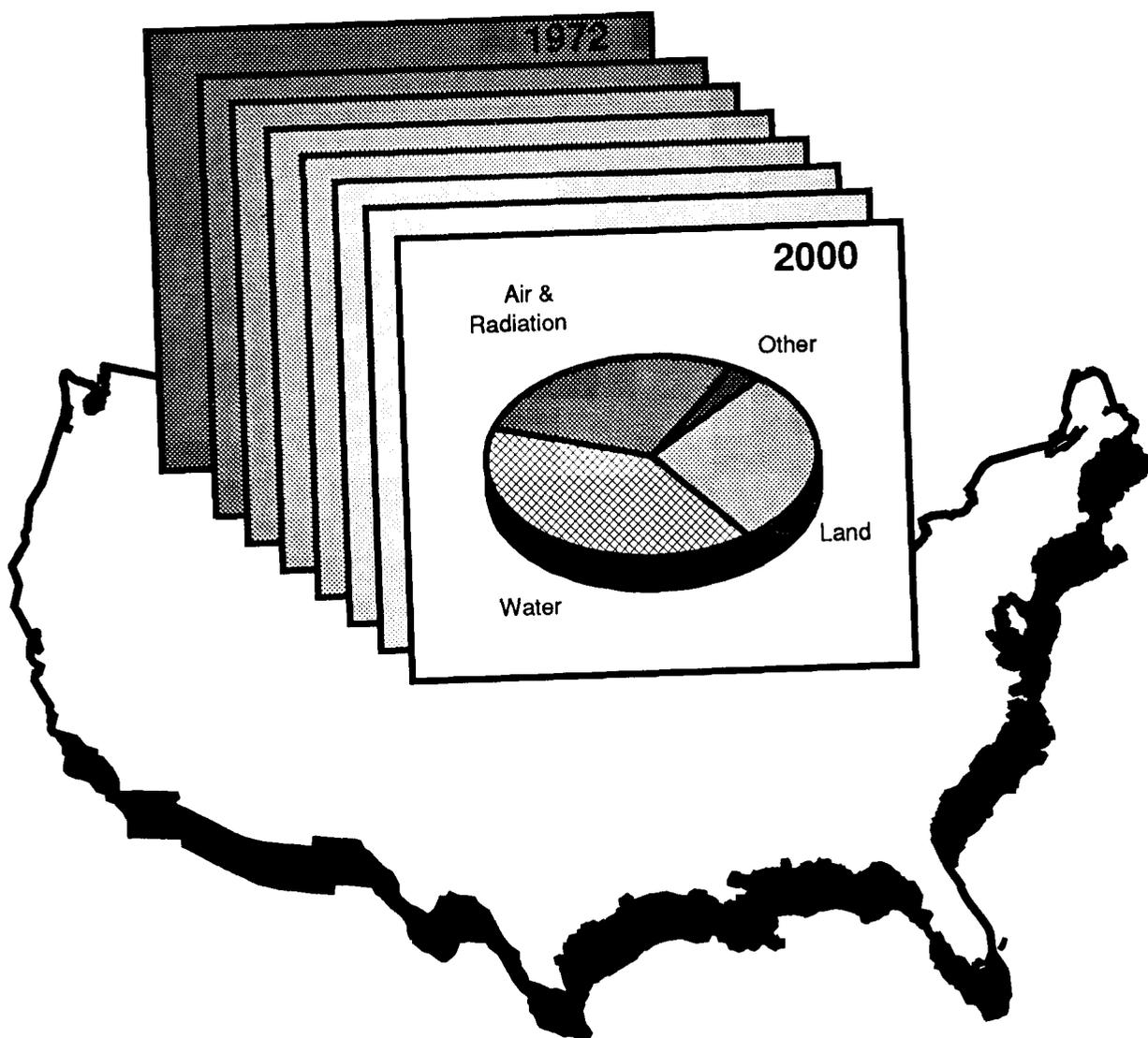




# Environmental Investments: The Cost Of A Clean Environment



Report of the Administrator of the  
Environmental Protection Agency  
to the Congress of the United States



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ENVIRONMENTAL INVESTMENTS:  
THE COST OF A CLEAN ENVIRONMENT

REPORT OF THE ADMINISTRATOR  
OF THE  
ENVIRONMENTAL PROTECTION AGENCY  
TO THE  
CONGRESS OF THE UNITED STATES

Washington, DC 20460

## ADMINISTRATOR'S PREFACE

Over the past 20 years, the citizens of the United States have made a significant, enduring commitment to protecting the environment. This new report, *Environmental Investments: The Cost of a Clean Environment*, for the first time shows the full extent of this commitment—amounting to an investment of \$115 billion a year in current dollars to protect and restore our nation's air, water, and land. This is just over two percent of our Gross National Product. EPA's report looks in some detail at what our country has spent, what we are spending, and what we are projected to spend on all types of pollution controls.

Of course, the country has received considerable value for these investments, and EPA has underway additional work to compile these benefits.

In the current report, a handful of points stand out:

- First, *spending on environmental problems is rising* significantly with obvious consequences for the expenditures of governments at all levels and of industry. Moreover, if the upward trend continues into the next century, this increased spending could affect U.S. competitiveness in world markets.
- Second, besides the level of spending, *the allocation of resources is changing*. The share of costs devoted to land protection is projected to rise relative to that for air and water protection over the next decade.
- Third, *the costs of pollution control are rising at a time when unmet environmental needs are still quite large*. The American people are asking for more in the way of environmental improvements and making clear politically they will not tolerate backsliding. Nor do I want to see rollbacks of hard won environmental progress. But particularly in today's economy, I am concerned about the price tag of meeting growing environmental demands.

Thus, one of my priorities at EPA is ensuring that resources devoted to achieving the nation's environmental goals are used as efficiently and effectively as possible. All EPA programs are considering the most cost-effective ways to meet the Agency's mandate consistent with our statutory responsibilities. Yet I have concluded we must redouble our efforts to find and apply more cost-effective approaches, to engage in negotiations and voluntary agreements to cut pollution, to foster breakthroughs in cleanup technologies, and to explore new ways to finance environmental improvements.

One promising approach to making environmental protection more efficient is to craft incentives that harness the marketplace on behalf of the environment. Using a combination of incentives and vigorous enforcement of existing laws, we can engage the marketplace to deal effectively with the subtle and complex environmental problems of the 1990s. These are often caused by small, widely scattered sources not always amenable to federal regulation—problems like municipal and hazardous wastes, toxic substances in the air and water, contamination of ground and surface waters

from agricultural and urban runoff, and global atmospheric changes—to name some current problems with which the Agency is grappling.

A good example of this approach is the system of economic incentives proposed by President Bush to curb acid rain, which were passed by the 101st Congress in the new Clean Air Act Amendments of 1990. Under this system, electric utilities will be given a limited number of marketable permits designed to reduce their sulfur dioxide emissions by about half. EPA will monitor emissions to ensure that they do not exceed the allotted levels. If a company finds that cleanup costs are high at one plant and that purchasing additional allowances would be less expensive, it will be able to buy allowances from other utilities. On the other hand, a company may cut emissions so far that it will be able to sell its extra allowances or bank them to provide for future growth. And the plant will be able to pursue the least expensive methods of pollution control—energy conservation, different fuels, new technology—provided only that it achieves the pollution reductions the law requires. Setting the goals nationally while providing to plant and business managers, who know their operations best, the flexibility to choose the methods that work for them will achieve air quality goals at the lowest possible cost, by our estimates at perhaps one-fifth less than the cost of more traditional command and control approaches. Like other economic incentives, this emission trading system also has the advantage of promoting innovation in pollution prevention.

As part of my emphasis at EPA on economically smart approaches to environmental protection, I am increasing the use of economic analysis, strategic planning, and research. They will be used to ensure that the resources devoted to pollution control are directed towards environmental goals where the greatest reductions in environmental risks can be achieved. In this regard, EPA is in the process of using the data base developed in this report to see where our spending can be better aligned with the most serious environmental risks. We believe, for instance, that some of the environmental problems that will see the greatest expected increase in costs during the decade, as reported here, are also areas where as yet uncontrolled environmental risks may be less than originally thought. In many cases, there is no discretion under the law as to what EPA must do, and we will carry out these responsibilities as fully and vigorously as we can. In other cases, EPA proposes through its strategic planning process and review of future regulations to direct resources, where discretion is allowed, to the highest priority environmental risks.

In sum, our challenge over the next decade is to reconcile the expectations of the American people for greater environmental protection with our country's aspirations for growth. We need to deliver in the most cost-effective manner the continued public health benefits of pollution control and assure that the natural systems that sustain all human activities, including economic activities, continue to provide for generations to come.

William K. Reilly  
Administrator

*November 1990*

## EXECUTIVE SUMMARY

This report is being transmitted to Congress in response to Section 312(a) of the Clean Air Act and Section 516(b) of the Clean Water Act. Unlike previous such reports, however, it goes beyond the requirements of these sections, by presenting a broader picture of environmental pollution control expenditures reflecting the Environmental Protection Agency's broad mandate.

### SUMMARY OF COSTS

The Report concludes that total annualized costs for all pollution control activities in the United States at seven percent interest have increased and are projected to increase as follows (figures for year 2000 are provided for both present and full implementation scenarios):

Total Annualized Costs	1972	1987	1990	2000	
				Present	Full
In billions of 1986 dollars	26	85	100	148	160
In billions of estimated 1990 dollars	30	98	115	171	185
As Percent of GNP	0.9	1.9	2.1	2.6	2.8

The present implementation option assumes that present levels of implementation of existing programs remain the same as in 1987. The full implementation option assumes that the investments needed to bring about nationwide attainment of the national ambient air quality standard for ozone and the fishable/swimmable goals of the Clean Water Act by the year 2000. The comparison with Gross National Product is intended to provide a frame of reference to allow the reader to judge the relative importance of environmental costs to a well-known aggregate measure of economic activity.

Although total annualized costs are increasing, they are increasing at a decreasing rate. The yearly rate of increase in total annualized costs decreased from 14 percent between 1972 and 1973 to six to eight percent in the mid-1980s and is projected to fall further to about three percent in the late 1990s (assuming full implementation).

The Report also provides estimates of those pollution control costs that are Federally-mandated as follows (assuming full implementation):

Federally-Mandated Annualized Costs	1972	1987	1990	2000
In billions of 1986 dollars	18	67	81	137
In billions of 1990 dollars	21	77	93	158
As Percent of GNP	0.9	1.9	2.1	2.4

Pollution control capital investment is estimated as follows (figures for year 2000 are provided for both present and full implementation scenarios):

<b>Pollution Control Capital Investment</b>	<b>1972</b>	<b>1987</b>	<b>1990</b>	<b>2000</b>	
				<b>Present</b>	<b>Full</b>
In billions of 1986 dollars	20	30	41	30	39
In billions of 1990 dollars	23	35	47	35	45
As Percent of Total Capital Investment	2.5	2.3	2.8	1.7	1.9

In general, pollution control capital investment as a percentage of total capital investment, which is an important measure of the impact of pollution control costs on U.S. capital markets, reached a high in the mid-1970s at about 3.4 percent and has been trending irregularly downward since then. It is important to mention, however, that the year 2000 capital costs may be underestimated because when the data were unclear, future costs for new regulations were assigned to operating rather than capital costs.

In general, this report presents data on environmental pollution control costs during the period 1972-1987, projects these costs for each subsequent year to the year 2000 under a number of assumptions, and breaks them down in a variety of ways. These ways include differentiating between capital, operating, and annualized costs, as well as the medium where the pollution is controlled, the sector (e.g., public, private) from which the control is funded, new versus existing regulations, whether the control is primarily a result of a Federal mandate or the result of local initiative, and to the extent permitted by the data, by pollutant controlled.

The historical data are largely based on surveys of actual spending as conducted primarily by the Department of Commerce. Projections are based on simple extrapolations of spending trends as well as EPA estimates of the cost of newly implemented and proposed regulations. The Administration's January 1990 Clean Air Act reauthorization proposal was the basis for projections of future air pollution control costs.

## COST COMPARISONS

The report draws five conclusions concerning cost comparisons made with the data presented:

- There is expected to be a major reallocation of the percentage of pollution control expenditures to each media over the next decade from air and particularly water pollution control to land pollution control. This is a result of the major land pollution control legislation passed by Congress beginning in the mid-1970s and greatly expanded in the 1980s. Specifically, the media shares were or are projected to be:

<b>Media Shares of Pollution Control Expenditures (percent of total)</b>	<b>1987</b>	<b>1997</b>
Air and Radiation Costs	28.9	27.1
Water Costs	42.9	35.7
Land Costs	26.0	33.9
Chemical Control Costs	1.2	1.9
Multi-media Costs	1.1	1.5

- Although increasing, national environmental pollution control expenditures remain less than half those for clothing and shoes, one-third those for national defense, one-third those for medical care, one-fifth those for housing, and one-sixth those for food.
- The non-EPA Federal share of total annualized pollution costs is projected to increase by more than 140 percent between 1987 and 2000, primarily as a result of the cost of military and nuclear waste clean-up. All other shares, particularly the private sector, are expected to fall somewhat. Even though the EPA share is projected to fall somewhat, the net effect is that the Federal share as a whole is projected to increase over this period while the state and local government share would decrease slightly.
- Although the percentage share of the burden on local government is expected to fall slightly change relative to that of other economic sectors, there is expected to be a significant increase in the real costs of pollution control on this sector; the result will be an increased burden on the taxpayers and rate payers, which may be burdensome for some smaller communities, unless mitigating measures are undertaken.
- National expenditures on environmental pollution control have been somewhat higher than in many Western European nations as a percentage of gross domestic product.

## ENVIRONMENTAL RESULTS

The report also summarizes the available evidence concerning changes in ambient pollution levels and emissions, the “result” of the pollution control expenditures detailed in other sections of the report. An ideal comparison of the costs and benefits of pollution control would require that these benefits be identified, quantified, and monetized. This is an extremely difficult and data intensive task and is not attempted in this report.

Instead, the report relies on historical data on estimated air and water pollutant emissions and ambient pollution levels, and information on the production and regulation of hazardous waste and toxic substances to provide an indication of environmental quality levels over time. While this provides some indication of changing environmental quality levels, it does not adequately show the degree of environmental protection afforded by cumulative pollution control efforts. In the absence of controls, increasing population and levels of economic activity would have resulted in steadily decreasing environmental quality over time. In order to show environmental quality improvements resulting from pollution controls adequately, one would need to compare current levels of

environmental quality indicators with estimated levels that would have prevailed in the absence of cumulative pollution control efforts. Except in the case of the criteria air pollutants emissions, such comparisons are precluded by the absence of data.

There are data, however, showing that there has been a substantial decrease in emissions of major air pollutants since 1970 compared to what they would have been without controls:

ACTUAL EMISSIONS AS A PERCENTAGE OF ESTIMATED EMISSIONS USING 1970  
LEVELS OF CONTROL

Year	Particulate Matter	Sulfur Dioxide	Nitrogen Oxides	Volatile Organic Compounds	Carbon Monoxide	Lead
1984	33	71	82	60	56	19
1988	30	58	72	58	43	3

There has also been a substantial actual decrease in industrial and municipal discharges of total suspended solids into water and some improvement in biochemical oxygen demand over the same period.

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## 1. INTRODUCTION

Since the early 1970s, the U.S. Environmental Protection Agency (EPA) has helped carry out the national mandate to restore and protect our environmental resources. It has proven to be a massive undertaking. The Federal government, states and localities, and the private sector have all participated in this effort and expended considerable resources to implement and comply with environmental programs.

This report presents estimates of historical pollution control expenditures and projected future costs for each public sector and the private sector. The time period covered includes the years 1972-2000. Estimates of capital costs, operation and maintenance costs, and total annualized costs are presented for five categories of environmental media. The report also uses the estimates to provide some comparisons of U.S. pollution control costs with those of several Western European nations, and to raise certain issues concerning costs that appear likely to prove important over the next several years.

In addition, the report presents some historical data on pollutant emissions and ambient pollution levels—the “output” of pollution control expenditures. These data are indicators of the level of environmental quality over time that are not readily comparable to the monetary cost estimates presented in this report. Reduced pollutant emissions and improved ambient environmental quality have resulted in substantial and valuable national benefits in the form of improved human health, recreational opportunities, visibility, and general environment integrity, among others. An ideal comparison of the costs and benefits of pollution control would require that these benefits be identified, quantified, and monetized. This is a much more difficult task than showing historical trends in pollution loadings and ambient pollution levels and is beyond the scope of this report. Ongoing EPA research focuses on estimating and monetizing the quantifiable benefits of aggregate pollution control efforts; the results of this research will be reported in future publications in this series.

The remainder of this chapter discusses the nature and scope of the cost estimates, the categories of costs considered, and conventions used throughout the analysis. Chapter 2 examines briefly the data sources used. The cost estimates are presented by media in Chapters 3 through 7. Total costs are presented in Chapter 8 along with a discussion of major sources of uncertainty in these estimates. Conclusions and data on environmental quality trends are presented in Chapters 9 and 10, respectively. More detailed documentation for the cost estimates and data sources are provided in the Appendices A-J.

### 1.1. DEFINITION OF COSTS CONSIDERED

#### *1.1.1. Scope of Costs*

The Clean Air and Water Acts require the Administrator of the EPA to periodically collect and report to Congress estimates of the national costs to all sectors—both public and private—of carrying

out the respective Acts.<sup>1</sup> This report presents cost estimates that fulfill these requirements. The report goes beyond the scope of these statutory directives, however, to provide cost estimates for all EPA programs pursuant to each of the major Federal environmental pollution control statutes. This provides a picture of the total direct costs of all Federal pollution control efforts, and permits cost comparisons across environmental media and major EPA program areas.

In addition, this report includes the costs of state, local, and private pollution control programs that are closely related to areas for which EPA currently has responsibility and are being pursued for the same purposes—pollution control and improved environmental quality. The most significant of these added costs are for local government and private sector trash collection and disposal. Federal legislation in the solid waste area is concerned primarily with the regulation of solid waste disposal facilities. Yet, local governments and private entities are involved with the full range of solid waste activities, including collection, handling, storage, treatment, and final disposal. Though only a relatively small portion of the total costs for these activities are incurred as a result of Federal legislation, all solid waste costs are included in this report. This is done on the grounds that all such expenditures contribute to pollution control and improved environmental quality.

This definition of costs excludes those associated with activities not directly related to pollution control. The costs of Federal environmental programs that are not pollution control programs, such as wildlife conservation and land management, are not included. In addition, the costs of non-pollution control aspects of programs that do involve pollution control are excluded. The cost of supplying drinking water, for example, is not considered an environmental cost in this report since the provision of drinking water (laying pipes and pumping water) does not contribute to pollution control. Only the costs of improving drinking water quality are included in this report. Another example of costs excluded are those associated with the treatment of incoming water used in manufacturing processes. In this case, water is treated not to improve environment quality, but rather to make it better suited to production requirements.

### *1.1.2. Nature of Costs*

The costs presented in this report represent estimates of direct regulatory implementation and compliance costs. They are the first-order, out-of-pocket costs to those entities that implement control measures and undertake compliance activities. For example, the private costs associated with existing programs represent the before-tax expenditures associated with all compliance activities, including the purchase, installation and operation and maintenance of existing pollution control equipment; the private costs of new and future programs represent, for the most part, projections of before-tax capital investment and operation and maintenance costs calculated using engineering analyses.

These direct costs are an imperfect proxy for the social costs of pollution control regulation. The true social costs of pollution control are represented by the total value that society places on the goods

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<sup>1</sup> Clean Air Act, Section 312(a) and Clean Water Act, Section 516(b).

and services foregone as a result of resources being diverted to environmental protection. Compliance costs do not fully reflect social costs because they neglect direct regulatory impacts that do not involve out-of-pocket costs as well as the intertemporal and secondary effects of environmental protection. In other words, they do not account for the dynamic, general equilibrium effects created throughout the economy that impose costs on industries and households not directly affected by regulation. Environmental protection imposes costs on virtually all economic entities—including the general public—that are largely hidden. Examples of social costs imposed by pollution controls that are not reflected in direct compliance cost estimates include lost or delayed production and consumption opportunities, reduced economic productivity, and higher price inflation. Some recent research suggests that compliance cost estimates may understate substantially the true long-term costs of pollution control.<sup>2</sup>

## 1.2. COST CATEGORIES

The cost estimates are broken down as follows (and discussed in the sections of the report indicated):

- 1.2.1. By economic type;
- 1.2.2. By environmental medium;
- 1.2.3. By the sector directly incurring the cost;
- 1.2.4. By pollutant controlled;
- 1.2.5. By mandate (Federal or other);
- 1.2.6. By new and existing regulations; and
- 1.2.7. By year.

### *1.2.1. Costs by Economic Type*

Two basic types of costs are included to represent implementation and compliance costs:

- capital costs, and
- operating costs.

From these, two aggregate cost measures are derived—annualized costs and total expenditures. Annualized costs are the aggregate cost measure used throughout most of the Report. The first table at the end of each media chapter and in most of the groups of total cost tables shows capital costs; the second shows operating costs; the third shows annualized costs. Total expenditures represent the sum of capital and operating costs. They are used only in Tables 8-18 and 8-19 of Chapter 8 and in Sections 9.1.1 through 9.1.3 of Chapter 9. The Report attempts to minimize confusion by referring

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<sup>2</sup> See, for example: M. Hazilla and R. Kopp, *The Social Cost of Environmental Quality Regulations: A General Equilibrium Analysis*, Discussion Paper QE89-11, Resources for the Future, Washington, DC, March 1989.

to capital plus operating costs as expenditures rather than costs. Further discussion of total expenditures can be found in these Sections.

The definitions of capital and operating costs follow those of the primary data sources used—The U.S. Department of Commerce *Government Finances* reports<sup>3</sup> and “Pollution Abatement and Control Expenditures” articles.<sup>4</sup>

Capital costs include acquisitions of plant and equipment (both replacement and expansion) and expenditures for construction in progress. They are chargeable to an establishment's accounts for plant and equipment and subject to amortization. Expenditures for research and development are excluded. For the purpose of analyzing the impact of demands for capital on financial markets, capital costs are attributed to the years in which the demand for capital occurred or is expected to occur. Capital costs as defined by the Commerce Department also include the costs of changes in production processes that reduce or eliminate the generation of pollutants, through material substitution, improved catalysts, reuse of waste or water, and equipment alteration.

Operating costs include all costs and expenses for the operation and maintenance of pollution abatement processes, including spending for materials, equipment leasing, parts and supplies, direct labor, fuel and power, services provided by private contractors, and research and development. Operating costs exclude costs associated with plant and equipment financing and depreciation, expenditures for health and safety, and payments to governmental units.

Government costs are also presented as outlays for capital and operating costs. All governmental costs for program implementation and administration are listed as operating costs.

As mentioned above, annualized costs, although not calculated and reported by the Commerce Department, are the principal aggregate cost presented in most of the Report. These are the sum of the operating costs for the year in question plus amortized capital costs, which include interest and depreciation associated with accumulated capital investment. Amortized (or annualized) capital costs represent the real resource costs of tying-up funds in the purchase and installation of capital equipment or other fixed assets required by environmental regulation. Annualized capital costs are computed using three rates of amortization—three, seven, and ten percent—and the following assumptions with regard to life of capital investment for different program areas:

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<sup>3</sup> U.S. Department of Commerce, Bureau of the Census, *Government Finances*, various years.

<sup>4</sup> U.S. Department of Commerce, Bureau of Economic Analysis, various articles often entitled “Pollution Abatement and Control Expenditures,” published periodically in the *Survey of Current Business*.

Mobile source air pollution control capital	10 years;
Radiation control capital	25 years;
Water pollution control capital (except drinking water)	30 years;
Superfund remediation capital	30 years;
Underground storage tank capital	30 years;
All other capital	20 years.

The assumed life of capital for mobile sources is based on the estimated average life of motor vehicles. The stationary source air and water capital lives are based on discussions with industry experts as described in Kappler and Rutledge (1982).<sup>5</sup> The capital lives assumed for all other programs except radon control correspond to assumptions commonly made by EPA in Regulatory Impact Analyses for each respective program area. In the case of radiation, a 25 year capital life is based on the assumptions that most radiation control capital is for the purpose of reducing radon exposure, that the average house life is 50 years, and that the average home age at the time of radon remediation is 25 years. The three amortization rates used for annualization were chosen to include the range of most interest to readers.

### 1.2.2. Costs by Environmental Medium

The cost estimates are categorized into three “environmental media”—air, water, and land— as well as useful chemicals and multi-media. The fifth category, labelled “multi-media”, consists of costs that do not fit well in any of the other four categories. Except in the case of chemicals, costs are allocated to the environmental medium that is most directly affected by the pollution controls associated with expenditures. There are cases, of course, where costs are incurred to reduce the threats posed by pollution that initially is released into one medium, but later impacts another. For the purposes of this report, however, costs to reduce pollutant emissions directly into a particular medium are allocated to that medium. Potentially hazardous chemicals such as pesticides differ from the pollutants associated with the other media because they have economic value and are not simply waste products. The costs of controlling risks from such chemicals are provided in the chemicals category.

As mentioned above, the allocation of pollution control costs among different environmental media categories is bound to cause some overlap and confusion due to the cross-media nature of many environmental problems and the control programs used to address them. This is particularly true for many of the program areas included under the “land” medium, which have as one of their most important objectives the prevention and reduction of groundwater contamination. Yet, because programs such as those relating to hazardous waste disposal are concerned with pollution that is initially released primarily onto land, their costs are allocated to the land medium. Despite problems of overlap, it was felt that the advantages of this categorization scheme favored its use.

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<sup>5</sup> Frederick G. Kappler and Gary L. Rutledge, “Stock of Plant and Equipment for Air and Water Pollution Abatement, 1980-81,” *Survey of Current Business*, pp. 18-25, November, 1982.

The four major environmental media categories also correspond roughly to the four major program offices within EPA, and encompass the major pollution control laws that EPA administers. The costs associated with the statutes listed below are discussed in the sections indicated.<sup>6</sup>

3. Air pollution and radiation control expenditures pursuant to:
  - 3.1. Clean Air Act; and
  - 3.2. Radon Gas and Indoor Air Quality Research Act of 1986, Radon Pollution Control Act of 1988, and earlier acts.
4. Water pollution control expenditures pursuant to:
  - 4.1. Clean Water Act; Marine Protection, Sanctuaries and Research Act; and
  - 4.3. Safe Drinking Water Act.
5. Land pollution control expenditures pursuant to:
  - 5.4. Resource Conservation and Recovery Act; and
  - 5.5. Comprehensive Environmental Response, Compensation, and Liability Act.
6. Chemical control expenditures pursuant to:
  - 6.1. Toxic Substances Control Act; and
  - 6.2. Federal Insecticide, Fungicide, and Rodenticide Act.
7. Non-media-specific expenditures, including those pursuant to:
  - 7.2. Energy Security Act; and
  - 7.4. Title III of the Superfund Amendments and Reauthorization Act.

Other non-media-specific EPA costs that are administered independently of the above programs are included in the following sections:

- 7.1. Management and support; and
- 7.3. Interdisciplinary.

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<sup>6</sup> The major exceptions to these allocations occur in the few cases where a section of a law is administered by an EPA office other than the one that administers most of the law. In that case, the cost is accounted for where possible under the office that administers the section involved rather than the office that has primary responsibility for the law as a whole.

### *1.2.3. Costs by Sector*

The cost estimates are also broken down by the economic sector that directly incurs them. Separate categories are included for:

- EPA costs;
- Non-EPA Federal costs;
- State government costs;
- Local government costs; and
- Private sector costs.

This classification is useful because it permits evaluation of the impacts on each of the major public sectors as well as the private sector. EPA and state government costs are primarily for program implementation, while non-EPA Federal, local government, and private costs are largely associated with compliance activities.

### *1.2.4. Costs by Pollutant*

In the case of air pollution control, an attempt was made to break down the cost estimates by pollutant, providing a sense of the relative control costs for various environmental contaminants. Unfortunately, data limitations prevented such a breakdown of costs for the other environmental media.

### *1.2.5. Costs by Mandate*

The report includes costs associated with all Federal pollution control programs as well as all state and local programs that are closely related to Federal initiatives. In addition, the report includes costs associated with certain local government activities and private sector initiatives directed towards improving environmental quality that do not follow from Federal mandates. The local programs include those solid waste collection and drinking water treatment activities that are not addressed by Federal laws and regulations. The private sector activities include solid waste collection, and radon removal in private homes. To distinguish the cost estimates for these programs from others presented in this report, two separate estimates of total costs are included in the environmental media categories—one for Federally-mandated costs and one for all costs.

### *1.2.6. New and Existing Regulatory Costs*

Finally, distinctions are made between the following pollution control costs:

- **Costs of existing regulations**—costs associated with regulations and programs that were substantially in place by 1987 and have achieved substantially full compliance with standards or attainment of goals;

- **Costs of new regulations**—costs estimated to result from new or recently implemented regulations and programs (*i.e.*, those not substantially in place by 1987), and regulations currently under development or proposed by EPA; and
- **Costs of full implementation**—costs that would arise from full attainment or full compliance with those existing laws, regulations, and programs for which the attainment deadline has passed but for which there was substantially less than full attainment by 1987. They include the costs of bringing all cities except Los Angeles and New York into attainment with the national ambient air quality standard for ozone, and expenditures needed to satisfy the nation's municipal wastewater treatment needs.

The costs for existing regulations are based on survey data on historical expenditures and extrapolations from these. New regulation costs are based on *ex ante* estimates of the costs associated with new and forthcoming regulations derived in EPA regulatory impact studies. The year 1987 is selected as the cut-off date because that is the last year for which survey data was available when this Report was prepared.

The estimates used to represent full implementation costs were derived from recent EPA analyses of wastewater treatment needs and measures required to reach substantially complete attainment of ozone air quality standards. Wastewater treatment costs were derived from a report to Congress on current and future municipal needs and the estimated expenditures required to meet them. The ozone attainment costs were derived from EPA analyses of the ozone attainment costs associated with the Administration's original proposed amendments to the Clean Air Act.

In November 1990, President Bush signed the Clean Air Act Amendments of 1990. These contained provisions which are expected to result in higher costs than those contained in the Administration's original proposed amendments. As a result, the costs for the Amendments are expected to be significantly higher by the year 2000 than the estimates presented in this Report. This is discussed further in Section 3.1.3.

#### *1.2.7. Costs by Year*

Finally, cost estimates are presented for each year over the period 1972-2000. The year 1972 was selected as the starting date because it represents the first year for which the Commerce Department collected reasonably complete cost data. The year 2000 was selected as the ending date because it is near enough so that reasonable cost projections could be made but far away enough to provide a useful perspective on future cost trends.

### 1.3. CONVENTIONS USED

Several conventions were followed to avoid double counting intergovernmental transfers, to project future costs, and to convert cost estimates into constant dollars. These are discussed briefly below.

### 1.3.1. Intergovernmental Transfers

Special care was taken to avoid double-counting intergovernmental grants. Such transfers were subtracted from non-Federal government expenditures for state and local programs that are funded in whole or part by Federal grants. In addition, for years in which the non-Federal portions of matching grant programs are not clearly identified in the national statistics, state and local shares were estimated using matching ratios over years for which data were available.<sup>7</sup>

### 1.3.2. Projection Techniques

#### 1.3.2.1. Existing Programs

Projecting future costs for existing programs is an attempt to predict what government and private sectors will spend to maintain compliance with existing pollution control requirements in the face of a changing economy and an expanding population.

To keep this task simple, historical pollution control expenditures were linearly regressed against time and the resulting parameter estimates used to predict costs for future years. Use of this method assumes that trends in population growth, economic growth, compliance levels, and other factors that may affect pollution control costs will continue as in the recent past, and will have similar influences on expenditures. All projections were calculated at the most disaggregated level of detail—municipal operating expenses for wastewater treatment plants, for example. Aggregations to national totals were simple arithmetic exercises once the component projections were made.

The estimated equations chosen for projecting costs for any regulation or program were those that best fit the individual time series data, considering recent trends in the data, the types of spending involved, and the maturity of the individual program.<sup>8</sup> In a number of cases there were one or more significant changes in trend during the years for which data were available. In such cases, equations fit on the most recent clearly discernible trend were used. This is illustrated in Figure 1-1 and Table 1-1, which show private capital costs for stationary air pollution control over the years 1972-87. Since the most recent discernible cost trend in the example is over the years 1983-87, an equation fit

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<sup>7</sup> Local government statistics on environmental expenditures include those attributable to a range of local government units, including towns, townships, cities, regional governments, and special districts.

<sup>8</sup> A two-phased model of environmental capital expenditures was assumed. In the early years following a regulatory program, capital is accumulated rapidly as large numbers of regulated units make initial investments. In the second phase there is less capital accumulation, most of which is associated with investments by previously recalcitrant units and expansion due to economic and population growth. Operating expenses are directly related to the number of units in compliance, and therefore grow in tandem with capital expenditures.

on those years was used in this report. Trends corresponding to two longer time periods are also shown for comparison.

One problem with using regression equations based on a small number of data points to extrapolate costs is the potential for under- or over-estimating future costs for relatively immature pollution control programs. Over-estimation is a potential problem for programs that were expanding rapidly during the period used in the model; under-estimation of future costs is a potential problem for programs that have been slow to develop since their initiation. In general, this does not appear to be a problem for the relatively old air and water programs, in which relatively few new rules have been implemented in recent years. The projection problem is probably of greatest concern for certain existing programs included under the land medium; specifically, the Resource Conservation and Recovery Act (RCRA) program which regulates all facets of current hazardous waste handling and disposal activities, and the Superfund hazardous waste remediation program.

RCRA hazardous waste costs increased significantly over the mid-1980s. Cost data for these years were used in a linear regression model to predict future costs associated with existing rules. The resulting estimates show significantly increasing future costs for existing hazardous waste programs. When these estimates are added to estimates of costs associated with new and forthcoming RCRA rules, the totals may over-estimate hazardous waste costs over the next several years. To check for potential upward bias in the estimates, a comparison was made between the rates of growth in projected costs for the existing hazardous waste program and the much older solid waste program. This comparison showed that the rate of growth in projected hazardous waste costs is less than for solid waste, and within reasonable bounds over the period 1988-2000. Despite this encouraging result, there may be some degree of upward bias in the RCRA hazardous waste cost projections.

In the case of the Superfund remediation program, future costs projections were based on cost estimates for years 1981-1989, which covers the full period of the program's existence. Superfund costs increased relatively slowly over the first five years, but have increased more dramatically since 1986. Since the costs projections are based on data for the entire period, there is no compelling reason to think the projections might significantly under- or over-estimate actual future expenditures.

#### 1.3.2.2. New Regulations

For new and not fully implemented regulations and programs, this report used cost estimates contained in EPA's Regulatory Impact Analyses (RIAs). Capital costs were gathered from the RIAs associated with new regulations identified in each EPA program area. Future capital costs are presented both as annual demands for capital and on an annualized basis.

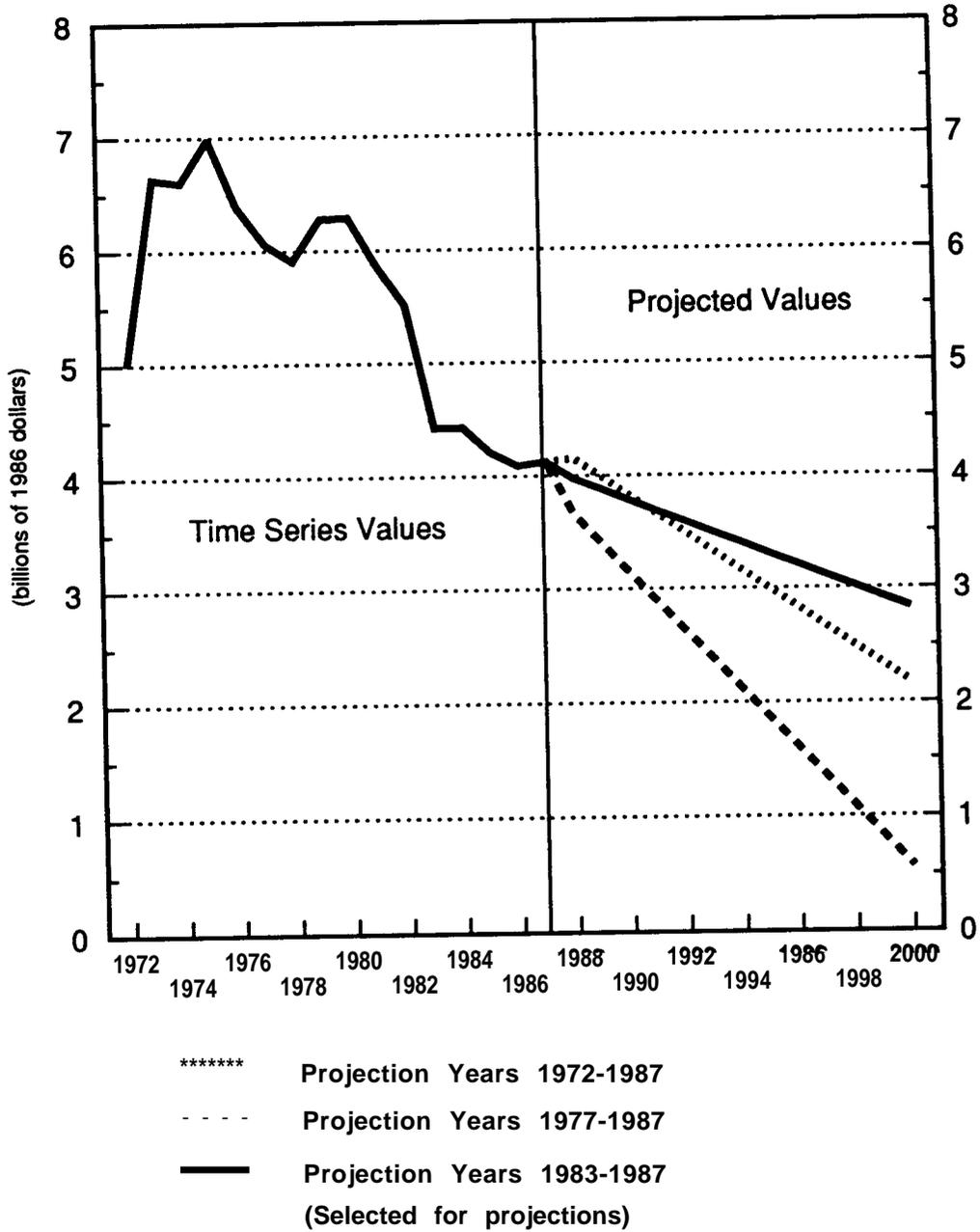
To show the timing of capital costs for new regulations, capital costs were typically spread out in equal lumps over a relatively few years. This method of showing demands for capital results in graphs with erratic changes in aggregate capital costs from year to year. In practice, control capital is typically phased in more gradually over time, imposing smoother demands for capital over a five to ten year compliance period.

Operation and maintenance (O&M) costs for new regulations were also derived from the RIAs. For the most part, O&M costs were assumed to begin one year after a capital investment is made and to continue through the expected useful life of the capital facility. Under these assumptions, annual O&M costs peak in the year after the last increment of capital is put in place, and continue at this level throughout the useful life of the capital. In certain cases, only annualized cost estimates were available for new or forthcoming regulations. In such cases, these estimates were reported under the O&M cost category.

### *1.3.3. Price Deflators Used*

All cost estimates are shown in 1986 dollars. The price deflators shown in Table 1-1 were used to convert current dollars in to 1986 dollars. These include indices developed by the Bureau of Economic Analysis of the U.S. Department of Commerce for air, water, and solid waste costs, and the GNP implicit price index. For other media and programs, the GNP price index was used for operating costs, and the Construction Cost index compiled by the *Engineering News Record* was used for capital costs.

**Fig. 1-1: PROJECTION TECHNIQUES ILLUSTRATED**



SOURCE: Table 3-1

Table 1-1: PROJECTION TECHNIQUES ILLUSTRATED  
Private Capital Costs for Stationary Air Pollution

<b>Standard Error</b>		35.957	37.513	24.371
<b>Degrees of Freedom</b>		14	9	3
<b>R Squared</b>		0.600	0.840	0.835
<b>Predictor Variables</b>		1972-1987	1977-1987	1983-1987
<b>H i s t o r i c a l  D a t a</b>	1972	4,994	4,994	4,994
	1973	6,628	6,628	6,628
	1974	6,601	6,601	6,601
	1975	6,983	6,983	6,983
	1976	6,387	6,387	6,387
	1977	6,061	6,061	6,061
	1978	5,908	5,908	5,908
	1979	6,276	6,276	6,276
	1980	6,288	6,288	6,288
	1981	5,860	5,860	5,860
	1982	5,508	5,508	5,508
	1983	4,425	4,425	4,425
	1984	4,433	4,433	4,433
	1985	4,207	4,207	4,207
	1986	4,090	4,090	4,090
	1987	4,122	4,122	4,122
<b>P r o j e c t i o n s</b>	1988	4,148	3,653	3,971
	1989	3,984	3,396	3,876
	1990	3,819	3,139	3,781
	1991	3,654	2,881	3,686
	1992	3,490	2,624	3,591
	1993	3,325	2,366	3,496
	1994	3,160	2,109	3,401
	1995	2,996	1,851	3,306
	1996	2,831	1,594	3,212
	1997	2,666	1,336	3,117
	1998	2,501	1,079	3,022
	1999	2,337	822	2,927
	2000	2,172	564	2,832

SOURCE: Table 3-1

Table 1-2: PRICE DEFLATORS INDEXED TO 1986

Year	Gen Indexes		Air Pollution			Water Pollution			Solid Waste		
	ENR	GNP	Cap	O&M	Govt	Cap	O&M	Govt	Cap	O&M	Govt
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1972	0.408	0.437	0.435	0.310	0.393	0.390	0.341	0.396	0.373	0.388	0.386
1973	0.441	0.461	0.448	0.338	0.418	0.413	0.362	0.426	0.390	0.420	0.418
1974	0.470	0.497	0.504	0.464	0.493	0.471	0.429	0.469	0.432	0.466	0.461
1975	0.515	0.537	0.560	0.508	0.555	0.516	0.490	0.496	0.489	0.495	0.494
1976	0.559	0.566	0.595	0.531	0.591	0.549	0.528	0.529	0.523	0.525	0.524
1977	0.599	0.594	0.629	0.576	0.631	0.589	0.572	0.569	0.568	0.552	0.553
1978	0.646	0.632	0.673	0.617	0.674	0.638	0.616	0.629	0.622	0.579	0.583
1979	0.699	0.685	0.735	0.735	0.740	0.704	0.676	0.702	0.684	0.635	0.639
1980	0.753	0.748	0.803	0.889	0.817	0.765	0.769	0.757	0.762	0.681	0.687
1981	0.823	0.818	0.876	0.986	0.890	0.839	0.854	0.816	0.848	0.778	0.782
1982	0.890	0.869	0.923	1.007	0.943	0.884	0.911	0.851	0.907	0.835	0.840
1983	0.947	0.904	0.939	1.018	0.956	0.922	0.938	0.900	0.947	0.876	0.882
1984	0.965	0.941	0.966	1.043	0.989	0.968	0.976	0.928	0.968	0.920	0.924
1985	0.977	0.974	0.984	1.064	0.998	0.994	0.995	0.983	0.970	0.957	0.959
1986	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1987	1.026	1.035	1.014	1.016	1.004	1.015	1.009	1.031	1.053	1.037	1.040
1988	1.052	1.071	1.122	1.224	1.143	1.123	1.145	1.107	1.143	1.084	1.090
1989	1.072	1.113	1.165	1.280	1.189	1.170	1.196	1.153	1.193	1.130	1.136
1990	1.090	1.153	1.209	1.335	1.235	1.216	1.246	1.199	1.243	1.175	1.182

Footnotes to Table 1-2 by column:

- (2) Construction Cost Index history, 1906-1990, *Engineering News Record*, March 26, 1990 (used for capital costs where BEA indexes were not available) indexed to 1986.
- (3) Fixed-weighted price indexes for gross national product, 1959-1987 *Economic Report of the President 1988*, Table B-4 (used for operating and maintenance costs where BEA indexes were not available) indexed to 1986. Indexes for 1989 and 1990 based on inflation factors of 1.036 and 1.039 respectively.
- (4-12) Figures in columns 4 through 12 are selected fixed-weighted price indexes constructed by the U.S. Department of Commerce, Bureau of Economic Analysis, indexed to 1986. The 1972-1982 indexes are taken from Farber, "Pollution Abatement and Control Expenditures," *Survey of Current Business*, July, 1986, Table 9. The 1983-1987 indexes are taken from Farber, *op. cit.*, 1989, Table 6. Indexes for 1988-1990 are linear projections based on 1972-1987 data.
- (4,7,&10) Cap: Business pollution control capital costs (line 49)
- (5,8,&11) O&M: Business pollution control operating and maintenance costs (line 50)
- (6,9,&12) Govt: Government pollution control capital costs and operating and maintenance costs (line 51)

## 2. DATA SOURCES

Table 2-1 presents an overview of the data sources and methodologies used to derive the cost estimates. It differentiates between actual cost data for years 1972-87 and estimated costs for years 1988-2000.

As discussed in sections 1.2.6 and 1.3.2, there is a basic difference between the estimates of future costs for established programs and costs for new and forthcoming regulations. To estimate costs for established regulations, estimates of recent historical costs for pollution control programs were extrapolated to future years, usually 1988-2000. This projection method assumes that future annual costs for existing programs will follow recent trends. For new and forthcoming regulations, cost estimates for years 1988-2000 are based primarily on data derived from EPA regulatory analyses.

Also provided are cost estimates that reflect full compliance with certain established programs for which the deadline for complete implementation has passed, but compliance is predicted to be less than full even with predicted future expenditures. This is in accordance with the Clean Air and Water Act provisions requiring estimates of full compliance costs. All the above is summarized in Table 2-1.

The cost estimates were derived from five principal data sources. These are listed below along with the sections in which they are discussed.

- 2.1. U.S. Department of Commerce survey data on historical private and government expenditures;
- 2.2. EPA budget justification data on historical EPA expenditures;
- 2.3. EPA regulatory impact analyses data for new and proposed regulations; and
- 2.4. Special EPA analyses data for programs not covered by other data sources.

Table 2-2 lists the data sources for the historical cost estimates in more detail corresponding to the organization of the remainder of this report.

### 2.1. U.S. DEPARTMENT OF COMMERCE SURVEY DATA

The basic source of pre-1988 data for private, non-EPA Federal, state, and local costs is the U.S. Department of Commerce. Data on private expenditures over the years 1959-1987 were obtained from a series of articles entitled "Pollution Abatement and Control Expenditures" (PACE reports) which are published periodically in the *Survey of Current Business* by the Bureau of Economic Analysis (BEA). These articles compile and organize data derived from a number of sources, including two key agency surveys—the "Pollution Abatement Costs and Expenditures Survey" (PACE Survey) and the "Pollution Abatement Plant and Equipment Survey," (PAPE Survey)—which are conducted annually by the Census Bureau for BEA.

The basic source of past non-EPA Federal expenditures for pollution control is surveys completed by each Federal agency detailing their pollution control expenditures. Completed surveys are submitted to BEA for inclusion in the PACE reports.

Data on state and local expenditures for the years 1972-87 are primarily from the results of an annual survey on governmental expenditures conducted by the Census Bureau and published in a series of annual reports entitled *Government Finances*. The data, which are reported for fiscal years, were converted into calendar years.<sup>1</sup> Federal grants in each program area were subtracted from total expenditures, and interest on debt, where reported, was netted from annual expenditure data to isolate O&M costs.

Data on state and local expenditures for air pollution control were obtained from the PACE reports published in the *Survey of Current Business*.

## 2.2. EPA BUDGET JUSTIFICATION DATA

The main source of data for EPA expenditures is the *Justification of Appropriation Estimates for Committee on Appropriations*. Outlays are shown for Fiscal Years 1972 through 1989. Budget projections of outlays are shown for Fiscal Years 1990 and 1991, as reported in an annual attachment entitled "Summary of Budget Authority, Obligations, Outlays, and Workyears by Media."

## 2.3. REGULATORY IMPACT ANALYSES DATA

The basic source of data for new and forthcoming regulations are Regulatory Impact Analyses (RIAs) and similar EPA analyses of major EPA regulations. RIAs have been prepared prior to the issuance of each major regulation since 1981, and include data on estimated compliance costs and benefits. Similar analyses for costs only were issued under different names before 1981. Table 2-3 lists those regulations for which RIA cost estimates have been used in this report; Appendix A contains summary information for each of these rules.

## 2.4. SPECIAL EPA ANALYSES DATA

Where the above data sources did not provide adequate or reliable data, special analyses conducted by EPA program offices or contractors were used. In general, this is the case for those programs not involving air, water, or solid waste, since these are the media covered by the Commerce Department data. Cost estimates for the Superfund program, for example, relied on a special analysis. In addition, a special EPA analysis was undertaken to estimate the costs of air mobile source control because of particular EPA expertise in this area, and because the Commerce Department data on mobile sources are not based on direct Commerce Department survey data.

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<sup>1</sup> To derive estimates for calendar year 1986, for example, one-half of the reported Fiscal Year 1986 estimate was added to one-half of the reported fiscal year 1987 estimate.

Table 2-1: PRINCIPAL DATA SOURCES BY TIME PERIOD

Program/ Sector	1972-1987	1988-2000	
		Current Implementation	Full Implementation
<i>Existing Regulations</i>			
EPA	EPA Budget (see section 2.2)	Projections based on historical costs (see section 1.3.2.1)	Not applicable
Non-EPA Federal	Commerce--BEA (see section 2.1)	Projections based on historical costs	Not applicable
State Government	Commerce-- <i>Government Finances</i> (see section 2.1)	Projections based on historical costs	Not applicable
Local Government	Commerce-- <i>Government Finances</i> (see section 2.1)	Projections based on historical costs	Special analysis (see section 2.4)
Private	Commerce--BEA (see section 2.1)	Projections based on historical costs	Special analysis (see section 2.4)
<i>New regulations and programs</i>			
All Sectors	Not applicable	Regulatory Impact Analysis estimates (see section 2.3)	Not applicable

Table 2-2: DATA SOURCES FOR HISTORICAL COSTS BY ENVIRONMENTAL MEDIUM

Report Section	Program	Sector Impacted				
		EPA	Non-EPA	State	Local	Private
<b>3.</b>	<b>Air &amp; Radiation</b>					
3.1	Air					
3.1.1	Stationary Sources	Budget outlays	BEA surveys	Not available	Not available	Commerce--BEA
3.1.2	Mobile Sources	Budget outlays	Not available	Not available	Not available	Special analysis
<b>4.</b>	<b>Water</b>					
4.1	Water Quality					
4.1.1	Point Source	Budget outlays	BEA surveys	Census <i>Government Finances</i> —Sanitation + 20% of natural resources net of Federal Grants	Census <i>Government Finances</i> —Sanitation + 20% of natural resources net of Federal Grants	Commerce—BEA
4.1.2	Non-Point Source	Special analysis	Special analysis	Special analysis	Special analysis	Special analysis
4.2	Drinking Water	Budget outlays	Not available	Special analysis using ASDWA survey	Special analysis using AWWA surveys; Commerce study; ODW EIAs	Special analysis
<b>5.</b>	<b>Land</b>					
5.1	Solid Waste	OSW Subtitle D estimate	BEA surveys	Census <i>Government Finances</i> —sanitation other than sewage	Census <i>Government Finances</i> —sanitation other than sewage	Commerce—BEA
5.2	Hazardous Waste	OSW budget minus Subtitle D	Special analysis	Not available	Not available	Commerce—BEA
5.3	LUST	Trust Fund outlays	Not available	Not available	Not available	Not available
5.5	Superfund	Budget outlays	Special analysis	Special analysis	Not available	Special analysis
<b>6.</b>	<b>Chemicals</b>					
6.1	Toxic Substances	Budget outlays	BEA surveys	Not available	Not available	Special analysis
6.2	Pesticides	Budget outlays	BEA surveys	Special analysis	Not available	Special analysis
<b>7.</b>	<b>Multi-Media</b>					
7.1	Management	Budget outlays	Not available	Not available	Not available	Not available
7.2	Energy	Budget outlays	Not available	Not available	Not available	Not available
7.3	Interdisciplinary	Budget outlays	Not available	Not available	Not available	Not available
7.4	SARA Title III	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
7.5	Undesignated	Not available	BEA surveys	Not applicable	Not applicable	Not applicable

(Footnotes to Table 2-2 on next page)

Explanation of Terms Used in Table 2-2

ASDWA survey: Association of State Drinking Water Agencies, “Survey of State Programs.”

AWWA surveys: American Water Works Association (AWWA), “Research Foundation Survey on Trihalomethanes” and “Member Survey: 1984 Water Utility Operating Data”.

Commerce study: U.S. Department of Commerce, *The 1977 Market for Water and Wastewater Treatment Equipment*.

ODW-EIA: U.S. EPA Office of Drinking Water, various “Economic Impact Analyses” for regulated drinking water pollutants.

Census—Government Finances: U.S. Department of Commerce, Bureau of the Census, *Government Finances*, various years.

Commerce—BEA: U.S. Department of Commerce, Bureau of Economic Analysis, various articles often entitled “Pollution Abatement and Control Expenditures,” published annually in the *Survey of Current Business*.

BEA surveys: Data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

OSW budget: Budget for the Office of Solid Waste, U.S. Environmental Protection Agency.

Table 2-3: INDIVIDUAL REGULATIONS INCLUDED IN THE COST ANALYSIS

Report Section/Media/Regulation	Reason for Inclusion
<b>3. Air and radiation</b>	
3.1 Air	
3.1.1 Stationary sources	
Particulate Matter National Ambient Air Quality Standard	New
Lead National Ambient Air Quality Standard (Revisions)	Proposed
Acid Rain Control	In development
Toxic Substances Control	In development
Expeditious Attainment of Ozone National Ambient Air Quality Standard	Non-attainment—existing
Stratospheric Ozone Protection Plan	New
3.1.2 Mobile Sources	
Fuel Volatility Rule	New
Diesel Fuel Standards	New
Nitrogen Oxides and Particulate Standards for Light-Duty Trucks & Heavy-Duty Engines	New
Expeditious Attainment of Ozone National Ambient Air Quality Standard	Non-attainment—existing
3.2 Radiation	
Radon Advisory	New

Table 2-3A: INDIVIDUAL REGULATIONS INCLUDED IN THE COST ANALYSIS

Report Section/Media/Regulation	Reason for Inclusion
<b>4. Water</b>	
4.1 Water Quality	
Treatment of Municipal Wastewater	Non-at-tainment—existing
Pretreatment Requirements	New
Sewage Sludge Disposal—Technical Requirements	Proposed
Stormwater Management	Proposed
Effluent Limitation Guideline: Organic Chemicals and Plastic Fibers Industry	New
Effluent Limitation Guideline: Offshore Oil and Gas Industry	Proposed
4.4 Drinking Water	
Volatile Organics	New
Fluorides	New
Total Coliforms	New
Surface Water Treatment	New
Phase II Inorganics and Synthetic Organics	Proposed
Lead, Copper, and Corrosion Control	Proposed
Mandatory Disinfection	In development
Radionuclides	In development
Phase IV Inorganics and Synthetic Organics	In development

Table 2-3B: INDIVIDUAL REGULATIONS INCLUDED IN THE COST ANALYSIS

Report Section/Media/Regulation	Reason for Inclusion
<b>5. Land</b>	
5.1 Solid Waste	
Municipal Landfill Subtitle D Criteria	Proposed
Municipal Waste Combusters Air Standards	In development
Municipal Waste Combusters Ash Disposal	In development
Management of Used Oil	Proposed
5.2 Hazardous Waste	
Land Disposal Restrictions—California List Wastes	New
Land Disposal Restrictions—Solvent and Dioxin-Containing Wastes	New
Land Disposal Restrictions—First Third Wastes	New
Land Disposal Restrictions—Second Third Wastes	New
Land Disposal Restrictions—Third Third Wastes	Proposed
Underground Injection: Solvents and Dioxin Waste Disposal Restrictions	New
Underground Injection: California List and First Third Waste Disposal Restrictions	New
Underground Injection: Second Thirds Waste Disposal Restrictions	New
Underground Injection: Third Thirds Waste Disposal Restrictions	Proposed
Toxicity Characteristics Rule	Proposed
Location Standards Rule	In development
Corrective Action for Solid Waste Management Units	Proposed
Minimum Technology Rule	New
Hazardous Waste Tanks Rule	New
Small Quantity Generators Rule	New

Table 2-3C: INDIVIDUAL REGULATIONS INCLUDED IN THE COST ANALYSIS

Report Section/Media/Regulation	Reason for Inclusion
5.3 Underground Storage Tanks (USTs) USTs Containing Petroleum—Financial Responsibility Requirements USTs Containing Petroleum—Technical Requirements 5.5 Superfund Site Clean-Ups	New New Less than full implementation
<b>6. Chemicals</b> 6.1 Toxic substances Asbestos in Schools Rule Asbestos in Products Ban/Phasedown	New New
<b>7. Multi-media</b> 7.4 SARA Title III Regulations Emergency and Hazardous Chemical Inventory Forms and Community Right-to-Know Reporting Requirements Extremely Hazardous Substances List and Threshold Planning Quantities; Emergency Planning and Release Notification Requirements Toxic Chemical Release Reporting; Community Right-to-Know Trade Secret Claims	New New New New

### 3. COSTS OF AIR AND RADIATION POLLUTION CONTROL

The costs of air and radiation control are broken down into several categories which are discussed in the sections listed below:

- 3.1. Air pollution control;
  - 3.1.1. Stationary sources;
  - 3.1.2. Mobile sources;
- 3.2. Radiation control; and
- 3.3. Total air pollution and radiation control costs.

Costs are shown in two separate ways—by funding source (government and private) and by pollutant controlled. Costs by funding source are shown in Tables 3-1 through 3-3. Costs by pollutant are shown in Tables 3-4 through 3-6.

Each group of tables provides data on three types of cost—capital, operation and maintenance, and total annualized. Capital costs are summarized in Tables 3-1 and 3-4. Operating costs are shown in Tables 3-2 and 3-5. Annualized costs are contained in Tables 3-3 and 3-6. Annualized costs are calculated using capital amortization rates of three, seven, and ten percent, and an assumed capital life of 20 years for stationary sources and ten years for mobile sources.

The discussion that follows focuses on the annualized cost estimates calculated using an amortization rate of seven percent for capital costs. Annualized costs calculated at a three percent rate are approximately nine to 15 percent lower, and those calculated at ten percent are approximately eight to 12 percent higher, than the estimates discussed below.

#### 3.1. AIR POLLUTION CONTROL

EPA regulatory programs governing air pollution control have been carried out in accordance with the Clean Air Act (CAA) of 1970 as amended in 1977. The program consists of an integrated approach to attainment of National Ambient Air Quality Standards (NAAQS) for several criteria pollutants, including: emission control requirements on stationary sources; emission control requirements on mobile sources; ambient air quality monitoring to assess status; and comprehensive state and regional air quality planning to assure progress towards attainment. The CAA also provides for control of specially designated hazardous air pollutants.

In November, 1990 President Bush signed into law the Clean Air Act Amendments of 1990, which are expected to substantially increase costs to control the precursors of acid precipitation, urban ozone, and air toxics. This Report was prepared using January 1990 EPA estimates of the original Administration proposal for revisions to the Clean Air Act. The impact of the new Amendments on total costs will be discussed further in Section 3.1.3 below.

Annualized costs for stationary sources, mobile sources, and both sources combined, are discussed separately below. Within each category is a discussion of “full implementation” costs, which represent the costs of substantially attaining the current NAAQS for ozone by the year 2000.

### *3.1.1. Stationary Sources*

Stationary source air pollution control costs, on an annualized basis, have increased steadily since the passage of the Clean Air Act in 1970. The biggest jump in costs occurred over the years immediately following passage of the Act, driven primarily by large expenditures for new capital equipment. Stationary source costs more than doubled between the years 1972 and 1979, reaching an estimated \$12.9 billion. In the years following, annualized costs increased at a less dramatic rate due to falling annual expenditures for new capital, reaching \$19 billion in 1987.

Stationary source costs are expected to rise significantly over the 1990s as the nation makes another push to attain existing ozone standards, and introduces new acid rain control measures and regulations on a large number of hazardous air pollutants. The Administration's proposed strategies for addressing ozone non-attainment, acid rain and air toxics, if enacted and implemented within the next few years, would push total annualized costs for stationary sources up to an estimated \$25 billion by 1995, and to \$29.7 billion by the year 2000.

The additional costs for attaining the ambient air standard for ozone in those urban areas currently not meeting the standard are presented in the “full implementation” cost category (discussed in Section 1.2.5) since they represent costs of meeting existing standards. The costs of regulating acid rain precursors and hazardous air pollutants, on the other hand, are included under the “new regulations” cost category since these are more in the nature of new programs.

Only partial information is available on historical stationary air pollution costs broken down by pollutant controlled, and is limited to private sector costs. This information is derived from capital cost estimates for the years 1973-86 reported in the Commerce Department's PACE reports published in the *Survey of Current Business*. All other air costs by pollutant were estimated using various assumptions and procedures which are detailed in Appendix B. Due to the many assumptions required to derive total air pollution control costs by pollutant controlled, these estimates should be viewed as highly uncertain.

The available data shows that particulates and sulfur oxides together accounted for over 80 percent of total annualized stationary source control costs in the first few years after passage of the Clean Air Act. While these two pollutants maintained a large share of total expenditures for all pollutants throughout the 1970s, the costs of controlling volatile organic compounds (VOCs) increasingly took on added significance. By 1980, expenditures for the control of particulates accounted for an estimated 55 percent of total annualized costs, sulfur oxides 17 percent, and VOCs 15 percent.

In the 1980s, expenditures for the control of VOCs became even more significant. By 1988, the share of total costs accounted for by particulates had decreased to 48 percent, the share for sulfur

oxides had decreased to 15 percent, while the share of total costs accounted for by VOCs had increased to 21 percent. The upward trend in VOC control costs is expected to continue into the future as the nation directs its air pollution control efforts towards attainment of the existing ambient air quality standard for ozone.

In the future, VOCs may account for the largest share of total control costs of any particular pollutant. Additionally, expenditures for the control of hazardous air pollutants and sulfur oxides would increase significantly during the 1990s if the Administration's strategies for addressing acid rain and air toxics are enacted and implemented within the next few years.

### *3.1.2. Mobile Sources*

The mobile source costs presented in this report represent the results of a special analysis prepared for EPA rather than the costs reported in the Commerce Department's PACE series. Pollution control costs for mobile sources are presented for the private sector only; they represent costs to purchasers and users of all mobile sources of air pollution. The general trends in total mobile source costs are discussed in this section, while cost estimates for individual vehicle types and the detailed assumptions and conventions used in their derivation are discussed in Appendix C.

Total annualized costs for mobile source emissions control increased steadily from \$1.3 billion in 1972 to \$7.5 billion in 1987. The original mobile source regulations sought to control two conventional air pollutants, hydrocarbons (HC) and carbon monoxide (CO), from both cars and trucks. Light-duty vehicle control costs consistently contribute between 65 and 75 percent of these costs. This is because passenger cars comprise the majority of motor vehicles in use and Federal regulation has focused to a greater degree on this vehicle class.

The increase in annualized costs over time is due primarily to steadily increasing capital costs. The steady, moderate rise in capital expenditures reflects a succession of more stringent standards requiring improved pollution control devices on an increasing number of vehicles and vehicle classes.

Trends in operation and maintenance (O&M) costs have been much more erratic. O&M costs increased steadily from 1972 through 1974, and then began to decline for two reasons. First, EPA estimates that maintenance costs actually became a maintenance cost savings with the introduction of catalytic devices in 1975. This is because catalytic devices require the use of unleaded fuels that extend the longevity of exhaust systems and spark plugs. Second, the cost associated with a reduction in fuel economy due to pollution controls began to decline significantly beginning in 1975 as pollution control equipment became less of a burden on fuel efficiency. EPA estimates that the advent of the three-way catalysts in 1982 actually improved fuel efficiency. EPA also estimates that operating costs resulting from premiums paid for unleaded fuels will be eliminated in 1990, as the price differential between unleaded and leaded fuels reaches zero.

The net effect of these changes is that EPA estimates of mobile source O&M costs begin to decline in 1975 and actually become a cost saving in 1989, and this savings is projected to increase significantly over the period 1990-2000. This greatly lowers total annualized costs for mobile sources

over the period 1975-2000. Other sources of mobile source cost estimates—such as the U.S. Department of Commerce PACE reports—do not recognize any beneficial effects of pollution control devices on O&M costs, and thus report significantly higher overall costs for mobile source pollution control.

In the 1990s, new and forthcoming regulations are expected to significantly increase total annualized costs for mobile source pollution control. These regulations are aimed at: (1) strengthening tailpipe emission control requirements for passenger cars and light-duty trucks; (2) reducing hazardous constituents in fuels; and (3) initiating new control requirements for heavy-duty diesel engines. These regulations are expected to add an additional \$1.2 billion in annualized control costs by 1995, increasing to \$3.3 billion by the year 2000. These new requirements will push total annualized mobile source costs to an estimated \$11 billion in 1995 and to over \$14 billion by the year 2000.

In addition, a host of other mobile source initiatives would be needed in order for the nation to reach the ambient air quality standard for ozone. The Administration's strategy for ozone attainment, if enacted and fully implemented within the next few years, would add an additional \$1.3 billion in annualized mobile source control costs by 1993, increasing to \$1.4 billion by year 2000.

### *3.1.3. Total Air Pollution*

On an annualized basis, total air pollution control costs increased steadily since the passage of the Clean Air Act in 1970. Total costs increased from almost \$8 billion in 1972 to nearly \$27 billion in 1987. Stationary source control costs accounted for approximately 67-74 percent of total costs during this period. In the future, costs associated with existing programs are expected to rise only slightly. However, the Clean Air Act Amendments of 1990 mentioned in Section 3.1 above would significantly increase total air pollution control costs in the coming years. The Administration's original proposal for attaining the ambient air quality standard for ozone would add \$4.3 billion in annual control costs by 1993, \$5.4 billion by 1997, and over \$6.5 billion by the year 2000. Additionally, the Administration's proposed strategies for regulating the precursors to acid precipitation and hazardous air pollutants would add an additional \$2 billion by 1995, increasing to almost \$6 billion by the year 2000. In sum, the January 1990 EPA estimates of the original Administration proposal would have pushed total annualized air pollution costs to over \$34.5 billion by 1993, to \$39.7 billion by 1997, and to \$44 billion by the year 2000. Stationary source costs would account for approximately 67 percent of total future air pollution control costs.

The estimated costs for the original Administration proposal were later adjusted upward due to revisions in air toxics cost estimates. The costs of both the Senate and House versions of the Amendments were estimated to be higher than the original Administration proposal, mainly due to requirements for tighter tailpipe standards, reformulated gasoline, and oxygenated fuels. Due to these modifications, the cost of the Clean Air Act Amendments may be significantly higher by the year 2000 than the estimates used in preparing this Report.

### 3.2. RADIATION CONTROL

The EPA Office of Radiation Programs administers a variety of programs involving several very unique regulatory and non-regulatory initiatives. For the most part, however, these are either prospective requirements or requirements shared with other Federal agencies. Thus, historical and current levels of compliance expenditures are relatively low, and probably much less than those that will be incurred in the long-term future.

Annualized costs to EPA and non-EPA Federal agencies for existing radiation programs increased from an estimated \$18 million in 1972 to a little over \$200 million in 1980, and to over \$300 million in 1987. Costs to Federal agencies for existing radiation programs are estimated to nearly double the 1987 level by the year 2000. Data on radiation control costs borne by private entities and state and local governments for existing radiation programs are not available.

Under the Uranium Mine Tailings And Reclamation Act, EPA has regulations in place directed to controlling contamination of groundwaters near uranium mines. These regulations are the source of compliance expenditures, but these costs were not collected for this report.

EPA has issued regulations governing the handling of high level radioactive wastes from power plants. However, these regulations currently impose no compliance costs because all nuclear power plant wastes are now being stored on-site as an interim measure until final disposal issues are resolved.

#### *3.2.1. Radon*

In the last few years EPA has undertaken a major new effort to reduce population exposure to radon gas. Radon is an odorless, invisible, radioactive gas found in many of the nation's buildings. It is thought to be the second leading cause of lung cancer in this country. The radon abatement effort was strengthened by the passage of two new laws, the Radon Gas and Indoor Air Quality Research Act of 1986 and the Radon Pollution Control Act of 1988. The EPA role is primarily one of studying the problem, educating the public, and providing information, technology, and other aid to states to assist them in developing radon control programs.

Although EPA has not required radon mitigation in private homes and buildings, the country has incurred modest costs for radon control. Estimates of these costs are based primarily on data gathered in surveys carried out for EPA in New York and the Washington, D.C. areas. There is considerable uncertainty in the estimates because the surveys were limited to only two regions, and the data gathered is far from comprehensive. (More detail on the surveys and the radon cost estimates are presented in Appendix D). The survey data, and projections for future years based on this data, suggest that private annualized expenditures for radon testing and mitigation were \$6 million in 1988, and will increase to an estimated \$71 million by 1993, and to \$180 million by the year 2000. Because these costs are not pursuant to Federal mandates, they are not included in the estimates of total Federally-mandated costs.

### 3.3. TOTAL AIR POLLUTION AND RADIATION CONTROL COSTS

On an annualized basis, total air and radiation pollution control costs have increased steadily since the passage of the Clean Air Act. Total costs increased from \$7.9 billion in 1972 to an estimated \$27 billion in 1987. Radiation programs accounted for less than two percent of these costs. In the future, costs are expected to rise by a much slower rate in the absence of new initiatives aimed at attaining the ambient air standard for ozone, controlling the precursors to acid rain, and regulating hazardous air pollutants. If the Administration's strategies for addressing ozone, acid rain, and air toxics are enacted and implemented within the next few years, however, they would add an estimated \$5.8 billion in control costs by 1995, and an estimated \$14.6 billion by the year 2000. Assuming this scenario comes to pass, total annualized air and radiation pollution control costs would reach \$44 billion by the year 2000.

Table 3-1: AIR AND RADIATION POLLUTION CONTROL CAPITAL COSTS BY FUNDING SOURCE

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	EPA															
	Non-EPA Federal			108	132	130	111	83	74	59	42	34	59	40	41	38
	State & Local Govt	160	196	211	184	264	312	304	385	487	507	539	442	421	329	312
	Private	4,994	6,628	6,601	6,983	6,387	6,061	5,908	6,276	6,288	5,860	5,508	4,425	4,433	4,207	4,090
	Total Stationary	5,155	6,824	6,920	7,299	6,781	6,484	6,295	6,735	6,834	6,409	6,081	4,925	4,894	4,577	4,440
	Federally Mandated	5,155	6,824	6,920	7,299	6,781	6,484	6,295	6,735	6,834	6,409	6,081	4,925	4,894	4,577	4,440
3.1.2	Mobile Sources															
	EPA															
	Non-EPA Federal															
	State & Local Govt															
	Private	268	564	472	2,775	3,256	3,548	3,685	4,010	3,716	4,189	4,049	4,812	6,125	6,664	6,885
	Total Mobile	268	564	472	2,775	3,256	3,548	3,685	4,010	3,716	4,189	4,049	4,812	6,125	6,664	6,885
	Federally Mandated	268	564	472	2,775	3,256	3,548	3,685	4,010	3,716	4,189	4,049	4,812	6,125	6,664	6,885
3.1.3	Undesignated Source															
	EPA															
	Non-EPA Federal															
	State & Local Govt															
	Total Undesignated															
	Federally Mandated															
3.1.4	Total Air Pollution	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
	Federally Mandated	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
3.2	Radiation															
	EPA															
	Non-EPA Federal			24	20	16	8	25	22	64	89	30	37	33	55	47
	State Government															
	Local Government															
	Private															
	Total Radiation			24	20	16	8	25	22	64	89	30	37	33	55	48
	Federally Mandated			24	20	16	8	25	22	64	89	30	37	33	55	47
3.3	Total Air & Rad	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,373
	Federally Mandated	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,372

## Footnotes to Table 3-1

EPA Stationary Sources: Assumed to be zero; EPA air expenses are assumed to be operating costs.

Non-EPA Federal Stationary Sources: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

State and Local Government: From Appendix B, Table B-10.

Private Stationary Sources: From Appendix B, Table B-5.

Stationary Federally Mandated: Assumed to be 100 percent of the total costs of stationary air pollution regulations.

Private Mobile Sources: From Appendix C, Table C-1.

Mobile Federally Mandated: Assumed to be 100 percent of the total costs of mobile air pollution regulations.

Undesignated Federally Mandated: Assumed to be 100 percent of the total costs of undesignated air pollution regulations.

Non-EPA Federal Radiation: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Radiation Federally Mandated: Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Total Air & Radiation Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations. Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Table 3-1A: AIR POLLUTION CONTROL CAPITAL COSTS BY FUNDING SOURCE

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	EPA															
	Non-EPA Federal	38	41	40	40	39	38	38	37	37	36	36	35	35	34	34
	State & Local Govt	312	276	253	227	200	174	148	121	95	69	42	16	(10)	(37)	(63)
	Private	4,090	4,122	3,971	3,876	3,781	3,686	3,591	3,496	3,401	3,306	3,212	3,117	3,022	2,927	2,832
	Total Existing Regs	4,440	4,438	4,264	4,142	4,020	3,898	3,777	3,655	3,533	3,411	3,290	3,168	3,046	2,924	2,803
	Federally Mandated	4,440	4,438	4,264	4,142	4,020	3,898	3,777	3,655	3,533	3,411	3,290	3,168	3,046	2,924	2,803
	New Regulations															
	Local Government															
	Private		477	477	477	106	106	106								
	Total New Regs		477	477	477	106	106	106								
	Full Implementation															
	Total Stationary	4,440	4,915	4,741	4,619	4,126	4,004	3,883	3,655	3,533	3,411	3,290	3,168	3,046	2,924	2,803
	Federally Mandated	4,440	4,915	4,741	4,619	4,126	4,004	3,883	3,655	3,533	3,411	3,290	3,168	3,046	2,924	2,803
3.1.2	Mobile Sources															
	Existing Regulations															
	EPA															
	Non-EPA Federal															
	State & Local Govt															
	Private	6,885	6,653	6,788	6,476	6,566	6,729	6,871	7,066	7,217	7,367	7,468	7,623	7,732	7,844	7,956
	Total Existing Regs	6,885	6,653	6,788	6,476	6,566	6,729	6,871	7,066	7,217	7,367	7,468	7,623	7,732	7,844	7,956
	Federally Mandated	6,885	6,653	6,788	6,476	6,566	6,729	6,871	7,066	7,217	7,367	7,468	7,623	7,732	7,844	7,956
	New Regulations															
	Local Government															
	Private			96	97	97	147	151	156	186	191	197	203	210	216	223
	Total New Regs			96	97	97	147	151	156	186	191	197	203	210	216	223
	Full Implementation															
	Total Mobile	6,885	6,653	6,883	6,573	6,663	6,876	7,022	7,222	7,403	7,559	7,665	7,827	7,941	8,061	8,179
	Federally Mandated	6,885	6,653	6,883	6,573	6,663	6,876	7,022	7,222	7,403	7,559	7,665	7,827	7,941	8,061	8,179
3.1.3	Undesignated Source															
	EPA															
	Non-EPA Federal															
	State & Local Govt															
	Total Undesignated															
	Federally Mandated															
3.1.4	Total Air Pollution	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981
	Federally Mandated	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981

## Footnotes to Table 3-1A

Existing EPA Stationary Sources: Assumed to be zero; EPA air expenses are assumed to be operating costs.

Existing Non-EPA Federal Stationary Sources: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1983-1986.

Existing State and Local Government: Figures for 1987-1988 from Appendix B, Table B-10. Linear projection of expenditures for 1988-2000 based on historical data for the years 1985-1987.

Existing Private Stationary Sources: 1986-1987 data from Appendix B, Table B-5. Linear projection of expenditures for 1988-2000 based on historical data for the years 1983-1987.

Existing Stationary Federally Mandated: Assumed to be 100 percent of the total costs of existing stationary air pollution regulations.

New Private Stationary Sources: Estimated on the basis of the regulations and sources listed in Appendix A.

Full Implementation: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Stationary Federally Mandated: Assumed to be 100 percent of the total costs of stationary air pollution regulations.

Existing Private Mobile Sources: From Appendix C, Table C-1A.

Existing Mobile Federally Mandated: Assumed to be 100 percent of the total costs of existing mobile air pollution regulations.

New Private Mobile Sources: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Mobile Federally Mandated: Assumed to be 100 percent of the total costs of mobile air pollution regulations.

Undesignated Federally Mandated: Assumed to be 100 percent of the total costs of undesignated air pollution regulations.

Total Air Pollution Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations.

Table 3-1B: RADIATION POLLUTION CONTROL CAPITAL COSTS BY FUNDING SOURCE

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	EPA															
	Non-EPA Federal	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
	State Government															
	Local Government															
	Private															
	Total Existing	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
	Federally Mandated	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
	New Regulations															
	Local Government															
	Private	1	4	34	79	79	94	89	93	98	103	107	112	117	122	127
	Total New Regs	1	4	34	79	79	94	89	93	98	103	107	112	117	122	127
	Full Implementation															
	Total Radiation	48	60	90	145	151	171	171	180	190	201	210	220	230	240	251
	Federally Mandated	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
3.3	Total Air & Rad	11,373	11,628	11,714	11,337	10,940	11,051	11,076	11,057	11,126	11,171	11,165	11,215	11,218	11,225	11,232
	Federally Mandated	11,372	11,624	11,680	11,258	10,861	10,957	10,987	10,964	11,028	11,068	11,058	11,103	11,101	11,103	11,105

Footnotes to Table 3-1B

Total Existing Federally Mandated: Assumed to be 100 percent of total federal radiation costs.

New Private Radiation: Estimated expenditures for radon control from Appendix D, Table D-1.

Total Radiation Federally Mandated: Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Total Air & Radiation Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations. Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Table 3-2: AIR AND RADIATION POLLUTION CONTROL OPERATING COSTS BY FUNDING SOURCE

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	EPA											[126]	[116]	[127]	[133]	[134]
	Non-EPA Federal			168	166	220	244	261	165	185	157	147	174	200	270	186
	State & Local Govt	343	359	394	348	338	363	390	423	441	406	396	410	420	455	507
	Private	5,400	5,491	5,021	5,243	5,935	6,626	7,194	7,377	7,072	6,938	6,540	7,331	7,715	7,914	8,571
	Total Stationary	5,744	5,850	5,583	5,756	6,494	7,234	7,845	7,965	7,698	7,501	7,083	7,915	8,335	8,639	9,264
	Federally Mandated	5,744	5,850	5,583	5,756	6,494	7,234	7,845	7,965	7,698	7,501	7,083	7,915	8,335	8,639	9,264
3.1.2	Mobile Sources															
	EPA											[15]	[16]	[17]	[18]	[20]
	Non-EPA Federal															
	State & Local Govt															
	Private	1,307	2,118	2,082	1,828	1,597	1,494	1,293	1,027	836	443	192	269	114	(3)	236
	Total Mobile	1,307	2,118	2,082	1,828	1,597	1,494	1,293	1,027	836	443	192	269	114	(3)	236
	Federally Mandated	1,307	2,118	2,082	1,828	1,597	1,494	1,293	1,027	836	443	192	269	114	(3)	236
3.1.3	Undesignated Source															
	EPA	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Non-EPA Federal															
	State & Local Govt															
	Total Undesignated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Federally Mandated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
	Federally Mandated	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
3.2	Radiation															
	EPA	18	17	14	18	12	10	9	12	15	15	13	15	12	16	13
	Non-EPA Federal			239	210	141	158	220	210	189	163	182	164	171	181	301
	State Government															
	Local Government															
	Private															
	Total Radiation	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
	Federally Mandated	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
3.3	Total Air & Rad	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045
	Federally Mandated	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045

Footnotes to Table 3-2

EPA Stationary Sources: Data from the 1990 President's Budget Justification Document. All EPA costs are included in the undesignated category (i.e., undesignated between stationary and mobile sources) because a distinction between stationary and mobile sources has not been possible to make for all years. The brackets indicate years where that distinction was possible. The numbers in brackets are included for illustrative purposes only and are not included as part of total costs. If done uniformly for all air categories, the corresponding numbers for the undesignated category would be those shown minus the bracketed numbers in stationary and mobile.

Non-EPA Federal Stationary Sources: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

State and Local Government: From Appendix B, Table B-10.

Private Stationary Sources: From Appendix B, Table B-7.

Existing Stationary Federally Mandated: Assumed to be 100 percent of the total costs of existing stationary air pollution regulations.

Total Stationary Federally Mandated: Assumed to be 100 percent of the total costs of stationary air pollution regulations.

EPA Mobile Sources: Data from the 1990 President's Budget Justification Document. All EPA costs are included in the undesignated category (i.e., undesignated between stationary and mobile sources) because a distinction between stationary and mobile sources has not been possible to make for all years. The brackets indicate years where that distinction was possible. The numbers in brackets are included for illustrative purposes only and are not included as part of total costs. If done uniformly for all air categories, the corresponding numbers for the undesignated category would be those shown minus the bracketed numbers in stationary and mobile.

Private Mobile Sources: From Appendix C, Table C-1.

Existing Mobile Federally Mandated: Assumed to be 100 percent of the total costs of existing mobile air pollution regulations.

Total Mobile Federally Mandated: Assumed to be 100 percent of the total costs of mobile air pollution regulations.

Undesignated Source: Represents air expenses not designated by source as either stationary or mobile; air pollution control costs for undesignated sources are assumed to be all operating costs.

Undesignated Federally Mandated: Assumed to be 100 percent of the total costs of undesignated air pollution regulations.

Total Air Pollution Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations.

EPA Radiation: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays).

Non-EPA Radiation: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Radiation Federally Mandated: Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Total Air & Radiation Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations. Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Table 3-2A: AIR POLLUTION CONTROL OPERATING COSTS BY FUNDING SOURCE

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	EPA	[134]	[132]	[130]	[135]	[137]	[139]	[141]	[143]	[144]	[146]	[148]	[150]	[152]	[153]	[155]
	Non-EPA Federal	186	243	258	274	289	305	320	336	351	366	382	397	413	428	444
	State & Local Govt	507	507	487	496	505	515	524	534	543	553	562	572	581	591	600
	Private	8,571	9,189	8,887	8,887	9,373	9,616	9,859	10,102	10,345	10,588	10,831	11,074	11,317	11,560	11,803
	Total Existing Regs	9,264	9,939	9,632	9,657	10,168	10,436	10,704	10,972	11,239	11,507	11,775	12,043	12,311	12,579	12,846
	Federally Mandated	9,264	9,939	9,632	9,657	10,168	10,436	10,704	10,972	11,239	11,507	11,775	12,043	12,311	12,579	12,846
	New Regulations															
	Local Government															
	Private			17	35	52	62	77	210	391	1,031	1,548	1,738	2,053	2,731	3,888
	Total New Regs			17	35	52	62	77	210	391	1,031	1,548	1,738	2,053	2,731	3,888
	Full Implementation								3,042	3,053	3,084	3,490	3,897	4,301	4,708	5,114
	Total Stationary	9,264	9,939	9,649	9,692	10,220	10,498	10,781	14,224	14,683	15,622	16,813	17,678	18,665	20,018	21,848
	Federally Mandated	9,264	9,939	9,649	9,692	10,220	10,498	10,781	14,224	14,683	15,622	16,813	17,678	18,665	20,018	21,848
3.1.2	Mobile Sources															
	Existing Regulations															
	EPA	[20]	[20]	[21]	[22]	[23]	[24]	[25]	[26]	[27]	[28]	[29]	[30]	[31]	[33]	[34]
	Non-EPA Federal															
	State & Local Govt															
	Private	236	238	213	(136)	(1,766)	(1,694)	(1,623)	(1,549)	(1,459)	(1,372)	(1,320)	(1,246)	(1,191)	(1,153)	(1,135)
	Total Existing Regs	236	238	213	(136)	(1,766)	(1,694)	(1,623)	(1,549)	(1,459)	(1,372)	(1,320)	(1,246)	(1,191)	(1,153)	(1,135)
	Federally Mandated	236	238	213	(136)	(1,766)	(1,694)	(1,623)	(1,549)	(1,459)	(1,372)	(1,320)	(1,246)	(1,191)	(1,153)	(1,135)
	New Regulations															
	Local Government															
	Private				134	134	375	484	438	389	1,035	1,718	2,401	3,083	3,065	3,049
	Total New Regs				134	134	375	484	438	389	1,035	1,718	2,401	3,083	3,065	3,049
	Full Implementation								1,326	1,345	1,505	1,522	1,537	1,553	1,568	1,440
	Total Mobile	236	238	213	(2)	(1,632)	(1,319)	(1,139)	215	275	1,168	1,920	2,692	3,445	3,480	3,354
	Federally Mandated	236	238	213	(2)	(1,632)	(1,319)	(1,139)	215	275	1,168	1,920	2,692	3,445	3,480	3,354
3.1.3	Undesignated Source															
	EPA	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
	Non-EPA Federal															
	State & Local Govt															
	Total Undesignated	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
	Federally Mandated	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	9,731	10,427	10,083	9,916	8,823	9,480	9,863	14,655	15,170	16,997	18,935	20,568	22,303	23,686	25,386
	Federally Mandated	9,731	10,427	10,083	9,916	8,823	9,480	9,863	14,655	15,170	16,997	18,935	20,568	22,303	23,686	25,386

## Footnotes to Table 3-2A

Existing EPA Stationary Sources: Data from the 1990 President's Budget Justification Document. All EPA costs are included in the undesignated category (i.e., undesignated between stationary and mobile sources) because a distinction between stationary and mobile sources has not been possible to make for all years. The brackets indicate years where that distinction was possible. The numbers in brackets are included for illustrative purposes only and are not included as part of total costs. If done uniformly for all air categories, the corresponding numbers for the undesignated category would be those shown minus the bracketed numbers in stationary and mobile.

Existing Non-EPA Federal Stationary Sources: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing State and Local Government: Figures for 1987-1988 from Appendix B, Table B-10. Linear projection of expenditures for 1988-2000 based on historical data for the years 1982-1987.

Existing Private Stationary Sources: 1986-1987 data from Appendix B, Table B-7. Linear projection of expenditures for 1988-2000 based on historical data for the years 1973-1987.

Existing Stationary Federally Mandated: Assumed to be 100 percent of the total costs of existing stationary air pollution regulations.

New Private Stationary Sources: Estimated on the basis of the regulations and sources listed in Appendix A.

Full Implementation: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Stationary Federally Mandated: Assumed to be 100 percent of the total costs of stationary air pollution regulations.

Existing EPA Mobile Sources: Data from the 1990 President's Budget Justification Document. All EPA costs are included in the undesignated category (i.e., undesignated between stationary and mobile sources) because a distinction between stationary and mobile sources has not been possible to make for all years. The brackets indicate years where that distinction was possible. The numbers in brackets are included for illustrative purposes only and are not included as part of total costs. If done uniformly for all air categories, the corresponding numbers for the undesignated category would be those shown minus the bracketed numbers in stationary and mobile.

Existing Private Mobile Sources: From Appendix C, Table C-1A.

Existing Mobile Federally Mandated: Assumed to be 100 percent of the total costs of existing mobile air pollution regulations.

New Private Mobile Sources: Estimated on the basis of the regulations and sources listed in Appendix A.

Full Implementation: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Mobile Federally Mandated: Assumed to be 100 percent of the total costs of mobile air pollution regulations.

Undesignated Federally Mandated: Assumed to be 100 percent of the total costs of undesignated air pollution regulations.

Total Air Pollution Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations.

Table 3-2B: RADIATION POLLUTION CONTROL OPERATING COSTS BY FUNDING SOURCE

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	EPA	13	18	14	19	25	27	29	32	35	38	41	43	46	49	52
	Non-EPA Federal	301	263	283	303	323	342	362	382	402	422	442	461	481	501	521
	State Government															
	Local Government															
	Private															
	Total Existing	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
	Federally Mandated	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
	New Regulations															
	Local Government															
	Private	0	0	3	8	14	20	25	31	36	42	48	53	59	65	71
	Total New Regs	0	0	3	8	14	20	25	31	36	42	48	53	59	65	71
	Full Implementation															
	Total Radiation	314	281	300	330	362	389	417	445	473	502	530	558	587	615	644
	Federally Mandated	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
3.3	Total Air & Rad	10,045	10,708	10,383	10,246	9,185	9,869	10,280	15,100	15,643	17,499	19,465	21,126	22,889	24,301	26,030
	Federally Mandated	10,045	10,708	10,380	10,237	9,171	9,850	10,255	15,069	15,607	17,457	19,417	21,072	22,830	24,236	25,959

## Footnotes to Table 3-2B

Existing EPA Radiation: 1986-1990 data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on historical data for the years 1986-1990.

