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SUPERFUND

How States Establish and Apply Environmental Standards When Cleaning Up Sites

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Resources, Community, and
Economic Development Division

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The Honorable Bud Shuster
Chairman
The Honorable James L. Oberstar
Ranking Minority Member
Committee on Transportation and Infrastructure
House of Representatives

The Honorable Sherwood L. Boehlert
Chairman
The Honorable Robert A. Borski
Ranking Minority Member
Subcommittee on Water Resources and Environment
Committee on Transportation and Infrastructure
House of Representatives

During the current debate on reauthorizing the Superfund program, one issue is whether to revise or eliminate the existing law's requirement that cleanups of hazardous waste sites comply with federal and certain state standards to protect public health and the environment. Among these standards are numeric limits on the concentrations of toxic chemicals in the environment, which were intended to ensure an adequate level of protection for public health. (See sec. 1 for more background information on standards.) Those responsible for cleaning up Superfund sites, however, have raised concerns that complying with these standards can result in more extensive and costlier cleanups than are necessary to safeguard public health. One criticism is that states, when setting standards, may choose stringent limits that are not based on a consideration of the human health risks posed by contaminants. Another concern is that using standards to determine the extent of cleanup does not allow a consideration of specific sites' conditions, such as the local climate, that may increase or decrease the health risks posed.

As background for your deliberations on the use of standards as requirements for cleanups, you asked us to provide information on the bases for states' standards. Specifically, you asked us to determine whether states, (1) when setting numeric standards, based them on estimates of the human health risks posed by exposure to contaminants and, (2) when using such standards, provided the flexibility to adjust the level of cleanup prescribed by the standards to take into account the conditions and risks found at individual hazardous waste sites. You also

expressed interest in the degree of correspondence between the states' standards and the federal standards that may be applied to the cleanup of groundwater determined to be a potential source of drinking water. We summarized preliminary information on these matters in a June 1995 testimony[1] and are now presenting our final results.

In conducting our work, we surveyed the 33 states with the greatest number of Superfund sites, which together covered 91 percent of the sites on the Environmental Protection Agency's (EPA) nationwide list of the hazardous waste sites posing the greatest risks to human health and the environment. We asked these states about their standards for soil and groundwater because these are the two media most frequently cleaned up at Superfund sites. We also limited our focus to chemical-specific standards that set numeric limits on concentrations of chemicals in order to protect public health.[2] Twenty-one of the surveyed states had established such standards for soil, groundwater, or both.[3] In all, 13 states had set soil standards, while 20 had set groundwater standards; about half of the 21 states had set both types of standards. (See app. I for more information on our objectives, scope, and methodology and app. II for a listing of the surveyed states that had set standards.)

In summary, we found the following:

- When developing their standards, 20 of the 21 states told us that they had based them, at least in part, on estimates of the human health risks posed by exposure to chemical waste. For example, they considered the increased probability that a person would develop cancer or another illness from such exposure. These states either adopted existing federal standards that were based on such risk estimates or developed their own standards, taking risk into account. Most of the 20 states said that in addition to health risks, they considered other factors in setting their standards, such as the cost and technical feasibility of achieving the necessary cleanup. When setting their standards for groundwater used as

[1]Superfund: EPA's Use of Risk Assessments in Cleanup Decisions (GAO/T-RCED-95-231, June 22, 1995).

[2]Other standards, such as those intended to protect the environment, could also be considered when deciding on the extent of a site's cleanup.

[3]We counted a state as having standards if it had established or proposed—in law, regulation, policy, or guidance—numeric limits on the concentrations of chemicals allowable in soil or groundwater. We did not count a state as having groundwater standards if it had simply adopted the federal drinking water standards. About one-third of the states that had not set their own soil standards said that they use risk assessments to develop cleanup levels for soil on a site-specific basis. About half of the states that did not have groundwater standards said that they had used the federal drinking water standards to set cleanup levels for groundwater.

drinking water, the states typically based them on the federal drinking water standards. However, we found that some states had set some of their standards at levels that differed from the levels in the federal standards. These differing standards tended to be more stringent than the federal standards. (See sec. 2 for a more detailed discussion of the bases for the states' soil and groundwater standards.)

