



STICKER SHOCK

**Recognizing the Full Cost
of Superfund Cleanups**

Hazardous Waste Cleanup Project

June 1993

"One of our biggest problems is the problem represented by the Superfund and some other areas where you've got to fix something bad that's already happened, where we spend too much money on lawyers, too much money on consultants, the endless decisions. It's almost impossible to get anybody at the local level to agree what the best solution is. And I'm saying all this by way of making a personal plea which is that - to Drew Lewis and to everybody in this audience, if you have specific ideas about what we could do to make the whole management of waste issue better handled by us in a responsible way, not only in terms of getting to decisions, but also in bringing all the affected parties along, I would very much like to have it. I'm just appalled by the paralysis and the political divisions and the fact that the money is being blown. Anybody who has any personal experience and knowledge and opinion on this, this is something that, I think, we are duty bound to do a much better job of and we need all the ideas we can get."

President-Elect Bill Clinton

Economic Summit

Little Rock, Arkansas

December 15, 1992

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ABOUT THE HAZARDOUS WASTE CLEANUP PROJECT

The Hazardous Waste Cleanup Project ("HWCP") is a coalition of trade associations in the industrial sector working to improve Superfund, RCRA, and related environmental cleanup programs by focusing on actual risks to human health and the environment, rather than hypothetical risks. The current members of the HWCP are:

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The HWCP is engaged in the collection and dissemination of information regarding the waste site remedy selection process and particularly seeks to inform policy-makers so that the United States can allocate its environmental resources to situations where the actual risks can be quickly and substantially reduced by the most cost-effective manner. In addition to its public information and general education activities, the HWCP is also involved in policy analysis and the convening of meetings, seminars, and workshops with key participants in the Superfund and RCRA processes.

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This paper was developed through the activities of the HWCP's Cleanup Costs Task Force, and particular thanks are due to its members for their guidance and help in drafting this paper. The current members of the Cleanup Costs Task Force are as follows:

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EXECUTIVE SUMMARY

STICKER SHOCK: RECOGNIZING THE FULL COST OF SUPERFUND CLEANUPS

The total cost of cleaning up environmental contamination under Superfund and its progeny will be much higher than any prior expectations. A problem that was originally thought to involve a limited number of abandoned waste sites that could be fixed with a one-time injection of \$1.6 billion has now ballooned to a federal program that has identified tens of thousands of sites and is still growing. The price tag for Superfund and the related cleanup programs (over the next thirty years) will likely exceed \$750 billion dollars and could easily reach one trillion dollars.

The enormous increase in the estimated cost to clean up America's environmental contamination is a result of many factors. These include:

Number of Sites Has Tripled: Since Superfund was enacted in 1980, EPA's list of sites to be considered has grown from 8,000 to more than 36,000. The National Priorities List has expanded from 418 to more than 1,275 and is expected to reach 2,000 in the next several years.

Average Cost Per Site Has Tripled: Early in the program EPA estimated that the cleanup cost per site would be \$7 million. Several years ago EPA increased this figure to \$25 million and others believe that \$40 to \$50 million per site is more accurate.

Cost Is a Minor Consideration: Statutory and regulatory requirements for "permanent" remedies lead EPA to give short shrift to costs, causing the Agency to disregard more cost-effective ways to achieve equal levels of environmental protection.

Government Waste: EPA's expertise does not extend to the kind of complex construction projects typically associated with the cleanup of waste sites. The OTA has estimated that 20 to 40% of EPA's Superfund expenditures are inefficient. Gross mismanagement has plagued the program and almost immediately after taking office EPA's new Administrator, Carol Browner, testified before Congress that she was "appalled" at the "total lack of management, accountability, and discipline" in the EPA contract management system.

Extrapolating Superfund to Other Remediation Programs: The true price tag of Superfund only becomes apparent when it is recognized that the Superfund approach is essentially being adopted for many other environmental remediation programs. A recent report from the University of Tennessee, entitled Hazardous Waste Remediation: The Task Ahead, concluded that, if current policies are continued, the cost of Superfund and other similar programs (over the next thirty years) is likely to be \$752 billion, as follows:

Superfund:	\$151 billion
RCRA Corrective Action:	\$234 billion
Underground Storage Tanks:	\$67 billion
Department of Defense:	\$30 billion
Department of Energy:	\$240 billion
State/Private Cleanups:	\$30 billion

The Task Ahead compared the cleanup cost of current federal policies to the costs of using remedies that use a greater degree of institutional controls and waste isolation and concluded that **\$268 billion could be saved while still providing equivalent levels of protection of human health and the environment.**

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STICKER SHOCK

Recognizing the Full Cost of Superfund Cleanups

I. Introduction

In recent years it has become clear that the cost of cleaning up the environmental contamination associated with our nation's past waste management practices will be vastly higher than anyone expected—perhaps as much as **one trillion dollars** over the next thirty years.¹ The problem was originally thought to involve a limited number of abandoned sites that could be addressed through a one-time injection of money under Superfund, but it has grown to include many thousands of sites across the country. Cleanup levels have become far more stringent since 1980, while at the same time proving both extraordinarily difficult and costly to achieve. As a result, it is now evident that truly enormous amounts of money will be spent by both the public and private sectors to deal with contaminated sites on military installations, at Department of Energy facilities, at manufacturing plants, and in cities, towns, and suburbs all over America.

Yet much of that spending is simply unnecessary. Protection of public health and the environment can be achieved at much lower cost. The crux of the problem is that under Superfund and similar programs, cleanup decisions are driven by unrealistic exposure assumptions that call for “edible soil” and “drinkable leachate” at most waste sites, instead of addressing actual risks. **Indications are that, under current policies, perhaps a third of the money that will be spent to clean up hazardous waste sites—upwards of \$250 billion—will be wasted**, because it will not significantly enhance protection of human health or the environment beyond the levels of protection that could be achieved under less costly, more sensible policies.²

Wasteful expenditures on this scale undermine and distort the productivity of our economy. If current policies continue, our manufacturing industries will be less competitive as they spend their investment dollars on cleanups that exceed the levels necessary to protect public health and the environment and that are not required of our foreign competitors. Jobs will be lost. Funds will be diverted from more cost-effective opportunities to protect human health or the environment—cancer research, pre-natal care, and the like. No matter who pays, industry or the American taxpayer, everyone loses when hundreds of billions of dollars are spent for no real benefit.

This booklet describes the programs that are currently in place for addressing the hazardous waste site problem, beginning with Superfund. It also shows how the programs have developed to the point where they fail to compare the costs of cleanups with the levels of risk reduction they achieve. This booklet then presents some of the latest available information on the likely

Superfund costs will be vastly higher than expected.

More than \$250 billion can be saved with no loss of protectiveness.

total cost of these programs, pointing out the significant savings that are possible if they were to be more rationally structured. Finally, the booklet puts the total expected cost of these programs in perspective, by comparing it to what is being spent on other federal programs to protect human health and safety—programs that offer much higher success rates per dollar of spending.

THE NEW YORK TIMES SERIES: WHAT PRICE CLEANUP?

In March, 1993 The New York Times ran a series of four articles entitled "What Price Cleanup?" that focused on "misguided" federal environmental policies where "billions of dollars are wasted each year in battling problems that are no longer considered especially dangerous, leaving little money for others that cause far more harm." As shown in the following excerpt, the lead article in the March 21, 1993 New York Times makes clear that the federal Superfund program is the most wasteful federal environmental program of them all.

Costly Solutions Seeking Problems*

Almost everyone involved, including community and local environmental groups, agrees that the toxic waste program stands as the most wasteful effort of all. It began 15 years ago when the nation rose in revulsion over the discovery of seeping chemicals at Love Canal in New York. Hundreds of people were evacuated from their homes.

In response, Congress passed two laws: the Superfund law of 1980 and amendments to the Resource Conservation and Recovery Act in 1984. A decade later, these laws have driven the Government to spend almost \$2 billion a year for the Superfund, which cleans up toxic waste sites, and more than \$8 billion more a year on similar programs in other agencies, even though many of the sites pose little if any danger.

"Does it make sense to spend millions of dollars cleaning up a site that only has a tenth of an ounce of contamination?" asked Dr. Richard Goodwin, a private environmental engineer in Upper Saddle River, N.J., who has overseen more than 20 toxic waste cleanups. "I say no. All we're doing in most cases is throwing money at a problem without improving public health or the environment."