Existing Non-EPA Federal Radiation: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing Radiation Federally Mandated: Assumed to be 100 percent of total federal radiation costs.

New Private Radiation: Estimated expenditures for radon control from Appendix D, Table D-1.

Total Radiation Federally Mandated: Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Total Air & Radiation Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations. Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Table 3-3: AIR AND RADIATION POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	EPA			178	189	255	289	314	225	251	227	220	253	282	356	276
	Non-EPA Federal			447	419	434	489	544	613	677	690	731	787	836	902	984
	State & Local Govt	359	393	6,741	7,622	8,918	10,181	11,306	12,081	12,370	12,789	12,911	14,120	14,922	15,518	16,561
	Private	6,230	6,981	7,366	8,229	9,607	10,959	12,164	12,920	13,298	13,706	13,862	15,159	16,041	16,777	17,821
	Total Stationary	6,230	6,981	7,366	8,229	9,607	10,959	12,164	12,920	13,298	13,706	13,862	15,159	16,041	16,777	17,821
	Federally Mandated	6,230	6,981	7,366	8,229	9,607	10,959	12,164	12,920	13,298	13,706	13,862	15,159	16,041	16,777	17,821
3.1.2	Mobile Sources															
	EPA															
	Non-EPA Federal															
	State & Local Govt	1,345	2,236	2,268	2,409	2,642	3,043	3,367	3,672	4,010	4,213	4,501	5,182	5,832	6,269	7,025
	Private	1,345	2,236	2,268	2,409	2,642	3,043	3,367	3,672	4,010	4,213	4,501	5,182	5,832	6,269	7,025
	Total Mobile	1,345	2,236	2,268	2,409	2,642	3,043	3,367	3,672	4,010	4,213	4,501	5,182	5,832	6,269	7,025
	Federally Mandated	1,345	2,236	2,268	2,409	2,642	3,043	3,367	3,672	4,010	4,213	4,501	5,182	5,832	6,269	7,025
3.1.3	Undesignated Source															
	EPA	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Non-EPA Federal															
	State & Local Govt	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Total Undesignated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Federally Mandated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
	Federally Mandated	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
3.2	Radiation															
	EPA	18	17	14	18	12	10	9	12	15	15	13	15	12	16	13
	Non-EPA Federal			241	214	146	164	228	220	204	186	208	193	203	217	341
	State Government															
	Local Government															
	Private															
	Total Radiation	18	17	255	232	158	173	237	232	219	201	220	207	215	233	355
	Federally Mandated	18	17	255	232	158	173	237	232	219	201	220	207	215	233	354
3.3	Total Air & Rad	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431
	Federally Mandated	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431

## Footnotes to Table 3-3

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2, plus amortized capital costs assuming an interest rate of seven percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Table 3-1 since 1972.

Table 3-3A: AIR POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	EPA															
	Non-EPA Federal	276	337	356	375	394	413	432	451	460	466	473	481	492	504	517
	State & Local Govt	984	1,010	1,013	1,044	1,073	1,099	1,107	1,109	1,108	1,106	1,095	1,076	1,056	1,026	983
	Private	16,561	17,568	17,642	18,007	18,850	19,441	19,552	19,499	19,440	19,336	19,279	19,244	19,215	19,141	19,058
	Total Existing Regs	17,821	18,915	19,011	19,427	20,317	20,953	21,091	21,059	21,007	20,908	20,847	20,801	20,762	20,671	20,558
	Federally Mandated	17,821	18,915	19,011	19,427	20,317	20,953	21,091	21,059	21,007	20,908	20,847	20,801	20,762	20,671	20,558
	New Regulations															
	Private		45	107	170	197	217	242	375	556	1,196	1,713	1,903	2,218	2,896	4,053
	Total New Regs		45	107	170	197	217	242	375	556	1,196	1,713	1,903	2,218	2,896	4,053
	Full Implementation								3,042	3,053	3,084	3,490	3,897	4,301	4,708	5,114
	Total Stationary	17,821	18,960	19,118	19,597	20,514	21,170	21,333	24,476	24,616	25,188	26,050	26,601	27,282	28,275	29,725
	Federally Mandated	17,821	18,960	19,118	19,597	20,514	21,170	21,333	24,476	24,616	25,188	26,050	26,601	27,282	28,275	29,725
3.1.2	Mobile Sources															
	Existing Regulations															
	EPA															
	Private	7,025	7,469	7,885	7,888	6,664	7,098	7,570	7,965	8,210	8,397	8,532	8,745	8,934	9,167	9,383
	Total Existing Regs	7,025	7,469	7,885	7,888	6,664	7,098	7,570	7,965	8,210	8,397	8,532	8,745	8,934	9,167	9,383
	Federally Mandated	7,025	7,469	7,885	7,888	6,664	7,098	7,570	7,965	8,210	8,397	8,532	8,745	8,934	9,167	9,383
	New Regulations															
	Private			14	161	175	437	568	544	521	1,195	1,906	2,618	3,316	3,315	3,317
	Total New Regs			14	161	175	437	568	544	521	1,195	1,906	2,618	3,316	3,315	3,317
	Full Implementation								1,326	1,345	1,505	1,522	1,537	1,553	1,568	1,440
	Total Mobile	7,025	7,469	7,899	8,049	6,839	7,535	8,138	9,835	10,076	11,097	11,960	12,899	13,803	14,050	14,140
	Federally Mandated	7,025	7,469	7,899	8,049	6,839	7,535	8,138	9,835	10,076	11,097	11,960	12,899	13,803	14,050	14,140
3.1.3	Undesignated Source															
	EPA	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
	Total Undesignated	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
	Federally Mandated	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	25,077	26,679	27,238	27,872	27,588	29,005	29,692	34,528	34,905	36,493	38,212	39,699	41,278	42,513	44,049
	Federally Mandated	25,077	26,679	27,238	27,872	27,588	29,005	29,692	34,528	34,905	36,493	38,212	39,699	41,278	42,513	44,049

Footnotes to Table 3-3A

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2A, plus amortized capital costs assuming an interest rate of seven percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Tables 3-1 and 3-1A since 1972.

Table 3-3B: RADIATION POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	EPA	13	18	14	19	25	27	29	32	35	38	41	43	46	49	52
	Non-EPA Federal	341	308	333	358	384	411	438	465	493	521	550	579	608	636	665
	State Government															
	Local Government															
	Private															
	Total Existing Radiation	354	326	347	377	410	438	467	497	528	559	590	622	654	685	717
	Federally Mandated	354	326	347	377	410	438	467	497	528	559	590	622	654	685	717
	New Regulations															
	Local Government															
	Private	0	1	6	19	31	45	58	71	85	100	115	130	146	162	179
	Total New Regs	0	1	6	19	31	45	58	71	85	100	115	130	146	162	179
	Full Implementation															
	Total Radiation	355	327	353	396	441	483	525	568	613	659	705	752	800	847	896
	Federally Mandated	354	326	347	377	410	438	467	497	528	559	590	622	654	685	717
3.3	Total Air & Rad	25,431	27,006	27,591	28,267	28,029	29,488	30,217	35,096	35,518	37,151	38,917	40,451	42,078	43,361	44,944
	Federally Mandated	25,431	27,005	27,585	28,249	27,998	29,443	30,159	35,025	35,433	37,051	38,802	40,321	41,932	43,198	44,765

## Footnotes to Table 3-3B

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2B, plus amortized capital costs assuming an interest rate of seven percent and a capital life of 25 years on the accumulated capital investment shown in Tables 3-1 and 3-1B since 1972.

Table 3-3C: AIR AND RADIATION POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	EPA															
	Non-EPA Federal			175	182	245	276	299	208	232	207	199	230	259	331	250
	State & Local Govt	354	383	432	398	407	452	500	559	609	608	634	678	716	774	847
	Private	5,736	6,272	6,246	6,937	8,059	9,157	10,122	10,727	10,845	11,104	11,077	12,165	12,847	13,329	14,261
	Total Stationary	6,090	6,655	6,853	7,517	8,711	9,886	10,921	11,493	11,686	11,919	11,910	13,074	13,822	14,434	15,357
	Federally Mandated	6,090	6,655	6,853	7,517	8,711	9,886	10,921	11,493	11,686	11,919	11,910	13,074	13,822	14,434	15,357
3.1.2	Mobile Sources															
	EPA															
	Private	1,338	2,215	2,235	2,306	2,457	2,769	3,000	3,205	3,450	3,547	3,740	4,315	4,822	5,161	5,825
	Total Mobile	1,338	2,215	2,235	2,306	2,457	2,769	3,000	3,205	3,450	3,547	3,740	4,315	4,822	5,161	5,825
	Federally Mandated	1,338	2,215	2,235	2,306	2,457	2,769	3,000	3,205	3,450	3,547	3,740	4,315	4,822	5,161	5,825
3.1.3	Undesignated Source															
	EPA	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Total Undesignated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Federally Mandated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
	Federally Mandated	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
3.2	Radiation															
	EPA	18	17	14	18	12	10	9	12	15	15	13	15	12	16	13
	Non-EPA Federal			240	213	144	162	225	217	199	178	199	183	192	205	328
	State Government															
	Local Government															
	Private															
	Total Radiation	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
	Federally Mandated	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
3.3	Total Air & Rad	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755
	Federally Mandated	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755

Footnotes to Table 3-3C

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2, plus amortized capital costs assuming an interest rate of three percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Table 3-1 since 1972.

Table 3-3D: AIR POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	EPA															
	Non-EPA Federal	250	310	328	346	364	382	400	418	428	437	447	457	469	482	496
	State & Local Govt	847	865	862	886	909	930	939	943	945	947	941	931	919	900	873
	Private	14,261	15,156	15,121	15,382	16,122	16,612	16,761	16,794	16,821	16,817	16,847	16,892	16,941	16,959	16,969
	Total Existing Regs	15,357	16,331	16,311	16,614	17,395	17,925	18,100	18,155	18,195	18,202	18,235	18,280	18,329	18,341	18,338
	Federally Mandated	15,357	16,331	16,311	16,614	17,395	17,925	18,100	18,155	18,195	18,202	18,235	18,280	18,329	18,341	18,338
	New Regulations															
	Private		32	81	131	155	172	195	328	509	1,149	1,666	1,856	2,171	2,849	4,006
	Total New Regs		32	81	131	155	172	195	328	509	1,149	1,666	1,856	2,171	2,849	4,006
	Full Implementation								3,042	3,053	3,084	3,490	3,897	4,301	4,708	5,114
	Total Stationary	15,357	16,363	16,392	16,745	17,550	18,097	18,295	21,524	21,757	22,434	23,390	24,032	24,801	25,897	27,457
	Federally Mandated	15,357	16,363	16,392	16,745	17,550	18,097	18,295	21,524	21,757	22,434	23,390	24,032	24,801	25,897	27,457
3.1.2	Mobile Sources															
	Existing Regulations															
	EPA															
	Private	5,825	6,192	6,530	6,470	5,175	5,545	5,947	6,284	6,502	6,672	6,792	6,980	7,146	7,345	7,525
	Total Existing Regs	5,825	6,192	6,530	6,470	5,175	5,545	5,947	6,284	6,502	6,672	6,792	6,980	7,146	7,345	7,525
	Federally Mandated	5,825	6,192	6,530	6,470	5,175	5,545	5,947	6,284	6,502	6,672	6,792	6,980	7,146	7,345	7,525
	New Regulations															
	Private			11	157	168	426	553	525	498	1,166	1,872	2,579	3,275	3,271	3,269
	Total New Regs			11	157	168	426	553	525	498	1,166	1,872	2,579	3,275	3,271	3,269
	Full Implementation								1,326	1,345	1,505	1,522	1,537	1,553	1,568	1,440
	Total Mobile	5,825	6,192	6,541	6,627	5,343	5,971	6,500	8,136	8,345	9,343	10,186	11,096	11,974	12,183	12,235
	Federally Mandated	5,825	6,192	6,541	6,627	5,343	5,971	6,500	8,136	8,345	9,343	10,186	11,096	11,974	12,183	12,235
3.1.3	Undesignated Source															
	EPA	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
	Total Undesignated	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
	Federally Mandated	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	21,414	22,804	23,154	23,598	23,128	24,369	25,016	29,877	30,314	31,985	33,779	35,326	36,967	38,269	39,876
	Federally Mandated	21,414	22,804	23,154	23,598	23,128	24,369	25,016	29,877	30,314	31,985	33,779	35,326	36,967	38,269	39,876

## Footnotes to Table 3-3D

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2A, plus amortized capital costs assuming an interest rate of three percent and a capital life of ten years for mobile sources and 20 years for all other capital on the accumulated capital investment shown in Table 3-1 and 3-1A since 1972.

Table 3-3E: RADIATION POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	EPA	13	18	14	19	25	27	29	32	35	38	41	43	46	49	52
	Non-EPA Federal	328	293	316	340	364	388	413	438	463	488	514	540	566	591	617
	State Government															
	Local Government															
	Private															
	Total Existing Radiation	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
	Federally Mandated	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
	New Regulations															
	Local Government															
	Private	0	1	5	15	25	36	47	58	69	81	93	105	117	130	143
	Total New Regs	0	1	5	15	25	36	47	58	69	81	93	105	117	130	143
	Full Implementation															
	Total Radiation	341	312	335	374	415	452	489	528	567	607	647	688	730	770	812
	Federally Mandated	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
3.3	Total Air & Rad	21,755	23,116	23,490	23,972	23,543	24,821	25,505	30,404	30,881	32,591	34,426	36,014	37,697	39,040	40,688
	Federally Mandated	21,755	23,116	23,485	23,957	23,517	24,785	25,458	30,346	30,811	32,510	34,334	35,910	37,580	38,910	40,545

Footnotes to Table 3-3E

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2B, plus amortized capital costs assuming an interest rate of three percent and a capital life of 25 years on the accumulated capital investment shown in Tables 3-1 and 3-1B since 1972.

Table 3-3F: AIR AND RADIATION POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	EPA															
	Non-EPA Federal			181	194	263	300	327	240	267	244	238	272	302	377	298
	State & Local Govt	362	401	460	436	458	519	582	660	735	759	813	879	938	1,012	1,101
	Private	5,987	6,856	7,161	8,204	9,646	11,049	12,311	13,231	13,665	14,219	14,468	15,779	16,683	17,376	18,514
	Total Stationary	6,349	7,257	7,802	8,834	10,367	11,869	13,220	14,131	14,667	15,222	15,518	16,929	17,924	18,765	19,912
	Federally Mandated	6,349	7,257	7,802	8,834	10,367	11,869	13,220	14,131	14,667	15,222	15,518	16,929	17,924	18,765	19,912
3.1.2	Mobile Sources															
	EPA															
	Private	1,350	2,253	2,295	2,492	2,791	3,265	3,663	4,051	4,464	4,752	5,117	5,885	6,650	7,166	7,996
	Total Mobile	1,350	2,253	2,295	2,492	2,791	3,265	3,663	4,051	4,464	4,752	5,117	5,885	6,650	7,166	7,996
	Federally Mandated	1,350	2,253	2,295	2,492	2,791	3,265	3,663	4,051	4,464	4,752	5,117	5,885	6,650	7,166	7,996
3.1.3	Undesignated Source															
	EPA	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Total Undesignated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Federally Mandated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
	Federally Mandated	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
3.2	Radiation															
	EPA	18	17	14	18	12	10	9	12	15	15	13	15	12	16	13
	Non-EPA Federal			242	215	148	165	230	223	209	193	215	201	212	228	353
	Total Radiation	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
	Federally Mandated	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
3.3	Total Air & Rad	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505
	Federally Mandated	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505

## Footnotes to Table 3-3F

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2, plus amortized capital costs assuming an interest rate of ten percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Table 3-1 since 1972.

Table 3-3G: AIR POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	EPA															
	Non-EPA Federal	298	359	380	400	420	440	460	479	486	491	495	502	511	522	535
	State & Local Govt	1,101	1,133	1,142	1,178	1,211	1,241	1,249	1,250	1,246	1,241	1,225	1,199	1,172	1,132	1,077
	Private	18,514	19,616	19,781	20,236	21,166	21,842	21,920	21,795	21,662	21,474	21,343	21,241	21,145	20,994	20,831
	Total Existing Regs	19,912	21,108	21,303	21,814	22,797	23,523	23,629	23,524	23,394	23,206	23,063	22,942	22,828	22,648	22,442
	Federally Mandated	19,912	21,108	21,303	21,814	22,797	23,523	23,629	23,524	23,394	23,206	23,063	22,942	22,828	22,648	22,442
	New Regulations															
	Private		56	129	203	233	255	282	415	596	1,236	1,753	1,943	2,258	2,936	4,093
	Total New Regs		56	129	203	233	255	282	415	596	1,236	1,753	1,943	2,258	2,936	4,093
	Full Implementation								3,042	3,053	3,084	3,490	3,897	4,301	4,708	5,114
	Total Stationary	19,912	21,165	21,432	22,017	23,030	23,778	23,911	26,982	27,044	27,526	28,307	28,782	29,387	30,292	31,650
	Federally Mandated	19,912	21,165	21,432	22,017	23,030	23,778	23,911	26,982	27,044	27,526	28,307	28,782	29,387	30,292	31,650
3.1.2	Mobile Sources															
	Existing Regulations															
	EPA															
	Private	7,996	8,503	8,983	9,035	7,870	8,355	8,886	9,326	9,593	9,795	9,942	10,174	10,383	10,644	10,888
	Total Existing Regs	7,996	8,503	8,983	9,035	7,870	8,355	8,886	9,326	9,593	9,795	9,942	10,174	10,383	10,644	10,888
	Federally Mandated	7,996	8,503	8,983	9,035	7,870	8,355	8,886	9,326	9,593	9,795	9,942	10,174	10,383	10,644	10,888
	New Regulations															
	Private			16	165	181	446	580	559	540	1,217	1,932	2,649	3,349	3,350	3,355
	Total New Regs			16	165	181	446	580	559	540	1,217	1,932	2,649	3,349	3,350	3,355
	Full Implementation								1,326	1,345	1,505	1,522	1,537	1,553	1,568	1,440
	Total Mobile	7,996	8,503	8,998	9,201	8,051	8,801	9,465	11,211	11,479	12,517	13,396	14,359	15,285	15,562	15,683
	Federally Mandated	7,996	8,503	8,998	9,201	8,051	8,801	9,465	11,211	11,479	12,517	13,396	14,359	15,285	15,562	15,683
3.1.3	Undesignated Source															
	EPA	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
	Total Undesignated	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
	Federally Mandated	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	28,139	29,918	30,651	31,444	31,315	32,880	33,598	38,409	38,735	40,251	41,906	43,339	44,865	46,043	47,516
	Federally Mandated	28,139	29,918	30,651	31,444	31,315	32,880	33,598	38,409	38,735	40,251	41,906	43,339	44,865	46,043	47,516

Footnotes to Table 3-3G

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2A, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of ten years for mobile sources and 20 years for all other capital on the accumulated capital investment shown in Tables 3-1 and 3-1A since 1972.

Table 3-3H: RADIATION POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	EPA	13	18	14	19	25	27	29	32	35	38	41	43	46	49	52
	Non-EPA Federal	353	321	347	374	402	430	459	488	518	549	580	612	644	674	706
	State Government															
	Local Government															
	Private															
	Total Existing Radiation	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
	Federally Mandated	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
	New Regulations															
	Local Government															
	Private	0	1	7	21	36	52	67	83	99	116	134	152	170	190	210
	Total New Regs	0	1	7	21	36	52	67	83	99	116	134	152	170	190	210
	Full Implementation															
	Total Radiation	366	340	368	414	463	509	555	603	653	703	755	807	861	913	967
	Federally Mandated	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
3.3	Total Air & Rad	28,505	30,258	31,019	31,858	31,778	33,389	34,153	39,013	39,387	40,954	42,660	44,146	45,726	46,956	48,483
	Federally Mandate	28,505	30,257	31,012	31,837	31,743	33,337	34,086	38,930	39,288	40,837	42,526	43,995	45,556	46,767	48,274

## Footnotes to Table 3-3H

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2B, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 25 years on the accumulated capital investment shown in Tables 3-1 and 3-1B since 1972.

Table 3-4: AIR POLLUTION CONTROL CAPITAL COSTS BY POLLUTANT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Particulates	3,041	4,026	3,816	4,242	3,936	3,860	3,585	3,872	3,615	3,457	2,830	2,173	2,347	2,053	1,643
	Sulfur Oxides	1,134	1,502	1,557	1,642	1,395	1,139	979	1,012	1,067	989	1,516	1,185	830	432	538
	NOx and CO	147	195	206	221	222	230	286	310	400	361	288	255	158	172	193
	Hydrocarbons/VOCs	444	588	623	667	670	696	866	936	1,210	1,091	871	770	918	1,259	1,495
	Lead	28	38	53	39	41	41	42	44	40	38	42	40	47	170	153
	Hazardous	98	129	181	133	140	141	146	153	136	129	145	137	215	134	151
	Other	262	346	485	356	376	377	390	409	365	345	389	366	379	356	267
	Total Stationary	5,155	6,824	6,920	7,299	6,781	6,484	6,295	6,735	6,834	6,409	6,081	4,925	4,894	4,577	4,440
3.1.2	Mobile Sources															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	268	564	472	2,775	3,256	3,548	3,685	4,010	3,716	4,189	4,049	4,812	6,125	6,664	6,885
	Total Mobile	268	564	472	2,775	3,256	3,548	3,685	4,010	3,716	4,189	4,049	4,812	6,125	6,664	6,885
3.1.3	Undesignated Source															
3.1.4	Total Air Pollution	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
3.2	Radiation															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrqcy Radi atn															
	Urani um Mill Tailg															
	Undesignated			24	20	16	8	25	22	64	89	30	37	33	55	47
	Total Radiation			24	20	16	8	25	22	64	89	30	37	33	55	48
3.3	Total Air & Rad	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,373

## Footnotes to Table 3-4

Air Stationary Sources: Total stationary source capital expenditures from Table 3-1 (Non-EPA Federal and Private) distributed across pollutants using factors in Appendix B, Table B-8.

Air Mobile Sources: Total mobile source capital expenditures from Table 3-1 (all Private). All mobile source capital expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible. Also see Appendix C, Table C-1.

Radiation: Total radiation capital expenditures from Table 3-1 (all Non-EPA Federal). All radiation capital expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

Table 3-4A: AIR POLLUTION CONTROL CAPITAL COSTS BY POLLUTANT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	Particulates	1,643	1,920	1,845	1,792	1,739	1,687	1,634	1,581	1,529	1,476	1,423	1,371	1,318	1,265	1,213
	Sulfur Oxides	538	570	548	532	516	501	485	469	454	438	423	407	391	376	360
	NOx and CO	193	168	161	157	152	147	143	138	134	129	124	120	115	111	106
	Hydrocarbons/VOCs	1,495	1,183	1,136	1,104	1,071	1,039	1,007	974	942	909	877	844	812	779	747
	Lead	153	120	115	112	109	105	102	99	96	92	89	86	82	79	76
	Hazardous	151	159	152	148	144	139	135	131	126	122	118	113	109	105	100
	Other	267	319	306	297	289	280	271	262	254	245	236	227	219	210	201
	Total Existing Regs	4,440	4,438	4,264	4,142	4,020	3,898	3,777	3,655	3,533	3,411	3,290	3,168	3,046	2,924	2,803
	New Regulations															
	Particulates		477	477	477											
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead					106	106	106								
	Hazardous															
	Other															
	Total New Regs		477	477	477	106	106	106								
	Total Stationary	4,440	4,915	4,741	4,619	4,126	4,004	3,883	3,655	3,533	3,411	3,290	3,168	3,046	2,924	2,803
3.1.2	Mobile Sources															
	Existing Regulations															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	6,885	6,653	6,788	6,476	6,566	6,729	6,871	7,066	7,217	7,367	7,468	7,623	7,732	7,844	7,956
	Total Existing Regs	6,885	6,653	6,788	6,476	6,566	6,729	6,871	7,066	7,217	7,367	7,468	7,623	7,732	7,844	7,956
	New Regulations															
	Particulates			5	5	5	40	41	43	69	71	73	75	77	80	82
	Sulfur Oxides															
	NOx and CO			91	92	92	106	110	113	117	120	124	128	132	136	141
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated			96	97	97	147	151	156	186	191	197	203	210	216	223
	Total New Regs			96	97	97	147	151	156	186	191	197	203	210	216	223
	Total Mobile	6,885	6,653	6,883	6,573	6,663	6,876	7,022	7,222	7,403	7,559	7,665	7,827	7,941	8,061	8,179
3.1.3	Undesignated Source															
3.1.4	Total Air Pollution	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981

## Footnotes to Table 3-4A

Existing Stationary Sources: Total existing stationary source capital expenditures from Table 3-1A (Non-EPA Federal and Private) distributed across pollutants using factors in Appendix B, Table B-8.

New Stationary Sources: Total new stationary source capital expenditures from Table 3-1A (all Private) distributed across pollutants using factors in Appendix B, Table B-8.

Existing Mobile Sources: Data are total existing mobile source capital expenditures from Table 3-1A (all Private). Also see Appendix C, Table C-1A. All mobile source capital expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

New Mobile Sources: Data are total new mobile source capital expenditures from Table 3-1A (all Private). Also see Appendix C, Table C-1A. All mobile source capital expenditure are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

Table 3-4B: RADIATION POLLUTION CONTROL CAPITAL COSTS BY POLLUTANT  
(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrqcy Radi atn															
	Urani um Mill Tailg															
	Undesi gnated	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
	Total Existing Regs	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
	New Regulations															
	Radon	1	4	34	79	79	94	89	93	98	103	107	112	117	122	127
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrqcy Radi atn															
	Urani um Mill Tailg															
	Undesi gnated															
	Total New Regs	1	4	34	79	79	94	89	93	98	103	107	112	117	122	127
	Total Radiation	48	60	90	145	151	171	171	180	190	201	210	220	230	240	251
3.3	Total Air & Rad	11,373	11,628	11,714	11,337	10,940	11,051	11,076	11,057	11,126	11,171	11,165	11,215	11,218	11,225	11,232

Footnotes to Table 3-4B

Existing Radiation: Total existing radiation capital expenditures from Table 3-1B (all Non-EPA Federal). All radiation capital expenditures for existing regulations are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

New Radiation: Estimated expenditures for radon control from Appendix D, Table D-1.

Table 3-5: AIR POLLUTION CONTROL OPERATING COSTS BY POLLUTANT  
(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Particulates	3,389	3,452	3,078	3,345	3,770	4,306	4,467	4,578	4,073	4,046	3,296	3,493	3,996	3,876	3,427
	Sulfur Oxides	1,264	1,287	1,256	1,295	1,336	1,271	1,221	1,196	1,202	1,157	1,766	1,904	1,414	816	1,122
	NOx and CO	164	167	166	174	212	257	357	366	451	422	335	409	269	324	403
	Hydrocarbons/VOCs	495	504	503	526	642	777	1,079	1,107	1,363	1,277	1,014	1,238	1,564	2,377	3,120
	Lead	32	32	43	31	39	46	53	53	45	44	49	64	80	321	319
	Hazardous	109	111	146	105	134	157	182	181	154	151	169	220	366	254	315
	Other	291	297	391	281	360	420	487	484	411	403	453	588	646	672	557
	Total Stationary	5,744	5,850	5,583	5,756	6,494	7,234	7,845	7,965	7,698	7,501	7,083	7,915	8,335	8,639	9,264
3.1.2	Mobile Sources															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	1,307	2,118	2,082	1,828	1,597	1,494	1,293	1,027	836	443	192	269	114	(3)	236
	Total Mobile	1,307	2,118	2,082	1,828	1,597	1,494	1,293	1,027	836	443	192	269	114	(3)	236
3.1.3	Undesignated Source	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
3.2	Radiation															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrcy Radi atn															
	Urani um Mill Tailg															
	Undesignated	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
	Total Radiation	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
3.3	Total Air & Rad	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045

Footnotes to Table 3-5

Air Stationary Sources: Total stationary source operating expenditures from Table 3-2 (EPA, Non-EPA Federal, and Private) distributed across pollutants using factors in Appendix B, Table B-8.

Air Mobile Sources: Total mobile source operating expenditures from Table 3-2 (EPA and Private). Also see Appendix C, Table C-1.

Undesignated Source: Total undesignated source operating expenditures from Table 3-2 (EPA, State and Local Government).

Radiation: Total radiation operating expenditures from Table 3-2 (EPA and Non-EPA Federal). All radiation operating expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

Table 3-5A: AIR POLLUTION CONTROL OPERATING COSTS BY POLLUTANT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	Particulates	3,427	4,300	4,168	4,179	4,400	4,515	4,631	4,747	4,863	4,979	5,095	5,211	5,327	5,442	5,558
	Sulfur Oxides	1,122	1,277	1,237	1,240	1,306	1,340	1,375	1,409	1,444	1,478	1,512	1,547	1,581	1,616	1,650
	NOx and CO	403	376	364	365	384	394	404	415	425	435	445	455	465	475	485
	Hydrocarbons/VOCs	3,120	2,649	2,567	2,574	2,710	2,781	2,853	2,924	2,995	3,067	3,138	3,210	3,281	3,352	3,424
	Lead	319	269	261	261	275	282	290	297	304	311	319	326	333	340	348
	Hazardous	315	355	344	345	364	373	383	392	402	412	421	431	440	450	459
	Other	557	713	691	693	730	749	768	787	807	826	845	864	884	903	922
	Total Existing Regs	9,264	9,939	9,632	9,657	10,168	10,436	10,704	10,972	11,239	11,507	11,775	12,043	12,311	12,579	12,846
	New Regulations															
52	Particulates				17	35	52	52	52	52	52	52	52	52	52	52
	Sulfur Oxides										327	654	654	654	654	1,308
	NOx and CO															
	Hydrocarbons/VOCs							5	5	63	66	70	74	79	448	641
29	Lead							10	20	29	29	29	29	29	29	29
	Hazardous									124	247	557	743	929	1,239	1,858
	Other															
	Total New Regs			17	35	52	62	77	210	391	1,031	1,548	1,738	2,053	2,731	3,888
	Total Stationary	9,264	9,939	9,649	9,692	10,220	10,498	10,781	11,182	11,630	12,538	13,323	13,781	14,364	15,310	16,734
3.1.2	Mobile Sources															
	Existing Regulations															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	236	238	213	(136)	(1,766)	(1,694)	(1,623)	(1,549)	(1,459)	(1,372)	(1,320)	(1,246)	(1,191)	(1,153)	(1,135)
	Total Existing Regs	236	238	213	(136)	(1,766)	(1,694)	(1,623)	(1,549)	(1,459)	(1,372)	(1,320)	(1,246)	(1,191)	(1,153)	(1,135)
	New Regulations															
	Particulates						241	484	438	389	335	318	301	283	265	249
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs				134	134	134									
	Lead															
	Other															
	Undesignated									700	1,400	2,100	2,800	2,800	2,800	
	Total New Regs				134	134	375	484	438	389	1,035	1,718	2,401	3,083	3,065	3,049
	Total Mobile	236	238	213	(2)	(1,632)	(1,319)	(1,139)	(1,111)	(1,070)	(337)	398	1,155	1,892	1,912	1,914
3.1.3	Undesignated Source	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	9,731	10,427	10,083	9,916	8,823	9,480	9,863	10,287	10,772	12,408	13,923	15,134	16,449	17,410	18,832

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Footnotes to Table 3-5A

Existing Stationary Sources: Total stationary source operating expenditures from Table 3-2A (EPA, Non-EPA Federal, and Private) distributed across pollutants using factors in Appendix B, Table B-8.

New Stationary Sources: Total stationary source operating expenditures from Table 3-2A (all Private) distributed across pollutants using factors in Appendix B, Table B-8.

Existing Mobile Sources: Data are total mobile source operating expenditures from Table 3-2A (EPA and Private). Also see Appendix C, Table C-1A. All mobile source operating expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

New Mobile Sources: Data are total mobile source operating expenditures from Table 3-2A (all Private). Also see Appendix C, Table C-1A. All mobile source operating expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

Table 3-5B: RADIATION POLLUTION CONTROL OPERATING COSTS BY POLLUTANT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrqcy Radi atn															
	Urani um Mill Tailg															
	Undesi gnated	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
	Total Existing Regs	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
	New Regulations															
	Radon	0	0	3	8	14	20	25	31	36	42	48	53	59	65	71
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrqcy Radi atn															
	Urani um Mill Tailg															
	Undesi gnated															
	Total New Regs	0	0	3	8	14	20	25	31	36	42	48	53	59	65	71
	Total Radiation	314	281	300	330	362	389	417	445	473	502	530	558	587	615	644
3.3	Total Air & Rad	10,045	10,708	10,383	10,246	9,185	9,869	10,280	10,732	11,245	12,910	14,453	15,692	17,035	18,025	19,476

## Footnotes to Table 3-5B

**Existing Radiation:** Total existing radiation operating expenditures from Table 3-2B (EPA and Non-EPA Federal). All radiation operating expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

**New Radiation:** Estimated expenditures for radon control from Appendix D, Table D-1.

Table 3-6: AIR POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Particulates	3,676	4,119	4,105	4,773	5,569	6,469	6,969	7,446	7,281	7,581	7,098	7,500	8,225	8,298	8,005
	Sulfur Oxides	1,371	1,536	1,651	1,846	2,019	2,061	2,103	2,174	2,281	2,329	3,081	3,331	2,920	2,362	2,719
	NOx and CO	178	199	218	247	306	372	499	537	660	665	606	704	579	650	747
	Hydrocarbons/VOCs	537	602	659	746	925	1,125	1,510	1,626	1,995	2,012	1,832	2,128	2,541	3,473	4,357
	Lead	34	39	54	45	58	68	80	83	79	82	91	110	130	387	400
	Hazardous	118	132	185	156	199	235	273	286	272	282	314	377	544	444	520
	Other	316	354	494	417	532	628	731	767	729	754	839	1,009	1,103	1,162	1,073
	Total Stationary	6,230	6,981	7,366	8,229	9,607	10,959	12,164	12,920	13,298	13,706	13,862	15,159	16,041	16,777	17,821
3.1.2	Mobile Sources															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	1,345	2,236	2,268	2,409	2,642	3,043	3,367	3,672	4,010	4,213	4,501	5,182	5,832	6,269	7,025
	Total Mobile	1,345	2,236	2,268	2,409	2,642	3,043	3,367	3,672	4,010	4,213	4,501	5,182	5,832	6,269	7,025
3.1.3	Undesignated Source	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
3.2	Radiation															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrqcy Radi atn															
	Urani um Mill Tail g															
	Undesignated	18	17	255	232	158	173	237	232	219	201	220	207	215	233	354
	Total Radiation	18	17	255	232	158	173	237	232	219	201	220	207	215	233	355
3.3	Total Air & Rad	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431

Footnotes to Table 3-6

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5, plus amortized capital costs assuming an interest rate of seven percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Table 3-4 since 1972.

## Environmental Investments

Table 3-6A: AIR POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	Particulates	8,005	9,059	9,101	9,281	9,666	9,941	9,924	9,809	9,709	9,564	9,443	9,324	9,226	9,095	8,985
	Sulfur Oxides	2,719	2,927	2,940	2,993	3,107	3,189	3,162	3,099	3,029	2,950	2,893	2,858	2,837	2,811	2,779
	NOx and CO	747	735	739	755	788	812	822	827	830	831	832	832	826	817	800
	Hydrocarbons/VOCs	4,357	3,998	4,023	4,134	4,371	4,541	4,665	4,773	4,874	4,969	5,060	5,145	5,211	5,268	5,295
	Lead	400	361	364	375	399	416	430	443	455	467	479	490	501	512	522
	Hazardous	520	575	579	593	625	648	661	671	675	684	691	698	704	709	715
	Other	1,073	1,259	1,266	1,296	1,360	1,406	1,426	1,437	1,434	1,443	1,449	1,454	1,457	1,458	1,461
	Total Existing Regs	17,821	18,915	19,011	19,427	20,317	20,953	21,091	21,059	21,007	20,908	20,847	20,801	20,762	20,671	20,558
	New Regulations															
	Particulates		45	107	170	187	187	187	187	187	187	187	187	187	187	187
	Sulfur Oxides										327	654	654	654	654	1,308
	NOx and CO															
	Hydrocarbons/VOCs							5	5	63	66	70	74	79	448	641
	Lead					10	30	50	59	59	59	59	59	59	59	59
	Hazardous								124	247	557	743	929	1,239	1,548	1,858
	Other															
	Total New Regs		45	107	170	197	217	242	375	556	1,196	1,713	1,903	2,218	2,896	4,053
	Total Stationary	17,821	18,960	19,118	19,597	20,514	21,170	21,333	21,434	21,563	22,104	22,560	22,704	22,981	23,567	24,611
3.1.2	Mobile Sources															
	Existing Regulations															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	7,025	7,469	7,885	7,888	6,664	7,098	7,570	7,965	8,210	8,397	8,532	8,745	8,934	9,167	9,383
	Total Existing Regs	7,025	7,469	7,885	7,888	6,664	7,098	7,570	7,965	8,210	8,397	8,532	8,745	8,934	9,167	9,383
	New Regulations															
	Particulates			1	1	2	249	498	458	419	375	368	362	354	347	342
	Sulfur Oxides															
	NOx and CO			13	26	39	54	70	86	103	120	137	156	162	168	175
	Hydrocarbons/VOCs				134	134	134									
	Lead															
	Other															
	Undesignated										700	1,400	2,100	2,800	2,800	2,800
	Total New Regs			14	161	175	437	568	544	521	1,195	1,906	2,618	3,316	3,315	3,317
	Total Mobile	7,025	7,469	7,899	8,049	6,839	7,535	8,138	8,509	8,731	9,592	10,438	11,362	12,250	12,482	12,700
3.1.3	Undesignated Source	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	25,077	26,679	27,238	27,872	27,588	29,005	29,692	30,160	30,507	31,904	33,200	34,265	35,424	36,237	37,495

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Footnotes to Table 3-6A

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5, plus amortized capital costs assuming an interest rate of seven percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Tables 3-4 and 3-4A since 1972.

Table 3-6B: RADIATION POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 7 PERCENT  
(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrcy Radi atn															
	Urani um Mill Tail g															
	Undesi gnated	354	326	347	377	410	438	467	497	528	559	590	622	654	685	717
	Total Existing Regs	354	326	347	377	410	438	467	497	528	559	590	622	654	685	717
	New Regulations															
	Radon	0	1	6	19	31	45	58	71	85	100	115	130	146	162	179
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrcy Radi atn															
	Urani um Mill Tail g															
	Undesi gnated															
	Total New Regs	0	1	6	19	31	45	58	71	85	100	115	130	146	162	179
	Total Radiation	355	327	353	396	441	483	525	568	613	659	705	752	800	847	896
3.3	Total Air & Rad	25,431	27,006	27,591	28,267	28,029	29,488	30,217	30,728	31,120	32,562	33,905	35,017	36,224	37,085	38,390

## Footnotes to Table 3-6B

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5B, plus amortized capital costs assuming an interest rate of seven percent and a capital life of 25 years on the accumulated capital investment shown in Tables 3-4 and 3-4B since 1972.

Table 3-6C: AIR POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 3 PERCENT  
(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Particulates	3,594	3,927	3,810	4,362	5,051	5,847	6,249	6,620	6,358	6,564	6,004	6,347	7,007	7,025	6,687
	Sulfur Oxides	1,340	1,464	1,537	1,687	1,822	1,833	1,849	1,893	1,970	1,992	2,703	2,920	2,486	1,917	2,260
	NOx and CO	174	190	203	226	279	339	458	488	599	595	528	619	490	556	648
	Hydrocarbons/VOCs	525	574	614	682	843	1,025	1,386	1,476	1,813	1,800	1,597	1,872	2,260	3,157	4,001
	Lead	34	37	51	41	52	62	72	75	69	71	79	97	115	368	377
	Hazardous	115	126	173	141	180	212	247	256	238	244	272	332	492	389	461
	Other	309	338	464	378	483	568	661	685	638	653	728	888	971	1,021	924
	Total Stationary	6,090	6,655	6,853	7,517	8,711	9,886	10,921	11,493	11,686	11,919	11,910	13,074	13,822	14,434	15,357
3.1.2	Mobile Sources															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	1,338	2,215	2,235	2,306	2,457	2,769	3,000	3,205	3,450	3,547	3,740	4,315	4,822	5,161	5,825
	Total Mobile	1,338	2,215	2,235	2,306	2,457	2,769	3,000	3,205	3,450	3,547	3,740	4,315	4,822	5,161	5,825
3.1.3	Undesignated Source	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
3.2	Radiation															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrcy Radi atn															
	Urani um Mill Tail g															
	Undesignated	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
	Total Radiation	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
3.3	Total Air & Rad	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755

Footnotes to Table 3-6C

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5, plus amortized capital costs assuming an interest rate of three percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Table 3-4 since 1972.

Table 3-6D: AIR POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 3 PERCENT  
(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	Particulates	6,687	7,689	7,681	7,812	8,150	8,379	8,400	8,352	8,314	8,244	8,191	8,139	8,103	8,044	7,998
	Sulfur Oxides	2,260	2,452	2,449	2,488	2,589	2,657	2,648	2,613	2,573	2,526	2,495	2,480	2,475	2,467	2,454
	NOx and CO	648	632	631	642	672	692	702	708	713	717	721	723	722	719	709
	Hydrocarbons/VOCs	4,001	3,609	3,604	3,685	3,893	4,034	4,143	4,241	4,333	4,421	4,506	4,588	4,655	4,716	4,757
	Lead	377	335	334	342	363	378	390	401	411	422	433	443	453	462	472
	Hazardous	461	512	511	522	550	569	581	591	597	605	613	621	628	635	642
	Other	924	1,102	1,101	1,122	1,179	1,217	1,236	1,250	1,254	1,265	1,275	1,284	1,292	1,298	1,306
	Total Existing Regs	15,357	16,331	16,311	16,614	17,395	17,925	18,100	18,155	18,195	18,202	18,235	18,280	18,329	18,341	18,338
	New Regulations															
	Particulates		32	81	131	148	148	148	148	148	148	148	148	148	148	148
	Sulfur Oxides										327	654	654	654	654	1,308
	NOx and CO							5	5	63	66	70	74	79	448	641
	Hydrocarbons/VOCs										50	50	50	50	50	50
	Lead					7	24	41	50	50	50	50	50	50	50	50
	Hazardous								124	247	557	743	929	1,239	1,548	1,858
	Other															
	Total New Regs		32	81	131	155	172	195	328	509	1,149	1,666	1,856	2,171	2,849	4,006
	Total Stationary	15,357	16,363	16,392	16,745	17,550	18,097	18,295	18,482	18,704	19,350	19,900	20,135	20,500	21,189	22,343
3.1.2	Mobile Sources															
	Existing Regulations															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	5,825	6,192	6,530	6,470	5,175	5,545	5,947	6,284	6,502	6,672	6,792	6,980	7,146	7,345	7,525
	Total Existing Regs	5,825	6,192	6,530	6,470	5,175	5,545	5,947	6,284	6,502	6,672	6,792	6,980	7,146	7,345	7,525
	New Regulations															
	Particulates			1	1	2	247	495	454	413	368	359	351	342	332	325
	Sulfur Oxides															
	NOx and CO			11	21	32	45	58	71	84	99	113	128	133	138	144
	Hydrocarbons/VOCs				134	134	134									
	Lead															
	Other															
	Undesignated										700	1,400	2,100	2,800	2,800	2,800
	Total New Regs			11	157	168	426	553	525	498	1,166	1,872	2,579	3,275	3,271	3,269
	Total Mobile	5,825	6,192	6,541	6,627	5,343	5,971	6,500	6,810	7,000	7,838	8,664	9,559	10,421	10,615	10,795
3.1.3	Undesignated Source	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	21,414	22,804	23,154	23,598	23,128	24,369	25,016	25,509	25,916	27,396	28,767	29,892	31,113	31,993	33,322

Footnotes to Table 3-6D

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5A, plus amortized capital costs assuming an interest rate of three percent and a capital life of ten years for mobile sources and 20 years for all other capital on the accumulated capital investment shown in Table 3-4 and 3-4A since 1972.

Table 3-6E: RADIATION POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrqcy Radi atn															
	Urani um Mill Tailg															
	Undesi gnated	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
	Total Existing Regs	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
	New Regulations															
	Radon	0	1	5	15	25	36	47	58	69	81	93	105	117	130	143
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrqcy Radi atn															
	Urani um Mill Tailg															
	Undesi gnated															
	Total New Regs	0	1	5	15	25	36	47	58	69	81	93	105	117	130	143
	Total Radiation	341	312	335	374	415	452	489	528	567	607	647	688	730	770	812
3.3	Total Air & Rad	21,755	23,116	23,490	23,972	23,543	24,821	25,505	26,036	26,483	28,002	29,414	30,580	31,843	32,764	34,134

## Footnotes to Table 3-6E

Existing Radiation: Sum of operating costs for year in question, shown on corresponding lines of Table 3-5B, plus amortized capital costs assuming an interest rate of three percent and a capital life of 25 years on the accumulated capital investment shown in Tables 3-4 and 3-4B since 1972.

Table 3-6F: AIR POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Particulates	3,746	4,282	4,356	5,122	6,009	6,998	7,580	8,147	8,066	8,445	8,027	8,480	9,258	9,379	9,124
	Sulfur Oxides	1,397	1,597	1,748	1,980	2,185	2,254	2,319	2,413	2,544	2,616	3,403	3,680	3,288	2,740	3,110
	NOx and CO	181	207	231	264	329	400	534	579	711	725	672	776	654	730	831
	Hydrocarbons/VOCs	547	626	697	799	994	1,210	1,615	1,752	2,150	2,192	2,032	2,346	2,780	3,740	4,660
	Lead	35	40	56	49	62	74	86	91	88	91	102	121	142	404	420
	Hazardous	120	138	194	168	214	254	295	312	301	314	349	416	587	490	570
	Other	322	368	519	451	574	679	791	836	807	839	934	1,112	1,215	1,282	1,199
	Total Stationary	6,349	7,257	7,802	8,834	10,367	11,869	13,220	14,131	14,667	15,222	15,518	16,929	17,924	18,765	19,912
3.1.2	Mobile Sources															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	1,350	2,253	2,295	2,492	2,791	3,265	3,663	4,051	4,464	4,752	5,117	5,885	6,650	7,166	7,996
	Total Mobile	1,350	2,253	2,295	2,492	2,791	3,265	3,663	4,051	4,464	4,752	5,117	5,885	6,650	7,166	7,996
3.1.3	Undesignated Source	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
3.2	Radiation															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrcy Radi atn															
	Urani um Mill Tailg															
	Undesignated	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
	Total Radiation	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
3.3	Total Air & Rad	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505

Footnotes to Table 3-6F

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5, plus amortized capital costs assuming an interest rate of ten percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Table 3-4 since 1972.

Table 3-6G: AIR POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 10 PERCENT  
(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	Particulates	9,124	10,222	10,306	10,528	10,953	11,267	11,218	11,046	10,893	10,685	10,505	10,329	10,178	9,988	9,822
	Sulfur Oxides	3,110	3,331	3,356	3,421	3,548	3,641	3,599	3,512	3,417	3,310	3,230	3,178	3,144	3,103	3,055
	NOx and CO	831	823	830	850	887	914	924	927	929	928	927	924	914	901	876
	Hydrocarbons/VOCs	4,660	4,327	4,379	4,515	4,777	4,971	5,108	5,225	5,334	5,433	5,529	5,618	5,683	5,736	5,753
	Lead	420	384	389	403	429	449	465	479	491	505	518	530	542	554	565
	Hazardous	570	629	636	654	689	715	729	739	742	750	757	764	769	773	778
	Other	1,199	1,393	1,407	1,443	1,514	1,566	1,586	1,596	1,588	1,594	1,597	1,599	1,598	1,593	1,593
	Total Existing Regs	19,912	21,108	21,303	21,814	22,797	23,523	23,629	23,524	23,394	23,206	23,063	22,942	22,828	22,648	22,442
	New Regulations															
	Particulates		56	129	203	220	220	220	220	220	220	220	220	220	220	220
	Sulfur Oxides										327	654	654	654	654	1,308
	NOx and CO							5	5	63	66	70	74	79	448	641
	Hydrocarbons/VOCs										66	70	74	79	448	641
	Lead					12	35	57	66	66	66	66	66	66	66	66
	Hazardous								124	247	557	743	929	1,239	1,548	1,858
	Other															
	Total New Regs		56	129	203	233	255	282	415	596	1,236	1,753	1,943	2,258	2,936	4,093
	Total Stationary	19,912	21,165	21,432	22,017	23,030	23,778	23,911	23,940	23,991	24,442	24,817	24,885	25,086	25,584	26,536
3.1.2	Mobile Sources															
	Existing Regulations															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	7,996	8,503	8,983	9,035	7,870	8,355	8,886	9,326	9,593	9,795	9,942	10,174	10,383	10,644	10,888
	Total Existing Regs	7,996	8,503	8,983	9,035	7,870	8,355	8,886	9,326	9,593	9,795	9,942	10,174	10,383	10,644	10,888
	New Regulations															
	Particulates			1	2	2	250	500	461	423	380	375	371	364	359	355
	Sulfur Oxides															
	NOx and CO			15	30	45	62	80	98	117	137	157	178	185	192	200
	Hydrocarbons/VOCs				134	134	134									
	Lead															
	Other															
	Undesignated										700	1,400	2,100	2,800	2,800	2,800
	Total New Regs			16	165	181	446	580	559	540	1,217	1,932	2,649	3,349	3,350	3,355
	Total Mobile	7,996	8,503	8,998	9,201	8,051	8,801	9,465	9,885	10,134	11,012	11,874	12,822	13,732	13,994	14,243
3.1.3	Undesignated Source	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	28,139	29,918	30,651	31,444	31,315	32,880	33,598	34,041	34,337	35,662	36,894	37,905	39,011	39,767	40,962

Footnotes to Table 3-6G

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5A, plus amortized capital costs assuming an interest rate of ten percent and a capital life of ten years for mobile sources and 20 years for all other capital on the accumulated capital investment shown in Tables 3-4 and 3-4A since 1972.

Table 3-6H: RADIATION POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 10 PERCENT  
(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrqcy Radi atn															
	Urani um Mill Tail g															
	Undesi gnated	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
	Total Existing Regs	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
	New Regulations															
	Radon	0	1	7	21	36	52	67	83	99	116	134	152	170	190	210
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radi ofrqcy Radi atn															
	Urani um Mill Tail g															
	Undesi gnated															
	Total New Regs	0	1	7	21	36	52	67	83	99	116	134	152	170	190	210
	Total Radiation	366	340	368	414	463	509	555	603	653	703	755	807	861	913	967
3.3	Total Air & Rad	28,505	30,258	31,019	31,858	31,778	33,389	34,153	34,645	34,989	36,365	37,648	38,712	39,872	40,680	41,929

## Footnotes to Table 3-6H

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5B, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 25 years on the accumulated capital investment shown in Tables 3-4 and 3-4B since 1972.

## 4. COSTS OF WATER POLLUTION CONTROL

The costs of water pollution control are broken down into several categories and discussed in the sections listed below:

- 4.1. Water quality;
  - 4.1.1. Point source;
  - 4.1.2. Non-point source;
  - 4.1.3. Groundwater protection;
- 4.2. Total water quality;
- 4.3. Drinking water; and
- 4.4. Total water pollution control costs.

The costs reported in this chapter are for existing water programs and new regulations for which cost information is available. New regulations for which cost information is not available, and pending legislation that would augment current water pollution control efforts, are noted in the appropriate sections. Efforts directed to groundwater pollution control are discussed in section 4.1.3. However, the costs of these efforts are for the most part listed and discussed in other chapters of this report.

Estimates of the capital costs of water pollution control are presented in Table 4-1. Table 4-2 presents estimates of operating costs, and Table 4-3 presents estimates of annualized costs calculated using capital amortization rates of three, seven, and ten percent. Annualized costs for all water pollution control programs except drinking water are based on a 30-year capital life. Annualized costs for the drinking water program are based on a 20-year capital life.

The discussion of water costs that follows focuses on the annualized cost estimates calculated using an amortization rate of seven percent for capital costs. Annualized costs calculated at a three percent rate are approximately 16 to 19 percent lower, and those calculated at the ten percent rate are 13 to 16 percent higher, than the annualized cost estimates discussed below.

### 4.1. WATER QUALITY

Water quality costs are defined as those pursuant to the Marine Protection, Sanctuaries and Research Act of 1972, and the Clean Water Act (CWA) as last amended in 1987.<sup>1</sup> They represent expenditures intended to improve the quality of the Nation's natural waters, including expenditures for wastewater treatment as well as those incurred in transporting wastewater from its point of origin to treatment facilities. Also included under water quality costs are "full implementation" costs which

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<sup>1</sup> Legislation has been introduced which would strengthen the water quality standards program for coastal waters. EPA has estimated that the House version (HR 2647, "Coastal Defense Initiative") would require expenditures of \$124 million by EPA and states in FY 1991, increasing to \$158 million for FY 1993. These costs are not included in the tables.

represent the projected additional expenditures needed to meet secondary treatment requirements for municipal wastewater by the year 2000, beyond what is projected to be spent by Federal, state and local governments for this purpose throughout the 1990s.

Water pollution control costs are broken down by “point” and “non-point” sources. Non-point source expenditures are those incurred to control pollution from sources other than single, specific locations. Non-point sources include land runoff, precipitation, drainage, and seepage, including agricultural storm drainage, and irrigation return flows. The costs of controlling point and non-point sources of water pollution by each sector are initially discussed separately.

The EPA and other Federal agencies such as the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and National Marine Fisheries Service, as well as states also incur costs for habitat protection, which involves both point and non-point source control. EPA and state expenditures for habitat protection cannot be readily broken out from other water quality costs, however. Non-EPA Federal costs for habitat protection are not included in the data base.

#### *4.1.1. Point Source*

##### *4.1.1.1. EPA*

EPA expenditures prior to 1977 were associated primarily with program development for the regulation of conventional pollutants, including: establishing water quality standards; developing a permit program for pollutant discharge; and setting effluent limitations for various industrial discharges. Under authority of the CWA and the Marine Protection, Research and Sanctuaries Act, EPA also established regulations for ocean disposal of wastes.

In recent years EPA expenditures have been primarily for oversight and guidance of regulatory implementation by the states. EPA costs, on an annualized basis, decreased throughout the 1980s except for a slight increase after the 1987 Amendments to the CWA. Among other things, the 1987 Amendments directed EPA to develop and maintain adequate controls for toxic discharges.

EPA expenditures for regulatory development, implementation, and oversight are provided in Table 4-2. Future EPA implementation costs may increase beyond the projections given in this report because of the potential for revisions in effluent limitation guidelines resulting from the new review process mandated under Section 304(m) of the CWA Amendments.

EPA capital expenditures, shown in Table 4-1, are for municipal wastewater treatment under the Construction Grants Program,<sup>2</sup> which provides matching funds to localities to build publicly-owned wastewater treatment plants. EPA construction grants increased dramatically after the passage of the CWA in 1972, increasing from \$1.6 billion in 1973 to \$6.2 billion in 1977. EPA expenditures fell

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<sup>2</sup> Includes spending pursuant to the CWA Construction Grants Program (Title II) and the 1987 CWA Amendments State Revolving Fund Program (Title VI).

off somewhat over the next few years and have declined steadily since 1981. The lower levels of Federal construction grants since 1977 reflect the 1977 CWA Amendments that provided for delegation of water quality management to the states.

Before 1985, EPA paid 75 percent of the eligible capital cost of conventional treatment facilities; local governments, some with state assistance, paid the remainder. In 1985, the Federal share was cut to 55 percent. By 1988, Federal assistance had fallen to about \$2.3 billion. Beginning in 1988, Federal assistance will be shifted to the capitalization of 50 state revolving funds (SRFs) at a substantially reduced level of funding. Federal assistance will decrease steadily to about \$434 million in 1994 and zero thereafter.

#### 4.1.1.2. State and Local Government

State expenditures support program implementation and administration of the National Pollutant Discharge Elimination System (NPDES) permit program to control discharges of water pollutants. Expenditures increased steadily throughout the 1980s as states assumed greater responsibility for implementation and enforcement of the regulations. As a result of the 1987 CWA Amendments, states are now working towards meeting water quality objectives involving toxic discharges. Other state water quality expenditures are for the Great Lakes, Chesapeake Bay and other estuary clean-up programs. While states have received considerable Federal assistance for some of these efforts, many are financed through state legislative appropriations. The cost projections do not necessarily reflect state and local expenditures to develop and implement state water quality standards established in addition to Federal effluent guidelines.

Federal grants are a small source of state spending for implementation of water quality programs. Between 1981 and 1987, they averaged 6.4 percent of total state operating and maintenance expenditures, falling to 4.9 percent in 1988. Currently, states set aside a small portion of construction grants to fund water quality planning and management. As Federal assistance is phased out, states will have to find other funding sources for these activities.

As mentioned above, the 1987 amendments to the CWA shifted Federal funds for municipal wastewater treatment facility construction from local communities to states. EPA grants to communities have been replaced by grants to states for the purpose of capitalizing SRFs over the years 1989-94. States must match Federal grants by 20 percent on the dollar. The SRFs will enable states to provide financial assistance to local governments in the form of low interest loans, loan refinancing, and loan guarantees. Federal grants to SRFs for wastewater treatment construction are not authorized beyond 1994.

Local government expenditures cover a large portion of total construction costs and all the operation and maintenance costs of municipal wastewater treatment facilities. About 100 municipalities contract with the private sector for the operation of wastewater treatment facilities. Most of these facilities are relatively small (less than ten million gallons per day) with limited

technical resources and finances.<sup>3</sup> Annualized local government costs for all wastewater services, including sewerage and wastewater treatment, increased from a little over \$3 billion in 1972 to \$10.1 billion in 1987. Local annual costs are projected to increase significantly throughout the 1990s, reaching an estimated \$16.5 billion by the year 2000.

The cost category labeled “full implementation” in Tables 4-1, 4-2, and 4-3 provides data on the amount of expenditures for wastewater treatment required to bring municipal wastewater treatment into full compliance with the fishable/swimmable goals of the Clean Water Act. These estimates represent costs beyond what local governments are expected to spend on wastewater treatment over the years 1990-2000. The annualized costs required to meet wastewater treatment needs above projected expenditures for this purpose are estimated to increase steadily from \$300 million in 1990 to about \$2.8 billion by 1995, and to almost \$6 billion by the year 2000. (The derivation of these full implementation costs is detailed in Appendix A.)

#### 4.1.1.3. Private

Private water quality expenditures are associated mainly with the control of industrial effluents in compliance with NPDES permits, and for the pretreatment of discharges to municipal wastewater treatment facilities. Water quality costs to the private sector, on an annualized basis, increased from about \$3.9 billion in 1972 to almost \$16 billion in 1987. Future private water quality costs are projected to continue this trend, reaching \$23 billion by the year 2000. The estimates of private costs for new regulations (\$565 million in the year 2000) do not include the costs of complying with new requirements for the control of toxic discharges and expanded pretreatment requirements that are expected to be implemented within the next few years.

#### 4.1.2. Non-point Source

For purposes of this report, non-point source costs include public and private expenditures for water quality related conservation practices, highway erosion control, feedlot operations, and stormwater runoff. These costs are a very small component of current and projected future total water pollution control costs, but may eventually escalate well beyond the projections shown in the tables. This result is possible because non-point sources currently are the largest contributor to the water pollution problem and additional measures to control these sources may be initiated within the next few years.

##### 4.1.2.1. EPA

Due to lack of data, no estimates of EPA expenditures directed to non-point source pollution control are provided.

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<sup>3</sup> Apogee Research, Inc., *The Nation's Public Works: Report of Wastewater Management*, prepared for the National Council on Public Works Improvements, May 1987.

#### 4.1.2.2. Non-EPA Federal

The non-EPA Federal costs shown in Table 4-1 are primarily for U.S. Department of Agriculture (USDA) programs involving construction and maintenance of erosion control structures. These programs, which are implemented through the Soil and Conservation Service and the Agricultural Stabilization and Conservation Service, provide capital grants to help finance erosion control practices, provide research funding for the development of new control technologies and best management practices designed to reduce erosion rates on farmland, and provide technical assistance to farmers implementing erosion control measures.

Rather than attribute all costs for erosion control practices to non-point source water pollution control in this report, information from the USDA on the proportion of their program costs targeted explicitly for water quality programs in 1986, the only year for which this data was broken out, was used to calculate the share of erosion control costs directed to water pollution control in years 1972-1986. The resulting estimates show that total capital costs for non-point source control have remained fairly stable since 1972, at around \$70 million per year. Operating costs have also remained stable at just over \$70 million per year.

#### 4.1.2.3. State and Local Government

State and local expenditures for non-point source pollution control include the costs of reducing the risks of erosion run-off due to new highway construction and the costs of supporting administrative programs.

As with the non-EPA Federal cost estimates, state and local funding for agricultural erosion control programs are not entirely for water quality maintenance. Therefore, only a portion of these costs were attributed to water quality programs. All state and local highway erosion control costs were counted as water quality control efforts, however.

State and for local costs for capital construction have generally run around \$50 million per year. Operating costs have been higher, averaging close to \$200 million per year. The majority of these costs are for maintaining highway erosion control measures. Both capital and operating costs remained relatively constant from 1972 to 1986.

#### 4.1.2.4. Private

Private expenditures for non-point source pollution control are primarily for agricultural erosion control and feedlot run-off control efforts. Private farms are required to match a small portion of Federal and state grant assistance for erosion control. As with public funding for agricultural erosion control, only a portion of these private expenditures were attributed to non-point source pollution control efforts.

Capital expenditures by private operators of farms and feedlots remained relatively stable over the period 1972-1986, averaging around \$70 million per year. Operating expenses have also been stable, averaging \$25 million per year.

#### *4.1.3. Groundwater Protection*

Since 1984, EPA has spent \$35 million to assist states in building the institutional capacity to develop groundwater protection programs. These expenditures are for program organization, state regulatory development, education, and data management. The states have also contributed funds to these activities. Currently, no expenditures are being incurred by local communities or the private sector under this Clean Water Act Program. The costs of developing state groundwater and wellhead protection programs are discussed in Section 4.3.

Many other pollution control programs are directed in part to groundwater pollution control. It is not feasible to differentiate groundwater protection expenditures from broader measures of costs for these programs. Consequently, such costs are not included in this chapter. Nevertheless, it should be recognized that prevention of groundwater contamination is a major benefit of pollution control expenditures associated with several EPA regulatory programs. For example, costs presented in Chapter 5 relating to hazardous wastes corrective action under RCRA and Superfund have a major focus on the prevention and mitigation of groundwater contamination. Other RCRA rules discussed in Chapter 5, such as those involving restrictions on the disposal of hazardous wastes on land and in underground injection wells, as well as technical standards for underground storage tanks and solid waste disposal facilities, have a significant groundwater protection component. Programs to register and control the use of pesticides and toxic substances, which are discussed in Chapter 6, also afford some protection of groundwaters.

## 4.2. TOTAL WATER QUALITY

On an annualized basis, total water quality costs have increased substantially over time, from just over \$9 billion in 1972 to an estimated \$32.3 billion in 1987. This trend is projected to continue into the future, with total annualized costs reaching \$56 billion by the year 2000. These costs are driven primarily by private spending for the control of industrial effluent discharges and the pretreatment of wastewater, and by local government spending for the construction and operation of sewerage and wastewater treatment facilities. Even with relatively large projected expenditures for municipal wastewater treatment over the coming years, however, significantly more expenditures would be needed to eliminate existing and projected future wastewater treatment needs by the year 2000.

## 4.3. DRINKING WATER

The nation's drinking water program derives from the 1974 Safe Drinking Water Act (SDWA) as amended in 1986. The Act directs EPA to establish "Maximum Contaminant Levels" or treatment requirements to ensure that public drinking water supplies do not pose unreasonable health risks. Interim regulations addressing microbiological contaminants, inorganics, radionuclides, a few pesticides, and the formation of trihalomethanes were promulgated by EPA in the 1970s and early

1980s. The 1986 SDWA amendments require EPA to promulgate standards for 83 contaminants, and to establish new regulations addressing surface water filtration and mandatory disinfection for all water supplies. These new regulations are currently being developed and implemented.

Implementation of the SDWA requirements involves a close Federal/state partnership whereby states assume a primacy role for implementing and enforcing Federal standards. The states also incur some costs for compliance with regulatory requirements, although most compliance costs are incurred by local government and private water supply systems.

As discussed in Chapter 1, only costs associated with improving environmental quality are included in this report. Thus, only the costs for drinking water treatment are shown in the tables.<sup>4</sup> Separate line items are provided to show total treatment costs and treatment costs pursuant to Federal mandates. The estimates were derived from a number of studies that estimated this “quality” component of total drinking water costs. (These studies are discussed in Appendix F.)

#### *4.3.1. EPA*

Federal program expenditures for the SDWA were between \$70 and \$80 million per year over the first half of the 1980s. In recent years they have been approximately \$100 million per year. The increase is due mainly to expanded requirements imposed by the SDWA 1986 Amendments. Further increases will be necessary to fully implement the SDWA mandate. EPA costs are projected to reach \$143 million in 1995 and \$169 million by the year 2000.

#### *4.3.2. State Government*

State governments incur costs for implementation of drinking water programs as well as relatively low costs for compliance with applicable standards. Current expenditures for regulatory program implementation are approximately \$95 million per year. State implementation expenditures are expected to increase as more Federal standards are promulgated. State compliance expenditures account for less than one percent of total state and local expenditures, however. This reflects that government water supplies are mostly owned and operated at the local level.

State costs are expected to increase in future years, reaching \$150 million in 1995 and \$185 million by the year 2000. These increases are driven in part by state efforts to develop and implement wellhead protection programs directed towards protecting groundwaters used by public water systems.

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<sup>4</sup> It should be noted that the bulk of expenditures made by water suppliers are unrelated to compliance with EPA contaminant limits or other measures to improve drinking water quality. Most drinking water costs are associated with supplying water to users, including expenditures for water acquisition, transport, and distribution. These are not included in this report, however.

#### *4.3.3. Local Government*

The bulk of all expenditures for treatment of drinking water supplies are incurred by local governments, the primary supplier of drinking water. Local government costs for water treatment increased steadily over time, from over \$600 million in 1972 to \$1.5 billion in 1980, and \$2.4 billion in 1987. Only about \$200 million of year 1987 costs were pursuant to Federal mandates, however, and none prior to 1979. Local government costs are expected to increase steadily in the coming years as new Federal regulations are promulgated and expanding populations increase the total demand for treated drinking water. New regulations pursuant to the 1986 SDWA amendments are expected to cost an additional \$1.8 billion in local government costs by the year 2000. Total costs for local drinking water treatment are projected to reach \$4 billion in 1995, and \$5 billion by the year 2000. Federally-mandated costs are estimated to account for approximately 28 percent of year 1995 costs and 35 percent of total costs by the year 2000.

#### *4.3.4. Private*

The private sector is also a significant supplier of treated drinking water supplies. Private costs for the treatment of drinking water were an estimated \$540 million in 1987. Future private costs are projected to reach \$1.1 billion by the year 2000.

#### *4.3.5. Total Drinking Water Costs*

Total annualized costs associated with the treatment of drinking water supplies increased steadily over time, from a little more than \$800 million in 1972 to \$3.1 billion in 1987. Local governments accounted for approximately 78 percent of these costs, and the private sector, 17 percent. Only a very small percentage of total drinking water treatment costs incurred in recent years were pursuant to Federally-mandated standards, however, and none prior to 1979. In 1987, the estimated costs associated with Federal standards were approximately \$200 million, or less than seven percent of total costs for drinking water treatment. Costs for Federal requirements are expected to increase dramatically in the next several years as new rules pursuant to the SDWA amendments of 1986 are implemented. Annualized costs due to Federal requirements are projected to reach \$1.4 billion by 1995 and \$2.2 billion by the year 2000. Most of these costs will be borne by local governments. Federally-mandated costs would represent approximately 27 percent of the estimated \$5.3 billion in total drinking water costs in 1995, and 34 percent of the estimated \$6.5 billion in total costs in the year 2000.

### 4.4. TOTAL WATER POLLUTION CONTROL COSTS

On an annualized basis, total water pollution control costs increased steadily over time, from about \$9.9 billion in 1972 to \$37.5 billion in 1987. Costs associated with point source control accounted for over 90 percent of these expenditures. Most of the historical point source control costs are due to local expenditures for sewerage services and wastewater treatment, and to private expenditures for the control of industrial effluents and the pretreatment of wastewater discharges to treatment facilities. Future costs are expected to increase significantly, reaching a projected \$58 bil-

lion by the year 2000. These future costs are also driven primarily by point source control expenditures by local governments and the private sector. Moreover, if the costs associated with fulfilling the nation's current and projected future wastewater treatment needs are included, total costs would reach \$64 billion by the year 2000. If only future costs associated with Federally-mandated programs are considered, however, then projected total costs drop slightly to approximately \$60 billion in 2000. This difference is accounted for by non-Federally-driven costs for the treatment of drinking water.

## Environmental Investments

Table 4-1: WATER POLLUTION CONTROL CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	1,044	1,607	3,312	3,906	4,589	6,209	5,067	5,349	5,734	4,755	4,413	3,316	2,828	2,950	3,113
	Non-EPA Federal			375	486	405	364	390	407	284	191	192	344	377	563	479
	State Government	261	258	291	296	307	370	403	430	435	424	357	287	355	395	405
	Local Government	4,056	2,861	2,181	1,869	926	664	955	1,164	1,761	1,935	2,020	2,728	2,406	2,085	2,675
	Private	7,091	7,759	6,763	6,925	7,572	7,731	7,827	7,514	6,574	5,670	5,442	5,425	5,838	5,783	5,781
	Total Point Source	12,452	12,486	12,922	13,482	13,799	15,338	14,642	14,865	14,787	12,975	12,423	12,101	11,803	11,776	12,453
	Federally Mandated	12,452	12,486	12,922	13,482	13,799	15,338	14,642	14,865	14,787	12,975	12,423	12,101	11,803	11,776	12,453
4.1.2	Non-Point Source															
	Existing Regulations															
	EPA															
	Non-EPA Federal	75	80	58	66	73	81	77	61	64	67	69	71	66	71	54
	State Government	60	55	48	52	51	44	39	41	43	41	46	44	47	46	47
	Local Government	60	60	59	59	60	61	60	59	59	59	60	60	59	60	58
	Private	75	79	65	71	76	82	77	64	67	67	69	70	66	71	54
4.2	Total Water Quality	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,090	15,020	13,211	12,666	12,345	12,043	12,023	12,666
	Federally Mandated	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,090	15,020	13,211	12,666	12,345	12,043	12,023	12,666
4.3	Drinking Water															
	EPA															
	Non-EPA Federal															
	State Government						4	25	63	83	60	58	47	23	27	31
	Local Government	602	630	709	749	731	662	654	749	816	817	783	725	728	855	997
	Private	135	141	159	168	164	148	146	168	183	183	175	162	163	191	223
	Total Drinking Water	736	772	868	917	895	814	825	979	1,081	1,060	1,016	935	915	1,073	1,251
	Federally Mandated								40	40	40	40	40	40	40	40
4.4	Total Water Costs	13,457	13,533	14,019	14,647	14,953	16,420	15,720	16,070	16,101	14,270	13,682	13,280	12,958	13,096	13,917
	Federally Mandated	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,130	15,060	13,251	12,706	12,385	12,083	12,063	12,706

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Footnotes to Table 4-1

WATER QUALITY COSTS

POINT SOURCE

EPA: From annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays).

Non-EPA Federal: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

State Government: From Appendix F, Table F-7. See Appendix F for detail.

Local Government: From Appendix F, Table F-7. See Appendix F for detail.

Private: From Appendix F, Table F-7. See Appendix F for detail.

Point Source Existing Federally Mandated: Assumed to be 100 percent of point source water quality capital costs.

Total Point Source Federally Mandated: Assumed to be 100 percent of total point source water quality capital costs.

NON-POINT SOURCE WATER QUALITY COSTS: Figures estimated on the basis of the regulations and sources listed in Appendix E.

Non-Point Source Existing Federally Mandated: Assumed to be 100 percent of non-point source water quality capital costs.

Total Non-Point Source Federally Mandated: Assumed to be 100 percent of total non-point water quality capital costs.

Total Water Quality Federally Mandated: Assumed to be 100 percent of total water quality capital costs.

DRINKING WATER

EPA: Assumed to be zero; EPA drinking water costs are assumed to be operating costs.

State Government: From Appendix F, Table F-12. See Appendix F for detail.

Local Government: From Appendix F, Table F-12. See Appendix F for detail.

Private: From Appendix F, Table F-12. See Appendix F for detail.

Existing Federally Mandated: For years 1972-78, figures represent 0 percent of capital outlays for existing pollution control regulations. For years 1979-86, figures estimated on basis of the regulations and sources listed in Appendix F, Table F-5.

Total Federally Mandated: Figures represent the sum of total outlays associated with regulations for drinking water pollution control.

Costs of Water Pollution Control

Table 4-1A: WATER POLLUTION CONTROL CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	3,113	2,831	2,271	2,038	1,971	1,879	1,395	898	434						
	Non-EPA Federal	479	616	690	764	838	912	986	1,060	1,133	1,207	1,281	1,355	1,429	1,503	1,577
	State Government	405	431	452	463	474	484	495	506	516	527	537	548	559	569	580
	Local Government	2,675	3,173	2,229	2,246	2,262	2,278	2,294	2,310	2,327	2,343	2,359	2,375	2,392	2,408	2,424
	Private	5,781	5,854	5,363	5,217	5,072	4,927	4,782	4,637	4,491	4,346	4,201	4,056	3,911	3,765	3,620
	Total Existing Regs	12,453	12,905	11,005	10,728	10,616	10,480	9,951	9,410	8,902	8,423	8,379	8,335	8,290	8,246	8,201
	Federally Mandated	12,453	12,905	11,005	10,728	10,616	10,480	9,951	9,410	8,902	8,423	8,379	8,335	8,290	8,246	8,201
	New Regulations															
	Local Government					19	19	116								
	Private			314	314	314										
	Total New Regs			314	314	333	19	116								
	Full Implementation					1,757	1,822	2,281	2,751	3,189	3,597	3,571	3,545	3,519	3,493	3,467
	Total Point Source	12,453	12,905	11,319	11,042	12,706	12,322	12,348	12,162	12,091	12,021	11,950	11,880	11,809	11,738	11,668
	Federally Mandated	12,453	12,905	11,319	11,042	12,706	12,322	12,348	12,162	12,091	12,021	11,950	11,880	11,809	11,738	11,668
4.1.2	Non-Point Source															
	Existing Regulations															
	Non-EPA Federal	54	63	63	62	61	61	60	59	58	58	57	56	56	55	54
	State Government	47	41	40	40	39	38	38	37	36	35	35	34	33	33	32
	Local Government	58	59	59	59	59	59	59	59	59	59	59	58	58	58	58
	Private	54	63	62	61	60	59	58	58	57	56	55	54	53	52	51
	Total Existing Regs	213	227	224	222	219	217	215	212	210	208	205	203	200	198	196
	Federally Mandated	213	227	224	222	219	217	215	212	210	208	205	203	200	198	196
	Total Non-Point Source	213	227	224	222	219	217	215	212	210	208	205	203	200	198	196
	Federally Mandated	213	227	224	222	219	217	215	212	210	208	205	203	200	198	196
4.2	Total Water Quality	12,666	13,132	11,543	11,264	12,926	12,539	12,563	12,374	12,301	12,228	12,155	12,082	12,009	11,937	11,864
	Federally Mandated	12,666	13,132	11,543	11,264	12,926	12,539	12,563	12,374	12,301	12,228	12,155	12,082	12,009	11,937	11,864
4.3	Drinking Water															
	Existing Regulations															
	State Government	31	18	51	54	57	60	63	66	68	71	74	77	80	83	85
	Local Government	997	982	897	896	912	928	944	960	977	993	1,009	1,025	1,041	1,057	1,066
	Private	223	220	201	201	204	208	211	215	219	222	226	230	233	237	239
	Total Existing Regs	1,251	1,220	1,149	1,150	1,173	1,196	1,218	1,241	1,264	1,286	1,309	1,332	1,354	1,377	1,390
	Federally Mandated	40	40	40												
	New Regulations															
	Local Government			29	59	65	310	707	960	1,128	1,380	1,460	1,109	522	184	184
	Private			7	13	15	69	158	215	253	309	327	249	117	41	41
	Total New Regs			36	73	80	379	865	1,175	1,381	1,690	1,787	1,358	639	225	225
	Total Drinking Water	1,251	1,220	1,185	1,223	1,253	1,575	2,083	2,416	2,645	2,976	3,096	2,690	1,993	1,602	1,615
	Federally Mandated	40	40	76	73	80	379	865	1,175	1,381	1,690	1,787	1,358	639	225	225
4.4	Total Water Costs	13,917	14,352	12,728	12,487	14,179	14,113	14,646	14,790	14,946	15,204	15,251	14,772	14,002	13,539	13,479
	Federally Mandated	12,706	13,172	11,619	11,336	13,006	12,918	13,428	13,549	13,682	13,918	13,942	13,440	12,648	12,162	12,089

## Footnotes to Table 4-1A

## WATER QUALITY COSTS

## POINT SOURCE

EPA: Figures for 1986-1988 represent Outlays from annual Justification of Appropriation Estimates for Committee on Appropriations. Allocations of Construction Grant funds under Title II of the Clean Water Act end in 1990. Allocations to states by EPA under Title VI (State Revolving Funds) begin in 1989 and end in 1994. Figures for 1989 and 1990 represent 50% Title II expenditures and 50% Title VI expenditures. Figures for 1991-1994 are Title VI expenditures only. Projections for 1995-2000 cannot be made based on current trends.

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing State Government: 1986 and 1987 data from Appendix F, Table F-7. State expenditures will continue through 2000; however, each state will determine the amount it will give to local governments. Linear projection of expenditures for 1988-2000 based on historical data for the years 1978-1987.

Existing Local Government: 1986 and 1987 data from Appendix F, Table F-7. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Private: 1986 and 1987 figures from Appendix F, Table F-7. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Point Source Existing Federally Mandated: Assumed to be 100 percent of point source water quality capital costs.

New Local Government Water Quality: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private Water Quality: Estimated on the basis of the regulations and sources listed in Appendix A.

Full Implementation: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Point Source Federally Mandated: Assumed to be 100 percent of total point source water quality capital costs.

NON-POINT SOURCE WATER QUALITY COSTS: 1986 figure estimated on basis of regulations and sources presented in Appendix E; linear projection of expenditures for 1987-2000 based on historical data for the years 1972-1986.

Non-Point Source Existing Federally Mandated: Assumed to be 100 percent of total non-point source water quality capital costs.

Total Water Quality Federally Mandated: Assumed to be 100 percent of total water quality capital costs.

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DRINKING WATER

EPA: Assumed to be zero; EPA drinking water costs are assumed to be operating costs.

State Government: 1986 and 1987 From Appendix F, Table F-12. See Appendix F for detail. Linear projection of expenditures for 1988-2000 based on data for the years 1972-1987.

Local Government: 1986 and 1987 from Appendix F, Table F-12. See Appendix F for detail. Linear projection of expenditures for 1988-2000 based on data for the years 1972-1987.

Private: 1986 and 1987 figures from Appendix F, Table F-12. See Appendix F for detail. Linear projection of expenditures for 1988-2000 based on data for the years 1972-1987.

Existing Federally Mandated: For the years 1989-2000, figures represent 0 percent of the capital outlays for existing pollution control. For 1986-1988, figures are estimated on basis of regulations and sources presented in Appendix F, Table F-5.

New Local Government Drinking Water: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private Drinking Water: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Figures represent the sum of total capital outlays associated with total existing regulations and total new regulations.

Table 4-2: WATER POLLUTION CONTROL OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	321	327	582	361	499	477	447	403	478	420	369	313	250	245	226
	Non-EPA Federal			247	284	299	271	289	283	293	256	301	311	282	309	381
	State Government	938	903	910	981	1,015	1,019	1,001	994	1,057	1,093	1,012	979	1,025	1,102	1,189
	Local Government	2,944	3,120	3,455	3,828	4,172	4,395	4,541	4,760	5,088	5,568	6,011	6,299	6,472	6,737	7,211
	Private	3,337	3,665	3,656	3,814	4,278	4,678	4,903	5,223	5,145	5,222	5,012	5,591	5,892	6,236	6,627
	Total Point Source	7,540	8,015	8,850	9,268	10,263	10,841	11,181	11,663	12,061	12,559	12,704	13,494	13,920	14,630	15,634
	Federally Mandated	7,540	8,015	8,850	9,268	10,263	10,841	11,181	11,663	12,061	12,559	12,704	13,494	13,920	14,630	15,634
4.1.2	Non-Point Source															
	Existing Regulations															
	EPA															
	Non-EPA Federal	81	86	62	70	79	87	81	66	68	74	75	77	73	76	58
	State Government	220	200	176	191	183	153	134	149	152	148	165	156	171	163	173
	Local Government	220	220	219	219	220	220	220	219	219	219	219	220	219	220	218
	Private	24	26	22	24	27	29	28	24	25	26	28	30	29	31	25
4.2	Total Water Quality	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,121	12,526	13,026	13,191	13,976	14,413	15,119	16,109
	Federally Mandated	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,121	12,526	13,026	13,191	13,976	14,413	15,119	16,109
4.3	Dri nki ng Water															
	EPA	10	9	11	10	19	51	67	85	91	108	95	94	86	87	86
	Non-EPA Federal															
	State Government						10	18	18	23	30	33	33	30	32	42
	Local Government	590	598	623	665	719	750	808	879	918	993	1,053	1,074	1,107	1,168	1,239
	Private	132	134	140	149	161	168	181	197	206	222	236	241	248	262	277
	Total Dri nki ng Water	732	741	774	824	899	979	1,073	1,180	1,238	1,353	1,417	1,442	1,471	1,549	1,645
	Federally Mandated							167	167	167	167	167	167	167	167	167
4.4	Total Water Costs	8,817	9,288	10,102	10,596	11,672	12,309	12,717	13,301	13,764	14,379	14,608	15,419	15,884	16,668	17,753
	Federally Mandated	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,288	12,693	13,193	13,358	14,143	14,580	15,286	16,276

Footnotes to Table 4-2

WATER QUALITY COSTS

POINT SOURCE

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays).

Non-EPA Federal: 1981-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

State Government: From Appendix F, Table F-7. See Appendix F for detail.

Local Government: From Appendix F, Table F-7. See Appendix F for detail.

Private: From Appendix F, Table F-7. See Appendix F for detail.

Point Source Existing Federally Mandated: Assumed to be 100 percent of point source water quality operating costs.

Total Point Source Federally Mandated: Assumed to be 100 percent of total point source water quality operating costs.

NON-POINT SOURCE WATER QUALITY COSTS: Figures estimated on the basis of the regulations and sources listed in Appendix E.

Non-Point Source Existing Federally Mandated: Assumed to be 100 percent of non-point source water quality operating costs.

Total Non-Point Source Federally Mandated: Assumed to be 100 percent of total non-point source water quality operating costs.

Total Water Quality Federally Mandated: Assumed to be 100 percent of total water quality operating costs.

DRINKING WATER

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays).

State Government: From Appendix F, Table F-12. See Appendix F for detail.

Local Government: From Appendix F, Table F-12. See Appendix F for detail.

Private: From Appendix F, Table F-12. See Appendix F for detail.

Existing Federally Mandated: For the years 1972-1978, figures represent 0 percent of the outlays for existing pollution control regulations. For 1979-86, figures estimated on basis of regulations and sources listed in Appendix F, Table F-5.

Total Federally Mandated: Figures represent the sum of total operating outlays for regulations associated with water pollution control.

Costs of Water Pollution Control

Table 4-2A: WATER POLLUTION CONTROL OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	226	232	242	235	278	288	222	210	198	186	174	162	150	137	125
	Non-EPA Federal	381	369	386	404	422	440	457	475	493	510	528	546	564	581	599
	State Government	1,189	1,210	1,156	1,172	1,187	1,202	1,217	1,233	1,248	1,263	1,278	1,294	1,309	1,324	1,339
	Local Government	7,211	7,450	7,716	8,021	8,325	8,630	8,934	9,239	9,543	9,848	10,152	10,457	10,761	11,066	11,370
	Private	6,627	7,360	7,011	7,243	7,474	7,706	7,938	8,170	8,402	8,634	8,866	9,097	9,329	9,561	9,793
	Total Existing Regs	15,634	16,621	16,512	17,074	17,686	18,266	18,769	19,326	19,884	20,441	20,998	21,555	22,112	22,669	23,227
	Federally Mandated	15,634	16,621	16,512	17,074	17,686	18,266	18,769	19,326	19,884	20,441	20,998	21,555	22,112	22,669	23,227
	New Regulations															
	Local Government			2	5	17	30	40	73	73	73	73	73	73	73	73
	Private				137	274	489	489	489	489	489	489	489	489	489	489
	Total New Regs			2	142	291	519	529	562	562	562	562	562	562	562	562
	Full Implementation					176	358	586	861	1,180	1,540	1,897	2,251	2,603	2,953	3,299
	Total Point Source	15,634	16,621	16,514	17,216	18,153	19,143	19,884	20,750	21,626	22,543	23,457	24,369	25,278	26,184	27,088
	Federally Mandated	15,634	16,621	16,514	17,216	18,153	19,143	19,884	20,750	21,626	22,543	23,457	24,369	25,278	26,184	27,088
4.1.2	Non-Point Source															
	Existing Regulations															
	Non-EPA Federal	58	69	68	67	67	66	65	65	64	63	63	62	61	61	60
	State Government	173	147	145	142	139	136	134	131	128	126	123	120	118	115	112
	Local Government	218	219	219	219	219	219	219	219	219	219	218	218	218	218	218
	Private	25	29	29	30	30	30	31	31	31	32	32	32	33	33	33
	Total Existing Regs	475	464	461	458	455	452	449	446	442	439	436	433	430	427	424
	Federally Mandated	475	464	461	458	455	452	449	446	442	439	436	433	430	427	424
	Total Non-Point Source	475	464	461	458	455	452	449	446	442	439	436	433	430	427	424
	Federally Mandated	475	464	461	458	455	452	449	446	442	439	436	433	430	427	424
4.2	Total Water Quality	16,109	17,085	16,975	17,674	18,608	19,595	20,333	21,195	22,068	22,982	23,893	24,802	25,708	26,611	27,512
	Federally Mandated	16,109	17,085	16,975	17,674	18,608	19,595	20,333	21,195	22,068	22,982	23,893	24,802	25,708	26,611	27,512
4.3	Drinking Water															
	Existing Regulations															
	EPA	86	94	95	97	103	108	127	132	137	143	148	153	159	164	169
	State Government	42	23	42	45	48	51	54	56	59	62	65	68	70	73	76
	Local Government	1,239	1,261	1,195	1,159	1,194	1,230	1,265	1,301	1,336	1,372	1,407	1,442	1,478	1,513	1,531
	Private	277	283	268	260	268	275	283	291	299	307	315	323	331	339	343
	Total Existing Regs	1,645	1,661	1,600	1,560	1,613	1,664	1,729	1,780	1,832	1,883	1,935	1,986	2,038	2,090	2,119
	Federally Mandated	167	167	167												
	New Regulations															
	Local Government			73	146	146	260	424	474	565	717	779	808	934	1,029	1,029
	Private			16	33	33	58	95	106	126	161	174	181	209	230	230
	Total New Regs			89	178	179	319	519	580	691	878	953	990	1,143	1,259	1,259
	Total Drinking Water	1,645	1,661	1,689	1,738	1,792	1,982	2,248	2,360	2,523	2,761	2,888	2,976	3,181	3,349	3,379
	Federally Mandated	167	167	256	178	179	319	519	580	691	878	953	990	1,143	1,259	1,259
4.4	Total Water Costs	17,753	18,746	18,664	19,412	20,399	21,577	22,581	23,555	24,591	25,743	26,781	27,778	28,888	29,960	30,890
	Federally Mandated	16,276	17,252	17,231	17,852	18,786	19,913	20,852	21,775	22,759	23,860	24,846	25,791	26,850	27,870	28,771

## Footnotes to Table 4-2A

## WATER QUALITY COSTS

## POINT SOURCE

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on historical data for the years 1972-1990.

