disturbances; anemia; and liver, kidney, and renal damage
34. Cyanide	Hyperventilation, vomiting, tremors, convulsions, and death.
Organic chemicals	
35. Endrin	Kidney and nervous system effects, convulsions, headaches, dizziness, sleeplessness, weakness, and/or loss of appetite
36. Alachlor	Liver effects and tumors in lungs, stomach, and thyroids; also is a possible cancer-causing agent
37. Atrazine	Nervous system, liver, and heart effects
38. Chlordane	Liver and central nervous system effects; also is a possible cancer-causing agent
39. Dibromochloropropane (DBCP)	Kidney, liver, and antifertility effects; also is a possible cancer-causing agent
40. 1,2-Dichloropropane (DCP)	Liver, lung, and kidney effects; also is a possible cancer-causing agent
41. 2,4-D	Liver and kidney effects, skeletal muscular changes, and muscular incoordination
42. Epichlorohydrin[a]	Kidney, central nervous system, lung, and liver effects; infertility; possibly cancer
43. Ethylene dibromide	Lung, liver, spleen, kidney, and central nervous system effects; also is a possible cancer-causing agent
44. Lindane	Central nervous system, liver, and kidney effects
45. Methoxychlor	Central nervous, liver, kidney, and reproductive system effects
46. Polychlorinated Biphenyls (PCBs)	Liver and reproductive and nervous system effects; also is a possible cancer-causing agent
47. Pentachlorophenol	Liver, kidney, and central nervous and reproductive system effects
48. Toluene	Speech, vision, and hearing problems; impaired memory; and kidney, lung, liver, and central nervous system effects
49. Toxaphene	Central nervous system, liver, and kidney effects; also is a possible cancer-causing agent
50. Acrylamide[a]	Peripheral nerve and muscular damage, tumors; also is a possible cancer-causing agent
51. Ethylbenzene[b]	Liver, kidney, and nervous system effects/disorders
52. Heptachlor epoxide[b]	Central nervous system disturbances and altered liver functions; also is a possible cancer-causing agent
53. Carbofuran	Drowsiness, dizziness, anxiety, vomiting, and nervous and reproductive system effects
54. Aldicarb Sulfoxide[b]	Nervous system effects
55. Aldicarb Sulfone[b]	Nervous system effects
56. 2,4,5-TP (Silvex)	Stomach irritation, depression, and kidney and liver effects
57. Xylene	Central nervous system and liver effects
58. Styrene[b]	Central nervous system and liver effects; also is a possible cancer-causing agent

(continued)

Contaminant	Adverse health effects
59. 2,3,7,8-TCDD (Dioxin)	Liver damage
60. Heptachlor[b]	Central nervous system and liver effects; also is a possible cancer-causing agent
61. Aldicarb	Central nervous system effects
Radionuclides	
62. Radium 226 and 228	Bone cancer
63. Beta particle and photon	Cancer of the lungs, bones, head cavities, and leukemia
64. Uranium	Kidney effects and cancer in skeletal tissues
65. Gross alpha particle activity	Cancer
66. Radon	Lung cancer

[a]Treatment techniques have been proposed in lieu of an MCL for this contaminant.

[b]The 1986 amendments allow EPA to substitute up to seven contaminants if regulation of the substituted contaminants would achieve greater protection of public health. On January 13, 1988, this contaminant was added as a substitute to the list of 83 contaminants.

Scope and Methodology for Review of State Enforcement Cases

As discussed in chapter 1, we reviewed a judgmental sample of 95 SNC violations at 75 community water systems located in six states. The objective of our review was to examine the states' enforcement performance. Accordingly, we designed our review to include all possible categories of cases. Individual review cases within each category were selected randomly. The following sections provide more detailed information on the selection of specific cases for our review. Our results represent only the cases reviewed and not all significant noncompliance cases nationwide.

Six States Selected

Because a nationwide sample was not feasible given time and resource constraints, we visited six states to gain insights into drinking water program enforcement. We selected two states in each of three geographically dispersed regions—Massachusetts and Vermont, in Region I; Oklahoma and Texas, in Region VI; and Oregon and Washington, in Region X—and planned to review at least 15 cases within each state.

Universe for Our Review Included All Types of SNC Violations

We chose 1987 as the base year for our review because we wanted to include cases that were initiated after EPA's enforcement policy was implemented in October 1986. In addition, we wanted SNC violations that were as recent as possible without being so new that one would not expect the states to have responded. We decided that selecting SNC violations identified during 1987 would allow sufficient time for state and EPA enforcement actions to occur.

