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Report to the Chairman, Subcommittee on Hazardous Wastes and Toxic Substances, Committee on Environment and Public Works, U.S. Senate

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GROUNDWATER STANDARDS

States Need More Information From EPA

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Program Evaluation and
Methodology Division

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The Honorable Max Baucus
Chairman, Subcommittee on Hazardous Wastes and
Toxic Substances
Committee on Environment and Public Works
United States Senate

Dear Mr. Chairman:

On January 9, 1986, you asked the U.S. General Accounting Office to conduct a series of evaluations in the area of groundwater protection. This report is the second in response to your request. The overall objective of this evaluation was to determine the extent to which state needs for information about groundwater contaminants are being met by technical documents currently prepared by the Environmental Protection Agency (EPA) through several different programs. In this report, we describe the information about groundwater contaminants that is available to the states for setting groundwater standards. Because the states rely heavily on federal drinking water standards to set groundwater standards, we also describe the drinking water standards that already exist and those that are planned for development. Finally, we present our recommendations for closing the gap between the groundwater-contaminant information that is available and the information that is needed.

Presently, there is no federal program for establishing standards for groundwater contaminants; many states have developed their own standards. But while these states have taken the initiative, they report that the information about contaminants that was accessible to them for the standard-setting process was often less than they needed. In addition, some states report a good deal of duplicative effort in developing their standards. Still other states have been deterred from implementing standards programs by the lack of information. Our report entitled Groundwater Quality: State Activities to Guard Against Contaminants (GAO/PEMD-88-5, February 1988), which we prepared for you, documents these conclusions.

With these issues in mind, we developed four evaluation questions for this second study: (1) What types of information do the states need in order to set groundwater standards? (2) To what extent is the information that the states need currently available in EPA documents? (3) Since

the states readily adopt drinking water standards as groundwater standards, what drinking water standards have been set and what standards are planned for development? (4) Is there a need for more information on groundwater contaminants and, if so, how can the need be satisfied?

We employed a different method for each evaluation question. We briefly discuss our methods within this letter. A more complete discussion is in appendix II, "Objective, Scope, and Methodology."

What Types of Information Do the States Need?

The states have assumed the major responsibility for protecting groundwater and have discharged that responsibility in a variety of ways. We surveyed the persons responsible for groundwater protection in the 50 states and 7 territories.[1] In our earlier report to you, we used the survey results to outline the states' groundwater protection activities and to describe the information needs expressed by the state officials.

Through that survey, we found that 26 states have set numerical standards for groundwater contaminants and that 65 percent of these states believe they are constrained in their standard-setting efforts by inadequate information. The state officials indicated, and we have concluded, that the information base does not meet the requirements for establishing groundwater standards. Moreover, 88 percent of the respondents from states with either numeric or narrative groundwater standards said that, rather than relying on drinking water standards to a "great" or "very great" extent for setting groundwater standards, they developed groundwater standards independently.

To understand the states' needs more precisely, we asked our respondents to consider 12 information areas that we had identified—with the assistance of members of the committee on groundwater of the National Academy of Sciences—as being important for setting groundwater standards:

1. the analytical chemistry of substances,

2. the environmental fate of substances (that is, information on the long-term behavior of contaminants in the environment),

3. the presence of substances in groundwater and their proximity to groundwater users,

[1] In this report, we refer to the states and territories collectively as "states."

4. the amount and location of the production and disposal of substances in the states,

5. monitoring methods for contaminants,

6. the technological feasibility of control,

7. human exposure,

8. the effects of contaminants on human health,

9. existing guidelines and standards,

10. references for further information,

11. contacts for additional information, and

12. how to use the information in setting groundwater standards.

The respondents from the majority of the states cited all but the third and fourth information areas as "moderately important," "very important," or "essential" for setting the standards. They also saw the federal government as the principal source of this information. (A more complete discussion of our findings in this area is in appendix III.)

To What Extent Is the Information Available From EPA?

The most basic type of information that the states have used for setting groundwater standards is drinking water standards. From our survey, we learned that when drinking water standards do exist, they are generally adopted as groundwater standards. Twenty-two drinking water standards for individual contaminants had been issued prior to July 1987; 20 of the 22 are being revised.[2] In 1982 and 1983, EPA's office of drinking water announced that it was reviewing 63 other contaminants for possible regulation. In July 1987, EPA issued standards for 8 of these contaminants.

Because of the states' need for technical information and the dependence of the states on federal research (as we found it through our survey), we sought to determine how much technical information for setting groundwater standards is already available from EPA. We reviewed EPA's published technical documents containing information on

[2]EPA has decided not to revise the standards for silver and total trihalomethanes.

the 83 contaminants referred to above. In the opinion of the director of EPA's office of groundwater protection, this office would consider these 83 contaminants first, were it directed to issue criteria documents for groundwater contaminants.[3] (Our analysis of EPA information available to the states is in appendix IV. In appendix V, we discuss EPA's progress in setting standards for the 83 contaminants under review and recent action by the Congress to hasten EPA's work.)

Criteria documents reporting information on contaminants of concern are issued by a number of program offices within EPA. They may be prepared as background to a regulatory action or as general information, and they vary in breadth and detail. Several program offices prepare their own documents, so that information on a single contaminant sometimes overlaps. EPA does not issue criteria documents on pollutants as contaminants of groundwater resources.

We identified 247 documents that deal with 1 or more of the 83 contaminants. We examined them for the 12 types of information applicable to setting groundwater standards. In our review of the 247 EPA criteria documents, we found that some information areas were fairly well covered for the 83 contaminants. For example, there was information on effects on human health for 74 of the 83 contaminants. However, we identified a substantial gap between what is currently available on the 83 contaminants and what would be needed if groundwater standards were to be developed. That gap was the most significant for 8 of the 83 contaminants: we found no information for these 8. For an additional 15 substances, fewer than 6 of the 12 information areas were covered by existing criteria documents. We found no information on how to set groundwater standards. We also found that no collection of documents (or document series) for a single contaminant covered all 12 areas of information.

It is important to note that EPA has not been assigned the responsibility of developing technical information for pollutants as groundwater contaminants. Moreover, the Congress has not given EPA general authority to set groundwater standards. Because none of the documents we reviewed was published to provide information specifically on groundwater contaminants, it is not surprising that the information we did find

[3]We use the term "criteria document" to include both documents entitled "criteria documents" and several major EPA documents that do not necessarily use the word "criteria" in the title but that represent substantial sources of information pertaining to toxic substances.

was not always relevant to the states' needs. For example, information on environmental fate usually pertained to air or to surface water.

If the states are to set technically sound groundwater standards, they will need more information from EPA or elsewhere. Working with current information resources is difficult because, although many of the 247 EPA contaminant documents provide some information related to groundwater contaminants, no single document series is devoted specifically to groundwater contaminants. A substantial effort would be required to synthesize information for any one contaminant.

What Drinking Water Standards Have Been Set and Are Being Planned?

EPA is developing drinking water standards beyond the 22 that have existed since 1979, as required by the 1986 amendments to the Safe Drinking Water Act (Public Law 99-339). Two types of standards are set for each drinking water contaminant that EPA regulates: one is a health-based goal known as "maximum contaminant level goal," and the other is an enforceable standard known as "maximum contaminant level."[4] In 1982 and 1983, EPA announced that it was considering reexamining 21 of the 22 standards that then existed and setting standards for an additional 62 contaminants. (See tables V.2 and V.3.)

EPA's operating plan for fiscal years 1986 and 1987 set the development of new standards in the drinking water program "among the highest priorities for the Agency." The Safe Drinking Water Act Amendments of 1986 directed that maximum contaminant levels for 9 substances be established by June 1987, for an additional 40 substances by June 1988, and for the remaining 36 contaminants or their substitutes by June 1989. In July 1987, EPA had completed work on 9, had begun but not completed work on 37, and had taken work on 39 up to the original advance notice of proposed rulemaking.[5] The standards that had been issued by July 1987 were for fluoride and a group of 8 volatile organic compounds.