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing State Government: 1986 and 1987 data from Appendix F, Table F-7. Linear projection of expenditures for 1988-2000 based on historical data for the years 1978-1987.

Existing Local Government: 1986 and 1987 data from Appendix F, Table F-7. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Existing Private: 1986 and 1987 data from Appendix F, Table F-7. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Point Source Existing Federally Mandated: Assumed to be 100 percent of point source water quality operating costs.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Full Implementation: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Point Source Federally Mandated: Assumed to be 100 percent of total point source water quality operating costs.

NON-POINT SOURCE WATER QUALITY COSTS: 1986 figure estimated on basis of regulations and sources presented in Appendix E; linear projection of expenditures for 1987-2000 based on historical data for the years 1972-1986.

Non-Point Source Existing Federally Mandated: Assumed to be 100 percent of non-point source water quality operating costs.

Total Non-Point Source Federally Mandated: Assumed to be 100 percent of total non-point source water quality operating costs.

Total Water Quality Federally Mandated: Assumed to be 100 percent of total water quality operating costs.

DRINKING WATER

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on historical data for the years 1972-1990.

State Government: 1986 and 1987 figures from Appendix F, Table F-12. Linear projection of expenditures for 1988-2000 based on data for the years 1972-1987.

Existing Local Government: 1986 and 1987 figures from Appendix F, Table F-12. Linear projection of expenditures for 1988-2000 based on data for the years 1972-1987.

Existing Private: 1986 and 1987 figures from Appendix F, Table F-12. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Existing Federally Mandated: For the years 1989-2000, figures represent 0 percent of the total outlays for pollution control. For the years 1986-1988, figures are estimated on regulations and sources presented in Appendix F, Table F-5.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Figures represent the sum of total outlays associated with total existing regulations and total new regulations.

Table 4-3: WATER POLLUTION CONTROL COSTS ANNUALIZED AT 7 PERCENT  
(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	405	540	1,063	1,156	1,664	2,142	2,521	2,908	3,445	3,770	4,075	4,286	4,451	4,684	4,915
	Non-EPA Federal			277	353	401	402	452	479	511	490	550	588	589	662	772
	State Government	959	945	975	1,070	1,129	1,163	1,177	1,205	1,303	1,373	1,320	1,311	1,386	1,495	1,614
	Local Government	3,271	3,677	4,188	4,712	5,130	5,407	5,630	5,943	6,413	7,049	7,654	8,163	8,529	8,962	9,652
	Private	3,909	4,862	5,397	6,114	7,188	8,211	9,067	9,992	10,444	10,978	11,206	12,222	12,994	13,805	14,661
	Total Point Source	8,543	10,025	11,901	13,406	15,513	17,326	18,846	20,526	22,116	23,660	24,806	26,571	27,949	29,607	31,615
	Federally Mandated	8,543	10,025	11,901	13,406	15,513	17,326	18,846	20,526	22,116	23,660	24,806	26,571	27,949	29,607	31,615
4.1.2	Non-Point Source															
	Existing Regulations															
	EPA															
	Non-EPA Federal	87	98	79	92	107	121	123	112	119	130	137	145	146	155	142
	State Government	225	209	189	208	205	178	162	180	187	186	207	201	220	216	230
	Local Government	225	230	233	239	244	249	254	258	263	267	272	277	282	287	290
	Private	30	38	39	47	57	65	70	72	78	84	92	99	104	111	110
4.2	Total Water Quality	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,147	22,763	24,328	25,514	27,294	28,700	30,376	32,386
	Federally Mandated	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,147	22,763	24,328	25,514	27,294	28,700	30,376	32,386
4.3	Drinking Water															
	EPA	10	9	11	10	19	51	67	85	91	108	95	94	86	87	86
	Non-EPA Federal															
	State Government						10	21	27	40	52	61	65	64	69	82
	Local Government	647	714	807	919	1,042	1,136	1,255	1,397	1,512	1,665	1,799	1,888	1,990	2,131	2,296
	Private	145	160	181	206	233	254	281	313	339	373	403	423	446	477	514
	Total Drinking Water	802	883	998	1,135	1,294	1,451	1,623	1,823	1,982	2,198	2,357	2,471	2,586	2,765	2,979
	Federally Mandated								171	175	178	182	186	190	193	197
4.4	Total Water Costs	9,912	11,484	13,439	15,126	17,419	19,391	21,078	22,970	24,745	26,525	27,871	29,765	31,286	33,141	35,365
	Federally Mandated	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,318	22,938	24,506	25,696	27,480	28,890	30,569	32,583

## Footnotes to Table 4-3

Sum of operating costs for year in question, shown on corresponding lines of Table 4-2, plus amortized capital costs assuming an interest rate of 7 percent and a capital life of 30 years for water quality and 20 years for drinking water on the accumulated capital investment shown in Table 4-1 since 1972.

Costs of Water Pollution Control

Table 4-3A: WATER POLLUTION CONTROL COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	4,915	5,149	5,343	5,499	5,702	5,863	5,910	5,970	5,993	5,981	5,969	5,957	5,944	5,932	5,920
	Non-EPA Federal	4,772	4,810	4,883	4,962	5,048	5,139	5,236	5,339	5,448	5,563	5,684	5,811	5,944	6,083	6,227
	State Government	1,614	1,670	1,693	1,705	1,758	1,813	1,868	1,924	1,981	2,038	2,097	2,156	2,217	2,278	2,340
	Local Government	9,652	10,147	10,592	11,078	11,565	12,053	12,542	13,033	13,525	14,018	14,513	15,008	15,506	16,004	16,504
	Private	14,661	15,866	15,949	16,601	17,242	17,871	18,488	19,093	19,687	20,269	20,840	21,398	21,945	22,481	23,004
	Total Existing Regs	31,615	33,642	34,419	35,846	37,314	38,738	40,043	41,359	42,633	43,869	45,102	46,331	47,556	48,777	49,996
	Federally Mandated	31,615	33,642	34,419	35,846	37,314	38,738	40,043	41,359	42,633	43,869	45,102	46,331	47,556	48,777	49,996
	New Regulations															
	Local Government			2	5	19	33	52	85	85	85	85	85	85	85	85
	Private			25	188	350	565	565	565	565	565	565	565	565	565	565
	Total New Regs			27	193	368	598	617	650	650	650	650	650	650	650	650
	Full Implementation					317	646	1,058	1,555	2,131	2,781	3,426	4,066	4,701	5,332	5,958
	Total Point Source	31,615	33,642	34,447	36,038	38,000	39,982	41,719	43,564	45,415	47,300	49,178	51,047	52,907	54,760	56,604
	Federally Mandated	31,615	33,642	34,447	36,038	38,000	39,982	41,719	43,564	45,415	47,300	49,178	51,047	52,907	54,760	56,604
4.1.2	Non-Point Source															
	Existing Regulations															
	Non-EPA Federal	142	157	162	166	170	174	179	183	187	191	195	198	202	206	210
	State Government	230	207	208	208	209	209	210	210	210	210	210	210	210	210	210
	Local Government	290	296	300	305	310	315	319	324	329	333	338	343	347	352	356
	Private	110	119	124	129	135	140	145	150	155	159	164	169	173	178	182
	Total Existing Regs	771	779	794	809	823	838	852	866	880	893	907	920	933	946	959
	Federally Mandated	771	779	794	809	823	838	852	866	880	893	907	920	933	946	959
	Total Non-Point Source	771	779	794	809	823	838	852	866	880	893	907	920	933	946	959
	Federally Mandated	771	779	794	809	823	838	852	866	880	893	907	920	933	946	959
4.2	Total Water Quality	32,386	34,421	35,241	36,847	38,823	40,820	42,571	44,430	46,295	48,194	50,085	51,967	53,840	55,706	57,563
	Federally Mandated	32,386	34,421	35,241	36,847	38,823	40,820	42,571	44,430	46,295	48,194	50,085	51,967	53,840	55,706	57,563
4.3	Drinking Water															
	Existing Regulations															
	EPA	86	94	95	97	103	108	127	132	137	143	148	153	159	164	169
	State Government	82	65	89	97	105	113	122	131	140	150	160	169	177	182	185
	Local Government	2,296	2,412	2,430	2,479	2,600	2,723	2,791	2,857	2,918	2,976	3,038	3,108	3,180	3,244	3,286
	Private	514	540	544	555	582	610	625	640	654	667	681	696	712	727	736
	Total Existing Regs	2,979	3,111	3,158	3,227	3,390	3,554	3,665	3,760	3,849	3,936	4,026	4,127	4,228	4,317	4,376
	Federally Mandated	197	201	205	38	38	38	38	38	38	38	38	38	38	34	30
	New Regulations															
	Local Government			76	154	161	304	535	675	872	1,155	1,354	1,489	1,663	1,776	1,793
	Private			17	34	36	68	120	151	195	259	303	333	373	398	402
	Total New Regs			92	188	196	372	654	826	1,068	1,414	1,658	1,822	2,036	2,174	2,195
	Total Drinking Water	2,979	3,111	3,250	3,415	3,587	3,926	4,319	4,586	4,917	5,350	5,684	5,949	6,264	6,491	6,571
	Federally Mandated	197	201	297	3,226	3,234	3,410	4,692	4,864	1,105	1,452	1,696	1,860	2,074	2,208	2,225
4.4	Total Water Costs	35,365	37,531	38,491	40,262	42,410	44,746	46,890	49,017	51,212	53,543	55,769	57,916	60,104	62,197	64,134
	Federally Mandated	32,583	34,622	35,538	37,073	39,057	41,230	43,263	45,294	47,400	49,645	51,780	53,827	55,914	57,913	59,788

## Footnotes to Table 4-3A

Sum of operating costs for year in question, shown on corresponding lines of Table 4-2A, plus amortized capital costs assuming an interest rate of 7 percent and a capital life of 30 years for water quality and 20 years for drinking water on the accumulated capital investment shown in Tables 4-1 and 4-1A since 1972.

Table 4-3B: WATER POLLUTION CONTROL COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	374	462	886	864	1,236	1,531	1,760	1,989	2,356	2,541	2,715	2,829	2,910	3,055	3,195
	Non-EPA Federal			266	328	364	354	392	407	431	404	459	486	477	532	629
	State Government	951	930	951	1,038	1,087	1,110	1,112	1,128	1,213	1,270	1,207	1,189	1,253	1,351	1,458
	Local Government	3,151	3,473	3,919	4,387	4,779	5,036	5,231	5,509	5,927	6,505	7,052	7,479	7,774	8,146	8,756
	Private	3,699	4,423	4,758	5,271	6,121	6,915	7,539	8,242	8,500	8,866	8,934	9,789	10,388	11,028	11,713
	Total Point Source	8,175	9,288	10,782	11,888	13,587	14,947	16,034	17,274	18,427	19,587	20,366	21,773	22,802	24,112	25,751
	Federally Mandated	8,175	9,288	10,782	11,888	13,587	14,947	16,034	17,274	18,427	19,587	20,366	21,773	22,802	24,112	25,751
4.1.2	Non-Point Source															
	Existing Regulations															
	EPA															
	Non-EPA Federal	85	94	73	84	97	109	107	95	100	109	114	120	119	126	111
	State Government	223	206	184	202	197	169	151	168	175	172	192	185	202	196	209
	Local Government	223	226	228	232	235	239	241	243	247	250	253	256	259	262	264
	Private	28	33	33	38	46	52	55	54	59	63	68	73	76	82	79
4.2	Total Water Quality	8,734	9,847	11,299	12,443	14,161	15,515	16,589	17,835	19,007	20,181	20,993	22,408	23,458	24,778	26,414
	Federally Mandated	8,734	9,847	11,299	12,443	14,161	15,515	16,589	17,835	19,007	20,181	20,993	22,408	23,458	24,778	26,414
4.3	Drinking Water															
	EPA	10	9	11	10	19	51	67	85	91	108	95	94	86	87	86
	Non-EPA Federal															
	State Government						10	20	25	35	46	53	56	54	58	71
	Local Government	630	680	754	846	949	1,025	1,126	1,248	1,341	1,472	1,584	1,654	1,735	1,854	1,992
	Private	141	152	169	190	213	230	252	280	300	330	355	370	389	415	446
	Total Drinking Water	782	842	933	1,046	1,181	1,315	1,465	1,638	1,768	1,955	2,087	2,175	2,265	2,415	2,595
	Federally Mandated							170	172	175	178	180	183	186	189	
4.4	Total Water Costs	9,516	10,689	12,233	13,489	15,342	16,830	18,054	19,473	20,775	22,136	23,079	24,582	25,723	27,193	29,009
	Federally Mandated	8,734	9,847	11,299	12,443	14,161	15,515	16,589	18,005	19,179	20,356	21,171	22,588	23,641	24,964	26,602

Footnotes to Table 4-3B

Sum of operating costs for year in question, shown on corresponding lines of Table 4-2, plus amortized capital costs assuming an interest rate of 3 percent and a capital life of 30 years for water quality and 20 years for drinking water on the accumulated capital investment shown in Table 4-1 since 1972.

## Environmental Investments

Table 4-3C: WATER POLLUTION CONTROL COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	3,195	3,345	3,471	3,568	3,712	3,818	3,823	3,857	3,867	3,855	3,843	3,830	3,818	3,806	3,794
	Non-EPA Federal	629	648	701	758	818	882	950	1,022	1,098	1,177	1,260	1,347	1,437	1,532	1,630
	State Government	1,458	1,501	1,471	1,509	1,549	1,589	1,629	1,712	1,712	1,754	1,797	1,840	1,884	1,928	1,973
	Local Government	8,756	9,157	9,537	9,956	10,376	10,797	11,218	11,641	12,064	12,488	12,913	13,338	13,765	14,192	14,620
	Private	11,713	12,745	12,669	13,167	13,658	14,141	14,617	15,085	15,547	16,000	16,446	16,885	17,316	17,740	18,157
	Total Existing Regs	25,751	27,397	27,849	28,958	30,112	31,227	32,238	33,275	34,287	35,273	36,258	37,240	38,221	39,198	40,174
	Federally Mandated	25,751	27,397	27,849	28,958	30,112	31,227	32,238	33,275	34,287	35,273	36,258	37,240	38,221	39,198	40,174
	New Regulations															
	Local Government			2	5	18	32	48	81	81	81	81	81	81	81	81
	Private			16	169	322	537	537	537	537	537	537	537	537	537	537
	Total New Regs			18	174	340	569	585	618	618	618	618	618	618	618	618
	Full Implementation					265	541	885	1,301	1,782	2,325	2,865	3,400	3,931	4,459	4,983
	Total Point Source	25,751	27,397	27,867	29,132	30,718	32,336	33,708	35,194	36,687	38,217	39,741	41,258	42,770	44,275	45,774
	Federally Mandated	25,751	27,397	27,867	29,132	30,718	32,336	33,708	35,194	36,687	38,217	39,741	41,258	42,770	44,275	45,774
4.1.2	Non-Point Source															
	Existing Regulations															
	Non-EPA Federal	111	125	127	130	132	135	137	139	142	144	146	148	151	153	155
	State Government	209	185	185	184	183	183	182	181	180	179	178	177	176	175	174
	Local Government	264	268	271	274	276	279	282	285	288	291	294	297	300	303	306
	Private	79	86	89	93	96	100	103	106	109	113	116	119	122	125	128
	Total Existing Regs	663	664	672	680	688	696	704	712	719	727	734	741	749	756	762
	Federally Mandated	663	664	672	680	688	696	704	712	719	727	734	741	749	756	762
	Total Non-Point Source	663	664	672	680	688	696	704	712	719	727	734	741	749	756	762
	Federally Mandated	663	664	672	680	688	696	704	712	719	727	734	741	749	756	762
4.2	Total Water Quality	26,414	28,060	28,539	29,812	31,406	33,032	34,412	35,905	37,406	38,944	40,475	42,000	43,519	45,031	46,537
	Federally Mandated	26,414	28,060	28,539	29,812	31,406	33,032	34,412	35,905	37,406	38,944	40,475	42,000	43,519	45,031	46,537
4.3	Drinking Water															
	Existing Regulations															
	EPA	86	94	95	97	103	108	127	132	137	143	148	153	159	164	169
	State Government	71	53	75	82	88	95	102	110	117	125	132	140	147	151	154
	Local Government	1,992	2,081	2,074	2,099	2,195	2,293	2,352	2,409	2,463	2,514	2,569	2,628	2,690	2,746	2,781
	Private	446	466	465	470	492	514	527	540	552	563	575	589	602	615	623
	Total Existing Regs	2,595	2,693	2,709	2,747	2,879	3,010	3,107	3,190	3,268	3,345	3,424	3,510	3,598	3,676	3,726
	Federally Mandated	189	191	194	27	27	27	27	27	27	27	27	27	27	24	22
	New Regulations															
	Local Government			75	151	156	292	503	617	784	1,029	1,189	1,293	1,453	1,561	1,573
	Private			17	34	35	65	113	138	176	230	266	290	325	350	352
	Total New Regs			91	185	191	357	615	755	959	1,260	1,455	1,583	1,779	1,910	1,926
	Total Drinking Water	2,595	2,693	2,801	2,932	3,070	3,367	3,723	3,945	4,228	4,604	4,879	5,093	5,376	5,586	5,652
	Federally Mandated	189	191	285	212	218	384	642	782	986	1,286	1,482	1,609	1,806	1,935	1,947
4.4	Total Water Costs	29,009	30,754	31,340	32,745	34,476	36,399	38,134	39,851	41,634	43,548	45,354	47,093	48,895	50,617	52,189
	Federally Mandated	26,602	28,251	28,824	30,025	31,624	33,416	35,054	36,687	38,392	40,230	41,957	43,609	45,324	46,965	48,484

November 1990

Footnotes to Table 4-3C

Sum of operating costs for year in question, shown on corresponding lines of Table 4-2A, plus amortized capital costs assuming an interest rate of 3 percent and a capital life of 30 years for water quality and 20 years for drinking water on the accumulated capital investment shown in Tables 4-1 and 4-1A since 1972.

Table 4-3D: WATER POLLUTION CONTROL COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	432	608	1,215	1,408	2,032	2,669	3,177	3,700	4,383	4,830	5,247	5,543	5,780	6,088	6,399
	Non-EPA Federal			287	375	433	444	503	540	581	564	629	676	687	773	896
	State Government	965	958	996	1,098	1,165	1,208	1,233	1,272	1,381	1,462	1,418	1,416	1,500	1,619	1,748
	Local Government	3,375	3,853	4,420	4,991	5,433	5,728	5,975	6,317	6,832	7,517	8,174	8,752	9,179	9,666	10,424
	Private	4,089	5,241	5,948	6,842	8,109	9,329	10,384	11,501	12,121	12,799	13,166	14,320	15,241	16,199	17,203
	Total Point Source	8,861	10,661	12,866	14,714	17,173	19,378	21,271	23,330	25,297	27,171	28,635	30,708	32,386	34,345	36,670
	Federally Mandated	8,861	10,661	12,866	14,714	17,173	19,378	21,271	23,330	25,297	27,171	28,635	30,708	32,386	34,345	36,670
4.1.2	Non-Point Source															
	Existing Regulations															
	EPA															
	Non-EPA Federal	89	102	84	99	116	132	136	127	135	148	156	167	169	180	168
	State Government	226	212	193	213	212	186	171	190	198	198	220	216	236	233	248
	Local Government	226	233	238	245	252	259	265	270	276	283	289	296	302	308	313
	Private	32	42	45	54	66	77	84	87	95	103	112	121	127	136	137
4.2	Total Water Quality	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,003	26,001	27,903	29,412	31,506	33,220	35,202	37,535
	Federally Mandated	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,003	26,001	27,903	29,412	31,506	33,220	35,202	37,535
4.3	Drinking Water															
	EPA	10	9	11	10	19	51	67	85	91	108	95	94	86	87	86
	Non-EPA Federal															
	State Government						10	21	29	44	57	67	73	73	78	92
	Local Government	661	742	851	981	1,121	1,230	1,364	1,524	1,658	1,829	1,981	2,087	2,205	2,367	2,555
	Private	148	166	191	220	251	276	306	341	371	410	444	468	494	530	572
	Total Drinking Water	819	918	1,053	1,211	1,391	1,567	1,758	1,980	2,164	2,404	2,587	2,722	2,858	3,062	3,305
	Federally Mandated							172	176	181	186	190	195	200	205	
4.4	Total Water Costs	10,253	12,168	14,479	16,537	19,209	21,598	23,683	25,983	28,165	30,307	31,999	34,229	36,079	38,264	40,840
	Federally Mandated	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,175	26,178	28,084	29,598	31,697	33,415	35,402	37,740

## Footnotes to Table 4-3D

Sum of operating costs for year in question, shown on corresponding lines of Table 4-2, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 30 years for water quality and 20 years for drinking water on the accumulated capital investment shown in Table 4-1 since 1972.

Table 4-3E: WATER POLLUTION CONTROL COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	6,399	6,705	6,956	7,165	7,417	7,627	7,709	7,792	7,826	7,814	7,802	7,790	7,778	7,765	7,753
	Non-EPA Federal	896	949	1,040	1,139	1,246	1,360	1,482	1,612	1,750	1,896	2,050	2,211	2,381	2,558	2,743
	State Government	1,748	1,816	1,809	1,874	1,939	2,006	2,074	2,143	2,213	2,284	2,356	2,429	2,504	2,579	2,656
	Local Government	10,424	11,000	11,502	12,045	12,589	13,135	13,683	14,233	14,784	15,337	15,892	16,448	17,007	17,566	18,128
	Private	17,203	18,557	18,776	19,562	20,331	21,086	21,825	22,549	23,257	23,950	24,627	25,290	25,936	26,568	27,183
	Total Existing Regs	36,670	39,026	40,084	41,784	43,523	45,214	46,773	48,329	49,830	51,281	52,727	54,168	55,605	57,037	58,464
	Federally Mandated	36,670	39,026	40,084	41,784	43,523	45,214	46,773	48,329	49,830	51,281	52,727	54,168	55,605	57,037	58,464
	New Regulations															
	Local Government			2	5	19	34	56	89	89	89	89	89	89	89	89
	Private			33	204	374	589	589	589	589	589	589	589	589	589	589
	Total New Regs			35	209	393	623	645	678	678	678	678	678	678	678	678
	Full Implementation					362	738	1,208	1,775	2,432	3,173	3,909	4,640	5,365	6,085	6,799
	Total Point Source	36,670	39,026	40,120	41,993	44,278	46,575	48,626	50,782	52,940	55,132	57,314	59,486	61,648	63,799	65,941
	Federally Mandated	36,670	39,026	40,120	41,993	44,278	46,575	48,626	50,782	52,940	55,132	57,314	59,486	61,648	63,799	65,941
4.1.2	Non-Point Source															
	Existing Regulations															
	Non-EPA Federal	168	185	191	197	203	209	214	220	225	231	236	242	247	252	257
	State Government	248	226	228	229	231	232	233	235	236	237	238	239	240	240	241
	Local Government	313	320	326	332	339	345	351	357	363	369	376	382	388	394	400
	Private	137	147	154	161	168	174	181	187	194	200	206	212	218	224	230
	Total Existing Regs	865	879	899	920	940	960	980	999	1,018	1,037	1,056	1,074	1,092	1,110	1,128
	Federally Mandated	865	879	899	920	940	960	980	999	1,018	1,037	1,056	1,074	1,092	1,110	1,128
	Total Non-Point Source	865	879	899	920	940	960	980	999	1,018	1,037	1,056	1,074	1,092	1,110	1,128
	Federally Mandated	865	879	899	920	940	960	980	999	1,018	1,037	1,056	1,074	1,092	1,110	1,128
4.2	Total Water Quality	37,535	39,905	41,019	42,912	45,218	47,535	49,606	51,781	53,958	56,169	58,370	60,560	62,740	64,910	67,069
	Federally Mandated	37,535	39,905	41,019	42,912	45,218	47,535	49,606	51,781	53,958	56,169	58,370	60,560	62,740	64,910	67,069
4.3	Drinking Water															
	Existing Regulations															
	EPA	86	94	95	97	103	108	127	132	137	143	148	153	159	164	169
	State Government	92	75	100	109	119	129	139	149	160	171	183	194	203	209	212
	Local Government	2,555	2,693	2,732	2,801	2,944	3,088	3,164	3,238	3,305	3,369	3,437	3,515	3,596	3,667	3,715
	Private	572	603	612	627	659	692	709	725	740	755	770	787	805	821	832
	Total Existing Regs	3,305	3,465	3,538	3,634	3,825	4,016	4,138	4,244	4,342	4,437	4,537	4,650	4,763	4,862	4,928
	Federally Mandated	205	209	214	47	47	47	47	47	47	47	47	47	47	42	38
	New Regulations															
	Local Government			76	156	164	315	562	724	947	1,262	1,495	1,655	1,842	1,958	1,980
	Private			17	35	37	71	126	162	212	283	335	371	412	439	444
	Total New Regs			93	191	201	385	687	886	1,160	1,545	1,830	2,026	2,254	2,397	2,424
	Total Drinking Water	3,305	3,465	3,632	3,825	4,025	4,401	4,825	5,130	5,502	5,982	6,367	6,676	7,017	7,259	7,351
	Federally Mandated	205	209	307	238	248	432	734	933	1,207	1,592	1,877	2,073	2,301	2,439	2,461
4.4	Total Water Costs	40,840	43,370	44,651	46,737	49,243	51,936	54,431	56,911	59,460	62,151	64,737	67,236	69,758	72,168	74,420
	Federally Mandated	37,740	40,114	41,326	43,150	45,466	47,967	50,340	52,714	55,165	57,761	60,247	62,633	65,041	67,349	69,530

## Footnotes to Table 4-3E

Sum of operating costs for year in question, shown on corresponding lines of Table 4-2A, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 30 years for water quality and 20 years for drinking water on the accumulated capital investment shown in Tables 4-1 and 4-1A since 1972.

## 5. COSTS OF LAND POLLUTION CONTROL

Tables 5-1, 5-2, and 5-3 provide data on capital costs, operation and maintenance costs, and total annualized costs for land pollution control. The estimates are broken down into several categories which are discussed in the sections indicated below.

- 5.1. Solid waste;
- 5.2. Hazardous waste;
- 5.3. Leaking Underground Storage Tanks;
- 5.4. Total Resource Conservation and Recovery Act;
- 5.5. Superfund; and
- 5.6. Total land pollution control costs.

Table 5-3 provides annualized cost estimates calculated using capital amortization rates of three, seven, and ten percent, and an assumed capital life of 20 years for solid and hazardous waste programs, and 30 years for the underground storage tanks and Superfund programs.

The annualized cost estimates discussed below are those calculated using a seven percent rate for capital amortization. Those calculated using a three percent rate are approximately three to 11 percent lower, and those calculated using a ten percent rate are three to nine percent higher, than the estimates discussed below.

### 5.1. SOLID WASTE

EPA expenditures for solid waste have historically been relatively low since activities were authorized by Subtitle D of the 1976 Resource Conservation and Recovery Act (RCRA). EPA solid waste expenditures have been rising in recent years, however, as more attention has focused on expanded regulation of wastes that are not defined as hazardous under Subtitle C of RCRA. State involvement varies but, for the most part, state programs have developed independently of the Federal program. State expenditures for program implementation are relatively low. Local governments have relatively high expenditures due primarily to the provision of services associated with the collection and disposal of household wastes and, to a lesser extent, for compliance with standards for solid waste disposal facilities. The private sector also provides solid waste collection and disposal services.

Total annualized solid waste costs for all sectors, including costs for trash collection and disposal services, increased from \$8.4 billion in 1972 to \$16.7 billion in 1987. Future annualized costs are expected to increase steadily, reaching a projected \$22.5 billion by the year 2000. Costs for Federally-mandated programs accounted for only a small part of historical solid waste costs, however, from less than \$500 million in 1972 and about \$1.1 billion in 1987. Future costs for Federally-mandated programs are expected to remain a small portion of total solid waste costs. Future annualized costs associated with Federal mandates are expected to increase to a projected

\$3.6 billion by the year 2000. These costs are driven primarily by expanded Federal regulation of municipal solid waste disposal facilities pursuant to RCRA Subtitle D.

#### *5.1.1. EPA*

The framework for the EPA solid waste program was set forth in Subtitle D of RCRA. Under the Subtitle D requirements, EPA established minimum technical requirements for solid waste disposal facilities and created a program under which participating states develop and implement solid waste management plans. Provisions for Federal financial and technical assistance to state and local jurisdictions were included to assist in the development of these plans. EPA expenditures are primarily for these plans, recycling programs, and regulation development. A major problem occurs in estimating EPA expenditures for solid waste activities because all RCRA costs since 1981 have been reported in EPA budget documents as hazardous waste costs. A special analysis was used to separate out EPA expenditures for solid waste activities. This analysis is discussed in Appendix G.

EPA grants for state and local solid waste plans and recycling programs have historically been relatively modest, reaching a high of \$114 million in 1980. EPA expenditures were much lower in recent years, accounting for only \$3 million in 1987. Future EPA expenditures are expected to increase steadily through the remainder of the century. These costs are associated primarily with regulation development and implementation.

#### *5.1.2. State Government*

Before 1981, state funds for implementation of solid waste activities came primarily from Federal grants. In subsequent years, state solid waste spending were largely a function of the importance a particular state places on the problem of solid waste disposal. No estimates of these state costs are available; they are probably very low since solid waste planning and management have historically been the responsibility of local governments.

#### *5.1.3. Local Government*

Local governments have relatively high costs for the services associated with the collection and disposal of solid waste, and compliance with Federal standards for solid waste disposal facilities. Local solid waste costs rose steadily from \$3.5 billion in 1972 to about \$6.3 billion in 1987. Future costs are expected to rise more dramatically as more stringent Subtitle D requirements for solid waste disposal facilities come into effect. The new Subtitle D standards are expected to impose a little more than \$1.5 billion in annualized costs to local governments by the year 2000. Total future costs to localities for solid waste disposal are estimated to increase steadily to approximately \$9.5 billion by the year 2000.

#### *5.1.4. Private*

Private solid waste expenditures are also for compliance with standards for solid waste disposal facilities and for solid waste collection and disposal services. Private solid waste costs increased steadily from an estimated \$4.8 billion in 1972 to \$10 billion in 1987. Private costs are projected to increase slightly in the future, reaching an estimated \$11.7 billion by the year 2000.

## 5.2. HAZARDOUS WASTES

Federal expenditures to administer a national hazardous waste management program and private costs to comply with EPA and state regulations constitute the majority of all hazardous waste expenditures under RCRA. Generally, EPA grants drive state expenditures for administration of permitting and enforcement programs. Local government expenditures are primarily associated with the siting of hazardous waste treatment facilities.

Annualized costs for all sectors increased dramatically from \$182 million in 1981 (the year in which costs were first recorded) to \$1.7 billion in 1987. This trend is expected to continue into the future, driven in large part by several new and forthcoming regulations, most notably rules restricting the land disposal of hazardous wastes and mandating corrective action at solid waste disposal facilities. These new regulations are expected to add an additional \$4.6 billion in annualized private sector costs by the year 2000. Future annual costs for all hazardous waste programs are projected to increase to \$9.2 billion in 1995, and to \$12 billion by the year 2000.

### *5.2.1. EPA and Non-EPA Federal*

Much of EPA's spending prior to 1982 was for program development, definition of wastes and activities to be regulated, development of permitting programs for waste handlers, and the establishment of procedures to transfer program administration to the states. Implementation began in 1982 after EPA developed compliance monitoring and enforcement regulations and began technical reviews of permit applications.

The Hazardous and Solid Waste Amendments of 1984 (HSWA) significantly enhanced EPA's regulatory activities under RCRA. The Act authorized a program to regulate underground storage tanks and directed EPA to develop standards to regulate carcinogenic, mutagenic, or other toxic waste materials that had escaped regulation in earlier years. HSWA also directed EPA to promulgate corrective action rules mandating the clean-up of operating and closing waste management facilities. In addition, EPA was to develop regulations to restrict the land disposal of hazardous waste. EPA costs for these activities increased from \$147 million in 1982 to \$240 million in 1987. Future EPA implementation costs are expected to increase slightly over time.

Non-EPA Federal agencies such as the Departments of Energy and Defense maintain facilities that are subject to regulations pursuant to RCRA Subtitle C. These agencies currently incur compliance costs which are expected to increase significantly over the next several years. The only

data available on such expenditures are actual budget appropriations data for recent years and estimates of budget needs over the next few years for the Departments of Energy and Defense, which together account for the large majority of expected Federal expenditures. This data was broken into capital and O&M cost components using rules of thumb discussed in Appendix H. The resulting estimates, on an annualized basis, indicate that Federal spending for compliance with RCRA was \$258 million in 1989, and is expected to increase dramatically to over \$2 billion by the year 1995, and to \$3.5 billion by the year 2000. These estimates are documented in Appendix H.

### *5.2.2. State Government*

Federal grants support the majority of state hazardous waste expenditures for reporting, permitting, and enforcement. States can be authorized to implement RCRA only if their programs are substantially the same as, or more stringent than, the Federal program. State funds are also derived from dedicated gasoline taxes and fees and used to finance special programs such as hazardous waste facility planning/siting. While some state programs stand out for their scope and funding—California's, for example—overall, state administrative expenditures are relatively small and compliance expenditures are negligible. State costs are not included in this report.

### *5.2.3. Local Government*

Overall, local government spending to implement or comply with RCRA and HSWA hazardous waste is negligible. Such spending is primarily to support the program planning and siting of hazardous waste treatment, storage and disposal facilities. Local costs are not included in this report.

### *5.2.4. Private*

Private expenditures to comply with RCRA hazardous waste regulations increased steadily since 1983, in line with the gradual regulation of an increasing number of waste streams, groups of hazardous waste generators, and management technologies. On an annualized basis, private costs increased from \$539 million in 1983 to \$1.4 billion in 1987. Private expenditures are expected to increase substantially throughout the 1990s as additional HSWA regulations take effect. Private costs to comply with new and existing regulations are projected to increase to an estimated \$6.8 billion in 1995, and to \$8.2 billion by the year 2000.

Of the new and soon-to-be implemented hazardous waste regulations, the most costly to the private sector is the corrective action rule for solid waste management units (SWMUs). This rule, which was proposed in 1990, will set technical standards and procedures for conducting corrective action on groundwater, soil, air and surface water caused by significant releases from SWMUs at operating, closed, or closing RCRA facilities. The rule will require any facility seeking a RCRA permit or closing SWMUs under interim status to undergo a Remedial Feasibility Assessment to determine whether any SWMU is the source of hazardous waste releases. If a leaking SWMU is identified, the owner/operator of the facility will be required to perform a Remedial Feasibility

Investigation to assess the extent of the problem and perform the needed corrective action. Annualized private costs for corrective action are expected to be about \$1.3 billion in 1993, increasing to \$1.8 billion in 1997, and to \$2.2 billion in the year 2000.

### 5.3. LEAKING UNDERGROUND STORAGE TANKS

The recently promulgated technical standards and financial responsibility requirements for petroleum-containing underground storage tanks (UST) are expected to impose significant compliance costs on the private sector. The rules impose a much lower level of costs on government entities, however. The technical standards rule, which took effect in 1989, requires the retirement, upgrade, or replacement within ten years of all tanks that do not meet the new tank standards, as well as the installation of leak detection monitors. In addition, the rule requires corrective action for contamination caused by tank releases. The financial responsibility rule requires tank owners/operators to demonstrate the financial capability to take prompt corrective action for contamination caused by tank releases, and to provide compensation to third parties harmed by any release. The costs of the financial responsibility rule are minimal compared to costs for the technical standards rule. Together, the new rules are expected to result in annualized costs of about \$3.2 billion in 1990, increasing to an estimated \$4.6 billion by the year 1993. These costs are driven primarily by corrective action activities over the years 1989-1993. Annualized costs are expected to drop off to approximately \$3 billion over the next few years, and then jump to \$3.8 billion in 1998, the compliance deadline year for tank upgrade/replacement.

#### *5.3.1. EPA and Non-EPA Federal*

The EPA administers the Leaking Underground Storage Tank Trust Fund (LUST Fund) to assist states in the development of programs to respond to releases from petroleum-containing underground tanks. Private companies have a large financing role; the LUST Fund is capitalized from taxes on private companies. (LUST Fund expenditures, however, are treated here as costs to EPA). EPA expenditures for years 1987 and 1988 are based on actual EPA appropriations from the LUST Fund. EPA costs for years 1989-2000 are based on projections from 1987 and 1988 levels. EPA costs were \$13 million in 1988, and are expected to increase to \$81 million in 1995, and to \$130 million by the year 2000.

Non-EPA Federal agencies will incur compliance costs associated with the new UST regulations. These costs are included in the non-EPA Federal costs estimates given for hazardous waste because they could not be separated out.

#### *5.3.2. Local Governments*

Local annualized costs of compliance with the UST rules are expected to be relatively low, increasing from about \$118 million in 1989 to \$359 million in 1993. Costs are then expected to drop to less than \$300 million per year through the year 2000.

### 5.3.3. Private

Private expenditures to comply with the new technical standards and financial responsibility requirements for petroleum-containing underground storage tanks are relatively high. Private annualized compliance costs are estimated to increase from about \$1.1 billion in 1989 to \$4.2 billion by 1993. These costs are driven primarily by large expenditures for corrective action in each of the years 1989-1993. Annualized costs are expected to fall to about \$2.7 billion in subsequent years and then jump to \$3.6 billion in 1998, the compliance deadline for tank upgrade/replacement.

## 5.4. TOTAL RCRA

Prior to 1981, all expenditures associated with RCRA-related pollution control programs were for the collection and disposal of solid waste, and for compliance with solid waste facility standards. These costs ranged from an estimated \$8.4 billion in 1972 to \$13.6 billion in 1980. Roughly 60 percent of these costs were borne by the private sector, and most of the remainder by local governments. Expenditures for hazardous waste programs began in the early 1980s, and increased steadily throughout the decade. By 1988, hazardous waste control costs were \$3 billion, while solid waste costs were about \$16.3 billion. In 1990, total RCRA-related costs are expected to be roughly \$25 billion, increasing to \$32.5 billion in 1995, and to \$38 billion by the year 2000. In the 1990s, costs for hazardous waste programs are expected to rise significantly and account for an increasing share of all RCRA-related pollution control expenditures.

If only Federally-mandated programs are considered (*i.e.*, excluding solid waste collection and disposal services), annualized costs will reach an estimated \$8.8 billion in 1990, increasing to \$15 billion in 1995, and to \$19.3 billion by the year 2000. Hazardous waste control costs (including UST control), are expected to account for over 80 percent of these costs throughout the 1990s. This large share of costs accounted for by hazardous waste programs is driven primarily by several new and forthcoming regulations, including the corrective action rule for solid waste management units, the UST technical standards rule, and several rules restricting the land disposal of hazardous wastes.

## 5.5. SUPERFUND

EPA has a major role as administrator of the Superfund Program, as authorized under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. EPA uses funds from the CERCLA Trust Fund (which is financed primarily by taxes on private industry) for program administration as well as for site clean-ups. Private sector expenditures for site clean-ups come from the parties identified as responsible for waste sites. Non-EPA Federal expenditures are associated with site investigation and clean-up activities primarily by the Department of Energy and the Department of Defense. The 1986 Amendments to CERCLA gave states an important role in evaluating and planning remedial actions at Superfund sites, and responsibility for a small portion of total operation and maintenance costs at sites relying on Trust Fund monies for clean-up. Local governments generally play a minor role in implementation of the Superfund Program.

On an annualized basis, total costs for Superfund implementation and compliance were relatively modest throughout much of the 1980s, increasing from \$15 million in 1981 to \$400 million in 1986. Costs jumped significantly after SARA was enacted, however, reaching an estimated \$683 million in 1987 and \$1.3 billion in 1989. Future costs are expected to continue this trend, reaching an estimated \$3.4 billion in 1993, \$6 billion in 1997, and over \$8 billion by the year 2000.

#### *5.5.1. EPA and Non-EPA Federal*

EPA expenditures for administration of the Superfund Program include site investigations, development of a priority site clean-up list, planning and conducting clean-ups, coordinating a national program of immediate removals in response to chemical spills and other releases of toxic substances into the environment, and enforcement actions. Monies for these activities come from the CERCLA Trust Fund. Prior to 1986, the Fund was financed primarily by taxes on chemical and petroleum feedstocks. Additional money came from interest earned on the balance in the Fund, fines and recoveries from responsible parties, and appropriations from general revenues. The 1986 Amendments to CERCLA (SARA) broadened the revenue base. Beginning in 1987, the Fund was financed by a tax on domestic and imported crude oil, the original tax on petroleum and chemical feedstocks, and a new tax on manufacturing industries nationwide. All expenditures from the Fund are treated here as costs to EPA.

EPA Superfund costs, on an annualized basis, increased steadily throughout the 1980s, reaching an estimated \$740 million in 1989. EPA Superfund costs are estimated to continue this trend throughout the 1990s, increasing from \$852 million in 1990 to \$1.6 billion in 1995, and to \$2.6 billion by the year 2000. (Detailed documentation for CERCLA remediation costs to all affected sectors is provided in Appendix H.)

Non-EPA Federal agencies—primarily the Departments of Energy and Defense—face significant responsibilities under CERCLA for clean-up of hazardous waste and nuclear facilities and sites that are no longer under active operations. Estimates of the annualized costs for these responsibilities are substantial, increasing from an estimated \$107 million in 1987 to \$396 million in 1990. Future non-EPA Federal costs are expected to rise dramatically, reaching \$1.7 billion in 1995 and \$2.8 billion by the year 2000.

#### *5.5.2. State Governments*

States are authorized to impose their own standards on Superfund-financed clean-ups. They must finance the marginal costs associated with stricter standards, however. States have the right to participate in preliminary assessments, site inspection, and hazard ranking as well as to review and comment on clean-up plans and to participate in negotiations for repayment from potentially responsible private parties. Beyond initial studies and investigations, states are required to match Federal funds for remedial action with a ten percent contribution (50 percent if the site is owned by state or local government) and to take responsibility for all future operating and maintenance costs not involving surface water and groundwater restoration. These requirements are expected to result

in annualized costs to states of about \$140 million in 1990, \$379 million in 1995, and \$727 million by the year 2000.

State involvement in the Superfund Program has varied. Many states with a large number of uncontrolled sites have established means to raise large sums of money for site clean-up as well as to develop their own Superfund Programs (*e.g.*, New York, California, New Jersey, and Illinois). The total costs associated with these state programs are not known, and no estimates for them are included in this report.

### 5.5.3. Private

Private expenditures for Superfund remediation activities are an important percentage of the total. The major private costs associated with Superfund are “Responsible Party” contributions for site investigation and clean-ups. (Although taxes paid into the CERCLA Trust Fund are largely costs to the private sector, they are treated as EPA expenditures in this report.)

Private annualized costs in years prior to 1987 were relatively modest, reaching an estimated \$57 million in 1986. Future private costs are expected to rise significantly, increasing to \$950 million in 1995 and to \$1.8 billion by the year 2000. In addition to site investigation and clean-up costs, private companies are spending large sums to contest liability in court. A recent *Wall Street Journal* article estimated that private companies are spending millions of dollars to prove that their insurance companies or other firms are liable for Superfund cleanups.<sup>1</sup> These costs are not included in this report.

## 5.6. TOTAL LAND POLLUTION CONTROL COSTS

Total annualized costs associated with land pollution control, including costs for solid waste collection and disposal services, increased steadily from approximately \$8.4 billion in 1972 to \$19 billion in 1987. Future costs are expected to rise dramatically, due primarily to new and forthcoming hazardous waste and UST regulations, and increased levels of activity under Superfund. Land pollution control costs are expected to be \$25.6 billion in 1990, increasing to \$37 billion by 1995, and to \$46 billion by the year 2000. Hazardous waste, UST and Superfund are expected to account for 35 percent of these costs by 1990, 43 percent by 1995, and by more than 50 percent by the year 2000.

When only Federally-mandated land pollution control programs are considered, however, (*i.e.*, excluding solid waste collection and disposal services), total land pollution control costs are significantly lower, and hazardous waste costs account for a large majority of the estimated future costs. Total annualized expenditures for Federally-mandated programs were less than \$500 million

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<sup>1</sup> Amal Kuman Naj, “Can \$100 Billion Have ‘No Material Effect’ on Balance Sheets?”, *Wall Street Journal*, May 11, 1988.

in 1972 and about \$910 million in 1980. Since 1980 these costs have increased dramatically, reaching \$3.5 billion in 1987. This trend is projected to continue into the future: costs for Federally-mandated programs are estimated to reach \$10.5 billion in 1990, \$19.7 billion in 1995, and over \$27 billion by the year 2000. Hazardous waste, UST, and Superfund programs are expected to account for more than 85 percent of the future annualized costs of Federally-mandated land pollution control programs.

Table 5-1: LAND POLLUTION CONTROL CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.1	Solid Waste															
	Existing Regulations															
	EPA															
	Non-EPA Federal			56	53	42	24	34	23	25	29	19	52	121	119	105
	State Government															
	Local Government	613	620	634	652	646	668	702	713	725	731	741	753	756	849	984
	Private	733	911	980	847	887	980	963	1,126	1,157	1,140	941	786	971	943	1,025
	Total Solid Waste	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,591	1,848	1,912	2,115
	Federally Mandated	67	77	137	128	119	106	117	115	119	123	103	129	207	209	205
5.2	Hazardous Waste															
	Existing Regulations															
	EPA															
	Non-EPA Federal													20	34	52
	State Government															
	Local Government															
	Private												65	93	334	169
	Total Hazardous Waste												65	113	368	558
	Federally Mandated												65	113	368	558
5.3	LUST															
	Existing Regulations															
	EPA															
	Non-EPA Federal															
	State Government															
	Local Government															
	Private															
	Total LUST															
	Federally Mandated															
5.4	Total RCRA	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,656	1,961	2,280	2,672
	Federally Mandated	67	77	137	128	119	106	117	115	119	123	103	193	320	577	763
5.5	Superfund															
	Existing Regulations															
	EPA										38	171	195	389	396	293
	Non-EPA Federal													77	158	209
	State Government									4	19	22	43	44	33	
	Local Government															
	Private											3	76	139	150	178
	Total Superfund									42	193	293	648	748	713	
	Federally Mandated									42	193	293	648	748	713	
5.6	Total Land	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,942	1,893	1,949	2,609	3,028	3,385
	Federally Mandated	67	77	137	128	119	106	117	115	119	165	296	486	968	1,325	1,476

November 1990

Footnotes to Table 5-1

SOLID WASTE

EPA: Assumed to be zero; EPA solid waste costs are assumed to be operating costs.

Non-EPA Federal: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Local Government: From Appendix G, Table G-4. See Appendix G for detail.

Private: From Appendix G, Table G-4. See Appendix G for detail.

Existing Federally Mandated: Assumed to be 100 percent of total costs for solid waste regulations.

Total Federally Mandated: Sum of total outlays for solid waste regulations.

HAZARDOUS WASTE

Private: Private manufacturing capital expenditures for pollution abatement are from the 1983-1986 annual editions of "Pollution Abatement Costs and Expenditures" published by the Bureau of the Census. Figures exclude manufacturing establishments with less than 20 employees. If adjusted to include those establishments with less than 20 employees, it is estimated that these numbers would be increased by approximately 2 percent or less.

Federally Mandated: Assumed to be 100 percent of total costs for hazardous waste regulations.

Total Federally Mandated: Sum of total outlays for hazardous waste regulations.

SUPERFUND

EPA, State Government, Private: Estimated on the basis of Appendix H.

Federally Mandated: Assumed to be 100 percent of total costs for Superfund regulations.

Total Federally Mandated: Sum of total outlays for Superfund regulations.

## Environmental Investments

Table 5-1A: RCRA CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.1	Solid Waste															
	Existing Regulations															
	EPA															
	Non-EPA Federal	105	149	170	192	213	235	256	277	299	320	342	363	384	406	427
	State Government															
	Local Government	984	1,018	930	952	975	997	1,020	1,042	1,065	1,088	1,110	1,133	1,155	1,178	1,200
	Private	1,025	1,002	883	854	824	795	766	736	707	677	648	618	589	559	530
	Total Existing Regs	2,115	2,169	1,983	1,998	2,012	2,027	2,041	2,056	2,070	2,085	2,099	2,114	2,128	2,143	2,157
	Federally Mandated	205	250	261	282	303	324	345	366	387	408	430	451	472	493	514
	New Regulations															
	Local Government						2,105	2,105	877	877	877	877	877	877	877	877
	Private							502	502	502	502	877	877	877	877	877
	Total New Regs						2,105	2,607	1,379	1,379	1,379	877	877	877	877	877
	Total Solid Waste	2,115	2,169	1,983	1,998	2,012	4,132	4,648	3,435	3,449	3,464	2,976	2,991	3,005	3,020	3,034
	Federally Mandated	205	250	261	282	303	2,429	2,952	1,745	1,766	1,787	1,307	1,328	1,349	1,370	1,391
5.2	Hazardous Waste															
	Existing Regulations															
	EPA															
	Non-EPA Federal	52	69	75	865	1,081	1,429	3,040	3,192	3,427	3,114	2,970	2,970	2,970	2,970	2,970
	State Government															
	Local Government															
	Private	169	303	359	414	469	525	580	635	691	746	802	857	912	968	1,023
	Total Existing Regs	221	372	434	1,279	1,550	1,954	3,620	3,827	4,118	3,860	3,772	3,827	3,882	3,938	3,993
	Federally Mandated	221	372	434	1,279	1,550	1,954	3,620	3,827	4,118	3,860	3,772	3,827	3,882	3,938	3,993
	New Regulations															
	Private	337	130	1,338	1,170	1,379	391	382	125	411	221	450	904	210	216	222
	Total New Regs	337	130	1,338	1,170	1,379	391	382	125	411	221	450	904	210	216	222
	Total Hazardous Waste	558	502	1,772	2,449	2,929	2,345	4,002	3,952	4,529	4,081	4,222	4,731	4,092	4,154	4,215
	Federally Mandated	558	502	1,772	2,449	2,929	2,345	4,002	3,952	4,529	4,081	4,222	4,731	4,092	4,154	4,215
5.3	LUST															
	Total Existing Regs															
	New Regulations															
	Local Government				473	473	514	473	473	23	23	23	23	602	5	5
	Private				4,777	4,777	5,583	4,777	4,777	433	433	433	433	11,153	95	95
	Total New Regs				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
	Total LUST				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
	Federally Mandated				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
5.4	Total RCRA	2,672	2,671	3,755	9,697	10,192	12,574	13,901	12,637	8,434	8,001	7,654	8,178	18,853	7,273	7,349
	Federally Mandated	763	752	2,033	7,981	8,483	10,871	12,204	10,948	6,751	6,325	5,984	6,514	17,196	5,623	5,706

November 1990

Footnotes to Table 5-1A

SOLID WASTE

EPA: Assumed to be zero; EPA solid waste costs are assumed to be operating costs.

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing Local Government: 1986 and 1987 figures from Appendix G, Table G-4. See Appendix G for detail. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Private: 1986 and 1987 figures from Appendix G, Table G-4. See Appendix G for detail. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Existing Federally Mandated: Assumed to be 100 percent of total costs for solid waste regulations.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total outlays for total existing solid waste regulations and total new regulations.

HAZARDOUS WASTE

Non-EPA Federal: Estimated cost of Federal facility compliance from Appendix H, Table H-2.

Existing Private: 1986 data for private manufacturing capital expenditure for pollution abatement from the 1986 edition of "Pollution Abatement Costs and Expenditures" published by the Bureau of the Census. Linear projection of expenditures for 1987-2000 based on historical data for the years 1983-1986. Figures exclude manufacturing establishments with less than 20 employees. If adjusted to include those establishments with less than 20 employees, it is estimated that these numbers would be increased by approximately 2 percent or less.

Existing Federally Mandated: Assumed to be 100 percent of total costs for hazardous waste regulations.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total costs for existing hazardous waste regulations and new regulations.

LUST

Existing Federally Mandated: Assumed to be 100 percent of total costs of regulations associated with LUST.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total costs of existing LUST regulations and new regulations.

Table 5-1B: CERCLA CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.5	Superfund															
	Existing Regulations															
	EPA	293	760	1,077	995	905	1,155	1,270	1,385	1,501	1,616	1,731	1,846	1,961	2,076	2,191
	Non-EPA Federal	209	276	300	801	970	1,302	2,381	2,756	2,876	2,962	2,797	2,797	2,797	2,797	2,797
	State Government	33	84	120	111	101	128	141	154	167	180	192	205	218	231	243
	Local Government															
	Private	178	342	401	874	879	983	1,103	1,205	1,325	1,429	1,546	1,654	1,770	1,874	1,992
	Total Existing Regs	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
	Federally Mandated	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
	New Regulations															
	Local Government															
	Private															
	Total New Regs															
	Full Implementation															
	Total Superfund	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
	Federally Mandated	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
5.6	Total Land	3,385	4,133	5,653	12,478	13,047	16,142	18,796	18,137	14,303	14,188	13,920	14,680	25,599	14,251	14,572
	Federally Mandated	1,476	2,214	3,931	10,762	11,338	14,439	17,099	16,448	12,620	12,512	12,250	13,016	23,942	12,601	12,929

Footnotes to Table 5-1B

EPA, State Government, Private: Estimated on the basis of Appendix H and the regulations and sources listed in Appendix A.

Non-EPA Federal: Estimated cost of Federal facility compliance from Appendix H, Table H-2.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with Superfund regulations.

Total Federally Mandated: Sum of total costs associated with existing and new Superfund regulations.

Table 5-2: LAND POLLUTION CONTROL OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.1	Solid Waste															
	Existing Regulations															
	EPA	70	72	20	24	36	36	39	99	114	19				2	3
	Non-EPA Federal			80	109	105	101	94	103	103	152	179	181	185	239	202
	State Government															
	Local Government	3,473	3,512	3,592	3,694	3,661	3,783	3,976	4,042	4,106	4,144	4,196	4,270	4,510	4,786	5,038
	Private	4,766	5,042	5,228	5,388	5,862	6,528	6,769	7,519	7,891	8,042	6,885	6,497	7,135	7,317	8,011
	Total Solid Waste	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,356	11,260	10,947	11,830	12,344	13,254
	Federally Mandated	482	499	541	587	617	653	671	780	816	780	733	719	767	846	857
5.2	Hazardous Waste															
	Existing Regulations															
	EPA										182	147	144	146	155	202
	Non-EPA Federal													4	6	9
	State Government															
	Local Government															
	Private												533	678	796	928
	Total Hazardous Waste										182	147	677	828	958	1,306
	Federally Mandated										182	147	677	828	958	1,306
5.3	LUST															
	Existing Regulations															
	EPA															
	Non-EPA Federal															
	State Government															
	Local Government															
	Private															
	Total LUST															
	Federally Mandated															
5.4	Total RCRA	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,538	11,407	11,624	12,658	13,301	14,561
	Federally Mandated	482	499	541	587	617	653	671	780	816	962	880	1,396	1,596	1,804	2,164
5.5	Superfund															
	Existing Regulations															
	EPA										12	36	60	105	100	114
	Non-EPA Federal													14	28	37
	State Government											4	8	16	20	27
	Local Government															
	Private												1	5	9	13
	Total Superfund										12	40	69	140	157	191
	Federally Mandated										12	40	69	140	157	191
5.6	Total Land	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,550	11,447	11,693	12,798	13,458	14,752
	Federally Mandated	482	499	541	587	617	653	671	780	816	974	920	1,465	1,736	1,961	2,355

Footnotes to Table 5-2

SOLID WASTE

EPA: Data for 1972-1980 from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays). Beginning in 1981 all EPA operating expenditures for solid waste management were included in the category "Hazardous Waste". The Office of Solid Waste, however, provided estimated proportions of hazardous waste which are actually for solid waste for the years 1981-1988. Extrapolations were then made for 1989 and 1990 based on proportions for 1984-1988. See Appendix G for details.

Non-EPA Federal: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Local Government: From Appendix G, Table G-4. See Appendix G for detail.

Private: From Appendix G, Table G-4. See Appendix G for detail.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with existing regulations for solid waste pollution control.

Total Federally Mandated: Sum of total costs associated with regulations for solid waste pollution control.

HAZARDOUS WASTE

EPA: Data for 1972-1980 from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays). Beginning in 1981 all EPA operating expenditures for solid waste management were included in the category "Hazardous Waste". The Office of Solid Waste, however, provided estimated proportions of hazardous waste which are actually for solid waste for the years 1981-1988. Extrapolations were then made for 1989 and 1990 based on proportions for 1984-1988. See Appendix G for details.

Private: Private manufacturing capital expenditures for pollution abatement are from the 1983-1986 annual editions of "Pollution Abatement Costs and Expenditures" published by the Bureau of the Census. Figures exclude manufacturing establishments with less than 20 employees. If adjusted to include those establishments with less than 20 employees, it is estimated that these numbers would be increased by approximately 2 percent or less.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with existing regulations for hazardous waste pollution control.

Total Federally Mandated: Sum of total costs associated with regulations for hazardous waste pollution control.

SUPERFUND

EPA, State Government, Private: Estimated on the basis of Appendix H.

Existing Federally Mandated: Assumed to be 100 percent of total costs of existing regulations associated with Superfund.

Total Federally Mandated: Sum of total costs of regulations associated with Superfund.

Costs of Land Pollution Control

Table 5-2A: RCRA OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.1	Solid Waste															
	Existing Regulations															
	EPA	3	3	6	9	12	14	16	18	20	22	24	26	28	30	32
	Non-EPA Federal	202	233	245	258	270	283	295	307	320	332	345	357	369	382	394
	Local Government	5,038	5,194	5,036	5,144	5,251	5,358	5,466	5,573	5,680	5,788	5,895	6,003	6,110	6,217	6,325
	Private	8,011	8,605	8,175	8,327	8,479	8,630	8,782	8,934	9,086	9,237	9,389	9,541	9,692	9,844	9,996
	Total Existing Regs	13,254	14,035	13,463	13,738	14,012	14,286	14,559	14,832	15,106	15,379	15,653	15,926	16,200	16,473	16,747
	Federally Mandated	857	926	912	941	969	996	1,023	1,051	1,078	1,105	1,133	1,160	1,188	1,215	1,242
	New Regulations															
	Local Government						196	196	318	439	439	439	439	439	439	439
	Private							77	77	77	77	77	77	77	77	77
	Total New Regs						196	273	395	516	516	516	516	516	516	516
	Total Solid Waste	13,254	14,035	13,463	13,738	14,012	14,482	14,832	15,227	15,622	15,895	16,169	16,442	16,716	16,989	17,263
	Federally Mandated	857	926	912	941	969	1,192	1,296	1,446	1,594	1,621	1,649	1,676	1,704	1,731	1,758
5.2	Hazardous Waste															
	Existing Regulations															
	EPA	202	239	231	214	210	236	245	254	263	272	281	290	299	308	317
	Non-EPA Federal	9	13	14	153	191	252	536	563	605	550	524	524	524	524	524
	State Government															
	Local Government															
	Private	928	1,060	1,190	1,321	1,451	1,582	1,712	1,842	1,973	2,103	2,234	2,364	2,495	2,625	2,755
	Total Existing Regs	1,139	1,312	1,435	1,688	1,853	2,070	2,493	2,660	2,841	2,926	3,039	3,178	3,318	3,457	3,597
	Federally Mandated	1,139	1,312	1,435	1,688	1,853	2,070	2,493	2,660	2,841	2,926	3,039	3,178	3,318	3,457	3,597
	New Regulations															
	EPA		3	3	3	3	3	3	3	3	3	3	3	3	3	3
	State Government		9	9	9	9	9	9	9	5	5	5	5	5	5	5
	Private	167	250	1,311	1,343	1,711	2,698	3,285	3,405	3,541	3,665	3,339	3,490	3,614	3,738	3,825
	Total New Regs	167	262	1,323	1,355	1,723	2,710	3,297	3,417	3,549	3,673	3,347	3,498	3,622	3,746	3,833
	Total Hazardous Waste	1,306	1,574	2,758	3,043	3,576	4,780	5,790	6,077	6,390	6,599	6,386	6,676	6,940	7,203	7,430
	Federally Mandated	1,306	1,574	2,758	3,043	3,576	4,780	5,790	6,077	6,390	6,599	6,386	6,676	6,940	7,203	7,430
5.3	LUST															
	Existing Regulations															
	EPA		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Total Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Federally Mandated		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	New Regulations															
	Local Government				80	156	156	165	165	57	30	30	30	30	14	14
	Private				778	2,182	2,182	2,199	2,200	937	551	551	552	553	253	253
	Total New Regs				858	2,338	2,338	2,364	2,365	994	581	581	582	583	267	267
	Total LUST		1	13	888	2,368	2,379	2,416	2,427	1,066	662	672	683	694	387	397
	Federally Mandated		1	13	888	2,368	2,379	2,416	2,427	1,066	662	672	683	694	387	397
5.4	Total RCRA	14,561	15,610	16,234	17,668	19,956	21,640	23,038	23,731	23,077	23,156	23,227	23,801	24,349	24,580	25,090
	Federally Mandated	2,164	2,501	3,684	4,871	6,913	8,351	9,503	9,949	9,050	8,882	8,707	9,035	9,337	9,321	9,585

## Footnotes to Table 5-2A

## SOLID WASTE

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Beginning in 1981 all EPA operating expenditures for solid waste management were included in the category "Hazardous Waste". The Office of Solid Waste, however, provided estimated proportions of hazardous waste which are actually for solid waste for the years 1981-1988. Extrapolations were then made for 1989 and 1990 based on proportions for 1984-1988. See Appendix G for details. Linear projection of expenditures for 1991-2000 based on derived data for the years 1984-1990.

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing Local Government: 1986 and 1987 figures from Appendix G, Table G-4. See Appendix G for detail. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Private: 1986 and 1987 figures from Appendix G, Table G-4. See Appendix G for detail. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with existing regulations for solid waste pollution control.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total costs associated with existing and new regulations for solid waste pollution control.

## HAZARDOUS WASTE

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Beginning in 1981 all EPA operating expenditures for solid waste management were included in the category "Hazardous Waste". The Office of Solid Waste, however, provided estimated proportions of hazardous waste which are actually for solid waste for the years 1981-1988. Extrapolations were then made for 1989 and 1990 based on proportions for 1984-1988. See Appendix G for details. Linear projection of expenditures for 1991-2000 based on derived data for the years 1981-1990.

Non-EPA Federal: Estimated cost of Federal facility compliance from Appendix H, Table H-2.

Existing Private: 1986 private manufacturing capital expenditure for pollution abatement from the 1986 edition of "Pollution Abatement Costs and Expenditures" published by the Bureau of the Census. Linear projection of expenditures for 1987-2000 based on historical data for the years 1983-1986. Figures exclude manufacturing establishments with less than 20 employees. If adjusted to include those establishments with less than 20 employees, it is estimated that these numbers would be increased by approximately 2 percent or less.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with regulations for hazardous waste pollution control.

New State Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total costs associated with existing and new regulations for hazardous waste pollution control.

LUST

EPA: Data for 1987-1990 from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on data for the years 1987-1990.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with existing regulations for LUST.

New Non-EPA Federal: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total costs associated with existing and new regulations for LUST.

*Environmental Investments*

Table 5-2B: CERCLA OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.5 Superfund																
Existing Regulations																
EPA		114	255	320	392	431	450	499	548	596	645	693	742	791	839	888
Non-EPA Federal		37	49	53	131	171	230	421	487	506	523	494	494	494	494	494
State Government		27	28	44	67	93	123	154	189	228	270	315	364	416	471	530
Local Government																
Private		13	21	30	51	72	96	123	152	184	218	255	295	337	382	430
Total Existing Regs		191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
Federally Mandated		191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
New Regulations																
Local Government																
Private																
Total New Regs																
Full Implementation																
Total Superfund		191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
Federally Mandated		191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
5.6 Total Land																
Federally Mandated		14,752	15,963	16,681	18,309	20,723	22,539	24,235	25,107	24,591	24,812	24,984	25,696	26,387	26,766	27,432
Federally Mandated		2,355	2,854	4,131	5,512	7,680	9,250	10,700	11,325	10,564	10,538	10,464	10,930	11,375	11,507	11,927

## Footnotes to Table 5-2B

EPA, State Government, Private: Estimated on the basis of Appendix H and the regulations and sources listed in Appendix A.

Non-EPA Federal: Estimated cost of Federal facility compliance from Appendix H, Table H-2.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated existing Superfund regulations.

Total Federally Mandated: Sum of total costs associated with existing and new Superfund regulations.

*November 1990*

Table 5-3: LAND POLLUTION CONTROL COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.1	Solid Waste															
	Existing Regulations															
	EPA	70	72	20	24	36	36	39	99	114	19				2	3
	Non-EPA Federal			85	119	119	118	114	125	127	179	208	215	230	295	268
	State Government															
	Local Government	3,530	3,629	3,768	3,931	3,960	4,144	4,404	4,538	4,669	4,777	4,899	5,043	5,355	5,711	6,056
	Private	4,835	5,197	5,475	5,716	6,274	7,032	7,363	8,220	8,701	8,959	7,892	7,577	8,307	8,579	9,369
	Total Solid Waste	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	13,934	12,998	12,835	13,892	14,587	15,697
	Federally Mandated	488	513	567	626	667	713	742	861	909	885	847	846	913	1,012	1,043
5.2	Hazardous Waste															
	Existing Regulations															
	EPA										182	147	144	146	155	202
	Non-EPA Federal													6	11	19
	Private												539	693	843	990
	Total Hazardous Waste										182	147	683	845	1,009	1,410
	Federally Mandated										182	147	683	845	1,009	1,410
5.3	LUST															
	Total LUST															
	Federally Mandated															
5.4	Total RCRA	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,116	13,145	13,518	14,737	15,596	17,107
	Federally Mandated	488	513	567	626	667	713	742	861	909	1,067	994	1,529	1,758	2,021	2,453
5.5	Superfund															
	Existing Regulations															
	EPA										15	53	93	169	196	233
	Non-EPA Federal													20	47	73
	State Government										0	6	12	23	31	40
	Local Government															
	Private											0	7	23	39	57
	Total Superfund										15	59	112	235	312	404
	Federally Mandated										15	59	112	235	312	404
5.6	Total Land	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,131	13,204	13,630	14,972	15,908	17,511
	Federally Mandated	488	513	567	626	667	713	742	861	909	1,082	1,053	1,640	1,993	2,333	2,856

Footnotes to Table 5-3

Sum of operating costs for year in question, shown on corresponding lines of Table 5-2, plus amortized capital costs assuming an interest rate of 7 percent and a capital life of 20 years for solid and hazardous waste and 30 years for LUST and Superfund on the accumulated capital investment shown in Table 5-1 since 1972.

## Environmental Investments

Table 5-3A: RCRA COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.1	Solid Waste															
	Existing Regulations															
	EPA	3	3	6	9	12	14	16	18	20	22	24	26	28	30	32
	Non-EPA Federal	268	313	342	372	405	439	476	515	550	588	628	673	718	767	817
	Local Government	6,056	6,308	6,238	6,435	6,635	6,836	6,982	7,129	7,277	7,426	7,577	7,728	7,879	8,030	8,182
	Private	9,369	10,058	9,712	9,944	10,173	10,400	10,555	10,690	10,816	10,952	11,081	11,198	11,315	11,413	11,505
	Total Existing Regs	15,697	16,683	16,298	16,761	17,226	17,690	18,029	18,352	18,663	18,987	19,310	19,625	19,940	20,240	20,537
	Federally Mandated	1,043	1,135	1,146	1,201	1,258	1,316	1,369	1,423	1,474	1,528	1,585	1,645	1,706	1,769	1,834
	New Regulations															
	Local Government						395	593	798	1,002	1,085	1,168	1,250	1,333	1,416	1,499
	Private							124	172	219	267	267	267	267	267	267
	Total New Regs						395	718	970	1,221	1,351	1,434	1,517	1,600	1,682	1,765
	Total Solid Waste	15,697	16,683	16,298	16,761	17,226	18,085	18,747	19,322	19,884	20,338	20,744	21,142	21,539	21,922	22,302
	Federally Mandated	1,043	1,135	1,146	1,201	1,258	1,710	2,086	2,393	2,696	2,880	3,019	3,162	3,305	3,451	3,599
5.2	Hazardous Waste															
	Existing Regulations															
	EPA	202	239	231	214	210	236	245	254	263	272	281	290	299	308	317
	Non-EPA Federal	19	30	38	258	398	594	1,165	1,493	1,859	2,098	2,352	2,633	2,913	3,193	3,474
	State Government															
	Local Government															
	Private	990	1,151	1,315	1,485	1,659	1,839	2,024	2,215	2,411	2,611	2,817	3,029	3,245	3,467	3,694
	Total Existing Regs	1,212	1,419	1,583	1,957	2,268	2,670	3,435	3,963	4,533	4,982	5,451	5,952	6,457	6,968	7,485
	Federally Mandated	1,212	1,419	1,583	1,957	2,268	2,670	3,435	3,963	4,533	4,982	5,451	5,952	6,457	6,968	7,485
	New Regulations															
	EPA		3	3	3	3	3	3	3	3	3	3	3	3	3	3
	State Government		9	9	9	9	9	9	9	5	5	5	5	5	5	5
	Private	199	294	1,481	1,624	2,122	3,146	3,769	3,901	4,076	4,220	3,937	4,173	4,317	4,461	4,569
	Total New Regs	199	306	1,493	1,636	2,134	3,158	3,781	3,913	4,084	4,228	3,945	4,181	4,325	4,469	4,577
	Total Hazardous Waste	1,410	1,725	3,077	3,593	4,402	5,827	7,216	7,875	8,616	9,210	9,396	10,133	10,782	11,438	12,062
	Federally Mandated	1,410	1,725	3,077	3,593	4,402	5,827	7,216	7,875	8,616	9,210	9,396	10,133	10,782	11,438	12,062
5.3	LUST															
	Existing Regulations															
	EPA		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Total Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Federally Mandated		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	New Regulations															
	Non-EPA Federal															
	Local Government															
	Private				118	232	274	321	359	253	228	229	231	280	264	265
	Total New Regs				1,163	2,952	3,402	3,804	4,190	2,962	2,611	2,645	2,681	3,581	3,289	3,296
	Total LUST				1,281	3,184	3,675	4,125	4,549	3,214	2,838	2,875	2,913	3,861	3,553	3,561
	Total LUST															
	Federally Mandated		1	13	1,311	3,215	3,716	4,177	4,611	3,286	2,920	2,966	3,014	3,972	3,673	3,691
	Federally Mandated		1	13	1,311	3,215	3,716	4,177	4,611	3,286	2,920	2,966	3,014	3,972	3,673	3,691
5.4	Total RCRA	17,107	18,409	19,388	21,664	24,842	27,629	30,139	31,808	31,787	32,468	33,106	34,289	36,293	37,033	38,055
	Federally Mandated	2,453	2,861	4,236	6,104	8,874	11,254	13,479	14,879	14,598	15,009	15,381	16,308	18,059	18,563	19,352

November 1990

Footnotes to Table 5-3A

Sum of operating costs for year in question, shown on corresponding lines of Table 5-2A, plus amortized capital costs assuming an interest rate of 7 percent and a capital life of 20 years for solid and hazardous waste and 30 years for LUST on the accumulated capital investment shown in Tables 5-1 and 5-1A since 1972.

*Environmental Investments*

Table 5-3B: CERCLA COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.5 Superfund																
Existing Regulations																
EPA		233	436	587	740	852	964	1,115	1,276	1,445	1,624	1,811	2,009	2,216	2,431	2,657
Non-EPA Federal		73	107	135	278	396	560	943	1,231	1,482	1,737	1,934	2,159	2,384	2,610	2,835
State Government		40	48	74	106	140	180	222	270	322	379	439	505	574	648	727
Local Government																
Private		57	93	134	225	317	420	536	662	801	950	1,112	1,285	1,470	1,666	1,874
Total Existing Regs		404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
Federally Mandated		404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
New Regulations																
Local Government																
Private																
Total New Regs																
Full Implementation																
Total Superfund		404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
Federally Mandated		404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
5.6 Total Land																
Federally Mandated		17,511	19,092	20,318	23,013	26,547	29,753	32,956	35,247	35,836	37,158	38,402	40,247	42,938	44,388	46,148
Federally Mandated		2,856	3,545	5,166	7,452	10,579	13,378	16,295	18,318	18,648	19,699	20,677	22,266	24,704	25,918	27,445

## Footnotes to Table 5-3B

Sum of the operating costs for the year in question, shown on corresponding lines of Table 5-2B, plus amortized capital costs assuming an interest rate of seven percent and a capital life of 30 years on the accumulated capital investment shown in Tables 5-1 and 5-1B since 1972.

*November 1990*

Table 5-3C: LAND POLLUTION CONTROL COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.1	Solid Waste															
	Existing Regulations															
	EPA	70	72	20	24	36	36	39	99	114	19				2	3
	Non-EPA Federal			84	116	115	113	108	119	120	171	200	205	217	279	249
	State Government															
	Local Government	3,514	3,595	3,717	3,863	3,874	4,040	4,280	4,395	4,507	4,595	4,697	4,820	5,111	5,444	5,763
	Private	4,815	5,153	5,404	5,621	6,155	6,887	7,192	8,018	8,468	8,695	7,602	7,266	7,970	8,215	8,978
	Total Solid Waste	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,480	12,498	12,292	13,298	13,941	14,994
	Federally Mandated	486	509	559	615	653	695	721	838	883	855	814	809	871	964	989
5.2	Hazardous Waste															
	Existing Regulations															
	EPA										182	147	144	146	155	202
	Non-EPA Federal													5	10	16
	State Government															
	Local Government															
	Private												537	689	829	972
	Total Hazardous Waste										182	147	681	840	994	1,380
	Federally Mandated										182	147	681	840	994	1,380
5.3	LUST															
	Existing Regulations															
	EPA															
	Non-EPA Federal															
	State Government															
	Local Government															
	Private															
	Total LUST															
	Federally Mandated															
5.4	Total RCRA	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,662	12,645	12,973	14,139	14,935	16,374
	Federally Mandated	486	509	559	615	653	695	721	838	883	1,037	961	1,491	1,712	1,958	2,370
5.5	Superfund															
	Existing Regulations															
	EPA										14	47	81	145	161	190
	Non-EPA Federal													18	40	60
	State Government									0	5	10	20	27	35	
	Local Government															
	Private											0	5	16	28	41
	Total Superfund										14	52	96	200	255	326
	Federally Mandated										14	52	96	200	255	326
5.6	Total Land	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,676	12,697	13,069	14,339	15,190	16,700
	Federally Mandated	486	509	559	615	653	695	721	838	883	1,051	1,013	1,586	1,912	2,214	2,695

## Footnotes to Table 5-3C

Sum of operating costs for year in question, shown on corresponding lines of Table 5-2, plus amortized capital costs assuming an interest rate of three percent and a capital life of 20 years for solid and hazardous waste and 30 years for LUST and Superfund on the accumulated capital investment shown in Table 5-1 since 1972.

Table 5-3D: RCRA COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
<b>5.1 Solid Waste</b>																
Existing Regulations																
EPA		3	3	6	9	12	14	16	18	20	22	24	26	28	30	32
Non-EPA Federal		249	290	314	339	366	394	424	455	484	514	547	582	618	656	695
Local Government		5,763	5,987	5,892	6,063	6,236	6,411	6,546	6,681	6,818	6,954	7,093	7,232	7,369	7,508	7,647
Private		8,978	9,640	9,269	9,478	9,685	9,891	10,045	10,185	10,318	10,458	10,594	10,721	10,848	10,961	11,071
Total Existing Regs		14,994	15,920	15,482	15,890	16,300	16,710	17,030	17,338	17,639	17,948	18,257	18,560	18,863	19,155	19,446
Federally Mandated		989	1,075	1,079	1,126	1,175	1,224	1,269	1,316	1,360	1,407	1,455	1,505	1,557	1,609	1,663
New Regulations																
Local Government							337	479	660	840	899	958	1,017	1,076	1,135	1,194
Private								111	144	178	212	212	212	212	212	212
Total New Regs							337	590	804	1,018	1,111	1,170	1,229	1,288	1,347	1,406
Total Solid Waste Federally Mandated		14,994	15,920	15,482	15,890	16,300	17,048	17,619	18,143	18,657	19,059	19,427	19,789	20,150	20,502	20,851
<b>5.2 Hazardous Waste</b>																
Existing Regulations																
EPA		202	239	231	214	210	236	245	254	263	272	281	290	299	308	317
Non-EPA Federal		16	25	31	228	339	496	984	1,226	1,498	1,652	1,826	2,025	2,225	2,425	2,624
State Government																
Local Government																
Private		972	1,125	1,279	1,437	1,599	1,765	1,934	2,108	2,285	2,465	2,649	2,837	3,029	3,225	3,424
Total Existing Regs		1,191	1,388	1,541	1,880	2,148	2,497	3,164	3,588	4,046	4,390	4,756	5,153	5,553	5,958	6,365
Federally Mandated		1,191	1,388	1,541	1,880	2,148	2,497	3,164	3,588	4,046	4,390	4,756	5,153	5,553	5,958	6,365
New Regulations																
EPA			3	3	3	3	3	3	3	3	3	3	3	3	3	3
State Government			9	9	9	9	9	9	9	9	9	9	9	9	9	9
Private		190	281	1,432	1,543	2,004	3,017	3,630	3,758	3,922	4,060	3,765	3,977	4,115	4,253	4,355
Total New Regs		190	293	1,444	1,555	2,016	3,029	3,642	3,770	3,930	4,068	3,773	3,985	4,123	4,261	4,363
Total Hazardous Waste Federally Mandated		1,380	1,681	2,985	3,435	4,164	5,526	6,805	7,358	7,975	8,458	8,529	9,138	9,676	10,219	10,728
<b>5.3 LUST</b>																
Existing Regulations																
EPA			1	13	30	30	41	52	62	72	81	91	101	111	120	130
Total Existing Regs			1	13	30	30	41	52	62	72	81	91	101	111	120	130
Federally Mandated			1	13	30	30	41	52	62	72	81	91	101	111	120	130
New Regulations																
Local Government					104	204	230	264	288	181	155	156	157	188	172	173
Private					1,022	2,669	2,954	3,215	3,460	2,219	1,855	1,877	1,900	2,470	2,175	2,180
Total New Regs					1,126	2,874	3,185	3,479	3,747	2,400	2,010	2,033	2,058	2,658	2,347	2,352
Total LUST Federally Mandated			1	13	1,155	2,904	3,226	3,531	3,809	2,471	2,091	2,124	2,158	2,769	2,468	2,483
Federally Mandated			1	13	1,155	2,904	3,226	3,531	3,809	2,471	2,091	2,124	2,158	2,769	2,468	2,483
<b>5.4 Total RCRA Federally Mandated</b>																
		16,374	17,603	18,480	20,480	23,369	25,799	27,956	29,310	29,104	29,609	30,080	31,085	32,595	33,188	34,062
		2,370	2,757	4,077	5,716	8,243	10,313	12,195	13,287	12,825	13,067	13,278	14,030	15,289	15,642	16,280

## Footnotes to Table 5-3D

Sum of operating costs for year in question, shown on corresponding lines of Table 5-2A, plus amortized capital costs assuming an interest rate of 3 percent and a capital life of 20 years for solid and hazardous waste and 30 years for LUST on the accumulated capital investment shown in Tables 5-1 and 5-1A since 1972.

Table 5-3E: CERCLA COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.5 Superfund																
Existing Regulations																
	EPA	190	369	489	612	697	775	889	1,009	1,133	1,265	1,401	1,544	1,693	1,847	2,008
	Non-EPA Federal	60	86	105	224	313	439	751	958	1,124	1,292	1,405	1,548	1,691	1,834	1,976
	State Government	35	41	63	91	123	159	197	240	288	339	394	453	516	583	654
	Local Government															
	Private	41	66	96	161	227	301	385	475	575	682	797	922	1,054	1,195	1,344
	Total Existing Regs	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
	Federally Mandated	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
New Regulations																
	Local Government															
	Private															
	Total New Regs															
Full Implementation																
	Total Superfund	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
	Federally Mandated	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
5.6 Total Land																
	Federally Mandated	16,700	18,165	19,233	21,569	24,729	27,474	30,178	31,992	32,223	33,186	34,078	35,552	37,550	38,647	40,045
	Federally Mandated	2,695	3,320	4,830	6,804	9,603	11,987	14,417	15,969	15,944	16,644	17,276	18,497	20,244	21,101	22,263

Footnotes to Table 5-3E

Sum of the operating costs for year in question, shown on corresponding lines of Table 5-2B, plus amortized capital costs assuming an interest rate of three percent and a capital life of 30 years on accumulated capital investment shown in Tables 5-1 and 5-1B since 1972.

Table 5-3F: LAND POLLUTION CONTROL COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.1	Solid Waste															
	Existing Regulations															
	EPA	70	72	20	24	36	36	39	99	114	19				2	3
	Non-EPA Federal			87	122	123	122	119	130	133	186	215	223	241	309	284
	State Government															
	Local Government	3,545	3,657	3,811	3,989	4,033	4,233	4,508	4,659	4,807	4,931	5,071	5,232	5,561	5,937	6,305
	Private	4,852	5,235	5,536	5,796	6,374	7,155	7,509	8,391	8,899	9,184	8,138	7,842	8,594	8,887	9,701
	Total Solid Waste	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,319	13,423	13,297	14,396	15,135	16,294
	Federally Mandated	490	516	573	635	679	727	759	881	932	910	875	877	949	1,052	1,088
5.2	Hazardous Waste															
	Existing Regulations															
	EPA										182	147	144	146	155	202
	Non-EPA Federal													6	12	21
	State Government															
	Local Government															
	Private												540	697	854	1,005
	Total Hazardous Waste										182	147	684	849	1,022	1,436
	Federally Mandated										182	147	684	849	1,022	1,436
5.3	LUST															
	Existing Regulations															
	EPA															
	Non-EPA Federal															
	State Government															
	Local Government															
	Private															
	Total LUST															
	Federally Mandated															
5.4	Total RCRA	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,502	13,570	13,981	15,246	16,156	17,730
	Federally Mandated	490	516	573	635	679	727	759	881	932	1,092	1,022	1,561	1,798	2,074	2,524
5.5	Superfund															
	Existing Regulations															
	EPA										16	58	103	189	226	271
	Non-EPA Federal													22	53	84
	State Government										0	6	13	25	34	45
	Local Government															
	Private											0	9	28	48	71
	Total Superfund									16	65	125	265	265	361	471
	Federally Mandated									16	65	125	265	265	361	471
5.6	Total Land	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,518	13,635	14,106	15,510	16,518	18,200
	Federally Mandated	490	516	573	635	679	727	759	881	932	1,109	1,087	1,686	2,063	2,435	2,994

Footnotes to Table 5-3F

Sum of operating costs for year in question, shown on corresponding lines of Table 5-2, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 20 years for solid and hazardous waste and 30 years for LUST and Superfund on the accumulated capital investment shown in Table 5-1 since 1972.

## Environmental Investments

Table 5-3G: RCRA COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.1	Solid Waste															
	Existing Regulations															
	EPA	3	3	6	9	12	14	16	18	20	22	24	26	28	30	32
	Non-EPA Federal	284	333	365	400	438	478	520	565	606	650	698	750	803	861	920
	Local Government	6,305	6,580	6,532	6,751	6,973	7,198	7,353	7,510	7,668	7,826	7,988	8,150	8,311	8,473	8,636
	Private	9,701	10,413	10,087	10,339	10,588	10,833	10,988	11,119	11,239	11,371	11,494	11,603	11,711	11,796	11,874
	Total Existing Regs	16,294	17,330	16,991	17,500	18,011	18,522	18,877	19,212	19,533	19,869	20,204	20,529	20,853	21,160	21,463
	Federally Mandated	1,088	1,186	1,203	1,264	1,328	1,394	1,453	1,514	1,571	1,632	1,696	1,763	1,832	1,904	1,978
	New Regulations															
	Local Government						443	691	916	1,140	1,243	1,346	1,449	1,552	1,655	1,758
	Private							136	195	254	313	313	313	313	313	313
	Total New Regs						443	826	1,110	1,393	1,555	1,658	1,761	1,864	1,967	2,070
	Total Solid Waste	16,294	17,330	16,991	17,500	18,011	18,966	19,703	20,322	20,926	21,424	21,862	22,291	22,718	23,127	23,533
	Federally Mandated	1,088	1,186	1,203	1,264	1,328	1,837	2,279	2,625	2,965	3,187	3,354	3,525	3,697	3,872	4,049
5.2	Hazardous Waste															
	Existing Regulations															
	EPA	202	239	231	214	210	236	245	254	263	272	281	290	299	308	317
	Non-EPA Federal	21	34	43	284	449	678	1,319	1,721	2,165	2,476	2,799	3,148	3,497	3,846	4,194
	State Government															
	Local Government															
	Private	1,005	1,173	1,346	1,525	1,710	1,902	2,101	2,306	2,517	2,736	2,960	3,191	3,429	3,673	3,923
	Total Existing Regs	1,229	1,445	1,620	2,023	2,370	2,816	3,665	4,281	4,946	5,484	6,040	6,629	7,225	7,827	8,435
	Federally Mandated	1,229	1,445	1,620	2,023	2,370	2,816	3,665	4,281	4,946	5,484	6,040	6,629	7,225	7,827	8,435
	New Regulations															
	EPA		3	3	3	3	3	3	3	3	3	3	3	3	3	3
	State Government		9	9	9	9	9	9	9	5	5	5	5	5	5	5
	Private	207	305	1,523	1,692	2,222	3,255	3,887	4,022	4,206	4,356	4,083	4,340	4,489	4,638	4,751
	Total New Regs	207	317	1,535	1,704	2,234	3,267	3,899	4,034	4,214	4,364	4,091	4,348	4,497	4,646	4,759
	Total Hazardous Waste	1,436	1,762	3,155	3,727	4,604	6,083	7,564	8,315	9,160	9,848	10,131	10,977	11,721	12,473	13,194
	Federally Mandated	1,436	1,762	3,155	3,727	4,604	6,083	7,564	8,315	9,160	9,848	10,131	10,977	11,721	12,473	13,194
5.3	LUST															
	Existing Regulations															
	EPA		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Total Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Federally Mandated		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	New Regulations															
	Local Government				130	256	311	370	420	315	290	293	295	359	343	344
	Private				1,285	3,195	3,788	4,311	4,819	3,602	3,262	3,308	3,355	4,539	4,249	4,259
	Total New Regs				1,415	3,452	4,099	4,682	5,239	3,917	3,552	3,601	3,650	4,898	4,592	4,603
	Total LUST		1	13	1,444	3,482	4,140	4,734	5,301	3,988	3,634	3,692	3,751	5,008	4,713	4,733
	Federally Mandated		1	13	1,444	3,482	4,140	4,734	5,301	3,988	3,634	3,692	3,751	5,008	4,713	4,733
5.4	Total RCRA	17,730	19,093	20,159	22,671	26,097	29,189	32,001	33,939	34,075	34,906	35,685	37,019	39,448	40,313	41,461
	Federally Mandated	2,524	2,949	4,371	6,436	9,414	12,060	14,577	16,241	16,113	16,669	17,177	18,253	20,427	21,057	21,976

November 1990

Footnotes to Table 5-3G

Sum of operating costs for year in question, shown on corresponding lines of Table 5-2A, plus amortized capital costs assuming an interest rate of ten percent and a capital life of 20 years for solid and hazardous waste and 30 years for LUST on the accumulated capital investment shown in Tables 5-1 and 5-1A since 1972.

Table 5-3H: CERCLA COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.5 Superfund																
Existing Regulations																
	EPA	271	493	672	850	985	1,126	1,310	1,506	1,713	1,933	2,165	2,410	2,667	2,935	3,217
	Non-EPA Federal	84	125	161	324	467	664	1,108	1,466	1,790	2,121	2,389	2,686	2,983	3,279	3,576
	State Government	45	54	83	118	155	198	244	296	352	413	479	549	625	704	789
	Local Government															
	Private	71	115	167	280	395	523	667	824	996	1,182	1,383	1,598	1,828	2,072	2,331
	Total Existing Regs	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
	Federally Mandated	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
New Regulations																
	Local Government															
	Private															
	Total New Regs															
Full Implementation																
	Total Superfund	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
	Federally Mandated	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
5.6 Total Land																
	Federally Mandated	18,200	19,881	21,242	24,244	28,098	31,700	35,330	38,030	38,927	40,556	42,101	44,263	47,550	49,303	51,373
	Federally Mandated	2,994	3,737	5,454	8,008	11,415	14,571	17,906	20,332	20,965	22,319	23,593	25,497	28,529	30,048	31,888

## Footnotes to Table 5-3H

Sum of the operating costs for year in question, shown on corresponding lines of Table 5-2B, plus interest (assuming a rate of 10 percent) and depreciation on the basis of capital life of 30 years on accumulated capital investment shown in Tables 5-1 and 5-1B since 1972.

