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The Honorable Frank H. Murkowski
Chairman, Committee on Energy and
Natural Resources
United States Senate

The Honorable John H. Chafee
Chairman, Committee on Environment
and Public Works
United States Senate

The Honorable Robert C. Smith
Chairman, Subcommittee on Superfund,
Waste Control, and Risk Assessment
Committee on Environment and Public
Works
United States Senate

The Department of Energy (DOE) is engaged in a massive cleanup of the nuclear weapons complex that is scheduled to last well into the next century at an estimated cost of \$200 billion to \$350 billion.¹ Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), in addition to DOE's responsibility to clean up its sites, DOE is liable to natural resource trustees for monetary damages to compensate for injuries to natural resources that resulted from DOE's nuclear weapons production. Such natural resources include wildlife, fish, rivers and lakes, groundwater, and land. DOE's report entitled *Estimating the Cold War Mortgage: The 1995 Baseline Environmental Management Report* indicates

¹Taken from the base case in DOE's report, *Estimating the Cold War Mortgage: The 1995 Baseline Environmental Management Report*. Except where noted, the costs cited in this report are in 1995 dollars but are not discounted because of uncertainty about the timing of expenditures.

that many of these sites may not be fully cleaned up and that instead, because of cost and technology limitations, contaminants may be left in place and contained in some manner. This situation, together with DOE's releases of hazardous substances in the past, raises the possibility that DOE may be subject to liability for natural resource damages under CERCLA.

Given this potential, and the already substantial cleanup bill that the nation faces, you asked us to (1) estimate the range of potential liability for natural resource damages at DOE's sites, (2) explain any differences between our estimates and the estimates developed by an interagency group headed by the Council on Environmental Quality (CEQ), and (3) identify factors that could affect the reliability of these estimates, including legal issues.

Two basic methods are available for estimating DOE's potential liability for natural resource damages—estimating potential liability on an individual site-by-site basis and estimating liability for the entire environmental restoration program. At DOE's facilities, conclusive information about possible injuries to resources is not generally available; therefore, estimating liability on an individual site-by-site basis is not possible. Consequently, we, as well as CEQ, estimated DOE's potential liability for its overall environmental restoration program by using information about settlements for natural resource damages from private sites to calculate a series of ratios of natural resource damages to the cleanup costs and applying these ratios to DOE's projections of its cleanup costs. This method assumes that DOE's experience with natural resource damages will be similar to the settlement experience to date at private sites.

The following summarizes our results:

- We estimate that DOE's potential liability for natural resource damages could vary from \$2.3 billion to \$20.5 billion and that a more likely range could be from \$2.8 billion to \$13 billion. In April 1996, CEQ estimated that DOE's potential liability was most likely to range from \$159 million to \$611 million.
- Two errors and differing assumptions about the likelihood of damages are major reasons for the differences between CEQ's April 1996 estimates and ours. Specifically, one error by CEQ resulted in an overly low ratio of damages to cleanup costs, and the second error resulted in lowering one estimate of DOE's cleanup costs. CEQ plans to correct these errors in revised estimates. In addition, CEQ assumed that only 35 percent of DOE's sites will incur natural resource damages. We did not assume that only 35 percent of DOE's sites would incur natural resource damages because the impact of the factors that CEQ used to support its assumption, such as the

extent of state and tribal trusteeship over resources, has not been clearly resolved. We did account for the possibility that some DOE sites may not incur natural resource damages through the use of two ratios to develop a range of estimates.

- Our estimates, as well as CEQ's, are based on several assumptions. If these assumptions prove to be incorrect, our estimates could either understate or overstate DOE's potential liability for natural resource damages. For example, it is not known whether DOE's settlement experience with natural resource damages will be like that of private sites. Furthermore, several unresolved legal issues could affect DOE's liability, such as the applicability of certain of CERCLA's exemptions from liability for natural resource damages to circumstances at DOE's sites.

BACKGROUND

In addition to requiring the cleanup of waste sites, CERCLA allows federal, state, and Indian tribal officials that have been designated as trustees to file claims for monetary damages for injuries to natural resources resulting from releases of hazardous substances. Claims may be filed at sites that are on CERCLA's National Priorities List, which identifies the most hazardous inactive waste sites, or at other sites where releases of hazardous substances have occurred. In this report, we use the term "injuries" to refer to hazardous substances' adverse effects on resources and the term "damages" to refer to the monetary recoveries for such injuries. CERCLA's provisions regarding natural resource damages cover resources that belong to, or are under the control or management of, the United States, a state, or a tribe.²

Monetary damages are usually for injuries that were not rectified by the cleanup and are to be used to (1) pay for assessments of the extent and monetary value of injuries to natural resources, (2) restore the natural resources or acquire equivalent resources, and (3) compensate the public for the interim loss of the resources.³ For example, a particular cleanup might remove a pollution source

²We have issued several related products on natural resource damages, including *Superfund: Outlook for and Experience With Natural Resource Damage Settlements* (GAO/RCED-96-71, Apr. 16, 1996) and *Superfund: Natural Resource Damage Claims* (GAO/T-RCED-95-182, May 11, 1995).

³According to officials from the Department of Justice, all recoveries, including those for interim losses, are spent on restoring, replacing, or acquiring the equivalent of the injured natural resources. In addition, recoveries reimburse

and much of the resulting contaminated soil but leave in the soil some contamination that continues to leach into a river. If such contamination adversely affected fish populations, natural resource damages may be recovered for the restoration of the fish and their habitat.

