United States General Accounting Office

GAO

Testimony

Before the Subcommittee on Water Resources and Environment, Committee on Transportation and Infrastructure, House of Representatives

For Release
on Delivery
Expected at
12:00 p.m. EDT
Thursday, June 22, 1995

SUPERFUND

EPA's Use of Risk Assessments in Cleanup Decisions

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Mr. Chairman and Members of the Subcommittee:

As the Subcommittee deliberates the Superfund program's reauthorization, congressional interest is focusing on the use of risk assessments as a way of controlling federal expenditures in this multibillion-dollar program. One important aspect of this debate is how the Environmental Protection Agency (EPA) conducts human health risk assessments and uses them in making cleanup decisions at Superfund sites.

In light of this interest, we are pleased to be here today to discuss our ongoing work for the Subcommittee on the extent to which EPA uses human health risk assessments and federal and state standards[1] in determining (1) whether to clean up a Superfund site and (2) how extensive the cleanup should be. We would also like to discuss both our ongoing work on whether federal and state standards are based on estimates of risk and our completed work on the extent to which Superfund risk assessments follow EPA's guidance. We expect to provide you with our final results later this year.

In summary:

- Preliminary results from our ongoing review of EPA's data on 225 sites show that the risk assessments conducted at these sites played a substantive role in EPA's decisions on whether cleanup was necessary. At 188 of these sites, EPA's cleanup decisions were consistent with the results of the risk assessments. At the remaining 37 sites, the decisions were not consistent with these results. Instead, EPA based its decisions on factors other than the results of the risk assessment, including its legal responsibility to ensure that the levels of contamination left at the sites comply with the limits set by federal or state standards.

- As part of our ongoing review, we are also examining EPA's basis for determining how extensive the cleanup should be. Our preliminary findings, based on data that were available for 139 of the 225 sites, indicate that EPA used federal and state standards more often than risk assessments to determine the extent of the cleanup. In general, EPA is required to follow these standards when they have been established by law.

- To date, the results of our ongoing review suggest that the federal standards used to determine the extent of

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[1]Federal and state standards set numerical limits on the permissible levels of toxic chemicals in the environment.

cleanup are generally derived from estimates of health risks, while the state standards appear to vary as to whether they are based on such health risk estimates.

- In response to congressional interest in risk assessments, last year we reviewed a sample of assessments from each of EPA's 10 regions. We found that although they generally followed EPA's guidance, they were inconsistent in several technical ways that could have resulted in overestimates--or, alternatively, underestimates--of people's exposure to contamination and, consequently, their risks.

BACKGROUND

In 1980, the Congress created the Superfund program to clean up the nation's most severely contaminated hazardous waste sites. EPA begins work at each site by conducting a "remedial investigation" to determine whether the nature and extent of the contamination warrant cleanup. An important part of this investigation is the baseline risk assessment--a scientific evaluation of any current and potential threats to human health that the site poses or could pose if no cleanup were to occur. The assessment analyzes in detail the toxicity of the chemicals involved and the ways in which people might be exposed to them. The assessment then calculates the risk of an individual's contracting cancer or other serious conditions, such as neurological or birth defects, from exposure to the contamination.

The risk assessment has two purposes: to document the baseline risks at a site and help make decisions about cleanup. These decisions include (1) whether a cleanup is necessary and (2) what level of cleanup is needed, as measured by the amounts of chemicals that can safely remain at the site without jeopardizing human health.

Under EPA's policy, cleanup is generally warranted if the risk assessment shows that an individual's chance of developing cancer from exposure to the contamination is significant, that is, if the chance is greater than 1 in 10,000. EPA might also decide to clean up a site if the contamination poses a significant risk of causing another serious disease or condition, such as nerve or liver damage, or if an environmental risk exists, such as a threat of damage to wetlands.

Other factors besides the risk assessment influence cleanup decisions. Under Superfund law, with certain exceptions, cleanups must meet "legally applicable" or "relevant and appropriate" requirements found in the various federal environmental laws. Cleanups must also meet state environmental laws if they are more stringent than the federal laws. These

include federal and state standards that set quantitative limits on the concentration of contaminants that can be in the groundwater, soil, surface water, air, and sediments. When standards do not exist, risk assessments play a more dominant role in determining cleanup decisions.

Groundwater and soil are the two media most frequently cleaned up at Superfund sites. For groundwater, federal standards set maximum levels allowable for more than 80 chemicals under the Safe Drinking Water Act. Many states have also developed their own standards for groundwater. For soil, few federal standards exist, but 13 states have set cleanup levels for a variety of contaminants.