- When applying their standards to determine the extent of the cleanup needed at a Superfund site, the states in our survey said that they provided more flexibility to adjust the cleanup level derived from their soil standards than from their groundwater standards, to reflect the specific conditions and health risks at that site. More than half of the states with soil standards regularly allowed the cleanup levels based on these standards to be adjusted for site-specific conditions, such as the amount of exposure to the contaminants that people are likely to have. In contrast, less than a fourth of the states with standards for groundwater that is or could be used as drinking water said that they allowed the cleanup levels based on these standards to be adjusted. This relative inflexibility reflected the states' concerns that groundwater be conserved as a potential source of drinking water. Some of the states that did not allow such adjustments did provide a degree of flexibility by setting different standards for different projected uses of land or groundwater. (See sec. 3 for a more detailed discussion of the extent to which the states said that they were flexible in applying soil and groundwater standards.)

We based our analysis on the results of telephone interviews we conducted with the 33 states surveyed and a review of background documents on standards and risk assessment. To verify our analysis, we gave each state a written summary to review and made any necessary changes. We also provided copies of a draft of this report to EPA officials, including the Director of the Office of Emergency and Remedial Response and officials responsible for working with state Superfund programs, for their review and comment. EPA generally agreed with the report and provided several technical changes and clarifications on the Superfund law's requirements for cleanups, which we incorporated. We conducted our work from March 1995 through March 1996 in accordance with generally accepted government auditing standards.

As arranged with your offices, unless you announce its contents earlier, we plan no further distribution of this report until 10 days after the date of this letter. At that time, we will send copies to the appropriate

congressional committees, the Administrator of EPA, and other interested parties. We will also make copies available to others on request.

Please call me at (202) 512-6112 if you or your staff have any questions. Major contributors to this report are listed in appendix III.

Peter F. Guerrero
Director, Environmental
Protection Issues

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Abbreviations

ARAR	applicable or relevant and appropriate requirement
EPA	Environmental Protection Agency
GAO	General Accounting Office
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by SARA
HEAST	Health Effects Assessment Summary Tables
IRIS	Integrated Risk Information System
MCL	maximum contaminant level
NPL	National Priorities List
PCB	polychlorinated biphenyl
SARA	Superfund Amendments and Reauthorization Act of 1986

Background

Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which created the Superfund program in 1980, the Environmental Protection Agency (EPA) assesses uncontrolled hazardous waste sites and places those posing the greatest risks to human health and the environment on the National Priorities List (NPL) for cleanup. As of September 1995, this list included 1,232 sites.

Cleanup standards and the degree of cleanup needed for Superfund sites are discussed in section 121(d) of the CERCLA statute, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). This section requires that Superfund sites be cleaned up to the extent necessary to protect both human health and the environment. In addition, cleanups must comply with requirements under federal environmental laws that are legally "applicable" or "relevant and appropriate" (ARAR) as well as with such state environmental requirements that are more stringent than the federal standards. Furthermore, Superfund cleanups must at least attain levels established under the Safe Drinking Water Act and the Clean Water Act, where such standards are relevant and appropriate as determined by the potential use of the water and other considerations.

The federal standards most frequently considered relevant and appropriate for groundwater cleanups at Superfund sites are set under the Safe Drinking Water Act. This act establishes standards, called maximum contaminant levels (MCL), for certain contaminants in water delivered by public drinking water systems. As of March 1996, the MCLs included numeric limits on about 70 contaminants. The MCLs take into account estimates of the human health risks posed by contaminants. They also consider whether it is technically and economically feasible to reduce the contamination to a level that no longer poses a health risk. Although MCLs are legally applicable to drinking water systems, section 121(d) of CERCLA generally requires that they be considered relevant and appropriate standards for cleaning up contaminated groundwater that is a potential source of drinking water. For example, the MCL for benzene is 5 micrograms per liter. This concentration would generally be the cleanup level for benzene in groundwater that is a potential source of drinking water unless the state has promulgated a more stringent standard or other requirement that is relevant and appropriate.