Under CERCLA, the Department of the Interior has developed regulations for performing natural resource damage assessments that contain detailed procedures for identifying and measuring injuries to resources and for determining the amount of monetary damages.⁴ Injuries, as defined in these regulations, are measurable adverse changes in the quality or viability of a resource. The presence of contamination does not necessarily mean that an injury exists; the party claiming damages must demonstrate that an adverse effect on resources exists and that the adverse effect results from the release of the hazardous substances into the environment. Under the regulations, injuries may be demonstrated in a number of ways, such as by (1) contamination in a river that violates water quality standards, (2) contaminant levels in fish that exceed safety standards for human consumption, or (3) a statistically significant increase in death or disease in wildlife.

In the case of private cleanup sites, various federal, state, and Indian tribal authorities have been designated as natural resource trustees and can file claims for injuries to resources under their trusteeship. For example, the Department of the Interior is the federal trustee for resources including migratory birds, certain fish, and endangered or threatened species, while the National Oceanic and Atmospheric Administration is the federal trustee for resources including fisheries, marine mammals, endangered or threatened marine species, and coastal habitats.

With respect to DOE's facilities, the Department is a trustee for its own lands; however, other federal agencies, states, and tribes also have trustee interests in resources associated with DOE's facilities. For instance, according to the Director of the Environmental Compliance Division at DOE's Hanford Site in Washington State, the states of Washington and Oregon, other federal trustees, and several Indian tribes have trustee interests in the Columbia River, which flows through the site. Because one federal agency generally cannot sue

trustees for the cost of assessing injuries to natural resources.

⁴The use of these damage assessment procedures is optional, but if the agencies designated as natural resource trustees implement the procedures fully, they are granted a legal presumption of correctness in a court of law that shifts the burden to the defendants to prove otherwise.

another federal agency, the other federal trustee agencies cannot bring court action against DOE for natural resource damages but may participate in such activities as studying injuries to natural resources and planning restoration actions.

At DOE's facilities, conclusive information about possible injuries to resources is generally not yet available. This is because (1) the effects of contamination on resources have not yet been fully studied and (2) remedial actions have not yet been selected at many locations; therefore residual effects that may remain after cleanup actions are not known. Claims for natural resource damages at federal facilities cannot be filed until the remedial action has been selected.⁵ The only claim for natural resource damages against DOE to date was filed in 1986 by the state of Ohio in the United States District Court for the Southern District of Ohio. The claim concerned DOE's Fernald site near Cincinnati, Ohio. That claim was stayed under a 1988 consent decree between Ohio and DOE, pending completion of the remedial investigation and feasibility study for remedial action.

ESTIMATING DOE'S POTENTIAL LIABILITY FOR NATURAL RESOURCE DAMAGES

Because detailed information on injuries to resources at individual DOE sites is generally not yet available, we used information about settlements for natural resource damages at private cleanup sites to estimate DOE's potential liability for natural resource damages for the Department's environmental restoration program. This method assumes that DOE's experience with natural resource damages will be similar to the settlement experience to date at private sites. Under this method, we used the following three steps:

- First, we obtained data on settlements for natural resource damages and cleanup costs at private sites from a compendium of settlements for natural resource damages compiled by the Department of Justice as of September 1995—the most recent compendium available.⁶ The compendium included

⁵CERCLA 113(g)(1) bars the filing of a claim for natural resource damages at any site on the CERCLA National Priorities List, any federal facility, or any other facility at which a remedial action is scheduled until after the selection of the remedial action.

⁶Natural resource damages included recoveries from private parties by federal trustee agencies, states, and Indian tribes. Cleanup costs included cost recoveries by the Environmental Protection Agency, estimates of future cleanup

settlements under CERCLA that had been entered into Justice's data system since the provisions for natural resource damages were first enacted through September 9, 1995. The compendium included only those cases in which a federal agency participated as a trustee. Approximately half—49 of the 96 settlement cases—involved monetary damages for natural resource injuries. The remaining settlement cases resulted in a covenant (an agreement) not to sue for monetary damages for natural resource injuries.

- Second, we calculated two ratios. Each ratio was calculated by dividing the sum of monetary damages by the sum of cleanup costs and was expressed as a percentage. For the first ratio, we used data for all of the cases in the compendium, including those where there was a covenant not to sue for monetary damages. This ratio was 5.95 percent. For the second ratio, we used data for only those cases that included monetary damages for injuries to natural resources. This ratio was 9.41 percent. We developed the two ratios to reflect two potential outcomes. The first ratio is intended to reflect an outcome in which DOE's experience would be similar to that of all private sites where there had been a settlement. The computation of the second ratio assumes a situation in which all of DOE's sites would pay monetary damages for injuries to natural resources. Table 1 illustrates how we derived the two ratios.

Table 1: Calculation of the Ratios of Damages to Cleanup Costs at Private Sites

Dollars in thousands

Sum of natural resource damages	Sum of cleanup costs	Ratio of damages to cleanup costs
\$124,825	\$2,098,371 (for all cases, with and without monetary damages)	$\$124,825 \div \$2,098,371 = 0.0595$, or 5.95 percent
\$124,825	\$1,327,033 (for cases with monetary damages only)	$\$124,825 \div \$1,327,033 = 0.0941$, or 9.41 percent

Note: In the Department of Justice's compendium, damages at private sites are stated in dollar values as of the time of settlement. For example, damage settlements that occurred in 1990 are stated in 1990 dollars. Similarly, cleanup costs are stated as recovered or as estimated in the record of decision. It was not possible to convert all

costs from records of decision, and in a few cases, civil penalties.

of these data to 1995 dollars because the cleanup costs/estimates and damages were generated at numerous points in time that were often not specified.