Hugh B. Kaufman, a hazardous waste specialist at the EPA who helped uncover the problem at Love Canal, said that in the few cases in which a site is near populated areas, "the best thing we can do is evacuate people if they want, then put up a fence and a flag that says stay away."

Mr. Kaufman said he knows that his idea represents a marked change in the traditional view of how the nation should care for its land. But he and other experts says it does not make sense to clean up these wastes at costs that frequently exceed \$10 million an acre.

Even a principal author of the Superfund law, Gov. Jim Florio of New Jersey, who was chairman of a House environmental subcommittee in the 1970's now argues that the inflexible rules meant that Superfund resources are too often devoted to making sites pristine.

"It doesn't make any sense to clean up a rail yard in downtown Newark so it can be a drinking water reservoir," he said.

* The New York Times, National Edition, Sunday, March 21, 1993, page 30.

II. The Superfund Program

A. Background

The Comprehensive Environmental Response, Compensation, and Liability Act 1980 ("CERCLA"), commonly referred to as "Superfund," was originally intended to fill a gap in the federal environmental laws by providing for the cleanup of inactive hazardous waste sites not regulated under the Resource Conservation and Recovery Act of 1976 ("RCRA"). Superfund undertook to achieve this objective by retroactively imposing strict liability on all companies that had contributed to contamination at such sites (commonly called "Potentially Responsible Parties," or "PRPs"). CERCLA also empowered EPA to implement the cleanups, either by direct federal remedial work or by suing the PRPs to force them to perform the cleanup. In order to fund EPA's direct cleanup actions, CERCLA created a revolving trust fund, known as the "Superfund," to pay for the cleanups, subject to later cost recovery from the PRPs at each site. The initial "seed money" for the Superfund was to come primarily from taxes on crude oil and commercial chemicals.

In the early days of CERCLA, the majority of the cleanup work was funded out of Superfund, with PRPs paying for only 30 percent of the remedial actions begun between Fiscal Years ("FY") 1980 and 1986.³ In recent years, however, that proportion has changed significantly, with PRPs funding slightly over 60 percent of the remedial actions that began in FY 1991 and over 80 percent of those that began in the third quarter of FY 1992.⁴ This shift toward direct private funding of Superfund cleanups is significant, because if EPA is not required to commit funds for cleanup projects, it has less incentive to seek cost-effective cleanups.

At the time of its enactment, CERCLA was seen as a bold but limited statute covering a relatively small and fixed number of pre-existing sites. Once these past sites were addressed under CERCLA, the environmental statutes, such as RCRA, that were intended to regulate the day-to-day activities of industrial facilities, would take over, while Superfund would wane in importance and eventually expire. These expectations were reflected in the fact that the Superfund was originally funded at only \$1.6 billion.⁵

In hindsight, it is obvious that either the framers of CERCLA had an overly simplistic view of the problem, or CERCLA has evolved into something bigger and broader than originally intended, or both. It is also now obvious that, for a variety of reasons, the ultimate cost of implementing CERCLA and its progeny will dwarf the initial Superfund.

The extent of the initial underestimation is partially illustrated by the dramatically increasing amounts of money that Congress has had to add to Superfund in the years since the program's inception. In 1986, with passage of the Superfund Amendments and Reauthorization Act ("SARA"), Congress expanded the initial

*As enacted in 1980
Superfund greatly
underestimated the
problem.*

*Superfund has evolved
into something bigger
than originally intended.*

*The Fund has already
grown from \$1.6 to \$15.2
billion.*

*Number of sites has
tripled, with more to come.*

*Cost per site is
skyrocketing.*

\$1.6 billion Superfund to \$8.5 billion. In 1991, Congress added \$5.1 billion more, bringing the total so far authorized to \$15.2 billion, or almost ten times the initial amount provided.⁶ As is discussed later, in future years and under current policies, much more money will need to be provided through the Superfund program. Additionally, the amounts that have been and will need to be provided by private parties as they directly fund CERCLA cleanups have also grown substantially and will continue to do so. The amounts involved are discussed later in this booklet.

Two primary reasons account for this massive growth in actual and expected Superfund spending. First, CERCLA is now being brought to bear at a much greater number of sites than was anticipated in 1980. Second, now that cleanup is actually under way at a number of sites, we see that the costs per site are substantially higher than expected, and are continuing to escalate. The breadth and depth of the program have expanded far beyond all expectations.

B. Growth in the Number of Sites

Increased information has resulted in a tremendous growth in the number of CERCLA sites identified during the last 12 years. In 1980, EPA identified approximately 8,000 sites across the country as "hazardous waste" sites to be considered for cleanup.⁷ By October, 1992, that number had grown to nearly 37,000.⁸ In 1982, when EPA first published its National Priority List (NPL) of sites deemed serious enough to be candidates for federally-funded cleanup under Superfund, the list included 418 sites.⁹ However by October, 1992, the NPL had expanded to 1,275 sites,¹⁰ and EPA now expects the number to grow to more than 2,000 sites by the turn of the century.¹¹ Other studies have projected even higher numbers; for example, **Congress' Office of Technology Assessment has projected the number of Superfund sites to rise to as high as 10,000.**¹²

C. The Cleanup Cost Per Site Is Much Higher Than Expected

Although only 40 sites have been deleted from EPA's National Priority List, and cleanup construction work has been completed at only another 109 sites,¹³ the past 12 years of experience with Superfund makes it clear that the cleanup cost per site is much higher than anyone expected. Originally, EPA estimated the average site cleanup cost to be \$7 million.¹⁴ Recently, the Agency estimated that cost to be \$25 million.¹⁵ Other estimates place the cost as high as \$40 to \$50 million.¹⁶

Several major factors have contributed to these extraordinary increases. First, Superfund cleanup levels at many sites go far beyond the levels necessary to protect human health and the environment.¹⁷ Second, EPA has interpreted CERCLA in such a way that cost considerations are a minor factor in selecting cleanup levels. **Third, even EPA admits that it has consistently failed to oversee and control its Superfund contrac-**

tors, resulting in abuses and tremendous waste.¹⁸ EPA is a regulatory agency, and does not have the mind-set, experience, or capacity to manage the complex construction projects that are Superfund cleanups. These factors, and others, result in a Superfund program that produces excessively expensive cleanups at a few sites, rather than cost-effective cleanups at many sites.

Factor: Cost Only a Minor Consideration

As a result of amendments made by SARA in 1986, CERCLA directs EPA to favor "permanence" and "treatment" in selecting hazardous waste site remedies. CERCLA also rigidly directs that cleanups achieve all legally "applicable or relevant and appropriate requirements" ("ARARs") drawn from other federal or state environmental laws, even if they are clearly not needed to protect human health and the environment at a site. While CERCLA also states that remedial actions selected shall be "cost-effective," EPA's regulations (known as the National Contingency Plan or "NCP") make cost one of only nine factors to be considered, and then only after other very rigid threshold criteria have been met.¹⁹ **The practical effect of the statute and the NCP regulations is to substantially discount cost as a consideration in choosing remedies. The result is that extravagant cleanups are chosen even where no real risks exist, and the cost of Superfund cleanups has skyrocketed.**

Factor: EPA Cleanups are Fraught with Waste

Many Congressional committees and independent agencies have criticized EPA's management of the Superfund program, particularly its management of the contractors that perform most of the work under the program.²⁰ Congress' Office of Technology Assessment has estimated that EPA's unnecessarily high or avoidable spending results in 20 to 40 percent of total Superfund spending being inefficient.²¹ The U.S. General Accounting Office ("GAO") has been a persistent critic of EPA, saying in 1991 that only 30% of total Superfund expenditures (through fiscal year 1990) went for actual cleanup work.²² More recently, the GAO concluded that "despite several years of GAO's reporting on the deficiencies in EPA's Superfund contracts management, EPA has not adequately addressed most of GAO's recommendations to reduce the program's vulnerability to fraud, waste and abuse."²³

In March of 1992, the House Energy and Commerce Committee's Oversight Subcommittee heard testimony about an EPA contractor accused of billing the Superfund for fishing licenses, chocolates imprinted with the company logo, rental of a reindeer suit, season tickets to professional football games, executive spouse travel to Hong Kong and Korea, a musical band known as "Johnny Limbo and the Lugnuts," and a catered lobbying cruise.²⁴ Representative John Dingell, the Chairman of the Subcommittee, said: "We hope to find out how one cleans up a

Costs are substantially disregarded.