MOST OF EPA'S DECISIONS ON THE NEED FOR CLEANUP WERE CONSISTENT WITH THE RISK ASSESSMENTS

In work now under way for this Subcommittee, we are analyzing EPA's most current database for 225 sites where EPA reached decisions on the need for cleanup between 1990 and 1993. EPA determined that 200 of the sites needed to be cleaned up and 25 did not. In preliminary work, we have found that EPA's decisions on the need for cleanup were generally consistent with the results of the risk assessments. That is, for 172 of the 200 sites where EPA decided cleanup was necessary, the risk assessment indicated that the risks were significant.[2] For 16 of the 25 sites where EPA decided that cleanup was not necessary, the assessment indicated that the risks were low.[3] (See fig. 1.)

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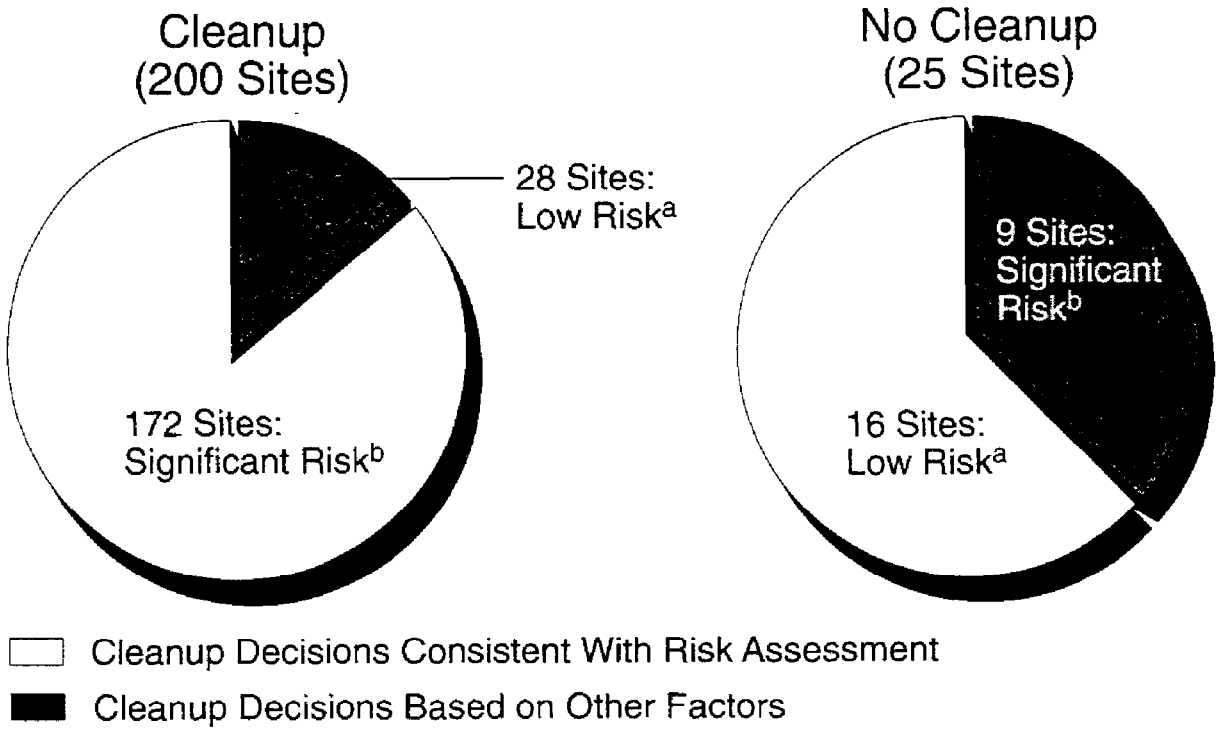
[2]That is, the cancer risk was greater than 1 in 10,000 and/or other health risks were present.

[3]That is, the cancer risk was less than or equal to 1 in 10,000 and other health risks were negligible. In these 16 sites we included 9 sites where the cancer risk was close to, but slightly greater than, 1 in 10,000, since EPA does not consider this number to be a strict cutoff.

Figure 1. Whether to Clean Up: Decisions Generally Consistent With Risk Assessments



[a]Low risk: cancer risk ≤ 1 in 10,000; other health risks negligible.
[b]Significant risk: cancer risk > 1 in 10,000 and/or other health risks present.

For 37 sites, EPA's decisions on the need for cleanup were not consistent with the results of the risk assessment. Specifically, for 28 sites, EPA decided that cleanup was necessary, yet the risks were low; for 9 sites, EPA decided that cleanup was not necessary, yet the risks were significant.