[4]Prior to the 1986 amendments, the maximum contaminant level goal was known as "recommended maximum contaminant level."

[5]There have been a number of changes in the list. Aldicarb sulfone, aldicarb sulfoxide, ethylbenzene, heptachlor, heptachlor epoxide, nitrite, and styrene have been substituted for aluminum, diboromoethane, molybdenum, silver, sodium, vanadium, and zinc, and 2 other substances (Ortho- and meta-dichlorobenzene) have been split off from their isomer (para-dichlorobenzene) and will be treated separately, making the number of substances 85 rather than 83. We focused on the 83 original contaminants for consistency.

We found that 260 substances are regulated by one or more states as groundwater contaminants. There is a significant difference between this number and the 30 substances regulated under federal drinking water standards.[6] If EPA meets the timetable set out in the Safe Drinking Water Act Amendments of 1986, the difference will be narrowed. However, there will very likely still be a gap between the number of groundwater contaminants the states are concerned about and the number EPA regulates as drinking water contaminants. Therefore, the states' requirements for information upon which to set groundwater standards cannot be fully met by the information to be developed in the near term.

A state's regulation of a groundwater contaminant does not in itself imply that the contaminant is a national concern. We have not reviewed the rationales upon which states have determined that certain contaminants should have standards established for them. We simply point out that EPA has decided to allow the states to decide which contaminants to regulate and that even after EPA establishes new drinking water standards, there will still be a large gap between the number of contaminants regulated by the states and the number regulated by EPA.

Is There a Need for More Information and How Can It Be Met?

In the absence of a federal program to establish groundwater standards, 41 of the 57 states and territories have set their own numeric or narrative standards for some contaminants. (The median number of contaminants regulated by state statute is 35.) Many state officials believe they are prevented from effectively setting standards by a lack of information on groundwater contaminants. When the states do proceed on their own, they often duplicate one another's efforts in collecting and analyzing information. A substantial gap exists between the information requirements of the states for setting groundwater standards and the information that is available from the federal sector. Additional information about contaminants should be developed and disseminated if state standards are to be developed in an efficient and technically sound fashion.

The information that does exist on a given contaminant is often dispersed in several different documents, making it harder to use; some information may be overlooked altogether. The states' standard-setting programs would benefit the most from a single, centralized reference source for groundwater contaminants—that is, a criteria document

[6]The standards for the 8 volatile organic compounds do not take effect until January 1989, but they are included in the 30.

series. The Environmental Protection Agency is clearly the appropriate organization to develop such information.

EPA has a history of serving as a reference source for drinking water, surface water, and other regulatory areas. In addition, EPA has some regulatory responsibilities for groundwater, has developed and provided a national groundwater protection strategy to state governments, and continues to work closely with the states. During fiscal years 1985 and 1986, EPA dispensed approximately $14 million in grants to assist the states in designing and implementing groundwater protection programs, many of which rely on EPA's standards. EPA recognizes the use of standards as tools for establishing specific goals for groundwater protection, determining compliance with and enforcing those goals, and assessing the success of protection programs. Providing the information the states need to establish groundwater protection standards would be consistent with EPA's current goals and efforts.

Finally, we do not believe that groundwater criteria documents should necessarily be established for the contaminants that EPA has proposed to regulate under the drinking water program. The risks that some substances pose for groundwater may be different from the risks they pose for drinking water. (Our detailed findings for this evaluation question are in appendix VI.)

Recommendation

EPA should establish a criteria document program for groundwater contaminants. The groundwater contaminants addressed should be those that pose the greatest risks.

EPA's Comments and Our Response

In its comments on a draft of this report, EPA agreed that information that would be useful to the states in setting groundwater standards is scattered among several types of documents issued by various EPA offices and that EPA should improve its ability to provide information to the states. (EPA's letter is in appendix VII.) EPA pointed out that it is currently conducting research in some of the technical areas where we think additional information is needed. However, the agency disagreed with our recommendation that it institute a criteria document program for groundwater contaminants. EPA maintained that carrying out our recommendation would be "time-consuming and resource-intensive." The agency suggested that the information gap could be more efficiently bridged by consolidating the information that is already available from other EPA programs.

EPA's proposal to consolidate the information that it has already collected would alleviate the problem of information that is dispersed through several different programs and, therefore, not likely to be used by the states. However, because the proposal would not consistently add to the limited information base already available, it would not fully respond to the needs of the states in setting groundwater standards. Moreover, EPA may have overestimated the effort required to create the groundwater criteria documents. We were not suggesting that the agency go through a lengthy administrative process, and our recommendation would not require the agency to embark on a process as time-consuming as EPA suggests.

Copies of the report are being sent to the administrator of the Environmental Protection Agency and will be made available to interested organizations, as appropriate, and to others upon request.

Sincerely yours,

Eleanor Chelimsky
Director

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Tables

Abbreviations

EPA	Environmental Protection Agency
GAO	General Accounting Office
NAS	National Academy of Sciences

Request Letter

January 9, 1986

The Honorable Charles A. Bowsher
Comptroller General
U.S. General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Bowsher:

In recent years, the nation has awakened to the threat of groundwater contamination. Groundwater contamination has been detected in every state. It has been linked to adverse health, economic, and social impacts. Clearly, understanding the groundwater issue is vitally important.

I have had a long-standing and continuing interest in groundwater protection, as evidenced by numerous hearings within the Subcommittee on Toxic Substances and Environmental Oversight and recent legislation (S. 1836) sponsored by several Committee members.

One major issue raised during the hearings and included in the legislation and one area where additional information is desperately needed, is in the groundwater standards setting process. In this regard, Committee staff have raised the subject with staff from your Program Evaluation and Methodology Division. It would be useful to the Congress for the General Accounting Office to explore various descriptive and informational questions including, but not limited to:

1. How do states set groundwater standards? How do these standards and the process from which they are derived differ across states?

2. Since some research suggests that EPA drinking water standards are often adopted by states as groundwater standards, how are EPA's drinking water standards derived? Do clean water criteria documents provide a more useful framework for states to set groundwater standards?

3. What uncertainties exist in EPA's standards? How methodologically defensible are EPA's standards setting protocols? Are drinking water standards directly transferable as groundwater standards?

The groundwater issue will remain important to the Committee's efforts throughout 1986. I request that the General Accounting Office staff work closely with the Committee to provide information and documents as needed and as negotiated during that period.

I look forward to an important cooperative effort. The contact point on our staff for this study will be Ron Cooper. Please ask your staff to coordinate all aspects of this study with him.

With best personal regards, I am

Sincerely yours,

Max Baucus

Objective, Scope, and Methodology

Our Objective

Our specific objective was to answer the following evaluation questions, which were derived from the congressional request letter:

- What types of information do the states need to set groundwater standards?
- To what extent is the information that the states need currently available in EPA documents?
- Since the states readily adopt drinking water standards as groundwater standards, what drinking water standards have been set and what standards are planned for development?
- Is there a need for more information on groundwater contaminants and, if so, how can the need be satisfied?

Our Methodology

To address these questions, we used a variety of approaches. We surveyed 57 states and territories to identify the extent of their efforts to establish groundwater standards and the types of information they need. (See Groundwater Quality: State Activities to Guard Against Contaminants (GAO/PEMD-88-5, February 1988), for a complete discussion of the survey.) For the survey, we developed a list of the types of technical information that are essential for setting numerical groundwater standards, and we asked state officials about the importance of the availability of such information from the federal government. Using the same list, we reviewed the EPA criteria documents developed under several different programs to determine the extent to which these documents contain these types of information. Finally, we examined the formal regulatory process by which federal drinking water standards are set, and we reviewed EPA's activities for setting drinking water standards.