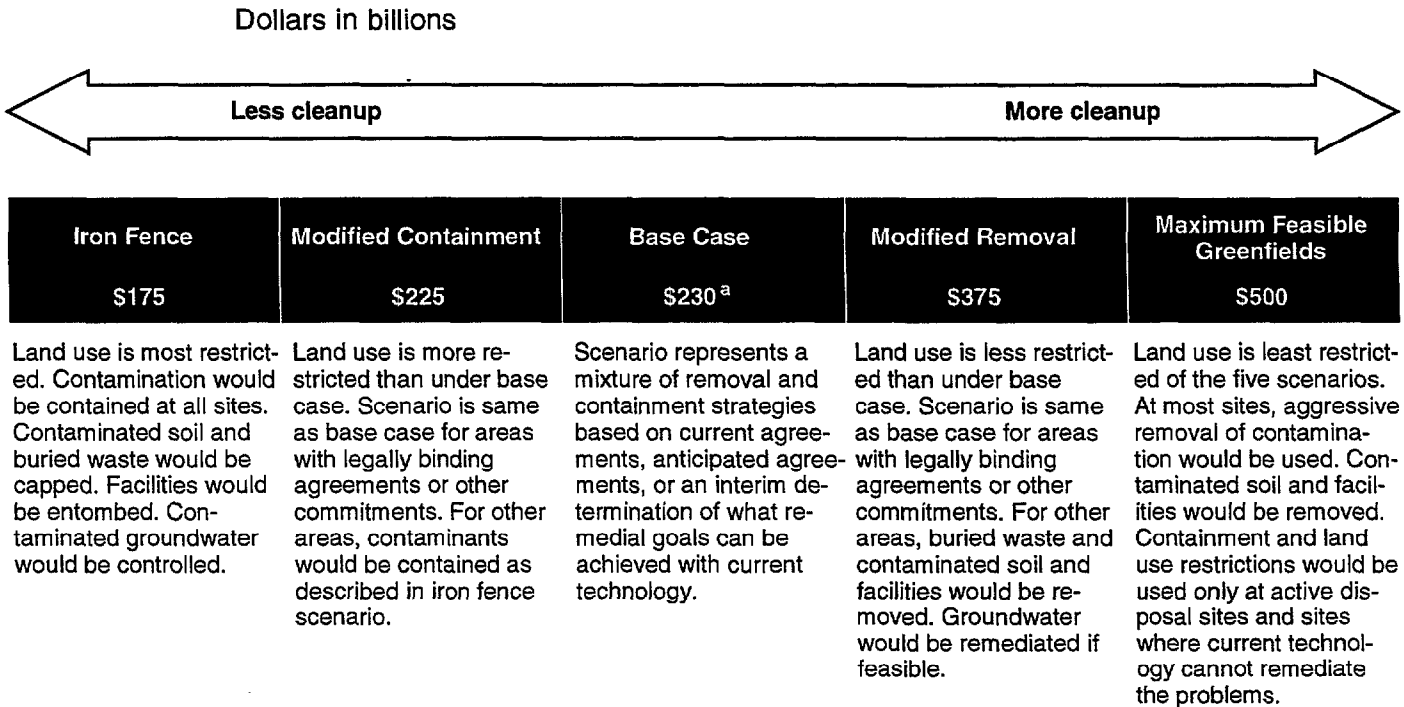
- Third, we multiplied these percentages by the estimates of DOE's total cleanup costs to produce a range of estimates of DOE's potential liability for natural resource damages. We used two sources for DOE's cleanup costs: (1) DOE's *1995 Baseline Environmental Management Report*, which estimated future costs, and (2) financial reports of the actual costs for fiscal years 1989 through 1994. (Cleanup costs were not separately reported prior to fiscal year 1989.) From each of these sources, we extracted the types of costs that are relevant to estimating natural resource damages, as described below.

The *1995 Baseline Environmental Management Report* identified five possible scenarios (see fig. 1) for cleanup and other environmental management activities, resulting in a range of cost estimates. Cost estimates for DOE's cleanup program are uncertain because only about one-fourth of the Department's sites have been fully characterized⁷ and because cleanup is expected to take as long as 75 years. The base case represents what DOE considers the most likely cost estimate for its environmental management program. It was compiled from data on approximately 10,500 sites where hazardous substances had been released. The base case reflects several general assumptions: (1) the use of existing technologies; (2) compliance with existing or reasonably anticipated agreements, such as legally binding agreements with regulatory agencies; and (3) remedies that are considered technically and environmentally reasonable and achievable.

In addition to the base case, DOE developed four alternative scenarios by varying assumptions about the future land uses of the sites and modeling the potential effects on costs. Future land use can affect cleanup costs because more restricted uses—such as continued government ownership and limitations on public access—would require a lesser degree of cleanup, resulting in lower cost. Less restricted uses—such as recreational use, private industrial use, or residential use—would require a greater degree of cleanup and higher cost.

⁷Characterization is the process of determining the nature and extent of contamination at a site and assessing potential threats to public health and the environment.

Figure 1: Scenarios Used in DOE's 1995 Baseline Environmental Management Report



Note: Cost estimates listed in this figure are estimates adjusted by DOE to reflect possible future savings from increased productivity.

^aThe base case scenario comprises three ranges--low (\$200 billion), mid (\$230 billion), and high (\$350 billion)--based on varying assumptions about possible future savings from increased productivity. For the mid-range of the base case, DOE also reports the present-value costs to be \$84 billion using a discount rate of 7 percent.

Because DOE considers the iron fence and maximum feasible greenfields scenarios to be unrealistic, we did not use the cost estimates for these scenarios in estimating DOE's potential liability for natural resource damages. Specifically, DOE's 1995 Baseline Management Report states that the iron fence scenario may be unrealistic from a legal or policy perspective because the scenario ignores many of DOE's legal and political commitments under the cleanup program, while the greenfields scenario may be unrealistic because of its high cost and the large volumes of waste that would be generated by such extensive remediation and demolition of buildings. The modified containment scenario and modified removal scenario were intended to estimate the costs for more realistic land-use possibilities. Hence, we used the modified containment, base case, and modified removal scenarios.