Our universe of SNC violations was compiled from September 30, 1987, SNC lists that EPA generated from its data management system for all six states. These lists included SNC violations involving (1) monitoring and MCL violations for turbidity and microbiological contaminants, (2) monitoring violations for total trihalomethane contaminants, and (3) MCL violations for chemical and radiological contaminants (including total trihalomethanes). The EPA data were incomplete, however, because the agency's data management system cannot identify SNC violations resulting from noncompliance with chemical and radiological monitoring requirements. (See chapter 2 for further discussion.) Thus, to include these SNCs in our universe, we relied upon data that the states supplied to EPA. EPA compiled this data and determined that these SNCs were identified as of January 1987. Although this SNC list was developed 9 months earlier than the September 30, 1987, SNC lists generated by EPA, using it was the most feasible way to ensure that our universe included all types of SNC violations.

Reporting Categories for Enforcement Review

We also wanted to ensure that our enforcement reviews included all types of cases. Based on the reporting categories used in EPA's tracking system, several types of cases were possible:

- The state could have taken one of four enforcement actions deemed appropriate under EPA's enforcement policy: bilateral compliance agreement (BCA), administrative order (AO), civil referral (CR), or criminal filing.
- The water system could have returned to compliance (RTC).[1]
- The case could be classified as "none of the previous" (or pending), denoting that the water system had neither returned to compliance nor been subject to an appropriate state enforcement action.

The review cases selected are presented in Table II.1 by reporting category and by state. For each reporting category, "U" designates the universe of SNCs, and "R" represents the number of SNCs reviewed during our analysis.

[1]Under EPA's definition, a system may be categorized as returned to compliance if, in the case of the microbiological and turbidity contaminants, the system has no monitoring or MCL violations for a period of 6 consecutive months. For the chemical and radiological contaminants, a system may be categorized as returned to compliance if it has conducted the required monitoring and if the test results show that the water quality is within the MCL.

Table II.1: Review Cases by Reporting Category and by State

State	Number of cases by reporting category											
	RTC		BCA		AO		Civil		Pending		Total	
	U	R	U	R	U	R	U	R	U	R	U	R
MA	0	0	0	0	2	2	0	0	2	2	4	4
OK	8	3	3	3	1	1	1	1	26	7[a]	39	15
OR	215	2[b]	40	4[a]	15	5	0	0	16	5[c]	286	16
TX	20	4	0	0	1	0[d]	2	2	105	12[a]	128	18
VT	4	4	6	6	0	0	0	0	5	5[e]	15	15
WA	206	2[b]	6	4	27	11	3	3	313	7[a]	555	27
Total	**453**	**15**	**55**	**17**	**46**	**19**	**6**	**6**	**467**	**38**	**1,027**	**95**

[a]We initially selected an additional case for review in this category, but eliminated one case because it did not qualify as a SNC violation as of the end of fiscal year 1987.

[b]We initially selected two additional cases for review in this category, but eliminated two because they did not qualify as SNC violations as of the end of fiscal year 1987.

[c]We initially selected seven cases for review, but eliminated two because the water systems did not qualify as community water systems.

[d]We selected this case for review, but found that the administrative order was issued by EPA and not the state. We actually reviewed this case as a pending case, and it is included in the total reviewed in that category.

[e]We initially selected an additional case for review, but eliminated one case because the water system did not qualify as a community water system.

For each of the six states selected for review, we (1) obtained state follow-up reports[2] applicable to the SNC lists in our universe, (2) recorded the status of each case as reported by the state, and (3) sorted this data base by reporting category. Since none of the six states reported any criminal actions during our sample period, we sorted the SNC violations into the other five categories and then selected our review cases.

SNC Violation Selection Method

Our plan was to select at least 15 cases in each of the six states we visited. The 15 cases selected within a state were to include three randomly selected cases from each of the five available reporting categories. However, Massachusetts had a total of 4 SNC violations in the universe, and Vermont had 15; in each case, we reviewed all SNC violations for those states. In some instances, the other states had fewer than three cases

[2]To determine whether states are taking timely and appropriate action, EPA periodically requires the states to submit status reports on each SNC violation. To the maximum extent possible, we recorded the status of each case using the state follow-up reports that were submitted when the period allowed for timely enforcement action had elapsed—8 or 14 months after the applicable SNC lists were issued, depending on the type of violation. EPA's timely and appropriate enforcement policy is discussed in greater detail in chapter 3.

within a particular reporting category. Whenever this occurred, we selected additional cases from the remaining categories to bring the total cases reviewed within a state to 15, whenever possible. Our first choice in making these additions was to select cases for which the states reported enforcement actions, but when that option was not available, we added cases from the pending category. (In most states, pending cases represented the largest category.)