## 6. COSTS OF CHEMICAL CONTROL

This Chapter discusses the costs of controlling chemicals that have useful properties to man as well as undesirable environmental effects. In order to be consistent with both the relevant legislation and EPA administrative organization, these chemicals are divided into toxic substances and pesticides. The costs of chemical control are summarized in Tables 6-1, 6-2, and 6-3, and are discussed in the following sections:

- 6.1 Toxic substance control;
- 6.2 Pesticide control; and
- 6.3 Total chemical control costs.

The components of, and documentation for, the costs of toxic substances and pesticide control programs are contained in Appendices I and J, respectively.

Annualized costs of chemical control are calculated using capital amortization rates of three, seven, and ten percent, and an assumed capital life of 20 years. The annualized costs discussed below are those based on a seven percent rate. The annualized costs calculated using a rate of three percent are approximately one to five percent lower, and those calculated using a ten percent rate are one to five percent higher, than the estimates discussed below.

### 6.1. TOXIC SUBSTANCE CONTROL

The Toxic Substances Program is implemented under the authority of the Toxic Substances Control Act (TSCA) of 1976. Title II of the Act was amended in 1986 to add the Asbestos Hazard Emergency Response Act. Federal and private spending constitute the majority of expenditures under TSCA; however, states and local “educational agencies” are prominent in the implementation of the Title II asbestos programs.

TSCA provide two main types of regulatory authority: (1) collection of information to support assessments of the potential hazards of chemical substances; and (2) control of releases of, and human exposure to, toxic substances. The information collection components of TSCA include the authority to require chemical manufacturers and processors to perform tests on their products for health and environmental effects (TSCA Section 4); to provide certain information concerning the use and effects of new chemicals in advance of their being introduced into the market (TSCA Section 5); and to provide requested information relating to use, exposure, and effects of existing chemicals (TSCA Section 8). The control authority of TSCA (Sections 6 and 7) allows EPA to regulate the manufacture, processing, distribution in commerce, and the use and disposal of those substances deemed to pose a significant risk to human health or the environment.

Total annualized costs for TSCA increased from \$47 million in 1977 to \$402 million in 1986. Future costs are expected to rise substantially, however, due primarily to recently implemented regulations relating to asbestos in schools and asbestos in products. Annualized costs for TSCA are

expected to reach \$1.2 billion by the year 2000. The new asbestos rules will account for over 55 percent of the total annualized costs for TSCA by 1995.

#### *6.1.1. EPA and Non-EPA Federal*

EPA costs for administering toxic substances control programs increased steadily since the passage of TSCA, from an estimated \$15 million in 1977 to \$123 million in 1987. Future EPA costs are projected to follow this trend, reaching \$175 million in 1995 and \$214 million by the year 2000.

Non-EPA Federal costs under TSCA have been more variable. Federal costs increased from \$32 million in 1977 to \$271 million in 1980, but then fell in subsequent years. Federal costs were an estimated \$127 million in 1987. Federal costs are expected to rise steadily in the future, however, reaching \$157 million in 1995 and \$180 million by the year 2000.<sup>1</sup>

#### *6.1.2. State and Local Governments*

Although the TSCA program involves mainly Federal expenditure for program implementation and private expenditure for compliance, states and localities bear some costs for the management of asbestos in schools under the 1986 Title II asbestos amendment. This amendment requires EPA to issue regulations prescribing proper inspection and abatement procedures for asbestos in school buildings. Local educational agencies are required to develop asbestos management plans for the school buildings under their respective authorities, and states are to establish contractor and laboratory accreditation programs. Annualized costs to local and state governments for asbestos removal in schools are expected to be \$221 million in 1990, increasing to \$568 million by 1993 and beyond.

#### *6.1.3. Private*

Under TSCA, private industry incurs costs as a result of regulation of chemicals on the existing TSCA Inventory as well as from review and regulation of new chemicals and new chemical uses. The private costs associated with existing chemicals include compliance with three rules under Section 6 restricting the manufacture, use, and distribution in commerce of polychlorinated biphenyls (PCBs) and one rule implementing a ban/phasedown on the use of asbestos in products. The costs associated with existing chemicals also stem from a number of information collection rules under TSCA Sections 4, 8 and 12. The private costs associated with new chemical uses include the costs of

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<sup>1</sup> The estimates of EPA TSCA costs in Tables 6-2 and 6-2A are for the toxic substance program as a whole. It should be noted that a comparison of Appendix I Tables I-4 and I-4A with Tables 6-2 and 6-2A shows that the more limited estimates of EPA costs in Appendix I, which cover only TSCA Section 5, are considerably lower than the total EPA outlays shown in the main text tables.

preparing and filing Premanufacture Notifications and the costs of complying with Significant New Use Rules.

Total annualized costs to the private sector averaged approximately \$82 million between 1978 and 1984, and rose gradually from \$101 million in 1985 to \$115 million in 1987. These costs are projected to rise significantly over the next decade, in large part due to the new asbestos ban/phasedown rule which is expected to add \$53 million in annual costs by 1995 and \$106 million by the year 2000. Total annualized costs to the private sector are projected to reach \$218 million by 1995 and \$271 million by the year 2000.

## 6.2. PESTICIDE CONTROL

The pesticide program is implemented under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). Originally enacted in 1947, FIFRA received a major overhaul in 1972 and has been amended a number of times since, the last in 1988. Pesticide program expenditures include those at the Federal and state levels for the registration and re-registration of pesticide active ingredients, certification of pesticide applicators, farmworker safety programs, and enforcement. At the private level (including manufacturers, formulators, distributors and applicators), costs are associated with compliance with FIFRA requirements, including registration-related toxicology and other pesticide testing, pesticide disposal, storage, and application requirements, and pesticide cancellations and suspensions.

Total annualized costs for pesticide regulation increased from \$92 million in 1972 to \$508 million in 1979. Annual costs fell slightly over the next several years, averaging \$432 over the period 1980-1988. Beginning in 1989, costs are expected to increase significantly due primarily to accelerated pesticide re-registration and increased farmworker safety requirements mandated by the 1988 FIFRA amendments. Future annual costs are expected to rise from an estimated \$697 million in 1989 to \$1.3 billion in 1995, and to over \$1.6 billion by the year 2000.

### 6.2.1. EPA

EPA expenditures are associated primarily with pesticide registration. EPA approval is required for the registration of all new pesticide products. Additionally, to ensure that previously registered pesticides measure up to current scientific and regulatory standards, FIFRA requires the review and re-registration of all existing pesticides. Of the approximately 600 active ingredients requiring re-registration under FIFRA, EPA has issued registration standards for about 185. A registration standard includes a comprehensive review of all the available data on the active ingredient, a list of additional data needed for full registration, and EPA's current regulatory position on the pesticide. Based on the pesticide test data, EPA may restrict the uses of pesticide products, cancel the registration of pesticides deemed by the agency to cause unreasonable adverse effects on human health or the environment, or suspend pesticide registration to prevent an imminent hazard. Other EPA costs include grants to the states for enforcement, and certification and training programs for pesticide applicators.

Total annual EPA costs under FIFRA averaged approximately \$50 million over the years 1972 to 1988. EPA costs are expected to jump to over \$110 million during 1989 and 1990 due to the agency's development of pesticide storage and disposal requirements and for reimbursement of storage costs to eligible registrants pursuant to the 1988 FIFRA amendments. Agency costs are expected to fall to about \$61 million in 1991, and then rise slowly over the remainder of the decade, reaching \$86 million by year 2000.

### *6.2.2. State and Local Governments*

States have the primary responsibility for FIFRA enforcement, and state expenditures are mostly for these activities. States may also be authorized to implement applicator certification and training and farmworker safety programs and to issue experimental use permits.

State costs for all activities were less than \$1 million per year from 1972 through 1976, but jumped to \$25 million in 1979. From 1980 through 1988, state costs averaged approximately \$18 million per year. Annual state costs for all activities are expected to average approximately \$24 million over the years 1989 through 2000.

### *6.2.3. Private*

Private expenditures are borne by the affected commercial and agricultural concerns involved with the registration, sale, storage, disposal and application of pesticides. The majority of private compliance costs for years 1972 through 1988 were associated with registration-related pesticide testing, pesticide storage and disposal, and pesticide cancellation and suspension. Private costs for all activities rose steadily from \$65 million in 1972 to \$392 million in 1979. From 1980 through 1988, private costs for FIFRA averaged approximately \$350 million per year. Future private costs are expected to rise significantly due to acceleration of the re-registration process and increased farmworker safety requirements mandated by the 1988 FIFRA amendments. Private costs jumped to over \$550 million in 1989, and are expected to increase to an estimated \$1.6 billion by the year 2000.

## 6.3. TOTAL CHEMICAL CONTROL COSTS

Total annualized costs of chemical control increased from \$92 million in 1972 to \$889 million in 1980. Costs then fell until 1983, when they started to increase again, reaching about \$820 million in 1986-87. Private sector pesticide control costs accounted for over 40 percent of these expenditures. Total costs are expected to increase significantly over the next several years, reaching about \$2.5 billion in 1995 and \$2.9 billion by the year 2000. Private expenditures for pesticide control are projected to increase to an more than \$1.6 billion by the year 2000. The increase in private pesticide costs is due to an expected steady rise in costs for pesticide research and development, cancellations and suspensions, and increased farmworker safety and applicator training and certification costs. These cost increases reflect accelerated levels of pesticide re-registration activity and more stringent pesticide applicator and farmworker safety requirements mandated by the 1988 FIFRA Amendments.

Table 6-1: CHEMICAL SUBSTANCE CONTROL CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6.1	Toxic Substances															
	Existing Regulations															
	EPA															
	Non-EPA Federal						2	28	83	27	17	16	8	15	33	45
	Private							20				43	23	121	120	117
	Total Toxic Substances						2	48	83	27	17	59	31	136	153	162
	Federally Mandated						2	48	83	27	17	59	31	136	153	162
6.2	Pesticides															
	EPA															
	Non-EPA Federal															
	State Government															
	Local Government															
	Private															
	Total Pesticides															
	Federally Mandated															
6.3	Total Chemicals						2	48	83	27	17	59	31	136	153	162
	Federally Mandated						2	48	83	27	17	59	31	136	153	162

Footnotes to Table 6-1

TOXIC SUBSTANCES

EPA: Assumed to be zero; EPA expenditures for toxic substances are assumed to be operating costs.

Non-EPA Federal: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Private: From Appendix I, Table I-1, first line.

Existing Federally Mandated: Assumed to be 100 percent of total existing toxic substances pollution control costs.

Total Federally Mandated: Sum of total toxic substances pollution control costs.

PESTICIDES: As explained in Appendix J, pesticide capital costs are believed to be small and are taken to be zero in this report.

Table 6-1A: CHEMICAL SUBSTANCE CONTROL CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
6.1	Toxic Substances															
	Existing Regulations															
	EPA															
	Non-EPA Federal	45	42	48	53	59	65	70	76	82	87	93	99	104	110	116
	State Government															
	Local Government															
	Private	117	114	110	89	89	89	89	89							
	Total Existing Regs	162	156	158	143	148	154	160	165	82	87	93	99	104	110	116
	Federally Mandated	162	156	158	143	148	154	160	165	82	87	93	99	104	110	116
	New Regulations															
	Non-EPA Federal															
	Local Government				830	830	830	830								
	Private															
	Total New Regs				830	830	830	830								
	Total Toxic Substances	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
	Federally Mandated	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
6.2	Pesticides															
	EPA															
	Non-EPA Federal															
	State Government															
	Local Government															
	Private															
	Total Pesticides															
	Federally Mandated															
6.3	Total Chemicals	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
	Federally Mandated	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116

Footnotes to Table 6-1A

TOXIC SUBSTANCES

EPA: Assumed to be zero; EPA expenditures for toxic substances are assumed to be operating costs.

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Private: From Appendix I, Tables I-1 and I-1A, first line.

Existing Federally Mandated: Assumed to be 100 percent of costs associated with total existing regulations for toxic substances.

New Non-EPA Federal: Estimated on the basis of the regulations and sources in Appendix A.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total costs associated with existing and new regulations for toxic substances.

PESTICIDES: As explained in Appendix J, pesticide capital costs are believed to be small and are taken to be zero in this report.

Table 6-2: CHEMICAL SUBSTANCE CONTROL OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6.1	Toxic Substances															
	Existing Regulations															
	EPA			9	5	9	15	19	69	79	119	95	88	82	87	110
	Non-EPA Federal						32	49	161	258	158	122	51	58	94	155
	State Government															
	Local Government															
	Private							85	102	77	74	76	72	67	70	63
	Total Toxic Substances			9	5	9	47	154	332	414	350	293	212	207	251	335
	Federally Mandated			9	5	9	47	154	332	414	350	293	212	207	251	335
6.2	Pesticides															
	EPA	26	33	35	36	65	64	50	75	69	64	52	48	49	58	53
	Non-EPA Federal					13	21	16	15	14	11	10	9	9	9	8
	State Government	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
	Local Government															
	Private	65	110	139	140	261	273	346	392	355	330	316	300	366	384	342
	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
	Federally Mandated	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	578	840	874	774	690	585	647	721	754
	Federally Mandated	92	143	183	181	349	408	578	840	874	774	690	585	647	721	754

## Footnotes to Table 6-2

## TOXIC SUBSTANCES

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays).

Non-EPA Federal: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Private: From Appendix I, Table I-4, last line.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with toxic substance pollution control.

Total Federally Mandated: Sum of total costs associated with toxic substance pollution control.

PESTICIDES

EPA: From Appendix J, Table J-3, last line.

Non-EPA Federal: From Appendix J, Table J-4, last line.

State Government: From Appendix J, Table J-2, last line.

Private: From Appendix J, Table J-1, last line.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with existing pesticides pollution control.

Total Federally Mandated: Sum of total costs associated with pesticides pollution control.

Table 6-2A: CHEMICAL SUBSTANCE CONTROL OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
-----																
6.1	Toxic Substances															
	Existing Regulations															
	EPA	110	123	122	128	98	144	152	160	168	175	183	191	199	207	214
	Non-EPA Federal	155	97	95	92	89	87	84	81	79	76	73	71	68	66	63
	State Government															
	Local Government															
	Private	63	62	62	66	63	62	61	61	59	60	60	60	61	61	62
	Total Existing Regs	329	283	278	285	250	293	297	303	306	311	317	322	328	334	339
	Federally Mandated	329	283	278	285	250	293	297	303	306	311	317	322	328	334	339
	New Regulations															
	Non-EPA Federal															
	Local Government	6		80	80	64	128	191	255	255	255	255	255	255	255	255
	Private				4	4	4	4	50	52	53	94	97	100	103	106
	Total New Regs	6		80	84	68	132	195	305	307	308	349	352	355	358	361
	Total Toxic Substances	335	283	358	369	318	425	492	608	613	619	666	674	683	692	700
	Federally Mandated	335	283	358	369	318	425	492	608	613	619	666	674	683	692	700
-----																
6.2	Pesticides															
	EPA	53	52	59	111	114	61	63	65	68	71	74	77	80	83	86
	Non-EPA Federal	8	8	7	7	7	8	7	7	7	7	8	8	8	8	8
	State Government	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
	Local Government															
	Private	342	378	372	554	838	995	1,079	1,159	1,207	1,252	1,301	1,356	1,399	1,465	1,537
	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
	Federally Mandated	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
-----																
6.3	Total Chemicals	754	736	813	1,066	1,297	1,510	1,662	1,865	1,917	1,972	2,072	2,140	2,199	2,273	2,358
	Federally Mandated	754	736	813	1,066	1,297	1,510	1,662	1,865	1,917	1,972	2,072	2,140	2,199	2,273	2,358
-----																

Footnotes to Table 6-2A

TOXIC SUBSTANCES

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on historical data for the years 1974-1990.

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing Private: From Appendix I, Table I-4A, last line.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with existing toxic substance regulations.

New Non-EPA Federal: Estimated on the basis of the regulations and sources listed in Appendix A.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of the sum of costs associated with existing and new toxic substances regulations.

PESTICIDES

EPA: From Appendix J, Table J-3A, last line.

Non-EPA Federal: From Appendix J, Table J-4A, last line.

State Government: From Appendix J, Table J-2A, last line.

Private: From Appendix J, Table J-1A, last line.

Existing Federally Mandated: Assumed to be 100 percent of total costs of existing pesticides pollution control.

Total Federally Mandated: Sum of total costs associated with pesticides pollution control.

Table 6-3: CHEMICAL SUBSTANCE CONTROL COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6.1	Toxic Substances															
	Existing Regulations															
	EPA			9	5	9	15	19	69	79	119	95	88	82	87	110
	Non-EPA Federal						32	52	172	271	173	138	68	77	116	181
	State Government															
	Local Government															
	Private							87	104	79	76	82	80	86	101	105
	Total Toxic Substances			9	5	9	47	158	345	429	367	315	237	245	303	402
	Federally Mandated			9	5	9	47	158	345	429	367	315	237	245	303	402
6.2	Pesticides															
	EPA	26	33	35	36	65	64	50	75	69	64	52	48	49	58	53
	Non-EPA Federal					13	21	16	15	14	11	10	9	9	9	8
	State Government	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
	Local Government															
	Private	65	110	139	140	261	273	346	392	355	330	316	300	366	384	342
	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
	Federally Mandated	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	583	853	889	791	712	610	685	773	822
	Federally Mandated	92	143	183	181	349	408	583	853	889	791	712	610	685	773	822

## Footnote to Table 6-3

Sum of operating costs for year in question, shown on corresponding lines of Table 6-2, plus amortized capital costs assuming an interest rate of seven percent and a capital life of 20 years on the accumulated capital investment shown in Table 6-1 since 1972.

Table 6-3A: CHEMICAL SUBSTANCE CONTROL COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
-----																
6.1	Toxic Substances															
	Existing Regulations															
	EPA	110	123	122	128	98	144	152	160	168	175	183	191	199	207	214
	Non-EPA Federal	181	127	129	131	134	138	142	146	151	157	163	170	174	174	180
	State Government															
	Local Government															
	Private	105	115	125	137	143	150	158	167	164	165	165	166	164	165	165
	Total Existing Regs	396	365	376	396	375	432	452	473	483	497	512	526	537	546	560
	Federally Mandated	396	365	376	396	375	432	452	473	483	497	512	526	537	546	560
	New Regulations															
	Non-EPA Federal															
	Local Government	6		80	158	221	363	504	568	568	568	568	568	568	568	568
	Private				4	4	4	4	50	52	53	94	97	100	103	106
	Total New Regs	6		80	162	225	367	508	618	620	621	662	665	668	671	674
	Total Toxic Substances	402	365	456	558	600	799	960	1,091	1,104	1,119	1,174	1,192	1,206	1,217	1,234
	Federally Mandated	402	365	456	558	600	799	960	1,091	1,104	1,119	1,174	1,192	1,206	1,217	1,234
-----																
6.2	Pesticides															
	EPA	53	52	59	111	114	61	63	65	68	71	74	77	80	83	86
	Non-EPA Federal	8	8	7	7	7	8	7	7	7	7	8	8	8	8	8
	State Government	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
	Local Government															
	Private	342	378	372	554	838	995	1,079	1,159	1,207	1,252	1,301	1,356	1,399	1,465	1,537
	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
	Federally Mandated	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
-----																
6.3	Total Chemicals	822	819	910	1,255	1,579	1,885	2,130	2,348	2,408	2,472	2,580	2,657	2,721	2,799	2,892
	Federally Mandated	822	819	910	1,255	1,579	1,885	2,130	2,348	2,408	2,472	2,580	2,657	2,721	2,799	2,892
-----																

Footnote to Table 6-3A

Sum of operating costs for year in question, shown on corresponding lines of Table 6-2A, plus amortized capital costs assuming an interest rate of seven percent and a capital life of 20 years on the accumulated capital investment shown in Tables 6-1 and 6-1A since 1972.

Table 6-3B: CHEMICAL SUBSTANCE CONTROL COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6.1	Toxic Substances															
	Existing Regulations															
	EPA			9	5	9	15	19	69	79	119	95	88	82	87	110
	Non-EPA Federal						32	51	169	267	169	134	63	71	109	173
	State Government															
	Local Government															
	Private							87	103	78	75	81	78	81	92	93
	Total Toxic Substances			9	5	9	47	157	341	425	362	309	229	234	288	383
	Federally Mandated			9	5	9	47	157	341	425	362	309	229	234	288	383
6.2	Pesticides															
	EPA	26	33	35	36	65	64	50	75	69	64	52	48	49	58	53
	Non-EPA Federal					13	21	16	15	14	11	10	9	9	9	8
	State Government	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
	Local Government															
	Private	65	110	139	140	261	273	346	392	355	330	316	300	366	384	342
	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
	Federally Mandated	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	581	849	885	786	705	603	674	758	802
	Federally Mandated	92	143	183	181	349	408	581	849	885	786	705	603	674	758	802

## Footnote to Table 6-3B

Sum of operating costs for year in question, shown on corresponding lines of Table 6-2, plus amortized capital costs assuming an interest rate of three percent and a capital life of 20 years on the accumulated capital investment shown in Table 6-1 since 1972.

Table 6-3C: CHEMICAL SUBSTANCE CONTROL COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
6.1	Toxic Substances															
	Existing Regulations															
	EPA	110	123	122	128	98	144	152	160	168	175	183	191	199	207	214
	Non-EPA Federal	173	118	119	120	121	123	125	128	130	134	137	141	144	143	146
	State Government															
	Local Government															
	Private	93	100	107	116	120	125	130	136	134	134	135	135	134	135	136
	Total Existing Regs	377	341	348	364	339	392	407	424	432	444	455	468	477	485	496
	Federally Mandated	377	341	348	364	339	392	407	424	432	444	455	468	477	485	496
	New Regulations															
	Non-EPA Federal															
	Local Government	6		80	136	176	295	414	478	478	478	478	478	478	478	478
	Private				4	4	4	4	50	52	53	94	97	100	103	106
	Total New Regs	6		80	140	180	299	418	528	530	531	572	575	578	581	584
	Total Toxic Substances	383	341	428	504	519	691	825	952	962	975	1,028	1,043	1,055	1,066	1,080
	Federally Mandated	383	341	428	504	519	691	825	952	962	975	1,028	1,043	1,055	1,066	1,080
6.2	Pesticides															
	EPA	53	52	59	111	114	61	63	65	68	71	74	77	80	83	86
	Non-EPA Federal	8	8	7	7	7	8	7	7	7	7	8	8	8	8	8
	State Government	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
	Local Government															
	Private	342	378	372	554	838	995	1,079	1,159	1,207	1,252	1,301	1,356	1,399	1,465	1,537
	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
	Federally Mandated	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	802	795	882	1,200	1,498	1,777	1,995	2,209	2,267	2,328	2,434	2,508	2,571	2,647	2,738
	Federally Mandated	802	795	882	1,200	1,498	1,777	1,995	2,209	2,267	2,328	2,434	2,508	2,571	2,647	2,738

Footnote to Table 6-3C

Sum of operating costs for year in question, shown on corresponding lines of Table 6-2A, plus amortized capital costs assuming an interest rate of three percent and a capital life of 20 years on the accumulated capital investment shown in Tables 6-1 and 6-1A since 1972.

Table 6-3D: CHEMICAL SUBSTANCE CONTROL COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6.1	Toxic Substances															
	Existing Regulations															
	EPA			9	5	9	15	19	69	79	119	95	88	82	87	110
	Non-EPA Federal						32	53	174	274	176	142	72	81	121	187
	State Government															
	Local Government															
	Private							88	104	79	76	84	82	91	108	115
	Total Toxic Substances			9	5	9	47	159	348	433	371	321	243	254	316	419
	Federally Mandated			9	5	9	47	159	348	433	371	321	243	254	316	419
6.2	Pesticides															
	EPA	26	33	35	36	65	64	50	75	69	64	52	48	49	58	53
	Non-EPA Federal					13	21	16	15	14	11	10	9	9	9	8
	State Government	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
	Local Government															
	Private	65	110	139	140	261	273	346	392	355	330	316	300	366	384	342
	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
	Federally Mandated	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	584	856	893	795	717	616	694	786	838
	Federally Mandated	92	143	183	181	349	408	584	856	893	795	717	616	694	786	838

## Footnote to Table 6-3D

Sum of operating costs for year in question, shown on corresponding lines of Table 6-2, plus amortized capital costs assuming an interest rate of ten percent and a capital life of 20 years on the accumulated capital investment shown in Table 6-1 since 1972.

Table 6-3E: CHEMICAL SUBSTANCE CONTROL COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
6.1	Toxic Substances															
	Existing Regulations															
	EPA	110	123	122	128	98	144	152	160	168	175	183	191	199	207	214
	Non-EPA Federal	187	134	137	141	145	150	156	162	169	177	185	194	200	201	208
	State Government															
	Local Government															
	Private	115	128	140	154	163	172	182	192	190	190	191	191	189	190	190
	Total Existing Regs	413	385	400	423	406	466	489	514	527	543	559	576	588	597	613
	Federally Mandated	413	385	400	423	406	466	489	514	527	543	559	576	588	597	613
	New Regulations															
	Non-EPA Federal															
	Local Government	6		80	177	259	420	581	645	645	645	645	645	645	645	645
	Private				4	4	4	4	50	52	53	94	97	100	103	106
	Total New Regs	6		80	181	263	424	585	695	697	698	739	742	745	748	751
	Total Toxic Substances	419	385	480	605	669	891	1,074	1,209	1,224	1,241	1,298	1,318	1,333	1,345	1,364
	Federally Mandated	419	385	480	605	669	891	1,074	1,209	1,224	1,241	1,298	1,318	1,333	1,345	1,364
6.2	Pesticides															
	EPA	53	52	59	111	114	61	63	65	68	71	74	77	80	83	86
	Non-EPA Federal	8	8	7	7	7	8	7	7	7	7	8	8	8	8	8
	State Government	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
	Local Government															
	Private	342	378	372	554	838	995	1,079	1,159	1,207	1,252	1,301	1,356	1,399	1,465	1,537
	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
	Federally Mandated	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	838	839	934	1,301	1,648	1,976	2,244	2,466	2,528	2,594	2,705	2,783	2,849	2,927	3,022
	Federally Mandated	838	839	934	1,301	1,648	1,976	2,244	2,466	2,528	2,594	2,705	2,783	2,849	2,927	3,022

Footnote to Table 6-3E

Sum of operating costs for year in question, shown on corresponding lines of Table 6-2A, plus amortized capital costs assuming an interest rate of ten percent and a capital life of 20 years on the accumulated capital investment shown in Tables 6-1 and 6-1A since 1972.

## 7. COSTS OF MULTI-MEDIA CONTROL PROGRAMS

There are a number of environmental protection programs that are not directed towards controlling pollution in any one environmental medium. The costs of these programs are shown in Tables 7-1, 7-2, and 7-3, and discussed in the following sections:

- 7.1. Management and support;
- 7.2. Energy;
- 7.3. Interdisciplinary;
- 7.4. Emergency planning and community right to know;
- 7.5. Undesignated non-EPA Federal; and
- 7.6. Total multi-media costs.

Annualized costs for multi-media programs were calculated using capital amortization rates of three, seven, and ten percent, and an assumed 20 year capital life. The annualized costs discussed below are those calculated using a seven percent rate. The estimates derived using a three percent rate are approximately one to six percent lower, and those calculated using a ten percent rate are one to five percent higher, than the estimates discussed below.

### 7.1. EPA MANAGEMENT AND SUPPORT

EPA expenditures for the Management and Support Program provide executive direction and policy oversight for all EPA programs as well as administrative and support services not assigned to specific programs. Program expenditures rose gradually over time from a low of \$96 million in 1972 to \$276 million in 1987. Annual costs are projected to increase to \$460 million by the year 2000. The major components of management and support are: program management, agency management, regional management and support, and general support services for all agency programs.

Program management includes policy development, program development and oversight, and the associated management activities for eight of EPA's program offices. These program offices include Air and Radiation, Water, Enforcement and Compliance Monitoring, External Affairs, Pesticides and Toxic Substances, General Counsel, Research and Development, and Solid Waste and Emergency Response. In addition, liaison activities are performed with other Federal agencies and offices, including the Office of Management and Budget.

Agency management is comprised of the following functions and activities: policy direction; policy, planning and evaluation; legal services for litigation; external affairs; inspector general activities; and administration and resource management. Activities under the Agency management budget are concerned with providing support and guidance to the agency on its policies. In addition, assistance is provided to ensure policy and program implementation.

Regional management provides centralized management and administrative functions for the regional offices as well as direction and support for administrative and financial services, budget development and execution, and legal and analytical support. The program consists of several elements ranging from resource management to financial management to regional management and counsel. Expenditures cover the regional and deputy regional administrators, their immediate staffs and regional staff for public affairs, Congressional and intergovernmental relations, and civil rights.

The final component of management and support is general support services for all agency programs. This component accounts for the largest expenditure. General support is provided for all agency programs except Superfund. Support is provided in the areas of professional training, support services, automated data processing, and laboratory support.

## 7.2. EPA ENERGY PROGRAM

The Energy Program is a multi-media research and development effort aimed at providing scientific information for the evaluation of environmental impacts from, and the potential controls on, the nation's energy sector. Expenditures are incurred only by EPA since the program is limited to research and development, and does not involve the implementation of a regulatory program.

EPA costs rose gradually from \$46 million in 1974 to \$183 million in 1980. Since 1980, expenditures for the Energy Program have fallen steadily, reaching \$54 million in 1987. Projections for future annual costs show program costs falling further over time, reaching zero by the year 1996.

For the past several years, the Energy Program has concentrated on two principal areas of research: acid deposition and limestone injection multistage burner (LIMB) control technology. The agency's acid deposition research is a component of the National Acid Precipitation Assessment Program (NAPAP) established by the Energy Security Act of 1980. The current research addresses both sources and effects of acid deposition. This includes developing estimates of man-made sulfur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>), volatile organic compounds (VOCs), and alkaline material air emissions; field studies and model development of atmospheric transport, transformation, and deposition processes; monitoring and measurement of wet and dry deposition levels; assessment and quantification of aquatic and terrestrial effects of acid deposition; assessment of effects on materials and cultural resources; and evaluation of "cost of controls" data.

EPA expenditures on LIMB control technology involves research designed to develop, demonstrate, and evaluate emission control systems to reduce air emissions of SO<sub>x</sub> and NO<sub>x</sub> from pulverized coal-fired boilers. Specifically, the research program involves pilot-scale testing of LIMB processes, commercial demonstrations of the wall-fired boiler and the tangential-fired boiler technologies, and the analyses of waste characteristics and disposal from the commercial scale tangential-fired boiler technology.

### 7.3. EPA INTERDISCIPLINARY PROGRAM

The Interdisciplinary Program addresses environmental issues that affect several media and require an interdisciplinary approach. Activities within the program include inter-media research, Federal agency compliance with pollution control laws, and the legal aspects of the agency's enforcement efforts.

Annual program expenditures increased from \$11 million in 1972 to \$37 million in 1980. Expenditures fell to approximately \$17 million for each of the years 1981-82, and then began to climb, reaching \$59 million in 1987. Annual costs for the program are projected to rise steadily in the future to \$184 million in the year 2000.

The Interdisciplinary Research Program encompasses several different programs which are outlined below.

- The Scientific Assessment Program has responsibility for developing and ensuring consistency of approach to uniform risk assessment guidelines for the Agency.
- The Technical Information and Liaison Program provides for the production and transfer of technical and scientific information from the Office of Research and Development (ORD) with a focus on communicating cost-effective methods for complying with EPA regulations.
- The Regulatory Support Program works to ensure that Agency regulation development is consistent with current technical and scientific research findings.
- The Exploratory Research Program conducts long-range exploratory research.
- The Quality Assurance Program provides centralized guidance and management for agency-wide quality assurance activities and performs audits to assess their effectiveness.
- The Integrated Program to reduce uncertainties in risk assessment develops exposure and exposure-response models for estimating adverse effects on humans and ecosystems attributable to environmental pollution.
- The NEPA Compliance Program ensures that Agency activities comply with the intent of NEPA.
- The Federal Facilities Compliance program oversees Federal compliance with all Federal statutory requirements.
- The Environmental Review Program ensures that Federal agencies carry out their activities in an environmentally sound manner, pursuant to NEPA and Section 309 of the Clean Water Act.

- The Indians Program develops and implements interdisciplinary policies for dealing with Indian tribes on environmental problems.
- The Enforcement Policy and Operations provides guidance for consistent enforcement activities for all non-Superfund activities, including establishment of enforcement and monitoring priorities and policies for enforcement procedure selection and investigation efforts, legal case development, litigation, and adjudicatory hearing activities for media enforcement programs.
- The National Enforcement Investigations Center provides support in preparing enforcement cases and serves as a point of coordination and support for complex investigations.

#### 7.4. COMMUNITY RIGHT TO KNOW PROGRAM (EPCRA)

The Emergency Planning and Community Right to Know Act (EPCRA), also known as the SARA Title III, sets requirements for Federal, state, and local governments and industry regarding emergency planning and “community right-to-know” reporting on hazardous and toxic chemicals. EPCRA provides for public access to information on possible hazardous chemical exposures and releases to all environmental media.

The annualized costs of the EPCRA provisions were an estimated \$277 million in 1988, \$545 million in 1989, and are estimated to reach almost \$600 million in 1990. Future costs are expected to be \$916 million per year. The private sector is expected to account for about 96 percent of these expenditures, and local governments the remainder. No data are available on state and Federal costs under the program.

#### 7.5. UNDESIGNATED NON-EPA FEDERAL

A significant portion of non-EPA Federal expenditures for environmental-related activities are not broken down by media. They have been included under the multi-media section although it is not known whether they actually possess a multi-media character. Such non-EPA Federal expenditures have been relatively high, increasing from \$268 million in 1974 to \$485 million in 1979. Annual expenditures averaged \$368 million during the period 1981-1988. If recent trends continue into the future, these EPA expenditures will rise over the next several years, reaching \$738 million by the year 2000.

#### 7.6. TOTAL MULTI-MEDIA COSTS

On an annualized basis, total expenditures for multi-media environmental programs increased from \$108 million in 1972 to \$869 million in 1980. Over 50 percent of these expenditures are non-EPA Federal costs, and approximately 25 percent are EPA costs for its management and support programs. During the period 1981-1987, annual expenditures on multi-media programs averaged \$728 million. Future annual costs are expected to rise significantly, largely due to the

costs associated with the recently implemented EPCRA provisions. Annual costs are expected to increase from an estimated \$842 million in 1987 to \$2.3 billion by the year 2000. The EPCRA provisions are expected to account for approximately 40 percent of these costs, undesignated non-EPA Federal programs 32 percent, and EPA management and support programs 20 percent.

Table 7-1: MULTI-MEDIA PROGRAMS CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
7.1	Management & Spt (EPA)															
7.2	Energy (EPA)															
7.3	Interdisciplin (EPA)															
7.4	EPCRA															
	EPA															
	Local Government															
	Private															
	Total EPCRA															
7.5	Undesign (Non-EPA Fed)				4	19	45	13	42	68	120	76	79	109	84	46
7.6	Total Multi-Media				4	19	45	13	42	68	120	76	79	109	84	46

## Footnotes for Table 7-1

## UNDESIGNATED

Non-EPA Federal: 1981-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Table 7-1A: MULTI-MEDIA PROGRAMS CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7.1	Management & Spt (EPA)															
7.2	Energy (EPA)															
7.3	Interdisciplin (EPA)															
7.4	EPCRA															
	EPA															
	Local Government			149												
	Private			1,716	371	1,519										
	Total EPCRA			1,865	371	1,519										
7.5	Undesign (Non-EPA Fed)	46	43	34	24	15	5									
7.6	Total Multi-Media	46	43	1,899	395	1,534	5									

Footnotes for Table 7-1A

EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW (EPCRA)

Local government: Estimated on the basis of the regulations and sources listed in Appendix A.

Private: Estimated on the basis of the regulations and sources listed in Appendix A.

UNDESIGNATED

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Table 7-2: MULTI-MEDIA PROGRAMS OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
7.1	Management & Spt (EPA)	96	108	117	127	118	246	250	216	214	257	244	243	269	271	282
7.2	Energy (EPA)			46	43	117	160	187	156	183	137	105	72	47	43	58
7.3	Interdisciplinary (EPA)	11	30	30	34	28	37	51	29	37	18	16	28	43	56	53
7.4	EPCRA EPA Local Government Private Total EPCRA															
7.5	Undesign (Non-EPA Fed)			268	384	463	470	408	473	416	253	205	305	245	254	458
7.6	Total Multi-Media	108	139	461	587	726	913	896	875	850	665	570	648	603	625	851

## Footnotes for Table 7-2

## MANAGEMENT &amp; SUPPORT

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (amount for 1974 is Budget Authority; data for 1975-1986 are Outlays).

## ENERGY

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (amount for 1974 is Budget Authority; data for 1975-1986 are Outlays).

## INTERDISCIPLINARY

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (amount for 1974 is Budget Authority; data for 1975-1986 are Outlays).

## UNDESIGNATED

Non-EPA Federal: 1981-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Table 7-2A: MULTI-MEDIA PROGRAMS OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7.1	Management & Spt (EPA)	282	276	313	323	342	378	363	375	387	399	411	424	436	448	460
7.2	Energy (EPA)	58	54	53	51	40	24	25	19	13	6					
7.3	Interdisciplinary (EPA)	53	59	58	59	100	126	111	120	129	138	147	156	165	175	184
7.4	EPCRA															
	EPA															
	Local Government				24	24	24	24	24	24	24	24	24	24	24	24
	Private			101	310	216	538	538	538	538	538	538	538	538	538	538
	Total EPCRA			101	334	240	562	562	562	562	562	562	562	562	562	562
7.5	Undesign (Non-EPA Fed)	458	382	405	428	450	473	496	519	541	564	587	610	632	655	678
7.6	Total Multi-Media	851	772	930	1,196	1,172	1,563	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883

Footnotes for Table 7-2A

MANAGEMENT & SUPPORT

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on data for the years 1981-1990.

ENERGY

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on data for the years 1986-1990.

INTERDISCIPLINARY

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on data for the years 1981-1990.

## EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW (EPCRA)

Local government: Estimated on the basis of the regulations and sources listed in Appendix A.

Private: Estimated on the basis of the regulations and sources listed in Appendix A.

## UNDESIGNATED

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Table 7-3: MULTI-MEDIA PROGRAMS COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
7.1	Management & Spt (EPA)	96	108	117	127	118	246	250	216	214	257	244	243	269	271	282
7.2	Energy (EPA)			46	43	117	160	187	156	183	137	105	72	47	43	58
7.3	Interdisciplin (EPA)	11	30	30	34	28	37	51	29	37	18	16	28	43	56	53
7.4	EPCRA EPA Local Government Private Total EPCRA															
7.5	Undesig (Non-EPA Fed)			268	384	465	476	416	485	434	282	242	349	299	316	525
7.6	Total Multi-Media	108	139	461	587	729	919	903	886	868	695	606	692	657	687	918

Footnotes to Table 7-3

Sum of operating costs for year in question, shown on corresponding lines of Table 7-2, plus amortized capital costs assuming an interest rate of 7 percent and a capital life of 20 years on the accumulated capital investment shown in Table 7-1 since 1972.

Table 7-3A: MULTI-MEDIA PROGRAMS COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7.1	Management & Spt (EPA)	282	276	313	323	342	378	363	375	387	399	411	424	436	448	460
7.2	Energy (EPA)	58	54	53	51	40	24	25	19	13	6					
7.3	Interdi sci pl i n (EPA)	53	59	58	59	100	126	111	120	129	138	147	156	165	175	184
7.4	EPCRA															
	EPA															
	Local Government			14	38	38	38	38	38	38	38	38	38	38	38	38
	Private			263	507	556	878	878	878	878	878	878	878	878	878	878
	Total EPCRA			277	545	594	916	916	916	916	916	916	916	916	916	916
7.5	Undesi g (Non-EPA Fed)	525	453	479	504	528	551	574	597	619	642	663	681	703	721	738
7.6	Total Mul ti -Media	918	842	1,180	1,483	1,603	1,995	1,989	2,027	2,065	2,102	2,138	2,177	2,220	2,260	2,298

## Footnotes to Table 7-3A

Sum of operating costs for year in question, shown on corresponding lines of Table 7-2A, plus amortized capital costs assuming an interest rate of 7 percent and a capital life of 20 years on the accumulated capital investment shown in Tables 7-1 and 7-1A since 1972.

Table 7-3B: MULTI-MEDIA PROGRAMS COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
7.1	Management & Spt (EPA)	96	108	117	127	118	246	250	216	214	257	244	243	269	271	282
7.2	Energy (EPA)			46	43	117	160	187	156	183	137	105	72	47	43	58
7.3	Interdi sci pl i n (EPA)	11	30	30	34	28	37	51	29	37	18	16	28	43	56	53
7.4	EPCRA EPA Local Government Pri vate Total EPCRA															
7.5	Undesi g (Non-EPA Fed)			268	384	465	475	413	481	429	274	231	336	284	298	505
7.6	Total Mul ti -Medi a	108	139	461	587	728	917	901	883	863	686	596	679	642	669	898

Footnotes to Table 7-3B

Sum of operating costs for year in question, shown on corresponding lines of Table 7-2, plus amortized capital costs assuming an interest rate of 3 percent and a capital life of 20 years on the accumulated capital investment shown in Table 7-1 since 1972.

Table 7-3C: MULTI-MEDIA PROGRAMS COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7.1	Management & Spt (EPA)	282	276	313	323	342	378	363	375	387	399	411	424	436	448	460
7.2	Energy (EPA)	58	54	53	51	40	24	25	19	13	6					
7.3	Interdi sci pl i n (EPA)	53	59	58	59	100	126	111	120	129	138	147	156	165	175	184
7.4	EPCRA															
	EPA															
	Local Government			10	34	34	34	34	34	34	34	34	34	34	34	34
	Private			216	450	458	780	780	780	780	780	780	780	780	780	780
	Total EPCRA			226	484	492	814	814	814	814	814	814	814	814	814	814
7.5	Undesi g (Non-EPA Fed)	505	433	458	482	506	529	551	574	597	619	641	661	682	702	720
7.6	Total Mul ti -Medi a	898	822	1,108	1,400	1,479	1,871	1,865	1,902	1,940	1,978	2,014	2,055	2,098	2,139	2,178

## Footnotes to Table 7-3C

Sum of operating costs for year in question, shown on corresponding lines of Table 7-2A, plus amortized capital costs assuming an interest rate of 3 percent and a capital life of 20 years on the accumulated capital investment shown in Tables 7-1 and 7-1A since 1972.

Table 7-3D: MULTI-MEDIA PROGRAMS COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
7.1	Management & Spt (EPA)	96	108	117	127	118	246	250	216	214	257	244	243	269	271	282
7.2	Energy (EPA)			46	43	117	160	187	156	183	137	105	72	47	43	58
7.3	Interdisciplin (EPA)	11	30	30	34	28	37	51	29	37	18	16	28	43	56	53
7.4	EPCRA EPA Local Government Private Total EPCRA															
7.5	Undesig (Non-EPA Fed)			268	384	466	478	418	487	438	290	250	360	313	331	541
7.6	Total Multi-Media	108	139	461	587	729	921	905	889	873	702	615	702	671	702	934

Footnotes to Table 7-3D

Sum of operating costs for year in question, shown on corresponding lines of Table 7-2, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 20 years on the accumulated capital investment shown in Table 7-1 since 1972.

Table 7-3E: MULTI-MEDIA PROGRAMS COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7.1	Management & Spt (EPA)	282	276	313	323	342	378	363	375	387	399	411	424	436	448	460
7.2	Energy (EPA)	58	54	53	51	40	24	25	19	13	6					
7.3	Interdi sci pl i n (EPA)	53	59	58	59	100	126	111	120	129	138	147	156	165	175	184
7.4	EPCRA															
	EPA															
	Local Government			18	42	42	42	42	42	42	42	42	42	42	42	42
	Private			303	555	640	962	962	962	962	962	962	962	962	962	962
	Total EPCRA			320	597	681	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003
7.5	Undesi g (Non-EPA Fed)	541	470	497	522	547	570	593	616	638	661	681	699	720	738	752
7.6	Total Mul ti -Medi a	934	860	1,241	1,553	1,709	2,101	2,095	2,133	2,170	2,208	2,243	2,282	2,324	2,363	2,399

## Footnotes to Table 7-3E

Sum of operating costs for year in question, shown on corresponding lines of Table 7-2A, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 20 years on the accumulated capital investment shown in Tables 7-1 and 7-1A since 1972.

## 8. TOTAL COSTS AND MAJOR SOURCES OF UNCERTAINTY

This chapter summarizes estimates of total costs for all pollution control efforts and examines briefly the major sources of uncertainty surrounding these estimates. Total costs are derived by aggregating the cost estimates for each of the environmental media presented in Chapters 3 through 7. These totals are presented in Tables 8-1 through 8-18 as explained below.

Total costs are given in several different ways. Tables 8-1 through 8-3 show costs by environmental medium under the present implementation scenario, which includes costs pursuant to all current and forthcoming control programs. Following the format of the cost tables presented in earlier chapters, Table 8-1 shows total capital costs, Table 8-2 shows total operating costs, and Table 8-3 shows total annualized costs based on capital amortization rates of seven, three, and ten percent, respectively. Tables 8-4 through 8-6 present total costs by environmental medium under the full implementation scenario, which includes the expenditures required to bring the nation into compliance with the ozone NAAQS and those required to satisfy all wastewater treatment needs, in addition to the costs for all current and forthcoming control programs. Tables 8-7 through 8-9 present total costs for the subset of environmental programs that are mandated by Federal laws and regulations. Tables 8-10 through 8-12 show total costs by funding source. Tables 8-13 and 8-14 show the effect on total annualized costs for air and water programs of including pre-1972 capital costs. Tables 8-15 through 8-17 show total costs by environmental medium, major EPA regulatory program, and by existing and new regulatory programs. Finally, Table 8-18 and 8-19 present total expenditures—which represent the sum of capital and operating costs—by environmental medium and by existing and new regulatory programs assuming full and present implementation, respectively.

### 8.1. GENERAL TRENDS IN TOTAL COSTS

General trends in pollution control costs over time are discussed in this section. The discussion proceeds in the same general order as the data tables. Where annualized costs are discussed, trends based on the estimates calculated at capital amortization rates of seven percent are given first. These are followed by a range of estimates bracketed by annualized cost estimates calculated at rates of three and ten percent, respectively. The ranges indicate the sensitivity of the cost estimates to the rate of capital amortization used for annualization. All the estimates are in 1986 dollars.

#### *8.1.1. Total Capital Expenditures*

As shown in more detail in Tables 8-1 and 8-4, total pollution control capital expenditures can be summarized as follows:

	1972	1987	1990	2000	
				Present Implementation	Full Implementation
Pollution Control Capital Investment (billions of 1986\$)	20	30	41	30	39
Pollution Control Capital Investment (billions of 1990\$)	23	35	47	35	45
As Percent of Total Capital Investment	2.5	2.3	2.8	1.7	1.9

Capital costs are also shown in 1990 dollars in order to make them more relevant for the time frame in which this Report will be issued.<sup>1</sup>

As shown in Tables 8-1 and 8-4, total pollution control capital expenditures were relatively stable at about \$25-30 billion annually over the period 1975-87. There is expected to be a significantly higher level of capital expenditures during the period 1988-92, however. Capital expenditures are estimated to reach \$43 billion in 1992, followed by falling levels over the years 1993-2000 except for a large jump in 1998. Capital expenditures are expected to reach \$47 billion in 1998 due to over \$10 billion in capital investment for the upgrade/replacement of underground storage tanks in that year. Capital expenditures are then expected to fall back to roughly \$36 billion over years 1999-2000. It should be noted, however, that because some of the future cost estimates contained in the Regulatory Impact Analyses and other sources are given in terms of annualized costs rather than being disaggregated between capital and operating costs, capital costs for future years may be underestimated relative to operating costs because when in doubt it was sometimes easier to assign all of the annualized costs shown in these studies to operating costs. This has the advantage of resulting in no change in annualized costs but possibly some overstatement of operating costs.

To put these estimates in perspective in terms of their impact on the U.S. capital markets, it is useful to compare capital investment in pollution control as a percentage of total national investment in plant and equipment over time. Figure 8-1 shows the highest percentages were in the mid-1970s at a little over three percent. These rates were somewhat lower over the period 1978-1982, and even lower over the next five years. Pollution control capital costs were an estimated 2.3 percent of national capital expenditures in 1987.

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<sup>1</sup> The costs shown in 1986 dollars were multiplied by 1.153 to obtain 1990 dollars, in accordance with the GNP deflator shown in Table 1-2.

Capital costs as a percentage of total capital investment jumped to 2.8 percent in 1988, but are estimated to fall steadily over the period 1989-1996, from 2.9 percent in 1989 to two percent in 1997. After a jump to 2.7 percent in 1998 due to large capital outlays for the upgrade/replacement of underground storage tanks, rates are expected to resume this fall, dropping to 1.7 percent by the year 2000.<sup>2</sup>

### 8.1.2. Total Annualized Costs

As shown in Tables 8-3 and 8-6, total annualized costs for all pollution control activities in the United States at seven percent interest have increased and are projected to increase as follows:

	1972	1987	1990	2000	
				Present Imple- mentation	Full Imple- mentation
Total Annualized Costs (billions of 1986\$)	26	85	100	148	160
Total Annualized Costs (billions of 1990\$)	30	98	115	171	185
As Percent of GNP	0.9	1.9	2.1	2.6	2.8

In order to provide a frame of reference to judge the relative importance of environmental costs to a well-known aggregate measure of economic activity, annualized costs as a percentage of Gross National Product (GNP) is also computed,<sup>3</sup> even though the approach taken toward accounting for capital costs is different. Estimates of annualized costs over for the period 1972-2000 under each of the alternative scenarios are shown in Figure 8-2. Annual costs as a percentage of GNP are shown graphically in Figure 8-3.

If capital amortization rates of three and ten percent are used, the total annualized cost estimates range from \$73-\$95 billion in 1987. In the year 2000 costs would range from \$126-\$166 under the present implementation scenario, and \$137-\$179 billion under the full implementation scenario.

<sup>2</sup> In order to compute capital investment in pollution control as a percentage of total capital investment for future years, data on total national plant and equipment expenditures over the period 1972-1988 (in constant 1986 dollars) were linearly extrapolated to years 1989-2000.

<sup>3</sup> In order to compute total pollution control costs as a percentage of GNP for future years, data on GNP over the period 1972-1989 (in constant 1986 dollars) were linearly extrapolated to years 1990-2000.

Although annualized costs have been and are projected to continue increasing, they are increasing at a decreasing rate. As shown in Figure 8-4, the yearly rate of increase in total annualized costs decreased from 14 percent between 1972 and 1973 to six to eight percent in the mid-1980s and is projected to fall further to about three percent in the late 1990s (assuming full implementation).

### 8.1.3. Total Federally-Mandated Costs

Table 8-9 shows total annualized costs for the subset of environmental programs that are Federally-mandated as follows:

	1972	1987	1990	2000 (Assuming Full Implementation)
Federally-Mandated Annualized Costs (billions of 1986\$)	18	67	81	137
Federally-Mandated Annualized Costs (billions of 1990\$)	21	77	93	158
As percent of GNP	0.9	1.9	2.1	2.4

If capital amortization rates of three and ten percent are used, the cost estimates for Federally-mandated programs under the full implementation scenario range from \$56-\$76 billion in 1987, \$93-\$125 billion in 1995, and \$116-\$155 billion in the year 2000.

### 8.1.4. Total Costs by Funding Source

Table 8-12 shows total annualized costs by funding source under the present implementation scenario. The changes are highlighted in Figure 8-5, which shows the percentage allocations in 1972, 1980, 1987, and 2000. The data indicate that the share of total annualized costs incurred by state and local governments fell during the 1970s at the expense of the Federal Government, which was expanding its environmental involvement, while private sector costs remained relatively stable. During the period 1980-87, there was remarkable stability in the cost shares. The future projections, however, are for a rapid growth in the non-EPA Federal share with a corresponding reduction in all other shares, particularly the private sector, over the period 1987-2000. The non-EPA Federal costs are projected to increase more than 140 percent over the period, primarily due to proposed Department of Defense and Department of Energy expenditures on military and nuclear waste clean-up. Although the share of EPA costs is projected to fall somewhat over the period, the overall Federal share is projected to increase while that of state and local governments are projected to fall. By the year 2000, it is estimated that the private sector will account for about 60 percent of total costs, local governments more than 22 percent, non-EPA Federal agencies almost eight percent, the EPA about seven percent, and state governments a little more than three percent.

### *8.1.5. Total Costs by Environmental Medium*

Table 8-17 shows total annualized costs broken down by environmental medium, major EPA program area, and by existing and new regulations. A line item is also included in the air and water categories for “full implementation” costs, which for air represent the costs associated with nationwide attainment of the NAAQS for ozone, and for water represent the costs of fulfilling the nation's wastewater treatment needs.

The data on costs by environmental medium show that the relative shares of total costs in the year 1975 were: approximately 30 percent for air and radiation, 41 percent for water, 27 percent for land (including the costs associated with solid waste collection and disposal services), and less than 1 percent for chemicals. By 1980, the share of total costs accounted for by water programs had increased to 43 percent, the share for land programs had decreased to 23 percent, and the shares for other media had remained unchanged. These cost shares remained fairly constant over the period 1981-1988. The cost projections indicate that by the year 2000 the shares of total costs accounted for by air and water programs will fall slightly to around 28 and 40 percent, respectively; the share of land costs will rise to over 28 percent; and chemical regulation costs will increase to about 1.8 percent.

Figure 8-6 shows total annualized costs under the full implementation scenario as a percentage of GNP, broken down by environmental medium. The figure shows that costs for land pollution control have recently been increasing faster than those for any other environmental medium except chemicals, and are expected to do so through the year 2000. A breakdown of land costs into their four major components—solid waste, hazardous waste, underground storage tanks, and Superfund—is shown in Figure 8-7.

By the year 2000, total annualized costs under the full implementation scenario would be approximately \$72 billion more than year 1988 costs, an increase of 80 percent. Roughly one-third of this increase is due to the estimated increase in costs for land pollution control programs. As existing RCRA and Superfund hazardous waste programs are more fully implemented, land costs are estimated to increase by more than \$17.4 billion over the period 1988-2000. Moreover, new and forthcoming RCRA regulations are estimated to add another \$8.4 billion in annual costs by the year 2000.

The air and water programs are also expected to impose significantly greater annual costs in the year 2000 than those estimated for 1988, although not enough to prevent a slight fall in the total cost shares accounted for by each medium. New regulatory programs directed towards the control of air toxics and acid rain are projected to increase annual air costs by over \$7 billion by the year 2000. Also, the costs of fully implementing the Administration's strategy for attaining the existing NAAQS for ozone, listed under the “full implementation” line item, would add \$6.5 billion in annual costs by the year 2000.

Annual costs for water programs are estimated to increase by approximately \$15 billion over the period 1988-2000. This increase is due largely to additional expenditures for pretreatment and wastewater treatment, and new and forthcoming drinking water regulations. If the costs included in the full implementation line item are added to the total, annual water costs would increase by an additional \$6 billion by the year 2000. These full implementation costs represent the expenditures needed for wastewater treatment above what Federal, state, and local governments are projected to spend for wastewater treatment over the period 1988-2000.

## 8.2. MAJOR SOURCES OF UNCERTAINTY

Considerable uncertainty surrounds the cost estimates presented in this report. Several possible contributing factors are discussed in the sections indicated below. They are classified according to whether they likely:

- 8.2.1. Bias the estimates in unknown directions;
- 8.2.2. Bias the estimates downward; or
- 8.2.3. Bias the estimates upward.

### *8.2.1. Factors Contributing to Bias in Unknown Directions*

#### 8.2.1.1. Commerce Department Survey Data

Uncertainty is inherent in the Commerce Department survey data used as the basis for the historical and projected future costs of existing regulations. Like all survey data, it is subject to sampling errors as well as possible intentional or unintentional misinterpretation of the questions or misrepresentation of the answers by respondents. Such sources of potential error could result in either upward or downward biases, and are not well understood.

#### 8.2.1.2. Cost Estimates for the Clean Air Act Amendments

The cost estimates for the Clean Air Act amendments now being considered by Congress are particularly uncertain because they are based on EPA estimates for the Administration's proposed bill. It is difficult to accurately estimate costs for such a complex bill; the estimates are thus highly uncertain. Moreover, the provisions included in any final Clean Air Act amendments eventually passed by Congress may differ substantially from the provisions included in the Administration's bill.

#### 8.2.1.3. Capital Amortization Rate

Another important factor influencing the point estimates for annualized costs is the amortization rate used to annualized capital costs. There currently is no consensus regarding the appropriate rate for amortizing pollution control capital costs. While the discussion of annualized costs focuses on those derived using the seven percent rate, all of the cost tables in this report show estimates

calculated using three different rates: three, seven, and ten percent. This is done to show the sensitivity of the cost estimates to other assumptions regarding the appropriate rate for amortizing capital costs.

### *8.2.2. Factors Contributing to Downward Bias*

#### *8.2.2.1. Exclusion of Pre-1972 Capital Costs*

This report did not include pre-1972 capital costs in the final cost estimates because such data are available only for private sector water and stationary source air pollution control costs. It was thought that inclusion of pre-1972 capital costs for these two categories and not for others would produce uneven estimates across environmental media and economic sectors. In order to build a consistent set of cost estimates, capital costs that were incurred prior to 1972 have been excluded from the final estimates. This has the effect of reducing the annualized cost estimates over the first half of the time period covered in this report.

Table 8-14 shows the size of this effect for private stationary source air and private water costs, assuming capital lives of 20 and 30 years, respectively. The estimates are calculated using capital cost data (shown in Table 8-13) and operating costs taken from the Commerce Department survey data for years 1959 through 1988. One complication is that the 1959 capital cost data represents the total pollution control capital stock as of that date. To assume that all pre-1960 capital investments were made in 1959, as Table 8-14 does, overstates annualized costs in later years since much of the 1959 total was actually made in earlier years and presumably would be retired sooner than the estimates show. Keeping this qualification in mind, lines 3 and 6 of Table 8-14 show the amount that should be added to air and water costs to account for pre-1972 capital investments. Including pre-1972 capital costs increases annualized costs for air and water programs by \$2.2 and \$1.8 billion, respectively, until the earliest capital is retired. Retirement of pre-1972 capital stock is assumed to begin in 1979 for air capital, and in 1989 for water capital. After these years, the additions to annualized costs due to inclusion of pre-1972 capital begins to fall annually.

#### *8.2.2.2. Exclusion of Certain Costs*

Although the cost estimate presented here are much more comprehensive than those included in earlier reports in this series, there are a number of programs and regulations for which little or no data are readily available, and are thus not included in this report. In general, the programs and regulations excluded are relatively small and their omission probably results in only a negligible downward bias in total costs. One example is the program directed to noise control. At the regulation level, most new and forthcoming rules for which there are no Regulatory Impact Analyses (RIAs) or similar reports are excluded. A partial list of excluded regulations can be found at the end of each major section of Appendix A.

### 8.2.3. Factors Contributing to Upward Bias

#### 8.2.3.1. Actual Costs Often Below *Ex Ante* Estimates

At least one study of *ex ante* estimates of costs for new and proposed environmental regulations concludes that such studies have tended to over-estimate actual costs.<sup>4</sup> One reason for this is that *ex ante* estimates are often based on assumptions of “end-of-pipe” treatment rather than changes in production processes; the latter are often a less costly means of achieving compliance. Also, cost estimations usually assume full compliance in accordance with the current EPA plans for regulatory development and promulgation; however, some regulated entities typically go out of business before adopting controls or do not comply fully with regulatory requirements. If the historical tendency to over-estimate regulatory costs applies to the data for new regulations obtained from the Regulatory Impact Analyses (RIAs) used for this report, the cost estimates for new and forthcoming regulations included here may over-estimate actual costs. On the other hand, both EPA and the Office of Management and Budget have issued detailed guidelines for preparing RIAs in recent years, and these may have resulted in a more consistent and careful preparation of cost estimates than those studied earlier.

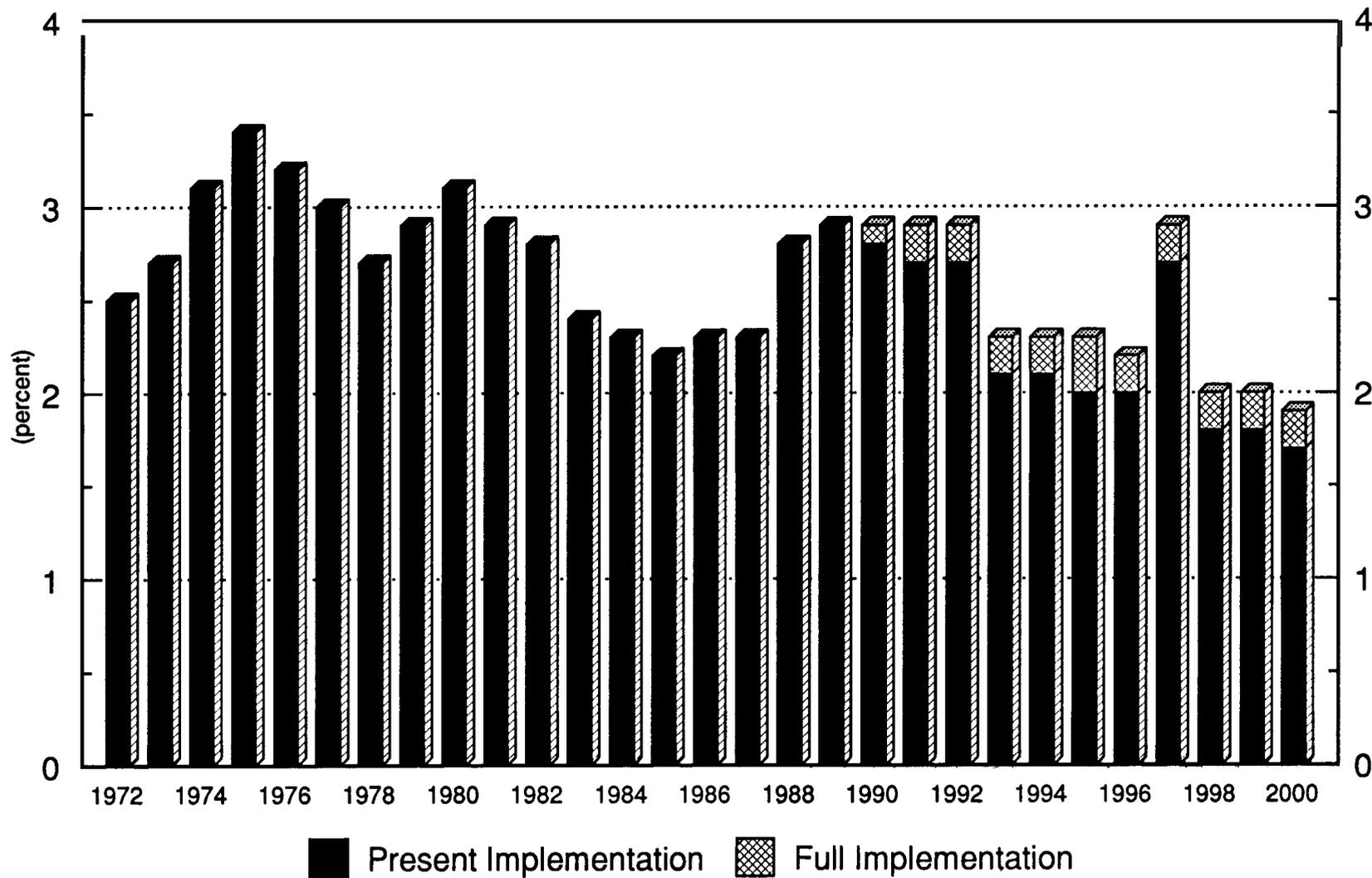
#### 8.2.3.2. Cost Projections for Existing Programs

As explained in Section 1.3.2.1, costs associated with existing regulations are projected to the year 2000 by linearly extrapolating recent trends in historical costs. In the case of those categories for which costs in recent years have been increasing rapidly because of program changes, there is a risk that linear extrapolations of costs may overestimate total costs when these projections are added to the costs associated with new and forthcoming rules. Since air and water costs have been relatively stable over the 1980s, this seems unlikely to be a major problem in these two media. This is more of a potential problem in the case of land costs, given the passage of new legislation in this area during the 1980s. Within the land category, the principal category of potential concern is the hazardous waste program, for which costs went from zero in 1980 to over \$1.4 billion in 1987. Comparison of the cost projections made for hazardous waste with projections made for the much older solid waste program suggests that hazardous waste expenditures for existing regulations are predicted to increase no faster than those for solid waste, however. Despite this encouraging result, there may be some small degree of upward bias in the cost estimates for hazardous waste regulation.

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<sup>4</sup> Putnam, Hayes and Bartlett, Inc., *Comparisons of Estimated and Actual Pollution Control Capital Expenditures for Selected Industries*, Report for U.S. EPA Office of Planning and Evaluation, June 1980.

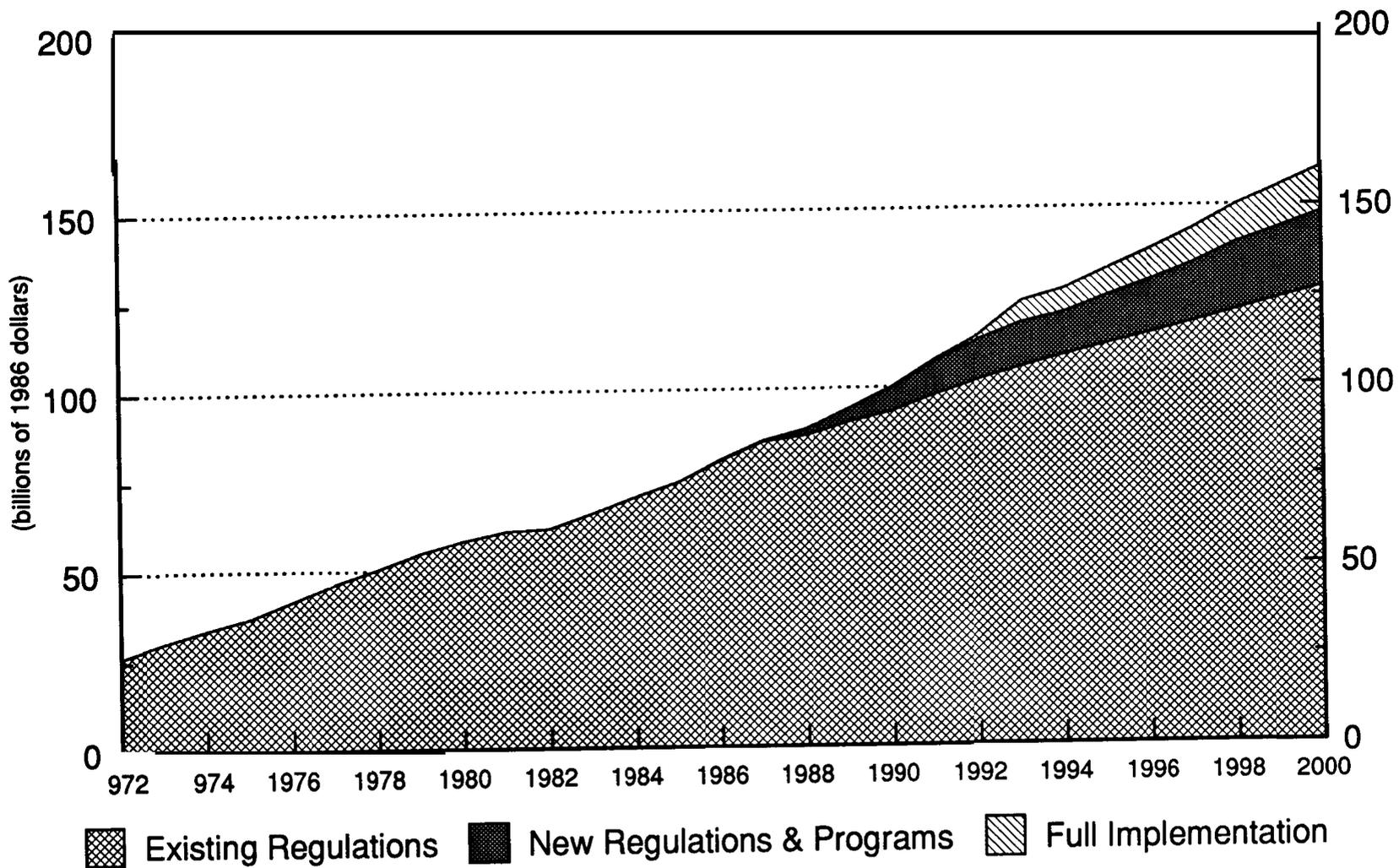
**Fig. 8-1: ENVIRONMENTAL CAPITAL INVESTMENT AS A PERCENTAGE OF TOTAL CAPITAL INVESTMENT**



Source: Tables 8-1 and 8-4

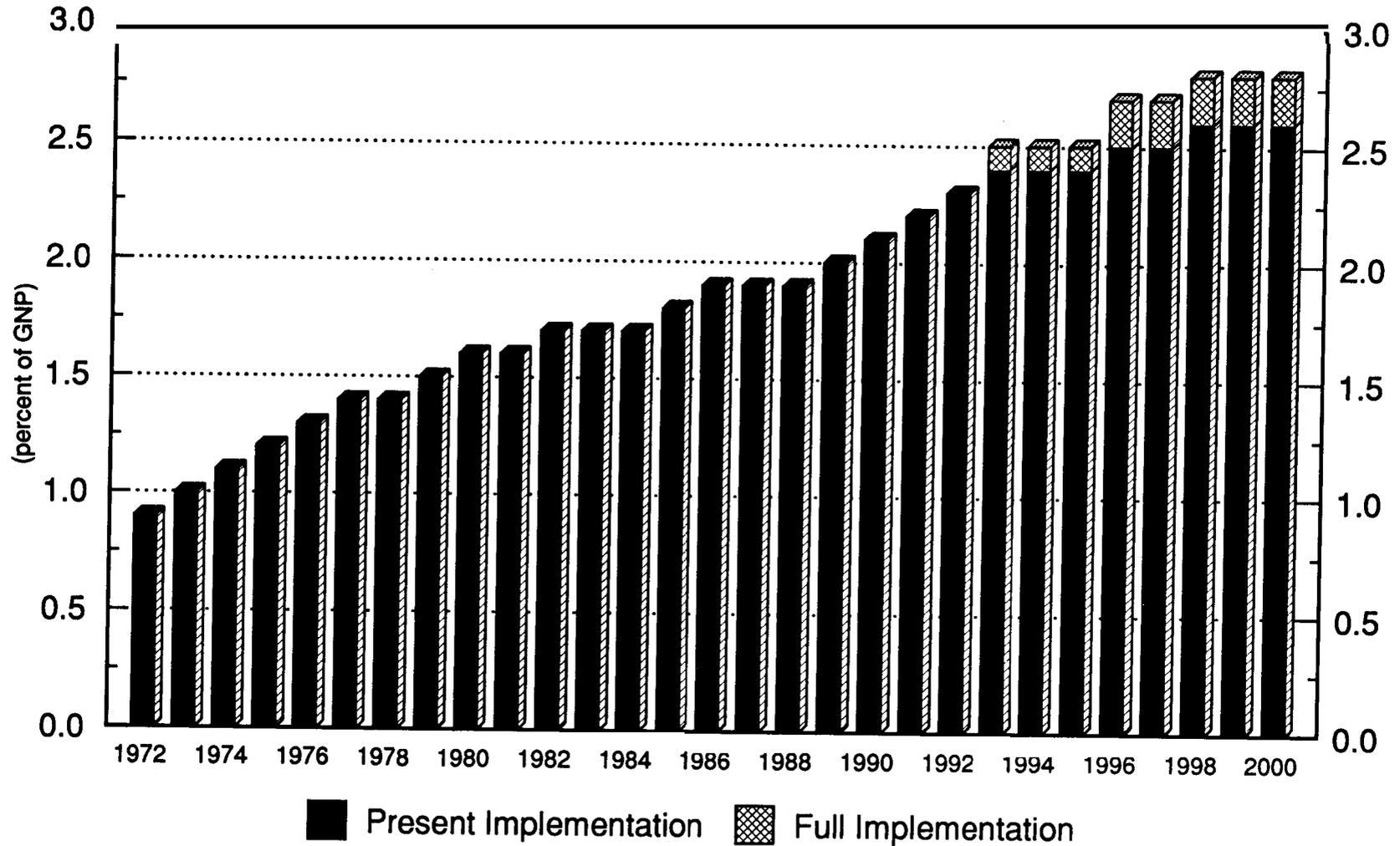
November 1990

**Fig. 8-2: TOTAL ANNUALIZED COSTS BY TYPE OF REGULATION**



Source: Table 8-17

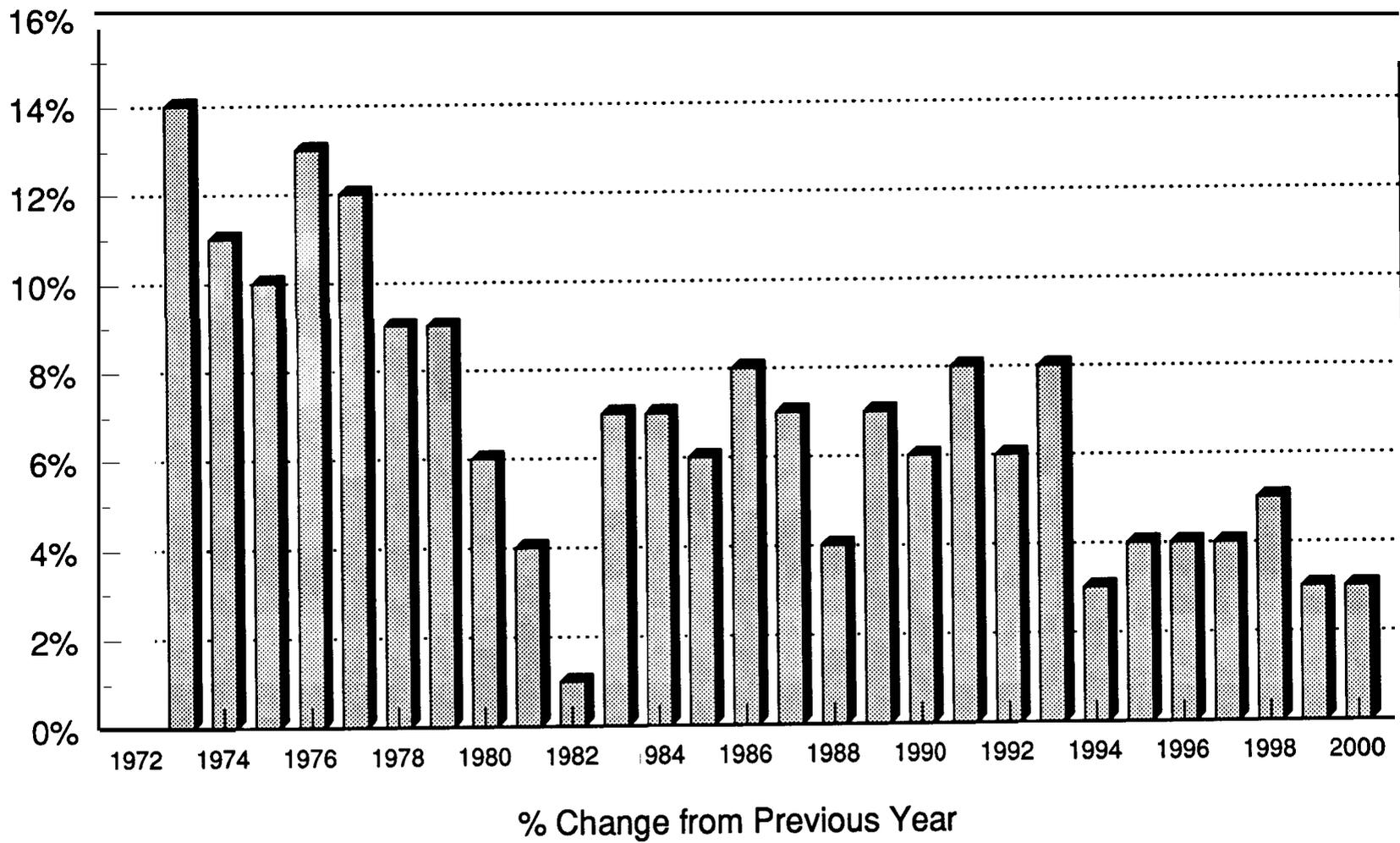
Fig. 8-3: TOTAL ANNUALIZED COSTS AS A PERCENTAGE OF GNP



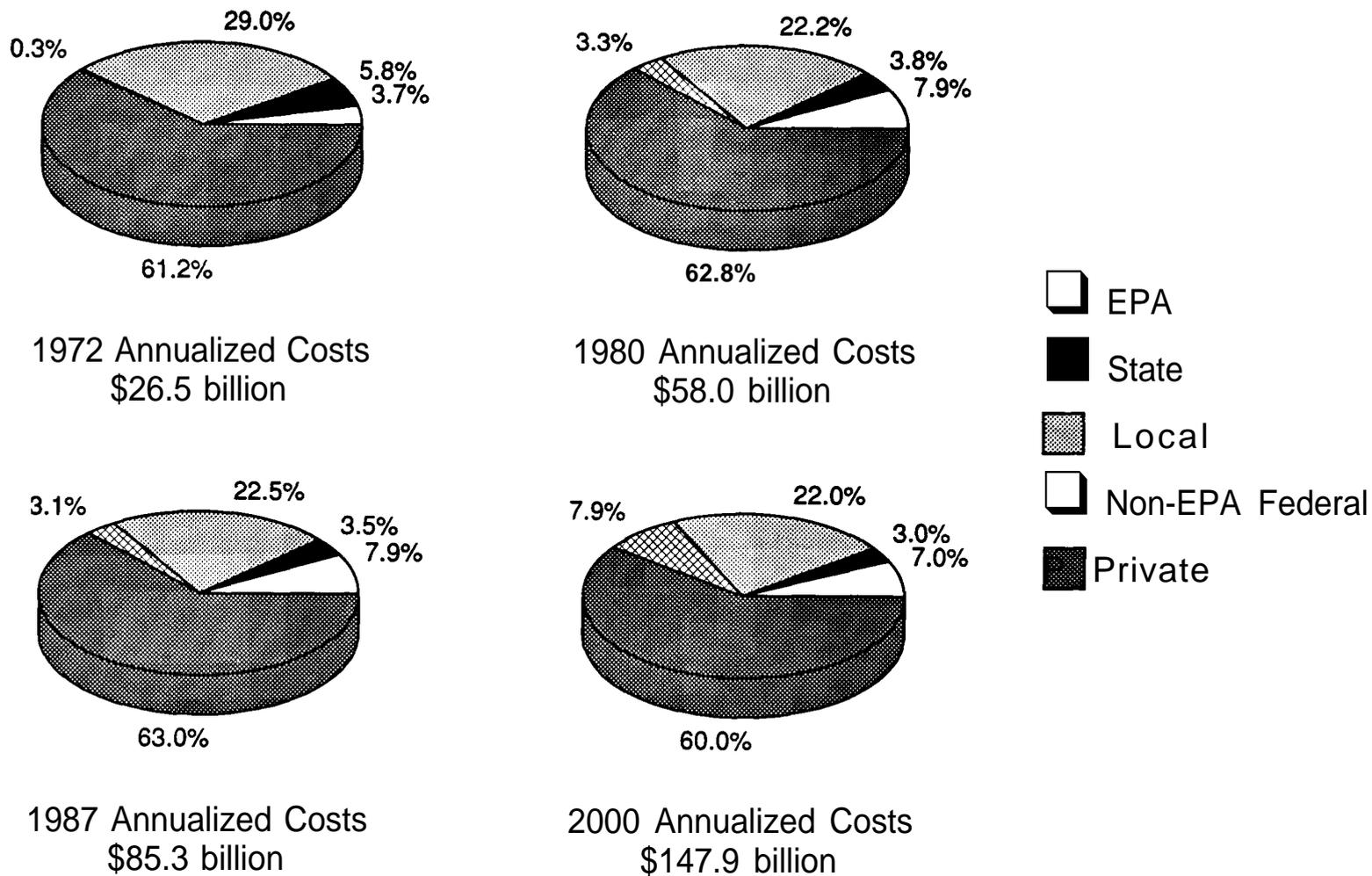
Source: Tables 8-3 and 8-6

November 1990

**Fig. 8-4: PERCENT CHANGE IN ANNUALIZED COSTS FROM PREVIOUS YEAR  
ASSUMING FULL IMPLEMENTATION AND 7% INTEREST**



**Fig. 8-5: TOTAL ANNUALIZED COSTS BY FUNDING SOURCE ASSUMING PRESENT IMPLEMENTATION AND 7% INTEREST**

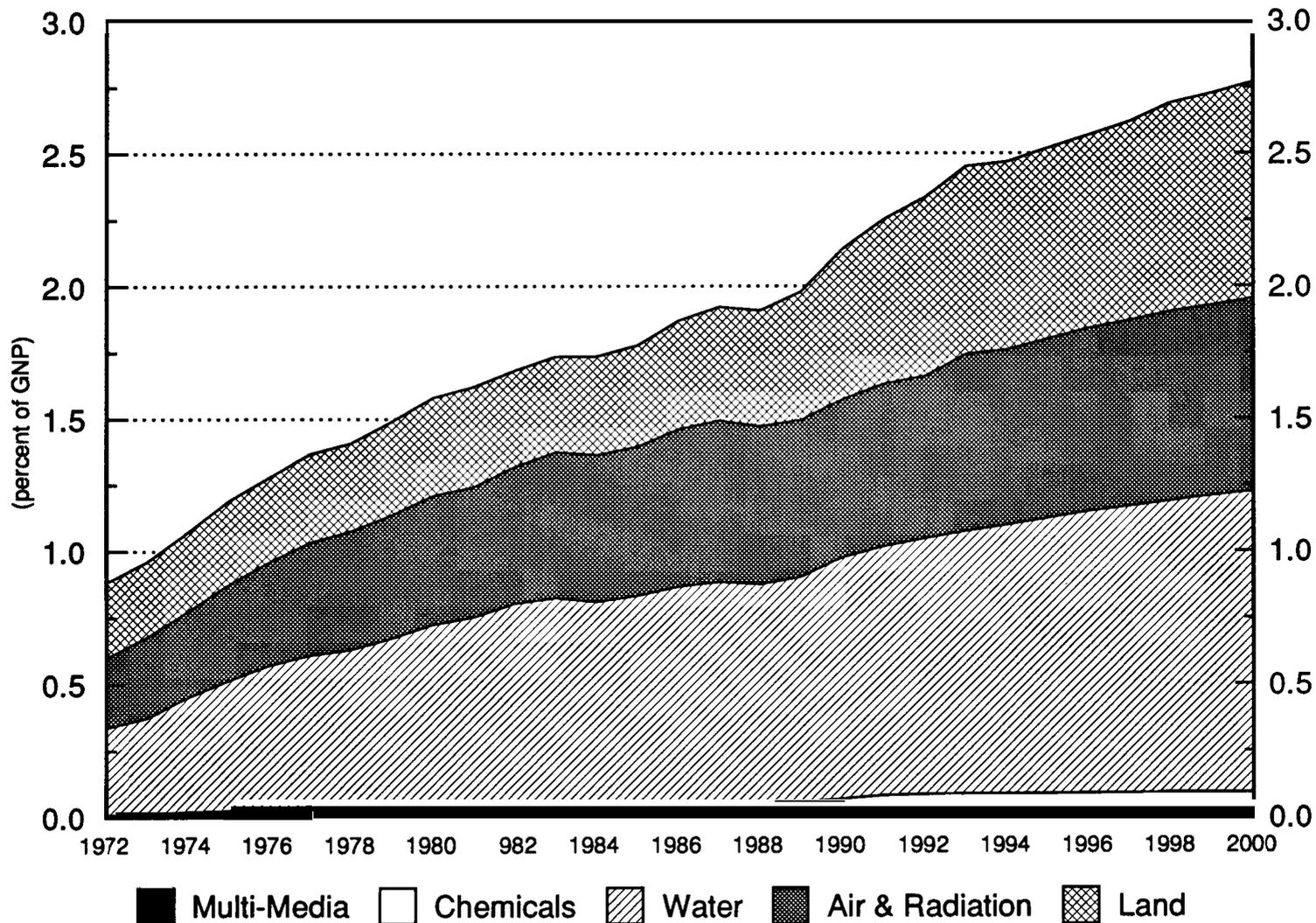


Source: Tables 8-12 and 8-12A

November 1990

**Fig. 8-6: TOTAL ANNUALIZED COSTS BY MEDIUM AS A PERCENTAGE OF GNP**

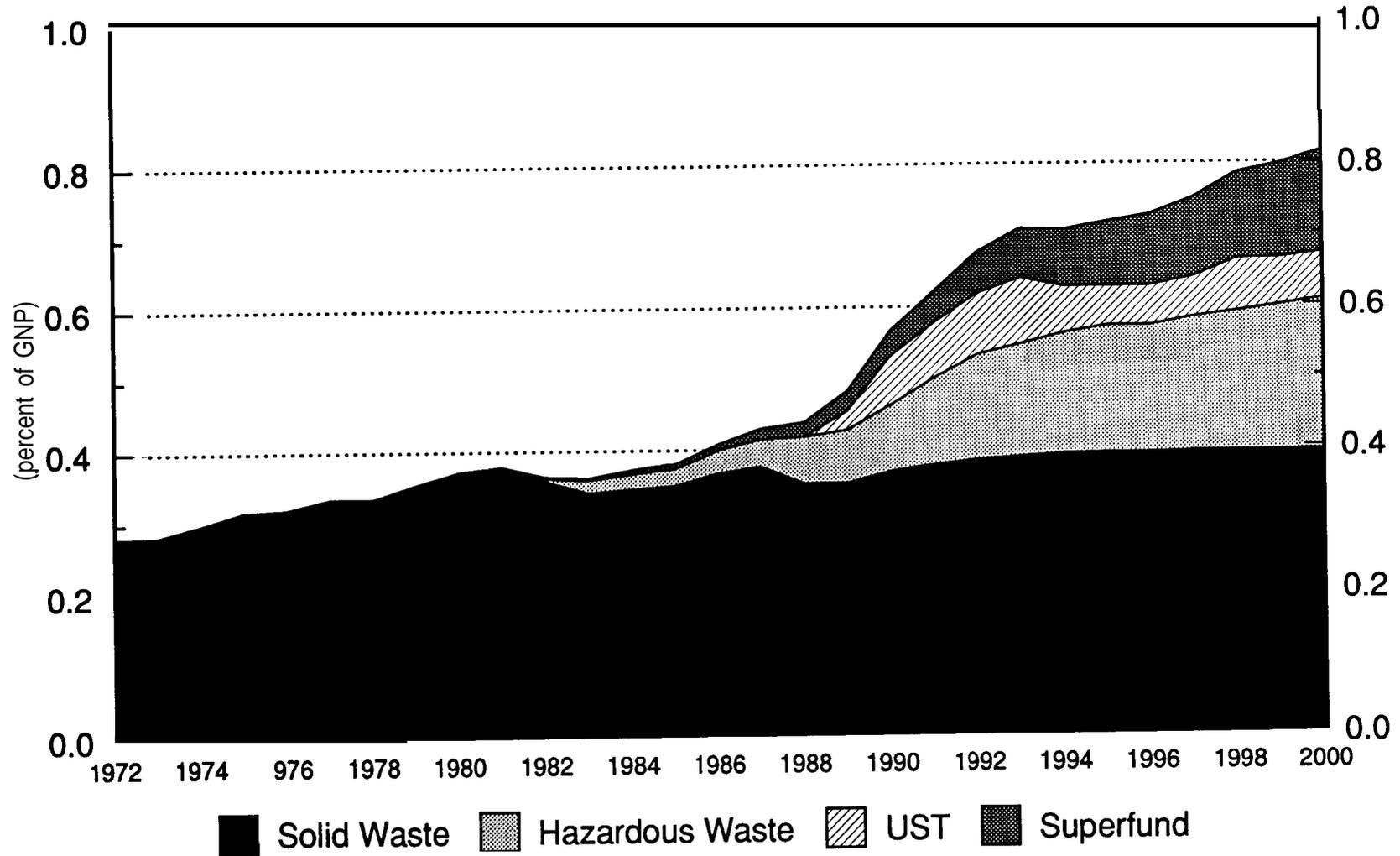
(Assuming Full Implementation)



Source: Tables 8-3 and 8-6

November 1990

Fig. 8-7: TOTAL LAND COSTS AS A PERCENTAGE OF GNP



Source: Table 5-3A

November 1990

Table 8-1: TOTAL CAPITAL COSTS ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
3.2	Radiation			24	20	16	8	25	22	64	89	30	37	33	55	48
3.3	Total Air & Radiation	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,373
4	Water															
4.1	Water Quality	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,090	15,020	13,211	12,666	12,345	12,043	12,023	12,666
4.2	Drinking Water	736	772	868	917	895	814	825	979	1,081	1,060	1,016	935	915	1,073	1,251
4.3	Total Water	13,457	13,533	14,019	14,647	14,953	16,420	15,720	16,070	16,101	14,270	13,682	13,280	12,958	13,096	13,917
5	Land															
5.1	Solid Waste	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,591	1,848	1,912	2,115
5.2	Hazardous Waste												65	113	368	558
5.3	LUST															
5.4	RCRA	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,656	1,961	2,280	2,672
5.5	Superfund										42	193	293	648	748	713
5.6	Total Land	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,942	1,893	1,949	2,609	3,028	3,385
6	Chemicals															
6.1	Toxic Substances						2	48	83	27	17	59	31	136	153	162
6.2	Pesticides															
6.3	Total Chemicals						2	48	83	27	17	59	31	136	153	162
7	Multi-Media				4	19	45	13	42	68	120	76	79	109	84	46
8	Total Costs	20,225	22,451	23,105	26,297	26,600	28,178	27,484	28,825	28,715	27,036	25,870	25,113	26,864	27,656	28,884
8.1	% of Total Capital Inv	2.5	2.7	3.1	3.4	3.2	3.0	2.7	2.9	3.1	2.9	2.8	2.4	2.3	2.2	2.3

## Footnotes to Table 8-1

Total capital costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding capital tables (those ending in "-1") in each media chapter, starting with Table 3-1 and ending with Table 7-1.