There are few federal standards for contaminants in soil that are considered potentially applicable or relevant and appropriate except those for certain highly toxic contaminants, most notably polychlorinated biphenyls (PCB) and lead. Under the Toxic Substances Control Act, EPA

sets requirements for cleaning up PCB contamination. In addition, EPA has issued guidance for cleaning up lead in soil.

Early in its investigation of a site, EPA determines, on the basis of the contamination present and the conditions at the site, which chemical-specific and other standards may be considered applicable or relevant and appropriate. As EPA proceeds with the selection of a cleanup method, it adjusts the list of standards to be considered on the basis of information gained during its investigation. Among the potential standards considered are any state environmental standards that are more stringent than the federal standards for the same contaminants.

In addition to numeric standards for specific contaminants, some states have set more generalized standards or policies that may have to be considered when cleaning up Superfund sites. For example, some states have established "antidegradation" policies for groundwater that could require more stringent cleanups than cleanups based on health risks. These policies are intended, among other things, to protect the state's groundwater as a potential source of drinking water.

If federal or state standards do not exist for a given contaminant, the party responsible for cleaning up a Superfund site may use a site-specific risk assessment to help establish a cleanup level for that contaminant. A risk assessment evaluates the extent to which people may be exposed to the contaminant, given its concentration and the physical characteristics of the site. For example, the type of soil and the depth of the groundwater may affect whether and how quickly waste will migrate and reach a population. A risk assessment uses exposure and toxicity data to estimate the increased probability, or risk, that people could develop cancer or other health problems through exposure to this contamination. A risk estimate can be used along with the proposed waste management strategy to help determine the extent of the cleanup necessary at a site.

EPA has published guidance for conducting risk assessments, a set of documents referred to collectively as the Risk Assessment Guidance for Superfund. These documents outline the well-established risk assessment principles and procedures that can be used to gather and assess information on human health risks. The documents also include information on mathematical models that can be used to estimate health risks at a site, given the contaminants present and the means of exposure to them. In addition to this guidance, EPA maintains an Integrated Risk Information System (IRIS), an on-line database on the toxicity of numerous

chemicals, and publishes the Health Effects Assessment Summary Tables (HEAST), another source of information on contaminants' toxicity. EPA uses this guidance in conducting baseline risk assessments at Superfund sites, which it uses in deciding whether the human health and environmental risks posed by the contaminants are serious enough to warrant cleaning up the sites. Some states also use EPA's risk assessment guidance in setting their standards for specific chemicals.

The Bases States Used in Developing Standards

States that have set environmental standards have made decisions about what levels, or concentrations, of chemical contaminants can remain at hazardous waste sites after cleanups. We analyzed the processes that the states in our survey said they went through, as well as the factors that they said they took into consideration, in developing their soil and groundwater standards. In this section, we first summarize (1) the extent to which the states based their soil standards on estimates of the human health risks posed by contaminants at the sites and (2) the methods that the states used to estimate these risks. We then report on the factors other than health risks that the states said they considered when developing their soil standards. Since the bases for the states' standards for groundwater differed somewhat from those for soil, we summarized the information on groundwater standards separately. Finally, since federal drinking water standards are frequently used as cleanup standards for groundwater, we compared the states' groundwater standards to the federal standards for the same contaminants to determine the extent of their correspondence.

We have included the information we obtained from the 33 states in our survey. In all, 21 of the 33 states had set their own standards for either soil or groundwater, or for both media.[4] (See table 2.1.)

Table 2.1: Number of States in Our Survey With Their Own Cleanup Standards

Type of standards	Number of states[a]
States with either soil or groundwater standards or with both types of standards	21
States with soil standards	13
States with groundwater standards	20

[a]Our survey included 33 states, which encompass 91 percent of the sites on EPA's list of the most contaminated sites in the nation.

Thirteen of the 21 states had set their own soil standards, and 20 had set some groundwater standards that were in addition to or different from the MCLs for drinking water, as discussed in the remainder of this section.