We eliminated 11 cases from our review because, upon examining the case files, we learned that (1) the water system responsible for the violation did not qualify as a community water system or (2) the case did not actually qualify as an SNC violation as of the end of fiscal year 1987.

Whenever a state had more than three cases within an individual reporting category, we randomly selected our review cases. When a state had three or fewer cases within a particular reporting category, we reviewed all cases in that category.

Some of the cases selected for our review involved water systems that had multiple SNC violations. Whenever an SNC violation was selected in one reporting category, we reviewed all other SNC violations committed by the same community water system during the review period. If a subsequent random case selection involved another SNC violation committed by a previously selected water system, a new selection was made. In other words, once a water system was selected, it could not be selected again. In total, we reviewed 95 SNC violations involving 75 community water systems. Sixty-one of these systems had a single SNC violation during the sample period, and 14 systems had multiple violations. Of these 14 systems, 11 had two violations, 1 had three violations, 1 had four violations, and 1 had five violations.

For each of the selected water systems, we conducted a detailed file review and interviews with state program managers. As necessary, we also discussed the cases with EPA regional officials. The results of our case reviews and our analysis of state enforcement performance are presented in chapter 3.

Summary of EPA's Efforts to Issue New Drinking Water Regulations Required by the 1986 Amendments to the Safe Drinking Water Act

(As of December 31, 1989)

Requirement	Statutory deadline	Status of EPA's efforts
1. Set maximum contaminant levels or treatment techniques and monitoring/ reporting requirements for 83 contaminants	6/19/87 for 9 contaminants	4/2/86—final regulation issued for one inorganic chemical (fluoride).[a] Final regulation became effective 10/2/87.
		7/8/87—final regulations issued for eight volatile organic chemicals (VOCs). Final regulations became effective 1/9/89.
	6/19/88 for 40 contaminants	8/18/88—proposed regulations issued for two inorganic contaminants (IOCs): lead and copper. Final regulations scheduled for promulgation in fall of 1990.
		5/22/89—proposed regulations issued for 38 contaminants: 30 synthetic organic chemicals (SOCs) and 8 IOCs. Final regulations scheduled for promulgation sometime in 1990.
	6/19/89 for 34 contaminants	6/29/89—final regulations issued for total coliforms contaminants. Final regulations will become effective 12/31/90.
		6/29/89—final regulations issued for remaining five microbiological contaminants. Final regulations to become effective 12/31/90.
		EPA plans to issue proposed regulations for the remaining 28 of the 83 contaminants by September 1990.
2. Issue filtration criteria for surface water systems	12/19/87	6/29/89—final filtration rule issued. Final rule to become effective 12/31/90.
3. Issue first regulations for monitoring unregulated contaminants	12/19/87	7/8/87—final monitoring requirements issued for 51 unregulated contaminants.
		5/22/89—proposed monitoring requirements issued for 100 additional unregulated contaminants.
4. Publish first Drinking Water Priority List	1/1/88 and every 3 years thereafter	1/22/88—first priority list published.

(continued)

Requirement	Statutory deadline	Status of EPA's efforts
5. Develop lead/copper corrosion control treatment regulation	6/16/88	8/18/88—proposed regulations issued for treatment of lead/copper corrosion control. Final regulations scheduled for promulgation in fall of 1990.
6. Issue disinfection treatment regulations, including criteria for granting variances, for all public water systems	6/19/89	6/29/89—final disinfection regulations issued for surface water systems. Final regulations become effective 12/31/90. EPA plans to issue proposed regulations for disinfection treatment of groundwater systems and disinfection by-products sometime in 1991. Final regulations scheduled for promulgation in 1992.
7. Promulgate regulations for at least 25 contaminants on the Drinking Water Priority List	1/1/91 and every 3 years thereafter	Office of Drinking Water staff plan to issue proposed regulations for these contaminants in early 1990.

[a]Fluoride was 1 of 26 contaminants regulated before enactment of the 1986 amendments. EPA issued revised fluoride regulations in 1986 to comply with the new drinking water requirements.

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