Because all of the costs reflected in figure 1 are not relevant for calculating natural resource damages, we identified the types of costs that are reported for private sites' cleanups in Justice's compendium. Then, we used only similar types of DOE's costs—namely, assessment, removal, remedial action, and long-term surveillance and maintenance.⁸ The total costs shown in figure 1 also include costs for the decontamination and decommissioning of buildings, waste management, the stabilization of nuclear facilities and materials, technology development, and program management and planning. We did not use these types of costs because they are not comparable to those reported for private sites.

DOE's *1995 Baseline Environmental Management Report* identifies costs for 1995 and future years through about 2070. For fiscal years 1989 through 1994, we used DOE's financial reports of the actual costs and identified the relevant types of remediation costs, as described above. Table 2 lists the remediation cost estimates for DOE that we used in estimating DOE's potential liability for natural resource damages.

⁸In addition to the costs for CERCLA sites, we included the costs for sites with corrective actions under the Resource Conservation and Recovery Act of 1976, as amended, and the Formerly Utilized Sites Remedial Action Program because these sites may involve releases of hazardous substances as defined in CERCLA. Therefore, these sites may fall under CERCLA's provisions concerning natural resource damages. In commenting on our report, DOE officials noted that DOE may not be liable for all of the formerly utilized sites since some were privately owned; however, they could not identify which sites should be excluded. Given this uncertainty, we retained the data for the formerly utilized sites in our cost calculations. We did not include the costs for DOE's uranium mill tailings cleanup sites because CERCLA excludes these sites from its provisions regarding cleanups and natural resource damages.

Table 2: Remediation Cost Estimates Used by GAO to Estimate DOE's Potential Liability for Natural Resource Damages

Dollars in billions (stated in 1995 dollars)

	Modified containment scenario	Base case scenario	Modified removal scenario
Remediation costs			
Remediation costs for fiscal years 1989 through 1994	\$ 5.2	\$ 5.2	\$ 5.2
DOE's estimate of remediation costs for 1995 to 2070 ^a	32.7	42.5	212.9
Total remediation costs^b	\$37.9	\$47.8	\$218.1

^aWhile DOE's *1995 Baseline Environmental Management Report* generally cites cost estimates that have been adjusted for possible future savings from increased productivity, DOE's cost estimates that we used were unadjusted for possible productivity savings because the attainment of such savings is uncertain.

^bMay not total because of rounding.

Our Estimates of DOE's Potential Liability for Natural Resource Damages

We estimate that DOE's potential liability for natural resource damages could vary from \$2.3 billion to \$20.5 billion and that a more likely range could be from \$2.8 billion to \$13 billion. For each of the three cleanup cost scenarios described earlier, we developed a low-end and a high-end estimate by applying the lower and higher percentages calculated from the private site settlement cases. For example, we derived the lowest estimate by multiplying the lower ratio (5.95 percent) times the remediation cost estimate for DOE's modified containment scenario (\$37.9 billion, as listed in table 2), which results in a low-end damage estimate of \$2.3 billion. Table 3 lists our estimates of DOE's potential liability, which are based on the three cleanup scenarios.

Table 3: GAO's Estimates of DOE's Potential Liability for Natural Resource Damages

Dollars in billions

Ratio of damages to cleanup costs at private sites	Potential liability based on DOE's modified containment scenario	Potential liability based on DOE's base case scenario	Potential liability based on DOE's modified removal scenario
5.95% (reflecting cases with and without monetary damages)	\$2.3	\$2.8	\$13.0
9.41% (reflecting cases with monetary damages only)	3.6	4.5	20.5

Two of the estimates shown in table 3 appear less likely to occur. First, under the modified containment scenario, the lower estimate of \$2.3 billion seems less likely to occur because the degree of cleanup under this scenario is less than that of the other scenarios. Because this scenario involves less cleanup, it seems more likely that injuries to natural resources would remain after cleanup. Therefore, for this scenario, it seems more appropriate to apply the higher ratio of 9.41 percent, since it reflects only those private site cases that had monetary damages. Second, under the modified removal scenario, the higher estimate of \$20.5 billion seems less likely because this scenario represents a greater degree of cleanup at DOE's sites. Hence, fewer locations would be expected to have injuries to natural resources remaining after cleanup. Therefore, it seems more appropriate to apply the lower ratio of 5.95 percent to this scenario, as the lower percentage reflects private sites with and without monetary natural resource damages.

If these two less likely estimates are excluded, the lowest estimate is the \$2.8 billion estimate derived from DOE's base case, while the highest estimate is the \$13 billion estimate derived from DOE's modified removal scenario. This is the range of estimates for natural resource damages for DOE that we consider more likely.

Any estimate of DOE's potential liability for natural resource damages is uncertain, as discussed below. Moreover, while our estimates are stated in 1995 dollars, natural resource damages would be paid at various unknown times in

the future. Because of this uncertainty, we did not estimate the present value of damage settlements.⁹

CEQ's Estimates of DOE's Potential Liability for Natural Resource Damages

CEQ led an interagency working group that developed estimates of DOE's potential liability for natural resource damages.¹⁰ (We refer to this group as CEQ and to the group's estimates as CEQ's estimates.) In an April 23, 1996, letter to Senator John Chafee, this group estimated that a likely range of DOE's potential liability for natural resource damages was \$159 million to \$611 million. The most likely range of damages in CEQ's estimate was derived from the base case scenario in DOE's *1995 Baseline Environmental Management Report*. CEQ used the same basic assumption and methodology for its estimates that we used—it developed ratios of damages to cleanup costs at private sites using the Department of Justice's data and applied the ratios to estimates of DOE's cleanup costs. Table 4 lists CEQ's estimates from the April 1996 letter.