In these 37 cases, EPA used factors other than the results of the risk assessment to determine whether cleanup was necessary. EPA may decide to clean up a site even when the health risks are low if the levels of contamination at the site violate federal and state standards. For example, at the Pacific Coast Pipeline site in California, EPA decided to clean up groundwater, at an estimated cost of $7 million, because the concentrations of four contaminants exceeded federal and state drinking water standards. The risk assessment had indicated no significant threat to public health. An EPA official in the Office of Emergency and Remedial Response explained that the agency may also decide to clean up a site even when the health risks are low if it determines that a threat to the environment exists or if specific conditions at the site indicate a need for

cleanup (e.g., erosion is causing a landfill to break down).

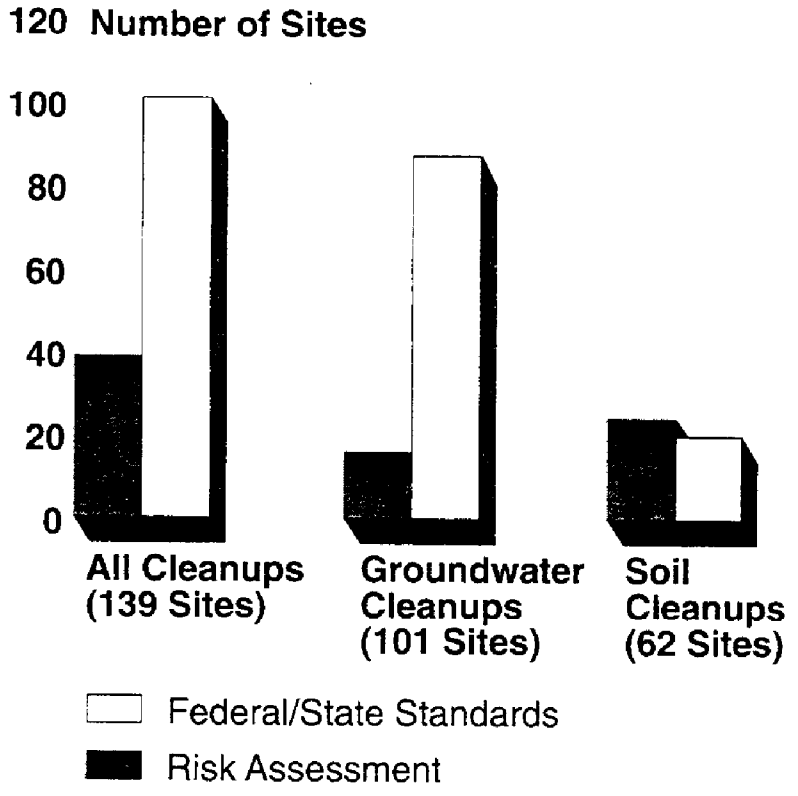
Conversely, the EPA official said that the agency may decide not to clean up a site even when the risk assessment indicates that the health risks are significant if the chemicals are expected to degrade into harmless by-products in the near future (in which case EPA would monitor the levels of contamination to ensure the chemicals degraded) or if site-specific factors could mitigate the risks. For example, restrictions on land use could limit exposure to contamination at a site and reduce the estimate of risk. At the Chem-Form, Inc., facility in Florida, where chemicals had contaminated the groundwater, EPA followed its risk assessment guidance and conservatively assumed that the site could be used for residential purposes, thereby arriving at estimates of significant risks. However, since the area was zoned for industrial use and its drinking water was supplied by a separate public water system, EPA decided that residents or workers were unlikely to be exposed to the contamination. In addition, the concentration of the main contaminant, arsenic, was below the federal standards. For these reasons, EPA decided not to clean up the groundwater at the site.

MOST OF EPA'S DECISIONS ON THE EXTENT OF CLEANUP WERE BASED ON STANDARDS

If EPA determines that a cleanup is necessary, it then decides on the appropriate extent, or level, of the cleanup. We are reviewing a subset of EPA's database that contains information on the basis for the cleanup levels selected for 139 sites. Our preliminary findings indicate that EPA predominantly used federal and state standards to set cleanup levels at the 139 sites. At 103 of these sites, EPA used federal and state standards to set cleanup levels; at 40 sites, it used risk assessments.[4]

[4]The sum of the two subtotals exceeds 139 sites because sites contain multiple contaminants and EPA sets a separate cleanup level for each contaminant.

Figure 2. Extent of Cleanup: Standards Often Used as Basis for Cleanup Levels



Note: EPA may use more than one basis for setting cleanup levels for the multiple contaminants at each site.

Under Superfund law, cleanups must protect public health and ensure that any chemicals left on-site do not exceed the limits set by the federal or state standards. Therefore, EPA often uses these standards to establish cleanup levels.

EPA uses risk assessments to establish cleanup levels when standards have not been established for a contaminant. Since there are fewer standards for soil than for groundwater, we found that EPA used risk assessments to set cleanup levels at about half the sites where the soil was contaminated and at about only 20 percent of the sites where the groundwater was contaminated.