% of Total Capital Inv.: Total capital expenditures for pollution control expressed as a percentage of total capital investment in this country. Total capital investment in this country is defined as fixed private investment plus fixed government investment plus consumer investment in durable goods. Sources: Fixed private investment and consumer investment in durable goods from *Survey of Current Business*, Department of Commerce, Bureau of Economic Analysis, September 1989. Fixed government investment from unpublished documents from Department of Commerce, Bureau of Economic Analysis.

Table 8-1A: TOTAL CAPITAL COSTS ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981
3.2	Radiation	48	60	90	145	151	171	171	180	190	201	210	220	230	240	251
3.3	Total Air & Radiation	11,373	11,628	11,714	11,337	10,940	11,051	11,076	11,057	11,126	11,171	11,165	11,215	11,218	11,225	11,232
4	Water															
4.1	Water Quality	12,666	13,132	11,543	11,264	11,169	10,716	10,282	9,623	9,112	8,631	8,584	8,537	8,491	8,444	8,397
4.2	Drinking Water	1,251	1,220	1,185	1,223	1,253	1,575	2,083	2,416	2,645	2,976	3,096	2,690	1,993	1,602	1,615
4.3	Total Water	13,917	14,352	12,728	12,487	12,422	12,291	12,366	12,039	11,756	11,607	11,680	11,227	10,483	10,046	10,012
5	Land															
5.1	Solid Waste	2,115	2,169	1,983	1,998	2,012	4,132	4,648	3,435	3,449	3,464	2,976	2,991	3,005	3,020	3,034
5.2	Hazardous Waste	558	502	1,772	2,449	2,929	2,345	4,002	3,952	4,529	4,081	4,222	4,731	4,092	4,154	4,215
5.3	LUST				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
5.4	RCRA	2,672	2,671	3,755	9,697	10,192	12,574	13,901	12,637	8,434	8,001	7,654	8,178	18,853	7,273	7,349
5.5	Superfund	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
5.6	Total Land	3,385	4,133	5,653	12,478	13,047	16,142	18,796	18,137	14,303	14,188	13,920	14,680	25,599	14,251	14,572
6	Chemicals															
6.1	Toxic Substances	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
6.2	Pesticides															
6.3	Total Chemicals	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
7	Multimedia	46	43	1,899	395	1,534	5									
8	Total Costs	28,884	30,313	32,151	37,670	38,921	40,473	43,227	41,398	37,268	37,053	36,858	37,220	47,404	35,633	35,932
8.1	% of Total Capital Inv	2.3	2.3	2.8	2.9	2.8	2.7	2.7	2.1	2.1	2	2	2.7	1.8	1.8	1.7

Footnotes to Table 8-1A

Total capital costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding capital tables in each media chapter (Tables 3-1A, 3-1B, 4-1, 5-1A, 5-1B, 6-1A, and 7-1A).

% of Total Capital Inv.: Total capital expenditures for pollution control expressed as a percentage of total capital investment in this country. Total capital investment in this country is defined as fixed private investment plus fixed government investment plus consumer investment in durable goods. Sources: Fixed private investment and consumer investment in durable goods from *Survey of Current Business*, Department of Commerce, Bureau of Economic Analysis, September 1989. Fixed government investment from unpublished documents from Department of Commerce, Bureau of Economic Analysis.

Table 8-2: TOTAL OPERATING COSTS ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
3.2	Radiation	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
3.3	Total Air & Radiation	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045
4	Water															
4.1	Water Quality	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,121	12,526	13,026	13,191	13,976	14,413	15,119	16,109
4.2	Drinking Water	732	741	774	824	899	979	1,073	1,180	1,238	1,353	1,417	1,442	1,471	1,549	1,645
4.3	Total Water	8,817	9,288	10,102	10,596	11,672	12,309	12,717	13,301	13,764	14,379	14,608	15,419	15,884	16,668	17,753
5	Land															
5.1	Solid Waste	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,356	11,260	10,947	11,830	12,344	13,254
5.2	Hazardous Waste										182	147	677	828	958	1,306
5.3	LUST															
5.4	RCRA	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,538	11,407	11,624	12,658	13,301	14,561
5.5	Superfund										12	40	69	140	157	191
5.6	Total Land	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,550	11,447	11,693	12,798	13,458	14,752
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	154	332	414	350	293	212	207	251	335
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	578	840	874	774	690	585	647	721	754
7	Multi-Media	108	139	461	587	726	913	896	875	850	665	570	648	603	625	851
8	Total Costs	24,735	26,545	27,876	28,678	30,936	33,258	34,666	36,303	36,767	36,768	35,046	36,939	38,800	40,538	44,155

## Footnotes to Table 8-2

Total operating costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding operating cost tables (those ending in "-2") in each media chapter, starting with Table 3-2 and ending with Table 7-2.

Table 8-2A: TOTAL OPERATING COSTS ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	9,731	10,427	10,083	9,916	8,823	9,480	9,863	10,287	10,772	12,408	13,923	15,134	16,449	17,410	18,832
3.2	Radiation	314	281	300	330	362	389	417	445	473	502	530	558	587	615	644
3.3	Total Air & Radiation	10,045	10,708	10,383	10,246	9,185	9,869	10,280	10,732	11,245	12,910	14,453	15,692	17,035	18,025	19,476
4	Water															
4.1	Water Quality	16,109	17,085	16,975	17,674	18,432	19,237	19,747	20,334	20,888	21,442	21,996	22,550	23,104	23,658	24,212
4.2	Drinking Water	1,645	1,661	1,689	1,738	1,792	1,982	2,248	2,360	2,523	2,761	2,888	2,976	3,181	3,349	3,379
4.3	Total Water	17,753	18,746	18,664	19,412	20,224	21,219	21,995	22,694	23,411	24,203	24,884	25,526	26,285	27,007	27,591
5	Land															
5.1	Solid Waste	13,254	14,035	13,463	13,738	14,012	14,482	14,832	15,227	15,622	15,895	16,169	16,442	16,716	16,989	17,263
5.2	Hazardous Waste	1,306	1,574	2,758	3,043	3,576	4,780	5,790	6,077	6,390	6,599	6,386	6,676	6,940	7,203	7,430
5.3	LUST		1	13	888	2,368	2,379	2,416	2,427	1,066	662	672	683	694	387	397
5.4	RCRA	14,561	15,610	16,234	17,668	19,956	21,640	23,038	23,731	23,077	23,156	23,227	23,801	24,349	24,580	25,090
5.5	Superfund	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
5.6	Total Land	14,752	15,963	16,681	18,309	20,723	22,539	24,235	25,107	24,591	24,812	24,984	25,696	26,387	26,766	27,432
6	Chemicals															
6.1	Toxic Substances	335	283	358	369	318	425	492	608	613	619	666	674	683	692	700
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	754	736	813	1,066	1,297	1,510	1,662	1,865	1,917	1,972	2,072	2,140	2,199	2,273	2,358
7	Multimedia	851	772	930	1,196	1,172	1,563	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883
8	Total Costs	44,155	46,925	47,470	50,228	52,601	56,701	59,729	61,992	62,797	65,567	68,101	70,805	73,701	75,911	78,740

Footnotes to Table 8-2A

Total operating costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding operating cost tables in each media chapter (Tables 3-2A, 3-2B, 4-2A, 5-2A, 5-2B, 6-2A, and 7-2A).

Table 8-3: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
3.2	Radiation	18	17	255	232	158	173	237	232	219	201	220	207	215	233	355
3.3	Total Air & Radiation	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431
4	Water															
4.1	Water Quality	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,147	22,763	24,328	25,514	27,294	28,700	30,376	32,386
4.2	Drinking Water	802	883	998	1,135	1,294	1,451	1,623	1,823	1,982	2,198	2,357	2,471	2,586	2,765	2,979
4.3	Total Water	9,912	11,484	13,439	15,126	17,419	19,391	21,078	22,970	24,745	26,525	27,871	29,765	31,286	33,141	35,365
5	Land															
5.1	Solid Waste	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	13,934	12,998	12,835	13,892	14,587	15,697
5.2	Hazardous Waste										182	147	683	845	1,009	1,410
5.3	LUST															
5.4	RCRA	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,116	13,145	13,518	14,737	15,596	17,107
5.5	Superfund										15	59	112	235	312	404
5.6	Total Land	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,131	13,204	13,630	14,972	15,908	17,511
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	158	345	429	367	315	237	245	303	402
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	583	853	889	791	712	610	685	773	822
7	Multimedia	108	139	461	587	729	919	903	886	868	695	606	692	657	687	918
8	Total Costs	26,481	30,261	33,614	36,842	41,572	46,509	50,482	54,824	57,969	60,539	61,237	65,477	69,925	74,021	80,046
8.1	Percentage of GNP	0.88	0.96	1.07	1.19	1.28	1.37	1.41	1.49	1.58	1.62	1.68	1.74	1.74	1.78	1.87

## Footnotes to Table 8-3

Total operating costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding seven percent annualized cost tables (those ending in "-3") in each section, starting with Table 3-3 and ending with Table 7-3.

Table 8-3A: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	25,077	26,679	27,238	27,872	27,588	29,005	29,692	30,160	30,507	31,904	33,200	34,265	35,424	36,237	37,495
3.2	Radiation	355	327	353	396	441	483	525	568	613	659	705	752	800	847	896
3.3	Total Air & Radiation	25,431	27,006	27,591	28,267	28,029	29,488	30,217	30,728	31,120	32,562	33,905	35,017	36,224	37,085	38,390
4	Water															
4.1	Water Quality	32,386	34,421	35,241	36,847	38,506	40,174	41,513	42,875	44,164	45,413	46,659	47,901	49,139	50,374	51,605
4.2	Drinking Water	2,979	3,111	3,250	3,415	3,587	3,926	4,319	4,586	4,917	5,350	5,684	5,949	6,264	6,491	6,571
4.3	Total Water	35,365	37,531	38,491	40,262	42,092	44,100	45,831	47,461	49,080	50,763	52,343	53,850	55,403	56,865	58,176
5	Land															
5.1	Solid Waste	15,697	16,683	16,298	16,761	17,226	18,085	18,747	19,322	19,884	20,338	20,744	21,142	21,539	21,922	22,302
5.2	Hazardous Waste	1,410	1,725	3,077	3,593	4,402	5,827	7,216	7,875	8,616	9,210	9,396	10,133	10,782	11,438	12,062
5.3	LUST		1	13	1,311	3,215	3,716	4,177	4,611	3,286	2,920	2,966	3,014	3,972	3,673	3,691
5.4	RCRA	17,107	18,409	19,388	21,664	24,842	27,629	30,139	31,808	31,787	32,468	33,106	34,289	36,293	37,033	38,055
5.5	Superfund	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
5.6	Total Land	17,511	19,092	20,318	23,013	26,547	29,753	32,956	35,247	35,836	37,158	38,402	40,247	42,938	44,388	46,148
6	Chemicals															
6.1	Toxic Substances	402	365	456	558	600	799	960	1,091	1,104	1,119	1,174	1,192	1,206	1,217	1,234
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	822	819	910	1,255	1,579	1,885	2,130	2,348	2,408	2,472	2,580	2,657	2,721	2,799	2,892
7	Multi-Media	918	842	1,180	1,483	1,603	1,995	1,989	2,027	2,065	2,102	2,138	2,177	2,220	2,260	2,298
8	Total Costs	80,046	85,290	88,490	94,280	99,850	107,221	113,123	117,811	120,510	125,056	129,368	133,948	139,507	143,396	147,904
8.1	Percentage of GNP	1.87	1.92	1.91	1.98	2.13	2.24	2.32	2.37	2.37	2.42	2.45	2.49	2.55	2.58	2.61

Footnotes to Table 8-3A

Total operating costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding seven percent annualized cost tables in each media chapter (Tables 3-3A, 3-3B, 4-3A, 5-3A, 5-3B, 6-3A, and 7-3A).

Table 8-3B: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
3.2	Radiation	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
3.3	Total Air & Radiation	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755
4	Water															
4.1	Water Quality	8,734	9,847	11,299	12,443	14,161	15,515	16,589	17,835	19,007	20,181	20,993	22,408	23,458	24,778	26,414
4.2	Drinking Water	782	842	933	1,046	1,181	1,315	1,465	1,638	1,768	1,955	2,087	2,175	2,265	2,415	2,595
4.3	Total Water	9,516	10,689	12,233	13,489	15,342	16,830	18,054	19,473	20,775	22,136	23,079	24,582	25,723	27,193	29,009
5	Land															
5.1	Solid Waste	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,480	12,498	12,292	13,298	13,941	14,994
5.2	Hazardous Waste										182	147	681	840	994	1,380
5.3	LUST															
5.4	RCRA	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,662	12,645	12,973	14,139	14,935	16,374
5.5	Superfund										14	52	96	200	255	326
5.6	Total Land	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,676	12,697	13,069	14,339	15,190	16,700
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	157	341	425	362	309	229	234	288	383
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	581	849	885	786	705	603	674	758	802
7	Multi-Media	108	139	461	587	728	917	901	883	863	686	596	679	642	669	898
8	Total Costs	25,901	29,042	31,737	34,222	38,203	42,344	45,542	49,072	51,408	53,221	53,200	56,751	60,462	63,860	69,164
8.1	Percentage of GNP	0.86	0.92	1.01	1.10	1.17	1.24	1.27	1.34	1.40	1.42	1.46	1.50	1.50	1.53	1.62

## Footnotes to Table 8-3B

Total annualized costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3C, 4-3B, 5-3C, 6-3B, and 7-3B).

Table 8-3C: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	21,414	22,804	23,154	23,598	23,128	24,369	25,016	25,509	25,916	27,396	28,767	29,892	31,113	31,993	33,322
3.2	Radiation	341	312	335	374	415	452	489	528	567	607	647	688	730	770	812
3.3	Total Air & Radiation	21,755	23,116	23,490	23,972	23,543	24,821	25,505	26,036	26,483	28,002	29,414	30,580	31,843	32,764	34,134
4	Water															
4.1	Water Quality	26,414	28,060	28,539	29,812	31,141	32,492	33,527	34,605	35,624	36,618	37,610	38,600	39,587	40,572	41,554
4.2	Drinking Water	2,595	2,693	2,801	2,932	3,070	3,367	3,723	3,945	4,228	4,604	4,879	5,093	5,376	5,586	5,652
4.3	Total Water	29,009	30,754	31,340	32,745	34,211	35,858	37,249	38,550	39,851	41,222	42,489	43,693	44,963	46,158	47,206
5	Land															
5.1	Solid Waste	14,994	15,920	15,482	15,890	16,300	17,048	17,619	18,143	18,657	19,059	19,427	19,789	20,150	20,502	20,851
5.2	Hazardous Waste	1,380	1,681	2,985	3,435	4,164	5,526	6,805	7,358	7,975	8,458	8,529	9,138	9,676	10,219	10,728
5.3	LUST		1	13	1,155	2,904	3,226	3,531	3,809	2,471	2,091	2,124	2,158	2,769	2,468	2,483
5.4	RCRA	16,374	17,603	18,480	20,480	23,369	25,799	27,956	29,310	29,104	29,609	30,080	31,085	32,595	33,188	34,062
5.5	Superfund	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
5.6	Total Land	16,700	18,165	19,233	21,569	24,729	27,474	30,178	31,992	32,223	33,186	34,078	35,552	37,550	38,647	40,045
6	Chemicals															
6.1	Toxic Substances	383	341	428	504	519	691	825	952	962	975	1,028	1,043	1,055	1,066	1,080
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	802	795	882	1,200	1,498	1,777	1,995	2,209	2,267	2,328	2,434	2,508	2,571	2,647	2,738
7	Multi-Media	898	822	1,108	1,400	1,479	1,871	1,865	1,902	1,940	1,978	2,014	2,055	2,098	2,139	2,178
8	Total Costs	69,164	73,652	76,052	80,887	85,459	91,801	96,792	100,690	102,764	106,716	110,430	114,388	119,025	122,355	126,302
8.1	Percentage of GNP	1.62	1.66	1.64	1.70	1.83	1.92	1.98	2.02	2.02	2.06	2.09	2.13	2.18	2.20	2.23

Footnotes to Table 8-3C

Total annualized costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3D, 3-3E, 4-3C, 5-3D, 5-3E, 6-3C, and 7-3C).

Table 8-3D: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
3.2	Radiation	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
3.3	Total Air & Radiation	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505
4	Water															
4.1	Water Quality	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,003	26,001	27,903	29,412	31,506	33,220	35,202	37,535
4.2	Drinking Water	819	918	1,053	1,211	1,391	1,567	1,758	1,980	2,164	2,404	2,587	2,722	2,858	3,062	3,305
4.3	Total Water	10,253	12,168	14,479	16,537	19,209	21,598	23,683	25,983	28,165	30,307	31,999	34,229	36,079	38,264	40,840
5	Land															
5.1	Solid Waste	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,319	13,423	13,297	14,396	15,135	16,294
5.2	Hazardous Waste										182	147	684	849	1,022	1,436
5.3	LUST															
5.4	RCRA	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,502	13,570	13,981	15,246	16,156	17,730
5.5	Superfund										16	65	125	265	361	471
5.6	Total Land	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,518	13,635	14,106	15,510	16,518	18,200
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	159	348	433	371	321	243	254	316	419
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	584	856	893	795	717	616	694	786	838
7	Multi-Media	108	139	461	587	729	921	905	889	873	702	615	702	671	702	934
8	Total Costs	26,978	31,305	35,222	39,082	44,451	50,067	54,699	59,732	63,566	66,781	68,091	72,916	77,988	82,679	89,318
8.1	Percentage of GNP	0.90	0.99	1.12	1.26	1.37	1.47	1.53	1.63	1.73	1.79	1.87	1.93	1.94	1.99	2.09

## Footnotes to Table 8-3D

Total annualized costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3F, 4-3D, 5-3F, 6-3D, and 7-3D).

Table 8-3E: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION AT ANNUALIZED 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	28,139	29,918	30,651	31,444	31,315	32,880	33,598	34,041	34,337	35,662	36,894	37,905	39,011	39,767	40,962
3.2	Radiation	366	340	368	414	463	509	555	603	653	703	755	807	861	913	967
3.3	Total Air & Radiation	28,505	30,258	31,019	31,858	31,778	33,389	34,153	34,645	34,989	36,365	37,648	38,712	39,872	40,680	41,929
4	Water															
4.1	Water Quality	37,535	39,905	41,019	42,912	44,856	46,797	48,398	50,006	51,527	52,996	54,461	55,920	57,375	58,825	60,270
4.2	Drinking Water	3,305	3,465	3,632	3,825	4,025	4,401	4,825	5,130	5,502	5,982	6,367	6,676	7,017	7,259	7,351
4.3	Total Water	40,840	43,370	44,651	46,737	48,881	51,198	53,223	55,136	57,028	58,978	60,828	62,596	64,393	66,084	67,621
5	Land															
5.1	Solid Waste	16,294	17,330	16,991	17,500	18,011	18,966	19,703	20,322	20,926	21,424	21,862	22,291	22,718	23,127	23,533
5.2	Hazardous Waste	1,436	1,762	3,155	3,727	4,604	6,083	7,564	8,315	9,160	9,848	10,131	10,977	11,721	12,473	13,194
5.3	LUST		1	13	1,444	3,482	4,140	4,734	5,301	3,988	3,634	3,692	3,751	5,008	4,713	4,733
5.4	RCRA	17,730	19,093	20,159	22,671	26,097	29,189	32,001	33,939	34,075	34,906	35,685	37,019	39,448	40,313	41,461
5.5	Superfund	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
5.6	Total Land	18,200	19,881	21,242	24,244	28,098	31,700	35,330	38,030	38,927	40,556	42,101	44,263	47,550	49,303	51,373
6	Chemicals															
6.1	Toxic Substances	419	385	480	605	669	891	1,074	1,209	1,224	1,241	1,298	1,318	1,333	1,345	1,364
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	838	839	934	1,301	1,648	1,976	2,244	2,466	2,528	2,594	2,705	2,783	2,849	2,927	3,022
7	Multi-Media	934	860	1,241	1,553	1,709	2,101	2,095	2,133	2,170	2,208	2,243	2,282	2,324	2,363	2,399
8	Total Costs	89,318	95,206	99,086	105,693	112,114	120,364	127,045	132,410	135,643	140,700	145,525	150,636	156,988	161,357	166,345
8.1	Percentage of GNP	2.09	2.15	2.14	2.22	2.39	2.52	2.60	2.66	2.67	2.72	2.76	2.80	2.87	2.90	2.94

Footnotes to Table 8-3E

Total annualized costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3G, 3-3H, 4-3E, 5-3G, 5-3H, 6-3E, and 7-3E).

Table 8-4: TOTAL CAPITAL COSTS ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981
3.2	Radiation	48	60	90	145	151	171	171	180	190	201	210	220	230	240	251
3.3	Total Air & Radiation	11,373	11,628	11,714	11,337	10,940	11,051	11,076	11,057	11,126	11,171	11,165	11,215	11,218	11,225	11,232
4	Water															
4.1	Water Quality	12,666	13,132	11,543	11,264	12,926	12,539	12,563	12,374	12,301	12,228	12,155	12,082	12,009	11,937	11,864
4.2	Drinking Water	1,251	1,220	1,185	1,223	1,253	1,575	2,083	2,416	2,645	2,976	3,096	2,690	1,993	1,602	1,615
4.3	Total Water	13,917	14,352	12,728	12,487	14,179	14,113	14,646	14,790	14,946	15,204	15,251	14,772	14,002	13,539	13,479
5	Land															
5.1	Solid Waste	2,115	2,169	1,983	1,998	2,012	4,132	4,648	3,435	3,449	3,464	2,976	2,991	3,005	3,020	3,034
5.2	Hazardous Waste	558	502	1,772	2,449	2,929	2,345	4,002	3,952	4,529	4,081	4,222	4,731	4,092	4,154	4,215
5.3	LUST				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
5.4	RCRA	2,672	2,671	3,755	9,697	10,192	12,574	13,901	12,637	8,434	8,001	7,654	8,178	18,853	7,273	7,349
5.5	Superfund	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
5.6	Total Land	3,385	4,133	5,653	12,478	13,047	16,142	18,796	18,137	14,303	14,188	13,920	14,680	25,599	14,251	14,572
6	Chemicals															
6.1	Toxic Substances	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
6.2	Pesticides															
6.3	Total Chemicals	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
7	Multi-Media	46	43	1,899	395	1,534	5									
8	Total Costs	28,884	30,313	32,151	37,670	40,678	42,295	45,507	44,150	40,457	40,650	40,429	40,765	50,923	39,126	39,398
8.1	% of Total Capital Inv	2.3	2.3	2.8	2.9	2.9	2.9	2.9	2.3	2.3	2.3	2.2	2.9	2.0	2.0	1.9

## Footnotes to Table 8-4

Total capital costs for implementing existing and new regulations for all media for the years 1986-2000. Table includes costs incurred to achieve full implementation of existing regulations and are taken from the corresponding capital cost tables (those ending in "-1A or "-1B") in each prior section, starting with Table 3-1A and ending with Table 7-1A.

% of Total Capital Inv.: Total capital expenditures for pollution control expressed as a percentage of total capital investment in this country. Total capital investment in this country is defined as fixed private investment plus fixed government investment plus consumer investment in durable goods. Sources: Fixed private investment and consumer investment in durable goods from *Survey of Current Business*, Department of Commerce, Bureau of Economic Analysis, September 1989. Fixed government investment from unpublished documents from Department of Commerce, Bureau of Economic Analysis.

Table 8-5: TOTAL OPERATING COSTS ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	9,731	10,427	10,083	9,916	8,823	9,480	9,863	14,655	15,170	16,997	18,935	20,568	22,303	23,686	25,386
3.2	Radiation	314	281	300	330	362	389	417	445	473	502	530	558	587	615	644
3.3	Total Air & Radiation	10,045	10,708	10,383	10,246	9,185	9,869	10,280	15,100	15,643	17,499	19,465	21,126	22,889	24,301	26,030
4	Water															
4.1	Water Quality	16,109	17,085	16,975	17,674	18,608	19,595	20,333	21,195	22,068	22,982	23,893	24,802	25,708	26,611	27,512
4.2	Drinking Water	1,645	1,661	1,689	1,738	1,792	1,982	2,248	2,360	2,523	2,761	2,888	2,976	3,181	3,349	3,379
4.3	Total Water	17,753	18,746	18,664	19,412	20,399	21,577	22,581	23,555	24,591	25,743	26,781	27,778	28,888	29,960	30,890
5	Land															
5.1	Solid Waste	13,254	14,035	13,463	13,738	14,012	14,482	14,832	15,227	15,622	15,895	16,169	16,442	16,716	16,989	17,263
5.2	Hazardous Waste	1,306	1,574	2,758	3,043	3,576	4,780	5,790	6,077	6,390	6,599	6,386	6,676	6,940	7,203	7,430
5.3	LUST		1	13	888	2,368	2,379	2,416	2,427	1,066	662	672	683	694	387	397
5.4	RCRA	14,561	15,610	16,234	17,668	19,956	21,640	23,038	23,731	23,077	23,156	23,227	23,801	24,349	24,580	25,090
5.5	Superfund	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
5.6	Total Land	14,752	15,963	16,681	18,309	20,723	22,539	24,235	25,107	24,591	24,812	24,984	25,696	26,387	26,766	27,432
6	Chemicals															
6.1	Toxic Substances	335	283	358	369	318	425	492	608	613	619	666	674	683	692	700
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	754	736	813	1,066	1,297	1,510	1,662	1,865	1,917	1,972	2,072	2,140	2,199	2,273	2,358
7	Multi-Media	851	772	930	1,196	1,172	1,563	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883
8	Total Costs	44,155	46,925	47,470	50,228	52,777	57,059	60,315	67,222	68,375	71,696	75,010	78,491	82,159	85,140	88,593

Footnotes to Table 8-5

Total operating costs for implementing existing and new regulations for all media for the years 1986-2000. Table includes costs incurred to achieve full implementation of existing regulations and are taken from the corresponding program totals of the corresponding operating cost tables (those ending in "-2A" and "-2B") in each section, starting with Table 3-2A and ending with Table 7-2A.

## Environmental Investments

Table 8-6: TOTAL COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	25,077	26,679	27,238	27,872	27,588	29,005	29,692	34,528	34,905	36,493	38,212	39,699	41,278	42,513	44,049
3.2	Radiation	355	327	353	396	441	483	525	568	613	659	705	752	800	847	896
3.3	Total Air & Radiation	25,431	27,006	27,591	28,267	28,029	29,488	30,217	35,096	35,518	37,151	38,917	40,451	42,078	43,361	44,944
4	Water															
4.1	Water Quality	32,386	34,421	35,241	36,847	38,823	40,820	42,571	44,430	46,295	48,194	50,085	51,967	53,840	55,706	57,563
4.2	Drinking Water	2,979	3,111	3,250	3,415	3,587	3,926	4,319	4,586	4,917	5,350	5,684	5,949	6,264	6,491	6,571
4.3	Total Water	35,365	37,531	38,491	40,262	42,410	44,746	46,890	49,017	51,212	53,543	55,769	57,916	60,104	62,197	64,134
5	Land															
5.1	Solid Waste	15,697	16,683	16,298	16,761	17,226	18,085	18,747	19,322	19,884	20,338	20,744	21,142	21,539	21,922	22,302
5.2	Hazardous Waste	1,410	1,725	3,077	3,593	4,402	5,827	7,216	7,875	8,616	9,210	9,396	10,133	10,782	11,438	12,062
5.3	LUST		1	13	1,311	3,215	3,716	4,177	4,611	3,286	2,920	2,966	3,014	3,972	3,673	3,691
5.4	RCRA	17,107	18,409	19,388	21,664	24,842	27,629	30,139	31,808	31,787	32,468	33,106	34,289	36,293	37,033	38,055
5.5	Superfund	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
5.6	Total Land	17,511	19,092	20,318	23,013	26,547	29,753	32,956	35,247	35,836	37,158	38,402	40,247	42,938	44,388	46,148
6	Chemicals															
6.1	Toxic Substances	402	365	456	558	600	799	960	1,091	1,104	1,119	1,174	1,192	1,206	1,217	1,234
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	822	819	910	1,255	1,579	1,885	2,130	2,348	2,408	2,472	2,580	2,657	2,721	2,799	2,892
7	Multi-Media	918	842	1,180	1,483	1,603	1,995	1,989	2,027	2,065	2,102	2,138	2,177	2,220	2,260	2,298
8	Total Costs	80,046	85,290	88,490	94,280	100,167	107,867	114,181	123,735	127,039	132,426	137,806	143,447	150,062	155,004	160,416
8.1	Percentage of GNP	1.87	1.92	1.91	1.98	2.14	2.26	2.34	2.49	2.50	2.56	2.61	2.67	2.74	2.78	2.83

## Footnotes to Table 8-6

Total annualized costs for implementing existing and new regulations for all media for the years 1986-2000. Table includes costs incurred to achieve full implementation of existing regulations and are taken from the corresponding program totals of the corresponding seven percent annualized cost tables in each media chapter (Tables 3-3A, 3-3B, 4-3A, 5-3A, 5-3B, 6-3A, and 7-3A).

November 1990

Table 8-6A: TOTAL COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	21,414	22,804	23,154	23,598	23,128	24,369	25,016	29,877	30,314	31,985	33,779	35,326	36,967	38,269	39,876
3.2	Radiation	341	312	335	374	415	452	489	528	567	607	647	688	730	770	812
3.3	Total Air & Radiation	21,755	23,116	23,490	23,972	23,543	24,821	25,505	30,404	30,881	32,591	34,426	36,014	37,697	39,040	40,688
4	Water															
4.1	Water Quality	26,414	28,060	28,539	29,812	31,406	33,032	34,412	35,905	37,406	38,944	40,475	42,000	43,519	45,031	46,537
4.2	Drinking Water	2,595	2,693	2,801	2,932	3,070	3,367	3,723	3,945	4,228	4,604	4,879	5,093	5,376	5,586	5,652
4.3	Total Water	29,009	30,754	31,340	32,745	34,476	36,399	38,134	39,851	41,634	43,548	45,354	47,093	48,895	50,617	52,189
5	Land															
5.1	Solid Waste	14,994	15,920	15,482	15,890	16,300	17,048	17,619	18,143	18,657	19,059	19,427	19,789	20,150	20,502	20,851
5.2	Hazardous Waste	1,380	1,681	2,985	3,435	4,164	5,526	6,805	7,358	7,975	8,458	8,529	9,138	9,676	10,219	10,728
5.3	LUST		1	13	1,155	2,904	3,226	3,531	3,809	2,471	2,091	2,124	2,158	2,769	2,468	2,483
5.4	RCRA	16,374	17,603	18,480	20,480	23,369	25,799	27,956	29,310	29,104	29,609	30,080	31,085	32,595	33,188	34,062
5.5	Superfund	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
5.6	Total Land	16,700	18,165	19,233	21,569	24,729	27,474	30,178	31,992	32,223	33,186	34,078	35,552	37,550	38,647	40,045
6	Chemicals															
6.1	Toxic Substances	383	341	428	504	519	691	825	952	962	975	1,028	1,043	1,055	1,066	1,080
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	802	795	882	1,200	1,498	1,777	1,995	2,209	2,267	2,328	2,434	2,508	2,571	2,647	2,738
7	Multi-Media	898	822	1,108	1,400	1,479	1,871	1,865	1,902	1,940	1,978	2,014	2,055	2,098	2,139	2,178
8	Total Costs	69,164	73,652	76,052	80,887	85,724	92,341	97,677	106,358	108,945	113,630	118,306	123,222	128,810	133,090	137,838
8.1	Percentage of GNP	1.62	1.66	1.64	1.70	1.83	1.93	2.00	2.14	2.15	2.20	2.24	2.29	2.36	2.39	2.43

Footnotes to Table 8-6A

Total annualized costs for implementing existing and new regulations for all media for the years 1986-2000. Table includes costs incurred to achieve full implementation of existing regulations and are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3D, 3-3E, 4-3C, 5-3D, 5-3E, 6-3C, and 7-3C).

Table 8-6B: TOTAL COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	28,139	29,918	30,651	31,444	31,315	32,880	33,598	38,409	38,735	40,251	41,906	43,339	44,865	46,043	47,516
3.2	Radiation	366	340	368	414	463	509	555	603	653	703	755	807	861	913	967
3.3	Total Air & Radiation	28,505	30,258	31,019	31,858	31,778	33,389	34,153	39,013	39,387	40,954	42,660	44,146	45,726	46,956	48,483
4	Water															
4.1	Water Quality	37,535	39,905	41,019	42,912	45,218	47,535	49,606	51,781	53,958	56,169	58,370	60,560	62,740	64,910	67,069
4.2	Drinking Water	3,305	3,465	3,632	3,825	4,025	4,401	4,825	5,130	5,502	5,982	6,367	6,676	7,017	7,259	7,351
4.3	Total Water	40,840	43,370	44,651	46,737	49,243	51,936	54,431	56,911	59,460	62,151	64,737	67,236	69,758	72,168	74,420
5	Land															
5.1	Solid Waste	16,294	17,330	16,991	17,500	18,011	18,966	19,703	20,322	20,926	21,424	21,862	22,291	22,718	23,127	23,533
5.2	Hazardous Waste	1,436	1,762	3,155	3,727	4,604	6,083	7,564	8,315	9,160	9,848	10,131	10,977	11,721	12,473	13,194
5.3	LUST		1	13	1,444	3,482	4,140	4,734	5,301	3,988	3,634	3,692	3,751	5,008	4,713	4,733
5.4	RCRA	17,730	19,093	20,159	22,671	26,097	29,189	32,001	33,939	34,075	34,906	35,685	37,019	39,448	40,313	41,461
5.5	Superfund	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
5.6	Total Land	18,200	19,881	21,242	24,244	28,098	31,700	35,330	38,030	38,927	40,556	42,101	44,263	47,550	49,303	51,373
6	Chemicals															
6.1	Toxic Substances	419	385	480	605	669	891	1,074	1,209	1,224	1,241	1,298	1,318	1,333	1,345	1,364
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	838	839	934	1,301	1,648	1,976	2,244	2,466	2,528	2,594	2,705	2,783	2,849	2,927	3,022
7	Multi-Media	934	860	1,241	1,553	1,709	2,101	2,095	2,133	2,170	2,208	2,243	2,282	2,324	2,363	2,399
8	Total Costs	89,318	95,206	99,086	105,693	112,476	121,102	128,253	138,553	142,473	148,462	154,446	160,710	168,207	173,718	179,698
8.1	Percentage of GNP	2.09	2.15	2.14	2.22	2.40	2.53	2.63	2.78	2.81	2.87	2.93	2.99	3.08	3.12	3.17

## Footnotes to Table 8-6B

Total annualized costs for implementing existing and new regulations for all media for the years 1986-2000. Table includes costs incurred to achieve full implementation of existing regulations and are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3G, 3-3H, 4-3E, 5-3G, 5-3H, 6-3E, and 7-3E).

Table 8-7: TOTAL FEDERALLY-MANDATED CAPITAL COSTS ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
3.2	Radiation			24	20	16	8	25	22	64	89	30	37	33	55	47
3.3	Total Air & Radiation	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,372
4	Water															
4.1	Water Quality	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,090	15,020	13,211	12,666	12,345	12,043	12,023	12,666
4.2	Drinking Water								40	40	40	40	40	40	40	40
4.3	Total Water	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,130	15,060	13,251	12,706	12,385	12,083	12,063	12,706
5	Land															
5.1	Solid Waste	67	77	137	128	119	106	117	115	119	123	103	129	207	209	205
5.2	Hazardous Waste												65	113	368	558
5.3	LUST															
5.4	RCRA	67	77	137	128	119	106	117	115	119	123	103	193	320	577	763
5.5	Superfund										42	193	293	648	748	713
5.6	Total Land	67	77	137	128	119	106	117	115	119	165	296	486	968	1,325	1,476
6	Chemicals															
6.1	Toxic Substances						2	48	83	27	17	59	31	136	153	162
6.2	Pesticides															
6.3	Total Chemicals						2	48	83	27	17	59	31	136	153	162
7	Multi-Media				4	19	45	13	42	68	120	76	79	109	84	46
8	Total Costs	18,211	20,225	20,704	23,956	24,249	25,798	25,078	26,138	25,887	24,239	23,297	22,755	24,349	24,920	25,762

Footnotes to Table 8-7

Total federally-mandated capital costs for implementing existing and new regulations for all media for the years 1972-1986. Table includes costs incurred to achieve full implementation of existing regulations and are taken from the corresponding program totals of the corresponding capital cost tables (those ending in "-1") each section, starting with Table 3-1 and ending with Table 7-1.

Table 8-7A: TOTAL FEDERALLY-MANDATED CAPITAL COSTS ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981
3.2	Radiation	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
3.3	Total Air & Radiation	11,372	11,624	11,680	11,258	10,861	10,957	10,987	10,964	11,028	11,068	11,058	11,103	11,101	11,103	11,105
4	Water															
4.1	Water Quality	12,666	13,132	11,543	11,264	12,926	12,539	12,563	12,374	12,301	12,228	12,155	12,082	12,009	11,937	11,864
4.2	Drinking Water	40	40	76	73	80	379	865	1,175	1,381	1,690	1,787	1,358	639	225	225
4.3	Total Water	12,706	13,172	11,619	11,336	13,006	12,918	13,428	13,549	13,682	13,918	13,942	13,440	12,648	12,162	12,089
5	Land															
5.1	Solid Waste	205	250	261	282	303	2,429	2,952	1,745	1,766	1,787	1,307	1,328	1,349	1,370	1,391
5.2	Hazardous Waste	558	502	1,772	2,449	2,929	2,345	4,002	3,952	4,529	4,081	4,222	4,731	4,092	4,154	4,215
5.3	LUST				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
5.4	RCRA	763	752	2,033	7,981	8,483	10,871	12,204	10,948	6,751	6,325	5,984	6,514	17,196	5,623	5,706
5.5	Superfund	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
5.6	Total Land	1,476	2,214	3,931	10,762	11,338	14,439	17,099	16,448	12,620	12,512	12,250	13,016	23,942	12,601	12,929
6	Chemicals															
6.1	Toxic Substances	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
6.2	Pesticides															
6.3	Total Chemicals	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
7	Multi-Media	46	43	1,899	395	1,534	5									
8	Total Costs	25,762	27,210	29,286	34,725	37,717	39,303	42,504	41,126	37,412	37,584	37,343	37,658	47,795	35,977	36,238

## Footnotes to Table 8-7A

Total federally-mandated capital costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding capital tables (those ending in "-1A" and "-1B") in each section, starting with Table 3-1A and ending with Table 7-1A.

Table 8-8: TOTAL FEDERALLY-MANDATED OPERATING COSTS ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
3.2	Radiation	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
3.3	Total Air & Radiation	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045
4	Water															
4.1	Water Quality	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,121	12,526	13,026	13,191	13,976	14,413	15,119	16,109
4.2	Drinking Water								167	167	167	167	167	167	167	167
4.3	Total Water	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,288	12,693	13,193	13,358	14,143	14,580	15,286	16,276
5	Land															
5.1	Solid Waste	482	499	541	587	617	653	671	780	816	780	733	719	767	846	857
5.2	Hazardous Waste										182	147	677	828	958	1,306
5.3	LUST															
5.4	RCRA	482	499	541	587	617	653	671	780	816	962	880	1,396	1,596	1,804	2,164
5.5	Superfund										12	40	69	140	157	191
5.6	Total Land	482	499	541	587	617	653	671	780	816	974	920	1,465	1,736	1,961	2,355
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	154	332	414	350	293	212	207	251	335
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	578	840	874	774	690	585	647	721	754
7	Multimedia	108	139	461	587	726	913	896	875	850	665	570	648	603	625	851
8	Total Costs	16,176	17,677	18,723	19,226	20,989	22,484	23,385	24,306	24,299	24,005	23,269	25,436	26,434	27,658	30,280

Footnotes to Table 8-8

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding operating cost tables (those ending in "-2") in each section, starting with Table 3-2 and ending with Table 7-2.

Table 8-8A: TOTAL FEDERALLY-MANDATED OPERATING COSTS ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	9,731	10,427	10,083	9,916	8,823	9,480	9,863	14,655	15,170	16,997	18,935	20,568	22,303	23,686	25,386
3.2	Radiation	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
3.3	Total Air & Radiation	10,045	10,708	10,380	10,237	9,171	9,850	10,255	15,069	15,607	17,457	19,417	21,072	22,830	24,236	25,959
4	Water															
4.1	Water Quality	16,109	17,085	16,975	17,674	18,608	19,595	20,333	21,195	22,068	22,982	23,893	24,802	25,708	26,611	27,512
4.2	Drinking Water	167	167	256	178	179	319	519	580	691	878	953	990	1,143	1,259	1,259
4.3	Total Water	16,276	17,252	17,231	17,852	18,786	19,913	20,852	21,775	22,759	23,860	24,846	25,791	26,850	27,870	28,771
5	Land															
5.1	Solid Waste	857	926	912	941	969	1,192	1,296	1,446	1,594	1,621	1,649	1,676	1,704	1,731	1,758
5.2	Hazardous Waste	1,306	1,574	2,758	3,043	3,576	4,780	5,790	6,077	6,390	6,599	6,386	6,676	6,940	7,203	7,430
5.3	LUST		1	13	888	2,368	2,379	2,416	2,427	1,066	662	672	683	694	387	397
5.4	RCRA	2,164	2,501	3,684	4,871	6,913	8,351	9,503	9,949	9,050	8,882	8,707	9,035	9,337	9,321	9,585
5.5	Superfund	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
5.6	Total Land	2,355	2,854	4,131	5,512	7,680	9,250	10,700	11,325	10,564	10,538	10,464	10,930	11,375	11,507	11,927
6	Chemicals															
6.1	Toxic Substances	335	283	358	369	318	425	492	608	613	619	666	674	683	692	700
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	754	736	813	1,066	1,297	1,510	1,662	1,865	1,917	1,972	2,072	2,140	2,199	2,273	2,358
7	Multimedia	851	772	930	1,196	1,172	1,563	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883
8	Total Costs	30,280	32,322	33,484	35,863	38,106	42,086	45,025	51,629	52,479	55,497	58,507	61,685	65,049	67,727	70,898

## Footnotes to Table 8-8A

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding operating cost tables (those ending in "-2A" and "-2B") in each section, starting with Table 3-2A and ending with Table 7-2A.

Table 8-9: TOTAL FEDERALLY-MANDATED COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
3.2	Radiation	18	17	255	232	158	173	237	232	219	201	220	207	215	233	354
3.3	Total Air & Radiation	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431
4	Water															
4.1	Water Quality	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,147	22,763	24,328	25,514	27,294	28,700	30,376	32,386
4.2	Drinking Water								171	175	178	182	186	190	193	197
4.3	Total Water	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,318	22,938	24,506	25,696	27,480	28,890	30,569	32,583
5	Land															
5.1	Solid Waste	488	513	567	626	667	713	742	861	909	885	847	846	913	1,012	1,043
5.2	Hazardous Waste										182	147	683	845	1,009	1,410
5.3	LUST															
5.4	RCRA	488	513	567	626	667	713	742	861	909	1,067	994	1,529	1,758	2,021	2,453
5.5	Superfund										15	59	112	235	312	404
5.6	Total Land	488	513	567	626	667	713	742	861	909	1,082	1,053	1,640	1,993	2,333	2,856
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	158	345	429	367	315	237	245	303	402
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	583	853	889	791	712	610	685	773	822
7	Multi-Media	108	139	461	587	729	919	903	886	868	695	606	692	657	687	918
8	Total Costs	17,732	20,993	23,835	26,542	30,556	34,440	37,680	41,052	43,459	45,470	46,911	51,202	54,550	57,875	62,610
8.1	Percentage of GNP	0.59	0.66	0.76	0.86	0.94	1.01	1.05	1.12	1.18	1.22	1.29	1.36	1.35	1.39	1.46

Footnotes to Table 8-9

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding seven percent annualized cost tables (those ending in "-3") in each media chapter, starting with Table 3-3 and ending with Table 7-3.

*Environmental Investments*

Table 8-9A: TOTAL FEDERALLY-MANDATED COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	25,077	26,679	27,238	27,872	27,588	29,005	29,692	34,528	34,905	36,493	38,212	39,699	41,278	42,513	44,049
3.2	Radiation	354	326	347	377	410	438	467	497	528	559	590	622	654	685	717
3.3	Total Air & Radiation	25,431	27,005	27,585	28,249	27,998	29,443	30,159	35,025	35,433	37,051	38,802	40,321	41,932	43,198	44,765
4	Water															
4.1	Water Quality	32,386	34,421	35,241	36,847	38,823	40,820	42,571	44,430	46,295	48,194	50,085	51,967	53,840	55,706	57,563
4.2	Drinking Water	197	201	297	226	234	410	692	864	1,105	1,452	1,696	1,860	2,074	2,208	2,225
4.3	Total Water	32,583	34,622	35,538	37,073	39,057	41,230	43,263	45,294	47,400	49,645	51,780	53,827	55,914	57,913	59,788
5	Land															
5.1	Solid Waste	1,043	1,135	1,146	1,201	1,258	1,710	2,086	2,393	2,696	2,880	3,019	3,162	3,305	3,451	3,599
5.2	Hazardous Waste	1,410	1,725	3,077	3,593	4,402	5,827	7,216	7,875	8,616	9,210	9,396	10,133	10,782	11,438	12,062
5.3	LUST		1	13	1,311	3,215	3,716	4,177	4,611	3,286	2,920	2,966	3,014	3,972	3,673	3,691
5.4	RCRA	2,453	2,861	4,236	6,104	8,874	11,254	13,479	14,879	14,598	15,009	15,381	16,308	18,059	18,563	19,352
5.5	Superfund	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
5.6	Total Land	2,856	3,545	5,166	7,452	10,579	13,378	16,295	18,318	18,648	19,699	20,677	22,266	24,704	25,918	27,445
6	Chemicals															
6.1	Toxic Substances	402	365	456	558	600	799	960	1,091	1,104	1,119	1,174	1,192	1,206	1,217	1,234
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	822	819	910	1,255	1,579	1,885	2,130	2,348	2,408	2,472	2,580	2,657	2,721	2,799	2,892
7	Multi-Media	918	842	1,180	1,483	1,603	1,995	1,989	2,027	2,065	2,102	2,138	2,177	2,220	2,260	2,298
8	Total Costs	62,610	66,832	70,378	75,512	80,816	87,932	93,837	103,012	105,953	110,969	115,978	121,248	127,492	132,088	137,188
8.1	Percentage of GNP	1.46	1.51	1.52	1.58	1.73	1.84	1.92	2.07	2.09	2.14	2.20	2.26	2.33	2.37	2.42

## Footnotes to Table 8-9A

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding seven percent annualized cost tables in each media chapter (Tables 3-3A, 3-3B, 4-3A, 5-3A, 5-3B, 6-3A, and 7-3A).

*November 1990*

Table 8-9B: TOTAL FEDERALLY-MANDATED COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
3.2	Radiation	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
3.3	Total Air & Radiation	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755
4	Water															
4.1	Water Quality	8,734	9,847	11,299	12,443	14,161	15,515	16,589	17,835	19,007	20,181	20,993	22,408	23,458	24,778	26,414
4.2	Drinking Water								170	172	175	178	180	183	186	189
4.3	Total Water	8,734	9,847	11,299	12,443	14,161	15,515	16,589	18,005	19,179	20,356	21,171	22,588	23,641	24,964	26,602
5	Land															
5.1	Solid Waste	486	509	559	615	653	695	721	838	883	855	814	809	871	964	989
5.2	Hazardous Waste										182	147	681	840	994	1,380
5.3	LUST															
5.4	RCRA	486	509	559	615	653	695	721	838	883	1,037	961	1,491	1,712	1,958	2,370
5.5	Superfund										14	52	96	200	255	326
5.6	Total Land	486	509	559	615	653	695	721	838	883	1,051	1,013	1,586	1,912	2,214	2,695
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	157	341	425	362	309	229	234	288	383
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	581	849	885	786	705	603	674	758	802
7	Multi-Media	108	139	461	587	728	917	901	883	863	686	596	679	642	669	898
8	Total Costs	17,207	19,889	22,138	24,167	27,495	30,648	33,178	35,812	37,486	38,816	39,608	43,274	45,954	48,654	52,753
8.1	Percentage of GNP	0.57	0.63	0.70	0.78	0.85	0.90	0.93	0.97	1.02	1.04	1.09	1.15	1.14	1.17	1.23

Footnotes to Table 8-9B

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3C, 4-3B, 5-3C, 6-3B, and 7-3B).

Table 8-9C: TOTAL FEDERALLY-MANDATED COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	21,414	22,804	23,154	23,598	23,128	24,369	25,016	29,877	30,314	31,985	33,779	35,326	36,967	38,269	39,876
3.2	Radiation	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
3.3	Total Air & Radiation	21,755	23,116	23,485	23,957	23,517	24,785	25,458	30,346	30,811	32,510	34,334	35,910	37,580	38,910	40,545
4	Water															
4.1	Water Quality	26,414	28,060	28,539	29,812	31,406	33,032	34,412	35,905	37,406	38,944	40,475	42,000	43,519	45,031	46,537
4.2	Drinking Water	189	191	285	212	218	384	642	782	986	1,286	1,482	1,609	1,806	1,935	1,947
4.3	Total Water	26,602	28,251	28,824	30,025	31,624	33,416	35,054	36,687	38,392	40,230	41,957	43,609	45,324	46,965	48,484
5	Land															
5.1	Solid Waste	989	1,075	1,079	1,126	1,175	1,561	1,859	2,120	2,378	2,517	2,625	2,734	2,844	2,956	3,069
5.2	Hazardous Waste	1,380	1,681	2,985	3,435	4,164	5,526	6,805	7,358	7,975	8,458	8,529	9,138	9,676	10,219	10,728
5.3	LUST		1	13	1,155	2,904	3,226	3,531	3,809	2,471	2,091	2,124	2,158	2,769	2,468	2,483
5.4	RCRA	2,370	2,757	4,077	5,716	8,243	10,313	12,195	13,287	12,825	13,067	13,278	14,030	15,289	15,642	16,280
5.5	Superfund	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
5.6	Total Land	2,695	3,320	4,830	6,804	9,603	11,987	14,417	15,969	15,944	16,644	17,276	18,497	20,244	21,101	22,263
6	Chemicals															
6.1	Toxic Substances	383	341	428	504	519	691	825	952	962	975	1,028	1,043	1,055	1,066	1,080
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	802	795	882	1,200	1,498	1,777	1,995	2,209	2,267	2,328	2,434	2,508	2,571	2,647	2,738
7	Multi-Media	898	822	1,108	1,400	1,479	1,871	1,865	1,902	1,940	1,978	2,014	2,055	2,098	2,139	2,178
8	Total Costs	52,753	56,303	59,128	63,386	67,722	73,836	78,789	87,114	89,355	93,690	98,014	102,579	107,816	111,762	116,208
8.1	Percentage of GNP	1.23	1.27	1.28	1.33	1.45	1.54	1.61	1.75	1.76	1.81	1.86	1.91	1.97	2.01	2.05

## Footnotes to Table 8-9C

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3D, 3-3E, 4-3C, 5-3D, 5-3E, 6-3C, and 7-3C).

Table 8-9D: TOTAL FEDERALLY-MANDATED COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
3.2	Radiation	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
3.3	Total Air & Radiation	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505
4	Water															
4.1	Water Quality	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,003	26,001	27,903	29,412	31,506	33,220	35,202	37,535
4.2	Drinking Water								172	176	181	186	190	195	200	205
4.3	Total Water	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,175	26,178	28,084	29,598	31,697	33,415	35,402	37,740
5	Land															
5.1	Solid Waste	490	516	573	635	679	727	759	881	932	910	875	877	949	1,052	1,088
5.2	Hazardous Waste										182	147	684	849	1,022	1,436
5.3	LUST															
5.4	RCRA	490	516	573	635	679	727	759	881	932	1,092	1,022	1,561	1,798	2,074	2,524
5.5	Superfund										16	65	125	265	361	471
5.6	Total Land	490	516	573	635	679	727	759	881	932	1,109	1,087	1,686	2,063	2,435	2,994
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	159	348	433	371	321	243	254	316	419
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	584	856	893	795	717	616	694	786	838
7	Multi-Media	108	139	461	587	729	921	905	889	873	702	615	702	671	702	934
8	Total Costs	18,182	21,939	25,289	28,575	33,173	37,681	41,526	45,527	48,557	51,148	53,142	57,963	61,877	65,734	71,011
8.1	Percentage of GNP	0.61	0.69	0.81	0.92	1.02	1.11	1.16	1.24	1.32	1.37	1.46	1.54	1.54	1.58	1.66

Footnotes to Table 8-9D

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3F, 4-3D, 5-3F, 6-3D, and 7-3D).

Table 8-9E: TOTAL FEDERALLY-MANDATED COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	28,139	29,918	30,651	31,444	31,315	32,880	33,598	38,409	38,735	40,251	41,906	43,339	44,865	46,043	47,516
3.2	Radiation	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
3.3	Total Air & Radiation	28,505	30,257	31,012	31,837	31,743	33,337	34,086	38,930	39,288	40,837	42,526	43,995	45,556	46,767	48,274
4	Water															
4.1	Water Quality	37,535	39,905	41,019	42,912	45,218	47,535	49,606	51,781	53,958	56,169	58,370	60,560	62,740	64,910	67,069
4.2	Drinking Water	205	209	307	238	248	432	734	933	1,207	1,592	1,877	2,073	2,301	2,439	2,461
4.3	Total Water	37,740	40,114	41,326	43,150	45,466	47,967	50,340	52,714	55,165	57,761	60,247	62,633	65,041	67,349	69,530
5	Land															
5.1	Solid Waste	1,088	1,186	1,203	1,264	1,328	1,837	2,279	2,625	2,965	3,187	3,354	3,525	3,697	3,872	4,049
5.2	Hazardous Waste	1,436	1,762	3,155	3,727	4,604	6,083	7,564	8,315	9,160	9,848	10,131	10,977	11,721	12,473	13,194
5.3	LUST		1	13	1,444	3,482	4,140	4,734	5,301	3,988	3,634	3,692	3,751	5,008	4,713	4,733
5.4	RCRA	2,524	2,949	4,371	6,436	9,414	12,060	14,577	16,241	16,113	16,669	17,177	18,253	20,427	21,057	21,976
5.5	Superfund	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
5.6	Total Land	2,994	3,737	5,454	8,008	11,415	14,571	17,906	20,332	20,965	22,319	23,593	25,497	28,529	30,048	31,888
6	Chemicals															
6.1	Toxic Substances	419	385	480	605	669	891	1,074	1,209	1,224	1,241	1,298	1,318	1,333	1,345	1,364
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	838	839	934	1,301	1,648	1,976	2,244	2,466	2,528	2,594	2,705	2,783	2,849	2,927	3,022
7	Multi-Media	934	860	1,241	1,553	1,709	2,101	2,095	2,133	2,170	2,208	2,243	2,282	2,324	2,363	2,399
8	Total Costs	71,011	75,806	79,967	85,849	91,980	99,953	106,671	116,575	120,117	125,719	131,314	137,189	144,299	149,453	155,113
8.1	Percentage of GNP	1.66	1.71	1.73	1.80	1.96	2.09	2.19	2.34	2.37	2.43	2.49	2.55	2.64	2.68	2.74

## Footnotes to Table 8-9E

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3G, 3-3H, 4-3E, 5-3G, 5-3H, 6-3E, and 7-3E).

Table 8-10: TOTAL CAPITAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE

(millions of 1986 dollars)

Funding Source/Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A EPA															
A.3 Air															
A.4 Water	1,044	1,607	3,312	3,906	4,589	6,209	5,067	5,349	5,734	4,755	4,413	3,316	2,828	2,950	3,113
A.5 Land										38	171	195	389	396	293
A.6 Chemicals															
A.7 Multi-Media															
A.8 Total EPA	1,044	1,607	3,312	3,906	4,589	6,209	5,067	5,349	5,734	4,793	4,584	3,511	3,217	3,346	3,406
A.9 Percentage of Total	5.16	7.16	14.33	14.85	17.25	22.04	18.44	18.56	19.97	17.73	17.72	13.98	11.97	12.10	11.79
B Non-EPA Federal															
B.3 Air			132	152	146	119	108	96	123	131	64	96	73	96	85
B.4 Water	75	80	433	552	478	445	467	468	348	258	261	415	443	634	533
B.5 Land			56	53	42	24	34	23	25	29	19	52	218	311	366
B.6 Chemicals						2	28	83	27	17	16	8	15	33	45
B.7 Multi-Media				4	19	45	13	42	68	120	76	79	109	84	46
B.8 Total Non-EPA Federal	75	80	621	761	685	635	650	712	591	555	436	650	858	1,158	1,075
B.9 Percentage of Total	0.37	0.36	2.69	2.89	2.58	2.25	2.37	2.47	2.06	2.05	1.69	2.59	3.20	4.19	3.72
C State Government															
C.3 Air	160	196	211	184	264	312	304	385	487	507	539	442	421	329	312
C.4 Water	320	313	339	348	358	418	466	535	560	526	460	378	426	467	484
C.5 Land										4	19	22	43	44	33
C.6 Chemicals															
C.8 Total State Govt	481	510	550	532	622	730	770	920	1,047	1,037	1,018	842	889	840	829
C.9 Percentage of Total	2.38	2.27	2.38	2.02	2.34	2.59	2.80	3.19	3.65	3.84	3.94	3.35	3.31	3.04	2.87
D Local Government															
D.3 Air															
D.4 Water	4,718	3,552	2,948	2,678	1,717	1,387	1,668	1,972	2,636	2,811	2,862	3,514	3,194	2,999	3,729
D.5 Land	613	620	634	652	646	668	702	713	725	731	741	753	756	849	984
D.6 Chemicals															
D.7 Multi-Media															
D.8 Total Local Govt	5,331	4,172	3,582	3,330	2,363	2,054	2,370	2,685	3,361	3,542	3,602	4,267	3,950	3,849	4,714
D.9 Percentage of Total	26.36	18.58	15.50	12.66	8.88	7.29	8.62	9.32	11.70	13.10	13.92	16.99	14.70	13.92	16.32
E Private															
E.3 Air	5,262	7,192	7,073	9,758	9,643	9,608	9,593	10,286	10,003	10,049	9,557	9,236	10,559	10,871	10,976
E.4 Water	7,301	7,979	6,987	7,164	7,812	7,961	8,051	7,746	6,823	5,920	5,686	5,657	6,067	6,045	6,058
E.5 Land	733	911	980	847	887	980	963	1,126	1,157	1,140	944	926	1,203	1,427	1,709
E.6 Chemicals							20				43	23	121	120	117
E.7 Multi-Media															
E.8 Total Private	13,295	16,082	15,040	17,769	18,342	18,549	18,626	19,158	17,983	17,108	16,229	15,843	17,950	18,463	18,860
E.9 Percentage of Total	65.74	71.63	65.09	67.57	68.95	65.83	67.77	66.47	62.63	63.28	62.73	63.09	66.82	66.76	65.30
F Total Costs	20,225	22,451	23,105	26,297	26,600	28,178	27,484	28,825	28,715	27,036	25,870	25,113	26,864	27,656	28,884

## Footnotes to Table 8-10

Total capital costs for present implementation of existing regulatory programs for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding capital cost tables (those ending in “-1”) in each media chapter, starting with Table 3-1 and ending with Table 7-1.

Table 8-10A: TOTAL CAPITAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE

(millions of 1986 dollars)

Funding Source/Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A EPA															
A.3 Air															
A.4 Water	3,113	2,831	2,271	2,038	1,971	1,879	1,395	898	434						
A.5 Land	293	760	1,077	995	905	1,155	1,270	1,385	1,501	1,616	1,731	1,846	1,961	2,076	2,191
A.6 Chemicals															
A.7 Multi-Media															
A.8 Total EPA	3,406	3,591	3,348	3,033	2,876	3,034	2,665	2,283	1,935	1,616	1,731	1,846	1,961	2,076	2,191
A.9 Percentage of Total	11.79	11.85	10.41	8.05	7.39	7.50	6.16	5.51	5.19	4.36	4.70	4.96	4.14	5.83	6.10
B Non-EPA Federal															
B.3 Air	85	97	96	106	111	115	120	125	129	134	139	143	148	153	157
B.4 Water	533	680	753	826	899	972	1,046	1,119	1,192	1,265	1,338	1,412	1,485	1,558	1,631
B.5 Land	366	494	545	1,858	2,264	2,966	5,677	6,225	6,602	6,396	6,109	6,130	6,151	6,173	6,194
B.6 Chemicals	45	42	48	53	59	65	70	76	82	87	93	99	104	110	116
B.7 Multi-Media	46	43	34	24	15	5									
B.8 Total Non-EPA Federal	1,075	1,355	1,476	2,867	3,348	4,124	6,913	7,545	8,005	7,883	7,679	7,784	7,889	7,994	8,099
B.9 Percentage of Total	3.72	4.47	4.59	7.61	8.60	10.19	15.99	18.23	21.48	21.27	20.83	20.91	16.64	22.43	22.54
C State Government															
C.3 Air	312	276	253	227	200	174	148	121	95	69	42	16	(10)	(37)	(63)
C.4 Water	484	490	544	557	570	582	595	608	621	633	646	659	672	684	697
C.5 Land	33	84	120	111	101	128	141	154	167	180	192	205	218	231	243
C.6 Chemicals															
C.8 Total State Govt	829	850	917	894	871	884	884	883	883	882	880	880	879	879	877
C.9 Percentage of Total	2.87	2.80	2.85	2.37	2.24	2.18	2.04	2.13	2.37	2.38	2.39	2.36	1.85	2.47	2.44
D Local Government															
D.3 Air															
D.4 Water	3,729	4,215	3,214	3,259	3,317	3,593	4,120	4,290	4,490	4,775	4,887	4,568	4,013	3,708	3,732
D.5 Land	984	1,018	930	1,425	1,448	3,616	3,598	2,392	1,965	1,988	2,010	2,033	2,634	2,060	2,082
D.6 Chemicals				830	830	830	830								
D.7 Multi-Media			149												
D.8 Total Local Govt	4,714	5,233	4,293	5,515	5,594	8,040	8,548	6,682	6,455	6,762	6,897	6,601	6,647	5,768	5,814
D.9 Percentage of Total	16.32	17.26	13.35	14.64	14.37	19.86	19.77	16.14	17.32	18.25	18.71	17.74	14.02	16.19	16.18
E Private															
E.3 Air	10,976	11,256	11,365	11,005	10,629	10,762	10,808	10,811	10,902	10,968	10,984	11,056	11,080	11,109	11,138
E.4 Water	6,058	6,137	5,946	5,806	5,665	5,264	5,210	5,124	5,020	4,934	4,809	4,588	4,314	4,096	3,951
E.5 Land	1,709	1,777	2,981	8,089	8,329	8,277	8,110	7,981	4,068	4,008	3,878	4,466	14,634	3,712	3,862
E.6 Chemicals	117	114	110	89	89	89	89	89	89						
E.7 Multi-Media			1,716	371	1,519										
E.8 Total Private	18,860	19,284	22,118	25,361	26,232	24,391	24,217	24,005	19,990	19,910	19,671	20,109	30,028	18,917	18,951
E.9 Percentage of Total	65.30	63.62	68.79	67.32	67.40	60.27	56.02	57.99	53.64	53.73	53.37	54.03	63.34	53.09	52.74
F Total Costs	28,884	30,313	32,151	37,670	38,921	40,473	43,227	41,398	37,268	37,053	36,858	37,220	47,404	35,633	35,932

## Footnotes to Table 8-10A

Total capital costs for present implementation of existing regulatory programs for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding capital cost tables (those ending in “-1A” or “-1B”) in each media chapter, starting with Table 3-1A and ending with Table 7-1A.

Table 8-11: TOTAL OPERATING COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE

(millions of 1986 dollars)

Funding Source/Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
<b>A EPA</b>															
A.3 Air	359	381	306	304	291	295	239	322	341	292	274	246	249	249	244
A.4 Water	331	336	593	371	518	528	514	489	569	528	464	408	336	333	312
A.5 Land	70	72	20	24	36	36	39	99	114	213	183	204	251	257	319
A.6 Chemicals	26	33	43	40	75	79	69	144	148	182	147	136	131	145	163
A.7 Multi-Media	108	139	193	203	263	443	488	402	434	412	365	343	358	371	393
A.8 Total EPA	894	960	1,155	943	1,183	1,381	1,349	1,455	1,607	1,628	1,433	1,337	1,326	1,355	1,431
A.9 Percentage of Total	3.61	3.62	4.14	3.29	3.82	4.15	3.89	4.01	4.37	4.43	4.09	3.62	3.42	3.34	3.24
<b>B Non-EPA Federal</b>															
B.3 Air			407	376	361	402	481	375	374	320	329	338	371	451	487
B.4 Water	81	86	309	354	378	358	370	349	361	330	376	388	355	385	439
B.5 Land			80	109	105	101	94	103	103	152	179	181	203	273	248
B.6 Chemicals				13	53	65	176	272	272	169	132	60	67	103	163
B.7 Multi-Media			268	384	463	470	408	473	416	253	205	305	245	254	458
B.8 Total Non-EPA Federal	81	86	1,064	1,223	1,320	1,383	1,418	1,476	1,525	1,224	1,220	1,272	1,240	1,466	1,795
B.9 Percentage of Total	0.33	0.32	3.82	4.26	4.27	4.16	4.09	4.07	4.15	3.33	3.48	3.44	3.20	3.62	4.07
<b>C State Government</b>															
C.3 Air	343	359	394	348	338	363	390	423	441	406	396	410	420	455	507
C.4 Water	1,157	1,103	1,086	1,172	1,199	1,182	1,153	1,161	1,233	1,271	1,210	1,169	1,226	1,298	1,404
C.5 Land											4	8	16	20	27
C.6 Chemicals	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
C.8 Total State Govt	1,501	1,463	1,480	1,520	1,538	1,548	1,555	1,610	1,697	1,695	1,628	1,604	1,679	1,791	1,955
C.9 Percentage of Total	6.07	5.51	5.31	5.30	4.97	4.65	4.49	4.43	4.61	4.61	4.64	4.34	4.33	4.42	4.43
<b>D Local Government</b>															
D.3 Air															
D.4 Water	3,754	3,937	4,297	4,712	5,111	5,366	5,569	5,858	6,225	6,781	7,283	7,593	7,797	8,124	8,668
D.5 Land	3,473	3,512	3,592	3,694	3,661	3,783	3,976	4,042	4,106	4,144	4,196	4,270	4,510	4,786	5,038
D.6 Chemicals															
D.7 Multi-Media															
D.8 Total Local Govt	7,227	7,450	7,889	8,406	8,772	9,149	9,545	9,901	10,331	10,925	11,480	11,863	12,307	12,910	13,712
D.9 Percentage of Total	29.22	28.07	28.30	29.31	28.36	27.51	27.53	27.27	28.10	29.71	32.76	32.11	31.72	31.85	31.05
<b>E Private</b>															
E.3 Air	6,707	7,609	7,103	7,071	7,533	8,120	8,487	8,404	7,909	7,381	6,732	7,600	7,829	7,911	8,807
E.4 Water	3,493	3,825	3,817	3,987	4,467	4,876	5,112	5,444	5,376	5,470	5,276	5,861	6,169	6,529	6,929
E.5 Land	4,766	5,042	5,228	5,388	5,862	6,528	6,769	7,519	7,891	8,042	6,885	7,030	7,818	8,122	9,119
E.6 Chemicals	65	110	139	140	261	273	432	494	431	404	392	372	432	454	405
E.7 Multi-Media															
E.8 Total Private	15,032	16,585	16,288	16,586	18,123	19,797	20,799	21,861	21,607	21,296	19,285	20,863	22,248	23,016	25,260
E.9 Percentage of Total	60.77	62.48	58.43	57.84	58.58	59.53	60.00	60.22	58.77	57.92	55.03	56.48	57.34	56.78	57.21
<b>F Total Costs</b>	<b>24,735</b>	<b>26,545</b>	<b>27,876</b>	<b>28,678</b>	<b>30,936</b>	<b>33,258</b>	<b>34,666</b>	<b>36,303</b>	<b>36,767</b>	<b>36,768</b>	<b>35,046</b>	<b>36,939</b>	<b>38,800</b>	<b>40,538</b>	<b>44,155</b>

## Footnotes to Table 8-11

Total operating costs for present implementation of existing regulatory programs for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding operating cost tables (those ending in “-2”) in each media chapter, starting with Table 3-2 and ending with Table 7-2.

Table 8-11A: TOTAL OPERATING COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE

(millions of 1986 dollars)

Funding Source/Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
<b>A EPA</b>															
A.3 Air	244	268	235	245	260	328	251	249	247	245	243	241	239	238	236
A.4 Water	312	326	337	331	381	396	349	342	335	329	322	315	308	302	295
A.5 Land	319	501	573	648	687	744	815	885	954	1,024	1,092	1,162	1,232	1,301	1,370
A.6 Chemicals	163	175	181	239	212	206	215	225	236	246	257	268	278	289	301
A.7 Multi-Media	393	389	424	434	481	528	499	514	529	544	559	580	601	622	643
A.8 Total EPA	1,431	1,659	1,750	1,897	2,021	2,202	2,128	2,215	2,301	2,387	2,473	2,566	2,659	2,751	2,845
A.9 Percentage of Total	3.24	3.54	3.69	3.78	3.84	3.88	3.56	3.57	3.66	3.64	3.63	3.62	3.61	3.62	3.61
<b>B Non-EPA Federal</b>															
B.3 Air	487	506	541	577	612	647	682	718	753	788	823	859	894	929	964
B.4 Water	439	437	455	472	489	506	523	540	557	574	591	608	625	642	659
B.5 Land	248	295	312	542	632	765	1,252	1,357	1,431	1,405	1,363	1,375	1,387	1,400	1,412
B.6 Chemicals	163	105	102	99	96	95	91	89	86	84	81	79	76	73	71
B.7 Multi-Media	458	382	405	428	450	473	496	519	541	564	587	610	632	655	678
B.8 Total Non-EPA Federal	1,795	1,726	1,815	2,117	2,280	2,485	3,044	3,222	3,368	3,415	3,445	3,530	3,615	3,700	3,784
B.9 Percentage of Total	4.07	3.68	3.82	4.21	4.33	4.38	5.10	5.20	5.36	5.21	5.06	4.99	4.90	4.87	4.81
<b>C State Government</b>															
C.3 Air	507	507	487	496	505	515	524	534	543	553	562	572	581	591	600
C.4 Water	1,404	1,381	1,343	1,359	1,374	1,389	1,405	1,420	1,435	1,451	1,466	1,482	1,497	1,512	1,528
C.5 Land	27	37	53	76	102	132	163	198	233	275	320	369	421	476	535
C.6 Chemicals	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
C.8 Total State Govt	1,955	1,941	1,899	1,954	2,001	2,057	2,113	2,177	2,234	2,302	2,373	2,447	2,528	2,605	2,689
C.9 Percentage of Total	4.43	4.14	4.00	3.89	3.80	3.63	3.54	3.51	3.56	3.51	3.48	3.46	3.43	3.43	3.42
<b>D Local Government</b>															
D.3 Air															
D.4 Water	8,668	8,931	9,205	9,549	9,902	10,369	10,882	11,305	11,736	12,228	12,629	12,999	13,464	13,899	14,221
D.5 Land	5,038	5,194	5,036	5,224	5,407	5,710	5,827	6,056	6,176	6,257	6,364	6,472	6,579	6,670	6,778
D.6 Chemicals	6		80	80	64	128	191	255	255	255	255	255	255	255	255
D.7 Multi-Media				24	24	24	24	24	24	24	24	24	24	24	24
D.8 Total Local Govt	13,712	14,124	14,321	14,877	15,396	16,231	16,924	17,640	18,191	18,764	19,272	19,749	20,322	20,848	21,278
D.9 Percentage of Total	31.05	30.10	30.17	29.62	29.27	28.63	28.33	28.45	28.97	28.62	28.30	27.89	27.57	27.46	27.02
<b>E Private</b>															
E.3 Air	8,807	9,427	9,120	8,929	7,808	8,379	8,823	9,232	9,702	11,324	12,824	14,020	15,321	16,268	17,676
E.4 Water	6,929	7,672	7,324	7,701	8,079	8,559	8,836	9,087	9,348	9,622	9,876	10,123	10,391	10,652	10,889
E.5 Land	9,119	9,936	10,707	11,820	13,895	15,188	16,178	16,610	15,797	15,852	15,845	16,319	16,768	16,919	17,336
E.6 Chemicals	405	440	434	624	905	1,061	1,144	1,270	1,318	1,364	1,455	1,514	1,560	1,629	1,705
E.7 Multi-Media			101	310	216	538	538	538	538	538	538	538	538	538	538
E.8 Total Private	25,260	27,475	27,685	29,384	30,903	33,726	35,519	36,738	36,704	38,700	40,538	42,514	44,578	46,007	48,143
E.9 Percentage of Total	57.21	58.55	58.32	58.50	58.75	59.48	59.47	59.26	58.45	59.02	59.53	60.04	60.48	60.61	61.14
<b>F Total Costs</b>	<b>44,155</b>	<b>46,925</b>	<b>47,470</b>	<b>50,228</b>	<b>52,601</b>	<b>56,701</b>	<b>59,729</b>	<b>61,992</b>	<b>62,797</b>	<b>65,567</b>	<b>68,101</b>	<b>70,805</b>	<b>73,701</b>	<b>75,911</b>	<b>78,740</b>

## Footnotes to Table 8-11A

Total operating costs for present implementation of existing regulatory programs for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding operating cost tables (those ending in “-2A” or “-2B”) in each media chapter, starting with Table 3-2A and ending with Table 7-2A.

Table 8-12: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE ANNUALIZED AT 7%

(millions of 1986 dollars)

Funding Source/Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
<b>A EPA</b>															
A.3 Air	359	381	306	304	291	295	239	322	341	292	274	246	249	249	244
A.4 Water	415	550	1,073	1,166	1,683	2,193	2,587	2,993	3,536	3,878	4,170	4,381	4,537	4,771	5,001
A.5 Land	70	72	20	24	36	36	39	99	114	216	200	237	315	353	439
A.6 Chemicals	26	33	43	40	75	79	69	144	148	182	147	136	131	145	163
A.7 Multi-Media	108	139	193	203	263	443	488	402	434	412	365	343	358	371	393
A.8 Total EPA	978	1,174	1,636	1,738	2,348	3,046	3,423	3,960	4,574	4,981	5,155	5,342	5,591	5,890	6,240
A.9 Percentage of Total	3.69	3.88	4.87	4.72	5.65	6.55	6.78	7.22	7.89	8.23	8.42	8.16	8.00	7.96	7.80
<b>B Non-EPA Federal</b>															
B.3 Air			419	402	401	453	542	445	455	413	428	445	485	573	617
B.4 Water	87	98	356	446	508	524	574	591	630	620	687	733	735	817	914
B.5 Land			85	119	119	118	114	125	127	179	208	215	256	353	360
B.6 Chemicals					13	53	67	187	285	184	148	77	85	124	189
B.7 Multi-Media			268	384	465	476	416	485	434	282	242	349	299	316	525
B.8 Total Non-EPA Federal	87	98	1,129	1,352	1,507	1,624	1,713	1,832	1,932	1,678	1,712	1,819	1,861	2,184	2,605
B.9 Percentage of Total	0.33	0.33	3.36	3.67	3.62	3.49	3.39	3.34	3.33	2.77	2.80	2.78	2.66	2.95	3.25
<b>C State Government</b>															
C.3 Air	359	393	447	419	434	489	544	613	677	690	731	787	836	902	984
C.4 Water	1,183	1,154	1,164	1,278	1,334	1,351	1,360	1,412	1,530	1,611	1,588	1,578	1,670	1,780	1,926
C.5 Land										0	6	12	23	31	40
C.6 Chemicals	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
C.8 Total State Govt	1,542	1,548	1,612	1,698	1,769	1,842	1,916	2,051	2,230	2,320	2,343	2,394	2,546	2,731	2,967
C.9 Percentage of Total	5.82	5.11	4.80	4.61	4.26	3.96	3.80	3.74	3.85	3.83	3.83	3.66	3.64	3.69	3.71
<b>D Local Government</b>															
D.3 Air															
D.4 Water	4,143	4,621	5,228	5,869	6,416	6,793	7,139	7,597	8,188	8,981	9,725	10,328	10,800	11,380	12,238
D.5 Land	3,530	3,629	3,768	3,931	3,960	4,144	4,404	4,538	4,669	4,777	4,899	5,043	5,355	5,711	6,056
D.6 Chemicals															6
D.7 Multi-Media															
D.8 Total Local Govt	7,673	8,250	8,996	9,801	10,376	10,937	11,542	12,135	12,857	13,758	14,624	15,371	16,155	17,091	18,301
D.9 Percentage of Total	28.98	27.26	26.76	26.60	24.96	23.52	22.86	22.13	22.18	22.73	23.88	23.48	23.10	23.09	22.86
<b>E Private</b>															
E.3 Air	7,217	8,824	9,009	10,031	11,559	13,224	14,673	15,753	16,380	17,002	17,412	19,302	20,754	21,787	23,586
E.4 Water	4,084	5,060	5,617	6,367	7,478	8,531	9,418	10,377	10,861	11,435	11,701	12,744	13,543	14,393	15,285
E.5 Land	4,835	5,197	5,475	5,716	6,274	7,032	7,363	8,220	8,701	8,959	7,892	8,124	9,023	9,460	10,615
E.6 Chemicals	65	110	139	140	261	273	434	496	433	406	398	380	452	485	447
E.7 Multi-Media															
E.8 Total Private	16,201	19,191	20,241	22,254	25,572	29,060	31,887	34,846	36,376	37,802	37,403	40,550	43,772	46,125	49,933
E.9 Percentage of Total	61.18	63.42	60.22	60.40	61.51	62.48	63.17	63.56	62.75	62.44	61.08	61.93	62.60	62.31	62.38
<b>F Total Costs</b>	26,481	30,261	33,614	36,842	41,572	46,509	50,482	54,824	57,969	60,539	61,237	65,477	69,925	74,021	80,046

## Footnotes to Table 8-12

Total annualized costs for implementing existing and new regulations for all media by funding source for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding seven percent annualized cost tables (those ending "-3") in each media chapter, starting with Table 3-3 and ending with Table 7-3.

Table 8-12A: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE ANNUALIZED AT 7%

(millions of 1986 dollars)

Funding Source/Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
<b>A EPA</b>															
A.3 Air	244	268	235	245	260	328	251	249	247	245	243	241	239	238	236
A.4 Water	5,001	5,243	5,438	5,596	5,805	5,971	6,036	6,102	6,130	6,123	6,117	6,110	6,103	6,096	6,090
A.5 Land	439	682	841	996	1,108	1,258	1,431	1,613	1,802	2,002	2,211	2,429	2,657	2,893	3,139
A.6 Chemicals	163	175	181	239	212	206	215	225	236	246	257	268	278	289	301
A.7 Multi-Media	393	389	424	434	481	528	499	514	529	544	559	580	601	622	643
A.8 Total EPA	6,240	6,758	7,118	7,509	7,865	8,291	8,432	8,703	8,944	9,161	9,386	9,628	9,879	10,139	10,409
A.9 Percentage of Total	7.80	7.92	8.04	7.96	7.88	7.73	7.45	7.39	7.42	7.33	7.26	7.19	7.08	7.07	7.04
<b>B Non-EPA Federal</b>															
B.3 Air	617	645	689	733	778	824	870	916	953	987	1,022	1,060	1,100	1,140	1,182
B.4 Water	914	967	1,045	1,128	1,218	1,313	1,414	1,522	1,635	1,754	1,879	2,009	2,146	2,289	2,437
B.5 Land	360	450	515	908	1,199	1,593	2,584	3,239	3,890	4,423	4,914	5,464	6,016	6,570	7,126
B.6 Chemicals	189	135	136	139	141	146	149	154	159	164	171	177	182	182	188
B.7 Multi-Media	525	453	479	504	528	551	574	597	619	642	663	681	703	721	738
B.8 Total Non-EPA Federal	2,605	2,649	2,863	3,412	3,865	4,427	5,591	6,427	7,256	7,970	8,648	9,392	10,146	10,902	11,670
B.9 Percentage of Total	3.25	3.11	3.24	3.62	3.87	4.13	4.94	5.46	6.02	6.37	6.69	7.01	7.27	7.60	7.89
<b>C State Government</b>															
C.3 Air	984	1,010	1,013	1,044	1,073	1,099	1,107	1,109	1,108	1,106	1,095	1,076	1,056	1,026	983
C.4 Water	1,926	1,942	1,949	2,010	2,072	2,135	2,199	2,265	2,331	2,398	2,467	2,536	2,604	2,670	2,735
C.5 Land	40	57	83	115	149	189	231	279	327	384	444	510	579	653	732
C.6 Chemicals	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
C.8 Total State Govt	2,967	3,025	3,061	3,193	3,313	3,444	3,558	3,678	3,788	3,911	4,030	4,147	4,269	4,375	4,476
C.9 Percentage of Total	3.71	3.55	3.46	3.39	3.32	3.21	3.15	3.12	3.14	3.13	3.12	3.10	3.06	3.05	3.03
<b>D Local Government</b>															
D.3 Air															
D.4 Water	12,238	12,854	13,400	14,020	14,653	15,427	16,239	16,974	17,729	18,568	19,328	20,033	20,781	21,462	22,025
D.5 Land	6,056	6,308	6,238	6,554	6,867	7,505	7,896	8,286	8,532	8,738	8,974	9,210	9,492	9,710	9,945
D.6 Chemicals	6		80	158	221	363	504	568	568	568	568	568	568	568	568
D.7 Multi-Media			14	38	38	38	38	38	38	38	38	38	38	38	38
D.8 Total Local Govt	18,301	19,162	19,733	20,770	21,779	23,333	24,678	25,867	26,868	27,913	28,909	29,850	30,879	31,778	32,577
D.9 Percentage of Total	22.86	22.47	22.30	22.03	21.81	21.76	21.81	21.96	22.29	22.32	22.35	22.28	22.13	22.16	22.03
<b>E Private</b>															
E.3 Air	23,586	25,083	25,654	26,245	25,918	27,237	27,990	28,454	28,813	30,224	31,545	32,639	33,829	34,682	35,990
E.4 Water	15,285	16,525	16,659	17,508	18,344	19,253	19,942	20,599	21,256	21,919	22,553	23,162	23,768	24,348	24,889
E.5 Land	10,615	11,595	12,642	14,441	17,224	19,208	20,813	21,830	21,284	21,611	21,859	22,633	24,195	24,563	25,206
E.6 Chemicals	447	493	497	695	985	1,149	1,241	1,376	1,423	1,470	1,560	1,619	1,663	1,733	1,808
E.7 Multi-Media			263	507	556	878	878	878	878	878	878	878	878	878	878
E.8 Total Private	49,933	53,696	55,715	59,396	63,027	67,726	70,864	73,137	73,654	76,101	78,395	80,932	84,333	86,203	88,772
E.9 Percentage of Total	62.38	62.96	62.96	63.00	63.12	63.16	62.64	62.08	61.12	60.85	60.60	60.42	60.45	60.12	60.02
<b>F Total Costs</b>	<b>80,046</b>	<b>85,290</b>	<b>88,490</b>	<b>94,280</b>	<b>99,850</b>	<b>107,221</b>	<b>113,123</b>	<b>117,811</b>	<b>120,510</b>	<b>125,056</b>	<b>129,368</b>	<b>133,948</b>	<b>139,507</b>	<b>143,396</b>	<b>147,904</b>

## Footnotes to Table 8-12A

Total annualized costs for implementing existing and new regulations for all media by funding source for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding seven percent annualized cost tables in each media chapter (Tables 3-3A, 3-3B, 4-3A, 5-3A, 5-3B, 6-3A, and 7-3A).