⁹The following is an example of how calculating the present value could affect the estimates of damages. By using DOE's information on the projected timing of cleanup expenditures from 1995 to 2070 under the base case, and assuming, for example, a 5-year lag between the outlay of funding for cleanup and the settlement of natural resource damages, the present value of \$4.5 billion in table 3 equals \$1.2 billion, using a 7-percent discount rate as recommended by the Office of Management and Budget. However, \$4.5 billion is a better indication of the dollar amount that the Congress may have to appropriate.

¹⁰The working group included officials from CEQ, DOE, Interior, the National Oceanic and Atmospheric Administration, the Department of Justice, the Office of Management and Budget, and the National Economic Council.

Table 4: CEQ's April 1996 Estimates of DOE's Potential Liability for Natural Resource Damages

Dollars in billions

Ratio of damages to cleanup costs at private sites	Potential liability for damages based on DOE's iron fence scenario	Potential liability for damages based on DOE's base case scenario	Potential liability for damages based on DOE's maximum feasible greenfields scenario
0.62% (reflecting cases with and without monetary damages)	\$0.125	\$0.159	\$0.328
6.82% (reflecting cases with monetary damages only)	0.475	0.611	1.259

Note: For DOE's sites that are not on CERCLA's National Priorities List, CEQ estimated liability for natural resource damages for the base case scenario only. The figures listed for the iron fence and greenfields scenarios are the total of CEQ's estimate of natural resource damages for National Priorities List sites under the particular scenario, plus the estimate for the base case for the sites not on the National Priorities List.

REASONS FOR DIFFERENCES BETWEEN GAO'S AND CEQ'S ESTIMATES

Two errors and differing assumptions about the likelihood of damages are major reasons for the differences between CEQ's April 1996 estimates and ours. While discussing the two errors with CEQ officials and members of the interagency group, they said that they plan to revise their estimates to correct these errors and were planning to transmit the revised estimates to interested parties in the Congress in July or August 1996. They also plan to use a more recent version of the Department of Justice's compendium of natural resource settlement cases in their revised estimates. The errors that we identified are as follows:

- First, in computing its lower ratio of 0.62 percent, CEQ used an incorrect, overly high figure for total cleanup costs for private sites. Because the ratio is derived by dividing damages by cleanup costs, the result of the overly high figure for cleanup costs is that this percentage is lower than it should be. Specifically, CEQ calculated the total cleanup costs to be nearly \$13 billion for the private site cases included in its analysis, which would mean an average cleanup cost of about \$138 million per site. In contrast, in computing our lower ratio of 5.95 percent, we calculated total cleanup costs to be approximately \$2 billion for the sites in our analysis, which results in an average cleanup cost of about \$22 million per site. CEQ agreed that its cost figure was too high and plans to recalculate and correct its total cleanup cost figure and the resulting ratio.

- Second, CEQ's April 1996 estimates reflect a large, incorrect downward adjustment to DOE's greenfields scenario estimate of remediation costs for sites on the National Priorities List. While the *1995 Baseline Environmental Management Report* and its supporting data indicate a total of well over \$200 billion for remediation costs for sites on the National Priorities List under the greenfields scenario, CEQ's estimates used an adjusted figure of only \$50 billion for such costs. Officials from DOE's Office of Environmental Restoration who provided CEQ with the \$50 billion figure told us that they lowered the greenfields cost estimate to reflect a more realistic cleanup approach. However, CEQ's April 1996 letter did not indicate that the greenfields cost estimate had been adjusted but described the greenfields cost estimate used as reflecting unrestricted future land use and active removal or destruction of contaminants. CEQ officials agreed that this description of the adjusted greenfields figure was not accurate. Moreover, the DOE officials who provided CEQ with the adjusted greenfields figure stated that the adjustment was based on a flawed assumption and that they plan to reassess what remediation cost estimates should be used in the planned revision to CEQ's estimates of DOE's potential liability for natural resource damages.

- Third, the difference between CEQ's estimates and ours is also due to the difference in assumptions made about the likelihood of natural resource damages at DOE's sites. Our estimates account for the possibility that some of DOE's sites may not incur damages through the use of the two ratios. The higher ratio of 9.41 percent reflects the possibility that all of DOE's sites may incur monetary damages, while the lower ratio of 5.95 percent was used to reflect the possibility that, like the settlement experience of private sites to date, some DOE sites may not incur natural resource damages.

CEQ's April 1996 estimates used two approaches to account for the possibility that some of DOE's sites may not incur natural resource damages—one approach for the low-end estimate for each scenario and another approach for the high-end estimates. First, in developing its low-end estimate for each scenario, CEQ used a lower ratio to reflect settlements at private sites with and without monetary damages and applied this lower ratio to DOE's total remediation cost estimates. This is the same method that we used. Second, in developing its high-end estimate for each scenario, CEQ assumed that there will likely be post-cleanup natural resource damages at only 35 percent of DOE's sites. The high-end estimates for each scenario were calculated by applying CEQ's higher ratio of 6.82 percent to 35 percent of DOE's remediation cost estimates.¹¹

CEQ's April 1996 letter lists several factors used to ascertain the percentage of sites likely to have natural resource damages but does not list details on how the factors were applied to arrive at the 35-percent adjustment. The factors included (1) the question of whether injuries to natural resources have occurred outside a facility's boundary, (2) the likelihood that anticipated remedial actions will address injuries to natural resources, (3) the question of whether state and tribal trustees have participated in and are satisfied with DOE's planned actions, and (4) the question of whether any injured resources are subject to state or tribal trusteeship. However, at many DOE sites, the nature, location, and extent, if any, of natural resource injuries have not yet been determined. Moreover, as described below, the extent of state and tribal trusteeship over resources and the extent of liability for on-site resource injuries have not yet been clearly resolved.

In addition to these three reasons, CEQ's April 1996 estimates and our estimates of DOE's potential liability for natural resource damages differ for several other reasons that are described in enclosure I.