Result: Extravagant cleanups even where no risks exist.

Superfund program is fraught with government waste.

***EPA contract
mismanagement is
widespread and deeply
embedded.***

***"Best guess" Superfund
costs: \$151 billion.***

***Other remediation
programs follow the
Superfund approach.***

toxic waste site in a reindeer suit."²⁵ Chairman Dingell also noted that in 1990 his Subcommittee "disclosed serious deficiencies in the auditing and oversight of EPA contractors . . . [and that] matter was not taken seriously by EPA."²⁶

EPA has admitted to major problems with its management of contractors. In 1992 testimony before Congress, William Reilly, the Administrator of EPA, characterized the agency's contract management weakness as "a systemic, pervasive, system-wide problem."²⁷ Another EPA official, testifying before Congress on the reported contractor abuses discussed above, properly characterized them as "offensive and insulting to the American taxpayer."²⁸ In her March 10, 1993 testimony before the House Energy and Commerce Subcommittee on Oversight and Investigation Carol Browner, the new Administrator of EPA spoke harshly of EPA's contracting practices, stating that she was "appalled" at the "total lack of management, accountability, and discipline" within the EPA.²⁹ Chairman Dingell could only agree, calling EPA one of the "worst cesspools" of contract mismanagement in government.³⁰

D. Total Costs for the Superfund Program

EPA has told the Congress that the total amount needed in Superfund to complete the cleanup of the sites on the NPL will reach \$27.2 billion, an increase of \$12 billion over the amount so far authorized.³¹ That amount would not include spending by responsible parties at CERCLA sites. However, **the General Accounting Office, in a July 1992 report to EPA's Administrator, stated that EPA's Superfund cost estimates are not reliable and that total Superfund costs could far exceed the amount that EPA has stated is necessary for the job.**³² Although GAO did not provide an independent estimate, it did note several factors that would increase the amount needed by more than \$12 billion by the year 2,000. That amount would put the total program level at almost \$40 billion, again not including spending by responsible parties.

Other independent observers have recently projected the total cost of cleaning up hazardous waste sites under CERCLA, including the amounts spent both by the Superfund and by responsible parties. Paul R. Portney, a vice president and senior fellow at Resources for the Future, an independent, non-partisan research organization, projects that cost to be \$96 billion.³³ A comprehensive report published by the Waste Management Research and Education Institute at the University of Tennessee puts the projected cost, under current policies, at between \$106 billion and \$302 billion, with a "best guess" of \$151 billion.³⁴

III. Other National Cleanup Needs

The 2,000 or more sites expected to be on the NPL at the turn of the century represent only the tip of the iceberg. Tens of thousands of other sites around the country will be addressed under the programs discussed below, several of which will

probably grow larger than the Superfund program. These programs tend to follow the decision-making criteria used under CERCLA to set cleanup levels. **Thus, if EPA continues to downgrade cost considerations in the Superfund program, so too will these other cleanup programs continue to downgrade cost. The resultant total national levels of spending will be staggering.**

A. RCRA Corrective Action

The Resource Conservation and Recovery Act ("RCRA") regulates the treatment, storage, and disposal of hazardous waste. Facilities engaged in those activities must obtain a RCRA permit. These facilities include not only those engaged in the waste disposal business, but also many of the nation's basic manufacturing facilities and other commercial enterprises.

Until recently, the RCRA Corrective Action program was a "sleeper" in the national policy debate on the cleanup of soils and groundwater contaminated by hazardous waste. Under amendments to RCRA enacted in 1984,³⁵ companies must conduct far-reaching investigations covering all solid waste management units ("SWMUs"), past or present, that are located on any parcel of land that also contains a permitted hazardous waste management unit. If any hazardous wastes or constituents have escaped from the SWMUs, then the corrective action provisions of RCRA require that the environment and the facility be cleaned up.

Thus RCRA, which was originally established to regulate current hazardous waste management practices, has been expanded to include remediation of problems from past solid waste practices at permitted facilities. This expansion is enormous. Over 5,000 facilities with as many as 80,000 SWMUs may be subject to this mandate.³⁶ Many companies project that their RCRA costs will substantially exceed their Superfund liabilities.

In 1990, EPA proposed regulations for implementing the RCRA Corrective Action program. Those regulations are similar to the Superfund pattern and make it clear that **cost will not be considered in establishing the levels to which SWMUs must be cleaned up.**³⁷ **Cost will be considered as only one of five factors in selecting among technologies that meet cleanup levels established using criteria other than cost.** As has been the case with the Superfund program, this will cause a skyrocketing growth in future costs under RCRA corrective action.

The University of Tennessee Report referenced earlier projects the total cost of the RCRA Corrective Action Program under current policy to be from \$170 billion to \$377 billion with a "best guess" projection of \$234 billion.³⁸

B. Department of Defense

Under its Defense Environmental Restoration Program, the Department of Defense ("DOD") has estimated that 7,300 present or former military sites will require some remediation over the

RCRA corrective action costs will exceed Superfund costs.

DOD costs: \$30 billion.

DOE costs: \$240 billion.

**Underground storage tank
cleanup costs: \$32-67
billion.**

**State and private costs:
\$30 billion.**

next 20 years.³⁹ DOD has stated that, in conducting its program, it will conform to the requirements of the NCP and will apply EPA guidelines. That commitment means that, just as in Superfund, **cost will be a very limited factor in establishing the levels to which DOD sites will be cleaned up.** DOD has projected that \$24.5 billion in appropriations will be needed to complete the cleanup of its 7,300 sites.⁴⁰ The University of Tennessee Report found that the DOD's cost estimates were generally reasonable under current policies and adjusted them only slightly upwards, to \$30 billion.⁴¹

C. Department of Energy

The Department of Energy ("DOE") environmental restoration program intends to clean up by the year 2019 more than 3,700 sites contaminated in connection with DOE's nuclear operations.⁴² As recently as April 1993, Hazel O'Leary, the new Secretary of the Department of Energy, announced that DOE's FY94 environmental cleanup budget should be increased by one billion dollars to \$6.5 billion.⁴³ For many of those sites, procedures for establishing cleanup levels will come directly from CERCLA and the NCP or will be derived through a process similar to that prescribed by CERCLA. Again, if CERCLA and the NCP are followed literally **for DOE sites, cost will be a limited factor in deciding what level of cleanup will be undertaken and thus DOE's cleanup costs are expected to be monumental.**

In 1988, DOE projected that from \$35 billion to \$64 billion will be required to carry out its cleanup program. DOE has not revised that projection since 1988 but has acknowledged that the cost has been growing.⁴⁴ The GAO has concluded that an accurate projection of DOE's total restoration costs is not possible because there are too many unknown factors, but that the amount might be in the hundreds of billions of dollars.⁴⁵ The University of Tennessee Report, in what is admittedly a "ballpark" estimate, has put the projection in a range from \$110 billion to \$240 billion, with \$240 billion representing the "best guess."⁴⁶

D. Underground Storage Tanks

In 1984, Congress amended RCRA to address underground storage tanks ("USTs") that hold petroleum or certain hazardous substances.⁴⁷ As a result, leaking USTs must be removed and replaced or closed, and any contamination resulting from the leaks must be remediated. EPA's data base contains approximately 1.75 million registered tanks; cost estimates for cleaning up the tanks and complying with the regulatory requirements range from \$32 to \$67 billion.⁴⁸

E. Non-Federal Cleanup Needs

Many contaminated sites that do not come under any of the federal programs discussed above will be remediated under state-sponsored programs ("mini-superfunds") or through private investment (e.g., as part of a real estate transaction or on a

voluntary basis). Although no systematic effort has been made to identify and inventory these sites, their number is generally believed to be in the tens of thousands. Based on a series of assumptions about the numbers and types of these sites, the University of Tennessee Report makes a best guess that the total cost of their remediation under current policy will be \$30 billion.⁴⁹

IV. The Total Cost of Cleaning Up America

The most comprehensive estimate of the total cost of remediating the nation's hazardous waste sites is found in the University of Tennessee Report. Table I below presents the report's projections for the total amount of money to be spent on a nationwide basis, over the next thirty years, in cleaning up the various categories of contaminated sites discussed above, based on current policies for establishing cleanup levels.