[4]This report represents the status of the states' standards at the time of our survey. For example, several states explained that they had modified their standards within the last year, and six told us that they were developing or considering whether to develop soil standards. EPA officials working with the states on cleanups pointed out that some states' standards have evolved and are less stringent now than they were formerly.

Consideration of Health Risks in Setting Soil Standards

All 13 of the states with soil standards indicated that they considered risks to human health when developing their standards. The number of chemical-specific standards per state ranged from about 10 to nearly 600. All but one of these states generally relied on EPA's guidance for estimating health risks from contaminants (Missouri had developed its soil standards before EPA issued its guidance). These states said that they had used EPA's guidance, either alone or in combination with their own methodologies and policies, to estimate health risks. (See table 2.2.) For example, Pennsylvania said that it had used EPA's guidance to estimate the toxicity of contaminants and its own model to estimate how much contamination from the soil might travel into groundwater. These estimates are two of the major components in the health risk calculation.

Table 2.2: Health Considerations Used by 13 States in Developing Their Own Soil Standards

Health considerations	Number of states
Use of EPA's guidance to estimate human health risk	
States used EPA's guidance only	3
States used both EPA's guidance and their own methodology	9
State developed its standards before EPA issued its guidance	1
Level of carcinogenic risk that states would allow at a site after cleanup[a]	
States used a 1-in-100,000 increased probability that exposure would cause cancer	5
States used a 1-in-1-million increased probability that exposure would cause cancer	8
Concentration of contaminants causing other health effects that states would allow to remain on site	
States used a measure equivalent to EPA's	11
States used a more stringent measure than EPA	2

[a]EPA uses a range of risk levels between 1 in 10,000 and 1 in 1 million; the states all used risk levels within this range.

Even after a cleanup, contaminants remaining at a site will pose some level of risk to human health. Therefore, the states, when setting standards for contaminants in soil, had to decide what level of risk they would allow to remain after a cleanup. For contaminants that can cause cancer, or carcinogens, the states had to determine an acceptable level of risk, or increased probability, that an individual would develop cancer from a lifetime's exposure to the remaining contamination. All 13 states generally chose risk levels that fell within the range of increased probability that EPA

uses at Superfund sites, which extends from 1 in 10,000 to 1 in 1 million. As shown in table 2.2, eight states chose the more stringent risk level of 1 in 1 million for individual carcinogens in soil, while five states chose the somewhat less stringent risk level of 1 in 100,000.[5] For noncarcinogens in soil, 11 states used the same measure that EPA uses at Superfund sites, while 2 states used a somewhat more stringent measure.

Consideration of Other Factors in Setting Soil Standards

Ten of the 13 states considered factors in addition to health risks when setting their soil standards. As a result, their standards could be either more or less stringent than those based solely on estimates of health risks. These other factors included the following:

- Chemical levels that occur naturally in the environment. In some locations, certain contaminants may exist naturally in the soil in concentrations differing from those that would be allowed under standards based on risks to human health. For such contaminants, the states typically set their standards at the naturally occurring levels rather than at the levels based solely on risk. In some cases, this practice would result in less stringent cleanups than would be necessary to meet the risk-based standards. However, since some chemicals do not occur naturally in the environment, this practice would in some instances result in more stringent cleanups than would otherwise be required.
- Detection limits and practical quantification limits. When the concentrations of some contaminants that could remain in the soil without posing health risks fell below the levels that can be accurately measured or detected by current technology, the states said that they typically adopt less stringent, but measurable, concentrations as their standards.
- Secondary, or aesthetic, criteria. Some chemicals cause unpleasant odors or other problems at levels that do not pose human health risks. The states may set their standards for these chemicals below risk-based levels to protect the public from such problems.

Consideration of Health Risks in Setting Groundwater Standards

Twenty of the 33 states we surveyed said that they had set some chemical-specific standards that would limit the concentrations of various toxic chemicals that could be present in groundwater at Superfund sites. These states not only adopted some of the existing federal standards, such as MCLs, but also set some standards in addition to or different from them.

[5]Some states chose different risk levels for different contaminants. For example, a state may have used a 1-in-1-million risk level for a contaminant linked by strong evidence to cancer in humans, while using a 1-in-100,000 risk level for other carcinogens. In these cases, we categorized the state as generally using a 1-in-1-million risk level.