FACTORS AFFECTING ESTIMATES OF POTENTIAL NATURAL RESOURCE DAMAGES

A number of factors affect the reliability of any estimate of DOE's potential liability for natural resource damages. Our estimates, as well as CEQ's, are based on several assumptions. If these assumptions prove to be incorrect, our estimates could either understate or overstate DOE's potential liability for

¹¹A percentage of sites was applied as though it were a percentage of costs, but the expected cleanup costs at DOE's sites vary greatly.

natural resource damages. In addition, the ultimate resolution of several legal issues could affect DOE's eventual liability.

Key Assumptions Affecting Estimates of DOE's Liability

Both our estimates and CEQ's rely on projections from past experiences with damages at private sites. The key assumptions that could affect estimates using this approach are as follows:

- Our estimates, as well as CEQ's, assume that DOE's experience with natural resource damages will reflect the settlement experience to date at private sites. However, if the magnitude and complexity of environmental problems at DOE's sites result in more severe injuries to resources than at private sites, DOE's potential liability could be higher than we or CEQ estimated. Conversely, if DOE is able to perform more resource restoration in conjunction with its remedial actions than that which occurred at private sites, then its potential liability for damages could be lower (although incremental increases in remedial costs could result in some cases).
- Both estimates are based on the relationship between settlements for natural resource damages and cleanup costs. Reliance on this relationship can produce a paradoxical result. For example, if DOE could achieve the same level of cleanup at less cost through improvements in productivity, using this approach would reduce the estimate of DOE's potential liability even though the actual contamination potentially causing injuries to resources may not have changed.
- In the absence of complete information on injuries to resources, we do not know how many DOE sites will experience claims for natural resource damages. Our use of a ratio based on data from private sites that include covenants not to sue for monetary damages is intended to reflect the possibility that some DOE sites will not incur claims for damages. However, DOE's potential liability could be reduced if the Department were successful in working with the other trustees to mitigate the need for claims. DOE's guidance recommends that DOE's sites work with the other trustees to assess resource injuries during the remedial investigation, avoid selecting remedies that harm natural resources, and select remedies with the least total costs, considering the combined costs of remedial action and natural resource restoration.
- Like CEQ, we were unable to develop an estimate for the major cleanup problems excluded from the *1995 Baseline Environmental Management*

Report. The result of excluding these problems is that both estimates understate DOE's potential liability. Several cleanup problems were excluded from the report's cost estimates because there is no known cleanup technology for the problem or because the remediation would cause excessive collateral injuries to the ecology. For example, at the Hanford site, there is no plan to remediate water and sediments in the Columbia River; however, the river itself and its salmon are highly valued by state and tribal trustees. Other exclusions from the *1995 Baseline Environmental Management Report* include potentially contaminated groundwater at the Idaho National Engineering Laboratory and underground contamination at the Nevada Test Site.

- The Department of Justice's compendium presents a "snapshot in time" of settlements at private sites. At some sites in the compendium, additional settlements for further monetary damages or cleanup costs may occur in the future. In addition, not all cleanup sites are included in the compendium—only those with natural resource damage settlements with a federal trustee agency. The sites that are not in the compendium may or may not have resource injuries remaining after cleanup. It is unclear how future settlements or information on cleanup sites that are not in the compendium would affect the ratios we used in estimating DOE's potential liability for damages.

Unresolved Legal Issues Affecting DOE's Liability

How various legal issues are resolved may affect DOE's eventual liability. These issues include (1) how DOE's ownership of a site affects a state's trusteeship, (2) how Indian treaty rights affect tribal trusteeship rights, (3) how the CERCLA exemption for the irreversible and irretrievable commitment of natural resources is applied, and (4) how Interior's regulation limiting damages for interim losses to "committed uses" of resources is interpreted. Each of these issues is currently unresolved. These issues are discussed briefly below.

According to DOE and Justice officials, federal ownership of a site might affect whether a state has trustee rights for natural resources at the site. CERCLA provides that a state may claim natural resource damages for injuries to natural resources that it owns, manages, or controls within its boundaries. However, CERCLA does not address whether natural resources located on federal installations are under state or federal trusteeship. If the land is federally owned, DOE could argue that while the site is within the geographic boundaries of a state, it is not within the state's ownership, management, or control. Under

this theory, the state might not be a trustee of solely on-site resources. The federal trustees have not taken a legal position on this issue.

Indian tribes are trustees for natural resources within their reservations' boundaries. In addition, tribal treaties can provide rights for off-reservation uses of resources, such as hunting and fishing. According to DOE and Justice officials, certain of these treaty rights are limited to "open and unclaimed" lands. How this limitation to open and unclaimed lands is interpreted could affect DOE's liability. For example, if DOE's lands are considered occupied and used for industrial and national defense purposes, tribal rights might be limited.

How DOE uses, and courts interpret, CERCLA's exemption from liability for "irreversible and irretrievable" commitments of resources could affect DOE's liability. Such commitments, for instance, could apply to a permitted waste disposal area and would exempt the disposal area from liability for natural resource damages if CERCLA's requirements were met. To obtain this exemption, CERCLA requires (1) an irreversible and irretrievable commitment of natural resources designated in an environmental impact statement or comparable environmental analysis, (2) a decision to grant a permit or license authorizing such a commitment of resources, and (3) compliance with the terms of the permit or license. It is uncertain how these requirements would apply to various circumstances at DOE's sites. For example, if the remedy selected for a site is to leave hazardous waste in place, DOE might be able to claim that it is making an irreversible and irretrievable commitment of resources and, therefore, that it is exempt from natural resource damages. However, it is uncertain whether the exemption would apply when existing contaminants are left in place. Under a 1989 case decided by the U.S. Court of Appeals for the Ninth Circuit, this exemption was found not to cover injuries that arose from mining activities that occurred before the environmental impact statement was issued.¹² Another uncertainty regarding remedies that contain wastes in place is that it is unclear how the exemption's requirement for a permit would be met. No permit under the Resource Conservation and Recovery Act of 1976, as amended (RCRA),¹³ is required when materials are left in place as a CERCLA remedy.