TABLE I
Resource Requirements Under CURRENT POLICY
(Billions of 1990 Dollars)

Remediation Authority	Plausible Lower Bound	Best Guess	Plausible Upper Bound
National Priority List (Superfund)	106	151	302
RCRA Corrective Action	170	234	377
Underground Storage Tanks	32	67	*
Department of Defense	*	30	*
Department of Energy	110	240	*
State/Private Programs	*	30	*
Total	478	752	1,046

* Denotes circumstances where the estimate is not thought to differ from the best guess or where no basis for drawing plausible lower or upper bounds exists.

Source: Russell, Colglazier and English, Hazardous Waste Remediation: The Task Ahead, Hazardous Waste Remediation Project, Waste Management Research and Education Institute, Univ. of Tenn. (Dec. 1991), p. 16.

**Best guess total costs:
\$752 billion.**

**\$268 billion can be saved
while providing
equivalent levels of
protection.**

To summarize the costs shown in Table I, in the words of the authors:

The clearest statement would be that in 1990 dollars, the total resources required to remediate hazardous waste sites will be approximately \$750 billion if the country maintains the course on which it has embarked. At the same time, it is plausible that contamination is substantially less than now perceived, and if that is so and some other conditions hold, the total could be as low as about \$480 billion. Conversely, the total could quite plausibly rise to over \$1 trillion in direct remediation costs over the next three decades, especially if the contamination is as great as some people suspect.⁵⁰

The University of Tennessee Report also projected national cleanup resource requirements under a "less stringent" scenario that assumed the same levels of contamination in the environment, but emphasized cleanups that utilized containment and isolation of wastes, rather than destruction and treatment. The Report made clear that the shift from the "current policy" approach to the "less stringent" approach **would not be expected to change significantly the ultimate impacts on human health and the environment.**⁵¹ A comparison of the costs of these two approaches is presented in Table II.

TABLE II
Comparison of Resource Requirements for Cost-Effective
Provision of the Same Levels as Current Policy
(Billions of 1990 Dollars)

Remediation Authority	Current Policy Approach	Less Stringent Approach	Savings
National Priority List (Superfund)	151	90	61
RCRA Corrective Action	234	199	35
Underground Storage Tanks	67	67	0
Department of Defense	30	18	12
Department of Energy	240	92	148
State/Private Programs	30	18	12
Total	752	484	268

Source: University of Tennessee Report, pp. 16 and 19, using the "Best Guess" estimate in each case.

V. Do the Benefits Justify the Costs?

The University of Tennessee Report uses a 30-year time period for projecting resources needed to rehabilitate the nation's hazardous waste sites. On average, over that 30-year period, **the annual cost of the \$752 billion "best guess, current policy" scenario would be \$25 billion (in 1990 dollars).** The \$268 billion that could be saved by switching from current Superfund policies to less stringent ones, without changing significantly the impact on human health and the environment, would amount to approximately \$9 billion (in 1990 dollars) per year. **In a world and at a time when resources are scarce relative to private and public needs, no waste of that magnitude should be allowed.**

As recently as December, 1992 the General Accounting Office identified the Superfund program as an area "especially vulnerable to waste, fraud, abuse and mismanagement" and stated:

The federal government cannot afford to spend the hundreds of billions of dollars expected to be needed to clean up Superfund sites without good assurance that this level of funding is appropriate. Finding the right funding level requires comparing the relative risks to human health and the environment of Superfund sites and of other environmental problems and the relative risk reduction that spending on Superfund cleanups and other environmental programs will achieve. Currently, decisions about funding are being made without adequate assessments of risks. If steps are taken to assess the relative risks posed by environmental problems, the Congress and EPA will have a more rational basis upon which to debate the allocation of limited federal resources.⁵²

Three questions must be asked before deciding whether to continue spending such huge amounts to clean up the nation's hazardous waste sites to the pristine levels dictated by current Superfund policy. **First**, as among the various environmental problems facing our nation, how great a risk do hazardous waste sites pose to human health and the environment? **Second**, how do the risks posed by hazardous waste sites compare to the risks posed by other public health problems? **Third**, how much are we spending on hazardous waste site cleanup as compared to other public health problems, and how do these programs compare in terms of risk reduction purchased per dollar spent?

A. The Relative Risks to Human Health Posed by Various Environmental Problems

The widespread perception in our society is that the improper disposal of hazardous wastes, and the risks associated with abandoned hazardous waste sites, are among the most serious environmental problems facing the nation.⁵³ Undoubtedly there are some hazardous waste sites that actually pose immediate and high risk threats to the surrounding population and therefore

Total cost per year: \$25 billion.

*Question must be asked:
Is this the best investment
for protecting human
health and the
environment?*

Public fear of waste sites significantly exceeds any actual health risks posed.

demand immediate action. More typically, however, the degree of risk posed by individual sites is overestimated by the public and overstated by EPA. Indeed, the very nature of the Superfund risk assessment process is such that it tends to overstate site-specific risks.⁵⁴

More important, there is good reason to doubt the popular perception that the hazardous waste site problem, taken as a whole, is one of the more serious environmental problems facing the nation. In recent years, EPA's Science Advisory Board members and many of the Agency's own experts have concluded that the public's perception of these risks is overstated. Table III presents the results of the Science Advisory Board's rankings of sample environmental problems by degree of risk, compared to rankings determined by a poll of the general public. The Table is based on a chart presented in testimony before Congress in 1991 by the Administrator of the EPA.⁵⁵

As shown in Table III, hazardous waste sites rate high on the public's list of environmental problems, but actually present only low to moderate risks in the view of EPA's Science Advisory Board. Similarly, in 1987, in a nine-month effort, about 75 EPA career program managers and experts ranked 31 environmental problems by degree of risk. With regard to hazardous waste sites, they arrived at virtually the same conclusion as did the Science Advisory Board.⁵⁶ **For both active and inactive hazardous waste sites, EPA's own experts said that "total health impacts do not appear to match public concerns in most areas."**⁵⁷

TABLE III
Public's Fear of Waste Sites Significantly Exceeds the Reality: Other Environmental Problems Present Greater Human Health Risks

Problem	Public Perception	Real Risk
Hazardous Waste Sites	H	M/L
Indoor Air Pollution	L	H
Worker Exposure to Chemicals	H	H
Outdoor Air Pollution	M/H	H
Stratospheric Ozone Depletion	H	M/H

H = Relatively High, M = Relatively Medium, L = Relatively Low
Source: EPA Science Advisory Board

B. The Relative Risks to Human Health Posed by Various Public Health Problems

Although the currently available information on the human health impact of hazardous waste sites is incomplete,⁵⁸ it is useful to place in perspective the general order of magnitude of the problem, using what information is available. First, as one leading expert on cancer-causing substances has noted:

Amounts of pollution that humans are ingesting from pesticide residues are trivial relative to the background of natural and traditional (e.g., from cooking food) carcinogens.

Natural carcinogens are everywhere: they are present in mushrooms, parsley, basil, celery, cola, wine, mustard, beer, and peanut butter, and many more remain to be discovered. Bread, cola, and beer all contain formaldehyde, a natural carcinogen. We make carcinogens when we cook our food or bake our bread. We make carcinogens in our normal metabolism, so that human blood contains many natural carcinogens. Every complex mixture has carcinogens: car exhaust, gasoline, smoke from your chimney, urine, feces, and dirt. Many of the chemical elements are carcinogens. Millions of tons of natural carcinogens are dropped on the ground when bracken fern and other plants die. Even the campfires and the cars of Sierra Club members are spewing carcinogens into the air. Given the uncertainties of our knowledge, it is impossible to prove that any of these many carcinogens are completely safe at low doses. If everyone is guilty until they prove themselves innocent for producing any amount of carcinogen, even parts per billion (one part per billion is one person in all of China), we will divert our wealth to fighting lawsuits over trivia. Though some people do benefit from lawsuits, the public health will not.⁵⁹

In its 1987 comparison of the risks associated with various environmental problems, EPA acknowledged the lack of reliable data, but estimated that for six of the chemicals most commonly found at inactive hazardous waste sites, about 1,100 cases of cancer per year might be attributable to all hazardous waste sites combined.⁶⁰ EPA's estimate was based on an extreme extrapolation from risk assessments at 35 sites to a total of more than 25,000 sites nationwide. EPA's estimate is clearly a worst-case estimate of cancer incidence, since it was based on EPA's overly conservative methodology for evaluating risk at the 35 original sites.⁶¹ But by using EPA's worst-case estimate as a theoretical benchmark, we can compare the health impact of hazardous waste sites to various other national health problems.