The Types of Information the States Need

From our review of groundwater literature and the type of information contained in a variety of EPA technical documents, we developed a preliminary list of the types of technical information necessary for setting groundwater standards. Then we contacted members of the committee on groundwater of the National Academy of Sciences to obtain their views on our preliminary list. We used their responses to produce the final list of 12 types of information needed for setting numerical groundwater standards:

1. analytical chemistry: information about the methods available for measuring the level or concentration of contaminants and a consideration of data on precision and accuracy for determining the levels at which substances can be accurately measured;

2. environmental fate: information on the long-term behavior of substances in the environment, including the rate at which their chemical structures change under various conditions;

3. presence in groundwater: specific information on the presence and concentration of substances, obtained through groundwater samples, and their proximity to the users of groundwater;

4. amount and location of production and disposal: specific information on plant locations and disposal sites where contaminants are concentrated;

5. monitoring methods: information on approaches for collecting samples of contaminants in order to determine their concentration;

6. technological feasibility of control: information on the technological effectiveness and cost of removing contaminants from groundwater;

7. human exposure: information on the potential levels of human exposure, the various pathways of exposure, and the relative contribution of each pathway in relation to total exposure;

8. human health effects: toxicological data on contaminants, including information on metabolism, acute effects, chronic effects, target organ toxicity, carcinogenicity, and mutagenicity;

9. existing guidelines and standards: information on guidelines or standards for substances, such as drinking water standards;

10. references for further information: bibliographies or lists of publications that contain additional information about the substances;

11. contacts for additional information: names and affiliations of individuals who contribute to technical documents and can be contacted for additional information;

12. how to use the information: descriptions of how information in the areas delineated above can be used for setting groundwater standards.

These 12 types of information were the framework for our analysis of state information needs and for our assessment of the information already available for the states' use in setting groundwater standards.

Our Survey of the States

Once we had identified the types of information that are important for setting groundwater standards, we designed a survey to identify the types of information state officials see as necessary and the role they believe the federal government should play in supplying that information. We discuss the survey as a whole in our earlier report; our discussion here is limited to the parts of the survey that were germane to the present report.

We sent the survey form to a designated official responsible for or associated with the groundwater protection program in each state. We took responses by telephone and entered them directly into computer files through a computer-assisted telephone-interview technique. After we analyzed the data, we contacted some officials again for clarification or additional information.

We obtained responses from all 50 states, the District of Columbia, the Virgin Islands, Puerto Rico, Guam, American Samoa, the Northern Marianas, and the Trust Territory of the Pacific Islands. In rare cases, state officials did not believe that particular questions should be answered. Our analysis of responses led us to our answer to our first evaluation question.

Our Review of EPA Documents

To address our second evaluation question, we systematically reviewed the EPA documents that contained technical information on specific contaminants. EPA publishes several series of documents that contain the agency's summary of research and technical information about potentially hazardous substances. We refer to these as criteria documents. They do not all recommend specific standards, but they do provide information important to the development of recommended criteria and standards.

We examined the criteria documents in order to characterize the types of information currently available on groundwater contaminants, searching for the 12 types of information listed above. We selected the contaminants by asking EPA to identify those for which it would most likely develop criteria documents if proposed legislation requiring such documents were enacted.[1] EPA officials indicated that the substances would probably be the same 83 contaminants regulated under the Safe Drinking Water Act.

[1]S. 20, introduced in the 100th Congress, would require EPA to issue criteria documents for groundwater contaminants. A similar bill was introduced in the 99th Congress.

To identify relevant criteria documents, we searched two computer database files: TOXLINE and TOXBACK76. TOXLINE contains abstracts of publications issued since 1981 on toxic substances; TOXBACK76 contains abstracts of 1976-80 publications. We also obtained from EPA officials lists of EPA criteria documents pertaining to the 83 substances. We crosschecked the lists from EPA and the database files to ensure that we had identified as many of the documents as possible, and then we reviewed all the documents we had identified. While it is possible that we did not locate every relevant criteria document that EPA has published, we did conduct an exhaustive search. EPA officials assisted by locating copies of the documents as well as by reviewing and concurring with our strategy.

One potential problem in our search was the large number of technical synonyms for the 83 contaminants. For example, dibromomethane is also known as methylene dibromide. However, it is not clear to what extent our search for documents was affected by this problem. The Registry of Toxic Effects of Chemical Substances is a directory that cross-references the synonymous common names of compounds. Since we consulted The Registry in order to identify as many synonyms of the 83 contaminants as possible, we are confident that we found in existing EPA criteria documents all the relevant information on those contaminants.

We reviewed the documents we located for the 12 types of information essential for the development of groundwater protection standards. We recorded the substances each document pertained to and the types of information in it. We summarized our reviews for each substance across all the documents in order to determine the extent to which each type of information was or was not included in the available documents.

Our Review of EPA's Drinking Water Regulatory Process

To answer the question about the standards that have been set and those that are being planned, we reviewed the EPA regulatory process for drinking water contaminants, identified the standards that have been set, and acquired information concerning the planned schedule for promulgating standards under the Safe Drinking Water Amendments of 1986. It was important to learn the exact number of contaminants that are to be addressed and the dates when federal standards are to be promulgated for them, because additional information on contaminants generally becomes available to the states then.

The Need for Groundwater Criteria Documents

We answered our fourth question on the need for greater federal involvement in the development and dissemination of information on groundwater contaminants by synthesizing the information we developed in answering the first three questions.

State Needs for Information About Groundwater Contaminants

We identified the extent to which the states have used various sources of information in setting groundwater standards. In addition, we identified the types of information the states viewed as necessary, and we determined whether a lack of information is hindering their standard-setting process. Here, we summarize the relevant findings from our survey of officials in 57 states and territories.

Information the States Use

We asked the respondents from states with numeric and narrative standards to indicate the extent to which they used various sources of information in developing groundwater standards. The responses indicated that EPA drinking water standards were the major source. More than three fourths of the respondents indicated that EPA drinking water standards were used to a great or very great extent.

Twenty-eight to 41 percent of the respondents indicated that they used their own expertise, comments from public hearings, EPA health advisories, and criteria on surface water quality to a great or very great extent. They used the remaining sources of information less.

Further evidence of the degree to which the states rely on other federal standards for establishing groundwater standards came from another question on the states' procedures in setting standards. Seventy-nine percent of the respondents indicated that they used state or federal standards of some kind to a great or very great extent. Comparatively few respondents (30 percent) indicated that their states relied on original efforts in risk assessment or on a review of medical evidence such as dose-response information (21 percent). Thus, there seems to be a greater reliance on existing information than on original research.

Information the States Need

Our survey of state officials asked several questions concerning the lack of technical information about groundwater contaminants, whether it hinders the state standard-setting process, and the types of information state officials concerned with groundwater protection need. We asked the respondents to indicate their constraints in setting groundwater standards. The frequency with which various constraints were reported is presented in table III.1, along with data on the 26 states that had numerical standards and the 31 states that did not. The responses indicate that a majority experience constraints and that inadequate information from the federal government, inadequate number of support staff, and a lack of technical expertise are among the most common difficulties.

Table III.1: Constraints Affecting States' Ability to Set Groundwater Standards

Constraint	Numerical standards: States with	Numerical standards: States without	Total[a]
Inadequate data provided by the federal government	17	16	**33**
Not enough support staff	13	20	**33**
Not enough technical expertise	8	18	**26**
Other[b]	5	14	**19**
Standard-setting procedures too burdensome	4	7	**11**
No legal authority to set standards	0	7	**7**

[a]At the time of the survey, 26 states had numerical standards and 31 did not. Total responses for all constraints add to more than the total number of respondents because some respondents gave more than one answer.

[b]Several states cited a lack of funding; this was the only response in the "other" category given by more than one respondent.

Table III.1 reveals a differential pattern. Except for "inadequate data provided by the federal government," states without numerical standards were more likely to affirm that they experienced one of these constraints than were those with numerical standards.