Table 8-12B: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE ANNUALIZED AT 3%

(millions of 1986 dollars)

Funding Source/Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A EPA															
A.3 Air	359	381	306	304	291	295	239	322	341	292	274	246	249	249	244
A.4 Water	384	471	897	874	1,255	1,582	1,826	2,074	2,447	2,649	2,810	2,923	2,996	3,143	3,281
A.5 Land	70	72	20	24	36	36	39	99	114	215	194	225	292	318	395
A.6 Chemicals	26	33	43	40	75	79	69	144	148	182	147	136	131	145	163
A.7 Multi-Media	108	139	193	203	263	443	488	402	434	412	365	343	358	371	393
A.8 Total EPA	947	1,096	1,459	1,446	1,921	2,435	2,662	3,041	3,485	3,751	3,790	3,873	4,026	4,226	4,476
A.9 Percentage of Total	3.66	3.77	4.60	4.23	5.03	5.75	5.84	6.20	6.78	7.05	7.12	6.82	6.66	6.62	6.47
B Non-EPA Federal															
B.3 Air			416	395	389	438	524	424	431	385	398	413	451	537	578
B.4 Water	85	94	339	412	460	463	500	502	532	513	573	607	596	658	740
B.5 Land			84	116	115	113	108	119	120	171	200	205	240	329	325
B.6 Chemicals				13	53	67	184	281	180	143	72	80	118	181	181
B.7 Multi-Media			268	384	465	475	413	481	429	274	231	336	284	298	505
B.8 Total Non-EPA Federal	85	94	1,106	1,307	1,442	1,541	1,612	1,710	1,793	1,524	1,545	1,633	1,650	1,940	2,330
B.9 Percentage of Total	0.33	0.32	3.49	3.82	3.78	3.64	3.54	3.49	3.49	2.86	2.90	2.88	2.73	3.04	3.37
C State Government															
C.3 Air	354	383	432	398	407	452	500	559	609	608	634	678	716	774	847
C.4 Water	1,174	1,136	1,136	1,239	1,285	1,289	1,284	1,321	1,422	1,488	1,451	1,430	1,510	1,606	1,738
C.5 Land										0	5	10	20	27	35
C.6 Chemicals	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
C.8 Total State Govt	1,528	1,519	1,568	1,638	1,692	1,744	1,796	1,905	2,054	2,115	2,109	2,136	2,264	2,424	2,637
C.9 Percentage of Total	5.90	5.23	4.94	4.79	4.43	4.12	3.94	3.88	4.00	3.97	3.96	3.76	3.74	3.80	3.81
D Local Government															
D.3 Air															
D.4 Water	4,005	4,379	4,901	5,465	5,963	6,300	6,598	7,000	7,515	8,227	8,888	9,389	9,768	10,262	11,012
D.5 Land	3,514	3,595	3,717	3,863	3,874	4,040	4,280	4,395	4,507	4,595	4,697	4,820	5,111	5,444	5,763
D.6 Chemicals															6
D.7 Multi-Media															
D.8 Total Local Govt	7,518	7,975	8,619	9,328	9,837	10,340	10,879	11,395	12,022	12,821	13,585	14,209	14,879	15,706	16,781
D.9 Percentage of Total	29.03	27.46	27.16	27.26	25.75	24.42	23.89	23.22	23.38	24.09	25.54	25.04	24.61	24.59	24.26
E Private															
E.3 Air	7,074	8,487	8,481	9,243	10,516	11,927	13,122	13,932	14,295	14,651	14,816	16,480	17,669	18,490	20,086
E.4 Water	3,868	4,609	4,960	5,498	6,379	7,197	7,846	8,576	8,859	9,259	9,357	10,233	10,853	11,525	12,238
E.5 Land	4,815	5,153	5,404	5,621	6,155	6,887	7,192	8,018	8,468	8,695	7,602	7,808	8,675	9,072	10,181
E.6 Chemicals	65	110	139	140	261	273	433	496	433	405	397	378	446	476	435
E.7 Multi-Media															
E.8 Total Private	15,823	18,359	18,985	20,503	23,311	26,284	28,593	31,021	32,054	33,010	32,172	34,899	37,643	39,563	42,940
E.9 Percentage of Total	61.09	63.21	59.82	59.91	61.02	62.07	62.79	63.22	62.35	62.02	60.47	61.50	62.26	61.95	62.09
F Total Costs	25,901	29,042	31,737	34,222	38,203	42,344	45,542	49,072	51,408	53,221	53,200	56,751	60,462	63,860	69,164

## Footnotes to Table 8-12B

Total annualized costs for implementing existing and new regulations for all media by funding source for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3C, 4-3B, 5-3C, 6-3B, and 7-3B).

Table 8-12C: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE ANNUALIZED AT 3%

(millions of 1986 dollars)

Funding Source/Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
<b>A EPA</b>															
A.3 Air	244	268	235	245	260	328	251	249	247	245	243	241	239	238	236
A.4 Water	3,281	3,439	3,566	3,664	3,815	3,925	3,950	3,989	4,004	3,997	3,991	3,984	3,977	3,970	3,964
A.5 Land	395	616	743	868	953	1,070	1,205	1,346	1,491	1,643	1,800	1,964	2,134	2,309	2,490
A.6 Chemicals	163	175	181	239	212	206	215	225	236	246	257	268	278	289	301
A.7 Multi-Media	393	389	424	434	481	528	499	514	529	544	559	580	601	622	643
A.8 Total EPA	4,476	4,887	5,149	5,450	5,721	6,057	6,119	6,322	6,507	6,676	6,850	7,037	7,230	7,428	7,634
A.9 Percentage of Total	6.47	6.64	6.77	6.74	6.69	6.60	6.32	6.28	6.33	6.26	6.20	6.15	6.07	6.07	6.04
<b>B Non-EPA Federal</b>															
B.3 Air	578	603	644	686	728	770	813	855	891	926	960	997	1,035	1,073	1,113
B.4 Water	740	773	828	887	950	1,017	1,087	1,161	1,239	1,321	1,406	1,495	1,588	1,685	1,785
B.5 Land	325	401	450	791	1,018	1,329	2,159	2,638	3,105	3,458	3,778	4,155	4,534	4,914	5,296
B.6 Chemicals	181	126	126	127	128	131	132	135	138	141	145	149	151	151	154
B.7 Multi-Media	505	433	458	482	506	529	551	574	597	619	641	661	682	702	720
B.8 Total Non-EPA Federal	2,330	2,335	2,506	2,974	3,330	3,775	4,743	5,364	5,970	6,465	6,930	7,457	7,991	8,525	9,068
B.9 Percentage of Total	3.37	3.17	3.29	3.68	3.90	4.11	4.90	5.33	5.81	6.06	6.28	6.52	6.71	6.97	7.18
<b>C State Government</b>															
C.3 Air	847	865	862	886	909	930	939	943	945	947	941	931	919	900	873
C.4 Water	1,738	1,740	1,730	1,775	1,820	1,867	1,913	1,961	2,009	2,058	2,107	2,157	2,206	2,254	2,301
C.5 Land	35	50	72	100	132	168	206	249	293	344	399	458	521	588	659
C.6 Chemicals	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
C.8 Total State Govt	2,637	2,670	2,680	2,786	2,881	2,986	3,079	3,179	3,269	3,371	3,472	3,571	3,676	3,768	3,860
C.9 Percentage of Total	3.81	3.63	3.52	3.44	3.37	3.25	3.18	3.16	3.18	3.16	3.14	3.12	3.09	3.08	3.06
<b>D Local Government</b>															
D.3 Air	11,012	11,505	11,959	12,485	13,022	13,693	14,403	15,033	15,679	16,403	17,045	17,638	18,289	18,883	19,361
D.4 Water	5,763	5,987	5,892	6,168	6,441	6,979	7,288	7,629	7,838	8,008	8,207	8,406	8,633	8,815	9,014
D.5 Land	6	80	136	176	295	414	478	478	478	478	478	478	478	478	478
D.6 Chemicals		10	34	34	34	34	34	34	34	34	34	34	34	34	34
D.7 Multi-Media															
D.8 Total Local Govt	16,781	17,492	17,941	18,822	19,672	21,001	22,139	23,174	24,030	24,924	25,764	26,555	27,434	28,210	28,886
D.9 Percentage of Total	24.26	23.75	23.59	23.27	23.02	22.88	22.87	23.02	23.38	23.36	23.33	23.22	23.05	23.06	22.87
<b>E Private</b>															
E.3 Air	20,086	21,380	21,748	22,155	21,646	22,792	23,502	23,989	24,399	25,885	27,269	28,411	29,649	30,552	31,913
E.4 Water	12,238	13,297	13,256	13,933	14,603	15,357	15,896	16,407	16,920	17,443	17,941	18,419	18,903	19,367	19,797
E.5 Land	10,181	11,112	12,076	13,642	16,185	17,928	19,319	20,129	19,496	19,732	19,894	20,569	21,728	22,021	22,586
E.6 Chemicals	435	478	479	675	962	1,124	1,213	1,345	1,393	1,439	1,530	1,589	1,633	1,703	1,778
E.7 Multi-Media			216	450	458	780	780	780	780	780	780	780	780	780	780
E.8 Total Private	42,940	46,267	47,776	50,855	53,854	57,982	60,711	62,650	62,988	65,280	67,415	69,769	72,694	74,423	76,854
E.9 Percentage of Total	62.09	62.82	62.82	62.87	63.02	63.16	62.72	62.22	61.29	61.17	61.05	60.99	61.07	60.83	60.85
<b>F Total Costs</b>	<b>69,164</b>	<b>73,652</b>	<b>76,052</b>	<b>80,887</b>	<b>85,459</b>	<b>91,801</b>	<b>96,792</b>	<b>100,690</b>	<b>102,764</b>	<b>106,716</b>	<b>110,430</b>	<b>114,388</b>	<b>119,025</b>	<b>122,355</b>	<b>126,302</b>

## Footnotes to Table 8-12C

Total annualized costs for implementing existing and new regulations for all media by funding source for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3D, 3-3E, 4-3C, 5-3D, 5-3E, 6-3C, and 7-3C).

Table 8-12D: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE ANNUALIZED AT 10%

(millions of 1986 dollars)

Funding Source/Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A EPA															
A.3 Air	359	381	306	304	291	295	239	322	341	292	274	246	249	249	244
A.4 Water	442	617	1,225	1,418	2,051	2,720	3,243	3,786	4,475	4,938	5,342	5,638	5,866	6,175	6,485
A.5 Land	70	72	20	24	36	36	39	99	114	217	205	247	335	383	476
A.6 Chemicals	26	33	43	40	75	79	69	144	148	182	147	136	131	145	163
A.7 Multi-Media	108	139	193	203	263	443	488	402	434	412	365	343	358	371	393
A.8 Total EPA	1,004	1,242	1,788	1,990	2,717	3,573	4,079	4,752	5,512	6,042	6,333	6,609	6,940	7,324	7,762
A.9 Percentage of Total	3.72	3.97	5.08	5.09	6.11	7.14	7.46	7.96	8.67	9.05	9.30	9.06	8.90	8.86	8.69
B Non-EPA Federal															
B.3 Air			422	409	411	466	557	463	476	436	453	473	514	605	650
B.4 Water	89	102	371	475	549	576	639	667	716	712	786	842	856	953	1,064
B.5 Land			87	122	123	122	119	130	133	186	215	223	270	374	390
B.6 Chemicals					13	53	68	190	288	188	152	81	90	130	195
B.7 Multi-Media			268	384	466	478	418	487	438	290	250	360	313	331	541
B.8 Total Non-EPA Federal	89	102	1,148	1,390	1,562	1,695	1,800	1,937	2,051	1,811	1,856	1,979	2,042	2,394	2,841
B.9 Percentage of Total	0.33	0.33	3.26	3.56	3.51	3.39	3.29	3.24	3.23	2.71	2.73	2.71	2.62	2.90	3.18
C State Government															
C.3 Air	362	401	460	436	458	519	582	660	735	759	813	879	938	1,012	1,101
C.4 Water	1,191	1,171	1,189	1,312	1,377	1,404	1,425	1,491	1,623	1,717	1,706	1,705	1,808	1,929	2,088
C.5 Land										0	6	13	25	34	45
C.6 Chemicals	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
C.8 Total State Govt	1,554	1,572	1,650	1,749	1,835	1,926	2,019	2,176	2,381	2,496	2,543	2,614	2,788	2,993	3,250
C.9 Percentage of Total	5.76	5.02	4.68	4.47	4.13	3.85	3.69	3.64	3.75	3.74	3.74	3.59	3.58	3.62	3.64
D Local Government															
D.3 Air															
D.4 Water	4,261	4,829	5,510	6,217	6,806	7,216	7,603	8,110	8,766	9,629	10,444	11,135	11,686	12,341	13,292
D.5 Land	3,545	3,657	3,811	3,989	4,033	4,233	4,508	4,659	4,807	4,931	5,071	5,232	5,561	5,937	6,305
D.6 Chemicals															
D.7 Multi-Media															
D.8 Total Local Govt	7,806	8,486	9,321	10,206	10,839	11,449	12,111	12,769	13,573	14,560	15,515	16,367	17,247	18,278	19,603
D.9 Percentage of Total	28.94	27.11	26.46	26.12	24.38	22.87	22.14	21.38	21.35	21.80	22.79	22.45	22.12	22.11	21.95
E Private															
E.3 Air	7,337	9,109	9,456	10,696	12,437	14,314	15,974	17,281	18,129	18,971	19,585	21,664	23,333	24,543	26,510
E.4 Water	4,269	5,449	6,184	7,116	8,426	9,681	10,773	11,929	12,587	13,311	13,721	14,909	15,862	16,865	17,911
E.5 Land	4,852	5,235	5,536	5,796	6,374	7,155	7,509	8,391	8,899	9,184	8,138	8,391	9,319	9,789	10,984
E.6 Chemicals	65	110	139	140	261	273	434	497	434	406	400	382	457	492	457
E.7 Multi-Media															
E.8 Total Private	16,524	19,903	21,315	23,747	27,498	31,424	34,690	38,098	40,049	41,872	41,844	45,346	48,971	51,689	55,863
E.9 Percentage of Total	61.25	63.58	60.52	60.76	61.86	62.76	63.42	63.78	63.00	62.70	61.45	62.19	62.79	62.52	62.54
F Total Costs	26,978	31,305	35,222	39,082	44,451	50,067	54,699	59,732	63,566	66,781	68,091	72,916	77,988	82,679	89,318

## Footnotes to Table 8-12D

Total annualized costs for implementing existing and new regulations for all media by funding source for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3F, 4-3D, 5-3F, 6-3D, and 7-3D).

Table 8-12E: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE ANNUALIZED AT 10%

(millions of 1986 dollars)

Funding Source/Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
<b>A EPA</b>															
A.3 Air	244	268	235	245	260	328	251	249	247	245	243	241	239	238	236
A.4 Water	6,485	6,799	7,051	7,261	7,520	7,735	7,836	7,924	7,963	7,957	7,950	7,943	7,936	7,930	7,923
A.5 Land	476	739	925	1,106	1,241	1,421	1,626	1,843	2,071	2,312	2,564	2,830	3,108	3,397	3,699
A.6 Chemicals	163	175	181	239	212	206	215	225	236	246	257	268	278	289	301
A.7 Multi-Media	393	389	424	434	481	528	499	514	529	544	559	580	601	622	643
A.8 Total EPA	7,762	8,370	8,816	9,285	9,714	10,217	10,426	10,755	11,046	11,304	11,573	11,862	12,163	12,476	12,801
A.9 Percentage of Total	8.69	8.79	8.90	8.78	8.66	8.49	8.21	8.12	8.14	8.03	7.95	7.87	7.75	7.73	7.70
<b>B Non-EPA Federal</b>															
B.3 Air	650	680	727	774	822	870	919	968	1,005	1,040	1,075	1,113	1,156	1,197	1,240
B.4 Water	1,064	1,134	1,231	1,336	1,448	1,569	1,697	1,832	1,976	2,127	2,286	2,453	2,627	2,810	3,000
B.5 Land	390	492	570	1,009	1,354	1,820	2,947	3,752	4,562	5,247	5,886	6,583	7,283	7,985	8,691
B.6 Chemicals	195	142	144	148	152	158	163	169	176	184	193	201	208	209	216
B.7 Multi-Media	541	470	497	522	547	570	593	616	638	661	681	699	720	738	752
B.8 Total Non-EPA Federal	2,841	2,919	3,169	3,789	4,323	4,986	6,318	7,337	8,357	9,259	10,121	11,050	11,993	12,938	13,899
B.9 Percentage of Total	3.18	3.07	3.20	3.58	3.86	4.14	4.97	5.54	6.16	6.58	6.95	7.34	7.64	8.02	8.36
<b>C State Government</b>															
C.3 Air	1,101	1,133	1,142	1,178	1,211	1,241	1,249	1,250	1,246	1,241	1,225	1,199	1,172	1,132	1,077
C.4 Water	2,088	2,117	2,137	2,212	2,289	2,367	2,446	2,526	2,608	2,692	2,777	2,862	2,947	3,028	3,109
C.5 Land	45	63	92	127	164	207	253	305	357	418	484	554	630	709	794
C.6 Chemicals	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
C.8 Total State Govt	3,250	3,329	3,388	3,541	3,683	3,836	3,969	4,106	4,234	4,375	4,509	4,641	4,777	4,895	5,006
C.9 Percentage of Total	3.64	3.50	3.42	3.35	3.29	3.19	3.12	3.10	3.12	3.11	3.10	3.08	3.04	3.03	3.01
<b>D Local Government</b>															
D.3 Air															
D.4 Water	13,292	14,013	14,638	15,339	16,055	16,917	17,816	18,641	19,489	20,427	21,289	22,089	22,921	23,676	24,312
D.5 Land	6,305	6,580	6,532	6,881	7,229	7,952	8,413	8,845	9,122	9,359	9,626	9,894	10,221	10,471	10,738
D.6 Chemicals	6		80	177	259	420	581	645	645	645	645	645	645	645	645
D.7 Multi-Media			18	42	42	42	42	42	42	42	42	42	42	42	42
D.8 Total Local Govt	19,603	20,593	21,268	22,440	23,584	25,331	26,851	28,173	29,297	30,472	31,601	32,670	33,829	34,833	35,736
D.9 Percentage of Total	21.95	21.63	21.46	21.23	21.04	21.05	21.14	21.28	21.60	21.66	21.72	21.69	21.55	21.59	21.48
<b>E Private</b>															
E.3 Air	26,510	28,176	28,915	29,661	29,486	30,950	31,735	32,179	32,492	33,839	35,105	36,158	37,305	38,114	39,377
E.4 Water	17,911	19,307	19,593	20,588	21,569	22,611	23,429	24,212	24,992	25,776	26,527	27,249	27,961	28,640	29,277
E.5 Land	10,984	12,006	13,122	15,121	18,110	20,301	22,091	23,285	22,815	23,219	23,541	24,401	26,309	26,741	27,452
E.6 Chemicals	457	506	512	713	1,005	1,171	1,265	1,401	1,449	1,495	1,586	1,645	1,688	1,758	1,833
E.7 Multi-Media			303	555	640	962	962	962	962	962	962	962	962	962	962
E.8 Total Private	55,863	59,995	62,445	66,639	70,809	75,995	79,481	82,039	82,709	85,291	87,721	90,414	94,225	96,216	98,902
E.9 Percentage of Total	62.54	63.02	63.02	63.05	63.16	63.14	62.56	61.96	60.98	60.62	60.28	60.02	60.02	59.63	59.46
<b>F Total Costs</b>															
F Total Costs	89,318	95,206	99,086	105,693	112,114	120,364	127,045	132,410	135,643	140,700	145,525	150,636	156,988	161,357	166,345

## Footnotes to Table 8-12E

Total annualized costs for implementing existing and new regulations for all media by funding source for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3G, 3-3H, 4-3E, 5-3G, 5-3H, 6-3E, and 7-3E).

Table 8-13: PRIVATE CAPITAL COSTS OF AIR AND WATER POLLUTION CONTROL

(millions of 1986 dollars)

Media	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
1 Private Air	4,471	477	473	510	590	758	962	1,325	1,861	2,074	2,479	3,229	4,185
2 Private Water	4,686	496	484	504	567	727	917	1,231	1,902	2,089	2,363	3,162	3,399
3 Total Priv Air & Water	9,158	973	957	1,014	1,157	1,485	1,878	2,556	3,763	4,163	4,843	6,391	7,584

Table 8-13A: PRIVATE CAPITAL COSTS OF AIR AND WATER POLLUTION CONTROL

(millions of 1986 dollars)

Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Private Air	4,994	6,628	6,601	6,983	6,387	6,061	5,908	6,276	6,288	5,860	5,508	4,425	4,433	4,207	4,090
2 Private Water	7,166	7,838	6,828	6,996	7,648	7,813	7,904	7,578	6,640	5,737	5,510	5,495	5,904	5,854	5,835
3 Total Priv Air & Water	12,160	14,466	13,429	13,979	14,035	13,874	13,813	13,854	12,928	11,597	11,019	9,919	10,338	10,061	9,925

Table 8-13B: PRIVATE CAPITAL COSTS OF AIR AND WATER POLLUTION CONTROL

(millions of 1986 dollars)

Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Private Air	4,090	4,122	3,971	3,876	3,781	3,686	3,591	3,496	3,401	3,306	3,212	3,117	3,022	2,927	2,832
2 Private Water	5,835	5,917	5,425	5,279	5,132	4,986	4,840	4,694	4,548	4,402	4,256	4,110	3,964	3,818	3,672
3 Total Priv Air & Water	9,925	10,039	9,395	9,154	8,913	8,672	8,431	8,190	7,949	7,708	7,467	7,227	6,986	6,745	6,504

Footnotes to Tables 8-13, 8-13A, 8-13B

1959-1988: Private capital investment in stationary air and water pollution control. Source: Department of Commerce, Bureau of Economic Analysis (BEA).

1989-2000: Linear extrapolation of 1975-1988 data for air and 1976-1988 data for water.

Table 8-14: PRIVATE COSTS OF AIR AND WATER POLLUTION CONTROL ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Prv Air (incl 1960-71)	8,080	8,796	8,949	9,830	11,126	12,389	13,514	13,867	14,111	14,485	14,559	15,712	16,443	16,948	17,867
2 Pr Air (not inc 60-71)	5,872	6,588	6,741	7,622	8,918	10,181	11,306	12,081	12,370	12,789	12,911	14,120	14,922	15,518	16,561
3 Difference	2,208	2,208	2,208	2,208	2,208	2,208	2,208	1,786	1,741	1,696	1,648	1,593	1,521	1,430	1,305
4 Prv Wtr (incl 1960-71)	5,754	6,716	7,252	7,977	9,060	10,092	10,952	11,879	12,338	12,878	13,113	14,137	14,913	15,731	16,586
5 Pr Wtr (not inc 60-71)	3,939	4,900	5,437	6,161	7,245	8,277	9,137	10,064	10,522	11,062	11,298	12,321	13,098	13,916	14,771
6 Difference	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815

Table 8-14A: PRIVATE COSTS OF AIR AND WATER POLLUTION CONTROL ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Prv Air (incl 1960-71)	17,867	18,698	18,575	18,707	19,245	19,441	19,552	19,499	19,440	19,336	19,279	19,244	19,215	19,141	19,058
2 Pr Air (not inc 60-71)	16,561	17,568	17,642	18,007	18,850	19,441	19,552	19,499	19,440	19,336	19,279	19,244	19,215	19,141	19,058
3 Difference	1,305	1,130	934	700	395										
4 Prv Wtr (incl 1960-71)	16,586	17,800	17,888	18,168	18,774	19,369	19,951	20,516	21,056	21,569	22,045	22,455	22,838	23,187	23,460
5 Pr Wtr (not inc 60-71)	14,771	15,985	16,073	16,730	17,376	18,010	18,632	19,243	19,842	20,429	21,004	21,567	22,119	22,658	23,187
6 Difference	1,815	1,815	1,815	1,438	1,398	1,359	1,318	1,273	1,214	1,140	1,041	888	719	529	274

Footnotes to Tables 8-14 and 8-14A by lines:

1. Private annualized costs for implementing existing regulations for stationary air. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1959-2000, annualized at 7 percent assuming a capital life of 20 years, and added to the operating cost estimates taken from the corresponding air operating cost tables (i.e., 3-2, 3-2A). The capital stock shown for 1959 in Table 8-13 is assumed to have been invested in 1959, even though much of it presumably dates from earlier years.

2. Private annualized costs for implementing existing regulations for stationary air. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1972-2000, annualized at 7 percent assuming a capital life of 20 years, and added to the operating cost estimates taken from the corresponding air operating cost tables (i.e., 3-2, 3-2A).

3. Line 1 minus line 2.

4. Private annualized costs for implementing existing regulations for water quality. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1959-2000, annualized at 7 percent assuming a capital life of 30 years, and added to the operating cost estimates taken from the corresponding water operating cost tables (i.e., 4-2, 4-2A). The capital stock shown for 1959 in Table 8-13 is assumed to have been invested in 1959, even though much of it presumably dates from earlier years.
5. Private annualized costs for implementing existing regulations for water quality. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1972-2000, annualized at 7 percent assuming a capital life of 30 years, and added to the operating cost estimates taken from the corresponding water operating cost tables (i.e., 4-2, 4-2A).
6. Line 4 minus line 5.

Table 8-14B: PRIVATE COSTS OF AIR AND WATER POLLUTION CONTROL ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Prv Air (incl 1960-71)	7,308	7,845	7,818	8,509	9,631	10,730	11,694	11,999	12,085	12,312	12,250	13,299	13,930	14,347	15,190
2 Pr Air (not inc 60-71)	5,736	6,272	6,246	6,937	8,059	9,157	10,122	10,727	10,845	11,104	11,077	12,165	12,847	13,329	14,261
3 Difference	1,572	1,572	1,572	1,572	1,572	1,572	1,572	1,272	1,240	1,208	1,174	1,134	1,083	1,018	929
4 Prv Wtr (incl 1960-71)	4,876	5,606	5,940	6,458	7,316	8,116	8,743	9,446	9,708	10,078	10,151	11,012	11,614	12,259	12,941
5 Pr Wtr (not inc 60-71)	3,727	4,457	4,791	5,309	6,167	6,967	7,594	8,296	8,559	8,929	9,002	9,863	10,464	11,109	11,792
6 Difference	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149

Table 8-14C: PRIVATE COSTS OF AIR AND WATER POLLUTION CONTROL ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Prv Air (incl 1960-71)	15,190	15,960	15,786	15,880	16,403	16,612	16,761	16,794	16,821	16,817	16,847	16,892	16,941	16,959	16,969
2 Pr Air (not inc 60-71)	14,261	15,156	15,121	15,382	16,122	16,612	16,761	16,794	16,821	16,817	16,847	16,892	16,941	16,959	16,969
3 Difference	929	804	665	498	281										
4 Prv Wtr (incl 1960-71)	12,941	13,980	13,908	14,170	14,639	15,101	15,555	15,997	16,424	16,834	17,221	17,566	17,894	18,200	18,458
5 Pr Wtr (not inc 60-71)	11,792	12,831	12,759	13,260	13,754	14,241	14,720	15,192	15,656	16,113	16,562	17,004	17,438	17,865	18,285
6 Difference	1,149	1,149	1,149	910	885	860	835	806	769	722	659	562	455	335	173

## Footnotes to Tables 8-14B and 8-14C by lines:

1. Private annualized costs for implementing existing regulations for stationary air. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1959-2000, annualized at 3 percent assuming a capital life of 20 years, and added to the operating cost estimates taken from the corresponding air operating cost tables (i.e., 3-2, 3-2A). The capital stock shown for 1959 in Table 8-13 is assumed to have been invested in 1959, even though much of it presumably dates from earlier years.
2. Private annualized costs for implementing existing regulations for stationary air. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1972-2000, annualized at 3 percent assuming a capital life of 20 years, and added to the operating cost estimates taken from the corresponding air operating cost tables (i.e., 3-2, 3-2A).
3. Line 1 minus line 2.

4. Private annualized costs for implementing existing regulations for water quality. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1959-2000, annualized at 3 percent assuming a capital life of 30 years, and added to the operating cost estimates taken from the corresponding water operating cost tables (i.e., 4-2, 4-2A). The capital stock shown for 1959 in Table 8-13 is assumed to have been invested in 1959, even though much of it presumably dates from earlier years.
5. Private annualized costs for implementing existing regulations for water quality. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1972-2000, annualized at 3 percent assuming a capital life of 30 years, and added to the operating cost estimates taken from the corresponding water operating cost tables (i.e., 4-2, 4-2A).
6. Line 4 minus line 5.

Table 8-14D: PRIVATE COSTS OF AIR AND WATER POLLUTION CONTROL ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Prv Air (incl 1960-71)	8,735	9,604	9,909	10,951	12,394	13,797	15,059	15,453	15,832	16,330	16,519	17,760	18,576	19,156	20,138
2 Pr Air (not inc 60-71)	5,987	6,856	7,161	8,204	9,646	11,049	12,311	13,231	13,665	14,219	14,468	15,779	16,683	17,376	18,514
3 Difference	2,748	2,748	2,748	2,748	2,748	2,748	2,748	2,223	2,167	2,111	2,051	1,982	1,893	1,780	1,624
4 Prv Wtr (incl 1960-71)	6,511	7,672	8,383	9,286	10,565	11,795	12,857	13,977	14,605	15,291	15,667	16,831	17,758	18,725	19,729
5 Pr Wtr (not inc 60-71)	4,121	5,283	5,993	6,896	8,175	9,406	10,468	11,587	12,215	12,901	13,278	14,441	15,368	16,335	17,339
6 Difference	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390

Table 8-14E: PRIVATE COSTS OF AIR AND WATER POLLUTION CONTROL ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Prv Air (incl 1960-71)	20,138	21,022	20,943	21,107	21,658	21,842	21,920	21,795	21,662	21,474	21,343	21,241	21,145	20,994	20,831
2 Pr Air (not inc 60-71)	18,514	19,616	19,781	20,236	21,166	21,842	21,920	21,795	21,662	21,474	21,343	21,241	21,145	20,994	20,831
3 Difference	1,624	1,406	1,162	871	492										
4 Prv Wtr (incl 1960-71)	19,729	21,093	21,320	21,615	22,339	23,049	23,741	24,411	25,049	25,650	26,204	26,670	27,101	27,487	27,774
5 Pr Wtr (not inc 60-71)	17,339	18,704	18,930	19,722	20,499	21,260	22,006	22,736	23,451	24,150	24,833	25,502	26,154	26,791	27,413
6 Difference	2,390	2,390	2,390	1,893	1,840	1,789	1,735	1,675	1,598	1,501	1,370	1,168	947	696	361

## Footnotes to Tables 8-14D and 8-14E by lines:

1. Private annualized costs for implementing existing regulations for stationary air. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1959-2000, annualized at 10 percent assuming a capital life of 20 years, and added to the operating cost estimates taken from the corresponding air operating cost tables (i.e., 3-2, 3-2A). The capital stock shown for 1959 in Table 8-13 is assumed to have been invested in 1959, even though much of it presumably dates from earlier years.
2. Private annualized costs for implementing existing regulations for stationary air. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1972-2000, annualized at 10 percent assuming a capital life of 20 years, and added to the operating cost estimates taken from the corresponding air operating cost tables (i.e., 3-2, 3-2A).
3. Line 1 minus line 2.

4. Private annualized costs for implementing existing regulations for water quality. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1959-2000, annualized at 10 percent assuming a capital life of 30 years, and added to the operating cost estimates taken from the corresponding water operating cost tables (i.e., 4-2, 4-2A). The capital stock shown for 1959 in Table 8-13 is assumed to have been invested in 1959, even though much of it presumably dates from earlier years.
5. Private annualized costs for implementing existing regulations for water quality. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1972-2000, annualized at 10 percent assuming a capital life of 30 years, and added to the operating cost estimates taken from the corresponding water operating cost tables (i.e., 4-2, 4-2A).
6. Line 4 minus line 5.

Table 8-15: TOTAL CAPITAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
3.1.2	New Regs															
3.1.3	Full Implementation															
3.1.4	Total Air	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
3.2	Radiation															
3.2.1	Existing Regs			24	20	16	8	25	22	64	89	30	37	33	55	47
3.2.2	New Regs															1
3.2.3	Total Radiation			24	20	16	8	25	22	64	89	30	37	33	55	48
3.3	Air & Radiation															
3.3.1	Existing Regs	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,372
3.3.2	New Regs															
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,373
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,090	15,020	13,211	12,666	12,345	12,043	12,023	12,666
4.1.2	New Regs															
4.1.3	Full Implementation															
4.1.4	Total Water Quality	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,090	15,020	13,211	12,666	12,345	12,043	12,023	12,666
4.2	Drinking Water															
4.2.1	Existing Regs	736	772	868	917	895	814	825	979	1,081	1,060	1,016	935	915	1,073	1,251
4.2.2	New Regs															
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	736	772	868	917	895	814	825	979	1,081	1,060	1,016	935	915	1,073	1,251
4.3	Water															
4.3.1	Existing Regs	13,457	13,533	14,019	14,647	14,953	16,420	15,720	16,070	16,101	14,270	13,682	13,280	12,958	13,096	13,917
4.3.2	New Regs															
4.3.3	Full Implementation															
4.3.4	Total Water	13,457	13,533	14,019	14,647	14,953	16,420	15,720	16,070	16,101	14,270	13,682	13,280	12,958	13,096	13,917
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,591	1,848	1,912	2,115
5.1.2	New Regs															
5.1.3	Total Solid Waste	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,591	1,848	1,912	2,115
5.2	Hazardous Waste															
5.2.1	Existing Regs												65	113	368	221
5.2.2	New Regs															
5.2.3	Total Hazardous Waste												65	113	368	558

(continued on next page)

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Table 8-15 (cont'd): TOTAL CAPITAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,656	1,961	2,280	2,335
5.4.2	New Regs															337
5.4.3	Total RCRA	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,656	1,961	2,280	2,672
5.5	Superfund															
5.5.1	Existing Regs										42	193	293	648	748	713
5.5.2	New Regs															
5.5.3	Total Superfund										42	193	293	648	748	713
5.6	Land															
5.6.1	Existing Regs	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,942	1,893	1,949	2,609	3,028	3,048
5.6.2	New Regs															337
5.6.3	Total Land	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,942	1,893	1,949	2,609	3,028	3,385
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs							2	48	83	27	17	59	31	136	153
6.1.2	New Regs															
6.1.3	Total Toxic Subs							2	48	83	27	17	59	31	136	153
6.2	Pesticides															
6.2.1	Existing Regs															
6.2.3	Total Pesticides															
6.3	Chemicals															
6.3.1	Existing Regs							2	48	83	27	17	59	31	136	153
6.3.2	New Regs															
6.3.3	Total Chemicals							2	48	83	27	17	59	31	136	153
7	Multi-Media				4	19	45	13	42	68	120	76	79	109	84	46
8	Capital Costs															
8.3	Total Full Impl															
8.4	Total Capital Costs	20,225	22,451	23,105	26,297	26,600	28,178	27,484	28,825	28,715	27,036	25,870	25,113	26,864	27,656	28,884

Footnotes to Table 8-15

Sum of the capital costs shown in Tables 3-1, 4-1, 5-1, 6-1, and 7-1.

Table 8-15A: TOTAL CAPITAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	11,325	11,091	11,051	10,618	10,587	10,628	10,648	10,720	10,750	10,779	10,758	10,791	10,778	10,769	10,758
3.1.2	New Regs		477	573	574	203	253	257	156	186	191	197	203	210	216	223
3.1.3	Full Implementation															
3.1.4	Total Air	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981
3.2	Radiation															
3.2.1	Existing Regs	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
3.2.2	New Regs	1	4	34	79	79	94	89	93	98	103	107	112	117	122	127
3.2.3	Total Radiation	48	60	90	145	151	171	171	180	190	201	210	220	230	240	251
3.3	Air & Radiation															
3.3.1	Existing Regs	11,372	11,147	11,107	10,684	10,658	10,704	10,730	10,808	10,843	10,876	10,861	10,899	10,891	10,887	10,882
3.3.2	New Regs	1	481	607	653	282	347	346	249	284	294	304	315	327	338	350
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	11,373	11,628	11,714	11,337	10,940	11,051	11,076	11,057	11,126	11,171	11,165	11,215	11,218	11,225	11,232
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	12,666	13,132	11,229	10,950	10,836	10,697	10,166	9,623	9,112	8,631	8,584	8,537	8,491	8,444	8,397
4.1.2	New Regs			314	314	333	19	116								
4.1.3	Full Implementation					1,757	1,822	2,281	2,751	3,189	3,597	3,571	3,545	3,519	3,493	3,467
4.1.4	Total Water Quality	12,666	13,132	11,543	11,264	12,926	12,539	12,563	12,374	12,301	12,228	12,155	12,082	12,009	11,937	11,864
4.2	Drinking Water															
4.2.1	Existing Regs	1,251	1,220	1,149	1,150	1,173	1,196	1,218	1,241	1,264	1,286	1,309	1,332	1,354	1,377	1,390
4.2.2	New Regs			36	73	80	379	865	1,175	1,381	1,690	1,787	1,358	639	225	225
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	1,251	1,220	1,185	1,223	1,253	1,575	2,083	2,416	2,645	2,976	3,096	2,690	1,993	1,602	1,615
4.3	Water															
4.3.1	Existing Regs	13,917	14,352	12,378	12,100	12,009	11,893	11,385	10,864	10,375	9,917	9,893	9,869	9,845	9,821	9,787
4.3.2	New Regs			350	387	413	398	981	1,175	1,381	1,690	1,787	1,358	639	225	225
4.3.3	Full Implementation					1,757	1,822	2,281	2,751	3,189	3,597	3,571	3,545	3,519	3,493	3,467
4.3.4	Total Water	13,917	14,352	12,728	12,487	14,179	14,113	14,646	14,790	14,946	15,204	15,251	14,772	14,002	13,539	13,479
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	2,115	2,169	1,983	1,998	2,012	2,027	2,041	2,056	2,070	2,085	2,099	2,114	2,128	2,143	2,157
5.1.2	New Regs						2,105	2,607	1,379	1,379	1,379	877	877	877	877	877
5.1.3	Total Solid Waste	2,115	2,169	1,983	1,998	2,012	4,132	4,648	3,435	3,449	3,464	2,976	2,991	3,005	3,020	3,034
5.2	Hazardous Waste															
5.2.1	Existing Regs	221	372	434	1,279	1,550	1,954	3,620	3,827	4,118	3,860	3,772	3,827	3,882	3,938	3,993
5.2.2	New Regs	337	130	1,338	1,170	1,379	391	382	125	411	221	450	904	210	216	222
5.2.3	Total Hazardous Waste	558	502	1,772	2,449	2,929	2,345	4,002	3,952	4,529	4,081	4,222	4,731	4,092	4,154	4,215

(continued on next page)

Table 8-15A (cont'd): TOTAL CAPITAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION  
(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
5.3.3	Total LUST				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
5.4	RCRA															
5.4.1	Existing Regs	2,335	2,541	2,417	3,277	3,563	3,981	5,662	5,883	6,188	5,945	5,871	5,941	6,011	6,080	6,150
5.4.2	New Regs	337	130	1,338	6,420	6,629	8,593	8,239	6,754	2,246	2,056	1,783	2,237	12,842	1,193	1,199
5.4.3	Total RCRA	2,672	2,671	3,755	9,697	10,192	12,574	13,901	12,637	8,434	8,001	7,654	8,178	18,853	7,273	7,349
5.5	Superfund															
5.5.1	Existing Regs	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
5.5.2	New Regs															
5.5.3	Total Superfund	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
5.6	Land															
5.6.1	Existing Regs	3,048	4,003	4,315	6,058	6,418	7,549	10,557	11,383	12,057	12,132	12,137	12,443	12,757	13,058	13,373
5.6.2	New Regs	337	130	1,338	6,420	6,629	8,593	8,239	6,754	2,246	2,056	1,783	2,237	12,842	1,193	1,199
5.6.3	Total Land	3,385	4,133	5,653	12,478	13,047	16,142	18,796	18,137	14,303	14,188	13,920	14,680	25,599	14,251	14,572
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	162	156	158	143	148	154	160	165	82	87	93	99	104	110	116
6.1.2	New Regs				830	830	830	830								
6.1.3	Total Toxic Subs	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
6.2	Pesticides															
6.2.1	Existing Regs															
6.2.3	Total Pesticides															
6.3	Chemicals															
6.3.1	Existing Regs	162	156	158	143	148	154	160	165	82	87	93	99	104	110	116
6.3.2	New Regs				830	830	830	830								
6.3.3	Total Chemicals	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
7	Multi-Media	46	43	1,899	395	1,534	5									
8	Capital Costs															
8.1	Total Existing Regs	28,546	29,702	29,857	29,380	30,767	30,305	32,830	33,220	33,357	33,013	32,984	33,310	33,597	33,876	34,157
8.2	Total New Regs	338	611	2,294	8,290	8,154	10,167	10,396	8,178	3,911	4,040	3,874	3,910	13,807	1,756	1,774
8.3	Total Full Impl					1,757	1,822	2,281	2,751	3,189	3,597	3,571	3,545	3,519	3,493	3,467
8.4	Total Capital Costs	28,884	30,313	32,151	37,670	40,678	42,295	45,507	44,150	40,457	40,650	40,429	40,765	50,923	39,126	39,398

Footnotes to Table 8-15A

Sum of the capital costs shown in Tables 3-1A, 3-1B, 4-1A, 5-1A, 5-1B, 6-1A, and 7-1A.

Table 8-16: TOTAL OPERATING COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
3.1.2	New Regs															
3.1.3	Full Implementation															
3.1.4	Total Air	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
3.2	Radiation															
3.2.1	Existing Regs	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
3.2.2	New Regs															0
3.2.3	Total Radiation	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
3.3	Air & Radiation															
3.3.1	Existing Regs	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045
3.3.2	New Regs															0
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,121	12,526	13,026	13,191	13,976	14,413	15,119	16,109
4.1.2	New Regs															
4.1.3	Full Implementation															
4.1.4	Total Water Quality	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,121	12,526	13,026	13,191	13,976	14,413	15,119	16,109
4.2	Drinking Water															
4.2.1	Existing Regs	732	741	774	824	899	979	1,073	1,180	1,238	1,353	1,417	1,442	1,471	1,549	1,645
4.2.2	New Regs															
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	732	741	774	824	899	979	1,073	1,180	1,238	1,353	1,417	1,442	1,471	1,549	1,645
4.3	Water															
4.3.1	Existing Regs	8,817	9,288	10,102	10,596	11,672	12,309	12,717	13,301	13,764	14,379	14,608	15,419	15,884	16,668	17,753
4.3.2	New Regs															
4.3.3	Full Implementation															
4.3.4	Total Water	8,817	9,288	10,102	10,596	11,672	12,309	12,717	13,301	13,764	14,379	14,608	15,419	15,884	16,668	17,753
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,356	11,260	10,947	11,830	12,344	13,254
5.1.2	New Regs															
5.1.3	Total Solid Waste	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,356	11,260	10,947	11,830	12,344	13,254
5.2	Hazardous Waste															
5.2.1	Existing Regs										182	147	677	828	958	1,139
5.2.2	New Regs															
5.2.3	Total Hazardous Waste										182	147	677	828	958	1,306

(continued on next page)

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Table 8-16 (cont'd): TOTAL OPERATING COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION  
(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,538	11,407	11,624	12,658	13,301	14,394
5.4.2	New Regs															
5.4.3	Total RCRA	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,538	11,407	11,624	12,658	13,301	14,561
5.5	Superfund															
5.5.1	Existing Regs										12	40	69	140	157	191
5.5.2	New Regs															
5.5.3	Total Superfund										12	40	69	140	157	191
5.6	Land															
5.6.1	Existing Regs	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,550	11,447	11,693	12,798	13,458	14,585
5.6.2	New Regs															167
5.6.3	Total Land	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,550	11,447	11,693	12,798	13,458	14,752
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs			9	5	9	47	154	332	414	350	293	212	207	251	329
6.1.2	New Regs															
6.1.3	Total Toxic Subs			9	5	9	47	154	332	414	350	293	212	207	251	335
6.2	Pesticides															
6.2.1	Existing Regs	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.2.3	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Chemicals															
6.3.1	Existing Regs	92	143	183	181	349	408	578	840	874	774	690	585	647	721	748
6.3.2	New Regs															6
6.3.3	Total Chemicals	92	143	183	181	349	408	578	840	874	774	690	585	647	721	754
7	Multi-Media	108	139	461	587	726	913	896	875	850	665	570	648	603	625	851
8	Operating Costs															
8.3	Total Full Impl															
8.4	Total Operating Costs	24,735	26,545	27,876	28,678	30,936	33,258	34,666	36,303	36,767	36,768	35,046	36,939	38,800	40,538	44,155

Footnotes to Table 8-16

Sum of the operating costs in Tables 3-2, 4-2, 5-2, 6-2, and 7-2.

Table 8-16A: TOTAL OPERATING COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	9,731	10,427	10,066	9,747	8,637	9,043	9,302	9,639	9,992	10,342	10,657	10,995	11,313	11,614	11,895
3.1.2	New Regs			17	169	186	437	561	648	780	2,066	3,266	4,139	5,136	5,796	6,937
3.1.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.1.4	Total Air	9,731	10,427	10,083	9,916	8,823	9,480	9,863	14,655	15,170	16,997	18,935	20,568	22,303	23,686	25,386
3.2	Radiation															
3.2.1	Existing Regs	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
3.2.2	New Regs	0	0	3	8	14	20	25	31	36	42	48	53	59	65	71
3.2.3	Total Radiation	314	281	300	330	362	389	417	445	473	502	530	558	587	615	644
3.3	Air & Radiation															
3.3.1	Existing Regs	10,045	10,708	10,363	10,068	8,985	9,413	9,694	10,053	10,429	10,802	11,139	11,499	11,840	12,164	12,468
3.3.2	New Regs	0	0	20	177	200	457	586	679	816	2,108	3,314	4,192	5,195	5,861	7,008
3.3.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.3.4	Tot. Air & Radiation	10,045	10,708	10,383	10,246	9,185	9,869	10,280	15,100	15,643	17,499	19,465	21,126	22,889	24,301	26,030
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	16,109	17,085	16,973	17,532	18,141	18,718	19,218	19,772	20,326	20,880	21,434	21,988	22,542	23,096	23,650
4.1.2	New Regs			2	142	291	519	529	562	562	562	562	562	562	562	562
4.1.3	Full Implementation					176	358	586	861	1,180	1,540	1,897	2,251	2,603	2,953	3,299
4.1.4	Total Water Quality	16,109	17,085	16,975	17,674	18,608	19,595	20,333	21,195	22,068	22,982	23,893	24,802	25,708	26,611	27,512
4.2	Drinking Water															
4.2.1	Existing Regs	1,645	1,661	1,600	1,560	1,613	1,664	1,729	1,780	1,832	1,883	1,935	1,986	2,038	2,090	2,119
4.2.2	New Regs			89	178	179	319	519	580	691	878	953	990	1,143	1,259	1,259
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	1,645	1,661	1,689	1,738	1,792	1,982	2,248	2,360	2,523	2,761	2,888	2,976	3,181	3,349	3,379
4.3	Water															
4.3.1	Existing Regs	17,753	18,746	18,573	19,092	19,754	20,381	20,947	21,552	22,158	22,764	23,369	23,975	24,580	25,186	25,770
4.3.2	New Regs			91	320	470	838	1,048	1,142	1,253	1,440	1,515	1,552	1,705	1,821	1,821
4.3.3	Full Implementation					176	358	586	861	1,180	1,540	1,897	2,251	2,603	2,953	3,299
4.3.4	Total Water	17,753	18,746	18,664	19,412	20,399	21,577	22,581	23,555	24,591	25,743	26,781	27,778	28,888	29,960	30,890
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	13,254	14,035	13,463	13,738	14,012	14,286	14,559	14,832	15,106	15,379	15,653	15,926	16,200	16,473	16,747
5.1.2	New Regs						196	273	395	516	516	516	516	516	516	516
5.1.3	Total Solid Waste	13,254	14,035	13,463	13,738	14,012	14,482	14,832	15,227	15,622	15,895	16,169	16,442	16,716	16,989	17,263
5.2	Hazardous Waste															
5.2.1	Existing Regs	1,139	1,312	1,435	1,688	1,853	2,070	2,493	2,660	2,841	2,926	3,039	3,178	3,318	3,457	3,597
5.2.2	New Regs	167	262	1,323	1,355	1,723	2,710	3,297	3,417	3,549	3,673	3,347	3,498	3,622	3,746	3,833
5.2.3	Total Haz. Waste	1,306	1,574	2,758	3,043	3,576	4,780	5,790	6,077	6,390	6,599	6,386	6,676	6,940	7,203	7,430

(continued on next page)

Table 8-16A (cont'd): TOTAL OPERATING COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION  
(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
5.3.2	New Regs				858	2,338	2,338	2,364	2,365	994	581	581	582	583	267	267
5.3.3	Total LUST		1	13	888	2,368	2,379	2,416	2,427	1,066	662	672	683	694	387	397
5.4	RCRA															
5.4.1	Existing Regs	14,394	15,348	14,911	15,455	15,895	16,396	17,104	17,554	18,018	18,386	18,783	19,205	19,628	20,051	20,474
5.4.2	New Regs	167	262	1,323	2,213	4,061	5,244	5,934	6,177	5,059	4,770	4,444	4,596	4,721	4,529	4,616
5.4.3	Total RCRA	14,561	15,610	16,234	17,668	19,956	21,640	23,038	23,731	23,077	23,156	23,227	23,801	24,349	24,580	25,090
5.5	Superfund															
5.5.1	Existing Regs	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
5.5.2	New Regs															
5.5.3	Total Superfund	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
5.6	Land															
5.6.1	Existing Regs	14,585	15,701	15,358	16,096	16,662	17,295	18,301	18,930	19,532	20,042	20,540	21,100	21,666	22,237	22,816
5.6.2	New Regs	167	262	1,323	2,213	4,061	5,244	5,934	6,177	5,059	4,770	4,444	4,596	4,721	4,529	4,616
5.6.3	Total Land	14,752	15,963	16,681	18,309	20,723	22,539	24,235	25,107	24,591	24,812	24,984	25,696	26,387	26,766	27,432
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	329	283	278	285	250	293	297	303	306	311	317	322	328	334	339
6.1.2	New Regs	6		80	84	68	132	195	305	307	308	349	352	355	358	361
6.1.3	Total Toxic Subs	335	283	358	369	318	425	492	608	613	619	666	674	683	692	700
6.2	Pesticides															
6.2.1	Existing Regs	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.2.3	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Chemicals															
6.3.1	Existing Regs	748	736	733	982	1,229	1,378	1,467	1,560	1,610	1,664	1,723	1,788	1,844	1,915	1,997
6.3.2	New Regs	6		80	84	68	132	195	305	307	308	349	352	355	358	361
6.3.3	Total Chemicals	754	736	813	1,066	1,297	1,510	1,662	1,865	1,917	1,972	2,072	2,140	2,199	2,273	2,358
7	Multi-Media	851	772	930	1,196	1,172	1,563	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883
8	Operating Costs															
8.1	Total Existing Regs	43,982	46,663	45,957	47,434	47,802	50,030	51,966	53,690	55,362	56,942	58,479	60,113	61,726	63,342	64,934
8.2	Total New Regs	173	262	1,514	2,795	4,799	6,670	7,763	8,303	7,436	8,626	9,622	10,692	11,976	12,569	13,806
8.3	Total Full Impl					176	358	586	5,229	5,578	6,129	6,909	7,685	8,457	9,229	9,853
8.4	Tot. Operating Costs	44,155	46,925	47,470	50,228	52,777	57,059	60,315	67,222	68,375	71,696	75,010	78,491	82,159	85,140	88,593

Footnotes to Table 8-16A

Sum of the operating costs in Tables 3-2A, 3-2B, 4-2A, 5-2A, 5-2B, 6-2A, and 7-2A.

Table 8-17: TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
3.1.2	New Regs															
3.1.3	Full Implementation															
3.1.4	Total Air	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
3.2	Radiation															
3.2.1	Existing Regs	18	17	255	232	158	173	237	232	219	201	220	207	215	233	354
3.2.2	New Regs															0
3.2.3	Total Radiation	18	17	255	232	158	173	237	232	219	201	220	207	215	233	355
3.3	Air & Radiation															
3.3.1	Existing Regs	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431
3.3.2	New Regs															0
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,147	22,763	24,328	25,514	27,294	28,700	30,376	32,386
4.1.2	New Regs															
4.1.3	Full Implementation															
4.1.4	Total Water Quality	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,147	22,763	24,328	25,514	27,294	28,700	30,376	32,386
4.2	Drinking Water															
4.2.1	Existing Regs	802	883	998	1,135	1,294	1,451	1,623	1,823	1,982	2,198	2,357	2,471	2,586	2,765	2,979
4.2.2	New Regs															
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	802	883	998	1,135	1,294	1,451	1,623	1,823	1,982	2,198	2,357	2,471	2,586	2,765	2,979
4.3	Water															
4.3.1	Existing Regs	9,912	11,484	13,439	15,126	17,419	19,391	21,078	22,970	24,745	26,525	27,871	29,765	31,286	33,141	35,365
4.3.2	New Regs															
4.3.3	Full Implementation															
4.3.4	Total Water	9,912	11,484	13,439	15,126	17,419	19,391	21,078	22,970	24,745	26,525	27,871	29,765	31,286	33,141	35,365
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	13,934	12,998	12,835	13,892	14,587	15,697
5.1.2	New Regs															
5.1.3	Total Solid Waste	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	13,934	12,998	12,835	13,892	14,587	15,697
5.2	Hazardous Waste															
5.2.1	Existing Regs										182	147	683	845	1,009	1,212
5.2.2	New Regs															199
5.2.3	Total Hazardous Waste										182	147	683	845	1,009	1,410

(continued on next page)

Table 8-17 (cont'd): TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REG ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,116	13,145	13,518	14,737	15,596	16,909
5.4.2	New Regs															199
5.4.3	Total RCRA	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,116	13,145	13,518	14,737	15,596	17,107
5.5	Superfund															
5.5.1	Existing Regs										15	59	112	235	312	404
5.5.2	New Regs															
5.5.3	Total Superfund										15	59	112	235	312	404
5.6	Land															
5.6.1	Existing Regs	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,131	13,204	13,630	14,972	15,908	17,312
5.6.2	New Regs															199
5.6.3	Total Land	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,131	13,204	13,630	14,972	15,908	17,511
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs			9	5	9	47	158	345	429	367	315	237	245	303	396
6.1.2	New Regs															6
6.1.3	Total Toxic Subs			9	5	9	47	158	345	429	367	315	237	245	303	402
6.2	Pesticides															
6.2.1	Existing Regs	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.2.3	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Chemicals															
6.3.1	Existing Regs	92	143	183	181	349	408	583	853	889	791	712	610	685	773	816
6.3.2	New Regs															6
6.3.3	Total Chemicals	92	143	183	181	349	408	583	853	889	791	712	610	685	773	822
7	Multi-Media	108	139	461	587	729	919	903	886	868	695	606	692	657	687	918
8	Annualized Costs															
8.3	Total Full Impl															
8.4	Tot. Annualized Costs	26,481	30,261	33,614	36,842	41,572	46,509	50,482	54,824	57,969	60,539	61,237	65,477	69,925	74,021	80,046

Footnotes to Table 8-17

Sum of the annualized costs in Tables 3-3, 4-3, 5-3, 6-3, and 7-3.

Table 8-17A: TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	25,077	26,634	27,117	27,540	27,216	28,351	28,882	29,241	29,430	29,513	29,581	29,744	29,890	30,026	30,125
3.1.2	New Regs		45	121	332	372	654	810	919	1,077	2,391	3,619	4,521	5,534	6,211	7,370
3.1.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.1.4	Total Air	25,077	26,679	27,238	27,872	27,588	29,005	29,692	34,528	34,905	36,493	38,212	39,699	41,278	42,513	44,049
3.2	Radiation															
3.2.1	Existing Regs	354	326	347	377	410	438	467	497	528	559	590	622	654	685	717
3.2.2	New Regs	0	1	6	19	31	45	58	71	85	100	115	130	146	162	179
3.2.3	Total Radiation	355	327	353	396	441	483	525	568	613	659	705	752	800	847	896
3.3	Air & Radiation															
3.3.1	Existing Regs	25,431	26,960	27,464	27,917	27,625	28,789	29,349	29,738	29,957	30,072	30,172	30,366	30,544	30,712	30,841
3.3.2	New Regs	0	46	127	350	403	699	868	990	1,163	2,491	3,733	4,651	5,680	6,373	7,549
3.3.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.3.4	Total Air & Radiation	25,431	27,006	27,591	28,267	28,029	29,488	30,217	35,096	35,518	37,151	38,917	40,451	42,078	43,361	44,944
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	32,386	34,421	35,213	36,654	38,137	39,576	40,895	42,225	43,513	44,763	46,009	47,251	48,489	49,723	50,954
4.1.2	New Regs			27	193	368	598	617	650	650	650	650	650	650	650	650
4.1.3	Full Implementation					317	646	1,058	1,555	2,131	2,781	3,426	4,066	4,701	5,332	5,958
4.1.4	Total Water Quality	32,386	34,421	35,241	36,847	38,823	40,820	42,571	44,430	46,295	48,194	50,085	51,967	53,840	55,706	57,563
4.2	Drinking Water															
4.2.1	Existing Regs	2,979	3,111	3,158	3,227	3,390	3,554	3,665	3,760	3,849	3,936	4,026	4,127	4,228	4,317	4,376
4.2.2	New Regs			92	188	196	372	654	826	1,068	1,414	1,658	1,822	2,036	2,174	2,195
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	2,979	3,111	3,250	3,415	3,587	3,926	4,319	4,586	4,917	5,350	5,684	5,949	6,264	6,491	6,571
4.3	Water															
4.3.1	Existing Regs	35,365	37,531	38,371	39,881	41,528	43,130	44,560	45,985	47,362	48,698	50,035	51,377	52,717	54,041	55,330
4.3.2	New Regs			120	381	565	970	1,272	1,476	1,718	2,064	2,308	2,473	2,686	2,824	2,845
4.3.3	Full Implementation					317	646	1,058	1,555	2,131	2,781	3,426	4,066	4,701	5,332	5,958
4.3.4	Total Water	35,365	37,531	38,491	40,262	42,410	44,746	46,890	49,017	51,212	53,543	55,769	57,916	60,104	62,197	64,134
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	15,697	16,683	16,298	16,761	17,226	17,690	18,029	18,352	18,663	18,987	19,310	19,625	19,940	20,240	20,537
5.1.2	New Regs						395	718	970	1,221	1,351	1,434	1,517	1,600	1,682	1,765
5.1.3	Total Solid Waste	15,697	16,683	16,298	16,761	17,226	18,085	18,747	19,322	19,884	20,338	20,744	21,142	21,539	21,922	22,302
5.2	Hazardous Waste															
5.2.1	Existing Regs	1,212	1,419	1,583	1,957	2,268	2,670	3,435	3,963	4,533	4,982	5,451	5,952	6,457	6,968	7,485
5.2.2	New Regs	199	306	1,493	1,636	2,134	3,158	3,781	3,913	4,084	4,228	3,945	4,181	4,325	4,469	4,577
5.2.3	Total Hazardous Waste	1,410	1,725	3,077	3,593	4,402	5,827	7,216	7,875	8,616	9,210	9,396	10,133	10,782	11,438	12,062

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Table 8-17A (cont'd): TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REG ANNUALIZED AT 7 PERCENT  
(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
5.3.2	New Regs				1,281	3,184	3,675	4,125	4,549	3,214	2,838	2,875	2,913	3,861	3,553	3,561
5.3.3	Total LUST		1	13	1,311	3,215	3,716	4,177	4,611	3,286	2,920	2,966	3,014	3,972	3,673	3,691
5.4	RCRA															
5.4.1	Existing Regs	16,909	18,103	17,895	18,747	19,524	20,401	21,516	22,377	23,268	24,050	24,852	25,678	26,508	27,328	28,152
5.4.2	New Regs	199	306	1,493	2,917	5,318	7,228	8,623	9,431	8,519	8,418	8,254	8,611	9,786	9,705	9,904
5.4.3	Total RCRA	17,107	18,409	19,388	21,664	24,842	27,629	30,139	31,808	31,787	32,468	33,106	34,289	36,293	37,033	38,055
5.5	Superfund															
5.5.1	Existing Regs	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
5.5.2	New Regs															
5.5.3	Total Superfund	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
5.6	Land															
5.6.1	Existing Regs	17,312	18,786	18,825	20,096	21,228	22,525	24,332	25,815	27,317	28,740	30,148	31,636	33,152	34,683	36,245
5.6.2	New Regs	199	306	1,493	2,917	5,318	7,228	8,623	9,431	8,519	8,418	8,254	8,611	9,786	9,705	9,904
5.6.3	Total Land	17,511	19,092	20,318	23,013	26,547	29,753	32,956	35,247	35,836	37,158	38,402	40,247	42,938	44,388	46,148
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	396	365	376	396	375	432	452	473	483	497	512	526	537	546	560
6.1.2	New Regs	6		80	162	225	367	508	618	620	621	662	665	668	671	674
6.1.3	Total Toxic Subs	402	365	456	558	600	799	960	1,091	1,104	1,119	1,174	1,192	1,206	1,217	1,234
6.2	Pesticides															
6.2.1	Existing Regs	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.2.3	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Chemicals															
6.3.1	Existing Regs	816	819	830	1,093	1,354	1,518	1,622	1,730	1,788	1,850	1,918	1,991	2,053	2,127	2,217
6.3.2	New Regs	6		80	162	225	367	508	618	620	621	662	665	668	671	674
6.3.3	Total Chemicals	822	819	910	1,255	1,579	1,885	2,130	2,348	2,408	2,472	2,580	2,657	2,721	2,799	2,892
7	Multi-Media	918	842	1,180	1,483	1,603	1,995	1,989	2,027	2,065	2,102	2,138	2,177	2,220	2,260	2,298
8	Annualized Costs															
8.1	Total Existing Regs	79,841	84,938	86,670	90,470	93,339	97,957	101,852	105,295	108,490	111,463	114,411	117,548	120,687	123,823	126,932
8.2	Total New Regs	205	352	1,820	3,810	6,511	9,264	11,271	12,516	12,020	13,594	14,958	16,400	18,820	19,573	20,972
8.3	Total Full Impl					317	646	1,058	5,923	6,529	7,370	8,438	9,500	10,555	11,608	12,512
8.4	Tot. Annualized Costs	80,046	85,290	88,490	94,280	100,167	107,867	114,181	123,735	127,039	132,426	137,806	143,447	150,062	155,004	160,416

Footnotes to Table 8-17A

Sum of the annualized costs in Tables 3-3A, 3-3B, 4-3A, 5-3A, 5-3B, 6-3A, and 7-3A.

Table 8-17B: TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
3.1.2	New Regs															
3.1.3	Full Implementation															
3.1.4	Total Air	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
3.2	Radiation															
3.2.1	Existing Regs	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
3.2.2	New Regs															0
3.2.3	Total Radiation	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
3.3	Air & Radiation															
3.3.1	Existing Regs	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755
3.3.2	New Regs															0
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	8,734	9,847	11,299	12,443	14,161	15,515	16,589	17,835	19,007	20,181	20,993	22,408	23,458	24,778	26,414
4.1.2	New Regs															
4.1.3	Full Implementation															
4.1.4	Total Water Quality	8,734	9,847	11,299	12,443	14,161	15,515	16,589	17,835	19,007	20,181	20,993	22,408	23,458	24,778	26,414
4.2	Drinking Water															
4.2.1	Existing Regs	782	842	933	1,046	1,181	1,315	1,465	1,638	1,768	1,955	2,087	2,175	2,265	2,415	2,595
4.2.2	New Regs															
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	782	842	933	1,046	1,181	1,315	1,465	1,638	1,768	1,955	2,087	2,175	2,265	2,415	2,595
4.3	Water															
4.3.1	Existing Regs	9,516	10,689	12,233	13,489	15,342	16,830	18,054	19,473	20,775	22,136	23,079	24,582	25,723	27,193	29,009
4.3.2	New Regs															
4.3.3	Full Implementation															
4.3.4	Total Water	9,516	10,689	12,233	13,489	15,342	16,830	18,054	19,473	20,775	22,136	23,079	24,582	25,723	27,193	29,009
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,480	12,498	12,292	13,298	13,941	14,994
5.1.2	New Regs															
5.1.3	Total Solid Waste	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,480	12,498	12,292	13,298	13,941	14,994
5.2	Hazardous Waste															
5.2.1	Existing Regs										182	147	681	840	994	1,191
5.2.2	New Regs															190
5.2.3	Total Hazardous Waste										182	147	681	840	994	1,380

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Table 8-17B (cont'd): TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REG ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,662	12,645	12,973	14,139	14,935	16,184
5.4.2	New Regs															190
5.4.3	Total RCRA	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,662	12,645	12,973	14,139	14,935	16,374
5.5	Superfund															
5.5.1	Existing Regs										14	52	96	200	255	326
5.5.2	New Regs															
5.5.3	Total Superfund										14	52	96	200	255	326
5.6	Land															
5.6.1	Existing Regs	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,676	12,697	13,069	14,339	15,190	16,510
5.6.2	New Regs															190
5.6.3	Total Land	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,676	12,697	13,069	14,339	15,190	16,700
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs			9	5	9	47	157	341	425	362	309	229	234	288	377
6.1.2	New Regs															6
6.1.3	Total Toxic Subs			9	5	9	47	157	341	425	362	309	229	234	288	383
6.2	Pesticides															
6.2.1	Existing Regs	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.2.3	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Chemicals															
6.3.1	Existing Regs	92	143	183	181	349	408	581	849	885	786	705	603	674	758	796
6.3.2	New Regs															6
6.3.3	Total Chemicals	92	143	183	181	349	408	581	849	885	786	705	603	674	758	802
7	Multi-Media	108	139	461	587	728	917	901	883	863	686	596	679	642	669	898
8	Annualized Costs															
8.3	Total Full Impl															
8.4	Tot. Annualized Costs	25,901	29,042	31,737	34,222	38,203	42,344	45,542	49,072	51,408	53,221	53,200	56,751	60,462	63,860	69,164

Footnotes to Table 8-17B

Sum of the annualized costs in Tables 3-3C, 4-3B, 5-3C, 6-3B, and 7-3B.

Table 8-17C: TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	21,414	22,772	23,062	23,310	22,805	23,770	24,268	24,656	24,909	25,081	25,229	25,458	25,668	25,874	26,047
3.1.2	New Regs		32	92	288	323	599	747	853	1,006	2,315	3,538	4,435	5,445	6,119	7,275
3.1.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.1.4	Total Air	21,414	22,804	23,154	23,598	23,128	24,369	25,016	29,877	30,314	31,985	33,779	35,326	36,967	38,269	39,876
3.2	Radiation															
3.2.1	Existing Regs	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
3.2.2	New Regs	0	1	5	15	25	36	47	58	69	81	93	105	117	130	143
3.2.3	Total Radiation	341	312	335	374	415	452	489	528	567	607	647	688	730	770	812
3.3	Air & Radiation															
3.3.1	Existing Regs	21,755	23,084	23,392	23,669	23,194	24,186	24,710	25,126	25,407	25,607	25,784	26,041	26,281	26,514	26,716
3.3.2	New Regs	0	33	97	303	349	635	794	911	1,076	2,396	3,631	4,540	5,562	6,249	7,418
3.3.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.3.4	Total Air & Radiation	21,755	23,116	23,490	23,972	23,543	24,821	25,505	30,404	30,881	32,591	34,426	36,014	37,697	39,040	40,688
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	26,414	28,060	28,521	29,638	30,801	31,923	32,942	33,987	35,006	36,000	36,992	37,982	38,969	39,954	40,936
4.1.2	New Regs			18	174	340	569	585	618	618	618	618	618	618	618	618
4.1.3	Full Implementation					265	541	885	1,301	1,782	2,325	2,865	3,400	3,931	4,459	4,983
4.1.4	Total Water Quality	26,414	28,060	28,539	29,812	31,406	33,032	34,412	35,905	37,406	38,944	40,475	42,000	43,519	45,031	46,537
4.2	Drinking Water															
4.2.1	Existing Regs	2,595	2,693	2,709	2,747	2,879	3,010	3,107	3,190	3,268	3,345	3,424	3,510	3,598	3,676	3,726
4.2.2	New Regs			91	185	191	357	615	755	959	1,260	1,455	1,583	1,779	1,910	1,926
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	2,595	2,693	2,801	2,932	3,070	3,367	3,723	3,945	4,228	4,604	4,879	5,093	5,376	5,586	5,652
4.3	Water															
4.3.1	Existing Regs	29,009	30,754	31,230	32,385	33,679	34,933	36,049	37,177	38,274	39,345	40,416	41,492	42,567	43,630	44,663
4.3.2	New Regs			109	359	531	926	1,200	1,373	1,577	1,877	2,073	2,201	2,397	2,528	2,543
4.3.3	Full Implementation					265	541	885	1,301	1,782	2,325	2,865	3,400	3,931	4,459	4,983
4.3.4	Total Water	29,009	30,754	31,340	32,745	34,476	36,399	38,134	39,851	41,634	43,548	45,354	47,093	48,895	50,617	52,189
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	14,994	15,920	15,482	15,890	16,300	16,710	17,030	17,338	17,639	17,948	18,257	18,560	18,863	19,155	19,446
5.1.2	New Regs						337	590	804	1,018	1,111	1,170	1,229	1,288	1,347	1,406
5.1.3	Total Solid Waste	14,994	15,920	15,482	15,890	16,300	17,048	17,619	18,143	18,657	19,059	19,427	19,789	20,150	20,502	20,851
5.2	Hazardous Waste															
5.2.1	Existing Regs	1,191	1,388	1,541	1,880	2,148	2,497	3,164	3,588	4,046	4,390	4,756	5,153	5,553	5,958	6,365
5.2.2	New Regs	190	293	1,444	1,555	2,016	3,029	3,642	3,770	3,930	4,068	3,773	3,985	4,123	4,261	4,363
5.2.3	Total Hazardous Waste	1,380	1,681	2,985	3,435	4,164	5,526	6,805	7,358	7,975	8,458	8,529	9,138	9,676	10,219	10,728

(continued on next page)

Table 8-17C (cont'd): TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REG ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
5.3.2	New Regs				1,126	2,874	3,185	3,479	3,747	2,400	2,010	2,033	2,058	2,658	2,347	2,352
5.3.3	Total LUST		1	13	1,155	2,904	3,226	3,531	3,809	2,471	2,091	2,124	2,158	2,769	2,468	2,483
5.4	RCRA															
5.4.1	Existing Regs	16,184	17,309	17,036	17,800	18,479	19,248	20,246	20,988	21,756	22,419	23,105	23,814	24,527	25,233	25,941
5.4.2	New Regs	190	293	1,444	2,681	4,889	6,551	7,710	8,322	7,347	7,189	6,976	7,271	8,069	7,955	8,121
5.4.3	Total RCRA	16,374	17,603	18,480	20,480	23,369	25,799	27,956	29,310	29,104	29,609	30,080	31,085	32,595	33,188	34,062
5.5	Superfund															
5.5.1	Existing Regs	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
5.5.2	New Regs															
5.5.3	Total Superfund	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
5.6	Land															
5.6.1	Existing Regs	16,510	17,872	17,789	18,888	19,840	20,922	22,468	23,670	24,876	25,996	27,102	28,282	29,481	30,692	31,924
5.6.2	New Regs	190	293	1,444	2,681	4,889	6,551	7,710	8,322	7,347	7,189	6,976	7,271	8,069	7,955	8,121
5.6.3	Total Land	16,700	18,165	19,233	21,569	24,729	27,474	30,178	31,992	32,223	33,186	34,078	35,552	37,550	38,647	40,045
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	377	341	348	364	339	392	407	424	432	444	455	468	477	485	496
6.1.2	New Regs	6		80	140	180	299	418	528	530	531	572	575	578	581	584
6.1.3	Total Toxic Subs	383	341	428	504	519	691	825	952	962	975	1,028	1,043	1,055	1,066	1,080
6.2	Pesticides															
6.2.1	Existing Regs	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.2.3	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Chemicals															
6.3.1	Existing Regs	796	795	802	1,061	1,318	1,477	1,577	1,681	1,737	1,797	1,862	1,933	1,993	2,066	2,154
6.3.2	New Regs	6		80	140	180	299	418	528	530	531	572	575	578	581	584
6.3.3	Total Chemicals	802	795	882	1,200	1,498	1,777	1,995	2,209	2,267	2,328	2,434	2,508	2,571	2,647	2,738
7	Multi-Media	898	822	1,108	1,400	1,479	1,871	1,865	1,902	1,940	1,978	2,014	2,055	2,098	2,139	2,178
8	Annualized Costs															
8.1	Total Existing Regs	68,968	73,326	74,321	77,404	79,510	83,389	86,669	89,556	92,234	94,722	97,178	99,802	102,419	105,041	107,635
8.2	Total New Regs	196	326	1,731	3,483	5,949	8,411	10,123	11,134	10,531	11,994	13,251	14,586	16,606	17,314	18,667
8.3	Total Full Impl					265	541	885	5,669	6,180	6,914	7,877	8,834	9,785	10,735	11,537
8.4	Tot. Annualized Costs	69,164	73,652	76,052	80,887	85,724	92,341	97,677	106,358	108,945	113,630	118,306	123,222	128,810	133,090	137,838

Footnotes to Table 8-17C

Sum of the annualized costs in Tables 3-3D, 3-3E, 4-3C, 5-3D, 5-3E, 6-3C, and 7-3C.

Table 8-17D: TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
3.1.2	New Regs															
3.1.3	Full Implementation															
3.1.4	Total Air	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
3.2	Radiation															
3.2.1	Existing Regs	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
3.2.2	New Regs															0
3.2.3	Total Radiation	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
3.3	Air & Radiation															
3.3.1	Existing Regs	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505
3.3.2	New Regs															0
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,003	26,001	27,903	29,412	31,506	33,220	35,202	37,535
4.1.2	New Regs															
4.1.3	Full Implementation															
4.1.4	Total Water Quality	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,003	26,001	27,903	29,412	31,506	33,220	35,202	37,535
4.2	Drinking Water															
4.2.1	Existing Regs	819	918	1,053	1,211	1,391	1,567	1,758	1,980	2,164	2,404	2,587	2,722	2,858	3,062	3,305
4.2.2	New Regs															
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	819	918	1,053	1,211	1,391	1,567	1,758	1,980	2,164	2,404	2,587	2,722	2,858	3,062	3,305
4.3	Water															
4.3.1	Existing Regs	10,253	12,168	14,479	16,537	19,209	21,598	23,683	25,983	28,165	30,307	31,999	34,229	36,079	38,264	40,840
4.3.2	New Regs															
4.3.3	Full Implementation															
4.3.4	Total Water	10,253	12,168	14,479	16,537	19,209	21,598	23,683	25,983	28,165	30,307	31,999	34,229	36,079	38,264	40,840
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,319	13,423	13,297	14,396	15,135	16,294
5.1.2	New Regs															
5.1.3	Total Solid Waste	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,319	13,423	13,297	14,396	15,135	16,294
5.2	Hazardous Waste															
5.2.1	Existing Regs										182	147	684	849	1,022	1,229
5.2.2	New Regs															207
5.2.3	Total Hazardous Waste										182	147	684	849	1,022	1,436

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Table 8-17D (cont'd): TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REG ANNUALIZED AT 10 PERCENT  
(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,502	13,570	13,981	15,246	16,156	17,523
5.4.2	New Regs															207
5.4.3	Total RCRA	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,502	13,570	13,981	15,246	16,156	17,730
5.5	Superfund															
5.5.1	Existing Regs										16	65	125	265	361	471
5.5.2	New Regs															
5.5.3	Total Superfund										16	65	125	265	361	471
5.6	Land															
5.6.1	Existing Regs	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,518	13,635	14,106	15,510	16,518	17,994
5.6.2	New Regs															207
5.6.3	Total Land	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,518	13,635	14,106	15,510	16,518	18,200
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs			9	5	9	47	159	348	433	371	321	243	254	316	413
6.1.2	New Regs															6
6.1.3	Total Toxic Subs			9	5	9	47	159	348	433	371	321	243	254	316	419
6.2	Pesticides															
6.2.1	Existing Regs	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.2.3	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Chemicals															
6.3.1	Existing Regs	92	143	183	181	349	408	584	856	893	795	717	616	694	786	832
6.3.2	New Regs															6
6.3.3	Total Chemicals	92	143	183	181	349	408	584	856	893	795	717	616	694	786	838
7	Multi-Media	108	139	461	587	729	921	905	889	873	702	615	702	671	702	934
8	Annualized Costs															
8.3	Total Full Impl															
8.4	Tot. Annualized Costs	26,978	31,305	35,222	39,082	44,451	50,067	54,699	59,732	63,566	66,781	68,091	72,916	77,988	82,679	89,318

Footnotes to Table 8-17D

Sum of the annualized costs in Tables 3-3F, 4-3D, 5-3F, 6-3D, and 7-3D.

Table 8-17E: TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	28,139	29,862	30,507	31,075	30,902	32,179	32,736	33,067	33,200	33,208	33,208	33,313	33,404	33,480	33,514
3.1.2	New Regs		56	145	368	414	701	862	974	1,137	2,454	3,686	4,592	5,608	6,287	7,448
3.1.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.1.4	Total Air	28,139	29,918	30,651	31,444	31,315	32,880	33,598	38,409	38,735	40,251	41,906	43,339	44,865	46,043	47,516
3.2	Radiation															
3.2.1	Existing Regs	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
3.2.2	New Regs	0	1	7	21	36	52	67	83	99	116	134	152	170	190	210
3.2.3	Total Radiation	366	340	368	414	463	509	555	603	653	703	755	807	861	913	967
3.3	Air & Radiation															
3.3.1	Existing Regs	28,505	30,201	30,868	31,468	31,329	32,636	33,224	33,588	33,753	33,795	33,828	33,969	34,094	34,204	34,271
3.3.2	New Regs	0	57	152	390	449	753	929	1,057	1,236	2,570	3,820	4,744	5,778	6,477	7,658
3.3.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.3.4	Total Air & Radiation	28,505	30,258	31,019	31,858	31,778	33,389	34,153	39,013	39,387	40,954	42,660	44,146	45,726	46,956	48,483
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	37,535	39,905	40,984	42,704	44,463	46,174	47,753	49,328	50,848	52,318	53,783	55,242	56,697	58,147	59,592
4.1.2	New Regs			35	209	393	623	645	678	678	678	678	678	678	678	678
4.1.3	Full Implementation					362	738	1,208	1,775	2,432	3,173	3,909	4,640	5,365	6,085	6,799
4.1.4	Total Water Quality	37,535	39,905	41,019	42,912	45,218	47,535	49,606	51,781	53,958	56,169	58,370	60,560	62,740	64,910	67,069
4.2	Drinking Water															
4.2.1	Existing Regs	3,305	3,465	3,538	3,634	3,825	4,016	4,138	4,244	4,342	4,437	4,537	4,650	4,763	4,862	4,928
4.2.2	New Regs			93	191	201	385	687	886	1,160	1,545	1,830	2,026	2,254	2,397	2,424
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	3,305	3,465	3,632	3,825	4,025	4,401	4,825	5,130	5,502	5,982	6,367	6,676	7,017	7,259	7,351
4.3	Water															
4.3.1	Existing Regs	40,840	43,370	44,522	46,338	48,287	50,190	51,890	53,572	55,191	56,755	58,320	59,892	61,460	63,008	64,519
4.3.2	New Regs			129	399	594	1,008	1,333	1,564	1,838	2,223	2,508	2,704	2,932	3,075	3,102
4.3.3	Full Implementation					362	738	1,208	1,775	2,432	3,173	3,909	4,640	5,365	6,085	6,799
4.3.4	Total Water	40,840	43,370	44,651	46,737	49,243	51,936	54,431	56,911	59,460	62,151	64,737	67,236	69,758	72,168	74,420
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	16,294	17,330	16,991	17,500	18,011	18,522	18,877	19,212	19,533	19,869	20,204	20,529	20,853	21,160	21,463
5.1.2	New Regs						443	826	1,110	1,393	1,555	1,658	1,761	1,864	1,967	2,070
5.1.3	Total Solid Waste	16,294	17,330	16,991	17,500	18,011	18,966	19,703	20,322	20,926	21,424	21,862	22,291	22,718	23,127	23,533
5.2	Hazardous Waste															
5.2.1	Existing Regs	1,229	1,445	1,620	2,023	2,370	2,816	3,665	4,281	4,946	5,484	6,040	6,629	7,225	7,827	8,435
5.2.2	New Regs	207	317	1,535	1,704	2,234	3,267	3,899	4,034	4,214	4,364	4,091	4,348	4,497	4,646	4,759
5.2.3	Total Hazardous Waste	1,436	1,762	3,155	3,727	4,604	6,083	7,564	8,315	9,160	9,848	10,131	10,977	11,721	12,473	13,194

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Table 8-17E (cont'd): TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REG ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
5.3.2	New Regs				1,415	3,452	4,099	4,682	5,239	3,917	3,552	3,601	3,650	4,898	4,592	4,603
5.3.3	Total LUST		1	13	1,444	3,482	4,140	4,734	5,301	3,988	3,634	3,692	3,751	5,008	4,713	4,733
5.4	RCRA															
5.4.1	Existing Regs	17,523	18,776	18,624	19,552	20,411	21,379	22,594	23,555	24,550	25,434	26,335	27,260	28,189	29,107	30,028
5.4.2	New Regs	207	317	1,535	3,119	5,686	7,809	9,407	10,384	9,524	9,472	9,350	9,760	11,259	11,206	11,433
5.4.3	Total RCRA	17,730	19,093	20,159	22,671	26,097	29,189	32,001	33,939	34,075	34,906	35,685	37,019	39,448	40,313	41,461
5.5	Superfund															
5.5.1	Existing Regs	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
5.5.2	New Regs															
5.5.3	Total Superfund	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
5.6	Land															
5.6.1	Existing Regs	17,994	19,564	19,707	21,124	22,412	23,891	25,923	27,646	29,402	31,084	32,751	34,503	36,291	38,097	39,940
5.6.2	New Regs	207	317	1,535	3,119	5,686	7,809	9,407	10,384	9,524	9,472	9,350	9,760	11,259	11,206	11,433
5.6.3	Total Land	18,200	19,881	21,242	24,244	28,098	31,700	35,330	38,030	38,927	40,556	42,101	44,263	47,550	49,303	51,373
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	413	385	400	423	406	466	489	514	527	543	559	576	588	597	613
6.1.2	New Regs	6		80	181	263	424	585	695	697	698	739	742	745	748	751
6.1.3	Total Toxic Subs	419	385	480	605	669	891	1,074	1,209	1,224	1,241	1,298	1,318	1,333	1,345	1,364
6.2	Pesticides															
6.2.1	Existing Regs	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.2.3	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Chemicals															
6.3.1	Existing Regs	832	839	854	1,120	1,385	1,552	1,659	1,771	1,831	1,896	1,966	2,041	2,104	2,179	2,271
6.3.2	New Regs	6		80	181	263	424	585	695	697	698	739	742	745	748	751
6.3.3	Total Chemicals	838	839	934	1,301	1,648	1,976	2,244	2,466	2,528	2,594	2,705	2,783	2,849	2,927	3,022
7	Multi-Media	934	860	1,241	1,553	1,709	2,101	2,095	2,133	2,170	2,208	2,243	2,282	2,324	2,363	2,399
8	Annualized Costs															
8.1	Total Existing Regs	89,105	94,832	97,191	101,603	105,122	110,370	114,791	118,710	122,348	125,737	129,108	132,686	136,273	139,851	143,401
8.2	Total New Regs	213	374	1,895	4,090	6,992	9,995	12,254	13,700	13,295	14,963	16,417	17,949	20,714	21,506	22,944
8.3	Total Full Impl					362	738	1,208	6,143	6,830	7,762	8,921	10,074	11,219	12,361	13,353
8.4	Tot. Annualized Costs	89,318	95,206	99,086	105,693	112,476	121,102	128,253	138,553	142,473	148,462	154,446	160,710	168,207	173,718	179,698

Footnotes to Table 8-17E

Sum of the annualized costs in Tables 3-3G, 3-3H, 4-3E, 5-3G, 5-3H, 6-3E, and 7-3E.

Table 8-18: TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	12,814	15,720	15,349	17,945	18,407	19,044	19,348	20,047	19,410	18,819	17,666	18,152	19,705	20,110	21,056
3.1.2	New Regs															
3.1.3	Full Implementation															
3.1.4	Total Air	12,814	15,720	15,349	17,945	18,407	19,044	19,348	20,047	19,410	18,819	17,666	18,152	19,705	20,110	21,056
3.2	Radiation															
3.2.1	Existing Regs	18	17	277	248	169	176	254	244	268	267	225	216	216	252	361
3.2.2	New Regs															1
3.2.3	Total Radiation	18	17	277	248	169	176	254	244	268	267	225	216	216	252	362
3.3	Air & Radiation															
3.3.1	Existing Regs	12,832	15,737	15,627	18,193	18,576	19,220	19,602	20,291	19,678	19,085	17,891	18,368	19,921	20,362	21,417
3.3.2	New Regs															1
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	12,832	15,737	15,627	18,193	18,576	19,220	19,602	20,291	19,678	19,085	17,891	18,368	19,921	20,362	21,418
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	20,806	21,308	22,479	23,502	24,831	26,935	26,539	27,211	27,545	26,236	25,858	26,321	26,455	27,142	28,774
4.1.2	New Regs															
4.1.3	Full Implementation															
4.1.4	Total Water Quality	20,806	21,308	22,479	23,502	24,831	26,935	26,539	27,211	27,545	26,236	25,858	26,321	26,455	27,142	28,774
4.2	Drinking Water															
4.2.1	Existing Regs	1,468	1,512	1,641	1,741	1,794	1,793	1,898	2,160	2,319	2,413	2,433	2,378	2,386	2,622	2,896
4.2.2	New Regs															
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	1,468	1,512	1,641	1,741	1,794	1,793	1,898	2,160	2,319	2,413	2,433	2,378	2,386	2,622	2,896
4.3	Water															
4.3.1	Existing Regs	22,275	22,820	24,121	25,243	26,625	28,729	28,437	29,371	29,864	28,650	28,290	28,699	28,841	29,764	31,670
4.3.2	New Regs															
4.3.3	Full Implementation															
4.3.4	Total Water	22,275	22,820	24,121	25,243	26,625	28,729	28,437	29,371	29,864	28,650	28,290	28,699	28,841	29,764	31,670
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,256	12,961	12,539	13,677	14,255	15,369
5.1.2	New Regs															
5.1.3	Total Solid Waste	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,256	12,961	12,539	13,677	14,255	15,369
5.2	Hazardous Waste															
5.2.1	Existing Regs										182	147	741	941	1,325	1,360
5.2.2	New Regs															504
5.2.3	Total Hazardous Waste										182	147	741	941	1,325	1,864

(continued on next page)

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Table 8-18 (cont'd): TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING FULL IMPLEMENTATION  
(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,438	13,108	13,280	14,619	15,581	16,729
5.4.2	New Regs															504
5.4.3	Total RCRA	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,438	13,108	13,280	14,619	15,581	17,233
5.5	Superfund															
5.5.1	Existing Regs										54	233	362	788	905	904
5.5.2	New Regs															
5.5.3	Total Superfund										54	233	362	788	905	904
5.6	Land															
5.6.1	Existing Regs	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,492	13,341	13,642	15,407	16,486	17,633
5.6.2	New Regs															504
5.6.3	Total Land	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,492	13,341	13,642	15,407	16,486	18,137
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs			9	5	9	49	201	415	441	367	352	243	343	404	491
6.1.2	New Regs															6
6.1.3	Total Toxic Subs			9	5	9	49	201	415	441	367	352	243	343	404	497
6.2	Pesticides															
6.2.1	Existing Regs	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.2.3	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Chemicals															
6.3.1	Existing Regs	92	143	183	181	349	410	625	923	901	791	749	616	783	873	910
6.3.2	New Regs															6
6.3.3	Total Chemicals	92	143	183	181	349	410	625	923	901	791	749	616	783	873	916
7	Multi-Media	108	139	461	591	745	958	909	917	918	785	646	727	712	709	897
8	Capital & O&M Costs															
8.3	Total Full Impl															
8.4	Total Capital & O&M	44,960	48,995	50,981	54,975	57,536	61,436	62,150	65,127	65,482	63,804	60,916	62,052	65,664	68,193	73,038
8.5	% of GNP	1.50	1.55	1.62	1.77	1.77	1.80	1.73	1.77	1.79	1.71	1.67	1.64	1.63	1.64	1.71

Footnotes to Table 8-18

9.1.1. Line 8.4 divided by Gross Domestic Product as given in "Economic Report of the President", February 1990, p. 304.

All other lines: Sum of corresponding lines in Tables 8-15 and 8-16.