The number of chemical-specific standards per state ranged from about 30 to nearly 600. While the remaining states that we surveyed had not developed any of their own groundwater standards, the federal MCLs are typically used as Superfund cleanup standards for groundwater.

Nineteen of the 20 states had based their groundwater standards, at least in part, on estimates of the human health risks posed by exposure to chemical contaminants. (See table 2.3.)

Table 2.3: Health Risk as the Basis for States' Groundwater Standards in States Surveyed

States' use of health risk estimates to develop standards	Number of states
States had set some of their own groundwater standards	20
States developed their own risk estimates for some of their standards	16
States predominantly adopted others' standards based on health risks	3
State had no historical information on the development of its standards	1

In the remaining state, none of the officials currently involved in implementing the standards could provide historical information on how the standards had been developed. Sixteen of the states had calculated their own health risk estimates when setting the standards for at least some of the contaminants. Three of the states had not predominantly developed their own estimates but had instead adopted standards developed by others, including some or all of the MCLs, that were based on estimates of health risks.

All 16 states that had developed formulas for calculating human health risks had used guidance from EPA on how to estimate such risks, either alone or in combination with their own procedures and formulas. (See table 2.4.) In setting their standards, 13 of these states used a risk level of 1 in 1 million for individual carcinogens, while 3 states used the less stringent risk level of 1 in 100,000. For individual noncarcinogens, 15 states used a measure that was as stringent as EPA's, while 1 state used a more stringent measure.

Table 2.4: Health Considerations Used by 13 States in Developing Their Own Groundwater Standards

Health considerations	Number of states
Use of EPA's guidance to estimate human health risk	
States used EPA's guidance only	7
States used both EPA's guidance and their own methodology	9
Level of carcinogenic risk that states would allow at a site after cleanup[a]	
States used a 1-in-100,000 increased probability that exposure would cause cancer	3
States used a 1-in-1-million increased probability that exposure would cause cancer	13
Concentrations of contaminants causing other health effects that states would allow to remain on site	
States used a measure equivalent to EPA's	15
States used a more stringent measure than EPA	1

[a]EPA uses a range of risk levels between 1 in 10,000 and 1 in 1 million; the states all used risk levels within this range.

Consideration of Other Factors in Setting Groundwater Standards

All but 2 of these 16 states said that they had considered factors in addition to human health risks when setting their groundwater standards. Taking such factors into account can affect the concentration of a chemical that a state will allow to remain under its standard. As a result, a standard may be either more or less stringent than one based solely on human health risks.

For groundwater as for soil, these factors included the levels of chemical contaminants that occur naturally in the environment and secondary, or aesthetic, factors, such as the taste and color of drinking water. They also included the following:

- Cost and technical feasibility. If achieving the cleanup level required by a standard based on human health risk would be too costly or technically infeasible, then some states would set the standard at a less stringent level. Similarly, EPA takes cost and technical feasibility into account when setting some federal standards.
- Groundwater protection policies/laws. Some states have adopted conservative laws or policies to protect groundwater as a potential source of drinking water. For example, some states have "antidegradation" policies that, for chemicals that do not occur naturally in the environment,

may require more stringent cleanups than would be required solely on the basis of risk.

Differences Between the States' Groundwater Standards and the Federal MCLs

Because the federal MCLs are typically used as cleanup standards for groundwater used as drinking water at Superfund sites and many of the states based some of their own groundwater standards on the federal MCLs, we compared the states' standards for contaminants to the corresponding MCLs. We found that if a federal MCL existed for a chemical that was included in a state's standards, the state usually set its standard at this level. However, a majority of the states had standards for a few chemicals that differed from the MCLs. These standards tended to be more stringent than the MCLs.

The states offered a variety of explanations for why their standards were more stringent than the federal MCLs. Two states set more stringent levels for certain contaminants if they could detect the contaminants at levels below the MCLs. Several states reported that some of their standards were more stringent because these standards had not been adjusted, as the MCLs had been, for other factors, such as cost or technical feasibility.