In addition, it is not clear whether a feasibility study or other CERCLA documents would be considered comparable to an environmental impact statement for purposes of the exemption for irreversible and irretrievable

¹²*Idaho v. Hanna Mining Co.*, 882 F.2d 392 (9th Cir. 1989).

¹³RCRA regulates active waste treatment, storage, and disposal sites.

commitments of resources. DOE has included provisions concerning the irreversible and irretrievable commitment of resources in records of decision and their supporting feasibility studies for several units at its Fernald site. For example, one record of decision states that natural "resources and associated services would be permanently committed as a result of implementing the selected remedy." These resources include 11.6 acres of land to be used for a disposal facility, 13.2 acres of land to be permanently disturbed during excavation and regrading activities, and potential habitats for several threatened and endangered species to be permanently disturbed by excavation activities.

Finally, it is unclear to what extent DOE will be required to pay damages for "compensable value"—the interim loss in services provided by the injured resources between the time of the release and the time the resources are restored. Under Interior's regulations, compensable value includes "use" and "nonuse" values. Use value is the value to the public attributable to the direct use of services provided by the resource, including recreational services, such as walking through a national forest or fishing in a stream, and ecological services, such as providing habitat for wildlife. Nonuse value includes the pleasure of knowing that the resource exists and will be preserved for future generations—for example, the value that people place on the continued existence of national parks that they do not actually visit. Under Interior's regulations, trustees can recover damages for compensable value only for "committed uses" of the resources. These uses must be "reasonably probable, not just in the realm of possibility." The regulations state that purely speculative uses of the injured resources are precluded from consideration in determining damages. How the regulations' provisions concerning committed uses may apply to particular circumstances at DOE's sites is not always clear. For example, if groundwater has not previously been used for drinking water, it is unclear how a claim that DOE is liable for the compensable value of the groundwater as a potential drinking water source would be resolved. Another example is that some lost use may result from the nation's commitment of DOE's sites for national defense purposes. Thus, DOE's liability for compensable value may be limited—at least for resources that do not migrate on and off DOE's sites.

AGENCY COMMENTS

We provided DOE and CEQ with a draft of this report for their review and comment. We discussed the report with officials from DOE's Office of Environmental Restoration, including the Director of the Office of Program Integration, and with officials of the interagency working group led by CEQ, including the Associate Director, CEQ. Overall, the officials agreed that the report accurately described CEQ's methods and the differences between their estimates and ours. Both agencies provided us with some technical and clarifying comments that we have incorporated in the report.

DOE officials did not agree with how we characterized our "more likely" range of estimates. They stated that DOE believes the base case reflects the most likely cost for the cleanup and, therefore, the range of potential liability for natural resource damages that we derived from the base case—our \$2.8 billion to \$4.5 billion estimate—is the more likely range. (See table 3.) They also noted that the other cost scenarios we used—modified containment and modified removal—were modeled on the base case and, therefore, are less reliable estimates. CEQ shared similar concerns.

Our objective in this review was to produce a range of estimates of DOE's potential liability for natural resource damages. We used the base case, modified containment, and modified removal cost scenarios because DOE's *1995 Baseline Environmental Management Report* developed these cost estimates to represent a range of realistic possible outcomes. Therefore, in order to develop a range of natural resource damage estimates, we felt it was important to use a realistic range of costs. In our view, DOE's eventual liability is more likely to fall within our broader range than within a narrower range limited by the base case.

Officials of the interagency working group led by CEQ had two concerns. First, they were concerned about our use of one case in the compendium for which there were only natural resource damages data but no cleanup cost data. They believed that this could bias our ratios since they believed it was unrealistic to expect DOE to pay only for natural resource damages and to avoid paying cleanup costs at a particular site. Second, they were concerned about the impact on our analysis of not including private sites that are not included in the Department of Justice's compendium. These include sites where the statute of limitations has run and natural resource damage claims can no longer be filed.

Regarding their first concern, we were aware of the case they cited as well as other cases that had damage data but no cleanup cost data. In each case, we

contacted officials directly associated with the case and asked them to help us allocate the data between natural resource damages and cleanup costs. For the case in question, the official we spoke with indicated that the data represented natural resource damages, as opposed to cleanup costs. In addition, we believe that DOE could experience natural resource damages at some sites where certain areas are not cleaned up. Specifically, as noted earlier, the *1995 Baseline Environmental Management Report* identifies areas where cleanup may not be technically feasible. For example, at the Hanford site, there is no plan to remediate water and sediments in the Columbia River. Therefore, while DOE may not clean up all areas at some sites, it may still have to pay for natural resource damages for these cleanup problems.

Regarding their second concern, we believe that we make clear in the report that our estimates as well as CEQ's depend on a variety of assumptions and data limitations and that if these assumptions prove to be incorrect or additional data become available, our estimates could either overstate or understate DOE's potential liability for natural resource damages. As we note in the section on factors affecting the estimates, it is unclear how information on cleanup sites that are not in the compendium would affect DOE's potential liability for damages.

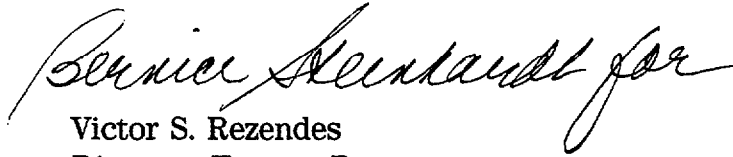
SCOPE AND METHODOLOGY

We conducted our review primarily at DOE's headquarters in Washington, D.C., and Germantown, Maryland, and with CEQ and Justice officials. Our work was performed from November 1995 through June 1996 in accordance with generally accepted government auditing standards. However, while we obtained explanations and clarifications from Justice and DOE officials, we did not independently verify the data in Justice's compendium of natural resource damage settlements or the cost estimates in DOE's *1995 Baseline Environmental Management Report*. Additional information on our methodology is found in enclosure II.