## Environmental Investments

Table 8-18A: TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	21,056	21,518	21,117	20,365	19,224	19,670	19,950	20,360	20,743	21,121	21,415	21,786	22,091	22,383	22,654
3.1.2	New Regs		477	590	743	389	690	818	804	966	2,257	3,463	4,342	5,346	6,012	7,160
3.1.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.1.4	Total Air	21,056	21,995	21,707	21,108	19,613	20,360	20,768	25,532	26,106	27,967	29,890	31,562	33,290	34,671	36,368
3.2	Radiation															
3.2.1	Existing Regs	361	337	353	388	420	447	473	501	529	557	585	613	641	668	696
3.2.2	New Regs	1	4	37	87	93	114	114	124	134	145	155	165	176	187	198
3.2.3	Total Radiation	362	341	390	475	513	560	588	625	664	702	740	778	817	855	894
3.3	Air & Radiation															
3.3.1	Existing Regs	21,417	21,855	21,470	20,753	19,643	20,117	20,424	20,861	21,272	21,678	22,000	22,399	22,731	23,052	23,350
3.3.2	New Regs	1	481	627	830	482	803	932	928	1,100	2,402	3,618	4,508	5,522	6,199	7,358
3.3.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.3.4	Total Air & Radiation	21,418	22,337	22,097	21,583	20,125	20,920	21,356	26,157	26,770	28,669	30,630	32,340	34,107	35,527	37,262
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	28,774	30,217	28,202	28,481	28,977	29,415	29,384	29,395	29,438	29,511	30,018	30,526	31,033	31,540	32,047
4.1.2	New Regs			316	456	624	538	645	562	562	562	562	562	562	562	562
4.1.3	Full Implementation					1,933	2,180	2,867	3,613	4,369	5,137	5,468	5,796	6,122	6,445	6,766
4.1.4	Total Water Quality	28,774	30,217	28,518	28,937	31,533	32,133	32,896	33,569	34,369	35,210	36,048	36,884	37,717	38,548	39,375
4.2	Drinking Water															
4.2.1	Existing Regs	2,896	2,882	2,749	2,711	2,786	2,859	2,947	3,021	3,096	3,170	3,244	3,318	3,392	3,466	3,509
4.2.2	New Regs			125	251	259	698	1,384	1,755	2,072	2,568	2,740	2,348	1,781	1,485	1,485
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	2,896	2,882	2,873	2,962	3,045	3,557	4,331	4,776	5,168	5,737	5,984	5,666	5,173	4,951	4,994
4.3	Water															
4.3.1	Existing Regs	31,670	33,098	30,951	31,192	31,763	32,274	32,331	32,416	32,533	32,681	33,262	33,844	34,425	35,007	35,556
4.3.2	New Regs			441	707	883	1,236	2,029	2,317	2,634	3,130	3,302	2,910	2,343	2,047	2,047
4.3.3	Full Implementation					1,933	2,180	2,867	3,613	4,369	5,137	5,468	5,796	6,122	6,445	6,766
4.3.4	Total Water	31,670	33,098	31,392	31,899	34,578	35,690	37,227	38,346	39,537	40,947	42,032	42,550	42,890	43,499	44,369
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	15,369	16,204	15,447	15,736	16,025	16,313	16,600	16,888	17,176	17,464	17,752	18,040	18,328	18,616	18,904
5.1.2	New Regs						2,301	2,880	1,774	1,895	1,895	1,393	1,393	1,393	1,393	1,393
5.1.3	Total Solid Waste	15,369	16,204	15,447	15,736	16,025	18,614	19,480	18,662	19,071	19,359	19,145	19,433	19,721	20,009	20,297
5.2	Hazardous Waste															
5.2.1	Existing Regs	1,360	1,684	1,869	2,967	3,403	4,023	6,113	6,487	6,959	6,786	6,810	7,005	7,200	7,395	7,589
5.2.2	New Regs	504	392	2,661	2,525	3,102	3,101	3,679	3,542	3,960	3,894	3,797	4,402	3,832	3,962	4,055
5.2.3	Total Hazardous Waste	1,864	2,076	4,530	5,492	6,505	7,124	9,792	10,029	10,919	10,680	10,607	11,407	11,032	11,357	11,644

(continued on next page)

Table 8-18A (cont'd): TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING FULL IMPLEMENTATION  
(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
5.3.2	New Regs				6,108	7,588	8,435	7,614	7,615	1,450	1,037	1,037	1,038	12,338	367	367
5.3.3	Total LUST		1	13	6,138	7,618	8,476	7,666	7,677	1,522	1,118	1,128	1,139	12,449	487	497
5.4	RCRA															
5.4.1	Existing Regs	16,729	17,889	17,329	18,732	19,458	20,377	22,766	23,437	24,207	24,331	24,654	25,146	25,639	26,131	26,624
5.4.2	New Regs	504	392	2,661	8,633	10,690	13,837	14,173	12,931	7,305	6,826	6,227	6,833	17,563	5,722	5,815
5.4.3	Total RCRA	17,233	18,281	19,990	27,365	30,148	34,214	36,939	36,368	31,512	31,157	30,881	31,979	43,202	31,853	32,439
5.5	Superfund															
5.5.1	Existing Regs	904	1,815	2,345	3,422	3,622	4,467	6,092	6,876	7,383	7,843	8,023	8,397	8,784	9,164	9,565
5.5.2	New Regs															
5.5.3	Total Superfund	904	1,815	2,345	3,422	3,622	4,467	6,092	6,876	7,383	7,843	8,023	8,397	8,784	9,164	9,565
5.6	Land															
5.6.1	Existing Regs	17,633	19,704	19,674	22,154	23,080	24,844	28,858	30,313	31,590	32,174	32,677	33,543	34,423	35,295	36,189
5.6.2	New Regs	504	392	2,661	8,633	10,690	13,837	14,173	12,931	7,305	6,826	6,227	6,833	17,563	5,722	5,815
5.6.3	Total Land	18,137	20,096	22,335	30,787	33,770	38,681	43,031	43,244	38,895	39,000	38,904	40,376	51,986	41,017	42,004
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	491	439	436	428	399	447	457	468	387	399	410	421	432	444	455
6.1.2	New Regs	6		80	914	898	962	1,025	305	307	308	349	352	355	358	361
6.1.3	Total Toxic Subs	497	439	516	1,342	1,297	1,409	1,482	773	694	707	759	773	787	802	816
6.2	Pesticides															
6.2.1	Existing Regs	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.2.3	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Chemicals															
6.3.1	Existing Regs	910	892	890	1,124	1,378	1,532	1,627	1,725	1,692	1,752	1,816	1,886	1,948	2,025	2,113
6.3.2	New Regs	6		80	914	898	962	1,025	305	307	308	349	352	355	358	361
6.3.3	Total Chemicals	916	892	970	2,038	2,276	2,494	2,652	2,030	1,999	2,060	2,165	2,238	2,303	2,383	2,474
7	Multi-Media	897	815	2,828	1,591	2,705	1,568	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883
8	Capital & O&M Costs															
8.1	Total Existing Regs	72,527	76,365	75,813	76,814	78,569	80,336	84,796	86,910	88,719	89,954	91,463	93,423	95,323	97,218	99,091
8.2	Total New Regs	511	873	3,808	11,084	12,953	16,838	18,160	16,481	11,346	12,666	13,496	14,602	25,783	14,326	15,580
8.3	Total Full Impl					1,933	2,180	2,867	7,981	8,767	9,726	10,480	11,230	11,976	12,721	13,320
8.4	Total Capital & O&M	73,038	77,238	79,621	87,899	93,454	99,354	105,822	111,371	108,832	112,346	115,439	119,256	133,082	124,265	127,992
8.5	% of GNP	1.71	1.74	1.72	1.84	2.00	2.08	2.17	2.24	2.14	2.17	2.19	2.22	2.43	2.23	2.26

Footnotes to Table 8-18A

Sum of the corresponding lines in Tables 8-15A and 8-16A.

Table 8-19: TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	12,814	15,720	15,349	17,945	18,407	19,044	19,348	20,047	19,410	18,819	17,666	18,152	19,705	20,110	21,056
3.1.2	New Regs															
3.1.3	Total Air	12,814	15,720	15,349	17,945	18,407	19,044	19,348	20,047	19,410	18,819	17,666	18,152	19,705	20,110	21,056
3.2	Radiation															
3.2.1	Existing Regs	18	17	277	248	169	176	254	244	268	267	225	216	216	252	361
3.2.2	New Regs															1
3.2.3	Total Radiation	18	17	277	248	169	176	254	244	268	267	225	216	216	252	362
3.3	Air & Radiation															
3.3.1	Existing Regs	12,832	15,737	15,627	18,193	18,576	19,220	19,602	20,291	19,678	19,085	17,891	18,368	19,921	20,362	21,417
3.3.2	New Regs															1
3.3.3	Total Air & Radiation	12,832	15,737	15,627	18,193	18,576	19,220	19,602	20,291	19,678	19,085	17,891	18,368	19,921	20,362	21,418
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	20,806	21,308	22,479	23,502	24,831	26,935	26,539	27,211	27,545	26,236	25,858	26,321	26,455	27,142	28,774
4.1.2	New Regs															
4.1.3	Total Water Quality	20,806	21,308	22,479	23,502	24,831	26,935	26,539	27,211	27,545	26,236	25,858	26,321	26,455	27,142	28,774
4.2	Drinking Water															
4.2.1	Existing Regs	1,468	1,512	1,641	1,741	1,794	1,793	1,898	2,160	2,319	2,413	2,433	2,378	2,386	2,622	2,896
4.2.2	New Regs															
4.2.3	Total Drinking Water	1,468	1,512	1,641	1,741	1,794	1,793	1,898	2,160	2,319	2,413	2,433	2,378	2,386	2,622	2,896
4.3	Water															
4.3.1	Existing Regs	22,275	22,820	24,121	25,243	26,625	28,729	28,437	29,371	29,864	28,650	28,290	28,699	28,841	29,764	31,670
4.3.2	New Regs															
4.3.3	Total Water	22,275	22,820	24,121	25,243	26,625	28,729	28,437	29,371	29,864	28,650	28,290	28,699	28,841	29,764	31,670
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,256	12,961	12,539	13,677	14,255	15,369
5.1.2	New Regs															
5.1.3	Total Solid Waste	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,256	12,961	12,539	13,677	14,255	15,369
5.2	Hazardous Waste															
5.2.1	Existing Regs										182	147	741	941	1,325	1,360
5.2.2	New Regs															504
5.2.3	Total Hazardous Waste										182	147	741	941	1,325	1,864

(continued on next page)

Table 8-19 (cont'd): TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING PRESENT IMPLEMENTATION  
(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,438	13,108	13,280	14,619	15,581	16,729
5.4.2	New Regs															
5.4.3	Total RCRA	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,438	13,108	13,280	14,619	15,581	17,233
5.5	Superfund															
5.5.1	Existing Regs										54	233	362	788	905	904
5.5.2	New Regs															
5.5.3	Total Superfund										54	233	362	788	905	904
5.6	Land															
5.6.1	Existing Regs	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,492	13,341	13,642	15,407	16,486	17,633
5.6.2	New Regs															504
5.6.3	Total Land	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,492	13,341	13,642	15,407	16,486	18,137
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs			9	5	9	49	201	415	441	367	352	243	343	404	491
6.1.2	New Regs															6
6.1.3	Total Toxic Subs			9	5	9	49	201	415	441	367	352	243	343	404	497
6.2	Pesticides															
6.2.1	Existing Regs	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.2.2	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Chemicals															
6.3.1	Existing Regs	92	143	183	181	349	410	625	923	901	791	749	616	783	873	910
6.3.2	New Regs															6
6.3.3	Total Chemicals	92	143	183	181	349	410	625	923	901	791	749	616	783	873	916
7	Multi-Media	108	139	461	591	745	958	909	917	918	785	646	727	712	709	897
8	Capital & O&M Costs															
8.3	Total Capital & O&M	44,960	48,995	50,981	54,975	57,536	61,436	62,150	65,127	65,482	63,804	60,916	62,052	65,664	68,193	73,038
8.4	% of GNP	1.50	1.55	1.62	1.77	1.77	1.80	1.73	1.77	1.79	1.71	1.67	1.64	1.63	1.64	1.71

Footnotes to Table 8-19

Lines correspond with Table 8-18 except full implementation lines have been omitted.

Table 8-19A: TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	21,056	21,518	21,117	20,365	19,224	19,670	19,950	20,360	20,743	21,121	21,415	21,786	22,091	22,383	22,654
3.1.2	New Regs		477	590	743	389	690	818	804	966	2,257	3,463	4,342	5,346	6,012	7,160
3.1.3	Total Air	21,056	21,995	21,707	21,108	19,613	20,360	20,768	21,164	21,708	23,378	24,878	26,128	27,436	28,395	29,814
3.2	Radiation															
3.2.1	Existing Regs	361	337	353	388	420	447	473	501	529	557	585	613	641	668	696
3.2.2	New Regs	1	4	37	87	93	114	114	124	134	145	155	165	176	187	198
3.2.3	Total Radiation	362	341	390	475	513	560	588	625	664	702	740	778	817	855	894
3.3	Air & Radiation															
3.3.1	Existing Regs	21,417	21,855	21,470	20,753	19,643	20,117	20,424	20,861	21,272	21,678	22,000	22,399	22,731	23,052	23,350
3.3.2	New Regs	1	481	627	830	482	803	932	928	1,100	2,402	3,618	4,508	5,522	6,199	7,358
3.3.3	Total Air & Radiation	21,418	22,337	22,097	21,583	20,125	20,920	21,356	21,789	22,372	24,080	25,618	26,906	28,253	29,251	30,708
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	28,774	30,217	28,202	28,481	28,977	29,415	29,384	29,395	29,438	29,511	30,018	30,526	31,033	31,540	32,047
4.1.2	New Regs			316	456	624	538	645	562	562	562	562	562	562	562	562
4.1.3	Total Water Quality	28,774	30,217	28,518	28,937	29,601	29,953	30,029	29,957	30,000	30,073	30,580	31,088	31,595	32,102	32,609
4.2	Drinking Water															
4.2.1	Existing Regs	2,896	2,882	2,749	2,711	2,786	2,859	2,947	3,021	3,096	3,170	3,244	3,318	3,392	3,466	3,509
4.2.2	New Regs			125	251	259	698	1,384	1,755	2,072	2,568	2,740	2,348	1,781	1,485	1,485
4.2.3	Total Drinking Water	2,896	2,882	2,873	2,962	3,045	3,557	4,331	4,776	5,168	5,737	5,984	5,666	5,173	4,951	4,994
4.3	Water															
4.3.1	Existing Regs	31,670	33,098	30,951	31,192	31,763	32,274	32,331	32,416	32,533	32,681	33,262	33,844	34,425	35,007	35,556
4.3.2	New Regs			441	707	883	1,236	2,029	2,317	2,634	3,130	3,302	2,910	2,343	2,047	2,047
4.3.3	Total Water	31,670	33,098	31,392	31,899	32,646	33,510	34,360	34,733	35,168	35,810	36,564	36,753	36,768	37,053	37,603
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	15,369	16,204	15,447	15,736	16,025	16,313	16,600	16,888	17,176	17,464	17,752	18,040	18,328	18,616	18,904
5.1.2	New Regs						2,301	2,880	1,774	1,895	1,895	1,393	1,393	1,393	1,393	1,393
5.1.3	Total Solid Waste	15,369	16,204	15,447	15,736	16,025	18,614	19,480	18,662	19,071	19,359	19,145	19,433	19,721	20,009	20,297
5.2	Hazardous Waste															
5.2.1	Existing Regs	1,360	1,684	1,869	2,967	3,403	4,023	6,113	6,487	6,959	6,786	6,810	7,005	7,200	7,395	7,589
5.2.2	New Regs	504	392	2,661	2,525	3,102	3,101	3,679	3,542	3,960	3,894	3,797	4,402	3,832	3,962	4,055
5.2.3	Total Hazardous Waste	1,864	2,076	4,530	5,492	6,505	7,124	9,792	10,029	10,919	10,680	10,607	11,407	11,032	11,357	11,644

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Table 8-19A (cont'd): TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
5.3.2	New Regs				6,108	7,588	8,435	7,614	7,615	1,450	1,037	1,037	1,038	12,338	367	367
5.3.3	Total LUST		1	13	6,138	7,618	8,476	7,666	7,677	1,522	1,118	1,128	1,139	12,449	487	497
5.4	RCRA															
5.4.1	Existing Regs	16,729	17,889	17,329	18,732	19,458	20,377	22,766	23,437	24,207	24,331	24,654	25,146	25,639	26,131	26,624
5.4.2	New Regs	504	392	2,661	8,633	10,690	13,837	14,173	12,931	7,305	6,826	6,227	6,833	17,563	5,722	5,815
5.4.3	Total RCRA	17,233	18,281	19,990	27,365	30,148	34,214	36,939	36,368	31,512	31,157	30,881	31,979	43,202	31,853	32,439
5.5	Superfund															
5.5.1	Existing Regs	904	1,815	2,345	3,422	3,622	4,467	6,092	6,876	7,383	7,843	8,023	8,397	8,784	9,164	9,565
5.5.2	New Regs															
5.5.3	Total Superfund	904	1,815	2,345	3,422	3,622	4,467	6,092	6,876	7,383	7,843	8,023	8,397	8,784	9,164	9,565
5.6	Land															
5.6.1	Existing Regs	17,633	19,704	19,674	22,154	23,080	24,844	28,858	30,313	31,590	32,174	32,677	33,543	34,423	35,295	36,189
5.6.2	New Regs	504	392	2,661	8,633	10,690	13,837	14,173	12,931	7,305	6,826	6,227	6,833	17,563	5,722	5,815
5.6.3	Total Land	18,137	20,096	22,335	30,787	33,770	38,681	43,031	43,244	38,895	39,000	38,904	40,376	51,986	41,017	42,004
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	491	439	436	428	399	447	457	468	387	399	410	421	432	444	455
6.1.2	New Regs	6		80	914	898	962	1,025	305	307	308	349	352	355	358	361
6.1.3	Total Toxic Subs	497	439	516	1,342	1,297	1,409	1,482	773	694	707	759	773	787	802	816
6.2	Pesticides															
6.2.1	Existing Regs	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.2.2	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Chemicals															
6.3.1	Existing Regs	910	892	890	1,124	1,378	1,532	1,627	1,725	1,692	1,752	1,816	1,886	1,948	2,025	2,113
6.3.2	New Regs	6		80	914	898	962	1,025	305	307	308	349	352	355	358	361
6.3.3	Total Chemicals	916	892	970	2,038	2,276	2,494	2,652	2,030	1,999	2,060	2,165	2,238	2,303	2,383	2,474
7	Multi-Media	897	815	2,828	1,591	2,705	1,568	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883
8	Capital & O&M Costs															
8.1	Total Existing Regs	72,527	76,365	75,813	76,814	78,569	80,336	84,796	86,910	88,719	89,954	91,463	93,423	95,323	97,218	99,091
8.2	Total New Regs	511	873	3,808	11,084	12,953	16,838	18,160	16,481	11,346	12,666	13,496	14,602	25,783	14,326	15,580
8.3	Total Capital & O&M	73,038	77,238	79,621	87,899	91,522	97,174	102,956	103,391	100,065	102,620	104,959	108,026	121,106	111,544	114,672
8.4	% of GNP	1.71	1.74	1.72	1.84	1.95	2.03	2.11	2.08	1.97	1.98	1.99	2.01	2.21	2.00	2.02

Footnotes to Table 8-19A

Lines correspond with Table 8-18A except full implementation lines have been omitted.

## 9. ANALYSIS AND CONCLUSIONS

The cost estimates presented in this report, together with data from other recent EPA studies, permit some interesting comparisons of pollution control costs. These lead to preliminary conclusions that may be of interest to Congress when considering the economic aspects of future environmental legislation. This chapter discusses five such cost comparisons, and some general conclusions that follow from these.

### 9.1. COST COMPARISONS

Below, comparisons of costs over time are discussed for the following categories of pollution control costs and expenditures:

- 9.1.1. Total expenditures as a percentage of Gross National Product;
- 9.1.2. International pollution control expenditures;
- 9.1.3. Environmental media expenditure shares;
- 9.1.4. Cost burdens on local governments; and
- 9.1.5. Long term trends in total costs.

#### *9.1.1. Total Expenditures as a Percentage of Gross National Product*

In Chapter 8, measures of total annualized pollution control costs as a percentage of Gross National Product (GNP) were used to provide a national economic perspective for the costs of environmental protection. Another way to examine the relationship between pollution control costs and national income aggregates is to compare annual measures of total pollution control expenditures—the sum of capital and operating outlays—as a percentage of GNP.

The total expenditures measure differs from the total annualized costs measure discussed throughout the previous chapters. Annualized costs reflect the sum of operating costs and total amortized capital costs, which represents depreciation and interest charges on the stock of capital in use as of that year. The total expenditures measure, on the other hand, represents total operating cost plus the total value of capital equipment purchased in that year alone. It thus includes total monetary outlays in a particular year, and excludes depreciation and interest charges on past capital investments. The measure of total expenditures as a percentage of GNP is useful because it uses the pollution control cost aggregate that is most similar to the GNP measure.

Tables 8-18 and 8-19 show total pollution control expenditures as a percentage of GNP under both present and full implementation scenarios over the period 1972-2000.<sup>1</sup> As illustrated in Figure 9-1, expenditures as a percentage of GNP increased from about 1.5 percent in the early 1970s to

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<sup>1</sup> In order to compute total pollution control expenditures as a percentage of GNP for future years, data on GNP over the period 1972-1989 (in constant 1986 dollars) were linearly extrapolated to years 1990-2000.

roughly 1.8 percent in the mid- and late 1970s, but fell slightly to about 1.7 percent during the 1980s. Expenditures as a percentage of GNP are projected to increase gradually over the 1990s, reaching an estimated 2.2 percent by the year 2000 under the full implementation scenario. Under the present implementation scenario, expenditures are expected to level off at about two percent in the late 1990s.

Figure 9-2 shows the break down of total expenditures by type of regulation for the years 1986-2000. In the early part of the period, new regulations make up most of the increase above that resulting from existing regulations; in the late 1990s, the added costs are more evenly split between new regulations and full implementation.

Another comparison that can be made using the total expenditures data is how environmental pollution control expenditures compare with other national expenditures familiar to the individual citizen. These comparisons can be made in terms of percentages of Gross National Product (GNP) as follows:

COMPARATIVE U.S. EXPENDITURES AS PERCENT OF GNP	1980	1987
Environmental Pollution Control <sup>1</sup>	1.8	1.7
Clothing and Shoes <sup>2</sup>	3.6	4.2
National Defense <sup>2</sup>	5.4	6.9
Medical Care <sup>2</sup>	6.3	7.0
Housing <sup>2</sup>	9.8	9.3
Food <sup>2</sup>	12.4	11.7
<sup>1</sup> From Table 8-19. Assumes full implementation.		
<sup>2</sup> From <i>Economic Report of the President</i> , January 1989, Tables B-2 and B-11.		

As can be seen, environmental pollution control represents a small fraction of the expenditures on many of the major components of GNP.

### 9.1.2. International Pollution Control Expenditures

Comparable estimates of pollution control costs in other developed countries are available for certain Western European nations only as a result of data collected by the Organization for Economic Cooperation and Development.<sup>2</sup> They largely used a total non-household expenditures measure of costs and the Gross Domestic Product (GDP) measure of national income to make the estimates comparable between countries. The nature of the total expenditures measure of costs is discussed in the previous section. In order to make the expenditure estimates presented in this Report comparable

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<sup>2</sup> These cost estimates are reported in: Organization for Economic Cooperation and Development, *Pollution Control and Abatement Expenditure in OECD Countries: A Statistical Compendium*, OECD Environment Monographs, No. 38, November 1990, p. 40.

to these OECD estimates, U.S. non-household expenditures are derived by subtracting out household pollution control expenditures from total U.S. pollution control expenditure estimates presented in Table 8-18. The U.S. non-household pollution control expenditure estimates are presented and explained in Table 9-1. Table 9-2 uses this data to compare the sum of non-household capital and operating expenditures as a percentage of GDP for the United States and these Western European countries over the years 1972-1986. Data including household expenditures are also presented for the United States and France, the only countries for which such data are available. The data for 1985, the most recent year for which data are available for all the countries listed in Table 9-2, are shown graphically in Figure 9-3.

International cost comparisons indicate that in almost every year for which there is comparable data, non-household pollution expenditures as a percentage of GDP were higher in the U.S. than in most of the nations for which comparable data are available. In 1985, the most recent year for which data are available for every country listed in Table 9-2, the percentage of non-household expenditures in the U.S. were nine to 76 percent higher than expenditures in Finland, the Netherlands, the United Kingdom, France, and Norway, and five percent less than in West Germany.<sup>3</sup>

### 9.1.3. Environmental Media Expenditure Shares

A third useful comparison involves the shares of total U.S. expenditures accounted for by different environmental media over time. The sum of capital and operating expenditures is used for these comparisons since this measure of costs does not include interest and depreciation costs on past capital investments, and thus illustrates near-term future trends more clearly than annualized costs. As in the previous section, this measure is referred to as total expenditures to distinguish it from annualized costs.

Figure 9-4 shows total expenditures by environmental medium over the period 1986 to 2000. Figure 9-5 shows the percentage of total expenditures accounted for by each environmental medium in 1997 compared to 1987. Both figures assume full implementation. The figures show that chemical control expenditures are expected to grow in the future at the most rapid rate for any environmental medium. However, chemical costs are relatively insignificant, and are expected to account for less than two percent of total expenditures in the year 1997. The most significant increase in total expenditures is expected in the land medium. Land expenditures are estimated to increase from 26 percent of total expenditures in 1987 to 34 percent by the year 1997. The share of water expenditures over these years is expected to fall from 43 percent of total expenditures in 1987 to 34 percent in 1997, while the share of air expenditures is expected to fall slightly from 29 percent to 27 percent. Since these estimates are based on full implementation, the share of water expenditures may fall even more if the full implementation assumptions with regard to meeting municipal wastewater treatment needs are not fulfilled.

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<sup>3</sup> It should be noted that the differences in the estimates for the United States and West Germany are small enough that they could be the result of inaccuracies in the data or the methods used to put them in comparable terms.

The components of future land expenditures are shown graphically in Figures 9-6 through 9-11. Figure 9-6 shows that total expenditures for existing land programs are projected to increase further over the period 1987-2000. The increase in land expenditures associated with new and forthcoming regulations follow a less regular trend. Expenditures for new regulations are expected to increase rapidly over the period 1987-1992. By 1992, new regulations will account for an estimated 34 percent of total land expenditures. Expenditures for new regulations are expected to fall off considerably over the next few years to roughly one-half the 1992 level. However, they are expected to jump again in 1998 and then fall back to the mid-1990 trend over years 1999-2000. Figure 9-7 shows that the two jumps in new regulation expenditures are due largely to those associated with new rules for underground storage tanks (UST). The first jump is due in part to large UST corrective action expenditures; the second jump is due primarily to large capital expenditures for the upgrade/replacement of tanks in 1998, the regulatory deadline for such action. The UST expenditures are broken out separately in Figure 9-10.

Solid waste is expected to account for the largest share of land expenditures over the period 1987-2000, followed by hazardous waste, Superfund, and UST. This is shown in Figure 9-7. The large majority of solid waste expenditures are for local government and private sector trash collection and disposal activities, however, most of which do not result from Federal laws and regulations. As shown in Figure 9-8, Federal solid waste regulations are expected to account for only 15 percent of total solid waste expenditures in 1992, decreasing to about ten percent in subsequent years.

Figure 9-9 breaks out hazardous waste expenditures by existing and new regulations, and also shows that portion of existing regulation expenditures expected to be incurred by the U.S. Department of Energy (DOE) and the U.S. Department of Defense (DOD). This figure shows that existing regulations will account for an average of 64 percent of total hazardous waste expenditures over the period 1992-2000. An average of approximately 52 percent of these expenditures will be incurred by DOE and DOD over the period.

Superfund expenditures are also estimated to increase rapidly over the period 1987-2000, and DOE and DOD together are expected to account for an average of about 35 percent of the total over the period. Figure 9-11 shows total Superfund expenditures and that portion of the total expected to be incurred by DOE and DOD.

#### *9.1.4. Cost Burdens on Local Governments*

A fourth interesting comparison involves local government pollution control costs over time. The estimates presented in Chapter 8 suggest that although the percentage share of costs funded by local government is not projected to change much, total annualized costs to local governments will increase substantially over the period 1987-2000. As shown in Table 8-12A, annualized costs under the present implementation scenario are expected to increase from \$19 billion in 1987 to over \$32 billion by the year 2000, a 69 percent increase. Increases in local government costs are driven primarily by expenditures for wastewater treatment and by revisions to several environmental laws in recent years that establish broader and more stringent standards for drinking water treatment, sewage sludge disposal, and solid waste disposal.

A more detailed examination of the economic impacts of environmental pollution control regulations at the local level can be found in the *Municipal Sector Study*<sup>4</sup> released by EPA in 1988. This report was part of a larger study that summarized the economic impacts of expanding pollution control requirements on municipalities, small business, and agriculture.<sup>5</sup>

The study found that new and forthcoming pollution controls on local governments will require significant additional capital investments and increases in rates charged to customers for expanded environmental services. It is estimated that in the coming years the average household will be charged an additional \$100 annually for locally-provided environmental services. Those municipalities with populations under 2,500 and over 250,000 will experience the greatest increases in total user costs on a per household basis, with average additions to annual user charges and fees of \$170 and \$160, respectively (see Table 9-3). When these costs are added to projected increases in costs necessary to maintain current services, average household costs in the year 2000 are estimated to be 60 to 120 percent higher than 1986 costs. Municipalities with populations under 2500 are expected to experience costs in the upper end of this range. Because smaller municipalities tend to have lower average household incomes and higher unit costs for improved environmental services, households in smaller communities will be required to pay a greater proportion of their incomes on average than households in larger cities for comparable environmental services. Households in communities with populations under 2,500 will pay an average 0.7 percent of their incomes for environmental services while those in larger cities will pay, on average, 0.5 percent.

Most municipalities are expected to be able to meet the estimated increases in environmental expenses and still remain financially sound. The municipalities most likely to experience difficulties will be those with populations of 2,500 or less. Between 21 percent and 30 percent of these communities may experience difficulties because of the high costs of certain individual regulations, the cumulative costs of recent legislative requirements, and the limited margin for expanding financial obligations in small communities. Such difficulties are not limited to small cities, but it is estimated that a much smaller proportion (between three and seven percent) of cities with populations over 2,500 persons will face financial problems as a result of EPA requirements.

The individual environmental regulations that account for the largest potential cost increases to small municipalities are sewage treatment and new drinking water treatment requirements. Several of the more costly drinking water regulations will apply to a greater proportion of smaller municipalities than larger municipalities since they deal with environmental risks that are more often found in smaller community water systems. Many larger water supply systems already have introduced treatment systems to control such risks. The costs of solid waste disposal, asbestos

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<sup>4</sup> U.S. EPA, *The Municipal Sector Study: Impacts of Environmental Regulation on Municipalities*, Report No. 230-09-88-038, September 1988.

<sup>5</sup> U.S. EPA, *Municipalities, Small Business, and Agriculture: The Challenge of Meeting Environmental Responsibilities*, Report No. 230-88-037, September 1988.

removal in schools, and underground storage tank regulations, also account for a significant portion of the additional costs expected to be borne by smaller communities.

#### *9.1.5. Long Term Trends in Total Costs*

A comparison of total annualized costs over the period 1972-2000 (see Figures 8-2 to 8-4) shows that pollution control costs in constant dollars and as a percentage of GNP have increased steadily over time, but at a decreasing rate of increase, and are expected to do so through the year 2000. In the year 2000, costs are expected to be more than 70 percent higher than year 1987 levels under the present implementation scenario, which includes costs for all current and planned pollution control programs. Year 2000 costs are estimated to be over 85 percent higher than 1987 levels under the full implementation scenario, which includes the costs of achieving the ozone NAAQS nationwide and the expenditures needed to fulfill the nation's wastewater treatments needs, in addition to costs for all current and planned programs. Since the ozone standard is more likely to be implemented, given the enactment of the Clean Air Amendments of 1990, than the wastewater treatment needs are to be met, the most likely projected costs would seem to be between the present and full implementation projections. On the other hand, as discussed in Section 3.1.3, the cost estimates for the Clean Air Act Amendments appear likely to be higher than those used in this report. A case can therefore be made that the costs may lie nearer the full than the present cost projections.

Beyond the year 2000, the difficulty of projecting costs becomes even greater. The Clean Air Act Amendments envision increasing costs beyond the year 2000. The annual costs for the Administration's Clean Air proposal included in this report are estimated to be \$4 to \$7 billion higher by the year 2005 compared to 2000. The trend also points upward, but at a decelerating rate of increase. All of this suggests continued cost increases beyond the year 2000, at least until 2005.

## 9.2. CONCLUSIONS

The comparisons of pollution control costs discussed above and in Chapter 8 lead to a number of conclusions. First, national expenditures on pollution control as a percentage of GDP have been somewhat higher in the U.S. than in most Western European nations for which comparable data are available. While these results are not conclusive evidence, they do suggest that the United States' commitment to national pollution control is at least as great as that of many of its economic peers.

Second, over the next decade there is expected to be a shift in the relative shares of total environmental control costs accounted for by different environmental media. Most significantly, there is expected to be a substantial increase in the share of total costs directed towards land pollution control (which includes a significant groundwater protection component), and a corresponding decrease in the share of total costs directed towards the control of surface water quality. This is due largely to legislation enacted in the 1980s relating to past and current hazardous waste management practices. Costs associated with the Superfund clean-up of abandoned hazardous waste sites and various RCRA programs involving current hazardous waste operations, including the corrective action and underground storage tank programs, are expected to impose significantly increasing costs over the next decade.

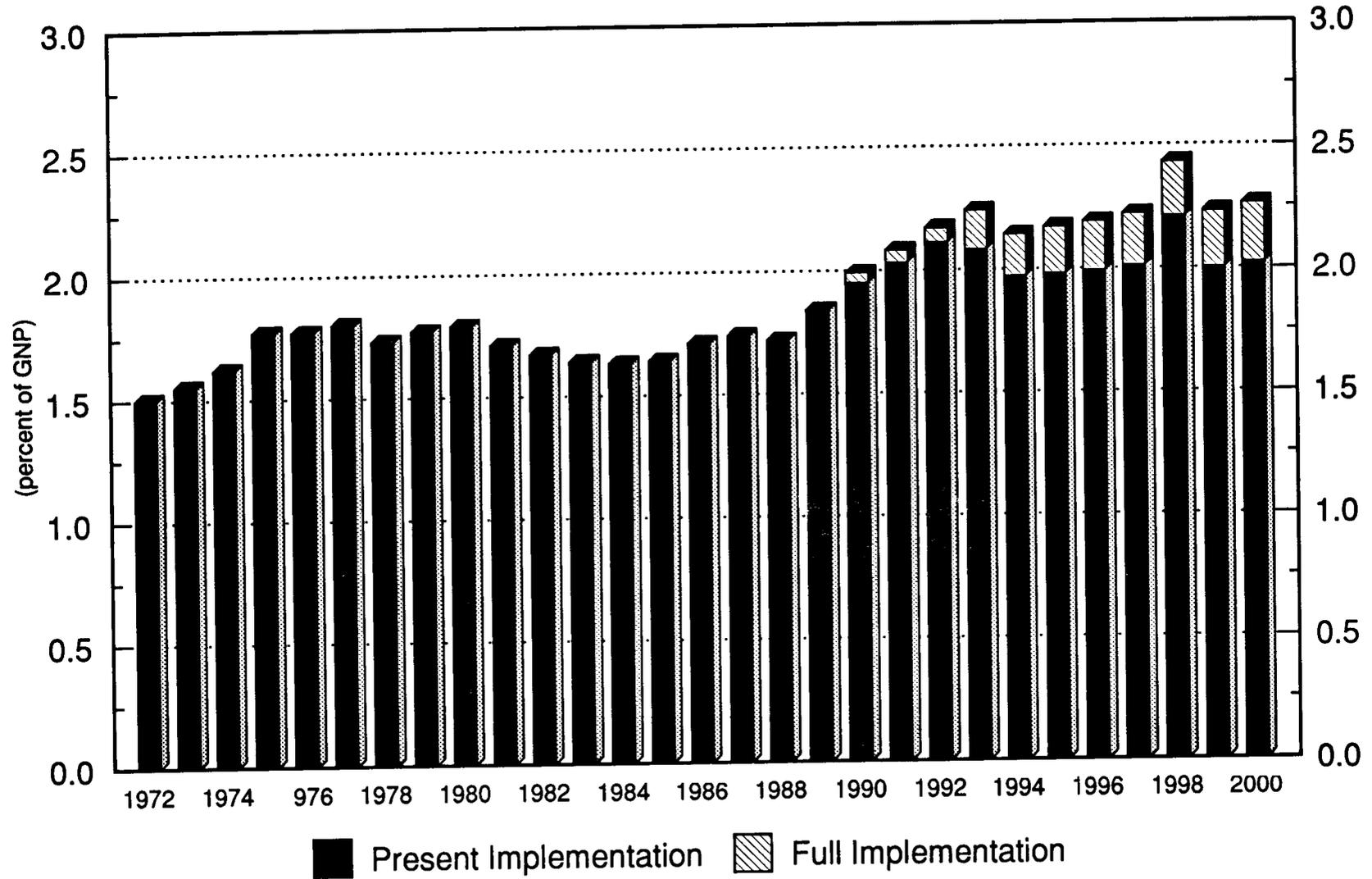
Third, although their percentage share of total pollution control expenditures is expected to fall slightly, it is projected that over the next several years pollution control burdens on municipalities will increase dramatically, and result in large increases in the fees charged to consumers for locally-provided environmental services. Moreover, many smaller municipalities may face severe difficulties in securing the capital resources necessary to comply with pollution control requirements. The EPA is currently extending technical and financial assistance to alleviate these constraints. The EPA, municipalities, and private entities are also exploring more innovative ways to mitigate pollution control burdens on localities. These include public partnerships and regionalization projects, whereby two or more communities may share expertise, jointly purchase environmental services in volume at discount prices, and enter into joint ventures for financing pollution control infrastructure.

Fourth, although increasing, national environmental pollution control expenditures remain less than half those for clothing and shoes, one-third those for national defense, one-third those for medical care, one-fifth those for housing, and one-sixth those for food.

Fifth, as discussed in Section 8.1.4, the non-EPA federal share of total annualized pollution costs is projected to increase by more than 140 percent between 1987 and 2000, primarily as a result of the cost of military and nuclear waste clean-up. All other shares, particularly the private sector, are expected to fall somewhat. Even though the EPA share is expected to fall, the net effect is that the federal share is projected to increase over this period.

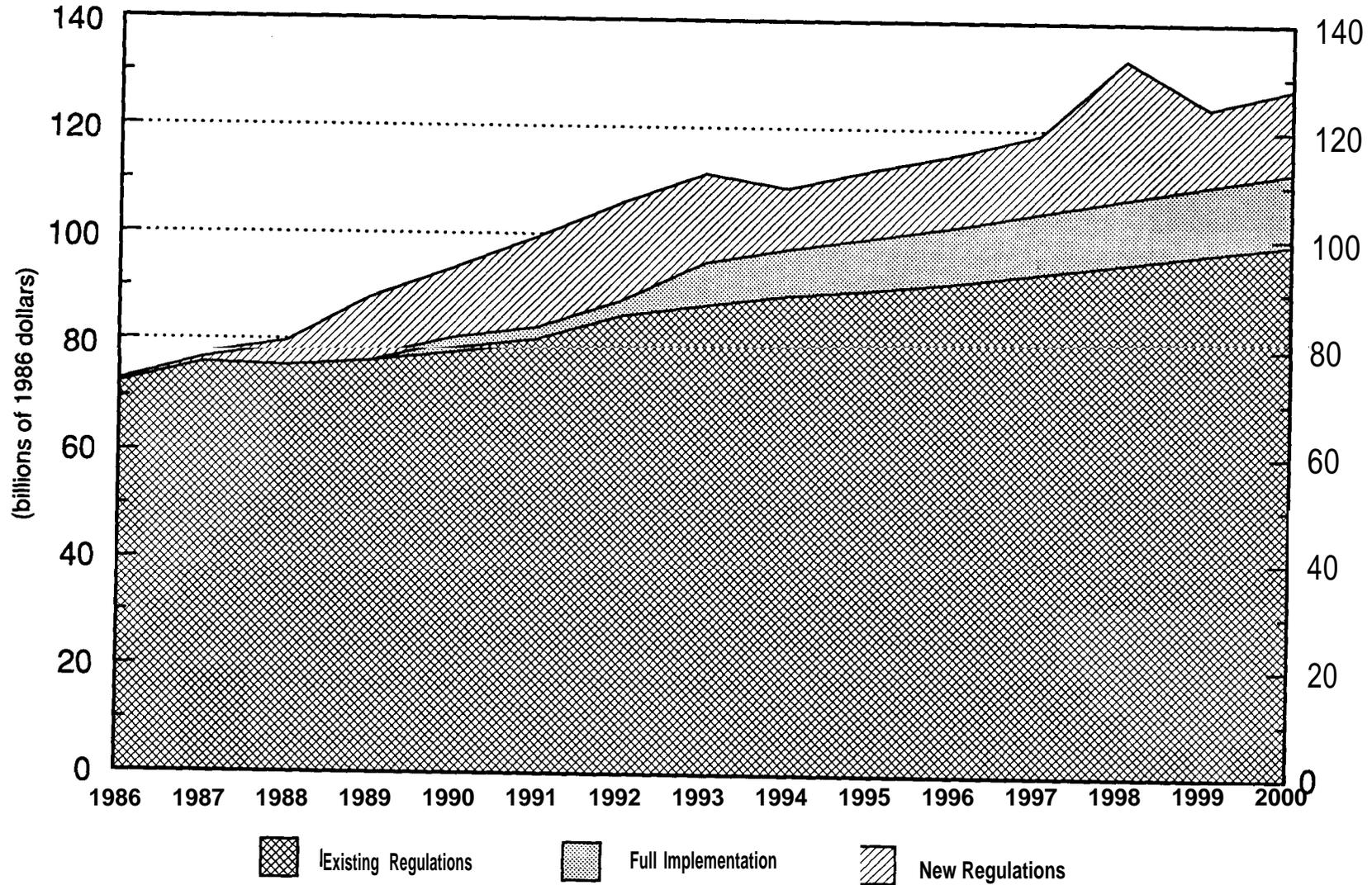
Finally, the estimates presented in this Report show that total annualized costs for pollution control programs have been increasing fairly rapidly in recent years, and are expected to continue this trend through the year 2000. Currently, the nation spends about two percent of GNP on pollution control; this is expected to increase to between 2.6 and 2.8 percent of GNP by the year 2000. There is reason to believe that pollution control costs will be rising significantly at least through the year 2005. Even if no new environmental legislation is passed beyond the Clean Air Act Amendments of 1990, pollution control costs appear likely to continue to increase beyond the costs projected in this report for the year 2000. Moreover, if new environmental legislation should be enacted in the future, costs would be higher than those projected in this report.

**Fig. 9-1: U.S. POLLUTION CONTROL EXPENDITURES AS A PERCENTAGE OF GNP**



Source: Tables 8-18, 8-18A, 8-19, and 8-19A

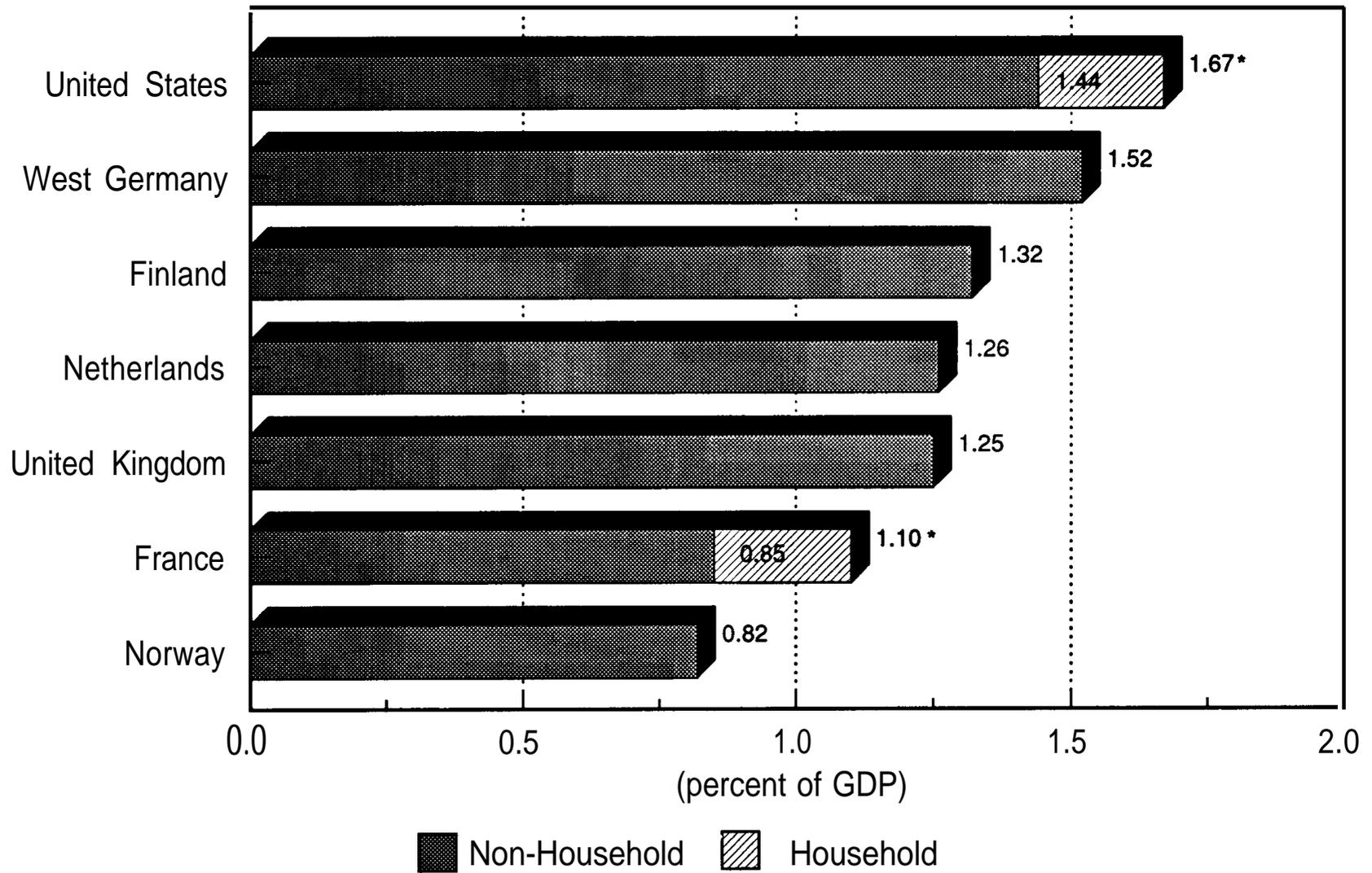
**Fig 9-2: TOTAL CAPITAL AND OPERATING EXPENDITURES BY TYPE**



Source: Table 8-18A

November 1990

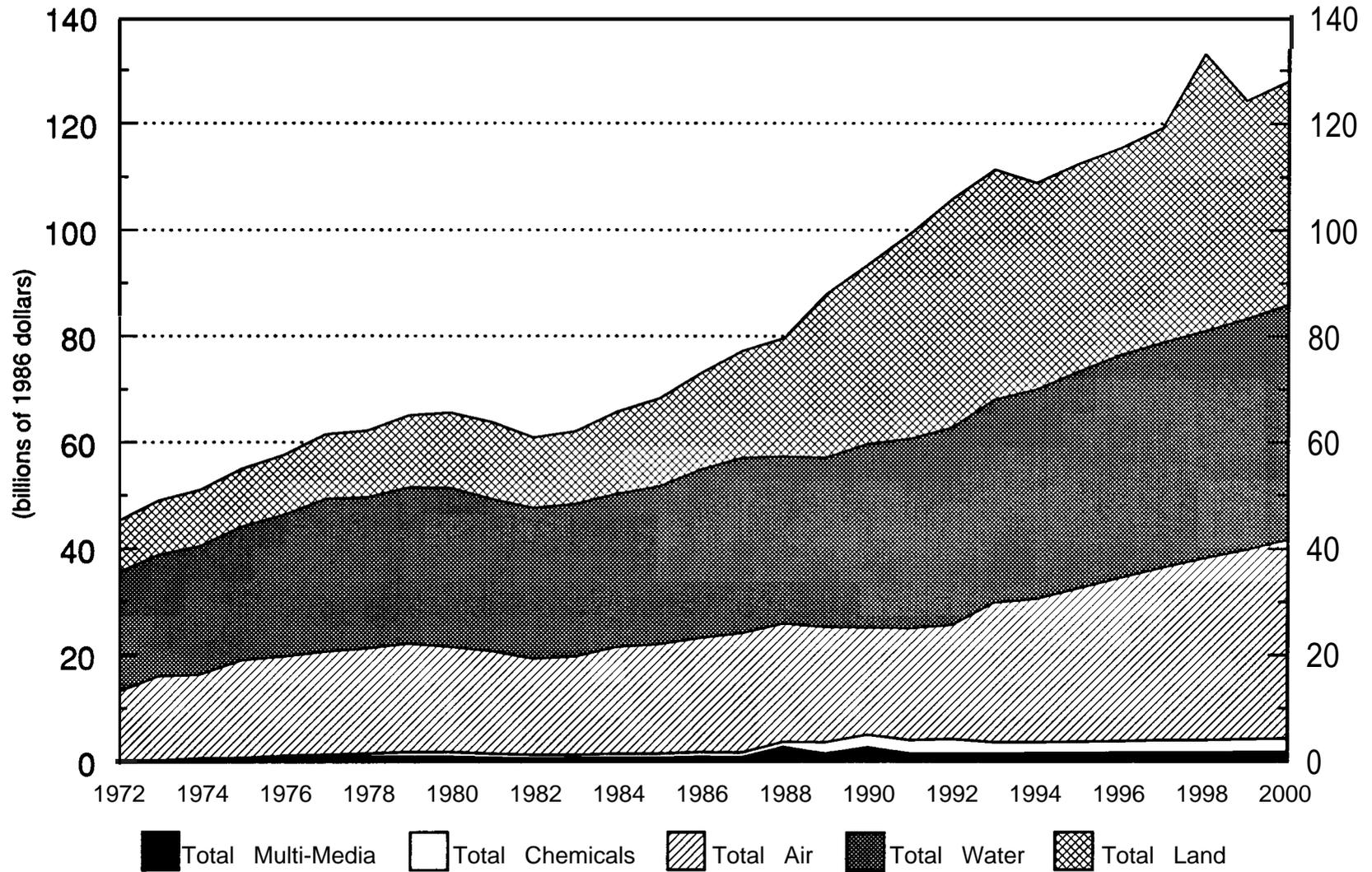
**Fig. 9-3: 1985 INTERNATIONAL POLLUTION CONTROL EXPENDITURES AS A PERCENTAGE OF GDP**



Source: Table 9-2

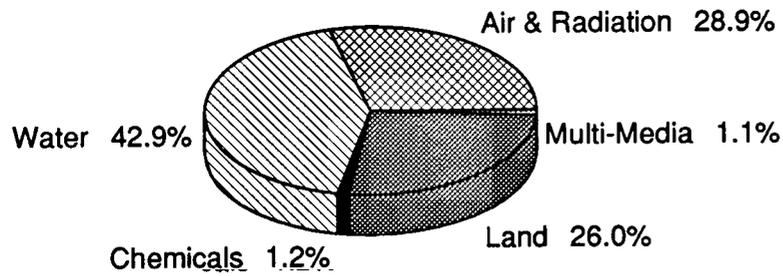
\* Includes household expenditures

Fig. 9-4: TOTAL CAPITAL AND OPERATING COSTS BY MEDIUM

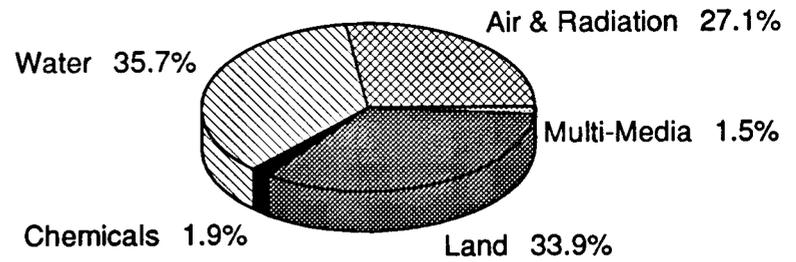


Source: Table 8-18A

**Fig. 9-5: PERCENTAGE OF CAPITAL PLUS OPERATING COSTS BY MEDIUM**



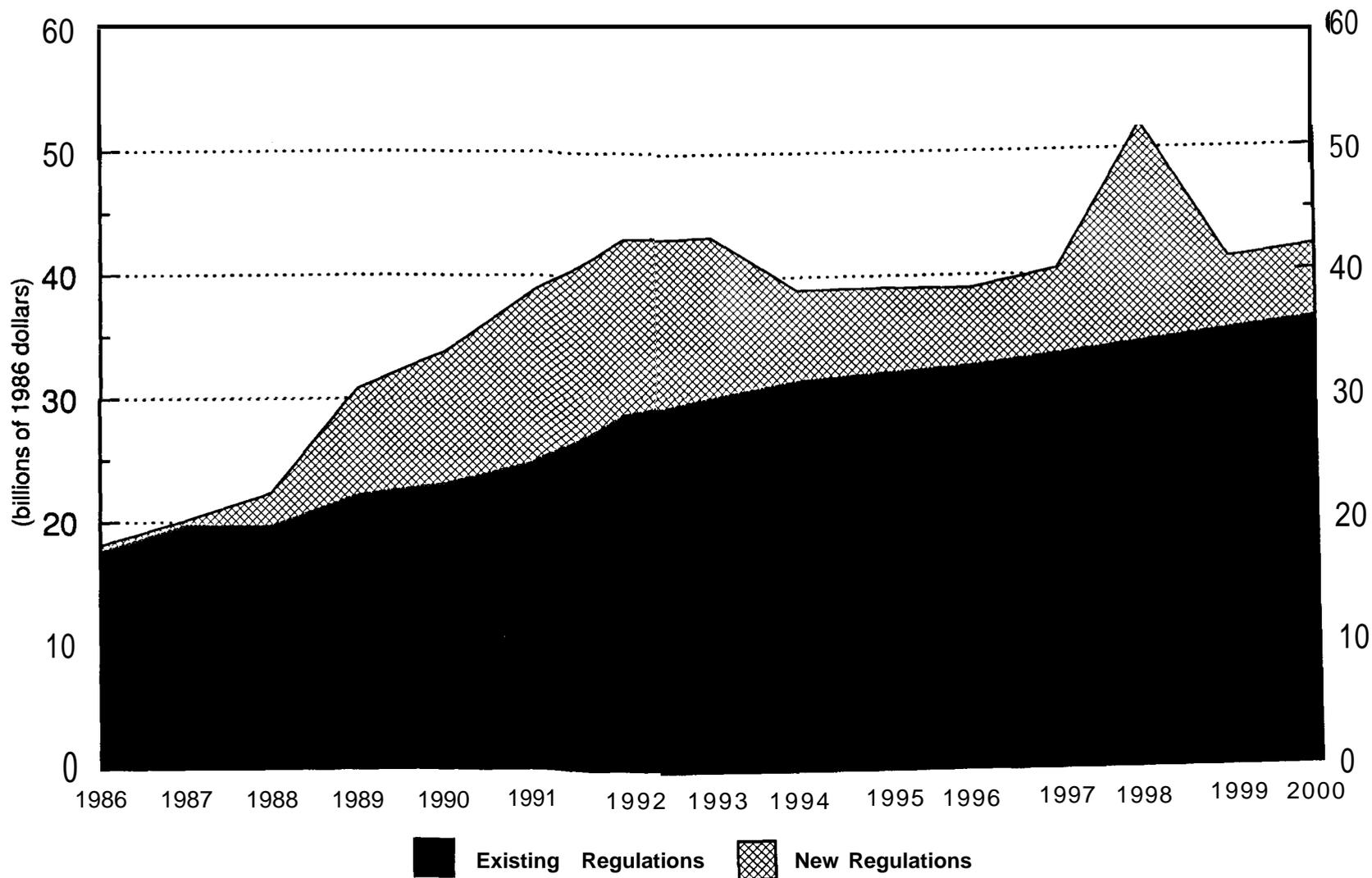
**1987 Total Cost  
(\$77 billion)**



**1997 Total Cost  
(\$119 billion)**

Source: Table 8-18

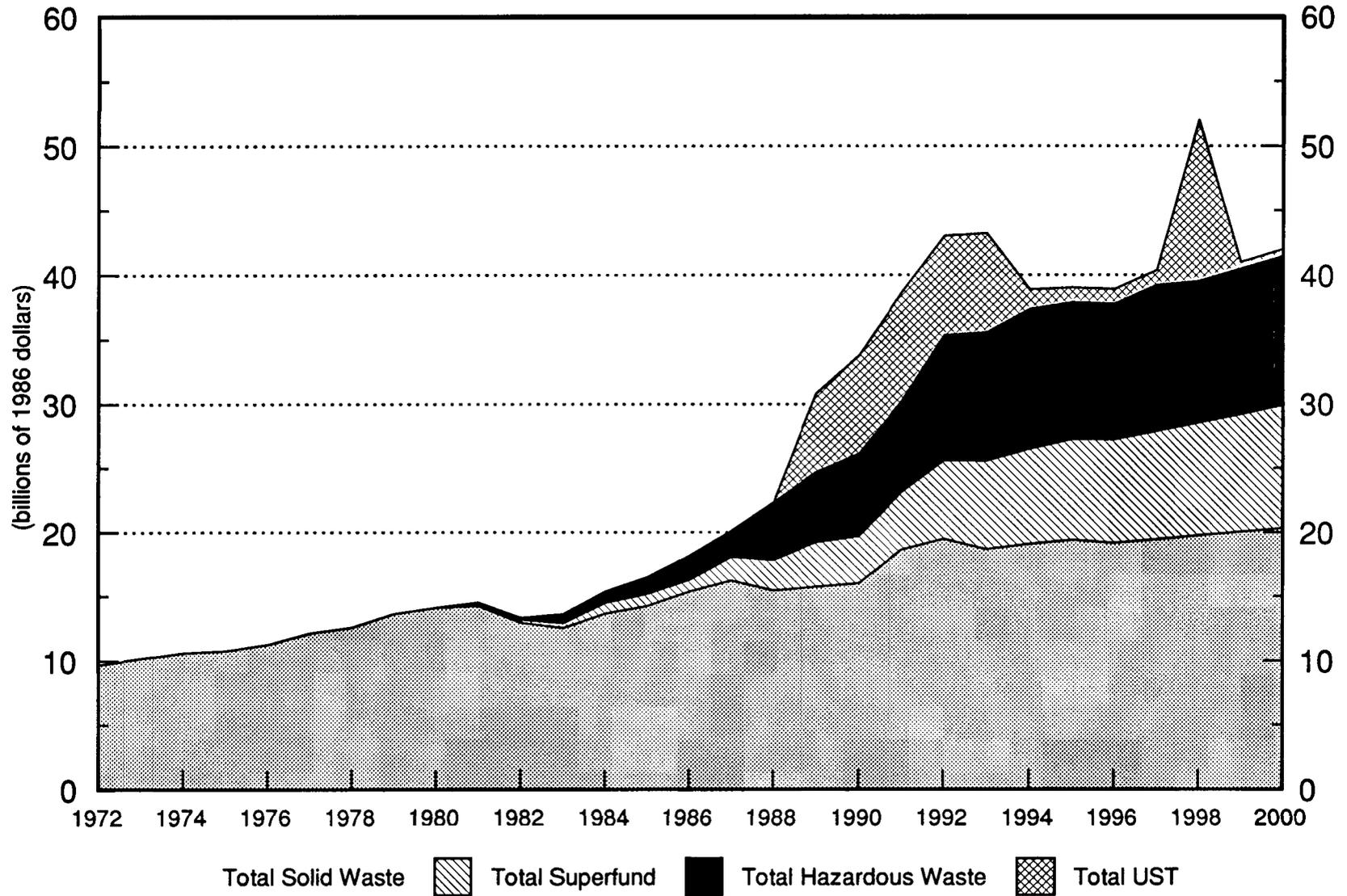
Fig. 9:6: TOTAL LAND CAPITAL AND OPERATING COSTS BY TYPE



Source: Table 8-1 8A

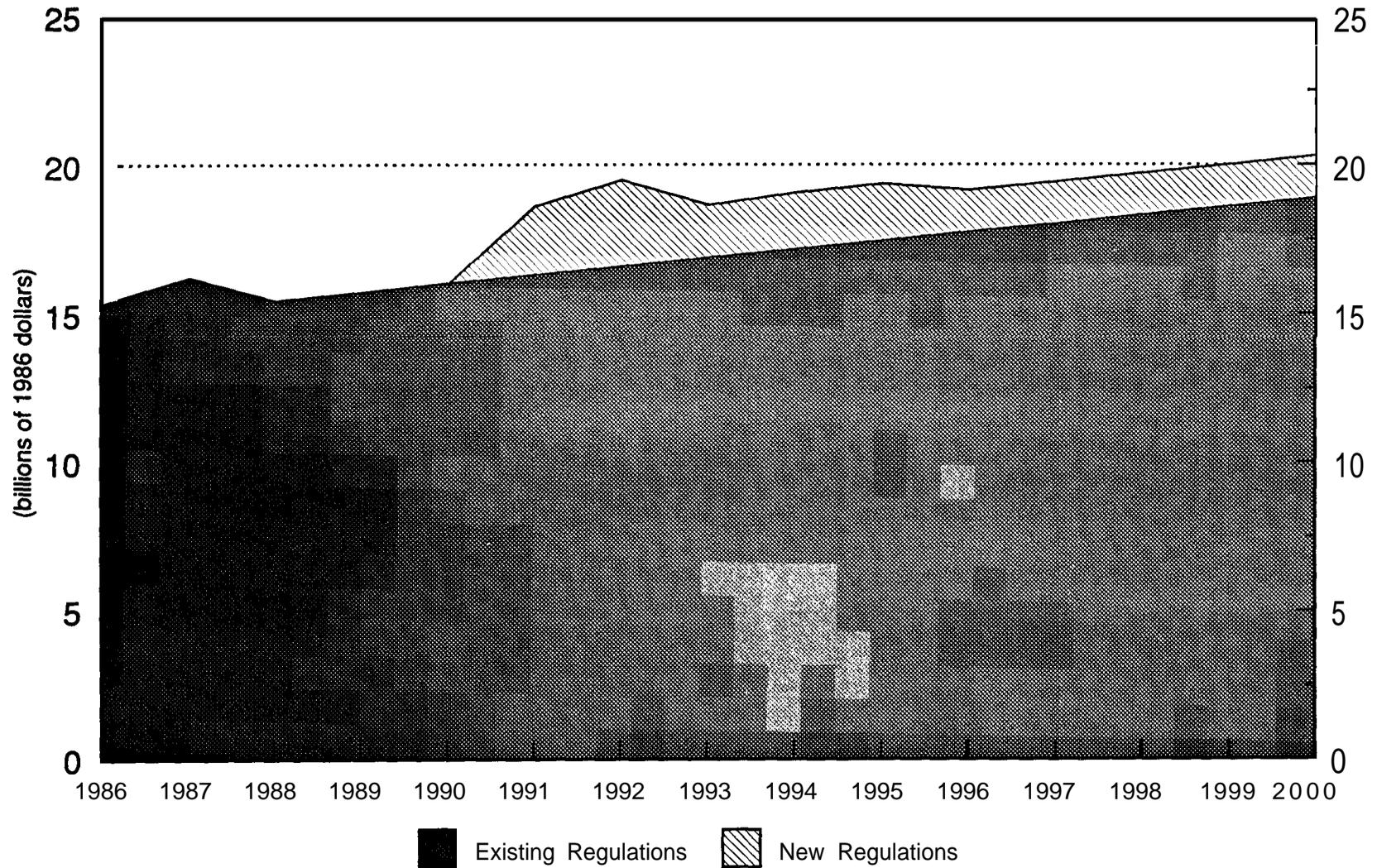
November 1990

Fig. 9-7: TOTAL LAND CAPITAL AND OPERATING COSTS BY PROGRAM



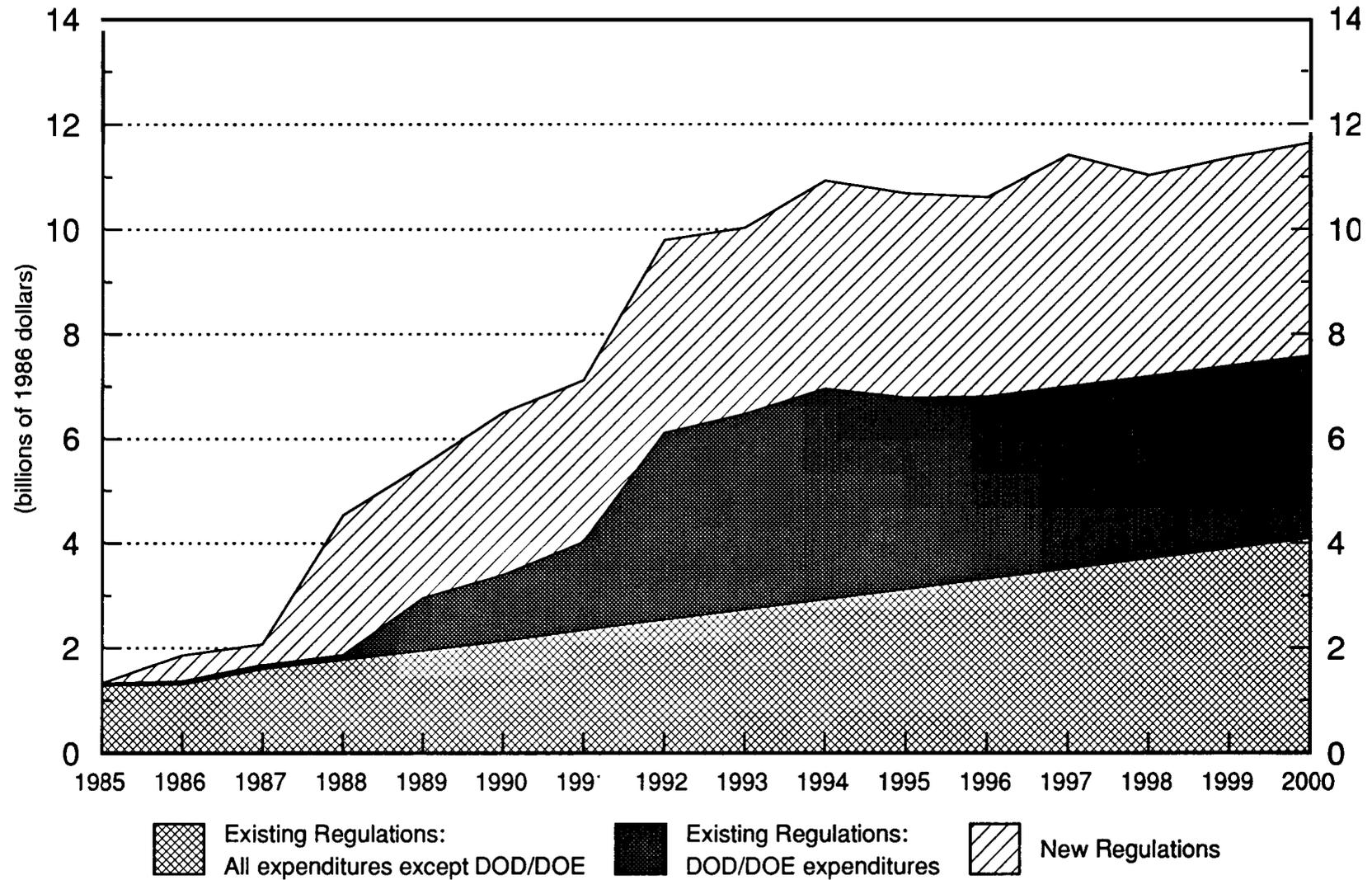
Source: Table 8-18A

**Fig. 9-8: SOLID WASTE CAPITAL AND OPERATING COSTS BY TYPE**



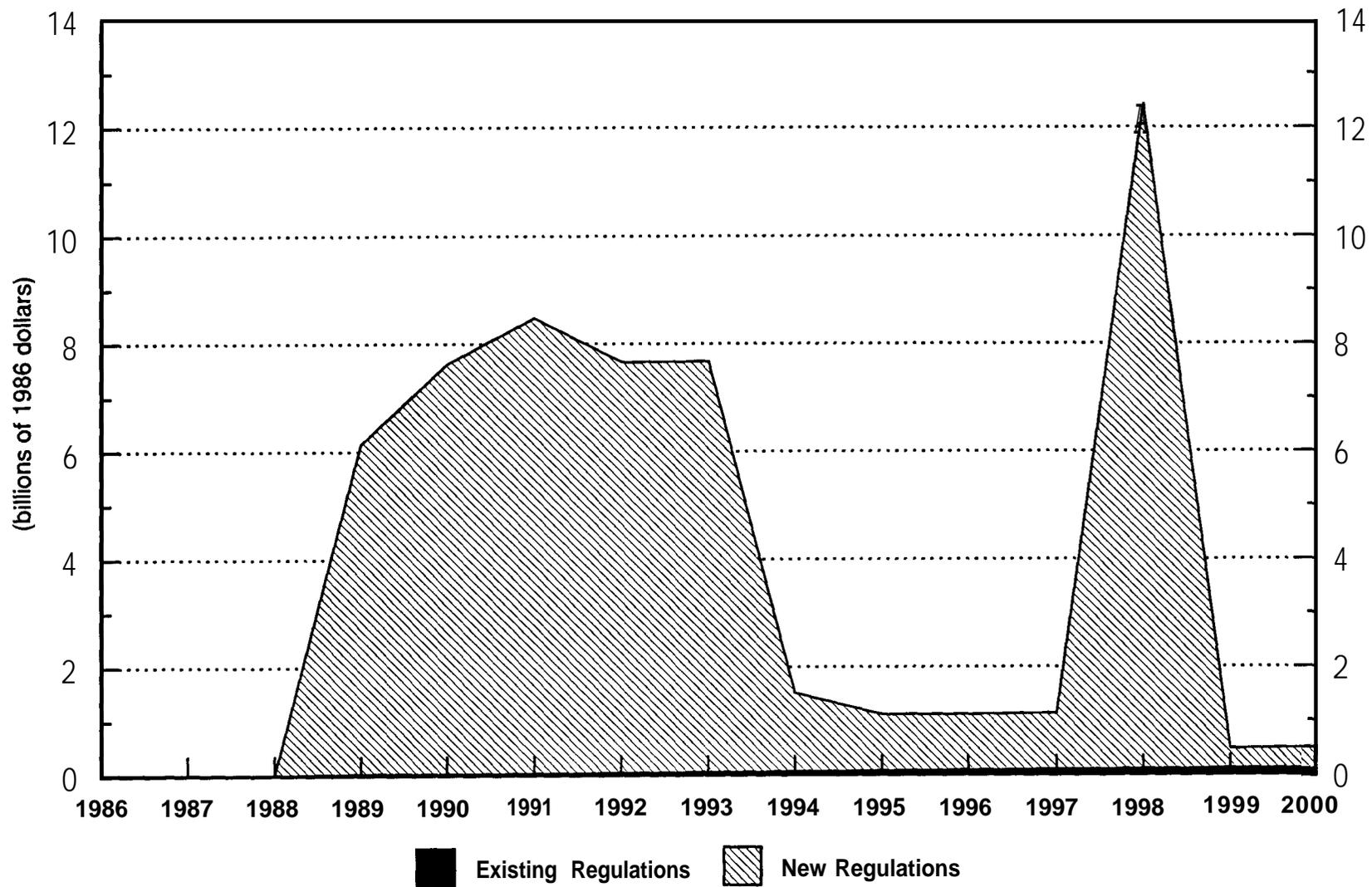
Source: Table 8-18A

**Fig. 9-9: HAZARDOUS WASTE CAPITAL AND OPERATING COSTS BY TYPE**



Source: Table 8-18A

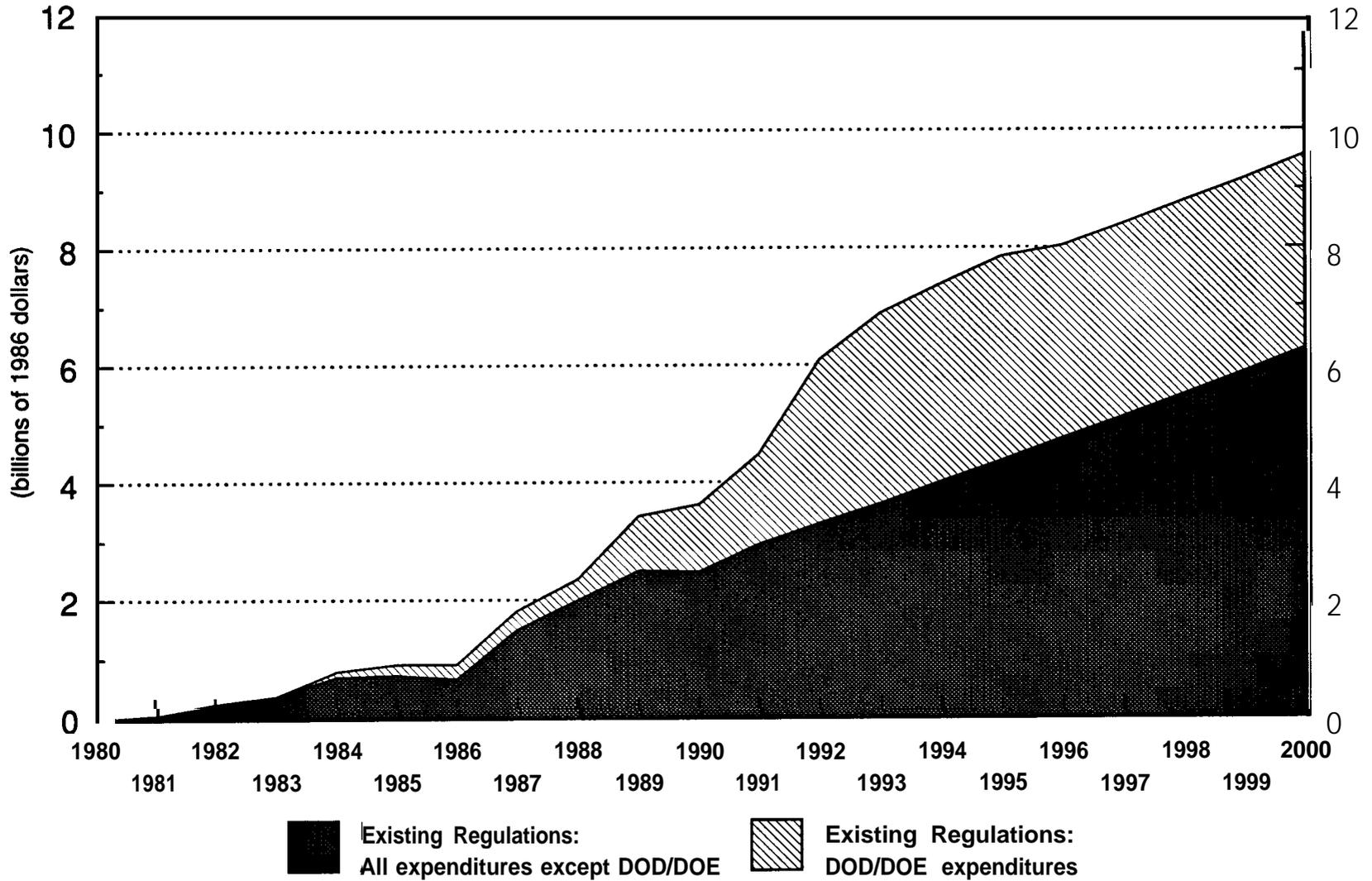
**Fig. 9-10: UST CAPITAL AND OPERATING COSTS BY TYPE OF REGULATION**



Source: Table 8-1 8A

November 1990

Fig. 9-11: SUPERFUND CAPITAL AND OPERATING COSTS BY TYPE



Source: Table 8-1 8A

Table 9-1: NON-HOUSEHOLD CAPITAL PLUS OPERATING EXPENDITURES

(millions of 1986 dollars)

Line (Report Section)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A. Total Expenditures	44,960	48,995	50,981	54,975	57,536	61,436	62,150	65,127	65,482	63,804	60,916	62,052	65,664	68,193	73,038
A.1 Gross Domestic Product (\$billions)	2,750	2,911	2,924	2,944	3,115	3,307	3,513	3,600	3,589	3,670	3,585	3,711	3,959	4,080	4,197
A.2 Total Expenditures as % of GDP	1.635	1.683	1.743	1.867	1.847	1.858	1.769	1.809	1.825	1.738	1.699	1.672	1.659	1.671	1.740
B. Household Capital Costs															
(3.1.2) Household Mobile	208	442	343	2,446	2,861	3,142	3,277	3,095	3,102	3,607	3,382	4,031	4,969	5,347	5,484
(3.2) Private Radon															1
(4.1.1) Septic System Cleaning	3,231	3,555	2,691	2,059	2,277	2,675	2,934	2,923	2,340	1,933	1,959	2,280	2,612	2,483	2,582
(5.1) Household Solid Waste	75	80	81	78	76	76	77	79	80	79	77	78	82	90	96
B.1 Total Household Capital Costs	3,514	4,077	3,114	4,582	5,214	5,892	6,288	6,096	5,523	5,619	5,418	6,390	7,663	7,921	8,163
C. Household Operating Costs															
(3.1.2) Household Mobile	957	1,497	1,479	1,209	965	890	686	451	263	(98)	(343)	(253)	(486)	(625)	(469)
(3.2) Private Radon															
(4.1.1) Septic System Cleaning	622	635	559	522	528	533	530	519	487	473	468	470	501	560	595
(5.1) Household Solid Waste	1,371	1,415	1,430	1,465	1,455	1,504	1,593	1,612	1,696	1,635	1,608	1,607	1,647	1,735	1,831
C.1 Total Household Operating Costs	2,950	3,547	3,468	3,196	2,948	2,927	2,809	2,582	2,445	2,010	1,732	1,824	1,661	1,669	1,957
D. Total Costs Less Household Costs	38,496	41,372	44,398	47,197	49,374	52,616	53,053	56,449	57,514	56,174	53,766	53,838	56,340	58,603	62,919
D.1 Non-household Costs as a % of GDP	1.400	1.421	1.518	1.603	1.585	1.591	1.510	1.568	1.603	1.531	1.500	1.451	1.423	1.436	1.499

Footnotes to Table 9-1 by line:

A. Total capital plus operating expenditures as shown in Table 8-18.

A.1. As given in the *Economic Report of the President*, February 1990, p. 304, adjusted to 1986 dollars using the GNP price deflators shown in Table 1-2.

A.2. Total capital plus operating costs divided by line A.1.

B. Household capital expenditures included in this Report under Section:

3.1.2. Expenditures by individuals for motor vehicle emission abatement devices. From line 2 of Tables C-2 and C-8. It is assumed that only light duty vehicles and motorcycles are purchased by the household sector. Some light duty vehicles are purchased by business and government, but this may be compensated for by the fact that some trucks and aircraft are purchased by the household sector.

3.2. Expenditures by individuals for radon control devices. From private new regulations on this line of Table 3-1B since this represents household investment in radon control.

- 4.1.1. Expenditures by households for septic system and lateral (connectors to sewer lines) investment. Based on data supplied to the Organization for Economic Cooperation and Development (OECD) by the Bureau of Economic Analysis of the Department of Commerce.
- 5.1. Expenditures by households for solid waste collection and disposal capital for handling household solid waste by private contract and self-service methods. Based on data supplied to OECD by the Bureau of Economic Analysis of the Department of Commerce.

C. Household operating expenditures included in this Report under Section:

- 3.1.2. Expenditures by individuals to operate and maintain motor vehicle emission abatement devices. From line 3 of Tables C-2 and C-8.
- 3.2. Expenditures by individuals to operate radon control devices. From private new regulations on this line of Table 3-2B.
- 4.1.1. Expenditures by households for septic system maintenance such as cleaning. Based on data supplied to OECD by the Bureau of Economic Analysis of the Department of Commerce.
- 5.1. Expenditures by households for solid waste collection and disposal. Data were supplied to OECD by the Bureau of Economic Analysis of the Department of Commerce.

D. Total capital plus operating expenditures less total household capital and operating expenditures (line A.1 minus lines B.1 and C.1).

D.1. Total non-household capital plus operating expenditures as a percentage of Gross Domestic Product (line D as a percentage of line A.1).

Table 9-2: CAPITAL PLUS OPERATING EXPENDITURES FOR SOME OECD COUNTRIES  
AS A PERCENTAGE OF GROSS DOMESTIC PRODUCT

Country	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
United States															
Non-household	1.40	1.42	1.52	1.60	1.59	1.59	1.51	1.57	1.60	1.53	1.50	1.45	1.42	1.44	1.50
Including household	1.64	1.68	1.74	1.87	1.85	1.86	1.77	1.81	1.83	1.74	1.70	1.67	1.66	1.67	1.74
Austria					1.09	1.16	1.10	1.13							
Finland									1.31	1.19	1.24	1.12	1.10	1.32	1.16
France															
Non-household										0.87	0.86	0.85	0.84	0.85	0.89
Including household														1.10	1.15
West Germany				1.37	1.36	1.29	1.33	1.37	1.45	1.45	1.45	1.41	1.37	1.52	
Netherlands									1.11		1.18			1.26	
Norway														0.82	
United Kingdom						1.66				1.57				1.25	

Footnotes to Table 9-2

United States: Table 9-1, lines D.1 and A.2.

All other countries: Represent non-household expenditures, except as noted in the case of France, as shown in Organization for Economic Co-operation and Development, *Pollution Control and Abatement Expenditure in OECD Countries: A Statistical Compendium*, OECD Environment Monographs No. 38, November 1990, p. 40.

Table 9-3: POTENTIAL INCREASES IN ANNUAL CHARGES BY CITY SIZE BY THE YEAR 2000

(1986 dollars per household)

Municipality Size Category (population)	Number of Municipalities	Types of Regulations				Total
		Wastewater	Drinking Water	Solid Waste	Miscellaneous	
0 - 2,500	26,315	45	40	26	59	170
2,500 - 10,000	6,279	20	15	23	32	90
10,000 - 50,000	2,694	20	5	32	23	80
50,000 - 250,000	463	20	10	28	12	70
Over 250,000	59	60	15	51	34	160

## Footnotes to Table 9-3

User charge increases have been calculated using weighted average costs of new regulations. The costs that a municipality may incur will depend on the regulations it has to comply with.

Source: U.S. Environmental Protection Agency, *The Municipal Sector Study: Impacts of Environmental Regulations on Municipalities*, Office of Policy, Planning and Evaluation, Report EPA-230-09/88-038, September, 1988, p. v.

## 10. ENVIRONMENTAL TRENDS

This chapter presents data and information on historical trends in various measures that are suggestive of the level of environmental quality over time. The objective is to provide some indication of the “output” of the pollution control costs presented in this report. As only indicators of environmental quality, these data are not readily comparable to the monetary cost estimates. Pollution controls have resulted in substantial and valuable national benefits in the form of improved human health, recreational opportunities, visibility, and general environmental integrity. An ideal comparison of the costs and benefits of pollution control would require that these benefits be identified, quantified, and monetized. This is an extremely difficult and data intensive task and far beyond the scope of this report.

Instead, this chapter relies on historical data on estimated air and water pollutant emissions and ambient pollution levels, and information on the production and regulation of hazardous waste and toxic substances to provide an indication of environmental quality levels over time. While this provides some indication of changing environmental quality levels, it does not adequately show the degree of environmental protection afforded by cumulative pollution control efforts. In the absence of controls, increasing population and levels of economic activity would have resulted in steadily decreasing environmental quality over time. In order to adequately show environmental quality improvements resulting from pollution controls, we would need to compare current levels of environmental quality indicators with estimated levels that would have prevailed in the absence of cumulative pollution control efforts. Except in the case of the criteria air pollutants emissions, such comparisons are precluded by the available data. For all other environmental indicators discussed in this chapter, no data are available on what these might have been in the absence of pollution control efforts.

The data presented for different environmental media and regulatory program areas are of widely varying quantity and quality. As might be expected, nationwide data on the more mature pollution control programs, such as those directed to air and water quality, are more extensive and better than those for the newer regulatory programs. The data and information on various environmental quality indicators are shown in Figures 10-1 through 10-15, and Tables 10-1 through 10-13. These data are summarized below in the following sections:

- 10.1. Air Quality;
- 10.2. Water Quality;
- 10.3. Land Quality; and
- 10.4. Exposure to Chemicals.

### 10.1. AIR QUALITY

Historical trends in emissions of the six criteria air pollutants or their precursors—particulate matter (PM), sulfur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>), volatile organic compounds (VOCs), carbon monoxide (CO), and lead (Pb)—and trends in ambient air quality with respect to these pollutants are discussed in this section. Because one of the criteria air pollutants, ozone, is a secondary pollutant

formed by the reaction of reactive volatile organic compounds and nitrogen oxides, emissions of reactive volatile organic compounds and nitrogen oxides (a criteria pollutant in its own right) are measured rather than ozone. The data indicate that since 1970 there has been a substantial decrease in emissions of these six pollutants except nitrogen oxides. In terms of ambient air quality, clear improvements have been observed with respect to every criteria pollutant (the same six pollutants with ozone substituted for volatile organic compounds) except ozone. The experience with ozone has been mixed. Despite these improvements, many regions of the country are still not in compliance with the National Ambient Air Quality Standards (NAAQSs) associated with one or more of the criteria pollutants.

### *10.1.1. Pollutant Emissions*

Table 10-1 presents estimates of national emissions over the period 1940-1988 by source category for particulate matter, sulfur oxides, nitrogen oxides, volatile organic compounds, carbon monoxide and lead.<sup>1</sup> (The data for lead in years prior to 1970 are incomplete.) According to these estimates, emissions of all the criteria air pollutants except nitrogen dioxide fell between 1970 and 1988. Historical emissions for each criteria pollutant are discussed separately below.

#### *10.1.1.1. Particulates*

Over the period 1970-1988, total air emissions of particulates declined by 63 percent. Emissions from industrial and stationary fuel combustion sources decreased significantly over the period due to the introduction of pollution controls on these sources. Solid waste emissions also declined as a result of restrictions on solid waste burning. Emissions from transportation sources increased slightly over the period, however. This is probably due to the large increases in the number of motor vehicles and miles travelled over time, which have offset the benefits of increasingly stringent pollution control requirement on mobile sources.

#### *10.1.1.2. Sulfur Oxides*

Over the period 1970-1988, total air emissions of sulfur oxides declined by approximately 28 percent. Stationary fuel combustion source emissions declined by 23 percent due in part to greater reliance on low sulfur fuels and in part to limited pollution control requirements. Industrial emissions decreased by 47 percent as a result of the introduction of controls on smelters and sulfuric acid plants. Emissions from transportation sources, which historically have accounted for a relatively small portion of total emissions, increased by approximately 30 percent over the period. Again, this is probably the result of significant increases in the number of vehicles and miles travelled over time.

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<sup>1</sup> These data are from: U.S. Environmental Protection Agency, *National Air Pollution Estimates 1940-1988*, Office of Air Quality Planning and Standards, National Air Data Branch, March 1990, and other reports in this series, 1984-1987.

#### 10.1.1.3. Nitrogen Oxides

Total air emissions of nitrogen oxides increased by approximately seven percent over the period 1970-1988. Emissions from transportation sources, which increased by approximately 123 percent from 1970 to 1980, have since fallen back to year 1970 levels. Emissions from stationary fuel combustion sources increased approximately 18 percent. This increase probably would have been much greater were it not for the introduction of pollution controls on coal-fired electric utility boilers. Industrial source emissions, which have historically been relatively low, did not change over the period. Solid waste emissions, which also have been relatively low, decreased by more than 50 percent.

#### 10.1.1.4. Volatile Organic Compounds

Over the period 1970-1988, total emissions of volatile organic compounds declined by 25 percent. Transportation source emissions declined by 40 percent due to the adoption of air pollution controls on motor vehicles. Industrial source emissions declined only slightly, however, and remain the largest source of total VOC air emissions. Stationary fuel combustion source emissions, which are a relatively small portion of total emissions, increased by approximately 30 percent over the period. This increase is probably the result of higher levels of residential fuel combustion. Solid waste emissions of VOC declined by 40 percent over the period.

#### 10.1.1.5. Carbon Monoxide

Total emissions of carbon monoxide declined by 39 percent over the period 1970-1988. Transportation emissions, by far the major source, decreased by 44 percent as a result of emission controls on motor vehicles, despite an increasing number of vehicles and miles driven. Stationary fuel combustion sources, on the other hand, increased by 64 percent from 1970 to 1988, due in part to increased levels of residential wood burning. Industrial source emissions declined by 48 percent due to the elimination of outdated processes and limited application of pollution controls. Solid wastes, which have historically accounted for the second largest share of carbon monoxide air emissions, declined by 43 percent over the period.

#### 10.1.1.6. Lead

Over the period 1970-1988, emissions of lead declined by over 96 percent. Transportation emissions, which accounted for over 80 percent of total lead emissions in 1970, declined by more than 98 percent from 1970 to 1980 due to the move towards unleaded gasoline. Emissions from industrial and stationary fuel combustion sources, which are the second and third largest sources of airborne lead, respectively, each declined by more than 90 percent over the period as a result of pollution control requirements. Emissions from solid wastes declined by 63 percent over the period.