It is possible that as states lacking numerical standards begin to solve their problems with inadequate levels of support staff and the lack of technical expertise, the inadequacy of available information will become more pressing. It is significant that for the group of states that have developed numerical standards, a lack of adequate information from the federal government is the predominant constraint. Even though many of them also report constraints regarding staff and technical expertise, they have had the opportunity to evaluate the quantity of data the federal government provides, and many have found it inadequate.

We asked the respondents whose states did not have numerical standards to indicate why they did not. The reason given most frequently was insufficient technical expertise (39 percent). Nineteen percent reported the lack of a central source of information as another reason. Together, these responses point up the need for technical expertise in these states or external assistance that could, to some degree, mitigate or eliminate the gap in technical resources.

We asked the respondents to react to our list of information types by placing each type on a 5-point scale from "little or no importance" to "essential." Table III.2 presents the results in terms of the respondents who chose "moderately important," "very important," or "essential."

Table III.2: The Importance of Federal Information

Type of information	Moderately important, very important, or essential
Effect on human health	100%
Existing guidelines and standards	98
Contacts for additional information and assistance	95
Environmental fate	94
Technological feasibility of control	91
References for further information	91
Analytical chemistry	87
Human exposure	87
Monitoring methods	81
How to use information	68
Presence of substances in groundwater and proximity to groundwater users	44
Amount and location of state production and disposal	31

From the perspective of average scores, three types of information were very important or more: health effects, existing guidelines and standards, and information about environmental fate. Seven additional types of information were, on the average, moderately important or more. The areas that on the average were moderately important or less were the amount and location of state production and disposal and the presence of substances in groundwater, topics the states may have thought were specific to each state and therefore not important for a federal initiative.

In summary, many states thought they did not have the technical expertise or resources to set groundwater standards without assistance from the federal government, and most thought that inadequate information from the federal government was a constraint on their setting groundwater contaminant standards. A large majority of the states cited a need for information from the federal government in 10 of the 12 areas that we presented to them.

Information Available in EPA Documents

We attempted to identify the EPA documents likely to contain information needed for setting groundwater standards. Originally we focused only on ambient-water-quality criteria documents, which are produced under the Clean Water Act. (We identified but did not review in depth other criteria documents such as those sponsored by the International Agency for Research on Cancer, the World Health Organization, and the National Institute for Occupational Safety and Health.) Our early work convinced us that it was important to expand this to all the EPA documents likely to contain important information, in order to make a comprehensive statement.

We identified nine series of EPA documents for review. With some exceptions, they were prepared by the office of health and environmental assessment.

Health and environmental effects profiles are summaries of the literature concerning health hazards associated with environmental exposure to particular contaminants. They are prepared to aid EPA's office of solid waste in developing hazardous-waste regulations under section 3001 of the Resource Conservation and Recovery Act of 1976 (Public Law 94-580).

Health assessment documents are comprehensive assessments of data on effects on health through all routes of exposure to particular contaminants. The office of air quality planning and standards uses these documents in determining whether to regulate compounds under sections 111 and 112 of the Clean Air Act, which require the promulgation of standards governing the emission of air pollutants from stationary sources.

Health effects assessments are brief, quantitatively oriented, preliminary assessments of data on the effects of contaminants on health. They are based on published literature and other documents from the office of health and environmental assessment. The office of emergency and remedial response within EPA uses them in preparing cost-benefit analyses under Executive Order 12291.

Ambient-water-quality criteria documents contain health assessments, advice on health and exposure, and supporting methodology. These documents are prepared to assist the office of water regulations and standards in implementing the state level of the water-quality standards program under section 304 of the Clean Water Act.

Health advisories on drinking water, prepared by the office of drinking water, are summaries of information on analytical methods, on the occurrence of contaminants and their effect on health, and on removal methods.

Occurrence documents are prepared by the office of drinking water to aid in evaluating contaminants for regulation under the Safe Drinking Water Act. They contain information on how widespread contaminants are in drinking water.

Drinking water criteria documents—also known as health effects, or health criteria, documents—are different from the health effects assessments. They are comprehensive evaluations of effects on health and are used in deriving recommended maximum contaminant levels for chemicals in drinking water. They are prepared under sections 1412 and 1414 of the Safe Drinking Water Act. The office of drinking water writes the chapter on human exposure, and the remainder is written by the office of health and environmental assessment.

Technology and cost documents are prepared by the office of drinking water to aid in determining the technologically feasible limits for controlling drinking water contaminants regulated under the Safe Drinking Water Act.

Risk assessments are documents EPA uses in determining whether chemical substances are carcinogenic, mutagenic, or teratogenic or affect human reproductive systems. They are prepared for various EPA program and regional offices.

We reviewed all identifiable EPA criteria documents on the 83 contaminants. We attempted to determine which of our 12 types of information were available for each of the 83 contaminants. We did not assess the quality of the information; instead, we focused on the more fundamental question of whether needed information was available.

We reviewed 247 documents. Some pertained to more than one contaminant. A summary of the degree to which the 12 types of information covered the 83 substances is in table IV.1 (on page 24). A characterization of the gap between available information and information that is needed to establish groundwater protection standards for these 83 substances is in table IV.2 (on page 26), which indicates for each substance the types of information we were not able to find.

Table IV.1: The Availability of Information for 83 Contaminants

Type of information	Contaminants for which information was available
References for further information	90%
Effects on human health	89
Human exposure	89
Existing guidelines and standards	81
Environmental fate	66
Technological feasibility of control	64
Contacts for additional information and assistance	62
Analytical chemistry	39
Amount and location of state production and disposal	27
Monitoring methods	22
Presence of contaminants in groundwater and proximity to groundwater users	1
How to use information	0

Solely from the point of view of whether there is information available (rather than the quality of information), three types of information seem to have received extensive coverage in EPA documents. For more than 75 percent of the substances, we found at least some information on effects on human health, references for further information, human exposure, and existing guidelines and standards. For many types of information, however, coverage was poor. The largest gaps in information were in

- how to use information in setting groundwater standards (missing for all 83 contaminants),
- the presence of contaminants in groundwater (missing for 82 contaminants),
- monitoring methods (missing for 65 contaminants),
- the amount and location of the production of substances (missing for 61 contaminants), and
- analytical chemistry (missing for 51 contaminants).

In summary, we found a substantial gap between the information the states need for setting groundwater standards and the information available to them from EPA. The information gap is even wider than these data suggest, because some information we found was not directly relevant to groundwater protection. For example, information on environmental fate was often concerned with a contaminant in the air or in surface water rather than in groundwater.

Another important issue is accessibility. We found no one document for each contaminant that states seeking information for setting groundwater standards could use. The large number of EPA documents available on the 83 contaminants could make it difficult for the states to identify, locate, and synthesize the information available on any one contaminant.

Distribution practices may also need improvement. In our interviews with the staff in various EPA offices, it became apparent that criteria documents prepared by the office of drinking water are not automatically provided to the responsible agency in each state.