Some states' standards may also have been more stringent because the states had antidegradation policies for groundwater. For example, Wisconsin mandates that the environment be restored to the extent practicable. Consequently, it has set "preventive action limits" for contaminants in groundwater that may be used to determine the extent of the cleanup required at Superfund sites unless it can be shown that meeting such limits would not be technically or economically feasible. All of the preventive action limits are more stringent than the corresponding federal MCLs. They limit the concentrations of chemicals that can cause cancer to one-tenth the concentrations allowed under the MCLs, and they limit the concentrations of chemicals that can cause other health effects to one-fifth the concentrations allowed under the MCLs. However, the state allows exemptions for contaminants that occur naturally at levels exceeding the preventive action limits.

Nearly all of the states had only a few, if any, standards for contaminants that were less stringent than the corresponding federal MCLs. However, under SARA, only those numeric standards that are more stringent than the federal standards are to be considered as cleanup levels at Superfund sites.

The Flexibility States Provided in Applying Standards to Cleanups

Even though the states have set environmental standards, they have found that applying these standards uniformly to all sites may not be effective because conditions can vary from one hazardous waste site to another. As a result, sites may pose different levels of health risks and may, therefore, require different degrees of cleanup. We examined whether the states (1) allow the level of cleanup determined to be necessary under their standards to be adjusted to take into account site-specific conditions and (2) set different standards for different uses of the land or groundwater (e.g., set more stringent cleanup standards for land that could be used for residential than for industrial purposes). Overall, the states provided more flexibility in applying their soil standards than their groundwater standards.

Flexibility to Adjust Cleanup Levels Based on Soil Standards to Account for Site-Specific Conditions

Eight of the 13 states that had soil standards indicated that they allow the extent of the cleanup deemed necessary under their standards to be adjusted for site-specific factors. For example:

- Georgia's risk reduction standards include the option of determining cleanup target concentrations for contaminants on the basis of site-specific risk assessments.
- Minnesota characterized its standards as "quick reference numbers," rather than fixed limits, that are considered when determining how extensively to clean up a site. Thus, cleanup levels can be tailored to local conditions. For example, if exposure to contaminants in soil were reduced or eliminated because the soil was inaccessible, the cleanup levels would not need to meet the standards. Alternatively, if multiple contaminants with the same toxic effect were found at the same location, the cleanup level for each individual contaminant might be more stringent than the standard.
- Pennsylvania said that it has developed interim standards pending final regulations for about 100 soil contaminants but considers these to be "worst case" numbers that can be adjusted to reflect site-specific conditions.

In contrast, the remaining five states said that, in general, their soil standards were fixed limits on the concentrations of contaminants that must be met when cleaning up a site. While adopting relatively inflexible standards, these five states said that they do provide for certain exceptions under limited circumstances. For example, one state mentioned that it did not require that soil lying beneath a building be cleaned up to comply with the standards because the building would prevent people's exposure to the

contaminated soil. Alternatively, under certain conditions, some states allow cleanups to be based on site-specific risk assessments. Three of these states also said that they permitted less stringent cleanup levels than those based on their standards if meeting them was not technologically feasible or if naturally occurring levels of chemicals in the local environment were higher than the levels set by the standards. However, the use of such alternatives was the exception rather than the rule.

Some of the states also indicated that even if they do not provide much flexibility in applying their standards, they may permit flexibility in determining how to achieve the required level of protection. For example, instead of requiring costly incineration of contaminated soil to meet its standards, a state may allow the area to be covered with a clay cap so that people cannot come into contact with the contaminants.

Different Soil Standards for Different Land Uses or Exposures

The states may also provide flexibility by establishing different standards for different projected uses of the land at a site. Ten of the 13 states with soil standards told us they had set such standards. For example, Michigan said that it had defined soil standards for three types of land uses: residential, industrial, and commercial (with two subcategories). Generally, the more stringent standards apply to residential property, since people are more likely to be exposed to contaminants for a longer period of time on residential property than on other types of property.