As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send a copy to the Secretary of Energy and the Chair, Council on Environmental Quality. We will make copies available to others upon request.

B-272411

If you have any questions concerning this report, please contact me at (202) 512-3841. Major contributors to this report were James Noël, Rachel Hesselink, Kathy Hale, Charles Bausell, and Doreen Stolzenberg Feldman.

A handwritten signature in cursive script, appearing to read "Victor S. Rezendes for".

Victor S. Rezendes
Director, Energy, Resources,
and Science Issues

Enclosures - 2

FURTHER REASONS FOR THE DIFFERENCES BETWEEN
GAO'S AND CEQ'S ESTIMATES

In addition to the two errors reflected in the Council on Environmental Quality's (CEQ's) April 1996 letter and differing assumptions about the likelihood of natural resource damages at the Department of Energy's (DOE's) sites, several other reasons account for the differences between our estimates of DOE's potential liability and CEQ's.

RATIOS OF DAMAGES TO CLEANUP COSTS

While we and CEQ calculated the ratios by similar methods, the resulting percentages were significantly different. Table I.1 compares the ratios we derived with CEQ's.

Table I.1: Ratios of Damages to Cleanup Costs, as Calculated by GAO and CEQ

Type of ratio	Ratios used by GAO	Ratios used by CEQ
Lower ratios (reflecting cases with and without monetary damages)	5.95%	0.62%
Higher ratios (reflecting only cases with monetary damages)	9.41%	6.82%

As noted in the section entitled "Reasons for Differences Between GAO's and CEQ's Estimates," CEQ agrees that its lower ratio of 0.62 percent is incorrect. Other reasons for the differences between the ratios used by CEQ and us include the following:

- We used a more recent version of the Department of Justice's compendium of settlements for natural resource damages at private sites, which resulted in the inclusion of two relatively large, recent settlements for natural resource damages of \$8.5 million and \$13.25 million and one small settlement for damages of \$24,000. CEQ plans to use more recent data in its planned revisions to its estimates.
- We included settlements in Justice's compendium from sites on the National Priorities List and three other sites subject to natural resource damages that are not on the National Priorities List; damages used to restore resources at these three sites totaled about \$23 million. CEQ included only settlements at National Priorities List sites. We included data from sites not on the National Priorities List because natural resource damages may be recovered at federal and private sites that are not on the National Priorities List.

ESTIMATES OF DOE'S CLEANUP COSTS

The results obtained also differ because we and CEQ used different estimates of DOE's cleanup costs in estimating the Department's potential liability for natural resource damages. In addition to the adjustment of DOE's greenfields cost estimates noted in the section entitled "Reasons for Differences Between GAO's and CEQ's Estimates," these differences occurred in the following two areas:

- While we both used DOE's report entitled *Estimating the Cold War Mortgage: The 1995 Baseline Environmental Management Report*, we based our estimates on the three middle scenarios that DOE considers more realistic—modified containment, base case, and modified removal. CEQ used the base case and the two extreme scenarios that DOE considers unrealistic—iron fence and greenfields—but based its likely range on the base case scenario.
- CEQ used only the cost estimates in DOE's *1995 Baseline Environmental Management Report*, which reflect the future costs of the program. We used these estimates but also included the remediation costs since the program's inception—fiscal years 1989 through 1994. However, this is not a large contributor to the differences between the estimates, as prior years' costs total only \$5.2 billion in 1995 dollars. For instance, our high-end estimate using the base case is \$3.9 billion higher than CEQ's high-end estimate using the base case. The \$5.2 billion in prior years' costs, multiplied by our higher ratio of 9.41 percent, accounts for only \$489 million of this difference.

METHODOLOGY

We examined possible methods for estimating DOE's potential liability for natural resource damages. Two basic methods are available for estimating DOE's potential liability for natural resource damages—estimating potential liability on an individual site-by-site basis and estimating liability for the entire program. At DOE's facilities, conclusive information about possible injuries to resources is not generally available; therefore, estimating liability on an individual site-by-site basis was not possible. Consequently, we estimated DOE's potential liability for its overall environmental restoration program. This method is described in detail in the section entitled "Estimating DOE's Potential Liability for Natural Resource Damages." We also attempted, but were unable, to develop an estimate for the major cleanup problems that were excluded from DOE's *1995 Baseline Environmental Management Report*. Because cleanup cost estimates were not developed for these excluded items, the methodology that we used—applying a ratio to the cleanup costs—could not be used. We examined the individual items, but in some cases, data on the existence and extent of injuries to resources were not yet available, and in other cases, preliminary information on DOE's resource restoration needs could not be compared with restoration needs at private sites because of site-specific factors.

To analyze CEQ's estimates of DOE's potential liability for natural resource damages, we reviewed CEQ's April 1996 letter and its support. We also interviewed officials who participated in developing CEQ's estimates from CEQ; the U.S. Fish and Wildlife Service, in the Department of the Interior; the Damage Assessment and Restoration Program, of the National Oceanic and Atmospheric Administration; and DOE's Office of Environmental Management.

To identify factors that might affect DOE's liability for natural resource damages, we discussed the difficulties involved in estimating damages with officials in the DOE offices responsible for environmental remediation and guidance on natural resource issues and with natural resource experts in the Department of the Interior and National Oceanic and Atmospheric Administration. We also discussed legal issues affecting damages with officials in DOE's Office of the General Counsel, officials in the DOE office that develops guidance on natural resource issues, and officials in the Department of Justice's Environment and Natural Resources Division and researched relevant regulations and legal cases.

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