Table IV.2: Twelve Types of Information Not Found on 83 Contaminants

Substance	Analytical chemistry	Environmental fate	Amount and location
Acrylamide	•		•
Adipates	•	•	•
Alachlor	•		
Aldicarb	•	•	•
Aluminum	•	•	•
Antimony	•		•
Arsenic	•		•
Asbestos			•
Atrazine	•		
Barium	•		•
Benzene			•
Beryllium			•
Beta particle and photon radioactivity	•	•	•
Cadmium	•		•
Carbofuran	•		
Carbon tetrachloride			•
Chlordane	•		•
Chlorobenzene			
Chromium			•
Coliform bacteria, total		•	•
Copper	•		•
Cyanide	•		•
Dalapon	•		
Dibromochloropropane	•	•	•
Dibromoethane	•		
Dichlorobenzene			
2,4-dichloroephenoxyacetic acid	•	•	•
1,2-dichloroethane			
1,1-dichloroethylene			•
Cis-1,2-dichloroethylene			•
trans-1,2-dichloroethylene			•
1,2-dichloropropane	•		
Dinoseb	•		
Diquat	•	•	•
Endothall	•	•	•
Endrin	•	•	•
Epichlorohydrin			
Ethylene dibromide	•		
Fluoride	•	•	•
Giardia lamblia		•	•
Glyphosate	•	•	•
Gross alpha particle activity	•	•	•

Monitoring	Presence in groundwater	Control	Health	Exposure	Standards	How to use	References	Contacts	No. of types
•						•		•	5
•	•	•	•		•	•		•	10
•	•					•		•	5
•	•					•			6
•	•	•			•	•		•	9
•	•	•				•			6
•	•					•			5
•	•					•			4
•	•	•				•		•	6
•	•					•		•	6
	•					•			3
•	•	•				•			5
•	•	•	•	•	•	•	•	•	12
•	•					•			5
•	•					•		•	5
	•					•			3
•	•					•			5
	•					•			2
	•					•			3
•	•	•		•	•	•		•	9
•	•					•			5
•	•					•			5
•	•	•				•		•	6
•	•					•			6
•	•	•				•		•	6
	•					•			2
•	•					•			6
	•					•			2
	•					•			3
	•					•			3
	•					•			3
•	•					•			4
•	•	•				•		•	6
•	•	•	•	•	•	•	•	•	12
•	•	•	•	•	•	•	•	•	12
•	•	•				•			7
•	•					•			3
•	•					•			4
•	•					•		•	7
•	•	•			•	•		•	8
•	•	•	•	•	•	•	•	•	12
•	•	•	•	•	•	•	•	•	12

(continued)

Substance	Analytical chemistry	Environmental fate	Amount and location
Heterotrophic bacteria		•	•
Hexachlorocyclopentadiene			
Lead	•		•
Legionella		•	•
Lindane	•		•
Mercury			•
Methoxychlor	•		
Methylene chloride			•
Molybdenum	•	•	•
Nickel			•
Nitrate	•	•	•
Pathogenic viruses		•	•
Pentachlorophenol (PCP)	•		
Phthalates	•	•	•
Pichloram	•	•	•
Polyaromatic hydrocarbons (PAHs)	•		•
Polychlorinated biphenyls (PCBs)	•		•
Radium 226 and 228 combined			•
Radon			•
Selenium	•		•
Silver	•		•
Simazine	•		
Sodium	•	•	•
Sulfate	•	•	•
2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)			
Tetrachloroethylene			
Thallium	•	•	•
Toluene			•
Toxaphene	•		•
2,4,5-TP	•	•	•
Trichlorobenzene			
1,1,1-trichloroethane			
1,1,2-trichloroethane	•		•
Trichloroethylene			
Turbidity		•	•
Uranium			•
Vanadium	•	•	•
Vinyl chloride			•
Vydate	•	•	•
Xylene	•		
Zinc	•		•
Total missing substances	**51**	**28**	**61**

Monitoring	Presence in groundwater	Control	Health	Exposure	Standards	How to use	References	Contacts	No. of types
•	•	•			•	•		•	8
•	•	•				•			4
•	•					•			5
•	•				•	•			6
•	•					•			5
•	•					•			4
•	•					•			4
	•					•			3
•	•					•		•	7
	•					•			3
•	•					•		•	7
•	•	•			•	•			7
•	•					•			4
•	•	•				•			7
•	•	•	•	•	•	•	•	•	12
•	•	•				•			6
•	•					•			5
•	•					•		•	5
•	•					•		•	5
•	•					•			5
•	•					•			5
•	•	•				•		•	6
•	•					•		•	7
•	•					•		•	7
	•	•				•			3
	•					•			2
•	•	•				•			7
	•					•			3
•	•					•			5
•	•					•			6
	•					•			2
	•					•			2
•	•	•				•			6
	•					•			2
•	•	•			•	•		•	8
•	•					•		•	5
•	•	•	•	•	•	•	•	•	12
	•					•			3
•	•	•	•	•	•	•	•	•	12
•	•					•			4
•	•	•				•			6
65	82	30	9	9	16	83	8	31	

Federal Drinking Water Standards Set and Being Developed

In our other report on groundwater, we reported that the states regulate 260 groundwater contaminants. In setting standards for groundwater contaminants, many states rely on EPA's drinking water standards. Nearly 90 percent of the state respondents to our survey indicated that they used EPA's drinking water standards to a great or very great extent in setting their own groundwater standards. Consequently, it is important to know the progress EPA has made and the work it plans to accomplish in establishing drinking water standards as well as the context within which it establishes its standards. In this appendix, we discuss the legislative requirements under the Safe Drinking Water Act of 1974 and its 1986 amendments, EPA's regulatory process for drinking water standards, and the status of and plans for standards for specific drinking water contaminants.

Legislative Requirements

The Safe Drinking Water Act of 1974

The Safe Drinking Water Act of 1974 was enacted to ensure that public water systems meet minimum standards for the protection of public health. The act defines a public water system as one that has at least 15 service connections or regularly serves a minimum of 25 people at least 60 days a year.

In the act, the Congress directed EPA to issue regulations for a large number of the contaminants threatening drinking water systems. The House report accompanying the law noted that more than 12,000 chemicals were being used commercially and that 500 substances are added to that list each year. The report noted that the act would direct EPA to establish federal standards for protection from all harmful drinking water contaminants.

Health-based standards under the Safe Drinking Water Act were termed "primary drinking water regulations." These regulations were to specify a maximum contaminant level at the tap for contaminants that the administrator of EPA believes could have an adverse effect on public health.

The 1974 law set out a two-step process for setting maximum contaminant levels. The first was to set a recommended maximum contaminant level, using a strictly health-based decision rule: "a level at which . . . no

known or anticipated adverse effects on the health of persons occur and which allows an adequate margin of safety." Recommended maximum contaminant levels were health goals, meaning that EPA could not assess penalties for failure to reach them. In essence, they were an idealistic goal that would allow no health risk from drinking water. The second step was to set the maximum contaminant level "as close to the recommended maximum contaminant level . . . as is feasible." This level was based upon technological feasibility and an enforceable standard that public water systems were expected to meet.

The Safe Drinking Water Act Amendments of 1986

On June 19, 1986, the Congress amended the Safe Drinking Water Act. The recommended maximum contaminant level was renamed "maximum contaminant level goal." This goal and the maximum contaminant level were to be published at the same time rather than in two steps as under the 1974 law. The amendments also imposed a schedule for making final standards for a list of 83 substances that EPA had listed in two regulatory notices (discussed below). They also directed that maximum contaminant levels be established for 9 substances by June 1987, for an additional 40 substances by June 1988, and for the remainder of the 83 by June 1989. The amendments allowed EPA to make substitutions for any 7 of the original substances listed. The 1986 amendments also directed EPA to issue maximum contaminant levels for an additional 25 substances by 1991. EPA's plans to meet these requirements are outlined in a later section of this appendix.

EPA's Regulatory Framework

Once a decision has been made to consider a substance for regulation, a lengthy process begins in which information from a wide variety of disciplines is collected and analyzed. Under the Safe Drinking Water Act, maximum contaminant levels and recommended maximum contaminant goals go through a proposal stage before they are issued. The proposed and the final standards are published in the Federal Register. In addition, before EPA even begins extensive work on developing a standard, it notifies the public that it intends to consider a substance for regulation, and this notice is also published in the Federal Register. Hearings are held, and the public has opportunity to comment on both the proposal and the advance notice. EPA operated within this framework of five steps before the 1986 amendments. We believe this framework, which we have outlined below, provides a reference for characterizing the status of standards for drinking water contaminants. Because most of the work leading to the current standards was performed prior to the 1986 Safe Drinking Water Act amendments, the regulatory process we outline

is the one in effect prior to the 1986 amendments. Future EPA standards will be developed under the requirements of the 1986 amendments.