Flexibility to Adjust Cleanup Levels Based on Groundwater Standards to Account for Site-Specific Conditions

While most states allowed flexibility in their cleanup levels for soil, the states were less flexible in setting cleanup levels for groundwater. The degree of flexibility largely depended on whether the groundwater was considered a potential source of drinking water.

Only 4 of the 20 states with groundwater standards said that they regularly allowed the cleanup levels for groundwater used as drinking water to be based on site-specific considerations. Texas, for example, incorporated this option in one of its cleanup strategies:

- Texas reported that it has three alternative "risk reduction" standards, any one of which can be used to clean up a site, with the state's approval. Cleanups under the first of these standards must ensure that the levels of contamination are no higher than the levels that occur naturally in the environment. Cleanups under the second standard must meet fixed limits set by the state, including federal MCLs that the state has adopted, and

place a notice in deed records to inform future property owners of any contamination left on the property. Cleanups under the third standard must also use federal MCLs when available, but for contaminants without corresponding MCLs, site-specific risk-based cleanup levels can be determined on the basis of the site's projected use. The third standard also requires deed notification.

The remaining 16 states indicated that, in general, for groundwater used as drinking water or considered potentially usable as drinking water, their standards were fixed limits that must be achieved during cleanup. Most of these states did say, though, that they allowed certain limited exceptions to their standards or the use of a site-specific risk assessment under some circumstances. For example, if the contaminated water came from an area where the contamination would not immediately threaten communities, a state might let the contamination be reduced naturally over time rather than require that it be cleaned up immediately.

The states gave various reasons for the relative inflexibility of their groundwater standards for drinking water. First, some of the states said that they were mirroring the federal MCLs for drinking water, which are also fixed limits. Some of the states also noted that, as discussed in section 2, they consider groundwater that may possibly be used as drinking water as a valuable resource that needs to be conserved.

Different Standards for Different Uses of Groundwater

Although the states in our survey told us that their standards for groundwater used as drinking water are relatively fixed, some states also reported that they provided some degree of flexibility by not classifying all groundwater as drinking water. They also set less stringent standards for groundwater that would not be considered a potential source of drinking water. For example, Connecticut's groundwater classification system acknowledges that in certain areas, such as those that have had long-term industrial or commercial use, the groundwater would not be a suitable source of drinking water unless it were treated. The state does not usually require that the groundwater in such areas be cleaned up to the standards for drinking water. Also, some states do not classify groundwater as drinking water if it has a high mineral content or if it is located in a geological formation that does not yield much water.

Twelve of the 20 states with groundwater standards said that they set different standards for different current or potential uses of groundwater. Thus, these states set separate standards for groundwater used for

agricultural purposes, groundwater of special ecological significance (e.g., supporting a vital wetland), and groundwater in urban, industrial, or commercial areas.[6]

Seven of these 12 states indicated that site-specific factors can be taken into account when determining the extent of the cleanup needed for these other types of groundwater. For example, Rhode Island told us that it allows the cleanup levels for some contaminants to differ from the levels set in its standards. For example, vapors escaping from volatile organic chemicals in the groundwater could accumulate in overlying buildings and cause potential health effects. In some cases, these vapors could build up and cause threats of explosion. In setting its "urban" groundwater standards, this state conservatively assumed that the buildings would not be ventilated and that the vapors from the underlying groundwater would be trapped in the buildings. However, in deciding how extensively to clean up a site, the state allows for a consideration of site-specific factors, such as depths to groundwater. When site-specific factors are considered, the cleanup levels may not need to be as stringent as the standards alone would require.

[6]While another five states exempted some of their groundwater from meeting drinking water standards, these states did not set other standards for the exempt water.

Objectives, Scope, and Methodology

The Chairmen and Ranking Minority Members of the House Committee on Transportation and Infrastructure and its Subcommittee on Water Resources and Environment asked us to determine whether states (1) when setting numeric standards for cleanups at hazardous waste sites, based them on estimates of the human health risks posed by exposure to contamination and (2) when using standards, provide the flexibility to adjust the level of cleanup prescribed by the standards to take into account the conditions and risks found at individual waste sites.