According to EPA officials, the fact that so many of the cleanup levels in our sample were based on standards indicates that the levels established by standards are, in general, more stringent than those set by risk assessments. Therefore, cleanups based on standards would be more extensive, and potentially more costly, than those based on risk assessments.

FEDERAL STANDARDS TYPICALLY ARE BASED ON RISK ESTIMATES, BUT STATE STANDARDS VARY

At the request of this Subcommittee, we are also determining whether federal and state standards are based on estimates of risk to human health. In general, we are finding that federal standards are based on such estimates while state standards vary.

The major federal criteria applied at Superfund sites to determine cleanup levels--maximum contaminant levels for groundwater used as drinking water and guidance on lead and PCB levels in soil--are expressed as quantitative limits or ranges for concentrations of specific contaminants. These numerical values, however, are all derived, at least in part, from estimates of risks to human health. Specifically:

- Maximum contaminant levels for drinking water are based on estimates of health risks, as well as data on the cost and feasibility of monitoring and treating contaminated water to meet these standards.

- Guidance on PCB levels in soil is based on estimates of risk that take into account potential exposure to the contamination through direct contact, such as touching contaminated soil and absorbing the contaminants through the skin.

- Guidance on lead levels in soil is based on a scientific model that considers the frequency and duration of exposure, as well as other variables used in risk assessments.

Some of these standards give EPA flexibility, when setting cleanup levels, to consider site-specific circumstances that could affect risk estimates. For example, the lead and PCB guidance sets numerical levels for cleanup that are based on generic risk assumptions. One assumption is that an individual would live on the site for 30 years and come into direct contact with the soil almost daily. At some sites, this assumption may not be realistic, in which case EPA can substitute other variables on the frequency and duration of exposure to estimate the risks and decide on the extent of cleanup. In contrast, the maximum contaminant levels for drinking water do not provide this flexibility.

Preliminary results from our ongoing interviews with state Superfund program managers indicate that state standards, unlike federal standards, vary as to whether they are based on estimates of risk. In one state, groundwater must meet the federal limits for those chemicals for which maximum contaminant levels exist. For any other contaminants, the state requires that they be removed entirely rather than reduced to risk-based levels. In

another state, groundwater cleanups must meet standards derived from estimates of risk that the state has calculated.

Our preliminary results also suggest that states vary in the extent to which they allow site-specific conditions to be considered in determining cleanup levels. One state allows the party responsible for cleanup to select the basis for establishing cleanup levels for soil. The responsible party can use the state's standards for soil, which are based on generic assumptions about exposure to contaminants, or it can use the Superfund risk assessment. Another state does not allow consideration of site-specific conditions. Instead, under most circumstances, it uses a standard formula for deriving cleanup levels for soil, applying different formulas for industrial and residential property.

RISK ASSESSMENTS GENERALLY FOLLOW GUIDANCE BUT ARE INCONSISTENT IN A FEW IMPORTANT WAYS

Last year, we reviewed a sample of risk assessments from each of EPA's 10 regions and reported that the assessments generally conformed with the agency's guidance, particularly in the way they estimated human exposure to contamination and calculated the resulting risk.[5] However, we found that the risk assessments departed from the guidance in a few key technical respects.

For example, several of the risk assessments, contrary to EPA's guidance, did not use the average chemical concentrations to calculate the potential exposure to contamination. Instead, they used higher, or even the highest, levels found at the site, potentially overstating people's exposure and, consequently, the site's risks. Other risk assessments we reviewed possibly understated health threats by not adding together the risks from all the contaminated media to which an individual might be exposed.

A number of the risk assessments we reviewed also used different assumptions about how much of a chemical could be absorbed through the skin if an individual were exposed to contaminated soil. EPA explained that such differences arose because good information for how people absorb contaminants from soil was unavailable.

EPA's guidance, we found, permits such inconsistency even though it may lead to different estimates of risk. EPA has acknowledged that risk assessment is not an exact science and

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[5]Superfund: Improved Reviews and Guidance Could Reduce Inconsistencies in Risk Assessments (GAO/RCED-94-200, Aug. 10, 1994).

that the data necessary for quantifying risk are often lacking or inconclusive. As a result, EPA has granted staff a great deal of latitude to exercise their professional judgment when developing risk assessments.

However, we found that many of the risk assessments in our study did not properly qualify their results by fully disclosing such things as the assumptions used and the effects these might have on the calculations of risk. EPA officials noted that the agency's guidance requires that the risk assessments clearly explain their assumptions and their effects, but the officials acknowledged that EPA could do a better job of ensuring such communication.

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That concludes our statement, Mr. Chairman. We would be happy to answer any questions.

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