Advance Notice of Proposed Rulemaking

This is an announcement that EPA is considering initiating regulatory action on a specific set of contaminants. It describes the substances under consideration and the reasons for considering them. It may also present a range of values, based on current information, within which the standards could fall. It also solicits public comment.

Publish Proposed Rule for Recommended Maximum Contaminant Level

The health goal in the proposed rule is based only on the risk posed by the contaminant from exposure and toxicology. The goal is set at a level that would prevent adverse health effects. There is an opportunity for public comment.

Promulgate Final Rule for Recommended Maximum Contaminant Level

The final rule may differ from the proposal, depending on new information and comments from the public.

Publish Proposed Rule for Maximum Contaminant Level

A proposed rule for maximum contaminant levels is published at the same time that the rule for recommended maximum contaminant levels is promulgated. The two rules are meant to be set as close together as is technologically feasible. There is an opportunity for public comment.

Promulgate Final Rule for Maximum Contaminant Level

The final rule may differ from the proposal, depending on new information and comments from the public.

The Status of EPA's Standards

Final Standards

EPA has issued final standards for 10 inorganic chemicals, 6 organic chemicals, 3 radioactive particles, 1 chemical class consisting of four

Table V.1: Enforceable Standards Under the Safe Drinking Water Act

Contaminant	Maximum level
Inorganic compound	
Arsenic	0.05 mg/l
Barium	1.0 mg/l
Cadmium	0.01 mg/l
Chromium	0.05 mg/l
Fluoride	4.0 mg/l
Lead	0.05 mg/l
Mercury	0.002 mg/l
Nitrate as N	10.0 mg/l
Selenium	0.01 mg/l
Silver	0.05 mg/l
Organic compound	
Nonvolatile	
2,4-D	0.1 mg/l
Endrin	0.0002 mg/l
Lindane	0.004 mg/l
Methoxychlor	0.1 mg/l
Total trihalomethanes	0.1 mg/l
Toxaphene	0.005 mg/l
2,4,5-TP	0.01 mg/l
Volatile[a]	
Benzene	0.005 mg/l
Carbon tetrachloride	0.005 mg/l
Para-dichlorobenzene	0.075 mg/l
1,2-dichloroethane	0.005 mg/l
1,1-dichloroethylene	0.007 mg/l
1,1,1-trichloroethane	0.20 mg/l
Trichloroethylene	0.005 mg/l
Vinyl chloride	0.002 mg/l
Other	
Gross alpha particle activity	15 picocuries per liter
Gross beta particle activity	4 millirems per year
Radium 226 and 228	5 picocuries per liter
Coliform bacteria	< 1/100 ml (mean)
Turbidity	1-5 turbidity units

[a]Standards for these substances are scheduled to take effect in January 1989.

trihalomethanes, coliform bacteria, and turbidity: a total of 22 contaminants. Table V.1 shows these substances and their enforceable

maximum levels. All these standards except those for trihalomethanes and fluoride were issued in 1975 as "interim" standards. EPA inherited them from the earlier drinking water program administered by the Public Health Service. (The regulation governing total trihalomethanes was issued in 1979. The current fluoride regulation was issued in 1986.) When we were concluding our review, EPA issued standards for 8 volatile organic compounds scheduled to take effect in January 1989. These are also listed in the table.

Standards Under Development

In 1982, EPA embarked on a standard-setting program for drinking water contaminants that was ambitious in comparison to previous initiatives within the office of drinking water as well as programs elsewhere in the agency. In two separate advance notices of proposed rulemaking, EPA announced that it was considering revising standards for 21 of the 22 contaminants and regulating an additional 62 chemicals or chemical groups. (EPA has put off revising the standard for 1 (total trihalomethanes) because it was issued more recently than the others.) For these 83 contaminants, EPA announced on March 4, 1982, that it was beginning standard-setting proceedings on 14 volatile organic compounds and, on October 5, 1983, that it was considering 69 other substances, microbes, and radioactive particles for regulation. EPA's operating plan for fiscal years 1986-87 placed the "revision of existing drinking water standards . . . among the highest priorities for the Agency."[1]

Table V.2 presents the status of new standards development. By July 1987, work had been completed on 9 contaminants. Work had been begun but not completed on 376 other contaminants. The regulation of an additional 398 contaminants had not progressed beyond the original advance notice of proposed rulemaking. Two substances (ortho- and meta-dichlorobenzene) had been split off from their isomer (para-dichlorobenzene) and were to be treated separately, adding 2 to the list of 83. Finally, as allowed in the Safe Drinking Water Act amendments, aluminum, diboromoethane, molybdenum, silver, sodium, vanadium, and zinc had been deleted; and aldicarb sulfone, aldicarb sulfoxide, ethylbenzene, heptachlor, heptachlor epoxide, nitrite, and styrene had been put in their place.

[1] Agency Operating Guidance: FY 1986-87 (Washington, D.C.: February 1985).

Table V.2: The Status of New Standards Development

Contaminant	Announced	Regulatory step completed[a] Step	Date
Volatile organic compound	March 4, 1982		
Meta-dichlorobenzene, methylene chloride, trichlorobenzenes		Advance notice	March 1982
Cis-1,2-dichloroethylene; trans-1,2-dichloroethylene; ortho-dichlorobenzene; tetrachloroethylene		RMCL proposed	June 1984
Chlorobenzene		RMCL proposed	November 1985
Benzene; carbon tetrachloride; 1,2-dichloroethane; 1,1-dichloroethylene; para-dichlorobenzene; 1,1,1-trichloroethane; trichloroethylene; vinyl chloride		MCL issued	July 1987
Microbiological agent and turbidity	October 5, 1983		
Legionella, standard plate count		Advance notice	October 1983
Coliform bacteria,[b] giardia lamblia, turbidity,[b] viruses		RMCL proposed	November 1985
Inorganic compound	October 5, 1983		
Aluminum,[c] antimony, beryllium, cyanide, molybdenum,[c] nickel, silver,[d] sodium,[c] sulfate, thallium, vanadium,[c] zinc,[c]		Advance notice	October 1983
Arsenic,[b] asbestos, barium,[b] cadmium,[b] chromium,[b] copper,[b] lead,[b] mercury,[b] nitrate,[b] selenium,[b]		RMCL proposed	November 1985
Fluoride[b]		MCL issued	April 1986
Organic compound	October 5, 1983		
Adipates; atrazine; dalapon; dibromomethane;[c] dinoseb; diquat; endothall; endrin;[b] glyphosate; hexachlorocyclopentadiene; PAHs; phthalates; pichloram; simazine; 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD); trichloroethane; vydate		Advance notice	October 1983
Acrylamide; alachlor; aldicarb; carbofuran; chlordane; 2,4-D;[b] dibromochloropropane; 1,2-dichloropropane; epichlorohydrin; ethylene dibromide; lindane;[b] methoxychlor;[b] pentachlorophenol; polychlorinated biphenyls (PCBs); toluene; toxaphene;[b] 2,4,5-TP;[b] xylene			
Radionuclide	October 5, 1983		
Beta particle and photon radioactivity,[b] gross alpha particle activity,[b] radium 226 and 228,[b] radon, uranium		Advance notice	October 1983
Additional compounds	July 8, 1987		
Aldicarb sulfone, aldicarb sulfoxide ethylbenzene, heptachlor, heptachlor epoxide, nitrite, styrene		Advance notice	July 1987

[a]MCL = maximum contaminant level; RMCL = recommended maximum contaminant level.

[b]Substance that has an interim primary drinking water standard

[c]Substance that EPA took off its list in July 1987.

[d]Substance that EPA took off its list in July 1987 but that has an interim primary drinking water standard

In table V.3, the contaminants are ordered chronologically by the date of the publication of the advance notice. Fluoride and the 8 volatile organic compounds do not appear in the table because final standards have been issued for them.