As a first step, EPA's worst-case estimate of 1,100 cancer cases per year can be adjusted to reflect not just hazardous waste sites, but all contaminated sites that are the subject of current cleanup

Carcinogenic risks from waste sites are very small compared to risks from naturally occurring carcinogens.

Waste site risks are trivial when compared to the risks of other everyday activities.

The projected waste site cleanup expenditure of \$25 billion per year exceeds the federal government's total budgeted expenditure (1992) for all disease and injury programs.

programs, including active manufacturing plant sites, municipal solid waste sites, and underground storage tanks. Adding these sites increases the EPA estimate from 1,100 cancer cases to 1,231 cancer cases per year.⁶²

Next, EPA's estimate of cancer incidence can be converted to an estimate of annual fatalities attributable to contaminated sites. Using the conservative assumption that all of the estimated 1,231 cancer cases per year attributable to contaminated waste sites are fatal cancers, and adding the further conservative-assumption that other chemicals found at hazardous waste sites effectively triple the number of deaths caused by those sites, produces the extraordinarily conservative estimate of 3,693 deaths per year. If this figure is rounded upward to the nearest thousand, it creates an even more conservative theoretical estimate of 4,000 total deaths per year attributable to hazardous waste sites.

Having made these conservative assumptions, we can now use Figure 1 to compare the theoretical 4,000 annual fatalities attributable to contaminated sites with the annual fatalities attributable to other known public health problems, as measured in a 1987 report produced by the Carter Center at Emory University.⁶³ Figure 1 dramatically demonstrates that the risks associated with waste sites are very low compared to numerous other public health risks, such as tobacco, alcohol, handguns, and unintended pregnancy.

Without minimizing the significance of the theoretical 4,000 deaths per year estimated to result from contaminated sites, it is clear from Figure 1 that there are many other public health problems that pose far more significant risks to human health in this country than are posed by hazardous waste sites.

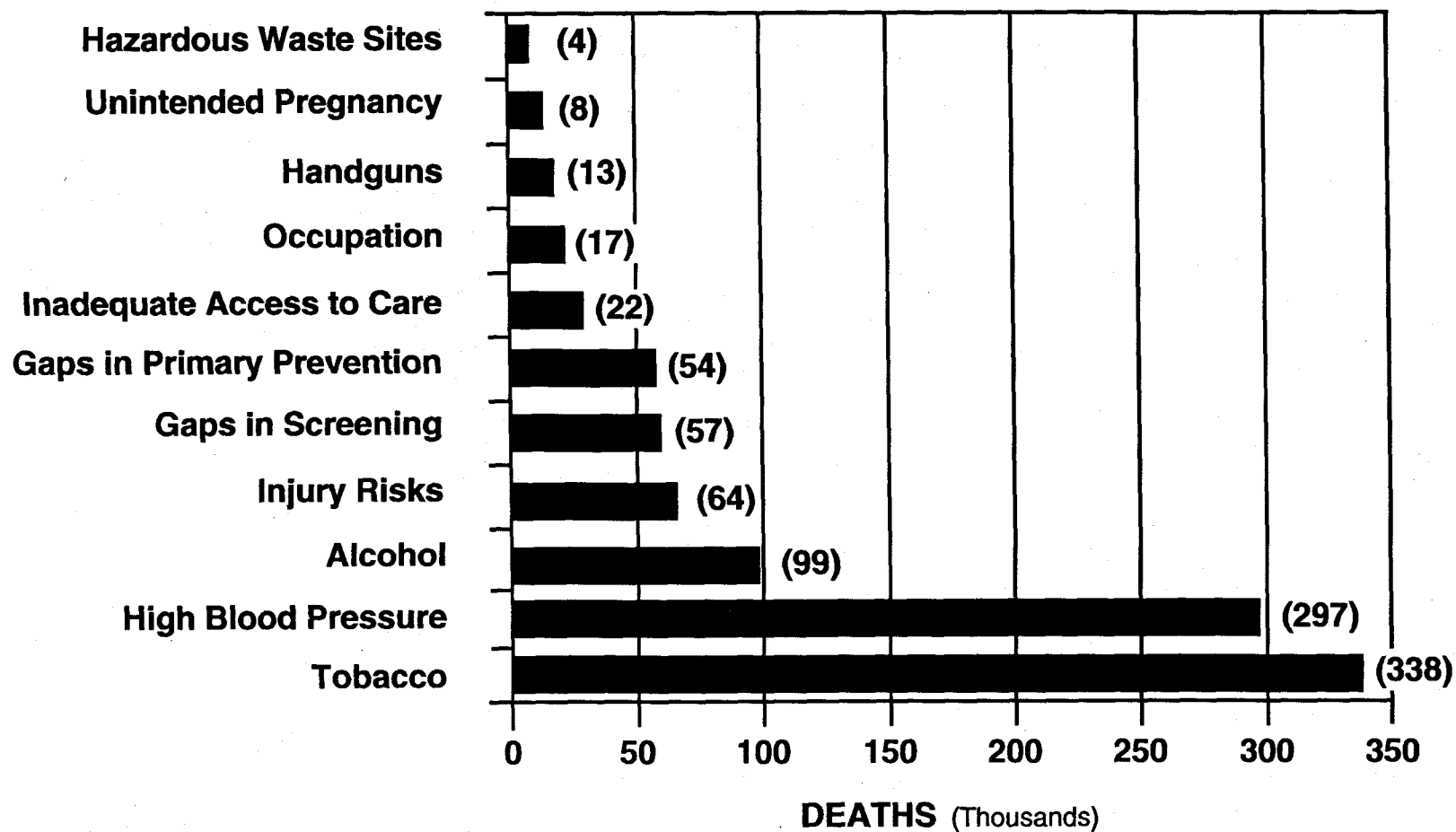
C. The Relative Levels of Federal Government Spending on Various Public Health Problems

Having examined the relative risks posed by contaminated sites and other public health problems, it is instructive to compare the relative levels of annual federal spending on each of these problems. Figure 2 on page 17 uses the University of Tennessee Report's "best guess" estimate of costs for all cleanup programs, translated into an annual average spending level of \$25 billion, as compared to the 1992 federal budget levels for five current programs designed to preventing significant threats to human healths.

Obviously, the amounts to be spent on hazardous waste site cleanup, if we continue our present course, will overwhelm what we are spending on these other worthwhile programs. To place the spending disparity in context, the \$25 billion projected to be spent annually on site cleanup is greater than the total amount in the 1992 federal budget for all government programs focused on prevention of premature deaths from disease and injury.⁶⁴ That total includes several of those listed in Figure 3 (childhood immunizations and cancer screening), and many others, such as

FIGURE 1

ATTRIBUTABLE DEATHS PER YEAR RANKED BY RISK



Sources: All information, except the hazardous waste sites estimate, is taken from The Carter Center of Emory University, *Closing the Gap*. The hazardous waste site figure is derived from an EPA worst-case estimate. (See text.)

The Superfund cost per life saved is disproportionately higher than for other programs.

The cost-effectiveness of other health protection programs is much greater than that of Superfund.

access to primary health care services, safety programs within the Department of Transportation, infant mortality reduction programs (Healthy Start), women, infants and children's nutrition assistance programs, smoking cessation programs, the prevention of lead poisoning in children, and several other programs.