To accomplish these objectives, we conducted a telephone survey of 33 states, receiving a response rate of 100 percent. We selected these states because they included approximately 91 percent of the sites that the Environmental Protection Agency (EPA) had included on its National Priorities List (NPL) as of April 1995. We obtained information for standards for contaminants in soil and groundwater, the two media most frequently cleaned up at Superfund sites. (See app. II for a list of the states, the number of NPL sites in each state, the types of standards in each state, and the types of authority for the standards.)

We defined standards as limits on the concentrations of toxic chemicals in soil and groundwater and included limits promulgated in a state's laws or regulations or established as guidance or policy. We also included in our definition only standards that might be used as the basis for setting cleanup levels at a Superfund facility. Because petroleum spills are not covered under Superfund legislation, we excluded states that had established standards only for petroleum products under their separate programs for cleaning up leaking underground storage tanks. We excluded states that had simply adopted the federal standards set under the Safe Drinking Water Act or had established antidegradation policies without also setting specific numeric limits on contaminants.

The questions in our survey included (1) whether a state's standards were derived from a risk-based formula and/or other factors, such as the naturally occurring levels of contamination in the soil and groundwater; (2) whether the formulas were based on EPA's guidance or on the state's own methodologies for estimating human health risks from contamination; (3) what risk levels, such as a 1-in-1-million increased probability of contracting cancer, were used in setting the standards; (4) whether the standards were set for different uses of the land or groundwater; and (5) whether the standards were considered fixed limits or the state provided flexibility to adjust the cleanup levels based on these standards to take into account specific conditions at a site. We interviewed the

managers of states' Superfund programs, technical experts in these programs, and other key officials responsible for developing and/or implementing the states' standards. When necessary to clarify information, we contacted officials again for follow-up questions.

The data we obtained were current as of September 1995. To ensure the accuracy of our information, we provided state officials with a summary of the information we had compiled on their standards for their review. In addition, we provided copies of a draft of our report to EPA officials, including the Director of the Office of Emergency and Remedial Response and officials responsible for working with state Superfund programs, for their review and comment. They said that the report was an accurate discussion of states' standards and provided several technical changes and clarifications on the Superfund law's requirements for cleanups. We incorporated their changes and suggestions. We conducted our audit work from March 1995 through March 1996.

States Included in Survey and Reported Status of States' Standards

State	Number of Superfund sites[a]	Standards	Authority: Law/ regulations	Authority: Policy/ guidance
New Jersey	100	Soil Groundwater	X X	X
Pennsylvania	95	Soil Groundwater		X X
New York	76	Soil Groundwater	 X	X
Michigan	74	Soil Groundwater	X X	
California	69	Groundwater	X	
Florida	48	Groundwater	X	
Wisconsin	40	Soil Groundwater	X X	
Washington	35	Soil Groundwater	X X	
Minnesota	34	Soil Groundwater	 X	X
Illinois	33	Groundwater	X	X
Indiana	32	None		
Ohio	31	None		
Texas	25	Soil Groundwater	X X	
South Carolina	23	None		
Massachusetts	22	Soil Groundwater	X X	
North Carolina	21	Groundwater	X	
Kentucky	19	None		
Missouri	19	Soil		X
Delaware	18	None		
Virginia	18	Groundwater	X	
Iowa	16	None		
New Hampshire	16	Groundwater	X	
Connecticut	14	Soil Groundwater	X[b] X[b]	
Tennessee	14	None		
Colorado	13	Groundwater	X	
Louisiana	13	None		
Arkansas	12	None		

(continued)

State	Number of Superfund sites[a]	Standards	Authority: Law/ regulations	Authority: Policy/ guidance
Georgia	11	Soil	X	
		Groundwater	X	
Kansas	10	Soil		X
		Groundwater		X
Rhode Island	10	Groundwater	X	
Alabama	9	None		
Oklahoma	9	None		
Oregon	9	None		

Note: Status of states' standards is as of September 1995. (See app. I for our definition of standards and a discussion of our methodology.)

[a]Does not include federal facilities.

[b]Connecticut's standards for soil and groundwater were adopted as state regulations on January 30, 1996.

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