Table V.3: Regulatory Steps Remaining After January 1988

Steps Remaining	Contaminant	Date of advance notice
Issue a maximum contaminant level goal and a maximum contaminant level for 36 substances	Chlorobenzene, cis-1,2-dichloroethylene; trans-1,2-dichloroethylene; tetrachloroethylene	March 4, 1982
	Acrylamide; alachlor; aldicarb; arsenic;[a] asbestos; barium;[a] cadmium;[a] carbofuran; chlordane; chromium;[a] coliform bacteria;[a] copper;[a] 2,4-D;[a] dibromochloropropane; 1,2-dichloropropane; epichlorohydrin; ethylene dibromide; giardia lamblia; lead;[a] lindane;[a] mercury;[a] methoxychlor;[a] nitrate;[a] pentachlorophenol; polychlorinated biphenyls (PCBs); selenium;[a] toluene; toxaphene;[a] 2,4,5-TP;[a] turbidity;[a] viruses; xylene	October 5, 1983
Propose and issue a recommended maximum contaminant level and a maximum contaminant level for 38 substances	Adipates; antimony; atrazine; beryllium; beta particle and photon activity;[a] cyanide; dalapon; dinoseb; diquat; endrin;[a] endothall; glyphosate; gross alpha particle activity;[a] hexachloropentadiene; legionella; methylene chloride; nickel; PAHs; phthalates; pichloram; radium 226 and 228;[a] radon; simazine; standard plate count; sulfate; 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD); thallium; trichlorobenzenes; 1,1,2-trichloroethane; uranium; vydate	October 5, 1983
	Aldicarb sulfone, aldicarb sulfoxide, ethylbenzene, heptachlor, heptachlor epoxide, nitrite, styrene	July 8, 1987

[a]Substance that has an interim primary drinking water standard.

EPA's Plans

The current work plan of the office of drinking water is to issue final maximum contaminant levels on schedule to meet its statutory timetable. Table V.4 presents EPA's plans for regulating contaminants according to the three dates in the 1986 amendments.

Table V.4: EPA's Statutory Dates for Regulating 83 Contaminants

Date	Type	Contaminant
June 1987[a]	Volatile organic compounds and fluoride	Benzene; carbon tetrachloride; 1,2-dichloroethane; 1,1-dichloroethylene; fluoride; paradichlorobenzene; 1,1,1-trichloroethane; trichloroethylene; vinyl chloride
June 1988[b]	Inorganic compound	Arsenic, asbestos, barium, cadmium, chromium, copper, lead, mercury, nitrate, selenium
	Organic compound	Acrylamide; alachlor; aldicarb; carbofuran; chlordane; chlorobenzene; 2,4-D; dibromochloroproprane (DBCP); cis-1,2-dichloroethylene; trans-1,2-dichloroethylene; 1,2-dichloropropane; epichlorohydrin; ethylene dibromide; lindane; methoxychlor; ortho-dichlorobenzene, pentachlorophenol; polychlorinated biphenyls (PCBs); tetrachloroethylene; toluene; toxaphene; 2,4,5-TP; xylene
	Microbiological or physical characteristic	Coliform bacteria, giardia lamblia, legionella, standard plate count, turbidity, viruses
June 1989[c]	Inorganic compound	Antimony, beryllium, cyanide, nickel, nitrite,[c] sulfate, thallium
	Organic compound	Adipates; aldicarb sulfone;[c] aldicarb sulfoxide;[c] atrazine; dalapon, dinoseb; diquat; endothall; endrin; ethylbenzene;[c] glyphosate; heptachlor;[c] heptachlor epoxide;[c] hexachlorocyclopentadiene; methylene chloride; PAHs; phthalates; pichloram; simazine;; styrene;[c] 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD); trichlorobenzenes; 1,1,2-trichloroethane; vydate
	Radiological activity or substance	Beta particle and photon activity, gross alpha particle activity, radium 226 and 228, radon, uranium

[a]EPA issued regulations for these contaminants by July 1987

[b]Advance notice has been published for these 39 compounds; EPA proposes to meet the requirement that 40 be regulated by June 1988 by adding one compound not in the statutory list.

[c]Substituted in the list in July 1987

EPA also plans to meet the requirement to regulate an additional 25 substances by 1991. We were told that although those specific substances have not been selected, they would include disinfectant byproducts, including trihalomethanes.

Implications for Groundwater Standards

The states regulate 260 substances as groundwater contaminants. This is one measure of the number of substances that should controlled. At present, there are federal drinking water standards for 30 of the 260, including the 8 standards for volatile organic compounds scheduled to go into effect in January 1989. This is less than 12 percent of the 260. EPA has embarked on an ambitious program of standard-setting that will expand the number regulated.

If EPA meets the timetable set out in the Safe Drinking Water Act Amendments of 1986, it will narrow the gap between the number of federal drinking water standards and the number of groundwater contaminants that the states believe should be controlled.[2] If it meets the statutory requirements, an additional 63 substances will have drinking water standards, but the gap in the number of standards will continue.[3] A large number of substances regulated by the states will remain unregulated by federal drinking water standards. This suggests that, to set groundwater standards, the states will continue to need technical guidance, whether in the form of drinking water standards or in some other form.

[2]The numerical gap does not fully reveal the extent of the deficiency. For two reasons, the gap could be smaller or larger than the difference between the number of contaminants with federal drinking water standards and the number of contaminants with state groundwater standards. One is that the number of contaminants that actually need groundwater standards has not been assessed. The other is the fact that the states regulate contaminants as groundwater contaminants, which does not directly address the issue of the universe of substances that should be regulated. It is not obvious that all groundwater contaminants regulated by the states warrant national concern or that the states have identified all contaminants. It is also not obvious that substances regulated as drinking water contaminants should necessarily be regulated under a groundwater protection program.

[3]Replacing silver, one of the substances already regulated, by 1 of the 7 previously unlisted contaminants in July 1987 increased the number of new substances being considered from 62 to 63.

How to Meet the Need for More Information

Our data suggest that the states need more information in establishing groundwater standards and that EPA should be more active in developing and disseminating information on groundwater contaminants.

In the absence of a national groundwater standards program, many states have expressed an interest in setting groundwater standards on their own. Forty-one of 57 states and territories have set some numeric or narrative groundwater standards, but many state officials believe they are constrained from doing so effectively by a lack of information on groundwater contaminants. There is a significant duplication of effort when states collect and analyze information individually and set individual standards. Furthermore, many states do not have the resources they consider adequate for the technical work required to establish groundwater standards. The quality of the work underlying the selection of standards therefore differs from state to state, and the differences in the standards may be unwarranted.

In our survey of state needs for information, we found a substantial gap between the information the states need and the information currently available. We believe that additional information should be developed and disseminated to support the states' standard-setting activities. The federal government, and EPA in particular, is the most appropriate organization for the task. EPA has a history of developing such information for air, surface water, and other related regulatory programs. To some extent, EPA currently prepares information on groundwater standards, and it has some groundwater responsibilities under various laws such as the Resource Conservation and Recovery Act and the Safe Drinking Water Act.

EPA has developed a national groundwater protection strategy that it has disseminated to state governments, and it continues to work with the states in a supportive manner. In fact, during fiscal years 1985 and 1986, EPA spent approximately $14 million in grants to assist the states in designing and implementing groundwater protection programs, many of which rely on federal groundwater standards. EPA recognizes the use of standards as tools for establishing specific goals for groundwater protection, determining compliance with and enforcing those goals, and assessing the success of protection programs. Providing the information the states need to establish groundwater protection standards would be consistent with the current goals and efforts of EPA. We believe no other agency has the technical ability and experience to develop the necessary information.