### 10.1.2. Effects of Pollution Controls on Air Emissions

Table 10-2 shows the estimated impact that air pollution controls have had on emissions of the six criteria air pollutants or their precursors. Actual emissions in each of the years 1984-88 are compared to estimates of emissions that would have occurred in these years if pollution controls pursuant to the Clean Air Act had not been introduced. Figure 10-1 shows actual emissions for years 1984-1988 as a percentage of hypothesized emissions in these years at the 1970 level of control.

The data indicate that by 1984 air pollution controls had resulted in substantial reductions in air emissions for all of the criteria air pollutants from levels that would have been observed in the absence of controls:

ACTUAL EMISSIONS AS A PERCENTAGE OF EMISSIONS  
USING 1970 LEVELS OF CONTROL

Year	Particulate Matter	Sulfur Dioxide	Nitrogen Oxides	Volatile Organic Compounds	Carbon Monoxide	Lead
1984	33	71	82	60	56	19
1988	30	58	72	58	43	3

For example, particulate matter emissions were 33 percent of what they would otherwise have been without the introduction of additional controls since 1970. In other words, pollution controls adopted since 1970 eliminated an estimated 67 percent of the particulates that would otherwise have been emitted into the atmosphere in 1984. By this measure, there has been continued improvement in air emissions since 1984, as shown in Figure 10-2, which illustrates actual emissions in 1988 as a percentage of estimated 1988 emission at the 1970 level of control.

### 10.1.3. Ambient Air Quality

Figures 10-4 through 10-9 show boxplot trends in ambient air concentrations of the six criteria air pollutants—particulates, sulfur dioxide, nitrogen dioxide, ozone, carbon monoxide and lead—between the years 1979 and 1988.<sup>2</sup> Air quality data before the mid-1970s are of questionable quality, and thus are not included in the estimated trends. Below, the boxplots are used to examine trends in average ambient pollutant concentrations over time and to compare estimated concentrations with the NAAQS for each pollutant.

Taken as a whole, the data show a downward national trend in average ambient concentrations for the criteria air pollutants over the ten year period. Annual average concentration of particulates fell by over 20 percent over the period; sulfur oxide concentrations by over 35 percent; carbon monoxide concentrations by about 32 percent; and lead concentrations by 88 percent. Moreover,

<sup>2</sup> Refer to Figure 10-3 for an explanation of the plotting conventions used in the boxplots.

except in the case of ozone, between 75 and 90 percent of all sites sampled showed average pollutant concentrations less than or equal to the NAAQS for each pollutant.

There are many regions of the country that are not in compliance with one or more NAAQS, however. In 1987, an estimated 21.5 million people lived in counties where average particulate levels were above the NAAQS for particulate matter; 1.6 million people lived in areas that exceeded the sulfur dioxide standards; 29.4 million people lived in areas that exceeded the carbon monoxide standards, 7.5 million people lived in areas that exceeded the standard for nitrogen dioxide level; 2.8 million people lived in areas that exceeded the lead standard; and 88.6 million people lived in areas where ozone levels were above the NAAQS level.

## 10.2. WATER QUALITY

In recent years, pollutant loadings for both industrial and municipal point source of water pollution have been well below those experienced in the early 1970s. Municipal point source improvements are primarily the result of better control technology. Industrial point source improvements are also the result of increased and improved control technology, as well as manufacturing process changes and increased discharges to public treatment facilities. While municipal discharges are now well below those experienced in 1970, they have been steadily increasing in recent years. Moreover, the available evidence suggests that improvements in in-stream water quality resulting from decreased point source pollution loadings have been negated to a large extent by increasing pollution loadings from non-point sources. Water pollution discharges and estimates of ambient water quality are discussed in more detail below.

### *10.2.1. Discharges*

Data on pollutant discharges to water bodies are summarized in Tables 10-3 through 10-5. The data, which shows direct discharges from municipal and industrial point sources as well as non-point sources, are discussed below.

#### 10.2.1.1. Municipal

Table 10-3 presents data on municipal treatment plant discharges of total suspended solids (TSS) and biological oxygen demand (BOD), two traditional water pollution indicators, in selected years over the period 1960-1988. The population levels served by municipal systems in these years are also shown in the table. The data shows that discharges of both pollutants increased significantly over the period 1960-1973. By 1980, the level of both pollutants had fallen considerably, however, but this was followed by a gradual rise in pollutant loadings over the 1980s. By 1988, municipal discharges of both TSS and BOD were comparable to those experienced in the 1960s, but were still well below the year 1973 levels.

The increase in pollution loadings from municipal treatment plants in recent years is probably due to a large increase in the volume handled by such facilities. This is the result of an increase in the number of people served by municipal systems, as well as a significant increase in the amount of

industrial and commercial wastes, both pretreated and untreated, being processed by municipal treatment plants. The increase in the volume of wastes handled by municipal systems would probably have resulted in much greater discharges of pollutants had it not been for expanded pollution controls. Improved water pollution controls have resulted in “cleaner” discharges from these facilities in terms of lower concentrations of pollutants per volume of wastewater released into waterways.

#### 10.2.1.2. Industrial

Table 10-4 shows direct discharges of TSS and BOD in 1973 and the period 1982-1987 for major industrial categories. The data show that for these industries, total industrial discharges of BOD declined by 93 percent over the two time periods, and discharges of suspended solids declined by 96 percent. One important reason for these declines is that more industrial wastes are being discharged to municipal treatment plants instead of directly to water bodies. Currently, only about 27 percent of total BOD discharges from these industries are made directly to water bodies, and only 39 percent of suspended solids discharges.<sup>3</sup> Better and more widely applied control technology and treatment techniques as well as manufacturing process changes are also responsible for the dramatic reduction in direct discharges from industrial sources.

Total municipal and industrial water discharges in 1973 and in the mid-1980s are shown graphically in Figure 10-10 in order to highlight the significant reductions in conventional pollutant discharges over time. The biggest reduction was in discharges of total suspended solids, although there was also a significant reduction in biological oxygen demand over this period.

#### 10.2.1.3. Non-point Source

Table 10-5 shows data on discharges of four conventional water pollutants—biological oxygen demand, suspended solids, nitrogen, and phosphorus—from various non-point and point sources in years 1973 and 1980. The non-point sources include agriculture, silviculture, and urban runoff. The point sources include municipal and industrial discharges. The table also shows the shares of total discharges of conventional pollutants accounted for by non-point and point sources, respectively, in each of the two years. Comparisons of the point and non-point sources of discharges are useful even though they are limited somewhat by gaps in the available data.

The data indicate that discharges of each pollutant except nitrogen increased significantly between 1973 and 1980. Nitrogen discharges are shown to have decreased slightly over the period due to the reported year 1973 nitrogen loadings from silviculture, which are eighteen times that reported for 1980. This large discrepancy may well be the result of differences in the sampling methodology used to measure forest discharges of nitrogen over the two years, however. The data also show that the increases in year 1980 discharges over those experienced in 1973 are the result of

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<sup>3</sup> U.S. Environmental Protection Agency, *Summary of Effluent Characteristics and Guidelines for Selected Industrial Point Source Categories*, Office of Water Regulations and Standards, October 1988.

increased non-point source loadings. In general, point source discharges decreased from 1973 to 1980, but this was more than made up for by large increases in non-point source discharges. The increase in non-point source discharges was driven primarily by agricultural discharges, which historically have accounted for the bulk of all non-point loadings. In 1980, agricultural discharges of each of the conventional pollutants listed in Table 10-5 were more than 60 percent of those experienced in 1973.

Taken as a whole, the data indicate that discharges of conventional water pollutants have been increasing over time. Moreover, while point-source discharges appear to be decreasing, non-point source loadings are increasing and more than offsetting point source gains. Finally, the data suggests that non-point sources account for the vast majority of all discharges of conventional water pollutants. This conclusion is backed by more recent research that found that non-point sources account for almost 100 percent of total sediment loadings, 84 percent of phosphorous loadings, and 82 percent of nitrogen loadings.<sup>4</sup>

### 10.2.2. Ambient Water Quality

Figure 10-11 includes the results of water pollution sampling at various stations around the country in years 1974 to 1981. The table shows the number of sampling stations that recorded increased or decreased levels of a variety of common water pollutants and trace elements in some year in the period 1974-1981 as compared to the previous most recent sampling results. The results for several pollutants are discussed below.

Stations with observed decreases in dissolved oxygen deficits, which result from BOD loadings, outnumbered stations with increasing values three to two, suggesting success in point source control by industry over the period. Decreases in fecal bacteria were also widespread and might be attributed to the success of municipal treatment systems.

The summary conclusions of the source<sup>5</sup> for the Figure 10-11 data indicate that much of these point source gains have been offset by increases in non-point source loadings. Some of these conclusions with regards to non-point sources discharges follow below.

Increases in suspended sediments are closely associated with land uses that historically have had high soil erosion rates. In other words, non-point sources are primarily responsible for the observed increases in this pollutant. Decreases in phosphorous levels over the period were attributed to point source controls, while phosphorus increases were attributed to increased levels of non-point source loadings. Nitrates increased significantly and were strongly associated with fertilized land and land

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<sup>4</sup> Leonard P. Gianessi, et al., *Nonpoint Source Pollution: Are Cropland Controls the Answer?*, Resources for the Future, 1986.

<sup>5</sup> R.A. Smith, et al., "Water Quality Trends in the Nation's Rivers", *Science*, V. 235, March 1987.

supporting livestock. Additionally, atmospheric deposition of nitrogen, although small, was found to be significant in the East and Midwest regions of the country. Increases in sodium, chloride, and sulfate were attributed to the use of highway salts and to surface coal mining. Increased levels of arsenic and cadmium suggest increased atmospheric deposition from fossil fuel combustion. The significant decreases shown for lead were attributed to the decline in atmospheric deposition of lead from vehicular fuel combustion.

### 10.3. LAND QUALITY

#### *10.3.1. Hazardous Waste Management*

Table 10-6 presents estimates of hazardous waste generation and management in years 1981 and 1985 based on two national surveys conducted in the early and mid-1980s, respectively.<sup>6</sup> Direct comparison of the two data sets are limited somewhat by changes in the definition of hazardous waste and waste generators for the year 1981 and 1985 data. Some general comparisons can be made, however, and these are useful because they span years before and after much of the first phase of RCRA regulations were put in place. Most of the current RCRA regulatory program was implemented after 1985, however, and thus is not reflected in the data.

The data show that only slight more waste was generated in 1985 than in 1981. The slightly higher waste generation reported in 1985 was most likely due to the wider definition of hazardous waste used in the later survey and its inclusion of more than three times the number of small-quantity generators than were included in year 1981 survey. The relative shares of total wastes accounted for by different classes of generators changed somewhat between the two years, however. While the share of total waste generation accounted for by chemical and petroleum industries was slightly more than 70 percent in each of the two years, the share accounted for by metals-related industries dropped significantly from 1981 to 1985. The data also show that there were more commercial treatment, storage, and disposal facilities in 1981 than in 1985. Some facilities probably closed after 1981 due to lack of certification or profitability, or concern about more stringent prospective regulation.

Table 10-7 includes data on the use of the various waste treatment and disposal options for years 1983-1987 collected in a national survey of selected commercial hazardous waste management firms.<sup>7</sup> The data show an increase in the use of incineration and landfill disposal options over the period, and a decrease in the use of deep-well injection. Recently promulgated rules restricting the land disposal

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<sup>6</sup> The 1981 data are from: Westat, Inc., *National Survey of Hazardous Waste Generators and Treatment, Storage, and Disposal Facilities Regulated Under RCRA in 1981*, Prepared for the US EPA Office of Solid Waste, April 1984. The 1985 data are from: Research Triangle Institute, *1986 National Screening Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities*, Prepared for the US EPA Office of Solid Waste, September 1988.

<sup>7</sup> ICF, Inc., *1986-1987 Survey of Selected Firms in the Commercial Hazardous Waste Industry*, Prepared for the US EPA Office of Policy Analysis, 1988.

of hazardous waste will most likely increase the use of waste recovery, treatment, and incineration in future years. Much waste will continue to be landfilled, however, until alternative disposal options become more widely available.

### 10.3.2. Hazardous Waste Remediation

Table 10-8 presents data on EPA activities under the Superfund Program, which is directed to cleaning-up abandoned hazardous waste sites. The data show that first-starts for hazardous waste removals, site investigation studies, remedial design studies, and remedial actions (*i.e.*, site clean-ups) increased steadily throughout the 1980s except for a drop in 1985-1986, when the controlling legislation was reauthorized. It should be noted that each type of activity takes well beyond one year to complete, and some activities, such as remedial actions, require several years for completion. Data for private sector activities under the program are not shown in the table. Private actions have increased steadily in recent years, but currently represent only about one-third of all Superfund activity.

### 10.3.3. Underground Storage Tanks

Table 10-9 shows data on the existing world of underground storage tanks and estimated rates of future growth in the use of different types of tanks. Bare steel tanks, currently the most widely used type, are expected to be phased out rapidly over the next several years and replaced with more leak resistance tank varieties required by the recently promulgated technical standards rule. Figure 10-12 shows the decline in the production of bare steel tank over the period 1980-1987. The figure also shows that production of protected tanks increased from roughly 15 percent of total tank production in 1980 to over 60 percent in 1987. Table 10-10 shows production data for protected tanks over the period 1980-1987.

## 10.4. EXPOSURE TO CHEMICALS

### 10.4.1. Toxic Substances

More than 65,000 chemical substances are licensed for manufacture or processing for commercial use in the United States. Figure 10-14 shows that notifications of intent to bring new chemicals into domestic production and/or use have been received by EPA for over 1000 new chemicals each year since 1982. This level of new chemical introduction is up sharply from levels experienced in the 1970s and early 1980s, and is expected to continue into the future. By the end of fiscal year 1985, EPA had received a cumulative total of 6,200 pre-manufacturing notices for new chemical introductions; this had jumped to 9,132 by the end of fiscal year 1987, however. As of 1987, EPA had prohibited or restricted the manufacture, use, or distribution of a total of 553 new chemicals.<sup>8</sup>

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<sup>8</sup> U.S. Environmental Protection Agency, *Environmental Progress and Challenges: EPA's Update*, EPA-230-07-88-033, August 1988.

Table 10-11 shows domestic production levels for selected industrial chemicals over the period 1960-1984. Generally, the data show increasing production of chemicals over time except for polychlorinated biphenols (PCBs) and benzene. Production of PCBs began to fall in 1973 and eventually ceased in 1978 as a result of an EPA ban on the chemical. (Figure 10-13 shows the persistence of PCBs in human tissue over the period 1972-1973). Benzene production also has decreased since 1980, reflecting EPA action to limit the uses of this chemical.

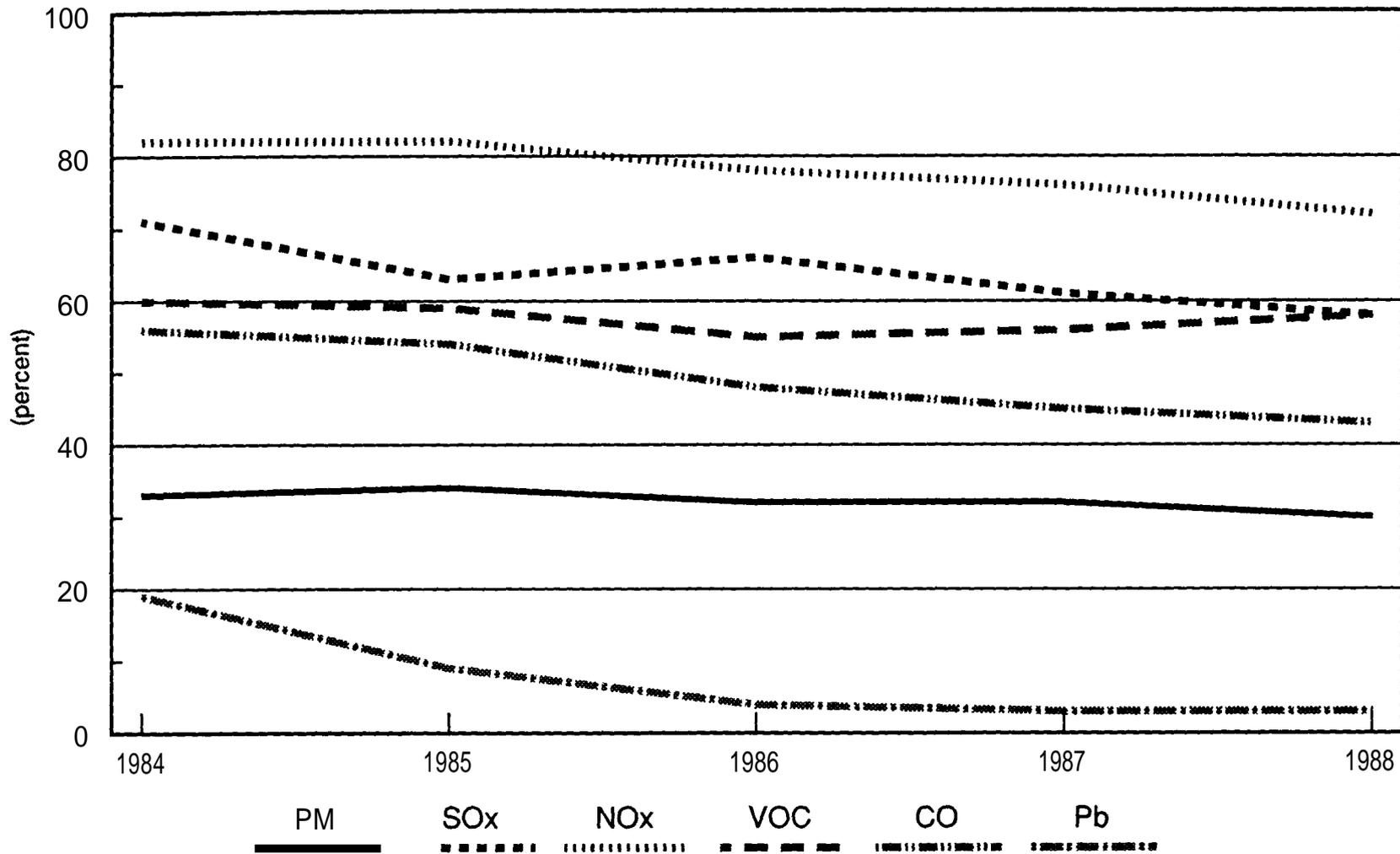
#### *10.4.2. Pesticides*

Table 10-12 shows data on annual use of pesticides in the U.S. and the estimated agricultural share over the period 1964-88. Table 10-13 shows total U.S. pesticide use by type over the period 1979-88. The data indicate that after increasing steadily over the 1960s and 1970s, pesticide use peaked in 1981 and has since fallen off somewhat. This is the result of the stabilization of agricultural pesticide use in recent years, which currently accounts for approximately 75 percent of total pesticide use. This trend towards lower use is probably the result of several factors, including lower application rates due to more efficient pesticide use and the introduction of more potent pesticides. The efficiency of pesticide use has improved as a result of more and better certification programs, more widespread use of integrated pest management techniques, and more detailed pesticide labelling. Increase interest in low input agricultural methods and reduced agricultural commodity price supports may further depress pesticide use in future years.

Table 10-14 shows the number of active ingredients that have been registered under FIFRA since 1967 for a variety of different pesticide types. Although the data show no clear trends, pesticide registration in the second decade was 20 percent less than experienced over the first. Also, there were more registrations of insecticides and herbicides than for other pesticides, with insecticides having a slightly higher total than herbicides. Since 1985, however, the registration of insecticides has dropped off while the registration of herbicides has increased. This may reflect the shift in usage patterns between the two pesticide types.

Figure 10-15 maps the presence of selected banned pesticides in human tissue over the period 1970-1983. The data show that some pesticides remain stored in human bodies, particularly in fatty tissue, long after their use has ceased.

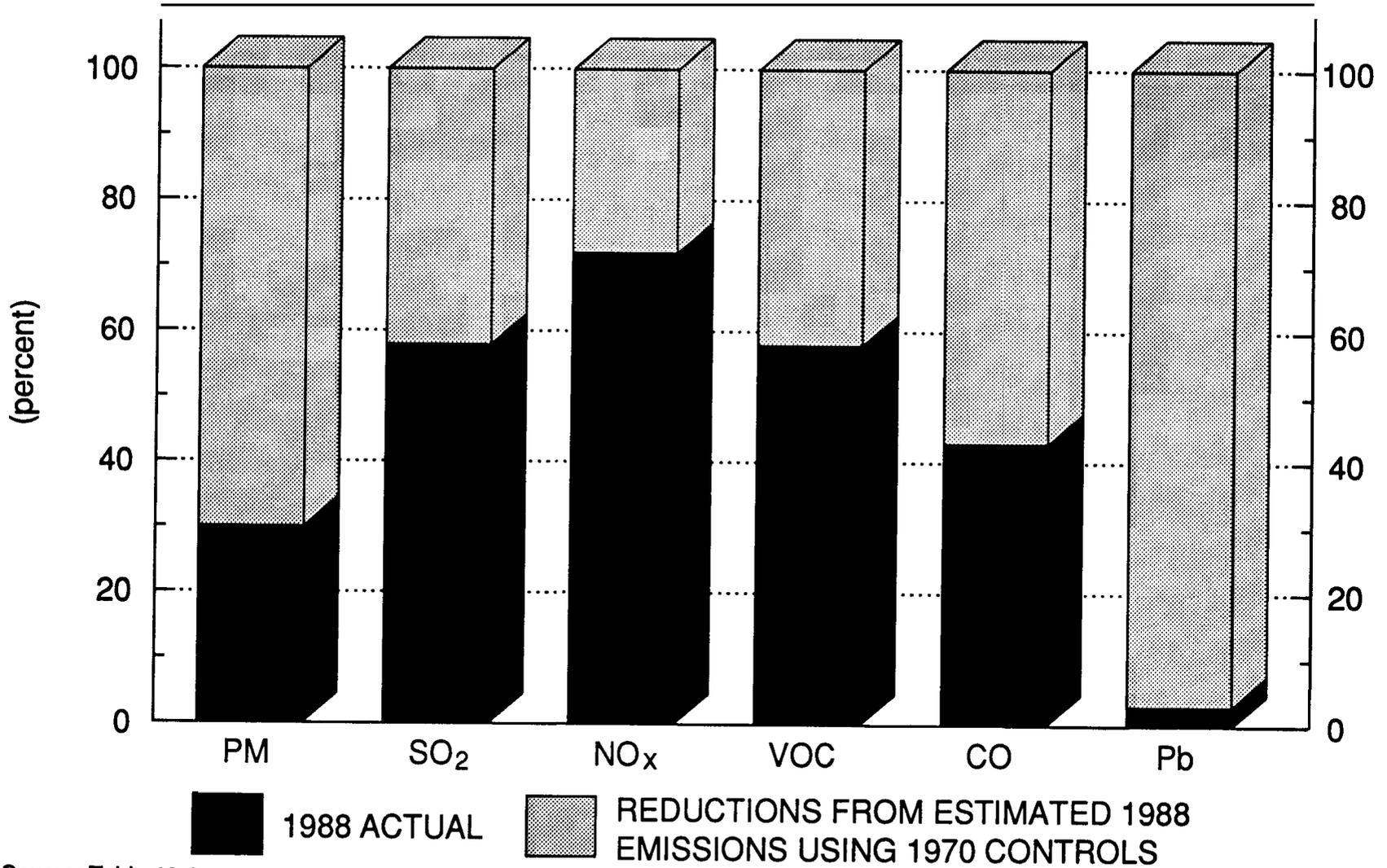
**Fig. 10-1: ACTUAL EMISSIONS AS A PERCENTAGE OF HYPOTHESIZED EMISSIONS AT THE 1970 LEVEL OF CONTROL**



Source: Table 10-2

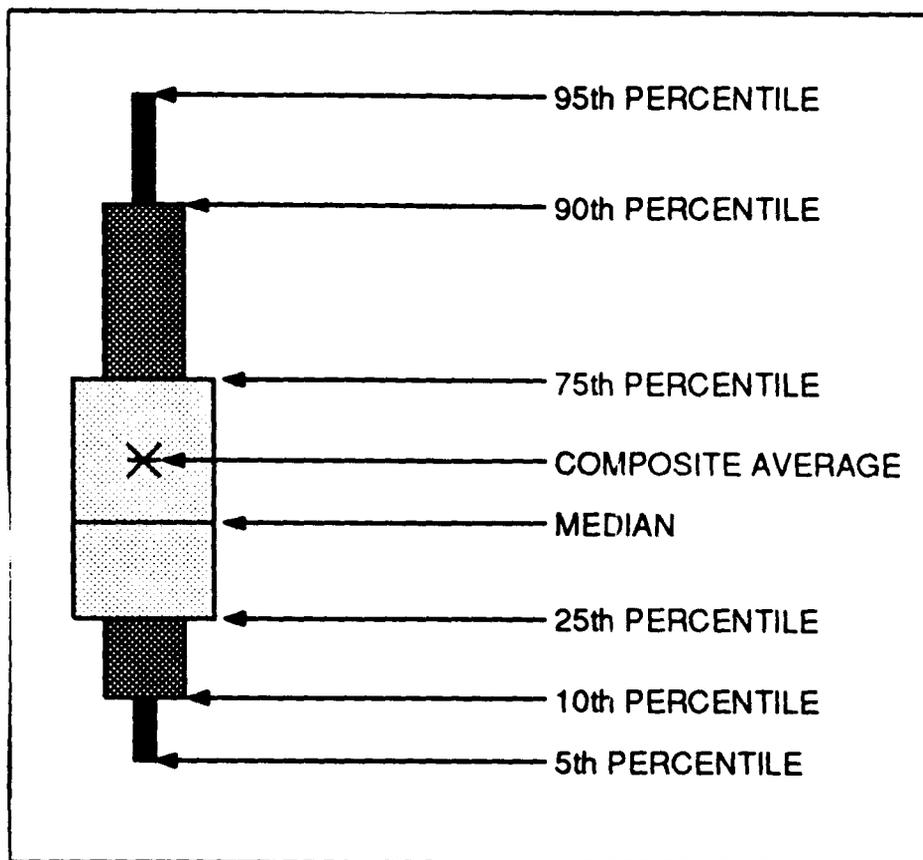
November 1990

**Fig. 10-2: ACTUAL 1988 EMISSIONS AS A PERCENTAGE OF ESTIMATED 1988 EMISSIONS AT THE 1970 LEVEL OF CONTROL**



Source: Table 10-2

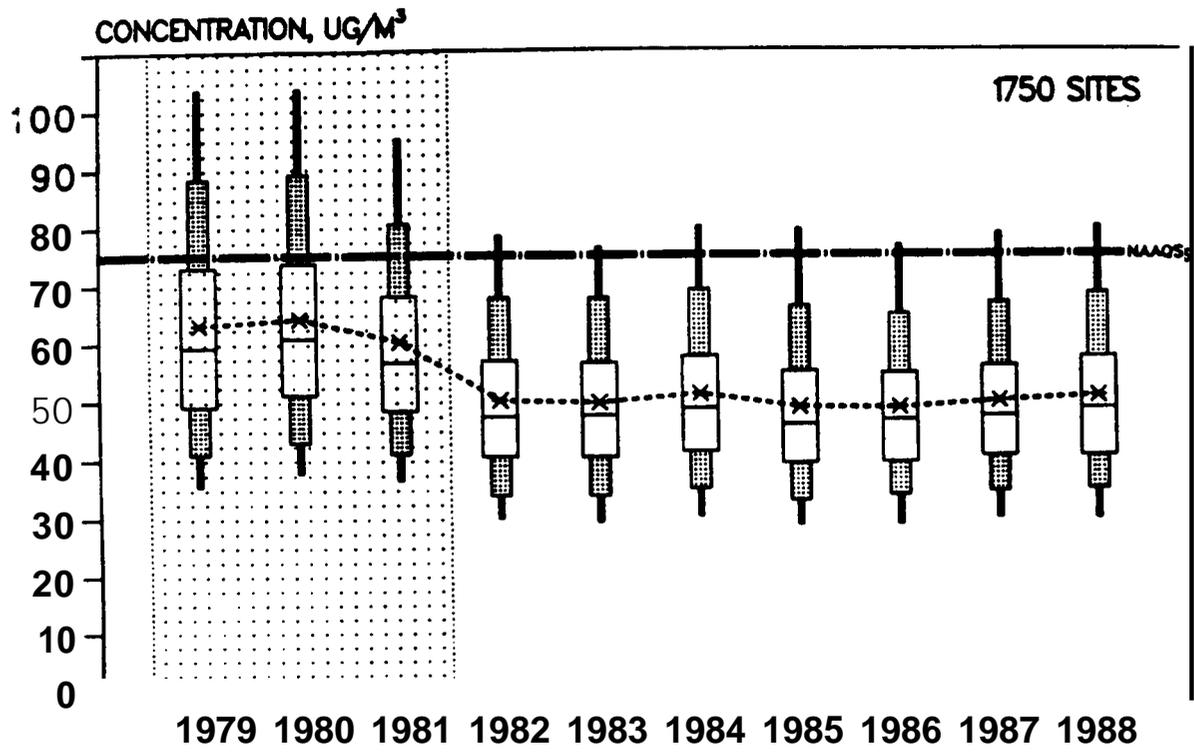
Fig. 10-3: ILLUSTRATIONS OF PLOTTING CONVENTIONS FOR BOXPLOTS



Source: U.S. EPA, *National Air Quality and Emissions Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

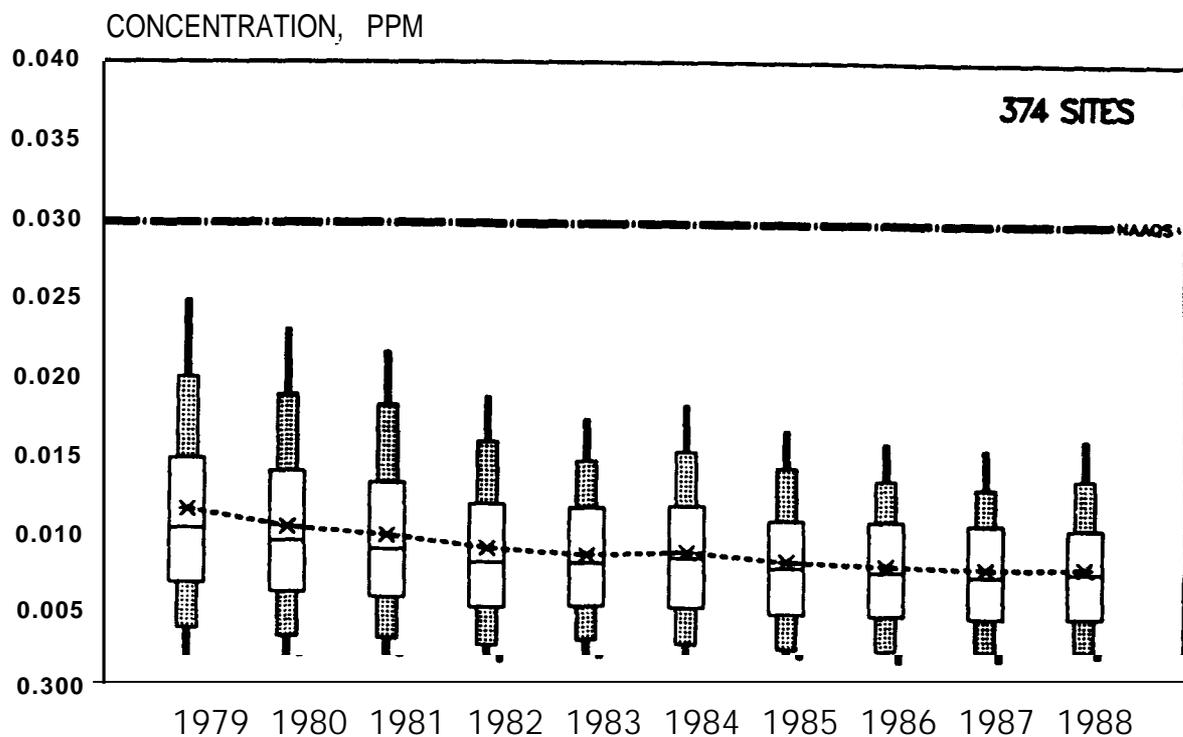
November 1990

**Fig. 10-4: ANNUAL GEOMETRIC MEAN TOTAL SUSPENDED PARTICULATE CONCENTRATIONS**



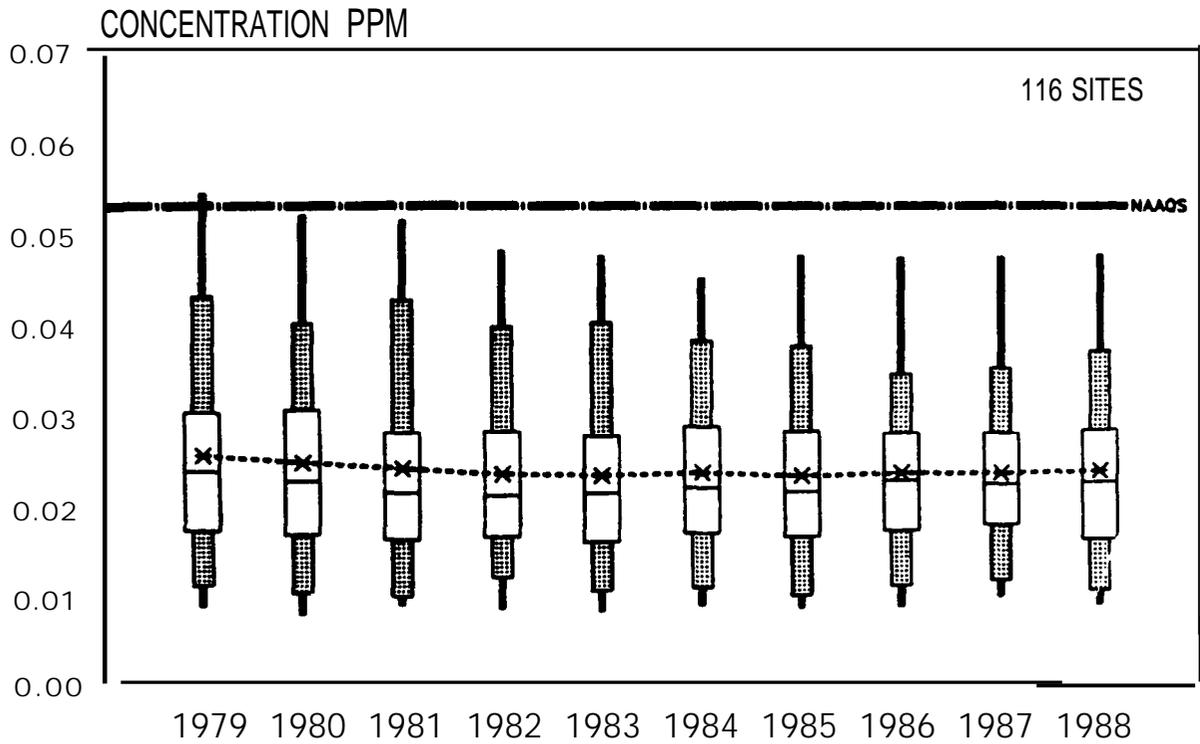
Source: U.S. EPA, *National Air Quality and Emission Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

Fig. 10-5: ANNUAL MEAN SULFUR DIOXIDE CONCENTRATIONS



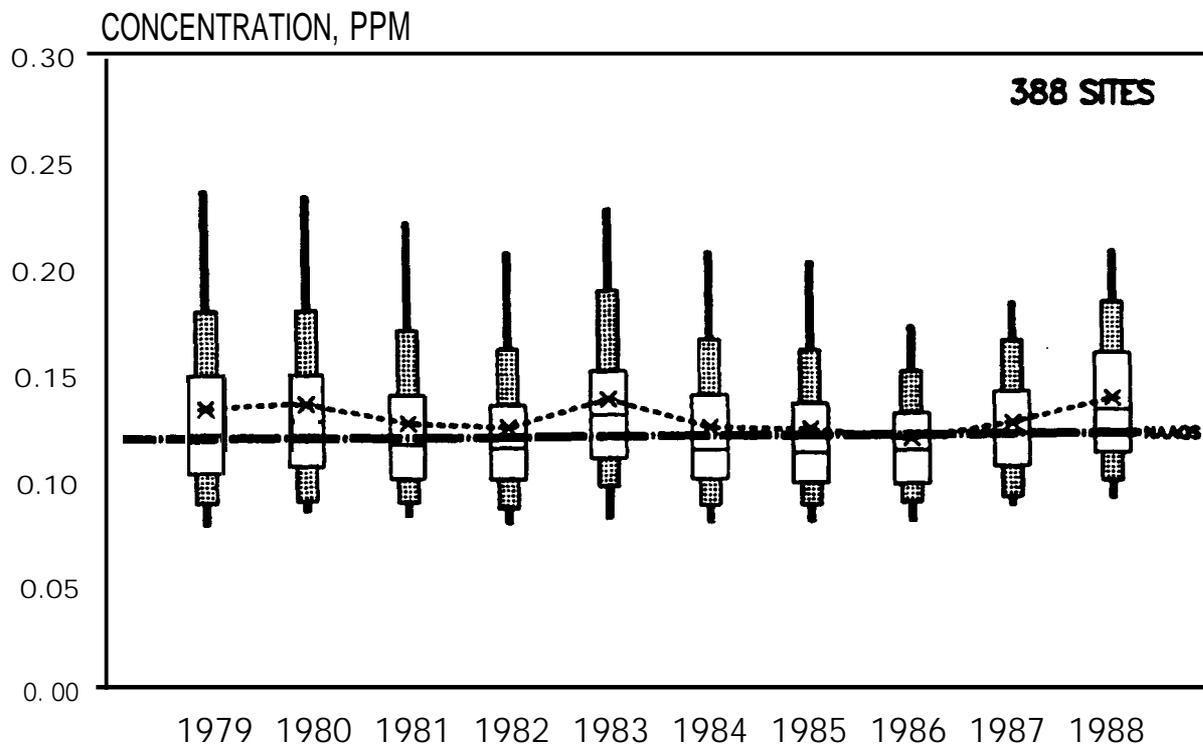
Source: U.S. EPA, *National Air Quality and Emissions Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

**Fig. 10-6: ANNUAL MEAN NITROGEN DIOXIDE CONCENTRATIONS**



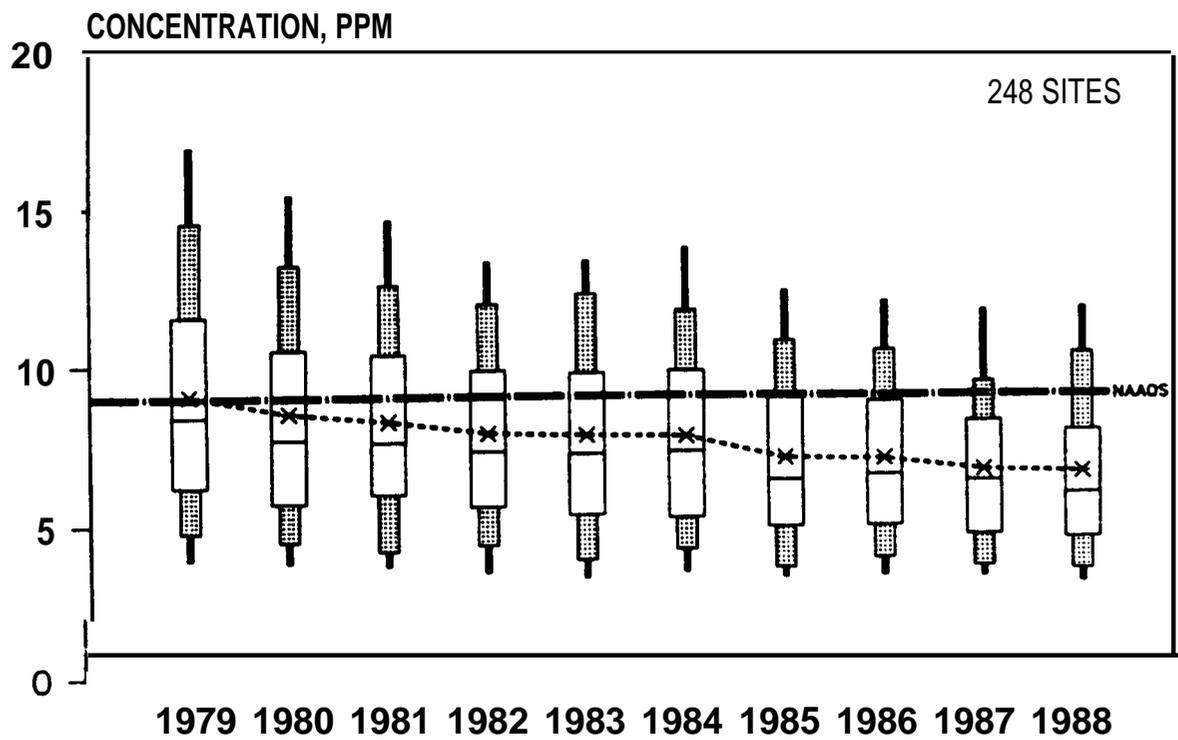
Source: U.S. EPA, *National Air Quality and Emissions Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

**Fig. 10-7: ANNUAL SECOND-HIGHEST DAILY MAXIMUM  
1-HOUR OZONE CONCENTRATIONS**



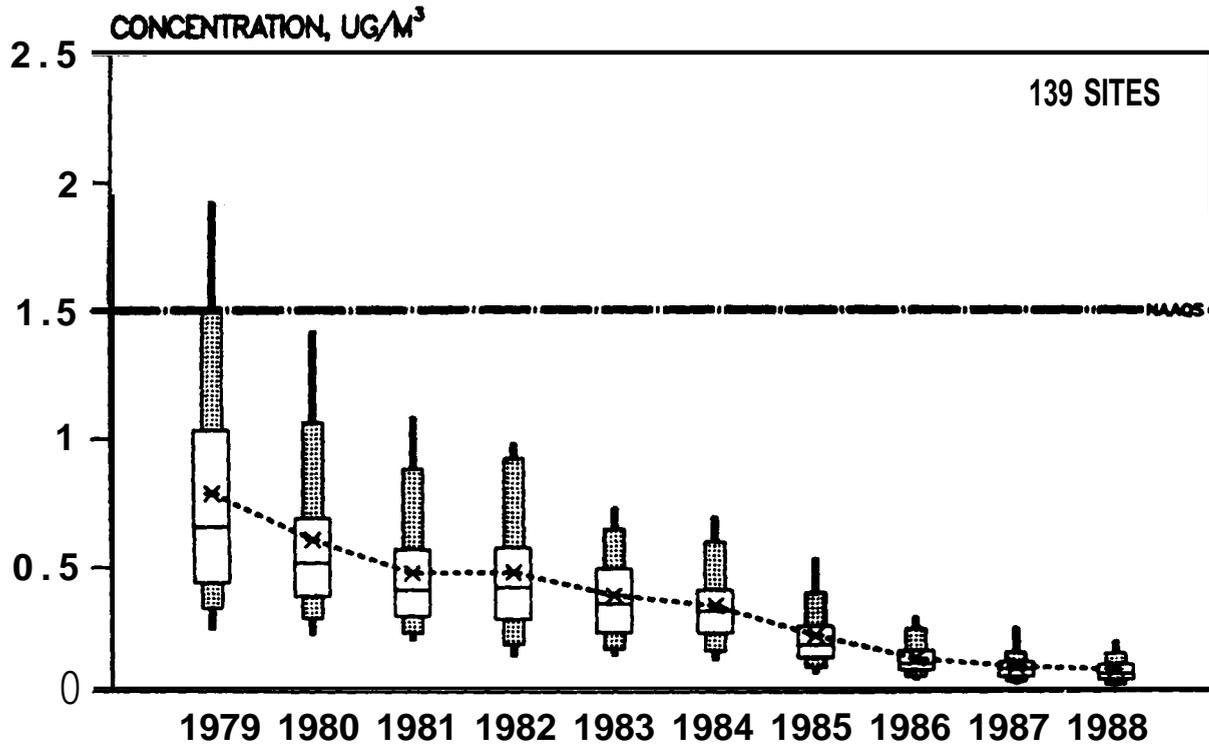
Source: U.S. EPA, *National Air Quality and Emissions Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

**Fig. 10-8: ANNUAL SECOND-HIGHEST NONOVERLAPPING 8-HOUR AVERAGE CARBON MONOXIDE CONCENTRATIONS**



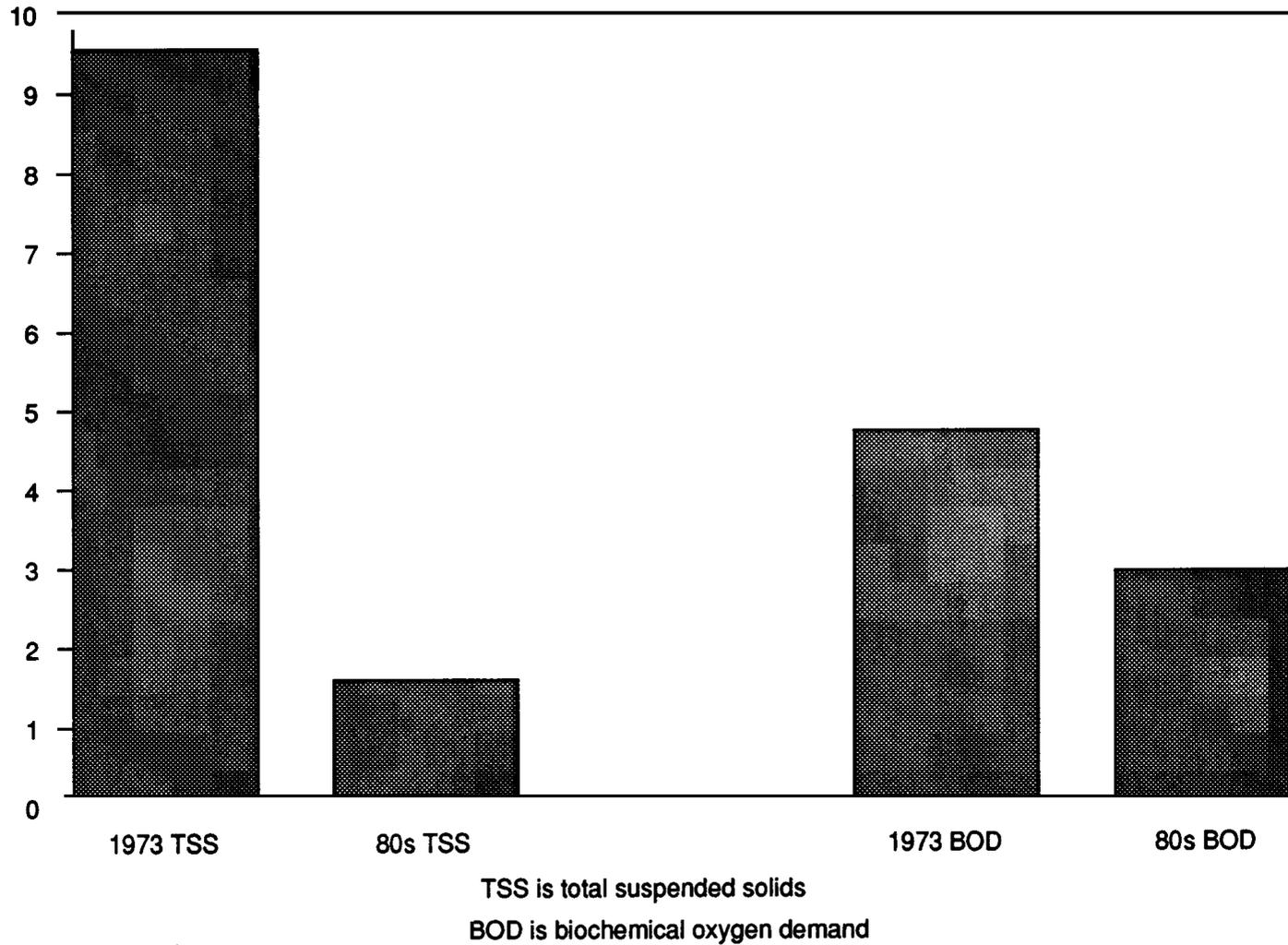
Source: U.S. EPA, *National Air Quality and Emission Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

Fig. 10-9: ANNUAL MAXIMUM QUARTERLY AVERAGE LEAD CONCENTRATIONS



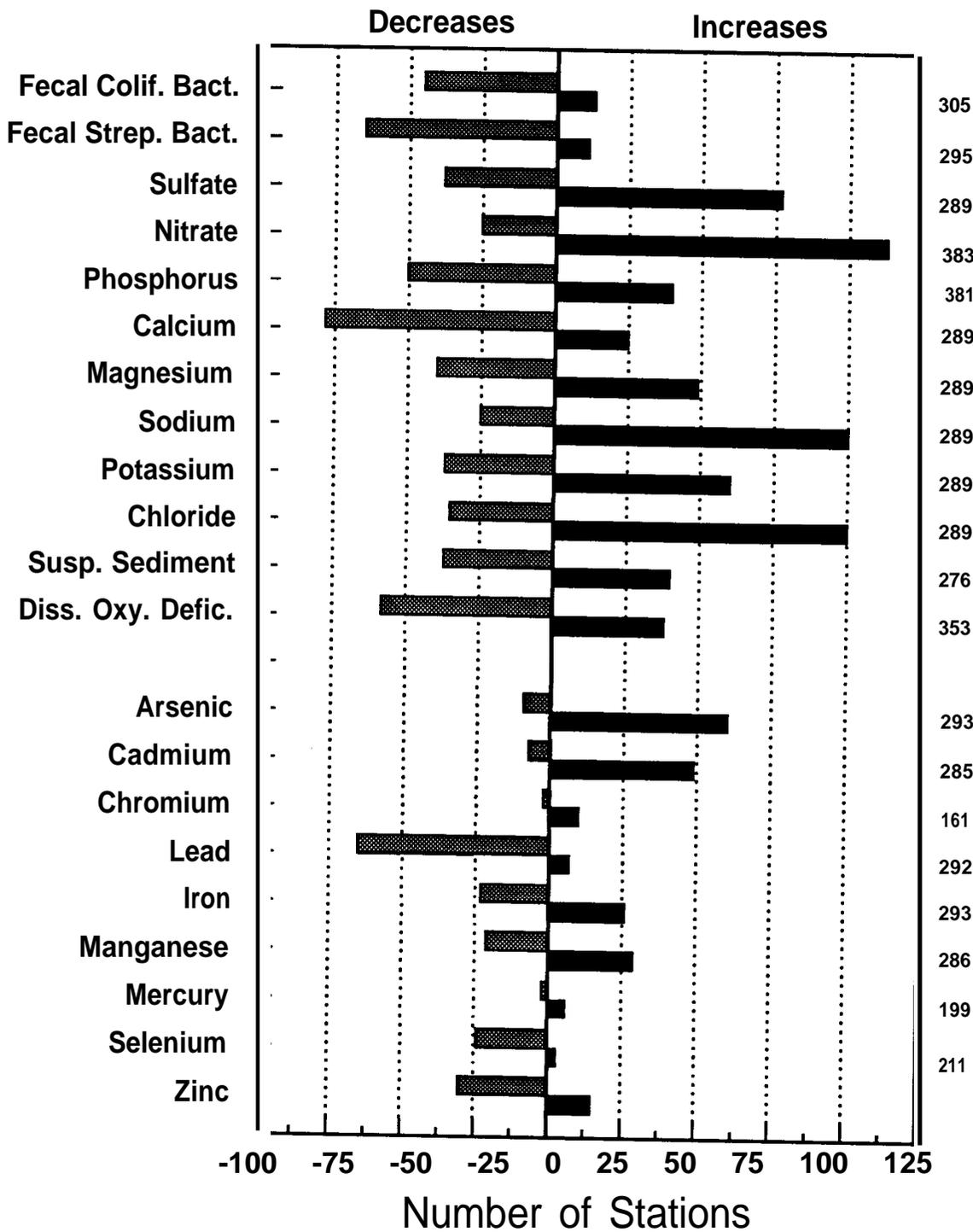
Source: U.S. EPA, *National Air Quality and Emissions Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

**Fig. 10-10: MUNICIPAL AND INDUSTRIAL WATER DISCHARGES IN 1973 AND THE MID-1980S**



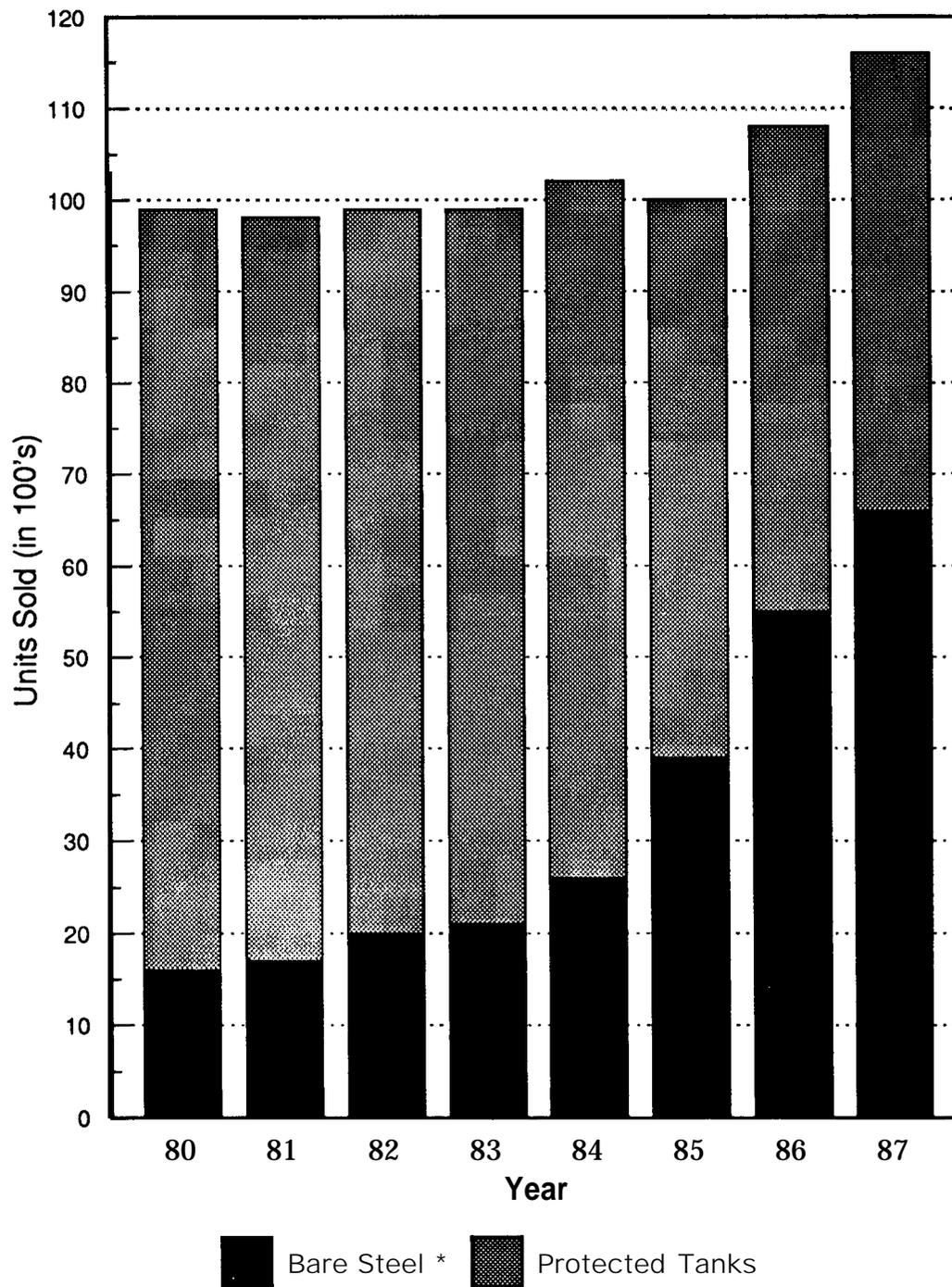
Source: Tables 10-3 and 10-4

Fig. 10-11: WATER QUALITY TRENDS, 1974-1981



Source: R. A. Smith *et. al.*, "Water Quality Trends in the Nation's Rivers", *Science* V. 235, March 1987.

Fig. 10-12: STEEL TANK VERSUS PROTECTED TANK PRODUCTION, 1980-1987

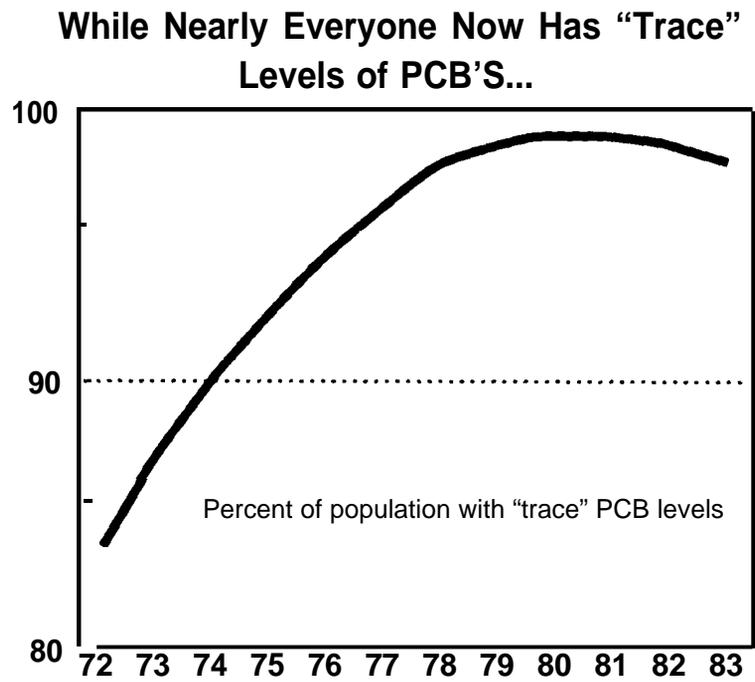


\*Includes unregulated tanks

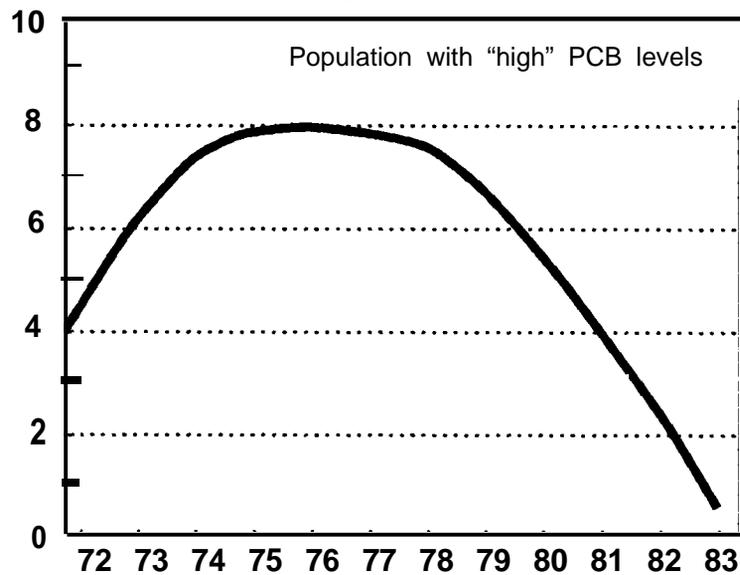
Source: Fiberglass Petroleum Tank and Pipe Institute, Technomics, STI registration files.

November 1990

Fig. 10-13: PERSISTENCE OF PCBs IN HUMANS, 1972-1983

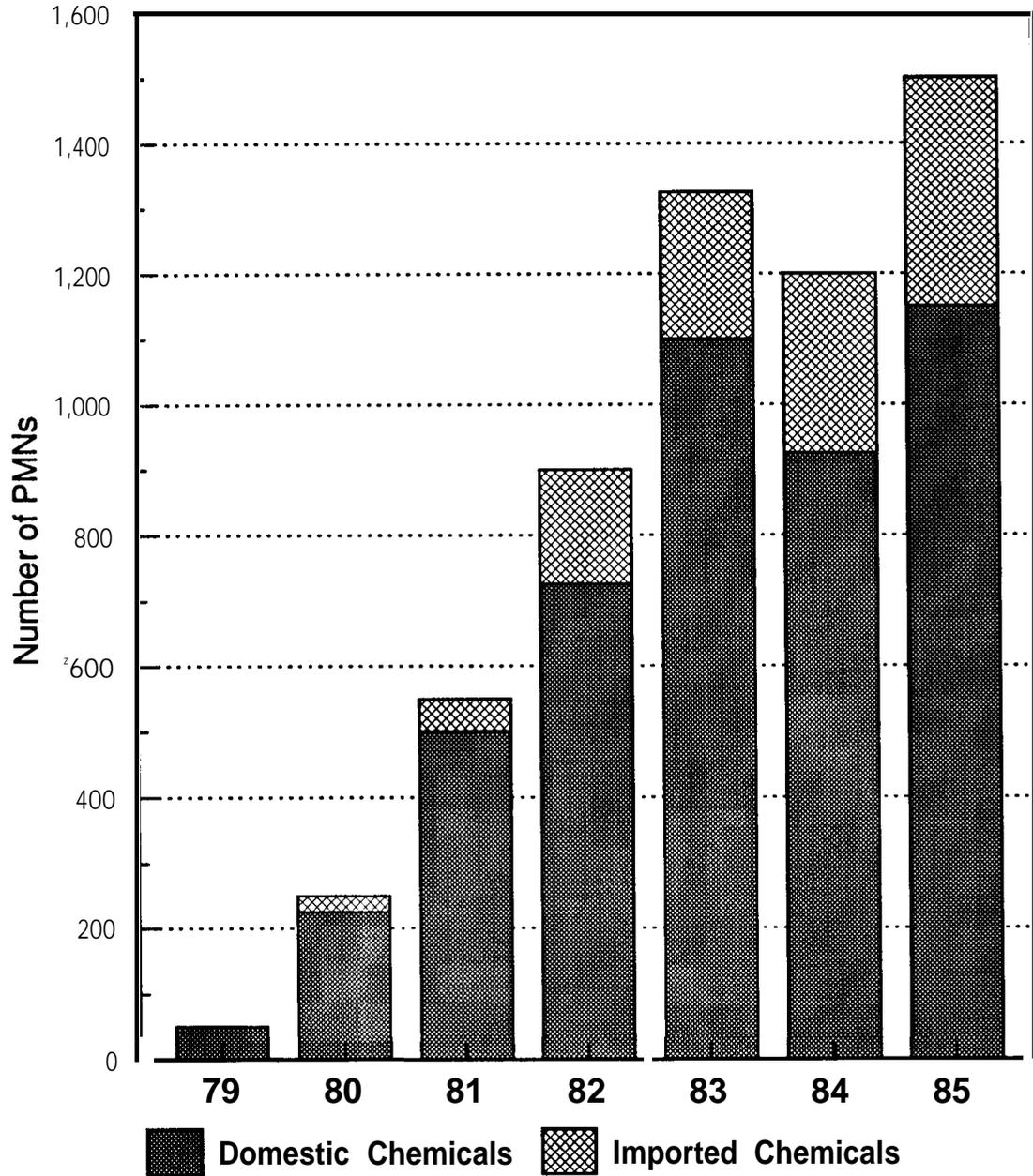


**...The Percentage of Population with "High" Levels Has Gone Down**



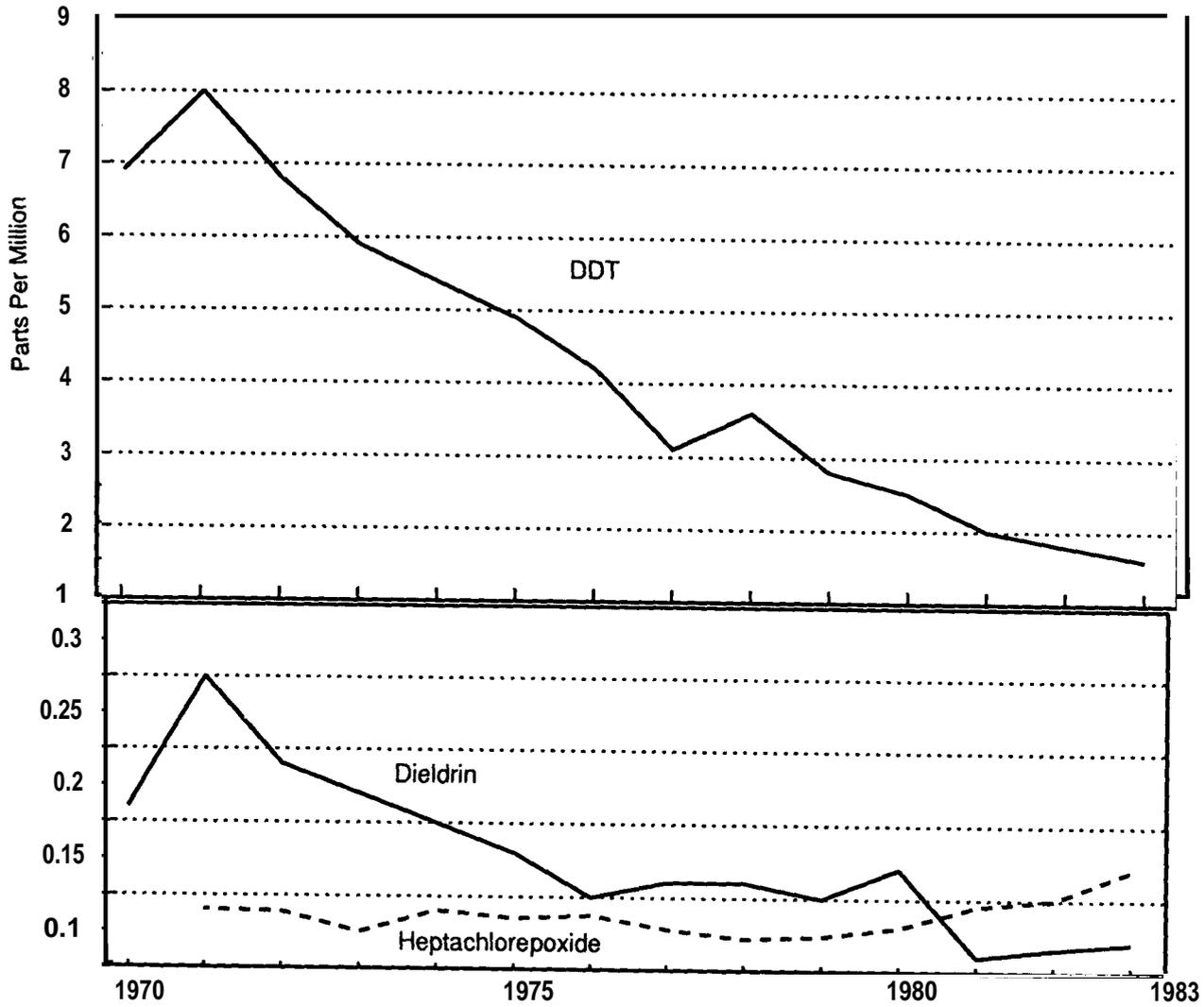
Source: U.S. EPA, *Environmental Progress and Challenges: EPA Update*, Office of Policy Planning and Evaluation, August 1988.

**Fig. 10-14: TRENDS IN PRE-MANUFACTURE NOTICES (PMNS) FOR NEW CHEMICALS RECEIVED BY EPA, 1979-1985**



Source: U.S. EPA, *Chemical Control in the United States: Accomplishments Under the New Chemicals Program*, Office of Toxic Substances, October 1986.

**Fig. 10-15: CONCENTRATIONS OF SELECTED PESTICIDES IN HUMAN TISSUE IN THE U.S., 1970-1983**



**1972- Most uses of DDT cancelled.**

**1974- Most uses of Dieldrin cancelled.**

**1983- Most uses of heptachlor cancelled or registrations denied.**

Source: Reprinted from Conservation Foundation, *State of the Environment: A View Towards the 1990s*, 1987.

Table 10-1: NATIONAL AIR EMISSIONS ESTIMATES BY SOURCE CATEGORY FOR SELECTED YEARS 1940-1988

(teragrams)

Pollutant/Source Category	1940	1950	1960	1970	1975	1980	1983	1984	1985	1986	1987	1988
Particulates	23.1	24.9	21.6	18.5	10.6	8.5	7.1	7.4	7.1	6.8	7.0	6.9
Transportation	2.7	2.1	0.7	1.2	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4
Sta. Source/Fuel Combust.	7.5	7.0	5.7	4.6	2.8	2.4	2.0	2.1	1.8	1.8	1.8	1.7
Industrial Process	8.7	12.7	12.5	10.5	5.2	3.3	2.4	2.8	2.8	2.5	2.5	2.6
Solid Waste/Misc.	4.2	3.1	2.7	2.2	1.3	1.5	1.4	1.2	1.1	1.1	1.3	1.2
Sulfur Oxides	17.6	19.8	19.7	28.3	25.8	23.4	20.7	21.5	21.1	20.9	20.6	20.7
Transportation	2.9	2.3	0.4	0.6	0.7	0.9	0.8	0.8	0.9	0.9	0.9	0.9
Sta. Source/Fuel Combust.	11.0	12.9	14.0	21.3	20.2	18.7	16.7	17.4	17.0	16.9	16.6	16.4
Industrial Process	3.7	4.6	5.3	6.4	5.0	3.8	3.3	3.3	3.2	3.1	3.2	3.4
Solid Waste/Misc.	0.5	0.5	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nitrogen Oxides	6.9	9.4	13.0	18.5	19.5	20.9	19.3	19.8	19.8	19.0	19.3	19.8
Transportation	2.3	3.6	5.1	8.0	9.3	9.8	8.9	8.8	8.9	8.3	8.0	8.1
Sta. Source/Fuel Combust.	3.4	4.7	6.7	9.1	9.3	10.1	9.6	10.2	10.2	10.0	10.5	10.8
Industrial Process	0.2	0.3	0.5	0.7	0.7	0.7	0.5	0.6	0.6	0.6	0.6	0.6
Solid Waste/Misc.	1.0	0.8	0.7	0.7	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.3
Volatile Organic Compounds	15.2	18.1	21.0	25.0	21.1	21.1	19.3	20.3	19.1	18.3	18.6	18.6
Transportation	4.7	6.8	9.4	10.3	8.8	7.5	7.1	7.2	6.9	6.5	6.4	6.1
Sta. Source/Fuel Combust.	1.8	1.3	0.8	0.6	0.6	0.9	1.0	1.0	0.9	0.9	0.9	0.9
Industrial Process	3.3	5.4	6.3	8.9	8.3	9.2	7.9	8.8	8.5	8.1	8.3	8.5
Solid Waste/Misc.	5.4	4.6	4.5	5.1	3.4	3.5	3.3	3.3	2.8	2.8	3.0	3.0
Carbon Monoxide	82.6	87.6	89.7	101.4	84.1	79.6	74.5	71.8	67.0	63.1	64.1	61.2
Transportation	29.9	44.7	58.2	74.4	65.0	56.1	52.4	50.6	47.9	44.6	43.2	41.2
Sta. Source/Fuel Combust.	16.3	11.6	7.1	4.5	4.3	7.4	8.2	8.3	7.4	7.5	7.6	7.6
Industrial Process	6.6	10.5	9.3	8.9	6.9	6.3	4.3	4.7	4.4	4.3	4.5	4.7
Solid Waste/Misc.	29.8	20.8	15.1	13.6	7.9	9.8	9.6	8.2	7.3	6.7	8.8	7.7
Lead (10s of short tons/yr)	NA	NA	NA	203.8	147.0	70.6	46.4	40.1	21.1	8.6	8.0	7.6
Transportation				163.6	122.6	59.4	40.8	34.7	15.5	3.5	3.0	2.6
Sta. Source/Fuel Combust.				9.6	9.3	3.9	0.6	0.5	0.5	0.5	0.5	0.5
Industrial Process				23.9	10.3	3.6	2.4	2.3	2.3	1.9	1.9	2.0
Solid Waste/Misc.				6.7	4.8	3.7	2.6	2.6	2.8	2.7	2.6	2.5

Footnotes to Table 10-1

Note: To obtain tons/yr, divide number by 1.1 -- they are now in teragrams/yr. NA = Not Available

Source: U.S. EPA, *National Air Pollutant Emission Estimates 1940-1988*, Office of Air Quality Planning and Standards, National Air Data Branch, March 1990, and other reports in this series 1984-1987.

Table 10-2: EFFECTS OF AIR POLLUTION CONTROLS ON 1984-1988 EMISSIONS

(millions of metric tons)

	1984	1985	1986	1987	1988
PM					
Actual Emissions	7.0	7.3	6.8	7.0	6.9
Estimated Emissions Using 1970 Level of Control	21.1	21.6	21.3	22.1	23.1
Actual Emissions as a Percent of Emissions Using 1970 Level of Control	33%	34%	32%	32%	30%
SO <sub>2</sub>					
Actual Emissions	21.4	20.7	21.2	20.4	20.7
Estimated Emissions Using 1970 Level of Control	30.2	32.6	32.0	33.6	35.6
Actual Emissions as a Percent of Emissions Using 1970 Level of Control	71%	63%	66%	61%	58%
NO <sub>x</sub>					
Actual Emissions	19.7	20.0	19.3	19.5	19.8
Estimated Emissions Using 1970 Level of Control	23.9	24.3	24.6	25.5	27.5
Actual Emissions as a Percent of Emissions Using 1970 Level of Control	82%	82%	78%	76%	72%
VOC					
Actual Emissions	21.5	21.3	19.5	19.6	18.6
Estimated Emissions Using 1970 Level of Control	36.0	35.8	35.7	34.9	32.2
Actual Emissions as a Percent of Emissions Using 1970 Level of Control	60%	59%	55%	56%	58%
CO					
Actual Emissions	69.9	67.5	60.9	61.4	61.2
Estimated Emissions Using 1970 Level of Control	124.6	125.7	127.4	136.4	142.0
Actual Emissions as a Percent of Emissions Using 1970 Level of Control	56%	54%	48%	45%	43%
Pb					
Actual Emissions	.040	.021	.009	.008	.007
Estimated Emissions Using 1970 Level of Control	.207	.223	.227	.230	.233
Actual Emissions as a Percent of Emissions Using 1970 Level of Control	19%	9%	4%	4%	3%

## Footnotes to Table 10-2

Metric tons divided by 1.1 equals short tons.

Sources: U.S. EPA, *National Air Pollutant Emission Estimates 1940-1988*, Office of Air Quality Planning and Standards, National Air Data Branch, March 1990, and other reports in this series 1984-1987.

Table 10-3: MUNICIPAL WASTE DISCHARGES IN SELECTED YEARS 1960-1988  
(millions of tons)

Source No.	Year	Constituent Loadings		Population Served(10 <sup>6</sup> )
		TSS	BOD	
3	1988	2.131	2.359	176
4	mid-80s	1.311	1.352	172(est)
5	1983	1.234	1.236	169
5	1980	1.161	1.163	159
6	1973	3.000	2.900	148(est)
7	1970	2.596	2.882	144
8	1963	2.169	2.398	120
5	1960	1.987	2.206	110

Footnotes to Table 10-3

TSS is total suspended solids.  
BOD is biological oxygen demand.

For 1988 loadings calculations: Removed amounts were given; 76 and 80 percent removable rates were assumed for BOD and TSS respectively.

For 1980, 1983 calculations: Removal rates (76/BOD, 80/TSS) were given; raw loads 0.167 lbs. BOD/per/day and 0.2 lbs. SS/per/day were assumed.

For 1960, 1970 loadings calculations: for BOD, 0.167 lbs/per/day and 34 percent removal assumed; for TSS, assumed 0.2 lbs/per/day and 51 percent removal assumed.

Table 10-4: INDUSTRIAL WASTE DISCHARGES IN 1973 AND 1982-1987

(millions of tons)

Industry	1973		1982-1987	
	BOD	TSS	BOD	TSS
Pulp and Paper	0.949	1.117	0.091	0.150
Org. Chem., Plastics, & Synthetics	0.718	0.054	0.031	0.050
Petroleum Refining	0.057	0.015	0.006	0.012
Iron and Steel	0.020	1.283	---	0.023
Inorganic Chemicals	0.003	0.573	---	0.030
Textiles	0.063	0.055	0.004	0.009
Ore Mining and Dressing	---	3.444	---	0.011
Leather Tanning	0.020	0.022	---	---
Total	1.830	6.563	0.132	0.285

## Footnotes for Table 10-4

TSS is total suspended solids.  
BOD is biological oxygen demand.

Source: U.S. EPA, *Summary of Effluent Characteristics and Guidelines for Selected Industrial Point Source Categories*, Office of Water Regulations and Standards, October 1988, and R. A. Luken and E. H. Pechan, *Water Pollution Control: Assessing the Impacts and Costs of Environmental Standards*, Praeger Press, 1977.

Table 10-5: NON-POINT SOURCE DISCHARGES IN 1973 AND 1980  
(millions of tons)

Source	1973				1980				
	BOD	SS	N	P	BOD	SS	N	P	
NON-POINT SOURCE (NPS)									
Agriculture	8.57	1,799	4.26	1.49	14.00	3,090	6.80	2.64	
Urban Runoff	1.66	0.03	0.64	0.09	0.50	20	0.39	0.09	
Forest	NA	NA	2.70	0.04	0.80	256	0.15	0.02	
Total Non-Point Source	10.23	1,800	7.63	1.63	15.3	3,366	7.34	2.75	
POINT SOURCE (PS)									
Municipal	2.90*	3.00*	1.00	0.23	1.16*	1.16*	NA	NA	
Industrial	1.83**	6.56**	NA	NA	0.13**	0.28**	NA	NA	
Total Point Source	4.73	9.56	1.00	0.23	1.29	1.45	---	---	
Total NPS + PS	14.96	1,809	8.63	1.86	16.59	3,367	7.34	2.75	
Percent NPS (%)	68	99	88	88	92	99	---	---	

Footnotes to Table 10-5

BOD is biological oxygen demand.  
 SS is suspended solids.  
 N is nitrogen.  
 P is phosphorus.

\* from Table 10-3.  
 \*\* from Table 10-4.  
 NA = Not Available.

Sources: 1973 data are from U.S. National Commission on Water Quality, *Public Law 92-500 Water Quality Analysis and Environmental Impact Assessment: Technical Report*, March 1976.

1980 data are from U.S. Council on Environmental Quality, *Environmental Quality*, Eighteenth Annual Report, 1987-88.

Table 10-6: RCRA HAZARDOUS WASTE GENERATION AND MANAGEMENT IN 1981 AND 1985  
(millions of metric tons)

	1981	1985
RCRA-regulated Hazardous Waste Generated	264	272
Chemical & Petroleum (SIC 28,29)	71%	72%
Metal Related Industries (SIC 33-37)	22%	4%
Other Industries	7%	24%
Waste Management Facilities <sup>a</sup>	4818	2971
Treatment	1495	1597
Storage	4299	2585
Disposal	430	817
Recycling	**	846

## Footnotes to Table 10-6

a Some facilities are counted more than once because they perform more than one waste handling function.

\*\* Although no recycling facilities were specifically tabulated in 1981, 43 percent of generators surveyed indicated that they were recycling.

Sources: The 1981 data are from Westat, Inc., *National Survey of Hazardous Waste Generators and Treatment, Storage, and Disposal Facilities Regulated under RCRA in 1981*. Prepared for the U.S. EPA Office of Solid Waste, April 1984.

The 1985 data are from Research Triangle Institute, *1986 National Screening Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities*. Prepared for the U.S. EPA Office of Solid Waste, September 1988.

Table 10-7: HAZARDOUS WASTE HANDLED BY SELECTED COMMERCIAL FIRMS, 1983-1987

(thousands of metric tons)

Disposal Technology	Year				
	1983	1984	1985	1986	1987
Incineration	169	224	270	352	473
Resource Recovery	313	243	316	264	331
Landfill	1609	2082	2352	2306	2454
Chemical/Biological Treatment	989	1074	1133	950	1014
Solidification	66	76	NA	NA	NA
Deepwell Injection	727	476	416	273	268
Totals	3873	4175	4487	4145	4540

Footnotes to Table 10-7

NA = Not Available.

Source: ICF, Inc., *1986-1987 Survey of Selected Firms in the Commercial Hazardous Management Industry*. Prepared for the U.S. EPA Office of Policy Analysis, 1988.

Table 10-8: SELECTED EPA SUPERFUND ACTIONS, 1981-1988

(First-Starts)

	Year							
	1981	1982	1983	1984	1985	1986	1987	1988
Removals	28	60	129	208	196	175	254	220
Investigation Studies	21	32	112	127	129	37	127	93
Design Studies	5	4	7	16	19	26	70	69
Remedial Actions	0	9	9	16	8	12	35	51

## Footnotes to Table 10-8

Source: U.S. EPA, *Progress Toward Implementing Superfund Fiscal Year 1987*, Office of Emergency and Remedial Response, April 1989, and a later report in this series dated March 1990.

Table 10-9: THE EXISTING UNDERGROUND STORAGE TANK WORLD

Type of Tank	Present Share of Population (%)	Estimated Number in Existence(10 <sup>3</sup> ) <sup>a</sup>	Expected Future Growth Trend
Bare Steel	70-80	900-1,000	Rapid Decrease
Coated with CP <sup>b</sup>	8	100	Rapid Increase
FRP <sup>c</sup>	12-15	156-195	Moderate Increase
Composite Corrosion Resistant	5-8	65-100	Moderate Increase

Footnotes to Table 10-9

a. Based on EPA's estimate of 1,381,000 underground storage tank systems in existence.

b. CP= Cathodically protected plastic.

c. FRP = Fiberglass reinforced plastic.

Source: Jacobs Engineering Group, *Causes of Release from UST Systems*. Prepared for the U.S. EPA Office of Underground Storage Tanks, 1987.

Table 10-10: NEW GENERATION UNDERGROUND STORAGE TANK PRODUCTION, 1980-1987

Year	FRP <sup>a</sup>	Composite <sup>b</sup>	STIP3 <sup>c</sup>
1980	9,000	NA	NA
1981	10,000	NA	NA
1982	11,000	NA	NA
1983	12,000	3,000	NA
1984	13,000	6,500	7,000
1985	14,000	8,000	14,000
1986	15,000	10,000	28,000
1987 (est.)	16,000	12,500	45,000

## Footnotes to Table 10-10

FRP = Fiberglass reinforced plastic.

STIP3 = Externally plastic coated, cathodically protected.

a. Data from conversation with Ed Neshoff of the Fiberglass Reinforced Plastic Technology Institute.

b. Data from the Association of Clad Tankers.

c. Data from conversation with Wayne Geyer of the Steel Tank Institute.

NA = Not Available.

Table 10-11: U.S. PRODUCTION OF SELECTED CHEMICALS, 1960-1972

(millions of pounds)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Acrylonitrile	0.2292	0.2495	0.3601	0.4553	0.5942	0.7716	0.7161	0.6708	1.0210	1.1566	1.0393	0.9789	1.1147
Benzene	3.3430	3.9867	3.9442	4.7326	5.3380	6.0447	6.9830	7.0859	7.3110	8.6649	8.2860	7.8649	9.1554
Vinyl Chlorides	1.0370	1.0440	1.3115	1.4352	1.6150	2.000	2.4995	2.4236	2.9689	3.7359	4.0402	4.3358	5.0885
Phthalates	0.3447	0.3765	0.4700	0.5219	0.6014	0.6787	0.7545	0.7839	0.8406	0.8834	0.8551	0.9782	1.1457
PCBs	0.0379	0.0365	0.0384	0.0447	0.0508	0.0605	0.0658	0.0753	0.0753	0.0753	0.0753	0.0753	0.0753

Table 10-11A: U.S. PRODUCTION OF SELECTED CHEMICALS, 1973-1984

(millions of pounds)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Acrylonitrile	1.3542	1.4117	1.2146	1.5178	1.646	1.7523	2.0178	1.8299	1.9964	2.0352	2.1462	2.2192
Benzene	10.6233	10.8792	7.4848	10.4184	10.4972	10.8772	12.2271	11.5836	9.7893	7.8119	N/A	N/A
Vinyl Chlorides	5.3511	5.6212	4.1963	5.6769	5.9859	6.9411	6.3888	3.4659	6.8736	4.9018	6.8754	6.0846
Phthalates	1.2031	1.2073	0.9038	1.0429	1.2024	1.2587	1.2910	1.0541	1.1198	0.9416	1.1466	1.1791
PCBs	0.0422	0.0411	0.0297	0.0296	0.0133	0	0	0	0	0	0	0

Footnotes to Tables 10-11 and 10-11A

Source: U.S. Council on Environmental Quality, *Environmental Trends*, Washington, D.C., 1981, as reproduced in Source 22.

U.S. Environmental Protection Agency, Interagency Testing Committee, unpublished data, 1986. Synthetic organic chemicals for phthalates, acrylonitrile, benzene, and vinyl chloride. Washington, D.C.

U.S. Environmental Protection Agency, 1976. Toxic Substances Control Act. (Pub. L. 94-469), Section 6. Regulation of hazardous chemicals and mixtures, (e) Polychlorinated biphenyls. Washington, D.C.

Table 10-12: U.S. CONVENTIONAL PESTICIDE USAGE, TOTAL AND ESTIMATED AGRICULTURAL SECTOR SHARE

(millions of pounds active ingredients)

<b>Year</b>	<b>Total U.S.</b>	<b>Agricultural Sector</b>	<b>Agricultural Sector Shares (percent)</b>
1964	540	320	59
1965	610	335	55
1966	680	350	51
1967	735	380	52
1968	835	470	56
1969	775	430	55
1970	740	430	58
1971	835	495	59
1972	875	525	60
1973	910	560	62
1974	950	590	62
1975	990	625	63
1976	1,030	660	64
1977	1,075	720	67
1978	1,110	780	70
1979	1,150	840	73
1980	1,175	846	72
1981	1,205	860	71
1982	1,100	880	80
1983	953	733	77
1984	1,080	850	79
1985	1,112	861	77
1986	1,096	820	75
1987	1,085	815	75
1988	1,130	845	75

Footnotes to Table 10-12

Note: Excludes wood preservatives, disinfectants, and sulfur.

Source: U.S. EPA, *Pesticide Industry Sales and Usage: 1988 Market Estimates*, Office of Pesticide Programs, December 1989.*November 1990*

Table 10-13: U.S. ANNUAL VOLUME OF PESTICIDE USAGE, BY TYPE, 1979-1988

(millions of pounds of active ingredients)

Pesticide Type	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Herbicide	560	555	570	544	575	675	670	655	645	660
Insecticide	378	395	405	391	255	270	300	295	260	268
Fungicide	106	120	123	119	68	80	82	86	122	132
Other	106	105	107	106	55	55	60	60	60	70
Total	1,150	1,175	1,205	1,160	953	1,080	1,112	1,096	1,087	1,130

Footnote to Table 10-13

Source: Source: U.S. EPA, *Pesticide Industry Sales and Usage: 1988 Market Estimates*, Office of Pesticide Programs, December 1989.

Table 10-14: NUMBER OF CHEMICALS REGISTERED FOR THE FIRST TIME UNDER FIFRA, BY TYPE, 1967-1988

Year	Insecti ci de	Herbi ci de	Fungi ci de	Bacteri ci de/		Rodenti ci de	Other	Total Uses Regi stered	Total Chemi cal s Regi stered
				Sl i mi ci de	Nemati ci de				
1967	4	2	2	5	0	2	1	16	16
1968	6	2	5	4	0	0	1	18	18
1969	7	4	0	2	0	0	1	14	14
1970	1	2	2	3	0	0	2	10	10
1971	0	1	1	1	0	1	1	5	4
1972	4	5	6	5	0	0	1	21	21
1973	5	2	4	2	1	0	0	15	13
1974	6	8	6	0	1	1	0	22	22
1975	8	11	5	11	0	0	1	36	35
1976	2	3	2	4	0	0	1	12	12
1977	1	1	0	1	0	0	0	3	3
1978	2	2	0	0	0	0	1	5	5
1979	8	2	4	0	0	1	2	17	17
1980	4	3	1	0	0	2	1	11	11
1981	4	3	2	1	0	0	6	16	16
1982	5	5	1	1	0	2	3	17	17
1983	5	5	3	1	0	0	0	14	14
1984	6	1	2	2	0	1	2	14	13
1985	8	1	1	1	0	0	2	13	10
1986	2	7	0	0	1	0	2	12	11
1987	3	5	0	1	1	0	2	12	11
1988	2	5	1	0	1	0	2	11	11

Footnotes to Table 10-14

Source: U.S. EPA, *Pesticide Industry Sales and Usage: 1988 Market Estimates*, Office of Pesticide Programs, December 1989.*November 1990*