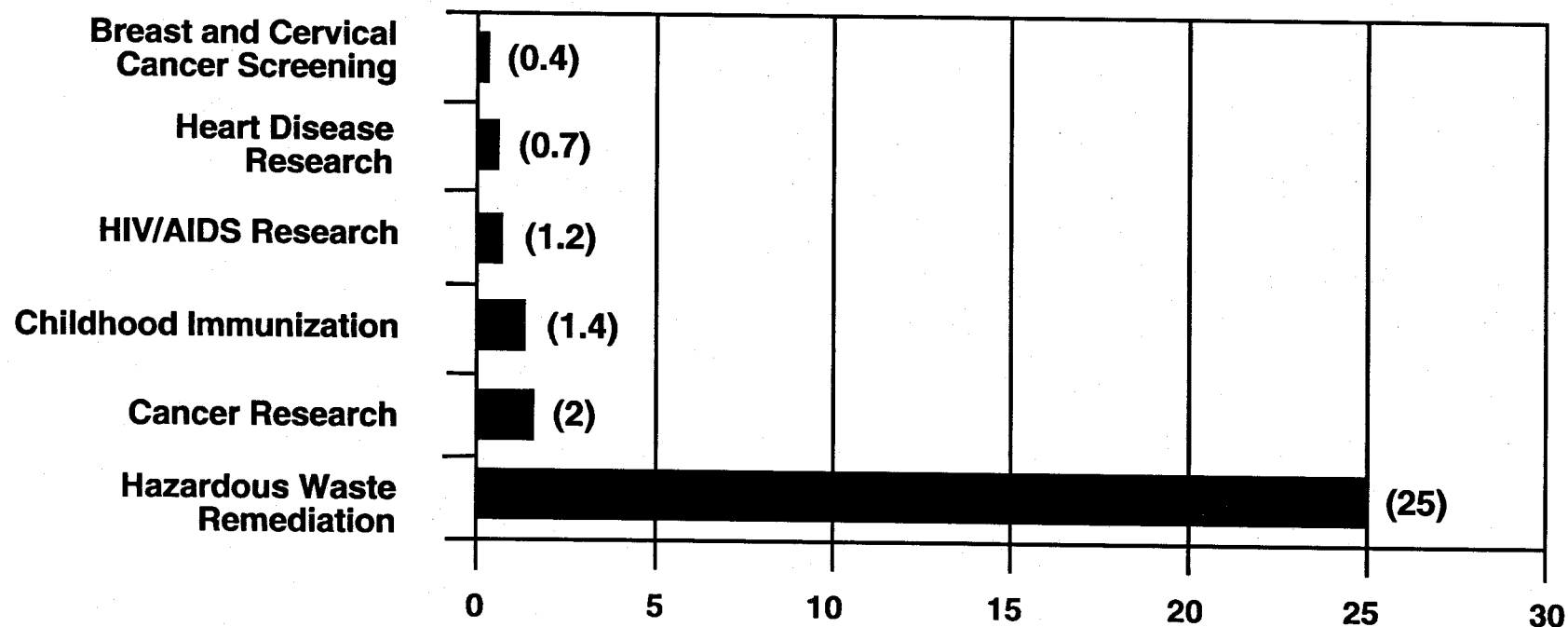
We need look no further than at the relative rankings of attributable deaths by risk contained in Figure 1 to demonstrate that such a disproportionate allocation of resources does not make sense. **It is difficult to justify spending \$25 billion a year remediating contaminated sites to save a theoretical 4,000 lives a year, while spending far less on programs to prevent diseases and accidents that take hundreds of thousands of lives every single year.** Although every human life has value, the estimates discussed here translate into spending \$6.25 million per life saved by cleaning up contaminated sites. This compares to significantly lower dollar figures (ranging from \$200,000 to \$3 million) used by other federal agencies to measure the costs and benefits of safety regulations in terms of "dollars per life saved." Safety regulations that exceed those costs are not considered cost-beneficial.⁶⁵

To put the comparison into further perspective, it is useful to calculate a cost-effectiveness measure for the projected level of spending on cleaning up contaminated sites and then compare it with the cost-effectiveness of various disease prevention programs. In a recent Harvard Health Letter article, Dr. David Eddy provided cost-effectiveness measures for a number of health screening and prevention programs, ranging from smoking cessation to cancer screening.⁶⁶ Cost-effectiveness was measured by calculating the person-years of life saved per \$1 million spent on each program. For example, smoking decreases life expectancy by at least seven years. Thus, at a \$1,000 expenditure to get a single smoker to quit, spending \$1 million on a smoker-education program would add approximately 7,000 person-years of life.

As stated, even if we use the upper bound theoretical figure of 4,000 deaths annually associated with hazardous waste sites, at a level of spending of \$25 billion per year, a completely successful remediation program would cost \$6.25 million per life saved. Assuming conservatively that each death as a result of a hazardous waste site decreases the person's lifespan by 21 years (triple that of smoking), then spending \$1 million on remediating hazardous waste sites would save two and a half person-years of life. Figure 3 shows this estimate in comparison to the cost-effectiveness of several prevention and screening programs. **In terms of cost-effectiveness, as measured by person-years of life saved per \$1 million of spending, hazardous waste site remediation is simply not in the same ballpark as health-screening and prevention programs.** Yet as discussed above, the amounts of money devoted to such programs are quite small when compared to the projected \$25 billion a year for hazardous waste site remediation.

FIGURE 2

**Hazardous Waste Remediation Expenses
Relative to Federal Programs
to Combat Other Human Health Problems**
(in billion dollars per year)

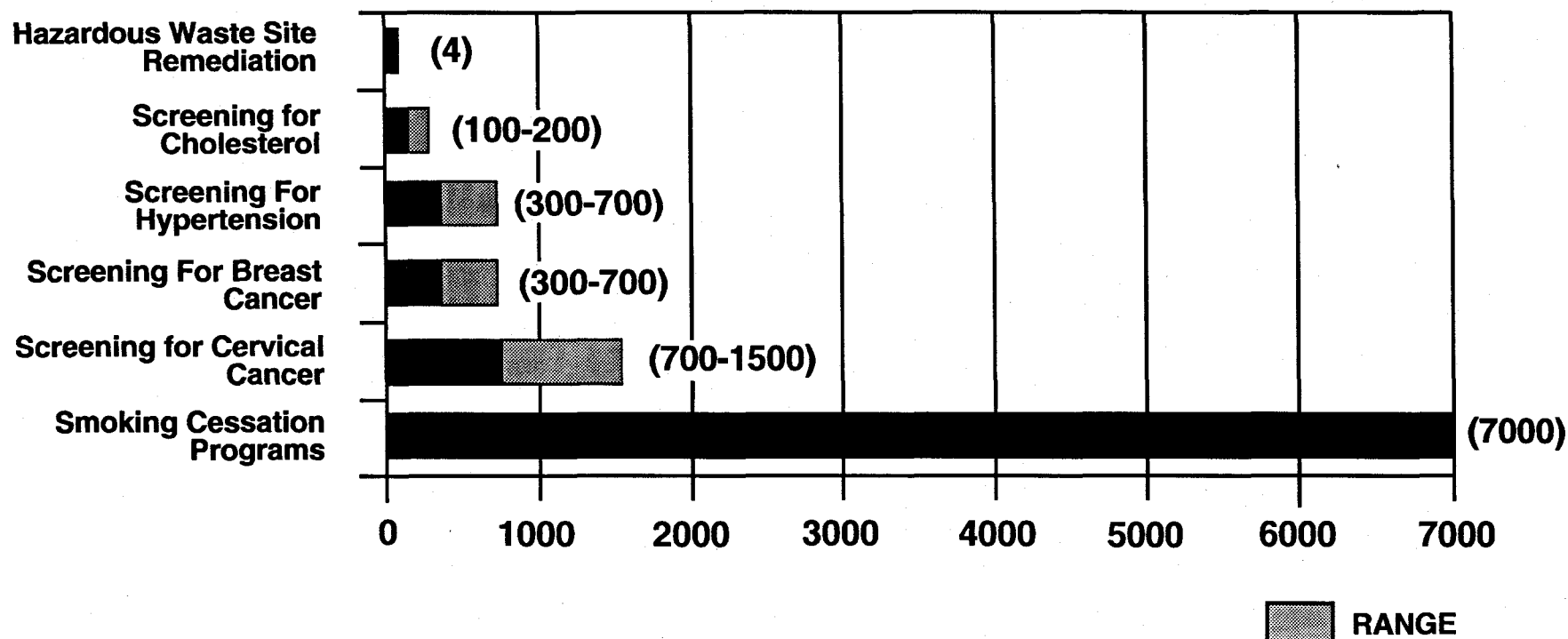


Sources: The hazardous waste site remediation figure is derived from *Hazardous Waste Remediation: The Task Ahead*, published by the University of Tennessee in December 1991. (See text.) All other information is the historical FY 1992 budgeted amounts for these programs as reported in President Bush's proposed Budget for FY 1993.