Information on groundwater contaminants is widely dispersed over various information sources: we identified 247 EPA documents for the 83 contaminants we studied. We believe that managing this information for all potential groundwater contaminants—we identified 260 contaminants regulated at the state level—would be difficult for the states. Many states have indicated that they lack the technical resources to conduct comprehensive information searches. For these reasons, we conclude that the states' standard-setting programs would benefit the most from one centralized reference source in the form of groundwater criteria documents for information on contaminants. Used as reference manuals, these documents would assist the states in setting their standards.

Following this approach, EPA would identify the substances that warrant concern as groundwater contaminants and would then prepare related documents. Because a great deal of information has recently been gathered by EPA's office of drinking water for many potential groundwater contaminants in several information areas (notably that of effects on human health), it would be reasonable for EPA to use whatever relevant data it has already reviewed. If EPA has recently published or has already planned to publish information on a contaminant in a criteria document on drinking water, the agency could prepare a supplementary document. Separate criteria documents on groundwater contaminants could be developed for substances for which criteria documents on drinking water had not recently been issued or planned.

In spite of the preference of the office of groundwater protection for focusing on the 83 substances in the drinking water program, it is not clear that exactly the same contaminants ought to be addressed in a groundwater program. The substances the office of drinking water identified were selected in 1982 and 1983 through surveys of public water utilities employing both surface and groundwater sources of supply. Although there may be some overlap, it may be important to address substances other than the 83 contaminants in groundwater criteria documents. One differentiating factor might be the relative risk of substances that contaminate only groundwater. Therefore, if EPA is to assist the states by developing criteria documents, it should consider developing a framework for selecting substances and determining the order in which the documents on them are prepared.

The states support a federal program of groundwater criteria documents. In our survey of 57 states and territories, we asked whether a new series of criteria documents on groundwater contaminants would be

useful. Eight-two percent answered "yes" or "probably yes." Further analysis revealed that of the 33 respondents who had said that inadequate data from the federal government was a constraint on standard-setting for groundwater contaminants, 29 (88 percent) thought that criteria documents specifically for groundwater contaminants would be useful. The judgments of these state officials, who are major users of such documents, are important evidence of the potential usefulness of criteria documents for groundwater contaminants.

Comments From the Environmental Protection Agency

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

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

OFFICE OF
POLICY, PLANNING AND EVALUATION

SEP 4 1987

Mr. Hugh J. Wessinger
Senior Associate Director
Resources, Community and
Economic Development Division
U.S. General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Wessinger:

This letter responds to your July 27 letter to the Administrator of the Environmental Protection Agency (EPA) concerning the General Accounting Office (GAO) draft report, "Groundwater Standards: States' Need For More Information" (PEMD-87-19). In accordance with Public Law 96-226, the Agency reviewed the report and provides the following comments.

See comment 1.

EPA agrees with the GAO report that information that would be useful to States in setting ground-water standards may be scattered among several types of documents issued by various EPA offices. While EPA agrees that it should improve its ability to provide such information to the States, the Agency believes that issuing a series of ground-water criteria documents would be an unnecessarily burdensome means for addressing this need. A less formal approach, such as consolidating existing information on health effects and environmental fate of specific substances, would meet the same need, but avoid the time-consuming and resource-intensive nature of a formal criteria-setting process.

Scientific understanding of ground-water contamination is steadily advancing, but there are many gaps in our knowledge about the occurrence, behavior and treatability of specific substances in ground-water. To develop a criteria document of all the topics suggested by GAO's list of information needs would involve substantial new data collection and analysis, and in many cases, years of basic research. Nonetheless, many of these information needs are currently being addressed in EPA research programs.

See comment 2.

EPA could consolidate this existing information. Consolidation of available data could be accomplished relatively quickly and inexpensively. Consolidated information would represent the best available information, and has the significant advantage of being easily updated for the States.

See comment 3.

With regard to States using drinking water standards for protecting potable ground water, current EPA plans do not include promulgating drinking water standards for every contaminant for which States have ground-water standards. However, EPA believes that within three years, standards will be in place for those contaminants specified in the 1986 Safe Drinking Water Act Amendments. Future plans for standards development will clearly take into account State needs and any potential gaps will eventually be filled. Meanwhile, for many as yet unregulated contaminants, EPA has issued Health Advisories and/or developed Reference Doses. Based on toxicological data, this information can be used by States to serve as a starting point for understanding potential health risks from a potential drinking water contaminant when an maximum contaminant level (MCL) has not yet been established.

See comment 4.

In addition, the Agency has developed a computer based system, referred to as the Integrated Risk Information System (IRIS), that is a compendium of the most current health data on carcinogens and the threshold values of certain toxicants. IRIS also includes Drinking Water Health Advisories and data on MCLs and maximum contaminant level goals. IRIS is an important step in consolidating risk information in a vehicle that will be readily accessible to States. EPA believes that IRIS addresses many concerns expressed in the GAO report.

See page 7.

As GAO notes, the Agency's position is that the contaminants for which drinking water standards are being proposed are the prime candidates for development of criteria documents (or, as EPA prefers, a consolidation of pertinent information). GAO suggests that EPA's position may be inappropriate, stating: "The relative risks which substances pose for ground water now may be different from their risks as drinking water contaminants." EPA is currently studying the health, environmental and resource risks associated with contaminated ground-water.

In conclusion, EPA agrees with GAO that the Agency should provide better access to the information we have that would be useful to States in setting ground-water standards. The Agency believes, however, that an effort to consolidate existing information and make it more accessible to the States would meet the same needs without creating a new major program to develop ground-water criteria documents. Where States choose to protect ground-water drinking water supplies, much of the health information needed will be provided as EPA develops MCLs, or in the interim, Health Advisories for potential drinking water contaminants. Given this process and the gaps in scientific understanding and information that now exist, a separate process for developing

ground-water criteria documents would be time-consuming and resource-intensive -- ultimately defeating the very purpose for which it is being proposed. EPA wants to improve its information transfer to the States, but believes consolidation of existing information would avoid the costs and delays that would be involved in developing criteria documents.

Thank you for the opportunity to comment on the report. I hope that these comments are useful during the final review of the GAO's report.

Sincerely yours,

John M. Campbell
Acting Assistant Administrator

The following are GAO's comments on the Environmental Protection Agency's September 4, 1987, letter.

GAO Comments

1. EPA agrees that the information the states need for setting standards for groundwater contaminants is not centrally available. However, EPA prefers a more informal approach than criteria documents, which EPA believes would be "time-consuming and resource-intensive." Implicit in EPA's comment is the view that the agency should not develop and make available to the states a uniform set of information documents that would support the development of groundwater protection standards. From our analysis of state groundwater protection programs around the nation, we believe that there is a need for a single reference source that would consistently provide the information the states need. Even for areas currently addressed, such as effects on health and the environmental fate of specific contaminants, our evaluation showed that information was not available for all contaminants.

It is important to note that we use a more flexible definition of "criteria document" than EPA suggests in its comment, in that we do not propose that the documents be prepared as part of a formal standard-setting process. Our recommendation does not require that the agency employ a time-consuming process in preparing these documents. EPA currently prepares criteria documents of a general type for surface water and drinking water contaminants.

2. The EPA comment does not take issue with our belief that the information needs we identified are necessary for the development of technically sound groundwater standards. The comment suggests a preference for using existing information for the development of standards rather than expanding that information base, which would require new data collection, analysis, and research. We do not agree with EPA's comment; without the expanded information base, the states are left in the position of developing groundwater standards without information they need.

3. By requesting clarification on this comment, we learned that EPA's intent had been to reinforce the point that an effort to produce criteria documents was not necessary and that EPA would continue to prepare information on individual contaminants as required. Our position on the need for criteria documents is discussed in comment 1.

4. The computer-based system EPA refers to does not address our concerns. It simply consolidates available information on effects on health. The system may help make information on the effects on health more accessible, but it addresses neither the inaccessibility of other information pertinent to setting groundwater standards nor the absence of much of the information the states need to prepare groundwater standards.