FIGURE 3

Cost-Effectiveness of Hazardous Waste Site Remediation Compared to Various Public Health Programs

(person-years saved per \$1 million)



Sources: All information, except the hazardous waste site estimate, is derived from the *Harvard Health Letter*, July 1992. The hazardous waste site figure is derived from an EPA worst-case estimate. (See text.)

The point is not that \$6.25 million per life saved is necessarily too high, or that \$25 billion per year is necessarily too much to spend on public health programs. Rather, the point is that we are spending vastly more on site cleanups than on demonstrated public health threats of far greater magnitude. Moreover, the site cleanup program is so costly that it ranks very low in terms of cost-effectiveness relative to other public health programs. Finally, the current pattern of spending runs directly counter to EPA's own assessment of the overall health risks presented by contaminated sites. All of this suggests rather strongly that the time has come to reconsider the basic assumptions that drive our current approach to Superfund and the other cleanup programs.

VI. Conclusion

The arrival of a new Administration and the convening of a new Congress provide an excellent opportunity to take a fresh and realistic look at the price tag for Superfund and its progeny. If the Superfund approach is extended to the RCRA Corrective Action and underground storage tank programs, is imposed on federal facility cleanups that must be performed by DOD and DOE, and is adopted by the states, then the ultimate price tag could well reach one trillion dollars. It is most probable that a substantial amount of this money will be wasted, either through poor management of Superfund contractors, or more fundamentally, on cleanup actions that exceed the work that is needed to protect human health and the environment. Finally, any hard look at the amounts that have been and will be spent on federal waste site remediation program will lead to the conclusion that **if protection of human health and the environment is our real goal, then Superfund expenditures, compared to many other ways of using our available resources, are a very poor investment indeed.**

The Hazardous Waste Cleanup Project believes that the Superfund program and other federal environmental cleanup programs can and should be changed so as to spend our resources more wisely without sacrificing the protection of human health and the environment. One key component of any such change must be to revise the Superfund remedy selection process to focus on the elimination of real risks, rather than the restoration of industrial facilities to pristine environmental conditions.

If protection of human health and the environment is our goal, then Superfund is a poor investment.

Superfund's focus should be on the cost-effective reduction of real risks.

ENDNOTES

1. Russell, Colglazier and English, Hazardous Waste Remediation: The Task Ahead, Hazardous Waste Remediation Project, Waste Management Research and Education Institute, University of Tennessee (Dec. 1991) (hereinafter the University of Tennessee Report). The trillion dollar amount is the plausible upper bound of the amount needed to remediate our nation's hazardous waste sites under current policies, principles and practices for hazardous waste site remediation. *Id.*, Table I, p. 16. The University of Tennessee Report also presents an upper bound estimate of almost \$ 1.7 trillion that would be required under cleanup policies that are more stringent than those in place today (i.e., policies that make greater use of treatment technologies). Table III, p. 22. Although not implausible, given trends of recent years, that higher estimate has not been used in this paper.
2. At p. 18 the University of Tennessee Report says: "An appropriate interpretation of the outcome of a tilt in policy toward less stringency in cleanups (as defined in this study) would be that on a Best Guess, resource requirements would be reduced about one-third from current policy levels. That is, costs would drop from about \$750 billion to less than \$500 billion. This would occur through use of technologies that emphasized containment and isolation of wastes rather than destruction, but that would not be expected to change significantly the ultimate impacts on human health and the environment." The conclusion of this HWCP booklet, that to spend \$250 billion for no significant improvement in protection of human health and the environment would be a waste, is driven by that statement in the University of Tennessee Report, but is not a conclusion of the Tennessee Report.
3. Environmental Protection Agency, End of Year FY 92 Superfund Management Report, Office of Solid Waste and Emergency Response (November 1992), p. III-2.
4. *Id.*
5. CERCLA §§ 221, 303, Pub. L. No. 96-510, 94 Stat. 2769 (1980).
6. U.S. General Accounting Office, Testimony of Peter F. Guerrero before the Subcommittee on Investigation and Oversight, Committee on Public Works and Transportation, U.S. House of Representatives, Superfund: Issues That Need to be Addressed Before the Program's Next Reauthorization, GAO/T-RCED-92-15 (Oct. 29, 1991), p. 2.
7. U.S. Congress Office of Technology Assessment, Coming Clean: Superfund's Problems Can Be Solved, OTA-ITE-433, Washington, D.C.: U.S. Government Printing Office (October 1989), p. 108.
8. EPA, End of Year FY 92 Superfund Management Report, *supra* note 3, p. I-4.
9. Environmental Protection Agency Proposed Rule, National Oil and Hazardous Substance Contingency Plan: The National Priorities List; Amendment, 47 Fed. Reg. 58,476 (1982) (to be codified at 40 C.F.R. Part 300).
10. EPA, End of Year FY 92 Superfund Management Report, *supra* note 3, p. I-4.
11. Environmental Protection Agency, Superfund Progress - Aficionado's Version, EPA 9200.1-12A (June 1992), p. 9.
12. U.S. OTA, Coming Clean, *supra* note 7, p. 127.
13. U.S. Congressional Budget Office, Testimony of Jan Paul Acton before the Subcommittee on Transportation and Hazardous Materials, Committee on Energy and Commerce, U.S. House of Representatives (April 21, 1993), p. 2.
14. Coming Clean, *supra* note 7, p. 179.
15. EPA, Superfund Progress-Aficionado's Version, *supra* note 11, p. 12.
16. Paul R. Portney, The Economics of Hazardous Waste Regulation, paper delivered at an 11/7/91 symposium on U.S. Waste Management Policies: Impact on Economic Growth and Investment Strategies, American Council for Capital Foundation, Center for Policy Research, (May 1992); University of Tennessee Report, *supra* note 1.
17. Hazardous Waste Cleanup Project, "Exaggerating Risk" (June, 1993).
18. Superfund Report, Vol. VI, No. 15, Inside Washington Publications (July 15, 1992), p. 3.
19. 40 C.F.R. § 300.430 (1992).

20. The Superfund program has also been criticized for the excessive amounts of money it causes to be spent on litigation and other transaction costs and how little it causes to be spent on actual cleanup. A Rand Corporation analysis of expenditures by four large insurers found that, of their total Superfund expenditures, an average of 88% were for transaction costs. Jan Paul Acton and Lloyd S. Dixon, Superfund and Transaction Costs: The Experience of Insurers and Very Large Industrial Firms. The Institute for Civil Justice, Rand Corporation Pub. No. R-4132-ICJ, pp. x, xi (1992). None of the spending totals given in this booklet for Superfund or programs driven by Superfund include such transaction costs.
21. Coming Clean, *supra* note 7, p. 28-29.
22. GAO, Superfund: Issues That Need to be Addressed, *supra* note 6, p. 6.
23. U.S. General Accounting Office, Superfund: EPA Has Not Corrected Long-Standing Contract Management Problems, GAO/RCED-92-45 (October 1992), p. 5.
24. New York Times, Friday Mar. 20, 1992, p. A34; Engineering News-Record, Mar. 30, 1992, p. 9.
25. USA Today, Thurs., Mar. 19, 1992, p. 1.
26. EPA: Contract Mismanagement; Hearings Before the Subcommittee on Oversight and Investigations of the House Committee on Energy and Commerce. 102d Congress, 2d Sess. 131 (1992).
27. Superfund Report, *supra* note 18.
28. EPA Acting Assistant Administrator Christian R. Holmes, before the Oversight Subcommittee of the House Energy and Commerce Committee; Hearings on Contractor Mismanagement (re CH2M Hill) prepared statement, p. 1, submitted March 19, 1992.
29. Congressional Monitor, March 11, 1993, p. 3.
30. BNA National Environment Daily, March 12, 1993.
31. Environmental Protection Agency, Progress Toward Implementing Superfund, Fiscal Year 1990, Report to Congress, EPA/540/B-91/004 (February 1992), p. 37.
32. U.S. General Accounting Office, Report to the Administrator, Environmental Protection Agency, Superfund: EPA Cost Estimates are not Reliable or Timely, GAO/AFMD-92-40 (July 1992), p. 7.
33. Portney, The Economics of Hazardous Waste Regulation, *supra* note 16.
34. University of Tennessee Report, *supra* note 1, pp. A-3.7 through A-3.19.
35. 42 U.S.C.A. §§ 6924(u)&(v), 6928(h) (West 1983 and Supp. 1992).
36. Environmental Protection Agency, Corrective Action for Solid Waste Management Units at Hazardous Waste Management Facilities; Proposed Rule, 55 Fed. Reg. 30,798, 30,861 (1990).
37. *Id.* at 30,824, 30,825.
38. University of Tennessee Report, *supra* note 1, pp. A-3.19 through A-3.26.
39. *Id.* at A-3.39.
40. *Id.* at A-3.38.
41. *Id.* at A-3.30 through A-3.39.
42. U.S. Department of Energy, Third Environmental Restoration and Waste Management Five Year Plan (Sept. 1991), p. 210.
43. BNA Environment Reporter, April 9, 1993, p. 3117.
44. U.S. General Accounting Office, Report to the Chairman, Committee on Governmental Affairs, U.S. Senate, Nuclear Health and Safety: More Can Be Done to Better Control Environmental Restoration Costs, GAO/RCED-92-71 (April 1992), p. 21.
45. *Id.* at 29.
46. University of Tennessee Report, *supra* note 1, pp. A-3.30 through A-3.39.
47. 42 U.S.C.A. §§ 6991-6991i (West 1983 & Supp. 1992).
48. This is the range of costs given by the University of Tennessee Report, *supra* note 1, Table I, p.16. Portney, *supra* note 16 (at \$50 billion) and EPA (at \$40 billion) have both made projections within that range. EPA's projection is in U.S. EPA, Environmental Investments:

The Cost of a Clean Environment, Report of the Administrator of the Environmental Protection Agency to the Congress of the United States (Dec. 1990) p. 5-24 (by summing across the columns).

49. University of Tennessee Report, supra note 1, p. A-3.42.
50. University of Tennessee Report, supra note 1, pp. 14-15.
51. University of Tennessee Report, supra note 1, p. 18.
52. U.S. General Accounting Office, Superfund Program Management GAO/HR-93-10 (December 1992), p. 35-26.
53. U.S. EPA, Unfinished Business: A Comparative Assessment of Environmental Problems, Office of Policy Analysis, EPA/230/2-87/015a (February, 1987), p. xix.
54. Exaggerating Risk, supra note 17.
55. Provided by EPA Administrator Reilly to The Committee on Environment and Public Works, United States Senate, During Hearings on The Report of the Environmental Protection Agency's Science Advisory Board, Hearing Report (January 25, 1991) at 22.
56. U.S. EPA, Unfinished Business, supra note 47.
57. Id. at 74, 76.
58. National Research Council, Environmental Epidemiology: Public Health and Hazardous Wastes, National Academy Press, Wash. D.C. (1991), p. 19(" critical information on the distribution of exposures and health effects associated with hazardous-waste sites is still lacking.")
59. Bruce N. Ames, "Six Common Errors Relating to Environmental Pollution," Journal of Regulatory Toxicology and Pharmacology 7 (1987) p. 379.
60. EPA, Unfinished Business, supra note 47, Table 2-2, pp. 29-30.
61. For a critique of the EPA methodology, see "Exaggerating Risk," supra note 17.
62. This reflects EPA's estimates of 1,000 cancers per year for "Hazardous Waste Sites—Inactive," 100 cancers per year for "Hazardous Waste Sites—Active," 40 cancers per year for "Nonhazardous Waste Sites—Municipal," 70 cancers per year for "Nonhazardous Waste Sites—Industrial," 20 cancers per year for "Mining Waste," and 1 cancer per year for "Releases from Storage Tanks." The estimate of 1,231 cancer cases per year does not reflect any downward adjustment for what EPA's report acknowledged was some "double counting" of risks in overlapping site categories.
63. Robert W. Amler and Donald L. Eddins, "Cross-Sectional Analysis: Precursors of Premature Death in the United States", contained in Closing the Gap: The Burden of Unnecessary Illness, a report on a consultation at the Carter Center of Emory University, Oxford University Press 1987. The data referenced in Figure 1 are for 1980 and are taken from Table 2, p. 184.
64. From the President's proposed 1993 Budget. Total of all 1992 enacted budget amounts for programs listed in Table 5-1, The Budget Provides Substantial Increases for Programs Focused on Prevention and the Next Generation, Part One-69.
65. In 1990 all safety regulatory agencies within the Department of Transportation began using a value of \$1.5 million to represent statistically a human fatality avoided. See, e.g., Federal Aviation Administration, Use of X-Ray Systems; Final Rule, 56 Fed. Reg. 48,370 (1991); U.S. Coast Guard, Stability Design and Operational Regulations; Final Rule, 57 Fed. Reg. 41,812 (1992). On January 8, 1993, the Department issued to all of its safety agencies updated guidance recommending that \$2.5 million be used as the "willingness to pay" value of a fatality averted. U.S. DOT, Office of the Secretary Memorandum, Treatment of Value of Life and Injuries in Preparing Economic Evaluations (signed by the General Counsel and the Assistant Secretary for Policy and International Affairs). The Consumer Product Safety Commission in its rulemakings has discussed value-of-life estimates ranging from \$200,000 to \$3 million per life. See, e.g., Consumer Product Safety Commission, Omnidirectional Citizens Band Base Station Antennas; Final Rule, 47 Fed. Reg. 36, 186 (1982).
66. Dr. David Eddy, "David Eddy Ranks the Tests", Harvard Health Letter, Special Supplement (July 1992).

BIBLIOGRAPHY

Acton, Jan Paul and Lloyd S. Dixon. Superfund and Transaction Costs: The Experience of Insurers and Very Large Industrial Firms, The Institute for Civil Justice, Rand Corporation Pub. No. R-4132-ICJ (1992).

Ames, Bruce. "Six Common Errors Relating to Environmental Pollution," Journal of Regulatory Toxicology and Pharmacology 7 (1987), p. 379.

Hazardous Waste Cleanup Project, Exaggerating Risk: How EPA's Risk Assessments Distort the Facts at Superfund Sites Throughout the United States (April 1993).

Natural Research Council, Environmental Epidemiology: Public Health and Hazardous Wastes, National Academy Press, Washington, D.C. (1991).

Portney, Paul. The Economics of Hazardous Waste Regulation, paper delivered at November 7, 1991 Symposium on U.S. Waste Management Policies: Impact on Economic Growth and Investment Strategies, American Council for Capital Foundation, Center for Policy Research (May 1992).

Russell, Colglazier and English, Hazardous Waste Remediation: The Task Ahead, Hazardous Waste Remediation Project, Waste Management Research and Education Institute, University of Tennessee (Dec. 1991).

The New York Times, Sunday, March 21, 1993 to Wednesday, March 24, 1993. Series of four articles, "What Price Cleanup?"

United States Congress, EPA Contract Mismanagement; Hearings Before the Subcommittee on Oversight and Investigations of the House Committee on Energy and Commerce, 102d Congress, 2d Sess. 131 (1992).

United States Department of Defense, Defense Environmental Restoration Program: Annual Report to Congress for Fiscal Year 1990 (Feb. 1991).

United States Department of Defense, Defense Environmental Restoration Program: Annual Report to Congress for Fiscal Year 1991 (Feb. 1992).

United States Department of Energy, Third Environmental Restoration and Waste Management Five Year Plan (Sept. 1991).

United States General Accounting Office, Report to the Chairman, Committee on Governmental Affairs, United States Senate, Nuclear Health and Safety: More Can Be Done to Better Control Environmental Restoration Costs, GAO/RCED-92-71 (April 1992).

United States General Accounting Office, Report to Congress, Environmental Protection: Meeting Public Expectations with Limited Resources, GAO/RCED-91-97 (June 1991).

United States General Accounting Office, Report to the Administrator, Environmental Protection Agency, Superfund: EPA Cost Estimates are Not Reliable or Timely, GAO/AFMD-92-40 (July 1992).

United States Environmental Protection Agency, End of Year FY 92 Superfund Management Report, Office of Solid Waste and Emergency Response (November 1992).

United States Environmental Protection Agency, Environmental Investments: The Cost of a Clean Environment, Report of the Administrator of the Environmental Protection Agency to the Congress of the United States (Dec. 1990).

United States Environmental Protection Agency, Unfinished Business: A Comparative Assessment of Environmental Problems, Office of Policy Analysis, EPA/230/2-87-015a (Feb. 1987).

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